

User's Guide

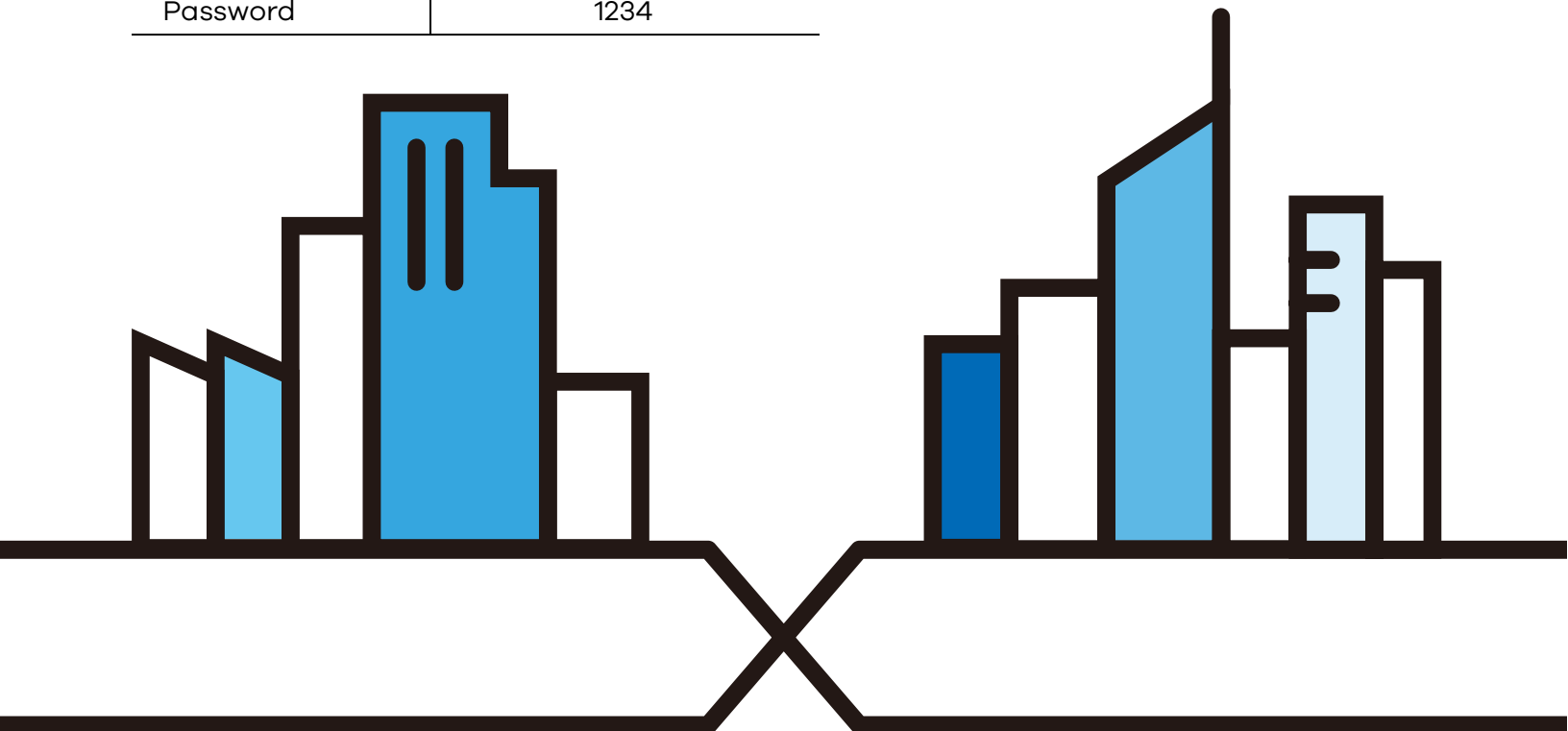
XS3800-28

28-port 10GbE L3 Managed Switch

Default Login Details

Out-of-Band MGMT Port	http://192.168.0.1
In-Band Ports	http://DHCP-assigned IP or http://192.168.1.1
User Name	admin
Password	1234

Version 4.70 Edition 1, 10/2020



IMPORTANT!

READ CAREFULLY BEFORE USE.

KEEP THIS GUIDE FOR FUTURE REFERENCE.

Screenshots and graphics in this book may differ slightly from your product due to differences in your product firmware or your computer operating system. Every effort has been made to ensure that the information in this manual is accurate.

Related Documentation

- CLI Reference Guide

This guide explains how to use the Command-Line Interface (CLI) to configure the Switch.

Note: It is recommended you use the Web Configurator to configure the Switch.

- Web Configurator Online Help

Click the help icon in any screen for help in configuring that screen and supplementary information.

- More Information

Go to **<https://businessforum.zyxel.com>** for product discussions.

Go to **support.zyxel.com** to find other information on the Switch.



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 device.

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

Syntax Conventions

- All models may be referred to as the "Switch" in this guide.
- 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, **Basic Setting > IP Setup > IP Configuration > Network Proxy Configuration** means you first click **Basic Setting** in the navigation panel, then the **IP Setup** sub menu, then **IP Configuration** and finally **Network Proxy Configuration** to get to that screen.

Icons Used in Figures

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

Switch 	Generic Router 	Wireless Router / Access Point 
Generic Switch 	Smart TV 	Desktop 
Laptop 	IP Camera 	Printer 
Server 		

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PART I

User's Guide

CHAPTER 1

Getting to Know Your Switch

1.1 Introduction

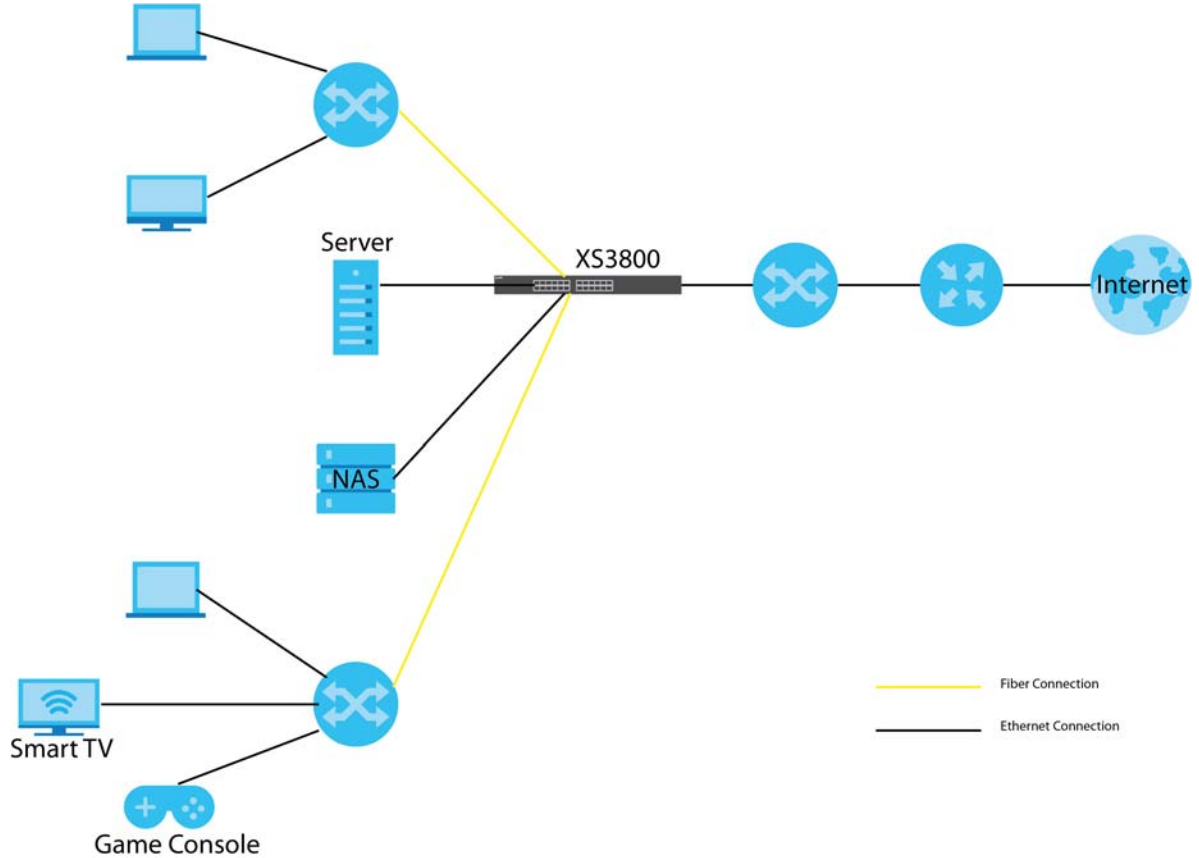
This chapter introduces the main features and applications of the Switch.

Your Switch is a stackable, layer-3, 10 Gigabit Ethernet (GbE) switch supporting Multi-Gigabit. See [Section 1.1.1 on page 26](#) for more information about Multi-Gigabit. The Switch comes with two power slots for dual AC power supply modules.

You could use 10 Gigabit SFP+ slots for fiber connections to the backbone switches, and you could use the 10 Gbps Ethernet ports for connections to other Ethernet devices requiring high-bandwidth, such as network-attached storage (NAS), game consoles, servers, and so on.

The last four combo ports can also be used for stacking. When working in stacking mode, the Switch can operate together with other Switches of the same model and firmware version and allows you to remotely manage them from one switch using one single IP address.

The Switch performs full layer-2 switching features and basic layer-3 routing features, such as static route, and IGMP.

Figure 1 Switch Application

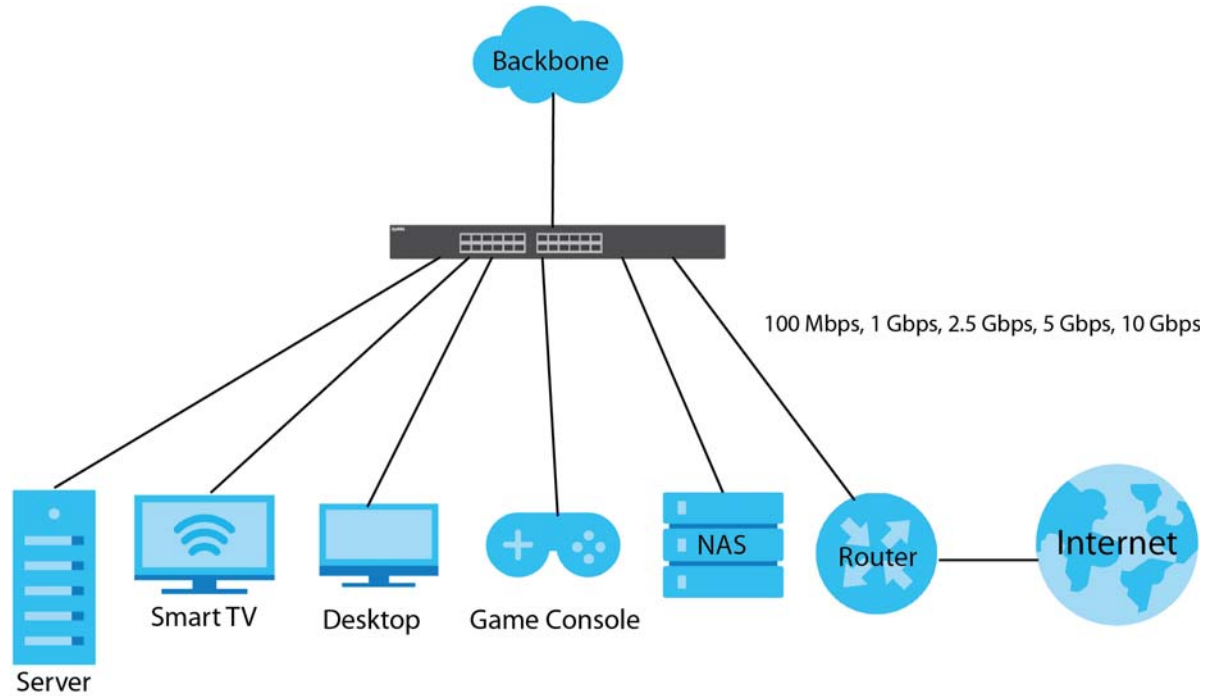
1.1.1 Multi-Gigabit

A 10 Gigabit port supports speeds of 10 Gbps if the connected device supports 10 Gbps and a Cat 6a (up to 100 m) or Cat 6 cable (up to 50 m) is used. The speed drops to 1G if these criteria are not met; it drops to 100 Mbps if a Cat 5 cable is used (up to 100 m).

If a network device such as a 5G network card, gaming computer, server, Network Attached Storage (NAS) or Access Point (AP) only supports 2.5 Gigabit or 5 Gigabit connectivity, then the maximum speed potential of these devices is never reached.

In addition, at the time of writing, most existing cabling is Cat 5e or Cat 6, further limiting maximum speed or distance potential.

Multi-Gigabit (IEEE 802.3bz) solves these problems by additionally supporting 2.5 Gigabit and 5 Gigabit Ethernet connections over Cat 5e and higher Ethernet cables. Multi-Gigabit ports are also backward compatible with 100 Mbps and 1 Gigabit ports.

Figure 2 Multi-Gigabit Application

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

Table 1 Cable Types

CABLE	TRANSMISSION SPEED	MAXIMUM DISTANCE	BANDWIDTH CAPACITY
Category 5	100 Mbps	100 m	100 MHz
Category 5e	1 Gbps/2.5 Gbps/5Gbps	100 m	100 MHz
Category 6	5 Gbps/10 Gbps	50 m	250 MHz
Category 6a	10 Gbps	100 m	500 MHz
Category 7	10 Gbps	100 m	650 MHz

Note: Make sure to select the correct speed for the port in **Basic Setting > Port Setup**.

1.1.2 Stacking Mode

The Switch can work in stacking mode and directly connect to other switches. The switches then operate together and act as a single switch or a virtual chassis. The stackable switches can be managed from a master switch in the stack.

Note: To set the Switch to stacking mode, go to the **Basic Setting > Stacking > Configuration** screen.

Note: When the Switch is in stacking mode, it uses the default static IP address 192.168.1.1.

Figure 3 Stacking Example

1.1.3 Management Method

With its built-in Web Configurator, managing and configuring the Switch is easy. In addition, the Switch can also be managed via Telnet, any terminal emulator program using the Command Line Interface (CLI), or third-party SNMP management.

1.1.4 Management Modes

NebulaFlex for 'hybrid mode' means you can set the Switch to operate in only one of either direct standalone or cloud mode (not both at the same time). The Nebula Control Center (NCC) is an alternative cloud-based network management system that allows you to remotely manage and monitor the Switch in cloud mode.

Note: Hybrid mode and NCC registration are reserved for future use.

Use the Web Configurator to configure and manage the Switch directly in standalone mode or use Nebula Control Center (NCC) to configure and manage the Switch in cloud mode. You may also access a minimized version of the Web Configurator in cloud mode.

1.1.5 Mode Changing

This section describes how to change the Switch's management mode.

Note: Hybrid mode and NCC registration are reserved for future use.

Note: If you change the Switch's management mode from standalone mode to Nebula-managed mode, the configuration settings of the Switch will be overwritten with what you have configured in Nebula.

Note: If you change the Switch's management mode from Nebula-managed mode to standalone mode, the Switch will reset to its factory-default settings.

From Standalone to Nebula Cloud Management

To manage your Switch via Nebula, connect the Switch to the Internet, and register it to a site and organization at the Nebula web portal (<https://nebula.zyxel.com>).

See the following steps or the Switch Quick Start Guide for how to do device registration.

Go to the NCC to Register the Switch

- 1 Go to the Nebula web portal in one of three ways.

- Type <https://nebula.zyxel.com> in a supported web browser. See the Nebula User's Guide for more information about supported browsers.
 - Click **Visit Nebula** in the Switch's login page.
 - Click the **Nebula** icon in the upper right corner of the Switch's Web Configurator.
- 2 Click **Login** in the Nebula web portal. Enter your myZykel account information. You will be redirected to another screen where you can sign up for a myZykel account if you do not have one.
 - 3 Create an organization and a site or select an existing site using the Nebula setup wizard.
 - 4 Register the Switch by entering its MAC address and serial number and assign it to the site. The serial number and MAC address can be found in the **Status** screen or the device back label on the Switch.

Use the Zyxel Nebula Mobile App to Register the Switch

- 1 Download and open the Zyxel Nebula Mobile app in your mobile device. Click **Sign Up** to create a myZykel account or enter your existing account information to log in.
- 2 Create an organization and site, or select an existing site using the Zyxel Nebula Mobile app.
- 3 Select a site and scan the Switch's QR code to add it to the site. You can find the QR code:
 - On a label on the Switch or
 - On its box or
 - In the Web Configurator at **Basic > Cloud Management > Nebula Switch Registration**.

See [Section 3.3 on page 45](#) for more information about the **CLOUD** LED or [Section 7.2 on page 81](#) for more information about the **Hybrid Mode** field in the **Status** screen to see if the Switch goes into Nebula cloud management mode successfully.

Note: The Switch goes into Nebula-managed mode automatically after it can access the Nebula web portal and is successfully registered there. Its login password and settings are then overwritten with what you have configured in the Nebula web portal.

From Nebula-managed to Standalone

To return to direct management standalone mode, just remove (unregister) the Switch from the organization or site in the Nebula web portal. The Switch will reboot and restore the factory default settings.

1.1.6 ZON Utility

With its built-in Web Configurator, including the Neighbor Management feature ([Section 7.2.1 on page 83](#)), viewing, managing and configuring the Switch and its neighboring devices is simplified.

In addition, Zyxel offers a proprietary software program called Zyxel One Network (ZON) Utility, it is a utility tool that assists you to set up and maintain network devices in a more simple and efficient way. You can download the ZON Utility at www.zyxel.com and install it on a PC (Windows operation system). For more information on ZON Utility see [Section 4.3 on page 51](#).

The following table shows which firmware version supports ZON and Neighbor Management (Smart Connect) for each Switch. The firmware on each Switch is identified by the firmware trunk version, followed by a unique model code and release number in brackets. For example, 4.70(ABML.0) is a

firmware version for the Switch where 4.70 is the firmware trunk version, ABML identifies the Switch and .0 is the first release of trunk version 4.70.

Table 2 Models and Firmware Version

SWITCH MODEL	FIRMWARE VERSION
XS3800-28	4.70(ABML.0) and later

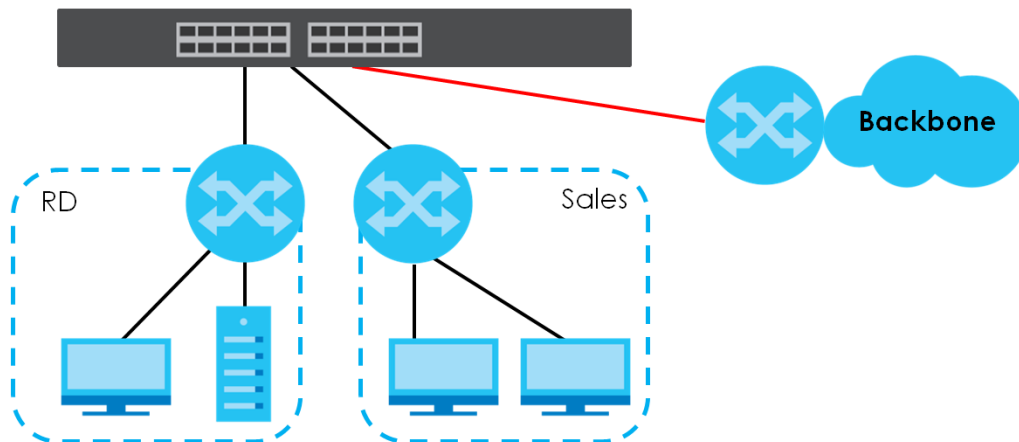
1.2 Example Applications

This section shows a few examples of using the Switch in various network environments. Note that the Switch in the figure is just an example Switch and not your actual Switch.

1.2.1 Bridging Example

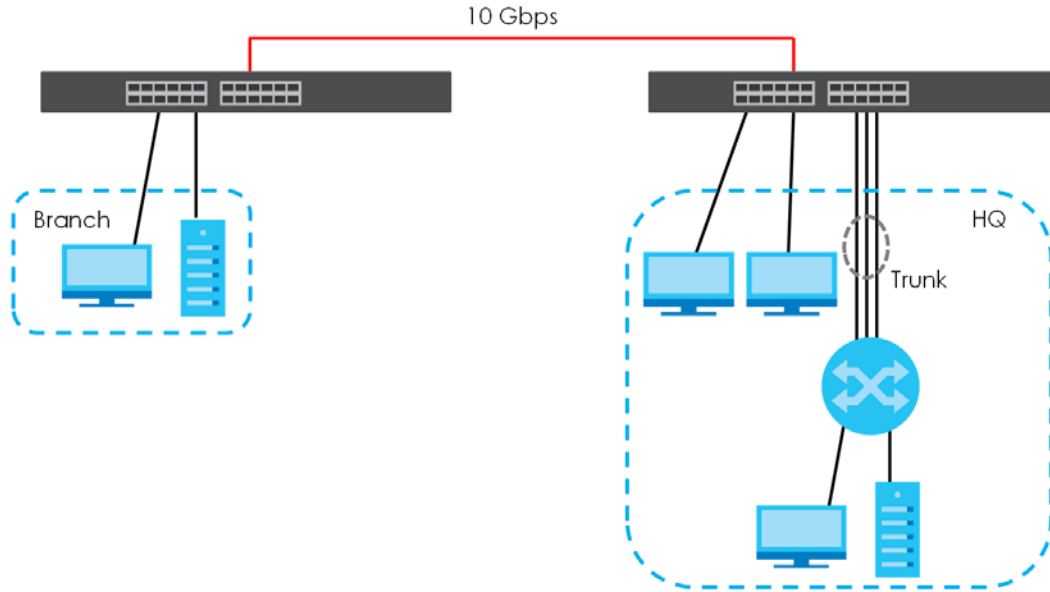
In this example, the Switch connects different company departments (**RD** and **Sales**) to the corporate backbone. It can alleviate bandwidth contention and eliminate server and network bottlenecks. All users that need high bandwidth can connect to high-speed department servers via the Switch. You can provide a super-fast uplink connection by using a Gigabit Ethernet or SFP port on the Switch.

Figure 4 Bridging Application



1.2.2 High Performance Switching Example

The Switch is ideal for connecting two geographically dispersed networks that need high bandwidth. In the following example, a company uses the 10 Gigabit uplink ports to connect the headquarters to a branch office network. Within the headquarters network, a company can use trunking to group several physical ports into one logical higher-capacity link. Trunking can be used if for example, it is cheaper to use multiple lower-speed links than to under-utilize a high-speed, but more costly, single-port link.

Figure 5 High Performance Switching

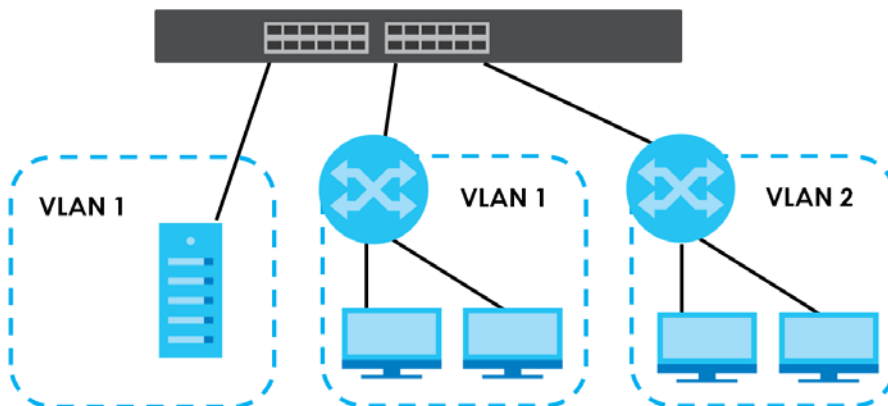
1.2.3 IEEE 802.1Q VLAN Application Examples

A VLAN (Virtual Local Area Network) allows a physical network to be partitioned into multiple logical networks. Stations on a logical network belong to one or more groups. With VLAN, a station cannot directly talk to or hear from stations that are not in the same groups unless such traffic first goes through a router.

1.2.3.1 Tag-based VLAN Example

Ports in the same VLAN group share the same frame broadcast domain thus increase network performance through reduced broadcast traffic. VLAN groups can be modified at any time by adding, moving or changing ports without any re-cabling.

Shared resources such as a server can be used by all ports in the same VLAN as the server. In the following figure only ports that need access to the server need to be part of VLAN 1. Ports can belong to other VLAN groups too.

Figure 6 Shared Server Using VLAN Example

1.2.4 IPv6 Support

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 3.4×10^{38} IP addresses. At the time of writing, the Switch supports the following features.

- Static address assignment
- Neighbor Discovery Protocol (a protocol used to discover other IPv6 devices in a network)
- Remote Management using ping, SNMP, SSH, telnet, HTTP and FTP services
- ICMPv6 to report errors encountered in packet processing and perform diagnostic functions, such as "ping"
- IPv4/IPv6 dual stack; the Switch can run IPv4 and IPv6 at the same time
- DHCPv6 client and relay
- Multicast Listener Discovery (MLD) snooping and proxy

For more information on IPv6, refer to [Appendix C on page 622](#) and the CLI Reference Guide.

1.3 Ways to Manage the Switch

Use any of the following methods to manage the Switch.

- NCC (Zyxel Nebula Control Center). With the NCC, you can remotely manage and monitor the Switch through a cloud-based network management system. See [Section 8.12 on page 129](#) or the NCC User's Guide for detailed information about how to access the NCC and manage your Switch via the NCC. See the NCC User's Guide for how to configure Nebula managed devices.
- Web Configurator. This is recommended for everyday management of the Switch using a (supported) web browser. See [Chapter 4 on page 48](#).
- Command Line Interface. Line commands offer an alternative to the Web Configurator and in some cases are necessary to configure advanced features. See the CLI Reference Guide.
- FTP. Use File Transfer Protocol for firmware upgrades and configuration backup or restore. See [Section 58.9.1 on page 538](#).
- SNMP. The Switch can be monitored and/or managed by an SNMP manager. See [Section 59.7.1 on page 552](#).
- Cluster Management. Cluster Management allows you to manage multiple switches through one switch, called the cluster manager. See [Chapter 63 on page 574](#).
- ZON Utility. ZON Utility is a program designed to help you deploy and perform initial setup on a network more efficiently. See [Section 4.3 on page 51](#).

1.4 Good Habits for Managing the Switch

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

- Change the password. Use a password that is not easy to guess and that consists of different types of characters, such as numbers and letters.
- Write down the password and put it in a safe place.

- Back up the configuration (and make sure you know how to restore it). 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 Switch to its factory default settings. If you backed up an earlier configuration file, you would not have to totally re-configure the Switch. You could simply restore your last configuration.

CHAPTER 2

Hardware Installation and Connection

This chapter shows you how to install and connect the Switch.

2.1 Safety Precautions

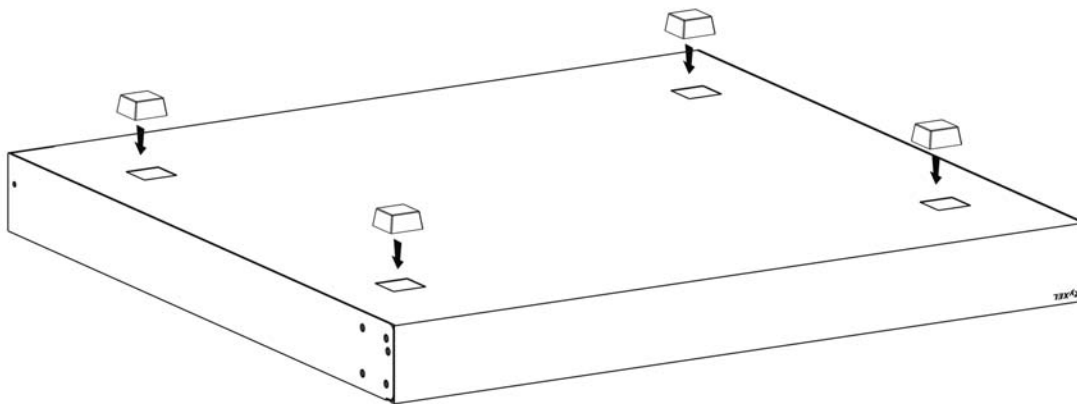
Please observe the following before using the Switch:

- It is recommended to ask an authorized technician to attach the Switch on a desk or to the rack or wall. Use the proper screws to prevent damage to the Switch. See the **Installation Requirements** sections in this chapter to know the types of screws and screwdrivers for each mounting method.
- Make sure there is at least 2 cm of clearance on the top and bottom of the Switch, and at least 5 cm of clearance on all four sides of the Switch. This allows air circulation for cooling.
- Do NOT block the ventilation holes nor store cables or power cords on the Switch. Allow clearance for the ventilation holes to prevent your Switch from overheating. This is especially crucial when your Switch does not have fans. Overheating could affect the performance of your Switch, or even damage it.
- The surface of the Switch could be hot when it is functioning. Do NOT put your hands on it. You may get burned. This could happen especially when you are using a fanless Switch.
- The Switches with fans are not suitable for use in locations where children are likely to be present.

To start using the Switch, simply connect the power cables and turn it on.

2.2 Freestanding Installation Procedure

- 1 Make sure the Switch is clean and dry.
- 2 Remove the adhesive backing from the rubber feet.
- 3 Attach the rubber feet to each corner on the bottom of the Switch. These rubber feet help protect the Switch from shock or vibration and ensure space between devices when stacking.

Figure 7 Attaching Rubber Feet

- 4 Set the Switch on a smooth, level surface strong enough to support the weight of the Switch and the connected cables. Make sure there is a power outlet nearby.

Cautions:

- Avoid stacking fanless Switches to prevent overheating.
- Ensure enough clearance around the Switch to allow air circulation for cooling.
- Do NOT remove the rubber feet as it provides space for air circulation.

2.3 Mounting the Switch on a Rack

The Switch can be mounted on an EIA standard size, 19-inch rack or in a wiring closet with other equipment. Follow the steps below to mount your Switch on a standard EIA rack using a rack-mounting kit.

Note: Make sure there is enough clearance between each equipment on the rack for air circulation.

2.3.1 Installation Requirements

- Two mounting brackets.
- Eight M3 flat head screws and a #2 Philips screwdriver.
- Four M5 flat head screws and a #2 Philips screwdriver.

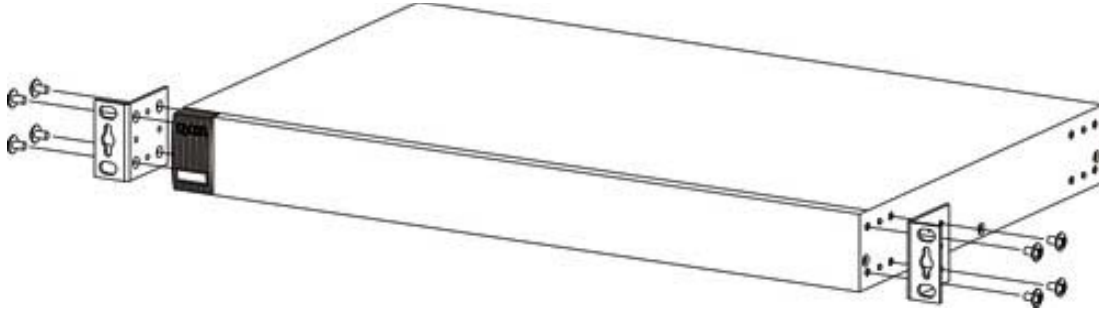
2.3.2 Precautions

- Make sure the rack will safely support the combined weight of all the equipment it contains. The maximum weight a bracket can hold is 21.5 kg.
- Make sure the position of the Switch does not make the rack unstable or top-heavy. Take all necessary precautions to anchor the rack securely before installing the unit.

2.3.3 Attaching the Mounting Brackets to the Switch

- 1 Position a mounting bracket on one side of the Switch, lining up the four screw holes on the bracket with the screw holes on the side of the Switch.

Figure 8 Attaching the Mounting Brackets

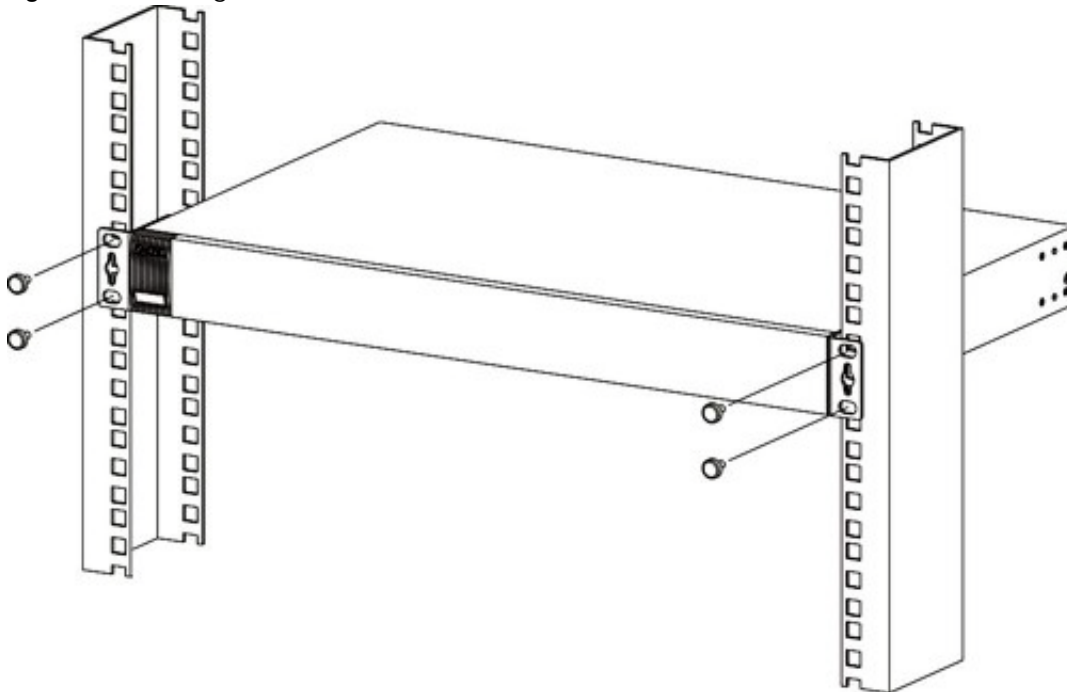


- 2 Using a #2 Philips screwdriver, install the M3 flat head screws through the mounting bracket holes into the Switch.
- 3 Repeat steps 1 and 2 to install the second mounting bracket on the other side of the Switch.
- 4 You may now mount the Switch on a rack. Proceed to the next section.

2.3.4 Mounting the Switch on a Rack

- 1 Position a mounting bracket (that is already attached to the Switch) on one side of the rack, lining up the two screw holes on the bracket with the screw holes on the side of the rack.

Figure 9 Mounting the Switch on a Rack



- 2** Using a #2 Philips screwdriver, install the M5 flat head screws through the mounting bracket holes into the rack.

Note: Make sure you tighten all the four screws to prevent the Switch from getting slanted.

- 3** Repeat steps [1](#) and [2](#) to attach the second mounting bracket on the other side of the rack.

CHAPTER 3

Hardware Panels

This chapter describes the front panel and rear panel of the Switch and shows you how to make the hardware connections.

3.1 Front Panel Connections

The Switch supports 16 SFP+ slots and four 10 Gigabit Ethernet ports. The Switch also comes with eight dual personality interfaces of 10 Gigabit. A dual personality interface includes one Gigabit port and one slot for a SFP+ module with one port active at a time.

Ethernet ports support Multi-Gigabit (100 Mbps, 1 Gbps, 2.5 Gbps, 5 Gbps, and 10 Gbps).

The figure below shows the front panel of the Switch.

Figure 10 Front Panel: XS3800-28



The following table describes the ports.

Table 3 Panel Connections

CONNECTOR	DESCRIPTION
16 10 GbE SFP+ Slots	Use SFP+ transceivers in these ports for high-bandwidth backbone connections. You can also insert an SFP+ Direct Attach Copper (DAC) in the SFP+ slot.
4 100 Mbps, 1 Gbps, 2.5 Gbps, 5 Gbps, and 10 Gbps RJ-45 Ethernet Ports	These are 10GBase-T auto-negotiating and auto-crossover Ethernet ports. Connect these ports to a computer, a hub, a router, or an Ethernet switch.
8 10 GbE Combo Ports (Dual Personality Interfaces)	Each interface has one 10GBase-T copper RJ-45 port and one SFP slot, with one port active at a time.
	8 10GBase-T Ports: Connect these ports to a computer, an Ethernet switch or router.
	8 SFP+ Slots: Use Small Form-Factor Pluggable (SFP) transceivers in these ports for fiber-optic connections to an Ethernet switch or router.
RJ-45 out-of-band Management Port	Connect to a computer using an RJ-45 Ethernet cable for local configuration of the Switch.
Console Port	Only connect this port to your computer (using an RS-232 cable) if you want to configure the Switch using the command line interface (CLI) via the console port.

Table 3 Panel Connections (continued)

CONNECTOR	DESCRIPTION
RESET	Press the RESET button to reboot the Switch without turning the power off.
RESTORE	Press the RESTORE button for 3 to 6 seconds to have the Switch automatically reboot and restore the last-saved custom default file. Press the RESTORE button for more than 7 seconds to have the Switch automatically reboot and restore the factory default file.

3.1.1 Ethernet Ports

The Switch has 10GBase-T auto-negotiating, auto-crossover Ethernet ports. In Multi-Gigabit Ethernet, the speed can be 100 Mbps, 1 Gbps, 2.5 Gbps, 5 Gbps, or 10 Gbps. The duplex mode can be full duplex at 100 Mbps and full duplex only at 1000 Mbps.

An auto-negotiating port can detect and adjust to the optimum Ethernet speed (10/100/1000 Mbps) and full duplex mode of the connected device.

An auto-negotiating port can detect and adjust to the optimum Ethernet speed (100 Mbps, 1 Gbps, 2.5 Gbps, 5 Gbps, and 10 Gbps) and full duplex mode of the connected device.

An auto-crossover (auto-MDI/MDI-X) port automatically works with a straight-through or crossover Ethernet cable.

When auto-negotiation is turned on, an Ethernet port negotiates with the peer automatically to determine the connection speed and duplex mode. If the peer Ethernet port does not support auto-negotiation or turns off this feature, the Switch determines the connection speed by detecting the signal on the cable and using half duplex mode. When the Switch's auto-negotiation is turned off, an Ethernet port uses the pre-configured speed and duplex mode when making a connection, thus requiring you to make sure that the settings of the peer Ethernet port are the same in order to connect.

3.1.1.1 Default Ethernet Negotiation Settings

The factory default negotiation settings for the Ethernet ports on the Switch are:

- Speed: Auto
- Duplex: Auto
- Flow control: Off
- Dual Personality Interface: Fiber module first

3.1.2 SFP/SFP+ Slots

The transceiver slots are for Small Form-Factor Pluggable (SFP), SFP+ transceivers or DAC (Direct Attach Cables) cable. The SFP+ (SFP Plus) and the DAC cable are enhanced versions of the SFP and support data rates of up to 10 Gbps. A transceiver is a single unit that houses a transmitter and a receiver. Use a transceiver or a DAC cable to connect a fiber cable to the Switch. The Switch does not come with transceivers nor DAC cables. You must use transceivers or DAC cables that comply with the Small Form-factor Pluggable (SFP) Transceiver MultiSource Agreement (MSA). See the SFF committee's INF-8074i specification Rev 1.0 for details.

You can change transceivers or the DAC cables while the Switch is operating. You can use different transceivers to connect to Ethernet switches with different types of fiber connectors.

- Type: SFP connection interface
- Connection speed: 1 or 10 Gigabit per second (Gbps)
- Type: SFP+/DAC connection interface

WARNING! To avoid possible eye injury, do not look into an operating fiber module's connectors.

HANDLING! All transceivers are static sensitive. To prevent damage from electrostatic discharge (ESD), it is recommended you attach an ESD preventive wrist strap to your wrist and to a bare metal surface when you install or remove a transceiver.

STORAGE! All modules are dust sensitive. When not in use, always keep the dust plug on. Avoid getting dust and other contaminant into the optical bores, as the optics do not work correctly when obstructed with dust.

3.1.2.1 Transceiver Installation

Use the following steps to install a 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 Switch 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 cables and the transceiver. Insert the fiber cable into the transceiver.

Figure 11 Latch in the Lock Position

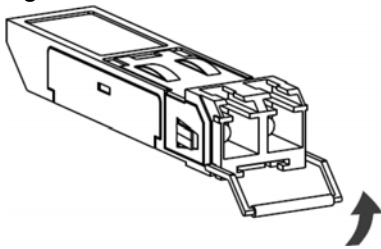


Figure 12 Transceiver Installation Example

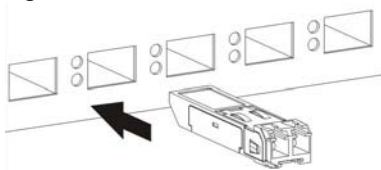
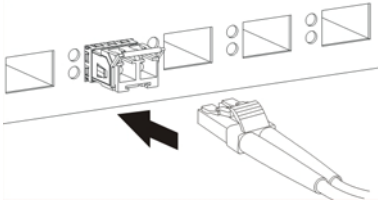


Figure 13 Connecting the Fiber Cables

3.1.2.2 Transceiver Removal

Use the following steps to remove an SFP transceiver.

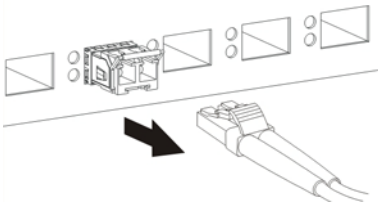
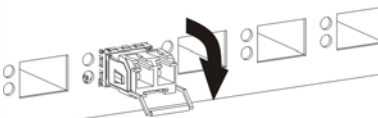
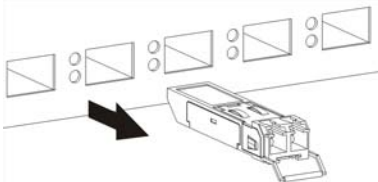
- 1 Attach an ESD preventive wrist strap to your wrist and to a bare metal surface on the chassis.
- 2 Remove the fiber cables from the transceiver.
- 3 Pull out the latch and down to unlock the transceiver (latch styles vary).

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 Switch and transceiver.

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

Figure 14 Removing the Fiber Cables**Figure 15** Opening the Transceiver's Latch Example**Figure 16** Transceiver Removal Example

3.1.3 Dual Personality Interfaces

A combo port is for uplink connections. It consists of a 10 Gigabit Ethernet port for Ethernet connection, and a SFP+ transceiver slot for fiber connection. The fiber connection takes priority if the corresponding Gigabit port is also connected.

- 100 Mbps/1 Gbps/2.5 Gbps/5 Gbps/10 Gbps – Connect these ports to high-bandwidth backbone network Ethernet switches using Category 5e/6/6a/7 copper cables.
- Transceiver Slots – Use SFP/SFP+ transceivers in these slots for connections to backbone Ethernet switches.

Figure 17 Combo Port Example: 10 Gigabit Port and SFP+ Transceiver Slot



3.1.4 Management Port

The 1000Base-T Ethernet **MGMT** (management) port is used for local management. Connect directly to this port using an Ethernet cable. You can configure the Switch via Telnet or the Web Configurator.

The default IP address of the management port is 192.168.0.1 with a subnet mask of 255.255.255.0.

3.1.5 Console Port

This console port is for troubleshooting only. With instructions from customer support, connect the male 9-pin end of the RS-232 console cable to the console port of the Switch. Connect the female end to a serial port (COM1, COM2 or other COM port) of your computer. You can use a computer with terminal emulation software configured to the following parameters:

- VT100 terminal emulation
- 115200 bps
- No parity, 8 data bits, 1 stop bit
- No flow control

3.2 Rear Panel

The following figures show the rear panels of the Switch. The rear panels contain:

- Two AC power receptacles (**A** and **B**)

Figure 18 Rear Panel: XS3800-28



3.2.1 Grounding

Grounding is a safety measure to direct excess electric charge to the ground. It prevents damage to the Switch, and protects you from electrocution. Use the grounding screw on the rear panel and the ground wire of the AC power supply to ground the Switch.

The grounding terminal and AC power ground where you install the Switch must follow your country's regulations. Qualified service personnel must ensure the building's protective earthing terminals are valid terminals.

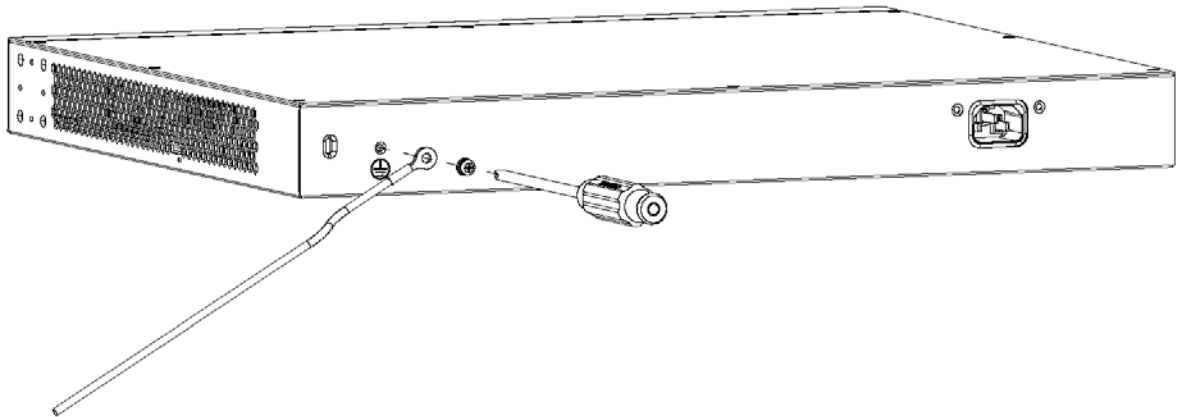
Installation of Ethernet cables must be separate from AC power lines. To avoid electric surge and electromagnetic interference, use a different electrical conduit or raceway (tube/trough or enclosed conduit for protecting electric wiring) that is 15 cm apart, or as specified by your country's electrical regulations.

Any device that is located outdoors and connected to this product must be properly grounded and surge protected. To the extent permissible by your country's applicable law, failure to follow these guidelines could result in damage to your Switch which may not be covered by its warranty.

Note: The specification for surge or ESD protection assumes that the Switch is properly grounded.

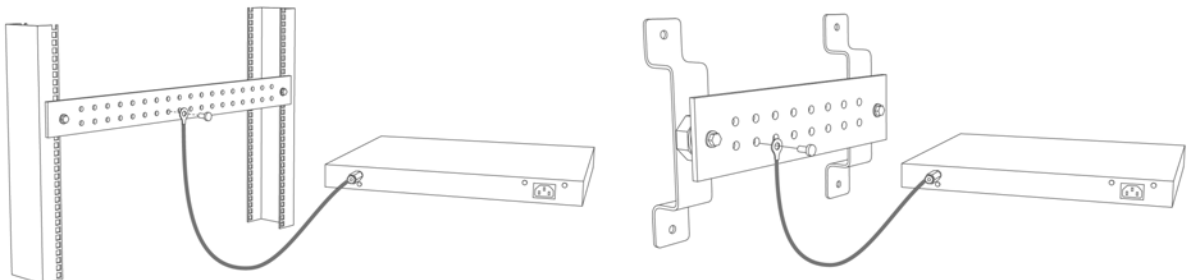
- 1 Remove the M4 ground screw from the Switch's rear panel.
- 2 Secure a green or yellow ground cable (16 AWG or smaller) to the Switch's rear panel using the M4 ground screw.

Figure 19 Grounding



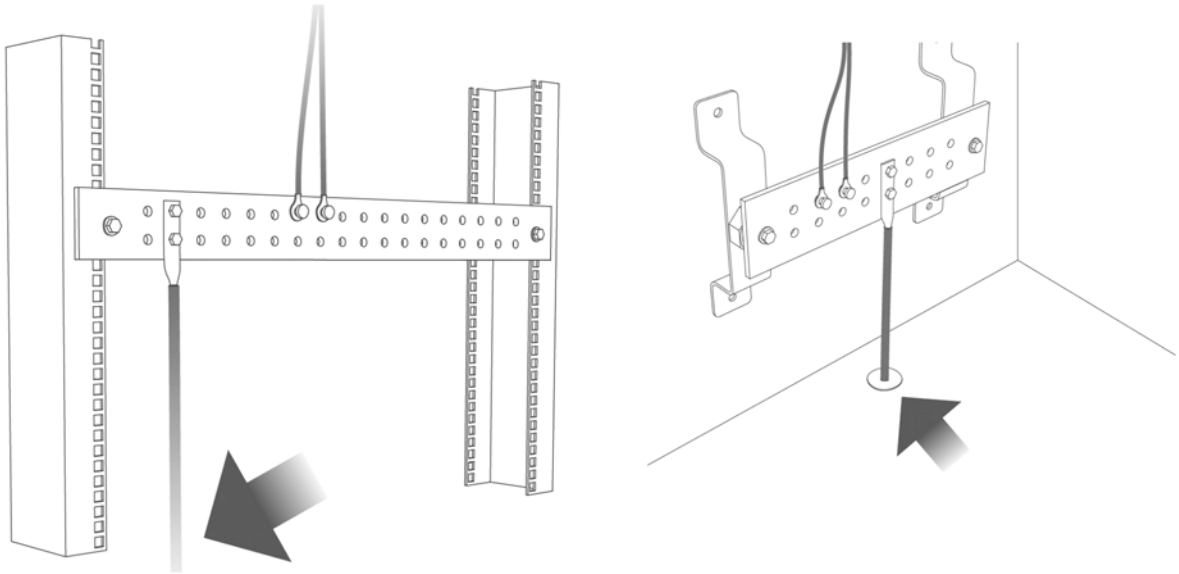
- 3 Attach the other end of the ground cable to a grounding bar located on the rack where you install the Switch or to an on-site grounding terminal.

Figure 20 Attach Ground Cable to Grounding Bar or On-site Grounding Terminal



- 4 The grounding terminal of the server rack or on-site grounding terminal must also be grounded and connected to the building's main grounding electrode. Make sure the grounding terminal is connected to the buildings grounding electrode and has an earth resistance of less than 10 ohms, or according to your country's electrical regulations.

Figure 21 Connecting to the Building's Main Grounding Electrode



If you are uncertain that suitable grounding is available, contact the appropriate electrical inspection authority or an electrician.

This device must be grounded. Do this before you make other connections.

3.2.2 AC Power Connection

Note: Make sure you are using the correct power source as shown on the panel and that no objects obstruct the airflow of the fans (located on the side of the unit).

The Switch uses two power supply modules, one of which is redundant, so if one power module fails the system can operate on the remaining module.

Connecting the Power

Use the following procedures to connect the Switch to a power source after you have installed it in a rack.

Note: Use the included power cord for the AC power connection.

- 1 Connect the female end of the power cord to the AC power socket.
- 2 Connect the other end of the cord to a power outlet.

Disconnecting the Power

The power input connectors can be disconnected from the power source individually.

- 1 Disconnect the power cord from the power outlet.
- 2 Disconnect the power cord from the AC power socket.

3.3 LEDs

The following table describes the LEDs.

Table 4 LEDs

LED	COLOR	STATUS	DESCRIPTION
PWR1	Green	On	The Switch is receiving power from the power module in the first power slot.
		Blinking	The Switch is returning to the last-saved custom default configuration settings.
	Amber	On	The Switch is returning to its factory default configuration settings.
		Blinking	The PWR1 LED will blink in amber in the following situations: - The Switch detected a power supply failure with the power cable connected to the Switch and a power source. - The fans are not functioning at a proper speed or malfunctioning.
		Off	The Switch is not receiving power from the power module in the first power slot.
PWR2	Green	On	The Switch is receiving power from the power module in the second power slot.
		Blinking	The Switch is returning to the last-saved custom default configuration settings.
	Amber	On	The Switch is returning to its factory default configuration settings.
		Blinking	The PWR2 LED will blink in amber in the following situations: - The Switch detected a power supply failure with the power cable connected to the Switch and a power source. - The fans are not functioning at a proper speed or malfunctioning.
		Off	The Switch is not receiving power from the power module in the second power slot.
SYS (System)	Green	On	The Switch is on and functioning properly.
		Blinking	The Switch is rebooting and performing self-diagnostic tests.
	Red	On	The Switch is functioning abnormally.
		Off	The power is off or the system is not ready or malfunctioning.

Table 4 LEDs (continued)

LED	COLOR	STATUS	DESCRIPTION
CLOUD	Green	On	The Switch has successfully connected to the NCC (Nebula Control Center).
		Blinking	The Switch cannot connect to the NCC because it is not registered.
	Amber	On	The Switch is registered at the NCC but cannot connect to the NCC. Please check the Internet connection of the Switch.
		Blinking	The Switch is not registered at the NCC and cannot connect to the NCC. Please check the Internet connection of the Switch and register the Switch at NCC.
		Off	The Switch is operating in standalone mode. Nebula Control Center Discovery is disabled in Basic > Cloud Management > Nebula Control Center Discovery in the Switch Web Configurator.
	Note: Hybrid mode and NCC registration are reserved for future use.		
LOCATOR	Blue	On	The Switch is uploading firmware. While the Switch is doing this, do not turn off the power.
		Blinking	Shows the actual location of the Switch between several devices in a rack. The default timer is 30 minutes when you are configuring the Switch.
		Off	The locator is not functioning or malfunctioning.
MAST (Master)	Green	On	The Switch is acting as a standalone switch or the master in stacking.
		Off	The Switch is acting as a non-master member in a stack or it is in standalone mode.
	Amber	On	There is an error occurred when the Switch is selected as the master member in a stack.
Ethernet Ports			
17 – 28	Green	On	The port has a successful 100 Mbps/1 Gbps/2.5 Gbps/5 Gbps connection.
		Blinking	The port is receiving or transmitting data at 100 Mbps/1 Gbps/2.5 Gbps/5 Gbps.
	Blue	On	The port has a successful 10 Gbps connection.
		Blinking	The port is receiving or transmitting data at 10 Gbps.
		Off	This link is disconnected or the port is disabled.
SFP+ Slots			
1 – 16; 21 – 28	Green	On	The port has a successful 1000 Mbps connection.
		Blinking	The port is receiving or transmitting data at 1000 Mbps.
	Blue	On	The port has a successful 10 Gbps connection.
		Blinking	The port is receiving or transmitting data 10 Gbps.
		Off	This link is disconnected.
MGMT (Management)	Green (Right)	On	The MGMT port is connected at 10/1000 Mbps.
		Blinking	The system is transmitting or receiving to or from an Ethernet device at 10/1000 Mbps through the MGMT port.
	Amber (Left)	On	The MGMT port is connected at 100 Mbps.
		Blinking	The system is transmitting or receiving to or from an Ethernet device at 100 Mbps through the MGMT port.
		Off	The MGMT port is not connected to an Ethernet device, or the port is disabled.
STACK ID			The LED is showing the Stack ID number of the Switch. ID 0 means it is a standalone Switch.

PART II

Technical Reference

CHAPTER 4

Web Configurator

4.1 Overview

This section introduces the configuration and functions of the Web Configurator.

The Web Configurator is an HTML-based management interface that allows easy system setup and management via Internet browser. Use a browser that supports HTML5, such as Microsoft Edge, Internet Explorer 11, Mozilla Firefox, or Google Chrome. The recommended screen resolution is 1024 by 768 pixels.

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

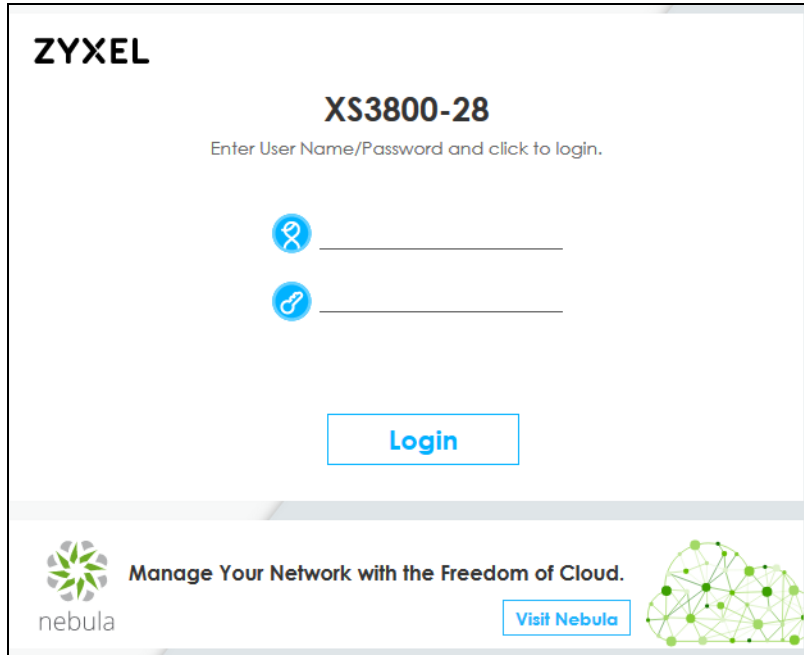
- Web browser pop-up windows from your device.
- JavaScript (enabled by default).
- Java permissions (enabled by default).

4.2 System Login

- 1 Start your web browser.
- 2 The Switch is a DHCP client by default. Type "http://DHCP-assigned IP" in the **Location** or **Address** field. Press [ENTER].

If the Switch is not connected to a DHCP server, type "http://" and the static IP address of the Switch (for example, the default management IP address is 192.168.1.1 through an in-band (non-**MGMT**) port and 192.168.0.1 through the **MGMT** port) in the **Location** or **Address** field. Press [ENTER]. Your computer must be in the same subnet in order to access this website address.

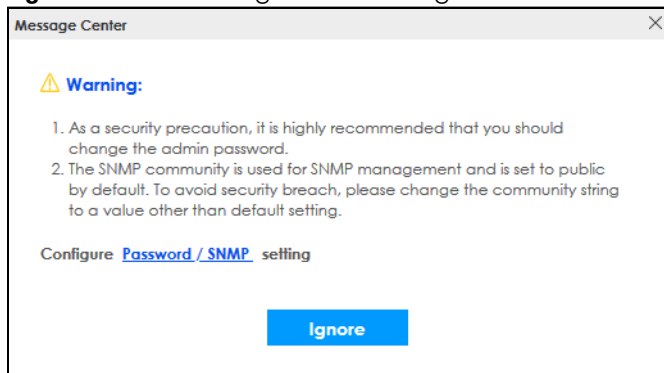
Also, you can use the ZON Utility to check your Switch's IP address. See [Section 4.3 on page 51](#) for more information on the ZON utility.
- 3 The following screen appears.

Figure 22 Web Configurator: Login


The login page for the ZYXEL XS3800-28 device. It features the ZYXEL logo at the top left and the model number XS3800-28 in the center. Below the model number, it says "Enter User Name/Password and click to login." There are two input fields: one for the username (indicated by a person icon) and one for the password (indicated by a key icon). A blue "Login" button is positioned below the password field. At the bottom, there is a banner for "nebulia" with the text "Manage Your Network with the Freedom of Cloud." and a "Visit Nebula" button.

- 4 Click **Login** to log into the Web Configurator to manage the Switch directly. The default user name is **admin** and associated default password is **1234**.
- 5 If you did not change the default administrator password and/or SNMP community values, a warning screen displays each time you log into the Web Configurator. Click **Password / SNMP** to open a screen where you can change the administrator password and SNMP community string simultaneously. Otherwise, click **Ignore** to close it.

Password/SNMP Setting

Figure 23 Web Configurator: Warning


A warning message box titled "Message Center" with a close button (X) in the top right corner. It contains a yellow warning triangle icon followed by the word "Warning:". Below this, there are two numbered points:

1. As a security precaution, it is highly recommended that you should change the admin password.
2. The SNMP community is used for SNMP management and is set to public by default. To avoid security breach, please change the community string to a value other than default setting.

 At the bottom, it says "Configure [Password / SNMP](#) setting" and has a blue "Ignore" button.

Figure 24 Web Configurator: Password

The screenshot shows the 'Password' and 'SNMP' configuration sections of a web configurator. The 'Password' section has three input fields: 'Old Password' (containing four dots), 'New Password', and 'Retype to confirm'. The 'SNMP' section is titled 'General Setting' and includes a 'Version' dropdown menu set to 'v2c', and three text input fields for 'Get Community', 'Set Community', and 'Trap Community', all of which contain the text 'public'. At the bottom of the form are 'Apply' and 'Cancel' buttons.

Change the default administrator and/or SNMP passwords, and then click **Apply** to save your changes.

Table 5 Web Configurator: Password/SNMP

LABEL	DESCRIPTION
Administrator	This is the default administrator account with the "admin" user name. You cannot change the default administrator user name.
Old Password	Type the existing system password (1234 is the default password when shipped).
New Password	Enter your new system password.
Retype to confirm	Retype your new system password for confirmation.
General Setting	Use this section to specify the SNMP version and community (password) values.
Version	Select the SNMP version for the Switch. The SNMP version on the Switch must match the version on the SNMP manager. Choose SNMP version 2c (v2c), SNMP version 3 (v3) or both (v3v2c). Note: SNMP version 2c is backwards compatible with SNMP version 1.
Get Community	Enter the Get Community string, which is the password for the incoming Get- and GetNext-requests from the management station. The Get Community string is only used by SNMP managers using SNMP version 2c or lower.
Set Community	Enter the Set Community string, which is the password for the incoming Set- requests from the management station. The Set Community string is only used by SNMP managers using SNMP version 2c or lower.
Trap Community	Enter the Trap Community string, which is the password sent with each trap to the SNMP manager. The Trap Community string is only used by SNMP managers using SNMP version 2c or lower.
Apply	Click Apply to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to begin configuring this screen afresh.

4.3 Zyxel One Network (ZON) Utility

ZON Utility is a program designed to help you deploy and manage a network more efficiently. It detects devices automatically and allows you to do basic settings on devices in the network without having to be near it.

The ZON Utility issues requests via Zyxel Discovery Protocol (ZDP) and in response to the query, the device responds back with basic information including IP address, firmware version, location, system and model name in the same broadcast domain. The information is then displayed in the ZON Utility screen and you can perform tasks like basic configuration of the devices and batch firmware upgrade in it. You can download the ZON Utility at www.zyxel.com and install it in a computer (Windows operating system).

4.3.1 Requirements

Before installing the ZON Utility in your computer, please make sure it meets the requirements listed below.

Operating System

At the time of writing, the ZON Utility is compatible with:

- Windows 7 (both 32-bit / 64-bit versions)
- Windows 8 (both 32-bit / 64-bit versions)
- Windows 8.1 (both 32-bit / 64-bit versions)
- Windows 10 (both 32-bit / 64-bit versions)

Note: To check for your Windows operating system version, right-click on **My Computer** > **Properties**. You should see this information in the **General** tab.

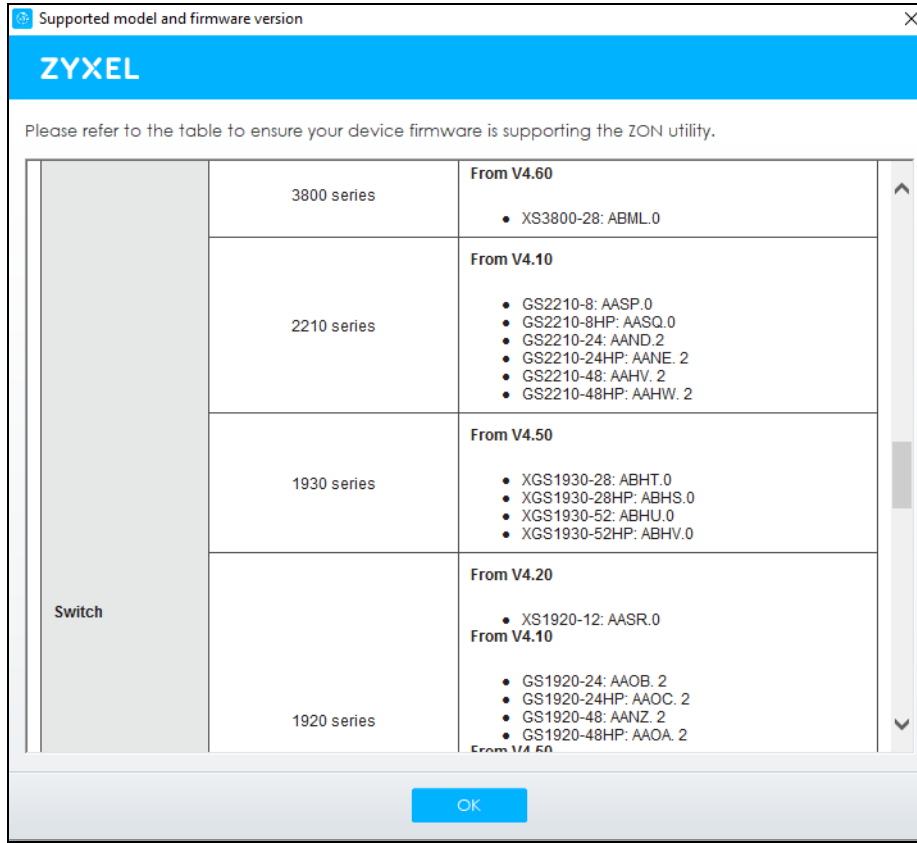
Hardware

Here are the minimum hardware requirements to use the ZON Utility on your computer.

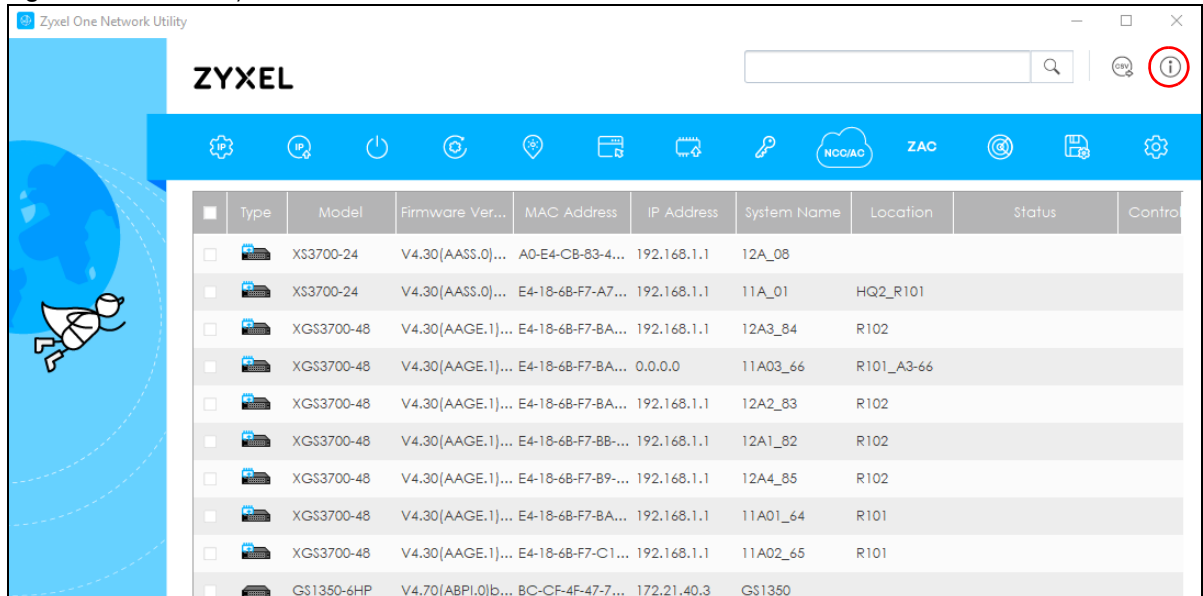
- Core i3 processor
- 2 GB RAM
- 100 MB free hard disk
- WXGA (Wide XGA 1280 by 800)

4.3.2 Run the ZON Utility

- 1 Double-click the ZON Utility to run it.
- 2 The first time you run the ZON Utility, you will see if your device and firmware version support the ZON Utility. Click the **OK** button to close this screen.

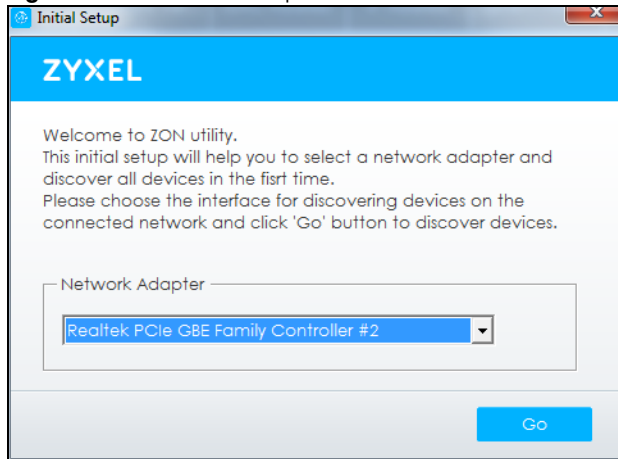
Figure 25 Supported Devices and Versions

If you want to check the supported models and firmware versions later, you can click the **Show information about ZON** icon in the upper right hand corner of the screen. Then select the **Supported model and firmware version** link. If your device is not listed here, see the device release notes for ZON Utility support. The release notes are in the firmware zip file on the ZyXel web site.

Figure 26 ZON Utility Screen

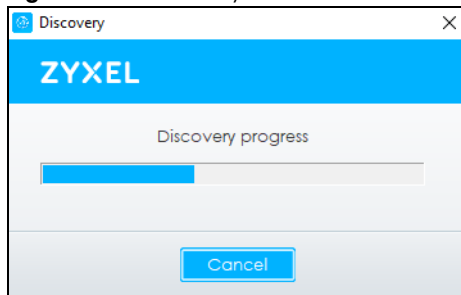
- 3 Select a network adapter to which your supported devices are connected.

Figure 27 Network Adapter



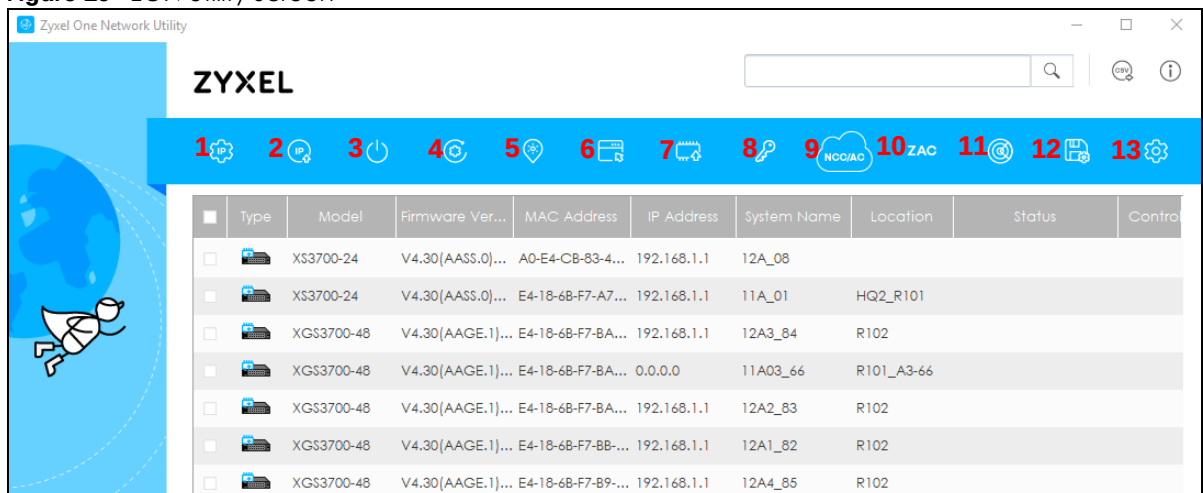
- 4 Click the **Go** button for the ZON Utility to discover all supported devices in your network.

Figure 28 Discovery



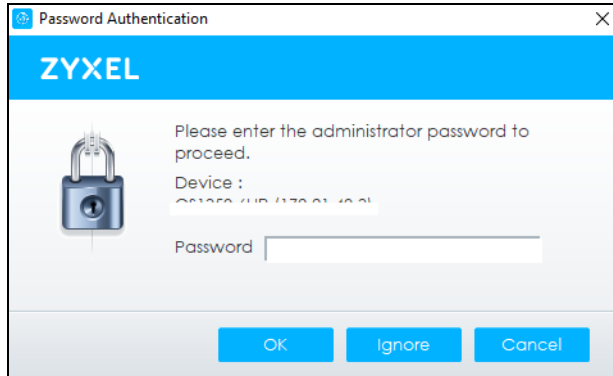
- 5 The ZON Utility screen shows the devices discovered.

Figure 29 ZON Utility Screen



- 6 Select a device and then use the icons to perform actions. Some functions may not be available for your devices.

Note: You must know the selected device admin password before taking actions on the device using the ZON Utility icons.

Figure 30 Password Prompt

The following table describes the icons numbered from left to right in the ZON Utility screen.

Table 6 ZON Utility Icons

ICON	DESCRIPTION
1 IP Configuration	Change the selected device's IP address.
2 Renew IP Address	Update a DHCP-assigned dynamic IP address.
3 Reboot Device	Use this icon to restart the selected devices. This may be useful when troubleshooting or upgrading new firmware.
4 Reset Configuration to Default	Use this icon to reload the factory-default configuration file. This means that you will lose all previous configurations.
5 Locator LED	Use this icon to locate the selected device by causing its Locator LED to blink.
6 Web GUI	Use this to access the selected device Web Configurator from your browser. You will need a user name and password to log in.
7 Firmware Upgrade	Use this icon to upgrade new firmware to selected devices of the same model. Make sure you have downloaded the firmware from the Zyxel website to your computer and unzipped it in advance.
8 Change Password	Use this icon to change the admin password of the selected device. You must know the current admin password before changing to a new one.
9 Configure NCC Discovery	You must have Internet access to use this feature. Use this icon to enable or disable the Nebula Control Center (NCC) discovery feature on the selected device. If it is enabled, the selected device will try to connect to the NCC. Once the selected device is connected to and has registered in the NCC, it will go into the Nebula cloud management mode.
10 ZAC	Use this icon to run the Zyxel AP Configurator of the selected AP.
11 Clear and Rescan	Use this icon to clear the list and discover all devices on the connected network again.
12 Save Configuration	Use this icon to save configuration changes to permanent memory on a selected device.
13 Settings	Use this icon to select a network adapter for the computer on which the ZON utility is installed, and the utility language.

The following table describes the fields in the ZON Utility main screen.

Table 7 ZON Utility Fields

LABEL	DESCRIPTION
Type	This field displays an icon of the kind of device discovered.
Model	This field displays the model name of the discovered device.
Firmware Version	This field displays the firmware version of the discovered device.
MAC Address	This field displays the MAC address of the discovered device.

Table 7 ZON Utility Fields (continued)

LABEL	DESCRIPTION
IP Address	This field displays the IP address of an internal interface on the discovered device that first received a ZDP discovery request from the ZON Utility.
System Name	This field displays the system name of the discovered device.
Location	This field displays where the discovered device is.
Status	This field displays whether changes to the discovered device have been done successfully. As the Switch does not support IP Configuration , Renew IP address and Flash Locator LED , this field displays "Update failed", "Not support Renew IP address" and "Not support Flash Locator LED" respectively.
Controller Discovery	This field displays if the discovered device supports the Nebula Control Center (NCC) discovery feature. If it is enabled, the selected device will try to connect to the NCC. Once the selected device is connected to and has registered in the NCC, it will go into the Nebula cloud management mode.
Serial Number	Enter the admin password of the discovered device to display its serial number.
Hardware Version	This field displays the hardware version of the discovered device.

4.4 Web Configurator Layout

The **Status** screen is the first screen that displays when you access the Web Configurator.

The following figure shows the navigating components of a Web Configurator screen.

Figure 31 Web Configurator Layout



A – Click the menu items to open sub-menu links, and then click on a sub-menu link to open the screen in the main window.

B, C, D, E, F, G – These are quick links which allow you to perform certain tasks no matter which screen you are currently working in.

B – Click this link to update the information in the screen you are viewing currently.

C – Click this link to save your configuration into the Switch's non-volatile memory. Non-volatile memory is the configuration of your Switch that stays the same even if the Switch's power is turned off.

D – Click this link to go to the status page of the Switch.

E – Click this link to log out of the Web Configurator.

F – Click this link to display web help pages. The help pages provide descriptions for all of the configuration screens.

G – Click this link to go to the Zyxel Community Biz Forum.

H – Click this link to go to the **Neighbor** screen where you can see and manage neighbor devices learned by the Switch.

In the navigation panel, click a main link to reveal a list of sub-menu links.

In the navigation panel, click a main link to reveal a list of sub-menu links.

Table 8 Navigation Panel Sub-links Overview

BASIC SETTING	ADVANCED APPLICATION	IP APPLICATION	MANAGEMENT
Menu Basic Setting Advanced Application IP Application Management System Info General Setup Switch Setup IP Setup Port Setup Interface Setup IPv6 Loopback Interface Stacking Cloud Management	Menu Basic Setting Advanced Application IP Application Management VLAN Static MAC Forwarding Static Multicast Forwarding Filtering Spanning Tree Protocol Bandwidth Control Broadcast Storm Control Mirroring Link Aggregation Port Authentication Port Security Time Range Classifier Policy Rule Queuing Method VLAN Stacking Multicast AAA IP Source Guard Loop Guard VLAN Mapping Layer 2 Protocol Tunneling sFlow PPPoE Erdisable Vlan Isolation MAC Pinning Private VLAN Green Ethernet LLDP Anti-Arpscan BPDU Guard OAM ZUID NLB Wot Relay	Menu Basic Setting Advanced Application IP Application Management Static Routing Policy Routing RIP OSPF IGMP DVMRP DiffServ DHCP VRRP Router Setup ARP Setup	Menu Basic Setting Advanced Application IP Application Management Maintenance Access Control Diagnostic System Log Syslog Setup Cluster Management MAC Table IP Table ARP Table Routing Table Path MTU Table Configure Clone IPv6 Neighbor Table Port Status Service Register

The following table describes the links in the navigation panel.

Table 9 Navigation Panel Links

LINK	DESCRIPTION
Basic Settings	
System Info	This link takes you to a screen that displays general system and hardware monitoring information.
General Setup	This link takes you to a screen where you can configure general identification information and time settings for the Switch.
Switch Setup	This link takes you to a screen where you can set up global Switch parameters such as VLAN type, MAC address learning, GARP and priority queues.
IP Setup	This link takes you to a screen where you can configure the IP address, subnet mask (necessary for Switch management) and set up to 128 IP routing domains.

Table 9 Navigation Panel Links (continued)

LINK	DESCRIPTION
Port Setup	This link takes you to screens where you can configure speed, flow control and priority settings for individual Switch ports.
Interface Setup	This link takes you to a screen where you can create virtual interfaces on the Switch.
IPv6	This link takes you to a screen where you can enable an IPv6 interface and configure the IPv6 settings on the Switch.
Loopback Interface	This link takes you to a screen where you can configure the IPv4 loopback interface settings on the Switch.
Stacking	This link takes you to a screen where you can view and configure stacking system for the Switch.
DNS	This link takes you to a screen where you can configure DNS (domain name server) IP addresses.
Cloud Management	This screen displays a link to a screen where you can enable or disable the Nebula Control Center Discovery feature. If it's enabled, you can have the Switch search for the NCC (Nebula Control Center). Another link takes you to the Nebula Switch Registration screen which has a QR code containing the Switch's serial number and MAC address for handy registration of the Switch at NCC.
Advanced Application	
VLAN	This link takes you to screens where you can configure port-based or 802.1Q VLAN (depending on what you configured in the Switch Setup menu). You can also configure a protocol based VLAN or a subnet based VLAN in these screens.
Static MAC Forwarding	This link takes you to screens where you can configure static MAC addresses for a port. These static MAC addresses do not age out.
Static Multicast Forwarding	This link takes you to a screen where you can configure static multicast MAC addresses for port(s). These static multicast MAC addresses do not age out.
Filtering	This link takes you to a screen to set up filtering rules.
Spanning Tree Protocol	This link takes you to screens where you can configure the RSTP/MRSTP/MSTP to prevent network loops.
Bandwidth Control	This link takes you to screens where you can cap the maximum bandwidth allowed on a port.
Broadcast Storm Control	This link takes you to a screen to set up broadcast filters.
Mirroring	This link takes you to screens where you can copy traffic from one port or ports to another port in order that you can examine the traffic from the first port without interference.
Link Aggregation	This link takes you to screen where you can logically aggregate physical links to form one logical, higher-bandwidth link.
Port Authentication	This link takes you to a screen where you can configure IEEE 802.1x port authentication as well as MAC authentication for clients communicating via the Switch.
Port Security	This link takes you to a screen where you can activate MAC address learning and set the maximum number of MAC addresses to learn on a port.
Time Range	This link takes you to a screen where you can configure time range for time-oriented features like Classifier.
Classifier	This link takes you to screens where you can configure the Switch to group packets based on the specified criteria.
Policy Rule	This link takes you to a screen where you can configure the Switch to perform special treatment on the grouped packets.
Queuing Method	This link takes you to a screen where you can configure queuing with associated queue weights for each port.
VLAN Stacking	This link takes you to screens where you can activate and configure VLAN stacking.
Multicast	This link takes you to screen where you can configure various multicast features, IGMP snooping, MLD snooping-proxy and create multicast VLANs.

Table 9 Navigation Panel Links (continued)

LINK	DESCRIPTION
AAA	This link takes you to a screen where you can configure authentication, authorization and accounting services via external servers. The external servers can be either RADIUS (Remote Authentication Dial-In User Service) or TACACS+ (Terminal Access Controller Access-Control System Plus).
IP Source Guard	This link takes you to screens where you can configure filtering of unauthorized DHCP and ARP packets in your network.
Loop Guard	This link takes you to a screen where you can configure protection against network loops that occur on the edge of your network.
VLAN Mapping	This link takes you to screens where you can configure VLAN mapping settings on the Switch.
Layer 2 Protocol Tunneling	This link takes you to a screen where you can configure L2PT (Layer 2 Protocol Tunneling) settings on the Switch.
sFlow	This link takes you to screens where you can configure sFlow settings on the Switch.
PPPoE	This link takes you to screens where you can configure how the Switch gives a PPPoE termination server additional subscriber information that the server can use to identify and authenticate a PPPoE client.
Errdisable	This link takes you to a screens where you can view errdisable status and configure errdisable settings in CPU protection, errdisable detect, and errdisable recovery.
VLAN Isolation	This link takes you to a screen where you can block traffic between ports in a VLAN on the Switch.
MAC Pinning	This link takes you to a screen where you can set specific ports to have priority over other ports in MAC address learning.
Private VLAN	This link takes you to a screen where you can block traffic between ports in a VLAN on the Switch.
Green Ethernet	This link takes you to a screen where you can configure the Switch to reduce port power consumption.
LLDP	This link takes you to a screen where you can configure LLDP settings.
Anti-Arpscan	This link takes you to screens where you can enable anti-arpscan on the Switch and ports, and view the port state. You can also create trusted hosts, view blocked hosts and unblock them.
BPDUGuard	This link takes you to screens where you can enable BPDUGuard on the Switch and ports, and view the port state.
OAM	This link takes you to screens where you can enable Ethernet OAM on the Switch, view the configuration of ports on which Ethernet OAM is enabled and perform remote-loopback tests.
ZULD	This link takes you to screens where you can enable ZULD on a port and configure related settings.
NLB	This link takes you to screens where you can configure to which MAC addresses and ports the Switch should forward the incoming NLB traffic, and map the IP address to the MAC address of a cluster for layer-3 forwarding.
Wol Relay	This link takes you to a screen where you can configure settings on Wake On LAN relay.
IP Application	
Static Routing	This link takes you to a screen where you can configure static routes. A static route defines how the Switch should forward traffic by configuring the TCP/IP parameters manually.
Policy Routing	This link takes you to screens where you can configure policy routing rules.
RIP	This link takes you to a screen where you can configure the RIP (Routing Information Protocol) direction and version for IPv4 RIP timer, and the method of preventing routing loops.
OSPF	This link takes you to a screen where you can view the OSPF status and configure OSPF settings for IPv4.
IGMP	This link takes you to a screen where you can configure the IGMP settings.

Table 9 Navigation Panel Links (continued)

LINK	DESCRIPTION
DVMRP	This link takes you to a screen where you can configure the DVMRP (Distance Vector Multicast Routing Protocol) settings.
DiffServ	This link takes you to screens where you can enable DiffServ, configure marking rules and set DSCP-to-IEEE802.1p mappings.
DHCP	This link takes you to screens where you can configure the DHCP settings.
VRRP	This link takes you to screens where you can configure redundant virtual router for your network.
Router Setup	This link takes you to a screen where you can enable Equal-Cost MultiPath (ECMP) routing and set the criteria the Switch uses to determine the routing path for a packet.
ARP Setup	This link takes you to a screen where you can configure ARP learning mode on a per-port basis and create static ARP entries which do not age out.
Management	
Maintenance	This link takes you to screens where you can perform firmware and configuration file maintenance as well as reboot the system.
Access Control	This link takes you to screens where you can change the system login password and configure SNMP and remote management.
Diagnostic	This link takes you to screens where you can ping IP addresses, run traceroute, test ports.
System Log	This link takes you to a screen where you can view system logs.
Syslog Setup	This link takes you to a screen where you can setup system logs and a system log server.
Cluster Management	This link takes you to a screen where you can configure clustering management and view its status.
MAC Table	This link takes you to a screen where you can view the MAC address and VLAN ID of a device attach to a port. You can also view what kind of MAC address it is.
IP Table	This link takes you to a screen where you can view the IP addresses and VLAN ID of a device attached to a port. You can also view what kind of device it is.
ARP Table	This link takes you to a screen where you can view the MAC address – IP address resolution table.
Routing Table	This link takes you to a screen where you can view the routing table.
Path MTU Table	This link takes you to a screen where you can view the IPv6 path MTU table.
Configure Clone	This link takes you to a screen where you can copy attributes of one port to other ports.
IPv6 Neighbor Table	This link takes you to a screen where you can view the Switch's IPv6 neighbor table.
Port Status	This link takes you to a screen where you can view the port statistics.
Service Register	This link takes you to a screen where you can view the status of your service registrations and upgrade licenses.

4.4.1 Change Your Password

After you log in for the first time, it is recommended you change the default administrator password. Click **Management > Access Control > Logins** to display the next screen.

Figure 32 Change Administrator Login Password

Logins [Access Control](#)

Administrator

Old Password

New Password

Retype to confirm

Please record your new password whenever you change it. The system will lock you out if you have forgotten your password.

Edit Logins

Login	User Name	Password	Retype to confirm	Privilege
1				
2				
3				
4				

4.5 Save Your Configuration

When you are done modifying the settings in a screen, click **Apply** to save your changes back to the run-time memory. Settings in the run-time memory are lost when the Switch's power is turned off.

Click the **Save** link in the upper right hand corner of the Web Configurator to save your configuration to non-volatile memory. Non-volatile memory refers to the Switch's storage that remains even if the Switch's power is turned off.

Note: Use the **Save** link when you are done with a configuration session.

4.6 Switch Lockout

You could block yourself (and all others) from using in-band-management (managing through the data ports) if you do one of the following:

- 1 Delete the management VLAN (default is VLAN 1).
- 2 Delete all port-based VLANs with the CPU port as a member. The "CPU port" is the management port of the Switch.
- 3 Filter all traffic to the CPU port.
- 4 Disable all ports.
- 5 Misconfigure the text configuration file.

- 6 Forget the password and/or IP address.
- 7 Prevent all services from accessing the Switch.
- 8 Change a service port number but forget it.
- 9 You forgot to log out of the Switch from a computer before logging in again on another computer.

Note: Be careful not to lock yourself and others out of the Switch. If you do lock yourself out, try using out-of-band management (via the management port) to configure the Switch.

4.7 Reset the Switch

If you lock yourself (and others) from the Switch or forget the administrator password, you will need to reload the factory-default configuration file or reset the Switch back to the factory defaults.

4.7.1 Using the RESTORE Button

See [Table 3 on page 38](#) to see how to use the **RESTORE** button to restore the factory default file.

4.7.2 Reload the Configuration File

Uploading the factory-default configuration file replaces the current configuration file with the factory-default configuration file. This means that you will lose all previous configurations and the speed of the console port will be reset to the default of 115200 bps with 8 data bit, no parity, one stop bit and flow control set to none. The password will also be reset to "1234" and the IP address to 192.168.1.1 or DHCP-assigned IP.

To upload the configuration file, do the following:

- 1 Connect to the console port using a computer with terminal emulation software.
- 2 Disconnect and reconnect the Switch's power to begin a session. When you reconnect the Switch's power, you will see the initial screen.
- 3 When you see the message "Press any key to enter Debug Mode within 3 seconds ..." press any key to enter debug mode.
- 4 Type `atlc` after the "Enter Debug Mode" message.
- 5 Wait for the "Starting XMODEM upload" message before activating XMODEM upload on your terminal.
- 6 After a configuration file upload, type `atgo` to restart the Switch.

Figure 33 Resetting the Switch: Via the Console Port

```

Bootbase Version: V1.00 | 02/21/2016 15:43:29
RAM: Size = 1048576 Kbytes
FLASH: 64M

ZyNOS Version: V4.60 (ABML.0) | 04/18/2017 11:41:8

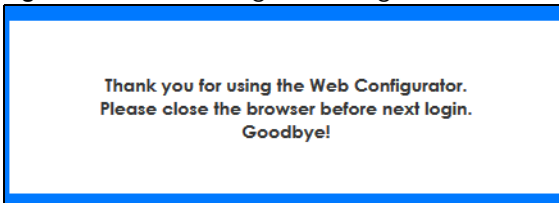
Press any key to enter debug mode within 1 second.
.....
Enter Debug Mode
ras> atlc
Starting XMODEM upload (CRC mode)....
CCCCCCCCCCCCCCCC
Total 393216 bytes received.
Erasing..
.....
OK
ras> atgo

```

The Switch is now reinitialized with a default configuration file including the default password of "1234".

4.8 Log Out of the Web Configurator

Click **Logout** in a screen to exit the Web Configurator. You have to log in with your password again after you log out. This is recommended after you finish a management session for security reasons.

Figure 34 Web Configurator: Logout Screen

4.9 Help

The Web Configurator's online help has descriptions of individual screens and some supplementary information.

Click the **Help** link from a Web Configurator screen to view an online help description of that screen.

CHAPTER 5

Initial Setup Example

5.1 Overview

This chapter shows how to set up the Switch for an example network.

The following lists the configuration steps for the initial setup:

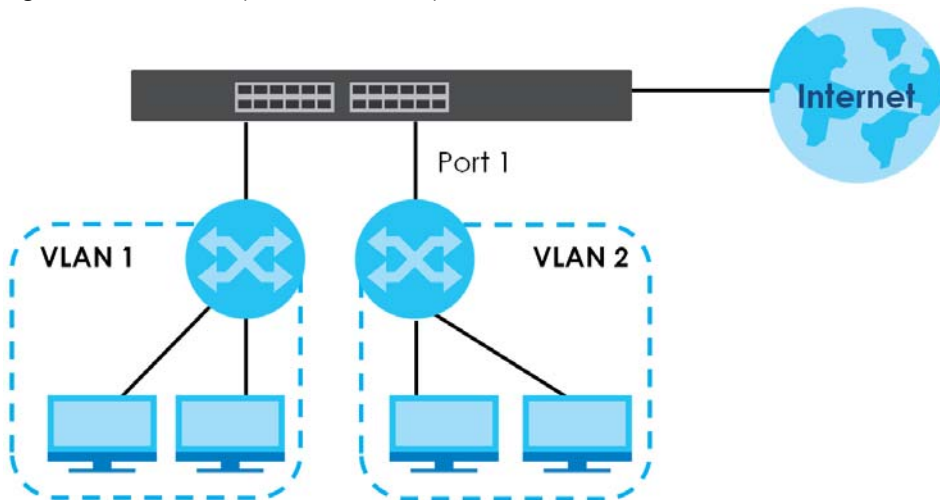
- [Create a VLAN](#)
- [Set Port VID](#)
- [Configure Switch Management IP Address](#)

5.1.1 Create a VLAN

VLANs confine broadcast frames to the VLAN group in which the ports belongs. You can do this with port-based VLAN or tagged static VLAN with fixed port members.

In this example, you want to configure port 1 as a member of VLAN 2.

Figure 35 Initial Setup Network Example: VLAN



- 1 Click **Advanced Application > VLAN > VLAN Configuration** in the navigation panel and click the **Static VLAN Setup** link.

VLAN Configuration		VLAN Status
Static VLAN Setup	Click Here	
VLAN Port Setup	Click Here	
Subnet Based VLAN Setup	Click Here	
Protocol Based VLAN Setup	Click Here	
Voice VLAN Setup	Click Here	
MAC Based VLAN Setup	Click Here	
Vendor ID Based VLAN Setup	Click Here	

- 2 In the **Static VLAN** screen, select **ACTIVE**, enter a descriptive name in the **Name** field and enter 2 in the **VLAN Group ID** field for the **VLAN2** network.

Port	Control	Tagging
1	Normal	Fixed
2	Normal	Fixed
3	Normal	Fixed
4	Normal	Fixed
5	Normal	Fixed
6	Normal	Fixed
7	Normal	Fixed
8	Normal	Fixed
9	Normal	Fixed
10	Normal	Fixed
11	Normal	Fixed

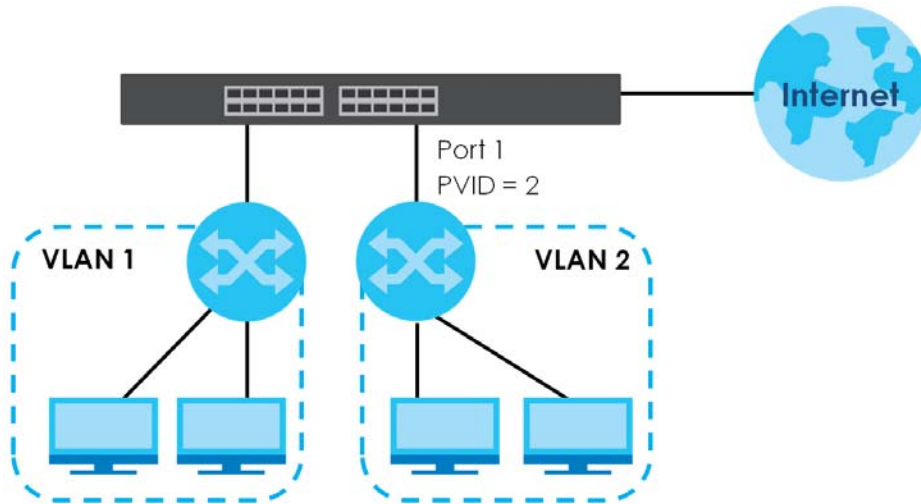
Note: The **VLAN Group ID** field in this screen and the **VID** field in the **IP Setup** screen refer to the same VLAN ID.

- 3 Since the **VLAN2** network is connected to port 1 on the Switch, select **Fixed** to configure port 1 to be a permanent member of the VLAN only.
- 4 To ensure that VLAN-unaware devices (such as computers and hubs) can receive frames properly, clear the **TX Tagging** check box to set the Switch to remove VLAN tags before sending.
- 5 Click **Add** to save the settings to the run-time memory. Settings in the run-time memory are lost when the Switch's power is turned off.

5.1.2 Set Port VID

Use PVID to add a tag to incoming untagged frames received on that port so that the frames are forwarded to the VLAN group that the tag defines.

In the example network, configure 2 as the port VID on port 1 so that any untagged frames received on that port get sent to VLAN 2.

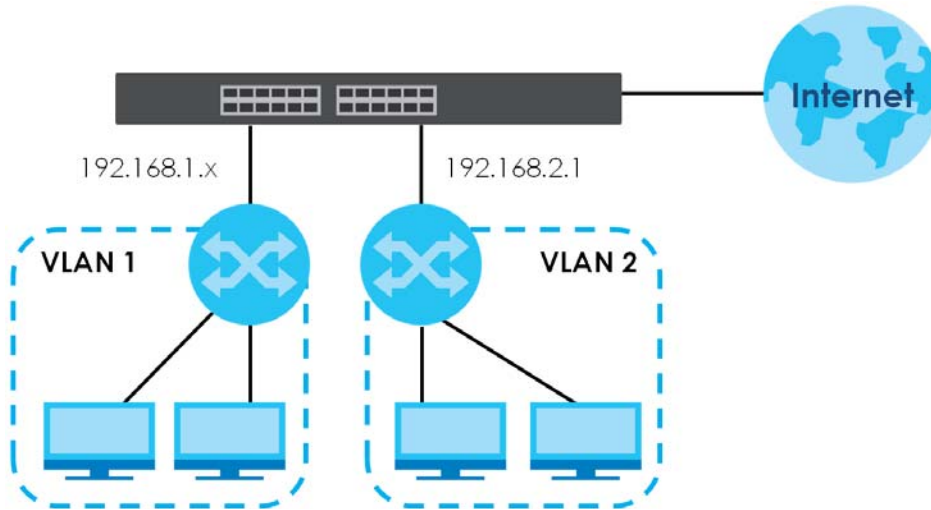
Figure 36 Initial Setup Network Example: Port VID

- 1 Click **Advanced Applications > VLAN > VLAN Configuration** in the navigation panel. Then click the **VLAN Port Setup** link.
- 2 Enter 2 in the **PVID** field for port 1 and click **Apply** to save your changes back to the run-time memory. Settings in the run-time memory are lost when the Switch's power is turned off.

VLAN Port Setting						
GVRP						
Port	Ingress Check	PVID	GVRP	Acceptable Frame Type	VLAN Trunking	Isolation
1	☐	2	☐	All	☐	☐
2	☐	1	☐	All	☐	☐
3	☐	1	☐	All	☐	☐
4	☐	1	☐	All	☐	☐
5	☐	1	☐	All	☐	☐
6	☐	1	☐	All	☐	☐
7	☐	1	☐	All	☐	☐
8	☐	1	☐	All	☐	☐

5.1.3 Configure Switch Management IP Address

If the Switch fails to obtain an IP address from a DHCP server, the Switch will use 192.168.1.1 as the management IP address. You can configure another IP address in a different subnet for management purposes. The following figure shows an example.

Figure 37 Initial Setup Example: Management IP Address

- 1 Connect your computer to any Ethernet port on the Switch. Make sure your computer is in the same subnet as the Switch.
- 2 Open your web browser and enter 192.168.1.1 (the default IP address) in the address bar to access the Web Configurator. See [Section 4.2 on page 48](#) for more information.
- 3 Click **Basic Setting** > **IP Setup** > **IP Configuration** in the navigation panel.

IP Configuration

[IP Status](#)
[Network Proxy Configuration](#)

Default Gateway	0.0.0.0
Domain Name Server 1	
Domain Name Server 2	
Default Management	☒ In-band ☐ Out-of-band

Apply

Cancel

Out-of-band Management IP Address

IP Address	192.168.0.1
IP Subnet Mask	255.255.255.0
Default Gateway	0.0.0.0

Apply

Cancel

IP Interface

IP Address	☐ DHCP Client	
	Option-60	☒
	Class-ID	Zyxel Corporation
	☒ Static IP Address	
	IP Address 192.168.2.1 IP Subnet Mask 255.255.255.0	
VID	2	

Add

Cancel

Index	IP Address	IP Subnet Mask	VID	Type	
1	172.21.40.34	255.255.252.0	1	DHCP	☐

Delete

Cancel

- 4 Configure the related fields in the **IP Configuration** screen.
- 5 For the **VLAN2** network, enter 192.168.2.1 as the IP address and 255.255.255.0 as the subnet mask.
- 6 In the **VID** field, enter the ID of the VLAN group to which you want this management IP address to belong. This is the same as the VLAN ID you configure in the **Static VLAN** screen.
- 7 Click **Add** to save your changes back to the run-time memory. Settings in the run-time memory are lost when the Switch's power is turned off.

CHAPTER 6

Tutorials

6.1 Overview

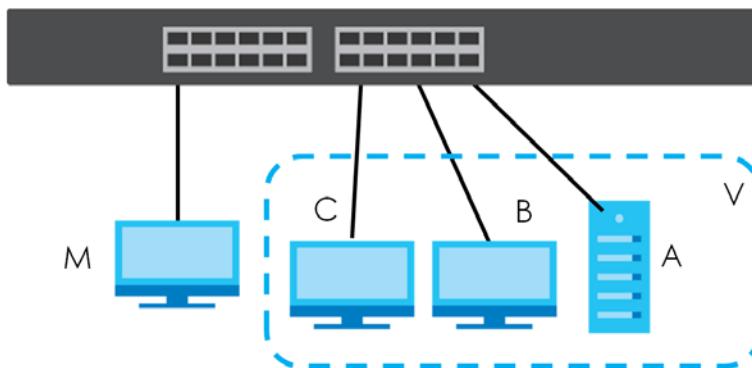
This chapter provides some examples of using the Web Configurator to set up and use the Switch. The tutorials include:

- [How to Use DHCPv4 Snooping on the Switch](#)
- [How to Use DHCPv4 Relay on the Switch](#)
- [How to Use Auto Configuration via a DHCP Server on the Switch](#)

6.2 How to Use DHCPv4 Snooping on the Switch

You only want DHCP server **A** connected to port 4 to assign IP addresses to all devices in VLAN network (**V**). Create a VLAN containing ports 5, 6 and 7. Connect a computer **M** to the Switch for management.

Figure 38 Tutorial: DHCP Snooping Tutorial Overview



The settings in this tutorial are as the following.

Table 10 Tutorial: Settings in this Tutorial

HOST	PORT CONNECTED	VLAN	PVID	DHCP SNOOPING PORT TRUSTED
DHCP Server (A)	5	1 and 100	100	Yes
DHCP Client (B)	6	1 and 100	100	No
DHCP Client (C)	7	1 and 100	100	No

- 1 Access the Switch through **http://192.168.1.1** by default. Log into the Switch by entering the user name (default: **admin**) and password (default: **1234**).

- 2 Go to **Advanced Application > VLAN > VLAN Configuration > Static VLAN Setup**, and create a VLAN with ID of 100. Add ports 5, 6 and 7 in the VLAN by selecting **Fixed** in the **Control** field as shown.

De-select **Tx Tagging** because you do not want outgoing traffic to contain this VLAN tag.

Click **Add**.

Figure 39 Tutorial: Create a VLAN and Add Ports to It

Static VLAN

VLAN Configuration

ACTIVE ☒

Name VLAN-100

VLAN Group ID 100

VLAN Type Normal ☒ Private ☐

Association VLAN List

Port	Control	Tagging
*	Normal	☒ Tx Tagging
1	Normal ☒ Fixed ☐ Forbidden ☐	☒ Tx Tagging
2	Normal ☒ Fixed ☐ Forbidden ☐	☒ Tx Tagging
3	Normal ☒ Fixed ☐ Forbidden ☐	☒ Tx Tagging
4	Normal ☒ Fixed ☐ Forbidden ☐	☒ Tx Tagging
5	Normal ☐ Fixed ☒ Forbidden ☐	☐ Tx Tagging
6	Normal ☐ Fixed ☒ Forbidden ☐	☐ Tx Tagging
7	Normal ☐ Fixed ☒ Forbidden ☐	☐ Tx Tagging
8	Normal ☒ Fixed ☐ Forbidden ☐	☒ Tx Tagging
9	Normal ☒ Fixed ☐ Forbidden ☐	☒ Tx Tagging
24	Normal ☒ Fixed ☐ Forbidden ☐	☒ Tx Tagging
25	Normal ☒ Fixed ☐ Forbidden ☐	☒ Tx Tagging
26	Normal ☒ Fixed ☐ Forbidden ☐	☒ Tx Tagging
27	Normal ☒ Fixed ☐ Forbidden ☐	☒ Tx Tagging

Add Cancel Clear

- 3 Go to **Advanced Application > VLAN > VLAN Configuration > VLAN Port Setup**, and set the PVID of the ports 5, 6 and 7 to 100. This tags untagged incoming frames on ports 5, 6 and 7 with the tag 100.

Figure 40 Tutorial: Tag Untagged Frames

VLAN Port Setting

VLAN Configuration

GVRP ☐

Port	Ingress Check	PVID	GVRP	Acceptable Frame Type	VLAN Trunking	Isolation
*	☐		☐	All	☐	☐
1	☐	1	☐	All	☐	☐
2	☐	1	☐	All	☐	☐
3	☐	1	☐	All	☐	☐
4	☐	1	☐	All	☐	☐
5	☐	100	☐	All	☐	☐
6	☐	100	☐	All	☐	☐
7	☐	100	☐	All	☐	☐
8	☐	1	☐	All	☐	☐

Apply Cancel

- 4 Go to **Advanced Application > IP Source Guard > IPv4 Source Guard Setup > DHCP Snooping > Configure**, activate and specify VLAN 100 as the DHCP VLAN as shown. Click **Apply**.

Figure 41 Tutorial: Specify DHCP VLAN

The screenshot shows the 'DHCP Snooping Configure' web interface. At the top, there are links for 'DHCP Snooping', 'Port', and 'VLAN'. The 'Active' checkbox is checked, and the 'DHCP Vlan' is set to 100. Below this is the 'Database' section with fields for 'Agent URL', 'Timeout interval' (300 seconds), and 'Write delay interval' (300 seconds). At the bottom, there is a 'Renew DHCP Snooping URL' field and a 'Renew' button. The 'Apply' button is circled in red.

- 5 Click the **Port** link at the top right corner.
- 6 The **DHCP Snooping Port Configure** screen appears. Select **Trusted** in the **Server Trusted state** field for port 5 because the DHCP server is connected to port 5. Keep ports 6 and 7 **Untrusted** because they are connected to DHCP clients. Click **Apply**.

Figure 42 Tutorial: Set the DHCP Server Port to Trusted

Port	Server Trusted state	Rate (pps)
*	Untrusted	
1	Untrusted	0
2	Untrusted	0
3	Untrusted	0
4	Untrusted	0
5	Trusted	0
6	Untrusted	0
7	Untrusted	0
8	Untrusted	0
9	Untrusted	0
10	Untrusted	0
11	Untrusted	0
12	Untrusted	0
13	Untrusted	0
14	Untrusted	0
15	Untrusted	0
16	Untrusted	0
17	Untrusted	0
18	Untrusted	0
19	Untrusted	0
20	Untrusted	0
21	Untrusted	0
22	Untrusted	0
23	Untrusted	0
24	Untrusted	0
25	Untrusted	0
26	Untrusted	0
27	Untrusted	0

Apply Cancel

- Go to **Advanced Application > IP Source Guard > IPv4 Source Guard Setup > DHCP Snooping > Configure > VLAN**, show VLAN 100 by entering 100 in the **Start VID** and **End VID** fields and click **Apply**. Then select **Yes** in the **Enabled** field of the VLAN 100 entry shown at the bottom section of the screen.
If you want to add more information in the DHCP request packets such as source VLAN ID or system name, you can also select an **Option82 Profile** in the entry.

Figure 43 Tutorial: Enable DHCP Snooping on this VLAN

Configure Port

VLAN Search by VID: 100 Search

The Number of Search Results: 1

VID	Enabled	Option 82 Profile
*	No	
100	Yes	

Apply Cancel

Change Pages Previous Next

- Click **Save** at the top right corner of the Web Configurator to save the configuration permanently.



- 9 Connect your DHCP server to port 5 and a computer (as DHCP client) to either port 6 or 7. The computer should be able to get an IP address from the DHCP server. If you put the DHCP server on port 6 or 7, the computer will NOT be able to get an IP address.
- 10 To check if DHCP snooping works, go to **Advanced Application > IP Source Guard > IPv4 Source Guard Setup**, you should see an IP assignment with the type **DHCP-Snooping** as shown.

Figure 44 Tutorial: Check the Binding If DHCP Snooping Works

IP Source Guard			IPSG Static Binding DHCP Snooping ARP Inspection			
Index	IP Address	VLAN	MAC Address	Port	Lease	Type
1	10.10.1.16	100	00:02:00:00:00:1c	6	6d23h17m 0s	dchp-snooping

You can also telnet. Use the command "show dhcp snooping binding" to see the DHCP snooping binding table as shown next.

```
sysname# show dhcp snooping binding
```

MacAddress	IpAddress	Lease	Type	VLAN	Port
00:02:00:00:00:1c	10.10.1.16	6d23h59m20s	dchp-snooping	100	6

Total number of bindings: 1

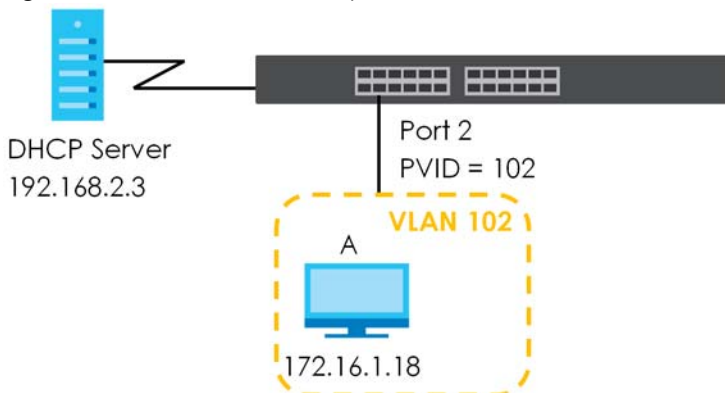
6.3 How to Use DHCPv4 Relay on the Switch

This tutorial describes how to configure your Switch to forward DHCP client requests to a specific DHCP server. The DHCP server can then assign a specific IP address based on the information in the DHCP requests.

6.3.1 DHCP Relay Tutorial Introduction

In this example, you have configured your DHCP server (192.168.2.3) and want to have it assign a specific IP address (say 172.16.1.18) to DHCP client **A** based on the system name, VLAN ID and port number in the DHCP request. Client **A** connects to the Switch's port 2 in VLAN 102.

Figure 45 Tutorial: DHCP Relay Scenario



6.3.2 Create a VLAN

Follow the steps below to configure port 2 as a member of VLAN 102.

- 1 Access the Web Configurator through the Switch's management port.
- 2 Go to **Basic Setting > Switch Setup** and set the VLAN type to **802.1Q**. Click **Apply** to save the settings to the run-time memory.

Figure 46 Tutorial: Set VLAN Type to 802.1Q

The screenshot shows the 'Switch Setup' web interface. The 'VLAN Type' section is highlighted with a red circle, showing two radio buttons: '802.1Q' (selected) and 'Port Based'. Below this, there are several configuration sections: 'Bridge Control Protocol Transparency' (Active checkbox), 'MAC Address Learning' (Aging Time: 300 seconds), 'ARP Aging Time' (Aging Time: 300 seconds), 'GARP Timer' (Join Timer: 200 milliseconds, Leave Timer: 600 milliseconds, Leave All Timer: 10000 milliseconds), and 'Priority Queue Assignment' (a table of priorities 7 through 0 with dropdown menus). At the bottom are 'Apply' and 'Cancel' buttons.

Switch Setup			
VLAN Type		☒ 802.1Q ☐ Port Based	
Bridge Control Protocol Transparency		Active ☐	
MAC Address Learning	Aging Time	300	seconds
ARP Aging Time	Aging Time	300	seconds
GARP Timer	Join Timer	200	milliseconds
	Leave Timer	600	milliseconds
	Leave All Timer	10000	milliseconds
Priority Queue Assignment	Priority7	7	▼
	Priority6	6	▼
	Priority5	5	▼
	Priority4	4	▼
	Priority3	3	▼
	Priority2	1	▼
	Priority1	0	▼
	Priority0	2	▼
Apply Cancel			

- 3 Click **Advanced Application > VLAN > VLAN Configuration > Static VLAN Setup**.
- 4 In the **Static VLAN** screen, select **ACTIVE**, enter a descriptive name (VLAN 102 for example) in the **Name** field and enter 102 in the **VLAN Group ID** field.
- 5 Select **Fixed** to configure port 2 to be a permanent member of this VLAN.
- 6 Clear the **TX Tagging** check box to set the Switch to remove VLAN tags before sending.
- 7 Click **Add** to save the settings to the run-time memory. Settings in the run-time memory are lost when the Switch's power is turned off.

Figure 47 Tutorial: Create a Static VLAN

Static VLAN [VLAN Configuration](#)

ACTIVE ☒

Name VLAN 102

VLAN Group ID 102

VLAN Type
☒ Normal
☐ Private ▼

Association VLAN List

Port	Control			Tagging
*	Normal ▼			☒ Tx Tagging
1	☒ Normal	☐ Fixed	☐ Forbidden	☒ Tx Tagging
2	☐ Normal	☒ Fixed	☐ Forbidden	☐ Tx Tagging
3	☒ Normal	☐ Fixed	☐ Forbidden	☒ Tx Tagging
4	☒ Normal	☐ Fixed	☐ Forbidden	☒ Tx Tagging
5	☒ Normal	☐ Fixed	☐ Forbidden	☒ Tx Tagging
6	☒ Normal	☐ Fixed	☐ Forbidden	☒ Tx Tagging
7	☒ Normal	☐ Fixed	☐ Forbidden	☒ Tx Tagging

Add
Cancel
Clear

- 8 Click the **VLAN Configuration** link in the **Static VLAN Setup** screen and then the **VLAN Port Setup** link in the **VLAN Configuration** screen.

Figure 48 Tutorial: Click the VLAN Port Setting Link

VLAN Configuration [VLAN Status](#)

Static VLAN Setup	Click Here
VLAN Port Setup	Click Here
Subnet Based VLAN Setup	Click Here
Protocol Based VLAN Setup	Click Here
Voice VLAN Setup	Click Here
MAC Based VLAN Setup	Click Here
Vendor ID Based VLAN Setup	Click Here

- 9 Enter 102 in the **PVID** field for port 2 to add a tag to incoming untagged frames received on that port so that the frames are forwarded to the VLAN group that the tag defines.
- 10 Click **Apply** to save your changes back to the run-time memory.

Figure 49 Tutorial: Add Tag for Frames Received on Port 2

Port	Ingress Check	PVID	GVRP	Acceptable Frame Type	VLAN Trunking	Isolation
*	☐		☐	All	☐	☐
1	☐	1	☐	All	☐	☐
2	☐	102	☐	All	☐	☐
3	☐	1	☐	All	☐	☐
4	☐	1	☐	All	☐	☐
5	☐	100	☐	All	☐	☐

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

- 11 Click the **Save** link in the upper right corner of the Web Configurator to save your configuration permanently.

6.3.3 Configure DHCPv4 Relay

Follow the steps below to enable DHCP relay on the Switch and allow the Switch to add relay agent information (such as the VLAN ID) to DHCP requests.

- 1 Click **IP Application > DHCP > DHCPv4** and then the **Global** link to open the **DHCP Relay** screen.
- 2 Select the **Active** check box.
- 3 Enter the DHCP server's IP address (192.168.2.3 in this example) in the **Remote DHCP Server 1** field.
- 4 Select **default1** or **default2** in the **Option 82 Profile** field.
- 5 Click **Apply** to save your changes back to the run-time memory.

Figure 50 Tutorial: Set DHCP Server and Relay Information

DHCP Relay		Status	Port
Active	☒		
Remote DHCP Server 1	192.168.2.3		
Remote DHCP Server 2	0.0.0.0		
Remote DHCP Server 3	0.0.0.0		
Option 82 Profile	default1		

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

- 6 Click the **Save** link in the upper right corner of the Web Configurator to save your configuration permanently.
- 7 The DHCP server can then assign a specific IP address based on the DHCP request.

6.3.4 Troubleshooting

Check client **A**'s IP address. If it did not receive the IP address 172.16.1.18, make sure:

- 1 Client **A** is connected to the Switch's port 2 in VLAN 102.
- 2 You configured the correct VLAN ID, port number and system name for DHCP relay on both the DHCP server and the Switch.
- 3 You clicked the **Save** link on the Switch to have your settings take effect.

6.4 How to Use Auto Configuration via a DHCP Server on the Switch

Follow the steps below to set up configurations on a DHCP server, TFTP server, and the Switch, so you can load an auto configuration file automatically from a TFTP server when you reboot the Switch.

Note that you can set up a DHCP server and TFTP server either on the same device or different devices. Also, make sure the Switch can communicate with the TFTP server.

Note: Steps order could vary according to different programs you use.

Note: You need to set up configurations on a DHCP server and TFTP server first to use auto configuration.

Setting up a DHCP Server

- 1 Set up a dynamic IP addresses pool so the DHCP server will assign an IP address to the Switch in that range.
- 2 Set up a TFTP server IP address, so the Switch will know where to load the auto configuration file.
- 3 Set up the filename of the auto configuration file, so the Switch will know which file to load when you reboot the Switch.
 - Enter the filename of an auto configuration file. The Switch will load this auto configuration file when rebooting with DHCP option 60 disabled.
 - If you want to load the auto configuration file with DHCP option 60 enabled and a Vendor Class Identifier assigned when you reboot the Switch, follow the instruction below. Otherwise, skip this step.
Enter the filename of an auto configuration file. Set up a Vendor Class Identifier. To have the Switch load this auto configuration file, two conditions listed above must be met. Please refer to the following steps to see how to set up a Vendor Class Identifier on the Switch.

Setting up a TFTP Server

- 1 Select a directory on the TFTP server.
- 2 Put the configuration files in that directory.

Setting up the Switch

- 1 Open the Web Configurator. Go to the **Management > Maintenance** screen, and click the **Click Here** button next to the **Auto Configuration** field.

Figure 51 Tutorial: Auto Configuration Screen

Auto Configuration	
Mode	None
State	None
Filename	None
Active	☐
Mode	DHCP
DHCP VLAN ID	1
HTTPS URL	
Apply Cancel	

- 2 Select the check box in the **Active** field to enable auto configuration. Select **DHCP** in the **Mode** field, and enter the VLAN ID where the DHCP server belongs to in the **DHCP VLAN ID** field. Click **Apply** to save your changes.

Figure 52 Tutorial: Enable Auto Configuration

Auto Configuration	
Mode	None
State	None
Filename	None
Active	☒
Mode	DHCP
DHCP VLAN ID	1
HTTPS URL	
<input checked="" type="button" value="Apply"/> Cancel	

- 3 Go to the **Basic Setting > IP Setup > IP Configuration** screen. Select the check box in the **DHCP Client** field.
- 4 If you want to load the auto configuration file with DHCP option 60 enabled and a Vendor Class Identifier assigned when you reboot the Switch, follow the instruction below. Otherwise, skip this step. In the **Basic Setting > IP Setup > IP Configuration** screen, select the check box in the **Option-60** field, and enter a Vendor Class Identifier in the **Class-ID** field. In this example, we use "ZyxelCorp". Click **Apply** to save your changes.

Figure 53 Tutorial: Enable DHCP Client & Option 60

IP Configuration [IP Status](#) [Network Proxy Configuration](#)

Default Gateway	0.0.0.0
Domain Name Server 1	
Domain Name Server 2	
Default Management	☒ In-band ☐ Out-of-band

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

Out-of-band Management IP Address

IP Address	192.168.0.1
IP Subnet Mask	255.255.255.0
Default Gateway	0.0.0.0

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

IP Interface

IP Address

☒ **DHCP Client**

Option-60 ☒

Class-ID

☐ Static IP Address

IP Address

IP Subnet Mask

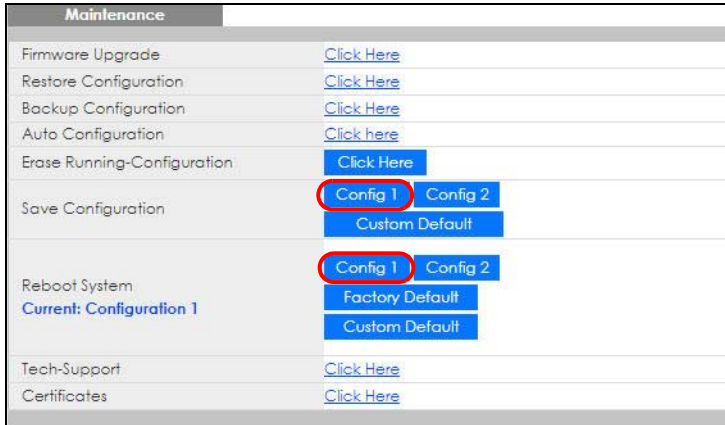
VID

[Add](#) [Cancel](#)

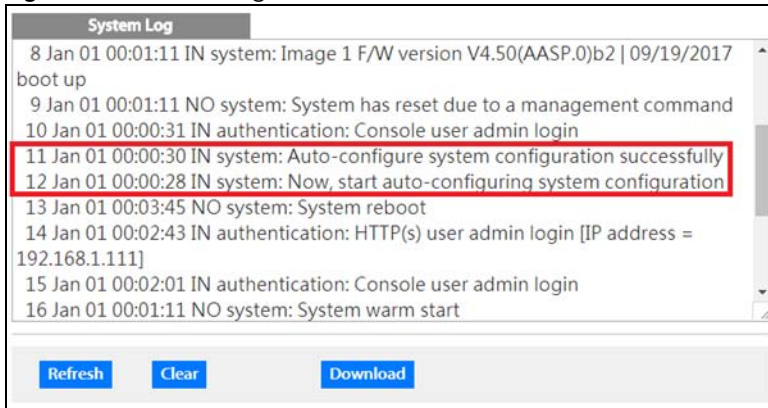
Index	IP Address	IP Subnet Mask	VID	Type	
1	172.21.40.34	255.255.252.0	1	DHCP	☐

[Delete](#) [Cancel](#)

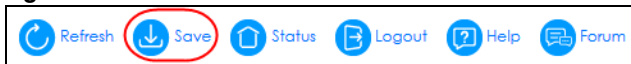
- 5 You need to save the current configuration in a configuration file, so the Switch will load the auto configuration file from the TFTP server automatically when rebooting. Go to the **Management > Maintenance** screen. Click the **Config 1**, **Config 2**, or **Custom Default** button next to the **Save Configuration** field.
- 6 Click the same button next to **Reboot System** field to reboot the Switch, and load the auto configuration setting as configured before. For example, if you save the auto configuration setting to **Config 1**, you need to click the **Config 1** button next to the **Reboot System** field.

Figure 54 Tutorial: Save Configuration and Reboot System

- 7 Go to the **Management > System Log** screen to see if auto configuration was performed successfully.

Figure 55 Tutorial: Log

- 8 Check the screens to see if it is the configuration file you want to load. If it is not, go through the steps above to check your configurations. If it is, click **Save** at the top right corner of the Web Configurator to save the configuration permanently.

Figure 56 Tutorial: Save

CHAPTER 7

Status

7.1 Overview

This chapter describes the screens for System Status and Neighbor Details.

7.1.1 What You Can Do

- Use the **Status** screen ([Section 7.2 on page 81](#)) to see the Switch's general device information, system status, and IP addresses. You can also display other status screens for more information.
- Use the **Neighbor** screen ([Section 7.2.1 on page 83](#)) to view a summary and manage Switch's neighbor devices.
- Use the **Neighbor Detail** screen ([Section 7.2.2 on page 85](#)) to view more detailed information on the Switch's neighbor devices.

7.2 Status

The **Status** screen displays when you log into the Switch or click **Status** at the top right corner of the Web Configurator. The **Status** screen displays general device information, system status, and its IP addresses.

Figure 57 Status

Status

Neighbor

Device Information

Device Type	XS3800-28	System Name	XS3800
Boot Version	V3.00 06/14/2019	System Location	
Firmware Version	V4.70(ABML0)b4 06/11/2020	System Time	01/01/2016 03:16:43
Hardware Version	V1.0	System Up Time	000 days,03 hours,16 mins,46 secs
MAC Address	00:19:ca:01:0b:0d	Login Timeout(mins)	55
Serial Number	xxxxxxxxxxxxxxxxxx	Registration MAC Address	00:19:ca:01:0b:0c
Hybrid Mode	Standalone QR Code	Cloud Control Status	Disconnected
Service Status	Not Licensed		
Detail			

IP Address Information

IPv4 Address	172.21.40.34	
Subnet Mask	255.255.252.0	
Default Gateway	172.21.43.254	IP Setup
IPv6 Global Unicast Address		
IPv6 Link-Local Address	fe80::219:caff:fe01:b0d	IPv6 configuration

Device Status and Quick Configuration

STP	Disable	Setting	SNMP Status (!)	Enable	Setting
Port Mirroring	Disable	Setting	802.1X Status	Disable	Setting
Storm Control	Disable	Setting	DHCP Relay	Disable	Setting
IGMP Snooping	Disable	Setting	IPSG	Disable	Setting
Stacking Status	Disable	Setting			

Quick Links

Port Status	Link Aggregation Status	MAC Table	Routing Table
IP Table	Diagnostic	System Log	Remote Access Control
Tech-support	VLAN Setup	Service Access Control	

The following table describes the labels in this screen.

Table 11 Status

LABEL	DESCRIPTION
Device Information	
Device Type	This field displays the model name of this Switch.
System Name	This field displays the name used to identify the Switch on any network.
Boot Version	This field displays the version number and date of the boot module that is currently on the Switch.
System Location	This field displays the geographic location of your Switch. You can change the setting in the Basic Setting > General Setup screen.
Firmware Version	This field displays the version number and date of the firmware the Switch is currently running.
System Time	This field displays the current date and time in the UAG. The format is mm-dd-yyyy hh:mm:ss.
Hardware Version	This field displays the hardware version number of the Switch. The integer is the generation number of the Switch series, and the decimal is the version of the hardware change. For example, V1.0 is a hardware version for the Switch where 1 identifies the first generation of the Switch series, and .0 is the first hardware change.
System Up Time	This field displays how long the Switch has been running since it last restarted or was turned on.
MAC Address	This field displays the MAC addresses of the Switch.
Login Timeout(mins)	This field displays how many minutes a management session can be left idle before the session times out. After it times out you have to log in with your password again.
Serial Number	This field displays the serial number of this Switch. The serial number is used for device tracking and control.

Table 11 Status (continued)

LABEL	DESCRIPTION
Registration MAC Address	This field displays the MAC address of the Switch that you must use to register at myZyxel.com or the NCC (Nebula Control Center).
Hybrid Mode	This field displays whether the Switch is in Standalone mode or Cloud mode. In Standalone mode you can see a link to a QR code to register the Switch to use NCC (Nebula Control Center).
Cloud Control Status	This field displays the registration and connection status between the Switch and the NCC (Nebula Control Center). In Standalone mode, the status will display Disconnected or Unregistered. In cloud mode the status will display Connected or Disconnected. Connected – The Switch is registered with and connected to the NCC. Disconnected – The Switch is not connected to the NCC. Unregistered – The Switch is not registered with the NCC.
Service Status	This field displays the service name (Basic Routing for example) if a service license is enabled at myZyxel or Not Licensed if the service license is not enabled. It also shows the amount of time that remains if you enabled a trial license (Basic Routing Trial 30 day(s) 0 hour(s) for example).
Detail	Click this link to go to the Basic Setting > System Info screen to check other detailed information, such as system resource usage and the Switch temperature, fan speeds or voltage.
IP Address Information	
IPv4 Address	This field displays the Switch's current IPv4 address.
Subnet Mask	This field displays the Switch's subnet mask.
Default Gateway	This field displays the IP address of the Switch's default gateway.
IP Setup	Click the link to go to the Basic Setting > IP Setup screen.
IPv6 Global Unicast Address	This field displays the Switch's IPv6 global unicast address
IPv6 Link-Local Address	This field displays the Switch's IPv6 link-local address.
IPv6 configuration	Click the link to go to the Basic Setting > IPv6 screen.
Device Status and Quick Configuration	This section shows whether a feature is enabled or not on the Switch. You can click a feature's Setting link to go to the configuration screen for the feature. Hover your cursor over a red exclamation mark to display information about the feature.
Quick Links	This section provides the shortcut link to a specific configuration screen.

7.2.1 Neighbor Screen

The **Neighbor** screen allows you to view a summary and manage the Switch's neighboring devices. It uses Layer Link Discovery Protocol (LLDP) to discover all neighbor devices connected to the Switch including non-Zyxel devices. You can use this screen to perform tasks on the neighboring devices like login.

This screen shows the neighboring device first recognized on an Ethernet port of the Switch. Device information is displayed in gray when the neighboring device is offline.

Click **Status > Neighbor** to see the following screen.

Figure 58 Status > Neighbor

Switch Neighbor						Status	Neighbor Detail
Port	Port Name	Link	System Name	IPv4	IPv6	☐	
1	--	Down	--	--	--	☐	
2	--	Down	--	--	--	☐	
3	--	Down	--	--	--	☐	
4	--	Down	--	--	--	☐	
5	--	Down	--	--	--	☐	
6	--	Down	--	--	--	☐	
7	--	Down	--	--	--	☐	
8	--	Down	--	--	--	☐	
9	--	Down	--	--	--	☐	
10	--	Down	--	--	--	☐	
11	--	Down	--	--	--	☐	
12	--	Down	--	--	--	☐	
13	--	Down	--	--	--	☐	
14	--	Down	--	--	--	☐	
15	--	Down	--	--	--	☐	
16	--	Down	--	--	--	☐	
17	--	Down	--	--	--	☐	
18	--	1G/F	--	--	--	☐	
19	--	Down	--	--	--	☐	
20	--	100M/F	12A3_84	0.0.0.0	--	☐	
21	--	Down	--	--	--	☐	
22	--	Down	--	--	--	☐	
23	--	Down	--	--	--	☐	
24	--	Down	--	--	--	☐	
25	--	Down	--	--	--	☐	
26	--	Down	--	--	--	☐	
27	--	Down	--	--	--	☐	
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7.2.2 Neighbor Detail

Use this screen to view detailed information about the neighboring devices. Device information is displayed in gray when the neighboring device is currently offline.

Up to 10 neighboring device records per Ethernet port can be retained in this screen even when the devices are offline. When the maximum number of neighboring device records per Ethernet port is reached, new device records automatically overwrite existing offline device records, starting with the oldest existing offline device record first.

Click the **Neighbor Detail** link in the **Status > Neighbor** screen to see the following screen.

Figure 59 Status > Neighbor > Neighbor Detail

Switch Neighbor Detail

Switch Neighbor

Local Port 1			
Desc.	--	Link	Down
Local Port 2			
Desc.	--	Link	Down
Local Port 3			
Desc.	--	Link	Down
Local Port 4			
Desc.	--	Link	Down
Local Port 5			
Desc.	--	Link	Down
Local Port 6			
Desc.	--	Link	Down
Local Port 7			
Desc.	--	Link	Down
Local Port 8			
Desc.	--	Link	Down
Local Port 9			
Desc.	--	Link	Down
Local Port 10			
Desc.	--	Link	Down
Local Port 11			
Desc.	--	Link	Down
Local Port 12			
Desc.	--	Link	Down
Local Port 13			
Desc.	--	Link	Down
Local Port 14			
Desc.	--	Link	Down
Local Port 15			
Desc.	--	Link	Down
Local Port 16			
Desc.	--	Link	Down
Local Port 17			
Desc.	--	Link	Down
Local Port 18			
Desc.	--	Link	1G/F

Remote

System Name	--	Model	--	Firmware	--	MAC	dc:4a:3e:40:ec:5f
IPv4	--		IPv6	--			
Port dc:4a:3e:40:ec:5f							

The following table describes the fields in the above screen.

