

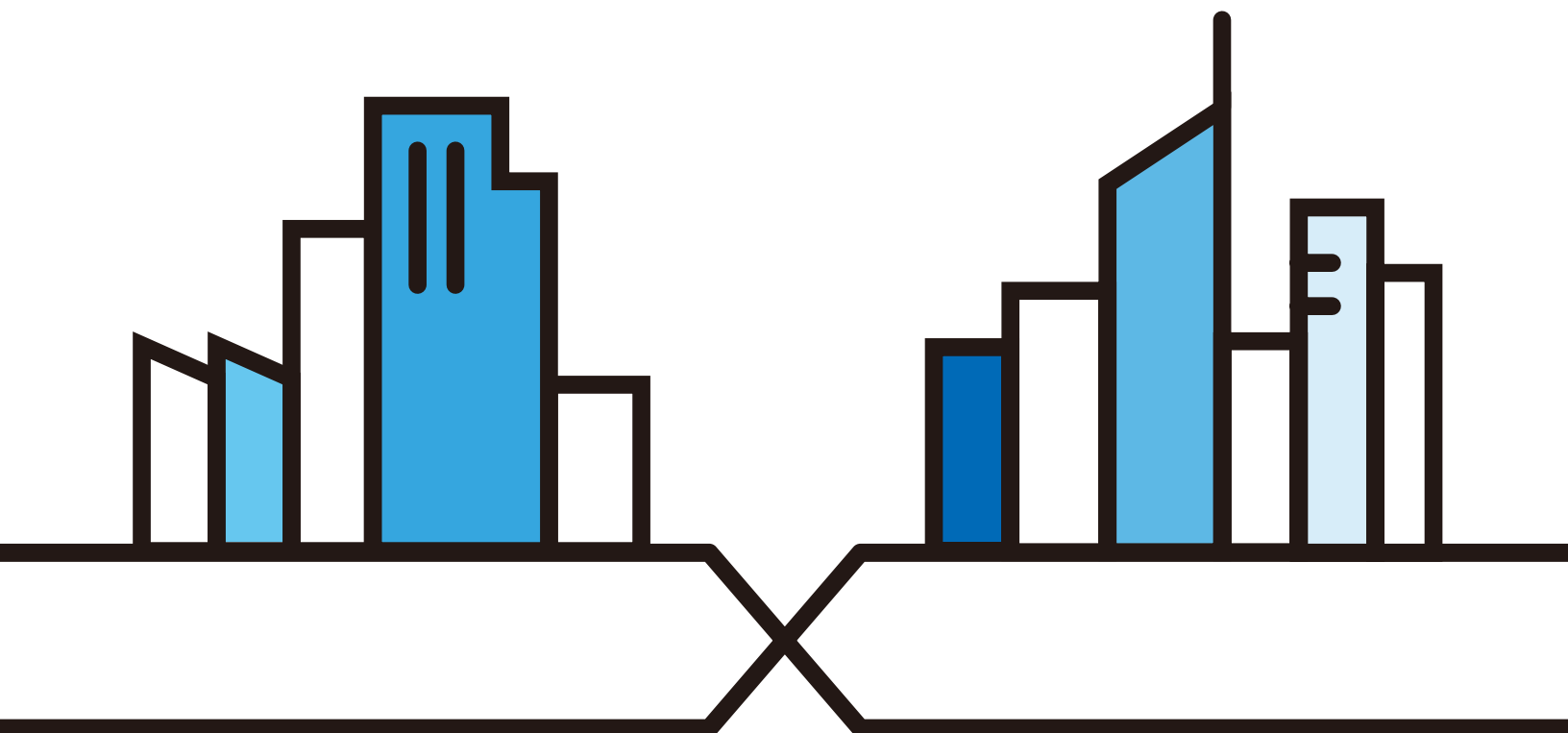
# User's Guide

## AX/DX/EX/PX Series

### Default Login Details

|                |                      |
|----------------|----------------------|
| LAN IP Address | http://192.168.1.1   |
| Login          | admin                |
| Password       | See the device label |

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## **IMPORTANT!**

## **READ CAREFULLY BEFORE USE**

## **KEEP THIS GUIDE FOR FUTURE REFERENCE**

This is a User's Guide for a series of products. Not all products support all firmware features. Screenshots and graphics in this book may differ slightly from your product due to differences in product features or Web Configurator brand style. Every effort has been made to ensure that the information in this manual is accurate.

### **Related Documentation**

- Quick Start Guide

The Quick Start Guide shows how to connect the Zyxel Device.

- MPro Mesh app. Download the Mpro Mesh app from Google Play or Apple Store to manage the Zyxel Device using a smartphone or tablet. To view Mpro Mesh app tutorials, please go to <https://service-provider.zyxel.com/app-help/MProMesh/>
- Zyxel One app. Download the Zyxel One app from Google Play or Apple Store to manage the Zyxel Device using a smartphone or tablet. To view Zyxel One app tutorials, please go to <https://service-provider.zyxel.com/app-help/ZyxelOne/FIA/LAN>
- More Information

Go to <https://service-provider.zyxel.com/global/en/tech-support> to find other information on Zyxel Device.



# Document Conventions

## Warnings and Notes

These are how warnings and notes are shown in this guide.

**Warnings tell you about things that could harm you or your Zyxel Device.**

Note: Notes tell you other important information (for example, other things you may need to configure or helpful tips) or recommendations.

## Syntax Conventions

- Product labels, screen names, field labels and field choices are all in **bold** font.
- A right angle bracket ( > ) within a screen name denotes a mouse click. For example, **Network Setting > Routing > DNS Route** means you first click **Network Setting** in the navigation panel, then the **Routing** submenu, and then finally the **DNS Route** tab to get to that screen.

## Icons Used in Figures

Figures in this user guide may use the following generic icons. The Zyxel Device icon is not an exact representation of your Zyxel Device.

|                                                                                                     |                                                                                                                  |                                                                                                            |
|-----------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------|
| Zyxel Device<br> | Generic Router<br>            | Switch<br>             |
| Server<br>       | Firewall<br>                  | USB Storage Device<br> |
| Printer<br>      | 4G LTE/5G NR Base Station<br> | Desktop<br>            |
| Laptop<br>       | Smart TV<br>                  | Wireless Device<br>    |

# Accessibility and Compatibility

## Introduction

This User's Guide complies with the accessibility requirements set out in EAA (European Accessibility Act) (EU) 2019/882.

Accessibility makes this User's Guide usable for people with disabilities, including those with visual, auditory, motor, and cognitive impairments. Compatibility ensures this User's Guide works well with a wide range of devices, software, and assistive technologies.

## Accessibility Feature – Screen Reader Support

The visually impaired may use screen readers, such as NVDA to read contents.

To use the screen reader, do the following:

- 1 Open your screen reader software.
- 2 Navigate to this User's Guide; the screen reader should automatically start reading the contents.
- 3 Use the keyboard shortcuts to navigate through this User's Guide (refer to the screen reader documentation).

## Accessibility Feature – Keyboard Navigation

Keyboard navigation allows you to read the contents in this User's Guide without a mouse. Use the following keys.

- **Tab** key: navigate between interactive elements (for example, buttons, links, fields).
- **Enter** key: select or activate the highlighted item.
- Arrow keys: move between options in menus or lists.
- **Esc** (Escape) key: close pop-up windows or cancel actions.

## How to Get Support

If you are an Internet Service Provider (ISP), please contact your Zyxel sales or service representative for direct support.

If you obtained your Zyxel Device from an ISP, please contact your ISP's support team directly, as the Zyxel Devices may have custom configurations.

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# PART I

## Use r's Guide

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# CHAPTER 1

## Introducing the Zyxel Device

### 1.1 Overview

The Zyxel Device refers to the models listed in the tables.

#### AX Series

- AX7501-B0
- AX7501-B1

#### DX Series

- DX3300-T0
- DX3301-T0
- DX3300-T1
- DX5401-B0
- DX5401-B1

#### EX Series

- EX3300-T0
- EX3301-T0
- EX3300-T1
- EX3500-T0
- EX3501-T0
- EX3600-T0
- EX5401-B0
- EX5401-B1
- EX5600-T1
- EX5601-T0
- EX5601-T1
- EX7501-B0
- EX7710-B0

#### PX Series

- PX3321-T1
- PX5301-T0
- PX5302-00

### 1.1.1 AX Series

The AX Series are AON (Active Optical Network) routers that connect to the Internet through a fiber cable.

The following table describes the feature differences of the AX Series by model. For more details about the ports panel, please refer to [AX7501-B0](#) / [AX7501-B1](#).

Table 1 AX Series Feature Comparison

|                                                             | <b>AX7501-B0</b>                                                             | <b>AX7501-B1</b>                                                             |
|-------------------------------------------------------------|------------------------------------------------------------------------------|------------------------------------------------------------------------------|
| WiFi 6 Wireless Standard                                    | YES                                                                          | YES                                                                          |
| Supported Frequency Bands                                   | 2.4 GHz<br>5 GHz                                                             | 2.4 GHz<br>5 GHz                                                             |
| Port Control Protocol                                       | YES                                                                          | YES                                                                          |
| Advanced Broadband                                          | NO                                                                           | NO                                                                           |
| Parental Control Schedule                                   | YES                                                                          | YES                                                                          |
| Parental Control URL Filter                                 | YES                                                                          | YES                                                                          |
| Home Security URL filter                                    | NO                                                                           | NO                                                                           |
| Operation Mode                                              | NO                                                                           | NO                                                                           |
| MPro Mesh Extender Support                                  | YES                                                                          | YES                                                                          |
| Backup WAN                                                  | NO                                                                           | NO                                                                           |
| Uplink Port                                                 | 1G Ethernet (SFP)<br>10G AON (SFP)<br>10G Ethernet (SFP)<br>10G XGPON (SFP+) | 1G Ethernet (SFP)<br>10G AON (SFP)<br>10G Ethernet (SFP)<br>10G XGPON (SFP+) |
| USB Port for Cellular Backup, File Sharing and Media Server | USB 3.0                                                                      | USB 3.0                                                                      |
| Phone Port (VoIP)                                           | YES                                                                          | YES                                                                          |
| Wall Mount                                                  | YES                                                                          | YES                                                                          |
| App Management                                              | Zyxel One                                                                    | Zyxel One                                                                    |

### 1.1.2 DX Series

The DX Series are DSL routers, which provide Internet access over telephone lines.

The following table describes the feature differences of the DX Series by model. For more details about the ports panel, please refer from [DX3300-T0 / DX3301-T0](#) to [DX5401-B0 / DX5401-B1](#).

Table 2 DX Series Feature Comparison

|                                                             | <b>DX3300-T0</b> | <b>DX3300-T1</b> | <b>DX3301-T0</b> | <b>DX5401-B0</b>         | <b>DX5401-B1</b>         |
|-------------------------------------------------------------|------------------|------------------|------------------|--------------------------|--------------------------|
| WiFi 6 Wireless Standard                                    | YES              | YES              | YES              | YES                      | YES                      |
| Supported Frequency Bands                                   | 2.4 GHz<br>5 GHz | 2.4 GHz<br>5 GHz | 2.4 GHz<br>5 GHz | 2.4 GHz<br>5 GHz         | 2.4 GHz<br>5 GHz         |
| Port Control Protocol                                       | YES              | YES              | YES              | YES                      | YES                      |
| Advanced Broadband                                          | YES              | YES              | YES              | YES                      | YES                      |
| Parental Control Schedule                                   | YES              | YES              | YES              | YES                      | YES                      |
| Parental Control URL Filter                                 | NO               | NO               | NO               | NO                       | NO                       |
| Home Security URL filter                                    | YES              | YES              | YES              | YES                      | YES                      |
| Operation Mode                                              | NO               | NO               | NO               | NO                       | NO                       |
| MPro Mesh Extender Support                                  | YES              | YES              | YES              | YES                      | YES                      |
| Backup WAN                                                  | NO               | YES              | NO               | NO                       | NO                       |
| Uplink Port                                                 | DSL              | DSL              | DSL              | DSL<br>1G Ethernet (SFP) | DSL<br>1G Ethernet (SFP) |
| USB Port for Cellular Backup, File Sharing and Media Server | USB 2.0          | USB 2.0          | USB 2.0          | USB 3.0                  | USB 3.0                  |
| Phone Port (VoIP)                                           | NO               | NO               | YES              | YES                      | YES                      |
| Wall Mount                                                  | YES              | NO               | YES              | YES                      | YES                      |
| App Management                                              | Zyxel One        | Zyxel One        | Zyxel One        | MPro Mesh                | MPro Mesh                |

### 1.1.3 EX Series

The EX Series are Ethernet gateways/routers that provide Internet access through the Ethernet WAN port or an SFP port.

The following table describes the feature differences of the EX Series by model. For more details about the ports panel, please refer from [EX3300-T0 / EX3301-T0](#) to [EX7501-B0](#).

Table 3 EX Series Feature Comparison (Part 1)

|                           | <b>EX3300-T0</b> | <b>EX3300-T1</b> | <b>EX3301-T0</b> | <b>EX3500-T0</b> | <b>EX3501-T0</b> | <b>EX3600-T0</b> | <b>EX5401-B0</b> |
|---------------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|
| WiFi 6 Wireless Standard  | YES              | YES              | YES              | YES              | YES              | YES              | YES              |
| Supported Frequency Bands | 2.4 GHz<br>5 GHz | 2.4 GHz<br>5 GHz | 2.4 GHz<br>5 GHz | 2.4 GHz<br>5 GHz | 2.4 GHz<br>5 GHz | 2.4 GHz<br>5 GHz | 2.4 GHz<br>5 GHz |
| Port Control Protocol     | YES              | YES              | YES              | YES              | YES              | YES              | YES              |

Table 3 EX Series Feature Comparison (Part 1) (continued)

|                                                             | <b>EX3300-TD</b> | <b>EX3300-TI</b> | <b>EX3301-TD</b> | <b>EX3500-TD</b> | <b>EX3501-TD</b> | <b>EX3600-TD</b> | <b>EX5401-B0</b>         |
|-------------------------------------------------------------|------------------|------------------|------------------|------------------|------------------|------------------|--------------------------|
| Advanced Broadband                                          | NO               | NO               | NO               | NO               | NO               | NO               | NO                       |
| Parental Control Schedule                                   | YES              | YES              | YES              | YES              | YES              | YES              | YES                      |
| Parental Control URL Filter                                 | NO               | NO               | NO               | NO               | NO               | NO               | NO                       |
| Home Security URL filter                                    | YES              | YES              | YES              | YES              | YES              | YES              | YES                      |
| Operation Mode                                              | NO               | NO               | NO               | YES              | YES              | YES              | NO                       |
| MPro Mesh Extender Support                                  | YES              | YES              | YES              | YES              | YES              | YES              | YES                      |
| Backup WAN                                                  | NO               | YES              | NO               | NO               | NO               | NO               | NO                       |
| Uplink Port                                                 | Ethernet         | Ethernet         | Ethernet         | Ethernet         | Ethernet         | Ethernet         | Ethernet<br>1G PON (SFP) |
| USB Port for Cellular Backup, File Sharing and Media Server | USB 2.0          | USB 2.0          | USB 2.0          | USB 2.0          | USB 2.0          | USB 3.0          | USB 3.0                  |
| Phone Port (VoIP)                                           | NO               | NO               | YES              | NO               | YES              | NO               | YES                      |
| Wall Mount                                                  | YES              | YES              | YES              | NO               | NO               | YES              | YES                      |
| App Management                                              | Zyxel One        | MPro Mesh        | Zyxel One        | Zyxel One        | Zyxel One        | Zyxel One        | MPro Mesh                |

Table 4 EX Series Feature Comparison (Part 2)

|                             | <b>EX5401-B1</b> | <b>EX5600-TI</b> | <b>EX5601-TD</b> | <b>EX5601-TI</b> | <b>EX7501-B0</b> |
|-----------------------------|------------------|------------------|------------------|------------------|------------------|
| WiFi 6 Wireless Standard    | YES              | YES              | YES              | YES              | YES              |
| Supported Frequency Bands   | 2.4 GHz<br>5 GHz | 2.4 GHz<br>5 GHz | 2.4 GHz<br>5 GHz | 2.4 GHz<br>5 GHz | 2.4 GHz<br>5 GHz |
| Port Control Protocol       | YES              | YES              | YES              | YES              | YES              |
| Advanced Broadband          | NO               | NO               | NO               | NO               | NO               |
| Parental Control Schedule   | YES              | YES              | YES              | YES              | YES              |
| Parental Control URL Filter | NO               | NO               | NO               | NO               | NO               |
| Home Security URL filter    | YES              | YES              | YES              | YES              | YES              |
| Operation Mode              | NO               | NO               | NO               | NO               | NO               |
| MPro Mesh Extender Support  | YES              | YES              | YES              | YES              | YES              |

Table 4 EX Series Feature Comparison (Part 2) (continued)

|                                                             | <b>EX5401-B1</b>         | <b>EX5600-T1</b> | <b>EX5601-T0</b>                                 | <b>EX5601-T1</b> | <b>EX7501-B0</b> |
|-------------------------------------------------------------|--------------------------|------------------|--------------------------------------------------|------------------|------------------|
| Backup WAN                                                  | NO                       | NO               | NO                                               | NO               | NO               |
| Uplink Port                                                 | Ethernet<br>1G PON (SFP) | Ethernet         | Ethernet<br>1G Ethernet (SFP)<br>2.5G GPON (SFP) | Ethernet         | Ethernet         |
| USB Port for Cellular Backup, File Sharing and Media Server | USB 3.0                  | USB 3.0          | USB 3.0                                          | USB 3.0          | USB 3.0          |
| Phone Port (VoIP)                                           | YES                      | NO               | YES                                              | YES              | YES              |
| Wall Mount                                                  | YES                      | YES              | YES                                              | YES              | YES              |
| App Management                                              | MPro Mesh                | MPro Mesh        | Zyxel One                                        | Zyxel One        | Zyxel One        |

Table 5 EX Series Feature Comparison (Part 3)

|                                                             | <b>EX7710-B0</b>          |
|-------------------------------------------------------------|---------------------------|
| WiFi 6 Wireless Standard                                    | YES                       |
| Supported Frequency Bands                                   | 2.4 GHz<br>5 GHz<br>6 GHz |
| Port Control Protocol                                       | NO                        |
| Advanced Broadband                                          | NO                        |
| Parental Control Schedule                                   | YES                       |
| Parental Control URL Filter                                 | NO                        |
| Home Security URL filter                                    | NO                        |
| Telnet                                                      | YES                       |
| Operation Mode                                              | NO                        |
| MPro Mesh Extender Support                                  | YES                       |
| Backup WAN                                                  | NO                        |
| Uplink Port                                                 | NO                        |
| USB Port for Cellular Backup, File Sharing and Media Server | USB 3.0                   |
| DSL Port                                                    | NO                        |
| Phone Port (VoIP)                                           | NO                        |
| Wall Mount                                                  | NO                        |
| App Management                                              | MPro Mesh                 |
| Supervisor Login                                            | NO                        |



Note: For EX3300/3301-T0, IGMP/MLD are enabled by default and are not configurable. The default IGMP version is 3. The default MLD version is 2.

### 1.1.4 PX Series

The PX Series are PON (Passive Optical Network) routers that connect to the Internet through a fiber cable.

The following table describes the feature differences of the PX Series by model. For more details about the ports panel, please refer to [PX3321-T1](#), [PX5301-T0](#) and [PX5302-00](#).

Table 6 PX Series Feature Comparison

|                                                             | <b>PX3321-T1</b>      | <b>PX5301-T0</b>                                    | <b>PX5302-00</b>                                  |
|-------------------------------------------------------------|-----------------------|-----------------------------------------------------|---------------------------------------------------|
| WiFi 6 Wireless Standard                                    | YES                   | YES                                                 | YES                                               |
| Supported Frequency Bands                                   | 2.4 GHz<br>5 GHz      | 2.4 GHz<br>5 GHz                                    | 2.4 GHz<br>5 GHz                                  |
| Port Control Protocol                                       | YES                   | YES                                                 | YES                                               |
| Advanced Broadband                                          | NO                    | NO                                                  | NO                                                |
| Parental Control Schedule                                   | YES                   | YES                                                 | YES                                               |
| Parental Control URL Filter                                 | NO                    | NO                                                  | NO                                                |
| Home Security URL filter                                    | YES                   | YES                                                 | YES                                               |
| Operation Mode                                              | NO                    | NO                                                  | NO                                                |
| MPro Mesh Extender Support                                  | YES                   | YES                                                 | YES                                               |
| Backup WAN                                                  | NO                    | NO                                                  | NO                                                |
| Uplink Port                                                 | 2.5G PON (SC-APC)     | 2.5G PON (SC-APC)                                   | 2.5G PON (SC-APC)                                 |
| USB Port for Cellular Backup, File Sharing and Media Server | USB 2.0               | USB 2.0                                             | NO                                                |
| Phone Port (VoIP)                                           | YES                   | YES                                                 | YES                                               |
| LAN Ports                                                   | 4<br>10/100/1000 Mbps | LAN1 – LAN3<br>10/100/1000 Mbps<br>LAN4<br>2.5 Gbps | LAN1, LAN2<br>10/100/1000 Mbps<br>LAN3<br>2.5Gbps |
| Wall Mount                                                  | YES                   | YES                                                 | YES                                               |
| App Management                                              | MPro Mesh             | MPro Mesh                                           | MPro Mesh                                         |

## 1.2 Example Applications

This section shows the few examples of using the Zyxel Device in various network environments.

Connect the WAN port to the Internet. Connect computers to the Zyxel Device's LAN ports, or wirelessly, and access the Internet simultaneously.

**Figure 1** Zyxel Device's Internet Access Application



In the figure above, you can also configure Firewall on the Zyxel Device for secure Internet access. When the Firewall is on, all incoming traffic from the Internet to your network is blocked by default unless it is initiated from your network. This means that probes from the outside to your network are not allowed, but you can safely browse the Internet and download files.

### 1.2.1 WAN Priority

The WAN connection priority is as follows:

- 1 PON WAN
- 2 SFP
- 3 Ethernet WAN
- 4 DSL
- 5 Cellular WAN (3G/4G)

See [Section 1.2.5 on page 29](#) for more information about Cellular backup.

### 1.2.2 Dual-Band WiFi

Note: Check [Section 1.1 on page 20](#) to see if your Zyxel Device supports dual-band WiFi.

When WiFi is enabled on the Zyxel Device, IEEE 802.11a/b/g/n/ac/ax compliant clients, such as notebooks, tablets, and smartphones can wirelessly connect to the Zyxel Device to access network resources.

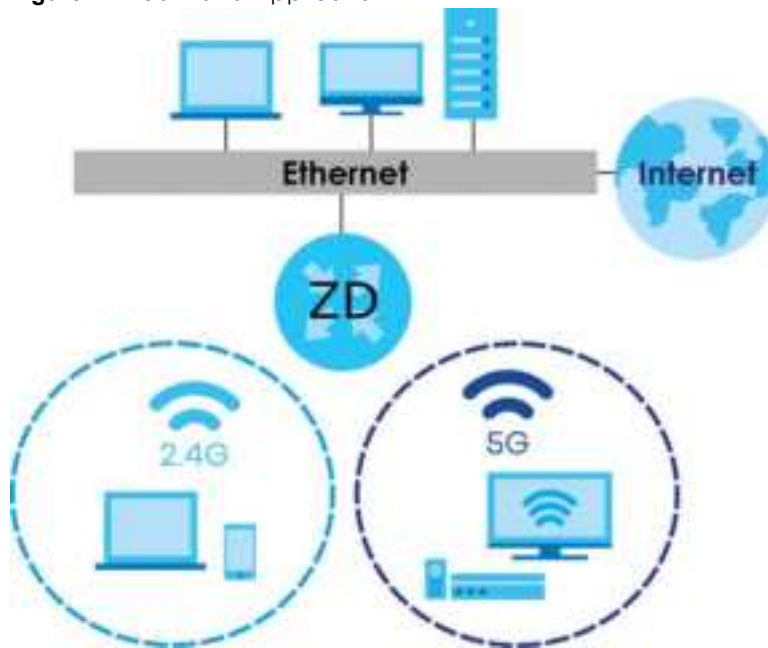
With dual-band, the Zyxel Device is a gateway that can use both 2.4 GHz and 5 GHz WiFi networks at the same time. IOT devices and other low-bandwidth clients could use the 2.4 GHz band for basic connectivity, while the 5GHz band handles time-sensitive traffic such as high-definition video, music, and gaming.

The Zyxel Device supports WiFi 6 that is most suitable in areas with a high concentration of users.

Zyxel Devices support backward compatibility with older WiFi standards, ensuring seamless connectivity

with previous-generation devices.

**Figure 2** Dual-Band Application



You can leverage concurrent tri-band connectivity across 2.4 GHz, 5 GHz, and 6 GHz bands. This allows IoT devices and various clients to simultaneously maintain connections for basic tasks with 2.4 GHz. At the same time, 5 GHz and 6 GHz handle time-sensitive traffic, and high-bandwidth applications like high-definition video, music, and gaming.

**Figure 3** Without Multi-Link Operation



**Figure 4** Multi-Link Operation Example



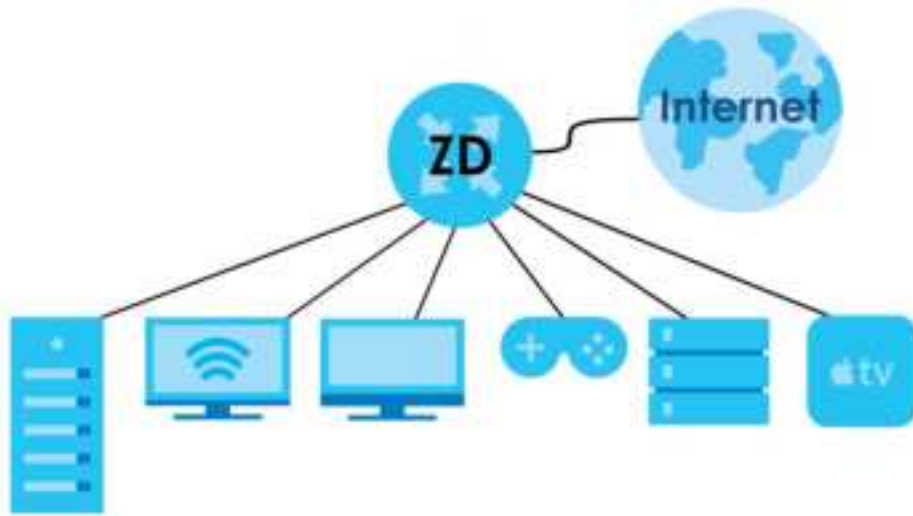
### 1.2.3 Multi-Gigabit Ethernet

Multi-Gigabit Ethernet supports network speeds of 1 Gbps, 2.5 Gbps, 5 Gbps, and 10 Gbps. Not all Multi-Gigabit ports support all speeds. See [Section 2.3 on page 62](#) for the speeds your Zyxel Device supports.

Some network devices, such as gaming computers, servers, NAS devices, or access points, support 2.5 Gbps or 5 Gbps connectivity. The Multi-Gigabit Ethernet technology enables the Zyxel Device to automatically detect and adjust to the required speed of the connected network device. A non-Multi-Gigabit 10G port would connect to a 2.5 Gbps or 5 Gbps device at just 1 Gbps.

Actual speeds also depend on the type of Ethernet cable used. See [Table 7 on page 28](#) for the correct Ethernet cable type.

**Figure 5** Multi-Gigabit Application



See the following table for the cables required and distance limitation to attain the corresponding speed.

**Table 7** Ethernet Cable Types

| CABLE       | TRANSMISSION SPEED | MAXIMUM DISTANCE | BANDWIDTH CAPACITY |
|-------------|--------------------|------------------|--------------------|
| Category 5  | 100M               | 100 m            | 100 MHz            |
| Category 5e | 1G / 2.5G / 5G     | 100 m            | 100 MHz            |
| Category 6  | 5G / 10G           | 100 m / 55 m     | 250 MHz            |
| Category 6a | 10G                | 100 m            | 500 MHz            |
| Category 7  | 10G                | 100 m            | 600 MHz            |

### 1.2.4 VoIP Applications

The Zyxel Device's VoIP function allows you to register up to eight SIP (Session Initiation Protocol) accounts and use the Zyxel Device to make and receive VoIP telephone calls. The Zyxel Device sends your call to a VoIP service provider's SIP server which forwards the calls to either VoIP or PSTN phones.

**Figure 6** VoIP Application

### 1.2.5 Zyxel Device's USB Support

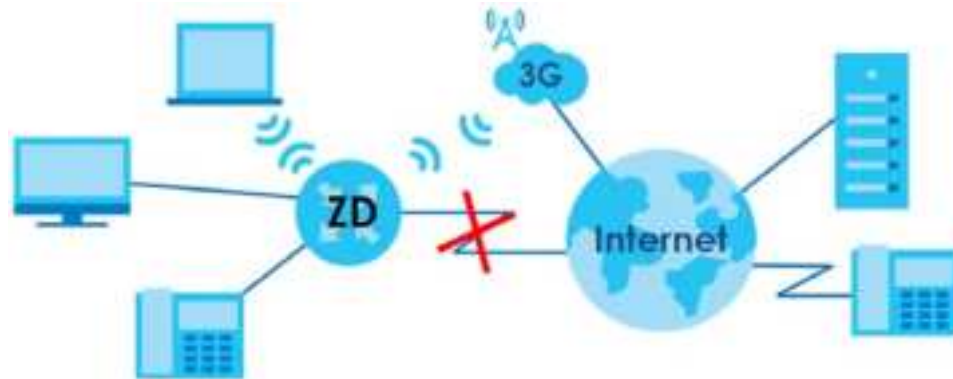
The USB port of the Zyxel Device is used for cellular WAN backup, file-sharing, and media server.

#### Cellular WAN Backup

Connect a supported cellular USB dongle with an active SIM card to the USB port. This adds a second WAN interface and allows the Zyxel Device to wirelessly access the Internet via a cellular network. The cellular WAN connection is a backup in case the DSL/Ethernet/Fiber connection fails.

To set up a cellular connection, click **Network > Broadband > Cellular Backup**.

To update the supported cellular USB dongle list, download the latest WWAN package from the Zyxel website and upload it to the Zyxel Device using the **Maintenance > Firmware Upgrade** screen.

**Figure 7** Internet Access Application: Cellular WAN

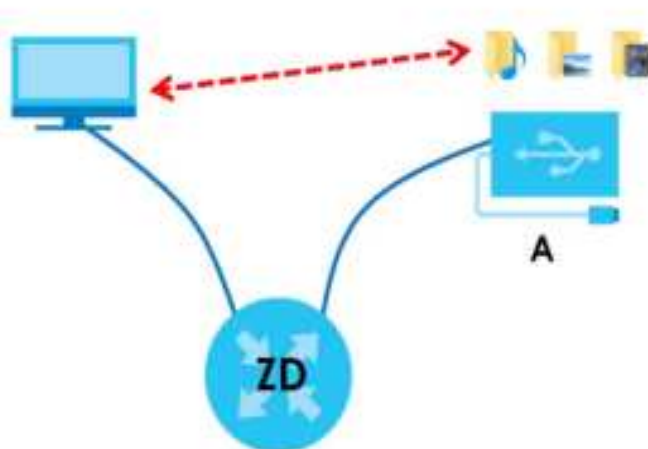
#### File Sharing

Use the built-in USB 3.0 port to share files on a USB memory stick or a USB hard drive (A).

**Figure 8** USB File Sharing Application

### Media Server

You can also use the Zyxel Device as a media server. This lets anyone on your network play video, music, and photos from a USB device (A) connected to the Zyxel Device's USB port (without having to copy them to another computer).

**Figure 9** USB Media Server Application

## 1.3 Ways to Manage the Zyxel Device

Use any of the following methods to manage the Zyxel Device.

- Web Configurator. This is recommended for management of the Zyxel Device using a (supported) web browser.
- Secure Shell (SSH), Telnet. Use for troubleshooting the Zyxel Device by qualified personnel.

- App. Download the app to manage your Zyxel Device using a mobile device. Refer to the Comparison table in [Section 1.1 on page 20](#) or the Quick Start Guide to find out which app is supported for your Zyxel Device.
- MPro Mesh app. Download the Mpro Mesh app from Google Play or Apple Store to manage the Zyxel Device using a smartphone or tablet. To view Mpro Mesh app tutorials, please go to <https://service-provider.zyxel.com/app-help/MProMesh/>
- Zyxel One app. Download the Zyxel One app from Google Play or Apple Store to manage the Zyxel Device using a smartphone or tablet. To view Zyxel One app tutorials, please go to <https://service-provider.zyxel.com/app-help/ZyxelOne/ELA/IAN>

## 1.4 Good Habits for Managing the Zyxel Device

Do the following things regularly to make the Zyxel Device more secure and to manage the Zyxel Device more effectively.

- Change the WiFi and Web Configurator passwords. Use a password that is not easy to guess and that consists of different types of characters, such as numbers, letters, and special characters.
- Write down the passwords and put it in a safe place.
- Back up the configuration. Restoring an earlier working configuration may be useful if the device becomes unstable or even crashes. If you forget your password, you will have to reset the Zyxel Device to its factory default settings. If you backed up an earlier configuration file, you would not have to totally re-configure the Zyxel Device. You could simply restore your last configuration.

# CHAPTER 2

## Hardware

### 2.1 Overview

This section describes the front and rear panels for each model. Refer to the Zyxel Device's Quick Start Guides to see the product drawings and how to make the hardware connections.

### 2.2 LED Indicators Panel

The following shows the LED indicator panel and the LED behaviors of the Zyxel Device. None of the LEDs are on if the Zyxel Device is not receiving power. See [Section 2.3 on page 62](#) to check whether your Zyxel Device has ports for multi-gigabit Ethernet, SFP, PON, or phone connections.

AON (Active Optical Network) Routers

- [AX7501-B0 / AX7501-B1](#)

DSL (Digital Subscriber Line) Routers

- [DX3300-T0 / DX3301-T0](#)
- [DX3300-T1](#)
- [DX5401-B0 / DX5401-B1](#)

Ethernet Gateways and Routers

- [EX3300-T0 / EX3301-T0](#)
- [EX3300-T1](#)
- [EX3500-T0 / EX3501-T0](#)
- [EX3600-T0](#)
- [EX5401-B0 / EX5401-B1](#)
- [EX5600-T1 / EX5601-T0 / EX5601-T1](#)
- [EX7501-B0](#)
- [EX7710-B0](#)

PON (Passive Optical Network) Routers

- [PX3321-T1](#)
- [PX5301-T0](#)
- [PX5302-00](#)



**AX7501-B0 / AX7501-B1****Figure 10** LED Indicators (AX7501-B0 / AX7501-B1)

The following are the LED descriptions for your Zyxel Device.

**Table 8** LED Descriptions (AX7501-B0 / AX7501-B1)

| LED                                                                                                    | COLOR | STATUS   | DESCRIPTION                                                                                                                                                                                       |
|--------------------------------------------------------------------------------------------------------|-------|----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>POWER</b><br>      | Green | On       | The Zyxel Device is receiving power and ready for use.                                                                                                                                            |
|                                                                                                        |       | Blinking | The Zyxel Device is self-testing.                                                                                                                                                                 |
|                                                                                                        | Red   | On       | The Zyxel Device detected an error while self-testing, or there is a device malfunction.                                                                                                          |
|                                                                                                        |       | Blinking | The Zyxel Device is upgrading firmware.                                                                                                                                                           |
|                                                                                                        |       | Off      | The Zyxel Device is not receiving power.                                                                                                                                                          |
| <b>FIBER</b><br>      | Green | On       | The FIBER port is connected to the ISP's ONT and the Zyxel Device is receiving optical signals normally.                                                                                          |
|                                                                                                        |       | Blinking | The Zyxel Device's FIBER port is trying to build a PON connection.                                                                                                                                |
|                                                                                                        | Red   | On       | The optical power received (the strength of optical signals transmitted on the remote optical module) is too low.                                                                                 |
|                                                                                                        |       | Off      | The connection to the ISP's ONT is down.                                                                                                                                                          |
| <b>INTERNET</b><br> | Green | On       | The Zyxel Device has an IP connection but no traffic.<br><br>Your device has a WAN IP address (either static or assigned by a DHCP server), PPP negotiation was successfully completed (if used). |
|                                                                                                        |       | Blinking | The Zyxel Device is sending or receiving IP traffic.<br><br>Note: For AON and PON routers only; see <a href="#">Section 1.1 on page 20</a> for more information.                                  |
|                                                                                                        |       | Off      | There is no Internet connection or the gateway is in Bridge mode.                                                                                                                                 |
|                                                                                                        | Red   | On       | The Zyxel Device attempted to make an IP connection but failed. Possible causes are no response from a DHCP server, no PPPoE response, PPPoE authentication failed.                               |
|                                                                                                        |       | Blinking | The Zyxel Device has an unsupported 100 Mbps Ethernet connection on the WAN.<br><br>Note: For Ethernet routers only, see <a href="#">Section 1.1 on page 20</a> for more information.             |
| <b>10G LAN</b><br>  | Green | On       | The Zyxel Device has a successful 100/1000/10000 Mbps Ethernet connection with a device on the Local Area Network (LAN) through the 10G LAN port.                                                 |
|                                                                                                        |       | Blinking | The Zyxel Device is sending or receiving data to/from the LAN at 100/1000/10000 Mbps through the 10G LAN port.                                                                                    |
|                                                                                                        |       | Off      | The Zyxel Device does not have an Ethernet connection with the LAN through the 10G LAN port.                                                                                                      |

Table 8 LED Descriptions (AX7501-B0 / AX7501-B1) (continued)

| LED                                                                                            | COLOR | STATUS   | DESCRIPTION                                                                                                                                                                                                            |
|------------------------------------------------------------------------------------------------|-------|----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| LAN1 to 4<br> | Green | On       | The Zyxel Device has a successful 100/1000 Mbps Ethernet connection with a device on the Local Area Network (LAN) through the LAN1 to 4 ports.                                                                         |
|                                                                                                |       | Blinking | The Zyxel Device is sending or receiving data to/from the LAN at 100/1000 Mbps through the LAN1 – 4 ports.<br><br>Note: For AON and PON routers only; see <a href="#">Section 1.1 on page 20</a> for more information. |
|                                                                                                |       | Off      | The Zyxel Device does not have an Ethernet connection with the LAN through the LAN1 to 4 ports.                                                                                                                        |
| WiFi 2.4G<br> | Green | On       | The 2.4G WiFi network is activated.                                                                                                                                                                                    |
|                                                                                                |       | Blinking | The Zyxel Device is communicating with 2.4G WiFi clients.<br><br>Note: For AON and PON routers only; see <a href="#">Section 1.1 on page 20</a> for more information.                                                  |
|                                                                                                |       | Off      | The 2.4G WiFi network is not activated.                                                                                                                                                                                |
|                                                                                                | Amber | Blinking | The Zyxel Device is setting up a WPS connection with a 2.4G WiFi client.                                                                                                                                               |
| WiFi 5G<br>   | Green | On       | The 5G WiFi network is activated.                                                                                                                                                                                      |
|                                                                                                |       | Blinking | The Zyxel Device is communicating with 5G WiFi clients.<br><br>Note: For AON and PON routers only; see <a href="#">Section 1.1 on page 20</a> for more information.                                                    |
|                                                                                                |       | Off      | The 5G WiFi network is not activated.                                                                                                                                                                                  |
|                                                                                                | Amber | Blinking | The Zyxel Device is setting up a WPS connection with a 5G WiFi client.                                                                                                                                                 |
| PHONE<br>   | Green | On       | A SIP account is registered for the phone port.                                                                                                                                                                        |
|                                                                                                |       | Blinking | The telephone connected to this phone port has an incoming call or is off the hook.                                                                                                                                    |
|                                                                                                |       | Off      | The phone port does not have a SIP account registered.                                                                                                                                                                 |
|                                                                                                | Amber | On       | A SIP account is registered for the phone port, and there is a voice message in the corresponding SIP account.                                                                                                         |
|                                                                                                |       | Blinking | The telephone connected to this phone port has an incoming call or is off the hook. There is a voice message in the corresponding SIP account.                                                                         |
| USB<br>     | Green | On       | The Zyxel Device recognizes a USB connection through the USB port.                                                                                                                                                     |
|                                                                                                |       | Blinking | The Zyxel Device is sending or receiving data to/from the USB device connected to it.<br><br>Note: For AON and PON routers only; see <a href="#">Section 1.1 on page 20</a> for more information.                      |
|                                                                                                |       | Off      | The Zyxel Device does not detect a USB connection through the USB port.                                                                                                                                                |

**DX3300-T0 / DX3301-T0****Figure 11** LED Indicators (DX3300-T0 / DX3301-T0)

The following are the LED descriptions for your Zyxel Device.

**Table 9** LED Descriptions (DX3300-T0)

| LED                                                                                                          | COLOR | STATUS        | DESCRIPTION                                                                              |
|--------------------------------------------------------------------------------------------------------------|-------|---------------|------------------------------------------------------------------------------------------|
| Power<br>                 | Green | On            | The Zyxel Device is receiving power and ready for use.                                   |
|                                                                                                              |       | Blinking      | The Zyxel Device is self-testing.                                                        |
|                                                                                                              | Red   | On            | The Zyxel Device detected an error while self-testing, or there is a device malfunction. |
|                                                                                                              |       | Blinking      | The Zyxel Device is upgrading firmware.                                                  |
| DSL / Ethernet<br>WAN<br> | Green | Off           | The Zyxel Device is not receiving power.                                                 |
|                                                                                                              |       | On            | The VDSL/ ADSL link is up.                                                               |
|                                                                                                              |       | Slow Blinking | The Zyxel Device is looking for a VDSL or ADSL link.                                     |
|                                                                                                              |       | Fast Blinking | The Zyxel Device is initializing the VDSL or ADSL link.                                  |

Table 9 LED Descriptions (DX3300-T0) (continued)

| LED                                                                                                | COLOR | STATUS   | DESCRIPTION                                                                                                                                                                                                                    |
|----------------------------------------------------------------------------------------------------|-------|----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Internet<br>      | Green | On       | The Zyxel Device has an IP connection but no traffic.<br><br>Your device has a WAN IP address (either static or assigned by a DHCP server), PPP negotiation was successfully completed (if used) and the DSL connection is up. |
|                                                                                                    |       | Blinking | The Zyxel Device is sending or receiving IP traffic.                                                                                                                                                                           |
|                                                                                                    |       | Off      | There is no Internet connection or the gateway is in bridged mode.                                                                                                                                                             |
|                                                                                                    | Red   | On       | The Zyxel Device attempted to make an IP connection but failed. Possible causes are no response from a DHCP server, no PPPoE response, PPPoE authentication failed.                                                            |
| LAN1 to 4<br>     | Green | On       | The Zyxel Device has a successful 10/100/1000 Mbps Ethernet connection with a device on the Local Area Network (LAN).                                                                                                          |
|                                                                                                    |       | Blinking | The Zyxel Device is sending or receiving data to/from the LAN at 10/100/1000 Mbps.                                                                                                                                             |
|                                                                                                    |       | Off      | The Zyxel Device does not have an Ethernet connection with the LAN.                                                                                                                                                            |
| 2.4G WLAN/WPS<br> | Green | On       | The 2.4 GHz WiFi network is activated.                                                                                                                                                                                         |
|                                                                                                    |       | Blinking | The Zyxel Device is communicating with 2.4 GHz WiFi clients.                                                                                                                                                                   |
|                                                                                                    |       | Off      | The link is down or disabled.                                                                                                                                                                                                  |
|                                                                                                    | Amber | Blinking | The Zyxel Device is setting up a WPS connection with a 2.4 GHz WiFi client.                                                                                                                                                    |
| 5G WLAN/WPS<br> | Green | On       | The 5 GHz WiFi network is activated.                                                                                                                                                                                           |
|                                                                                                    |       | Blinking | The Zyxel Device is communicating with 5 GHz WiFi clients.                                                                                                                                                                     |
|                                                                                                    |       | Off      | The link is down or disabled.                                                                                                                                                                                                  |
|                                                                                                    | Amber | Blinking | The Zyxel Device is setting up a WPS connection with a 5 GHz WiFi client.                                                                                                                                                      |

The following are the LED descriptions for your Zyxel Device.

Table 10 LED Descriptions (DX3301-T0)

| LED                                                                                                       | COLOR | STATUS        | DESCRIPTION                                                                              |
|-----------------------------------------------------------------------------------------------------------|-------|---------------|------------------------------------------------------------------------------------------|
| Power<br>              | Green | On            | The Zyxel Device is receiving power and ready for use.                                   |
|                                                                                                           |       | Blinking      | The Zyxel Device is self-testing.                                                        |
|                                                                                                           | Red   | On            | The Zyxel Device detected an error while self-testing, or there is a device malfunction. |
|                                                                                                           |       | Blinking      | The Zyxel Device is upgrading firmware.                                                  |
|                                                                                                           |       | Off           | The Zyxel Device is not receiving power.                                                 |
| DSL / Ethernet WAN<br> | Green | On            | The VDSL / ADSL link is up.                                                              |
|                                                                                                           |       | Slow Blinking | The Zyxel Device is looking for a VDSL / ADSL link.                                      |
|                                                                                                           |       | Fast Blinking | The Zyxel Device is initializing the VDSL / ADSL link.                                   |

Table 10 LED Descriptions (DX3301-T0) (continued)

| LED                                                                                                   | COLOR | STATUS   | DESCRIPTION                                                                                                                                                                                                                             |
|-------------------------------------------------------------------------------------------------------|-------|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Internet<br>         | Green | On       | The Zyxel Device has an IP connection but no traffic.<br><br>Your device has a WAN IP address (either static or assigned by a DHCP server), PPP negotiation was successfully completed (if used) and the DSL connection is up.          |
|                                                                                                       |       | Blinking | The Zyxel Device is sending or receiving IP traffic.                                                                                                                                                                                    |
|                                                                                                       |       | Off      | There is no Internet connection or the gateway is in bridged mode.                                                                                                                                                                      |
|                                                                                                       | Red   | On       | The Zyxel Device attempted to make an IP connection but failed. Possible causes are no response from a DHCP server, no PPPoE response, PPPoE authentication failed.                                                                     |
| LAN1 to 4<br>        | Green | On       | The Zyxel Device has a successful 10/100/1000 Mbps Ethernet connection with a device on the Local Area Network (LAN).                                                                                                                   |
|                                                                                                       |       | Blinking | The Zyxel Device is sending or receiving data to/from the LAN at 10/100/1000 Mbps.                                                                                                                                                      |
|                                                                                                       |       | Off      | The Zyxel Device does not have an Ethernet connection with the LAN.                                                                                                                                                                     |
| 2.4G WLAN/WPS<br>    | Green | On       | The 2.4 GHz WiFi network is activated.                                                                                                                                                                                                  |
|                                                                                                       |       | Blinking | The Zyxel Device is communicating with 2.4 GHz WiFi clients.                                                                                                                                                                            |
|                                                                                                       |       | Off      | The link is down or disabled.                                                                                                                                                                                                           |
|                                                                                                       | Amber | Blinking | The Zyxel Device is setting up a WPS connection with a 2.4 GHz WiFi client.                                                                                                                                                             |
| 5G WLAN/WPS<br>    | Green | On       | The 5 GHz WiFi network is activated.                                                                                                                                                                                                    |
|                                                                                                       |       | Blinking | The Zyxel Device is communicating with 5 GHz WiFi clients.                                                                                                                                                                              |
|                                                                                                       |       | Off      | The link is down or disabled.                                                                                                                                                                                                           |
|                                                                                                       | Amber | Blinking | The Zyxel Device is setting up a WPS connection with a 5 GHz WiFi client.                                                                                                                                                               |
| Phone1, Phone2<br> | Green | On       | A SIP account is registered for at least one phone port, and there is no voice message in the corresponding SIP account.                                                                                                                |
|                                                                                                       |       | Blinking | A telephone connected to one of the phone port has its receiver off the hook or there is an incoming call. There is no voice message in the corresponding SIP account.                                                                  |
|                                                                                                       | Amber | On       | A SIP account is registered for the phone port and there is a voice message in the corresponding SIP account.                                                                                                                           |
|                                                                                                       |       | Blinking | A telephone connected to the phone port has its receiver off the hook or there is an incoming call. There is voice message in the corresponding SIP account.                                                                            |
|                                                                                                       |       | Off      | <ul style="list-style-type: none"> <li>The Zyxel Device is turned off.</li> <li>The VoIP function is not activated.</li> <li>The SIP account is not enabled.</li> <li>The phone port does not have a SIP account registered.</li> </ul> |

**DX3300-T1****Figure 12** LED Indicators (DX3300-T1)

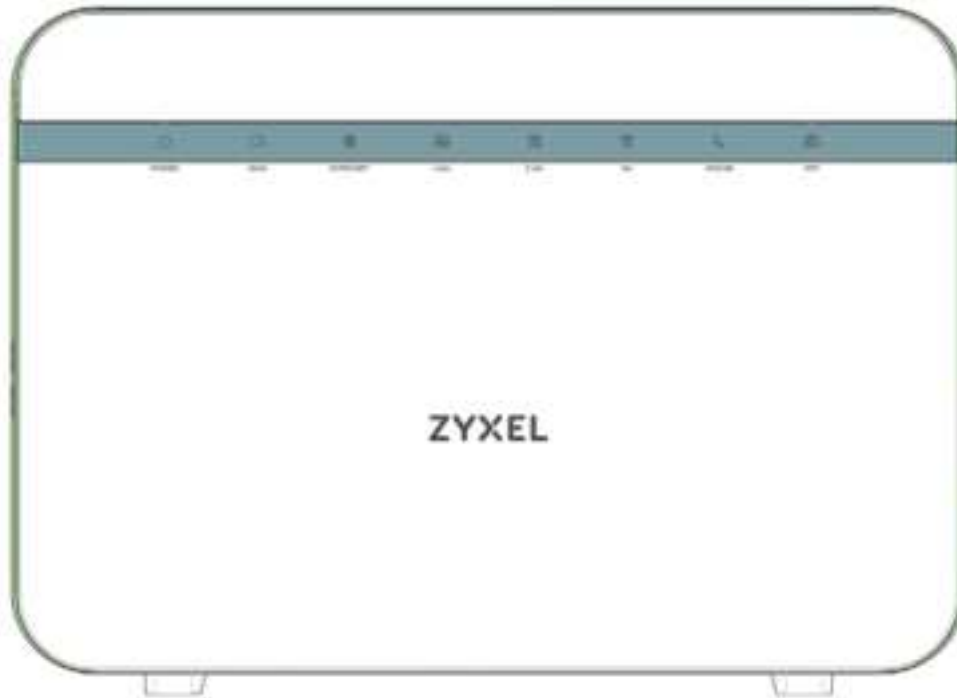
The following are the LED descriptions for your Zyxel Device.

**Table 11** LED Descriptions (DX3300-T1)

| LED                                                                                            | COLOR | STATUS        | DESCRIPTION                                                                             |
|------------------------------------------------------------------------------------------------|-------|---------------|-----------------------------------------------------------------------------------------|
| POWER<br>   | Green | On            | The Zyxel Device is receiving power and ready for use.                                  |
|                                                                                                |       | Blinking      | The Zyxel Device is booting up.                                                         |
|                                                                                                | Red   | On            | The Zyxel Device detects an error while self-testing, or there is a device malfunction. |
|                                                                                                |       | Blinking      | The Zyxel Device is upgrading firmware.                                                 |
|                                                                                                |       | Off           | The Zyxel Device is not receiving power.                                                |
| DSL WAN<br> | Green | On            | The ADSL/VDSL link on the WAN is up.                                                    |
|                                                                                                |       | Slow Blinking | The ADSL/VDSL link is down, and the Zyxel Device is looking for an ADSL/VDSL link.      |
|                                                                                                |       | Fast Blinking | The Zyxel Device is initializing the ADSL/VDSL link.                                    |
|                                                                                                |       | Off           | The ADSL/VDSL link is down.                                                             |

Table 11 LED Descriptions (DX3300-T1) (continued)

| LED                                                                                              | COLOR | STATUS   | DESCRIPTION                                                                                                                                                                                 |
|--------------------------------------------------------------------------------------------------|-------|----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| INTERNET<br>    | Green | On       | The Zyxel Device has a WAN IP address (either static or assigned by a DHCP server) and the Internet connection is up.                                                                       |
|                                                                                                  |       | Blinking | The Zyxel Device is sending or receiving traffic.                                                                                                                                           |
|                                                                                                  | Red   | On       | The Zyxel Device attempted to obtain a WAN IP but failed. Possible causes are no response from a DHCP server, no PPPoE response, PPPoE authentication failed.                               |
|                                                                                                  |       | Off      | There is no Internet connection or the gateway is in bridge mode.                                                                                                                           |
| LAN1 to 3<br>   | Green | On       | The Zyxel Device has a successful Ethernet connection with a device on the Local Area Network (LAN) port.                                                                                   |
|                                                                                                  |       | Blinking | The Zyxel Device is sending or receiving data to/from the LAN port.                                                                                                                         |
|                                                                                                  |       | Off      | The Zyxel Device does not have an Ethernet connection on the LAN port.                                                                                                                      |
| LAN4 or WAN<br> | Green | On       | <p>LAN mode: The Zyxel Device has a successful Ethernet connection with a device on the LAN4 or WAN port.</p> <p>WAN mode: The Ethernet WAN connection is up on the LAN4 or WAN port.</p>   |
|                                                                                                  |       | Blinking | The Zyxel Device is sending or receiving data to/from the LAN4 or WAN port.                                                                                                                 |
|                                                                                                  |       | Off      | <p>LAN mode: The Zyxel Device does not have an Ethernet connection with a device on the LAN4 or WAN port.</p> <p>WAN mode: The Ethernet WAN connection on the LAN4 or WAN port is down.</p> |
| 2.4G<br>      | Green | On       | The 2.4 GHz WiFi is activated.                                                                                                                                                              |
|                                                                                                  |       | Blinking | The Zyxel Device is sending or receiving data to/from 2.4 GHz WiFi clients.                                                                                                                 |
|                                                                                                  | Amber | Blinking | The Zyxel Device is connecting to a 2.4 GHz WiFi client through WPS.                                                                                                                        |
|                                                                                                  |       | Off      | The 2.4 GHz WiFi network is not activated.                                                                                                                                                  |
| 5G<br>        | Green | On       | The 5 GHz WiFi network is activated.                                                                                                                                                        |
|                                                                                                  |       | Blinking | The Zyxel Device is sending or receiving data to/from 5 GHz WiFi clients.                                                                                                                   |
|                                                                                                  | Amber | Blinking | The Zyxel Device is connecting to a 5 GHz WiFi client through WPS.                                                                                                                          |
|                                                                                                  |       | Off      | The 5 GHz WiFi network is not activated.                                                                                                                                                    |

**DX5401-B0 / DX5401-B1****Figure 13** LED Indicators (DX5401-B0 / DX5401-B1)

The following are the LED descriptions for your Zyxel Device.

**Table 12** LED Descriptions (DX5401-B0 / DX5401-B1)

| LED                                                                                                       | COLOR | STATUS        | DESCRIPTION                                                                             |
|-----------------------------------------------------------------------------------------------------------|-------|---------------|-----------------------------------------------------------------------------------------|
| Power<br>              | Green | On            | The Zyxel Device is receiving power and ready for use.                                  |
|                                                                                                           |       | Blinking      | The Zyxel Device is self-testing.                                                       |
|                                                                                                           | Red   | On            | The Zyxel Device detects an error while self-testing, or there is a device malfunction. |
|                                                                                                           |       | Blinking      | The Zyxel Device is upgrading firmware.                                                 |
|                                                                                                           |       | Off           | The Zyxel Device is not receiving power.                                                |
| DSL / Ethernet WAN<br> | Green | On            | The VDSL line or a successful 100/1000 Mbps Ethernet connection on the WAN is up.       |
|                                                                                                           |       | Slow Blinking | The Zyxel Device is looking for a VDSL line.                                            |
|                                                                                                           |       | Fast Blinking | The Zyxel Device is initializing the VDSL line.                                         |
|                                                                                                           |       | Off           | There is no Ethernet connection on the WAN.                                             |
|                                                                                                           | Amber | On            | The ADSL line on the WAN is up.                                                         |
|                                                                                                           |       | Slow Blinking | The Zyxel Device is looking for an ADSL line                                            |
|                                                                                                           |       | Fast Blinking | The Zyxel Device is initializing the ADSL line.                                         |



Table 12 LED Descriptions (DX5401-B0 / DX5401-B1) (continued)

| LED                                                                                                   | COLOR | STATUS   | DESCRIPTION                                                                                                                                                                                                                    |
|-------------------------------------------------------------------------------------------------------|-------|----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Internet<br>         | Green | On       | The Zyxel Device has an IP connection but no traffic.<br><br>Your device has a WAN IP address (either static or assigned by a DHCP server), PPP negotiation was successfully completed (if used) and the DSL connection is up. |
|                                                                                                       |       | Blinking | The Zyxel Device is sending or receiving IP traffic.                                                                                                                                                                           |
|                                                                                                       |       | Off      | There is no Internet connection or the gateway is in bridged mode.                                                                                                                                                             |
|                                                                                                       | Red   | On       | The Zyxel Device attempted to make an IP connection but failed. Possible causes are no response from a DHCP server, no PPPoE response, PPPoE authentication failed.                                                            |
| LAN1 to 4<br>        | Green | On       | The Zyxel Device has a successful 10/100/1000 Mbps Ethernet connection with a device on the Local Area Network (LAN).                                                                                                          |
|                                                                                                       |       | Blinking | The Zyxel Device is sending or receiving data to/from the LAN at 10/100/1000 Mbps.                                                                                                                                             |
|                                                                                                       |       | Off      | The Zyxel Device does not have an Ethernet connection with the LAN.                                                                                                                                                            |
| 2.4G WLAN/WPS<br>    | Green | On       | The 2.4 GHz WiFi network is activated.                                                                                                                                                                                         |
|                                                                                                       |       | Blinking | The Zyxel Device is communicating with 2.4 GHz WiFi clients.                                                                                                                                                                   |
|                                                                                                       | Amber | On       | The WPS process fails.                                                                                                                                                                                                         |
|                                                                                                       |       | Blinking | The Zyxel Device is setting up a WPS connection with a 2.4 GHz WiFi client.                                                                                                                                                    |
|                                                                                                       |       | Off      | The 2.4 GHz WiFi network is not activated.                                                                                                                                                                                     |
| 5G WLAN/WPS<br>    | Green | On       | The 5 GHz WiFi network is activated.                                                                                                                                                                                           |
|                                                                                                       |       | Blinking | The Zyxel Device is communicating with 5 GHz WiFi clients.                                                                                                                                                                     |
|                                                                                                       | Amber | On       | The WPS process fails.                                                                                                                                                                                                         |
|                                                                                                       |       | Blinking | The Zyxel Device is setting up a WPS connection with a 5 GHz WiFi client.                                                                                                                                                      |
|                                                                                                       |       | Off      | The 5 GHz WiFi network is not activated.                                                                                                                                                                                       |
| Phone1, Phone2<br> | Green | On       | A SIP account is registered for at least one phone port, and there is no voice message in the corresponding SIP account.                                                                                                       |
|                                                                                                       |       | Blinking | A telephone connected to one of the phone port has its receiver off the hook or there is an incoming call. There is no voice message in the corresponding SIP account.                                                         |
|                                                                                                       | Amber | On       | A SIP account is registered for the phone port and there is a voice message in the corresponding SIP account.                                                                                                                  |
|                                                                                                       |       | Blinking | A telephone connected to the phone port has its receiver off the hook or there is an incoming call. There is voice message in the corresponding SIP account.                                                                   |
| SFP<br>            | Green | On       | The SFP port is connected to the ISP's ONT and the Zyxel Device is receiving optical signals normally, or the SFP port's Ethernet WAN connection is up.                                                                        |
|                                                                                                       |       | Off      | The connection to the ISP's ONT or the Ethernet WAN connection is down.                                                                                                                                                        |

**EX3300-T0 / EX3301-T0****Figure 14** LED Indicators (EX3300-T0 / EX3301-T0)

The following are the LED descriptions for your Zyxel Device.

**Table 13** LED Descriptions (EX3300-T0)

| LED                                                                                                 | COLOR | STATUS        | DESCRIPTION                                                                              |
|-----------------------------------------------------------------------------------------------------|-------|---------------|------------------------------------------------------------------------------------------|
| Power<br>        | Green | On            | The Zyxel Device is receiving power and ready for use.                                   |
|                                                                                                     |       | Blinking      | The Zyxel Device is self-testing.                                                        |
|                                                                                                     | Red   | On            | The Zyxel Device detected an error while self-testing, or there is a device malfunction. |
|                                                                                                     |       | Blinking      | The Zyxel Device is upgrading firmware.                                                  |
|                                                                                                     |       | Off           | The Zyxel Device is not receiving power.                                                 |
| Ethernet WAN<br> | Green | On            | The WAN connection is active and ready to use.                                           |
|                                                                                                     |       | Slow Blinking | The Zyxel Device is looking for a WAN connection.                                        |
|                                                                                                     |       | Fast Blinking | The Zyxel Device is initializing the WAN connection.                                     |

Table 13 LED Descriptions (EX3300-T0) (continued)

| LED                                                                                                | COLOR | STATUS   | DESCRIPTION                                                                                                                                                                                                                    |
|----------------------------------------------------------------------------------------------------|-------|----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Internet<br>      | Green | On       | The Zyxel Device has an IP connection but no traffic.<br><br>Your device has a WAN IP address (either static or assigned by a DHCP server), PPP negotiation was successfully completed (if used) and the DSL connection is up. |
|                                                                                                    |       | Blinking | The Zyxel Device is sending or receiving IP traffic.                                                                                                                                                                           |
|                                                                                                    |       | Off      | There is no Internet connection or the gateway is in bridged mode.                                                                                                                                                             |
|                                                                                                    | Red   | On       | The Zyxel Device attempted to make an IP connection but failed. Possible causes are no response from a DHCP server, no PPPoE response, PPPoE authentication failed.                                                            |
| LAN1 to 4<br>     | Green | On       | The Zyxel Device has a successful 10/100/1000 Mbps Ethernet connection with a device on the Local Area Network (LAN).                                                                                                          |
|                                                                                                    |       | Blinking | The Zyxel Device is sending or receiving data to/from the LAN at 10/100/1000 Mbps.                                                                                                                                             |
|                                                                                                    |       | Off      | The Zyxel Device does not have an Ethernet connection with the LAN.                                                                                                                                                            |
| 2.4G WLAN/WPS<br> | Green | On       | The 2.4 GHz WiFi network is activated.                                                                                                                                                                                         |
|                                                                                                    |       | Blinking | The Zyxel Device is communicating with 2.4 GHz WiFi clients.                                                                                                                                                                   |
|                                                                                                    |       | Off      | The link is down or disabled.                                                                                                                                                                                                  |
|                                                                                                    | Amber | Blinking | The Zyxel Device is setting up a WPS connection with a 2.4 GHz WiFi client.                                                                                                                                                    |
| 5G WLAN/WPS<br> | Green | On       | The 5 GHz WiFi network is activated.                                                                                                                                                                                           |
|                                                                                                    |       | Blinking | The Zyxel Device is communicating with 5 GHz WiFi clients.                                                                                                                                                                     |
|                                                                                                    |       | Off      | The link is down or disabled.                                                                                                                                                                                                  |
|                                                                                                    | Amber | Blinking | The Zyxel Device is setting up a WPS connection with a 5 GHz WiFi client.                                                                                                                                                      |

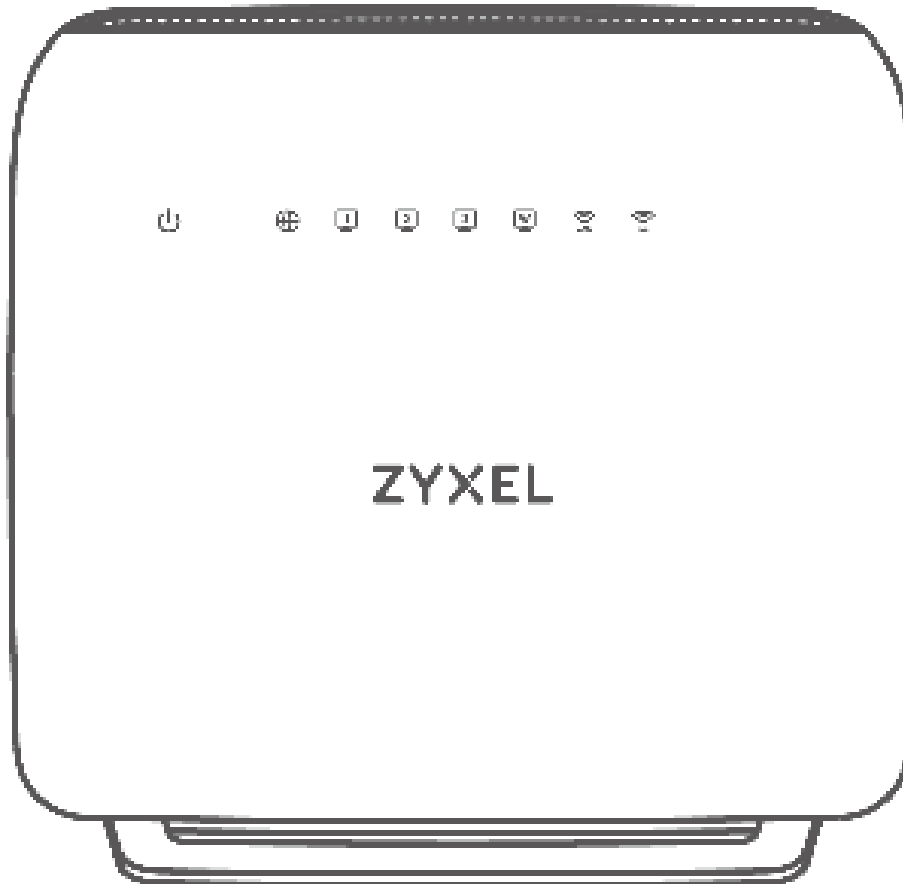
The following are the LED descriptions for your Zyxel Device.

**Figure 15** LED Descriptions (EX3301-T0)

| LED                                                                                                 | COLOR | STATUS        | DESCRIPTION                                                                              |
|-----------------------------------------------------------------------------------------------------|-------|---------------|------------------------------------------------------------------------------------------|
| Power<br>        | Green | On            | The Zyxel Device is receiving power and ready for use.                                   |
|                                                                                                     |       | Blinking      | The Zyxel Device is self-testing.                                                        |
|                                                                                                     | Red   | On            | The Zyxel Device detected an error while self-testing, or there is a device malfunction. |
|                                                                                                     |       | Blinking      | The Zyxel Device is upgrading firmware.                                                  |
|                                                                                                     |       | Off           | The Zyxel Device is not receiving power.                                                 |
| Ethernet WAN<br> | Green | On            | The WAN connection is active and ready to use.                                           |
|                                                                                                     |       | Slow Blinking | The Zyxel Device is looking for a WAN connection.                                        |
|                                                                                                     |       | Fast Blinking | The Zyxel Device is initializing the WAN connection.                                     |

**Figure 15** LED Descriptions (EX3301-T0) (continued)

| LED                                                                                                   | COLOR | STATUS   | DESCRIPTION                                                                                                                                                                                                                             |
|-------------------------------------------------------------------------------------------------------|-------|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Internet<br>         | Green | On       | The Zyxel Device has an IP connection but no traffic.<br><br>Your device has a WAN IP address (either static or assigned by a DHCP server), PPP negotiation was successfully completed (if used) and the DSL connection is up.          |
|                                                                                                       |       | Blinking | The Zyxel Device is sending or receiving IP traffic.                                                                                                                                                                                    |
|                                                                                                       |       | Off      | There is no Internet connection or the gateway is in bridged mode.                                                                                                                                                                      |
|                                                                                                       | Red   | On       | The Zyxel Device attempted to make an IP connection but failed. Possible causes are no response from a DHCP server, no PPPoE response, PPPoE authentication failed.                                                                     |
| LAN1 to 4<br>        | Green | On       | The Zyxel Device has a successful 10/100/1000 Mbps Ethernet connection with a device on the Local Area Network (LAN).                                                                                                                   |
|                                                                                                       |       | Blinking | The Zyxel Device is sending or receiving data to/from the LAN at 10/100/1000 Mbps.                                                                                                                                                      |
|                                                                                                       |       | Off      | The Zyxel Device does not have an Ethernet connection with the LAN.                                                                                                                                                                     |
| 2.4G WLAN/WPS<br>    | Green | On       | The 2.4 GHz WiFi network is activated.                                                                                                                                                                                                  |
|                                                                                                       |       | Blinking | The Zyxel Device is communicating with 2.4 GHz WiFi clients.                                                                                                                                                                            |
|                                                                                                       |       | Off      | The link is down or disabled.                                                                                                                                                                                                           |
|                                                                                                       | Amber | Blinking | The Zyxel Device is setting up a WPS connection with a 2.4 GHz WiFi client.                                                                                                                                                             |
| 5G WLAN/WPS<br>    | Green | On       | The 5 GHz WiFi network is activated.                                                                                                                                                                                                    |
|                                                                                                       |       | Blinking | The Zyxel Device is communicating with 5 GHz WiFi clients.                                                                                                                                                                              |
|                                                                                                       |       | Off      | The link is down or disabled.                                                                                                                                                                                                           |
|                                                                                                       | Amber | Blinking | The Zyxel Device is setting up a WPS connection with a 5 GHz WiFi client.                                                                                                                                                               |
| Phone1, Phone2<br> | Green | On       | A SIP account is registered for at least one phone port, and there is no voice message in the corresponding SIP account.                                                                                                                |
|                                                                                                       |       | Blinking | A telephone connected to one of the phone port has its receiver off the hook or there is an incoming call. There is no voice message in the corresponding SIP account.                                                                  |
|                                                                                                       | Amber | On       | A SIP account is registered for the phone port and there is a voice message in the corresponding SIP account.                                                                                                                           |
|                                                                                                       |       | Blinking | A telephone connected to the phone port has its receiver off the hook or there is an incoming call. There is voice message in the corresponding SIP account.                                                                            |
|                                                                                                       |       | Off      | <ul style="list-style-type: none"> <li>The Zyxel Device is turned off.</li> <li>The VoIP function is not activated.</li> <li>The SIP account is not enabled.</li> <li>The phone port does not have a SIP account registered.</li> </ul> |

**EX3300-T1****Figure 16** LED Indicators (EX3300-T1)

The following are the LED descriptions for your Zyxel Device.

**Table 14** LED Descriptions (EX3300-T1)

| LED                                                                                             | COLOR | STATUS   | DESCRIPTION                                                                                                                                                   |
|-------------------------------------------------------------------------------------------------|-------|----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|
| POWER<br>    | Green | On       | The Zyxel Device is receiving power and ready for use.                                                                                                        |
|                                                                                                 |       | Blinking | The Zyxel Device is booting up.                                                                                                                               |
|                                                                                                 | Red   | On       | The Zyxel Device detects an error while self-testing, or there is a device malfunction.                                                                       |
|                                                                                                 |       | Blinking | The Zyxel Device is upgrading firmware.                                                                                                                       |
|                                                                                                 |       | Off      | The Zyxel Device is not receiving power.                                                                                                                      |
| INTERNET<br> | Green | On       | The Zyxel Device has a WAN IP address (either static or assigned by a DHCP server) and the Internet connection is up.                                         |
|                                                                                                 |       | Blinking | The Zyxel Device is sending or receiving traffic.                                                                                                             |
|                                                                                                 | Red   | On       | The Zyxel Device attempted to obtain a WAN IP but failed. Possible causes are no response from a DHCP server, no PPPoE response, PPPoE authentication failed. |
|                                                                                                 |       | Off      | There is no Internet connection or the gateway is in bridge mode.                                                                                             |

Table 14 LED Descriptions (EX3300-T1) (continued)

| LED                                                                                              | COLOR | STATUS   | DESCRIPTION                                                                                                                                                                          |
|--------------------------------------------------------------------------------------------------|-------|----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| LAN1 to 3<br>   | Green | On       | The Zyxel Device has a successful Ethernet connection with a device on the Local Area Network (LAN) port.                                                                            |
|                                                                                                  |       | Blinking | The Zyxel Device is sending or receiving data to/from the LAN port.                                                                                                                  |
|                                                                                                  |       | Off      | The Zyxel Device does not have an Ethernet connection on the LAN port.                                                                                                               |
| LAN4 or WAN<br> | Green | On       | LAN mode: The Zyxel Device has a successful Ethernet connection with a device on the LAN4 or WAN port.<br><br>WAN mode: The Ethernet WAN connection is up on the LAN4 or WAN port.   |
|                                                                                                  |       | Blinking | The Zyxel Device is sending or receiving data to/from the LAN4 or WAN port.                                                                                                          |
|                                                                                                  |       | Off      | LAN mode: The Zyxel Device does not have an Ethernet connection with a device on the LAN4 or WAN port.<br><br>WAN mode: The Ethernet WAN connection on the LAN4 or WAN port is down. |
| 2.4G<br>        | Green | On       | The 2.4 GHz WiFi is activated.                                                                                                                                                       |
|                                                                                                  |       | Blinking | The Zyxel Device is sending or receiving data to/from 2.4 GHz WiFi clients.                                                                                                          |
|                                                                                                  | Amber | Blinking | The Zyxel Device is connecting to a 2.4 GHz WiFi client through WPS.                                                                                                                 |
|                                                                                                  |       | Off      | The 2.4 GHz WiFi network is not activated.                                                                                                                                           |
| 5G<br>          | Green | On       | The 5 GHz WiFi network is activated.                                                                                                                                                 |
|                                                                                                  |       | Blinking | The Zyxel Device is sending or receiving data to/from 5 GHz WiFi clients.                                                                                                            |
|                                                                                                  | Amber | Blinking | The Zyxel Device is connecting to a 5 GHz WiFi client through WPS.                                                                                                                   |
|                                                                                                  |       | Off      | The 5 GHz WiFi network is not activated.                                                                                                                                             |

**EX3500-T0 / EX3501-T0****Figure 17** LED Indicators (EX3500-T0)

**Figure 18** LED Indicators (EX3501-T0)

The following are the LED descriptions for your Zyxel Device.

**Table 15** LED Descriptions (EX3500-T0 / EX3501-T0)

| LED                                                                                                     | COLOR | STATUS   | DESCRIPTION                                                                                                                                                   |
|---------------------------------------------------------------------------------------------------------|-------|----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>POWER</b><br>     | Green | On       | The Zyxel Device is receiving power and ready for use.                                                                                                        |
|                                                                                                         |       | Blinking | The Zyxel Device is booting up.                                                                                                                               |
|                                                                                                         | Red   | On       | The Zyxel Device detects an error while self-testing, or there is a device malfunction.                                                                       |
|                                                                                                         |       | Blinking | The Zyxel Device is upgrading firmware.                                                                                                                       |
|                                                                                                         |       | Off      | The Zyxel Device is not receiving power.                                                                                                                      |
| <b>WAN</b><br>       | Green | On       | The Ethernet link on the WAN is up.                                                                                                                           |
|                                                                                                         |       | Off      | The Ethernet link on the WAN is down.                                                                                                                         |
| <b>INTERNET</b><br>  | Green | On       | The Zyxel Device has a WAN IP address (either static or assigned by a DHCP server) and the Internet connection is up.                                         |
|                                                                                                         |       | Blinking | The Zyxel Device is sending or receiving Internet data.                                                                                                       |
|                                                                                                         | Red   | On       | The Zyxel Device attempted to obtain a WAN IP but failed. Possible causes are no response from a DHCP server, no PPPoE response, PPPoE authentication failed. |
|                                                                                                         |       | Off      | There is no Internet connection or the gateway is in bridge mode.                                                                                             |
| <b>LAN1 to 3</b><br> | Green | On       | The Zyxel Device has a successful Ethernet connection with a device on the Local Area Network (LAN) port.                                                     |
|                                                                                                         |       | Blinking | The Zyxel Device is sending or receiving data to/from the LAN port.                                                                                           |
|                                                                                                         |       | Off      | The Zyxel Device does not have an Ethernet connection on the LAN port.                                                                                        |

Table 15 LED Descriptions (EX3500-T0 / EX3501-T0) (continued)

| LED                                                                                                    | COLOR | STATUS   | DESCRIPTION                                                                                                                                                            |
|--------------------------------------------------------------------------------------------------------|-------|----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2.4G<br>              | Green | On       | The 2.4 GHz WiFi is activated.                                                                                                                                         |
|                                                                                                        |       | Blinking | The Zyxel Device is sending or receiving data to/from 2.4 GHz WiFi clients.                                                                                            |
|                                                                                                        | Amber | Blinking | The Zyxel Device is connecting to a 2.4 GHz WiFi client through WPS.                                                                                                   |
|                                                                                                        |       | Off      | The 2.4 GHz WiFi network is not activated.                                                                                                                             |
| 5G<br>                | Green | On       | The 5 GHz WiFi network is activated.                                                                                                                                   |
|                                                                                                        |       | Blinking | The Zyxel Device is sending or receiving data to/from 5 GHz WiFi clients.                                                                                              |
|                                                                                                        | Amber | Blinking | The Zyxel Device is connecting to a 5 GHz WiFi client through WPS.                                                                                                     |
|                                                                                                        |       | Off      | The 5 GHz WiFi network is not activated.                                                                                                                               |
| Phone1,<br>Phone2<br> | Green | On       | A SIP account is registered for at least one phone port, and there is no voice message in the corresponding SIP account.                                               |
|                                                                                                        |       | Blinking | A telephone connected to one of the phone port has its receiver off the hook or there is an incoming call. There is no voice message in the corresponding SIP account. |
|                                                                                                        | Amber | On       | A SIP account is registered for the phone port and there is a voice message in the corresponding SIP account.                                                          |
|                                                                                                        |       | Blinking | A telephone connected to the phone port has its receiver off the hook or there is an incoming call. There's voice message in the corresponding SIP account.            |
|                                                                                                        |       | Off      | The phone port has a telephone connection, but it is not in use. VoIP is disabled, or there is no registered SIP account defined for the phone port.                   |

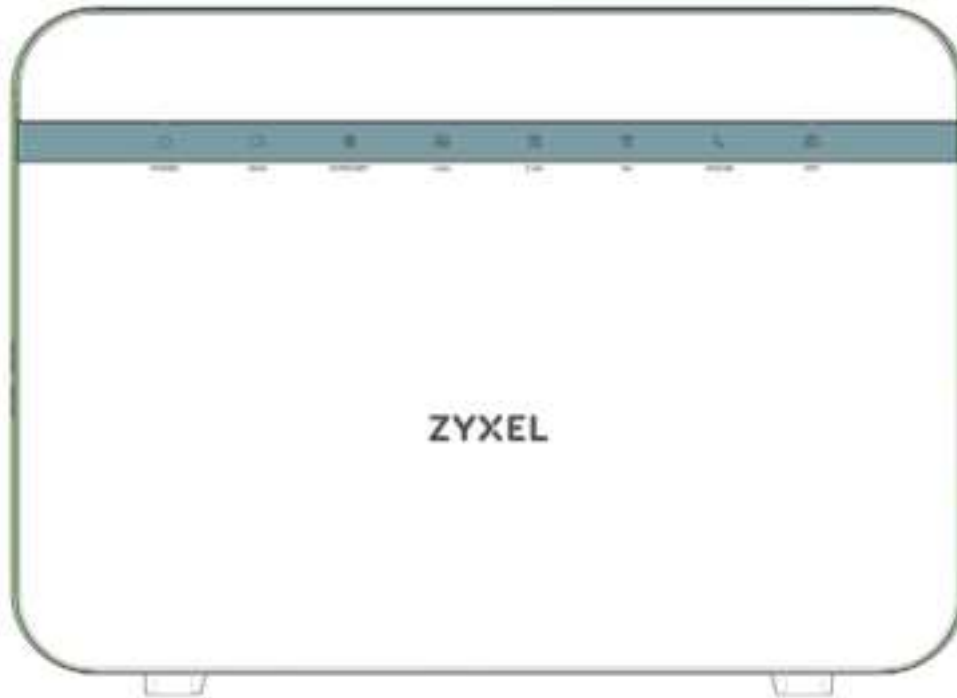
**EX3600-T0****Figure 19** LED Indicators (EX3600-T0)



The following are the LED descriptions for your Zyxel Device.

Table 16 LED Descriptions (EX3600-T0)

| LED                                                                                                      | COLOR | STATUS   | DESCRIPTION                                                                                                                                                                                                                                                                                 |
|----------------------------------------------------------------------------------------------------------|-------|----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Power<br>               | Green | On       | The Zyxel Device is receiving power and ready for use.<br><br>The Zyxel Device is in <b>Extender</b> mode and the MPro Mesh pairing process is done.                                                                                                                                        |
|                                                                                                          |       | Blinking | The Zyxel Device is booting up.<br><br>The Zyxel Device is in <b>Extender</b> mode and under the MPro Mesh pairing process.                                                                                                                                                                 |
|                                                                                                          | Red   | On       | The Zyxel Device detected an error while self-testing, or there is a device malfunction.                                                                                                                                                                                                    |
|                                                                                                          |       | Blinking | The Zyxel Device is upgrading firmware.                                                                                                                                                                                                                                                     |
|                                                                                                          |       | Off      | The Zyxel Device is not receiving power.                                                                                                                                                                                                                                                    |
| Ethernet WAN<br>        | Green | On       | The Ethernet WAN port is connected successfully.                                                                                                                                                                                                                                            |
|                                                                                                          |       | Off      | The Ethernet WAN port is not connected successfully.                                                                                                                                                                                                                                        |
| Internet<br>            | Green | On       | The Internet connection is up.                                                                                                                                                                                                                                                              |
|                                                                                                          |       | Blinking | The Zyxel Device is sending or receiving IP traffic.                                                                                                                                                                                                                                        |
|                                                                                                          | Red   | On       | The Zyxel Device attempted to make an IP connection but failed. Possible causes are no response from a DHCP server, no PPPoE response, PPPoE authentication failed.<br><br>The Zyxel Device is in <b>Extender</b> mode and the Internet connection to the gateway modem/controller is weak. |
|                                                                                                          |       | Off      | There is no Internet connection or the gateway is in <b>Bridge</b> mode.                                                                                                                                                                                                                    |
| LAN1 to 4<br>         | Green | On       | The Zyxel Device has a successful Ethernet connection with a device on the Local Area Network (LAN).                                                                                                                                                                                        |
|                                                                                                          |       | Blinking | The Zyxel Device is sending or receiving data to/from the LAN.                                                                                                                                                                                                                              |
|                                                                                                          |       | Off      | The Zyxel Device does not have an Ethernet connection with the LAN.                                                                                                                                                                                                                         |
| 2.4G WLAN/<br>WPS<br> | Green | On       | The 2.4 GHz WiFi network is activated.                                                                                                                                                                                                                                                      |
|                                                                                                          |       | Blinking | The Zyxel Device is communicating with 2.4 GHz WiFi clients.                                                                                                                                                                                                                                |
|                                                                                                          |       | Off      | The link is down or disabled.                                                                                                                                                                                                                                                               |
|                                                                                                          | Amber | Blinking | The Zyxel Device is setting up a WPS connection with a 2.4 GHz WiFi client.                                                                                                                                                                                                                 |
| 5G WLAN/<br>WPS<br>   | Green | On       | The 5 GHz WiFi network is activated.                                                                                                                                                                                                                                                        |
|                                                                                                          |       | Blinking | The Zyxel Device is communicating with 5 GHz WiFi clients.                                                                                                                                                                                                                                  |
|                                                                                                          | Amber | On       | The Zyxel Device is in <b>Extender</b> mode and under the MPro Mesh pairing process.                                                                                                                                                                                                        |
|                                                                                                          |       | Blinking | The Zyxel Device is setting up a WPS connection with a 5 GHz WiFi client.<br><br>The Zyxel Device is in <b>Extender</b> mode and the MPro Mesh pairing process has failed.                                                                                                                  |
|                                                                                                          |       | Off      | The link is down or disabled.                                                                                                                                                                                                                                                               |

**EX5401-B0 / EX5401-B1****Figure 20** LED Indicators (EX5401-B0 / EX5401-B1)

The following are the LED descriptions for your Zyxel Device.

**Table 17** LED Descriptions (EX5401-B0 / EX5401-B1)

| LED                                                                                                 | COLOR | STATUS        | DESCRIPTION                                                                             |
|-----------------------------------------------------------------------------------------------------|-------|---------------|-----------------------------------------------------------------------------------------|
| Power<br>        | Green | On            | The Zyxel Device is receiving power and ready for use.                                  |
|                                                                                                     |       | Blinking      | The Zyxel Device is self-testing.                                                       |
|                                                                                                     | Red   | On            | The Zyxel Device detects an error while self-testing, or there is a device malfunction. |
|                                                                                                     |       | Blinking      | The Zyxel Device is upgrading firmware.                                                 |
|                                                                                                     |       | Off           | The Zyxel Device is not receiving power.                                                |
| Ethernet WAN<br> | Green | On            | The WAN connection is up.                                                               |
|                                                                                                     |       | Slow Blinking | The Zyxel Device is looking for the WAN connection.                                     |
|                                                                                                     |       | Fast Blinking | The Zyxel Device is initializing the WAN connection.                                    |
|                                                                                                     |       | Off           | There is no Ethernet connection on the WAN.                                             |
|                                                                                                     | Amber | On            | The ADSL line on the WAN is up.                                                         |
|                                                                                                     |       | Slow Blinking | The Zyxel Device is looking for an ADSL line                                            |
|                                                                                                     |       | Fast Blinking | The Zyxel Device is initializing the ADSL line.                                         |

Table 17 LED Descriptions (EX5401-B0 / EX5401-B1) (continued)

| LED                                                                                                   | COLOR | STATUS   | DESCRIPTION                                                                                                                                                                                                                    |
|-------------------------------------------------------------------------------------------------------|-------|----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Internet<br>         | Green | On       | The Zyxel Device has an IP connection but no traffic.<br><br>Your device has a WAN IP address (either static or assigned by a DHCP server), PPP negotiation was successfully completed (if used) and the DSL connection is up. |
|                                                                                                       |       | Blinking | The Zyxel Device is sending or receiving IP traffic.                                                                                                                                                                           |
|                                                                                                       |       | Off      | There is no Internet connection or the gateway is in bridged mode.                                                                                                                                                             |
|                                                                                                       | Red   | On       | The Zyxel Device attempted to make an IP connection but failed. Possible causes are no response from a DHCP server, no PPPoE response, PPPoE authentication failed.                                                            |
| LAN1 to 4<br>        | Green | On       | The Zyxel Device has a successful 10/100/1000 Mbps Ethernet connection with a device on the Local Area Network (LAN).                                                                                                          |
|                                                                                                       |       | Blinking | The Zyxel Device is sending or receiving data to/from the LAN at 10/100/1000 Mbps.                                                                                                                                             |
|                                                                                                       |       | Off      | The Zyxel Device does not have an Ethernet connection with the LAN.                                                                                                                                                            |
| 2.4G WLAN/WPS<br>    | Green | On       | The 2.4 GHz WiFi network is activated.                                                                                                                                                                                         |
|                                                                                                       |       | Blinking | The Zyxel Device is communicating with 2.4 GHz WiFi clients.                                                                                                                                                                   |
|                                                                                                       | Amber | On       | The WPS process fails.                                                                                                                                                                                                         |
|                                                                                                       |       | Blinking | The Zyxel Device is setting up a WPS connection with a 2.4 GHz WiFi client.                                                                                                                                                    |
|                                                                                                       |       | Off      | The 2.4 GHz WiFi network is not activated.                                                                                                                                                                                     |
| 5G WLAN/WPS<br>    | Green | On       | The 5 GHz WiFi network is activated.                                                                                                                                                                                           |
|                                                                                                       |       | Blinking | The Zyxel Device is communicating with 5 GHz WiFi clients.                                                                                                                                                                     |
|                                                                                                       | Amber | On       | The WPS process fails.                                                                                                                                                                                                         |
|                                                                                                       |       | Blinking | The Zyxel Device is setting up a WPS connection with a 5 GHz WiFi client.                                                                                                                                                      |
|                                                                                                       |       | Off      | The 5 GHz WiFi network is not activated.                                                                                                                                                                                       |
| Phone1, Phone2<br> | Green | On       | A SIP account is registered for at least one phone port, and there is no voice message in the corresponding SIP account.                                                                                                       |
|                                                                                                       |       | Blinking | A telephone connected to one of the phone port has its receiver off the hook or there is an incoming call. There is no voice message in the corresponding SIP account.                                                         |
|                                                                                                       | Amber | On       | A SIP account is registered for the phone port and there is a voice message in the corresponding SIP account.                                                                                                                  |
|                                                                                                       |       | Blinking | A telephone connected to the phone port has its receiver off the hook or there is an incoming call. There is voice message in the corresponding SIP account.                                                                   |
| SFP<br>            | Green | On       | The SFP port is connected to the ISP's ONT and the Zyxel Device is receiving optical signals normally, or the SFP port's Ethernet WAN connection is up.                                                                        |
|                                                                                                       |       | Off      | The connection to the ISP's ONT or the Ethernet WAN connection is down.                                                                                                                                                        |

**EX5600-T1 / EX5601-T0 / EX5601-T1**

**Figure 21** LED Indicators (EX5600-T1)

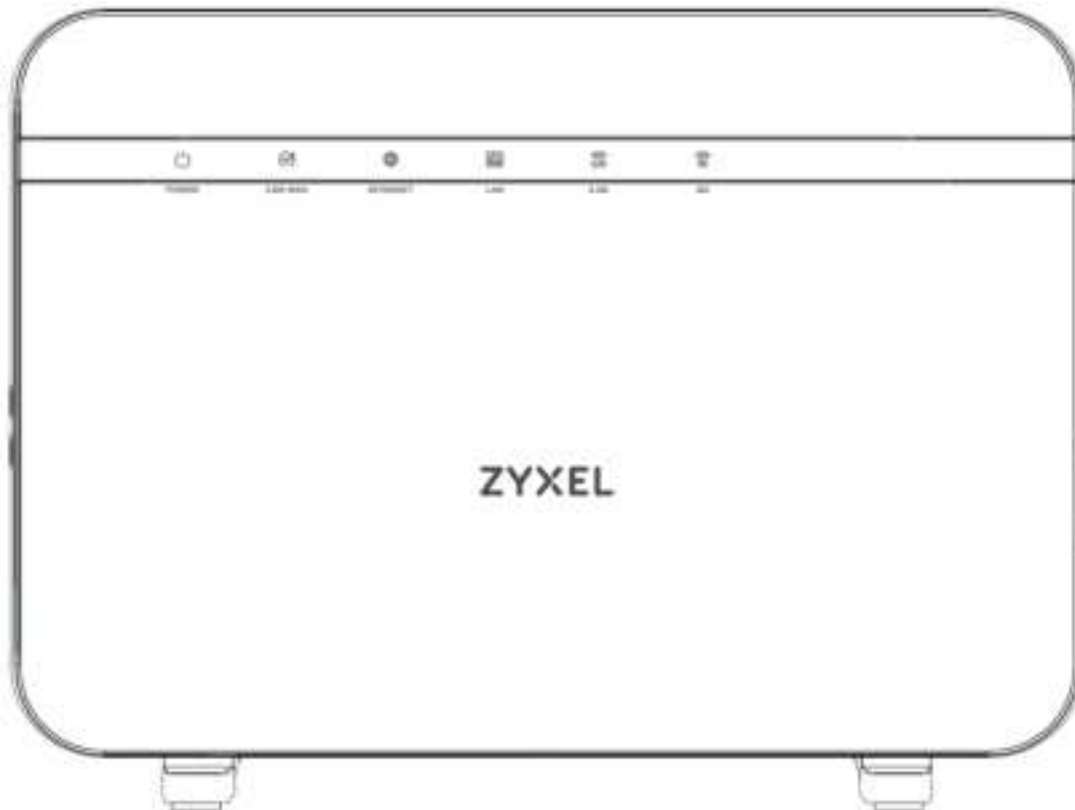


**Figure 22** LED Indicators (EX5601-T0)

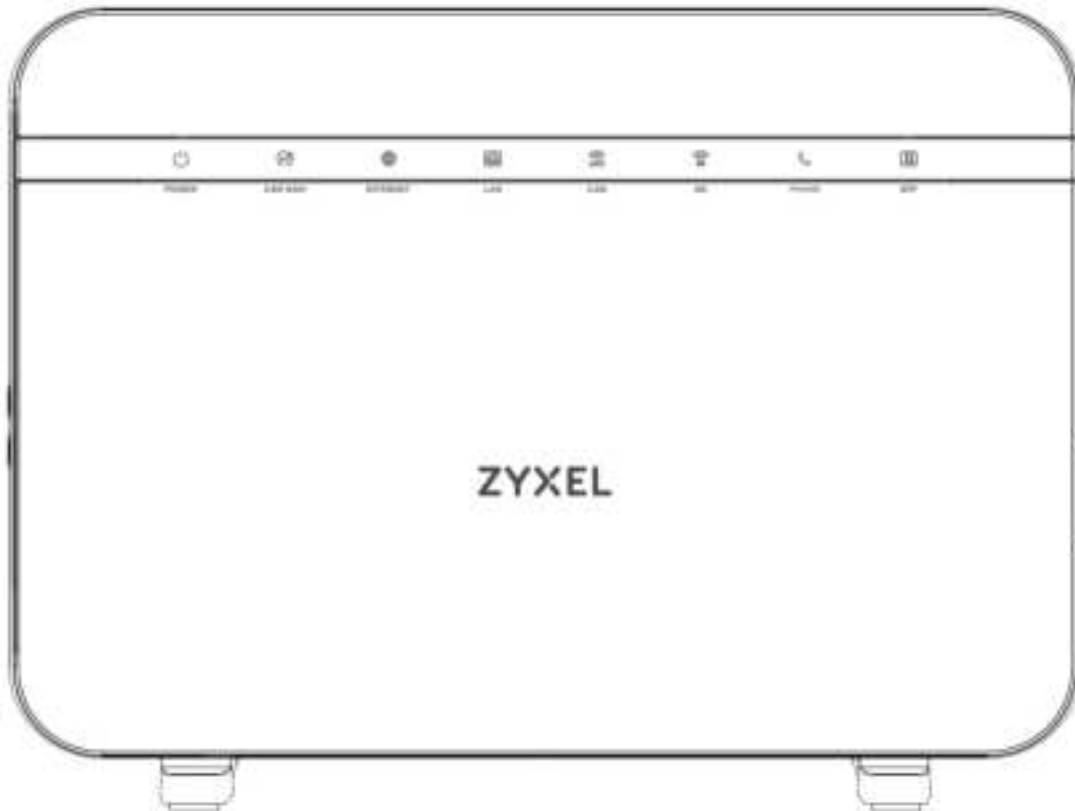
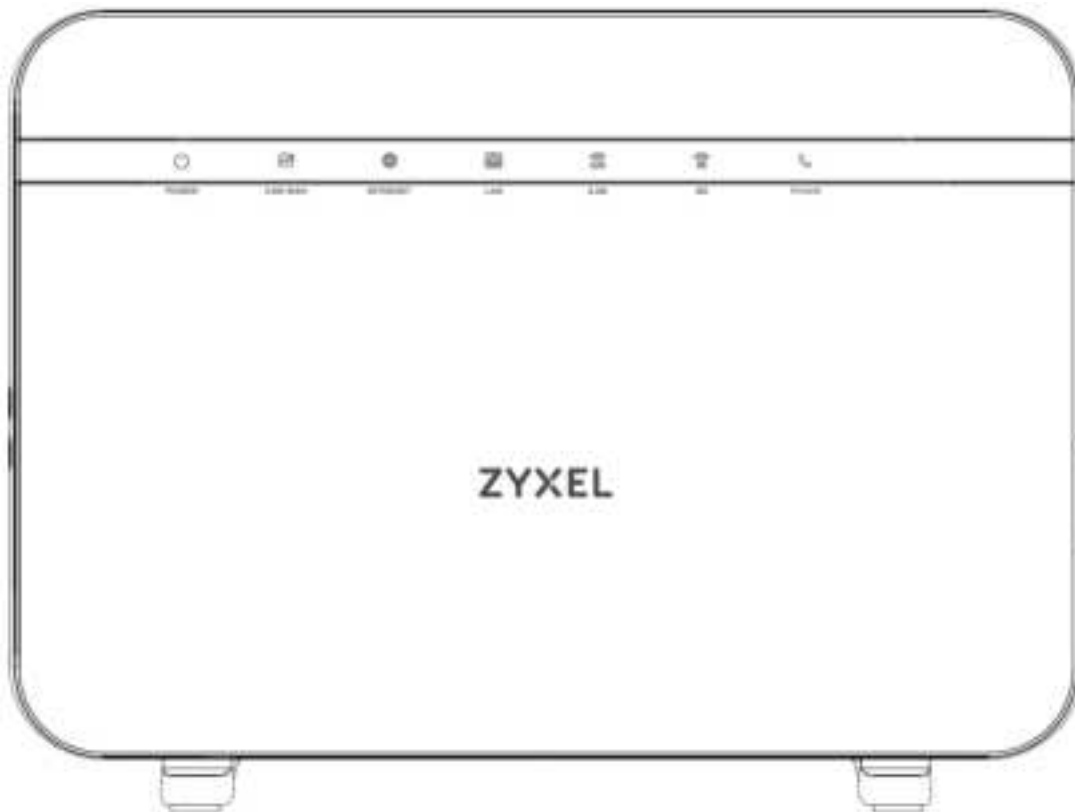


**Figure 23** LED Indicators (EX5601-T1)



Note: The SFP LED is for the Zyxel Device with an SFP port only; see [Section 1.1 on page 20](#) for more information.

The following are the LED descriptions for your Zyxel Device.

Table 18 LED Descriptions (EX5600-T1 / EX5601-T0 / EX5601-T1)

| LED                                                                                           | COLOR | STATUS   | DESCRIPTION                                                                                                                                                            |
|-----------------------------------------------------------------------------------------------|-------|----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| POWER<br>    | Green | On       | The Zyxel Device is receiving power and ready for use.                                                                                                                 |
|                                                                                               |       | Blinking | The Zyxel Device is booting up.                                                                                                                                        |
|                                                                                               | Red   | On       | The Zyxel Device detects an error while self-testing, or there is a device malfunction.                                                                                |
|                                                                                               |       | Blinking | The Zyxel Device is upgrading firmware.                                                                                                                                |
|                                                                                               |       | Off      | The Zyxel Device is not receiving power.                                                                                                                               |
| 2.5G WAN<br> | Green | On       | The Zyxel Device has a successful Ethernet connection on the 2.5G WAN port.                                                                                            |
|                                                                                               |       | Off      | The Zyxel Device does not have an Ethernet connection on the 2.5G WAN port.                                                                                            |
| INTERNET<br> | Green | On       | The Zyxel Device has a WAN IP address (either static or assigned by a DHCP server) and the Internet connection is up.                                                  |
|                                                                                               |       | Blinking | The Zyxel Device is sending or receiving traffic.                                                                                                                      |
|                                                                                               |       | Off      | There is no Internet connection or the gateway is in bridged mode.                                                                                                     |
|                                                                                               | Red   | On       | The Zyxel Device attempted to obtain a WAN IP but failed. Possible causes are no response from a DHCP server, no PPPoE response, PPPoE authentication failed.          |
| LAN<br>    | Green | On       | The Zyxel Device has a successful Ethernet connection with a device on the Local Area Network (LAN).                                                                   |
|                                                                                               |       | Blinking | The Zyxel Device is sending or receiving data to/from the LAN.                                                                                                         |
|                                                                                               |       | Off      | The Zyxel Device does not have an Ethernet connection on the LAN.                                                                                                      |
| 2.4G<br>   | Green | On       | The 2.4 GHz WiFi is activated.                                                                                                                                         |
|                                                                                               |       | Blinking | The Zyxel Device is communicating with 2.4 GHz WiFi clients.                                                                                                           |
|                                                                                               | Amber | Blinking | The Zyxel Device is setting up a WPS connection with a 2.4 GHz WiFi client.                                                                                            |
|                                                                                               |       | Off      | The 2.4 GHz WiFi network is not activated.                                                                                                                             |
| 5G<br>     | Green | On       | The 5 GHz WiFi network is activated.                                                                                                                                   |
|                                                                                               |       | Blinking | The Zyxel Device is communicating with 5 GHz WiFi clients.                                                                                                             |
|                                                                                               | Amber | Blinking | The Zyxel Device is connecting to 5 GHz WiFi clients through WPS.                                                                                                      |
|                                                                                               |       | Off      | The 5 GHz WiFi network is not activated.                                                                                                                               |
| Phone<br>  | Green | On       | All phone ports are on-hook. An SIP account is registered for at least one phone port, and there is no voice message in the corresponding SIP account.                 |
|                                                                                               |       | Blinking | A telephone connected to one of the phone port has its receiver off the hook or there is an incoming call. There is no voice message in the corresponding SIP account. |
|                                                                                               | Amber | On       | A SIP account is registered for the phone port and there is a voice message in the corresponding SIP account.                                                          |
|                                                                                               |       | Blinking | A telephone connected to the phone port has its receiver off the hook or there is an incoming call. There is voice message in the corresponding SIP account.           |
|                                                                                               |       | Off      | All phone ports are on-hook. The VoIP function is disabled, or there is no registered SIP account defined for any of the phone ports.                                  |

Table 18 LED Descriptions (EX5600-T1 / EX5601-T0 / EX5601-T1) (continued)

| LED                                                                               | COLOR | STATUS | DESCRIPTION                                                                                                                                             |
|-----------------------------------------------------------------------------------|-------|--------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | Green | On     | The SFP port is connected to the ISP's ONT and the Zyxel Device is receiving optical signals normally, or the SFP port's Ethernet WAN connection is up. |
|                                                                                   |       | Off    | The connection to the ISP's ONT or the Ethernet WAN connection is down.                                                                                 |

**EX7501-B0****Figure 24** LED Indicators (EX7501-B0)

The following are the LED descriptions for your Zyxel Device.

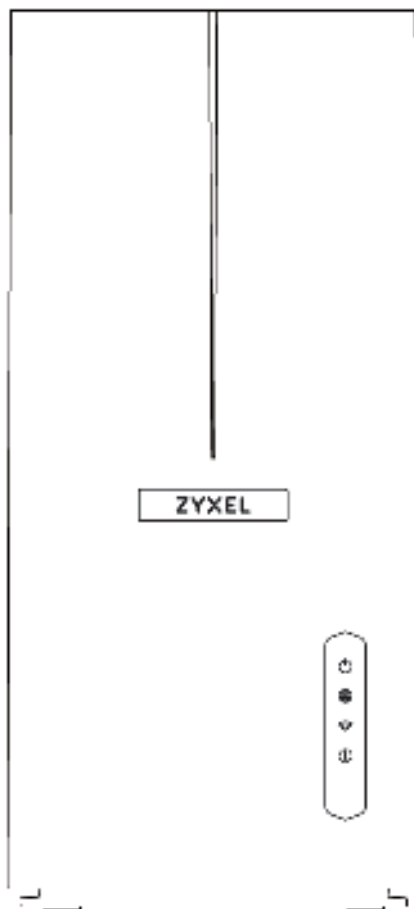
Table 19 LED Descriptions (EX7501-B0)

| LED                                                                                 | COLOR | STATUS   | DESCRIPTION                                                                                                                                                   |
|-------------------------------------------------------------------------------------|-------|----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|
|    | Green | On       | The Zyxel Device is receiving power and ready for use.                                                                                                        |
|                                                                                     |       | Blinking | The Zyxel Device is booting up.                                                                                                                               |
|                                                                                     | Red   | On       | The Zyxel Device detects an error while self-testing, or there is a device malfunction.                                                                       |
|                                                                                     |       | Blinking | The Zyxel Device is upgrading firmware.                                                                                                                       |
|                                                                                     |       | Off      | The Zyxel Device is not receiving power.                                                                                                                      |
|  | Green | On       | The Zyxel Device has a successful Ethernet connection on the 10G WAN port.                                                                                    |
|                                                                                     |       | Off      | The Zyxel Device does not have an Ethernet connection on the 10G WAN port.                                                                                    |
|  | Green | On       | The Zyxel Device has a WAN IP address (either static or assigned by a DHCP server) and the Internet connection is up.                                         |
|                                                                                     |       | Blinking | The Zyxel Device is sending or receiving traffic.                                                                                                             |
|                                                                                     |       | Off      | There is no Internet connection or the gateway is in bridged mode.                                                                                            |
|                                                                                     | Red   | On       | The Zyxel Device attempted to obtain a WAN IP but failed. Possible causes are no response from a DHCP server, no PPPoE response, PPPoE authentication failed. |
|  | Green | On       | The Zyxel Device has a successful Ethernet connection with a device on the 10G LAN (Local Area Network) port.                                                 |
|                                                                                     |       | Blinking | The Zyxel Device is sending or receiving data to/from the 10G LAN port.                                                                                       |
|                                                                                     |       | Off      | The Zyxel Device does not have an Ethernet connection on the 10G LAN port.                                                                                    |
|  | Green | On       | The Zyxel Device has a successful Ethernet connection with a device on the LAN (Local Area Network) port.                                                     |
|                                                                                     |       | Blinking | The Zyxel Device is sending or receiving data to/from the LAN port.                                                                                           |
|                                                                                     |       | Off      | The Zyxel Device does not have an Ethernet connection on the LAN port.                                                                                        |

Table 19 LED Descriptions (EX7501-B0) (continued)

| LED                                                                                        | COLOR | STATUS   | DESCRIPTION                                                                                                                                                                        |
|--------------------------------------------------------------------------------------------|-------|----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2.4G<br>  | Green | On       | The 2.4 GHz WiFi is activated.                                                                                                                                                     |
|                                                                                            |       | Blinking | The Zyxel Device is communicating with 2.4 GHz WiFi clients.                                                                                                                       |
|                                                                                            | Amber | Blinking | The Zyxel Device is setting up a WPS connection with a 2.4 GHz WiFi client.                                                                                                        |
|                                                                                            |       | Off      | The 2.4 GHz WiFi network is not activated.                                                                                                                                         |
| 5G<br>    | Green | On       | The 5 GHz WiFi network is activated.                                                                                                                                               |
|                                                                                            |       | Blinking | The Zyxel Device is communicating with 5 GHz WiFi clients.                                                                                                                         |
|                                                                                            | Amber | Blinking | The Zyxel Device is connecting to 5 GHz WiFi clients through WPS.                                                                                                                  |
|                                                                                            |       | Off      | The 5 GHz WiFi network is not activated.                                                                                                                                           |
| Phone<br> | Green | On       | All phone ports are on-hook. An SIP account is registered for at least one phone port, and there is no voice message in the corresponding SIP account.                             |
|                                                                                            |       | Blinking | At least one telephone connected to one of the phone ports has its receiver off the hook or there is an incoming call. There is no voice message in the corresponding SIP account. |
|                                                                                            | Amber | On       | All phone ports are on-hook. A SIP account is registered for the phone port and there is a voice message in the corresponding SIP account.                                         |
|                                                                                            |       | Blinking | At least one telephone connected to the phone port has its receiver off the hook or there is an incoming call. There is voice message in the corresponding SIP account.            |
|                                                                                            |       | Off      | All phone ports are on-hook. The VoIP function is disabled, or there is no registered SIP account defined for any of the phone ports.                                              |
| USB<br> | Green | On       | A device is connected to the USB port.                                                                                                                                             |
|                                                                                            |       | Off      | There is currently no device connected to the USB port.                                                                                                                            |



**EX7710-B0****Figure 25** LED Indicators (EX7710-B0)

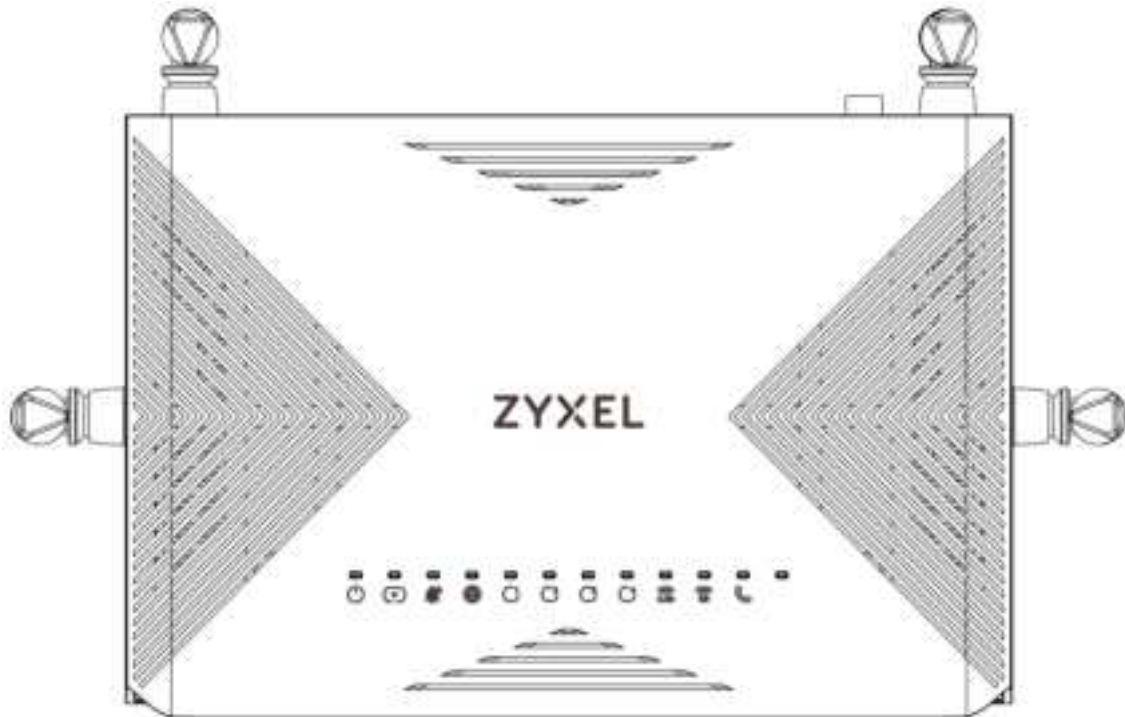
The following are the LED descriptions for your Zyxel Device.

**Table 20** LED Descriptions (EX7710-B0)

| LED                                                                                 | COLOR | STATUS   | DESCRIPTION                                                                                                                                                           |
|-------------------------------------------------------------------------------------|-------|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | Blue  | On       | The Zyxel Device is receiving power and ready for use.                                                                                                                |
|                                                                                     |       | Blinking | The Zyxel Device is booting up.                                                                                                                                       |
|                                                                                     | Red   | On       | The Zyxel Device detects an error while self-testing, or there is a device malfunction.                                                                               |
|                                                                                     |       | Blinking | The Zyxel Device is upgrading firmware.                                                                                                                               |
|                                                                                     |       | Off      | The Zyxel Device is not receiving power.                                                                                                                              |
|  | Blue  | On       | The Zyxel Device has a WAN IP address (either static or assigned by a DHCP server) and the Internet connection is up.                                                 |
|                                                                                     |       | Blinking | The Zyxel Device is sending or receiving Internet data.                                                                                                               |
|                                                                                     | Red   | On       | The Zyxel Device attempted to obtain a WAN IP address but failed. Possible causes are no response from a DHCP server, no PPPoE response, PPPoE authentication failed. |
|  | Blue  | On       | The 2.4G, 5G or 6G Wi-Fi connection is activated.                                                                                                                     |
|                                                                                     |       | Blinking | The Zyxel Device is sending or receiving data.                                                                                                                        |
|                                                                                     |       | Off      | The 2.4G, 5G or 6G Wi-Fi network is not ready or failed.                                                                                                              |

Table 20 LED Descriptions (EX7710-B0) (continued)

| LED                                                                               | COLOR | STATUS   | DESCRIPTION                                |
|-----------------------------------------------------------------------------------|-------|----------|--------------------------------------------|
|  | Green | Blinking | The WPS process is in progress.            |
|                                                                                   |       | Off      | The WPS is not activated.                  |
|                                                                                   | Amber | Blinking | The IPTV Wi-Fi network WPS is in progress. |

**PX3321-T1****Figure 26** LED Indicators (PX3321-T1)

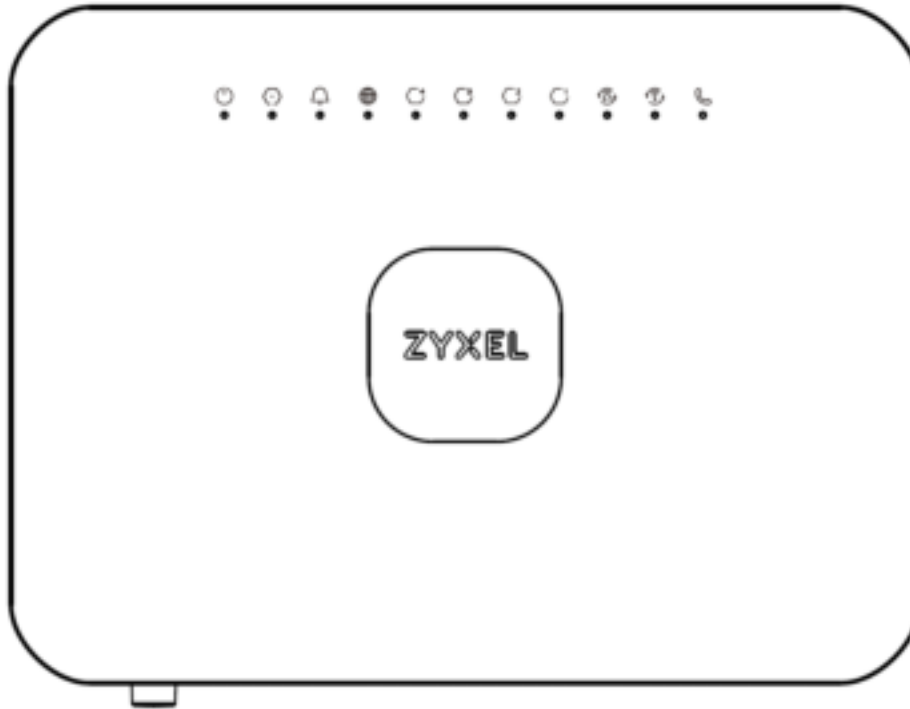
The following are the LED descriptions for your Zyxel Device.

Table 21 LED Descriptions (PX3321-T1)

| LED                                                                                 | COLOR | STATUS   | DESCRIPTION                                                                 |
|-------------------------------------------------------------------------------------|-------|----------|-----------------------------------------------------------------------------|
|  | Green | On       | The Zyxel Device is receiving power and ready for use.                      |
|                                                                                     |       | Blinking | The Zyxel Device is booting up or upgrading firmware.                       |
|                                                                                     |       | Off      | The Zyxel Device is not receiving power.                                    |
|  | Green | On       | The Zyxel Device is ready for PON connection.                               |
|                                                                                     |       | Blinking | The Zyxel Device is setting up a PON connection.                            |
|                                                                                     |       | Off      | The Zyxel Device is not receiving an optical signal.                        |
|  | Red   | On       | The PON transceiver is not receiving an optical signal.                     |
|                                                                                     |       | Blinking | The optical signal the PON transceiver receiving is too weak or too strong. |
|                                                                                     |       | Off      | The PON connection is ready.                                                |

Table 21 LED Descriptions (PX3321-T1) (continued)

| LED                                                                                             | COLOR | STATUS   | DESCRIPTION                                                                                                                                               |
|-------------------------------------------------------------------------------------------------|-------|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|
| INTERNET<br>   | Green | On       | The Zyxel Device has a WAN IP address (either static or assigned by a DHCP server) and the Internet connection is up.                                     |
|                                                                                                 |       | Blinking | The Zyxel Device is trying to build an Internet connection.                                                                                               |
|                                                                                                 |       | Off      | The Zyxel Device's WAN connection is down or in <b>Bridge</b> mode. You can select modes on the <b>Network Setting &gt; Broadband &gt; Modify</b> screen. |
| LAN 1 to 4<br> | Green | On       | The Zyxel Device has a successful Ethernet connection with a device on the LAN (Local Area Network) port.                                                 |
|                                                                                                 |       | Blinking | The Zyxel Device is sending or receiving data to/from the LAN port.                                                                                       |
|                                                                                                 |       | Off      | The Zyxel Device does not have an Ethernet connection on the LAN port.                                                                                    |
| 2.4G<br>       | Green | On       | The 2.4 GHz WiFi is activated.                                                                                                                            |
|                                                                                                 |       | Blinking | The Zyxel Device is communicating with 2.4 GHz WiFi clients.                                                                                              |
|                                                                                                 |       | Off      | The 2.4 GHz WiFi network is not activated.                                                                                                                |
|                                                                                                 | Amber | Blinking | The Zyxel Device is setting up a WPS connection with a 2.4 GHz WiFi client.                                                                               |
| 5G<br>         | Green | On       | The 5 GHz WiFi network is activated.                                                                                                                      |
|                                                                                                 |       | Blinking | The Zyxel Device is communicating with 5 GHz WiFi clients.                                                                                                |
|                                                                                                 |       | Off      | The 5 GHz WiFi network is not activated.                                                                                                                  |
|                                                                                                 | Amber | Blinking | The Zyxel Device is connecting to 5 GHz WiFi clients through WPS.                                                                                         |
| Phone<br>    | Green | On       | The phone port has a telephone connection, but it is not in use. A SIP account is registered for the phone port.                                          |
|                                                                                                 |       | Blinking | The phone port has a telephone connection, and it is in use.                                                                                              |
|                                                                                                 |       | Off      | The phone port has a telephone connection, but it is not in use. VoIP is disabled, or there is no registered SIP account defined for the phone port.      |

**PX5301-T0****Figure 27** LED Indicators (PX5301-T0)

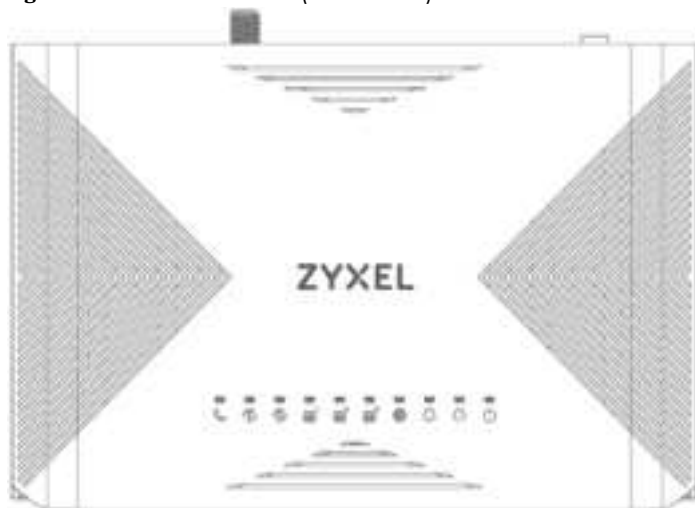
The following are the LED descriptions for your Zyxel Device.

**Table 22** LED Descriptions (PX5301-T0)

| LED                                                                                 | COLOR | STATUS   | DESCRIPTION                                                                                                           |
|-------------------------------------------------------------------------------------|-------|----------|-----------------------------------------------------------------------------------------------------------------------|
|  | Green | On       | The Zyxel Device is receiving power and ready for use.                                                                |
|                                                                                     |       | Blinking | The Zyxel Device is booting up or upgrading firmware.                                                                 |
|                                                                                     |       | Off      | The Zyxel Device is not receiving power.                                                                              |
|  | Green | On       | The Zyxel Device is ready for GPON connection.                                                                        |
|                                                                                     |       | Blinking | The Zyxel Device is setting up a GPON connection.                                                                     |
|                                                                                     |       | Off      | The Zyxel Device is not receiving an optical signal.                                                                  |
|  | Red   | On       | The GPON transceiver is not receiving an optical signal.                                                              |
|                                                                                     |       | Blinking | The optical signal the GPON transceiver receiving is too weak.                                                        |
|                                                                                     |       | Off      | The Zyxel Device is receiving stable optical power.                                                                   |
|  | Green | On       | The Zyxel Device has a WAN IP address (either static or assigned by a DHCP server) and the Internet connection is up. |
|                                                                                     |       | Blinking | The Zyxel Device is sending or receiving Internet data.                                                               |
|                                                                                     |       | Off      | There is no Internet connection or the Zyxel Device is in <b>Bridge</b> mode.                                         |
|  | Green | On       | The Zyxel Device has a successful Ethernet connection with a device on the LAN (Local Area Network) port.             |
|                                                                                     |       | Blinking | The Zyxel Device is sending or receiving data to/from the LAN port.                                                   |
|                                                                                     |       | Off      | The Zyxel Device does not have an Ethernet connection on the LAN port.                                                |

Table 22 LED Descriptions (PX5301-T0) (continued)

| LED                                                                               | COLOR | STATUS   | DESCRIPTION                                                                                                                                          |
|-----------------------------------------------------------------------------------|-------|----------|------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | Green | On       | The 2.4 GHz WiFi network is activated.                                                                                                               |
|                                                                                   |       | Blinking | The Zyxel Device is communicating with 2.4 GHz WiFi clients.                                                                                         |
|                                                                                   |       | Off      | The 2.4 GHz WiFi network is not activated.                                                                                                           |
|                                                                                   | Amber | Blinking | The Zyxel Device is setting up a WPS connection with a 2.4 GHz WiFi client.                                                                          |
|  | Green | On       | The 5 GHz WiFi network is activated.                                                                                                                 |
|                                                                                   |       | Blinking | The Zyxel Device is communicating with 5 GHz WiFi clients.                                                                                           |
|                                                                                   |       | Off      | The 5 GHz WiFi network is not activated.                                                                                                             |
|                                                                                   | Amber | Blinking | The Zyxel Device is setting up a WPS connection with a 5 GHz WiFi client.                                                                            |
|  | Green | On       | The phone port has a telephone connection, but it is not in use. A SIP account is registered for the phone port.                                     |
|                                                                                   |       | Blinking | The phone port has a telephone connection, and it is in use.                                                                                         |
|                                                                                   |       | Off      | The phone port has a telephone connection, but it is not in use. VoIP is disabled, or there is no registered SIP account defined for the phone port. |

**PX5302-00****Figure 28** LED Indicators (PX5302-00)

The following are the LED descriptions for your Zyxel Device.

Table 23 LED Descriptions (PX5302-00)

| LED                                                                                 | COLOR | STATUS   | DESCRIPTION                                            |
|-------------------------------------------------------------------------------------|-------|----------|--------------------------------------------------------|
|  | Green | On       | The Zyxel Device is receiving power and ready for use. |
|                                                                                     |       | Blinking | The Zyxel Device is booting up or upgrading firmware.  |
|                                                                                     |       | Off      | The Zyxel Device is not receiving power.               |
|  | Green | On       | The Zyxel Device is ready for GPON connection.         |
|                                                                                     |       | Blinking | The Zyxel Device is setting up a GPON connection.      |
|                                                                                     |       | Off      | The Zyxel Device is not receiving an optical signal.   |

Table 23 LED Descriptions (PX5302-00) (continued)

| LED                                                                                             | COLOR | STATUS   | DESCRIPTION                                                                                                                                          |
|-------------------------------------------------------------------------------------------------|-------|----------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| LOS<br>        | Red   | On       | The GPON transceiver is not receiving an optical signal.                                                                                             |
|                                                                                                 |       | Blinking | The optical signal the GPON transceiver receiving is too weak.                                                                                       |
|                                                                                                 |       | Off      | The Zyxel Device is receiving stable optical power.                                                                                                  |
| INTERNET<br>   | Green | On       | The Zyxel Device has a WAN IP address (either static or assigned by a DHCP server) and the Internet connection is up.                                |
|                                                                                                 |       | Blinking | The Zyxel Device is sending or receiving Internet data.                                                                                              |
|                                                                                                 |       | Off      | There is no Internet connection or the Zyxel Device is in <b>Bridge</b> mode.                                                                        |
| LAN 3 to 1<br> | Green | On       | The Zyxel Device has a successful Ethernet connection with a device on the LAN (Local Area Network) port.                                            |
|                                                                                                 |       | Blinking | The Zyxel Device is sending or receiving data to/from the LAN port.                                                                                  |
|                                                                                                 |       | Off      | The Zyxel Device does not have an Ethernet connection on the LAN port.                                                                               |
| 2.4G/WPS<br>   | Green | On       | The 2.4 GHz WiFi network is activated.                                                                                                               |
|                                                                                                 |       | Blinking | The Zyxel Device is communicating with 2.4 GHz WiFi clients.                                                                                         |
|                                                                                                 |       | Off      | The 2.4 GHz WiFi network is not activated.                                                                                                           |
|                                                                                                 | Amber | Blinking | The Zyxel Device is setting up a WPS connection with a 2.4 GHz WiFi client.                                                                          |
| 5G/WPS<br>    | Green | On       | The 5 GHz WiFi network is activated.                                                                                                                 |
|                                                                                                 |       | Blinking | The Zyxel Device is communicating with 5 GHz WiFi clients.                                                                                           |
|                                                                                                 |       | Off      | The 5 GHz WiFi network is not activated.                                                                                                             |
|                                                                                                 | Amber | Blinking | The Zyxel Device is setting up a WPS connection with a 5 GHz WiFi client.                                                                            |
| Phone<br>    | Green | On       | The phone port has a telephone connection, but it is not in use. A SIP account is registered for the phone port.                                     |
|                                                                                                 |       | Blinking | The phone port has a telephone connection, and it is in use.                                                                                         |
|                                                                                                 |       | Off      | The phone port has a telephone connection, but it is not in use. VoIP is disabled, or there is no registered SIP account defined for the phone port. |

## 2.3 Ports Panel

The following shows the Zyxel Device ports panel and connection ports.

AON (Active Optical Network) Routers

- [AX7501-B0 / AX7501-B1](#)

DSL (Digital Subscriber Line) Routers

- [DX3300-T0 / DX3301-T0](#)
- [DX3300-T1](#)
- [DX5401-B0 / DX5401-B1](#)

Ethernet Gateways and Routers

- EX3300-T0 / EX3301-T0
- EX3300-T1
- EX3500-T0 / EX3501-T0
- EX3600-T0
- EX5401-B0 / EX5401-B1
- EX5600-T1 / EX5601-T0 / EX5601-T1
- EX7501-B0
- EX7710-B0

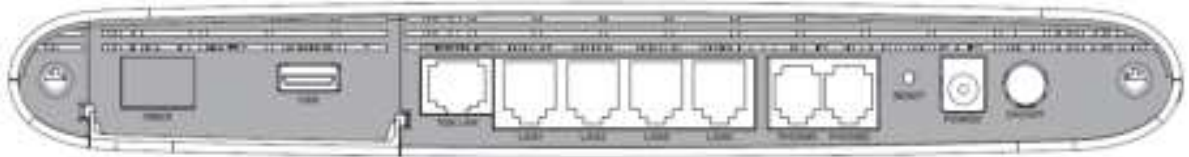
#### PON (Passive Optical Network) Routers

- PX3321-T1
- PX5301-T0
- PX5302-00

### **AX7501-B0 / AX7501-B1**

Place the Zyxel Device with the ports and buttons facing you and the two wall-mounting holes at the bottom.

**Figure 29** Bottom Panel (AX7501-B0 / AX7501-B1)



The **WLAN** and **WPS** buttons are on the right-hand side of the Zyxel Device. The **WLAN** button is closer to you, and the **WPS** button is farther from you.

**Figure 30** WLAN / WPS Buttons on the Right-Hand Side (AX7501-B0 / AX7501-B1)



The following table describes the items on the ports panels of your Zyxel Device.

**Table 24** Panel Ports and Buttons (AX7501-B0 / AX7501-B1)

| <b>LABEL</b> | <b>DESCRIPTION</b>                                                                                                                                                     |
|--------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| FIBER        | Insert a compatible SFP+ transceiver to the FIBER port and connect the fiber cable for Internet access.                                                                |
| USB          | The USB port is used for cellular WAN backup, file-sharing, and media server.                                                                                          |
| 10G LAN      | The 10G LAN port supports speeds of 100/1000/10000 Mbps. Connect computers or other Ethernet devices to the 10G LAN port for Internet access with speed up to 10 Gbps. |
| LAN1 to LAN4 | LAN1 to LAN4 are 1G ports supporting speeds of 100/1000 Mbps. Connect computers or other Ethernet devices to Ethernet ports for Internet access.                       |
| PHONE1/2     | Connect analog phones to the PHONE ports to make phone calls.                                                                                                          |
| RESET        | Press the button to return the Zyxel Device to the factory defaults.                                                                                                   |

Table 24 Panel Ports and Buttons (AX7501-B0 / AX7501-B1) (continued)

| LABEL | DESCRIPTION                                                                                                                             |
|-------|-----------------------------------------------------------------------------------------------------------------------------------------|
| POWER | Connect the power adapter and press the ON/OFF button to start the device.                                                              |
| WLAN  | Press the WLAN button for more than 2 seconds to enable the WiFi function.                                                              |
| WPS   | Press the WPS button for more than 5 seconds to quickly set up a secure WiFi connection between the device and a WPS-compatible client. |

**DX3300-T0 / DX3301-T0**

Place the Zyxel Device with the ports and buttons facing you and the two wall-mounting holes closer to the top.

**Figure 31** Rear Panel (DX3300-T0)



**Figure 32** Rear Panel (DX3301-T0)

The **WPS** and **WiFi ON/OFF** buttons are on the right side of the rear panel of the Zyxel Device. The **WPS** button is the upper one, and the **WiFi ON/OFF** button is the lower one.

**Figure 33** WPS and WiFi ON/OFF Buttons on the rear panel (DX3300-T0 / DX3301-T0)

The following table describes the items on the ports panels of your Zyxel Device.

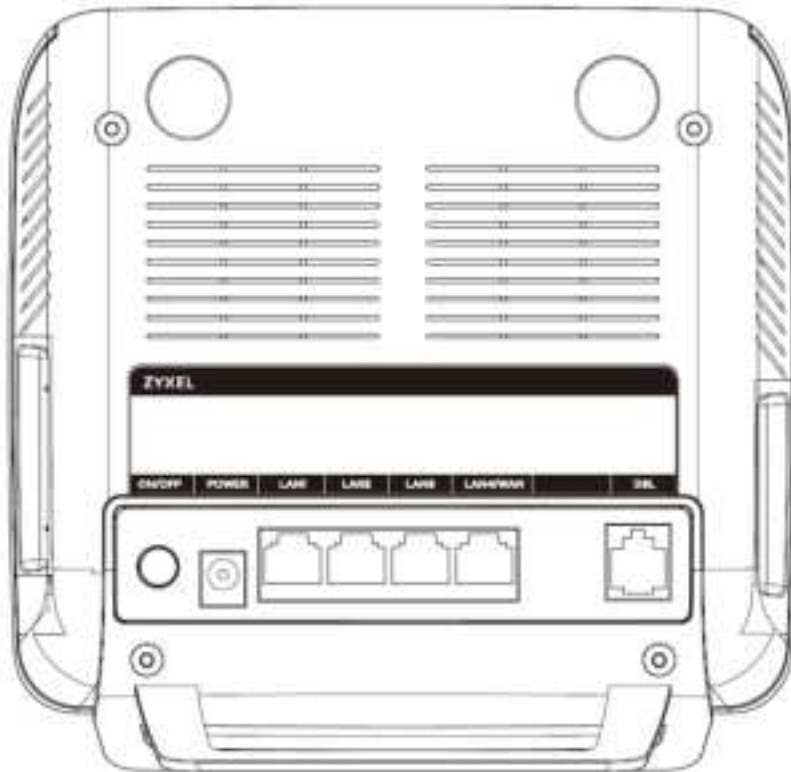
Table 25 Panel Ports and Buttons (DX3300-T0 / DX3301-T0)

| LABEL        | DESCRIPTION                                                                                                                                                                                                     |
|--------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| POWER        | Connect the power adapter and press the <b>ON/OFF</b> button to start the device.                                                                                                                               |
| RESET        | Press the button to return the Zyxel Device to the factory defaults.                                                                                                                                            |
| PHONE1/2     | For DX3301-T0, connect analog phones to the <b>PHONE</b> ports to make phone calls.                                                                                                                             |
| USB          | The <b>USB</b> port is used for cellular WAN backup, file-sharing, and media server.                                                                                                                            |
| LAN4 to LAN1 | <b>LAN4</b> to <b>LAN1</b> are 1G ports supporting speeds of 100/1000 Mbps. Connect computers or other Ethernet devices to Ethernet ports for Internet access.                                                  |
| WAN          | The 1G <b>WAN</b> port supports speeds of 100/1000 Mbps. For EX3300-T0, EX2210-T0, EX3301-T0 and EX5401-B0/B1, use an Ethernet cable to connect the <b>WAN</b> port to a gateway/modem for Internet connection. |
| DSL          | For DX3300-T0, DX3301-T0 and DX5401-B0/B1, connect a DSL cable to the <b>DSL</b> port for Internet connection.                                                                                                  |
| WPS          | Press the <b>WPS</b> button once within 3 seconds to quickly setup a secure WiFi connection between the device and a WPS-compatible client.                                                                     |
| WiFi ON/OFF  | Press the <b>WiFi ON/OFF</b> button for more than 2 seconds to enable the WiFi function.                                                                                                                        |

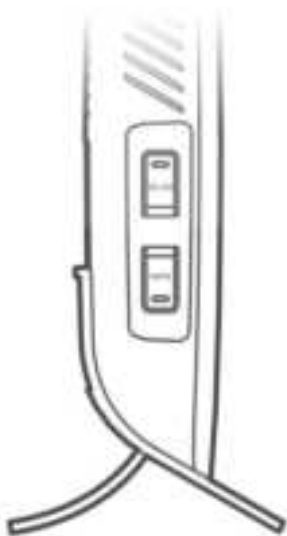
## DX3300-T1

Place the Zyxel Device with the ports and buttons facing you and the feet at the bottom.

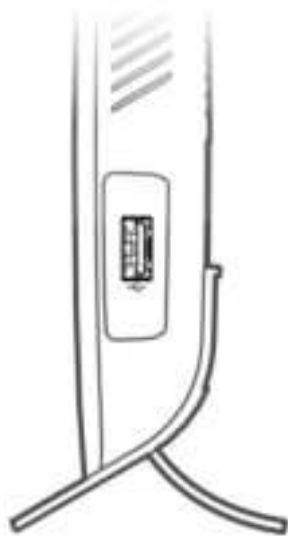
Figure 34 Rear Panel (DX3300-T1)



The **WLAN** and **WPS** buttons are on the right-hand side of the Zyxel Device. The **WLAN** button is the upper one, and the **WPS** button is the lower one.

**Figure 35** WLAN and WPS Buttons on the Right-Hand Side (DX3300-T1)

The USB port is on the left-hand side of the Zyxel Device.

**Figure 36** USB Port on the Left-Hand Side (DX3300-T1)

The following table describes the items on the ports panels of your Zyxel Device.

**Table 26** Panel Ports and Buttons (DX3300-T1)

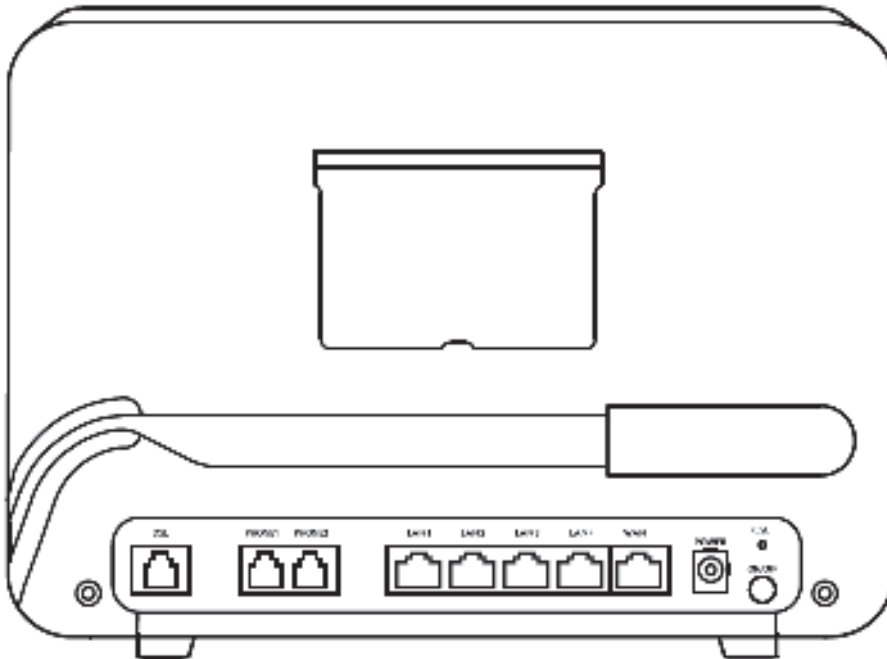
| <b>LABEL</b> | <b>DESCRIPTION</b>                                                                                                                                                                                                                                                                                    |
|--------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| POWER        | Connect the power adapter and press the <b>ON/OFF</b> button to start the device.                                                                                                                                                                                                                     |
| LAN1 to LAN3 | LAN1 to LAN3 are 1G ports supporting speeds of 100/1000 Mbps. Connect computers or other Ethernet devices to Ethernet ports for Internet access.                                                                                                                                                      |
| LAN4 or WAN  | <p>The 1G LAN/WAN port supports speeds of 100/1000 Mbps.</p> <p>LAN mode: Connect computers or other Ethernet devices to the <b>LAN4 or WAN</b> port for Internet access.</p> <p>WAN mode: Connect the <b>LAN4 or WAN</b> port to a gateway/modem with an Ethernet cable for Internet connection.</p> |

Table 26 Panel Ports and Buttons (DX3300-T1) (continued)

| LABEL | DESCRIPTION                                                                                                                                 |
|-------|---------------------------------------------------------------------------------------------------------------------------------------------|
| RESET | Press the button to return the Zyxel Device to the factory defaults.                                                                        |
| DSL   | For DX3300-T1, connect a DSL cable to the <b>DSL</b> port for Internet connection.                                                          |
| WLAN  | Press the <b>WLAN</b> button for more than 1 second to enable the WiFi function.                                                            |
| WPS   | Press the <b>WPS</b> button once within 3 seconds to quickly setup a secure WiFi connection between the device and a WPS-compatible client. |
| USB   | The USB port is used for cellular WAN backup, file-sharing, and media server.                                                               |

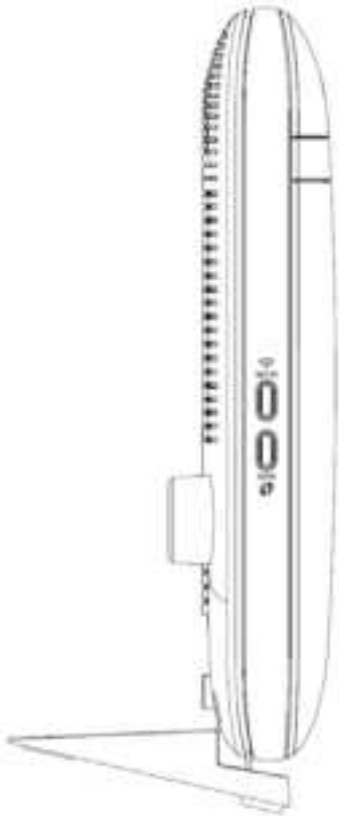
**DX5401-B0 / DX5401-B1**

Place the Zyxel Device with the ports and buttons facing you and the two wall-mounting holes closer to the top.

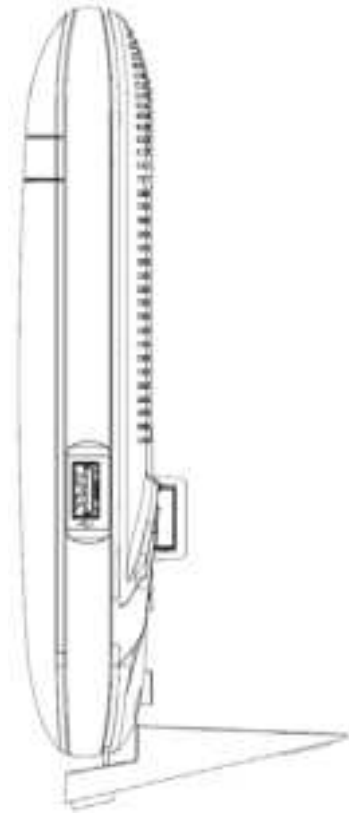
**Figure 37** Rear Panel (DX5401-B0 / DX5401-B1)

The **Wi-Fi** and **WPS** buttons are on the right-hand side of the Zyxel Device. The **Wi-Fi** button is the upper one, and the **WPS** button is the lower one.

**Figure 38** Wi-Fi and WPS Buttons on the Right-Hand Side (DX5401-B0 / DX5401-B1)



The USB port is on the left-hand side of the Zyxel Device.

**Figure 39** USB Port on the Left-Hand Side (DX5401-B0 / DX5401-B1)

The following table describes the items on the ports panels of your Zyxel Device.

Table 27 Panel Ports and Buttons (DX5401-B0 / DX5401-B1)

| <b>LABEL</b> | <b>DESCRIPTION</b>                                                                                                                               |
|--------------|--------------------------------------------------------------------------------------------------------------------------------------------------|
| FIBER        | For DX5401-B0, Insert a compatible SFP transceiver to the FIBER port and connect the fiber cable for Internet access.                            |
| DSL          | Connect a DSL cable to the <b>DSL</b> port for Internet connection.                                                                              |
| PHONE1/2     | Connect analog phones to the <b>PHONE</b> ports to make phone calls.                                                                             |
| LAN1 to LAN4 | LAN1 to LAN4 are 1G ports supporting speeds of 100/1000 Mbps. Connect computers or other Ethernet devices to Ethernet ports for Internet access. |
| WAN          | The 1G WAN port supports speeds of 100/1000 Mbps.                                                                                                |
| RESET        | Press the button to return the Zyxel Device to the factory defaults.                                                                             |
| POWER        | Connect the power adapter and press the <b>ON/OFF</b> button to start the device.                                                                |
| Wi-Fi        | Press the <b>Wi-Fi</b> button for more than 2 seconds to enable the WiFi function.                                                               |
| WPS          | Press the <b>WPS</b> button once within 3 seconds to quickly setup a secure WiFi connection between the device and a WPS-compatible client.      |
| USB          | The USB port is used for cellular WAN backup, file-sharing, and media server.                                                                    |

### **EX3300-T0 / EX3301-T0**

Place the Zyxel Device with the ports and buttons facing you and the two wall-mounting holes closer to the top.

**Figure 40** Rear Panel (EX3300-T0)**Figure 41** Rear Panel (EX3301-T0)

The **WPS** and **Wi-Fi ON/OFF** buttons are on the right side of the rear panel of the Zyxel Device. The **WPS** button is the upper one, and the **Wi-Fi ON/OFF** button is the lower one.

**Figure 42** WPS and WiFi ON/OFF Buttons (EX3300-T0)



**Figure 43** WPS and WiFi ON/OFF Buttons (EX3301-T0)





The following table describes the items on the ports panels of your Zyxel Device

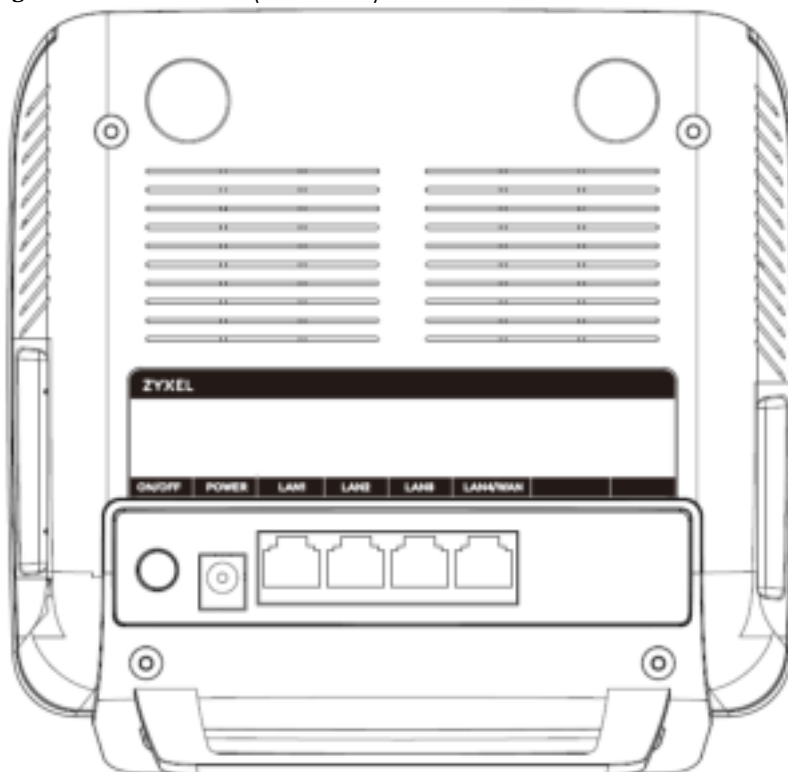
Table 28 Panel Ports and Buttons (EX3300-T0 / EX3301-T0)

| LABEL        | DESCRIPTION                                                                                                                                                                                       |
|--------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| POWER        | Connect the power adapter and press the <b>ON/OFF</b> button to start the device.                                                                                                                 |
| RESET        | Press the button to return the Zyxel Device to the factory defaults.                                                                                                                              |
| PHONE1/2     | For EX3301-T0, connect analog phones to the <b>PHONE</b> ports to make phone calls.                                                                                                               |
| USB          | The USB port is used for cellular WAN backup, file-sharing, and media server.                                                                                                                     |
| LAN4 to LAN1 | LAN4 to LAN1 are 1G ports supporting speeds of 100/1000 Mbps. Connect computers or other Ethernet devices to Ethernet ports for Internet access.                                                  |
| WAN          | The 1G WAN port supports speeds of 100/1000 Mbps. For EX3300-T0, EX2210-T0, EX3301-T0 and EX5401-B0/B1, use an Ethernet cable to connect the WAN port to a gateway/modem for Internet connection. |
| WPS          | Press the <b>WPS</b> button once within 3 seconds to quickly setup a secure WiFi connection between the device and a WPS-compatible client.                                                       |
| WiFi ON/OFF  | Press the <b>WiFi ON/OFF</b> button for more than 2 seconds to enable the WiFi function.                                                                                                          |

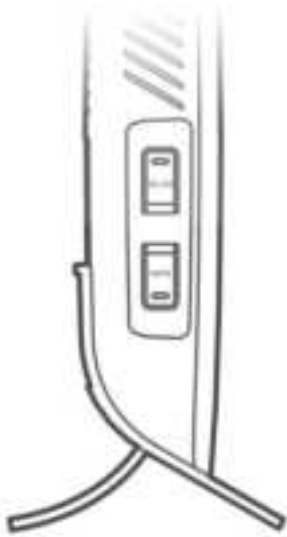
## EX3300-T1

Place the Zyxel Device with the ports and buttons facing you and the feet at the bottom.