Table 13 Status > Neighbor > Neighbor Detail

LABEL	DESCRIPTION
Local Port	This shows the port of the Switch, on which the neighboring device is discovered.
Desc.	This shows the port description of the Switch.
Link	This shows the speed (either 10M for 10 Mbps, 100M for 100 Mbps, or 1G for 1 Gbps) and the duplex (F for full duplex or H for half). This field displays Down if the port is not connected to any device.
Remote	

Table 13 Status > Neighbor > Neighbor Detail (continued)

LABEL	DESCRIPTION
System Name	This shows the system name of the neighbor device.
Model	This shows the model name of the neighbor device. This field will show "-" for devices that do not support the ZON utility.
Firmware	This shows the firmware version of the neighbor device. This field will show "-" for devices that do not support the ZON utility.
MAC	This shows the MAC address of the neighbor device.
IPv4	This shows the IPv4 address of the neighbor device. The IPv4 address is a hyper link that you can click to log into and manage the neighbor device through its Web Configurator.
IPv6	This shows the IPv6 address of the neighbor device. The IPv6 address is a hyper link that you can click to log into and manage the neighbor device through its Web Configurator.
Port	This show the number of the neighbor device's port which is connected to the Switch.
Desc.	This shows the description of the neighbor device's port which is connected to the Switch.
Location	This shows the geographic location of the neighbor device. This field will show "-" for devices that do not support the ZON utility.

CHAPTER 8

Basic Setting

8.1 Overview

This chapter describes how to configure the **System Info**, **General Setup**, **Switch Setup**, **IP Setup**, **Port Setup**, **Interface Setup**, **IPv6**, **Loopback Interface**, **Stacking**, and **Cloud Management** screens.

8.1.1 What You Can Do

- Use the **System Info** screen ([Section 8.2 on page 87](#)) to check the firmware version number and monitor the Switch temperature.
- Use the **General Setup** screen ([Section 8.3 on page 92](#)) to configure general settings such as the system name and time.
- Use the **Switch Setup** screen ([Section 8.5 on page 94](#)) to choose your VLAN type and assign priorities to queues.
- Use the **IP Setup** screen ([Section 8.6 on page 96](#)) to configure the Switch IP address, default gateway device, management VLAN ID, and proxy server.
- Use the **Port Setup** screen ([Section 8.7 on page 104](#)) to configure Switch port settings.
- Use the **Interface Setup** screens ([Section 8.8 on page 107](#)) to configure Switch interface type and interface ID settings.
- Use the **IPv6** screens ([Section 8.9 on page 108](#)) to view IPv6 status and IPv6 configuration.
- Use the **Loopback Interface** screen ([Section 8.10 on page 122](#)) to configure the IPv4 loopback interface settings on the Switch.
- Use the **Stacking** screen ([Section 8.11 on page 123](#)) to view and configure stacking system for the Switch.
- Use the **Cloud Management** screen ([Section 8.12 on page 129](#)) to display links to **Nebula Control Center Discovery** and **Nebula Switch Registration** screens.

8.2 System Information

In the navigation panel, click **Basic Setting** > **System Info** to display the screen as shown. Use this screen to view general system information.

Figure 60 Basic Setting > System Info (Standalone Mode)

System Info					
System Name	V8000				
Product Model	V8000-28				
ZyNOS F/W Version	V4.20180111-015-1.00/00/0010				
Ethernet Address	bc:99:11:d8:3a:a5				
CPU Utilization					
Current (%)	4.53				
Memory Utilization					
Name	Total (byte)	Used (byte)	Utilization (%)		
common	63940992	12624272	19		
Hardware Monitor					
Temperature Unit: C					
Temperature (C)	Current	MAX	MIN	Threshold	Status
CPU/MAC	41.0	42.0	39.0	76.0	Normal
BOARD	42.0	43.0	41.0	113.0	Normal
PHY	42.0	42.0	40.0	99.0	Normal
FAN Speed (RPM)	Current	MAX	MIN	Threshold	Status
FAN1	6498	6529	6467	500	Normal
FAN2	6345	6375	6315	500	Normal
FAN3	6286	6286	6228	500	Normal
Voltage (V)	Current	MAX	MIN	Threshold	Status
1.88V_84887	1.920	1.920	1.920	+4%/-4%	Normal
1V_84888	1.013	1.013	1.013	+5%/-5%	Normal
1.88V	1.907	1.920	1.907	+4%/-4%	Normal
1.0V	1.025	1.025	1.025	+5%/-5%	Normal
1.8V	1.803	1.803	1.803	+6%/-6%	Normal
1.0V_H3	1.025	1.025	1.025	+5%/-5%	Normal
1V5_DDR	1.490	1.490	1.490	+6%/-6%	Normal
VTT_DDR	0.744	0.744	0.744	+5%/-5%	Normal
3.3V	3.274	3.274	3.274	+6%/-6%	Normal
2.5V	2.539	2.565	2.539	+6%/-6%	Normal
12V	11.656	11.656	11.656	+10%/-20%	Normal
Power Source					Status
PSU_1					Active
PSU_2					N/A

Figure 61 Basic Setting > System Info (Stacking Mode)

System Info

System Name	VS2000
Product Model	VS2000-20
ZyNOS F/W Version	V4.00(10/11/2015) 01/11/2015/0010
Ethernet Address	bc:99:11:d8:3a:a5

CPU Utilization

Current (%)	7.98

Memory Utilization

Name	Total (byte)	Used (byte)	Utilization (%)
common	63940992	19704288	30

Hardware Status

Slot	Name	Voltage	Temperature	Fan	Power Source
1	VS2000-20	Normal	Normal	Normal	Normal

The following table describes the labels in this screen.

Table 14 Basic Setting > System Info

LABEL	DESCRIPTION
System Name	This field displays the descriptive name of the Switch for identification purposes.
Product Model	This field displays the product model of the Switch. Use this information when searching for firmware upgrade or looking for other support information in the website.
ZyNOS F/W Version	This field displays the version number of the Switch 's current firmware including the date created.
Ethernet Address	This field refers to the Ethernet MAC (Media Access Control) address of the Switch.
CPU Utilization	CPU utilization quantifies how busy the system is. Current (%) displays the current percentage of CPU utilization.
Memory Utilization	Memory utilization shows how much DRAM memory is available and in use. It also displays the current percentage of memory utilization.
Name	This field displays the name of the memory pool.
Total (byte)	This field displays the total number of bytes in this memory pool.
Used (byte)	This field displays the number of bytes being used in this memory pool.
Utilization (%)	This field displays the percentage (%) of memory being used in this memory pool.
Hardware Monitor	
Temperature Unit	The Switch has temperature sensors that are capable of detecting and reporting if the temperature rises above the threshold. You may choose the temperature unit (Centigrade or Fahrenheit) in this field.
Temperature (C/F)	BOARD / MAC and PHY/POWER refers to the location of the temperature sensor on the Switch printed circuit board.
Current	This shows the current temperature at this sensor.
MAX	This field displays the maximum temperature measured at this sensor.
MIN	This field displays the minimum temperature measured at this sensor.
Threshold	This field displays the upper temperature limit at this sensor.
Status	This field displays Normal for temperatures below the threshold and Error for those above.

Table 14 Basic Setting > System Info (continued)

LABEL	DESCRIPTION
FAN Speed (RPM)	A properly functioning fan is an essential component (along with a sufficiently ventilated, cool operating environment) in order for the device to stay within the temperature threshold. Each fan has a sensor that is capable of detecting and reporting if the fan speed falls below the threshold shown.
Current	This field displays this fan's current speed in Revolutions Per Minute (RPM).
MAX	This field displays this fan's maximum speed measured in Revolutions Per Minute (RPM).
MIN	This field displays this fan's minimum speed measured in Revolutions Per Minute (RPM). "<41" is displayed for speeds too small to measure (under 2000 RPM).
Threshold	This field displays the minimum speed at which a normal fan should work.
Status	Normal indicates that this fan is functioning above the minimum speed. Error indicates that this fan is functioning below the minimum speed.
Voltage(V)	The power supply for each voltage has a sensor that is capable of detecting and reporting if the voltage falls out of the tolerance range.
Current	This is the current voltage reading.
MAX	This field displays the maximum voltage measured at this point.
MIN	This field displays the minimum voltage measured at this point.
Threshold	This field displays the percentage tolerance of the voltage with which the Switch still works.
Status	Normal indicates that the voltage is within an acceptable operating range at this point; otherwise Error is displayed.
Power Source	This field lists the power supply modules installed in the Switch. PSU_1 is PWR1 , and PSU_2 is PWR2 .
Status	Active indicates the Switch is currently operating from the power source to which the power module is connected. Standby indicates the power module is connected to a power source but the Switch is NOT operating from it. N/A is displayed when the power module is not connected to a power source and there is no available power.
Hardware Status (Stacking Mode)	
Slot	This number identifies the Switch in the stack. Click the number to see more detailed information on the Switch.
Name	This is the system name of the Switch in the stack.
Voltage	This shows if the power supply voltage sensor is within normal tolerance range.
Temperature	This shows if the temperature sensors on the Switch printed circuit board are within normal tolerance range.
Fan	This shows if the fan sensors are within normal tolerance range.
Power Source	This shows if the Switch is properly operating from the connected power source.

8.2.1 System Information Stacking Hardware Monitor

Click a slot number in the **System Information** screen to display more detailed hardware information on a Switch.

Figure 62 Basic Setting > System Info > Hardware Monitor (Stacking Mode)

Hardware Monitor					System Info
SLOT 1					
Temperature Unit C					
Temperature (C)	Current	MAX	MIN	Threshold	Status
1/CPU/MAC	41.0	42.0	40.0	76.0	Normal
1/BOARD	42.0	43.0	41.0	113.0	Normal
1/PHY	42.0	42.0	41.0	99.0	Normal
FAN Speed (RPM)	Current	MAX	MIN	Threshold	Status
1/FAN1	6529	6529	6498	500	Normal
1/FAN2	6345	6375	6315	500	Normal
1/FAN3	6257	6286	6228	500	Normal
Voltage (V)	Current	MAX	MIN	Threshold	Status
1/1.88V_	1.920	1.920	1.920	+4%/-4%	Normal
1/1V_848	1.013	1.013	1.013	+5%/-5%	Normal
1/1.88V	1.907	1.920	1.907	+4%/-4%	Normal
1/1.0V	1.025	1.025	1.025	+5%/-5%	Normal
1/1.8V	1.803	1.803	1.803	+6%/-6%	Normal
1/1.0V_H	1.025	1.025	1.025	+5%/-5%	Normal
1/1V5_DD	1.490	1.490	1.490	+6%/-6%	Normal
1/VTT_DD	0.744	0.744	0.744	+5%/-5%	Normal
1/3.3V	3.274	3.274	3.274	+6%/-6%	Normal
1/2.5V	2.565	2.565	2.539	+6%/-6%	Normal
1/12V	11.656	11.656	11.656	+10%/-20%	Normal
Power Source					Status
1/PSU_1					Active
1/PSU_2					N/A

The following table describes the labels in this screen.

Table 15 Basic Setting > System Info > Hardware Monitor (Stacking Mode)

LABEL	DESCRIPTION
SLOT	This number identifies the Switch in the stack.
Temperature Unit	The Switch has temperature sensors that are capable of detecting and reporting if the temperature rises above the threshold. You may choose the temperature unit (Centigrade or Fahrenheit) in this field.
Temperature	BOARD , PHY , CPU and MAC refer to the location of the temperature sensors on the Switch printed circuit board.
Current	This shows the current temperature at this sensor.
MAX	This field displays the maximum temperature measured at this sensor.
MIN	This field displays the minimum temperature measured at this sensor.
Threshold	This field displays the upper temperature limit at this sensor.
Status	This field displays Normal for temperatures below the threshold and Error for those above.
Fan Speed (RPM)	A properly functioning fan is an essential component (along with a sufficiently ventilated, cool operating environment) in order for the device to stay within the temperature threshold. Each fan has a sensor that is capable of detecting and reporting if the fan speed falls below the threshold shown.
Current	This field displays this fan's current speed in Revolutions Per Minute (RPM).
MAX	This field displays this fan's maximum speed measured in RPM.
MIN	This field displays this fan's minimum speed measured in RPM. "<41" is displayed for speeds too small to measure (under 2000 RPM).
Threshold	This field displays the minimum speed at which a normal fan should work.

Table 15 Basic Setting > System Info > Hardware Monitor (Stacking Mode) (continued)

LABEL	DESCRIPTION
Status	Normal indicates that this fan is functioning above the minimum speed. Error indicates that this fan is functioning below the minimum speed.
Voltage (V)	The power supply for each voltage has a sensor that is capable of detecting and reporting if the voltage falls out of the tolerance range.
Current	This is the current voltage reading.
MAX	This field displays the maximum voltage measured at this point.
MIN	This field displays the minimum voltage measured at this point.
Threshold	This field displays the percentage tolerance of the voltage with which the Switch still works.
Status	Normal indicates that the voltage is within an acceptable operating range at this point; otherwise Error is displayed.
Power Source	This field lists which power sources can be connected.
Status	Active indicates the Switch is currently operating from the power source. Otherwise, N/A is displayed.

8.3 General Setup

Use this screen to configure general settings such as the system name and time. Click **Basic Setting > General Setup** in the navigation panel to display the screen as shown.

Figure 63 Basic Setting > General Setup

General Setup

System Name

Location

Contact Person's Name

Use Time Server when Bootup

NTP(RFC-1305) ▾

Time Server IP Address

1.pool.ntp.org

Time Server Sync Interval

1440 minutes

Current Time

11 : 00 : 46 UTC+00:00

New Time (hh:mm:ss)

11 : 00 : 46

Current Date

2016 - 01 - 01

New Date (yyyy-mm-dd)

2016 - 01 - 01

Time Zone

UTC ▾

Daylight Saving Time

☐

Start Date

First ▾ Sunday ▾ of January ▾ at 0:00 ▾

End Date

First ▾ Sunday ▾ of January ▾ at 0:00 ▾

Apply

Cancel

The following table describes the labels in this screen.

Table 16 Basic Setting > General Setup

LABEL	DESCRIPTION
System Name	Choose a descriptive name for identification purposes. This name consists of up to 64 printable characters; spaces are allowed.
Location	Enter the geographic location of your Switch. You can use up to 32 printable ASCII characters; spaces are allowed.
Contact Person's Name	Enter the name of the person in charge of this Switch. You can use up to 32 printable ASCII characters; spaces are allowed.
Use Time Server when Bootup	Enter the time service protocol that your time server uses. Not all time servers support all protocols, so you may have to use trial and error to find a protocol that works. The main differences between them are the time format. When you select the Daytime (RFC 867) format, the Switch displays the day, month, year and time with no time zone adjustment. When you use this format it is recommended that you use a Daytime timeserver within your geographical time zone. Time (RFC-868) format displays a 4-byte integer giving the total number of seconds since 1970/1/1 at 0:0:0. NTP (RFC-1305) is similar to Time (RFC-868). None is the default value. Enter the time manually. Each time you turn on the Switch, the time and date will be reset to 1970-1-1 0:0:0.
Time Server IP Address	Enter the IP address or domain name of your timeserver. The Switch searches for the timeserver for up to 60 seconds.
Time Server Sync Interval	Enter the period in minutes between each time server synchronization. The Switch checks the time server after every synchronization interval.
Current Time	This field displays the time you open this menu (or refresh the menu).
New Time (hh:min:ss)	Enter the new time in hour, minute and second format. The new time then appears in the Current Time field after you click Apply .
Current Date	This field displays the date you open this menu.
New Date (yyyy-mm-dd)	Enter the new date in year, month and day format. The new date then appears in the Current Date field after you click Apply .
Time Zone	Select the time difference between UTC (Universal Time Coordinated, formerly known as GMT, Greenwich Mean Time) and your time zone from the drop-down list box.
Daylight Saving Time	Daylight saving 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. Select this option if you use Daylight Saving Time.
Start Date	Configure the day and time when Daylight Saving Time starts if you selected Daylight Saving Time. The time is displayed in the 24 hour format. Here are a couple of examples: 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 you would select Second, Sunday, March and 2:00. 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 select Last, Sunday, March and the last field depends on your time zone. In Germany for instance, you would select 2:00 because Germany's time zone is one hour ahead of GMT or UTC (GMT+1).

Table 16 Basic Setting > General Setup (continued)

LABEL	DESCRIPTION
End Date	Configure the day and time when Daylight Saving Time ends if you selected Daylight Saving Time. The time field uses the 24 hour format. Here are a couple of examples: 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 select First, Sunday, November and 2:00. 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 select Last, Sunday, October and the last field depends on your time zone. In Germany for instance, you would select 2:00 because Germany's time zone is one hour ahead of GMT or UTC (GMT+1).
Apply	Click Apply to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to begin configuring this screen afresh.

8.4 Introduction to VLANs

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.

In MTU (Multi-Tenant Unit) 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.

Note: VLAN is unidirectional; it only governs outgoing traffic.

8.5 Switch Setup

Click **Basic Setting > Switch Setup** in the navigation panel to display the screen as shown. The VLAN setup screens change depending on whether you choose **802.1Q** or **Port Based** in the **VLAN Type** field in this screen (in Standalone mode).

Figure 64 Basic Setting Switch Setup (Standalone Mode)

Switch Setup			
VLAN Type	☒ 802.1Q ☐ Port Based		
Bridge Control Protocol Transparency	Active	☐	
MAC Address Learning	Aging Time	300	seconds
ARP Aging Time	Aging Time	300	seconds
GARP Timer	Join Timer	200	milliseconds
	Leave Timer	600	milliseconds
	Leave All Timer	10000	milliseconds
Priority Queue Assignment	Priority7	7	▼
	Priority6	6	▼
	Priority5	5	▼
	Priority4	4	▼
	Priority3	3	▼
	Priority2	1	▼
	Priority1	0	▼
	Priority0	2	▼
Apply Cancel			

Figure 65 Basic Setting > Switch Setup (Stacking Mode)

Switch Setup			
Bridge Control Protocol Transparency	Active	☐	
MAC Address Learning	Aging Time	300	seconds
ARP Aging Time	Aging Time	300	seconds
GARP Timer	Join Timer	200	milliseconds
	Leave Timer	600	milliseconds
	Leave All Timer	10000	milliseconds
Priority Queue Assignment	Priority7	5	▼
	Priority6	5	▼
	Priority5	4	▼
	Priority4	3	▼
	Priority3	2	▼
	Priority2	0	▼
	Priority1	0	▼
	Priority0	1	▼
Apply Cancel			

The following table describes the labels in this screen.

Table 17 Basic Setting > Switch Setup

LABEL	DESCRIPTION
VLAN Type (Standalone mode only)	Choose 802.1Q or Port Based . The VLAN Setup screen changes depending on whether you choose 802.1Q VLAN type or Port Based VLAN type in this screen. The Switch does not have port-based VLAN available in stacking mode (Active is enabled in Basic Setting > Stacking > Configuration), so this field does not display in stacking mode.
Bridge Control Protocol Transparency	Select Active to allow the Switch to handle bridging control protocols (STP, for example). You also need to define how to treat a BPDU in the Port Setup screen.
MAC Address Learning	MAC address learning reduces outgoing traffic broadcasts. For MAC address learning to occur on a port, the port must be active.
Aging Time	Enter a time from 10 to 1000000 seconds. This is how long all dynamically learned MAC addresses remain in the MAC address table before they age out (and must be relearned).

Table 17 Basic Setting > Switch Setup (continued)

LABEL	DESCRIPTION
ARP Aging Time	
Aging Time	Enter a time from 60 to 1000000 seconds. This is how long dynamically learned ARP entries remain in the ARP table before they age out (and must be relearned). The setting here applies to ARP entries which are newly added in the ARP table after you click Apply .
GARP Timer: Switches join VLANs by making a declaration. A declaration is made by issuing a Join message using GARP. Declarations are withdrawn by issuing a Leave message. A Leave All message terminates all registrations. GARP timers set declaration timeout values. See the chapter on VLAN setup for more background information.	
Join Timer	Join Timer sets the duration of the Join Period timer for GVRP in milliseconds. Each port has a Join Period timer. The allowed Join Time range is between 100 and 65535 milliseconds; the default is 200 milliseconds. See the chapter on VLAN setup for more background information.
Leave Timer	Leave Time sets the duration of the Leave Period timer for GVRP in milliseconds. Each port has a single Leave Period timer. Leave Time must be two times larger than Join Timer ; the default is 600 milliseconds.
Leave All Timer	Leave All Timer sets the duration of the Leave All Period timer for GVRP in milliseconds. Each port has a single Leave All Period timer. Leave All Timer must be larger than Leave Timer.
Priority Queue Assignment IEEE 802.1p defines up to eight separate traffic types by inserting a tag into a MAC-layer frame that contains bits to define class of service. Frames without an explicit priority tag are given the default priority of the ingress port. Use the next fields to configure the priority level-to-physical queue mapping. The Switch has eight physical queues that you can map to the eight priority levels. On the Switch, traffic assigned to higher index queues gets through faster while traffic in lower index queues is dropped if the network is congested. Priority Level (The following descriptions are based on the traffic types defined in the IEEE 802.1d standard (which incorporates the 802.1p). To map a priority level to a physical queue, select a physical queue from the drop-down menu on the right.	
Priority 7	Typically used for network control traffic such as router configuration messages.
Priority 6	Typically used for voice traffic that is especially sensitive to jitter (jitter is the variations in delay).
Priority 5	Typically used for video that consumes high bandwidth and is sensitive to jitter.
Priority 4	Typically used for controlled load, latency-sensitive traffic such as SNA (Systems Network Architecture) transactions.
Priority 3	Typically used for "excellent effort" or better than best effort and would include important business traffic that can tolerate some delay.
Priority 2	This is for "spare bandwidth".
Priority 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.
Priority 0	Typically used for best-effort traffic.
Apply	Click Apply to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to begin configuring this screen afresh.

8.6 IP Setup

Use the **IP Setup** screen to configure the default gateway device, the default domain name server and add IP domains.

8.6.1 IP Interfaces

The Switch needs an IP address for it to be managed over the network. When the Switch (in Standalone mode) fails to obtain an IP address from a DHCP server, the static IP address 192.168.1.1 will be automatically added and used as the Switch's management IP address.

On the Switch, an IP address is not bound to any physical ports. Since each IP address on the Switch must be in a separate subnet, the configured IP address is also known as IP interface (or routing domain). In addition, this allows routing between subnets based on the IP address without additional routers.

You can configure multiple routing domains on the same VLAN as long as the IP address ranges for the domains do not overlap. To change the IP address of the Switch in a routing domain, simply add a new routing domain entry with a different IP address in the same subnet.

You can configure up to 128 IP domains which are used to access and manage the Switch from the ports belonging to the pre-defined VLANs.

Note: You must configure a VLAN first. Each VLAN can have multiple management IP addresses, and you can log into the Switch via different management IP addresses simultaneously.

8.6.2 IP Status

Figure 66 Basic Setting > IP Status

IP Status

Domain Name Server

Source

172.21.10.1

DHCPv4

IP Configuration

IP Interface

Index	IP Address	IP Subnet Mask	VID	Type	Action	
1	172.21.40.3	255.255.252.0	1	DHCP	Renew	Release

The following table describes the labels in this screen.

Table 18 Basic Setting > IP Status

LABEL	DESCRIPTION
IP Status	
Domain Name Server	This field displays the IP address of the DNS server.
Source	This field displays whether the DNS server address is configured manually (Static) or obtained automatically using DHCPv4 .
IP Interface	
Index	This field displays the index number of an entry.
IP Address	This field displays the IP address of the Switch in the IP domain.
IP Subnet Mask	This field displays the subnet mask of the Switch in the IP domain.
VID	This field displays the VLAN identification number of the IP domain on the Switch.
Type	This shows whether this IP address is dynamically assigned from a DHCP server or manually assigned (Static).

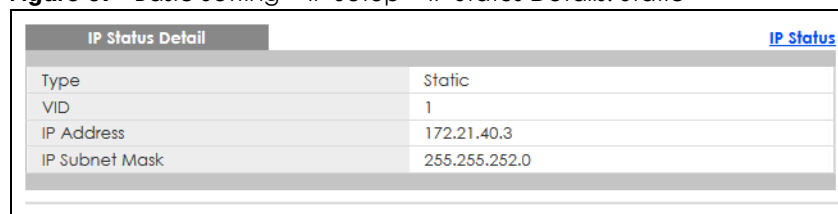
Table 18 Basic Setting > IP Status (continued)

LABEL	DESCRIPTION
Renew	Click this to renew the dynamic IP address.
Release	Click this to release the dynamic IP address.

8.6.3 IP Status Details

Use this screen to view IP status details. Click a number in the **Index** column in the **IP Status** screen to display the screen as shown next.

Figure 67 Basic Setting > IP Setup > IP Status Details: Static



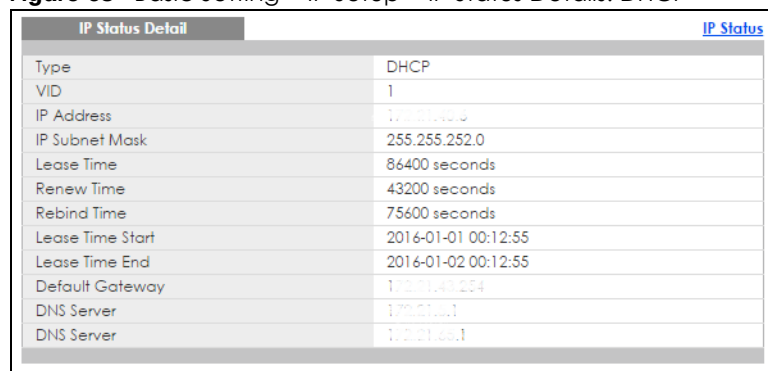
IP Status Detail		IP Status
Type	Static	
VID	1	
IP Address	172.21.40.3	
IP Subnet Mask	255.255.252.0	

The following table describes the labels in this screen.

Table 19 Basic Setting > IP Setup > IP Status Details: Static

LABEL	DESCRIPTION
Type	This shows the IP address is manually assigned (Static).
VID	This is the VLAN identification number to which an IP routing domain belongs.
IP Address	This is the IP address of your Switch in dotted decimal notation for example 192.168.1.1.
IP Subnet Mask	This is the IP subnet mask of your Switch in dotted decimal notation for example 255.255.255.0.

Figure 68 Basic Setting > IP Setup > IP Status Details: DHCP



IP Status Detail		IP Status
Type	DHCP	
VID	1	
IP Address	172.21.40.3	
IP Subnet Mask	255.255.252.0	
Lease Time	86400 seconds	
Renew Time	43200 seconds	
Rebind Time	75600 seconds	
Lease Time Start	2016-01-01 00:12:55	
Lease Time End	2016-01-02 00:12:55	
Default Gateway	172.21.40.254	
DNS Server	172.21.40.1	
DNS Server	172.21.40.1	

The following table describes the labels in this screen.

Table 20 Basic Setting > IP Setup > IP Status Details: DHCP

LABEL	DESCRIPTION
Type	This shows the IP address is dynamically assigned from a DHCP server (DHCP).
VID	This is the VLAN identification number to which an IP routing domain belongs.
IP Address	This is the IP address of your Switch in dotted decimal notation for example 192.168.1.1.
IP Subnet Mask	This is the IP subnet mask of your Switch in dotted decimal notation for example 255.255.255.0.

Table 20 Basic Setting > IP Setup > IP Status Details: DHCP (continued)

LABEL	DESCRIPTION
Lease Time	This displays the length of time in seconds that this interface can use the current dynamic IP address from the DHCP server.
Renew Time	This displays the length of time from the lease start that the Switch will request to renew its current dynamic IP address from the DHCP server.
Rebind Time	This displays the length of time from the lease start that the Switch will request to get any dynamic IP address from the DHCP server.
Lease Time Start	This displays the date and time that the current dynamic IP address assignment from the DHCP server began. You should configure date and time in Basic Setting > General Setup .
Lease Time End	This displays the date and time that the current dynamic IP address assignment from the DHCP server will end. You should configure date and time in Basic Setting > General Setup .
Default Gateway	This displays the IP address of the default gateway assigned by the DHCP server. 0.0.0.0 means no gateway is assigned.
DNS Server	This displays the IP address of the primary and secondary DNS servers assigned by the DHCP server. 0.0.0.0 means no DNS server is assigned.

8.6.4 IP Configuration

Use this screen to configure the default gateway device, the default domain name server and add IP domains.

Figure 69 Basic Setting > IP Setup > IP Configuration

IP Configuration [IP Status](#) [Network Proxy Configuration](#)

Default Gateway: 0.0.0.0

Domain Name Server 1:

Domain Name Server 2:

Default Management: ☒ In-band ☐ Out-of-band

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

Out-of-band Management IP Address

IP Address: 192.168.0.1

IP Subnet Mask: 255.255.255.0

Default Gateway: 0.0.0.0

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

IP Interface

IP Address: ☒ DHCP Client

Option-60: ☒

Class-ID: Zyxel Corporation

☐ Static IP Address

IP Address: 0.0.0.0

IP Subnet Mask: 0.0.0.0

VID:

[Add](#) [Cancel](#)

Index	IP Address	IP Subnet Mask	VID	Type	
1	172.21.40.34	255.255.252.0	1	DHCP	☐

[Delete](#) [Cancel](#)

The following table describes the labels in this screen.

Table 21 Basic Setting > IP Setup > IP Configuration

LABEL	DESCRIPTION
Domain Name Server 1/2	Enter a domain name server IPv4 address in order to be able to use a domain name instead of an IP address.
Default Management IP Address	
Use these fields to create or edit IP routing domains on the Switch.	
DHCP Client	Select this option if you have a DHCP server that can assign the Switch an IP address, subnet mask, a default gateway IP address and a domain name server IP address automatically.
Option-60	DHCP Option 60 is used by the Switch for identification to the DHCP server using the VCI (Vendor Class Identifier) on the DHCP server. The Switch adds it in the initial DHCP discovery message that a DHCP client broadcasts in search of an IP address. The DHCP server can assign different IP addresses or options to clients with the specific VCI or reject the request from clients without the specific VCI. Select this and enter the device identity you want the Switch to add in the DHCP discovery frames that go to the DHCP server. This allows the Switch to identify itself to the DHCP server.
Class-ID	Type a string of up to 32 characters to identify this Switch to the DHCP server. For example, Zyxel-TW.

Table 21 Basic Setting > IP Setup > IP Configuration (continued)

LABEL	DESCRIPTION
Static IP Address	Select this option if you do not have a DHCP server or if you wish to assign static IP address information to the Switch. You need to fill in the following fields when you select this option.
IP Address	Enter the IP address of your Switch in dotted decimal notation, for example, 172.21.40.x. This is the IP address of the Switch in an IP routing domain.
IP Subnet Mask	Enter the IP subnet mask of an IP routing domain in dotted decimal notation, for example, 255.255.252.0.
Default Gateway	Type the IP address of the default outgoing gateway in dotted decimal notation, for example 172.21.43.254.
VID	Enter the VLAN identification number to which an IP routing domain belongs.
Apply	Click Apply to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to reset the fields to your previous configuration.
Management IP Address	
Use these fields to set the settings for the management port.	
IP Address	Enter the out-of-band management IP address of your Switch in dotted decimal notation. For example, 192.168.0.1.
IP Subnet Mask	Enter the IP subnet mask of your Switch in dotted decimal notation, for example, 255.255.255.0.
VID	Enter the VLAN identification number to which an IP routing domain belongs.
Default Gateway	Enter the IP address of the default outgoing gateway in dotted decimal notation, for example, 192.168.0.254.
Add	Click this to create a new entry. This saves your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to reset the fields to your previous configuration.
Index	This field displays the index number of an entry.
IP Address	This field displays IP address of the Switch in the IP domain.
IP Subnet Mask	This field displays the subnet mask of the Switch in the IP domain.
VID	This field displays the VLAN identification number of the IP domain on the Switch.
Default Gateway	This field displays the IP address of the default outgoing gateway in dotted decimal notation.
	Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries.
Delete	Click Delete to remove the selected entry from the summary table. Note: Deleting all IP subnets locks you out of the Switch.
Cancel	Click Cancel to clear the check boxes.

The following table describes the labels in this screen.

Table 22 Basic Setting > IP Setup > IP Configuration

LABEL	DESCRIPTION
Default Gateway	Type the IP address of the default outgoing gateway in dotted decimal notation, for example 192.168.1.254.
Domain Name Server 1/2	Enter a domain name server IPv4 address in order to be able to use a domain name instead of an IP address.
Default Management	Specify which traffic flow (In-Band or Out-of-band) the Switch is to send packets originating from itself (such as SNMP traps) or packets with unknown source. Select Out-of-band to have the Switch send the packets to the management port labeled MGMT . This means that devices connected to the other ports do not receive these packets. Select In-Band to have the Switch send the packets to all ports except the management port (labeled MGMT) to which connected devices do not receive these packets.
Apply	Click Apply to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to reset the fields to your previous configuration.
Out-of-band Management IP Address	
Use these fields to set the settings for the out-of-band management port.	
IP Address	Enter the out-of-band management IP address of your Switch in dotted decimal notation. For example, 192.168.0.1.
IP Subnet Mask	Enter the IP subnet mask of your Switch in dotted decimal notation, for example, 255.255.255.0.
Default Gateway	Enter the IP address of the default outgoing gateway in dotted decimal notation, for example, 192.168.0.254.
Apply	Click Apply to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to reset the fields to your previous configuration.
IP Interface	
Use these fields to create or edit IP routing domains on the Switch.	
DHCP Client	Select this option if you have a DHCP server that can assign the Switch an IP address, subnet mask, a default gateway IP address and a domain name server IP address automatically.
Option-60	DHCP Option 60 is used by the Switch for identification to the DHCP server using the VCI (Vendor Class Identifier) on the DHCP server. The Switch adds it in the initial DHCP discovery message that a DHCP client broadcasts in search of an IP address. The DHCP server can assign different IP addresses or options to clients with the specific VCI or reject the request from clients without the specific VCI. Select this and enter the device identity you want the Switch to add in the DHCP discovery frames that go to the DHCP server. This allows the Switch to identify itself to the DHCP server.
Class-ID	Type a string of up to 32 characters to identify this Switch to the DHCP server. For example, Zyxel-TW.
Static IP Address	Select this option if you do not have a DHCP server or if you wish to assign static IP address information to the Switch. You need to fill in the following fields when you select this option.
IP Address	Enter the IP address of your Switch in dotted decimal notation, for example, 192.168.1.1. This is the IP address of the Switch in an IP routing domain.
IP Subnet Mask	Enter the IP subnet mask of an IP routing domain in dotted decimal notation, for example, 255.255.255.0.
VID	Enter the VLAN identification number to which an IP routing domain belongs.

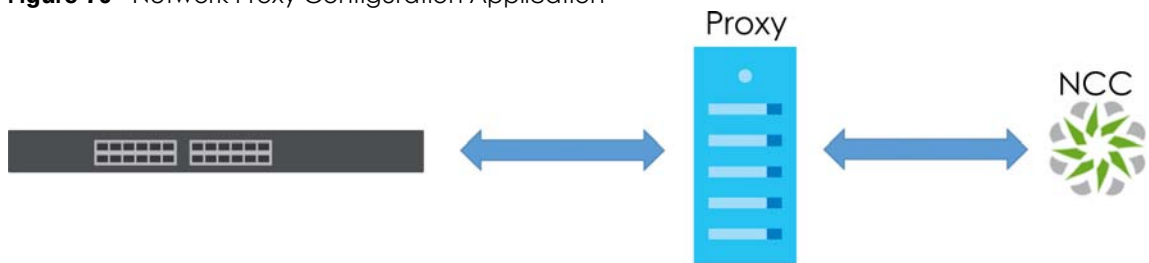
Table 22 Basic Setting > IP Setup > IP Configuration (continued)

LABEL	DESCRIPTION
Add	Click this to create a new entry. This saves your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to reset the fields to your previous configuration.
Index	This field displays the index number of an entry.
IP Address	This field displays the IP address of the Switch in the IP domain.
IP Subnet Mask	This field displays the subnet mask of the Switch in the IP domain.
VID	This field displays the VLAN identification number of the IP domain on the Switch.
Type	This field displays the type of IP address status.
	Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries.
Delete	Click Delete to remove the selected entry from the summary table. Note: Deleting all IP subnets locks you out of the Switch.
Cancel	Click Cancel to clear the check boxes.

8.6.5 Network Proxy Configuration

The proxy server of an organization may prohibit communication between the Switch and NCC (Nebula Control Center) ([Section 8.12 on page 129](#)). Use this screen to enable communication between the Switch and NCC through the proxy server.

Figure 70 Network Proxy Configuration Application



As of this writing, this setting only allows communication between the Switch and the NCC.

Figure 71 Basic Setting > IP Setup > IP Configuration > Network Proxy Configuration

Network Proxy Configuration		IP Configuration
Active	☐	
Server		
Port		
Authentication	☐	
Username		
Password		
Apply Cancel		

The following table describes the labels in this screen.

Table 23 Basic Setting > IP Setup > IP Configuration > Network Proxy Configuration

LABEL	DESCRIPTION
Active	Select this option to enable communication between the Switch and NCC through a proxy server.
Server	Enter the IP address (dotted decimal notation) or host name of the proxy server. When entering the host name, up to 128 alphanumeric characters are allowed for the Server including special characters inside the square quotes [~!@#\$\$%^&*()_+{} :"<>?-=[]\;',./'].]
Port	Enter the port number of the proxy server (1 – 65535).
Authentication	Select this option to enable proxy server authentication using a Username and Password .
Username	Enter a login user name from the proxy server administrator. Up to 32 alphanumeric characters are allowed for the Username including special characters inside the square quotes [~!@#\$\$%^&*()_+{} :"<>?-=[]\;',./'].]
Password	Enter a login password from the proxy server administrator. Up to 32 alphanumeric characters are allowed for the Password including special characters inside the square quotes [~!@#\$\$%^&*()_+{} :"<>?-=[]\;',./'].]
Apply	Click Apply to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to reset the fields to your previous configuration.

8.7 Port Setup

Use this screen to configure Switch port settings. Click **Basic Setting > Port Setup** in the navigation panel to display the configuration screen.

Figure 72 Basic Setting > Port Setup (Standalone Mode)

Port Setup							
Port	Active	Name	Speed / Duplex	Flow Control	802.1p Priority	BPDU Control	Media Type
*	☐		10-an Auto	☐	0	Peer	sfp_plus
1	☒		Auto	☐	0	Peer	sfp_plus
2	☒		Auto	☐	0	Peer	sfp_plus
3	☒		Auto	☐	0	Peer	sfp_plus
4	☒		Auto	☐	0	Peer	sfp_plus
5	☒		Auto	☐	0	Peer	sfp_plus
6	☒		Auto	☐	0	Peer	sfp_plus
7	☒		Auto	☐	0	Peer	sfp_plus
8	☒		Auto	☐	0	Peer	sfp_plus
9	☒		Auto	☐	0	Peer	sfp_plus
10	☒		Auto	☐	0	Peer	sfp_plus
11	☒		Auto	☐	0	Peer	sfp_plus
12	☒		Auto	☐	0	Peer	sfp_plus
13	☒		Auto	☐	0	Peer	sfp_plus
14	☒		Auto	☐	0	Peer	sfp_plus
15	☒		Auto	☐	0	Peer	sfp_plus
16	☒		Auto	☐	0	Peer	sfp_plus
17	☒		Auto	☐	0	Peer	
18	☒		Auto	☐	0	Peer	
19	☒		Auto	☐	0	Peer	
20	☒		Auto	☐	0	Peer	
21	☒		Auto	☐	0	Peer	sfp_plus
22	☒		Auto	☐	0	Peer	sfp_plus
23	☒		Auto	☐	0	Peer	sfp_plus
24	☒		Auto	☐	0	Peer	sfp_plus
25	☒		Auto	☐	0	Peer	sfp_plus
26	☒		Auto	☐	0	Peer	sfp_plus
27	☒		Auto	☐	0	Peer	sfp_plus

Figure 73 Basic Setting > Port Setup (Stacking Mode)

Port	Active	Name	Speed / Duplex	Flow Control	802.1p Priority	BPDU Control	Media Type
1/*	☐		Auto	☐	0	Peer	sfp_plus
1/1	☒		Auto	☐	0	Peer	sfp_plus
1/2	☒		Auto	☐	0	Peer	sfp_plus
1/3	☒		Auto	☐	0	Peer	sfp_plus
1/4	☒		Auto	☐	0	Peer	sfp_plus
1/5	☒		Auto	☐	0	Peer	sfp_plus
1/6	☒		Auto	☐	0	Peer	sfp_plus
1/7	☒		Auto	☐	0	Peer	sfp_plus
1/8	☒		Auto	☐	0	Peer	sfp_plus
1/9	☒		Auto	☐	0	Peer	sfp_plus
1/10	☒		Auto	☐	0	Peer	sfp_plus
1/11	☒		Auto	☐	0	Peer	sfp_plus
1/12	☒		Auto	☐	0	Peer	sfp_plus
1/13	☒		Auto	☐	0	Peer	sfp_plus
1/14	☒		Auto	☐	0	Peer	sfp_plus
1/15	☒		Auto	☐	0	Peer	sfp_plus
1/16	☒		Auto	☐	0	Peer	sfp_plus
1/17	☒		Auto	☐	0	Peer	sfp_plus
1/18	☒		Auto	☐	0	Peer	sfp_plus
1/19	☒		Auto	☐	0	Peer	sfp_plus
1/20	☒		Auto	☐	0	Peer	sfp_plus
1/21	☒		Auto	☐	0	Peer	sfp_plus
1/22	☒		Auto	☐	0	Peer	sfp_plus
1/23	☒		Auto	☐	0	Peer	sfp_plus

Apply Cancel

The following table describes the labels in this screen.

Table 24 Basic Setting > Port Setup

LABEL	DESCRIPTION
SLOT	This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack.
Port	This is the port index number. In stacking mode, the first number represents the slot ID and the second one is the port number. Please note that the default stacking ports (the last four ports of your Switch) cannot be configured. They are reserved for stacking only.
*	Settings in this row apply to all ports. Use this row only if you want to make some settings the same for all ports. Use this row first to set the common settings and then make adjustments on a port-by-port basis. Note: Changes in this row are copied to all the ports as soon as you make them.
Active	Select this check box to enable a port. The factory default for all ports is enabled. A port must be enabled for data transmission to occur.
Name	Type a descriptive name that identifies this port. You can enter up to 128 alpha-numerical characters. Note: Due to space limitations, the port name may be truncated in some Web Configurator screens.

Table 24 Basic Setting > Port Setup (continued)

LABEL	DESCRIPTION
Speed/Duplex	Select the speed and the duplex mode of the Ethernet connection on this port. The choices are Auto, Auto-1G, 2.5G / Full Duplex, 5G / Full Duplex, and 100M / Full Duplex for a 100Base-T connection. 1G / Full Duplex is supported by both 1000Base-T and 1000Base-X connections. 10G / Full Duplex is supported by the 10 Gigabit Ethernet connections on the Switch that has a 10 Gigabit interface. Selecting Auto-1G or Auto (auto-negotiation) allows one port to negotiate with a peer port automatically to obtain the connection speed and duplex mode that both ends support. When auto-negotiation is turned on, a port on the Switch negotiates with the peer automatically to determine the connection speed and duplex mode. If the peer port does not support auto-negotiation or turns off this feature, the Switch determines the connection speed by detecting the signal on the cable and using half duplex mode. When the Switch's auto-negotiation is turned off, a port uses the pre-configured speed and duplex mode when making a connection, thus requiring you to make sure that the settings of the peer port are the same in order to connect.
Flow Control	A concentration of traffic on a port decreases port bandwidth and overflows buffer memory causing packet discards and frame losses. Flow Control is used to regulate transmission of signals to match the bandwidth of the receiving port. The Switch uses IEEE 802.3x flow control in full duplex mode and backpressure flow control in half duplex mode. IEEE 802.3x flow control is used in full duplex mode to send a pause signal to the sending port, causing it to temporarily stop sending signals when the receiving port memory buffers fill. Back Pressure flow control is typically used in half duplex mode to send a "collision" signal to the sending port (mimicking a state of packet collision) causing the sending port to temporarily stop sending signals and resend later. Select Flow Control to enable it.
802.1p Priority	This priority value is added to incoming frames without a (802.1p) priority queue tag.
BPDU Control	Configure the way to treat BPDUs received on this port. You must activate bridging control protocol transparency in the Switch Setup screen first. Select Peer to process any BPDU (Bridge Protocol Data Units) received on this port. Select Tunnel to forward BPDUs received on this port. Select Discard to drop any BPDU received on this port. Select Network to process a BPDU with no VLAN tag and forward a tagged BPDU.
Media Type	You can insert either an SFP+ transceiver or an SFP+ Direct Attach Copper (DAC) cable into the 10 Gigabit interface of the Switch. Select the media type (sfp_plus or dac10g) of the SFP+ module that is attached to the 10 Gigabit interface.
Apply	Click Apply to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to begin configuring this screen afresh.

8.8 Interface Setup

An IPv6 address is configured on a per-interface basis. The interface can be a physical interface (for example, an Ethernet port) or a virtual interface (for example, a VLAN). The Switch supports the VLAN interface type for IPv6 at the time of writing.

Use this screen to set IPv4 loopback interfaces for routing protocols or IPv6 interfaces on which you can

configure an IPv6 address to access and manage the Switch.

Click **Basic Setting** > **Interface Setup** in the navigation panel to display the configuration screen.

Figure 74 Basic Setting > Interface Setup

The following table describes the labels in this screen.

Table 25 Basic Setting > Interface Setup

LABEL	DESCRIPTION
Interface Type	Select the type of IPv6 interface for which you want to configure. The Switch supports the VLAN interface type for IPv6 at the time of writing.
Interface ID	Specify a unique identification number (from 1 to 4094) for the VLAN interface or a unique identification number (from 0 to 2) for the loopback interface. To have IPv6 function properly, you should configure a static VLAN with the same ID number in the Advanced Application > VLAN screens.
Add	Click this to create a new entry. This saves your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to reset the fields to your previous configuration.
Index	This field displays the index number of an entry.
Interface Type	This field displays the type of interface.
Interface ID	This field displays the identification number of the interface.
Interface	This field displays the interface's descriptive name which is generated automatically by the Switch. The name is from a combination of the interface type and ID number.
	Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries.
Delete	Click Delete to remove the selected entry from the summary table.
Cancel	Click Cancel to clear the check boxes.

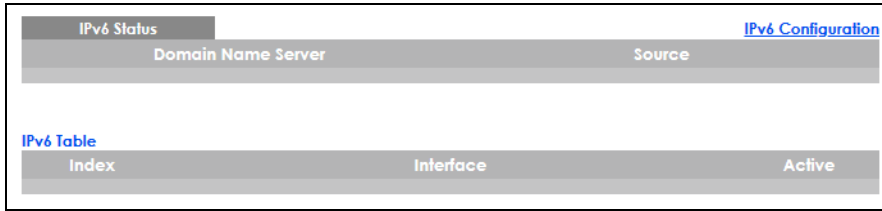
8.9 IPv6

Use this screen to view the IPv6 interface status and configure the Switch's management IPv6 addresses.

8.9.1 IPv6 Status

Click **Basic Setting** > **IPv6** in the navigation panel to display the IPv6 status screen as shown next.

Figure 75 Basic Setting > IPv6



The following table describes the labels in this screen.

Table 26 Basic Setting > IPv6

LABEL	DESCRIPTION
IPv6 Status	
Domain Name Server	This field displays the IP address of the DNS server.
Source	This field displays whether the DNS server address is configured manually (Static) or obtained automatically using DHCPv6 .
IPv6 Table	
Index	This field displays the index number of an IPv6 interface. Click on an index number to view more interface details.
Interface	This is the name of the IPv6 interface you created.
Active	This field displays whether the IPv6 interface is activated or not.

8.9.2 IPv6 Interface Status

Use this screen to view a specific IPv6 interface status and detailed information. Click an interface index number in the **Basic Setting** > **IPv6** screen. The following screen opens.

Figure 76 Basic Setting > IPv6 > IPv6 Interface Status

IPv6 Interface Status

IPv6 Status

Interface: VLAN1

IPv6 Active	enable
MTU Size	1500
ICMPv6 Rate Limit Bucket Size	100
ICMPv6 Rate Limit Error Interval	1000
Link Local Address	fe80::219:caff:fe01:b0d/64 [preferred]
Global Unicast Address(es)	
Joined Group Address(es)	ff02::2 ff01::1 ff02::1 ff02::1:ff01:b0d
ND DAD Active	enable
Number of DAD Attempts	1
NS-Interval (millisecond)	1000
ND Reachable Time (millisecond)	30000

DHCPv6 Client Active		Yes
Identity Association	IA Type	IA-NA
	IAID	11
	T1	0
	T2	0
	State	
	SID	
	Address	
	Preferred Lifetime	0
Valid Lifetime	0	
DNS		
Domain List		

Restart DHCPv6 Client

Click Here

The following table describes the labels in this screen.

Table 27 Basic Setting > IPv6 > IPv6 Interface Status

LABEL	DESCRIPTION
IPv6 Active	This field displays whether the IPv6 interface is activated or not.
MTU Size	This field displays the Maximum Transmission Unit (MTU) size for IPv6 packets on this interface.
ICMPv6 Rate Limit Bucket Size	This field displays the maximum number of ICMPv6 error messages which are allowed to transmit in a given time interval. If the bucket is full, subsequent error messages are suppressed.
ICMPv6 Rate Limit Error Interval	This field displays the time period (in milliseconds) during which ICMPv6 error messages of up to the bucket size can be transmitted. 0 means no limit.
Link Local Address	This field displays the Switch's link-local IP address and prefix generated by the interface. It also shows whether the IP address is preferred, which means it is a valid address and can be used as a sender or receiver address.
Global Unicast Address(es)	This field displays the Switch's global unicast address to identify this interface.
Joined Group Address(es)	This field displays the IPv6 multicast addresses of groups the Switch's interface joins.

Table 27 Basic Setting > IPv6 > IPv6 Interface Status (continued)

LABEL	DESCRIPTION
ND DAD Active	This field displays whether Neighbor Discovery (ND) Duplicate Address Detection (DAD) is enabled on the interface.
Number of DAD Attempts	This field displays the number of consecutive neighbor solicitations the Switch sends for this interface.
NS-Interval (millisecond)	This field displays the time interval (in milliseconds) at which neighbor solicitations are re-sent for this interface.
ND Reachable Time (millisecond)	This field displays how long (in milliseconds) a neighbor is considered reachable for this interface.
DHCPv6 Client Active	This field displays whether the Switch acts as a DHCPv6 client to get an IPv6 address from a DHCPv6 server.
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.
IA Type	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.
IAID	Each IA consists of a unique IAID and associated IP information.
T1	This field displays the DHCPv6 T1 timer. After T1, the Switch sends the DHCPv6 server a Renew message. 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.
T2	This field displays the DHCPv6 T2 timer. If the time T2 is reached and the server does not respond, the Switch sends a Rebind message to any available server.
State	This field displays the state of the TA. It shows Active when the Switch obtains addresses from a DHCPv6 server and the TA is created. Renew when the TA's address lifetime expires and the Switch sends out a Renew message. Rebind when the Switch does not receive a response from the original DHCPv6 server and sends out a Rebind message to another DHCPv6 server.
SID	This field displays the DHCPv6 server's unique ID.
Address	This field displays the Switch's global address which is assigned by the DHCPv6 server.
Preferred Lifetime	This field displays how long (in seconds) that the global address remains preferred.
Valid Lifetime	This field displays how long (in seconds) that the global address is valid.
DNS	This field displays the DNS server address assigned by the DHCPv6 server.
Domain List	This field displays the address record when the Switch queries the DNS server to resolve domain names.
Restart DHCPv6 Client	Click Click Here to send a new DHCP request to the DHCPv6 server and update the IPv6 address and DNS information for this interface.

8.9.3 IPv6 Configuration

Use this screen to configure IPv6 settings on the Switch. Click the **IPv6 Configuration** link in the **Basic Setting > IPv6** screen. The following screen opens.

Figure 77 Basic Setting > IPv6 > IPv6 Configuration

IPv6 Configuration		IPv6 Status
IPv6 Global Setup		Click Here
IPv6 Interface Setup		Click Here
IPv6 Addressing	IPv6 Link-Local Address Setup	Click Here
	IPv6 Global Address Setup	Click Here
	IPv6 Neighbor Discovery Setup	Click Here
IPv6 Neighbor Discovery	IPv6 Router Discovery Setup	Click Here
	IPv6 Prefix Setup	Click Here
IPv6 Neighbor Setup		Click Here
DHCPv6 Client Setup		Click Here

The following table describes the labels in this screen.

Table 28 Basic Setting > IPv6 > IPv6 Configuration

LABEL	DESCRIPTION
IPv6 Global Setup	Click the link to go to a screen where you can configure the global IPv6 settings on the Switch.
IPv6 Interface Setup	Click the link to go to a screen where you can enable an IPv6 interface on the Switch.
IPv6 Addressing	
IPv6 Link-Local Address Setup	Click the link to go to a screen where you can configure the IPv6 link-local address for an interface.
IPv6 Global Address Setup	Click the link to go to a screen where you can configure the IPv6 global address for an interface.
IPv6 Neighbor Discovery	
IPv6 Neighbor Discovery Setup	Click the link to go to a screen where you can configure the IPv6 neighbor discovery settings.
IPv6 Router Discovery Setup	Click the link to go to a screen where you can configure the IPv6 router discovery settings.
IPv6 Prefix Setup	Click the link to go to a screen where you can configure the Switch's IPv6 prefix list.
IPv6 Neighbor Setup	Click the link to go to a screen where you can create a static IPv6 neighbor entry in the Switch's IPv6 neighbor table.
DHCPv6 Client Setup	Click the link to go to a screen where you can configure the Switch DHCPv6 client settings.

8.9.4 IPv6 Global Setup

Use this screen to configure the global IPv6 settings. Click the link next to **IPv6 Global Setup** in the **IPv6 Configuration** screen to display the screen as shown next.

Figure 78 Basic Setting > IPv6 > IPv6 Configuration > IPv6 Global Setup

IPv6 Global Setup		IPv6 Configuration
IPv6 Hop Limit	64	
ICMPv6 Rate Limit Bucket Size	100	
ICMPv6 Rate Limit Error Interval	1000	milliseconds
Apply Cancel Clear		

The following table describes the labels in this screen.

Table 29 Basic Setting > IPv6 > IPv6 Configuration > IPv6 Global Setup

LABEL	DESCRIPTION
IPv6 Hop Limit	Specify the maximum number of hops (from 1 to 255) in router advertisements. This is the maximum number of hops on which an IPv6 packet is allowed to transmit before it is discarded by an IPv6 router, which is similar to the TTL field in IPv4.
ICMPv6 Rate Limit Bucket Size	Specify the maximum number of ICMPv6 error messages (from 1 to 200) which are allowed to transmit in a given time interval. If the bucket is full, subsequent error messages are suppressed.
ICMPv6 Rate Limit Error Interval	Specify the time period (from 0 to 2147483647 milliseconds) during which ICMPv6 error messages of up to the bucket size can be transmitted. 0 means no limit.
Apply	Click Apply to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to begin configuring this screen afresh.
Clear	Click Clear to reset the fields to the factory defaults.

8.9.5 IPv6 Interface Setup

Use this screen to turn on or off an IPv6 interface. Click the link next to **IPv6 Interface Setup** in the **IPv6 Configuration** screen to display the screen as shown next.

Figure 79 Basic Setting > IPv6 > IPv6 Configuration > IPv6 Interface Setup

Index	Interface	Active
1	VLAN1	Yes

The following table describes the labels in this screen.

Table 30 Basic Setting > IPv6 > IPv6 Configuration > IPv6 Interface Setup

LABEL	DESCRIPTION
Interface	Select the IPv6 interface you want to configure.
Active	Select this option to enable the interface.
Apply	Click Apply to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to begin configuring this screen afresh.
Clear	Click Clear to reset the fields to the factory defaults.
Index	This is the interface index number. Click on an index number to change the settings.
Interface	This is the name of the IPv6 interface you created.
Active	This field displays whether the IPv6 interface is activated or not.

8.9.6 IPv6 Link-Local Address Setup

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.

Use this screen to configure the interface's link-local address and default gateway. Click the link next to **IPv6 Link-Local Address Setup** in the **IPv6 Configuration** screen to display the screen as shown next.

Figure 80 Basic Setting > IPv6 > IPv6 Configuration > IPv6 Link-Local Address Setup

Index	Interface	IPv6 Link-Local Address	IPv6 Default Gateway
1	VLAN100		

The following table describes the labels in this screen.

Table 31 Basic Setting > IPv6 > IPv6 Configuration > IPv6 Link-Local Address Setup

LABEL	DESCRIPTION
Interface	Select the IPv6 interface you want to configure.
Link-Local Address	Manually configure a static IPv6 link-local address for the interface.
Default Gateway	Set the default gateway IPv6 address for the interface. When an interface cannot find a routing information for a frame's destination, it forwards the packet to the default gateway.
Apply	Click Apply to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to begin configuring this screen afresh.
Clear	Click Clear to reset the fields to the factory defaults.
Index	This is the interface index number. Click an index number to change the settings.
Interface	This is the name of the IPv6 interface you created.
IPv6 Link-Local Address	This is the static IPv6 link-local address for the interface.
IPv6 Default Gateway	This is the default gateway IPv6 address for the interface.

8.9.7 IPv6 Global Address Setup

Use this screen to configure the interface's IPv6 global address. Click the link next to **IPv6 Global Address Setup** in the **IPv6 Configuration** screen to display the screen as shown next.

Figure 81 Basic Setting > IPv6 > IPv6 Configuration > IPv6 Global Address Setup

The following table describes the labels in this screen.

Table 32 Basic Setting > IPv6 > IPv6 Configuration > IPv6 Global Address Setup

LABEL	DESCRIPTION
Domain Name Server 1/2	Enter a domain name server IPv6 address in order to be able to use a domain name instead of an IP address.
Apply	Click Apply to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click this to reset the Domain Name Server values in this screen to their last-saved values.
Interface	Select the IPv6 interface you want to configure.
IPv6 Global Address	Manually configure a static IPv6 global address for the interface.
Prefix Length	Specify an IPv6 prefix length that specifies how many most significant bits (start from the left) in the address compose the network address.
EUI-64	Select this option to have the interface ID be generated automatically using the EUI-64 format.
Add	Click this to create a new entry. This saves your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to begin configuring this screen afresh.
Clear	Click Clear to reset the fields to the factory defaults.
Index	This is the interface index number. Click an index number to change the settings.
Interface	This is the name of the IPv6 interface you created.
IPv6 Global Address/Prefix Length	This field displays the IPv6 global address and prefix length for the interface.
EUI-64	This shows whether the interface ID of the global address is generated using the EUI-64 format.
	Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries.

Table 32 Basic Setting > IPv6 > IPv6 Configuration > IPv6 Global Address Setup (continued)

LABEL	DESCRIPTION
Delete	Check the entries that you want to remove and then click Delete to remove the selected entries from the summary table.
Cancel	Click Cancel to clear the check boxes.

8.9.8 IPv6 Neighbor Discovery Setup

Use this screen to configure neighbor discovery settings for each interface. Click the link next to **IPv6 Neighbor Discovery Setup** in the **IPv6 Configuration** screen to display the screen as shown next.

Figure 82 Basic Setting > IPv6 > IPv6 Configuration > IPv6 Neighbor Discovery Setup

Index	Interface	DAD Attempts	NS Interval	Reachable Time
1	VLAN100	1	1000	30000

The following table describes the labels in this screen.

Table 33 Basic Setting > IPv6 > IPv6 Configuration > IPv6 Neighbor Discovery Setup

LABEL	DESCRIPTION
Interface	Select the IPv6 interface you want to configure.
DAD Attempts	The Switch uses Duplicate Address Detection (DAD) with neighbor solicitation and advertisement messages to check whether an IPv6 address is already in use before assigning it to an interface. Specify the number of consecutive neighbor solicitations (from 0 to 600) the Switch sends for this interface. Enter 0 to turn off DAD.
NS Interval	Specify the time interval (from 1000 to 3600000 milliseconds) at which neighbor solicitations are re-sent for this interface.
Reachable Time	Specify how long (from 1000 to 3600000 milliseconds) a neighbor is considered reachable for this interface.
Apply	Click Apply to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to begin configuring this screen afresh.
Clear	Click Clear to reset the fields to the factory defaults.
Index	This is the interface index number. Click on an index number to change the settings.
Interface	This is the name of the IPv6 interface you created.
DAD Attempts	This field displays the number of consecutive neighbor solicitations the Switch sends for this interface.

Table 33 Basic Setting > IPv6 > IPv6 Configuration > IPv6 Neighbor Discovery Setup (continued)

LABEL	DESCRIPTION
NS Interval	This field displays the time interval (in milliseconds) at which neighbor solicitations are re-sent for this interface.
Reachable Time	This field displays how long (in milliseconds) a neighbor is considered reachable for this interface.

8.9.9 IPv6 Router Discovery Setup

Use this screen to configure router discovery settings for each interface. Click the link next to **IPv6 Router Discovery Setup** in the **IPv6 Configuration** screen to display the screen as shown next.

Figure 83 Basic Setting > IPv6 > IPv6 Configuration > IPv6 Router Discovery Setup

Index	Interface	Flags	Minimum Interval	Maximum Interval	Lifetime	Suppress
1	VLAN123		200	600	1800	No

The following table describes the labels in this screen.

Table 34 Basic Setting > IPv6 > IPv6 Configuration > IPv6 Router Discovery Setup

LABEL	DESCRIPTION
Interface	Select the IPv6 interface you want to configure.
Flags	Select the Managed Config Flag option to have the Switch set the "managed address configuration" flag (the M flag) to 1 in IPv6 router advertisements, which means IPv6 hosts use DHCPv6 to obtain IPv6 stateful addresses. De-select the option to set the flag to 0 and the host will not use DHCPv6 to obtain IPv6 stateful addresses. Select the Other Config Flag option to have the Switch set the "Other stateful configuration" flag (the O flag) to 1 in IPv6 router advertisements, which means IPv6 hosts use DHCPv6 to obtain additional configuration settings, such as DNS information. De-select the option to set the flag to 0 and the host will not use DHCPv6 to obtain additional configuration settings.
Minimum Interval	Specify the minimum time interval (from 3 to 1350 seconds) at which the Switch sends router advertisements for this interface. Note: The minimum time interval cannot be greater than three-quarters of the maximum time interval.
Maximum Interval	Specify the maximum time interval (from 4 to 1800 seconds) at which the Switch sends router advertisements for this interface.

Table 34 Basic Setting > IPv6 > IPv6 Configuration > IPv6 Router Discovery Setup (continued)

LABEL	DESCRIPTION
Lifetime	Specify how long (from 0 to 9000 seconds) the router in router advertisements can be used as a default router for this interface.
Suppress	Select this option to set the Switch to not send router advertisements and responses to router solicitations on this interface.
Apply	Click Apply to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to begin configuring this screen afresh.
Clear	Click Clear to reset the fields to the factory defaults.
Index	This is the interface index number. Click an index number to change the settings.
Interface	This is the name of the IPv6 interface you created.
Flags	This field displays whether IPv6 hosts use DHCPv6 to obtain IPv6 stateful addresses (M) and/or additional configuration settings (O) .
Minimum Interval	This field displays the minimum time interval at which the Switch sends router advertisements for this interface.
Maximum Interval	This field displays the maximum time interval at which the Switch sends router advertisements for this interface.
Lifetime	This field displays how long the router in router advertisements can be used as a default router for this interface.
Suppress	This field displays whether the Switch sends router advertisements and responses to router solicitations on this interface (No) or not (Yes) .

8.9.10 IPv6 Prefix Setup

Use this screen to configure the Switch's IPv6 prefix list for each interface. Click the link next to **IPv6 Prefix Setup** in the **IPv6 Configuration** screen to display the screen as shown next.

Figure 84 Basic Setting > IPv6 > IPv6 Configuration > IPv6 Prefix Setup

IPv6 Prefix Setup [IPv6 Configuration](#)

Interface:

Prefix:

Prefix Length:

Valid Lifetime: seconds

Preferred Lifetime: seconds

Flags:

- ☐ No-Autoconfig Flag
- ☐ No-Onlink Flag
- ☐ No-Advertise Flag

Add **Cancel** **Clear**

Index	Interface	Prefix/Prefix Length	Valid Lifetime	Preferred Lifetime	

Delete **Cancel**

The following table describes the labels in this screen.

Table 35 Basic Setting > IPv6 > IPv6 Configuration > IPv6 Prefix Setup

LABEL	DESCRIPTION
Interface	Select the IPv6 interface you want to configure.
Prefix	Set the IPv6 prefix that the Switch includes in router advertisements for this interface.
Prefix Length	Set the prefix length that the Switch includes in router advertisements for this interface.
Valid Lifetime	Specify how long (from 0 to 4294967295 seconds) the prefix is valid for on-link determination.
Preferred Lifetime	Specify how long (from 0 to 4294967295 seconds) that addresses generated from the prefix remain preferred. The preferred lifetime cannot exceed the valid lifetime.
Flags	Select No-Autoconfig Flag to not allow IPv6 hosts to use this prefix. Select No-Onlink Flag to not allow the specified prefix to be used for on-link determination. Select No-Advertise Flag to set the Switch to not include the specified IPv6 prefix, prefix length in router advertisements for this interface.
Add	Click this to create a new entry or to update an existing one. This saves your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to begin configuring this screen afresh.
Clear	Click Clear to reset the fields to the factory defaults.
Index	This is the interface index number. Click an index number to change the settings.
Interface	This is the name of the IPv6 interface you created.
Prefix/Prefix Length	This field displays the IPv6 prefix and prefix length that the Switch includes in router advertisements for this interface.
Valid Lifetime	This field displays the IPv6 prefix valid lifetime.
Preferred Lifetime	This field displays the preferred lifetime of an IPv6 address generated from the prefix.
	Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries.
Delete	Check the entries that you want to remove in the Delete column and then click Delete to remove the selected entries from the summary table.
Cancel	Click Cancel to clear the Delete check boxes.

8.9.11 IPv6 Neighbor Setup

Use this screen to create a static IPv6 neighbor entry in the Switch's IPv6 neighbor table to store the neighbor information permanently. Click the link next to **IPv6 Neighbor Setup** in the **IPv6 Configuration** screen to display the screen as shown next.

Figure 85 Basic Setting > IPv6 > IPv6 Configuration > IPv6 Neighbor Setup

The following table describes the labels in this screen.

Table 36 Basic Setting > IPv6 > IPv6 Configuration > IPv6 Neighbor Setup

LABEL	DESCRIPTION
Interface Type	Select the type of IPv6 interface for which you want to configure. The Switch supports the VLAN interface type for IPv6 at the time of writing.
Interface ID	Specify a unique identification number (from 1 to 4094) for the interface. A static IPv6 neighbor entry displays in the Management > IPv6 Neighbor Table screen only when the interface ID is also created in the Basic Setup > Interface Setup screen. To have IPv6 function properly, you should configure a static VLAN with the same ID number in the Advanced Application > VLAN screens.
Neighbor Address	Specify the IPv6 address of the neighboring device which can be reached through the interface.
MAC	Specify the MAC address of the neighboring device which can be reached through the interface.
Add	Click this to create a new entry or to update an existing one. This saves your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to begin configuring this screen afresh.
Clear	Click Clear to reset the fields to the factory defaults.
Index	This is the interface index number. Click an index number to change the settings.
Interface	This is the name of the IPv6 interface you created.
Neighbor Address	This field displays the IPv6 address of the neighboring device which can be reached through the interface.
MAC	This field displays the MAC address of the neighboring device which can be reached through the interface.
	Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries.
Delete	Check the entries that you want to remove and then click Delete to remove the selected entries from the summary table.
Cancel	Click Cancel to clear the check boxes.

8.9.12 DHCPv6 Client Setup

Use this screen to configure the Switch's DHCP settings when it is acting as a DHCPv6 client. Click the link next to **DHCPv6 Client Setup** in the **IPv6 Configuration** screen to display the screen as shown next.

Figure 86 Basic Setting > IPv6 > IPv6 Configuration > DHCPv6 Client Setup

DHCPv6 Client Setup		IPv6 Configuration				
Interface	VLAN100 ▼					
IA Type	☐ IA-NA ☐ Rapid-Commit					
Options	☐ DNS ☐ Domain-List					
Information Refresh Minimum	86400 seconds					
Apply Cancel Clear						
Index	Interface	IA-NA	Rapid-Commit	DNS	Domain-List	Information Refresh Minimum
1	VLAN100	No	No	No	No	86400

The following table describes the labels in this screen.

Table 37 Basic Setting > IPv6 > IPv6 Configuration > DHCPv6 Client Setup

LABEL	DESCRIPTION
Interface	Select the IPv6 interface you want to configure.
IA Type	Select IA-NA to set the Switch to get a non-temporary IP address from the DHCPv6 server for this interface. Optionally, you can also select Rapid-Commit to have the Switch send its DHCPv6 Solicit message with a Rapid Commit option to obtain information from the DHCPv6 server by a rapid two-message exchange. The Switch discards any Reply messages that do not include a Rapid Commit option. The DHCPv6 server should also support the Rapid Commit option to have it work well.
Options	Select DNS to have the Switch obtain DNS server IPv6 addresses and/or select Domain-List to have the Switch obtain a list of domain names from the DHCP server.
Information Refresh Minimum	Specify the time interval (from 600 to 4294967295 seconds) at which the Switch exchanges other configuration information with a DHCPv6 server again.
Apply	Click Apply to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to begin configuring this screen afresh.
Clear	Click Clear to reset the fields to the factory defaults.
Index	This is the interface index number. Click an index number to change the settings.
Interface	This is the name of the IPv6 interface you created.
IA-NA	This field displays whether the Switch obtains a non-temporary IP address from the DHCPv6 server.
Rapid-Commit	This field displays whether the Switch obtains information from the DHCPv6 server by a rapid two-message exchange.
DNS	This field displays whether the Switch obtains DNS server IPv6 addresses from the DHCPv6 server.

Table 37 Basic Setting > IPv6 > IPv6 Configuration > DHCPv6 Client Setup (continued)

LABEL	DESCRIPTION
Domain-List	This field displays whether the Switch obtains a list of domain names from the DHCP server.
Information Refresh Minimum	This field displays the time interval (in seconds) at which the Switch exchanges other configuration information with a DHCPv6 server again.

8.10 Loopback Interface

The loopback interface is a virtual interface which can be assigned an IP address and used by routing protocols. The loopback interface does not need to be connected to any devices and will always be available if the Switch is functioning normally and connected to a network. You can enable multiple loopback interfaces on the Switch, and each loopback interface must be uniquely identified.

The Switch can use a loopback interface address as the source address of all packets that originate from the Switch. Filters can then be applied to the loopback address to protect the system.

Click the link next to **IPv4 Loopback Interface** in the **Basic Setting > Loopback Interface** screen. The following screen opens.

Figure 87 Basic Setting > Loopback Interface



8.10.1 IPv4 Loopback Interface

Use this screen to configure IPv4 loopback interfaces on the Switch.

Figure 88 Basic Setting > Loopback Interface > IPv4 Loopback Interface

ID	Active	Name	IP Address	IP Subnet Mask	
1	No	test1	192.168.2.1	255.255.255.0	

The following table describes the labels in this screen.

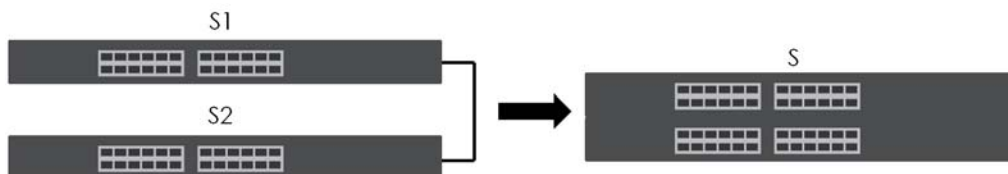
Table 38 Basic Setting > Loopback Interface > IPv4 Loopback Interface

LABEL	DESCRIPTION
Loopback Interface ID	Select the ID of loopback interface you want to configure.
Active	Select this option to enable the interface.
Name	Enter a descriptive name for the IPv4 loopback interface for identification purposes. This name consists of up to 64 printable characters; spaces are allowed.
IP Address	Enter the IP address of your Switch in dotted decimal notation, for example, 192.168.1.1. This is the IP address of the Switch in an IP routing domain.
IP Subnet Mask	Enter the IP subnet mask of an IP routing domain in dotted decimal notation, for example, 255.255.255.0.
Add	Click this to create a new entry. This saves your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to reset the fields to the factory defaults.
Clear	Click Clear to begin configuring this screen afresh.
ID	This field displays the identification number of the interface.
Active	This field displays whether the IPv4 loopback interface is activated or not.
Name	This field displays the descriptive name for this IPv4 loopback interface.
IP Address	This field displays the IP address of the Switch in the IP domain.
IP Subnet Mask	This field displays the subnet mask of the Switch in the IP domain.
	Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries.
Delete	Click Delete to remove the selected entry from the summary table.
Cancel	Click Cancel to clear the check boxes.

8.11 Stacking

Stacking is directly connecting Switches to form a larger system that behaves as a single Switch or a virtual chassis with increased port density.

Figure 89 Switch Stacking Concept



The last four combo ports of your Switch are dedicated for Switch stacking. At the time of writing, the Switch can only connect to another Switch of the same model and firmware version.

Note: Up to four Switches per stack are allowed.

You can manage each Switch in the stack from a master Switch using its Web Configurator or console. Each Switch supports up to two stacking channels. The stacking ports used to form the same stacking

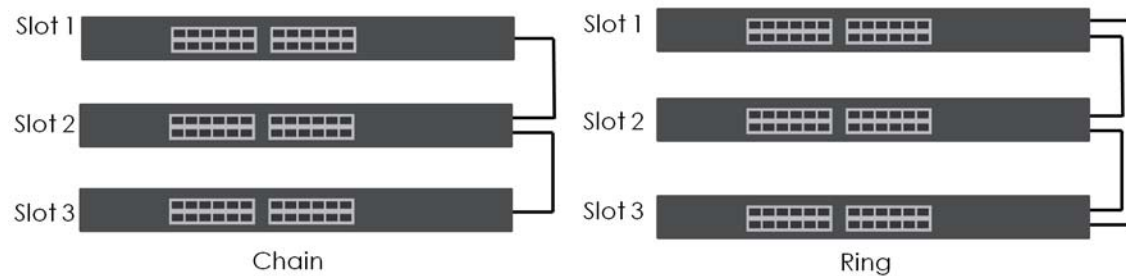
channel must be connected to the ports of the same channel on a neighboring Switch. For example, ports 25 and 26 (channel 1) on Switch A can connect to ports 25 and 26 (channel 1) or ports 27 and 28 (channel 2) on Switch B.

Table 39 Stacking Channels and Ports

STACKING CHANNEL	STACKING PORTS
1	25, 26
2	27, 28

You can build a Switch stack using a ring or chain topology. In a ring topology, the last Switch is connected to the first.

Figure 90 Stacking Topology



Use the master Switch to assign a 'slot ID' for each 'linecard' non-master Switch. 'Slot' refers to a Switch in the 'virtual chassis' stack.

The advantages of stacking are:

- High port density – for example, two 24-port Switches can become one 48-port logical Switch
- Centralized management – log into a single IP address of the master switch to control all Switches in the stacking system using the web configurator, CLI, SNMP or FTP
- Redundancy – Data redundancy allows traffic to be forwarded even if one Switch in the stack fails. Management redundancy lets you still manage the stack even if one Switch in the stack fails
- Modularity and hot-swappable – you can add, remove, or replace Switches to increase or decrease the stack with minimum disruption to ongoing network traffic

8.11.1 Stacking Status

Click **Basic Setting** > **Stacking** in the navigation panel to display the **Stacking Status** screen as shown next.

Figure 91 Basic Setting > Stacking > Stacking Status

Stacking Status				Configuration
Slot	Name	Status	MAC address	Role
*1	XS3800-28	active	bc:99:11:d8:3a:a5	master
StackingTopology : Chain				
Slot No.	Stacking Channel 1 Neighbor	Stacking Channel 1 Speed	Stacking Channel 2 Neighbor	Stacking Channel 2 Speed
*1	-	-	-	-

The following table describes the labels in this screen.

Table 40 Basic Setting > Stacking > Stacking Status

LABEL	DESCRIPTION
Slot	'Slot' refers to a Switch in the 'virtual chassis' stack. This field displays the slot ID of the stacked Switch. You can click the ID number to go to the Stacking Slot Status screen.
Name	This field displays the model name of the stacked Switch.
Status	This field displays whether the stacked Switch is active or inactive in a stack system. Init means the slot ID is being initialized by the master Switch. active* means the Switch is in the stack, but some items failed to initiate. See the system logs for details. If the Switch is not a master, disconnect and reconnect the stacking port and wait. Restart the Switch if it still displays active* . If the Switch is a master, restart it or choose another master.
MAC address	This field displays the MAC address of the stacked Switch.
Role	This field displays whether the Switch is a master, backup or linecard. There's only one master and one backup Switch in the stacking mode; all others are linecard Switches.
Stacking Topology: Ring/Chain	
Slot No.	This field displays the slot ID number of the stacked Switch.
Stacking Channel1	
Neighbor	This field displays the neighbor Switch that is connected using slot channel 1 of the Switch.
Speed	This field displays the Ethernet speed of stacking channel 1 of the Switch.
Stacking Channel2	
Neighbor	This field displays the neighbor Switch that is connected to slot channel 2 of the Switch.
Speed	This field displays the Ethernet speed of stacking channel 2 of the Switch.

8.11.2 Stacking Slot

Click a stack number in **Basic Setting > Stacking > Stacking Status** to display the **Stacking Slot Status** screen as shown next.

Figure 92 Basic Setting > Stacking > Stacking Status > Slot

Stacking Slot Status		Stacking Status
Slot	1	
Stacking	active	
Role	master	
Force Master Mode	inactive	
Priority	32	
Slot ID After Reboot	auto	
Stacking Status	active	
Master Capable	auto	
Stacking MAC Address	bc:99:11:d8:3a:a5	
Stacking Channel 1	down	
Stacking Channel 2	down	
Stacking Up Time	1:03:23	
ZyNOS Version *Running / Flash	V4.60(ABML.2)b4	

The following table describes the labels in this screen.

Table 41 Basic Setting > Stacking > Stacking Status > Slot

LABEL	DESCRIPTION
Slot	This field displays the slot ID of the Switch.
Stacking	This field displays whether the Switch is active in the stacking system.
Role	This field displays whether the stacked Switch is a master, backup or linecard Switch.
Force Master Mode	This field displays whether the Force Master Mode is enabled or disabled on this Switch. The Active Force Master Mode forces this Switch to become a master Switch. This Switch will have the highest priority over all other Switch in the stack. If two Switches are set as masters, they will have the same priority level, but the Switch that has the longest active run-time will be selected as the master Switch automatically.
Priority	This field displays the priority level of the Switch. A higher number represents higher priority.
Slot ID After Reboot	This field displays the slot ID of the Switch after a reboot. You can save the slot ID of the Switch after a reboot by clicking Freeze in the Stacking Configuration screen.
Stacking Status	This field displays whether the stacked Switch is active or inactive in a stack system. Init means the slot ID is being initialized by the master Switch. active* means the Switch is in the stack, but some items failed to initiate. See the system logs for details. If the Switch is not a master, disconnect and reconnect the stacking port and wait. Restart the Switch if it still displays active* . If the Switch is a master, restart it or choose another master.
Master Capable	This field displays whether the Switch has capacity to become a master Switch. Auto means the stack system master election process will determine if the Switch can be assigned as a master Switch.
Stacking MAC Address	This field displays the stacking Switch MAC address.
Stacking Channel 1	This field displays the status of the port stacking channel 1 of the Switch. It will display up for active or down for inactive.
Stacking Channel 2	This field displays the status of the port stacking channel 2 of the Switch. It will display up for active or down for inactive.
Stacking Up Time	This field displays the time that the active Switch in a stack has been running.
ZyNOS version *Running/Flash	This field displays the ZyNOS firmware that is currently running on the Switch.

8.11.3 Stacking Configuration

A supported Switch can change between stacking and standalone mode by selecting the **Active** check box in the **Basic Setting > Stacking > Configuration** screen.

Note: When you change modes, all configurations except user accounts, but including running configuration, config01, config02 and custom default configuration will be erased and the Switch will reboot with a new config01. Therefore, you should back up previous configurations if you want to reload them later.

Note: When the Switch is in stacking mode, it uses the default static IP address 192.168.1.1.

Stacking will automatically choose a master Switch in a stack but you can overwrite that by actively forcing a Switch to become a master Switch. In the **Stacking Configuration** screen, click **Force Master Mode** to choose the master Switch. This master Switch will have the highest priority over all other stacked Switches even when they have same priority value.

If two or more Switches have **Force Master Mode** enabled, they have the same **System Priority**. Then the Switch with the longest up-time is selected. Uptime is measured in increments of 10 minutes. The Switch with the higher number of increments is selected. If they have the same uptime, then the Switch with the lowest MAC address will be the master.

This is the master election priority in a stack system:

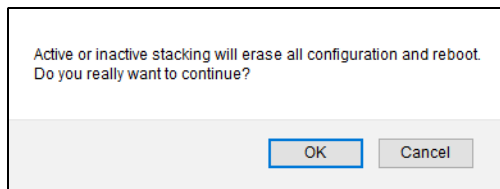
- 1 Active **Force Master Mode**
- 2 Highest **Stacking Priority**
- 3 Longest **System Up Time**
- 4 Lowest MAC Address

Note: Master election occurs when a stacking port link status changes (up or down). The link status changes when (for example):

- a stacking port cable is disconnected
- a Switch in the stack reboots (as happens after you change stacking mode to standalone)
- you add a Switch to the stack or
- a Switch in the stack shuts down.

Use the following procedure to create a stack:

- 1 Select a Switch to be the master. Change its mode to stacking mode. You will see a message asking you to confirm the change. Click **OK** to confirm and the Switch will reboot automatically using a new config01 and the default static IP address 192.168.1.1.



- 2 After reboot completes, the master LED will turn on.
- 3 Configure the Switch stacking priority to a high value, such as 63.
- 4 Change a second Switch to stacking mode and wait for it to finish rebooting automatically. This master LED will also turn on.
- 5 Connect the two Switches using the stacking ports for the Switch defined.
- 6 The second Switch master LED will then turn off, and its **Sys** LED will blink while it is initializing. Please wait until it stops blinking, indicating that it has joined the stack.
- 7 Repeat steps 4 to 6 to connect other Switches to the stack.

When the Switch is in Stacking mode, the Web Configurator will change port and VLAN port settings to support the stacking mode.

Click **Basic Setting > Stacking > Configuration** to see the following screen.

Figure 93 Basic Setting > Stacking > Configuration

Stacking Configuration [Stacking Status](#)

Active ☒

Apply Cancel

Force Master Mode ☐

System Priority 32

Apply Cancel

Slot ID :

Slot ID Freeze Freeze

Slot	MAC Address	Type	Slot ID After Reboot
1	bc:99:11:d8:3a:a5	XS3800-28	Auto ▼

Apply Cancel

The following table describes the labels in this screen.

Table 42 Basic Setting > Stacking > Configuration

LABEL	DESCRIPTION
Active	Select the Active check box to put the Switch in stacking mode. This will erase the running configuration, config01 and config02. The master Switch's login will remain unchanged. If you want to reload a previous configuration, please back one up first.
Apply	Click Apply to activate the stacking mode.
Cancel	Click Cancel to clear the Active check box.
Force Master Mode	Select the Force Master Mode check box to force this Switch to become a master Switch.
System Priority	Enter a number (from 1 to 63) to assign a priority for the stacking Switch. The higher the number, the higher the priority.
Apply	Click Apply to save the Active Force Master Mode and System Priority fields.
Cancel	Click Cancel to clear the Active Force Master Mode and System Priority fields.
Slot ID Freeze	Click the Freeze button to have the Switch retain its slot ID after reboot.
Slot	This field displays the slot or port channel of the stacked Switch.
MAC Address	This field displays the MAC address of the stacked Switch.
Type	This field displays the model name of the Switch.
Slot ID After Reboot	Choose Auto to have a new slot ID assigned after reboot. If you want to keep the original slot ID after reboot, you can click Freeze or select an ID in the Slot ID After Reboot list box.
Apply	Click Apply to save the Slot ID After Reboot field.
Cancel	Click Cancel to clear the Slot ID After Reboot field.

8.12 Cloud Management

The Zyxel Nebula Control Center (NCC) is a cloud-based network management system that allows you to remotely manage and monitor Zyxel Nebula APs, Ethernet switches and security gateways.

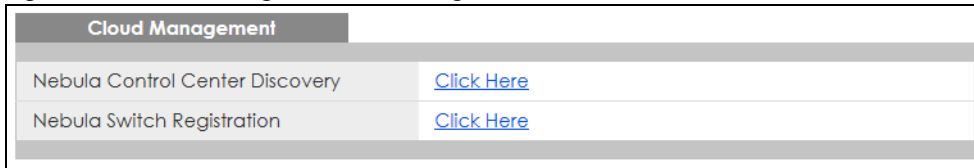
The Switch is managed and provisioned automatically by the NCC (Nebula Control Center) when:

- It is connected to the Internet.
- The **Nebula Control Center Discovery** feature is enabled.
- It has been registered in the NCC.

This screen displays links to **Nebula Control Center Discovery** where you can have the Switch search for the NCC (Nebula Control Center) and to **Nebula Switch Registration** which has a QR code containing the Switch's serial number and MAC address for handy registration of the Switch at NCC.

Click **Basic Setting** > **Cloud Management** in the navigation panel to display this screen.

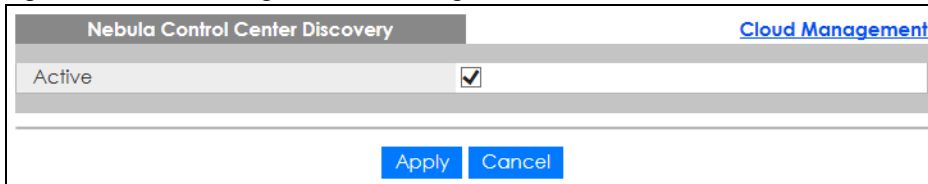
Figure 94 Basic Setting > Cloud Management



8.12.1 Nebula Center Control Discovery

Click **Basic Setting** > **Cloud Management** > **Nebula Control Center Discovery** to display this screen.

Figure 95 Basic Setting > Cloud Management > Nebula Control Center Discovery



Select **Active** to turn on NCC discovery on the Switch. If the Switch has Internet access and has been registered in the NCC, it will go into cloud management mode.

In cloud management mode, then NCC will first check if the firmware on the Switch needs to be upgraded. If it does, the Switch will upgrade the firmware immediately. If the firmware does not need to be upgraded, but there is newer firmware available for the Switch, then it will be upgraded according to the firmware upgrade schedule for the Switch on the NCC. Below is the process for upgrading firmware:

- 1 Download firmware via the NCC.
- 2 Upgrade the firmware and reboot.

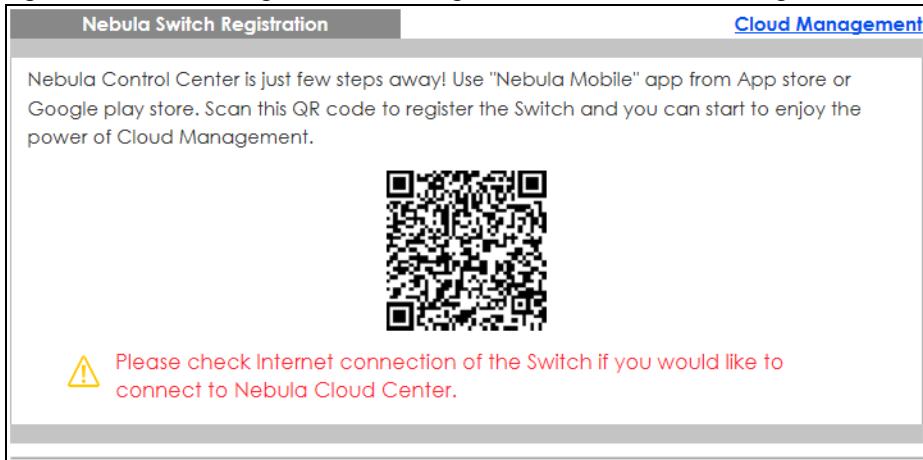
Note: While the Switch is rebooting, do NOT turn off the power.

Clear **Active** to turn off NCC discovery on the Switch. The Switch will NOT discover the NCC and remain in standalone mode.

8.12.2 Nebula Switch Registration

Click **Basic Setting** > **Cloud Management** > **Nebula Switch Registration** to display this screen.

Figure 96 Basic Setting > Cloud Management > Nebula Switch Registration



This screen has a QR code containing the Switch's serial number and MAC address for handy NCC registration of the Switch using the Nebula Mobile app. First, download the app from the Google Play store for Android devices or the App Store for iOS devices and create an organization and site.

CHAPTER 9

VLAN

9.1 Overview

This chapter shows you how to configure 802.1Q tagged and port-based VLANs.

The type of screen you see here depends on the **VLAN Type** you selected in the **Switch Setup** screen which is only available in standalone mode. The Switch does not support port-based VLANs in stacking mode.

9.1.1 What You Can Do

- Use the **VLAN** screen ([Section 9.3 on page 134](#)) to view and search all static VLAN groups.
- Use the **VLAN Detail** screen ([Section 9.3.1 on page 135](#)) to view detailed port settings and status of the static VLAN group.
- Use the **Private VLAN Status** screen ([Section 9.4 on page 137](#)) to view all private VLANs created on the Switch.
- Use the **Static VLAN Setup** screen ([Section 9.6 on page 138](#)) to configure a static VLAN for the Switch.
- Use the **VLAN Port Setup** screen ([Section 9.7 on page 141](#)) to configure the static VLAN (IEEE 802.1Q) settings on a port.
- Use the **Subnet Based VLAN Setup** screen ([Section 9.8 on page 143](#)) to set up VLANs that allow you to group traffic into logical VLANs based on the source IP subnet you specify.
- Use the **Protocol Based VLAN Setup** screen ([Section 9.9 on page 146](#)) to set up VLANs that allow you to group traffic into logical VLANs based on the protocol you specify.
- Use the **Voice VLAN Setup** screen ([Section 9.10 on page 149](#)) to set up VLANs that allow you to group voice traffic with defined priority and enable the Switch port to carry the voice traffic separately from data traffic to ensure the sound quality does NOT deteriorate.
- Use the **MAC Based VLAN Setup** screen ([Section 9.11 on page 151](#)) to set up VLANs that allow you to group untagged packets into logical VLANs based on the source MAC address of the packet. This eliminates the need to reconfigure the Switch when you change ports. The Switch will forward the packets based on the source MAC address you set up previously.
- Use the **Vendor ID Based VLAN Setup** screen ([Section 9.12 on page 152](#)) to set up VLANs that allow you to group untagged packets into logical VLANs based on the source MAC address of the packet. You can specify a mask for the MAC address to create a MAC address filter and enter a weight to set the VLAN rule's priority.

9.1.2 What You Need to Know

Read this section to know more about VLAN and how to configure the screens.

9.2 Introduction to IEEE 802.1Q Tagged VLANs

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 or 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 4096 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 4094.

TPID	User Priority	CFI	VLAN ID
2 Bytes	3 Bits	1 Bit	12 bits

Forwarding Tagged and Untagged Frames

Each port on the Switch is capable of passing tagged or untagged frames. To forward a frame from an 802.1Q VLAN-aware switch to an 802.1Q VLAN-unaware switch, the Switch first decides where to forward the frame and then strips off the VLAN tag. To forward a frame from an 802.1Q VLAN-unaware switch to an 802.1Q VLAN-aware switch, the Switch first decides where to forward the frame, and then inserts a VLAN tag reflecting the ingress port's default VID. The default PVID is VLAN 1 for all ports, but this can be changed.

A broadcast frame (or a multicast frame for a multicast group that is known by the system) is duplicated only on ports that are members of the VID (except the ingress port itself), thus confining the broadcast to a specific domain.

9.2.0.1 Automatic VLAN Registration

GARP and GVRP are the protocols used to automatically register VLAN membership across switches.

GARP

GARP (Generic Attribute Registration Protocol) allows network switches to register and de-register attribute values with other GARP participants within a bridged LAN. GARP is a protocol that provides a generic mechanism for protocols that serve a more specific application, for example, GVRP.

GARP Timers

Switches join VLANs by making a declaration. A declaration is made by issuing a Join message using GARP. Declarations are withdrawn by issuing a Leave message. A Leave All message terminates all registrations. GARP timers set declaration timeout values.

GVRP

GVRP (GARP VLAN Registration Protocol) is a registration protocol that defines a way for switches to register necessary VLAN members on ports across the network. Enable this function to permit VLAN groups beyond the local Switch.

Please refer to the following table for common IEEE 802.1Q VLAN terminology.

Table 43 IEEE 802.1Q VLAN Terminology

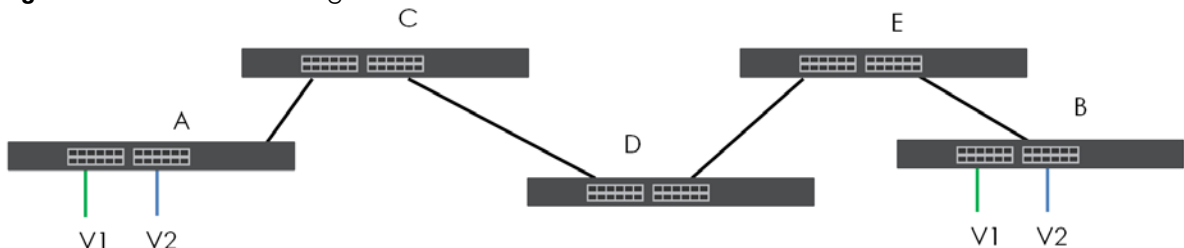
VLAN PARAMETER	TERM	DESCRIPTION
VLAN Type	Permanent VLAN	This is a static VLAN created manually.
	Dynamic VLAN	This is a VLAN configured by a GVRP registration or de-registration process.
VLAN Administrative Control	Registration Fixed	Fixed registration ports are permanent VLAN members.
	Registration Forbidden	Ports with registration forbidden are forbidden to join the specified VLAN.
	Normal Registration	Ports dynamically join a VLAN using GVRP.
VLAN Tag Control	Tagged	Ports belonging to the specified VLAN tag all outgoing frames transmitted.
	Untagged	Ports belonging to the specified VLAN do not tag all outgoing frames transmitted.
VLAN Port	Port VID	This is the VLAN ID assigned to untagged frames that this port received.
	Acceptable Frame Type	You may choose to accept both tagged and untagged incoming frames, just tagged incoming frames or just untagged incoming frames on a port.
	Ingress filtering	If set, the Switch discards incoming frames for VLANs that do not have this port as a member.

9.2.0.2 Port VLAN Trunking

Enable **VLAN Trunking** on a port to allow frames belonging to unknown VLAN groups to pass through that port. This is useful if you want to set up VLAN groups on end devices without having to configure the same VLAN groups on intermediary devices.

Refer to the following figure. Suppose you want to create VLAN groups 1 and 2 (V1 and V2) on devices A and B. Without **VLAN Trunking**, you must configure VLAN groups 1 and 2 on all intermediary switches C, D and E; otherwise they will drop frames with unknown VLAN group tags. However, with **VLAN Trunking** enabled on ports in each intermediary switch you only need to create VLAN groups in the end devices (A and B). C, D and E automatically allow frames with VLAN group tags 1 and 2 (VLAN groups that are unknown to those switches) to pass through their VLAN trunking ports.

Figure 97 Port VLAN Trunking



9.2.0.3 Select the VLAN Type

Select a VLAN type in the **Basic Setting > Switch Setup** screen.

VLAN Type is not applicable in stacking mode.

Figure 98 Basic Setting > Switch Setup > Select VLAN Type

Switch Setup			
VLAN Type	☒ 802.1Q ☐ Port Based		
Bridge Control Protocol Transparency	Active	☐	
MAC Address Learning	Aging Time	300	seconds
ARP Aging Time	Aging Time	300	seconds
GARP Timer	Join Timer	200	milliseconds
	Leave Timer	600	milliseconds
	Leave All Timer	10000	milliseconds
Priority Queue Assignment	Priority7	7	▼
	Priority6	6	▼
	Priority5	5	▼
	Priority4	4	▼
	Priority3	3	▼
	Priority2	1	▼
	Priority1	0	▼
	Priority0	2	▼
Apply Cancel			

802.1Q Static VLAN

Make sure **802.1Q** is selected in the **Basic Setting > Switch Setup** screen.

Use a static VLAN to decide whether an incoming frame on a port should be

- sent to a VLAN group as normal depending on its VLAN tag.
- sent to a group whether it has a VLAN tag or not.
- blocked from a VLAN group regardless of its VLAN tag.

You can also tag all outgoing frames (that were previously untagged) from a port with the specified VID.

9.3 VLAN Status

Use this screen to view and search all static VLAN groups. Click **Advanced Application > VLAN** from the navigation panel to display the **VLAN Status** screen as shown next.

Figure 99 Advanced Application > VLAN: VLAN Status

VLAN Status [Private VLAN Status](#) [VLAN Configuration](#)

VLAN Search by VID [Search](#)

The Number of VLAN: 1.

Index	VID	Name	Tagged Port	Untagged Port	Elapsed Time	Status
1	1	1		1-28	10:27:54	Static

Change Pages [Previous](#) [Next](#)

The following table describes the labels in this screen.

Table 44 Advanced Application > VLAN: VLAN Status

LABEL	DESCRIPTION
VLAN Search by VID	Enter (an) existing VLAN ID numbers (use a comma (,) to separate individual VLANs or a dash (-) to indicate a range of VLANs. For example, "3,4" or "3-9") and click Search to display only the specified VLANs in the list below. Leave this field blank and click Search to display all VLANs configured on the Switch.
The Number of VLAN	This is the number of VLANs configured on the Switch.
The Number of Search Results	This is the number of VLANs that match the searching criteria and display in the list below. This field displays only when you use the Search button to look for certain VLANs.
Index	This is the VLAN index number. Click an index number to view more VLAN details.
VID	This is the VLAN identification number that was configured in the corresponding VLAN configuration screen.
Name	This fields shows the descriptive name of the VLAN.
Tagged Port	This field shows the tagged ports that are participating in the VLAN.
Untagged Port	This field shows the untagged ports that are participating in the VLAN.
Elapsed Time	This field shows how long it has been since a normal VLAN was registered or a static VLAN was set up.
Status	This field shows how this VLAN was added to the Switch. • Dynamic – using GVRP • Static – manually added as a normal VLAN • Private – manually added as a private VLAN (primary, isolated or community) • RMirror – manually added as a remote port mirroring VLAN • MVR – added via Multicast VLAN Registration (MVR)
Change Pages	Click Previous or Next to show the previous or next screen if all status information cannot be seen in one screen.

9.3.1 VLAN Details

Use this screen to view detailed port settings and status of the static VLAN group. Click an index number in the **VLAN Status** screen to display VLAN details.

Figure 100 Advanced Application > VLAN > VLAN Detail (Standalone Mode)

VLAN Detail																VLAN Status	
VID	Port Number														Elapsed Time	Status	
	2	4	6	8	10	12	14	16	18	20	22	24	26	28			
1	1	3	5	7	9	11	13	15	17	19	21	23	25	27	11:06:44	Static	
	U	U	U	U	U	U	U	U	U	U	U	U	U	U			
	U	U	U	U	U	U	U	U	U	U	U	U	U	U			
Private VLAN Status																	
Primary VLAN	Secondary VLAN				Type				Port List								
Change Pages																	
PreviousNext																	

Figure 101 Advanced Application > VLAN > VLAN Detail (Stacking Mode)

VLAN Detail														VLAN Status	
VID	Slot	Port Number												Elapsed Time	Status
		2	4	6	8	10	12	14	16	18	20	22	24		
		1	3	5	7	9	11	13	15	17	19	21	23		
1	1	U	U	U	U	U	U	U	U	U	U	U	U	19:01:03	Static
		U	U	U	U	U	U	U	U	U	U	U	U		
Private VLAN Status															
Primary VLAN	Secondary VLAN		Type		Port List										
Change Pages															
		Previous		Next											

The following table describes the labels in this screen.

Table 45 Advanced Application > VLAN > VLAN Detail

LABEL	DESCRIPTION
VLAN Status	Click this to go to the VLAN Status screen.
VID	This is the VLAN identification number that was configured in the corresponding VLAN configuration screen.
Slot	'Slot' refers to a Switch in the 'virtual chassis' stack. This field displays the slot ID of the stacked Switch.
Port Number	This column displays the ports that are participating in a VLAN. A tagged port is marked as T , an untagged port is marked as U and ports not participating in a VLAN are marked as "-".
Elapsed Time	This field shows how long it has been since a normal VLAN was registered or a static VLAN was set up.
Status	This field shows how this VLAN was added to the Switch. • Dynamic – using GVRP • Static – manually added as a normal VLAN • Private – manually added as a private VLAN (primary, isolated or community) • RMirror – manually added as a remote port mirroring VLAN • MVR – added via Multicast VLAN Registration (MVR)
Private VLAN Status	These fields show private VLAN information for the selected VLAN.
Primary VLAN	This field shows the primary VLAN ID in the selected VLAN.
Secondary VLAN	This field shows the secondary VLAN ID in the selected VLAN.
Type	This field shows the type of private VLAN: Primary , Community or Isolated .

Table 45 Advanced Application > VLAN > VLAN Detail (continued)

LABEL	DESCRIPTION
Port List	This shows the ports mapped to the private VLAN using the Advanced Application > Private VLAN or Advanced Application > VLAN > Static VLAN screen.
Change Pages	Click Previous or Next to show the previous or next screen if all status information cannot be seen in one screen.

9.4 Private VLAN Status

Use this screen to view all private VLANs created on the Switch. Click **Advanced Application > VLAN > Private VLAN Status** to see the following screen.

Figure 102 Advanced Application > VLAN > Private VLAN Status

Private VLAN Status				VLAN Status
Primary VLAN	Secondary VLAN	Type	Port List	
Change Pages Previous Next				

The following table describes the labels in this screen.

Table 46 Advanced Application > VLAN > Private VLAN Status

LABEL	DESCRIPTION
Private VLAN Status	These fields show information for the all private VLANs. See also Advanced Application > Private VLAN .
Primary VLAN	This field shows the primary VLAN ID in a private VLAN.
Secondary VLAN	This field shows the secondary VLAN ID in a private VLAN.
Type	This field shows the type of private VLAN: Primary , Community or Isolated .
Port List	This shows the ports mapped to the private VLAN using the Advanced Application > Private VLAN or Advanced Application > VLAN > Static VLAN screen.
Change Pages	Use the Previous and Next buttons to display different pages.

9.5 VLAN Configuration

Use this screen to view IEEE 802.1Q VLAN parameters for the Switch. Click **Advanced Application > VLAN > VLAN Configuration** to see the following screen.

Figure 103 Advanced Application > VLAN > VLAN Configuration

VLAN Configuration		VLAN Status
Static VLAN Setup	Click Here	
VLAN Port Setup	Click Here	
Subnet Based VLAN Setup	Click Here	
Protocol Based VLAN Setup	Click Here	
Voice VLAN Setup	Click Here	
MAC Based VLAN Setup	Click Here	
Vendor ID Based VLAN Setup	Click Here	

The following table describes the labels in the above screen.

Table 47 Advanced Application > VLAN > VLAN Configuration

LABEL	DESCRIPTION
Static VLAN Setup	Click Click Here to configure the Static VLAN for the Switch.
VLAN Port Setup	Click Click Here to configure the VLAN Port for the Switch.
Subnet Based VLAN Setup	Click Click Here to configure the Subnet Based VLAN for the Switch.
Protocol Based VLAN Setup	Click Click Here to configure the Protocol Based VLAN for the Switch.
Voice VLAN Setup	Click Click Here to configure the Voice VLAN for the Switch.
MAC Based VLAN Setup	Click Click Here to configure the MAC Based VLAN for the Switch.
Vendor ID Based VLAN Setup	Click Click Here to configure the Vendor ID Based VLAN for the Switch.

9.6 Configure a Static VLAN

Use this screen to configure a static VLAN for the Switch. Click the **Static VLAN Setup** link in the **VLAN Configuration** screen to display the screen as shown next.

Figure 104 Advanced Application > VLAN > VLAN Configuration > Static VLAN Setup (Standalone Mode)

Static VLAN

[VLAN Configuration](#)

ACTIVE

☐

Name

VLAN Group ID

VLAN Type

☒ Normal

☐ Private

Association VLAN List

Port	Control			Tagging
*	Normal			☒ Tx Tagging
1	☒ Normal	☐ Fixed	☐ Forbidden	☒ Tx Tagging
2	☒ Normal	☐ Fixed	☐ Forbidden	☒ Tx Tagging
3	☒ Normal	☐ Fixed	☐ Forbidden	☒ Tx Tagging
4	☒ Normal	☐ Fixed	☐ Forbidden	☒ Tx Tagging
5	☒ Normal	☐ Fixed	☐ Forbidden	☒ Tx Tagging
6	☒ Normal	☐ Fixed	☐ Forbidden	☒ Tx Tagging
7	☒ Normal	☐ Fixed	☐ Forbidden	☒ Tx Tagging
8	☒ Normal	☐ Fixed	☐ Forbidden	☒ Tx Tagging
9	☒ Normal	☐ Fixed	☐ Forbidden	☒ Tx Tagging
10	☒ Normal	☐ Fixed	☐ Forbidden	☒ Tx Tagging
11	☒ Normal	☐ Fixed	☐ Forbidden	☒ Tx Tagging
12	☒ Normal	☐ Fixed	☐ Forbidden	☒ Tx Tagging

Add

Cancel

Clear

VID	Active	Name	VLAN Type	Association VLAN List	
1	Yes	1	Normal		☐
123	Yes	VLAN123	Normal		☐

Delete

Cancel

Figure 105 Advanced Application > VLAN > VLAN Configuration > Static VLAN Setup (Stacking Mode)

Static VLAN [VLAN Configuration](#)

ACTIVE ☒

Name

VLAN Group ID

VLAN Type
☒ Normal
☐ Private

Association VLAN List

SLOT 1 ▼

Port	Control			Tagging
1/*		Normal ▼		☒ Tx Tagging
1/1	☐ Normal	☒ Fixed	☐ Forbidden	☐ Tx Tagging
1/2	☐ Normal	☒ Fixed	☐ Forbidden	☐ Tx Tagging
1/3	☐ Normal	☒ Fixed	☐ Forbidden	☐ Tx Tagging
1/4	☐ Normal	☒ Fixed	☐ Forbidden	☐ Tx Tagging
1/5	☐ Normal	☒ Fixed	☐ Forbidden	☐ Tx Tagging
1/6	☐ Normal	☒ Fixed	☐ Forbidden	☐ Tx Tagging
1/7	☐ Normal	☒ Fixed	☐ Forbidden	☐ Tx Tagging
1/8	☐ Normal	☒ Fixed	☐ Forbidden	☐ Tx Tagging
1/9	☐ Normal	☒ Fixed	☐ Forbidden	☐ Tx Tagging
1/10	☐ Normal	☒ Fixed	☐ Forbidden	☐ Tx Tagging

Add Cancel Clear

VID	Active	Name	VLAN Type	Association VLAN List
1	Yes	1	Normal	

Delete Cancel

The following table describes the related labels in this screen.

Table 48 Advanced Application > VLAN > VLAN Configuration > Static VLAN Setup

LABEL	DESCRIPTION
ACTIVE	Select this check box to activate the VLAN settings.
Name	Enter a descriptive name for the VLAN group for identification purposes. This name consists of up to 64 printable characters. Spaces are allowed.
VLAN Group ID	Enter the VLAN ID for this static entry; the valid range is between 1 and 4094. Note: Do NOT add a VLAN ID that has been used in the Voice VLAN Setup .
VLAN Type	Select Normal (static) or Private . For Private VLANs, select Primary , Isolated or Community .
Association VLAN List	Primary private VLANs can associate with several (secondary) Community private VLANs and up to one (secondary) Isolated private VLAN. You only configure VLAN Association List for Primary private VLANs. Use a dash to associate consecutive VLANs and a comma (no spaces) to associate non-consecutive VLANs. For example, 51–53 includes 51, 52 and 53, but 51,53 does not include 52. Secondary private VLANs can only be associated with one primary private VLAN.
SLOT	This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack.

Table 48 Advanced Application > VLAN > VLAN Configuration > Static VLAN Setup (continued)

LABEL	DESCRIPTION
Port	The port number identifies the port you are configuring. In stacking mode, the first number represents the slot ID and the second one is the port number. Please note that the default stacking ports (the last four ports of your Switch) cannot be configured. They are reserved for stacking only.
*	Settings in this row apply to all ports. Use this row only if you want to make some settings the same for all ports. Use this row first to set the common settings and then make adjustments on a port-by-port basis. Note: Changes in this row are copied to all the ports as soon as you make them.
Control	Select Normal for the port to dynamically join this VLAN group using GVRP. This is the default selection. Select Fixed for the port to be a permanent member of this VLAN group. Select Forbidden if you want to prohibit the port from joining this VLAN group.
Tagging	Select TX Tagging if you want the port to tag all outgoing frames transmitted with this VLAN Group ID.
Add	Click this to create a new entry or to update an existing one. This saves your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to begin configuring this screen afresh.
Clear	Click Clear to start configuring the screen again.
VID	This field displays the ID number of the VLAN group. Click the number to edit the VLAN settings.
Active	This field indicates whether the VLAN settings are enabled (Yes) or disabled (No).
Name	This field displays the descriptive name for this VLAN group.
VLAN Type	This field displays the Normal or Private (Primary, Isolated or Community) type VLAN configured in the top part of this screen.
Association VLAN List	This field displays which secondary private VLANs are associated with a primary private VLAN configured in the top part of this screen.
	Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries.
Delete	Click Delete to remove the selected entry from the summary table.
Cancel	Click Cancel to clear the check boxes.

9.7 Configure VLAN Port Settings

Use this screen to configure the static VLAN (IEEE 802.1Q) settings on a port. Click the **VLAN Port Setup** link in the **VLAN Configuration** screen.

Figure 106 Advanced Application > VLAN > VLAN Configuration > VLAN Port Setup (Standalone Mode)

VLAN Port Setting [VLAN Configuration](#)

GVRP ☐

Port	Ingress Check	PVID	GVRP	Acceptable Frame Type	VLAN Trunking	Isolation
*	☐		☐	All ▼	☐	☐
1	☐	1	☐	All ▼	☐	☐
2	☐	1	☐	All ▼	☐	☐
3	☐	1	☐	All ▼	☐	☐
4	☐	1	☐	All ▼	☐	☐
5	☐	1	☐	All ▼	☐	☐
6	☐	1	☐	All ▼	☐	☐
7	☐	1	☐	All ▼	☐	☐
8	☐	1	☐	All ▼	☐	☐
9	☐	1	☐	All ▼	☐	☐
10	☐	1	☐	All ▼	☐	☐
11	☐	1	☐	All ▼	☐	☐
12	☐	1	☐	All ▼	☐	☐

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

Figure 107 Advanced Application > VLAN > VLAN Configuration > VLAN Port Setup (Stacking Mode)

VLAN Port Setting [VLAN Configuration](#)

GVRP ☐

SLOT 1 ▼

Port	Ingress Check	PVID	GVRP	Acceptable Frame Type	VLAN Trunking	Isolation
1/*	☐		☐	All ▼	☐	☐
1/1	☐	1	☐	All ▼	☐	☐
1/2	☐	1	☐	All ▼	☐	☐
1/3	☐	1	☐	All ▼	☐	☐
1/4	☐	1	☐	All ▼	☐	☐
1/5	☐	1	☐	All ▼	☐	☐
1/6	☐	1	☐	All ▼	☐	☐
1/7	☐	1	☐	All ▼	☐	☐
1/8	☐	1	☐	All ▼	☐	☐
1/9	☐	1	☐	All ▼	☐	☐
1/10	☐	1	☐	All ▼	☐	☐
1/11	☐	1	☐	All ▼	☐	☐
1/12	☐	1	☐	All ▼	☐	☐

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

The following table describes the labels in this screen.

Table 49 Advanced Application > VLAN > VLAN Configuration > VLAN Port Setup

LABEL	DESCRIPTION
GVRP	GVRP (GARP VLAN Registration Protocol) is a registration protocol that defines a way for switches to register necessary VLAN members on ports across the network. Select this check box to permit VLAN groups beyond the local Switch.
SLOT	This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack.
Port	This field displays the port number of the Switch. In stacking mode, the first number represents the slot ID and the second is the port number. Please note that the default stacking ports (the last four ports of your Switch) cannot be configured. They are reserved for stacking only.
*	Settings in this row apply to all ports. Use this row only if you want to make some settings the same for all ports. Use this row first to set the common settings and then make adjustments on a port-by-port basis. Note: Changes in this row are copied to all the ports as soon as you make them.
Ingress Check	If this check box is selected, the Switch discards incoming frames on a port for VLANs that do not include this port in its member set. Clear this check box to disable ingress filtering.
PVID	A PVID (Port VLAN ID) is a tag that adds to incoming untagged frames received on a port so that the frames are forwarded to the VLAN group that the tag defines. Enter a number between 1 and 4094 as the port VLAN ID.
GVRP	Select this check box to allow GVRP on this port.
Acceptable Frame Type	Specify the type of frames allowed on a port. Choices are All , Tag Only and Untag Only . Select All from the drop-down list box to accept all untagged or tagged frames on this port. This is the default setting. Select Tag Only to accept only tagged frames on this port. All untagged frames will be dropped. Select Untag Only to accept only untagged frames on this port. All tagged frames will be dropped. Note: When the Switch is in stacking mode and the master Switch has VLAN1, all other ports will be configured to untagged port.
VLAN Trunking	Enable VLAN Trunking on ports connected to other switches or routers (but not ports directly connected to end users) to allow frames belonging to unknown VLAN groups to pass through the Switch.
Isolation	Select this to allow this port to communicate only with the CPU management port and the ports on which the isolation feature is NOT enabled.
Apply	Click Apply to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to begin configuring this screen afresh.

9.8 Subnet Based VLANs

Subnet based VLANs allow you to group traffic into logical VLANs based on the source IP subnet you specify. When a frame is received on a port, the Switch checks if a tag is added already and the IP

subnet it came from. The untagged packets from the same IP subnet are then placed in the same subnet based VLAN. One advantage of using subnet based VLANs is that priority can be assigned to traffic from the same IP subnet.

Note: Subnet based VLAN applies to un-tagged packets and is applicable only when you use IEEE 802.1Q tagged VLAN.

For example, an ISP (Internet Services Provider) may divide different types of services it provides to customers into different IP subnets. Traffic for voice services is designated for IP subnet 172.16.1.0/24, video for 192.168.1.0/24 and data for 10.1.1.0/24. The Switch can then be configured to group incoming traffic based on the source IP subnet of incoming frames.

You configure a subnet based VLAN with priority 6 and VID of 100 for traffic received from IP subnet 172.16.1.0/24 (voice services). You also have a subnet based VLAN with priority 5 and VID of 200 for traffic received from IP subnet 192.168.1.0/24 (video services). Lastly, you configure VLAN with priority 3 and VID of 300 for traffic received from IP subnet 10.1.1.0/24 (data services). All untagged incoming frames will be classified based on their source IP subnet and prioritized accordingly. That is video services receive the highest priority and data the lowest.

Figure 108 Subnet Based VLAN Application Example

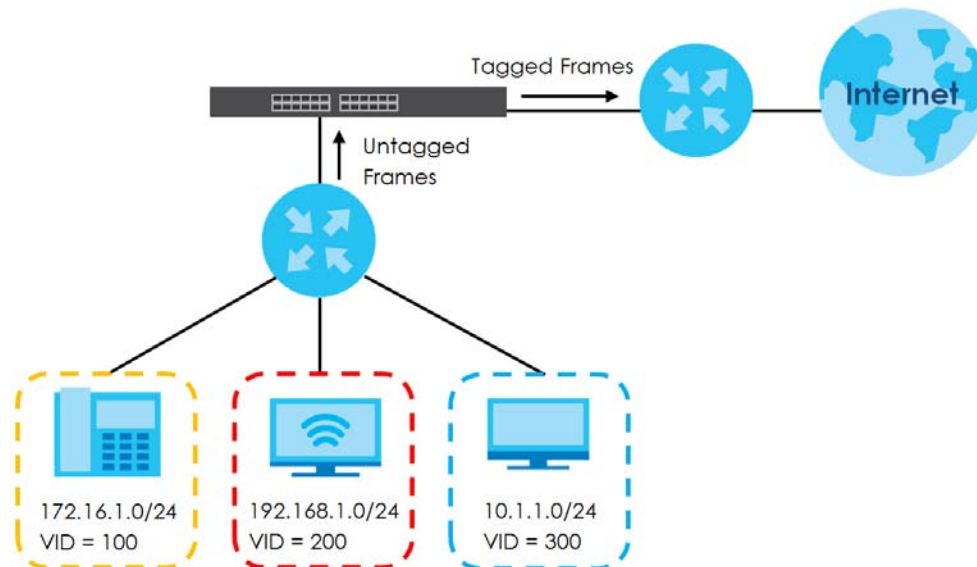


Figure 109 Advanced Application > VLAN > VLAN Configuration > Subnet Based VLAN Setup

The screenshot shows the 'Subnet Based VLAN' configuration interface. At the top, there's a title bar with 'Subnet Based VLAN' and a link to 'VLAN Configuration'. Below this, there are two main sections. The first section contains 'Active' and 'DHCP-Vlan Override' checkboxes, an 'Apply' button, and a table listing existing VLANs with columns: Index, Active, Name, IP, Mask-Bits, VID, and Priority. The second section is for creating or editing a VLAN, featuring input fields for Name, IP, Mask-Bits, VID, and Priority, along with 'Add' and 'Cancel' buttons.

The following table describes the labels in this screen.

Table 50 Advanced Application > VLAN > VLAN Configuration > Subnet Based VLAN Setup

LABEL	DESCRIPTION
Active	Check this box to activate this subnet based VLANs on the Switch.
DHCP-Vlan Override	When DHCP snooping is enabled DHCP clients can renew their IP address through the DHCP VLAN or via another DHCP server on the subnet based VLAN. Select this check box to force the DHCP clients in this IP subnet to obtain their IP addresses through the DHCP VLAN.
Apply	Click Apply to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Active	Check this box to activate the IP subnet VLAN you are creating or editing.
Name	Enter up to 32 alpha numeric characters to identify this subnet based VLAN.
IP	Enter the IP address of the subnet for which you want to configure this subnet based VLAN.
Mask-Bits	Enter the bit number of the subnet mask. To find the bit number, convert the subnet mask to binary format and add all the 1's together. Take "255.255.255.0" for example. 255 converts to eight 1s in binary. There are three 255s, so add three eights together and you get the bit number (24).
VID	Enter the ID of a VLAN with which the untagged frames from the IP subnet specified in this subnet based VLAN are tagged. This must be an existing VLAN which you defined in the Advanced Application > VLAN > Static VLAN screen.
Priority	Select the priority level that the Switch assigns to frames belonging to this VLAN.
Add	Click this to create a new entry or to update an existing one. This saves your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to begin configuring this screen afresh.
Index	This is the index number identifying this subnet based VLAN. Click on any of these numbers to edit an existing subnet based VLAN.

Table 50 Advanced Application > VLAN > VLAN Configuration > Subnet Based VLAN Setup (continued)

LABEL	DESCRIPTION
Active	This field shows whether the subnet based VLAN is active or not.
Name	This field shows the name the subnet based VLAN.
IP	This field shows the IP address of the subnet for this subnet based VLAN.
Mask-Bits	This field shows the subnet mask in bit number format for this subnet based VLAN.
VID	This field shows the VLAN ID of the frames which belong to this subnet based VLAN.
Priority	This field shows the priority which is assigned to frames belonging to this subnet based VLAN.
	Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries.
Delete	Click this to delete the subnet based VLANs which you marked for deletion.
Cancel	Click Cancel to clear the check boxes.

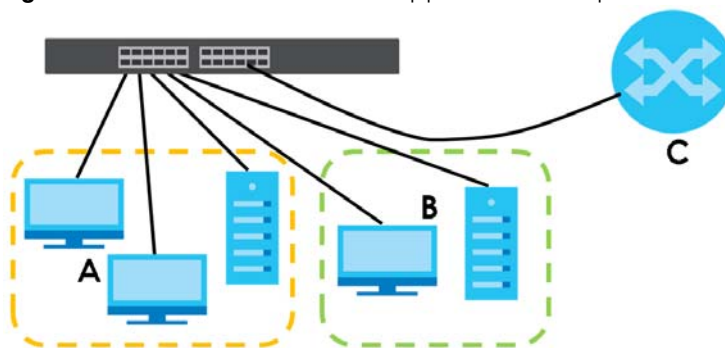
9.9 Protocol Based VLANs

Protocol based VLANs allow you to group traffic into logical VLANs based on the protocol you specify. When an upstream frame is received on a port (configured for a protocol based VLAN), the Switch checks if a tag is added already and its protocol. The untagged packets of the same protocol are then placed in the same protocol based VLAN. One advantage of using protocol based VLANs is that priority can be assigned to traffic of the same protocol.

Note: Protocol-based VLAN applies to un-tagged packets and is applicable only when you use IEEE 802.1Q tagged VLAN.

For example, port 1, 2, 3 and 4 belong to static VLAN 100, and port 4, 5, 6, 7 belong to static VLAN 120. You configure a protocol based VLAN A with priority 3 for ARP traffic received on port 1, 2 and 3. You also have a protocol based VLAN B with priority 2 for Apple Talk traffic received on port 6 and 7. All upstream ARP traffic from port 1, 2 and 3 will be grouped together, and all upstream Apple Talk traffic from port 6 and 7 will be in another group and have higher priority than ARP traffic, when they go through the uplink port to a backbone switch C.

Figure 110 Protocol Based VLAN Application Example



9.9.1 Configuring Protocol Based VLAN

Click the **Protocol Based VLAN Setup** link in the **VLAN Configuration** screen to display the configuration screen as shown.

Figure 111 Advanced Application > VLAN > VLAN Configuration > Protocol Based VLAN Setup (Standalone Mode)

Figure 112 Advanced Application > VLAN > VLAN Configuration > Protocol Based VLAN Setup (Stacking Mode)

The following table describes the labels in this screen.

Table 51 Advanced Application > VLAN > VLAN Configuration > Protocol Based VLAN Setup

LABEL	DESCRIPTION
Active	Check this box to activate this protocol based VLAN.
Port	Type a port number to be included in this protocol based VLAN. In stacking mode, the first box field is the slot ID and the second field is the port number. This port must belong to a static VLAN in order to participate in a protocol based VLAN.
Name	Enter up to 32 alpha numeric characters to identify this protocol based VLAN.
Ethernet-type	Use the drop down list box to select a predefined protocol to be included in this protocol based VLAN or select Others and type the protocol number in hexadecimal notation. For example the IP protocol in hexadecimal notation is 0800, and Novell IPX protocol is 8137. Note: Protocols in the hexadecimal number range of 0x0000 to 0x05ff are not allowed to be used for protocol based VLANs.
VID	Enter the ID of a VLAN to which the port belongs. This must be an existing VLAN which you defined in the Advanced Application > VLAN > Static VLAN screen.

Table 51 Advanced Application > VLAN > VLAN Configuration > Protocol Based VLAN Setup

LABEL	DESCRIPTION
Priority	Select the priority level that the Switch will assign to frames belonging to this VLAN.
Add	Click this to create a new entry or to update an existing one. This saves your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to begin configuring this screen afresh.
Index	This is the index number identifying this protocol based VLAN. Click any of these numbers to edit an existing protocol based VLAN.
Active	This field shows whether the protocol based VLAN is active or not.
Port	This field shows which port belongs to this protocol based VLAN. In stacking mode, the first number represents the slot ID and the second is the port number.
Name	This field shows the name of the protocol based VLAN.
Ethernet-type	This field shows which Ethernet protocol is part of this protocol based VLAN.
VID	This field shows the VLAN ID of the port.
Priority	This field shows the priority which is assigned to frames belonging to this protocol based VLAN.
	Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries.
Delete	Click this to delete the protocol based VLANs which you marked for deletion.
Cancel	Click Cancel to clear the check boxes.

9.9.1.1 Create an IP-based VLAN Example

This example shows you how to create an IP VLAN which includes ports 1, 4 and 8. Follow these steps using the screen below:

- 1 Activate this protocol based VLAN.
- 2 Type the port number you want to include in this protocol based VLAN. Type **1**.
- 3 Give this protocol-based VLAN a descriptive name. Type **IP-VLAN**.
- 4 Select the protocol. Leave the default value **IP**.
- 5 Type the VLAN ID of an existing VLAN. In our example we already created a static VLAN with an ID of 5. Type **5**.
- 6 Leave the priority set to **0** and click **Add**.

Figure 113 Protocol Based VLAN Configuration Example

Protocol Based VLAN [VLAN Configuration](#)

Active ☒

Port

Name

Ethernet-type ☒ IP ☐ Others (Hex)

VID

Priority

[Add](#) [Cancel](#)

EXAMPLE

Index	Active	Port	Name	Ethernet-type	VID	Priority	

[Delete](#) [Cancel](#)

To add more ports to this protocol based VLAN.

- 1 Click the index number of the protocol based VLAN entry. Click **1**.
- 2 Change the value in the **Port** field to the next port you want to add.
- 3 Click **Add**.

9.10 Voice VLAN

Voice VLAN is a VLAN that is specifically allocated for voice traffic. It ensures that the sound quality of an IP phone is preserved from deteriorating when the data traffic on the Switch ports is high. It groups the voice traffic with defined priority into an assigned VLAN which enables the separation of voice and data traffic coming onto the Switch port.

The Switch can determine whether a received packet is

- an untagged voice packet when the incoming port is a fixed port for voice VLAN.
- a tagged voice packet when the incoming port and VLAN tag belongs to a voice VLAN.

It then checks the source packet's MAC address against an OUI list. If a match is found, the packet is considered as a voice packet.

You can set priority level to the Voice VLAN and add MAC address of IP phones from specific manufacturers by using its ID from the Organizationally Unique Identifiers (OUI).

Click the **Voice VLAN Setup** link in the **VLAN Configuration** screen to display the configuration screen as shown.

Figure 114 Advanced Application > VLAN > VLAN Configuration > Voice VLAN Setup

Voice VLAN Setup [VLAN Configuration](#)

Voice VLAN Global Setup

Voice VLAN ☐ Disable ☒ 1

Priority 5

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

Voice VLAN OUI Setup

OUI address

OUI mask

Description

[Add](#) [Cancel](#)

Index	OUI address	OUI mask	Description	☐
Delete Cancel				

The following table describes the fields in the above screen.

Table 52 Advanced Application > VLAN > VLAN Configuration > Voice VLAN Setup

LABEL	DESCRIPTION
Voice VLAN Global Setup	
Voice VLAN	Click the second radio button if you want to enable the Voice VLAN feature. Type a VLAN ID number in the box next to the radio button that is associated with the Voice VLAN. You also need to create a static VLAN with the same VID in the Static VLAN Setup screen, and then connect the IP phone with the specified OUI MAC address to a port that joins the static VLAN. Click Disable radio button if you do not want to enable the Voice VLAN feature.
Priority	Select the priority level of the voice traffic from 0 to 7. Default setting is 5. The higher the numeric value you assign, the higher the priority for this voice traffic.
Apply	Click Apply to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to begin configuring this section afresh.
Clear	Click Clear to reset the fields to default settings.
Voice VLAN OUI Setup	
OUI address	Enter the IP phone manufacturer's OUI MAC address. The first 3 bytes is the manufacturer identifier, the last 3 bytes is a unique station ID.
OUI mask	Enter the mask for the specified IP phone manufacturer's OUI MAC address to determine which bits a packet's MAC address should match. Enter "f" for each bit of the specified 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.
Description	Enter a description up to 32 characters for the Voice VLAN device. For example: Siemens.
Add	Click Add to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.

Table 52 Advanced Application > VLAN > VLAN Configuration > Voice VLAN Setup (continued)

LABEL	DESCRIPTION
Cancel	Click Cancel to begin configuring this section afresh.
Index	This field displays the index number of the Voice VLAN.
OUI address	This field displays the OUI address of the Voice VLAN.
OUI mask	This field displays the OUI mask address of the Voice VLAN.
Description	This field displays the description of the Voice VLAN with OUI address.
	Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries.
Delete	Click Delete to remove the selected entry from the summary table.
Cancel	Click Cancel to clear the check boxes.

9.11 MAC Based VLAN

The MAC-based VLAN feature assigns incoming untagged packets to a VLAN and classifies the traffic based on the source MAC address of the packet. When untagged packets arrive at the Switch, the source MAC address of the packet is looked up in a MAC to VLAN mapping table. If an entry is found, the corresponding VLAN ID is assigned to the packet. The assigned VLAN ID is verified against the VLAN table. If the VLAN is valid, ingress processing on the packet continues; otherwise, the packet is dropped.

This feature allows users to change ports without having to reconfigure the VLAN. You can assign priority to the MAC-based VLAN and define a MAC to VLAN mapping table by entering a specified source MAC address in the MAC-based VLAN setup screen. You can also delete a MAC-based VLAN entry in the same screen.

Click the **MAC Based VLAN Setup** link in the **VLAN Configuration** screen to see the following screen.

Figure 115 Advanced Application > VLAN > VLAN Configuration > MAC Based VLAN Setup

The screenshot shows the 'MAC Based VLAN Setup' interface. At the top, there's a header with 'Mac Based VLAN' and a link to 'VLAN Configuration'. Below this is a form with four input fields: 'Name', 'MAC Address', 'VID', and 'Priority'. Under the form are 'Add' and 'Cancel' buttons. At the bottom, there's a table with columns: 'Index', 'Name', 'MAC Address', 'VID', 'Priority', and a checkbox. Below the table are 'Delete' and 'Cancel' buttons.

The following table describes the fields in the above screen.

Table 53 Advanced Application > VLAN > VLAN Configuration > MAC Based VLAN Setup

LABEL	DESCRIPTION
Name	Type a name up to 32 alpha numeric characters for the MAC-based VLAN entry.
MAC Address	Type a MAC address that is bind to the MAC-based VLAN entry. This is the source MAC address of the data packet that is looked up when untagged packets arrive at the Switch.
VID	Type an ID (from 1 to 4094) for the VLAN that is associated with the MAC-based VLAN entry.
Priority	Type a priority (0 to 7) that the Switch assigns to frames belonging to this VLAN. The higher the numeric value you assign, the higher the priority for this MAC-based VLAN entry.
Add	Click Add to save the new MAC-based VLAN entry.
Cancel	Click Cancel to clear the fields in the MAC-based VLAN entry.
Index	This field displays the index number of the MAC-based VLAN entry.
Name	This field displays the name of the MAC-based VLAN entry.
MAC Address	This field displays the source MAC address that is bind to the MAC-based VLAN entry.
VID	This field displays the VLAN ID of the MAC-based VLAN entry.
Priority	This field displays the priority level which is assigned to frames belonging to this MAC-based VLAN entity.
	Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries.
Delete	Click Delete to remove the selected entry from the summary table.
Cancel	Click Cancel to clear the check boxes.

9.12 Vendor ID Based VLAN

The Vendor ID based VLAN feature assigns incoming untagged packets to a VLAN and classifies the traffic based on the source MAC address of the packet. When untagged packets arrive at the switch, the source MAC address of the packet is looked up in a Vendor ID to VLAN mapping table. If an entry is found, the corresponding VLAN ID is assigned to the packet. The assigned VLAN ID is verified against the VLAN table. If the VLAN is valid, ingress processing on the packet continues; otherwise, the packet is dropped.

This feature allows users to change ports without having to reconfigure the VLAN. You can assign a 802.1p priority to the vendor ID based VLAN and define a vendor ID to VLAN mapping table by entering a specified source MAC address and mask in the vendor ID based VLAN setup screen. You can also delete a vendor ID based VLAN entry in the same screen.

For every vendor ID based VLAN rule you set, you can specify a weight number to define the rule's priority level. As rules are processed one after the other, stating a priority order will let you choose which rule has to be applied first and which second.

Click the **Vendor ID Based VLAN Setup** link in the **VLAN Configuration** screen to see the following screen.

Figure 116 Advanced Application > VLAN > VLAN Configuration > Vendor ID Based VLAN Setup

Vendor ID Based VLAN							VLAN Configuration
Name							
MAC address	5c:e2:8c:11:22:33						
Mask	ff:ff:ff:00:00:00						
VLAN							
Priority	0 ▼						
Weight	127						
							Add Cancel
Index	Name	MAC address	Mask	VLAN	Priority	Weight	☐
							Delete Cancel

The following table describes the fields in the above screen.

Table 54 Advanced Application > VLAN > VLAN Configuration > Vendor ID Based VLAN Setup

LABEL	DESCRIPTION
Name	Type a name up to 32 alpha numeric characters for the vendor ID based VLAN entry.
MAC Address	Type a MAC address that is bind to the vendor ID-based VLAN entry. This is the source MAC address of the data packet that is looked up when untagged packets arrive at the Switch.
Mask	Type the mask for the specified source MAC address to determine which bits a packet's MAC address should match. Enter "f" for each bit of the specified 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.
VLAN	Type an ID (from 1 to 4094) for the VLAN that is associated with the vendor ID based VLAN entry.
Priority	Select the priority level that the Switch assigns to frames belonging to this VLAN. The higher the numeric value you assign, the higher the priority for this vendor ID based VLAN entry.
Weight	Enter a number between 0 and 255 to specify the rule's weight. This is to decide the priority in which the rule is applied. The higher the number, the higher the rule's priority.
Add	Click Add to save the new vendor ID based VLAN entry.
Cancel	Click Cancel to clear the fields in the vendor ID based VLAN entry.
Index	This field displays the index number of the vendor ID based VLAN entry.
Name	This field displays the name of the vendor ID based VLAN entry.
MAC Address	This field displays the source MAC address that is bind to the vendor ID based VLAN entry.
Mask	This field displays the mask for the source MAC address that is bind to the vendor ID based VLAN entry.
VLAN	This field displays the VLAN ID of the vendor ID based VLAN entry.
Priority	This field displays the priority level which is assigned to frames belonging to this vendor ID based VLAN.
Weight	This field displays the weight of the vendor ID based VLAN entry.

Table 54 Advanced Application > VLAN > VLAN Configuration > Vendor ID Based VLAN Setup

LABEL	DESCRIPTION
	Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries.
Delete	Click Delete to remove the selected entry from the summary table.
Cancel	Click Cancel to clear the check boxes.

9.13 Port-Based VLAN Setup

Port-based VLANs are VLANs where the packet forwarding decision is based on the destination MAC address and its associated port.

Port-based VLANs require allowed outgoing ports to be defined for each port. Therefore, if you wish to allow two subscriber ports to talk to each other, for example, between conference rooms in a hotel, you must define the egress (an egress port is an outgoing port, that is, a port through which a data packet leaves) for both ports.

Port-based VLANs are specific only to the Switch on which they were created.

Note: When you activate port-based VLAN, the Switch uses a default VLAN ID of 1. You cannot change it.

Note: In screens (such as **IP Setup** and **Filtering**) that require a VID, you must enter 1 as the VID.

The port-based VLAN setup screen is shown next. The **CPU** management port forms a VLAN with all Ethernet ports.

9.13.1 Configure a Port-Based VLAN

Select **Port Based** as the VLAN Type in the **Basic Setting > Switch Setup** screen and then click **Advanced Application > VLAN** from the navigation panel to display the next screen.

Select either **All Connected** or **Port Isolated** from the drop-down list depending on your VLAN and VLAN security requirements. If VLAN members need to communicate directly with each other, then select **All Connected**. Select **Port Isolated** if you want to restrict users from communicating directly. Click **Apply** to save your settings.

The following screen shows users on a port-based, all-connected VLAN configuration.

Figure 117 Advanced Application > VLAN > Port Based VLAN Setup (All Connected)

Port Based VLAN Setup

Setting Wizard

All connected

Apply

	Incoming																												
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	
1	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	1	
2	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	2	
3	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	3	
4	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	4	
5	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	5	
6	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	6	
7	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	7	
8	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	8	
9	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	9	
10	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	10	
11	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	11	
12	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	12	
13	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	13	
14	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	14	
Outgoing 15	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	15	
16	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	16	
17	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	17	
18	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	18	
19	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	19	
20	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	20	
21	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	21	
22	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	22	
23	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	23	
24	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	24	
25	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	25	
26	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	26	
27	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	27	
28	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	28	
CPU	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	CPU	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	

Apply

Cancel

The following screen shows users on a port-based, port-isolated VLAN configuration.

Port Based VLAN Setup

Setting Wizard Port isolation Apply

Incoming

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	
1	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	1
2	☐	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	2
3	☐	☐	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	3
4	☐	☐	☐	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	4
5	☐	☐	☐	☐	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	5
6	☐	☐	☐	☐	☐	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	6
7	☐	☐	☐	☐	☐	☐	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	7
8	☐	☐	☐	☐	☐	☐	☐	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	8
9	☐	☐	☐	☐	☐	☐	☐	☐	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	9
10	☐	☐	☐	☐	☐	☐	☐	☐	☐	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	10
11	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	11
12	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	12
13	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	13
14	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	14
15	☐	☐																											

Table 55 Advanced Application > VLAN: Port Based VLAN Setup (continued)

LABEL	DESCRIPTION
Apply	Click Apply to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to begin configuring this screen afresh.

CHAPTER 10

Static MAC Forwarding

10.1 Overview

This chapter discusses how to configure forwarding rules based on MAC addresses of devices on your network.

Use these screens to configure static MAC address forwarding.

10.1.1 What You Can Do

Use the **Static MAC Forwarding** screen ([Section 10.2 on page 158](#)) to assign static MAC addresses for a port.

10.2 Configure Static MAC Forwarding

A static MAC address is an address that has been manually entered in the MAC address table. Static MAC addresses do not age out. When you set up static MAC address rules, you are setting static MAC addresses for a port. This may reduce the need for broadcasting.

Click **Advanced Application > Static MAC Forwarding** in the navigation panel to display the configuration screen as shown.

Figure 119 Advanced Application > Static MAC Forwarding (Standalone Mode)

Static MAC Forwarding						
Active	☐					
Name						
MAC Address						
VID						
Port						
Add Cancel Clear						
Index	Active	Name	MAC Address	VID	Port	
Delete Cancel						

Figure 120 Advanced Application > Static MAC Forwarding (Stacking Mode)

The screenshot shows the 'Static MAC Forwarding' configuration interface in stacking mode. It includes a form with fields for 'Active' (checkbox), 'Name', 'MAC Address', 'VID', and 'Port' (a dropdown menu followed by a text box). Below the form are 'Add', 'Cancel', and 'Clear' buttons. At the bottom, there is a table with columns: 'Index', 'Active', 'Name', 'MAC Address', 'VID', 'Port', and a checkbox. Below the table are 'Delete' and 'Cancel' buttons.

The following table describes the labels in this screen.

Table 56 Advanced Application > Static MAC Forwarding

LABEL	DESCRIPTION
Active	Select this check box to activate your rule. You may temporarily deactivate a rule without deleting it by clearing this check box.
Name	Enter a descriptive name for identification purposes for this static MAC address forwarding rule.
MAC Address	Enter the MAC address in valid MAC address format, that is, six hexadecimal character pairs. Note: Static MAC addresses do NOT age out.
VID	Enter the VLAN identification number.
Port	Enter the port where the MAC address entered in the previous field will be automatically forwarded. In stacking mode, the first box field is the slot ID and the second field is the port number.
Add	Click this to create a new entry or to update an existing one. This saves your rule to the Switch's run-time memory. The Switch loses this rule if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to reset the fields to their last saved values.
Clear	Click Clear to begin configuring this screen afresh.
Index	Click an index number to modify a static MAC address rule for a port.
Active	This field displays whether this static MAC address forwarding rule is active (Yes) or not (No). You may temporarily deactivate a rule without deleting it.
Name	This field displays the descriptive name for identification purposes for this static MAC address-forwarding rule.
MAC Address	This field displays the MAC address that will be forwarded and the VLAN identification number to which the MAC address belongs.
VID	This field displays the ID number of the VLAN group.
Port	This field displays the port where the MAC address shown in the next field will be forwarded. In stacking mode, the first number represents the slot ID and the second is the port number.
	Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries.

Table 56 Advanced Application > Static MAC Forwarding (continued)

LABEL	DESCRIPTION
Delete	Click Delete to remove the selected entry from the summary table.
Cancel	Click Cancel to clear the check boxes.

CHAPTER 11

Static Multicast Forwarding

11.1 Overview

This chapter discusses how to configure forwarding rules based on multicast MAC addresses of devices on your network.

Use these screens to configure static multicast address forwarding.

11.1.1 What You Can Do

Use the **Static Multicast Forwarding** screen ([Section 11.2 on page 162](#)) to configure rules to forward specific multicast frames, such as streaming or control frames, to specific ports.

11.1.2 What You Need To Know

A multicast MAC address is the MAC address of a member of a multicast group. A static multicast address is a multicast MAC address that has been manually entered in the multicast table. Static multicast addresses do not age out. Static multicast forwarding allows you (the administrator) to forward multicast frames to a member without the member having to join the group first.

If a multicast group has no members, then the switch will either flood the multicast frames to all ports or drop them. [Figure 121 on page 161](#) shows such unknown multicast frames flooded to all ports. With static multicast forwarding, you can forward these multicasts to ports within a VLAN group. [Figure 122 on page 162](#) shows frames being forwarded to devices connected to port 3. [Figure 123 on page 162](#) shows frames being forwarded to ports 2 and 3 within VLAN group 4.

Figure 121 No Static Multicast Forwarding

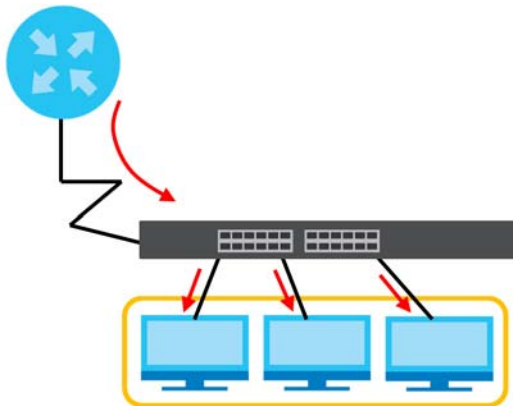
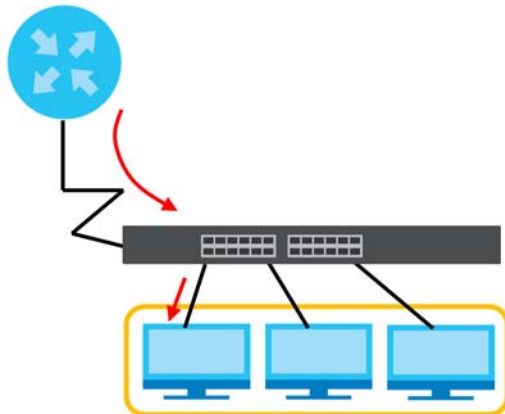
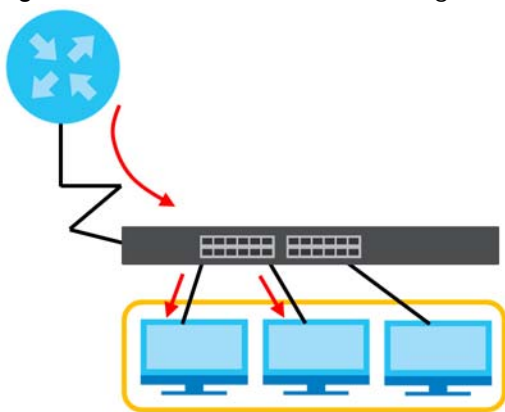


Figure 122 Static Multicast Forwarding to a Single Port**Figure 123** Static Multicast Forwarding to Multiple Ports

11.2 Configure Static Multicast Forwarding

Use this screen to configure rules to forward specific multicast frames, such as streaming or control frames, to specific ports.

Click **Advanced Application > Static Multicast Forwarding** to display the configuration screen as shown.

Figure 124 Advanced Application > Static Multicast Forwarding

The following table describes the labels in this screen.

Table 57 Advanced Application > Static Multicast Forwarding

LABEL	DESCRIPTION
Active	Select this check box to activate your rule. You may temporarily deactivate a rule without deleting it by clearing this check box.
Name	Type a descriptive name (up to 32 printable ASCII characters) for this static multicast MAC address forwarding rule. This is for identification only.
MAC Address	Enter a multicast MAC address which identifies the multicast group. The last binary bit of the first octet pair in a multicast MAC address must be 1. For example, the first octet pair 00000001 is 01 and 00000011 is 03 in hexadecimal, so 01:00:5e:00:00:0A and 03:00:5e:00:00:27 are valid multicast MAC addresses.
VID	You can forward frames with matching destination MAC address to ports within a VLAN group. Enter the ID that identifies the VLAN group here. If you do NOT have a specific target VLAN, enter 1.
Port	Enter the ports where frames with destination MAC address that matched the entry above are forwarded. You can enter multiple ports separated by (no space) comma (,) or hyphen (-) for a range. For example, enter "3-5" for ports 3, 4, and 5. Enter "3,5,7" for ports 3, 5, and 7. In stacking mode, the first number represents the slot ID and the second is the port number. Enter 1/1-1/24,2/23 for ports 1 to 24 for the Switch in slot 1 and port 23 for the Switch in slot 2, for example.
Add	Click this to create a new entry or to update an existing one. This saves your rule to the Switch's run-time memory. The Switch loses this rule if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to reset the fields to their last saved values.
Clear	Click Clear to begin configuring this screen afresh.
Index	Click an index number to modify a static multicast MAC address rule for ports.
Active	This field displays whether a static multicast MAC address forwarding rule is active (Yes) or not (No). You may temporarily deactivate a rule without deleting it.
Name	This field displays the descriptive name for identification purposes for a static multicast MAC address-forwarding rule.
MAC Address	This field displays the multicast MAC address that identifies a multicast group.

Table 57 Advanced Application > Static Multicast Forwarding (continued)

LABEL	DESCRIPTION
VID	This field displays the ID number of a VLAN group to which frames containing the specified multicast MAC address will be forwarded.
Port	This field displays the ports within an identified VLAN group to which frames containing the specified multicast MAC address will be forwarded.
	Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries.
Delete	Click Delete to remove the selected entry from the summary table.
Cancel	Click Cancel to clear the check boxes.

CHAPTER 12

Filtering

12.1 Filtering Overview

This chapter discusses MAC address port filtering.

Filtering means sifting traffic going through the Switch based on the source and/or destination MAC addresses and VLAN group (ID).

12.1.1 What You Can Do

Use the **Filtering** screen ([Section 12.2 on page 165](#)) to create rules for traffic going through the Switch.

12.2 Configure a Filtering Rule

Use this screen to create rules for traffic going through the Switch. Click **Advanced Application > Filtering** in the navigation panel to display the screen as shown next.

Figure 125 Advanced Application > Filtering

Filtering						
Active	☐					
Name						
Action	☐ Discard source ☐ Discard destination					
MAC						
VID						
Add Cancel Clear						
Index	Active	Name	MAC Address	VID	Action	☐
Delete Cancel						

The following table describes the related labels in this screen.

Table 58 Advanced Application > Filtering

LABEL	DESCRIPTION
Active	Make sure to select this check box to activate your rule. You may temporarily deactivate a rule without deleting it by de-selecting this check box.
Name	Type a descriptive name (up to 32 printable ASCII characters) for this rule. This is for identification only.
Action	Select Discard source to drop the frames from the source MAC address (specified in the MAC field). The Switch can still send frames to the MAC address. Select Discard destination to drop the frames to the destination MAC address (specified in the MAC address). The Switch can still receive frames originating from the MAC address. Select Discard source and Discard destination to block traffic to or from the MAC address specified in the MAC field.
MAC	Type a MAC address in valid MAC address format, that is, six hexadecimal character pairs.
VID	Type the VLAN group identification number.
Add	Click this to create a new entry or to update an existing one. This saves your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to reset the fields to your previous configuration.
Clear	Click Clear to clear the fields to the factory defaults.
Index	This field displays the index number of the rule. Click an index number to change the settings.
Active	This field displays Yes when the rule is activated and No when is it deactivated.
Name	This field displays the descriptive name for this rule. This is for identification purpose only.
MAC Address	This field displays the source or destination MAC address with the VLAN identification number to which the MAC address belongs.
VID	This field displays the VLAN group identification number.
Action	This field displays Discard source , Discard destination , or Discard both depending on what you configured above.
	Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries.
Delete	Check the rules that you want to remove and then click the Delete button.
Cancel	Click Cancel to clear the selected check boxes.

CHAPTER 13

Spanning Tree Protocol

13.1 Spanning Tree Protocol Overview

The Switch supports Spanning Tree Protocol (STP), Rapid Spanning Tree Protocol (RSTP) and Multiple Spanning Tree Protocol (MSTP) as defined in the following standards.

- IEEE 802.1D Spanning Tree Protocol
- IEEE 802.1w Rapid Spanning Tree Protocol
- IEEE 802.1s Multiple Spanning Tree Protocol

The Switch also allows you to set up multiple STP configurations (or trees). Ports can then be assigned to the trees.

13.1.1 What You Can Do

- Use the **Spanning Tree Protocol Status** screen ([Section 13.2 on page 170](#)) to view the STP status in the different STP modes (RSTP, MRSTP or MSTP) you can configure on the Switch.
- Use the **Spanning Tree Configuration** screen ([Section 13.3 on page 170](#)) to activate one of the STP modes on the Switch.
- Use the **Rapid Spanning Tree Protocol Status** screen ([Section 13.4 on page 171](#)) to view the RSTP status.
- Use the **Rapid Spanning Tree Protocol** screen ([Section 13.5 on page 173](#)) to configure RSTP settings.
- Use the **Multiple Spanning Tree Protocol** screen ([Section 13.6 on page 175](#)) to configure MSTP.
- Use the **Multiple Spanning Tree Protocol Status** screen ([Section 13.7 on page 181](#)) to view the MSTP status.
- Use the **Multiple Rapid Spanning Tree Protocol** screen ([Section 13.8 on page 185](#)) to configure MRSTP.
- Use the **Multiple Rapid Spanning Tree Protocol Status** screen ([Section 13.9 on page 187](#)) to view the MRSTP status.

13.1.2 What You Need to Know

Read on for concepts on STP that can help you configure the screens in this chapter.

(Rapid) Spanning Tree Protocol

(R)STP detects and breaks network loops and provides backup links between switches, bridges or routers. It allows a switch to interact with other (R)STP-compliant switches in your network to ensure that only one path exists between any two stations on the network.

The Switch uses IEEE 802.1w RSTP (Rapid Spanning Tree Protocol) that allows faster convergence of the

spanning tree than STP (while also being backwards compatible with STP-only aware bridges). In RSTP, topology change information is directly propagated throughout the network from the device that generates the topology change. In STP, a longer delay is required as the device that causes a topology change first notifies the root bridge that then notifies the network. Both RSTP and STP flush unwanted learned addresses from the filtering database. In RSTP, the port states are Discarding, Learning, and Forwarding.

Note: In this user's guide, "STP" refers to both STP and RSTP.

STP Terminology

The root bridge is the base of the spanning tree.

Path cost is the cost of transmitting a frame onto a LAN through that port. The recommended cost is assigned according to the speed of the link to which a port is attached. The slower the media, the higher the cost.

Table 59 STP Path Costs

	LINK SPEED	RECOMMENDED VALUE	RECOMMENDED RANGE	ALLOWED RANGE
Path Cost	4 Mbps	250	100 to 1000	1 to 65535
Path Cost	10 Mbps	100	50 to 600	1 to 65535
Path Cost	16 Mbps	62	40 to 400	1 to 65535
Path Cost	100 Mbps	19	10 to 60	1 to 65535
Path Cost	1 Gbps	4	3 to 10	1 to 65535
Path Cost	10 Gbps	2	1 to 5	1 to 65535

On each bridge, the root port is the port through which this bridge communicates with the root. It is the port on this switch with the lowest path cost to the root (the root path cost). If there is no root port, then this switch has been accepted as the root bridge of the spanning tree network.

For each LAN segment, a designated bridge is selected. This bridge has the lowest cost to the root among the bridges connected to the LAN.

How STP Works

After a bridge determines the lowest cost-spanning tree with STP, it enables the root port and the ports that are the designated ports for connected LANs, and disables all other ports that participate in STP. Network packets are therefore only forwarded between enabled ports, eliminating any possible network loops.

STP-aware switches exchange Bridge Protocol Data Units (BPDUs) periodically. When the bridged LAN topology changes, a new spanning tree is constructed.

Once a stable network topology has been established, all bridges listen for Hello BPDUs (Bridge Protocol Data Units) transmitted from the root bridge. If a bridge does not get a Hello BPDU after a predefined interval (Max Age), the bridge assumes that the link to the root bridge is down. This bridge then initiates negotiations with other bridges to reconfigure the network to re-establish a valid network topology.

STP Port States

STP assigns five port states to eliminate packet looping. A bridge port is not allowed to go directly from

blocking state to forwarding state so as to eliminate transient loops.

Table 60 STP Port States

PORT STATE	DESCRIPTION
Disabled	STP is disabled (default).
Blocking	Only configuration and management BPDUs are received and processed.
Listening	All BPDUs are received and processed. Note: The listening state does NOT exist in RSTP.
Learning	All BPDUs are received and processed. Information frames are submitted to the learning process but not forwarded.
Forwarding	All BPDUs are received and processed. All information frames are received and forwarded.

Multiple RSTP

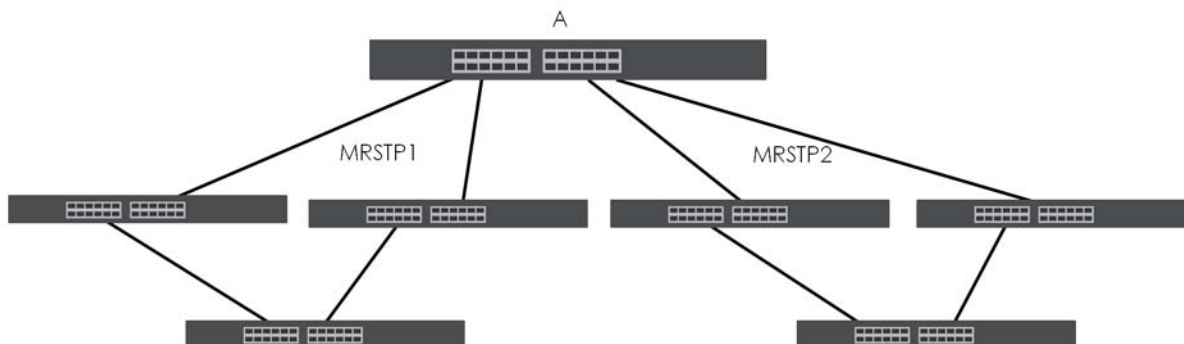
MRSTP (Multiple RSTP) is Zyxel's proprietary feature that is compatible with RSTP and STP. With MRSTP, you can have more than one spanning tree on your Switch and assign ports to each tree. Each spanning tree operates independently with its own bridge information.

In the following example, there are two RSTP instances (**MRSTP 1** and **MRSTP2**) on switch **A**.

To set up MRSTP, activate MRSTP on the Switch and specify which ports belong to which spanning tree.

Note: Each port can belong to one STP tree only.

Figure 126 MRSTP Network Example



Multiple STP

Multiple Spanning Tree Protocol (IEEE 802.1s) is backward compatible with STP/RSTP and addresses the limitations of existing spanning tree protocols (STP and RSTP) in networks to include the following features:

- One Common and Internal Spanning Tree (CIST) that represents the entire network's connectivity.
- Grouping of multiple bridges (or switching devices) into regions that appear as one single bridge on the network.
- A VLAN can be mapped to a specific Multiple Spanning Tree Instance (MSTI). MSTI allows multiple VLANs to use the same spanning tree.
- Load-balancing is possible as traffic from different VLANs can use distinct paths in a region.

13.2 Spanning Tree Protocol Status

The Spanning Tree Protocol status screen changes depending on what standard you choose to implement on your network. Click **Advanced Application** > **Spanning Tree Protocol** to see the screen as shown.

Figure 127 Advanced Application > Spanning Tree Protocol (Standalone mode)

Spanning Tree Protocol Status			Configuration	RSTP	MRSTP	MSTP
Spanning Tree Protocol: RSTP						
Bridge	Root	Our Bridge				
Bridge ID	0000-000000000000	0000-000000000000				
Hello Time (second)	0	0				
Max Age (second)	0	0				
Forwarding Delay (second)	0	0				
Cost to Bridge	0					
Port ID	0x0000					
Topology Changed Times	0					
Time Since Last Change	0:00:00					
Port	Port State	Port Role	Designated Bridge ID	Designated Port ID	Designated Cost	Root Guard State

13.3 Spanning Tree Configuration

Use the **Spanning Tree Configuration** screen to activate one of the STP modes on the Switch. Click **Configuration** in the **Advanced Application** > **Spanning Tree Protocol**.

Figure 128 Advanced Application > Spanning Tree Protocol > Configuration

Spanning Tree Configuration		Status
Spanning Tree Mode	☒ Rapid Spanning Tree ☐ Multiple Rapid Spanning Tree ☐ Multiple Spanning Tree	
Apply Cancel		

The following table describes the labels in this screen.

Table 61 Advanced Application > Spanning Tree Protocol > Configuration

LABEL	DESCRIPTION
Spanning Tree Mode	You can activate one of the STP modes on the Switch. Select Rapid Spanning Tree , Multiple Rapid Spanning Tree or Multiple Spanning Tree .
Apply	Click Apply to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to begin configuring this screen afresh.

Table 62 Advanced Application > Spanning Tree Protocol > Spanning Tree Protocol Status: RSTP

LABEL	DESCRIPTION
Max Age (second)	This is the maximum time (in seconds) the Switch can wait without receiving a configuration message before attempting to reconfigure.
Forwarding Delay (second)	This is the time (in seconds) the root switch will wait before changing states (that is, listening to learning to forwarding). Note: The listening state does NOT exist in RSTP.
Cost to Bridge	This is the path cost from the root port on this Switch to the root switch.
Port ID	This is the priority and number of the port on the Switch through which this Switch must communicate with the root of the Spanning Tree.
Topology Changed Times	This is the number of times the spanning tree has been reconfigured.
Time Since Last Change	This is the time since the spanning tree was last reconfigured.
SLOT	This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack.
Port	This field displays the number of the port on the Switch. In stacking mode, the first number represents the slot ID and the second is the port number.
Port State	This field displays the port state in STP. • Discarding – The port does not forward or process received frames or learn MAC addresses, but still listens for BPDUs. • Learning – The port learns MAC addresses and processes BPDUs, but does NOT forward frames yet. • Forwarding – The port is operating normally. It learns MAC addresses, processes BPDUs and forwards received frames.
Port Role	This field displays the role of the port in STP. • Root – A forwarding port on a non-root bridge, which has the lowest path cost and is the best port from the non-root bridge to the root bridge. A root bridge does NOT have a root port. • Designated – A forwarding port on the designated bridge for each connected LAN segment. A designated bridge has the lowest path cost to the root bridge among the bridges connected to the LAN segment. All the ports on a root bridge (root switch) are designated ports. • Alternate – A blocked port, which has a best alternate path to the root bridge. This path is different from using the root port. The port moves to the forwarding state when the designated port for the LAN segment fails. • Backup – A blocked port, which has a backup or redundant path to a LAN segment where a designated port is already connected when a switch has two links to the same LAN segment. • Disabled – Not strictly part of STP. The port can be disabled manually.
Designated Bridge ID	This field displays the identifier of the designated bridge to which this port belongs when the port is a designated port. Otherwise, it displays the identifier of the designated bridge for the LAN segment to which this port is connected.
Designated Port ID	This field displays the priority and number of the bridge port (on the designated bridge), through which the designated bridge transmits the stored configuration messages.
Designated Cost	This field displays the path cost to the LAN segment to which the port is connected when the port is a designated port. Otherwise, it displays the path cost to the root bridge from the designated port for the LAN segment to which this port is connected.
Root Guard State	This field displays the state of the port on which root guard is enabled. • Root-inconsistent – the Switch receives superior BPDUs on the port and blocks the port. • Forwarding – the Switch unblocks and allows the port to forward frames again.

13.5 Configure Rapid Spanning Tree Protocol

Use this screen to configure RSTP settings, see [Section 13.1 on page 167](#) for more information on RSTP. Click **RSTP** in the **Advanced Application > Spanning Tree Protocol** screen.

Figure 131 Advanced Application > Spanning Tree Protocol > RSTP (Standalone Mode)

Rapid Spanning Tree Protocol

Status

Active

☐

Bridge Priority

32768 ▼

Hello Time

2

Seconds

MAX Age

20

Seconds

Forwarding Delay

15

Seconds

Port	Active	Edge	Root Guard	Priority	Path Cost
*	☐	☐	☐		
1	☐	☐	☐	128	4
2	☐	☐	☐	128	4
3	☐	☐	☐	128	4
4	☐	☐	☐	128	4
5	☐	☐	☐	128	4
6	☐	☐	☐	128	4
7	☐	☐	☐	128	4
8	☐	☐	☐	128	4
9	☐	☐	☐	128	4
10	☐	☐	☐	128	4
11	☐	☐	☐	128	2

Apply

Cancel

Figure 132 Advanced Application > Spanning Tree Protocol > RSTP (Stacking Mode)

Rapid Spanning Tree Protocol				Status	
Active	☐				
Bridge Priority	32768 ▼				
Hello Time	2	Seconds			
MAX Age	20	Seconds			
Forwarding Delay	15	Seconds			

SLOT 1 ▼

Port	Active	Edge	Root Guard	Priority	Path Cost
*	☐	☐	☐		
1/1	☐	☐	☐	128	2
1/2	☐	☐	☐	128	2
1/3	☐	☐	☐	128	2
1/4	☐	☐	☐	128	2
1/5	☐	☐	☐	128	2
1/6	☐	☐	☐	128	2
1/7	☐	☐	☐	128	2
1/8	☐	☐	☐	128	2
1/9	☐	☐	☐	128	2
1/10	☐	☐	☐	128	2
1/11	☐	☐	☐	128	2

Apply Cancel

The following table describes the labels in this screen.

Table 63 Advanced Application > Spanning Tree Protocol > RSTP

LABEL	DESCRIPTION
Status	Click Status to display the RSTP Status screen.
Bridge Priority	Bridge priority is used in determining the root switch, root port and designated port. The Switch with the highest priority (lowest numeric value) becomes the STP root switch. If all Switches have the same priority, the Switch with the lowest MAC address will then become the root switch. Select a value from the drop-down list box. The lower the numeric value you assign, the higher the priority for this bridge. Bridge Priority determines the root bridge, which in turn determines Hello Time, Max Age and Forwarding Delay.
Hello Time	This is the time interval in seconds between BPDU (Bridge Protocol Data Units) configuration message generations by the root switch. The allowed range is 1 to 10 seconds.
Max Age	This is the maximum time (in seconds) the Switch can wait without receiving a BPDU before attempting to reconfigure. All Switch ports (except for designated ports) should receive BPDUs at regular intervals. Any port that ages out STP information (provided in the last BPDU) becomes the designated port for the attached LAN. If it is a root port, a new root port is selected from among the Switch ports attached to the network. The allowed range is 6 to 40 seconds.
Forwarding Delay	This is the maximum time (in seconds) the Switch will wait before changing states. This delay is required because every Switch must receive information about topology changes before it starts to forward frames. In addition, each port needs time to listen for conflicting information that would make it return to a blocking state; otherwise, temporary data loops might result. The allowed range is 4 to 30 seconds. As a general rule: $2 * (\text{Forward Delay} - 1) \geq \text{Max Age} \geq 2 * (\text{Hello Time} + 1)$
SLOT	This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack.

Table 63 Advanced Application > Spanning Tree Protocol > RSTP (continued)

LABEL	DESCRIPTION
Port	This field displays the port number. In stacking mode, the first number represents the slot ID and the second is the port number. Please note that the default stacking ports (the last four ports of your Switch) cannot be configured. They are reserved for stacking only.
*	Settings in this row apply to all ports. Use this row only if you want to make some settings the same for all ports. Use this row first to set the common settings and then make adjustments on a port-by-port basis. Note: Changes in this row are copied to all the ports as soon as you make them.
Active	Select this check box to activate RSTP on this port.
Edge	Select this check box to configure a port as an edge port when it is directly attached to a computer. An edge port changes its initial STP port state from blocking state to forwarding state immediately without going through listening and learning states right after the port is configured as an edge port or when its link status changes. Note: An edge port becomes a non-edge port as soon as it receives a Bridge Protocol Data Unit (BPDU).
Root Guard	Select this check box to enable root guard on this port in order to prevent the switches attached to the port from becoming the root bridge. With root guard enabled, a port is blocked when the Switch receives a superior BPDU on it. The Switch allows traffic to pass through this port again when the switch connected to the port stops to send superior BPDUs.
Priority	Configure the priority for each port here. Priority decides which port should be disabled when more than one port forms a loop in a switch. Ports with a higher priority numeric value are disabled first. The allowed range is between 0 and 255 and the default value is 128.
Path Cost	Path cost is the cost of transmitting a frame on to a LAN through that port. It is recommended to assign this value according to the speed of the bridge. The slower the media, the higher the cost.
Apply	Click Apply to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to begin configuring this screen afresh.

13.6 Configure Multiple Spanning Tree Protocol

To configure MSTP, click **MSTP** in the **Advanced Application > Spanning Tree Protocol** screen.

Figure 133 Advanced Application > Spanning Tree Protocol > MSTP (Standalone Mode)

Multiple Spanning Tree Protocol

[Status](#) [Port](#)

Bridge

Active	☐
Hello Time	2 seconds
MAX Age	20 seconds
Forwarding Delay	15 seconds
Maximum hops	20
Configuration Name	1c740dfef65e
Revision Number	0

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

Instance

Instance	
Bridge Priority	32768 ▼
VLAN Range	Start End Add Remove Clear
Enabled VLAN(s)	

Port	Active	Priority	Path Cost
*	☐		
1	☐	128	4
2	☐	128	4
3	☐	128	4
4	☐	128	4
5	☐	128	4
6	☐	128	2

[Add](#) [Cancel](#)

Instance	VLAN	Active Port
0	1-4094	-

[Delete](#) [Cancel](#)

Figure 134 Advanced Application > Spanning Tree Protocol > MSTP (Stacking Mode)

Multiple Spanning Tree Protocol

Status Port

Bridge

Active

☐

Hello Time

2

seconds

MAX Age

20

seconds

Forwarding Delay

15

seconds

Maximum hops

20

Configuration Name

bc9911d83aa5

Revision Number

0

Apply

Cancel

Instance

Instance

Bridge Priority

32768

▼

VLAN Range

Start

End

Add

Remove

Clear

Enabled VLAN(s)

▲

▼

SLOT 1 ▼

Port	Active	Priority	Path Cost
*	☐		
1/1	☐	128	2
1/2	☐	128	2
1/3	☐	128	2
1/4	☐	128	2
1/5	☐	128	2
1/6	☐	128	2
1/7	☐	128	2
1/8	☐	128	2

Add

Cancel

Instance	VLAN	Active Port
0	1-4094	-

Delete

Cancel

The following table describes the labels in this screen.

Table 64 Advanced Application > Spanning Tree Protocol > MSTP

LABEL	DESCRIPTION
Status	Click Status to display the MSTP Status screen.
Port	Click Port to display the MSTP Port screen.
Active	Select this check box to activate MSTP on the Switch. Clear this check box to disable MSTP on the Switch. Note: You must also activate Multiple Spanning Tree in the Advanced Application > Spanning Tree Protocol > Configuration screen to enable MSTP on the Switch.
Hello Time	This is the time interval in seconds between BPDU (Bridge Protocol Data Units) configuration message generations by the root switch. The allowed range is 1 to 10 seconds.

Table 64 Advanced Application > Spanning Tree Protocol > MSTP (continued)

LABEL	DESCRIPTION
MaxAge	This is the maximum time (in seconds) a switch can wait without receiving a BPDU before attempting to reconfigure. All switch ports (except for designated ports) should receive BPDUs at regular intervals. Any port that ages out STP information (provided in the last BPDU) becomes the designated port for the attached LAN. If it is a root port, a new root port is selected from among the Switch ports attached to the network. The allowed range is 6 to 40 seconds.
Forwarding Delay	This is the maximum time (in seconds) a switch will wait before changing states. This delay is required because every switch must receive information about topology changes before it starts to forward frames. In addition, each port needs time to listen for conflicting information that would make it return to a blocking state; otherwise, temporary data loops might result. The allowed range is 4 to 30 seconds. As a general rule: Note: $2 * (\text{Forward Delay} - 1) \geq \text{Max Age} \geq 2 * (\text{Hello Time} + 1)$
Maximum hops	Enter the number of hops (between 1 and 255) in an MSTP region before the BPDU is discarded and the port information is aged.
Configuration Name	Enter a descriptive name (up to 32 characters) of an MST region.
Revision Number	Enter a number to identify a region's configuration. Devices must have the same revision number to belong to the same region.
Apply	Click Apply to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to begin configuring this screen afresh.
Instance	Use this section to configure MSTI (Multiple Spanning Tree Instance) settings.
Instance	Enter the number you want to use to identify this MST instance on the Switch. The Switch supports instance numbers 0 – 15.
Bridge Priority	Set the priority of the Switch for the specific spanning tree instance. The lower the number, the more likely the Switch will be chosen as the root bridge within the spanning tree instance. Enter priority values between 0 and 61440 in increments of 4096 (thus valid values are 4096, 8192, 12288, 16384, 20480, 24576, 28672, 32768, 36864, 40960, 45056, 49152, 53248, 57344 and 61440).
VLAN Range	Enter the start of the VLAN ID range that you want to add or remove from the VLAN range edit area in the Start field. Enter the end of the VLAN ID range that you want to add or remove from the VLAN range edit area in the End field. Next click: • Add – to add this range of VLANs to be mapped to the MST instance. • Remove – to remove this range of VLANs from being mapped to the MST instance. • Clear – to remove all VLANs from being mapped to this MST instance.
Enabled VLAN(s)	This field displays which VLANs are mapped to this MST instance.
SLOT	This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack.
Port	This field displays the port number. In stacking mode, the first number represents the slot ID and the second is the port number. Please note that the default stacking ports (the last four ports of your Switch) cannot be configured. They are reserved for stacking only.
*	Settings in this row apply to all ports. Use this row only if you want to make some settings the same for all ports. Use this row first to set the common settings and then make adjustments on a port-by-port basis. Note: Changes in this row are copied to all the ports as soon as you make them.
Active	Select this check box to add this port to the MST instance.

Table 64 Advanced Application > Spanning Tree Protocol > MSTP (continued)

LABEL	DESCRIPTION
Priority	Configure the priority for each port here. Priority decides which port should be disabled when more than one port forms a loop in the Switch. Ports with a higher priority numeric value are disabled first. The allowed range is between 0 and 255 and the default value is 128.
Path Cost	Path cost is the cost of transmitting a frame on to a LAN through that port. It is recommended to assign this value according to the speed of the bridge. The slower the media, the higher the cost.
Add	Click this to create a new entry or to update an existing one. This saves your changes to the Switch's run-time memory. The Switch loses this change if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to begin configuring this screen afresh.
Instance	This field displays the ID of an MST instance.
VLAN	This field displays the VID (or VID ranges) to which the MST instance is mapped.
Active Port	This field display the ports configured to participate in the MST instance.
	Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries.
Delete	Check the rules that you want to remove and then click the Delete button.
Cancel	Click Cancel to clear the selected check boxes.

13.6.1 Multiple Spanning Tree Protocol Port Configuration

Click **Advanced Application > Spanning Tree Protocol > MSTP > Port** in the navigation panel to display the status screen as shown next.

Figure 135 Advanced Application > Spanning Tree Protocol > MSTP > Port (Standalone Mode)

Port	Edge	Root Guard
*	☐	☐
1	☐	☐
2	☐	☐
3	☐	☐
4	☐	☐
5	☐	☐
6	☐	☐
7	☐	☐
8	☐	☐
9	☐	☐
10	☐	☐
11	☐	☐
12	☐	☐
13	☐	☐
14	☐	☐
15	☐	☐
16	☐	☐
17	☐	☐
18	☐	☐
19	☐	☐
20	☐	☐
21	☐	☐
22	☐	☐
23	☐	☐
24	☐	☐
25	☐	☐
26	☐	☐
27	☐	☐

Figure 136 Advanced Application > Spanning Tree Protocol > MSTP > Port (Stacking Mode)

Port	Edge	Root Guard
1/*	☐	☐
1/1	☐	☐
1/2	☐	☐
1/3	☐	☐
1/4	☐	☐
1/5	☐	☐
1/6	☐	☐
1/7	☐	☐
1/8	☐	☐
1/9	☐	☐
1/10	☐	☐
1/11	☐	☐
1/12	☐	☐
1/13	☐	☐
1/14	☐	☐

The following table describes the labels in this screen.

Table 65 Advanced Application > Spanning Tree Protocol > MSTP > Port

LABEL	DESCRIPTION
MSTP	Click MSTP to edit MSTP settings on the Switch.
SLOT	This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack.

Table 65 Advanced Application > Spanning Tree Protocol > MSTP > Port (continued)

LABEL	DESCRIPTION
Port	This field displays the port number. In stacking mode, the first number represents the slot ID and the second is the port number. Please note that the default stacking ports (the last four ports of your Switch) cannot be configured. They are reserved for stacking only.
*	Settings in this row apply to all ports. Use this row only if you want to make some settings the same for all ports. Use this row first to set the common settings and then make adjustments on a port-by-port basis. Note: Changes in this row are copied to all the ports as soon as you make them.
Edge	Select this check box to configure a port as an edge port when it is directly attached to a computer. An edge port changes its initial STP port state from blocking state to forwarding state immediately without going through listening and learning states right after the port is configured as an edge port or when its link status changes. Note: An edge port becomes a non-edge port as soon as it receives a Bridge Protocol Data Unit (BPDU).
Root Guard	Select this check box to enable root guard on this port in order to prevent the switches attached to the port from becoming the root bridge. With root guard enabled, a port is blocked when the Switch receives a superior BPDU on it. The Switch allows traffic to pass through this port again when the switch connected to the port stops to send superior BPDUs.
Apply	Click Apply to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to begin configuring this screen afresh.

13.7 Multiple Spanning Tree Protocol Status

Click **Advanced Application > Spanning Tree Protocol** in the navigation panel to display the status screen as shown next.

Note: This screen is only available after you activate MSTP on the Switch.

Figure 137 Advanced Application > Spanning Tree Protocol > Status: MSTP (Standalone Mode)

Spanning Tree Protocol Status

[Configuration](#)
[RSTP](#)
[MRSTP](#)
[MSTP](#)

Spanning Tree Protocol: MSTP

CST

Bridge	Root	Our Bridge
Bridge ID	8000-1c740def65e	8000-1c740def65e
Hello Time (second)	2	2
Max Age (second)	20	20
Forwarding Delay (second)	15	15
Cost to Bridge	0	0
Port ID	0x0000	0x0000
Configuration Name	1c740def65e	
Revision Number	0	
Configuration Digest	AC36177F50283CD48B3821D8AB26DE62	
Topology Changed Times	0	
Time Since Last Change	0:02:04	

Instance

Instance	VLAN
0	1-4094

MSTI

0 ▼

Bridge	Regional Root	Our Bridge
Bridge ID	8000-1c740def65e	8000-1c740def65e
Internal Cost	0	0
Port ID	0x0000	0x0000

Port	Port State	Port Role	Designated Bridge ID	Designated Port ID	Designated Cost	Root Guard State
1	DISCARDING	Disabled	8000-1c740def65e	0x8001	0	Forwarding
2	DISCARDING	Disabled	8000-1c740def65e	0x8002	0	Forwarding

Figure 138 Advanced Application > Spanning Tree Protocol > Status: MSTP (Stacking Mode)

Spanning Tree Protocol Status

[Configuration](#)
[RSTP](#)
[MRSTP](#)
[MSTP](#)

Spanning Tree Protocol: MSTP

CST

Bridge	Root	Our Bridge
Bridge ID	0000-000000000000	0000-000000000000
Hello Time (second)	0	0
Max Age (second)	0	0
Forwarding Delay (second)	0	0
Cost to Bridge	0	0
Port ID	0x0000	0x0000
Configuration Name	bc9911d83aa5	
Revision Number	0	
Configuration Digest	0	
Topology Changed Times	0	
Time Since Last Change	0:00:00	

Instance

Instance	VLAN
0	1-4094

MSTI 0 ▼

Bridge	Regional Root	Our Bridge
Bridge ID	0000-000000000000	0000-000000000000
Internal Cost	0	0
Port ID	0x0000	0x0000

SLOT 1 ▼

Port	Port State	Port Role	Designated Bridge ID	Designated Port ID	Designated Cost	Root Guard State

The following table describes the labels in this screen.

Table 66 Advanced Application > Spanning Tree Protocol > Status: MSTP

LABEL	DESCRIPTION
Configuration	Click Configuration to specify which STP mode you want to activate. Click MSTP to edit MSTP settings on the Switch.
CST	This section describes the Common Spanning Tree settings.
Bridge	Root refers to the base of the spanning tree (the root bridge). Our Bridge is this switch. This Switch may also be the root bridge.
Bridge ID	This is the unique identifier for this bridge, consisting of bridge priority plus MAC address. This ID is the same for Root and Our Bridge if the Switch is the root switch.
Hello Time (second)	This is the time interval (in seconds) at which the root switch transmits a configuration message. The root bridge determines Hello Time , Max Age and Forwarding Delay .
Max Age (second)	This is the maximum time (in seconds) the Switch can wait without receiving a configuration message before attempting to reconfigure.
Forwarding Delay (second)	This is the time (in seconds) the root switch will wait before changing states (that is, listening to learning to forwarding).
Cost to Bridge	This is the path cost from the root port on this Switch to the root switch.
Port ID	This is the priority and number of the port on the Switch through which this Switch must communicate with the root of the Spanning Tree.
Configuration Name	This field displays the configuration name for this MST region.
Revision Number	This field displays the revision number for this MST region.

Table 66 Advanced Application > Spanning Tree Protocol > Status: MSTP (continued)

LABEL	DESCRIPTION
Configuration Digest	A configuration digest is generated from the VLAN-MSTI mapping information. This field displays the 16-octet signature that is included in an MSTP BPDU. This field displays the digest when MSTP is activated on the system.
Topology Changed Times	This is the number of times the spanning tree has been reconfigured.
Time Since Last Change	This is the time since the spanning tree was last reconfigured.
Instance	These fields display the MSTI to VLAN mapping. In other words, which VLANs run on each spanning tree instance.
Instance	This field displays the MSTI ID.
VLAN	This field displays which VLANs are mapped to an MSTI.
MSTI	Select the MST instance settings you want to view.
Bridge	Root refers to the base of the MST instance. Our Bridge is this switch. This Switch may also be the root bridge.
Bridge ID	This is the unique identifier for this bridge, consisting of bridge priority plus MAC address. This ID is the same for Root and Our Bridge if the Switch is the root switch.
Internal Cost	This is the path cost from the root port in this MST instance to the regional root switch.
Port ID	This is the priority and number of the port on the Switch through which this Switch must communicate with the root of the MST instance.
SLOT	This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack.
Port	This field displays the number of the port on the Switch. In stacking mode, the first number represents the slot ID and the second is the port number.
Port State	This field displays the port state in STP. • Discarding – The port does not forward or process received frames or learn MAC addresses, but still listens for BPDUs. • Learning – The port learns MAC addresses and processes BPDUs, but does not forward frames yet. • Forwarding – The port is operating normally. It learns MAC addresses, processes BPDUs and forwards received frames.
Port Role	This field displays the role of the port in STP. • Root – A forwarding port on a non-root bridge, which has the lowest path cost and is the best port from the non-root bridge to the root bridge. A root bridge does not have a root port. • Designated – A forwarding port on the designated bridge for each connected LAN segment. A designated bridge has the lowest path cost to the root bridge among the bridges connected to the LAN segment. All the ports on a root bridge (root switch) are designated ports. • Alternate – A blocked port, which has a best alternate path to the root bridge. This path is different from using the root port. The port moves to the forwarding state when the designated port for the LAN segment fails. • Backup – A blocked port, which has a backup or redundant path to a LAN segment where a designated port is already connected when a switch has two links to the same LAN segment. • Disabled – Not strictly part of STP. The port can be disabled manually.
Designated Bridge ID	This field displays the identifier of the designated bridge to which this port belongs when the port is a designated port. Otherwise, it displays the identifier of the designated bridge for the LAN segment to which this port is connected.
Designated Port ID	This field displays the priority and number of the bridge port (on the designated bridge), through which the designated bridge transmits the stored configuration messages.

Table 66 Advanced Application > Spanning Tree Protocol > Status: MSTP (continued)

LABEL	DESCRIPTION
Designated Cost	This field displays the path cost to the LAN segment to which the port is connected when the port is a designated port. Otherwise, it displays the path cost to the root bridge from the designated port for the LAN segment to which this port is connected.
Root Guard State	This field displays the state of the port on which root guard is enabled. • Root-inconsistent – the Switch receives superior BPDUs on the port and blocks the port. • Forwarding – the Switch unblocks and allows the port to forward frames again.

13.8 Configure Multiple Rapid Spanning Tree Protocol

To configure MRSTP, click **MRSTP** in the **Advanced Application > Spanning Tree Protocol** screen.

Figure 139 Advanced Application > Spanning Tree Protocol > MRSTP (Standalone Mode)

Multiple Rapid Spanning Tree Protocol

Status

Tree	Active	Bridge Priority	Hello Time	MAX Age	Forwarding Delay
1	☐	32768 ▼	2 seconds	20 seconds	15 seconds
2	☐	32768 ▼	2 seconds	20 seconds	15 seconds
3	☐	32768 ▼	2 seconds	20 seconds	15 seconds
4	☐	32768 ▼	2 seconds	20 seconds	15 seconds

Port	Active	Edge	Root Guard	Priority	Path Cost	Tree
*	☐	☐	☐			1 ▼
1	☐	☐	☐	128	4	1 ▼
2	☐	☐	☐	128	4	1 ▼
3	☐	☐	☐	128	4	1 ▼
4	☐	☐	☐	128	4	1 ▼
5	☐	☐	☐	128	4	1 ▼
6	☐	☐	☐	128	4	1 ▼
7	☐	☐	☐	128	4	1 ▼
8	☐	☐	☐	128	4	1 ▼
9	☐	☐	☐	128	4	1 ▼
10	☐	☐	☐	128	2	1 ▼

Apply

Cancel

Figure 140 Advanced Application > Spanning Tree Protocol > MRSTP (Stacking Mode)

Multiple Rapid Spanning Tree Protocol										Status
Tree	Active	Bridge Priority	Hello Time		MAX Age		Forwarding Delay			
1	☐	32768 ▼	2	seconds	20	seconds	15	seconds		
2	☐	32768 ▼	2	seconds	20	seconds	15	seconds		
3	☐	32768 ▼	2	seconds	20	seconds	15	seconds		
4	☐	32768 ▼	2	seconds	20	seconds	15	seconds		

SLOT 1 ▼

Port	Active	Edge	Root Guard	Priority	Path Cost	Tree
1/*	☐	☐	☐			1 ▼
1/1	☐	☐	☐	128	2	1 ▼
1/2	☐	☐	☐	128	2	1 ▼
1/3	☐	☐	☐	128	2	1 ▼
1/4	☐	☐	☐	128	2	1 ▼
1/5	☐	☐	☐	128	2	1 ▼
1/6	☐	☐	☐	128	2	1 ▼
1/7	☐	☐	☐	128	2	1 ▼
1/8	☐	☐	☐	128	2	1 ▼
1/9	☐	☐	☐	128	2	1 ▼
1/10	☐	☐	☐	128	2	1 ▼

Apply Cancel

The following table describes the labels in this screen.

Table 67 Advanced Application > Spanning Tree Protocol > MRSTP

LABEL	DESCRIPTION
Status	Click Status to display the MRSTP Status screen.
Tree	This is a read only index number of the STP trees.
Active	Select this check box to activate an STP tree. Clear this check box to disable an STP tree. Note: You must also activate Multiple Rapid Spanning Tree in the Advanced Application > Spanning Tree Protocol > Configuration screen to enable MRSTP on the Switch.
Bridge Priority	Bridge priority is used in determining the root switch, root port and designated port. The switch with the highest priority (lowest numeric value) becomes the STP root switch. If all switches have the same priority, the switch with the lowest MAC address will then become the root switch. Select a value from the drop-down list box. The lower the numeric value you assign, the higher the priority for this bridge. Bridge Priority determines the root bridge, which in turn determines Hello Time, Max Age and Forwarding Delay.
Hello Time	This is the time interval in seconds between BPDU (Bridge Protocol Data Units) configuration message generations by the root switch. The allowed range is 1 to 10 seconds.
Max Age	This is the maximum time (in seconds) the Switch can wait without receiving a BPDU before attempting to reconfigure. All Switch ports (except for designated ports) should receive BPDUs at regular intervals. Any port that ages out STP information (provided in the last BPDU) becomes the designated port for the attached LAN. If it is a root port, a new root port is selected from among the Switch ports attached to the network. The allowed range is 6 to 40 seconds.

Table 67 Advanced Application > Spanning Tree Protocol > MRSTP (continued)

LABEL	DESCRIPTION
Forwarding Delay	This is the maximum time (in seconds) the Switch will wait before changing states. This delay is required because every switch must receive information about topology changes before it starts to forward frames. In addition, each port needs time to listen for conflicting information that would make it return to a blocking state; otherwise, temporary data loops might result. The allowed range is 4 to 30 seconds. As a general rule: $2 * (\text{Forward Delay} - 1) \geq \text{Max Age} \geq 2 * (\text{Hello Time} + 1)$
SLOT	This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack.
Port	This field displays the port number. In stacking mode, the first number represents the slot ID and the second is the port number. Please note that the default stacking ports (the last four ports of your Switch) cannot be configured. They are reserved for stacking only.
*	Settings in this row apply to all ports. Use this row only if you want to make some settings the same for all ports. Use this row first to set the common settings and then make adjustments on a port-by-port basis. Note: Changes in this row are copied to all the ports as soon as you make them.
Active	Select this check box to activate STP on this port.
Edge	Select this check box to configure a port as an edge port when it is directly attached to a computer. An edge port changes its initial STP port state from blocking state to forwarding state immediately without going through listening and learning states right after the port is configured as an edge port or when its link status changes. Note: An edge port becomes a non-edge port as soon as it receives a Bridge Protocol Data Unit (BPDU).
Root Guard	Select this check box to enable root guard on this port in order to prevent the switch(es) attached to the port from becoming the root bridge. With root guard enabled, a port is blocked when the Switch receives a superior BPDU on it. The Switch allows traffic to pass through this port again when the switch connected to the port stops to send superior BPDUs.
Priority	Configure the priority for each port here. Priority decides which port should be disabled when more than one port forms a loop in a switch. Ports with a higher priority numeric value are disabled first. The allowed range is between 0 and 255 and the default value is 128.
Path Cost	Path cost is the cost of transmitting a frame on to a LAN through that port. It is recommended to assign this value according to the speed of the bridge. The slower the media, the higher the cost.
Tree	Select which STP tree configuration this port should participate in.
Apply	Click Apply to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to begin configuring this screen afresh.

13.9 Multiple Rapid Spanning Tree Protocol Status

Click **Advanced Application > Spanning Tree Protocol** in the navigation panel to display the status screen as shown next. See [Section 13.9 on page 187](#) for more information on MRSTP.

Note: This screen is only available after you activate MRSTP on the Switch.

Figure 141 Advanced Application > Spanning Tree Protocol > Status: MRSTP (Standalone Mode)

Spanning Tree Protocol Status

[Configuration](#)
[RSTP](#)
[MRSTP](#)
[MSTP](#)

Spanning Tree Protocol: MRSTP

Tree

1 ▼

Bridge	Root	Our Bridge
Bridge ID	8000-1c740dfef65e	8000-1c740dfef65e
Hello Time (second)	2	2
Max Age (second)	20	20
Forwarding Delay (second)	15	15
Cost to Bridge	0	
Port ID	0X0000	
Topology Changed Times	0	
Time Since Last Change	0:03:25	

Port	Port State	Port Role	Designated Bridge ID	Designated Port ID	Designated Cost	Root Guard State
1	DISCARDING	Disabled	0000-000000000000	0x0000	0	Forwarding
2	DISCARDING	Disabled	0000-000000000000	0x0000	0	Forwarding
3	DISCARDING	Disabled	0000-000000000000	0x0000	0	Forwarding

Figure 142 Advanced Application > Spanning Tree Protocol > Status: MRSTP (Stacking Mode)

Spanning Tree Protocol Status

[Configuration](#)
[RSTP](#)
[MRSTP](#)
[MSTP](#)

Spanning Tree Protocol: MRSTP

Tree 1

Bridge	Root	Our Bridge
Bridge ID	8000-bc9911d83aa5	8000-bc9911d83aa5
Hello Time (second)	2	2
Max Age (second)	20	20
Forwarding Delay (second)	15	15
Cost to Bridge	0	
Port ID	0X0000	
Topology Changed Times	0	
Time Since Last Change	0:00:17	

SLOT 1

Port	Port State	Port Role	Designated Bridge ID	Designated Port ID	Designated Cost	Root Guard State
1/1	DISCARDING	Disabled	0000-000000000000	0x0000	0	Forwarding
1/2	DISCARDING	Disabled	0000-000000000000	0x0000	0	Forwarding

The following table describes the labels in this screen.

Table 68 Advanced Application > Spanning Tree Protocol > Status: MRSTP

LABEL	DESCRIPTION
Configuration	Click Configuration to specify which STP mode you want to activate. Click MRSTP to edit MRSTP settings on the Switch.
Tree	Select which STP tree configuration you want to view.
Bridge	Root refers to the base of the spanning tree (the root bridge). Our Bridge is this switch. This Switch may also be the root bridge.
Bridge ID	This is the unique identifier for this bridge, consisting of bridge priority plus MAC address. This ID is the same for Root and Our Bridge if the Switch is the root switch.
Hello Time (second)	This is the time interval (in seconds) at which the root switch transmits a configuration message. The root bridge determines Hello Time , Max Age and Forwarding Delay .
Max Age (second)	This is the maximum time (in seconds) the Switch can wait without receiving a configuration message before attempting to reconfigure.

Table 68 Advanced Application > Spanning Tree Protocol > Status: MRSTP (continued)

LABEL	DESCRIPTION
Forwarding Delay (second)	This is the time (in seconds) the root switch will wait before changing states (that is, listening to learning to forwarding). Note: The listening state does not exist in RSTP.
Cost to Bridge	This is the path cost from the root port on this Switch to the root switch.
Port ID	This is the priority and number of the port on the Switch through which this Switch must communicate with the root of the Spanning Tree.
Topology Changed Times	This is the number of times the spanning tree has been reconfigured.
Time Since Last Change	This is the time since the spanning tree was last reconfigured.
SLOT	This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack.
Port	This field displays the number of the port on the Switch. In stacking mode, the first number represents the slot ID and the second is the port number.
Port State	This field displays the port state in STP. • Discarding – The port does not forward or process received frames or learn MAC addresses, but still listens for BPDUs. • Learning – The port learns MAC addresses and processes BPDUs, but does not forward frames yet. • Forwarding – The port is operating normally. It learns MAC addresses, processes BPDUs and forwards received frames.
Port Role	This field displays the role of the port in STP. • Root – A forwarding port on a non-root bridge, which has the lowest path cost and is the best port from the non-root bridge to the root bridge. A root bridge does not have a root port. • Designated – A forwarding port on the designated bridge for each connected LAN segment. A designated bridge has the lowest path cost to the root bridge among the bridges connected to the LAN segment. All the ports on a root bridge (root switch) are designated ports. • Alternate – A blocked port, which has a best alternate path to the root bridge. This path is different from using the root port. The port moves to the forwarding state when the designated port for the LAN segment fails. • Backup – A blocked port, which has a backup or redundant path to a LAN segment where a designated port is already connected when a switch has two links to the same LAN segment. • Disabled – Not strictly part of STP. The port can be disabled manually.
Designated Bridge ID	This field displays the identifier of the designated bridge to which this port belongs when the port is a designated port. Otherwise, it displays the identifier of the designated bridge for the LAN segment to which this port is connected.
Designated Port ID	This field displays the priority and number of the bridge port (on the designated bridge), through which the designated bridge transmits the stored configuration messages.
Designated Cost	This field displays the path cost to the LAN segment to which the port is connected when the port is a designated port. Otherwise, it displays the path cost to the root bridge from the designated port for the LAN segment to which this port is connected.
Root Guard State	This field displays the state of the port on which root guard is enabled. • Root – inconsistent – the Switch receives superior BPDUs on the port and blocks the port. • Forwarding – the Switch unblocks and allows the port to forward frames again.

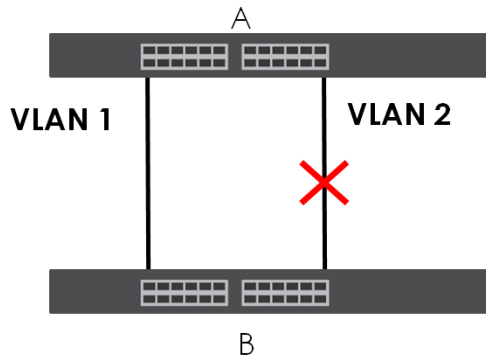
13.10 Technical Reference

This section provides technical background information on the topics discussed in this chapter.

13.10.1 MSTP Network Example

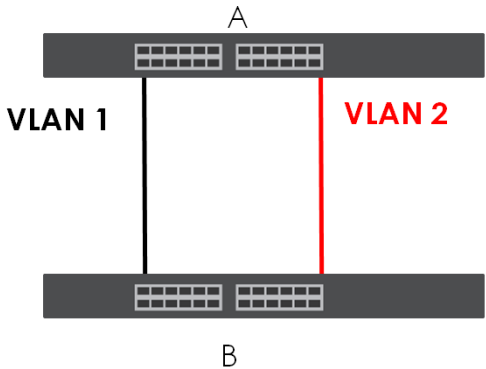
The following figure shows a network example where two VLANs are configured on the two switches. If the switches are using STP or RSTP, the link for VLAN 2 will be blocked as STP and RSTP allow only one link in the network and block the redundant link.

Figure 143 STP/RSTP Network Example



With MSTP, VLANs 1 and 2 are mapped to different spanning trees in the network. Thus traffic from the two VLANs travel on different paths. The following figure shows the network example using MSTP.

Figure 144 MSTP Network Example



13.10.2 MST Region

An MST region is a logical grouping of multiple network devices that appears as a single device to the rest of the network. Each MSTP-enabled device can only belong to one MST region. When BPDUs enter an MST region, external path cost (of paths outside this region) is increased by one. Internal path cost (of paths within this region) is increased by one when BPDUs traverse the region.

Devices that belong to the same MST region are configured to have the same MSTP configuration identification settings. These include the following parameters:

- Name of the MST region
- Revision level as the unique number for the MST region

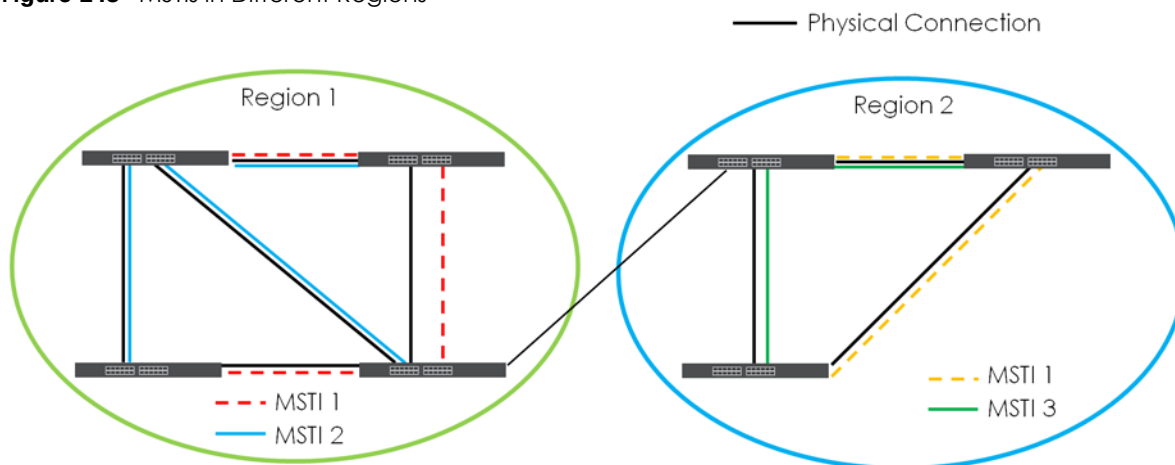
- VLAN-to-MST Instance mapping

13.10.3 MST Instance

An MST Instance (MSTI) is a spanning tree instance. VLANs can be configured to run on a specific MSTI. Each created MSTI is identified by a unique number (known as an MST ID) known internally to a region. Thus an MSTI does not span across MST regions.

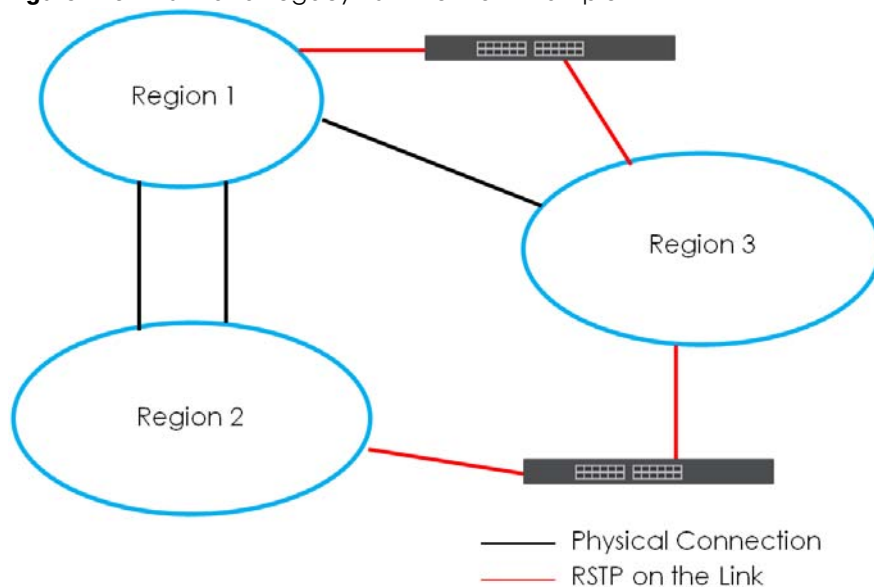
The following figure shows an example where there are two MST regions. Regions 1 and 2 have two spanning tree instances.

Figure 145 MSTIs in Different Regions



13.10.4 Common and Internal Spanning Tree (CIST)

A CIST represents the connectivity of the entire network and it is equivalent to a spanning tree in an STP/RSTP. The CIST is the default MST instance (MSTID 0). Any VLANs that are not members of an MST instance are members of the CIST. In an MSTP-enabled network, there is only one CIST that runs between MST regions and single spanning tree devices. A network may contain multiple MST regions and other network segments running RSTP.

Figure 146 MSTP and Legacy RSTP Network Example

CHAPTER 14

Bandwidth Control

14.1 Bandwidth Control Overview

This chapter shows you how you can cap the maximum bandwidth using the **Bandwidth Control** screen.

Bandwidth control means defining a maximum allowable bandwidth for incoming and/or out-going traffic flows on a port.

14.1.1 What You Can Do

Use the **Bandwidth Control** screen ([Section 14.2 on page 193](#)) to limit the bandwidth for traffic going through the Switch.

14.1.2 CIR and PIR

The Committed Information Rate (CIR) is the guaranteed bandwidth for the incoming traffic flow on a port. The Peak Information Rate (PIR) is the maximum bandwidth allowed for the incoming traffic flow on a port when there is no network congestion.

The CIR and PIR should be set for all ports that use the same uplink bandwidth. If the CIR is reached, packets are sent at the rate up to the PIR. When network congestion occurs, packets through the ingress port exceeding the CIR will be marked for drop.

Note: The CIR should be less than the PIR.

Note: The sum of CIRs cannot be greater than or equal to the uplink bandwidth.

14.2 Bandwidth Control Setup

Click **Advanced Application > Bandwidth Control** in the navigation panel to bring up the screen as shown next.

Figure 147 Advanced Application > Bandwidth Control (Standalone Mode)

Port	Active	Commit Rate	Ingress Rate Active	Peak Rate	Active	Egress Rate
*	☐		kbps		☐	kbps
1	☐	1	kbps	1	☐	1 kbps
2	☐	1	kbps	1	☐	1 kbps
3	☐	1	kbps	1	☐	1 kbps
4	☐	1	kbps	1	☐	1 kbps
5	☐	1	kbps	1	☐	1 kbps
6	☐	1	kbps	1	☐	1 kbps
7	☐	1	kbps	1	☐	1 kbps
8	☐	1	kbps	1	☐	1 kbps
9	☐	1	kbps	1	☐	1 kbps
10	☐	1	kbps	1	☐	1 kbps
11	☐	1	kbps	1	☐	1 kbps
12	☐	1	kbps	1	☐	1 kbps
13	☐	1	kbps	1	☐	1 kbps
14	☐	1	kbps	1	☐	1 kbps
15	☐	1	kbps	1	☐	1 kbps
16	☐	1	kbps	1	☐	1 kbps
17	☐	1	kbps	1	☐	1 kbps
18	☐	1	kbps	1	☐	1 kbps
19	☐	1	kbps	1	☐	1 kbps
20	☐	1	kbps	1	☐	1 kbps
21	☐	1	kbps	1	☐	1 kbps
22	☐	1	kbps	1	☐	1 kbps
23	☐	1	kbps	1	☐	1 kbps
24	☐	1	kbps	1	☐	1 kbps
25	☐	1	kbps	1	☐	1 kbps
26	☐	1	kbps	1	☐	1 kbps
27	☐	1	kbps	1	☐	1 kbps
28	☐	1	kbps	1	☐	1 kbps
29	☐	1	kbps	1	☐	1 kbps
30	☐	1	kbps	1	☐	1 kbps
31	☐	1	kbps	1	☐	1 kbps
32	☐	1	kbps	1	☐	1 kbps

Apply Cancel

Figure 148 Advanced Application > Bandwidth Control (Stacking Mode)

Port	Active	Commit Rate	Ingress Rate Active	Peak Rate	Active	Egress Rate
1/*	☐		kbps		☐	kbps
1/1	☐	1	kbps	1	☐	1 kbps
1/2	☐	1	kbps	1	☐	1 kbps
1/3	☐	1	kbps	1	☐	1 kbps
1/4	☐	1	kbps	1	☐	1 kbps
1/5	☐	1	kbps	1	☐	1 kbps
1/6	☐	1	kbps	1	☐	1 kbps
1/7	☐	1	kbps	1	☐	1 kbps
1/8	☐	1	kbps	1	☐	1 kbps
1/9	☐	1	kbps	1	☐	1 kbps
1/10	☐	1	kbps	1	☐	1 kbps

Apply Cancel

The following table describes the related labels in this screen.

Table 69 Advanced Application > Bandwidth Control

LABEL	DESCRIPTION
Active	Select this check box to enable bandwidth control on the Switch.
SLOT	This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack.
Port	This field displays the port number. In stacking mode, the first number represents the slot ID and the second is the port number. Please note that the default stacking ports (the last four ports of your Switch) cannot be configured. They are reserved for stacking only.

Table 69 Advanced Application > Bandwidth Control (continued)

LABEL	DESCRIPTION
*	Settings in this row apply to all ports. Use this row only if you want to make some settings the same for all ports. Use this row first to set the common settings and then make adjustments on a port-by-port basis. Note: Changes in this row are copied to all the ports as soon as you make them.
Ingress Rate	
Active	Select this check box to activate commit rate limits on this port.
Commit Rate	Specify the guaranteed bandwidth allowed in kilobits per second (Kbps) for the incoming traffic flow on a port. The commit rate should be less than the peak rate. The sum of commit rates cannot be greater than or equal to the uplink bandwidth.
Active	Select this check box to activate peak rate limits on this port.
Peak Rate	Specify the maximum bandwidth allowed in kilobits per second (Kbps) for the incoming traffic flow on a port.
Active	Select this check box to activate egress rate limits on this port.
Egress Rate	Specify the maximum bandwidth allowed in kilobits per second (Kbps) for the out-going traffic flow on a port.
Apply	Click Apply to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to reset the fields.

CHAPTER 15

Broadcast Storm Control

15.1 Broadcast Storm Control Overview

This chapter introduces and shows you how to configure the broadcast storm control feature.

Broadcast storm control limits the number of broadcast, multicast and destination lookup failure (DLF) packets the Switch receives per second on the ports. When the maximum number of allowable broadcast, multicast and/or DLF packets is reached per second, the subsequent packets are discarded. Enable this feature to reduce broadcast, multicast and/or DLF packets in your network. You can specify limits for each packet type on each port.

15.1.1 What You Can Do

Use the **Broadcast Storm Control** screen ([Section 15.2 on page 196](#)) to limit the number of broadcast, multicast and destination lookup failure (DLF) packets the Switch receives per second on the ports.

15.2 Broadcast Storm Control Setup

Click **Advanced Application > Broadcast Storm Control** in the navigation panel to display the screen as shown next.

Figure 149 Advanced Application > Broadcast Storm Control (Standalone Mode)

Broadcast Storm Control						
Active ☐						
Port		Broadcast (pkt/s)		Multicast (pkt/s)		DLF (pkt/s)
*	☐			☐		☐
1	☐	0		☐	0	☐
2	☐	0		☐	0	☐
3	☐	0		☐	0	☐
4	☐	0		☐	0	☐
5	☐	0		☐	0	☐
6	☐	0		☐	0	☐
7	☐	0		☐	0	☐
8	☐	0		☐	0	☐
9	☐	0		☐	0	☐
10	☐	0		☐	0	☐
11	☐	0		☐	0	☐
12	☐	0		☐	0	☐
13	☐	0		☐	0	☐
14	☐	0		☐	0	☐
15	☐	0		☐	0	☐

Apply Cancel

Figure 150 Advanced Application > Broadcast Storm Control (Stacking Mode)

Broadcast Storm Control						
Active ☐						
SLOT 1 ▼						
Port		Broadcast (pkt/s)		Multicast (pkt/s)		DLF (pkt/s)
1/*	☐			☐		☐
1/1	☐	0		☐	0	☐
1/2	☐	0		☐	0	☐
1/3	☐	0		☐	0	☐
1/4	☐	0		☐	0	☐
1/5	☐	0		☐	0	☐
1/6	☐	0		☐	0	☐
1/7	☐	0		☐	0	☐
1/8	☐	0		☐	0	☐
1/9	☐	0		☐	0	☐
1/10	☐	0		☐	0	☐
1/11	☐	0		☐	0	☐
1/12	☐	0		☐	0	☐

Apply Cancel

The following table describes the labels in this screen.

Table 70 Advanced Application > Broadcast Storm Control

LABEL	DESCRIPTION
Active	Select this check box to enable traffic storm control on the Switch. Clear this check box to disable this feature.
SLOT	This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack.

Table 70 Advanced Application > Broadcast Storm Control (continued)

LABEL	DESCRIPTION
Port	This field displays the port number. In stacking mode, the first number represents the slot ID and the second is the port number. Please note that the default stacking ports (the last four ports of your Switch) cannot be configured. They are reserved for stacking only.
*	Settings in this row apply to all ports. Use this row only if you want to make some settings the same for all ports. Use this row first to set the common settings and then make adjustments on a port-by-port basis. Note: Changes in this row are copied to all the ports as soon as you make them.
Broadcast (pkt/s)	Select this option to enable and specify how many broadcast packets the Switch accepts per second on the port. The Switch will generate a trap and/or log when the actual rate is higher than the specified threshold.
Multicast (pkt/s)	Select this option to enable and specify how many multicast packets the Switch accepts per second on the port. The Switch will generate a trap and/or log when the actual rate is higher than the specified threshold.
DLF (pkt/s)	Select this option and specify how many destination lookup failure (DLF) packets the port receives per second.
Apply	Click Apply to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to reset the fields.

CHAPTER 16

Mirroring

16.1 Mirroring Overview

This chapter discusses port mirroring setup screens.

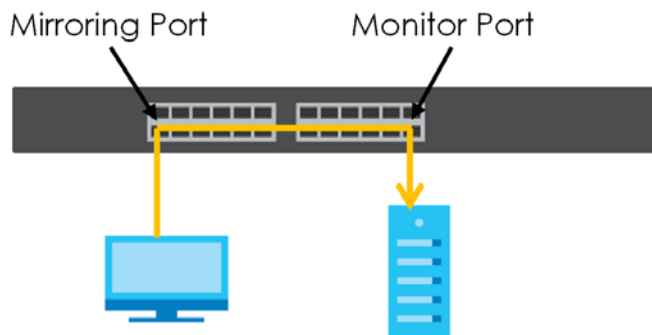
Port mirroring allows you to copy a traffic flow to a monitor port (the port you copy the traffic to) in order that you can examine the traffic from the monitor port without interference.

16.1.1 What You Need to Know

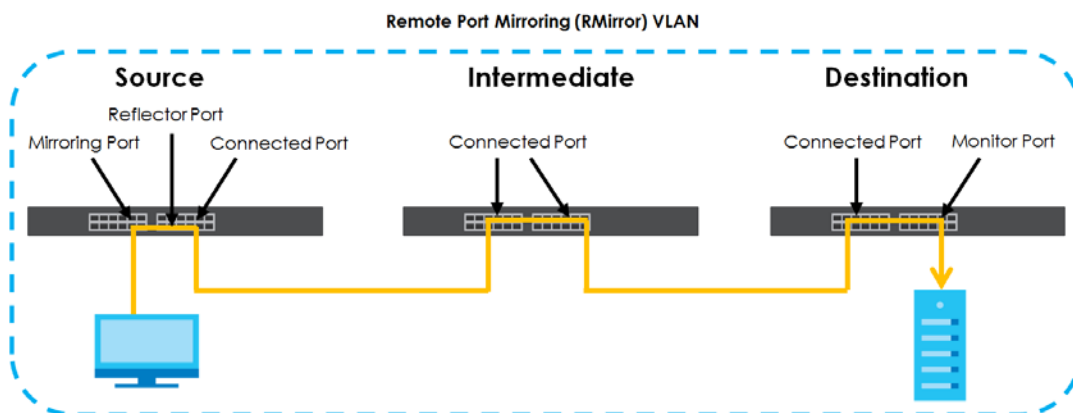
Read on for concepts on Mirroring that can help you configure the screens in this chapter.

The Switch supports both local port mirroring and remote port mirroring.

In local port mirroring, the mirroring ports (through which traffic you copy passes) and the monitor port are on the same device.

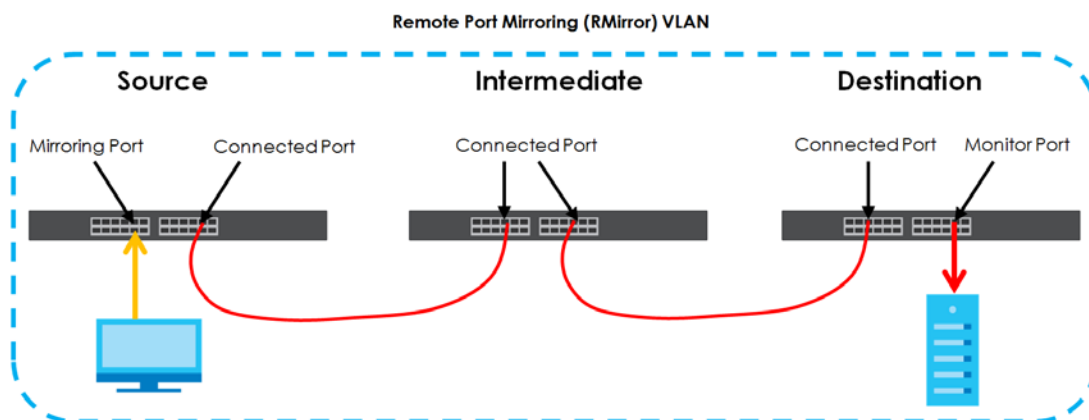


In remote port mirroring (RMirror), the mirroring ports and monitor port can be on different devices in a network. You can use it to monitor multiple switches across your network. The traffic from the source device's mirroring ports is sent to a reflector port for VLAN tagging and copied to the connected ports. Traffic are then carried over the specified remote port mirroring (RMirror) VLAN and sent to the destination device's monitor port through the connected ports that connect to other switches.



Single-Destination RMirror

If the mirrored traffic is forwarded to one single destination switch, you can disable the reflector port. The Switch adds RMirror VLAN tag and forwards mirrored traffic from the mirroring port to the connected port directly.



16.2 Local Port Mirroring

Click **Advanced Application > Mirroring** in the navigation panel to display the **Mirroring** screen. Use this screen to select a monitor port and specify the traffic flow to be copied to the monitor port.

Figure 151 Advanced Application > Mirroring (Standalone Mode)

Mirroring

RMirror

Active

☐

Monitor Port

Apply

Cancel

Figure 152 Advanced Application > Mirroring (Stacking Mode)

Mirroring [RMirror](#)

Active ☐

Monitor Port 1 /

SLOT 1 ▾

Port	Mirrored	Direction
1/*	☐	Ingress ▾
1/1	☐	Ingress ▾
1/2	☐	Ingress ▾
1/3	☐	Ingress ▾
1/4	☐	Ingress ▾
1/5	☐	Ingress ▾
1/6	☐	Ingress ▾
1/7	☐	Ingress ▾
1/8	☐	Ingress ▾
1/9	☐	Ingress ▾
1/10	☐	Ingress ▾
1/11	☐	Ingress ▾
1/24	☐	Ingress ▾

Apply Cancel

The following table describes the labels in this screen.

Table 71 Advanced Application > Mirroring

LABEL	DESCRIPTION
Active	Select this check box to activate port mirroring on the Switch. Clear this check box to disable the feature.
Monitor Port	The monitor port is the port you copy the traffic to in order to examine it in more detail without interfering with the traffic flow on the original ports. Type the port number of the monitor port. In stacking mode, the first box field is the slot ID and the second field is the port number.
SLOT	This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack.
Port	This field displays the port number. In stacking mode, the first number represents the slot ID and the second is the port number. Please note that the default stacking ports (the last four ports of your Switch) cannot be configured. They are reserved for stacking only.
*	Settings in this row apply to all ports. Use this row only if you want to make some settings the same for all ports. Use this row first to set the common settings and then make adjustments on a port-by-port basis. Note: Changes in this row are copied to all the ports as soon as you make them.
Mirrored	Select this option to mirror the traffic on a port.
Direction	Specify the direction of the traffic to mirror by selecting from the drop-down list box. Choices are Egress (outgoing), Ingress (incoming) and Both .
Apply	Click Apply to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to reset the fields.

16.2.1 Remote Port Mirroring

Use this screen to create a remote port mirroring (RMirror) VLAN through which the mirrored traffic is forwarded.

Note: Your Switch automatically creates a static VLAN (with the same VID) when you create a RMirror VLAN in this screen.

Click the **RMirror** link in the **Advanced Application > Mirroring** screen. The following screen opens.

Figure 153 Advanced Application > Mirroring > RMirror

The following table describes the labels in this screen.

Table 72 Advanced Application > Mirroring > RMirror

LABEL	DESCRIPTION
Active	Select the option to enable the VLAN.
RMirror VLAN ID	Specify the ID number of remote port mirroring (RMirror) VLAN.
Apply	Click Apply to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to begin configuring this screen afresh.
VLAN	This field displays the ID number of the RMirror VLAN. Click on the VLAN ID number to change the settings.
Active	This field displays whether the VLAN is enabled or not.
	Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries.
Delete	Check the rules that you want to remove and then click the Delete button.
Cancel	Click Cancel to clear the selected check boxes.

16.2.2 Source

Use this screen to configure the reflector port and specify the traffic flow to be copied to the monitor port when the Switch is the source device in remote port mirroring.

Click the **Source** link in the **RMirror** screen. The following screen opens.

Figure 154 Advanced Application > Mirroring > RMirror > Source (Standalone Mode)

Source [RMirror](#)

RMirror VLAN ID

Priority

Reflector Port ☐ Active

Port	Mirrored	Direction
*	☐	Both ▼
1	☐	Both ▼
2	☐	Both ▼
3	☐	Both ▼
4	☐	Both ▼
5	☐	Both ▼
6	☐	Both ▼
7	☐	Both ▼
8	☐	Both ▼
9	☐	Both ▼
10	☐	Both ▼
11	☐	Both ▼
12	☐	Both ▼

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

VLAN Priority Ingress Mirror Port Egress Both Reflector Port Active Port

Figure 155 Advanced Application > Mirroring > RMirror > Source (Stacking Mode)

Source [RMirror](#)

RMirror VLAN ID

Priority

Reflector Port ☐ Active

SLOT 1 ▼

Port	Mirrored	Direction
1/*	☐	Both ▼
1/1	☐	Both ▼
1/2	☐	Both ▼
1/3	☐	Both ▼
1/4	☐	Both ▼
1/5	☐	Both ▼
1/6	☐	Both ▼
1/7	☐	Both ▼
1/8	☐	Both ▼
1/9	☐	Both ▼

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

VLAN Priority Ingress Mirror Port Egress Both Reflector Port Active Port

The following table describes the labels in this screen.

Table 73 Advanced Application > Mirroring > RMirror > Source

LABEL	DESCRIPTION
RMirror VLAN ID	Select the RMirror VLAN over which the mirrored traffic is forwarded.
Priority	Enter the priority of the mirrored traffic.
Reflector Port	Select the check box to enable the specified reflector port. Enter the number of reflector port that adds the RMirror VLAN tag to all mirrored traffic and forwards traffic to the connected ports in the same RMirror VLAN. In stacking mode, the first box field is the slot ID and the second field is the port number.
SLOT	This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack.
Port	This field displays the port number. In stacking mode, the first number represents the slot ID and the second is the port number. Please note that the default stacking ports (the last four ports of your Switch) cannot be configured. They are reserved for stacking only.
*	Settings in this row apply to all ports. Use this row only if you want to make some settings the same for all ports. Use this row first to set the common settings and then make adjustments on a port-by-port basis. Note: Changes in this row are copied to all the ports as soon as you make them.
Mirrored	Select this option to mirror the traffic on a port.
Direction	Specify the direction of the traffic to mirror by selecting from the drop-down list box. Choices are Egress (outgoing), Ingress (incoming) and Both .
Apply	Click Apply to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to begin configuring this screen afresh.
VLAN	This field displays the ID number of RMirror VLAN over which the mirrored traffic is forwarded.
Priority	This field displays the priority of the mirrored traffic.
Mirror Port	
Ingress	This field displays the number of ports on which the incoming traffic is mirrored.
Egress	This field displays the number of ports on which the outgoing traffic is mirrored.
Both	This field displays the number of ports on which the incoming and outgoing traffic is mirrored.
Reflector Port	This field displays whether the reflector port is enabled and the number of reflector port in this RMirror VLAN.

16.2.3 Destination

Use this screen to specify the RMirror VLAN and configure the monitor port when the Switch is the destination device in remote port mirroring.

Click the **Destination** link in the **RMirror** screen. The following screen opens.

Figure 156 Advanced Application > Mirroring > RMirror > Destination (Standalone Mode)

Figure 157 Advanced Application > Mirroring > RMirror > Destination (Stacking Mode)

The following table describes the labels in this screen.

Table 74 Advanced Application > Mirroring > RMirror > Destination

LABEL	DESCRIPTION
RMirror VLAN ID	Select the RMirror VLAN over which the mirrored traffic is forwarded.
Monitor Port	Specify the port to which you copy the traffic in order to examine it in more detail without interfering with the traffic flow on the original ports. In stacking mode, the first box field is the slot ID and the second field is the port number.
Tagging	Select whether to add the RMirror VLAN tag to mirrored traffic on the monitor port.
Apply	Click Apply to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to begin configuring this screen afresh.
VLAN	This field displays the ID number of RMirror VLAN over which the mirrored traffic is forwarded.
Monitor Port	This field displays the number of port that receives the mirrored traffic from the source device for analysis.
Tagging	This field displays whether the mirrored traffic is tagged with the RMirror VLAN ID.
	Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries.
Delete	Check the rules that you want to remove in the Delete column and then click the Delete button.
Cancel	Click Cancel to begin configuring this screen afresh.

16.2.4 Connected Port

Use this screen to select the RMirror VLAN and specify the ports that helps forward mirrored traffic to other connected switches and/or receive mirrored traffic from other connected port in the same RMirror VLAN.

Click the **Connected Port** link in the **RMirror** screen. The following screen opens.

Figure 158 Advanced Application > Mirroring > RMirror > Connected Port (Standalone Mode)

Connected Port

[RMirror](#)

RMirror VLAN ID

Port	Connected Port
*	☐
1	☐
2	☐
3	☐
4	☐
5	☐
6	☐
7	☐
8	☐
9	☐
10	☐
11	☐
12	☐
13	☐
14	☐
15	☐
16	☐
17	☐
18	☐
19	☐
20	☐
21	☐
22	☐
23	☐
24	☐
25	☐
26	☐
27	☐

Apply

Cancel

VLAN

Connected Port

Figure 159 Advanced Application > Mirroring > RMirror > Connected Port (Stacking Mode)

The screenshot shows the 'Connected Port' configuration interface. At the top, there's a 'Connected Port' tab and an 'RMirror' link. Below is a dropdown for 'RMirror VLAN ID'. A 'SLOT 1' dropdown is also present. The main area is a table with two columns: 'Port' and 'Connected Port'. The 'Port' column lists various port identifiers from 1/* to 1/10. The 'Connected Port' column contains checkboxes for each port. At the bottom, there are 'Apply' and 'Cancel' buttons.

The following table describes the labels in this screen.

Table 75 Advanced Application > Mirroring > RMirror > Connected Port

LABEL	DESCRIPTION
RMirror VLAN ID	Select the RMirror VLAN over which the mirrored traffic is forwarded.
SLOT	This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack.
Port	This field displays the port number. In stacking mode, the first number represents the slot ID and the second is the port number. Please note that the default stacking ports (the last four ports of your Switch) cannot be configured. They are reserved for stacking only.
*	Settings in this row apply to all ports. Use this row only if you want to make some settings the same for all ports. Use this row first to set the common settings and then make adjustments on a port-by-port basis. Note: Changes in this row are copied to all the ports as soon as you make them.
Connected Port	When the Switch is a source device in remote port mirroring, select this option to have the port help forward mirrored traffic to the connected port of the intermediate or destination device in the same RMirror VLAN. When the Switch is an intermediate device in remote port mirroring, select this option to have the port receive mirrored traffic from the connected source or another intermediate device or forward mirrored traffic to the connected destination or another intermediate device in the same RMirror VLAN. When the Switch is a destination device in remote port mirroring, select this option to have the port receive mirrored traffic from the connected source or intermediate device in the same RMirror VLAN.
Apply	Click Apply to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to begin configuring this screen afresh.

Table 75 Advanced Application > Mirroring > RMirror > Connected Port (continued)

LABEL	DESCRIPTION
VLAN	This field displays the ID number of port mirroring VLAN over which the mirrored traffic is forwarded.
Connected Port	This field displays the number of ports that helps forward mirrored traffic to other connected switches.

CHAPTER 17

Link Aggregation

17.1 Link Aggregation Overview

This chapter shows you how to logically aggregate physical links to form one logical, higher-bandwidth link.

Link aggregation (trunking) is the grouping of physical ports into one logical higher-capacity link. You may want to trunk ports if for example, it is cheaper to use multiple lower-speed links than to under-utilize a high-speed, but more costly, single-port link. However, the more ports you aggregate then the fewer available ports you have. A trunk group is one logical link containing multiple ports.

The beginning port of each trunk group must be physically connected to form a trunk group.

17.1.1 What You Can Do

- Use the **Link Aggregation Status** screen ([Section 17.2 on page 211](#)) to view ports you have configured to be in the trunk group, ports that are currently transmitting data as one logical link in the trunk group and so on.
- Use the **Link Aggregation Setting** screen ([Section 17.3 on page 213](#)) to configure static link aggregation.
- Use the **Link Aggregation Control Protocol** screen ([Section 17.3.1 on page 215](#)) to enable Link Aggregation Control Protocol (LACP).

17.1.2 What You Need to Know

The Switch supports both static and dynamic link aggregation.

Note: In a properly planned network, it is recommended to implement static link aggregation only. This ensures increased network stability and control over the trunk groups on your Switch.

See [Section 17.4.1 on page 218](#) for a static port trunking example.

Dynamic Link Aggregation

The Switch adheres to the IEEE 802.3ad standard for static and dynamic (LACP) port trunking.

The IEEE 802.3ad standard describes the Link Aggregation Control Protocol (LACP) for dynamically creating and managing trunk groups.

When you enable LACP link aggregation on a port, the port can automatically negotiate with the ports at the remote end of a link to establish trunk groups. LACP also allows port redundancy, that is, if an

operational port fails, then one of the “standby” ports become operational without user intervention. Please note that:

- You must connect all ports point-to-point to the same Ethernet switch and configure the ports for LACP trunking.
- LACP only works on full-duplex links.
- All ports in the same trunk group must have the same media type, speed, duplex mode and flow control settings.

Configure trunk groups or LACP before you connect the Ethernet switch to avoid causing network topology loops.

Link Aggregation ID

LACP aggregation ID consists of the following information¹:

Table 76 Link Aggregation ID: Local Switch

SYSTEM PRIORITY	MAC ADDRESS	KEY	PORT PRIORITY	PORT NUMBER
0000	00-00-00-00-00-00	0000	00	0000

Table 77 Link Aggregation ID: Peer Switch

SYSTEM PRIORITY	MAC ADDRESS	KEY	PORT PRIORITY	PORT NUMBER
0000	00-00-00-00-00-00	0000	00	0000

Traffic Distribution Criteria

The Switch supports both unicast and non-unicast traffic (broadcast and multicast) network load sharing over link aggregation. Load sharing works by statically splitting the traffic based on source or destination IP/MAC address, and then distributing the load across multiple paths. In link aggregation, this allows the trunk group (ports) to transmit data as one logical link to a single or group of hosts on the network.

Unicast and non-unicast traffic network load sharing over link aggregation (trunking) is enabled by default.

17.2 Link Aggregation Status

Click **Advanced Application > Link Aggregation** in the navigation panel. The **Link Aggregation Status** screen displays by default. See [Section 17.1 on page 210](#) for more information.

1. Port Priority and Port Number are 0 as it is the aggregator ID for the trunk group, not the individual port.

Figure 160 Advanced Application > Link Aggregation Status

Link Aggregation Status			Link Aggregation Setting		
Group ID	Enabled Ports	Synchronized Ports	Aggregator ID	Criteria	Status
T1	-	-	-	src-dst-mac	-
T2	-	-	-	src-dst-mac	-
T3	-	-	-	src-dst-mac	-
T4	-	-	-	src-dst-mac	-
T5	-	-	-	src-dst-mac	-
T6	-	-	-	src-dst-mac	-
T7	-	-	-	src-dst-mac	-
T8	-	-	-	src-dst-mac	-
T9	-	-	-	src-dst-mac	-
T10	-	-	-	src-dst-mac	-
T11	-	-	-	src-dst-mac	-
T12	-	-	-	src-dst-mac	-
T13	-	-	-	src-dst-mac	-

The following table describes the labels in this screen.

Table 78 Advanced Application > Link Aggregation Status

LABEL	DESCRIPTION
Group ID	This field displays the group ID to identify a trunk group, that is, one logical link containing multiple ports.
Enabled Ports	These are the ports you have configured in the Link Aggregation screen to be in the trunk group. The port numbers displays only when this trunk group is activated and there is a port belonging to this group.
Synchronized Ports	These are the ports that are currently transmitting data as one logical link in this trunk group.
Aggregator ID	Link Aggregator ID consists of the following: system priority, MAC address, key, port priority and port number. The ID displays only when there is a port belonging to this trunk group and LACP is also enabled for this group.
Criteria	This shows the outgoing traffic distribution algorithm used in this trunk group. Packets from the same source and/or to the same destination are sent over the same link within the trunk. src-mac means the Switch distributes traffic based on the packet's source MAC address. dst-mac means the Switch distributes traffic based on the packet's destination MAC address. src-dst-mac means the Switch distributes traffic based on a combination of the packet's source and destination MAC addresses. src-ip means the Switch distributes traffic based on the packet's source IP address. dst-ip means the Switch distributes traffic based on the packet's destination IP address. src-dst-ip means the Switch distributes traffic based on a combination of the packet's source and destination IP addresses.
Status	This field displays how these ports were added to the trunk group. It displays: Static – if the ports are configured as static members of a trunk group. LACP – if the ports are configured to join a trunk group via LACP.

17.3 Link Aggregation Setting

Click **Advanced Application > Link Aggregation > Link Aggregation Setting** to display the screen shown next. See [Section 17.1 on page 210](#) for more information on link aggregation.

Figure 161 Advanced Application > Link Aggregation > Link Aggregation Setting (Standalone Mode)

Link Aggregation Setting

[Status](#) [LACP](#)

Group ID	Active	Criteria
T1	☐	src-dst-mac ▼
T2	☐	src-dst-mac ▼
T3	☐	src-dst-mac ▼
T4	☐	src-dst-mac ▼
T5	☐	src-dst-mac ▼
T6	☐	src-dst-mac ▼
T7	☐	src-dst-mac ▼
T8	☐	src-dst-mac ▼
T9	☐	src-dst-mac ▼
T10	☐	src-dst-mac ▼
T11	☐	src-dst-mac ▼
T12	☐	src-dst-mac ▼
T13	☐	src-dst-mac ▼
T14	☐	src-dst-mac ▼
T15	☐	src-dst-mac ▼

Port	Group
1	None ▼
2	None ▼
3	None ▼
4	None ▼
5	None ▼
6	None ▼
7	None ▼
8	None ▼
9	None ▼
10	None ▼

Apply

Cancel

Figure 162 Advanced Application > Link Aggregation > Link Aggregation Setting (Stacking Mode)

Link Aggregation Setting

Status LACP

Group ID	Active	Criteria
T1	☐	src-dst-mac ▼
T2	☐	src-dst-mac ▼
T3	☐	src-dst-mac ▼
T4	☐	src-dst-mac ▼
T5	☐	src-dst-mac ▼
T6	☐	src-dst-mac ▼
T7	☐	src-dst-mac ▼
T8	☐	src-dst-mac ▼
T9	☐	src-dst-mac ▼
T10	☐	src-dst-mac ▼
T11	☐	src-dst-mac ▼

SLOT 1 ▼

Port	Group
1/1	None ▼
1/2	None ▼
1/3	None ▼
1/4	None ▼
1/5	None ▼
1/6	None ▼
1/7	None ▼
1/8	None ▼
1/9	None ▼
1/10	None ▼
1/11	None ▼
1/12	None ▼

Apply

Cancel

The following table describes the labels in this screen.

Table 79 Advanced Application > Link Aggregation > Link Aggregation Setting

LABEL	DESCRIPTION
Link Aggregation Setting	This is the only screen you need to configure to enable static link aggregation.
Group ID	The field identifies the link aggregation group, that is, one logical link containing multiple ports.
Active	Select this option to activate a trunk group.

Table 79 Advanced Application > Link Aggregation > Link Aggregation Setting (continued)

LABEL	DESCRIPTION
Criteria	Select the outgoing traffic distribution type. Packets from the same source and/or to the same destination are sent over the same link within the trunk. By default, the Switch uses the src-dst-mac distribution type. If the Switch is behind a router, the packet's destination or source MAC address will be changed. In this case, set the Switch to distribute traffic based on its IP address to make sure port trunking can work properly. Select src-mac to distribute traffic based on the packet's source MAC address. Select dst-mac to distribute traffic based on the packet's destination MAC address. Select src-dst-mac to distribute traffic based on a combination of the packet's source and destination MAC addresses. Select src-ip to distribute traffic based on the packet's source IP address. Select dst-ip to distribute traffic based on the packet's destination IP address. Select src-dst-ip to distribute traffic based on a combination of the packet's source and destination IP addresses.
SLOT	This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack.
Port	This field displays the port number. In stacking mode, the first number represents the slot ID and the second is the port number. Please note that the default stacking ports (the last four ports of your Switch) cannot be configured. They are reserved for stacking only.
Group	Select the trunk group to which a port belongs. Note: When you enable the port security feature on the Switch and configure port security settings for a port, you cannot include the port in an active trunk group.
Apply	Click Apply to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to begin configuring this screen afresh.

17.3.1 Link Aggregation Control Protocol

Click **Advanced Application > Link Aggregation > Link Aggregation Setting > LACP** to display the screen shown next. See [Dynamic Link Aggregation on page 210](#) for more information on dynamic link aggregation.

Figure 163 Advanced Application > Link Aggregation > Link Aggregation Setting > LACP (Standalone Mode)

Link Aggregation Control Protocol

[Link Aggregation Setting](#)

Active

☐

System Priority

65535

Group ID	LACP Active
T1	☐
T2	☐
T3	☐
T4	☐
T5	☐
T6	☐
T7	☐
T8	☐
T9	☐
T10	☐
T11	☐
T12	☐
T13	☐
T14	☐
T15	☐

Port	LACP Timeout
*	30 ▼ seconds
1	30 ▼ seconds
2	30 ▼ seconds
3	30 ▼ seconds
4	30 ▼ seconds
5	30 ▼ seconds

Apply

Cancel

Figure 164 Advanced Application > Link Aggregation > Link Aggregation Setting > LACP (Stacking Mode)

Link Aggregation Control Protocol		Link Aggregation Setting
Active	☐	
System Priority	65535	

Group ID	LACP Active
T1	☐
T2	☐
T3	☐
T4	☐
T5	☐
T6	☐
T7	☐
T8	☐
T9	☐
T10	☐
T11	☐

SLOT 1 ▾

Port	LACP Timeout
1/*	30 ▾ seconds
1/1	30 ▾ seconds
1/2	30 ▾ seconds
1/3	30 ▾ seconds
1/4	30 ▾ seconds
1/5	30 ▾ seconds
1/6	30 ▾ seconds
1/7	30 ▾ seconds
1/8	30 ▾ seconds
1/9	30 ▾ seconds
1/10	30 ▾ seconds
1/11	30 ▾ seconds

The following table describes the labels in this screen.

Table 80 Advanced Application > Link Aggregation > Link Aggregation Setting > LACP

LABEL	DESCRIPTION
Link Aggregation Control Protocol	Note: Do NOT configure this screen unless you want to enable dynamic link aggregation.
Active	Select this check box to enable Link Aggregation Control Protocol (LACP).
System Priority	LACP system priority is a number between 1 and 65535. The switch with the lowest system priority (and lowest port number if system priority is the same) becomes the LACP "server". The LACP "server" controls the operation of LACP setup. Enter a number to set the priority of an active port using Link Aggregation Control Protocol (LACP). The smaller the number, the higher the priority level.
Group ID	The field identifies the link aggregation group, that is, one logical link containing multiple ports.
LACP Active	Select this option to enable LACP for a trunk.
SLOT	This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack.

Table 80 Advanced Application > Link Aggregation > Link Aggregation Setting > LACP (continued)

LABEL	DESCRIPTION
Port	This field displays the port number. In stacking mode, the first number represents the slot ID and the second is the port number. Please note that the default stacking ports (the last four ports of your Switch) cannot be configured. They are reserved for stacking only.
*	Settings in this row apply to all ports. Use this row only if you want to make some settings the same for all ports. Use this row first to set the common settings and then make adjustments on a port-by-port basis. Note: Changes in this row are copied to all the ports as soon as you make them.
LACP Timeout	Timeout is the time interval between the individual port exchanges of LACP packets in order to check that the peer port in the trunk group is still up. If a port does not respond after three tries, then it is deemed to be "down" and is removed from the trunk. Set a short timeout (1 second) for busy trunked links to ensure that disabled ports are removed from the trunk group as soon as possible. Select either 1 second or 30 seconds.
Apply	Click Apply to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to begin configuring this screen afresh.

17.4 Technical Reference

This section provides technical background information on the topics discussed in this chapter.

17.4.1 Static Trunking Example

This example shows you how to create a static port trunk group for ports 2 – 5.

- 1 **Make your physical connections** – make sure that the ports that you want to belong to the trunk group are connected to the same destination. The following figure shows ports 2 – 5 on switch **A** connected to switch **B**.

Figure 165 Trunking Example – Physical Connections



- 2 **Configure static trunking** – Click **Advanced Application > Link Aggregation > Link Aggregation Setting**. In this screen activate trunk group **T1**, select the traffic distribution algorithm used by this group and select the ports that should belong to this group as shown in the figure below. Click **Apply** when you are done.

Figure 166 Trunking Example – Configuration Screen

Link Aggregation Setting [Status](#) [LACP](#)

Group ID	Active	Criteria
T1	☒	src-dst-mac ▼
T2	☐	src-dst-mac ▼
T3	☐	src-dst-mac ▼
T4	☐	src-dst-mac ▼
T5	☐	src-dst-mac ▼
T6	☐	src-dst-mac ▼
T7	☐	src-dst-mac ▼
T8	☐	src-dst-mac ▼
T9	☐	src-dst-mac ▼
T10	☐	src-dst-mac ▼
T11	☐	src-dst-mac ▼
T12	☐	src-dst-mac ▼
T13	☐	src-dst-mac ▼
T14	☐	src-dst-mac ▼
T15	☐	src-dst-mac ▼

Port	Group
1	None ▼
2	T1 ▼
3	T1 ▼
4	T1 ▼
5	T1 ▼
6	None ▼
7	None ▼
8	None ▼
9	None ▼

EXAMPLE

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

Your trunk group 1 (**T1**) configuration is now complete.

CHAPTER 18

Port Authentication

18.1 Port Authentication Overview

This chapter describes the IEEE 802.1x, MAC, Guest VLAN, and Compound authentication methods.

Port authentication is a way to validate access to ports on the Switch to clients based on an external server (authentication server). The Switch supports the following methods for port authentication:

- **IEEE 802.1x²** – An authentication server validates access to a port based on a user name and password provided by the user.
- **MAC Authentication** – An authentication server validates access to a port based on the MAC address and password of the client.
- **Guest VLAN** – A user that fails an authentication server can still access the port, but traffic from the user is forwarded to the guest VLAN port.
- **Compound Authentication** – An authentication server validates access to a port based on a user name and password provided by the user and/or MAC address and password of the client.

All types of authentication use the RADIUS (Remote Authentication Dial In User Service, RFC 2138, 2139) protocol to validate users.

Note: If you enable IEEE 802.1x authentication and MAC authentication on the same port, the Switch performs IEEE 802.1x authentication first. If a user fails to authenticate via the IEEE 802.1x method, then access to the port is denied.

18.1.1 What You Can Do

- Use the **Port Authentication** screen ([Section 18.2 on page 222](#)) to display the links to the configuration screens where you can enable the port authentication methods.
- Use the **802.1x** screen ([Section 18.3 on page 222](#)) to activate IEEE 802.1x security.
- Use the **MAC Authentication** screen ([Section 18.4 on page 225](#)) to activate MAC authentication.
- Use the **Guest Vlan** screen ([Section 18.5 on page 228](#)) to enable and assign a guest VLAN to a port.
- Use the **Compound Authentication** screen ([Section 18.6 on page 231](#)) to allow network access for clients that pass either IEEE 802.1x authentication OR MAC authentication, or pass both IEEE 802.1x authentication AND MAC authentication.

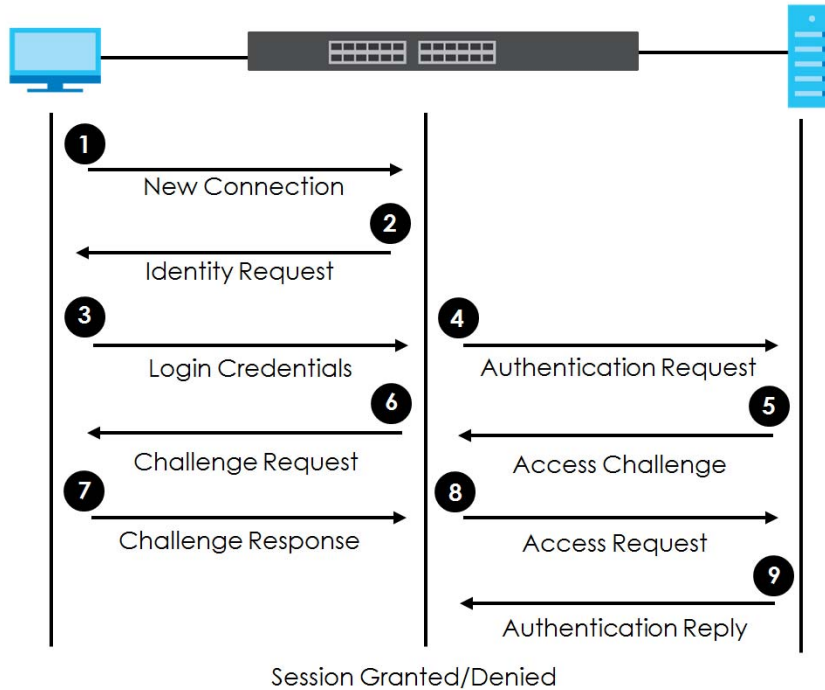
2. At the time of writing, IEEE 802.1x is not supported by all operating systems. See your operating system documentation. If your operating system does not support 802.1x, then you may need to install 802.1x client software.

18.1.2 What You Need to Know

IEEE 802.1x Authentication

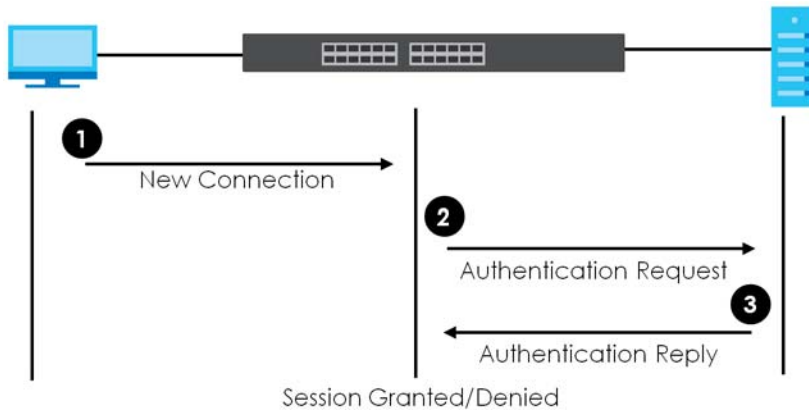
The following figure illustrates how a client connecting to a IEEE 802.1x authentication enabled port goes through a validation process. The Switch prompts the client for login information in the form of a user name and password after the client responds to its identity request. When the client provides the login credentials, the Switch sends an authentication request to a RADIUS server. The RADIUS server validates whether this client is allowed access to the port.

Figure 167 IEEE 802.1x Authentication Process



18.1.3 MAC Authentication

MAC authentication works in a very similar way to IEEE 802.1x authentication. The main difference is that the Switch does not prompt the client for login credentials. The login credentials are based on the source MAC address of the client connecting to a port on the Switch along with a password configured specifically for MAC authentication on the Switch.

Figure 168 MAC Authentication Process

18.2 Port Authentication Configuration

To enable port authentication, first activate the port authentication methods (both on the Switch and the ports), then configure the RADIUS server settings in the **AAA > RADIUS Server Setup** screen.

Click **Advanced Application > Port Authentication** in the navigation panel to display the screen as shown. Select a port authentication method's link in the screen that appears.

Figure 169 Advanced Application > Port Authentication

Port Authentication	
802.1x	Click here
MAC Authentication	Click here
Guest Vlan	Click here
Compound Authentication Mode	Click here

18.3 Activate IEEE 802.1x Security

Use this screen to activate IEEE 802.1x security. In the **Port Authentication** screen click **802.1x** to display the configuration screen as shown.

Figure 170 Advanced Application > Port Authentication > 802.1x (Standalone Mode)

802.1x
[Port Authentication](#)

Active

☐

EAPOL flood

☐

Port	Active	Max-Req	Reauth	Reauth-period secs	Quiet-period secs	Tx-period secs	Supp-Timeout secs
*	☐		On ▼				
1	☐	2	On ▼	3600	60	30	30
2	☐	2	On ▼	3600	60	30	30
3	☐	2	On ▼	3600	60	30	30
4	☐	2	On ▼	3600	60	30	30
5	☐	2	On ▼	3600	60	30	30
6	☐	2	On ▼	3600	60	30	30
7	☐	2	On ▼	3600	60	30	30
8	☐	2	On ▼	3600	60	30	30
9	☐	2	On ▼	3600	60	30	30
10	☐	2	On ▼	3600	60	30	30
11	☐	2	On ▼	3600	60	30	30
12	☐	2	On ▼	3600	60	30	30
13	☐	2	On ▼	3600	60	30	30
14	☐	2	On ▼	3600	60	30	30
15	☐	2	On ▼	3600	60	30	30
16	☐	2	On ▼	3600	60	30	30
17	☐	2	On ▼	3600	60	30	30

Apply Cancel

Figure 171 Advanced Application > Port Authentication > 802.1x (Stacking Mode)

802.1x Port Authentication

Active ☐

EAPOL flood ☐

SLOT 1 ▼

Port	Active	Max-Req	Reauth	Reauth-period secs	Quiet-period secs	Tx-period secs	Supp-Timeout secs
1/*	☐		On ▼				
1/1	☐	2	On ▼	3600	60	30	30
1/2	☐	2	On ▼	3600	60	30	30
1/3	☐	2	On ▼	3600	60	30	30
1/4	☐	2	On ▼	3600	60	30	30
1/5	☐	2	On ▼	3600	60	30	30
1/6	☐	2	On ▼	3600	60	30	30
1/7	☐	2	On ▼	3600	60	30	30
1/8	☐	2	On ▼	3600	60	30	30
1/9	☐	2	On ▼	3600	60	30	30
1/10	☐	2	On ▼	3600	60	30	30
1/11	☐	2	On ▼	3600	60	30	30

Apply Cancel

The following table describes the labels in this screen.

Table 81 Advanced Application > Port Authentication > 802.1x

LABEL	DESCRIPTION
Active	Select this check box to permit 802.1x authentication on the Switch. Note: You must first enable 802.1x authentication on the Switch before configuring it on each port.
EAPOL flood	Select this check box to flood EAPOL packets to all ports in the same VLAN. EAP over LAN (EAPOL) is a port authentication protocol used in IEEE 802.1x. It is used to encapsulate and transmit EAP packets between the supplicant (a client device that requests access to the network resources or services) and authenticator (the Switch) directly over the LAN. Note: EAPOL flood will not take effect when 802.1x authentication is enabled.
SLOT	This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack.
Port	This field displays the port number. In stacking mode, the first number represents the slot ID and the second is the port number. Please note that the default stacking ports (the last four ports of your Switch) cannot be configured. They are reserved for stacking only.
*	Settings in this row apply to all ports. Use this row only if you want to make some settings the same for all ports. Use this row first to set the common settings and then make adjustments on a port-by-port basis. Note: Changes in this row are copied to all the ports as soon as you make them.
Active	Select this to permit 802.1x authentication on this port. You must first allow 802.1x authentication on the Switch before configuring it on each port.

Table 81 Advanced Application > Port Authentication > 802.1x (continued)

LABEL	DESCRIPTION
Max-Req	Specify the number of times the Switch tries to authenticate clients before sending unresponsive ports to the Guest VLAN. This is set to 2 by default. That is, the Switch attempts to authenticate a client twice. If the client does not respond to the first authentication request, the Switch tries again. If the client still does not respond to the second request, the Switch sends the client to the Guest VLAN. The client needs to send a new request to be authenticated by the Switch again.
Reauth	Specify if a subscriber has to periodically re-enter his or her user name and password to stay connected to the port.
Reauth-period secs	Specify the length of time required to pass before a client has to re-enter his or her user name and password to stay connected to the port.
Quiet-period secs	Specify the number of seconds the port remains in the HELD state and rejects further authentication requests from the connected client after a failed authentication exchange.
Tx-period secs	Specify the number of seconds the Switch waits for client's response before re-sending an identity request to the client.
Supp-Timeout secs	Specify the number of seconds the Switch waits for client's response to a challenge request before sending another request.
Apply	Click Apply to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to begin configuring this screen afresh.

18.4 Activate MAC Authentication

Use this screen to activate MAC authentication. In the **Port Authentication** screen click **MAC Authentication** to display the configuration screen as shown.

Figure 172 Advanced Application > Port Authentication > MAC Authentication (Standalone Mode)

MAC Authentication

Port Authentication

Active

☐

Name Prefix

Delimiter

Dash ▾

Case

☒ Upper ☐ Lower

Password Type

☒ Static ☐ MAC-Address

Password

zyxel

Timeout

0

Port	Active	Trusted-VLAN List
*	☐	
1	☐	
2	☐	
3	☐	
4	☐	
5	☐	
6	☐	
7	☐	
8	☐	
9	☐	
26	☐	
27	☐	

Apply

Cancel

Figure 173 Advanced Application > Port Authentication > MAC Authentication (Stacking Mode)

MAC Authentication		Port Authentication
Active	☐	
Name Prefix		
Delimiter	Dash ▼	
Case	☒ Upper ☐ Lower	
Password Type	☒ Static ☐ MAC-Address	
Password	zyxel	
Timeout	0	

SLOT 1 ▼

Port	Active	Trusted-VLAN List
1/*	☐	
1/1	☐	
1/2	☐	
1/3	☐	
1/4	☐	
1/5	☐	
1/6	☐	
1/7	☐	
1/8	☐	
1/9	☐	
1/10	☐	
1/11	☐	

Apply Cancel

The following table describes the labels in this screen.

Table 82 Advanced Application > Port Authentication > MAC Authentication

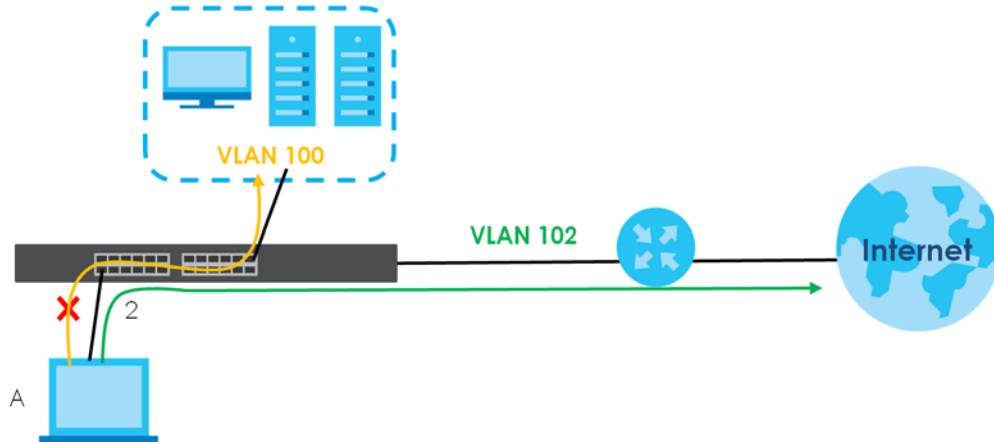
LABEL	DESCRIPTION
Active	Select this check box to permit MAC authentication on the Switch. Note: You must first enable MAC authentication on the Switch before configuring it on each port.
Name Prefix	Type the prefix that is appended to all MAC addresses sent to the RADIUS server for authentication. You can enter up to 32 printable ASCII characters. If you leave this field blank, then only the MAC address of the client is forwarded to the RADIUS server.
Delimiter	Select the delimiter the RADIUS server uses to separate the pairs in MAC addresses used as the account user name (and password). You can select Dash (-) , Colon (:) , or None to use no delimiters at all in the MAC address.
Case	Select the case (Upper or Lower) the RADIUS server requires for letters in MAC addresses used as the account user name (and password).
Password Type	Select Static to have the Switch send the password you specify below or MAC-Address to use the client MAC address as the password.
Password	Type the password the Switch sends along with the MAC address of a client for authentication with the RADIUS server. You can enter up to 32 printable ASCII characters.

Table 82 Advanced Application > Port Authentication > MAC Authentication (continued)

LABEL	DESCRIPTION
Timeout	Specify the amount of time before the Switch allows a client MAC address that fails authentication to try and authenticate again. Maximum time is 3000 seconds. When a client fails MAC authentication, its MAC address is learned by the MAC address table with a status of denied. The timeout period you specify here is the time the MAC address entry stays in the MAC address table until it is cleared. If you specify 0 for the timeout value, the Switch uses the Aging Time configured in the Switch Setup screen. Note: If the Aging Time in the Switch Setup screen is set to a lower value, then it supersedes this setting.
SLOT	This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack.
Port	This field displays the port number. In stacking mode, the first number represents the slot ID and the second is the port number. Please note that the default stacking ports (the last four ports of your Switch) cannot be configured. They are reserved for stacking only.
*	Use this row to make the setting the same for all ports. Use this row first and then make adjustments on a port-by-port basis. Note: Changes in this row are copied to all the ports as soon as you make them.
Active	Select this check box to permit MAC authentication on this port. You must first allow MAC authentication on the Switch before configuring it on each port.
Trusted VLAN List	Enter the ID numbers of the trusted VLANs (separated by a comma). If a client's VLAN ID is specified here, the client can access the port and the connected networks without MAC authentication.
Apply	Click Apply to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to begin configuring this screen afresh.

18.5 Guest VLAN

When 802.1x port authentication is enabled on the Switch and its ports, clients that do not have the correct credentials are blocked from using the ports. You can configure your Switch to have one VLAN that acts as a guest VLAN. If you enable the guest VLAN (**102** in the example) on a port (**2** in the example), the user (**A** in the example) that is not IEEE 802.1x capable or fails to enter the correct user name and password can still access the port, but traffic from the user is forwarded to the guest VLAN. That is, unauthenticated users can have access to limited network resources in the same guest VLAN, such as the Internet. The rights granted to the Guest VLAN depends on how the network administrator configures switches or routers with the guest network feature.

Figure 174 Guest VLAN Example

Use this screen to enable and assign a guest VLAN to a port. In the **Port Authentication** screen click **Guest Vlan** to display the configuration screen as shown.

Figure 175 Advanced Application > Port Authentication > Guest VLAN (Standalone Mode)

Guest Vlan		Port Authentication			
Port	Active	Guest Vlan	Host-mode	Multi-Secure Num	
*	☐		Multi-Host		
1	☐	1	Multi-Host	1	
2	☐	1	Multi-Host	1	
3	☐	1	Multi-Host	1	
4	☐	1	Multi-Host	1	
5	☐	1	Multi-Host	1	
6	☐	1	Multi-Host	1	
7	☐	1	Multi-Host	1	
8	☐	1	Multi-Host	1	
9	☐	1	Multi-Host	1	
10	☐	1	Multi-Host	1	
11	☐	1	Multi-Host	1	
12	☐	1	Multi-Host	1	
13	☐	1	Multi-Host	1	
14	☐	1	Multi-Host	1	
15	☐	1	Multi-Host	1	
16	☐	1	Multi-Host	1	
17	☐	1	Multi-Host	1	
18	☐	1	Multi-Host	1	
19	☐	1	Multi-Host	1	
20	☐	1	Multi-Host	1	
21	☐	1	Multi-Host	1	
22	☐	1	Multi-Host	1	
23	☐	1	Multi-Host	1	
24	☐	1	Multi-Host	1	
25	☐	1	Multi-Host	1	
26	☐	1	Multi-Host	1	
27	☐	1	Multi-Host	1	

Apply Cancel

Figure 176 Advanced Application > Port Authentication > Guest VLAN (Stacking Mode)

Port	Active	Guest Vlan	Host-mode	Multi-Secure Num
1/*	☐		Multi-Host	
1/1	☐	1	Multi-Host	1
1/2	☐	1	Multi-Host	1
1/3	☐	1	Multi-Host	1
1/4	☐	1	Multi-Host	1
1/5	☐	1	Multi-Host	1
1/6	☐	1	Multi-Host	1
1/7	☐	1	Multi-Host	1
1/8	☐	1	Multi-Host	1
1/9	☐	1	Multi-Host	1
1/10	☐	1	Multi-Host	1
1/11	☐	1	Multi-Host	1
1/12	☐	1	Multi-Host	1
1/13	☐	1	Multi-Host	1

The following table describes the labels in this screen.

Table 83 Advanced Application > Port Authentication > Guest VLAN

LABEL	DESCRIPTION
SLOT	This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack.
Port	This field displays the port number. In stacking mode, the first number represents the slot ID and the second is the port number. Please note that the default stacking ports (the last four ports of your Switch) cannot be configured. They are reserved for stacking only.
*	Settings in this row apply to all ports. Use this row only if you want to make some settings the same for all ports. Use this row first to set the common settings and then make adjustments on a port-by-port basis. Changes in this row are copied to all the ports as soon as you make them.
Active	Select this check box to enable the guest VLAN feature on this port. Clients that fail authentication are placed in the guest VLAN and can receive limited services.
Guest Vlan	A guest VLAN is a pre-configured VLAN on the Switch that allows non-authenticated users to access limited network resources through the Switch. You must also enable IEEE 802.1x authentication on the Switch and the associated ports. Enter the number that identifies the guest VLAN. Make sure this is a VLAN recognized in your network.
Host-mode	Specify how the Switch authenticates users when more than one user connect to the port (using a hub). Select Multi-Host to authenticate only the first user that connects to this port. If the first user enters the correct credential, any other users are allowed to access the port without authentication. If the first user fails to enter the correct credential, they are all put in the guest VLAN. Once the first user who did authentication logs out or disconnects from the port, the rest of the users are blocked until a user does the authentication process again. Select Multi-Secure to authenticate each user that connects to this port.
Multi-Secure Num	If you set Host-mode to Multi-Secure , specify the maximum number of users (between 1 and 24) that the Switch will authenticate on this port.

Table 83 Advanced Application > Port Authentication > Guest VLAN (continued)

LABEL	DESCRIPTION
Apply	Click Apply to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to begin configuring this screen afresh.

18.6 Compound Authentication

Use this screen to allow network access for clients that:

- pass either IEEE 802.1x authentication OR MAC authentication, or
- pass both IEEE 802.1x authentication AND MAC authentication.

The authentication modes are:

- In IEEE 802.1x authentication, the Switch prompts the client for login information in the form of a user name and password. When the client provides the login credentials, the Switch sends an authentication request to a RADIUS server. The RADIUS server validates whether this client is allowed access to the port. Use the **AAA > RADIUS Server Setup** screen to configure the RADIUS server.
- In MAC authentication, the login credentials are based on the source MAC address of the client connecting to a port on the Switch along with a password configured specifically for MAC authentication on the Switch.

In the **Port Authentication** screen click **Compound Authentication Mode** to display the configuration screen as shown.

Figure 177 Advanced Application > Port Authentication > Compound Authentication Mode (Standalone Mode)

Compound Authentication Mode		Port Authentication
Port	Compound Authentication Mode	
*	Strict	▼
1	Strict	▼
2	Strict	▼
3	Strict	▼
4	Strict	▼
5	Strict	▼
6	Strict	▼
7	Strict	▼
8	Strict	▼
9	Strict	▼
10	Strict	▼
11	Strict	▼
12	Strict	▼
13	Strict	▼
14	Strict	▼
15	Strict	▼
16	Strict	▼
17	Strict	▼
18	Strict	▼
19	Strict	▼
20	Strict	▼
21	Strict	▼
22	Strict	▼
23	Strict	▼
24	Strict	▼
25	Strict	▼
26	Strict	▼
27	Strict	▼

Apply Cancel

Figure 178 Advanced Application > Port Authentication > Compound Authentication Mode (Stacking Mode)

Compound Authentication Mode [Port Authentication](#)

SLOT 1 ▾

Port	Compound Authentication Mode
1/*	Strict ▾
1/1	Strict ▾
1/2	Strict ▾
1/3	Strict ▾
1/4	Strict ▾
1/5	Strict ▾
1/6	Strict ▾
1/7	Strict ▾
1/8	Strict ▾
1/9	Strict ▾
1/10	Strict ▾
1/11	Strict ▾
1/12	Strict ▾
1/13	Strict ▾
1/14	Strict ▾
1/15	Strict ▾
1/16	Strict ▾
1/17	Strict ▾
1/18	Strict ▾
1/19	Strict ▾
1/20	Strict ▾
1/21	Strict ▾
1/22	Strict ▾
1/23	Strict ▾

Apply Cancel

The following table describes the labels in this screen.