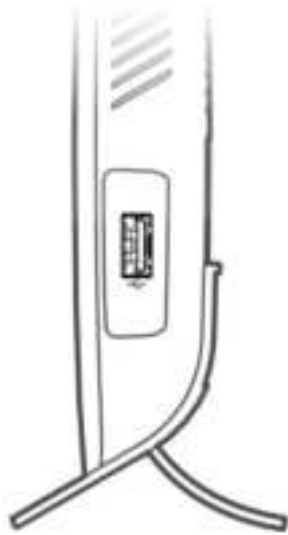
Figure 44 Rear Panel (EX3300-T1)



The **WiFi** and **WPS** buttons are on the right-hand side of the Zyxel Device. The **WiFi** button is the upper one, and the **WPS** button is the lower one.

**Figure 45** WLAN and WPS Buttons on the Right-Hand Side (EX3300-T1)

The USB port is on the left-hand side of the Zyxel Device.

**Figure 46** USB Port on the Left-Hand Side (EX3300-T1)

The following table describes the items on the ports panels of your Zyxel Device.

**Table 29** Panel Ports and Buttons (EX3300-T1)

| <b>LABEL</b> | <b>DESCRIPTION</b>                                                                                                                                                                                                                                                                                    |
|--------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| POWER        | Connect the power adapter and press the <b>ON/OFF</b> button to start the device.                                                                                                                                                                                                                     |
| LAN1 to LAN3 | LAN1 to LAN3 are 1G ports supporting speeds of 100/1000 Mbps. Connect computers or other Ethernet devices to Ethernet ports for Internet access.                                                                                                                                                      |
| LAN4 or WAN  | <p>The 1G LAN/WAN port supports speeds of 100/1000 Mbps.</p> <p>LAN mode: Connect computers or other Ethernet devices to the <b>LAN4 or WAN</b> port for Internet access.</p> <p>WAN mode: Connect the <b>LAN4 or WAN</b> port to a gateway/modem with an Ethernet cable for Internet connection.</p> |

Table 29 Panel Ports and Buttons (EX3300-T1) (continued)

| LABEL | DESCRIPTION                                                                                                                                 |
|-------|---------------------------------------------------------------------------------------------------------------------------------------------|
| RESET | Press the button to return the Zyxel Device to the factory defaults.                                                                        |
| WLAN  | Press the <b>WLAN</b> button for more than 1 second to enable the WiFi function.                                                            |
| WPS   | Press the <b>WPS</b> button once within 3 seconds to quickly setup a secure WiFi connection between the device and a WPS-compatible client. |
| USB   | The USB port is used for cellular WAN backup, file-sharing, and media server.                                                               |

**EX3500-T0 / EX3501-T0**

Place the Zyxel Device with the ports and buttons facing you and the feet at the bottom.

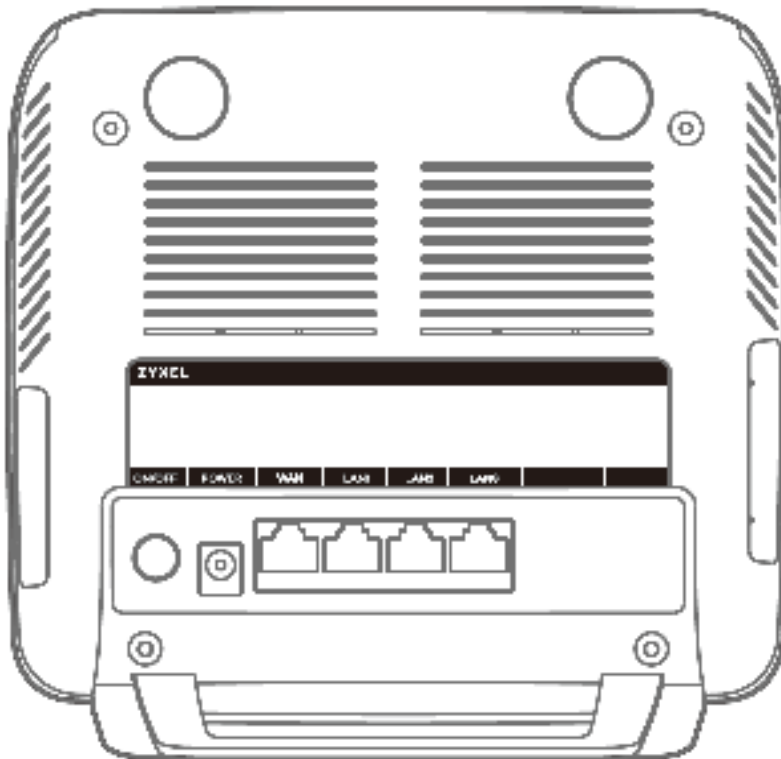
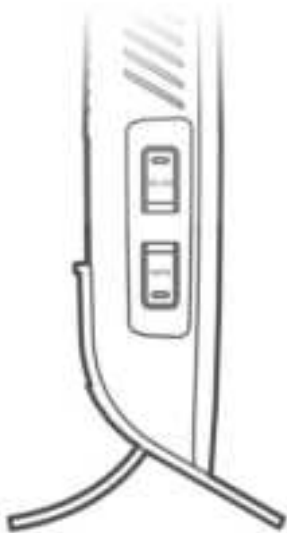
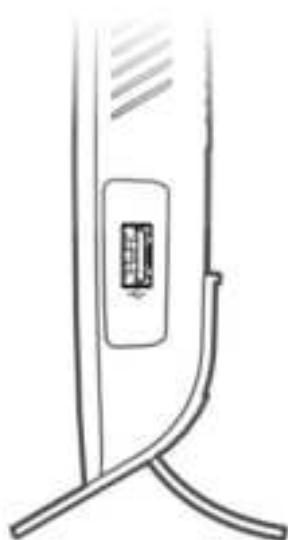
**Figure 47** Rear Panel (EX3500-T0)

**Figure 48** Rear Panel (EX3501-T0)

The **WLAN** and **WPS** buttons are on the right-hand side of the Zyxel Device. The **WLAN** button is the upper one, and the **WPS** button is the lower one.

**Figure 49** WLAN and WPS Buttons on the Right-Hand Side (EX3500-T0 / EX3501-T0)

The USB port is on the left-hand side of the Zyxel Device.

**Figure 50** USB Port on the Left-Hand Side (EX3500-T0 / EX3501-T0)

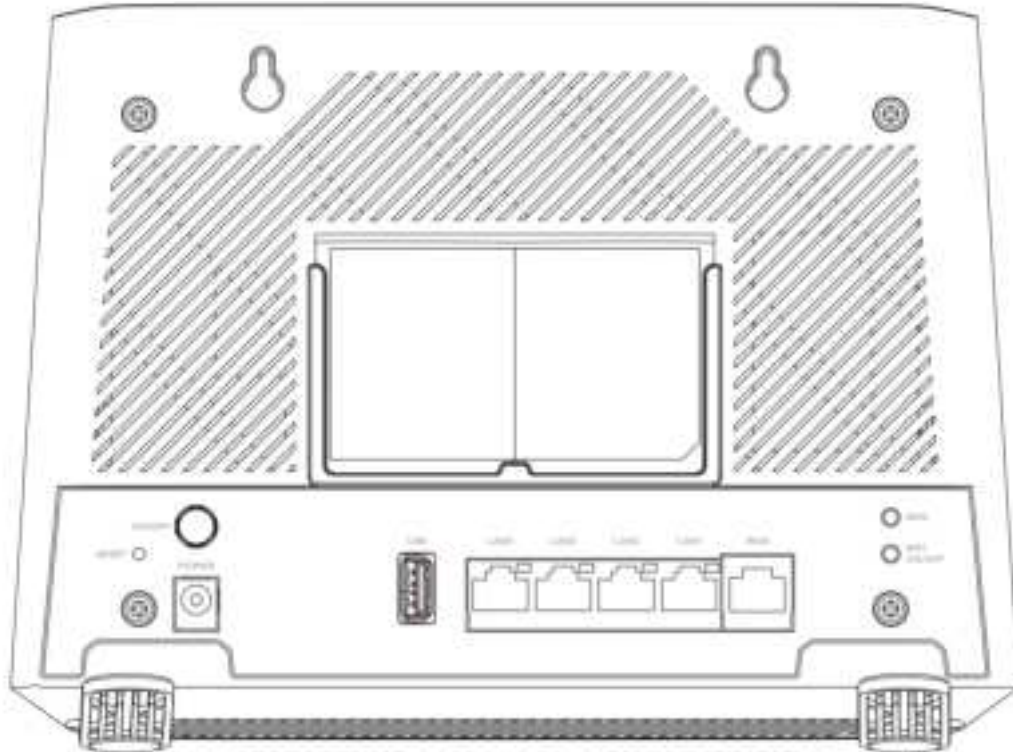
The following table describes the items on the ports panels of your Zyxel Device.

Table 30 Panel Ports and Buttons (EX3500-T0 / EX3501-T0)

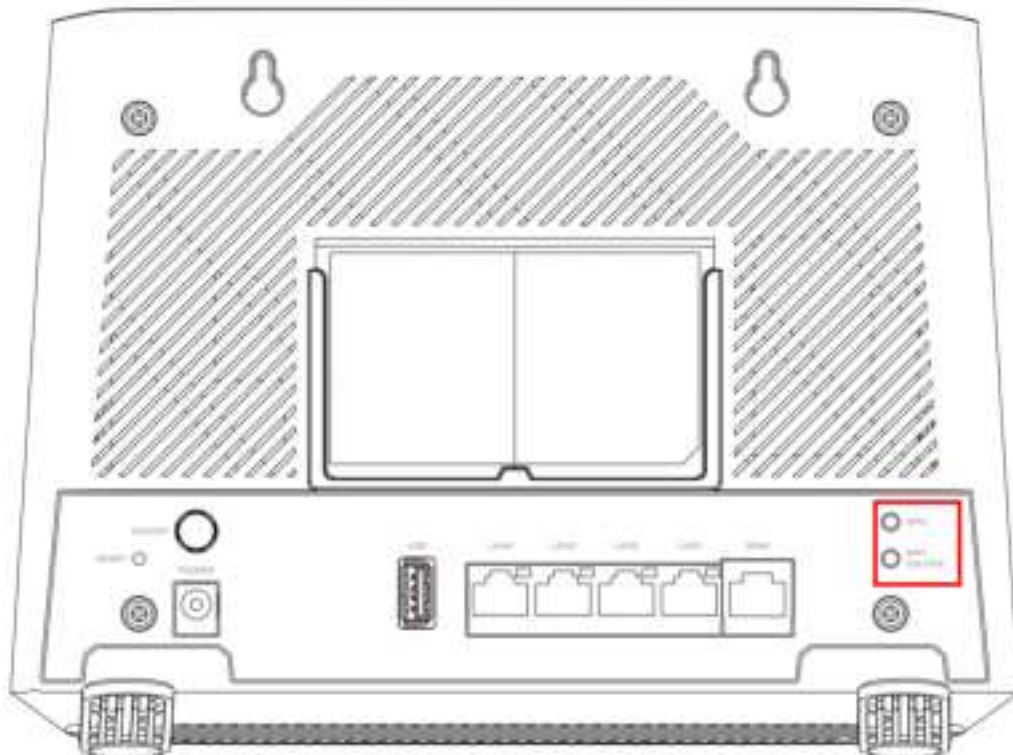
| <b>LABEL</b> | <b>DESCRIPTION</b>                                                                                                                                     |
|--------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|
| POWER        | Connect the power adapter and press the <b>ON/OFF</b> button to start the device.                                                                      |
| WAN          | The 1G WAN port supports speeds of 100/1000 Mbps. Use an Ethernet cable to connect the <b>WAN</b> port to a gateway/modem for Internet connection.     |
| LAN1 to LAN3 | LAN1 to LAN3 are 1G LAN ports that support speeds of 100/1000 Mbps. Connect computers or other Ethernet devices to Ethernet ports for Internet access. |
| Phone1/2     | Connect analog phones to the <b>PHONE</b> ports to make phone calls.                                                                                   |
| RESET        | Press the button to return the Zyxel Device to the factory defaults.                                                                                   |
| WLAN         | Press the <b>WLAN</b> button for more than 1 second to enable the WiFi function.                                                                       |
| WPS          | Press the <b>WPS</b> button once within 3 seconds to quickly setup a secure WiFi connection between the device and a WPS-compatible client.            |
| USB          | The USB port is used for cellular WAN backup, file-sharing, and media server.                                                                          |

### EX3600-T0

Place the Zyxel Device with the ports and buttons facing you and the two wall-mounting holes closer to the top.

**Figure 51** Rear Panel (EX3600-T0)

The **WPS** and **WiFi ON/OFF** buttons are on the right side of the rear panel of the Zyxel Device. The **WPS** button is the upper one, and the **WiFi ON/OFF** button is the lower one.

**Figure 52** WPS and WiFi ON/OFF Buttons (EX3600-T0)

The following table describes the items on the ports panels of your Zyxel Device.

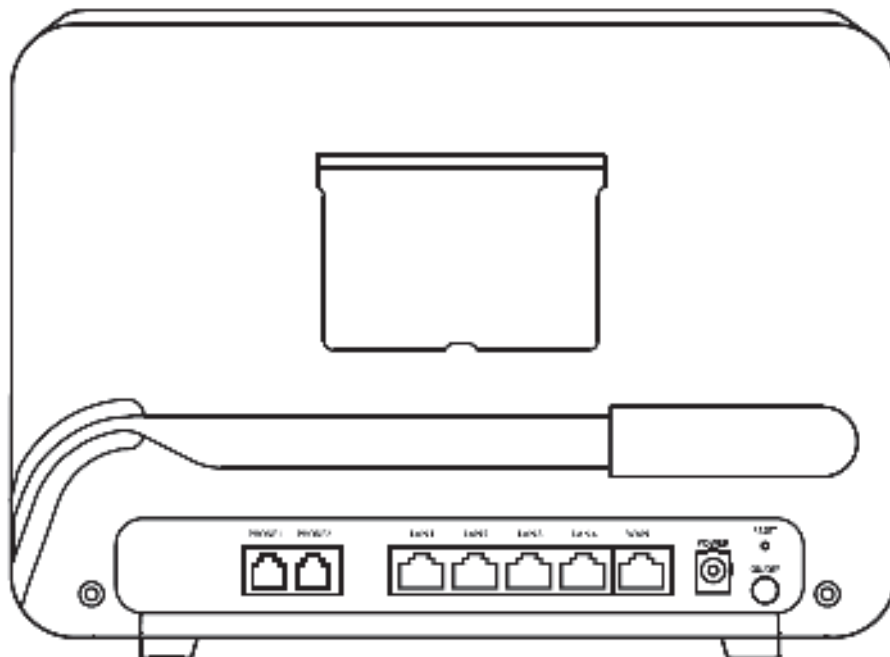
Table 31 Panel Ports and Buttons (EX3600-T0)

| LABEL        | DESCRIPTION                                                                                                                                        |
|--------------|----------------------------------------------------------------------------------------------------------------------------------------------------|
| POWER        | Connect the power adapter and press the <b>ON/OFF</b> button to start the device.                                                                  |
| RESET        | Press the button for more than 5 seconds to return the Zyxel Device to the factory defaults.                                                       |
| USB          | The USB port is used for cellular WAN backup, file-sharing, and media server.                                                                      |
| LAN4 to LAN1 | LAN4 to LAN1 are 1G ports supporting speeds of 100/1000 Mbps. Connect computers or other Ethernet devices to Ethernet ports for Internet access.   |
| WAN          | The 1G WAN port supports speeds of 100/1000 Mbps. Use an Ethernet cable to connect the <b>WAN</b> port to a gateway/modem for Internet connection. |
| WPS          | Press the <b>WPS</b> button once within 3 seconds to quickly setup a secure WiFi connection between the device and a WPS-compatible client.        |
| WiFi ON/OFF  | Press the <b>WiFi ON/OFF</b> button for more than 2 seconds to enable the WiFi function.                                                           |

### EX5401-B0 / EX5401-B1

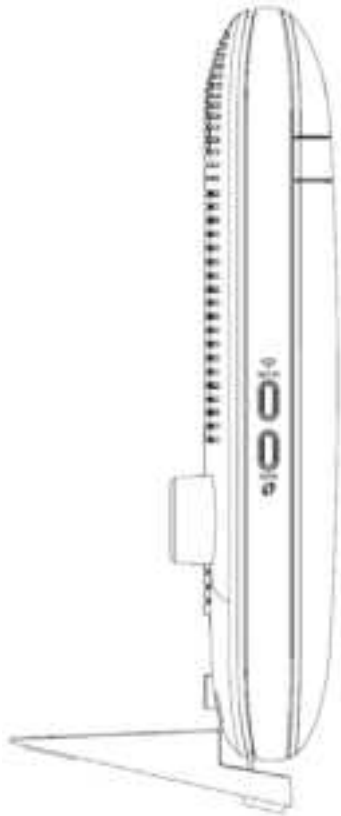
Place the Zyxel Device with the ports and buttons facing you and the two wall-mounting holes closer to the top.

Figure 53 Rear Panel (EX5401-B0 / EX5401-B1)



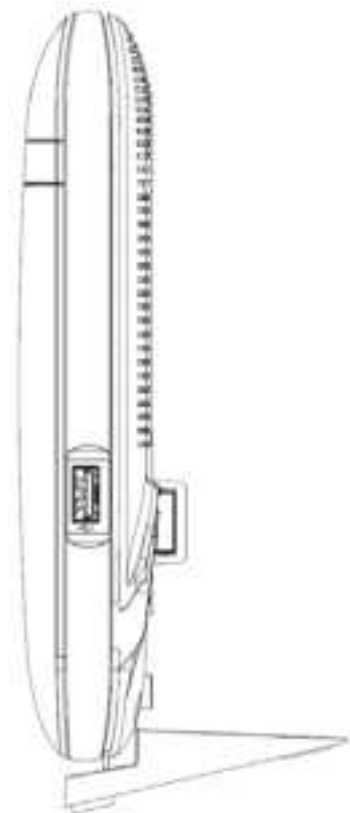
The **Wi-Fi** and **WPS** buttons are on the right-hand side of the Zyxel Device. The **Wi-Fi** button is the upper one, and the **WPS** button is the lower one.

**Figure 54** Wi-Fi and WPS Buttons on the Right-Hand Side (EX5401-B0 / EX5401-B1)



The USB port is on the left-hand side of the Zyxel Device.



**Figure 55** USB Port on the Left-Hand Side (EX5401-B0 / EX5401-B1)

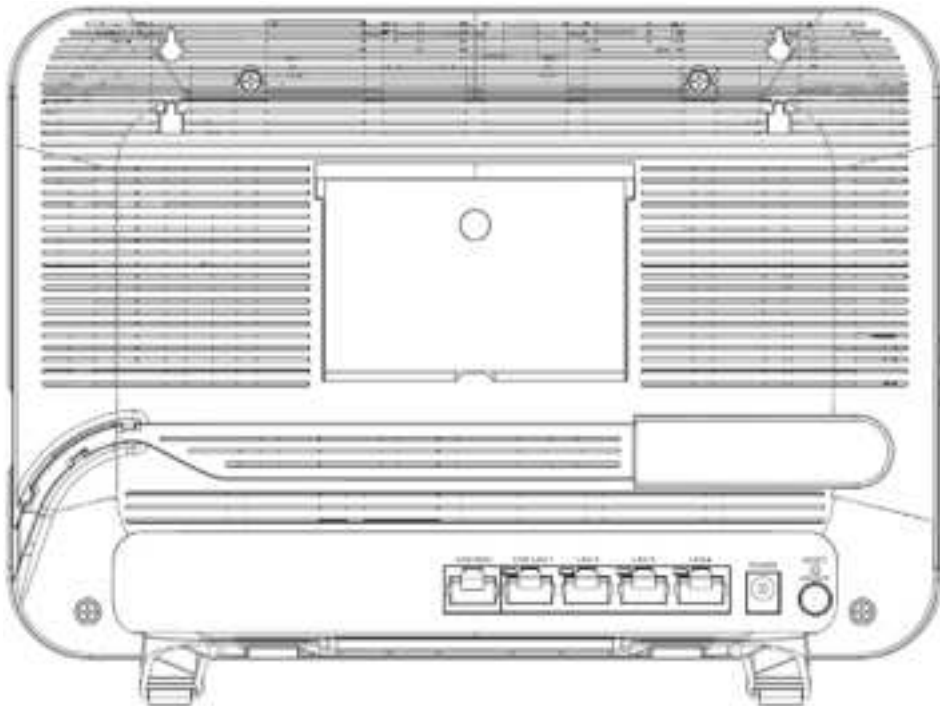
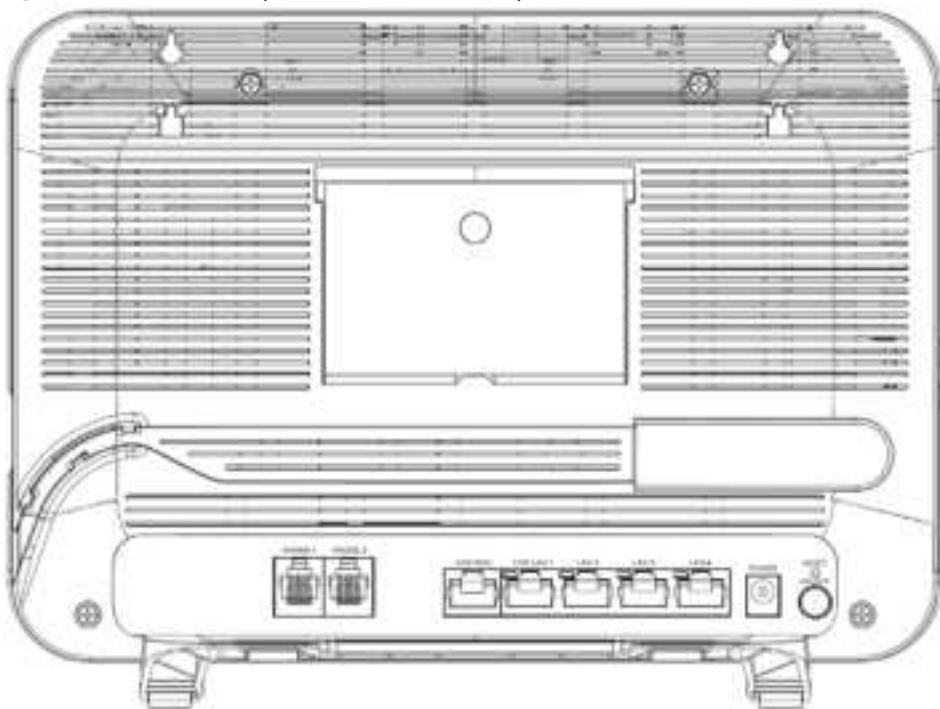
The following table describes the items on the ports panels of your Zyxel Device.

Table 32 Panel Ports and Buttons (EX5401-B0 / EX5401-B1)

| <b>LABEL</b> | <b>DESCRIPTION</b>                                                                                                                                                                                |
|--------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| FIBER        | Insert a compatible SFP transceiver to the FIBER port and connect the fiber cable for Internet access.                                                                                            |
| PHONE1/2     | Connect analog phones to the <b>PHONE</b> ports to make phone calls.                                                                                                                              |
| LAN1 to LAN4 | LAN1 to LAN4 are 1G ports supporting speeds of 100/1000 Mbps. Connect computers or other Ethernet devices to Ethernet ports for Internet access.                                                  |
| WAN          | The 1G WAN port supports speeds of 100/1000 Mbps. For EX3300-T0, EX2210-T0, EX3301-T0 and EX5401-B0/B1, use an Ethernet cable to connect the WAN port to a gateway/modem for Internet connection. |
| RESET        | Press the button to return the Zyxel Device to the factory defaults.                                                                                                                              |
| POWER        | Connect the power adapter and press the <b>ON/OFF</b> button to start the device.                                                                                                                 |
| Wi-Fi        | Press the <b>Wi-Fi</b> button for more than 2 seconds to enable the WiFi function.                                                                                                                |
| WPS          | Press the <b>WPS</b> button once within 3 seconds to quickly setup a secure WiFi connection between the device and a WPS-compatible client.                                                       |
| USB          | The USB port is used for cellular WAN backup, file-sharing, and media server.                                                                                                                     |

### **EX5600-T1 / EX5601-T0 / EX5601-T1**

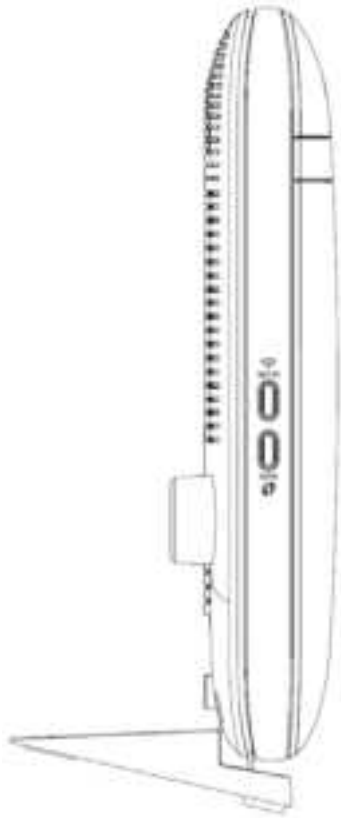
Place the Zyxel Device with the ports and buttons facing you and the two wall-mounting holes closer to the top.

**Figure 56** Rear Panel (EX5600-T1)**Figure 57** Rear Panel (EX5601-T0 / EX5601-T1)

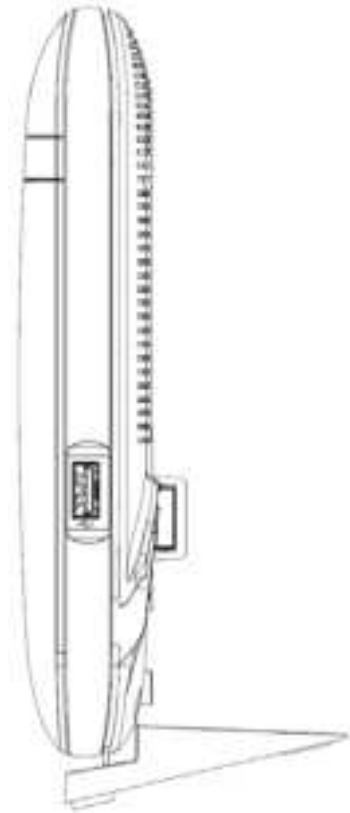
Note: Refer to [Section 1.1 on page 20](#) to see if your Zyxel Device supports the SFP port.

The **Wi-Fi** and **WPS** button are on the right-hand side of the Zyxel Device. The **Wi-Fi** button is the upper one, and the **WPS** button is the lower one.

**Figure 58** Wi-Fi and WPS Buttons on the Right-Hand side (EX5600-T1 / EX5601-T0 / EX5601-T1)



The USB port is on the left-hand side of the Zyxel Device.

**Figure 59** USB port on the Left-Hand Side (EX5600-T1 / EX5601-T0 / EX5601-T1)

The following table describes the items on the ports panels of your Zyxel Device.

**Table 33** Panel Ports and Buttons (EX5600-T1 / EX5601-T0 / EX5601-T1)

| <b>LABEL</b> | <b>DESCRIPTION</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|--------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SFP          | For EX5601-T0, insert a compatible SFP transceiver to the SFP port and connect a fiber optic or Ethernet cable for an (up to) 2.5 Gbps Internet connection.                                                                                                                                                                                                                                                                                                                                           |
| PHONE1/2     | For EX5601-T0, and EX5601-T1, connect analog phones to the PHONE ports with RJ 11 cables for VoIP services.                                                                                                                                                                                                                                                                                                                                                                                           |
| 2.5G WAN     | <p>The 2.5G WAN port is a multi-gigabit Ethernet port that supports connection speeds of 1 Gbps and 2.5 Gbps.</p> <p>For EX5600-T1 and EX5601-T1, use an Ethernet cable to connect the 2.5G WAN port to a gateway/modem for an (up to) 2.5 Gbps Internet connection.</p> <p>For EX5601-T0, use an Ethernet cable to connect the 2.5G WAN port to a gateway/modem, or connect a fiber optic/Ethernet cable to the SFP port through an SFP transceiver for an (up to) 2.5 Gbps Ethernet connection.</p> |
| 2.5G LAN1    | The 2.5G LAN port is a multi-gigabit Ethernet port that supports connection speeds of 1 Gbps and 2.5 Gbps. Connect computers or other Ethernet devices to the 2.5G LAN port for Internet access with speed up to 2.5 Gbps.                                                                                                                                                                                                                                                                            |
| LAN2 to LAN4 | LAN2 to LAN4 are 1G ports supporting speeds of 100/1000 Mbps. Connect computers or other Ethernet devices to Ethernet ports for Internet access.                                                                                                                                                                                                                                                                                                                                                      |
| POWER        | Connect the power adapter and press the <b>ON/OFF</b> button to start the device.                                                                                                                                                                                                                                                                                                                                                                                                                     |
| RESET        | Press the button for more than 5 seconds to return the Zyxel Device to the factory defaults.                                                                                                                                                                                                                                                                                                                                                                                                          |
| Wi-Fi        | Press the <b>Wi-Fi</b> button for more than 2 seconds to enable the WiFi function.                                                                                                                                                                                                                                                                                                                                                                                                                    |

Table 33 Panel Ports and Buttons (EX5600-T1 / EX5601-T0 / EX5601-T1) (continued)

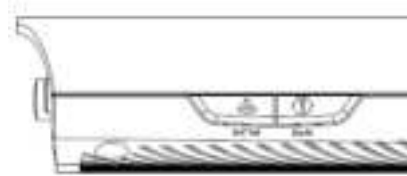
| LABEL | DESCRIPTION                                                                                                                                 |
|-------|---------------------------------------------------------------------------------------------------------------------------------------------|
| WPS   | Press the <b>WPS</b> button once within 3 seconds to quickly setup a secure WiFi connection between the device and a WPS-compatible client. |
| USB   | The USB port is used for cellular WAN backup, file-sharing, and media server.                                                               |

**EX7501-B0**

Place the Zyxel Device with the ports and buttons facing you and the two wall-mounting holes at the bottom.

**Figure 60** Bottom Panel (EX7501-B0)

The **WLAN** and **WPS** buttons are on the right-hand side of the Zyxel Device. The **WLAN** button is closer to you, and the **WPS** button is farther from you.

**Figure 61** WLAN/WPS Buttons on the Right-Hand Side (EX7501-B0)

The following table describes the items on the ports panels of EX7501-B0.

Table 34 Panel Ports and Buttons (EX7501-B0)

| LABEL     | DESCRIPTION                                                                                                                                                                                                                                      |
|-----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 10G WAN   | The 10G WAN port is a multi-gigabit Ethernet port that supports connection speeds of 1 Gbps, 2.5 Gbps, 5 Gbps, and 10 Gbps. Connect an Ethernet cable to the <b>10G WAN</b> port for an (up to) 10 Gbps Ethernet connection.                     |
| USB       | The USB port is used for cellular WAN backup, file-sharing, and media server.                                                                                                                                                                    |
| 10G LAN   | The 10G LAN port is a multi-gigabit Ethernet port that supports connection speeds of 1 Gbps, 2.5 Gbps, 5 Gbps, and 10 Gbps. Connect computers or other Ethernet devices to the <b>10G LAN</b> port for Internet access with speed up to 10 Gbps. |
| LAN1 to 4 | LAN1 to LAN4 are 1G ports supporting speeds of 100/1000 Mbps. Connect computers or other Ethernet devices to Ethernet ports for Internet access.                                                                                                 |
| PHONE1/2  | Connect analog phones to the <b>PHONE</b> ports with RJ-11 cables for VoIP services.                                                                                                                                                             |
| RESET     | Press the button for more than 5 seconds to return the Zyxel Device to the factory defaults.                                                                                                                                                     |
| POWER     | Connect the power adapter and press the <b>ON/OFF</b> button to start the device.                                                                                                                                                                |
| WLAN      | Press the <b>WLAN</b> button for more than 2 seconds to enable the WiFi function.                                                                                                                                                                |
| WPS       | Press the <b>WPS</b> button once within 3 seconds to quickly setup a secure WiFi connection between the device and a WPS-compatible client.                                                                                                      |

**EX7710-B0**

Place the Zyxel Device with the ports and buttons facing you and the feet at the bottom.

**Figure 62** Rear Panel (EX7710-B0)



**Figure 63** Panel Ports (EX7710-B0)

The following table describes the items on the ports panel of your Zyxel Device.

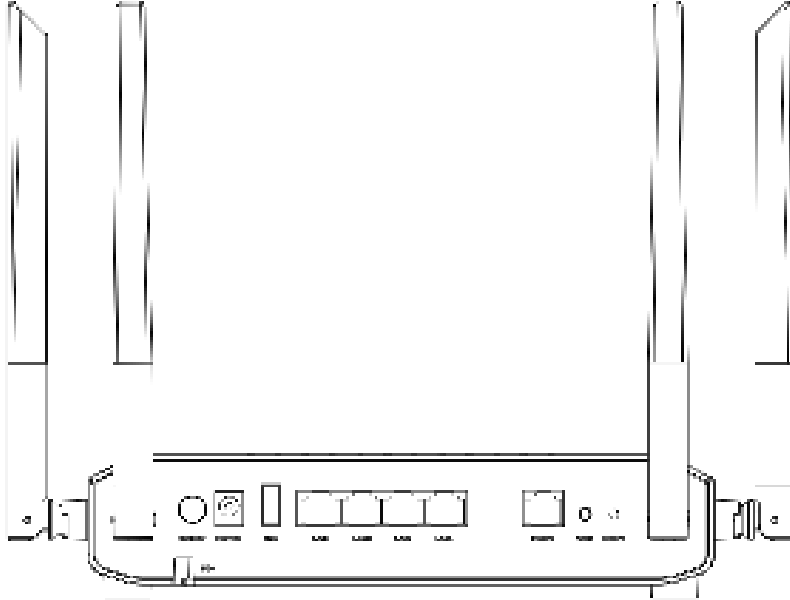
Table 35 Panel Ports and Buttons (EX7710-B0)

| LABEL           | DESCRIPTION                                                                                                                                                                                                                      |
|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| WPS             | Press the <b>WPS</b> button for more than 1 second to quickly set up a secure Wi-Fi connection between the Zyxel Device and a WPS-compatible client.                                                                             |
| RESET           | Press the button for more than 5 seconds to return the Zyxel Device to the factory defaults.                                                                                                                                     |
| ETHERNET 4 to 1 | ETHERNET 4 to ETHERNET 1 are 1G ports support speeds of 100/1000 Mbps. Connect computers or other Ethernet devices to Ethernet ports for Internet access.                                                                        |
| USB             | The USB port is used for cellular WAN backup, file-sharing, and media server.                                                                                                                                                    |
| 10G LAN         | The 10G LAN port is a multi-gigabit Ethernet port that supports connection speeds of 1 Gbps, 2.5 Gbps, and 10 Gbps. Connect computers or other Ethernet devices to the 10G LAN port for Internet access with speed up to 10Gbps. |
| 10G WAN         | The 10G WAN port is a multi-gigabit Ethernet port that supports connection speeds of 1 Gbps, 2.5 Gbps, and 10 Gbps. Connect an Ethernet cable to the 10G WAN port for an (up to) 10Gbps Ethernet connection.                     |
| POWER           | Connect the power adapter and press the ON/OFF button to start the device.                                                                                                                                                       |

**PX3321-T1**

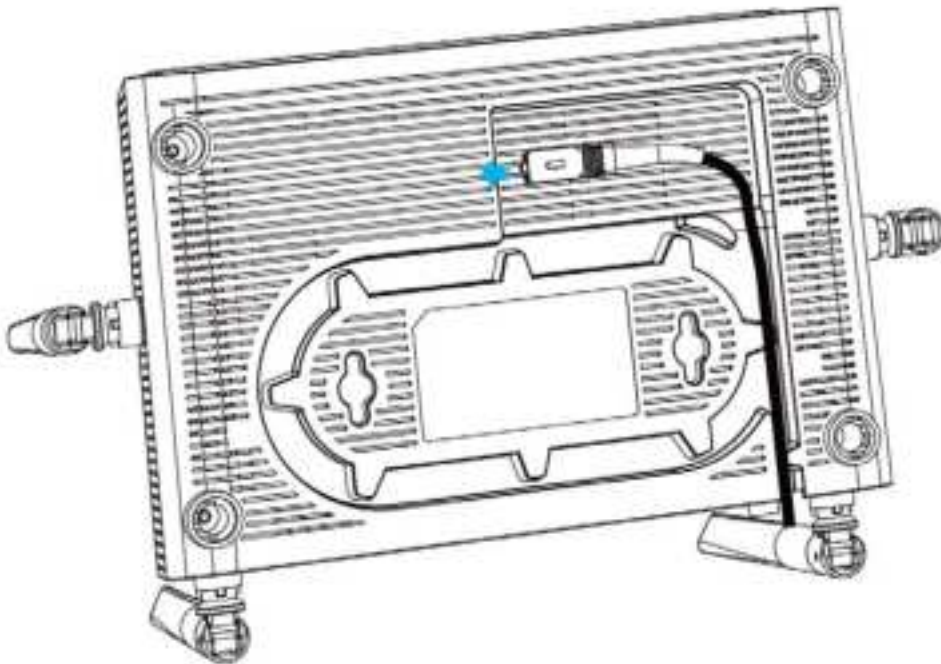
Place the Zyxel Device with the ports and buttons facing you and the two wall-mounting holes at the bottom.

**Figure 64** Rear Panel (PX3321-T1)



The PON port is at the bottom of the Zyxel Device.

**Figure 65** PX3321-T1 Bottom Panel (PON Port)





The following table describes the items on the ports panel of your Zyxel Device.

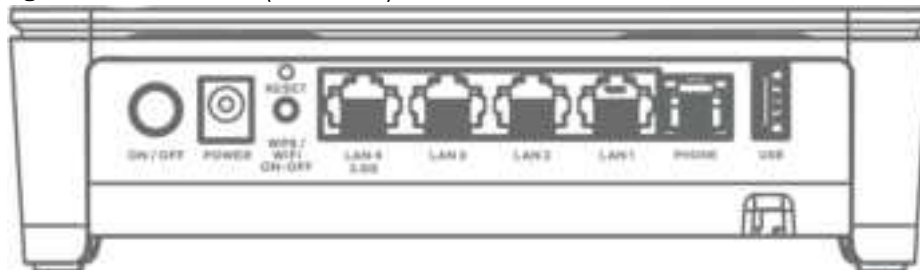
Table 36 Panel Ports and Buttons (PX3321-T1)

| LABEL      | DESCRIPTION                                                                                                                                                                                                                                                            |
|------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| POWER      | Connect the power adapter and press the <b>ON/OFF</b> button to start the device.                                                                                                                                                                                      |
| USB        | The USB port is used for cellular WAN backup, file-sharing, and media server.                                                                                                                                                                                          |
| LAN 4 to 1 | LAN4 to LAN1 are 1G ports supporting speeds of 100/1000 Mbps. Connect computers or other Ethernet devices to Ethernet ports for Internet access.                                                                                                                       |
| Phone      | Connect analog phone to the <b>PHONE</b> port with RJ11 cable for VoIP services.                                                                                                                                                                                       |
| WPS        | Press the <b>WPS</b> button once within 3 seconds to quickly setup a secure WiFi connection between the device and a WPS-compatible client.<br><br>Press the <b>WPS</b> button once more than 3 seconds to enable or disable the WiFi. The WiFi is enabled by default. |
| RESET      | Press the button for more than 5 seconds to return the Zyxel Device to the factory defaults.                                                                                                                                                                           |
| PON        | Connect the fiber optic cable to the PON (Passive Optical Network) port for Internet access.                                                                                                                                                                           |

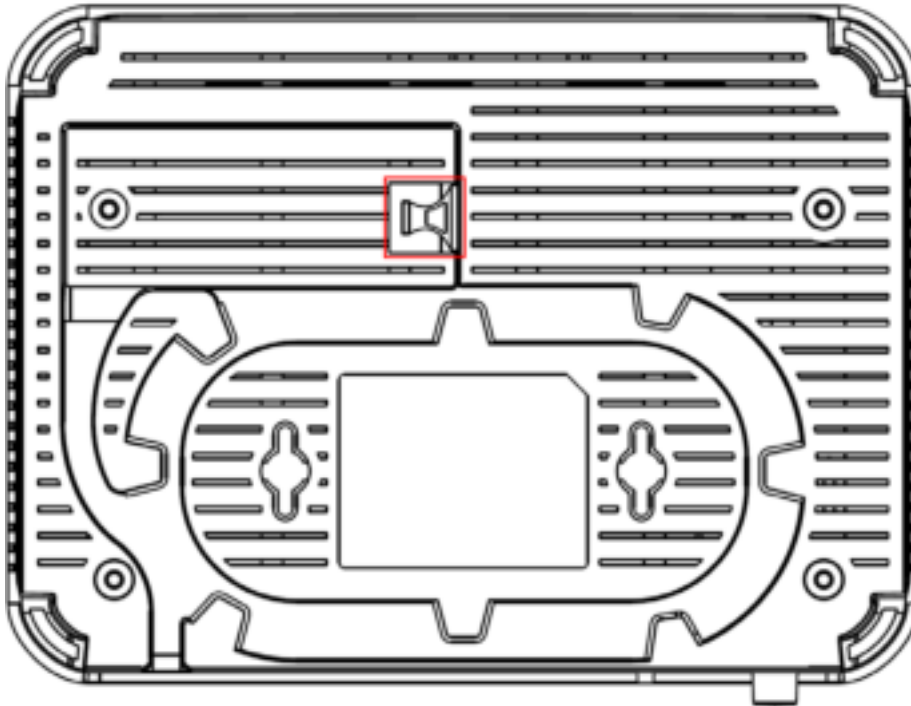
### PX5301-T0

Place the Zyxel Device with the ports and buttons facing you and the two wall-mounting holes at the bottom.

Figure 66 Rear Panel (PX5301-T0)



The PON port is at the bottom of the Zyxel Device.

**Figure 67** PX5301-T0 Bottom Panel (PON Port)

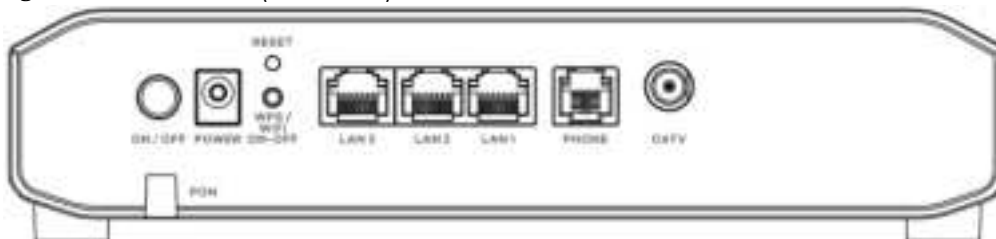
The following table describes the items on the ports panel of your Zyxel Device.

**Table 37** Panel Ports and Buttons (PX5301-T0)

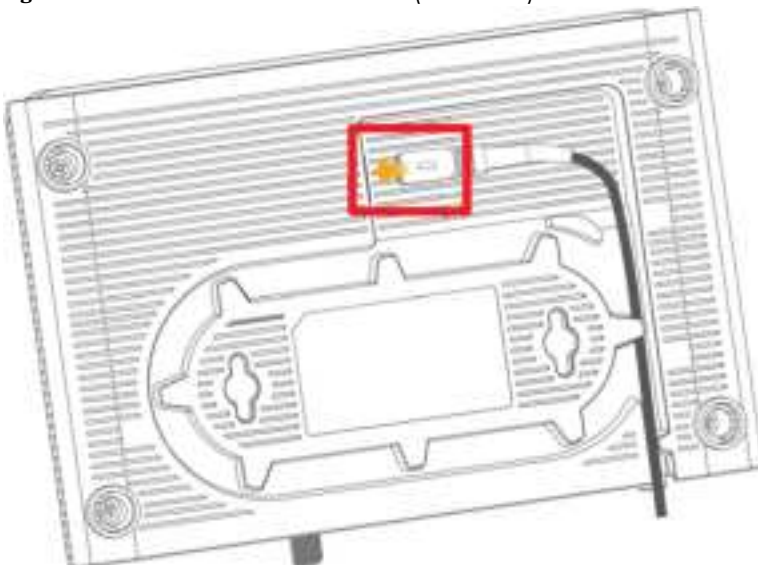
| LABEL           | DESCRIPTION                                                                                                                                                                                                                                                                                    |
|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| POWER           | Connect the power adapter and press the <b>ON/OFF</b> button to start the device.                                                                                                                                                                                                              |
| RESET           | Press the button for more than 5 seconds to return the Zyxel Device to the factory defaults.                                                                                                                                                                                                   |
| WPS/WiFi On-Off | Press the <b>WPS/WiFi On-Off</b> button once within 3 seconds to quickly setup a secure WiFi connection between the device and a WPS-compatible client.<br><br>Press the <b>WPS/WiFi On-Off</b> button once more than 3 seconds to enable or disable the WiFi. The WiFi is enabled by default. |
| LAN 4 2.5G      | LAN 4 is a 2.5G multi-gigabit Ethernet port that supports connection speeds of 1 Gbps and 2.5 Gbps.                                                                                                                                                                                            |
| LAN 3 to 1      | LAN1 to LAN3 are 1G ports supporting speeds of 100/1000 Mbps. Connect computers or other Ethernet devices to Ethernet ports for Internet access.                                                                                                                                               |
| Phone           | Connect analog phone to the <b>PHONE</b> port with RJ11 cable for VoIP services.                                                                                                                                                                                                               |
| USB             | The USB port is used for cellular WAN backup, file-sharing, and media server.                                                                                                                                                                                                                  |
| PON             | Connect the fiber optic cable to the PON (Passive Optical Network) port for Internet access.                                                                                                                                                                                                   |

### PX5302-00

Place the Zyxel Device with the ports and buttons facing you and the two wall-mounting holes at the bottom.

**Figure 68** Rear Panel (PX5302-00)

The PON port is at the bottom of the Zyxel Device.

**Figure 69** PX5302-00 Bottom Panel (PON Port)

The following table describes the items on the ports panel of your Zyxel Device.

Table 38 Panel Ports and Buttons (PX5302-00)

| LABEL              | DESCRIPTION                                                                                                                                                                                                                                                                                    |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| POWER              | Connect the power adapter and press the <b>ON/OFF</b> button to start the device.                                                                                                                                                                                                              |
| RESET              | Press the button for more than 5 seconds to return the Zyxel Device to the factory defaults.                                                                                                                                                                                                   |
| WPS/WiFi<br>ON-OFF | Press the <b>WPS/WiFi ON-OFF</b> button once within 3 seconds to quickly setup a secure WiFi connection between the device and a WPS-compatible client.<br><br>Press the <b>WPS/WiFi ON-OFF</b> button once more than 3 seconds to enable or disable the WiFi. The WiFi is enabled by default. |
| LAN 3<br>2.5G      | <b>LAN 3</b> is a 2.5G multi-gigabit Ethernet port that supports connection speeds of 1 Gbps and 2.5 Gbps.                                                                                                                                                                                     |
| LAN2, LAN1         | <b>LAN2</b> and <b>LAN1</b> are 1G ports supporting speeds of 10/100/1000 Mbps. Connect computers or other Ethernet devices to Ethernet ports for Internet access.                                                                                                                             |
| PHONE              | Connect analog phone to the <b>PHONE</b> port with RJ11 cable for VoIP services.                                                                                                                                                                                                               |
| CATV               | Connect an STB (Set Top Box) to the <b>CATV</b> port using a coaxial cable.                                                                                                                                                                                                                    |
| PON                | Connect the fiber optic cable to the <b>PON</b> (Passive Optical Network) port for Internet access.                                                                                                                                                                                            |

### 2.3.1 Transceiver Installation/ Removal

#### Transceiver Installation

Use the following steps to install an SFP transceiver.

- 1 Attach an ESD preventive wrist strap to your wrist and to a bare metal surface.
- 2 Align the transceiver in front of the slot opening.
- 3 Make sure the latch is in the lock position (latch styles vary), then insert the transceiver into the slot with the exposed section of PCB board facing down.
- 4 Press the transceiver firmly until it clicks into place.
- 5 The Zyxel Device automatically detects the installed transceiver. Check the LEDs to verify that it is functioning properly.
- 6 Remove the dust plugs from the transceiver and cables (dust plug styles vary).
- 7 Identify the signal transmission direction of the fiber optic cables and the transceiver. Insert the fiber optic cable into the transceiver.

**Figure 70** Latch in the Lock Position

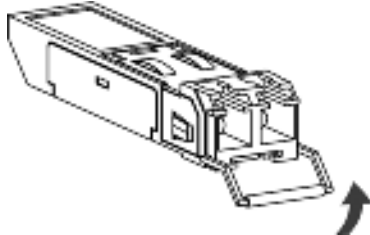


**Figure 71** Transceiver Installation Example

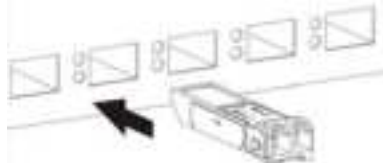
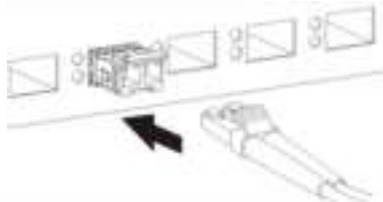


**Figure 72** Connecting the Fiber Optic Cables



#### Transceiver Removal

Use the following steps to remove an SFP transceiver.

- 1 Attach an ESD preventive wrist strap to your wrist and to a bare metal surface on the chassis.
- 2 Remove the fiber optic cables from the transceiver.

- 3 Pull out the latch and down to unlock the transceiver (latch styles vary).

Note: Make sure the transceiver's latch is pushed all the way down, so the transceiver can be pulled out successfully.

- 4 Pull the latch, or use your thumb and index finger to grasp the tabs on both sides of the transceiver, and carefully slide it out of the slot.

Note: Do NOT pull the transceiver out by force. You could damage it. If the transceiver will not slide out, grasp the tabs on both sides of the transceiver with a slight up or down motion and carefully slide it out of the slot. If unsuccessful, contact Zyxel Support to prevent damage to your Zyxel Device and transceiver.

- 5 Insert the dust plug into the ports on the transceiver and the cables.

**Figure 73** Removing the Fiber Optic Cables

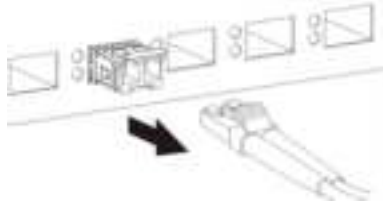
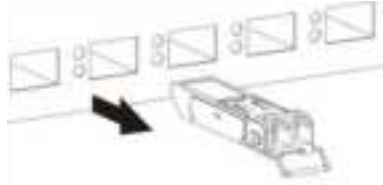


**Figure 74** Opening the Transceiver's Latch Example



**Figure 75** Transceiver Removal Example



### 2.3.2 WPS Button

You can use the **WPS** button to quickly set up a secure WiFi connection between the Zyxel Device and a WPS-compatible client by adding one device at a time.

#### To Activate WPS

- 1 Make sure the **POWER** LED is on and not blinking.
- 2 Press the **WPS** button once within 3 seconds (see the ports panel table of each Zyxel Device model in [Section 2.3 on page 62](#) for more information) and release it.
- 3 Press the **WPS** button on another WPS-enabled device within range of the Zyxel Device (within 120 seconds). The **WPS** LED flashes green while the Zyxel Device sets up a WPS connection with the other wireless device.

- 4 Once the connection is successfully made, the **WPS** LED will light off.

### 2.3.3 RESET Button

If you forget your password or cannot access the Web Configurator, you will need to use the **RESET** button to reload the factory-default configuration file. This means that you will lose all configurations that you had previously. The password will be reset to the factory default (see the device label), and the LAN IP address will be "192.168.1.1".

- 1 Make sure the **POWER** LED is on (not blinking).
- 2 To set the device back to the factory default settings, press the **RESET** button for more than 5 seconds or until the **POWER** LED begins to blink and then release it. When the **POWER** LED begins to blink, the defaults have been restored and the device restarts.

# CHAPTER 3

## Web Configurator

### 3.1 Overview

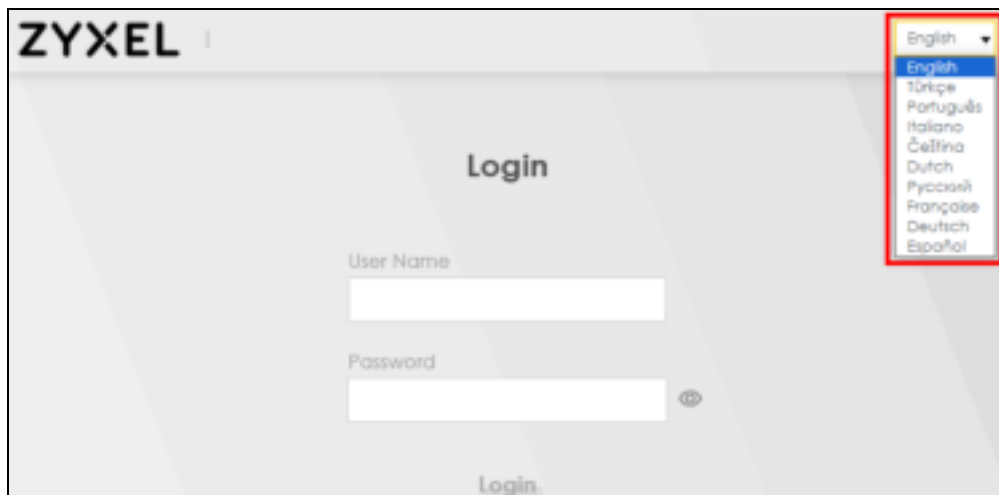
The Web Configurator is an HTML-based management interface that allows easy system setup and management through Internet browser. Use a browser that supports HTML5, such as Microsoft Edge, Mozilla Firefox, or Google Chrome. The recommended minimum screen resolution is 1024 by 768 pixels.

In order to use the Web Configurator you need to allow:

- Web browser pop-up windows from your computer.
- JavaScript (enabled by default).
- Java permissions (enabled by default).

#### 3.1.1 Access the Web Configurator

- 1 Make sure your Zyxel Device hardware is properly connected (refer to the Quick Start Guide).
- 2 Make sure your computer has an IP address in the same subnet as the Zyxel Device.
- 3 Launch your web browser. Type `http://192.168.1.1` in your browser address bar.
- 4 A login screen displays. Select the language you prefer (upper right).



- 5 To access the administrative Web Configurator and manage the Zyxel Device, enter the default user name **admin** and the randomly assigned default password (see the Zyxel Device label) in the **Login** screen and click **Login**. If you have changed the password, enter your password and click **Login**.



The Login screen features a light gray background. At the top center, the word "Login" is displayed in a bold, black font. Below this, there are two white input fields. The first field is labeled "User Name" in a small, gray font. The second field is labeled "Password" in a small, gray font. To the right of the Password field, there is a small, circular icon with a keyhole symbol. At the bottom center, there is a "Login" button with a light gray background and black text.

Note: The first time you enter the password, you will be asked to change it. The new password must be at least 8 characters, must contain at least one uppercase letter, one lowercase letter, one number, and one special character. For some models, the password must contain at least one English character and one number. Please see the password requirement displayed on the screen.



The Password Reset screen has a light gray background. At the top center, the text "Password Reset" is shown in a bold, black font. Below this, there are two white input fields. The first field is labeled "New Password" in a small, gray font. The second field is labeled "Password" in a small, gray font. To the right of each field is a small, circular icon with a keyhole symbol. Below the input fields, there is a line of small, gray text: "The password must be at least 8 characters long, including 1 uppercase letter, 1 lowercase letter, 1 number and 1 special character." At the bottom center, there is a "Change password" button with a yellow background and black text.

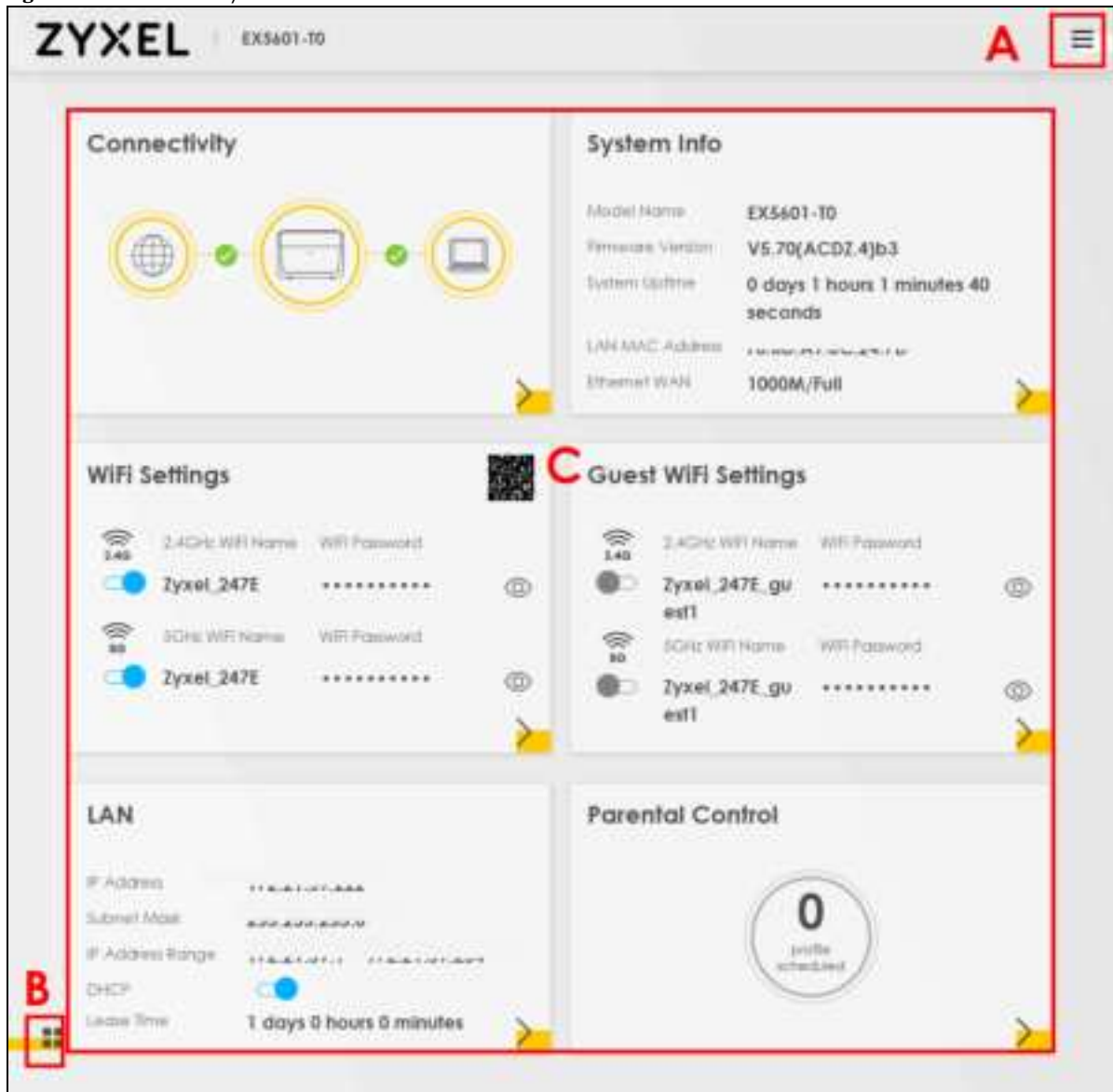
- 6 The **Connection Status** screen appears. Use this screen to configure basic Internet access and WiFi settings.



| Connectivity                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | System Info                                                                                                                                                                                                                                                                                                    |                  |               |                                     |                  |                             |                                                                                   |                                     |                   |                                     |                                        |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                   |                  |               |                          |                   |       |                                                                                   |                |               |                          |                   |       |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|---------------|-------------------------------------|------------------|-----------------------------|-----------------------------------------------------------------------------------|-------------------------------------|-------------------|-------------------------------------|----------------------------------------|-------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------|---------------|--------------------------|-------------------|-------|-----------------------------------------------------------------------------------|----------------|---------------|--------------------------|-------------------|-------|
|                                                                                                                                                                                                                                                                                                                                                                                                              | <table><tr><td>Model Name</td><td>EX5601-TD</td></tr><tr><td>Firmware Version</td><td>V5.70(ACD2.4)b3</td></tr><tr><td>System Uptime</td><td>0 days 1 hours 1 minutes 40 seconds</td></tr><tr><td>LAN MAC Address</td><td>98-00-07-54-00-00</td></tr><tr><td>Ethernet WAN</td><td>1000M/Full</td></tr></table> | Model Name       | EX5601-TD     | Firmware Version                    | V5.70(ACD2.4)b3  | System Uptime               | 0 days 1 hours 1 minutes 40 seconds                                               | LAN MAC Address                     | 98-00-07-54-00-00 | Ethernet WAN                        | 1000M/Full                             |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                   |                  |               |                          |                   |       |                                                                                   |                |               |                          |                   |       |
| Model Name                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | EX5601-TD                                                                                                                                                                                                                                                                                                      |                  |               |                                     |                  |                             |                                                                                   |                                     |                   |                                     |                                        |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                   |                  |               |                          |                   |       |                                                                                   |                |               |                          |                   |       |
| Firmware Version                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | V5.70(ACD2.4)b3                                                                                                                                                                                                                                                                                                |                  |               |                                     |                  |                             |                                                                                   |                                     |                   |                                     |                                        |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                   |                  |               |                          |                   |       |                                                                                   |                |               |                          |                   |       |
| System Uptime                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 0 days 1 hours 1 minutes 40 seconds                                                                                                                                                                                                                                                                            |                  |               |                                     |                  |                             |                                                                                   |                                     |                   |                                     |                                        |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                   |                  |               |                          |                   |       |                                                                                   |                |               |                          |                   |       |
| LAN MAC Address                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 98-00-07-54-00-00                                                                                                                                                                                                                                                                                              |                  |               |                                     |                  |                             |                                                                                   |                                     |                   |                                     |                                        |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                   |                  |               |                          |                   |       |                                                                                   |                |               |                          |                   |       |
| Ethernet WAN                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 1000M/Full                                                                                                                                                                                                                                                                                                     |                  |               |                                     |                  |                             |                                                                                   |                                     |                   |                                     |                                        |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                   |                  |               |                          |                   |       |                                                                                   |                |               |                          |                   |       |
| WiFi Settings                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Guest WiFi Settings                                                                                                                                                                                                                                                                                            |                  |               |                                     |                  |                             |                                                                                   |                                     |                   |                                     |                                        |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                   |                  |               |                          |                   |       |                                                                                   |                |               |                          |                   |       |
| <table><tr><td></td><td>2.4GHz WiFi Name</td><td>WiFi Password</td></tr><tr><td><input checked="" type="checkbox"/></td><td>Zyxel_247E</td><td>*****</td></tr><tr><td></td><td>5GHz WiFi Name</td><td>WiFi Password</td></tr><tr><td><input checked="" type="checkbox"/></td><td>Zyxel_247E</td><td>*****</td></tr></table> |                                                                                                                                                                                                                               | 2.4GHz WiFi Name | WiFi Password | <input checked="" type="checkbox"/> | Zyxel_247E       | *****                       |  | 5GHz WiFi Name                      | WiFi Password     | <input checked="" type="checkbox"/> | Zyxel_247E                             | ***** | <table><tr><td></td><td>2.4GHz WiFi Name</td><td>WiFi Password</td></tr><tr><td><input type="checkbox"/></td><td>Zyxel_247E_guest1</td><td>*****</td></tr><tr><td></td><td>5GHz WiFi Name</td><td>WiFi Password</td></tr><tr><td><input type="checkbox"/></td><td>Zyxel_247E_guest1</td><td>*****</td></tr></table> |  | 2.4GHz WiFi Name | WiFi Password | <input type="checkbox"/> | Zyxel_247E_guest1 | ***** |  | 5GHz WiFi Name | WiFi Password | <input type="checkbox"/> | Zyxel_247E_guest1 | ***** |
|                                                                                                                                                                                                                                                                                                                                                                                                              | 2.4GHz WiFi Name                                                                                                                                                                                                                                                                                               | WiFi Password    |               |                                     |                  |                             |                                                                                   |                                     |                   |                                     |                                        |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                   |                  |               |                          |                   |       |                                                                                   |                |               |                          |                   |       |
| <input checked="" type="checkbox"/>                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Zyxel_247E                                                                                                                                                                                                                                                                                                     | *****            |               |                                     |                  |                             |                                                                                   |                                     |                   |                                     |                                        |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                   |                  |               |                          |                   |       |                                                                                   |                |               |                          |                   |       |
|                                                                                                                                                                                                                                                                                                                                                                                                              | 5GHz WiFi Name                                                                                                                                                                                                                                                                                                 | WiFi Password    |               |                                     |                  |                             |                                                                                   |                                     |                   |                                     |                                        |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                   |                  |               |                          |                   |       |                                                                                   |                |               |                          |                   |       |
| <input checked="" type="checkbox"/>                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Zyxel_247E                                                                                                                                                                                                                                                                                                     | *****            |               |                                     |                  |                             |                                                                                   |                                     |                   |                                     |                                        |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                   |                  |               |                          |                   |       |                                                                                   |                |               |                          |                   |       |
|                                                                                                                                                                                                                                                                                                                                                                                                              | 2.4GHz WiFi Name                                                                                                                                                                                                                                                                                               | WiFi Password    |               |                                     |                  |                             |                                                                                   |                                     |                   |                                     |                                        |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                   |                  |               |                          |                   |       |                                                                                   |                |               |                          |                   |       |
| <input type="checkbox"/>                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Zyxel_247E_guest1                                                                                                                                                                                                                                                                                              | *****            |               |                                     |                  |                             |                                                                                   |                                     |                   |                                     |                                        |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                   |                  |               |                          |                   |       |                                                                                   |                |               |                          |                   |       |
|                                                                                                                                                                                                                                                                                                                                                                                                              | 5GHz WiFi Name                                                                                                                                                                                                                                                                                                 | WiFi Password    |               |                                     |                  |                             |                                                                                   |                                     |                   |                                     |                                        |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                   |                  |               |                          |                   |       |                                                                                   |                |               |                          |                   |       |
| <input type="checkbox"/>                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Zyxel_247E_guest1                                                                                                                                                                                                                                                                                              | *****            |               |                                     |                  |                             |                                                                                   |                                     |                   |                                     |                                        |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                   |                  |               |                          |                   |       |                                                                                   |                |               |                          |                   |       |
| LAN                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Parental Control                                                                                                                                                                                                                                                                                               |                  |               |                                     |                  |                             |                                                                                   |                                     |                   |                                     |                                        |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                   |                  |               |                          |                   |       |                                                                                   |                |               |                          |                   |       |
| <table><tr><td>IP Address</td><td>192.168.1.1</td></tr><tr><td>Subnet Mask</td><td>255.255.255.0</td></tr><tr><td>IP Address Range</td><td>192.168.1.1 - 192.168.1.254</td></tr><tr><td>DHCP</td><td><input checked="" type="checkbox"/></td></tr><tr><td>Lease Time</td><td>1 days 0 hours 0 minutes</td></tr></table>                                                                                                                                                                       | IP Address                                                                                                                                                                                                                                                                                                     | 192.168.1.1      | Subnet Mask   | 255.255.255.0                       | IP Address Range | 192.168.1.1 - 192.168.1.254 | DHCP                                                                              | <input checked="" type="checkbox"/> | Lease Time        | 1 days 0 hours 0 minutes            | <div>0<br/>profile<br/>scheduled</div> |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                   |                  |               |                          |                   |       |                                                                                   |                |               |                          |                   |       |
| IP Address                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 192.168.1.1                                                                                                                                                                                                                                                                                                    |                  |               |                                     |                  |                             |                                                                                   |                                     |                   |                                     |                                        |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                   |                  |               |                          |                   |       |                                                                                   |                |               |                          |                   |       |
| Subnet Mask                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 255.255.255.0                                                                                                                                                                                                                                                                                                  |                  |               |                                     |                  |                             |                                                                                   |                                     |                   |                                     |                                        |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                   |                  |               |                          |                   |       |                                                                                   |                |               |                          |                   |       |
| IP Address Range                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 192.168.1.1 - 192.168.1.254                                                                                                                                                                                                                                                                                    |                  |               |                                     |                  |                             |                                                                                   |                                     |                   |                                     |                                        |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                   |                  |               |                          |                   |       |                                                                                   |                |               |                          |                   |       |
| DHCP                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | <input checked="" type="checkbox"/>                                                                                                                                                                                                                                                                            |                  |               |                                     |                  |                             |                                                                                   |                                     |                   |                                     |                                        |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                   |                  |               |                          |                   |       |                                                                                   |                |               |                          |                   |       |
| Lease Time                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 1 days 0 hours 0 minutes                                                                                                                                                                                                                                                                                       |                  |               |                                     |                  |                             |                                                                                   |                                     |                   |                                     |                                        |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                   |                  |               |                          |                   |       |                                                                                   |                |               |                          |                   |       |

## 3.2 Web Configurator Layout

**Figure 76** Screen Layout



As illustrated above, the main screen is divided into these parts:

- **A** – Settings Icon (Navigation Panel and Side Bar)
- **B** – Layout Icon
- **C** – Main Window

### 3.2.1 Settings Icon

Click this icon () to see the side bar and navigation panel.

### 3.2.1.1 Side Bar

The side bar provides some icons on the right hand side.

**Figure 77** Side Bar



The icons provide the following functions.

**Table 39** Web Configurator Icons in the Title Bar

| ICON | DESCRIPTION                                                                                                            |
|------|------------------------------------------------------------------------------------------------------------------------|
|      | <b>LED:</b> Click this icon to turn off/on the Zyxel Device's panel LEDs.                                              |
|      | <b>Wizard:</b> Click this icon to open screens where you can configure the Zyxel Device's time zone and WiFi settings. |

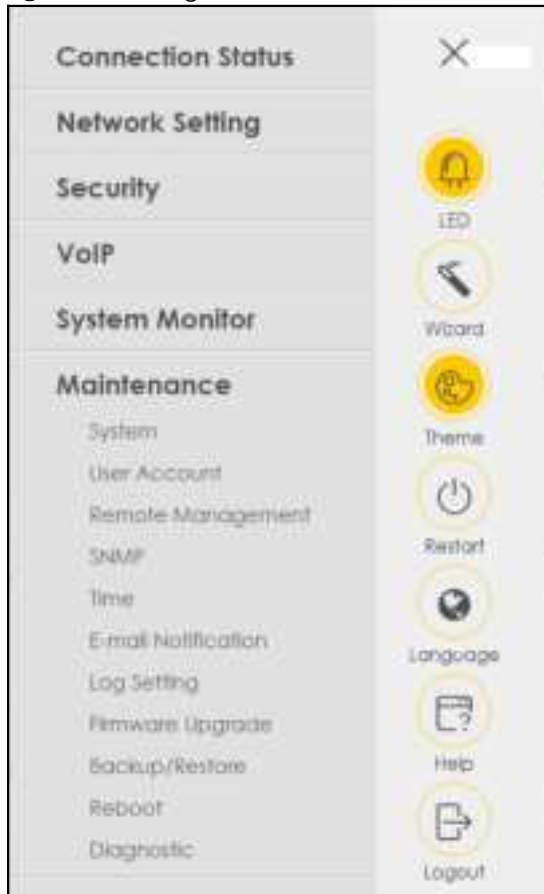
Table 39 Web Configurator Icons in the Title Bar (continued)

| ICON                                                                               | DESCRIPTION                                                                                                                                                                                 |
|------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|   | <b>Theme:</b> Click this icon to select a color that you prefer and apply it to the Web Configurator.<br> |
|   | <b>Language:</b> Select the language you prefer.                                                                                                                                            |
|   | <b>Help:</b> Click this link to display web help pages. The help pages provide descriptions for all of the configuration screens.                                                           |
|   | <b>Restart:</b> Click this icon to reboot the Zyxel Device without turning the power off.                                                                                                   |
|  | <b>Logout:</b> Click this icon to log out of the Web Configurator.                                                                                                                          |

### 3.2.1.2 Navigation Panel

Click the menu icon () to display the navigation panel that contains configuration menus and icons (quick links). Click **X** to close the navigation panel.

Use the menu items on the navigation panel to open screens to configure Zyxel Device features. The following tables describe each menu item.

**Figure 78** Navigation Panel**Table 40** Navigation Panel Summary

| LINK              | TAB             | FUNCTION                                                                                                                                                                                                   |
|-------------------|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Connection Status |                 | Use this screen to configure basic Internet access, wireless settings, and parental control settings. This screen also shows the network status of the Zyxel Device and computers/devices connected to it. |
| Network Setting   |                 |                                                                                                                                                                                                            |
| Broadband         | Broadband       | Use this screen to view and configure ISP parameters, WAN IP address assignment, and other advanced properties. You can also add new WAN connections.                                                      |
|                   | Cellular Backup | Use this screen to configure a cellular WAN connection as a backup to keep you online if the primary WAN connection fails.                                                                                 |
| Wireless          | General         | Use this screen to configure the WiFi settings and WiFi authentication or security settings.                                                                                                               |
|                   | Guest/More AP   | Use this screen to configure multiple BSSs on the Zyxel Device.                                                                                                                                            |
|                   | WPS             | Use this screen to configure and view your WPS (WiFi Protected Setup) settings.                                                                                                                            |
|                   | Channel Status  | Use this screen to scan WiFi channel noises and view the results.                                                                                                                                          |
|                   | MESH            | Use this screen to enable or disable MPro Mesh.                                                                                                                                                            |
| Home Networking   | LAN Setup       | Use this screen to configure LAN TCP/IP settings, and other advanced properties.                                                                                                                           |
|                   | Static DHCP     | Use this screen to assign specific IP addresses to individual MAC addresses.                                                                                                                               |

Table 40 Navigation Panel Summary (continued)

| LINK               | TAB                  | FUNCTION                                                                                                                                                                                                         |
|--------------------|----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                    | UPnP                 | Use this screen to turn UPnP and UPnP NAT-T on or off.                                                                                                                                                           |
|                    | Additional Subnet    | Use this screen to configure IP alias and public static IP.                                                                                                                                                      |
|                    | STB Vendor ID        | Use this screen to configure the Vendor IDs of the connected Set Top Box (STB) devices, which have the Zyxel Device automatically create static DHCP entries for the STB devices when they request IP addresses. |
|                    | Wake on LAN          | Use this screen to remotely turn on a device on the local network.                                                                                                                                               |
|                    | TFTP Server Name     | Use DHCP option 66 to identify a TFTP server name.                                                                                                                                                               |
| Routing            | Static Route         | Use this screen to view and set up static routes on the Zyxel Device.                                                                                                                                            |
|                    | DNS Route            | Use this screen to forward DNS queries for certain domain names through a specific WAN interface to its DNS servers.                                                                                             |
|                    | Policy Route         | Use this screen to configure policy routing on the Zyxel Device.                                                                                                                                                 |
|                    | RIP                  | Use this screen to configure Routing Information Protocol to exchange routing information with other routers.                                                                                                    |
| QoS                | General              | Use this screen to enable QoS and traffic prioritizing. You can also configure the QoS rules and actions.                                                                                                        |
|                    | Queue Setup          | Use this screen to configure QoS queues.                                                                                                                                                                         |
|                    | Classification Setup | Use this screen to define a classifier.                                                                                                                                                                          |
|                    | Shaper Setup         | Use this screen to limit outgoing traffic rate on the selected interface.                                                                                                                                        |
|                    | Policer Setup        | Use this screen to configure QoS policers.                                                                                                                                                                       |
| NAT                | Port Forwarding      | Use this screen to make your local servers visible to the outside world.                                                                                                                                         |
|                    | Port Triggering      | Use this screen to change your Zyxel Device's port triggering settings.                                                                                                                                          |
|                    | DMZ                  | Use this screen to configure a default server which receives packets from ports that are not specified in the <b>Port Forwarding</b> screen.                                                                     |
|                    | ALG                  | Use this screen to enable the ALGs (Application Layer Gateways) in the Zyxel Device to allow applications to operate through NAT.                                                                                |
|                    | Address Mapping      | Use this screen to change your Zyxel Device's IP address mapping settings.                                                                                                                                       |
|                    | Sessions             | Use this screen to configure the maximum number of NAT sessions each client host is allowed to have through the Zyxel Device.                                                                                    |
|                    | PCP                  | Use this screen to configure PCP (Port Control Protocol) to allow devices such as web or file sharing servers behind the Zyxel Device to receive incoming traffic.                                               |
| DNS                | DNS Entry            | Use this screen to view and configure DNS routes.                                                                                                                                                                |
|                    | Dynamic DNS          | Use this screen to allow a static hostname alias for a dynamic IP address.                                                                                                                                       |
| IGMP/MLD           | IGMP/MLD             | Use this screen to configure multicast settings (IGMP for IPv4 and MLD for IPv6 multicast groups) on the WAN.                                                                                                    |
| VLAN Group         | VLAN Group           | Use this screen to group and tag VLAN IDs to outgoing traffic from the specified interface.                                                                                                                      |
| Interface Grouping | Interface Grouping   | Use this screen to map a port to create multiple networks on the Zyxel Device.                                                                                                                                   |
| USB Service        | File Sharing         | Use this screen to enable file sharing through the Zyxel Device.                                                                                                                                                 |
|                    | Media Server         | Use this screen to use the Zyxel Device as a media server.                                                                                                                                                       |
| Security           |                      |                                                                                                                                                                                                                  |
| Firewall           | General              | Use this screen to configure the security level of your firewall.                                                                                                                                                |

Table 40 Navigation Panel Summary (continued)

| LINK             | TAB                     | FUNCTION                                                                                                                                                                                            |
|------------------|-------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                  | Protocol                | Use this screen to add Internet services and configure firewall rules.                                                                                                                              |
|                  | Access Control          | Use this screen to enable specific traffic directions for network services.                                                                                                                         |
|                  | DoS                     | Use this screen to activate protection against Denial of Service (DoS) attacks.                                                                                                                     |
| MAC Filter       | MAC Filter              | Use this screen to block or allow traffic from devices of certain MAC addresses to the Zyxel Device.                                                                                                |
| Home Security    | Connected Home Security | Use this screen to set up a URL filter that blocks users on your network from accessing certain websites.                                                                                           |
| Parental Control | Parental Control        | Use this screen to define time periods and days during which the Zyxel Device performs parental control and/or block web sites with the specific URL.                                               |
| Scheduler Rule   | Scheduler Rule          | Use this screen to configure the days and times when a configured restriction (such as parental control) is enforced.                                                                               |
| Certificates     | Local Certificates      | Use this screen to view a summary list of certificates and manage certificates and certification requests.                                                                                          |
|                  | Trusted CA              | Use this screen to view and manage the list of the trusted CAs.                                                                                                                                     |
| VoIP             |                         |                                                                                                                                                                                                     |
| SIP              | SIP Account             | Use this screen to set up information about your SIP account and configure audio settings such as volume levels for the phones connected to the Zyxel Device.                                       |
|                  | SIP Service Provider    | Use this screen to configure the SIP server information, and other SIP settings, such as QoS for VoIP calls, outbound proxy, DTMF mode and SIP timers.                                              |
|                  | SIP TLS Common          | Use this screen to change the default TLS local port if you need to, and select a local certificate for the SIP server to verify the Zyxel Device.                                                  |
| Phone            | Phone Device            | Use this screen to control which SIP accounts each phone uses to handle outgoing and incoming calls.                                                                                                |
|                  | Region                  | Use this screen to select your location and call service mode.                                                                                                                                      |
| Call Rule        | Call Rule               | Use this screen to configure speed dial for SIP phone numbers that you often call.                                                                                                                  |
| Call History     | Call History            | Use this screen to view detailed information for each outgoing call you made or each incoming call from someone calling you. You can also view a summary list of received, dialed and missed calls. |
| System Monitor   |                         |                                                                                                                                                                                                     |
| Log              | System Log              | Use this screen to view the status of events that occurred to the Zyxel Device. You can export or email the logs.                                                                                   |

Table 40 Navigation Panel Summary (continued)

| LINK                  | TAB                   | FUNCTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|-----------------------|-----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                       | Security Log          | <p>Use this screen to view all security related events. You can select the level and category of the security events in their proper drop-down list window.</p> <p>Levels include:</p> <ul style="list-style-type: none"> <li>• Emergency</li> <li>• Alert</li> <li>• Critical</li> <li>• Error</li> <li>• Warning</li> <li>• Notice</li> <li>• Informational</li> <li>• Debugging</li> </ul> <p>Categories include:</p> <ul style="list-style-type: none"> <li>• Account</li> <li>• Attack</li> <li>• Firewall</li> <li>• MAC Filter</li> </ul> |
| Traffic Status        | WAN                   | Use this screen to view the status of all network traffic going through the WAN port of the Zyxel Device.                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|                       | LAN                   | Use this screen to view the status of all network traffic going through the LAN ports of the Zyxel Device.                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|                       | NAT                   | Use this screen to view NAT statistics for connected hosts.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| VoIP Status           | VoIP Status           | Use this screen to view VoIP registration, current call status and phone numbers for the phone ports.                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| ARP Table             | ARP Table             | Use this screen to view the ARP table. It displays the IP and MAC address of each DHCP connection.                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Routing Table         | Routing Table         | Use this screen to view the routing table on the Zyxel Device.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Multicast Status      | IGMP Status           | Use this screen to view the status of all IGMP settings on the Zyxel Device.                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|                       | MLD Status            | Use this screen to view the status of all MLD settings on the Zyxel Device.                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| WLAN Station Status   | WLAN Station Status   | Use this screen to view the wireless stations that are currently associated to the Zyxel Device's WiFi.                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Cellular Statistics   | Cellular Statistics   | Use this screen to look at the cellular Internet connection status.                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Optical Signal Status | Optical Signal Status | Use this screen to view the optical fiber transceiver's TX power and RX power level and its temperature.                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Maintenance           |                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| System                | System                | Use this screen to set the Zyxel Device name and Domain name.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| User Account          | User Account          | Use this screen to change the user password on the Zyxel Device.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Remote Management     | MGMT Services         | Use this screen to enable specific traffic directions for network services.                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|                       | Trust Domain          | Use this screen to view a list of public IP addresses which are allowed to access the Zyxel Device through the services configured in the <b>Maintenance &gt; Remote Management &gt; MGMTServices</b> screen.                                                                                                                                                                                                                                                                                                                                    |
| Time                  | Time                  | Use this screen to change your Zyxel Device's time and date.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| E-mail Notification   | E-mail Notification   | Use this screen to configure up to two mail servers and sender addresses on the Zyxel Device.                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Log Setting           | Log Settings          | Use this screen to change your Zyxel Device's log settings.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |



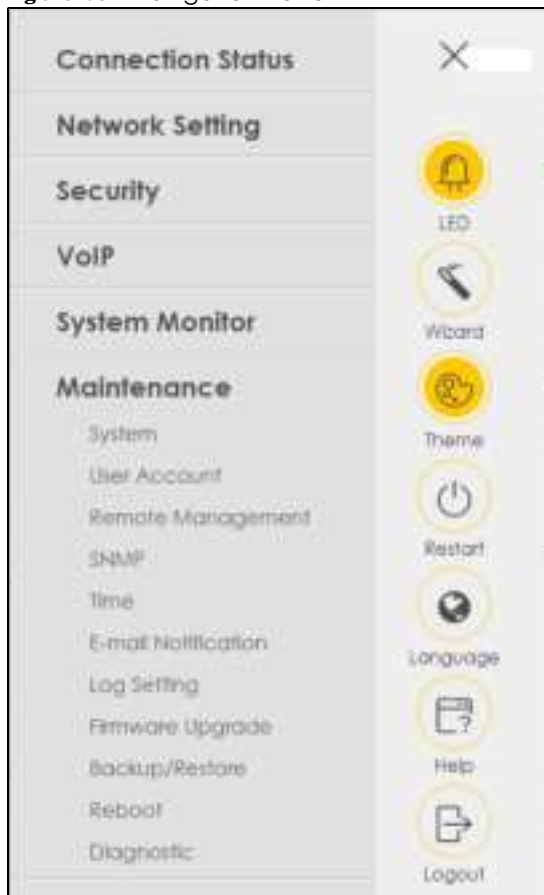
Table 40 Navigation Panel Summary (continued)

| LINK             | TAB                       | FUNCTION                                                                                                                                                                     |
|------------------|---------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Firmware Upgrade | Firmware Upgrade          | Use this screen to upload firmware to your Zyxel Device.                                                                                                                     |
| Backup/Restore   | Backup/Restore            | Use this screen to backup and restore your Zyxel Device's configuration (settings) or reset the factory default settings.                                                    |
| Reboot           | Reboot                    | Use this screen to reboot the Zyxel Device / Zyxel Mesh system without turning the power off.                                                                                |
| Diagnostic       | Ping&Traceroute &Nslookup | Use this screen to identify problems with the Zyxel Device. You can use Ping, TraceRoute, or Nslookup to help you identify problems.                                         |
|                  | 802.1ag                   | Use this screen to configure CFM (Connectivity Fault Management) MD (maintenance domain) and MA (maintenance association), perform connectivity tests and view test reports. |
|                  | 802.3ah                   | Use this screen to configure link OAM port parameters,                                                                                                                       |

### 3.2.1.3 Dashboard

Use the menu items in the navigation panel on the right to open screens to configure the Zyxel Device's features.

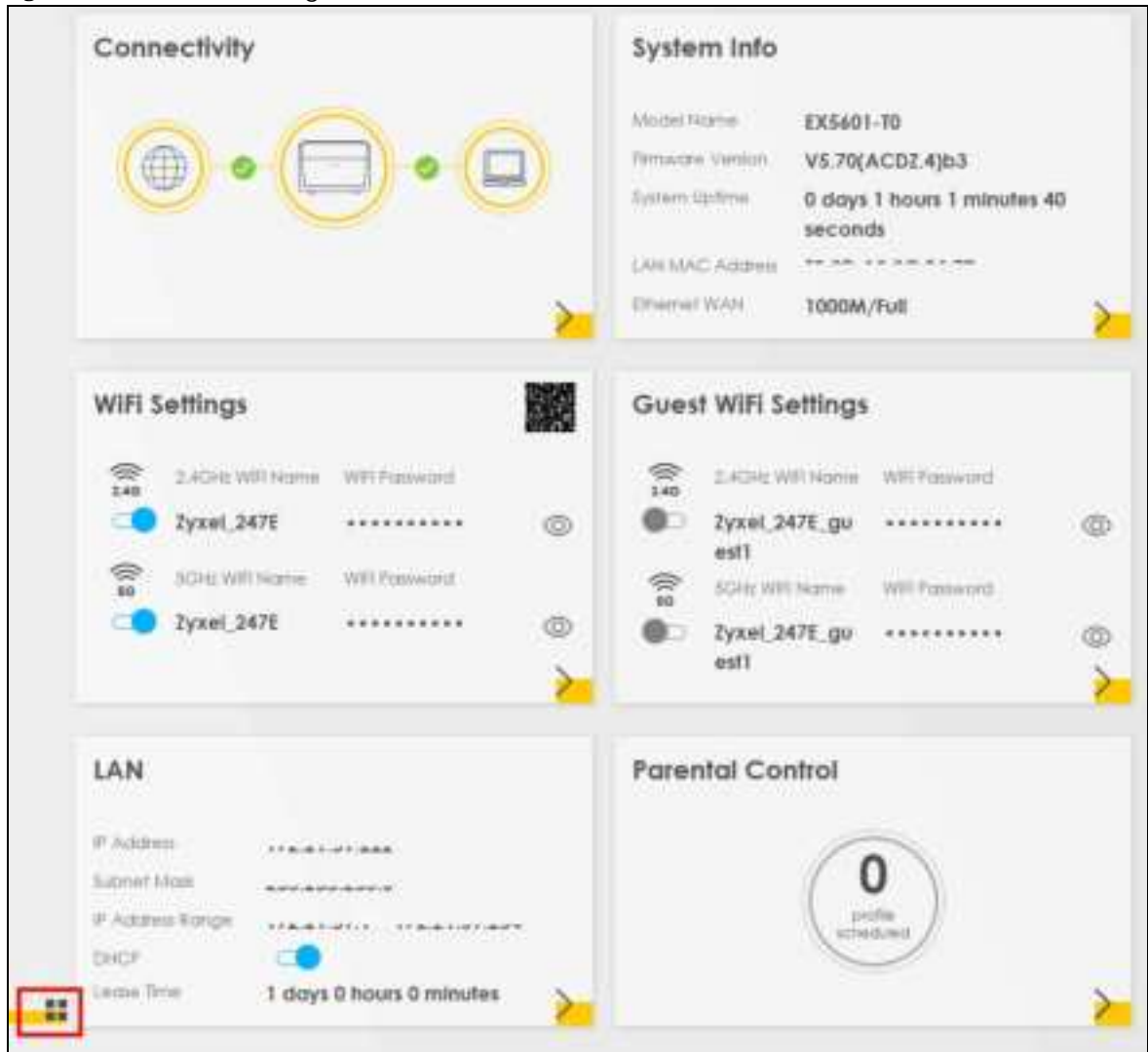
Figure 79 Navigation Panel



### 3.2.2 Widget Icon

Click the Widget icon () in the lower left corner to arrange the screen order.

**Figure 80** Dashboard Widget



The following screen appears. Select a block and hold it to move around. Click the Check icon () in the lower left corner to save the changes.

**Figure 81** Check Icon



# CHAPTER 4

## Quick Start

### 4.1 Quick Start Overview

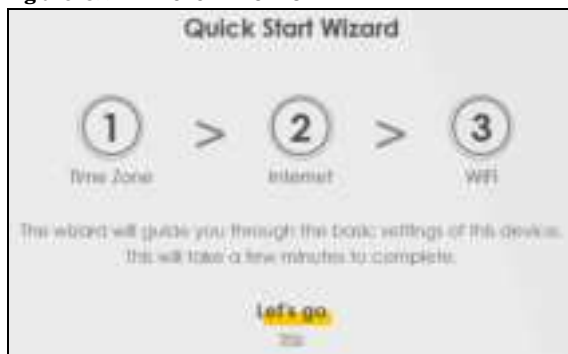
Use the **Wizard** screens to configure the Zyxel Device's time zone and WiFi settings.

Note: See the technical reference chapters for background information on the features in this chapter.

### 4.2 Quick Start Setup

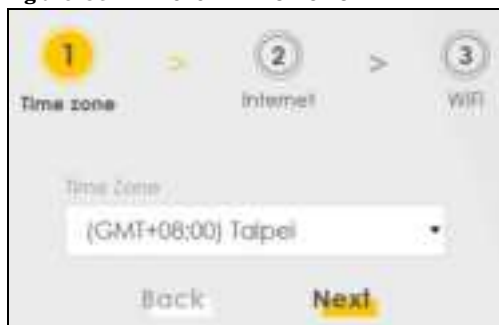
You can click the **Wizard** icon in the side bar to open the **Wizard** screens. After you click the **Wizard** icon, the following screen appears. Click **Let's go** to proceed with settings on time zone and WiFi networks. It will take you a few minutes to complete the settings on the **Wizard** screens. You can click **Skip** to leave the **Wizard** screens.

**Figure 82** Wizard – Home



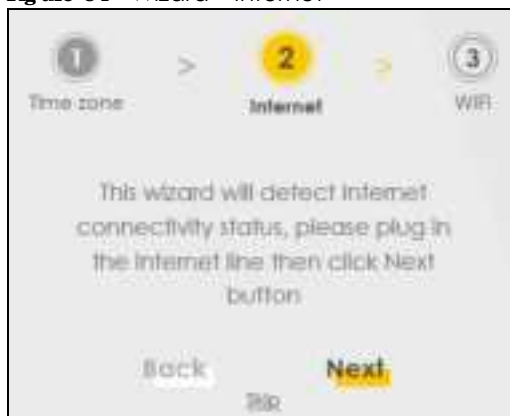
### 4.3 Quick Start Setup – Time Zone

Select the time zone of the Zyxel Device's location. Click **Next**.

**Figure 83** Wizard – Time Zone

## 4.4 Quick Start Setup – Internet Connection

The Zyxel Device detects your Internet connection status. Click **Next** to continue.

**Figure 84** Wizard – Internet

### 4.4.1 Successful Internet Connection

The Zyxel Device has Internet access.

**Figure 85** Wizard – Successful Internet Connection

### 4.4.2 Unsuccessful Internet Connection

The Zyxel Device did not detect a WAN connection. See [Section 4.3.5 on page 501](#) for troubleshooting the Zyxel Device WAN connection.

**Figure 86** Wizard – Internet Connection is Down



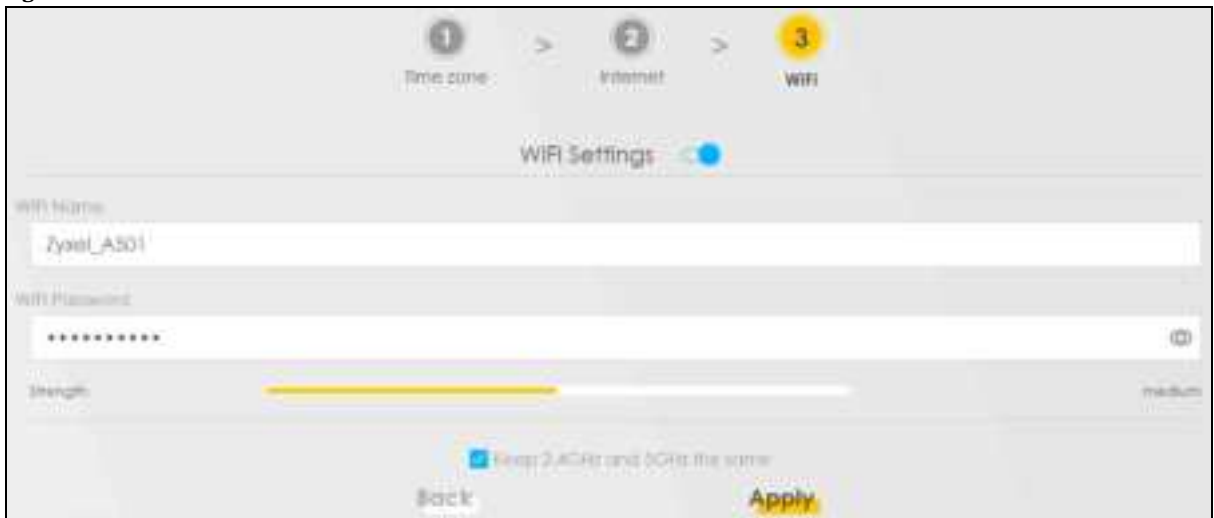
## 4.5 Quick Start Setup – WiFi

Turn WiFi on or off. If you keep it on, record the **WiFi Name** and **Password** in this screen so you can configure your WiFi clients to connect to the Zyxel Device. If you want to show or hide your WiFi password, click the Eye icon (👁).

Select **Keep 2.4GHz and 5GHz the same** to use the same SSID for 2.4 GHz and 5 GHz WiFi networks. Otherwise, clear the checkbox to have two different SSIDs for 2.4 GHz and 5 GHz WiFi networks. The screen and fields to enter may vary when you select or clear the checkbox.

You have to disable **MPro Mesh** in the **Network > Wireless > MESH** screen to clear the **Keep 2.4GHz and 5GHz the same** checkbox. Click **Done**.

**Figure 87** Wizard – WiFi



## **4.6 Quick Start Setup – Finish**

Your Zyxel Device saves and applies your settings.

# CHAPTER 5

## Web Interface Tutorials

### 5.1 Web Interface Overview

This chapter shows you how to use the Zyxel Device's various features.

- [Device Settings](#) - Rename your Zyxel Device, change the admin password, and change the management IP address.
- [Wired Network Setup](#) - Set up a wired network connection using DSL/GPON/Ethernet.
- [WiFi Network Setup](#) - Change the security mode, connect to the WiFi network using the WPS, set up a guest WiFi network with different WiFi bands, and configure the channel and bandwidth for each WiFi band.
- [USB Applications](#) - Set up file sharing and play files through Windows Media Player with a USB device.
- [Network Security](#) - Configure a firewall rule, set up parental control rule, and configure a MAC Filter rule.
- [Internet Calls](#) - Add a SIP service provider or a SIP account, to make phone calls over the Internet.
- [Device Maintenance](#) - Upgrade the firmware, back up the firmware, restore the Zyxel Device configuration, and reset the Zyxel Device to factory defaults.
- [Remote Access from WAN](#) - Configure remote access to your Zyxel Device and configure the trust domain.
- [System Log](#) - View the system log of the Zyxel Device, and send the log file through E-mail.

### 5.2 Device Settings

This section shows you how to:

- [Rename Your Zyxel Device](#)
- [Change the Admin Password](#)
- [Change the Management IP Address](#)

You can rename your device, and change the admin password.

#### 5.2.1 Rename Your Zyxel Device

An FQDN (Fully Qualified Domain Name) is used to identify a specific host on the Internet, consisting of a host name and a domain name.

Proper naming of the host name and domain name makes the Zyxel Device and the network easier to identify, manage, and troubleshoot. The host name is the name of your Zyxel Device, while the domain name is the name of the entire network your Zyxel Device belongs to. If your Zyxel Device's host name is



room1, and it belongs to the domain you name with home.com, then your Zyxel Device's FQDN would be room1.home.com.

To change the host name and the domain name, please follow the steps below:

- 1 Go to the **Maintenance > System** screen. Enter a new host name in the **Host Name** field and a domain name in the **Domain Name** field (special characters and spaces are not allowed). Click **Apply**.

- 2 Go to the **Connection Status > System Info**. You can see the new host name has been applied successfully.

## 5.2.2 Change the Admin Password

Change the Web Configurator login password regularly to secure access to your Zyxel Device. To change the admin password, follow the steps below:

- 1 Go to the **Maintenance > User Account** screen. Click the **Edit** icon.

| # | Active | User Name | Entry Times | Idle Timeout | Lock Failed | Group         | Modify |
|---|--------|-----------|-------------|--------------|-------------|---------------|--------|
| 1 | YES    | admin     | 1           | 60           | 0           | Administrator | EDIT   |

- 2 The **User Account Edit** screen appears. Enter your old and new passwords in the corresponding field. Click **OK**.

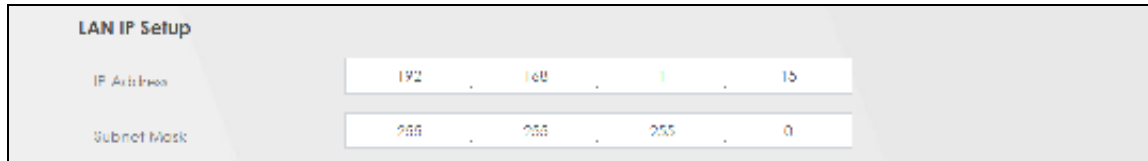
Note: The new password must be at least 8 characters, must contain at least one uppercase letter, one lowercase letter, one number, and one special character. For some models, the password must contain at least one English character and one number. Please see the password requirement displayed on the screen.

### 5.2.3 Change the Management IP Address

Duplicated IP addresses in the network environment may cause failure to connect to the Zyxel Device. To change the management IP address of your Zyxel Device, please follow the steps below:

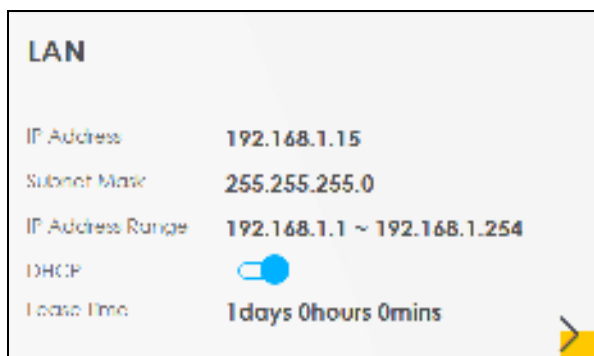
- 1 Change your computer's IP address to the same subnet as the Zyxel Device. For example, if the default static IP address of the Zyxel Device is 192.168.1.1, set your computer IP address between 192.168.1.2 and 192.168.1.254.

- Log into the Zyxel Device using the default IP address "192.168.1.1". Go to **Network Setting > Home Networking**. Enter your preferred IPv4 address in the **IP Address** field. For example, "192.168.1.15". Click **Apply** and the Zyxel Device will disconnect from your computer due to the IP address change.



| LAN IP Setup |                     |
|--------------|---------------------|
| IP Address   | 192 . 168 . 1 . 15  |
| Subnet Mask  | 255 . 255 . 255 . 0 |

- Enter the new IP address "192.168.1.15" in the address bar to check if you can access the Zyxel Device's Web Configurator.
- After logging in, click the menu icon () and go to **Connection Status**. In the **LAN** section, the **IP Address** should now be "192.168.1.15".



| LAN              |                                     |
|------------------|-------------------------------------|
| IP Address       | 192.168.1.15                        |
| Subnet Mask      | 255.255.255.0                       |
| IP Address Range | 192.168.1.1 ~ 192.168.1.254         |
| DHCP             | <input checked="" type="checkbox"/> |
| Lease Time       | 1 days 0 hours 0 mins               |

## 5.3 Wired Network Setup

This section shows you how to:

- [Set Up a DSL Connection](#)
- [Set Up a GPON Connection](#)
- [Set Up an Ethernet Connection](#)

You can set up a PON, DSL or Ethernet Internet connection with the **Broadband** screens. The screens vary by the connection mode, encapsulation type and IP mode (IPv6 or IPv4) you select.

Set the Zyxel Device to **Routing** mode or **Bridge** mode on this connection as follows:

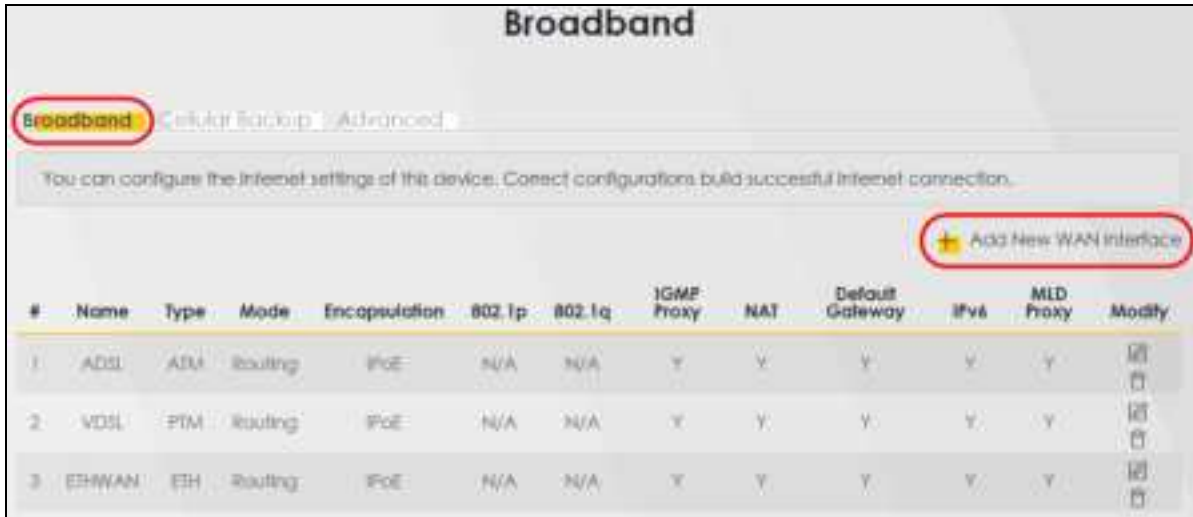
- Use **Routing** mode if you want the Zyxel Device to use routing mode functions such as **NAT**, **Firewall**, or **DHCP Server**. You will need to reconfigure your network if you have an existing router.
- Use **Bridge** mode to pass the ISP-assigned IP address(es) to your devices connected to the LAN port. All traffic from the Internet passes through the Zyxel Device directly to devices connected to the LAN port. Use this mode if you already have a router with complete routing functions in your network.

### 5.3.1 Set Up a DSL Connection

This tutorial shows you how to set up a DSL Internet connection using the Web Configurator on DSL routers (see [Section 1.1 on page 20](#)).

If you connect to the Internet through a DSL connection, use the information from your Internet Service Provider (ISP) to configure the **Broadband** screens.

- 1 Go to **Network Setting > Broadband** and then the following screen appears. Click **Add New WAN Interface**.



- 2 To set the Zyxel Device to **Routing** mode, see [Routing Mode on page 116](#).  
To set the Zyxel Device to **Bridge** mode, see [Bridge Mode on page 119](#).

## Routing Mode

- 1 In this routing mode example, the DSL WAN connection has the following information.

|                       |                   |
|-----------------------|-------------------|
| General               |                   |
| Name                  | MyDSLConnection   |
| Type                  | ADSL over ATM     |
| Connection Mode       | Routing           |
| Encapsulation         | PPPoE             |
| IPv6/IPv4 Mode        | IPv4              |
| ATM PVC Configuration |                   |
| VPI/VCI               | 36/48             |
| Encapsulation Mode    | LLC/SNAP-Bridging |
| Service Category      | UBR without PCR   |
| Account Information   |                   |
| PPP User Name         | 1234@DSL-Ex.com   |
| PPP Password          | ABCDEF!           |
| Static IP Address     | 192.168.1.32      |
| Gateway IP Address    | 192.168.1.254     |
| Primary DNS server    | 192.168.5.2       |

|                      |                                                                                                                                                                    |
|----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Secondary DNS server | 192.168.5.1                                                                                                                                                        |
| Others               | Authentication Method: AUTO<br>PPPoE Passthrough: Disabled<br>NAT: Enabled<br>IGMP Multicast Proxy: Enabled<br>Apply as Default Gateway: Enabled<br>VLAN: Disabled |

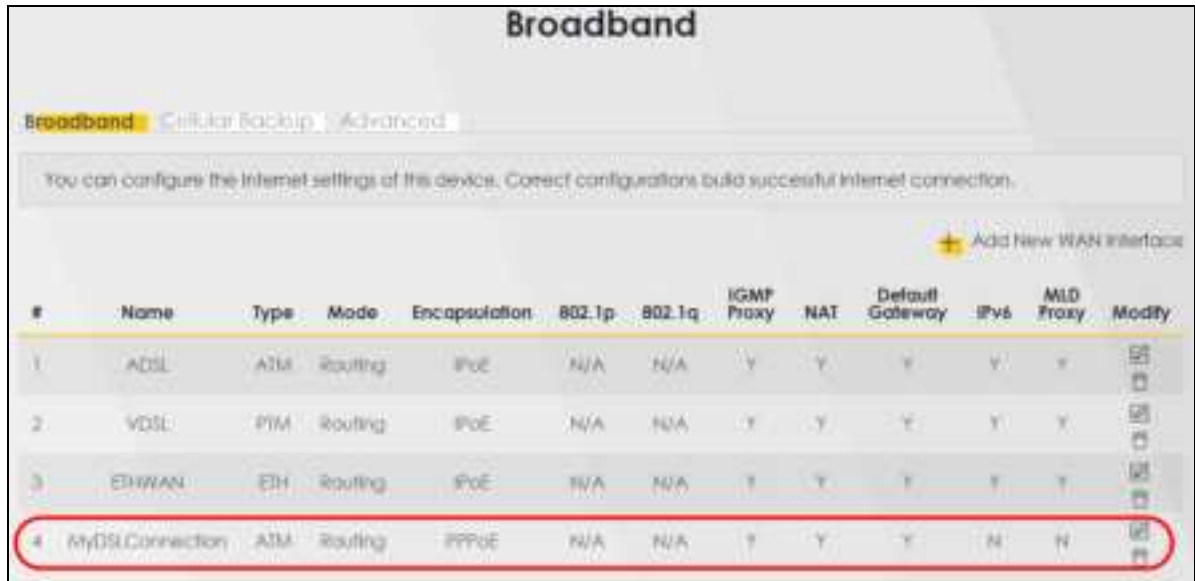
- 2 Enter the **General** and **ATM PVC Configuration** settings as provided above.
  - Set the **Type** to **ADSL over ATM**.
  - Set the **Mode** to **Routing**.
  - Choose the **Encapsulation** specified by your DSL service provider.
  - Set the **IPv4/IPv6 Mode** to **IPv4 Only**.
- 3 Enter the account information provided by your DSL service provider.
- 4 Enable **Apply as Default Gateway** to use this rule as your default Internet connection. Then select **Use Following Static DNS Address** and enter the DNS server addresses provided by your DSL service provider.
- 5 For the rest of the fields, use the default settings.
- 6 Click **Apply** to save your settings.

### Add New WAN Interface

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                    |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>General</b> <span style="float: right;"><input checked="" type="checkbox"/></span></p> <p>Name: <input type="text" value="MySQL Connect"/></p> <p>Type: <input type="text" value="ADSL over ATM"/> ▼</p> <p>Mode: <input type="text" value="Routing"/> ▼</p> <p>Encapsulation: <input type="text" value="PPPoE"/> ▼</p> <p>IPv4/IPv6 Mode: <input type="text" value="IPv4 Only"/> ▼</p>                                                                                                                            | <p><b>PPP Information</b></p> <p>PPP User Name: <input type="text" value="admin"/></p> <p>PPP Password: <input type="password" value="****"/> ⓘ</p> <p>PPP Connection Trigger: <input checked="" type="radio"/> Auto-Connect <input type="radio"/> On-Demand</p> <p>PPPd Passthrough: <input type="checkbox"/></p> |
| <p><b>ATM PVC Configuration</b></p> <p>VPI (0-255): <input type="text" value="0"/></p> <p>VCI (32-65535): <input type="text" value="33"/></p> <p>Encapsulation: <input type="text" value="LLC/SNAP-BRIDGING"/> ▼</p> <p>Service Category: <input type="text" value="USB Without PCIE"/> ▼</p>                                                                                                                                                                                                                            | <p><b>VLAN</b> <span style="float: right;"><input type="checkbox"/></span></p> <p>802.1p: <input type="text" value="0"/></p> <p>802.1q: <input type="text" value="1"/> (1~4094)</p><br><p><b>MTU</b></p> <p>mtu: <input type="text" value="1500"/></p>                                                             |
| <p><b>IP Address</b></p> <p><input type="radio"/> Obtain an IP Address Automatically</p> <p><input checked="" type="radio"/> Static IP Address</p> <p>IP Address: <input type="text" value="192.168.1.1"/></p><br><p><b>DNS Server</b></p> <p><input type="radio"/> Obtain DNS Info Automatically</p> <p><input checked="" type="radio"/> Use Following Static DNS Address</p> <p>Primary DNS Server: <input type="text" value="192.168.1.1"/></p> <p>Secondary DNS Server: <input type="text" value="192.168.1.1"/></p> | <p><b>Routing Feature</b></p> <p>NAT: <input checked="" type="checkbox"/> IGMP Proxy: <input checked="" type="checkbox"/></p> <p>Apply as Default Gateway: <input type="checkbox"/> Fullcone NAT: <input type="checkbox"/></p> <p>6RD: <input type="checkbox"/></p>                                                |

Cancel
Apply

The new connection is displayed on the **Broadband** screen.



## Bridge Mode

- 1 In this bridge mode example, the DSL WAN connection has the following information.

|                       |                   |
|-----------------------|-------------------|
| General               |                   |
| Name                  | MyDSLConnection   |
| Type                  | ADSL over ATM     |
| Connection Mode       | Bridge            |
| ATM PVC Configuration |                   |
| VPI/VCI               | 36/48             |
| Encapsulation Mode    | LLC/SNAP-BRIDGING |
| Service Category      | UBR without PCR   |

- 2 Enter the **General** and **ATM PVC Configuration** settings as provided above.
- 3 For the rest of the fields, use the default settings.
- 4 Click **Apply** to save your settings.
- 5 Try to connect to a website to see if you have correctly set up your Internet connection.

### 5.3.2 Set Up a GPON Connection

If you connect to the Internet through a GPON connection, you need to connect a broadband modem or router with Internet access to the WAN GPON port on the Zyxel Device. You need to configure the Internet settings from the broadband modem or router on the Zyxel Device. First, make sure you have Internet access through the broadband modem or router by connecting directly to it.

- 1 Make sure you have the GPON WAN port connect to a modem or router.

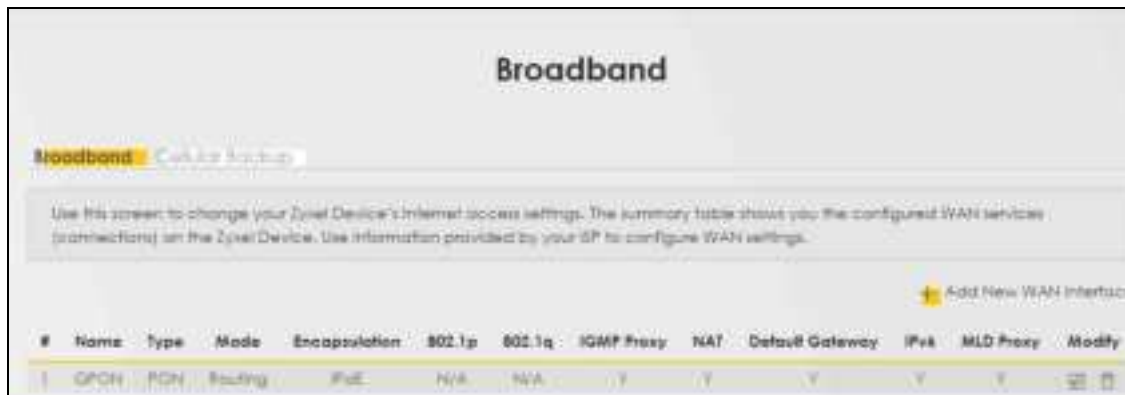
- 2 Register the GPON serial number on the back label of the Zyxel Device (ONT, Optical Network Terminal) with your Internet service provider (OLT, Optical Line Terminal). The LED indicator will show the status of the registration. The GPON registration process includes the states below for the Zyxel Device:

Table 41 GPON registration process

| STATE | DESCRIPTION                                                                                                                                                                                                                     |
|-------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| O1    | Initial State: Check if the GPON port of the Zyxel Device(ONT) is enabled and ready to connect to the Internet service provider (OLT).                                                                                          |
| O2    | Standby State: The Zyxel Device(ONT) is trying to receive signals sent by the Internet service provider (OLT) and is responding.                                                                                                |
| O3    | Serial Number State: The Internet service provider (OLT) is sending a serial number request for the Zyxel Device (ONT). The Zyxel Device (ONT) replies with the GPON serial number found on the back label of the Zyxel Device. |
| O4    | Ranging State: The Internet service provider (OLT) is sending a ranging request to the Zyxel Device (ONT) and is asking for a response.                                                                                         |
| O5    | Operation State: The GPON connection is established between the Zyxel Device (ONT) and the Internet service provider (OLT).                                                                                                     |

See [Table 2.2 on page 32](#) for more information about the LED of GPON registration.

- 3 Go to **Network Setting > Broadband** and then the following screen appears. Click **Add New WAN Interface**.



- 4 To set the Zyxel Device to **Routing** mode, see [Routing Mode on page 120](#).  
To set the Zyxel Device to **Bridge** mode, see [Bridge Mode on page 123](#).

## Routing Mode

- 1 In this routing mode example, the PON WAN connection has the following information.

|                 |         |
|-----------------|---------|
| General         |         |
| Name            | GPON-1  |
| Type            | GPON    |
| Connection Mode | Routing |
| Encapsulation   | IPoE    |



|                |                                                                                                     |
|----------------|-----------------------------------------------------------------------------------------------------|
| IPv6/IPv4 Mode | IPv4 Only                                                                                           |
| Others         | NAT: Enabled<br>IGMP Multicast Proxy: Enabled<br>Apply as Default Gateway: Enabled<br>VLAN: Enabled |

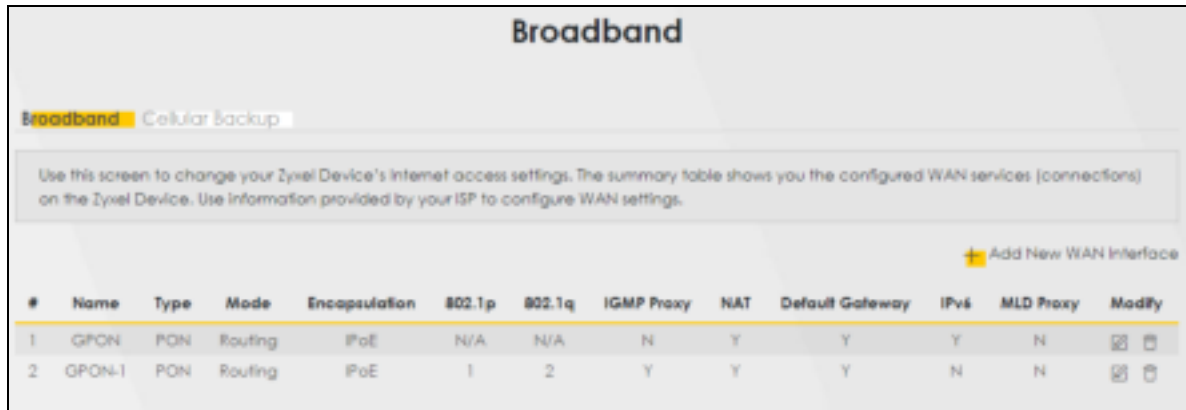
- 2 Enter the **General** settings as provided above.
  - Enter a **Name** to identify your WAN connection.
  - Set the **Type** to **GPON**.
  - Set the **Mode** to **Routing**.
  - Choose the **Encapsulation** specified by your GPON service provider.
  - Set the **IPv4/IPv6 Mode** to **IPv4 Only**.
- 3 Under **Routing Feature**, enable **NAT** and **Apply as Default Gateway**.
- 4 For the rest of the fields, use the default settings.
- 5 Click **Apply** to save your settings.

The screenshot displays the 'Edit WAN interface' configuration page. It is divided into several sections:

- General:** Includes fields for Name (wan1), Type (wan), Mode (Routing), Encapsulation (IPv4), and IPv4/IPv6 Mode (IPv4 Only).
- VLAN:** Includes fields for VLAN ID (1) and VLAN Name (wan1).
- MTU:** Includes a field for MTU (1500).
- IP Address:** Includes radio buttons for 'Obtain an IP Address Automatically' (selected) and 'Static IP Address'.
- DNS Server:** Includes radio buttons for 'Obtain DNS info Automatically' (selected) and 'Use Following Static DNS Address'.
- Routing Feature:** Includes toggle switches for NAT (selected), IGMP Proxy (selected), Apply as Default Gateway (selected), Fullcone NAT (disabled), and 6RD (disabled).
- DHCP Options:** Includes sections for Request Options (option 43, 42, 125, 129) and Sent Options (option 12, option 66, Vendor ID, option 61, MAC, DUID, option 129).

At the bottom, there are 'Cancel' and 'Apply' buttons.

- 6 Try to connect to a website to see if you have correctly set up your Internet connection. Go to the **Network Setting > Broadband** screen to view the established Ethernet connection. The new connection is displayed on the **Broadband** screen



The new connection is displayed on the **Broadband** screen.

## Bridge Mode

- 1 In this bridge mode example, the GPON WAN connection has the following information.

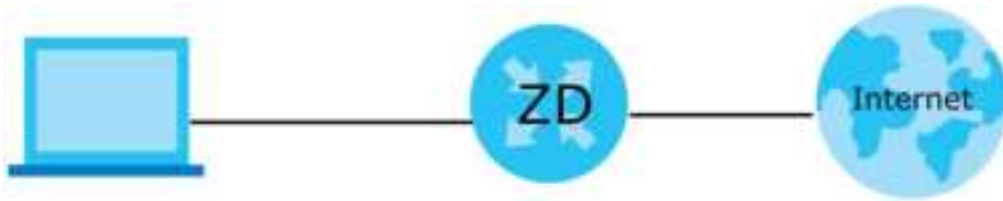
|                 |        |
|-----------------|--------|
| General         |        |
| Name            | GPON-2 |
| Type            | GPON   |
| Connection Mode | Bridge |

- 2 Enter the **General** settings provided by your Internet service provider.
  - Enter a **Name** to identify your WAN connection.
  - Set the **Type** to **GPON**.
  - Set your GPON connection **Mode** to **Bridge**.
- 3 For the rest of the fields, use the default settings.
- 4 Click **Apply** to save your settings.



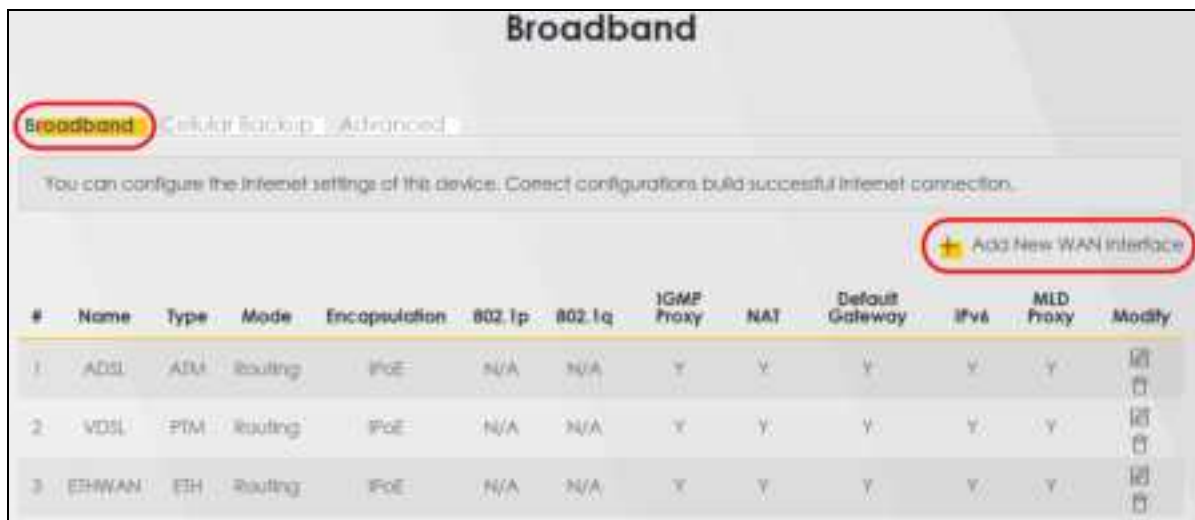
### 5.3.3 Set Up an Ethernet Connection

If you connect to the Internet through an Ethernet connection, you need to connect a broadband modem or router with Internet access to the WAN Ethernet port on the Zyxel Device. You need to configure the Internet settings from the broadband modem or router on the Zyxel Device. First, make sure you have Internet access through the broadband modem or router by connecting directly to it.



This example shows you how to configure an Ethernet WAN connection.

- 1 Make sure you have the Ethernet WAN port connect to a modem or router.
- 2 Go to **Network Setting > Broadband** and then the following screen appears. Click **Add New WAN Interface** to add a WAN connection.



- 3 To set the Zyxel Device to **Routing** mode, see [Routing Mode on page 124](#).  
To set the Zyxel Device to **Bridge** mode, see [Bridge Mode on page 127](#).

#### Routing Mode

- 1 In this routing mode example, configure the following information for the Ethernet WAN connection.

|                 |                   |
|-----------------|-------------------|
| General         |                   |
| Name            | My ETH Connection |
| Type            | Ethernet          |
| Connection Mode | Routing           |

|                               |           |
|-------------------------------|-----------|
| Encapsulation (Internet Type) | IPoE      |
| IPv6/IPv4 Mode                | IPv4 Only |

- 2 Enter the **General** settings provided by your Internet service provider.
  - Enter a **Name** to identify your WAN connection.
  - Set the **Type** to **Ethernet**.
  - Set your Ethernet connection **Mode** to **Routing**.
  - Choose the **Encapsulation** specified by your Internet service provider. For this example, select **IPoE** as the WAN encapsulation type.
  - Set the **IPv4/IPv6 Mode** to **IPv4 Only**.
- 3 Under **Routing Feature**, enable **NAT** and **Apply as Default Gateway**.
- 4 For the rest of the fields, use the default settings.
- 5 Click **Apply** to save your settings.

**Add New WAN Interface**

**General** ☒

Name:

Type:

Mode:

Encapsulation:

IPv4/IPv6 mode:

**VLAN** ☐

VLAN ID:

**MTU**

MTU:

**IP Address**

☒ Obtain an IP Address Automatically

☐ Static IP Address

**DNS Server**

☒ Obtain DNS Info Automatically

☐ Use Following Static DNS Address

**Routing Feature**

NAT: ☒ IGMP Proxy: ☒

Apply as Default Gateway: ☒ Fullcone NAT: ☐

6RD: ☐

**DHCP Options**

Request Options:

☐ option 41 ☐ option 43 ☐ option 120 ☐ option 121

Send Options:

☐ option 12

☐ option 60

Vendor ID:

☐ option 44

MAC:

CID:

☐ option 128

**Cancel** **Apply**

- 6 Go to the **Network Setting > Broadband** screen to view the established Ethernet connection. The new connection is displayed on the **Broadband** screen.



## Bridge Mode

- 1 In this bridge mode example, configure the following information for the Ethernet WAN connection.

| General         |                   |
|-----------------|-------------------|
| Name            | My ETH Connection |
| Type            | Ethernet          |
| Connection Mode | Bridge            |

- 2 Enter the **General** settings provided by your Internet service provider.
  - Enter a **Name** to identify your WAN connection.
  - Set the **Type** to **Ethernet**.
  - Set your Ethernet connection **Mode** to **Bridge**.
- 3 For the rest of the fields, use the default settings.
- 4 Click **Apply** to save your settings.



## 5.4 WiFi Network Setup

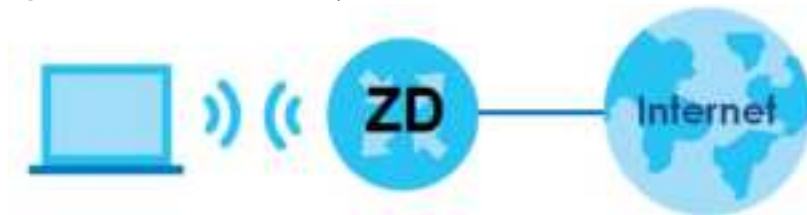
This section shows you how to:

- [Change Security Settings on a WiFi Network](#)
- [Connect to the Zyxel Device's WiFi Network Using WPS](#)
- [Set Up a Guest Network](#)
- [Set Up Two Guest WiFi Networks on Different WiFi Bands](#)
- [Configure the Channel and Bandwidth for Each WiFi Band](#)

For Zyxel Devices that support MPro Mesh, you can use the MPro Mesh app or the Zyxel One app to configure your WiFi network. See [Section 6.1 on page 148](#) for setting up your WiFi network with the Zyxel MPro Mesh app. See [Section on page 206](#) for setting up your WiFi network with the Zyxel One app.

In this example, you want to set up a WiFi network so that you can use your notebook to access the Internet. In this WiFi network, the Zyxel Device is an access point (AP), and the notebook is a WiFi client. The WiFi client can access the Internet through the AP.

**Figure 88** WiFi Network Setup



See the label on the Zyxel Device for the WiFi network settings and then connect manually to the Zyxel Device. Alternatively, you can connect to the Zyxel Device WiFi network using WPS. See [Section 2.3.3 on page 94](#).

### 5.4.1 Change Security Settings on a WiFi Network

This example changes the default security settings of a WiFi network to the following:

|                       |                   |
|-----------------------|-------------------|
| <b>SSID</b>           | Example           |
| <b>Security Mode</b>  | WPA3-SAE/WPA2-PSK |
| <b>Pre-Shared Key</b> | Admin1234!!       |
| <b>802.11 Mode</b>    | 802.11b/g/n Mixed |

- 1 Go to the **Network Setting > Wireless > General** screen. Select **More Secure** as the security level and **WPA2-PSK** as the security mode. Configure the screen using the provided parameters. Click **Apply**.



## Wireless

**General** | **Advanced** | **WPS** | **Update Firmware** | **Channel** | **SSID** | **Security**

Use this screen to enable the Wireless LAN, enter the SSID and select the wireless security mode. We recommend that you select **More Secure** to enable WPA3-SAE/WPA2-PSK data encryption.

---

### Wireless

Wireless: ☐ Keep the same settings for 2.4GHz and 5GHz wireless networks

### Wireless Network Setup

Band: 2.4GHz  
 Wireless: ☒  
 Channel: Auto Default: 6, 11, 36, 48, 149  
 Bandwidth: 20/40MHz  
 Control Channel: Control

### Wireless Network Settings

Wireless Network Name: Example  
 Max Clients: 34  
☒ **More Secure** 1  
☒ Multicast Forwarding  
 Max. Upstream Bandwidth:  Hide  
 Max. Downstream Bandwidth:  Hide

**Notes**

(1) If you are configuring the Zyxel Device from a computer connected by WiFi and you change the Zyxel Device's SSID, channel or security settings, you will lose your WiFi connection when you press **Apply**. You must change the WiFi settings of your computer to match the new settings on the Zyxel Device.

(2) If upstream/downstream bandwidth is empty, the Zyxel Device sets the value automatically. Setting a maximum upstream/downstream bandwidth will significantly decrease wireless performance.

SSID:  RECOMMENDED

### Security Level

No Security More Secure (Recommended)

Security Mode: WPA3-SAE/WPA2-PSK

Protection Management Protocol: WPA3-SAE

☐ Generate password automatically

The password must be at least 8 characters long, including 1 uppercase letter, 1 lowercase letter, 1 number and 1 special character.

Password: \*\*\*\*\* Eye icon

Strength:  Strong

Cancel Apply

- 2 Go to the **Wireless > Others** screen. Set **802.11 Mode** to **802.11b/g/n Mixed**, and then click **Apply**.

**Wireless**

General Guest/More AP MAC Authentication WPS WMM **Others** Channel Status MESH

The configurations below are the advanced wireless settings.

|                             |                          |
|-----------------------------|--------------------------|
| RTS/CTS Threshold           | 2347                     |
| Fragmentation Threshold     | 2346                     |
| Output Power                | 100%                     |
| Beacon Interval             | 100                      |
| DTIM Interval               | 1                        |
| <b>802.11 Mode</b>          | <b>802.11b/g/n Mixed</b> |
| 802.11 Protection           | Auto                     |
| Preamble                    | Long                     |
| Protected Management Frames | Capable                  |

Cancel **Apply**

You can now use the WPS feature to establish a WiFi connection between your notebook and the Zyxel Device (see [Section 8.7 on page 252](#)). Now use the new security settings to connect to the Internet through the Zyxel Device using WiFi.

## 5.4.2 Connect to the Zyxel Device's WiFi Network Using WPS

This section shows you how to connect a WiFi device to the Zyxel Device's WiFi network using WPS. WPS (WiFi Protected Setup) is a security standard that allows devices to connect to a router securely without you having to enter a password. There is one method:

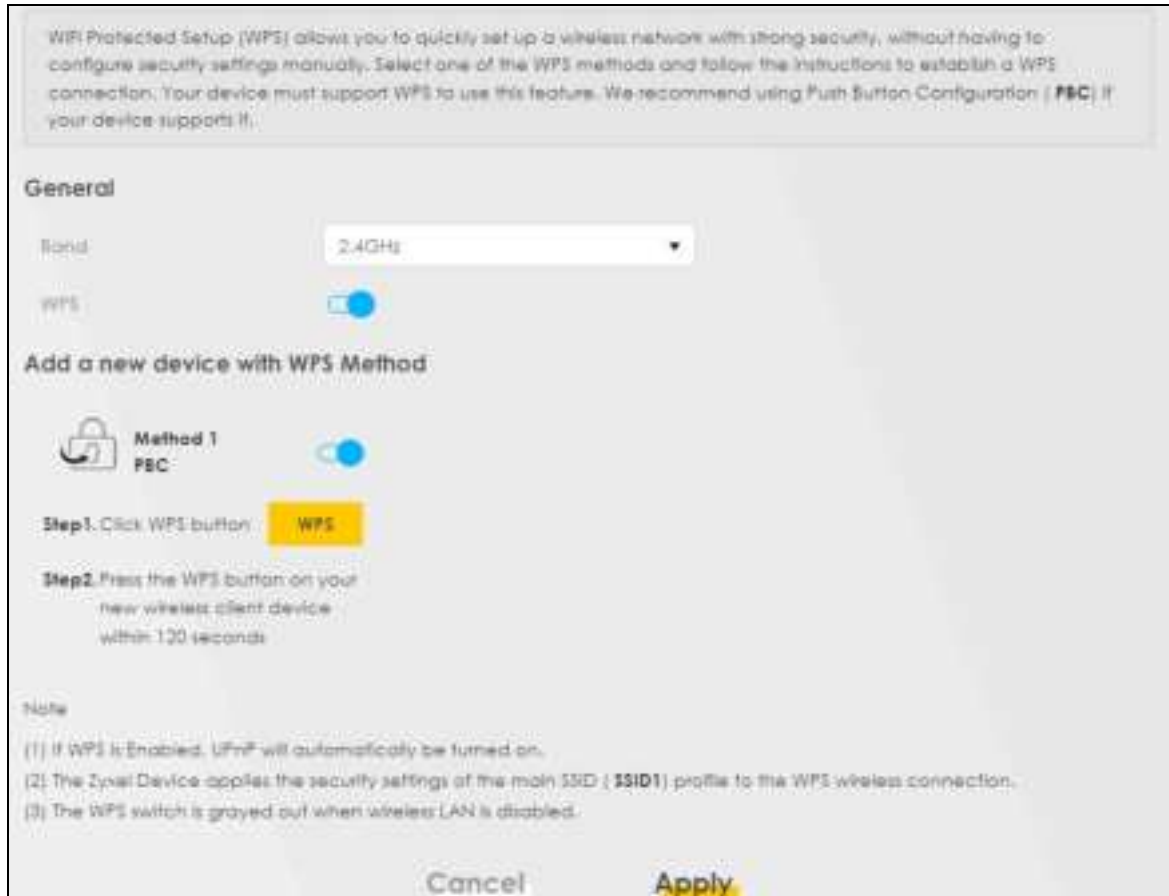
- **Push Button Configuration (PBC)** – Connect to the WiFi network by pressing a button. This is the simplest method.

### 5.4.2.1 WPS Push Button Configuration (PBC)

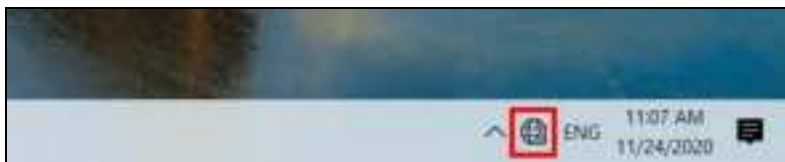
This example shows how to connect to the Zyxel Device's WiFi network from a notebook computer running Windows 10.

- 1 Make sure that your Zyxel Device is turned on, and your notebook is within range of the Zyxel Device's WiFi signal.

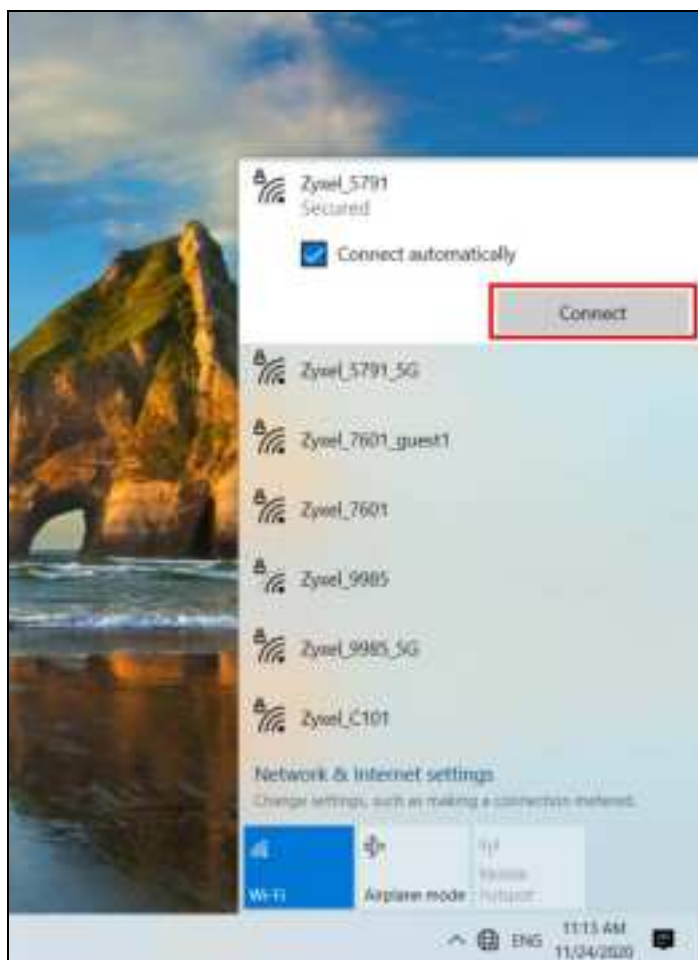
- 2 Push and hold the **WPS** button located on the Zyxel Device until the **WiFi** or **WPS** LED starts blinking slowly. Alternatively, log into the Zyxel Device's Web Configurator, and then go to the **Network Setting > Wireless > WPS** screen. Enable **WPS** and **Method 1 PBC**, click **Apply**, and then click the **WPS button**.
- 3 Log into the Zyxel Device's Web Configurator, and then go to the **Network Setting > Wireless > WPS** screen. Enable **WPS** and **Method 1 PBC**, click **Apply**, and then click the **WPS button**.



- 4 In Windows 10, click on the Network icon in the system tray to open the list of available WiFi networks.



- 5 Locate the WiFi network of the Zyxel Device. The default WiFi network name is "Zyxel\_XXXX" (2.4 GHz) or "Zyxel\_XXXX\_5G" (5 GHz). Then click **Connect**.



The Zyxel Device sends the WiFi network settings to Windows using WPS. Windows displays "Getting settings from the router".



The WiFi device is then able to connect to the WiFi network securely.

### 5.4.3 Set Up a Guest Network

The Zyxel Device authenticates the WiFi device using the PIN, and then sends the WiFi network settings to the device using WPS. This process may take up to 2 minutes. The WiFi device is then able to connect to the WiFi network securely. A company wants to create two WiFi networks for different groups of users as shown in the following figure. Each WiFi network has its own SSID and security mode. Both networks are accessible on both 2.4 GHz and 5 GHz WiFi bands.



- Employees using the **General** WiFi network group will have access to the local network and the Internet.
- Visitors using the **Guest** WiFi network group with a different SSID and password will have access to the Internet only.

Use the following parameters to set up the WiFi network groups.

|                       | GENERAL            | GUEST        |
|-----------------------|--------------------|--------------|
| <b>2.4/ 5G SSID</b>   | Example            | Guest        |
| <b>Security Level</b> | More Secure        | More Secure  |
| <b>Security Mode</b>  | WPA3-SAE/WPA2-PSK  | WPA2-PSK     |
| <b>Pre-Shared Key</b> | ForCompanyOnly123! | Guest123456! |

Go to the **Network Setting > Wireless > General** screen. Use this screen to set up the company's general WiFi network group. Configure the screen using the provided parameters and click **Apply**. Note that if you have employees using 2.4 GHz and 5 GHz devices, enable **Keep the same settings for 2.4GHz and 5GHz wireless networks** to use the same SSID and password. Clear it if you want to configure different SSIDs and passwords for 2.4 GHz and 5 GHz bands.

## Wireless

**General** | **Channel** | **Security** | **Advanced** | **WPS** | **Update** | **Factory** | **Channel** | **SSID** | **SSID**

Use this screen to enable the Wireless LAN, enter the SSID and select the wireless security mode. We recommend that you select **More Secure** to enable WPA3-SAE/WPA2-PSK data encryption.

---

### Wireless

Wireless: ☐ Keep the same settings for 2.4GHz and 5GHz wireless networks

### Wireless Network Setup

SSID:

Wireless: ☒

Channel:  Default: 6, 11, 36, 48, 149

Transmit Power:

Control Password:

### Wireless Network Settings

Wireless Network Name:

Max Clients:

☒ **More Secure**

☒ Multicast Forwarding

Max. Upstream Bandwidth:  None

Max. Downstream Bandwidth:  None

**Notes:**

(1) If you are configuring the Zyxel Device from a computer connected by WiFi and you change the Zyxel Device's SSID, channel or security settings, you will lose your WiFi connection when you press **Apply**. You must change the WiFi settings of your computer to match the new settings on the Zyxel Device.

(2) If upstream/downstream bandwidth is empty, the Zyxel Device sets the value automatically. Setting a maximum upstream/downstream bandwidth will significantly decrease wireless performance.

SSID:  RECOMMENDED

### Security Level

**No Security** **More Secure (Recommended)**

Security Mode:

Protection Management:

☐ Generate password automatically

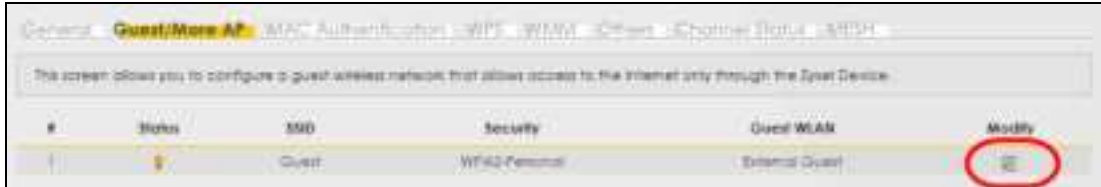
The password must be at least 8 characters long, including 1 uppercase letter, 1 lowercase letter, 1 number and 1 special character.

Password:

Strength:

**Cancel** **Apply**

- 6 Go to the **Network Setting > Wireless > Guest/More AP** screen. Click the **Modify** icon to configure the second WiFi network group. A **Home Guest** can access the Internet, LAN wired devices connected to the Zyxel Device, and other Home Guest WiFi clients. An **External Guest** can just access the Internet through the Zyxel Device.



- 7 On the **Guest/More AP** screen, click the **Modify** icon to configure the other Guest WiFi network group. Configure the screen using the provided parameters and click **OK**.



**More AP Edit**

Use this screen to create Guest and additional wireless networks with different security settings.

**Wireless Network Setup**

Wireless: ☒

**Wireless Network Settings**

Wireless Network Name:

☐ Hide SSID

☒ Guest WLAN

Access Scenario:

Max. Upstream Bandwidth:  Kbps

Max. Downstream Bandwidth:  Kbps

**Note**

If upstream/downstream bandwidth is empty, the Zyvel Device sets the value automatically. Setting a maximum upstream/downstream bandwidth will significantly decrease wireless performance.

SSID:

SSID Subnet: ☐

**Security Level**

No Security More Secure: (Recommended)

**Security Mode**:

**Protected Management Frames**:

☐ Generate password automatically

The password must be at least 8 characters long, including 1 uppercase letter, 1 lowercase letter, 1 number and 1 special character, or 34 hexadecimal digits [0-9, 'A-F']

Password:

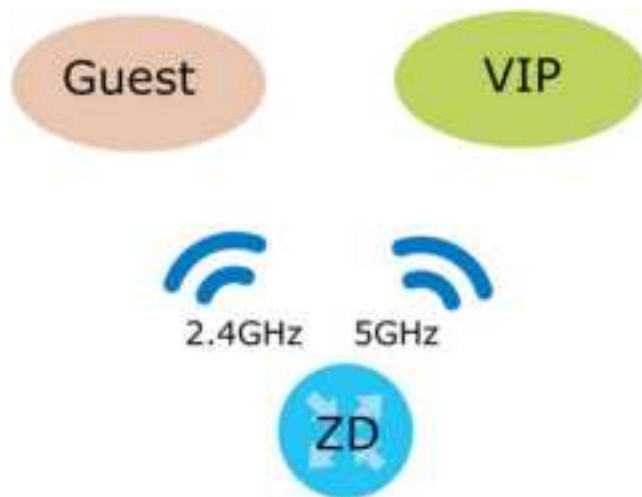
Strength:

- 8 Check the status of **Guest** in the **Guest/More AP** screen. A yellow bulb under **Status** means the SSID is active and ready for WiFi access.