Table 84 Advanced Application > Port Authentication > Compound Authentication Mode

LABEL	DESCRIPTION
SLOT	This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack.
Port	This field displays the port number. In stacking mode, the first number represents the slot ID and the second is the port number. Please note that the default stacking ports (the last four ports of your Switch) cannot be configured. They are reserved for stacking only.
*	Settings in this row apply to all ports. Use this row only if you want to make some settings the same for all ports. Use this row first to set the common settings and then make adjustments on a port-by-port basis. Changes in this row are copied to all the ports as soon as you make them.
Compound Authentication Mode	Specify how the Switch authenticates clients for network access. Select Strict to allow network access to clients only when clients passes IEEE 802.1x authentication AND MAC authentication at the same time. Select Loose to allow network access to clients when clients passes IEEE 802.1x authentication OR MAC authentication.
Apply	Click Apply to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to begin configuring this screen afresh.

18.7 Technical Reference

This section provides technical background information on the topics discussed in this chapter.

18.7.1 IEEE 802.1x

The IEEE 802.1x is a standard for authentication as well as providing additional accounting and control features. It can be implemented both on wired and wireless networks. It is supported by Windows XP and a number of network devices. Some advantages of IEEE 802.1x are:

- User based identification
- 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 switch or the wired clients.

18.7.2 RADIUS

RADIUS is based on a client-server model that supports authentication, authorization and accounting. 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 actions that are performed on the switch, such as login events.

RADIUS is a simple package exchange in which your switch acts as a message relay between the wired client and the network RADIUS server.

18.7.2.1 Types of RADIUS Messages

The following types of RADIUS messages are exchanged between the switch and the RADIUS server for user authentication:

- Access-Request

Sent by a switch 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 switch sends a proper response from the user and then sends another Access-Request message.

The following types of RADIUS messages are exchanged between the switch and the RADIUS server for user accounting:

- Accounting-Request

Sent by the switch requesting accounting.

- Accounting-Response

Sent by the RADIUS server to indicate that it has started or stopped accounting.

The switch and the RADIUS server use a shared secret key, which is a password, they both know to authenticate the communications between them, and ensure network security. A shared key is not sent over the network.

The switch forwards the RADIUS requests of a client to the RADIUS server. The login password information exchanged is sent over the network and encrypted to protect the network from unauthorized access.

18.7.3 EAP (Extensible Authentication Protocol) Authentication

This section discusses some popular authentication types: EAP-MD5, EAP-TLS, EAP-TTLS, PEAP and LEAP. Your wired 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, a switch helps a wired station and a RADIUS server perform authentication.

The type of authentication you use depends on the RADIUS server and an intermediary switch that supports IEEE 802.1x.

For EAP-TLS authentication type, you must first have a wired connection to the network and obtain the certificates 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 wired client. The wired 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 plain text 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 wired 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 user name 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 user name 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.

18.7.4 EAPOL (EAP over LAN)

EAPOL is a port authentication protocol used in IEEE 802.1x. It encapsulates and sends EAP packets from the LAN. EAPOL exchanges the following messages between a wired client and switch.

- EAPOL-Start

A wired client will send this message to a switch to let it know the wired client is ready.

- EAPOL-Key

The switch will send an encryption key to the wired client. It will be allowed access to the network when both of the switch and wired client have the correct encryption keys.

- EAP-Packet

Both of the wired client and the switch will send this message to complete the authentication process.

- EAPOL-Logoff

This message will be sent when the wired client wants to be disconnected from the network.

- EAPOL-Encapsulated-ASF-Alert

This message is sent if the authentication process is not completed yet, and alerts need to be forwarded.

CHAPTER 19

Port Security

This chapter shows you how to set up port security.

19.1 About Port Security

Port security allows only packets with dynamically learned MAC addresses and/or configured static MAC addresses to pass through a port on the Switch. The Switch can learn up to 32K MAC addresses in total with no limit on individual ports other than the sum cannot exceed 32K.

For maximum port security, enable this feature, disable MAC address learning and configure static MAC addresses for a port. It is not recommended you disable port security together with MAC address learning as this will result in many broadcasts. By default, MAC address learning is still enabled even though the port security is not activated.

19.2 Port Security Setup

Click **Advanced Application > Port Security** in the navigation panel to display the screen as shown.

Figure 179 Advanced Application > Port Security (Standalone Mode)

Port Security [VLAN MAC Address Limit](#)

MAC Freeze

Port List [MAC freeze](#)

Port Security

Active ☐

Port	Active	Address Learning	Limited Number of Learned MAC Address
*	☐	☒	
1	☐	☒	0
2	☐	☒	0
3	☐	☒	0
4	☐	☒	0
5	☐	☒	0
6	☐	☒	0
7	☐	☒	0
8	☐	☒	0
9	☐	☒	0

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

Figure 180 Advanced Application > Port Security (Stacking Mode)

Port Security [VLAN MAC Address Limit](#)

MAC freeze

Port List **MAC freeze**

Port Security

Active ☐

SLOT 1 ▼

Port	Active	Address Learning	Limited Number of Learned MAC Address
1/*	☐	☒	
1/1	☐	☒	0
1/2	☐	☒	0
1/3	☐	☒	0
1/4	☐	☒	0
1/5	☐	☒	0
1/6	☐	☒	0
1/7	☐	☒	0
1/8	☐	☒	0

Apply **Cancel**

The following table describes the labels in this screen.

Table 85 Advanced Application > Port Security

LABEL	DESCRIPTION
Port List	Enter the number of the ports (separated by a comma) on which you want to enable port security and disable MAC address learning. In stacking mode, the first number represents the slot and the second the port number. Enter 1/1–1/24,2/23 for ports 1 to 24 for the Switch in slot 1 and port 23 for the Switch in slot 2, for example. After you click MAC freeze , all previously learned MAC addresses on the specified ports will become static MAC addresses and display in the Static MAC Forwarding screen.
MAC freeze	Click MAC freeze to have the Switch automatically select the Active check boxes and clear the Address Learning check boxes only for the ports specified in the Port List .
Active	Select this option to enable port security on the Switch.
SLOT	This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack.
Port	This field displays the port number. In stacking mode, the first number represents the slot ID and the second is the port number. Please note that the default stacking ports (the last four ports of your Switch) cannot be configured. They are reserved for stacking only.
*	Settings in this row apply to all ports. Use this row only if you want to make some of the settings the same for all ports. Use this row first to set the common settings and then make adjustments on a port-by-port basis. Note: Changes in this row are copied to all the ports as soon as you make them.
Active	Select this check box to enable the port security feature on this port. The Switch forwards packets whose MAC addresses is in the MAC address table on this port. Packets with no matching MAC addresses are dropped. Clear this check box to disable the port security feature. The Switch forwards all packets on this port.

Table 85 Advanced Application > Port Security (continued)

LABEL	DESCRIPTION
Address Learning	MAC address learning reduces outgoing broadcast traffic. For MAC address learning to occur on a port, the port itself must be active with address learning enabled.
Limited Number of Learned MAC Address	Use this field to limit the number of (dynamic) MAC addresses that may be learned on a port. For example, if you set this field to "5" on port 2, then only the devices with these five learned MAC addresses may access port 2 at any one time. A sixth device must wait until one of the five learned MAC addresses ages out. MAC address aging out time can be set in the Switch Setup screen. The valid range is from "0" to "32K". "0" means this feature is disabled.
Apply	Click Apply to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to begin configuring this screen afresh.

19.3 VLAN MAC Address Limit

Use this screen to set the MAC address learning limit on per-port and per-VLAN basis. Click **VLAN MAC Address Limit** in the **Advanced Application > Port Security** screen to display the screen as shown.

Figure 181 Advanced Application > Port Security > VLAN MAC Address Limit (Standalone Mode)

VLAN MAC Address Limit [Port Security](#)

Active ☐

Port

VID

Limit Number

[Add](#) [Cancel](#) [Clear](#)

Index	Active	Port	VID	Limit Number	☐
Delete Cancel					

Figure 182 Advanced Application > Port Security > VLAN MAC Address Limit (Stacking Mode)

VLAN MAC Address Limit [Port Security](#)

Active ☐

Port /

VID

Limit Number

[Add](#) [Cancel](#) [Clear](#)

Index	Active	Port	VID	Limit Number	☐
Delete Cancel					

The following table describes the labels in this screen.

Table 86 Advanced Application > Port Security > VLAN MAC Address Limit

LABEL	DESCRIPTION
Active	Select this option to activate this rule.
Port	Enter the number of the port to which this rule is applied. In stacking mode, the first box field is the slot ID and the second field is the port number.
VID	Enter the VLAN identification number.
Limit Number	Use this field to limit the number of (dynamic) MAC addresses that may be learned on a port in a specified VLAN. For example, if you set this field to "5" on port 2, then only the devices with these five learned MAC addresses may access port 2 at any one time. A sixth device would have to wait until one of the five learned MAC addresses aged out. MAC address aging out time can be set in the Switch Setup screen. The valid range is from "0" to "32K". "0" means this feature is disabled.
Add	Click this to create a new entry or to update an existing one. This saves your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to reset the fields to your previous configuration.
Clear	Click Clear to reset the fields to the factory defaults.
Index	This field displays the index number of the rule. Click an index number to change the settings.
Active	This field displays Yes when the rule is activated and No when it is deactivated.
Port	This field displays the number of the port to which this rule is applied.
VID	This is the VLAN ID number to which the port belongs.
Limit Number	This is the maximum number of MAC addresses which a port can learn in a VLAN.
	Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries.
Delete	Check the rules that you want to remove in the Delete column and then click the Delete button.
Cancel	Click Cancel to clear the selected check boxes in the Delete column.

CHAPTER 20

Time Range

20.1 Time Range Overview

You can set a time range for time-oriented features such as Classifier ACL (Access Control List) rule which categorizes data packets into different network traffic flow. The advantage of the time range feature is that it allows you to schedule the active time of configurations.

The time range can be configured in two ways – Absolute and Periodic. Absolute is a fixed time range with a start and end time. Periodic is recurrence of a time range and does not have an end time.

20.1.1 What You Can Do

Use the **Time Range** screen ([Section 20.2 on page 241](#)) to view or define a schedule on the Switch.

20.2 Configuring Time Range

Click **Advanced Application > Time Range** in the navigation panel to display the screen as shown.

Figure 183 Advanced Application > Time Range

Time Range			
Name			
Type	☒ Absolute ☐ Periodic		
Absolute	Start	1970 ▾ 01 ▾ 01 ▾ 00 ▾ : 00 ▾	
	End	1970 ▾ 01 ▾ 01 ▾ 00 ▾ : 00 ▾	
Periodic	☒	Monday ▾ 00 ▾ : 00 ▾ to Monday ▾ 00 ▾ : 00 ▾	
	☐	☐ Mon ☐ Tue ☐ Wed ☐ Thu ☐ Fri ☐ Sat ☐ Sun ☐ Weekdays ☐ Weekend	
	☐	Daily 00 ▾ : 00 ▾ to 00 ▾ : 00 ▾	
Add Cancel Clear			
Index	Name	Type	Range
Delete Cancel			

The following table describes the labels in this screen.

Table 87 Advanced Application > Time Range

LABEL	DESCRIPTION
Name	Enter a descriptive name for this rule for identifying purposes.
Type	Select Absolute to create a one-time schedule. One-time schedules begin on a specific start date and time and end on a specific stop date and time. One-time schedules are useful for long holidays and vacation periods. Alternatively, select Periodic to create a recurring schedule. Recurring schedules begin at a specific start time and end at a specific stop time on selected days of the week (Sunday, Monday, Tuesday, Wednesday, Thursday, Friday, and Saturday). Recurring schedules are useful for defining the workday and off-work hours.
Absolute	This section is available only when you set Type to Absolute .
Start	Specify the year, month, day, hour and minute when the schedule begins.
End	Specify the year, month, day, hour and minute when the schedule ends.
Periodic	This section is available only when you set Type to Periodic. Select the first option if you want to define a recurring schedule for a consecutive time period. You then select the day of the week, hour and minute when the schedule begins and ends respectively. Select the second option if you want to define a recurring schedule for multiple non-consecutive time periods. You need to select each day of the week the recurring schedule is effective. You also need to specify the hour and minute when the schedule begins and ends each day. The schedule begins and ends in the same day.
Add	Click Add to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to reset the fields to your previous configuration.
Clear	Click Clear to clear the fields to the factory defaults.
Index	This field displays the index number of the rule. Click an index number to change the settings.
Name	This field displays the descriptive name for this rule. This is for identification purpose only.
Type	This field displays the type of the schedule.
Range	This field displays the time periods to which this schedule applies.
	Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries.
Delete	Check the rules that you want to remove and then click the Delete button.
Cancel	Click Cancel to clear the selected check boxes.

CHAPTER 21

Classifier

21.1 Classifier Overview

This chapter introduces and shows you how to configure the packet classifier on the Switch. It also discusses Quality of Service (QoS) and classifier concepts as employed by the Switch.

21.1.1 What You Can Do

- Use the **Classifier Status** screen ([Section 21.2 on page 244](#)) to view the classifiers configured on the Switch and how many times the traffic matches the rules.
- Use the **Classifier Configuration** screen ([Section 21.3 on page 244](#)) to define the classifiers and view a summary of the classifier configuration. After you define the classifier, you can specify actions (or policy) to act upon the traffic that matches the rules.
- Use the **Classifier Global Setting** screen ([Section 21.4 on page 249](#)) to configure the match order and enable logging on the Switch.

21.1.2 What You Need to Know

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 application such as video-on-demand.

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 port number. For example, you can configure a classifier to select traffic from the same protocol port (such as Telnet) to form a flow.

Configure QoS on the Switch to group and prioritize application traffic and fine-tune network performance. Setting up QoS involves two separate steps:

- 1 Configure classifiers to sort traffic into different flows.
- 2 Configure policy rules to define actions to be performed on a classified traffic flow (refer to [Chapter 22 on page 252](#) to configure policy rules).

You can also configure policy routing to forward a classified traffic flow to a different gateway for cost savings and load sharing.

21.2 Classifier Status

Use this screen to view the classifiers configured on the Switch and how many times the traffic matches the rules.

Click **Advanced Application > Classifier** in the navigation panel to display the configuration screen as shown.

Figure 184 Advanced Application > Classifier > Classifier Status

Classifier Status					Classifier Configuration
Index	Active	Weight	Name	Match Count	Rule
1	No	32767	Class1	-	vlan 1;

☒ Any
 ☐ Classifier

The following table describes the labels in this screen.

Table 88 Advanced Application > Classifier > Classifier Status

LABEL	DESCRIPTION
Index	This field displays the index number of the rule. Click an index number to edit the rule.
Active	This field displays Yes when the rule is activated and No when it is deactivated.
Weight	This field displays the rule's weight. This is to indicate a rule's priority when the match order is set to manual in the Classifier > Classifier Configuration > Classifier Global Setting screen. The higher the number, the higher the rule's priority.
Name	This field displays the descriptive name for this rule. This is for identification purpose only.
Match Count	This field displays the number of times a rule is applied. It displays '-' if the rule does not have count enabled.
Rule	This field displays a summary of the classifier rule's settings.
Any	Select Any , then click Clear to clear the matched count for all classifiers.
Classifier	Select Classifier , enter a classifier rule name and then click Clear to erase the recorded statistical information for that classifier, or select Any to clear statistics for all classifiers.
Clear	Click Clear to erase the recorded statistical information for the classifier.

21.3 Classifier Configuration

Use the **Classifier Configuration** screen to define the classifiers. After you define the classifier, you can specify actions (or policy) to act upon the traffic that matches the rules.

In the **Classifier Status** screen click **Classifier Configuration** to display the configuration screen as shown.

Figure 185 Advanced Application > Classifier > Classifier Configuration

Classifier Configuration		Classifier Status	Classifier Global Setting
Active	☐		
Name			
Weight	32767		
Log	☐		
Count	☐		
Time Range	None		
Ingress Port	Port	☒ Any ☐	
	Trunk	☒ Any ☐	
Packet Format	All		
Layer 2	VLAN	VLAN	☒ Any ☐
		Inner VLAN	☒ Any ☐
	Priority	Priority	☒ Any ☐ 0
		Inner Priority	☒ Any ☐ 0
	Ethernet Type	☒ All ☐ Others (Hex)	
	Source	MAC Address	☒ Any ☐ MAC /Mask
	Destination	MAC Address	☒ Any ☐ MAC /Mask
	Layer 3	IP Packet Length	☒ Any ☐ To Bytes
DSCP		IPv4	☒ Any ☐
		IPv6	☒ Any ☐
Precedence		☒ Any ☐	
ToS		☒ Any ☐	
IP Protocol		☒ All ☐ Establish Only ☐ Others (Dec)	
IPv6 Next Header		☒ All ☐ Establish Only ☐ Others (Dec)	
Source		IP Address / Address Prefix	/
Destination	IP Address / Address Prefix	/	
Layer 4	Source	Socket Number	☒ Any ☐ To
	Destination	Socket Number	☒ Any ☐ To

The following table describes the labels in this screen.

Table 89 Advanced Application > Classifier > Classifier Configuration

LABEL	DESCRIPTION
Active	Select this option to enable this rule.
Name	Enter a descriptive name for this rule for identifying purposes.
Weight	Enter a number between 0 and 65535 to specify the rule's weight. When the match order is in manual mode in the Classifier Global Setting screen, a higher weight means a higher priority.
Log	Select this option to have the Switch create a log message when the rule is applied and record the number of matched packets in a particular time interval. Note: Make sure you also enable logging in the Classifier Global Setting screen.
Count	Select this option to have the Switch count how many times the rule is applied.
Time Range	Select the name of the pre-configured schedule that you want to apply to the rule. The rule will be active only at the scheduled date and/or time. If you select None , the rule will be active all the time.
Ingress Port	
Port	Type the port number to which the rule should be applied. You may choose one port only or all ports (Any). You can enter multiple ports separated by (no space) comma (,) or hyphen (-) for a range. For example, enter "3-5" for ports 3, 4, and 5. Enter "3,5,7" for ports 3, 5, and 7. In stacking mode, the first number represents the slot and the second the port number. Enter 1/1-1/24,2/23 for ports 1 to 24 for the Switch in slot 1 and port 23 for the Switch in slot 2, for example.
Trunk	Select Any to apply the rule to all trunk groups. To specify a trunk group, select the second choice and type a trunk group ID.
Layer 2	
Specify the fields below to configure a layer 2 classifier.	
VLAN	
VLAN	Select Any to classify traffic from any VLAN or select the second option and specify the source VLAN ID in the field provided.
Inner VLAN	Select Any to classify traffic from any inner VLAN (the customer's VLAN) or select the second option and specify the source VLAN ID in the field provided.
Priority	
Priority	Select Any to classify traffic from any priority level or select the second option and specify a priority level in the field provided.
Inner Priority	Select Any to classify traffic from any inner priority level or select the second option and specify a priority level in the field provided.
Ethernet Type	Select an Ethernet type or select Other and enter the Ethernet type number in hexadecimal value.
Source	
MAC Address	Select Any to apply the rule to all MAC addresses. To specify a source, select MAC/Mask to enter the source MAC address of the packet in valid MAC address format (six hexadecimal character pairs) and type the mask for the specified MAC address to determine which bits a packet's MAC address should match. Enter "f" for each bit of the specified 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. If you leave the Mask field blank, the Switch automatically sets the mask to ff:ff:ff:ff:ff:ff.

Table 89 Advanced Application > Classifier > Classifier Configuration (continued)

LABEL	DESCRIPTION
Destination	
MAC Address	Select Any to apply the rule to all MAC addresses. To specify a destination, select MAC/Mask to enter the destination MAC address of the packet in valid MAC address format (six hexadecimal character pairs) and type the mask for the specified MAC address to determine which bits a packet's MAC address should match. Enter "f" for each bit of the specified 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. If you leave the Mask field blank, the Switch automatically sets the mask to ff:ff:ff:ff:ff:ff.
Layer 3	
Specify the fields below to configure a layer 3 classifier.	
IP Packet Length	Click Any to classify any size of packet length or manually enter a range of number (from/to) of packet size in the field provided.
DSCP IPv4/IPv6	Select Any to classify traffic from any DSCP or select the second option and specify a DSCP (DiffServ Code Point) number between 0 and 63 in the field provided.
Precedence	Select Any to classify traffic from any precedence or select the second option and specify an IP Precedence (the first 3 bits of the 8-bit ToS field) value between 0 and 7 in the field provided.
ToS	Select Any to classify traffic from any ToS or select the second option and specify Type of Service (the last 5 bits of the 8-bit ToS field) value between 0 and 255 in the field provided.
IP Protocol	Select an IPv4 protocol type or select Other and enter the protocol number in decimal value. You may select Establish Only for TCP protocol type. This means that the Switch will pick out the packets that are sent to establish TCP connections.
IPv6 Next Header	Select an IPv6 protocol type or select Other and enter an 8-bit next header in the IPv6 packet. The Next Header field is similar to the IPv4 Protocol field. The IPv6 protocol number ranges from 1 to 255. You may select Establish Only for TCP protocol type. This means that the Switch will identify packets that initiate or acknowledge (establish) TCP connections.
Source	
IP Address/Address Prefix	Enter a source IP address in dotted decimal notation. Specify the address prefix by entering the number of ones in the subnet mask. A subnet mask can be represented in a 32-bit notation. For example, the subnet mask "255.255.255.0" can be represented as "11111111.11111111.11111111.00000000", and counting up the number of ones in this case results in 24.
Destination	
IP Address/Address Prefix	Enter a destination IP address in dotted decimal notation. Specify the address prefix by entering the number of ones in the subnet mask.
Layer 4	
Specify the fields below to configure a layer 4 classifier.	
Source	
Socket Number	Note: You must select either UDP or TCP in the IP Protocol field before you configure the socket numbers. Select Any to apply the rule to all TCP/UDP protocol port numbers or select the second option and enter a TCP/UDP protocol port number.

Table 89 Advanced Application > Classifier > Classifier Configuration (continued)

LABEL	DESCRIPTION
Destination	
Socket Number	Note: You must select either UDP or TCP in the IP Protocol field before you configure the socket numbers. Select Any to apply the rule to all TCP/UDP protocol port numbers or select the second option and enter a TCP/UDP protocol port number.
Add	Click this to create a new entry or to update an existing one. This saves your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to reset the fields back to your previous configuration.
Clear	Click Clear to set the above fields back to the factory defaults.

21.3.1 Viewing and Editing Classifier Configuration Summary

To view a summary of the classifier configuration, scroll down to the summary table at the bottom of the **Classifier** screen. To change the settings of a rule, click a number in the **Index** field.

Note: When two rules conflict with each other, a higher layer rule has priority over lower layer rule.

Figure 186 Advanced Application > Classifier > Classifier Configuration: Summary Table

Index	Active	Weight	Name	Rule	☐
1	Yes	32767	rate limit v10	vlan 10; count;	☐
2	Yes	32767	rate limit v20	vlan 20; count;	☐
3	Yes	32767	rate limit v30	vlan 30; count;	☐
4	Yes	32767	rate limit v40	vlan 40; count;	☐

The following table describes the labels in this screen.

Table 90 Advanced Application > Classifier > Classifier Configuration: Summary Table

LABEL	DESCRIPTION
Index	This field displays the index number of the rule. Click an index number to edit the rule.
Active	This field displays Yes when the rule is activated and No when it is deactivated.
Weight	The field displays the priority of the rule when the match order is in manual mode. A higher weight means a higher priority.
Name	This field displays the descriptive name for this rule. This is for identification purpose only.
Rule	This field displays a summary of the classifier rule's settings.
	Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries.
Delete	Click Delete to remove the selected entry from the summary table.
Cancel	Click Cancel to clear the check boxes.

The following table shows some other common Ethernet types and the corresponding protocol number.

Table 91 Common Ethernet Types and Protocol Numbers

ETHERNET TYPE	PROTOCOL NUMBER
IP ETHII	0800
X.75 Internet	0801
NBS Internet	0802
ECMA Internet	0803
Chaosnet	0804
X.25 Level 3	0805
XNS Compat	0807
Banyan Systems	0BAD
BBN Simnet	5208
IBM SNA	80D5
AppleTalk AARP	80F3

Some of the most common TCP and UDP port numbers are:

Table 92 Common TCP and UDP Port Numbers

PROTOCOL NAME	TCP/UDP PORT NUMBER
FTP	21
Telnet	23
SMTP	25
DNS	53
HTTP	80
POP3	110

21.4 Classifier Global Setting Configuration

Use this screen to configure the match order and enable logging on the Switch. In the **Classifier Configuration** screen click **Classifier Global Setting** to display the configuration screen as shown.

Figure 187 Advanced Application > Classifier > Classifier Configuration > Classifier Global Setting

Classifier Global Setting		Classifier Configuration
Match Order	auto ▼	
Logging	Active	☐
	Interval	3600 Second(s)
Apply Cancel		

The following table describes the labels in this screen.

Table 93 Advanced Application > Classifier > Classifier Configuration > Classifier Global Setting

LABEL	DESCRIPTION
Match Order	Select manual to have classifier rules applied according to the weight of each rule you configured in Advanced Application > Classifier > Classifier Configuration. Alternatively, select auto to have classifier rules applied according to the layer of the item configured in the rule. Layer-4 items have the highest priority, and layer-2 items has the lowest priority. For example, you configure a layer-2 item (VLAN ID) in classifier A and configure a layer-3 item (source IP address) in classifier B. When an incoming packet matches both classifier rules, classifier B has priority over classifier A.
Logging	
Active	Select this to allow the Switch to create a log when packets match a classifier rule during a defined time interval.
Interval	Select the length of the time period (in seconds) to count matched packets for a classifier rule. Enter an integer from 0 – 65535. 0 means that no logging is done.
Apply	Click Apply to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to begin configuring this screen afresh.

21.5 Classifier Example

The following screen shows an example where you configure a classifier that identifies all traffic from MAC address 00:50:ba:ad:4f:81 on port 2.

Figure 188 Classifier: Example

Classifier Configuration		Classifier Status	Classifier Global Setting
Active	☒		
Name	example		
Weight	32767		
Log	☐		
Count	☐		
Time Range	None ▼		
Ingress Port	Port	☐ Any ☒ 2	
	Trunk	☒ Any ☐	
Layer 2	VLAN	VLAN	☒ Any ☐
	Priority	Priority	☒ Any ☐ 0 ▼
	Ethernet Type	☒ All ☐ Others (Hex)	
	Source	MAC Address	☒ Any ☒ MAC 00:50:ba:ad:4f:81 /Mask
Layer 3	Destination	MAC Address	☒ Any ☐ MAC /Mask
	DSCP	IPv4	☒ Any ☐
		IPv6	☒ Any ☐
	Precedence	☒ Any ☐	
	ToS	☒ Any ☐	
	IP Protocol	☒ All ▼ ☐ Establish Only ☐ Others (Dec)	
	IPv6 Next Header	☒ All ▼ ☐ Establish Only ☐ Others (Dec)	
	Source	IP Address / Address Prefix	
Destination	IP Address / Address Prefix		
Layer 4	Source	Socket Number	☒ Any ☐ To
	Destination	Socket Number	☒ Any ☐ To

EXAMPLE

[Add](#) [Cancel](#) [Clear](#)

After you have configured a classifier, you can configure a policy (in the **Policy** screen) to define actions on the classified traffic flow.

CHAPTER 22

Policy Rule

22.1 Policy Rules Overview

This chapter shows you how to configure policy rules.

A classifier distinguishes traffic into flows based on the configured criteria (refer to [Chapter 21 on page 243](#) for more information). A policy rule ensures that a traffic flow gets the requested treatment in the network.

22.1.1 What You Can Do

Use the **Policy Rule** screen ([Section 22.2 on page 253](#)) to enable the policy and display the active classifiers you configure in the **Classifier** screen.

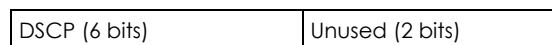
22.1.2 DiffServ

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.

22.1.3 DSCP 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.



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.

22.2 Configuring Policy Rules

You must first configure a classifier in the **Classifier** screen.

Click **Advanced Application > Policy Rule** in the navigation panel to display the screen as shown.

Figure 189 Advanced Application > Policy Rule

Policy

Active

☐

Name

Classifier(s)

Example

Parameters

General

Egress Port

Priority

DSCP

TOS

Metering

Bandwidth

 kbps

Out-of-Profile DSCP

Action

Forwarding

☒ No change

☐ Discard the packet

☐ Do not drop the matching frame previously marked for dropping

Priority

☒ No change

☐ Set the packet's 802.1p priority and send the packet to priority queue

☐ Replace the 802.1p priority field with the IP TOS value and send the packet to priority queue

☐ Replace the 802.1p priority field with the inner 802.1p priority value and send the packet to priority queue

Diffserv

☒ No change

☐ Set the packet's TOS field

☐ Replace the IP TOS field with the 802.1p priority value

☐ Set the Diffserv Codepoint field in the frame

Outgoing

☐ Send the packet to the mirror port

☐ Send the packet to the egress port

Metering

☐ Enable

Out-of-profile action

☐ Drop the packet

☐ Change the DSCP value

☐ Set Out-Drop Precedence

☐ Do not drop the matching frame previously marked for dropping

Add

Cancel

Clear

Index

Active

Name

Classifier(s)

Delete

Cancel

The following table describes the labels in this screen.

Table 94 Advanced Application > Policy Rule

LABEL	DESCRIPTION
Active	Select this option to enable the policy.
Name	Enter a descriptive name for identification purposes.

Table 94 Advanced Application > Policy Rule (continued)

LABEL	DESCRIPTION
Classifier(s)	This field displays the active classifiers you configure in the Classifier screen. Select the classifiers to which this policy rule applies. To select more than one classifier, press [SHIFT] and select the choices at the same time.
Parameters	
Set the fields below for this policy. You only have to set the fields that is related to the actions you configure in the Action field.	
General	
Egress Port	Type the number of an outgoing port. In stacking mode, the first number represents the slot and the second the port number.
Priority	Specify a priority level.
DSCP	Specify a DSCP (DiffServ Code Point) number between 0 and 63.
TOS	Specify the type of service (TOS) priority level.
Metering	You can configure the desired bandwidth available to a traffic flow. Traffic that exceeds the maximum bandwidth allocated (in cases where the network is congested) is called out-of-profile traffic.
Bandwidth	Specify the bandwidth in kilobit per second (Kbps). Enter a number between 1 and 1000000.
Out-of-Profile DSCP	Specify a new DSCP number (between 0 and 63) if you want to replace or remark the DSCP number for out-of-profile traffic.
Action	
Specify the actions the Switch takes on the associated classified traffic flow.	
Forwarding	Select No change to forward the packets. Select Discard the packet to drop the packets. Select Do not drop the matching frame previously marked for dropping to retain the frames that were marked to be dropped before.
Priority	Select No change to keep the priority setting of the frames. Select Set the packet's 802.1p priority and send the packet to priority queue to replace the packet's 802.1p priority field with the value you set in the Priority field and put the packets in the designated queue. Select Replace the 802.1p priority field with the IP TOS value and send the packet to priority queue to replace the packet's 802.1p priority field with the value you set in the TOS field and put the packets in the designated queue. Select Replace the 802.1p priority field with the inner 802.1p priority value and send the packet to priority queue to replace the packet's 802.1p priority field with the existing customer priority level carried in the frames and put the packets in the designated queue.
Diffserv	Select No change to keep the TOS and/or DSCP fields in the packets. Select Set the packet's TOS field to set the TOS field with the value you configure in the TOS field. Select Replace the IP TOS with the 802.1p priority value to replace the TOS field with the value you configure in the Priority field. Select Set the Diffserv Codepoint field in the frame to set the DSCP field with the value you configure in the DSCP field.
Outgoing	Select Send the packet to the mirror port to send the packet to the mirror port. Select Send the packet to the egress port to send the packet to the egress port.
Metering	Select Enable to activate bandwidth limitation on the traffic flows then set the actions to be taken on out-of-profile packets.

Table 94 Advanced Application > Policy Rule (continued)

LABEL	DESCRIPTION
Out-of-profile action	Select the actions to be performed for out-of-profile traffic. Select Drop the packet to discard the out-of-profile traffic. Select Change the DSCP value to replace the DSCP field with the value specified in the Out of profile DSCP field. Select Set Out-Drop Precedence to mark out-of-profile traffic and drop it when network is congested. Select Do not drop the matching frame previously marked for dropping to queue the frames that are marked to be dropped.
Add	Click this to create a new entry or to update an existing one. This saves your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to begin configuring this screen afresh.
Clear	Click Clear to set the above fields back to the factory defaults.
Index	This field displays the policy index number. Click an index number to edit the policy.
Active	This field displays Yes when policy is activated and No when it is deactivated.
Name	This field displays the name you have assigned to this policy.
Classifier(s)	This field displays the names of the classifier to which this policy applies.
	Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries.
Delete	Click Delete to remove the selected entry from the summary table.
Cancel	Click Cancel to clear the check boxes.

22.3 Policy Example

The figure below shows an example **Policy** screen where you configure a policy to limit bandwidth and discard out-of-profile traffic on a traffic flow classified using the **Example** classifier (refer to [Section 21.5 on page 250](#)).

Figure 190 Policy Example

Policy	
Active	☒
Name	Test
Classifier(s)	Example
Parameters	General Egress Port: 1 Priority: 0 ▾ DSCP: TOS: 0 ▾
	Metering Bandwidth: 10000 kbps Out-of-Profile DSCP:
	Forwarding ☒ No change ☐ Discard the packet ☐ Do not drop the matching frame previously marked for dropping
	Priority ☒ No change ☐ Set the packet's 802.1p priority and send the packet to priority queue ☐ Replace the 802.1p priority field with the IP TOS value and send the packet to priority queue ☐ Replace the 802.1p priority field with the inner 802.1p priority value and send the packet to priority queue
Action	Diffserv ☒ No change ☐ Set the packet's TOS field ☐ Replace the IP TOS field with the 802.1p priority value ☐ Set the Diffserv Codepoint field in the frame
	Outgoing ☐ Send the packet to the mirror port ☐ Send the packet to the egress port
	Metering ☐ Enable
	Out-of-profile action ☒ Drop the packet ☐ Change the DSCP value ☐ Set Out-Drop Precedence ☐ Do not drop the matching frame previously marked for dropping
Add Cancel Clear	

EXAMPLE

CHAPTER 23

Queuing Method

23.1 Queuing Method Overview

This chapter introduces the queuing methods supported.

Queuing is used to help solve performance degradation when there is network congestion. Use the **Queuing Method** screen to configure queuing algorithms for outgoing traffic. See also **Priority Queue Assignment** in **Switch Setup** and **802.1p Priority** in **Port Setup** for related information.

23.1.1 What You Can Do

Use the **Queuing Method** screen ([Section 23.2 on page 258](#)) to set priorities for the queues of the Switch. This distributes bandwidth across the different traffic queues.

23.1.2 What You Need to Know

Queuing algorithms allow switches to maintain separate queues for packets from each individual source or flow and prevent a source from monopolizing the bandwidth.

Strictly Priority Queuing

Strictly Priority Queuing (SPQ) 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. SPQ does not automatically adapt to changing network requirements.

Weighted Fair Queuing

Weighted Fair Queuing is used to guarantee each queue's minimum bandwidth based on its bandwidth weight (portion) (the number you configure in the Weight field) when there is traffic congestion. WFQ is activated only when a port has more traffic than it can handle. Queues with larger weights get more guaranteed bandwidth than queues with smaller weights. This queuing mechanism is highly efficient in that it divides any available bandwidth across the different traffic queues. By default, the weight for Q0 is 1, for Q1 is 2, for Q2 is 3, and so on.

Weighted Round Robin Scheduling (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.

23.2 Configuring Queuing

Use this screen to set priorities for the queues of the Switch. This distributes bandwidth across the different traffic queues.

Click **Advanced Application > Queuing Method** in the navigation panel.

Figure 191 Advanced Application > Queuing Method (Standalone Mode)

Queuing Method										
Port	Method	Q0	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Hybrid-SPQ Lowest-Queue
*	SPQ ▼									None ▼
1	☒ SPQ									None ▼
	☐ WFQ	1	2	3	4	5	6	7	8	
	☐ WRR									
2	☒ SPQ									None ▼
	☐ WFQ	1	2	3	4	5	6	7	8	
	☐ WRR									
3	☒ SPQ									None ▼
	☐ WFQ	1	2	3	4	5	6	7	8	
	☐ WRR									
4	☒ SPQ									None ▼
	☐ WFQ	1	2	3	4	5	6	7	8	
	☐ WRR									
5	☒ SPQ									None ▼
	☐ WFQ	1	2	3	4	5	6	7	8	
	☐ WRR									
6	☒ SPQ									None ▼
	☐ WFQ	1	2	3	4	5	6	7	8	
	☐ WRR									
7	☒ SPQ									None ▼
	☐ WFQ	1	2	3	4	5	6	7	8	
	☐ WRR									
	☒ SPQ									None ▼
	☐ WRR									

Figure 192 Advanced Application > Queuing Method (Stacking Mode)

Queuing Method								
SLOT 1 ▼								
Port	Method	Q0	Q1	Weight			Q5	Hybrid-SPQ Lowest-Queue
1/*	SPQ ▼							None ▼
	☒ SPQ ☐ WFQ ☐ WRR							
1/1		1	2	3	4	5	6	None ▼
	☒ SPQ ☐ WFQ ☐ WRR							
1/2		1	2	3	4	5	6	None ▼
	☒ SPQ ☐ WFQ ☐ WRR							
1/3		1	2	3	4	5	6	None ▼
	☒ SPQ ☐ WFQ ☐ WRR							
1/4		1	2	3	4	5	6	None ▼
	☒ SPQ ☐ WFQ ☐ WRR							
1/5		1	2	3	4	5	6	None ▼
	☒ SPQ ☐ WFQ ☐ WRR							
1/6		1	2	3	4	5	6	None ▼
	☒ SPQ ☐ WFQ ☐ WRR							
	☒ SPQ ☐ WRR							None ▼
Apply Cancel								

The following table describes the labels in this screen.

Table 95 Advanced Application > Queuing Method

LABEL	DESCRIPTION
SLOT	This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack.
Port	This field displays the port number. In stacking mode, the first number represents the slot ID and the second is the port number. Please note that the default stacking ports (the last four ports of your Switch) cannot be configured. They are reserved for stacking only.
Port	This field displays the port number. In stacking mode, the first number represents the slot ID and the second is the port number.
*	Settings in this row apply to all ports. Use this row only if you want to make some settings the same for all ports. Use this row first to set the common settings and then make adjustments on a port-by-port basis. Note: Changes in this row are copied to all the ports as soon as you make them.

Table 95 Advanced Application > Queuing Method (continued)

LABEL	DESCRIPTION
Method	Select SPQ (Strictly Priority Queuing), WFQ (Weighted Fair Queuing) or WRR (Weighted Round Robin). Strictly Priority Queuing services queues based on priority only. When the highest priority queue empties, traffic on the next highest-priority queue begins. Q7 has the highest priority and Q0 the lowest. Weighted Fair Queuing is used to guarantee each queue's minimum bandwidth based on their bandwidth portion (weight) (the number you configure in the Weight field). Queues with larger weights get more guaranteed bandwidth than queues with smaller weights. Weighted Round Robin 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.
Weight	When you select WFQ or WRR enter the queue weight here. Bandwidth is divided across the different traffic queues according to their weights.
Hybrid-SPQ Lowest-Queue	This field is applicable only when you select WFQ or WRR. Select a queue (Q0 to Q7) to have the Switch use SPQ to service the subsequent queues after and including the specified queue for the port. For example, if you select Q5, the Switch services traffic on Q5, Q6 and Q7 using SPQ. Select None to always use WFQ or WRR for the port.
Apply	Click Apply to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to begin configuring this screen afresh.

CHAPTER 24

VLAN Stacking

This chapter shows you how to configure VLAN stacking on your Switch. See the chapter on VLANs for more background information on Virtual LANs (VLANs).

24.1 VLAN Stacking Overview

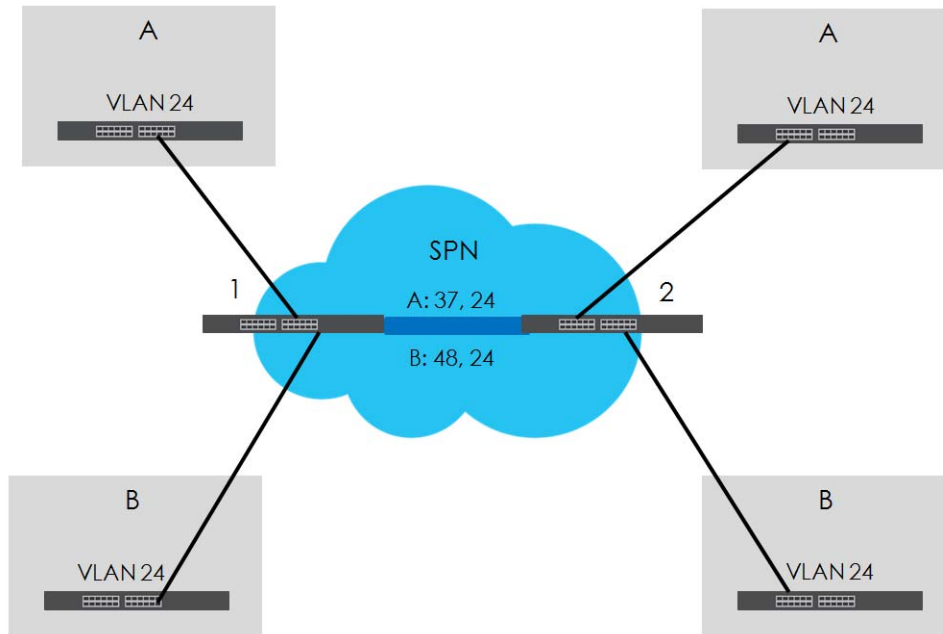
A service provider can use VLAN stacking to allow it to distinguish multiple customers VLANs, even those with the same (customer-assigned) VLAN ID, within its network.

Use VLAN stacking to add an outer VLAN tag to the inner IEEE 802.1Q tagged frames that enter the network. By tagging the tagged frames ("double-tagged" frames), the service provider can manage up to 4094 VLAN groups with each group containing up to 4094 customer VLANs. This allows a service provider to provide different service, based on specific VLANs, for many different customers.

A service provider's customers may require a range of VLANs to handle multiple applications. A service provider's customers can assign their own inner VLAN tags on ports for these applications. The service provider can assign an outer VLAN tag for each customer. Therefore, there is no VLAN tag overlap among customers, so traffic from different customers is kept separate.

24.1.1 VLAN Stacking Example

In the following example figure, both **A** and **B** are Service Provider's Network (SPN) customers with VPN tunnels between their head offices and branch offices respectively. Both have an identical VLAN tag for their VLAN group. The service provider can separate these two VLANs within its network by adding tag 37 to distinguish customer **A** and tag 48 to distinguish customer **B** at edge device **1** and then stripping those tags at edge device **2** as the data frames leave the network.

Figure 193 VLAN Stacking Example

24.2 VLAN Stacking Port Roles

Each port can have three VLAN stacking “roles”, **Normal**, **Access Port** and **Tunnel Port** (the latter is for Gigabit ports only).

- Select **Normal** for “regular” (non-VLAN stacking) IEEE 802.1Q frame switching.
- Select **Access Port** for ingress ports on the service provider's edge devices (**1** and **2** in the VLAN stacking example figure). The incoming frame is treated as “untagged”, so a second VLAN tag (outer VLAN tag) can be added.

Note: Static VLAN **Tx Tagging** MUST be disabled on a port where you choose **Normal** or **Access Port**.

- Select **Tunnel Port** (available for Gigabit ports only) for egress ports at the edge of the service provider's network. All VLANs belonging to a customer can be aggregated into a single service provider's VLAN (using the outer VLAN tag defined by the Service Provider's (SP) VLAN ID (VID)).

Note: Static VLAN **Tx Tagging** MUST be enabled on a port where you choose **Tunnel Port**.

24.3 VLAN Tag Format

A VLAN tag (service provider VLAN stacking or customer IEEE 802.1Q) consists of the following three fields.

Table 96 VLAN Tag Format

Type	Priority	VID

Type is a standard Ethernet type code identifying the frame and indicates that whether the frame carries IEEE 802.1Q tag information. **SP TPID** (Service Provider Tag Protocol Identifier) is the service provider VLAN stacking tag type. Many vendors use 0x8100 or 0x9100.

TPID (Tag Protocol Identifier) is the customer IEEE 802.1Q tag.

- If the VLAN stacking port role is **Access Port**, then the Switch adds the **SP TPID** tag to all incoming frames on the service provider's edge devices (1 and 2 in the VLAN stacking example figure).
- If the VLAN stacking port role is **Tunnel Port**, then the Switch only adds the **SP TPID** tag to all incoming frames on the service provider's edge devices (1 and 2 in the VLAN stacking example figure) that have an **SP TPID** different to the one configured on the Switch. (If an incoming frame's **SP TPID** is the same as the one configured on the Switch, then the Switch will not add the tag.)

Priority refers to the IEEE 802.1p standard that allows the service provider to prioritize traffic based on the class of service (CoS) the customer has paid for.

- On the Switch, configure priority level of the inner IEEE 802.1Q tag in the **Port Setup** screen.
- "0" is the lowest priority level and "7" is the highest.

VID is the VLAN ID. **SP VID** is the VID for the second (service provider's) VLAN tag.

24.3.1 Frame Format

The frame format for an untagged Ethernet frame, a single-tagged 802.1Q frame (customer) and a "double-tagged" 802.1Q frame (service provider) is shown next.

Configure the fields as highlighted in the Switch **VLAN Stacking** screen.

Table 97 Single and Double Tagged 802.1Q Frame Format

						DA	SA	Len/Etype	Data	FCS	Untagged Ethernet frame
			DA	SA	TPID	Priority	VID	Len/Etype	Data	FCS	IEEE 802.1Q customer tagged frame
DA	SA	SPTPID	Priority	VID	TPID	Priority	VID	Len/Etype	Data	FCS	Double-tagged frame

Table 98 802.1Q Frame

DA	Destination Address	Priority	802.1p Priority
SA	Source Address	Len/Etype	Length and type of Ethernet frame
(SP)TPID	(Service Provider) Tag Protocol IDentifier	Data	Frame data
VID	VLAN ID	FCS	Frame Check Sequence

24.4 Configuring VLAN Stacking

Click **Advanced Application > VLAN Stacking** to display the screen as shown.

Figure 194 Advanced Application > VLAN Stacking (Standalone Mode)

VLAN Stacking [Port-based QinQ](#) [Selective QinQ](#)

Active ☐

Port	Role	Tunnel TPID
*	Normal ▼	
1	Normal ▼	8100
2	Normal ▼	8100
3	Normal ▼	8100
4	Normal ▼	8100
5	Normal ▼	8100
6	Normal ▼	8100
7	Normal ▼	8100
8	Normal ▼	8100
9	Normal ▼	8100
10	Normal ▼	8100
11	Normal ▼	8100

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

Figure 195 Advanced Application > VLAN Stacking (Stacking Mode)

VLAN Stacking [Port-based QinQ](#) [Selective QinQ](#)

Active ☐

SLOT 1 ▼

Port	Role	Tunnel TPID
1/*	Normal ▼	
1/1	Normal ▼	8100
1/2	Normal ▼	8100
1/3	Normal ▼	8100
1/4	Normal ▼	8100
1/5	Normal ▼	8100
1/6	Normal ▼	8100
1/7	Normal ▼	8100
1/8	Normal ▼	8100
1/9	Normal ▼	8100
1/10	Normal ▼	8100
1/11	Normal ▼	8100

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

The following table describes the labels in this screen.

Table 99 Advanced Application > VLAN Stacking

LABEL	DESCRIPTION
Active	Select this check box to enable VLAN stacking on the Switch.
SLOT	This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack.
Port	This field displays the port number. In stacking mode, the first number represents the slot ID and the second is the port number. Please note that the default stacking ports (the last four ports of your Switch) cannot be configured. They are reserved for stacking only.

Table 99 Advanced Application > VLAN Stacking (continued)

LABEL	DESCRIPTION
*	Settings in this row apply to all ports. Use this row only if you want to make some settings the same for all ports. Use this row first to set the common settings and then make adjustments on a port-by-port basis. Note: Changes in this row are copied to all the ports as soon as you make them.
Role	Select Normal to have the Switch ignore frames received (or transmitted) on this port with VLAN stacking tags. Anything you configure in SPVID and Priority of the Port-based QinQ or the Selective QinQ screen are ignored. Select Access Port to have the Switch add the SP TPID tag to all incoming frames received on this port. Select Access Port for ingress ports at the edge of the service provider's network. Select Tunnel Port (available for Gigabit ports only) for egress ports at the edge of the service provider's network. Select Tunnel Port to have the Switch add the Tunnel TPID tag to all outgoing frames sent on this port. In order to support VLAN stacking on a port, the port must be able to allow frames of 1526 Bytes (1522 Bytes + 4 Bytes for the second tag) to pass through it.
Tunnel TPID	TPID is a standard Ethernet type code identifying the frame and indicates whether the frame carries IEEE 802.1Q tag information. Enter a four-digit hexadecimal number from 0000 to FFFF that the Switch adds in the outer VLAN tag of the frames sent on the tunnel ports. The Switch also uses this to check if the received frames are double-tagged. The value of this field is 0x8100 as defined in IEEE 802.1Q. It is used to identify the customer tag of an incoming frame. If the Switch needs to communicate with other vendors' devices, they should use the same TPID. Note: You can define up to four different tunnel TPIDs (including 8100) in this screen at a time.
Apply	Click Apply to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to begin configuring this screen afresh.

24.4.1 Port-based Q-in-Q

Port-based Q-in-Q lets the Switch treat all frames received on the same port as the same VLAN flows and add the same outer VLAN tag to them, even if they have different customer VLAN IDs.

Click **Port-based QinQ** in the **Advanced Application > VLAN Stacking** screen to display the screen as shown.

Figure 196 Advanced Application > VLAN Stacking > Port-based QinQ (Standalone Mode)

Port-based QinQ [VLAN Stacking](#)

Port	SPVID	Priority
*		0 ▼
1	1	0 ▼
2	1	0 ▼
3	1	0 ▼
4	1	0 ▼
5	1	0 ▼
6	1	0 ▼
7	1	0 ▼
8	1	0 ▼
9	1	0 ▼
10	1	0 ▼
11	1	0 ▼
12	1	0 ▼
13	1	0 ▼
14	1	0 ▼

Apply Cancel

Figure 197 Advanced Application > VLAN Stacking > Port-based QinQ (Stacking Mode)

Port-based QinQ [VLAN Stacking](#)

SLOT 1 ▼

Port	SPVID	Priority
1/*		0 ▼
1/1	1	0 ▼
1/2	1	0 ▼
1/3	1	0 ▼
1/4	1	0 ▼
1/5	1	0 ▼
1/6	1	0 ▼
1/7	1	0 ▼
1/8	1	0 ▼
1/9	1	0 ▼
1/10	1	0 ▼
1/11	1	0 ▼
1/12	1	0 ▼

Apply Cancel

The following table describes the labels in this screen.

Table 100 Advanced Application > VLAN Stacking > Port-based QinQ

LABEL	DESCRIPTION
SLOT	This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack.
Port	This field displays the port number. In stacking mode, the first number represents the slot ID and the second is the port number. Please note that the default stacking ports (the last four ports of your Switch) cannot be configured. They are reserved for stacking only.

Table 100 Advanced Application > VLAN Stacking > Port-based QinQ (continued)

LABEL	DESCRIPTION
*	Settings in this row apply to all ports. Use this row only if you want to make some settings the same for all ports. Use this row first to set the common settings and then make adjustments on a port-by-port basis. Note: Changes in this row are copied to all the ports as soon as you make them.
SPVID	SPVID is the service provider's VLAN ID (the outer VLAN tag). Enter the service provider ID (from 1 to 4094) for frames received on this port.
Priority	Select a priority level (from 0 to 7). This is the service provider's priority level that adds to the frames received on this port. "0" is the lowest priority level and "7" is the highest.
Apply	Click Apply to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to begin configuring this screen afresh.

24.4.2 Selective Q-in-Q

Selective Q-in-Q is VLAN-based. It allows the Switch to add different outer VLAN tags to the incoming frames received on one port according to their inner VLAN tags.

Note: Selective Q-in-Q rules are only applied to single-tagged frames received on the access ports. If the incoming frames are untagged or single-tagged but received on a tunnel port or cannot match any selective Q-in-Q rules, the Switch applies the port-based Q-in-Q rules to them.

Click **Selective QinQ** in the **Advanced Application > VLAN Stacking** screen to display the screen as shown.

Figure 198 Advanced Application > VLAN Stacking > Selective QinQ (Standalone Mode)

The screenshot shows the 'Selective QinQ' configuration interface. At the top, there's a header 'Selective QinQ' and a link 'VLAN Stacking'. The main area contains a form with the following fields:

- Active:** A checkbox.
- Name:** A text input field.
- Port:** A text input field.
- CVID:** A text input field.
- SPVID:** A text input field.
- Priority:** A dropdown menu currently showing '0'.

Below the form are two buttons: 'Add' and 'Cancel'. At the bottom of the screen, there is a table with the following columns: Index, Active, Name, Port, CVID, SPVID, Priority, and a checkbox. Below the table are two buttons: 'Delete' and 'Cancel'.

Figure 199 Advanced Application > VLAN Stacking > Selective QinQ (Stacking Mode)

The following table describes the labels in this screen.

Table 101 Advanced Application > VLAN Stacking > Selective QinQ

LABEL	DESCRIPTION
Active	Check this box to activate this rule.
Name	Enter a descriptive name (up to 32 printable ASCII characters) for identification purposes.
Port	The port number identifies the port you are configuring. In stacking mode, the first field is the slot ID and the second field is the port number.
CVID	Enter a customer VLAN ID (the inner VLAN tag) from 1 to 4094. This is the VLAN tag carried in the packets from the subscribers.
SPVID	SPVID is the service provider's VLAN ID (the outer VLAN tag). Enter the service provider ID (from 1 to 4094) for frames received on this port.
Priority	Select a priority level (from 0 to 7). This is the service provider's priority level that adds to the frames received on this port. "0" is the lowest priority level and "7" is the highest.
Add	Click this to create a new entry or to update an existing one. This saves your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to begin configuring this screen afresh.
Index	This is the number of the selective VLAN stacking rule. Click an index number to change the settings.
Active	This shows whether this rule is activated or not.
Name	This is the descriptive name for this rule.
Port	This is the port number to which this rule is applied. In stacking mode, the first number represents the slot and the second the port number.
CVID	This is the customer VLAN ID in the incoming packets.
SPVID	This is the service provider's VLAN ID that adds to the packets from the subscribers.
Priority	This is the service provider's priority level in the packets.
	Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries.
Delete	Check the rules that you want to remove in the Delete column and then click the Delete button.
Cancel	Click Cancel to clear the Delete check boxes.

CHAPTER 25

Multicast

25.1 Multicast Overview

This chapter shows you how to configure various multicast features.

Traditionally, IP packets are transmitted in one of either two ways – Unicast (one sender to one recipient) or Broadcast (one sender to everybody on the network). Multicast delivers IP packets to just a group of hosts on the network.

IGMP (Internet Group Management Protocol) is a network-layer protocol used to establish membership in a multicast group – it is not used to carry user data. Refer to RFC 1112, RFC 2236 and RFC 3376 for information on IGMP versions 1, 2 and 3 respectively.

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 similar to IGMPv2 and MLDv2 is similar 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.

25.1.1 What You Can Do

- Use the **Multicast Setup** screen ([Section 25.2 on page 273](#)) to display the links to the configuration screens where you can configure IPv4 multicast settings.
- Use the **IPv4 Multicast Status** screen ([Section 25.3 on page 273](#)) to view multicast group information.
- Use the **IGMP Snooping** screen ([Section 25.3.1 on page 274](#)) to enable IGMP snooping to forward group multicast traffic only to ports that are members of that group.
- Use the **IGMP Snooping VLAN** screen ([Section 25.3.2 on page 278](#)) to perform IGMP snooping on up to 16 VLANs.
- Use the **IGMP Filtering Profile** ([Section 25.3.3 on page 279](#)) to specify a range of multicast groups that clients connected to the Switch are able to join.
- Use the **IPv6 Multicast Status** screen ([Section 25.4 on page 280](#)) to view multicast group information.
- Use the **MLD Snooping-proxy** screen ([Section 25.4.1 on page 281](#)) to enable the upstream port to report group changes to a connected multicast router and forward MLD messages to other upstream ports.
- Use the **MVR** screens ([Section 25.5 on page 288](#)) to create multicast VLANs and select the receiver ports and a source port for each multicast VLAN.

25.1.2 What You Need to Know

Read on for concepts on Multicasting that can help you configure the screens in this chapter.

IP Multicast Addresses

In IPv4, a multicast address allows a device to send packets to a specific group of hosts (multicast group) in a different subnetwork. A multicast IP address represents a traffic receiving group, not individual receiving devices. IP addresses in the Class D range (224.0.0.0 to 239.255.255.255) are used for IP multicasting. Certain IP multicast numbers are reserved by IANA for special purposes (see the IANA website for more information).

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.

IGMP Filtering

With the IGMP filtering feature, you can control which IGMP groups a subscriber on a port can join. This allows you to control the distribution of multicast services (such as content information distribution) based on service plans and types of subscription.

You can set the Switch to filter the multicast group join reports on a per-port basis by configuring an IGMP filtering profile and associating the profile to a port.

IGMP Snooping

A Switch can passively snoop on IGMP packets transferred between IP multicast routers or switches and IP multicast hosts to learn the IP multicast group membership. It checks IGMP packets passing through it, picks out the group registration information, and configures multicasting accordingly. IGMP snooping allows the Switch to learn multicast groups without you having to manually configure them.

The Switch forwards multicast traffic destined for multicast groups (that it has learned from IGMP snooping or that you have manually configured) to ports that are members of that group. IGMP snooping generates no additional network traffic, allowing you to significantly reduce multicast traffic passing through your Switch.

IGMP Snooping and VLANs

The Switch can perform IGMP snooping on up to 16 VLANs. You can configure the Switch to automatically learn multicast group membership of any VLANs. The Switch then performs IGMP snooping on the first 16 VLANs that send IGMP packets. This is referred to as auto mode. Alternatively, you can specify the VLANs that IGMP snooping should be performed on. This is referred to as fixed mode. In fixed mode the Switch does not learn multicast group membership of any VLANs other than those explicitly added as an IGMP snooping VLAN.

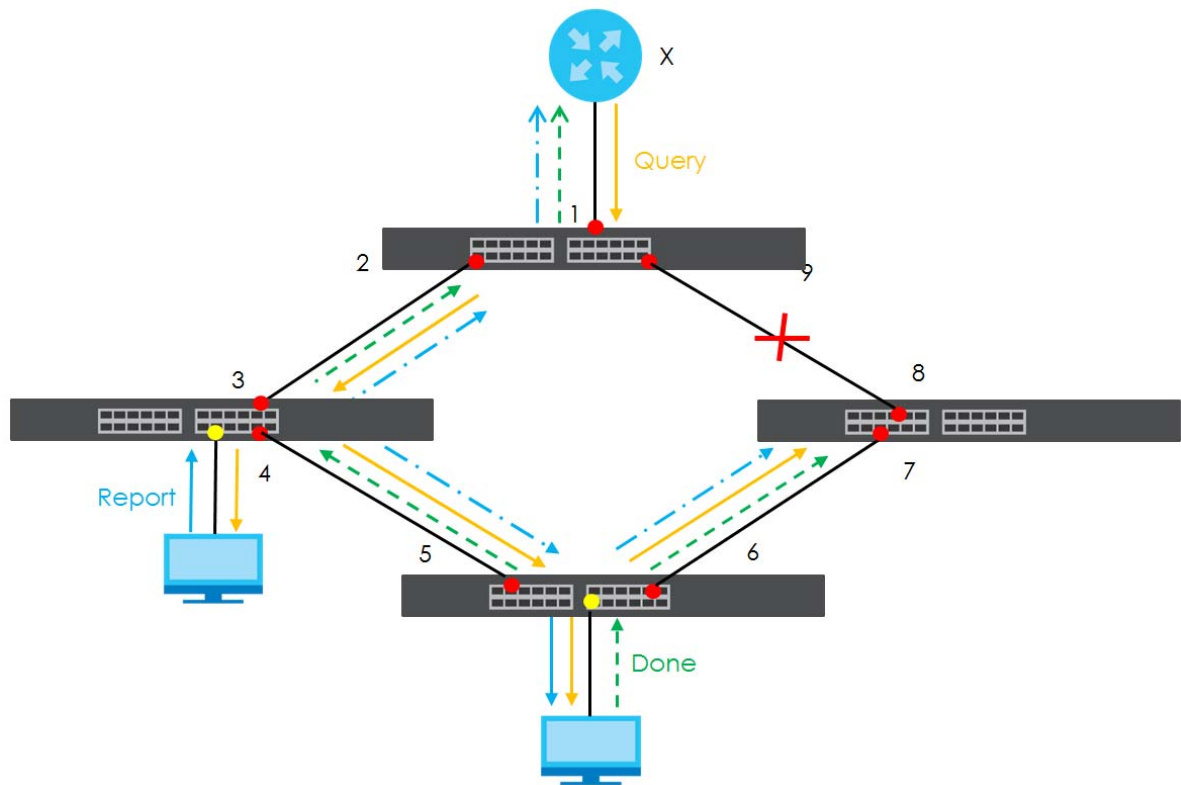
MLD Snooping-proxy

MLD snooping-proxy is a Zyxel-proprietary feature. IPv6 MLD proxy allows only one upstream interface on a switch, while MLD snooping-proxy supports more than one upstream port on a switch. The upstream port in MLD snooping-proxy can report group changes to a connected multicast router and forward

MLD messages to other upstream ports. This helps especially when you want to have a network that uses STP to provide backup links between switches and also performs MLD snooping and proxy functions. MLD snooping-proxy, like MLD proxy, can minimize MLD control messages and allow better network performance.

In MLD snooping-proxy, if one upstream port is learned via snooping, all other upstream ports on the same device will be added to the same group. If one upstream port requests to leave a group, all other upstream ports on the same device will also be removed from the group.

In the following MLD snooping-proxy example, all connected upstream ports (1 – 7) are treated as one interface. The connection between ports 8 and 9 is blocked by STP to break the loop. If there is one query from a router (X) or MLD Done or Report message from any upstream port, it will be broadcast to all connected upstream ports.



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 similar 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. If the leave mode is not set to **Immediate**, the router or switch 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.

MVR Overview

Multicast VLAN Registration (MVR) is designed for applications (such as Media-on-Demand (MoD)) that use multicast traffic across an Ethernet ring-based service provider network.

MVR allows one single multicast VLAN to be shared among different subscriber VLANs on the network. While isolated in different subscriber VLANs, connected devices can subscribe to and unsubscribe from the multicast stream in the multicast VLAN. This improves bandwidth utilization with reduced multicast traffic in the subscriber VLANs and simplifies multicast group management.

MVR only responds to IGMP join and leave control messages from multicast groups that are configured under MVR. Join and leave reports from other multicast groups are managed by IGMP snooping.

The following figure shows a network example. The subscriber VLAN (**1**, **2** and **3**) information is hidden from the streaming media server, **S**. In addition, the multicast VLAN information is only visible to the Switch and **S**.

Figure 200 MVR Network Example



Types of MVR Ports

In MVR, a source port is a port on the Switch that can send and receive multicast traffic in a multicast VLAN while a receiver port can only receive multicast traffic. Once configured, the Switch maintains a forwarding table that matches the multicast stream to the associated multicast group.

MVR Modes

You can set your Switch to operate in either dynamic or compatible mode.

In dynamic mode, the Switch sends IGMP leave and join reports to the other multicast devices (such as multicast routers or servers) in the multicast VLAN. This allows the multicast devices to update the multicast forwarding table to forward or not forward multicast traffic to the receiver ports.

In compatible mode, the Switch does not send any IGMP reports. In this case, you must manually configure the forwarding settings on the multicast devices in the multicast VLAN.

How MVR Works

The following figure shows a multicast television example where a subscriber device (such as a computer) in VLAN 1 receives multicast traffic from the streaming media server, **S**, via the Switch. Multiple subscriber devices can connect through a port configured as the receiver on the Switch.

When the subscriber selects a television channel, computer **A** sends an IGMP report to the Switch to join the appropriate multicast group. If the IGMP report matches one of the configured MVR multicast group addresses on the Switch, an entry is created in the forwarding table on the Switch. This maps the subscriber VLAN to the list of forwarding destinations for the specified multicast traffic.

When the subscriber changes the channel or turns off the computer, an IGMP leave message is sent to

the Switch to leave the multicast group. The Switch sends a query to VLAN 1 on the receiver port (in this case, an uplink port on the Switch). If there is another subscriber device connected to this port in the same subscriber VLAN, the receiving port will still be on the list of forwarding destination for the multicast traffic. Otherwise, the Switch removes the receiver port from the forwarding table.

Figure 201 MVR Multicast Television Example



25.2 Multicast Setup

Use this screen to configure IGMP for IPv4. Click **Advanced Application > Multicast** in the navigation panel.

Figure 202 Advanced Application > Multicast Setup

Multicast Setup	
IPv4 Multicast	Click Here
IPv6 Multicast	Click Here
MVR	Click Here

The following table describes the labels in this screen.

Table 102 Advanced Application > Multicast Setup

LABEL	DESCRIPTION
IPv4 Multicast	Click the link to open screens where you can configure IGMP snooping and IGMP filtering for IPv4.
IPv6 Multicast	Click the link to open screens where you can configure MLD snooping-proxy and MLD filtering for IPv6.
MVR	Click the link to open screens where you can create multicast VLANs.

25.3 IPv4 Multicast Status

Click **Advanced Application > Multicast > IPv4 Multicast** to display the screen as shown. This screen shows the IPv4 multicast group information. See [Section 25.1 on page 269](#) for more information on multicasting.

Figure 203 Advanced Application > Multicast > IPv4 Multicast

IPv4 Multicast Status			Multicast Setup	IGMP Snooping
Index	VID	Port	Multicast Group	

The following table describes the labels in this screen.

Table 103 Advanced Application > Multicast > IPv4 Multicast

LABEL	DESCRIPTION
Index	This is the index number of the entry.
VID	This field displays the multicast VLAN ID.
Port	This field displays the port number that belongs to the multicast group. In stacking mode, the first number represents the slot and the second is the port number.
Multicast Group	This field displays IP multicast group addresses.

25.3.1 IGMP Snooping

Click the **IGMP Snooping** link in the **Advanced Application > Multicast > IPv4 Multicast** screen to display the screen as shown. See [Section 25.1 on page 269](#) for more information on multicasting.

Figure 204 Advanced Application > Multicast > IPv4 Multicast > IGMP Snooping (Standalone Mode)

IGMP Snooping

[IPv4 Multicast Status](#)
[IGMP Snooping VLAN](#)
[IGMP Filtering Profile](#)

IGMP Snooping

Active ☐
Querier ☐
Querier Version v3 ▾
Report Proxy ☒
Host Timeout 260
802.1p Priority No-Change ▾

IGMP Filtering

Active ☐
Unknown Multicast Frame
☐ Flooding ☐ Drop ☒ Drop on VLAN
Unknown Multicast Frame to Querier Port
☐ Drop ☐ Forwarding ☒ Forwarding on VLAN
Reserved Multicast Group
☒ Flooding ☐ Drop

Port	Immed. Leave	Normal Leave	Fast Leave	Group Limited	Max Group Num.	Throttling	IGMP Filtering Profile	IGMP Querier Mode
*	☐	☒	☐	☐		Deny ▾	Default ▾	Auto ▾
1	☐	☒ 4000	☐ 200	☐	0	Deny ▾	Default ▾	Auto ▾
2	☐	☒ 4000	☐ 200	☐	0	Deny ▾	Default ▾	Auto ▾
3	☐	☒ 4000	☐ 200	☐	0	Deny ▾	Default ▾	Auto ▾
4	☐	☒ 4000	☐ 200	☐	0	Deny ▾	Default ▾	Auto ▾
5	☐	☒ 4000	☐ 200	☐	0	Deny ▾	Default ▾	Auto ▾
6	☐	☒ 4000	☐ 200	☐	0	Deny ▾	Default ▾	Auto ▾
7	☐	☒ 4000	☐ 200	☐	0	Deny ▾	Default ▾	Auto ▾
8	☐	☒ 4000	☐ 200	☐	0	Deny ▾	Default ▾	Auto ▾
9	☐	☒ 4000	☐ 200	☐	0	Deny ▾	Default ▾	Auto ▾

Apply

Cancel

Figure 205 Advanced Application > Multicast > IPv4 Multicast > IGMP Snooping (Stacking Mode)

IGMP Snooping [IPv4 Multicast Status](#) [IGMP Snooping VLAN](#) [IGMP Filtering Profile](#)

IGMP Snooping: Active ☐ Querier ☐ Querier Version: v3 Report Proxy ☒ Host Timeout: 260 802.1p Priority: No-Change

IGMP Filtering: Active ☐

Unknown Multicast Frame: ☒ Flooding ☐ Drop ☐ Drop on VLAN

Unknown Multicast Frame to Querier Port: ☒ Drop ☐ Forwarding ☐ Forwarding on VLAN

Reserved Multicast Group: ☒ Flooding ☐ Drop

SLOT 1

Port	Immed. Leave	Normal Leave	Fast Leave	Group Limited	Max Group Num.	Throttling	IGMP Filtering Profile	IGMP Querier Mode
1/*	☐	☒	☐	☐		Deny	Default	Auto
1/1	☐	☒	☐	☐	0	Deny	Default	Auto
1/2	☐	☒	☐	☐	0	Deny	Default	Auto
1/3	☐	☒	☐	☐	0	Deny	Default	Auto
1/4	☐	☒	☐	☐	0	Deny	Default	Auto
1/5	☐	☒	☐	☐	0	Deny	Default	Auto
1/6	☐	☒	☐	☐	0	Deny	Default	Auto
1/7	☐	☒	☐	☐	0	Deny	Default	Auto
1/8	☐	☒	☐	☐	0	Deny	Default	Auto
1/9	☐	☒	☐	☐	0	Deny	Default	Auto
1/10	☐	☒	☐	☐	0	Deny	Default	Auto
1/11	☐	☒	☐	☐	0	Deny	Default	Auto
1/12	☐	☒	☐	☐	0	Deny	Default	Auto
1/13	☐	☒	☐	☐	0	Deny	Default	Auto
1/14	☐	☒	☐	☐	0	Deny	Default	Auto
1/15	☐	☒	☐	☐	0	Deny	Default	Auto
1/16	☐	☒	☐	☐	0	Deny	Default	Auto
1/17	☐	☒	☐	☐	0	Deny	Default	Auto
1/18	☐	☒	☐	☐	0	Deny	Default	Auto
1/19	☐	☒	☐	☐	0	Deny	Default	Auto
1/20	☐	☒	☐	☐	0	Deny	Default	Auto
1/21	☐	☒	☐	☐	0	Deny	Default	Auto
1/22	☐	☒	☐	☐	0	Deny	Default	Auto
1/23	☐	☒	☐	☐	0	Deny	Default	Auto

Apply Cancel

The following table describes the labels in this screen.

Table 104 Advanced Application > Multicast > IPv4 Multicast > IGMP Snooping

LABEL	DESCRIPTION
IGMP Snooping	Use these settings to configure IGMP snooping.
Active	Select Active to enable IGMP Snooping to forward group multicast traffic only to ports that are members of that group.
Querier	Select this option to allow the Switch to send IGMP General Query messages to the VLANs with the multicast hosts attached.
Querier Version	IGMP snooping query works only when both host and Switch support the same IGMP version. Select v2 to allow the Switch to send IGMPv2 queries only. Select v3 to allow the Switch to send IGMPv3 queries only.

Table 104 Advanced Application > Multicast > IPv4 Multicast > IGMP Snooping (continued)

LABEL	DESCRIPTION
Report Proxy	Select this option to allow the Switch to act as the IGMP report proxy and leave proxy. It will report group changes to a connected multicast router. The Switch not only checks IGMP packets between multicast routers or switches and multicast hosts to learn the multicast group membership, but also replaces the source MAC address in an IGMP v1/v2 report with its own MAC address before forwarding to the multicast router or switch. When the Switch receives more than one IGMP v1/v2 join report that requests to join the same multicast group, it only sends a new join report with its MAC address. This helps reduce the number of multicast join reports passed to the multicast router or switch. The Switch sends a leave message with its MAC address to the multicast router or switch only when it receives the leave message from the last host in a multicast group.
Host Timeout	Specify the time (from 1 to 16711450) in seconds that elapses before the Switch removes an IGMP group membership entry if it does not receive report messages from the port.
802.1p Priority	Select a priority level (0 – 7) to which the Switch changes the priority in outgoing IGMP control packets. Otherwise, select No-Change to not replace the priority.
IGMP Filtering	Select Active to enable IGMP filtering to control which IGMP groups a subscriber on a port can join. If you enable IGMP filtering, you must create and assign IGMP filtering profiles for the ports that you want to allow to join multicast groups.
Unknown Multicast Frame	Specify the action to perform when the Switch receives an unknown multicast frame. • Select Drop to discard the frames. • Select Flooding to send the frames to all ports. • Select Drop on VLAN and enter the VLAN ID numbers to discard the frames on the specified VLANs. Use a dash to specify consecutive VLANs and a comma (no spaces) to specify non-consecutive VLANs. For example, 51–53 includes 51, 52 and 53, but 51,53 does not include 52.
Unknown Multicast Frame to Querier Port	Specify the action to perform when Unknown Multicast Frame is set to Drop. • Select Drop to discard the frames. • Select Forwarding to send the frames to all querier ports. • Select Forwarding on VLAN and enter the VLAN ID numbers to send the frames to the ports which are used as an IGMP query port on the specified VLANs. Use a dash to specify consecutive VLANs and a comma (no spaces) to specify non-consecutive VLANs. For example, 51–53 includes 51, 52 and 53, but 51,53 does not include 52.
Reserved Multicast Group	The IP address range of 224.0.0.0 to 224.0.0.255 are reserved for multicasting on the local network only. For example, 224.0.0.1 is for all hosts on a local network segment and 224.0.0.9 is used to send RIP routing information to all RIP v2 routers on the same network segment. A multicast router will not forward a packet with the destination IP address within this range to other networks. See the IANA web site for more information. The layer-2 multicast MAC addresses used by Cisco layer-2 protocols, 01:00:0C:CC:CC:CC and 01:00:0C:CC:CC:CD, are also included in this group. Specify the action to perform when the Switch receives a frame with a reserved multicast address. • Select Drop to discard the frames. • Select Flooding to send the frames to all ports.
SLOT	This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack.
Port	This field displays the port number. In stacking mode, the first number represents the slot ID and the second is the port number. Please note that the default stacking ports (the last four ports of your Switch) cannot be configured. They are reserved for stacking only.

Table 104 Advanced Application > Multicast > IPv4 Multicast > IGMP Snooping (continued)

LABEL	DESCRIPTION
*	Settings in this row apply to all ports. Use this row only if you want to make some settings the same for all ports. Use this row first to set the common settings and then make adjustments on a port-by-port basis. Changes in this row are copied to all the ports as soon as you make them.
Immed. Leave	Select this option to set the Switch to remove this port from the multicast tree when an IGMP version 2 leave message is received on this port. Select this option if there is only one host connected to this port.
Normal Leave	Enter an IGMP normal leave timeout value (from 200 to 6348800) in milliseconds. Select this option to have the Switch use this timeout to update the forwarding table for the port. In normal leave mode, when the Switch receives an IGMP leave message from a host on a port, it forwards the message to the multicast router. The multicast router then sends out an IGMP Group-Specific Query (GSQ) message to determine whether other hosts connected to the port should remain in the specific multicast group. The Switch forwards the query message to all hosts connected to the port and waits for IGMP reports from hosts to update the forwarding table. This defines how many seconds the Switch waits for an IGMP report before removing an IGMP snooping membership entry when an IGMP leave message is received on this port from a host.
Fast Leave	Enter an IGMP fast leave timeout value (from 200 to 6348800) in milliseconds. Select this option to have the Switch use this timeout to update the forwarding table for the port. In fast leave mode, right after receiving an IGMP leave message from a host on a port, the Switch itself sends out an IGMP Group-Specific Query (GSQ) message to determine whether other hosts connected to the port should remain in the specific multicast group. This helps speed up the leave process. This defines how many seconds the Switch waits for an IGMP report before removing an IGMP snooping membership entry when an IGMP leave message is received on this port from a host.
Group Limited	Select this option to limit the number of multicast groups this port is allowed to join.
Max Group Num.	Enter the number of multicast groups this port is allowed to join. Once a port is registered in the specified number of multicast groups, any new IGMP join report frames is dropped on this port.
Throttling	IGMP throttling controls how the Switch deals with the IGMP reports when the maximum number of the IGMP groups a port can join is reached. Select Deny to drop any new IGMP join report received on this port until an existing multicast forwarding table entry is aged out. Select Replace to replace an existing entry in the multicast forwarding table with the new IGMP reports received on this port.
IGMP Filtering Profile	Select the name of the IGMP filtering profile to use for this port. Otherwise, select Default to prohibit the port from joining any multicast group. You can create IGMP filtering profiles in the Multicast > IPv4 Multicast > IGMP Snooping > IGMP Filtering Profile screen.
IGMP Querier Mode	The Switch treats an IGMP query port as being connected to an IGMP multicast router (or server). The Switch forwards IGMP join or leave packets to an IGMP query port. Select Auto to have the Switch use the port as an IGMP query port if the port receives IGMP query packets. Select Fixed to have the Switch always use the port as an IGMP query port. Select this when you connect an IGMP multicast server to the port. Select Edge to stop the Switch from using the port as an IGMP query port. The Switch will not keep any record of an IGMP router being connected to this port. The Switch does not forward IGMP join or leave packets to this port.

Table 104 Advanced Application > Multicast > IPv4 Multicast > IGMP Snooping (continued)

LABEL	DESCRIPTION
Apply	Click Apply to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to begin configuring this screen afresh.

25.3.2 IGMP Snooping VLAN

Click **Advanced Application > Multicast > IPv4 Multicast** in the navigation panel. Click the **IGMP Snooping** link and then the **IGMP Snooping VLAN** link to display the screen as shown. See [IGMP Snooping and VLANs on page 270](#) for more information on IGMP Snooping VLAN.

Figure 206 Advanced Application > Multicast > IPv4 Multicast > IGMP Snooping > IGMP Snooping VLAN

The following table describes the labels in this screen.

Table 105 Advanced Application > Multicast > IPv4 Multicast > IGMP Snooping > IGMP Snooping VLAN

LABEL	DESCRIPTION
Mode	Select auto to have the Switch learn multicast group membership information of any VLANs automatically. Select fixed to have the Switch only learn multicast group membership information of the VLANs that you specify below. In either auto or fixed mode, the Switch can learn up to 16 VLANs (including up to five VLANs you configured in the MVR screen). For example, if you have configured one multicast VLAN in the MVR screen, you can only specify up to 15 VLANs in this screen. The Switch drops any IGMP control messages which do not belong to these 16 VLANs. You must also enable IGMP snooping in the Multicast > IPv4 Multicast > IGMP Snooping screen first.
Apply	Click Apply to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to begin configuring this screen afresh.

Table 105 Advanced Application > Multicast > IPv4 Multicast > IGMP Snooping > IGMP Snooping VLAN

LABEL	DESCRIPTION
VLAN	Use this section of the screen to add VLANs upon which the Switch is to perform IGMP snooping.
Name	Enter the descriptive name of the VLAN for identification purposes.
VID	Enter the ID of a static VLAN; the valid range is between 1 and 4094. Note: You cannot configure the same VLAN ID as in the MVR screen.
Add	Click this to create a new entry or to update an existing one. This saves your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to reset the fields to your previous configuration.
Clear	Click Clear to reset the fields to the factory defaults.
Index	This is the index number of the IGMP snooping VLAN entry in the table. Click on an index number to view more details or change the settings.
Name	This field displays the descriptive name for this VLAN group.
VID	This field displays the ID number of the VLAN group.
	Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries.
Delete	Check the entries that you want to remove, then click the Delete button.
Cancel	Click Cancel to clear the check boxes.

25.3.3 IGMP Filtering Profile

An IGMP filtering profile specifies a range of multicast groups that clients connected to the Switch are able to join. A profile contains a range of multicast IP addresses which you want clients to be able to join. Profiles are assigned to ports (in the **IGMP Snooping** screen). Clients connected to those ports are then able to join the multicast groups specified in the profile. Each port can be assigned a single profile. A profile can be assigned to multiple ports.

Click **Advanced Application > Multicast > IPv4 Multicast** in the navigation panel. Click the **IGMP Snooping** link and then the **IGMP Filtering Profile** link to display the screen as shown.

Figure 207 Advanced Application > Multicast > IPv4 Multicast > IGMP Snooping > IGMP Filtering Profile

IGMP Filtering Profile [IGMP Snooping](#)

Profile Setup

Profile Name	Start Address	End Address
	224.0.0.0	224.0.0.0

[Add](#) [Clear](#)

Profile Name	Start Address	End Address	Delete Profile	Delete Rule
Default	0.0.0.0	0.0.0.0	☐	☐

[Delete](#) [Cancel](#)

The following table describes the labels in this screen.

Table 106 Advanced Application > Multicast > IPv4 Multicast > IGMP Snooping > IGMP Filtering Profile

LABEL	DESCRIPTION
Profile Name	Enter a descriptive name for the profile for identification purposes. To configure additional rules for a profile that you have already added, enter the profile name and specify a different IP multicast address range.
Start Address	Type the starting multicast IP address for a range of multicast IP addresses that you want to belong to the IGMP filter profile.
End Address	Type the ending multicast IP address for a range of IP addresses that you want to belong to the IGMP filter profile. If you want to add a single multicast IP address, enter it in both the Start Address and End Address fields.
Add	Click this to create a new entry. This saves your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Clear	Click Clear to reset the fields to the factory defaults.
Profile Name	This field displays the descriptive name of the profile.
Start Address	This field displays the start of the multicast address range.
End Address	This field displays the end of the multicast address range.
Delete Profile	Select a profile's check box to select a specific profile. Otherwise, select the check box in the table heading row to select all profiles.
Delete Rule	Select the check boxes of the rules that you want to remove from a profile.
Delete	To delete the profiles and all the accompanying rules, select the profiles that you want to remove in the Delete Profile column, then click the Delete button. To delete a rules from a profile, select the rules that you want to remove in the Delete Rule column, then click the Delete button.
Cancel	Click Cancel to clear the Delete Profile or Delete Rule check boxes.

25.4 IPv6 Multicast Status

Click **Advanced Application > Multicast > IPv6 Multicast** to display the screen as shown. This screen shows the IPv6 multicast group information. See [Section 25.1 on page 269](#) for more information on multicasting.

Figure 208 Advanced Application > Multicast > IPv6 Multicast

IPv6 Multicast Status			Multicast Setup	MLD Snooping-proxy
Index	VID	Port	Multicast Group	Group Timeout

The following table describes the fields in the above screen.

Table 107 Advanced Application > Multicast > IPv6 Multicast

LABEL	DESCRIPTION
Index	This is the index number of the entry.
VID	This field displays the multicast VLAN ID.

Table 107 Advanced Application > Multicast > IPv6 Multicast (continued)

LABEL	DESCRIPTION
Port	This field displays the port number that belongs to the multicast group. In stacking mode, the first number represents the slot and the second is the port number.
Multicast Group	This field displays IP multicast group addresses.
Group Timeout	This field displays the time (in seconds) that elapses before the Switch removes a MLD group membership entry if it does not receive report messages from the port.

25.4.1 MLD Snooping-proxy

Click the **MLD Snooping-proxy** link in the **Advanced Application > Multicast > IPv6 Multicast** screen to display the screen as shown. See [Section 25.1 on page 269](#) for more information on multicasting.

Figure 209 Advanced Application > Multicast > IPv6Multicast > MLD Snooping-proxy

The following table describes the fields in the above screen.

Table 108 Advanced Application > Multicast > IPv6 Multicast > MLD Snooping-proxy

LABEL	DESCRIPTION
MLD Snooping-proxy	Use these settings to configure MLD snooping-proxy.
Active	Select Active to enable MLD snooping-proxy on the Switch to minimize MLD control messages and allow better network performance.
802.1p Priority	Select a priority level (0 – 7) to which the Switch changes the priority in outgoing MLD messages.
Apply	Click Apply to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to begin configuring this screen afresh.

25.4.2 MLD Snooping-proxy VLAN

Click the **VLAN** link in the **Advanced Application > Multicast > IPv6 Multicast > MLD Snooping-proxy** screen to display the screen as shown. See [Section 25.1 on page 269](#) for more information on multicasting.

Figure 210 Advanced Application > Multicast > IPv6 Multicast > MLD Snooping-proxy > VLAN

VLAN		MLD Snooping-proxy Port Role Setting							
VID									
Upstream	Query Interval	125000	milliseconds						
	Maximum Response Delay	10000	milliseconds						
	Robustness Variable	2							
	Last Member Query Interval	1000	milliseconds						
Downstream	Query Interval	125000	milliseconds						
	Maximum Response Delay	10000	milliseconds						
Add Cancel Clear									
<table border="1"> <thead> <tr> <th>Index</th> <th>VID</th> <th></th> </tr> </thead> <tbody> <tr> <td></td> <td></td> <td>☐</td> </tr> </tbody> </table>				Index	VID				☐
Index	VID								
		☐							
Delete Cancel									

The following table describes the fields in the above screen.

Table 109 Advanced Application > Multicast > IPv6 Multicast > MLD Snooping-proxy > VLAN

LABEL	DESCRIPTION
VID	Enter the ID number of the VLAN on which you want to enable MLD snooping-proxy and configure related settings.
Upstream	
Query Interval	Enter the amount of time (in milliseconds) between general query messages sent by the router connected to the upstream port. This value should be exactly the same as what is configured in the connected multicast router. This value is used to calculate the amount of time an MLD snooping membership entry (learned only on the upstream port) can remain in the forwarding table. When an MLD Report message is received, the Switch sets the timeout period of the entry to be $T = (QI \times RV) + MRD$, where T = Timeout, QI = Query Interval, RV = Robustness Variable, and MRD = Maximum Response Delay.
Maximum Response Delay	Enter the amount of time (in milliseconds) the router connected to the upstream port waits for a response to an MLD general query message. This value should be exactly the same as what is configured in the connected multicast router. This value is used to calculate the amount of time an MLD snooping membership entry (learned only on the upstream port) can remain in the forwarding table. When an MLD Report message is received, the Switch sets the timeout period of the entry to be $T = (QI \times RV) + MRD$, where T = Timeout, QI = Query Interval, RV = Robustness Variable, and MRD = Maximum Response Delay. When an MLD Done message is received, the Switch sets the entry's lifetime to be the product of Last Member Query Interval and Robustness Variable.
Robustness Variable	Enter the number of queries. A multicast address entry (learned only on an upstream port by snooping) is removed from the forwarding table when there is no response to the configured number of queries sent by the router connected to the upstream port. This value should be exactly the same as what's configured in the connected multicast router. This value is used to calculate the amount of time an MLD snooping membership entry (learned only on the upstream port) can remain in the forwarding table.

Table 109 Advanced Application > Multicast > IPv6 Multicast > MLD Snooping-proxy > VLAN

LABEL	DESCRIPTION
Last Member Query Interval	Enter the amount of time (in milliseconds) between the MLD group-specific queries sent by an upstream port when an MLD Done message is received. This value should be exactly the same as what's configured in the connected multicast router. This value is used to calculate the amount of time an MLD snooping membership entry (learned only on the upstream port) can remain in the forwarding table after a Done message is received. When an MLD Done message is received, the Switch sets the entry's lifetime to be the product of Last Member Query Interval and Robustness Variable.
Downstream	
Query Interval	Enter the amount of time (in milliseconds) between general query messages sent by the downstream port.
Maximum Response Delay	Enter the maximum time (in milliseconds) that the Switch waits for a response to a general query message sent by the downstream port.
Add	Click this to create a new entry or to update an existing one. This saves your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to reset the fields to your previous configuration.
Clear	Click Clear to reset the fields to the factory defaults.
Index	This is the index number of the MLD snooping-proxy VLAN entry in the table. Click on an index number to view more details or change the settings.
VID	This field displays the ID number of the VLAN group.
	Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries.
Delete	Click Delete to remove the selected entries permanently.
Cancel	Click Cancel to clear the check boxes.

25.4.3 MLD Snooping-proxy VLAN Port Role Setting

Click the **Port Role Setting** link in the **Advanced Application > Multicast > IPv6 Multicast > MLD Snooping-proxy > VLAN** screen to display the screen as shown. See [Section 25.1 on page 269](#) for more information on multicasting.

Figure 211 Advanced Application > Multicast > IPv6 Multicast > MLD Snooping-proxy > VLAN > Port Role Setting (Standalone Mode)

Port Role Setting
[VLAN](#)

MLD Snooping-proxy VLAN ID ▼

Port	Port Role	Leave Mode	Leave Timeout	Fast Leave Timeout
*	None ▼	Normal ▼		
1	None ▼	Normal ▼	4000	4000
2	None ▼	Normal ▼	4000	4000
3	None ▼	Normal ▼	4000	4000
4	None ▼	Normal ▼	4000	4000
5	None ▼	Normal ▼	4000	4000
6	None ▼	Normal ▼	4000	4000
7	None ▼	Normal ▼	4000	4000
8	None ▼	Normal ▼	4000	4000
9	None ▼	Normal ▼	4000	4000
10	None ▼	Normal ▼	4000	4000

Apply
Cancel

Figure 212 Advanced Application > Multicast > IPv6 Multicast > MLD Snooping-proxy > VLAN > Port Role Setting (Stacking Mode)

Port Role Setting
[VLAN](#)

MLD Snooping-proxy VLAN ID ▼

SLOT 1 ▼

Port	Port Role	Leave Mode	Leave Timeout	Fast Leave Timeout
1/*	None ▼	Normal ▼		
1/1	None ▼	Normal ▼	4000	4000
1/2	None ▼	Normal ▼	4000	4000
1/3	None ▼	Normal ▼	4000	4000
1/4	None ▼	Normal ▼	4000	4000
1/5	None ▼	Normal ▼	4000	4000
1/6	None ▼	Normal ▼	4000	4000
1/7	None ▼	Normal ▼	4000	4000
1/8	None ▼	Normal ▼	4000	4000
1/9	None ▼	Normal ▼	4000	4000
1/10	None ▼	Normal ▼	4000	4000
1/11	None ▼	Normal ▼	4000	4000

Apply
Cancel

The following table describes the fields in the above screen.

Table 110 Advanced Application > Multicast > IPv6 Multicast > MLD Snooping-proxy > VLAN > Port Role Setting

LABEL	DESCRIPTION
MLD Snooping-proxy VLAN ID	Select the VLAN ID for which you want to configure a port's MLD snooping-proxy settings.
SLOT	This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack.
Port	This field displays the port number. In stacking mode, the first number represents the slot ID and the second is the port number. Please note that the default stacking ports (the last four ports of your Switch) cannot be configured. They are reserved for stacking only.
*	Settings in this row apply to all ports. Use this row only if you want to make some settings the same for all ports. Use this row first to set the common settings and then make adjustments on a port-by-port basis. Changes in this row are copied to all the ports as soon as you make them.
Port Role	A port on the Switch can be either a Downstream port or Upstream port in MLD. A downstream port connects to MLD hosts and acts as a multicast router to send MLD queries and listen to the MLD host's Report and Done messages. An upstream port connects to a multicast router and works as a host to send Report or Done messages when receiving queries from a multicast router. Otherwise, select None if the port is not joining a multicast group or does not belong to this VLAN.
Leave Mode	Select the leave mode for the specified downstream ports in this VLAN. This specifies whether the Switch removes an MLD snooping membership entry (learned on a downstream port) immediately (Immediate) or wait for an MLD report before the leave timeout (Normal) or fast leave timeout (Fast) when an MLD leave message is received on this port from a host.
Leave Timeout	Enter the MLD snooping normal leave timeout (in milliseconds) the Switch uses to update the forwarding table for the specified downstream ports. This defines how many seconds the Switch waits for an MLD report before removing an MLD snooping membership entry (learned on a downstream port) when an MLD Done message is received on this port from a host.
Fast Leave Timeout	Enter the fast leave timeout (in milliseconds) for the specified downstream ports. This defines how many seconds the Switch waits for an MLD report before removing an MLD snooping membership entry (learned on a downstream port) when an MLD Done message is received on this port from a host.
Apply	Click Apply to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to reset the fields to your previous configuration.

25.4.4 MLD Snooping-proxy Filtering

Use this screen to configure the Switch's MLD filtering settings. Click the **Filtering** link in the **Advanced Application > Multicast > IPv6 Multicast > MLD Snooping-proxy** screen to display the screen as shown.

Figure 213 Advanced Application > Multicast > IPv6 Multicast > MLD Snooping-proxy > Filtering (Standalone Mode)

Filtering

MLD Snooping-proxy Filtering Profile

Active ☐

Port	Group Limit	Max Group Num.	Filtering Profile
*	☐		Default ▼
1	☐	0	Default ▼
2	☐	0	Default ▼
3	☐	0	Default ▼
4	☐	0	Default ▼
5	☐	0	Default ▼
6	☐	0	Default ▼
7	☐	0	Default ▼
8	☐	0	Default ▼
9	☐	0	Default ▼

Apply

Cancel

Figure 214 Advanced Application > Multicast > IPv6 Multicast > MLD Snooping-proxy > Filtering (Stacking Mode)

Filtering

MLD Snooping-proxy Filtering Profile

Active ☐

SLOT 1 ▼

Port	Group Limit	Max Group Num.	Filtering Profile
1/*	☐		Default ▼
1/1	☐	0	Default ▼
1/2	☐	0	Default ▼
1/3	☐	0	Default ▼
1/4	☐	0	Default ▼
1/5	☐	0	Default ▼
1/6	☐	0	Default ▼
1/7	☐	0	Default ▼
1/8	☐	0	Default ▼
1/9	☐	0	Default ▼
1/10	☐	0	Default ▼
1/11	☐	0	Default ▼

Apply

Cancel

The following table describes the fields in the above screen.

Table 111 Advanced Application > Multicast > IPv6 Multicast > MLD Snooping-proxy > Filtering

LABEL	DESCRIPTION
Active	Select this option to enable MLD filtering on the Switch.
SLOT	This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack.
Port	This field displays the port number. In stacking mode, the first number represents the slot ID and the second is the port number. Please note that the default stacking ports (the last four ports of your Switch) cannot be configured. They are reserved for stacking only.
*	Settings in this row apply to all ports. Use this row only if you want to make some settings the same for all ports. Use this row first to set the common settings and then make adjustments on a port-by-port basis. Changes in this row are copied to all the ports as soon as you make them.
Group Limit	Select this option to limit the number of multicast groups this port is allowed to join.
Max Group Num.	Enter the number of multicast groups this port is allowed to join. Once a port is registered in the specified number of multicast groups, any new MLD Report message is dropped on this port.
Filtering Profile	Select the name of the MLD filtering profile to use for this port. Otherwise, select Default to prohibit the port from joining any multicast group. You can create MLD filtering profiles in the Multicast > IPv6 Multicast > MLD Snooping-proxy > Filtering > Filtering Profile screen.
Apply	Click Apply to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to reset the fields to your previous configuration.

25.4.5 MLD Snooping-proxy Filtering Profile

Use this screen to create an MLD filtering profile and set the range of the multicast addresses. Click the **Filtering Profile** link in the **Advanced Application > Multicast > IPv6 Multicast > MLD Snooping-proxy > Filtering** screen to display the screen as shown.

Figure 215 Advanced Application > Multicast > IPv6 Multicast > MLD Snooping-proxy > Filtering > Filtering Profile

The screenshot shows the 'Filtering Profile' configuration interface. At the top, there's a navigation bar with 'Filtering Profile' and a 'Filtering' link. Below this is a 'Profile Setup' section containing three input fields: 'Profile Name', 'Start Address', and 'End Address'. To the right of these fields are 'Add' and 'Clear' buttons. Below the input fields is a table with the following structure:

Profile Name	Start Address	End Address	
Default	0:0:0:0:0:0:0:0	0:0:0:0:0:0:0:0	☐

At the bottom of the screen, there are 'Delete' and 'Cancel' buttons.

The following table describes the fields in the above screen.

Table 112 Advanced Application > Multicast > IPv6 Multicast > MLD Snooping-proxy > Filtering > Filtering Profile

LABEL	DESCRIPTION
Profile Name	Enter a descriptive name for the profile for identification purposes. To configure additional rules for a profile that you have already added, enter the profile name and specify a different IP multicast address range.
Start Address	Type the starting multicast IPv6 address for a range of multicast IPv6 addresses that you want to belong to the MLD filtering profile.
End Address	Type the ending multicast IPv6 address for a range of IPv6 addresses that you want to belong to the MLD filtering profile. If you want to add a single multicast IPv6 address, enter it in both the Start Address and End Address fields.
Add	Click this to create a new entry. This saves your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Clear	Click Clear to reset the fields to the factory defaults.
Profile Name	This field displays the descriptive name of the profile.
Start Address	This field displays the start of the multicast IPv6 address range.
End Address	This field displays the end of the multicast IPv6 address range.
	To delete the profiles and all the accompanying rules, select the profiles that you want to remove, then click the Delete button. You can select the check box in the table heading row to select all profiles. To delete a rules from a profile, select the rules that you want to remove, then click the Delete button.
Delete	Click Delete button to permanently delete the entries you selected.
Cancel	Click Cancel to clear the check boxes.

25.5 General MVR Configuration

Use the **MVR** screen to create multicast VLANs and select the receiver ports and a source port for each multicast VLAN. Click **Advanced Application > Multicast > MVR** to display the screen as shown next.

Note: You can create up to five multicast VLANs and up to 256 multicast rules on the Switch.

Note: Your Switch automatically creates a static VLAN (with the same VID) when you create a multicast VLAN in this screen.

Figure 216 Advanced Application > Multicast > MVR (Standalone Mode)

MVR

[Multicast Setup](#)
[Group Configuration](#)

Active

☐

Group Name

Multicast VLAN ID

802.1p Priority

0 ▾

Mode

☒ Dynamic
 ☐ Compatible

Port	Source Port	Receiver Port	None	Tagging
*		None ▾		☐
1	☐	☐	☒	☐
2	☐	☐	☒	☐
3	☐	☐	☒	☐
4	☐	☐	☒	☐
5	☐	☐	☒	☐
6	☐	☐	☒	☐
7	☐	☐	☒	☐
8	☐	☐	☒	☐
9	☐	☐	☒	☐

Add

Cancel

VLAN	Active	Name	Mode	Source Port	Receiver Port	802.1p
						☐

Delete

Cancel

Figure 217 Advanced Application > Multicast > MVR (Stacking Mode)

MVR [Multicast Setup](#) [Group Configuration](#)

Active ☐

Group Name

Multicast VLAN ID

802.1p Priority 0 ▼

Mode ☒ Dynamic ☐ Compatible

SLOT 1 ▼

Port	Source Port	Receiver Port	None	Tagging
1/*		None ▼		☐
1/1	☐	☐	☒	☐
1/2	☐	☐	☒	☐
1/3	☐	☐	☒	☐
1/4	☐	☐	☒	☐
1/5	☐	☐	☒	☐
1/6	☐	☐	☒	☐
1/7	☐	☐	☒	☐
1/8	☐	☐	☒	☐
1/9	☐	☐	☒	☐

Add Cancel

VLAN	Active	Name	Mode	Source Port	Receiver Port	802.1p	☐

Delete Cancel

The following table describes the related labels in this screen.

Table 113 Advanced Application > Multicast > MVR

LABEL	DESCRIPTION
Active	Select this check box to enable MVR to allow one single multicast VLAN to be shared among different subscriber VLANs on the network.
Group Name	Enter a descriptive name (up to 32 printable ASCII characters) for identification purposes.
Multicast VLAN ID	Enter the VLAN ID (1 to 4094) of the multicast VLAN.
802.1p Priority	Select a priority level (0 – 7) with which the Switch replaces the priority in outgoing IGMP or MLD control packets (belonging to this multicast VLAN).
Mode	Specify the MVR mode on the Switch. Choices are Dynamic and Compatible . Select Dynamic to send IGMP reports or MLD messages to all MVR source ports in the multicast VLAN. Select Compatible to set the Switch not to send IGMP reports or MLD messages.
SLOT	This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack.
Port	This field displays the port number. In stacking mode, the first number represents the slot ID and the second is the port number. Please note that the default stacking ports (the last four ports of your Switch) cannot be configured. They are reserved for stacking only.

Table 113 Advanced Application > Multicast > MVR (continued)

LABEL	DESCRIPTION
*	Settings in this row apply to all ports. Use this row only if you want to make some settings the same for all ports. Use this row first to set the common settings and then make adjustments on a port-by-port basis. Changes in this row are copied to all the ports as soon as you make them.
Source Port	Select this option to set this port as the MVR source port that sends and receives multicast traffic. All source ports must belong to a single multicast VLAN.
Receiver Port	Select this option to set this port as a receiver port that only receives multicast traffic.
None	Select this option to set the port not to participate in MVR. No MVR multicast traffic is sent or received on this port.
Tagging	Select this check box if you want the port to tag the VLAN ID in all outgoing frames transmitted.
Add	Click this to create a new entry or to update an existing one. This saves your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to begin configuring this screen afresh.
VLAN	This field displays the multicast VLAN ID. Click on an index number to change the settings.
Active	This field displays whether the multicast group is enabled or not.
Name	This field displays the descriptive name for this setting.
Mode	This field displays the MVR mode.
Source Port	This field displays the source port numbers.
Receiver Port	This field displays the receiver port numbers.
802.1p	This field displays the priority level.
	Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries.
Delete	To delete a multicast VLANs, select the rules that you want to remove, then click the Delete button.
Cancel	Click Cancel to clear the check boxes.

25.5.1 MVR Group Configuration

All source ports and receiver ports belonging to a multicast group can receive multicast data sent to this multicast group.

Use this screen to configure MVR IP multicast group addresses. Click the **Group Configuration** link in the **MVR** screen.

Note: A port can belong to more than one multicast VLAN. However, IP multicast group addresses in different multicast VLANs cannot overlap.

Figure 218 Advanced Application > Multicast > MVR > Group Configuration

The following table describes the labels in this screen.

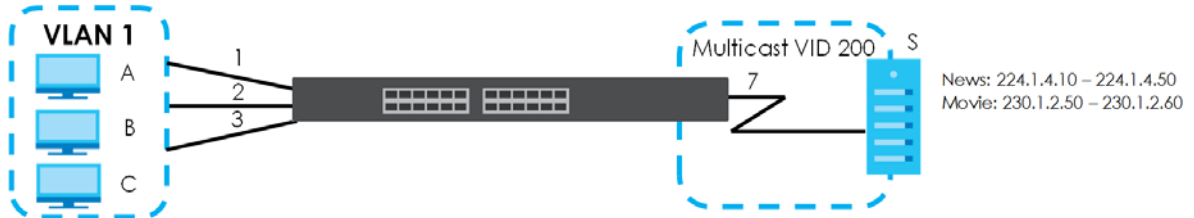
Table 114 Advanced Application > Multicast > MVR > Group Configuration

LABEL	DESCRIPTION
Multicast VLAN ID	Select a multicast VLAN ID (that you configured in the MVR screen) from the drop-down list box.
Group Name	Enter a descriptive name for identification purposes.
Start Address	Enter the starting IP multicast address of the multicast group in dotted decimal notation.
End Address	Enter the ending IP multicast address of the multicast group in dotted decimal notation. Enter the same IP address as the Start Address field if you want to configure only one IP address for a multicast group.
Add	Click this to create a new entry. This saves your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to begin configuring this screen afresh.
MVLAN	This field displays the multicast VLAN ID.
Group Name	This field displays the descriptive name for this setting.
Start Address	This field displays the starting IP address of the multicast group.
End Address	This field displays the ending IP address of the multicast group.
	To delete the profiles and all the accompanying rules, select the profiles that you want to remove, then click the Delete button. You can select the check box in the table heading row to select all profiles. To delete rules from a profile, select the rules that you want to remove, then click the Delete button.
Delete	Select the entries that you want to remove, then click the Delete button to remove the selected entries from the table. If you delete a multicast VLAN, all multicast groups in this VLAN will also be removed.
Cancel	Select Cancel to clear the check boxes in the table.

25.5.2 MVR Configuration Example

The following figure shows a network example where ports 1, 2 and 3 on the Switch belong to VLAN 1. In addition, port 7 belongs to the multicast group with VID 200 to receive multicast traffic (the **News** and **Movie** channels) from the remote streaming media server, **S**. Computers A, B and C in VLAN 1 are able to receive the traffic.

Figure 219 MVR Configuration Example



To configure the MVR settings on the Switch, create a multicast VLAN in the **MVR** screen and set the receiver and source ports.

Figure 220 MVR Configuration Example

MVR [Multicast Setup](#) [Group Configuration](#)

Active ☒

Group Name

Multicast VLAN ID

802.1p Priority

Mode ☒ Dynamic ☐ Compatible

Port	Source Port	Receiver Port	None	Tagging
*		Receiver ▼		☐
1	☐	☒	☐	☐
2	☐	☒	☐	☐
3	☐	☒	☐	☐
4	☐	☐	☒	☐
5	☐	☐	☒	☐
6	☐	☐	☒	☐
7	☒	☐	☐	☒
8	☐	☒	☐	☐
9	☐	☒	☐	☐

EXAMPLE

[Add](#) [Cancel](#)

To set the Switch to forward the multicast group traffic to the subscribers, configure multicast group settings in the **Group Configuration** screen. The following figure shows an example where two IPv4 multicast groups (**News** and **Movie**) are configured for the multicast VLAN 200.

Figure 221 MVR Group Configuration Example-1

Group Configuration [MVR](#)

Multicast VLAN ID 200 ▾

Group Name	Movie		
Start Address	230.1.2.50		
End Address	230.1.2.60		

Add Cancel

EXAMPLE

MVLAN

Group Name	Start Address	End Address	
200			☐
News	224.1.4.10	224.1.4.50	☐

Delete Cancel

Figure 222 MVR Group Configuration Example-2

Group Configuration [MVR](#)

Multicast VLAN ID 200 ▾

Group Name			
Start Address			
End Address			

Add Cancel

EXAMPLE

MVLAN

Group Name	Start Address	End Address	
200			☐
Movie	230.1.2.50	230.1.2.60	☐
News	224.1.4.10	224.1.4.50	☐

Delete Cancel

CHAPTER 26

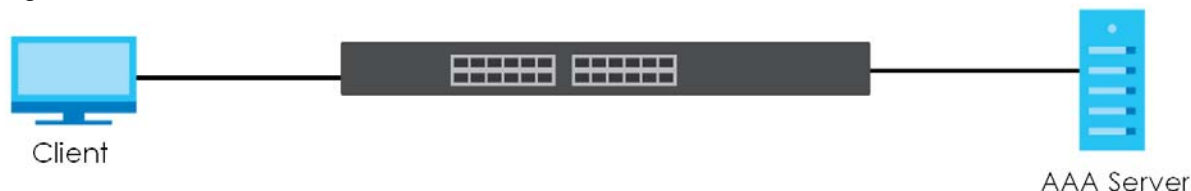
AAA

26.1 Authentication, Authorization and Accounting (AAA)

This chapter describes how to configure authentication, authorization and accounting settings on the Switch.

The external servers that perform authentication, authorization and accounting functions are known as AAA servers. The Switch supports RADIUS (Remote Authentication Dial-In User Service) as the external authentication, authorization, and accounting server.

Figure 223 AAA Server



26.1.1 What You Can Do

- Use the **AAA** screen ([Section 26.2 on page 296](#)) to display the links to the screens where you can enable authentication and authorization or both of them on the Switch.
- use the **RADIUS Server Setup** screen ([Section 26.3 on page 296](#)) to configure your RADIUS server settings.
- Use the **TACACS+ Server Setup** screen ([Section 26.4 on page 298](#)) to configure your TACACS+ authentication settings.
- Use the **AAA Setup** screen ([Section 26.5 on page 300](#)) to configure authentication, authorization and accounting settings, such as the methods used to authenticate users accessing the Switch and which database the Switch should use first.

26.1.2 What You Need to Know

Authentication is the process of determining who a user is and validating access to the Switch. The Switch can authenticate users who try to log in based on user accounts configured on the Switch itself. The Switch can also use an external authentication server to authenticate a large number of users.

Authorization is the process of determining what a user is allowed to do. Different user accounts may have higher or lower privilege levels associated with them. For example, user A may have the right to create new login accounts on the Switch but user B cannot. The Switch can authorize users based on user accounts configured on the Switch itself or it can use an external server to authorize a large number of users.

Accounting is the process of recording what a user is doing. The Switch can use an external server to track when users log in, log out, execute commands and so on. Accounting can also record system

related actions such as boot up and shut down times of the Switch.

Local User Accounts

By storing user profiles locally on the Switch, your Switch is able to authenticate and authorize users without interacting with a network AAA server. However, there is a limit on the number of users you may authenticate in this way.

RADIUS and TACACS+

RADIUS and TACACS+ are security protocols used to authenticate users by means of an external server instead of (or in addition to) an internal device user database that is limited to the memory capacity of the device. In essence, RADIUS and TACACS+ authentication both allow you to validate an unlimited number of users from a central location.

The following table describes some key differences between RADIUS and TACACS+.

Table 115 RADIUS vs. TACACS+

	RADIUS	TACACS+
Transport Protocol	UDP (User Datagram Protocol)	TCP (Transmission Control Protocol)
Encryption	Encrypts the password sent for authentication.	All communication between the client (the Switch) and the TACACS server is encrypted.

26.2 AAA Screens

The **AAA** screens allow you to enable authentication and authorization or both of them on the Switch. First, configure your authentication server settings (RADIUS, TACACS+ or both) and then set up the authentication priority, activate authorization.

Click **Advanced Application > AAA** in the navigation panel to display the screen as shown.

Figure 224 Advanced Application > AAA



26.3 RADIUS Server Setup

Use this screen to configure your RADIUS server settings. Click the **RADIUS Server Setup** link in the **AAA** screen to view the screen as shown.

Figure 225 Advanced Application > AAA > RADIUS Server Setup

RADIUS Server Setup

[AAA](#)

Authentication Server

Mode

index-priority ▾

Timeout

30

seconds

Index	IP Address	UDP Port	Shared Secret	Delete
1	0.0.0.0	1812		☐
2	0.0.0.0	1812		☐

Accounting Server

Timeout

30

seconds

Index	IP Address	UDP Port	Shared Secret	Delete
1	0.0.0.0	1813		☐
2	0.0.0.0	1813		☐

Attribute

NAS-IP-Address

0.0.0.0

Apply
Cancel

The following table describes the labels in this screen.

Table 116 Advanced Application > AAA > RADIUS Server Setup

LABEL	DESCRIPTION
Authentication Server	Use this section to configure your RADIUS authentication settings.
Mode	This field is only valid if you configure multiple RADIUS servers. Select index-priority and the Switch tries to authenticate with the first configured RADIUS server, if the RADIUS server does not respond then the Switch tries to authenticate with the second RADIUS server. Select round-robin to alternate between the RADIUS servers that it sends authentication requests to.
Timeout	Specify the amount of time in seconds that the Switch waits for an authentication request response from the RADIUS server. If you are using index-priority for your authentication and you are using two RADIUS servers then the timeout value is divided between the two RADIUS servers. For example, if you set the timeout value to 30 seconds, then the Switch waits for a response from the first RADIUS server for 15 seconds and then tries the second RADIUS server.
Index	This is a read-only number representing a RADIUS server entry.
IP Address	Enter the IP address of an external RADIUS server in dotted decimal notation.
UDP Port	The default port of a RADIUS server for authentication is 1812 . You need not change this value unless your network administrator instructs you to do so.

Table 116 Advanced Application > AAA > RADIUS Server Setup (continued)

LABEL	DESCRIPTION
Shared Secret	Specify a password (up to 32 alphanumeric characters) as the key to be shared between the external RADIUS server and the Switch. This key is not sent over the network. This key must be the same on the external RADIUS server and the Switch.
Delete	Check this box if you want to remove an existing RADIUS server entry from the Switch. This entry is deleted when you click Apply .
Accounting Server	Use this section to configure your RADIUS accounting server settings.
Timeout	Specify the amount of time in seconds that the Switch waits for an accounting request response from the RADIUS accounting server.
Index	This is a read-only number representing a RADIUS accounting server entry.
IP Address	Enter the IP address of an external RADIUS accounting server in dotted decimal notation.
UDP Port	The default port of a RADIUS accounting server for accounting is 1813 . You need not change this value unless your network administrator instructs you to do so.
Shared Secret	Specify a password (up to 32 alphanumeric characters) as the key to be shared between the external RADIUS accounting server and the Switch. This key is not sent over the network. This key must be the same on the external RADIUS accounting server and the Switch.
Delete	Check this box if you want to remove an existing RADIUS accounting server entry from the Switch. This entry is deleted when you click Apply .
Attribute	Use this section to define the RADIUS server attribute for its account.
NAS-IP-Address	Enter the IP address of the NAS (Network Access Server).
Apply	Click Apply to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to begin configuring this screen afresh.

26.4 TACACS+ Server Setup

Use this screen to configure your TACACS+ server settings. Click on the **TACACS+ Server Setup** link in the **AAA** screen to view the screen as shown.

Figure 226 Advanced Application > AAA > TACACS+ Server Setup

TACACS+ Server Setup
[AAA](#)

Authentication Server

Mode	index-priority ▼		
Timeout	30	seconds	

Index	IP Address	TCP Port	Shared Secret	Delete
1	0.0.0.0	49		☐
2	0.0.0.0	49		☐

Accounting Server

Timeout	30	seconds	

Index	IP Address	TCP Port	Shared Secret	Delete
1	0.0.0.0	49		☐
2	0.0.0.0	49		☐

Apply
Cancel

The following table describes the labels in this screen.

Table 117 Advanced Application > AAA > TACACS+ Server Setup

LABEL	DESCRIPTION
Authentication Server	Use this section to configure your TACACS+ authentication settings.
Mode	This field is only valid if you configure multiple TACACS+ servers. Select index-priority and the Switch tries to authenticate with the first configured TACACS+ server, if the TACACS+ server does not respond then the Switch tries to authenticate with the second TACACS+ server. Select round-robin to alternate between the TACACS+ servers that it sends authentication requests to.
Timeout	Specify the amount of time in seconds that the Switch waits for an authentication request response from the TACACS+ server. If you are using index-priority for your authentication and you are using two TACACS+ servers then the timeout value is divided between the two TACACS+ servers. For example, if you set the timeout value to 30 seconds, then the Switch waits for a response from the first TACACS+ server for 15 seconds and then tries the second TACACS+ server.
Index	This is a read-only number representing a TACACS+ server entry.
IP Address	Enter the IP address of an external TACACS+ server in dotted decimal notation.
TCP Port	The default port of a TACACS+ server for authentication is 49 . You need not change this value unless your network administrator instructs you to do so.
Shared Secret	Specify a password (up to 32 alphanumeric characters) as the key to be shared between the external TACACS+ server and the Switch. This key is not sent over the network. This key must be the same on the external TACACS+ server and the Switch.

Table 117 Advanced Application > AAA > TACACS+ Server Setup (continued)

LABEL	DESCRIPTION
Delete	Check this box if you want to remove an existing TACACS+ server entry from the Switch. This entry is deleted when you click Apply .
Accounting Server	Use this section to configure your TACACS+ accounting settings.
Timeout	Specify the amount of time in seconds that the Switch waits for an accounting request response from the TACACS+ server.
Index	This is a read-only number representing a TACACS+ accounting server entry.
IP Address	Enter the IP address of an external TACACS+ accounting server in dotted decimal notation.
TCP Port	The default port of a TACACS+ accounting server is 49 . You need not change this value unless your network administrator instructs you to do so.
Shared Secret	Specify a password (up to 32 alphanumeric characters) as the key to be shared between the external TACACS+ accounting server and the Switch. This key is not sent over the network. This key must be the same on the external TACACS+ accounting server and the Switch.
Delete	Check this box if you want to remove an existing TACACS+ accounting server entry from the Switch. This entry is deleted when you click Apply .
Apply	Click Apply to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to begin configuring this screen afresh.

26.5 AAA Setup

Use this screen to configure authentication, authorization and accounting settings on the Switch. Click on the **AAA Setup** link in the **AAA** screen to view the screen as shown.

Figure 227 Advanced Application > AAA > AAA Setup

AAA Setup

AAA

Authentication

Type	Method 1	Method 2	Method 3
Privilege Enable	local ▼	- ▼	- ▼
Login	local ▼	- ▼	- ▼

Authorization

Type	Active	Console	Method
Exec	☐	☐	radius ▼
Dot1x	☐	-	radius

Accounting

Update Period 0 minutes

Type	Active	Broadcast	Mode	Method	Privilege
System	☐	☐	-	radius ▼	-
Exec	☐	☐	start-stop ▼	radius ▼	-
Dot1x	☐	☐	start-stop ▼	radius ▼	-
Commands	☐	☐	stop-only	tacacs+	0 ▼

Apply Cancel

The following table describes the labels in this screen.

Table 118 Advanced Application > AAA > AAA Setup

LABEL	DESCRIPTION
Authentication	Use this section to specify the methods used to authenticate users accessing the Switch.
Privilege Enable	These fields specify which database the Switch should use (first, second and third) to authenticate access privilege level for administrator accounts (users for Switch management). Configure the access privilege of accounts via commands (see the Ethernet Switch CLI Reference Guide) for local authentication. The TACACS+ and RADIUS are external servers. Before you specify the priority, make sure you have set up the corresponding database correctly first. You can specify up to three methods for the Switch to authenticate the access privilege level of administrators. The Switch checks the methods in the order you configure them (first Method 1, then Method 2 and finally Method 3). You must configure the settings in the Method 1 field. If you want the Switch to check other sources for access privilege level specify them in Method 2 and Method 3 fields. Select local to have the Switch check the access privilege configured for local authentication. Select radius or tacacs+ to have the Switch check the access privilege via the external servers.
Login	These fields specify which database the Switch should use (first, second and third) to authenticate administrator accounts (users for Switch management). Configure the local user accounts in the Access Control > Logins screen. The TACACS+ and RADIUS are external servers. Before you specify the priority, make sure you have set up the corresponding database correctly first. You can specify up to three methods for the Switch to authenticate administrator accounts. The Switch checks the methods in the order you configure them (first Method 1, then Method 2 and finally Method 3). You must configure the settings in the Method 1 field. If you want the Switch to check other sources for administrator accounts, specify them in Method 2 and Method 3 fields. Select local to have the Switch check the administrator accounts configured in the Access Control > Logins screen. Select radius to have the Switch check the administrator accounts configured via the RADIUS Server. Select tacacs+ to have the Switch check the administrator accounts configured via the TACACS+ Server.
Authorization	Use this section to configure authorization settings on the Switch.
Type	Set whether the Switch provides the following services to a user. Exec: Allow an administrator which logs into the Switch through Telnet or SSH to have a different access privilege level assigned via the external server. Dot1x: Allow an IEEE 802.1x client to have different bandwidth limit or VLAN ID assigned via the external server.
Active	Select this to activate authorization for a specified event types.
Console	Select this to allow an administrator which logs in the Switch through the console port to have different access privilege level assigned via the external server.
Method	Select whether you want to use RADIUS or TACACS+ for authorization of specific types of events. RADIUS is the only method for IEEE 802.1x authorization.
Accounting	Use this section to configure accounting settings on the Switch.
Update Period	This is the amount of time in minutes before the Switch sends an update to the accounting server. This is only valid if you select the start-stop option for the Exec or Dot1x entries.

Table 118 Advanced Application > AAA > AAA Setup (continued)

LABEL	DESCRIPTION
Type	The Switch supports the following types of events to be sent to the accounting servers: • System – Configure the Switch to send information when the following system events occur: system boots up, system shuts down, system accounting is enabled, system accounting is disabled. • Exec – Configure the Switch to send information when an administrator logs in and logs out via the console port, telnet or SSH. • Dot1x – Configure the Switch to send information when an IEEE 802.1x client begins a session (authenticates via the Switch), ends a session as well as interim updates of a session. • Commands – Configure the Switch to send information when commands of specified privilege level and higher are executed on the Switch.
Active	Select this to activate accounting for a specified event types.
Broadcast	Select this to have the Switch send accounting information to all configured accounting servers at the same time. If you do not select this and you have two accounting servers set up, then the Switch sends information to the first accounting server and if it does not get a response from the accounting server then it tries the second accounting server.
Mode	The Switch supports two modes of recording login events. Select: • start-stop – to have the Switch send information to the accounting server when a user begins a session, during a user's session (if it lasts past the Update Period), and when a user ends a session. • stop-only – to have the Switch send information to the accounting server only when a user ends a session.
Method	Select whether you want to use RADIUS or TACACS+ for accounting of specific types of events. TACACS+ is the only method for recording Commands type of event.
Privilege	This field is only configurable for Commands type of event. Select the threshold command privilege level for which the Switch should send accounting information. The Switch will send accounting information when commands at the level you specify and higher are executed on the Switch.
Apply	Click Apply to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to begin configuring this screen afresh.

26.6 Technical Reference

This section provides technical background information on the topics discussed in this chapter.

26.6.1 Vendor Specific Attribute

RFC 2865 standard specifies a method for sending vendor-specific information between a RADIUS server and a network access device (for example, the Switch). A company can create Vendor Specific Attributes (VSAs) to expand the functionality of a RADIUS server.

The Switch supports VSAs that allow you to perform the following actions based on user authentication:

- Limit bandwidth on incoming or outgoing traffic for the port the user connects to.
- Assign account privilege levels (See the CLI Reference Guide for more information on account privilege levels) for the authenticated user.

The VSAs are composed of the following:

- **Vendor-ID:** An identification number assigned to the company by the IANA (Internet Assigned Numbers Authority). Zyxel's vendor ID is 890.
- **Vendor-Type:** A vendor specified attribute, identifying the setting you want to modify.
- **Vendor-data:** A value you want to assign to the setting.

Note: Refer to the documentation that comes with your RADIUS server on how to configure VSAs for users authenticating via the RADIUS server.

The following table describes the VSAs supported on the Switch. Note that these attributes only work when you enable authorization (see [Section 26.5 on page 300](#)).

Table 119 Supported VSAs

FUNCTION	ATTRIBUTE
Ingress Bandwidth Assignment	Vendor-Id = 890 Vendor-Type = 1 Vendor-data = ingress rate (Kbps in decimal format)
Egress Bandwidth Assignment	Vendor-Id = 890 Vendor-Type = 2 Vendor-data = egress rate (Kbps in decimal format)
Privilege Assignment	Vendor-ID = 890 Vendor-Type = 3 Vendor-Data = " shell:priv-lvl=N " or Vendor-ID = 9 (CISCO) Vendor-Type = 1 (CISCO-AVPAIR) Vendor-Data = " shell:priv-lvl=N " where N is a privilege level (from 0 to 14). Note: If you set the privilege level of a login account differently on the RADIUS servers and the Switch, the user is assigned a privilege level from the database (RADIUS or local) the Switch uses first for user authentication.

26.6.1.1 Tunnel Protocol Attribute

You can configure tunnel protocol attributes on the RADIUS server (refer to your RADIUS server documentation) to assign a port on the Switch to a VLAN based on IEEE 802.1x authentication. The port VLAN settings are fixed and untagged. This will also set the port's VID. The following table describes the values you need to configure. Note that these attributes only work when you enable authorization (see [Section 26.5 on page 300](#)).

Table 120 Supported Tunnel Protocol Attribute

FUNCTION	ATTRIBUTE
VLAN Assignment	Tunnel-Type = VLAN (13) Tunnel-Medium-Type = 802 (6) Tunnel-Private-Group-ID = VLAN ID Note: You must also create a VLAN with the specified VID on the Switch. Note: The bolded values in this table are fixed values as defined in RFC 3580.

26.6.2 Supported RADIUS Attributes

Remote Authentication Dial-In User Service (RADIUS) attributes are data used to define specific authentication elements in a user profile, which is stored on the RADIUS server. This section lists the RADIUS attributes supported by the Switch.

Refer to RFC 2865 for more information about RADIUS attributes used for authentication.

Refer to RFC 2866 and RFC 2869 for RADIUS attributes used for accounting.

This section lists the attributes used by authentication functions on the Switch. In cases where the attribute has a specific format associated with it, the format is specified.

26.6.3 Attributes Used for Authentication

The following sections list the attributes sent from the Switch to the RADIUS server when performing authentication.

26.6.3.1 Attributes Used for Authenticating Privilege Access

User-Name

- The format of the User-Name attribute is **\$enab#\$**, where # is the privilege level (1 – 14).

User-Password

NAS-Identifier

NAS-IP-Address

26.6.3.2 Attributes Used to Login Users

User-Name

User-Password

NAS-Identifier

NAS-IP-Address

26.6.3.3 Attributes Used by the IEEE 802.1x Authentication

User-Name
 NAS-Identifier
 NAS-IP-Address
 NAS-Port
 NAS-Port-Type
 – This value is set to **Ethernet(15)** on the Switch.
 Calling-Station-Id
 Frame-MTU
 EAP-Message
 State
 Message-Authenticator

26.6.4 Attributes Used for Accounting

The following sections list the attributes sent from the Switch to the RADIUS server when performing authentication.

26.6.4.1 Attributes Used for Accounting System Events

NAS-IP-Address
 NAS-Identifier
 Acct-Status-Type
 Acct-Session-ID
 – The format of Acct-Session-Id is **date+time+8-digit sequential number**, for example, 2007041917210300000001. (date: 2007/04/19, time: 17:21:03, serial number: 00000001)
 Acct-Delay-Time

26.6.4.2 Attributes Used for Accounting Exec Events

The attributes are listed in the following table along with the time that they are sent (the difference between Console and Telnet/SSH Exec events is that the Telnet/SSH events utilize the Calling-Station-Id attribute):

Table 121 RADIUS Attributes – Exec Events via Console

ATTRIBUTE	START	INTERIM-UPDATE	STOP
User-Name	✓	✓	✓
NAS-Identifier	✓	✓	✓
NAS-IP-Address	✓	✓	✓
Service-Type	✓	✓	✓
Acct-Status-Type	✓	✓	✓
Acct-Delay-Time	✓	✓	✓
Acct-Session-Id	✓	✓	✓
Acct-Authentic	✓	✓	✓

Table 121 RADIUS Attributes – Exec Events via Console (continued)

ATTRIBUTE	START	INTERIM-UPDATE	STOP
Acct-Session-Time		✓	✓
Acct-Terminate-Cause			✓

Table 122 RADIUS Attributes – Exec Events via Telnet/SSH

ATTRIBUTE	START	INTERIM-UPDATE	STOP
User-Name	✓	✓	✓
NAS-Identifier	✓	✓	✓
NAS-IP-Address	✓	✓	✓
Service-Type	✓	✓	✓
Calling-Station-Id	✓	✓	✓
Acct-Status-Type	✓	✓	✓
Acct-Delay-Time	✓	✓	✓
Acct-Session-Id	✓	✓	✓
Acct-Authentic	✓	✓	✓
Acct-Session-Time		✓	✓
Acct-Terminate-Cause			✓

26.6.4.3 Attributes Used for Accounting IEEE 802.1x Events

The attributes are listed in the following table along with the time of the session they are sent:

Table 123 RADIUS Attributes – Exec Events via Console

ATTRIBUTE	START	INTERIM-UPDATE	STOP
User-Name	✓	✓	✓
NAS-IP-Address	✓	✓	✓
NAS-Port	✓	✓	✓
Class	✓	✓	✓
Called-Station-Id	✓	✓	✓
Calling-Station-Id	✓	✓	✓
NAS-Identifier	✓	✓	✓
NAS-Port-Type	✓	✓	✓
Acct-Status-Type	✓	✓	✓
Acct-Delay-Time	✓	✓	✓
Acct-Session-Id	✓	✓	✓
Acct-Authentic	✓	✓	✓
Acct-Input-Octets		✓	✓
Acct-Output-Octets		✓	✓
Acct-Session-Time		✓	✓
Acct-Input-Packets		✓	✓

Table 123 RADIUS Attributes – Exec Events via Console (continued)

ATTRIBUTE	START	INTERIM-UPDATE	STOP
Acct-Output-Packets		✓	✓
Acct-Terminate-Cause			✓
Acct-Input-Gigawords		✓	✓
Acct-Output-Gigawords		✓	✓

CHAPTER 27

IP Source Guard

27.1 IP Source Guard Overview

IP source guard uses a binding table to distinguish between authorized and unauthorized DHCP and ARP packets in your network. A binding contains these key attributes:

- MAC address
- VLAN ID
- IP address
- Port number

When the Switch receives a DHCP or ARP packet, it looks up the appropriate MAC address, VLAN ID, IP address, and port number in the binding table. If there is a binding, the Switch forwards the packet. If there is not a binding, the Switch discards the packet.

The Switch builds the binding table by snooping DHCP packets (dynamic bindings) and from information provided manually by administrators (static bindings).

IP source guard consists of the following features:

- Static bindings. Use this to create static bindings in the binding table.
- DHCP snooping. Use this to filter unauthorized DHCP packets on the network and to build the binding table dynamically.
- ARP inspection. Use this to filter unauthorized ARP packets on the network.

If you want to use dynamic bindings to filter unauthorized ARP packets (typical implementation), you have to enable DHCP snooping before you enable ARP inspection.

27.1.1 What You Can Do

- Use the **IP Source Guard** screen ([Section 27.3 on page 310](#)) to look at the current bindings for DHCP snooping and ARP inspection.
- Use the **IP Source Guard Static Binding** screen ([Section 27.4 on page 310](#)) to manage static bindings for DHCP snooping and ARP inspection.

27.1.2 What You Need to Know

The Switch builds the binding table by snooping DHCP packets (dynamic bindings) and from information provided manually by administrators (static bindings).

IP source guard consists of the following features:

- Static bindings. Use this to create static bindings in the binding table.
- DHCP snooping. Use this to filter unauthorized DHCP packets on the network and to build the binding table dynamically.
- ARP inspection. Use this to filter unauthorized ARP packets on the network.

If you want to use dynamic bindings to filter unauthorized ARP packets (typical implementation), you have to enable DHCP snooping before you enable ARP inspection.

27.2 IP Source Guard

Use this screen to look at the current bindings for DHCP snooping and ARP inspection. Bindings are used by DHCP snooping and ARP inspection to distinguish between authorized and unauthorized packets in the network. The Switch learns the bindings by snooping DHCP packets (dynamic bindings) and from information provided manually by administrators (static bindings). To open this screen, click **Advanced Application > IP Source Guard**.

Figure 228 Advanced Application > IP Source Guard

IP Source Guard		
IPv4	Source Guard Setup	
	Click Here	
	Source Binding Status	
IPv6	Static Binding Setup	
	Click Here	
	Source Guard	Policy Setup
		Port Setup
	Snooping	Policy Setup
		VLAN Setup
	DHCP Trust Setup	

The following table describes the labels in this screen.