#### 5.4.4 Set Up Two Guest WiFi Networks on Different WiFi Bands

In this example, a company wants to create two Guest WiFi networks: one for the **Guest** group and the other for the **VIP** group as shown in the following figure. Each network will have its SSID and security mode to access the internet.



- The **Guest** group will use the 2.4 GHz band.
- The **VIP** group will use the 5 GHz band.

The Company will use the following parameters to set up the WiFi network groups.

Table 42 WiFi Settings Parameters Example

| BAND           | 2.4 GHZ      | 5 GHZ             |
|----------------|--------------|-------------------|
| SSID           | Guest        | VIP               |
| Security Mode  | WPA2-PSK     | WPA3-SAE/WPA2-PSK |
| Pre-Shared Key | Guest123456! | Zyxel1234@@!      |

- 1 Go to the **Wireless > General** screen and set **Band** to **2.4GHz** to configure 2.4 GHz Guest WiFi settings for **Guest**. Click **Apply**.

Note: You will not be able to configure the 2.4 GHz and 5 GHz Guest WiFi settings separately if **Keep the same settings for 2.4GHz and 5GHz wireless networks** is enabled.

**Wireless**

**General** Guest/More AP MAC Authentication WPS WMM Others Channel Status

Use this screen to enable the Wireless LAN, enter the SSID and select the wireless security mode. We recommend that you select **More Secure** to enable **WPA2-PSK** data encryption.

**Wireless**

Wireless ☐ Keep the same settings for 2.4G and 5G wireless network

**Wireless Network Setup**

Band: 2.4GHz

Wireless: ☒

Channel: Auto Current: 3 / 20 MHz

bandwidth: 20/40MHz

Control Sidelband: Lower

**Wireless Network Settings**

Wireless network Name: Guest

Max Clients: 32

☐ Hide SSID !

☒ Multicast Forwarding

Max, Upstream Bandwidth:  kbps

Max, Downstream Bandwidth:  kbps

- 2 Go to the **Wireless > Guest/More AP** screen and click the **Modify** icon. The following screen appears. Configure the **Security Mode** and **Password** using the provided parameters and click **OK**.

**More AP Edit**

Use this screen to create Guest and additional wireless networks with different security settings.

**Wireless Network Setup**

Wireless: ☒

**Wireless Network Settings**

Wireless Network Name:

☐ Hide SSID

☒ Guest WLAN

Access Mode:

Max. Upstream Bandwidth:

Max. Downstream Bandwidth:

**Note**

If upstream/downstream bandwidth is empty, the Zyvel Device sets the value automatically. Setting a maximum upstream/downstream bandwidth will significantly decrease wireless performance.

SSID:

SSID Subnet: ☐

**Security Level**

No Security More Secure (Recommended)

Security Mode:

Protected Management Frames:

☐ Generate password automatically

The password must be at least 8 characters long, including 1 uppercase letter, 1 lowercase letter, 1 number and 1 special character, or 34 hexadecimal digits [0-9, 'A-F']

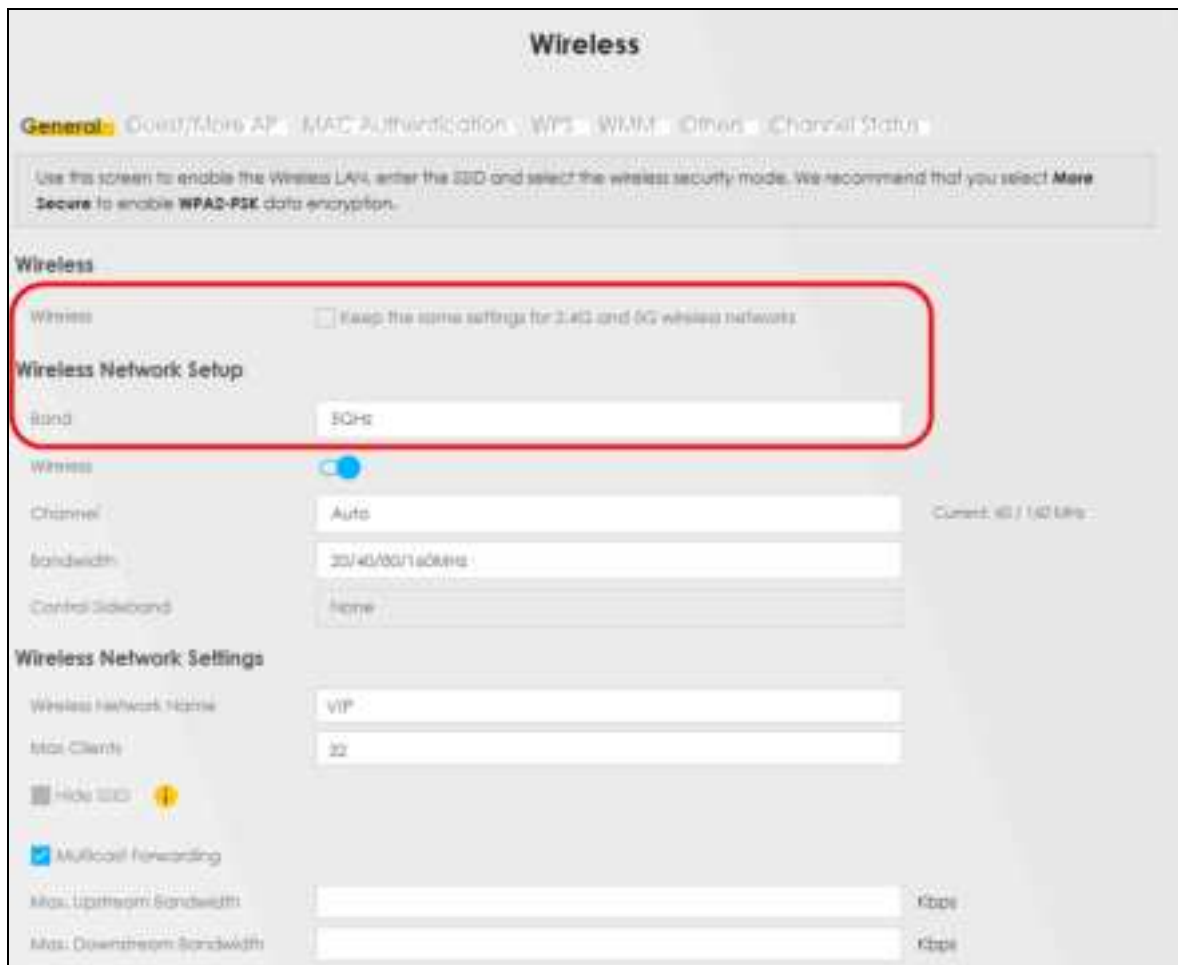
Password:

Strength: strong

The 2.4 GHz **Guest** WiFi network is now configured.



- 3 Go to the **Wireless** > **General** screen and set **Band** to **5GHz** to configure the 5G Guest WiFi settings for **VIP**. Click **OK**.



- 4 Go to the **Wireless** > **Guest/More AP** screen and click the **Modify** icon. The following screen appears. Configure the **Security Mode** and **Password** using the provided parameters and click **OK**.

---

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The 5G **VIP** WiFi network is now configured.

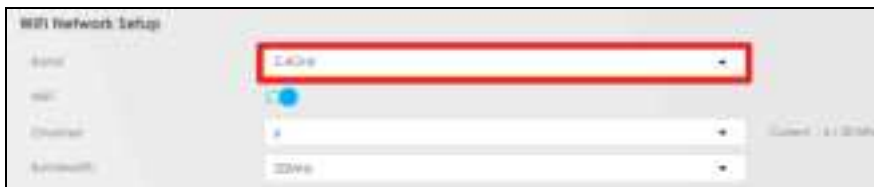


### 5.4.5 Configure the Channel and Bandwidth for Each WiFi Band

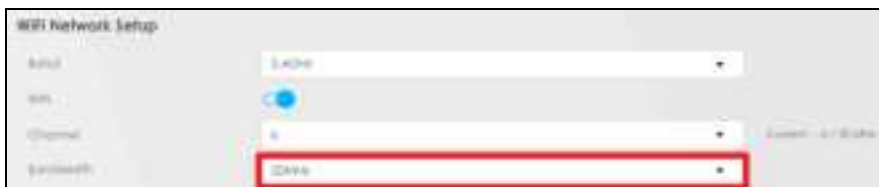
For optimal WiFi network performance, you can change the bandwidth and channel for a specific band to improve the throughput and minimize the interference. You can refer to [Table 43 on page 143](#) for the recommended setup.

In this tutorial, you want to configure the channel to 6 and bandwidth to 20 MHz for 2.4 GHz band.

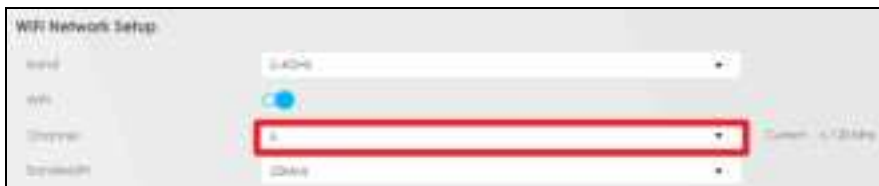
- 1 Go to **Network Setting > Wireless > General**.
- 2 In **Band**, select **2.4GHz** from the drop-down list.



- 3 In **Bandwidth**, select **20MHz** from the drop-down list.



- 4 In **Channel**, select **6** from the drop-down list.



The table below shows the recommended application for each band, along with the suggested channel and bandwidth.

Table 43 Recommended Application for Each Band

| BAND    | BANDWIDTH | CHANNEL  | APPLICATION                                   |
|---------|-----------|----------|-----------------------------------------------|
| 2.4 GHz | 20 MHz    | 1, 6, 11 | Web browsing, email, IoT (Internet of Things) |

Table 43 Recommended Application for Each Band (continued)

| BAND  | BANDWIDTH | CHANNEL                  | APPLICATION                         |
|-------|-----------|--------------------------|-------------------------------------|
| 5 GHz | 40 MHz    | 36, 40, 44, 48           | HD streaming, online meetings       |
|       | 80 MHz    | 36, 40, 44, 48 or 52-128 | 4K/8K streaming, multiplayer gaming |

Note: If you are still unsure about this configuration, you can set the **Channel** to **Auto**, allowing the Zyxel Device to automatically determine the proper channel for the selected band.

## 5.5 USB Applications

This section shows you how to:

- [Set Up File Sharing on Your Zyxel Device](#)
- [Access Your Shared Files From a Computer](#)
- [Configure the Zyxel Device as a Media server](#)

### 5.5.1 File Sharing

This section shows you how to create a shared folder on your Zyxel Device through a USB device and allow others to access the shared folder with File Sharing services.

#### 5.5.1.1 Set Up File Sharing on Your Zyxel Device

- 1 Before enabling file sharing in the Zyxel Device, please set up your shared folders beforehand in your USB device.
- 2 Connect your USB device to the USB port of the Zyxel Device.
- 3 Go to the **Network Setting > USB Service > File Sharing** screen. Enable **File Sharing Services** and click **Apply** to activate the file sharing function. The Zyxel Device automatically adds your USB device to the **Information** table.



### USB Service

**File Sharing** *More Options*

The device can share files from your USB flash drive or disk when you attach it to the USB port. You may start from deciding which folders in the USB disk to share and which users can access the shared folders.

**Information**

| Volume    | Capacity | Used Space |
|-----------|----------|------------|
| USB_DISK1 | 3.5 GB   | 0.0 KB     |

**Server Configuration**

*File Sharing Services* ☒

**Share Directory List**

| Active | Status | Share Name | Share Path | Share Description | Modify |
|--------|--------|------------|------------|-------------------|--------|
|--------|--------|------------|------------|-------------------|--------|

**Account Management**

| Status | User Name |
|--------|-----------|
|        | admin     |

- 4 Click **+ Add New Share** to add a new share.

**USB Service**

**File Sharing** *Access Control*

The device can share files from your USB flash drive or disk when you attach it to the USB port. You may start from deciding which folders in the USB disks to share and which users can access the shared folders.

**Information:**

| Volume     | Capacity | Used Space |
|------------|----------|------------|
| usb1_disk1 | 3.5 GB   | 0.0 KB     |

**Server Configuration**

File Sharing Services ☒

**Share Directory List**

[+ Add New Share](#)

| Active | Status | Share Name | Share Path | Share Description | Modify |
|--------|--------|------------|------------|-------------------|--------|
|--------|--------|------------|------------|-------------------|--------|

**Account Management**

[+ Add New User](#)

| Status | User Name |
|--------|-----------|
|        | admin     |

[Cancel](#) [Apply](#)

5 The **Add New Share** screen appears.

- Select your USB device from the **Volume** drop-down list box.
- Enter a **Description** name for the added share to identify the device.
- Click **Browse** and the **Browse Directory** screen appears.

**Add New Share**

Volume: usb1\_disk1

Share Path: BobShare

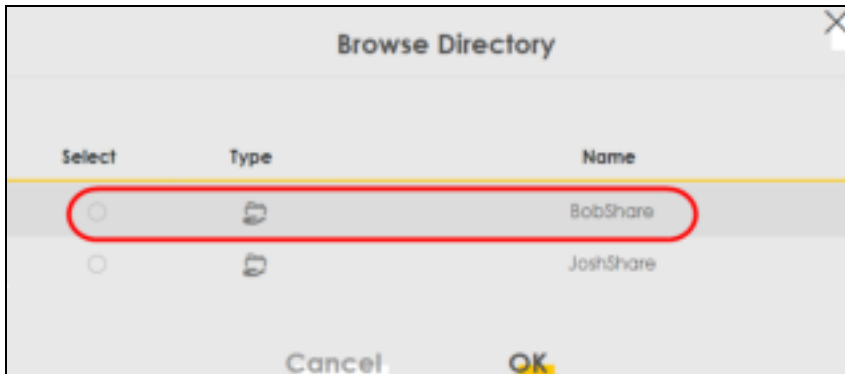
Description: Bob

Access Level: Public

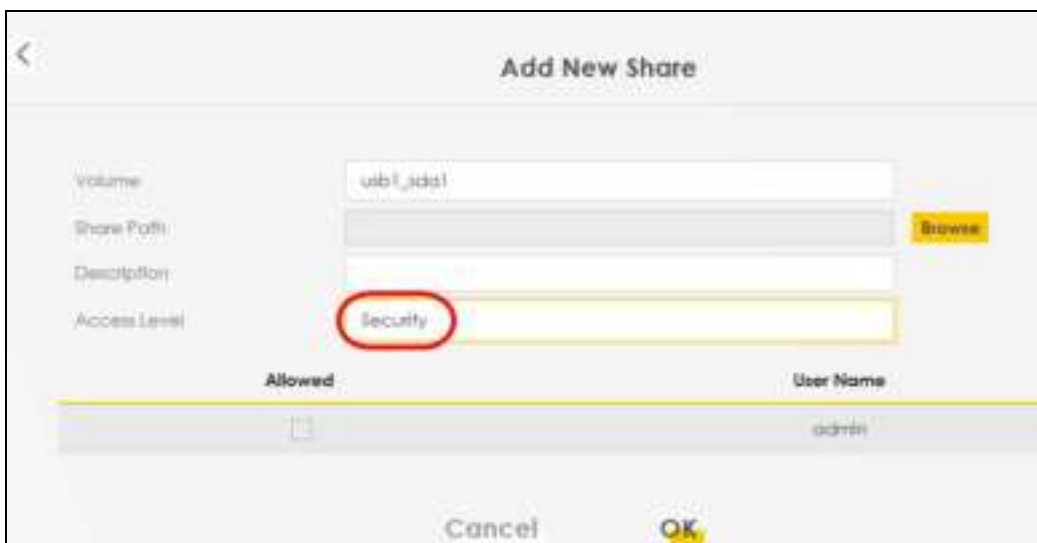
[Browse](#)

[Cancel](#) [OK](#)

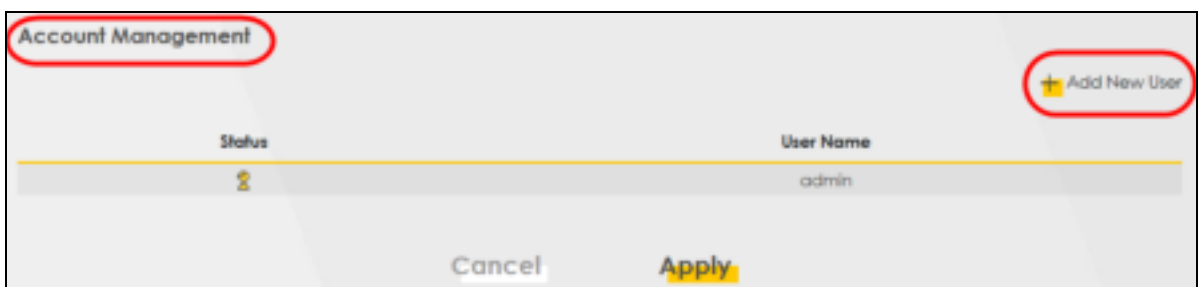
- On the **Browse Directory** screen, select the folder that you want to add as a share. In this example, select **BobShare** and then click **OK**.



- In **Access Level**, select **Public** to let the share to be accessed by all users connected to the Zyxel Device. Otherwise, select **Security** to let the share to be accessed by specific users to access only. Click **OK** to save the settings.



- 6 To set **Access level** to **Security**, you need to create one or more users accounts. Under **Account Management**, click + **Add New User** to open the **User Account** screen.



- 7 After you create a new user account, the screen looks like the following.



- 8 File sharing is now configured. You can see the USB storage device listed in the table below.

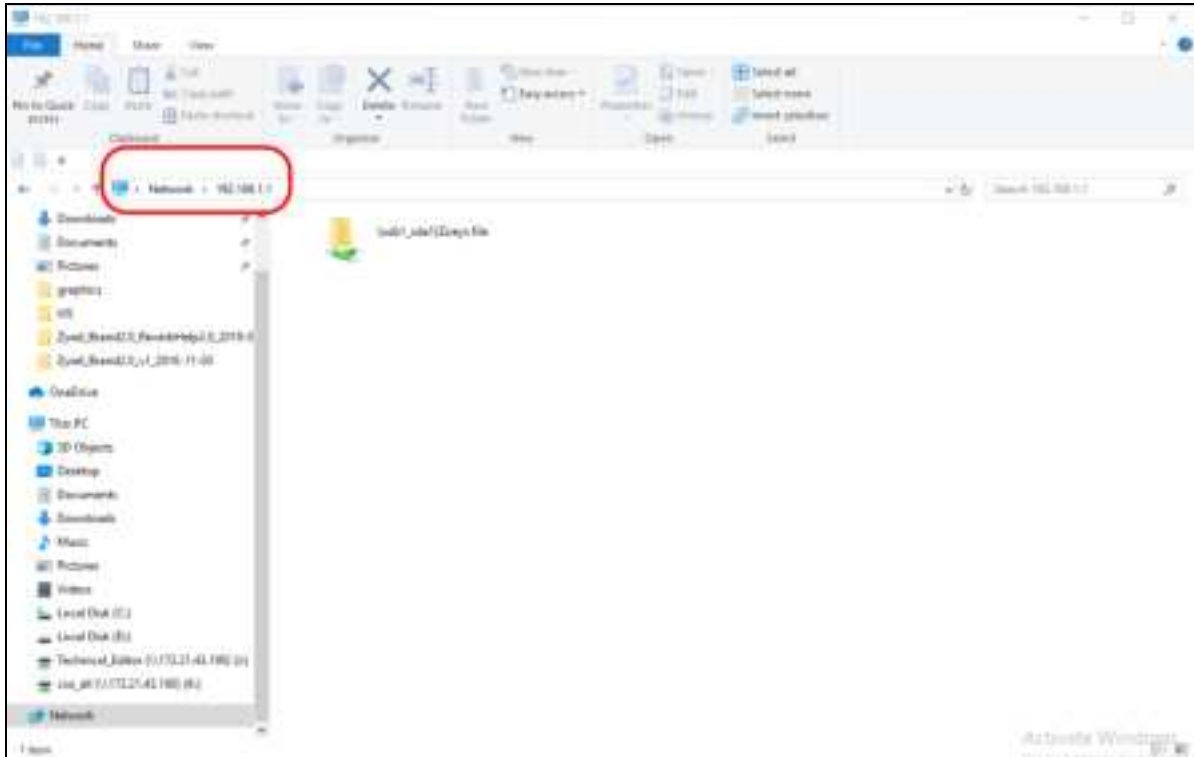
| Active | Status | Share Name | Share Path               | Share Description | Modify |
|--------|--------|------------|--------------------------|-------------------|--------|
|        |        | bobshare   | /mnt/usb1_sda1/bobshare  | Bob               |        |
|        |        | joshshare  | /mnt/usb1_sda1/joshshare | Josh              |        |

#### 5.5.1.2 Access Your Shared Files From a Computer

You can use Windows Explorer to access the USB storage devices connected to the Zyxel Device.

Note: This example shows you how to use Microsoft Windows 10 to browse shared files in a share called (usb1\_sda)Zoey's file. Refer to your operating system's documentation for how to browse your file structure.

- 1 Open Windows Explorer.
- 2 In the Windows Explorer's address bar, enter a double backslash "\\" followed by the IP address of the Zyxel Device (the default IP address of the Zyxel Device is 192.168.1.1)



- 3 Double-click on **(usb1\_sda)Zoey's file**, and then enter the share's username and password if prompted.
- 4 After you access **(usb1\_sda)Zoey's file** through your Zyxel Device, you do not have to log in again unless you restart your computer.

## 5.5.2 Media Server

Use the media server feature to play files on a computer or on your television.

This section shows you how the media server feature works using the following:

- Microsoft (MS) Windows Media Player  
Media Server works with Windows 10. Make sure your computer is able to play media files (music, videos and pictures).
- A digital media adapter  
You need to set up the media adapter to work with your television (TV).

Before you begin, connect the USB storage device containing the media files you want to play to the USB port of your Zyxel Device.

### 5.5.2.1 Configure the Zyxel Device as a Media server

To use your Zyxel Device as a media server, follow the steps below.

- 1 Go to the **Network Setting > USB Service > Media Server** screen.

**USB Service**

☐ **Media Server**

If you would like to play any media contents stored in a USB flash drive or disk through a media client, like PSL, attach the USB flash drive or disk onto this device and enable the Media Server function.

Media Server: ☒

Interface: Default ▼

Media Library Path:

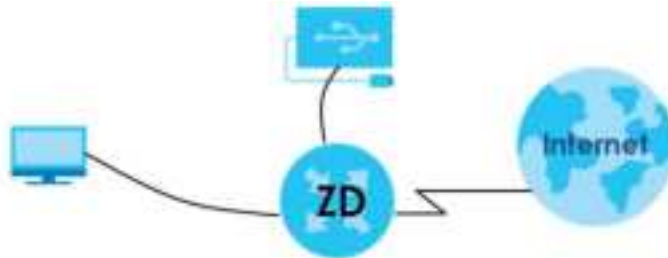
Cancel Apply

- 2 Enable **Media Server**, and then select an interface on which you want to enable the media server function.
- 3 Enter the path clients use to access the media files on a USB storage device connected to the Zyxel Device, and click **Apply**.

This enables DLNA-compliant media clients to play the video, music and image files in your USB storage device.

#### 5.5.2.2 Playing Media Using Windows Media Player on Windows 10

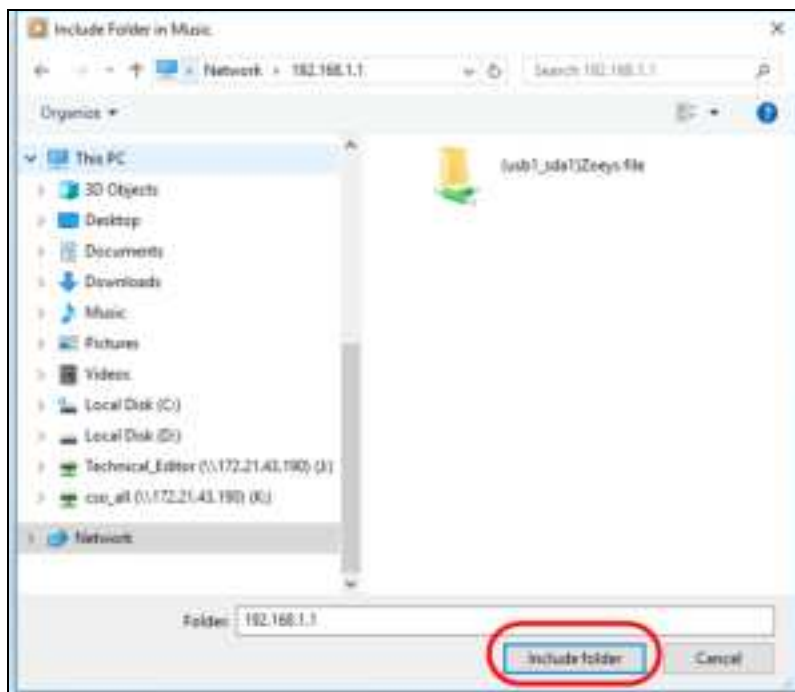
This section shows you how to play the media files on the USB storage device connected to your Zyxel Device using Windows Media Player.



- 1 Open Windows Media Player. It automatically detects the Zyxel Device.



- 2 If you cannot see the Zyxel Device in the left panel as shown above, go to **Organize > Manage Libraries > Music > Add** on the Windows Media Player Home screen. In the Windows Explorer's address bar, enter **\\192.168.1.1**. The following screen appears. Select the folder containing the media you wish to upload to Windows Media Player, and then click **Include Folder**.



- 3 Select the shared folder, and then click **Add** to add it to your Media Library. Click **OK** to save the settings.



- 4 In the right panel, you can browse and play the files available in the USB storage device based on the category (**Music**, **Video**, **Pictures**, **Recorded TV**) you selected.



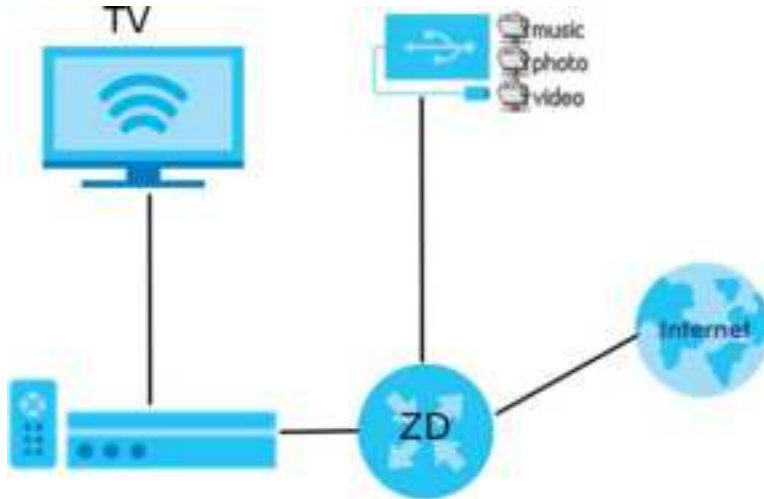


### 5.5.2.3 Using a Digital Media Player

This section shows you how you can use the Zyxel Device with a hardware digital media player to play media files stored in the USB storage device on your TV screen.

Note: For this tutorial, your digital media player is already connected to the TV.

- 1 Connect the digital media player to an available LAN port on your Zyxel Device.



- 2 Turn on the TV and wait for the digital media player **Home** screen to appear. Select the Zyxel Device as your media server.





- 3 The screen shows you the list of available media files in the USB storage device. Select the file you want to open and push the **Play** button on the remote control.



## 5.6 Network Security

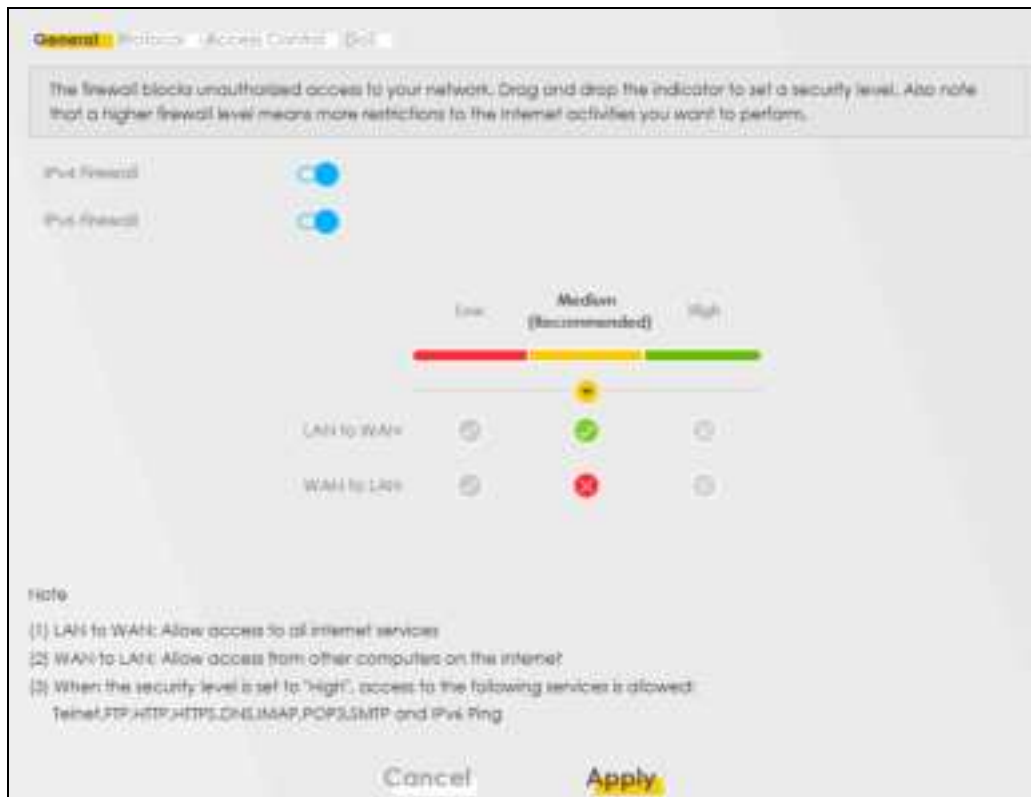
This section shows you how to:

- [Configure a Firewall Rule](#)
- [Set Up Parental Control](#)
- [Configure a MAC Address Filter for Wired LAN Connections](#)

### 5.6.1 Configure a Firewall Rule

You can enable the firewall to protect your LAN computers from malicious attacks from the Internet.

- 1 Go to the **Security > Firewall > General** screen.
- 2 Select **IPv4 Firewall/IPv6 Firewall** to enable the firewall, and then click **Apply**.



- 3 Open the **Access Control** screen, click **+ Add New ACLRule** to create a rule.

## Firewall

General Protocol **Access Control** Tools

An Access Control List (ACL) rule is a manually-defined rule that can accept, reject, or drop incoming or outgoing packets from your network based on the type of service. For example, you could block users using Instant Messaging in your network. This screen displays a list of the configured incoming or outgoing filtering rules. Note the order in which the rules are listed.

The ordering of your rules is very important as rules are applied in turn.

Rules Storage Space Usage 0%

[+ Add New ACL Rule](#)

| # | Name | Src IP | Dest IP | Service | Action | Modify |
|---|------|--------|---------|---------|--------|--------|
|---|------|--------|---------|---------|--------|--------|

- 4 Use the following fields to configure and apply a new ACL (Access Control List) rule.

### Add New ACL Rule

Filter Name:

Order:

Select Source IP Address:

Source IP Address:  (specify length)

Select Destination Device:

Destination IP Address:  (specify length)

IP Type:

Select Service:

Protocol:

Custom Source Port:   -

Custom Destination Port:   -

Policy:

Direction:

Enable Rate Limit: ☒

packets per  (1-8192)

Scheduler Rules:  [Add New Rule](#)

[Cancel](#) [OK](#)

- **Filter Name:** Enter a name to identify the firewall rule. **Source IP Address:** Enter the IP address of the computer that initializes traffic for the application or service.
- **Destination IP Address:** Enter the IP address of the computer to which traffic for the application or service is entering.
- **Protocol:** Select the protocol (**ALL**, **TCP/UDP**, **TCP**, **UDP**, **ICMP** or **ICMPv6**) used to transport the packets.
- **Policy:** Select whether to (**ACCEPT**, **DROP**, or **REJECT**) the packets.
- **Direction:** Select the direction (**WAN to LAN**, **LAN to WAN**, **WAN to ROUTER**, or **LAN to ROUTER**) of the traffic to which this rule applies.

5 Select **Enable Rate Limit** to activate the rules you created. Click **OK**.

## 5.6.2 Set Up Parental Control

This section shows you how to configure rules for accessing the Internet using parental control.

Note: The style and features of your parental control vary depending on the Zyxel Device you are using.

### 5.6.2.1 Configure Parental Control Schedule and Filter

Parental Control Profile (**PCP**) allows you to set up a rule for:

- Internet usage scheduling.
- Websites and URL keyword blocking.

Use this feature to:

- Limit the days and times a user can access the Internet.
- Limit the websites a user can access on the Internet.

This example shows you how to block a user from accessing the Internet during time for studying. It also shows you how to stop a user from accessing specific websites.

Use the parameters below to configure a schedule rule and a URL keyword blocking rule.

| PRO FILE NAME | INTERNET ACCESS SCHEDULE                                                               | NETWORK SERVICE                                                                                                                       | SITE/ URL KEYWORD                                                                            |
|---------------|----------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|
| Study         | <b>Day:</b><br>Monday to Friday<br><br><b>Time:</b><br>8:00 to 11:00<br>13:00 to 17:00 | <b>Network Service Setting:</b><br>Block<br><br><b>Service Name:</b><br>HTTP<br><br><b>Protocol:</b><br>TCP<br><br><b>Port:</b><br>80 | <b>Block or Allow the Web Site:</b><br>Block the web URLs<br><br><b>Website:</b><br>gambling |

## Parental Control Screen

Open the **Parental Control** screen. Select **Enable** under **General** to enable parental control. Then click **+ Add New PCP** to add a rule.

**Parental Control**

Parental control allows you to limit the time a user can access the Internet and prevent users from viewing inappropriate content or participating in specified online activities.

Use this screen to enable parental control and view parental control rules and schedules. You can limit the time a user can access the Internet and prevent users from viewing inappropriate content or participating in specified online activities. These rules are defined in a Parental Control Profile (PCP).

**General**

Parental Control ☒ Enable ☐ Disable (Settings are invalid when disabled)

Parental Control Profile(PCP)

**+ Add New PCP**

| #                          | Status | PCP Name | Home Network User | Internet Access Schedule | Network Service | Website Blocked | Modify |
|----------------------------|--------|----------|-------------------|--------------------------|-----------------|-----------------|--------|
| <p>Cancel <b>Apply</b></p> |        |          |                   |                          |                 |                 |        |

## Add New PCP Screen

- Go to **Parental Control > Add New PCP**. Under **General**:
  - Select **Enable** to enable the rule you are configuring.
  - Enter the **Parental Control Profile Name** given in the above parameter.
  - Select an user this rule applies to in **Home Network User**, then click **Add**. You will see the MAC address of the user you just select in **Rule List**.

**General**

Active ☒ Enable ☐ Disable (Settings are invalid when disabled)

Parental Control Profile Name

Home Network User  **Add**

**Rule List**

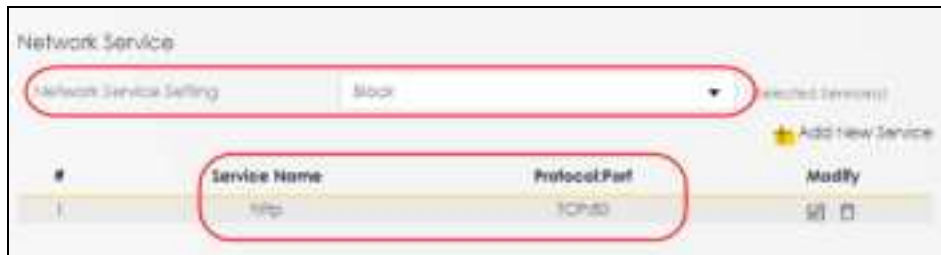
| User MAC Address  | Delete |
|-------------------|--------|
| DC-4A-3E-40-6C-67 |        |

- Under **Internet Access Schedule**:
  - Click **+ Add New Time** to add a second schedule.
  - Use the parameter given above to configure the time settings of your schedule.



**3 Under Network Service:**

- In **Network Service Setting**, select **Block**.
- Click **+ Add New Service**, then use the parameter given above to configure settings for the Internet service you are blocking.



**4 Under Site / URL Keyword:**

- Select **Block the web URLs** in **Block or Allow the Web Site**.
- Click **Add**, then use the parameter given above to configure settings for the URL keyword you are blocking.
- Select **Redirect blocked site to Zyxel Family Safety page** to redirect the web browser to the Zyxel Family Safety page if he or she tries to access a website with the blocked URL keyword.



**5 Click OK to save your settings.**

### 5.6.2.2 Configuring a Parental Control Schedule

Parental Control Profile allows you to set up a schedule rule for Internet usage. Use this feature to limit the days and times a user can access the Internet.

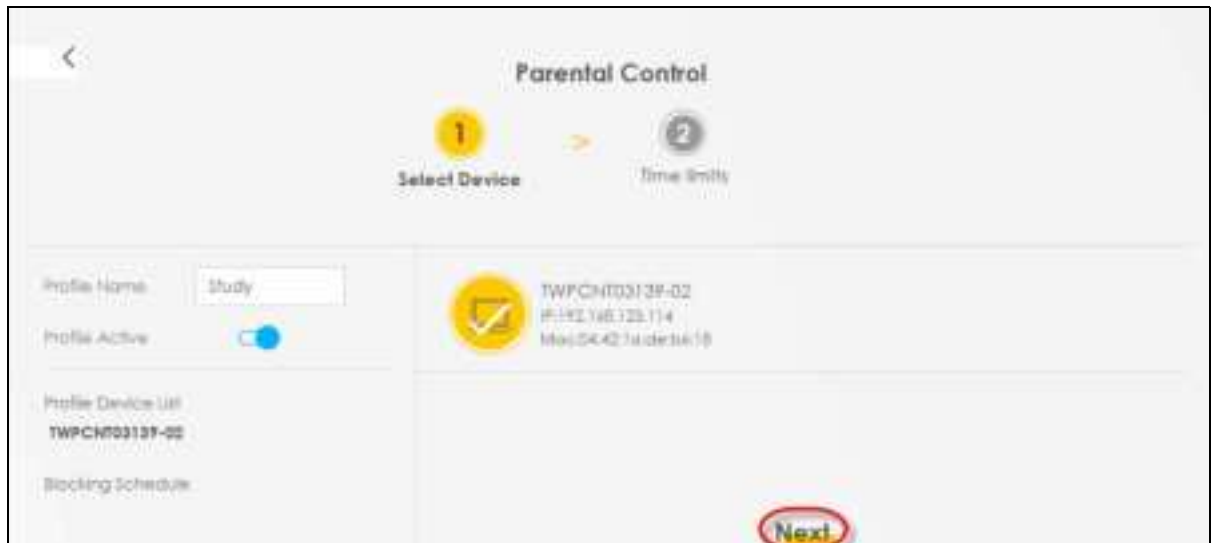
This example shows you how to block an user from accessing the Internet during time for studying. Use the parameter below to configure a schedule rule.

| PRO FILE NAME | STARTBLO C KING | END BLO C KING | REPEATON              |
|---------------|-----------------|----------------|-----------------------|
| Study         | 8:00 am         | 11:00 am       | from Monday to Friday |
|               | 1:00 pm         | 5:00 pm        | from Monday to Friday |

- 1 Click **Add more Profile** to open the **Parental Control** screen.



- 2 Use this screen to add a Parental Control rule.
  - Enter the **Profile Name** given in the above parameter.
  - Click on the switch to enable **Profile Active**.
  - Select a device, and then click **Next** to proceed.



- 3 Use this screen to edit the Parental Control schedule.
  - Click **Add New Schedule** to add a second schedule.
  - Use the parameter given above to configure the time settings of your schedules.
  - Click **Save** to save the settings.



**Parental Control**

1 Select Device > 2 Time limits

Profile Name: Study

Profile Active: ☒

Profile Device List: TW9CH003131-00

Blocking Schedule:

Mon, Tue, Wed, Thu, Fri  
From 13:00 to 17:00

Mon, Tue, Wed, Thu, Fri  
From 08:00 to 11:00

**Schedule** Add New Schedule

Start blocking: From 13:00 To 17:00 (3 hours)

End blocking: To 17:00 (3 hours)

Repeat On: Mon, Tue, Wed, Thu, Fri, Sat, Sun

Start blocking: From 08:00 To 11:00 (3 hours)

End blocking: To 11:00 (3 hours)

Repeat On: Mon, Tue, Wed, Thu, Fri, Sat, Sun

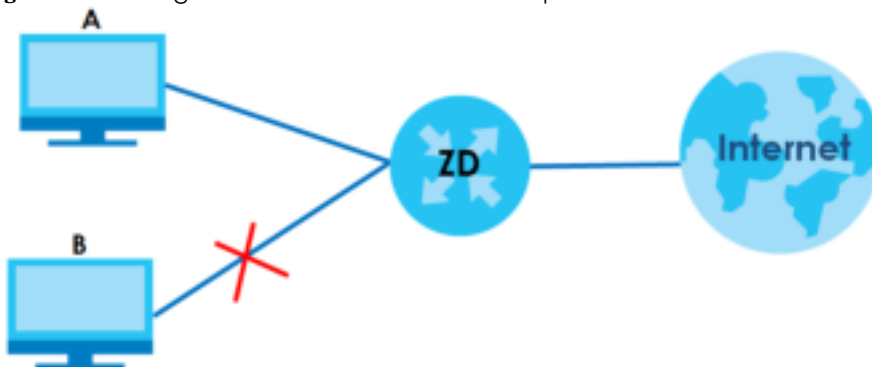
Back Save

### 5.6.3 Configure a MAC Address Filter for Wired LAN Connections

You can use a MAC address filter to exclusively allow or permanently block someone from the wired LAN network.

This example shows that computer B is not allowed access to the wired LAN network.

**Figure 89** Configure a MAC Address Filter Example



- 1 Go to the **Security > MAC Filter > MAC Filter** screen. Under **MAC Address Filter**, select **Enable**.

**MAC Filter**

You can configure the Zynol Device to permit access to clients based on their MAC addresses in the **MAC Filter** screen. This applies to wired and wireless connections. Every Ethernet device has a unique MAC (Media Access Control) address. The MAC address is assigned at the factory and consists of six pairs of hexadecimal characters, for example: 00:A0:C5:00:00:02. You need to know the MAC addresses of the LAN client to configure this screen.

MAC Address Filter ☒ Enable ☐ Disable (Settings are invalid when disabled)

MAC Restrict Mode ☒ Allow ☐ Deny

[Add New Rule](#)

| Set | Active | Host Name | MAC Address | Delete |
|-----|--------|-----------|-------------|--------|
|     |        |           |             |        |

Note  
Enable **MAC Address Filter** and add the host name and MAC address of a LAN client to the table if you wish to allow or deny them access to your network.

[Cancel](#) [Apply](#)

- Click **Add New Rule** to add a new entry. Select **Active**, and then enter the **Host Name** and **MAC Address** of computer B. Click **Apply**.

MAC Address Filter ☒ Enable ☐ Disable (Settings are invalid when disabled)

MAC Restrict Mode ☐ Allow ☒ Deny

[Add New Rule](#)

| Set | Active                              | Host Name | MAC Address                 | Delete |
|-----|-------------------------------------|-----------|-----------------------------|--------|
| 1   | <input checked="" type="checkbox"/> | B         | 00 - 24 - 21 - AB - 1F - 00 |        |

[Cancel](#) [Apply](#)

## 5.7 Internet Calls

This section shows you how to:

- [Add a SIP Service Provider](#)
- [Add a SIP Account](#)
- [Configure a Phone](#)
- [Make a VoIP Call](#)

### 5.7.1 Configure VoIP

To make voice calls over the Internet, you must set up a Session Initiation Protocol (SIP) provider and SIP account on the Zyxel Device. You should have an account with a SIP service provider already set up.

### 5.7.2 Add a SIP Service Provider

Follow the steps below to add a SIP service provider.

- 1 Make sure your Zyxel Device is connected to the Internet.
- 2 Open the Web Configurator.
- 3 Go to the **VoIP > SIP > SIP Service Provider** screen. Click the **Add New Provider** button to add the SIP Service Provider.



- 4 On the **Add New Provider** screen, select **Enable SIP Service Provider**.
- 5 Enter the **SIP Service Provider Name** of up to 64 printable characters except [ " ], [ ` ], [ ' ], [ < ], [ > ], [ ^ ], [ \$ ], [ | ], [ & ], or [ ; ].
- 6 Enter **SIP Proxy Server Address**, **SIP REGISTRAR Server Address**, and **SIP Service Domain** provided by your SIP service provider. Click **OK** to save your settings.

The screenshot shows a web interface titled "Add New Provider". Below the title is a section "SIP Service Provider Selection" with a sub-header "Service Provider Selection" and a button "ADD\_NEW". Underneath is a "General" section with the following fields:

- SIP Service Provider:** A checkbox labeled "Enable SIP Service Provider" is checked.
- SIP Service Provider Name:** A text input field containing "Verizon".
- SIP Local Port:** A text input field containing "5060", with a hint "(1025-65535)" to its right.
- SIP Proxy Server Address:** A text input field containing "sip.infostada.it".
- SIP Proxy Server Port:** A text input field containing "5060", with a hint "(1025-65535)" to its right.
- SIP REGISTRAR Server Address:** A text input field containing "sip.infostada.it".
- SIP REGISTRAR Server Port:** A text input field containing "5060", with a hint "(1025-65535)" to its right.
- SIP Service Domain:** A text input field containing "sip.infostada.it".

At the bottom of the form are two buttons: "Cancel" and "OK".

### 5.7.3 Add a SIP Account

The SIP account must be associated with the SIP service provider configured above. You may configure several SIP accounts for the same service provider. Follow the steps below to set up your SIP account:

- 1 Make sure your Zyxel Device is connected to the Internet.
- 2 Open the Web Configurator.
- 3 Go to the **VoIP > SIP > SIP Account** screen.
- 4 Click the **Add New Account** button on the **SIP Account** screen to add a SIP account and map it to a phone port.

**SIP Account** SIP Service Provider

You can make calls over the Internet using VoIP technology. For this, you first need to set up a SIP account with a SIP service provider.

The Zyxel Device uses a SIP account to make outgoing VoIP calls and check if an incoming call's destination number matches your SIP account's VoIP number. In order to make or receive a VoIP call, you need to enable and configure a SIP account and map it to a phone port. The SIP account contains information that allows your Zyxel Device to connect to your VoIP service provider.

[+ Add New Account](#)

| # | Enable   | SIP Account | Service Provider | Account Number | Modify |
|---|----------|-------------|------------------|----------------|--------|
| 1 | Enabled  | SP1         | Verizon          | Account1       |        |
| 2 | Enabled  | SP2         | Verizon          | Account2       |        |
| 3 | Disabled | SP3         | Verizon          | Account3       |        |

- 5 Under **General**, select **Enable SIP Account**, and then enter the **SIP Account Number**.
- 6 Under **Authentication**, enter **Username** and **Password**. Leave the other settings as default. Click **OK** to save your settings.

**SIP Account Entry Edit**

**SIP Account Selection**

SIP Account Selection: SIP1

**SIP Service Provider Association**

SIP Account Associated with: Verizon

**General**

☒ Enable SIP Account

SIP Account Number: Account1

**Authentication**

Username: User1

Password: \*\*\*\*\*

**URL Type**

URL Type: SIP

### 5.7.4 Configure a Phone

You must now configure the phone port to use the SIP account you just configured.

- 1 Go to the **VoIP > Phone > Phone Device** screen.
- 2 Click the **Modify** icon of **PHONE1** to configure PHONE1 on your Zyxel Device. The following screen appears.



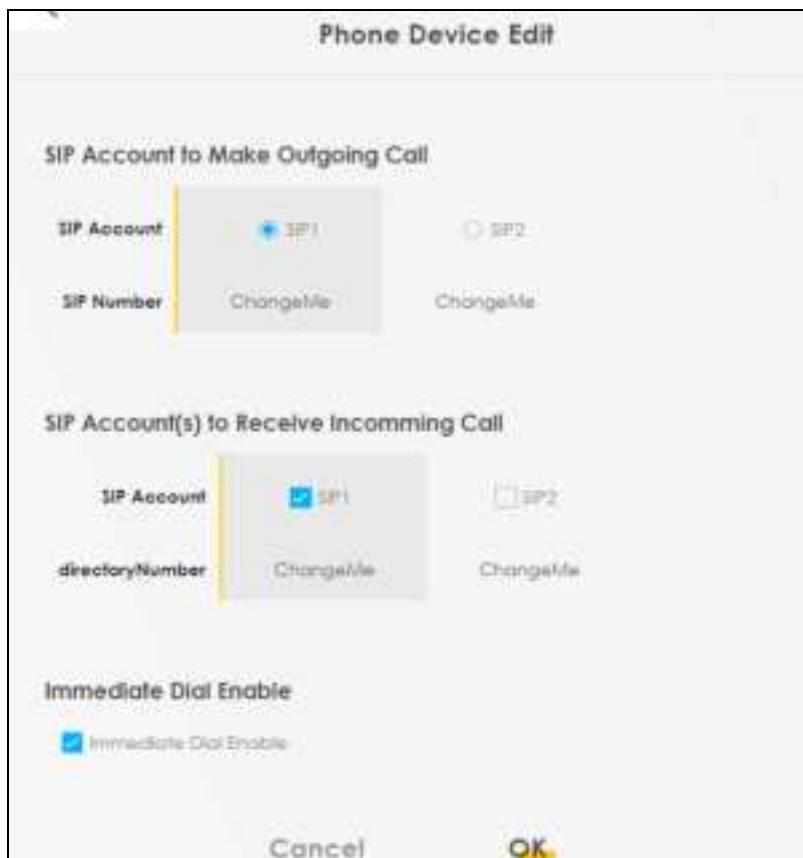
Phone Device Region

Use this screen to view detailed information on phones used for Internet phone calls (SIP). You can define which phone(s) will ring when a specific SIP address receives an incoming call, and which SIP address will be used when an outgoing call is made with a specific phone.

Analog Phone

| # | Phone ID | Internal Number | Incoming SIP Number | Outgoing SIP Number | Modify |
|---|----------|-----------------|---------------------|---------------------|--------|
| 1 | PHONE1   | **11            | Account1            | Account1            |        |
| 2 | PHONE2   | **12            | Account2            | Account2            |        |

- 3 Under **SIP1 SIP Account to Make Outgoing Call**, select **SIP1** to have the phone connected to the first phone port use the registered SIP1 account to make outgoing calls.
- 4 Under **SIP Account(s) to Receive Incoming Call**, select **SIP1** to have the phone connected to the first phone port receive phone calls for the SIP1 account. Click **OK** to save your changes.



Phone Device Edit

SIP Account to Make Outgoing Call

SIP Account: ☒ SIP1 ☐ SIP2

SIP Number:

SIP Account(s) to Receive Incoming Call

SIP Account: ☒ SIP1 ☐ SIP2

directoryNumber:

Immediate Dial Enable

☒ Immediate Dial Enable

Cancel **OK**

### 5.7.5 Make a VoIP Call

Follow these steps to make a phone call using Voice over IP (VoIP).

- 1 Make sure you connect a telephone to phone port 1 on the Zyxel Device.
- 2 Make sure the Zyxel Device is turned on and connected to the Internet.
- 3 Pick up the phone receiver.
- 4 Dial the VoIP phone number you want to call.

## 5.8 Device Maintenance

This section shows you how to:

- [Upgrade the Firmware](#)
- [Back up the Device Configuration](#)
- [How to Reset the Zyxel Device to the Factory Defaults](#)

You can upgrade the Zyxel Device firmware, back up the configuration and restore the Zyxel Device to its previous or default settings.

### 5.8.1 Upgrade the Firmware

Upload the latest firmware to the Zyxel Device for feature enhancements.

- 1 To download the latest firmware of your Zyxel Device, go to <https://www.zyxel.com/service-provider> and search for your model. The latest firmware will be available under the **Downloads & resources** tab. The model code for the Zyxel Device in this example is v5.13(ABLZ.1). Note the model code for your Zyxel Device.
- 2 Unzip the file.
- 3 Go to the **Maintenance > Firmware Upgrade** screen.
- 4 Click **Browse/Choose File** and select the file with a ".bin" extension to upload. Click **Upload**.

**Firmware Upgrade**

This screen lets you upload new firmware to your Zyxel Device.

Download the latest firmware file from the Zyxel website and upload it to your Zyxel Device using this screen. The upload process uses HTTP (Hypertext Transfer Protocol) and may take up to two minutes. After a successful upload, the Zyxel Device will reboot.

**Restore Partial Default Settings After Firmware Upgrade**  
 Reset All Settings Except Mesh After Firmware Upgrade resets all your configurations, except for Mesh WiFi settings, to the factory defaults after firmware upgrade.

**Upgrade Firmware**

Reset All Settings After Firmware Upgrade ☐

Reset All Settings Except Mesh After Firmware Upgrade ☐

Current Firmware Version: v5.18(4CH1.01B2)

File Path:  No file chosen

**Upgrade WWAN Package**

Current WWAN Package Version: 1.24

File Path:  No file chosen

- 5 This process may take up to 2 minutes to finish. After 2 minutes, log in again and check your new firmware version in the **Connection Status** screen.

## 5.8.2 Back up the Device Configuration

Back up a configuration file allows you to return to your previous settings.

- 1 Go to the **Maintenance > Backup/Restore** screen.
- 2 Under **Backup Configuration**, click **Backup**. A configuration file is saved to your computer. In this case, the **Backup/Restore** file is saved.



**Backup/Restore**

Information related to factory default settings and backup configuration are shown in this screen. You can also use this to restore previous device configurations.

Backup Configuration allows you to back up (save) the Zyxel Device's current configuration to a file on your computer. Once your Zyxel Device is configured and functioning properly, it is highly recommended that you back up your configuration file before making configuration changes.

Restore Configuration allows you to upload a new or previously saved configuration file from your computer to your Zyxel Device.

**Backup Configuration**

Click Backup to save the current configuration of your system to your computer.

**Backup**

**Restore Configuration**

To restore a previously saved configuration file to your system, browse to the location of the configuration file and click Upload.

File Path:

**Back to Factory Default Settings**

Click Reset to clear all user-entered configuration information and return to factory default settings. After resetting, the

- Password is printed on a label on the bottom of the device, written after the text "Password".
- LAN IP address will be 192.168.1.1

Do you want to save Backup\_Restore (3.25 KB) from 192.168.1.1?

### 5.8.3 Restore the Device Configuration

This section shows you how to restore a previously-saved configuration file from your computer to your Zyxel Device.

- 1 Go to the **Maintenance > Backup/Restore** screen.
- 2 Under **Restore Configuration**, click **Browse/Choose File**, and then select the configuration file that you want to upload. Click **Upload**.

**Backup/Restore**

Information related to factory default settings and backup configuration are shown in this screen. You can also use this to restore previous device configurations.

Backup Configuration allows you to back up (save) the Zyxel Device's current configuration to a file on your computer. Once your Zyxel Device is configured and functioning properly, it is highly recommended that you back up your configuration file before making configuration changes.

Restore Configuration allows you to upload a new or previously saved configuration file from your computer to your Zyxel Device.

**Backup Configuration**

Click Backup to save the current configuration of your system to your computer.

**Backup**

**Restore Configuration**

To restore a previously saved configuration file to your system, browse to the location of the configuration file and click Upload.

File Path: C:\Users\N003\3W\Desktop **Browse...** **Upload**

**Back to Factory Default Settings**

Click Reset to clear all user-entered configuration information and return to factory default settings. After resetting, the

- Password is printed on a label on the bottom of the device, written after the text "Password".
- LAN IP address will be 192.168.1.1
- DHCP will be reset to default setting

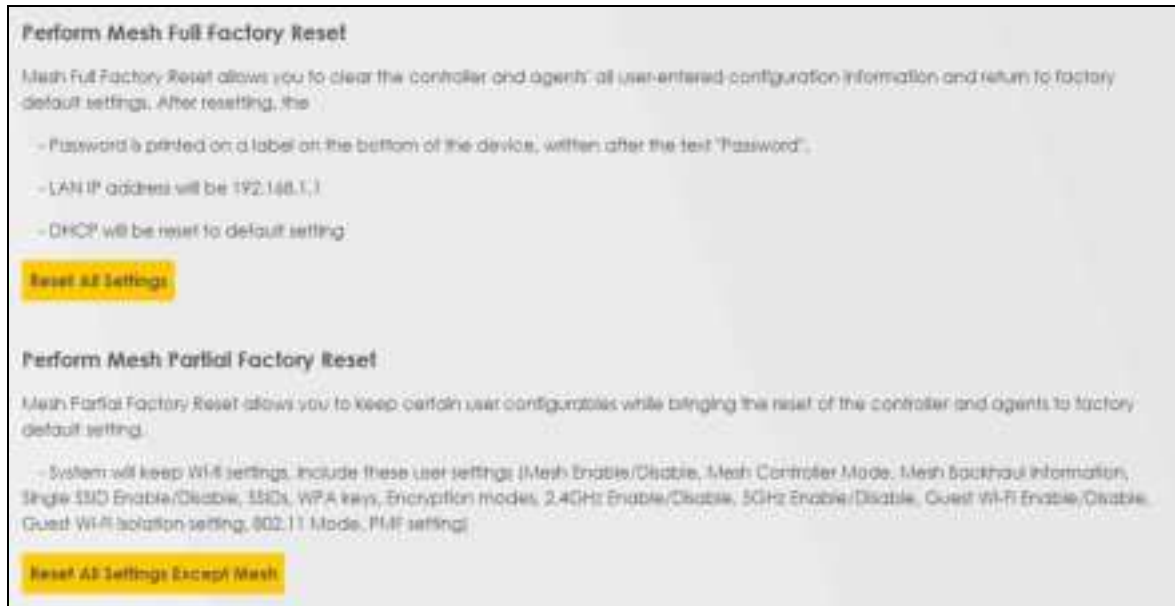
**Reset**

- 3 The Zyxel Device automatically restarts after the configuration file is successfully uploaded. Wait for one minute before logging into the Zyxel Device again. Go to the **Connection Status** page to check the firmware version after the reboot.

#### 5.8.4 How to Reset the Zyxel Device to the Factory Defaults

To reset the Zyxel Device, you can press the **RESET** button on the rear panel for more than 5 seconds. Alternatively, you can use the web configurator to reset the Zyxel Device.

Go to **Maintenance > Backup/Restore** and click the **Reset All Settings** button. The Zyxel Device will reset to factory defaults and the LAN IP address will be set to the default IP address.



If you want to reset the Zyxel Device while keeping the Mesh WiFi Settings, click the **Reset All Settings Except Mesh** button. See [Chapter 41 on page 483](#) for more details.

## 5.9 Remote Access from WAN

This section shows you how to:

- [Configure Access to Your Zyxel Device](#)
- [Configure the Trust Domain](#)

You can configure WAN access for a specific trusted computer through HTTPS, SSH to the Zyxel Device. Remote management determines which interface and web services are allowed to access the Zyxel Device.

### 5.9.1 Configure Access to Your Zyxel Device

Perform the following to configure access to your Zyxel Device:

- 1 Go to the **Maintenance > Remote Management > MGMTServices** screen. Select the WAN interface and services allowed to access the Zyxel Device remotely.

**Remote Management**

**MGMT Services** [Trust Domain](#)

Use this screen to configure the interfaces through which services can access the Zyxel Device. You can also specify service port numbers. Computers must use to connect to the Zyxel Device.

**Service Control**

WAN Interface used for services: ☒ Any\_WAN ☐ MAB\_WAN

☐ EDR\_WAN

| Service | LAN                             | WLAN                            | WAN                             | Trust Domain                    | Port |
|---------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|------|
| HTTPS   | <input type="checkbox"/> Enable | <input type="checkbox"/> Enable | <input type="checkbox"/> Enable | <input type="checkbox"/> Enable | 443  |
| FTP     | <input type="checkbox"/> Enable | <input type="checkbox"/> Enable | <input type="checkbox"/> Enable | <input type="checkbox"/> Enable | 21   |
| TELNET  | <input type="checkbox"/> Enable | <input type="checkbox"/> Enable | <input type="checkbox"/> Enable | <input type="checkbox"/> Enable | 23   |
| SSH     | <input type="checkbox"/> Enable | <input type="checkbox"/> Enable | <input type="checkbox"/> Enable | <input type="checkbox"/> Enable | 22   |
| SNMP    | <input type="checkbox"/> Enable | <input type="checkbox"/> Enable | <input type="checkbox"/> Enable | <input type="checkbox"/> Enable | 161  |
| Ping    | <input type="checkbox"/> Enable | <input type="checkbox"/> Enable | <input type="checkbox"/> Enable | <input type="checkbox"/> Enable |      |

[Cancel](#) [Apply](#)

These are the different ways to access the Zyxel Device remotely.

| ACCESS TYPE       | LABEL        | DESCRIPTION                                                                                                                          |
|-------------------|--------------|--------------------------------------------------------------------------------------------------------------------------------------|
| LAN / WLAN (WiFi) | LAN / WLAN   | This allows access of the selected <b>Service</b> from the local LAN.                                                                |
| WAN               | WAN          | This allows access of the selected <b>Service</b> from the WAN connections.                                                          |
| Trust Domain      | Trust Domain | This allows access of the selected <b>Service</b> only from the trusted IPv4 / IPv6 addresses configured under <b>Trust Domain</b> . |

- 2 Select how you want to access the Zyxel Device remotely.
- 3 You may change the server **Port** number for a service if needed, however you must use the same port number in order to use that service for remote management.

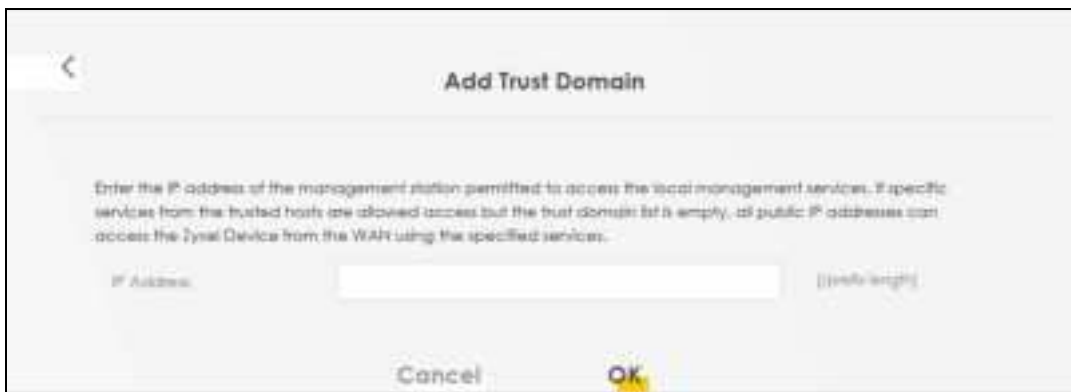
## 5.9.2 Configure the Trust Domain

Perform the following to configure the Trust Domain on your Zyxel Device:

- 1 Go to the **Maintenance > Remote Management > Trust Domain** screen. Click + **Add Trust Domain** to go to the **Add Trust Domain** screen to add a trusted host IPv4 / IPv6 address.



- 2 Enter a public IPv4 / IPv6 IP address which is allowed to access the service on the Zyxel Device from the WAN. Then click **OK**.



## 5.10 System Log

This section shows you how to:

- [View System Log](#)
- [Send the System Log through E-mail](#)

### 5.10.1 View System Log

To view the system log of the Zyxel Device, go to **System Monitor > Log > System Log**.

Select the **Level** to filter the log by severity. Select the **Category** to filter the log by different features. If you want to download the log file on your local computer, click **Export Log** to download the Zyxel Device's system log to your local computer.

| # | Time            | Facility | Level   | Category | Messages                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|---|-----------------|----------|---------|----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | Feb 17 08:34:40 | daemon   | debug   | dhcpd    | dhcpd: dhcpd: send dhcp message to 192.168.1.100 and 192.168.1.1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| 2 | Feb 17 08:34:40 | daemon   | debug   | dhcpd    | dhcpd: dhcpd: send dhcp message to 192.168.1.100 and 192.168.1.1<br>dhcpd: dhcpd: send to send to 192.168.1.100 and 192.168.1.1<br>dhcpd: dhcpd: send to send to 192.168.1.100 and 192.168.1.1<br>dhcpd: dhcpd: send to send to 192.168.1.100 and 192.168.1.1<br>dhcpd: dhcpd: send to send to 192.168.1.100 and 192.168.1.1<br>dhcpd: dhcpd: send to send to 192.168.1.100 and 192.168.1.1<br>dhcpd: dhcpd: send to send to 192.168.1.100 and 192.168.1.1<br>dhcpd: dhcpd: send to send to 192.168.1.100 and 192.168.1.1                                    |
| 3 | Feb 17 08:34:40 | daemon   | info    | dhcpd    | dhcpd: dhcpd: send dhcp message to 192.168.1.100 and 192.168.1.1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| 4 | Feb 17 08:34:40 | daemon   | warning | dhcpd    | dhcpd: dhcpd: send dhcp message to 192.168.1.100 and 192.168.1.1<br>dhcpd: dhcpd: send dhcp message to 192.168.1.100 and 192.168.1.1<br>dhcpd: dhcpd: send dhcp message to 192.168.1.100 and 192.168.1.1<br>dhcpd: dhcpd: send dhcp message to 192.168.1.100 and 192.168.1.1<br>dhcpd: dhcpd: send dhcp message to 192.168.1.100 and 192.168.1.1<br>dhcpd: dhcpd: send dhcp message to 192.168.1.100 and 192.168.1.1<br>dhcpd: dhcpd: send dhcp message to 192.168.1.100 and 192.168.1.1<br>dhcpd: dhcpd: send dhcp message to 192.168.1.100 and 192.168.1.1 |

### 5.10.2 Send the System Log through E-mail

You can also use the Web Configurator to send the system log of the Zyxel Device to the specific email addresses. Please follow the steps below:

- 1 Go to **Maintenance > E-mail Notifications** and click **Add New e-mail** to create an account to receive the log.

**E-mail Notification**

A mail server is an application or a computer that can receive, forward and deliver e-mail messages.

To have the modem send reports, logs or notifications via e-mail, you must specify an e-mail server and the e-mail addresses of the sender and receiver.

Use this screen to view, remove and add e-mail account information on the modem. This account can be set to receive e-mail notifications for logs.

| Mail Server Address | Username | Port | Security | E-mail Address | Modify | Remove |
|---------------------|----------|------|----------|----------------|--------|--------|
| + Add New e-mail    |          |      |          |                |        |        |

- 2 Enter the following information and click **OK**.
  - **Mail Server Address:** Enter the server name or the IP address of the mail server for the email address specified in the **Account e-mail Address** field.
  - **Authentication Username:** Enter the user name of a mail account you specified in the **Account e-mail Address** field.

- **Authentication Password:** Enter the password associated with the user name above.
- **Account e-mail Address:** Enter the email address you want to appear as the sender of the emails Zyxel Device sends.

- 3 You can see the account you add on the **Maintenance > E-mail Notifications** screen.
- 4 Go to **Maintenance > Log Setting**. Set up or enter the following information under **E-mail Log Settings** and click **Apply**.
  - **E-mail Log Settings:** Slide the switch to the right.
  - **Mail Account:** Select the server you set up in Step 2 to send the log.
  - **Send Log to:** Enter the email address to which you want to send the log.

- 5 Go to **System Monitor > Log > System Log**. Click **E-mail Log Now** to send the log file to the email address you specified.

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# **PART II**

## **T e c h n i c a l R e f e r e n c e**

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# CHAPTER 6

## Connection Status

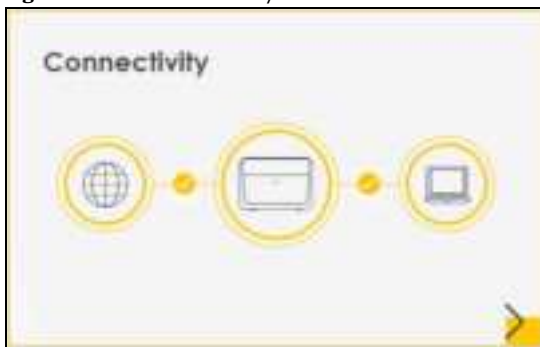
### 6.1 Connection Status Overview

After you log into the Web Configurator, the **Connection Status** screen appears. You can configure basic Internet access and WiFi settings in this screen. It also shows the network status of the Zyxel Device and computers or devices connected to it.

#### 6.1.1 Connectivity

Use this screen to view the network connection status of the Zyxel Device and its clients.

**Figure 90** Connectivity



Click the Arrow icon (  ) to view IP addresses and MAC addresses of the wireless and wired devices connected to the Zyxel Device.

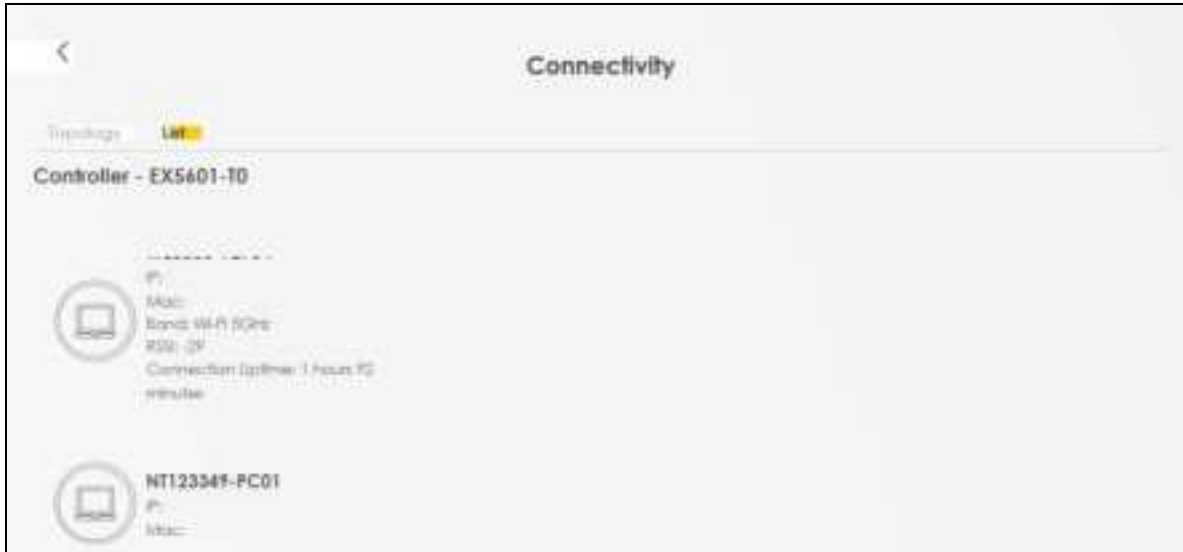
You can change the icon and name of a connected device. Place your mouse within the device block, and an Edit icon (  ) will appear. Click the Edit icon, and you will see there are several icon choices for you to select. Enter a name in the **Device Name** field for a connected device. Click to enable (  ) **Internet Blocking** for a connected WiFi client.

The following screen appears when you enable **MPro Mesh** in the **Network Setting > Wireless > MESH** screen. Check [Section 1.1 on page 20](#) to see if your Zyxel Device supports Mesh.

Use the **Topology** view screen to display an overview of your Mesh network.

**Figure 91** Connectivity: Connected Devices: Topology View

Use the **List** view screen to view IP addresses and MAC addresses of the WiFi and wired devices connected to the Zyxel Device. Place your mouse within the device block, and an **Edit** icon (  ) will appear. Click the **Edit** icon to change the icon and name of a connected device.

**Figure 92** Connectivity: Connected Devices: List View

### 6.1.2 Icon and Device Name

Select an icon and/or enter a name in the **Device Name** field for a connected device. Click to enable () **Internet Blocking** (or **Active**) for a connected WiFi client. Click **Save** to save your changes.

**Figure 93** Connectivity: Edit

### 6.1.3 System Info

Use this screen to view the basic system information of the Zyxel Device.

**Figure 94** System Info



Click the Arrow icon (  ) to view more information on the status of your firewall and interfaces (WAN, LAN, and WLAN).

**Figure 95** System Info: Detailed Information (Ethernet Routers)

**System Info**

Host Name: EX5601-10  
 Model Name: EX5601-10  
 Serial Number:   
 Firmware Version: V5.70(ACD).4)b3  
 System uptime: 0 days 1 hours 4 minutes 55 seconds  
 Interface up Time: 0 days 1 hours 4 minutes 16 seconds  
 CPU usage: 0%  
 Memory usage: 23.0%

**Interface Status**

LAN1: 100Mbps LAN2: LAN3: LAN4: WAN: 1000Mbps 3G/4G/LTE: No Service WLAN: 802 Mbps WLAN: 400 Mbps

**WAN Information (Ethernet WAN)**

|                      |                                        |
|----------------------|----------------------------------------|
| Name                 | ETHWAN                                 |
| Encapsulation        | IPoE                                   |
| IP Address           | 172.21.10.1<br><a href="#">Release</a> |
| IP Subnet Mask       | 255.255.252.0                          |
| IPv6 Address         | N/A                                    |
| MAC Address          | -----                                  |
| IPv6 Gateway         | -----                                  |
| IPv6 Gateway         | N/A                                    |
| Primary DNS server   | 172.21.10.1                            |
| Secondary DNS server | 172.21.5.1                             |
| Connection uptime    | 0 days 1 hours 4 minutes 10 seconds    |

**LAN Information**

|                         |                            |
|-------------------------|----------------------------|
| IP Address              | 172.21.10.1                |
| Subnet Mask             | 255.255.255.0              |
| IPv6 Address            | N/A                        |
| IPv6 Link Local Address | fe80::b013:2000:fe00::c75d |
| DHCP                    | Server                     |
| Static Address          | 172.21.10.1                |

**Security**

|          |        |
|----------|--------|
| Firewall | Medium |
|----------|--------|

**WLAN Information**

|             | 2.4GHz                   | 5GHz                     |
|-------------|--------------------------|--------------------------|
| MAC Address | -----                    | -----                    |
| Status      | On                       | On                       |
| SSID        | Zyxel_247E               | Zyxel_247E               |
| Channel     | Auto(Current 5)          | Auto(Current 64)         |
| Security    | WPA3-Personal-Transition | WPA3-Personal-Transition |
| 802.11 Mode | 802.11b/g/n/ax Mixed     | 802.11a/n/ac/ax Mixed    |
| WPS         | On                       | On                       |

**Figure 96** System Info: Detailed Information (PON Routers)

Each field is described in the following table.

**Table 44** System Info: Detailed Information

| LABEL                                      | DESCRIPTION                                                                                                                                                                                                              |
|--------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Host Name                                  | This field displays the Zyxel Device system name. It is used for identification.                                                                                                                                         |
| Model Name                                 | This shows the model number of your Zyxel Device.                                                                                                                                                                        |
| Serial Number                              | This field displays the serial number of the Zyxel Device.                                                                                                                                                               |
| GPON Serial Number                         | This field displays the unique GPON serial number of the GPON port on the Zyxel Device. Use this serial number to register the Zyxel Device (ONT, Optical Network Terminal) with the OLT (Optical Line Terminal) server. |
| Firmware Version                           | This is the current version of the firmware inside the Zyxel Device.                                                                                                                                                     |
| System Uptime                              | This field displays how long the Zyxel Device has been running since it last started up. The Zyxel Device starts up when you plug it in, when you restart it ( <b>Maintenance &gt; Reboot</b> ), or when you reset it.   |
| Interface Up Time/<br>WAN Interface Uptime | This field displays the length of time of the Ethernet WAN connection.                                                                                                                                                   |
| CPU Usage                                  | This displays the current CPU usage percentage.                                                                                                                                                                          |

Table 44 System Info: Detailed Information (continued)

| LABEL                                                                  | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Memory Usage                                                           | This displays the current RAM usage percentage.                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| WAN Information (These fields display when you have a WAN connection.) |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Name                                                                   | This field displays the name given to the Internet connection.                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Encapsulation                                                          | This field displays the current encapsulation method.                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| IP Address                                                             | This field displays the current IP address of the Zyxel Device in the WAN. Click the <b>Release / Renew</b> button if you want to release/renew your WAN IP address.                                                                                                                                                                                                                                                                                                                          |
| IP Subnet Mask                                                         | This field displays the current IPv4 subnet mask of the Zyxel Device in the WAN.                                                                                                                                                                                                                                                                                                                                                                                                              |
| IPv6 Address                                                           | This field displays the current IPv6 address of the Zyxel Device in the WAN.                                                                                                                                                                                                                                                                                                                                                                                                                  |
| MAC Address                                                            | This field displays the WAN Ethernet adapter MAC (Media Access Control) address of your Zyxel Device.                                                                                                                                                                                                                                                                                                                                                                                         |
| IPv4 Gateway                                                           | This field displays the IPv4 address of the default gateway. The default gateway is a router or switch on the same segment as your Zyxel Device's interface. The gateway helps forward packets to destinations outside the local network.                                                                                                                                                                                                                                                     |
| IPv6 Gateway                                                           | This field displays the IPv6 address of the default gateway. The default gateway is a router or switch on the same segment as your Zyxel Device's interface. The gateway helps forward packets to destinations outside the local network.                                                                                                                                                                                                                                                     |
| Primary DNS server                                                     | This field displays the first DNS server address assigned by the ISP.                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Secondary DNS server                                                   | This field displays the second DNS server address assigned by the ISP.                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Primary DNSv6 server                                                   | This field displays the first DNS server IPv6 address assigned by the ISP.                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Secondary DNSv6 server                                                 | This field displays the second DNS server IPv6 address assigned by the ISP.                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Connection Uptime                                                      | This field displays the time the Zyxel Device's network connection has been active.                                                                                                                                                                                                                                                                                                                                                                                                           |
| LAN Information                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| IP Address                                                             | This is the current IP address of the Zyxel Device in the LAN.                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Subnet Mask                                                            | This is the current subnet mask in the LAN.                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| IPv6 Address                                                           | This is the current IPv6 address of the Zyxel Device in the LAN.                                                                                                                                                                                                                                                                                                                                                                                                                              |
| IPv6 Link Local Address                                                | <p>This field displays the current link-local address of the Zyxel Device for the LAN interface.</p> <p>A link-local address is a special type of the IP address that is only valid for communication within the local network segment or broadcast domain of the device. Typically, link-local addresses are used for automatic address configuration and neighbor discovery protocols.</p>                                                                                                  |
| DHCP                                                                   | <p>This field displays what DHCP services the Zyxel Device is providing to the LAN. The possible values are:</p> <p><b>Server</b> – The Zyxel Device is a DHCP server in the LAN. It assigns IP addresses to other computers in the LAN.</p> <p><b>Relay</b> – The Zyxel Device acts as a surrogate DHCP server and relays DHCP requests and responses between the remote server and the clients.</p> <p><b>Disable</b> – The Zyxel Device is not providing any DHCP services to the LAN.</p> |
| MAC Address                                                            | This shows the network adapter MAC (Media Access Control) Address of the LAN interface.                                                                                                                                                                                                                                                                                                                                                                                                       |
| Security                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Firewall                                                               | This displays the firewall's current security level ( <b>High</b> , <b>Medium</b> , <b>Low</b> , or <b>Disabled</b> ).                                                                                                                                                                                                                                                                                                                                                                        |
| WLAN Information                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| MAC Address                                                            | This shows the WiFi adapter MAC (Media Access Control) Address of the WiFi interface.                                                                                                                                                                                                                                                                                                                                                                                                         |

Table 44 System Info: Detailed Information (continued)

| Label       | Description                                                                      |
|-------------|----------------------------------------------------------------------------------|
| Status      | This displays whether the WLAN is activated.                                     |
| SSID        | This is the descriptive name used to identify the Zyxel Device in a WLAN.        |
| Channel     | This is the channel number currently used by the WiFi interface.                 |
| Security    | This displays the type of security mode the WiFi interface is using in the WLAN. |
| 802.11 Mode | This displays the type of 802.11 mode the WiFi interface is using in the WLAN.   |
| WPS         | This displays whether WPS is activated on the WiFi interface.                    |

### 6.1.4 WiFi Settings

The following compares the main WiFi network and the guest WiFi network.

Table 45 Main/Guest WiFi Networks key Differences

| Feature        | Main WiFi                                                         | Guest WiFi                                           |
|----------------|-------------------------------------------------------------------|------------------------------------------------------|
| Purpose        | For primary household or business users.                          | For visitors.                                        |
| Network Access | For access to internal devices, such as printers or file servers. | Internet access only; no access to internal devices. |

Use this screen to enable or disable the main WiFi network. When the switch turns blue, the function is enabled. You can use this screen or the QR code on the upper right corner to check the SSIDs (WiFi network name) and passwords of the main WiFi networks. If you want to show or hide your WiFi passwords, click the Eye icon (👁).

Figure 97 WiFi Settings (for 2.4 GHz and 5 GHz models)

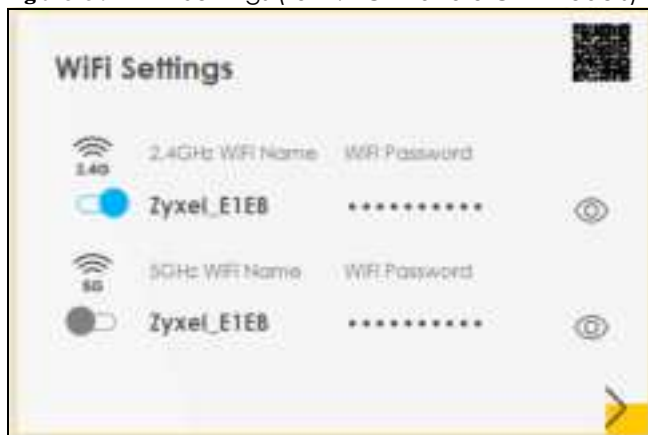




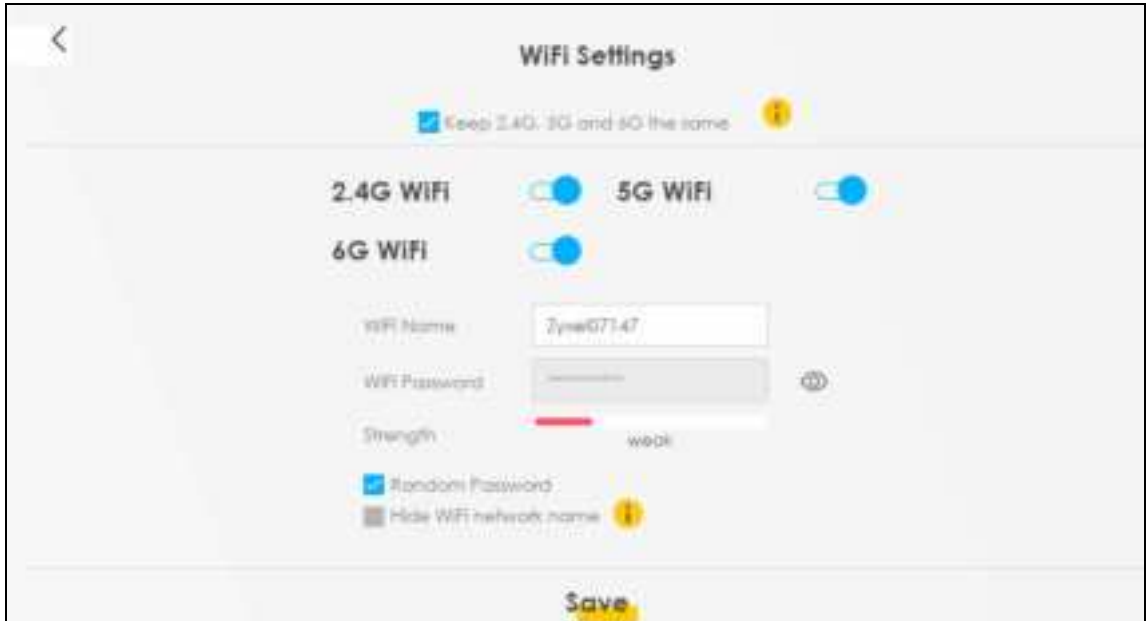
**Figure 98** WiFi Settings (for 2.4 GHz, 5 GHz, and 6 GHz models)

Click the Arrow icon (→) to configure the SSIDs and/or passwords for your main WiFi networks. Click the Eye icon (👁) to display the characters as you enter the WiFi Password.

Scanning the QR code is an alternative way to connect your WiFi client to the WiFi network.

Note: When you enable Mesh in the **Network > Wireless > MESH** screen, **Keep 2.4G, 5G and 6G the same** will be enabled and cannot be disabled.

**Figure 99** WiFi Settings: Configuration (for 2.4 GHz and 5 GHz models)

**Figure 100** WiFi Settings: Configuration (2.4 GHz, 5 GHz, and 6 GHz models)

Each field is described in the following table.

**Table 46** WiFi Settings: Configuration

| Label                         | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|-------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Keep 2.4G, 5G and 6G the same | <p>Select this and the 2.4 GHz, 5 GHz and 6 GHz wireless networks will use the same SSID.</p> <p>If you deselect this, the screen will change. You need to assign different SSIDs for the 2.4 GHz and 5 GHz wireless networks.</p> <p>Note: To see if your model supports 6 GHz, please see <a href="#">Section 1.1 on page 20</a> for more information.</p>                                                                                                                                                                                                          |
| 2.4G / 5G / 6G WiFi           | <p>Click this switch to enable or disable the 2.4 GHz / 5 GHz / 6 GHz WiFi network. When the switch turns blue , the function is enabled.</p> <p>Note: To see if your model supports 6 GHz, please see <a href="#">Section 1.1 on page 20</a> for more information.</p>                                                                                                                                                                                                            |
| WiFi Name                     | <p>The SSID (Service Set Identifier) identifies the service set with which a WiFi device is associated. WiFi devices associating to the access point (AP) must have the same SSID.</p> <p>Enter a descriptive name for the WiFi. You can use up to 32 printable characters, including spaces.</p>                                                                                                                                                                                                                                                                     |
| WiFi Password                 | <p>If you selected <b>Random Password</b>, this field displays a pre-shared key generated by the Zyxel Device.</p> <p>If you did not select <b>Random Password</b>, you can manually enter a pre-shared key from 8 to 63 alphanumeric (0-9, a-z, A-Z) and special characters, including spaces.</p> <p>Click the Eye icon to show or hide the password for your WiFi network. When the Eye icon is slashed , you will see the password in plain text. Otherwise, it is hidden.</p> |
| Random Password               | <p>Select this to have the Zyxel Device automatically generate a password. The <b>WiFi Password</b> field will not be configurable when you select this option.</p>                                                                                                                                                                                                                                                                                                                                                                                                   |

Table 46 WiFi Settings: Configuration (continued)

| LABEL                  | DESCRIPTION                                                                                                                                                                                                                                     |
|------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Hide WiFi network name | Select this to hide the SSID in the outgoing beacon frame so a station cannot obtain the SSID through scanning using a site survey tool.<br><br>Note: Disable WPS in the <b>Network Setting &gt; Wireless &gt; WPS</b> screen to hide the SSID. |
| Save                   | Click <b>Save</b> to save your changes.                                                                                                                                                                                                         |

## 6.2 Guest WiFi Settings

Use this screen to enable or disable the guest 2.4 GHz / 5 GHz WiFi networks. When the switch goes to the right () , the function is enabled. Otherwise, it is not. You can check their SSIDs (WiFi network name) and passwords from this screen. If you want to show or hide your WiFi passwords, click the Eye icon.

Note: To see if your model supports 6 GHz, please see [Section 1.1 on page 20](#) for more information.

Note: To see the difference of the main WiFi network and the guest WiFi network, please refer to [Table 45 on page 184](#).

**Figure 101** Guest WiFi Settings (for 2.4 GHz and 5 GHz models)



**Figure 102** Guest WiFi Settings (for 2.4 GHz, 5 GHz, and 6 GHz models)

Click the Arrow icon (👉) to open the following screen. Use this screen to configure the SSIDs and/or passwords for your guest WiFi networks.

To see if your model supports 6 GHz, please see [Section 1.1 on page 20](#) for more information.

To assign different SSIDs to the 2.4 GHz and 5 GHz guest wireless networks, clear the **Keep 2.4G, 5G and 6G the same** checkbox in the **WiFi Settings** screen, and the **Guest WiFi Settings** screen will change.

**Figure 103** Guest WiFi Settings: Different SSIDs (for 2.4 GHz and 5 GHz models)

**Figure 104** Guest WiFi Settings: Different SSIDs (for 2.4 GHz, 5 GHz, and 6 GHz models)

**Guest WiFi Settings**

2.4G WIFI ☒ 5G WIFI ☒  
6G WIFI ☒

WiFi Name: Zyxel07147\_guest

WiFi Password: [masked] 

Strength: [Progress bar] weak

☒ Random Password  
☐ Hide WiFi network name 

**Save**

Each field is described in the following table.

**Table 47** WiFi Settings: Configuration

| LABEL                  | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                        |
|------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2.4G/5G/6G WiFi        | Click this switch to enable or disable the 2.4 GHz / 5 GHz / 6 GHz WiFi networks. When the switch goes to the right  , the function is enabled. Otherwise, it is not.<br><br>Note: To see if your model supports 6 GHz, please see <a href="#">Section 1.1 on page 20</a> for more information. |
| WiFi Name              | The SSID (Service Set IDentity) identifies the service set with which a wireless device is associated. Wireless devices associating to the access point (AP) must have the same SSID.<br>Enter a descriptive name (up to 32 printable characters, including spaces) for the WiFi.                                                                                                  |
| WiFi Password          | If you selected <b>Random Password</b> , this field displays a pre-shared key generated by the Zyxel Device.<br><br>If you did not select <b>Random Password</b> , you can manually enter a pre-shared key from 8 to 64 alphanumeric (0-9, a-z, A-Z) and special characters, including spaces.                                                                                     |
| Strength               | This displays the current password strength – <b>weak</b> , <b>medium</b> , <b>strong</b> .                                                                                                                                                                                                                                                                                        |
|                        | Click the Eye icon to show or hide the password of your WiFi network. When the Eye icon is slashed  , you will see the password in plain text. Otherwise, it is hidden.                                                                                                                         |
| Random Password        | Select this option to have the Zyxel Device automatically generate a password. The <b>WiFi Password</b> field will not be configurable when you select this option.                                                                                                                                                                                                                |
| Hide WiFi network name | Select this checkbox to hide the SSID in the outgoing beacon frame so a station cannot obtain the SSID through scanning using a site survey tool.<br><br>Note: Disable WPS in the <b>Network Setting &gt; Wireless &gt; WPS</b> screen to hide the SSID.                                                                                                                           |
| Save                   | Click <b>Save</b> to save your changes.                                                                                                                                                                                                                                                                                                                                            |

### 6.2.1 LAN

Use this screen to view the LAN IP address, subnet mask, and DHCP settings of your Zyxel Device. Click the switch button to turn on/off the DHCP server.

**Figure 105** LAN

**LAN**

IP Address: 192.168.1.1

Subnet Mask: 255.255.255.0

IP Address Range: 192.168.1.3 ~ 192.168.1.254

DHCP: ☒

Lease Time: 1 days 0 hours 0 mins

Click the Arrow icon (  ) to configure the LAN IP settings and DHCP setting for your Zyxel Device.

**Figure 106** LAN Setup

**LAN**

**LAN IP Setup**

IP Address: 192 . 168 . 1 . 1

Subnet Mask: 255 . 255 . 255 . 0

**IP Addressing Values**

Beginning IP Address: 192 . 168 . 1 . 2

Ending IP Address: 192 . 168 . 1 . 254

**DHCP Server State**

DHCP Server Lease Time: 1 days 0 hours 0 minutes

**Save**

Each field is described in the following table.

**Table 48** LAN Setup

| <b>LABEL</b>                | <b>DESCRIPTION</b>                                                                                                                                                                                                                                                         |
|-----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>LAN IP Setup</b>         |                                                                                                                                                                                                                                                                            |
| IP Address                  | Enter the LAN IPv4 IP address you want to assign to your Zyxel Device in dotted decimal notation, for example, (factory default).                                                                                                                                          |
| Subnet Mask                 | Enter the subnet mask of your network in dotted decimal notation, for example 255.255.255.0 (factory default). Your Zyxel Device automatically computes the subnet mask based on the IP Address you enter, so do not change this field unless you are instructed to do so. |
| <b>IP Addressing Values</b> |                                                                                                                                                                                                                                                                            |
| Beginning IP Address        | This field specifies the first of the contiguous addresses in the IP address pool.                                                                                                                                                                                         |
| Ending IP Address           | This field specifies the last of the contiguous addresses in the IP address pool.                                                                                                                                                                                          |

Table 48 LAN Setup (continued)

| LABEL                  | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                             |
|------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| DHCP Server State      |                                                                                                                                                                                                                                                                                                                                                                                         |
| DHCP Server Lease Time | This is the period of time a DHCP-assigned address is valid, before it expires.<br><br>When a client connects to the Zyxel Device, DHCP automatically assigns the client an IP addresses from the IP address pool. DHCP leases each addresses for a limited period of time, which means that past addresses are "recycled" and made available for future reassignment to other devices. |
| Days/Hours/Minutes     | Enter the lease time of the DHCP server.                                                                                                                                                                                                                                                                                                                                                |

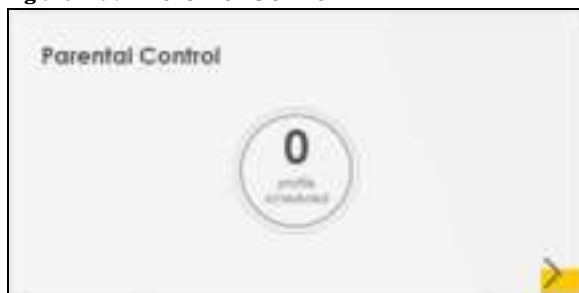
## 6.3 The Parental Control Screen

Parental control allows you to limit the time a user can access the Internet and prevent users from viewing inappropriate content or participating in specified online activities.

Your parental control screens may be different depending on the model you are using. Some Zyxel Devices support scheduling, some support scheduling and URL filtering.

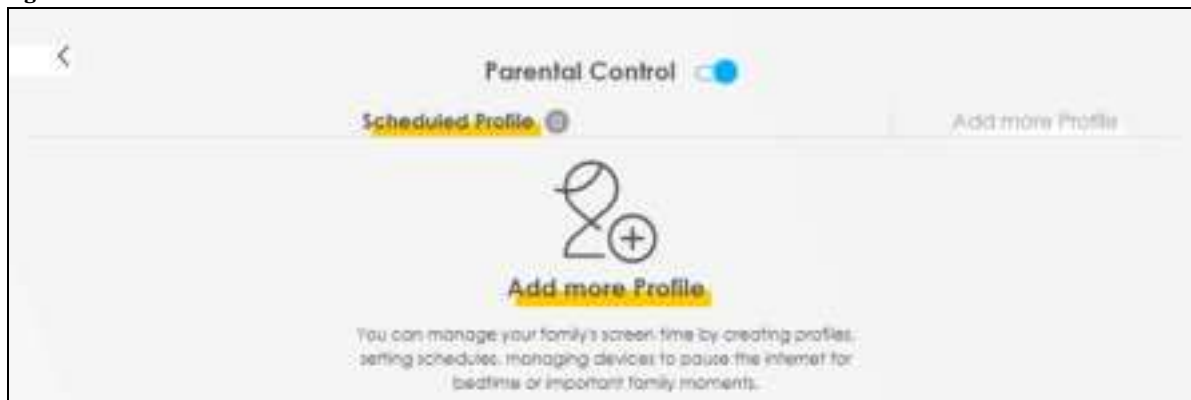
Use this screen to view the number of profiles that were created for parental control.

Figure 107 Parental Control



Click the yellow Arrow icon to open the following screen. Use this screen to enable parental control and add more profiles. Add a profile to create restricted access schedules. Go to the **Security > Parental Control > Add New PCP/Edit** screen to configure URL filtering settings to block the users on your network from accessing certain web sites.

Figure 108 Parental Control



Each field is described in the following table.

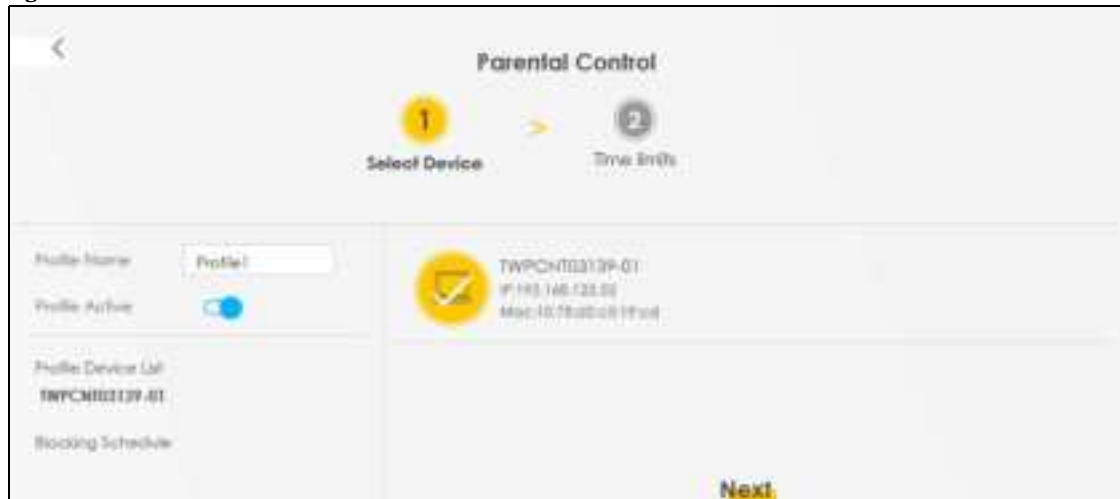
Table 49 Parental Control: Schedule

| LABEL             | DESCRIPTION                                   |
|-------------------|-----------------------------------------------|
| Parental Control  | Click this switch to enable parental control. |
| Scheduled Profile | This screen shows all the created profiles.   |
| Add More Profile  | Click this to create a new profile.           |

### 6.3.1 Create a Parental Control Profile

Click **Add more Profile** to create a profile. Use this screen to add a devices in a profile and block Internet access on the profile devices.

Figure 109 Parental Control: Add More Profile



Each field is described in the following table.

Table 50 Parental Control: Add More Profile

| LABEL               | DESCRIPTION                                                                                                                                                                                                                      |
|---------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Profile Name        | Enter a descriptive name for the profile.                                                                                                                                                                                        |
| Profile Active      | Click this switch to enable or disable Internet access. When the switch goes to the right  , the function is enabled. Otherwise, it is not. |
| Profile Device List | This field shows the devices selected on the right for this profile.                                                                                                                                                             |
| Blocking Schedule   | This field shows the time during which Internet access is blocked on the profile device(s).                                                                                                                                      |
|                     | Select a device(s) on your network for this profile.                                                                                                                                                                             |



**Figure 110** Parental Control: Schedule

Each field is described in the following table.

**Table 51** Parental Control: Schedule

| Label               | Description                                                                                                                                                                              |
|---------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Profile Name        | Enter a descriptive name for the profile. You can use up to 17 printable characters except [ " ], [ ` ], [ ' ], [ < ], [ > ], [ ^ ], [ \$ ], [   ], [ & ], or [ ; ]. Spaces are allowed. |
| Profile Active      | Click this switch to enable this profile.                                                                                                                                                |
| Profile Device List | This field shows the devices selected on the right for this profile.                                                                                                                     |
| Blocking Schedule   | This field shows the time during which Internet access is blocked on the profile devices.                                                                                                |
| Schedule            |                                                                                                                                                                                          |
| Add New Schedule    | Click this to add a new block for scheduling.                                                                                                                                            |
| Start/End blocking  | Select the time period when Internet access is blocked on the profile devices.                                                                                                           |
| Repeat On           | Select the days when Internet access is blocked on the profile devices.<br>Select <b>Whole Week</b> to make the profile schedule repeat on everyday.                                     |
| Back                | Click <b>Back</b> to return to the previous screen.                                                                                                                                      |
| Save                | Click <b>Save</b> to save your changes.                                                                                                                                                  |

Once a profile is created, it will show in the following screen. Click this  to **Delete** or **Edit** a profile.

**Figure 111** Parental Control: Edit/Delete

# CHAPTER 7

## Broadband

### 7.1 Broadband Overview

This chapter discusses the Zyxel Device's **Broadband** screens. Use these screens to configure your Zyxel Device for Internet access.

A Wide Area Network (WAN) connection is an outside connection to another network or the Internet. It connects your private networks, such as a Local Area Network (LAN) and other networks, so that a computer in one location can communicate with computers in other locations.

**Figure 112** LAN and WAN



#### 7.1.1 What You Can Do in this Chapter

- Use **Broadband** screens to view, remove or add a WAN interface. You can also configure the WAN settings on the Zyxel Device for Internet access.

The **Broadband** screens for DSL routers and Ethernet/AON/PON routers are slightly different.

For DSL routers, see [Section 7.2 on page 199](#).

For Ethernet, AON and PON routers, see [Section 7.3 on page 209](#).

See [Section 1.1 on page 20](#) to see which router type your Zyxel Device belongs to.

- Use the **Cellular Backup** screen to configure cellular WAN connection ([Section 7.4 on page 218](#)).
- Use the **Advanced** screen to enable or disable PTM over ADSL, Annex M/Annex J, and DSL PhyR functions ([Section 7.5 on page 224](#)). Alternatively, use the **Advanced** screen to configure the Zyxel Device to reduce the power consumption.
- Use the **Backup WAN** screen to convert the fourth LAN port as a WAN port or reset the Ethernet WAN port to a LAN port ([Section 7.7 on page 229](#)).

Table 52 WAN Setup Overview (Ethernet, AON, PON Routers)

| LAYER 2 INTERFACE                                                                                                           | INTERNET CONNECTION |               |                                                                                                       |
|-----------------------------------------------------------------------------------------------------------------------------|---------------------|---------------|-------------------------------------------------------------------------------------------------------|
| CONNECTION                                                                                                                  | MODE                | ENCAPSULATION | CONNECTION SETTINGS                                                                                   |
| Ethernet                                                                                                                    | Routing             | PPPoE         | PPP user name and password, WAN IPv4/IPv6 IP address, routing feature, DNS server, VLAN, QoS, and MTU |
|                                                                                                                             |                     | IPoE          | WAN IPv4/IPv6 IP address, NAT, DNS server and routing feature                                         |
|                                                                                                                             | Bridge              | N/A           | VLAN                                                                                                  |
| GPON                                                                                                                        | Routing             | PPPoE         | PPP user name and password, WAN IPv4/IPv6 IP address, routing feature, DNS server, VLAN, QoS, and MTU |
|                                                                                                                             |                     | IPoE          | WAN IPv4/IPv6 IP address, NAT, DNS server and routing feature                                         |
|                                                                                                                             | Bridge              | N/A           |                                                                                                       |
| Note: This table is for the Ethernet, AON and PON routers. See <a href="#">Section 1.1 on page 20</a> for more information. |                     |               |                                                                                                       |

Table 53 WAN Setup Overview (DSL Routers)

| LAYER 2 INTERFACE  |               | INTERNET CONNECTION |               |                                                                                                               |
|--------------------|---------------|---------------------|---------------|---------------------------------------------------------------------------------------------------------------|
| CONNECTION         | DSL LINK TYPE | MODE                | ENCAPSULATION | CONNECTION SETTINGS                                                                                           |
| ADSL/VDSL over PTM | N/A           | Routing             | PPPoE         | PPP information, IPv4/IPv6 IP address, routing feature, DNS server, VLAN, QoS, and MTU                        |
|                    |               |                     | IPoE          | IPv4/IPv6 IP address, routing feature, DNS server, VLAN, QoS, and MTU                                         |
|                    |               | Bridge              | N/A           | VLAN and QoS                                                                                                  |
| ADSL over ATM      | EoA           | Routing             | PPPoE/PPPoA   | ATM PVC configuration, PPP information, IPv4/IPv6 IP address, routing feature, DNS server, VLAN, QoS, and MTU |
|                    |               |                     | IPoE/IPoA     | ATM PVC configuration, IPv4/IPv6 IP address, routing feature, DNS server, VLAN, QoS, and MTU                  |
|                    |               | Bridge              | N/A           | ATM PVC configuration, and QoS                                                                                |
| Ethernet           | N/A           | Routing             | PPPoE         | PPP user name and password, WAN IPv4/IPv6 IP address, routing feature, DNS server, VLAN, QoS, and MTU         |
|                    |               |                     | IPoE          | WAN IPv4/IPv6 IP address, NAT, DNS server and routing feature                                                 |
|                    |               | Bridge              | N/A           | VLAN and QoS                                                                                                  |

Note: This table is for the DSL routers. See [Section 1.1 on page 20](#) for more information.

## 7.1.2 What You Need to Know

The following terms and concepts may help as you read this chapter.

## WAN IP Address

The WAN IP address is an IP address for the Zyxel Device, which makes it accessible from an outside network. It is used by the Zyxel Device to communicate with other devices in other networks. It can be static (fixed) or dynamically assigned by the ISP each time the Zyxel Device tries to access the Internet.

If your ISP assigns you a static WAN IP address, they should also assign you the subnet mask and DNS server IP addresses.

## ATM

Asynchronous Transfer Mode (ATM) is a WAN networking technology that provides high-speed data transfer. ATM uses fixed-size packets of information called cells. With ATM, a high QoS (Quality of Service) can be guaranteed. ATM uses a connection-oriented model and establishes a virtual circuit (VC).

## PIM

Packet Transfer Mode (PTM) is packet-oriented and supported by the VDSL2 standard. In PTM, packets are encapsulated directly in the High-level Data Link Control (HDLC) frames. It is designed to provide a low-overhead, transparent way of transporting packets over DSL links, as an alternative to ATM.

## IPv6 Introduction

IPv6 (Internet Protocol version 6), is designed to enhance IP address size and features. The increase in IPv6 address size to 128 bits (from the 32-bit IPv4 address) allows up to  $3.4 \times 10^{38}$  IP addresses. The Zyxel Device can use IPv4/IPv6 dual stack to connect to IPv4 and IPv6 networks, and supports IPv6 rapid deployment (6RD).

## IPv6 Addressing

The 128-bit IPv6 address is written as eight 16-bit hexadecimal blocks separated by colons (:). This is an example IPv6 address 2001:0db8:1a2b:0015:0000:0000:1a2f:0000.

IPv6 addresses can be abbreviated in two ways:

- Leading zeros in a block can be omitted. So 2001:0db8:1a2b:0015:0000:0000:1a2f:0000 can be written as 2001:db8:1a2b:15:0:0:1a2f:0.
- Any number of consecutive blocks of zeros can be replaced by a double colon. A double colon can only appear once in an IPv6 address. So 2001:0db8:0000:0000:1a2f:0000:0000:0015 can be written as 2001:0db8::1a2f:0000:0015, 2001:0db8:0000:0000:1a2f::0015, 2001:db8::1a2f:0:0:15 or 2001:db8:0:0:1a2f::15.

## IPv6 Prefix and Prefix Length

Similar to an IPv4 subnet mask, IPv6 uses an address prefix to represent the network address. An IPv6 prefix length specifies how many most significant bits (start from the left) in the address compose the network address. The prefix length is written as "/x" where x is a number. For example,

2001:db8:1a2b:15::1a2f:0/32

means that the first 32 bits (2001:db8) is the subnet prefix.

## IPv6 Subnet Masking

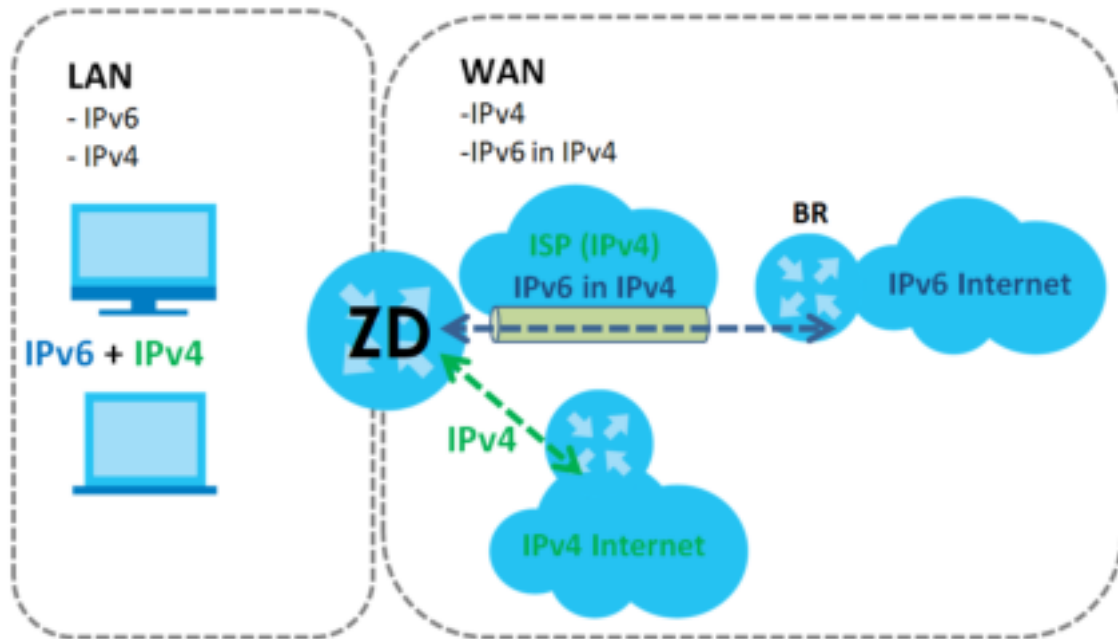
Both an IPv6 address and IPv6 subnet mask compose of 128-bit binary digits, which are divided into eight 16-bit blocks and written in hexadecimal notation. Hexadecimal uses four bits for each character (1 – 10, A – F). Each block's 16 bits are then represented by four hexadecimal characters. For example, FFFF:FFFF:FFFF:FFFF:FC00:0000:0000:0000.

## IPv6 Rapid Deployment

Use IPv6 Rapid Deployment (6rd) when the local network uses IPv6 and the ISP has an IPv4 network. When the Zyxel Device has an IPv4 WAN address and you set **IPv6/IPv4 Mode** to **IPv4 Only**, you can enable 6rd to encapsulate IPv6 packets in IPv4 packets to cross the ISP's IPv4 network.

The Zyxel Device generates a global IPv6 prefix from its IPv4 WAN address and tunnels IPv6 traffic to the ISP's Border Relay router (BR in the figure) to connect to the native IPv6 Internet. The local network can also use IPv4 services. The Zyxel Device uses its configured IPv4 WAN IP to route IPv4 traffic to the IPv4 Internet.

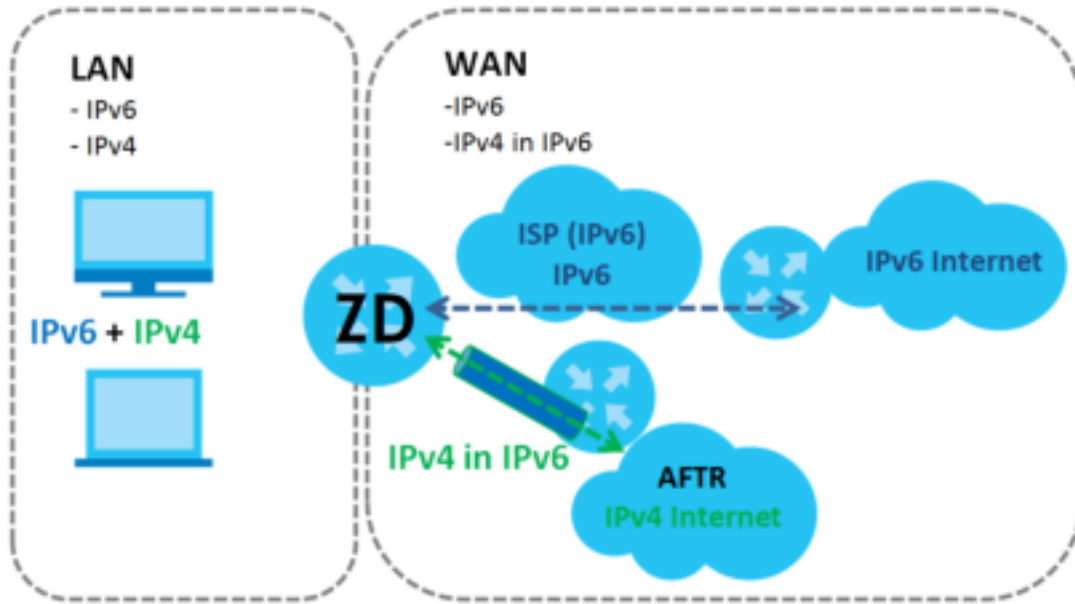
**Figure 113** IPv6 Rapid Deployment



## Dual Stack Lite

Use Dual Stack Lite when local network computers use IPv4 and the ISP has an IPv6 network. When the Zyxel Device has an IPv6 WAN address and you set **IPv6/IPv4 Mode** to **IPv6 Only**, you can enable Dual Stack Lite to use IPv4 computers and services.

The Zyxel Device tunnels IPv4 packets inside IPv6 encapsulation packets to the ISP's Address Family Transition Router (AFTR in the graphic) to connect to the IPv4 Internet. The local network can also use IPv6 services. The Zyxel Device uses its configured IPv6 WAN IP to route IPv6 traffic to the IPv6 Internet.

**Figure 114** Dual Stack Lite**Carrier-Grade NAT (CGNAT)**

CGNAT allows an Internet Service Provider (ISP) to use a single public WAN IP address for multiple customers with different Internet access devices.

**7.1.3 Before You Begin**

You need to know your Internet access settings such as encapsulation and WAN IP address. Get this information from your ISP.

**7.2 Broadband Settings for DSL Routers**

Use this screen to change your Zyxel Device's Internet access settings. The summary table shows you the configured WAN services (connections) on the Zyxel Device. Use information provided by your ISP to configure WAN settings.

Click **Network Setting** > **Broadband** to access this screen.

**Figure 115** Network Setting > Broadband (Ethernet Gateways)

| # | Name   | Type  | Mode    | Encapsulation | 802.1p | 802.1q | IGMP Proxy | NAT | Default Gateway | IPv6 | MLD Proxy | Modify      |
|---|--------|-------|---------|---------------|--------|--------|------------|-----|-----------------|------|-----------|-------------|
| 1 | ADSL   | ATM   | Routing | PoE           | N/A    | N/A    | Y          | Y   | Y               | Y    | Y         | Edit Delete |
| 2 | VDSL   | FTM   | Routing | PoE           | N/A    | N/A    | Y          | Y   | Y               | Y    | Y         | Edit Delete |
| 3 | ETHWAN | ETH   | Routing | PoE           | N/A    | N/A    | Y          | Y   | Y               | Y    | Y         | Edit Delete |
| 4 | PPPOE  | PPPoE | Routing | PoE           | N/A    | N/A    | Y          | Y   | Y               | Y    | Y         | Edit Delete |

The following table describes the labels in this screen.

**Table 54** Network Setting > Broadband

| LABEL                 | DESCRIPTION                                                                                                                                                        |
|-----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Add New WAN Interface | Click this button to create a new connection.                                                                                                                      |
| #                     | This is the index number of the entry.                                                                                                                             |
| Name                  | This is the service name of the connection.                                                                                                                        |
| Type                  | This shows types of connections the router has.                                                                                                                    |
| Mode                  | This shows whether the connection is in routing or bridge mode.                                                                                                    |
| Encapsulation         | This is the method of encapsulation used by this connection.                                                                                                       |
| 802.1p                | This indicates the 802.1p priority level assigned to traffic sent through this connection. This displays <b>N/A</b> when there is no priority level assigned.      |
| 802.1q                | This indicates the VLAN ID number assigned to traffic sent through this connection. This displays <b>N/A</b> when there is no VLAN ID number assigned.             |
| IGMP Proxy            | This shows whether the Zyxel Device act as an IGMP proxy on this connection.                                                                                       |
| NAT                   | This shows whether NAT is activated or not for this connection.                                                                                                    |
| Default Gateway       | This shows whether the Zyxel Device use the WAN interface of this connection as the system default gateway.                                                        |
| IPv6                  | This shows whether IPv6 is activated or not for this connection. IPv6 is not available when the connection uses the bridging service.                              |
| MLD Proxy             | This shows whether Multicast Listener Discovery (MLD) is activated or not for this connection. MLD is not available when the connection uses the bridging service. |
| Modify                | Click the <b>Edit</b> icon to configure the WAN connection.<br>Click the <b>Delete</b> icon to remove the WAN connection.                                          |

## 7.2.1 Add or Edit Internet Connection

Click **Add New WAN Interface** in the **Broadband** screen or the Edit icon next to an existing WAN interface to open the following screen. Use this screen to configure a WAN connection. The screen varies depending on the mode, encapsulation, and IPv6 or IPv4 mode you select.



## **Routing Mode**

Use **Routing** mode if your ISP give you one IP address only and you want multiple computers to share an Internet account.

The following example screen displays when you select the **Routing** mode and **PPPoE** encapsulation. The screen varies when you select other encapsulation and IPv6 or IPv4 mode.

**Figure 116** Network Setting > Broadband > Add or Edit New WAN Interface (Routing Mode)

**Edit WAN Interface**

**General** ☒

Name:

Type:

Mode:

Encapsulation:

IPv4/IPv6 Mode:

**PPP Information**

PPP User Name:

PPP Password:

PPP Connection Trigger: ☒ Auto ☐ On Demand

PPPoE Passthrough: ☐

**ATM PVC Configuration**

vpi (0-255):

vci (32-65535):

Encapsulation:

Service Category:

**VLAN** ☐

VLAN ID:

VLAN ID Range:

**MTU**

MTU:

**IP Address**

☒ Obtain an IP Address Automatically

☐ Static IP Address

**DNS Server**

☒ Obtain DNS Info Automatically

☐ Use Following Static DNS Address

**IPv6 Address**

☒ Obtain an IPv6 Address Automatically

☐ Static IPv6 Address

**IPv6 DNS Server**

☒ Obtain IPv6 DNS Info Automatically

☐ Use Following Static IPv6 DNS Address

**Routing Feature**

NAT: ☒ **IGMP Proxy**: ☒

Apply as Default Gateway: ☒ **Fullcone NAT**: ☐

**IPv6 Routing Feature**

MLD Proxy: ☒ **Apply as Default Gateway**: ☒

**DHCPv6 Option**

IPv6 Address From DHCPv6 Server: ☐ **Other Information From DHCPv6 Server**: ☐

Cancel **Apply**

The following table describes the labels in this screen.

Table 55 Network Setting > Broadband > Add or Edit New WAN Interface (Routing Mode)

| LABEL                                                                                                                                                                | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| General                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Click the switch to enable this WAN interface.                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Name                                                                                                                                                                 | Specify a descriptive name for this connection. You can use up to 15 alphanumeric (0-9, a-z, A-Z) and special characters except [ " ], [ ` ], [ ' ], [ < ], [ > ], [ ^ ], [ \$ ], [   ], [ & ], or [ ; ]. Spaces are allowed.<br><br>This field is read-only if you are editing the WAN interface.                                                                                                                                                                                                                                                                                                                                  |
| Type                                                                                                                                                                 | This field shows the types of available connections.<br><br>This field is read-only if you are editing the WAN interface.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Mode                                                                                                                                                                 | Select <b>Routing</b> if your ISP give you one IP address only and you want multiple computers to share an Internet account.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Encapsulation                                                                                                                                                        | Select the method of encapsulation used by your ISP from the drop-down list box. This option is available only when you select <b>Routing</b> in the <b>Mode</b> field.<br><br>When you select <b>ADSL/VDSLoverATM</b> or <b>Ethernet</b> , the choices are <b>PPPoE</b> and <b>IPoE</b> .<br><br>When you select <b>ADSLoverATM</b> , the choices are <b>PPPoE</b> , <b>IPoE</b> , <b>PPPoA</b> and <b>IPoA</b> .                                                                                                                                                                                                                  |
| IPv4/IPv6 Mode                                                                                                                                                       | Select <b>IPv4 Only</b> if you want the Zyxel Device to run IPv4 only.<br><br>Select <b>IPv4 IPv6 DualStack</b> to allow the Zyxel Device to run IPv4 and IPv6 at the same time.<br><br>Select <b>IPv6 Only</b> if you want the Zyxel Device to run IPv6 only.                                                                                                                                                                                                                                                                                                                                                                      |
| PPP Information (This is available only when you select <b>Routing</b> in the <b>Mode</b> field and <b>PPPoE</b> or <b>PPPoA</b> in the <b>Encapsulation</b> field.) |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| PPP User Name                                                                                                                                                        | Enter the user name exactly as your ISP assigned. If assigned a name in the form user@domain where domain identifies a service name, then enter both components exactly as given.                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| PPP Password                                                                                                                                                         | Enter the password associated with the user name above. Select <b>password unmask</b> to show your entered password in plain text.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| PPP Connection Trigger                                                                                                                                               | Select when to have the Zyxel Device establish the PPP connection.<br><br><b>Auto Connect</b> – select this to not let the connection time out.<br><br><b>On Demand</b> – select this to automatically bring up the connection when the Zyxel Device receives packets destined for the Internet.                                                                                                                                                                                                                                                                                                                                    |
| Idle Timeout                                                                                                                                                         | This value specifies the time in minutes that elapses before the router automatically disconnects from the PPPoE server.<br><br>This field is not available if you select <b>Auto Connect</b> in the <b>PPP Connection Trigger</b> field.                                                                                                                                                                                                                                                                                                                                                                                           |
| PPPoE Passthrough                                                                                                                                                    | This field is available when you select <b>PPPoE</b> encapsulation.<br><br>In addition to the Zyxel Device's built-in PPPoE client, you can enable PPPoE pass through to allow up to ten hosts on the LAN to use PPPoE client software on their computers to connect to the ISP through the Zyxel Device. Each host can have a separate account and a public WAN IP address.<br><br>PPPoE pass through is an alternative to NAT for application where NAT is not appropriate.<br><br>Disable PPPoE pass through if you do not need to allow hosts on the LAN to use PPPoE client software on their computers to connect to the ISP. |
| ATM PVC Configuration (This is available only when you select <b>ADSLoverATM</b> in the <b>Type</b> field.)                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| VPI [0-255]                                                                                                                                                          | The valid range for the VPI is 0 to 255. Enter the VPI assigned to you.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| VCI [32-65535]                                                                                                                                                       | The valid range for the VCI is 32 to 65535 (0 to 31 is reserved for local management of ATM traffic). Enter the VCI assigned to you.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |

Table 55 Network Setting &gt; Broadband &gt; Add or Edit New WAN Interface (Routing Mode) (continued)

| LABEL                                                                                                                                                                                                                                               | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Encapsulation                                                                                                                                                                                                                                       | <p>Select the method of multiplexing used by your ISP from the drop-down list box. Choices are:</p> <ul style="list-style-type: none"> <li>• <b>LCC/SNAP-BRIDGING:</b> In LCC encapsulation, bridged PDUs are encapsulated by identifying the type of the bridged media in the SNAP header.</li> <li>• <b>VC/MUX:</b> In VC multiplexing, each protocol is carried on a single ATM virtual circuit (VC). To transport multiple protocols, the Zyxel Device needs separate VCs. There is a binding between a VC and the type of the network protocol carried on the VC. This reduces payload overhead since there is no need to carry protocol information in each Protocol Data Unit (PDU) payload.</li> </ul> |
| Service Category                                                                                                                                                                                                                                    | <p>Select <b>UBR Without PCR</b> for applications that are non-time sensitive, such as email.</p> <p>Select <b>CBR</b> (Continuous Bit Rate) to specify fixed (always-on) bandwidth for voice or data traffic.</p> <p>Select <b>Non Realtime VBR</b> (non real-time Variable Bit Rate) for connections that do not require closely controlled delay and delay variation.</p> <p>Select <b>Realtime VBR</b> (real-time Variable Bit Rate) for applications with bursty connections that require closely controlled delay and delay variation.</p>                                                                                                                                                               |
| Peak Cell Rate [cells/s]                                                                                                                                                                                                                            | Divide the DSL line rate (bps) by 424 (the size of an ATM cell) to find the Peak Cell Rate (PCR). This is the maximum rate at which the sender can send cells. Type the PCR here.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Sustainable Cell Rate                                                                                                                                                                                                                               | The Sustain Cell Rate (SCR) sets the average cell rate (long-term) that can be transmitted. Type the SCR, which must be less than the PCR. Note that system default is 0 cells/sec.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Maximum Burst Size [cells]                                                                                                                                                                                                                          | Maximum Burst Size (MBS) refers to the maximum number of cells that can be sent at the peak rate. Type the MBS, which is less than 65535.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <p><b>VLAN</b></p> <p>Click this switch to enable VLAN on this WAN interface.</p> <p>This field is not available if you select <b>ADSL over ATM</b> in the <b>Type</b> field and <b>PPPoA</b> or <b>IPoA</b> in the <b>Encapsulation</b> field.</p> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| 802.1p                                                                                                                                                                                                                                              | <p>IEEE 802.1p defines up to 8 separate traffic types by inserting a tag into a MAC-layer frame that contains bits to define class of service.</p> <p>Select the IEEE 802.1p priority level (from 0 to 7) to add to traffic through this connection. The greater the number, the higher the priority level.</p>                                                                                                                                                                                                                                                                                                                                                                                                |
| 802.1q                                                                                                                                                                                                                                              | Type the VLAN ID number (from 0 to 4094) for traffic through this connection.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| MTU (This is not available if you select <b>ADSL over ATM</b> in the <b>Type</b> field and <b>PPPoA</b> or <b>IPoA</b> in the <b>Encapsulation</b> field.)                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| MTU                                                                                                                                                                                                                                                 | Enter the MTU (Maximum Transfer Unit) size for traffic through this connection.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| IP Address (This is available only when you select <b>IPv4 Only</b> or <b>IPv4 IPv6 DualStack</b> in the <b>IPv4/IPv6 Mode</b> field.)                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Obtain an IP Address Automatically                                                                                                                                                                                                                  | A static IP address is a fixed IP that your ISP gives you. A dynamic IP address is not fixed; the ISP assigns you a different one each time you connect to the Internet. Select this if you have a dynamic IP address.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Static IP Address                                                                                                                                                                                                                                   | Select this option if the ISP assigned a fixed IP address.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| IP Address                                                                                                                                                                                                                                          | Enter the static IP address provided by your ISP.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Subnet Mask                                                                                                                                                                                                                                         | <p>Enter the subnet mask provided by your ISP.</p> <p>This is available only when you set the <b>Encapsulation</b> to <b>IPoE</b> or <b>IPoA</b>.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Gateway IP Address                                                                                                                                                                                                                                  | <p>Enter the gateway IP address provided by your ISP.</p> <p>This is available only when you set the <b>Encapsulation</b> to <b>IPoE</b>.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| DNS Server (This is available only when you select <b>IPv4 Only</b> or <b>IPv4 IPv6 DualStack</b> in the <b>IPv4/IPv6 Mode</b> field.)                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Obtain DNS Info Automatically                                                                                                                                                                                                                       | Select <b>Obtain DNS Info Automatically</b> if you want the Zyxel Device to use the DNS server addresses assigned by your ISP.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Use Following Static DNS Address                                                                                                                                                                                                                    | Select <b>Use Following Static DNS Address</b> if you want the Zyxel Device to use the DNS server addresses you configure manually.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |

Table 55 Network Setting &gt; Broadband &gt; Add or Edit New WAN Interface (Routing Mode) (continued)

| LABEL                                                                                                                                                                                                                                                                                                                 | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Primary DNS Server                                                                                                                                                                                                                                                                                                    | Enter the first DNS server address assigned by the ISP.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Secondary DNS Server                                                                                                                                                                                                                                                                                                  | Enter the second DNS server address assigned by the ISP.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Routing Feature (This is available only when you select <b>IPv4 Only</b> or <b>IPv4 IPv6 DualStack</b> in the <b>IPv4/IPv6 Mode</b> field.)                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| NAT                                                                                                                                                                                                                                                                                                                   | Click this switch to activate NAT on this connection.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| IGMP Proxy                                                                                                                                                                                                                                                                                                            | <p>Internet Group Multicast Protocol (IGMP) is a network-layer protocol used to establish membership in a multicast group – it is not used to carry user data.</p> <p>Click this switch to have the Zyxel Device act as an IGMP proxy on this connection.</p> <p>This allows the Zyxel Device to get subscribing information and maintain a joined member list for each multicast group. It can reduce multicast traffic significantly.</p>                                                                                                   |
| Apply as Default Gateway                                                                                                                                                                                                                                                                                              | Click this switch to have the Zyxel Device use this WAN interface of this connection as the system default gateway.                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Fullcone NAT                                                                                                                                                                                                                                                                                                          | <p>Click this switch to enable full cone NAT on this WAN connection.</p> <p>This field is available only when you activate <b>NAT</b>.</p> <p>In full cone NAT, the Zyxel Device maps all outgoing packets from an internal IP address and port to a single IP address and port on the external network. The Zyxel Device also maps packets coming to that external IP address and port to the internal IP address and port.</p>                                                                                                              |
| <p>6RD</p> <p>The 6RD (IPv6 rapid deployment) fields display when you set the <b>IPv6/IPv4 Mode</b> field to <b>IPv4 Only</b>. See <a href="#">IPv6 Rapid Deployment on page 198</a> for more information.</p> <p>Click this switch to tunnel IPv6 traffic from the local network through the ISP's IPv4 network.</p> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Automatically configured by DHCP                                                                                                                                                                                                                                                                                      | The <b>Automatically configured by DHCP</b> option is configurable only when you set the method of encapsulation to <b>IPoE</b> .                                                                                                                                                                                                                                                                                                                                                                                                             |
| Manually Configured                                                                                                                                                                                                                                                                                                   | Select <b>Manually Configured</b> if you have the IPv4 address of the relay server. Otherwise, select <b>Automatically configured by DHCP</b> to have the Zyxel Device detect it automatically through DHCP.                                                                                                                                                                                                                                                                                                                                  |
| Service Provider IPv6 Prefix                                                                                                                                                                                                                                                                                          | Enter an IPv6 prefix for tunneling IPv6 traffic to the ISP's border relay router and connecting to the native IPv6 Internet.                                                                                                                                                                                                                                                                                                                                                                                                                  |
| IPv4 Mask Length                                                                                                                                                                                                                                                                                                      | Enter the subnet mask number (1 – 32) for the IPv4 network.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Border Relay IPv4 Address                                                                                                                                                                                                                                                                                             | When you select <b>Manually Configured</b> , specify the relay server's IPv4 address in this field.                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <p>DHCP Options (This is available only when you select <b>IPv4 Only</b> or <b>IPv4 IPv6 DualStack</b> in the <b>IPv4/IPv6 Mode</b> field and <b>IPoE</b> in the <b>Encapsulation</b> field.)</p> <p>Note: The available DHCP options may differ by model.</p>                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Request Options                                                                                                                                                                                                                                                                                                       | <p>Select <b>Option 42</b> to have the Zyxel Device get NTP time server information from DHCP packets sent from the DHCP server.</p> <p>Select <b>Option 43</b> to have the Zyxel Device get vendor specific information from DHCP packets sent from the DHCP server.</p> <p>Select <b>Option 120</b> to have the Zyxel Device get static route information from DHCP packets sent from the DHCP server.</p> <p>Select <b>Option 121</b> to have the Zyxel Device get SIP server information from DHCP packets sent from the DHCP server.</p> |
| Sent Options                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |

Table 55 Network Setting &gt; Broadband &gt; Add or Edit New WAN Interface (Routing Mode) (continued)

| LABEL                                                                                                                                                                                                           | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                       |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| option 12                                                                                                                                                                                                       | To identify the Zyxel Device to the DHCP server, select this to automatically add the hostname of the Zyxel Device in the DHCP discovery packets that go to the DHCP server.                                                                                                                                                                                      |
| option 60                                                                                                                                                                                                       | Select this and enter the device identity you want the Zyxel Device to add in the DHCP discovery packets that go to the DHCP server.                                                                                                                                                                                                                              |
| Vendor ID                                                                                                                                                                                                       | Enter the Vendor Class Identifier, such as the type of the hardware or firmware.                                                                                                                                                                                                                                                                                  |
| option 61                                                                                                                                                                                                       | Select this and enter any string that identifies the device.                                                                                                                                                                                                                                                                                                      |
| IAID                                                                                                                                                                                                            | Enter the Identity Association Identifier (IAID) of the device, for example, the WAN connection index number.                                                                                                                                                                                                                                                     |
| DUID                                                                                                                                                                                                            | Enter the hardware type, a time value and the MAC address of the device.                                                                                                                                                                                                                                                                                          |
| option 125                                                                                                                                                                                                      | Select this to have the Zyxel Device automatically generate and add vendor specific parameters in the DHCP discovery packets that go to the DHCP server.                                                                                                                                                                                                          |
| IPv6 Address (This is available only when you select <b>IPv4 IPv6 DualStack</b> or <b>IPv6 Only</b> in the <b>IPv4/IPv6 Mode</b> field.)                                                                        |                                                                                                                                                                                                                                                                                                                                                                   |
| Obtain an IPv6 Address Automatically                                                                                                                                                                            | Select <b>Obtain an IPv6 Address Automatically</b> if you want to have the Zyxel Device use the IPv6 prefix from the connected router's Router Advertisement (RA) to generate an IPv6 address.                                                                                                                                                                    |
| Static IPv6 Address                                                                                                                                                                                             | Select <b>Static IPv6 Address</b> if you have a fixed IPv6 address assigned by your ISP. When you select this, the following fields appear.                                                                                                                                                                                                                       |
| IPv6 Address                                                                                                                                                                                                    | Enter an IPv6 IP address that your ISP gave to you for this WAN interface.                                                                                                                                                                                                                                                                                        |
| Prefix Length                                                                                                                                                                                                   | Enter the address prefix length to specify how many most significant bits in an IPv6 address compose the network address.                                                                                                                                                                                                                                         |
| IPv6 Default Gateway                                                                                                                                                                                            | Enter the IP address of the next-hop gateway. The gateway is a router or switch on the same segment as your Zyxel Device's interfaces. The gateway helps forward packets to their destinations.                                                                                                                                                                   |
| IPv6 DNS Server (This is available only when you select <b>IPv4 IPv6 DualStack</b> or <b>IPv6 Only</b> in the <b>IPv4/IPv6 Mode</b> field. Configure the IPv6 DNS server in the following section.)             |                                                                                                                                                                                                                                                                                                                                                                   |
| Obtain IPv6 DNS Info Automatically                                                                                                                                                                              | Select <b>Obtain IPv6 DNS Info Automatically</b> to have the Zyxel Device get the IPv6 DNS server addresses from the ISP automatically.                                                                                                                                                                                                                           |
| Use Following Static IPv6 DNS Address                                                                                                                                                                           | Select <b>Use Following Static IPv6 DNS Address</b> to have the Zyxel Device use the IPv6 DNS server addresses you configure manually.                                                                                                                                                                                                                            |
| Primary DNS Server                                                                                                                                                                                              | Enter the first IPv6 DNS server address assigned by the ISP.                                                                                                                                                                                                                                                                                                      |
| Secondary DNS Server                                                                                                                                                                                            | Enter the second IPv6 DNS server address assigned by the ISP.                                                                                                                                                                                                                                                                                                     |
| IPv6 Routing Feature (This is available only when you select <b>IPv4 IPv6 DualStack</b> or <b>IPv6 Only</b> in the <b>IPv4/IPv6 Mode</b> field. You can enable IPv6 routing features in the following section.) |                                                                                                                                                                                                                                                                                                                                                                   |
| MLD Proxy Enable                                                                                                                                                                                                | Select this checkbox to have the Zyxel Device act as an MLD proxy on this connection. This allows the Zyxel Device to get subscription information and maintain a joined member list for each multicast group. It can reduce multicast traffic significantly.                                                                                                     |
| Apply as Default Gateway                                                                                                                                                                                        | Select this option to have the Zyxel Device use the WAN interface of this connection as the system default gateway.                                                                                                                                                                                                                                               |
| DS-Lite                                                                                                                                                                                                         | This is available only when you select <b>IPv6 Only</b> in the <b>IPv4/IPv6 Mode</b> field. Enable Dual Stack Lite to let local computers use IPv4 through an ISP's IPv6 network. See <a href="#">Dual Stack Lite on page 198</a> for more information.<br><br>Click this switch to enable DS-Lite to let local computers use IPv4 through an ISP's IPv6 network. |
| Automatically configured by DHCP                                                                                                                                                                                | Select this to have the Zyxel Device detect the relay server automatically through DHCP.                                                                                                                                                                                                                                                                          |

Table 55 Network Setting &gt; Broadband &gt; Add or Edit New WAN Interface (Routing Mode) (continued)

| LABEL                                                                                                                                     | DESCRIPTION                                                                                                                                                                                                                  |
|-------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Manually Configured                                                                                                                       | Select <b>Manually Configured</b> if you have the IPv6 address of the relay server. Otherwise, select <b>Automatically configured by DHCP</b> to have the Zyxel Device detect it automatically through DHCP.                 |
| DS-Lite Relay Server IP                                                                                                                   | Specify the transition router's IPv6 address.                                                                                                                                                                                |
| DHCPv6 Option (This is available only when you select <b>IPv6 Only</b> or <b>IPv4 IPv6 DualStack</b> in the <b>IPv4/IPv6 Mode</b> field.) |                                                                                                                                                                                                                              |
| IPv6 Address From DHCPv6 Server                                                                                                           | Click the switch to let the Zyxel Device send DHCP requests to the DHCPv6 server to obtain an IPv6 address.                                                                                                                  |
| Other Information From DHCPv6 Server                                                                                                      | Click the switch to have the Zyxel Device get other information, such as DNS information, from DHCPv6 packets sent from the DHCPv6 server.<br><br>This will be enabled if <b>IPv6 Address From DHCPv6 Server</b> is enabled. |
| IPv6 MAP                                                                                                                                  | This is available when you edit an IPv6 WAN interface. Slide the switch to the right to create an IPv6 map domain.                                                                                                           |
| Transport Mode                                                                                                                            | Select <b>MAP-T</b> (Translation) or <b>MAP-E</b> (Encapsulation) based on the ISP deployment.                                                                                                                               |
| Setting Mode                                                                                                                              | Select <b>DHCP S46</b> or <b>Manual</b> to configure the following fields.                                                                                                                                                   |
| Note: The following Prefix/Address fields are used for the address mapping rule of MAP-T or MAP-E.                                        |                                                                                                                                                                                                                              |
| BR IPv6 Prefix                                                                                                                            | This is the IPv6 network address/prefix assigned to the BR, including the prefix length.                                                                                                                                     |
| Rule IPv6 Prefix                                                                                                                          | This is the IPv6 network prefix, including the prefix length.                                                                                                                                                                |
| Rule IPv4 Prefix                                                                                                                          | This is the IPv4 network prefix, including the prefix length.                                                                                                                                                                |
| Note: The following PSID fields are used for the port mapping rule of MAP-T or MAP-E.                                                     |                                                                                                                                                                                                                              |
| PSID Offset                                                                                                                               | The Port Set Identifier (PSID) offset specifies the excluded port range. The default <b>PSID Offset</b> is 6; port 0~1023 will be reserved for the system to use.                                                            |
| PSID Length                                                                                                                               | This specifies the number of sharing ratio. When <b>PSID Length</b> is set to 8, the ports will be separated and assigned for 2^8 MAP CEs to use.                                                                            |
| PSID                                                                                                                                      | A Port Set ID ( <b>PSID</b> ) identifies a set of ports assigned to a CE for mapping. <b>PSID</b> should be unique for each CE sharing the IPv4 address.                                                                     |
| Cancel                                                                                                                                    | Click <b>Cancel</b> to restore your previously saved settings.                                                                                                                                                               |
| Apply                                                                                                                                     | Click <b>Apply</b> to save your changes.                                                                                                                                                                                     |

## Bridge Mode

Click the **Add new WAN Interface** in the **Network Setting > Broadband** screen or the **Edit** icon next to the connection you want to configure. The following example screen displays when you select **Bridge** mode.

**Figure 117** Network Setting > Broadband > Add or Edit New WAN Interface (Bridge Mode)

The following table describes the fields in this screen.

**Table 56** Network Setting > Broadband > Add/Edit New WAN Interface (Bridge Mode)

| Label                                                                                                         | Description                                                                                                                                                                                                                                                                                                                    |
|---------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| General                                                                                                       |                                                                                                                                                                                                                                                                                                                                |
| Click this switch to enable the WAN interface.                                                                |                                                                                                                                                                                                                                                                                                                                |
| Name                                                                                                          | Enter a service name of the connection. You can use up to 15 alphanumeric (0-9, a-z, A-Z) and special characters except [ " ], [ ' ], [ < ], [ > ], [ ^ ], [ \$ ], [   ], [ & ], or [ ; ]. Spaces are allowed.<br>This field is read-only if you are editing the WAN interface.                                                |
| Type                                                                                                          | Select <b>VDSL over ATM</b> , <b>ADSL over ATM</b> or <b>Ethernet</b> as the WAN interface type.<br>This field is read-only if you are editing the WAN interface.                                                                                                                                                              |
| Mode                                                                                                          | Select <b>Bridge</b> when your ISP provides you more than one IP address and you want the connected computers to get individual IP address from ISP's DHCP server directly. If you select <b>Bridge</b> , you cannot use routing functions, such as QoS, Firewall, DHCP server and NAT on traffic from the selected LAN ports. |
| VLAN                                                                                                          |                                                                                                                                                                                                                                                                                                                                |
| Click this switch to enable VLAN on this WAN interface.                                                       |                                                                                                                                                                                                                                                                                                                                |
| 802.1p                                                                                                        | IEEE 802.1p defines up to 8 separate traffic types by inserting a tag into a MAC-layer frame that contains bits to define class of service.<br><br>Select the IEEE 802.1p priority level (from 0 to 7) to add to traffic through this connection. The greater the number, the higher the priority level.                       |
| 802.1q                                                                                                        | Type the VLAN ID number (from 0 to 4094) for traffic through this connection.                                                                                                                                                                                                                                                  |
| MTU                                                                                                           |                                                                                                                                                                                                                                                                                                                                |
| MTU                                                                                                           | Enter the MTU (Maximum Transfer Unit) size for traffic through this connection.                                                                                                                                                                                                                                                |
| ATM PVC Configuration (This is available only when you select <b>ADSL over ATM</b> in the <b>Type</b> field.) |                                                                                                                                                                                                                                                                                                                                |
| VPI [0-255]                                                                                                   | The valid range for the VPI is 0 to 255. Enter the VPI assigned to you.                                                                                                                                                                                                                                                        |



Table 56 Network Setting &gt; Broadband &gt; Add/Edit New WAN Interface (Bridge Mode) (continued)

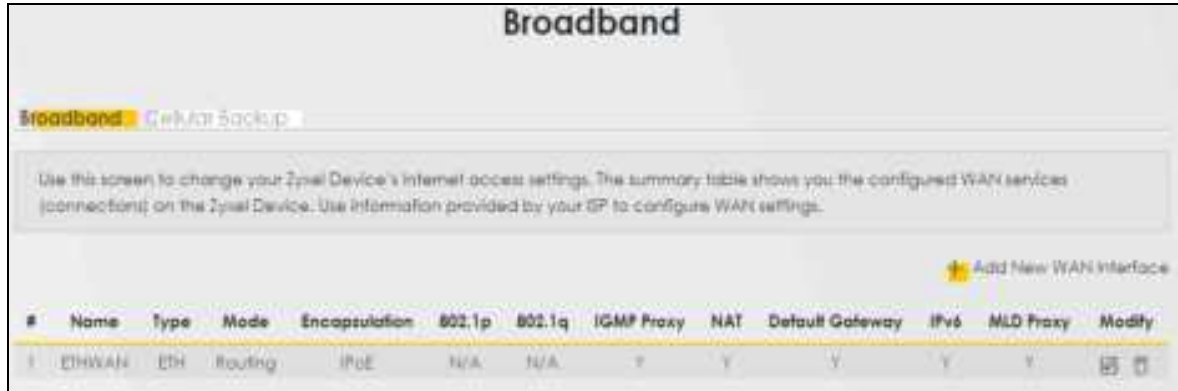
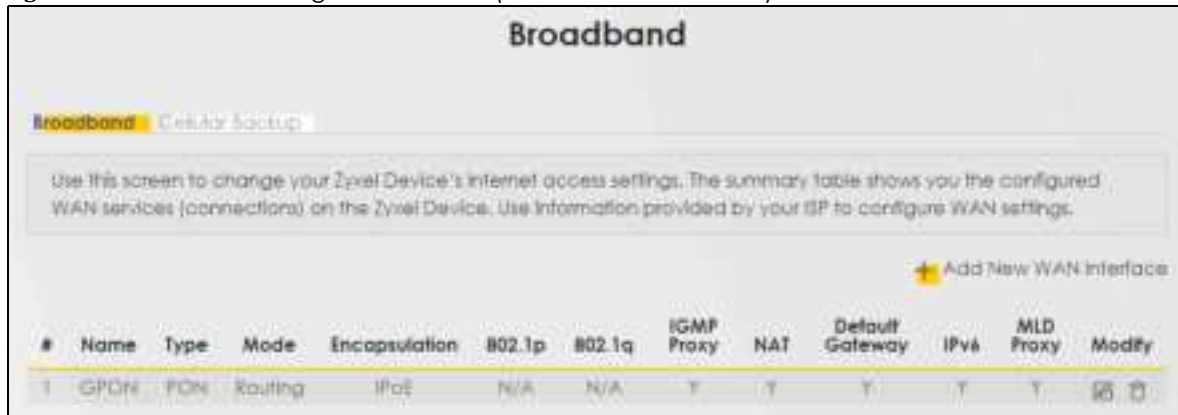
| LABEL                      | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| VCI [32–65535]             | The valid range for the VCI is 32 to 65535 (0 to 31 is reserved for local management of ATM traffic). Enter the VCI assigned to you.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Encapsulation              | <p>Select the method of multiplexing used by your ISP from the drop-down list box. Choices are:</p> <ul style="list-style-type: none"> <li>• <b>LCC/ SNAP BRIDGING:</b> In LCC encapsulation, bridged PDUs are encapsulated by identifying the type of the bridged media in the SNAP header.</li> <li>• <b>VC/ MUX:</b> In VC multiplexing, each protocol is carried on a single ATM virtual circuit (VC). To transport multiple protocols, the Zyxel Device needs separate VCs. There is a binding between a VC and the type of the network protocol carried on the VC. This reduces payload overhead since there is no need to carry protocol information in each Protocol Data Unit (PDU) payload.</li> </ul> |
| Service Category           | <p>Select <b>UBR Without PCR</b> for applications that are non-time sensitive, such as email.</p> <p>Select <b>CBR</b> (Continuous Bit Rate) to specify fixed (always-on) bandwidth for voice or data traffic.</p> <p>Select <b>Non Realtime VBR</b> (non real-time Variable Bit Rate) for connections that do not require closely controlled delay and delay variation.</p> <p>Select <b>Realtime VBR</b> (real-time Variable Bit Rate) for applications with bursty connections that require closely controlled delay and delay variation.</p>                                                                                                                                                                 |
| Peak Cell Rate [cells/s]   | Divide the DSL line rate (bps) by 424 (the size of an ATM cell) to find the Peak Cell Rate (PCR). This is the maximum rate at which the sender can send cells. Enter the PCR here. This is not available when you set the <b>Service Category</b> to <b>UBR Without PCR</b> .                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Sustainable Cell Rate      | The Sustain Cell Rate (SCR) sets the average cell rate (long-term) that can be transmitted. Enter the SCR, which must be less than the PCR. Note that system default is 0 cells/sec. This is not available when you set the <b>Service Category</b> to <b>UBR Without PCR</b> or <b>CBR</b> .                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Maximum Burst Size [cells] | Maximum Burst Size (MBS) refers to the maximum number of cells that can be sent at the peak rate. Enter the MBS, which is less than 65535. This is not available when you set the <b>Service Category</b> to <b>UBR Without PCR</b> or <b>CBR</b> .                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Cancel                     | Click <b>Cancel</b> to exit this screen without saving any changes.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Apply                      | Click <b>Apply</b> to save your changes.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |

## 7.3 Broadband Settings for Ethernet, AON and PON Routers

Use this screen to change your Zyxel Device's Internet access settings. The summary table shows you the configured WAN services (connections) on the Zyxel Device. Use information provided by your ISP to configure WAN settings.