Table 124 Advanced Application > IP Source Guard

LABEL	DESCRIPTION
IPv4 Source Guard Setup	Click the link to open screens where you can view and manage static bindings, configure DHCP snooping or ARP inspection and look at various statistics.
IPv6 Source Binding Status	Click the link to open a screen where you can view the current IPv6 dynamic and static bindings or remove dynamic bindings based on IPv6 address and/or IPv6 prefix.
IPv6 Static Binding Setup	Click the link to open a screen where you can manually create IPv6 source guard static binding entries.
IPv6 Source Guard Policy Setup	Click the link to open a screen where you can define policies to have IPv6 source guard forward valid addresses and/or prefixes and allow or block data traffic from all link-local addresses.
IPv6 Source Guard Port Setup	Click the link to open a screen where you can apply the configured IPv6 source guard policy to a port.
IPv6 Snooping Policy Setup	Click the link to open a screen where you can set up DHCPv6 snooping policies for the binding table.
IPv6 Snooping VLAN Setup	Click the link to open a screen where you can enable a DHCPv6 snooping policy on a specific VLAN interface.
IPv6 DHCP Trust Setup	Click the link to open a screen where you can specify which ports are trusted for DHCPv6 snooping.

27.3 IPv4 Source Guard Setup

Use this screen to look at the current bindings for DHCP snooping and ARP inspection. Bindings are used by DHCP snooping and ARP inspection to distinguish between authorized and unauthorized packets in the network. The Switch learns the bindings by snooping DHCP packets (dynamic bindings) and from information provided manually by administrators (static bindings). To open this screen, click **Advanced Application > IP Source Guard > IPv4 Source Guard Setup**.

Figure 229 Advanced Application > IP Source Guard > IPv4 Source Guard Setup

IP Source Guard		IPSG Static Binding DHCP Snooping ARP Inspection				
Index	IP Address	VLAN	MAC Address	Port	Lease	Type

The following table describes the labels in this screen.

Table 125 Advanced Application > IP Source Guard > IPv4 Source Guard Setup

LABEL	DESCRIPTION
Index	This field displays a sequential number for each binding.
IP Address	This field displays the IP address assigned to the MAC address in the binding.
VLAN	This field displays the source VLAN ID in the binding.
MAC Address	This field displays the source MAC address in the binding.
Port	This field displays the port number in the binding. If this field is blank, the binding applies to all ports.
Lease	This field displays how many days, hours, minutes, and seconds the binding is valid; for example, 2d3h4m5s means the binding is still valid for 2 days, 3 hours, 4 minutes, and 5 seconds. This field displays infinity if the binding is always valid (for example, a static binding).
Type	This field displays how the Switch learned the binding. static : This binding was learned from information provided manually by an administrator. dhcp-snooping : This binding was learned by snooping DHCP packets.

27.4 IPv4 Source Guard Static Binding

Use this screen to manage static bindings for DHCP snooping and ARP inspection. Static bindings are uniquely identified by the MAC address and VLAN ID. Each MAC address and VLAN ID can only be in one static binding. If you try to create a static binding with the same MAC address and VLAN ID as an existing static binding, the new static binding replaces the original one. To open this screen, click **Advanced Application > IP Source Guard > IPv4 Source Guard Setup > Static Binding**.

Figure 230 Advanced Application > IP Source Guard > IPv4 Source Guard Setup > Static Binding (Standalone Mode)

IP Source Guard Static Binding

IPv4 SG

ARP Freeze

Condition

☐ All
 ☐ Port List
 ☐ VLAN List

ARP Freeze

Static Binding

IP Address

VLAN

MAC Address

Port

☐ Any

☐ Any

Add

Cancel

Clear

Index	IP Address	VLAN	MAC Address	Port	Lease	Type	
Delete Cancel							

Figure 231 Advanced Application > IP Source Guard > IPv4 Source Guard Setup > Static Binding (Stacking Mode)

IP Source Guard Static Binding

IPv4 SG

ARP Freeze

Condition

☐ All
 ☐ Port List
 ☐ VLAN List

ARP Freeze

Static Binding

IP Address

VLAN

MAC Address

Port

☒ Any

☐ Any

Add

Cancel

Clear

Index	IP Address	VLAN	MAC Address	Port	Lease	Type	
Delete Cancel							

The following table describes the labels in this screen.

Table 126 Advanced Application > IP Source Guard > IPv4 Source Guard Setup > Static Binding

LABEL	DESCRIPTION
ARP Freeze	ARP Freeze allows you to automatically create static bindings from the current ARP entries (either dynamically learned or static ARP entries) until the Switch's binding table is full. Note: The ARP learning mode should be set to ARP-Request in the IP Application > ARP Setup > ARP Learning screen before you use the ARP Freeze feature.
Condition	All – Select this and click ARP Freeze to have the Switch automatically add all the current ARP entries to the static bindings table. Port List – Select this and enter the number of the ports (separated by a comma). ARP entries learned on the specified ports are added to the static bindings table after you click ARP Freeze. VLAN List – Select this and enter the ID number of the VLANs (separated by a comma). ARP entries for the specified VLANs are added to the static bindings table after you click ARP Freeze.
Static Binding	
IP Address	Enter the IP address assigned to the MAC address in the binding.
VLAN	Enter the source VLAN ID in the binding.
MAC Address	Enter the source MAC address in the binding. If this binding applies to all MAC addresses, select Any .
Port	Specify the ports in the binding. If this binding has one port, select the first radio button and enter the port number in the field to the right. In stacking mode, the first field is the slot ID and the second field is the port number. If this binding applies to all ports, select Any .
Add	Click this to create a new entry or to update an existing one. This saves your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click this to reset the values above based on the last selected static binding or, if not applicable, to clear the fields above.
Clear	Click Clear to reset the fields to the factory defaults.
Index	This field displays a sequential number for each binding. Click on an index number to view more details or change the settings.
IP Address	This field displays the IP address assigned to the MAC address in the binding.
VLAN	This field displays the source VLAN ID in the binding.
MAC Address	This field displays the source MAC address in the binding.
Port	This field displays the port number. In stacking mode, the first number represents the slot ID and the second is the port number.
Lease	This field displays how long the binding is valid.
Type	This field displays how the Switch learned the binding. static: This binding was learned from information provided manually by an administrator.
	Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries.
Delete	Select the entries that you want to remove, then click the Delete button to remove the selected entries from the table.
Cancel	Click this to clear the check boxes above.

CHAPTER 28

DHCP Snooping

28.1 DHCP Snooping Overview

With DHCP snooping, the Switch can build the binding table dynamically by snooping DHCP packets (dynamic bindings) and filter unauthorized DHCP packets in your network.

The Switch uses a binding table to distinguish between authorized and unauthorized DHCP packets in your network. A binding contains these key attributes:

- MAC address
- VLAN ID
- IP address
- Port number

When the Switch receives a DHCP packet, it looks up the appropriate MAC address, VLAN ID, IP address, and port number in the binding table. If there is a binding, the Switch forwards the packet. If there is not a binding, the Switch discards the packet.

28.1.1 What You Can Do

- Use the **DHCP Snooping** screen ([Section 28.2 on page 313](#)) to look at various statistics about the DHCP snooping database.
- Use this **DHCP Snooping Configure** screen ([Section 28.3 on page 316](#)) to enable DHCP snooping on the Switch (not on specific VLAN), specify the VLAN where the default DHCP server is located, and configure the DHCP snooping database.
- Use the **DHCP Snooping Port Configure** screen ([Section 28.3.1 on page 317](#)) to specify whether ports are trusted or untrusted ports for DHCP snooping.
- Use the **DHCP Snooping VLAN Configure** screen ([Section 28.3.2 on page 319](#)) to enable DHCP snooping on each VLAN and to specify whether or not the Switch adds DHCP relay agent option 82 information to DHCP requests that the Switch relays to a DHCP server for each VLAN.
- Use the **DHCP Snooping VLAN Port Configure** screen ([Section 28.3.3 on page 320](#)) to apply a different DHCP option 82 profile to certain ports in a VLAN.

28.2 DHCP Snooping

Use this screen to look at various statistics about the DHCP snooping database.

To open this screen, click **Advanced Application > IP Source Guard > IPv4 Source Guard Setup > DHCP Snooping**.

Figure 232 Advanced Application > IP Source Guard > IPv4 Source Guard Setup > DHCP Snooping

DHCP Snooping

IPv4 SGConfigure

Database Status

Description	Status
Agent URL	
Write delay timer	300seconds
Abort timer	300seconds
Agent running	None
Delay timer expiry	Not Running
Abort timer expiry	Not Running
Last succeeded time	None
Last failed time	None
Last failed reason	No failure recorded
Times	
Total attempts	0
Startup failures	0
Successful transfers	0
Failed transfers	0
Successful reads	0
Failed reads	0
Successful writes	0
Failed writes	0

Database detail

Description	Status
First successful access	None
Last ignored bindings counters	
Binding collisions	0
Invalid interfaces	0
Parse failures	0
Expired leases	0
Unsupported vlans	0
Last ignored time	None
Total ignored bindings counters	
Binding collisions	0
Invalid interfaces	0
Parse failures	0
Expired leases	0
Unsupported vlans	0

The following table describes the labels in this screen.

Table 127 Advanced Application > IP Source Guard > IPv4 Source Guard Setup > DHCP Snooping

LABEL	DESCRIPTION
Database Status	
	This section displays the current settings for the DHCP snooping database. You can configure them in the DHCP Snooping Configure screen.
Agent URL	This field displays the location of the DHCP snooping database.
Write delay timer	This field displays how long (in seconds) the Switch tries to complete a specific update in the DHCP snooping database before it gives up.
Abort timer	This field displays how long (in seconds) the Switch waits to update the DHCP snooping database after the current bindings change.
	This section displays information about the current update and the next update of the DHCP snooping database.

Table 127 Advanced Application > IP Source Guard > IPv4 Source Guard Setup > DHCP Snooping

LABEL	DESCRIPTION
Agent running	This field displays the status of the current update or access of the DHCP snooping database. none: The Switch is not accessing the DHCP snooping database. read: The Switch is loading dynamic bindings from the DHCP snooping database. write: The Switch is updating the DHCP snooping database.
Delay timer expiry	This field displays how much longer (in seconds) the Switch tries to complete the current update before it gives up. It displays Not Running if the Switch is not updating the DHCP snooping database right now.
Abort timer expiry	This field displays when (in seconds) the Switch is going to update the DHCP snooping database again. It displays Not Running if the current bindings have not changed since the last update.
	This section displays information about the last time the Switch updated the DHCP snooping database.
Last succeeded time	This field displays the last time the Switch updated the DHCP snooping database successfully.
Last failed time	This field displays the last time the Switch updated the DHCP snooping database unsuccessfully.
Last failed reason	This field displays the reason the Switch updated the DHCP snooping database unsuccessfully.
	This section displays historical information about the number of times the Switch successfully or unsuccessfully read or updated the DHCP snooping database.
Total attempts	This field displays the number of times the Switch has tried to access the DHCP snooping database for any reason.
Startup failures	This field displays the number of times the Switch could not create or read the DHCP snooping database when the Switch started up or a new URL is configured for the DHCP snooping database.
Successful transfers	This field displays the number of times the Switch read bindings from or updated the bindings in the DHCP snooping database successfully.
Failed transfers	This field displays the number of times the Switch was unable to read bindings from or update the bindings in the DHCP snooping database.
Successful reads	This field displays the number of times the Switch read bindings from the DHCP snooping database successfully.
Failed reads	This field displays the number of times the Switch was unable to read bindings from the DHCP snooping database.
Successful writes	This field displays the number of times the Switch updated the bindings in the DHCP snooping database successfully.
Failed writes	This field displays the number of times the Switch was unable to update the bindings in the DHCP snooping database.
Database detail	
First successful access	This field displays the first time the Switch accessed the DHCP snooping database for any reason.
Last ignored bindings counters	This section displays the number of times and the reasons the Switch ignored bindings the last time it read bindings from the DHCP binding database. You can clear these counters by restarting the Switch or using CLI commands. See the Ethernet Switch CLI Reference Guide.
Binding collisions	This field displays the number of bindings the Switch ignored because the Switch already had a binding with the same MAC address and VLAN ID.
Invalid interfaces	This field displays the number of bindings the Switch ignored because the port number was a trusted interface or does not exist anymore.
Parse failures	This field displays the number of bindings the Switch ignored because the Switch was unable to understand the binding in the DHCP binding database.

Table 127 Advanced Application > IP Source Guard > IPv4 Source Guard Setup > DHCP Snooping

LABEL	DESCRIPTION
Expired leases	This field displays the number of bindings the Switch ignored because the lease time had already expired.
Unsupported vlans	This field displays the number of bindings the Switch ignored because the VLAN ID does not exist anymore.
Last ignored time	This field displays the last time the Switch ignored any bindings for any reason from the DHCP binding database.
Total ignored bindings counters	This section displays the reasons the Switch has ignored bindings any time it read bindings from the DHCP binding database. You can clear these counters by restarting the Switch or using CLI commands. See the Ethernet Switch CLI Reference Guide.
Binding collisions	This field displays the number of bindings the Switch has ignored because the Switch already had a binding with the same MAC address and VLAN ID.
Invalid interfaces	This field displays the number of bindings the Switch has ignored because the port number was a trusted interface or does not exist anymore.
Parse failures	This field displays the number of bindings the Switch has ignored because the Switch was unable to understand the binding in the DHCP binding database.
Expired leases	This field displays the number of bindings the Switch has ignored because the lease time had already expired.
Unsupported vlans	This field displays the number of bindings the Switch has ignored because the VLAN ID does not exist anymore.

28.3 DHCP Snooping Configure

Use this screen to enable DHCP snooping on the Switch (not on specific VLAN), specify the VLAN where the default DHCP server is located, and configure the DHCP snooping database. The DHCP snooping database stores the current bindings on a secure, external TFTP server so that they are still available after a restart.

To open this screen, click **Advanced Application > IP Source Guard > IPv4 Source Guard Setup > DHCP Snooping > Configure**.

Figure 233 Advanced Application > IP Source Guard > IPv4 Source Guard Setup > DHCP Snooping > Configure

The screenshot shows the 'DHCP Snooping Configure' configuration page. At the top, there are tabs for 'DHCP Snooping', 'Port', and 'VLAN'. The 'Active' checkbox is unchecked. Under 'DHCP Vlan', the 'Disable' radio button is selected. The 'Database' section includes an 'Agent URL' field, a 'Timeout interval' of 300 seconds, and a 'Write delay interval' of 300 seconds. At the bottom, there is a 'Renew DHCP Snooping URL' field with a 'Renew' button. The 'Apply' and 'Cancel' buttons are at the very bottom.

The following table describes the labels in this screen.

Table 128 Advanced Application > IP Source Guard > IPv4 Source Guard Setup > DHCP Snooping > Configure

LABEL	DESCRIPTION
Active	Select this to enable DHCP snooping on the Switch. You still have to enable DHCP snooping on specific VLAN and specify trusted ports. Note: The Switch will drop all DHCP requests if you enable DHCP snooping and there are no trusted ports.
DHCP Vlan	Select a VLAN ID if you want the Switch to forward DHCP packets to DHCP servers on a specific VLAN. Note: You have to enable DHCP snooping on the DHCP VLAN too. You can select an option 82 profile in the DHCP Snooping VLAN Configure screen to help the DHCP servers distinguish between DHCP requests from different VLAN. Select Disable if you do not want the Switch to forward DHCP packets to a specific VLAN.
Database	If Timeout interval is greater than Write delay interval , it is possible that the next update is scheduled to occur before the current update has finished successfully or timed out. In this case, the Switch waits to start the next update until it completes the current one.
Agent URL	Enter the location of the DHCP snooping database. The location should be expressed like this: ftp://{domain name or IP address}/directory, if applicable/file name ; for example, ftp://192.168.10.1/database.txt .
Timeout interval	Enter how long (10 – 65535 seconds) the Switch tries to complete a specific update in the DHCP snooping database before it gives up.
Write delay interval	Enter how long (10 – 65535 seconds) the Switch waits to update the DHCP snooping database the first time the current bindings change after an update. Once the next update is scheduled, additional changes in current bindings are automatically included in the next update.
Renew DHCP Snooping URL	Enter the location of a DHCP snooping database, and click Renew if you want the Switch to load it. You can use this to load dynamic bindings from a different DHCP snooping database than the one specified in Agent URL . When the Switch loads dynamic bindings from a DHCP snooping database, it does not discard the current dynamic bindings first. If there is a conflict, the Switch keeps the dynamic binding in volatile memory and updates the Binding collisions counter in the DHCP Snooping screen.
Apply	Click Apply to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click this to reset the values in this screen to their last-saved values.

28.3.1 DHCP Snooping Port Configure

Use this screen to specify whether ports are trusted or untrusted ports for DHCP snooping.

Note: The Switch will drop all DHCP requests if you enable DHCP snooping and there are no trusted ports.

You can also specify the maximum number for DHCP packets that each port (trusted or untrusted) can receive each second.

To open this screen, click **Advanced Application > IP Source Guard > IPv4 Source Guard Setup > DHCP Snooping > Configure > Port**.

Figure 234 Advanced Application > IP Source Guard > IPv4 Source Guard Setup > DHCP Snooping > Configure > Port (Standalone Mode)

Port	Server Trusted state	Rate (pps)
*	Untrusted ▼	
1	Untrusted ▼	0
2	Untrusted ▼	0
3	Untrusted ▼	0
4	Untrusted ▼	0
5	Untrusted ▼	0
6	Untrusted ▼	0
7	Untrusted ▼	0
8	Untrusted ▼	0
9	Untrusted ▼	0

Figure 235 Advanced Application > IP Source Guard > IPv4 Source Guard Setup > DHCP Snooping > Configure > Port (Stacking Mode)

Port	Server Trusted state	Rate (pps)
1/*	Untrusted ▼	
1/1	Untrusted ▼	0
1/2	Untrusted ▼	0
1/3	Untrusted ▼	0
1/4	Untrusted ▼	0
1/5	Untrusted ▼	0
1/6	Untrusted ▼	0
1/7	Untrusted ▼	0
1/8	Untrusted ▼	0
1/9	Untrusted ▼	0
1/10	Untrusted ▼	0
1/11	Untrusted ▼	0

The following table describes the labels in this screen.

Table 129 Advanced Application > IP Source Guard > IPv4 Source Guard Setup > DHCP Snooping > Configure > Port

LABEL	DESCRIPTION
SLOT	This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack.
Port	This field displays the port number. In stacking mode, the first number represents the slot ID and the second is the port number. Please note that the default stacking ports (the last four ports of your Switch) cannot be configured. They are reserved for stacking only.
*	Settings in this row apply to all ports. Use this row only if you want to make some settings the same for all ports. Use this row first to set the common settings and then make adjustments on a port-by-port basis. Note: Changes in this row are copied to all the ports as soon as you make them.

Table 129 Advanced Application > IP Source Guard > IPv4 Source Guard Setup > DHCP Snooping > Configure > Port (continued)

LABEL	DESCRIPTION
Server Trusted state	Select whether this port is a trusted port (Trusted) or an untrusted port (Untrusted). Trusted ports are connected to DHCP servers or other switches, and the Switch discards DHCP packets from trusted ports only if the rate at which DHCP packets arrive is too high. Untrusted ports are connected to subscribers, and the Switch discards DHCP packets from untrusted ports in the following situations: - The packet is a DHCP server packet (for example, OFFER, ACK, or NACK). - The source MAC address and source IP address in the packet do not match any of the current bindings. - The packet is a RELEASE or DECLINE packet, and the source MAC address and source port do not match any of the current bindings. - The rate at which DHCP packets arrive is too high.
Rate (pps)	Specify the maximum number for DHCP packets (1 – 2048) that the Switch receives from each port each second. The Switch discards any additional DHCP packets. Enter 0 to disable this limit, which is recommended for trusted ports.
Apply	Click Apply to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click this to reset the values in this screen to their last-saved values.

28.3.2 DHCP Snooping VLAN Configure

Use this screen to enable DHCP snooping on each VLAN and to specify whether or not the Switch adds DHCP relay agent option 82 information to DHCP requests that the Switch relays to a DHCP server for each VLAN.

To open this screen, click **Advanced Application > IP Source Guard > IPv4 Source Guard Setup > DHCP Snooping > Configure > VLAN**.

Figure 236 Advanced Application > IP Source Guard > IPv4 Source Guard Setup > DHCP Snooping > Configure > VLAN

DHCP Snooping VLAN Configure [Configure](#) [Port](#)

VLAN Search by VID [Search](#)

The Number of VLAN: 0

VID	Enabled	Option 82 Profile
*	No v	v

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

Change Pages [Previous](#) [Next](#)

The following table describes the labels in this screen.

Table 130 Advanced Application > IP Source Guard > IPv4 Source Guard Setup > DHCP Snooping > Configure > VLAN

LABEL	DESCRIPTION
VLAN Search by VID	Enter the VLAN ID you want to manage. Use a comma (,) to separate individual VLANs or a dash (-) to indicate a range of VLANs. For example, "3,4" or "3-9".
Search	Click this to display the specified range of VLANs in the section below.
VID	This field displays the VLAN ID of each VLAN in the range specified above. If you configure the * VLAN, the settings are applied to all VLANs.
Enabled	Select Yes to enable DHCP snooping on the VLAN. You still have to enable DHCP snooping on the Switch and specify trusted ports. Note: The Switch will drop all DHCP requests if you enable DHCP snooping and there are no trusted ports.
Option 82 Profile	Select a pre-defined DHCP option 82 profile that the Switch applies to all ports in the specified VLANs. The Switch adds the information (such as slot number, port number, VLAN ID and/or system name) specified in the profile to DHCP requests that it broadcasts to the DHCP VLAN, if specified, or VLAN. You can specify the DHCP VLAN in the DHCP Snooping Configure screen.
Apply	Click Apply to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click this to reset the values in this screen to their last-saved values.
Change Pages	Click Previous or Next to show the previous/next screen if all status information cannot be seen in one screen.

28.3.3 DHCP Snooping VLAN Port Configure

Use this screen to apply a different DHCP option 82 profile to certain ports in a VLAN.

To open this screen, click **Advanced Application > IP Source Guard > IPv4 Source Guard Setup > DHCP Snooping > Configure > VLAN > Port**.

Figure 237 Advanced Application > IP Source Guard > IPv4 Source Guard Setup > DHCP Snooping > Configure > VLAN > Port

The screenshot shows the 'DHCP Snooping VLAN Configure' screen. At the top, there's a navigation bar with 'Port' and 'DHCP Snooping VLAN Configure'. Below this, there are three input fields: 'VID', 'Port', and 'Option 82 Profile'. Below these fields are three buttons: 'Add', 'Cancel', and 'Clear'. At the bottom, there is a table with columns: 'Index', 'VID', 'Port', 'Profile Name', and 'Delete'. Below the table are two buttons: 'Delete' and 'Cancel'.

The following table describes the labels in this screen.

Table 131 Advanced Application > IP Source Guard > IPv4 Source Guard Setup > DHCP Snooping > Configure > VLAN > Port

LABEL	DESCRIPTION
VID	Enter the ID number of the VLAN you want to configure here.
Port	Enter the number of ports to which you want to apply the specified DHCP option 82 profile. You can enter multiple ports separated by (no space) comma (,) or hyphen (–) for a range. For example, enter “3–5” for ports 3, 4, and 5. Enter “3,5,7” for ports 3, 5, and 7. In stacking mode, the first number represents the slot and the second the port number. Enter 1/1–1/24,2/23 for ports 1 to 24 for the Switch in slot 1 and port 23 for the Switch in slot 2, for example.
Option 82 Profile	Select a pre-defined DHCP option 82 profile that the Switch applies to the specified ports in this VLAN. The Switch adds the information (such as slot number, port number, VLAN ID and/or system name) specified in the profile to DHCP requests that it broadcasts to the DHCP VLAN, if specified, or VLAN. You can specify the DHCP VLAN in the DHCP Snooping Configure screen. Note: The profile you select here has priority over the one you select in the DHCP Snooping > Configure > VLAN screen.
Add	Click this to create a new entry or to update an existing one. This saves your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click this to reset the values above based on the last selected entry or, if not applicable, to clear the fields above.
Clear	Click Clear to reset the fields to the factory defaults.
Index	This field displays a sequential number for each entry. Click an index number to change the settings.
VID	This field displays the VLAN to which the ports belongs.
Port	This field displays the ports to which the Switch applies the settings. In stacking mode, the first number represents the slot and the second the port number.
Profile Name	This field displays the DHCP option 82 profile that the Switch applies to the ports.
Delete	Select the entries that you want to remove in the Delete column, and then click the Delete button to remove the selected entries from the table.
Cancel	Click this to clear the Delete check boxes above.

28.4 Technical Reference

This section provides technical background information on the topics discussed in this chapter.

28.4.1 DHCP Snooping Overview

Use DHCP snooping to filter unauthorized DHCP packets on the network and to build the binding table dynamically. This can prevent clients from getting IP addresses from unauthorized DHCP servers.

28.4.1.1 Trusted vs. Untrusted Ports

Every port is either a trusted port or an untrusted port for DHCP snooping. This setting is independent of the trusted or untrusted setting for ARP inspection. You can also specify the maximum number for DHCP packets that each port (trusted or untrusted) can receive each second.

Trusted ports are connected to DHCP servers or other switches. The Switch discards DHCP packets from trusted ports only if the rate at which DHCP packets arrive is too high. The Switch learns dynamic bindings from trusted ports.

Note: If DHCP is enabled and there are no trusted ports, DHCP requests will not succeed.

Untrusted ports are connected to subscribers. The Switch discards DHCP packets from untrusted ports in the following situations:

- The packet is a DHCP server packet (for example, OFFER, ACK, or NACK).
- The source MAC address and source IP address in the packet do not match any of the current bindings.
- The packet is a RELEASE or DECLINE packet, and the source MAC address and source port do not match any of the current bindings.
- The rate at which DHCP packets arrive is too high.

28.4.1.2 DHCP Snooping Database

The Switch stores the binding table in volatile memory. If the Switch restarts, it loads static bindings from permanent memory but loses the dynamic bindings, in which case the devices in the network have to send DHCP requests again. As a result, it is recommended you configure the DHCP snooping database.

The DHCP snooping database maintains the dynamic bindings for DHCP snooping and ARP inspection in a file on an external TFTP server. If you set up the DHCP snooping database, the Switch can reload the dynamic bindings from the DHCP snooping database after the Switch restarts.

You can configure the name and location of the file on the external TFTP server. The file has the following format:

Figure 238 DHCP Snooping Database File Format

```
<initial-checksum>
TYPE DHCP-SNOOPING
VERSION 1
BEGIN
<binding-1> <checksum-1>
<binding-2> <checksum-1-2>
...
...
<binding-n> <checksum-1-2-...-n>
END
```

The <initial-checksum> helps distinguish between the bindings in the latest update and the bindings from previous updates. Each binding consists of 72 bytes, a space, and another checksum that is used to validate the binding when it is read. If the calculated checksum is not equal to the checksum in the file, that binding and all others after it are ignored.

28.4.1.3 DHCP Relay Option 82 Information

The Switch can add information to DHCP requests that it does not discard. This provides the DHCP server more information about the source of the requests. The Switch can add the following information:

- Slot ID (1 byte), port ID (1 byte), and source VLAN ID (2 bytes)
- System name (up to 32 bytes)

This information is stored in an Agent Information field in the option 82 field of the DHCP headers of client DHCP request frames.

When the DHCP server responds, the Switch removes the information in the Agent Information field before forwarding the response to the original source.

You can configure this setting for each source VLAN. This setting is independent of the DHCP relay settings.

28.4.1.4 Configuring DHCP Snooping

Follow these steps to configure DHCP snooping on the Switch.

- 1 Enable DHCP snooping on the Switch.
- 2 Enable DHCP snooping on each VLAN, and configure DHCP relay option 82.
- 3 Configure trusted and untrusted ports, and specify the maximum number of DHCP packets that each port can receive per second.
- 4 Configure static bindings.

CHAPTER 29

ARP Inspection

29.1 ARP Inspection Status

Use this screen to look at the current list of MAC address filters that were created because the Switch identified an unauthorized ARP packet. When the Switch identifies an unauthorized ARP packet, it automatically creates a MAC address filter to block traffic from the source MAC address and source VLAN ID of the unauthorized ARP packet. To open this screen, click **Advanced Application > IP Source Guard > IPv4 Source Guard Setup > ARP Inspection**.

Figure 239 Advanced Application > IP Source Guard > IPv4 Source Guard Setup > ARP Inspection Status

The following table describes the labels in this screen.

Table 132 Advanced Application > IP Source Guard > IPv4 Source Guard Setup > ARP Inspection Status

LABEL	DESCRIPTION
Total number of filters	This field displays the current number of MAC address filters that were created because the Switch identified unauthorized ARP packets.
Index	This field displays a sequential number for each MAC address filter.
MAC Address	This field displays the source MAC address in the MAC address filter.
VID	This field displays the source VLAN ID in the MAC address filter.
Port	This field displays the source port of the discarded ARP packet. In stacking mode, the first number represents the slot and the second the port number.
Expiry (sec)	This field displays how long (in seconds) the MAC address filter remains in the Switch. You can also delete the record manually (Delete).
	Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries.
Delete	Click this to remove the selected entries.
Cancel	Click this to clear the Delete check boxes above.
Change Pages	Click Previous Page or Next Page to show the previous or next screen if all status information cannot be seen in one screen.

29.1.1 ARP Inspection VLAN Status

Use this screen to look at various statistics about ARP packets in each VLAN. To open this screen, click **Advanced Application > IP Source Guard > IPv4 Source Guard Setup > ARP Inspection > VLAN Status**.

Figure 240 Advanced Application > IP Source Guard > IPv4 Source Guard Setup > ARP Inspection > VLAN Status

ARP Inspection VLAN Status [Status](#)

VLAN Search by VID [Search](#)

The Number of VLAN: 0

VID	Received	Request	Reply	Forwarded	Dropped

Change Pages [Previous](#) [Next](#)

The following table describes the labels in this screen.

Table 133 Advanced Application > IP Source Guard > IPv4 Source Guard Setup > ARP Inspection > VLAN Status

LABEL	DESCRIPTION
VLAN Search by VID	Specify the VLANs you want to view in the section below. Use a comma (,) to separate individual VLANs or a dash (-) to indicates a range of VLANs. For example, "3,4" or "3-9".
Search	Click this to display the specified range of VLANs in the section below.
The Number of VLAN	This is the number of VLANs that match the searching criteria and display in the list below. This field displays only when you use the Search button to look for certain VLANs.
VID	This field displays the VLAN ID of each VLAN in the range specified above.
Received	This field displays the total number of ARP packets received from the VLAN since the Switch last restarted.
Request	This field displays the total number of ARP Request packets received from the VLAN since the Switch last restarted.
Reply	This field displays the total number of ARP Reply packets received from the VLAN since the Switch last restarted.
Forwarded	This field displays the total number of ARP packets the Switch forwarded for the VLAN since the Switch last restarted.
Dropped	This field displays the total number of ARP packets the Switch discarded for the VLAN since the Switch last restarted.
Change Pages	Click Previous or Next to show the previous/next screen if all status information cannot be seen in one screen.

29.1.2 ARP Inspection Log Status

Use this screen to look at log messages that were generated by ARP packets and that have not been sent to the syslog server yet. To open this screen, click **Advanced Application > IP Source Guard > IPv4 Source Guard Setup > ARP Inspection > Log Status**.

Figure 241 Advanced Application > IP Source Guard > IPv4 Source Guard Setup > ARP Inspection > Log Status

Index	Port	VID	Sender MAC	Sender IP	Num Pkts	Reason	Time

The following table describes the labels in this screen.

Table 134 Advanced Application > IP Source Guard > IPv4 Source Guard Setup > ARP Inspection > Log Status

LABEL	DESCRIPTION
Clearing log status table	Click Apply to remove all the log messages that were generated by ARP packets and that have not been sent to the syslog server yet.
Total number of logs	This field displays the number of log messages that were generated by ARP packets and that have not been sent to the syslog server yet. If one or more log messages are dropped due to unavailable buffer, there is an entry called overflow with the current number of dropped log messages.
Index	This field displays a sequential number for each log message.
Port	This field displays the source port of the ARP packet. In stacking mode, the first number represents the slot and the second the port number.
VID	This field displays the source VLAN ID of the ARP packet.
Sender MAC	This field displays the source MAC address of the ARP packet.
Sender IP	This field displays the source IP address of the ARP packet.
Num Pkts	This field displays the number of ARP packets that were consolidated into this log message. The Switch consolidates identical log messages generated by ARP packets in the log consolidation interval into one log message. You can configure this interval in the ARP Inspection Configure screen.
Reason	This field displays the reason the log message was generated. dhcp deny: An ARP packet was discarded because it violated a dynamic binding with the same MAC address and VLAN ID. static deny: An ARP packet was discarded because it violated a static binding with the same MAC address and VLAN ID. deny: An ARP packet was discarded because there were no bindings with the same MAC address and VLAN ID. dhcp permit: An ARP packet was forwarded because it matched a dynamic binding. static permit: An ARP packet was forwarded because it matched a static binding. In the ARP Inspection VLAN Configure screen, you can configure the Switch to generate log messages when ARP packets are discarded or forwarded based on the VLAN ID of the ARP packet.
Time	This field displays when the log message was generated.

29.2 ARP Inspection Configure

Use this screen to enable ARP inspection on the Switch. You can also configure the length of time the Switch stores records of discarded ARP packets and global settings for the ARP inspection log. To open this screen, click **Advanced Application > IP Source Guard > IPv4 Source Guard Setup > ARP Inspection >**

Configure.**Figure 242** Advanced Application > IP Source Guard > IPv4 Source Guard Setup > ARP Inspection > Configure

ARP Inspection Configure		ARP Inspection	Port	VLAN
Active	☐			
Filter Aging Time				
Filter aging time	300	seconds		
Log Profile				
Log buffer size	32	entries		
Syslog rate	5	entries		
Log interval	1	seconds		
Apply Cancel				

The following table describes the labels in this screen.

Table 135 Advanced Application > IP Source Guard > IPv4 Source Guard Setup > ARP Inspection > Configure

LABEL	DESCRIPTION
Active	Select this to enable ARP inspection on the Switch. You still have to enable ARP inspection on specific VLAN and specify trusted ports.
Filter Aging Time	
Filter aging time	This setting has no effect on existing MAC address filters. Enter how long (1 – 2147483647 seconds) the MAC address filter remains in the Switch after the Switch identifies an unauthorized ARP packet. The Switch automatically deletes the MAC address filter afterwards. Type 0 if you want the MAC address filter to be permanent.
Log Profile	
Log buffer size	Enter the maximum number (1 – 1024) of log messages that were generated by ARP packets and have not been sent to the syslog server yet. Make sure this number is appropriate for the specified Syslog rate and Log interval. If the number of log messages in the Switch exceeds this number, the Switch stops recording log messages and simply starts counting the number of entries that were dropped due to unavailable buffer. Click Clearing log status table in the ARP Inspection Log Status screen to clear the log and reset this counter.
Syslog rate	Type the maximum number of syslog messages the Switch can send to the syslog server in one batch. This number is expressed as a rate because the batch frequency is determined by the Log Interval. You must configure the syslog server to use this. Enter 0 if you do not want the Switch to send log messages generated by ARP packets to the syslog server. The relationship between Syslog rate and Log interval is illustrated in the following examples: - Four invalid ARP packets per second, Syslog rate is 5, Log interval is 1: the Switch sends 4 syslog messages every second. - Six invalid ARP packets per second, Syslog rate is 5, Log interval is 2: the Switch sends 5 syslog messages every 2 seconds.
Log interval	Type how often (1 – 86400 seconds) the Switch sends a batch of syslog messages to the syslog server. Enter 0 if you want the Switch to send syslog messages immediately. See Syslog rate for an example of the relationship between Syslog rate and Log interval.

Table 135 Advanced Application > IP Source Guard > IPv4 Source Guard Setup > ARP Inspection > Configure (continued)

LABEL	DESCRIPTION
Apply	Click Apply to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click this to reset the values in this screen to their last-saved values.

29.2.1 ARP Inspection Port Configure

Use this screen to specify whether ports are trusted or untrusted ports for ARP inspection. You can also specify the maximum rate at which the Switch receives ARP packets on each untrusted port. To open this screen, click **Advanced Application > IP Source Guard > IPv4 Source Guard Setup > ARP Inspection > Configure > Port**.

Figure 243 Advanced Application > IP Source Guard > IPv4 Source Guard Setup > ARP Inspection > Configure > Port (Standalone Mode)

Port	Trusted State	Rate (pps)	Limit Burst interval (seconds)
*	Untrusted ▼		
1	Untrusted ▼	15	1
2	Untrusted ▼	15	1
3	Untrusted ▼	15	1
4	Untrusted ▼	15	1
5	Untrusted ▼	15	1
6	Untrusted ▼	15	1
7	Untrusted ▼	15	1
8	Untrusted ▼	15	1
9	Untrusted ▼	15	1

Figure 244 Advanced Application > IP Source Guard > IPv4 Source Guard Setup > ARP Inspection > Configure > Port (Stacking Mode)

Port	Trusted State	Rate (pps)	Limit Burst interval (seconds)
1/*	Untrusted ▼		
1/1	Untrusted ▼	15	1
1/2	Untrusted ▼	15	1
1/3	Untrusted ▼	15	1
1/4	Untrusted ▼	15	1
1/5	Untrusted ▼	15	1
1/6	Untrusted ▼	15	1
1/7	Untrusted ▼	15	1
1/8	Untrusted ▼	15	1
1/9	Untrusted ▼	15	1
1/10	Untrusted ▼	15	1
1/11	Untrusted ▼	15	1

The following table describes the labels in this screen.

Table 136 Advanced Application > IP Source Guard > IPv4 Source Guard Setup > ARP Inspection > Configure > Port

LABEL	DESCRIPTION
SLOT	This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack.
Port	This field displays the port number. In stacking mode, the first number represents the slot ID and the second is the port number. Please note that the default stacking ports (the last four ports of your Switch) cannot be configured. They are reserved for stacking only.
*	Settings in this row apply to all ports. Use this row only if you want to make some settings the same for all ports. Use this row first to set the common settings and then make adjustments on a port-by-port basis. Note: Changes in this row are copied to all the ports as soon as you make them.
Trusted State	Select whether this port is a trusted port (Trusted) or an untrusted port (Untrusted). The Switch does not discard ARP packets on trusted ports for any reason. The Switch discards ARP packets on untrusted ports in the following situations: - The sender's information in the ARP packet does not match any of the current bindings. - The rate at which ARP packets arrive is too high. You can specify the maximum rate at which ARP packets can arrive on untrusted ports.
Limit	Rate and Burst Interval settings have no effect on trusted ports.
Rate (pps)	Specify the maximum rate (1 – 2048 packets per second) at which the Switch receives ARP packets from each port. The Switch discards any additional ARP packets. Enter 0 to disable this limit.
Burst interval (seconds)	The burst interval is the length of time over which the rate of ARP packets is monitored for each port. For example, if the Rate is 15 pps and the burst interval is 1 second, then the Switch accepts a maximum of 15 ARP packets in every one-second interval. If the burst interval is 5 seconds, then the Switch accepts a maximum of 75 ARP packets in every five-second interval. Enter the length (1 – 15 seconds) of the burst interval.
Apply	Click Apply to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click this to reset the values in this screen to their last-saved values.

29.2.2 ARP Inspection VLAN Configure

Use this screen to enable ARP inspection on each VLAN and to specify when the Switch generates log messages for receiving ARP packets from each VLAN. To open this screen, click **Advanced Application > IP Source Guard > IPv4 Source Guard Setup > ARP Inspection > Configure > VLAN**.

Figure 245 Advanced Application > IP Source Guard > IPv4 Source Guard Setup > ARP Inspection > Configure > VLAN

The following table describes the labels in this screen.

Table 137 Advanced Application > IP Source Guard > IPv4 Source Guard Setup > ARP Inspection > Configure > VLAN

LABEL	DESCRIPTION
VLAN Search by VID	Specify the VLANs you want to manage in the section below. Use a comma (,) to separate individual VLANs or a dash (-) to indicate a range of VLANs. For example, "3,4" or "3-9".
Search	Click this to display the specified range of VLANs in the section below.
VID	This field displays the VLAN ID of each VLAN in the range specified above. If you configure the * VLAN, the settings are applied to all VLANs.
Enabled	Select Yes to enable ARP inspection on the VLAN. Select No to disable ARP inspection on the VLAN.
Log	Specify when the Switch generates log messages for receiving ARP packets from the VLAN. None: The Switch does not generate any log messages when it receives an ARP packet from the VLAN. Deny: The Switch generates log messages when it discards an ARP packet from the VLAN. Permit: The Switch generates log messages when it forwards an ARP packet from the VLAN. All: The Switch generates log messages every time it receives an ARP packet from the VLAN.
Apply	Click Apply to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click this to reset the values in this screen to their last-saved values.
Change Pages	Click Previous or Next to show the previous or next screen if all status information cannot be seen in one screen.

29.3 IPv6 Source Guard Overview

The purpose of IPv6 source guard is to distinguish between authorized and unauthorized users by using a binding table that validates the source of IPv6 traffic. The binding table can be manually created or be learned through Dynamic Host Configuration Protocol version 6 snooping (DHCPv6 snooping). IPv6 source guard can deny IPv6 traffic from an unknown source. The IPv6 source guard binding table includes:

- IPv6 address
- IPv6 prefix
- VLAN ID
- Port number
- MAC address

Enable IPv6 source guard on a port for the Switch to check incoming IPv6 packets on that port. A packet is allowed when it matches any entry in the IPSG binding table. If a user tries to send IPv6 packets to the Switch that do not match an entry in the IPSG binding table, the Switch will drop these packets. The Switch forwards matching traffic normally. The IPv6 source guard related screens are available in standalone mode.

29.4 IPv6 Source Binding Status

Use this screen to look at the current IPv6 dynamic and static bindings and to remove dynamic bindings based on IPv6 address and/or IPv6 prefix. Bindings are used to distinguish between authorized and unauthorized packets in the network. The Switch learns the bindings by snooping DHCP packets (dynamic bindings) and from information provided manually by administrators (static bindings). To open this screen, click **Advanced Application > IP Source Guard > IPv6 Source Binding Status**.

Figure 246 Advanced Application > IP Source Guard > IPv6 Source Binding Status

The following table describes the labels in this screen.

Table 138 Advanced Application > IP Source Guard > IPv6 Source Binding Status

LABEL	DESCRIPTION
Clear Dynamic Source Binding	Specify how you want the Switch to remove dynamic IPv6 source binding entries when you click Flush . • Select All to remove all of the dynamic entries from the IPv6 source binding table. • Select IPv6 Address and enter an IPv6 address to remove the dynamic entries snooped with the specified IPv6 address. • Select IPv6 Prefix and enter a Prefix address to remove the dynamic entries snooped with the specified Prefix address.
Flush	Click this to remove dynamic IPv6 source binding entries according to your selections.
Cancel	Click this to reset the values above based or if not applicable, to clear the fields above.
Index	This field displays a sequential number for each binding.
Source Address	This field displays the source IP address in the binding. If the entry is blank, this field will not be checked in the binding.
MAC Address	This field displays the source MAC address in the binding. If the entry is blank, this field will not be checked in the binding.

Table 138 Advanced Application > IP Source Guard > IPv6 Source Binding Status (continued)

LABEL	DESCRIPTION
VLAN	This field displays the source VLAN ID in the binding. If the entry is blank, this field will not be checked in the binding.
Port	This field displays the port number in the binding. If this field is blank, the binding applies to all ports.
Lease	This field displays how many days, hours, minutes, and seconds the binding is valid; for example, 2d3h4m5s means the binding is still valid for 2 days, 3 hours, 4 minutes, and 5 seconds. This field displays infinity if the binding is always valid (for example, a static binding).
Type	This field displays how the Switch learned the binding. S: This static binding was learned from information provided manually by an administrator. DH: This dhcp-snooping binding was learned by snooping DHCP packets.

29.5 IPv6 Static Binding Setup

Use this screen to manually create an IPv6 source guard binding table entry and manage IPv6 static bindings. Static bindings are uniquely identified by the source IPv6 address / prefix. Each source IPv6 address / prefix can only be in one static binding. If you try to create a static binding with the same source IPv6 address / prefix as an existing static binding, the new static binding replaces the original one. To open this screen, click **Advanced Application > IP Source Guard > IPv6 Static Binding Setup**.

Figure 247 Advanced Application > IP Source Guard > IPv6 Static Binding Setup (Standalone Mode)

IPv6 Static Binding [IPSG](#)

Source Address: ☐ IPv6 Address ☐ IPv6 Prefix /

MAC Address: ☐ ☐ Any

VLAN: ☐ ☐ Any

Port: ☐ ☐ Any

[Add](#) [Cancel](#) [Clear](#)

Index	Source Address	MAC Address	VLAN	Port	
Delete Cancel					

Figure 248 Advanced Application > IP Source Guard > IPv6 Static Binding Setup (Stacking Mode)

The following table describes the labels in this screen.

Table 139 Advanced Application > IP Source Guard > IPv6 Static Binding Setup

LABEL	DESCRIPTION
IPv6 Static Binding	
Source Address	Enter the IPv6 address or IPv6 prefix and prefix length in the binding.
MAC Address	Enter the source MAC address in the binding. If this binding does not check this field, select Any . Note: You cannot choose Any for all three of MAC Address , VLAN and Port . You must fill in at least one.
VLAN	Enter the source VLAN ID in the binding. If this binding does not check this field, select Any .
Port	Specify the ports in the binding. If this binding has one port, select the first radio button and enter the port number in the field to the right. In stacking mode, the first field is the slot ID and the second field is the port number. If this binding applies to all ports, select Any .
Add	Click this to create the specified static binding or to update an existing one.
Cancel	Click this to reset the values above based or if not applicable, to clear the fields above.
Clear	Click this to clear the fields above.
Index	This field displays a sequential number for each binding.
Source Address	This field displays the IPv6 address or IPv6 prefix and prefix length in the binding.
MAC Address	This field displays the source MAC address in the binding. If the entry is blank, this field will not be checked in the binding.
VLAN	This field displays the source VLAN ID in the binding. If the entry is blank, this field will not be checked in the binding.
Port	This field displays the port number in the binding. If this field is blank, the binding applies to all ports. In stacking mode, the first number represents the slot and the second the port number
	Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries.
Delete	Select an entry check box and click Delete to remove the specified entry.
Cancel	Click this to clear the Delete check boxes above.

29.6 IPv6 Source Guard Policy Setup

Use this screen to have IPv6 source guard forward valid IPv6 addresses and/or IPv6 prefixes that are stored in the binding table and allow or block data traffic from all link-local addresses. To open this screen, click **Advanced Application > IP Source Guard > IPv6 Source Guard Policy Setup**.

- If you select **Validate Address** and not **Validate Prefix**, traffic for a binding entry that matches a IPv6 address and VLAN ID, port number, and MAC address will be forwarded. If this binding entry is a IPv6 prefix, the traffic will be denied.
- If you select **Validate Prefix** and not **Validate Address**, traffic for a binding entry that matches a IPv6 prefix and VLAN ID, port number, and MAC address will be forwarded. If this binding entry is a IPv6 address, the traffic will be denied.
- If you select both **Validate Prefix** and **Validate Address** then traffic matching either IPv6 address or prefix will be forwarded.

Figure 249 Advanced Application > IP Source Guard > IPv6 Source Guard Policy Setup

The following table describes the labels in this screen.

Table 140 Advanced Application > IP Source Guard > IPv6 Source Guard Policy Setup

LABEL	DESCRIPTION
Name	Enter a descriptive name for identification purposes for this IPv6 source guard policy.
Validate Address	Select Validate Address to have IPv6 source guard forward valid addresses that are stored in the binding table.
Validate Prefix	Select Validate Prefix to have IPv6 source guard forward valid prefixes that are stored in the binding table.
Link Local	Select Permit to allow data traffic from all link-local addresses; otherwise leave the setting at Deny . A link-local address is an IPv6 unicast address that can be automatically configured on any interface using the link-local prefix FE80::/10 and the interface identifier in the modified EUI-64 format.
Add	Click this to create the IPv6 source guard policy or to update an existing one.
Cancel	Click this to reset the values above or if not applicable, to clear the fields above.
Clear	Click this to clear the fields above.
Index	This field displays a sequential number for each policy.
Name	This field displays the descriptive name for identification purposes for this IPv6 source guard policy.
Validate Address	This field displays the Validate Address status for this IPv6 source guard policy.
Validate Prefix	This field displays the Validate Prefix status for this IPv6 source guard policy.
Link Local	This field displays the Link Local traffic status for this IPv6 source guard policy.
	Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries.

Table 140 Advanced Application > IP Source Guard > IPv6 Source Guard Policy Setup (continued)

LABEL	DESCRIPTION
Delete	Select an entry check box and click Delete to remove the specified entry.
Cancel	Click this to clear the Delete check boxes above.

29.7 IPv6 Source Guard Port Setup

Use this screen to apply configured IPv6 source guard policies to ports you specify. Use port * to apply a policy to all ports. To open this screen, click **Advanced Application > IP Source Guard > IPv6 Source Guard Port Setup**.

Figure 250 Advanced Application > IP Source Guard > IPv6 Source Guard Port Setup (Standalone Mode)

The screenshot displays the 'IPv6 Source Guard Port Setup' interface. It features a table with two columns: 'Port' and 'Policy Name'. The 'Port' column lists ports from * to 27. The 'Policy Name' column has a dropdown menu for each port. At the bottom, there are 'Apply' and 'Cancel' buttons.

Port	Policy Name
*	
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	
16	
17	
18	
19	
20	
21	
22	
23	
24	
25	
26	
27	

Apply Cancel

Figure 251 Advanced Application > IP Source Guard > IPv6 Source Guard Port Setup (Stacking Mode)

Port	Policy Name
1/*	▼
1/1	▼
1/2	▼
1/3	▼
1/4	▼
1/5	▼
1/6	▼
1/7	▼
1/8	▼
1/9	▼
1/10	▼
1/11	▼

The following table describes the labels in this screen.

Table 141 Advanced Application > IP Source Guard > IPv6 Source Guard Port Setup

LABEL	DESCRIPTION
SLOT	This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack.
Port	This field displays the port number. In stacking mode, the first number represents the slot ID and the second is the port number. Please note that the default stacking ports (the last four ports of your Switch) cannot be configured. They are reserved for stacking only.
*	Settings in this row apply to all ports. Use this row only if you want to make some settings the same for all ports. Use this row first to set the common settings and then make adjustments on a port-by-port basis. Note: Changes in this row are copied to all the ports as soon as you make them.
Policy Name	Select an IPv6 source guard policy that the Switch will apply to this port.
Apply	Click Apply to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click this to reset the values in this screen to their last-saved values.

29.8 IPv6 Snooping Policy Setup

Use this screen to dynamically create an IPv6 source guard binding table using a DHCPv6 snooping policy. A DHCPv6 snooping policy lets the Switch sniff DHCPv6 packets sent from a DHCPv6 server to a DHCPv6 client when it is assigning an IPv6 address. When a DHCPv6 client successfully gets a valid IPv6 address, DHCPv6 snooping builds the binding table dynamically. To open this screen, click **Advanced Application > IP Source Guard > IPv6 Snooping Policy Setup**.

Note: If you do not select **Protocol** and **Prefix Glean**, then the Switch cannot perform DHCPv6 snooping.

Figure 252 Advanced Application > IP Source Guard > IPv6 Snooping Policy Setup

The following table describes the labels in this screen.

Table 142 Advanced Application > IP Source Guard > IPv6 Snooping Policy Setup

LABEL	DESCRIPTION
Name	Enter a descriptive name for identification purposes for this IPv6 snooping policy.
Protocol	Select DHCP to let the Switch sniff DHCPv6 packets sent from a DHCPv6 server to a DHCPv6 client.
Prefix Glean	Select this to learn the IPv6 prefix and length from DHCPv6 sniffed packets.
Limit Address Count	This is the number of IPv6 addresses and prefixes learned using the IPv6 snooping policy. Note: The maximum limit address count is the maximum size of the IPv6 source guard binding table. See the product data sheet for the latest specifications.
Add	Click this to create the IPv6 source guard policy or to update an existing one.
Cancel	Click this to reset the values above or if not applicable, to clear the fields above.
Clear	Click this to clear the fields above.
Index	This field displays a sequential number for each IPv6 snooping policy.
Name	This field displays the descriptive name for identification purposes for this IPv6 source guard policy.
Protocol	This field displays the protocols learned from DHCPv6 sniffed packets.
Prefix Glean	This field displays the IPv6 prefixes learned from DHCPv6 sniffed packets.
Limit Address Count	This field displays the number of IPv6 addresses and prefixes learned using the IPv6 snooping policy.
	Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries.
Delete	Select an entry check box and click Delete to remove the specified entry.
Cancel	Click this to clear the Delete check boxes above.

29.9 IPv6 Snooping VLAN Setup

Use this screen to enable a DHCPv6 snooping policy on a specific VLAN interface. To open this screen, click **Advanced Application > IP Source Guard > IPv6 Snooping VLAN Setup**.

Figure 253 Advanced Application > IP Source Guard > IPv6 Snooping VLAN Setup

The following table describes the labels in this screen.

Table 143 Advanced Application > IP Source Guard > IPv6 Snooping VLAN Setup

LABEL	DESCRIPTION
Interface	Select the VLAN interface to apply the selected DHCPv6 snooping policy.
Policy	Select the IPv6 snooping policy to apply to this VLAN interface.
Add	Click this to create the IPv6 source guard policy or to update an existing one.
Cancel	Click this to reset the values above or if not applicable, to clear the fields above.
Clear	Click this to clear the fields above.
Index	This field displays a sequential number for each binding.
Interface	This field displays the VLAN interface.
Policy	This field displays the DHCPv6 snooping policy.
	Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries.
Delete	Select an entry check box and click Delete to remove the specified entry.
Cancel	Click this to clear the Delete check boxes above.

29.10 IPv6 DHCP Trust Setup

Use this screen to specify which ports are trusted for DHCPv6 snooping. To open this screen, click **Advanced Application > IP Source Guard > IPv6 DHCP Trust Setup**.

Note: DHCPv6 solicit packets are sent from a DHCPv6 client to a DHCPv6 server. Reply packets from a DHCPv6 server connected to an untrusted port are discarded.

Use port * to have all ports be **Untrusted** or **Trusted**.

Figure 254 Advanced Application > IP Source Guard > IPv6 DHCP Trust Setup (Standalone Mode)

DHCP Trust [IPSG](#)

Trust Setting

Active ☐

Port Setting

Port	Trusted State
*	Untrusted ▼
1	Untrusted ▼
2	Untrusted ▼
3	Untrusted ▼
4	Untrusted ▼
5	Untrusted ▼
6	Untrusted ▼
7	Untrusted ▼
8	Untrusted ▼
9	Untrusted ▼

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

Figure 255 Advanced Application > IP Source Guard > IPv6 DHCP Trust Setup (Stacking Mode)

DHCP Trust [IPSG](#)

Trust Setting

Active ☐

Port Setting

SLOT 1 ▼

Port	Trusted State
1/*	Untrusted ▼
1/1	Untrusted ▼
1/2	Untrusted ▼
1/3	Untrusted ▼
1/4	Untrusted ▼
1/5	Untrusted ▼
1/6	Untrusted ▼
1/7	Untrusted ▼
1/8	Untrusted ▼
1/9	Untrusted ▼
1/10	Untrusted ▼

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

The following table describes the labels in this screen.

Table 144 Advanced Application > IP Source Guard > IPv6 DHCP Trust Setup

LABEL	DESCRIPTION
Trust Setting	
Active	Select this to specify whether ports are trusted or untrusted ports for DHCP snooping. If you do not select this then IPv6 DHCP Trust is not used and all ports are automatically trusted.
Port Setting	
SLOT	This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack.
Port	This field displays the port number. In stacking mode, the first number represents the slot ID and the second is the port number. Please note that the default stacking ports (the last four ports of your Switch) cannot be configured. They are reserved for stacking only.

Table 144 Advanced Application > IP Source Guard > IPv6 DHCP Trust Setup (continued)

LABEL	DESCRIPTION
*	Settings in this row apply to all ports. Use this row only if you want to make some settings the same for all ports. Use this row first to set the common settings and then make adjustments on a port-by-port basis. Note: Changes in this row are copied to all the ports as soon as you make them.
Trusted State	Select whether this port is a trusted port (Trusted) or an untrusted port (Untrusted). Trusted ports are connected to DHCPv6 servers or other switches. Untrusted ports are connected to subscribers, and the Switch discards DHCPv6 packets from untrusted ports in the following situations: • The packet is a DHCPv6 server packet (for example, ADVERTISE, REPLY, or RELAY-REPLY). • The source MAC address and source IP address in the packet do not match any of the current bindings.
Apply	Click Apply to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click this to reset the values in this screen to their last-saved values.

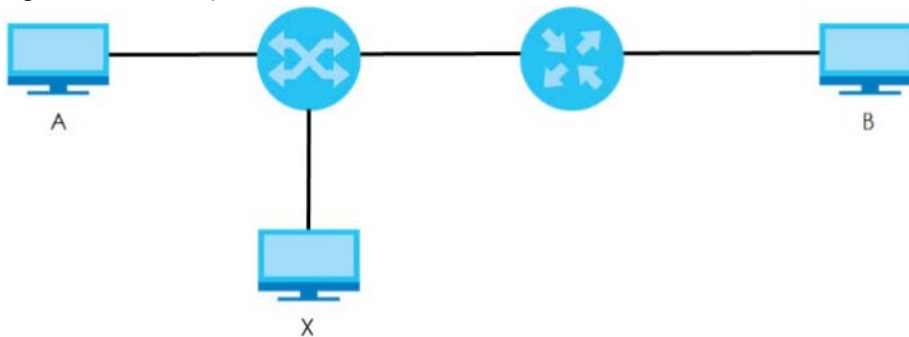
29.11 Technical Reference

This section provides technical background information on the topics discussed in this chapter.

29.11.1 ARP Inspection Overview

Use ARP inspection to filter unauthorized ARP packets on the network. This can prevent many kinds of man-in-the-middle attacks, such as the one in the following example.

Figure 256 Example: Man-in-the-middle Attack



In this example, computer **B** tries to establish a connection with computer **A**. Computer **X** is in the same broadcast domain as computer **A** and intercepts the ARP request for computer **A**. Then, computer **X** does the following things:

- It pretends to be computer **A** and responds to computer **B**.
- It pretends to be computer **B** and sends a message to computer **A**.

As a result, all the communication between computer **A** and computer **B** passes through computer **X**. Computer **X** can read and alter the information passed between them.

29.11.1.1 ARP Inspection and MAC Address Filters

When the Switch identifies an unauthorized ARP packet, it automatically creates a MAC address filter to block traffic from the source MAC address and source VLAN ID of the unauthorized ARP packet. You can configure how long the MAC address filter remains in the Switch.

These MAC address filters are different than regular MAC address filters.

- They are stored only in volatile memory.
- They do not use the same space in memory that regular MAC address filters use.
- They appear only in the **ARP Inspection** screens and commands, not in the **MAC Address Filter** screens and commands.

29.11.1.2 Trusted vs. Untrusted Ports

Every port is either a trusted port or an untrusted port for ARP inspection. This setting is independent of the trusted or untrusted setting for DHCP snooping. You can also specify the maximum rate at which the Switch receives ARP packets on untrusted ports.

The Switch does not discard ARP packets on trusted ports for any reason.

The Switch discards ARP packets on untrusted ports in the following situations:

- The sender's information in the ARP packet does not match any of the current bindings.
- The rate at which ARP packets arrive is too high.

29.11.1.3 Syslog

The Switch can send syslog messages to the specified syslog server when it forwards or discards ARP packets. The Switch can consolidate log messages and send log messages in batches to make this mechanism more efficient.

29.11.1.4 Configuring ARP Inspection

Follow these steps to configure ARP inspection on the Switch.

- 1 Configure DHCP snooping.

Note: It is recommended you enable DHCP snooping at least one day before you enable ARP inspection so that the Switch has enough time to build the binding table.

- 2 Enable ARP inspection on each VLAN.
- 3 Configure trusted and untrusted ports, and specify the maximum number of ARP packets that each port can receive per second.

CHAPTER 30

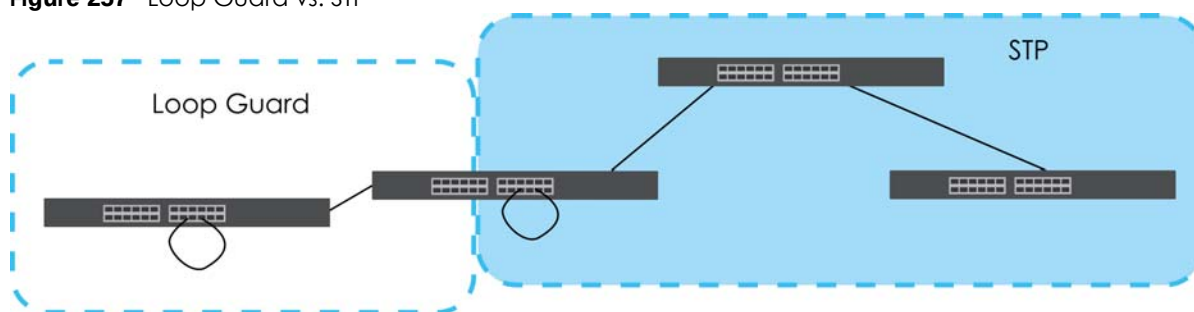
Loop Guard

30.1 Loop Guard Overview

This chapter shows you how to configure the Switch to guard against loops on the edge of your network.

Loop guard allows you to configure the Switch to shut down a port if it detects that packets sent out on that port loop back to the Switch. While you can use Spanning Tree Protocol (STP) to prevent loops in the core of your network, STP cannot prevent loops that occur on the edge of your network.

Figure 257 Loop Guard vs. STP



Refer to [Section 30.1.2 on page 342](#) for more information.

30.1.1 What You Can Do

Use the **Loop Guard** screen ([Section 30.2 on page 344](#)) to enable loop guard on the Switch and in specific ports.

30.1.2 What You Need to Know

Loop guard is designed to handle loop problems on the edge of your network. This can occur when a port is connected to a Switch that is in a loop state. Loop state occurs as a result of human error. It happens when two ports on a switch are connected with the same cable. When a switch in loop state sends out broadcast messages the messages loop back to the switch and are re-broadcast again and again causing a broadcast storm.

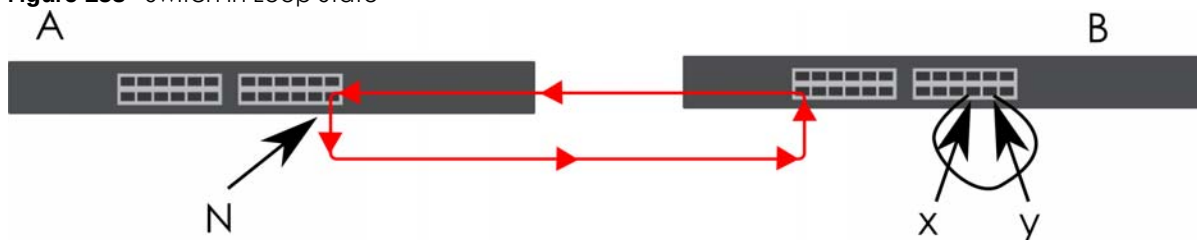
If a switch (not in loop state) connects to a switch in loop state, then it will be affected by the switch in loop state in the following way:

- The switch (not in loop state) will receive broadcast messages sent out from the switch in loop state.
- The switch (not in loop state) will receive its own broadcast messages that it sends out as they loop back. It will then re-broadcast those messages again.

The following figure shows port **N** on switch **A** connected to switch **B**. Switch **B** has two ports, **x** and **y**, mistakenly connected to each other. It forms a loop. When broadcast or multicast packets leave port **N**

and reach switch **B**, they are sent back to port **N** on **A** as they are rebroadcast from **B**.

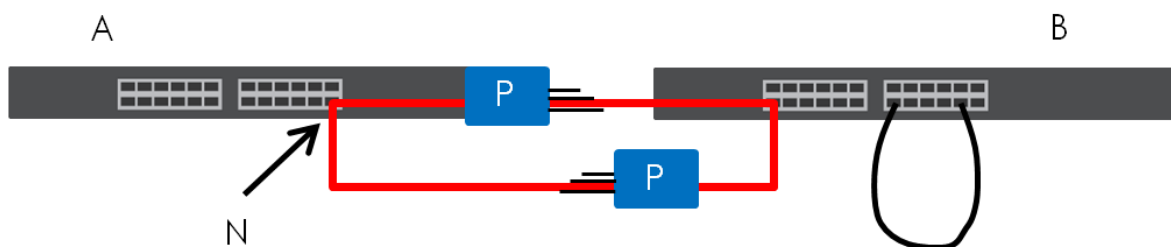
Figure 258 Switch in Loop State



The loop guard feature checks to see if a loop guard enabled port is connected to a Switch in loop state. This is accomplished by periodically sending a probe packet and seeing if the packet returns on the same port. If this is the case, the Switch will shut down the port connected to the switch in loop state.

Loop guard can be enabled on both Ethernet ports. The following figure shows a loop guard enabled port **N** on switch **A** sending a probe packet **P** to switch **B**. Since switch **B** is in loop state, the probe packet **P** returns to port **N** on **A**. The Switch then shuts down port **N** to ensure that the rest of the network is not affected by the switch in loop state.

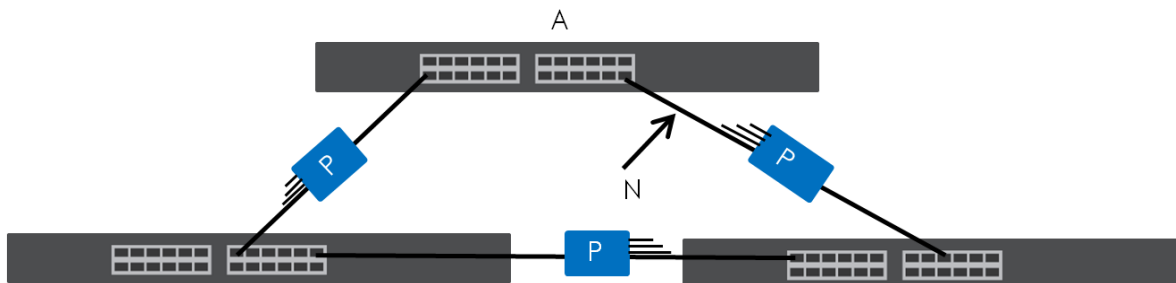
Figure 259 Loop Guard – Probe Packet



The Switch also shuts down port **N** if the probe packet returns to switch **A** on any other port. In other words loop guard also protects against standard network loops.

The following figure illustrates three switches forming a loop. A sample path of the loop guard probe packet is also shown. In this example, the probe packet is sent from port **N** and returns on another port. As long as loop guard is enabled on port **N**. The Switch will shut down port **N** if it detects that the probe packet has returned to the Switch.

Figure 260 Loop Guard – Network Loop



Note: After resolving the loop problem on your network you can re-activate the disabled port via the Web Configurator (see [Section 8.7 on page 104](#)) or via commands (See the CLI Reference Guide).

30.2 Loop Guard Setup

Click **Advanced Application > Loop Guard** in the navigation panel to display the screen as shown.

Note: The loop guard feature cannot be enabled on the ports that have Spanning Tree Protocol (RSTP, MRSTP or MSTP) enabled.

Figure 261 Advanced Application > Loop Guard (Standalone Mode)

Loop Guard

Active☐

Port	Active
*	☐
1	☐
2	☐
3	☐
4	☐
5	☐
6	☐
7	☐
8	☐
9	☐

ApplyCancel

Figure 262 Advanced Application > Loop Guard (Stacking Mode)

Loop Guard

Active☐

SLOT 1 ▾

Port	Active
1/*	☐
1/1	☐
1/2	☐
1/3	☐
1/4	☐
1/5	☐
1/6	☐
1/7	☐
1/8	☐
1/9	☐
1/10	☐
1/11	☐

ApplyCancel

The following table describes the labels in this screen.

Table 145 Advanced Application > Loop Guard

LABEL	DESCRIPTION
Active	Select this option to enable loop guard on the Switch. The Switch generates syslog, internal log messages as well as SNMP traps when it shuts down a port via the loop guard feature.
SLOT	This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack.
Port	This field displays the port number. In stacking mode, the first number represents the slot ID and the second is the port number. Please note that the default stacking ports (the last four ports of your Switch) cannot be configured. They are reserved for stacking only.
*	Settings in this row apply to all ports. Use this row only if you want to make some settings the same for all ports. Use this row first to set the common settings and then make adjustments on a port-by-port basis. Note: Changes in this row are copied to all the ports as soon as you make them.
Active	Select this check box to enable the loop guard feature on this port. The Switch sends broadcast and multicast probe packets from this port to check if the switch it is connected to is in loop state. If the switch that this port is connected is in loop state the Switch will shut down this port. Clear this check box to disable the loop guard feature.
Apply	Click Apply to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to begin configuring this screen afresh.

CHAPTER 31

VLAN Mapping

This chapter shows you how to configure VLAN mapping on the Switch.

31.1 VLAN Mapping Overview

With VLAN mapping enabled, the Switch can map the VLAN ID and priority level of packets received from a private network to those used in the service provider's network.

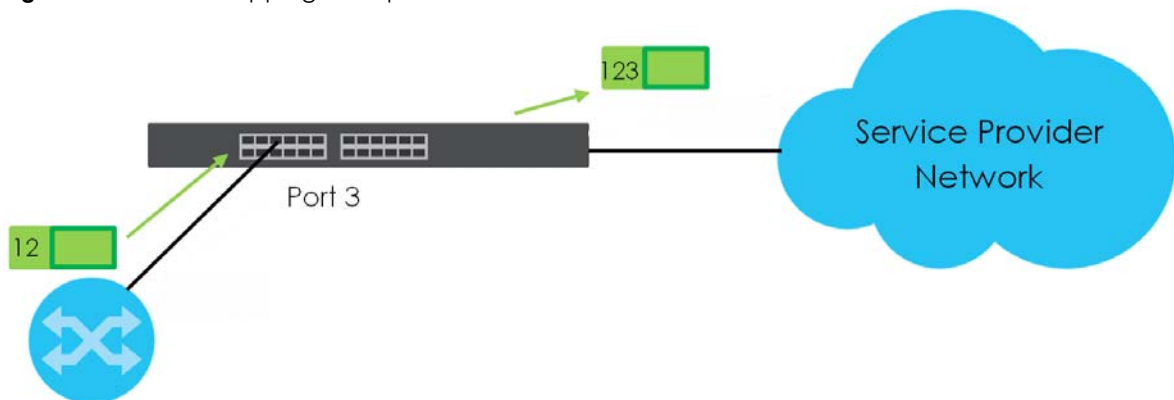
The Switch checks incoming traffic from the switch ports (non-management ports) against the VLAN mapping table first, the MAC learning table and then the VLAN table before forwarding them through the Gigabit uplink port. When VLAN mapping is enabled, the Switch discards the tagged packets that do not match an entry in the VLAN mapping table. If the incoming packets are untagged, the Switch adds a PVID based on the VLAN setting.

Note: You cannot enable VLAN mapping and VLAN stacking at the same time.

31.1.1 VLAN Mapping Example

In the following example figure, packets that carry VLAN ID 12 and are received on port 3 match a pre-configured VLAN mapping rule. The Switch translates the VLAN ID from 12 into 123 before forwarding the packets. Any packets carrying a VLAN tag other than 12 (such as 10) and received on port 3 will be dropped.

Figure 263 VLAN Mapping Example



31.1.2 What You Can Do

- Use the **VLAN Mapping** screen ([Section 31.2 on page 347](#)) to enable VLAN mapping on the Switch and ports.
- Use the **VLAN Mapping Configure** screen ([Section 31.2.1 on page 348](#)) to enable and edit the VLAN mapping rules.

31.2 Enable VLAN Mapping

Click **Advanced Application** and then **VLAN Mapping** in the navigation panel to display the screen as shown.

Figure 264 Advanced Application > VLAN Mapping (Standalone Mode)

Port	Active
*	☐
1	☒
2	☒
3	☒
4	☒
5	☒
6	☒
7	☒
8	☒
9	☐
10	☐

Figure 265 Advanced Application > VLAN Mapping (Stacking Mode)

SLOT 1 ▼

Port	Active
1/*	☐
1/1	☐
1/2	☐
1/3	☐
1/4	☐
1/5	☐
1/6	☐
1/7	☐
1/8	☐
1/9	☐
1/10	☐

The following table describes the labels in this screen.

Table 146 Advanced Application > VLAN Mapping

LABEL	DESCRIPTION
Active	Select this option to enable VLAN mapping on the Switch.
SLOT	This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack.
Port	This field displays the port number. In stacking mode, the first number represents the slot ID and the second is the port number. Please note that the default stacking ports (the last four ports of your Switch) cannot be configured. They are reserved for stacking only.
*	Settings in this row apply to all ports. Use this row only if you want to make some settings the same for all ports. Use this row first to set the common settings and then make adjustments on a port-by-port basis. Note: Changes in this row are copied to all the ports as soon as you make them.
Active	Select this check box to enable the VLAN mapping feature on this port. Clear this check box to disable the VLAN mapping feature.
Apply	Click Apply to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to begin configuring this screen afresh.

31.2.1 VLAN Mapping Configure

Click the **VLAN Mapping Configure** link in the **VLAN Mapping** screen to display the screen as shown. Use this screen to enable and edit the VLAN mapping rules.

Figure 266 Advanced Application > VLAN Mapping > VLAN Mapping Configuration (Standalone Mode)

The screenshot shows the 'VLAN Mapping Configure' screen. At the top, there is a header bar with 'VLAN Mapping Configure' on the left and a link 'VLAN Mapping' on the right. Below the header is a form with the following fields:

- Active: ☐
- Name:
- Port:
- VID:
- Translated VID:
- Priority:

Below the form are two buttons: 'Add' and 'Cancel'. Below the buttons is a table with the following columns: Index, Active, Name, Port, VID, Translated VID, Priority, and a checkbox. The table contains five rows of data:

Index	Active	Name	Port	VID	Translated VID	Priority	
1	Yes	10 to 100	1	10	100	0	☐
2	Yes	10 to 100	2	10	100	0	☐
3	Yes	20 to 100	3	20	100	0	☐
4	Yes	20 to 100	4	20	100	0	☐
5	Yes	30 to 100	30	30	100	0	☐

At the bottom of the table are two buttons: 'Delete' and 'Cancel'.

Figure 267 Advanced Application > VLAN Mapping > VLAN Mapping Configuration (Stacking Mode)

The screenshot shows the 'VLAN Mapping Configure' window. At the top, there's a header with 'VLAN Mapping Configure' and a link to 'VLAN Mapping'. The main area contains a form with the following fields: 'Active' with a checkbox, 'Name' with a text input, 'Port' with a dropdown menu showing '1' and a text input, 'VID' with a text input, 'Translated VID' with a text input, and 'Priority' with a dropdown menu showing '0'. Below the form are 'Add' and 'Cancel' buttons. Underneath is a table with columns: 'Index', 'Active', 'Name', 'Port', 'VID', 'Translated VID', 'Priority', and a checkbox. Below the table are 'Delete' and 'Cancel' buttons.

The following table describes the labels in this screen.

Table 147 Advanced Application > VLAN Mapping > VLAN Mapping Configuration

LABEL	DESCRIPTION
Active	Check this box to activate this rule.
Name	Enter a descriptive name (up to 32 printable ASCII characters) for identification purposes.
Port	Type a port to be included in this rule. In stacking mode, the first field is the slot ID and the second field is the port number.
VID	Enter a VLAN ID from 1 to 4094. This is the VLAN tag carried in the packets and will be translated into the VID you specified in the Translated VID field.
Translated VID	Enter a VLAN ID (from 1 to 4094) into which the customer VID carried in the packets will be translated.
Priority	Select a priority level (from 0 to 7). This is the priority level that replaces the customer priority level in the tagged packets or adds to the untagged packets.
Add	Click this to create a new entry or to update an existing one. This saves your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to reset the fields to your previous configuration.
Index	This is the number of the VLAN mapping entry in the table. Click on an index number to change the settings.
Active	This shows whether this entry is activated or not.
Name	This is the descriptive name for this rule.
Port	This is the port number to which this rule is applied.
VID	This is the customer VLAN ID in the incoming packets.
Translated VID	This is the VLAN ID that replaces the customer VLAN ID in the tagged packets.
Priority	This is the priority level that replaces the customer priority level in the tagged packets.
	Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries.
Delete	Check the rules that you want to remove in the Delete column and then click the Delete button.
Cancel	Click Cancel to clear the Delete check boxes.

CHAPTER 32

Layer 2 Protocol Tunneling

32.1 Layer 2 Protocol Tunneling Overview

This chapter shows you how to configure layer 2 protocol tunneling on the Switch.

32.1.1 What You Can Do

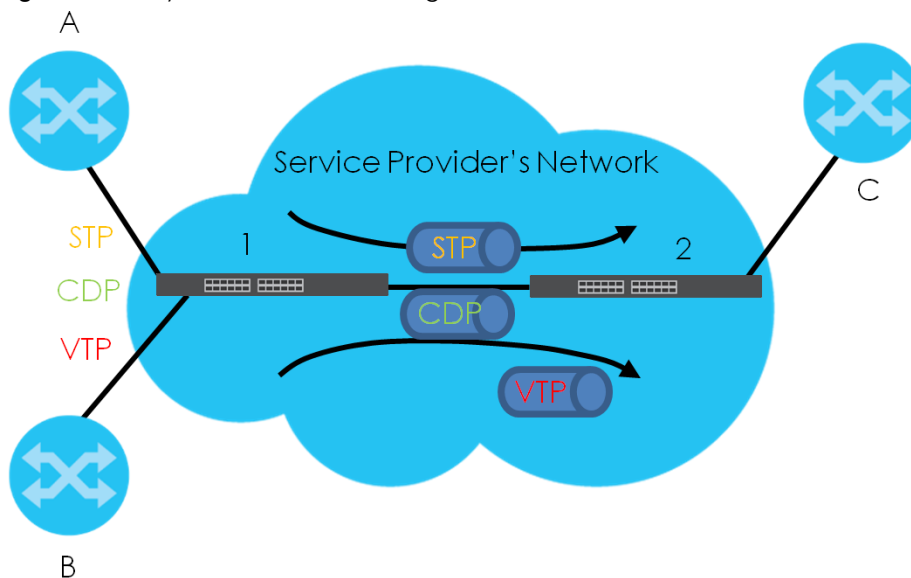
Use the **Layer 2 Protocol Tunnel** screen ([Section 32.2 on page 351](#)) to enable layer 2 protocol tunneling on the Switch and specify a MAC address with which the Switch uses to encapsulate the layer 2 protocol packets by replacing the destination MAC address in the packets.

32.1.2 What You Need to Know

Layer 2 protocol tunneling (L2PT) is used on the service provider's edge devices.

L2PT allows edge switches (**1** and **2** in the following figure) to tunnel layer 2 STP (Spanning Tree Protocol), CDP (Cisco Discovery Protocol) and VTP (VLAN Trunking Protocol) packets between customer switches (**A**, **B** and **C** in the following figure) connected through the service provider's network. The edge switch encapsulates layer 2 protocol packets with a specific MAC address before sending them across the service provider's network to other edge switches.

Figure 268 Layer 2 Protocol Tunneling Network Scenario

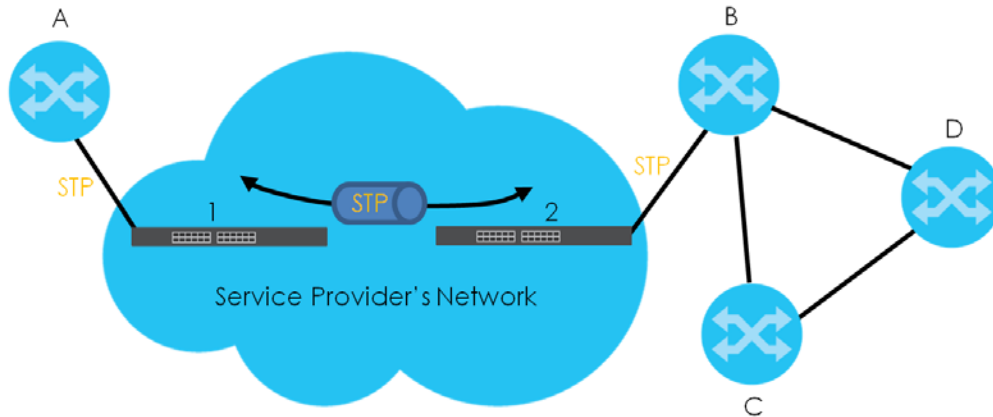


In the following example, if you enable L2PT for STP, you can have switches **A**, **B**, **C** and **D** in the same

spanning tree, even though switch **A** is not directly connected to switches **B**, **C** and **D**. Topology change information can be propagated throughout the service provider's network.

To emulate a point-to-point topology between two customer switches at different sites, such as **A** and **B**, you can enable protocol tunneling on edge switches **1** and **2** for PAgP (Port Aggregation Protocol), LACP or UDLD (Uni-Directional Link Detection).

Figure 269 L2PT Network Example



32.1.2.1 Layer 2 Protocol Tunneling Mode

Each port can have two layer 2 protocol tunneling modes, **Access** and **Tunnel**.

- The **Access** port is an ingress port on the service provider's edge device (**1** or **2** in [Figure 269 on page 351](#)) and connected to a customer switch (**A** or **B**). Incoming layer 2 protocol packets received on an access port are encapsulated and forwarded to the tunnel ports.
- The **Tunnel** port is an egress port at the edge of the service provider's network and connected to another service provider's switch. Incoming encapsulated layer 2 protocol packets received on a tunnel port are decapsulated and sent to an access port.

32.2 Configuring Layer 2 Protocol Tunneling

Click **Advanced Application > Layer 2 Protocol Tunneling** in the navigation panel to display the screen as shown.

Figure 270 Advanced Application > Layer 2 Protocol Tunneling (Standalone Mode)

Layer 2 Protocol Tunnel							
Active	☐						
Destination MAC Address	00:00:00:00:00:00						
Port	CDP	STP	VTP	PAGP	Point to Point LACP	UDLD	Mode
*	☐	☐	☐	☐	☐	☐	Access ▾
1	☐	☐	☐	☐	☐	☐	Access ▾
2	☐	☐	☐	☐	☐	☐	Access ▾
3	☐	☐	☐	☐	☐	☐	Access ▾
4	☐	☐	☐	☐	☐	☐	Access ▾
5	☐	☐	☐	☐	☐	☐	Access ▾
6	☐	☐	☐	☐	☐	☐	Access ▾
7	☐	☐	☐	☐	☐	☐	Access ▾
8	☐	☐	☐	☐	☐	☐	Access ▾
9	☐	☐	☐	☐	☐	☐	Access ▾

Figure 271 Advanced Application > Layer 2 Protocol Tunneling (Stacking Mode)

Layer 2 Protocol Tunnel							
Active	☐						
Destination MAC Address	00:00:00:00:00:00						
SLOT 1 ▾							
Port	CDP	STP	VTP	PAGP	Point to Point LACP	UDLD	Mode
1/*	☐	☐	☐	☐	☐	☐	Access ▾
1/1	☐	☐	☐	☐	☐	☐	Access ▾
1/2	☐	☐	☐	☐	☐	☐	Access ▾
1/3	☐	☐	☐	☐	☐	☐	Access ▾
1/4	☐	☐	☐	☐	☐	☐	Access ▾
1/5	☐	☐	☐	☐	☐	☐	Access ▾
1/6	☐	☐	☐	☐	☐	☐	Access ▾
1/7	☐	☐	☐	☐	☐	☐	Access ▾
1/8	☐	☐	☐	☐	☐	☐	Access ▾
1/9	☐	☐	☐	☐	☐	☐	Access ▾

The following table describes the labels in this screen.

Table 148 Advanced Application > Layer 2 Protocol Tunneling

LABEL	DESCRIPTION
Active	Select this to enable layer 2 protocol tunneling on the Switch.
Destination MAC Address	Specify a MAC address with which the Switch uses to encapsulate the layer 2 protocol packets by replacing the destination MAC address in the packets. Note: The MAC address can be either a unicast MAC address or multicast MAC address. If you use a unicast MAC address, make sure the MAC address does not exist in the address table of a switch on the service provider's network. Note: All the edge switches in the service provider's network should be set to use the same MAC address for encapsulation.
SLOT	This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack.
Port	This field displays the port number. In stacking mode, the first number represents the slot ID and the second is the port number. Please note that the default stacking ports (the last four ports of your Switch) cannot be configured. They are reserved for stacking only.
*	Use this row to make the setting the same for all ports. Use this row first and then make adjustments on a port-by-port basis. Note: Changes in this row are copied to all the ports as soon as you make them.
CDP	Select this option to have the Switch tunnel CDP (Cisco Discovery Protocol) packets so that other Cisco devices can be discovered through the service provider's network.
STP	Select this option to have the Switch tunnel STP (Spanning Tree Protocol) packets so that STP can run properly across the service provider's network and spanning trees can be set up based on bridge information from all (local and remote) networks.
VTP	Select this option to have the Switch tunnel VTP (VLAN Trunking Protocol) packets so that all customer switches can use consistent VLAN configuration through the service provider's network.
Point to Point	The Switch supports PAgP (Port Aggregation Protocol), LACP (Link Aggregation Control Protocol) and UDLD (UniDirectional Link Detection) tunneling for a point-to-point topology. Both PAgP and UDLD are Cisco's proprietary data link layer protocols. PAgP is similar to LACP and used to set up a logical aggregation of Ethernet ports automatically. UDLD is to determine the link's physical status and detect a unidirectional link.
PAGP	Select this option to have the Switch send PAgP packets to a peer to automatically negotiate and build a logical port aggregation.
LACP	Select this option to have the Switch send LACP packets to a peer to dynamically creates and manages trunk groups.
UDLD	Select this option to have the Switch send UDLD packets to a peer's port it connected to monitor the physical status of a link.
Mode	Select Access to have the Switch encapsulate the incoming layer 2 protocol packets and forward them to the tunnel ports. Select Access for ingress ports at the edge of the service provider's network. Note: You can enable L2PT services for STP, LACP, VTP, CDP, UDLD, and PAGP on the access ports only. Select Tunnel for egress ports at the edge of the service provider's network. The Switch decapsulates the encapsulated layer 2 protocol packets received on a tunnel port by changing the destination MAC address to the original one, and then forward them to an access port. If the services is not enabled on an access port, the protocol packets are dropped.

Table 148 Advanced Application > Layer 2 Protocol Tunneling (continued)

LABEL	DESCRIPTION
Apply	Click Apply to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to begin configuring this screen afresh.

CHAPTER 33

sFlow

This chapter shows you how to configure sFlow to have the Switch monitor traffic in a network and send information to an sFlow collector for analysis.

33.1 sFlow Overview

sFlow (RFC 3176) is a standard technology for monitoring switched networks. An sFlow agent embedded on a switch or router gets sample data and packet statistics from traffic forwarded through its ports. The sFlow agent then creates sFlow data and sends it to an sFlow collector. The sFlow collector is a server that collects and analyzes sFlow datagram. An sFlow datagram includes packet header, input and output interface, sampling process parameters and forwarding information.

sFlow minimizes impact on CPU load of the Switch as it analyzes sample data only. sFlow can continuously monitor network traffic and create reports for network performance analysis and troubleshooting. For example, you can use it to know which IP address or which type of traffic caused network congestion.

Figure 272 sFlow Application



33.2 sFlow Port Configuration

Click **Advanced Application** > **sFlow** in the navigation panel to display the screen as shown.

Figure 273 Advanced Application > sFlow (Standalone Mode)

sFlow [Collector](#)

Active ☐

Apply Cancel

Port	Active	Sample-rate	poll-interval	Collector Address
*	☐			
1	☐	32768	120	
2	☐	32768	120	
3	☐	32768	120	
4	☐	32768	120	
5	☐	32768	120	
6	☐	32768	120	
7	☐	32768	120	
8	☐	32768	120	
9	☐	32768	120	
10	☐	32768	120	
11	☐	32768	120	
12	☐	32768	120	

Apply Cancel

Figure 274 Advanced Application > sFlow (Stacking Mode)

sFlow [Collector](#)

Active ☐

Apply Cancel

SLOT 1 ▼

Port	Active	Sample-rate	poll-interval	Collector Address
1/*	☐			
1/1	☐	32768	120	
1/2	☐	32768	120	
1/3	☐	32768	120	
1/4	☐	32768	120	
1/5	☐	32768	120	
1/6	☐	32768	120	
1/7	☐	32768	120	
1/8	☐	32768	120	
1/9	☐	32768	120	

Apply Cancel

The following table describes the labels in this screen.

Table 149 Advanced Application > sFlow

LABEL	DESCRIPTION
Active	Select this to enable the sFlow agent on the Switch.
Apply	Click Apply to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to begin configuring this screen afresh.
SLOT	This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack.

Table 149 Advanced Application > sFlow (continued)

LABEL	DESCRIPTION
Port	This field displays the port number. In stacking mode, the first number represents the slot ID and the second is the port number. Please note that the default stacking ports (the last four ports of your Switch) cannot be configured. They are reserved for stacking only.
*	Settings in this row apply to all ports. Use this row only if you want to make some settings the same for all ports. Use this row first to set the common settings and then make adjustments on a port-by-port basis. Note: Changes in this row are copied to all the ports as soon as you make them.
Active	Select this to allow the Switch to monitor traffic on this port and generate and send sFlow datagram to the specified collector.
Sample-rate	Enter a number (N) from 256 to 65535. The Switch captures every one out of N packets for this port and creates sFlow datagram.
poll-interval	Specify a time interval (from 20 to 120 in seconds) the Switch waits before sending the sFlow datagram and packet counters for this port to the collector.
Collector Address	Enter the IP address of the sFlow collector. Note: You must have the sFlow collector already configured in the sFlow > Collector screen. The sFlow collector does not need to be in the same subnet as the Switch, but it must be accessible from the Switch. Note: Configure UDP port 6343 (the default) on a NAT router to allow port forwarding if the collector is behind a NAT router. Configure a firewall rule for UDP port 6343 (the default) to allow incoming traffic if the collector is behind a firewall.
Apply	Click Apply to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to begin configuring this screen afresh.

33.2.1 sFlow Collector Configuration

Click the **Collector** link in the **sFlow** screen to display the screen as shown. You can configure up to four sFlow collectors in this screen. You may want to configure more than one collector if the traffic load to be monitored is more than one collector can manage.

Figure 275 Advanced Application > sFlow > Collector

The screenshot shows the 'sFlow Collector' configuration interface. At the top, there's a 'sFlow' header with a 'Port' link. Below it, the 'Collector' section contains two input fields: 'Collector Address' with the value '0.0.0.0' and 'UDP Port' with the value '6343'. Underneath these fields are three buttons: 'Add', 'Cancel', and 'Clear'. At the bottom of the screen, there is a table with columns 'Index', 'Collector Address', and 'UDP Port', and a 'Delete' button.

The following table describes the labels in this screen.

Table 150 Advanced Application > sFlow > Collector

LABEL	DESCRIPTION
Collector Address	Enter the IP address of the sFlow collector.
UDP Port	Enter a UDP port number the Switch uses to send sFlow datagram to the collector. If you change the port here, make sure you change it on the collector, too. The default port is 6343.
Add	Click this to create a new entry or to update an existing one. This saves your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to reset the fields to your previous configuration.
Clear	Click Clear to reset the fields to the factory defaults.
Index	This field displays the index number of this entry. Click on an index number to change the settings.
Collector Address	This field displays IP address of the sFlow collector.
UDP Port	This field displays port number the Switch uses to send sFlow datagram to the collector.
	Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries.
Delete	Check the rules that you want to remove in the Delete column and then click the Delete button.
Cancel	Click Cancel to begin configuring this screen afresh.

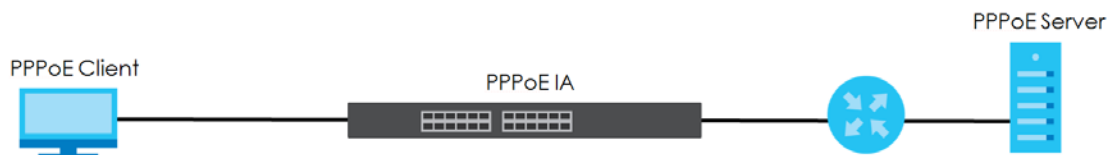
CHAPTER 34

PPPoE

34.1 PPPoE Intermediate Agent Overview

This chapter describes how the Switch gives a PPPoE termination server additional information that the server can use to identify and authenticate a PPPoE client.

A PPPoE Intermediate Agent (PPPoE IA) is deployed between a PPPoE server and PPPoE clients. It helps the PPPoE server identify and authenticate clients by adding subscriber line specific information to PPPoE discovery packets from clients on a per-port or per-port-per-VLAN basis before forwarding them to the PPPoE server.



34.1.1 What You Can Do

- Use the **PPPoE** screen ([Section 34.2 on page 361](#)) to display the main PPPoE screen.
- Use the **Intermediate Agent** screen ([Section 34.3 on page 362](#)) to enable the PPPoE Intermediate Agent on the Switch.
- Use the **PPPoE IA Per-Port** screen ([Section 34.3.1 on page 363](#)) to set the port state and configure PPPoE intermediate agent sub-options on a per-port basis.
- Use the **PPPoE IA Per-Port Per-VLAN** screen ([Section 34.3.2 on page 365](#)) to configure PPPoE IA settings that apply to a specific VLAN on a port.
- Use the **PPPoE IA for VLAN** ([Section 34.3.3 on page 366](#)) to enable the PPPoE Intermediate Agent on a VLAN.

34.1.2 What You Need to Know

Read on for concepts on ARP that can help you configure the screen in this chapter.

34.1.2.1 PPPoE Intermediate Agent Tag Format

If the PPPoE Intermediate Agent is enabled, the Switch adds a vendor-specific tag to PADI (PPPoE Active Discovery Initialization) and PADR (PPPoE Active Discovery Request) packets from PPPoE clients.

This tag is defined in RFC 2516 and has the following format for this feature.

Table 151 PPPoE Intermediate Agent Vendor-specific Tag Format

Tag_Type (0x0105)	Tag_Len	Value	i1	i2

The Tag_Type is 0x0105 for vendor-specific tags, as defined in RFC 2516. The Tag_Len indicates the length of Value, i1 and i2. The Value is the 32-bit number 0x00000DE9, which stands for the "ADSL Forum" IANA entry. i1 and i2 are PPPoE intermediate agent sub-options, which contain additional information about the PPPoE client.

34.1.2.2 Sub-Option Format

There are two types of sub-option: "Agent Circuit ID Sub-option" and "Agent Remote ID Sub-option". They have the following formats.

Table 152 PPPoE IA Circuit ID Sub-option Format: User-defined String

SubOpt	Length	Value
0x01 (1 byte)	N (1 byte)	String (63 bytes)

Table 153 PPPoE IA Remote ID Sub-option Format

SubOpt	Length	Value
0x02 (1 byte)	N (1 byte)	MAC Address or String (63 bytes)

The 1 in the first field identifies this as an Agent Circuit ID sub-option and 2 identifies this as an Agent Remote ID sub-option. The next field specifies the length of the field. The Switch takes the Circuit ID string you manually configure for a VLAN on a port as the highest priority and the Circuit ID string for a port as the second priority. In addition, the Switch puts the PPPoE client's MAC address into the Agent Remote ID Sub-option if you do not specify any user-defined string.

Flexible Circuit ID Syntax with Identifier String and Variables

If you do not configure a Circuit ID string for a VLAN on a specific port or for a specific port, the Switch adds the user-defined identifier string and variables into the Agent Circuit ID Sub-option. The variables can be the slot ID of the PPPoE client, the port number of the PPPoE client and/or the VLAN ID on the PPPoE packet.

The identifier-string, slot ID, port number and VLAN ID are separated from each other by a pound key (#), semi-colon (;), period (.), comma (,), forward slash (/) or space. An Agent Circuit ID Sub-option example is "Switch/07/0123" and indicates the PPPoE packets come from a PPPoE client which is connected to the Switch's port 7 and belong to VLAN 123.

Table 154 PPPoE IA Circuit ID Sub-option Format: Using Identifier String and Variables

SubOpt	Length	Value						
0x01 (1 byte)	N (1 byte)	Identifier String (53 byte)	delimiter (1 byte)	Slot ID (1 byte)	delimiter (1 byte)	Port No (2 byte)	delimiter (1 byte)	VLAN ID (4 bytes)

WT-101 Default Circuit ID Syntax

If you do not configure a Circuit ID string for a specific VLAN on a port or for a specific port, and disable the flexible Circuit ID syntax in the **PPPoE > Intermediate Agent** screen, the Switch automatically generates a Circuit ID string according to the default Circuit ID syntax which is defined in the DSL Forum Working Text (WT)-101. The default access node identifier is the host name of the PPPoE intermediate agent and the eth indicates "Ethernet".

Table 155 PPPoE IA Circuit ID Sub-option Format: Defined in WT-101

SubOpt	Length	Value								
0x01 (1 byte)	N (1 byte)	Access Node Identifier (20 byte)	Space (1 byte)	eth (3 byte)	Space (1 byte)	Slot ID (1 byte)	/ (1 byte)	Port No (2 byte)	: (1 byte)	VLAN ID (4 bytes)

34.1.2.3 Port State

Every port is either a trusted port or an untrusted port for the PPPoE intermediate agent. This setting is independent of the trusted or untrusted setting for DHCP snooping or ARP inspection. You can also specify the agent sub-options (circuit ID and remote ID) that the Switch adds to PADI and PADR packets from PPPoE clients.

Trusted ports are connected to PPPoE servers.

- If a PADO (PPPoE Active Discovery Offer), PADS (PPPoE Active Discovery Session-confirmation), or PADT (PPPoE Active Discovery Terminate) packet is sent from a PPPoE server and received on a trusted port, the Switch forwards it to all other ports.
- If a PADI or PADR packet is sent from a PPPoE client but received on a trusted port, the Switch forwards it to other trusted ports.

Note: The Switch will drop all PPPoE discovery packets if you enable the PPPoE intermediate agent and there are no trusted ports.

Untrusted ports are connected to subscribers.

- If a PADI, PADR, or PADT packet is sent from a PPPoE client and received on an untrusted port, the Switch adds a vendor-specific tag to the packet and then forwards it to the trusted ports.
- The Switch discards PADO and PADS packets which are sent from a PPPoE server but received on an untrusted port.

34.2 PPPoE

Use this screen to configure the PPPoE Intermediate Agent on the Switch.

Click **Advanced Application > PPPoE** in the navigation panel to display the screen as shown. Click **Click Here** to go to the **Intermediate Agent** screen.

Figure 276 Advanced Application > PPPoE > Intermediate Agent



34.3 PPPoE Intermediate Agent

Use this screen to configure the Switch to give a PPPoE termination server additional subscriber information that the server can use to identify and authenticate a PPPoE client.

Click **Advanced Application > PPPoE > Intermediate Agent** in the navigation panel to display the screen as shown.

Figure 277 Advanced Application > PPPoE > Intermediate Agent

The following table describes the labels in this screen.

Table 156 Advanced Application > PPPoE > Intermediate Agent

LABEL	DESCRIPTION
Active	Select this option to enable the PPPoE intermediate agent globally on the Switch.
access-node-identifier	Enter up to 20 ASCII characters to identify the PPPoE intermediate agent. Hyphens (–) and spaces are also allowed. The default is the Switch's host name.
circuit-id	Use this section to configure the Circuit ID field in the PADI and PADR packets. The Circuit ID you configure for a specific port or for a specific VLAN on a port has priority over this. The Circuit ID you configure for a specific port (in the Advanced Application > PPPoE > Intermediate Agent > Port screen) or for a specific VLAN on a port (in the Advanced Application > PPPoE > Intermediate Agent > Port > VLAN screen) has priority over this. That means, if you also want to configure PPPoE IA Per-Port or Per-Port Per-VLAN setting, leave the fields here empty and configure circuit-id and remote-id in the Per-Port or Per-Port Per-VLAN screen.
Active	Select this option to have the Switch add the user-defined identifier string and variables (specified in the option field) to PADI or PADR packets from PPPoE clients. If you leave this option unselected and do not configure any Circuit ID string (using CLI commands) on the Switch, the Switch will use the string specified in the access-node-identifier field.
identifier-string	Specify a string that the Switch adds in the Agent Circuit ID sub-option. You can enter up to 53 ASCII characters. Spaces are allowed.
option	Select the variables that you want the Switch to generate and add in the Agent Circuit ID sub-option. The variable options include sp , sv , pv and spv which indicate combinations of slot-port, slot-VLAN, port-VLAN and slot-port-VLAN respectively. The Switch enters a zero into the PADI and PADR packets for the slot value.
delimiter	Select a delimiter to separate the identifier-string, slot ID, port number and/or VLAN ID from each other. You can use a pound key (#), semi-colon (;), period (.), comma (,), forward slash (/) or space.

Table 156 Advanced Application > PPPoE > Intermediate Agent (continued)

LABEL	DESCRIPTION
Apply	Click Apply to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to begin configuring this screen afresh.

34.3.1 PPPoE IA Per-Port

Use this screen to specify whether individual ports are trusted or untrusted ports and have the Switch add extra information to PPPoE discovery packets from PPPoE clients on a per-port basis.

Note: The Switch will drop all PPPoE packets if you enable the PPPoE Intermediate Agent on the Switch and there are no trusted ports.

Click the **Port** link in the **Intermediate Agent** screen to display the screen as shown.

Figure 278 Advanced Application > PPPoE > Intermediate Agent > Port (Standalone Mode)

Port	Server Trusted State	Circuit-id	Remote-id
*	Untrusted ▾		
1	Untrusted ▾		
2	Untrusted ▾		
3	Untrusted ▾		
4	Untrusted ▾		
5	Untrusted ▾		
6	Untrusted ▾		
7	Untrusted ▾		
8	Untrusted ▾		
9	Untrusted ▾		

Apply Cancel

Figure 279 Advanced Application > PPPoE > Intermediate Agent > Port (Stacking Mode)

Port	Server Trusted State	Circuit-id	Remote-id
1/*	Untrusted ▼		
1/1	Untrusted ▼		
1/2	Untrusted ▼		
1/3	Untrusted ▼		
1/4	Untrusted ▼		
1/5	Untrusted ▼		
1/6	Untrusted ▼		
1/7	Untrusted ▼		
1/8	Untrusted ▼		
1/9	Untrusted ▼		
1/10	Untrusted ▼		
1/11	Untrusted ▼		

Apply Cancel

The following table describes the labels in this screen.

Table 157 Advanced Application > PPPoE > Intermediate Agent > Port

LABEL	DESCRIPTION
SLOT	This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack.
Port	This field displays the port number. In stacking mode, the first number represents the slot ID and the second is the port number. Please note that the default stacking ports (the last four ports of your Switch) cannot be configured. They are reserved for stacking only.
*	Use this row to make the setting the same for all ports. Use this row first and then make adjustments on a port-by-port basis. Changes in this row are copied to all the ports as soon as you make them.
Server Trusted State	Select whether this port is a trusted port (Trusted) or an untrusted port (Untrusted). Trusted ports are uplink ports connected to PPPoE servers. If a PADO (PPPoE Active Discovery Offer), PADS (PPPoE Active Discovery Session-confirmation), or PADT (PPPoE Active Discovery Terminate) packet is sent from a PPPoE server and received on a trusted port, the Switch forwards it to all other ports. If a PADI or PADR packet is sent from a PPPoE client but received on a trusted port, the Switch forwards it to other trusted ports. Untrusted ports are downlink ports connected to subscribers. If a PADI, PADR, or PADT packet is sent from a PPPoE client and received on an untrusted port, the Switch adds a vendor-specific tag to the packet and then forwards it to the trusted ports. The Switch discards PADO and PADS packets which are sent from a PPPoE server but received on an untrusted port.
Circuit-id	Enter a string of up to 63 ASCII characters that the Switch adds into the Agent Circuit ID sub-option for PPPoE discovery packets received on this port. Spaces are allowed. The Circuit ID you configure for a specific VLAN on a port (in the Advanced Application > PPPoE > Intermediate Agent > Port > VLAN screen) has the highest priority.

Table 157 Advanced Application > PPPoE > Intermediate Agent > Port (continued)

LABEL	DESCRIPTION
Remote-id	Enter a string of up to 63 ASCII characters that the Switch adds into the Agent Remote ID sub-option for PPPoE discovery packets received on this port. Spaces are allowed. If you do not specify a string here or in the Remote-id field for a VLAN on a port, the Switch automatically uses the PPPoE client's MAC address. The Remote ID you configure for a specific VLAN on a port (in the Advanced Application > PPPoE > Intermediate Agent > Port > VLAN screen) has the highest priority.
Apply	Click Apply to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to begin configuring this screen afresh.

34.3.2 PPPoE IA Per-Port Per-VLAN

Use this screen to configure PPPoE IA settings that apply to a specific VLAN on a port.

Click the **VLAN** link in the **Intermediate Agent > Port** screen to display the screen as shown.

Figure 280 Advanced Application > PPPoE > Intermediate Agent > Port > VLAN (Standalone Mode)

Figure 281 Advanced Application > PPPoE > Intermediate Agent > Port > VLAN (Stacking Mode)

The following table describes the labels in this screen.

Table 158 Advanced Application > PPPoE > Intermediate Agent > Port > VLAN

LABEL	DESCRIPTION
Show Port	Enter a port number to show the PPPoE Intermediate Agent settings for the specified VLANs on the port. In stacking mode, the first field is the slot ID and the second field is the port number.
Show VLAN	Use this section to specify the VLANs you want to configure in the section below.

Table 158 Advanced Application > PPPoE > Intermediate Agent > Port > VLAN (continued)

LABEL	DESCRIPTION
Start VID	Enter the lowest VLAN ID you want to configure in the section below.
End VID	Enter the highest VLAN ID you want to configure in the section below.
Apply	Click Apply to display the specified range of VLANs in the section below.
Port	This field displays the port number specified above.
Slot / Port	In stacking mode, it displays the slot ID and port number specified above.
VID	This field displays the VLAN ID of each VLAN in the range specified above. If you configure the * VLAN, the settings are applied to all VLANs.
*	Use this row to make the setting the same for all VLANs. Use this row first and then make adjustments on a VLAN-by-VLAN basis. Changes in this row are copied to all the VLANs as soon as you make them.
Circuit-id	Enter a string of up to 63 ASCII characters that the Switch adds into the Agent Circuit ID sub-option for this VLAN on the specified port. Spaces are allowed. The Circuit ID you configure here has the highest priority.
Remote-id	Enter a string of up to 63 ASCII characters that the Switch adds into the Agent Remote ID sub-option for this VLAN on the specified port. Spaces are allowed. If you do not specify a string here or in the Remote-id field for a specific port, the Switch automatically uses the PPPoE client's MAC address. The Remote ID you configure here has the highest priority.
Apply	Click Apply to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to begin configuring this screen afresh.

34.3.3 PPPoE IA for VLAN

Use this screen to set whether the PPPoE Intermediate Agent is enabled on a VLAN and whether the Switch appends the Circuit ID and/or Remote ID to PPPoE discovery packets from a specific VLAN.

Click the **VLAN** link in the **Intermediate Agent** screen to display the screen as shown.

Figure 282 Advanced Application > PPPoE > Intermediate Agent > VLAN

VID	Enabled	Circuit-id	Remote-id
*	No		

The following table describes the labels in this screen.

Table 159 Advanced Application > PPPoE > Intermediate Agent > VLAN

LABEL	DESCRIPTION
Show VLAN	Use this section to specify the VLANs you want to configure in the section below.
Start VID	Enter the lowest VLAN ID you want to configure in the section below.
End VID	Enter the highest VLAN ID you want to configure in the section below.
Apply	Click Apply to display the specified range of VLANs in the section below.
VID	This field displays the VLAN ID of each VLAN in the range specified above. If you configure the * VLAN, the settings are applied to all VLANs.
*	Use this row to make the setting the same for all VLANs. Use this row first and then make adjustments on a VLAN-by-VLAN basis. Changes in this row are copied to all the VLANs as soon as you make them.
Enabled	Select this option to turn on the PPPoE Intermediate Agent on a VLAN.
Circuit-id	Select this option to make the Circuit ID settings for a specific VLAN take effect.
Remote-id	Select this option to make the Remote ID settings for a specific VLAN take effect.
Apply	Click Apply to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to begin configuring this screen afresh.

CHAPTER 35

Error Disable

35.1 Error Disable Overview

This chapter shows you how to configure the rate limit for control packets on a port, and set the Switch to take an action (such as to shut down a port or stop sending packets) on a port when the Switch detects a pre-configured error. It also shows you how to configure the Switch to automatically undo the action after the error is gone.

35.1.1 CPU Protection Overview

Switches exchange protocol control packets in a network to get the latest networking information. If a switch receives large numbers of control packets, such as ARP, BPDU or IGMP packets, which are to be processed by the CPU, the CPU may become overloaded and be unable to handle regular tasks properly.

The CPU protection feature allows you to limit the rate of ARP, BPDU and IGMP packets to be delivered to the CPU on a port. This enhances the CPU efficiency and protects against potential DoS attacks or errors from other networks. You then can choose to drop control packets that exceed the specified rate limit or disable a port on which the packets are received.

35.1.2 Error-Disable Recovery Overview

Some features, such as loop guard or CPU protection, allow the Switch to shut down a port or discard specific packets on a port when an error is detected on the port. For example, if the Switch detects that packets sent out the ports loop back to the Switch, the Switch can shut down the ports automatically. After that, you need to enable the ports or allow the packets on a port manually via the Web Configurator or the commands. With error-disable recovery, you can set the disabled ports to become active or start receiving the packets again after the time interval you specify.

35.1.3 What You Can Do

- Use the **Errdisable Status** screen ([Section 35.3 on page 369](#)) to view whether the Switch detected that control packets exceeded the rate limit configured for a port or a port is disabled according to the feature requirements and what action you configure, and related information.
- Use the **CPU Protection** screen ([Section 35.4 on page 371](#)) to limit the maximum number of control packets (ARP, BPDU and/or IGMP) that the Switch can receive or transmit on a port.
- Use the **Errdisable Detect** screen ([Section 35.5 on page 373](#)) to have the Switch detect whether the control packets exceed the rate limit configured for a port and configure the action to take once the limit is exceeded.
- Use the **Errdisable Recovery** screen ([Section 35.6 on page 374](#)) to set the Switch to automatically undo an action after the error is gone.

35.2 Error Disable Settings

Use this screen to go to the screens where you can configure error disable related settings. Click **Advanced Application > Errdisable** in the navigation panel to open the following screen.

Figure 283 Advanced Application > Errdisable

Errdisable	
Errdisable Status	Click here
CPU protection	Click here
Errdisable Detect	Click here
Errdisable Recovery	Click here

The following table describes the labels in this screen.

Table 160 Advanced Application > Errdisable

LABEL	DESCRIPTION
Errdisable Status	Click this link to view whether the Switch detected that control packets exceeded the rate limit configured for a port or a port is disabled according to the feature requirements and what action you configure, and related information.
CPU protection	Click this link to limit the maximum number of control packets (ARP, BPDU and/or IGMP) that the Switch can receive or transmit on a port.
Errdisable Detect	Click this link to have the Switch detect whether the control packets exceed the rate limit configured for a port and configure the action to take once the limit is exceeded.
Errdisable Recovery	Click this link to set the Switch to automatically undo an action after the error is gone.

35.3 Error-Disable Status

Use this screen to view whether the Switch detected that control packets exceeded the rate limit configured for a port or a port is disabled according to the feature requirements and what action you configure, and related information. Click the **Click here** link next to **Errdisable Status** in the **Advanced Application > Errdisable** screen to display the screen as shown.

Figure 284 Advanced Application > Errdisable > Errdisable Status (Standalone Mode)

Errdisable Status

Inactive-reason mode reset

Port List

Cause

ARP ▼

Reset

Errdisable Status

Port	Cause	Active	Mode	Rate	Status	Recovery Time Left (secs)	Total Dropped
1	Loop Guard	NO	inactive-port	-	Forwarding	-	-
	ARP	NO	inactive-port	0	Forwarding	-	-
	BPDU	NO	inactive-port	0	Forwarding	-	-
	IGMP	NO	inactive-port	0	Forwarding	-	-
	Anti-arpscan	NO	inactive-port	-	Forwarding	-	-
	BPDU Guard	NO	inactive-port	-	Forwarding	-	-
2	ZULD	NO	inactive-port	-	Forwarding	-	-
	Loop Guard	NO	inactive-port	-	Forwarding	-	-
	ARP	NO	inactive-port	0	Forwarding	-	-
	BPDU	NO	inactive-port	0	Forwarding	-	-
	IGMP	NO	inactive-port	0	Forwarding	-	-
	Anti-arpscan	NO	inactive-port	-	Forwarding	-	-
3	BPDU Guard	NO	inactive-port	-	Forwarding	-	-
	ZULD	NO	inactive-port	-	Forwarding	-	-
	Loop Guard	NO	inactive-port	-	Forwarding	-	-
	ARP	NO	inactive-port	0	Forwarding	-	-
	BPDU	NO	inactive-port	0	Forwarding	-	-
	IGMP	NO	inactive-port	0	Forwarding	-	-
4	Anti-arpscan	NO	inactive-port	-	Forwarding	-	-
	BPDU Guard	NO	inactive-port	-	Forwarding	-	-
	ZULD	NO	inactive-port	-	Forwarding	-	-

Figure 285 Advanced Application > Errdisable > Errdisable Status (Stacking Mode)

Errdisable Status

Inactive-reason mode reset

Port List

Cause

ARP

Reset

Errdisable Status

SLOT 1

Port	Cause	Active	Mode	Rate	Status	Recovery Time Left (secs)	Total Dropped
1/1	Loop Guard	NO	inactive-port	-	Forwarding	-	-
	ARP	NO	inactive-port	0	Forwarding	-	-
	BPDU	NO	inactive-port	0	Forwarding	-	-
	IGMP	NO	inactive-port	0	Forwarding	-	-
	Anti-arpscan	NO	inactive-port	-	Forwarding	-	-
	BPDU Guard	NO	inactive-port	-	Forwarding	-	-
1/2	ZULD	NO	inactive-port	-	Forwarding	-	-
	Loop Guard	NO	inactive-port	-	Forwarding	-	-
	ARP	NO	inactive-port	0	Forwarding	-	-
	BPDU	NO	inactive-port	0	Forwarding	-	-
	IGMP	NO	inactive-port	0	Forwarding	-	-
	Anti-arpscan	NO	inactive-port	-	Forwarding	-	-
1/3	BPDU Guard	NO	inactive-port	-	Forwarding	-	-
	ZULD	NO	inactive-port	-	Forwarding	-	-
	Loop Guard	NO	inactive-port	-	Forwarding	-	-
	ARP	NO	inactive-port	0	Forwarding	-	-
	BPDU	NO	inactive-port	0	Forwarding	-	-
	IGMP	NO	inactive-port	0	Forwarding	-	-
1/4	Anti-arpscan	NO	inactive-port	-	Forwarding	-	-
	BPDU Guard	NO	inactive-port	-	Forwarding	-	-
	ZULD	NO	inactive-port	-	Forwarding	-	-
	Loop Guard	NO	inactive-port	-	Forwarding	-	-
	ARP	NO	inactive-port	0	Forwarding	-	-
	BPDU	NO	inactive-port	0	Forwarding	-	-

The following table describes the labels in this screen.

Table 161 Advanced Application > Errdisable > Errdisable Status

LABEL	DESCRIPTION
Inactive-reason mode reset	
Port List	Enter the number of the ports (separated by a comma) on which you want to reset inactive-reason status. In stacking mode, the first number represents the slot and the second the port number. Enter 1/1–1/24,2/23 for ports 1 to 24 for the Switch in slot 1 and port 23 for the Switch in slot 2, for example.
Cause	Select the cause of inactive-reason mode you want to reset here.
Reset	Press to reset the specified ports to handle ARP, BPDU or IGMP packets instead of ignoring them, if the ports is in inactive-reason mode.
Errdisable Status	
SLOT	This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack.
Port	This field displays the port number. In stacking mode, the first number represents the slot ID and the second is the port number. Please note that the default stacking ports (the last four ports of your Switch) cannot be configured. They are reserved for stacking only.
Cause	This displays the type of the control packet received on the port or the feature enabled on the port and causing the Switch to take the specified action.
Active	This field displays whether the control packets (ARP, BPDU, and/or IGMP) on the port is being detected or not. It also shows whether loop guard, anti-arp scanning, BPDU guard or ZULD is enabled on the port.
Mode	This field shows the action that the Switch takes for the cause. • inactive-port – The Switch disables the port. • inactive-reason – The Switch drops all the specified control packets (such as BPDU) on the port. • rate-limitation – The Switch drops the additional control packets the ports has to handle in every one second.
Rate	This field displays how many control packets this port can receive or transmit per second. It can be adjusted in CPU Protection . 0 means no rate limit.
Status	This field displays the errdisable status • Forwarding: The Switch is forwarding packets. Rate-limitation mode is always in Forwarding status. • Err-disable: The Switch disables the port on which the control packets are received (inactive-port) or drops specified control packets on the port (inactive-reason).
Recovery Time Left (secs)	This field displays the time (seconds) left before the ports becomes active of Errdisable Recovery.
Total Dropped	This field displays the total packet number dropped by this port where the packet rate exceeds the rate of mode rate-limitation.

35.4 CPU Protection Configuration

Use this screen to limit the maximum number of control packets (ARP, BPDU and/or IGMP) that the Switch can receive or transmit on a port. Click the **Click Here** link next to **CPU protection** in the **Advanced Application > Errdisable** screen to display the screen as shown.

Note: After you configure this screen, make sure you also enable error detection for the specific control packets in the **Advanced Application > Errdisable > Errdisable Detect** screen.

Figure 286 Advanced Application > Errdisable > CPU protection (Standalone Mode)

CPU protection Errdisable

Reason: ARP ▼

Port	Rate Limit (pkt/s)
*	0
1	0
2	0
3	0
4	0
5	0
6	0
7	0
8	0
9	0

Apply Cancel

Figure 287 Advanced Application > Errdisable > CPU protection (Stacking Mode)

CPU protection Errdisable

Reason: ARP ▼

SLOT 1 ▼

Port	Rate Limit (pkt/s)
1/*	0
1/1	0
1/2	0
1/3	0
1/4	0
1/5	0
1/6	0
1/7	0
1/8	0
1/9	0
1/10	0
1/11	0

Apply Cancel

The following table describes the labels in this screen.

Table 162 Advanced Application > Errdisable > CPU protection

LABEL	DESCRIPTION
Reason	Select the type of control packet you want to configure here.
SLOT	This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack.

Table 162 Advanced Application > Errdisable > CPU protection (continued)

LABEL	DESCRIPTION
Port	This field displays the port number. In stacking mode, the first number represents the slot ID and the second is the port number. Please note that the default stacking ports (the last four ports of your Switch) cannot be configured. They are reserved for stacking only.
*	Use this row to make the setting the same for all ports. Use this row first and then make adjustments to each port if necessary. Changes in this row are copied to all the ports as soon as you make them.
Rate Limit (pkt/s)	Enter a number from 0 to 256 to specify how many control packets this port can receive or transmit per second. 0 means no rate limit. You can configure the action that the Switch takes when the limit is exceeded.
Apply	Click Apply to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to begin configuring this screen afresh.

35.5 Error-Disable Detect Configuration

Use this screen to have the Switch detect whether the control packets exceed the rate limit configured for a port and configure the action to take once the limit is exceeded. Click the **Click Here** link next to **Errdisable Detect** link in the **Advanced Application > Errdisable** screen to display the screen as shown.

Figure 288 Advanced Application > Errdisable > Errdisable Detect

Cause	Active	Mode
*	☐	inactive-port ▼
ARP	☐	inactive-port ▼
BPDU	☐	inactive-port ▼
IGMP	☐	inactive-port ▼

Apply Cancel

The following table describes the labels in this screen.

Table 163 Advanced Application > Errdisable > Errdisable Detect

LABEL	DESCRIPTION
Cause	This field displays the types of control packet that may cause CPU overload.
*	Use this row to make the setting the same for all entries. Use this row first and then make adjustments to each entry if necessary. Changes in this row are copied to all the entries as soon as you make them.
Active	Select this option to have the Switch detect if the configured rate limit for a specific control packet is exceeded and take the action selected below.

Table 163 Advanced Application > Errdisable > Errdisable Detect (continued)

LABEL	DESCRIPTION
Mode	Select the action that the Switch takes when the number of control packets exceed the rate limit on a port, set in the Advanced Application > Errdisable > CPU protection screen. inactive-port – The Switch disables the port on which the control packets are received. inactive-reason – The Switch drops all the specified control packets (such as BPDU) on the port. rate-limitation – The Switch drops the additional control packets the ports has to handle in every one second.
Apply	Click Apply to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to begin configuring this screen afresh.

35.6 Error-Disable Recovery Configuration

Use this screen to configure the Switch to automatically undo an action after the error is gone. Click the **Click Here** link next to **Errdisable Recovery** in the **Advanced Application > Errdisable** screen to display the screen as shown.

Figure 289 Advanced Application > Errdisable > Errdisable Recovery

Reason	Timer Status	Interval
*	☐	
loopguard	☐	300
ARP	☐	300
BPDU	☐	300
IGMP	☐	300
anti-arp scan	☐	300
bpduguard	☐	300
zuld	☐	300

The following table describes the labels in this screen.

Table 164 Advanced Application > Errdisable > Errdisable Recovery

LABEL	DESCRIPTION
Active	Select this option to turn on the error-disable recovery function on the Switch.
Reason	This field displays the supported features that allow the Switch to shut down a port or discard packets on a port according to the feature requirements and what action you configure.
*	Use this row to make the setting the same for all entries. Use this row first and then make adjustments to each entry if necessary. Changes in this row are copied to all the entries as soon as you make them.

Table 164 Advanced Application > Errdisable > Errdisable Recovery (continued)

LABEL	DESCRIPTION
Timer Status	Select this check box to allow the Switch to wait for the specified time interval to activate a port or allow specific packets on a port, after the error was gone. Clear the check box to turn off this rule.
Interval	Enter the number of seconds (from 30 to 2592000) for the time interval.
Apply	Click Apply to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to begin configuring this screen afresh.

CHAPTER 36

VLAN Isolation

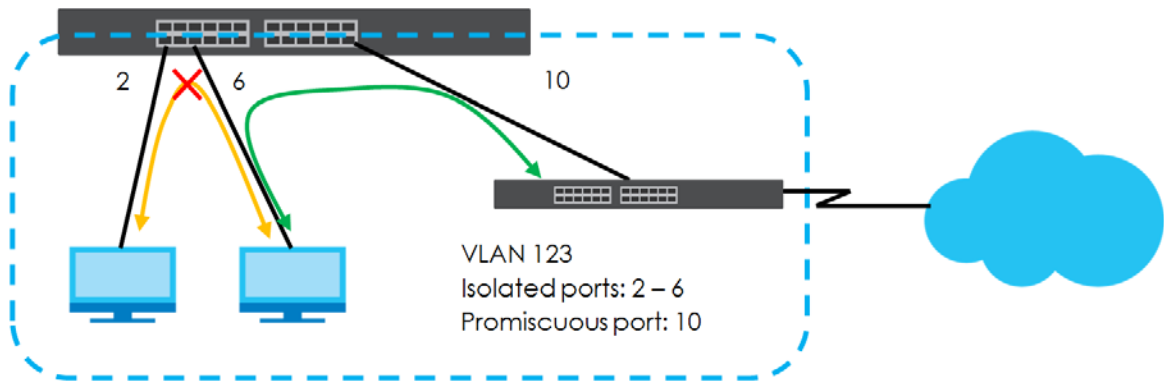
This chapter shows you how to configure the Switch to prevent communications between ports in a VLAN.

36.1 VLAN Isolation Overview

Vlan Isolation allows you to do port isolation within a VLAN in a simple way. You specify which ports in a VLAN is not isolated by adding it to the promiscuous port list. The Switch automatically adds other ports in this VLAN to the isolated port list and blocks traffic between the isolated ports. A promiscuous port can communicate with any port in the same VLAN. An isolated port can communicate with the promiscuous ports only.

Note: You can have up to one VLAN Isolation rule for each VLAN.

Figure 290 VLAN Isolation Example



Note: Make sure you keep at least one port in the promiscuous port list for a VLAN with VLAN Isolation enabled. Otherwise, this VLAN is blocked from the whole network.

36.2 Configuring VLAN Isolation

Click **Advanced Application > Vlan Isolation** in the navigation panel to display the screen as shown.

Figure 291 Advanced Application > VLAN Isolation

VLAN Isolation

Active ☐

Name

VLAN ID

Promiscuous Ports

[Add](#) [Cancel](#) [Clear](#)

Index	Active	Name	VLAN	Promiscuous Ports	☐
Delete Cancel					

The following table describes the labels in this screen.

Table 165 Advanced Application > VLAN Isolation

LABEL	DESCRIPTION
Active	Check this box to enable VLAN Isolation in a VLAN.
Name	Enter a descriptive name (up to 32 printable ASCII characters) for identification purposes.
VLAN ID	Enter a VLAN ID from 1 to 4094. This is the VLAN to which this rule applies.
Promiscuous Ports	Enter the number of the ports that can communicate with any ports in the same VLAN. Other ports belonging to this VLAN will be added to the isolation list and can only send and receive traffic from the ports you specify here.
Add	Click Add to insert the entry in the summary table below and save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to reset the fields to your previous configuration.
Clear	Click Clear to clear the fields to the factory defaults.
Index	This is the index number of the rule.
Active	This shows whether this rule is activated or not.
Name	This is the descriptive name for this rule.
VLAN	This is the VLAN to which this rule is applied.
Promiscuous Ports	This shows the ports that can communicate with any ports in the same VLAN.
	Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries.
Delete	Check the rules that you want to remove and then click the Delete button.
Cancel	Click Cancel to clear the check boxes.

CHAPTER 37

MAC Pinning

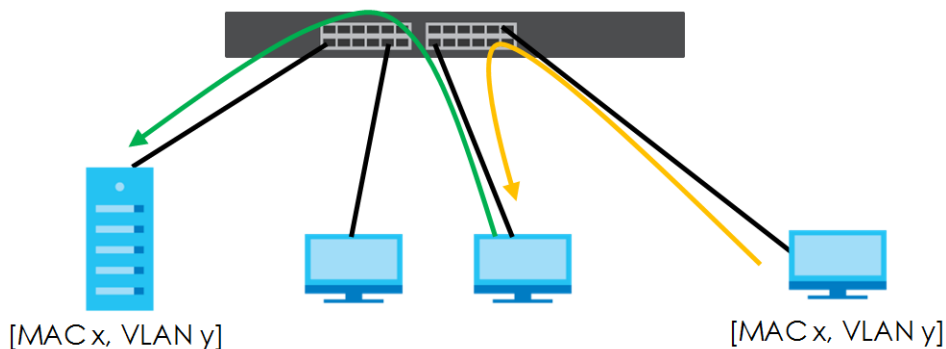
This chapter shows you how to configure MAC pinning on the Switch.

37.1 MAC Pinning Overview

When the Switch obtains a connected device's MAC address, it adds an entry in the MAC address forwarding table and uses the table to determine how to forward frames. In addition to the source MAC address of a received frame, the Switch also learns the VLAN to which the device belongs and the port on which the frame is received. If the Switch learns the same MAC address and same VLAN ID on another port, it updates the MAC address table immediately.

MAC pinning allows you to set a port or multiple ports to have priority over other ports in MAC address learning. That means when a MAC address (and VLAN ID) is learned on a MAC-pinning-enabled port, the MAC address will not be learned on any other port until the aging time for the dynamically learned MAC address in the table expires.

This helps enhance security. For example, when an attacker (**A**) sends packets to all connected clients by spoofing the source MAC address of a server (**B**) connected to one of the Switch's ports, on which MAC pinning is enabled, the responses from clients will still be forwarded to the server according to the Switch's MAC forwarding table.



37.2 MAC Pinning Configuration

Use this screen to enable MAC pinning on the Switch and on specific ports. Click **Advanced Application > MAC Pinning** in the navigation panel to open the following screen.

Figure 292 Advanced Application > MAC Pinning (Standalone Mode)

MAC Pinning

Active ☐

Port	Active
*	☐
1	☐
2	☐
3	☐
4	☐
5	☐
6	☐
7	☐
8	☐
9	☐
10	☐
11	☐
12	☐
13	☐

Apply Cancel

Figure 293 Advanced Application > MAC Pinning (Stacking Mode)

MAC Pinning

Active ☐

SLOT 1 ▼

Port	Active
1/*	☐
1/1	☐
1/2	☐
1/3	☐
1/4	☐
1/5	☐
1/6	☐
1/7	☐
1/8	☐
1/9	☐
1/10	☐
1/11	☐
1/12	☐

Apply Cancel

The following table describes the labels in this screen.

Table 166 Advanced Application > MAC Pinning

LABEL	DESCRIPTION
Active	Select this option to turn on the MAC pinning function on the Switch.
SLOT	This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack.
Port	This field displays the port number. In stacking mode, the first number represents the slot ID and the second is the port number. Please note that the default stacking ports (the last four ports of your Switch) cannot be configured. They are reserved for stacking only.

Table 166 Advanced Application > MAC Pinning (continued)

LABEL	DESCRIPTION
*	Settings in this row apply to all ports. Use this row only if you want to make some settings the same for all ports. Use this row first to set the common settings and then make adjustments on a port-by-port basis. Note: Changes in this row are copied to all the ports as soon as you make them.
Active	Select this check box to enable MAC pinning on this port. The port then has priority over other ports in MAC address learning. Clear this check box to disable MAC pinning.
Apply	Click Apply to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to begin configuring this screen afresh.

CHAPTER 38

Private VLAN

38.1 Private VLAN Overview

Use private VLAN if you want you to block traffic between ports in the same VLAN. **Community** and **Isolated** VLANs are secondary private VLANs that must be associated with a **Primary** private VLAN.

- **Primary:** Ports in a **Primary** VLAN are promiscuous and they can communicate with all promiscuous ports in the same primary VLAN, and all ports in associated community and isolated VLANs. They cannot communicate with ports in different primary VLANs.
- **Community:** Ports in a **Community** VLAN can communicate with promiscuous ports in an associated **Primary** VLAN and other community ports in the same **Community** VLAN. They cannot communicate with ports in **Isolated** VLANs, non-associated **Primary** VLAN promiscuous ports nor community ports in different **Community** VLANs.
- **Isolated:** Ports in an **Isolated** VLAN can communicate with promiscuous ports in an associated **Primary** VLAN only. They cannot communicate with other isolated ports in the same **Isolated** VLAN, non-associated **Primary** VLAN promiscuous ports nor any community ports.

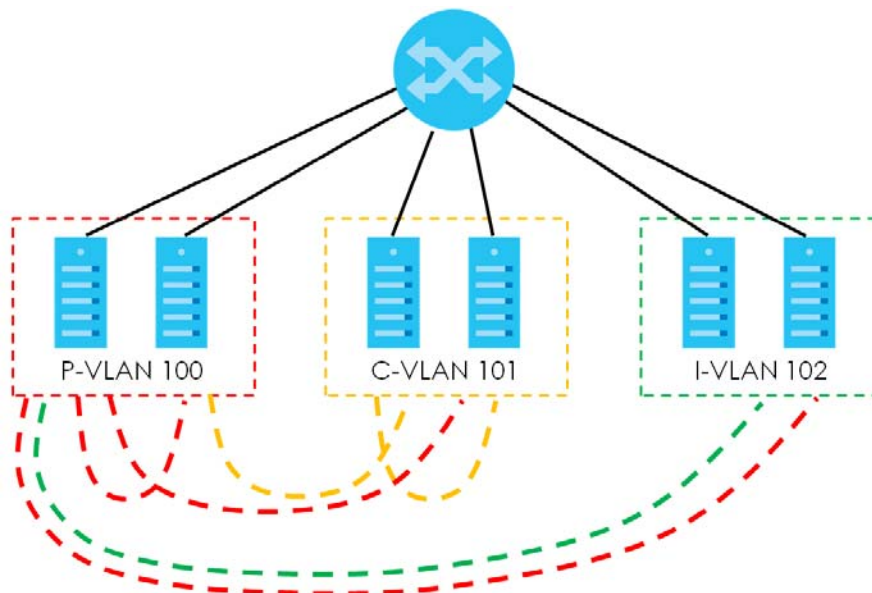


Table 167 PVLAN Graphic Key

LABEL	DESCRIPTION
P-VLAN 100	Primary private VLAN
C-VLAN 101	Community private VLAN
I-VLAN 102	Isolated private VLAN

Tagged Private VLANs can span switches but trunking ports must be VLAN-trunking ports – see

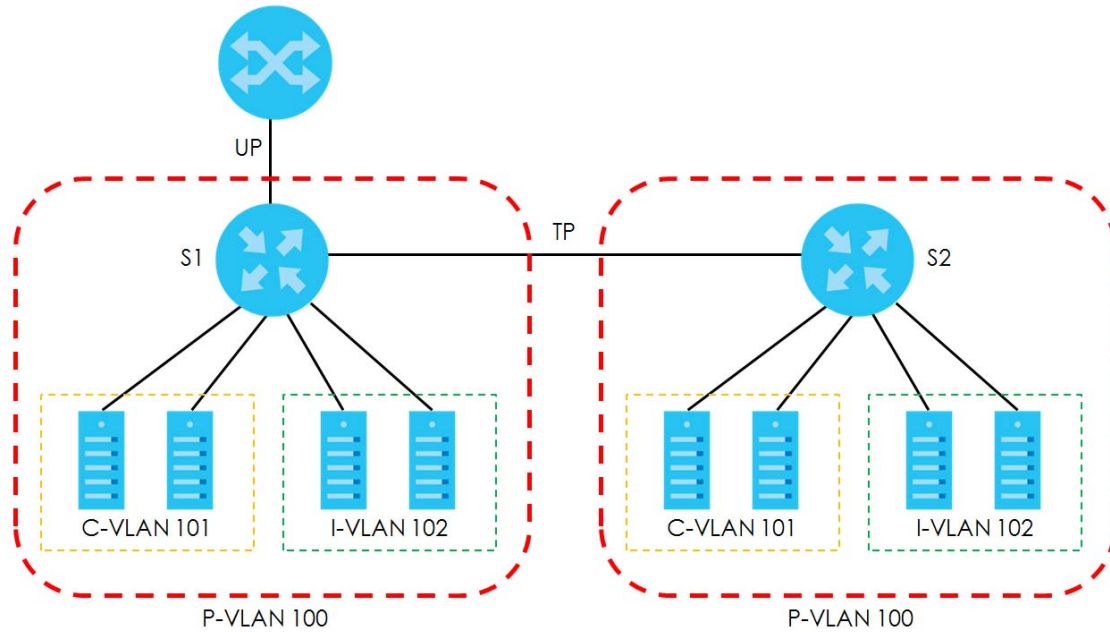


Table 168 Spanning PVLAN Graphic Key

LABEL	DESCRIPTION
UP	Uplink promiscuous port
TP	VLAN-trunking ports
S1, S2	Switch 1, Switch 2
P-VLAN 100	Primary private VLAN with VLAN ID tag of 100
C-VLAN 101	Community private VLAN with VLAN ID tag of 101
I-VLAN 102	Isolated private VLAN with VLAN ID tag of 102

This is the communication process if primary VLAN **P-VLAN 100** is associated with community VLAN **C-VLAN 101** and isolated VLAN **I-VLAN 102**.

- Promiscuous ports in **P-VLAN 100** can communicate with all ports in **P-VLAN 100** including community ports in **C-VLAN 101** and isolated ports in **I-VLAN 102**.
- Community ports in **C-VLAN 101** can communicate with promiscuous ports in **P-VLAN 100** and other community ports in **C-VLAN 101**. They cannot communicate with isolated ports in **I-VLAN 102**.
- Isolated ports can communicate with promiscuous ports in **P-VLAN 100**. They cannot communicate with other isolated ports in **I-VLAN 102** nor community ports in **C-VLAN 101**.

Note: **Isolation** in **VLAN > VLAN Port Setting** has a higher priority than private VLAN settings, so promiscuous ports with **Isolation** in **VLAN > VLAN Port Setting** enabled will not be able to communicate with each other.

38.1.1 Configuration

You must go to the **Static VLAN** screen first to create VLAN IDs for **Primary**, **Isolated** or **Community** VLANs.

Click **Advanced Application > Private VLAN** to display the following screen.

Figure 294 Advanced Application > Private VLAN (Standalone Mode)

Private VLAN				
Port	Mode	Associated VLAN	Tagged	
*	Normal ▼			☐
1	Normal ▼	0		☐
2	Normal ▼	0		☐
3	Normal ▼	0		☐
4	Normal ▼	0		☐
5	Normal ▼	0		☐
6	Normal ▼	0		☐
7	Normal ▼	0		☐
8	Normal ▼	0		☐
9	Normal ▼	0		☐
10	Normal ▼	0		☐
11	Normal ▼	0		☐
12	Normal ▼	0		☐
13	Normal ▼	0		☐
14	Normal ▼	0		☐

Apply Cancel

Figure 295 Advanced Application > Private VLAN (Stacking Mode)

Private VLAN				
SLOT 1 ▼				
Port	Mode	Associated VLAN	Tagged	
1/*	Normal ▼			☐
1/1	Normal ▼	0		☐
1/2	Normal ▼	0		☐
1/3	Normal ▼	0		☐
1/4	Normal ▼	0		☐
1/5	Normal ▼	0		☐
1/6	Normal ▼	0		☐
1/7	Normal ▼	0		☐
1/8	Normal ▼	0		☐
1/9	Normal ▼	0		☐
1/10	Normal ▼	0		☐
1/11	Normal ▼	0		☐

Apply Cancel

The following table describes the labels in this screen.

Table 169 Advanced Application > Private VLAN

LABEL	DESCRIPTION
SLOT	This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack.
Port	This field displays the port number. In stacking mode, the first number represents the slot ID and the second is the port number. Please note that the default stacking ports (the last four ports of your Switch) cannot be configured. They are reserved for stacking only.
*	Settings in this row apply to all ports. Use this row only if you want to make some settings the same for all ports. Use this row first to set the common settings and then make adjustments on a port-by-port basis. Note: Changes in this row are copied to all the ports as soon as you make them.

Table 169 Advanced Application > Private VLAN (continued)

LABEL	DESCRIPTION
Mode	This is the type of VLAN mapped to this port. • Normal: These are ports in a static VLAN. This is not a private VLAN. • Promiscuous: Ports in a Primary VLAN are Promiscuous. They can communicate with all ports in the Primary VLAN and associated Community and Isolated VLANs. They cannot communicate with Promiscuous ports in different primary VLANs. • Community: Ports in a Community VLAN can communicate with Promiscuous ports in an associated Primary VLAN and other community ports in the same Community VLAN. They cannot communicate with ports in an Isolated VLAN, non-associated Primary VLAN Promiscuous ports nor Community ports in different Community VLANs. • Isolated: Ports in an Isolated VLAN can communicate with Promiscuous ports in an associated Primary VLAN only. They cannot communicate with other Isolated ports in the same Isolated VLAN, non-associated Primary VLAN Promiscuous ports nor any Community ports.
Associated VLAN	Enter the VLAN ID of a previously created VLAN here. Note: The VLAN ID and Mode selected here must be the same as the VLAN ID and VLAN Type created in Advanced Application > VLAN > Static VLAN.
Tagged	A VLAN ID tag identifies VLAN membership of a frame across switches. Select this if the VLAN includes ports on multiple switches. The Switch forwards tagged frames through this port; it adds the PVID to untagged frames before sending them out. Clear this if the VLAN includes ports on this Switch only. The Switch forwards untagged frames through this port; it removes the VLAN ID from tagged frames before sending them out.
Apply	Click Apply to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to begin configuring this screen afresh.

CHAPTER 39

Green Ethernet

This chapter shows you how to configure the Switch to reduce the power consumed by switch ports.

39.1 Green Ethernet Overview

Green Ethernet reduces switch port power consumption in the following ways.

IEEE 802.3az Energy Efficient Ethernet (EEE)

If EEE is enabled, both sides of a link support EEE and there is no traffic, the port enters Low Power Idle (LPI) mode. LPI mode turns off some functions of the physical layer (becomes quiet) to save power. Periodically the port transmits a REFRESH signal to allow the link partner to keep the link alive. When there is traffic to be sent, a WAKE signal is sent to the link partner to return the link to active mode.

Auto Power Down

Auto Power Down turns off almost all functions of the port's physical layer functions when the link is down, so the port only uses power to check for a link up pulse from the link partner. After the link up pulse is detected, the port wakes up from **Auto Power Down** and operates normally.

Short Reach

Traditional Ethernet transmits all data with enough power to reach the maximum cable length. Shorter cables lose less power, so **Short Reach** saves power by adjusting the transmit power of each port according to the length of cable attached to that port.

39.2 Configuring Green Ethernet

Click **Advanced Application > Green Ethernet** in the navigation panel to display the screen as shown.

Note: EEE, Auto Power Down and Short Reach are NOT supported on an uplink port.

Figure 296 Advanced Application > Green Ethernet (Standalone Mode)

Green Ethernet			
EEE	☐		
Auto Power Down	☐		
Short Reach	☐		

Port	EEE	Auto Power Down	Short Reach
*	☐	☐	☐
1	☐	☐	☐
2	☐	☐	☐
3	☐	☐	☐
4	☐	☐	☐
5	☐	☐	☐
6	☐	☐	☐
7	☐	☐	☐
8	☐	☐	☐
9	☐	☐	☐
10	☐	☐	☐
11	☐	☐	☐
12	☐	☐	☐
13	☐	☐	☐
14	☐	☐	☐
15	☐	☐	☐
16	☐	☐	☐
17	☐	☒	☐
18	☐	☒	☐
19	☐	☐	☐
20	☐	☐	☐
21	☐	☐	☐
22	☐	☐	☐
23	☐	☐	☐
24	☐	☐	☐
25	☐	☐	☐
26	☐	☐	☐
27	☐	☐	☐
28	☐	☐	☐

Figure 297 Advanced Application > Green Ethernet (Stacking Mode)

Green Ethernet

EEE ☐

Auto Power Down ☐

Short Reach ☐

SLOT 1 ▼

Port	EEE	Auto Power Down	Short Reach
1/*	☐	☐	☐
1/1	☐	☐	☐
1/2	☐	☐	☐
1/3	☐	☐	☐
1/4	☐	☐	☐
1/5	☐	☐	☐
1/6	☐	☐	☐
1/7	☐	☐	☐
1/8	☐	☐	☐
1/9	☐	☐	☐
1/10	☐	☐	☐
1/11	☐	☐	☐

Apply Cancel

The following table describes the labels in this screen.

Table 170 Advanced Application > Green Ethernet

LABEL	DESCRIPTION
EEE	Select this to activate Energy Efficient Ethernet globally.
Auto Power Down	Select this to activate Auto Power Down globally.
Short Reach	Select this to activate Short Reach globally.
SLOT	This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack.
Port	This field displays the port number. In stacking mode, the first number represents the slot ID and the second is the port number. Please note that the default stacking ports (the last four ports of your Switch) cannot be configured. They are reserved for stacking only.
*	Use this row to make the setting the same for all ports. Use this row first and then make adjustments to each port if necessary. Changes in this row are copied to all the ports as soon as you make them.
EEE	Select this to activate Energy Efficient Ethernet on this port.
Auto Power Down	Select this to activate Auto Power Down on this port.
Short Reach	Select this to activate Short Reach on this port.
Apply	Click Apply to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to begin configuring this screen afresh.

CHAPTER 40

Link Layer Discovery Protocol (LLDP)

40.1 LLDP Overview

The LLDP (Link Layer Discovery Protocol) is a layer 2 protocol. It allows a network device to advertise its identity and capabilities on the local network. It also allows the device to maintain and store information from adjacent devices which are directly connected to the network device. This helps an administrator discover network changes and perform necessary network reconfiguration and management. The device information is encapsulated in the LLDPDUs (LLDP data units) in the form of TLV (Type, Length, Value). Device information carried in the received LLDPDUs is stored in the standard MIB.

The Switch supports these basic management TLVs.

- End of LLDPDU (mandatory)
- Chassis ID (mandatory)
- Port ID (mandatory)
- Time to Live (mandatory)
- Port Description (optional)
- System Name (optional)
- System Description (optional)
- System Capabilities (optional)
- Management Address (optional)

The Switch also supports the IEEE 802.1 and IEEE 802.3 organizationally-specific TLVs.

IEEE 802.1 specific TLVs:

- Port VLAN ID TLV (optional)
- Port and Protocol VLAN ID TLV (optional)

IEEE 802.3 specific TLVs:

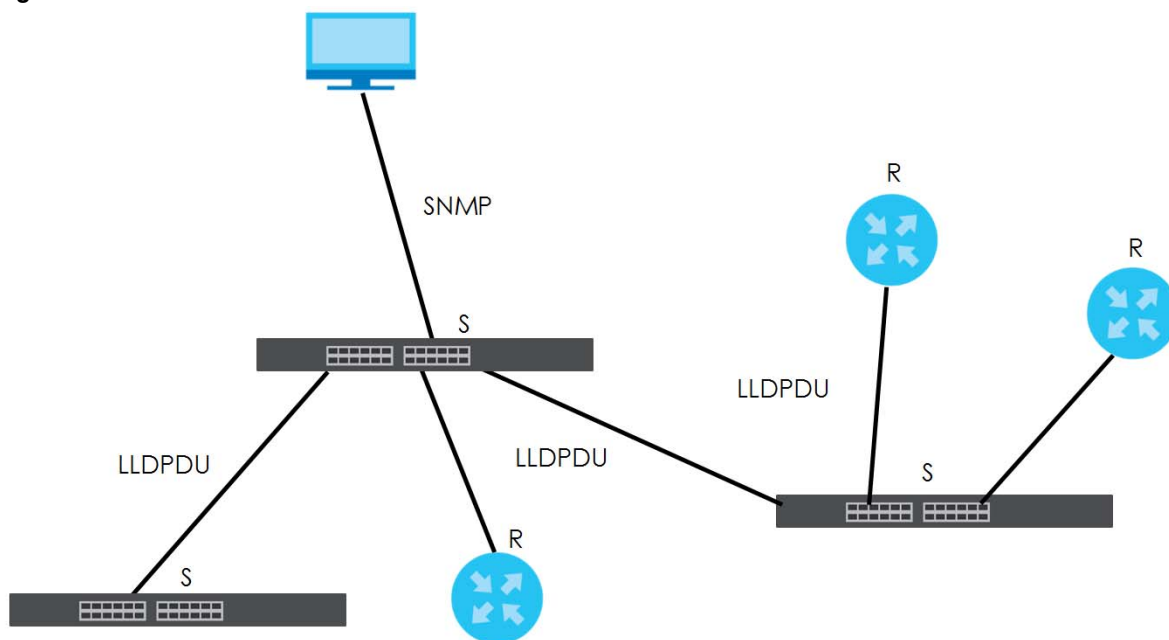
- MAC/PHY Configuration/Status TLV (optional)
- Link Aggregation TLV (optional)
- Maximum Frame Size TLV (optional)

The optional TLVs are inserted between the Time To Live TLV and the End of LLDPDU TLV.

The next figure demonstrates that the network devices Switches and Routers (S and R) transmit and receive device information via LLDPDU and the network manager can query the information using

Simple Network Management Protocol (SNMP).

Figure 298 LLDP Overview



40.2 LLDP-MED Overview

LLDP-MED (Link Layer Discovery Protocol for Media Endpoint Devices) is an extension to the standard LLDP developed by the Telecommunications Industry Association (TIA) TR-41.4 subcommittee which defines the enhanced discovery capabilities, such as VoIP applications, to enable network administrators manage their network topology application more efficiently. Unlike the traditional LLDP, which has some limitations when handling multiple application devices, the LLDP-MED offers display of accurate physical topology, interoperability of devices, and easy trouble shooting for mis-configured IP addresses. There are three classes of endpoint devices that the LLDP-MED supports:

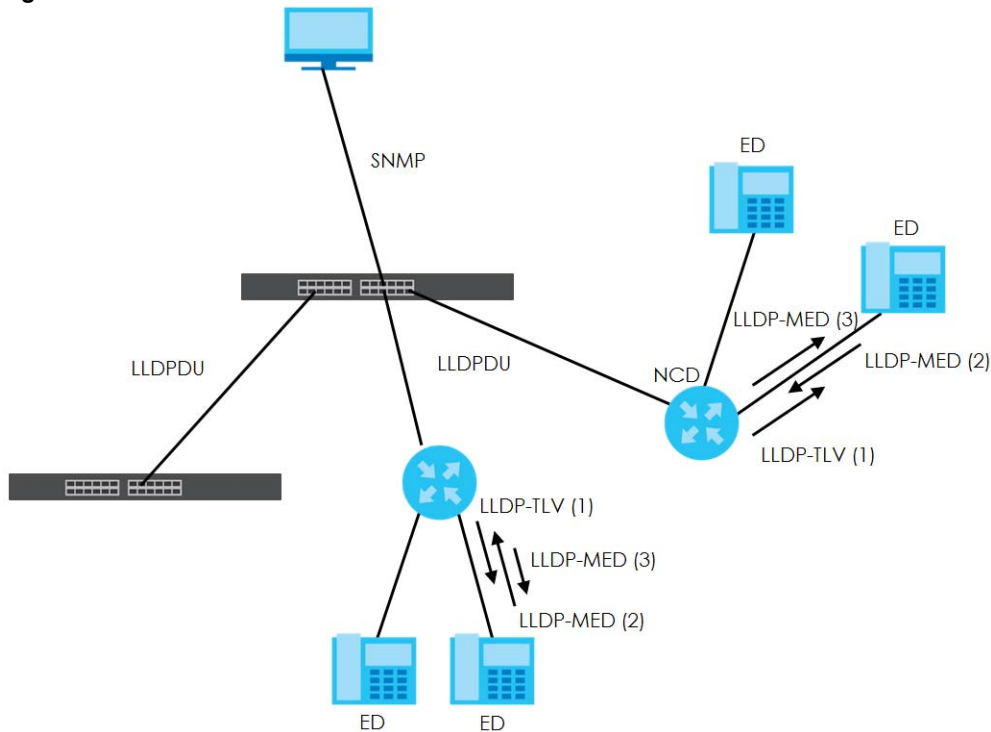
Class I: IP Communications Controllers or other communication related servers

Class II: Voice Gateways, Conference Bridges or Media Servers

Class III: IP-Phones, PC-based Softphones, End user Communication Appliances supporting IP Media

The following figure shows that with the LLDP-MED, network connectivity devices (NCD) like Switches and Routers will transmit LLDP TLV to endpoint device (ED) like IP Phone first (1), to get its device type and capabilities information, then it will receive that information in LLDP-MED TLV back from endpoint devices (2), after that the network connectivity devices will transmit LLDP-MED TLV (3) to provision the endpoint device to such that the endpoint device's network policy and location identification information is updated. Since LLDPDU updates status and configuration information periodically, network managers may check the result of provision via remote status. The remote status is updated by receiving LLDP-MED TLVs from endpoint devices.

Figure 299 LLDP-MED Overview



40.3 LLDP Settings

Click **Advanced Application > LLDP** in the navigation panel to display the screen as shown next.

Figure 300 Advanced Application > LLDP

LLDP		
LLDP	LLDP Local Status	Click here
	LLDP Remote Status	Click here
	LLDP Configuration	Click here
LLDP-MED	LLDP-MED Configuration	Click here
	LLDP-MED Network Policy	Click here
	LLDP-MED Location	Click here

The following table describes the labels in this screen.

Table 171 Advanced Application > LLDP

LABEL	DESCRIPTION
LLDP	
LLDP Local Status	Click here to show a screen with the Switch's LLDP information.
LLDP Remote Status	Click here to show a screen with LLDP information from the neighboring devices.
LLDP Configuration	Click here to show a screen to configure LLDP parameters.
LLDP-MED	

Table 171 Advanced Application > LLDP (continued)

LABEL	DESCRIPTION
LLDP-MED Configuration	Click here to show a screen to configure LLDP-MED (Link Layer Discovery Protocol for Media Endpoint Devices) parameters.
LLDP-MED Network Policy	Click here to show a screen to configure LLDP-MED (Link Layer Discovery Protocol for Media Endpoint Devices) network policy parameters.
LLDP-MED Location	Click here to show a screen to configure LLDP-MED (Link Layer Discovery Protocol for Media Endpoint Devices) location parameters.

40.4 LLDP Local Status

This screen displays a summary of LLDP status on this Switch. Click **Advanced Application > LLDP > LLDP Local Status** to display the screen as shown next.

Figure 301 Advanced Application > LLDP > LLDP Local Status (Standalone Mode)

Figure 3-32 LLDP Local Status

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Figure 302 Advanced Application > LLDP > LLDP Local Status (Stacking Mode)

LLDP Local Status			LLDP
LLDP System Information			
Basic TLV			
Chassis ID TLV	Chassis ID Subtype	mac-address	
	Chassis ID	bc:99:11:d8:3a:a5	
System Name TLV	System Name	XS3800	
System Description TLV	System Description	V4.60(ABML.2)b4 03/08/2019	
System Capabilities TLV	System Capabilities Supported	Bridge	
	System Capabilities Enabled	Bridge	
Management Address TLV	Management Address Subtype	ipv4 / all-802	
	Interface Number Subtype	unknown	
	Interface Number	0	
	Object Identifier	0	
LLDP Port Information			
SLOT 1 v			
Local Port	Port ID Subtype	Port ID	Port Description
1/1	local-assigned	1/1	
1/2	local-assigned	1/2	
1/3	local-assigned	1/3	
1/4	local-assigned	1/4	
1/5	local-assigned	1/5	
1/6	local-assigned	1/6	
1/7	local-assigned	1/7	
1/8	local-assigned	1/8	
1/9	local-assigned	1/9	
1/10	local-assigned	1/10	
1/11	local-assigned	1/11	
1/12	local-assigned	1/12	
1/13	local-assigned	1/13	
1/14	local-assigned	1/14	
1/15	local-assigned	1/15	
1/16	local-assigned	1/16	
1/17	local-assigned	1/17	
1/18	local-assigned	1/18	
1/19	local-assigned	1/19	
1/20	local-assigned	1/20	

The following table describes the labels in this screen.

Table 172 Advanced Application > LLDP > LLDP Local Status

LABEL	DESCRIPTION
Basic TLV	
Chassis ID TLV	This displays the chassis ID of the local Switch, that is the Switch you are configuring. The chassis ID is identified by the chassis ID subtype. Chassis ID Subtype – this displays how the chassis of the Switch is identified. Chassis ID – This displays the chassis ID of the local Switch.
System Name TLV	This shows the host name of the Switch.
System Description TLV	This shows the firmware version of the Switch.
System Capabilities TLV	This shows the System Capabilities enabled and supported on the local Switch. System Capabilities Supported – Bridge System Capabilities Enabled – Bridge

Table 172 Advanced Application > LLDP > LLDP Local Status (continued)

LABEL	DESCRIPTION
Management Address TLV	The Management Address TLV identifies an address associated with the local LLDP agent that may be used to reach higher layer entities to assist discovery by network management. The TLV may also include the system interface number and an object identifier (OID) that are associated with this management address. This field displays the Management Address settings on the specified ports. • Management Address Subtype – ipv4 or all-802 • Interface Number Subtype – unknown • Interface Number – 0 (not supported) • Object Identifier – 0 (not supported)
LLDP Port Information	This displays the local port information.
SLOT	This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack.
Local Port	This displays the number of the Switch port which receives the LLDPDU from the remote device. Click a port number to view the detailed LLDP status on this port at LLDP Local Port Status Detail screen. In stacking mode, the first number represents the slot ID and the second is the port number. Please note that the default stacking ports (the last four ports of your Switch) cannot be configured. They are reserved for stacking only.
Port ID Subtype	This indicates how the port ID field is identified.
Port ID	This is an alpha-numeric string that contains the specific identifier for the port from which this LLDPDU was transmitted.
Port Description	This shows the port description that the Switch will advertise from this port.

40.4.1 LLDP Local Port Status Detail

This screen displays detailed LLDP status for each port on this Switch. Click **Advanced Application > LLDP > LLDP Local Status** and then, click a port number, for example 1 in the local port column to display the screen as shown next.

Figure 303 Advanced Application > LLDP > LLDP Local Status > LLDP Local Port Status Detail (Basic TLV)

LLDP Local Port Status Detail

[LLDP Local Status](#)

Local Port: 1

Basic TLV

Port ID TLV	Port ID Subtype	local-assigned
	Port ID	1
Port Description TLV	Port Description	

Dot1 TLV

Port VLAN ID TLV	Port VLAN ID	1
Port-Protocol VLAN ID TLV	Port-Protocol VLAN ID	

Dot3 TLV

MAC PHY Configuration & Status TLV	AN Supported	Yes
	AN Enabled	Yes
	AN Advertised Capability	100baseTX 100baseTXFD 1000baseTFD
	Oper MAU Type	30
Link Aggregation TLV	Aggregation Capability	Yes
	Aggregation Status	No
	Aggregated Port ID	0
Max Frame Size TLV	Max Frame Size	1518

Figure 304 Advanced Application > LLDP > LLDP Local Status > LLDP Local Port Status Detail (MED TLV)

MED TLV		
Capabilities TLV	Network Policy	Yes
	Location	Yes
	Extend Power via MDI PSE	No
	Extend Power via MDI PD	No
	Inventory Management	No
Device Type TLV	Device Type	Network Connectivity
Network Policy TLV	Voice	
	Voice-Signaling	
	Guest-Voice	
	Guest-Voice-Signaling	
	Softphone-Voice	
	Video-Conferencing	
	Streaming-Video	
Location Identification TLV	Video-Signaling	
	Coordinate-base LCI	
	Civic LCI	
	ELIN	

The following table describes the labels in this screen.

Table 173 Advanced Application > LLDP > LLDP Local Status > LLDP Local Port Status Detail

LABEL	DESCRIPTION
Local Port	This displays the number of the Switch's port.
Basic TLV	These are the Basic TLV flags
Port ID TLV	The port ID TLV identifies the specific port that transmitted the LLDP frame. • Port ID Subtype: This shows how the port is identified. • Port ID: This is the ID of the port. In stacking mode, the first number represents the slot and the second the port number.
Port Description TLV	This displays the local port description.
Dot1 TLV	
Port VLAN ID TLV	This displays the VLAN ID sent by the IEEE 802.1 Port VLAN ID TLV.
Port Protocol VLAN ID TLV	This displays the IEEE 802.1 Port Protocol VLAN ID TLVs, which indicates whether the VLAN is enabled and supported.
Dot3 TLV	
MAC PHY Configuration & Status TLV	The MAC/PHY Configuration/Status TLV advertises the bit-rate and duplex capability of the sending 802.3 node. It also advertises the current duplex and bit-rating of the sending node. Lastly, it advertises whether these setting were the result of auto-negotiation during link initiation or manual override. • AN Supported – Displays if the port supports or does not support auto-negotiation. • AN Enabled – The current auto-negotiation status of the port. • AN Advertised Capability – The auto-negotiation capabilities of the port. • Oper MAU Type – The current Medium Attachment Unit (MAU) type of the port.
Link Aggregation TLV	The Link Aggregation TLV indicates whether the link is capable of being aggregated, whether the link is currently in an aggregation, and if in an aggregation, the port identification of the aggregation. • Aggregation Capability – The current aggregation capability of the port. • Aggregation Status – The current aggregation status of the port. • Aggregation Port ID – The aggregation ID of the current port.
Max Frame Size TLV	This displays the maximum supported frame size in octets.
MED TLV	LLDP Media Endpoint Discovery (MED) is an extension of LLDP that provides additional capabilities to support media endpoint devices. MED enables advertisement and discovery of network policies, device location discovery to allow creation of location databases, and information for troubleshooting.
Capabilities TLV	This field displays which LLDP-MED TLV are capable to transmit on the Switch. • Network Policy • Location • Extend Power via MDI PSE • Extend Power via MDI PD • Inventory Management
Device Type TLV	This is the LLDP-MED device class. The Zyxel Switch device type is: • Network Connectivity

Table 173 Advanced Application > LLDP > LLDP Local Status > LLDP Local Port Status Detail (continued)

LABEL	DESCRIPTION
Network Policy TLV	This displays a network policy for the specified application. • Voice • Voice-Signaling • Guest-Voice • Guest-Voice-Signaling • Softphone-Voice • Video-Conferencing • Streaming-Video • Video-Signaling
Location Identification TLV	This shows the location information of a caller by its ELIN (Emergency Location Identifier Number) or the IETF Geopriv Civic Address based Location Configuration Information (Civic Address LCI). • Coordinate-based LCI – latitude, longitude and altitude coordinates of the location Configuration Information (LCI) • Civic LCI – IETF Geopriv Civic Address based Location Configuration Information • ELIN – (Emergency Location Identifier Number)

40.5 LLDP Remote Status

This screen displays a summary of LLDP status for each LLDP connection to a neighboring Switch. Click **Advanced Application > LLDP > LLDP Remote Status (Click Here)** to display the screen as shown next.

Figure 305 Advanced Application > LLDP > LLDP Remote Status (Standalone Mode)

LLDP Remote Status						LLDP
Index	Local Port	Chassis ID	Port ID	Port Description	System Name	Management Address
1	1	08:26:97:c4:cc:a2	08:26:97:c4:c c:a2			
2	1	0a:26:97:c4:cc:a4	08:26:97:c4:c c:a2			
3	3	dc:4a:3e:40:ec:5f	dc:4a:3e:40:e c:5f			
4	5	e4:18:6b:f7:ba:0d	39		12A3_84	e4:18:6b:f7:ba:0d

Figure 306 Advanced Application > LLDP > LLDP Remote Status (Stacking Mode)

LLDP Remote Status						LLDP
SLOT 1 ▼						
Index	Local Port	Chassis ID	Port ID	Port Description	System Name	Management Address
1	1/18	00:19:cb:00:00:01	5		GS1350	172.16.21.40

The following table describes the labels in this screen.

Table 174 Advanced Application > LLDP > LLDP Remote Status

LABEL	DESCRIPTION
SLOT	This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack.
Index	The index number shows the number of remote devices that are connected to the Switch. Click on an index number to view the detailed LLDP status for this remote device in the LLDP Remote Port Status Detail screen.
Local Port	This is the number of the Switch's port that received LLDPDU from the remote device. In stacking mode, the first number represents the slot and the second the port number.

Table 174 Advanced Application > LLDP > LLDP Remote Status (continued)

LABEL	DESCRIPTION
Chassis ID	This displays the chassis ID of the remote device associated with the transmitting LLDP agent. The chassis ID is identified by the chassis ID subtype. For example, the MAC address of the remote device.
Port ID	This is an alpha-numeric string that contains the specific identifier for the port from which this LLDPDU was transmitted. The port ID is identified by the port ID subtype.
Port Description	This displays a description for the port from which this LLDPDU was transmitted.
System Name	This displays the system name of the remote device.
Management Address	This displays the management address of the remote device. It could be the MAC address or IP address.

40.5.1 LLDP Remote Port Status Detail

This screen displays detailed LLDP status of the remote device connected to the Switch. Click **Advanced Application > LLDP > LLDP Remote Status (Click Here)** and then click an index number, for example 1, in the **Index** column in the **LLDP Remote Status** screen to display the screen as shown next.

Figure 307 Advanced Application > LLDP > LLDP Remote Status > LLDP Remote Port Status Detail (Basic TLV)

LLDP Remote Port Status Detail			LLDP Remote Status
Local Port: 5			
Basic TLV			
Chassis ID TLV	Chassis ID Subtype	mac-address	
	Chassis ID	e4:18:6b:f7:ba:0d	
Port ID TLV	Port ID Subtype	local-assigned	
	Port ID	39	
Time To Live TLV	Time To Live	120	
Port Description TLV	Port Description		
System Name TLV	System Name	12A3_84	
System Description TLV	System Description	V4.30(AAGE.2) 12/12/2018	
System Capabilities TLV	System Capabilities Supported	bridge	
	System Capabilities Enabled	bridge	
Management Address TLV	Management Address Subtype	ALL_802	
	Management Address	e4:18:6b:f7:ba:0d	
	Interface Number Subtype	unknown	
	Interface Number	0	
	Object Identifier		

The following table describes the labels in Basic TLV part of the screen.

Table 175 Advanced Application > LLDP > LLDP Remote Status > LLDP Remote Port Status Detail (Basic TLV)

LABEL	DESCRIPTION
Local Port	This displays the number of the Switch's port to which the remote device is connected. In stacking mode, the first number represents the slot and the second the port number.
Basic TLV	
Chassis ID TLV	• Chassis ID Subtype – this displays how the chassis of the remote device is identified. • Chassis ID – this displays the chassis ID of the remote device. The chassis ID is identified by the chassis ID subtype.
Port ID TLV	• Port ID Subtype – this displays how the port of the remote device is identified. • Port ID – this displays the port ID of the remote device. The port ID is identified by the port ID subtype.
Time To Live TLV	This displays the time-to-live (TTL) multiplier of LLDP frames. The device information on the neighboring devices ages out and is discarded when its corresponding TTL expires. The TTL value is to multiply the TTL multiplier by the LLDP frames transmitting interval.
Port Description TLV	This displays the remote port description.
System Name TLV	This displays the system name of the remote device.
System Description TLV	This displays the system description of the remote device.
System Capabilities TLV	This displays whether the system capabilities are enabled and supported on the remote device. • System Capabilities Supported • System Capabilities Enabled
Management Address TLV	This displays the management address of the remote device. • Management Address Subtype • Management Address • Interface Number Subtype • Interface Number • Object Identifier

Figure 308 Advanced Application > LLDP > LLDP Remote Status > LLDP Remote Port Status Detail (Dot 1 and Dot3 TLV)

Dot1 TLV		
Port VLAN ID TLV	Port VLAN ID	
Port-Protocol VLAN ID TLV	Port-Protocol VLAN ID	
	Port-Protocol VLAN ID Supported	
	Port-Protocol VLAN ID Enabled	
Vlan Name TLV	VLAN ID	
	VLAN Name	
Protocol Identity TLV	Protocol ID	
Dot3 TLV		
MAC PHY Configuration & Status TLV	AN Supported	No
	AN Enabled	No
	AN Advertised Capability	
	Oper MAU type	0
Link Aggregation TLV	Aggregation Capability	Yes
	Aggregation Status	No
	Aggregated Port ID	0
Power Via MDI TLV	Port Class	
	MDI Supported	
	MDI Enabled	
	Pair Controlable	
	PSE Power Pairs	
	Power Class	
Max Frame Size TLV	Max Frame Size	

The following table describes the labels in the Dot1 and Dot3 parts of the screen.

Table 176 Advanced Application > LLDP > LLDP Remote Status > LLDP Remote Port Status Detail (Dot1 and Dot3 TLV)

LABEL	DESCRIPTION
Dot1 TLV	
Port VLAN ID TLV	This displays the VLAN ID of this port on the remote device.
Port-Protocol VLAN ID TLV	This displays the IEEE 802.1 Port Protocol VLAN ID TLV, which indicates whether the VLAN ID and whether it is enabled and supported on the port of remote Switch which sent the LLDPDU. • Port-Protocol VLAN ID • Port-Protocol VLAN ID Supported • Port-Protocol VLAN ID Enabled

Table 176 Advanced Application > LLDP > LLDP Remote Status > LLDP Remote Port Status Detail (Dot1 and Dot3 TLV) (continued)

LABEL	DESCRIPTION
Vlan Name TLV	This shows the VLAN ID and name for remote device port. • VLAN ID • VLAN Name
Protocol Identity TLV	The Protocol Identity TLV allows the Switch to advertise the particular protocols that are accessible through its port.
Dot3 TLV	
MAC PHY Configuration & Status TLV	The MAC/PHY Configuration/Status TLV advertises the bit-rate and duplex capability of the sending 802.3 node. It also advertises the current duplex and bit-rating of the sending node. Lastly, it advertises whether these setting were the result of auto-negotiation during link initiation or manual override. • AN Supported – Displays if the port supports or does not support auto-negotiation. • AN Enabled – The current auto-negotiation status of the port. • AN Advertised Capability – The auto-negotiation capabilities of the port. • Oper MAU Type – The current Medium Attachment Unit (MAU) type of the port.
Link Aggregation TLV	The Link Aggregation TLV indicates whether the link is capable of being aggregated, whether the link is currently in an aggregation, and if in an aggregation, the port identification of the aggregation. • Aggregation Capability – The current aggregation capability of the port. • Aggregation Status – The current aggregation status of the port. • Aggregation Port ID – The aggregation ID of the current port.
Power Via MDI TLV	The Power Via MDI TLV allows network management to advertise and discover the MDI power support capabilities of the sending port on the remote device. • Port Class • MDI Supported • MDI Enabled • Pair Controllable • PSE Power Pairs • Power Class
Max Frame Size TLV	This displays the maximum supported frame size in octets.

Figure 309 Advanced Application > LLDP > LLDP Remote Status > LLDP Remote Port Status Detail (MED TLV)

MED TLV		
Capabilities TLV	Network Policy	
	Location	
	Extend Power via MDI PSE	
	Extend Power via MDI PD	
	Inventory Management	
Device Type TLV	Device Type	
Network Policy TLV	Voice	
	Voice-Signaling	
	Guest-Voice	
	Guest-Voice-Signaling	
	Softphone-Voice	
	Video-Conferencing	
	Streaming-Video	
	Video-Signaling	
Location Identification TLV	Coordinate-base LCI	
	Civic LCI	
	ELIN	
Inventory TLV	Hardware Revision	
	Software Revision	
	Firmware Revision	
	Model Name	
	Manufacturer	
	Serial Number	
	Asset ID	
Extended Power via MDI TLV	Power Type	
	Power Source	
	Power Priority	
	Power Value	

The following table describes the labels in the MED TLV part of the screen.

Table 177 Advanced Application > LLDP > LLDP Remote Status > LLDP Remote Port Status Detail (MED TLV)

LABEL	DESCRIPTION
MED TLV	LLDP Media Endpoint Discovery (MED) is an extension of LLDP that provides additional capabilities to support media endpoint devices. MED enables advertisement and discovery of network policies, device location discovery to allow creation of location databases, and information for troubleshooting.
Capabilities TLV	This displays the MED capabilities the remote port supports. • Network Policy • Location • Extend Power via MDI PSE • Extend Power via MDI PD • Inventory Management
Device Type TLV	LLDP-MED endpoint device classes: • Endpoint Class I • Endpoint Class II • Endpoint Class III • Network Connectivity
Network Policy TLV	This displays a network policy for the specified application. • Voice • Voice-Signaling • Guest-Voice • Guest-Voice-Signaling • Softphone-Voice • Video-Conferencing • Streaming-Video • Video-Signaling
Location Identification TLV	This shows the location information of a caller by its: • Coordinate-base LCI – latitude and longitude coordinates of the Location Configuration Information (LCI) • Civic LCI – IETF Geopriv Civic Address based Location Configuration Information • ELIN – (Emergency Location Identifier Number)
Inventory TLV	The majority of IP Phones lack support of management protocols such as SNMP, so LLDP-MED inventory TLVs are used to provide their inventory information to the Network Connectivity Devices such as the Switch. The Inventory TLV may contain the following information. • Hardware Revision • Software Revision • Firmware Revision • Model Name • Manufacturer • Serial Number • Asset ID
Extended Power via MDI TLV	Extended Power Via MDI Discovery enables detailed power information to be advertised by Media Endpoints, such as IP phones and Network Connectivity Devices such as the Switch. • Power Type – whether it is currently operating from primary power or is on backup power (backup power may indicate to the Endpoint Device that it should move to a power conservation mode). • Power Source – whether or not the Endpoint is currently operating from an external power source. • Power Priority – the Endpoint Device's power priority (which the Network Connectivity Device may use to prioritize which devices will remain in service during power shortages). • Power Value – power requirement, in fractions of Watts, in current configuration.

40.6 LLDP Configuration

Use this screen to configure global LLDP settings on the Switch. Click **Advanced Application > LLDP > LLDP Configuration (Click Here)** to display the screen as shown next.

Figure 310 Advanced Application > LLDP > LLDP Configuration (Standalone Mode)

LLDP Configuration

[LLDP](#) [Basic TLV Setting](#) [Org-specific TLV Setting](#)

Active

☒

Transmit Interval

30

seconds

Transmit Hold

4

times

Transmit Delay

2

seconds

Reinitialize Delay

2

seconds

Apply

Cancel

Port	Admin Status	Notification
*	Disable ▾	☐
1	Tx-Rx ▾	☐
2	Tx-Rx ▾	☐
3	Tx-Rx ▾	☐
4	Tx-Rx ▾	☐
5	Tx-Rx ▾	☐
6	Tx-Rx ▾	☐
7	Tx-Rx ▾	☐
8	Tx-Rx ▾	☐
9	Tx-Rx ▾	☐
10	Tx-Rx ▾	☐

Apply

Cancel

Figure 311 Advanced Application > LLDP > LLDP Configuration (Stacking Mode)

LLDP Configuration [LLDP](#) [Basic TLV Setting](#) [Org-specific TLV Setting](#)

Active ☒

Transmit Interval seconds

Transmit Hold times

Transmit Delay seconds

Reinitialize Delay seconds

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

SLOT 1 ▾

Port	Admin Status	Notification
1/*	Disable ▾	☐
1/1	Tx-Rx ▾	☐
1/2	Tx-Rx ▾	☐
1/3	Tx-Rx ▾	☐
1/4	Tx-Rx ▾	☐
1/5	Tx-Rx ▾	☐
1/6	Tx-Rx ▾	☐
1/7	Tx-Rx ▾	☐
1/8	Tx-Rx ▾	☐
1/9	Tx-Rx ▾	☐
1/10	Tx-Rx ▾	☐
1/11	Tx-Rx ▾	☐

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

The following table describes the labels in this screen.

Table 178 Advanced Application > LLDP > LLDP Configuration

LABEL	DESCRIPTION
Active	Select to enable LLDP on the Switch. It is enabled by default.
Transmit Interval	Enter how many seconds the Switch waits before sending LLDP packets.
Transmit Hold	Enter the time-to-live (TTL) multiplier of LLDP frames. The device information on the neighboring devices ages out and is discarded when its corresponding TTL expires. The TTL value is to multiply the TTL multiplier by the LLDP packets transmitting interval.
Transmit Delay	Enter the delay (in seconds) between successive LLDPDU transmissions initiated by value or status changes in the Switch MIB.
Reinitialize Delay	Enter the number of seconds for LLDP to wait before initializing on a port.
Apply	Click Apply to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to begin configuring this screen afresh.
SLOT	This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack.
Port	This field displays the port number. In stacking mode, the first number represents the slot ID and the second is the port number. Please note that the default stacking ports (the last four ports of your Switch) cannot be configured. They are reserved for stacking only.
*	Use this row to make the setting the same for all ports. Use this row first and then make adjustments to each port if necessary. Changes in this row are copied to all the ports as soon as you make them.

Table 178 Advanced Application > LLDP > LLDP Configuration (continued)

LABEL	DESCRIPTION
Admin Status	Select whether LLDP transmission and/or reception is allowed on this port. • Disable – not allowed • Tx-Only – transmit only • Rx-Only – receive only • Tx-Rx – transmit and receive
Notification	Select whether LLDP notification is enabled on this port.
Apply	Click Apply to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to begin configuring this screen afresh.

40.6.1 LLDP Configuration Basic TLV Setting

Use this screen to configure Basic TLV settings. Click **Advanced Application > LLDP > LLDP Configuration (Click Here) > Basic TLV Setting** to display the screen as shown next.

Figure 312 Advanced Application > LLDP > LLDP Configuration> Basic TLV Setting (Standalone Mode)

Basic TLV Setting						LLDP Configuration
Port	Management Address	Port Description	System Capabilities	System Description	System Name	
*	☐	☐	☐	☐	☐	☐
1	☒	☒	☒	☒	☒	☒
2	☒	☒	☒	☒	☒	☒
3	☒	☒	☒	☒	☒	☒
4	☒	☒	☒	☒	☒	☒
5	☒	☒	☒	☒	☒	☒
6	☒	☒	☒	☒	☒	☒
7	☒	☒	☒	☒	☒	☒
8	☒	☒	☒	☒	☒	☒
9	☒	☒	☒	☒	☒	☒

Figure 313 Advanced Application > LLDP > LLDP Configuration> Basic TLV Setting (Stacking Mode)

Port	Management Address	Port Description	System Capabilities	System Description	System Name
1/*	☐	☐	☐	☐	☐
1/1	☒	☒	☒	☒	☒
1/2	☒	☒	☒	☒	☒
1/3	☒	☒	☒	☒	☒
1/4	☒	☒	☒	☒	☒
1/5	☒	☒	☒	☒	☒
1/6	☒	☒	☒	☒	☒
1/7	☒	☒	☒	☒	☒
1/8	☒	☒	☒	☒	☒
1/9	☒	☒	☒	☒	☒
1/10	☒	☒	☒	☒	☒
1/11	☒	☒	☒	☒	☒
1/12	☒	☒	☒	☒	☒
1/13	☒	☒	☒	☒	☒

Apply Cancel

The following table describes the labels in this screen.

Table 179 Advanced Application > LLDP > LLDP Configuration > Basic TLV Setting

LABEL	DESCRIPTION
SLOT	This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack.
Port	This field displays the port number. In stacking mode, the first number represents the slot ID and the second is the port number. Please note that the default stacking ports (the last four ports of your Switch) cannot be configured. They are reserved for stacking only.
*	Use this row to make the setting the same for all ports. Use this row first and then make adjustments to each port if necessary. Changes in this row are copied to all the ports as soon as you make them.
Management Address	Select the check boxes to enable or disable the sending of Management Address TLVs on the ports.
Port Description	Select the check boxes to enable or disable the sending of Port Description TLVs on the ports.
System Capabilities	Select the check boxes to enable or to disable the sending of System Capabilities TLVs on the ports.
System Description	Select the check boxes to enable or to disable the sending of System Description TLVs on the ports.
System Name	Select the check boxes to enable or to disable the sending of System Name TLVs on the ports.
Apply	Click Apply to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to begin configuring this screen afresh.

40.6.2 LLDP Configuration Org-specific TLV Setting

Use this screen to configure organization-specific TLV settings. Click **Advanced Application > LLDP > LLDP Configuration (Click Here) > Org-specific TLV Setting** to display the screen as shown next.

Figure 314 Advanced Application > LLDP > LLDP Configuration> Org-specific TLV Setting (Standalone Mode)

Port	Dot1 TLV		Link Aggregation	Dot3 TLV	Max Frame Size
	Port-Protocol	VLAN ID		MAC/PHY	
*	☐	☐	☐	☐	☐
1	☐	☒	☐	☒	☐
2	☐	☒	☐	☒	☐
3	☐	☒	☐	☒	☐
4	☐	☒	☐	☒	☐
5	☐	☒	☐	☒	☐
6	☐	☒	☐	☒	☐
7	☐	☒	☐	☒	☐
8	☐	☒	☐	☒	☐
9	☐	☒	☐	☒	☐
10	☐	☒	☐	☒	☐

Apply Cancel

Figure 315 Advanced Application > LLDP > LLDP Configuration> Org-specific TLV Setting (Stacking Mode)

Port	Dot1 TLV		Link Aggregation	Dot3 TLV	Max Frame Size
	Port-Protocol	VLAN ID		MAC/PHY	
1/*	☐	☐	☐	☐	☐
1/1	☐	☒	☐	☒	☐
1/2	☐	☒	☐	☒	☐
1/3	☐	☒	☐	☒	☐
1/4	☐	☒	☐	☒	☐
1/5	☐	☒	☐	☒	☐
1/6	☐	☒	☐	☒	☐
1/7	☐	☒	☐	☒	☐
1/8	☐	☒	☐	☒	☐
1/9	☐	☒	☐	☒	☐
1/10	☐	☒	☐	☒	☐
1/11	☐	☒	☐	☒	☐
1/12	☐	☒	☐	☒	☐
1/13	☐	☒	☐	☒	☐

Apply Cancel

The following table describes the labels in this screen.

Table 180 Advanced Application > LLDP > LLDP Configuration > Org-specific TLV Setting

LABEL	DESCRIPTION
SLOT	This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack.
Port	This field displays the port number. In stacking mode, the first number represents the slot ID and the second is the port number. Please note that the default stacking ports (the last four ports of your Switch) cannot be configured. They are reserved for stacking only.
*	Use this row to make the setting the same for all ports. Use this row first and then make adjustments to each port if necessary. Changes in this row are copied to all the ports as soon as you make them.
Dot1 TLV	
Port-Protocol VLAN ID	Select the check boxes to enable or disable the sending of IEEE 802.1 Port and Protocol VLAN ID TLVs on the ports.
Port VLAN ID	Select the check boxes to enable or disable the sending of IEEE 802.1 Port VLAN ID TLVs on the ports. All check boxes in this column are enabled by default.

Table 180 Advanced Application > LLDP > LLDP Configuration > Org-specific TLV Setting (continued)

LABEL	DESCRIPTION
Dot3 TLV	
Link Aggregation	Select the check boxes to enable or disable the sending of IEEE 802.3 Link Aggregation TLVs on the ports.
MAC/PHY	Select the check boxes to enable or disable the sending of IEEE 802.3 MAC/PHY Configuration/Status TLVs on the ports. All check boxes in this column are enabled by default.
Max Frame Size	Select the check boxes to enable or disable the sending of IEEE 802.3 Max Frame Size TLVs on the ports.
Power Via MDI	Note: For PoE models only. The Power Via MDI TLV allows network management to advertise and discover the MDI power support capabilities of the sending port on the remote device. • Port Class • MDI Supported • MDI Enabled • Pair Controllable • PSE Power Pairs • Power Class
Apply	Click Apply to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to begin configuring this screen afresh.

40.7 LLDP-MED Configuration

Click **Advanced Application > LLDP > LLDP-MED Configuration** to display the screen as shown next.

Figure 316 Advanced Application > LLDP > LLDP-MED Configuration (Standalone Mode)

LLDP-MED Configuration			
Port	Notification	MED TLV Setting	
	Topology Change	Location	Network Policy
*	☐	☐	☐
1	☐	☐	☐
2	☐	☐	☐
3	☐	☐	☐
4	☐	☐	☐
5	☐	☐	☐
6	☐	☐	☐
7	☐	☐	☐
8	☐	☐	☐
9	☐	☐	☐

[LLDP](#)

Figure 317 Advanced Application > LLDP > LLDP-MED Configuration (Stacking Mode)

LLDP-MED Configuration [LLDP](#)

SLOT 1 ▼

Port	Notification Topology Change	Location	Network Policy
1/*	☐	☐	☐
1/1	☐	☐	☐
1/2	☐	☐	☐
1/3	☐	☐	☐
1/4	☐	☐	☐
1/5	☐	☐	☐
1/6	☐	☐	☐
1/7	☐	☐	☐
1/8	☐	☐	☐
1/9	☐	☐	☐
1/10	☐	☐	☐
1/11	☐	☐	☐
1/12	☐	☐	☐
1/13	☐	☐	☐

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

The following table describes the labels in this screen.

Table 181 Advanced Application > LLDP > LLDP-MED Configuration

LABEL	DESCRIPTION
SLOT	This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack.
Port	This field displays the port number. In stacking mode, the first number represents the slot ID and the second is the port number. Please note that the default stacking ports (the last four ports of your Switch) cannot be configured. They are reserved for stacking only.
*	Use this row to make the setting the same for all ports. Use this row first and then make adjustments to each port if necessary. Changes in this row are copied to all the ports as soon as you make them.
Notification	
Topology Change	Select to enable LLDP-MED topology change traps on this port.
MED TLV Setting	
Location	Select to enable transmitting LLDP-MED location TLV.
Network Policy	Select to enable transmitting LLDP-MED Network Policy TLV.
Apply	Click Apply to save the changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to begin configuring this screen afresh.

40.8 LLDP-MED Network Policy

Click **Advanced Application > LLDP > LLDP-MED Network Policy (Click Here)** to display the screen as shown next.

Figure 318 Advanced Application > LLDP > LLDP-MED Network Policy (Standalone Mode)

LLDP-MED Network Policy [LLDP](#)

Port:

Application Type:

Tag:

VLAN:

DSCP:

Priority:

Index	Port	Application Type	Tag	VLAN	Priority	DSCP	☐

Figure 319 Advanced Application > LLDP > LLDP-MED Network Policy (Stacking Mode)

LLDP-MED Network Policy [LLDP](#)

Port: /

Application Type:

Tag:

VLAN:

DSCP:

Priority:

Index	Port	Application Type	Tag	VLAN	Priority	DSCP	☐

The following table describes the labels in this screen.

Table 182 Advanced Application > LLDP > LLDP-MED Network Policy

LABEL	DESCRIPTION
Port	Enter the port number to set up the LLDP-MED network policy. You can enter multiple ports separated by (no space) comma (,) or hyphen for a range. For example, enter "3-5" for ports 3, 4, and 5. Enter "3,5,7" for ports 3, 5, and 7. In stacking mode, the first number represents the slot and the second the port number. Enter 1/1-1/24,2/23 for ports 1 to 24 for the Switch in slot 1 and port 23 for the Switch in slot 2, for example.
Application Type	Select the type of application used in the network policy. • voice • voice-signaling • guest-voice • guest-voice-signaling • softphone-voice • video-conferencing • streaming-video • video-signaling
Tag	Select to tag or untag in the network policy. • tagged • untagged
VLAN	Enter the VLAN ID number. It should be from 1 to 4094. For priority tagged frames, enter "0".

Table 182 Advanced Application > LLDP > LLDP-MED Network Policy (continued)

LABEL	DESCRIPTION
DSCP	Enter the DSCP value of the network policy. The value is defined from 0 through 63 with the 0 representing use of the default DSCP value.
Priority	Enter the priority value for the network policy.
Add	Click Add after finish entering the network policy information. A summary table will list all the Switch you have added.
Cancel	Click Cancel to begin entering the information afresh.
Index	This field displays the of index number of the network policy. Click an index number to edit the rule.
Port	This field displays the port number of the network policy. In stacking mode, the first number represents the slot and the second the port number.
Application Type	This field displays the application type of the network policy.
Tag	This field displays the Tag Status of the network policy.
VLAN	This field displays the VLAN ID of the network policy.
Priority	This field displays the priority value of the network policy.
DSCP	This field displays the DSCP value of the network policy.
	Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries.
Delete	Check the rules that you want to remove, then click the Delete button.
Cancel	Click Cancel to clear the selected check boxes.

40.9 LLDP-MED Location

Click **Advanced Application > LLDP > LLDP-MED Location (Click Here)** to display the screen as shown next.

Figure 320 Advanced Application > LLDP > LLDP-MED Location (Standalone Mode)

LLDP-MED Location LLDP				
Port				
Location Coordinates	Latitude		north ▼	
	Longitude		west ▼	
	Altitude		meters ▼	
	Datum	WGS84 ▼		
Civic Address	Country		State	
	County		City	
	Division		Neighbor	
	Street		Leading-Street-Direction	
	Street-Suffix		Trailing-Street-Suffix	
	House-Number		House-Number-Suffix	
	Landmark		Additional-Location	
	Name		Zip-Code	
	Building		Unit	
	Floor		Room-Number	
	Place-Type		Postal-Community-Name	
	Post-Office-Box		Additional-Code	
	ELIN Number			
Add Cancel				
Index	Port	Location Coordinates	Civic Address	ELIN Number
Delete Cancel				

Figure 321 Advanced Application > LLDP > LLDP-MED Location (Stacking Mode)

LLDP-MED Location LLDP

Port: 1 /

Location Coordinates

Latitude: north
Longitude: west
Altitude: meters
Datum: WGS84

Civic Address

Country: State:
County: City:
Division: Neighbor:
Street: Leading-Street-Direction:
Street-Suffix: Trailing-Street-Suffix:
House-Number: House-Number-Suffix:
Landmark: Additional-Location:
Name: Zip-Code:
Building: Unit:
Floor: Room-Number:
Place-Type: Postal-Community-Name:
Post-Office-Box: Additional-Code:

ELIN Number:

Add Cancel

Index	Port	Location Coordinates	Civic Address	ELIN Number	
Delete Cancel					

The following table describes the labels in this screen.

Table 183 Advanced Application > LLDP > LLDP-MED Location

LABEL	DESCRIPTION
Port	Enter the port number you want to set up the location within the LLDP-MED network. In stacking mode, the first field is the slot ID and the second field is the port number.
Location Coordinates	The LLDP-MED uses geographical coordinates and Civic Address to set the location information of the remote device. Geographical based coordinates includes latitude, longitude, altitude and datum. Civic Address includes Country, State, County, City, Street and other related information.
Latitude	Enter the latitude information. The value should be from 0° to 90°. • north • south
Longitude	Enter the longitude information. The value should be from 0° to 180°. • west • east

Table 183 Advanced Application > LLDP > LLDP-MED Location (continued)

LABEL	DESCRIPTION
Altitude	Enter the altitude information. The value should be from -2097151 to 2097151 in meters or in floors. • meters • floor
Datum	Select the appropriate geodetic datum used by GPS. • WGS84 • NAD83-NAVD88 • NAD83-MLLW
Civic Address	Enter the Civic Address by providing information such as Country, State, County, City, Street, Number, ZIP code and other additional information. Enter at least 2 fields in this configuration including the Country. The valid length of the Country field is 2 characters and all other fields are up to 32 characters. • Country • State • County • City • Division • Neighbor • Street • Leading-Street-Direction • Street-Suffix • Trailing-Street-Suffix • House-Number • House-Number-Suffix • Landmark • Additional-Location • Name • Zip-Code • Building • Unit • Floor • Room-Number • Place-Type • Postal-Community-Name • Post-Office-Box • Additional-Code
ELIN Number	Enter a numerical digit string, corresponding to the ELIN identifier which is used during emergency call setup to a traditional CAMA or ISDN trunk-based PSAP. The valid length is from 10 to 25 characters.
Add	Click Add after finish entering the location information.
Cancel	Click Cancel to begin entering the location information afresh.
Index	This lists the index number of the location configuration. Click an index number to view or edit the location.
Port	This lists the port number of the location configuration. In stacking mode, the first number represents the slot and the second the port number.
Location Coordinates	This field displays the location configuration information based on geographical coordinates that includes longitude, latitude, altitude and datum.
Civic Address	This field displays the Civic Address for the remote device using information such as Country, State, County, City, Street, Number, ZIP code and additional information.

Table 183 Advanced Application > LLDP > LLDP-MED Location (continued)

LABEL	DESCRIPTION
ELIN Number	This field shows the Emergency Location Identification Number (ELIN), which is used to identify endpoint devices when they issue emergency call services. The valid length is form 10 to 25 characters.
	Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries.
Delete	Check the locations that you want to remove, then click the Delete button.
Cancel	Click Cancel to clear the selected check boxes.

CHAPTER 41

Anti-Arpscan

41.1 Anti-Arpscan Overview

Address Resolution Protocol (ARP), RFC 826, is a protocol used to convert a network-layer IP address to a link-layer MAC address. ARP scan is used to scan the network of a certain interface for alive hosts. It shows the IP address and MAC addresses of all hosts found. Hackers could use ARP scan to find targets in your network. **Anti-arpscan** is used to detect unusual ARP scan activity and block suspicious hosts or ports.

Unusual ARP scan activity is determined by port and host thresholds that you set. A port threshold is determined by the number of packets received per second on the port. If the received packet rate is over the threshold, then the port is put into an **Err-Disable** state. You can recover the normal state of the port manually if this happens and after you identify the cause of the problem.

A host threshold is determined by the number of ARP-request packets received per second. There is a global threshold rate for all hosts. If the rate of a host is over the threshold, then that host is blocked by using a MAC address filter. A blocked host is released automatically after the MAC aging time expires.

Note: A port-based threshold must be larger than the host-based threshold or the host-based threshold will not work.

41.1.1 What You Can Do

- Use the **Anti-Arpscan Status** screen ([Section 41.2 on page 417](#)) to see what ports are trusted and are forwarding traffic or are disabled.
- Use the **Anti-Arpscan Host Status** screen ([Section 41.3 on page 418](#)) to view blocked hosts and clear selected ones.
- Use the **Anti-Arpscan Trust Host** screen ([Section 41.4 on page 419](#)) to create or remove trusted hosts identified by IP address and subnet mask. **Anti-arpscan** is not performed on trusted hosts.
- Use this **Anti-Arpscan Configure** screen ([Section 41.5 on page 419](#)) to enable anti-arpscan, set port and host thresholds as well as configure ports to be trusted or untrusted.

41.1.2 What You Need to Know

- You should set an uplink port as a trusted port before enabling **Anti-arpscan** so as to prevent the port from being shutdown due to receiving too many ARP messages.
- When a port is configured as a trusted port, **Anti-arpscan** is not performed on the port. Both host and port thresholds are ignored for trusted ports. If the received ARP packet rate on a port or the received ARP-requests from a host exceed the thresholds, the trusted port will not be closed.
- If a port on the Switch is closed by **Anti-arpscan**, and you want to recover it, then do one of the following:

- Go to **Basic Setting > Port Setup**. Clear **Active** and click **Apply**. Then select **Active** and click **Apply** again.
- Go to **Application > Errdisable > Errdisable Recovery** and set the interval for **Anti-arpscan**. After the interval expires, the closed ports will become active and start receiving packets again.
- Use the command `port no inactive`.
- Refer to the port logs to see when a port was closed.

41.2 Anti-Arpscan Status

Use this screen to see what ports are trusted and are forwarding traffic or are disabled. To open this screen, click **Advanced Application > Anti-Arpscan**.

Figure 322 Advanced Application > Anti-Arpscan Status (Standalone Mode)

Anti-Arpscan Status			Host Status	Trust Host	Configure
Anti-Arpscan is disabled					
Port	Trusted	State			
1	No	Forwarding			
2	No	Forwarding			
3	No	Forwarding			
4	No	Forwarding			
5	No	Forwarding			
6	No	Forwarding			
7	No	Forwarding			
8	No	Forwarding			
9	No	Forwarding			
10	No	Forwarding			

Figure 323 Advanced Application > Anti-Arpscan Status (Stacking Mode)

Anti-Arpscan Status			Host Status	Trust Host	Configure
Anti-Arpscan is disabled					
SLOT 1 ▼					
Port	Trusted	State			
1/1	No	Forwarding			
1/2	No	Forwarding			
1/3	No	Forwarding			
1/4	No	Forwarding			
1/5	No	Forwarding			
1/6	No	Forwarding			
1/7	No	Forwarding			
1/8	No	Forwarding			
1/9	No	Forwarding			
1/10	No	Forwarding			
1/11	No	Forwarding			
1/12	No	Forwarding			
1/13	No	Forwarding			
1/14	No	Forwarding			

The following table describes the fields in the above screen.

Table 184 Advanced Application > Anti-Arpscan Status

LABEL	DESCRIPTION
Anti-Arpscan is....	This shows whether Anti-arpscan is enabled or disabled on the Switch.
SLOT	This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack.

Table 184 Advanced Application > Anti-Arpscan Status (continued)

LABEL	DESCRIPTION
Port	This field displays the port number of the Switch. In stacking mode, the first number represents the slot ID and the second is the port number. Please note that the default stacking ports (the last four ports of your Switch) cannot be configured. They are reserved for stacking only.
Trusted	This field displays whether the port is trusted or untrusted. Anti-arpscan is not performed on a trusted port.
State	This field displays whether the port can forward traffic normally (Forwarding) or is disabled (Err-Disable).

41.3 Anti-Arpscan Host Status

Use this screen to view blocked hosts and unblock ones connected to certain ports. To open this screen, click **Advanced Application > Anti-Arpscan > Host Status**.

Figure 324 Advanced Application > Anti-Arpscan > Host Status

The following table describes the fields in the above screen.

Table 185 Advanced Application > Anti-Arpscan > Host Status

LABEL	DESCRIPTION
Clear Filtered host	A filtered host is a blocked IP address.
Port List	Type a port number or a series of port numbers separated by commas and spaces, and then click Clear to unblock all hosts connected to these ports.
Filtered host	This table lists information on blocked hosts.
Index	This displays the index number of an IP address (a host) that has been blocked.
Host IP	This displays the IP address of the blocked host.
MAC	This displays the MAC address of the blocked host.
VLAN	This displays the VLAN ID that shows which VLAN the blocked host is in.
Port	This displays the port number to which the blocked host is connected.
State	This shows Err-Disable if the ARP-request rate from this host is over the threshold. Forwarding hosts are not displayed.

41.4 Anti-Arpscan Trust Host

Use this screen to create or remove trusted hosts identified by IP address and subnet mask. **Anti-arpscan** is not performed on trusted hosts. To open this screen, click **Advanced Application > Anti-Arpscan > Trust Host**.

Figure 325 Advanced Application > Anti-Arpscan > Trust Host

The following table describes the fields in the above screen.

Table 186 Advanced Application > Anti-Arpscan > Trust Host

LABEL	DESCRIPTION
Name	Type a descriptive name of up to 32 printable ASCII characters to identify this host.
Host IP	Type the IP address of the host.
Mask	A trusted host may consist of a subnet of IP addresses. Type a subnet mask to create a single host or a subnet of hosts.
Add	Click this to create the trusted host.
Cancel	Click this to reset the values above based or, if not applicable, to clear the fields above.
Clear	Click this to clear the fields above.
Index	This field displays a sequential number for each trusted host.
Name	This field displays the name of the trusted host.
Host IP	This field displays the IP address of the trusted host.
Mask	This field displays the subnet mask of the trusted host.
	Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries.
Delete	Select an entry check box and click Delete to remove the specified entry.
Cancel	Click this to clear the check boxes above.

41.5 Anti-Arpscan Configure

Use this screen to enable **Anti-Arpscan**, set port and host thresholds as well as configure ports to be trusted or untrusted. To open this screen, click **Advanced Application > Anti-Arpscan > Configure**.

Figure 326 Advanced Application > Anti-Arpscan > Configure (Standalone Mode)

Anti-Arpscan Configure [Status](#)

Active ☐

Port Threshold pps

Host Threshold pps

Port	Trusted State
*	Untrusted ▾
1	Untrusted ▾
2	Untrusted ▾
3	Untrusted ▾
4	Untrusted ▾
5	Untrusted ▾
6	Untrusted ▾
7	Untrusted ▾
8	Untrusted ▾
9	Untrusted ▾

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

Figure 327 Advanced Application > Anti-Arpscan > Configure (Stacking Mode)

Anti-Arpscan Configure [Status](#)

Active ☐

Port Threshold pps

Host Threshold pps

SLOT 1 ▾

Port	Trusted State
1/*	Untrusted ▾
1/1	Untrusted ▾
1/2	Untrusted ▾
1/3	Untrusted ▾
1/4	Untrusted ▾
1/5	Untrusted ▾
1/6	Untrusted ▾
1/7	Untrusted ▾
1/8	Untrusted ▾
1/9	Untrusted ▾
1/10	Untrusted ▾

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

The following table describes the fields in the above screen.

Table 187 Advanced Application > Anti-Arpscan > Configure

LABEL	DESCRIPTION
Active	Select this to enable Anti-arpscan on the Switch.
Port Threshold	A port threshold is determined by the number of packets received per second on the port. If the received packet rate is over the threshold, then the port is put into an Err-Disable state. Type the maximum number of packets per second allowed on the port before it is blocked. Note: The allowed range is 2 to 255 packets received per second.
Host Threshold	A host threshold is determined by the number of ARP-request packets received per second. This is the global threshold rate for all hosts. If the rate of a host is over the threshold, then that host is blocked by using a MAC address filter. A blocked host is released automatically after the MAC aging time expires. Type the maximum number of ARP-request packets allowed by a host before it is blocked. Note: The allowed range is 2 to 100 ARP-request packets per second. Note: The port-based threshold must be larger than the host-based threshold or the host-based threshold will not be applied.
SLOT	This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack.
Port	This field displays the port number. In stacking mode, the first number represents the slot ID and the second is the port number. Please note that the default stacking ports (the last four ports of your Switch) cannot be configured. They are reserved for stacking only.
*	Settings in this row apply to all ports. Use this row only if you want to make some settings the same for all ports. Use this row first to set the common settings and then make adjustments on a port-by-port basis. Note: Changes in this row are copied to all the ports as soon as you make them.
Trusted State	Select Untrusted or Trusted for the associated port. Anti-arpscan is not performed on trusted hosts.
Apply	Click Apply to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click this to reset the values in this screen to their last-saved values.

CHAPTER 42

BPDU Guard

42.1 BPDU Guard Overview

A BPDU (Bridge Protocol Data Units) is a data frame that contains information about STP. STP-aware switches exchange BPDUs periodically.

The BPDU guard feature allows you to prevent any new STP-aware switch from connecting to an existing network and causing STP topology changes in the network. If there is any BPDU detected on the ports on which BPDU guard is enabled, the Switch disables the ports automatically. You can then enable the ports manually in the **Basic Setting > Port Setup** screen, or use the **Errdisable Recovery** screen (see [Section 35.6 on page 374](#)) to have the ports become active after a certain time interval.

42.1.1 What You Can Do

- Use the **BPDU Guard Status** screen ([Section 42.2 on page 422](#)) to view the BPDU guard status.
- Use the **BPDU Guard Configuration** screen ([Section 42.3 on page 423](#)) to enable BPDU guard on the Switch.

42.2 BPDU Guard Status

Use this screen to view whether BPDU guard is enabled on the Switch and the port status. Click **Advanced Application > BPDU Guard** in the navigation panel.

Figure 328 Advanced Application > BPDU Guard Status (Standalone Mode)

BPDU Guard Status			Configuration
BPDU guard globally configuration: Disable			
Port	Active	Status	
1	No	Forwarding	
2	No	Forwarding	
3	No	Forwarding	
4	No	Forwarding	
5	No	Forwarding	
6	No	Forwarding	
7	No	Forwarding	
8	No	Forwarding	
9	No	Forwarding	
10	No	Forwarding	

Figure 329 Advanced Application > BPDU Guard Status (Stacking Mode)

BPDU Guard Status			Configuration
BPDU guard globally configuration: Disable			
SLOT 1 ▾			
Port	Active	Status	
1/1	No	Forwarding	
1/2	No	Forwarding	
1/3	No	Forwarding	
1/4	No	Forwarding	
1/5	No	Forwarding	
1/6	No	Forwarding	
1/7	No	Forwarding	
1/8	No	Forwarding	
1/9	No	Forwarding	
1/10	No	Forwarding	
1/11	No	Forwarding	
1/12	No	Forwarding	

The following table describes the fields in the above screen.

Table 188 Advanced Application > BPDU Guard Status

LABEL	DESCRIPTION
BPDU guard globally configuration	This field displays whether BPDU guard is activated on the Switch.
SLOT	This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack.
Port	This field displays the port number. In stacking mode, the first number represents the slot ID and the second is the port number. Please note that the default stacking ports (the last four ports of your Switch) cannot be configured. They are reserved for stacking only.
Active	This shows whether BPDU guard is activated on the port.
Status	This shows whether the port is shut down (Err-disable) or able to transmit packets (Forwarding).

42.3 BPDU Guard Configuration

Use this screen to turn on the BPDU guard feature on the Switch and ports.

In the **BPDU Guard Status** screen, click **Configuration** to display the configuration screen as shown.

Figure 330 Advanced Application > BPDU Guard > BPDU Guard Configuration (Standalone Mode)

BPDU Guard Configuration

Status

Active☐

Port	Active
*	☐
1	☐
2	☐
3	☐
4	☐
5	☐
6	☐
7	☐
8	☐
9	☐
10	☐
11	☐
12	☐
13	☐
14	☐
15	☐
16	☐
17	☐

ApplyCancel

Figure 331 Advanced Application > BPDU Guard > BPDU Guard Configuration (Stacking Mode)

BPDU Guard Configuration

Status

Active☐

SLOT 1

Port	Active
1/*	☐
1/1	☐
1/2	☐
1/3	☐
1/4	☐
1/5	☐
1/6	☐
1/7	☐
1/8	☐
1/9	☐
1/10	☐
1/11	☐
1/12	☐

ApplyCancel

The following table describes the fields in the above screen.

Table 189 Advanced Application > BPDU Guard > BPDU Guard Configuration

LABEL	DESCRIPTION
Active	Select this option to enable BPDU guard on the Switch.
SLOT	This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack.
Port	This field displays the port number. In stacking mode, the first number represents the slot ID and the second is the port number. Please note that the default stacking ports (the last four ports of your Switch) cannot be configured. They are reserved for stacking only.

Table 189 Advanced Application > BPDU Guard > BPDU Guard Configuration (continued)

LABEL	DESCRIPTION
*	Settings in this row apply to all ports. Use this row only if you want to make some settings the same for all ports. Use this row first to set the common settings and then make adjustments on a port-by-port basis. Note: Changes in this row are copied to all the ports as soon as you make them.
Active	Select this check box to enable the BPDU guard feature on this port. The Switch shuts down this port if there is any BPDU received on the port. Clear this check box to disable the BPDU guard feature.
Apply	Click Apply to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to begin configuring this screen afresh.

CHAPTER 43

OAM

43.1 OAM Overview

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 or OAM PDUs to transmit link status information between directly connected Ethernet devices. Both devices must support IEEE 802.3ah. Because link layer Ethernet OAM operates at layer two of the OSI (Open Systems Interconnection Basic Reference) model, neither IP or SNMP are necessary to monitor or troubleshoot network connection problems.

The Switch supports the following IEEE 802.3ah features:

- Discovery – this identifies the devices on each end of the Ethernet link and their OAM configuration.
- Remote Loopback – this can initiate a loopback test between Ethernet devices.

43.1.1 What You Can Do

- Use the **OAM Status** screen ([Section 43.2 on page 426](#)) to view the configuration of ports on which Ethernet OAM is enabled.
- Use the **OAM Configuration** screen ([Section 43.3 on page 431](#)) to enable Ethernet OAM on the Switch.
- Use the **OAM Remote Loopback** screen ([Section 43.4 on page 433](#)) to perform remote-loopback tests.

43.2 OAM Status

Use this screen to view the configuration of ports on which Ethernet OAM is enabled. Click **Advanced Application > OAM** in the navigation panel.

Figure 332 Advanced Application > OAM Status (Standalone Mode)

OAM Status Configuration Remote Loopback						
OAM is disabled						
Local			Remote			
Port	Mode	Mac Address	OUI	Mode	Config	
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
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Figure 333 Advanced Application > OAM Status (Stacking Mode)

OAM Status Configuration Remote Loopback						
OAM is disabled						
SLOT 1 ▾						
Local			Remote			
Port	Mode	Mac Address	OUI	Mode	Config	
1/1						
1/2						
1/3						
1/4						
1/5						
1/6						
1/7						
1/8						
1/9						
1/10						
1/11						
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1/98						
1/99						
1/100						

The following table describes the fields in the above screen.

Table 190 Advanced Application > OAM Status

LABEL	DESCRIPTION
SLOT	This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack.
Local	This section displays information about the ports on the Switch.
Port	This field displays the port number. In stacking mode, the first number represents the slot ID and the second is the port number. Please note that the default stacking ports (the last four ports of your Switch) cannot be configured. They are reserved for stacking only.

Table 190 Advanced Application > OAM Status (continued)

LABEL	DESCRIPTION
Mode	This field displays the operational state of the port when OAM is enabled on the port. Active – Allows the port to issue and respond to Ethernet OAM commands. Passive – Allows the port to respond to Ethernet OAM commands.
Remote	This section displays information about the remote device.
Mac Address	This field displays the MAC address of the remote device.
OUI	This field displays the OUI (first 3 bytes of the MAC address) of the remote device.
Mode	This field displays the operational state of the port when OAM is enabled on the port. Active – Allows the port to issue and respond to Ethernet OAM commands. Passive – Allows the port to respond to Ethernet OAM commands.
Config	This field displays the capabilities of the Switch and remote device.

43.2.1 OAM Details

Use this screen to view OAM configuration details and operational status of a specific port. Click a number in the **Port** column in the **OAM Status** screen to display the screen as shown next.

Figure 334 Advanced Application > OAM Status > OAM Details

OAM Details		OAM Status
Port No: 1		
Discovery	Local Client	OAM configurations
	Mode	
	Unidirectional	
	Remote loopback	
	Link events	
	Variable retrieval	
	Max. OAMPDU size	
	Local Client	Operational status
	Link status	
	Info. revision	
	Parser state	
	Discovery state	
	Remote Client	
	MAC address	
	Vendor(oui)	
	Remote Client	OAM configurations
	Mode	
	Unidirectional	
	Remote loopback	
	Link events	
	Variable retrieval	
	Max OAMPDU size	
	Remote Client	Operational status
	Info revision	
Statistics		
	Information OAMPDU Tx	
	Information OAMPDU Rx	
	Event Notification OAMPDU Tx	
	Event Notification OAMPDU Rx	
	Loopback Control OAMPDU Tx	
	Loopback Control OAMPDU Rx	
	Variable Request OAMPDU Tx	
	Variable Request OAMPDU Rx	
	Variable Response OAMPDU Tx	
	Variable Response OAMPDU Rx	
	Unsupported OAMPDU Tx	
	Unsupported OAMPDU Rx	

The following table describes the fields in the above screen.

Table 191 Advanced Application > OAM Status > OAM Details

LABEL	DESCRIPTION
Discovery	This section displays OAM configuration details and operational status of the port on the Switch and/or the remote device.
Local Client/Remote Client	
OAM configurations	
Mode	This field displays the OAM mode. The device in active mode (typically the service provider's device) controls the device in passive mode (typically the subscriber's device). Active: The port initiates OAM discovery; sends information PDUs; and may send event notification PDUs, variable request/response PDUs, or loopback control PDUs. Passive: The port waits for the remote device to initiate OAM discovery; sends information PDUs; may send event notification PDUs; and may respond to variable request PDUs or loopback control PDUs. The Switch might not support some types of PDUs, as indicated in the fields below.

Table 191 Advanced Application > OAM Status > OAM Details (continued)

LABEL	DESCRIPTION
Unidirectional	This field indicates whether or not the port can send information PDUs to transmit fault information when the receive path is non-operational.
Remote loopback	This field indicates whether or not the port can use loopback control PDUs to put the remote device into loopback mode.
Link events	This field indicates whether or not the port can interpret link events, such as link fault and dying gasp. Link events are sent in event notification PDUs and indicate when the number of errors in a 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.
Variable retrieval	This field indicates whether or not the port can respond to requests for more information, such as requests for Ethernet counters and statistics, about link events.
Max. OAMPDU size	This field displays the maximum size of PDU for receipt and delivery.
Local Client/Remote Client	
Operational status	
Link status	This field indicates that the link between the Switch port and a connected IEEE 802.3ah-enabled remote Ethernet device is up or down.
Info. revision	This field displays the current version of local state and configuration. This two-octet value starts at zero and increments every time the local state or configuration changes.
Parser state	This field indicates the current state of the parser. Forward: The port is forwarding packets normally. Loopback: The port is in loopback mode. Discard: The port is discarding non-OAM PDUs because it is trying to or has put the remote device into loopback mode.
Discovery state	This field indicates the state in the OAM discovery process. OAM-enabled devices use this process to detect each other and to exchange information about their OAM configuration and capabilities. OAM discovery is a handshake protocol. Fault: One of the devices is transmitting OAM PDUs with link fault information, or the interface is not operational. Active Send Local: The port is in active mode and is trying to see if the remote device supports OAM. Passive Wait: The port is in passive mode and is waiting for the remote device to begin OAM discovery. Send Local Remote: This state occurs in the following circumstances. - The port has discovered the remote device but has not accepted or rejected the connection yet. - The port has discovered the remote device and rejected the connection. Send Local Remote OK: The port has discovered the remote device and has accepted the connection. In addition, the remote device has not accepted or rejected the connection yet, or the remote device has rejected the connection. Send Any: The port and the remote device have accepted the connection. This is the operating state for OAM links that are fully operational.
Remote Client	
MAC Address	This field displays the MAC address of the IEEE 802.3ah-enabled remote Ethernet device that is connected to the Switch.
Vendor(oui)	This field displays the Organizationally Unique Identifiers (OUI) representing the vendor of the IEEE 802.3ah-enabled remote Ethernet device that is connected to the Switch.

Table 191 Advanced Application > OAM Status > OAM Details (continued)

LABEL	DESCRIPTION
Statistics	
This section displays the number of OAM packets transferred on the port of the Switch.	
Information OAMPDU Tx	This field displays the number of OAM PDUs sent on the port.
Information OAMPDU Rx	This field displays the number of OAM PDUs received on the port.
Event Notification OAMPDU Tx	This field displays the number of unique or duplicate OAM event notification PDUs sent on the port.
Event Notification OAMPDU Rx	This field displays the number of unique or duplicate OAM event notification PDUs received on the port.
Loopback Control OAMPDU Tx	This field displays the number of loopback control OAM PDUs sent on the port.
Loopback Control OAMPDU Rx	This field displays the number of loopback control OAM PDUs received on the port.
Variable Request OAMPDU Tx	This field displays the number of OAM PDUs sent to request MIB objects on the remote device.
Variable Request OAMPDU Rx	This field displays the number of OAM PDUs received requesting MIB objects on the Switch.
Variable Response OAMPDU Tx	This field displays the number of OAM PDUs sent by the Switch in response to requests.
Variable Response OAMPDU Rx	This field displays the number of OAM PDUs sent by the remote device in response to requests.
Unsupported OAMPDU Tx	This field displays the number of unsupported OAM PDUs sent on the port.
Unsupported OAMPDU Rx	This field displays the number of unsupported OAM PDUs received on the port.

43.3 OAM Configuration

Use this screen to turn on Ethernet OAM on the Switch and ports and configure the related settings.

In the **OAM Status** screen click **Configuration** to display the configuration screen as shown.

Figure 335 Advanced Application > OAM > OAM Configuration (Standalone Mode)

Port	Active	Mode	Remote Loopback Supported	Remote Loopback Ignore-Rx
*	☐	Active ▾	☐	☐
1	☐	Active ▾	☐	☐
2	☐	Active ▾	☐	☐
3	☐	Active ▾	☐	☐
4	☐	Active ▾	☐	☐
5	☐	Active ▾	☐	☐
6	☐	Active ▾	☐	☐
7	☐	Active ▾	☐	☐
8	☐	Active ▾	☐	☐
9	☐	Active ▾	☐	☐

Figure 336 Advanced Application > OAM > OAM Configuration (Stacking Mode)

Port	Active	Mode	Remote Loopback Supported	Remote Loopback Ignore-Rx
1/*	☐	Active ▾	☐	☐
1/1	☐	Active ▾	☐	☐
1/2	☐	Active ▾	☐	☐
1/3	☐	Active ▾	☐	☐
1/4	☐	Active ▾	☐	☐
1/5	☐	Active ▾	☐	☐
1/6	☐	Active ▾	☐	☐
1/7	☐	Active ▾	☐	☐
1/8	☐	Active ▾	☐	☐
1/9	☐	Active ▾	☐	☐
1/10	☐	Active ▾	☐	☐
1/11	☐	Active ▾	☐	☐
1/12	☐	Active ▾	☐	☐
1/13	☐	Active ▾	☐	☐

The following table describes the fields in the above screen.

Table 192 Advanced Application > OAM > OAM Configuration

LABEL	DESCRIPTION
Active	Select this option to enable Ethernet OAM on the Switch.
SLOT	This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack.

Table 192 Advanced Application > OAM > OAM Configuration (continued)

LABEL	DESCRIPTION
Port	This field displays the port number. In stacking mode, the first number represents the slot ID and the second is the port number. Please note that the default stacking ports (the last four ports of your Switch) cannot be configured. They are reserved for stacking only.
*	Settings in this row apply to all ports. Use this row only if you want to make some settings the same for all ports. Use this row first to set the common settings and then make adjustments on a port-by-port basis. Note: Changes in this row are copied to all the ports as soon as you make them.
Active	Select this check box to enable Ethernet OAM on this port. Clear this check box to disable Ethernet OAM on the port.
Mode	Specify the OAM mode on the port. Select Active to allow the port to issue and respond to Ethernet OAM commands. Select Passive to allow the port to respond to Ethernet OAM commands.
Remote Loopback Supported	Select this check box to enable the remote loopback feature on the port. Otherwise, clear the check box to disable it.
Remote Loopback Ignore-Rx	Select this check box to set the Switch to process loopback commands received on the port. Otherwise, clear the check box to have the Switch ignore loopback commands received on the port.
Apply	Click Apply to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to begin configuring this screen afresh.

43.4 OAM Remote Loopback

Use this screen to perform a remote loopback test. In the **OAM Status** screen click **Remote Loopback** to display the screen as shown.

Figure 337 Advanced Application > OAM > OAM Remote Loopback (Standalone Mode)

OAM Remote Loopback [OAM Status](#)

- Info -

Remote Loopback Test	Port		Test
	Number of Packet		
	Packet Size		
Remote Loopback Mode	Port		Start Stop

Figure 338 Advanced Application > OAM > OAM Remote Loopback (Stacking Mode)

The following table describes the fields in the above screen.

Table 193 Advanced Application > OAM > OAM Remote Loopback

LABEL	DESCRIPTION
Remote Loopback Test	
Port	Enter the number of the port from which the Switch performs a remote-loopback test. In stacking mode, the first field is the slot ID and the second field is the port number.
Number of Packet	Define the allowable packet number of the loopback test frames.
Packet Size	Define the allowable packet size of the loopback test frames.
Test	Click Test to begin the test.
Remote Loopback Mode	
Port	Enter the number of the port from which the Switch sends loopback control PDUs to initiate or terminate a remote-loopback test. In stacking mode, the first field is the slot ID and the second field is the port number.
Start	Click Start to initiate a remote-loopback test from the specified port by sending Enable Loopback Control PDUs to the remote device.
Stop	Click Stop to terminate a remote-loopback test from the specified port by sending Disable Loopback Control PDUs to the remote device.

CHAPTER 44

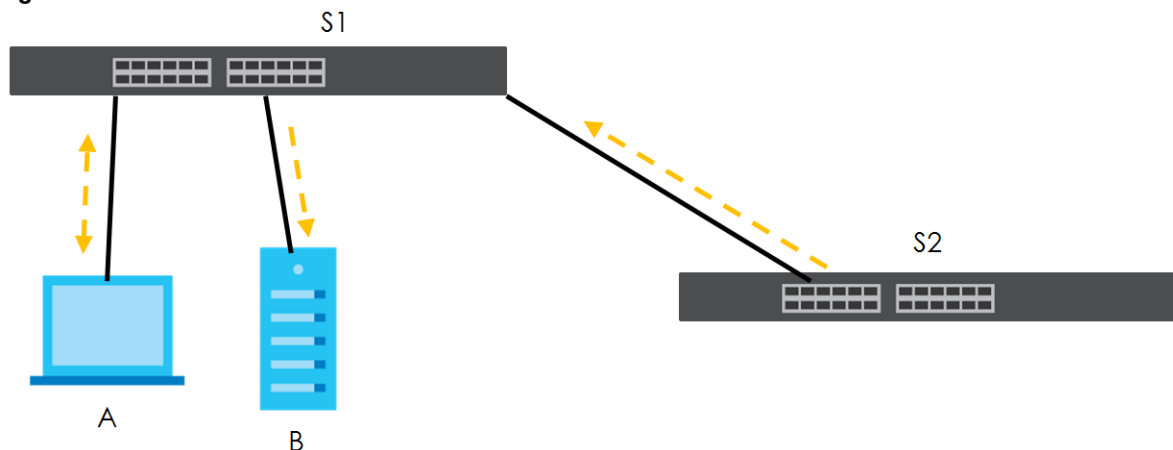
ZULD

44.1 ZULD Overview

A unidirectional link is a connection where the link is up on both ends, but only one end can receive packets. This may happen if OAM was initially enabled but then disabled, there are mis-configured transmitting or receiving lines or the hardware is malfunctioning. Zyxel Unidirectional Link Detection (**ZULD**) is a layer-2 protocol that can detect and disable these physical one-way links before they cause loops or communication malfunction.

In the figure below, S1-A is a bidirectional link as both ends can send packets to each other. S1-B is unidirectional as B cannot send packets to S1 (although the S1-B link is up). Similarly, S2-S1 is unidirectional as S1 cannot send packets to S2 (although the S1-S2 link is up).

Figure 339 ZULD Overview



44.1.1 What You Can Do

- Use the **ZULD Status** screen ([Section 44.2 on page 436](#)) to see details on ZULD.
- Use the **ZULD Configuration** screen ([Section 44.3 on page 438](#)) to enable ZULD on a port, configure a mode and set the probe time.

44.1.2 What You Need to Know

- ZULD must be enabled on the Switch and the ports in order to detect unidirectional links by monitoring OAMPDUs.

- Ports advertise their unidirectional link detection capability using OAMPDUs, so all connected devices must support **OAM** as well as **ZULD**. You need to enable OAM on the Switch by going to **Advanced Application > OAM > Configuration** and selecting **Active**. OAM must be enabled on other connected devices too. If OAM is not enabled initially, **ZULD** will not work.
- If OAM is enabled initially and later disabled on one end of a link, the link will be unidirectional as that end cannot send OAMPDUs.
- OAM discovery, the sending of OAMPDUs to other ports, is initiated by an active port.
- When **ZULD** detects a unidirectional link, it sends a syslog and SNMP trap and may shut down the affected port (**Aggressive Mode**).
- If a port on the Switch is shut down by **ZULD**, and you want to recover it, then do one of the following:
 - Go to **Basic Setting > Port Setup**. Clear **Active** and click **Apply**. Then select **Active** and click **Apply** again.
 - Go to **Advanced Application > Errdisable > Errdisable Recovery** and set the interval for **ZULD**. After the interval expires, the closed ports will become active and start receiving packets again.
 - Use the command `port no inactive`.
- Refer to the ZULD logs to see when a unidirectional link is detected and when it is recovered to a bidirectional link.

44.2 ZULD Status

Use this screen to see details of unidirectional and bidirectional links discovered by **ZULD**. To open this screen, click **Advanced Application > ZULD**.

Figure 340 Advanced Application > ZULD Status (Standalone Mode)

ZULD Status

[Configuration](#)

ZULD is disabled

Port	Active	Mode	Probe Time	Link State	Remote Operation	Remote MAC Addr	Remote Port
1	No	Normal					
2	No	Normal					
3	No	Normal					
4	No	Normal					
5	No	Normal					
6	No	Normal					
7	No	Normal					
8	No	Normal					
9	No	Normal					

Figure 341 Advanced Application > ZULD Status (Stacking Mode)

Port	Active	Mode	Probe Time	Link State	Remote Operation	Remote MAC Addr	Remote Port
1/1	No	Normal					
1/2	No	Normal					
1/3	No	Normal					
1/4	No	Normal					
1/5	No	Normal					
1/6	No	Normal					
1/7	No	Normal					
1/8	No	Normal					
1/9	No	Normal					
1/10	No	Normal					
1/11	No	Normal					
1/12	No	Normal					
1/13	No	Normal					

The following table describes the fields in the above screen.

Table 194 Advanced Application > ZULD Status

LABEL	DESCRIPTION
ZULD is....	This shows whether ZULD is enabled or disabled on the Switch.
SLOT	This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack.
Port	This field displays the port number. In stacking mode, the first number represents the slot ID and the second is the port number. Please note that the default stacking ports (the last four ports of your Switch) cannot be configured. They are reserved for stacking only.
Active	This field displays whether ZULD is enabled on the port or not. ZULD must be enabled to detect an unidirectional link by monitoring OAMPDUs.
Mode	This field indicates what ZULD will do when a unidirectional link is detected. In Normal mode, ZULD only sends a syslog and trap when it detects a unidirectional link. In Aggressive mode, ZULD shuts down the port (puts it into an ErrDisable state) as well as sends a syslog and trap when it detects a unidirectional link.
Probe Time	Probe time is the length of time that ZULD waits before declaring that a link is unidirectional. When the probe time expires, and one port (either on the Switch or the connected device) still has not received an OAMPDU, then ZULD declares that the link is unidirectional.
Link State	This field shows the following link states: • Linkdown: This is an initialization state, where the port is not yet up. • Probe: This indicates that ZULD is discovering the connected device on this link. • Bidirectional: Traffic sent by the Switch is received by the connected device on this link, and traffic from the connected device on this link is received by the Switch. • Unidirectional: The state of the link between the port and its connected port cannot be determined either because no ZULD message was received, or one port is not capable of sending traffic. • Shutdown: The port has been shut down because its link with the connected device is unidirectional and ZULD is in Aggressive mode.
Remote Operation	This field displays whether ZULD is enabled or disabled on the connected device on this link. ZULD must be enabled on the connected device and on the port that is connecting to the Switch.

Table 194 Advanced Application > ZULD Status (continued)

LABEL	DESCRIPTION
Remote MAC Addr	This is the MAC address of the port on the connected device to which the port of the Switch is connected.
Remote Port	This is the port number of the port on the connected device to which the port of the Switch is connected.

44.3 ZULD Configuration

Use this screen to enable ZULD on a port, configure a mode and set the probe time. To open this screen, click **Advanced Application > ZULD > Configuration**.

Figure 342 Advanced Application > ZULD > Configuration (Standalone Mode)

The screenshot shows the 'ZULD Configuration' screen. At the top, there is a 'Status' link. Below it, an 'Active' checkbox is present. The main part of the screen is a table with the following columns: Port, Active, Mode, and Probe Time. The table lists ports from 1 to 9, with a '*' row at the top. Each port has an 'Active' checkbox, a 'Mode' dropdown menu (all set to 'Normal'), and a 'Probe Time' input field (all set to '5'). At the bottom of the screen, there are 'Apply' and 'Cancel' buttons.

Port	Active	Mode	Probe Time
*	☐	Normal	
1	☐	Normal	5
2	☐	Normal	5
3	☐	Normal	5
4	☐	Normal	5
5	☐	Normal	5
6	☐	Normal	5
7	☐	Normal	5
8	☐	Normal	5
9	☐	Normal	5

Figure 343 Advanced Application > ZULD > Configuration (Stacking Mode)

Port	Active	Mode	Probe Time
1/*	☐	Normal	
1/1	☐	Normal	5
1/2	☐	Normal	5
1/3	☐	Normal	5
1/4	☐	Normal	5
1/5	☐	Normal	5
1/6	☐	Normal	5
1/7	☐	Normal	5
1/8	☐	Normal	5
1/9	☐	Normal	5
1/10	☐	Normal	5
1/11	☐	Normal	5
1/12	☐	Normal	5
1/13	☐	Normal	5

The following table describes the fields in the above screen.

Table 195 Advanced Application > ZULD > Configuration

LABEL	DESCRIPTION
Active	Select this to enable ZULD on the Switch.
SLOT	This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack.
Port	This field displays the port number. In stacking mode, the first number represents the slot ID and the second is the port number. Please note that the default stacking ports (the last four ports of your Switch) cannot be configured. They are reserved for stacking only.
*	Settings in this row apply to all ports. Use this row only if you want to make some settings the same for all ports. Use this row first to set the common settings and then make adjustments on a port-by-port basis. Note: Changes in this row are copied to all the ports as soon as you make them.
Active	Select this to enable ZULD on the port. ZULD must be enabled to detect an unidirectional link by monitoring OAMPDUs.
Mode	Select Normal or Aggressive . In Normal mode, ZULD only sends a syslog and trap when it detects a unidirectional link. In Aggressive mode, ZULD shuts down the port (puts it into an ErrDisable state) as well as sends a syslog and trap when it detects a unidirectional link.
Probe Time	Type the length of time that ZULD waits before declaring that a link is unidirectional. When the probe time expires, and one port (either on the Switch or the connected device) still has not received an OAMPDU, then ZULD declares that the link is unidirectional. The allowed time range is from 5 – 65535 seconds.

Table 195 Advanced Application > ZULD > Configuration (continued)

LABEL	DESCRIPTION
Apply	Click Apply to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click this to reset the values in this screen to their last-saved values.

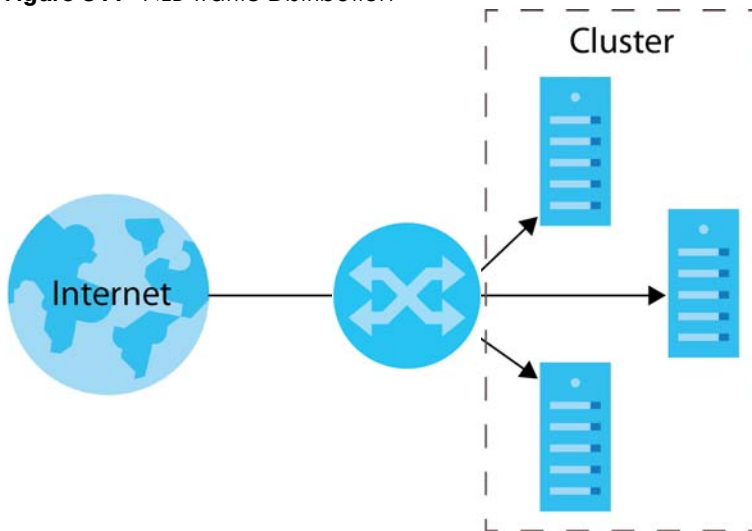
CHAPTER 45

NLB

45.1 NLB Overview

The Switch supports NLB (Network Load Balancing) traffic distribution. The Switch will copy and forward the incoming traffic to a cluster. Each server in a cluster tackles a separate copy of traffic.

Figure 344 NLB Traffic Distribution



The Switch only supports up to two clusters for NLB traffic distribution.

Note: NLB settings are configured on the servers.

See [Section 45.1.2 on page 442](#) for more information about NLB.

45.1.1 What You Can Do

- Use the **MAC Forwarding** screen ([Section 45.2 on page 442](#)) to configure to which MAC addresses and ports the Switch should forward the incoming NLB traffic.
- Use the **IP Configuration** screen ([Section 45.3 on page 444](#)) to map the IP address to the MAC address of a cluster for layer-3 forwarding.

45.1.2 What You Need to Know

NLB

Network Load Balancing (NLB) is a feature developed by Microsoft. NLB enhances the performance reliability for critical applications by sharing traffic with multiple servers in a cluster using TCP/IP protocol. Each server of a cluster tackles a copy of a traffic. You can create a cluster by grouping up to 32 servers together.

If a server in a cluster fails, traffic will be redistributed to the other operating servers. When the server is back in service, it will join the cluster automatically and share the traffic.

Unicast Mode

NLB replaces the real MAC addresses of the servers in a cluster with a unicast MAC address. Each server uses the same unicast MAC address, and a switch cannot map the unicast MAC address to a port. This forces a switch to flood traffic meant for the cluster to all ports of the switch to make sure the traffic is forwarded to the right destination.

The servers in a cluster cannot communicate with each other, because they use the same unicast MAC address.

Multicast Mode

NLB assigns a multicast MAC address to the servers in a cluster. Therefore, each server has two MAC addresses, the real MAC address and the multicast MAC address.

Create static ARP entries on a switch for the servers, so the switch will only forward traffic to the servers of the cluster.

The servers in a cluster can communicate with each other, because they keep their real MAC address and already have their own IP addresses.

45.2 MAC Forwarding

Use this screen to configure to which MAC addresses and ports the Switch should forward the incoming NLB traffic.

Click **Advanced Application > NLB** in the navigation panel to display the screen as shown.

Note: The following screens cannot have duplicate settings as the **Advanced Application > NLB** screen.

- **Advanced Application > Static MAC Forwarding**
- **Advanced Application > Static Multicast Forwarding**
- **Advanced Application > Filtering**

Figure 345 Advanced Application > NLB

The screenshot shows the 'MAC forwarding' configuration interface. It includes a header with 'MAC forwarding' and 'IP configuration' tabs. The main form has four input fields: 'Name', 'MAC Address', 'VID', and 'Port'. Below these fields are three buttons: 'Add', 'Cancel', and 'Clear'. At the bottom of the screen, there is a table with the following columns: 'Index', 'Name', 'MAC Address', 'VID', 'Port', and a checkbox. Below the table are 'Delete' and 'Cancel' buttons.

The following table describes the labels in this screen.

Table 196 Advanced Application > NLB

LABEL	DESCRIPTION
MAC forwarding	
Name	Enter a descriptive name for identification purposes for this rule.
MAC Address	Enter a multicast or unicast MAC address of a cluster. The last binary bit of the first octet pair in a multicast MAC address must be 1. For example, the first octet pair 00000001 is 01 and 00000011 is 03 in hexadecimal, so 01:00:5e:00:00:0A and 03:00:5e:00:00:27 are valid multicast MAC addresses. The last binary bit of the first octet pair in a unicast MAC address must be 0. For example, the first octet pair 00000000 is 00 and 00000010 is 02 in hexadecimal, so 00:00:5e:00:00:0A and 02:00:5e:00:00:27 are valid unicast MAC addresses.
VID	Enter the VLAN identification number. If you do not have a specific target VLAN, enter 1. The Switch will forward traffic to ports in this VLAN group.
Port	Enter the ports to which you want the Switch to forward the incoming NLB traffic. You can enter multiple ports separated by (no space) comma (,) or hyphen (-). For example, enter "3-5" for ports 3, 4, and 5. Enter "3,5,7" for ports 3, 5, and 7. In stacking mode, the first number represents the slot and the second the port number. Enter 1/1-1/24,2/23 for ports 1 to 24 for the Switch in slot 1 and port 23 for the Switch in slot 2, for example.
Add	Click Add to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to begin configuring this screen afresh.
Clear	Click Clear to reset the fields to the factory defaults.
Index	This field displays the index number of the rule.
Name	This field displays the descriptive name of the rule.
MAC Address	This field displays the multicast or unicast MAC address of this rule.
VID	This field displays the VLAN group identification number.
Port	This field displays the ports to which the Switch will forward the incoming NLB traffic.

Table 196 Advanced Application > NLB (continued)

LABEL	DESCRIPTION
	Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries.
Delete	Click Delete to remove the selected entry from the summary table.
Cancel	Click Cancel to clear the check boxes.

45.3 IP Configuration

Use this screen to map the IP address to the MAC address of a cluster for layer-3 forwarding. Use the MAC address added in the **Advanced Application > NLB** screen.

Click **Advanced Application > NLB > IP configuration** in the navigation panel to display the screen as shown.

Note: The settings configured in the **Advanced Application > NLB > IP configuration** and **IP Application > ARP Setup > Static ARP** screens cannot duplicate.

Figure 346 Advanced Application > NLB > IP Configuration

The following table describes the labels in this screen.

Table 197 Advanced Application > NLB > IP Configuration

LABEL	DESCRIPTION
IP Configuration	
Name	Enter a descriptive name for identification purposes for this rule.
IP Address	Enter an IPv4 or IPv6 address for a cluster.
MAC Address	Enter a multicast or unicast MAC address added in the Advanced Application > NLB screen. The last binary bit of the first octet pair in a multicast MAC address must be 1. For example, the first octet pair 00000001 is 01 and 00000011 is 03 in hexadecimal, so 01:00:5e:00:00:0A and 03:00:5e:00:00:27 are valid multicast MAC addresses. The last binary bit of the first octet pair in a unicast MAC address must be 0. For example, the first octet pair 00000000 is 00 and 00000010 is 02 in hexadecimal, so 00:00:5e:00:00:0A and 02:00:5e:00:00:27 are valid unicast MAC addresses.
Add	Click Add to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.

Table 197 Advanced Application > NLB > IP Configuration (continued)

LABEL	DESCRIPTION
Cancel	Click Cancel to begin configuring this screen afresh.
Clear	Click Clear to reset the fields to the factory defaults.
Index	This field displays the index number of the rule.
Name	This field displays the descriptive name of the rule.
IP Address	This field displays the IP address of the cluster.
MAC Address	This field displays the multicast or unicast MAC address of this rule.
	Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries.
Delete	Click Delete to remove the selected entry from the summary table.
Cancel	Click Cancel to clear the check boxes.

CHAPTER 46

Wol Relay

46.1 Wol Relay Overview

Wake On LAN is a feature to remotely turn on a device on the LAN network. A device is turned on by receiving a magic packet. 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.

A magic packet is a UDP broadcast packet. The device that you want to turn on is off, so it cannot respond to a TCP packet. Therefore, It has to be a UDP broadcast packet to turn on a device.

Broadcast packets are generally not routed. A magic packet cannot be routed. This prevents DDoS attacks, but also prohibits you from sending magic packets to other devices in different subnets. The Switch's Wake On LAN relay feature allows you to send magic packets to devices across different subnets.

46.2 Wol Relay

Use this screen to configure settings on Wake On LAN relay. Click **Advanced Application > Wol Relay** to open the following screen.

Figure 347 Advanced Application > Wol Relay

Wol Relay			
UDP			
Source VLAN			
Destination VLAN			

[Add](#) [Cancel](#) [Clear](#)

Index	UDP	Source VLAN	Destination VLAN	
				☐

[Delete](#) [Cancel](#)

The following table describes the labels in this screen.

Table 198 Advanced Application > Wol Relay

LABEL	DESCRIPTION
Wol Relay	
UDP	Enter a UDP port number that magic packets are sent through. The most common port for transmission is UDP port 9.
Source VLAN	Enter the source VLAN ID where the magic packet originates from.
Destination VLAN	Enter the destination VLAN ID where the magic packet will be sent to.
Add	Click Add to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to begin configuring this screen afresh.
Clear	Click Clear to reset the fields to the factory defaults.
Index	This field displays the index number of the rule.
UDP	This field displays the UDP port of the rule.
Source VLAN	This field displays the source VLAN ID of the rule.
Destination VLAN	This field displays the destination VLAN ID of the rule.
	Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries.
Delete	Click Delete to remove the selected entry from the summary table.
Cancel	Click Cancel to clear the check boxes.

CHAPTER 47

Static Route

47.1 Static Routing Overview

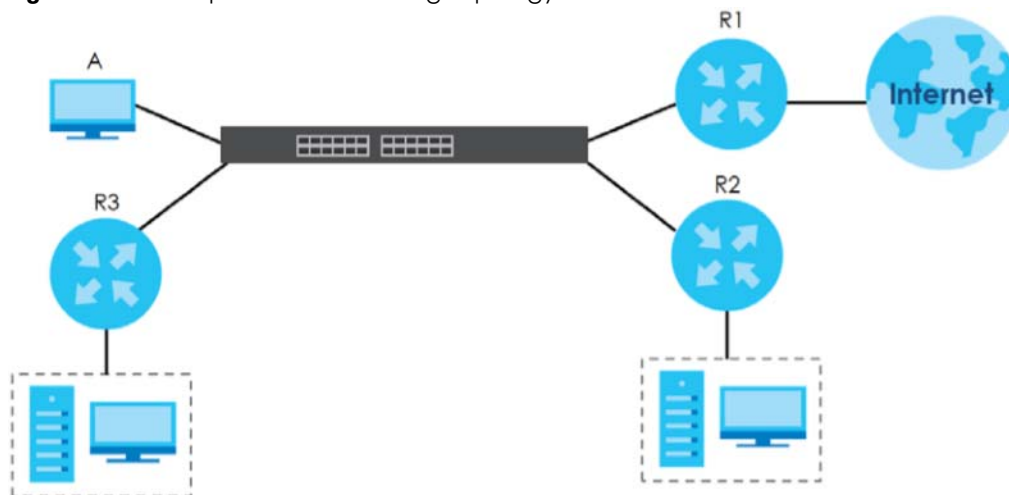
This chapter shows you how to configure static routes.

The Switch uses IP for communication with management computers, for example using HTTP, Telnet, SSH, or SNMP. Use IP static routes to have the Switch respond to remote management stations that are not reachable through the default gateway. The Switch can also use static routes to send data to a server or device that is not reachable through the default gateway, for example when sending SNMP traps or using ping to test IP connectivity.

The Switch usually uses the default gateway to route outbound traffic from computers on the LAN to the Internet. To have the Switch 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 Switch. The Switch routes most traffic from **A** to the Internet through the Switch'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 Switch.

Figure 348 Example of Static Routing Topology



47.1.1 What You Can Do

- Use the **Static Routing** screen ([Section 47.2 on page 449](#)) to display the link to the **IPv4 Static Route** screen.
- Use the **IPv4 Static Route** screen ([Section 47.3 on page 449](#)) to configure and enable an IPv4 static route.
- Use the **IPv6 Static Route** screen ([Section 47.4 on page 450](#)) to configure and enable an IPv6 static route.

47.2 Static Routing

Click **IP Application > Static Routing** in the navigation panel to display the screen as shown.

Click the link next to **IPv4 Static Route** to open a screen where you can create IPv4 static routing rules.

Click the link next to **IPv6 Static Route** to open a screen where you can create IPv6 static routing rules.

Figure 349 IP Application > Static Routing



47.3 IPv4 Static Route

Click the link next to **IPv4 Static Route** in the **IP Application > Static Routing** screen to display the screen as shown.

Figure 350 IP Application > Static Routing > IPv4 Static Route

The following table describes the related labels you use to create a static route.

Table 199 IP Application > Static Routing > IPv4 Static Route

LABEL	DESCRIPTION
Active	This field allows you to activate or deactivate this static route.
Name	Enter a descriptive name (up to 10 printable ASCII characters) for identification purposes.
Destination IP Address	This parameter specifies the IP network address of the final destination.
IP Subnet Mask	Enter the subnet mask for this 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.
Gateway IP Address	Enter the IP address of the gateway. The gateway is an immediate neighbor of your Switch that will forward the packet to the destination. The gateway must be a router on the same segment as your Switch.

Table 199 IP Application > Static Routing > IPv4 Static Route (continued)

LABEL	DESCRIPTION
Metric	The metric represents the "cost" of transmission for routing purposes. IP routing uses hop count as the measurement of cost, with a minimum of 1 for directly connected networks. Enter a number that approximates the cost for this link. The number need not be precise, but it must be between 1 and 15. In practice, 2 or 3 is usually a good number.
Add	Click Add to insert a new static route to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to reset the above fields to your previous configuration.
Clear	Click Clear to set the above fields back to the factory defaults.
Index	This field displays the index number of the route. Click a number to edit the static route entry.
Active	This field displays Yes when the static route is activated and NO when it is deactivated.
Name	This field displays the descriptive name for this route. This is for identification purposes only.
Destination Address	This field displays the IP network address of the final destination.
Subnet Mask	This field displays the subnet mask for this destination.
Gateway Address	This field displays the IP address of the gateway. The gateway is an immediate neighbor of your Switch that will forward the packet to the destination.
Metric	This field displays the cost of transmission for routing purposes.
	Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries.
Delete	Click Delete to remove the selected entry from the summary table.
Cancel	Click Cancel to clear the check boxes.

47.4 IPv6 Static Route

Click the link next to **IPv6 Static Route** in the **IP Application > Static Routing** screen to display the screen as shown.

Figure 351 IP Application > Static Routing > IPv6 Static Route

The screenshot shows the 'IPv6 Static Route' configuration interface. At the top, there's a title bar with 'IPv6 Static Route' and a link to 'Static Routing'. Below this, there are several input fields: 'Route Destination', 'Prefix Length', 'Next Hop', 'Interface Type' (which is set to 'VLAN'), and 'Interface ID'. Under these fields are two buttons: 'Add' and 'Cancel'. At the bottom of the screen, there is a table with the following columns: 'Index', 'Interface', 'Route Destination/Prefix Length', 'Next Hop', and a checkbox. Below the table are two more buttons: 'Delete' and 'Cancel'.

The following table describes the related labels you use to create a static route.

Table 200 IP Application > Static Routing > IPv6 Static Route

LABEL	DESCRIPTION
Route Destination	Enter the IPv6 address of the final destination.
Prefix Length	Enter the prefix length number of up to 64 for this destination.
Next Hop	Enter the IPv6 address of the next-hop router.
Interface Type	Select the type of the IPv6 interface through which the IPv6 packets are forwarded. The Switch supports only the VLAN interface type at the time of writing.
Interface ID	Enter the ID number of the IPv6 interface through which the IPv6 packets are forwarded.
Add	Click Add to insert a new static route to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to begin configuring this screen afresh.
Index	This field displays the index number of the route. Click a number to edit the static route entry.
Interface	This field displays the descriptive name of the interface that is used to forward the packets to the destination.
Route Destination/Prefix Length	This field displays the IPv6 subnet prefix and prefix length of the final destination.
Next Hop	This field displays the IPv6 address of the gateway that helps forward the packet to the destination.
	Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries.
Delete	Click Delete to remove the selected entry from the summary table.
Cancel	Click Cancel to clear the check boxes.

CHAPTER 48

Policy Routing

This chapter shows you how to configure policy routing rules.

48.1 Policy Route Overview

Traditionally, routing is based on the destination address only and the Switch takes the shortest path to forward a packet. Policy routing provides a mechanism to override the default routing behavior and alter the packet forwarding based on the policy defined by the network administrator. Policy-based routing is applied to incoming packets prior to the normal routing.

Individual routing policies are used as part of the overall policy routing process. A routing policy defines the action to take when a packet meets the criteria in a specified classifier. The action is taken only when all the criteria are met.

48.1.1 Benefits

- Source-Based Routing – Network administrators can use policy-based routing to direct traffic from different users through different connections.
- Cost Savings – Policy routing allows organizations to distribute interactive traffic on high-bandwidth, high-cost paths while using low-cost paths for batch traffic.
- Load Sharing – Network administrators can use policy routing to distribute traffic among multiple paths.

48.2 Configuring Policy Routing Profile

Click **IP Application > Policy Routing** in the navigation panel to display the screen as shown. Use this screen to configure a policy routing profile, which can consist of multiple policy routing rules.

Figure 352 IP Application > Policy Routing

Policy Route		
Active	☐	
Profile Name		
Add Cancel Clear		
Index	Active	Profile name
Delete Cancel		

The following table describes the labels in this screen.

Table 201 IP Application > Policy Routing

LABEL	DESCRIPTION
Active	This field allows you to activate or deactivate this policy routing profile and rules in the profile.
Profile Name	Enter a descriptive name (up to 32 printable ASCII characters) for identification purposes. Spaces are allowed.
Add	Click this to create a new entry or to update an existing one. This saves your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to reset the fields to your previous configuration.
Clear	Click Clear to set the above fields back to the factory defaults.
Index	This field displays the index number of the policy routing profile. Click a number to edit the policy routing profile entry.
Active	This field displays Yes when the policy routing profile is activated and No when it is deactivated.
Profile Name	This field displays the descriptive name for this profile. This is for identification purposes only.
	Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries.
Delete	Click Delete to remove the selected entry from the summary table.
Cancel	Click Cancel to clear the check boxes.

48.2.1 Policy Routing Rule Configuration

You must first configure a layer-3 classifier in the **Classifier** screen and a policy routing profile in the **Policy Routing** screen.

Use this screen to configure a policy route to override the default (shortest path) routing behavior and forward packets based on the classifier and action you specify. A policy route rule defines the matching classifier and the action to take when a packet meets the criteria in the classifier. The action is taken only when all the criteria are met. Policy-based routing is applied to incoming packets on a per interface basis before normal routing. The Switch does not perform normal routing on packets that match any of the policy routes.

Click **Rule Configuration** in the **IP Application > Policy Routing** screen to display the screen as shown.

Figure 353 IP Application > Policy Routing > Rule Configuration

The screenshot shows the 'Rule Configuration' interface. It includes a 'Policy Route' header and a 'Profile Configuration' link. The main form contains the following fields:

- Profile Name:** A text input field.
- Sequence:** A numeric input field.
- Statement:** Radio buttons for 'Permit' (selected) and 'Deny'.
- Classifier:** A dropdown menu.
- Action:** A section with a 'Next Hop' label and a text input field containing '0.0.0.0'.

Below the form are three buttons: 'Add', 'Cancel', and 'Clear'. At the bottom of the screen is a table with the following columns: 'Active', 'Profile name', 'Seq', 'State', 'Classifier', and a checkbox. Below the table are 'Delete' and 'Cancel' buttons.

The following table describes the labels in this screen.

Table 202 IP Application > Policy Routing > Rule Configuration

LABEL	DESCRIPTION
Profile Name	This field displays the policy routing profiles you configure in the IP Application > Policy Routing screen. Select a profile for which you want to configure a policy routing rule.
Sequence	Enter the rule number from 1 to 64. The ordering of your rules is important as rules are applied in turn. You can not specify a number already in use by another rule.
Statement	Select Permit to forward traffic that matches this rule to the gateway specified in the rule. Select Deny to disable the rule action and forward traffic that matches this rule according to the routing table on the Switch.
Classifier	This field displays the available active classifiers you configure in the Classifier screen, which are not used by any policy rule or policy routing rule. Select a classifier to which this policy routing rule applies.
Action	Enter the IP address of the gateway. The gateway is an immediate neighbor of your Switch that will forward the packet to the destination.
Add	Click this to create a new entry or to update an existing one. This saves your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to reset the fields to your previous configuration.
Clear	Click Clear to set the above fields back to the factory defaults.
Active	This field displays whether the policy route profile is enabled or not.
Profile Name	This field displays the name of the policy route profile with which the rule is associated.
Seq	This field displays the rule index number that you configure in the Sequence field. Click an index number to change the rule's Statement .
State	This field displays permit when the rule action is activated and deny when it is deactivated.

Table 202 IP Application > Policy Routing > Rule Configuration (continued)

LABEL	DESCRIPTION
Classifier	This field displays the name of the classifier to which this policy applies.
	Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries.
Delete	Click Delete to remove the selected entries from the summary table.
Cancel	Click Cancel to clear the check boxes.

CHAPTER 49

RIP

This chapter shows you how to configure RIP (Routing Information Protocol).

49.1 RIP Overview

RIP (Routing Information Protocol) allows a routing device to exchange routing information with other routers. The **Direction** field controls the sending and receiving of RIP packets. When set to:

- **Both** – the Switch will broadcast its routing table periodically and incorporate the RIP information that it receives.
- **Incoming** – the Switch will not send any RIP packets but will accept all RIP packets received.
- **Outgoing** – the Switch will send out RIP packets but will not accept any RIP packets received.
- **None** – the Switch will not send any RIP packets and will ignore any RIP packets received.

The **Version** field controls the format and the broadcasting method of the RIP packets that the Switch sends (it recognizes both formats when receiving). **RIP-1** is universally supported; but RIP-2 carries more information. **RIP-1** is probably adequate for most networks, unless you have an unusual network topology.

Both **RIP-2B** and **RIP-2M** send the routing data in RIP-2 format; the difference being that **RIP-2B** uses subnet broadcasting while **RIP-2M** uses multicasting.

RIPv2 uses UDP port 520 and the multicast address 224.0.0.9.

49.1.1 Administrative Distance

When two or more than two different routing protocols, such as RIP and OSPF provide multiple routes to the same destination, the Switch can use the administrative distance of the route to determine which routing protocol to use and add the route to the routing table.

The lower the administrative distance value is, the more preferable the routing protocol is. If two routes have the same administrative distance value, the Switch uses the route that has the lowest metric value. The following table lists the default administrative distance value of the route sources supported on the Switch.

Table 203 Default Distance Value

ROUTE SOURCE	ADMINISTRATIVE DISTANCE
Local	0
Static	1

Table 203 Default Distance Value (continued)

ROUTE SOURCE	ADMINISTRATIVE DISTANCE
OSPF	110
RIP	120

49.2 RIP Configuration

Click **IP Application** > **RIP** in the navigation panel to display the screen as shown.

Click the link next to **IPv4 RIP** to open a screen where you can enable RIP for IPv4 and configure the RIP version and direction for an IP interface.

Figure 354 IP Application > RIP



49.3 Configuring IPv4 RIP

Click **IP Application** > **RIP** > **IPv4 RIP** in the navigation panel to display the screen as shown. You cannot manually configure a new entry. Each entry in the table is automatically created when you configure a new IP domain in the **IP Setup** screen.

Figure 355 IP Application > RIP > IPv4 RIP

The following table describes the labels in this screen.

Table 204 IP Application > RIP > IPv4 RIP

LABEL	DESCRIPTION
Active	Select this check box to enable IPv4 RIP on the Switch.
Distance	Enter a number from 10 to 255 to specify the administrative distance that is assigned to routes learned by RIP. The lower the administrative distance value is, the more preferable the routing protocol is. Note: You cannot set two routing protocols to have the same administrative distance.
Index	This field displays the index number of an IP interface.

Table 204 IP Application > RIP > IPv4 RIP (continued)

LABEL	DESCRIPTION
*	Settings in this row apply to all entries. Use this row only if you want to make some settings the same for all entries. Use this row first to set the common settings and then make adjustments on a per entry basis. Note: Changes in this row are copied to all the entries as soon as you make them.
Network	This field displays the IP interface configured on the Switch. Refer to the section on IP Setup for more information on configuring IP domains.
Direction	Select the RIP direction from the drop-down list box. Choices are Outgoing, Incoming, Both and None.
Version	Select the RIP version from the drop-down list box. Choices are RIP-1, RIP-2B and RIP-2M.
Apply	Click Apply to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to begin configuring this screen afresh.

CHAPTER 50

OSPF

This chapter describes the OSPF (Open Shortest Path First) routing protocol and shows you how to configure OSPF.

50.1 OSPF Overview

OSPF (Open Shortest Path First) is a link-state protocol designed to distribute routing information within an autonomous system (AS). An autonomous system is a collection of networks using a common routing protocol to exchange routing information.

OSPF offers some advantages over traditional vector-space routing protocols (such as RIP). The following table summarizes some of the major differences between OSPF and RIP.

Table 205 OSPF vs. RIP

	OSPF	RIP
Network Size	Large	Small (with up to 15 routers)
Metrics	Bandwidth, hop count, throughput, round trip time and reliability.	Hop count
Convergence	Fast	Slow

The Switch uses OSPFv2 for IPv4. OSPFv2 uses plain text or MD5 authentication.

50.1.1 OSPF Autonomous Systems and Areas

An OSPF autonomous system (AS) can be divided into logical areas. Each area represents a group of adjacent networks. All areas are connected to a backbone (also known as area 0). The backbone is the transit area to route packets between two areas. A stub area, at the edge of an AS is not a transit area since there is only one connection to the stub area.

The following table describes the four classes of OSPF routers.

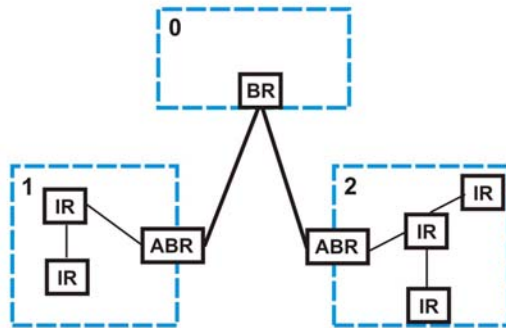
Table 206 OSPF: Router Types

TYPE	DESCRIPTION
Internal Router (IR)	An Internal or intra-area router is a router in an area.
Area Border Router (ABR)	An Area Border Router connects two or more areas.
Backbone Router (BR)	A backbone router has an interface to the backbone.
AS Boundary Router	An AS boundary router exchanges routing information with routers in other ASs.

The following figure depicts an OSPF network example. The backbone is area 0 with a backbone router.

The internal routers are in area 1 and 2. The area border routers connect area 1 and 2 to the backbone.

Figure 356 OSPF Network Example



50.1.2 How OSPF Works

Layer-3 devices exchange routing information to build a synchronized link state database within the same AS or area. The link state database contains records of router IDs, their associated links and path costs. Each device can then use the link state database and Dijkstra algorithm to compute the least cost paths to network destinations.

Layer-3 devices build a synchronized link state database by exchanging Hello messages to confirm which neighbor (layer-3) devices exist and then they exchange database descriptions (DDs) to create the link state database. The link state database is constantly updated through LSAs (Link State Advertisements).

50.1.3 Interfaces and Virtual Links

An OSPF interface is a link between a layer-3 device and an OSPF network. An interface has state information, an IP address and subnet mask associated with it. When you configure an OSPF interface, you first set an interface to transmit OSPF traffic and add the interface to an area.

You can configure a virtual link to establish/maintain connectivity between a non-backbone area and the backbone. The virtual link must be configured on both layer-3 devices in the non-backbone area and the backbone.

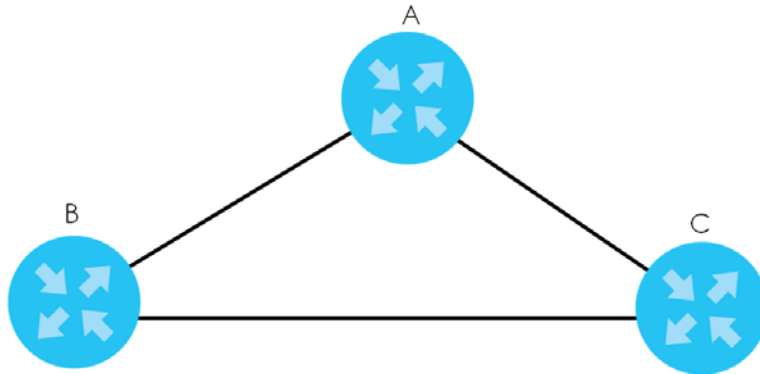
50.1.4 OSPF and Router Elections

The OSPF protocol provides for automatic election of Designated Router (DR) and Backup Designated Router (BDR) on network segments. The DR and BDR keep track of link state updates in their area and make sure LSAs are sent to the rest of the network.

In most cases the default DR/BDR election is fine, but in some situations it must be controlled. In the following figure only router **A** has direct connectivity with all the other routers on the network segment. Routers **B** and **C** do not have a direct connection with each other. Therefore they should not be allowed

to become DR or BDR. Only router A should become the DR.

Figure 357 OSPF Router Election Example



You can assign a priority to an interface which determines whether this router will be elected to be a DR or BDR. The router with the highest priority becomes the DR, while a router with a priority of 0 does not participate in router elections. In [Figure 357 on page 461](#) you can assign a priority of 0 to routers **B** and **C**, thereby ensuring they do not become DR or BDR and assign a priority of 1 to router **A** to make sure that it does become the DR.

50.1.5 Configuring OSPF

To configure OSPF on the Switch, do the following tasks:

- 1 Enable OSPF.
- 2 Create OSPF areas.
- 3 Create and associate interfaces to an area.
- 4 Create virtual links to maintain backbone connectivity.

50.2 OSPF Screen

Click **IP Application > OSPF** in the navigation panel to display the screen as shown. Click the link next to **IPv4 OSPF** to open screens where you can view IPv4 OSPF status and configure OSPF for IPv4.

Figure 358 IP Application > OSPF



50.3 IPv4 OSPF Status

Use this screen to view current IPv4 OSPF status. Click **IP Application > OSPF > IPv4 OSPF** the navigation panel to display the screen as shown next. See [Section 50.1 on page 459](#) for more information on OSPF.

Figure 359 IP Application > OSPF > IPv4 OSPF > OSPF Status

The screenshot shows the 'OSPF Status' configuration page. At the top, there's a title bar with 'OSPF Status' and a 'Configuration' link. Below this, the status is 'OSPF: Down'. There are three main sections: 'Interface', 'Neighbor', and 'Link State Database'. Each section has a status indicator (e.g., 'OSPF Down - Interface Down') and a scrollable text area. At the bottom, there is a 'Poll Interval(s)' field set to 40, and 'Set Interval' and 'Stop' buttons.

The following table describes the labels in this screen.

Table 207 IP Application > OSPF > IPv4 OSPF > OSPF Status

LABEL	DESCRIPTION
OSPF	This field displays whether OSPF is activated (Running) or not (Down).
Interface	The text box displays the OSPF status of the interfaces on the Switch.
Neighbor	The text box displays the status of the neighboring router participating in the OSPF network.
Link State Database	The text box displays information in the link state database which contains data in the LSAs.
Poll Interval(s)	The text box displays how often (in seconds) this screen refreshes. You may change the refresh interval by typing a new number in the text box and then clicking Set Interval .
Stop	Click Stop to end OSPF status polling.

The following table describes some common output fields.

Table 208 IP Application > IPv4 OSPF > OSPF Status: Common Output Fields

FIELD	DESCRIPTION
Interface	
Internet Address	This field displays the IP address and subnet bits of an IP routing domain.
Area	This field displays the area ID.
Router ID	This field displays the unique ID of the Switch.
Transmit Delay	This field displays the transmission delay in seconds.
State	This field displays the state of the Switch (backup or DR (designated router)).
Priority	This field displays the priority of the Switch. This number is used in the designated router election.
Designated Router	This field displays the router ID of the designated router.
Backup Designated Router	This field displays the router ID of a backup designated router.
Time Intervals Configured	This field displays the time intervals (in seconds) configured.
Neighbor Count	This field displays the number of neighbor routers.
Adjacent Neighbor Count	This field displays the number of neighbor routers that is adjacent to the Switch.
Neighbor	
Neighbor ID	This field displays the router ID of the neighbor.
Pri	This field displays the priority of the neighbor. This number is used in the designated router election.
State	This field displays the state of the neighbor (backup or DR (designated router)).
Dead Time	This field displays the dead time in seconds.
Address	This field displays the IP address of a neighbor.
Interface	This field displays the MAC address of a device.
Link State Database	
Link ID	This field displays the ID of a router or subnet.
ADV Router	This field displays the IP address of the layer-3 device that sends the LSAs.
Age	This field displays the time (in seconds) since the last LSA was sent.
Seq #	This field displays the link sequence number of the LSA.
Checksum	This field displays the checksum value of the LSA.
Link Count	This field displays the number of links in the LSA.

50.4 IPv4 OSPF Configuration

Use this screen to activate OSPF for IPv4 and set general settings. Click **IP Application > OSPF > IPv4 OSPF > Configuration** to display the **IPv4 OSPF Configuration** screen. See [Section 50.1 on page 459](#) for more information on OSPF.