Note: The differences of the broadband screens between Ethernet, AON and PON routers are the type of connections available.

Click **Network Setting > Broadband** to access this screen.

**Figure 118** Network Setting > Broadband (Ethernet Routers)**Figure 119** Network Setting > Broadband (AON and PON Routers)

The following table describes the labels in this screen.

**Table 57** Network Setting > Broadband

| Label                 | Description                                                                                                                                                   |
|-----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Add New WAN Interface | Click this button to create a new connection.                                                                                                                 |
| #                     | This is the index number of the entry.                                                                                                                        |
| Name                  | This is the service name of the connection.                                                                                                                   |
| Type                  | This displays the type of connections available.                                                                                                              |
| Mode                  | This shows whether the connection is in routing or bridge mode.                                                                                               |
| Encapsulation         | This is the method of encapsulation used by this connection.                                                                                                  |
| 802.1p                | This indicates the 802.1p priority level assigned to traffic sent through this connection. This displays <b>N/A</b> when there is no priority level assigned. |
| 802.1q                | This indicates the VLAN ID number assigned to traffic sent through this connection. This displays <b>N/A</b> when there is no VLAN ID number assigned.        |
| IGMP Proxy            | This shows whether the Zyxel Device act as an IGMP proxy on this connection.                                                                                  |
| NAT                   | This shows whether NAT is activated or not for this connection.                                                                                               |
| Default Gateway       | This shows whether the Zyxel Device use the WAN interface of this connection as the system default gateway.                                                   |
| IPv6                  | This shows whether IPv6 is activated or not for this connection. IPv6 is not available when the connection uses the bridging service.                         |

Table 57 Network Setting &gt; Broadband (continued)

| LABEL     | DESCRIPTION                                                                                                                                                        |
|-----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| MLD Proxy | This shows whether Multicast Listener Discovery (MLD) is activated or not for this connection. MLD is not available when the connection uses the bridging service. |
| Modify    | Click the <b>Edit</b> icon to configure the WAN connection.<br>Click the <b>Delete</b> icon to remove the WAN connection.                                          |

### 7.3.1 Add or Edit Internet Connection

Click **Add New WAN Interface** in the **Broadband** screen or the Edit icon next to an existing WAN interface to open the following screen. Use this screen to configure a WAN connection. The screen varies depending on the mode, encapsulation, and IPv6 or IPv4 mode you select.

#### Routing Mode

Use **Routing** mode if your ISP give you one IP address only and you want multiple computers to share an Internet account.

The following example screen displays when you select the **Routing** mode and **PPPoE** encapsulation. The screen varies when you select other encapsulation and IPv6 or IPv4 mode.

**Figure 120** Network Setting > Broadband > Add or Edit New WAN Interface (Ethernet Routers Routing Mode)

**Add New WAN Interface**

**General** ☒

Name:

Type:

Mode:

Encapsulation:

IPv4/IPv6 Mode:

**VLAN** ☒

VLAN ID:

VLAN ID:  (0-4095)

**MTU**

MTU:

**IP Address**

☒ Obtain an IP Address Automatically

☐ Static IP Address

**DNS Server**

☒ Obtain DNS Info Automatically

☐ Use Following Static DNS Address

**Routing Feature**

NAT ☒ IGMP Proxy ☒

Apply as Default Gateway ☐ Fullcone NAT ☐

**DHCP Options**

Request Options

☐ option 42 ☐ option 43 ☐ option 129 ☐ option 121

Send Options

☐ option 42

Vendor ID:

☐ option 43

IID:

☐ option 129

**IPv6 Address**

☒ Obtain an IPv6 Address Automatically

☐ Static IPv6 Address

**IPv6 DNS Server**

☒ Obtain IPv6 DNS Info Automatically

☐ Use Following Static IPv6 DNS Address

**IPv6 Routing Feature**

MLD Proxy ☒ Apply as Default Gateway ☒

**DHCPv6 Option**

IPv6 Address From DHCPv6 Server ☒ Other Information from DHCPv6 Server ☐

Cancel **Apply**

**Figure 121** Network Setting > Broadband > Add or Edit New WAN Interface (AON and PON Routers Routing Mode)

**Edit WAN interface**

**General** ☒

Name:   
 Type:   
 Mode:   
 Encapsulation:   
 IPv4/IPv6 Mode:

**PPP information**

PPP User Name:   
 PPP Password:   
 PPP Connection Trigger: ☒ Auto ☐ On Demand  
 PPPoE Passthrough: ☐

**VLAN** ☐

VLAN ID:   
 VLAN Name:

**MTU**

MTU:

**IP Address**

☒ Obtain IPv4 Address Automatically  
☐ Static IP Address

**DNS Server**

☒ Obtain DNS info Automatically  
☐ Use Following Static DNS Address

**Routing Feature**

NAT: ☒ IGMP Proxy: ☒  
 Apply as Default Gateway: ☒ Fullcone NAT: ☐

**IPv6 Address**

☐ Obtain IPv6 Address Automatically  
☒ Static IPv6 Address  
 IPv6 Address:   
 Prefix Length:

**IPv6 DNS Server**

☐ Obtain IPv6 DNS info Automatically  
☒ Use Following Static IPv6 DNS Address  
 Primary DNS Server:   
 Secondary DNS Server:

**IPv6 Routing Feature**

MLD Proxy: ☒ Apply as Default Gateway: ☒  
 IPv6 Address from DHCPv6 Server: ☐ Other Information from DHCPv6 Server: ☐

**DHCPv6 Option**

Cancel **Apply**

The following table describes the labels in this screen.

Table 58 Network Setting > Broadband > Add or Edit New WAN Interface (Routing Mode)

| LABEL                                                                                                    | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|----------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| General                                                                                                  | Click this switch to enable the WAN interface.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Name                                                                                                     | Specify a descriptive name for this connection. You can use up to 15 alphanumeric (0-9, a-z, A-Z) and special characters except [ " ], [ ` ], [ ' ], [ < ], [ > ], [ ^ ], [ \$ ], [   ], [ & ], or [ ; ]. Spaces are allowed.<br><br>This field is read-only is you are editing the WAN interface.                                                                                                                                                                                                                                                                                                                                  |
| Type                                                                                                     | This field shows <b>Ethernet</b> and indicates an Ethernet connection.<br><br>This field is read-only is you are editing the WAN interface.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Mode                                                                                                     | Select <b>Routing</b> if your ISP give you one IP address only and you want multiple computers to share an Internet account.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Encapsulation                                                                                            | Select the method of encapsulation used by your ISP from the drop-down list box. This option is available only when you select <b>Routing</b> in the <b>Mode</b> field.<br><br>The choices are <b>PPPoE</b> and <b>IPoE</b> .                                                                                                                                                                                                                                                                                                                                                                                                       |
| IPv4/IPv6 Mode                                                                                           | Select <b>IPv4 Only</b> if you want the Zyxel Device to run IPv4 only.<br><br>Select <b>IPv4 IPv6 DualStack</b> to allow the Zyxel Device to run IPv4 and IPv6 at the same time.<br><br>Select <b>IPv6 Only</b> if you want the Zyxel Device to run IPv6 only.                                                                                                                                                                                                                                                                                                                                                                      |
| PPP Information (This is available only when you select <b>PPPoE</b> in the <b>Encapsulation</b> field.) |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| PPP User Name                                                                                            | Enter the user name exactly as your ISP assigned. If assigned a name in the form user@domain where domain identifies a service name, then enter both components exactly as given.                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| PPP Password                                                                                             | Enter the password associated with the user name above. Select <b>password unmask</b> to show your entered password in plain text.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| PPP Connection Trigger                                                                                   | Select when to have the Zyxel Device establish the PPP connection.<br><br><b>Auto Connect</b> – select this to not let the connection time out.<br><br><b>On Demand</b> – select this to automatically bring up the connection when the Zyxel Device receives packets destined for the Internet.                                                                                                                                                                                                                                                                                                                                    |
| Idle Timeout                                                                                             | This value specifies the time in minutes that elapses before the router automatically disconnects from the PPPoE server.<br><br>This field is only available if you select <b>On Demand</b> in the <b>PPP Connection Trigger</b> field.                                                                                                                                                                                                                                                                                                                                                                                             |
| PPPoE Passthrough                                                                                        | This field is available when you select <b>PPPoE</b> encapsulation.<br><br>In addition to the Zyxel Device's built-in PPPoE client, you can enable PPPoE pass through to allow up to ten hosts on the LAN to use PPPoE client software on their computers to connect to the ISP through the Zyxel Device. Each host can have a separate account and a public WAN IP address.<br><br>PPPoE pass through is an alternative to NAT for application where NAT is not appropriate.<br><br>Disable PPPoE pass through if you do not need to allow hosts on the LAN to use PPPoE client software on their computers to connect to the ISP. |
| VLAN                                                                                                     | Click this switch to enable or disable VLAN on this WAN interface. When the switch goes to the right  , the function is enabled. Otherwise, it is not.                                                                                                                                                                                                                                                                                                                                                                                           |
| 802.1p                                                                                                   | IEEE 802.1p defines up to 8 separate traffic types by inserting a tag into a MAC-layer frame that contains bits to define class of service.<br><br>Select the IEEE 802.1p priority level (from 0 to 7) to add to traffic through this connection. The greater the number, the higher the priority level.                                                                                                                                                                                                                                                                                                                            |
| 802.1q                                                                                                   | Type the VLAN ID number (from 0 to 4094) for traffic through this connection.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| MTU                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |

Table 58 Network Setting &gt; Broadband &gt; Add or Edit New WAN Interface (Routing Mode) (continued)

| LABEL                                                                                                                                                                                    | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| MTU                                                                                                                                                                                      | Enter the MTU (Maximum Transfer Unit) size for traffic through this connection.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| IP Address (This is available only when you select <b>IPv4 Only</b> or <b>IPv4 IPv6 DualStack</b> in the <b>IPv4/IPv6 Mode</b> field.)                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Obtain an IP Address Automatically                                                                                                                                                       | A static IP address is a fixed IP that your ISP gives you. A dynamic IP address is not fixed; the ISP assigns you a different one each time you connect to the Internet. Select this if you have a dynamic IP address.                                                                                                                                                                                                                                                                                                                                                                                      |
| Static IP Address                                                                                                                                                                        | Select this option if the ISP assigned a fixed IP address.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| IP Address                                                                                                                                                                               | Enter the static IP address provided by your ISP.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Subnet Mask                                                                                                                                                                              | Enter the subnet mask provided by your ISP.<br><br>This is available only when you set the <b>Encapsulation</b> to <b>IPoE</b> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Gateway IP Address                                                                                                                                                                       | Enter the gateway IP address provided by your ISP.<br><br>This is available only when you set the <b>Encapsulation</b> to <b>IPoE</b> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| DNS Server (This is available only when you select <b>IPv4 Only</b> or <b>IPv4 IPv6 DualStack</b> in the <b>IPv4/IPv6 Mode</b> field.)                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|                                                                                                                                                                                          | Select <b>Obtain DNS Info Automatically</b> if you want the Zyxel Device to use the DNS server addresses assigned by your ISP.<br><br>Select <b>Use Following Static DNS Address</b> if you want the Zyxel Device to use the DNS server addresses you configure manually.                                                                                                                                                                                                                                                                                                                                   |
| Primary DNS Server                                                                                                                                                                       | Enter the first DNS server address assigned by the ISP.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Secondary DNS Server                                                                                                                                                                     | Enter the second DNS server address assigned by the ISP.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Routing Feature (This is available only when you select <b>IPv4 Only</b> or <b>IPv4 IPv6 DualStack</b> in the <b>IPv4/IPv6 Mode</b> field.)                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| NAT                                                                                                                                                                                      | Click this switch to activate or deactivate NAT on this connection. When the switch goes to the right  , the function is enabled. Otherwise, it is not.                                                                                                                                                                                                                                                                                                                                                                  |
| IGMP Proxy                                                                                                                                                                               | Internet Group Multicast Protocol (IGMP) is a network-layer protocol used to establish membership in a Multicast group - it is not used to carry user data.<br><br>Click this switch to have the Zyxel Device act as an IGMP proxy on this connection. When the switch goes to the right  , the function is enabled. Otherwise, it is not.<br><br>This allows the Zyxel Device to get subscribing information and maintain a joined member list for each multicast group. It can reduce multicast traffic significantly. |
| Apply as Default Gateway                                                                                                                                                                 | Click this switch to have the Zyxel Device use the WAN interface of this connection as the system default gateway. When the switch goes to the right  , the function is enabled. Otherwise, it is not.                                                                                                                                                                                                                                                                                                                   |
| Fullcone NAT Enable                                                                                                                                                                      | Click this switch to enable or disable full cone NAT on this connection. When the switch goes to the right  , the function is enabled. Otherwise, it is not.<br><br>This field is available only when you activate <b>NAT</b> .<br><br>In full cone NAT, the Zyxel Device maps all outgoing packets from an internal IP address and port to a single IP address and port on the external network. The Zyxel Device also maps packets coming to that external IP address and port to the internal IP address and port.    |
| DHCP Options (This is available only when you set the <b>Encapsulation</b> to <b>IPoE</b> and select <b>IPv4 Only</b> or <b>IPv4 IPv6 DualStack</b> in the <b>IPv4/IPv6 Mode</b> field.) |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Note: The available DHCP options may differ by model.                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |

Table 58 Network Setting &gt; Broadband &gt; Add or Edit New WAN Interface (Routing Mode) (continued)

| LABEL                                                                                                                                                                                                           | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Request Options                                                                                                                                                                                                 | <p>Select <b>Option 42</b> to have the Zyxel Device get NTP time server information from DHCP packets sent from the DHCP server.</p> <p>Select <b>Option 43</b> to have the Zyxel Device get vendor specific information from DHCP packets sent from the DHCP server.</p> <p>Select <b>Option 120</b> to have the Zyxel Device get static route information from DHCP packets sent from the DHCP server.</p> <p>Select <b>Option 121</b> to have the Zyxel Device get SIP server information from DHCP packets sent from the DHCP server.</p> |
| Sent Options                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| option 60                                                                                                                                                                                                       | Select this and enter the device identity you want the Zyxel Device to add in the DHCP discovery packets that go to the DHCP server.                                                                                                                                                                                                                                                                                                                                                                                                          |
| Vendor ID                                                                                                                                                                                                       | Enter the Vendor Class Identifier, such as the type of the hardware or firmware.                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| option 61                                                                                                                                                                                                       | Select this and enter any string that identifies the device.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| IAID                                                                                                                                                                                                            | Enter the Identity Association Identifier (IAID) of the device, for example, the WAN connection index number.                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| DUID                                                                                                                                                                                                            | Enter the hardware type, a time value and the MAC address of the device.                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| option 125                                                                                                                                                                                                      | Select this to have the Zyxel Device automatically generate and add vendor specific parameters in the DHCP discovery packets that go to the DHCP server.                                                                                                                                                                                                                                                                                                                                                                                      |
| IPv6 Address (This is available only when you select <b>IPv4 IPv6 DualStack</b> or <b>IPv6 Only</b> in the <b>IPv4/IPv6 Mode</b> field.)                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Obtain an IPv6 Address Automatically                                                                                                                                                                            | Select <b>Obtain an IPv6 Address Automatically</b> if you want to have the Zyxel Device use the IPv6 prefix from the connected router's Router Advertisement (RA) to generate an IPv6 address.                                                                                                                                                                                                                                                                                                                                                |
| Static IPv6 Address                                                                                                                                                                                             | Select <b>Static IPv6 Address</b> if you have a fixed IPv6 address assigned by your ISP. When you select this, the following fields appear.                                                                                                                                                                                                                                                                                                                                                                                                   |
| IPv6 Address                                                                                                                                                                                                    | Enter an IPv6 IP address that your ISP gave to you for this WAN interface.                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Prefix Length                                                                                                                                                                                                   | Enter the address prefix length to specify how many most significant bits in an IPv6 address compose the network address.                                                                                                                                                                                                                                                                                                                                                                                                                     |
| IPv6 Default Gateway                                                                                                                                                                                            | Enter the IP address of the next-hop gateway. The gateway is a router or switch on the same segment as your Zyxel Device's interfaces. The gateway helps forward packets to their destinations.                                                                                                                                                                                                                                                                                                                                               |
| IPv6 DNS Server (This is available only when you select <b>IPv4 IPv6 DualStack</b> or <b>IPv6 Only</b> in the <b>IPv4/IPv6 Mode</b> field. Configure the IPv6 DNS server in the following section.)             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Obtain IPv6 DNS Info Automatically                                                                                                                                                                              | Select <b>Obtain IPv6 DNS Info Automatically</b> to have the Zyxel Device get the IPv6 DNS server addresses from the ISP automatically.                                                                                                                                                                                                                                                                                                                                                                                                       |
| Use Following Static IPv6 DNS Address                                                                                                                                                                           | Select <b>Use Following Static IPv6 DNS Address</b> to have the Zyxel Device use the IPv6 DNS server addresses you configure manually.                                                                                                                                                                                                                                                                                                                                                                                                        |
| Primary DNS Server                                                                                                                                                                                              | Enter the first IPv6 DNS server address assigned by the ISP.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Secondary DNS Server                                                                                                                                                                                            | Enter the second IPv6 DNS server address assigned by the ISP.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| IPv6 Routing Feature (This is available only when you select <b>IPv4 IPv6 DualStack</b> or <b>IPv6 Only</b> in the <b>IPv4/IPv6 Mode</b> field. You can enable IPv6 routing features in the following section.) |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| MLD Proxy Enable                                                                                                                                                                                                | Select this checkbox to have the Zyxel Device act as an MLD proxy on this connection. This allows the Zyxel Device to get subscription information and maintain a joined member list for each multicast group. It can reduce multicast traffic significantly.                                                                                                                                                                                                                                                                                 |
| Apply as Default Gateway                                                                                                                                                                                        | Select this option to have the Zyxel Device use the WAN interface of this connection as the system default gateway.                                                                                                                                                                                                                                                                                                                                                                                                                           |



Table 58 Network Setting &gt; Broadband &gt; Add or Edit New WAN Interface (Routing Mode) (continued)

| LABEL                                                                                                                                                                                                                                                                                                                 | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                              |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| DS-Lite                                                                                                                                                                                                                                                                                                               | <p>This is available only when you select <b>IPv6 Only</b> in the <b>IPv4/IPv6 Mode</b> field. Enable Dual Stack Lite to let local computers use IPv4 through an ISP's IPv6 network. See <a href="#">Dual Stack Lite on page 198</a> for more information.</p> <p>Click this switch to enable DS-Lite to let local computers use IPv4 through an ISP's IPv6 network.</p> |
| DS-Lite Relay Server IP                                                                                                                                                                                                                                                                                               | Specify the transition router's IPv6 address.                                                                                                                                                                                                                                                                                                                            |
| <p>6RD</p> <p>The 6RD (IPv6 rapid deployment) fields display when you set the <b>IPv6/IPv4 Mode</b> field to <b>IPv4 Only</b>. See <a href="#">IPv6 Rapid Deployment on page 198</a> for more information.</p> <p>Click this switch to tunnel IPv6 traffic from the local network through the ISP's IPv4 network.</p> |                                                                                                                                                                                                                                                                                                                                                                          |
|                                                                                                                                                                                                                                                                                                                       | <p>Select <b>Manually Configured</b> if you have the IPv4 address of the relay server. Otherwise, select <b>Automatically configured by DHCP</b> to have the Zyxel Device detect it automatically through DHCP.</p> <p>The <b>Automatically configured by DHCP</b> option is configurable only when you set the method of encapsulation to <b>IPoE</b>.</p>              |
| Service Provider IPv6 Prefix                                                                                                                                                                                                                                                                                          | Enter an IPv6 prefix for tunneling IPv6 traffic to the ISP's border relay router and connecting to the native IPv6 Internet.                                                                                                                                                                                                                                             |
| IPv4 Mask Length                                                                                                                                                                                                                                                                                                      | Enter the subnet mask number (1 – 32) for the IPv4 network.                                                                                                                                                                                                                                                                                                              |
| Border Relay IPv4 Address                                                                                                                                                                                                                                                                                             | When you select <b>Manually Configured</b> , specify the relay server's IPv4 address in this field.                                                                                                                                                                                                                                                                      |
| DHCPv6 Option (This is available only when you select <b>IPv6 Only</b> or <b>IPv4 IPv6 DualStack</b> in the <b>IPv4/IPv6 Mode</b> field.)                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                          |
| IPv6 Address From DHCPv6 Server                                                                                                                                                                                                                                                                                       | Click the switch (to the right) to let the Zyxel Device send DHCP requests to the DHCPv6 server to obtain an IPv6 address.                                                                                                                                                                                                                                               |
| Other Information From DHCPv6 Server                                                                                                                                                                                                                                                                                  | <p>Click the switch (to the right) to have the Zyxel Device get other information, such as DNS information, from DHCPv6 packets sent from the DHCPv6 server.</p> <p>This will be enabled if <b>IPv6 Address From DHCPv6 Server</b> is enabled.</p>                                                                                                                       |
| Cancel                                                                                                                                                                                                                                                                                                                | Click <b>Cancel</b> to restore your previously saved settings.                                                                                                                                                                                                                                                                                                           |
| Apply                                                                                                                                                                                                                                                                                                                 | Click <b>Apply</b> to save your changes.                                                                                                                                                                                                                                                                                                                                 |

## Bridge Mode

Click the **Add new WAN Interface** in the **Network Setting > Broadband** screen or the **Edit** icon next to the connection you want to configure. The following example screen displays when you select **Bridge** mode.

**Figure 122** Network Setting > Broadband > Add or Edit New WAN Interface (Bridge Mode)

The following table describes the fields in this screen.

**Table 59** Network Setting > Broadband > Add or Edit New WAN Interface (Bridge Mode)

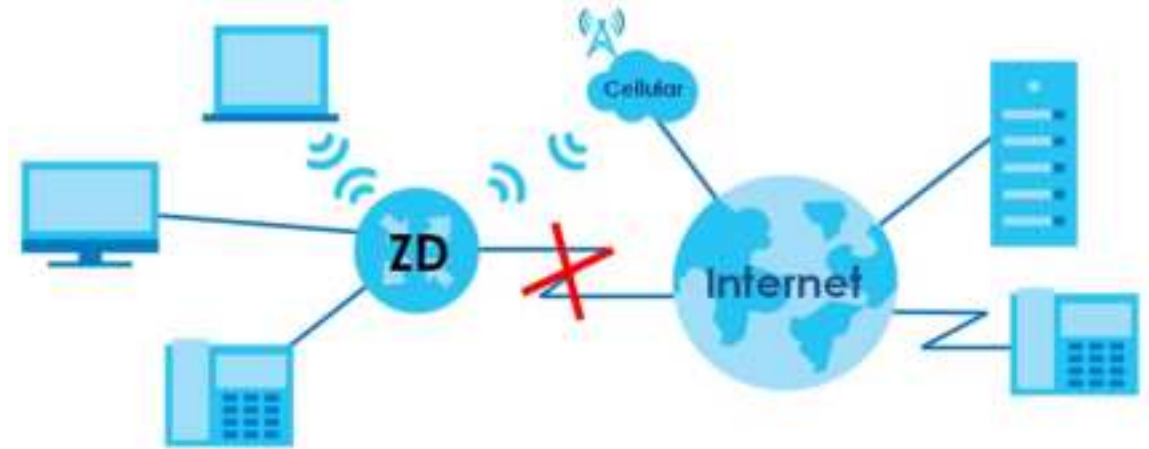
| LABEL   | DESCRIPTION                                                                                                                                                                                                                                                                                                                    |
|---------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| General | Click this switch to enable the interface.                                                                                                                                                                                                                                                                                     |
| Name    | Enter a service name of the connection. You can use up to 15 alphanumeric (0-9, a-z, A-Z) and special characters except [ " ], [ ` ], [ ' ], [ < ], [ > ], [ ^ ], [ \$ ], [   ], [ & ], or [ ; ]. Spaces are allowed.<br>This field is read-only is you are editing the WAN interface.                                         |
| Type    | This field shows <b>Ethernet</b> and indicates an Ethernet connection.<br>This field is read-only is you are editing the WAN interface.                                                                                                                                                                                        |
| Mode    | Select <b>Bridge</b> when your ISP provides you more than one IP address and you want the connected computers to get individual IP address from ISP's DHCP server directly. If you select <b>Bridge</b> , you cannot use routing functions, such as QoS, Firewall, DHCP server and NAT on traffic from the selected LAN ports. |
| VLAN    | Click this switch to enable VLAN on this WAN interface.                                                                                                                                                                                                                                                                        |
| 802.1p  | IEEE 802.1p defines up to 8 separate traffic types by inserting a tag into a MAC-layer frame that contains bits to define class of service.<br>Select the IEEE 802.1p priority level (from 0 to 7) to add to traffic through this connection. The greater the number, the higher the priority level.                           |
| 802.1q  | Type the VLAN ID number (from 0 to 4094) for traffic through this connection.                                                                                                                                                                                                                                                  |
| MTU     |                                                                                                                                                                                                                                                                                                                                |
| MTU     | Enter the MTU (Maximum Transfer Unit) size for traffic through this connection.                                                                                                                                                                                                                                                |
| Cancel  | Click <b>Cancel</b> to exit this screen without saving any changes.                                                                                                                                                                                                                                                            |
| Apply   | Click <b>Apply</b> to save your changes.                                                                                                                                                                                                                                                                                       |

## 7.4 Cellular Backup

The USB port of the Zyxel Device allows you to attach a cellular dongle to wirelessly connect to a cellular network for Internet access. You can have the Zyxel Device use the cellular WAN connection as a

backup to keep you online if the primary WAN connection fails for **Consecutive Fail** times. Consult your cellular service provider to configure the settings in this screen. Disconnect the Fiber port to use the cellular dongle as your primary WAN connection, as the Zyxel Device automatically uses a wired WAN connection when available.

**Figure 123** Internet Access Application: Cellular WAN



Use this screen to configure your cellular settings. Click **Network Setting > Broadband > Cellular Backup**.

The actual data rate you obtain varies depending on the cellular card you use, the signal strength to the service provider's base station, and so on.

Note: Entering a wrong PIN code three times will lock the SIM card in your cellular dongle.

Note: If you select **Drop** in the **Current Cellular Connection** field, the Zyxel Device will drop the cellular WAN connection when the **Time Budget** or **Data Budget** is reached. It may take some time for the cellular WAN connection to be disconnected when the **Time Budget** or **Data Budget** is reached.

**Figure 124** Network Setting > Broadband > Cellular Backup

The USB-port of the Zyxel Device allows you to attach a cellular dongle to wirelessly connect to a cellular network for internet access. You can have the Zyxel Device use the cellular WAN connection as a backup to keep you online if the primary WAN connection fails for **Consecutive Fail** times. Consult your cellular service provider to configure the settings in this screen. Disconnect the DSL/Ethernet/Fiber WAN ports to use the cellular dongle as your primary WAN connection, as the Zyxel Device automatically uses a wired WAN connection when available.

### General

Cellular Backup ☒

Ping Check ☒

Check Cycle: Every  (30-180 Sec)

Consecutive Fail  (2-3 times)

☐ Ping Default Gateway

☒ Ping Host  (Host name or IP address)

### Cellular Connection Settings

Card Description: N/A

Username  (Optional)

Password  (Optional)

Authentication: Auto ▼

PIN  (Optional) (Only for unlock PIN need time)  
(PIN remaining authentication times)

Dial String

APN

Connection:  ▼

☒ Obtain IP Address Automatically

☐ Use the Following Static IP Address

☒ Obtain DNS Info Dynamically

☐ Use the Following Static DNS IP Address

Enable e-mail Notification ☐

Note  
Entering a wrong PIN code three times will lock the SIM card in your cellular dongle.

**Figure 125** Network > Broadband > Cellular Backup (Budget Setup)

**Budget Setup**

Enable Budget Control ☒

☐ Time Budget: 0 hours per month

☐ Data Budget: 0 Mbytes Download/Upload per month

☐ Data Budget: 0 kPackets Download/Upload per month

Reset all budget counters on last day of the month

**Reset time and data budget counters**

Actions before over budget

☐ Data Budget: 0 % of time budget

☐ Data Budget: 0 % of data budget (Mbytes)

☐ Data Budget: 0 % of data budget (Packets)

Actions when over budget

Current Cellular Connection: Keep

Actions

Enable e-mail Notification ☒

☐ Enable Log Interval: 0 minutes

**Note**

If you select **Drop** in the **Current Cellular Connection** field, the will drop the Zyxel Device cellular WAN connection when the **Time Budget** or **Data Budget** is reached. It may take some time for the cellular WAN connection to be disconnected when the **Time Budget** or **Data Budget** is reached.

**Cancel** **Apply**

The following table describes the labels in this screen.

**Table 60** Network Setting > Broadband > Cellular Backup

| LABEL           | DESCRIPTION                                                                                                                                                                                   |
|-----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| General         |                                                                                                                                                                                               |
| Cellular Backup | Click this switch to have the Zyxel Device use the cellular connection as your WAN or a backup when the wired WAN connection fails.                                                           |
| Ping Check      | Click this switch to ping check the connection status of your WAN.<br>You can configure the frequency of the ping check and number of consecutive failures before triggering cellular backup. |
| Check Cycle     | Enter the frequency of the ping check in this field.                                                                                                                                          |

Table 60 Network Setting &gt; Broadband &gt; Cellular Backup (continued)

| Label                               | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|-------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Consecutive Fail                    | Enter how many consecutive failures are required before cellular backup is triggered.                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Ping Default Gateway                | Select this to have the Zyxel Device ping the WAN interface's default gateway IP address.                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Ping Host                           | Select this to have the Zyxel Device ping the particular host name or IP address you typed in this field.                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Cellular Connection Settings        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Card Description                    | This field displays the manufacturer and model name of your cellular card if you inserted one in the Zyxel Device. Otherwise, it displays <b>N/A</b> .                                                                                                                                                                                                                                                                                                                                                                                          |
| Username                            | Enter the user name (of up to 64 alphanumeric (0-9, a-z, A-Z) and special characters, including spaces) given to you by your service provider.                                                                                                                                                                                                                                                                                                                                                                                                  |
| Password                            | Enter the password (of up to 64 alphanumeric (0-9, a-z, A-Z) and special characters, including spaces) associated with the user name above.                                                                                                                                                                                                                                                                                                                                                                                                     |
| Authentication                      | The Zyxel Device supports PAP (Password Authentication Protocol) and CHAP (Challenge Type Handshake Authentication Protocol). In PAP, peers identify themselves with a user name and password. In CHAP, additionally to user name and password the Zyxel Device sends regular challenges to make sure an intruder has not replaced a peer. CHAP is more secure than PAP; however, PAP is available on more platforms. Select an authentication protocol (Auto, CHAP or PAP). Contact your service provider for the correct authentication type. |
| PIN                                 | <p>A PIN (Personal Identification Number) code is a key to a cellular card. Without the PIN code, you cannot use the cellular card.</p> <p>If your ISP enabled PIN code authentication, enter the 4-digit PIN code (0000 for example) provided by your ISP. If you enter the PIN code incorrectly, the cellular card may be blocked by your ISP and you cannot use the account to access the Internet.</p> <p>If your ISP disabled PIN code authentication, leave this field blank.</p>                                                         |
| Dial String                         | <p>Enter the phone number (dial string) used to dial up a connection to your service provider's base station. Your ISP should provide the phone number.</p> <p>For example, *99# is the dial string to establish a GPRS or cellular connection in Taiwan.</p>                                                                                                                                                                                                                                                                                   |
| APN                                 | <p>Enter the APN (Access Point Name) provided by your service provider. Connections with different APNs may provide different services (such as Internet access or MMS (Multi-Media Messaging Service)) and charge method.</p> <p>You can enter up to 32 printable characters except [ " ], [ ` ], [ ' ], [ &lt; ], [ &gt; ], [ ^ ], [ \$ ], [   ], [ &amp; ], or [ ; ]. Spaces are allowed.</p>                                                                                                                                                |
| Connection                          | <p>Select <b>Naïled UP</b> if you do not want the connection to time out.</p> <p>Select <b>On Demand</b> if you do not want the connection up all the time and specify an idle time-out in the <b>Max Idle Time out</b> field.</p>                                                                                                                                                                                                                                                                                                              |
| Max Idle Timeout                    | This value specifies the time in minutes that elapses before the Zyxel Device automatically disconnects from the ISP.                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Obtain an IP Address Automatically  | Select this option if your ISP did not assign you a fixed IP address.                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Use the Following Static IP Address | Select this option if the ISP assigned a fixed IP address.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| IP Address                          | Enter your WAN IP address in this field if you selected <b>Use the following static IP address</b> .                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Subnet Mask                         | Enter the subnet mask of the IP address.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Obtain DNS Info Dynamically         | Select this to have the Zyxel Device get the DNS server addresses from the ISP automatically.                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

Table 60 Network Setting &gt; Broadband &gt; Cellular Backup (continued)

| Label                                                                                                                                       | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|---------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Use the Following Static DNS IP Address                                                                                                     | Select this to have the Zyxel Device use the DNS server addresses you configure manually.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Primary DNS Server                                                                                                                          | Enter the first DNS server address assigned by the ISP.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Secondary DNS Server                                                                                                                        | Enter the second DNS server address assigned by the ISP.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Enable e-mail Notification                                                                                                                  | Select this to enable the email notification function. The Zyxel Device will email you a notification when the cellular connection is up.                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Mail Account                                                                                                                                | Select an email address you have configured in <b>Maintenance &gt; E-mail Notification</b> . The Zyxel Device uses the corresponding mail server to send notifications.<br><br>You must have configured a mail server already in the <b>Maintenance &gt; E-mail Notification</b> screen.                                                                                                                                                                                                                                                                                                    |
| Cellular Backup e-mail Title                                                                                                                | Enter a title that you want to be in the subject line of the email notifications that the Zyxel Device sends.                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Send Notification to E-mail                                                                                                                 | Notifications are sent to the email address specified in this field. If this field is left blank, notifications cannot be sent through email.                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Click this  to show the advanced cellular backup settings. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Budget Setup                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Enable Budget Control                                                                                                                       | Click this switch to set a monthly limit for the user account of the installed cellular card.<br><br>You can set a limit on the total traffic and/or call time. The Zyxel Device takes the actions you specified when a limit is exceeded during the month.                                                                                                                                                                                                                                                                                                                                 |
| Time Budget                                                                                                                                 | Select this and specify the amount of time (in hours) that the cellular connection can be used within one month. If you change the value after you configure and enable budget control, the Zyxel Device resets the statistics.                                                                                                                                                                                                                                                                                                                                                             |
| Data Budget (Mbytes)                                                                                                                        | Select this and specify how much downstream and/or upstream data (in Mega bytes) can be transmitted through the cellular connection within one month.<br><br>Select <b>Download/ Upload</b> to set a limit on the total traffic in both directions.<br><br>Select <b>Download</b> to set a limit on the downstream traffic (from the ISP to the Zyxel Device).<br><br>Select <b>Upload</b> to set a limit on the upstream traffic (from the Zyxel Device to the ISP).<br><br>If you change the value after you configure and enable budget control, the Zyxel Device resets the statistics. |
| Data Budget (kPackets)                                                                                                                      | Select this and specify how much downstream and/or upstream data (in k Packets) can be transmitted through the cellular connection within one month.<br><br>Select <b>Download/ Upload</b> to set a limit on the total traffic in both directions.<br><br>Select <b>Download</b> to set a limit on the downstream traffic (from the ISP to the Zyxel Device).<br><br>Select <b>Upload</b> to set a limit on the upstream traffic (from the Zyxel Device to the ISP).<br><br>If you change the value after you configure and enable budget control, the Zyxel Device resets the statistics.  |
| Reset all budget counters on                                                                                                                | Select the date on which the Zyxel Device resets the budget every month. Select <b>last</b> if you want the Zyxel Device to reset the budget on the last day of the month. Select <b>specific</b> and enter the number of the date you want the Zyxel Device to reset the budget.                                                                                                                                                                                                                                                                                                           |
| Reset time and data budget counters                                                                                                         | Click this button to reset the time and data budgets immediately. The count starts over with the cellular connection's full configured monthly time and data budgets. This does not affect the normal monthly budget restart; so if you configured the time and data budget counters to reset on the second day of the month and you use this button on the first, the time and data budget counters will still reset on the second.                                                                                                                                                        |

Table 60 Network Setting &gt; Broadband &gt; Cellular Backup (continued)

| Label                                                                       | Description                                                                                                                                                                                                                                                                          |
|-----------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Actions before over budget                                                  | Specify the actions the Zyxel Device takes before the time or data limit exceeds.                                                                                                                                                                                                    |
| Data Budget<br>% of time budget/data budget (Mbytes)/data budget (kPackets) | Select the checkboxes and enter a number from 1 to 99 in the percentage fields. If you change the value after you configure and enable budget control, the Zyxel Device resets the statistics.                                                                                       |
| Actions when over budget                                                    | Specify the actions the Zyxel Device takes when the time or data limit is exceeded.                                                                                                                                                                                                  |
| Current Cellular Connection                                                 | Select <b>Keep</b> to maintain an existing cellular connection or <b>Drop</b> to disconnect it.                                                                                                                                                                                      |
| Actions                                                                     |                                                                                                                                                                                                                                                                                      |
| Enable e-mail Notification                                                  | Click this switch to enable the email notification function.<br>The Zyxel Device will email you a notification whenever over budget occurs.                                                                                                                                          |
| Mail Account                                                                | Select an email address you have configured in <b>Maintenance &gt; E-mail Notification</b> . The Zyxel Device uses the corresponding mail server to send notifications.<br>You must have configured a mail server already in the <b>Maintenance &gt; E-mail Notification</b> screen. |
| Cellular Backup e-mail Title                                                | Enter a title that you want to be in the subject line of the email notifications that the Zyxel Device sends.                                                                                                                                                                        |
| Send Notification to E-mail                                                 | Notifications are sent to the email address specified in this field. If this field is left blank, notifications cannot be sent through email.                                                                                                                                        |
| Enable Log: Interval                                                        | Select this to and enter the <b>Interval</b> of how many minutes (1 – 9999) you want the Zyxel Device to email you.                                                                                                                                                                  |
| Cancel                                                                      | Click <b>Cancel</b> to discard any changes to the settings.                                                                                                                                                                                                                          |
| Apply                                                                       | Click <b>Apply</b> to save your changes.                                                                                                                                                                                                                                             |

## 7.5 Broadband Advanced Screen for DSL Routers

Use the **Advanced** screen to enable or disable ADSL over PTM, Annex M, DSL PhyR, and SRA (Seamless Rate Adaptation) functions. The Zyxel Device supports the PhyR retransmission scheme. PhyR is a retransmission scheme designed to provide protection against noise on the DSL line. It improves voice, video and data transmission resilience by utilizing a retransmission buffer. It also lists ITU-T G.993.2 standard VDSL profiles you can comply with.

ITU-T G.993.2 standard defines a wide range of settings for various parameters, some of which are encompassed in profiles as shown in the next table.

Note: This features is not available on all models. See [Section 1.1 on page 20](#) for more information.



Note: If the settings in the screen are changed, the Zyxel Device will re-establish the DSL connections.

Table 61 VDSL Profiles

| PRO FILE | BANDWIDTH<br>(MHZ) | NUMBER OF<br>DOWNSTREAM<br>CARRIERS | CARRIER<br>BANDWIDTH<br>(KHZ) | POWER (DBM) | MAX.<br>DOWNSTREAM<br>THROUGHPUT<br>(MBIT/ S) |
|----------|--------------------|-------------------------------------|-------------------------------|-------------|-----------------------------------------------|
| 8a       | 8.832              | 2048                                | 4.3125                        | 17.5        | 50                                            |
| 8b       | 8.832              | 2048                                | 4.3125                        | 20.5        | 50                                            |
| 8c       | 8.5                | 1972                                | 4.3125                        | 11.5        | 50                                            |
| 8d       | 8.832              | 2048                                | 4.3125                        | 14.5        | 50                                            |
| 12a      | 12                 | 2783                                | 4.3125                        | 14.5        | 68                                            |
| 12b      | 12                 | 2783                                | 4.3125                        | 14.5        | 68                                            |
| 17a      | 17.664             | 4096                                | 4.3125                        | 14.5        | 100                                           |
| 35a      | 30.000             | 3479                                | 4.3125                        | 14.5        | 100                                           |
| 35b      | 35.328             | 8192                                | 4.3125                        | 17.0        | 300                                           |

Click **Network Setting > Broadband > Advanced** to display the following screen.

**Figure 126** Network Setting > Broadband > Advanced

## Broadband

Broadband Cellular Backup **Advanced**

Use the **Advanced** screen to enable or disable ADSL over PTM, Annex M, DSL PHY, and SRA (Variable Rate Adaptation) functions. The Zyxel Device supports the PHY retransmission scheme. PHY is a retransmission scheme designed to provide protection against noise on the DSL line. It improves voice, video and data transmission resilience by utilizing a retransmission buffer. It also lets ITU-T G.993.2 standard VDSL profiles you can comply with.

### DSL Capabilities

|         |                                     |
|---------|-------------------------------------|
| PHY LL  | <input type="checkbox"/>            |
| PHY DL  | <input checked="" type="checkbox"/> |
| Flowcap | <input checked="" type="checkbox"/> |
| SRA     | <input checked="" type="checkbox"/> |

### DSL Modulation

|               |                                     |
|---------------|-------------------------------------|
| PTM over ADSL | <input checked="" type="checkbox"/> |
| G.dmt         | <input checked="" type="checkbox"/> |
| G.97x         | <input checked="" type="checkbox"/> |
| T1.413        | <input checked="" type="checkbox"/> |
| ADSL2         | <input checked="" type="checkbox"/> |
| Annex L       | <input checked="" type="checkbox"/> |
| ADSL2+        | <input checked="" type="checkbox"/> |
| Annex M       | <input checked="" type="checkbox"/> |
| VDSL2         | <input checked="" type="checkbox"/> |

### VDSL Profile

|            |                                     |
|------------|-------------------------------------|
| 8a Enable  | <input checked="" type="checkbox"/> |
| 8b Enable  | <input checked="" type="checkbox"/> |
| 8c Enable  | <input checked="" type="checkbox"/> |
| 8d Enable  | <input checked="" type="checkbox"/> |
| 12a Enable | <input checked="" type="checkbox"/> |
| 12b Enable | <input checked="" type="checkbox"/> |
| 17a Enable | <input checked="" type="checkbox"/> |
| 30a Enable | <input type="checkbox"/>            |
| 30b Enable | <input checked="" type="checkbox"/> |
| US0        | <input checked="" type="checkbox"/> |

Cancel **Apply**

The following table describes the labels in this screen.

Table 62 Network Setting > Broadband > Advanced

| LABEL            | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| DSL Capabilities |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| PhyR US          | Enable or disable <b>PhyR US</b> (upstream) for upstream transmission to the WAN. PhyR US should be enabled if data being transmitted upstream is sensitive to noise. However, enabling PhyR US can decrease the US line rate. Enabling or disabling PhyR will require the CPE to retrain. For PhyR to function, the DSLAM must also support PhyR and have it enabled.                                                                                                                                                                            |
| PhyR DS          | Enable or disable <b>PhyR DS</b> (downstream) for downstream transmission from the WAN. PhyR DS should be enabled if data being transmitted downstream is sensitive to noise. However, enabling PhyR DS can decrease the DS line rate. Enabling or disabling PhyR will require the CPE to retrain. For PhyR to function, the DSLAM must also support PhyR and have it enabled.                                                                                                                                                                    |
| PhyR US/DS       | Enable or disable <b>PhyR US/ DS</b> (upstream/downstream) for both upstream and downstream transmission to the WAN. PhyR US should be enabled if data being transmitted upstream is sensitive to noise. However, enabling PhyR US can decrease the US line rate. Enabling or disabling PhyR will require the CPE to retrain. For PhyR to function, the DSLAM must also support PhyR and have it enabled.                                                                                                                                         |
| Bitswap          | Select <b>Enable</b> to allow the Zyxel Device to adapt to line changes when you are using G.dmt.<br>Bit-swapping is a way of keeping the line more stable by constantly monitoring and redistributing bits between channels.                                                                                                                                                                                                                                                                                                                     |
| SRA              | Enable or disable Seamless Rate Adaption (SRA). Select <b>Enable</b> to have the Zyxel Device automatically adjust the connection's data rate according to line conditions without interrupting service.                                                                                                                                                                                                                                                                                                                                          |
| DSL Modulation   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| PTM over ADSL    | Select <b>Enable</b> to use PTM over ADSL. Since PTM has less overhead than ATM, some ISPs use this for better performance.                                                                                                                                                                                                                                                                                                                                                                                                                       |
| G.Dmt            | ITU G.992.1 (better known as G.dmt) is an ITU standard for ADSL using discrete multitone modulation. G.dmt full-rate ADSL expands the usable bandwidth of existing copper telephone lines, delivering high-speed data communications at rates up to 8 Mbit/s downstream and 1.3 Mbit/s upstream.                                                                                                                                                                                                                                                  |
| G.lite           | ITU G.992.2 (better known as G.lite) is an ITU standard for ADSL using discrete multitone modulation. G.lite does not strictly require the use of DSL filters, but like all variants of ADSL generally functions better with splitters.                                                                                                                                                                                                                                                                                                           |
| T1.413           | ANSI T1.413 is a technical standard that defines the requirements for the single asymmetric digital subscriber line (ADSL) for the interface between the telecommunications network and the customer installation in terms of their interaction and electrical characteristics.                                                                                                                                                                                                                                                                   |
| ADSL2            | It optionally extends the capability of basic ADSL in data rates to 12 Mbit/s downstream and, depending on Annex version, up to 3.5 Mbit/s upstream (with a mandatory capability of ADSL2 transceivers of 8 Mbit/s downstream and 800 kbit/s upstream).                                                                                                                                                                                                                                                                                           |
| Annex L          | Annex L is an optional specification in the ITU-T ADSL2 recommendation G.992.3 titled Specific requirements for a Reach Extended ADSL2 (READSL2) system operating in the frequency band above POTS, therefore it is often referred to as Reach Extended ADSL2 or READSL2. The main difference between this specification and commonly deployed Annex A is the maximum distance that can be used. The power of the lower frequencies used for transmitting data is boosted up to increase the reach of this signal up to 7 kilometers (23,000 ft). |
| ADSL2+           | ADSL2+ extends the capability of basic ADSL by doubling the number of downstream channels. The data rates can be as high as 24 Mbit/s downstream and up to 1.4 Mbit/s upstream depending on the distance from the DSLAM to the customer's premises.                                                                                                                                                                                                                                                                                               |
| Annex M          | Annex M is an optional specification in ITU-T recommendations G.992.3 (ADSL2) and G.992.5 (ADSL2+), also referred to as ADSL2 M and ADSL2+ M. This specification extends the capability of commonly deployed Annex A by more than doubling the number of upstream bits. The data rates can be as high as 12 or 24 Mbit/s downstream and 3 Mbit/s upstream depending on the distance from the DSLAM to the customer's premises.                                                                                                                    |

Table 62 Network Setting &gt; Broadband &gt; Advanced (continued)

| LABEL                                       | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|---------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Annex M/J                                   | Annex M and Annex J are specified in ITU-T recommendations G.992.3 (ADSL2) and G.992.5 (ADSL2+). Annex M and Annex J enhance the capabilities of Annex A and Annex B by increasing the upstream transmission data rate, but slightly reduce the downstream data rates as a trade-off. Annex M supports data rates of up to 12 Mbit/s downstream and 3.5 Mbit/s upstream for ADSL2, and up to 24 Mbit/s downstream and 2.5 Mbit/s upstream for ADSL2+. Annex J supports data rates of up to 12 Mbit/s downstream and 3.5 Mbit/s upstream for ADSL2, and up to 24 Mbit/s downstream and 3.5 Mbit/s upstream for ADSL2+. However, the actual downstream/upstream data rates depend on the distance from the ISP DSLAM to the Zyxel Device and the quality of your telephone line. Click the switch to enable the Zyxel Device to use Annex M for Zyxel Device models that use POTS WAN connection, and use Annex J for Zyxel Device models that use ISDN WAN connection. |
| VDSL2                                       | VDSL2 (Very High Speed Digital Subscriber Line 2) is the second generation of the VDSL standard (which is currently denoted VDSL1). VDSL2 allows a frequency band of up to 30MHz and transmission rates of up to 100 Mbps in each direction. VDSL2 is defined in G.993.2.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| VDSL Profile                                | VDSL2 profiles differ in the width of the frequency band used to transmit the broadband signal. Profiles that use a wider frequency band can deliver higher maximum speeds.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| 8a, 8b, 8c, 8d, 12a, 12b, 17a, 30a, 35b US0 | The G.993.2 VDSL standard defines a wide range of profiles that can be used in different VDSL deployment settings, such as in a central office, a street cabinet or a building.<br><br>The Zyxel Device must comply with at least one profile specified in G.993.2, but compliance with more than one profile is allowed.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Cancel                                      | Click <b>Cancel</b> to return to the previous configuration.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Apply                                       | Click <b>Apply</b> to save your changes back to the Zyxel Device.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |

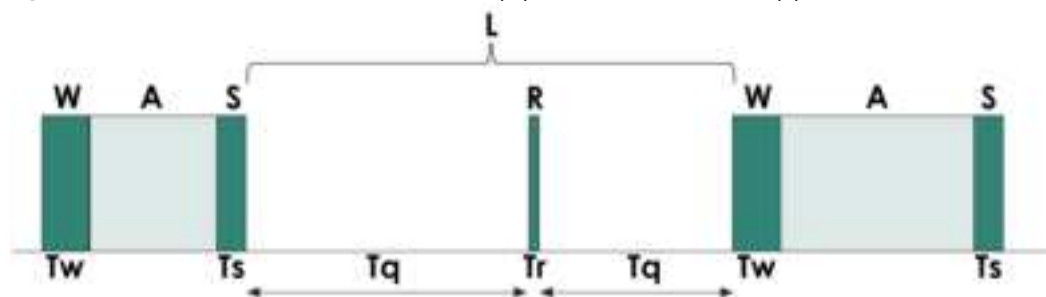
## 7.6 Broadband Advanced Screen for Ethernet Routers

Use the **Advanced** screen to configure the Zyxel Device to reduce the power consumption.

### IEEE 802.3az Energy Efficient Ethernet (EEE)

If EEE is enabled, and there is no WAN/LAN traffic (**A**) on the Zyxel Device, the Zyxel Device enters low power idle (**L**) (or sleep (**S**)) mode. Transitioning to low power mode (**L**) requires (**T<sub>s</sub>**) seconds. Low power idle (**L**) mode turns off some functions of the physical layer to save power. Periodically the Zyxel Device transmits a REFRESH (**R**) signal during short refresh intervals (**T<sub>r</sub>**) to allow the connected WAN/LAN device to keep the link active. The Zyxel Device stays quiet during large intervals (**T<sub>q</sub>**). When there is traffic to be sent, a WAKE (**W**) signal is sent to the connected WAN/LAN device to return the link to active mode (**A**). This wake (**W**) transition takes (**T<sub>w</sub>**) seconds.

**Figure 127** Transition Between the Active (A) and Low Power Idle (L) Modes in EEE

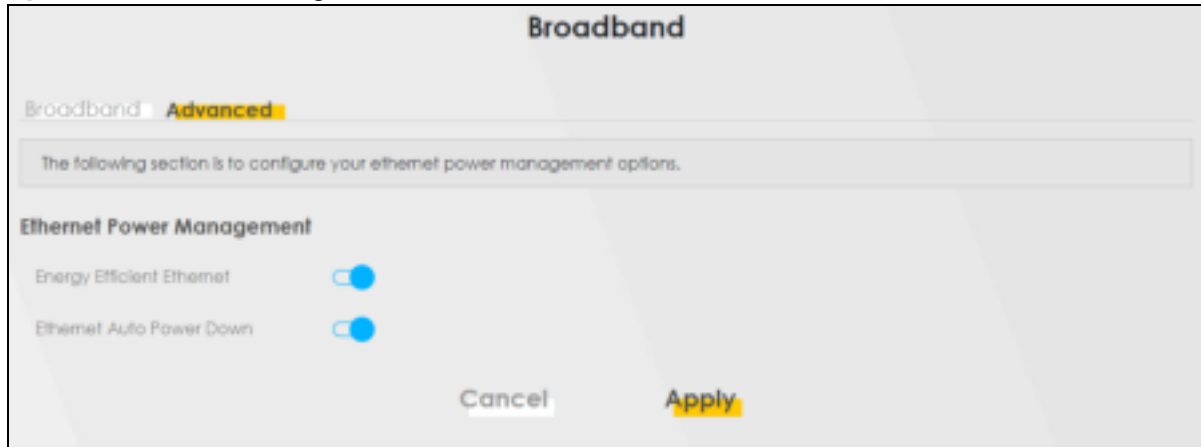


## Auto Power Down

Auto Power Down turns off almost all functions of the Zyxel Device's physical layer when the link is down, so the Zyxel Device only uses power when there is a link up pulse from the connected WAN/LAN device. After the link up pulse is detected, the Zyxel Device wakes up from Auto Power Down and operates normally.

Click **Network Setting** > **Broadband** > **Advanced** to display the following screen.

**Figure 128** Network Setting > Broadband > Advanced



The following table describes the labels in this screen.

Table 63 Network Setting > Broadband > Advanced

| LABEL                     | DESCRIPTION                                                                              |
|---------------------------|------------------------------------------------------------------------------------------|
| Ethernet Power Management |                                                                                          |
| Energy Efficient Ethernet | Slide the switch to the right to activate Energy Efficient Ethernet on the Zyxel Device. |
| Ethernet Auto Power Down  | Slide the switch to the right to activate Auto Power Down on the Zyxel Device.           |
| Cancel                    | Click <b>Cancel</b> to return to the previous configuration.                             |
| Apply                     | Click <b>Apply</b> to save your changes back to the Zyxel Device.                        |

## 7.7 Backup WAN

Use this screen to have the **LAN/WAN** port on the Zyxel Device ports panel to act as an Ethernet WAN port. The Ethernet WAN connection has priority over the DSL WAN connection.

It's not enough to just enable the fourth LAN port as a WAN port here. You must also go to **Network Setting** > **Broadband** screen and create a new interface for it with the **Type** as **Ethernet** and **Encapsulation** as **IPoE**. It's suggested to enable NAT.

Note: The Ethernet WAN connection has priority over the DSL connection. See [Section 1.2.1 on page 26](#) for the Zyxel Device WAN priority.

Click **Network Setting** > **Broadband** > **Backup WAN** to display the following screen.

**Figure 129** Network Setting > Broadband > Backup WAN

The following table describes the fields in this screen.

Table 64 Network Setting &gt; Broadband &gt; Backup WAN

| LABEL  | DESCRIPTION                                                                                                                                                   |
|--------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|
| State: | Click this switch to enable backup WAN to have the <b>LAN/WAN</b> port act as an Ethernet WAN port. Otherwise, the <b>LAN/WAN</b> port remains as a LAN port. |
| Cancel | Click <b>Cancel</b> to exit this screen without saving any changes.                                                                                           |
| Apply  | Click <b>Apply</b> to save your changes.                                                                                                                      |

## 7.8 Technical Reference

The following section contains additional technical information about the Zyxel Device features described in this chapter.

### Encapsulation

Be sure to use the encapsulation method required by your ISP. The Zyxel Device can work in bridge mode or routing mode. When the Zyxel Device is in routing mode, it supports the following methods.

#### IP over Ethernet

IP over Ethernet (IPoE) is an alternative to PPPoE. IP packets are being delivered across an Ethernet network, without using PPP encapsulation. They are routed between the Ethernet interface and the WAN interface and then formatted so that they can be understood in a bridged environment. For instance, it encapsulates routed Ethernet frames into bridged Ethernet cells.

#### PPP over ATM (PPPoA)

PPPoA stands for Point to Point Protocol over ATM Adaptation Layer 5 (AAL5). A PPPoA connection functions like a dial-up Internet connection. The Zyxel Device encapsulates the PPP session based on RFC1483 and sends it through an ATM PVC (Permanent Virtual Circuit) to the Internet Service Provider's (ISP) DSLAM (digital access multiplexer). Please refer to RFC 2364 for more information on PPPoA. Refer to RFC 1661 for more information on PPP.

## **PPP over Ethernet (PPPoE)**

Point-to-Point Protocol over Ethernet (PPPoE) provides access control and billing functionality in a manner similar to dial-up services using PPP. PPPoE is an IETF standard (RFC 2516) specifying how a personal computer (PC) interacts with a broadband modem (DSL, cable, WiFi, and so on) connection.

For the service provider, PPPoE offers an access and authentication method that works with existing access control systems (for example RADIUS).

One of the benefits of PPPoE is the ability to let you access one of multiple network services, a function known as dynamic service selection. This enables the service provider to easily create and offer new IP services for individuals.

Operationally, PPPoE saves significant effort for both you and the ISP or carrier, as it requires no specific configuration of the broadband modem at the customer site.

By implementing PPPoE directly on the Zyxel Device (rather than individual computers), the computers on the LAN do not need PPPoE software installed, since the Zyxel Device does that part of the task. Furthermore, with NAT, all of the LANs' computers will have access.

## **RFC 1483**

RFC 1483 describes two methods for Multiprotocol Encapsulation over ATM Adaptation Layer 5 (AAL5). The first method allows multiplexing of multiple protocols over a single ATM virtual circuit (LLC-based multiplexing) and the second method assumes that each protocol is carried over a separate ATM virtual circuit (VC-based multiplexing). Please refer to RFC 1483 for more detailed information.

## **Multiplexing**

There are two conventions to identify what protocols the virtual circuit (VC) is carrying. Be sure to use the multiplexing method required by your ISP.

### **VC-based Multiplexing**

In this case, by prior mutual agreement, each protocol is assigned to a specific virtual circuit; for example, VC1 carries IP, etc. VC-based multiplexing may be dominant in environments where dynamic creation of large numbers of ATM VCs is fast and economical.

### **LLC-based Multiplexing**

In this case one VC carries multiple protocols with protocol identifying information being contained in each packet header. Despite the extra bandwidth and processing overhead, this method may be advantageous if it is not practical to have a separate VC for each carried protocol, for example, if charging heavily depends on the number of simultaneous VCs.

## **Traffic Shaping**

Traffic Shaping is an agreement between the carrier and the subscriber to regulate the average rate and fluctuations of data transmission over an ATM network. This agreement helps eliminate congestion, which is important for transmission of real time data such as audio and video connections.

Peak Cell Rate (PCR) is the maximum rate at which the sender can send cells. This parameter may be lower (but not higher) than the maximum line speed. 1 ATM cell is 53 bytes (424 bits), so a maximum

speed of 832Kbps gives a maximum PCR of 1962 cells/sec. This rate is not guaranteed because it is dependent on the line speed.

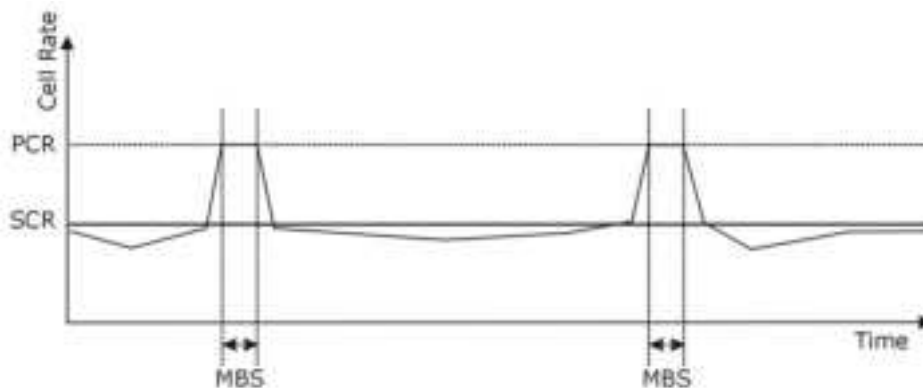
Sustained Cell Rate (SCR) is the mean cell rate of each bursty traffic source. It specifies the maximum average rate at which cells can be sent over the virtual connection. SCR may not be greater than the PCR.

Maximum Burst Size (MBS) is the maximum number of cells that can be sent at the PCR. After MBS is reached, cell rates fall below SCR until cell rate averages to the SCR again. At this time, more cells (up to the MBS) can be sent at the PCR again.

If the PCR, SCR or MBS is set to the default of "0", the system will assign a maximum value that correlates to your upstream line rate.

The following figure illustrates the relationship between PCR, SCR and MBS.

**Figure 130** Example of Traffic Shaping



## ATM Traffic Classes

These are the basic ATM traffic classes defined by the ATM Forum Traffic Management 4.0 Specification.

### Constant Bit Rate (CBR)

Constant Bit Rate (CBR) provides fixed bandwidth that is always available even if no data is being sent. CBR traffic is generally time-sensitive (does not tolerate delay). CBR is used for connections that continuously require a specific amount of bandwidth. A PCR is specified and if traffic exceeds this rate, cells may be dropped. Examples of connections that need CBR would be high-resolution video and voice.

### Variable Bit Rate (VBR)

The Variable Bit Rate (VBR) ATM traffic class is used with bursty connections. Connections that use the Variable Bit Rate (VBR) traffic class can be grouped into real time (VBR-RT) or non-real time (VBR-nRT) connections.

The VBR-RT (real-time Variable Bit Rate) type is used with bursty connections that require closely controlled delay and delay variation. It also provides a fixed amount of bandwidth (a PCR is specified) but is only available when data is being sent. An example of an VBR-RT connection would be video conferencing. Video conferencing requires real-time data transfers and the bandwidth requirement varies in proportion to the video image's changing dynamics.



The VBR-nRT (non real-time Variable Bit Rate) type is used with bursty connections that do not require closely controlled delay and delay variation. It is commonly used for "bursty" traffic typical on LANs. PCR and MBS define the burst levels, SCR defines the minimum level. An example of an VBR-nRT connection would be non-time sensitive data file transfers.

#### Unspecified Bit Rate (UBR)

The Unspecified Bit Rate (UBR) ATM traffic class is for bursty data transfers. However, UBR does not guarantee any bandwidth and only delivers traffic when the network has spare bandwidth. An example application is background file transfer.

### IP Address Assignment

A static IP is a fixed IP that your ISP gives you. A dynamic IP is not fixed; the ISP assigns you a different one each time. The Single User Account feature can be enabled or disabled if you have either a dynamic or static IP. However, the encapsulation method assigned influences your choices for IP address and default gateway.

### Introduction to VLANs

A Virtual Local Area Network (VLAN) allows a physical network to be partitioned into multiple logical networks. Devices on a logical network belong to one group. A device can belong to more than one group. With VLAN, a device cannot directly talk to or hear from devices that are not in the same groups; the traffic must first go through a router.

In Multi-Tenant Unit (MTU) applications, VLAN is vital in providing isolation and security among the subscribers. When properly configured, VLAN prevents one subscriber from accessing the network resources of another on the same LAN, thus a user will not see the printers and hard disks of another user in the same building.

VLAN also increases network performance by limiting broadcasts to a smaller and more manageable logical broadcast domain. In traditional switched environments, all broadcast packets go to each and every individual port. With VLAN, all broadcasts are confined to a specific broadcast domain.

### Introduction to IEEE 802.1Q Tagged VLAN

A tagged VLAN uses an explicit tag (VLAN ID) in the MAC header to identify the VLAN membership of a frame across bridges – they are not confined to the switch on which they were created. The VLANs can be created statically by hand or dynamically through GVRP. The VLAN ID associates a frame with a specific VLAN and provides the information that switches need to process the frame across the network. A tagged frame is 4 bytes longer than an untagged frame and contains 2 bytes of TPID (Tag Protocol Identifier), residing within the type/length field of the Ethernet frame) and 2 bytes of TCI (Tag Control Information), starts after the source address field of the Ethernet frame).

The CFI (Canonical Format Indicator) is a single-bit flag, always set to zero for Ethernet switches. If a frame received at an Ethernet port has a CFI set to 1, then that frame should not be forwarded as it is to an untagged port. The remaining twelve bits define the VLAN ID, giving a possible maximum number of 4,096 VLANs. Note that user priority and VLAN ID are independent of each other. A frame with VID (VLAN Identifier) of null (0) is called a priority frame, meaning that only the priority level is significant and the default VID of the ingress port is given as the VID of the frame. Of the 4096 possible VIDs, a VID of 0 is

used to identify priority frames and value 4095 (FFF) is reserved, so the maximum possible VLAN configurations are 4,094.

| TPID    | User Priority | CFI   | VLAN ID |
|---------|---------------|-------|---------|
| 2 Bytes | 3 Bits        | 1 Bit | 12 Bits |

## **Multicast**

IP packets are transmitted in either one of two ways – Unicast (1 sender – 1 recipient) or Broadcast (1 sender – everybody on the network). Multicast delivers IP packets to a group of hosts on the network – not everybody and not just 1.

Internet Group Multicast Protocol (IGMP) is a network-layer protocol used to establish membership in a Multicast group - it is not used to carry user data. IGMP version 2 (RFC 2236) is an improvement over version 1 (RFC 1112) but IGMP version 1 is still in wide use. If you would like to read more detailed information about interoperability between IGMP version 2 and version 1, please see sections 4 and 5 of RFC 2236. The class D IP address is used to identify host groups and can be in the range 224.0.0.0 to 239.255.255.255. The address 224.0.0.0 is not assigned to any group and is used by IP multicast computers. The address 224.0.0.1 is used for query messages and is assigned to the permanent group of all IP hosts (including gateways). All hosts must join the 224.0.0.1 group in order to participate in IGMP. The address 224.0.0.2 is assigned to the multicast routers group.

At start up, the Zyxel Device queries all directly connected networks to gather group membership. After that, the Zyxel Device periodically updates this information.

## **DNS Server Address Assignment**

Use Domain Name System (DNS) to map a domain name to its corresponding IP address and vice versa, for instance, the IP address of [www.zyxel.com](http://www.zyxel.com) is 204.217.0.2. The DNS server is extremely important because without it, you must know the IP address of a computer before you can access it.

The Zyxel Device can get the DNS server addresses in the following ways.

- 1 The ISP tells you the DNS server addresses, usually in the form of an information sheet, when you sign up. If your ISP gives you DNS server addresses, manually enter them in the DNS server fields.
- 2 If your ISP dynamically assigns the DNS server IP addresses (along with the Zyxel Device's WAN IP address), set the DNS server fields to get the DNS server address from the ISP.

## **IPv6 Addressing**

The 128-bit IPv6 address is written as eight 16-bit hexadecimal blocks separated by colons (:). This is an example IPv6 address 2001:0db8:1a2b:0015:0000:0000:1a2f:0000.

IPv6 addresses can be abbreviated in two ways:

- Leading zeros in a block can be omitted. So 2001:0db8:1a2b:0015:0000:0000:1a2f:0000 can be written as 2001:db8:1a2b:15:0:0:1a2f:0.

- Any number of consecutive blocks of zeros can be replaced by a double colon. A double colon can only appear once in an IPv6 address. So 2001:0db8:0000:0000:1a2f:0000:0000:0015 can be written as 2001:0db8::1a2f:0000:0000:0015, 2001:0db8:0000:0000:1a2f::0015, 2001:db8::1a2f:0:0:15 or 2001:db8:0:0:1a2f::15.

### **IPv6 Prefix and Prefix Length**

Similar to an IPv4 subnet mask, IPv6 uses an address prefix to represent the network address. An IPv6 prefix length specifies how many most significant bits (start from the left) in the address compose the network address. The prefix length is written as "/x" where x is a number. For example,

2001:db8:1a2b:15::1a2f:0/32

means that the first 32 bits (2001:db8) is the subnet prefix.

# CHAPTER 8

## Wireless

### 8.1 Wireless Overview

This chapter describes the Zyxel Device's **Network Setting** > **Wireless** screens. Use these screens to set up your Zyxel Device's WiFi network and security settings.

#### 8.1.1 What You Can Do in this Chapter

This section describes the Zyxel Device's **Wireless** screens. Use these screens to set up your Zyxel Device's WiFi connection.

- Use the **General** screen to enable the Wireless LAN, enter the SSID and select the WiFi security mode ([Section 8.2 on page 238](#)).
- Use the **Guest/More AP** screen to set up multiple WiFi networks on your Zyxel Device ([Section 8.3 on page 243](#)).
- Use the **MAC Authentication** screen to allow or deny WiFi clients based on their MAC addresses from connecting to the Zyxel Device ([Section 8.4 on page 247](#)).
- Use the **WPS** screen to enable or disable WPS, view or generate a security PIN (Personal Identification Number) ([Section 8.5 on page 249](#)).
- Use the **WMM** screen to enable WiFi MultiMedia (WMM) to ensure quality of service in WiFi networks for multimedia applications ([Section 8.6 on page 251](#)).
- Use the **Others** screen to configure WiFi advanced features, such as the RTS/CTS Threshold ([Section 8.7 on page 252](#)).
- Use the **Channel Status** screen to scan the number of accessing points and view the results ([Section 8.8 on page 255](#)).
- Use the **MESH** screen to enable or disable Mesh on your Zyxel Device ([Section 8.9 on page 256](#)).

#### 8.1.2 What You Need to Know

##### WiFi Standard / IEEE 802.11

IEEE 802.11 is a set of standards developed by the Institute of Electrical and Electronics Engineers (IEEE) for wireless local area networks (WLANs). These standards define how devices like laptops, smartphones, and routers communicate wirelessly using radio waves.

The following table displays the comparison of the different WiFi standards.

Table 65 WiFi Standards Comparison

| WIFI STANDARD | MAXIMUM LINK RATE* | BAND              | SIMULTANEOUS CONNECTIONS |
|---------------|--------------------|-------------------|--------------------------|
| 802.11b       | 11 Mbps            | 2.4 GHz           | 1                        |
| 802.11a/g     | 54 Mbps            | 2.4 GHz and 5 GHz | 1                        |

Table 65 WiFi Standards Comparison (continued)

| WIFI STANDARD | MAXIMUM LINK RATE* | BAND              | SIMULTANEOUS CONNECTIONS |
|---------------|--------------------|-------------------|--------------------------|
| 802.11n       | 600 Mbps           | 2.4 GHz and 5 GHz | 1                        |
| 802.11ac      | 6.93 Gbps          | 5 GHz             | 4                        |
| 802.11ax      | 2.4 Gbps           | 2.4 GHz           | 128                      |
|               | 9.61 Gbps          | 5 GHz and 6 GHz   |                          |

Note: \* The maximum link rate is for reference under ideal conditions only.

### WiFi 6 / IEEE 802.11ax

WiFi 6 is backwards compatible with IEEE 802.11a/b/g/n/ac and is most suitable in areas with a high concentration of users. WiFi 6 devices support Target Wakeup Time (TWT) allowing them to automatically power down when they are inactive.

### WiFi 6E (IEEE 802.11ax - Extended Standard)

WiFi 6E is an extended standard of WiFi 6 (IEEE 802.11ax). WiFi 6E inherits all the WiFi 6 features and brings with an additional 6 GHz band. The 6 GHz band allows you to avoid possible congested traffic in the lower 2.4 GHz and 5 GHz bands. WiFi clients must support WiFi 6E to connect to the device using the 6 GHz band.

Note: Check your client device's product specification to see if your client device supports the 6 GHz band (WiFi 6E). If not, you should still use the 2.4/5 GHz bands for connection.

**Figure 131** Without Multi-Link Operation



**Figure 132** Multi-Link Operation Example



### Finding Out More

See [Section 8.10 on page 257](#) for advanced technical information on WiFi networks.

## 8.2 Wireless General Settings

Use this screen to enable the WiFi, enter the SSID and select the WiFi security mode. We recommend that you select **More Secure** to enable **WPA3-SAE** data encryption.

Note: If you are configuring the Zyxel Device from a computer connected by WiFi and you change the Zyxel Device's SSID, channel or security settings, you will lose your WiFi connection when you press **Apply**. You must change the WiFi settings of your computer to match the new settings on the Zyxel Device.

Note: If upstream or downstream bandwidth is empty, the Zyxel Device sets the value automatically.

Note: Setting a maximum upstream or downstream bandwidth will significantly decrease wireless performance.

Note: **Keep the same settings for 2.4 GHz, 5 GHz, 6 GHz wireless networks** is enabled and cannot be disabled when you enable **Mesh** in the **Network > Wireless > MESH** screen. To see if your model supports 6 GHz, please see [Section 1.1 on page 20](#) for more information.

Click **Network Setting > Wireless** to open the **General** screen.

**Figure 133** Network Setting > Wireless > General (for 2.4 GHz and 5 GHz models)

## Wireless

General | Quick Setup | Advanced Setup | WPS | Update Firmware | Channel Width | SSID

Use this screen to enable the Wireless LAN, enter the SSID and select the wireless security mode. We recommend that you select **More Secure** to enable WPA3-SAE/WPA2-PSK data encryption.

---

### Wireless

Wireless: ☐ Keep the same settings for 2.4GHz and 5GHz wireless networks

### Wireless Network Setup

Band: 2.4GHz

Wireless: ☒

Channel: Auto Default: 11 (2.4GHz)

Bandwidth: 80+20MHz

Control Channel: Control

### Wireless Network Settings

Wireless Network Name: Example

Max Clients: 34

☒ WPA3-SAE 1

☒ Multicast Forwarding

Max. Upstream Bandwidth:  High

Max. Downstream Bandwidth:  High

**Notes**

(1) If you are configuring the Zyxel Device from a computer connected by Wi-Fi and you change the Zyxel Device's SSID, channel or security settings, you will lose your Wi-Fi connection when you press **Apply**. You must change the Wi-Fi settings of your computer to match the new settings on the Zyxel Device.

(2) If upstream/downstream bandwidth is empty, the Zyxel Device sets the value automatically. Setting a maximum upstream/downstream bandwidth will significantly decrease wireless performance.

SSID:  PASSWORD:

### Security Level

Low Security More Secure (Recommended)

Security Mode: WPA3-SAE/WPA2-PSK

Protect Management Frames: ☐ Disabled

☐ Generate password automatically

The password must be at least 8 characters long, including 1 uppercase letter, 1 lowercase letter, 1 number and 1 special character.

Password:

Strength:  Strong

The following table describes the general WiFi labels in this screen.

Table 66 Network Setting > Wireless > General

| LABEL                          | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|--------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Wireless                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Wireless                       | <p>Select <b>Keep the same settings for 2.4GHz, 5GHz and 6GHz wireless networks</b> and the 2.4 GHz, 5 GHz and 6 GHz WiFi networks will use the same SSID and wireless security settings.</p> <p>Note: To see if your model supports 6 GHz, please see <a href="#">Section 1.1 on page 20</a> for more information.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Wireless/WiFi Network Setup    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Band                           | <p>This shows the WiFi band which this radio profile is using. <b>2.4GHz</b> is the frequency used by IEEE 802.11b/g/n/ax WiFi clients, <b>5GHz</b> is used by IEEE 802.11a/n/ac/ax WiFi clients while <b>6GHz</b> is used by IEEE 802.11a/n/ac/ax WiFi clients.</p> <p>Note: To see if your model supports 6 GHz, please see <a href="#">Section 1.1 on page 20</a> for more information.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Wireless/WiFi                  | Click this switch to enable or disable WiFi in this field. When the switch turns blue, the function is enabled. Otherwise, it is not.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Channel                        | <p>Select a channel from the drop-down list box. The options vary depending on the frequency band and the country you are in.</p> <p>Use <b>Auto</b> to have the Zyxel Device automatically determine a channel to use.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Bandwidth                      | <p>A standard 20 MHz channel offers transfer speeds of up to 150 Mbps whereas a 40 MHz channel uses two standard channels and offers speeds of up to 300 Mbps.</p> <p>40 MHz (channel bonding or dual channel) bonds two adjacent radio channels to increase throughput. The WiFi clients must also support 40 MHz. It is often better to use the 20 MHz setting in a location where the environment hinders the WiFi signal.</p> <p>An 80 MHz channel groups adjacent 40 MHz channels into pairs to increase bandwidth even higher.</p> <p>Select <b>20MHz</b> if you want to lessen radio interference with other wireless devices in your neighborhood or the WiFi clients do not support channel bonding.</p> <p>Not all Zyxel Devices support all channels. The Zyxel Device will choose the best bandwidth available automatically depending on the radio you chose and network conditions.</p> |
| Control Sideband               | This is available for some regions when you select a specific channel and set the <b>Bandwidth</b> field to <b>40MHz</b> or <b>20/40MHz</b> . Set whether the control channel (set in the <b>Channel</b> field) should be in the <b>Lower</b> or <b>Upper</b> range of channel bands.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Wireless/WiFi Network Settings |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Wireless/WiFi Network Name     | <p>The SSID (Service Set IDentity) identifies the service set with which a wireless device is associated. Wireless devices associating to the access point (AP) must have the same SSID.</p> <p>Enter a descriptive name for this WiFi network. You can use up to 32 printable characters, including spaces.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Max Clients                    | Specify the maximum number of clients that can connect to this network at the same time.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Hide SSID                      | <p>Select this checkbox to hide the SSID in the outgoing beacon frame so a station cannot obtain the SSID through scanning using a site survey tool.</p> <p>This checkbox is grayed out if the WPS function is enabled in the <b>Network Setting &gt; Wireless &gt; WPS</b> screen.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Blocking BSSID LAN Access      | Select this checkbox so that the WiFi client's access to all devices on the LAN will be blocked.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Multicast Forwarding           | Select this checkbox to allow the Zyxel Device to convert wireless Multicast traffic into wireless unicast traffic.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |



Table 66 Network Setting &gt; Wireless &gt; General (continued)

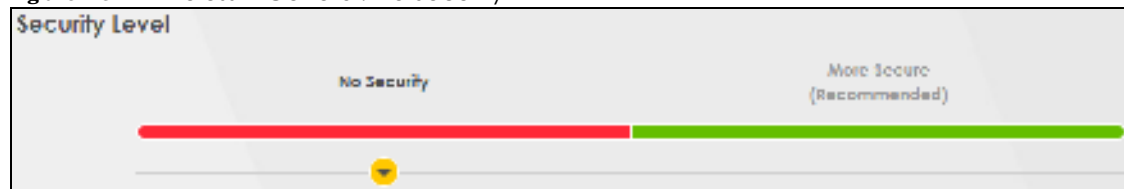
| LABEL                     | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|---------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Max. Upstream Bandwidth   | Max. Upstream Bandwidth allows you to specify the maximum rate for upstream wireless traffic to the WAN from this wireless LAN in kilobits per second (Kbps).                                                                                                                                                                                                                                                                                                                                        |
| Max. Downstream Bandwidth | Max. Upstream Bandwidth allows you to specify the maximum rate for downstream wireless traffic to this wireless LAN from the WAN in kilobits per second (Kbps).                                                                                                                                                                                                                                                                                                                                      |
| BSSID                     | This shows the MAC address of the wireless interface on the Zyxel Device when WiFi is enabled.                                                                                                                                                                                                                                                                                                                                                                                                       |
| Security Level            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Security Mode             | <p>Select <b>More Secure (Recommended)</b> to add security on this WiFi network. The WiFi clients which want to associate to this network must have same WiFi security settings as the Zyxel Device. When you select to use a security, additional options appears in this screen.</p> <p>Or you can select <b>No Security</b> to allow any client to associate this network without any data encryption or authentication.</p> <p>See the following sections for more details about this field.</p> |
| Cancel                    | Click <b>Cancel</b> to restore your previously saved settings.                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Apply                     | Click <b>Apply</b> to save your changes.                                                                                                                                                                                                                                                                                                                                                                                                                                                             |

### 8.2.1 No Security

Select **No Security** to allow wireless stations to communicate with the access points without any data encryption or authentication.

Note: If you do not enable any WiFi security on your Zyxel Device, your network is accessible to any wireless networking device that is within range.

Figure 134 Wireless &gt; General: No Security



The following table describes the labels in this screen.

Table 67 Wireless &gt; General: No Security

| LABEL          | DESCRIPTION                                                                                        |
|----------------|----------------------------------------------------------------------------------------------------|
| Security Level | Choose <b>No Security</b> to allow all WiFi connections without data encryption or authentication. |

### 8.2.2 More Secure (Recommended)

The WPA-PSK (WiFi Protected Access-Pre-Shared Key) security mode provides both improved data encryption and user authentication over WEP. Using a pre-shared key, both the Zyxel Device and the connecting client share a common password in order to validate the connection. This type of encryption, while robust, is not as strong as WPA, WPA2 or even WPA2-PSK. The WPA2-PSK security mode is a more robust version of the WPA encryption standard. It offers better security, although the use of PSK makes it less robust than it could be.

The WPA3-SAE (Simultaneous Authentication of Equals handshake) security mode protects against dictionary attacks (password guessing attempts). It improves security by requiring a new encryption key every time a WPA3 connection is made. A handshake is the communication between the Zyxel Device and a connecting client at the beginning of a WiFi session.

Click **Network Setting > Wireless** to display the **General** screen. Select **More Secure** as the security level. Then select **WPA3-SAE** from the **Security Mode** list if your WiFi client supports it. If you are not sure, select **WPA3-SAE/WPA2-PSK** or **WPA2-PSK**.

**Figure 135** Wireless > General: More Secure: WPA3-SAE/WPA2-PSK

The following table describes the labels in this screen.

**Table 68** Wireless > General: More Secure: WPA3-SAE/WPA2-PSK

| LABEL                       | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|-----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Security Level              | Select <b>More Secure</b> to enable data encryption.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Security Mode               | Select a security mode from the drop-down list box.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Protected Management Frames | <p>This option is only available when using <b>WPA2-PSK</b> as the <b>Security Mode</b> and <b>AES Encryption</b> in <b>Network Setting &gt; Wireless &gt; General</b>. Management frame protection (MFP) helps prevent WiFi DoS (Denial of Service) attacks.</p> <p>Select <b>Disable</b> if you do not want to use MFP.</p> <p>Select <b>Capable</b> to encrypt management frames of WiFi clients that support MFP. Clients that do not support MFP will still be allowed to join the WiFi network, but remain unprotected.</p> <p>Select <b>Required</b> to allow only clients that support MFP to join the WiFi network.</p> <p>When Mesh is enabled, the settings of <b>Protected Management Frames</b> of 5G will follow 2.4G.</p> |

Table 68 Wireless &gt; General: More Secure: WPA3-SAE/WPA2-PSK (continued)

| LABEL                                                                                                                                                                                                                                        | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Generate password automatically                                                                                                                                                                                                              | Select this option to have the Zyxel Device automatically generate a password. The password field will not be configurable when you select this option.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Password                                                                                                                                                                                                                                     | <p>Select <b>Generate password automatically</b> or enter a <b>Password</b>.</p> <p>The password has two uses.</p> <ol style="list-style-type: none"> <li>1. Manual. Manually enter the same password on the Zyxel Device and the client. The password must be at least 8 characters long, including one uppercase letter, one lowercase letter, one number, and one special character.</li> <li>2. WPS. When using WPS, the Zyxel Device sends this password to the client.</li> </ol> <p>Note: More than 63 hexadecimal characters are not accepted for WPS.</p> <p>Click the Eye icon to show or hide the password for your wireless network. When the Eye icon is slashed , you will see the password in plain text. Otherwise, it is hidden.</p> |
| Strength                                                                                                                                                                                                                                     | This displays the current password strength – <b>weak, medium, strong</b> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Click this  to show more fields in this section. Click this  to hide them. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Encryption                                                                                                                                                                                                                                   | <p><b>AES</b> is the default data encryption type, which uses a 128-bit key.</p> <p>Select the encryption type (<b>AES</b> or <b>TKIP+AES</b>) for data encryption.</p> <p>Select <b>AES</b> if your WiFi clients can all use AES.</p> <p>Select <b>TKIP+AES</b> to allow the WiFi clients to use either TKIP or AES.</p> <p>Note: Not all models support <b>TKIP+AES</b> encryption.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Timer                                                                                                                                                                                                                                        | This is the rate at which the RADIUS server sends a new group key out to all clients.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |

## 8.3 Guest/More AP Screen

Use this screen to configure a guest WiFi network that allows access to the Internet through the Zyxel Device. You can use one access point to provide several BSSs simultaneously. You can then assign varying security types to different SSIDs. WiFi clients can use different SSIDs to associate with the same access point.

Click **Network Setting > Wireless > Guest/More AP**.

The following table introduces the supported WiFi networks.

Table 69 Supported WiFi Networks

| WIFI NETWORKS | WHERE TO CONFIGURE                                |
|---------------|---------------------------------------------------|
| Main/1        | Network Setting > Wireless > General screen       |
| Guest/3       | Network Setting > Wireless > Guest/More AP screen |

The following screen displays.

**Figure 136** Network Setting > Wireless > Guest/More AP

This screen allows you to configure a guest wireless network that allows access to the Internet only through the Zyxel Device. You can also configure additional wireless networks, each with different security settings, in this screen.

Band: 2.4GHz

| # | Status | SSID               | Security                 | Guest WLAN     | Modify |
|---|--------|--------------------|--------------------------|----------------|--------|
| 1 | 🟡      | Zyxel_5258B_guest1 | WPA3-Personal-Transition | External Guest | 🔧      |
| 2 | 🟡      | Zyxel_5258B_guest2 | WPA3-Personal-Transition | External Guest | 🔧      |
| 3 | 🟡      | Zyxel_5258B_guest3 | WPA3-Personal-Transition | External Guest | 🔧      |

The following table describes the labels in this screen.

Table 70 Network Setting &gt; Wireless &gt; Guest/More AP

| Label      | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Band       | Select a <b>2.4GHz</b> or <b>5GHz</b> frequency band to display the SSID profile of the selected band.                                                                                                                                                                                                                                                                                                                                                                                                                    |
| #          | This is the index number of the entry.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Status     | This field indicates whether this SSID is active. A yellow bulb signifies that this SSID is active, while a gray bulb signifies that this SSID is not active.                                                                                                                                                                                                                                                                                                                                                             |
| SSID       | <p>An SSID profile is the set of parameters relating to one of the Zyxel Device's BSSs. The SSID (Service Set Identifier) identifies the Service Set with which a wireless device is associated.</p> <p>This field displays the name of the wireless profile on the network. When a WiFi client scans for an AP to associate with, this is the name that is broadcast and seen in the WiFi client utility.</p> <p>Note: The SSID profiles displayed differ by the frequency band you select in the <b>Band</b> field.</p> |
| Security   | This field indicates the security mode of the SSID profile.                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Guest WLAN | <p>This displays if the guest WLAN function has been enabled for this WLAN.</p> <p>A <b>Home Guest</b> can access the Internet, LAN wired devices connected to the Zyxel Device, and other Home Guest WiFi clients.</p> <p>An <b>External Guest</b> can just access the Internet through the Zyxel Device.</p> <p><b>N/A</b> displays if guest WLAN is disabled.</p>                                                                                                                                                      |
| Modify     | Click the <b>Edit</b> icon of an SSID profile to configure the SSID profile.                                                                                                                                                                                                                                                                                                                                                                                                                                              |

### 8.3.1 The Edit Guest/More AP Screen

Use this screen to create Guest and additional WiFi networks with different security settings.

Note: If upstream/downstream bandwidth is empty, the Zyxel Device sets the value automatically. Setting a maximum upstream/downstream bandwidth will significantly decrease WiFi performance.

Click the **Edit** icon next to an SSID in the **Guest/More AP** screen. The following screen displays.

**Figure 137** Network Setting > Wireless > Guest/More AP > Edit

**More AP Edit**

Use this screen to create Guest and additional wireless networks with different security settings.

**Wireless Network Setup**

Wireless ☒

**Wireless Network Settings**

Wireless Network Name: ZyXEL\_A301\_guest1

☐ Hide SSID

☒ Guest WLAN

Access Scenario: Extend Guest

Max. Upstream Bandwidth: Kbps

Max. Downstream Bandwidth: Kbps

**Note**

If upstream/downstream bandwidth is empty, the Zyxel Device sets the value automatically. Setting a maximum upstream/downstream bandwidth will significantly decrease wireless performance.

SSID: AX102A102A301

☐ SSID Subnet

**Security Level**

No Security More Secure (Recommended)

Security Mode: WPA3-SAE/WPA2-PSK

Protected Management Frames: Disabled

☒ Generate password automatically

The password must be at least 8 characters long, including 1 uppercase letter, 1 lowercase letter, 1 number and 1 special character, or 34 hexadecimal digits (0-9, A-F)

Password: [REDACTED]

Strength: weak

Encryption: AES

Timer: 3600

Cancel OK

The following table describes the fields in this screen.

Table 71 Network Setting > Wireless > Guest/More AP > Edit

| LABEL                          | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|--------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| WiFi/Wireless Network Setup    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| WiFi/Wireless                  | Click this switch to enable or disable the WiFi in this field. When the switch turns blue  , the function is enabled; otherwise, it is not.                                                                                                                                                                                                                                                                                        |
| WiFi/Wireless Network Settings |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| WiFi/Wireless Network Name     | The SSID (Service Set Identity) identifies the service set with which a wireless device is associated. Wireless devices associating to the access point (AP) must have the same SSID.<br><br>Enter a descriptive name for the WiFi. You can use up to 32 printable characters, including spaces.                                                                                                                                                                                                                      |
| Hide SSID                      | Select this checkbox to hide the SSID in the outgoing beacon frame so a station cannot obtain the SSID through scanning using a site survey tool.                                                                                                                                                                                                                                                                                                                                                                     |
| Guest WLAN                     | Select this to create Guest WLANs for home and external clients. Select the WLAN type in the <b>Access Scenario</b> field.                                                                                                                                                                                                                                                                                                                                                                                            |
| Access Scenario                | Select <b>Home Guest</b> or <b>External Guest</b> to provide different levels of access to the Zyxel Device and the other WiFi clients.<br><br>A <b>Home Guest</b> can access the Internet, LAN wired devices connected to the Zyxel Device, and other Home Guest WiFi clients.<br><br>An <b>External Guest</b> can just access the Internet through the Zyxel Device.                                                                                                                                                |
| Max. Upstream Bandwidth        | Specify the maximum rate for upstream wireless traffic to the WAN from this WLAN in kilobits per second (Kbps).                                                                                                                                                                                                                                                                                                                                                                                                       |
| Max. Downstream Bandwidth      | Specify the maximum rate for downstream wireless traffic to this WLAN from the WAN in kilobits per second (Kbps).                                                                                                                                                                                                                                                                                                                                                                                                     |
| BSSID                          | This shows the MAC address of the WiFi interface on the Zyxel Device when WiFi is enabled.                                                                                                                                                                                                                                                                                                                                                                                                                            |
| SSID Subnet                    | Click on this switch to <b>Enable</b> this function if you want the wireless network interface to assign DHCP IP addresses to the associated WiFi clients.<br><br>This option cannot be used if <b>Keep 2.4G and 5G wireless network name the same</b> is enabled in <b>Network &gt; Wireless &gt; General</b> .                                                                                                                                                                                                      |
| DHCP Start Address             | Specify the first of the contiguous addresses in the DHCP IP address pool.<br><br>The Zyxel Device assigns IP addresses from this DHCP pool to WiFi clients connecting to the SSID.                                                                                                                                                                                                                                                                                                                                   |
| DHCP End Address               | Specify the last of the contiguous addresses in the DHCP IP address pool.                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| SSID Subnet Mask               | Specify the subnet mask of the Zyxel Device for the SSID subnet.                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| LAN IP Address                 | Specify the IP address of the Zyxel Device for the SSID subnet.                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Security Level                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Security Mode                  | Select <b>More Secure (Recommended)</b> to add security on this WiFi network. The WiFi clients which want to associate to this network must have the same WiFi security settings as the Zyxel Device. After you select to use a security, additional options appears in this screen.<br><br>Or you can select <b>No Security</b> to allow any client to associate this network without any data encryption or authentication.<br><br>See <a href="#">Section 8.2.1 on page 241</a> for more details about this field. |

Table 71 Network Setting &gt; Wireless &gt; Guest/More AP &gt; Edit (continued)

| LABEL                                                                                                                                                       | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Protected Management Frames                                                                                                                                 | <p>This option is only available when using <b>WPA2-PSK</b> as the <b>Security Mode</b> and <b>AES Encryption</b> in <b>Network Setting &gt; Wireless &gt; General</b>. Management frame protection (MFP) helps prevent WiFi DoS (Denial of Service) attacks.</p> <p>Select <b>Disable</b> if you do not want to use MFP.</p> <p>Select <b>Capable</b> to encrypt management frames of WiFi clients that support MFP. Clients that do not support MFP will still be allowed to join the WiFi network, but remain unprotected.</p> <p>Select <b>Required</b> to allow only clients that support MFP to join the WiFi network.</p> <p>When Mesh is enabled, the settings of <b>Protected Management Frames</b> of 5G will follow 2.4G.</p> |
| Generate password automatically                                                                                                                             | <p>Select this option to have the Zyxel Device automatically generate a password. The password field will not be configurable when you select this option.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Password                                                                                                                                                    | <p>WPA2-PSK uses a simple common password, instead of user-specific credentials.</p> <p>1. If you did not select <b>Generate password automatically</b>, you can manually enter a pre-shared key at least 8 characters long, including one uppercase letter, one lowercase letter, one number, and one special character.</p> <p>Click the Eye icon to show or hide the password of your WiFi network. When the Eye icon is slashed , you will see the password in plain text. Otherwise, it is hidden.</p>                                                                                                                                             |
| Strength                                                                                                                                                    | <p>This displays the current password strength – <b>weak, medium, strong</b>.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Click this  to show more fields in this section. Click again to hide them. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Encryption                                                                                                                                                  | <p>Select the encryption type (<b>AES</b> or <b>TKIP+AES</b>) for data encryption.</p> <p>Select <b>AES</b> if your WiFi clients can all use AES.</p> <p>Select <b>TKIP+AES</b> to allow the WiFi clients to use either TKIP or AES.</p> <p>Not all models support the <b>TKIP+AES</b> option.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Timer                                                                                                                                                       | <p>The <b>Timer</b> is the rate at which the RADIUS server sends a new group key out to all clients.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Cancel                                                                                                                                                      | <p>Click <b>Cancel</b> to exit this screen without saving.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| OK                                                                                                                                                          | <p>Click <b>OK</b> to save your changes.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |

## 8.4 MAC Authentication

Use this screen to give exclusive access to specific connected devices (**Allow**) or exclude specific devices from accessing the Zyxel Device (**Deny**), based on the MAC address of each connected device. Every Ethernet device has a unique factory-assigned MAC (Media Access Control) address, which consists of six pairs of hexadecimal characters, for example: 00:A0:C5:00:00:02. You need to know the MAC addresses of the connected device you want to allow/deny to configure this screen.

Note: You can have up to 25 MAC authentication rules.

Note: This screen is not available when Mesh is enabled in the **Network Setting > Wireless > MESH** screen.

Use this screen to view your Zyxel Device's MAC filter settings and add new MAC filter rules. Click **Network Setting > Wireless > MAC Authentication**. The screen appears as shown.

**Figure 138** Network Setting> Wireless > MAC Authentication



The following table describes the labels in this screen.

**Table 72** Network Setting > Wireless > MAC Authentication

| LABEL             | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                              |
|-------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| General           |                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Band              | Select a <b>2.4GHz</b> or <b>5GHz</b> frequency band to display associated WiFi devices in the selected band, identified by MAC address.                                                                                                                                                                                                                                                                                 |
| SSID              | Select the SSID for which you want to configure MAC filter settings.                                                                                                                                                                                                                                                                                                                                                     |
| MAC Restrict Mode | Define the filter action for the list of MAC addresses in the <b>MAC Address</b> table.<br><br>Select <b>Disable</b> to turn off MAC filtering.<br><br>Select <b>Deny</b> to block access to the Zyxel Device. MAC addresses not listed will be allowed to access the Zyxel Device.<br><br>Select <b>Allow</b> to permit access to the Zyxel Device. MAC addresses not listed will be denied access to the Zyxel Device. |
| MAC address List  |                                                                                                                                                                                                                                                                                                                                                                                                                          |



Table 72 Network Setting &gt; Wireless &gt; MAC Authentication (continued)

| LABEL               | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|---------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Add new MAC address | <p>This field is available when you select <b>Deny</b> or <b>Allow</b> in the <b>MAC Restrict Mode</b> field.</p> <p>Click this if you want to add a new MAC address entry to the MAC filter list below.</p> <p>Select an existing WiFi client from the list to add as a new entry. Select <b>Custom</b> if you want to manually enter the <b>Host Name</b> and <b>MAC Address</b>.</p> <p>Enter the MAC addresses of the WiFi devices that are allowed or denied access to the Zyxel Device in these address fields. Enter the MAC addresses in a valid MAC address format, that is, six hexadecimal character pairs, for example, 12:34:56:78:9a:bc.</p>  |
| #                   | This is the index number of the entry.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| MAC Address         | This is the MAC addresses of the WiFi devices that are allowed or denied access to the Zyxel Device.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Modify              | <p>Click the <b>Edit</b> icon and type the MAC address of the peer device in a valid MAC address format (six hexadecimal character pairs, for example 12:34:56:78:9a:bc).</p> <p>Click the <b>Delete</b> icon to delete the entry.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Cancel              | Click <b>Cancel</b> to exit this screen without saving.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Apply               | Click <b>Apply</b> to save your changes.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |

## 8.5 WPS

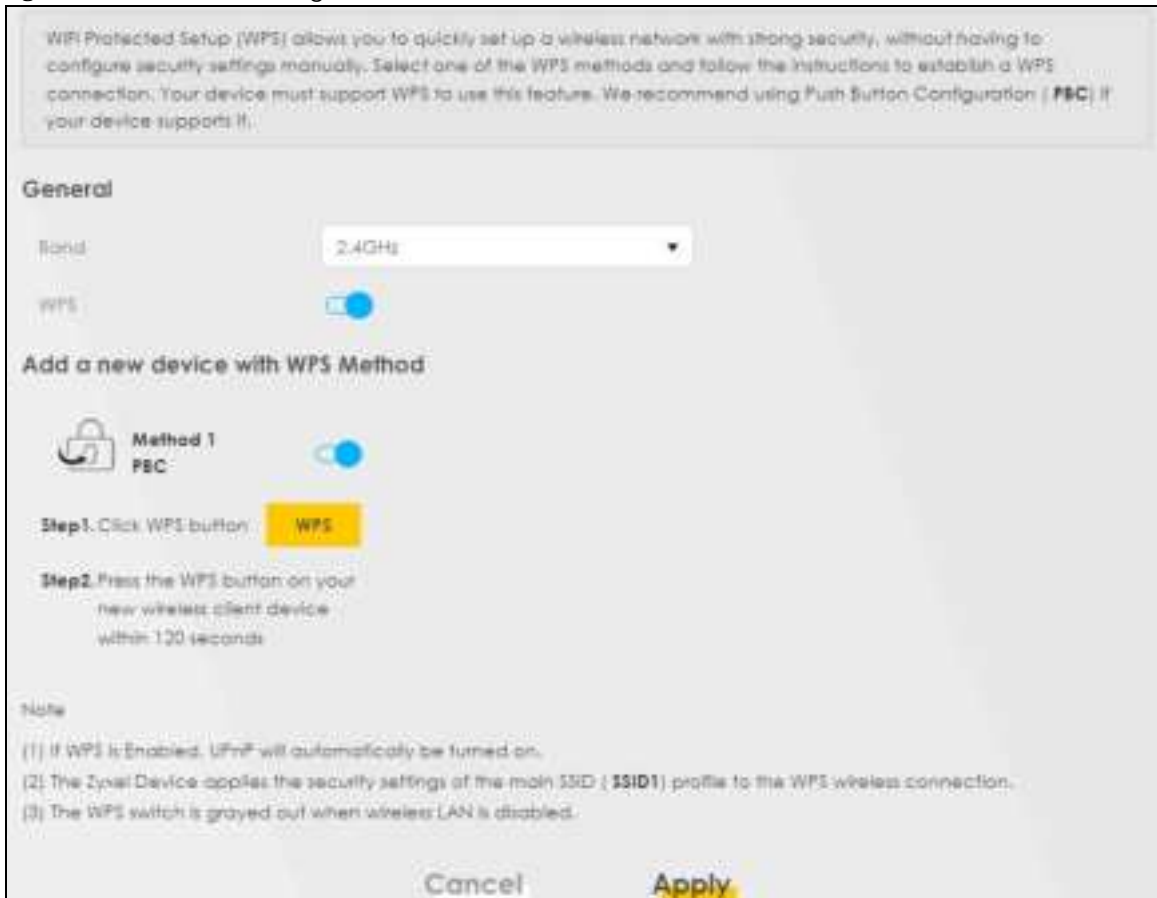
Use this screen to configure WiFi Protected Setup (WPS) on your Zyxel Device.

WiFi Protected Setup (WPS) allows you to quickly set up a WiFi network with strong security, without having to configure security settings manually. Select one of the WPS methods and follow the instructions to establish a WPS connection. Your WiFi devices must support WPS to use this feature. We recommend using Push Button Configuration (**PBC**) if your WiFi device supports it.

Note: The Zyxel Device applies the security settings of the main SSID (**SSID1**) profile to the WPS wireless connection (see [Section 8.2.2 on page 241](#)). Some models support more than one SSID profile, check the supported number on the **Network Setting > Wireless > General** screen.

Note: The WPS switch is unavailable if the WiFi is disabled.  
If WPS is enabled, UPnP will automatically be turned on.

Click **Network Setting > Wireless > WPS**. The following screen displays. Click this switch and it will turn blue. Click **Apply** to activate the WPS function. Then you can configure the WPS settings in this screen.

**Figure 139** Network Setting > Wireless > WPS

The following table describes the labels in this screen.

**Table 73** Network Setting > Wireless > WPS

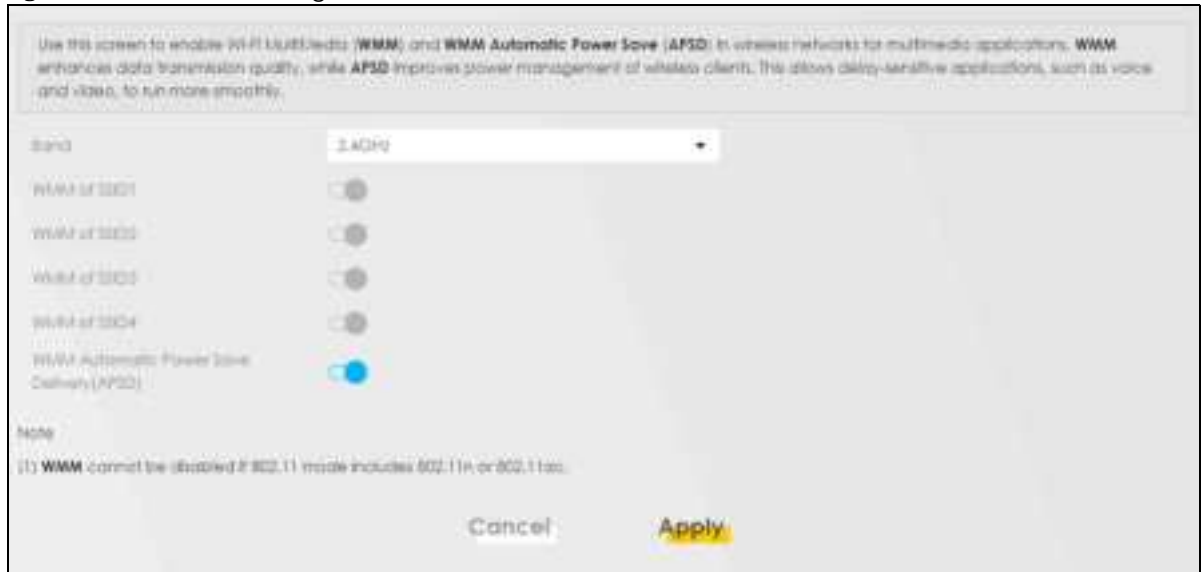
| LABEL                            | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                    |
|----------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| General                          |                                                                                                                                                                                                                                                                                                                                                                                |
| Band                             | Select a <b>2.4GHz</b> and <b>5GHz</b> frequency band to enable WPS for all WiFi networks in the selected band.<br><br>If you use the WPS button on the Zyxel Device ports panel, WPS is automatically enabled on both 2.4 GHz and 5 GHz bands. See <a href="#">Section 2.3 on page 62</a> for more information about the WPS button.                                          |
| WPS                              | Slide this to the right to enable and have the Zyxel Device activate WPS. Otherwise, it is disabled.                                                                                                                                                                                                                                                                           |
| Add a new device with WPS Method |                                                                                                                                                                                                                                                                                                                                                                                |
| Method 1 PBC                     | Use this section to set up a WPS WiFi network using Push Button Configuration (PBC). Click this switch to make it turn blue. Click <b>Apply</b> to activate WPS method 1 on the Zyxel Device.                                                                                                                                                                                  |
| WPS                              | Click this button to add another WPS-enabled WiFi device (within WiFi range of the Zyxel Device) to your WiFi network. This button may either be a physical button on the outside of a WiFi device, or a menu button similar to the <b>WPS button</b> on this screen.<br><br>Note: You must press the other WiFi device's WPS button within 2 minutes of pressing this button. |
| Cancel                           | Click <b>Cancel</b> to restore your previously saved settings.                                                                                                                                                                                                                                                                                                                 |
| Apply                            | Click <b>Apply</b> to save your changes.                                                                                                                                                                                                                                                                                                                                       |

## 8.6 WMM

Use this screen to enable WiFi MultiMedia (**WMM**) and **WMM Automatic Power Save Delivery (APSD)** in WiFi networks for multimedia applications. **WMM** enhances data transmission quality, while **APSD** improves power management of WiFi clients. This allows time-sensitive applications, such as voice and videos, to run more smoothly.

Click **Network Setting > Wireless > WMM** to display the following screen.

**Figure 140** Network Setting > Wireless > WMM



Note: **WMM** cannot be disabled if 802.11 mode includes 802.11n or 802.11ac.

Note: APSD only affects SSID1. For SSID2-SSID4, APSD is always enabled.

Note: This screen is not available when Mesh is enabled in the **Network Setting > Wireless > MESH** screen.

The following table describes the labels in this screen.

Table 74 Network Setting > Wireless > WMM

| LABEL       | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|-------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Band        | Select a <b>2.4GHz</b> and <b>5GHz</b> frequency band to enable or disable the <b>WMM of SSID</b> of the selected band.                                                                                                                                                                                                                                                                                                                                                                                                                      |
| WMM of SSID | <p>Select <b>On</b> to have the Zyxel Device automatically give the WiFi network (SSIDx) a priority level according to the ToS value in the IP header of packets it sends. WMM QoS (WiFi MultiMedia Quality of Service) gives high priority to video, which makes them run more smoothly.</p> <p>SSID1 is the <b>General</b> WiFi SSID; SSID2-SSID4 are the <b>Guest</b> WiFi SSIDs.</p> <p>If the <b>802.11 Mode</b> in <b>Network Setting &gt; Wireless &gt; Others</b> is set to include 802.11n or 802.11ac, WMM cannot be disabled.</p> |

Table 74 Network Setting &gt; Wireless &gt; WMM (continued)

| Label                                    | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| WMM Automatic Power Save Delivery (APSD) | Select this option to extend the battery life of your mobile devices (especially useful for small devices that are running multimedia applications). The Zyxel Device goes to sleep mode to save power when it is not transmitting data. The AP buffers the packets sent to the Zyxel Device until the Zyxel Device "wakes up." The Zyxel Device wakes up periodically to check for incoming data.<br><br>Note: This works only if the WiFi device to which the Zyxel Device is connected also supports this feature. |
| Cancel                                   | Click <b>Cancel</b> to restore your previously saved settings.                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Apply                                    | Click <b>Apply</b> to save your changes.                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |

## 8.7 Others

Use this screen to configure advanced WiFi settings, such as additional security settings, power saving, and data transmission settings. Click **Network Setting > Wireless > Others**. The screen appears as shown.

Note: This screen is not available when Mesh is enabled in the **Network Setting > Wireless > MESH** screen.

See [Section 8.10.2 on page 259](#) for detailed definitions of the terms listed here.

**Figure 141** Network Setting > Wireless > Others

Use this screen to configure advanced wireless settings, such as additional security settings, power saving, and data transmission settings.

|                         |                      |    |
|-------------------------|----------------------|----|
| Band                    | 2.4GHz               |    |
| RTT/RTT Threshold       | 2547                 |    |
| Fragmentation Threshold | 2346                 |    |
| Output Power            | 100%                 |    |
| Beacon Interval         | 100                  | ms |
| DTIM Interval           | 1                    | ms |
| 802.11 Mode             | 802.11b/g/n/ax mixed |    |
| 802.11 Protection       | Auto                 |    |
| Priority                | High                 |    |

Cancel Apply

The following table describes the labels in this screen.

Table 75 Network Setting > Wireless > Others

| <b>LABEL</b>            | <b>DESCRIPTION</b>                                                                                                                                                                                                                                                                                                                                                                                                          |
|-------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Band                    | Select a <b>2.4GHz</b> or <b>5GHz</b> frequency band to display the following wireless settings for the selected band.                                                                                                                                                                                                                                                                                                      |
| RTS/CTS Threshold       | Data with its frame size larger than this value will perform the RTS (Request To Send)/CTS (Clear To Send) handshake.<br><br>Enter a value between 0 and 2347.                                                                                                                                                                                                                                                              |
| Fragmentation Threshold | This is the maximum data fragment size that can be sent. Enter a value between 256 and 2346.                                                                                                                                                                                                                                                                                                                                |
| Output Power            | Set the output power of the Zyxel Device. If there is a high density of APs in an area, decrease the output power to reduce interference with other APs. Select one of the following: <b>20%</b> , <b>40%</b> , <b>60%</b> , <b>80%</b> or <b>100%</b> .                                                                                                                                                                    |
| Beacon Interval         | When a wirelessly networked device sends a beacon, it includes with it a beacon interval. This specifies the time period before the device sends the beacon again.<br><br>The interval tells receiving devices on the network how long they can wait in low power mode before waking up to handle the beacon. This value can be set from 50 ms to 1000 ms. A high value helps save current consumption of the access point. |
| DTIM Interval           | Delivery Traffic Indication Message (DTIM) is the time period after which broadcast and Multicast packets are transmitted to mobile clients in the Power Saving mode. A high DTIM value can cause clients to lose connectivity with the network. This value can be set from 1 to 255.                                                                                                                                       |

Table 75 Network Setting &gt; Wireless &gt; Others (continued)

| LABEL             | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 802.11 Mode       | <p>For 2.4 GHz frequency WiFi devices:</p> <ul style="list-style-type: none"> <li>• Select <b>802.11b Only</b> to allow only IEEE 802.11b compliant WiFi devices to associate with the Zyxel Device.</li> <li>• Select <b>802.11g Only</b> to allow only IEEE 802.11g compliant WiFi devices to associate with the Zyxel Device.</li> <li>• Select <b>802.11n Only</b> to allow only IEEE 802.11n compliant WiFi devices to associate with the Zyxel Device.</li> <li>• Select <b>802.11b/g Mixed</b> to allow either IEEE 802.11b or IEEE 802.11g compliant WiFi devices to associate with the Zyxel Device. The transmission rate of your Zyxel Device might be reduced.</li> <li>• Select <b>802.11b/g/n Mixed</b> to allow IEEE 802.11b, IEEE 802.11g or IEEE 802.11n compliant WiFi devices to associate with the Zyxel Device. The transmission rate of your Zyxel Device might be reduced.</li> <li>• Select <b>802.11b/g/n/ax Mixed</b> to allow IEEE 802.11b, IEEE 802.11g, IEEE 802.11n or IEEE 802.11ax compliant WiFi devices to associate with the Zyxel Device. The transmission rate of your Zyxel Device might be reduced.</li> </ul> <p>For 5 GHz / 6GHz frequency WiFi devices:</p> <ul style="list-style-type: none"> <li>• Select <b>802.11a Only</b> to allow only IEEE 802.11a compliant WiFi devices to associate with the Zyxel Device.</li> <li>• Select <b>802.11n Only</b> to allow only IEEE 802.11n compliant WiFi devices to associate with the Zyxel Device.</li> <li>• Select <b>802.11ac Only</b> to allow only IEEE 802.11ac compliant WiFi devices to associate with the Zyxel Device.</li> <li>• Select <b>802.11a/n Mixed</b> to allow either IEEE 802.11a or IEEE 802.11n compliant WiFi devices to associate with the Zyxel Device. The transmission rate of your Zyxel Device might be reduced.</li> <li>• Select <b>802.11n/ac Mixed</b> to allow either IEEE 802.11n or IEEE 802.11ac compliant WiFi devices to associate with the Zyxel Device. The transmission rate of your Zyxel Device might be reduced.</li> <li>• Select <b>802.11a/n/ac Mixed</b> to allow IEEE 802.11a, IEEE 802.11n or IEEE 802.11ac compliant WiFi devices to associate with the Zyxel Device. The transmission rate of your Zyxel Device might be reduced.</li> <li>• Select <b>802.11a/n/ac/ax Mixed</b> to allow IEEE 802.11a, IEEE 802.11n, IEEE 802.11ac or IEEE 802.11ax compliant WiFi devices to associate with the Zyxel Device. The transmission rate of your Zyxel Device might be reduced.</li> </ul> <p>Note: To see if your model supports 6GHz, please see <a href="#">Section 1.1 on page 20</a> for more information.</p> |
| 802.11 Protection | <p>Enabling this feature can help prevent collisions in mixed-mode networks (networks with both IEEE 802.11b and IEEE 802.11g traffic).</p> <p>Select <b>Auto</b> to have the wireless devices transmit data after a RTS/CTS handshake. This helps improve IEEE 802.11g performance.</p> <p>Select <b>Off</b> to disable 802.11 protection. The transmission rate of your Zyxel Device might be reduced in a mixed-mode network.</p> <p>This field displays <b>Off</b> and is not configurable when you set <b>802.11 Mode</b> to <b>802.11b Only</b>.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Preamble          | <p>Select a preamble type from the drop-down list box. Choices are <b>Long</b> or <b>Short</b>. See <a href="#">Section 8.10.7 on page 262</a> for more information.</p> <p>This field is configurable only when you set 802.11 Mode to <b>802.11b</b>.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Cancel            | Click <b>Cancel</b> to restore your previously saved settings.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Apply             | Click <b>Apply</b> to save your changes.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |

## 8.8 Channel Status

Use this screen to scan for WiFi channel noise and view the results. Click **Scan** to start, and then view the results in the **Channel Scan Result** section. The value on each channel number indicates the number of Access Points (AP) using that channel. The Auto-channel-selection algorithm does not always directly follow the AP count; other factors about the channels are also considered. Click **Network Setting > Wireless > Channel Status**. The screen appears as shown.

Note: If the current channel is a DFS channel, the warning 'Channel scan process is denied because current channel is a DFS channel (Channel: 52 – 140). If you want to run channel scan, please select a non-DFS channel and try again.' appears.

Note: The AP count may not be a real-time value.

**Figure 142** Network Setting > Wireless > Channel Status



The following table describes the labels in this screen.

Table 76 Network Setting > Wireless > Channel Status

| LABEL                      | DESCRIPTION                                                                                                                                                                                                                  |
|----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Channel Monitor            |                                                                                                                                                                                                                              |
| Wireless Network Setup     |                                                                                                                                                                                                                              |
| Band                       | Select a <b>2.4 GHz</b> , <b>5 GHz</b> or <b>6 GHz</b> frequency band on which you want to conduct a channel scan.                                                                                                           |
| Scan wireless LAN Channels | Click the <b>Scan</b> button to scan WiFi channels.                                                                                                                                                                          |
| Channel Scan Result        | This displays the results of the channel scan.<br>The blue bar displays the number of access points ( <b>AP count</b> ) in the WiFi channel.<br>The orange bar displays the WiFi channel that the Zyxel Device is now using. |

## 8.9 MESH

The Zyxel Device supports Mesh to manage your WiFi network. Mesh is the Zyxel implantation of WiFi-Alliance Easy Mesh. It supports AP steering, band steering, auto-configuration and other advances for your WiFi network.

The Zyxel Device can function as a controller to automatically configure WiFi settings on extenders in the network as well as optimize bandwidth usage.

The Zyxel Device optimizes bandwidth usage by directing WiFi clients to an extender (AP steering) or a 2.4 GHz / 5 GHz band (band steering) that is less busy.

See [Section 1.3 on page 30](#) for the complete tutorials with the MPro Mesh app or Zyxel One app.

- Setting up your Mesh network with the Zyxel Device and an Mesh extender,
- setting up your general/guest WiFi,
- basic configurations.

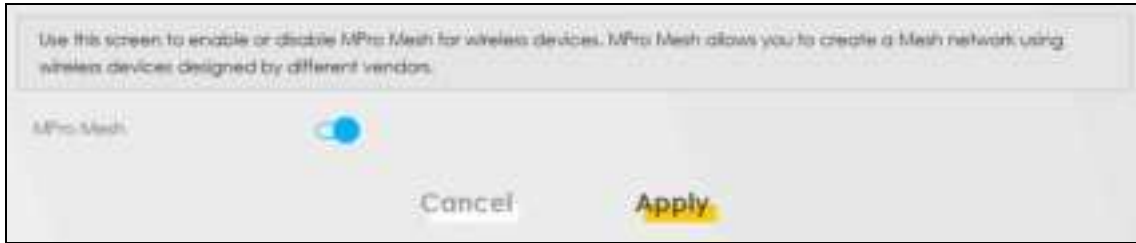
### 8.9.1 MPro Mesh

Use this screen to enable or disable the Mesh on the Zyxel Device.

Click **Network Setting > Wireless > MESH**. The following screen displays.

Note: When MPro Mesh is enabled, the SSID and WiFi password of the main 2.4 GHz WiFi network will be copied to the main 5 GHz WiFi network.



**Figure 143** Network Setting > Wireless > MESH

The following table describes the labels in this screen.

**Table 77** Network Setting > Wireless > MESH

| LABEL     | DESCRIPTION                                                                                                  |
|-----------|--------------------------------------------------------------------------------------------------------------|
| MPro Mesh | Click the button (to the right) to enable the Mesh feature on the Zyxel Device and set up your Mesh network. |

## 8.10 Technical Reference

This section discusses WiFi in depth.

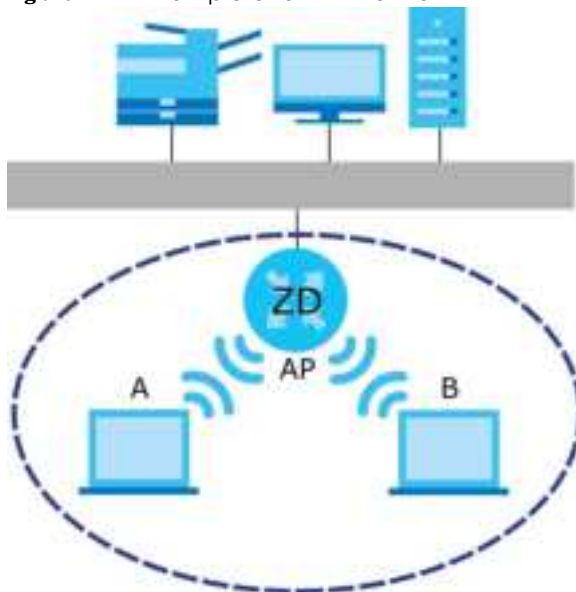
### 8.10.1 WiFi Network Overview

WiFi networks consist of WiFi clients, access points and bridges.

- A WiFi client is a radio connected to a user's computer.
- An access point is a radio with a wired connection to a network, which can connect with numerous WiFi clients and let them access the network.
- A bridge is a radio that relays communications between access points and WiFi clients, extending a network's range.

Normally, a WiFi network operates in an "infrastructure" type of network. An "infrastructure" type of network has one or more access points and one or more WiFi clients. The WiFi clients connect to the access points.

The following figure provides an example of a WiFi network.

**Figure 144** Example of a WiFi Network

The WiFi network is the part in the blue circle. In this WiFi network, devices **A** and **B** use the access point (**AP**) to interact with the other devices (such as the printer) or with the Internet. Your Zyxel Device is the AP.

Every WiFi network must follow these basic guidelines.

- Every WiFi device in the same WiFi network must use the same SSID.  
The SSID is the name of the WiFi network. It stands for Service Set Identifier.
- If two WiFi networks overlap, they should use a different channel.  
Like radio stations or television channels, each WiFi network uses a specific channel, or frequency, to send and receive information.
- Every WiFi device in the same WiFi network must use security compatible with the AP.  
Security stops unauthorized devices from using the WiFi network. It can also protect the information that is sent in the WiFi network.

### 8.10.2 Additional WiFi Terms

The following table describes some WiFi network terms and acronyms used in the Zyxel Device's Web Configurator.

Table 78 Additional WiFi Terms

| TERM                    | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|-------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| RTS/CTS Threshold       | <p>In a WiFi network which covers a large area, WiFi devices are sometimes not aware of each other's presence. This may cause them to send information to the AP at the same time and result in information colliding and not getting through.</p> <p>By setting this value lower than the default value, the WiFi devices must sometimes get permission to send information to the Zyxel Device. The lower the value, the more often the devices must get permission.</p> <p>If this value is greater than the fragmentation threshold value (see below), then WiFi devices never have to get permission to send information to the Zyxel Device.</p> |
| Preamble                | A preamble affects the timing in your WiFi network. There are two preamble modes: long and short. If a WiFi device uses a different preamble mode than the Zyxel Device does, it cannot communicate with the Zyxel Device.                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Authentication          | The process of verifying whether a WiFi device is allowed to use the WiFi network.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Fragmentation Threshold | A small fragmentation threshold is recommended for busy networks, while a larger threshold provides faster performance if the network is not very busy.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |

### 8.10.3 WiFi Security Overview

By their nature, radio communications are simple to intercept. For WiFi data networks, this means that anyone within range of a WiFi network without security can not only read the data passing over the airwaves, but also join the network. Once an unauthorized person has access to the network, he or she can steal information or introduce malware (malicious software) intended to compromise the network. For these reasons, a variety of security systems have been developed to ensure that only authorized people can use a WiFi data network, or understand the data carried on it.

These security standards do two things. First, they authenticate. This means that only people presenting the right credentials (often a username and password, or a "key" phrase) can access the network. Second, they encrypt. This means that the information sent over the air is encoded. Only people with the code key can understand the information, and only people who have been authenticated are given the code key.

These security standards vary in effectiveness. Some can be broken, such as the old Wired Equivalent Protocol (WEP). Using WEP is better than using no security at all, but it will not keep a determined attacker out. Other security standards are secure in themselves but can be broken if a user does not use them properly. For example, the WPA-PSK security standard is very secure if you use a long key which is difficult for an attacker's software to guess – for example, a twenty-letter long string of apparently random numbers and letters – but it is not very secure if you use a short key which is very easy to guess – for example, a three-letter word from the dictionary.

Because of the damage that can be done by a malicious attacker, it is not just people who have sensitive information on their network who should use security. Everybody who uses any WiFi network should ensure that effective security is in place.

A good way to come up with effective security keys, passwords and so on is to use obscure information that you personally will easily remember, and to enter it in a way that appears random and does not include real words. For example, if your mother owns a 1970 Dodge Challenger and her favorite movie is

Vanishing Point (which you know was made in 1971) you could use "70dodchal71vanpoi" as your security key.

The following sections introduce different types of WiFi security you can set up in the WiFi network.

### 8.10.3.1 SSID

Normally, the Zyxel Device acts like a beacon and regularly broadcasts the SSID in the area. You can hide the SSID instead, in which case the Zyxel Device does not broadcast the SSID. In addition, you should change the default SSID to something that is difficult to guess.

This type of security is fairly weak, however, because there are ways for unauthorized WiFi devices to get the SSID. In addition, unauthorized WiFi devices can still see the information that is sent in the WiFi network.

### 8.10.3.2 MAC Address Filter

Every device that can use a WiFi network has a unique identification number, called a MAC address.<sup>1</sup> A MAC address is usually written using twelve hexadecimal characters<sup>2</sup>; for example, 00A0C5000002 or 00:A0:C5:00:00:02. To get the MAC address for each WiFi device in the WiFi network, see the WiFi device's User's Guide or other documentation.

You can use the MAC address filter to tell the Zyxel Device which devices are allowed or not allowed to use the WiFi network. If a WiFi device is allowed to use the WiFi network, it still has to have the correct information (SSID, channel, and security). If a WiFi device is not allowed to use the WiFi network, it does not matter if it has the correct information.

This type of security does not protect the information that is sent in the WiFi network. Furthermore, there are ways for unauthorized WiFi devices to get the MAC address of an authorized WiFi device. Then, they can use that MAC address to use the WiFi network.

### 8.10.3.3 Encryption

WiFi networks can use encryption to protect the information that is sent in the WiFi network. Encryption is like a secret code. If you do not know the secret code, you cannot understand the message.

The types of encryption you can choose depend on the type of authentication. (See [Section 8.10.3.3 on page 260](#) for information about this.)

Table 79 Types of Encryption for Each Type of Authentication

|                                                                                     | NO AUTHENTICATION | RADIUS SERVER                        |
|-------------------------------------------------------------------------------------|-------------------|--------------------------------------|
| <b>Weakest</b>                                                                      | No Security       | WPA                                  |
|  | WPA-PSK           | WPA2                                 |
|                                                                                     | WPA2              |                                      |
| <b>Strongest</b>                                                                    | WPA3-SAE          | WPA3 (server certificate validation) |

1. Some wireless devices, such as scanners, can detect WiFi networks but cannot use WiFi networks. These kinds of wireless devices might not have MAC addresses.

2. Hexadecimal characters are 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, A, B, C, D, E, and F.

For example, if the WiFi network has a RADIUS server, you can choose **WPA**, **WPA2**, or **WPA3**. If users do not log in to the WiFi network, you can choose no encryption, **WPA2-PSK**, or **WPA3-SAE**.

Note: It is recommended that WiFi networks use **WPA3-SAE**, **WPA2-PSK**, or stronger encryption. The other types of encryption are better than none at all, but it is still possible for unauthorized WiFi devices to figure out the original information pretty quickly.

Many types of encryption use a key to protect the information in the WiFi network. The longer the key, the stronger the encryption. Every device in the WiFi network must have the same key.

#### 8.10.4 Signal Problems

Because WiFi networks are radio networks, their signals are subject to limitations of distance, interference and absorption.

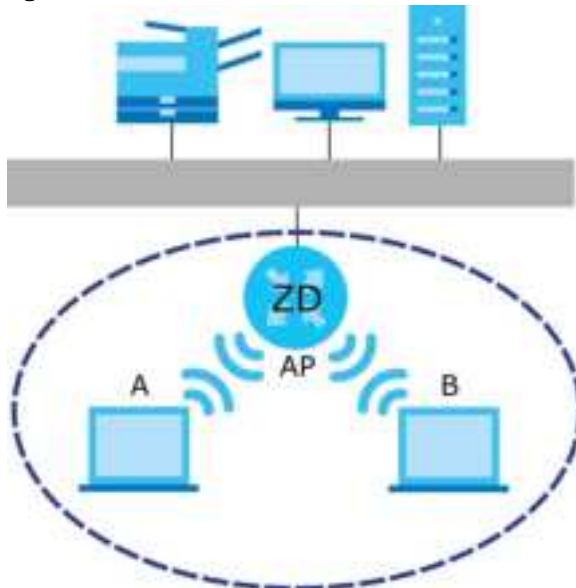
Problems with distance occur when the two radios are too far apart. Problems with interference occur when other radio waves interrupt the data signal. Interference may come from other radio transmissions, such as military or air traffic control communications, or from machines that are coincidental emitters such as electric motors or microwaves. Problems with absorption occur when physical objects (such as thick walls) are between the two radios, muffling the signal.

#### 8.10.5 BSS

A Basic Service Set (BSS) exists when all communications between wireless stations go through one access point (AP).

Intra-BSS traffic is traffic between wireless stations in the BSS. When Intra-BSS traffic blocking is disabled, wireless station A and B can access the wired network and communicate with each other. When Intra-BSS traffic blocking is enabled, wireless station A and B can still access the wired network but cannot communicate with each other.

**Figure 145** Basic Service Set



### 8.10.6 MBSSID

Traditionally, you need to use different APs to configure different Basic Service Sets (BSSs). As well as the cost of buying extra APs, there is also the possibility of channel interference. The Zyxel Device's MBSSID (Multiple Basic Service Set Identifier) function allows you to use one access point to provide several BSSs simultaneously. You can then assign varying QoS priorities and/or security modes to different SSIDs.

Wireless devices can use different BSSIDs to associate with the same AP.

#### 8.10.6.1 Notes on Multiple BSSs

- A maximum of eight BSSs are allowed on one AP simultaneously.
- You must use different keys for different BSSs. If two wireless devices have different BSSIDs (they are in different BSSs), but have the same keys, they may hear each other's communications (but not communicate with each other).
- MBSSID should not replace but rather be used in conjunction with 802.1x security.

### 8.10.7 Preamble Type

Preamble is used to signal that data is coming to the receiver. Short and long refer to the length of the synchronization field in a packet.

Short preamble increases performance as less time sending preamble means more time for sending data. All IEEE 802.11 compliant WiFi adapters support long preamble, but not all support short preamble.

Use long preamble if you are unsure what preamble mode other WiFi devices on the network support, and to provide more reliable communications in busy WiFi networks.

Use short preamble if you are sure all WiFi devices on the network support it, and to provide more efficient communications.

Use the dynamic setting to automatically use short preamble when all WiFi devices on the network support it, otherwise the Zyxel Device uses long preamble.

Note: The WiFi devices MUST use the same preamble mode in order to communicate.

### 8.10.8 WiFi Protected Setup (WPS)

Your Zyxel Device supports WiFi Protected Setup (WPS), which is an easy way to set up a secure WiFi network. WPS is an industry standard specification, defined by the WiFi Alliance.

WPS allows you to quickly set up a WiFi network with strong security, without having to configure security settings manually. Each WPS connection works between two devices. Both devices must support WPS (check each device's documentation to make sure).

Depending on the devices you have, you can either press a button (on the device itself, or in its configuration utility) or enter a PIN (a unique Personal Identification Number that allows one device to authenticate the other) in each of the two devices. When WPS is activated on a device, it has 2 minutes to find another device that also has WPS activated. Then, the two devices connect and set up a secure network by themselves.

### 8.10.8.1 Push Button Configuration

WPS Push Button Configuration (PBC) is initiated by pressing a button on each WPS-enabled device, and allowing them to connect automatically. You do not need to enter any information.

Not every WPS-enabled device has a physical WPS button. Some may have a WPS PBC button in their configuration utilities instead of or in addition to the physical button.

Take the following steps to set up WPS using the button.

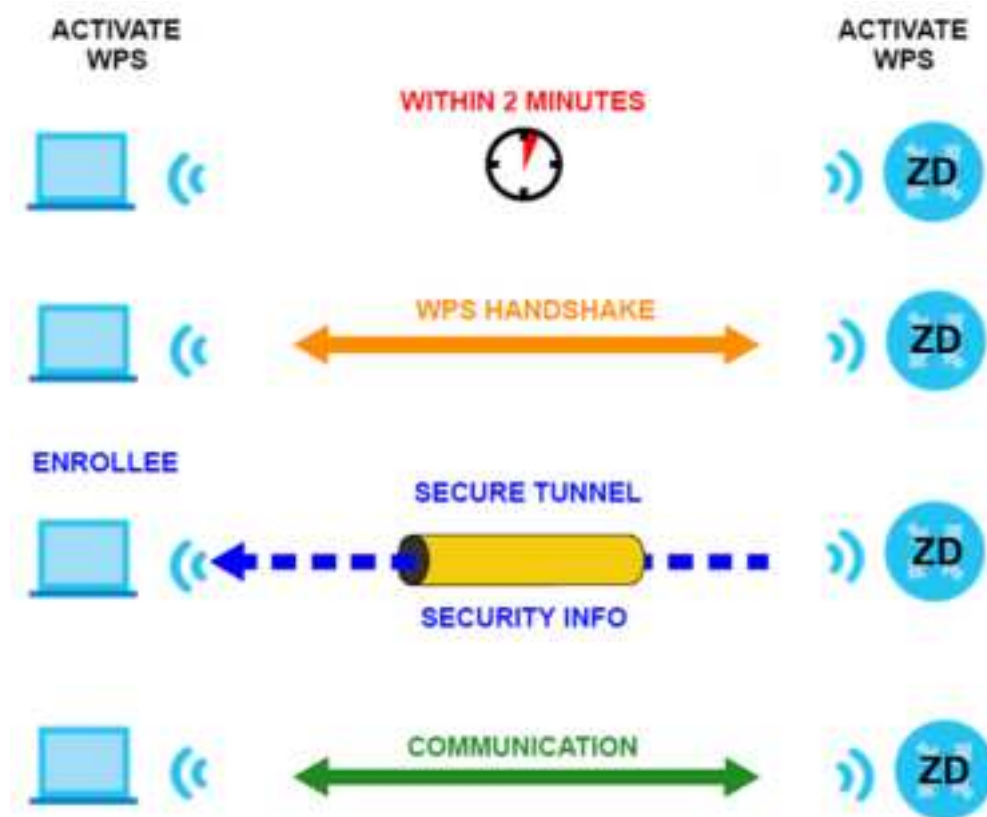
- 1 Ensure that the two devices you want to set up are within WiFi range of one another.
- 2 Look for a WPS button on each device. If the device does not have one, log into its configuration utility and locate the button (see the device's User's Guide for how to do this – for the Zyxel Device).
- 3 Press the button on one of the devices (it does not matter which). For the Zyxel Device you must press the **WiFi** button for more than 5 seconds.
- 4 Within 2 minutes, press the button on the other device. The registrar sends the network name (SSID) and security key through a secure connection to the enrollee.

If you need to make sure that WPS worked, check the list of associated WiFi clients in the AP's configuration utility. If you see the WiFi client in the list, WPS was successful.

### 8.10.8.2 How WPS Works

When two WPS-enabled devices connect, each device must assume a specific role. One device acts as the registrar (the device that supplies network and security settings) and the other device acts as the enrollee (the device that receives network and security settings). The registrar creates a secure EAP (Extensible Authentication Protocol) tunnel and sends the network name (SSID) and the WPA-PSK or WPA2-PSK pre-shared key to the enrollee. Whether WPA-PSK or WPA2-PSK is used depends on the standards supported by the devices. If the registrar is already part of a network, it sends the existing information. If not, it generates the SSID and WPA2-PSK randomly.

The following figure shows a WPS-enabled client (installed in a notebook computer) connecting to a WPS-enabled access point.

**Figure 146** How WPS Works

The roles of registrar and enrollee last only as long as the WPS setup process is active (2 minutes). The next time you use WPS, a different device can be the registrar if necessary.

The WPS connection process is like a handshake; only two devices participate in each WPS transaction. If you want to add more devices you should repeat the process with one of the existing networked devices and the new device.

Note that the access point (AP) is not always the registrar, and the WiFi client is not always the enrollee. All WPS-certified APs can be a registrar, and so can some WPS-enabled WiFi clients.

By default, a WPS device is 'un-configured'. This means that it is not part of an existing network and can act as either enrollee or registrar (if it supports both functions). If the registrar is un-configured, the security settings it transmits to the enrollee are randomly-generated. Once a WPS-enabled device has connected to another device using WPS, it becomes 'configured'. A configured WiFi client can still act as enrollee or registrar in subsequent WPS connections, but a configured access point can no longer act as enrollee. It will be the registrar in all subsequent WPS connections in which it is involved. If you want a configured AP to act as an enrollee, you must reset it to its factory defaults.

### 8.10.8.3 Example WPS Network Setup

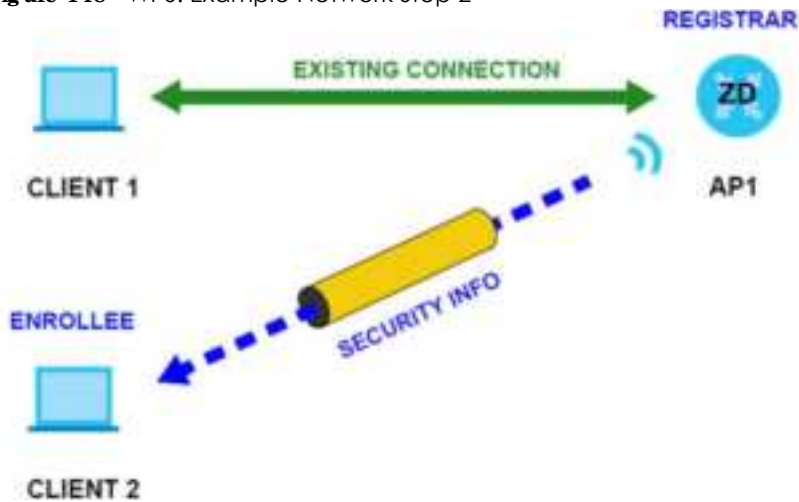
This section shows how security settings are distributed in a sample WPS setup.

The following figure shows a sample network. In step 1, both **API** and **Client 1** are un-configured. When WPS is activated on both, they perform the handshake. In this example, **API** is the registrar, and **Client 1** is the enrollee. The registrar randomly generates the security information to set up the network, since it is un-configured and has no existing information.

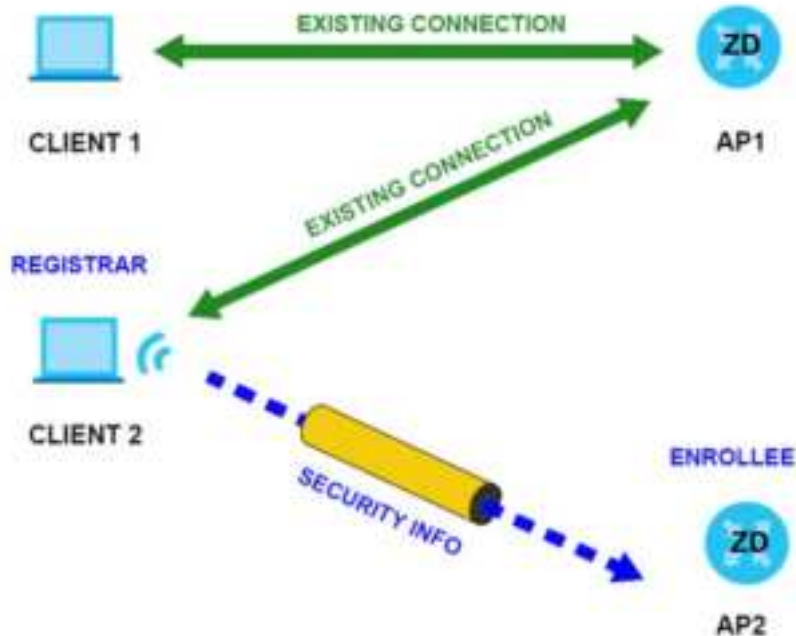


**Figure 147** WPS: Example Network Step 1

In step 2, you add another WiFi client to the network. You know that **Client 1** supports registrar mode, but it is better to use **AP1** for the WPS handshake with the new client since you must connect to the access point anyway in order to use the network. In this case, **AP1** must be the registrar, since it is configured (it already has security information for the network). **AP1** supplies the existing security information to **Client 2**.

**Figure 148** WPS: Example Network Step 2

In step 3, you add another access point (**AP2**) to your network. **AP2** is out of range of **AP1**, so you cannot use **AP1** for the WPS handshake with the new access point. However, you know that **Client 2** supports the registrar function, so you use it to perform the WPS handshake instead.

**Figure 149** WPS: Example Network Step 3

#### 8.10.8.4 Limitations of WPS

WPS has some limitations of which you should be aware.

- When you use WPS, it works between two devices only. You cannot enroll multiple devices simultaneously, you must enroll one after the other.

For instance, if you have two enrollees and one registrar you must set up the first enrollee (by pressing the WPS button on the registrar and the first enrollee, for example), then check that it was successfully enrolled, then set up the second device in the same way.

- WPS works only with other WPS-enabled devices. However, you can still add non-WPS devices to a network you already set up using WPS.

WPS works by automatically issuing a randomly-generated WPA-PSK or WPA2-PSK pre-shared key from the registrar device to the enrollee devices. Whether the network uses WPA-PSK or WPA2-PSK depends on the device. You can check the configuration interface of the registrar device to discover the key the network is using (if the device supports this feature). Then, you can enter the key into the non-WPS device and join the network as normal (the non-WPS device must also support WPA-PSK or WPA2-PSK).

- When you use the PBC method, there is a short period (from the moment you press the button on one device to the moment you press the button on the other device) when any WPS-enabled device could join the network. This is because the registrar has no way of identifying the 'correct' enrollee, and cannot differentiate between your enrollee and a rogue device. This is a possible way for a hacker to gain access to a network.

You can easily check to see if this has happened. WPS only works simultaneously between two devices, so if another device has enrolled your device will be unable to enroll, and will not have access to the network. If this happens, open the access point's configuration interface and look at the list of associated clients (usually displayed by MAC address). It does not matter if the access point is the WPS registrar, the enrollee, or was not involved in the WPS handshake; a rogue device must still associate with the access point to gain access to the network. Check the MAC addresses of your WiFi clients (usually printed on a label on the bottom of the device). If there is an unknown MAC address you can remove it or reset the AP.

# CHAPTER 9

## Home Networking

### 9.1 Home Networking Overview

A Local Area Network (LAN) is a shared communication system to which many computers are attached. A LAN is usually located in one immediate area such as a building or floor of a building.

The LAN screens can help you configure a LAN DHCP server and manage IP addresses.

**Figure 150** Home Networking Example



#### 9.1.1 What You Can Do in this Chapter

- Use the **LAN Setup** screen to set the LAN IP address, subnet mask, and DHCP settings ([Section 9.2 on page 269](#)).
- Use the **Static DHCP** screen to assign IP addresses on the LAN to specific individual computers based on their MAC addresses ([Section 9.3 on page 275](#)).
- Use the **UPnP** screen to enable UPnP ([Section 9.4 on page 277](#)).
- Use the **Additional Subnet** screen to configure IP alias and public static IP ([Section 9.5 on page 278](#)).
- Use the **STB Vendor ID** screen to configure the Vendor IDs of the connected Set Top Box (STB) devices, which have the Zyxel Device automatically create static DHCP entries for the STB devices when they request IP addresses ([Section 9.6 on page 280](#)).
- Use the **Wake on LAN** screen to remotely turn on a device on the network. ([Section 9.7 on page 281](#)).
- Use the **TFTP Server Name** screen to identify a TFTP server for configuration file download using DHCP option 66. ([Section 9.8 on page 281](#)).
- Use the **APAS** screen to allow incoming traffic from any port to access any service on a LAN device ([Section 9.9 on page 282](#)).
- Use the **Loop Guard** screen to shut down a port if the Zyxel Device detects packets sent out through the port loops back to the Zyxel Device ([Section 9.10 on page 284](#)).

#### 9.1.2 What You Need To Know

The following terms and concepts may help as you read this chapter.

### 9.1.2.1 About IAN

#### **IP Address**

Similar to the way houses on a street share a common street name, so too do computers on a LAN share one common network number. This is known as an Internet Protocol address.

#### **Subnet Mask**

The subnet mask specifies the network number portion of an IP address. Your Zyxel Device will compute the subnet mask automatically based on the IP address that you entered. You do not need to change the subnet mask computed by the Zyxel Device unless you are instructed to do otherwise.

#### **DHCP**

DHCP (Dynamic Host Configuration Protocol) allows clients to obtain TCP/IP configuration at start-up from a server. This Zyxel Device has a built-in DHCP server capability that assigns IP addresses and DNS servers to systems that support DHCP client capability.

#### **DNS**

DNS (Domain Name System) maps a domain name to its corresponding IP address and vice versa. The DNS server is extremely important because without it, you must know the IP address of a computer before you can access it. The DNS server addresses you enter when you set up DHCP are passed to the client machines along with the assigned IP address and subnet mask.

#### **RADVD (Router Advertisement Daemon)**

When an IPv6 host sends a Router Solicitation (RS) request to discover the available routers, RADVD with Router Advertisement (RA) messages in response to the request. It specifies the minimum and maximum intervals of RA broadcasts. RA messages containing the address prefix. IPv6 hosts can be generated with the IPv6 prefix an IPv6 address.

### 9.1.2.2 About UPnP

#### **How do I know if I am using UPnP?**

UPnP hardware is identified as an icon in the Network Connections folder (Windows 7). Each UPnP compatible device installed on your network will appear as a separate icon. Selecting the icon of a UPnP device will allow you to access the information and properties of that device.

#### **NAT Traversal**

UPnP NAT traversal automates the process of allowing an application to operate through NAT. UPnP network devices can automatically configure network addressing, announce their presence in the network to other UPnP devices and enable exchange of simple product and service descriptions. NAT traversal allows the following:

- Dynamic port mapping
- Learning public IP addresses

- Assigning lease times to mappings

Windows Messenger is an example of an application that supports NAT traversal and UPnP.

### **Cautions with UPnP**

The automated nature of NAT traversal applications in establishing their own services and opening firewall ports may present network security issues. Network information and configuration may also be obtained and modified by users in some network environments.

When a UPnP device joins a network, it announces its presence with a Multicast message. For security reasons, the Zyxel Device allows Multicast messages on the LAN only.

All UPnP-enabled devices may communicate freely with each other without additional configuration. Disable UPnP if this is not your intention.

### **UPnP and Zyxel**

Zyxel has achieved UPnP certification from the Universal Plug and Play Forum UPnP™ Implementers Corp. (UIC).

See [Section 9.12 on page 287](#) for examples on installing and using UPnP.

## **9.1.3 Before You Begin**

Find out the MAC addresses of your network devices if you intend to add them to the DHCP Client List screen.

## **9.2 LAN Setup**

A LAN IP address is the IP address of a networking device in the LAN. You can use the Zyxel Device's LAN IP address to access its Web Configurator from the LAN. The DHCP server settings define the rules on assigning IP addresses to LAN clients on your network.

Use this screen to set the Local Area Network IP address and subnet mask of your Zyxel Device. Configure DHCP settings to have the Zyxel Device or a DHCP server assign IP addresses to devices. Click **Network Setting > Home Networking** to open the **LAN Setup** screen.

Follow these steps to configure your LAN settings.

- 1 Select the **Interface Group** you want to set up the LAN. To configure an interface group, go to **Network Setting > Interface Grouping**. See [Chapter 16](#) for more details about interface group.
- 2 Enter an IP address into the **IP Address** field. The IP address must be in dotted decimal notation. This will become the IP address of your Zyxel Device.
- 3 Enter the IP subnet mask into the **IP Subnet Mask** field. Unless instructed otherwise it is best to leave this alone, the configurator will automatically compute a subnet mask based upon the IP address you entered.

- 4 Click **Apply** to save your settings.

**Figure 151** Network Setting > Home Networking > LAN Setup

Use this screen to set the Local Area Network IP address and subnet mask of your Zyxel Device. Configure DHCP settings to have the Zyxel Device or a DHCP server assign IP addresses to devices.

**Interface Group**

Group Name: Default

**LAN IP Setup**

IP Address:

Subnet Mask: 255 255 255 0

**DHCP Server State**

DHCP: ☒ Enable ☐ Disable ☐ DHCP Relay

**IP Addressing Values**

Beginning IP Address: 192 168 1 2

Ending IP Address: 192 168 1 254

Auto-reserve IP for this same host: ☐

**DHCP Server Lease Time**

1 days 0 hours 0 minutes

**DNS Values**

DNS: ☒ DNS Proxy ☐ Static ☐ From ISP

**Figure 152** Network Setting > Home Networking > LAN Setup (Continued)

The screenshot displays the 'LAN Setup' configuration page for IPv6. It includes sections for enabling IPv6, selecting address and identifier types (EUI64 or Manual), configuring the prefix (Delegate from WAN or Static), setting address assignment (Stateless), and DNS assignment (From RA & DHCPv6 Server). It also features DHCPv6 and IPv6 Router Advertisement (RADVD) status toggles, a table for IPv6 DNS servers with proxy settings and address input fields, and a DNS Query Scenario dropdown. 'Cancel' and 'Apply' buttons are at the bottom.

**LAN IPv6 Mode Setup**

IPv6 Active ☒

**Link Local Address Type**

☒ EUI64  
☐ Manual

**LAN Global Identifier Type**

☒ EUI64  
☐ Manual

**LAN IPv6 Prefix Setup**

☒ Delegate prefix from WAN   
☐ Static

**LAN IPv6 Address Assign Setup**

**LAN IPv6 DNS Assign Setup**

**DHCPv6 Configuration**

DHCPv6 Active ☐ DHCPv6 Server ☐

**IPv6 Router Advertisement State**

RADVD Active ☐ Enable ☐

**IPv6 DNS Values**

| IPv6 DNS Server   | Proxy                              | Address              |
|-------------------|------------------------------------|----------------------|
| IPv6 DNS Server 1 | <input type="text" value="Proxy"/> | <input type="text"/> |
| IPv6 DNS Server 2 | <input type="text" value="Proxy"/> | <input type="text"/> |
| IPv6 DNS Server 3 | <input type="text" value="Proxy"/> | <input type="text"/> |

**DNS Query Scenario**

Cancel Apply

The following table describes the fields in this screen.

Table 80 Network Setting > Home Networking > LAN Setup

| LABEL                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | DESCRIPTION                                                                                                                                                                                                                                                                |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Interface Group                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                            |
| Group Name                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Select the interface group that you want to configure for the LAN settings. You must enable DHCP.                                                                                                                                                                          |
| LAN IP Setup                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                            |
| IP Address                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Enter the LAN IP address you want to assign to your in dotted decimal notation, for example, (factory default).                                                                                                                                                            |
| Subnet Mask                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Enter the subnet mask of your network in dotted decimal notation, for example 255.255.255.0 (factory default). Your Zyxel Device automatically computes the subnet mask based on the IP address you enter, so do not change this field unless you are instructed to do so. |
| IGMP Snooping<br>See <a href="#">Section 14.1 on page 353</a> for more information on IGMP snooping.                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                            |
| Active                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Select <b>Enable</b> to allow the Zyxel Device to passively learn multicast group.                                                                                                                                                                                         |
| IGMP Mode                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Select <b>Standard Mode</b> to forward multicast packets to a port that joins the multicast group and broadcast unknown multicast packets from the WAN to all LAN ports.                                                                                                   |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Select <b>Blocking Mode</b> to block all unknown multicast packets from the WAN.                                                                                                                                                                                           |
| DHCP Server State                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                            |
| DHCP                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Select <b>Enable</b> to have your Zyxel Device assign IP addresses, an IP default gateway and DNS servers to LAN computers and other devices that are DHCP clients.                                                                                                        |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | If you select <b>Disable</b> , you need to manually configure the IP addresses of the computers and other devices on your LAN.                                                                                                                                             |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | If you select <b>DHCP Relay</b> , the Zyxel Device acts as a surrogate DHCP server and relays DHCP requests and responses between the remote server and the clients.                                                                                                       |
| DHCP Relay Server Address                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                            |
| This field is only available when you select <b>DHCP Relay</b> in the <b>DHCP</b> field.                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                            |
| IP Address                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Enter the IPv4 IP address of the actual remote DHCP server in this field.                                                                                                                                                                                                  |
| IP Addressing Values                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                            |
| The <b>IP Addressing Values</b> fields appear only when you select <b>Enable</b> in the <b>DHCP</b> field.                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                            |
| Beginning IP Address                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | This field specifies the first of the contiguous addresses in the IP address pool.                                                                                                                                                                                         |
| Ending IP Address                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | This field specifies the last of the contiguous addresses in the IP address pool.                                                                                                                                                                                          |
| Auto reserve IP for the same host                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Enable this if you want to reserve the IP address for the same host.                                                                                                                                                                                                       |
| DHCP Server Lease Time<br><br>This is the period of time DHCP-assigned addresses is used. DHCP automatically assigns IP addresses to clients when they log in. DHCP centralizes IP address management on central computers that run the DHCP server program. DHCP leases addresses, for a period of time, which means that past addresses are "recycled" and made available for future reassignment to other systems.<br><br>This field is only available when you select <b>Enable</b> in the <b>DHCP</b> field. |                                                                                                                                                                                                                                                                            |
| Days/Hours/Minutes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | DHCP server leases an address to a new client device for a period of time, called the DHCP lease time. When the lease expires, the DHCP server might assign the IP address to a different client device.                                                                   |
| DNS Values                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                            |
| This field appears only when you select <b>Enable</b> in the <b>DHCP</b> field.                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                            |



Table 80 Network Setting &gt; Home Networking &gt; LAN Setup (continued)

| LABEL                             | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |              |   |              |         |         |         |
|-----------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|---|--------------|---------|---------|---------|
| DNS                               | <p>The Zyxel Device supports DNS proxy by default. The Zyxel Device sends out its own LAN IP address to the DHCP clients as the first DNS server address. DHCP clients use this first DNS server to send domain-name queries to the Zyxel Device. The Zyxel Device sends a response directly if it has a record of the domain-name to IP address mapping. If it does not, the Zyxel Device queries an outside DNS server and relays the response to the DHCP client.</p> <p>Select <b>DNS Proxy</b> to have the DHCP clients use the Zyxel Device's own LAN IP address. The Zyxel Device works as a DNS relay.</p> <p>Select <b>Static</b> if you have the IP address of a DNS server. Enter the DNS server's IP address in the field to the right.</p> <p>Select <b>From ISP</b> if your ISP dynamically assigns DNS server information (and the Zyxel Device's WAN IP address).</p> |              |   |              |         |         |         |
| LAN IPv6 Mode Setup               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |              |   |              |         |         |         |
| IPv6 Active                       | <p>Use this to enable or disable IPv6 on the Zyxel Device.</p> <p>When IPv6 is used, the following fields need to be set.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |              |   |              |         |         |         |
| Link Local Address Type           | <p>A link-local address uniquely identifies a device on the local network (the LAN). It is similar to a "private IP address" in IPv6. You can have the same link-local address on multiple interfaces on a device. A link-local unicast address has a predefined prefix of fe80::/10. The link-local unicast address format is as follows. Select <b>EUI64</b> to allow the Zyxel Device to generate an interface ID for the LAN interface's link-local address using the EUI-64 format. Otherwise, enter an interface ID for the LAN interface's link-local address if you select <b>Manual</b>.</p> <p>Link-local Unicast Address Format</p> <table><tr><td>1111 1110 10</td><td>0</td><td>Interface ID</td></tr><tr><td>10 bits</td><td>54 bits</td><td>64 bits</td></tr></table>                                                                                                  | 1111 1110 10 | 0 | Interface ID | 10 bits | 54 bits | 64 bits |
| 1111 1110 10                      | 0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Interface ID |   |              |         |         |         |
| 10 bits                           | 54 bits                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 64 bits      |   |              |         |         |         |
| EUI64                             | Select this to have the Zyxel Device generate an interface ID for the LAN interface's link-local address using the EUI-64 format.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |              |   |              |         |         |         |
| Manual                            | Select this to manually enter an interface ID for the LAN interface's link-local address.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |              |   |              |         |         |         |
| LAN Global Identifier Type        | Select <b>EUI64</b> to have the Zyxel Device generate an interface ID using the EUI-64 format for its global address. Select <b>Manual</b> to manually enter an interface ID for the LAN interface's global IPv6 address.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |              |   |              |         |         |         |
| EUI64                             | Select this to have the Zyxel Device generate an interface ID using the EUI-64 format for its global address.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |              |   |              |         |         |         |
| Manual                            | Select this to manually enter an interface ID for the LAN interface's global IPv6 address.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |              |   |              |         |         |         |
| LAN IPv6 Prefix Setup             | Select <b>Delegate prefix from WAN</b> to automatically obtain an IPv6 network prefix from the service provider or an uplink router. Select <b>Static</b> to configure a fixed IPv6 address for the Zyxel Device's LAN IPv6 address.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |              |   |              |         |         |         |
| Delegate prefix from WAN          | Select this option to automatically obtain an IPv6 network prefix from the service provider or an uplink router.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |              |   |              |         |         |         |
| Static                            | Select this option to configure a fixed IPv6 address for the Zyxel Device's LAN IPv6 address.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |              |   |              |         |         |         |
| MLD Snooping / Multicast Snooping | Multicast Listener Discovery (MLD) allows an IPv6 switch or router to discover the presence of MLD hosts who wish to receive multicast packets and the IP addresses of multicast groups the hosts want to join on its network.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |              |   |              |         |         |         |
| Active                            | <p>Click this switch to enable or disable MLD Snooping on the Zyxel Device. When the switch goes to the right the function is enabled. Otherwise, it is not.</p> <p>This allows the Zyxel Device to check MLD packets passing through it and learn the multicast group membership. It helps reduce multicast traffic.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |              |   |              |         |         |         |

Table 80 Network Setting &gt; Home Networking &gt; LAN Setup (continued)

| LABEL                           | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| MLD Mode                        | <p>Select <b>Standard Mode</b> to forward multicast packets to a port that joins the multicast group and broadcast unknown multicast packets from the WAN to all LAN ports.</p> <p>Select <b>Blocking Mode</b> to block all unknown multicast packets from the WAN.</p>                                                                                                                                                                                                                                                                                                                                                                                  |
| LAN IPv6 Address Assign Setup   | <p>Select how you want to obtain an IPv6 address:</p> <p><b>Stateless:</b> The Zyxel Device uses IPv6 stateless auto-configuration. RADVD (Router Advertisement Daemon) is enabled to have the Zyxel Device send IPv6 prefix information in router advertisements periodically and in response to router solicitations. DHCPv6 server is disabled.</p> <p><b>Stateful:</b> The Zyxel Device uses IPv6 stateful auto-configuration. The DHCPv6 server is enabled to have the Zyxel Device act as a DHCPv6 server and pass IPv6 addresses to DHCPv6 clients.</p>                                                                                           |
| LAN IPv6 DNS Assign Setup       | <p>Select how the Zyxel Device provide DNS server and domain name information to the clients:</p> <p><b>From RA &amp; DHCPv6 Server:</b> The Zyxel Device provides DNS information through both router advertisements and DHCPv6.</p> <p><b>From DHCPv6 Server:</b> The Zyxel Device provides DNS information through DHCPv6.</p> <p><b>From Router Advertisement:</b> The Zyxel Device provides DNS information through router advertisements.</p>                                                                                                                                                                                                      |
| DHCPv6 Configuration            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| DHCPv6 Active                   | This shows the status of the DHCPv6. <b>DHCP Server</b> displays if you configured the Zyxel Device to act as a DHCPv6 server which assigns IPv6 addresses and/or DNS information to clients.                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| IPv6 Router Advertisement State |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| RADVD Active                    | This shows whether RADVD is enabled or not.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| IPv6 Address Values             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| IPv6 Start Address              | This field specifies the first of the contiguous addresses in the IPv6 address pool.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| IPv6 End Address                | This field specifies the last of the contiguous addresses in the IPv6 address pool.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| IPv6 Domain Name                | The field specifies the domain name of the IPv6 address.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| IPv6 DNS Values                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| IPv6 DNS Server 1 – 3           | <p>Specify the IP addresses up to three DNS servers for the DHCP clients to use. Use one of the following ways to specify these IP addresses.</p> <p><b>User Defined</b> – Select this if you have the IPv6 address of a DNS server. Enter the DNS server IPv6 addresses the Zyxel Device passes to the DHCP clients.</p> <p><b>From ISP</b> – Select this if your ISP dynamically assigns IPv6 DNS server information.</p> <p><b>Proxy</b> – Select this if the DHCP clients use the IP address of this interface and the Zyxel Device works as a DNS relay.</p> <p>Otherwise, select <b>None</b> if you do not want to configure IPv6 DNS servers.</p> |

Table 80 Network Setting &gt; Home Networking &gt; LAN Setup (continued)

| LABEL              | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| DNS Query Scenario | <p>Select how the Zyxel Device handles clients' DNS information requests.</p> <p><b>IPv4/IPv6 DNS Server:</b> The Zyxel Device forwards the requests to both the IPv4 and IPv6 DNS servers and sends clients the first DNS information it receives.</p> <p><b>IPv6 DNS Server Only:</b> The Zyxel Device forwards the requests to the IPv6 DNS server and sends clients the DNS information it receives.</p> <p><b>IPv4 DNS Server Only:</b> The Zyxel Device forwards the requests to the IPv4 DNS server and sends clients the DNS information it receives.</p> <p><b>IPv6 DNS Server First:</b> The Zyxel Device forwards the requests to the IPv6 DNS server first and then the IPv4 DNS server. Then it sends clients the first DNS information it receives.</p> <p><b>IPv4 DNS Server First:</b> The Zyxel Device forwards the requests to the IPv4 DNS server first and then the IPv6 DNS server. Then it sends clients the first DNS information it receives.</p> |
| Apply              | Click <b>Apply</b> to save your changes.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Cancel             | Click <b>Cancel</b> to restore your previously saved settings.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |

## 9.3 Static DHCP

When any of the LAN clients in your network want an assigned fixed IP address, add a static lease for each LAN client. Knowing the LAN client's MAC addresses is necessary. This table allows you to assign IP addresses on the LAN to individual computers based on their MAC addresses.

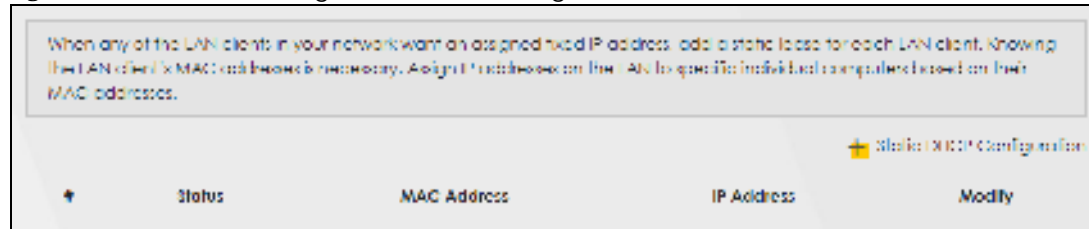
Every Ethernet device has a unique MAC (Media Access Control) address. The MAC address is assigned at the factory and consists of six pairs of hexadecimal characters, for example, 00:A0:C5:00:00:02.

### 9.3.1 Before You Begin

Find out the MAC addresses of your network devices if you intend to add them to the **Static DHCP** screen.

Use this screen to change your Zyxel Device's static DHCP settings. Click **Network Setting > Home Networking > Static DHCP** to open the following screen.

Figure 153 Network Setting &gt; Home Networking &gt; Static DHCP



The following table describes the labels in this screen.

Table 81 Network Setting > Home Networking > Static DHCP

| LABEL                     | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                          |
|---------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Static DHCP Configuration | Click this to configure a static DHCP entry.                                                                                                                                                                                                                                                                                                                         |
| #                         | This is the index number of the entry.                                                                                                                                                                                                                                                                                                                               |
| Status                    | This field displays whether the client is connected to the Zyxel Device.                                                                                                                                                                                                                                                                                             |
| MAC Address               | The MAC (Media Access Control) or Ethernet address on a LAN (Local Area Network) is unique to your computer (six pairs of hexadecimal notation).<br><br>A network interface card such as an Ethernet adapter has a hardwired address that is assigned at the factory. This address follows an industry standard that ensures no other adapter has a similar address. |
| IP Address                | This field displays the IP address relative to the # field listed above.                                                                                                                                                                                                                                                                                             |
| Modify                    | Click the <b>Edit</b> icon to configure the connection.<br><br>Click the <b>Delete</b> icon to remove the connection.                                                                                                                                                                                                                                                |

If you click **Static DHCP Configuration** in the **Static DHCP** screen, the following screen displays. Using a static DHCP means a LAN client will always have the same IP address assigned to it by the DHCP server. Assign a fixed IP address to a client device by selecting the interface group of this client device and its IP address type and selecting the device/computer from a list or manually entering its MAC address and assigned IP address.

Figure 154 Network Setting > Home Networking > Static DHCP: Static DHCP Configuration

The following table describes the labels in this screen.

Table 82 Network Setting > Home Networking > Static DHCP: Static DHCP Configuration

| LABEL              | DESCRIPTION                                                                                                                                                                                             |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Active             | Select <b>Enable</b> to activate static DHCP in your Zyxel Device.                                                                                                                                      |
| Group Name         | Select the interface group for which you want to configure the static DHCP settings.                                                                                                                    |
| IP Type            | The <b>IP Type</b> is normally <b>IPv4</b> (non-configurable).                                                                                                                                          |
| Select Device Info | Select between <b>Manual Input</b> which allows you to enter the next two fields ( <b>MAC Address</b> and <b>IP Address</b> ); or select an existing LAN device to show its MAC address and IP address. |

Table 82 Network Setting &gt; Home Networking &gt; Static DHCP: Static DHCP Configuration (continued)

| LABEL       | DESCRIPTION                                                                                                                                                                       |
|-------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| MAC Address | Enter the MAC address of a computer on your LAN if you select <b>Manual Input</b> in the previous field.                                                                          |
| IP Address  | Enter the IP address that you want to assign to the computer on your LAN with the MAC address that you will also specify if you select <b>Manual Input</b> in the previous field. |
| OK          | Click <b>OK</b> to save your changes.                                                                                                                                             |
| Cancel      | Click <b>Cancel</b> to exit this screen without saving.                                                                                                                           |

## 9.4 UPnP

Universal Plug and Play (UPnP) is an open networking standard that uses TCP/IP for simple peer-to-peer network connectivity between networking devices or software applications which have UPnP enabled. A UPnP device can dynamically join a network, obtain an IP address, advertise its services, and learn about other devices on the network. A device can also leave a network automatically when it is no longer in use.

See [Section 9.12 on page 287](#) for more information on UPnP.

Note: To use **UPnP NAT-T**, enable **NAT** in the **Network Setting > Broadband > Edit or Add New WAN Interface** screen.

Use the following screen to configure the UPnP settings on your Zyxel Device. Click **Network Setting > Home Networking > UPnP** to display the screen shown next.

**Figure 155** Network Setting > Home Networking > UPnP

Universal Plug and Play (UPnP) is an open networking standard that uses TCP/IP for simple peer-to-peer network connectivity between networking devices or software applications which have UPnP enabled. A UPnP device can dynamically join a network, obtain an IP address, advertise its services, and learn about other devices on the network. A device can also leave a network automatically when it is no longer in use.

**UPnP State**

UPnP ☒

**UPnP NAT-T State**

UPnP NAT-T ☒

**Note**  
To use **UPnP NAT-T**, enable **NAT** in the **Network Setting > Broadband > Edit/Add New WAN Interface** screen.

| # | Description | Destination IP Address | External Port | Internal Port | Protocol |
|---|-------------|------------------------|---------------|---------------|----------|
|---|-------------|------------------------|---------------|---------------|----------|

Cancel Apply

The following table describes the labels in this screen.

Table 83 Network Settings > Home Networking > UPnP

| LABEL                  | DESCRIPTION                                                                                                                                                                                                                                                                                                                                           |
|------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| UPnP State             |                                                                                                                                                                                                                                                                                                                                                       |
| UPnP                   | Select <b>Enable</b> to activate UPnP. Be aware that anyone could use a UPnP application to open the Web Configurator's login screen without entering the Zyxel Device's IP address (although you must still enter the password to access the Web Configurator).                                                                                      |
| UPnP NAT-T State       |                                                                                                                                                                                                                                                                                                                                                       |
| UPnP NAT-T             | Select <b>Enable</b> to activate UPnP with NAT enabled. UPnP NAT traversal automates the process of allowing an application to operate through NAT. UPnP network devices can automatically configure network addressing, announce their presence in the network to other UPnP devices and enable exchange of simple product and service descriptions. |
| #                      | This field displays the index number of the entry.                                                                                                                                                                                                                                                                                                    |
| Description            | This field displays the description of the UPnP NAT-T connection.                                                                                                                                                                                                                                                                                     |
| Destination IP Address | This field displays the IP address of the other connected UPnP-enabled device.                                                                                                                                                                                                                                                                        |
| External Port          | This field displays the external port number that identifies the service.                                                                                                                                                                                                                                                                             |
| Internal Port          | This field displays the internal port number that identifies the service.                                                                                                                                                                                                                                                                             |
| Protocol               | This field displays the protocol of the NAT mapping rule. Choices are <b>TCP</b> or <b>UDP</b> .                                                                                                                                                                                                                                                      |
| Apply                  | Click <b>Apply</b> to save your changes.                                                                                                                                                                                                                                                                                                              |
| Cancel                 | Click <b>Cancel</b> to restore your previously saved settings.                                                                                                                                                                                                                                                                                        |

## 9.5 LAN Additional Subnet

Use this screen to configure IP alias and public static IP.

IP alias allows you to partition a physical network into different logical networks over the same Ethernet interface. The Zyxel Device supports multiple logical LAN interfaces through its physical Ethernet interface with the Zyxel Device itself as the gateway for the LAN network. When you use IP alias, you can also configure firewall rules to control access to the LAN's logical network (subnet).

If your ISP provides the **Public LAN** service, the Zyxel Device may use a LAN IP address that can be accessed from the WAN.

Click **Network Setting > Home Networking > Additional Subnet** to display the screen shown next.

**Figure 156** Network Setting > Home Networking > Additional Subnet

**Home Networking**

LAN Setup   Static DHCP   IPv6   **Additional Subnet**   STA Vendor ID   Wake on LAN   FTP Server Name

Use this screen to configure IP alias and public static IP. IP alias allows you to partition a physical network into different logical networks over the same Ethernet interface. The Zyxel Device supports multiple logical LAN interfaces via its physical Ethernet interface with the Zyxel Device itself as the gateway for the LAN network. When you use IP alias, you can also configure firewall rules to control access to the LAN's logical network (subnet).

If your ISP provides the **Public LAN** service, the Zyxel Device may use a LAN IP address that can be accessed from the WAN.

**IP Alias Setup**

Group Name: Default

Active: ☐

IPv4 Address:

Subnet Mask:

**Public LAN**

Active: ☐

IPv4 Address:

Subnet Mask: 255 . 255 . 255 . 0

Offer Public IP to DHCP: ☐

Enable ARP Proxy: ☐

Cancel   **Apply**

The following table describes the labels in this screen.

**Table 84** Network Setting > Home Networking > Additional Subnet

| LABEL          | DESCRIPTION                                                                                                                                                                                    |
|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| IP Alias Setup |                                                                                                                                                                                                |
| Group Name     | Select the interface group name for which you want to configure the IP alias settings.                                                                                                         |
| Active         | Click this switch to enable a logical LAN for the Zyxel Device. When this is enabled, the following fields will be configurable.                                                               |
| IPv4 Address   | Enter the IP address of your Zyxel Device in dotted decimal notation.                                                                                                                          |
| Subnet Mask    | Your Zyxel Device will automatically calculate the subnet mask based on the IPv4 address that you assign. Unless you are implementing subnetting, use this value computed by the Zyxel Device. |
| Public LAN     |                                                                                                                                                                                                |
| Active         | Click this switch to enable or disable the Public LAN feature.<br>Your ISP must support Public LAN and static IP.                                                                              |
| IPv4 Address   | Enter the public IP address provided by your ISP.                                                                                                                                              |

Table 84 Network Setting &gt; Home Networking &gt; Additional Subnet (continued)

| Label                   | Description                                                                                                              |
|-------------------------|--------------------------------------------------------------------------------------------------------------------------|
| Subnet Mask             | Enter the public IPv4 subnet mask provided by your ISP.                                                                  |
| Offer Public IP by DHCP | Click this switch to enable the Zyxel Device to provide public IP addresses by DHCP server. Otherwise, click to disable. |
| Enable ARP Proxy        | Click this switch to enable the Address Resolution Protocol (ARP) proxy. Otherwise, click to disable.                    |
| Cancel                  | Click <b>Cancel</b> to restore your previously saved settings.                                                           |
| Apply                   | Click <b>Apply</b> to save your changes.                                                                                 |

## 9.6 STB Vendor ID

Use this screen to configure the Vendor IDs of connected Set Top Boxes (STBs) so the Zyxel Device can automatically create static DHCP entries for them when they request IP addresses.

Click **Network Setting > Home Networking > STB Vendor ID** to open this screen.

Figure 157 Network Setting &gt; Home Networking &gt; STB Vendor ID

The following table describes the labels in this screen.

Table 85 Network Setting &gt; Home Networking &gt; STB Vendor ID

| Label           | Description                                                                                                                                                              |
|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Vendor ID 1 – 5 | These are STB's Vendor Class Identifiers (DHCP option 60). A Vendor Class Identifier is usually used to inform the DHCP server a DHCP client's vendor and functionality. |
| Cancel          | Click <b>Cancel</b> to restore your previously saved settings.                                                                                                           |
| Apply           | Click <b>Apply</b> to save your changes.                                                                                                                                 |



## 9.7 Wake on LAN

Wake on LAN (WoL) allows you to remotely turn on a device on the network, such as a computer, storage device or media server. To use this feature, the remote hardware (for example the network adapter on a computer) must support Wake on LAN using the 'Magic Packet' method.

You need to know the MAC address of the LAN device. It may be on a label on the LAN device.

Click **Network Setting** > **Home Networking** > **Wake on LAN** to open this screen.

**Figure 158** Network Setting > Home Networking > Wake on LAN

The following table describes the labels in this screen.

Table 86 Network Setting > Home Networking > Wake on LAN

| Label           | Description                                                                                                                                                                                                                                                                                                                                         |
|-----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Wake by Address | Select <b>Manual</b> and enter the IP address or MAC address of the LAN device to turn it on remotely. The drop-down list also lists the IP addresses that can be found in the Zyxel Device's ARP table. If you select an IP address, the MAC address of the LAN device with the selected IP address then displays in the <b>MAC Address</b> field. |
| IP Address      | Enter the IPv4 IP address of the LAN device to turn it on.<br>This field is not available if you select an IP address in the <b>Wake by Address</b> field.                                                                                                                                                                                          |
| MAC Address     | Enter the MAC address of the LAN device to turn it on. A MAC address consists of six hexadecimal character pairs.                                                                                                                                                                                                                                   |
| Wake Up         | Click this to send a WoL magic packet to wake up the specified LAN device.                                                                                                                                                                                                                                                                          |

## 9.8 TFTP Server Name

Use the **TFTP Server Name** screen to identify a TFTP server for configuration file download using DHCP option 66. RFC 2132 defines the option 66 open standard. DHCP option 66 supports the IP address or the host name of a single TFTP server.

Click **Network Setting** > **Home Networking** > **TFTP Server Name** to open this screen.

**Figure 159** Network Setting > Home Networking > TFTP Server Name

The following table describes the labels in this screen.

**Table 87** Network Setting > Home Networking > TFTP Server Name

| LABEL            | DESCRIPTION                                                    |
|------------------|----------------------------------------------------------------|
| TFTP Server Name | Enter the IP address or the host name of a single TFTP server. |
| Cancel           | Click <b>Cancel</b> to restore your previously saved settings. |
| Apply            | Click <b>Apply</b> to save your changes.                       |

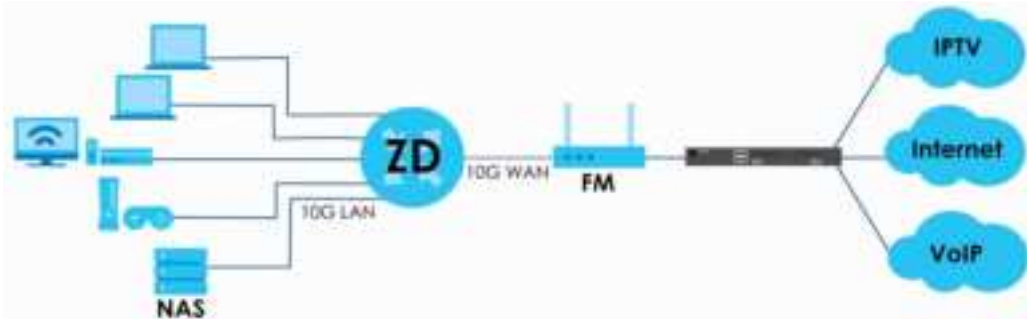
## 9.9 Any Port Any Service (APAS)

**Any Port Any Service** (APAS) allows a LAN device to use any available port to access any available service from a remote WAN device. Typically, a LAN device, such as a Set Top Box (STB), would have to use a specific port to access video streams from a video server. With APAS, the video streams only need to be received through the specified Bridge WAN interface for the LAN device specified in the APAS rule. You can connect the LAN device to any LAN port. Other LAN devices can access the Internet using the default gateway.

Unlike **Port Forwarding**, which forwards traffic based on port numbers, you do not need to know the port number for the video traffic from the IPTV server. You just select the LAN device host name or enter its MAC address and select a Bridge WAN interface.

Use the wildcard '\*' for a range of MAC addresses for multiple LAN devices. For example, enter 00:13:49:\*.\*\* for all LAN devices from a vendor with the MAC OUI 00:13:49. (range). Any device with that MAC OUI aa:bb:cc connected to any LAN port on the Zyxel Device can access services or can be accessed for services through the specified Bridge WAN interface. For example, the LAN device could be an STB receiving video streams from a video server, or it could be a server, allowing access to it through the specified Bridge WAN interface.

Note: You must configure a Bridge WAN interface in advance.



As APAS allows incoming traffic from any port to access any service on a configured LAN device, it may be difficult to distinguish between appropriate and malicious traffic going to the LAN device. Make sure to properly configure firewall rules to protect the LAN device, and monitor network traffic for suspicious activity.

Click **Network Setting** > **Home Networking** > **APAS** to open this screen.

Network Setting > Home Networking > APAS

The screenshot shows the 'Home Networking' configuration screen for APAS. At the top, there are tabs for 'LAN Setup', 'Static DHCP', 'IPMP', 'Additional Subnet', 'SIS Vendor ID', 'Wake on LAN', 'FTP Server Name', and 'APAS'. The 'APAS' tab is selected. Below the tabs, there is a description: 'This table allows you to configure Any Port Any Service. Any Port Any Service is filtering device with specific OUI (or masked MAC prefix) to specific bridge WAN interface.' There is an 'Enable' toggle switch which is currently turned on. To the right of the toggle is a button labeled '+ Add new Mac Rule'. Below this is a table with columns: '#', 'Enable', 'Name', 'Mac Rule', and 'WAN interface'. At the bottom of the screen are 'Cancel' and 'OK' buttons.

The following table describes the labels in this screen.

Table 88 Network Setting > Home Networking > APAS

| LABEL            | DESCRIPTION                                                                    |
|------------------|--------------------------------------------------------------------------------|
| Enable           | Click <b>Enable</b> to activate APAS.                                          |
| Add new MAC Rule | Click this button to add a new MAC rule. You can create up to eight MAC rules. |
| #                | This is the index number.                                                      |
| Name             | This is the name of the rule.                                                  |
| MAC Rule         | This is the LAN host MAC address that is applied to the rule.                  |
| WAN Interface    | This is the bridge WAN interface for incoming traffic.                         |
| Cancel           | Click <b>Cancel</b> to restore your previously saved changes.                  |
| OK               | Click <b>OK</b> to save your changes.                                          |

### 9.9.1 Add APAS

Use this screen to create a new MAC rule. Click **Network Setting > Home Networking > APAS > Add New MAC Rule** to open the following screen.

**Figure 160** Network Setting > Home Networking > APAS > Add New MAC Rule

The following table describes the labels in this screen.

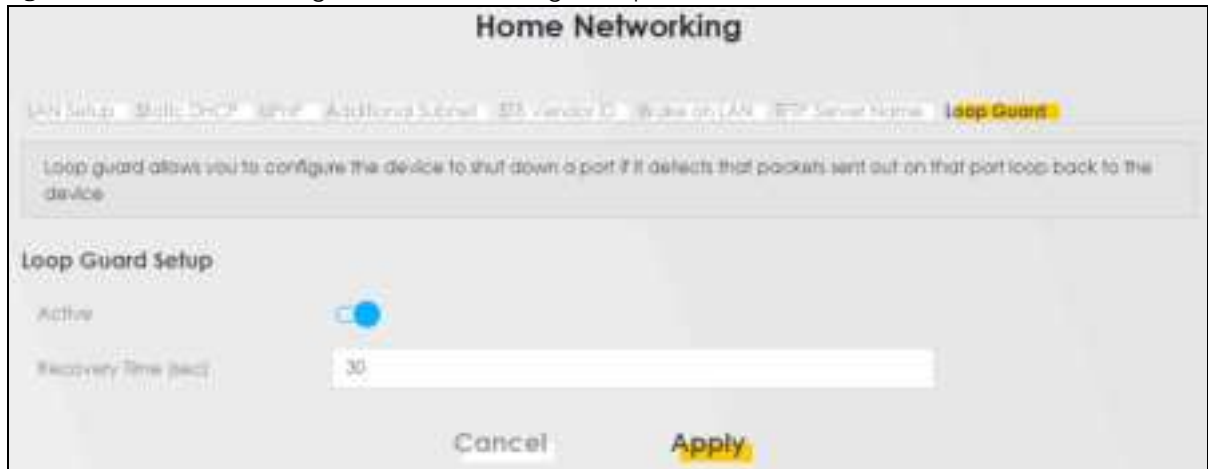
Table 89 Network Setting > Home Networking > APAS > Add New MAC Rule

| LABEL              | DESCRIPTION                                                                                                                                                                                                                                                      |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Enable             | Click this to enable APAS on the Zyxel Device.                                                                                                                                                                                                                   |
| Name               | Enter a name of up to 64 characters for the <b>APAS</b> rule to this host(s). Allowed characters for <b>Name</b> include the following within quotes: " !#%()*+,-./0123456789:;=?@ABCDEFGHIJKLMNPQRSTUVWXYZ[\_abcdefghijklmnopqrstuvwxyz~"                       |
| Select Device Info | Select a connected LAN host or select <b>Manual Input</b> to enter the MAC address of a client that is not yet connected and does not display in <b>Connection Status &gt; Connectivity</b> .                                                                    |
| MAC Rule           | If you selected <b>Manual Input</b> for <b>Select Device Info</b> , then enter the LAN host MAC address here. You can use the wildcard '*' for a MAC address range. For example, enter 00:13:49:*:* for all LAN devices from a vendor with the MAC OUI 00:13:49. |
| Bridge WAN Name    | Select a Bridge WAN interface for incoming traffic to apply the rule. You must have created at least one Bridge WAN interface in <b>Network Setting &gt; Broadband</b> screen.                                                                                   |
| Cancel             | Click <b>Cancel</b> to exit this screen without saving.                                                                                                                                                                                                          |
| OK                 | Click <b>OK</b> to save your changes.                                                                                                                                                                                                                            |

## 9.10 Loop Guard Protection

Use the **Loop Guard** screen to configure the loop guard to protect against network loops. Loop guard shuts down a port if the Zyxel Device detects packets sent out through the port looping back to the Zyxel Device.

Click **Network Setting > Home Networking > Loop Guard** to open this screen.

**Figure 161** Network Setting > Home Networking > Loop Guard

The following table describes the labels in this screen.

**Table 90** Network Setting > Home Networking > Loop Guard

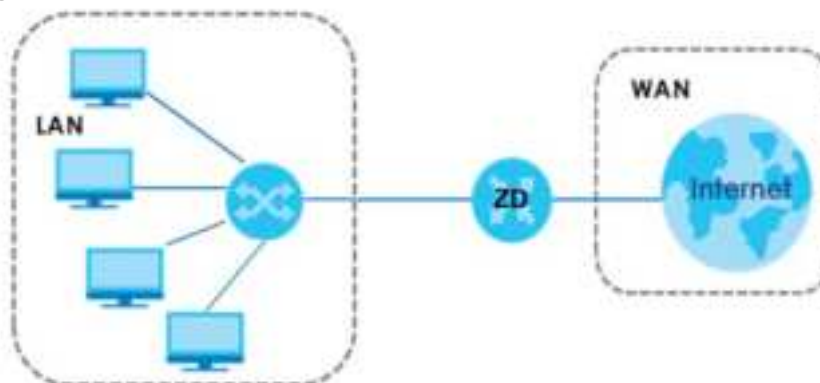
| LABEL              | DESCRIPTION                                                                                                                                |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------|
| Active             | Click this switch to the right to enable the loop guard to protect against network loops.                                                  |
| Recover Time (sec) | When you enable loop guard, specify how many seconds (15 to 300) the Zyxel Device waits before re-enabling a port shut down by loop guard. |
| Cancel             | Click <b>Cancel</b> to restore your previously saved settings.                                                                             |
| Apply              | Click <b>Apply</b> to save your changes.                                                                                                   |

## 9.11 Technical Reference

This section provides some technical background information about the topics covered in this chapter.

### LANs, WANs and the Zyxel Device

The actual physical connection determines whether the Zyxel Device ports are LAN or WAN ports. There are two separate IP networks, one inside the LAN network and the other outside the WAN network as shown next.

**Figure 162** LAN and WAN IP Addresses

### 9.11.1 DHCP Setup

DHCP (Dynamic Host Configuration Protocol, RFC 2131 and RFC 2132) allows individual clients to obtain TCP/IP configuration at start-up from a server. You can configure the Zyxel Device as a DHCP server or disable it. When configured as a server, the Zyxel Device provides the TCP/IP configuration for the clients. If you turn DHCP service off, you must have another DHCP server on your LAN, or else the computer must be manually configured.

#### IP Pool Setup

The Zyxel Device is pre-configured with a pool of IP addresses for the DHCP clients (DHCP Pool). See the product specifications in the appendices. Do not assign static IP addresses from the DHCP pool to your LAN computers.

### 9.11.2 DNS Server Addresses

DNS (Domain Name System) maps a domain name to its corresponding IP address and vice versa. The DNS server is extremely important because without it, you must know the IP address of a computer before you can access it. The DNS server addresses you enter when you set up DHCP are passed to the client machines along with the assigned IP address and subnet mask.

There are two ways that an ISP disseminates the DNS server addresses.

- The ISP tells you the DNS server addresses, usually in the form of an information sheet, when you sign up. If your ISP gives you DNS server addresses, enter them in the **DNS Server** fields in the **DHCP Setup** screen.
- Some ISPs choose to disseminate the DNS server addresses using the DNS server extensions of IPCP (IP Control Protocol) after the connection is up. If your ISP did not give you explicit DNS servers, chances are the DNS servers are conveyed through IPCP negotiation. The Zyxel Device supports the IPCP DNS server extensions through the DNS proxy feature.

Please note that DNS proxy works only when the ISP uses the IPCP DNS server extensions. It does not mean you can leave the DNS servers out of the DHCP setup under all circumstances. If your ISP gives you explicit DNS servers, make sure that you enter their IP addresses in the **DHCP Setup** screen.

### 9.11.3 LAN TCP/IP

The Zyxel Device has built-in DHCP server capability that assigns IP addresses and DNS servers to systems that support DHCP client capability.

#### IP Address and Subnet Mask

Similar to the way houses on a street share a common street name, so too do computers on a LAN share one common network number.

Where you obtain your network number depends on your particular situation. If the ISP or your network administrator assigns you a block of registered IP addresses, follow their instructions in selecting the IP addresses and the subnet mask.

If the ISP did not explicitly give you an IP network number, then most likely you have a single user account and the ISP will assign you a dynamic IP address when the connection is established. If this is the case, it is recommended that you select a network number from 192.168.0.0 to 192.168.255.0 and

you must enable the Network Address Translation (NAT) feature of the Zyxel Device. The Internet Assigned Number Authority (IANA) reserved this block of addresses specifically for private use; please do not use any other number unless you are told otherwise. Let's say you select 192.168.1.0 as the network number; which covers 254 individual addresses, from 192.168.1.1 to 192.168.1.254 (zero and 255 are reserved). In other words, the first three numbers specify the network number while the last number identifies an individual computer on that network.

Once you have decided on the network number, pick an IP address that is easy to remember, for instance, 192.168.1.1, for your Zyxel Device, but make sure that no other device on your network is using that IP address.

The subnet mask specifies the network number portion of an IP address. Your Zyxel Device will compute the subnet mask automatically based on the IP address that you entered. You do not need to change the subnet mask computed by the Zyxel Device unless you are instructed to do otherwise.

### **Private IP Addresses**

Every machine on the Internet must have a unique address. If your networks are isolated from the Internet, for example, only between your two branch offices, you can assign any IP addresses to the hosts without problems. However, the Internet Assigned Numbers Authority (IANA) has reserved the following three blocks of IP addresses specifically for private networks:

- 10.0.0.0 — 10.255.255.255
- 172.16.0.0 — 172.31.255.255
- 192.168.0.0 — 192.168.255.255

You can obtain your IP address from the IANA, from an ISP or it can be assigned from a private network. If you belong to a small organization and your Internet access is through an ISP, the ISP can provide you with the Internet addresses for your local networks. On the other hand, if you are part of a much larger organization, you should consult your network administrator for the appropriate IP addresses.

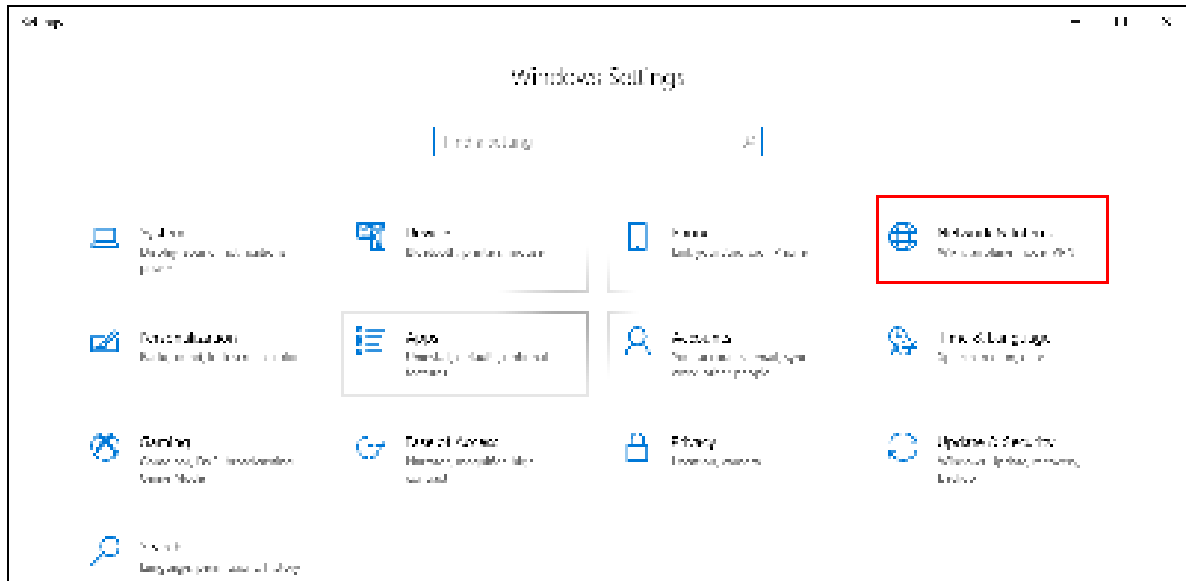
Note: Regardless of your particular situation, do not create an arbitrary IP address; always follow the guidelines above. For more information on address assignment, please refer to RFC 1597, "Address Allocation for Private Internets" and RFC 1466, "Guidelines for Management of IP Address Space".

## **9.12 Turn on UPnP in Windows 10 Example**

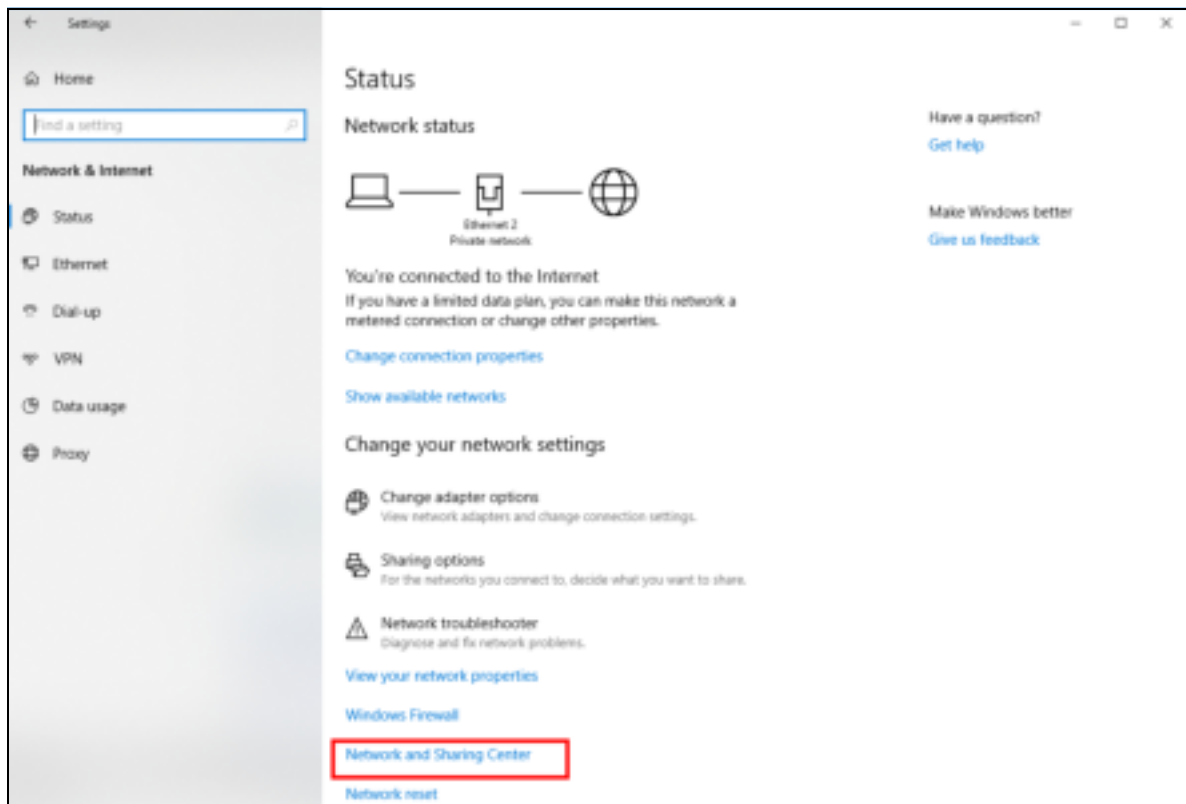
This section shows you how to use the UPnP feature in Windows 10. UPnP server is installed in Windows 10. Activate UPnP on the Zyxel Device by clicking **Network Setting** > **Home Networking** > **UPnP**.

Make sure the computer is connected to the LAN port of the Zyxel Device. Turn on your computer and the Zyxel Device.

- 1 Click the start icon, **Settings** and then **Network & Internet**.

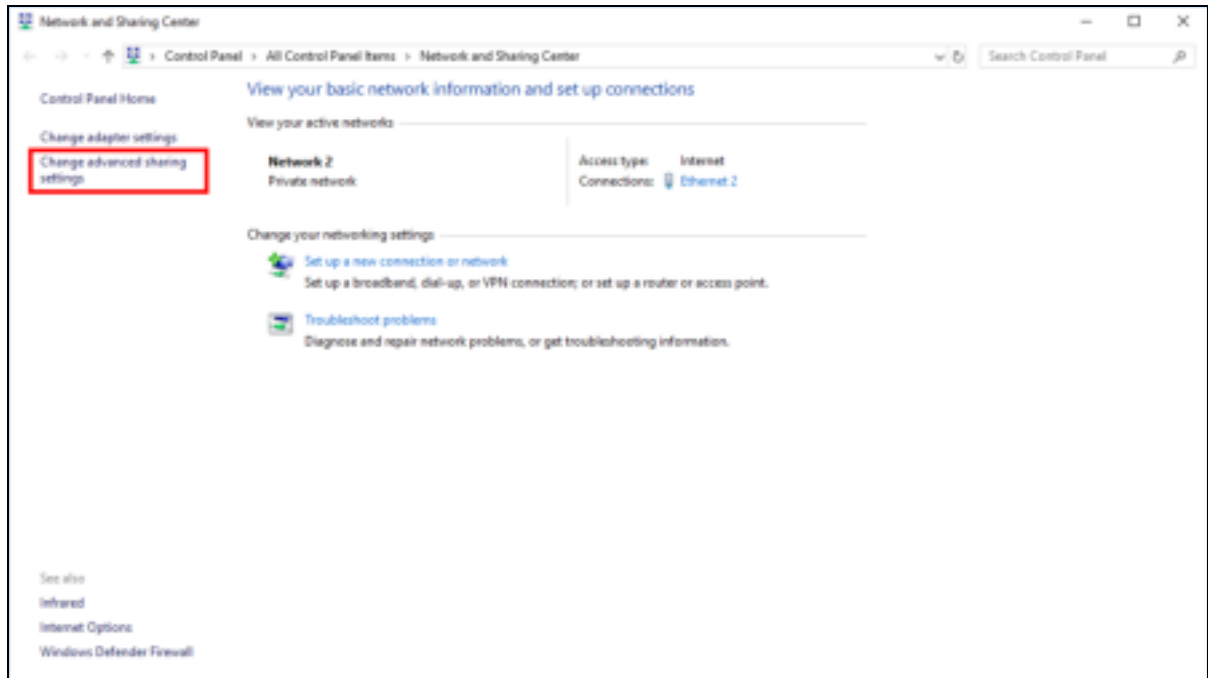


- 2 Click **Network and Sharing Center**.

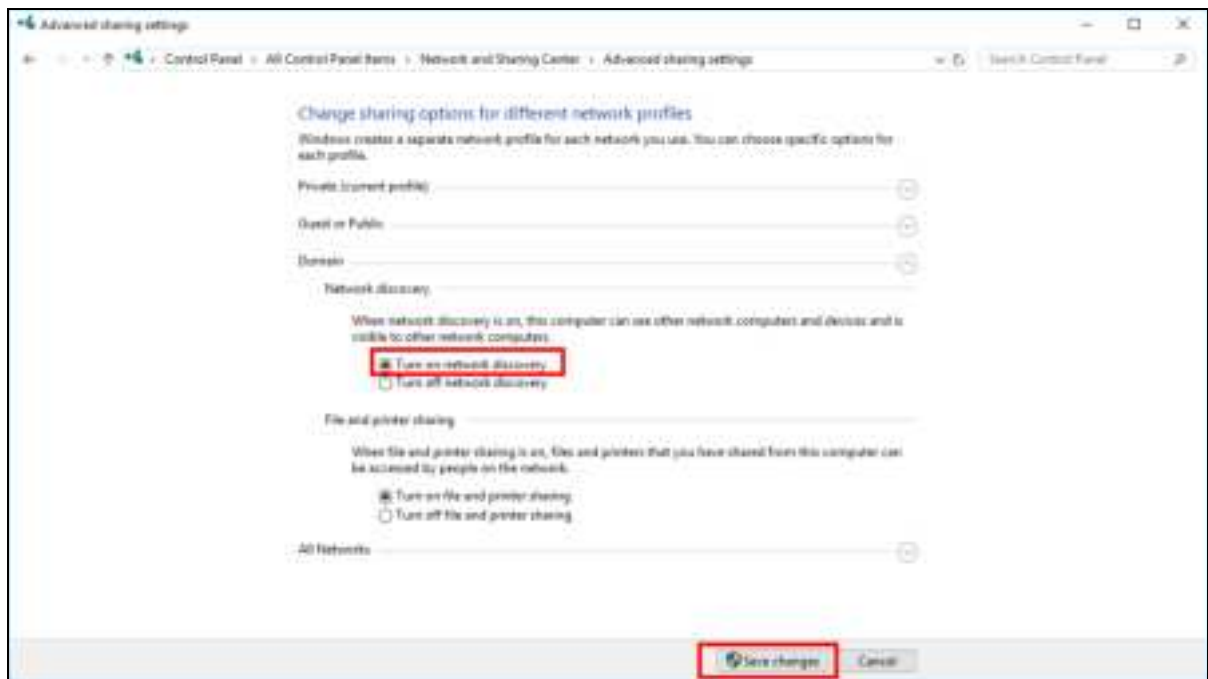


- 3 Click **Change advanced sharing settings**.





- 4 Under **Domain**, select **Turn on network discovery** and click **Save Changes**. Network discovery allows your computer to find other computers and devices on the network and other computers on the network to find your computer. This makes it easier to share files and printers.



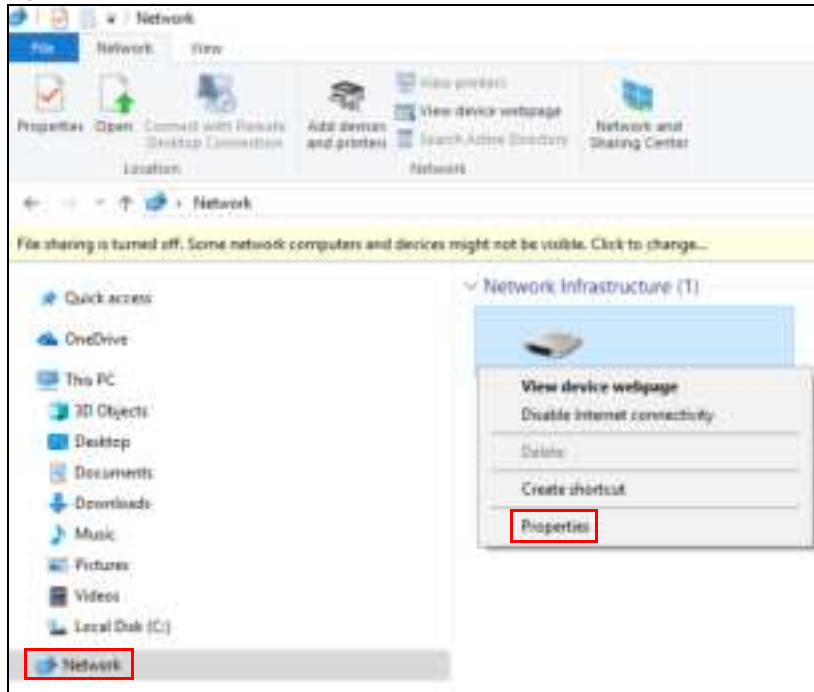
### 9.12.1 Auto-discover Your UPnP-enabled Network Device

Before you follow these steps, make sure you already have UPnP activated on the Zyxel Device and in your computer.

Make sure your computer is connected to the LAN port of the Zyxel Device.

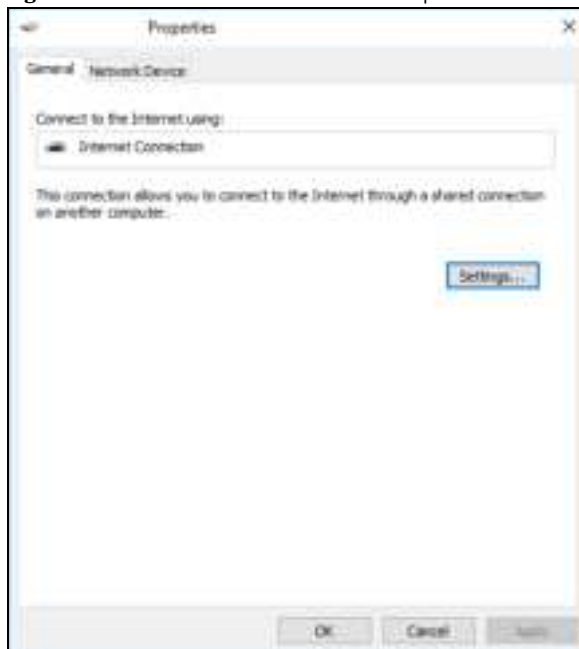
- 1 Open **File Explorer** and click **Network**.
- 2 Right-click the Zyxel Device icon and select **Properties**.

**Figure 163** Network Connections

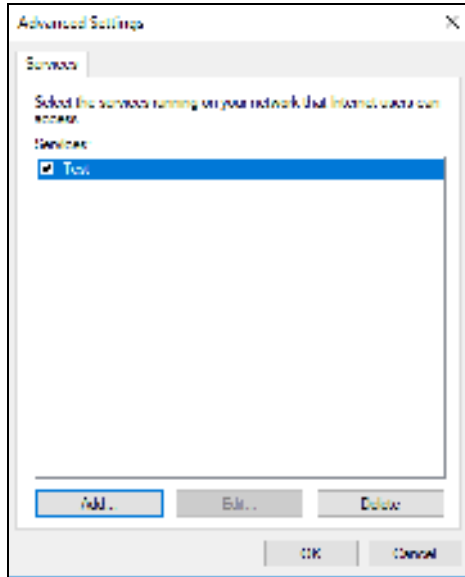
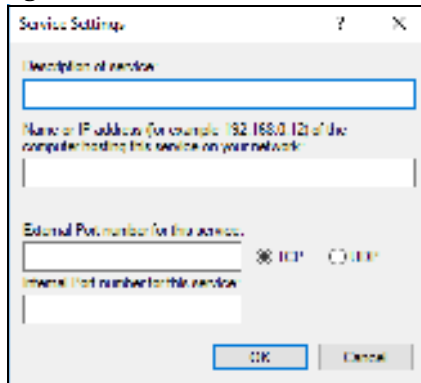


- 3 In the **Internet Connection Properties** window, click **Settings** to see port mappings.

**Figure 164** Internet Connection Properties

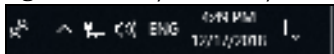


- 4 You may edit or delete the port mappings or click **Add** to manually add port mappings.

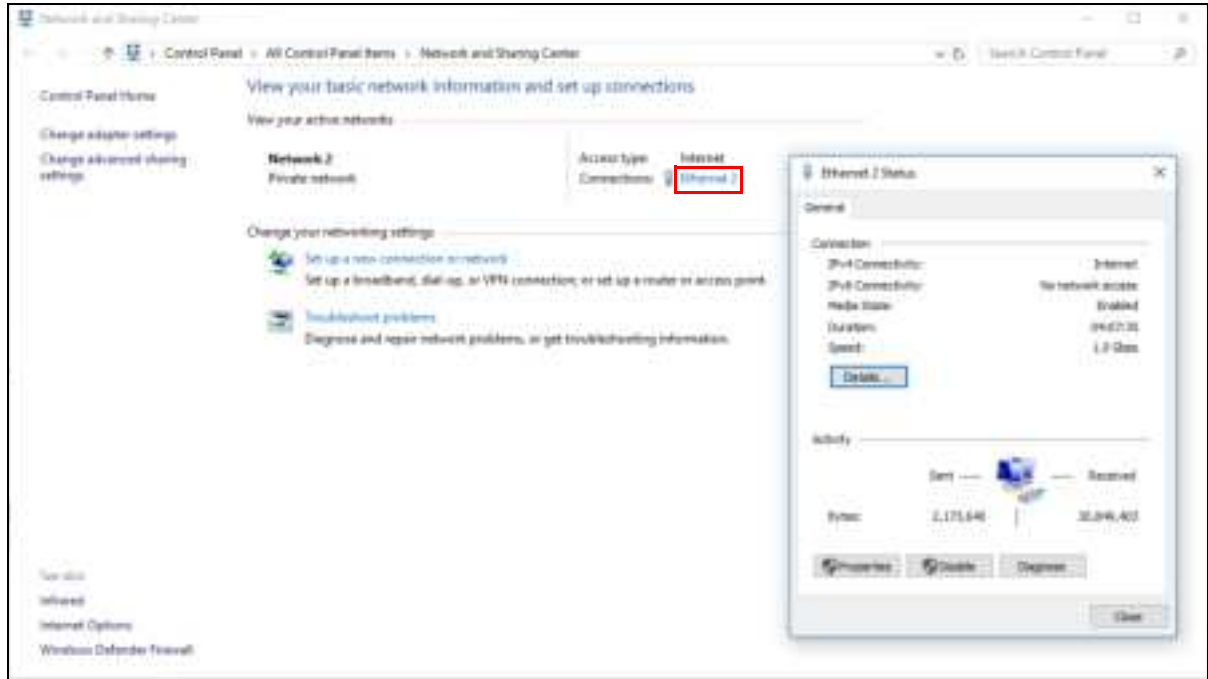
**Figure 165** Internet Connection Properties: Advanced Settings**Figure 166** Internet Connection Properties: Advanced Settings: Add

Note: When the UPnP-enabled device is disconnected from your computer, all port mappings will be deleted automatically.

- 5 Click **OK**. Check the network icon on the system tray to see your Internet connection status.

**Figure 167** System Tray Icon

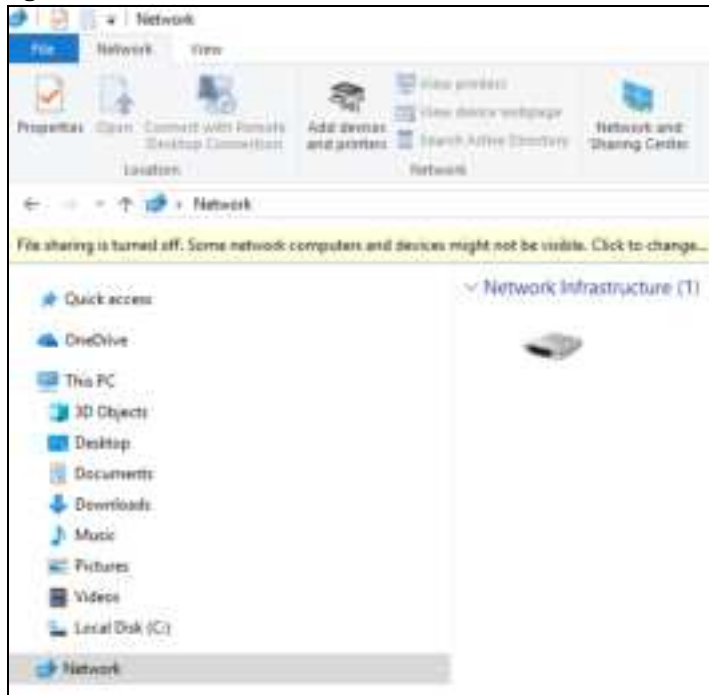
- 6 To see more details about your current Internet connection status, right click the network icon in the system tray and click **Open Network & Internet settings**. Click **Network and Sharing Center** and click the **Connections**.

**Figure 168** Internet Connection Status

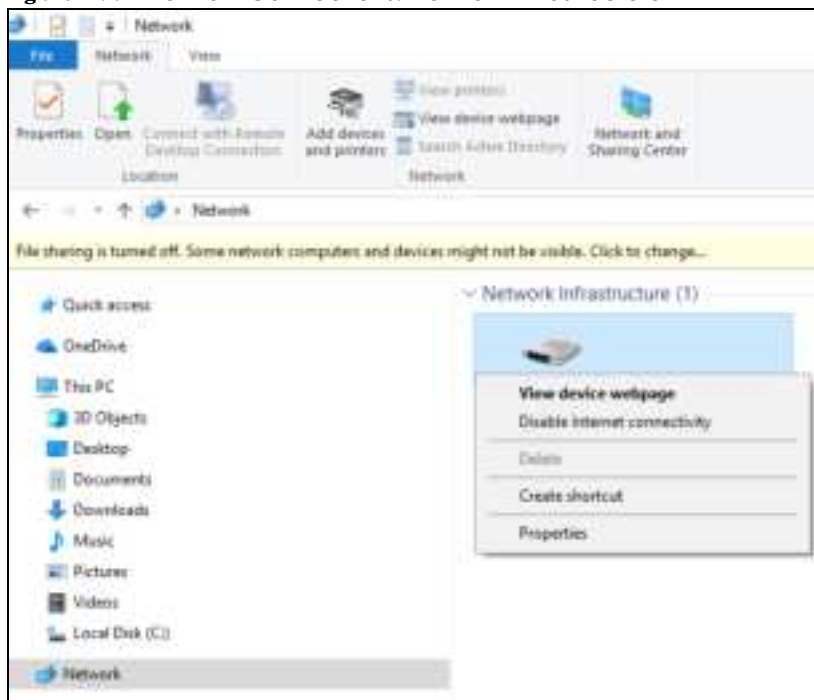
## 9.13 Web Configurator Access with UPnP in Windows 10

Follow the steps below to access the Web Configurator.

- 1 Open **File Explorer**.
- 2 Click **Network**.

**Figure 169** Network Connections

- 3 An icon with the description for each UPnP-enabled device displays under **Network Infrastructure**.
- 4 Right-click the icon for your Zyxel Device and select **View device webpage**. The Web Configurator login screen displays.

**Figure 170** Network Connections: Network Infrastructure

- 5 Right-click the icon for your Zyxel Device and select **Properties**. Click the **Network Device** tab. A window displays information about the Zyxel Device.

**Figure 171** Network Connections: Network Infrastructure: Properties: Example

# CHAPTER 10

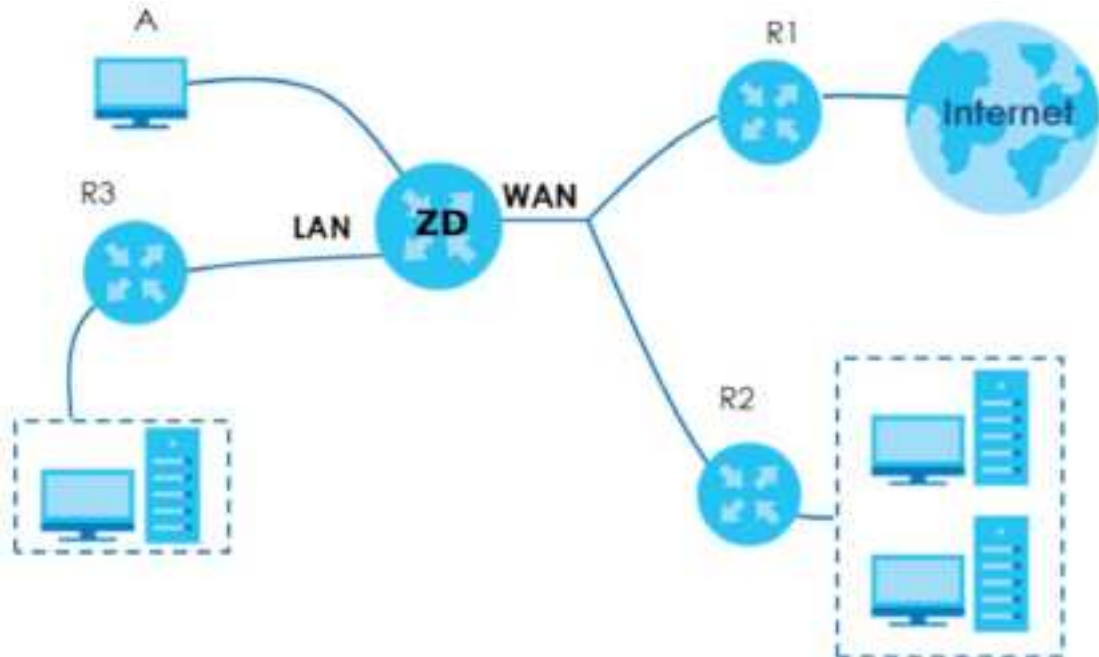
## Routing

### 10.1 Routing Overview

The Zyxel Device usually uses the default gateway to route outbound traffic from computers on the LAN to the Internet. To have the Zyxel Device send data to devices not reachable through the default gateway, use static routes.

For example, the next figure shows a computer (**A**) connected to the Zyxel Device's LAN interface. The Zyxel Device routes most traffic from **A** to the Internet through the Zyxel Device's default gateway (**R1**). You create one static route to connect to services offered by your ISP behind router **R2**. You create another static route to communicate with a separate network behind a router **R3** connected to the LAN.

**Figure 172** Example of Static Routing Topology



### 10.2 Configure Static Route

Use this screen to view and configure static route rules on the Zyxel Device. A static route is used to save time and bandwidth usage when LAN devices within an Intranet are transferring files or packets, especially when there are more than two Internet connections in your home or office network. Click **Network Setting > Routing** to open the **Static Route** screen.

**Figure 173** Network Setting > Routing > Static Route

Use this screen to view and configure the static route rules on the Zyxel Device. A static route is used to save time and bandwidth usage when LAN devices within an intranet are transferring files or packets, especially when there are more than two Internet connections available in your home or office network.

 Add New Static Route

| # | Status | Name | Destination IP | Subnet Mask/Prefix Length | Gateway | Interface | Modify |
|---|--------|------|----------------|---------------------------|---------|-----------|--------|
|---|--------|------|----------------|---------------------------|---------|-----------|--------|

The following table describes the labels in this screen.

**Table 91** Network Setting > Routing > Static Route

| Label                     | Description                                                                                                                                                                                    |
|---------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Add New Static Route      | Click this to set up a new static route on the Zyxel Device.                                                                                                                                   |
| #                         | This is the number of an individual static route.                                                                                                                                              |
| Status                    | This field indicates whether the rule is active (yellow bulb) or not (gray bulb).                                                                                                              |
| Name                      | This is the name of the static route.                                                                                                                                                          |
| Destination IP            | This parameter specifies the IP network address of the final destination. Routing is always based on network number.                                                                           |
| Subnet Mask/Prefix Length | This parameter specifies the IP network subnet mask of the final destination.                                                                                                                  |
| Gateway                   | This is the IP address of the gateway. The gateway is a router or switch on the same network segment as the device's LAN or WAN port. The gateway helps forward packets to their destinations. |
| Interface                 | This is the WAN interface through which the traffic is routed.                                                                                                                                 |
| Modify                    | Click the <b>Edit</b> icon to go to the screen where you can set up a static route on the Zyxel Device.<br>Click the <b>Delete</b> icon to remove a static route from the Zyxel Device.        |

### 10.2.1 Add or Edit Static Route

Use this screen to add or edit a static route. Click **Add New Static Route** in the **Static Route** screen, the following screen appears. Configure the required information for a static route.

Note: The **Gateway IP Address** must be within the range of the selected interface in **Use Interface**.



**Figure 174** Network Setting > Routing > Static Route > Add New Static Route

The following table describes the labels in this screen.

**Table 92** Network Setting > Routing > Static Route > Add New Static Route

| LABEL                  | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Active                 | Click this switch to activate static route. Otherwise, click to disable.                                                                                                                                                                                                                                                                                                                                                                                                     |
| Route Name             | Enter a name for your static route. You can use up to 15 printable characters except [ " ], [ ` ], [ ' ], [ < ], [ > ], [ ^ ], [ \$ ], [   ], [ & ], or [ ; ]. Spaces are allowed.                                                                                                                                                                                                                                                                                           |
| IP Type                | Select between <b>IPv4</b> or <b>IPv6</b> . Compared to <b>IPv4</b> , <b>IPv6</b> (Internet Protocol version 6), is designed to enhance IP address size and features. The increase in <b>IPv6</b> address size to 128 bits (from the 32-bit <b>IPv4</b> address) allows up to 3.4 x 10 <sup>38</sup> IP addresses. The Zyxel Device can use <b>IPv4/IPv6</b> dual stack to connect to <b>IPv4</b> and <b>IPv6</b> networks, and supports <b>IPv6</b> rapid deployment (6RD). |
| Destination IP Address | This parameter specifies the IP network address of the final destination. Routing is always based on network number. If you need to specify a route to a single host, use a subnet mask of 255.255.255.255 in the subnet mask field to force the network number to be identical to the host ID.                                                                                                                                                                              |
| Subnet Mask            | If you are using IPv4 and need to specify a route to a single host, use a subnet mask of 255.255.255.255 in the subnet mask field to force the network number to be identical to the host ID. Enter the IP subnet mask here.<br><br>Note: This field appears only when you select <b>IPv4</b> in the <b>IP Type</b> field.                                                                                                                                                   |
| Prefix Length          | If you are using IPv6, enter the address prefix length to specify how many most significant bits in an IPv6 address compose the network address.<br><br>Note: This field appears only when you select <b>IPv6</b> in the <b>IP Type</b> field.                                                                                                                                                                                                                               |
| Use Gateway IP Address | The gateway is a router or switch on the same network segment as the device's LAN or WAN port. The gateway helps forward packets to their destinations.<br><br>Click this switch to enable or disable the gateway IP address. When the switch goes to the right, the function is enabled. Otherwise, it is not.                                                                                                                                                              |

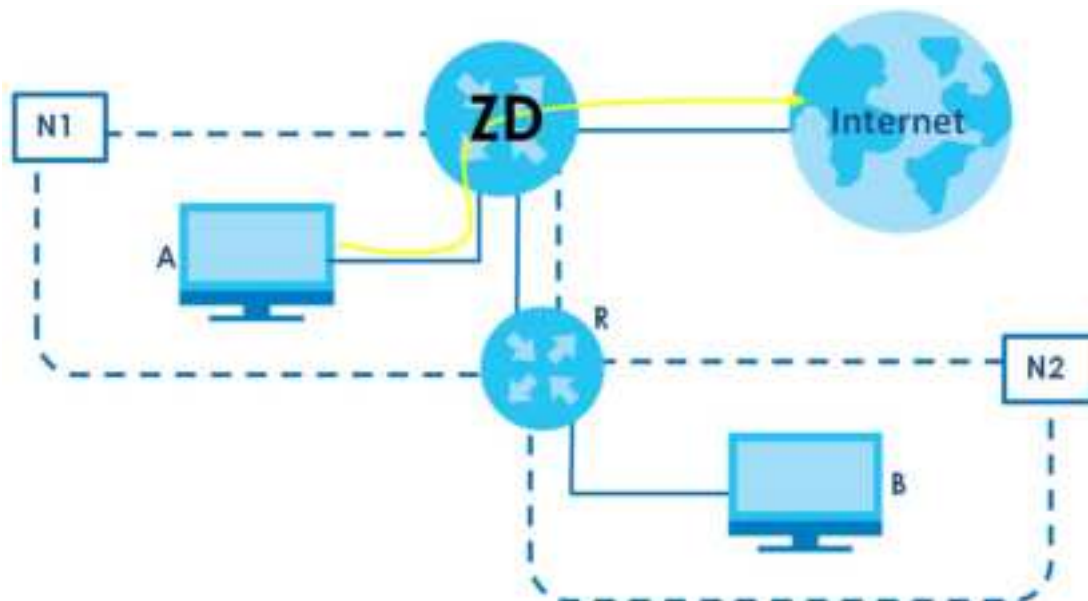
Table 92 Network Setting &gt; Routing &gt; Static Route &gt; Add New Static Route (continued)

| LABEL              | DESCRIPTION                                                     |
|--------------------|-----------------------------------------------------------------|
| Gateway IP Address | Enter the IP address of the gateway.                            |
| User Interface     | Select the WAN interface you want to use for this static route. |
| OK                 | Click this to save your changes.                                |
| Cancel             | Click this to exit this screen without saving.                  |

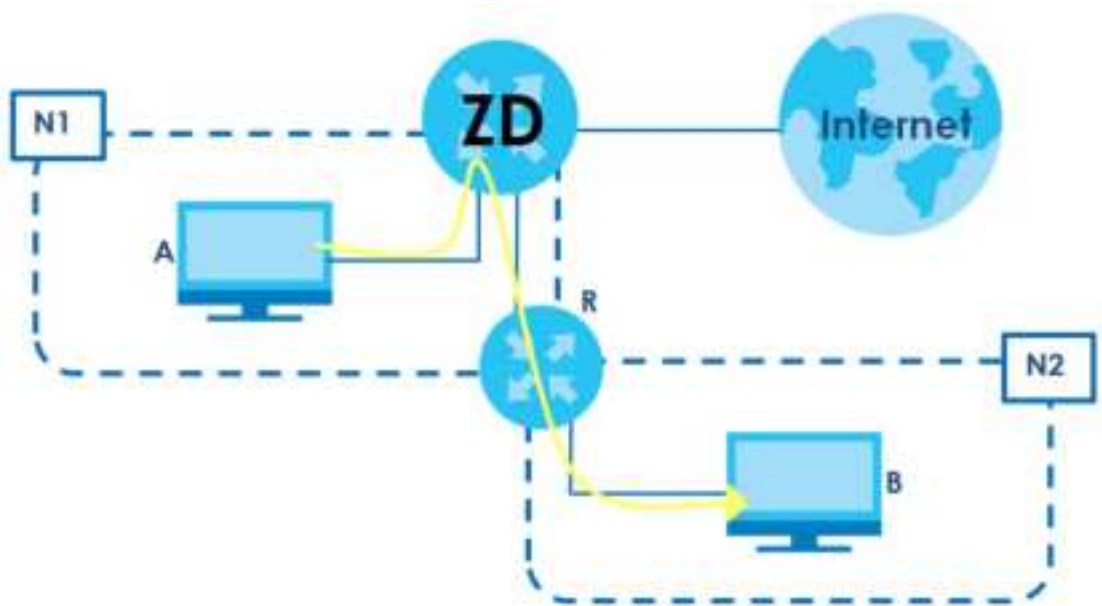
### 10.2.1.1 An Example of Adding a Static Route

In order to extend your Intranet and control traffic flowing directions, you may connect a router to the Zyxel Device's LAN. The router may be used to separate two department networks. This tutorial shows how to configure a static routing rule for two network routings.

In the following figure, router **R** is connected to the Zyxel Device's LAN. **R** connects to two networks, **N1** (192.168.1.x/24) and **N2** (192.168.10.x/24). If you want to send traffic from computer **A** (in **N1** network) to computer **B** (in **N2** network), the traffic is sent to the Zyxel Device's WAN default gateway by default. In this case, **B** will never receive the traffic.



You need to specify a static routing rule on the Zyxel Device to specify **R** as the router in charge of forwarding traffic to **N2**. In this case, the Zyxel Device routes traffic from **A** to **R** and then **R** routes the traffic to **B**.



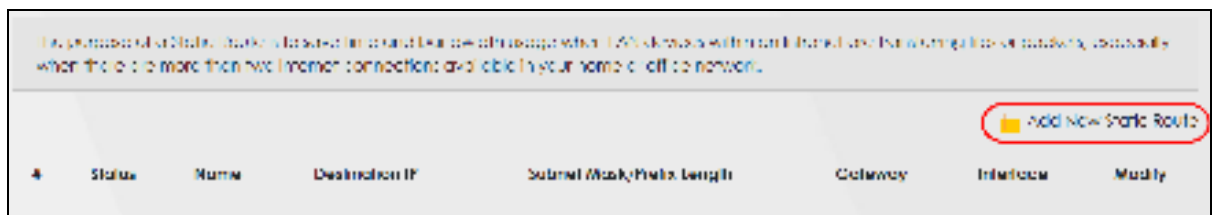
This tutorial uses the following example IP settings:

Table 93 IP Settings in this Tutorial

| DEVICE/ COMPUTER       | IP ADDRESS    |
|------------------------|---------------|
| The Zyxel Device's WAN | 172.16.1.1    |
| The Zyxel Device's LAN | 192.168.1.1   |
| IP Type                | IPv4          |
| Use Interface          | Default       |
| <b>A</b>               | 192.168.1.34  |
| <b>R's N1</b>          | 192.168.1.253 |
| <b>R's N2</b>          | 192.168.10.2  |
| <b>B</b>               | 192.168.10.33 |

To configure a static route to route traffic from **N1** to **N2**:

- 1 Log into the Zyxel Device's Web Configurator.
- 2 Click **Network Setting > Routing**.
- 3 Click **Add new Static Route** in the **Static Route** screen.



- 4 Configure the **Static Route Setup** screen using the following settings:
  - Click the **Active** button to enable this static route. When the switch goes to the right, the function is enabled. Enter the **Route Name** as **R**.

- Set **IP Type** to **IPv4**.
- Enter the **Destination IP Address** **192.168.10.1** and **IP Subnet Mask** **255.255.255.0** for the destination, **N2**.
- Click the **Use Gateway IP Address** button to enable this function. When the switch goes to the right, the function is enabled. Enter **192.168.1.253** (**R**'s **N1** address) in the **Gateway IP Address** field.
- Select **Default** as the **Use Interface**.
- Click **OK**.

Now **B** should be able to receive traffic from **A**. You may need to additionally configure **B**'s firewall settings to allow specific traffic to pass through.

**Add New Static Route**

Configure the required information for a static route.

Active: ☒

Route Name: R

IP Type: IPv4

Destination IP Address: 192 . 168 . 10 . 1

Subnet Mask: 255 . 255 . 255 . 0

Use Gateway IP Address: ☒

Gateway IP Address: 192 . 168 . 1 . 253

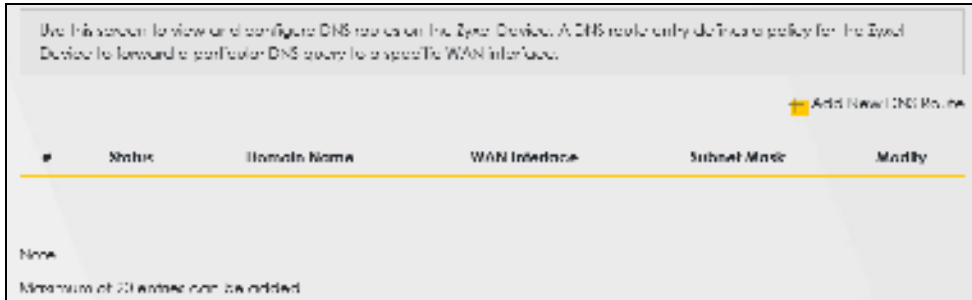
Use Interface: Default

Note: The input range of the Gateway IP Address must be in the same range of the Use interface.

Cancel OK

## 10.3 DNS Route

Use this screen to view and configure DNS routes on the Zyxel Device. A DNS route entry defines a policy for the Zyxel Device to forward a particular DNS query to a specific WAN interface. Click **Network Setting** > **Routing** > **DNS Route** to open the **DNS Route** screen.

**Figure 175** Network Setting > Routing > DNS Route

The following table describes the labels in this screen.

**Table 94** Network Setting > Routing > DNS Route

| Label             | Description                                                                                                                                           |
|-------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| Add New DNS Route | Click this to create a new entry.                                                                                                                     |
| #                 | This is the number of an individual DNS route.                                                                                                        |
| Status            | This field indicates whether the rule is active (yellow bulb) or not (gray bulb).                                                                     |
| Domain Name       | This is the domain name to which the DNS route applies.                                                                                               |
| WAN Interface     | This is the WAN interface through which the matched DNS request is routed.                                                                            |
| Subnet Mask       | This parameter specifies the IP network subnet mask.                                                                                                  |
| Modify            | Click the <b>Edit</b> icon to configure a DNS route on the Zyxel Device.<br>Click the <b>Delete</b> icon to remove a DNS route from the Zyxel Device. |

### 10.3.1 Add or Edit DNS Route

You can manually add the Zyxel Device's DNS route entry. Click **Add New DNS Route** in the **DNS Route** screen, use this screen to configure the required information for a DNS route.

**Figure 176** Network Setting > Routing > DNS Route > Add New DNS Route

The following table describes the labels in this screen.

Table 95 Network Setting > Routing > DNS Route > Add New DNS Route

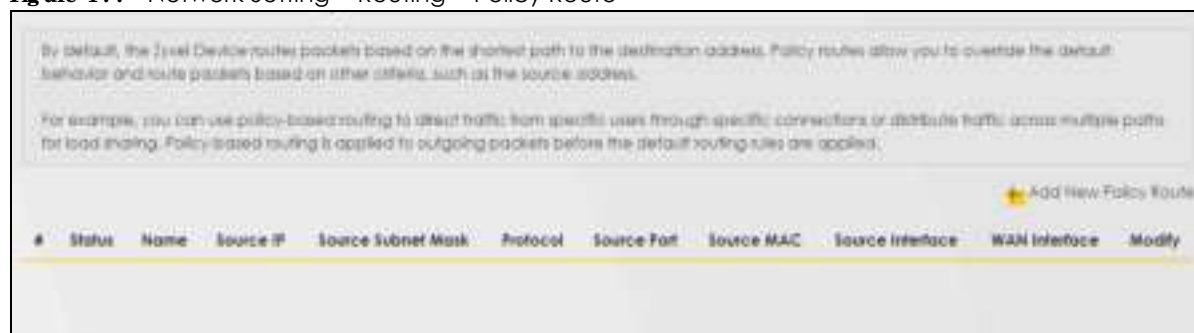
| LABEL         | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                             |
|---------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Active        | Enable DNS route in your Zyxel Device.                                                                                                                                                                                                                                                                                                                                                                  |
| Domain Name   | Enter the domain name you want to resolve. You can use up to 64 alphanumeric (0-9, a-z, A-Z) characters with hyphens [ - ] and periods [ . ].<br><br>You can use the wildcard character, an "*" (asterisk) as the left most part of a domain name, such as *.example.com. The Zyxel Device forwards DNS queries for any domain name ending in example.com to the WAN interface specified in this route. |
| Subnet Mask   | Enter the subnet mask of the network for which to use the DNS route in dotted decimal notation, for example 255.255.255.255.                                                                                                                                                                                                                                                                            |
| WAN Interface | Select a WAN interface through which the matched DNS query is sent. You must have the WAN interfaces already configured in the <b>Broadband</b> screen.                                                                                                                                                                                                                                                 |
| OK            | Click this to save your changes.                                                                                                                                                                                                                                                                                                                                                                        |
| Cancel        | Click this to exit this screen without saving.                                                                                                                                                                                                                                                                                                                                                          |

## 10.4 Policy Route

By default, the Zyxel Device routes packets based on the shortest path to the destination address. Policy routes allow you to override the default behavior and route packets based on other criteria, such as the source address. For example, you can use policy-based routing to direct traffic from specific users through specific connections or distribute traffic across multiple paths for load sharing. Policy-based routing is applied to outgoing packets before the default routing rules are applied.

The **Policy Route** screen let you view and configure routing policies on the Zyxel Device. Click **Network Setting > Routing > Policy Route** to open the following screen.

Figure 177 Network Setting > Routing > Policy Route



The following table describes the labels in this screen.

Table 96 Network Setting > Routing > Policy Route

| LABEL                | DESCRIPTION                                                                                                                                                                 |
|----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Add New Policy Route | Click this to create a new policy forwarding rule.                                                                                                                          |
| #                    | This is the index number of the entry.                                                                                                                                      |
| Status               | This field displays whether the DNS route is active or not. A yellow bulb signifies that this DNS route is active. A gray bulb signifies that this DNS route is not active. |

Table 96 Network Setting &gt; Routing &gt; Policy Route (continued)

| LABEL              | DESCRIPTION                                                                                                                                                                                               |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Name               | This is the name of the rule.                                                                                                                                                                             |
| Source IP          | This is the source IP address.                                                                                                                                                                            |
| Source Subnet Mask | This is the source subnet mask address.                                                                                                                                                                   |
| Protocol           | This is the transport layer protocol.                                                                                                                                                                     |
| Source Port        | This is the source port number.                                                                                                                                                                           |
| Source MAC         | This is the source MAC address.                                                                                                                                                                           |
| Source Interface   | This is the interface from which the matched traffic is sent.                                                                                                                                             |
| WAN Interface      | This is the WAN interface through which the traffic is routed.                                                                                                                                            |
| Modify             | Click the <b>Edit</b> icon to edit this policy.<br><br>Click the <b>Delete</b> icon to remove a policy from the Zyxel Device. A window displays asking you to confirm that you want to delete the policy. |

### 10.4.1 Add or Edit Policy Route

Click **Add New Policy Route** in the **Policy Route** screen or click the **Edit** icon next to a policy. Use this screen to configure the required information for a policy route.

Figure 178 Network Setting &gt; Routing &gt; Policy Route: Add or Edit

The screenshot shows the 'Add New Policy Route' configuration window. It includes the following fields and controls:

- Active:** A toggle switch that is currently turned on (blue).
- Route Name:** A text input field.
- Source IP Address:** A text input field.
- Source Subnet Mask:** A text input field.
- Protocol:** A dropdown menu with 'None' selected.
- Source Port:** A disabled text input field.
- Source MAC:** A text input field.
- Source Interface (eth, br0 or LAN1-LAN4):** A text input field.
- WAN Interface:** A dropdown menu with 'WAN' selected.

At the bottom of the window, there are 'Cancel' and 'OK' buttons.

The following table describes the labels in this screen.

Table 97 Network Setting > Routing > Policy Route: Add or Edit

| LABEL                                             | DESCRIPTION                                                                                                                                                                                   |
|---------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Active                                            | Click this switch to activate this policy route. Otherwise, click to disable.                                                                                                                 |
| Route Name                                        | Enter a descriptive name of this policy route. You can use up to 15 printable characters except [ " ], [ ` ], [ ' ], [ < ], [ > ], [ ^ ], [ \$ ], [   ], [ & ], or [ ; ]. Spaces are allowed. |
| Source IP Address                                 | Enter the source IP address.                                                                                                                                                                  |
| Source Subnet Mask                                | Enter the source subnet mask address.                                                                                                                                                         |
| Protocol                                          | Select the transport layer protocol ( <b>TCP</b> , <b>UDP</b> , or <b>None</b> ).                                                                                                             |
| Source Port                                       | Enter the source port number.                                                                                                                                                                 |
| Source MAC                                        | Enter the source MAC address.                                                                                                                                                                 |
| Source Interface<br>(example: br0 or LAN1 – LAN4) | Enter the name of the interface from which the matched traffic is sent.                                                                                                                       |
| WAN Interface                                     | Select a WAN interface through which the traffic is sent. You must have the WAN interfaces already configured in the <b>Broadband</b> screens.                                                |
| Cancel                                            | Click <b>Cancel</b> to exit this screen without saving.                                                                                                                                       |
| OK                                                | Click <b>OK</b> to save your changes.                                                                                                                                                         |

## 10.5 RIP Overview

Routing Information Protocol (RIP, RFC 1058 and RFC 1389) allows the Zyxel Device to exchange routing information with other routers. To activate RIP for the WAN interface, select the supported RIP version and operation.

### 10.5.1 RIP

Click **Network Setting > Routing > RIP** to open the **RIP** screen. Select the desired RIP version and operation by clicking the checkbox. To stop RIP on the WAN interface, clear the checkbox. Click the **Apply** button to start or stop RIP and save the configuration.

Figure 179 Network Setting > Routing > RIP

| # | Interface | Version | Operation | Enable                              | Double Default Gateway   |
|---|-----------|---------|-----------|-------------------------------------|--------------------------|
| 1 | ADSL1     | RIPv2   | Active    | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| 2 | ADSL2     | RIPv2   | Active    | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| 3 | ETH0/WAN  | RIPv2   | Active    | <input checked="" type="checkbox"/> | <input type="checkbox"/> |



The following table describes the labels in this screen.

Table 98 Network Setting > Routing > RIP

| <b>LABEL</b>            | <b>DESCRIPTION</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|-------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #                       | This is the index of the interface in which the RIP setting is used.                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Interface               | This is the name of the interface in which the RIP setting is used.                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Version                 | The RIP version controls the format and the broadcasting method of the RIP packets that the Zyxel Device sends (it recognizes both formats when receiving). <b>RIPv1</b> is universally supported but <b>RIPv2</b> carries more information. <b>RIPv1</b> is probably adequate for most networks, unless you have an unusual network topology. When set to <b>Both</b> , the Zyxel Device will broadcast its routing table periodically and incorporate the RIP information that it receives |
| Operation               | Select <b>Passive</b> to have the Zyxel Device update the routing table based on the RIP packets received from neighbors but not advertise its route information to other routers in this interface.<br><br>Select <b>Active</b> to have the Zyxel Device advertise its route information and also listen for routing updates from neighboring routers.                                                                                                                                      |
| Enable                  | Select the checkbox to activate the settings.                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Disable Default Gateway | Select the checkbox to set the Zyxel Device to not send the route information to the default gateway.                                                                                                                                                                                                                                                                                                                                                                                        |
| Cancel                  | Click <b>Cancel</b> to exit this screen without saving.                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Apply                   | Click <b>Apply</b> to save your changes back to the Zyxel Device.                                                                                                                                                                                                                                                                                                                                                                                                                            |

# CHAPTER 11

## Quality of Service (QoS)

### 11.1 QoS Overview

Quality of Service (QoS) refers to both a network's ability to deliver data with minimum delay, and the networking methods used to control the use of bandwidth. Without QoS, all traffic data is equally likely to be dropped when the network is congested. This can cause a reduction in network performance and make the network inadequate for time-critical applications such as video-on-demand.

Configure QoS on the Zyxel Device to group and prioritize application traffic and fine-tune network performance. Setting up QoS involves these steps:

- 1 Configure classifiers to sort traffic into different flows.
- 2 Assign priority and define actions to be performed for a classified traffic flow.

The Zyxel Device assigns each packet a priority and then queues the packet accordingly. Packets assigned a high priority are processed more quickly than those with low priority if there is congestion, allowing time-sensitive applications to flow more smoothly. Time-sensitive applications include both those that require a low level of latency (delay) and a low level of jitter (variations in delay) such as Voice over IP (VoIP) or Internet gaming, and those for which jitter alone is a problem such as Internet radio or streaming video. There are eight priority levels, with 1 having the highest priority.

This chapter contains information about configuring QoS and editing classifiers.

#### 11.1.1 What You Can Do in this Chapter

- The **General** screen lets you enable or disable QoS and set the upstream bandwidth ([Section 11.3 on page 308](#)).
- The **Queue Setup** screen lets you configure QoS queue assignment ([Section 11.4 on page 310](#)).
- The **Classification Setup** screen lets you add, edit or delete QoS classifiers ([Section 11.5 on page 312](#)).
- The **Shaper Setup** screen limits outgoing traffic transmission rate on the selected interface ([Section 11.6 on page 318](#)).
- The **Policer Setup** screen lets you control incoming traffic transmission rate and bursts ([Section 11.7 on page 319](#)).
- The **Monitor** screen lets you use any available port to access any available service from a remote WAN device ([Section 11.8 on page 323](#)).

### 11.2 What You Need to Know

The following terms and concepts may help as you read through this chapter.

## QoS versus CoS

QoS is used to prioritize source-to-destination traffic flows. All packets in the same flow are given the same priority. CoS (class of service) is a way of managing traffic in a network by grouping similar types of traffic together and treating each type as a class. You can use CoS to give different priorities to different packet types.

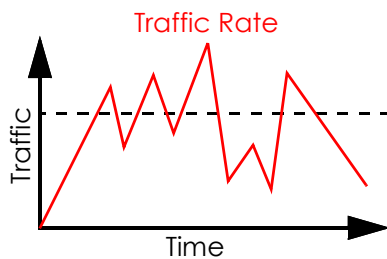
CoS technologies include IEEE 802.1p layer 2 tagging and DiffServ (Differentiated Services or DS). IEEE 802.1p tagging makes use of 3 bits in the packet header, while DiffServ is a new protocol and defines a new DS field, which replaces the eight-bit ToS (Type of Service) field in the IP header.

## Tagging and Marking

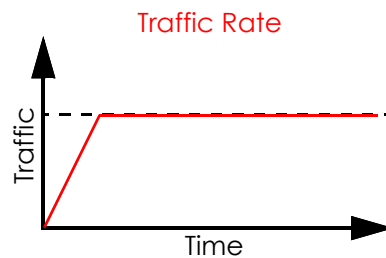
In a QoS class, you can configure whether to add or change the DSCP (DiffServ Code Point) value, IEEE 802.1p priority level and VLAN ID number in a matched packet. When the packet passes through a compatible network, the networking device, such as a backbone switch, can provide specific treatment or service based on the tag or marker.

## Traffic Shaping

Bursty traffic may cause network congestion. Traffic shaping regulates packets to be transmitted with a pre-configured data transmission rate using buffers (or queues). Your Zyxel Device uses the Token Bucket algorithm to allow a certain amount of large bursts while keeping a limit at the average rate.



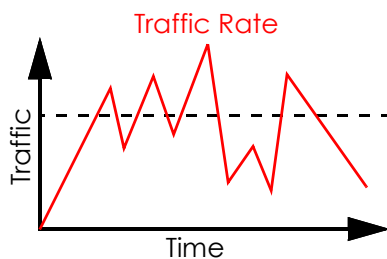
(Before Traffic Shaping)



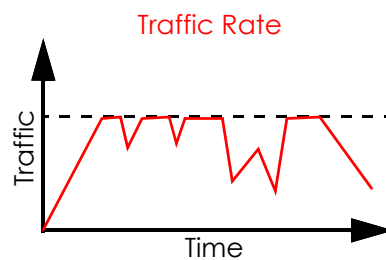
(After Traffic Shaping)

## Traffic Policing

Traffic policing is the limiting of the input or output transmission rate of a class of traffic on the basis of user-defined criteria. Traffic policing methods measure traffic flows against user-defined criteria and identify it as either conforming, exceeding or violating the criteria.



(Before Traffic Policing)



(After Traffic Policing)

The Zyxel Device supports three incoming traffic metering algorithms: Token Bucket Filter (TBF), Single Rate Two Color Marker (srTCM), and Two Rate Two Color Marker (trTCM). You can specify actions which are performed on the colored packets. See [Section 11.9 on page 324](#) for more information on each metering algorithm.

### **Strictly Priority**

Strictly Priority (SP) services queues based on priority only. As traffic comes into the Switch, traffic on the highest priority queue, Q7 is transmitted first. When that queue empties, traffic on the next highest priority queue, Q6 is transmitted until Q6 empties, and then traffic is transmitted on Q5 and so on. If higher priority queues never empty, then traffic on lower priority queues never gets sent. SP does not automatically adapt to changing network requirements.

### **Weighted Round Robin Schedule (WRR)**

Round Robin Scheduling services queues on a rotating basis and is activated only when a port has more traffic than it can handle. A queue is given an amount of bandwidth irrespective of the incoming traffic on that port. This queue then moves to the back of the list. The next queue is given an equal amount of bandwidth, and then moves to the end of the list; and so on, depending on the number of queues being used. This works in a looping fashion until a queue is empty.

Weighted Round Robin Scheduling (WRR) uses the same algorithm as round robin scheduling, but services queues based on their priority and queue weight (the number you configure in the queue **Weight** field) rather than a fixed amount of bandwidth. WRR is activated only when a port has more traffic than it can handle. Queues with larger weights get more service than queues with smaller weights. This queuing mechanism is highly efficient in that it divides any available bandwidth across the different traffic queues and returns to queues that have not yet emptied.

## **11.3 Quality of Service General Settings**

Use this screen to enable or disable QoS and set the upstream bandwidth or assign traffic priority. See [Section 11.1 on page 306](#) for more information.

When one of the following situations happens, the current WAN linkup rate will be used instead:

- 1 **WAN Managed Upstream Bandwidth** is set to 0
- 2 **WAN Managed Upstream Bandwidth** is empty
- 3 **WAN Managed Upstream Bandwidth** is higher than the current WAN interface linkup rate

Note: Manually defined QoS is ignored when **Upstream Traffic Priority** is selected.

Note: **Upstream Traffic Priority** automatically assigns a traffic priority level based on the selected criteria.

Note: To have your QoS settings configured in other **QoS** screens take effect, select **None** in the **Upstream Traffic Priority Assigned by** field.

Click **Network Setting > QoS > General** to open the screen as shown next.

**Figure 180** Network Setting > QoS > General

**QoS**

**General** Queue Setup Classification Setup Shaper Setup Policy Setup

Use this screen to enable or disable QoS and set the upstream bandwidth or assign traffic priority.

When one of the following situations happens, the current WAN link rate will be used instead:

1. WAN Managed Upstream Bandwidth is set to 0
2. WAN Managed Upstream Bandwidth is empty
3. WAN Managed Upstream Bandwidth is higher than the current WAN interface linkup rate

QoS ☒

WAN Managed Upstream Bandwidth:  kbps

Upstream Traffic Priority Assigned by: None

Note:

(1) Manually defined QoS is ignored when **Upstream Traffic Priority** is selected.

(2) **Upstream Traffic Priority** automatically assigns a traffic priority based on the selected criteria.

(3) To have your QoS settings configured in other **QoS** screens take effect, select **None** in the **Upstream Traffic Priority Assigned by** field.

Cancel Apply

The following table describes the labels in this screen.

**Table 99** Network Setting > QoS > General

| LABEL                                 | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|---------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| QoS                                   | Click this switch to enable QoS to improve your network performance.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| WAN Managed Upstream Bandwidth        | <p>Enter the amount of upstream bandwidth for the WAN interfaces that you want to allocate using QoS.</p> <p>The recommendation is to set this speed to match the interfaces' actual transmission speed. For example, set the WAN interfaces' speed to 100000 kbps if your Internet connection has an upstream transmission speed of 100 Mbps.</p> <p>You can also set this number lower than the interfaces' actual transmission speed. This will cause the Zyxel Device to not use some of the interfaces' available bandwidth.</p> <p>If you leave this field blank, the Zyxel Device automatically sets this number to be 95% of the WAN interfaces' actual upstream transmission speed.</p>                                                                                                                                                                                                                                                                    |
| Upstream Traffic Priority Assigned by | <p>Select how the Zyxel Device assigns priorities to various upstream traffic flows.</p> <ul style="list-style-type: none"> <li>• <b>None:</b> Disables auto priority mapping and has the Zyxel Device put packets into the queues according to your classification rules. Traffic which does not match any of the classification rules is mapped into the default queue with the lowest priority.</li> <li>• <b>Enhanced Priority:</b> Automatically assign priority based on the IEEE 802.1p priority level.</li> <li>• <b>IP Precedence:</b> Automatically assign priority based on the first three bits of the TOS field in the IP header.</li> <li>• <b>Packet Length:</b> Automatically assign priority based on the packet size. Smaller packets get higher priority since control, signaling, VoIP, Internet gaming, or other real-time packets are usually small while larger packets are usually best effort data packets like file transfers.</li> </ul> |
| Cancel                                | Click <b>Cancel</b> to restore your previously saved settings.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Apply                                 | Click <b>Apply</b> to save your changes.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |

## 11.4 Queue Setup

Click **Network Setting > QoS > Queue Setup** to open the screen as shown next.

Use this screen to configure QoS queue assignment to decide the priority on WAN or LAN interfaces. Traffic with higher priority gets through faster than those with lower priority. Low-priority traffic is dropped first when the network is congested.

Note: Configure the priority level for a QoS queue from 1 to 8. The smaller the number in the **Priority** column, the higher the priority.

Note: The corresponding classifiers will be removed automatically if a queue is deleted.

Note: Rate limit 0 means there is no rate limit on a queue.

**Figure 181** Network Setting > QoS > Queue Setup

**Queue Setup**

Use this screen to configure QoS queue assignment to decide the priority on WAN/LAN interfaces. Traffic with higher priority gets through faster than those with lower priority. Low-priority traffic is dropped first when the network is congested.

Queue Setting: SP

| # | Status | Name    | Interface | Discipline | Priority | Weight | Buffer Management | Rate Limit |
|---|--------|---------|-----------|------------|----------|--------|-------------------|------------|
| 1 |        | Highest | WAN       | SP         | 1        | 8      | OT                | N/A        |
| 2 |        | High    | WAN       | SP         | 2        | 8      | OT                | N/A        |
| 3 |        | Medium  | WAN       | SP         | 3        | 8      | OT                | N/A        |
| 4 |        | Low     | WAN       | SP         | 4        | 1      | OT                | N/A        |

Cancel Apply

Note:  
Priority level 1 is the highest priority for QoS.

The following table describes the labels in this screen.

Table 100 Network Setting > QoS > Queue Setup

| LABEL         | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|---------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Add New Queue | Click this to create a new queue entry.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Queue Setting | Select between <b>SP</b> (Strict Priority), <b>SP+WRR</b> , or <b>WRR</b> (Weighted Round Robin). <b>SP</b> scheduling singles out the highest priority queue and ensures all queued traffic in this queue is transmitted before servicing the lower priority queues. <b>WRR</b> scheduling services queues on a rotating basis based on their queue weight (the number you configure in the queue <b>Weight</b> field. Queues with larger weights get more service than queues with smaller weights. If you choose <b>SP+WRR</b> , the first and second queue will be <b>SP</b> , and the third and fourth queue will be <b>WRR</b> . |
| #             | This is the index number of the entry.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Status        | This field displays whether the queue is active or not. A yellow bulb signifies that this queue is active. A gray bulb signifies that this queue is not active.                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Name          | This shows the descriptive name of this queue.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Interface     | This shows the name of the Zyxel Device's interface through which traffic in this queue passes.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |

Table 100 Network Setting &gt; QoS &gt; Queue Setup (continued)

| LABEL             | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|-------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Discipline        | <p>This shows the discipline of the queue. The discipline is changed according to the option chosen in <b>Queue Setting</b>. If you choose <b>SP</b>, the discipline will be SP. If you choose <b>SP+WRR</b>, the discipline of the first and second queue will be SP, and the third and fourth queue will be WRR. If you choose <b>WRR</b>, the discipline will be WRR. Strict Priority scheduling services the remaining queues using WRR.</p> <p>WRR scheduling services queues on a rotating basis based on their queue weight (the number you configure in the queue Weight field). Queues with larger weights get more service than queues with smaller weights.</p> <p>Note: Queue weights can only be changed when Weighted Round Robin is selected.</p> |
| Priority          | This shows the priority of this queue. The lower the number, the higher the priority level.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Weight            | This shows the weight of this queue.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Buffer Management | <p>This shows the queue management algorithm used for this queue.</p> <p>Queue management algorithms determine how the Zyxel Device should handle packets when it receives too many (network congestion).</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Rate Limit        | This shows the maximum transmission rate allowed for traffic on this queue.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Modify            | <p>Click the <b>Edit</b> icon to edit the queue.</p> <p>Click the <b>Delete</b> icon to delete an existing queue. Note that subsequent rules move up by one when you take this action.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |

### 11.4.1 Add a QoS Queue

Click **Add New Queue** or the **Edit** icon in the **Queue Setup** screen to configure a queue.

Figure 182 Network Setting &gt; QoS &gt; Queue Setup &gt; Add New Queue/Edit

The screenshot shows the 'Add New Queue' dialog box. It includes the following fields and controls:

- Active:** A toggle switch currently turned off.
- Name:** A text input field.
- Interface:** A dropdown menu with 'WAN' selected.
- Priority:** A dropdown menu with '1 (highest)' selected.
- Weight:** A dropdown menu with '1' selected.
- Buffer Management:** A dropdown menu with 'Drop Tail (DT)' selected.
- Rate Limit:** A text input field with a '(kbps)' label to its right.
- Buttons:** 'Cancel' and 'OK' buttons at the bottom.

The following table describes the labels in this screen.

Table 101 Network Setting > QoS > Queue Setup > Add New Queue/Edit

| LABEL             | DESCRIPTION                                                                                                                                                                                                                                                                                                                                   |
|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Active            | Click this switch to enable the queue.                                                                                                                                                                                                                                                                                                        |
| Name              | Enter a descriptive name for this queue. You can use up to 32 printable characters except [ " ], [ ` ], [ ' ], [ < ], [ > ], [ ^ ], [ \$ ], [   ], [ & ], or [ ; ]. Spaces are allowed.                                                                                                                                                       |
| Interface         | Select the interface to which this queue is applied.<br>This field is read-only if you are editing the queue.                                                                                                                                                                                                                                 |
| Priority          | Select the priority level (from 1 to 8) of this queue.<br><br>The smaller the number, the higher the priority level. Traffic assigned to higher priority queues gets through faster while traffic in lower priority queues is dropped if the network is congested.                                                                            |
| Weight            | Select the weight (from 1 to 8) of this queue.<br><br>If two queues have the same priority level, the Zyxel Device divides the bandwidth across the queues according to their weights. Queues with larger weights get more bandwidth than queues with smaller weights.                                                                        |
| Buffer Management | This field displays <b>Drop Tail (DT)</b> . <b>Drop Tail (DT)</b> is a simple queue management algorithm that allows the Zyxel Device buffer to accept as many packets as it can until it is full. Once the buffer is full, new packets that arrive are dropped until there is space in the buffer again (packets are transmitted out of it). |
| Rate Limit        | Specify the maximum transmission rate (in Kbps) allowed for traffic on this queue. If you enter 0 here, this means there's no rate limit on this queue.                                                                                                                                                                                       |
| Cancel            | Click <b>Cancel</b> to exit this screen without saving.                                                                                                                                                                                                                                                                                       |
| OK                | Click <b>OK</b> to save your changes.                                                                                                                                                                                                                                                                                                         |

## 11.5 QoS Classification Setup

Use this screen to add, edit or delete QoS classifiers. A classifier groups traffic into data flows according to specific criteria such as the source address, destination address, source port number, destination port number or incoming interface. For example, you can configure a classifier to select traffic from the same protocol port (such as Telnet) to form a flow.

You can give different priorities to traffic that the Zyxel Device forwards through the WAN interface. Give high priority to voice and video to make them run more smoothly. Similarly, give low priority to many large file downloads so that they do not reduce the quality of other applications.

Click **Network Setting > QoS > Classification Setup** to open the following screen.



**Figure 183** Network Setting > QoS > Classification Setup

The following table describes the labels in this screen.

**Table 102** Network Setting > QoS > Classification Setup

| <b>LABEL</b>            | <b>DESCRIPTION</b>                                                                                                                                                                            |
|-------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Add New Classification  | Click this to create a new classifier.                                                                                                                                                        |
| Order                   | This is the index number of the entry. The classifiers are applied in order of their numbering.                                                                                               |
| Status                  | This field displays whether the classifier is active or not. A yellow bulb signifies that this classifier is active. A gray bulb signifies that this classifier is not active.                |
| Class Name              | This is the name of the classifier.                                                                                                                                                           |
| Classification Criteria | This shows criteria specified in this classifier, for example the interface from which traffic of this class should come and the source MAC address of traffic that matches this classifier.  |
| DSCP Mark               | This is the DSCP number added to traffic of this classifier.                                                                                                                                  |
| 802.1P Mark             | This is the IEEE 802.1p priority level assigned to traffic of this classifier.                                                                                                                |
| VLAN ID Tag             | This is the VLAN ID number assigned to traffic of this classifier.                                                                                                                            |
| To Queue                | This is the name of the queue in which traffic of this classifier is put.                                                                                                                     |
| Modify                  | Click the <b>Edit</b> icon to edit the classifier.<br><br>Click the <b>Delete</b> icon to delete an existing classifier. Note that subsequent rules move up by one when you take this action. |

### 11.5.1 Add or Edit QoS Class

Click **Add New Classification** in the **Classification Setup** screen or the **Edit** icon next to a classifier to open the following screen.

**Figure 184** Network Setting > QoS > Classification Setup > Add New Classification/Edit: Step1

**Add New Classification**

Please follow the guidance through step 1~5 to configure a QoS rule

**Step1: Class Configuration**

Active: ☒

Class Name:

Classification Order:

**Figure 185** Network Setting > QoS > Classification Setup > Add New Classification/Edit: Step2

**Step2: Criteria Configuration**

Use the configurations below to specify the characteristics of a data flow needed to be managed by this QoS rule

**Basic**

From Interface:

Ether Type:

**Source**

☐ Address:

☐ Port Range:  -

☒ MAC:

Subnet Mask:

MAC Mask:

☐ Exclude

☐ Exclude

☒ Exclude

**Destination**

☐ Address:

☐ Port Range:  -

☒ MAC:

Subnet Mask:

MAC Mask:

☐ Exclude

☐ Exclude

☒ Exclude

**Others**

☐ Service:

☐ IP protocol:

☐ DHCP

☐ IP Packet Length:  -

☐ DSCP:  (0~63)

☐ 802.1P:

☐ VLAN ID:  (1~4094)

☐ TCP ACK

☐ Exclude

☐ Exclude

☐ Exclude

☐ Exclude

☐ Exclude

☐ Exclude

☐ Exclude

**Figure 186** Network Setting > QoS > Classification Setup > Add New Classification/Edit: Step3

**Step3: Packet Modification**

The content of the packet can be modified by applying the following settings:

DSCP Mark: Unchange (0-63)

VLAN ID Tag: Unchange (1-4094)

802.1P Mark: 0-15

**Figure 187** Network Setting > QoS > Classification Setup > Add New Classification/Edit: Step4

**Step4: Class Routing**

This module can route a packet to a certain interface according to the class setting.

Forward To Interfaces: Unchange

**Figure 188** Network Setting > QoS > Classification Setup > Add New Classification/Edit: Step5

**Step5: Outgoing Queue Selection**

Outgoing queue decides the priority of the traffic and how traffic should be shaped in the WAN interface.

To Queue Index: default queue

Cancel OK

The following table describes the labels in this screen.

Table 103 Network Setting &gt; QoS &gt; Classification Setup &gt; Add New Classification/Edit

| Label                                | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|--------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Step1: Class Configuration</b>    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Active                               | Click this switch to enable the classifier.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Class Name                           | Enter a descriptive name for this class. You can use up to 32 printable characters except [ " ], [ ` ], [ ' ], [ < ], [ > ], [ ^ ], [ \$ ], [   ], [ & ], or [ ; ]. Spaces are allowed.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Classification Order                 | Select an existing number for where you want to put this classifier to move the classifier to the number you selected after clicking <b>Apply</b> .<br>Select <b>Last</b> to put this rule in the back of the classifier list.                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Step2: Criteria Configuration</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Basic                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| From Interface                       | If you want to classify the traffic by an ingress interface, select an interface from the <b>From Interface</b> drop-down list box.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Ether Type                           | Select a predefined application to configure a class for the matched traffic. Traffic will be classified with the Ether Type of Ethernet frames. Ether Type is a field in an Ethernet frame used to identify the protocol encapsulated in the frame.<br>Select <b>NA</b> to specify traffic that does not belong to any Ether type.<br>If you select <b>IP</b> , you also need to configure source or destination, IP address, DHCP options, DSCP value or the protocol type.<br>If you select <b>IPv6</b> , you also need to configure source or destination, IPv6 address, DSCP value or the protocol type.<br>If you select <b>802.1Q</b> , you can configure an 802.1p priority level. |
| Source                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |

Table 103 Network Setting &gt; QoS &gt; Classification Setup &gt; Add New Classification/Edit (continued)

| LABEL         | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Address       | Select the checkbox and enter the source IP address in dotted decimal notation. A blank source IP address means any source IP address.                                                                                                                                                                                                                                                                                                                                                                    |
| Subnet Mask   | This field is available only when you select <b>IP</b> in the <b>EtherType</b> field.<br>Enter the source subnet mask.                                                                                                                                                                                                                                                                                                                                                                                    |
| Prefix Length | This field is available only when you select <b>IPv6</b> in the <b>EtherType</b> field.<br>Enter the source prefix length.                                                                                                                                                                                                                                                                                                                                                                                |
| Port Range    | If you select <b>TCP</b> or <b>UDP</b> in the <b>IP Protocol</b> field, select the checkbox and enter the port numbers of the source.                                                                                                                                                                                                                                                                                                                                                                     |
| MAC           | Select the checkbox and enter the source MAC address of the packet.                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| MAC Mask      | Enter the mask for the specified MAC address to determine which bits a packet's MAC address should match.<br><br>Enter "f" for each bit of the specified source MAC address that the traffic's MAC address should match. Enter "0" for the bits of the matched traffic's MAC address, which can be of any hexadecimal characters. For example, if you set the MAC address to 00:13:49:00:00:00 and the mask to ff:ff:ff:00:00:00, a packet with a MAC address of 00:13:49:12:34:56 matches this criteria. |
| Exclude       | Select this option to exclude the packets that match the specified criteria from this classifier.                                                                                                                                                                                                                                                                                                                                                                                                         |
| Destination   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Address       | Select the checkbox and enter the source IP address in dotted decimal notation. A blank source IP address means any source IP address.                                                                                                                                                                                                                                                                                                                                                                    |
| Subnet Mask   | This field is available only when you select <b>IP</b> in the <b>EtherType</b> field.<br>Enter the source subnet mask.                                                                                                                                                                                                                                                                                                                                                                                    |
| Prefix Length | This field is available only when you select <b>IPv6</b> in the <b>EtherType</b> field.<br>Enter the source prefix length.<br><br>See the IPv6 Appendix for more IPv6 information.                                                                                                                                                                                                                                                                                                                        |
| Port Range    | If you select <b>TCP</b> or <b>UDP</b> in the <b>IP Protocol</b> field, select the checkbox and enter the port numbers of the source.                                                                                                                                                                                                                                                                                                                                                                     |
| MAC           | Select the checkbox and enter the source MAC address of the packet.                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| MAC Mask      | Enter the mask for the specified MAC address to determine which bits a packet's MAC address should match.<br><br>Enter "f" for each bit of the specified source MAC address that the traffic's MAC address should match. Enter "0" for the bits of the matched traffic's MAC address, which can be of any hexadecimal characters. For example, if you set the MAC address to 00:13:49:00:00:00 and the mask to ff:ff:ff:00:00:00, a packet with a MAC address of 00:13:49:12:34:56 matches this criteria. |
| Exclude       | Select this option to exclude the packets that match the specified criteria from this classifier.                                                                                                                                                                                                                                                                                                                                                                                                         |
| Others        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Service       | This field is available only when you select <b>IP</b> or <b>IPv6</b> in the <b>EtherType</b> field.<br><br>This field simplifies classifier configuration by allowing you to select a predefined application. When you select a predefined application, you do not configure the rest of the filter fields.                                                                                                                                                                                              |
| IP Protocol   | This field is available only when you select <b>IP</b> or <b>IPv6</b> in the <b>EtherType</b> field.<br><br>Select this option and select the protocol (service type) from <b>TCP</b> , <b>UDP</b> , <b>ICMP</b> or <b>IGMP</b> . If you select <b>User defined</b> , enter the protocol (service type) number.                                                                                                                                                                                           |

Table 103 Network Setting &gt; QoS &gt; Classification Setup &gt; Add New Classification/Edit (continued)

| LABEL                           | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| DHCP                            | <p>This field is available only when you select <b>IP</b> in the <b>EtherType</b> field.</p> <p>Select this option and select a DHCP option.</p> <p>If you select <b>VendorClass ID (DHCP Option 60)</b>, enter the Vendor Class Identifier (Option 60) of the matched traffic, such as the type of the hardware or firmware.</p> <p>If you select <b>Client ID (DHCP Option 61)</b>, enter the Identity Association Identifier (IAD Option 61) of the matched traffic, such as the MAC address of the device.</p> <p>If you select <b>UserClass ID (DHCP Option 77)</b>, enter a string that identifies the user's category or application type in the matched DHCP packets.</p> <p>If you select <b>VendorSpecific Info (DHCP Option 125)</b>, enter the vendor specific information of the matched traffic, such as the product class, model name, and serial number of the device.</p> |
| IP Packet Length                | <p>This field is available only when you select <b>IP</b> in the <b>EtherType</b> field.</p> <p>Select this option and enter the minimum and maximum packet length (from 46 to 1500) in the fields provided.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| DSCP                            | <p>This field is available only when you select <b>IP</b> or <b>IPv6</b> in the <b>EtherType</b> field.</p> <p>Select this option and specify a DSCP (DiffServ Code Point) number between 0 and 63 in the field provided.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 802.1P                          | <p>This field is available only when you select <b>802.1Q</b> in the <b>EtherType</b> field.</p> <p>Select this option and select a priority level (between 0 and 7) from the drop-down list box. "0" is the lowest priority level and "7" is the highest.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| VLAN ID                         | <p>This field is available only when you select <b>802.1Q</b> in the <b>EtherType</b> field.</p> <p>Select this option and specify a VLAN ID number.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| TCP ACK                         | <p>This field is available only when you select <b>IP</b> in the <b>EtherType</b> field.</p> <p>If you select this option, the matched TCP packets must contain the ACK (Acknowledge) flag.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Exclude                         | Select this option to exclude the packets that match the specified criteria from this classifier.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Step3: Packet Modification      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| DSCP Mark                       | <p>This field is available only when you select <b>IP</b> in the <b>EtherType</b> field.</p> <p>If you select <b>Remark</b>, enter a DSCP value with which the Zyxel Device replaces the DSCP field in the packets.</p> <p>If you select <b>Unchange</b>, the Zyxel Device keep the DSCP field in the packets.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| VLAN ID Tag                     | <p>If you select <b>Remark</b>, enter a VLAN ID number with which the Zyxel Device replaces the VLAN ID of the frames.</p> <p>If you select <b>Remove</b>, the Zyxel Device deletes the VLAN ID of the frames before forwarding them out.</p> <p>If you select <b>Add</b>, the Zyxel Device treat all matched traffic untagged and add a second VLAN ID.</p> <p>If you select <b>Unchange</b>, the Zyxel Device keep the VLAN ID in the packets.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| 802.1P Mark                     | <p>Select a priority level with which the Zyxel Device replaces the IEEE 802.1p priority field in the packets.</p> <p>If you select <b>Unchange</b>, the Zyxel Device keep the 802.1p priority field in the packets.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Step4: Class Routing            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Forward to Interface            | Select a WAN interface through which traffic of this class will be forwarded out. If you select <b>Unchange</b> , the Zyxel Device forward traffic of this class according to the default routing table.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Step5: Outgoing Queue Selection |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |

Table 103 Network Setting &gt; QoS &gt; Classification Setup &gt; Add New Classification/Edit (continued)

| Label          | Description                                                                                                                |
|----------------|----------------------------------------------------------------------------------------------------------------------------|
| To Queue Index | Select a queue that applies to this class.<br>You should have configured a queue in the <b>Queue Setup</b> screen already. |
| Cancel         | Click <b>Cancel</b> to exit this screen without saving any changes.                                                        |
| OK             | Click <b>OK</b> to save your changes.                                                                                      |

## 11.6 QoS Shaper Setup

This screen lets you use the token bucket algorithm to allow a certain amount of large bursts of traffic while keeping most outgoing traffic at the average rate. Click **Network Setting > QoS > Shaper Setup**. The screen appears as shown.

Figure 189 Network Setting &gt; QoS &gt; Shaper Setup



The following table describes the labels in this screen.

Table 104 Network Setting &gt; QoS &gt; Shaper Setup

| Label          | Description                                                                                                                                                                       |
|----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Add New Shaper | Click this to create a new entry.                                                                                                                                                 |
| #              | This is the index number of the entry.                                                                                                                                            |
| Status         | This field displays whether the shaper is active or not. A yellow bulb signifies that this policer is active. A gray bulb signifies that this shaper is not active.               |
| Interface      | This shows the name of the Zyxel Device's interface through which traffic in this shaper applies.                                                                                 |
| Rate Limit     | This shows the average rate limit of traffic bursts for this shaper.                                                                                                              |
| Modify         | Click the <b>Edit</b> icon to edit the shaper.<br>Click the <b>Delete</b> icon to delete an existing shaper. Note that subsequent rules move up by one when you take this action. |

### 11.6.1 Add or Edit a QoS Shaper

Click **Add New Shaper** in the **Shaper Setup** screen or the **Edit** icon next to a shaper to show the following screen.

**Figure 190** Network Setting > QoS > Shaper Setup > Add New Shaper/Edit

The following table describes the labels in this screen.

Table 105 Network Setting > QoS > Shaper Setup > Add New Shaper/Edit

| LABEL      | DESCRIPTION                                                                     |
|------------|---------------------------------------------------------------------------------|
| Active     | Click this switch to enable the shaper.                                         |
| Interface  | Select a Zyxel Device's interface through which traffic in this shaper applies. |
| Rate Limit | Enter the average rate limit of traffic bursts for this shaper.                 |
| Cancel     | Click <b>Cancel</b> to exit this screen without saving any changes.             |
| OK         | Click <b>OK</b> to save your changes.                                           |

## 11.7 QoS Polic er Setup

Use this screen to view QoS policers that allow you to limit the transmission rate of incoming traffic and apply actions, such as drop, pass, or modify, to the DSCP value of matched traffic. Click **Network Setting > QoS > Polic er Setup**. The screen appears as shown.

**Figure 191** Network Setting > QoS > Polic er Setup

The following table describes the labels in this screen.

Table 106 Network Setting > QoS > Policer Setup

| <b>LABEL</b>      | <b>DESCRIPTION</b>                                                                                                                                                                      |
|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Add New Policer   | Click this to create a new entry.                                                                                                                                                       |
| #                 | This is the index number of the entry.                                                                                                                                                  |
| Status            | This field displays whether the policer is active or not. A yellow bulb signifies that this policer is active. A gray bulb signifies that this policer is not active.                   |
| Name              | This field displays the descriptive name of this policer.                                                                                                                               |
| Regulated Classes | This field displays the name of a QoS classifier                                                                                                                                        |
| Meter Type        | This field displays the type of QoS metering algorithm used in this policer.                                                                                                            |
| Rule              | These are the rates and burst sizes against which the policer checks the traffic of the member QoS classes.                                                                             |
| Action            | This shows how the policer has the Zyxel Device treat different types of traffic belonging to the policer's member QoS classes.                                                         |
| Modify            | Click the <b>Edit</b> icon to edit the policer.<br><br>Click the <b>Delete</b> icon to delete an existing policer. Note that subsequent rules move up by one when you take this action. |

### 11.7.1 Add or Edit a QoS Policer

Click **Add New Policer** in the **Policer Setup** screen or the **Edit** icon next to a policer to show the following screen.



**Figure 192** Network Setting > QoS > Policer Setup > Add New Policer/Edit

The following table describes the labels in this screen.

Table 107 Network Setting &gt; QoS &gt; Policer Setup &gt; Add New Policer/Edit

| Label  | Description                                                                                                                                                                               |
|--------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Active | Click this switch to enable the policer.                                                                                                                                                  |
| Name   | Enter a descriptive name for this policer. You can use up to 16 printable characters except [ " ], [ ` ], [ ' ], [ < ], [ > ], [ ^ ], [ \$ ], [   ], [ & ], or [ ; ]. Spaces are allowed. |

Table 107 Network Setting &gt; QoS &gt; Policer Setup &gt; Add New Policer/Edit (continued)

| LABEL                            | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Meter Type                       | <p>This shows the traffic metering algorithm used in this policer.</p> <p>The <b>Simple Token Bucket</b> algorithm uses tokens in a bucket to control when traffic can be transmitted. Each token represents one byte. The algorithm allows bursts of up to <i>b</i> bytes which is also the bucket size.</p> <p>The <b>Single Rate Three Color</b> Marker (srTCM) is based on the token bucket filter and identifies packets by comparing them to the Committed Information Rate (CIR), the Committed Burst Size (CBS) and the Excess Burst Size (EBS).</p> <p>The <b>Two Rate Three Color</b> Marker (trTCM) is based on the token bucket filter and identifies packets by comparing them to the Committed Information Rate (CIR) and the Peak Information Rate (PIR).</p> |
| Committed Rate                   | Specify the committed rate. When the incoming traffic rate of the member QoS classes is less than the committed rate, the device applies the conforming action to the traffic.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Committed Burst Size             | <p>Specify the committed burst size for packet bursts. This must be equal to or less than the peak burst size (two rate three color) or excess burst size (single rate three color) if it is also configured.</p> <p>This is the maximum size of the (first) token bucket in a traffic metering algorithm.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Excess Burst Size                | <p>Specify the additional amount of bytes that are admitted at the committed rate besides the committed burst size.</p> <p>This is the maximum size of the second token bucket in the srTCM.</p> <p>This field is only available when you select <b>Single Rate Three Color</b> in the <b>Meter Type</b> field.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Peak Rate                        | <p>Specify the maximum rate at which packets are admitted to the network.</p> <p>The peak rate should be greater than or equal to the committed rate. This is to specify how many bytes of tokens are added to the second bucket every second in the trTCM.</p> <p>This field is only available when you select <b>Two Rate Three Color</b> in the <b>Meter Type</b> field.</p>                                                                                                                                                                                                                                                                                                                                                                                              |
| Peak Burst Size                  | <p>Specify the maximum amount of bytes that are admitted at the committed rate.</p> <p>This is the maximum size of the second token bucket in the trTCM.</p> <p>This field is only available when you select <b>Two Rate Three Color</b> in the <b>Meter Type</b> field.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Conforming Action                | <p>Specify what the Zyxel Device does for packets within the committed rate and burst size (green-marked packets).</p> <ul style="list-style-type: none"> <li>• <b>Pass:</b> Send the packets without modification.</li> <li>• <b>DSCP Mark:</b> Change the DSCP mark value of the packets. Enter the DSCP mark value to use.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Partial Conforming Action        | <p>Specify the action that the Zyxel Device takes on yellow-marked packets.</p> <p>Select <b>Pass</b> to forward the packets.</p> <p>Select <b>Drop</b> to discard the packets.</p> <p>Select <b>DSCP Mark</b> to assign a specified DSCP number (between 0 and 63) to the packets and forward them. The packets are dropped if there is congestion on the network.</p> <p>This field is only available when you select <b>Single/Two Rate Three Color</b> in the <b>Meter Type</b> field.</p>                                                                                                                                                                                                                                                                               |
| Non-Conforming Action            | <p>Specify what the Zyxel Device does for packets that exceed the excess burst size or peak rate and burst size (red-marked packets).</p> <ul style="list-style-type: none"> <li>• <b>Drop:</b> Discard the packets.</li> <li>• <b>DSCP Mark:</b> Change the DSCP mark value of the packets. Enter the DSCP mark value to use. The packets may be dropped if there is congestion on the network.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                  |
| Regulated Classes Member Setting |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |

Table 107 Network Setting &gt; QoS &gt; Policer Setup &gt; Add New Policer/Edit (continued)

| LABEL           | DESCRIPTION                                                                                                                                                                                                                          |
|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Available Class | Select a QoS classifier to apply this QoS policer to traffic that matches the QoS classifier.                                                                                                                                        |
| Selected Class  | Highlight a QoS classifier in the <b>Available Class</b> box and use the > button to move it to the <b>Selected Class</b> box.<br><br>To remove a QoS classifier from the <b>Selected Class</b> box, select it and use the < button. |
| Cancel          | Click <b>Cancel</b> to exit this screen without saving any changes.                                                                                                                                                                  |
| OK              | Click <b>OK</b> to save your changes.                                                                                                                                                                                                |

## 11.8 QoS Monitor

To view the Zyxel Device's QoS packet statistics, click **Network Setting > QoS > Monitor**. The screen appears as shown.

Figure 193 Network Setting &gt; QoS &gt; Monitor

Use this screen to view QoS statistics for WAN/LAN interfaces and the status of the Queue setup.

Refresh Interval: None

### Interface Monitor

| # | Name | Pass Rate(bps) | Drop Rate (bps) |
|---|------|----------------|-----------------|
| 1 | WAN  | 0              | 0               |
| 2 | LAN  | 0              | 0               |

### Queue Monitor

| # | Name | Pass Rate(bps) | Drop Rate (bps) |
|---|------|----------------|-----------------|
|---|------|----------------|-----------------|

The following table describes the labels in this screen.

Table 108 Network Setting &gt; QoS &gt; Monitor

| LABEL             | DESCRIPTION                                                                                             |
|-------------------|---------------------------------------------------------------------------------------------------------|
| Refresh Interval  | Select how often you want the Zyxel Device to update this screen. Select <b>None</b> to stop refreshing |
| Interface Monitor |                                                                                                         |
| #                 | This is the index number of the entry.                                                                  |
| Name              | This shows the name of the interface on the Zyxel Device.                                               |
| Pass Rate (bps)   | This shows how many packets forwarded to this interface are transmitted successfully.                   |
| Drop Rate (bps)   | This shows how many packets forwarded to this interface are dropped.                                    |
| Queue Monitor     |                                                                                                         |
| #                 | This is the index number of the entry.                                                                  |
| Name              | This shows the name of the queue.                                                                       |

Table 108 Network Setting &gt; QoS &gt; Monitor (continued)

| <b>LABEL</b>    | <b>DESCRIPTION</b>                                                               |
|-----------------|----------------------------------------------------------------------------------|
| Pass Rate (bps) | This shows how many packets assigned to this queue are transmitted successfully. |
| Drop Rate (bps) | This shows how many packets assigned to this queue are dropped.                  |

## 11.9 Technical Reference

The following section contains additional technical information about the Zyxel Device features described in this chapter.

### IEEE 802.1Q Tag

The IEEE 802.1Q standard defines an explicit VLAN tag in the MAC header to identify the VLAN membership of a frame across bridges. A VLAN tag includes the 12-bit VLAN ID and 3-bit user priority. The VLAN ID associates a frame with a specific VLAN and provides the information that devices need to process the frame across the network.

IEEE 802.1p specifies the user priority field and defines up to eight separate traffic types. The following table describes the traffic types defined in the IEEE 802.1d standard (which incorporates the 802.1p).

Table 109 IEEE 802.1p Priority Level and Traffic Type

| <b>PRIORITY LEVEL</b> | <b>TRAFFIC TYPE</b>                                                                                                                                           |
|-----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Level 7               | Typically used for network control traffic such as router configuration messages.                                                                             |
| Level 6               | Typically used for voice traffic that is especially sensitive to jitter (jitter is the variations in delay).                                                  |
| Level 5               | Typically used for video that consumes high bandwidth and is sensitive to jitter.                                                                             |
| Level 4               | Typically used for controlled load, latency-sensitive traffic such as SNA (Systems Network Architecture) transactions.                                        |
| Level 3               | Typically used for "excellent effort" or better than best effort and would include important business traffic that can tolerate some delay.                   |
| Level 2               | This is for "spare bandwidth".                                                                                                                                |
| Level 1               | This is typically used for non-critical "background" traffic such as bulk transfers that are allowed but that should not affect other applications and users. |
| Level 0               | Typically used for best-effort traffic.                                                                                                                       |

### DiffServ

QoS is used to prioritize source-to-destination traffic flows. All packets in the flow are given the same priority. You can use CoS (class of service) to give different priorities to different packet types.

DiffServ (Differentiated Services) is a class of service (CoS) model that marks packets so that they receive specific per-hop treatment at DiffServ-compliant network devices along the route based on the application types and traffic flow. Packets are marked with DiffServ Code Points (DSCPs) indicating the level of service desired. This allows the intermediary DiffServ-compliant network devices to handle the packets differently depending on the code points without the need to negotiate paths or remember state information for every flow. In addition, applications do not have to request a particular service or give advanced notice of where the traffic is going.

## DSCP and Per-Hop Behavior

DiffServ defines a new Differentiated Services (DS) field to replace the Type of Service (TOS) field in the IP header. The DS field contains a 2-bit unused field and a 6-bit DSCP field which can define up to 64 service levels. The following figure illustrates the DS field.

DSCP is backward compatible with the three precedence bits in the ToS octet so that non-DiffServ compliant, ToS-enabled network device will not conflict with the DSCP mapping.

|               |                 |
|---------------|-----------------|
| DSCP (6 bits) | Unused (2 bits) |
|---------------|-----------------|

The DSCP value determines the forwarding behavior, the PHB (Per-Hop Behavior), that each packet gets across the DiffServ network. Based on the marking rule, different kinds of traffic can be marked for different kinds of forwarding. Resources can then be allocated according to the DSCP values and the configured policies.

## IP Precedence

Similar to IEEE 802.1p prioritization at layer-2, you can use IP precedence to prioritize packets in a layer-3 network. IP precedence uses three bits of the eight-bit ToS (Type of Service) field in the IP header. There are eight classes of services (ranging from zero to seven) in IP precedence. Zero is the lowest priority level and seven is the highest.

## Automatic Priority Queue Assignment

If you enable QoS on the Zyxel Device, the Zyxel Device can automatically base on the IEEE 802.1p priority level, IP precedence and/or packet length to assign priority to traffic which does not match a class.

The following table shows you the internal layer-2 and layer-3 QoS mapping on the Zyxel Device. On the Zyxel Device, traffic assigned to higher priority queues gets through faster while traffic in lower index queues is dropped if the network is congested.

Table 110 Internal Layer2 and Layer3 QoS Mapping

| PRIORITY<br>QUEUE | LAYER 2                                             | LAYER 3                 |                                      |                            |
|-------------------|-----------------------------------------------------|-------------------------|--------------------------------------|----------------------------|
|                   | IEEE 802.1P USER<br>PRIORITY (ETHERNET<br>PRIORITY) | TO S (IP<br>PRECEDENCE) | DSCP                                 | IP PACKET LENGTH<br>(BYTE) |
| 0                 | 1                                                   | 0                       | 000000                               |                            |
| 1                 | 2                                                   |                         |                                      |                            |
| 2                 | 0                                                   | 0                       | 000000                               | >1100                      |
| 3                 | 3                                                   | 1                       | 001110<br>001100<br>001010<br>001000 | 250 – 1100                 |
| 4                 | 4                                                   | 2                       | 010110<br>010100<br>010010<br>010000 |                            |

Table 110 Internal Layer2 and Layer3 QoS Mapping (continued)

| PRIORITY<br>QUEUE | LAYER 2                                             | LAYER 3                 |                                      |                            |
|-------------------|-----------------------------------------------------|-------------------------|--------------------------------------|----------------------------|
|                   | IEEE 802.1P USER<br>PRIORITY (ETHERNET<br>PRIORITY) | TO S (IP<br>PRECEDENCE) | DSCP                                 | IP PACKET LENGTH<br>(BYTE) |
| 5                 | 5                                                   | 3                       | 011110<br>011100<br>011010<br>011000 | <250                       |
| 6                 | 6                                                   | 4                       | 100110<br>100100<br>100010<br>100000 |                            |
|                   |                                                     | 5                       | 101110<br>101000                     |                            |
| 7                 | 7                                                   | 6                       | 110000                               |                            |
|                   |                                                     | 7                       | 111000                               |                            |

### Token Bucket

The token bucket algorithm uses tokens in a bucket to control when traffic can be transmitted. The bucket stores tokens, each of which represents one byte. The algorithm allows bursts of up to  $b$  bytes which is also the bucket size, so the bucket can hold up to  $b$  tokens. Tokens are generated and added into the bucket at a constant rate. The following shows how tokens work with packets:

- A packet can be transmitted if the number of tokens in the bucket is equal to or greater than the size of the packet (in bytes).
- After a packet is transmitted, a number of tokens corresponding to the packet size is removed from the bucket.
- If there are no tokens in the bucket, the Zyxel Device stops transmitting until enough tokens are generated.
- If not enough tokens are available, the Zyxel Device treats the packet in either one of the following ways:

In traffic shaping:

- Holds it in the queue until enough tokens are available in the bucket.

In traffic policing:

- Drops it.
- Transmits it but adds a DSCP mark. The Zyxel Device may drop these marked packets if the network is overloaded.

Configure the bucket size to be equal to or less than the amount of the bandwidth that the interface can support. It does not help if you set it to a bucket size over the interface's capability. The smaller the bucket size, the lower the data transmission rate and that may cause outgoing packets to be dropped. A larger transmission rate requires a big bucket size. For example, use a bucket size of 10 kbytes to get the transmission rate up to 10 Mbps.

### **Single Rate Three Color Marker**

The Single Rate Three Color Marker (srTCM, defined in RFC 2697) is a type of traffic policing that identifies packets by comparing them to one user-defined rate, the Committed Information Rate (CIR), and two burst sizes: the Committed Burst Size (CBS) and Excess Burst Size (EBS).

The srTCM evaluates incoming packets and marks them with one of three colors which refer to packet loss priority levels. High packet loss priority level is referred to as red, medium is referred to as yellow and low is referred to as green.

The srTCM is based on the token bucket filter and has two token buckets (CBS and EBS). Tokens are generated and added into the bucket at a constant rate, called Committed Information Rate (CIR). When the first bucket (CBS) is full, new tokens overflow into the second bucket (EBS).

All packets are evaluated against the CBS. If a packet does not exceed the CBS it is marked green. Otherwise it is evaluated against the EBS. If it is below the EBS then it is marked yellow. If it exceeds the EBS then it is marked red.

The following shows how tokens work with incoming packets in srTCM:

- A packet arrives. The packet is marked green and can be transmitted if the number of tokens in the CBS bucket is equal to or greater than the size of the packet (in bytes).
- After a packet is transmitted, a number of tokens corresponding to the packet size is removed from the CBS bucket.
- If there are not enough tokens in the CBS bucket, the Zyxel Device checks the EBS bucket. The packet is marked yellow if there are sufficient tokens in the EBS bucket. Otherwise, the packet is marked red. No tokens are removed if the packet is dropped.

### **Two Rate Three Color Marker**

The Two Rate Three Color Marker (trTCM, defined in RFC 2698) is a type of traffic policing that identifies packets by comparing them to two user-defined rates: the Committed Information Rate (CIR) and the Peak Information Rate (PIR). The CIR specifies the average rate at which packets are admitted to the network. The PIR is greater than or equal to the CIR. CIR and PIR values are based on the guaranteed and maximum bandwidth respectively as negotiated between a service provider and client.

The trTCM evaluates incoming packets and marks them with one of three colors which refer to packet loss priority levels. High packet loss priority level is referred to as red, medium is referred to as yellow and low is referred to as green.

The trTCM is based on the token bucket filter and has two token buckets (Committed Burst Size (CBS) and Peak Burst Size (PBS)). Tokens are generated and added into the two buckets at the CIR and PIR respectively.

All packets are evaluated against the PIR. If a packet exceeds the PIR it is marked red. Otherwise it is evaluated against the CIR. If it exceeds the CIR then it is marked yellow. Finally, if it is below the CIR then it is marked green.