Figure 360 IP Application > IPv4 OSPF > Configuration

The screenshot shows the 'IPv4 OSPF Configuration' screen. It has three main sections. The top section, 'OSPF Configuration', is highlighted with a red rounded rectangle and contains the following fields: 'Active' (checkbox), 'Router ID' (text box), 'Distance' (text box with value 110), 'Default-information Originate' (checkbox), 'Always' (checkbox), 'Metric' (text box with value 10), and 'Metric Type' (dropdown menu with value 2). Below this section are 'Apply' and 'Cancel' buttons. The middle section contains fields for 'Name' (text box with value 'name'), 'Area ID' (text box with value '0.0.0.0'), 'Authentication' (dropdown menu with value 'None'), 'Stub / NSSA' (checkbox), 'No Summary' (checkbox), and 'Default route cost' (text box with value 15). Below this section are 'Add', 'Cancel', and 'Clear' buttons. The bottom section is a table with columns 'Index', 'Name', 'Area ID', 'Authentication', 'Stub/NSSA', and a checkbox. Below the table are 'Delete' and 'Cancel' buttons.

The follow table describes the related labels in this screen.

Table 209 IP Application > IPv4 OSPF > Configuration

LABEL	DESCRIPTION
Active	OSPF for IPv4 is disabled by default. Select this option to enable it.
Router ID	Router ID uniquely identifies the Switch in an OSPF. Enter a unique ID (that uses the format of an IP address in dotted decimal notation) for the Switch.
Distance	Enter a number from 10 to 255 to specify the administrative distance that is assigned to routes learned by OSPF. The lower the administrative distance value is, the more preferable the routing protocol is. Note: You cannot set two routing protocols to have the same administrative distance.
Default-information Originate	Select Active to advertise a default route in your OSPF network if there is one in the routing table. When no matching route is found in the routing table, the default route will be used to forward traffic.
Always	Select the check box to have the Switch advertise a default route to neighboring OSPF routers even if the Switch does not have one in its routing table.
Metric	Enter a route cost (between 0 and 16777215) for the default route.

Table 209 IP Application > IPv4 OSPF > Configuration (continued)

LABEL	DESCRIPTION
Metric Type	Select 1 to configure the default route as type 1, which has a default cost (metric) of 20 and adds up the cost toward the destination. Its external metrics are directly comparable to the internal OSPF cost. When selecting a path, the internal OSPF cost is added to the AB boundary router to the external metrics. Select 2 to configure the default route as type 2. The route has a default cost of 20 and the metric will never change along a traffic path. Its external metrics are not comparable to the OSPF cost. In this case, the external cost of the AB boundary router is used in path decision to a destination.
Apply	Click Apply to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to begin configuring this screen afresh.

50.5 Configure IPv4 OSPF Areas

To ensure that the Switch receives only routing information from a trusted layer-3 devices, activate authentication. The OSPF supports three levels of authentication:

- **None** – no authentication is used.
- **Simple** – authenticate link state updates using an 8 printable ASCII character password.
- **MD5** – authenticate link state updates using a 16 printable ASCII character password.

To configure an area, set the related fields in the **IPv4 OSPF Configuration** screen.

Figure 361 IP Application > OSPF > IPv4 OSPF > Configuration: Area Setup

OSPF Configuration [Status](#) [Redistribute](#) [Interface](#) [Virtual-Link](#)

Active ☐

Router ID

Distance

Default-information Originate

Active ☐

Always ☐

Metric

Metric Type

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

Area Setup

Name

Area ID

Authentication

Stub / NSSA

No Summary ☐

Default route cost

[Add](#) [Cancel](#) [Clear](#)

Index	Name	Area ID	Authentication	Stub/NSSA
				☐

[Delete](#) [Cancel](#)

The following table describes the related labels in this screen.

Table 210 IP Application > OSPF > IPv4 OSPF > Configuration: Area Setup

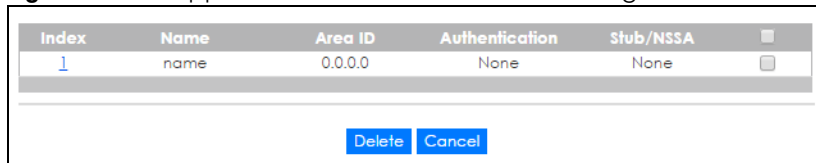
LABEL	DESCRIPTION
Name	Enter a descriptive name (up to 32 printable ASCII characters) for identification purposes.
Area ID	Enter a 32-bit ID (that uses the format of an IP address in dotted decimal notation) that uniquely identifies an area. A value of 0.0.0.0 indicates that this is a backbone (also known as Area 0). You can create only one backbone area on the Switch.
Authentication	Select an authentication method (Simple or MD5) to activate authentication. Select None (default) to disable authentication. Usually interfaces and virtual interfaces should use the same authentication method as the associated area. If interfaces and virtual interfaces use different authentication methods than the associated area, the authentication methods are based on the interfaces and virtual interfaces settings.
Stub / NSSA	Select this option to set the area as a stub area or a not-so-stubby area. If you enter 0.0.0.0 in the Area ID field, the settings in the stub area fields are ignored.
No Summary	Select this option to set the Switch to not send or receive LSAs.
Default route cost	Specify a cost (between 0 and 16777215) used to add a default route into a stub area for routes which are external to an OSPF domain. If you do not set a route cost, no default route is added.

Table 210 IP Application > OSPF > IPv4 OSPF > Configuration: Area Setup (continued)

LABEL	DESCRIPTION
Add	Click Add to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to begin configuring this screen afresh.
Clear	Click Clear to reset the fields to default settings.

50.5.1 View OSPF Area Information Table

The bottom of the **IPv4 OSPF Configuration** screen displays a summary table of all the OSPF areas you have configured.

Figure 362 IP Application > OSPF > IPv4 OSPF > Configuration: Summary Table


Index	Name	Area ID	Authentication	Stub/NSSA	
1	name	0.0.0.0	None	None	☐

Delete Cancel

The following table describes the related labels in this screen.

Table 211 IP Application > OSPF > IPv4 OSPF > Configuration: Summary Table

LABEL	DESCRIPTION
Index	This field displays the index number of an area.
Name	This field displays the descriptive name of an area.
Area ID	This field displays the area ID (that uses the format of an IP address in dotted decimal notation) that uniquely identifies an area. An area ID of 0.0.0.0 indicates the backbone.
Authentication	This field displays the authentication method used (None , Simple or MD5).
Stub / NSSA	This field displays the area defined (Stub , NSSA or None).
	Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries.
Delete	Click Delete to remove the selected entry from the summary table.
Cancel	Click Cancel to clear the check boxes.

50.6 Configuring IPv4 OSPF Redistribution

Use this screen to configure route redistribution and summary addresses. Route redistribution is used when other routers which use RIP routing protocol and/or static routes need to exchange routing information with the Switch using OSPF routing protocol. A summary address is used to cover more than one routing entries in order to reduce the routing table size.

In the **IPv4 OSPF Configuration** screen, click **Redistribute** to display the **OSPF Redistribution** screen.

Figure 363 IP Application > OSPF > IPv4 OSPF > Configuration > Redistribute

Redistribute Route	Active	Type	Metric value
RIP	☐	1 v	15
Static	☐	1 v	15

Apply Cancel

Summary address

Subnet mask

Add Cancel

Index	Summary address	Subnet mask	☐

Delete Cancel

The following table describes the labels in this screen.

Table 212 IP Application > OSPF > IPv4 OSPF > Configuration > Redistribute

LABEL	DESCRIPTION
Redistribute Route	Route redistribution allows your Switch to import and translate external routes learned through RIP routing protocol or configured manually (Static) into the OSPF network transparently.
Active	Select this option to activate route redistribution for routes learned through the selected protocol.
Type	Select 1 for routing protocols (such as RIP) whose external metrics are directly comparable to the internal OSPF cost. When selecting a path, the internal OSPF cost is added to the AB boundary router to the external metrics. Select 2 for routing protocols whose external metrics are not comparable to the OSPF cost. In this case, the external cost of the AB boundary router is used in path decision to a destination.
Metric Value	Enter a route cost (between 0 and 16777215). The default metric value is 15.
Apply	Click Apply to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to begin configuring this screen afresh.
Summary address	Enter a network IP address which can cover more than one network in order to reduce the routing table size. For example, you can use 192.168.8.0/22 instead of using 192.168.8.0/24, 192.168.9.0/24, 192.168.10.0/24, and 192.168.11.0/24. The third octet of these four network IP addresses is 00001000, 00001001, 00001010, 00001011 respectively. The first 6 digits (000010) are the common part among these IP addresses. So 192.168.8.0/22 can represent all of these networks.
Subnet mask	Enter the subnet mask for this summary IP address which can cover multiple networks.
Add	Click Add to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to begin configuring this screen afresh.

Table 212 IP Application > OSPF > IPv4 OSPF > Configuration > Redistribute (continued)

LABEL	DESCRIPTION
Index	This field displays the index number of the summary address.
Summary address	This field displays the summary IP address.
Subnet mask	This field displays the subnet mask for the summary IP address.
	Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries.
Delete	Check the rules that you want to remove and then click the Delete button.
Cancel	Click Cancel to clear the check boxes.

50.7 Configuring IPv4 OSPF Interfaces

To configure an OSPF interface, first create an IP routing domain in the **IP Setup** screen. Once you create an IP routing domain, an OSPF interface entry is automatically created. See [Section 50.1 on page 459](#) for more information on OSPF.

In the **IPv4 OSPF Configuration** screen, click **Interface** to display the **OSPF Interface** screen.

Figure 364 IP Application > OSPF > IPv4 OSPF > Configuration > Interface

The following table describes the labels in this screen.

Table 213 IP Application > OSPF > IPv4 OSPF > Configuration > Interface

LABEL	DESCRIPTION
Network	Select an IP interface.
Area ID	Select the area ID (in an IP address format with dotted decimal notation) of an area to associate the interface to that area.

Table 213 IP Application > OSPF > IPv4 OSPF > Configuration > Interface (continued)

LABEL	DESCRIPTION
Authentication	Note: OSPF Interfaces must use the same authentication method within the same area. Select an authentication method. The choices are Same-as-Area, None (default), Simple and MD5. To participate in an OSPF network, you must make the authentication method and/or password settings the same as the associated area. Select Same-as-Area to use the same authentication method within the area and set the related fields when necessary. Select None to disable authentication. This is the default setting. Select Simple and set the Key field to authenticate OSPF packets transmitted through this interface using simple password authentication. Select MD5 and set the Key ID and Key fields to authenticate OSPF packets transmitted through this interface using MD5 authentication.
Key ID	When you select MD5 in the Authentication field, specify the identification number of the authentication you want to use.
Key	When you select Simple in the Authentication field, enter a password eight-character long. Characters after the eighth character will be ignored. When you select MD5 in the Authentication field, enter a password 16-character long.
Cost	The interface cost is used for calculating the routing table. Enter a number between 1 and 65535. The default interface cost is 15.
Priority	The priority you assign to the interface is used in router elections to decide which router is going to be the Designated Router (DR) or the Backup Designated Router (BDR). You can assign a number between 0 and 255. A priority of 0 means that the router will not participate in router elections.
Retransmit Interval	Specify how long (in seconds) the Switch should wait for an acknowledgment packet from the interface's neighbor device before retransmitting link-state advertisements (LSAs) on the interface. The valid range for retransmitting is between 1 and 65535. The default value is 5 seconds.
Transmit Delay	Set the estimated time (in seconds) that is required to transmit a link-state update packet on the interface. The valid range for transmitting delay is between 1 and 65535. The default value is 1 second.
Hello Interval	Specify how often (in seconds) the Switch sends hello packets on the interface to check if the interface's neighbor devices still exist. The valid range for hello interval is between 1 and 65535. The default value is 10 seconds.
Dead Interval	Specify how long (in seconds) the Switch should wait for a hello packet from the interface's neighbor device before declaring that the neighbor device is not available. The valid range for dead interval is between 1 and 65535. The default value is 40 seconds.
Add	Click Add to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to begin configuring this screen afresh.
Clear	Click Clear to set the above fields back to the factory defaults.
Index	This field displays the index number for an interface.
Network	This field displays the IP interface information.
Area ID	This field displays the area ID (in an IP address format with dotted decimal notation) of an area to associate the interface to that area.
Authentication	This field displays the authentication method used (Same-as-Area , None , Simple or MD5).

Table 213 IP Application > OSPF > IPv4 OSPF > Configuration > Interface (continued)

LABEL	DESCRIPTION
Key ID	When the Authentication field displays MD5 , this field displays the identification number of the key used.
Cost	This field displays the interface cost used for calculating the routing table.
Priority	This field displays the priority for this OSPF interface.
	Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries.
Delete	Click Delete to remove the selected entry from the summary table.
Cancel	Click Cancel to begin configuring this screen afresh.

50.8 IPv4 OSPF Virtual-Links

Configure and view virtual link settings in this screen. See [Section 50.1 on page 459](#) for more information on OSPF.

In the **IPv4 OSPF Configuration** screen, click **Virtual-Link** to display the screen as shown next.

Figure 365 IP Application > OSPF > IPv4 OSPF > Configuration > Virtual-Link

The following table describes the related labels in this screen.

Table 214 IP Application > OSPF > IPv4 OSPF > Configuration > Virtual-Link

LABEL	DESCRIPTION
Name	Enter a descriptive name (up to 32 printable ASCII characters) for identification purposes.
Area ID	Select the area ID (in an IP address format with dotted decimal notation) of an area to associate the interface to that area.
Peer Router ID	Enter the ID of a peer border router.

Table 214 IP Application > OSPF > IPv4 OSPF > Configuration > Virtual-Link (continued)

LABEL	DESCRIPTION
Authentication	Note: Virtual interfaces must use the same authentication method within the same area. Select an authentication method. The choices are Same-as-Area, None (default), Simple and MD5. To exchange OSPF packets with a peer border router, you must make the authentication method and/or password settings the same as the peer border router. Select Same-as-Area to use the same authentication method within the area and set the related fields when necessary. Select None to disable authentication. This is the default setting. Select Simple to authenticate OSPF packets transmitted through this interface using a simple password. Select MD5 to authenticate OSPF packets transmitted through this interface using MD5 authentication.
Key ID	When you select MD5 in the Authentication field, specify the identification number of the authentication you want to use.
Key	When you select Simple in the Authentication field, enter a password eight-character long. When you select MD5 in the Authentication field, enter a password 16-character long.
Retransmit Interval	Specify how long (in seconds) the Switch should wait for an acknowledgment packet from the interface's neighbor device before retransmitting link-state advertisements (LSAs) on the interface. The valid range for retransmitting is between 1 and 65535. The default value is 5 seconds.
Transmit Delay	Set the estimated time (in seconds) that is required to transmit a link-state update packet on the interface. The valid range for transmitting delay is between 1 and 65535. The default value is 1 second.
Hello Interval	Specify how often (in seconds) the Switch sends hello packets on the interface to check if the interface's neighbor devices still exist. The valid range for hello interval is between 1 and 65535. The default value is 10 seconds.
Dead Interval	Specify how long (in seconds) the Switch should wait for a hello packet from the interface's neighbor device before declaring that the neighbor device is not available. The valid range for dead interval is between 1 and 65535. The default value is 40 seconds.
Add	Click Add to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to begin configuring this screen afresh.
Clear	Click Clear to set the above fields back to the factory defaults.
Index	This field displays an index number of an entry.
Name	This field displays a descriptive name of a virtual link.
Peer Router ID	This field displays the ID (that uses the format of an IP address in dotted decimal notation) of a peer border router.
Authentication	This field displays the authentication method used (Same-as-Area , None , Simple or MD5).
Key ID	When the Authentication field displays MD5 , this field displays the identification number of the key used.
	Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries.
Delete	Click Delete to remove the selected entry from the summary table.
Cancel	Click Cancel to clear the Delete check boxes.

The following table describes some common output fields.

Table 215 IP Application > IPv6 OSPF > OSPF Status: Common Output Fields

FIELD	DESCRIPTION
Interface	
Interface ID	This field displays the ID number of the IPv6 interface.
Internet Address	This field displays the IPv6 link-local/global addresses and prefix length for the IPv6 interface.
Neighbor	
Neighbor ID	This field displays the router ID of the neighbor.
Pri	This field displays the priority of the neighbor. This number is used in the designated router election.
Dead Time	This field displays the dead time in seconds the Switch waits for a hello packet from the interface's neighbor device before declaring that the neighbor device is not available. The default value is 40 seconds.
State/IfState	This field displays the state of the neighbor (Init , ExStart , Exchange or Full) and whether the neighbor interface is acting as a DR (designated router), BDR (backup designated router) or DRother .
Duration	This field displays how long a relationship between the neighbor and the Switch IPv6 interface has been established to exchange routing information.
I/F [State]	This field displays the name of the Switch IPv6 interface and whether it is a (DR (designated router), BDR (backup designated router) or DRother).
Link State Database	
Type	This field displays the type of the LSA. • Type 1: Router LSA • Type 2: Network LSA • Type 3: Inter-Area Prefix LSA • Type 4: Inter-Area Router LSA • Type 5: AS-External LSA • Type 6: Group Membership LSA • Type 7: NSSA LSA • Type 8: Link LSA • Type 9: Intra-area Prefix LSA
LSId	This field displays the link state ID to identify what is advertised by the LSA.
Adv Router	This field displays the router ID of the layer-3 device that sends the LSAs.
Age	This field displays the time (in seconds) since the last LSA was sent.
Seq Num	This field displays the link sequence number of the LSA.
Checksum	This field displays the checksum value of the LSA.
Link Count	This field displays the number of links in the LSA.
Payload	This field displays the router ID for LSA type 1 or 2, the next-hop router address for LSA type 8, and the IPv6 prefix of the route entry for other LSA types.

CHAPTER 51

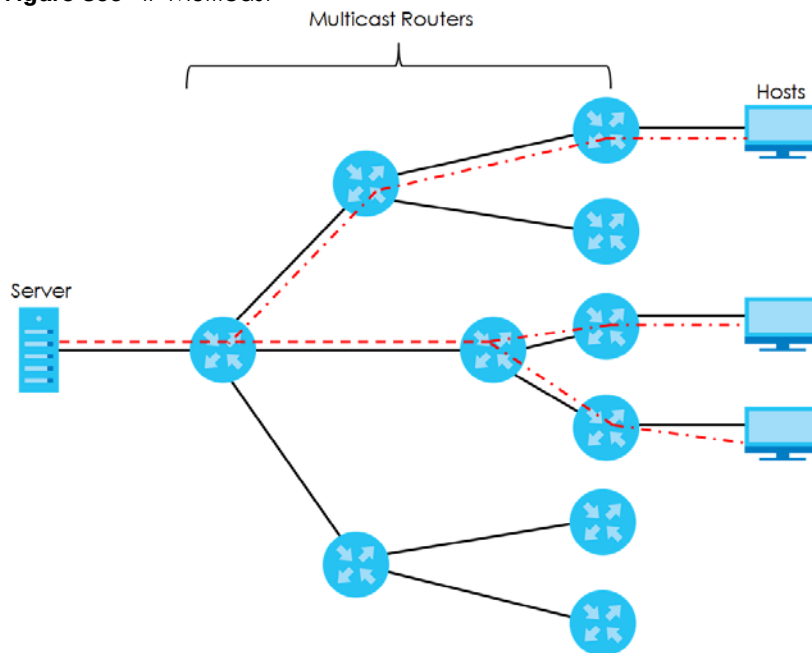
IGMP

This chapter shows you how to configure the Switch as a multicast router.

51.1 IGMP Overview

IP multicast is an IETF standard for distributing data to multiple recipients. The following figure shows a multicast session and the relationship between a multicast server, multicast routers and multicast hosts. A multicast server transmits multicast packets and multicast routers forward multicast packets to multicast hosts.

Figure 366 IP Multicast



A host can decide to join or leave a multicast group at any time. A host can also be a member of more than one multicast group. Multicast groups are identified by IP addresses in the Class D range (224.0.0.0 to 239.255.255.255). A multicast server sends packets addressed to a particular multicast group (multicast IP address).

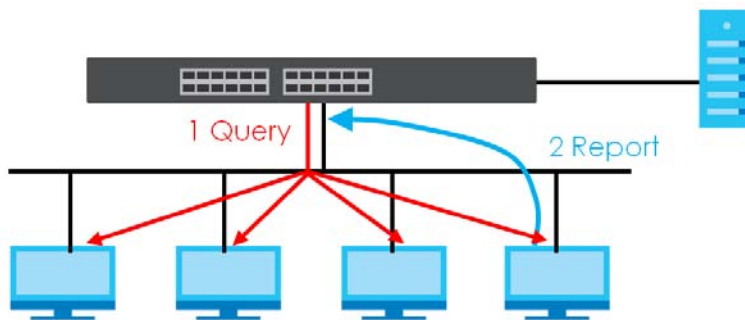
IGMP (Internet Group Management Protocol) is used by multicast hosts to indicate their multicast group membership to multicast routers. Multicast routers can also use IGMP to periodically check if multicast hosts still want to receive transmission from a multicast server. In other words, multicast routers check if any hosts on their network are still members of a specific multicast group.

The Switch supports IGMP version 1 (**IGMP-v1**), version 2 (**IGMP-v2**) and IGMP version 3 (**IGMP-v3**). Refer to RFC 1112, RFC 2236 and RFC 3376 for information on IGMP versions 1, 2 and 3 respectively. At start up, the Switch queries all directly connected networks to gather group membership. After that, the Switch periodically updates this information.

51.1.1 How IGMP Works

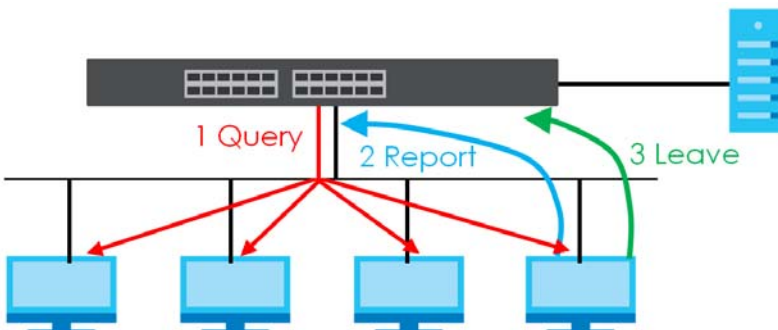
This section describes how IGMP works and the changes it has gone through from version 1 to version 3. IGMP version 1 defines how a multicast router checks to see if any multicast hosts are part of a multicast group. It checks for group membership by sending out an IGMP Query packet. Hosts that are members of a multicast group reply with an IGMP Report packet. This is also referred to as a join group request. The multicast router then keeps a list of all networks that have members of this multicast group and forwards multicast traffic to that network.

Figure 367 IGMP Version 1 Example



The main difference in IGMP version 2 is that it provides a mechanism for a multicast group member to notify a multicast router that it is leaving a multicast group. The multicast router then sends a group-specific IGMP query to check if there are any members remaining in that group. If the multicast router does not receive an IGMP report from any members, it stops sending multicast traffic to that group. This change helps shorten the leave convergence time, in other words, the amount of time that a multicast router believes that there are group members on a particular network. This in turn helps reduce the amount of multicast traffic going through the multicast router.

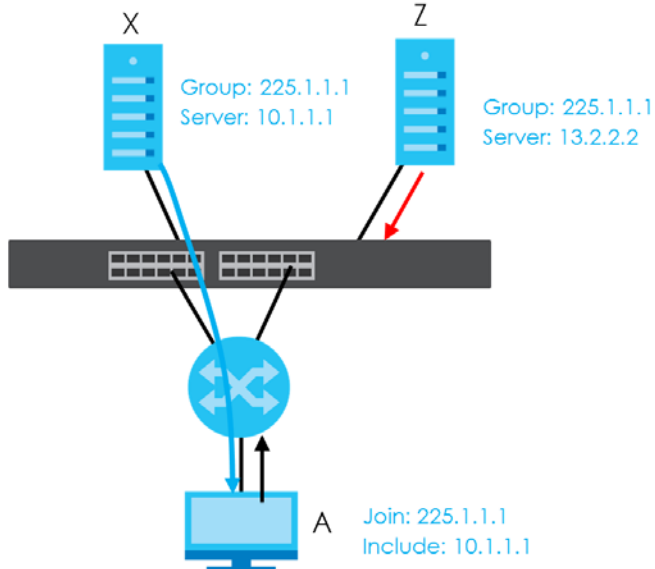
Figure 368 IGMP Version 2 Example



IGMP version 3 allows a multicast host to join a multicast group and specify from which source (multicast server) it wants to receive multicast packets. Alternatively, a multicast host can specify from which multicast servers it does not want to receive multicast packets. In the following figure multicast server **X** (IP address **10.1.1.1**) and multicast server **Z** (IP address **13.2.2.2**) both send multicast traffic to the same multicast group identified by the multicast IP address **225.1.1.1**. In IGMP version 3 multicast host **A** can

join multicast group **225.1.1.1** and specify that it only wants to receive multicast packets from server **X**.

Figure 369 IGMP Version 3 Example



51.2 Port-based IGMP

The Switch sends IGMP Query packets to all ports. The Switch then listens for IGMP Report packets, and it records which port the messages came from. It then delivers multicast traffic to only those ports from which it received a request to join a multicast group.

51.3 Configuring IGMP

Click **IP Application > IGMP** in the navigation panel to display the screen as shown next. Each entry in the table is automatically created when you configure a new IP domain in the **IP Setup** screen.

Figure 370 IP Application > IGMP

IGMP		
Active	☐	
Unknown Multicast Frame	☒ Flooding ☐ Drop	
Index	Network	Version
*	-	None ▼
1	10.2.1.23/24	None ▼
2	192.168.1.1/24	None ▼

Apply Cancel

The following table describes the labels in this screen.

Table 216 IP Application > IGMP

LABEL	DESCRIPTION
Active	Select this check box to enable IGMP on the Switch. Note: You cannot enable both IGMP snooping and IGMP at the same time.
Unknown Multicast Frame	Specify the action to perform when the Switch receives an unknown multicast frame. Unknown multicast frames are addressed to multicast groups for which the Switch has not recorded any group members. Select Drop to discard the frames. Select Flooding to send the frames to all ports.
Index	This field displays an index number of an entry.
Network	This field displays the IP domain configured on the Switch.
Version	Select an IGMP version from the drop-down list box. The choices are IGMP-v1 , IGMP-v2 , IGMP-v3 and None . Generally, if you want to enable IGMP on the Switch, you should choose IGMP-v3 as it is compatible with older versions. Choose an earlier version of IGMP (IGMP-v2 or IGMP-v1) if the multicast hosts on your network can not recognize IGMP version 3 or version 2 Query messages.
Apply	Click Apply to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to begin configuring this screen afresh.

CHAPTER 52

DVMRP

This chapter introduces DVMRP and tells you how to configure it.

52.1 DVMRP Overview

DVMRP (Distance Vector Multicast Routing Protocol) is a protocol used for routing multicast data within an autonomous system (AS). This DVMRP implementation is based on draft-ietf-idmr-dvmrp-v3-10. DVMRP provides multicast forwarding capability to a layer-3 switch that runs both the IPv4 protocol (with IP Multicast support) and the IGMP protocol. The DVMRP metric is a hop count of 32.

IGMP is a protocol used for joining or leaving a multicast group. You must have IGMP enabled when you enable DVMRP; otherwise you see the screen as in [Figure 373 on page 480](#).

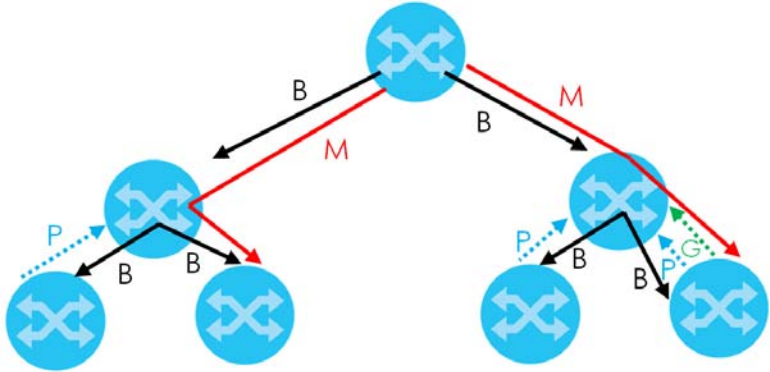
52.2 How DVMRP Works

DVMRP uses the Reverse Path Multicasting (RPM) algorithm to generate an IP Multicast delivery tree. Multicast packets are forwarded along these multicast tree branches. DVMRP dynamically learns host membership information using Internet Group Management Protocol (IGMP). The trees are updated dynamically to track the membership of individual groups.

- 1 Initially an advertisement multicast packet is broadcast ("**B**" in the following figure).
- 2 DVMRP-enabled Layer-3 devices that do not have any hosts in their networks that belong to this multicast group send back a prune message ("**P**").
- 3 If hosts later join the multicast group, a graft message ("**G**") to undo the prune is sent to the parent.

- 4 The final multicast ("M") after pruning and grafting is shown in the next figure.

Figure 371 How DVMRP Works



52.2.1 DVMRP Terminology

DVMRP probes are used to discover other DVMRP Neighbors on a network.

DVMRP reports are used to exchange DVMRP source routing information. These packets are used to build the DVMRP multicast routing table that is used to build source trees and also perform Reverse Path Forwarding (RPF) checks on incoming multicast packets. RPF checks prevent duplicate packets being filtered when loops exist in the network topology.

DVMRP prunes trim the multicast delivery trees. DVMRP grafts attach a branch back onto the multicast delivery tree.

52.3 Configuring DVMRP

Configure DVMRP on the Switch when you wish it to act as a multicast router ("mrouter"). Click **IP Application > DVMRP** in the navigation panel to display the screen as shown.

Figure 372 IP Application > DVMRP

DVMRP			
Active	☐		
Threshold	255		
Index	Network	VID	Active
*	-	-	☐
1	10.2.1.23/24	123	☐
2	192.168.1.1/24	1	☐
Apply Cancel			

The following table describes the labels in this screen.

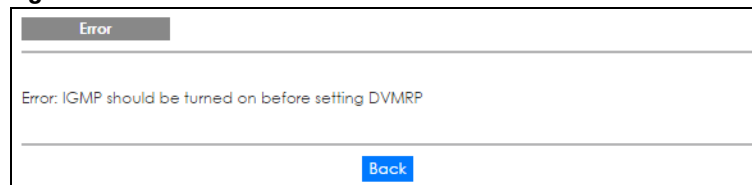
Table 217 IP Application > DVMRP

LABEL	DESCRIPTION
Active	Select Active to enable DVMRP on the Switch. You should do this if you want the Switch to act as a multicast router.
Threshold	Threshold is the maximum time to live (TTL) value. TTL is used to limit the scope of multicasting. You should reduce this value if you do not wish to flood Layer-3 devices many hops away with multicast traffic. This applies only to multicast traffic this Switch sends out.
Index	Index is the DVMRP configuration for the IP routing domain defined under Network . The maximum number of DVMRP configurations allowed is the maximum number of IP routing domains allowed on the Switch.
Network	This is the IP routing domain IP address and subnet mask you set up in IP Setup .
VID	DVMRP cannot be enabled on the same VLAN group across different IP routing domains, that is, you cannot have duplicate VIDs for different DVMRP configurations.
Active	Select Active to enable DVMRP on this IP routing domain.
Apply	Click Apply to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to begin configuring this screen afresh.

52.3.1 DVMRP Configuration Error Messages

You must have IGMP enabled when you enable DVMRP; otherwise you see the screen as in the next figure.

Figure 373 DVMRP: IGMP Not Set Error



When you disable IGMP, but DVMRP is still active you also see another warning screen.

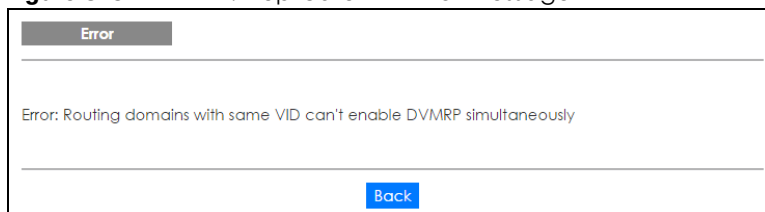
Figure 374 DVMRP: Unable to Disable IGMP Error



Each IP routing domain DVMRP configuration must be in a different VLAN group; otherwise you see the

following screen.

Figure 375 DVMRP: Duplicate VID Error Message



52.4 Default DVMRP Timer Values

The following are some default DVMRP timer values.

Table 218 DVMRP: Default Timer Values

DVMRP FIELD	DEFAULT VALUE
Probe interval	10 sec
Report interval	35 sec
Route expiration time	140 sec
Prune lifetime	Variable (less than two hours)
Prune retransmission time	3 sec with exponential back off
Graft retransmission time	5 sec with exponential back off

CHAPTER 53

Differentiated Services

53.1 DiffServ Overview

This chapter shows you how to configure Differentiated Services (DiffServ) on the Switch.

Quality of Service (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 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.

53.1.1 What You Can Do

- Use the **DiffServ** screen ([Section 53.2 on page 483](#)) to activate DiffServ to apply marking rules or IEEE 802.1p priority mapping on the Switch.
- Use the **DSCP Setting** screen ([Section 53.3.1 on page 485](#)) to change the DSCP-IEEE 802.1p mapping.

53.1.2 What You Need to Know

Read on for concepts on Differentiated Services that can help you configure the screens in this chapter.

DSCP 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 6-bit DSCP field which can define up to 64 service levels and the remaining 2 bits are defined as currently unused (CU). The following figure illustrates the DS field.

Figure 376 DiffServ: Differentiated Service Field

DSCP (6 bits)	CU (2 bits)

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.

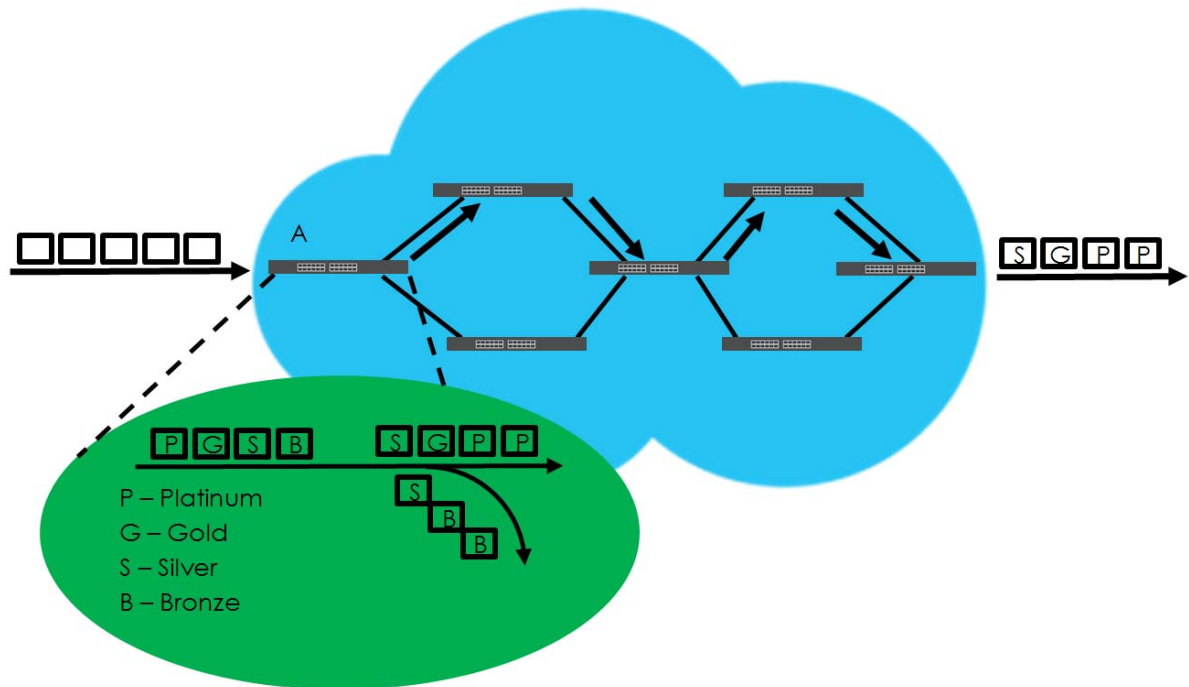
The DSCP value determines the PHB (Per-Hop Behavior), that each packet gets as it is forwarded across the DiffServ network. Based on the marking rule different kinds of traffic can be marked for different

priorities of forwarding. Resources can then be allocated according to the DSCP values and the configured policies.

DiffServ Network Example

The following figure depicts a DiffServ network consisting of a group of directly connected DiffServ-compliant network devices. The boundary node (**A** in Figure 377) in a DiffServ network classifies (marks with a DSCP value) the incoming packets into different traffic flows (**Platinum, Gold, Silver, Bronze**) based on the configured marking rules. A network administrator can then apply various traffic policies to the traffic flows. An example traffic policy, is to give higher drop precedence to one traffic flow over others. In our example, packets in the **Bronze** traffic flow are more likely to be dropped when congestion occurs than the packets in the **Platinum** traffic flow as they move across the DiffServ network.

Figure 377 DiffServ Network



53.2 Activating DiffServ

Activate DiffServ to apply marking rules or IEEE 802.1p priority mapping on the selected ports.

Click **IP Application** > **DiffServ** in the navigation panel to display the screen as shown.

Figure 378 IP Application > DiffServ (Standalone Mode)

Port	Active
*	☐
1	☐
2	☐
3	☐
4	☐
5	☐
6	☐
7	☐
8	☐
9	☐

Figure 379 IP Application > DiffServ (Stacking Mode)

Port	Active
1/*	☐
1/1	☐
1/2	☐
1/3	☐
1/4	☐
1/5	☐
1/6	☐
1/7	☐
1/8	☐
1/9	☐
1/10	☐
1/11	☐
1/12	☐
1/13	☐

The following table describes the labels in this screen.

Table 219 IP Application > DiffServ

LABEL	DESCRIPTION
Active	Select this option to enable DiffServ on the Switch.
Slot	This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack.
Port	This field displays the index number of a port on the Switch. In stacking mode, the first number represents the slot and the second the port number. * means all ports (on the same Switch).
*	Settings in this row apply to all ports. Use this row only if you want to make some settings the same for all ports. Use this row first to set the common settings and then make adjustments on a port-by-port basis. Changes in this row are copied to all the ports as soon as you make them.

Table 219 IP Application > DiffServ (continued)

LABEL	DESCRIPTION
Active	Select Active to enable Diffserv on the port.
Apply	Click Apply to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to begin configuring this screen afresh.

53.3 DSCP-to-IEEE 802.1p Priority Settings

You can configure the DSCP to IEEE 802.1p mapping to allow the Switch to prioritize all traffic based on the incoming DSCP value according to the DiffServ to IEEE 802.1p mapping table.

The following table shows the default DSCP-to-IEEE802.1p mapping.

Table 220 Default DSCP-IEEE 802.1p Mapping

DSCP VALUE	0 – 7	8 – 15	16 – 23	24 – 31	32 – 39	40 – 47	48 – 55	56 – 63
IEEE 802.1p	0	1	2	3	4	5	6	7

53.3.1 Configuring DSCP Settings

To change the DSCP-IEEE 802.1p mapping click the **DSCP Setting** link in the **DiffServ** screen to display the screen as shown next.

Figure 380 IP Application > DiffServ > DSCP Setting

DSCP Setting																Diffserv
DSCP to 802.1p Mapping																
0	0 ▼	1	0 ▼	2	0 ▼	3	0 ▼	4	0 ▼	5	0 ▼	6	0 ▼	7	0 ▼	
8	1 ▼	9	1 ▼	10	1 ▼	11	1 ▼	12	1 ▼	13	1 ▼	14	1 ▼	15	1 ▼	
16	2 ▼	17	2 ▼	18	2 ▼	19	2 ▼	20	2 ▼	21	2 ▼	22	2 ▼	23	2 ▼	
24	3 ▼	25	3 ▼	26	3 ▼	27	3 ▼	28	3 ▼	29	3 ▼	30	3 ▼	31	3 ▼	
32	4 ▼	33	4 ▼	34	4 ▼	35	4 ▼	36	4 ▼	37	4 ▼	38	4 ▼	39	4 ▼	
40	5 ▼	41	5 ▼	42	5 ▼	43	5 ▼	44	5 ▼	45	5 ▼	46	5 ▼	47	5 ▼	
48	6 ▼	49	6 ▼	50	6 ▼	51	6 ▼	52	6 ▼	53	6 ▼	54	6 ▼	55	6 ▼	
56	7 ▼	57	7 ▼	58	7 ▼	59	7 ▼	60	7 ▼	61	7 ▼	62	7 ▼	63	7 ▼	

Apply Cancel

The following table describes the labels in this screen.

Table 221 IP Application > DiffServ > DSCP Setting

LABEL	DESCRIPTION
0 ... 63	This is the DSCP classification identification number. To set the IEEE 802.1p priority mapping, select the priority level from the drop-down list box.

Table 221 IP Application > DiffServ > DSCP Setting (continued)

LABEL	DESCRIPTION
Apply	Click Apply to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to begin configuring this screen afresh.

CHAPTER 54

DHCP

54.1 DHCP Overview

This chapter shows you how to configure the DHCP feature.

DHCP (Dynamic Host Configuration Protocol RFC 2131 and RFC 2132) allows individual computers to obtain TCP/IP configuration at start-up from a server. You can configure the Switch as a DHCP server or a DHCP relay agent. When configured as a server, the Switch provides the TCP/IP configuration for the clients. If you configure the Switch as a relay agent, then the Switch forwards DHCP requests to DHCP server on your network. If you do not configure the Switch as a DHCP server or relay agent then you must have a DHCP server in the broadcast domain of the client computers or else the client computers must be configured manually.

54.1.1 What You Can Do

- Use the **DHCPv4 Status** screen ([Section 54.3 on page 488](#)) to display the server status and relay mode.
- Use the **DHCPv4 Server Status Detail** screen ([Section 54.3.1 on page 489](#)) to view details regarding DHCP server settings configured on the Switch.
- Use the **DHCPv4 Option 82 Profile** screen ([Section 54.4.2 on page 491](#)) to create DHCPv4 option 82 profiles.
- Use the **DHCPv4 Global Relay** screen ([Section 54.4.3 on page 493](#)) to configure global DHCPv4 relay.
- Use the **DHCPv4 Global Relay Port** screen ([Section 54.4.4 on page 494](#)) to apply a different DHCP option 82 profile to certain ports on the Switch.
- Use the **VLAN Setting** screen ([Section 54.4.6 on page 496](#)) to configure your DHCPv4 settings based on the VLAN domain of the DHCPv4 clients.
- Use the **DHCPv4 VLAN Port** screen ([Section 54.4.7 on page 498](#)) to apply a different DHCP option 82 profile to certain ports in a VLAN.
- Use the **DHCPv6 Status** screen ([Section 54.5 on page 500](#)) to see information on the DHCPv6 server.
- Use the **DHCPv6 Information** screen ([Section 54.6 on page 501](#)) to configure DHCPv6 and DNS server settings on the Switch.
- Use the **DHCPv6 Prefix Delegation** screen ([Section 54.7 on page 502](#)) to configure DHCPv6 client and IPv6 prefix settings for a specific VLAN on the Switch.
- Use the **DHCPv6 Relay** screen ([Section 54.8 on page 503](#)) to enable and configure DHCPv6 relay.
- Use the **DHCP Server Guard** screen ([Section 54.9 on page 505](#)) to specify whether ports are trusted or untrusted ports for DHCP packets.

54.1.2 What You Need to Know

Read on for concepts on DHCP that can help you configure the screens in this chapter.

DHCP Modes

The Switch can be configured as a DHCP server or DHCP relay agent.

- If you configure the Switch as a DHCP server, it will maintain the pool of IP addresses along with subnet masks or prefixes, DNS server and default gateway information and distribute them to your LAN computers.
- If there is already a DHCP server on your network, then you can configure the Switch as a DHCP relay agent. When the Switch receives a request from a computer on your network, it contacts the DHCP server for the necessary IP information, and then relays the assigned information back to the computer.

DHCPv4 Configuration Options

The DHCPv4 configuration on the Switch is divided into **Global** and **VLAN** screens. The screen you should use for configuration depends on the DHCP services you want to offer the DHCP clients on your network. Choose the configuration screen based on the following criteria:

- **Global** – The Switch forwards all DHCP requests to the same DHCP server.
- **VLAN** – The Switch is configured on a VLAN by VLAN basis. The Switch can be configured as a DHCP server for one VLAN and at the same time the Switch can be configured to relay DHCPv4 requests for clients in another VLAN.

54.2 DHCP Configuration

Click **IP Application > DHCP** in the navigation panel to display the screen as shown. Click the link next to **DHCPv4** to open screens where you can enable and configure DHCPv4 relay settings and create option 82 profiles. Click the link next to **DHCPv6** to open a screen where you can configure DHCPv6 relay settings. Click the link next to **DHCP Server Guard** to open a screen where you can specify whether ports are trusted or untrusted ports for DHCP packets.

Figure 381 IP Application > DHCP

DHCP	
DHCPv4	Click Here
DHCPv6	Click Here
DHCP Server Guard	Click Here

54.3 DHCPv4 Status

Click **IP Application > DHCP > DHCPv4** in the navigation panel. The **DHCP Status** screen displays.

Figure 382 IP Application > DHCP > DHCPv4

DHCP Status		DHCP Option 82 Profile Global VLAN	
Server Status			
Index	VID	Server Status	IP Pool Size
Relay Status			
Relay Mode	VLAN: 123		
VID	Current Source Address		
123	10.2.1.23		

The following table describes the labels in this screen.

Table 222 IP Application > DHCP > DHCPv4

LABEL	DESCRIPTION
Server Status	This section displays configuration settings related to the Switch's DHCP server mode.
Index	This is the index number. Click an index number to change the settings.
VID	This field displays the VLAN ID for which the Switch is a DHCP server.
Server Status	This field displays the starting DHCP client IP address.
IP Pool Size	This field displays the number of IP addresses that can be assigned to clients.
Relay Status	This section displays configuration settings related to the Switch's DHCP relay mode.
Relay Mode	This field displays: None – if the Switch is not configured as a DHCP relay agent. Global – if the Switch is configured as a DHCP relay agent only. VLAN – followed by a VLAN ID or multiple VLAN IDs if it is configured as a relay agent for specific VLANs.
VID	This field displays the ID number of the VLAN for which the Switch acts as a DHCP relay agent.
Current Source Address	This field displays the source IP address of the DHCP requests that the Switch forwards to a DHCP server.

54.3.1 DHCPv4 Server Status Detail

Click **IP Application > DHCP > DHCPv4** in the navigation panel and then click an existing index number of a DHCP server configuration to view the screen as shown. Use this screen to view details regarding DHCP server settings configured on the Switch.

Figure 383 IP Application > DHCP > DHCPv4 > Server Status Detail

Server Status Detail		DHCP Status		
Start IP Address	192.168.11.100			
End IP Address	192.168.11.104			
Subnet Mask	255.255.255.0			
Default Gateway	192.168.11.254			
Primary DNS Server	0.0.0.0			
Secondary DNS Server	0.0.0.0			
Lease Time	3 day 0 hour 0 minute			
Address Leases				
Index	IP Address	Timer	Hardware Address	Hostname

The following table describes the labels in this screen.

Table 223 IP Application > DHCP > DHCPv4 > Server Status Detail

LABEL	DESCRIPTION
Start IP Address	This field displays the starting IP address of the IP address pool configured for this DHCP server instance.
End IP Address	This field displays the last IP address of the IP address pool configured for this DHCP server instance.
Subnet Mask	This field displays the subnet mask value sent to clients from this DHCP server instance.
Default Gateway	This field displays the default gateway value sent to clients from this DHCP server instance.
Primary DNS Server	This field displays the primary DNS server value sent to clients from this DHCP server instance.
Secondary DNS Server	This field displays the secondary DNS server value sent to clients from this DHCP server instance.
Lease Time	This field displays the amount of time that the IP address is valid.
Address Leases	This section displays information about the IP addresses this DHCP server issued to clients.
Index	This field displays a sequential number for each DHCP request handled by the Switch.
IP Address	This is the IP address issued to a DHCP client.
Timer	This field displays the time remaining before the DHCP client has to renew its IP address.
Hardware Address	This field displays the MAC address of the DHCP client. It may also display SELF OCCUPIED ADDRESS if the IP address cannot be used for DHCP because it is already assigned to the Switch itself.
Hostname	This field displays the system name of the client.

54.4 DHCPv4 Relay

Configure DHCP relay on the Switch if the DHCP clients and the DHCP server are not in the same broadcast domain. During the initial IP address leasing, the Switch helps to relay network information (such as the IP address and subnet mask) between a DHCP client and a DHCP server. Once the DHCP client obtains an IP address and can connect to the network, network information renewal is done between the DHCP client and the DHCP server without the help of the Switch.

The Switch can be configured as a global DHCP relay. This means that the Switch forwards all DHCP requests from all domains to the same DHCP server. You can also configure the Switch to relay DHCP information based on the VLAN membership of the DHCP clients.

54.4.1 DHCPv4 Relay Agent Information

The Switch can add information about the source of client DHCP requests that it relays to a DHCP server by adding **Relay Agent Information**. This helps provide authentication about the source of the requests. The DHCP server can then provide an IP address based on this information. Please refer to RFC 3046 for more details.

The DHCP **Relay Agent Information** feature adds an Agent Information field (also known as the **Option 82** field) to DHCP requests. The **Option 82** field is in the DHCP headers of client DHCP request frames that the Switch relays to a DHCP server.

Relay Agent Information can include the **System Name** of the Switch if you select this option. You can change the **System Name** in **Basic Setting > General Setup**.

The following describes the DHCP relay agent information that the Switch sends to the DHCP server:

Table 224 Relay Agent Information

FIELD LABELS	DESCRIPTION
Slot ID	(1 byte) This value is always 0 for stand-alone switches.
Port ID	(1 byte) This is the port that the DHCP client is connected to.
VLAN ID	(2 bytes) This is the VLAN that the port belongs to.
Information	(up to 64 bytes) This optional, read-only field is set according to system name set in Basic Setting > General Setup .

54.4.1.1 DHCPv4 Relay Agent Information Format

A DHCP Relay Agent Information option has the following format.

Table 225 DHCP Relay Agent Information Option Format



i1, i2 and iN are DHCP relay agent sub-options, which contain additional information about the DHCP client. You need to define at least one sub-option.

54.4.1.2 Sub-Option Format

There are two types of sub-option: "Agent Circuit ID Sub-option" and "Agent Remote ID Sub-option". They have the following formats.

Table 226 DHCP Relay Agent Circuit ID Sub-option Format

SubOpt Code	Length	Value
1 (1 byte)	N (1 byte)	Slot ID, Port ID, VLAN ID, System Name or String

Table 227 DHCP Relay Agent Remote ID Sub-option Format

SubOpt Code	Length	Value
2 (1 byte)	N (1 byte)	MAC Address or String

The 1 in the first field identifies this as an Agent Circuit ID sub-option and two identifies this as an Agent Remote ID sub-option. The next field specifies the length of the field.

54.4.2 DHCPv4 Option 82 Profile

Use this screen to create DHCPv4 option 82 profiles. Click **IP Application > DHCP > DHCPv4** in the navigation panel and click the **Option 82 Profile** link to display the screen as shown.

Figure 384 IP Application > DHCP > DHCPv4 > Option 82 Profile

Profile Name	Circuit-ID Enable	Circuit-ID Field	Remote-ID Enable	Remote-ID Field	
default1	Yes	slot-port, vlan	No	-	☐
default2	Yes	slot-port, vlan, hostname	No	-	☐

The following table describes the labels in this screen.

Table 228 IP Application > DHCP > DHCPv4 > Option 82 Profile

LABEL	DESCRIPTION
Name	Enter a descriptive name for the profile for identification purposes. You can use up to 32 ASCII characters. Spaces are allowed.
Circuit-ID	Use this section to configure the Circuit ID sub-option to include information that is specific to the relay agent (the Switch).
Enable	Select this option to have the Switch add the Circuit ID sub-option to client DHCP requests that it relays to a DHCP server.
slot-port	Select this option to have the Switch add the number of port that the DHCP client is connected to.
vlan	Select this option to have the Switch add the ID of VLAN which the port belongs to.
hostname	This is the system name you configure in the Basic Setting > General Setup screen. Select this option for the Switch to add the system name to the client DHCP requests that it relays to a DHCP server.
string	Enter a string of up to 64 ASCII characters that the Switch adds into the client DHCP requests. Spaces are allowed.
Remote-ID	Use this section to configure the Remote ID sub-option to include information that identifies the relay agent (the Switch).
Enable	Select this option to have the Switch append the Remote ID sub-option to the option 82 field of DHCP requests.
mac	Select this option to have the Switch add its MAC address to the client DHCP requests that it relays to a DHCP server.
string	Enter a string of up to 64 ASCII characters for the remote ID information in this field. Spaces are allowed.

Table 228 IP Application > DHCP > DHCPv4 > Option 82 Profile (continued)

LABEL	DESCRIPTION
Add	Click this to create a new entry or to update an existing one. This saves your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to reset the fields to their last saved values.
Profile Name	This field displays the descriptive name of the profile. Click the name to change the settings.
Circuit-ID	This section displays the Circuit ID sub-option including information that is specific to the relay agent (the Switch).
Enable	This field displays whether the Circuit ID sub-option is added to client DHCP requests.
Field	This field displays the information that is included in the Circuit ID sub-option.
Remote-ID	This section displays the Remote ID sub-option including information that identifies the relay agent (the Switch).
Enable	This field displays whether the Remote ID sub-option is added to client DHCP requests.
Field	This field displays the information that is included in the Remote ID sub-option.
	Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries.
Delete	Check the entries that you want to remove and then click the Delete button.
Cancel	Click Cancel to clear the selected check boxes.

54.4.3 Configuring DHCPv4 Global Relay

Use this screen to configure global DHCPv4 relay. Click **IP Application > DHCP > DHCPv4** in the navigation panel and click the **Global** link to display the screen as shown.

Figure 385 IP Application > DHCP > DHCPv4 > Global

DHCP Relay		Status	Port
Active	☐		
Remote DHCP Server 1	0.0.0.0		
Remote DHCP Server 2	0.0.0.0		
Remote DHCP Server 3	0.0.0.0		
Option 82 Profile			

Apply Cancel

The following table describes the labels in this screen.

Table 229 IP Application > DHCP > DHCPv4 > Global

LABEL	DESCRIPTION
Active	Select this check box to enable DHCPv4 relay.
Remote DHCP Server 1 .. 3	Enter the IP address of a DHCPv4 server in dotted decimal notation.
Option 82 Profile	Select a pre-defined DHCPv4 option 82 profile that the Switch applies to all ports. The Switch adds the Circuit ID sub-option and/or Remote ID sub-option specified in the profile to DHCP requests that it relays to a DHCP server.

Table 229 IP Application > DHCP > DHCPv4 > Global (continued)

LABEL	DESCRIPTION
Apply	Click Apply to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to begin configuring this screen afresh.

54.4.4 Configure DHCPv4 Global Relay Port

Use this screen to apply a different DHCP option 82 profile to certain ports on the Switch. To open this screen, click **IP Application > DHCP > DHCPv4 > Global > Port**.

Figure 386 IP Application > DHCP > DHCPv4 > Global > Port

The screenshot shows the 'Port' configuration screen. At the top, there's a navigation bar with 'Port' and 'DHCP relay' links. Below this, there are two input fields: 'Port' and 'Option 82 Profile'. Under these fields are three buttons: 'Add', 'Cancel', and 'Clear'. At the bottom, there is a table with columns 'Index', 'Port', and 'Profile Name', and a 'Delete' button.

The following table describes the labels in this screen.

Table 230 IP Application > DHCP > DHCPv4 > Global > Port

LABEL	DESCRIPTION
Port	Enter the number of ports to which you want to apply the specified DHCP option 82 profile. You can enter multiple ports separated by (no space) comma (,) or hyphen (–) for a range. For example, enter "3–5" for ports 3, 4, and 5. Enter "3,5,7" for ports 3, 5, and 7. In stacking mode, the first number represents the slot and the second the port number. Enter 1/1–1/24,2/28 for ports 1 to 24 for the Switch in slot 1 and port 28 for the Switch in slot 2, for example.
Option 82 Profile	Select a pre-defined DHCP option 82 profile that the Switch applies to the specified ports. The Switch adds the Circuit ID sub-option and/or Remote ID sub-option specified in the profile to DHCP requests that it relays to a DHCP server. The profile you select here has priority over the one you select in the DHCP > DHCPv4 > Global screen.
Add	Click this to create a new entry or to update an existing one. This saves your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click this to reset the values above based on the last selected entry or, if not applicable, to clear the fields above.
Clear	Click Clear to reset the fields to the factory defaults.
Index	This field displays a sequential number for each entry. Click an index number to change the settings.

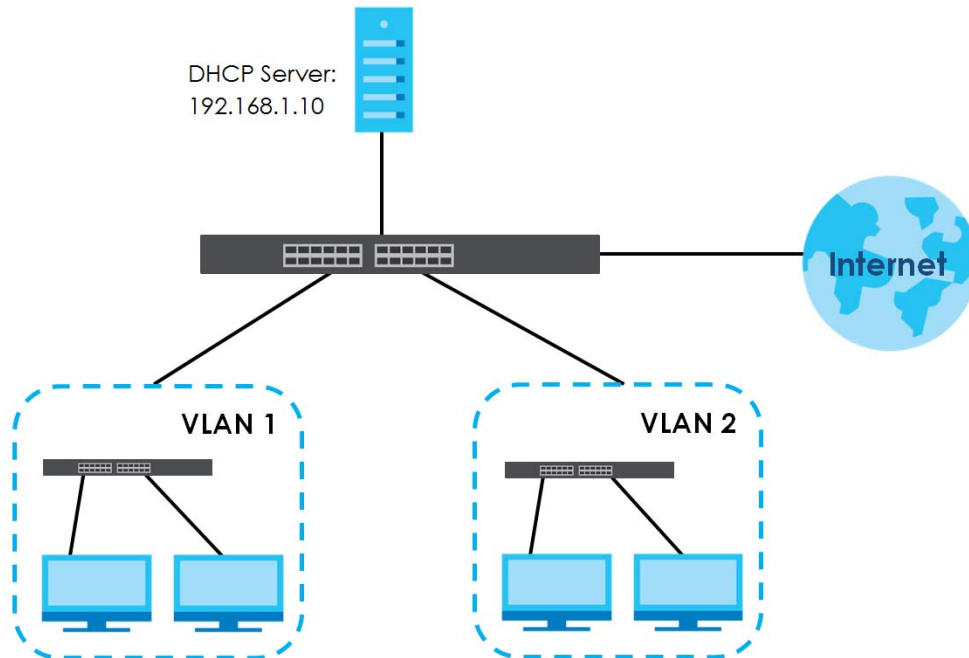
Table 230 IP Application > DHCP > DHCPv4 > Global > Port (continued)

LABEL	DESCRIPTION
Port	This field displays the port(s) to which the Switch applies the settings. In stacking mode, the first number represents the slot and the second the port number.
Profile Name	This field displays the DHCP option 82 profile that the Switch applies to the ports.
	Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries.
Delete	Select the entries that you want to remove, then click the Delete button to remove the selected entries from the table.
Cancel	Click this to clear the check boxes above.

54.4.5 Global DHCP Relay Configuration Example

The follow figure shows a network example where the Switch is used to relay DHCP requests for the **VLAN1** and **VLAN2** domains. There is only one DHCP server that services the DHCP clients in both domains.

Figure 387 Global DHCP Relay Network Example



Configure the **DHCP Relay** screen as shown. Make sure you select a DHCP option 82 profile (**default1** in this example) to set the Switch to send additional information (such as the VLAN ID) together with the DHCP requests to the DHCP server. This allows the DHCP server to assign the appropriate IP address according to the VLAN ID.

Figure 388 DHCP Relay Configuration Example

DHCP Relay		Status	Port
Active	☒		
Remote DHCP Server 1	192.168.1.100		
Remote DHCP Server 2	0.0.0.0		
Remote DHCP Server 3	0.0.0.0		
Option 82 Profile	default1 ▼		

EXAMPLE

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

54.4.6 DHCPv4 VLAN Setting

Use this screen to configure your DHCP settings based on the VLAN domain of the DHCP clients. Click **IP Application > DHCP > DHCPv4** in the navigation panel, then click the **VLAN** link in the **DHCP Status** screen that displays.

Note: You must set up a management IP address for each VLAN that you want to configure DHCP settings for on the Switch. See [Section 5.1.3 on page 66](#) for information on how to do this.

Figure 389 IP Application > DHCP > DHCPv4 > VLAN

VLAN Setting		Status	Port
VID			
DHCP Status	☒ Server ☐ Relay		
Server			
Client IP Pool Starting Address	0.0.0.0		
Size of Client IP Pool			
IP Subnet Mask	0.0.0.0		
Default Gateway	0.0.0.0		
Primary DNS Server	0.0.0.0		
Secondary DNS Server	0.0.0.0		
Lease Time	☐ Infinite ☒ Days 3 Hours 00 Minutes 00		
Relay			
Remote DHCP Server 1	0.0.0.0		
Remote DHCP Server 2	0.0.0.0		
Remote DHCP Server 3	0.0.0.0		
Source Address	0.0.0.0		
Option 82 Profile	▼		

[Add](#)
[Cancel](#)
[Clear](#)

VID	Type	DHCP Status	Source Address
11	Server	192.168.11.100/5	

[Delete](#)
[Cancel](#)

The following table describes the labels in this screen.

Table 231 IP Application > DHCP > DHCPv4 > VLAN

LABEL	DESCRIPTION
VID	Enter the ID number of the VLAN to which these DHCP settings apply.
DHCP Status	Select whether the Switch should function as a DHCP Server or Relay for the specified VID. If you select Server then fields related to DHCP relay configuration are grayed out and vice versa.
Server	Use this section if you want to configure the Switch to function as a DHCP server for this VLAN.
Client IP Pool Starting Address	Specify the first of the contiguous addresses in the IP address pool.
Size of Client IP Pool	Specify the size, or count of the IP address pool. The Switch can issue from 1 to 253 IP addresses to DHCP clients.
IP Subnet Mask	Enter the subnet mask for the client IP pool.
Default Gateway	Enter the IP address of the default gateway device.
Primary/ Secondary DNS Server	Enter the IP addresses of the DNS servers. The DNS servers are passed to the DHCP clients along with the IP address and the subnet mask.
Lease Time	Select Infinite to have the binding always valid. Select the second radio button to set up the binding's valid days, hours and minutes.
Relay	Use this section if you want to configure the Switch to function as a DHCP relay for this VLAN.
Remote DHCP Server 1 .. 3	Enter the IP address of a DHCP server in dotted decimal notation.
Source Address	Enter the source IP address that the Switch adds to DHCP requests from clients on this VLAN before forwarding them. If you leave this field set to 0.0.0.0 , the Switch automatically sets the source IP address of the DHCP requests to the IP address of the interface on which the packet is received. The source IP address helps DHCP clients obtain an appropriate IP address when you configure multiple routing domains on a VLAN.
Option 82 Profile	Select a pre-defined DHCP option 82 profile that the Switch applies to all ports in this VLAN. The Switch adds the Circuit ID sub-option and/or Remote ID sub-option specified in the profile to DHCP requests that it relays to a DHCP server.
Add	Click this to create a new entry or to update an existing one. This saves your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to begin configuring this screen afresh.
Clear	Click Clear to reset the fields to the factory defaults.
VID	This field displays the ID number of the VLAN group to which this DHCP settings apply.
Type	This field displays Server or Relay for the DHCP mode.
DHCP Status	For DHCP server configuration, this field displays the starting IP address and the size of the IP address pool. For DHCP relay configuration, this field displays the first remote DHCP server IP address.
Source Address	This field displays the source IP address you configured for DHCP requests from clients on this VLAN.
	Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries.
Delete	Select the configuration entries you want to remove and click Delete to remove them.
Cancel	Click Cancel to clear the check boxes.

54.4.7 Configure DHCPv4 VLAN Port

Use this screen to apply a different DHCP option 82 profile to certain ports in a VLAN. To open this screen, click **IP Application > DHCP > DHCPv4 > VLAN > Port**.

Figure 390 IP Application > DHCP > DHCPv4 > VLAN > Port

The following table describes the labels in this screen.

Table 232 IP Application > DHCP > DHCPv4 > VLAN > Port

LABEL	DESCRIPTION
VID	Enter the ID number of the VLAN you want to configure here.
Port	Enter the number of ports to which you want to apply the specified DHCP option 82 profile. You can enter multiple ports separated by (no space) comma (,) or hyphen (–) for a range. For example, enter “3–5” for ports 3, 4, and 5. Enter “3,5,7” for ports 3, 5, and 7. In stacking mode, the first number represents the slot and the second the port number. Enter 1/1–1/24,2/28 for ports 1 to 24 for the Switch in slot 1 and port 28 for the Switch in slot 2, for example.
Option 82 Profile	Select a pre-defined DHCP option 82 profile that the Switch applies to the specified ports in this VLAN. The Switch adds the Circuit ID sub-option and/or Remote ID sub-option specified in the profile to DHCP requests that it relays to a DHCP server. The profile you select here has priority over the one you select in the DHCP > DHCPv4 > VLAN screen.
Add	Click this to create a new entry or to update an existing one. This saves your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click this to reset the values above based on the last selected entry or, if not applicable, to clear the fields above.
Clear	Click Clear to reset the fields to the factory defaults.
Index	This field displays a sequential number for each entry. Click an index number to change the settings.
VID	This field displays the VLAN to which the ports belongs.
Port	This field displays the ports to which the Switch applies the settings.
Profile Name	This field displays the DHCP option 82 profile that the Switch applies to the ports in this VLAN.
	Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries.

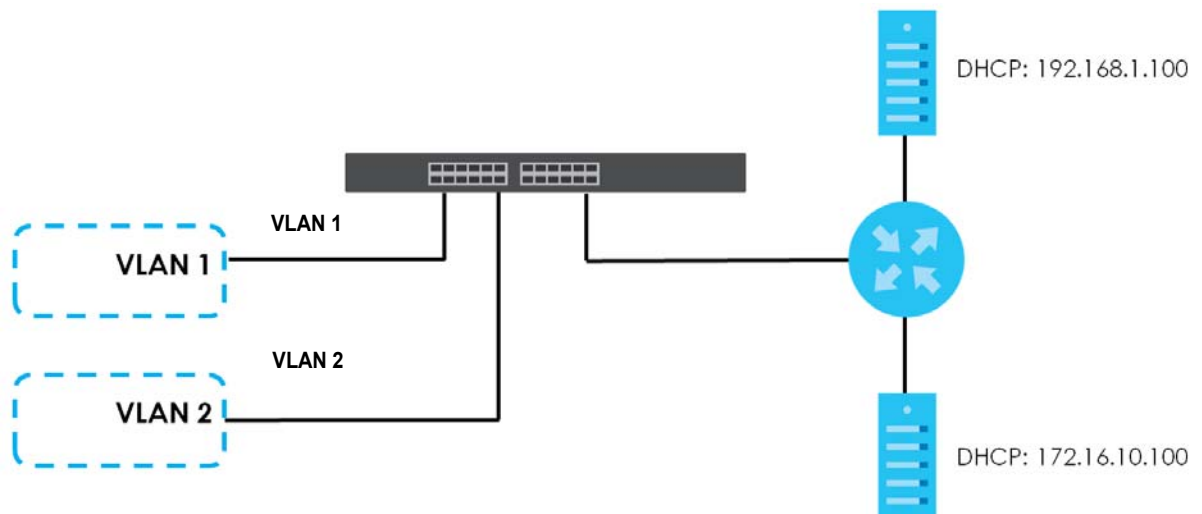
Table 232 IP Application > DHCP > DHCPv4 > VLAN > Port (continued)

LABEL	DESCRIPTION
Delete	Select the entries that you want to remove, then click the Delete button to remove the selected entries from the table.
Cancel	Click this to clear the check boxes above.

54.4.8 Example: DHCP Relay for Two VLANs

The following example displays two VLANs (VIDs 1 and 2) for a campus network. Two DHCP servers are installed to serve each VLAN. The system is set up to forward DHCP requests from the dormitory rooms (VLAN 1) to the DHCP server with an IP address of 192.168.1.100. Requests from the academic buildings (VLAN 2) are sent to the other DHCP server with an IP address of 172.16.10.100.

Figure 391 DHCP Relay for Two VLANs



For the example network, configure the **VLAN Setting** screen as shown.

Figure 392 DHCP Relay for Two VLANs Configuration Example

VLAN Setting		Status	Port
VID	2		
DHCP Status	☐ Server ☒ Relay		
Server			
Client IP Pool Starting Address	0.0.0.0		
Size of Client IP Pool	1		
IP Subnet Mask	0.0.0.0		
Default Gateway	0.0.0.0		
Primary DNS Server	0.0.0.0		
Secondary DNS Server	0.0.0.0		
Lease Time	☐ Infinite ☒ Days 3 Hours 00 Minutes 00		
Relay			
Remote DHCP Server 1	172.16.10.100		
Remote DHCP Server 2	0.0.0.0		
Remote DHCP Server 3	0.0.0.0		
Source Address	0.0.0.0		
Option 82 Profile			

Add Cancel Clear

EXAMPLE

VID	Type	DHCP Status	Source Address	

Delete Cancel

54.5 DHCPv6 Status

Click **IP Application > DHCP > DHCPv6** in the navigation panel to see information on the DHCPv6 server. The **DHCPv6 Status** screen displays.

Figure 393 IP Application > DHCP > DHCPv6

DHCPv6 Status					
DHCP Information Prefix Delegation DHCPv6 Relay					
Server Status					
Index	VID	Information	DHCP Server	Prefix Delegation	DHCP Relay

The following table describes the labels in this screen.

Table 233 IP Application > DHCP > DHCPv6

LABEL	DESCRIPTION
Server Status	This section displays configuration settings related to the Switch's DHCP server mode.
Index	This is the index number of a DHCPv6 server information.
VID	This field displays the VLAN ID to which the DHCP server belongs.
DHCP Server	A DHCPv6 server can assign and pass IPv6 network addresses, prefixes and other configuration information to DHCP clients.
Information	This field displays Yes when the entry supports display of the refresh time and DNS server; it shows No when it does not.

Table 233 IP Application > DHCP > DHCPv6 (continued)

LABEL	DESCRIPTION
Prefix Delegation	This field displays Yes when the entry supports the prefix delegation; it shows No when it does not. The prefix delegation is used by an IPv6 device to generate its IP address.
DHCP Relay	A DHCPv6 relay agent is on the same network as the DHCPv6 clients and helps forward messages between the DHCPv6 server (that's in another network) and the DHCPv6 clients. This field displays Yes when the Switch supports DHCPv6 Relay and No when it does not. Yes means the Switch forwards all DHCP requests to the same DHCP server. No means the Switch does not forward DHCP requests to a DHCP server.

54.6 DHCPv6 Information

Use this screen to configure DHCPv6 and DNS server settings on the Switch. Click **IP Application > DHCP > DHCPv6 > Information** in the navigation panel to display the screen as shown.

Figure 394 IP Application > DHCP > DHCPv6 > Information

The screenshot shows the 'DHCPv6 Server Information' configuration page. It includes a title bar with the text 'DHCPv6 Server Information' and a link 'DHCPv6 Status'. Below the title bar is an 'Information Table' with the following fields: 'Active' (a checkbox), 'VID' (a text input field), 'Refresh Time' (a text input field), and 'DNS Server' (a text input field). Below the table are three buttons: 'Add', 'Cancel', and 'Clear'. At the bottom of the screen is a table with columns: 'index', 'Active', 'VID', 'Refresh Time', and 'DNS Server'. Below this table are two buttons: 'Delete' and 'Cancel'.

The following table describes the labels in this screen.

Table 234 IP Application > DHCP > DHCPv6 > Information

LABEL	DESCRIPTION
Active	Select this check box to enable the entry.
VID	Enter the ID number of the VLAN to which the DHCPv6 server belongs here.
Refresh Time	Enter the number of seconds a DHCPv6 client should wait before refreshing information retrieved from a DHCPv6 server. The allowed range is 600 to 4294967295 seconds.
DNS Server	Specify the IPv6 address of the DNS server for the DHCP clients to use here. An 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'.

Table 234 IP Application > DHCP > DHCPv6 > Information (continued)

LABEL	DESCRIPTION
Add	Click this to create a new entry or to update an existing one. This saves your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to reset the fields to their last saved values.
Clear	Click Clear to reset the fields to the factory defaults.
Index	This field displays a sequential number for each entry. Click an index number to change its settings.
Active	This field displays whether the entry is activated or not.
VID	This field displays the ID number of the VLAN to which the DHCPv6 server belongs.
Refresh Time	This field displays the number of seconds a DHCPv6 client should wait before refreshing information retrieved from a DHCPv6 server. It displays disable if Refresh Time is not configured.
DNS Server	This field displays the IPv6 address of the DNS server that the DHCP clients will use. It displays disable when it is not configured.
	Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries.
Delete	Check the entries that you want to remove and then click the Delete button.
Cancel	Click Cancel to clear the selected check boxes.

54.7 DHCPv6 Prefix Delegation

Prefix delegation enables an IPv6 device to use the received IPv6 prefix (for example, '2001:db2::/48') to generate its IP address. The Switch passes the IPv6 prefix information to its connected hosts (according to VLAN) so that they can generate their IPv6 addresses.

Use this screen to configure DHCPv6 client and IPv6 prefix settings for a specific VLAN on the Switch. Click **IP Application > DHCP > DHCPv6 > Prefix Delegation** in the navigation panel to display the screen as shown.

Figure 395 IP Application > DHCP > DHCPv6 > Prefix Delegation

DHCPv6 Server Prefix Delegation [DHCPv6 Status](#)

Prefix Delegation Table

Client DUID	
Client Name	
VID	
Prefix Address	
Prefix Length	

[Add](#) [Cancel](#) [Clear](#)

Index	Client DUID	Client Name	VID ☐

[Delete](#) [Cancel](#)

The following table describes the labels in this screen.

Table 235 IP Application > DHCP > DHCPv6 > Prefix Delegation

LABEL	DESCRIPTION
Client DUID	Each DHCP client and server has a unique DHCP Unique IDentifier (DUID), which is used for identification when they are exchanging DHCPv6 messages. The DUID is generated from the MAC address, time, vendor assigned ID and/or the vendor's private enterprise number registered with the IANA. Type the client DUID for the devices connected to the Switch in this field.
Client Name	Type a name to identify the DHCPv6 client in this field.
VID	Type the ID number of the VLAN to which the DHCPv6 client belongs here.
Prefix Address	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' is a prefix address with prefix length. /32 means that the first 32 bits ('2001:db8') from the left is the network prefix. Type the prefix address in this field. For example, type '2001:db8:1a2b:15::1a2f:0'
Prefix Length	Type the prefix length in this field. For example, type 32.
Add	Click this to create a new entry or to update an existing one. This saves your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to reset the fields to their last saved values.
Clear	Click Clear to reset the fields to the factory defaults.
Index	This field displays a sequential number for each entry. Click an index number to change its settings.
Client DUID	This field displays the client DHCP Unique IDentifier (DUID) which uniquely identifies the client.
Client Name	This field displays a name to identify the DHCPv6 client.
VID	This field displays the ID number of the VLAN to which the DHCPv6 client belongs.
	Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries.
Delete	Check the entries that you want to remove and then click the Delete button.
Cancel	Click Cancel to clear the selected check boxes.

54.8 DHCPv6 Relay

A DHCPv6 relay agent is on the same network as the DHCPv6 clients and helps forward messages between the DHCPv6 server (that is in another network) and the DHCPv6 clients.

The DHCPv6 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 DHCPv6 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.

Use this screen to configure DHCPv6 relay settings for a specific VLAN on the Switch. Click **IP Application > DHCP > DHCPv6 > DHCPv6 Relay** in the navigation panel to display the screen as shown.

Figure 396 IP Application > DHCP > DHCPv6 Relay

The screenshot shows the DHCPv6 Relay configuration interface. It includes input fields for VID, Helper Address, and Remote ID. There is a checkbox for Interface ID. Action buttons for Add, Cancel, and Clear are present. A table at the bottom lists existing configurations with columns for VID, Helper Address, Interface ID, Remote ID, and a checkbox. Delete and Cancel buttons are also provided for the table.

The following table describes the labels in this screen.

Table 236 IP Application > DHCP > DHCPv6 Relay

LABEL	DESCRIPTION
VID	Enter the ID number of the VLAN to which the DHCPv6 server that will assign IP information belongs here.
Helper Address	Enter the IPv6 address of the DHCPv6 server that will assign IP information here. An 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'.
Options	
Interface ID	Select this option to have the Switch add the interface-ID option in the DHCPv6 requests from the clients in the specified VLAN before the Switch forwards them to a DHCPv6 server.
Remote ID	Enter a string of up to 64 printable characters to be carried in the remote-ID option. The Switch adds the remote-ID option in the DHCPv6 requests from the clients in the specified VLAN before the Switch forwards them to a DHCPv6 server.
Add	Click this to create a new entry or to update an existing one. This saves your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to reset the fields to their last saved values.
Clear	Click Clear to reset the fields to the factory defaults.
VID	This field displays the VLAN ID number. Click the VLAN ID to change the settings.
Helper Address	This field displays the IPv6 address of the remote DHCPv6 server for this VLAN.
Interface ID	This field displays whether the interface-ID option is added to DHCPv6 requests from clients in this VLAN.
Remote ID	This field displays whether the remote-ID option is added to DHCPv6 requests from clients in this VLAN.

Table 236 IP Application > DHCP > DHCPv6 Relay (continued)

LABEL	DESCRIPTION
	Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries.
Delete	Check the entries that you want to remove and then click the Delete button.
Cancel	Click Cancel to clear the selected check boxes.

54.9 DHCP Server Guard

Use this screen to specify whether ports are trusted or untrusted ports for DHCP packets. Click **IP Application > DHCP > DHCP Server Guard** in the navigation panel to display the screen as shown.

Figure 397 IP Application > DHCP > DHCP Server Guard

Port	Trusted State
*	Untrusted ▾
1	Untrusted ▾
2	Untrusted ▾
3	Untrusted ▾
4	Untrusted ▾
5	Untrusted ▾
6	Untrusted ▾
7	Untrusted ▾
8	Untrusted ▾
9	Untrusted ▾

The following table describes the labels in this screen.

Table 237 IP Application > DHCP > DHCP Server Guard

LABEL	DESCRIPTION
Active	Select this option to enable DHCP Server Guard.
Port Setting	
Port	The port number identifies the port you are configuring.
*	Settings in this row apply to all ports. Use this row only if you want to make some settings the same for all ports. Use this row first to set the common settings and then make adjustments on a port-by-port basis. Note: Changes in this row are copied to all the ports as soon as you make them.
Trusted State	Select whether this port is a trusted port (Trusted) or an untrusted port (Untrusted). The Switch does not discard DHCP packets on trusted ports for any reason. The Switch discards DHCP packets from untrusted ports when the packet is a DHCP server packet (for example, OFFER, ACK, or NACK).

Table 237 IP Application > DHCP > DHCP Server Guard (continued)

LABEL	DESCRIPTION
Apply	Click Apply to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to reset the fields to their last saved values.

CHAPTER 55

VRRP

This chapter shows you how to configure and monitor the Virtual Router Redundancy Protocol (VRRP) on the Switch.

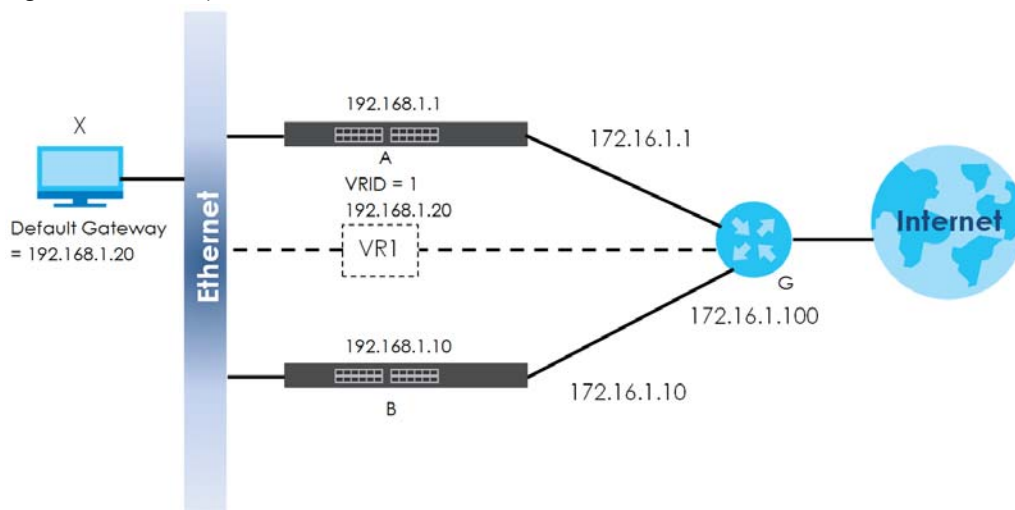
55.1 VRRP Overview

Each host on a network is configured to send packets to a statically configured default gateway (this Switch). The default gateway can become a single point of failure. Virtual Router Redundancy Protocol (VRRP), defined in RFC 2338, allows you to create redundant backup gateways to ensure that the default gateway of a host is always available.

In VRRP, a virtual router (VR) represents a number of physical layer-3 devices. An IP address is associated with the virtual router. A layer-3 device having the same IP address is the preferred master router while the other Layer-3 devices are the backup routers. The master router forwards traffic for the virtual router. When the master router becomes unavailable, a backup router assumes the role of the master router until the master router comes back up and takes over.

The following figure shows a VRRP network example with the switches (**A** and **B**) implementing one virtual router **VR1** to ensure the link between the host **X** and the uplink gateway **G**. Host **X** is configured to use **VR1** (192.168.1.20) as the default gateway. If switch **A** has a higher priority, it is the master router. Switch **B**, having a lower priority, is the backup router.

Figure 398 Example 1



If switch **A** (the master router) is unavailable, switch **B** takes over. Traffic is then processed by switch **B**.

55.2 VRRP Status

Click **IP Application** > **VRRP** in the navigation panel to display the **VRRP Status** screen as shown next.

Figure 399 IP Application > VRRP Status

VRRP Status Configuration				
Index	Network	VRID	VR Status	Uplink Status

Poll Interval(s) [Set Interval](#) [Stop](#)

The following table describes the labels in this screen.

Table 238 IP Application > VRRP Status

LABEL	DESCRIPTION
Index	This field displays the index number of a rule.
Network	This field displays the IP address and the subnet mask bits of an IP routing domain that is associated to a virtual router.
VRID	This field displays the ID number of the virtual router.
VR Status	This field displays the status of the virtual router. This field is Master indicating that this Switch functions as the master router. This field is Backup indicating that this Switch functions as a backup router. This field displays Init when this Switch is initiating the VRRP protocol or when the Uplink Status field displays Dead.
Uplink Status	This field displays the status of the link between this Switch and the uplink gateway. This field is Alive indicating that the link between this Switch and the uplink gateway is up. Otherwise, this field is Dead. This field displays Probe when this Switch is check for the link state.
Poll Interval(s)	The text box displays how often (in seconds) this screen refreshes. You may change the refresh interval by typing a new number in the text box and then clicking Set Interval .
Stop	Click Stop to halt system statistic polling.

55.3 VRRP Configuration

The following sections describe the different parts of the **VRRP Configuration** screen.

55.3.1 IP Interface Setup

Before configuring VRRP, first create an IP interface (or routing domain) in the **IP Setup** screen.

Click **IP Application**, **VRRP** and click the **Configuration** link to display the **VRRP Configuration** screen as shown next.

Note: You can only configure VRRP on interfaces with unique VLAN IDs.

Note: Routing domains with the same VLAN ID are not displayed in the table indicated.

Figure 400 IP Application > VRRP Configuration: IP Interface

VRRP Configuration Status

Index	Network	Authentication	Key
1	10.2.1.23/24	None ▼	
2	192.168.1.1/24	None ▼	
3	192.168.11.1/24	None ▼	

Apply Cancel

Active ☐

Name

Network

Virtual Router ID

Advertisement Interval

Preempt Mode ☒

Priority

Uplink Gateway

Response Ping ☐

Primary Virtual IP

Secondary Virtual IP

Add Cancel Clear

Index	Active	Name	Network	VRID	Primary VIP	Uplink Gateway	Priority	

Delete Cancel

The following table describes the labels in this screen.

Table 239 IP Application > VRRP Configuration: IP Interface

LABEL	DESCRIPTION
Index	This field displays the index number of an entry.
Network	This field displays the IP address and number of subnet mask bit of an IP domain.
Authentication	Select None to disable authentication. This is the default setting. Select Simple to use a simple password to authenticate VRRP packet exchanges on this interface.
Key	When you select Simple in the Authentication field, enter a password key (up to eight printable ASCII character long) in this field.
Apply	Click Apply to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to discard all changes made in this table.

55.3.2 VRRP Parameters

This section describes the VRRP parameters.

55.3.2.1 Advertisement Interval

The master router sends out Hello messages to let the other backup routers know that it is still up and running. The time interval between sending the Hello messages is the advertisement interval. By default, a Hello message is sent out every second.

If the backup routers do not receive a Hello message from the master router after this interval expires, it is assumed that the master router is down. Then the backup router with the highest priority becomes the master router.

Note: All routers participating in the virtual router must use the same advertisement interval.

55.3.2.2 Priority

Configure the priority level (1 to 254) to set which backup router to take over in case the master router goes down. The backup router with the highest priority will take over. The priority of the VRRP router that owns the IP address(es) associated with the virtual router is 255.

55.3.2.3 Preempt Mode

If the master router is unavailable, a backup router assumes the role of the master router. However, when another backup router with a higher priority joins the network, it will preempt the lower priority backup router that is the master. Disable preempt mode to prevent this from happening.

By default, a layer 3 device with the same IP address as the virtual router will become the master router regardless of the preempt mode.

55.3.3 Configuring VRRP Parameters

After you set up an IP interface, configure the VRRP parameters in the **VRRP Configuration** screen.

Figure 401 IP Application > VRRP Configuration: VRRP Parameters

Active	☐
Name	name
Network	192.168.1.1/24
Virtual Router ID	1
Advertisement Interval	1
Preempt Mode	☒
Priority	100
Uplink Gateway	0.0.0.0
Response Ping	☐
Primary Virtual IP	0.0.0.0
Secondary Virtual IP	0.0.0.0

The following table describes the labels in this screen.

Table 240 IP Application > VRRP Configuration: VRRP Parameters

LABEL	DESCRIPTION
Active	Select this option to enable this VRRP entry.
Name	Enter a descriptive name (up to 32 printable ASCII characters) for identification purposes.
Network	Select an IP domain to which this VRRP entry applies.

Table 240 IP Application > VRRP Configuration: VRRP Parameters (continued)

LABEL	DESCRIPTION
Virtual Router ID	Select a virtual router number (1 to 7) for which this VRRP entry is created. You can configure up to seven virtual routers for one network.
Advertisement Interval	Specify the number of seconds between Hello message transmissions. The default is 1 .
Preempt Mode	Select this option to activate preempt mode.
Priority	Enter a number (between 1 and 254) to set the priority level. The bigger the number, the higher the priority. This field is 100 by default.
Uplink Gateway	Enter the IP address of the uplink gateway in dotted decimal notation. The Switch checks the link to the uplink gateway.
Response Ping	Select this option to have the Switch respond to a ping that is sent to the virtual IP address.
Primary Virtual IP	Enter the IP address of the primary virtual router in dotted decimal notation.
Secondary Virtual IP	This field is optional. Enter the IP address of a secondary virtual router in dotted decimal notation. This field is ignored when you enter 0.0.0.0 .
Add	Click this to create a new entry or to update an existing one. This saves your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to discard all changes made in this table.
Clear	Click Clear to set the above fields back to the factory defaults.

55.3.4 Viewing VRRP Summary

View the VRRP configuration summary at the bottom of the screen.

Figure 402 IP Application > VRRP Configuration: Summary



Index	Active	Name	Network	VRID	Primary VIP	Uplink Gateway	Priority	

Delete Cancel

The following table describes the labels in this screen.

Table 241 IP Application > VRRP Configuration: Summary

LABEL	DESCRIPTION
Index	This field displays the index number of an entry. Click an index number to change the settings.
Active	This field shows whether a VRRP entry is enabled (Yes) or disabled (No).
Name	This field displays a descriptive name of an entry.
Network	This field displays the IP address and subnet mask of an interface.
VRID	This field displays the ID number of a virtual router.
Primary VIP	This field displays the IP address of the primary virtual router.
Uplink Gateway	This field displays the IP address of the uplink gateway.
Priority	This field displays the priority level (1 to 255) of the entry.
	Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries.

Table 241 IP Application > VRRP Configuration: Summary (continued)

LABEL	DESCRIPTION
Delete	Click Delete to remove the selected entry from the summary table.
Cancel	Click Cancel to clear the check boxes.

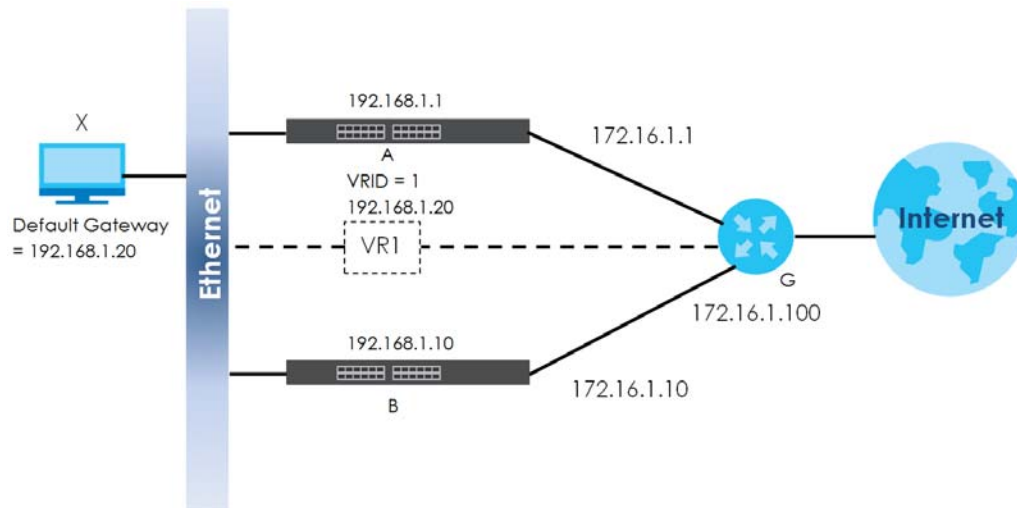
55.4 VRRP Configuration Examples

The following sections show two VRRP configuration examples on the Switch.

55.4.1 One Subnet Network Example

The figure below shows a simple VRRP network with only one virtual router **VR1** (VRID =1) and two switches. The network is connected to the WAN via an uplink gateway **G** (172.16.1.100). The host computer **X** is set to use **VR1** as the default gateway.

Figure 403 VRRP Configuration Example: One Virtual Router Network



You want to set switch **A** as the master router. Configure the VRRP parameters in the **VRRP Configuration** screens on the switches as shown in the figures below.

Figure 404 VRRP Example 1: VRRP Parameter Settings on Switch A

Active	☒
Name	Example1
Network	192.168.1.1/24
Virtual Router ID	1
Advertisement Interval	1
Preempt Mode	☒
Priority	110
Uplink Gateway	172.16.1.100
Response Ping	☒
Primary Virtual IP	192.168.1.20
Secondary Virtual IP	0.0.0.0

EXAMPLE

Add Cancel Clear

Figure 405 VRRP Example 1: VRRP Parameter Settings on Switch B

Active	☒
Name	Example1
Network	192.168.1.10/24 ▼
Virtual Router ID	1 ▼
Advertisement Interval	1
Preempt Mode	☒
Priority	110
Uplink Gateway	172.16.1.100
Response Ping	☒
Primary Virtual IP	192.168.1.20
Secondary Virtual IP	0.0.0.0

EXAMPLE

[Add](#) [Cancel](#) [Clear](#)

After configuring and saving the VRRP configuration, the **VRRP Status** screens for both switches are shown next.

Figure 406 VRRP Example 1: VRRP Status on Switch A

VRRP Status					Configuration
Index	Network	VRID	VR Status	Uplink Status	
1	192.168.1.1/24	1	Master	Alive	EXAMPLE

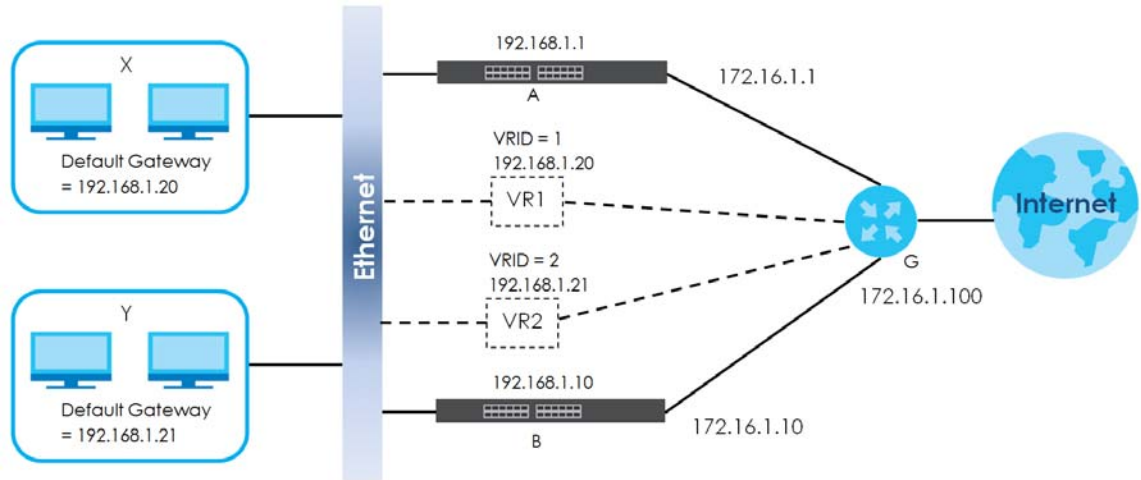
Figure 407 VRRP Example 1: VRRP Status on Switch B

VRRP Status					Configuration
Index	Network	VRID	VR Status	Uplink Status	
1	192.168.1.10/24	1	Backup	Alive	EXAMPLE

55.4.2 Two Subnets Example

The following figure depicts an example in which two switches share the network traffic. Hosts in the two network groups use different default gateways. Each switch is configured to backup a virtual router using VRRP.

You wish to configure switch **A** as the master router for virtual router **VR1** and as a backup for virtual router **VR2**. On the other hand, switch **B** is the master for **VR2** and a backup for **VR1**.

Figure 408 VRRP Configuration Example: Two Virtual Router Network

You need to configure the **VRRP Configuration** screen for virtual router VR2 on each switch, while keeping the VRRP configuration in example 1 for virtual router **VR1** (refer to [Section 55.4.2 on page 513](#)). Configure the VRRP parameters on the switches as shown in the figures below.

Figure 409 VRRP Example 2: VRRP Parameter Settings for VR2 on Switch A

Active	☒
Name	Example2
Network	192.168.1.1/24 ▼
Virtual Router ID	2 ▼
Advertisement Interval	1
Preempt Mode	☒
Priority	100
Uplink Gateway	172.16.1.100
Response Ping	☒
Primary Virtual IP	192.168.1.21
Secondary Virtual IP	0.0.0.0

EXAMPLE

[Add](#) [Cancel](#) [Clear](#)

Figure 410 VRRP Example 2: VRRP Parameter Settings for VR2 on Switch B

Active	☒
Name	Example2
Network	192.168.1.10/24 ▼
Virtual Router ID	2 ▼
Advertisement Interval	1
Preempt Mode	☒
Priority	100
Uplink Gateway	172.16.1.100
Response Ping	☒
Primary Virtual IP	192.168.1.21
Secondary Virtual IP	0.0.0.0

EXAMPLE

[Add](#) [Cancel](#) [Clear](#)

After configuring and saving the VRRP configuration, the **VRRP Status** screens for both switches are shown next.

Figure 411 VRRP Example 2: VRRP Status on Switch A

VRRP Status				Configuration
Index	Network	VRID	VR Status	Uplink Status
1	192.168.1.1/24	2	Backup	Alive
2	192.168.1.1/24	1	Master	Alive

EXAMPLE**Figure 412** VRRP Example 2: VRRP Status on Switch B

VRRP Status				Configuration
Index	Network	VRID	VR Status	Uplink Status
1	192.168.1.10/24	2	Master	Alive
2	192.168.1.10/24	1	Backup	Alive

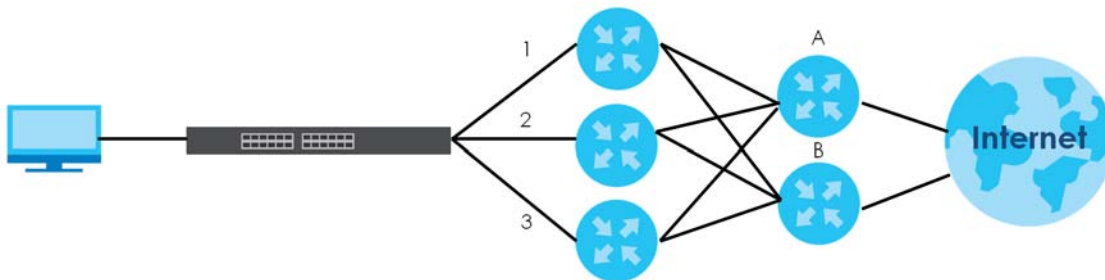
EXAMPLE

CHAPTER 56

Router Setup

56.1 Router Setup Overview

The Switch learns the next-hops using ARP and determines routing paths for a destination. The Switch supports Equal-Cost MultiPath (ECMP) to forward packets destined to the same device (**A** for example) through different routing paths (**1**, **2** and **3**) of equal path cost. This allows you to balance or share traffic loads between multiple routing paths when the Switch is connected to more than one next-hop. ECMP works with static routes or a routing protocol, such as OSPF. With ECMP, packets are routed through the paths of equal cost according to the hash algorithm output.



56.2 Configuring Router Setup

Click **IP Application > Router Setup** in the navigation panel to display the screen as shown next.

Figure 413 IP Application > Router Setup

Load Sharing	
Active	☐
Criteria	src-dst-ip ▼
Aging Time	1200 seconds
Discover Time	3600 seconds
Maximum Paths	8
Apply Cancel	

The following table describes the labels in this screen.

Table 242 IP Application > Router Setup

LABEL	DESCRIPTION
Active	Select this option to enable Equal-Cost MultiPath (ECMP) routing on the Switch.
Criteria	Select the criteria the Switch uses to determine the routing path for a packet. Select src-ip to have the Switch use a hash algorithm to convert a packet's source IP address into a hash value which acts as an index to a route path. Select src-dst-ip to have the Switch use a hash algorithm to convert a packet's source and destination IP addresses into a hash value which acts as an index to a route path.
Aging Time	Specify the time interval (from 0 to 86400 in increments of 10) in seconds at which the Switch sends an ARP request to update a resolved next-hop's MAC address.
Discover Time	Specify the time interval (from 0 to 86400 in increments of 10) in seconds at which the Switch sends an ARP request to update an unresolved next-hop's MAC address.
Maximum Paths	Set the maximum number of paths for one ECMP (Equal-Cost MultiPath) route. The maximum number varies by Switch. A smaller number of maximum-paths means more ECMP routes are allowed and a larger number of maximum-paths means fewer ECMP routes are allowed. The number of paths for a static route for ECMP cannot be bigger than the maximum-paths value configured here. Throughput may be influenced while configuring ECMP maximum-paths.
Apply	Click Apply to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to begin configuring this screen afresh.

CHAPTER 57

ARP Setup

57.1 ARP Overview

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.

An IP (version 4) address is 32 bits long. In an Ethernet LAN, MAC addresses are 48 bits long. The ARP table maintains an association between each MAC address and its corresponding IP address.

57.1.1 What You Can Do

Use the **ARP Learning** screen ([Section 57.2.1 on page 520](#)) to configure ARP learning mode on a per-port basis.

Use the **Static ARP** screen ([Section 57.2.2 on page 522](#)) to create static ARP entries that will display in the **Management > ARP Table** screen and will not age out.

57.1.2 What You Need to Know

Read on for concepts on ARP that can help you configure the screen in this chapter.

57.1.2.1 How ARP Works

When an incoming packet destined for a host device on a local area network arrives at the Switch, the Switch looks in the ARP Table and if it finds the address, it 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 Switch 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 Switch 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.

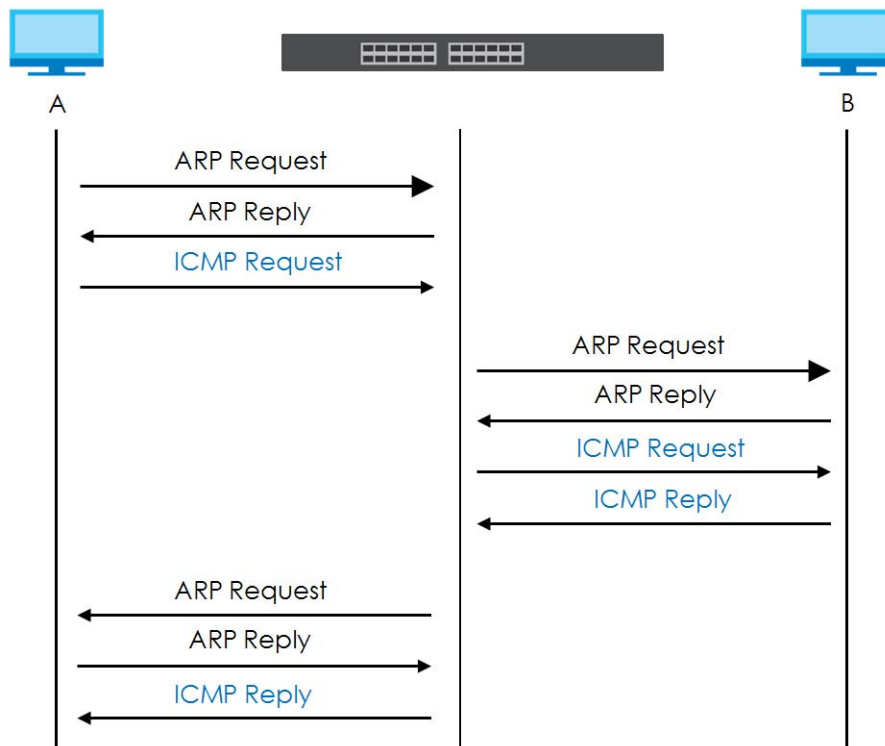
57.1.2.2 ARP Learning Mode

The Switch supports three ARP learning modes: ARP-Reply, Gratuitous-ARP, and ARP-Request.

ARP-Reply

The Switch in ARP-Reply learning mode updates the ARP table only with the ARP replies to the ARP requests sent by the Switch. This can help prevent ARP spoofing.

In the following example, the Switch does not have IP address and MAC address mapping information for hosts **A** and **B** in its ARP table, and host **A** wants to ping host **B**. Host **A** sends an ARP request to the Switch and then sends an ICMP request after getting the ARP reply from the Switch. The Switch finds no matched entry for host **B** in the ARP table and broadcasts the ARP request to all the devices on the LAN. When the Switch receives the ARP reply from host **B**, it updates its ARP table and also forwards host **A**'s ICMP request to host **B**. After the Switch gets the ICMP reply from host **B**, it sends out an ARP request to get host **A**'s MAC address and updates the ARP table with host **A**'s ARP reply. The Switch then can forward host **B**'s ICMP reply to host **A**.



Gratuitous-ARP

A gratuitous ARP is an ARP request in which both the source and destination IP address fields are set to the IP address of the device that sends this request and the destination MAC address field is set to the broadcast address. There will be no reply to a gratuitous ARP request.

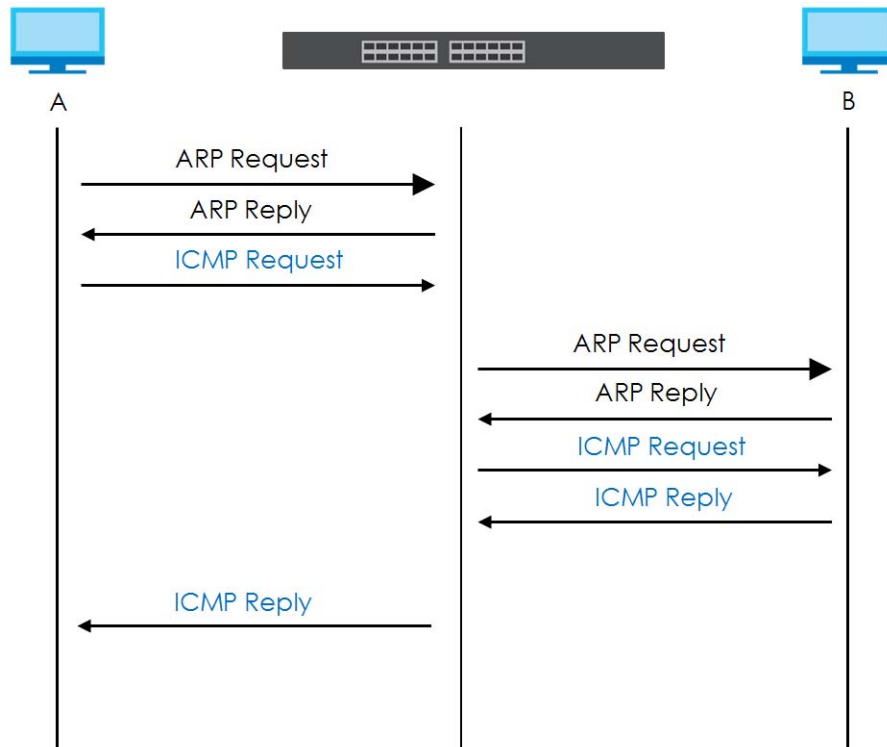
A device may send a gratuitous ARP packet to detect IP collisions. If a device restarts or its MAC address is changed, it can also use gratuitous ARP to inform other devices in the same network to update their ARP table with the new mapping information.

In Gratuitous-ARP learning mode, the Switch updates its ARP table with either an ARP reply or a gratuitous ARP request.

ARP-Request

When the Switch is in ARP-Request learning mode, it updates the ARP table with both ARP replies, gratuitous ARP requests and ARP requests.

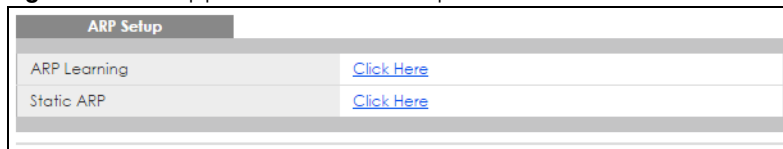
Therefore in the following example, the Switch can learn host **A**'s MAC address from the ARP request sent by host **A**. The Switch then forwards host **B**'s ICMP reply to host **A** right after getting host **B**'s MAC address and ICMP reply.



57.2 ARP Setup

Click the link next to **ARP Learning** to open a screen where you can set the ARP learning mode for each port. Click the link next to **Static ARP** to open a screen where you can create static ARP entries on the Switch.

Figure 414 IP Application > ARP Setup



57.2.1 ARP Learning

Use this screen to configure each port's ARP learning mode. Click the link next to **ARP Learning** in the **IP Application > ARP Setup** screen to display the screen as shown next.

Figure 415 IP Application > ARP Setup > ARP Learning (Standalone Mode)

Port	ARP Learning Mode
*	ARP-Reply
1	ARP-Reply
2	ARP-Reply
3	ARP-Reply
4	ARP-Reply
5	ARP-Request
6	ARP-Reply
7	Gratuitous-ARP
8	ARP-Reply
9	ARP-Reply

Apply Cancel

Figure 416 IP Application > ARP Setup > ARP Learning (Stacking Mode)

Port	ARP Learning Mode
1/*	ARP-Reply
1/1	ARP-Reply
1/2	ARP-Reply
1/3	ARP-Reply
1/4	ARP-Reply
1/5	ARP-Reply
1/6	ARP-Reply
1/7	ARP-Reply
1/8	ARP-Reply
1/9	ARP-Reply
1/10	ARP-Reply
1/11	ARP-Reply
1/12	ARP-Reply
1/13	ARP-Reply

Apply Cancel

The following table describes the labels in this screen.

Table 243 IP Application > ARP Setup > ARP Learning

LABEL	DESCRIPTION
SLOT	This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack.
Port	This field displays the port number. In stacking mode, the first number represents the slot ID and the second is the port number. Please note that the default stacking ports (the last four ports of your Switch) cannot be configured. They are reserved for stacking only.
*	Settings in this row apply to all ports. Use this row only if you want to make some settings the same for all ports. Use this row first to set the common settings and then make adjustments on a port-by-port basis. Changes in this row are copied to all the ports as soon as you make them.

Table 243 IP Application > ARP Setup > ARP Learning (continued)

LABEL	DESCRIPTION
ARP Learning Mode	Select the ARP learning mode the Switch uses on the port. Select ARP-Reply to have the Switch update the ARP table only with the ARP replies to the ARP requests sent by the Switch. Select Gratuitous-ARP to have the Switch update its ARP table with either an ARP reply or a gratuitous ARP request. Select ARP-Request to have the Switch update the ARP table with both ARP replies, gratuitous ARP requests and ARP requests.
Apply	Click Apply to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to begin configuring this screen afresh.

57.2.2 Static ARP

Use this screen to create static ARP entries that will display in the **Management > ARP Table** screen and will not age out. Click the link next to **Static ARP** in the **IP Application > ARP Setup** screen to display the screen as shown.

Figure 417 IP Application > ARP Setup > Static ARP (Standalone Mode)

Static ARP [ARP Setup](#)

Active ☐

Name

IP Address

MAC Address

VID

Port

[Add](#) [Cancel](#) [Clear](#)

Index	Active	Name	IP Address	MAC Address	VID	Port	

[Delete](#) [Cancel](#)

Figure 418 IP Application > ARP Setup > Static ARP (Stacking Mode)

Static ARP [ARP Setup](#)

Active ☐

Name

IP Address

MAC Address

VID

Port /

[Add](#) [Cancel](#) [Clear](#)

Index	Active	Name	IP Address	MAC Address	VID	Port	

[Delete](#) [Cancel](#)

The following table describes the related labels in this screen.

Table 244 IP Application > ARP Setup > Static ARP

LABEL	DESCRIPTION
Active	Select this check box to activate your rule. You may temporarily deactivate a rule without deleting it by clearing this check box.
Name	Enter a descriptive name (up to 32 printable ASCII characters) for identification purposes.
IP Address	Enter the IP address of a device connected to a Switch port with the corresponding MAC address below.
MAC Address	Enter the MAC address of the device with the corresponding IP address above.
VID	Enter the ID number of VLAN to which the device belongs.
Port	Enter the number of port to which the device connects. In stacking mode, the first field is the slot ID and the second field is the port number.
Add	Click this to create a new entry or to update an existing one. This saves your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to begin configuring this screen afresh.
Clear	Click Clear to set the above fields back to the factory defaults.
Index	This field displays the index number of an entry. Click an index number to change the settings.
Active	This field displays Yes when the entry is activated and NO when it is deactivated.
Name	This field displays the descriptive name for this entry. This is for identification purposes only.
IP Address	This is the IP address of a device connected to a Switch port with the corresponding MAC address below.
MAC Address	This is the MAC address of the device with the corresponding IP address above.
VID	This field displays the VLAN to which the device belongs.
Port	This field displays the port to which the device connects.
	Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries.
Delete	Click Delete to remove the selected entry from the summary table.
Cancel	Click Cancel to clear the check boxes.

CHAPTER 58

Maintenance

58.1 Overview

This chapter explains how to configure the screens that let you maintain the firmware and configuration files.

58.1.1 What You Can Do

- Use the **Maintenance** screen ([Section 58.2 on page 524](#)) to manage firmware and your configuration files.
- Use the **Firmware Upgrade** screen ([Section 58.3 on page 529](#)) to upload the latest firmware.
- Use the **Restore Configuration** screen ([Section 58.4 on page 531](#)) to upload a stored device configuration file.
- Use the **Backup Configuration** screen ([Section 58.5 on page 531](#)) to save your configurations for later use.
- Use the **Auto Configuration** screen ([Section 58.6 on page 532](#)) to overwrite the running configuration stored in the Switch's RAM.
- Use the **Erase Running-Configuration** screen ([Section 58.2.1 on page 526](#)) to reset the configuration to the Zyxel default configuration settings.
- Use the **Save Configuration** screen ([Section 58.2.2 on page 526](#)) to save the current configuration settings to a specific configuration file on the Switch.
- Use the **Reboot System** screen ([Section 58.2.3 on page 527](#)) to restart the Switch without physically turning the power off and load a specific configuration file.
- Use the **Tech-Support** screen ([Section 58.7 on page 533](#)) to create reports for customer support if there are problems with the Switch.
- Use the **Certificates** screen ([Section 58.8 on page 535](#)) to see the **Certificate** screen and import the Switch's CA-signed certificates.

58.2 Maintenance Settings

Use this screen to manage firmware and your configuration files. Click **Management > Maintenance** in the navigation panel to open the following screen.

Figure 419 Management > Maintenance (Standalone Mode)

Maintenance	
Firmware Upgrade	Click Here
Restore Configuration	Click Here
Backup Configuration	Click Here
Auto Configuration	Click Here
Erase Running-Configuration	Click Here
Save Configuration	Config 1 Config 2
	Custom Default
Reboot System Current: Configuration 1	Config 1 Config 2
	Factory Default
	Custom Default
Tech-Support	Click Here
Certificates	Click Here

Figure 420 Management > Maintenance (Stacking Mode)

Maintenance	
Firmware Upgrade	Click Here
Restore Configuration	Click Here
Backup Configuration	Click Here
Erase Running-Configuration	Click Here
Save Configuration	Config 1 Config 2
	Custom Default
Reboot System Current: Configuration 1	Config 1 Config 2
	Stacking Default
	Factory Default
	Custom Default
Tech-Support	Click Here
Certificates	Click Here

The following table describes the labels in this screen.

Table 245 Management > Maintenance

LABEL	DESCRIPTION
Firmware Upgrade	Click Click Here to go to the Firmware Upgrade screen.
Restore Configuration	Click Click Here to go to the Restore Configuration screen.
Backup Configuration	Click Click Here to go to the Backup Configuration screen.
Auto Configuration	Click Click Here to go to the Auto Configuration screen.
Erase Running-Configuration	Click Click Here to reset the configuration to the Zyxel default configuration settings. Note that this will not reset the configuration to the factory default settings.
Save Configuration	Click Config 1 to save the current configuration settings to Configuration 1 on the Switch. Click Config 2 to save the current configuration settings to Configuration 2 on the Switch. Click Custom Default to save the current configuration settings to a customized default file on the Switch. This file can be used instead of the Zyxel factory default configuration file.

Table 245 Management > Maintenance (continued)

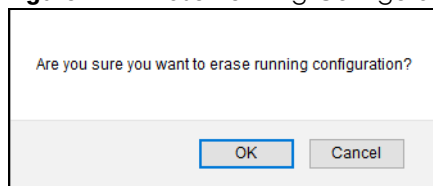
LABEL	DESCRIPTION
Reboot System	Click Config 1 to reboot the system and load Configuration 1 on the Switch. Click Config 2 to reboot the system and load Configuration 2 on the Switch. Click Stacking Default to reboot the system and load stacking configurations on the Switch. Click Factory Default to reboot the system and load the factory default configuration on the Switch. Click Custom Default to reboot the system and load a saved Custom Default configuration file on the Switch. This will save the custom default configuration settings to both Configuration 1 and Configuration 2. If a Custom Default configuration file was not saved, clicking Custom Default loads the factory default configuration on the Switch. Note: Make sure to click the Save button in any screen to save your settings to the current configuration on the Switch.
Current	This field displays which configuration (Configuration 1 or Configuration 2) is currently operating on the Switch.
Tech-Support	Click Click Here to see the Tech-Support screen. You can set CPU and memory thresholds for log reports and download related log reports for issue analysis. Log reports include CPU history and utilization, crash and memory.
Certificates	Click Click Here to see the Certificate screen and import the Switch's CA-signed certificates.

58.2.1 Erase Running-Configuration

Follow the steps below to clear current configuration on the Switch. Note that this will NOT reset the Switch back to its factory defaults. For example, if your Switch is set to stacking mode and you click erase running-configuration, after the Switch restarts, it will remain in stacking mode. If you want to change the Switch to its factory default mode, click the **Factory Default** button in **Reboot System**.

- 1 In the **Maintenance** screen, click the **Click Here** button next to **Erase Running-Configuration** to clear all Switch configuration information you configured and return to the Zyxel default configuration settings.
- 2 Click **OK** to reset all Switch configurations.

Figure 421 Erase Running-Configuration: Confirmation



- 3 In the Web Configurator, click the **Save** button in the top of the screen to make the changes take effect. If you want to access the Switch Web Configurator again, you may need to change the IP address of your computer to be in the same subnet as that of the default Switch IP address (192.168.1.1 or DHCP-assigned IP).

58.2.2 Save Configuration

Click **Config 1** to save the current configuration settings permanently to **Configuration 1** on the Switch. These configurations are set up according to your network environment.

Click **Config 2** to save the current configuration settings permanently to **Configuration 2** on the Switch. These configurations are set up according to your network environment.

Click **Custom Default** to save the current configuration settings permanently to a customized default file on the Switch. If configuration changes cause the Switch to behave abnormally, click **Custom Default** (next to **Reboot System**) to have the Switch automatically reboot and restore the saved **Custom Default** configuration file.

Alternatively, click **Save** on the top right-hand corner in any screen to save the configuration changes to the current configuration.

58.2.3 Reboot System

Reboot System allows you to restart the Switch without physically turning the power off. It also allows you to load configuration one (**Config 1**), configuration two (**Config 2**), a **Custom Default** or the **Factory Default** configuration when you reboot. Follow the steps below to reboot the Switch.

- 1 In the **Maintenance** screen, click a configuration button next to **Reboot System** to reboot and load that configuration file. The confirmation screen displays.
- 2 Click **OK** again and then wait for the Switch to restart. This takes up to 2 minutes. This does not affect the Switch's configuration.

Click **Config 1** and follow steps 1 to 2 to reboot and load configuration one on the Switch.

Click **Config 2** and follow steps 1 to 2 to reboot and load configuration two on the Switch.

Click **Stacking Default** and follow steps 1 to 2 to reboot and load stacking default configuration settings on the Switch.

Click **Factory Default** and follow steps 1 to 2 to reboot and load Zyxel factory default configuration settings on the Switch.

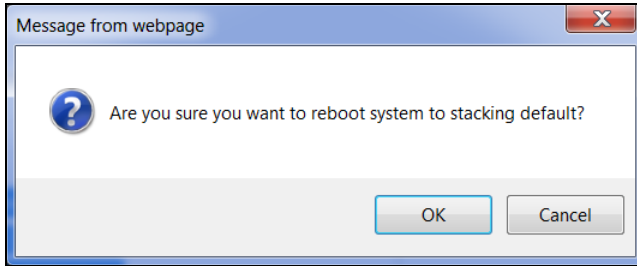
Click **Custom Default** and follow steps 1 to 2 to reboot and load a customized default file on the Switch. This will save the custom default configuration settings to both **Configuration 1** and **Configuration 2**.

Note: If a customized default file was not saved, clicking **Custom Default** loads the factory default configuration on the Switch.

58.2.4 Stacking Default

Follow the steps below to reset the Switch back to the stacking defaults. The master Switch login information will not be reset.

- 1 Click the **Stacking Default** button to clear all Switch configuration information you configured and return to the stacking defaults.
- 2 Click **OK** to continue or **Cancel** to abort.

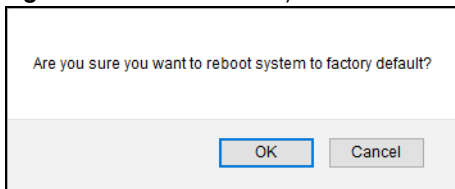
Figure 422 Load Stacking Default: Start

- 3 If you want to access the Switch Web Configurator again, you may need to change the IP address of your computer to be in the same subnet as that of the default Switch IP address (192.168.1.1).

58.2.5 Factory Default

Follow the steps below to reset the Switch back to the factory defaults.

- 1 Click the **Factory Default** button.
- 2 Click **OK** to continue or **Cancel** to abort.

Figure 423 Load Factory Default: Confirmation

If you want to access the Switch Web Configurator again, you may need to change the IP address of your computer to be in the same subnet as that of the default Switch IP address (192.168.1.1 or DHCP-assigned IP).

58.2.6 Custom Default

Follow the steps below to reset the Switch back to the **Custom Default** configuration file you created. This will save the custom default configuration settings to both **Configuration 1** and **Configuration 2**.

- 1 Click the **Custom Default** button.
- 2 Click **OK** to continue or **Cancel** to abort.

Note: If you did not save a **Custom Default** file in the Web Configurator or CLI using `copy running-config custom-default`, then the factory default file is restored after you press click **Custom Default** (next to **Reboot System**) on the Switch. You will then have to make all your configurations again on the Switch.

Figure 424 Load Custom Default: Confirmation

Are you sure you want to reboot system to custom default?

OK Cancel

58.3 Firmware Upgrade

Use the following screen to upgrade your Switch to the latest firmware. The Switch supports dual firmware images, **Firmware 1** and **Firmware 2**. Use this screen to specify which image is updated when firmware is uploaded using the Web Configurator and to specify which image is loaded when the Switch starts up.

SwitchMake sure you have downloaded (and unzipped) the correct model firmware and version to your computer before uploading to the device.

Be sure to upload the correct model firmware as uploading the wrong model firmware may damage your device.

Click **Management > Maintenance > Firmware Upgrade** to view the screen as shown next.

Figure 425 Management > Maintenance > Firmware Upgrade (Standalone Mode)

Firmware Upgrade		Maintenance
Name	Version	
Running	V4.70(ABRP.0)b4 05/21/2020	
Firmware 1	V4.70(ABRP.0)b4 05/21/2020	
Firmware 2	V4.70(ABRP.0)b3 05/04/2020	

Current Boot Image	Firmware 1
Config Boot Image	Firmware 2 ▾

Apply Cancel

To upgrade the internal switch firmware, browse the location of the binary (.BIN) file and click Upgrade button.

Firmware	2 ▾	File Path	Browse...	470ABRP0b5.bin

Upgrade

Figure 426 Management > Maintenance > Firmware Upgrade (Stacking Mode)

Firmware Upgrade			Maintenance	
Slot	Name	Status	Version	
1	XS3800-28	active	Running	V4.60(ABML2)b4 03/08/2019
			Firmware 1	V4.60(ABML2)b3 01/10/2019
			Firmware 2	V4.60(ABML2)b4 03/08/2019
2		inactive	Running	
			Firmware 1	
			Firmware 2	
3		inactive	Running	
			Firmware 1	
			Firmware 2	
4		inactive	Running	
			Firmware 1	
			Firmware 2	

Current Boot Image	Firmware 2
Config Boot Image	Firmware 2 ▼

Apply Cancel

To upgrade the internal switch firmware, browse the location of the binary (.BIN) file and click Upgrade button.

All ▼	Firmware 1 ▼	File Path	Browse...

Upgrade

The top of firmware upgrade screen shows which firmware version is currently running on the Switch. Type the path and file name of the firmware file you wish to upload to the Switch in the **File Path** text box or click **Choose File** or **Browse** to locate it. Firmware upgrades are only applied after a reboot. Click **Upgrade** to load the new firmware. Select the **Config Boot Image** drop-down list box if you want to reboot the Switch and click **Apply** to apply the new firmware immediately. Click **Upgrade** to load the new firmware.

After the process is complete, see the **System Info** screen to verify your current firmware version number.

Table 246 Management > Maintenance > Firmware Upgrade

LABEL	DESCRIPTION
Slot	This field appears only in stacking mode. This is the slot index number.
Name	This is the name of the Switch that you are configuring.
Status	This field appears only in stacking mode. This field displays the current stacking status on the Switch.
Version	The Switch has 2 firmware sets, Firmware 1 and Firmware 2 , residing in flash. Running shows the version number (and model code) and MM/DD/YYYY creation date of the firmware currently in use on the Switch (Firmware 1 or Firmware 2). The firmware information is also displayed at System Information in Basic Setting. Firmware 1 shows its version number (and model code) and MM/DD/YYYY creation date. Firmware 2 shows its version number (and model code) and MM/DD/YYYY creation date.
Current Boot Image	This displays which firmware is currently in use on the Switch (Firmware 1 or Firmware 2).

Table 246 Management > Maintenance > Firmware Upgrade (continued)

LABEL	DESCRIPTION
Config Boot Image	Select which firmware (Firmware 1 or Firmware 2) should load, click Apply and reboot the Switch to see changes, you will also see changes in the Current Boot Image field above as well.
Apply	Click Apply to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to begin configuring this screen afresh.
	This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack to upgrade the firmware on this slot. Or select All to upgrade the firmware for all slots.
Firmware	Choose to upload the new firmware to (Firmware) 1 or (Firmware) 2 .
File Path	Type the path and file name of the firmware file you wish to upload to the Switch in the File Path text box or click Choose File or Browse to locate it.
Upgrade	Click Upgrade to load the new firmware. s are only applied after a reboot. To reboot, go to Management > Maintenance > Reboot System and click Config 1 , Config 2 or Factory Default (Config 1 , Config 2 and Factory Default are the configuration files you want the Switch to use when it restarts).

58.4 Restore Configuration

Use this screen to restore a previously saved configuration from your computer to the Switch.

Figure 427 Management > Maintenance > Restore Configuration

Type the path and file name of the configuration file you wish to restore in the **File Path** text box or click **Choose File** or **Browse** to locate it. After you have specified the file, click **Restore**. "config" is the name of the configuration file on the Switch, so your backup configuration file is automatically renamed when you restore using this screen.

58.5 Backup Configuration

Backing up your Switch configurations allows you to create various "snap shots" of your device from which you may restore at a later date.

Back up your current Switch configuration to a computer using the **Backup Configuration** screen.

Figure 428 Management > Maintenance > Backup Configuration

The screenshot shows the 'Backup Configuration' page. At the top, there is a header bar with 'Backup Configuration' on the left and a link to 'Maintenance' on the right. Below the header, a message states: 'This page allows you to back up the device's current configuration to your workstation. Now click the Backup button.' Underneath this message is a form with a label 'Configuration' and a dropdown menu currently set to 'Running Config'. At the bottom of the page, there is a blue 'Backup' button.

Follow the steps below to back up the current Switch configuration to your computer in this screen.

- 1 Select which Switch configuration file you want to download to your computer.
- 2 Click **Backup**.
- 3 If the current configuration file is open and/or downloaded to your computer automatically, you can click **File > Save As** to save the file to a specific place.

If a dialog box pops up asking whether you want to open or save the file, click **Save** or **Save File** to download it to the default downloads folder on your computer. If a **Save As** screen displays after you click **Save** or **Save File**, choose a location to save the file on your computer from the **Save in** drop-down list box and type a descriptive name for it in the **File name** list box. Click **Save** to save the configuration file to your computer.

58.6 Auto Configuration

The Switch can download an pre-saved auto configuration file automatically when you reboot the Switch using the DHCP or HTTPS mode. This will overwrite the running configuration stored in the Switch's RAM instead of the startup configuration stored in the Switch's flash memory.

Figure 429 Management > Maintenance > Auto Configuration

The screenshot shows the 'Auto Configuration' page. At the top, there is a header bar with 'Auto Configuration' on the left and a link to 'Maintenance' on the right. Below the header, there is a table with three rows: 'Mode' with value 'None', 'State' with value 'None', and 'Filename' with value 'None'. Below this table, there is another section with four rows: 'Active' with a checkbox, 'Mode' with a dropdown menu set to 'DHCP', 'DHCP VLAN ID' with a text input field containing '1', and 'HTTPS URL' with a text input field. At the bottom of the page, there are two buttons: 'Apply' and 'Cancel'.

The following table describes the labels in this screen.

Table 247 Management > Maintenance > Auto Configuration

LABEL	DESCRIPTION
Use this section to view the auto configuration status after you restarted the Switch.	
Mode	This field shows the mode (DHCP or HTTPS) that is used for auto configuration after you enabled auto configuration and restarted the Switch. It shows None if auto configuration was not enabled.
State	This field shows whether auto configuration was executed successfully the last time the Switch rebooted. None – Auto configuration was disabled and not executed. Success – An auto configuration file was downloaded successfully to the Switch. Un-success – An auto configuration file was not downloaded to the Switch.
Filename	This field displays the name of the auto configuration file that was downloaded the last time the Switch rebooted. It shows None if auto configuration was not enabled or not executed successfully.
Use this section to enable auto configuration and select the mode that you want to use for auto configuration.	
Active	Select the check box to enable auto configuration.
Mode	Select DHCP to have the Switch use the TFTP server IP address and auto configuration file name assigned by a DHCP server to download a pre-saved configuration file when the Switch reboots. Note: The Switch should act as a DHCP client to send a DHCP request so that it can get the TFTP server address and configuration file name from the DHCP server. Select HTTPS to have the Switch use the URL you specified in the HTTPS URL field to access a web server and download the auto configuration file using HTTPS.
DHCP VLAN ID	Enter the VLAN ID of the DHCP server that assigns the TFTP server IP address and auto configuration file name to the Switch.
HTTPS URL	Type the URL that can be used to access and download the auto configuration file from a web server using HTTPS. For example, https://webserverIPaddress/configfilename.cfg. Note: You must fill in this field if you select HTTPS in the Mode field. Otherwise, auto configuration will not work.
Apply	Click Apply to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to begin configuring this screen afresh.

58.7 Tech-Support

The Tech-Support feature is a log enhancement tool that logs useful information such as CPU utilization history, memory and Mbuf (Memory Buffer) log and crash reports for issue analysis by customer support should you have difficulty with your Switch. The Tech Support menu eases your effort in obtaining reports and it is also available in CLI command by typing "Show tech-support" command.

Click **Management > Maintenance > Tech-Support** to see the following screen.

Figure 430 Management > Maintenance > Tech-Support

Tech-Support		Maintenance	
CPU	threshold	100	keep 5 seconds
Mbuf	threshold	50	%
Apply Cancel			
All	Download		
Crash	Download		
CPU history	Download		
Memory section	Download		
Mbuf	Download		
ROM	Download		
L3	Download		

You may need WordPad or similar software to see the log report correctly. The table below describes the fields in the above screen.