The following shows how tokens work with incoming packets in trTCM:

- A packet arrives. If the number of tokens in the PBS bucket is less than the size of the packet (in bytes), the packet is marked red and may be dropped regardless of the CBS bucket. No tokens are removed if the packet is dropped.

- If the PBS bucket has enough tokens, the Zyxel Device checks the CBS bucket. The packet is marked green and can be transmitted if the number of tokens in the CBS bucket is equal to or greater than the size of the packet (in bytes). Otherwise, the packet is marked yellow.



# CHAPTER 12

# Network Address Translation (NAT)

## 12.1 NAT Overview

NAT (Network Address Translation – NAT, RFC 1631) is the translation of the IP address of a host in a packet, for example, the source address of an outgoing packet, used within one network to a different IP address known within another network.

### 12.1.1 What You Can Do in this Chapter

- Use the **Port Forwarding** screen to configure forward incoming service requests to the servers on your local network ([Section 12.2 on page 330](#)).
- Use the **Port Triggering** screen to add and configure the Zyxel Device's trigger port settings ([Section 12.3 on page 333](#)).
- Use the **DMZ** screen to configure a default server ([Section 12.4 on page 337](#)).
- Use the **ALG** screen to enable or disable the SIP ALG ([Section 12.5 on page 337](#)).
- Use the **Address Mapping** screen to enable and disable the NAT Address Mapping in the Zyxel Device ([Section 12.6 on page 338](#)).
- Use the **Sessions** screen to limit the number of concurrent NAT sessions each client can use ([Section 12.7 on page 341](#)).
- Use the **Port Control Protocol** screen to configure incoming traffic for devices behind the Zyxel Device ([Section 12.8 on page 341](#)).

### 12.1.2 What You Need To Know

The following terms and concepts may help as you read this chapter.

#### Inside/Outside and Global/Local

Inside/outside denotes where a host is located relative to the Zyxel Device, for example, the computers of your subscribers are the inside hosts, while the web servers on the Internet are the outside hosts.

Global/local denotes the IP address of a host in a packet as the packet traverses a router, for example, the local address refers to the IP address of a host when the packet is in the local network, while the global address refers to the IP address of the host when the same packet is traveling in the WAN side.

#### NAT

In the simplest form, NAT changes the source IP address in a packet received from a subscriber (the inside local address) to another (the inside global address) before forwarding the packet to the WAN

side. When the response comes back, NAT translates the destination address (the inside global address) back to the inside local address before forwarding it to the original inside host.

### Port Forwarding

A port forwarding set is a list of inside (behind NAT on the LAN) servers, for example, web that you can make visible to the outside world even though NAT makes your whole inside network appear as a single computer to the outside world.

## 12.2 Port Forwarding

Use **Port Forwarding** to forward incoming service requests from the Internet to the servers on your local network. Port forwarding is commonly used when you want to host online gaming, P2P file sharing, or other servers on your network.

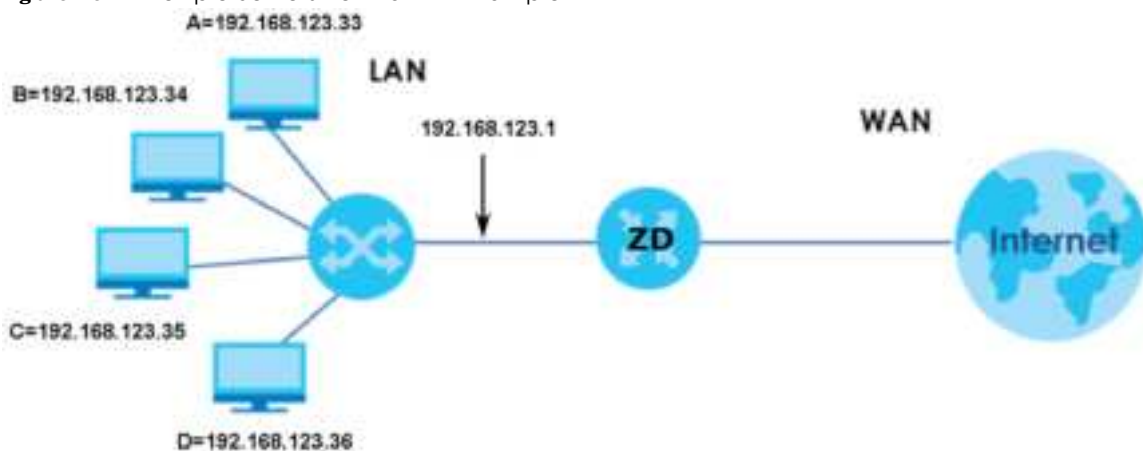
You may enter a single port number or a range of port numbers to be forwarded, and the local IP address of the desired server. The port number identifies a service; for example, web service is on port 80 on port 21. In some cases, such as for unknown services or where one server can support more than one service (for example web service), it might be better to specify a range of port numbers. You can allocate a server IP address that corresponds to a port or a range of ports. Please refer to RFC 1700 for further information about port numbers.

Note: Many residential broadband ISP accounts do not allow you to run any server processes (such as a Web server) from your location. Your ISP may periodically check for servers and may suspend your account if it discovers any active services at your location. If you are unsure, refer to your ISP.

### Configure Servers Behind Port Forwarding (Example)

Let's say you want to assign ports 21-25 to one Telnet and SMTP server (**A** in the example), port 80 to another (**B** in the example), a default server IP address of 192.168.1.35 to a third (**C** in the example), and a default server IP address of 192.168.1.36 to a fourth (**D** in the example). You assign the LAN IP addresses and the ISP assigns the WAN IP address. The NAT network appears as a single host on the Internet.

**Figure 194** Multiple Servers Behind NAT Example

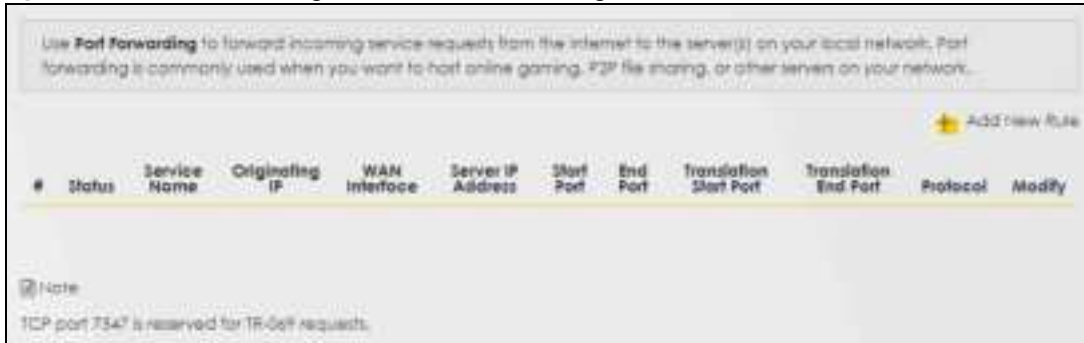


## 12.2.1 Port Forwarding

Click **Network Setting** > **NAT** to open the **Port Forwarding** screen.

Note: TCP port 7547 is reserved for system use.

**Figure 195** Network Setting > NAT > Port Forwarding



The following table describes the fields in this screen.

Table 111 Network Setting > NAT > Port Forwarding

| LABEL                  | DESCRIPTION                                                                                                                                                                                                                       |
|------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Add New Rule           | Click this to add a new port forwarding rule.                                                                                                                                                                                     |
| #                      | This is the index number of the entry.                                                                                                                                                                                            |
| Status                 | This field indicates whether the rule is active or not.<br>A yellow bulb signifies that this rule is active. A gray bulb signifies that this rule is not active.                                                                  |
| Service Name           | This is the service's name. This shows <b>User Defined</b> if you manually added a service. You can change this by clicking the edit icon.                                                                                        |
| Originating IP         | This is the source's IP address.                                                                                                                                                                                                  |
| WAN Interface          | Select the WAN interface for which to configure NAT port forwarding rules.                                                                                                                                                        |
| Server IP Address      | This is the server's IP address.                                                                                                                                                                                                  |
| Start Port             | This is the first external port number that identifies a service.                                                                                                                                                                 |
| End Port               | This is the last external port number that identifies a service.                                                                                                                                                                  |
| Translation Start Port | This is the first internal port number that identifies a service.                                                                                                                                                                 |
| Translation End Port   | This is the last internal port number that identifies a service.                                                                                                                                                                  |
| Protocol               | This field displays the protocol (TCP, UDP, TCP+UDP) used to transport the packets for which you want to apply the rule.                                                                                                          |
| Modify                 | Click the <b>Edit</b> icon to edit the port forwarding rule.<br><br>Click the <b>Delete</b> icon to delete an existing port forwarding rule. Note that subsequent address mapping rules move up by one when you take this action. |

## 12.2.2 Add or Edit Port Forwarding

Create or edit a port forwarding rule. Specify either a port or a range of ports, a server IP address, and a protocol to configure a port forwarding rule. Click **Add New Rule** in the **Port Forwarding** screen or the **Edit** icon next to an existing rule to open the following screen.

**Figure 196** Network Setting > NAT > Port Forwarding: Add or Edit

**Add New Rule**

Active: ☒

Service Name:

WAN Interface:

Start Port:

End Port:

Translation Start Port:

Translation End Port:

Server IP Address:

Configure Originating IP: ☒ Enable

Originating IP:

Protocol:

**Note**

(1) Create or edit a port forwarding rule. Specify either a port or a range of ports, a server IP address, and a protocol to configure a port forwarding rule.

(2) To configure port forwarding, you need to have the same configurations in the **Start Port**, **End Port**, **Translation Start Port**, and **Translation End Port** fields.

To configure port translation, you need to have different configurations in the **Start Port**, **End Port**, **Translation Start Port**, and **Translation End Port** fields.

(3) TCP port 7547 is reserved for system use.

Cancel OK

Note: To configure port forwarding, you need to have the same configurations in the **Start Port**, **End Port**, **Translation Start Port**, and **Translation End Port** fields.

To configure port translation, you need to have different configurations in the **Start Port**, **End Port**, **Translation Start Port**, and **Translation End Port** fields.

Here is an example to configure port translation. Configure **Start Port** to 100, **End Port** to 120, **Translation Start Port** to 200, and **Translation End Port** to 220.

Note: TCP port 7547 is reserved for system use.

The following table describes the labels in this screen.

Table 112 Network Setting &gt; NAT &gt; Port Forwarding: Add or Edit

| LABEL         | DESCRIPTION                                                                                                                                                                              |
|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Active        | Click to turn the port forwarding rule on or off.                                                                                                                                        |
| Service Name  | Enter a name for the service to forward. You can use up to 256 printable characters except [ " ], [ ` ], [ ' ], [ < ], [ > ], [ ^ ], [ \$ ], [   ], [ & ], or [ ; ]. Spaces are allowed. |
| WAN Interface | Select the WAN interface for which to configure NAT port forwarding rules.                                                                                                               |

Table 112 Network Setting &gt; NAT &gt; Port Forwarding: Add or Edit (continued)

| LABEL                    | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                        |
|--------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Start Port               | Configure this for a user-defined entry. Enter the original destination port for the packets.<br>To forward only one port, enter the port number again in the <b>End Port</b> field.<br>To forward a series of ports, enter the start port number here and the end port number in the <b>End Port</b> field.                                                                       |
| End Port                 | Configure this for a user-defined entry. Enter the last port of the original destination port range.<br>To forward only one port, enter the port number in the <b>Start Port</b> field above and then enter it again in this field.<br>To forward a series of ports, enter the last port number in a series that begins with the port number in the <b>Start Port</b> field above. |
| Translation Start Port   | Configure this for a user-defined entry. This shows the port number to which you want the Zyxel Device to translate the incoming port. For a range of ports, enter the first number of the range to which you want the incoming ports translated.                                                                                                                                  |
| Translation End Port     | Configure this for a user-defined entry. This shows the last port of the translated port range.                                                                                                                                                                                                                                                                                    |
| Server IP Address        | Enter the inside IP address of the virtual server here.                                                                                                                                                                                                                                                                                                                            |
| Configure Originating IP | Click the <b>Enable</b> checkbox to enter the source IP in the next field.                                                                                                                                                                                                                                                                                                         |
| Originating IP           | Enter the source IP address here.                                                                                                                                                                                                                                                                                                                                                  |
| Protocol                 | Select the protocol supported by this virtual server. Choices are <b>TCP</b> , <b>UDP</b> , or <b>TCP/UDP</b> .                                                                                                                                                                                                                                                                    |
| OK                       | Click this to save your changes.                                                                                                                                                                                                                                                                                                                                                   |
| Cancel                   | Click this to exit this screen without saving.                                                                                                                                                                                                                                                                                                                                     |

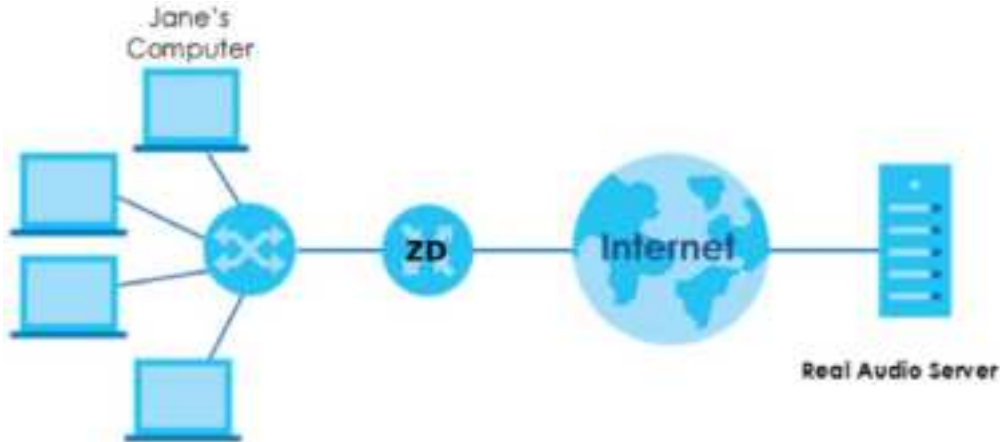
## 12.3 Port Triggering

Some services use a dedicated range of ports on the client side and a dedicated range of ports on the server side. With regular port forwarding, you set a forwarding port in NAT to forward a service (coming in from the server on the WAN) to the IP address of a computer on the client side (LAN). The problem is that port forwarding only forwards a service to a single LAN IP address. In order to use the same service on a different LAN computer, you have to manually replace the LAN computer's IP address in the forwarding port with another LAN computer's IP address.

Trigger port forwarding allows computers on the LAN to dynamically take turns using the service.

The Zyxel Device records the IP address of a LAN computer that sends traffic to the WAN to request a service with a specific port number and protocol (a \"trigger\" port). When the Zyxel Device's WAN port receives a response with a specific port number and protocol (\"open\" port), the Zyxel Device forwards the traffic to the LAN IP address of the computer that sent the request. After that computer's connection for that service closes, another computer on the LAN can use the service in the same manner. This way you do not need to configure a new IP address each time you want a different LAN computer to use the application.

For example:

**Figure 197** Trigger Port Forwarding Process: Example

- 1 Jane requests a file from the Real Audio server (port 7070).
- 2 Port 7070 is a "trigger" port and causes the Zyxel Device to record Jane's computer IP address. The Zyxel Device associates Jane's computer IP address with the "open" port range of 6970 – 7170.
- 3 The Real Audio server responds using a port number ranging between 6970 – 7170.
- 4 The Zyxel Device forwards the traffic to Jane's computer IP address.
- 5 Only Jane can connect to the Real Audio server until the connection is closed or times out. The Zyxel Device times out in 3 minutes with UDP (User Datagram Protocol) or 2 hours with TCP/IP (Transfer Control Protocol/Internet Protocol).

Click **Network Setting > NAT > Port Triggering** to open the following screen. Use this screen to view your Zyxel Device's trigger port settings.

Note: TCP port 7547 is reserved for system use.

Note: The sum of trigger ports in all rules must be less than 1000 and every open port range must be less than 1000. When the protocol is TCP/UDP, the ports are counted twice.

**Figure 198** Network Setting > NAT > Port Triggering

Trigger port forwarding allows computers on the LAN to dynamically take turns using the service. The Zyxel Device records the IP address of a LAN computer that sends traffic to the WAN to request a service with a specific port number and protocol (a "trigger" port). When the Zyxel Device's WAN port receives a response with a specific port number and protocol ("open" port), the Zyxel Device forwards the traffic to the LAN IP address of the computer that sent the request. After that computer's connection for that service closes, another computer on the LAN can use the service in the same manner. This way you do not need to configure a new IP address each time you want a different LAN computer to use the application.

+ Add New Rule

| #                                                             | Status | Service Name | WAN Interface | Trigger Start Port | Trigger End Port | Trigger Proto. | Open Start Port | Open End Port | Open Protocol | Modify |
|---------------------------------------------------------------|--------|--------------|---------------|--------------------|------------------|----------------|-----------------|---------------|---------------|--------|
| <p>Note:</p> <p>TCP port 7547 is reserved for system use.</p> |        |              |               |                    |                  |                |                 |               |               |        |

The following table describes the labels in this screen.

Table 113 Network Setting > NAT > Port Triggering

| <b>LABEL</b>       | <b>DESCRIPTION</b>                                                                                                                                                                                                                                                                                                         |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Add New Rule       | Click this to create a new rule.                                                                                                                                                                                                                                                                                           |
| #                  | This is the index number of the entry.                                                                                                                                                                                                                                                                                     |
| Status             | This field displays whether the port triggering rule is active or not. A yellow bulb signifies that this rule is active. A gray bulb signifies that this rule is not active.                                                                                                                                               |
| Service Name       | This field displays the name of the service used by this rule.                                                                                                                                                                                                                                                             |
| WAN Interface      | This field shows the WAN interface through which the service is forwarded.                                                                                                                                                                                                                                                 |
| Trigger Start Port | The trigger port is a port (or a range of ports) that causes (or triggers) the Zyxel Device to record the IP address of the LAN computer that sent the traffic to a server on the WAN.<br><br>This is the first port number that identifies a service.                                                                     |
| Trigger End Port   | This is the last port number that identifies a service.                                                                                                                                                                                                                                                                    |
| Trigger Proto.     | This is the trigger transport layer protocol.                                                                                                                                                                                                                                                                              |
| Open Start Port    | The open port is a port (or a range of ports) that a server on the WAN uses when it sends out a particular service. The Zyxel Device forwards the traffic with this port (or range of ports) to the client computer on the LAN that requested the service.<br><br>This is the first port number that identifies a service. |
| Open End Port      | This is the last port number that identifies a service.                                                                                                                                                                                                                                                                    |
| Open Protocol      | This is the open transport layer protocol.                                                                                                                                                                                                                                                                                 |
| Modify             | Click the <b>Edit</b> icon to edit this rule.<br><br>Click the <b>Delete</b> icon to delete an existing rule.                                                                                                                                                                                                              |

### 12.3.1 Add or Edit Port Triggering Rule

This screen lets you create new port triggering rules. Click **Add New Rule** in the **Port Triggering** screen or click a rule's **Edit** icon to open the following screen. Use this screen to configure a port or range of ports and protocols for sending out requests and for receiving responses.

**Figure 199** Network Setting > NAT > Port Triggering: Add or Edit

The following table describes the labels in this screen.

**Table 114** Network Setting > NAT > Port Triggering: Add or Edit

| <b>LABEL</b>       | <b>DESCRIPTION</b>                                                                                                                                                                                                                                                                                                                        |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Active             | Click this switch to activate this rule.                                                                                                                                                                                                                                                                                                  |
| Service Name       | Enter a name to identify this rule. You can use up to 256 printable characters except [ " ], [ ` ], [ ' ], [ < ], [ > ], [ ^ ], [ \$ ], [   ], [ & ], or [ ; ]. Spaces are allowed.                                                                                                                                                       |
| WAN Interface      | Select a WAN interface for which you want to configure port triggering rules.                                                                                                                                                                                                                                                             |
| Trigger Start Port | The trigger port is a port (or a range of ports) that causes (or triggers) the Zyxel Device to record the IP address of the LAN computer that sent the traffic to a server on the WAN.<br>Enter a port number or the starting port number in a range of port numbers.                                                                     |
| Trigger End Port   | Enter a port number or the ending port number in a range of port numbers.                                                                                                                                                                                                                                                                 |
| Trigger Protocol   | Select the transport layer protocol from <b>TCP</b> , <b>UDP</b> , or <b>TCP/UDP</b> .                                                                                                                                                                                                                                                    |
| Open Start Port    | The open port is a port (or a range of ports) that a server on the WAN uses when it sends out a particular service. The Zyxel Device forwards the traffic with this port (or range of ports) to the client computer on the LAN that requested the service.<br>Enter a port number or the starting port number in a range of port numbers. |
| Open End Port      | Enter a port number or the ending port number in a range of port numbers.                                                                                                                                                                                                                                                                 |
| Open Protocol      | Select the transport layer protocol from <b>TCP</b> , <b>UDP</b> , or <b>TCP/UDP</b> .                                                                                                                                                                                                                                                    |
| Cancel             | Click <b>Cancel</b> to exit this screen without saving.                                                                                                                                                                                                                                                                                   |
| OK                 | Click <b>OK</b> to save your changes.                                                                                                                                                                                                                                                                                                     |



## 12.4 DMZ

Use this screen to specify the IP address of a default server to receive packets from ports not specified in the **Port Triggering** screen. The DMZ (DeMilitarized Zone) is a network between the WAN and the LAN that is accessible to devices on both the WAN and LAN with firewall protection. Devices on the WAN can initiate connections to devices on the DMZ but not to those on the LAN.

You can put public servers, such as email and web servers, on the DMZ to provide services on both the WAN and LAN. To use this feature, you first need to assign a DMZ host. Click **Network Setting > NAT > DMZ** to open the **DMZ** screen.

Note: Use an IPv4 address for the DMZ server.

Note: Enter the IP address of the default server in the **Default Server Address** field, and click **Apply** to activate the DMZ host. Otherwise, clear the IP address in the **Default Server Address** field, and click **Apply** to deactivate the DMZ host.

**Figure 200** Network Setting > NAT > DMZ

Use this screen to specify the IP address of a default server to receive packets from ports not specified in the **Port Triggering** screen. The DMZ (DeMilitarized Zone) is a network between the WAN and the LAN that is accessible to devices on both the WAN and LAN with firewall protection. Devices on the WAN can initiate connections to devices on the DMZ but not to those on the LAN.

You can put public servers, such as email, web, and FTP servers, on the DMZ to provide services on both the WAN and LAN. To use this feature, you first need to assign a DMZ host.

Default Server Address:

Note:  
Enter the IP address of the default server in the **Default Server Address** field, and click **Apply** to activate the DMZ host. Otherwise, clear the IP address in the **Default Server Address** field, and click **Apply** to deactivate the DMZ host.

The following table describes the fields in this screen.

Table 115 Network Setting > NAT > DMZ

| LABEL                  | DESCRIPTION                                                                                                                                                                                                                                                                                               |
|------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Default Server Address | Enter the IP address of the default server which receives packets from ports that are not specified in the <b>Port Forwarding</b> screen.<br><br>Note: If you do not assign a default server, the Zyxel Device discards all packets received for ports not specified in the virtual server configuration. |
| Apply                  | Click this to save your changes back to the Zyxel Device.                                                                                                                                                                                                                                                 |
| Cancel                 | Click <b>Cancel</b> to restore your previously saved settings.                                                                                                                                                                                                                                            |

## 12.5 ALG

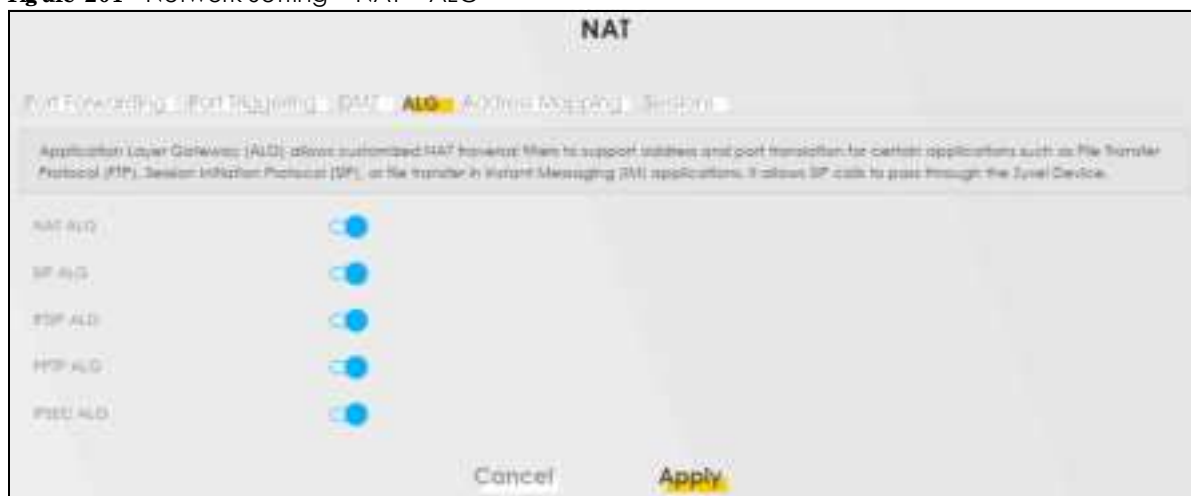
Application Layer Gateway (ALG) allows customized NAT traversal filters to support address and port translation for certain applications such as Session Initiation Protocol (SIP) or file transfer in Instant Messaging (IM) applications. It allows SIP calls to pass through the Zyxel Device. When the Zyxel Device

registers with the SIP register server, the SIP ALG translates the Zyxel Device's private IP address inside the SIP data stream to a public IP address. You do not need to use STUN or an outbound proxy if your Zyxel Device is behind a SIP ALG.

Click **Network Setting > NAT > ALG** to open the **ALG** screen. Use this screen to enable and disable the NAT Application Layer Gateway (ALG) in the Zyxel Device.

Application Layer Gateway (ALG) allows certain applications such as Session Initiation Protocol (SIP) or file transfer in Instant Messaging (IM) applications to pass through the Zyxel Device.

**Figure 201** Network Setting > NAT > ALG



The following table describes the fields in this screen.

Table 116 Network Setting > NAT > ALG

| LABEL     | DESCRIPTION                                                                                                                                                                                                                                 |
|-----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| NAT ALG   | Enable this to make sure applications such as file transfer in IM applications work correctly with port-forwarding and address-mapping rules.                                                                                               |
| SIP ALG   | Click this switch to enable SIP ALG to make sure SIP (VoIP) works correctly with port-forwarding and address-mapping rules.                                                                                                                 |
| RTSP ALG  | Click this switch to enable RTSP ALG to have the Zyxel Device detect RTSP traffic and help build RTSP sessions through its NAT. The Real Time Streaming (media control) Protocol (RTSP) is a remote control for multimedia on the Internet. |
| PPTP ALG  | Click this switch to enable the PPTP ALG on the Zyxel Device to detect PPTP traffic and help build PPTP sessions through the Zyxel Device's NAT.                                                                                            |
| IPSEC ALG | Click this switch to enable IPsec ALG on the Zyxel Device to detect IPsec traffic and help build IPsec sessions through the Zyxel Device's NAT.                                                                                             |
| Apply     | Click <b>Apply</b> to save your changes back to the Zyxel Device.                                                                                                                                                                           |
| Cancel    | Click <b>Cancel</b> to restore your previously saved settings.                                                                                                                                                                              |

## 12.6 Address Mapping

Address mapping can map local IP Addresses to global IP addresses. Ordering your rules is important because the Zyxel Device applies the rules in the order that you specify. When a rule matches the current packet, the Zyxel Device takes the corresponding action and the remaining rules are ignored.

Use this screen to enable or disable the NAT Address Mapping in the Zyxel Device.

### 12.6.1 Address Mapping Screen

Click **Network Setting > NAT > Address Mapping** to open the **Address Mapping** screen.

**Figure 202** Network Setting > NAT > Address Mapping

| Rule Name | Local Start IP | Local End IP | Global Start IP | Global End IP | Type | WAN Interface | Modify |
|-----------|----------------|--------------|-----------------|---------------|------|---------------|--------|
|           |                |              |                 |               |      |               |        |

The following table describes the fields in this screen.

Table 117 Network Setting > NAT > Address Mapping

| Label           | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Add New Rule    | Click this to create a new rule.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Rule Name       | This is the name of the rule.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Local Start IP  | This is the starting Inside Local IP Address (ILA).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Local End IP    | This is the ending Inside Local IP Address (ILA). If the rule is for all local IP addresses, then this field displays 0.0.0.0 as the Local Start IP address and 255.255.255.255 as the Local End IP address. This field is blank for <b>One-to-One</b> mapping types.                                                                                                                                                                                                                                                                                            |
| Global Start IP | This is the starting Inside Global IP Address (IGA). Enter 0.0.0.0 here if you have a dynamic IP address from your ISP. You can only do this for the <b>Many-to-One</b> mapping type.                                                                                                                                                                                                                                                                                                                                                                            |
| Global End IP   | This is the ending Inside Global IP Address (IGA). This field is blank for <b>One-to-One</b> and <b>Many-to-One</b> mapping types.                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Type            | <p>This is the address mapping type.</p> <p><b>One-to-One</b>: This mode maps one local IP address to one global IP address. Note that port numbers do not change for the One-to-One NAT mapping type.</p> <p><b>Many-to-One</b>: This mode maps multiple local IP addresses to one global IP address. This is equivalent to SUA (i.e., PAT, port address translation), the Device's Single User Account feature that previous routers supported only.</p> <p><b>Many-to-Many</b>: This mode maps multiple local IP addresses to shared global IP addresses.</p> |
| WAN Interface   | This is the WAN interface to which the address mapping rule applies.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Modify          | <p>Click the <b>Edit</b> icon to go to the screen where you can edit the address mapping rule.</p> <p>Click the <b>Delete</b> icon to delete an existing address mapping rule. Note that subsequent address mapping rules move up by one when you take this action.</p>                                                                                                                                                                                                                                                                                          |

### 12.6.2 Add New Rule Screen

To add or edit an address mapping rule, click **Add New Rule** or the **Modify** icon in the **Address Mapping** screen to display the screen shown next.

**Figure 203** Network Setting > NAT > Address Mapping > Add New Rule

The following table describes the fields in this screen.

Table 118 Network Setting &gt; NAT &gt; Address Mapping &gt; Add New Rule

| Label           | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Rule Name       | Enter a descriptive name for this rule. You can use up to 20 printable characters except [ " ], [ ` ], [ ' ], [ < ], [ > ], [ ^ ], [ \$ ], [   ], [ & ], or [ ; ]. Spaces are allowed.                                                                                                                                                                                                                                                                                                                                                                                                          |
| Type            | Choose the IP or port mapping type from one of the following.<br><br><b>One-to-One</b> : This mode maps one local IP address to one global IP address. Note that port numbers do not change for the One-to-One NAT mapping type.<br><br><b>Many-to-One</b> : This mode maps multiple local IP addresses to one global IP address. This is equivalent to SUA (for example, PAT, port address translation), the device's Single User Account feature that previous routers supported only.<br><br><b>Many-to-Many</b> : This mode maps multiple local IP addresses to shared global IP addresses. |
| Local Start IP  | Enter the starting Inside Local IP Address (ILA).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Local End IP    | Enter the ending Inside Local IP Address (ILA). If the rule is for all local IP addresses, then this field displays 0.0.0.0 as the Local Start IP address and 255.255.255.255 as the Local End IP address. This field is blank for <b>One-to-One</b> mapping types.                                                                                                                                                                                                                                                                                                                             |
| Global Start IP | Enter the starting Inside Global IP Address (IGA). Enter 0.0.0.0 here if you have a dynamic IP address from your ISP. You can only do this for the Many-to-One mapping type.                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Global End IP   | Enter the ending Inside Global IP Address (IGA). This field is blank for <b>One-to-One</b> and <b>Many-to-One</b> mapping types.                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| WAN Interface   | Select a WAN interface to which the address mapping rule applies.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Cancel          | Click <b>Cancel</b> to exit this screen without saving.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| OK              | Click <b>OK</b> to save your changes.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |

## 12.7 Sessions

Use this screen to limit the number of concurrent NAT sessions a client can use, to ensure that no single client uses up too many available NAT sessions. Some applications, such as P2P file sharing, demand a greater number of NAT sessions in order to get a better uploading and downloading rate. Click **Network Setting > NAT > Sessions** to display the following screen.

Use the **Sessions** screen to limit the number of concurrent NAT sessions each client can use. Click **Network Setting > NAT > Sessions** to open the **Sessions** screen.

Note: Enter a number of concurrent NAT sessions in the **MAX NAT Session Per Host** field, and click **Apply** to limit the number of concurrent NAT sessions a client can use. Otherwise, clear the number in the **MAX NAT Session Per Host** field. Click **Apply** and there is no limit for concurrent NAT sessions a client can use.

**Figure 204** Network Setting > NAT > Sessions

Use this screen to limit the number of concurrent NAT sessions a client can use, to ensure that no single client uses up too many available NAT sessions. Some applications, such as P2P file sharing, demand a greater number of NAT sessions in order to get a better uploading and downloading rate.

MAX NAT Session Per Host (0 - 255)

Note:  
Enter a number of concurrent NAT sessions in the **MAX NAT Session Per Host** field, and click **Apply** to limit the number of concurrent NAT sessions a client can use. Otherwise, clear the number in the **MAX NAT Session Per Host** field. Click **Apply** and there is no limit for concurrent NAT sessions a client can use.

Cancel Apply

The following table describes the fields in this screen.

Table 119 Network Setting > NAT > Sessions

| LABEL                    | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                         |
|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| MAX NAT Session Per Host | Use this field to set a common limit to the number of concurrent NAT sessions each client computer can have.<br><br>If only a few clients use peer to peer applications, you can raise this number to improve their performance. With heavy peer to peer application use, lower this number to ensure no single client uses too many of the available NAT sessions. |
| Cancel                   | Click <b>Cancel</b> to restore your previously saved settings.                                                                                                                                                                                                                                                                                                      |
| Apply                    | Click <b>Apply</b> to save your changes.                                                                                                                                                                                                                                                                                                                            |

## 12.8 Port Control Protocol (PCP)

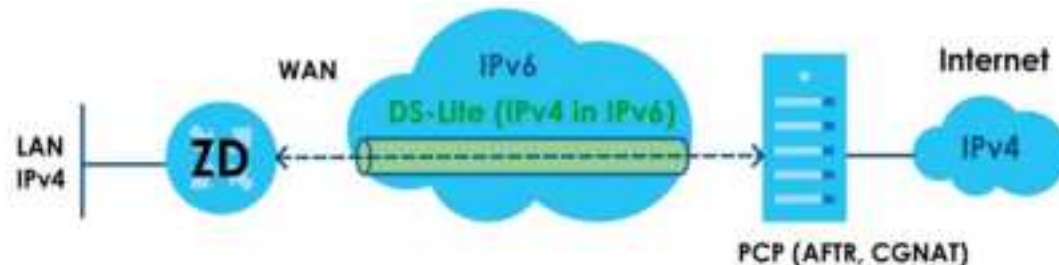
Use this screen to view, add, or delete PCP rules. Port Control Protocol (PCP) allows devices such as web or file sharing servers behind the Zyxel Device to receive incoming traffic.

### Example Applications

- Some remote access applications, such as remote desktop or SSH, require incoming traffic to be routed to the user's device in order to establish a remote connection. Use PCP to dynamically map incoming traffic to the user's device, allowing them to establish remote connections.

The PCP server allows dynamic mapping of external ports to internal IP addresses and ports. PCP allows devices to request and release mappings for specific ports, and to specify the lifetime of those mappings. This allows devices to dynamically open and close ports just as needed, and does not need keepalive packets that can drain battery life of home devices such as smartphones.

In the following figure, the Zyxel Device is the PCP client. DS-Lite tunnels IPv4 packets over an IPv6 network to an AFTR (Address Family Transition Router) and Carrier-Grade NAT (CGNAT) which includes the PCP server, then sends traffic to its external IPv4 network. The Port Control Protocol with DS Lite allows you to create PCP mapping rules with the PCP server.



## Requirement

You must enable DS Lite (Dual-Stack Lite) in **Network Setting > Broadband > Edit WAN Interface** to use PCP.

- If you select **Automatically configured by DHCP**, then the IP address of the PCP server is assigned to the Zyxel Device using DHCP Option 64.

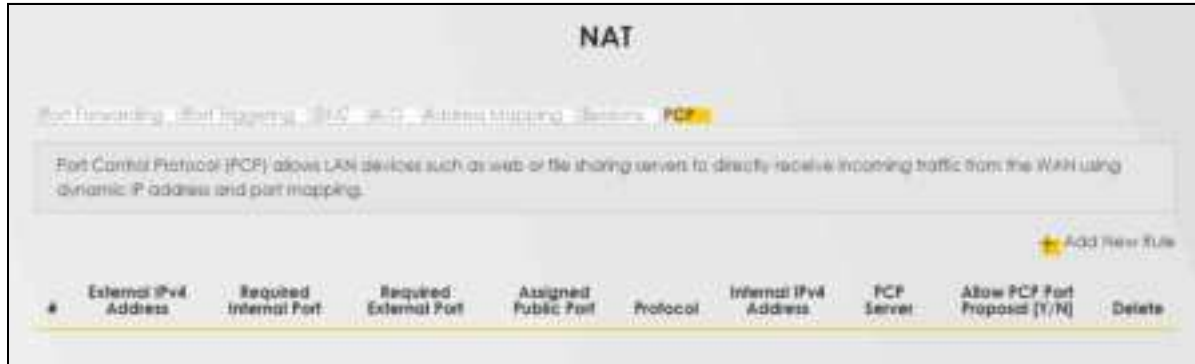


- If you select **Manually Configured**, then you must enter the IPv6 address of the PCP server in the **DS-Lite Relay server IP** field.



## Configuring PCP

Click **Network Setting > NAT > PCP** to display the following screen.

**Figure 205** Network Setting > NAT > PCP

The following table describes the fields in this screen.

**Table 120** Network Setting > NAT > PCP

| Label                         | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|-------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Add New Rule                  | Click this to add a new PCP rule.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| #                             | This is the index number of the rule.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| External IPv4 Address         | This displays the external IP address assigned by the PCP server. PCP maps from this IP address to the LAN device IP address.                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Required Internal Port        | This displays the internal port number that the PCP server maps to, from the external port.                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Required External Port        | This displays the proposed external port number that the PCP server maps from, to the internal port.                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Assigned Public Port          | This displays the allocated external port number assigned by the PCP server for the service on the WAN if Allow PCP Port Proposal is enabled. PCP maps from this port number to the internal port number.                                                                                                                                                                                                                                                                                                                                      |
| Protocol                      | This is the protocol ( <b>TCP</b> or <b>UDP</b> ) for port number that identifies a service.                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Internal IPv4 Address         | This is the LAN device IP address. PCP maps the external IP address to this IP address.                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| PCP Server                    | This field displays the status of the PCP mapping request to the PCP server. <ul style="list-style-type: none"> <li><b>Succeeded</b> - The PCP server successfully mapped the external IP address and port to the internal IP address and port.</li> <li><b>Failed</b> - The PCP server failed to map the external IP address and port to the internal IP address and port. Make sure to select Allow PCP Port Proposal to allow the PCP server to assign an external IP address and port if the configured ones are not available.</li> </ul> |
| Allow PCP Port Proposal (Y/N) | This displays <b>Y</b> if the PCP server can assign a different external IP address and port to the required ones you configured.                                                                                                                                                                                                                                                                                                                                                                                                              |
| Delete                        | Select a rule, then click this icon to remove the rule from the Zyxel Device.                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |

### 12.8.1 Add New Rule Screen

To add a new PCP rule, click **Add New Rule**. To edit an existing rule, select the rule, then click the **Modify** icon. The following screen displays.

**Note:** Be careful not to configure conflicting mapping between PCP and NAT port forwarding for incoming traffic.

**Figure 206** Network Setting > NAT > PCP > Add New Rule

The following table describes the fields in this screen.

Table 121 Network Setting &gt; NAT &gt; PCP &gt; Add New Rule

| <b>LABEL</b>            | <b>DESCRIPTION</b>                                                                                                                                                                           |
|-------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Required Internal Port  | Enter an internal port number that the PCP server maps to, from the external port.                                                                                                           |
| Required External Port  | Enter a proposed external port number that the PCP server maps from, to the internal port.                                                                                                   |
| Protocol                | Select the transport layer protocol. Choices are <b>TCP</b> and <b>UDP</b> . See the Service Appendix to see what services require what protocol and port number.                            |
| Internal IPv4 Address   | Enter the IP address of the LAN device. PCP maps the external IP address to this IP address.                                                                                                 |
| Allow PCP Port Proposal | Select this to allow the PCP server to assign an external IP address and port. If you clear this, PCP mapping will fail if the required ones configured are not available on the PCP server. |
| Cancel                  | Click <b>Cancel</b> to exit this screen without saving.                                                                                                                                      |
| OK                      | Click <b>OK</b> to save your changes.                                                                                                                                                        |

## 12.9 Technical Reference

This part contains more information regarding NAT.

### 12.9.1 NAT Definitions

Inside or outside denotes where a host is located relative to the Zyxel Device, for example, the computers of your subscribers are the inside hosts, while the web servers on the Internet are the outside hosts.

Global or local denotes the IP address of a host in a packet as the packet traverses a router, for example, the local address refers to the IP address of a host when the packet is in the local network,



while the global address refers to the IP address of the host when the same packet is traveling in the WAN side.

Note that inside or outside refers to the location of a host, while global/local refers to the IP address of a host used in a packet. Thus, an inside local address (ILA) is the IP address of an inside host in a packet when the packet is still in the local network, while an inside global address (IGA) is the IP address of the same inside host when the packet is on the WAN side. The following table summarizes this information.

Table 122 NAT Definitions

| ITEM    | DESCRIPTION                                                                                 |
|---------|---------------------------------------------------------------------------------------------|
| Inside  | This refers to the host on the LAN.                                                         |
| Outside | This refers to the host on the WAN.                                                         |
| Local   | This refers to the packet address (source or destination) as the packet travels on the LAN. |
| Global  | This refers to the packet address (source or destination) as the packet travels on the WAN. |

NAT never changes the IP address (either local or global) of an outside host.

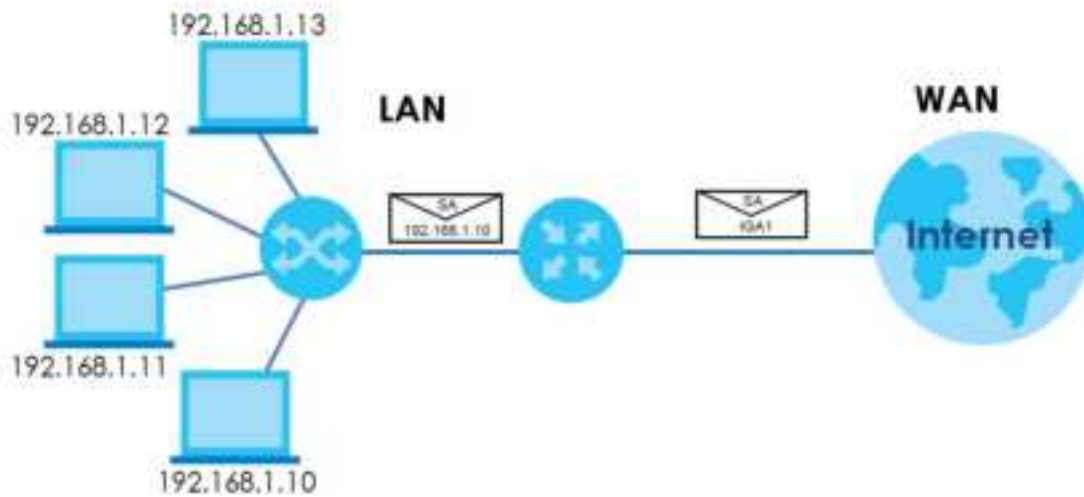
### 12.9.2 What NAT Does

In the simplest form, NAT changes the source IP address in a packet received from a subscriber (the inside local address) to another (the inside global address) before forwarding the packet to the WAN side. When the response comes back, NAT translates the destination address (the inside global address) back to the inside local address before forwarding it to the original inside host. Note that the IP address (either local or global) of an outside host is never changed.

The global IP addresses for the inside hosts can be either static or dynamically assigned by the ISP. In addition, you can designate servers, for example, a web server and a telnet server, on your local network and make them accessible to the outside world. If you do not define any servers (for Many-to-One and Many-to-Many Overload mapping), NAT offers the additional benefit of firewall protection. With no servers defined, your Zyxel Device filters out all incoming inquiries, thus preventing intruders from probing your network. For more information on IP address translation, refer to *RFC 1631, The IP Network Address Translator (NAT)*.

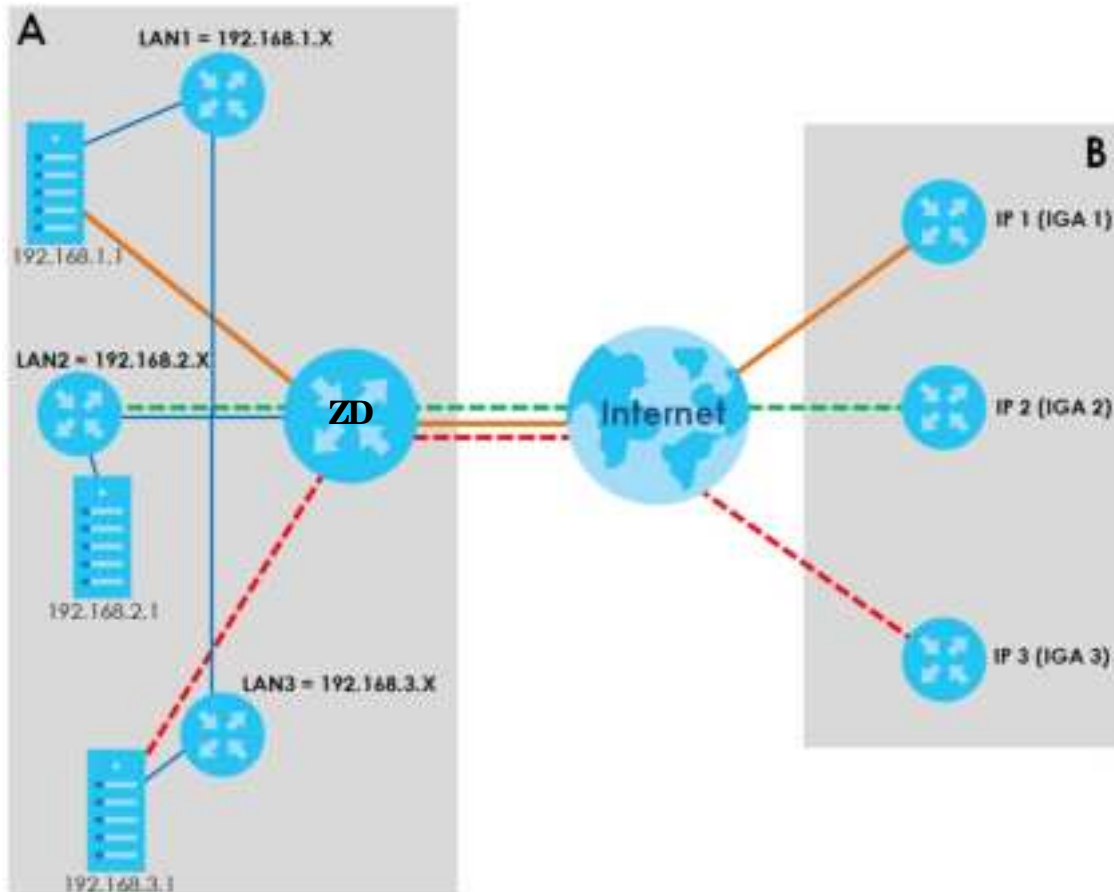
### 12.9.3 How NAT Works

Each packet has two addresses – a source address and a destination address. For outgoing packets, the ILA (Inside Local Address) is the source address on the LAN, and the IGA (Inside Global Address) is the source address on the WAN. For incoming packets, the ILA is the destination address on the LAN, and the IGA is the destination address on the WAN. NAT maps private (local) IP addresses to globally unique ones required for communication with hosts on other networks. It replaces the original IP source address (and TCP or UDP source port numbers for Many-to-One and Many-to-Many Overload NAT mapping) in each packet and then forwards it to the Internet. The Zyxel Device keeps track of the original addresses and port numbers so incoming reply packets can have their original values restored. The following figure illustrates this.

**Figure 207** How NAT Works

### 12.9.4 NAT Application

The following figure illustrates a possible NAT application, where three inside LANs (logical LANs using IP alias) behind the Zyxel Device can communicate with three distinct WAN networks.

**Figure 208** NAT Application With IP Alias

## Port Forwarding: Services and Port Numbers

The most often used port numbers are shown in the following table. Please refer to RFC 1700 for further information about port numbers. Please also refer to the Supporting CD for more examples and details on port forwarding and NAT.

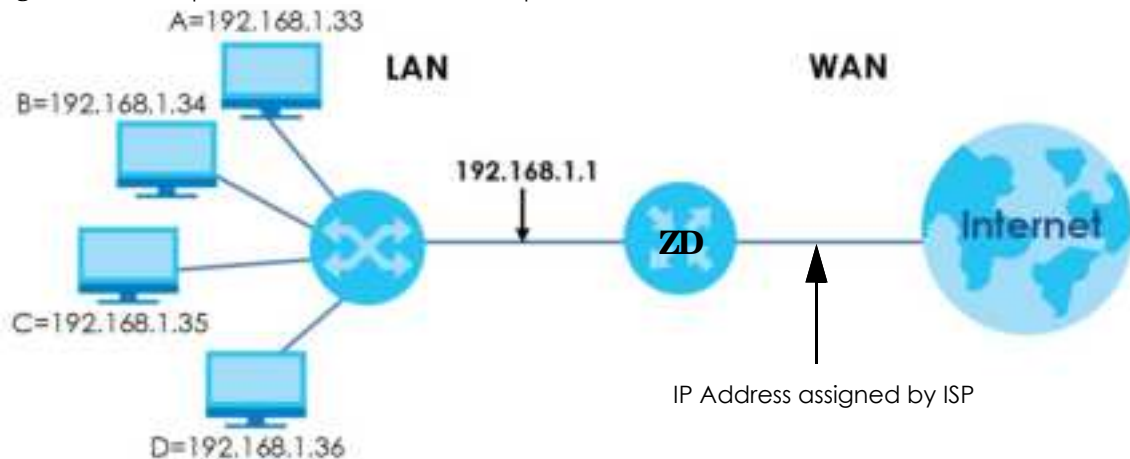
Table 123 Services and Port Numbers

| SERVICES                                        | PORTNUMBER |
|-------------------------------------------------|------------|
| ECHO                                            | 7          |
| SMTP (Simple Mail Transfer Protocol)            | 25         |
| DNS (Domain Name System)                        | 53         |
| Finger                                          | 79         |
| HTTP (Hyper Text Transfer protocol or WWW, Web) | 80         |
| POP3 (Post Office Protocol)                     | 110        |
| NNTP (Network News Transport Protocol)          | 119        |
| SNMP (Simple Network Management Protocol)       | 161        |
| SNMP trap                                       | 162        |
| PPTP (Point-to-Point Tunneling Protocol)        | 1723       |

## Port Forwarding Example

Let's say you want to assign ports 21 – 25 to one Telnet and SMTP server (**A** in the example), port 80 to another (**B** in the example) and assign a default server IP address of 192.168.1.35 to a third (**C** in the example). You assign the LAN IP addresses and the ISP assigns the WAN IP address. The NAT network appears as a single host on the Internet.

**Figure 209** Multiple Servers Behind NAT Example



# CHAPTER 13

## DNS

### 13.1 DNS Overview

#### DNS

DNS (Domain Name System) is for mapping a domain name to its corresponding IP address and vice versa. The DNS server is extremely important because without it, you must know the IP address of a machine before you can access it.

In addition to the system DNS servers, each WAN interface (service) is set to have its own static or dynamic DNS server list. You can configure a DNS static route to forward DNS queries for certain domain names through a specific WAN interface to its DNS servers. The Zyxel Device uses a system DNS server (in the order you specify in the **Broadband** screen) to resolve domain names that do not match any DNS routing entry. After the Zyxel Device receives a DNS reply from a DNS server, it creates a new entry for the resolved IP address in the routing table.

#### Dynamic DNS

Dynamic DNS allows you to use a dynamic IP address with one or many dynamic DNS services so that anyone can contact you (in NetMeeting, CU-SeeMe, and so on). You can also access your Web site on your own computer using a domain name (for instance myhost.dhs.org, where myhost is a name of your choice) that will never change instead of using an IP address that changes each time you reconnect. Your friends or relatives will always be able to call you even if they do not know your IP address.

You first need to have registered a dynamic DNS account with [www.dyndns.org](http://www.dyndns.org). This is for people with a dynamic IP from their ISP or DHCP server that would still like to have a domain name. The Dynamic DNS service provider will give you a password or key.

#### 13.1.1 What You Can Do in this Chapter

- Use the **DNS Entry** screen to view, configure, or remove DNS routes ([Section 13.2 on page 349](#)).
- Use the **Dynamic DNS** screen to enable DDNS and configure the DDNS settings on the Zyxel Device ([Section 13.3 on page 350](#)).

#### 13.1.2 What You Need To Know

##### DYNDNS Wildcard

Enabling the wildcard feature for your host causes \*.yourhost.dyndns.org to be aliased to the same IP address as yourhost.dyndns.org. This feature is useful if you want to be able to use, for example, [www.yourhost.dyndns.org](http://www.yourhost.dyndns.org) and still reach your hostname.

If you have a private WAN IP address, then you cannot use Dynamic DNS.

## 13.2 DNS Entry (DNS)

DNS (Domain Name System) is used for mapping a domain name to its corresponding IP address and vice versa. Use this screen to view and configure manual DNS entries on the Zyxel Device. Click **Network Setting** > **DNS** to open the **DNS Entry** screen.

Note: The host name should consist of the host's local name and the domain name. For example, Mycomputer.home is a host name where Mycomputer is the host's local name, and .home is the domain name.

**Figure 210** Network Setting > DNS > DNS Entry



The following table describes the fields in this screen.

Table 124 Network Setting > DNS > DNS Entry

| LABEL             | DESCRIPTION                                                                                              |
|-------------------|----------------------------------------------------------------------------------------------------------|
| Add New DNS Entry | Click this to create a new DNS entry.                                                                    |
| #                 | This is the index number of the entry.                                                                   |
| HostName          | This indicates the host name or domain name.                                                             |
| IP Address        | This indicates the IP address assigned to this computer.                                                 |
| Modify            | Click the <b>Edit</b> icon to edit the rule.<br>Click the <b>Delete</b> icon to delete an existing rule. |

### 13.2.1 Add or Edit DNS Entry

You can manually add or edit the Zyxel Device's DNS name and IP address entry. Click **Add New DNS Entry** in the **DNS Entry** screen or the **Edit** icon next to the entry you want to edit. The screen shown next appears.

**Figure 211** Network Setting > DNS > DNS Entry: Add

The following table describes the labels in this screen.

Table 125 Network Setting &gt; DNS &gt; DNS Entry: Add or Edit

| LABEL        | DESCRIPTION                                                                                                                                                                                                                                                           |
|--------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Host Name    | Enter the host name of the DNS entry. You can use up to 256 alphanumeric (0-9, a-z, A-Z) characters with hyphens [ - ] and periods [ . ].<br><br>You can use the wildcard character, an "*" (asterisk) as the left most part of a domain name, such as *.example.com. |
| IPv4 Address | Enter the IPv4 address of the DNS entry.                                                                                                                                                                                                                              |
| Cancel       | Click <b>Cancel</b> to exit this screen without saving.                                                                                                                                                                                                               |
| OK           | Click <b>OK</b> to save your changes.                                                                                                                                                                                                                                 |

### 13.3 Dynamic DNS

Dynamic DNS can update your current dynamic IP address mapping to a hostname. Configure a DDNS service provider on your Zyxel Device. Click **Network Setting > DNS > Dynamic DNS**. The screen appears as shown.

**Figure 212** Network Setting > DNS > Dynamic DNS

Dynamic DNS can update your current dynamic IP address mapping to a hostname. Configure a DNS service provider on your Zyxel Device.

### Dynamic DNS Setup

Dynamic DNS: ☒ Enable ☐ Disable (Settings are invalid when disable)

Service Provider:

Host Name:

Username:

Password:

☒ Enable Wildcard Option

☒ Enable Off Line Option (Only applies to custom DNS)

### Dynamic DNS Status

User Authentication Result:

Last Updated Time:

Current Dynamic IP:

The following table describes the fields in this screen.

Table 126 Network Setting &gt; DNS &gt; Dynamic DNS

| LABEL                                               | DESCRIPTION                                                                                                                                                                                                                                                                |
|-----------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Dynamic DNS Setup                                   |                                                                                                                                                                                                                                                                            |
| Dynamic DNS                                         | Select <b>Enable</b> to use dynamic DNS.                                                                                                                                                                                                                                   |
| Service Provider                                    | Select your Dynamic DNS service provider from the drop-down list box.                                                                                                                                                                                                      |
| Host Name                                           | Enter the domain name assigned to your Zyxel Device by your Dynamic DNS provider. You can use up to 256 alphanumeric (0-9, a-z, A-Z) characters with hyphens [ - ] and periods [ . ].<br><br>You can specify up to two host names in the field separated by a comma (","). |
| Username                                            | Enter your user name.                                                                                                                                                                                                                                                      |
| Password                                            | Enter the password assigned to you.                                                                                                                                                                                                                                        |
| Enable Wildcard Option                              | Select the checkbox to enable DynDNS Wildcard.                                                                                                                                                                                                                             |
| Enable Off Line Option (Only applies to custom DNS) | Check with your Dynamic DNS service provider to have traffic redirected to a URL (that you can specify) while you are off line.                                                                                                                                            |
| Dynamic DNS Status                                  |                                                                                                                                                                                                                                                                            |
| User Authentication Result                          | This shows <b>Success</b> if the account is correctly set up with the Dynamic DNS provider account.                                                                                                                                                                        |
| Last Updated Time                                   | This shows the last time the IP address the Dynamic DNS provider has associated with the hostname was updated.                                                                                                                                                             |
| Current Dynamic IP                                  | This shows the IP address your Dynamic DNS provider has currently associated with the hostname.                                                                                                                                                                            |

Table 126 Network Setting &gt; DNS &gt; Dynamic DNS (continued)

| LABEL  | DESCRIPTION                                             |
|--------|---------------------------------------------------------|
| Cancel | Click <b>Cancel</b> to exit this screen without saving. |
| Apply  | Click <b>Apply</b> to save your changes.                |



# CHAPTER 14

## IGMP/MLD

### 14.1 IGMP/MLD Overview

Multicast delivers IP packets to a group of hosts on the network defined by multicast groups. Membership to these multicast groups are established using IGMP/MLD.

Use the **IGMP/MLD** screen to configure IGMP/MLD group settings.

#### 14.1.1 What You Need To Know

##### **Multicast and IGMP**

See [Multicast on page 234](#) for more information.

##### **Multicast Listener Discovery (MLD)**

The Multicast Listener Discovery (MLD) protocol (defined in RFC 2710) is derived from IPv4's Internet Group Management Protocol version 2 (IGMPv2). MLD uses ICMPv6 message types, rather than IGMP message types. MLDv1 is equivalent to IGMPv2 and MLDv2 is equivalent to IGMPv3.

- MLD allows an IPv6 switch or router to discover the presence of MLD hosts who wish to receive multicast packets and the IP addresses of multicast groups the hosts want to join on its network.
- MLD snooping and MLD proxy are analogous to IGMP snooping and IGMP proxy in IPv4.
- MLD filtering controls which multicast groups a port can join.
- An MLD Report message is equivalent to an IGMP Report message, and an MLD Done message is equivalent to an IGMP Leave message.

##### **IGMP Fast Leave**

When a host leaves a multicast group (224.1.1.1), it sends an IGMP leave message to inform all routers (224.0.0.2) in the multicast group. When a router receives the leave message, it sends a specific query message to all multicast group (224.1.1.1) members to check if any other hosts are still in the group. Then the router deletes the host's information.

With the IGMP fast leave feature enabled, the router removes the host's information from the group member list once it receives a leave message from a host and the fast leave timer expires.

## 14.2 The IGMP/MLD Screen

Use this screen to configure multicast groups that the Zyxel Device manages through IGMP/MLD settings. To open this screen, click **Network Setting > IGMP/MLD**.

Note: Some models only support IGMP/MLD **Default Version** configuration.

Note: For DX3300/3301-T0, IGMP/MLD are enabled by default and are not configurable. The default IGMP version is 3. The default MLD version is 2.

**Figure 213** Network Setting > IGMP/MLD

**IGMP/MLD**

Enable IGMP/MLD and select configuration. Note: If you want modify, select model should select. Please note that if you modify, select query interval, and query response interval will not be changed, and not select.

**IGMP Configuration**

|                                             |                                     |
|---------------------------------------------|-------------------------------------|
| Default Version                             | 3                                   |
| Query Interval                              | 125                                 |
| Query Response Interval                     | 10                                  |
| Last Member Query Interval                  | 10                                  |
| Robustness Value                            | 2                                   |
| Maximum Multicast Groups                    | 25                                  |
| Maximum Multicast Data Sources (for IGMPv3) | 10                                  |
| Maximum Multicast Groups Members            | 25                                  |
| Fast Leave Enable                           | <input checked="" type="checkbox"/> |
| LAN to LAN (aka LAN) Multicast Enable       | <input checked="" type="checkbox"/> |
| Membership LAN Forwardable (PTV)            | <input checked="" type="checkbox"/> |

**MLD Configuration**

|                                             |                                     |
|---------------------------------------------|-------------------------------------|
| Default Version                             | 2                                   |
| Query Interval                              | 125                                 |
| Query Response Interval                     | 10                                  |
| Last Member Query Interval                  | 10                                  |
| Robustness Value                            | 2                                   |
| Maximum Multicast Groups                    | 10                                  |
| Maximum Multicast Data Sources (for IGMPv3) | 10                                  |
| Maximum Multicast Groups Members            | 10                                  |
| Fast Leave Enable                           | <input checked="" type="checkbox"/> |
| LAN to LAN (aka LAN) Multicast Enable       | <input checked="" type="checkbox"/> |

Cancel Apply

The following table describes the labels in this screen.

Table 127 Network Setting > IGMP/MLD

| <b>LABEL</b>                               | <b>DESCRIPTION</b>                                                                                                                                                                                                                                                                                                                 |
|--------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| IGMP/MLD Configuration                     |                                                                                                                                                                                                                                                                                                                                    |
| Default Version                            | Enter the version of IGMP (1~3) and MLD (1~2) that you want the Zyxel Device to use on the WAN.                                                                                                                                                                                                                                    |
| Query Interval                             | Enter the number of seconds the Zyxel Device sends a query message to hosts to get the group membership information.                                                                                                                                                                                                               |
| Query Response Interval                    | Enter the maximum number of seconds the Zyxel Device can wait for receiving a General Query message. Multicast routers use general queries to learn which multicast groups have members.                                                                                                                                           |
| Last Member Query Interval                 | Enter the maximum number of seconds the Zyxel Device can wait for receiving a response to a Group-Specific Query message. Multicast routers use group-specific queries to learn whether any member remains in a specific multicast group.                                                                                          |
| Robustness Value                           | Enter the number of times (1~7) the Zyxel Device can resend a packet if packet loss occurs due to network congestion.                                                                                                                                                                                                              |
| Maximum Multicast Groups                   | Enter a number to limit the number of multicast groups an interface on the Zyxel Device is allowed to join. Once a multicast member is registered in the specified number of multicast groups, any new IGMP or MLD join report frames are dropped by the interface.                                                                |
| Maximum Multicast Data Sources(for IGMPv3) | Enter a number to limit the number of multicast data sources (1-24) a multicast group is allowed to have.<br><br>Note: The setting only works for IGMPv3 and MLDv2.                                                                                                                                                                |
| Maximum Multicast Group Members            | Enter a number to limit the number of multicast members a multicast group can have.                                                                                                                                                                                                                                                |
| Fast Leave Enable                          | Select this option to set the Zyxel Device to remove a port from the multicast tree immediately (without sending an IGMP or MLD membership query message) once it receives an IGMP or MLD leave message. This is helpful if a user wants to quickly change a TV channel (multicast group change) especially for IPTV applications. |
| LAN to LAN (Intra LAN) Multicast Enable    | Select this to enable LAN to LAN IGMP snooping capability.                                                                                                                                                                                                                                                                         |
| Membership Join Immediate (IPTV)           | Select this to have the Zyxel Device add a host to a multicast group immediately once the Zyxel Device receives an IGMP or MLD join message.                                                                                                                                                                                       |
| Cancel                                     | Click <b>Cancel</b> to exit this screen without saving.                                                                                                                                                                                                                                                                            |
| Apply                                      | Click <b>Apply</b> to save your changes back to the Zyxel Device.                                                                                                                                                                                                                                                                  |

# CHAPTER 15

## VLAN Group

### 15.1 VLAN Group Overview

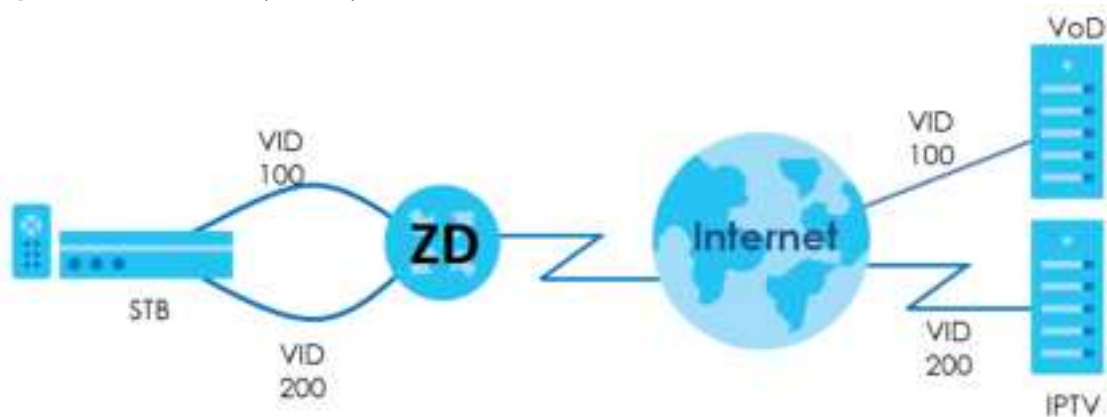
A VLAN (Virtual Local Area Network) allows a physical network to be partitioned into multiple logical networks. Devices on a logical network belong to one group. A device can belong to more than one group. With VLAN, a device cannot directly talk to or hear from devices that are not in the same groups; the traffic must first go through a router.

Ports in the same VLAN group share the same frame broadcast domain thus increase network performance through reduced broadcast traffic. Shared resources such as a server can be used by all ports in the same VLAN as the server. Ports can belong to other VLAN groups too. VLAN groups can be modified at any time by adding, moving or changing ports without any re-cabling.

A tagged VLAN uses an explicit tag (VLAN ID) in the MAC header to identify the VLAN membership of a frame across bridges. The VLAN ID associates a frame with a specific VLAN and provides the information that switches the need to process the frame across the network.

In the following example, VLAN IDs (VIDs) 100 and 200 are added to identify Video-on-Demand and IPTV traffic respectively coming from the VoD and IPTV multicast servers. The Zyxel Device can also tag outgoing requests to the servers with these VLAN IDs.

**Figure 214** VLAN Group Example



#### 15.1.1 What You Can Do in this Chapter

Use these screens to manage VLAN groups on the Zyxel Device.

## 15.2 VLAN Group Settings

This screen shows the VLAN groups created on the Zyxel Device. Click **Network Setting > VLAN Group** to open the following screen.

**Figure 215** Network Setting > VLAN Group



The following table describes the fields in this screen.

Table 128 Network Setting > VLAN Group

| LABEL              | DESCRIPTION                                                                                                                   |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------|
| Add New VLAN Group | Click this button to create a new VLAN group.                                                                                 |
| #                  | This is the index number of the VLAN group.                                                                                   |
| Group Name         | This shows the descriptive name of the VLAN group.                                                                            |
| VLAN ID            | This shows the unique ID number that identifies the VLAN group.                                                               |
| Interface          | This shows the LAN ports included in the VLAN group and if traffic leaving the port will be tagged with the VLAN ID.          |
| Modify             | Click the <b>Edit</b> icon to change an existing VLAN group setting or click the <b>Delete</b> icon to remove the VLAN group. |

### 15.2.1 Add or Edit a VLAN Group

Click the **Add New VLAN Group** button in the **VLAN Group** screen to open the following screen. Use this screen to create a new VLAN group.

**Figure 216** Network Setting > VLAN Group > Add New VLAN Group/Edit

The screenshot shows the 'Add New VLAN Group' configuration screen. It features a title bar with a back arrow and the title 'Add New VLAN Group'. Below the title bar, there are two input fields: 'VLAN Group Name' and 'VLAN ID'. Underneath these fields, there are five rows of configuration options for different interfaces: LAN1, LAN2, LAN3, LAN4, and 10G LAN. Each row contains two checkboxes: 'Include' and 'Tx Tagging'. At the bottom of the screen, there are two buttons: 'Cancel' and 'OK'.

The following table describes the fields in this screen.

Table 129 Network Setting &gt; VLAN Group &gt; Add New VLAN Group/Edit

| LABEL   | DESCRIPTION                                                                                                                                                                                                            |
|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| VLAN ID | Enter a unique ID number, from 1 to 4,094, to identify this VLAN group. Outgoing traffic is tagged with this ID if <b>TX Tagging</b> is selected below.                                                                |
| LAN     | Select <b>Include</b> to add the associated LAN interface to this VLAN group.<br><br>Note: Select <b>TX Tagging</b> to tag outgoing traffic from the associated LAN port with the <b>VLAN ID</b> number entered above. |
| 10G LAN | Select <b>Include</b> to add the associated LAN interface to this VLAN group.<br><br>Note: Select <b>TX Tagging</b> to tag outgoing traffic from the associated LAN port with the <b>VLAN ID</b> number entered above. |

# CHAPTER 16

## Interface Grouping

### 16.1 Interface Grouping Overview

By default, all LAN and WAN interfaces on the Zyxel Device are in the default group. Client devices in the default group can communicate with all devices in the default and other groups. Create interface groups to have the Zyxel Device assign IP addresses in different domains. Each group acts as an independent network on the Zyxel Device. Client devices in the same group can communicate with each other directly. Interfaces that do not belong to any user-defined group belong to the default group.

#### 16.1.1 What You Can Do in this Chapter

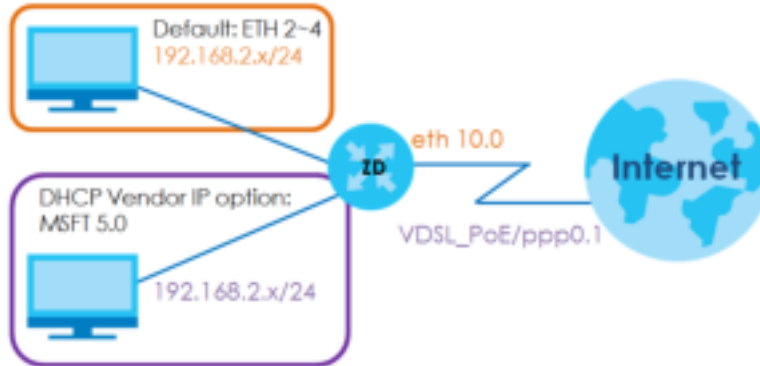
The **Interface Grouping** screen lets you create multiple networks on the Zyxel Device ([Section 16.2 on page 359](#)).

### 16.2 Interface Grouping

You can manually add a LAN interface to a new group. Alternatively, you can have the Zyxel Device automatically add the incoming traffic and the LAN interface on which traffic is received to an interface group when its DHCP Vendor ID option information matches one listed for the interface group.

Use the **LAN Setup** screen to configure the private IP addresses the DHCP server on the Zyxel Device assigns to the clients in the default and/or user-defined groups. If you set the Zyxel Device to assign IP addresses based on the client's DHCP Vendor ID option information, you must enable DHCP server and configure LAN TCP/IP settings for both the default and user-defined groups. See [Chapter 9 on page 267](#) for more information.

In the following example, the client that sends packets with the DHCP Vendor ID option set to MSFT 5.0 (meaning it is a Windows 2000 DHCP client) is assigned the IP address 192.168.2.2 and uses the WAN VDSL\_PoE/ppp0.1 interface.

**Figure 217** Interface Grouping Application

You can use this screen to create new user-defined interface groups or modify existing ones. Interfaces that do not belong to any user-defined group always belong to the default group.

Click **Network Setting > Interface Grouping** to open the following screen.

**Figure 218** Network Setting > Interface Grouping

| Group Name | WAN Interface | LAN Interface                                                                                                                                                                                                                                       | Criteria | Modify |
|------------|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|--------|
| Default    | Any WAN       | LAN1, LAN2, LAN3, Zyxe<br>L2581(*2.4G), ZyxeL_2<br>581_guest1(*2.4G), Zy<br>xel_2581_guest2(*2.4<br>G), ZyxeL_2581_guest3<br>(*2.4G), ZyxeL_2581(*5<br>G), ZyxeL_2581_guest1<br>(*5G), ZyxeL_2581_gue<br>st2_5G(*5G), ZyxeL_25<br>81_guest3_5G(*5G) |          |        |

The following table describes the fields in this screen.

Table 130 Network Setting &gt; Interface Grouping

| Label                   | Description                                        |
|-------------------------|----------------------------------------------------|
| Add New Interface Group | Click this button to create a new interface group. |
| Group Name              | This shows the descriptive name of the group.      |
| WAN Interface           | This shows the WAN interfaces in the group.        |
| LAN Interfaces          | This shows the LAN interfaces in the group.        |



Table 130 Network Setting &gt; Interface Grouping (continued)

| LABEL    | DESCRIPTION                                                                                                                             |
|----------|-----------------------------------------------------------------------------------------------------------------------------------------|
| Criteria | This shows the filtering criteria for the group.                                                                                        |
| Modify   | Click the <b>Edit</b> icon to modify an existing Interface group setting or click the <b>Delete</b> icon to remove the Interface group. |

### 16.2.1 Interface Group Configuration

Click the **Add New Interface Group** button in the **Interface Grouping** screen to open the following screen. Use this screen to create a new interface group. If you want to automatically add LAN clients to a new group, use filtering criteria.

Note: An interface can belong to only one group at a time.

Note: After configuring a vendor ID, reboot the client device attached to the Zyxel Device to obtain an appropriate IP address.

**Figure 219** Network Setting > Interface Grouping > Add New Interface Group (for DSL routers)

**Add New Interface Group**

Use this screen to create a new interface group. If you want to automatically add LAN clients to a new group, use filtering criteria.

Group Name:

WAN interfaces used in the grouping:

PTM type:

ATM type:

ETH type:

WWAN type:

**# Available LAN interfaces**

- ☐ LAN1
- ☐ LAN2
- ☐ LAN3
- ☐ LAN4
- ☐ Zyxel\_0002(\*2-4G)

**# Selected LAN interfaces**

Automatically Add Clients With the following DHCP Vendor IDs:

| # | Filter Criteria | Wildcard Support | Modify |
|---|-----------------|------------------|--------|
| 1 | Option 53: 53   | Y                |        |

Add

**Note**

- (1) After configuring a vendor ID, reboot the client device attached to the Zyxel Device to obtain an appropriate IP address.
- (2) You can have up to 15 filter criteria.

Cancel

**Figure 220** Network Setting > Interface Grouping > Add New Interface Group (for Ethernet routers)

Use this screen to create a new interface group. If you want to automatically add LAN clients to a new group, use filtering criteria.

Group Name:

WAN interfaces used in the grouping:

ETH type:

WAN type:

**# Available LAN interfaces**

- ☐ LAN1
- ☐ LAN2
- ☐ LAN3
- ☐ LAN4
- ☐ Zyxel\_0000[\*24G]

**# Selected LAN interfaces**

Automatically Add Clients With the following DHCP Vendor IDs:

| # | Filter Criteria | WildCard Support | Modify |
|---|-----------------|------------------|--------|
|   |                 |                  |        |

Note

(1) After configuring a vendor ID, reboot the client device attached to the Zyxel Device to obtain an appropriate IP address.

(2) You can have up to 10 filter criteria.

**Figure 221** Network Setting > Interface Grouping > Add New Interface Group (for AON and PON routers)

The following table describes the fields in this screen.

Table 131 Network Setting &gt; Interface Grouping &gt; Add New Interface Group/Edit

| LABEL                                               | DESCRIPTION                                                                                                                                                                                                                                                                                                                                   |
|-----------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Group Name                                          | Enter a descriptive name for this interface group. You can use up to 32 printable characters except [ " ], [ ` ], [ ' ], [ < ], [ > ], [ ^ ], [ \$ ], [   ], [ & ], or [ ; ]. Spaces are allowed.                                                                                                                                             |
| WAN Interfaces used in the grouping                 | Select the WAN interface this group uses. The group can have up to one PTM interface, up to one ATM interface, up to one ETH interface, and up to one WWAN interface.<br>Select <b>None</b> to not add a WAN interface to this group.                                                                                                         |
| Selected LAN Interfaces<br>Available LAN Interfaces | Select one or more interfaces (Ethernet LAN, wireless LAN) in the <b>Available LAN Interfaces</b> list and use the left arrow to move them to the <b>Selected LAN Interfaces</b> list to add the interfaces to this group.<br>To remove a LAN or wireless LAN interface from the <b>Selected LAN Interfaces</b> , use the right-facing arrow. |

Table 131 Network Setting &gt; Interface Grouping &gt; Add New Interface Group/Edit (continued)

| LABEL                                                        | DESCRIPTION                                                                                                                                                                                         |
|--------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Automatically Add Clients With the following DHCP Vendor IDs | Click <b>Add</b> to identify LAN hosts to add to the interface group by criteria such as the type of the hardware or firmware. See <a href="#">Section 16.2.2 on page 365</a> for more information. |
| #                                                            | This shows the index number of the rule.                                                                                                                                                            |
| Filter Criteria                                              | This shows the filtering criteria. The LAN interface on which the matched traffic is received will belong to this group automatically.                                                              |
| Wildcard Support                                             | This shows if wildcard on DHCP option 60 is enabled.                                                                                                                                                |
| Modify                                                       | Click the <b>Edit</b> icon to change the group setting.<br>Click the <b>Delete</b> icon to delete this group from the Zyxel Device.                                                                 |
| Cancel                                                       | Click <b>Cancel</b> to exit this screen without saving.                                                                                                                                             |
| OK                                                           | Click OK to save your changes.                                                                                                                                                                      |

## 16.2.2 Interface Grouping Criteria

Click the **Add** button in the **Interface Grouping Configuration** screen to open the following screen. Use this screen to automatically add clients to an interface group based on specified criteria. You can choose to define a group based on a MAC address, a vendor ID (DHCP option 60), an Identity Association Identifier (DHCP option 61), vendor specific information (DHCP option 125), or a VLAN group.

**Figure 222** Network Setting > Interface Grouping > Interface Group Configuration: Add

**Add new criteria**

**Criteria**

☐ Source MAC address  
☐ DHCP option 60  
☐ DHCP option 61  
☒ DHCP option 125

Enterprise Number   
 Manufacturer OUI   
 Serial Number   
 Product Class

☐ VLAN Group

Cancel OK

The following table describes the fields in this screen.

Table 132 Network Setting > Interface Grouping > Interface Group Configuration: Add

| <b>LABEL</b>       | <b>DESCRIPTION</b>                                                                                                                                            |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Source MAC Address | Enter the source MAC address of the packet.                                                                                                                   |
| APAS MAC Filter    | Select this option and enter the MAC address of the matched LAN host.                                                                                         |
| DHCP Option 60     | Select this option and enter the Vendor Class Identifier (Option 60) of the matched traffic, such as the type of the hardware or firmware.                    |
| Enable wildcard    | Select this option to be able to use wildcards in the Vendor Class Identifier configured for DHCP option 60.                                                  |
| DHCP Option 61     | Select this and enter the device identity of the matched traffic.                                                                                             |
|                    | Enter the Identity Association Identifier (IAID) of the device, for example, the WAN connection index number.                                                 |
| DHCP Option 125    | Select this and enter vendor specific information of the matched traffic.                                                                                     |
| Enterprise Number  | Enter the vendor's 32-bit enterprise number registered with the IANA (Internet Assigned Numbers Authority).                                                   |
| Manufacturer OUI   | Specify the vendor's OUI (Organization Unique Identifier). It is usually the first 3 bytes of the MAC address.                                                |
| Serial Number      | Enter the serial number of the device.                                                                                                                        |
| Product Class      | Enter the product class of the device.                                                                                                                        |
| VLAN Group         | Select this and the VLAN group of the matched traffic from the drop-down list box. A VLAN group can be configured in <b>Network Setting &gt; VLAN Group</b> . |
| Cancel             | Click <b>Cancel</b> to exit this screen without saving.                                                                                                       |
| OK                 | Click <b>OK</b> to save your changes.                                                                                                                         |

# CHAPTER 17

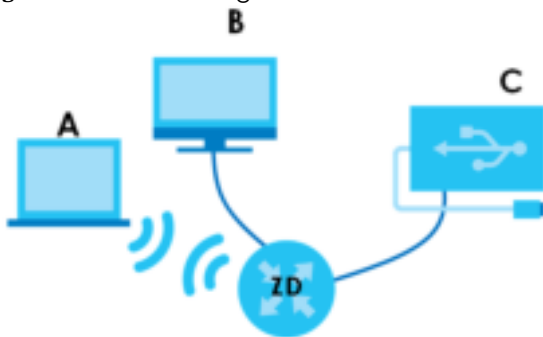
## USB Service

### 17.1 USB Service Overview

You can share files on a USB memory stick or hard drive connected to your Zyxel Device with users on your network.

The following figure is an overview of the Zyxel Device's file server feature. Computers **A** and **B** can access files on a USB device (**C**) which is connected to the Zyxel Device.

**Figure 223** File Sharing Overview



The Zyxel Device will not be able to join a workgroup if your local area network has restrictions set up that do not allow devices to join a workgroup. In this case, contact your network administrator.

#### 17.1.1 What You Can Do in this Chapter

- Use the **File Sharing** screen to enable file-sharing server ([Section 17.2 on page 368](#)).
- Use the **Media Server** screen to enable or disable the sharing of media files ([Section 17.3 on page 372](#)).

#### 17.1.2 What You Need To Know

The following terms and concepts may help as you read this chapter.

Note: To see how to use the USB port to do the cellular backup, please refer to [Section 7.4 on page 218](#).

#### 17.1.3 File Sharing

##### Workgroup Name

This is the name given to a set of computers that are connected on a network and share resources such as a printer or files. Windows automatically assigns the workgroup name when you set up a network.

## **Shares**

When settings are set to default, each USB device connected to the Zyxel Device is given a folder, called a "share". If a USB hard drive connected to the Zyxel Device has more than one partition, then each partition will be allocated a share. You can also configure a "share" to be a sub-folder or file on the USB device.

## **File Systems**

A file system is a way of storing and organizing files on your hard drive and storage device. Often different operating systems such as Windows or Linux have different file systems. The file sharing feature on your Zyxel Device supports File Allocation Table (FAT) and FAT32.

## **Common Internet File System**

The Zyxel Device uses Common Internet File System (CIFS) protocol for its file sharing functions. CIFS compatible computers can access the USB file storage devices connected to the Zyxel Device. CIFS protocol is supported on Microsoft Windows, Linux Samba and other operating systems (refer to your systems specifications for CIFS compatibility).

### **17.1.4 Before You Begin**

- 1 Make sure the Zyxel Device is connected to your network and turned on.
- 2 Connect the USB device to one of the Zyxel Device's USB port. If you are connecting a USB hard drive that comes with an external power supply, make sure it is connected to an appropriate power source.
- 3 The Zyxel Device detects the USB device and makes its contents available for browsing.

Note: If your USB device cannot be detected by the Zyxel Device, see the troubleshooting for suggestions.

## **17.2 USB Service**

Use this screen to set up file sharing through the Zyxel Device. The Zyxel Device's LAN users can access the shared folder (or share) from the USB device inserted in the Zyxel Device. To access this screen, click **Network Setting > USB Service**.



**Figure 224** Network Setting > USB Service

**USB Service**

The modem can share files from your USB flash drive or disk when you attach it to the USB port. You may start from deciding which folders in the USB drive to share and which users can access the shared folders.

**Information**

| Volume    | Capacity | Used Space |
|-----------|----------|------------|
| usb2_sdq1 | 30111 MB | 3703 MB    |

**Server Configuration**

File Sharing Services: ☒

**Share Directory List**

[Add New Share](#)

| Active | Status | Share Name | Share Path | Share Description | Modify |
|--------|--------|------------|------------|-------------------|--------|
|        |        |            |            |                   |        |

**Account Management**

[Add New User](#)

| Status                              | User Name |
|-------------------------------------|-----------|
| <input checked="" type="checkbox"/> | admin     |

[Cancel](#) [Apply](#)

Note: The **Share Directory List** is only visible when you connect a USB device.

Each field is described in the following table.

Table 133 Network Setting &gt; USB Service

| Label                                                  | Description                                                               |
|--------------------------------------------------------|---------------------------------------------------------------------------|
| Information                                            |                                                                           |
| Volume                                                 | This is the volume name the Zyxel Device gives to an inserted USB device. |
| Capacity                                               | This is the total available memory size (in megabytes) on the USB device. |
| Used Space                                             | This is the memory size (in megabytes) already used on the USB device.    |
| Server Configuration                                   |                                                                           |
| File Sharing Services                                  | Click this switch to enable file sharing through the Zyxel Device.        |
| Share Directory List                                   |                                                                           |
| This only appears when you have inserted a USB device. |                                                                           |
| Add New Share                                          | Click this to set up a new share on the Zyxel Device.                     |
| Active                                                 | Select this to allow the share to be accessed.                            |

Table 133 Network Setting &gt; USB Service (continued)

| Label              | Description                                                                                                                                                                                                                                                                                                          |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Status             | This field shows the status of the share<br> : The share is not activated.<br> : The share is activated.                                           |
| Share Name         | This field displays the name of the file you shared.                                                                                                                                                                                                                                                                 |
| Share Path         | This field displays the location in the USB of the file you shared.                                                                                                                                                                                                                                                  |
| Share Description  | This field displays a description of the file you shared.                                                                                                                                                                                                                                                            |
| Modify             | Click the <b>Edit</b> icon to change the settings of an existing share.<br>Click the <b>Delete</b> icon to delete this share in the list.                                                                                                                                                                            |
| Account Management |                                                                                                                                                                                                                                                                                                                      |
| Add New User       | Click this button to create a user account to access the secured shares. This button redirects you to <b>Maintenance &gt; User Account</b> .                                                                                                                                                                         |
| Status             | This field shows the status of the user.<br> : The user account is not activated for the share.<br> : The user account is activated for the share. |
| User Name          | This is the name of a user who is allowed to access the secured shares on the USB device.                                                                                                                                                                                                                            |
| Cancel             | Click this to restore your previously saved settings.                                                                                                                                                                                                                                                                |
| Apply              | Click this to save your changes to the Zyxel Device.                                                                                                                                                                                                                                                                 |

### 17.2.1 Add New Share

Use this screen to set up a new share or edit an existing share on the Zyxel Device. Click **Add New Share** in the **File Sharing** screen or click the **Edit** or **Modify** icon next to an existing share.

Please note that you need to set up shared folders on the USB device before enabling file sharing in the Zyxel Device. Spaces and the following special characters, [ " ], [ ` ], [ ' ], [ < ], [ > ], [ ^ ], [ \$ ], [ | ], [ & ], [ ; ], are not allowed for the USB share name.

**Figure 225** Network Setting > USB Service > Add New Share

The following table describes the labels in this menu.

**Table 134** Network Setting > USB Service > Add New Share

| LABEL        | DESCRIPTION                                                                                                                                                                                                                       |
|--------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Volume       | Select the volume in the USB storage device that you want to add as a share in the Zyxel Device.<br>This field is read-only when you are editing the share.                                                                       |
| Share Path   | Manually enter the file path for the share, or click the <b>Browse</b> button and select the folder that you want to add as a share.<br>This field is read-only when you are editing the share.                                   |
| Description  | You can either enter a short description of the share, or leave this field blank. You can use up to 128 printable characters except [ " ], [ ` ], [ ' ], [ < ], [ > ], [ ^ ], [ \$ ], [   ], [ & ], or [ ; ]. Spaces are allowed. |
| Access Level | Select <b>Public</b> if you want the share to be accessed by users connecting to the Zyxel Device. Otherwise, select <b>Security</b> .                                                                                            |
| Allowed      | If <b>Security</b> is selected in the <b>Access Level</b> field, select this checkbox to allow/prohibit access to the share.                                                                                                      |
| User Name    | This field specifies the user for which the <b>Allowed</b> setting applies. Users can be added or modified in <b>Maintenance &gt; User Account</b> .                                                                              |
| Cancel       | Click <b>Cancel</b> to return to the previous screen.                                                                                                                                                                             |
| OK           | Click <b>OK</b> to save your changes.                                                                                                                                                                                             |

## 17.2.2 Add New User Screen

Once you click the **Add New User** button, you will be directed to the **User Account** screen. To create a user account that can access the secured shares on the USB device, click the **Add New Account** button in the **Network Setting > USB Service > User Account** screen.

Please see [Chapter 35 on page 461](#), for detailed information about **User Account** screen.

## 17.3 Media Server

The media server feature lets anyone on your network play video, music, and photos from the USB storage device connected to your Zyxel Device without having to copy them to another computer. The Zyxel Device can function as a DLNA-compliant media server, where the Zyxel Device streams files to DLNA-compliant media clients like Windows Media Player. The Digital Living Network Alliance (DLNA) is a group of personal computer and electronics companies that works to make products compatible in a home network.

The Zyxel Device media server enables you to:

- Publish all shares for everyone to play media files in the USB storage device connected to the Zyxel Device.
- Use hardware-based media clients like the DMA-2500 to play the files.

**Note:** Anyone on your network can play the media files in the published shares. No user name and password or other form of security is used. The media server is enabled by default with the video, photo, and music shares published.

To change your Zyxel Device's media server settings, click **Network Setting > USB Service > Media Server**. The screen appears as shown.

**Figure 226** Network Setting > USB Service > Media Server

**USB Service**

File Sharing **Media Server**

The media server feature lets anyone on your network play video, music, and photos from the USB storage device connected to your Zyxel Device without having to copy them to another computer. The Zyxel Device can function as a DLNA-compliant media server, where the Zyxel Device streams files to DLNA-compliant media clients like Windows Media Player. The Digital Living Network Alliance (DLNA) is a group of personal computer and electronics companies that works to make products compatible in a home network.

Media Server ☒

Interface: Default

Volume: All USB Devices

Media Library Path:  Browse

Cancel Apply

The following table describes the labels in this menu.

Table 135 Network Setting > USB Service > Media Server

| LABEL              | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                             |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Media Server       | Click this switch to have the Zyxel Device function as a DLNA-compliant media server. When the switch goes to the right  , the function is enabled. Otherwise, it is not.<br><br>Enable the media server to let (DLNA-compliant) media clients on your network play media files located in the shares. |
| Interface          | Select an interface on which you want to enable the media server function. An interface can be added or modified in <b>Network Setting &gt; Interface Grouping</b> .                                                                                                                                                                                                                    |
| Volume             | This is the volume name the Zyxel Device gives to an inserted USB device. Select a volume in the USB storage device(s) to allow the Zyxel Device media server access. Select <b>All USB Devices</b> to enable access on all volumes.                                                                                                                                                    |
| Media Library Path | Enter the path clients use to access the media files on a USB storage device connected to the Zyxel Device.                                                                                                                                                                                                                                                                             |
| Cancel             | Click <b>Cancel</b> to restore your previously saved settings.                                                                                                                                                                                                                                                                                                                          |
| Apply              | Click <b>Apply</b> to save your changes.                                                                                                                                                                                                                                                                                                                                                |

# CHAPTER 18

## Fire wall

### 18.1 Fire wall Overview

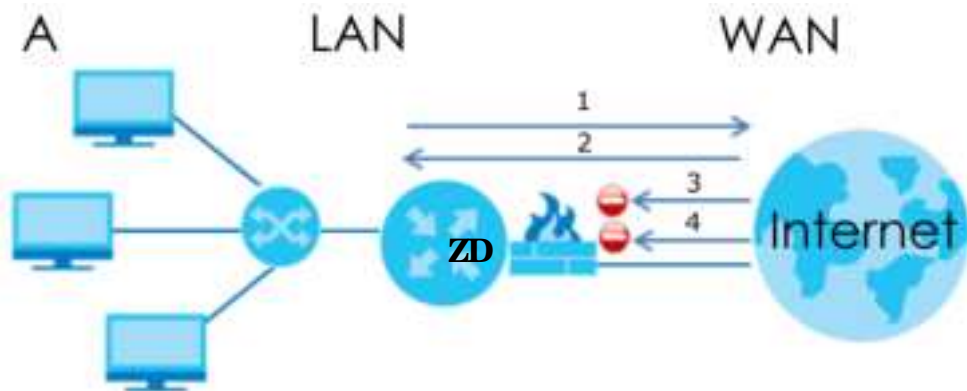
This chapter shows you how to enable the Zyxel Device firewall. Use the firewall to protect your Zyxel Device and network from attacks by hackers on the Internet and control access to it. The firewall:

- allows traffic that originates from your LAN computers to go to all other networks.
- blocks traffic that originates on other networks from going to the LAN.

By default, the Zyxel Device blocks DoS attacks whether the firewall is enabled or disabled.

The following figure illustrates the firewall action. User **A** can initiate an IM (Instant Messaging) session from the LAN to the WAN (**1**). Return traffic for this session is also allowed (**2**). However other traffic initiated from the WAN is blocked (**3** and **4**).

**Figure 227** Default Firewall Action



#### 18.1.1 What You Need to Know About Fire wall

##### SYN Attack

A SYN attack floods a targeted system with a series of SYN packets. Each packet causes the targeted system to issue a SYN-ACK response. While the targeted system waits for the ACK that follows the SYN-ACK, it queues up all outstanding SYN-ACK responses on a backlog queue. SYN-ACKs are moved off the queue only when an ACK comes back or when an internal timer terminates the three-way handshake. Once the queue is full, the system will ignore all incoming SYN requests, making the system unavailable for legitimate users.

##### DoS

Denial-of-Service (DoS) attacks are aimed at devices and networks with a connection to the Internet. Their goal is not to steal information, but to disable a device or network so users no longer have access

to network resources. The Zyxel Device is pre-configured to automatically detect and thwart all known DoS attacks.

### **DoS Thresholds**

For DoS attacks, the Zyxel Device uses thresholds to determine when to drop sessions that do not become fully established. These thresholds apply globally to all sessions. You can use the default threshold values, or you can change them to values more suitable to your security requirements.

### **DDoS**

A Distributed Denial-of-Service (DDoS) attack is one in which multiple compromised systems attack a single target, thereby causing denial of service for users of the targeted system.

### **ICMP**

Internet Control Message Protocol (ICMP) is a message control and error-reporting protocol between a host server and a gateway to the Internet. ICMP uses Internet Protocol (IP) datagrams, but the messages are processed by the TCP/IP software and directly apparent to the application user.

### **LAND Attack**

In a LAND attack, hackers flood SYN packets into the network with a spoofed source IP address of the target system. This makes it appear as if the host computer sent the packets to itself, making the system unavailable while the target system tries to respond to itself.

### **Ping of Death**

Ping of Death uses a 'ping' utility to create and send an IP packet that exceeds the maximum 65,536 bytes of data allowed by the IP specification. This may cause systems to crash, hang or reboot.

### **SPI**

Stateful Packet Inspection (SPI) tracks each connection crossing the firewall and makes sure it is valid. Filtering decisions are based not only on rules but also context. For example, traffic from the WAN may only be allowed to cross the firewall in response to a request from the LAN.

## **18.2 Firewall**

Use the firewall to protect your Zyxel Device and network from attacks by hackers on the Internet and control access to it.

### **18.2.1 What You Can Do in this Chapter**

- Use the **General** screen to configure the security level of the firewall on the Zyxel Device ([Section 18.3 on page 376](#)).
- Use the **Protocol** screen to add or remove predefined Internet services and configure firewall rules ([Section 18.4 on page 377](#)).

- Use the **Access Control** screen to view and configure incoming or outgoing filtering rules ([Section 18.5 on page 378](#)).
- Use the **DoS** screen to activate protection against Denial of Service (DoS) attacks ([Section 18.6 on page 381](#)).

## 18.3 General

Use the firewall to protect your Zyxel Device and network from attacks by hackers on the Internet and control access to it. Use this screen to set the security level of the firewall on the Zyxel Device. Firewall rules are grouped based on the direction of travel of packets. A higher firewall level means more restrictions on the Internet activities you can perform. Click **Security > Firewall > General** to display the following screen. Use the slider to select the level of firewall protection.

**Figure 228** Security > Firewall > General



Note: LAN to WAN is your access to all Internet services. WAN to LAN is the access of other computers on the Internet to devices behind the Zyxel Device. When the security level is set to **High**, Telnet, HTTP, HTTPS, DNS, IMAP, POP3, SMTP, and/or IPv6 ICMPv6 (Ping) traffic from the LAN are still allowed.



The following table describes the labels in this screen.

Table 136 Security > Firewall > General

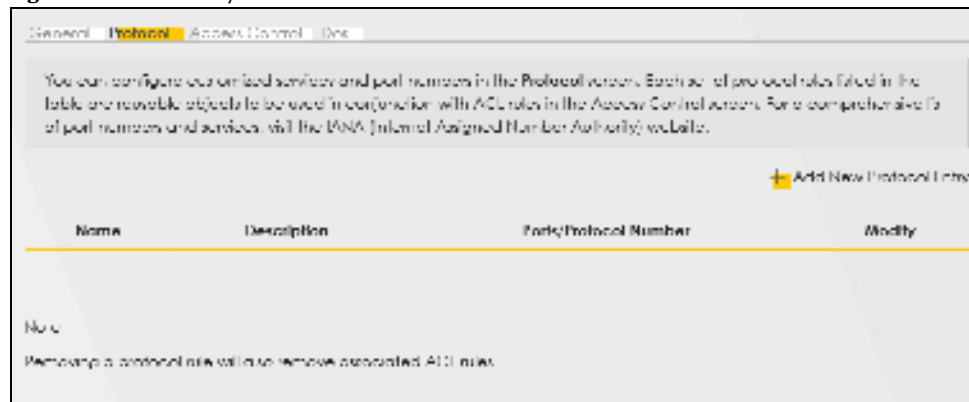
| LABEL         | DESCRIPTION                                                                                                                                                                              |
|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| IPv4 Firewall | Enable firewall protection when using <b>IPv4</b> (Internet Protocol version 4).                                                                                                         |
| IPv6 Firewall | Enable firewall protection when using <b>IPv6</b> (Internet Protocol version 6).                                                                                                         |
| High          | This setting blocks all traffic to and from the Internet. Only local network traffic and LAN to WAN service (Telnet, HTTP, HTTPS, DNS, POP3, SMTP) is permitted.                         |
| Medium        | This is the recommended setting. It allows traffic to the Internet but blocks anyone from the Internet from accessing any services on your local network.                                |
| Low           | This setting allows traffic to the Internet and also allows someone from the Internet to access services on your local network. This would be used with Port Forwarding, Default Server. |
| Apply         | Click this to save your changes.                                                                                                                                                         |
| Cancel        | Click this to restore your previously saved settings.                                                                                                                                    |

## 18.4 Protocol (Customized Services)

You can configure customized services and port numbers in the **Protocol** screen. Each set of protocol rules listed in the table are reusable objects to be used in conjunction with ACL rules in the Access Control screen. For a comprehensive list of port numbers and services, visit the IANA (Internet Assigned Number Authority) website. Click **Security > Firewall > Protocol** to display the following screen.

Note: Removing a protocol rule will also remove associated ACL rules.

Figure 229 Security > Firewall > Protocol



The following table describes the labels in this screen.

Table 137 Security > Firewall > Protocol

| LABEL                  | DESCRIPTION                                       |
|------------------------|---------------------------------------------------|
| Add New Protocol Entry | Click this to configure a customized service.     |
| Name                   | This is the name of your customized service.      |
| Description            | This is a description of your customized service. |

Table 137 Security &gt; Firewall &gt; Protocol (continued)

| Label                 | Description                                                                                                                |
|-----------------------|----------------------------------------------------------------------------------------------------------------------------|
| Ports/Protocol Number | This shows the port number or range and the IP protocol ( <b>TCP</b> or <b>UDP</b> ) that defines your customized service. |
| Modify                | Click this to edit a customized service.                                                                                   |

### 18.4.1 Add Customized Service

Add a customized rule or edit an existing rule by specifying the protocol and the port numbers. Click **Add New Protocol Entry** in the **Protocol** screen to display the following screen.

Figure 230 Security &gt; Firewall &gt; Protocol: Add New Protocol Entry

The following table describes the labels in this screen.

Table 138 Security &gt; Firewall &gt; Protocol: Add New Protocol Entry

| Label           | Description                                                                                                                                                                                          |
|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Service Name    | Enter a descriptive name for your customized service. You can use up to 16 printable characters except [ " ], [ ` ], [ ' ], [ < ], [ > ], [ ^ ], [ \$ ], [   ], [ & ], or [ ; ]. Spaces are allowed. |
| Description     | Enter a description for your customized service. You can use up to 16 printable characters except [ " ], [ ` ], [ ' ], [ < ], [ > ], [ ^ ], [ \$ ], [   ], [ & ], or [ ; ]. Spaces are allowed.      |
| Protocol        | Select the protocol ( <b>TCP</b> , <b>UDP</b> , <b>ICMP</b> , <b>ICMPv6</b> , or <b>Other</b> ) that defines your customized port from the drop down list box.                                       |
| Protocol Number | Enter a single port number or the range of port numbers ( <b>0 – 255</b> ) that define your customized service.                                                                                      |
| OK              | Click this to save your changes.                                                                                                                                                                     |
| Cancel          | Click this to exit this screen without saving.                                                                                                                                                       |

## 18.5 Access Control (Rules)

An Access Control List (ACL) rule is a manually-defined rule that can accept, reject, or drop incoming or outgoing packets from your network. This screen displays a list of the configured incoming or outgoing filtering rules. Note the order in which the rules are listed. Click **Security > Firewall > Access Control** to display the following screen.

Note: The ordering of your rules is very important as rules are applied in turn.

**Figure 231** Security > Firewall > Access Control



The following table describes the labels in this screen.

**Table 139** Security > Firewall > Access Control

| <b>LABEL</b>              | <b>DESCRIPTION</b>                                                                                                                                                                                                                                                         |
|---------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Rules Storage Space Usage | This read-only bar shows how much of the Zyxel Device's memory is in use for recording firewall rules. When you are using 80% or less of the storage space, the bar is green. When the amount of space used is over 80%, the bar is red.                                   |
| Add New ACL Rule          | Select an index number and click <b>Add New ACL Rule</b> to add a new firewall rule after the selected index number. For example, if you select "6", your new rule becomes number 7 and the previous rule 7 (if there is one) becomes rule 8.                              |
| #                         | This field displays the rule index number. The ordering of your rules is important as rules are applied in turn.                                                                                                                                                           |
| Status                    | This field displays the status of the ACL rule. A yellow bulb signifies that this ACL rule is active, while a gray bulb signifies that this ACL rule is not active.                                                                                                        |
| Name                      | This field displays the rule name.                                                                                                                                                                                                                                         |
| Src IP                    | This field displays the source IP addresses to which this rule applies.                                                                                                                                                                                                    |
| Dest IP                   | This field displays the destination IP addresses to which this rule applies.                                                                                                                                                                                               |
| Service                   | This field displays the protocol (All, TCP, UDP, TCP/UDP, ICMP, ICMPv6, or any) used to transport the packets for which you want to apply the rule.                                                                                                                        |
| Action                    | Displays whether the firewall silently discards packets ( <b>Drop</b> ), discards packets and sends a TCP reset packet or an ICMP destination-unreachable message to the sender ( <b>Reject</b> ), or allow the passage of ( <b>Accept</b> ) packets that match this rule. |
| Modify                    | Click the <b>Edit</b> icon to edit the firewall rule.<br><br>Click the <b>Delete</b> icon to delete an existing firewall rule.                                                                                                                                             |

### 18.5.1 Add New ACL Rule

Click **Add new ACL rule** or the **Edit** icon next to an existing ACL rule in the **Access Control** screen. The following screen displays. Use this screen to accept, reject, or drop packets based on specified parameters, such as source and destination IP address, IP Type, service, and direction. You can also specify a limit as to how many packets this rule applies to at a certain period of time or specify a schedule for this rule.

**Figure 232** Security > Firewall > Access Control > Add New ACL Rule

The screenshot shows the 'Add New ACL Rule' configuration window. The 'Active' toggle is turned on. The 'Filter Name' field is empty. The 'Order' is set to 1. The 'Select Source IP Address' is set to 'Specific IP Address'. The 'Source IP Address' field is empty. The 'Select Destination Device' is set to 'Specific IP Address'. The 'Destination IP Address' field is empty. The 'MAC Address' field is empty. The 'IP Type' is set to 'IPv4'. The 'Select Service' is set to 'Specific Service'. The 'Protocol' is set to 'ALL'. The 'Custom Source Port' and 'Custom Destination Port' are both set to 'Range'. The 'Policy' is set to 'ACCEPT'. The 'Direction' is set to 'WAN TO LAN'. The 'Enable Rule Limit' toggle is turned off. The 'Scheduler Rules' dropdown is empty. At the bottom, there are 'Cancel' and 'OK' buttons.

The following table describes the labels in this screen.

**Table 140** Security > Firewall > Access Control > Add New ACL Rule

| LABEL                     | DESCRIPTION                                                                                                                                                                                   |
|---------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Active                    | Click this switch to enable this ACL rule.                                                                                                                                                    |
| Filter Name               | Enter a descriptive name for your filter rule. You can use up to 16 printable characters except [ " ], [ ` ], [ ' ], [ < ], [ > ], [ ^ ], [ \$ ], [   ], [ & ], or [ : ]. Spaces are allowed. |
| Order                     | Assign the order of your rules as rules are applied in turn.                                                                                                                                  |
| Select Source IP Address  | If you want the source to come from a particular (single) IP, select <b>Specific IP Address</b> . If not, select from a detected device.                                                      |
| Source IP Address         | If you selected <b>Specific IP Address</b> in the previous item, enter the source device's IP address here. Otherwise this field will be hidden if you select the detected device.            |
| Select Destination Device | If you want your rule to apply to packets with a particular (single) IP, select <b>Specific IP Address</b> . If not, select a detected device.                                                |
| Destination IP Address    | If you selected <b>Specific IP Address</b> in the previous item, enter the destination device's IP address here. Otherwise this field will be hidden if you select the detected device.       |

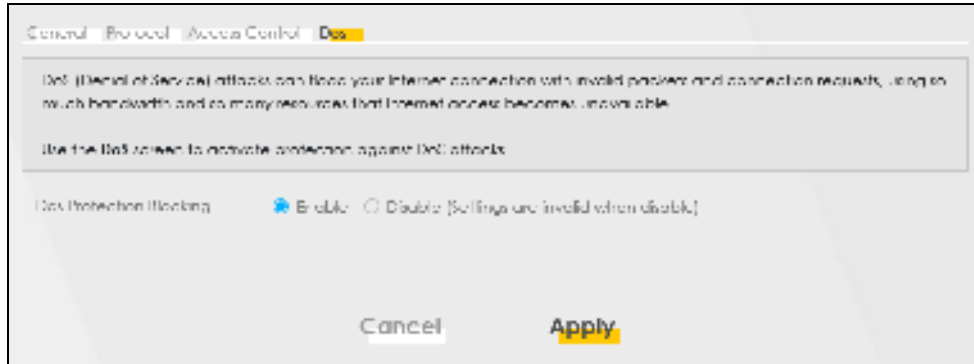
Table 140 Security &gt; Firewall &gt; Access Control &gt; Add New ACL Rule (continued)

| LABEL                   | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|-------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| MAC Address             | Enter the MAC addresses of the WiFi or wired LAN clients that are allowed access to the Zyxel Device in these address fields. Enter the MAC addresses in a valid MAC address format, that is, six hexadecimal character pairs, for example, 12:34:56:78:9a:bc.                                                                                                                                                                                                   |
| IP Type                 | Select between <b>IPv4</b> or <b>IPv6</b> . Compared to <b>IPv4</b> , <b>IPv6</b> (Internet Protocol version 6), is designed to enhance IP address size and features. The increase in <b>IPv6</b> address size to 128 bits (from the 32-bit <b>IPv4</b> address) allows up to 3.4 x 1038 IP addresses. The Zyxel Device can use <b>IPv4/IPv6</b> dual stack to connect to <b>IPv4</b> and <b>IPv6</b> networks, and supports <b>IPv6</b> rapid deployment (6RD). |
| Select Service          | Select a service from the <b>Select Service</b> box.                                                                                                                                                                                                                                                                                                                                                                                                             |
| Protocol                | Select the protocol ( <b>ALL</b> , <b>TCP/UDP</b> , <b>TCP</b> , <b>UDP</b> , <b>ICMP</b> , or <b>ICMPv6</b> ) used to transport the packets for which you want to apply the rule.                                                                                                                                                                                                                                                                               |
| Custom Source Port      | This is a single port number or the starting port number of a range that defines your rule.                                                                                                                                                                                                                                                                                                                                                                      |
| Custom Destination Port | This is a single port number or the ending port number of a range that defines your rule.                                                                                                                                                                                                                                                                                                                                                                        |
| TCP Flag                | Select the TCP Flag (SYN, ACK, URG, PSH, RST, FIN).<br><br>This appears when you select <b>TCP/UDP</b> or <b>TCP</b> in the <b>Protocol</b> field.                                                                                                                                                                                                                                                                                                               |
| Policy                  | Use the drop-down list box to select whether to discard ( <b>Drop</b> ), deny and send an ICMP destination-unreachable message to the sender ( <b>Reject</b> ), or allow the passage of ( <b>Accept</b> ) packets that match this rule.                                                                                                                                                                                                                          |
| Direction               | Select <b>WAN to LAN</b> to apply the rule to traffic from WAN to LAN. Select <b>LAN to WAN</b> to apply the rule to traffic from LAN to WAN. Select <b>WAN to Router</b> to apply the rule to traffic from WAN to router. Select <b>LAN to Router</b> to apply the rule to traffic from LAN to router.                                                                                                                                                          |
| Enable Rate Limit       | Click this switch to enable the setting of maximum number of packets per maximum number of minute or second to limit the throughput of traffic that matches this rule. If not, the next item will be disabled.                                                                                                                                                                                                                                                   |
| Scheduler Rules         | Select a schedule rule for this ACL rule form the drop-down list box. You can configure a new schedule rule by clicking <b>Add New Rule</b> . This will bring you to the <b>Security &gt; Scheduler Rules</b> screen.                                                                                                                                                                                                                                            |
| OK                      | Click this to save your changes.                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Cancel                  | Click this to exit this screen without saving.                                                                                                                                                                                                                                                                                                                                                                                                                   |

## 18.6 DoS

DoS (Denial of Service) attacks can flood your Internet connection with invalid packets and connection requests, using so much bandwidth and so many resources that Internet access becomes unavailable. Use the **DoS** screen to activate protection against DoS attacks.

Click **Security > Firewall > DoS** to display the following screen.

**Figure 233** Security > Firewall > DoS

The following table describes the labels in this screen.

Table 141 Security &gt; Firewall &gt; DoS

| Label                   | Description                                                                                                      |
|-------------------------|------------------------------------------------------------------------------------------------------------------|
| DoS Protection Blocking | Enable this to protect against DoS attacks. The Zyxel Device will drop sessions that surpass maximum thresholds. |
| Apply                   | Click this to save your changes.                                                                                 |
| Cancel                  | Click this to restore your previously saved settings.                                                            |

## 18.7 Firewall Technical Reference

This section provides some technical background information about the topics covered in this chapter.

### 18.7.1 Firewall Rules Overview

Your customized rules take precedence and override the Zyxel Device's default settings. The Zyxel Device checks the source IP address, destination IP address and IP protocol type of network traffic against the firewall rules (in the order you list them). When the traffic matches a rule, the Zyxel Device takes the action specified in the rule.

Firewall rules are grouped based on the direction of travel of packets to which they apply:

- LAN to Router
- LAN to WAN
- WAN to LAN
- WAN to Router

By default, the Zyxel Device's stateful packet inspection allows packets traveling in the following directions:

- LAN to Router
  - These rules specify which computers on the LAN can manage the Zyxel Device (remote management).

**Note:** You can also configure the remote management settings to allow only a specific computer to manage the Zyxel Device.

- LAN to WAN

These rules specify which computers on the LAN can access which computers or services on the WAN.

By default, the Zyxel Device's stateful packet inspection drops packets traveling in the following directions:

- WAN to LAN

These rules specify which computers on the WAN can access which computers or services on the LAN.

Note: You also need to configure NAT port forwarding (or full featured NAT address mapping rules) to allow computers on the WAN to access devices on the LAN.

- WAN to Router

By default the Zyxel Device stops computers on the WAN from managing the Zyxel Device. You could configure one of these rules to allow a WAN computer to manage the Zyxel Device.

Note: You also need to configure the remote management settings to allow a WAN computer to manage the Zyxel Device.

You may define additional rules and sets or modify existing ones but please exercise extreme caution in doing so.

For example, you may create rules to:

- Block certain types of traffic, such as IRC (Internet Relay Chat), from the LAN to the Internet.
- Allow certain types of traffic, such as Lotus Notes database synchronization, from specific hosts on the Internet to specific hosts on the LAN.
- Allow everyone except your competitors to access a web server.
- Restrict use of certain protocols, such as Telnet, to authorized users on the LAN.

These custom rules work by comparing the source IP address, destination IP address and IP protocol type of network traffic to rules set by the administrator. Your customized rules take precedence and override the Zyxel Device's default rules.

## **18.7.2 Guidelines For Security Enhancement With Your Firewall**

- 1 Change the default password through the Web Configurator.
- 2 Think about access control before you connect to the network in any way.
- 3 Limit who can access your router.
- 4 Do not enable any local service (such as telnet) that you do not use. Any enabled service could present a potential security risk. A determined hacker might be able to find creative ways to misuse the enabled services to access the firewall or the network.
- 5 For local services that are enabled, protect against misuse. Protect by configuring the services to communicate only with specific peers, and protect by configuring rules to block packets for the services at specific interfaces.

- 6 Protect against IP spoofing by making sure the firewall is active.
- 7 Keep the firewall in a secured (locked) room.

### 18.7.3 Security Considerations

Note: Incorrectly configuring the firewall may block valid access or introduce security risks to the Zyxel Device and your protected network. Use caution when creating or deleting firewall rules and test your rules after you configure them.

Consider these security ramifications before creating a rule:

- 1 Does this rule stop LAN users from accessing critical resources on the Internet? For example, if IRC (Internet Relay Chat) is blocked, are there users that require this service?
- 2 Is it possible to modify the rule to be more specific? For example, if IRC is blocked for all users, will a rule that blocks just certain users be more effective?
- 3 Does this rule conflict with any existing rules?

Once these questions have been answered, adding rules is simply a matter of entering the information into the correct fields in the Web Configurator screens.



# CHAPTER 19

## MAC Filter

### 19.1 MAC Filter Overview

You can configure the Zyxel Device to permit access to clients based on their MAC addresses in the **MAC Filter** screen. This applies to wired connections. Every Ethernet device has a unique MAC (Media Access Control) address. The MAC address is assigned at the factory and consists of six pairs of hexadecimal characters, for example, 00:A0:C5:00:00:02. You need to know the MAC addresses of wired LAN client to configure this screen.

### 19.2 MAC Filter

Enable **MAC Address Filter** and add the host name and MAC address of a wired LAN client to the table if you wish to allow or deny them access to your network. You can choose to enable or disable the filters per entry; make sure that the checkbox under **Active** is selected if you want to use a filter. Select **Security > MAC Filter**. The screen appears as shown.

**Figure 234** Security > MAC Filter

**MAC Filter**

You can configure the Zyxel Device to permit access to clients based on their MAC addresses in the **MAC Filter** screen. This applies to wired connections. Every Ethernet device has a unique MAC (Media Access Control) address. The MAC address is assigned at the factory and consists of six pairs of hexadecimal characters, for example, 00:A0:C5:00:00:02. You need to know the MAC addresses of the LAN client to configure this screen.

Enable **MAC Address Filter** and add the host name and MAC address of a LAN client to the table if you wish to allow or deny them access to your network. You can choose to enable or disable the filters per entry; make sure that the check box under **Active** is selected if you want to use a filter.

MAC Address Filter ☐ Enable ☒ Disable (Settings are invalid when disable)

MAC Restrict Mode ☒ Allow ☐ Deny

Add New Rule Custom

| Set | Active | Host Name | MAC Address | Delete |
|-----|--------|-----------|-------------|--------|
|-----|--------|-----------|-------------|--------|

The following table describes the labels in this screen.

Table 142 Security > MAC Filter

| LABEL              | DESCRIPTION                                                                                                                                                                                                                                 |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| MAC Address Filter | Select <b>Enable</b> to activate the MAC filter function.                                                                                                                                                                                   |
| MAC Restrict Mode  | Select <b>Allow</b> to only permit the listed MAC addresses access to the Zyxel Device. Select <b>Deny</b> to permit anyone access to the Zyxel Device except the listed MAC addresses.                                                     |
| Add New Rule       | Select an existing wired LAN client from the list to add as a new entry. Select <b>Custom</b> if you want to manually enter the <b>Host Name</b> and <b>MAC Address</b> .<br>Click the <b>Add</b> button to create a new entry.             |
| Set                | This is the index number of the MAC address.                                                                                                                                                                                                |
| Active             | Select <b>Active</b> to enable the MAC filter rule. The rule will not be applied if <b>Allow</b> is not selected under <b>MAC Restrict Mode</b> .                                                                                           |
| Host Name          | Enter the host name of a wired LAN client that you want to allow access to the Zyxel Device. You can use up to 17 printable characters except [ " ], [ ` ], [ ' ], [ < ], [ > ], [ ^ ], [ \$ ], [   ], [ & ], or [ ; ]. Spaces are allowed. |
| MAC Address        | Enter the MAC address of a wired LAN client that you want to allow access to the Zyxel Device. Enter the MAC addresses in a valid MAC address format, that is, six hexadecimal character pairs, for example, 12:34:56:78:9a:bc.             |
| Delete             | Click the <b>Delete</b> icon to delete an existing rule.                                                                                                                                                                                    |
| Cancel             | Click <b>Cancel</b> to restore your previously saved settings.                                                                                                                                                                              |
| Apply              | Click <b>Apply</b> to save your changes.                                                                                                                                                                                                    |

### 19.2.1 Add New Rule

You can choose to enable or disable the filters per entry; make sure that the checkbox under **Active** is selected if you want to use a filter, as shown in the example below. Select **Security > MAC Filter > Add New Rule**. The screen appears as shown.

Figure 235 Security > MAC Filter > Add New Rule



The following table describes the labels in this screen.

Table 143 Security > MAC Filter > Add New Rule

| LABEL       | DESCRIPTION                                                                                                                                                                                                                                               |
|-------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Set         | This is the index number of the MAC address.                                                                                                                                                                                                              |
| Active      | Select <b>Active</b> to enable the MAC filter rule. The rule will not be applied if <b>Allow</b> is not selected under <b>MAC Restrict Mode</b> .                                                                                                         |
| Host Name   | Enter the host name of a wired LAN client that you want to allow access to the Zyxel Device. You can use up to 17 printable characters except [ " ], [ ` ], [ ' ], [ < ], [ > ], [ ^ ], [ \$ ], [   ], [ & ], or [ ; ]. Spaces are allowed.               |
| MAC Address | Enter the MAC addresses of a wired LAN client that you want to allow access to the Zyxel Device in these address fields. Enter the MAC addresses in a valid MAC address format, that is, six hexadecimal character pairs, for example, 12:34:56:78:9a:bc. |

Table 143 Security &gt; MAC Filter &gt; Add New Rule (continued)

| LABEL  | DESCRIPTION                                                    |
|--------|----------------------------------------------------------------|
| Delete | Click the <b>Delete</b> icon to delete an existing rule.       |
| Cancel | Click <b>Cancel</b> to restore your previously saved settings. |
| Apply  | Click <b>Apply</b> to save your changes.                       |

# CHAPTER 20

## Home Security

### 20.1 Home Security Overview

The Zyxel Device supports URL (Uniform Resource Locator) filtering that allows you to block user access to specific websites containing inappropriate or harmful content. Users on your network will not be able to enter the websites with URL domain names, keywords or full URLs you specify. Check [Section 1.1 on page 20](#) to see if your Zyxel Device supports the Home Security feature.

### 20.2 Home Security

Use this screen to configure URL filtering settings to block users on your network from accessing certain websites. To access this screen, click **Security > Home Security**.

**Figure 236** Security > Home Security

**Connected Home Security**

You may be more specific by adding URL into the list. The website under the specific domain will be blocked.

Enter Website URL

example.com

Block

Block List

examplewebsite X

The following table describes the labels in this screen.

Table 144 Security > Home Security

| LABEL             | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Enter Website URL | <p>Enter the URL of a website or URL keyword to which the Zyxel Device blocks access. Click <b>Block</b> to add the website to the <b>Block List</b>.</p> <p>Use keywords, domain names, or full URLs to block websites. For example, if you want to block a website with the domain name "www.exampleWeb.com", you can use the following input formats:</p> <ul style="list-style-type: none"><li>• http://exampleWeb.com</li><li>• https://exampleWeb.com</li><li>• exampleWeb.com</li><li>• www.exampleWeb.com</li><li>• example</li></ul> |
| Block List        | <p>The Zyxel Device prohibits users on your network from viewing the websites with the URLs/keywords in this block list. Click <b>x</b> to remove the entry from the list.</p>                                                                                                                                                                                                                                                                                                                                                                |

# CHAPTER 21

## Parental Control

### 21.1 Parental Control Overview

Parental control allows you to limit the time a user can access the Internet and prevent users from viewing inappropriate content or participating in specified online activities.

Your parental control screens may be different depending on the model you are using. Some Zyxel Devices support scheduling, some support scheduling and URL filtering.

See [Section 1.1 on page 20](#) for more information.

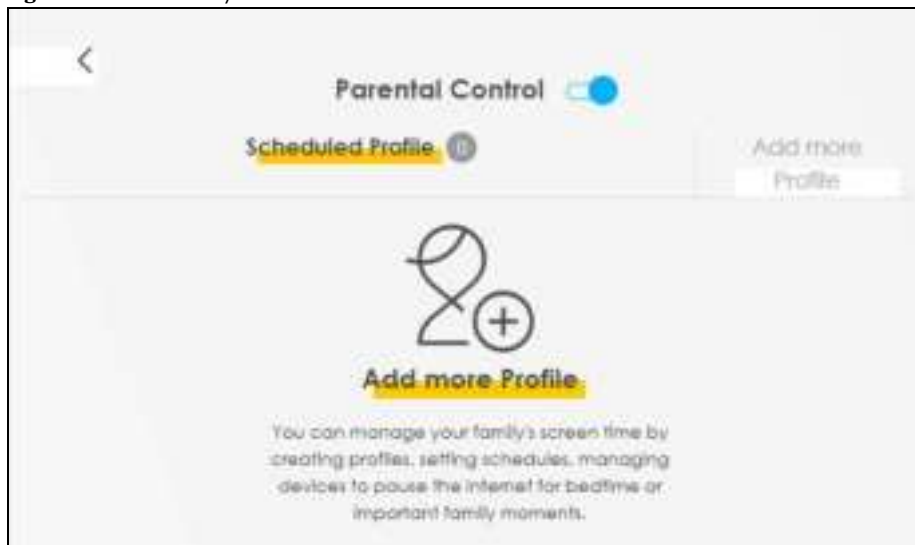
### 21.2 Parental Control Schedule

Use this screen to enable parental control and view parental control rules and schedules. You can limit the time a user can access the Internet. These rules are defined in a Parental Control Profile (PCP).

Click **Security** > **Parental Control** to open the following screen.

Note: For some Zyxel Device models, you need to disable MESH to add a new parental control profile.

**Figure 237** Security > Parental Control



The following table describes the fields in this screen.

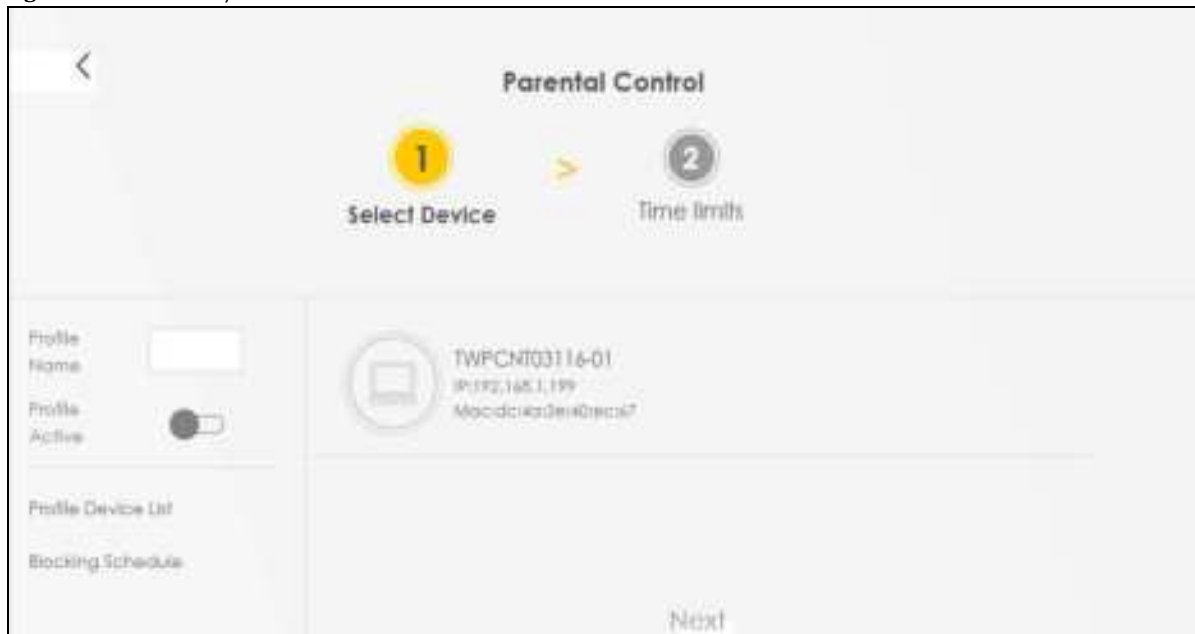
Table 145 Security > Parental Control

| LABEL             | DESCRIPTION                                              |
|-------------------|----------------------------------------------------------|
| Parental Control  | Click this switch to enable or disable parental control. |
| Scheduled Profile | This screen shows all the created profiles.              |
| Add more Profile  | Click this button to create a new profile.               |

### 21.2.1 Add or Edit a Parental Control Profile

Click **Add more Profile** in the **Parental Control** screen to add a new rule or click the **Edit** icon next to an existing rule to edit it. Use this screen to configure a restricted access schedule.

Figure 238 Security > Parental Control > Add more Profile: Select Device



The following table describes the fields in this screen.

Table 146 Security > Parental Control > Add more Profile: Select Device

| LABEL               | DESCRIPTION                                                                                                                                                                              |
|---------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Profile Name        | Enter a descriptive name for the profile. You can use up to 17 printable characters except [ " ], [ ` ], [ ' ], [ < ], [ > ], [ ^ ], [ \$ ], [   ], [ & ], or [ : ]. Spaces are allowed. |
| Profile Active      | Click this switch to enable or disable this profile.                                                                                                                                     |
| Profile Device List | This field shows the devices selected on the right for this profile.                                                                                                                     |
| Blocking Schedule   | This field shows the time during which Internet access is blocked on the profile devices.                                                                                                |
| Next                | Click <b>Next</b> to go to the next step to set a schedule for this profile.                                                                                                             |

### 21.2.2 Define a Schedule

This screen allow you to define time periods and days during which Internet access is blocked on the profile devices. Finish the settings in the **Select Device** step and click **Next** to access this screen.

**Figure 239** Security > Parental Control > Add more Profile: Time limits

The following table describes the fields in this screen.

Table 147 Security > Parental Control > Add more Profile: Time limits

| Label               | Description                                                                                                                                                   |
|---------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Profile Name        | Enter a descriptive name for the profile.                                                                                                                     |
| Profile Active      | Click this switch to enable or disable this profile. When the switch goes to the right (🔴), this profile is active. Otherwise, it is not.                     |
| Profile Device List | This field shows the devices selected on the right for this profile.                                                                                          |
| Blocking Schedule   | This field shows the time during which Internet access is blocked on the profile devices.                                                                     |
| Schedule            |                                                                                                                                                               |
| Add New Schedule    | Click this to add a new block for scheduling.                                                                                                                 |
| Start/End blocking  | Select the time period when Internet access is blocked on the profile devices.                                                                                |
| Repeat On           | Select the days when Internet access is blocked on the profile devices. Select <b>Whole Week</b> and the scheduler rule will be activated for the whole week. |
| Back                | Click <b>Back</b> to return to the previous screen.                                                                                                           |
| Save                | Click <b>Save</b> to save your changes.                                                                                                                       |



### 21.2.3 Parental Control Scheduled Profile

Use this screen to view and manage the created parental control profiles.

**Figure 240** Security > Parental Control > Scheduled Profile



The following table describes the fields in this screen.

Table 148 Security > Parental Control > Scheduled Profile

| LABEL             | DESCRIPTION                                                                                                                                                                                                                                                                                                                           |
|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Parental Control  | Click this switch to enable or disable parental control. When the switch goes to the right (🔵), the function is enabled. Otherwise, it is not.                                                                                                                                                                                        |
| Profile Active    | Click this switch to enable or disable a created profile. When the switch goes to the right (🔵), this profile is active. Otherwise, it is not.                                                                                                                                                                                        |
| Scheduled Profile | This screen shows all the created profiles.<br><br>Click beside <b>Profile Device List</b> to view more information about the profile. You can click <b>Delete</b> to remove the profile or click <b>Edit</b> to change the profile settings.<br><br>Only the <b>Add more Profile</b> button displays if there is no profile created. |
| Add more Profile  | Click this button to create a new profile.                                                                                                                                                                                                                                                                                            |

# CHAPTER 22

## Scheduler Rule

### 22.1 Scheduler Rule Overview

A Scheduler Rule allows you to define time periods and days during which the Zyxel Device allows certain actions.

### 22.2 Scheduler Rule Settings

Use this screen to view, add, or edit time schedule rules. A scheduler rule is a reusable object that is applied to other features, such as Firewall Access Control.

Click **Security > Scheduler Rule** to open the following screen.

**Figure 241** Security > Scheduler Rule



The following table describes the fields in this screen.

Table 149 Security > Scheduler Rule

| LABEL        | DESCRIPTION                                                                                                                                                                                       |
|--------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Add New Rule | Click this to create a new rule.                                                                                                                                                                  |
| #            | This is the index number of the entry.                                                                                                                                                            |
| Rule Name    | This shows the name of the rule.                                                                                                                                                                  |
| Day          | This shows the days on which this rule is enabled.                                                                                                                                                |
| Time         | This shows the period of time on which this rule is enabled.                                                                                                                                      |
| Description  | This shows the description of this rule.                                                                                                                                                          |
| Modify       | Click the <b>Edit</b> icon to edit the schedule.<br>Click the <b>Delete</b> icon to delete a scheduler rule.<br>Note: You cannot delete a scheduler rule once it is applied to a certain feature. |

### 22.2.1 Add or Edit a Schedule Rule

Click the **Add New Rule** button in the **Scheduler Rule** screen or click the **Edit** icon next to a schedule rule to open the following screen. Use this screen to configure a restricted access schedule.

**Figure 242** Security > Scheduler Rule: Add or Edit

The following table describes the fields in this screen.

Table 150 Security > Scheduler Rule: Add or Edit

| LABEL             | DESCRIPTION                                                                                                                                                                                 |
|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Rule Name         | Enter a descriptive name for this schedule. You can use up to 31 printable characters except [ " ], [ ` ], [ ' ], [ < ], [ > ], [ ^ ], [ \$ ], [   ], [ & ], or [ ; ]. Spaces are allowed.  |
| Day               | Select check boxes for the days that you want the Zyxel Device to perform this scheduler rule.                                                                                              |
| Time of Day Range | Enter the time period of each day, in 24-hour format, during which the rule will be enforced.                                                                                               |
| Description       | Enter a description for this scheduler rule. You can use up to 63 printable characters except [ " ], [ ` ], [ ' ], [ < ], [ > ], [ ^ ], [ \$ ], [   ], [ & ], or [ ; ]. Spaces are allowed. |
| Cancel            | Click <b>Cancel</b> to exit this screen without saving.                                                                                                                                     |
| OK                | Click <b>OK</b> to save your changes.                                                                                                                                                       |

# CHAPTER 23

## Certificates

### 23.1 Certificates Overview

The Zyxel Device can use certificates (also called digital IDs) to authenticate users. Certificates are based on public-private key pairs. A certificate contains the certificate owner's identity and public key. Certificates provide a way to exchange public keys for use in authentication.

#### 23.1.1 What You Can Do in this Chapter

- Use the **Local Certificates** screen to view and import the Zyxel Device's CA-signed (Certification Authority) certificates ([Section 23.3 on page 396](#)).
- Use the **Trusted CA** screen to save the certificates of trusted CAs to the Zyxel Device. You can also export the certificates to a computer ([Section 23.4 on page 401](#)).

### 23.2 What You Need to Know

The following terms and concepts may help as you read through this chapter.

#### Certification Authority

A Certification Authority (CA) issues certificates and guarantees the identity of each certificate owner. There are commercial certification authorities like CyberTrust or VeriSign and government certification authorities. The certification authority uses its private key to sign certificates. Anyone can then use the certification authority's public key to verify the certificates. You can use the Zyxel Device to generate certification requests that contain identifying information and public keys and then send the certification requests to a certification authority.

### 23.3 Local Certificates

Use this screen to view the Zyxel Device's summary list of certificates, generate certification requests, and import signed certificates. You can import the following certificates to your Zyxel Device:

- Web Server – This certificate secures HTTP connections.
- SSH – This certificate secures remote connections.

Click **Security > Certificates** to open the **Local Certificates** screen.

**Figure 243** Security > Certificates > Local Certificates

**Certificates**

**Local Certificates** [Tutorial](#)

The Zyxel Device can use certificates (also called digital IDs) to authenticate users. Certificates are based on public-private key pairs. A certificate contains the certificate owner's identity and public key. Certificates provide a way to exchange public keys for use in authentication.

Use this screen to view the Zyxel Device's summary list of certificates, generate certification requests, and import signed certificates.

Replace PrivateKey/Certificate file in PEM format

☐ Private Key is protected by password

No file chosen

| Current file | Subject | Issuer | Valid from | Valid to | Modify |
|--------------|---------|--------|------------|----------|--------|
|--------------|---------|--------|------------|----------|--------|

The following table describes the labels in this screen.

**Table 151** Security > Certificates > Local Certificates

| Label                                              | Description                                                                                                                                                                                                                                                                                      |
|----------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Replace Private Key/Certificate file in PEM format |                                                                                                                                                                                                                                                                                                  |
| Private Key is protected by password               | Select the checkbox and enter the private key into the text box to store it on the Zyxel Device. You can use up to 63 alphanumeric (0-9, a-z, A-Z) and special characters, including spaces.                                                                                                     |
| Choose File/Browse                                 | Click this button to find the certificate file you want to upload.                                                                                                                                                                                                                               |
| Import Certificate                                 | Click this button to save the certificate that you have enrolled from a certification authority from your computer to the Zyxel Device.                                                                                                                                                          |
| Create Certificate Request                         | Click this button to go to the screen where you can have the Zyxel Device generate a certification request.                                                                                                                                                                                      |
| Current File                                       | This field displays the name used to identify this certificate. It is recommended that you give each certificate a unique name.                                                                                                                                                                  |
| Subject                                            | This field displays identifying information about the certificate's owner, such as <b>CN</b> (Common Name), <b>OU</b> (Organizational Unit or department), <b>O</b> (Organization or company) and <b>C</b> (Country). It is recommended that each certificate have a unique subject information. |
| Issuer                                             | This field displays identifying information about the certificate's issuing certification authority, such as a common name, organizational unit or department, organization or company and country.                                                                                              |
| Valid From                                         | This field displays the date that the certificate becomes applicable. The text displays in red and includes a <b>Not Yet Valid!</b> message if the certificate has not yet become applicable.                                                                                                    |

Table 151 Security &gt; Certificates &gt; Local Certificates (continued)

| LABEL    | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Valid To | This field displays the date that the certificate expires. The text displays in red and includes an <b>Expiring!</b> or <b>Expired!</b> message if the certificate is about to expire or has already expired.                                                                                                                                                                                                                                                 |
| Modify   | Click the <b>View</b> icon to open a screen with an in-depth list of information about the certificate.<br><br>For a certification request, click <b>Load Signed</b> to import the signed certificate.<br><br>Click the <b>Remove</b> icon to remove the certificate (or certification request). A window displays asking you to confirm that you want to delete the certificate. Note that subsequent certificates move up by one when you take this action. |

### 23.3.1 Create Certificate Request

Click **Security > Certificates > Local Certificates** and then **Create Certificate Request** to open the following screen. Use this screen to have the Zyxel Device generate a certification request. To create a certificate signing request, you need to enter a common name, organization name, state or province name, and the default US two-letter country code (The US country code is by default and not changeable when sold in the U.S.) for the certificate.

Figure 244 Security &gt; Certificates &gt; Local Certificates: Create Certificate Request

The following table describes the labels in this screen.

Table 152 Security &gt; Certificates &gt; Local Certificates: Create Certificate Request

| LABEL             | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|-------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Certificate Name  | Enter a descriptive name to identify this certificate. You can use up to 63 printable characters except [ " ], [ ` ], [ ' ], [ < ], [ > ], [ ^ ], [ \$ ], [   ], [ & ], or [ ; ]. Spaces are allowed.                                                                                                                                                                                                                                                                                     |
| Common Name       | Select <b>Auto</b> to have the Zyxel Device configure this field automatically. Or select <b>Customize</b> to enter it manually.<br><br>Enter the IP address (in dotted decimal notation), domain name or email address in the field provided. You can use up to 63 printable characters except [ " ], [ ` ], [ ' ], [ < ], [ > ], [ ^ ], [ \$ ], [   ], [ & ], or [ ; ]. Spaces are allowed. The domain name or email address is for identification purposes only and can be any string. |
| Organization Name | Enter a descriptive name to identify the company or group to which the certificate owner belongs. You can use up to 32 printable characters except [ " ], [ ` ], [ ' ], [ < ], [ > ], [ ^ ], [ \$ ], [   ], [ & ], or [ ; ]. Spaces are allowed.                                                                                                                                                                                                                                          |

Table 152 Security &gt; Certificates &gt; Local Certificates: Create Certificate Request (continued)

| LABEL               | DESCRIPTION                                                                                                                                                                                                                                       |
|---------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| State/Province Name | Enter a descriptive name to identify the state or province where the certificate owner is located. You can use up to 32 printable characters except [ " ], [ ` ], [ ' ], [ < ], [ > ], [ ^ ], [ \$ ], [   ], [ & ], or [ ; ]. Spaces are allowed. |
| Country/Region Name | Select a country to identify the nation where the certificate owner is located.                                                                                                                                                                   |
| Cancel              | Click <b>Cancel</b> to exit this screen without saving.                                                                                                                                                                                           |
| OK                  | Click <b>OK</b> to save your changes.                                                                                                                                                                                                             |

### 23.3.2 View Certificate Request

Use this screen to view in-depth information about the certificate request. The **Certificate** is used to verify the authenticity of the certification authority. The **Private Key** serves as your digital signature for authentication and must be safely stored. The **Signing Request** contains the certificate signing request value that you will copy upon submitting the certificate request to the CA (certificate authority).

Click the **View** icon in the **Local Certificates** screen to open the following screen.

**Figure 245** Security > Certificates > Local Certificates: View Certificate

The following table describes the fields in this screen.

**Table 153** Security > Certificates > Local Certificates: View Certificate

| LABEL   | DESCRIPTION                                                                                                                                                         |
|---------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Name    | This field displays the identifying name of this certificate.                                                                                                       |
| Type    | This field displays general information about the certificate. <b>ca</b> means that a Certification Authority signed the certificate.                               |
| Subject | This field displays information that identifies the owner of the certificate, such as Common Name (CN), Organizational Unit (OU), Organization (O) and Country (C). |



Table 153 Security &gt; Certificates &gt; Local Certificates: View Certificate (continued)

| Label           | Description                                                                                                                                                                                                                                                                                                                                                                                    |
|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Certificate     | This read-only text box displays the certificate in Privacy Enhanced Mail (PEM) format. PEM uses base 64 to convert the binary certificate into a printable form.<br><br>You can copy and paste the certificate into an email to send to friends or colleagues or you can copy and paste the certificate into a text editor and save the file on a management computer for later distribution. |
| Private Key     | This field displays the private key of this certificate.                                                                                                                                                                                                                                                                                                                                       |
| Signing Request | This field displays the CSR (Certificate Signing Request) information of this certificate. The CSR will be provided to a certificate authority, and it includes information about the public key, organization name, domain name, location, and country of this certificate.                                                                                                                   |
| Back            | Click <b>Back</b> to return to the previous screen.                                                                                                                                                                                                                                                                                                                                            |

## 23.4 Trusted CA

Click **Security > Certificates > Trusted CA** to open the following screen. This screen displays a summary list of certificates of the certification authorities that you have set the Zyxel Device to accept as trusted. The Zyxel Device accepts any valid certificate signed by a certification authority on this list as being trustworthy, which means you do not need to import any certificate that is signed by one of these certification authorities.

Note: A maximum of ten certificates can be added.

Figure 246 Security &gt; Certificates &gt; Trusted CA



The following table describes the labels in this screen.

Table 154 Security &gt; Certificates &gt; Trusted CA

| Label              | Description                                                                                                                                                                                                                                                              |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Import Certificate | Click this to open a screen where you can save the certificate of a certification authority that you trust to the Zyxel Device.                                                                                                                                          |
| #                  | This is the index number of the entry.                                                                                                                                                                                                                                   |
| Name               | This field displays the name used to identify this certificate.                                                                                                                                                                                                          |
| Subject            | This field displays information that identifies the owner of the certificate, such as Common Name (CN), OU (Organizational Unit or department), Organization (O), State (ST) and Country (C). It is recommended that each certificate have a unique subject information. |

Table 154 Security &gt; Certificates &gt; Trusted CA (continued)

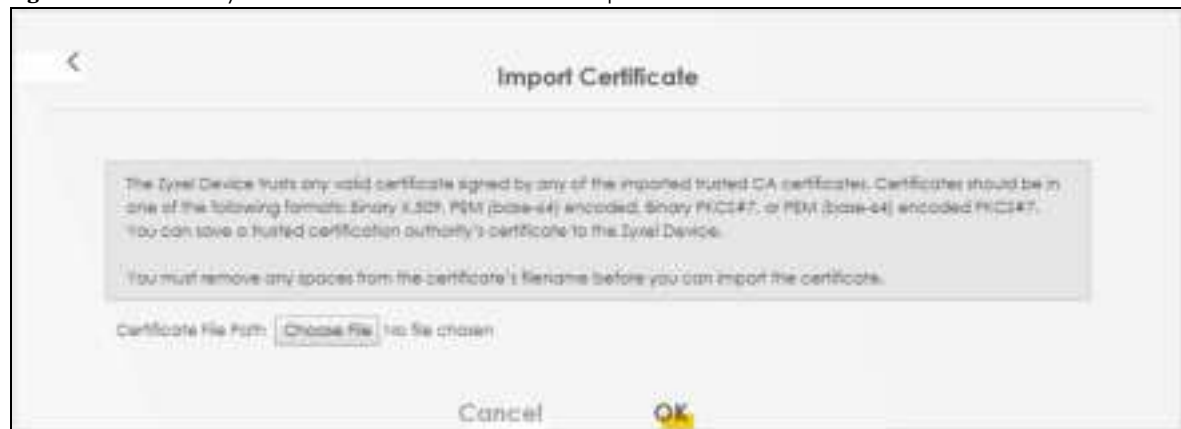
| LABEL  | DESCRIPTION                                                                                                                                                                                                                                                                                                  |
|--------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Type   | This field displays general information about the certificate. <b>ca</b> means that a Certification Authority signed the certificate.                                                                                                                                                                        |
| Modify | Click the <b>View</b> icon to open a screen with an in-depth list of information about the certificate (or certification request).<br><br>Click the <b>Remove</b> icon to delete the certificate (or certification request). You cannot delete a certificate that one or more features is configured to use. |

## 23.5 Import Trusted CA Certificate

Click **Import Certificate** in the **Trusted CA** screen to open the **Import Certificate** screen. The Zyxel Device trusts any valid certificate signed by any of the imported trusted CA certificates. Certificates should be in one of the following formats: Binary X.509, PEM (base-64) encoded, Binary PKCS#7, or PEM (base-64) encoded PKCS#7.

Note: You must remove any spaces from the certificate's filename before you can import the certificate.

Figure 247 Security &gt; Certificates &gt; Trusted CA &gt; Import Certificate



The following table describes the labels in this screen.

Table 155 Security &gt; Certificates &gt; Trusted CA &gt; Import Certificate

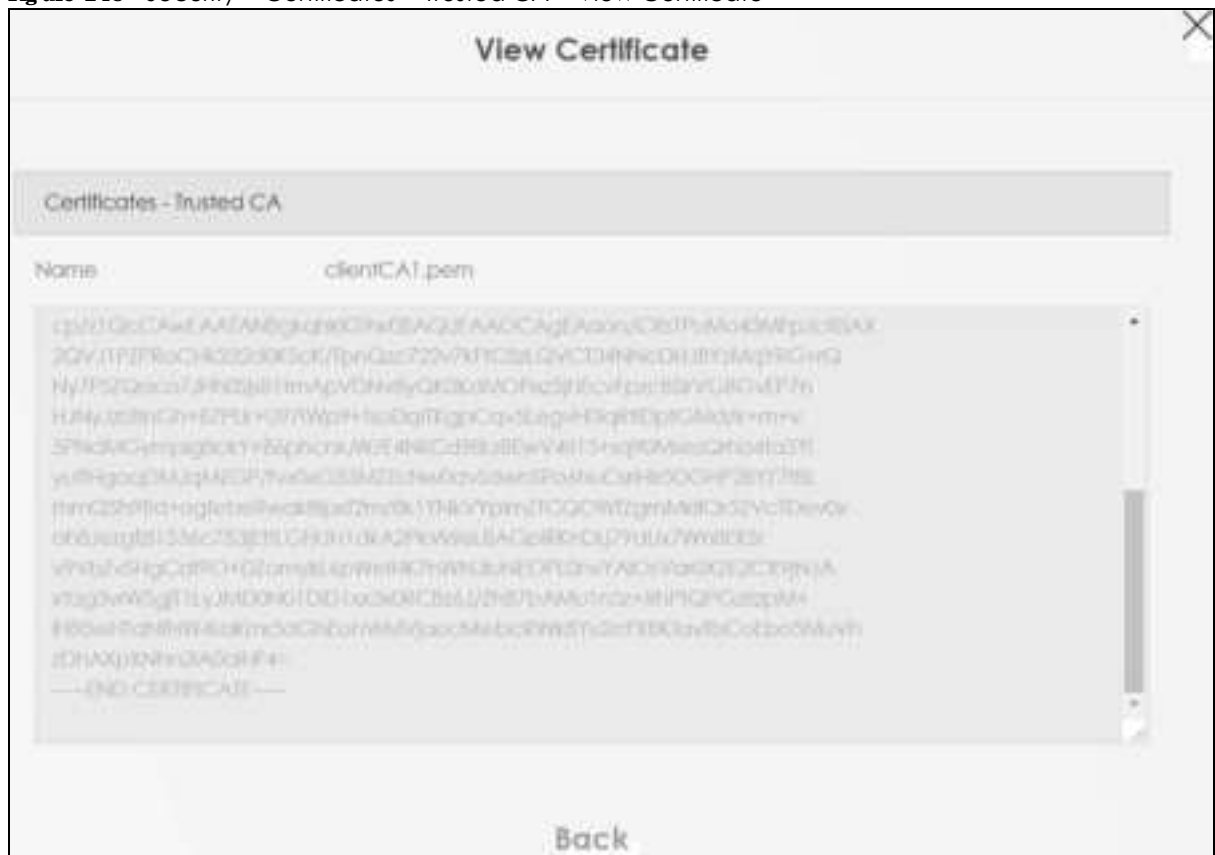
| LABEL                 | DESCRIPTION                                                                                                    |
|-----------------------|----------------------------------------------------------------------------------------------------------------|
| Certificate File Path | Enter the location of the file you want to upload in this field or click <b>Choose File/Browse</b> to find it. |
| Choose File/Browse    | Click this to find the certificate file you want to upload.                                                    |
| OK                    | Click this to save the certificate on the Zyxel Device.                                                        |
| Cancel                | Click this to exit this screen without saving.                                                                 |

## 23.6 View Trusted CA Certificate

Use this screen to view in-depth information about the certification authority's certificate. The certificate text box is read-only and can be distributed to others.

Click **Security > Certificates > Trusted CA** to open the **Trusted CA** screen. Click the **View** icon to open the **View Certificate** screen.

**Figure 248** Security > Certificates > Trusted CA > View Certificate



The following table describes the labels in this screen.

Table 156 Security > Certificates > Trusted CA > View Certificate

| LABEL | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|-------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Name  | This field displays the identifying name of this certificate.                                                                                                                                                                                                                                                                                                                                                                                                                    |
|       | <p>This read-only text box displays the certificate or certification request in Privacy Enhanced Mail (PEM) format. PEM uses 64 ASCII characters to convert the binary certificate into a printable form.</p> <p>You can copy and paste the certificate into an email to send to friends or colleagues or you can copy and paste the certificate into a text editor and save the file on a management computer for later distribution (through USB thumb drive for example).</p> |
| Back  | Click this to return to the previous screen.                                                                                                                                                                                                                                                                                                                                                                                                                                     |

## 23.7 Certificates Technical Reference

This section provides some technical background information about the topics covered in this chapter.

### **Certification Authorities**

A Certification Authority (CA) issues certificates and guarantees the identity of each certificate owner. There are commercial certification authorities like CyberTrust or VeriSign and government certification authorities.

### **Public and Private Keys**

When using public-key cryptology for authentication, each host has two keys. One key is public and can be made openly available; the other key is private and must be kept secure. Public-key encryption in general works as follows.

- 1 Tim wants to send a private message to Jenny. Tim generates a public-private key pair. What is encrypted with one key can only be decrypted using the other.
- 2 Tim keeps the private key and makes the public key openly available.
- 3 Tim uses his private key to encrypt the message and sends it to Jenny.
- 4 Jenny receives the message and uses Tim's public key to decrypt it.
- 5 Additionally, Jenny uses her own private key to encrypt a message and Tim uses Jenny's public key to decrypt the message.

The Zyxel Device uses certificates based on public-key cryptology to authenticate users attempting to establish a connection. The method used to secure the data that you send through an established connection depends on the type of connection. For example, a VPN tunnel might use the triple DES encryption algorithm.

The certification authority uses its private key to sign certificates. Anyone can then use the certification authority's public key to verify the certificates.

### **Advantages of Certificates**

- Certificates offer the following benefits. The Zyxel Device only has to store the certificates of the certification authorities that you decide to trust, no matter how many devices you need to authenticate.
- Key distribution is simple and very secure since you can freely distribute public keys and you never need to transmit private keys.

### **Certificate File Format**

The certification authority certificate that you want to import has to be in PEM (Base-64) encoded X.509 file format. This Privacy Enhanced Mail format uses 64 ASCII characters to convert a binary X.509 certificate into a printable form.

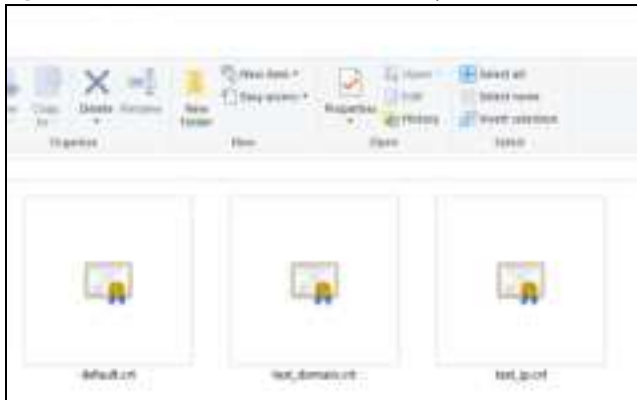
### 23.7.1 Verify a Certificate

Before you import a trusted CA or trusted remote host certificate into the Zyxel Device, you should verify that you have the actual certificate. This is especially true of trusted CA certificates since the Zyxel Device also trusts any valid certificate signed by any of the imported trusted CA certificates.

You can use a certificate's fingerprint to verify it. A certificate's fingerprint is a message digest calculated using the MD5 or SHA1 algorithms. The following procedure describes how to check a certificate's fingerprint to verify that you have the actual certificate.

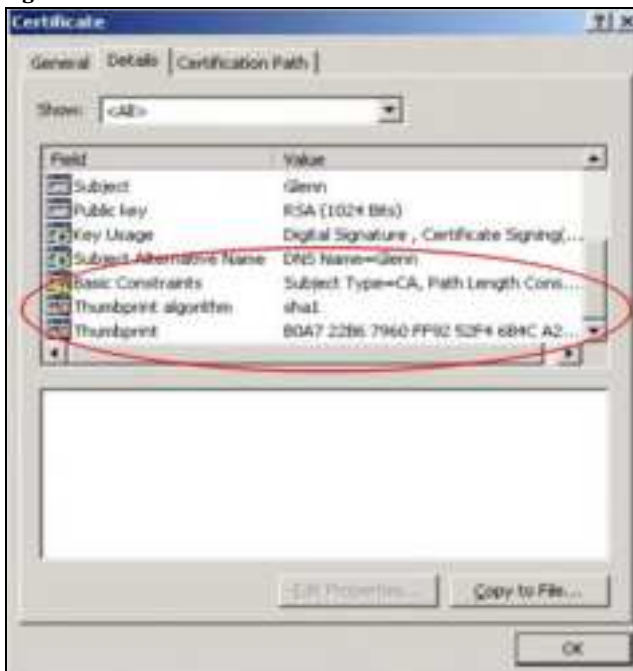
- 1 Browse to where you have the certificate saved on your computer.
- 2 Make sure that the certificate has a ".cer" or ".crt" file name extension.

**Figure 249** Certificates on Your Computer



- 3 Double-click the certificate's icon to open the **Certificate** window. Click the **Details** tab and scroll down to the **Thumbprint Algorithm** and **Thumbprint** fields.

**Figure 250** Certificate Details



Use a secure method to verify that the certificate owner has the same information in the **Thumbprint Algorithm** and **Thumbprint** fields. The secure method may vary based on your situation. Possible examples would be over the telephone or through an HTTPS connection.

# CHAPTER 24

## Voice

### 24.1 Voice Overview

You can make calls over the Internet using VoIP technology. For this, you first need to set up a SIP account with a SIP service provider.

Use this chapter to:

- Connect an analog phone to the Zyxel Device.
- Configure settings such as speed dial.
- Configure network settings to optimize the voice quality of your phone calls.

#### 24.1.1 What You Can Do in this Chapter

These screens allow you to configure your Zyxel Device to make phone calls over the Internet and your regular phone line, and to set up the phone you connect to the Zyxel Device.

- Use the **SIP Account** screen to set up information about your SIP account, control which SIP accounts the phones connected to the Zyxel Device use, and configure audio settings such as volume levels for the phones connected to the Zyxel Device ([Section 24.3 on page 408](#)).
- Use the **SIP Service Provider** screen to configure the SIP server information, and the numbers for certain phone functions ([Section 24.4 on page 414](#)).
- Use the **SIP TLS Common** screen to change the default TLS local port if you need to, and select a local certificate for the SIP server to verify the Zyxel Device. ([Section 24.5 on page 419](#)).
- Use the **Phone** screens to change settings that depend on which region of the world the Zyxel Device is in ([Section 24.6 on page 420](#)).
- Use the **Call Rule** screen to set up shortcuts for dialing frequently-used (VoIP) phone numbers ([Section 24.8 on page 423](#)).
- Use the **Call History** screen to view a call history list ([Section 24.9 on page 424](#)).

You do not necessarily need to use all these screens to set up your account. In fact, if your service provider did not supply information on a particular field in a screen, it is usually best to leave it at its default setting.

#### 24.1.2 What You Need to Know About VoIP

##### VoIP

VoIP stands for Voice over IP. IP is the Internet Protocol, which is the message-carrying standard the Internet runs on. So, Voice over IP is the sending of voice signals (speech) over the Internet (or another network that uses the Internet Protocol).

## **SIP**

SIP stands for Session Initiation Protocol. SIP is a signaling standard that lets one network device (like a computer or the Zyxel Device) send messages to another. In VoIP, these messages are about phone calls over the network. For example, when you dial a number on your Zyxel Device, it sends a SIP message over the network asking the other device (the number you dialed) to take part in the call. To access this screen, click **VoIP > SIP**.

## **SIP Accounts**

A SIP account is a type of VoIP account. It is an arrangement with a service provider that lets you make phone calls over the Internet. When you set the Zyxel Device to use your SIP account to make calls, the Zyxel Device is able to send all the information about the phone call to your service provider on the Internet.

Strictly speaking, you do not need a SIP account. It is possible for one SIP device (like the Zyxel Device) to call another without involving a SIP service provider. However, the networking difficulties involved in doing this make it tremendously impractical under normal circumstances. Your SIP account provider removes these difficulties by taking care of the call routing and setup – figuring out how to get your call to the right place in a way that you and the other person can talk to one another.

## **SIP Address**

A SIP address is a URI (Uniform Resource Identifier) that resembles an email address, using the format: user@domain. It uniquely identifies a telephone extension over a VoIP system. A SIP address of 123-45-67@voip-provider.net tells a client to connect to voip-provider.net and request a connection to 123-45-67. While VoIP can only send voice messages over the Internet, SIP (though strictly speaking is a type of VoIP) can send voice, data, video, and other media. VoIP phones also need to be connected to a computer to function, whereas SIP phones only need to be connected to a modem.

## **24.2 Before You Begin**

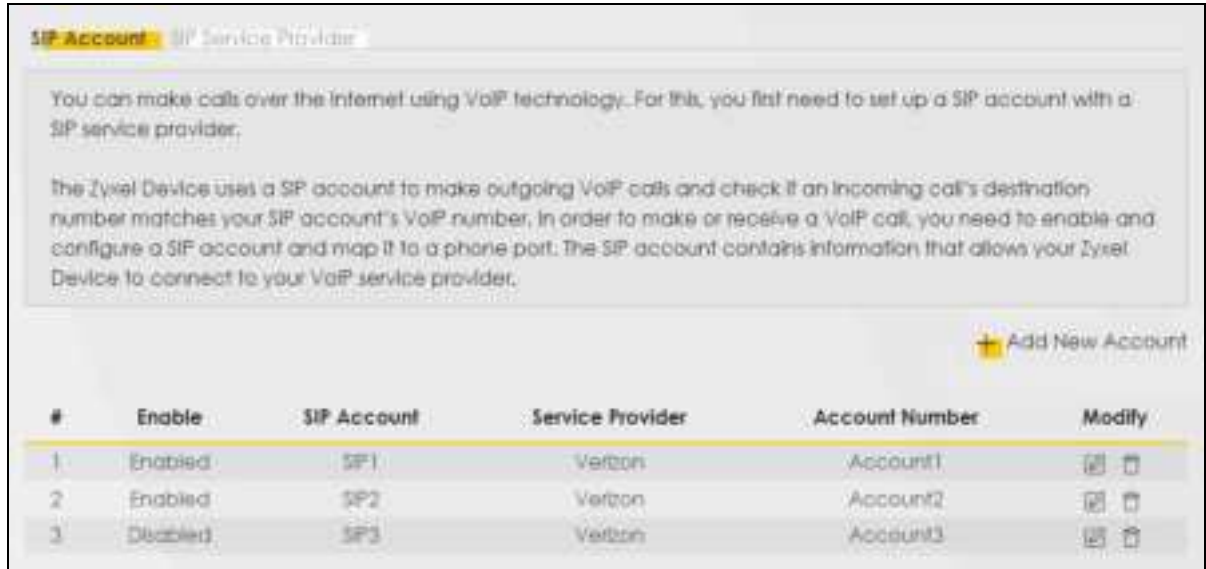
- Before you can use these screens, you need to have a VoIP account already set up. If you do not have one yet, you can sign up with a VoIP service provider over the Internet.
- You should have the information your VoIP service provider gave you ready, before you start to configure the Zyxel Device.

## **24.3 SIP Account**

You can make calls over the Internet using VoIP technology. For this, you first need to set up a SIP account with a SIP service provider. The Zyxel Device uses a SIP account to make outgoing VoIP calls, and to check if an incoming call's destination number matches your SIP account's VoIP number. In order to make and receive VoIP calls, you need to enable and configure a SIP account, and then map it to a phone port. The SIP account contains information that allows your Zyxel Device to connect to your VoIP service provider.

To access this screen, click **VoIP > SIP > SIP Account**.



**Figure 251** VoIP > SIP > SIP Account

The following table describes the labels in this screen.

Table 157 VoIP &gt; SIP &gt; SIP Account

| LABEL            | DESCRIPTION                                                                                                                                                                   |
|------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Add New Account  | Click this to configure a SIP account.                                                                                                                                        |
| #                | This is the index number of the entry.                                                                                                                                        |
| Enable           | This shows whether the SIP account is activated or not. A yellow bulb signifies that this SIP account is activated. A gray bulb signifies that this SIP account is activated. |
| SIP Account      | This shows the name of the SIP account.                                                                                                                                       |
| Service Provider | This shows the name of the SIP service provider.                                                                                                                              |
| Account Number   | This shows the SIP number.                                                                                                                                                    |
| Modify           | Click the <b>Modify</b> icon to configure the SIP account.                                                                                                                    |

### 24.3.1 Add or Edit SIP Account

Use this screen to configure a SIP account and map it to a phone port in the **Phone Device** screen. To access this screen, click the **Add New Account** button or click the **Edit** icon of an entry in the **VoIP > SIP > SIP Account** screen.

Note: You do not necessarily need to use all these fields to set up your account.

**Figure 252** VoIP > SIP > SIP Account > Add Account or Edit

**Add New Account**

**SIP Account Selection**

SIP Account Selection: ChangeMe

**SIP Service Provider Association**

SIP Account Associated with: ChangeMe

**General**

☐ Enable SIP Account

SIP Account Number: ChangeMe

**Authentication**

Username: ChangeMe

Password:

**URL Type**

URL Type: SIP

**Voice Features**

Primary Compression Type: G.711u

Secondary Compression Type: G.711a

Third Compression Type: G.722

Speaking Volume Control: Middle

Listening Volume Control: Middle

☒ Enable G.188 (Echo Cancellation)

☒ Enable VAD (Voice Active Detector)

**Figure 253** VoIP > SIP > SIP Account > Add Account or Edit (Call Features)

**Call Features**

☒ Send Caller ID

☒ Enable Call Transfer

☒ Enable Call Waiting

Call Waiting Reject Time:  (10-40 Second)

☐ Enable Unconditional Forward: To Number:

☐ Enable Busy Forward: To Number:

☐ Enable No Answer Forward: To Number:

No Answer Time:  (10-175 Second)

**Caution:**  
If you enable [Unconditional Forward], [Busy Forward] and [No Answer] will be ignored.

☐ Enable Do Not Disturb (DND)

**Warning:**  
If you enable this item, you will not get indication when somebody call you.

☐ Active Incoming Anonymous Call Block

☐ Enable MWI

MWI Subscribe Expiration Time:  (1-20000 Second)

☐ Hot Line / Warm Line Number

☒ Warm Line ☐ Hot Line

Hot Line / Warm Line Number:

Warm Line Timer:  (1-600 Second)

☐ Enable Mixed Call Email Notification

Mail Account:

Send Notification to e-mail:

Mixed Call e-mail Title:

**Notice:**  
Please configure mail server in "Maintenance > e-mail notification" page and select the mail server for this feature.

☐ Sorry Message

IVR Play Index:

☐ Music On Hold (MOH)

IVR Play Index:

Cancel **OK**

VoIPThe following table describes the labels in this screen.

Table 158 VoIP > SIP > SIP Account > SIP Account Entry Edit

| LABEL                                    | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SIP Account Selection                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| SIP Account Selection                    | This field displays <b>ChangeMe</b> if you are creating a new SIP account or the SIP account you are modifying.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| SIP Service Provider Association         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| SIP Account Associated with              | <p>Select the SIP service provider profile to use for the SIP account you are configuring in this screen. You should already have configured a SIP service provider profile in the <b>SIP Service Provider</b> screen.</p> <p>This field is read-only when you are modifying an existing SIP account.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| General                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Enable SIP Account                       | Select this if you want the Zyxel Device to use this account. Clear it if you do not want the Zyxel Device to use this account.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| SIP Account Number                       | Enter your SIP number. In the full SIP URI, this is the part before the @ symbol. You can use up to 127 printable characters and spaces.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Authentication                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Username                                 | Enter the user name for registering this SIP account, exactly as it was given to you. You can use up to 95 alphanumeric (0-9, a-z, A-Z), printable special characters and spaces.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Password                                 | Enter the password for registering this SIP account, exactly as it was given to you. You can use up to 95 alphanumeric (0-9, a-z, A-Z), printable special characters and spaces.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| URL Type                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| URL Type                                 | <p>Select whether or not to include the SIP service domain name when the Zyxel Device sends the SIP number.</p> <p><b>SIP</b> – include the SIP service domain name.</p> <p><b>TEL</b> – do not include the SIP service domain name.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Voice Features                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Primary/Secondary/Third Compression Type | <p>Select the type of voice coder or decoder (codec) that you want the Zyxel Device to use.</p> <p>G.711 provides higher voice quality but requires more bandwidth (64 kbps).</p> <ul style="list-style-type: none"> <li>• <b>G.729</b> provides good sound quality and reduces the required bandwidth to 8 kbps.</li> <li>• <b>G.711a</b> is typically used in Europe.</li> <li>• <b>G.711u</b> is typically used in North America and Japan.</li> <li>• <b>G.726-24</b> operates at 24 kbps.</li> <li>• <b>G.726-32</b> operates at 32 kbps.</li> <li>• <b>G.722</b> operates at 6.3 kbps or 5.3 kbps.</li> </ul> <p>When two SIP devices start a SIP session, they must agree on a codec.</p> <p>Select the Zyxel Device's first choice for voice coder or decoder.</p> <p>Select the Zyxel Device's second choice for voice coder or decoder. Select <b>None</b> if you only want the Zyxel Device to accept the first choice.</p> <p>Select the Zyxel Device's third choice for voice coder or decoder. Select <b>None</b> if you only want the Zyxel Device to accept the first or second choice.</p> |
| Speaking Volume Control                  | Select the loudness that the Zyxel Device uses for speech that it sends to the peer device. Choices are <b>Minimum</b> , <b>Middle</b> , and <b>Maximum</b> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |

Table 158 VoIP &gt; SIP &gt; SIP Account &gt; SIP Account Entry Edit (continued)

| <b>LABEL</b>                         | <b>DESCRIPTION</b>                                                                                                                                                                                                                                                                                                                                      |
|--------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Listening Volume Control             | Select the loudness that the Zyxel Device uses for speech that it receives from the peer device. Choices are <b>Minimum</b> , <b>Middle</b> , and <b>Maximum</b> .                                                                                                                                                                                      |
| Enable G.168 (Echo Cancellation)     | Select this if you want to eliminate the echo caused by the sound of your voice reverberating in the telephone receiver while you talk.                                                                                                                                                                                                                 |
| Enable VAD (Voice Active Detector)   | Select this if the Zyxel Device should stop transmitting when you are not speaking. This reduces the bandwidth the Zyxel Device uses.                                                                                                                                                                                                                   |
| Call Features                        |                                                                                                                                                                                                                                                                                                                                                         |
| Send Caller ID                       | Select this if you want to send identification when you make VoIP phone calls. Clear this if you do not want to send identification.                                                                                                                                                                                                                    |
| Enable Call Transfer                 | Select this to enable call transfer on the Zyxel Device. This allows you to transfer an incoming call (that you have answered) to another phone.                                                                                                                                                                                                        |
| Enable Call Waiting                  | Select this to enable call waiting on the Zyxel Device. This allows you to place a call on hold while you answer another incoming call on the same telephone (directory) number.                                                                                                                                                                        |
| Call Waiting Reject Timer            | Specify a time of seconds that the Zyxel Device waits before rejecting the second call if you do not answer it.                                                                                                                                                                                                                                         |
| Enable Unconditional Forward         | Select this if you want the Zyxel Device to forward all incoming calls to the specified phone number.<br><br>Specify the phone number in the <b>To Number</b> field on the right.                                                                                                                                                                       |
| Enable Busy Forward                  | Select this if you want the Zyxel Device to forward incoming calls to the specified phone number if the phone port is busy.<br><br>Specify the phone number in the <b>To Number</b> field on the right.<br><br>If you have call waiting, the incoming call is forwarded to the specified phone number if you reject or ignore the second incoming call. |
| Enable No Answer Forward             | Select this if you want the Zyxel Device to forward incoming calls to the specified phone number if the call is unanswered. (See <b>No Answer Time</b> .)<br><br>Specify the phone number in the <b>To Number</b> field on the right.                                                                                                                   |
| No Answer Time                       | This field is used by the <b>Active No Answer Forward</b> feature.<br><br>Enter the number of seconds the Zyxel Device should wait for you to answer an incoming call before it considers the call unanswered.                                                                                                                                          |
| Enable Do Not Disturb (DND)          | Select this to turn the do not disturb feature on. This has the Zyxel Device reject all calls destined to the phone line.                                                                                                                                                                                                                               |
| Active Incoming Anonymous Call Block | Select this to have the phone not ring for incoming calls with caller ID deactivated.                                                                                                                                                                                                                                                                   |
| Enable MWI                           | Select this if you want to hear a waiting (beeping) dial tone on your phone when you have at least one voice message. Your VoIP service provider must support this feature.                                                                                                                                                                             |
| MWI Subscribe Expiration Time        | Keep the default value of this field unless your VoIP service provider tells you to change it. Enter the number of seconds the SIP server should provide the message waiting service each time the Zyxel Device subscribes to the service. Before this time passes, the Zyxel Device automatically subscribes again.                                    |
| Hot Line / Warm Line Number          | Select this to enable the hot line or warm line feature on the Zyxel Device.                                                                                                                                                                                                                                                                            |
| Hot Line                             | Select this to have the Zyxel Device dial the specified hot line number immediately when you pick up the telephone.                                                                                                                                                                                                                                     |
| Warm Line                            | Select this to have the Zyxel Device dial the specified warm line number after you pick up the telephone and do not press any keys on the keypad for a period of time.                                                                                                                                                                                  |

Table 158 VoIP &gt; SIP &gt; SIP Account &gt; SIP Account Entry Edit (continued)

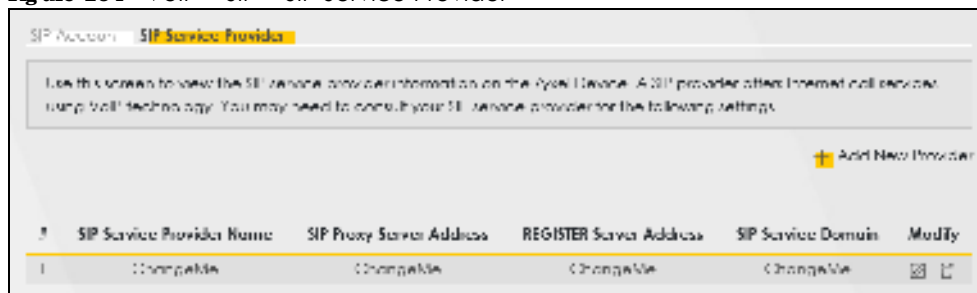
| Label                                 | Description                                                                                                                                                                                                                                  |
|---------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Hot Line / Warm Line Number           | Enter the number of the hot line or warm line that you want the Zyxel Device to dial.                                                                                                                                                        |
| Warm Line Timer                       | Enter a number of seconds that the Zyxel Device waits before dialing the warm line number if you pick up the telephone and do not press any keys on the keypad.                                                                              |
| Enable Missed Call Email Notification | Select this option to have the Zyxel Device email you a notification when there is a missed call.                                                                                                                                            |
| Mail Account                          | Select a mail account for the email address specified below. If you select <b>None</b> here, email notifications will not be sent through email.<br>You must have configured a mail account already in the <b>Email Notification</b> screen. |
| Send Notification to e-mail           | Notifications are sent to the email address specified in this field. If this field is left blank, notifications will not be sent through email.                                                                                              |
| Missed Call e-mail Title              | Type a title that you want to be in the subject line of the email notifications that the Zyxel Device sends.                                                                                                                                 |
| Early Media                           | Select this if you want people to hear a customized recording when they call you.                                                                                                                                                            |
| IVR Play Index                        | Select the tone you want people to hear when they call you.<br>This field is configurable only when you select <b>Early Media</b> . See <a href="#">Section 24.10 on page 425</a> for information on how to record these tones.              |
| Music On Hold (MOH)                   | Select this to play a customized recording when you put people on hold.                                                                                                                                                                      |
| IVR Play Index                        | Select the tone to play when you put someone on hold.<br>This field is configurable only when you select <b>Music on Hold</b> . See <a href="#">Section 24.10 on page 425</a> for information on how to record these tones.                  |
| OK                                    | Click this to save your changes.                                                                                                                                                                                                             |
| Cancel                                | Click this to exit this screen without saving.                                                                                                                                                                                               |

## 24.4 SIP Service Provider

Use this screen to view the SIP service provider information on the Zyxel Device. A SIP provider offers Internet call services using VoIP technology. You may need to consult your SIP service provider for the following settings.

To access this screen, click **VoIP > SIP > SIP Service Provider**.

Figure 254 VoIP &gt; SIP &gt; SIP Service Provider



The following table describes the labels in this screen.

Table 159 VoIP > SIP > SIP Service Provider

| LABEL                     | DESCRIPTION                                                                                                                                                  |
|---------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Add New Provider          | Click this button to add a new SIP service provider.                                                                                                         |
| #                         | This is the index number of the entry.                                                                                                                       |
| SIP Service Provider Name | This shows the name of the SIP service provider.                                                                                                             |
| SIP Proxy Server Address  | This shows the IP address or domain name of the SIP server.                                                                                                  |
| REGISTER Server Address   | This shows the IP address or domain name of the SIP register server.                                                                                         |
| SIP Service Domain        | Enter the SIP service domain name. In the full SIP URI, this is the part after the @symbol. You can use up to 127 printable ASCII Extended set characters.   |
| Modify                    | Click the <b>Edit</b> icon to configure the SIP service provider.<br>Click the <b>Delete</b> icon to delete this SIP service provider from the Zyxel Device. |

### 24.4.1 Provider Entry Add/ Edit

Use this screen to configure the SIP server information, the numbers for certain phone functions and dialing plan for a SIP service provider.

Click the **Modify** icon next to a profile of SIP service provider settings in the **VoIP > SIP > SIP Service Provider** to open the following screen.

Note: Click this () to see all the fields in the screen. You do not necessarily need to use all these fields to set up your account. Click again to see and configure only the fields needed for this feature.

**Figure 255** VoIP > SIP > SIP Service Provider: Add New Provider or Edit

**Add New Provider**

**SIP Service Provider Selection**  
 Service Provider Selection: **ADD NEW**

**General**

☒ Create SIP Service Provider

SIP Service Provider Name:

SIP Access Port:  (1024-65535)

SIP Proxy Server Address:

SIP Proxy Server Port:  (1024-65535)

SIP REGISTER Server Address:

SIP REGISTER Server Port:  (1024-65535)

SIP Service Domain:

**RTC Support**  
☒ Enable SIP, H.323, and RTP/RTCP

**VoIP-QoS Flags**  
☒ Enable the VoIP QoS flag in DSCP to DSCP mapping  
☒ Enable the VoIP QoS flag in DSCP to DSCP mapping

**Session Interface Name**  
 Session Interface Name: ☒ Ethernet ☐ Cellular

**Outbound Proxy**  
 Outbound Proxy Address:

Outbound Proxy Port:  (1024-65535)

☒ Use SIP Proxy (SIP Proxy)

**SIP Port Range**  
 Start Port:  (1024-65535)  
 End Port:  (1024-65535)

**SETP Support**  
☒ SIP Support

Enable Setp: ☐ Available ☒ Disabled

**SRTP Mode**  
 SRTP Mode:

**Transport Type**  
 Transport Type:

**TAX Option**  
☐ Enable Taxation ☒ Disable Taxation

**QoS Tag**  
 SIP DSCP Mark Setting:  (0-63)  
 RTP DSCP Mark Setting:  (0-63)

**Timer Setting**  
 SIP Register Expiration Duration:  (30-86400 seconds)  
 SIP Register Refresh Interval:  (30-86400 seconds)  
 Session Expires (s):  (100-86400 seconds)  
 SIP INV:  (100-86400 seconds)

**Timing Interval Selection**  
 Timing Interval Selection:  (1-1000)

**SIP Server Locating DNS Method**  
☒ DNS ☐ Static ☐ Manual

Cancel



The following table describes the labels in this screen.

Table 160 VoIP > SIP > SIP Service Provider > Add New Provider or Edit

| LABEL                                                    | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|----------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SIP Service Provider Selection                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Service Provider Selection                               | This field displays <b>ADD_NEW</b> if you are creating a new SIP service provider profile or the SIP service provider name you are modifying.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| General                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| SIP Service Provider                                     | Select this if you want the Zyxel Device to use this SIP provider. Clear it if you do not want the Zyxel Device to use this SIP provider.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| SIP Service Provider Name                                | Enter the name of your SIP service provider.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| SIP Local Port                                           | Enter the Zyxel Device's listening port number, if your VoIP service provider gave you one. Otherwise, keep the default value.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| SIP Proxy Server Address                                 | Enter the IP address or domain name of the SIP server provided by your VoIP service provider. You can use up to 95 printable characters except [ " ], [ ` ], [ ' ], [ < ], [ > ], [ ^ ], [ \$ ], [   ], [ & ], or [ ; ]. It does not matter whether the SIP server is a proxy, redirect or register server.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| SIP Proxy Server Port                                    | Enter the SIP server's listening port number, if your VoIP service provider gave you one. Otherwise, keep the default value.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| SIP REGISTRAR Server Address                             | Enter the IP address or domain name of the SIP register server, if your VoIP service provider gave you one. Otherwise, enter the same address you entered in the <b>SIP ServerAddress</b> field. You can use up to 95 printable characters except [ " ], [ ` ], [ ' ], [ < ], [ > ], [ ^ ], [ \$ ], [   ], [ & ], or [ ; ].                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| SIP REGISTRAR Server Port                                | Enter the SIP register server's listening port number, if your VoIP service provider gave you one. Otherwise, enter the same port number you entered in the <b>SIP ServerPort</b> field.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| SIP Service Domain                                       | Enter the SIP service domain name. In the full SIP URI, this is the part after the @ symbol. You can use up to 127 printable characters except [ " ], [ ` ], [ ' ], [ < ], [ > ], [ ^ ], [ \$ ], [   ], [ & ], or [ ; ].                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| RFC Support                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| PRACK (RFC 3262, Require: 100rel)                        | <p>During a call session, there are two types of SIP responses used – final and provisional. Final responses convey the result of a request and require a confirmation response. Provisional responses only convey the request processing progress and does not require a confirmation response, and are therefore considered unreliable.</p> <p>RFC 3262 defines a mechanism to provide reliable transmission of SIP provisional response messages, which convey information on the processing progress of the request. This uses the option tag 100rel and the Provisional Response ACKnowledgement (PRACK) method.</p> <p>Which is, the Zyxel Device includes a SIP Require header field with the option tag 100rel in all INVITE requests. When the Zyxel Device receives a SIP response message indicating that the phone it called is ringing, the Zyxel Device sends a PRACK message to have both sides confirm the message is received.</p> <p>Select this to have the caller require the option tag 100rel to send provisional responses reliably.</p> |
| VoIP IOP Flags – Select VoIP inter-operability settings. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Replace dial digit '#' to '%23' in SIP messages          | Replace a dial digit "#" with "%23" in the INVITE messages.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Remove the 'Route' header in SIP messages                | Remove the 'Route' header in SIP packets.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Bound Interface Name                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |

Table 160 VoIP &gt; SIP &gt; SIP Service Provider &gt; Add New Provider or Edit (continued)

| LABEL                            | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Bound Interface Name             | <p>If you select <b>AnyWAN</b>, the Zyxel Device automatically activates the VoIP service when any WAN connection is up.</p> <p>If you select <b>MultiWAN</b>, you also need to select the pre-configured WAN connections. The VoIP service is activated only when one of the selected WAN connections is up.</p>                                                                                                                                                                                                                             |
| Outbound Proxy                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Outbound Proxy Address           | Enter the IP address or domain name of the SIP outbound proxy server if your VoIP service provider has a SIP outbound server to handle voice calls. This allows the Zyxel Device to work with any type of NAT router and eliminates the need for STUN or a SIP ALG. Turn off any SIP ALG on a NAT router in front of the Zyxel Device to keep it from re-translating the IP address (since this is already handled by the outbound proxy server).                                                                                             |
| Outbound Proxy Port              | Enter the SIP outbound proxy server's listening port, if your VoIP service provider gave you one. Otherwise, keep the default value.                                                                                                                                                                                                                                                                                                                                                                                                          |
| Use DHCP Option 120 first        | Select this to have the Zyxel Device use DHCP Option 120 first.                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| RTP Port Range                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Start/End Port                   | <p>Enter the listening port numbers for RTP traffic, if your VoIP service provider gave you this information. Otherwise, keep the default values.</p> <p>To enter one port number, enter the port number in the <b>Start Port</b> and <b>End Port</b> fields.</p> <p>To enter a range of ports,</p> <ul style="list-style-type: none"> <li>enter the port number at the beginning of the range in the <b>Start Port</b> field.</li> <li>enter the port number at the end of the range in the <b>End Port</b> field.</li> </ul>                |
| DTMF Mode                        | <p>Control how the Zyxel Device handles the tones that your telephone makes when you push its buttons. You should use the same mode your VoIP service provider uses.</p> <p><b>RFC 2833</b> – send the DTMF tones in RTP packets.</p> <p><b>PCM</b> – send the DTMF tones in the voice data stream. This method works best when you are using a codec that does not use compression (like G.711). Codecs that use compression (like G.729 and G.726) can distort the tones.</p> <p><b>SIP INFO</b> – send the DTMF tones in SIP messages.</p> |
| Transport Type                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Transport Type                   | <p>Select the protocol used to transport the SIP packets.</p> <p>For <b>UDP</b> and <b>TCP</b>, see the Service appendix for more information on the example services and the required protocol and port number.</p>                                                                                                                                                                                                                                                                                                                          |
| Ignore Direct IP                 | Select <b>Enable</b> to have the connected devices accept SIP requests only from the SIP proxy/register server specified above. SIP requests sent from other IP addresses will be ignored.                                                                                                                                                                                                                                                                                                                                                    |
| QoS Tag                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| SIP DSCP Mark Setting            | Enter the DSCP (DiffServ Code Point) number for SIP message transmissions. The Zyxel Device creates Class of Service (CoS) priority tags with this number to SIP traffic that it transmits.                                                                                                                                                                                                                                                                                                                                                   |
| RTP DSCP Mark Setting            | Enter the DSCP (DiffServ Code Point) number for RTP voice transmissions. The Zyxel Device creates Class of Service (CoS) priority tags with this number to RTP traffic that it transmits.                                                                                                                                                                                                                                                                                                                                                     |
| Timer Setting                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| SIP Register Expiration Duration | Enter the number of seconds your SIP account is registered with the SIP register server before it is deleted. The Zyxel Device automatically tries to re-register your SIP account when one-half of this time has passed (The SIP register server might have a different expiration).                                                                                                                                                                                                                                                         |

Table 160 VoIP &gt; SIP &gt; SIP Service Provider &gt; Add New Provider or Edit (continued)

| LABEL                          | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|--------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SIP Register Fall Re-try timer | Enter the number of seconds the Zyxel Device waits before it tries again to register the SIP account, if the first try failed or if there is no response.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Session Expires [SE]           | Enter the number of seconds the Zyxel Device lets a SIP session remain idle (without traffic) before it automatically disconnects the session.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Min-SE                         | Enter the minimum number of seconds the Zyxel Device lets a SIP session remain idle (without traffic) before it automatically disconnects the session. When two SIP devices start a SIP session, they must agree on an expiration time for idle sessions. This field is the shortest expiration time that the Zyxel Device accepts.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Dialing Interval Selection     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Dialing Interval Selection     | Enter the number of seconds the Zyxel Device should wait after you stop dialing numbers before it makes the phone call. The value depends on how quickly you dial phone numbers.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| SIP Server Location DNS Method | <p>Select the method that the Zyxel Device used to query the ISP's DNS server for SIP server address. The Zyxel Device will use the query result to locate the SIP server for phone service registration.</p> <p>Select <b>BASIC</b> to have the Zyxel Device query the DNS server for a DNS A record that contains the IP address of the SIP server.</p> <p>Select <b>SRV</b> to have the Zyxel Device query the DNS server for a DNS Service (SRV) record. The SRV record is a list of all available SIP servers information that the DNS server maintains. The Zyxel Device will then use the SRV record to perform A query to get the SIP server IP. This is useful if your primary SIP server experiences difficulties, making it hard for your IP phone users to make SIP calls.</p> <p>Select <b>NAPTR</b> to have the Zyxel Device query the DNS server for DNS Name Authority Pointer (NAPTR) records in order to find the available services (transport protocols) supported by the SIP server. The Zyxel Device will then perform an SRV or A query to get the SIP server information.</p> |
| OK                             | Click this to save your changes.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Cancel                         | Click this to exit this screen without saving.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |

## 24.5 SIP TLS Common

Use this screen to:

- Change the default TLS local port.
- Select a local certificate for the SIP server to verify the Zyxel Device.

Note: To activate **SIP TLS Common**, select **TLS** in **Transport Type** in the **SIP Service Provider** screen.

To access this screen, click **VoIP > SIP > SIP TLS Common**.

**Figure 256** VoIP > SIP > SIP TLS Common

The following table describes the labels in this screen.

Table 161 VoIP &gt; SIP &gt; SIP TLS Common

| LABEL                     | DESCRIPTION                                                                                                                                                                                                                                                                                       |
|---------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| TLS Local Port            | Port 5061 is typically used for SIP over TLS. Enter the Zyxel Device's TLS local port number if your VoIP service provider gave you one. Otherwise, keep the default value.                                                                                                                       |
| Local Certificate         | This is the certificate the SIP server uses to verify the Zyxel Device. Go to <b>Certificate &gt; Local Certificate</b> and import a Zyxel Device certificate that the SIP server can use to verify the Zyxel Device, if required. Then select the certificate you imported in this field.        |
| Verify Server Certificate | Click to enable this if you want the Zyxel Device to verify the certificate from the SIP server. If required or if your VoIP service provider gave you a certificate, import the dedicated CA in <b>Certificate &gt; Trusted CA</b> in order for the Zyxel Device to authenticate the SIP server. |

## 24.6 Phone

Use these screens to configure SIP numbers and regions for IP phones that are connected to the Zyxel Device.

### 24.6.1 Phone Device

Use this screen to view detailed information on phones used for Internet phone calls (SIP). You can define which phones will ring when a specific SIP address receives an incoming call, and which SIP address will be used when an outgoing call is made with a specific phone.

To access this screen, click **VoIP > Phone > Phone Device**.

**Figure 257** VoIP > Phone > Phone Device

| # | Phone ID | Internal Number | Incoming SIP Number | Outgoing SIP Number | Modify |
|---|----------|-----------------|---------------------|---------------------|--------|
| 1 | PHONE1   | 111             | Changelle           | Changelle           | Edit   |
| 2 | PHONE2   | 112             | Changelle           | Changelle           | Edit   |

Each field is described in the following table.

Table 162 VoIP &gt; Phone &gt; Phone Device

| Label               | Description                                                                           |
|---------------------|---------------------------------------------------------------------------------------|
| #                   | This displays the index number of the phone device.                                   |
| Phone ID            | This field displays the name of a phone port on the Zyxel Device.                     |
| Internal Number     | This field displays the internal call prefix of a phone port on the Zyxel Device.     |
| Incoming SIP Number | This field displays the SIP address that you use to receive calls on this phone port. |
| Outgoing SIP Number | This field displays the SIP address that you use to make calls on this phone port.    |
| Modify              | Click the <b>Edit</b> icon to configure the SIP account.                              |

### 24.6.2 Phone Device Edit

Use this screen to control which SIP account and PSTN line each phone uses. Click an **Edit** icon in **VoIP > Phone > Phone Device** to open the following screen.

**Figure 258** VoIP > Phone > Phone Device > Edit

Each field is described in the following table.

**Table 163** VoIP > Phone > Phone Device > Edit

| LABEL                                   | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|-----------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SIP Account to Make Outgoing Call       | Select the SIP account you want to use when making outgoing calls with the analog phone connected to this phone port.                                                                                                                                                                                                                                                                                                                                                                                    |
| SIP Account(s) to Receive Incoming Call | Select a SIP account if you want to receive phone calls for the selected SIP account on this phone port.<br><br>If you select more than one SIP account for incoming calls, there is no way to distinguish between them when you receive phone calls. If you do not select a source for incoming calls, you cannot receive any calls on this phone port.                                                                                                                                                 |
| Immediate Dial Enable                   | Select this if you want to use the pound key (#) to tell the Zyxel Device to make the phone call immediately, instead of waiting for the number of second you selected in the <b>Dialog Interval Selection</b> field of the <b>VoIP &gt; SIP &gt; SIP Service Provider &gt; Add New Provider</b> or <b>Edit</b> screen.<br><br>If you select this, dial the phone number, and then press the pound key. The Zyxel Device makes the call immediately instead of waiting. You can still wait, if you want. |
| Cancel                                  | Click <b>Cancel</b> to exit this screen without saving                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| OK                                      | Click <b>OK</b> to save your changes.                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

## 24.7 Phone Region

Use this screen to configure settings that depend on which region of the world the Zyxel Device is in. Selecting the region where the device is physically located improves the quality of phone calls.

To access this screen, click **VoIP > Phone > Region**.

**Figure 259** VoIP > Phone > Region

Phone Device > **Region**

Use the screen to configure settings that depend on which region of the world the Zyxel Device is in. Selecting the region where the device is physically located improves the quality of phone calls.

Region Setting: NOR - Norway

Call Service Mode: Europe Type

None

You need to reboot the device after changing the region settings for it to take effect.

Cancel Apply

The following table describes the labels in this screen.

Table 164 VoIP > Phone > Region

| LABEL             | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Region Setting    | Select the place in which the Zyxel Device is located.                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Call Service Mode | Select the mode for supplementary phone services (call hold, call waiting, call transfer and three-way conference calls) that your VoIP service provider supports. <ul style="list-style-type: none"> <li>• <b>Europe Type</b> – use supplementary phone services in European mode.</li> <li>• <b>USA Type</b> – use supplementary phone services American mode.</li> </ul> You might have to subscribe to these services to use them. Contact your VoIP service provider. |
| Apply             | Click this to save your changes and to apply them to the Zyxel Device.                                                                                                                                                                                                                                                                                                                                                                                                     |
| Cancel            | Click this to set every field in this screen to its last-saved value.                                                                                                                                                                                                                                                                                                                                                                                                      |

Note: You need to reboot the Zyxel Device after changing the region settings for it to take effect.

## 24.8 Call Rule

Use this screen to add, edit, or remove speed-dial numbers for outgoing calls. Speed dial provides shortcuts for dialing frequently-used (VoIP) phone numbers. You also have to create speed-dial entries if you want to call SIP numbers that contain letters. Once you have configured a speed dial rule, you can use a shortcut (the speed dial number, #01 for example) on your phone's keypad to call the phone number. To access this screen, click **VoIP > Call Rule**.

**Figure 260** VoIP > Call Rule

**Call Rule**

Use this screen to add, edit, or remove speed-dial numbers for outgoing calls. Speed dial provides shortcuts for dialing frequently-used VoIP phone numbers. You also have to create speed dial entries if you want to dial SIP addresses that contain letters. Once you have configured a speed dial rule, you can use a shortcut (the speed dial number, 401 for example) on your phone's keypad to call the phone number.

**Clear All Speed Dials**

| Keys | Number | Description |
|------|--------|-------------|
| #01  |        |             |
| #02  |        |             |
| #03  |        |             |
| #04  |        |             |
| #05  |        |             |
| #06  |        |             |
| #07  |        |             |
| #08  |        |             |
| #09  |        |             |
| #10  |        |             |

**Cancel** **Apply**

The following table describes the labels in this screen.

**Table 165** VoIP > Call Rule

| LABEL                 | DESCRIPTION                                                                                                                                                                                                                                   |
|-----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Keys                  | This field displays the speed-dial number you should dial to use this entry.                                                                                                                                                                  |
| Number                | Enter the SIP number you want the Zyxel Device to call when you dial the speed-dial number.                                                                                                                                                   |
| Description           | Enter a short description to identify the party you call when you dial the speed-dial number. You can use up to 127 printable characters except [ " ], [ ` ], [ ' ], [ < ], [ > ], [ ^ ], [ \$ ], [   ], [ & ], or [ ; ]. Spaces are allowed. |
| Clear All Speed Dials | Click this button to remove all speed dials saved.                                                                                                                                                                                            |
| Apply                 | Click this to save your changes and to apply them to the Zyxel Device.                                                                                                                                                                        |
| Cancel                | Click this to set every field in this screen to its last-saved value.                                                                                                                                                                         |

## 24.9 Call History

The Zyxel Device logs calls from or to your SIP addresses. This screen allows you to view a summary of received, dialed and missed calls and a call history list. You can also view detailed information on each outgoing and incoming call.

To access this screen, click **VoIP > Call History**.



**Figure 261** VoIP > Call History

The Zyxel Device logs calls from or to your SIP addresses. This screen allows you to view the summary of received, missed and missed calls and a call history list. You can also see detailed information for each outgoing call you made or each incoming call from someone calling you. The Zyxel Device stores up to 300 incoming call logs and 300 outgoing call logs. If the number of entries exceed the maximum value, the oldest log of that type will be deleted.

**Summary**

| Date | Total Calls | Outgoing Calls | Incoming Calls | Missing Calls | Total Duration(hh:mm:ss) |
|------|-------------|----------------|----------------|---------------|--------------------------|
| ➔    |             |                |                |               |                          |

Classify:

| Type | Date/Time | Peer Number | Phone Number | Duration (hh:mm:ss) | Delete |
|------|-----------|-------------|--------------|---------------------|--------|
| ➔    |           |             |              |                     |        |

Each field is described in the following table.

**Table 166** VoIP > Call History

| Label                     | Description                                                                                                          |
|---------------------------|----------------------------------------------------------------------------------------------------------------------|
| Clear                     | Click this button to remove all entries from the call history list.                                                  |
| Refresh                   | Click this button to renew the call history list.                                                                    |
| Summary                   |                                                                                                                      |
| Date                      | This is the date when the calls were made.                                                                           |
| Total Calls               | This displays the total number of calls from or to your SIP addresses that day.                                      |
| Outgoing Calls            | This displays how many calls originated from you that day.                                                           |
| Incoming Calls            | This displays how many calls you received that day.                                                                  |
| Missing Calls             | This displays how many incoming calls were not answered that day.                                                    |
| Total Duration (hh:mm:ss) | This displays how long all calls lasted that day.                                                                    |
| Classify                  | Select the type of the calls. The call types are: <b>All</b> , <b>Incoming</b> , <b>Outgoing</b> and <b>Missed</b> . |
| Type                      | This displays the type of the calls.                                                                                 |
| Date/Time                 | This displays the date and time when the calls were made.                                                            |
| Peer Number               | This displays the SIP address that called you or you called.                                                         |
| Phone Number              | This displays the phone number of the call.                                                                          |
| Duration (hh:mm:ss)       | This displays how long the call lasted.                                                                              |
| Delete                    | Click the <b>Delete</b> icon to remove the call history.                                                             |

## 24.10 Technical Reference

This section contains background material relevant to the **VoIP** screens.

## **VoIP**

VoIP is the sending of voice signals over Internet Protocol. This allows you to make phone calls and send faxes over the Internet at a fraction of the cost of using the traditional circuit-switched telephone network. You can also use servers to run telephone service applications like PBX services and voice mail. Internet Telephony Service Provider (ITSP) companies provide VoIP service.

Circuit-switched telephone networks require 64 kilobits per second (Kbps) in each direction to handle a telephone call. VoIP can use advanced voice coding techniques with compression to reduce the required bandwidth.

## **SIP**

The Session Initiation Protocol (SIP) is an application-layer control (signaling) protocol that handles the setting up, altering and tearing down of voice and multimedia sessions over the Internet.

SIP signaling is separate from the media for which it handles sessions. The media that is exchanged during the session can use a different path from that of the signaling. SIP handles telephone calls and can interface with traditional circuit-switched telephone networks.

## **SIP Identities**

A SIP account uses an identity (sometimes referred to as a SIP address). A complete SIP identity is called a SIP URI (Uniform Resource Identifier). A SIP account's URI identifies the SIP account in a way similar to the way an email address identifies an email account. The format of a SIP identity is SIP-Number@SIP-Service-Domain.

## **SIP Number**

The SIP number is the part of the SIP URI that comes before the "@" symbol. A SIP number can use letters like in an email address (johndoe@your-ITSP.com for example) or numbers like a telephone number (1122334455@VoIP-provider.com for example).

## **SIP Service Domain**

The SIP service domain of the VoIP service provider is the domain name in a SIP URI. For example, if the SIP address is [1122334455@VoIP-provider.com](mailto:1122334455@VoIP-provider.com), then "VoIP-provider.com" is the SIP service domain.

## **SIP Registration**

Each Zyxel Device is an individual SIP User Agent (UA). To provide voice service, it has a public IP address for SIP and RTP protocols to communicate with other servers.

A SIP user agent has to register with the SIP registrar and must provide information about the users it represents, as well as its current IP address (for the routing of incoming SIP requests). After successful registration, the SIP server knows that the users (identified by their dedicated SIP URIs) are represented by the UA, and knows the IP address to which the SIP requests and responses should be sent.

Registration is initiated by the User Agent Client (UAC) running in the VoIP gateway (the Zyxel Device). The gateway must be configured with information letting it know where to send the REGISTER message, as well as the relevant user and authorization data.

A SIP registration has a limited lifespan. The User Agent Client must renew its registration within this lifespan. If it does not do so, the registration data will be deleted from the SIP registrar's database and the connection broken.

The Zyxel Device attempts to register all enabled subscriber ports when it is switched on. When you enable a subscriber port that was previously disabled, the Zyxel Device attempts to register the port immediately.

### Authorization Requirements

SIP registrations (and subsequent SIP requests) require a username and password for authorization. These credentials are validated through a challenge / response system using the HTTP digest mechanism (as detailed in RFC 3261, "SIP: Session Initiation Protocol").

### SIP Servers

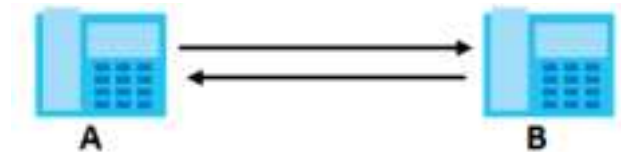
SIP is a client-server protocol. A SIP client is an application program or device that sends SIP requests. A SIP server responds to the SIP requests.

When you use SIP to make a VoIP call, it originates at a client and terminates at a server. A SIP client could be a computer or a SIP phone. One device can act as both a SIP client and a SIP server.

### SIP User Agent

A SIP user agent can make and receive VoIP telephone calls. This means that SIP can be used for peer-to-peer communications even though it is a client-server protocol. In the following figure, either **A** or **B** can act as a SIP user agent client to initiate a call. **A** and **B** can also both act as a SIP user agent to receive the call.

**Figure 262** SIP User Agent

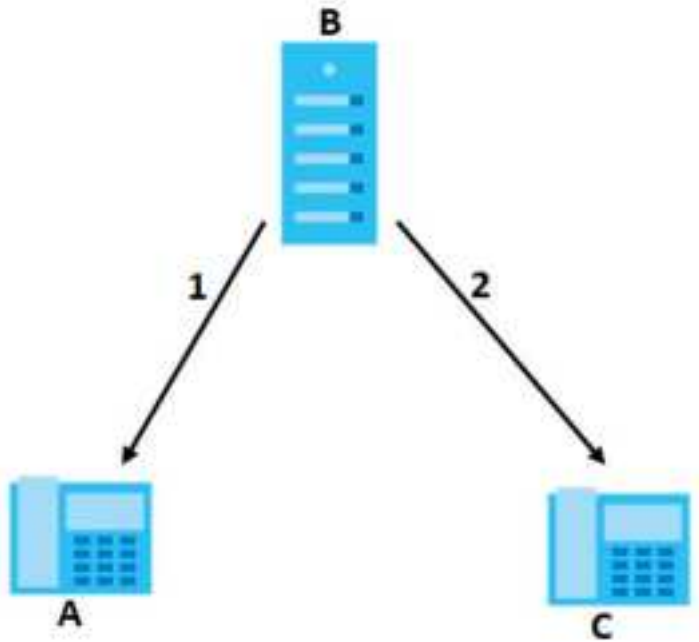


### SIP Proxy Server

A SIP proxy server receives requests from clients and forwards them to another server.

In the following example, you want to use client device **A** to call someone who is using client device **C**.

- 1 The client device (**A** in the figure) sends a call invitation to the SIP proxy server (**B**).
- 2 The SIP proxy server forwards the call invitation to **C**.

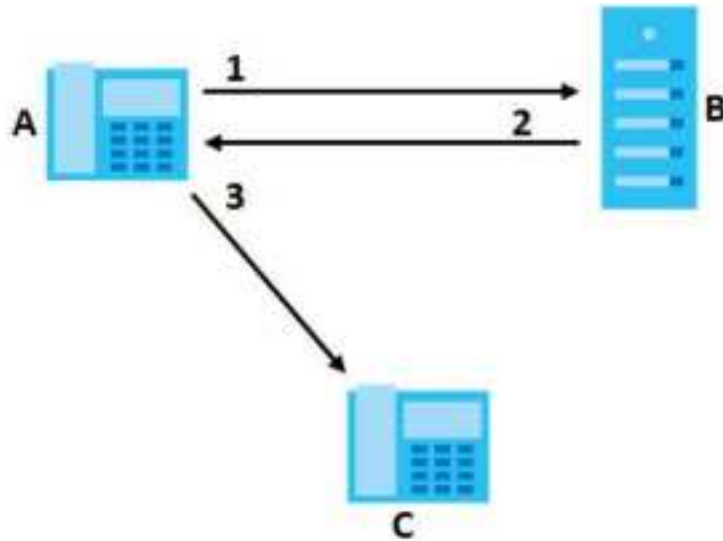
**Figure 263** SIP Proxy Server

### **SIP Redirect Server**

A SIP redirect server accepts SIP requests, translates the destination address to an IP address and sends the translated IP address back to the device that sent the request. Then the client device that originally sent the request can send requests to the IP address that it received back from the redirect server. Redirect servers do not initiate SIP requests.

In the following example, you want to use client device **A** to call someone who is using client device **C**.

- 1** Client device **A** sends a call invitation for **C** to the SIP redirect server (**B**).
- 2** The SIP redirect server sends the invitation back to **A** with **C**'s IP address (or domain name).
- 3** Client device **A** then sends the call invitation to client device **C**.

**Figure 264** SIP Redirect Server

### SIP Register Server

A SIP register server maintains a database of SIP identity-to-IP address (or domain name) mapping. The register server checks your user name and password when you register.

### RTP

When you make a VoIP call using SIP, the RTP (Real time Transport Protocol) is used to handle voice data transfer. See RFC 1889 for details on RTP.

### Pulse Code Modulation

Pulse Code Modulation (PCM) measures analog signal amplitudes at regular time intervals and converts them into bits.

### SIP Call Progression

The following figure displays the basic steps in the setup and tear down of a SIP call. A calls B.

Table 167 SIP Call Progression

| A         |                             | B          |
|-----------|-----------------------------|------------|
| 1. INVITE | →                           |            |
|           | ←                           | 2. Ringing |
|           | ←                           | 3. OK      |
| 4. ACK    | →                           |            |
|           | 5. Dialogue (voice traffic) |            |
| 6. BYE    | →                           |            |
|           | ←                           | 7. OK      |

- 1 **A** sends a SIP INVITE request to **B**. This message is an invitation for **B** to participate in a SIP telephone call.
- 2 **B** sends a response indicating that the telephone is ringing.
- 3 **B** sends an OK response after the call is answered.
- 4 **A** then sends an ACK message to acknowledge that **B** has answered the call.
- 5 Now **A** and **B** exchange voice media (talk).
- 6 After talking, **A** hangs up and sends a BYE request.
- 7 **B** replies with an OK response confirming receipt of the BYE request and the call is terminated.

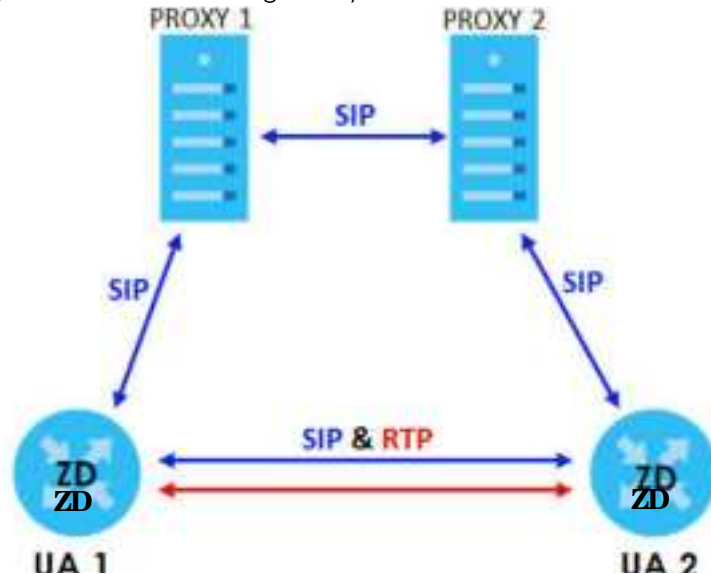
### SIP Call Progression Through Proxy Servers

Usually, the SIP UAC sets up a phone call by sending a request to the SIP proxy server. Then, the proxy server looks up the destination to which the call should be forwarded (according to the URI requested by the SIP UAC). The request may be forwarded to more than one proxy server before arriving at its destination.

The response to the request goes to all the proxy servers through which the request passed, in reverse sequence. Once the session is set up, session traffic is sent between the UAs directly, bypassing all the proxy servers in between.

The following figure shows the SIP and session traffic flow between the user agents (**UA 1** and **UA 2**) and the proxy servers (this example shows two proxy servers, **PROXY 1** and **PROXY 2**).

**Figure 265** SIP Call Through Proxy Servers

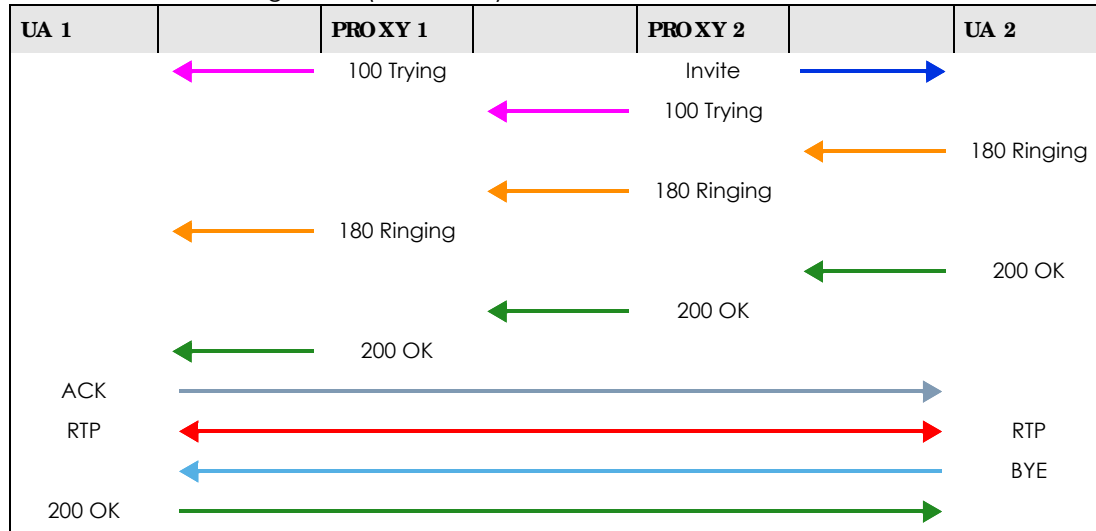


The following table shows the SIP call progression.

Table 168 SIP Call Progression

| UA 1   |   | PROXY 1 |        | PROXY 2 |  | UA 2 |
|--------|---|---------|--------|---------|--|------|
| Invite | → |         | Invite | →       |  |      |

Table 168 SIP Call Progression (continued)



- 1 **UserAgent 1** sends a SIP INVITE request to **Proxy 1**. This message is an invitation to **UserAgent 2** to participate in a SIP telephone call. **Proxy 1** sends a response indicating that it is trying to complete the request.
- 2 **Proxy 1** sends a SIP INVITE request to **Proxy 2**. **Proxy 2** sends a response indicating that it is trying to complete the request.
- 3 **Proxy 2** sends a SIP INVITE request to **UserAgent 2**.
- 4 **UserAgent 2** sends a response back to **Proxy 2** indicating that the phone is ringing. The response is relayed back to **UserAgent 1** through **Proxy 1**.
- 5 **UserAgent 2** sends an OK response to **Proxy 2** after the call is answered. This is also relayed back to **UserAgent 1** through **Proxy 1**.
- 6 **UserAgent 1** and **UserAgent 2** exchange RTP packets containing voice data directly, without involving the proxies.
- 7 When **UserAgent 2** hangs up, he sends a BYE request.
- 8 **UserAgent 1** replies with an OK response confirming receipt of the BYE request, and the call is terminated.

## Voice Coding

A codec (coder/decoder) codes analog voice signals into digital signals and decodes the digital signals back into analog voice signals. The Zyxel Device supports the following codecs.

- G.711 is a Pulse Code Modulation (PCM) waveform codec. PCM measures analog signal amplitudes at regular time intervals and converts them into digital samples. G.711 provides very good sound quality but requires 64 kbps of bandwidth.

- G.726 is an Adaptive Differential PCM (ADPCM) waveform codec that uses a lower bitrate than standard PCM conversion. ADPCM converts analog audio into digital signals based on the difference between each audio sample and a prediction based on previous samples. The more similar the audio sample is to the prediction, the less space needed to describe it. G.726 operates at 16, 24, 32 or 40 kbps.
- G.729 is an Analysis-by-Synthesis (AbS) hybrid waveform codec that uses a filter based on information about how the human vocal tract produces sounds. G.729 provides good sound quality and reduces the required bandwidth to 8 kbps.

### Voice Activity Detection/ Silence Suppression

Voice Activity Detection (VAD) detects whether or not speech is present. This lets the Zyxel Device reduce the bandwidth that a call uses by not transmitting "silent packets" when you are not speaking.

### Comfort Noise Generation

When using VAD, the Zyxel Device generates comfort noise when the other party is not speaking. The comfort noise lets you know that the line is still connected as total silence could easily be mistaken for a lost connection.

### Echo Cancellation

G.168 is an ITU-T standard for eliminating the echo caused by the sound of your voice reverberating in the telephone receiver while you talk.

### MWI (Message Waiting Indication)

Enable Message Waiting Indication (MWI) enables your phone to give you a message-waiting (beeping) dial tone when you have a voice message(s). Your VoIP service provider must have a messaging system that sends message waiting status SIP packets as defined in RFC 3842.

### Custom Tones (IVR)

IVR (Interactive Voice Response) is a feature that allows you to use your telephone to interact with the Zyxel Device. The Zyxel Device allows you to record custom tones for the **Early Media** and **Music On Hold** functions. The same recordings apply to both the caller ringing and on hold tones.

Table 169 Custom Tones Details

| LABEL                            | DESCRIPTION                                                                                            |
|----------------------------------|--------------------------------------------------------------------------------------------------------|
| Total Time for All Tones         | 900 seconds for all custom tones combined                                                              |
| Maximum Time per Individual Tone | 180 seconds                                                                                            |
| Total Number of Tones Recordable | 5<br><br>You can record up to 5 different custom tones but the total time must be 900 seconds or less. |

### Recording Custom Tones

Use the following steps if you would like to create new tones or change your tones:



- 1 Pick up the phone and press “\*\*\*\*” on your phone's keypad and wait for the message that says you are in the configuration menu.
- 2 Press a number from 1101 – 1105 on your phone followed by the “#” key.
- 3 Play your desired music or voice recording into the receiver's mouthpiece. Press the “#” key.
- 4 You can continue to add, listen to, or delete tones, or you can hang up the receiver when you are done.

### **Listening to Custom Tones**

Do the following to listen to a custom tone:

- 1 Pick up the phone and press “\*\*\*\*” on your phone's keypad and wait for the message that says you are in the configuration menu.
- 2 Press a number from 1201 – 1208 followed by the “#” key to listen to the tone.
- 3 You can continue to add, listen to, or delete tones, or you can hang up the receiver when you are done.

### **Deleting Custom Tones**

Do the following to delete a custom tone:

- 1 Pick up the phone and press “\*\*\*\*” on your phone's keypad and wait for the message that says you are in the configuration menu.
- 2 Press a number from 1301 – 1308 followed by the “#” key to delete the tone of your choice. Press 14 followed by the “#” key if you wish to clear all your custom tones.

You can continue to add, listen to, or delete tones, or you can hang up the receiver when you are done.

## **24.10.1 Quality of Service (QoS)**

Quality of Service (QoS) refers to both a network's ability to deliver data with minimum delay, and the networking methods used to provide bandwidth for real-time multimedia applications.

### **Type of Service (ToS)**

Network traffic can be classified by setting the ToS (Type of Service) values at the data source (for example, at the Zyxel Device) so a server can decide the best method of delivery, that is the least cost, fastest route and so on.

### **DiffServ**

DiffServ is a class of service (CoS) model that marks packets so that they receive specific per-hop treatment at DiffServ-compliant network devices along the route based on the application types and traffic flow. Packets are marked with DiffServ Code Points (DSCP) indicating the level of service desired.

This allows the intermediary DiffServ-compliant network devices to handle the packets differently depending on the code points without the need to negotiate paths or remember state information for every flow. In addition, applications do not have to request a particular service or give advanced notice of where the traffic is going.<sup>3</sup>

### **DiffServ and Per-Hop Behavior**

DiffServ defines a new DS (Differentiated Services) field to replace the Type of Service (ToS) field in the IP header. The DS field contains a 2-bit unused field and a 6-bit DSCP field which can define up to 64 service levels. The following figure illustrates the DS field.

DSCP is backward compatible with the three precedence bits in the ToS octet so that non-DiffServ compliant, ToS-enabled network device will not conflict with the DSCP mapping.

**Figure 266** DiffServ: Differentiated Service Field

|                 |                   |
|-----------------|-------------------|
| DSCP<br>(6-bit) | Unused<br>(2-bit) |
|-----------------|-------------------|

The DSCP value determines the forwarding behavior, the PHB (Per-Hop Behavior), that each packet gets across the DiffServ network. Based on the marking rule, different kinds of traffic can be marked for different priorities of forwarding. Resources can then be allocated according to the DSCP values and the configured policies.

## **24.10.2 Phone Services Overview**

Supplementary services such as call hold, call waiting, and call transfer, are generally available from your VoIP service provider. The Zyxel Device supports the following services:

- Call Return
- Call Hold
- Call Waiting
- Making a Second Call
- Call Transfer
- Call Forwarding
- Three-Way Conference
- Internal Calls
- Call Park and Pickup
- Do not Disturb
- IVR
- Call Completion
- CCBS
- Outgoing SIP

---

3. The Zyxel Device does not support DiffServ at the time of writing.

Note: To take full advantage of the supplementary phone services available through the Zyxel Device's phone ports, you may need to subscribe to the services from your VoIP service provider.

### 24.10.2.1 The Flash Key

Flashing means to press the hook for a short period of time (a few hundred milliseconds) before releasing it. On newer telephones, there should be a "flash" key (button) that generates the signal electronically. If the flash key is not available, you can tap (press and immediately release) the hook by hand to achieve the same effect. However, using the flash key is preferred since the timing is much more precise. With manual tapping, if the duration is too long, it may be interpreted as hanging up by the Zyxel Device.

You can invoke all the supplementary services by using the flash key.

### 24.10.2.2 Europe Type Supplementary Phone Services

This section describes how to use supplementary phone services with the **Europe Type Call Service Mode**. Commands for supplementary services are listed in the table below.

After pressing the flash key, if you do not issue the sub-command before the default sub-command timeout (2 seconds) expires or issue an invalid sub-command, the current operation will be aborted.

Table 170 European Flash Key Commands

| COMMAND | SUB-COMMAND | DESCRIPTION                                                                                                                                                                                                                     |
|---------|-------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Flash   |             | Put a current call on hold to place a second call.<br>Switch back to the call (if there is no second call).                                                                                                                     |
| Flash   | 0           | Drop the call presently on hold or reject an incoming call which is waiting for answer.                                                                                                                                         |
| Flash   | 1           | Disconnect the current phone connection and answer the incoming call or resume with caller presently on hold.                                                                                                                   |
| Flash   | 2           | 1. Switch back and forth between two calls.<br>2. Put a current call on hold to answer an incoming call.<br>3. Separate the current three-way conference call into two individual calls (one is on-line, the other is on hold). |
| Flash   | 3           | Create three-way conference connection.                                                                                                                                                                                         |
| Flash   | *98#        | Transfer the call to another phone.                                                                                                                                                                                             |

### European Call Hold

Call hold allows you to put a call (**A**) on hold by pressing the flash key.

If you have another call, press the flash key and then "2" to switch back and forth between caller **A** and **B** by putting either one on hold.

Press the flash key and then "0" to disconnect the call presently on hold and keep the current call on line.

Press the flash key and then "1" to disconnect the current call and resume the call on hold.

If you hang up the phone but a caller is still on hold, there will be a remind ring.

### **European Call Waiting**

This allows you to place a call on hold while you answer another incoming call on the same telephone (directory) number.

If there is a second call to a telephone number, you will hear a call waiting tone. Take one of the following actions.

- Reject the second call.  
Press the flash key and then press "0".
- Disconnect the first call and answer the second call.  
Either press the flash key and press "1", or just hang up the phone and then answer the phone after it rings.
- Put the first call on hold and answer the second call.  
Press the flash key and then "2".

### **European Call Transfer**

Do the following to transfer an incoming call (that you have answered) to another phone.

- 1 Press the flash key to put the caller on hold.
- 2 When you hear the dial tone, dial "\*98#" followed by the number to which you want to transfer the call.
- 3 After you hear the ring signal or the second party answers it, hang up the phone.

### **European Three-Way Conference**

Use the following steps to make three-way conference calls.

- 1 When you are on the phone talking to someone, press the flash key to put the caller on hold and get a dial tone.
- 2 Dial a phone number directly to make another call.
- 3 When the second call is answered, press the flash key and press "3" to create a three-way conversation.
- 4 Hang up the phone to drop the connection.
- 5 If you want to separate the activated three-way conference into two individual connections (one is on-line, the other is on hold), press the flash key and press "2".

#### **24.10.2.3 USA Type Supplementary Services**

This section describes how to use supplementary phone services with the **USA Type Call Service Mode**. Commands for supplementary services are listed in the table below.

After pressing the flash key, if you do not issue the sub-command before the default sub-command timeout (2 seconds) expires or issue an invalid sub-command, the current operation will be aborted.

Table 171 USA Flash Key Commands

| COMMAND | SUB-COMMAND | DESCRIPTION                                                                                                                                                                                                      |
|---------|-------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Flash   |             | Put a current call on hold to place a second call. After the second call is successful, press the flash key again to have a three-way conference call.<br>Put a current call on hold to answer an incoming call. |
| Flash   | *98#        | Transfer the call to another phone.                                                                                                                                                                              |

### USA Call Hold

Call hold allows you to put a call (**A**) on hold by pressing the flash key.

If you have another call, press the flash key to switch back and forth between caller **A** and **B** by putting either one on hold.

If you hang up the phone but a caller is still on hold, there will be a remind ring.

### USA Call Waiting

This allows you to place a call on hold while you answer another incoming call on the same telephone (directory) number.

If there is a second call to your telephone number, you will hear a call waiting tone.

Press the flash key to put the first call on hold and answer the second call.

### USA Call Transfer

Do the following to transfer an incoming call (that you have answered) to another phone.

- 1 Press the flash key to put the caller on hold.
- 2 When you hear the dial tone, dial "\*98#" followed by the number to which you want to transfer the call.
- 3 After you hear the ring signal or the second party answers it, hang up the phone.

### USA Three-Way Conference

Use the following steps to make three-way conference calls.

- 1 When you are on the phone talking to someone (party A), press the flash key to put the caller on hold and get a dial tone.
- 2 Dial a phone number directly to make another call (to party B).
- 3 When party B answers the second call, press the flash key to create a three-way conversation.
- 4 Hang up the phone to drop the connection.

- 5 If you want to separate the activated three-way conference into two individual connections (with party A on-line and party B on hold), press the flash key.
- 6 If you want to go back to the three-way conversation, press the flash key again.
- 7 If you want to separate the activated three-way conference into two individual connections again, press the flash key. This time the party B is on-line and party A is on hold.

#### 24.10.2.4 Phone Functions Summary

The following table shows the key combinations you can enter on your phone's keypad to use certain features.

Table 172 Phone Functions Summary

| ACTION | FUNCTION                     | DESCRIPTION                                                                                                                                                                                                                                     |
|--------|------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| *98#   | Call transfer                | Transfer a call to another phone. See <a href="#">Section 24.10.2.2 on page 435</a> (Europe type) and <a href="#">Section 24.10.2.3 on page 436</a> (USA type).                                                                                 |
| *66#   | Call return                  | Place a call to the last person who called you.                                                                                                                                                                                                 |
| *95#   | Enable Do Not Disturb        | Use these to set your phone not to ring when someone calls you, or to turn this function off.                                                                                                                                                   |
| #95#   | Disable Do Not Disturb       |                                                                                                                                                                                                                                                 |
| *41#   | Enable Call Waiting          | Use these to allow you to put a call on hold when you are answering another, or to turn this function off.                                                                                                                                      |
| #41#   | Disable Call Waiting         |                                                                                                                                                                                                                                                 |
| ****   | IVR                          | Use these to set up Interactive Voice Response (IVR). IVR allows you to record custom caller ringing tones (the sound a caller hears before you pick up the phone) and on hold tones (the sound someone hears when you put their call on hold). |
| ####   | Internal Call                | Call the phone(s) connected to the Zyxel Device.                                                                                                                                                                                                |
| *82    | One Shot Caller Display Call | Activate or deactivate caller ID for the next call only.                                                                                                                                                                                        |
| *67    | One Shot Caller Hidden Call  |                                                                                                                                                                                                                                                 |

# CHAPTER 25

## Log

### 25.1 What You Need To Know

The following terms and concepts may help as you read this chapter.

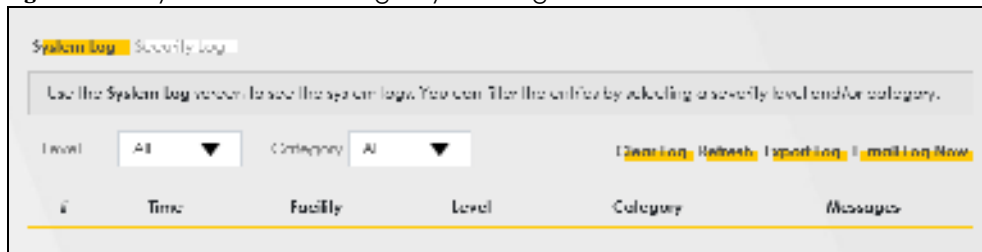
#### Alerts and Logs

An alert is a type of log that warrants more serious attention. They include system errors, attacks (access control) and attempted access to blocked web sites. Some categories such as **System Errors** consist of both logs and alerts. You may differentiate them by their color in the **View Log** screen. Alerts display in red and logs display in black.

### 25.2 System Log

Use the **System Log** screen to see the system logs. You can filter the entries by selecting a severity level and/or category. Click **System Monitor > Log** to open the **System Log** screen.

**Figure 267** System Monitor > Log > System Log



The following table describes the fields in this screen.

Table 173 System Monitor > Log > System Log

| LABEL          | DESCRIPTION                                                                                                                                                                                                                            |
|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Level          | Select a severity level from the drop-down list box. This filters search results according to the severity level you have selected. When you select a severity, the Zyxel Device searches through all logs of that severity or higher. |
| Category       | Select the type of logs to display.                                                                                                                                                                                                    |
| Clear Log      | Click this to delete all the logs.                                                                                                                                                                                                     |
| Refresh        | Click this to renew the log screen.                                                                                                                                                                                                    |
| Export Log     | Click this to export the selected logs.                                                                                                                                                                                                |
| E-mail Log Now | Click this to send the log files to the email address you specify in the <b>Maintenance &gt; Log Setting</b> screen.                                                                                                                   |
| #              | This field is a sequential value and is not associated with a specific entry.                                                                                                                                                          |

Table 173 System Monitor &gt; Log &gt; System Log (continued)

| Label    | Description                                                                                                                                           |
|----------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| Time     | This field displays the time the log was recorded.                                                                                                    |
| Facility | The log facility allows you to send logs to different files in the syslog server. Refer to the documentation of your syslog program for more details. |
| Level    | This field displays the severity level of the log that the Zyxel Device is to send to this syslog server.                                             |
| Category | This field displays the type of the log.                                                                                                              |
| Messages | This field states the reason for the log.                                                                                                             |

## 25.3 Security Log

Use the **Security Log** screen to see the security-related logs for the categories that you select. You can filter the entries by selecting a severity level and/or category. Click **System Monitor > Log > Security Log** to open the following screen.

Figure 268 System Monitor &gt; Log &gt; Security Log

The following table describes the fields in this screen.

Table 174 System Monitor &gt; Log &gt; Security Log

| Label          | Description                                                                                                                                                                                                                            |
|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Level          | Select a severity level from the drop-down list box. This filters search results according to the severity level you have selected. When you select a severity, the Zyxel Device searches through all logs of that severity or higher. |
| Category       | Select the type of logs to display.                                                                                                                                                                                                    |
| Clear Log      | Click this to delete all the logs.                                                                                                                                                                                                     |
| Refresh        | Click this to renew the log screen.                                                                                                                                                                                                    |
| Export Log     | Click this to export the selected logs.                                                                                                                                                                                                |
| E-mail Log Now | Click this to send the log files to the email address you specify in the <b>Maintenance &gt; Log Setting</b> screen.                                                                                                                   |
| #              | This field is a sequential value and is not associated with a specific entry.                                                                                                                                                          |
| Time           | This field displays the time the log was recorded.                                                                                                                                                                                     |
| Facility       | The log facility allows you to send logs to different files in the syslog server. Refer to the documentation of your syslog program for more details.                                                                                  |
| Level          | This field displays the severity level of the log that the Zyxel Device is to send to this syslog server.                                                                                                                              |
| Category       | This field displays the type of the log.                                                                                                                                                                                               |
| Messages       | This field states the reason for the log.                                                                                                                                                                                              |



# CHAPTER 26

## Traffic Status

### 26.1 Traffic Status Overview

Use the **Traffic Status** screens to look at the network traffic status and statistics of the WAN/LAN interfaces and NAT.

#### 26.1.1 What You Can Do in this Chapter

- Use the **WAN** screen to view the WAN traffic statistics ([Section 26.2 on page 441](#)).
- Use the **LAN** screen to view the LAN traffic statistics ([Section 26.3 on page 443](#)).
- Use the **NAT** screen to view the NAT status of the Zyxel Device's clients ([Section 26.4 on page 444](#)).

### 26.2 WAN Status

Click **System Monitor > Traffic Status** to open the **WAN** screen. The figures in this screen show the number of bytes received and sent through the Zyxel Device's WAN interface. The table below shows packet statistics for each WAN interface.

**Figure 269** System Monitor > Traffic Status > WAN

The following table describes the fields in this screen.

**Table 175** System Monitor > Traffic Status > WAN

| LABEL               | DESCRIPTION                                                                    |
|---------------------|--------------------------------------------------------------------------------|
| Refresh Interval    | Select how often you want the Zyxel Device to update this screen.              |
| Connected Interface | This shows the name of the WAN interface that is currently connected.          |
| Packets Sent        |                                                                                |
| Data                | This indicates the number of transmitted packets on this interface.            |
| Error               | This indicates the number of frames with errors transmitted on this interface. |
| Drop                | This indicates the number of outgoing packets dropped on this interface.       |
| Packets Received    |                                                                                |
| Data                | This indicates the number of received packets on this interface.               |
| Error               | This indicates the number of frames with errors received on this interface.    |
| Drop                | This indicates the number of received packets dropped on this interface.       |
| Disabled Interface  | This shows the name of the WAN interface that is currently disabled.           |
| Packets Sent        |                                                                                |
| Data                | This indicates the number of transmitted packets on this interface.            |
| Error               | This indicates the number of frames with errors transmitted on this interface. |
| Drop                | This indicates the number of outgoing packets dropped on this interface.       |

Table 175 System Monitor &gt; Traffic Status &gt; WAN (continued)

| LABEL            | DESCRIPTION                                                                 |
|------------------|-----------------------------------------------------------------------------|
| Packets Received |                                                                             |
| Data             | This indicates the number of received packets on this interface.            |
| Error            | This indicates the number of frames with errors received on this interface. |
| Drop             | This indicates the number of received packets dropped on this interface.    |

## 26.3 LAN Status

Click **System Monitor > Traffic Status > LAN** to open the following screen. This screen allows you to view packet statistics for each LAN or WLAN interface on the Zyxel Device.

Figure 270 System Monitor &gt; Traffic Status &gt; LAN



The following table describes the fields in this screen.

Table 176 System Monitor &gt; Traffic Status &gt; LAN

| LABEL              | DESCRIPTION                                                                    |
|--------------------|--------------------------------------------------------------------------------|
| Refresh Interval   | Select how often you want the Zyxel Device to update this screen.              |
| Interface          | This shows the LAN or WLAN interface.                                          |
| Bytes Sent         | This indicates the number of bytes transmitted on this interface.              |
| Bytes Received     | This indicates the number of bytes received on this interface.                 |
| Interface          | This shows the LAN or WLAN interfaces.                                         |
| Sent (Packets)     |                                                                                |
| Data               | This indicates the number of transmitted packets on this interface.            |
| Error              | This indicates the number of frames with errors transmitted on this interface. |
| Drop               | This indicates the number of outgoing packets dropped on this interface.       |
| Received (Packets) |                                                                                |
| Data               | This indicates the number of received packets on this interface.               |
| Error              | This indicates the number of frames with errors received on this interface.    |
| Drop               | This indicates the number of received packets dropped on this interface.       |

## 26.4 NAT Status

Click **System Monitor > Traffic Status > NAT** to open the following screen. This screen lists the devices that have received an IP address from the Zyxel Device LAN or WLAN interfaces and have ever established a session with the Zyxel Device.

**Figure 271** System Monitor > Traffic Status > NAT



The following table describes the fields in this screen.

Table 177 System Monitor > Traffic Status > NAT

| Label                | Description                                                                                                                                                                                                                                       |
|----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Refresh Interval     | Select how often you want the Zyxel Device to update this screen.                                                                                                                                                                                 |
| Device Name          | This displays the name of the connected host.                                                                                                                                                                                                     |
| IPv4 Address         | This displays the IP address of the connected host.                                                                                                                                                                                               |
| MAC Address          | This displays the MAC address of the connected host.                                                                                                                                                                                              |
| No. of Open Sessions | This displays the number of NAT sessions currently opened for the connected host.                                                                                                                                                                 |
| Total                | This displays what percentage of NAT sessions the Zyxel Device can support is currently being used by all connected hosts. You can also see the number of active NAT sessions and the maximum number of NAT sessions the Zyxel Device can support |

# CHAPTER 27

## VoIP Status

### 27.1 VoIP Status Screen

Click **System Monitor > VoIP Status** to open the following screen. You can view the Voice over IP (VoIP) registration, current call status and phone numbers in this screen.

**Figure 272** System Monitor > VoIP Status

The screenshot displays the VoIP Status screen with the following sections:

- Information:** A text box stating "Information, such as whether a SIP account is registered and the total call volume made by a SIP account, can be viewed in this page."
- Poll Interval:** A text input field containing "10" and a "sec" label. To the right are "Set Interval" and "Stop" buttons.
- SIP Status:** A table with columns: Account, Register Action, Registration, Registration Time, (URI), Message Waiting, Last Incoming Number, and Last Outgoing Number. The first row shows Account "1", a disabled Register Action switch, Registration "Disabled", Registration Time "ChangeMe", (URI) "ChangeMe@ChangeMe", and Message Waiting "NO".
- Call Status:** A table with columns: Account, Duration, Status, Call Type, Codec, From Phone Part Type, To Phone Part Type, and Peer Number.
- Phone Status:** A table with columns: Phone, Outgoing Number, Incoming Number, and Hook Status. The first row shows Phone "Phone 1", Outgoing Number "ChangeMe", Incoming Number "ChangeMe", and Hook Status "On-hook".

The following table describes the labels in this screen.

**Table 178** System Monitor > VoIP Status

| Label           | Description                                                                                                                                                                                                                                                                                                                                    |
|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Poll Interval   | Enter the number of seconds the Device needs to wait before updating this screen and then click <b>Set Interval</b> . Click <b>Stop</b> to have the Device stop updating this screen.                                                                                                                                                          |
| SIP Status      |                                                                                                                                                                                                                                                                                                                                                |
| Account         | This column displays each SIP account in the Device.                                                                                                                                                                                                                                                                                           |
| Register Action | Click on this switch to register/unregister the SIP account. This switch will turn blue if a registration attempt is successful; otherwise, it will revert to its unregistered setting. Unregistering an account does not delete the SIP account itself, but removes the mapping between your SIP identity and your IP address or domain name. |

Table 178 System Monitor &gt; VoIP Status (continued)

| LABEL                | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Registration         | <p>This field displays the current registration status of the SIP account.</p> <p><b>Registered</b> - The SIP account is activated and has been registered with a SIP server. You can use it to make a VoIP call.</p> <p><b>Unregistered</b> - The SIP account is activated, but the last time the Zyxel Device tried to register the SIP account with the SIP server, the attempt failed. Use the <b>Register Action</b> switch to register the account again. The Zyxel Device will also automatically try to register the SIP account again after a period of time that you configured in <b>VoIP &gt; SIP &gt; SIP Service Provider &gt; Add/ Edit &gt; SIP Register Fail Re-Try Timer</b>.</p> <p><b>Disabled</b> - The SIP account is not active. Make sure the corresponding SIP Service Provider and SIP Account are both enabled in <b>VoIP &gt; SIP &gt; SIP Service Provider &gt; Add/ Edit</b> and <b>VoIP &gt; SIP &gt; SIP Account &gt; Add/ Edit</b>.</p> |
| Registration Time    | This field displays the last time the Device successfully registered the SIP account. The field is blank if the Device has never successfully registered this account.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| URI                  | This field displays the account number and service domain of the SIP account. You can change these in the <b>VoIP &gt; SIP</b> screen.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Message Waiting      | This field indicates whether or not there are any messages waiting for the SIP account.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Last Incoming Number | This field displays the last number that called the SIP account. The field is blank if no number has ever dialed the SIP account.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Last Outgoing Number | This field displays the last number the SIP account called. The field is blank if the SIP account has never dialed a number.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Call Status          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Account              | This column displays each SIP account in the Device.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Duration             | This field displays how long the current call has lasted.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Status               | <p>This field displays the current state of the phone call.</p> <p><b>Idle</b> - There are no current VoIP calls, incoming calls or outgoing calls being made.</p> <p><b>Dial</b> - The callee's phone is ringing.</p> <p><b>Ring</b> - The phone is ringing for an incoming VoIP call.</p> <p><b>Process</b> - There is a VoIP call in progress.</p> <p><b>DISC</b> - The callee's line is busy, the callee hung up or your phone was left off the hook.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |

Table 178 System Monitor &gt; VoIP Status (continued)

| LABEL                | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Call Type            | <p>This field displays the call direction type of the current VoIP call. Outgoing Call – It is a SIP VoIP call made by local phone ports, and this SIP account is able to issue a (SIP-based) call setup to the SIP account of remote peers for a VoIP call establishment. This (SIP-based) call setup signal is sent to the SIP server first, and then the SIP server would relay it to the target peer after correctly resolving and locating the target peer. During the call setup (signaling) phase, Calling state is displayed in the Status field, and it turns to InCall state once the call is successfully established.</p> <p>Incoming Call – It is a SIP VoIP call made or originated by remote SIP accounts to connect to this local SIP account. One or more local phone ports can be configured to receive this type of call, see the Incoming Number below, and all of them should begin to ring during the call setup (signaling phase), see the Status above. Once some remote SIP accounts start to ring one local phone, answer by off-hook to the call, and the call is successfully established. The other ringing local phone ports will stop ringing and turning to InCall state in the Status field.</p> <p>Internal Call – It is a local VoIP call between two different local phone ports. No SIP signaling is needed and thus no SIP server is involved to establish this type of call. This type of call is established through the Internal and Non-SIP local setup signaling procedure between the call- originating and call-terminating local phone ports. In general, one or more local phone ports can be designed to receive this type of call, and once any of the ringing phones answer the call, the other ringing ones will stop ringing. During the call setup phase (signaling phase), Calling state is displayed in Status field, and turns to InCall state once the call is successfully established.</p> |
| Codec                | This field displays what voice codec is being used for a current VoIP call through a phone port.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| From Phone Port Type | This field displays the phone ports type used to originate, start, or create the current VoIP call. Type Two possible type values will be displayed here: SIP – For the current call which is categorized as Incoming Call in the Call Type field, this field will show the type SIP. FXS – As for the other cases: Outgoing Call and Internal Call, this field will show the corresponding local phone port type: FXS, the legacy analog phone port on the device.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| To Phone Port Type   | This field displays the phone ports type used to receive the current VoIP call. Three possible type Type values will be displayed here: SIP – For the current call which is categorized as Outgoing Call in the Call Type field, this field will show the type SIP. FXS and Unknown – As for the other cases: Incoming Call and Internal Call, this field will show the corresponding local phone port type: FXS, the legacy analog phone port on the device. While the call is established, this field shows Unknown during the call setup phase (signaling phase). This is because one or more local phone ports can be configured or designed to receive these two types of calls, see the Call Type above, and the local phone port will answer the call that hasn't been determined yet at that time.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Peer Number          | This field displays the SIP number of the party that is currently engaged in a VoIP call through a phone port.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Phone Status         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Phone                | This field displays the name of a phone port on the Device.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Outgoing Number      | This field displays the SIP number that you use to make calls on this phone port.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Incoming Number      | This field displays the SIP number that you use to receive calls on this phone port.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Hook Status          | <p>This field displays whether the phone is in the on or off hook status.</p> <p><b>Off-Hook</b> means a telephone connected to one of the phone port has its receiver off the hook.</p> <p><b>On-Hook</b> means a telephone connected to one of the phone port has its receiver on the hook.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |

# CHAPTER 28

## ARP Table

### 28.1 ARP Table Overview

Address Resolution Protocol (ARP) is a protocol for mapping an Internet Protocol (IP) address to a physical machine address, known as a Media Access Control (MAC) address, on the local area network.

An IP version 4 address is 32 bits long. MAC addresses are 48 bits long. The ARP table maintains an association between each MAC address and its corresponding IP address.

#### 28.1.1 How ARP Works

When an incoming packet destined for a host device on a local area network arrives at the device, the device's ARP program looks in the ARP table and, if it finds the address, sends it to the device.

If no entry is found for the IP address, ARP broadcasts the request to all the devices on the LAN. The device fills in its own MAC and IP address in the sender address fields, and puts the known IP address of the target in the target IP address field. In addition, the device puts all ones in the target MAC field (FF.FF.FF.FF.FF.FF is the Ethernet broadcast address). The replying device (which is either the IP address of the device being sought or the router that knows the way) replaces the broadcast address with the target's MAC address, swaps the sender and target pairs, and unicasts the answer directly back to the requesting machine. ARP updates the ARP table for future reference and then sends the packet to the MAC address that replied.

### 28.2 ARP Table

Use the ARP table to view the IPv4-to-MAC address mappings for each device connected to the Zyxel Device. The neighbor table shows the IPv6-to-MAC address mappings of each IPv6 neighbor. To open this screen, click **System Monitor > ARP Table**.



**Figure 273** System Monitor > ARP Table

| ARP Table                                                                                                                                                                                                            |                         |                   |        |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|-------------------|--------|
| Address Resolution Protocol (ARP) is a protocol for mapping an Internet Protocol address (IP address) to a physical machine address, also known as a Media Access Control or MAC address, on the local area network. |                         |                   |        |
| The ARP table maintains an association between each MAC address and its corresponding IP address.                                                                                                                    |                         |                   |        |
| Use the ARP table to view the IPv4-to-MAC address mapping(s) for the LANs. The neighbor table shows the IPv6-to-MAC address mapping(s) of each neighbor.                                                             |                         |                   |        |
| IPv4 ARP Table                                                                                                                                                                                                       |                         |                   |        |
| #                                                                                                                                                                                                                    | IPv4 Address            | MAC Address       | Device |
| 1                                                                                                                                                                                                                    | 192.168.1.10            | 08:00:27:00:00:00 | br0    |
| 2                                                                                                                                                                                                                    | 192.168.1.15            | 08:00:27:00:00:00 | br0    |
| IPv6 Neighbor Table                                                                                                                                                                                                  |                         |                   |        |
| #                                                                                                                                                                                                                    | IPv6 Address            | MAC Address       | Device |
| 1                                                                                                                                                                                                                    | fe80::200:1:0:0:0:0:0:0 | 08:00:27:00:00:00 | br0    |
| 2                                                                                                                                                                                                                    | fe80::200:1:0:0:0:0:0:0 | 08:00:27:00:00:00 | br0    |

The following table describes the labels in this screen.

**Table 179** System Monitor > ARP Table

| Label               | Description                                                                                                                  |
|---------------------|------------------------------------------------------------------------------------------------------------------------------|
| #                   | This is the ARP table entry number.                                                                                          |
| IPv4 / IPv6 Address | This is the learned IPv4 or IPv6 IP address of a device connected to the Zyxel Device.                                       |
| MAC Address         | This is the MAC address of the connected device with the listed IP address.                                                  |
| Device              | This is the type of interface used by the connected device. You can click the device type to go to its configuration screen. |

# CHAPTER 29

## Routing Table

### 29.1 Routing Table Overview

Routing is based on the destination address only and the Zyxel Device takes the shortest path to forward a packet.

### 29.2 Routing Table

The table below shows IPv4 and IPv6 routing information. The IPv4 subnet mask is '255.255.255.255' for a host destination and '0.0.0.0' for the default route. The gateway address is written as '\*' (IPv4) / '::' (IPv6) if none is set.

Click **System Monitor > Routing Table** to open the following screen.

**Figure 274** System Monitor > Routing Table

[illegible]

The following table describes the labels in this screen.

Table 180 System Monitor &gt; Routing Table

| Label       | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|-------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Destination | This indicates the destination IPv4 address or IPv6 address and prefix of this route.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Gateway     | This indicates the IPv4 address or IPv6 address of the gateway that helps forward this route's traffic.                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Subnet Mask | This indicates the destination subnet mask of the IPv4 route.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Interface   | <p>This indicates the name of the interface through which the route is forwarded.</p> <ul style="list-style-type: none"> <li>• <b>brx</b> indicates a LAN interface where x can be 0 – 3 to represent LAN1 to LAN4 respectively.</li> <li>• <b>ptm0</b> indicates a VDSL (including G.fast) WAN interface using IPoE or in bridge mode.</li> <li>• <b>ethx</b> indicates an Ethernet WAN interface using IPoE or in bridge mode.</li> <li>• <b>ppp0</b> indicates a WAN interface using PPPoE.</li> <li>• <b>wlx</b> indicates a wireless interface where x can be 0 – 1.</li> </ul> |

# CHAPTER 30

## Multicast Status

### 30.1 Multicast Status Overview

Use the **Multicast Status** screens to look at IGMP/MLD group status and traffic statistics.

### 30.2 The IGMP Status Screen

Use this screen to look at the current list of multicast groups the Zyxel Device manages through IGMP. Configure IGMP in **Network Setting > IGMP/MLD**. To open this screen, click **System Monitor > Multicast Status > IGMP Status**.

**Figure 275** System Monitor > Multicast Status > IGMP Status



The following table describes the labels in this screen.

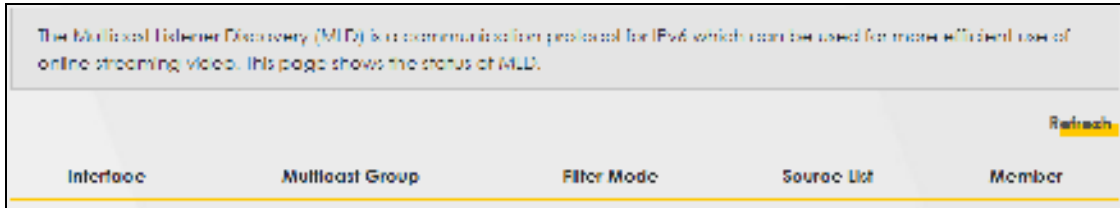
Table 181 System Monitor > Multicast Status > IGMP Status

| LABEL           | DESCRIPTION                                                                                                                                                                                                                                                                          |
|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Refresh         | Click this button to update the information on this screen.                                                                                                                                                                                                                          |
| Interface       | This field displays the name of an interface on the Zyxel Device that belongs to an IGMP multicast group.                                                                                                                                                                            |
| Multicast Group | This field displays the name of the IGMP multicast group to which the interface belongs.                                                                                                                                                                                             |
| Filter Mode     | <b>INCLUDE</b> means that only the IP addresses in the <b>Source List</b> get to receive the multicast group's traffic.<br><b>EXCLUDE</b> means that the IP addresses in the <b>Source List</b> are not allowed to receive the multicast group's traffic but other IP addresses can. |
| Source List     | This is the list of IP addresses that are allowed or not allowed to receive the multicast group's traffic depending on the filter mode.                                                                                                                                              |
| Member          | This is the list of the members of the multicast group.                                                                                                                                                                                                                              |

### 30.3 The MLD Status Screen

Use this screen to look at the current list of multicast groups the Zyxel Device manages through MLD. Configure MLD in **Network Setting > IGMP/MLD**. To open this screen, click **System Monitor > Multicast Status > MLD Status**.

**Figure 276** System Monitor > Multicast Status > MLD Status



The following table describes the labels in this screen.

Table 182 System Monitor > Multicast Status > MLD Status

| LABEL           | DESCRIPTION                                                                                                                                                                                                                                                                                     |
|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Refresh         | Click this button to update the status on this screen.                                                                                                                                                                                                                                          |
| Interface       | This field displays the name of an interface on the Zyxel Device that belongs to an MLD multicast group.                                                                                                                                                                                        |
| Multicast Group | This field displays the name of the MLD multicast group to which the interface belongs.                                                                                                                                                                                                         |
| Filter Mode     | <p><b>INCLUDE</b> means that only the IP addresses in the <b>Source List</b> get to receive the multicast group's traffic.</p> <p><b>EXCLUDE</b> means that the IP addresses in the <b>Source List</b> are not allowed to receive the multicast group's traffic but other IP addresses can.</p> |
| Source List     | This is the list of IP addresses that are allowed or not allowed to receive the multicast group's traffic depending on the filter mode.                                                                                                                                                         |
| Member          | This is the list of members in the multicast group.                                                                                                                                                                                                                                             |

# CHAPTER 31

## WLAN Station Status

### 31.1 WLAN Station Status Overview

Click **System Monitor > WLAN Station Status** to open the following screen. Use this screen to view information and status of the WiFi stations (WiFi clients) that are currently associated with the Zyxel Device. Being associated means that a WiFi client (for example, your computer with a WiFi network card installed) has connected successfully to an AP (or WiFi router) using the same SSID, channel, and WiFi security settings.

**Figure 277** System Monitor > WLAN Station Status (For 2.4G and 5G models)

**WLAN Station Status**

Use this screen to view information and status of the wireless stations (wireless clients) that are currently associated with the Zyxel Device. Being associated means that a wireless client (for example, your computer with a wireless network card installed) has connected successfully to an AP (or wireless router) using the same SSID, channel, and WiFi security settings.

Refresh Interval: 1 min

**WLAN 2.4G Station Status**

| # | MAC Address | Rate (Mbps) | RSSI (dBm) | SNR | Level | Connection Uptime |
|---|-------------|-------------|------------|-----|-------|-------------------|
|---|-------------|-------------|------------|-----|-------|-------------------|

**WLAN 5G Station Status**

| # | MAC Address       | Rate (Mbps) | RSSI (dBm) | SNR | Level | Connection Uptime |
|---|-------------------|-------------|------------|-----|-------|-------------------|
| 1 | 88:EE:4F:43:7A:2A | 4000        | -27        | 62  | 5     | 3 hours 0 minutes |

The following table describes the labels in this screen.

Table 183 System Monitor > WLAN Station Status

| LABEL            | DESCRIPTION                                                                                                                                                                                                                                                                                         |
|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Refresh Interval | Select how often you want the Zyxel Device to update this screen.                                                                                                                                                                                                                                   |
| #                | This is the index number of an associated WiFi station.                                                                                                                                                                                                                                             |
| MAC Address      | This field displays the MAC address of an associated WiFi station.                                                                                                                                                                                                                                  |
| Rate (Mbps)      | This field displays the transmission rate of WiFi traffic between an associated WiFi station and the Zyxel Device.                                                                                                                                                                                  |
| RSSI (dBm)       | The RSSI (Received Signal Strength Indicator) field shows the WiFi signal strength of the station's WiFi connection.<br><br>The normal range is -30dBm to -79dBm. If the value drops below -80dBm, try moving the associated WiFi station closer to the Zyxel Device to get better signal strength. |

Table 183 System Monitor &gt; WLAN Station Status (continued)

| LABEL             | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SNR               | <p>The Signal-to-Noise Ratio (SNR) is the ratio between the received signal power and the received noise power. The greater the number, the better the quality of WiFi.</p> <p>The normal range is 15 to 40. If the value drops below 15, try moving the associated WiFi station closer to the Zyxel Device to get better quality WiFi.</p>                                                                                                                                                                                                                                                                                      |
| Level             | <p>This field displays a number which represents the strength of the WiFi signal between an associated WiFi station and the Zyxel Device. The Zyxel Device uses the RSSI and SNR values to determine the strength of the WiFi signal.</p> <p><b>5</b> means the Zyxel Device is receiving an excellent WiFi signal.</p> <p><b>4</b> means the Zyxel Device is receiving a very good WiFi signal.</p> <p><b>3</b> means the Zyxel Device is receiving a weak WiFi signal,</p> <p><b>2</b> means the Zyxel Device is receiving a very weak WiFi signal.</p> <p><b>1</b> means the Zyxel Device is not receiving a WiFi signal.</p> |
| Channel           | <p>This field displays the wireless channel bandwidth of an associated WiFi station.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Connection Uptime | <p>This field displays the connection duration of the client devices currently linked to the Zyxel Device.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

# CHAPTER 32

## Cellular Statistics

### 32.1 Cellular Statistics Overview

Use the **Cellular Statistics** screens to look at cellular Internet connection status. By default, a cellular WAN connection is used as a backup for the wired DSL or Ethernet WAN connections.

### 32.2 Cellular Statistics Settings

To open this screen, click **System Monitor > Cellular Statistics**. Cellular information is available on this screen only when you insert a compatible cellular dongle in the USB port on the Zyxel Device.

**Figure 278** System Monitor > Cellular Statistics

**Cellular Statistics**

Use the **Cellular Statistics** screens to look at cellular Internet connection status. By default, a cellular WAN connection is used as a backup for the wired DSL/Ethernet WAN connections.

Cellular information is available on this screen only when you insert a compatible cellular dongle in the USB port on the Zyxel Device.

**Monitor**

Refresh Interval:

**Status**

|                            |           |
|----------------------------|-----------|
| Cellular Status            | No Device |
| Service Provider           | N/A       |
| Signal Strength            | N/A       |
| Connection Uptime          | N/A       |
| Cellular Card Manufacturer | N/A       |
| Cellular Card Model        | N/A       |
| Cellular Card F/W Version  | N/A       |
| SIM Card BULK              | N/A       |
| VO/MD                      | N/A       |



The following table describes the labels in this screen.

Table 184 System Monitor > Cellular Statistics

| <b>LABEL</b>               | <b>DESCRIPTION</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Monitor                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Refresh Interval           | Select how often you want the Zyxel Device to update this screen. Select <b>None</b> to stop refreshing.                                                                                                                                                                                                                                                                                                                                                                                          |
| Status                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Cellular Status            | This field displays the status of the cellular Internet connection. This field can display:<br><br><b>GSM</b> – Global System for Mobile Communications, 2G<br><b>GPRS</b> – General Packet Radio Service, 2.5G<br><b>EDGE</b> – Enhanced Data rates for GSM Evolution, 2.75G<br><b>WCDMA</b> – Wideband Code Division Multiple Access, 3G<br><b>HSDPA</b> – High-Speed Downlink Packet Access, 3.5G<br><b>HSUPA</b> – High-Speed Uplink Packet Access, 3.75G<br><b>HSPA</b> – HSDPA+HSUPA, 3.75G |
| Service Provider           | This field displays the name of the service provider.                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Signal Strength            | This field displays the strength of the signal in dBm.                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Connection Uptime          | This field displays the time the connection has been up.                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Cellular Card Manufacturer | This field displays the manufacturer of the cellular card.                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Cellular Card Model        | This field displays the model name of the cellular card.                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Cellular Card F/W Version  | This field displays the firmware version of the cellular card.                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| SIM Card IMSI              | The International Mobile Subscriber Identity or IMSI is a unique identification number associated with all cellular networks. This number is provisioned in the SIM card.                                                                                                                                                                                                                                                                                                                         |
| VID/PID                    | This field displays the USB Vendor ID and Product ID of the cellular card.                                                                                                                                                                                                                                                                                                                                                                                                                        |

# CHAPTER 33

## Optical Signal Status

### 33.1 Overview

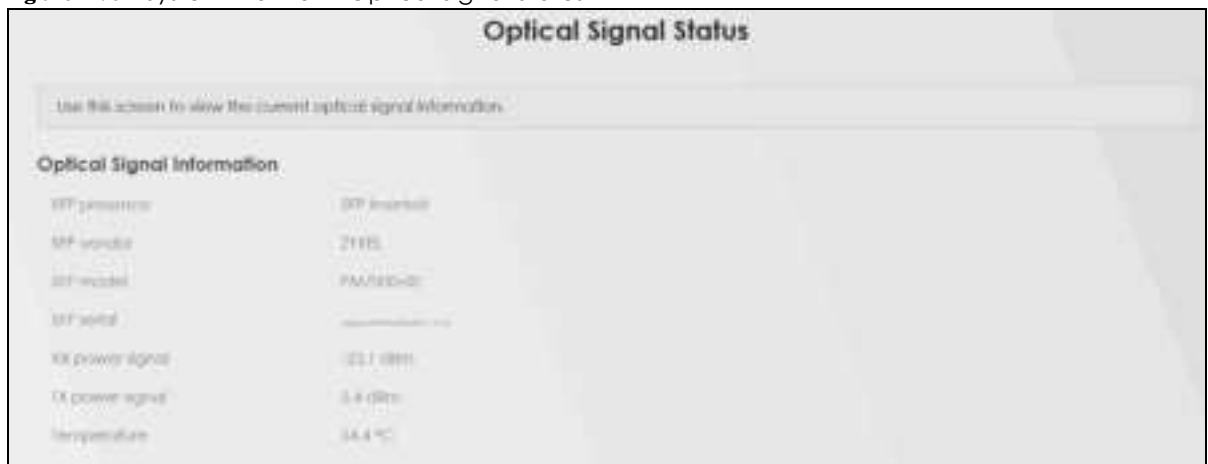
Use this screen to view the PON (Passive Optical Network) transceiver's TX power and RX power level and temperature.

### 33.2 The Optical Signal Status Screen

Click **System Monitor > Optical Signal Status** to open the **Optical Signal Status** screen to see the real-time DDMI (Digital Diagnostics Monitoring Interface) parameters.

The PON transceiver's support for the DDMI function lets you monitor the PON transceiver's parameters to perform component monitoring, fault isolation, and failure prediction tasks. This allows proactive, preventative network maintenance to help ensure service continuity.

**Figure 279** System Monitor > Optical Signal Status



The following table describes the labels in this screen.

Table 185 System Monitor > Optical Signal Status

| LABEL                      | DESCRIPTION                                                      |
|----------------------------|------------------------------------------------------------------|
| Optical Signal Information |                                                                  |
| SFP presence               | This displays whether the SFP transceiver is inserted.           |
| SFP vendor                 | This displays the vendor name of the inserted SFP transceiver.   |
| SFP model                  | This displays the model name of the inserted SFP transceiver.    |
| SFP serial                 | This displays the serial number of the inserted SFP transceiver. |
| RX power signal            | This displays the PON transceiver's receiving power in dBm.      |

Table 185 System Monitor &gt; Optical Signal Status (continued)

| <b>LABEL</b>    | <b>DESCRIPTION</b>                                                  |
|-----------------|---------------------------------------------------------------------|
| TX power signal | This displays the PON transceiver's transmitting power in dBm.      |
| Temperature     | This displays the PON transceiver's temperature in degrees Celsius. |

Note: Make sure the fiber optic cable is well connected to the PON port.

The following table shows the normal range of optical signal information.

Table 186 Normal Range of Optical Signal Information

| <b>LABEL</b>    | <b>NORMAL RANGE</b>                                                                                                                                                |
|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| RX power signal | -9 to -28 dBm<br><br>Note: The higher the value, the stronger the signal as there is less background noise. For example, -9 dBm is a stronger signal than -28 dBm. |
| TX power signal | 4 to 9 dBm                                                                                                                                                         |
| Temperature     | 0 to 85 degrees Celsius (185 degrees Fahrenheit)                                                                                                                   |

Note: If the TX and RX power signals of the DDML are out of range, inspect the fiber optic cable for dirt, any fiber optic cable bends or excessive curves. If the fiber optic cable is clean and undamaged, use the power meter to measure whether the actual RX power signal of the Zyxel Device falls within the normal range.

# CHAPTER 34

## System

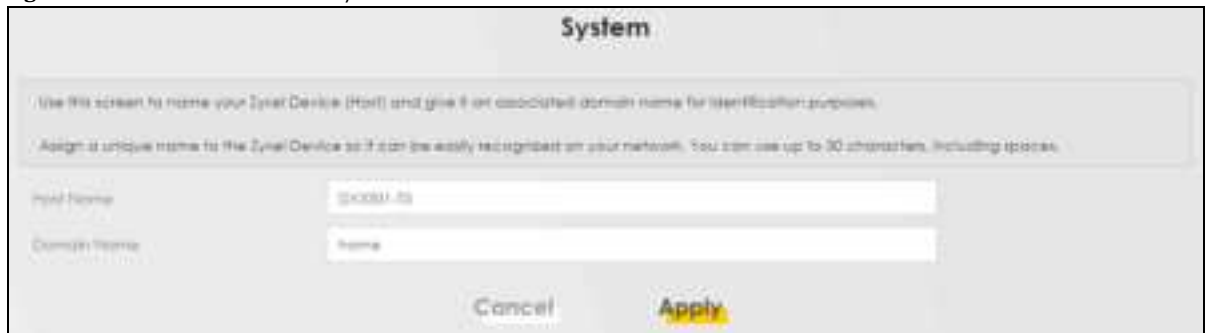
### 34.1 System Overview

Use this screen to name your Zyxel Device (Host) and give it an associated domain name for identification purposes.

### 34.2 System

Click **Maintenance > System** to open the following screen. Assign a unique name to the Zyxel Device so it can be easily recognized on your network.

**Figure 280** Maintenance > System



The following table describes the labels in this screen.

Table 187 Maintenance > System

| LABEL       | DESCRIPTION                                                                                                                                                                                                                                                                               |
|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Host Name   | Enter a descriptive host name for your Zyxel Device. You can use up to 30 printable characters except [ " ], [ ` ], [ ' ], [ < ], [ > ], [ ^ ], [ \$ ], [   ], [ & ], or [ ; ]. Spaces are allowed.<br>For some models, the supported maximum input length is 16 alphanumeric characters. |
| Domain Name | Enter a domain name for your host Zyxel Device. You can use up to 30 printable characters except [ " ], [ ` ], [ ' ], [ < ], [ > ], [ ^ ], [ \$ ], [   ], [ & ], or [ ; ]. Spaces are allowed.                                                                                            |
| Cancel      | Click <b>Cancel</b> to abandon this screen without saving.                                                                                                                                                                                                                                |
| Apply       | Click <b>Apply</b> to save your changes.                                                                                                                                                                                                                                                  |

# CHAPTER 35

## User Account

### 35.1 User Account Overview

In the **User Account** screen, you can view the settings of the “admin” that you use to log into the Zyxel Device to manage it.

The number of accounts you can create:

|                       |   |
|-----------------------|---|
| Administrator Account | 4 |
| User Account          | 4 |

The privileges of administrator and user accounts differ. Some features are available only to the administrator accounts but are not accessible to user accounts.

Below is an example of the account privilege.

Table 188 Account Privilege Comparison Table - Example

|                    | ADMINISTRATOR | USER |
|--------------------|---------------|------|
| Wizard             |               |      |
| Quick Start        | YES           | NO   |
| Configuration      |               |      |
| Connection Status  | YES           | YES  |
| Network            |               |      |
| Broadband          | YES           | NO   |
| Wireless           | YES           | NO   |
| Home Networking    | YES           | NO   |
| Routing            | YES           | NO   |
| QoS                | YES           | NO   |
| NAT                | YES           | NO   |
| DNS                | YES           | NO   |
| IGMP/MLD           | YES           | NO   |
| Interface Grouping | YES           | NO   |
| Security           |               |      |
| Firewall           | YES           | NO   |
| Mac Filter         | YES           | NO   |
| Certificates       | YES           | NO   |
| System Monitor     |               |      |
| Log                | YES           | YES  |
| Traffic Status     | YES           | YES  |

Table 188 Account Privilege Comparison Table - Example (continued)

|                     | ADMINISTRATOR | USER |
|---------------------|---------------|------|
| ARP Table           | YES           | YES  |
| Routing Table       | YES           | YES  |
| Multicast Status    | YES           | YES  |
| WLAN Station Status | YES           | YES  |
| Maintenance         |               |      |
| System              | YES           | NO   |
| User Account        | YES           | YES  |
| Remote Management   | YES           | YES  |
| Time                | YES           | YES  |
| Email Notification  | YES           | YES  |
| Log Setting         | YES           | YES  |
| Firmware Upgrade    | YES           | YES  |
| Backup/Restore      | YES           | YES  |
| Reboot              | YES           | YES  |
| Diagnostic          | YES           | YES  |

## 35.2 User Account

Click **Maintenance > User Account** to open the following screen. Use this screen to create and manage user accounts and their privileges on the Zyxel Device.

**Figure 281** Maintenance > User Account

**User Account**

In the **User Account** screen, you can view the settings of the "admin" and other user accounts that you use to log into the Zyxel Device to manage it.  
Use this screen to create or manage user accounts and their privileges on the Zyxel Device.

+ Add New Account

| # | Active                              | User Name | Retry Times | Idle Timeout | Lock Period | Group         | Remote Privilege | Modify |
|---|-------------------------------------|-----------|-------------|--------------|-------------|---------------|------------------|--------|
| 1 | <input checked="" type="checkbox"/> | admin     | 3           | 5            | 5           | Administrator | LAN/WAN          |        |

Cancel Apply

The following table describes the labels in this screen.

Table 189 Maintenance &gt; User Account

| LABEL           | DESCRIPTION                                                                                                                                                |
|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Add New Account | Click this button to add a new user account.                                                                                                               |
| #               | This is the index number.                                                                                                                                  |
| Active          | This indicates whether the user account is active or not.<br>The checkbox is selected when the user account is enabled. It is cleared when it is disabled. |

Table 189 Maintenance &gt; User Account (continued)

| LABEL            | DESCRIPTION                                                                                                                                                                                  |
|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| User Name        | This displays the name of the account used to log into the Zyxel Device Web Configurator.                                                                                                    |
| Retry Times      | This displays the number of times consecutive wrong passwords can be entered for this account. 0 means there is no limit.                                                                    |
| Idle Timeout     | This displays the length of inactive time before the Zyxel Device will automatically log the user out of the Web Configurator.                                                               |
| Lock Period      | This field displays the length of time a user must wait before attempting to log in again after a number of consecutive wrong passwords have been entered as defined in <b>Retry Times</b> . |
| Group            | This field displays this user has <b>Administrator</b> privileges.                                                                                                                           |
| Remote Privilege | This field displays whether this user can access the Zyxel Device with HTTP, Telnet or SSH through the <b>WAN, LAN</b> or <b>LAN/WAN</b> .                                                   |
| Modify           | Click the <b>Edit</b> icon to configure the entry.<br>Click the <b>Delete</b> icon to remove the entry.                                                                                      |
| Cancel           | Click <b>Cancel</b> to restore your previously saved settings.                                                                                                                               |
| Apply            | Click <b>Apply</b> to save your changes.                                                                                                                                                     |

### 35.2.1 User Account Add or Edit

Add or change the name of the user account, set the security password and the retry times, and whether this user will have **Administrator** or **User** privileges. Click **Add New Account** or the **Edit** icon of an existing account in the **Maintenance > User Account** to open the following screen.

Figure 282 Maintenance &gt; User Account: Add

**Figure 283** Maintenance > User Account: Edit

The following table describes the labels in this screen.

Table 190 Maintenance &gt; User Account &gt; User Account Add/Edit

| LABEL           | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Active          | Click to enable (switch turns blue) or disable (switch turns gray) to activate or deactivate the user account.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| User Name       | Enter a name for this account. You can use up to 31 printable characters except [ " ], [ ` ], [ ' ], [ < ], [ > ], [ ^ ], [ \$ ], [   ], [ & ], or [ ; ]. Spaces are allowed.                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Password        | <p>Enter your new system password. The password must contain at least one numeric and one alphabetic character. You can use 6 – 64 alphanumeric (0-9, a-z, A-Z) and special characters except [ " ], [ ` ], [ ' ], [ &lt; ], [ &gt; ], [ ^ ], [ \$ ], [   ], [ &amp; ], or [ ; ]. Spaces are allowed.</p> <p>Note that as you type a password, the screen displays a (*) for each character you type. After you change the password, use the new password to access the Zyxel Device.</p> <p>If you are changing your existing password, you have to first enter your <b>Old Password</b> then enter your <b>New Password</b>.</p> |
| Verify Password | Enter the new password again for confirmation.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Retry Times     | Enter the number of times consecutive wrong passwords can be entered for this account. 0 means there is no limit.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Idle Timeout    | Enter the length of inactive time before the Zyxel Device will automatically log the user out of the Web Configurator.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Lock Period     | Enter the length of time a user must wait before attempting to log in again after a number of consecutive wrong passwords have been entered as defined in <b>Retry Times</b> .                                                                                                                                                                                                                                                                                                                                                                                                                                                     |



Table 190 Maintenance &gt; User Account &gt; User Account Add/Edit (continued)

| LABEL            | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Group            | <p>Specify whether this user will have <b>Administrator</b> or <b>User</b> privileges. An <b>Administrator</b> account can access all Web Configurator menus. A <b>User</b> account can only access <b>Monitor</b> and <b>Maintenance</b> menus.</p> <p>The maximum account number of <b>Administrator</b> and <b>User</b> are both four. The total number of the users allowed to log in the Zyxel Device at the same time is eight.</p> <p><b>The Administrator privileges are the following:</b></p> <ul style="list-style-type: none"> <li>• <b>Quick Start</b> setup.</li> <li>• The following screens are visible for setup:<br/> <b>Broadband, Wireless, Home Networking, Routing, NAT, DNS, Firewall, MAC Filter, Voice, Log, Traffic Status, ARP Table, Routing Table, Cellular WAN Status, System, User Account, Remote Management, Time, Email Notification, Log Setting, Firmware Upgrade, Backup/Restore, Reboot, Diagnostic.</b></li> </ul> <p><b>The User privileges are the following:</b></p> <ul style="list-style-type: none"> <li>• The following screens are visible for setup:<br/> <b>Log, Traffic Status, ARP Table, Routing Table, Cellular WAN Status, User Account, Remote Management, Time, Email Notification, Log Setting, Firmware Upgrade, Backup/Restore, Reboot, Diagnostic.</b></li> </ul> |
| Remote Privilege | <p>Select whether this user can access the Zyxel Device with HTTP, Telnet or SSH through the <b>WAN</b>, <b>LAN</b> or <b>LAN/WAN</b>. Only the <b>Administrator</b> is allowed to use Telnet and SSH for remote management.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Cancel           | <p>Click <b>Cancel</b> to restore your previously saved settings.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| OK               | <p>Click <b>OK</b> to save your changes.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |

# CHAPTER 36

## Remote Management

### 36.1 Remote Management Overview

Use Remote Management to control web services (HTTP, HTTPS, SSH, SNMP, and Ping) can access the Zyxel Device through which interfaces.

Note: Use the Web Configurator (HTTP) to manage the Zyxel Device.

#### 36.1.1 What You Can Do in this Chapter

- Use the **MGMTServices** screen to allow various approaches to access the Zyxel Device remotely from a WAN and/or LAN connection ([Section 36.2 on page 466](#)).
- Use the **Trust Domain** screen to enable users to permit access from local management services by entering specific IP addresses ([Section 36.3 on page 468](#)).

### 36.2 MGMTServices

Use this screen to configure the interfaces through which services can access the Zyxel Device. You can also specify service port numbers computers must use to connect to the Zyxel Device. Click **Maintenance > Remote Management > MGMTServices** to open the following screen.

**Figure 284** Maintenance > Remote Management > MGMT Services

**Remote Management**

**MGMT Services** Trust Domain

Use the screen to configure the interfaces through which services can access the Zyxel Device. You can also specify service port numbers computers must use to connect to the Zyxel Device.

**Service Control**

WAN Interface used for service: ☒ Any\_WAN ☐ Multi\_WAN

☐ WWAN ☐ Ethernet

| Service | LAN                                        | WLAN                                       | WAN                             | Trust Domain                    | Port | Redirect                        |
|---------|--------------------------------------------|--------------------------------------------|---------------------------------|---------------------------------|------|---------------------------------|
| HTTP    | <input checked="" type="checkbox"/> Enable | <input checked="" type="checkbox"/> Enable | <input type="checkbox"/> Enable | <input type="checkbox"/> Enable | 80   | <input type="checkbox"/> Enable |
| HTTPS   | <input checked="" type="checkbox"/> Enable | <input checked="" type="checkbox"/> Enable | <input type="checkbox"/> Enable | <input type="checkbox"/> Enable | 443  |                                 |
| SSH     | <input checked="" type="checkbox"/> Enable | <input checked="" type="checkbox"/> Enable | <input type="checkbox"/> Enable | <input type="checkbox"/> Enable | 22   |                                 |
| SNMP    | <input checked="" type="checkbox"/> Enable | <input checked="" type="checkbox"/> Enable | <input type="checkbox"/> Enable | <input type="checkbox"/> Enable | 161  |                                 |
| PING    | <input checked="" type="checkbox"/> Enable | <input checked="" type="checkbox"/> Enable | <input type="checkbox"/> Enable | <input type="checkbox"/> Enable |      |                                 |

Cancel Apply

The following table describes the fields in this screen.

**Table 191** Maintenance > Remote Management > MGMT Services

| Label                           | Description                                                                                                                                                                                                                                                                                                             |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Service Control                 |                                                                                                                                                                                                                                                                                                                         |
| WAN Interface used for services | Select <b>Any_WAN</b> to have the Zyxel Device automatically activate the remote management service when any WAN connection is up.<br><br>Select <b>Multi_WAN</b> and then select one or more WAN connections to have the Zyxel Device activate the remote management service when the selected WAN connections are up. |
| WWAN                            | Enable the WWAN (cellular) connection configured in <b>Network Setting &gt; Broadband &gt; Cellular Backup</b> to access the service on the Zyxel Device.                                                                                                                                                               |
| Ethernet                        | Enable the Ethernet WAN connection configured in <b>Network Setting &gt; Broadband &gt; Ethernet WAN</b> to access the service on the Zyxel Device.                                                                                                                                                                     |
| ADSL                            | Enable the ADSL connection configured in <b>Network Setting &gt; Broadband &gt; Add New WAN Interface</b> or <b>Modify</b> to access the service on the Zyxel Device.                                                                                                                                                   |
| VDSL                            | Enable the VDSL WAN connection configured in <b>Network Setting &gt; Broadband &gt; Add New WAN Interface</b> or <b>Modify</b> to access the service on the Zyxel Device.                                                                                                                                               |
| GPON                            | Enable the Gigabit Ethernet Passive Optical Network WAN connection configured in <b>Network Setting &gt; Broadband &gt; Add New WAN Interface</b> or <b>Modify</b> to access the service on the Zyxel Device.                                                                                                           |
| Service                         | This is the service you may use to access the Zyxel Device.                                                                                                                                                                                                                                                             |
| LAN                             | Select the <b>Enable</b> checkbox for the corresponding services that you want to allow access to the Zyxel Device from the LAN.                                                                                                                                                                                        |
| WLAN                            | Select the <b>Enable</b> checkbox for the corresponding services that you want to allow access to the Zyxel Device from the WLAN.                                                                                                                                                                                       |

Table 191 Maintenance &gt; Remote Management &gt; MGMT Services (continued)

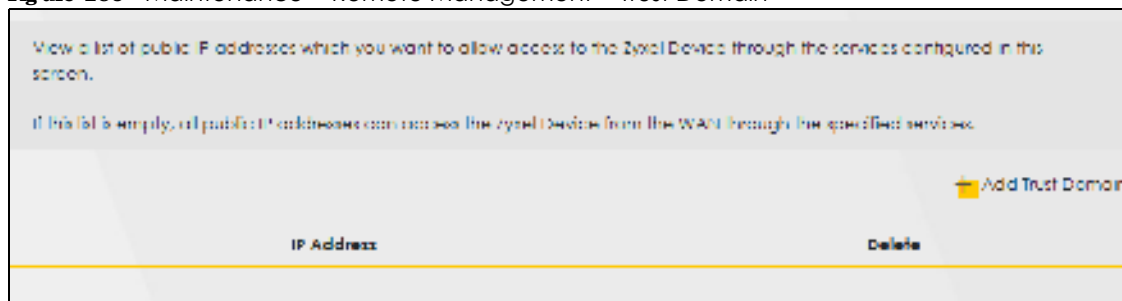
| LABEL        | DESCRIPTION                                                                                                                                                                                                                                                                                                                  |
|--------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| WAN          | Select the <b>Enable</b> checkbox for the corresponding services that you want to allow access to the Zyxel Device from all WAN connections.                                                                                                                                                                                 |
| Trust Domain | Select the <b>Enable</b> checkbox for the corresponding services that you want to allow access to the Zyxel Device from the trusted host IP address.                                                                                                                                                                         |
| Port         | You may change the server port number for a service if needed, however you must use the same port number in order to use that service for remote management.                                                                                                                                                                 |
| Redirect     | To allow only secure Web Configurator access, select this to redirect all HTTP connection requests to the HTTPS server. For example, if you enter http://192.168.1.1 in your browser to access the Web Configurator, then the Zyxel Device will automatically change this to the more secure https://192.168.1.1 for access. |
| Apply        | Click <b>Apply</b> to save your changes back to the Zyxel Device.                                                                                                                                                                                                                                                            |
| Cancel       | Click <b>Cancel</b> to restore your previously saved settings.                                                                                                                                                                                                                                                               |

### 36.3 Trust Domain

Use this screen to view a list of public IP addresses which are allowed to access the Zyxel Device through the services configured in the **Maintenance > Remote Management > MGMTServices** screen. Click **Maintenance > Remote Management > Trust Domain** to open the following screen.

Note: Enter the IP address of the management station permitted to access the local management services. If specific services from the trusted hosts are allowed access but the trust domain list is empty, all public IP addresses can access the Zyxel Device from the WAN using the specified services.

Figure 285 Maintenance &gt; Remote Management &gt; Trust Domain



The following table describes the fields in this screen.

Table 192 Maintenance &gt; Remote Management &gt; Trust Domain

| LABEL            | DESCRIPTION                                                         |
|------------------|---------------------------------------------------------------------|
| Add Trust Domain | Click this to add a trusted host IP address.                        |
| IP Address       | This field shows a trusted host IP address.                         |
| Delete           | Click the <b>Delete</b> icon to remove the trusted host IP address. |

### 36.3.1 Add Trust Domain

Use this screen to add a public IP addresses or a complete domain name of a device which is allowed to access the Zyxel Device. Enter the IP address of the management station permitted to access the local management services. If specific services from the trusted-hosts are allowed access but the trust domain list is empty, all public IP addresses can access the Zyxel Device from the WAN using the specified services.

Click the **Add Trust Domain** button in the **Maintenance > Remote Management > Trust Domain** screen to open the following screen.

**Figure 286** Maintenance > Remote Management > Trust Domain > Add Trust Domain

The following table describes the fields in this screen.

Table 193 Maintenance > Remote Management > Trust Domain > Add Trust Domain

| LABEL      | DESCRIPTION                                                                                                  |
|------------|--------------------------------------------------------------------------------------------------------------|
| IP Address | Enter a public IPv4/IPv6 IP address which is allowed to access the service on the Zyxel Device from the WAN. |
| OK         | Click <b>OK</b> to save your changes back to the Zyxel Device.                                               |
| Cancel     | Click <b>Cancel</b> to restore your previously saved settings.                                               |

# CHAPTER 37

## Time Settings

### 37.1 Time Settings Overview

This chapter shows you how to configure system related settings, such as system date and time.

### 37.2 Time

For effective scheduling and logging, the Zyxel Device system time must be accurate. Use this screen to configure the Zyxel Device's time based on your local time zone. You can enter a time server address, select the time zone where the Zyxel Device is physically located, and configure Daylight Savings settings if needed.

To change your Zyxel Device's time and date, click **Maintenance** > **Time**. The screen appears as shown.

**Figure 287** Maintenance > Time

Configure the Zyxel Device's time based on your local time zone. You can add a time server address, select your time zone, and configure Daylight Savings if your location uses it.

**Current Date/Time**

Current Time: 14:21:55  
Current Date: 2019-02-27

**Time and Date Setup**

Time Protocol: NTP (RFC-1769)

First Time Server Address: pool.ntp.org

Second Time Server Address: pool.ntp.org

Third Time Server Address: pool.ntp.org

Fourth Time Server Address: None

Fifth Time Server Address: None

**Time Zone**

Time Zone: GMT+08:00 Taipei

**Daylight Savings**

Active: ☒

**Start Rule**

Day: |

Time: 00:00

Month: March

Hour: 0

**End Rule**

Day: |

Time: 00:00

Month: October

Hour: 0

Cancel Apply

The following table describes the fields in this screen.

**Table 194** Maintenance > Time

| Label               | Description                                                                                                                                    |
|---------------------|------------------------------------------------------------------------------------------------------------------------------------------------|
| Current Date/Time   |                                                                                                                                                |
| Current Time        | This displays the time of your Zyxel Device.<br>Each time you reload this screen, the Zyxel Device synchronizes the time with the time server. |
| Current Date        | This displays the date of your Zyxel Device.<br>Each time you reload this screen, the Zyxel Device synchronizes the date with the time server. |
| Time and Date Setup |                                                                                                                                                |
| Time Protocol       | This displays the time protocol used by your Zyxel Device.                                                                                     |

Table 194 Maintenance &gt; Time (continued)

| LABEL                                                                                                                                                                                                      | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| First – Fifth Time Server Address                                                                                                                                                                          | <p>Select an NTP time server from the drop-down list box.</p> <p>Otherwise, select <b>Other</b> and enter the IP address or URL (up to 29 printable characters in length) of your time server.</p> <p>Select <b>None</b> if you do not want to configure the time server.</p> <p>Check with your ISP/network administrator if you are unsure of this information.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Time Zone                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Time zone                                                                                                                                                                                                  | Choose the time zone of your location. This will set the time difference between your time zone and Greenwich Mean Time (GMT).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Daylight Savings<br>Daylight Saving Time is a period from late spring to early fall when many countries set their clocks ahead of normal local time by one hour to give more daytime light in the evening. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Active                                                                                                                                                                                                     | Click this switch to enable or disable Daylight Saving Time. When the switch turns blue, the function is enabled. Otherwise, it is not.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Start Rule                                                                                                                                                                                                 | <p>Configure the day and time when Daylight Saving Time starts if you enabled Daylight Saving. You can select a specific date in a particular month or a specific day of a specific week in a particular month. The <b>Time</b> field uses the 24 hour format. Here are a couple of examples:</p> <p>Daylight Saving Time starts in most parts of the United States on the second Sunday of March. Each time zone in the United States starts using Daylight Saving Time at 2 A.M. local time. So in the United States, set the day to <b>Second, Sunday</b>, the month to <b>March</b> and the time to <b>2</b> in the <b>Hour</b> field.</p> <p>Daylight Saving Time starts in the European Union on the last Sunday of March. All of the time zones in the European Union start using Daylight Saving Time at the same moment (1 A.M. GMT or UTC). So in the European Union you would set the day to <b>Last, Sunday</b> and the month to <b>March</b>. The time you select in the <b>o'clock</b> field depends on your time zone. In Germany for instance, you would select <b>2</b> in the <b>Hour</b> field because Germany's time zone is one hour ahead of GMT or UTC (GMT+1).</p> |
| End Rule                                                                                                                                                                                                   | <p>Configure the day and time when Daylight Saving Time ends if you enabled Daylight Saving. You can select a specific date in a particular month or a specific day of a specific week in a particular month. The <b>Time</b> field uses the 24 hour format. Here are a couple of examples:</p> <p>Daylight Saving Time ends in the United States on the first Sunday of November. Each time zone in the United States stops using Daylight Saving Time at 2 A.M. local time. So in the United States you would set the day to <b>First, Sunday</b>, the month to <b>November</b> and the time to <b>2</b> in the <b>Hour</b> field.</p> <p>Daylight Saving Time ends in the European Union on the last Sunday of October. All of the time zones in the European Union stop using Daylight Saving Time at the same moment (1 A.M. GMT or UTC). So in the European Union you would set the day to <b>Last, Sunday</b>, and the month to <b>October</b>. The time you select in the <b>o'clock</b> field depends on your time zone. In Germany for instance, you would select <b>2</b> in the <b>Hour</b> field because Germany's time zone is one hour ahead of GMT or UTC (GMT+1).</p>     |
| Cancel                                                                                                                                                                                                     | Click <b>Cancel</b> to exit this screen without saving.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Apply                                                                                                                                                                                                      | Click <b>Apply</b> to save your changes.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |



# CHAPTER 38

## Email Notification

### 38.1 Email Notification Overview

A mail server is an application or a computer that can receive, forward and deliver email messages.

To have the Zyxel Device send reports, logs or notifications through email, you must specify an email server and the email addresses of the sender and receiver.

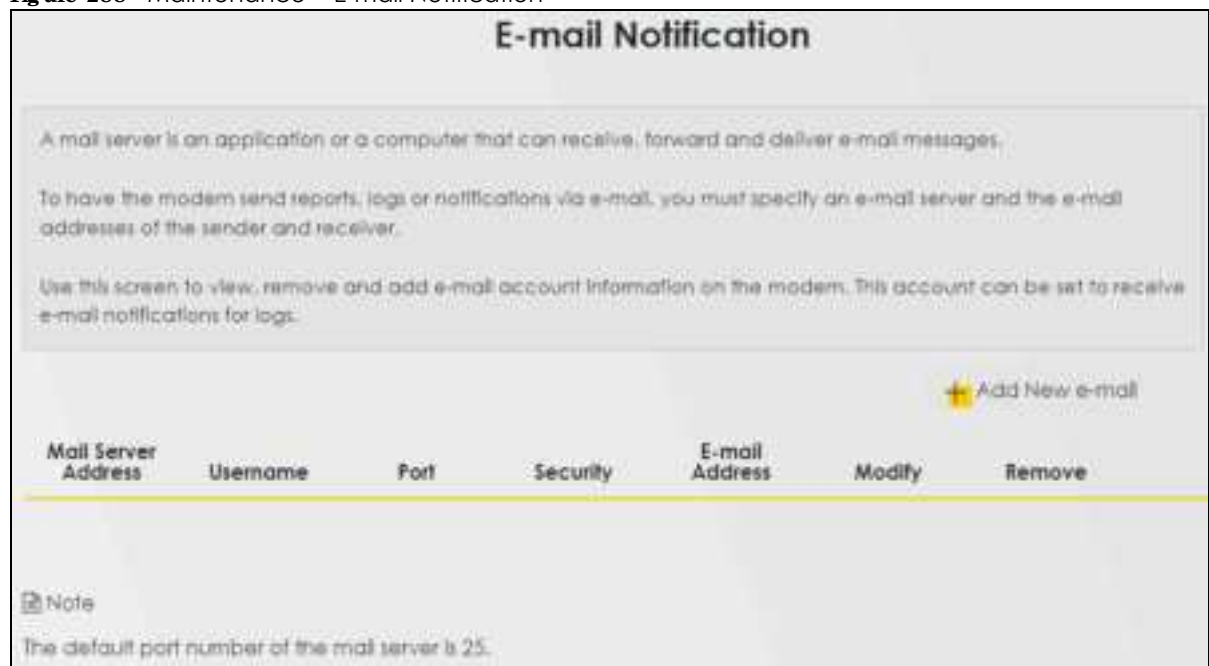
### 38.2 Email Notification

Use this screen to view, remove and add email account information on the Zyxel Device. This account can be set to send email notifications for logs.

Click **Maintenance > E-mail Notification** to open the **E-mail Notification** screen.

Note: The default port number of the mail server is 25.

**Figure 288** Maintenance > E-mail Notification



| Mail Server Address | Username | Port | Security | E-mail Address | Modify | Remove |
|---------------------|----------|------|----------|----------------|--------|--------|
|---------------------|----------|------|----------|----------------|--------|--------|

Note  
The default port number of the mail server is 25.

The following table describes the labels in this screen.

Table 195 Maintenance > E-mail Notification

| LABEL               | DESCRIPTION                                                                                                                    |
|---------------------|--------------------------------------------------------------------------------------------------------------------------------|
| Add New e-mail      | Click this button to create a new entry (up to 32 can be created).                                                             |
| Mail Server Address | This displays the server name or the IP address of the mail server.                                                            |
| Username            | This displays the user name of the sender's mail account.                                                                      |
| Port                | This field displays the port number of the mail server.                                                                        |
| Security            | This field displays the protocol used for encryption.                                                                          |
| E-mail Address      | This field displays the email address that you want to be in the from or sender line of the email that the Zyxel Device sends. |
| Modify              | Click the <b>Edit</b> icon to configure the entry.<br>Click the <b>Delete</b> icon to remove the entry.                        |
| Remove              | Click this button to delete the selected entries.                                                                              |

### 38.2.1 E-mail Notification Edit

Click the **Add** button in the **E-mail Notification** screen. Use this screen to configure the required information for sending email through a mail server.

Figure 289 Maintenance > E-mail Notification > Add

The screenshot shows the 'Add New e-mail' configuration screen. The title bar includes a back arrow and the text 'Add New e-mail'. The main content area is titled 'E-mail Notification Configuration'. It contains several input fields: 'Mail Server Address', 'Port' (with the value '25'), 'Authentication Username', 'Authentication Password', and 'Account e-mail Address'. To the right of the 'Port' field is a dropdown menu with 'STARTTLS' selected and 'SSL' as an option. At the bottom of the screen are 'Cancel' and 'OK' buttons.

The following table describes the labels in this screen.

Table 196 Maintenance > E-mail Notification > Add

| <b>LABEL</b>            | <b>DESCRIPTION</b>                                                                                                                                                                                                                                                             |
|-------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Mail Server Address     | Enter the server name or the IP address of the mail server for the email address specified in the <b>Account e-mail Address</b> field.<br><br>If this field is left blank, reports, logs or notifications will not be sent through email.                                      |
| Port                    | Enter the same port number here as is on the mail server for mail traffic.                                                                                                                                                                                                     |
| Authentication Username | Enter the user name. You can use up to 32 printable characters except [ " ], [ ` ], [ ' ], [ < ], [ > ], [ ^ ], [ \$ ], [   ], [ & ], or [ ; ]. Spaces are allowed. This is usually the user name of a mail account you specified in the <b>Account e-mail Address</b> field.  |
| Authentication Password | Enter the password associated with the user name above.                                                                                                                                                                                                                        |
| Account e-mail Address  | Enter the email address that you want to be in the from or sender line of the email notification that the Zyxel Device sends.<br><br>If you activate SSL/TLS authentication, the email address must be able to be authenticated by the mail server as well.                    |
| Connection Security     | Select <b>SSL</b> to use Secure Sockets Layer (SSL) or Transport Layer Security (TLS) if you want encrypted communications between the mail server and the Zyxel Device.<br><br>Select <b>STARTLS</b> to upgrade a plain text connection to a secure connection using SSL/TLS. |
| Cancel                  | Click this button to begin configuring this screen afresh.                                                                                                                                                                                                                     |
| OK                      | Click this button to save your changes and return to the previous screen.                                                                                                                                                                                                      |

# CHAPTER 39

## Log Setting

### 39.1 Log Setting Overview

You can configure where the Zyxel Device sends logs and which type of logs the Zyxel Device records in the **Log Setting** screen.

### 39.2 Log Setting

Use this screen to configure where the Zyxel Device sends logs, and which type of logs the Zyxel Device records.

If you have a server that is running a syslog service, you can also save log files to it by enabling **Syslog Logging**, and then entering the IP address of the server in the **Syslog Server** field. Select **Remote** to store logs on the syslog server, or select **Local File** to store logs on the Zyxel Device. Select **Local File and Remote** to store logs on both the Zyxel Device and the syslog server. To change your Zyxel Device's log settings, click **Maintenance > Log Setting**. The screen appears as shown.

**Figure 290** Maintenance > Log Setting

### Log Settings

Use this screen to configure where the Zyxel Device sends logs, and which type of logs the Zyxel Device records.

If you have a server that is running a syslog service, you can also save log files to it by enabling **Syslog Logging** and then entering the IP address of the server in the **Syslog Server** field. Select **Remote** to store logs on the syslog server, or select **Local File** to store logs on the Zyxel Device. Select **Local File and Remote** to store logs on both the Zyxel Device and on the syslog server.

---

#### Syslog Settings

Syslog Logging: ☒

Mode: Local File and Remote

Syslog Server: 9.0.0.1 (Syslog Server IP or FQDN)

UDP Port: 514 (Server Port)

Enable Syslog over TLS: ☒

Local Certificate Used by Syslog Client:

---

#### E-mail Log Settings

Email Log Settings: ☒

Mail Account: Select one account

System Log Mail Subject:

Security Log Mail Subject:

Send Log To:  (E-Mail Address)

Send Alarm To:  (E-Mail Address)

Alarm Interval: 60 (Seconds)

---

#### Active Log

##### System Log

- ☒ WAN DHCP
- ☒ DHCP Server
- ☒ PPPoE
- ☐ TR-069
- ☐ HTTP
- ☐ HTTPS
- ☒ System
- ☒ IDS
- ☐ ACL
- ☐ Wireless
- ☐ VoIP
- ☐ QoS
- ☐ VPN

##### Security Log

- ☐ Account
- ☒ Attack
- ☒ Threat
- ☐ MAC Filter

Cancel Apply

The following table describes the fields in this screen.

Table 197 Maintenance > Log Setting

| LABEL                                   | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|-----------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Syslog Settings                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Syslog Logging                          | Slide the switch to the right to enable syslog logging.                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Mode                                    | <p>Select <b>Remote</b> to have the Zyxel Device send it to an external syslog server.</p> <p>Select <b>Local File</b> to have the Zyxel Device save the log file on the Zyxel Device itself.</p> <p>Select <b>Local File and Remote</b> to have the Zyxel Device save the log file on the Zyxel Device itself and send it to an external syslog server.</p> <p>Note: A warning appears upon selecting <b>Remote</b> or <b>Local File and Remote</b>. Just click <b>OK</b> to continue.</p> |
| Syslog Server                           | Enter the server name or IP address of the syslog server that will log the selected categories of logs.                                                                                                                                                                                                                                                                                                                                                                                     |
| UDP Port                                | Enter the port number used by the syslog server.                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Enable Syslog over TLS                  | <p>Use <b>Syslog over TLS</b> to securely send logs from the Zyxel Device to the syslog server using TLS encryption.</p> <p>On the Zyxel Device, first generate a certificate for syslog authentication of the Zyxel Device. The CN (Certificate Name) must match the IP address of the Zyxel Device's interface to the syslog server. Go to <b>Certificates &gt; Local CA</b> and import a certificate for syslog authentication. This is required.</p>                                    |
| Local Certificate Used by Syslog Client | Optionally, the Syslog server may also request a certificate from the Zyxel Device for mutual authentication. Go to <b>Certificates &gt; Local Certificate</b> and import a Zyxel Device certificate that the syslog server can use to verify the Zyxel Device.                                                                                                                                                                                                                             |
| E-mail Log Settings                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| E-mail Log Settings                     | <p>Slide the switch to the right to allow the sending through email the system and security logs to the email address specified in <b>Send Log to</b>.</p> <p>Note: Make sure that the <b>Mail Server Address</b> field is not left blank in the <b>Maintenance &gt; E-mail Notifications</b> screen.</p>                                                                                                                                                                                   |
| Mail Account                            | Select a server specified in <b>Maintenance &gt; E-mail Notifications</b> to send the logs to.                                                                                                                                                                                                                                                                                                                                                                                              |
| System Log Mail Subject                 | This field allows you to enter a descriptive name for the system log email (for example Zyxel System Log). Up to 127 printable characters are allowed for the <b>System Log Mail Subject</b> including special characters inside the square brackets [!#%()*+,-./:=?@[{}~].                                                                                                                                                                                                                 |
| Security Log Mail Subject               | This field allows you to enter a descriptive name for the security log email (for example Zyxel Security Log). Up to 127 printable characters are allowed for the <b>Security Log Mail Subject</b> including special characters inside the square brackets [!#%()*+,-./:=?@[{}~].                                                                                                                                                                                                           |
| Send Log to                             | This field allows you to enter the log's designated email recipient. The log's format is plain text file sent as an email attachment.                                                                                                                                                                                                                                                                                                                                                       |
| Send Alarm to                           | This field allows you to enter the alarm's designated e-mail recipient. The alarm's format is plain text file sent as an email attachment.                                                                                                                                                                                                                                                                                                                                                  |
| Alarm Interval                          | Select the frequency of showing of the alarm.                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Active Log                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| System Log                              | Select the categories of <b>System Logs</b> that you want to record.                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Security Log                            | Select the categories of <b>Security Logs</b> that you want to record.                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Apply                                   | Click <b>Apply</b> to save your changes.                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Cancel                                  | Click <b>Cancel</b> to restore your previously saved settings.                                                                                                                                                                                                                                                                                                                                                                                                                              |

### 39.2.1 Example Email Log

An 'End of Log' message displays for each mail in which a complete log has been sent. The following is an example of a log sent by email.

- You may edit the subject title.
- The date format here is Day-Month-Year.
- The date format here is Month-Day-Year. The time format is Hour-Minute-Second.
- 'End of Log' message shows that a complete log has been sent.

**Figure 291** Email Log Example

```
Subject:
    Firewall Alert From
Date:
    Fri, 07 Apr 2000 10:05:42
From:
    user@zyxel.com
To:
    user@zyxel.com
1| Apr 7 00 | From:192.168.1.1      To:192.168.1.255 | default policy | forward
  | 09:54:03 | UDP      src port:00520 dest port:00520 | <1,00>         |
2| Apr 7 00 | From:192.168.1.131   To:192.168.1.255 | default policy | forward
  | 09:54:17 | UDP      src port:00520 dest port:00520 | <1,00>         |
3| Apr 7 00 | From:192.168.1.6     To:10.10.10.10   | match          | forward
  | 09:54:19 | UDP      src port:03516 dest port:00053 | <1,01>         |
.....{snip}.....
.....{snip}.....
126| Apr 7 00 | From:192.168.1.1     To:192.168.1.255 | match          | forward
   | 10:05:00 | UDP      src port:00520 dest port:00520 | <1,02>         |
127| Apr 7 00 | From:192.168.1.131   To:192.168.1.255 | match          | forward
   | 10:05:17 | UDP      src port:00520 dest port:00520 | <1,02>         |
128| Apr 7 00 | From:192.168.1.1     To:192.168.1.255 | match          | forward
   | 10:05:30 | UDP      src port:00520 dest port:00520 | <1,02>         |

End of Firewall Log
```

# CHAPTER 40

## Firmware Upgrade

### 40.1 Firmware Upgrade Overview

This chapter explains how to upload new firmware to your Zyxel Device if you get new firmware releases from your service provider.

### 40.2 Firmware Upgrade

This screen lets you upload new firmware to your Zyxel Device.

Get the latest firmware from your service provider. Then upload the firmware file to your Zyxel Device. The upload process uses HTTP (Hypertext Transfer Protocol). The upload may take up to 3 minutes. After a successful upload, the Zyxel Device will reboot.

Click **Maintenance > Firmware Upgrade** to open the **following** screen.

**Do NOT turn off the Zyxel Device while firmware upload is in progress!**

**Figure 292** Maintenance > Firmware Upgrade

The screenshot shows the 'Firmware Upgrade' web interface. At the top, it says 'Firmware Upgrade'. Below that, there is a text box explaining the process: 'This screen lets you upload new firmware to your Zyxel Device. Download the latest firmware file from the Zyxel website and upload it to your Zyxel Device using this screen. The upload process uses HTTP (Hypertext Transfer Protocol) and may take up to two minutes. After a successful upload, the Zyxel Device will reboot. Restore Partial Default Settings After Firmware Upgrade: Reset All Settings Except Mesh After Firmware Upgrade resets all your configurations, except for Mesh WiFi settings, to the factory defaults after firmware upgrade.'

Under the 'Upgrade Firmware' section, there are two checkboxes: 'Reset All Settings After Firmware Upgrade' and 'Reset All Settings Except Mesh After Firmware Upgrade', both of which are currently unchecked. Below these, it shows 'Current Firmware Version: v3.15(ACH101B2)'. There is a 'File Path' field with a 'Choose File' button and 'No file chosen' text. To the right of this is a yellow 'Upload' button.

Under the 'Upgrade WWAN Package' section, it shows 'Current WWAN Package Version: 1.24'. There is a 'File Path' field with a 'Choose File' button and 'No file chosen' text. To the right of this is a yellow 'Upload' button.



The following table describes the labels in this screen.

Table 198 Maintenance > Firmware Upgrade

| LABEL                                                 | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|-------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Upgrade Firmware                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Restore Default Settings After Firmware Upgrade       | <p>Select this to reset all your configurations, including Mesh WiFi settings, to the factory defaults after firmware upgrade. Otherwise, make sure this is cleared if you do not want the Zyxel Device to lose all its current configurations and return to the factory defaults.</p> <p>Note: Make sure to back up the Zyxel Device's configuration settings first in case the reset all settings process is not successful.</p>                                                                                                                                   |
| Reset All Settings Except Mesh After Firmware Upgrade | <p>Select this to reset all your configurations, except for Mesh WiFi settings, to the factory defaults after firmware upgrade. This minimizes interruption to your Mesh WiFi network after upgrading firmware.</p> <p>Mesh WiFi settings include:</p> <ul style="list-style-type: none"> <li>• Controller/Agent Mode</li> <li>• Mesh Internet Access</li> <li>• Main and Guest SSIDs including Guest WiFi isolation</li> <li>• 2.4GHz &amp; 5GHz Radios</li> <li>• 802.11 Mode</li> <li>• Protected Management Frames</li> <li>• Encryption and WPA keys</li> </ul> |
| Current Firmware Version                              | <p>The firmware on each Zyxel Device is identified by the firmware trunk version, followed by a unique code which identifies the model, and then the release number after the period. For example, V5.70 (ACDZ.0) is a firmware for the 5.70 version trunk, the ACDZ code identifies the EX5601 model, and .0 is the first firmware release for the model.</p>                                                                                                                                                                                                       |
| File Path                                             | <p>Enter the location of the file you want to upload in this field or click <b>Choose File/Browse</b> to find it.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Choose File/Browse                                    | <p>Click this to find the .bin file you want to upload. Remember that you must decompress compressed (.zip) files before you can upload them.</p>                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Upload                                                | <p>Click this to begin the upload process. This process may take up to 3 minutes.</p> <p>Note: Only use firmware for your Zyxel Device's specific model. Refer to the label on the bottom of your Zyxel Device. For example, if the Zyxel Device's current firmware version is V5.70(ACDZ.0)B4, you must upload the firmware file containing "ACDZ".</p>                                                                                                                                                                                                             |
| Upgrade WWAN Package                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Current WWAN Package Version                          | <p>This is the current version or the WWAN (Wireless Wide Area Network) package installed in the Zyxel Device. A WWAN package adds support for more 4G USB dongles without you having to upgrade the Zyxel Device's firmware.</p>                                                                                                                                                                                                                                                                                                                                    |
| File Path                                             | <p>Enter the location of the file you want to upload in this field or click <b>Choose File/Browse</b> to find it.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Choose File/Browse                                    | <p>Click this to find the .bin file you want to upload. Remember that you must decompress compressed (.zip) files before you can upload them.</p>                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Upload                                                | <p>Click this to begin the upload process. This process may take up to 3 minutes.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |

After you see the firmware updating screen, wait a few minutes before logging into the Zyxel Device again.

**Figure 293** Firmware Uploading



The Zyxel Device automatically restarts in this time causing a temporary network disconnect. In some operating systems, you may see the following icon on your desktop.

**Figure 294** Network Temporarily Disconnected



After 2 minutes, log in again and check your new firmware version in the **Connection Status** screen.

If the upload was not successful, an error screen will appear. Click **OK** to go back to the **Firmware Upgrade** screen.

**Figure 295** Error Message



# C H A P T E R 41

## Ba c k u p / R e s t o r e

### 41.1 B a c k u p / R e s t o r e O v e r v i e w

Information related to factory default settings and backup configuration are shown in this screen. You can also use this to restore Zyxel Device's previous configurations.

### 41.2 B a c k u p / R e s t o r e

Click **M a i n t e n a n c e > B a c k u p / R e s t o r e**. Information related to factory defaults, backup configuration, and restoring configuration appears in this screen, as shown next.

**Figure 296** Maintenance > Backup/Restore

**Backup/Restore**

**Backup/Restore:** Backup/Restore

Information related to factory default settings and backup configuration are shown in this screen. You can also use this to restore previous device configurations.

Backup Configuration allows you to back up (save) the Zyxel Device's current configuration to a file on your computer. Once your Zyxel Device is configured and functioning properly, it is highly recommended that you back up your configuration file before making configuration changes.

Restore Configuration allows you to upload a new or previously saved configuration file from your computer to your Zyxel Device.

**Backup Configuration**

Click **Backup** to save the current configuration of your system to your computer.

**Backup**

**Restore Configuration**

To restore a previously saved configuration file to your system, browse to the location of the configuration file and click **Upload**.

File Path:  Choose file No file chosen **Upload**

**Perform Mesh Full Factory Reset**

Mesh Full Factory Reset allows you to clear the controller and agents' all user-entered configuration information and return to factory default settings. After resetting, the

- Password is printed on a label on the bottom of the device, written after the text "Password".
- LAN IP address will be 192.168.1.1
- DHCP will be reset to default setting.

**Reset All Settings**

**Perform Mesh Partial Factory Reset**

Mesh Partial Factory Reset allows you to keep certain user-configurables while bringing the reset of the controller and agents to factory default setting.

- System will keep Wi-Fi settings. Include these user settings: (Mesh Enable/Disable, Mesh Controller Mode, Mesh Backhaul Information, Single SSID Enable/Disable, SSIDs, WPA keys, Encryption modes, 2.4GHz Enable/Disable, 5GHz Enable/Disable, Guest Wi-Fi Enable/Disable, Guest Wi-Fi Isolation setting, 802.11 Mode, PMF setting)

**Reset All Settings Except Mesh**

## Backup Configuration

**Backup Configuration** allows you to back up (save) the Zyxel Device's current configuration to a file on your computer. Once your Zyxel Device is configured and functioning properly, it is highly recommended that you back up your configuration file before making configuration changes. The backup configuration file will be useful in case you need to return to your previous settings.

Click **Backup** to save the Zyxel Device's current configuration to your computer.

## Restore Configuration

**Restore Configuration** allows you to upload a new or previously saved configuration file from your computer to your Zyxel Device.

Table 199 Maintenance > Backup/Restore: Restore Configuration

| LABEL                | DESCRIPTION                                                                                                                           |
|----------------------|---------------------------------------------------------------------------------------------------------------------------------------|
| File Path            | Enter in the location of the file you want to upload in this field or click <b>Choose File / Browse</b> to find it.                   |
| Choose File / Browse | Click this to find the file you want to upload. Remember that you must decompress compressed (.ZIP) files before you can upload them. |
| Upload               | Click this to begin the upload process.                                                                                               |
| Reset                | Click this to reset your Zyxel Device settings back to the factory default.                                                           |

**Do not turn off the Zyxel Device while configuration file upload is in progress.**

After the Zyxel Device configuration has been restored successfully, the login screen appears. Login again to restart the Zyxel Device.

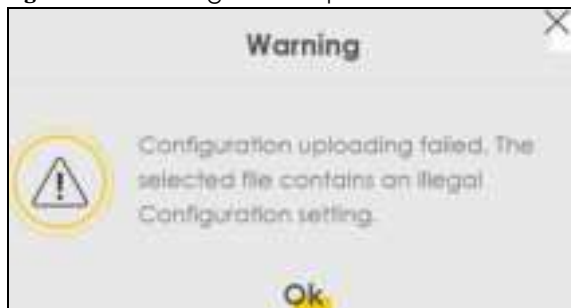
The Zyxel Device automatically restarts in this time causing a temporary network disconnect. In some operating systems, you may see the following icon on your desktop.

**Figure 297** Network Temporarily Disconnected



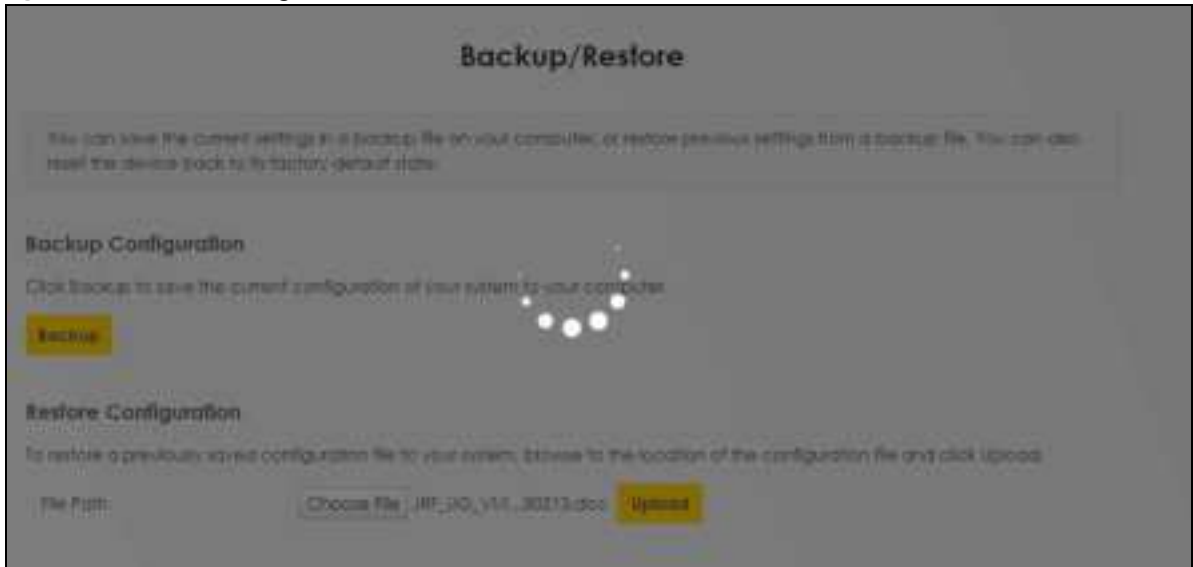
If you restore the default configuration, you may need to change the IP address of your computer to be in the same subnet as that of the default Zyxel Device IP address (192.168.1.1 – 192.168.225.225). If the upload was not successful, an error screen will appear. Click **OK** to go back to the **Configuration** screen.

**Figure 298** Configuration Upload Error



## Back to Factory Default Settings

Click the **Reset All Settings** button to clear all user-entered configuration information and return the Zyxel Device to its factory defaults. The following warning screen appears.

**Figure 299** Reset Warning Message**Figure 300** Reset In Progress

You can also press the **RESET** button on the panel to reset the Zyxel Device to the factory defaults.

## Perform Partial Factory Reset

Click the **Reset All Settings Except Mesh** button to clear all user-entered configuration information and return the Zyxel Device to its factory defaults except for Mesh WiFi settings. The following warning screen appears.

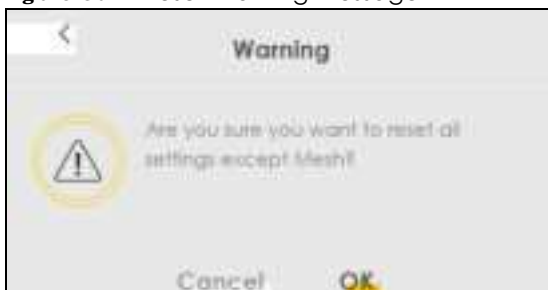
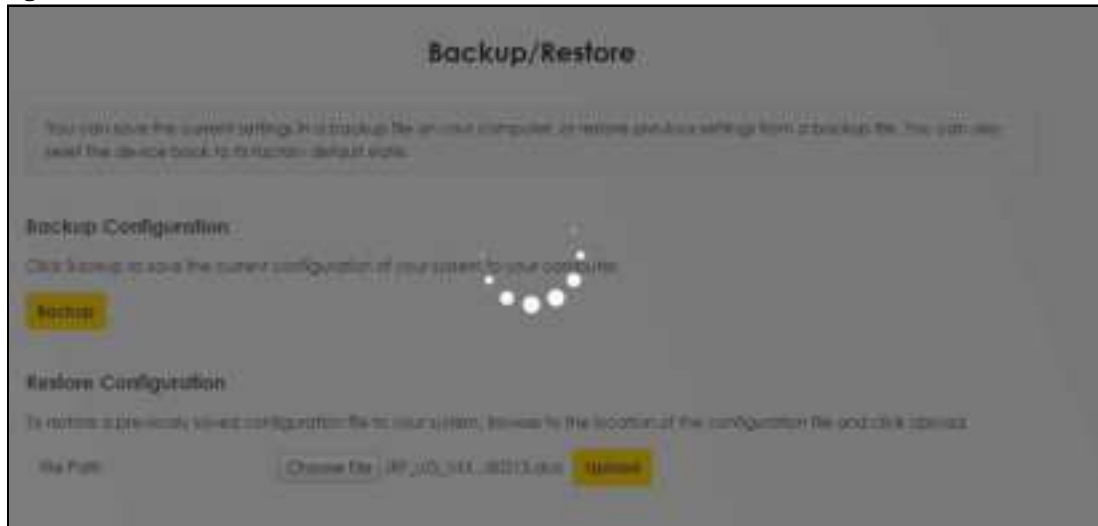
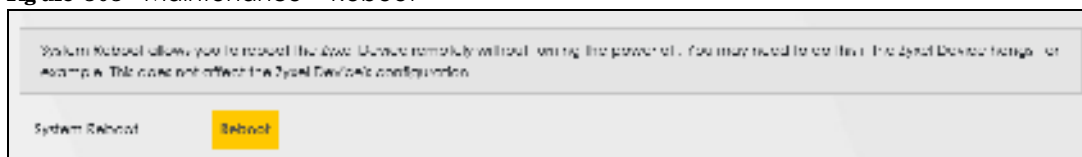
**Figure 301** Reset Warning Message

**Figure 302** Reset In Process

## 41.3 Reboot

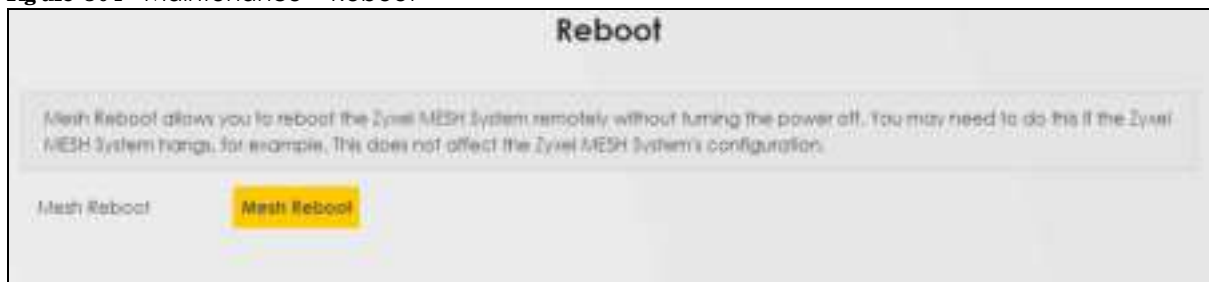
System **Reboot** allows you to restart the Zyxel Device remotely without turning the power off. You may need to do this if the Zyxel Device hangs, for example. This does not affect the Zyxel Device's configuration.

Click **Maintenance** > **Reboot**. Click **Reboot** to have the Zyxel Device restart.

**Figure 303** Maintenance > Reboot

**Mesh Reboot** allows you to reboot the Zyxel Mesh system remotely without turning the power off. You may need to do this if the Mesh system hangs, for example. This does not affect the Zyxel Mesh system's configuration.

Click **Maintenance** > **Reboot**. Click **Mesh Reboot** to have the Zyxel Mesh system reboot.

**Figure 304** Maintenance > Reboot

# CHAPTER 42

## Diagnostic

### 42.1 Diagnostic Overview

The **Diagnostic** screen displays information to help you identify Internet connection problems with the Zyxel Device.

The route between an Ethernet switch and one of its Customer-Premises Equipment (CPE) may go through switches owned by independent organizations. A connectivity fault point generally takes time to discover and impacts subscriber's network access. In order to eliminate the management and maintenance efforts, IEEE 802.1ag is a Connectivity Fault Management (CFM) specification which allows network administrators to identify and manage connection faults. Through discovery and verification of the path, CFM can detect, analyze and isolate connectivity faults in bridged LANs.

#### 42.1.1 What You Can Do in this Chapter

- The **Ping&Trace route&Nslookup** screen lets you ping an IP address or trace the route packets take to a host ([Section 42.3 on page 489](#)).
- The **802.1ag** screen lets you perform CFM actions ([Section 42.4 on page 490](#)).
- The **802.3ah** screen lets you configure link OAM port parameters ([Section 42.5 on page 491](#)).
- The **OAM Ping** screen lets you send an ATM OAM (Operation, Administration and Maintenance) packet to verify the connectivity of a specific PVC ([Section 42.6 on page 493](#)).

### 42.2 What You Need to Know

The following terms and concepts may help as you read through this chapter.

#### How CFM Works

A Maintenance Association (MA) defines a VLAN and associated Maintenance End Point (MEP) ports on the device under a Maintenance Domain (MD) level. An MEP port has the ability to send Connectivity Check Messages (CCMs) and get other MEP ports information from neighbor devices' CCMs within an MA.

CFM provides two tests to discover connectivity faults.

- Loopback test – checks if the MEP port receives its Loop Back Response (LBR) from its target after it sends the Loop Back Message (LBM). If no response is received, there might be a connectivity fault between them.
- Link trace test – provides additional connectivity fault analysis to get more information on where the fault is. If an MEP port does not respond to the source MEP, this may indicate a fault. Administrators can take further action to check and resume services from the fault according to the line connectivity status report.



## 42.3 Diagnostic

Use this screen to ping, traceroute or nslookup for troubleshooting. Ping and traceroute are used to test whether a particular host is reachable. After entering an IP address and clicking one of the buttons to start a test, the results will be shown in the screen. Use nslookup to find the IP address for a host name and the host name for an IP address.

Click **Maintenance > Diagnostic** to open the following screen.

**Figure 305** Maintenance > Diagnostic

The **Diagnostic** screens display information to help you identify problems with the Zyxel Device.

Use this screen to ping, traceroute, or nslookup for troubleshooting. Ping and traceroute are used to test whether a particular host is reachable. After entering an IP address and clicking on one of the buttons to start a test, the results will be shown in the Ping/Traceroute Test area. Use nslookup to find the IP address for a host name and vice versa.

### Diagnostic Test

**TCP/IP**

Address:

The following table describes the fields in this screen.

Table 200 Maintenance > Diagnostic

| LABEL                | DESCRIPTION                                                                                                                                        |
|----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|
| Ping/TraceRoute Test | The result of tests is shown here in the info area.                                                                                                |
| Select Test Method   |                                                                                                                                                    |
| Ping                 | Select this to perform a ping test on the IPv4 address or host name in order to test a connection. The ping statistics will show in the info area. |
| Ping 6               | Select this to perform a ping test on the IPv6 address or host name in order to test a connection. The ping statistics will show in the info area. |
| Trace Route          | Select this to perform the IPv4 trace route function. This determines the path a packet takes to the specified host.                               |
| Trace Route 6        | Select this to perform the IPv6 trace route function. This determines the path a packet takes to the specified host.                               |
| Nslookup             | Select this to perform a DNS lookup on the IP address or host name.                                                                                |

Table 200 Maintenance &gt; Diagnostic (continued)

| LABEL   | DESCRIPTION                                                                                                              |
|---------|--------------------------------------------------------------------------------------------------------------------------|
| TCP/IP  |                                                                                                                          |
| Address | Enter the IP address of a computer that you want to perform ping, trace route or nslookup in order to test a connection. |

## 42.4 802.1ag (CFM)

Click **Maintenance > Diagnostic > 802.1ag** to open the following screen. Use this screen to configure and perform Connectivity Fault Management (CFM) actions as defined by the IEEE 802.1ag standard. CFM protocols include Continuity Check Protocol (CCP), Link Trace (LT), and Loopback (LB).

Figure 306 Maintenance &gt; Diagnostic &gt; 802.1ag

**Diagnostic**

Ping/TraceRoute/Nslookup > SpeedTest > 802.1ag > 802.1ag

Use this screen to configure and perform Connectivity Fault Management (CFM) actions as defined by the IEEE 802.1ag standard. CFM protocols include Continuity Check Protocol (CCP), Link Trace (LT), and Loopback (LB).

### 802.1ag Connectivity Fault Management

IEEE 802.1ag CFM ☒

KCFM ☒

Interface:

Maintenance Domain (MD) Level:

MD ID:

802.1Q VLAN ID:  (1-4096) empty means no VLAN tag

Local MEP ID:  (1-8191)

CCM ☒

Remote MEP ID:  (1-8191) empty means not configure Remote MEP

**Test the connection to another Maintenance End Point (MEP)**

Destination (MAC Address):

**Test Result**

Loopback Message (LB):

Linktrace Message (LT):

The following table describes the fields in this screen.

Table 201 Maintenance > Diagnostic > 802.1ag

| LABEL                                                      | DESCRIPTION                                                                                                                                                                                                                                                                                                                  |
|------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 802.1ag Connectivity Fault Management                      |                                                                                                                                                                                                                                                                                                                              |
| IEEE 802.1ag CFM                                           | Click this switch to enable or disable the IEEE802.1ag CFM specification, which allows network administrators to identify and manage connection faults. When the switch goes to the right  , the function is enabled. Otherwise, it is not. |
| Y.1731                                                     | Click this switch to enable or disable Y.1731, which monitors Ethernet performance. When the switch goes to the right  , the function is enabled. Otherwise, it is not.                                                                     |
| Interface                                                  | Select the interface on which you want to enable the IEEE 802.1ag CFM.                                                                                                                                                                                                                                                       |
| Maintenance Domain (MD) Level                              | Select a level (0 – 7) under which you want to create an MA.                                                                                                                                                                                                                                                                 |
| MEG ID                                                     | Enter a descriptive name to identify the Maintenance Entity Group. This field only appears if the <b>Y.1731</b> field is enabled.                                                                                                                                                                                            |
| MD Name                                                    | Enter a descriptive name for the MD (Maintenance Domain). This field only appears if the <b>Y.1731</b> field is disabled.                                                                                                                                                                                                    |
| MA ID                                                      | Enter a descriptive name to identify the Maintenance Association (MA). This field only appears if the <b>Y.1731</b> field is disabled.                                                                                                                                                                                       |
| MEG ID                                                     | Enter a descriptive name to identify the Maintenance Entity Group. This field only appears if the <b>Y.1731</b> field is enabled.                                                                                                                                                                                            |
| 802.1Q VLAN ID                                             | Enter a VLAN ID (1 – 4094) for this MA.                                                                                                                                                                                                                                                                                      |
| Local MEP ID                                               | Enter the local Maintenance Endpoint Identifier (1 – 8191).                                                                                                                                                                                                                                                                  |
| CCM                                                        | Click the switch to the right  to continue sending MEP information by CCM (Connectivity Check Messages).<br><br>When CCMs are received the Zyxel Device will always process it, whether <b>CCM</b> is enabled or not.                      |
| Remote MEP ID                                              | Enter the remote Maintenance Endpoint Identifier (1 – 8191).                                                                                                                                                                                                                                                                 |
| Test the connection to another Maintenance End Point (MEP) |                                                                                                                                                                                                                                                                                                                              |
| Destination MAC Address                                    | Enter the target device's MAC address to which the Zyxel Device performs a CFM loopback and linktrace test.                                                                                                                                                                                                                  |
| Test Result                                                |                                                                                                                                                                                                                                                                                                                              |
| Loopback Message (LBM)                                     | This shows <b>Pass</b> if a Loop Back Messages (LBMs) responses are received. If LBMs do not get a response it shows <b>Fail</b> .                                                                                                                                                                                           |
| Linktrace Message (LTM)                                    | This shows the MAC address of MEPs that respond to the LTMs.                                                                                                                                                                                                                                                                 |
| Apply                                                      | Click this button to save your changes.                                                                                                                                                                                                                                                                                      |
| Send Loopback                                              | Click this button to have the selected MEP send the LBM (Loop Back Message) to a specified remote end point.                                                                                                                                                                                                                 |
| Send Linktrace                                             | Click this button to have the selected MEP send the LTMs (Link Trace Messages) to a specified remote end point.                                                                                                                                                                                                              |

## 42.5 802.3ah (OAM)

Click **Maintenance > Diagnostic > 803.ah** to open the following screen. Link layer Ethernet OAM (Operations, Administration and Maintenance) as described in IEEE 802.3ah is a link monitoring protocol.

It utilizes OAM Protocol Data Units (OAM PDU's) to transmit link status information between directly connected Ethernet devices. Both devices must support IEEE 802.3ah.

**Figure 307** Maintenance > Diagnostic > 802.3ah

The following table describes the labels in this screen.

Table 202 Maintenance > Diagnostics > 802.3ah

| LABEL                     | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|---------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| IEEE 802.3ah Ethernet OAM | Click this switch to enable or disable the Ethernet OAM on the specified interface. When the switch goes to the right  , the function is enabled. Otherwise, it is not.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Interface                 | Select the interface on which you want to enable the IEEE802.3ah.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| OAM ID                    | Enter a positive integer to identify this node.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Auto Event                | Click this switch to detect link status and send a notification when an error (such as errors in symbol, frames, or seconds) is detected. Otherwise, disable this and you will not be notified. When the switch goes to the right  , the function is enabled. Otherwise, it is not.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Features                  | <p>Select <b>Variable Retrieval</b> so the Zyxel Device can respond to requests for information, such as requests for Ethernet counters and statistics, about link events.</p> <p>Select <b>Link Events</b> so the Zyxel Device can interpret link events, such as link fault and dying asp.Link events are set in event notification PDUs (Protocol Data Units), and indicate when the number of errors in a certain given interval (time, number of frames, number of symbols, or number of error frame seconds) exceeds a specified threshold. Organizations may create organization-specific link event TLVs as well.</p> <p>Select <b>Remote Loopback</b> so the Zyxel Device can accept loopback control PDUs to convert Zyxel Device into loopback mode.</p> <p>Select <b>Active Mode</b> so the Zyxel Device initiates OAM discovery, send information PDUs; and may send event notification PDUs, variable request/response PDUs, or loopback control PDUs.</p> |
| Apply                     | Click this button to save your changes.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |

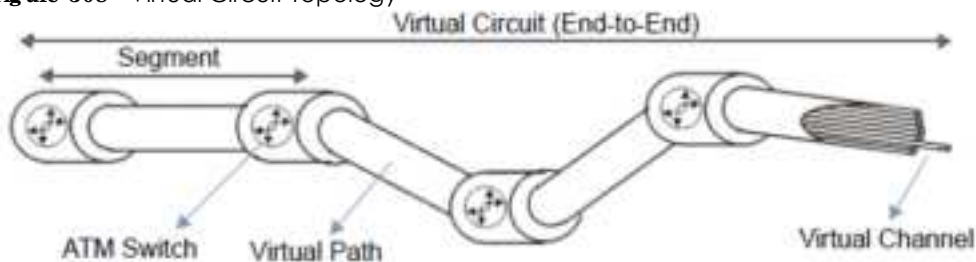
## 42.6 OAM Ping

Click **Maintenance > Diagnostic > OAM Ping** to open the screen shown next. Use this screen to perform an OAM (Operation, Administration and Maintenance) F4 or F5 loopback test on a PVC. The DX5301-B2/B3 sends an OAM F4 or F5 packet to the DSLAM or ATM switch and then returns it to the DX5301-B2/B3. The test result then displays in the text box.

ATM sets up virtual circuits over which end systems communicate. The terminology for virtual circuits is as follows:

- Virtual Channel (VC) Logical connections between ATM devices
- Virtual Path (VP) A bundle of virtual channels
- Virtual Circuits A series of virtual paths between circuit end points

**Figure 308** Virtual Circuit Topology



Think of a virtual path as a cable that contains a bundle of wires. The cable connects two points and wires within the cable provide individual circuits between the two points. In an ATM cell header, a VPI (Virtual Path Identifier) identifies a link formed by a virtual path; a VCI (Virtual Channel Identifier) identifies a channel within a virtual path. A series of virtual paths make up a virtual circuit.

F4 cells operate at the virtual path (VP) level, while F5 cells operate at the virtual channel (VC) level. F4 cells use the same VPI as the user data cells on VP connections, but use different predefined VCI values. F5 cells use the same VPI and VCI as the user data cells on the VC connections, and are distinguished from data cells by a predefined Payload Type Identifier (PTI) in the cell header. Both F4 flows and F5 flows are bidirectional and have two types.

- segment F4 flows (VCI=3)
- end-to-end F4 flows (VCI=4)
- segment F5 flows (PTI=100)
- end-to-end F5 flows (PTI=101)

OAM F4 or F5 tests are used to check virtual path or virtual channel availability between two DSL devices. Segment flows are terminated at the connecting point which terminates a VP or VC segment. End-to-end flows are terminated at the end point of a VP or VC connection, where an ATM link is terminated. Segment loopback tests allow you to verify integrity of a PVC to the nearest neighboring ATM device. End-to-end loopback tests allow you to verify integrity of an end-to-end PVC.

**Note:** The DSLAM to which the DX5301-B2/B3 is connected must also support ATM F4 and/or F5 to use this test.

**Note:** This screen is available only when you configure an ATM layer-2 interface using DX5301-B2/B3.

**Figure 309** Maintenance > Diagnostic > OAM Ping

The following table describes the labels in this screen.

**Table 203** Maintenance > Diagnostics > OAM Ping

| <b>LABEL</b>                                                 | <b>DESCRIPTION</b>                                        |
|--------------------------------------------------------------|-----------------------------------------------------------|
| Select a PVC on which you want to perform the loopback test. |                                                           |
| F4 segment                                                   | Press this to perform an OAM F4 segment loopback test.    |
| F4 end-end                                                   | Press this to perform an OAM F4 end-to-end loopback test. |
| F5 segment                                                   | Press this to perform an OAM F5 segment loopback test.    |
| F5 end-end                                                   | Press this to perform an OAM F5 end-to-end loopback test. |

---

# **PART III**

## **Troubleshooting and Appendices**

---

Appendices contain general information. Some information may not apply to your Zyxel Device.

# CHAPTER 43

## Troubleshooting

### 43.1 Troubleshooting Overview

This chapter offers some suggestions to solve problems you might encounter. The potential problems are divided into the following categories.

- [Accessibility and Compatibility Problems](#)
- [Power and Hardware Problems](#)
- [Device Access Problems](#)
- [Internet Problems](#)
- [WiFi Problems](#)
- [Mesh Problems](#)
- [USB Problems](#)
- [VoIP Problems](#)
- [UPnP Problems](#)

### 43.2 Accessibility and Compatibility Problems

---

[Screen reader not reading content.](#)

---

- Ensure the latest version of the screen reader is installed.
- Check if the screen reader's accessibility settings are enabled.

---

[Web browser not displaying correctly.](#)

---

- Clear your web browser cache.
- Ensure that JavaScript is enabled.
- Try using a different supported web browser.



## 43.3 Power and Hardware Problems

---

The Zyxel Device does not turn on.

---

- 1 Make sure you are using the power adapter included with the Zyxel Device.
- 2 Make sure the power adapter is connected to the Zyxel Device and plugged in to an appropriate power source. Make sure the power source is turned on.
- 3 Disconnect and re-connect the power adapter to the Zyxel Device.
- 4 Make sure you have pressed the **POWER** button to turn on the Zyxel Device.
- 5 If the problem continues, contact the vendor.

---

The LED does not behave as expected.

---

- 1 Make sure you understand the normal behavior of the LED.
- 2 Check the hardware connections.
- 3 Inspect your cables for damage. Contact the vendor to replace any damaged cables.
- 4 Turn the Zyxel Device off and on.
- 5 If the problem continues, contact the vendor.

## 43.4 Device Access Problems

---

I do not know the IP address of the Zyxel Device.

---

- 1 The default IP address is 192.168.1.1.
- 2 If you changed the IP address, you might be able to find the IP address of the Zyxel Device by looking up the IP address of your computer's default gateway. To do this in Microsoft Windows, click **Start > Run**, enter **cmd**, and then enter **ipconfig**. The IP address of the **Default Gateway** might be the IP address of the Zyxel Device, depending on your network environment.
- 3 If this does not work, reset the Zyxel Device to its factory defaults.
  - Locate a small hole labeled **RESET** on the Zyxel Device.
  - Use a paperclip or a similar tool to press and hold the **RESET** button for more than 5 seconds.

- Release the button, and the Zyxel Device will reset to its default settings, including the default IP address, user name, and password.

Note: Resetting the Zyxel Device will erase all your custom settings, so you need to reconfigure it.

---

### I forgot the admin password.

---

- 1 See the Zyxel Device label or this document's cover page for the default admin password.
- 2 If you changed the password from default and cannot remember the new one, you have to reset the Zyxel Device to its factory default settings.

---

### I cannot access the Web Configurator login screen.

---

- 1 Make sure you are using the correct IP address.
  - The default IP address is 192.168.1.1.
  - If you changed the IP address, use the new IP address.
  - If you changed the IP address and have forgotten the new address, see the troubleshooting suggestions for [I do not know the IP address of the Zyxel Device](#).
- 2 Check the hardware connections, and make sure the LEDs are behaving as expected.
- 3 Make sure your Internet browser does not block pop-up windows and has JavaScript and Java enabled. Clear the Internet browser cache and try accessing the Web Configurator login screen again. Outdated browser data can cause login issues. If the problem persists, try logging into the web configurator using a different browser. (e.g., Chrome, Firefox, Edge)
- 4 If it is possible to log in from another interface, check the service control settings for HTTP and HTTPS (**Maintenance > Remote Management**).
- 5 Reset the Zyxel Device to its factory default, and try to access the Zyxel Device with the default IP address.
- 6 If the problem continues, contact the network administrator or vendor, or try one of the advanced suggestions.

#### Advanced Suggestions

- Make sure you have logged out of any earlier management sessions using the same user account even if they were through a different interface or using a different browser.
- Try to access the Zyxel Device using another service, such as Telnet. If you can access the Zyxel Device, check the remote management settings and firewall rules to find out why the Zyxel Device does not respond to HTTP.

---

### I cannot log into the Zyxel Device.

---

- 1 For first-time Zyxel Device logins, after using the label password to access the web configurator, ensure your new password meets the requirements on the screen. For example, some models require the new password to be at least 8 characters long and include at least one uppercase letter, one lowercase letter, one number, and one special character.
- 2 Make sure you have entered the user name and password correctly. The default user name is **admin**. These both user name and password are case-sensitive, so make sure [Caps Lock] is not on.
- 3 You cannot log in to the Web Configurator while someone is using Telnet to access the Zyxel Device. Log out of the Zyxel Device in the other session, or ask the person who is logged in to log out.
- 4 Turn the Zyxel Device off and on.
- 5 If this does not work, you have to reset the Zyxel Device to its factory default. To reset the Zyxel Device, press the **RESET** button until the POWER LED begins to blink and then release it.

---

### I cannot log into the Zyxel Device using DDNS.

---

If you connect your Zyxel Device to the Internet and it uses a dynamic WAN IP address, it is inconvenient for you to manage the Zyxel Device from the Internet. The Zyxel Device's WAN IP address changes dynamically. Dynamic DNS (DDNS) allows you to access the Zyxel Device using a domain name.



To use this feature, you have to apply for DDNS service at [www.dyndns.org](http://www.dyndns.org).

Note: If you have a private WAN IP address, then you cannot use DDNS.

Here are the three steps to use a domain name to log in the Web Configurator:

**Step 1 Register for a DDNS Account on [www.dyndns.org](http://www.dyndns.org)**

- 1 Open a browser and enter **http://www.dyndns.org**.
- 2 Apply for a user account. This tutorial uses **UserName1** and **12345** as the username and password.
- 3 Log into [www.dyndns.org](http://www.dyndns.org) using your account.

- 4 Add a new DDNS host name. This tutorial uses the following settings as an example.
  - Hostname: **zyxelrouter.dyndns.org**
  - Service Type: **Host with IP address**
  - IP Address: Enter the WAN IP address that your Zyxel Device is currently using. You can find the IP address on the Zyxel Device's Web Configurator **Status** page.

Then you will need to configure the same account and host name on the Zyxel Device later.

#### **Step 2 Configure DDNS on Your Zyxel Device**

Configure the following settings in the **Network Setting > DNS > Dynamic DNS** screen.

- Select **Enable Dynamic DNS**.
- Select **www.DynDNS.com** as the service provider.
- Enter **zyxelrouter.dyndns.org** in the **Host Name** field.
- Enter the user name (**UserName1**) and password (**12345**). Click **Apply**.

#### **Step 3 Test the DDNS Setting**

Now you should be able to access the Zyxel Device from the Internet. To test this:

- 1 Open a web browser on the computer (using the IP address **a.b.c.d**) that is connected to the Internet.
- 2 Enter **http://zyxelrouter.dyndns.org** and press [Enter].
- 3 The Zyxel Device's login page should appear. You can then log into the Zyxel Device and manage it.

---

### [I cannot connect to the Zyxel Device using Telnet, SSH, or Ping.](#)

---

- 1 See the Remote Management section for details on allowing web services (such as HTTPS, Telnet, SSH and Ping) to access the Zyxel Device.
- 2 Check the server **Port** number field for the web service in the **Maintenance > Remote Management** screen. You must use the same port number in order to use that web service for remote management.
- 3 Try the troubleshooting suggestions for [I cannot access the Web Configurator login screen](#). Ignore the suggestions about your browser.

---

### [I cannot access the Zyxel Device from outside the network \(WAN\).](#)

---

To test if this is due to CGNAT, follow these steps:

- 1 Log in to your Zyxel Device's Web Configurator using the default IPv4 address (for example, 192.168.1.1).
- 2 Locate the WAN IP address on the **Dashboard** screen. You can find this information in the Network or WAN settings.

- 3 Go to a website that can show you the public IP address of your network (for example, <https://whatsmyip.com>). When you access this site, it will display your public IP address.



- 4 Compare the WAN IP address displayed on the **Dashboard** screen with the public IP address shown on the <https://whatsmyip.com> website.
- If both IP addresses are the same, your ISP is not using Carrier-Grade NAT, and you should be able to access your Zyxel Device from the WAN (outside).
  - If the IP addresses are different, it indicates that your ISP is using Carrier-Grade NAT, and your Zyxel Device has a shared public IP address. As a result, remote access to your Zyxel Device from the WAN will not be possible.

If you discover that your Zyxel Device is behind a Carrier-Grade NAT and you need remote access, you must contact your ISP and request a public IP address for your SIM card or Zyxel Device.

## 43.5 Internet Problems

I cannot access the Internet.

- 1 Check the hardware connections and make sure the LEDs are behaving as expected. See the **Quick Start Guide**.
- 2 Make sure you entered your ISP account information correctly on the **Network Setting > Broadband** screen. Fields on this screen are case-sensitive, so check if [Caps Lock] is on or off.
- 3 If you are trying to access the Internet wirelessly, make sure that you enabled the WiFi in the Zyxel Device and your WiFi client and that the WiFi settings in the WiFi client are the same as the settings in the Zyxel Device.
- 4 Disconnect all the cables from your Zyxel Device and reconnect them.
- 5 If the problem continues, contact your ISP.

I cannot connect to the Internet using an Ethernet connection.

- 1 Make sure you have the Ethernet WAN port connected to a Modem or Router.
- 2 Make sure you configured a proper Ethernet WAN interface (**Network Setting** > **Broadband** screen) with the Internet account information provided by your ISP and that it is enabled.

- 3 Check that the WAN interface you are connected to is in the same interface group as the Ethernet connection (**Network Setting** > **Interface Group**).
- 4 If you set up a WAN connection using bridging service, make sure you turn off the DHCP feature in the **Network Setting** > **Home Networking** > **LAN Setup** screen to have the clients get WAN IP addresses directly from your ISP's DHCP server.

---

### I cannot connect to the Internet using a Fiber connection.

---

- 1 Make sure the Fiber/SFP port has a compatible SFP/SFP+ transceiver installed with a fiber/Ethernet cable connected to it.
- 2 Check the hardware connections, and make sure the LEDs are behaving as expected. See the **Quick Start Guide**.

The **PON** LED is off if the optical transceiver has malfunctioned or the fiber cable is not connected or is broken or damaged enough to break the PON connection.

The **LOS** LED is red if the GPON Device is not receiving an optical signal.

The **LOS** LED blinks red if the GPON Device is receiving a weak optical signal.

- 3 Disconnect all the cables from your device and reconnect them. Make sure the fiber cable is not curved too much.
- 4 If that does not work, restart your Zyxel Device.
- 5 If the problems continues, contact your ISP.

---

### I cannot connect to the Internet using a cellular connection.

---

- 1 The DSL and Ethernet connections have priority in that order. If the DSL or Ethernet connection is up, then the cellular connection will be down.
- 2 Make sure you have connected a compatible cellular dongle to the USB port, if required.
- 3 Make sure you have configured **Network Setting** > **Broadband** > **Cellular Backup** correctly.
- 4 Check that the Zyxel Device is within range of a cellular base station.

---

### The Zyxel Device cannot assign individual IP addresses to the connected client devices.

---

- 1 Make sure to select **Bridge** in **Network Setting** > **Broadband** > **Add/Edit New WAN Interface: Mode**.
- 2 Make sure to reboot the Zyxel Device after changing to **Bridge** mode.

- 3 Make sure the Zyxel Device can get an IP address dynamically (DHCP) from the router controller.

---

#### The Internet connection is slow or intermittent.

---

- 1 There might be a lot of traffic on the network. If the Zyxel Device is sending or receiving a lot of information, try closing some programs that use the Internet, especially peer-to-peer applications.
- 2 If your Zyxel Device keeps alternating between ISPs, then choose a fixed ISP. Go to the **Network Setting** > **Cellular PLMN** screen, disable **PLMN Auto Selection** and then choose your preferred ISP.
- 3 Turn the Zyxel Device off and on.
- 4 If the problem continues, contact the network administrator or vendor, or try the advanced suggestions in [I cannot access the Web Configurator login screen](#).

Note: If your Zyxel Device is an outdoor-type, inclement weather like rain and hot weather may affect cellular signals.

---

#### What should I do if my Zyxel Device is under attack?

---

A slow Internet speed, a web browser that keeps redirecting you, suspicious activity alerts from your ISP, and increased pop-ups on the Zyxel Device; could be signs that your Zyxel Device is under attack. If you suspect that your Zyxel Device is under attack, do the following:

- 1 Create an ACL (Access Control List) rule to block the ports being targeted. See [Section 18.5 on page 378](#) for more information on using ACL. See also [Section 5.6.1 on page 155](#) for more information on configuring a firewall rule. Go to **System Monitor** > **Log** > **Security Log** to view the security-related logs to determine which ports are being targeted. See [Section 25.3 on page 440](#) for more information on security logs.
- 2 Contact your ISP to report the attack and seek assistance.
- 3 When possible, turn off the Zyxel Device for 24 hours, then turn it on again.
- 4 Request the ISP to change your IP address.

## 43.6 WiFi Problems

---

#### I cannot connect to the Zyxel Device WiFi.

---

- 1 Check the WiFi LED status to make sure the Zyxel Device WiFi is on.

- 2 Make sure your WiFi client is within transmission range of the Zyxel Device.
- 3 Make sure you entered the correct SSID and password. See the Zyxel Device back label for the default SSID and password.
- 4 Make sure your WiFi client is using the same WiFi security type (WPA2-PSK, WPA3-SAE, or none) as the Zyxel Device.
- 5 Make sure the WiFi adapter on your WiFi client is working properly. Right-click your computer's network adapter then select **Properties** to check your network adapter status.
- 6 Make sure the WiFi adapter on your WiFi client is IEEE 802.11-compatible and supports the same WiFi standard as the Zyxel Device radio.

Note: To check if it is your Zyxel Device that is causing the problem and not your WiFi connection, try using a wired connection.

---

### The WiFi connection is slow and intermittent.

---

The following factors may cause interference:

- Obstacles: walls, ceilings, furniture, and so on.
- Building Materials: metal doors, aluminum studs.
- Electrical devices: microwaves, monitors, electric motors, cordless phones, and other wireless devices.

To optimize the speed and quality of your WiFi connection, you can:

- Move your wireless device closer to the AP if the signal strength is low.
- Reduce wireless interference that may be caused by other WiFi networks or surrounding wireless electronics such as cordless phones.
- Place the AP where there are minimum obstacles (such as walls and ceilings) between the AP and the WiFi client.
- Reduce the number of WiFi clients connecting to the same AP simultaneously, or add additional APs if necessary.
- Try closing some programs that use the Internet, especially peer-to-peer applications. If the WiFi client is sending or receiving a lot of information, it may have too many programs open that use the Internet.
- Place the Zyxel Device where there are minimum obstacles (such as walls and ceilings) between the Zyxel Device and the WiFi client. Avoid placing the Zyxel Device inside any type of box that might block WiFi signals.

---

### I want to allow or block specific devices from connecting to the Zyxel Device's WiFi network.

---

MAC authentication allows devices with MAC addresses listed in the Zyxel Device's MAC address list to connect or block access to its WiFi network.



To set up MAC authentication of your Zyxel Device, follow the steps below:

- 1 Log into your Zyxel Device's Web Configurator, and go to **Network Setting > Wireless > MAC Authentication**.
- 2 In the **General** section, select the SSID of the WiFi network for which you want to configure MAC authentication from the dropdown list.
- 3 There are two ways to configure the MAC authentication:
  - 3a Set the MAC addresses you want to block access to the Zyxel Device's WiFi network.
    - In the **MAC Restrict Mode** section, select **Deny**.
    - In the **MAC address list** section, click the  icon to add a new MAC address.
    - The **Add MAC address to list** screen will appear. In the **MAC Address** field, enter the MAC address you want to block access to the Zyxel Device's WiFi network.
  - 3b Set the MAC addresses you want to allow to connect to the Zyxel Device's WiFi network.
    - In the **MAC Restrict Mode** section, select **Allow**.
    - In the **MAC address list** section, click the  icon to add a new MAC address.
    - The **Add MAC address to list** screen will appear. In the **MAC Address** field, enter the MAC address you want to allow to connect to the Zyxel Device's WiFi network.

## 43.7 Mesh Problems

---

I can't build a mesh network between the Zyxel Device and the extender(s).

---

Different mesh technologies may be incompatible, so make sure the Zyxel Device and the extender(s) use the same mesh technology.

To build a mesh network and ensure the smooth client roaming between the Zyxel Device and the extender(s), please check the following.

- 1 Make sure the Zyxel Device and the extender(s) have consistent SSID and security settings.
- 2 Make sure the Zyxel Device and the extender(s) are not too far or too close to each other.

## 43.8 USB Problems

---

The Zyxel Device fails to detect my USB device.

---

- 1 Disconnect the USB device.

- 2 Reboot the Zyxel Device.
- 3 If you are connecting a USB hard drive that comes with an external power supply, make sure it is connected to an appropriate power source that is on.
- 4 Reconnect your USB device to the Zyxel Device.

## 43.9 VoIP Problems

---

I cannot make phone calls through the phone connected to the Zyxel Device.

---

- 1 Pick up the phone and check the phone tone. You should hear the dial tone if your configuration on the Zyxel Device is correct, and your phone is successfully connected to the SIP server.
- 2 Check that the settings from your VoIP service are entered correctly on the Zyxel Device.
- 3 Make sure your phone is connected to the Zyxel Device phone port through an RJ-11 cable. Check the Zyxel Device phone LED for the corresponding phone status.
- 4 Make sure the Zyxel Device has an Internet connection. See [Section 43.5 on page 501](#) for more information.
- 5 Make sure your SIP account is registered and your SIP service plan is valid. Use the **System Monitor > VoIP Status** screen to check the account **Registration** status.
- 6 Make sure your SIP server settings (in the **VoIP > SIP > SIP Service Provider** and the **VoIP > SIP > SIP Account** screens) use the correct information from your SIP service provider. For example, your SIP service provider name, SIP account and password.
- 7 Make sure your phone settings (in the **VoIP > Phone > Phone Device** screen) are correct.
- 8 Contact the SIP server administrator and make sure your SIP server is not down.

---

I am experiencing echoes during calls.

---

Go to **VoIP > SIP > SIP Account > SIP Account Entry Edit**. Click **Enable G.168 (Echo Cancellation)** to eliminate echo during calls.

## 43.10 UPnP Problems

---

My computer cannot detect UPnP settings from the Zyxel Device.

---

- 1 Make sure that UPnP is enabled in your computer.
- 2 On the Zyxel Device, make sure that UPnP is enabled on the **Network Settings > Home Networking > UPnP** screen.
- 3 Disconnect the Ethernet cable from the Zyxel Device's Ethernet port or from your computer.
- 4 Reconnect the Ethernet cable.
- 5 Restart your computer.

## 43.11 Getting More Troubleshooting Help

Search for support information for your model at <https://service-provider.zyxel.com/global/en/tech-support> and [community.zyxel.com](https://community.zyxel.com) for more troubleshooting suggestions.

# APPENDIX A

## Customer Support

In the event of problems that cannot be solved by using this manual, you should contact your vendor. If you cannot contact your vendor, then contact a Zyxel office for the region in which you bought the Zyxel Device.

Zyxel

Please have the following information ready when you contact an office.

### Required Information

- Product model and serial number.
- Warranty Information.
- Date that you received your device.
- Brief description of the problem and the steps you took to solve it.

### Corporate Headquarters (Worldwide)

#### Taiwan

- Zyxel Communications (Taiwan) Co., Ltd.
- <https://www.zyxel.com>

### Asia

#### China

- Zyxel Communications Corporation–China Office
- <https://www.zyxel.com/cn/sc>

#### India

- Zyxel Communications Corporation–India Office
- <https://www.zyxel.com/in/en-in>

#### Kazakhstan

- Zyxel Kazakhstan
- <https://www.zyxel.com/ru/ru>

#### Korea

- Zyxel Korea Co., Ltd.
- <http://www.zyxel.kr/>

### **Malaysia**

- Zyxel Communications Corp.
- <https://www.zyxel.com/global/en>

### **Philippines**

- Zyxel Communications Corp.
- <https://www.zyxel.com/global/en>

### **Singapore**

- Zyxel Communications Corp.
- <https://www.zyxel.com/global/en>

### **Taiwan**

- Zyxel Communications (Taiwan) Co., Ltd.
- <https://www.zyxel.com/tw/zh>

### **Thailand**

- Zyxel Thailand Co., Ltd.
- <https://www.zyxel.com/th/th>

### **Vietnam**

- Zyxel Communications Corporation–Vietnam Office
- <https://www.zyxel.com/vn/vi>

## **Europe**

### **Belarus**

- Zyxel Communications Corp.
- <https://www.zyxel.com/ru/ru>

### **Belgium (Netherlands)**

- Zyxel Benelux
- <https://www.zyxel.com/nl/nl>
- <https://www.zyxel.com/fr/fr>

### **Bulgaria**

- Zyxel Bulgaria
- <https://www.zyxel.com/bg/bg>

### **Czech Republic**

- Zyxel Communications Czech s.r.o.

- <https://www.zyxel.com/cz/cs>

### **Denmark**

- Zyxel Communications A/S
- <https://www.zyxel.com/dk/da>

### **Finland**

- Zyxel Communications
- <https://www.zyxel.com/fi/fi>

### **France**

- Zyxel France
- <https://www.zyxel.com/fr/fr>

### **Germany**

- Zyxel Deutschland GmbH.
- <https://www.zyxel.com/de/de>

### **Hungary**

- Zyxel Hungary & SEE
- <https://www.zyxel.com/hu/hu>

### **Italy**

- Zyxel Communications Italy S.r.l.
- <https://www.zyxel.com/it/it>

### **Norway**

- Zyxel Communications A/S
- <https://www.zyxel.com/no/no>

### **Poland**

- Zyxel Communications Poland
- <https://www.zyxel.com/pl/pl>

### **Romania**

- Zyxel Romania
- <https://www.zyxel.com/ro/ro>

### **Russian Federation**

- Zyxel Communications Corp.
- <https://www.zyxel.com/ru/ru>

### **Slova kia**

- Zyxel Slovakia
- <https://www.zyxe l.c o m /sk/sk>

### **Spa in**

- Zyxel Iberia
- <https://www.zyxe l.c o m /e s/e s>

### **Sweden**

- Zyxel Communications A/S
- <https://www.zyxe l.c o m /se /sv>

### **Switze rla nd**

- Studerus AG
- <https://www.zyxe l.c o m /c h/de -c h>
- <https://www.zyxe l.c o m /fr/fr>

### **Turkey**

- Zyxel Turkey A.S.
- <https://www.zyxe l.c o m /tr/tr>

### **UK**

- Zyxel Communications UK Ltd.
- <https://www.zyxe l.c o m /uk/e n-gb>

### **Ukraine**

- Zyxel Ukraine
- <https://www.zyxe l.c o m /ua /uk-ua>

## **South America**

### **Argentina**

- Zyxel Communications Corp.
- <https://www.zyxe l.c o m /c o /e s-c o>

### **Brazil**

- Zyxel Communications Brasil Ltda.
- <https://www.zyxe l.c o m /br/pt>

### **Colombia**

- Zyxel Communications Corp.

- <https://www.zyxel.com/co/es-co>

### **Ecuador**

- Zyxel Communications Corp.
- <https://www.zyxel.com/co/es-co>

### **South America**

- Zyxel Communications Corp.
- <https://www.zyxel.com/co/es-co>

## **Middle East**

### **Israel**

- Zyxel Communications Corp.
- <https://il.zyxel.com>

## **North America**

### **USA**

- Zyxel Communications, Inc. – North America Headquarters
- <https://www.zyxel.com/us/en-us>



# APPENDIX B

## Wireless LANs

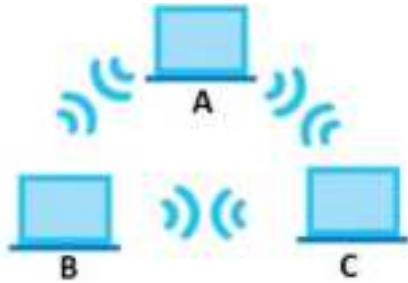
### Wireless LAN Topologies

This section discusses ad-hoc and infrastructure wireless LAN topologies.

#### Ad-hoc Wireless LAN Configuration

The simplest WLAN configuration is an independent (Ad-hoc) WLAN that connects a set of computers with wireless adapters (A, B, C). Any time two or more wireless adapters are within range of each other, they can set up an independent network, which is commonly referred to as an ad-hoc network or Independent Basic Service Set (IBSS). The following diagram shows an example of notebook computers using wireless adapters to form an ad-hoc wireless LAN.

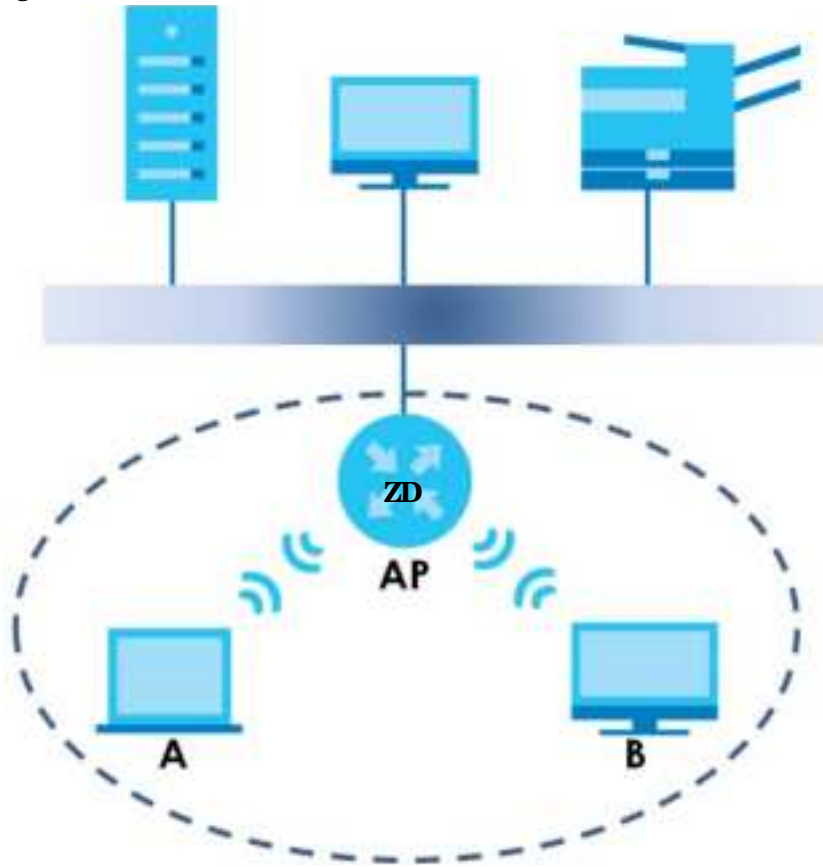
**Figure 310** Peer-to-Peer Communication in an Ad-hoc Network



### BSS

A Basic Service Set (BSS) exists when all communications between WiFi clients or between a WiFi client and a wired network client go through one access point (AP).

Intra-BSS traffic is traffic between WiFi clients in the BSS. When Intra-BSS is enabled, WiFi client **A** and **B** can access the wired network and communicate with each other. When Intra-BSS is disabled, WiFi client **A** and **B** can still access the wired network but cannot communicate with each other.

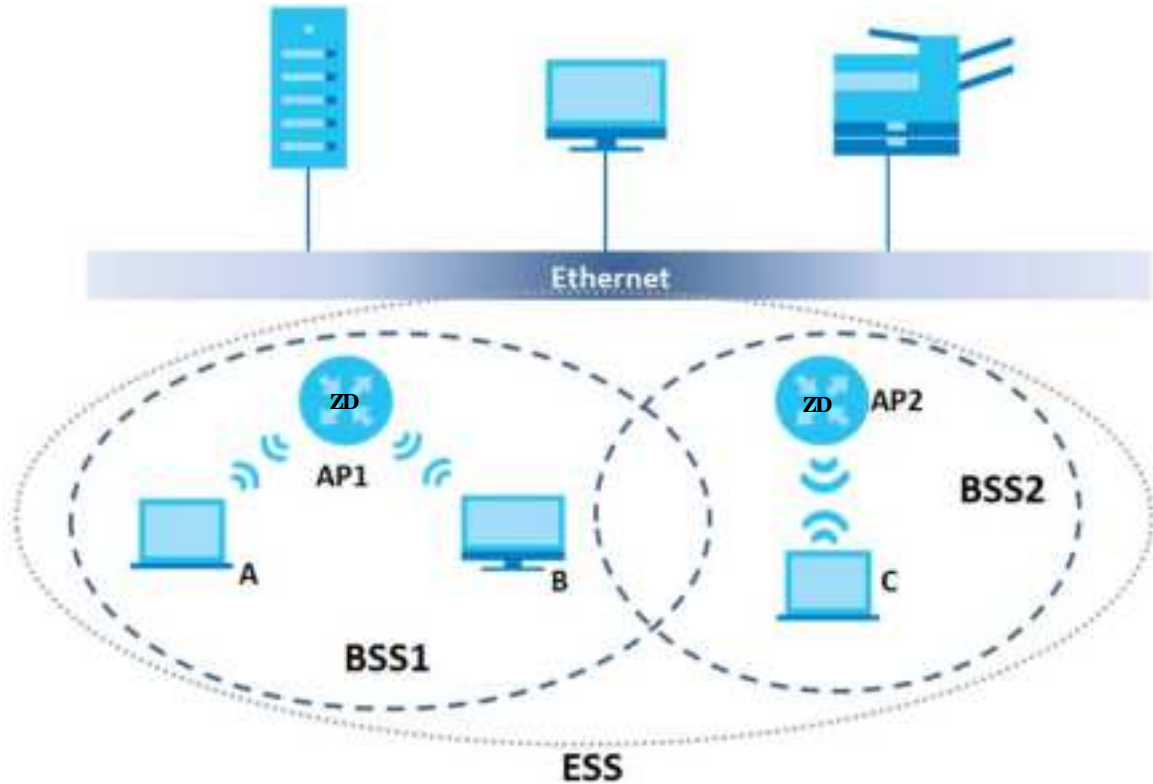
**Figure 311** Basic Service Set

## ESS

An Extended Service Set (ESS) consists of a series of overlapping BSSs, each containing an access point, with each access point connected together by a wired network. This wired connection between APs is called a Distribution System (DS).

This type of wireless LAN topology is called an Infrastructure WLAN. The Access Points not only provide communication with the wired network but also mediate wireless network traffic in the immediate neighborhood.

An ESSID (ESS IDentification) uniquely identifies each ESS. All access points and their associated WiFi clients within the same ESS must have the same ESSID in order to communicate.

**Figure 312** Infrastructure WLAN

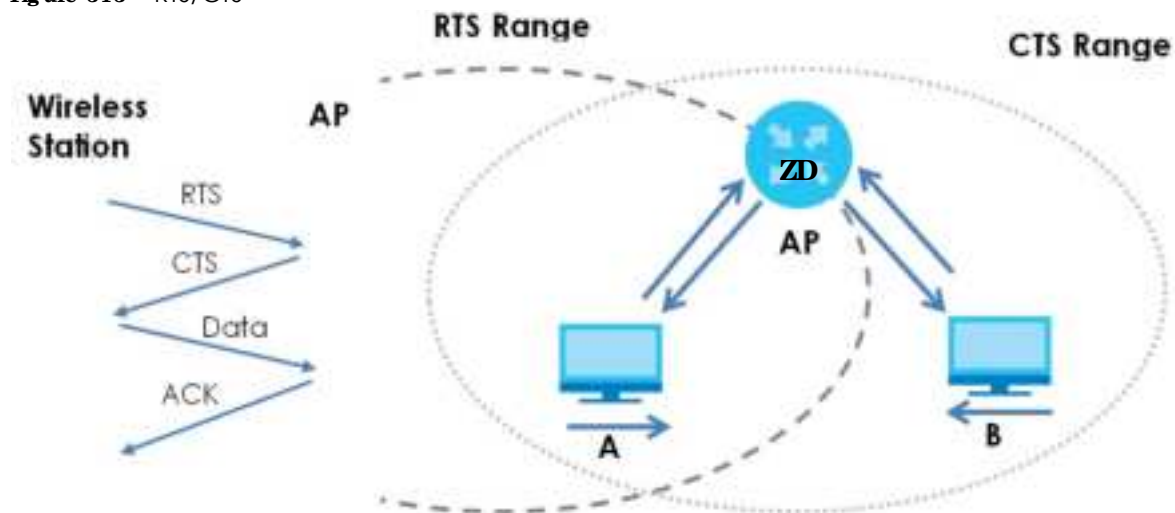
## Channel

A channel is the radio frequency(ies) used by wireless devices to transmit and receive data. Channels available depend on your geographical area. You may have a choice of channels (for your region) so you should use a channel different from an adjacent AP (access point) to reduce interference. Interference occurs when radio signals from different access points overlap causing interference and degrading performance.

Adjacent channels partially overlap however. To avoid interference due to overlap, your AP should be on a channel at least five channels away from a channel that an adjacent AP is using. For example, if your region has 11 channels and an adjacent AP is using channel 1, then you need to select a channel between 6 or 11.

## RIS/CTS

A hidden node occurs when two stations are within range of the same access point, but are not within range of each other. The following figure illustrates a hidden node. Both stations (STA) are within range of the access point (AP) or wireless gateway, but out-of-range of each other, so they cannot "hear" each other, that is they do not know if the channel is currently being used. Therefore, they are considered hidden from each other.

**Figure 313** RTS/CTS

When station **A** sends data to the AP, it might not know that the station **B** is already using the channel. If these two stations send data at the same time, collisions may occur when both sets of data arrive at the AP at the same time, resulting in a loss of messages for both stations.

**RTS/CTS** is designed to prevent collisions due to hidden nodes. An **RTS/CTS** defines the biggest size data frame you can send before an RTS (Request To Send)/CTS (Clear to Send) handshake is invoked.

When a data frame exceeds the **RTS/CTS** value you set (between 0 to 2432 bytes), the station that wants to transmit this frame must first send an RTS (Request To Send) message to the AP for permission to send it. The AP then responds with a CTS (Clear to Send) message to all other stations within its range to notify them to defer their transmission. It also reserves and confirms with the requesting station the time frame for the requested transmission.

Stations can send frames smaller than the specified **RTS/CTS** directly to the AP without the RTS (Request To Send)/CTS (Clear to Send) handshake.

You should only configure **RTS/CTS** if the possibility of hidden nodes exists on your network and the "cost" of resending large frames is more than the extra network overhead involved in the RTS (Request To Send)/CTS (Clear to Send) handshake.

If the **RTS/CTS** value is greater than the **Fragmentation Threshold** value (see next), then the RTS (Request To Send)/CTS (Clear to Send) handshake will never occur as data frames will be fragmented before they reach **RTS/CTS** size.

Note: Enabling the RTS Threshold causes redundant network overhead that could negatively affect the throughput performance instead of providing a remedy.

## Fragmentation Threshold

A **Fragmentation Threshold** is the maximum data fragment size (between 256 and 2432 bytes) that can be sent in the wireless network before the AP will fragment the packet into smaller data frames.

A large **Fragmentation Threshold** is recommended for networks not prone to interference while you should set a smaller threshold for busy networks or networks that are prone to interference.

If the **Fragmentation Threshold** value is smaller than the **RTS/CTS** value (see previously) you set then the RTS (Request To Send)/CTS (Clear to Send) handshake will never occur as data frames will be fragmented before they reach **RTS/CTS** size.

## IEEE 802.11g Wireless LAN

IEEE 802.11g is fully compatible with the IEEE 802.11b standard. This means an IEEE 802.11b adapter can interface directly with an IEEE 802.11g access point (and vice versa) at 11 Mbps or lower depending on range. IEEE 802.11g has several intermediate rate steps between the maximum and minimum data rates. The IEEE 802.11g data rate and modulation are as follows:

Table 204 IEEE 802.11g

| DATA RATE (Mbps)      | MODULATION                                         |
|-----------------------|----------------------------------------------------|
| 1                     | DBPSK (Differential Binary Phase Shift Keyed)      |
| 2                     | DQPSK (Differential Quadrature Phase Shift Keying) |
| 5.5 / 11              | CCK (Complementary Code Keying)                    |
| 6/9/12/18/24/36/48/54 | OFDM (Orthogonal Frequency Division Multiplexing)  |

## Wireless Security Overview

Wireless security is vital to your network to protect wireless communication between WiFi clients, access points and the wired network.

Wireless security methods available on the Zyxel Device are data encryption, WiFi client authentication, restricting access by device MAC address and hiding the Zyxel Device identity.

The following figure shows the relative effectiveness of these wireless security methods available on your Zyxel Device.

Table 205 Wireless Security Levels

| SECURITY LEVEL | SECURITY TYPE                                    |
|----------------|--------------------------------------------------|
| Least Secure   | Unique SSID (Default)                            |
|                | Unique SSID with Hide SSID Enabled               |
|                | MAC Address Filtering                            |
|                | WEP Encryption                                   |
|                | IEEE802.1x EAP with RADIUS Server Authentication |
| Most Secure    | WiFi Protected Access (WPA)                      |
|                | WPA2                                             |

Note: You must enable the same wireless security settings on the Zyxel Device and on all WiFi clients that you want to associate with it.

## IEEE 802.1x

In June 2001, the IEEE 802.1x standard was designed to extend the features of IEEE 802.11 to support extended authentication as well as providing additional accounting and control features. It is supported by Windows XP and a number of network devices. Some advantages of IEEE 802.1x are:

- User based identification that allows for roaming.

- Support for RADIUS (Remote Authentication Dial In User Service, RFC 2138, 2139) for centralized user profile and accounting management on a network RADIUS server.
- Support for EAP (Extensible Authentication Protocol, RFC 2486) that allows additional authentication methods to be deployed with no changes to the access point or the WiFi clients.

## **RADIUS**

RADIUS is based on a client-server model that supports authentication, authorization and accounting. The access point is the client and the server is the RADIUS server. The RADIUS server handles the following tasks:

- Authentication  
Determines the identity of the users.
- Authorization  
Determines the network services available to authenticated users once they are connected to the network.
- Accounting  
Keeps track of the client's network activity.

RADIUS is a simple package exchange in which your AP acts as a message relay between the WiFi client and the network RADIUS server.

### **Types of RADIUS Messages**

The following types of RADIUS messages are exchanged between the access point and the RADIUS server for user authentication:

- Access-Request  
Sent by an access point requesting authentication.
- Access-Reject  
Sent by a RADIUS server rejecting access.
- Access-Accept  
Sent by a RADIUS server allowing access.
- Access-Challenge  
Sent by a RADIUS server requesting more information in order to allow access. The access point sends a proper response from the user and then sends another Access-Request message.

The following types of RADIUS messages are exchanged between the access point and the RADIUS server for user accounting:

- Accounting-Request  
Sent by the access point requesting accounting.
- Accounting-Response  
Sent by the RADIUS server to indicate that it has started or stopped accounting.

In order to ensure network security, the access point and the RADIUS server use a shared secret key, which is a password, they both know. The key is not sent over the network. In addition to the shared key, password information exchanged is also encrypted to protect the network from unauthorized access.

## **Types of EAP Authentication**

This section discusses some popular authentication types: EAP-MD5, EAP-TLS, EAP-TTLS, PEAP and LEAP. Your wireless LAN device may not support all authentication types.

EAP (Extensible Authentication Protocol) is an authentication protocol that runs on top of the IEEE 802.1x transport mechanism in order to support multiple types of user authentication. By using EAP to interact with an EAP-compatible RADIUS server, an access point helps a wireless station and a RADIUS server perform authentication.

The type of authentication you use depends on the RADIUS server and an intermediary AP(s) that supports IEEE 802.1x.

For EAP-TLS authentication type, you must first have a wired connection to the network and obtain the certificate(s) from a certificate authority (CA). A certificate (also called digital IDs) can be used to authenticate users and a CA issues certificates and guarantees the identity of each certificate owner.

### **EAP-MD5 (Message-Digest Algorithm 5)**

MD5 authentication is the simplest one-way authentication method. The authentication server sends a challenge to the WiFi client. The WiFi client 'proves' that it knows the password by encrypting the password with the challenge and sends back the information. Password is not sent in plain text.

However, MD5 authentication has some weaknesses. Since the authentication server needs to get the plaintext passwords, the passwords must be stored. Thus someone other than the authentication server may access the password file. In addition, it is possible to impersonate an authentication server as MD5 authentication method does not perform mutual authentication. Finally, MD5 authentication method does not support data encryption with dynamic session key. You must configure WEP encryption keys for data encryption.

### **EAP-TLS (Transport Layer Security)**

With EAP-TLS, digital certifications are needed by both the server and the WiFi clients for mutual authentication. The server presents a certificate to the client. After validating the identity of the server, the client sends a different certificate to the server. The exchange of certificates is done in the open before a secured tunnel is created. This makes user identity vulnerable to passive attacks. A digital certificate is an electronic ID card that authenticates the sender's identity. However, to implement EAP-TLS, you need a Certificate Authority (CA) to handle certificates, which imposes a management overhead.

### **EAP-TTLS (Tunneled Transport Layer Service)**

EAP-TTLS is an extension of the EAP-TLS authentication that uses certificates for only the server-side authentications to establish a secure connection. Client authentication is then done by sending username and password through the secure connection, thus client identity is protected. For client authentication, EAP-TTLS supports EAP methods and legacy authentication methods such as PAP, CHAP, MS-CHAP and MS-CHAP v2.

### **PEAP (Protected EAP)**

Like EAP-TTLS, server-side certificate authentication is used to establish a secure connection, then use simple username and password methods through the secured connection to authenticate the clients, thus hiding client identity. However, PEAP only supports EAP methods, such as EAP-MD5, EAP-MSCHAPv2

and EAP-GTC (EAP-Generic Token Card), for client authentication. EAP-GTC is implemented only by Cisco.

## LEAP

LEAP (Lightweight Extensible Authentication Protocol) is a Cisco implementation of IEEE 802.1x.

## Dynamic WEP Key Exchange

The AP maps a unique key that is generated with the RADIUS server. This key expires when the wireless connection times out, disconnects or reauthentication times out. A new WEP key is generated each time reauthentication is performed.

If this feature is enabled, it is not necessary to configure a default encryption key in the wireless security configuration screen. You may still configure and store keys, but they will not be used while dynamic WEP is enabled.

Note: EAP-MD5 cannot be used with Dynamic WEP Key Exchange

For added security, certificate-based authentications (EAP-TLS, EAP-TTLS and PEAP) use dynamic keys for data encryption. They are often deployed in corporate environments, but for public deployment, a simple user name and password pair is more practical. The following table is a comparison of the features of authentication types.

Table 206 Comparison of EAP Authentication Types

|                            | <b>EAP-MD5</b> | <b>EAP-TLS</b> | <b>EAP-TTLS</b> | <b>PEAP</b> | <b>LEAP</b> |
|----------------------------|----------------|----------------|-----------------|-------------|-------------|
| Mutual Authentication      | No             | Yes            | Yes             | Yes         | Yes         |
| Certificate – Client       | No             | Yes            | Optional        | Optional    | No          |
| Certificate – Server       | No             | Yes            | Yes             | Yes         | No          |
| Dynamic Key Exchange       | No             | Yes            | Yes             | Yes         | Yes         |
| Credential Integrity       | None           | Strong         | Strong          | Strong      | Moderate    |
| Deployment Difficulty      | Easy           | Hard           | Moderate        | Moderate    | Moderate    |
| Client Identity Protection | No             | No             | Yes             | Yes         | No          |

## WPA and WPA2

WiFi Protected Access (WPA) is a subset of the IEEE 802.11i standard. WPA2 (IEEE 802.11i) is a wireless security standard that defines stronger encryption, authentication and key management than WPA.

Key differences between WPA or WPA2 and WEP are improved data encryption and user authentication.

If both an AP and the WiFi clients support WPA2 and you have an external RADIUS server, use WPA2 for stronger data encryption. If you don't have an external RADIUS server, you should use WPA2-PSK (WPA2-Pre-Shared Key) that only requires a single (identical) password entered into each access point, wireless gateway and WiFi client. As long as the passwords match, a WiFi client will be granted access to a WLAN.

If the AP or the WiFi clients do not support WPA2, just use WPA or WPA-PSK depending on whether you have an external RADIUS server or not.



Select WEP only when the AP and/or WiFi clients do not support WPA or WPA2. WEP is less secure than WPA or WPA2.

## **Encryption**

WPA improves data encryption by using Temporal Key Integrity Protocol (TKIP), Message Integrity Check (MIC) and IEEE 802.1x. WPA2 also uses TKIP when required for compatibility reasons, but offers stronger encryption than TKIP with Advanced Encryption Standard (AES) in the Counter mode with Cipher block chaining Message authentication code Protocol (CCMP).

TKIP uses 128-bit keys that are dynamically generated and distributed by the authentication server. AES (Advanced Encryption Standard) is a block cipher that uses a 256-bit mathematical algorithm called Rijndael. They both include a per-packet key mixing function, a Message Integrity Check (MIC) named Michael, an extended initialization vector (IV) with sequencing rules, and a re-keying mechanism.

WPA and WPA2 regularly change and rotate the encryption keys so that the same encryption key is never used twice.

The RADIUS server distributes a Pairwise Master Key (PMK) key to the AP that then sets up a key hierarchy and management system, using the PMK to dynamically generate unique data encryption keys to encrypt every data packet that is wirelessly communicated between the AP and the WiFi clients. This all happens in the background automatically.

The Message Integrity Check (MIC) is designed to prevent an attacker from capturing data packets, altering them and resending them. The MIC provides a strong mathematical function in which the receiver and the transmitter each compute and then compare the MIC. If they do not match, it is assumed that the data has been tampered with and the packet is dropped.

By generating unique data encryption keys for every data packet and by creating an integrity checking mechanism (MIC), with TKIP and AES it is more difficult to decrypt data on a WiFi network than WEP and difficult for an intruder to break into the network.

The encryption mechanisms used for WPA(2) and WPA(2)-PSK are the same. The only difference between the two is that WPA(2)-PSK uses a simple common password, instead of user-specific credentials. The common-password approach makes WPA(2)-PSK susceptible to brute-force password-guessing attacks but it's still an improvement over WEP as it employs a consistent, single, alphanumeric password to derive a PMK which is used to generate unique temporal encryption keys. This prevents all wireless devices sharing the same encryption keys. (a weakness of WEP).

## **User Authentication**

WPA and WPA2 apply IEEE 802.1x and Extensible Authentication Protocol (EAP) to authenticate WiFi clients using an external RADIUS database. WPA2 reduces the number of key exchange messages from six to four (CCMP 4-way handshake) and shortens the time required to connect to a network. Other WPA2 authentication features that are different from WPA include key caching and pre-authentication. These two features are optional and may not be supported in all wireless devices.

Key caching allows a WiFi client to store the PMK it derived through a successful authentication with an AP. The WiFi client uses the PMK when it tries to connect to the same AP and does not need to go with the authentication process again.

Pre-authentication enables fast roaming by allowing the WiFi client (already connected to an AP) to perform IEEE 802.1x authentication with another AP before connecting to it.

## WiFi Client WPA Supplicants

A WiFi client supplicant is the software that runs on an operating system instructing the WiFi client how to use WPA. At the time of writing, the most widely available supplicant is the WPA patch for Windows XP, Funk Software's Odyssey client.

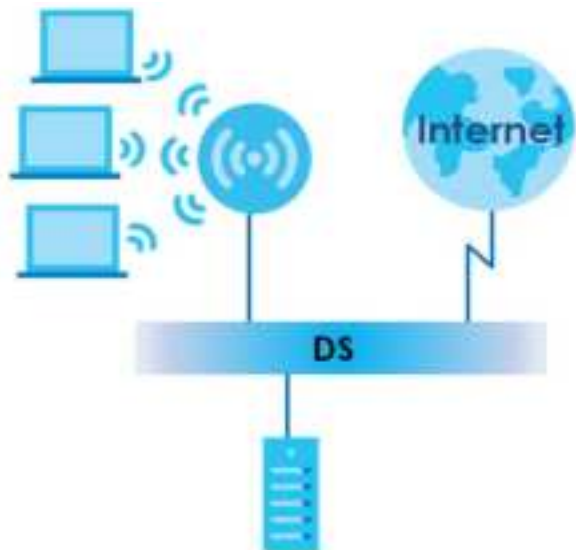
The Windows XP patch is a free download that adds WPA capability to Windows XP's built-in "Zero Configuration" WiFi client. However, you must run Windows XP to use it.

## WPA(2) with RADIUS Application Example

To set up WPA(2), you need the IP address of the RADIUS server, its port number (default is 1812), and the RADIUS shared secret. A WPA(2) application example with an external RADIUS server looks as follows. "A" is the RADIUS server. "DS" is the distribution system.

- 1 The AP passes the WiFi client's authentication request to the RADIUS server.
- 2 The RADIUS server then checks the user's identification against its database and grants or denies network access accordingly.
- 3 A 256-bit Pairwise Master Key (PMK) is derived from the authentication process by the RADIUS server and the client.
- 4 The RADIUS server distributes the PMK to the AP. The AP then sets up a key hierarchy and management system, using the PMK to dynamically generate unique data encryption keys. The keys are used to encrypt every data packet that is wirelessly communicated between the AP and the WiFi clients.

**Figure 314** WPA(2) with RADIUS Application Example



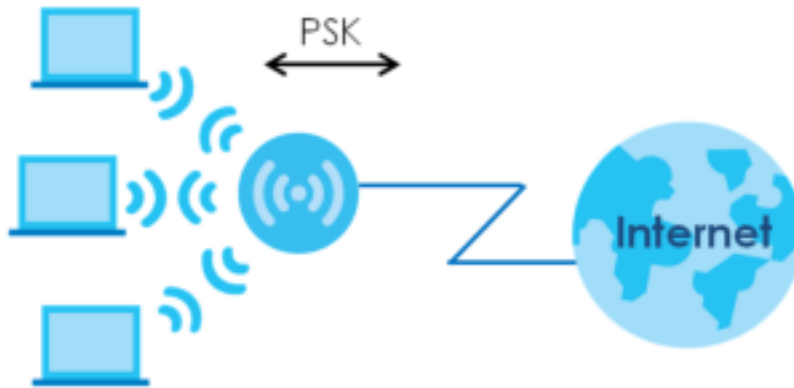
## WPA(2)-PSK Application Example

A WPA(2)-PSK application looks as follows.

- 1 First enter identical passwords into the AP and all WiFi clients. The Pre-Shared Key (PSK) must consist of between 8 to 63 alphanumeric (0-9, a-z, A-Z) and special characters, including spaces.

- 2 The AP checks each WiFi client's password and allows it to join the network only if the password matches.
- 3 The AP and WiFi clients generate a common PMK (Pairwise Master Key). The key itself is not sent over the network, but is derived from the PSK and the SSID.
- 4 The AP and WiFi clients use the TKIP or AES encryption process, the PMK and information exchanged in a handshake to create temporal encryption keys. They use these keys to encrypt data exchanged between them.

**Figure 315** WPA(2)-PSK Authentication



## Security Parameters Summary

Refer to this table to see what other security parameters you should configure for each authentication method or key management protocol type. MAC address filters are not dependent on how you configure these security features.

Table 207 Wireless Security Relational Matrix

| AUTHENTICATION METHOD/<br>KEY MANAGEMENT<br>PROTOCOL | ENCRYPTION<br>METHOD | ENTER MANUAL<br>KEY | IEEE 802.1X                    |
|------------------------------------------------------|----------------------|---------------------|--------------------------------|
| Open                                                 | None                 | No                  | Disable                        |
|                                                      |                      |                     | Enable without Dynamic WEP Key |
| Open                                                 | WEP                  | No                  | Enable with Dynamic WEP Key    |
|                                                      |                      | Yes                 | Enable without Dynamic WEP Key |
|                                                      |                      | Yes                 | Disable                        |
| Shared                                               | WEP                  | No                  | Enable with Dynamic WEP Key    |
|                                                      |                      | Yes                 | Enable without Dynamic WEP Key |
|                                                      |                      | Yes                 | Disable                        |
| WPA                                                  | TKIP/AES             | No                  | Enable                         |
| WPA-PSK                                              | TKIP/AES             | Yes                 | Disable                        |
| WPA2                                                 | TKIP/AES             | No                  | Enable                         |
| WPA2-PSK                                             | TKIP/AES             | Yes                 | Disable                        |

## Antenna Overview

An antenna couples RF signals onto air. A transmitter within a wireless device sends an RF signal to the antenna, which propagates the signal through the air. The antenna also operates in reverse by capturing RF signals from the air.

Positioning the antennas properly increases the range and coverage area of a wireless LAN.

## Antenna Characteristics

### Frequency

An antenna in the frequency of 2.4 GHz (IEEE 802.11b and IEEE 802.11g) or 5 GHz (IEEE 802.11a) is needed to communicate efficiently in a wireless LAN.

### Radiation Pattern

A radiation pattern is a diagram that allows you to visualize the shape of the antenna's coverage area.

### Antenna Gain

Antenna gain, measured in dB (decibel), is the increase in coverage within the RF beam width. Higher antenna gain improves the range of the signal for better communications.

For an indoor site, each 1 dB increase in antenna gain results in a range increase of approximately 2.5%. For an unobstructed outdoor site, each 1 dB increase in gain results in a range increase of approximately 5%. Actual results may vary depending on the network environment.

Antenna gain is sometimes specified in dBi, which is how much the antenna increases the signal power compared to using an isotropic antenna. An isotropic antenna is a theoretical perfect antenna that sends out radio signals equally well in all directions. dBi represents the true gain that the antenna provides.

## Types of Antennas for WiFi

There are two types of antennas used for WiFi applications.

- Omni-directional antennas send the RF signal out in all directions on a horizontal plane. The coverage area is torus-shaped (like a donut) which makes these antennas ideal for a room environment. With a wide coverage area, it is possible to make circular overlapping coverage areas with multiple access points.
- Directional antennas concentrate the RF signal in a beam, like a flashlight does with the light from its bulb. The angle of the beam determines the width of the coverage pattern. Angles typically range from 20 degrees (very directional) to 120 degrees (less directional). Directional antennas are ideal for hallways and outdoor point-to-point applications.

## Positioning Antennas

In general, antennas should be mounted as high as practically possible and free of obstructions. In point-to-point application, position both antennas at the same height and in a direct line of sight to each other to attain the best performance.

For omni-directional antennas mounted on a table, desk, and so on, point the antenna up. For omni-directional antennas mounted on a wall or ceiling, point the antenna down. For a single AP application, place omni-directional antennas as close to the center of the coverage area as possible.

For directional antennas, point the antenna in the direction of the desired coverage area.

# APPENDIX C

## IPv6

### Overview

IPv6 (Internet Protocol version 6), is designed to enhance IP address size and features. The increase in IPv6 address size to 128 bits (from the 32-bit IPv4 address) allows up to  $3.4 \times 10^{38}$  IP addresses.

### IPv6 Addressing

The 128-bit IPv6 address is written as eight 16-bit hexadecimal blocks separated by colons (:). This is an example IPv6 address 2001:db8:1a2b:0015:0000:0000:1a2f:0000.

IPv6 addresses can be abbreviated in two ways:

- Leading zeros in a block can be omitted. So 2001:db8:1a2b:0015:0000:0000:1a2f:0000 can be written as 2001:db8:1a2b:15:0:0:1a2f:0.
- Any number of consecutive blocks of zeros can be replaced by a double colon. A double colon can only appear once in an IPv6 address. So 2001:db8:0000:0000:1a2f:0000:0000:0015 can be written as 2001:db8::1a2f:0000:0000:0015, 2001:db8:0000:0000:1a2f::0015, 2001:db8::1a2f:0:0:15 or 2001:db8:0:0:1a2f::15.

### Prefix and Prefix Length

Similar to an IPv4 subnet mask, IPv6 uses an address prefix to represent the network address. An IPv6 prefix length specifies how many most significant bits (start from the left) in the address compose the network address. The prefix length is written as "/x" where x is a number. For example,

2001:db8:1a2b:15::1a2f:0/32

means that the first 32 bits (2001:db8) is the subnet prefix.

### Link-local Address

A link-local address uniquely identifies a device on the local network (the LAN). It is similar to a "private IP address" in IPv4. You can have the same link-local address on multiple interfaces on a device. A link-local unicast address has a predefined prefix of fe80::/10. The link-local unicast address format is as follows.

Table 208 Link-local Unicast Address Format

|              |         |              |
|--------------|---------|--------------|
| 1111 1110 10 | 0       | Interface ID |
| 10 bits      | 54 bits | 64 bits      |

### Global Address

A global address uniquely identifies a device on the Internet. It is similar to a "public IP address" in IPv4. A global unicast address starts with a 2 or 3.

## Unspecified Address

An unspecified address (0:0:0:0:0:0 or ::) is used as the source address when a device does not have its own address. It is similar to "0.0.0.0" in IPv4.

## Loopback Address

A loopback address (0:0:0:0:0:1 or ::1) allows a host to send packets to itself. It is similar to "127.0.0.1" in IPv4.

## Multicast Address

In IPv6, Multicast addresses provide the same functionality as IPv4 broadcast addresses. Broadcasting is not supported in IPv6. A Multicast address allows a host to send packets to all hosts in a Multicast group.

Multicast scope allows you to determine the size of the Multicast group. A Multicast address has a predefined prefix of ff00::/8. The following table describes some of the predefined Multicast addresses.

Table 209 Predefined Multicast Address

| MULTICASTADDRESS   | DESCRIPTION                            |
|--------------------|----------------------------------------|
| FF01:0:0:0:0:0:0:1 | All hosts on a local node.             |
| FF01:0:0:0:0:0:0:2 | All routers on a local node.           |
| FF02:0:0:0:0:0:0:1 | All hosts on a local connected link.   |
| FF02:0:0:0:0:0:0:2 | All routers on a local connected link. |
| FF05:0:0:0:0:0:0:2 | All routers on a local site.           |
| FF05:0:0:0:0:0:1:3 | All DHCP servers on a local site.      |

The following table describes the Multicast addresses which are reserved and cannot be assigned to a Multicast group.

Table 210 Reserved Multicast Address

| MULTICASTADDRESS   |
|--------------------|
| FF00:0:0:0:0:0:0:0 |
| FF01:0:0:0:0:0:0:0 |
| FF02:0:0:0:0:0:0:0 |
| FF03:0:0:0:0:0:0:0 |
| FF04:0:0:0:0:0:0:0 |
| FF05:0:0:0:0:0:0:0 |
| FF06:0:0:0:0:0:0:0 |
| FF07:0:0:0:0:0:0:0 |
| FF08:0:0:0:0:0:0:0 |
| FF09:0:0:0:0:0:0:0 |
| FF0A:0:0:0:0:0:0:0 |
| FF0B:0:0:0:0:0:0:0 |
| FF0C:0:0:0:0:0:0:0 |
| FF0D:0:0:0:0:0:0:0 |
| FF0E:0:0:0:0:0:0:0 |
| FF0F:0:0:0:0:0:0:0 |

## Subnet Masking

Both an IPv6 address and IPv6 subnet mask compose of 128-bit binary digits, which are divided into eight 16-bit blocks and written in hexadecimal notation. Hexadecimal uses four bits for each character (1 – 10, A – F). Each block's 16 bits are then represented by four hexadecimal characters. For example, FFFF:FFFF:FFFF:FFFF:FC00:0000:0000:0000.

## Interface ID

In IPv6, an interface ID is a 64-bit identifier. It identifies a physical interface (for example, an Ethernet port) or a virtual interface (for example, the management IP address for a VLAN). One interface should have a unique interface ID.

## EUI-64

The EUI-64 (Extended Unique Identifier) defined by the IEEE (Institute of Electrical and Electronics Engineers) is an interface ID format designed to adapt with IPv6. It is derived from the 48-bit (6-byte) Ethernet MAC address as shown next. EUI-64 inserts the hex digits fffe between the third and fourth bytes of the MAC address and complements the seventh bit of the first byte of the MAC address. See the following example.

**Table 211**

|     |    |   |    |   |    |   |    |   |    |   |    |
|-----|----|---|----|---|----|---|----|---|----|---|----|
| MAC | 00 | : | 13 | : | 49 | : | 12 | : | 34 | : | 56 |
|-----|----|---|----|---|----|---|----|---|----|---|----|

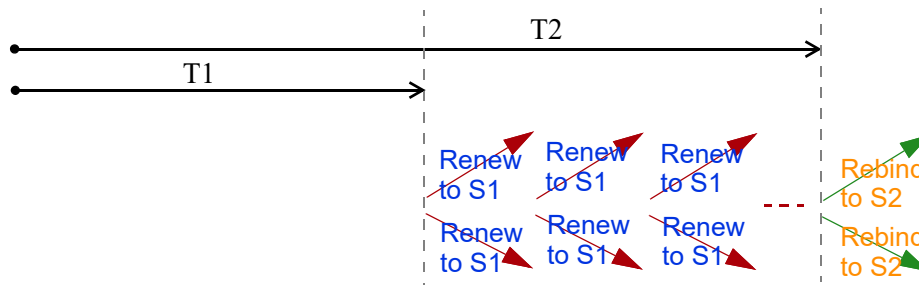
**Table 212**

|        |    |   |    |   |    |   |    |   |    |   |    |   |    |   |    |
|--------|----|---|----|---|----|---|----|---|----|---|----|---|----|---|----|
| EUI-64 | 02 | : | 13 | : | 49 | : | FF | : | FE | : | 12 | : | 34 | : | 56 |
|--------|----|---|----|---|----|---|----|---|----|---|----|---|----|---|----|

## Identity Association

An Identity Association (IA) is a collection of addresses assigned to a DHCP client, through which the server and client can manage a set of related IP addresses. Each IA must be associated with exactly one interface. The DHCP client uses the IA assigned to an interface to obtain configuration from a DHCP server for that interface. Each IA consists of a unique IAID and associated IP information.

The IA type is the type of address in the IA. Each IA holds one type of address. IA\_NA means an identity association for non-temporary addresses and IA\_TA is an identity association for temporary addresses. An IA\_NA option contains the T1 and T2 fields, but an IA\_TA option does not. The DHCPv6 server uses T1 and T2 to control the time at which the client contacts with the server to extend the lifetimes on any addresses in the IA\_NA before the lifetimes expire. After T1, the client sends the server (**S1**) (from which the addresses in the IA\_NA were obtained) a Renew message. If the time T2 is reached and the server does not respond, the client sends a Rebind message to any available server (**S2**). For an IA\_TA, the client may send a Renew or Rebind message at the client's discretion.





## DHCP Relay Agent

A DHCP relay agent is on the same network as the DHCP clients and helps forward messages between the DHCP server and clients. When a client cannot use its link-local address and a well-known multicast address to locate a DHCP server on its network, it then needs a DHCP relay agent to send a message to a DHCP server that is not attached to the same network.

The DHCP relay agent can add the remote identification (remote-ID) option and the interface-ID option to the Relay-Forward DHCPv6 messages. The remote-ID option carries a user-defined string, such as the system name. The interface-ID option provides slot number, port information and the VLAN ID to the DHCPv6 server. The remote-ID option (if any) is stripped from the Relay-Reply messages before the relay agent sends the packets to the clients. The DHCP server copies the interface-ID option from the Relay-Forward message into the Relay-Reply message and sends it to the relay agent. The interface-ID should not change even after the relay agent restarts.

## Prefix Delegation

Prefix delegation enables an IPv6 router to use the IPv6 prefix (network address) received from the ISP (or a connected uplink router) for its LAN. The Zyxel Device uses the received IPv6 prefix (for example, 2001:db2::/48) to generate its LAN IP address. Through sending Router Advertisements (RAs) regularly by Multicast, the Zyxel Device passes the IPv6 prefix information to its LAN hosts. The hosts then can use the prefix to generate their IPv6 addresses.

## ICMPv6

Internet Control Message Protocol for IPv6 (ICMPv6 or ICMP for IPv6) is defined in RFC 4443. ICMPv6 has a preceding Next Header value of 58, which is different from the value used to identify ICMP for IPv4. ICMPv6 is an integral part of IPv6. IPv6 nodes use ICMPv6 to report errors encountered in packet processing and perform other diagnostic functions, such as "ping".

## Neighbor Discovery Protocol (NDP)

The Neighbor Discovery Protocol (NDP) is a protocol used to discover other IPv6 devices and track neighbor's reachability in a network. An IPv6 device uses the following ICMPv6 messages types:

- Neighbor solicitation: A request from a host to determine a neighbor's link-layer address (MAC address) and detect if the neighbor is still reachable. A neighbor being "reachable" means it responds to a neighbor solicitation message (from the host) with a neighbor advertisement message.
- Neighbor advertisement: A response from a node to announce its link-layer address.
- Router solicitation: A request from a host to locate a router that can act as the default router and forward packets.
- Router advertisement: A response to a router solicitation or a periodical Multicast advertisement from a router to advertise its presence and other parameters.

## IPv6 Cache

An IPv6 host is required to have a neighbor cache, destination cache, prefix list and default router list. The Zyxel Device maintains and updates its IPv6 caches constantly using the information from response messages. In IPv6, the Zyxel Device configures a link-local address automatically, and then sends a neighbor solicitation message to check if the address is unique. If there is an address to be resolved or verified, the Zyxel Device also sends out a neighbor solicitation message. When the Zyxel Device

receives a neighbor advertisement in response, it stores the neighbor's link-layer address in the neighbor cache. When the Zyxel Device uses a router solicitation message to query for a router and receives a router advertisement message, it adds the router's information to the neighbor cache, prefix list and destination cache. The Zyxel Device creates an entry in the default router list cache if the router can be used as a default router.

When the Zyxel Device needs to send a packet, it first consults the destination cache to determine the next hop. If there is no matching entry in the destination cache, the Zyxel Device uses the prefix list to determine whether the destination address is on-link and can be reached directly without passing through a router. If the address is unreach, the address is considered as the next hop. Otherwise, the Zyxel Device determines the next-hop from the default router list or routing table. Once the next hop IP address is known, the Zyxel Device looks into the neighbor cache to get the link-layer address and sends the packet when the neighbor is reachable. If the Zyxel Device cannot find an entry in the neighbor cache or the state for the neighbor is not reachable, it starts the address resolution process. This helps reduce the number of IPv6 solicitation and advertisement messages.

## **Multicast Listener Discovery**

The Multicast Listener Discovery (MLD) protocol (defined in RFC 2710) is derived from IPv4's Internet Group Management Protocol version 2 (IGMPv2). MLD uses ICMPv6 message types, rather than IGMP message types. MLDv1 is equivalent to IGMPv2 and MLDv2 is equivalent to IGMPv3.

MLD allows an IPv6 switch or router to discover the presence of MLD listeners who wish to receive Multicast packets and the IP addresses of Multicast groups the hosts want to join on its network.

MLD snooping and MLD proxy are analogous to IGMP snooping and IGMP proxy in IPv4.

MLD filtering controls which Multicast groups a port can join.

## **MLD Messages**

A Multicast router or switch periodically sends general queries to MLD hosts to update the Multicast forwarding table. When an MLD host wants to join a Multicast group, it sends an MLD Report message for that address.

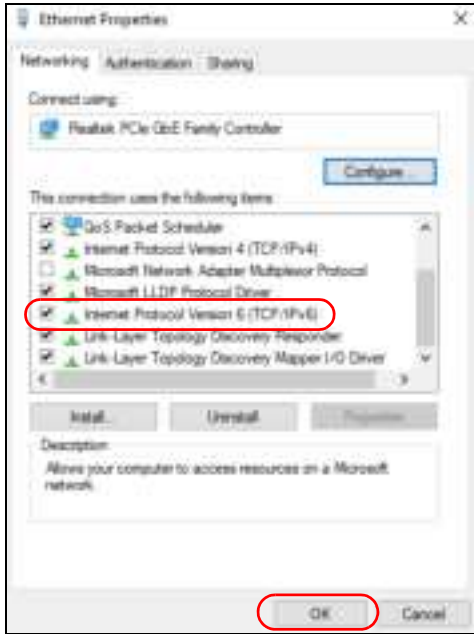
An MLD Done message is equivalent to an IGMP Leave message. When an MLD host wants to leave a Multicast group, it can send a Done message to the router or switch. The router or switch then sends a group-specific query to the port on which the Done message is received to determine if other devices connected to this port should remain in the group.

## **Example – Enabling IPv6 on Windows 10**

Windows 10 supports IPv6 by default. DHCPv6 is also enabled when you enable IPv6 on a Windows 10 computer.

To enable IPv6 in Windows 10:

- 1 Click the start icon, **Settings** and then **Network & Internet**.
- 2 Select the **Internet Protocol Version 6 (TCP/IPv6)** checkbox to enable it.
- 3 Click **OK** to save the change.



- 4 Click the Search icon (🔍) and then enter "cmd" in the search box.
- 5 Use the `ipconfig` command to check your dynamic IPv6 address. This example shows a global address (2001:b021:2d::1000) obtained from a DHCP server.

```
C:\>ipconfig

Windows IP Configuration

Ethernet adapter Local Area Connection:

    Connection-specific DNS Suffix  . : 
    IPv6 Address. . . . . : 2001:b021:2d::1000
    Link-local IPv6 Address . . . . . : fe80::25d8:dcab:c80a:5189%11
    IPv4 Address. . . . . : 172.16.100.61
    Subnet Mask . . . . . : 255.255.255.0
    Default Gateway . . . . . : fe80::213:49ff:f
```

# APPENDIX D

## Services

The following table lists some commonly-used services and their associated protocols and port numbers.

- **Name:** This is a short, descriptive name for the service. You can use this one or create a different one, if you like.
- **Protocol:** This is the type of IP protocol used by the service. If this is **TCP/UDP**, then the service uses the same port number with TCP and UDP. If this is **USER-DEFINED**, the **Port(s)** is the IP protocol number, not the port number.
- **Port(s):** This value depends on the **Protocol**.
  - If the **Protocol** is **TCP**, **UDP**, or **TCP/UDP**, this is the IP port number.
  - If the **Protocol** is **USER**, this is the IP protocol number.
- **Description:** This is a brief explanation of the applications that use this service or the situations in which this service is used.

Table 213 Examples of Services

| NAME               | PROTOCOL                                 | PORT(S)                  | DESCRIPTION                                                                                                                            |
|--------------------|------------------------------------------|--------------------------|----------------------------------------------------------------------------------------------------------------------------------------|
| AH (IPSEC_TUNNEL)  | User-Defined                             | 51                       | The IPSEC AH (Authentication Header) tunneling protocol uses this service.                                                             |
| AIM                | TCP                                      | 5190                     | AOL's Internet Messenger service.                                                                                                      |
| AUTH               | TCP                                      | 113                      | Authentication protocol used by some servers.                                                                                          |
| BGP                | TCP                                      | 179                      | Border Gateway Protocol.                                                                                                               |
| BOOTP_CLIENT       | UDP                                      | 68                       | DHCP Client.                                                                                                                           |
| BOOTP_SERVER       | UDP                                      | 67                       | DHCP Server.                                                                                                                           |
| CU-SEEME           | TCP/UDP<br>TCP/UDP                       | 7648<br>24032            | A popular videoconferencing solution from White Pines Software.                                                                        |
| DNS                | TCP/UDP                                  | 53                       | Domain Name Server, a service that matches web names (for instance <a href="http://www.zyxe.com">www.zyxe.com</a> ) to IP numbers.     |
| ESP (IPSEC_TUNNEL) | User-Defined                             | 50                       | The IPSEC ESP (Encapsulation Security Protocol) tunneling protocol uses this service.                                                  |
| FINGER             | TCP                                      | 79                       | Finger is a UNIX or Internet related command that can be used to find out if a user is logged on.                                      |
| H.323              | TCP                                      | 1720                     | NetMeeting uses this protocol.                                                                                                         |
| HTTP               | TCP                                      | 80                       | Hyper Text Transfer Protocol – a client/server protocol for the world wide web.                                                        |
| HTTPS              | TCP                                      | 443                      | HTTPS is a secured http session often used in e-commerce.                                                                              |
| ICMP               | User-Defined                             | 1                        | Internet Control Message Protocol is often used for diagnostic purposes.                                                               |
| ICQ                | UDP                                      | 4000                     | This is a popular Internet chat program.                                                                                               |
| IGMP (MULTICAST)   | User-Defined                             | 2                        | Internet Group Multicast Protocol is used when sending packets to a specific group of hosts.                                           |
| IKE                | UDP                                      | 500                      | The Internet Key Exchange algorithm is used for key distribution and management.                                                       |
| IMAP4              | TCP                                      | 143                      | The Internet Message Access Protocol is used for email.                                                                                |
| IMAP4S             | TCP                                      | 993                      | This is a more secure version of IMAP4 that runs over SSL.                                                                             |
| IRC                | TCP/UDP                                  | 6667                     | This is another popular Internet chat program.                                                                                         |
| MSN Messenger      | TCP                                      | 1863                     | Microsoft Networks' messenger service uses this protocol.                                                                              |
| NetBIOS            | TCP/UDP<br>TCP/UDP<br>TCP/UDP<br>TCP/UDP | 137<br>138<br>139<br>445 | The Network Basic Input/Output System is used for communication between computers in a LAN.                                            |
| NEW-ICQ            | TCP                                      | 5190                     | An Internet chat program.                                                                                                              |
| NEWS               | TCP                                      | 144                      | A protocol for news groups.                                                                                                            |
| NFS                | UDP                                      | 2049                     | Network File System – NFS is a client/server distributed file service that provides transparent file sharing for network environments. |
| NNTP               | TCP                                      | 119                      | Network News Transport Protocol is the delivery mechanism for the USENET newsgroup service.                                            |

Table 213 Examples of Services (continued)

| NAME              | PROTOCOL     | PORT(S) | DESCRIPTION                                                                                                                                                                     |
|-------------------|--------------|---------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| PING              | User-Defined | 1       | Packet Internet Groper is a protocol that sends out ICMP echo requests to test whether or not a remote host is reachable.                                                       |
| POP3              | TCP          | 110     | Post Office Protocol version 3 lets a client computer get email from a POP3 server through a temporary connection (TCP/IP or other).                                            |
| POP3S             | TCP          | 995     | This is a more secure version of POP3 that runs over SSL.                                                                                                                       |
| PPTP              | TCP          | 1723    | Point-to-Point Tunneling Protocol enables secure transfer of data over public networks. This is the control channel.                                                            |
| PPTP_TUNNEL (GRE) | User-Defined | 47      | PPTP (Point-to-Point Tunneling Protocol) enables secure transfer of data over public networks. This is the data channel.                                                        |
| RCMD              | TCP          | 512     | Remote Command Service.                                                                                                                                                         |
| REAL_AUDIO        | TCP          | 7070    | A streaming audio service that enables real time sound over the web.                                                                                                            |
| REXEC             | TCP          | 514     | Remote Execution Daemon.                                                                                                                                                        |
| RLOGIN            | TCP          | 513     | Remote Login.                                                                                                                                                                   |
| ROADRUNNER        | TCP/UDP      | 1026    | This is an ISP that provides services mainly for cable modems.                                                                                                                  |
| RTELNET           | TCP          | 107     | Remote Telnet.                                                                                                                                                                  |
| RTSP              | TCP/UDP      | 554     | The Real Time Streaming (media control) Protocol (RTSP) is a remote control for multimedia on the Internet.                                                                     |
| SFTP              | TCP          | 115     | The Simple File Transfer Protocol is an old way of transferring files between computers.                                                                                        |
| SMTP              | TCP          | 25      | Simple Mail Transfer Protocol is the message-exchange standard for the Internet. SMTP enables you to move messages from one email server to another.                            |
| SMTPS             | TCP          | 465     | This is a more secure version of SMTP that runs over SSL.                                                                                                                       |
| SNMP              | TCP/UDP      | 161     | Simple Network Management Program.                                                                                                                                              |
| SNMP-TRAPS        | TCP/UDP      | 162     | Traps for use with the SNMP (RFC:1215).                                                                                                                                         |
| SQL-NET           | TCP          | 1521    | Structured Query Language is an interface to access data on many different types of database systems, including mainframes, midrange systems, UNIX systems and network servers. |
| SSDP              | UDP          | 1900    | The Simple Service Discovery Protocol supports Universal Plug-and-Play (UPnP).                                                                                                  |
| SSH               | TCP/UDP      | 22      | Secure Shell Remote Login Program.                                                                                                                                              |
| STRM WORKS        | UDP          | 1558    | Stream Works Protocol.                                                                                                                                                          |
| SYSLOG            | UDP          | 514     | Syslog allows you to send system logs to a UNIX server.                                                                                                                         |
| TACACS            | UDP          | 49      | Login Host Protocol used for (Terminal Access Controller Access Control System).                                                                                                |

Table 213 Examples of Services (continued)

| NAME    | PROTOCOL   | PORT(S)                  | DESCRIPTION                                                                                                                                                                                                    |
|---------|------------|--------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| TELNET  | TCP        | 23                       | Telnet is the login and terminal emulation protocol common on the Internet and in UNIX environments. It operates over TCP/IP networks. Its primary function is to allow users to log into remote host systems. |
| VDOLIVE | TCP<br>UDP | 7000<br>user-<br>defined | A videoconferencing solution. The UDP port number is specified in the application.                                                                                                                             |

# APPENDIX E

## Legal Information

### Copyright

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The contents of this publication may not be reproduced in any part or as a whole, transcribed, stored in a retrieval system, translated into any language, or transmitted in any form or by any means, electronic, mechanical, magnetic, optical, chemical, photocopying, manual, or otherwise, without the prior written permission of Zyxel and/or its affiliates.

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### Disclaimer

Zyxel does not assume any liability arising out of the application or use of any products, or software described herein. Neither does it convey any license under its patent rights nor the patent rights of others. Zyxel further reserves the right to make changes in any products described herein without notice. This publication is subject to change without notice.

### Regulatory Notice and Statement

#### United States of America



The following information applies if you use the product within USA area.

#### FCC Statement

- The device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:
  - (1) This device may not cause harmful interference, and
  - (2) This device must accept any interference received, including interference that may cause undesired operation.
- Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna
- Increase the separation between the equipment and receiver
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected
- Consult the dealer or an experienced radio/TV technician for help

#### FCC Radiation Exposure Statement

- This device complies with FCC Radio Frequency (RF) radiation exposure limits set forth for an uncontrolled environment.
- This transmitter must be at least 20 cm from the user and must not be co-located or operating in conjunction with any other antenna or transmitter.

#### The following information applies for products operating in the 5.925-7.125 GHz band.

##### Low-power Indoor Access Point

- FCC regulations restrict the operation of this device to indoor use only.
- The operation of this device is prohibited on oil platforms, cars, trains, boats, and aircraft, except that operation of this device is permitted in large aircraft while flying above 10,000 feet in the 5.925-6.425 GHz band.
- Operation of transmitters in the 5.925-7.125 GHz band is prohibited for control of or communications with unmanned aircraft systems.

##### Standard Power Access Point

- The operation of this device is prohibited on oil platforms, cars, trains, boats, and aircraft.
- Operation of transmitters in the 5.925-7.125 GHz band is prohibited for control of or communications with unmanned aircraft systems.

#### Industry Canada radiation exposure statement

This equipment complies with ICSED radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with a minimum distance of 20 cm between the radiator and your body.



**Déclaration d'exposition aux radiations**

Cet équipement est conforme aux limites d'exposition aux rayonnements ISED établies pour un environnement non contrôlé. Cet équipement doit être installé et utilisé avec un minimum de 20 cm de distance entre la source de rayonnement et votre corps.

**Europe and the United Kingdom**

The following information applies if you use the product within the European Union and United Kingdom.

**Declaration of Conformity with Regard to EU Directive 2014/53/EU (Radio Equipment Directive, RED) and UK Radio Equipment Regulations 2017**

Model List: AX7501-B0, AX7501-B1, DX3300-T0, DX3300-T1, DX3301-T0, DX5401-B0, DX5401-B1, EX3300-T0, EX3300-T1, EX3301-T0, EX3500-T0, EX3501-T0, EX3600-T0, EX5401-B0, EX5401-B1, EX5600-T1, EX5601-T0, EX5601-T1, EX7501-B0, PX3321-T1, PX5301-T0, PX5302-00

- Compliance information for wireless products relevant to the EU, United Kingdom, and other Countries following the EU Directive 2014/53/EU (RED) and UK Radio Equipment Regulations 2017. And this product may be used in all EU countries (and other countries following the EU Directive 2014/53/EU) and United Kingdom without any limitation except for the countries mentioned below table:
- In the majority of the EU, United Kingdom, and other European countries, the 5 GHz bands have been made available for the use of wireless local area networks (LANs). Later in this document you will find an overview of countries in which additional restrictions or requirements or both are applicable. The requirements for any country may evolve. Zyxel recommends that you check with the local authorities for the latest status of their national regulations for the 5 GHz wireless LANs.
- If this device operates in the 5150 to 5350 MHz band, it is for indoor use only.
- This equipment should be installed and operated with a minimum distance of 20cm between the radio equipment and your body.
- The maximum RF operating power for each band is as follows:
- DX3300-T0 / DX3301-T0 / EX3300-T0 / EX3301-T0
  - 95.28 mW for the 2,400 to 2,483.5 MHz band
  - 192.31 mW for the 5,150 to 5,350 MHz band
  - 912.01 mW for the 5,470 to 5,725 MHz band
- AX7501-B0
  - 96.38 mW for the 2,400 to 2,483.5 MHz band
  - 184.50 mW for the 5,150 to 5,350 MHz band
  - 905.73 mW for the 5,470 to 5,725 MHz band
- AX7501-B1
  - 90.16 mW for the 2,400 to 2,483.5 MHz band
  - 194.98 mW for the 5,150 to 5,350 MHz band
  - 993.12 mW for the 5,470 to 5,725 MHz band
- DX5401-B0 / EX5401-B0
  - 8.57 mW for the 2,400 to 2,483.5 MHz band (Zigbee)
  - 97.72 mW for the 2,400 to 2,483.5 MHz band (WiFi)
  - 177.42 mW for the 5,150 to 5,350 MHz band
  - 857.04 mW for the 5,470 to 5,725 MHz band
- DX5401-B1 / EX5401-B1
  - 96.61 mW for the 2,400 to 2,483.5 MHz band
  - 193.64 mW for the 5,150 to 5,350 MHz band
  - 698.23 mW for the 5,470 to 5,725 MHz band
- EX3500-T0 / EX3501-T0
  - 97.72 mW for the 2,400 to 2,483.5 MHz band
  - 191.43 mW for the 5,150 to 5,350 MHz band
  - 916.22 mW for the 5,470 to 5,725 MHz band
- EX3600-T0
  - 90.99 dBm for the 2,400 to 2,483.5 MHz band
  - 192.75 dBm for the 5,150 to 5,350 MHz band
  - 602.55 dBm for the 5,470 to 5,725 MHz band
  - 182.81 dBm for the 5,725 to 5,850 MHz band (UK only)
- EX5600-T1 / EX5601-T0 / EX5601-T1
  - 86.5 mW for the 2,400 to 2,483.5 MHz band
  - 176.6 mW for the 5,150 to 5,350 MHz band
  - 870.1 mW for the 5,470 to 5,725 MHz band
  - 170.61 mW for the 5,725 to 5,850 MHz band (UK only)
- EX7501-B0
  - 88.51 mW for the 2,400 to 2,483.5 MHz band
  - 179.47 mW for the 5,150 to 5,350 MHz band

- 883.08 mW for the 5,470 to 5,725 MHz band
- 177.42 mW for the 5,725 to 5,850 MHz band (UK only)
- DX3300-T1 / EX3300-T1
  - 97.5 mW for the 2,400 to 2,483.5 MHz band
  - 194.09 mW for the 5,150 to 5,350 MHz band
  - 922.57 mW for the 5,470 – 5,725 MHz band
- PX3321-T1 / PX5301-T0
  - 99.31 mW for the 2,400 to 2,483.5 MHz band
  - 194.98 mW for the 5,150 to 5,350 MHz band
  - 997.7 mW for the 5,470 to 5,725 MHz band
- PX5302-00
  - 90.36 mW for the 2,400 to 2,483.5 MHz band
  - 173.78 mW for the 5,150 to 5,350 MHz band
  - 788.86 mW for the 5,470 to 5,725 MHz band

|                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|--------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Belgium<br>(English)           | <b>National Restrictions</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| België (Flemish)               | <ul style="list-style-type: none"> <li>• The Belgian Institute for Postal Services and Telecommunications (BIPT) must be notified of any outdoor wireless link having a range exceeding 300 meters. Please check <a href="http://www.bipt.be">http://www.bipt.be</a> for more details.</li> <li>• Draadloze verbindingen voor buitengebruik en met een reikwijdte van meer dan 300 meter dienen aangemeld te worden bij het Belgisch Instituut voor postdiensten en telecommunicatie (BIPT). Zie <a href="http://www.bipt.be">http://www.bipt.be</a> voor meer gegevens.</li> <li>• Les liaisons sans fil pour une utilisation en extérieur d'une distance supérieure à 300 mètres doivent être notifiées à l'Institut Belge des services Postaux et des Télécommunications (IBPT). Visitez <a href="http://www.bipt.be">http://www.bipt.be</a> pour de plus amples détails.</li> </ul>                                                                                                                                                                          |
| Belgique<br>(French)           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Čeština<br>(Czech)             | Zyxel tímto prohlašuje, že tento zařízení je ve shodě se základními požadavky a dalšími příslušnými ustanoveními směrnice 2014/53/EU.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Dansk (Danish)                 | Undertegnede Zyxel erklærer herved, at følgende udstyr overholder de væsentlige krav og øvrige relevante krav i direktiv 2014/53/EU.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Deutsch<br>(German)            | Hiermit erklärt Zyxel, dass sich das Gerät Ausstattung in Übereinstimmung mit den grundlegenden Anforderungen und den übrigen einschlägigen Bestimmungen der Richtlinie 2014/53/EU befindet.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Eesti keel<br>(Estonian)       | Käesolevaga kinnitab Zyxel seadme seadmed vastavust direktiivi 2014/53/EL põhinõuetele ja nimetatud direktiivist tulenevatele teistele asjakohastele sätetele.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Ελληνικά<br>(Greek)            | ΜΕ ΤΗΝ ΠΑΡΟΥΣΑ Zyxel ΔΗΛΩΝΕΙ ΟΤΙ ΕΞΟΠΛΙΣΜΟΣ ΣΥΜΜΟΡΦΩΝΕΤΑΙ ΠΡΟΣ ΤΙΣ ΟΥΣΙΩΔΕΙΣ ΑΠΑΙΤΗΣΕΙΣ ΚΑΙ ΤΙΣ ΛΟΙΠΕΣ ΣΧΕΤΙΚΕΣ ΔΙΑΤΑΞΕΙΣ ΤΗΣ ΟΔΗΓΙΑΣ 2014/53/ΕΕ.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| English                        | Hereby, Zyxel declares that this device is in compliance with the essential requirements and other relevant provisions of Directive 2014/53/EU.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Español<br>(Spanish)           | Por medio de la presente Zyxel declara que el equipo cumple con los requisitos esenciales y cualesquiera otras disposiciones aplicables o exigibles de la Directiva 2014/53/UE.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Français<br>(French)           | Par la présente Zyxel déclare que l'appareil équipements est conforme aux exigences essentielles et aux autres dispositions pertinentes de la directive 2014/53/UE.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Hrvatski<br>(Croatian)         | Zyxel ovime izjavljuje da je radijska oprema tipa u skladu s Direktivom 2014/53/UE.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Íslenska<br>(Icelandic)        | Hér með lýsir, Zyxel því yfir að þessi búnaður er í samræmi við grunnkröfur og önnur viðeigandi ákvæði tilskipunar 2014/53/UE.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Italiano (Italian)             | <p>Con la presente Zyxel dichiara che questo attrezzatura è conforme ai requisiti essenziali ed alle altre disposizioni pertinenti stabilite dalla direttiva 2014/53/UE.</p> <p><b>National Restrictions</b></p> <ul style="list-style-type: none"> <li>• This product meets the National Radio Interface and the requirements specified in the National Frequency Allocation Table for Italy. Unless this wireless LAN product is operating within the boundaries of the owner's property, its use requires a "general authorization." Please check <a href="https://www.mise.gov.it/it/">https://www.mise.gov.it/it/</a> for more details.</li> <li>• Questo prodotto è conforme alla specifiche di Interfaccia Radio Nazionali e rispetta il Piano Nazionale di ripartizione delle frequenze in Italia. Se non viene installato all'interno del proprio fondo, l'utilizzo di prodotti Wireless LAN richiede una "Autorizzazione Generale". Consultare <a href="https://www.mise.gov.it/it/">https://www.mise.gov.it/it/</a> per maggiori dettagli.</li> </ul> |
| Latviešu valoda<br>(Latvian)   | Ar šo Zyxel deklarē, ka iekārtas atbilst Direktīvas 2014/53/ES būtiskajām prasībām un citiem ar to saistītajiem noteikumiem.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Lietuvių kalba<br>(Lithuanian) | Šiuo Zyxel deklaruoja, kad šis įranga atitinka esminius reikalavimus ir kitas 2014/53/ES Direktyvos nuostatas.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Magyar<br>(Hungarian)          | Alulírott, Zyxel nyilatkozom, hogy a berendezés megfelel a vonatkozó alapvető követelményeknek és az 2014/53/EU irányelv egyéb előírásainak.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Malti (Maltese)                | Hawnhekk, Zyxel, jiddikjara li dan tagħmir jikkonforma mal-htigijiet essenzjali u ma provvedimenti oħrajn rilevanti li hemm fid-Direttiva 2014/53/UE.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Nederlands<br>(Dutch)          | Hierbij verklaart Zyxel dat het toestel uitrusting in overeenstemming is met de essentiële eisen en de andere relevante bepalingen van richtlijn 2014/53/EU.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Norsk<br>(Norwegian)           | Erklærer herved Zyxel at dette utstyret er i samsvar med de grunnleggende kravene og andre relevante bestemmelser i direktiv 2014/53/EU.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |

|                        |                                                                                                                                                                         |
|------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Polski (Polish)        | Niniejszym Zyxel oświadcza, że sprzęt jest zgodny z zasadniczymi wymogami oraz pozostałymi stosownymi postanowieniami Dyrektywy 2014/53/UE.                             |
| Português (Portuguese) | Zyxel declara que este equipamento está conforme com os requisitos essenciais e outras disposições da Directiva 2014/53/UE.                                             |
| Română (Romanian)      | Prin prezenta, Zyxel declară că acest echipament este în conformitate cu cerințele esențiale și alte prevederi relevante ale Directivei 2014/53/UE.                     |
| Slovenčina (Slovak)    | Zyxel týmto vyhlasuje, že zariadenia spĺňa základné požiadavky a všetky príslušné ustanovenia Smernice 2014/53/EÚ.                                                      |
| Slovenščina (Slovene)  | Zyxel izjavlja, da je ta oprema v skladu z bistvenimi zahtevami in ostalimi relevantnimi določili direktive 2014/53/EU.                                                 |
| Suomi (Finnish)        | Zyxel vakuuttaa täten että laitteet tyyppinen laite on direktiivin 2014/53/EU oleellisten vaatimusten ja sitä koskevien direktiivin muiden ehtojen mukainen.            |
| Svenska (Swedish)      | Härmed intygar Zyxel att denna utrustning står i överensstämmelse med de väsentliga egenskapskrav och övriga relevanta bestämmelser som framgår av direktiv 2014/53/EU. |
| Български (Bulgarian)  | С настоящото Zyxel декларира, че това оборудване е в съответствие със съществените изисквания и другите приложими разпоредбите на Директива 2014/53/ЕС.                 |

**Notes:**

- Not all European states that implement EU Directive 2014/53/EU are European Union (EU) members.
- The regulatory limits for maximum output power are specified in EIRP. The EIRP level (in dBm) of a device can be calculated by adding the gain of the antenna used (specified in dBi) to the output power available at the connector (specified in dBm).

**List of national codes**

| COUNTRY        | ISO 3166 2 LETTER CODE | COUNTRY        | ISO 3166 2 LETTER CODE |
|----------------|------------------------|----------------|------------------------|
| Austria        | AT                     | Liechtenstein  | LI                     |
| Belgium        | BE                     | Lithuania      | LT                     |
| Bulgaria       | BG                     | Luxembourg     | LU                     |
| Croatia        | HR                     | Malta          | MT                     |
| Cyprus         | CY                     | Netherlands    | NL                     |
| Czech Republic | CZ                     | Norway         | NO                     |
| Denmark        | DK                     | Poland         | PL                     |
| Estonia        | EE                     | Portugal       | PT                     |
| Finland        | FI                     | Romania        | RO                     |
| France         | FR                     | Serbia         | RS                     |
| Germany        | DE                     | Slovakia       | SK                     |
| Greece         | GR                     | Slovenia       | SI                     |
| Hungary        | HU                     | Spain          | ES                     |
| Iceland        | IS                     | Switzerland    | CH                     |
| Ireland        | IE                     | Sweden         | SE                     |
| Italy          | IT                     | Turkey         | TR                     |
| Latvia         | LV                     | United Kingdom | GB                     |

**Safety Warnings**

- Do not put the device in a place that is humid, dusty, has extreme temperatures, or that blocks the device ventilation slots. These conditions may harm your device.
- Please refer to the device back label, datasheet, box specifications or catalog information for power rating of the device and operating temperature.
- There is a remote risk of electric shock from lightning: (1) Do not use the device outside, and make sure all the connections are indoors. (2) Do not install or service this device during a thunderstorm.
- The Power Supply is not waterproof, avoid contact with liquid. Handle the Power Supply with care; do not pry open, nor pull or press the pins on it.
- Do not expose your device to dampness, dust or corrosive liquids.
- Do not store things on the device.
- Do not obstruct the device ventilation slots as insufficient airflow may harm your device. For example, do not place the device in an enclosed space such as a box or on a very soft surface such as a bed or sofa.
- Do not install or service this device during a thunderstorm. There is a remote risk of electric shock from lightning.
- Connect ONLY suitable accessories to the device.
- Do not open the Zyxel Device. Opening or removing the device covers can expose you to dangerous high voltage points or other risks.
- Only qualified service personnel should service or disassemble this device. Please contact your vendor for further information.
- Make sure to connect the cables to the correct ports.

- Place connected cables carefully so that no one will step on them or stumble over them.
- Disconnect all cables from this device before servicing or disassembling.
- Do not remove the plug and connect it to a power outlet by itself; always attach the plug to the power adaptor first before connecting it to a power outlet.
- Do not allow anything to rest on the power adaptor or cord and do NOT place the product where anyone can walk on the power adaptor or cord.
- Please use the provided or designated connection cables/power cables/adaptors. Connect the power adaptor or cord to the right supply voltage (for example, 120V AC in North America or 230V AC in Europe). If the power adaptor or cord is damaged, it might cause electrocution. Remove the damaged power adaptor or cord from the device and the power source. Contact your local vendor to order a new one.
- CAUTION: There is a risk of explosion if you replace the device battery with an incorrect one. Dispose of used batteries according to the instructions. Dispose them at the applicable collection point for the recycling of electrical and electronic devices. For detailed information about recycling of this product, please contact your local city office, your household waste disposal service or the store where you purchased the product.
- Do not leave a battery in an extremely high temperature environment or surroundings since it can result in an explosion or the leakage of flammable liquid or gas.
- Do not subject a battery to extremely low air pressure since it may result in an explosion or the leakage of flammable liquid or gas.
- The following warning statements apply, where the disconnect device is not incorporated in the device or where the plug on the power supply cord is intended to serve as the disconnect device,
  - For a permanently connected device, a readily accessible method to disconnect the device shall be incorporated externally to the device;
  - For a pluggable device, the socket-outlet shall be installed near the device and shall be easily accessible.
- This product is intended to be supplied by a DC power source marked 'L.P.S' or 'Limited Power Source'. The rating for each model is as follows:
  - AX7501-B0 / AX7501-B1 / EX7501-B0: 12 Vdc / 3.5 A / Tma 40 °C
  - DX3300-T0 / DX3301-T0 / EX3300-T0 / EX3301-T0: 12 Vdc / 1.5 A or 2 A / Tma 40 °C
  - DX3300-T1 / EX3300-T1 / EX3500-T0 / EX3501-T0 / PX3321-T1 / PX5301-T0 / PX5302-00: 12 Vdc / 1.5A / Tma 40 °C
  - DX5401-B0 / EX5401-B0 / DX5401-B1 / EX5401-B1 / EX5600-T1 / EX5601-T0 / EX5601-T1: 12 Vdc / 3A / Tma 40 °C
  - EX3600-T0: 12Vdc / 2A / Tma 40 °C

**The following information applies for products with SFP:**

- CLASS 1 LASER PRODUCT & "IEC 60825-1:2014"
- CLASS 1 CONSUMER LASER PRODUCT & "EN 50689:2021"
- Caution – Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.
- Complies with 21 CFR 1040.10 and 1040.11 except for conformance with IEC 60825-1 Ed. 3., as described in Laser Notice No. 56, dated May 8, 2019.

## Important Safety Instructions

- Caution! The RJ-45 jacks are not used for telephone line connection.
- Caution! Do not use this product near water, for example a wet basement or near a swimming pool.
- Caution! Avoid using this product (other than a cordless type) during an electrical storm. There may be a remote risk of electric shock from lightning.
- Caution! Always disconnect all telephone lines from the wall outlet before servicing or disassembling this product.
- Attention: Les prises RJ-45 ne sont pas utilisées pour la connexion de la ligne téléphonique.
- Attention: Ne pas utiliser ce produit près de l'eau, par exemple un sous-sol humide ou près d'une piscine.
- Attention: Évitez d'utiliser ce produit (autre qu'un type sans fil) pendant un orage. Il peut y avoir un risque de choc électrique de la foudre.
- Attention: Toujours débrancher toutes les lignes téléphoniques de la prise murale avant de réparer ou de démonter ce produit.
- Attention: L'utilisation des commandes ou réglages ou l'exécution des procédures autres que celles spécifiées dans les présents exigences peuvent être la cause d'une exposition à un rayonnement dangereux

## Environment Statement

### ErP (Energy-related Products)

Zyxel products put on the EU and United Kingdom market in compliance with the requirement of the European Parliament and the Council published Directive 2009/125/EC and UK regulation establishing a framework for the setting of ecodesign requirements for energy-related products (recast), so called as "ErP Directive (Energy-related Products directive)" as well as ecodesign requirement laid down in applicable implementing measures, power consumption has satisfied regulation requirements which are:

- Network standby power consumption < 8 W, and/or
- Off mode power consumption < 0.5 W, and/or
- Standby mode power consumption < 0.5 W.

(Wireless setting, please refer to the chapter about wireless settings for more detail.)

### Disposal and Recycling Information

The symbol below means that according to local regulations your product and/or its battery shall be disposed of separately from domestic waste. If this product is end of life, take it to a recycling station designated by local authorities. At the time of disposal, the separate collection of your product and/or its battery will help save natural resources and ensure that the environment is sustainable development.

Die folgende Symbol bedeutet, dass Ihr Produkt und/oder seine Batterie gemäß den örtlichen Bestimmungen getrennt vom Hausmüll entsorgt werden muss. Wenden Sie sich an eine Recyclingstation, wenn dieses Produkt das Ende seiner Lebensdauer erreicht hat. Zum Zeitpunkt der Entsorgung wird die getrennte Sammlung von Produkt und/oder seiner Batterie dazu beitragen, natürliche Ressourcen zu sparen und die Umwelt und die menschliche Gesundheit zu schützen.

El símbolo de abajo indica que según las regulaciones locales, su producto y/o su batería deberán depositarse como basura separada de la doméstica. Cuando este producto alcance el final de su vida útil, llévelo a un punto limpio. Cuando llegue el momento de desechar el producto, la recogida por separado éste y/o su batería ayudará a salvar los recursos naturales y a proteger la salud humana y medioambiental.

Le symbole ci-dessous signifie que selon les réglementations locales votre produit et/ou sa batterie doivent être éliminés séparément des ordures ménagères. Lorsque ce produit atteint sa fin de vie, amenez-le à un centre de recyclage. Au moment de la mise au rebut, la collecte séparée de votre produit et/ou de sa batterie aidera à économiser les ressources naturelles et protéger l'environnement et la santé humaine.

Il simbolo sotto significa che secondo i regolamenti locali il vostro prodotto e/o batteria deve essere smaltito separatamente dai rifiuti domestici. Quando questo prodotto raggiunge la fine della vita di servizio portarlo a una stazione di riciclaggio. Al momento dello smaltimento, la raccolta separata del vostro prodotto e/o della sua batteria aiuta a risparmiare risorse naturali e a proteggere l'ambiente e la salute umana.

Symbolen innebär att enligt lokal lagstiftning ska produkten och/eller dess batteri kastas separat från hushållsavfallet. När den här produkten når slutet av sin livslängd ska du ta den till en återvinningsstation. Vid tiden för kasseringen bidrar du till en bättre miljö och mänsklig hälsa genom att göra dig av med den på ett återvinningsställe.



台灣



以下訊息僅適用於產品具有無線功能且銷售至台灣地區

- 取得審驗證明之低功率射頻器材，非經核准，公司、商號或使用者均不得擅自變更頻率、加大功率或變更原設計之特性及功能。
- 低功率射頻器材之使用不得影響飛航安全及干擾合法通信；經發現有干擾現象時，應立即停用，並改善至無干擾時方得繼續使用。前述合法通信，指依電信管理法規定作業之無線電通信。低功率射頻器材須忍受合法通信或工業、科學及醫療用電波輻射性電機設備之干擾。
- 本機限在不干擾合法電台與不被干擾保障條件下於室內使用。本產品使用時建議應距離人體 20 cm 以上。
- 無線資訊傳輸設備忍受合法通信之干擾且不得干擾合法通信；如造成干擾，應立即停用，俟無干擾之虞，始得繼續使用。
- 無線資訊傳輸設備的製造廠商應確保頻率穩定性，如依製造廠商使用手冊上所述正常操作，發射的信號應維持於操作頻帶中。
- 使用無線產品時，應避免影響附近雷達系統之操作。
- 高增益指向性天線只得應用於固定式點對點系統。

以下訊息僅適用於產品屬於專業安裝並銷售至台灣地區

- 本器材須經專業工程人員安裝及設定，始得設置使用，且不得直接販售給一般消費者。

安全警告 – 為了您的安全，請先閱讀以下警告及指示：

- 請勿將此產品接近水、火焰或放置在高溫的環境。
- 避免設備接觸：
  - 任何液體 - 切勿讓設備接觸水、雨水、高濕度、污水腐蝕性的液體或其他水份。
  - 灰塵及污物 - 切勿接觸灰塵、污物、沙土、食物或其他不適合的材料。
- 雷雨天氣時，不要安裝或維修此設備。有遭受電擊的風險。
- 切勿重摔或撞擊設備，並勿使用不正確的電源變壓器。
- 若接上不正確的電源變壓器會有爆炸的風險。
- 請勿隨意更換產品內的電池。
- 如果更換不正確的電池型式，會有爆炸的風險，請依製造商說明書處理使用過之電池。
- 請將廢電池丟棄在適當的電器或電子設備回收處。
- 請勿將設備解體。
- 請勿阻礙設備的散熱孔，空氣對流不足將會造成設備損害。
- 請使用隨貨提供或指定的連接線 / 電源線 / 電源變壓器，將其連接到合適的供應電壓（如：台灣供應電壓 110 伏特）。
- 假若電源變壓器或電源變壓器的纜線損壞，請從插座拔除，若您還繼續插電使用，會有觸電死亡的風險。
- 請勿試圖修理電源變壓器或電源變壓器的纜線，若有毀損，請直接聯絡您購買的店家，購買一個新的電源變壓器。
- 請勿將此設備安裝於室外，此設備僅適合放置於室內。
- 請勿隨一般垃圾丟棄。
- 請參閱產品背貼上的設備額定功率。
- 請參考產品型錄或是彩盒上的作業溫度。
- 產品沒有斷電裝置或者採用電源線的插頭視為斷電裝置的一部分，以下警語將適用：
  - 對永久連接之設備，在設備外部須安裝可觸及之斷電裝置；
  - 對插接式之設備，插座必須接近安裝之地點而且是易於觸及的。

## About the Symbols

Various symbols are used in this product to ensure correct usage, to prevent danger to the user and others, and to prevent property damage. The meaning of these symbols are described below. It is important that you read these descriptions thoroughly and fully understand the contents.

### Explanation of the Symbols

| SYMBOL                                                                            | EXPLANATION                                                                                                                                                    |
|-----------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | Alternating current (AC):<br>AC is an electric current in which the flow of electric charge periodically reverses direction.                                   |
|  | Direct current (DC):<br>DC is the unidirectional flow or movement of electric charge carriers.                                                                 |
|  | Earth; ground:<br>A wiring terminal intended for connection of a Protective Earthing Conductor.                                                                |
|  | Class II equipment:<br>The method of protection against electric shock in the case of class II equipment is either double insulation or reinforced insulation. |

## Viewing Certifications

Go to <http://www.zyxel.com> to view this product's documentation and certifications.

## Zyxel Limited Warranty

Zyxel warrants to the original end user (purchaser) that this product is free from any defects in material or workmanship for a specific period (the Warranty Period) from the date of purchase. The Warranty Period varies by region. Check with your vendor and/or the authorized Zyxel local distributor for details about the Warranty Period of this product. During the warranty period, and upon proof of purchase, should the product have indications of failure due to faulty workmanship and/or materials, Zyxel will, at its discretion, repair or replace the defective products or components without charge for either parts or labor, and to whatever extent it shall deem necessary to restore the product or components to proper operating condition. Any replacement will consist of a new or re-manufactured functionally equivalent product of equal or higher value, and will be solely at the discretion of Zyxel. This warranty shall not apply if the product has been modified, misused, tampered with, damaged by an act of God, or subjected to abnormal working conditions.

### Note

Repair or replacement, as provided under this warranty, is the exclusive remedy of the purchaser. This warranty is in lieu of all other warranties, express or implied, including any implied warranty of merchantability or fitness for a particular use or purpose. Zyxel shall in no event be held liable for indirect or consequential damages of any kind to the purchaser.

To obtain the services of this warranty, contact your vendor.

## Enquiries

Go to <https://www.zyxel.com/service-provider/global/en/download-enquiry> to request a User's Guide for configuration assistance and related safety warnings.

**Download enquiry**

Please use this enquiry form if you are an Internet service provider (ISP) or system integrator. We will respond shortly after your submission.

First name \*      Last name \*

Email \*      Phone \*

Job title      Company \*

Country \*  
- Select your country -      Model \*

Select the materials you need

☐ Dataset

☐ Quick start guide

☐ Users Guide

Message

☐ I have read the Privacy Policy \*  
[Information here.](#)

☐ Sign up for exclusive networking insights, news, and special offers.

Submit

## Open Source Licenses

This product may contain in part some free software distributed under GPL license terms and/or GPL-like licenses.

To request the source code covered under these licenses, please go to: <https://service-providers.zyxel.com/global/en/gpl-oss-software-notice>.

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