Table 248 Management > Maintenance > Tech-Support

LABEL	DESCRIPTION
CPU	Type a number ranging from 50 to 100 in the CPU threshold box, and type another number ranging from 5 to 60 in the seconds box then click Apply. For example, 80 for CPU threshold and 5 for seconds means a log will be created when CPU utilization reaches over 80% and lasts for 5 seconds. The log report holds 7 days of CPU log data and is stored in volatile memory (RAM). The data is lost if the Switch is turned off or in event of power outage. After 7 days, the logs wrap around and new ones and replace the earliest ones. The higher the CPU threshold number, the fewer logs will be created, and the less data technical support will have to analyze and vice versa.
Mbuf	Type a number ranging from 50 to 100 in the Mbuf (Memory Buffer) threshold box. The Mbuf log report is stored in flash (permanent) memory. For example, Mbuf 50 means a log will be created when the Mbuf utilization is over 50%. The higher the Mbuf threshold number, the fewer logs will be created, and the less data technical support will have to analyze and vice versa.
Apply	Click Apply to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to begin configuring this screen afresh.
All	Click Download to see all the log report and system status. This log report is stored in flash memory. If the All log report is too large, you can download the log reports separately below.
Crash	Click Download to see the crash log report. The log will include information of the last crash and is stored in flash memory.
CPU history	Click Download to see the CPU history log report. The 7-days log is stored in RAM and you will need to save it, otherwise it will be lost when the Switch is shutdown or during power outage.
Memory Section	Click Download to see the memory section log report. This log report is stored in flash memory.
Mbuf	Click Download to see the Mbuf log report. The log includes Mbuf over threshold information. This log report is stored in flash memory.

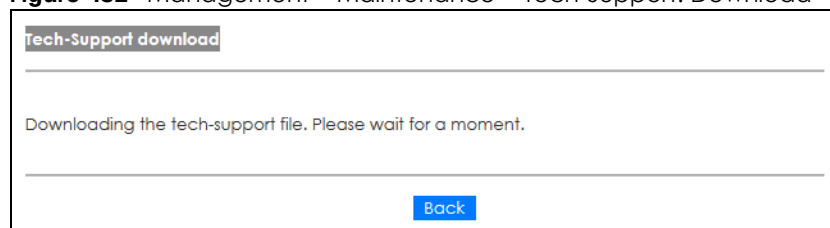
Table 248 Management > Maintenance > Tech-Support (continued)

LABEL	DESCRIPTION
ROM	Click Download to see the Read Only Memory (ROM) log report. This report is stored in flash memory.
L3	Click Download to see the layer-3 Switch log report. The log only applies to the layer-3 Switch models. This report is stored in flash memory.

58.7.1 Tech-Support Download

When you click **Download** to save your current Switch configuration to a computer, the following screen appears. When the log report has downloaded successfully, click **Back** to return to the previous screen.

Figure 431 Management > Maintenance > Tech-Support: Download



58.8 Certificates

The Switch can use HTTPS certificates that are verified by a third party to create secure HTTPS connections between your computer and the Switch. This way, you may securely access the Switch using the Web Configurator. See [Section 59.7.3 on page 560](#) for more information about HTTPS.

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.

Click **Management > Maintenance > Certificates** to open the following screen. Use this screen to import the Switch's CA-signed certificates.

Figure 432 Management > Maintenance > Certificates

Certificates [Maintenance](#)

Please specify the location of the HTTPS certificate file to be imported. The certificate file must be the Binary PKCS#12 format.

File Path No file selected.

Password

Synchronize Certificate

Active ☒

Service	Subject	Issuer	Valid From	Valid To	☐
HTTPS	/CN=XS3800 0019cb000001	/CN=XS3800 0019cb000001	Jan 1 00:00:41 2016 GMT	Mar 26 00:00:41 2076 GMT	☐

The following table describes the labels in this screen.

Table 249 Management > Maintenance > Certificates

LABEL	DESCRIPTION
File Path	Click Choose File or Browse to find the certificate file you want to upload.
Password	Enter the certificate file's password that was created when the PKCS #12 file was exported. The password consists of up to 32 ASCII characters.
Import	Click this button to save the certificate that you have enrolled from a certification authority from your computer to the Switch.
Synchronize Certificate	Note: This part only appears in stacking mode.
Active	Enable this option to allow the master Switch in stacking mode to synchronize CA-signed certificates to all stacking members and save it to their non-volatile memory. Or, delete the stacking members' CA-signed certificate if a CA-signed certificate does not exist in the master Switch. Otherwise, disable this option.
Apply	Click Apply to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to begin configuring this screen afresh.
Service	This field displays the service type that this certificate is for.
Subject	This field displays identifying information about the certificate's owner, such as CN (Common Name), OU (Organizational Unit or department), O (Organization or company) and C (Country). It is recommended that each certificate have 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.
Valid To	This field displays the date that the certificate expires.

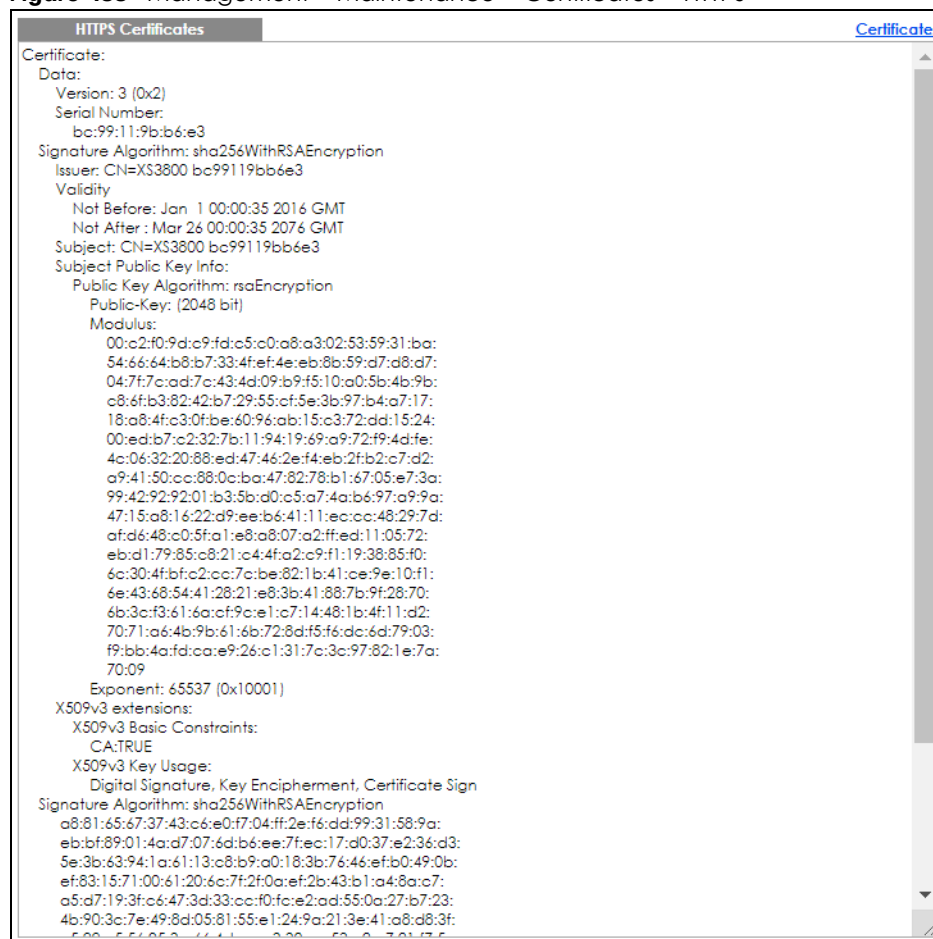
Table 249 Management > Maintenance > Certificates (continued)

LABEL	DESCRIPTION
	Select an entry's check box to select a specific entry.
Delete	Click this button to delete the certificate (or certification request). You cannot delete a certificate that one or more features is configured to use.

58.8.1 HTTPS Certificates

Use this screen to view the HTTPS certificate details. Click a hyperlink in the **Service** column in the **Management > Maintenance > Certificates** screen to open the following screen.

Figure 433 Management > Maintenance > Certificates > HTTPS



58.9 Technical Reference

This section provides technical background information on the topics discussed in this chapter.

58.9.1 FTP Command Line

This section shows some examples of uploading to or downloading files from the Switch using FTP commands. First, understand the filename conventions.

58.9.2 Filename Conventions

The configuration file (also known as the romfile or ROM) contains the Zyxel factory default configuration settings in the screens such as password, Switch setup, IP Setup, and so on. Once you have customized the Switch's settings, they can be saved back to your computer under a filename of your choosing.

ZyNOS (Zyxel Network Operating System sometimes referred to as the "ras" file) is the system firmware and has a "bin" filename extension.

Table 250 Filename Conventions

FILE TYPE	INTERNAL NAME	EXTERNAL NAME	DESCRIPTION
Configuration File	config	*.cfg	This is the configuration filename on the Switch. Uploading the config file replaces the specified configuration file system, including your Switch configurations, system-related data (including the default password), the error log and the trace log.
Firmware	ras-0 ras-1	*.bin	This is the generic name for the ZyNOS firmware on the Switch. ras-0 is image 1; ras-1 is image 2.

You can store up to two images, or firmware files of the same device model, on the Switch. Only one image is used at a time.

- Run the `boot image <1|2>` command to specify which image is updated when firmware is loaded using the Web Configurator and to specify which image is loaded when the Switch starts up.
- You can also use FTP commands to upload firmware to any image.

The Switch supports dual firmware images, ras-0 and ras-1. You can switch from one to the other by using the `boot image <index>` command, where <index> is 1 (ras-0) or 2 (ras-1). See the CLI Reference Guide for more information about using commands. The system does not reboot after it switches from one image to the other.

58.9.2.1 Example FTP Commands

```
ftp> put firmware.bin ras
```

This is a sample FTP session showing the transfer of the computer file "firmware.bin" to the Switch.

```
ftp> get config config.cfg
```

This is a sample FTP session saving the current configuration to a file called "config.cfg" on your computer.

If your (T)FTP client does not allow you to have a destination filename different than the source, you will need to rename them as the Switch only recognizes "config" and "ras". Be sure you keep unaltered copies of both files for later use.

Be sure to upload the correct model firmware as uploading the wrong model firmware may damage your device.

58.9.3 FTP Command Line Procedure

- 1 Launch the FTP client on your computer.
- 2 Enter `open`, followed by a space and the IP address of your Switch.
- 3 Press [ENTER] when prompted for a username.
- 4 Enter your password as requested (the default is "1234").
- 5 Enter `bin` to set transfer mode to binary.
- 6 Use `put` to transfer files from the computer to the Switch, for example, `put firmware.bin ras` transfers the firmware on your computer (firmware.bin) to the Switch and renames it to "ras". Similarly, `put config.cfg config` transfers the configuration file on your computer (config.cfg) to the Switch and renames it to "config". Likewise `get config config.cfg` transfers the configuration file on the Switch to your computer and renames it to "config.cfg". See [Table 250 on page 538](#) for more information on filename conventions.
- 7 Enter `quit` to exit the ftp prompt.

58.9.4 GUI-based FTP Clients

The following table describes some of the commands that you may see in GUI-based FTP clients.

Table 251 General Commands for GUI-based FTP Clients

COMMAND	DESCRIPTION
Host Address	Enter the address of the host server.
Login Type	Anonymous. This is when a user I.D. and password is automatically supplied to the server for anonymous access. Anonymous logins will work only if your ISP or service administrator has enabled this option. Normal. The server requires a unique User ID and Password to login.
Transfer Type	Transfer files in either ASCII (plain text format) or in binary mode. Configuration and firmware files should be transferred in binary mode.
Initial Remote Directory	Specify the default remote directory (path).
Initial Local Directory	Specify the default local directory (path).

58.9.5 FTP Restrictions

FTP will not work when:

- FTP service is disabled in the **Service Access Control** screen.
- The IP addresses in the **Remote Management** screen does not match the client IP address. If it does not match, the Switch will disconnect the FTP session immediately.

CHAPTER 59

Access Control

59.1 Access Control Overview

This chapter describes how to control access to the Switch.

A console port and FTP are allowed one session each, Telnet and SSH share nine sessions, up to five web sessions (five different user names and passwords) and/or limitless SNMP access control sessions are allowed.

Table 252 Access Control Overview

Console Port	SSH	Telnet	FTP	Web	SNMP
One session	Share up to 9 sessions		One session	Up to 5 accounts	No limit

A console port access control session and Telnet access control session cannot coexist when multi-login is disabled. See the CLI Reference Guide for more information on disabling multi-login.

59.1.1 What You Can Do

- Use the **Access Control** screen ([Section 59.2 on page 541](#)) to display the main screen.
- Use the **SNMP** screen ([Section 59.3 on page 542](#)) to configure your SNMP settings.
- Use the **Trap Group** screen ([Section 59.3.1 on page 543](#)) to specify the types of SNMP traps that should be sent to each SNMP manager.
- Use the **User Information** screen ([Section 59.3.3 on page 546](#)) to create SNMP users for authentication with managers using SNMP v3 and associate them to SNMP groups.
- Use the **Logins** screens ([Section 59.4 on page 548](#)) to assign which users can access the Switch via Web Configurator at any one time.
- Use the **Service Access Control** screen ([Section 59.5 on page 549](#)) to decide what services you may use to access the Switch.
- Use the **Remote Management** screen ([Section 59.6 on page 550](#)) to specify a group of one or more "trusted computers" from which an administrator may use a service to manage the Switch.

59.2 Access Control Main Settings

Use this screen to display the main screen.

Click **Management > Access Control** in the navigation panel to display the main screen as shown.

Figure 434 Management > Access Control

Access Control	
SNMP	Click Here
Logins	Click Here
Service Access Control	Click Here
Remote Management	Click Here

The following table describes the labels in this screen.

Table 253 Management > Access Control

LABEL	DESCRIPTION
SNMP	Click this link to configure your SNMP settings.
Logins	Click this link to assign which users can access the Switch via Web Configurator at any one time.
Service Access Control	Click this link to decide what services you may use to access the Switch.
Remote Management	Click this link to specify a group of one or more "trusted computers" from which an administrator may use a service to manage the Switch.

59.3 Configure SNMP

Use this screen to configure your SNMP settings.

Click **Management > Access Control > SNMP** to view the screen as shown.

Figure 435 Management > Access Control > SNMP

SNMP		Access Control	Trap Group	User
General Setting				
Version	v2c ▼			
Get Community	public			
Set Community	public			
Trap Community	public			
Trap Destination				
Version	IP	Port	Username	
v2c ▼	0.0.0.0	162		
v2c ▼	0.0.0.0	162		
v2c ▼	0.0.0.0	162		
v2c ▼	0.0.0.0	162		
Apply Cancel				

The following table describes the labels in this screen.

Table 254 Management > Access Control > SNMP

LABEL	DESCRIPTION
General Setting	Use this section to specify the SNMP version and community (password) values.
Version	Select the SNMP version for the Switch. The SNMP version on the Switch must match the version on the SNMP manager. Choose SNMP version 2c (v2c), SNMP version 3 (v3) or both (v3v2c). SNMP version 2c is backwards compatible with SNMP version 1.
Get Community	Enter the Get Community string, which is the password for the incoming Get- and GetNext-requests from the management station. The Get Community string is only used by SNMP managers using SNMP version 2c or lower.
Set Community	Enter the Set Community , which is the password for incoming Set- requests from the management station. The Set Community string is only used by SNMP managers using SNMP version 2c or lower.
Trap Community	Enter the Trap Community string, which is the password sent with each trap to the SNMP manager. The Trap Community string is only used by SNMP managers using SNMP version 2c or lower.
Trap Destination	Use this section to configure where to send SNMP traps from the Switch.
Version	Specify the version of the SNMP trap messages.
IP	Enter the IP addresses of up to four managers to send your SNMP traps to.
Port	Enter the port number upon which the manager listens for SNMP traps.
Username	Enter the username to be sent to the SNMP manager along with the SNMP v3 trap. This username must match an existing account on the Switch (configured in the Management > Access Control > SNMP > User screen).
Apply	Click Apply to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to begin configuring this screen afresh.

59.3.1 Configure SNMP Trap Group

From the **SNMP** screen, click **Trap Group** to view the screen as shown. Use the **Trap Group** screen to specify the types of SNMP traps that should be sent to each SNMP manager.

Figure 436 Management > Access Control > SNMP > Trap Group

Type	Options
System	☐ * ☐ coldstart ☐ temperature ☐ timesync ☐ powersource ☐ custom-ca ☐ warmstart ☐ voltage ☐ loopguard ☐ loginrecord ☐ fanspeed ☐ reset ☐ errdisable ☐ service-register
Interface	☐ * ☐ linkup ☐ lldp ☐ zuld ☐ linkdown ☐ transceiver-ddm ☐ autonegotiation ☐ storm-control
AAA	☐ * ☐ authentication ☐ authorization ☐ accounting
IP	☐ * ☐ ping ☐ traceroute
Switch	☐ * ☐ stp ☐ mactable ☐ rmon ☐ classifier

The following table describes the labels in this screen.

Table 255 Management > Access Control > SNMP > Trap Group

LABEL	DESCRIPTION
Trap Destination IP	Select one of your configured trap destination IP addresses. These are the IP addresses of the SNMP managers. You must first configure a trap destination IP address in the SNMP Setting screen. Use the rest of the screen to select which traps the Switch sends to that SNMP manager.
Type	Select the categories of SNMP traps that the Switch is to send to the SNMP manager.
Options	Select the individual SNMP traps that the Switch is to send to the SNMP station. The traps are grouped by category. Selecting a category automatically selects all of the category's traps. Clear the check boxes for individual traps that you do not want the Switch to send to the SNMP station. Clearing a category's check box automatically clears all of the category's trap check boxes (the Switch only sends traps from selected categories).
Apply	Click Apply to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to begin configuring this screen afresh.

59.3.2 Enable or Disable Sending of SNMP Traps on a Port

From the **SNMP > Trap Group** screen, click **Port** to view the screen as shown. Use this screen to set whether a trap received on the ports would be sent to the SNMP manager.

Figure 437 Management > Access Control > SNMP > Trap Group > Port (Standalone Mode)

Trap Group Port [Trap Group](#)

Option: **loopguard** ▼

Port	Active
*	☐
1	☒
2	☒
3	☒
4	☒
5	☒
6	☒
7	☒
8	☒
9	☐

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

Figure 438 Management > Access Control > SNMP > Trap Group > Port (Stacking Mode)

Port [Trap Group](#)

Option: **loopguard** ▼

SLOT 1 ▼

Port	Active
1/*	☐
1/1	☒
1/2	☒
1/3	☒
1/4	☒
1/5	☒
1/6	☒
1/7	☒
1/8	☒
1/9	☒
1/10	☒
1/11	☒
1/12	☒
1/13	☒

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

The following table describes the labels in this screen.

Table 256 Management > Access Control > SNMP > Trap Group > Port

LABEL	DESCRIPTION
Option	Select the trap type you want to configure here.
SLOT	This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack.
Port	This field displays the port number. In stacking mode, the first number represents the slot ID and the second is the port number. Please note that the default stacking ports (the last four ports of your Switch) cannot be configured. They are reserved for stacking only.
*	Settings in this row apply to all ports. Use this row only if you want to make some of the settings the same for all ports. Use this row first to set the common settings and then make adjustments on a port-by-port basis. Changes in this row are copied to all the ports as soon as you make them.

Table 256 Management > Access Control > SNMP > Trap Group > Port (continued)

LABEL	DESCRIPTION
1/*	Settings in this row apply to all ports for the Switch represented by the slot ID (in stacking mode). Use this row only if you want to make some of the settings the same for all ports. Use this row first to set the common settings and then make adjustments on a port-by-port basis. Note: Changes in this row are copied to all the ports as soon as you make them.
Active	Select this check box to enable the trap type of SNMP traps on this port. The Switch sends the related traps received on this port to the SNMP manager. Clear this check box to disable the sending of SNMP traps on this port.
Apply	Click Apply to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to begin configuring this screen afresh.

59.3.3 Configure SNMP User

From the **SNMP** screen, click **User** to view the screen as shown. Use the **User** screen to create SNMP users for authentication with managers using SNMP v3 and associate them to SNMP groups. An SNMP user is an SNMP manager.

Figure 439 Management > Access Control > SNMP > User

The following table describes the labels in this screen.

Table 257 Management > Access Control > SNMP > User

LABEL	DESCRIPTION
User Information	Note: Use the username and password of the login accounts you specify in this screen to create accounts on the SNMP v3 manager.
Username	Specify the username of a login account on the Switch.

Table 257 Management > Access Control > SNMP > User (continued)

LABEL	DESCRIPTION
Security Level	Select whether you want to implement authentication and/or encryption for SNMP communication from this user. Choose: noauth – to use the username as the password string to send to the SNMP manager. This is equivalent to the Get, Set and Trap Community in SNMP v2c. This is the lowest security level. auth – to implement an authentication algorithm for SNMP messages sent by this user. priv – to implement authentication and encryption for SNMP messages sent by this user. This is the highest security level. Note: The settings on the SNMP manager must be set at the same security level or higher than the security level settings on the Switch.
Authentication	Select an authentication algorithm. MD5 (Message Digest 5) and SHA (Secure Hash Algorithm) are hash algorithms used to authenticate SNMP data. SHA authentication is generally considered stronger than MD5, but is slower.
Password	Enter the password of up to 32 ASCII characters for SNMP user authentication.
Privacy	Specify the encryption method for SNMP communication from this user. You can choose one of the following: DES – Data Encryption Standard is a widely used (but breakable) method of data encryption. It applies a 56-bit key to each 64-bit block of data. AES – Advanced Encryption Standard is another method for data encryption that also uses a secret key. AES applies a 128-bit key to 128-bit blocks of data.
Password	Enter the password of up to 32 ASCII characters for encrypting SNMP packets.
Group	SNMP v3 adopts the concept of View-based Access Control Model (VACM) group. SNMP managers in one group are assigned common access rights to MIBs. Specify in which SNMP group this user is. admin – Members of this group can perform all types of system configuration, including the management of administrator accounts. readwrite – Members of this group have read and write rights, meaning that the user can create and edit the MIBs on the Switch, except the user account and AAA configuration. readonly – Members of this group have read rights only, meaning the user can collect information from the Switch.
Add	Click this to create a new entry or to update an existing one. This saves your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to reset the fields to your previous configuration.
Clear	Click Clear to reset the fields to the factory defaults.
Index	This is a read-only number identifying a login account on the Switch. Click on an index number to view more details and edit an existing account.
Username	This field displays the username of a login account on the Switch.
Security Level	This field displays whether you want to implement authentication and/or encryption for SNMP communication with this user.
Authentication	This field displays the authentication algorithm used for SNMP communication with this user.
Privacy	This field displays the encryption method used for SNMP communication with this user.
Group	This field displays the SNMP group to which this user belongs.
	Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries.
Delete	Click Delete to remove the selected entry from the summary table.
Cancel	Click Cancel to begin configuring this screen afresh.

59.4 Set Up Login Accounts

Up to five people (one administrator and four non-administrators) may access the Switch via Web Configurator at any one time.

- An administrator is someone who can both view and configure Switch changes. The username for the Administrator is always **admin**. The default administrator password is **1234**.

Note: It is highly recommended that you change the default administrator password (**1234**).

- A non-administrator (username is something other than **admin**) is someone who can view and/or configure Switch settings. The configuration right varies depending on the user's privilege level.

Click **Management > Access Control > Logins** to view the screen as shown.

Figure 440 Management > Access Control > Logins

The following table describes the labels in this screen.

Table 258 Management > Access Control > Logins

LABEL	DESCRIPTION
Administrator	This is the default administrator account with the "admin" user name. You cannot change the default administrator user name.
Old Password	Type the existing system password (1234 is the default password when shipped).
New Password	Enter your new system password.
Retype to confirm	Retype your new system password for confirmation.
Edit Logins	You may configure passwords for up to four users. These users can have read-only or read/write access. You can give users higher privileges via the Web Configurator or the CLI. For more information on assigning privileges via the CLI see the Ethernet Switch CLI Reference Guide.
User Name	Set a user name (up to 32 ASCII characters long).

Table 258 Management > Access Control > Logins (continued)

LABEL	DESCRIPTION
Password	Enter your new system password.
Retype to confirm	Retype your new system password for confirmation.
Privilege	Type the privilege level for this user. At the time of writing, users may have a privilege level of 0, 3, 13, or 14 representing different configuration rights as shown below. 0 – Display basic system information. 3 – Display configuration or status. 13 – Configure features except for login accounts, SNMP user accounts, the authentication method sequence and authorization settings, multiple logins, administrator and enable passwords, and configuration information display. 14 – Configure login accounts, SNMP user accounts, the authentication method sequence and authorization settings, multiple logins, and administrator and enable passwords, and display configuration information. Users can run command lines if the session's privilege level is greater than or equal to the command's privilege level. The session privilege initially comes from the privilege of the login account. For example, if the user has a privilege of 5, he or she can run commands that requires privilege level of 5 or less but not more.
Apply	Click Apply to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to begin configuring this screen afresh.

59.5 Service Access Control

Service Access Control allows you to decide what services you may use to access the Switch. You may also change the default service port and configure "trusted computers" for each service in the **Remote Management** screen (discussed later). Click **Access Control** to go back to the main **Access Control** screen.

Figure 441 Management > Access Control > Service Access Control

Services	Active	Service Port	Timeout	Login Timeout
Console			5 Minutes	
Telnet	☒	23	5 Minutes	150 Seconds
SSH	☒	22		
FTP	☒	21	5 Minutes	
HTTP	☒	80	5 Minutes	
HTTPS	☒	443		
ICMP	☒			
SNMP	☒			

Apply Cancel

The following table describes the fields in this screen.

Table 259 Management > Access Control > Service Access Control

LABEL	DESCRIPTION
Services	Services you may use to access the Switch are listed here.
Active	Select this option for the corresponding services that you want to allow to access the Switch.

Table 259 Management > Access Control > Service Access Control (continued)

LABEL	DESCRIPTION
Service Port	For Telnet, SSH, FTP, HTTP or HTTPS services, you may change the default service port by typing the new port number in the Service Port field. If you change the default port number then you will have to let people (who wish to use the service) know the new port number for that service.
Timeout	Enter how many minutes (from 1 to 255) a management session can be left idle before the session times out. After it times out you have to log in with your password again. Very long idle timeouts may have security risks.
Login Timeout	The Telnet or SSH server do not allow multiple user logins at the same time. Enter how many seconds (from 30 to 300 seconds) a login session times out. After it times out you have to start the login session again. Very long login session timeouts may have security risks. For example, if User A attempts to connect to the Switch (via SSH), but during the login stage, do not enter the user name and/or password, User B cannot connect to the Switch (via SSH) before the Login Timeout for User A expires (default 150 seconds).
Apply	Click Apply to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to begin configuring this screen afresh.

59.6 Remote Management

Use this screen to specify a group of one or more "trusted computers" from which an administrator may use a service to manage the Switch.

Click **Management > Access Control > Remote Management** to view the screen as shown next.

Click **Access Control** to return to the **Access Control** screen.

Figure 442 Management > Access Control > Remote Management

Entry	Active	Start Address	End Address	Telnet	FTP	HTTP	ICMP	SNMP	SSH	HTTPS
1	☒	0.0.0.0	0.0.0.0	☒	☒	☒	☒	☒	☒	☒
2	☐	0.0.0.0	0.0.0.0	☐	☐	☐	☐	☐	☐	☐
3	☐	0.0.0.0	0.0.0.0	☐	☐	☐	☐	☐	☐	☐
4	☐	0.0.0.0	0.0.0.0	☐	☐	☐	☐	☐	☐	☐
5	☐	0.0.0.0	0.0.0.0	☐	☐	☐	☐	☐	☐	☐
6	☐	0.0.0.0	0.0.0.0	☐	☐	☐	☐	☐	☐	☐
7	☐	0.0.0.0	0.0.0.0	☐	☐	☐	☐	☐	☐	☐
8	☐	0.0.0.0	0.0.0.0	☐	☐	☐	☐	☐	☐	☐
9	☐	0.0.0.0	0.0.0.0	☐	☐	☐	☐	☐	☐	☐
10	☐	0.0.0.0	0.0.0.0	☐	☐	☐	☐	☐	☐	☐
11	☐	0.0.0.0	0.0.0.0	☐	☐	☐	☐	☐	☐	☐
12	☐	0.0.0.0	0.0.0.0	☐	☐	☐	☐	☐	☐	☐
13	☐	0.0.0.0	0.0.0.0	☐	☐	☐	☐	☐	☐	☐
14	☐	0.0.0.0	0.0.0.0	☐	☐	☐	☐	☐	☐	☐
15	☐	0.0.0.0	0.0.0.0	☐	☐	☐	☐	☐	☐	☐
16	☐	0.0.0.0	0.0.0.0	☐	☐	☐	☐	☐	☐	☐

Apply Cancel

The following table describes the labels in this screen.

Table 260 Management > Access Control > Remote Management

LABEL	DESCRIPTION
Entry	This is the client set index number. A "client set" is a group of one or more "trusted computers" from which an administrator may use a service to manage the Switch.
Active	Select this check box to activate this secured client set. Clear the check box if you wish to temporarily disable the set without deleting it.
Start Address	Configure the IP address range of trusted computers from which you can manage this Switch.
End Address	The Switch checks if the client IP address of a computer requesting a service or protocol matches the range set here. The Switch immediately disconnects the session if it does not match.
Telnet/FTP/HTTP/ICMP/SNMP/SSH/HTTPS	Select services that may be used for managing the Switch from the specified trusted computers.
Apply	Click Apply to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to begin configuring this screen afresh.

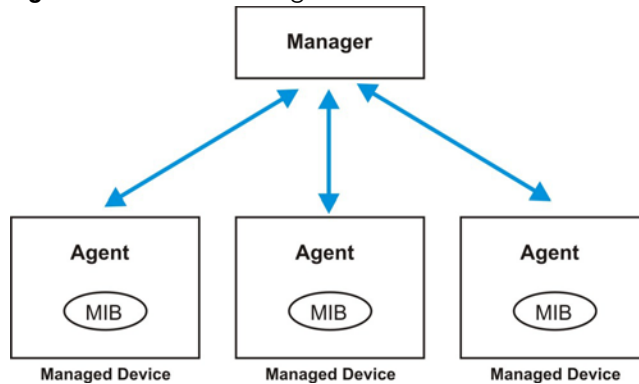
59.7 Technical Reference

This section provides technical background information on the topics discussed in this chapter.

59.7.1 About SNMP

Simple Network Management Protocol (SNMP) is an application layer protocol used to manage and monitor TCP/IP-based devices. SNMP is used to exchange management information between the network management system (NMS) and a network element (NE). A manager station can manage and monitor the Switch through the network via SNMP version 1 (SNMPv1), SNMP version 2c or SNMP version 3. The next figure illustrates an SNMP management operation. SNMP is only available if TCP/IP is configured.

Figure 443 SNMP Management Model



An SNMP managed network consists of two main components: agents and a manager.

An agent is a management software module that resides in a managed Switch (the Switch). An agent translates the local management information from the managed Switch into a form compatible with SNMP. The manager is the console through which network administrators perform network management functions. It executes applications that control and monitor managed devices.

The managed devices contain object variables or managed objects that define each piece of information to be collected about a Switch. Examples of variables include number of packets received, node port status and so on. A Management Information Base (MIB) is a collection of managed objects. SNMP allows a manager and agents to communicate for the purpose of accessing these objects.

SNMP itself is a simple request or response protocol based on the manager or agent model. The manager issues a request and the agent returns responses using the following protocol operations:

Table 261 SNMP Commands

LABEL	DESCRIPTION
Get	Allows the manager to retrieve an object variable from the agent.
GetNext	Allows the manager to retrieve the next object variable from a table or list within an agent. In SNMPv1, when a manager wants to retrieve all elements of a table from an agent, it initiates a Get operation, followed by a series of GetNext operations.
Set	Allows the manager to set values for object variables within an agent.
Trap	Used by the agent to inform the manager of some events.

SNMP v3 and Security

SNMP v3 enhances security for SNMP management. SNMP managers can be required to authenticate with agents before conducting SNMP management sessions.

Security can be further enhanced by encrypting the SNMP messages sent from the managers.

Encryption protects the contents of the SNMP messages. When the contents of the SNMP messages are encrypted, only the intended recipients can read them.

Supported MIBs

MIBs let administrators collect statistics and monitor status and performance.

The Switch supports the following MIBs:

- SNMP MIB II (RFC 1213)
- RFC 1157 SNMP v1
- RFC 1493 Bridge MIBs
- RFC 1643 Ethernet MIBs
- RFC 1155 SMI
- RFC 2674 SNMPv2, SNMPv2c
- RFC 1757 RMON
- SNMPv2, SNMPv2c or later version, compliant with RFC 2011 SNMPv2 MIB for IP, RFC 2012 SNMPv2 MIB for TCP, RFC 2013 SNMPv2 MIB for UDP

SNMP Traps

The Switch sends traps to an SNMP manager when an event occurs. The following tables outline the SNMP traps by category.

An OID (Object ID) that begins with “**1.3.6.1.4.1.890.1.15**” is defined in private MIBs. Otherwise, it is a standard MIB OID.

Table 262 SNMP System Traps

OPTION	OBJECT LABEL	OBJECT ID	DESCRIPTION
coldstart	coldStart	1.3.6.1.6.3.1.1.5.1	This trap is sent when the Switch is turned on.
warmstart	warmStart	1.3.6.1.6.3.1.1.5.2	This trap is sent when the Switch restarts.
fanspeed	zyHwMonitorFanSpeedOutOfRange	1.3.6.1.4.1.890.1.15.3.26.2.1	This trap is sent when the fan speed goes above or below the normal operating range.
	zyHwMonitorFANSpeedOutOfRangeRecovered	1.3.6.1.4.1.890.1.15.3.26.2.6	This trap is sent when the fan speed is recovered from the out of range to normal operating range.
temperature	zyHwMonitorTemperatureOutOfRange	1.3.6.1.4.1.890.1.15.3.26.2.2	This trap is sent when the temperature goes above or below the normal operating range.
	zyHwMonitorTemperatureOutOfRangeRecovered	1.3.6.1.4.1.890.1.15.3.26.2.7	This trap is sent when the temperature is recovered from the out of range to normal operating range.
voltage	zyHwMonitorPowerSupplyVoltageOutOfRange	1.3.6.1.4.1.890.1.15.3.26.2.3	This trap is sent when the voltage goes above or below the normal operating range.

Table 262 SNMP System Traps (continued)

OPTION	OBJECT LABEL	OBJECT ID	DESCRIPTION
reset	zySysMgmtUncontrolledSystemReset	1.3.6.1.4.1.890.1.15.3.49.2.1	This trap is sent when the Switch automatically resets.
	zySysMgmtControlledSystemReset	1.3.6.1.4.1.890.1.15.3.49.2.2	This trap is sent when the Switch resets by an administrator through a management interface.
	zySysMgmtBootImageInconsistence	1.3.6.1.4.1.890.1.15.3.49.2.3	This trap is sent when the index number of image which is loaded when the Switch starts up is different from what is specified via the CLI.
	RebootEvent	1.3.6.1.4.1.890.1.5.1.1.2	This trap is sent when the Switch reboots by an administrator through a management interface.
timesync	zyDateTimeTrapTimeServerNotReachable	1.3.6.1.4.1.890.1.15.3.82.3.1	This trap is sent when the Switch's date and time is not manually entered or the specified time server is not reachable.
	zyDateTimeTrapTimeServerNotReachableRecovered	1.3.6.1.4.1.890.1.15.3.82.3.2	This trap is sent when the Switch's real time clock is up to date.
intrusionlock	zyPortIntrusionLock	1.3.6.1.4.1.890.1.15.3.61.3.2	This trap is sent when intrusion lock occurs on a port.
loopguard	zyLoopGuardLoopDetect	1.3.6.1.4.1.890.1.15.3.45.2.1	This trap is sent when loopguard shuts down a port.
errdisable	zyErrdisableDetect	1.3.6.1.4.1.890.1.15.3.24.4.1	This trap is sent when an error is detected on a port, such as a loop occurs or the rate limit for specific control packets is exceeded.
	zyErrdisableRecovery	1.3.6.1.4.1.890.1.15.3.24.4.2	This trap is sent when the Switch ceases the action taken on a port, such as shutting down the port or discarding packets on the port, after the specified recovery interval.
poe (For PoE models only)	zyPoePowerPortOverload	1.3.6.1.4.1.890.1.15.3.59.4.1	This trap is sent when the port is turned off to supply power due to overloading.
	zyPoePowerPortShortCircuit	1.3.6.1.4.1.890.1.15.3.59.4.2	This trap is sent when the port is turned off to supply power due to short circuit.
	zyPoePowerPortOverSystemBudget	1.3.6.1.4.1.890.1.15.3.59.4.3	This trap is sent when the port is turned off to supply power because the requested power exceeds the total PoE power budget on the Switch.
	zyPoePowerPortOverloadRecovered	1.3.6.1.4.1.890.1.15.3.59.4.5	This trap is sent when the port is turned on to recover from an overloaded state.
	zyPoePowerPortShortCircuitRecovered	1.3.6.1.4.1.890.1.15.3.59.4.6	This trap is sent when the port is turned on to recover from a short circuit.
	zyPoePowerPortOverSystemBudgetRecovered	1.3.6.1.4.1.890.1.15.3.59.4.7	This trap is sent when the port is turned on to recover from an over system budget.
loginrecord	zyAccessControlLoginRecord	1.3.6.1.4.1.890.1.15.3.9.4.1	This trap is sent when users log in.
	zyAccessControlLogoutRecord	1.3.6.1.4.1.890.1.15.3.9.4.2	This trap is sent when users log out.
	zyAccessControlLoginFail	1.3.6.1.4.1.890.1.15.3.9.4.3	This trap is sent when users fail in login.

Table 263 SNMP Stacking Traps

OPTION	OBJECT LABEL	OBJECT ID	DESCRIPTION
Channel	zyStackingChannelUp	1.3.6.1.4.1.890.1.15.3.97.4.1	Stacking channel up.
	zyStackingChannelDown	1.3.6.1.4.1.890.1.15.3.97.4.2	Stacking channel down.
Slot	zyStackingSlotAttach	1.3.6.1.4.1.890.1.15.3.97.4.3	Stacking slot attached success.
	zyStackingSlotDetach	1.3.6.1.4.1.890.1.15.3.97.4.4	Stacking slot detached.
Master	zyStackingNewMaster	1.3.6.1.4.1.890.1.15.3.97.4.5	Backup takeover as master.
Upgrade Firmware	zyStackingUpgradeFirmwareFail	1.3.6.1.4.1.890.1.15.3.97.4.6	Upgrade Firmware fail with correspond slot ID.
Backup	zyStackingNewBackup	1.3.6.1.4.1.890.1.15.3.97.4.7	New Backup with correspond slot ID.
	zyStackingBackupTakeover	1.3.6.1.4.1.890.1.15.3.97.4.8	Replaced master with correspond slot ID.
Master	zyStackingNewMasterFromTakeover	1.3.6.1.4.1.890.1.15.3.97.4.9	New master from taking over with correspond slot ID.
Fail	zyStackingSyncConfFail	1.3.6.1.4.1.890.1.15.3.97.4.10	Sync. configuration fail with correspond slot ID.
	zyStackingSysRestoreConfFail	1.3.6.1.4.1.890.1.15.3.97.4.11	Stacking backup takeover restore configuration fail.
	zyStackingSlotInitFail	1.3.6.1.4.1.890.1.15.3.97.4.12	Stacking Slot init fail.
Change	zyStackingSlotChangeIndex	1.3.6.1.4.1.890.1.15.3.97.4.13	Stacking change slot index.
	zyStackingPriorityChange	1.3.6.1.4.1.890.1.15.3.97.4.14	Stacking priority change.
	zyStackingTopologyChange	1.3.6.1.4.1.890.1.15.3.97.4.15	Stacking topology change.

Table 264 SNMP Interface Traps

OPTION	OBJECT LABEL	OBJECT ID	DESCRIPTION
linkup	linkUp	1.3.6.1.6.3.1.1.5.4	This trap is sent when the Ethernet link is up.
linkdown	linkDown	1.3.6.1.6.3.1.1.5.3	This trap is sent when the Ethernet link is down.
autonegotiation	zyPortAutonegotiationFailed	1.3.6.1.4.1.890.1.15.3.61.3.1	This trap is sent when an Ethernet interface fails to auto-negotiate with the peer Ethernet interface.
lldp	lldpRemTablesChange	1.0.8802.1.1.2.0.0.1	The trap is sent when entries in the remote database have any updates. Link Layer Discovery Protocol (LLDP), defined as IEEE 802.1ab, enables LAN devices that support LLDP to exchange their configured settings. This helps eliminate configuration mismatch issues.

Table 264 SNMP Interface Traps (continued)

OPTION	OBJECT LABEL	OBJECT ID	DESCRIPTION
transceiver-ddm	zyTransceiverDdmiTemperatureOutOfRange	1.3.6.1.4.1.890.1.15.3.84.3.1	This trap is sent when the transceiver temperature is above or below the normal operating range.
	zyTransceiverDdmiTxPowerOutOfRange	1.3.6.1.4.1.890.1.15.3.84.3.2	This trap is sent when the transmitted optical power is above or below the normal operating range.
	zyTransceiverDdmiRxPowerOutOfRange	1.3.6.1.4.1.890.1.15.3.84.3.3	This trap is sent when the received optical power is above or below the normal operating range.
	zyTransceiverDdmiVoltageOutOfRange	1.3.6.1.4.1.890.1.15.3.84.3.4	This trap is sent when the transceiver supply voltage is above or below the normal operating range.
	zyTransceiverDdmiTxBiasOutOfRange	1.3.6.1.4.1.890.1.15.3.84.3.5	This trap is sent when the transmitter laser bias current is above or below the normal operating range.
	zyTransceiverDdmiTemperatureOutOfRangeRecovered	1.3.6.1.4.1.890.1.15.3.84.3.6	This trap is sent when the transceiver temperature is recovered from the out of normal operating range.
	zyTransceiverDdmiTxPowerOutOfRangeRecovered	1.3.6.1.4.1.890.1.15.3.84.3.7	This trap is sent when the transmitted optical power is recovered from the out of normal operating range.
	zyTransceiverDdmiRxPowerOutOfRangeRecovered	1.3.6.1.4.1.890.1.15.3.84.3.8	This trap is sent when the received optical power is recovered from the out of normal operating range.
	zyTransceiverDdmiVoltageOutOfRangeRecovered	1.3.6.1.4.1.890.1.15.3.84.3.9	This trap is sent when the transceiver supply voltage is recovered from the out of normal operating range.
	zyTransceiverDdmiTxBiasOutOfRangeRecovered	1.3.6.1.4.1.890.1.15.3.84.3.10	This trap is sent when the transmitter laser bias current is recovered from the out of normal operating range.
Storm-control	zyPortStormControlTrap	1.3.6.1.4.1.890.1.15.3.78.2.1	This trap is sent when storm control is detected on a specific port. A packet filter action has been applied on the interface.
zuld	zyZuldUnidirectionalDetected	1.3.6.1.4.1.890.1.15.3.110.3.1	This trap is sent when a unidirectional link is detected.
	zyZuldBidirectionalRecovered	1.3.6.1.4.1.890.1.15.3.110.3.2	This trap is sent when the port which is shut down by ZULD becomes active again.

Table 265 SNMP AAA Traps

OPTION	OBJECT LABEL	OBJECT ID	DESCRIPTION
authentication	authenticationFailure	1.3.6.1.6.3.1.1.5.5	This trap is sent when authentication fails due to incorrect user name and/or password.
	zyAaaAuthenticationFailure	1.3.6.1.4.1.890.1.15.3.8.3.1	This trap is sent when authentication fails due to incorrect user name and/or password.
	zyRadiusServerAuthenticationServerNotReachable	1.3.6.1.4.1.890.1.15.3.71.2.1	This trap is sent when there is no response message from the RADIUS authentication server.
	zyRadiusServerAuthenticationServerNotReachableRecovered	1.3.6.1.4.1.890.1.15.3.71.2.3	This trap is sent when there is a response message from the previously unreachable RADIUS authentication server.
authorization	zyAaaAuthorizationFailure	1.3.6.1.4.1.890.1.15.3.8.3.2	This trap is sent when management connection authorization failed.
accounting	zyRadiusServerAccountingServerNotReachable	1.3.6.1.4.1.890.1.15.3.71.2.2	This trap is sent when there is no response message from the RADIUS accounting server.
	zyRadiusServerAccountingServerNotReachableRecovered	1.3.6.1.4.1.890.1.15.3.71.2.4	This trap is sent when there is a response message from the previously unreachable RADIUS accounting server.

Table 266 SNMP IP Traps

OPTION	OBJECT LABEL	OBJECT ID	DESCRIPTION
ping	pingProbeFailed	1.3.6.1.2.1.80.0.1	This trap is sent when a single ping probe fails.
	pingTestFailed	1.3.6.1.2.1.80.0.2	This trap is sent when a ping test (consisting of a series of ping probes) fails.
	pingTestCompleted	1.3.6.1.2.1.80.0.3	This trap is sent when a ping test is completed.
traceroute	traceRouteTestFailed	1.3.6.1.2.1.81.0.2	This trap is sent when a traceroute test fails.
	traceRouteTestCompleted	1.3.6.1.2.1.81.0.3	This trap is sent when a traceroute test is completed.

Table 267 SNMP Switch Traps

OPTION	OBJECT LABEL	OBJECT ID	DESCRIPTION
stp	STPNewRoot	1.3.6.1.2.1.17.0.1	This trap is sent when the STP root switch changes.
	zyMrstpNewRoot	1.3.6.1.4.1.890.1.15.3.5 2.3.1	This trap is sent when the MRSTP root switch changes.
	zyMstpNewRoot	1.3.6.1.4.1.890.1.15.3.5 3.3.1	This trap is sent when the MSTP root switch changes.
	STPTopologyChange	1.3.6.1.2.1.17.0.2	This trap is sent when the STP topology changes.
	zyMrstpTopologyChange	1.3.6.1.4.1.890.1.15.3.5 2.3.2	This trap is sent when the MRSTP topology changes.
	zyMstpTopologyChange	1.3.6.1.4.1.890.1.15.3.5 3.3.2	This trap is sent when the MSTP root switch changes.
mactable	zyMacForwardingTableFull	1.3.6.1.4.1.890.1.15.3.4 8.2.1	This trap is sent when more than 99% of the MAC table is used.
	zyMacForwardingTableFullReco vered	1.3.6.1.4.1.890.1.15.3.4 8.2.2	This trap is sent when the MAC address switching table has become normal from full.
rmon	RmonRisingAlarm	1.3.6.1.2.1.16.0.1	This trap is sent when a variable goes over the RMON "rising" threshold.
	RmonFallingAlarm	1.3.6.1.2.1.16.0.2	This trap is sent when the variable falls below the RMON "falling" threshold.
classifier	zyAcIV2ClassifierLogNotification	1.3.6.1.4.1.890.1.15.3.1 05.4.1	This trap is sent when the Switch detects classifier log information.
rip	zyRipExceedMaxDynamicRoute	1.3.6.1.4.1.890.1.15.3.7 4.2.1	This trap is sent when the maximum allowed number of dynamic routes learned through RIP has been exceeded.
ospf	zyOspfExceedMaxDynamicRoute Path	1.3.6.1.4.1.890.1.15.3.5 7.3.1	This trap is sent when the maximum allowed number of dynamic routes learned through OSPF has been exceeded.

59.7.2 SSH Overview

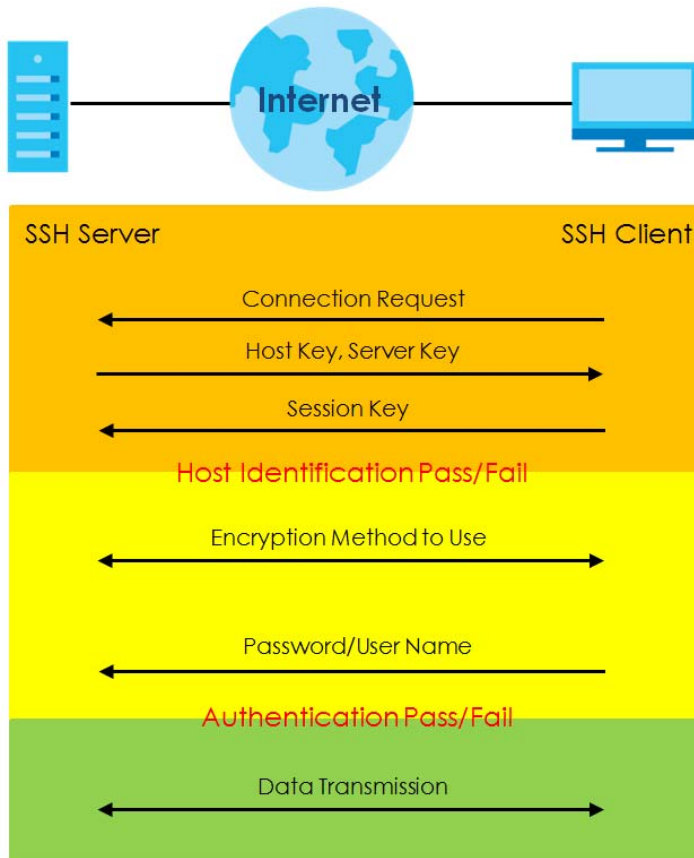
Unlike Telnet or FTP, which transmit data in clear text, SSH (Secure Shell) is a secure communication protocol that combines authentication and data encryption to provide secure encrypted communication between two hosts over an unsecured network.

Figure 444 SSH Communication Example



59.7.2.1 How SSH Works

The following table summarizes how a secure connection is established between two remote hosts.

Figure 445 How SSH Works**1 Host Identification**

The SSH client sends a connection request to the SSH server. The server identifies itself with a host key. The client encrypts a randomly generated session key with the host key and server key and sends the result back to the server.

The client automatically saves any new server public keys. In subsequent connections, the server public key is checked against the saved version on the client computer.

2 Encryption Method

Once the identification is verified, both the client and server must agree on the type of encryption method to use.

3 Authentication and Data Transmission

After the identification is verified and data encryption activated, a secure tunnel is established between the client and the server. The client then sends its authentication information (user name and password) to the server to log in to the server.

59.7.2.2 SSH Implementation on the Switch

Your Switch supports SSH version 2 using RSA authentication and three encryption methods (DES, 3DES and Blowfish). The SSH server is implemented on the Switch for remote management and file transfer on port 22. Only one SSH connection is allowed at a time.

59.7.2.3 Requirements for Using SSH

You must install an SSH client program on a client computer (Windows or Linux operating system) that is used to connect to the Switch over SSH.

59.7.3 Introduction to HTTPS

HTTPS (HyperText Transfer Protocol over Secure Socket Layer, or HTTP over SSL) is a web protocol that encrypts and decrypts web pages. Secure Socket Layer (SSL) is an application-level protocol that enables secure transactions of data by ensuring confidentiality (an unauthorized party cannot read the transferred data), authentication (one party can identify the other party) and data integrity (you know if data has been changed).

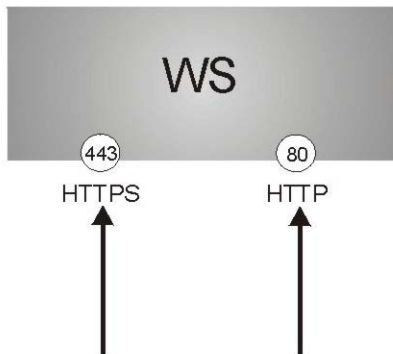
It relies upon certificates, public keys, and private keys.

HTTPS on the Switch is used so that you may securely access the Switch using the Web Configurator. The SSL protocol specifies that the SSL server (the Switch) must always authenticate itself to the SSL client (the computer which requests the HTTPS connection with the Switch), whereas the SSL client only should authenticate itself when the SSL server requires it to do so. Authenticating client certificates is optional and if selected means the SSL-client must send the Switch a certificate. You must apply for a certificate for the browser from a Certificate Authority (CA) that is a trusted CA on the Switch.

Please refer to the following figure.

- 1 HTTPS connection requests from an SSL-aware web browser go to port 443 (by default) on the Switch's WS (web server).
- 2 HTTP connection requests from a web browser go to port 80 (by default) on the Switch's WS (web server).

Figure 446 HTTPS Implementation



Note: If you disable HTTP in the Service Access Control screen, then the Switch blocks all HTTP connection attempts.

59.7.3.1 HTTPS Example

If you have not changed the default HTTPS port on the Switch, then in your browser enter "https://Switch IP Address/" as the web site address where "Switch IP Address" is the IP address or domain name of the Switch you wish to access.

Internet Explorer Warning Messages

Internet Explorer 6

When you attempt to access the Switch HTTPS server, a Windows dialog box pops up asking if you trust the server certificate.

You see the following **Security Alert** screen in Internet Explorer. Select **Yes** to proceed to the Web Configurator login screen; if you select **No**, then Web Configurator access is blocked.

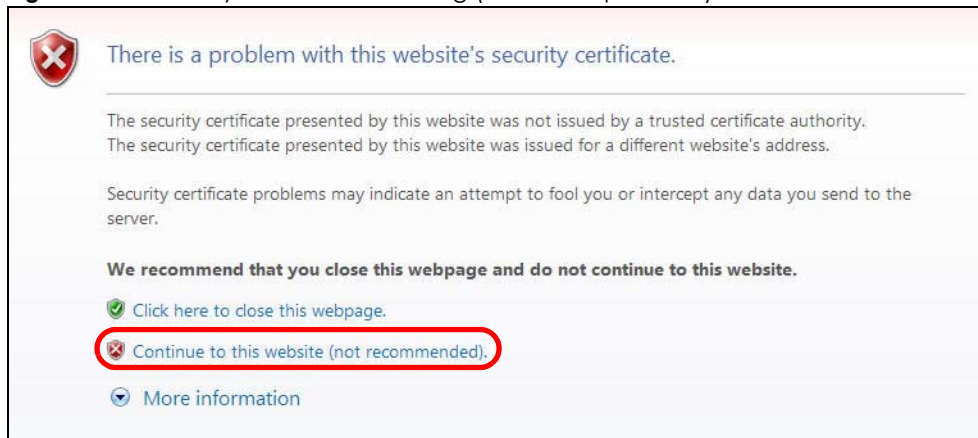
Figure 447 Security Alert Dialog Box (Internet Explorer 6)



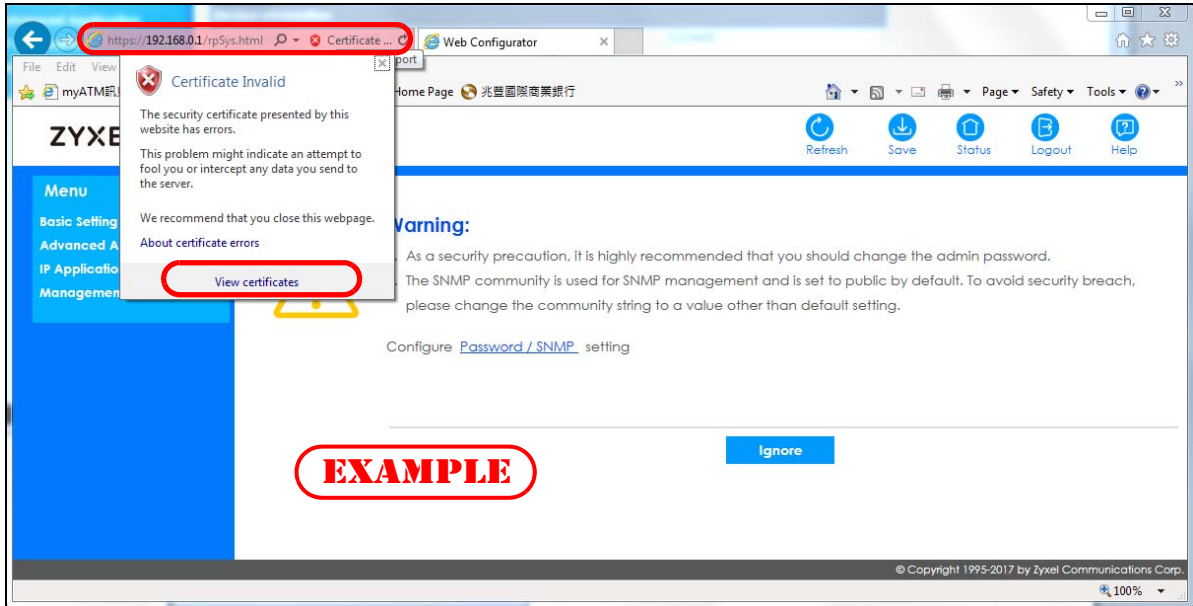
Internet Explorer 7 later version

When you attempt to access the Switch HTTPS server, a screen with the message "There is a problem with this website's security certificate." may display. If that is the case, click **Continue to this website (not recommended)** to proceed to the Web Configurator login screen.

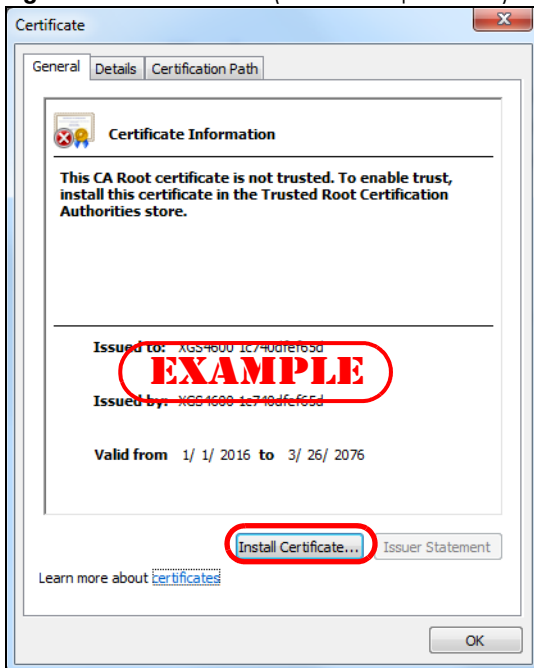
Figure 448 Security Certificate Warning (Internet Explorer 11)



After you log in, you will see the red address bar with the message **Certificate Error**. Click on **Certificate Error** next to the address bar and click **View certificates**.

Figure 449 Certificate Error (Internet Explorer 11)

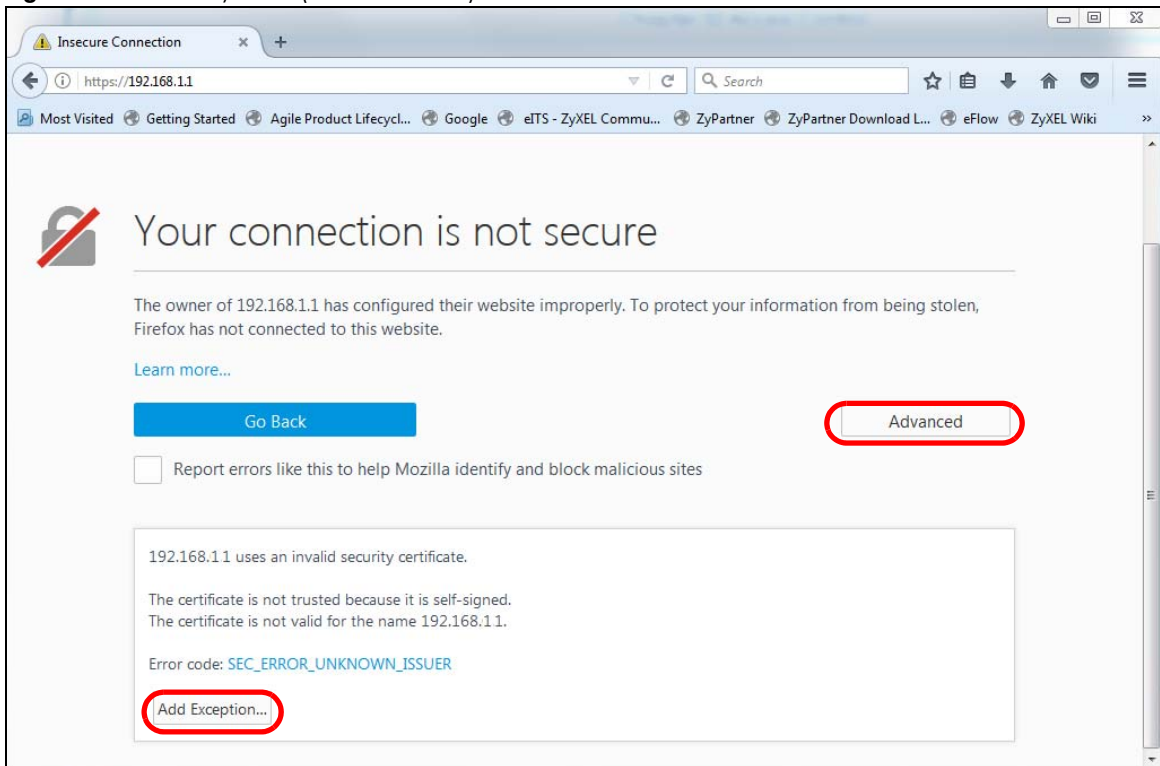
Click **Install Certificate...** and follow the on-screen instructions to install the certificate in your browser.

Figure 450 Certificate (Internet Explorer 11)

Mozilla Firefox Warning Messages

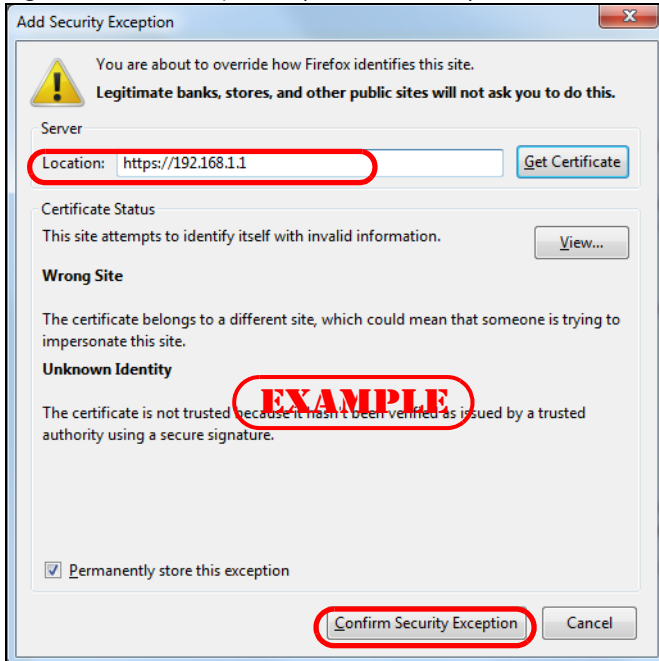
When you attempt to access the Switch HTTPS server, a **Your connection is not secure** screen may display. If that is the case, click **I Understand the Risks** and then the **Add Exception...** button.

Figure 451 Security Alert (Mozilla Firefox)



Confirm the HTTPS server URL matches. Click **Confirm Security Exception** to proceed to the Web Configurator login screen.

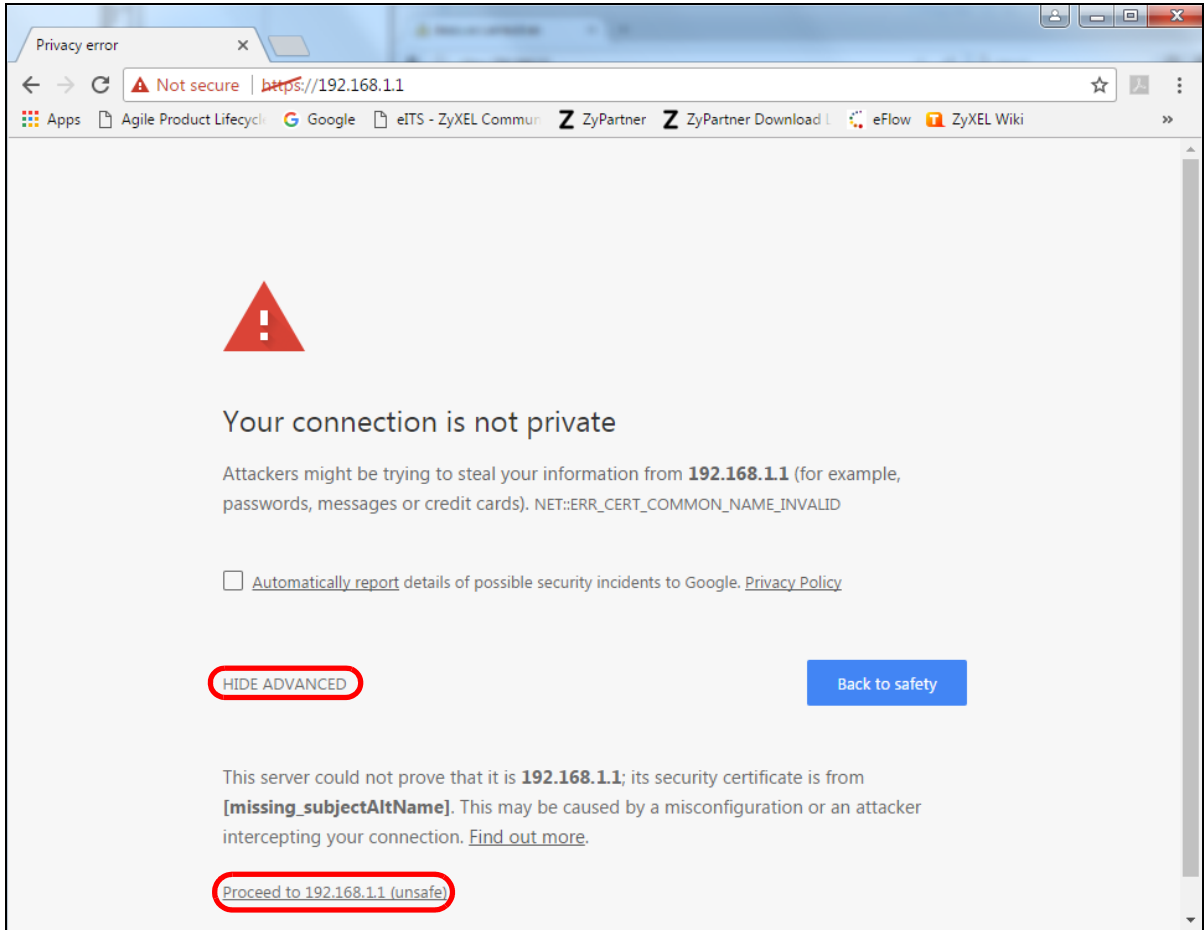
Figure 452 Security Alert (Mozilla Firefox)



59.7.4 Google Chrome Warning Messages

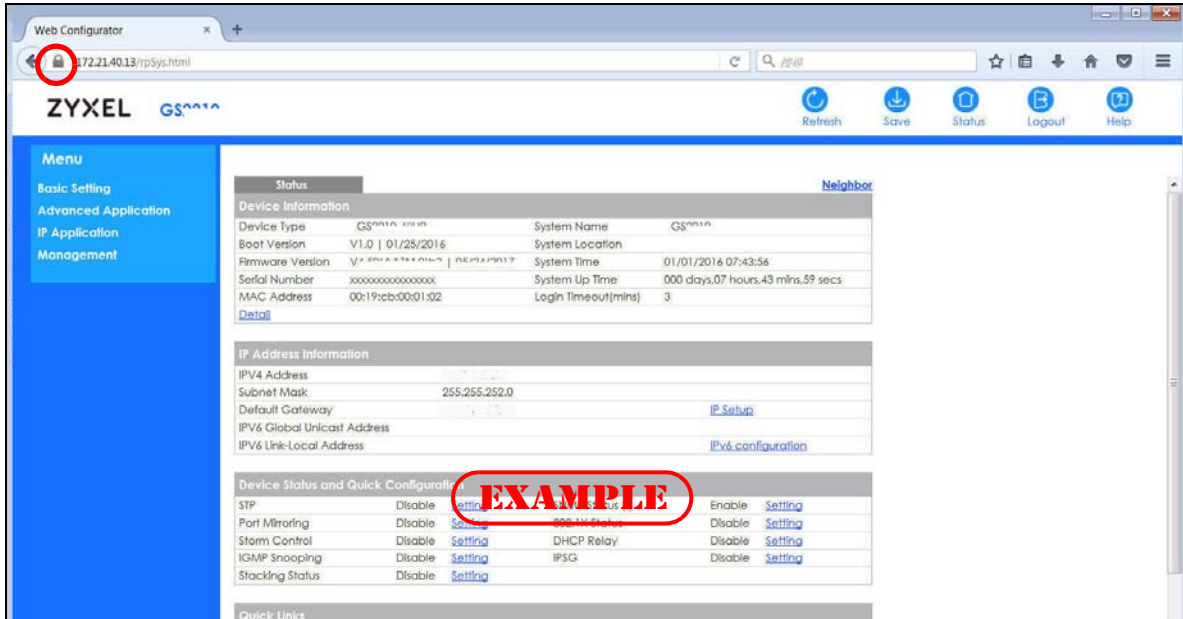
When you attempt to access the Switch HTTPS server, a **Your connection is not private** screen may display. If that is the case, click **Advanced** and then **Proceed to x.x.x.x (unsafe)** to proceed to the Web Configurator login screen.

Figure 453 Security Alert (Google Chrome 58.0.3029.110)



59.7.4.1 Main Settings

After you accept the certificate and enter the login username and password, the Switch main screen appears. The lock displayed in the bottom right of the browser status bar or next to the website address denotes a secure connection.

Figure 454 Example: Lock Denoting a Secure Connection

CHAPTER 60

Diagnostic

60.1 Overview

This chapter explains the **Diagnostic** screen. You can use this screen to help you identify problems.

60.2 Diagnostic

Click **Management > Diagnostic** in the navigation panel to open this screen. Use this screen to ping IP addresses, run a traceroute, perform port tests or show the Switch's location between devices.

Figure 455 Management > Diagnostic (Standalone Mode)

Diagnostic				
Port	Channel	Pair status	Cable length (m)	Distance to fault (m)
26	pairA	Ok	2.00	N/A
	pairB	Ok	4.00	N/A
	pairC	Open	N/A	0.00
	pairD	Open	N/A	0.00

Ping Test	☒ IPv4	-		Ping
	☐ IPv6	-		
	IP Address/Host Name			
	Source IP Address			
	Count	3		
Trace Route Test	☒ IPv4	-		Trace Route
	☐ IPv6			
	IP Address/Host Name			
	TTL	30		
	Wait Time	2 Seconds		
	Queries	3		
Ethernet Port Test	Port		Port Test	
Cable Diagnostics	Port		Diagnose	
Locator LED	30	Minutes	Blink Stop	

Figure 456 Management > Diagnostic (Stacking Mode)

Diagnostic

- Info -

Ping Test

☒ IPv4 ☐ IPv6

IP Address/Host Name **Ping**

Source IP Address

Count

Trace Route Test

☒ IPv4 ☐ IPv6

IP Address/Host Name **Trace Route**

TTL

Wait Time Seconds

Queries

Ethernet Port Test

Port **Port Test**

Cable Diagnostics

Port **Diagnose**

Locator LED

Minutes **Blink** **Stop**

The following table describes the labels in this screen.

Table 268 Management > Diagnostic

LABEL	DESCRIPTION
Ping Test	
IPv4	Select this option if you want to ping an IPv4 address, and select which traffic flow (in-band or out-of-band) the Switch is to send ping frames. If you select in-band, the Switch sends the frames to all ports except the management port (labeled MGMT). If you select out-of-band, the Switch sends the frames to the management port (labeled MGMT). Otherwise, select – to send ping requests to all VLANs on the Switch.
IPv6	Select this option if you want to ping an IPv6 address. You can also select vlan and specify the ID number of the VLAN to which the Switch is to send ping requests. Otherwise, select – to send ping requests to all VLANs on the Switch.
IP Address/Host Name	Type the IP address or host name of a device that you want to ping in order to test a connection. Click Ping to have the Switch ping the IP address.
Source IP Address	Type the source IP address that you want to ping in order to test a connection. Click Ping to have the Switch ping the IP address.
Count	Enter the number of ICMP Echo Request (ping) messages the Switch continuously sends.

Table 268 Management > Diagnostic (continued)

LABEL	DESCRIPTION
Trace Route Test	
IPv4	Select this option if you want to trace the route packets take to a device with an IPv4 address, and select in-band or out-of-band on which the Switch traces the path. Otherwise, select – to trace the path on any VLAN.
IPv6	Select this option if you want to trace the route packets take to a device with an IPv6 address.
IP Address/Host Name	Enter the IP address or host name of a device to which you want to perform a traceroute. Click Trace Route to have the Switch perform the traceroute function. This determines the path a packet takes to the specified device.
TTL	Enter the Time To Live (TTL) value for the ICMP Echo Request packets. This is to set the maximum number of the hops (routers) a packet can travel through. Each router along the path will decrement the TTL value by one and forward the packets. When the TTL value becomes zero and the destination is not found, the router drops the packets and informs the sender.
Wait Time	Specify how many seconds the Switch waits for a response to a probe before running another traceroute.
Queries	Specify how many times the Switch performs the traceroute function.
Ethernet Port Test	The slot field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack. Enter a port number and click Port Test to perform an internal loopback test.
Port	This is the number of the physical Ethernet port on the Switch.
Cable Diagnostics	The slot field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack. Enter an Ethernet port number and click Diagnose to perform a physical wire-pair test of the Ethernet connections on the specified ports. The following fields display when you diagnose a port. This field is available only on the Switch that has one or more copper Ethernet ports (except the MGMT port).
Port	This is the number of the physical Ethernet port on the Switch.
Channel	An Ethernet cable usually has four pairs of wires. A 10BASE-T or 100BASE-TX port only use and test two pairs, while a 1000BASE-T port requires all four pairs. This displays the descriptive name of the wire-pair in the cable.
Pair status	Ok: The physical connection between the wire-pair is okay. Open: There is no physical connection (an open circuit detected) between the wire-pair. Short: There is an short circuit detected between the wire-pair. Unknown: The Switch failed to run cable diagnostics on the cable connected this port. Unsupported: The port is a fiber port or it is not active.
Cable length	This displays the total length of the Ethernet cable that is connected to the port when the Pair status is Ok and the Switch chipset supports this feature. This shows N/A if the Pair status is Open or Short . Check the Distance to fault . This shows Unsupported if the Switch chipset does not support to show the cable length.

Table 268 Management > Diagnostic (continued)

LABEL	DESCRIPTION
Distance to fault	This displays the distance between the port and the location where the cable is open or shorted. This shows N/A if the Pair status is Ok. This shows Unsupported if the Switch chipset does not support to show the distance.
Locator LED	Enter a time interval (in minutes) and click Blink to show the actual location of the Switch between several devices in a rack. The default time interval is 30 minutes. Click Stop to have the Switch terminate the blinking locator LED.

CHAPTER 61

System Log

61.1 Overview

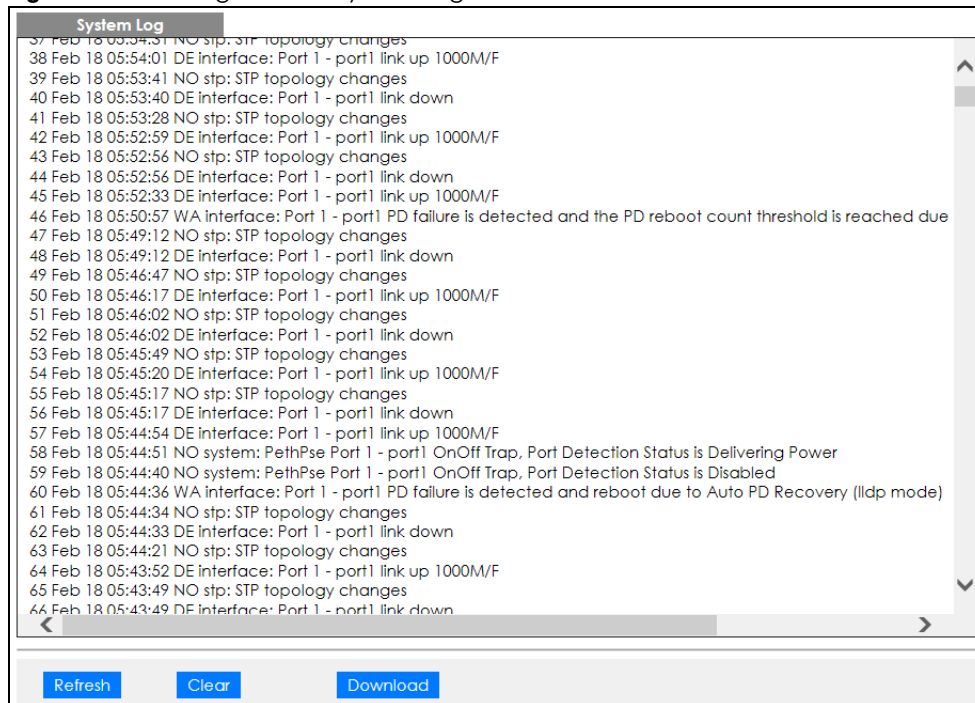
A log message stores the information for viewing.

61.2 System Log

Click **Management > System Log** in the navigation panel to open this screen. Use this screen to check current system logs.

Note: When a log reaches the maximum number of log messages, new log messages automatically overwrite existing log messages, starting with the oldest existing log message first.

Figure 457 Management > System Log



The summary table shows the time the log message was recorded and the reason the log message was generated. Click **Refresh** to update this screen. Click **Clear** to clear the whole log, regardless of what is currently displayed on the screen. Click **Download** to save the log to your computer.

CHAPTER 62

Syslog Setup

62.1 Syslog Overview

This chapter explains the syslog screens.

The syslog protocol allows devices to send event notification messages across an IP network to syslog servers that collect the event messages. A syslog-enabled device can generate a syslog message and send it to a syslog server.

Syslog is defined in RFC 3164. The RFC defines the packet format, content and system log related information of syslog messages. Each syslog message has a facility and severity level. The syslog facility identifies a file in the syslog server. Refer to the documentation of your syslog program for details. The following table describes the syslog severity levels.

Table 269 Syslog Severity Levels

CODE	SEVERITY
0	Emergency: The system is unusable.
1	Alert: Action must be taken immediately.
2	Critical: The system condition is critical.
3	Error: There is an error condition on the system.
4	Warning: There is a warning condition on the system.
5	Notice: There is a normal but significant condition on the system.
6	Informational: The syslog contains an informational message.
7	Debug: The message is intended for debug-level purposes.

62.1.1 What You Can Do

Use the **Syslog Setup** screen ([Section 62.2 on page 571](#)) to configure the device's system logging settings and configure a list of external syslog servers.

62.2 Syslog Setup

The syslog feature sends logs to an external syslog server. Use this screen to configure the device's system logging settings and configure a list of external syslog servers.

Click **Management > Syslog Setup** in the navigation panel to display this screen.

Figure 458 Management > Syslog Setup

Syslog Setup

Syslog ☐ Active

Logging type	Active	Facility
System	☐	local use 0 ▼
Interface	☐	local use 0 ▼
Switch	☐	local use 0 ▼
AAA	☐	local use 0 ▼
IP	☐	local use 0 ▼

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

Syslog Server Setup

Active ☐

Server Address

UDP Port

Log Level

[Add](#) [Cancel](#) [Clear](#)

Index	Active	IP Address	UDP Port	Log Level

[Delete](#) [Cancel](#)

The following table describes the labels in this screen.

Table 270 Management > Syslog Setup

LABEL	DESCRIPTION
Syslog	Select Active to turn on syslog (system logging) and then configure the syslog setting.
Logging Type	This column displays the names of the categories of logs that the device can generate.
Active	Select this option to set the device to generate logs for the corresponding category.
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.
Apply	Click Apply to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to begin configuring this screen afresh.
Syslog Server Setup	
Active	Select this check box to have the device send logs to this syslog server. Clear the check box if you want to create a syslog server entry but not have the device send logs to it (you can edit the entry later).
Server Address	Enter the IPv4 or IPv6 address of the syslog server.
UDP Port	The default syslog server port is 514. If your syslog server uses a different port, configure the one it uses here.
Log Level	Select the severity levels of the logs that you want the device to send to this syslog server. The lower the number, the more critical the logs are.

Table 270 Management > Syslog Setup (continued)

LABEL	DESCRIPTION
Add	Click Add to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to begin configuring this screen afresh.
Clear	Click Clear to return the fields to the factory defaults.
Index	This is the index number of a syslog server entry. Click this number to edit the entry.
Active	This field displays Yes if the device is to send logs to the syslog server. No displays if the device is not to send logs to the syslog server.
IP Address	This field displays the IP address of the syslog server.
UDP Port	This field displays the port of the syslog server.
Log Level	This field displays the severity level of the logs that the device is to send to this syslog server.
	Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries.
Delete	Click Delete to remove the selected entries.
Cancel	Click Cancel to begin configuring this screen afresh.

CHAPTER 63

Cluster Management

63.1 Cluster Management Overview

This chapter introduces cluster management.

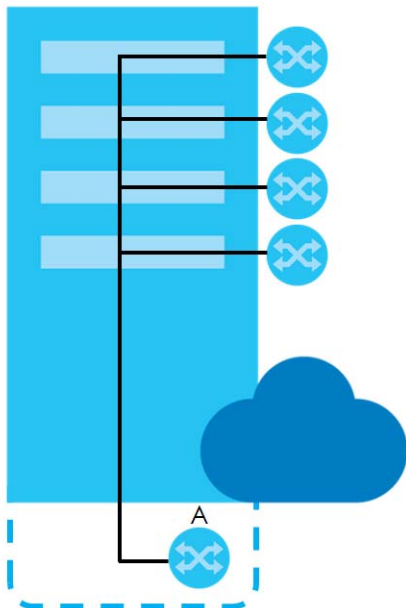
Cluster Management allows you to manage switches through one Switch, called the cluster manager. The switches must be directly connected and be in the same VLAN group so as to be able to communicate with one another.

Table 271 Zyxel Clustering Management Specifications

Maximum number of cluster members	24
Cluster Member Models	Must be compatible with Zyxel cluster management implementation.
Cluster Manager	The Switch through which you manage the cluster member switches.
Cluster Members	The switches being managed by the cluster manager Switch.

In the following example, switch **A** in the basement is the cluster manager and the other switches on the upper floors of the building are cluster members.

Figure 459 Clustering Application Example



63.1.1 What You Can Do

- Use the **Cluster Management Status** screen ([Section 63.2 on page 575](#)) to view the role of the Switch within the cluster and to access a cluster member Switch's Web Configurator.
- Use the **Clustering Management Configuration** screen ([Section 63.3 on page 576](#)) to configure clustering management.

63.2 Cluster Management Status

Use this screen to view the role of the Switch within the cluster and to access a cluster member Switch's Web Configurator.

Click **Management > Cluster Management** in the navigation panel to display the following screen.

Note: A cluster can only have one manager.

Figure 460 Management > Cluster Management Status

Clustering Management Status		Configuration		
Status	None			
Manager	00:00:00:00:00:00			
The Number Of Member = 0				
Index	MacAddr	Name	Model	Status

The following table describes the labels in this screen.

Table 272 Management > Cluster Management Status

LABEL	DESCRIPTION
Status	This field displays the role of this Switch within the cluster. Manager Member (you see this if you access this screen in the cluster member Switch directly and not via the cluster manager) None (neither a manager nor a member of a cluster)
Manager	This field displays the cluster manager Switch's hardware MAC address.
The Number of Member	This field displays the number of switches that make up this cluster. The following fields describe the cluster member switches.
Index	You can manage cluster member switches via the cluster manager Switch. Each number in the Index column is a hyperlink leading to the cluster member Switch's Web Configurator.
MacAddr	This is the cluster member Switch's hardware MAC address.
Name	This is the cluster member Switch's System Name .

Table 272 Management > Cluster Management Status (continued)

LABEL	DESCRIPTION
Model	This field displays the model name.
Status	This field displays: Online (the cluster member Switch is accessible) Error (for example the cluster member Switch password was changed or the Switch was set as the manager and so left the member list, and so on) Offline (the Switch is disconnected – Offline shows approximately 1.5 minutes after the link between cluster member and manager goes down)

63.3 Clustering Management Configuration

Use this screen to configure clustering management. Click **Management > Cluster Management > Configuration** to display the next screen.

Figure 461 Management > Cluster Management > Configuration

Clustering Management Configuration [Status](#)

Clustering Manager

Active ☐

Name

VID

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

Clustering Candidate

List

Password

[Add](#) [Cancel](#) [Refresh](#)

Index	MacAddr	Name	Model

[Remove](#) [Cancel](#)

The following table describes the labels in this screen.

Table 273 Management > Cluster Management > Configuration

LABEL	DESCRIPTION
Clustering Manager	The following fields relate to configuring the cluster manager.
Active	Select Active to have this Switch become the cluster manager switch. A cluster can only have one manager. Other (directly connected) switches that are set to be cluster managers will not be visible in the Clustering Candidates list. If a switch that was previously a cluster member is later set to become a cluster manager, then its Status is displayed as Error in the Cluster Management Status screen and a warning icon () appears in the member summary list below.
Name	Type a name to identify the Clustering Manager . You may use up to 32 printable characters (spaces are allowed).
VID	This is the VLAN ID and is only applicable if the Switch is set to 802.1Q VLAN. All switches must be directly connected and in the same VLAN group to belong to the same cluster. Switches that are not in the same VLAN group are not visible in the Clustering Candidates list. This field is ignored if the Clustering Manager is using Port-based VLAN.
Apply	Click Apply to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to begin configuring this screen afresh.
Clustering Candidate	The following fields relate to the switches that are potential cluster members.
List	A list of suitable candidates found by auto-discovery is shown here. The switches must be directly connected. Directly connected switches that are set to be cluster managers will not be visible in the Clustering Candidate list. Switches that are not in the same management VLAN group will not be visible in the Clustering Candidate list.
Password	Each cluster member's password is its Web Configurator password. Select a member in the Clustering Candidate list and then enter its Web Configurator password. If that switch administrator changes the Web Configurator password afterwards, then it cannot be managed from the Cluster Manager . Its Status is displayed as Error in the Cluster Management Status screen. If multiple devices have the same password then hold [SHIFT] and click those switches to select them. Then enter their common Web Configurator password.
Add	Click Add to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to begin configuring this screen afresh.
Refresh	Click Refresh to perform auto-discovery again to list potential cluster members.
The next summary table shows the information for the clustering members configured.	
Index	This is the index number of a cluster member switch.
MacAddr	This is the cluster member switch's hardware MAC address.
Name	This is the cluster member switch's System Name .
Model	This is the cluster member switch's model name.
	Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries.
Remove	Click the Remove button to remove the selected cluster member switches from the cluster.
Cancel	Click Cancel to begin configuring this screen afresh.

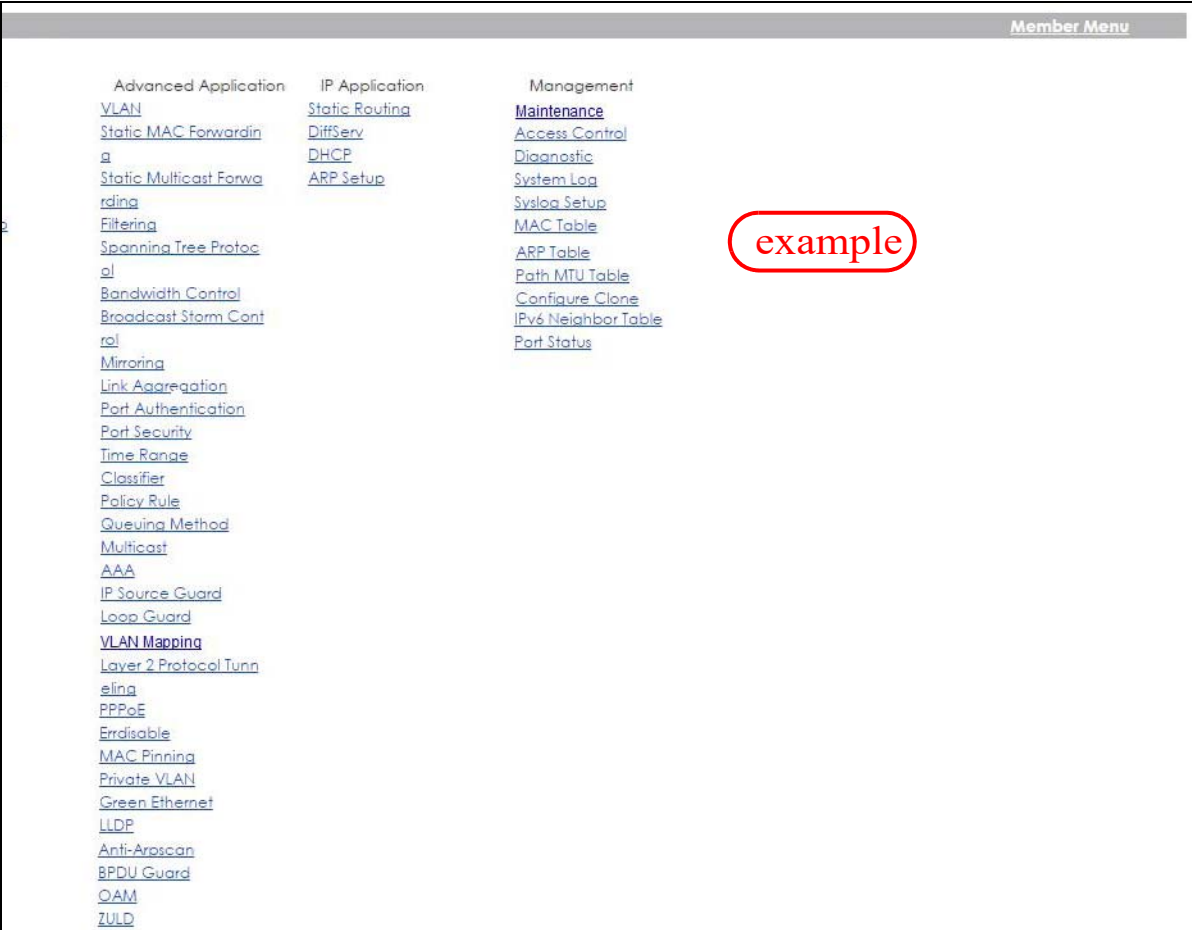
63.4 Technical Reference

This section provides technical background information on the topics discussed in this chapter.

63.4.1 Cluster Member Switch Management

Go to the **Clustering Management Status** screen of the cluster manager switch and then select an **Index** hyperlink from the list of members to go to that cluster member switch's Web Configurator home page. This cluster member Web Configurator home page and the home page that you would see if you accessed it directly are different.

Figure 462 Cluster Management: Cluster Member Web Configurator Screen



63.4.1.1 Uploading Firmware to a Cluster Member Switch

You can use FTP to upload firmware to a cluster member switch through the cluster manager switch as shown in the following example.

Figure 463 Example: Uploading Firmware to a Cluster Member Switch

```

C:\>ftp 192.168.1.1
Connected to 192.168.1.1.
220 Switch FTP version 1.0 ready at Thu Jan  1 00:58:46 1970
User (192.168.0.1:(none)): admin
331 Enter PASS command
Password:
230 Logged in
ftp> ls
200 Port command okay
150 Opening data connection for LIST
--w--w--w-  1 owner   group           3042210 Jul  01 12:00 ras
-rw-rw-rw-   1 owner   group           393216 Jul  01 12:00 config
--w--w--w-  1 owner   group              0 Jul  01 12:00 fw-00-a0-c5-01-23-46
-rw-rw-rw-   1 owner   group              0 Jul  01 12:00 config-00-a0-c5-01-23-46
226 File sent OK
ftp: 297 bytes received in 0.00Seconds 297000.00Kbytes/sec.
ftp> bin
200 Type I OK
ftp> put 460ABPI0.bin fw-00-a0-c5-01-23-46
200 Port command okay
150 Opening data connection for STOR fw-00-a0-c5-01-23-46
226 File received OK
ftp: 262144 bytes sent in 0.63Seconds 415.44Kbytes/sec.
ftp>

```

The following table explains some of the FTP parameters.

Table 274 FTP Upload to Cluster Member Example

FTP PARAMETER	DESCRIPTION
User	Enter "admin".
Password	The Web Configurator password default is 1234.
ls	Enter this command to list the name of cluster member switch's firmware and configuration file.
460ABPI0.bin	This is the name of the firmware file you want to upload to the cluster member switch.
fw-00-a0-c5-01-23-46	This is the cluster member switch's firmware name as seen in the cluster manager switch.
config-00-a0-c5-01-23-46	This is the cluster member switch's configuration file name as seen in the cluster manager switch.

CHAPTER 64

MAC Table

64.1 MAC Table Overview

This chapter introduces the **MAC Table** screen.

The **MAC Table** screen (a MAC table is also known as a filtering database) shows how frames are forwarded or filtered across the Switch's ports. When a device (which may belong to a VLAN group) sends a packet which is forwarded to a port on the Switch, the MAC address of the device is shown on the Switch's **MAC Table**. It also shows whether the MAC address is dynamic (learned by the Switch) or static (manually entered in the **Static MAC Forwarding** screen).

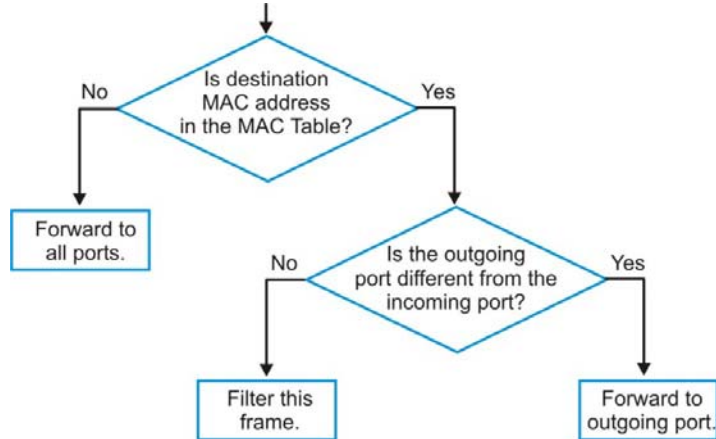
64.1.1 What You Can Do

Use the **MAC Table** screen ([Section 64.2 on page 581](#)) to check whether the MAC address is dynamic or static.

64.1.2 What You Need to Know

The Switch uses the **MAC Table** to determine how to forward frames. See the following figure.

- 1 The Switch examines a received frame and learns the port on which this source MAC address came.
- 2 The Switch checks to see if the frame's destination MAC address matches a source MAC address already learned in the **MAC Table**.
 - If the Switch has already learned the port for this MAC address, then it forwards the frame to that port.
 - If the Switch has not already learned the port for this MAC address, then the frame is flooded to all ports. Too much port flooding leads to network congestion, then the Switch sends an ARP to request the MAC address. The Switch then learns the port that replies with the MAC address.
 - If the Switch has already learned the port for this MAC address, but the destination port is the same as the port it came in on, then it filters the frame.

Figure 464 MAC Table Flowchart

64.2 Viewing the MAC Table

Use this screen to search specific MAC addresses. You can also directly add dynamic MAC addresses into the static MAC forwarding table or MAC filtering table from the MAC table using this screen.

Click **Management > MAC Table** in the navigation panel to display the following screen.

Figure 465 Management > MAC Table

MAC table

Condition

☒ All
☐ Static
☐ MAC
☐ VID
☐ Port
☐ Trunk

Sort by

MAC ▼

Transfer Type

☒ Dynamic to MAC forwarding
☐ Dynamic to MAC filtering

Search

Transfer

Cancel

Index	MAC Address	VID	Port	Type
1	00:00:5e:00:01:02	1	3	Dynamic
2	00:03:21:10:be:00	1	3	Dynamic
3	00:03:21:10:f7:7c	1	3	Dynamic
4	00:03:21:10:f7:7d	1	3	Dynamic
5	00:03:21:11:02:a1	1	3	Dynamic
6	00:08:54:72:ad:bc	1	3	Dynamic
7	00:0e:e3:00:3d:0d	1	3	Dynamic
8	00:0e:e3:00:3d:48	1	3	Dynamic
9	00:0e:e3:01:75:e2	1	3	Dynamic
10	00:0e:e3:03:e5:e6	1	3	Dynamic

The following table describes the labels in this screen.

Table 275 Management > MAC Table

LABEL	DESCRIPTION
Condition	Select one of the buttons and click Search to only display the data which matches the criteria you specified. Select All to display any entry in the MAC table of the Switch. Select Static to display the MAC entries manually configured on the Switch. Select MAC and enter a MAC address in the field provided to display a specified MAC entry. Select VID and enter a VLAN ID in the field provided to display the MAC entries belonging to the specified VLAN. Select Port and enter a port number in the field provided to display the MAC addresses which are forwarded on the specified port. Select Trunk and type the ID of a trunk group to display all MAC addresses learned from the ports in the trunk group.
Sort by	Define how the Switch displays and arranges the data in the summary table below. Select MAC to display and arrange the data according to MAC address. Select VID to display and arrange the data according to VLAN group. Select PORT to display and arrange the data according to port number.
Transfer Type	Select Dynamic to MAC forwarding and click the Transfer button to change all dynamically learned MAC address entries in the summary table below into static entries. They also display in the Static MAC Forwarding screen. Select Dynamic to MAC filtering and click the Transfer button to change all dynamically learned MAC address entries in the summary table below into MAC filtering entries. These entries will then display only in the Filtering screen and the default filtering action is Discard source.
Search	Click this to search data in the MAC table according to your input criteria.
Transfer	Click this to perform the MAC address transferring you selected in the Transfer Type field.
Cancel	Click Cancel to change the fields back to their last saved values.
Index	This is the incoming frame index number.
MAC Address	This is the MAC address of the device from which this incoming frame came.
VID	This is the VLAN group to which this frame belongs.
Port	This is the port from which the above MAC address was learned. In stacking mode, the first number represents the slot and the second the port number.
Type	This shows whether the MAC address is dynamic (learned by the Switch) or static (manually entered in the Static MAC Forwarding screen).

CHAPTER 65

IP Table

This chapter introduces the IP table.

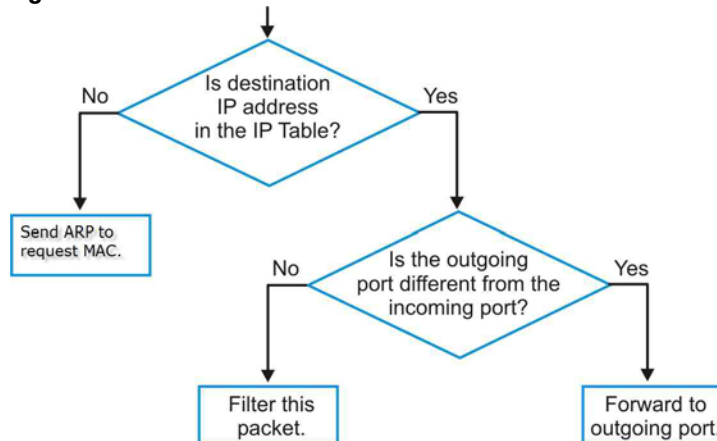
65.1 IP Table Overview

The **IP Table** screen shows how packets are forwarded or filtered across the Switch's ports. When a device (which may belong to a VLAN group) sends a packet which is forwarded to a port on the Switch, the IP address of the device is shown on the Switch's **IP Table**. The **IP Table** also shows whether the IP address is dynamic (learned by the Switch) or static (belonging to the Switch).

The Switch uses the **IP Table** to determine how to forward packets. See the following figure.

- 1 The Switch examines a received packet and learns the port from which this source IP address came.
- 2 The Switch checks to see if the packet's destination IP address matches a source IP address already learned in the **IP Table**.
 - If the Switch has already learned the port for this IP address, then it forwards the packet to that port.
 - If the Switch has not already learned the port for this IP address, then the packet is flooded to all ports. Too much port flooding leads to network congestion then the Switch sends an ARP to request the MAC address. The Switch then learns the port that replies with the MAC address.
 - If the Switch has already learned the port for this IP address, but the destination port is the same as the port it came in on, then it filters the packet.

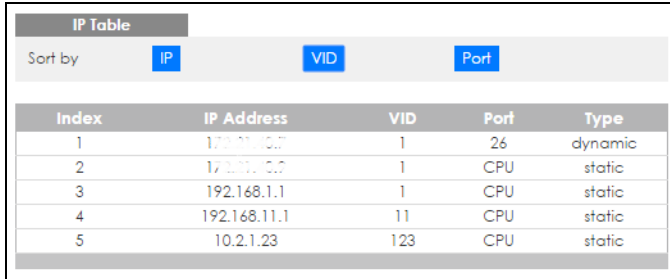
Figure 466 IP Table Flowchart



65.2 Viewing the IP Table

Click **Management > IP Table** in the navigation panel to display the following screen.

Figure 467 Management > IP Table



IP Table				
Sort by				
IP VID Port				
Index	IP Address	VID	Port	Type
1	172.17.0.2	1	26	dynamic
2	172.17.0.2	1	CPU	static
3	192.168.1.1	1	CPU	static
4	192.168.11.1	11	CPU	static
5	10.2.1.23	123	CPU	static

The following table describes the labels in this screen.

Table 276 Management > IP Table

LABEL	DESCRIPTION
Sort by	Click one of the following buttons to display and arrange the data according to that button type. The information is then displayed in the summary table below.
IP	Click this button to display and arrange the data according to IP address.
VID	Click this button to display and arrange the data according to VLAN group.
Port	Click this button to display and arrange the data according to port number.
Index	This field displays the index number.
IP Address	This is the IP address of the device from which the incoming packets came.
VID	This is the VLAN group to which the packet belongs.
Port	This is the port from which the above IP address was learned. This field displays CPU to indicate the IP address belongs to the Switch. In stacking mode, the first number represents the slot and the second the port number.
Type	This shows whether the IP address is dynamic (learned by the Switch) or static (belonging to the Switch).

CHAPTER 66

ARP Table

66.1 Overview

This chapter introduces 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.

An IP (version 4) address is 32 bits long. In an Ethernet LAN, MAC addresses are 48 bits long. The ARP Table maintains an association between each MAC address and its corresponding IP address.

66.1.1 What You Can Do

Use the **ARP Table** screen ([Section 66.2 on page 585](#)) to view IP-to-MAC address mappings.

66.1.2 What You Need to Know

When an incoming packet destined for a host device on a local area network arrives at the Switch, the Switch's ARP program looks in the ARP Table and if it finds the address, it 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 Switch 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 Switch 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.

66.2 Viewing the ARP Table

Use the ARP table to view IP-to-MAC address mappings and remove specific dynamic ARP entries.

Click **Management > ARP Table** in the navigation panel to open the following screen.

Figure 468 Management > ARP Table

Index	IP Address	MAC Address	VID	Port	Age(s)	Type
1	10.214.80.44	dc:4a:3e:40:ec:67	1	20	220	dynamic

The following table describes the labels in this screen.

Table 277 Management > ARP Table

LABEL	DESCRIPTION
Condition	Specify how you want the Switch to remove ARP entries when you click Flush . Select All to remove all of the dynamic entries from the ARP table. Select IP Address and enter an IP address to remove the dynamic entries learned with the specified IP address. Select Port and enter a port number to remove the dynamic entries learned on the specified port.
Flush	Click Flush to remove the ARP entries according to the condition you specified.
Cancel	Click Cancel to return the fields to the factory defaults.
Index	This is the ARP table entry number.
IP Address	This is the IP address of a device connected to a Switch port with the corresponding MAC address below.
MAC Address	This is the MAC address of the device with the corresponding IP address above.
VID	This field displays the VLAN to which the device belongs.
Port	This field displays the port to which the device connects. CPU means this IP address is the Switch's management IP address. In stacking mode, the first number represents the slot and the second the port number.
Age(s)	This field displays how long (in seconds) an entry can still remain in the ARP table before it ages out and needs to be relearned. This shows 0 for a static entry.
Type	This shows the IP address is dynamic (learned by the Switch).

CHAPTER 67

Routing Table

This chapter introduces the routing table.

67.1 Routing Table Overview

The routing table contains the route information to the networks that the Switch can reach.

67.2 The Routing Table Main Screen

Click **Management > Routing Table** in the navigation panel to display the main screen as shown. Click the link next to **IPv4 Routing Table** to open a screen where you can view the IPv4 routing table information. Click the link next to **IPv6 Routing Table** to open a screen where you can view the IPv6 routing table information.

Figure 469 Management > Routing Table

Routing Table	
IPv4 Routing Table	Click Here
IPv6 Routing Table	Click Here

67.3 IPv4 Routing Table

Use this screen to view IPv4 routing table information. Click **Management > Routing Table > IPv4 Routing Table** in the navigation panel to display the screen as shown.

Figure 470 Management > Routing Table > IPv4 Routing Table

IPv4 Routing Table						Routing Table
Index	Destination	Gateway	Interface	Metric	Type	Uptime
1	172.21.40.0/22	172.21.40.3	172.21.40.3	1	LOCAL	10:17:19
2	127.0.0.0/16	127.0.0.1	127.0.0.1	1	LOCAL	10:18:31
3	default	172.21.43.254	172.21.40.3	2	STATIC	10:17:19

The following table describes the labels in this screen.

Table 278 Management > Routing Table > IPv4 Routing Table

LABEL	DESCRIPTION
Index	This field displays the index number.
Destination	This field displays the destination IP routing domain.
Gateway	This field displays the IP address of the gateway device.
Interface	This field displays the IP address of the IPv4 Interface.
Metric	This field displays the cost of the route.
Type	This field displays the method used to learn the route. STATIC – added as a static entry. LOCAL – added as a local interface entry.
Uptime	This field displays how long the route has been running since the Switch learned the route and added an entry in the routing table.

67.4 IPv6 Routing Table

Use this screen to view IPv6 routing table information. Click **Management > Routing Table > IPv6 Routing Table** in the navigation panel to display the screen as shown.

Figure 471 Management > Routing Table > IPv6 Routing Table



IPv6 Routing Table Routing Table					
Index	Route Destination / Prefix Length	Next Hop	Interface	Metric	Type

The following table describes the labels in this screen.

Table 279 Management > Routing Table > IPv6 Routing Table

LABEL	DESCRIPTION
Index	This field displays the index number.
Route Destination / Prefix Length	This field displays the IPv6 subnet prefix and prefix length of the final destination.
Next Hop	This field displays the IPv6 address of the gateway that helps forward the packet to the destination.
Interface	This field displays the descriptive name of the IPv6 interface that is used to forward the packets to the destination.
Metric	This field displays the cost of the route.
Type	This field displays the method used to learn the route. STATIC – added as a static entry. Connect – added as a local interface entry.

CHAPTER 68

Path MTU Table

68.1 Path MTU Overview

This chapter introduces the IPv6 Path MTU table.

The largest size (in bytes) of a packet that can be transferred over a data link is called the maximum transmission unit (MTU). The Switch uses Path MTU Discovery to discover Path MTU (PMTU), that is, the minimum link MTU of all the links in a path to the destination. If the Switch receives an ICMPv6 Packet Too Big error message after sending a packet, it fragments the next packet according to the suggested MTU in the error message.

68.2 Viewing the Path MTU Table

Use this screen to view IPv6 path MTU information on the Switch. Click **Management > Path MTU Table** in the navigation panel to display the screen as shown.

Figure 472 Management > Path MTU Table

Path MTU Table			
Path MTU aging time : 10 minutes			
Index	Destination Address	MTU	Expire

The following table describes the labels in this screen.

Table 280 Management > Path MTU Table

LABEL	DESCRIPTION
Path MTU aging time	This field displays how long an entry remains in the Path MTU table before it ages out and needs to be relearned.
Index	This field displays the index number of each entry in the table.
Destination Address	This field displays the destination IPv6 address of each path or entry.
MTU	This field displays the maximum transmission unit of the links in the path.
Expire	This field displays how long (in minutes) an entry can still remain in the Path MTU table before it ages out and needs to be relearned.

CHAPTER 69

Configure Clone

69.1 Overview

This chapter shows you how you can copy the settings of one port onto other ports.

69.2 Configure Clone

Cloning allows you to copy the basic and advanced settings from a source port to a destination port or ports. Click **Management** > **Configure Clone** to open the following screen.

Figure 473 Management > Configure Clone (Standalone Mode)

Configure Clone	
Source	Destination
☒ Port	

Port Features

	☐ *
Basic Setting	☐ Active
	☐ Name
	☐ Speed / Duplex
	☐ BPDU Control
	☐ Flow Control
Advanced Application	☐ VLAN1q
	☐ VLAN1q Member
	☐ Bandwidth Control
	☐ VLAN Stacking
	☐ Port Security
	☐ Broadcast Storm Control
	☐ Mirroring
	☐ Port Authentication
	☐ Queuing Method
	☐ IGMP Filtering
	☐ Spanning Tree Protocol
	☐ Multiple Rapid Spanning Tree Protocol
	☐ Protocol-based VLAN
	☐ Port-based VLAN
	☐ MAC Authentication
	☐ Ethernet OAM
	☐ Loop Guard
	☐ ARP Inspection
	☐ DHCP Snooping
	☐ VLAN Mapping
	☐ Layer 2 Protocol Tunneling
	☐ LLDP
	☐ sFlow
	☐ PPPoE IA
	☐ ARP Learning
	☐ CPU Protection
	☐ Multiple Spanning Tree Protocol
	☐ SNMP Trap
	☐ MAC Pinning
	☐ Green Ethernet
	☐ Diffserv
	☐ MLD Snooping-Proxy Filtering
	☐ Anti-Arpscan
☐ BPDU Guard	
☐ IPv6 DHCP Trust	
☐ IPv6 Source Guard	
☐ ZULD	

Figure 474 Management > Configure Clone (Stacking Mode)

Configure Clone	
Source	Destination
☒ Port 1 / ☐ SLOT 1	☐ SLOT 1 ☐ SLOT 2 ☐ SLOT 3 ☐ SLOT 4
Port Features	
Basic Setting	☐ * ☐ Active ☐ Name ☐ Speed / Duplex ☐ BPDU Control ☐ Flow Control
Advanced Application	☐ VLAN1q ☐ VLAN1q Member ☐ Bandwidth Control ☐ VLAN Stacking ☐ Port Security ☐ Broadcast Storm Control ☐ Mirroring ☐ Port Authentication ☐ Queuing Method ☐ IGMP Filtering ☐ Spanning Tree Protocol ☐ Multiple Rapid Spanning Tree Protocol ☐ Protocol-based VLAN ☐ MAC Authentication ☐ Ethernet OAM ☐ Loop Guard ☐ ARP Inspection ☐ DHCP Snooping ☐ VLAN Mapping ☐ Layer 2 Protocol Tunneling ☐ LLDP ☐ sFlow ☐ PPPoE IA ☐ ARP Learning ☐ CPU Protection ☐ Multiple Spanning Tree Protocol ☐ SNMP Trap ☐ MAC Pinning ☐ Green Ethernet ☐ Diffserv ☐ MLD Snooping-Proxy Filtering ☐ Anti-Arpscan ☐ BPDU Guard ☐ IPv6 DHCP Trust ☐ IPv6 Source Guard ☐ ZULD
Apply Cancel	

The following table describes the labels in this screen.

Table 281 Management > Configure Clone

LABEL	DESCRIPTION
Source/ Destination	In stacking mode, a port is defined by a slot ID representing the Switch in the stack and a port number. Select the source port and slot (in stacking mode) under the Source label. This port's attributes are copied. Enter the destination port or ports under the Destination label. These are the ports which are going to have the same attributes as the source port. You can enter individual ports separated by a comma or a range of ports by using a hyphen. For example, 2, 4, 6 indicates that ports 2, 4 and 6 are the destination ports. 2-6 indicates that ports 2 through 6 are the destination ports. In stacking mode, you can select multiple destination slots.
Basic Setting	Select * to apply all settings to the port. Use this first to select the common settings and then remove the settings you do not want copied. Select which port settings (you configured in the Basic Setting menus) should be copied to the destination ports.
Advanced Application	Select which port settings (you configured in the Advanced Application menus) should be copied to the destination ports.
Apply	Click Apply to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring.
Cancel	Click Cancel to begin configuring this screen afresh.

CHAPTER 70

IPv6 Neighbor Table

70.1 IPv6 Neighbor Table Overview

This chapter introduces the IPv6 neighbor table.

An IPv6 host is required to have a neighbor table. If there is an address to be resolved or verified, the Switch sends out a neighbor solicitation message. When the Switch receives a neighbor advertisement in response, it stores the neighbor's link-layer address in the neighbor table. You can also manually create a static IPv6 neighbor entry using the **Basic Setting > IPv6 > IPv6 Configuration > IPv6 Neighbor Setup** screen.

When the Switch needs to send a packet, it first consults other table to determine the next hop. Once the next hop IPv6 address is known, the Switch looks into the neighbor table to get the link-layer address and sends the packet when the neighbor is reachable. If the Switch cannot find an entry in the neighbor table 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.

70.2 Viewing the IPv6 Neighbor Table

Use this screen to view IPv6 neighbor information on the Switch. Click **Management > IPv6 Neighbor Table** in the navigation panel to display the screen as shown.

Figure 475 Management > IPv6 Neighbor Table

IPv6 Neighbor Table					
Sort by:	Address	MAC	Interface		
Index	Address	MAC	Status	Type	Interface

The following table describes the labels in this screen.

Table 282 Management > IPv6 Neighbor Table

LABEL	DESCRIPTION
Sort by	Select this to display and arrange the data according to IPv6 address (Address), MAC address (MAC) or IPv6 interface (Interface). The information is then displayed in the summary table below.
Index	This field displays the index number of each entry in the table.
Address	This field displays the IPv6 address of the Switch or a neighboring device.
MAC	This field displays the MAC address of the IPv6 interface on which the IPv6 address is configured or the MAC address of the neighboring device.

Table 282 Management > IPv6 Neighbor Table (continued)

LABEL	DESCRIPTION
Status	This field displays whether the neighbor IPv6 interface is reachable. In IPv6, "reachable" means an IPv6 packet can be correctly forwarded to a neighbor node (host or router) and the neighbor can successfully receive and handle the packet. The available options in this field are: • reachable (R): The interface of the neighboring device is reachable. (The Switch has received a response to the initial request.) • stale (S): The last reachable time has expired and the Switch is waiting for a response to another initial request. The field displays this also when the Switch receives an unrequested response from the neighbor's interface. • delay (D): The neighboring interface is no longer known to be reachable, and traffic has been sent to the neighbor recently. The Switch delays sending request packets for a short to give upper-layer protocols a chance to determine reachability. • probe (P): The Switch is sending request packets and waiting for the neighbor's response. • invalid (IV): The neighbor address is with an invalid IPv6 address. • unknown (?): The status of the neighboring interface cannot be determined for some reason. • incomplete (I): Address resolution is in progress and the link-layer address of the neighbor has not yet been determined. The interface of the neighboring device did not give a complete response.
Type	This field displays the type of an address mapping to a neighbor interface. The available options in this field are: • other (O): none of the following type. • local (L): A Switch interface is using the address. • dynamic (D): The IP address to MAC address can be successfully resolved using IPv6 Neighbor Discovery protocol. Is it similar as IPv4 ARP (Address Resolution protocol). • static (S): The interface address is statically configured.
Interface	This field displays the ID number of the IPv6 interface on which the IPv6 address is created or through which the neighboring device can be reached.

CHAPTER 71

Port Status

71.1 Overview

This chapter introduces the port status screens.

71.2 Status

This screen displays only when the Switch is in stacking mode and you click the **Port Status** quick link from the **Status** screen. Use this screen to view system status and click a number in the **Slot** column to display each port statistical summary on the stacked Switch.

Figure 476 Status > Port Status: Status (Stacking Mode)

Status			
System Up Time : 0:25:21			
Slot	Name	Status	Up Time
1	VS2000 00	active	25:21
2			
3			
4			

The following table describes the labels in this screen.

Table 283 Status > Port Status: Status (Stacking Mode)

LABEL	DESCRIPTION
System Up Time	This field displays how long the stacked Switch has been running since it last restarted or was turned on.
Slot	This field displays the slot ID of the stacked Switch. You can click the ID number to go to the Port Status screen.
Name	This field displays the model name of the stacked Switch.
Status	This field displays whether the stacked Switch is active or inactive in a stack system.
Up Time	This field displays the time that the active Switch in a stack has been running.

71.3 Port Status

This screen displays a port statistical summary with links to each port showing statistical details. To view the port statistics, click **Status** in all Web Configurator screens and then the **Port Status** link in the **Quick Links** section of the **Status** screen to display the **Port Status** screen as shown next. You can also click **Management > Port Status** to see the following screen.

Figure 477 Management > Management > Port Status (Standalone Mode)

Port Status

DDMI Utilization

Port	Name	Link	State	LACP	TxPkts	RxPkts	Errors	Tx kB/s	Rx kB/s	Up Time
1		Down	STOP	Disabled	0	0	0	0.0	0.0	0:00:00
2		Down	STOP	Disabled	0	0	0	0.0	0.0	0:00:00
3		Down	STOP	Disabled	0	0	0	0.0	0.0	0:00:00
4		Down	STOP	Disabled	0	0	0	0.0	0.0	0:00:00
5		Down	STOP	Disabled	0	0	0	0.0	0.0	0:00:00
6		Down	STOP	Disabled	0	0	0	0.0	0.0	0:00:00
7		Down	STOP	Disabled	0	0	0	0.0	0.0	0:00:00
8		Down	STOP	Disabled	0	0	0	0.0	0.0	0:00:00
9		Down	STOP	Disabled	0	0	0	0.0	0.0	0:00:00
10		Down	STOP	Disabled	0	0	0	0.0	0.0	0:00:00
11		Down	STOP	Disabled	0	0	0	0.0	0.0	0:00:00
12		Down	STOP	Disabled	0	0	0	0.0	0.0	0:00:00
13		Down	STOP	Disabled	0	0	0	0.0	0.0	0:00:00
14		Down	STOP	Disabled	0	0	0	0.0	0.0	0:00:00
15		Down	STOP	Disabled	0	0	0	0.0	0.0	0:00:00
16		Down	STOP	Disabled	0	0	0	0.0	0.0	0:00:00
17		Down	STOP	Disabled	10016	1034	0	0.0	0.0	0:00:00
18	1G/F	FORWARDING	Disabled	576243	2588514	0	20.166	1.89	2:26:41	
19		Down	STOP	Disabled	0	0	0	0.0	0.0	0:00:00
20	1G/F	FORWARDING	Disabled	502313	388930	0	0.104	0.243	2:26:44	
21		Down	STOP	Disabled	0	0	0	0.0	0.0	0:00:00
22		Down	STOP	Disabled	2093900	204188	0	0.0	0.0	0:00:00
23		Down	STOP	Disabled	0	0	0	0.0	0.0	0:00:00
24		Down	STOP	Disabled	0	0	0	0.0	0.0	0:00:00

☒ Any

☐ Port

Clear Counter

Figure 478 Management > Port Status (Stacking Mode)

Port Status		DDMI Utilization								
Port	Name	Link	State	LACP	TxPkts	RxPkts	Errors	Tx kB/s	Rx kB/s	Up Time
1/1		Down	STOP	Disabled	0	0	0	0.0	0.0	0:00:00
1/2		Down	STOP	Disabled	0	0	0	0.0	0.0	0:00:00
1/3		Down	STOP	Disabled	0	0	0	0.0	0.0	0:00:00
1/4		Down	STOP	Disabled	0	0	0	0.0	0.0	0:00:00
1/5		Down	STOP	Disabled	0	0	0	0.0	0.0	0:00:00
1/6		Down	STOP	Disabled	0	0	0	0.0	0.0	0:00:00
1/7		Down	STOP	Disabled	0	0	0	0.0	0.0	0:00:00
1/8		Down	STOP	Disabled	0	0	0	0.0	0.0	0:00:00
1/9		Down	STOP	Disabled	0	0	0	0.0	0.0	0:00:00
1/10		Down	STOP	Disabled	0	0	0	0.0	0.0	0:00:00
1/11		Down	STOP	Disabled	0	0	0	0.0	0.0	0:00:00
1/12		Down	STOP	Disabled	0	0	0	0.0	0.0	0:00:00
1/13		Down	STOP	Disabled	0	0	0	0.0	0.0	0:00:00
1/14		Down	STOP	Disabled	0	0	0	0.0	0.0	0:00:00
1/15		Down	STOP	Disabled	0	0	0	0.0	0.0	0:00:00
1/16		Down	STOP	Disabled	0	0	0	0.0	0.0	0:00:00

The following table describes the labels in this screen.

Table 284 Management > Port Status

LABEL	DESCRIPTION
SLOT	This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack.
Port	This identifies the Ethernet port. In stacking mode, the first number represents the slot ID and the second is the port number. Please note that the default stacking ports (the last four ports of your Switch) cannot be configured. They are reserved for stacking only. Click a port number to display the Port Details screen.
Name	This is the name you assigned to this port in the Basic Setting > Port Setup screen.
Link	This field displays the speed (either 100M for 100Mbps, 1G for 1 Gbps, 2.5G for 2.5 Gbps, 5G for 5 Gbps, or 10G for 10 Gbps) and the duplex (F for full duplex or H for half). It also shows the cable type (Copper or Fiber) for the combo ports. This field displays Down if the port is not connected to any device.
State	If STP (Spanning Tree Protocol) is enabled, this field displays the STP state of the port. If STP is disabled, this field displays FORWARDING if the link is up, otherwise, it displays STOP . When LACP (Link Aggregation Control Protocol) and STP are in blocking state, it displays Blocking .
TxPkts	This field shows the number of transmitted frames on this port.
RxPkts	This field shows the number of received frames on this port.
Errors	This field shows the number of received errors on this port.
Tx KB/s	This field shows the number of kilobytes per second transmitted on this port.
Rx KB/s	This field shows the number of kilobytes per second received on this port.
Up Time	This field shows the total amount of time in hours, minutes and seconds the port has been up.
Clear Counter	Select Port , enter a port number and then click Clear Counter to erase the recorded statistical information for that port, or select Any to clear statistics for all ports.

71.3.1 Port Details

Click a number in the **Port** column in the **Port Status** screen to display individual port statistics. Use this screen to check status and detailed performance data about an individual port on the Switch.

Figure 479 Management > Port Status > Port Details

Port Details		Port Status
Port Info	Port NO.	1
	Name	
	Link	Down
	State	STOP
	LACP	Disabled
	TxPkts	0
	RxPkts	0
	Errors	0
	Tx kB/s	0.0
	Tx Utilization%	0.0
	Rx kB/s	0.0
	Rx Utilization%	0.0
	Up Time	0:00:00
TX Packet	Unicast	0
	Multicast	0
	Broadcast	0
	Pause	0
	Tagged	0
RX Packet	Unicast	0
	Multicast	0
	Broadcast	0
	Pause	0
	Control	0
TX Collision	Single	0
	Multiple	0
	Excessive	0
	Late	0
Error Packet	RX CRC	0
	Length	0
	Runt	0
Distribution	64	0
	65 to 127	0
	128 to 255	0
	256 to 511	0
	512 to 1023	0
	1024 to 1518	0
	Giant	0

The following table describes the labels in this screen.

Table 285 Management > Port Status > Port Details

LABEL	DESCRIPTION
Port Info	
Port NO.	This field displays the port number you are viewing. In stacking mode, the first number represents the slot and the second the port number.
Name	This field displays the name of the port.
Link	This field displays the speed (either 100M for 100Mbps, 1G for 1 Gbps, 2.5G for 2.5 Gbps, 5G for 5 Gbps, or 10G for 10 Gbps) and the duplex (F for full duplex or H for half). It also shows the cable type (Copper or Fiber) for the combo ports. This field displays Down if the port is not connected to any device.
State	If STP (Spanning Tree Protocol) is enabled, this field displays the STP state of the port. If STP is disabled, this field displays FORWARDING if the link is up, otherwise, it displays STOP . When LACP (Link Aggregation Control Protocol), STP, and dot1x are in blocking state, it displays Blocking .
LACP	This field shows if LACP is enabled on this port or not.

Table 285 Management > Port Status > Port Details (continued)

LABEL	DESCRIPTION
TxPkts	This field shows the number of transmitted frames on this port.
RxPkts	This field shows the number of received frames on this port.
Errors	This field shows the number of received errors on this port.
Tx kB/s	This field shows the number of kilobytes per second transmitted on this port.
Tx Utilization%	This field shows the percentage of actual transmitted frames on this port as a percentage of the Link speed.
Rx kB/s	This field shows the number of kilobytes per second received on this port.
Rx Utilization%	This field shows the percentage of actual received frames on this port as a percentage of the Link speed.
Up Time	This field shows the total amount of time the connection has been up.
Tx Packet	
The following fields display detailed information about packets transmitted.	
Unicast	This field shows the number of good unicast packets transmitted.
Multicast	This field shows the number of good multicast packets transmitted.
Broadcast	This field shows the number of good broadcast packets transmitted.
Pause	This field shows the number of 802.3x pause packets transmitted.
Tagged	This field shows the number of packets with VLAN tags transmitted.
Rx Packet	
The following fields display detailed information about packets received.	
Unicast	This field shows the number of good unicast packets received.
Multicast	This field shows the number of good multicast packets received.
Broadcast	This field shows the number of good broadcast packets received.
Pause	This field shows the number of 802.3x pause packets received.
Control	This field shows the number of control packets received (including those with CRC error) but it does not include the 802.3x Pause packets.
TX Collision	
The following fields display information on collisions while transmitting.	
Single	This is a count of successfully transmitted packets for which transmission is inhibited by exactly one collision.
Multiple	This is a count of successfully transmitted packets for which transmission was inhibited by more than one collision.
Excessive	This is a count of packets for which transmission failed due to excessive collisions. Excessive collision is defined as the number of maximum collisions before the retransmission count is reset.
Late	This is the number of times a late collision is detected, that is, after 512 bits of the packets have already been transmitted.
Error Packet	
The following fields display detailed information about packets received that were in error.	
RX CRC	This field shows the number of packets received with CRC (Cyclic Redundant Check) errors.
Length	This field shows the number of packets received with a length that was out of range.
Runt	This field shows the number of packets received that were too short (shorter than 64 octets), including the ones with CRC errors.
Distribution	
64	This field shows the number of packets (including bad packets) received that were 64 octets in length.

Table 285 Management > Port Status > Port Details (continued)

LABEL	DESCRIPTION
65 to 127	This field shows the number of packets (including bad packets) received that were between 65 and 127 octets in length.
128 to 255	This field shows the number of packets (including bad packets) received that were between 128 and 255 octets in length.
256 to 511	This field shows the number of packets (including bad packets) received that were between 256 and 511 octets in length.
512 to 1023	This field shows the number of packets (including bad packets) received that were between 512 and 1023 octets in length.
1024 to 1518	This field shows the number of packets (including bad packets) received that were between 1024 and 1518 octets in length.
Giant	This field shows the number of packets (including bad packets) received that were between 1519 octets and the maximum frame size. The maximum frame size varies depending on your switch model.

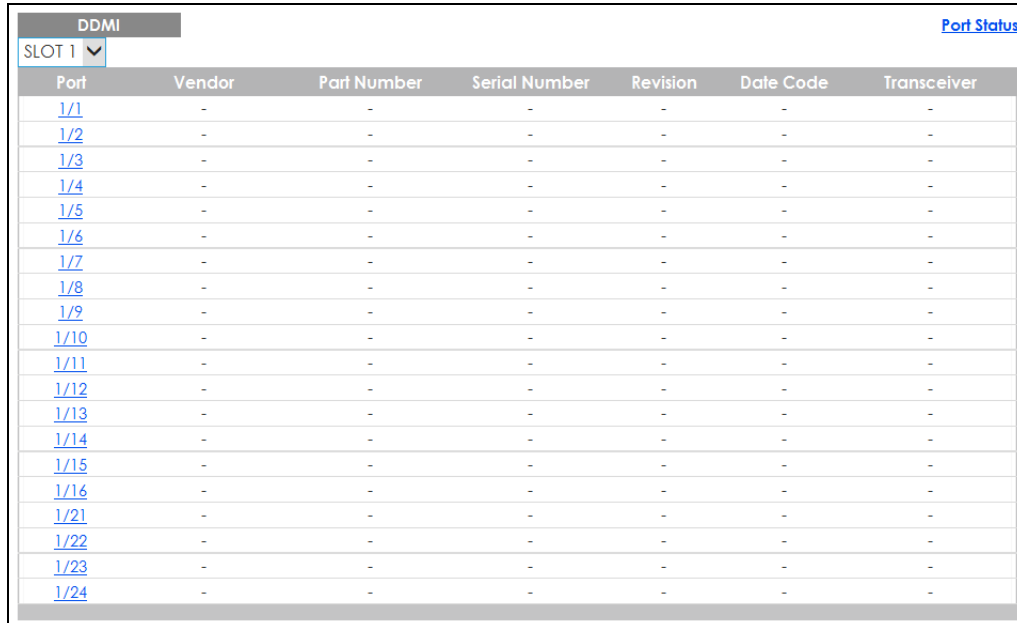
71.3.2 DDMI

The optical SFP transceiver's support for the Digital Diagnostics Monitoring Interface (DDMI) function lets you monitor the transceiver's parameters to perform component monitoring, fault isolation and failure prediction tasks. This allows proactive, preventative network maintenance to help ensure service continuity.

Use this screen to view the DDMI status of the Switch's SFP transceivers. Click **Management > Port Status > DDMI** to see the following screen. Alternatively, click **Status** from any Web Configurator screen and then the **Port Status** link in the **Quick Links** section of the **Status** screen to display the **Port Status** screen and then click the **DDMI** link tab.

Figure 480 Management > Port Status > DDMI (Standalone Mode)

DDMI							Port Status
Port	Vendor	Part Number	Serial Number	Revision	Date Code	Transceiver	
1	-	-	-	-	-	-	
2	-	-	-	-	-	-	
3	-	-	-	-	-	-	
4	-	-	-	-	-	-	
5	-	-	-	-	-	-	
6	-	-	-	-	-	-	
7	-	-	-	-	-	-	
8	-	-	-	-	-	-	
9	-	-	-	-	-	-	
10	-	-	-	-	-	-	
11	-	-	-	-	-	-	
12	-	-	-	-	-	-	
13	-	-	-	-	-	-	
14	-	-	-	-	-	-	
15	-	-	-	-	-	-	
16	-	-	-	-	-	-	
21	-	-	-	-	-	-	
22	-	-	-	-	-	-	
23	-	-	-	-	-	-	
24	-	-	-	-	-	-	
25	-	-	-	-	-	-	
26	-	-	-	-	-	-	
27	-	-	-	-	-	-	
28	-	-	-	-	-	-	

Figure 481 Management > Port Status > DDMI (Stacking Mode)


DDMI							Port Status
SLOT 1							
Port	Vendor	Part Number	Serial Number	Revision	Date Code	Transceiver	
1/1	-	-	-	-	-	-	
1/2	-	-	-	-	-	-	
1/3	-	-	-	-	-	-	
1/4	-	-	-	-	-	-	
1/5	-	-	-	-	-	-	
1/6	-	-	-	-	-	-	
1/7	-	-	-	-	-	-	
1/8	-	-	-	-	-	-	
1/9	-	-	-	-	-	-	
1/10	-	-	-	-	-	-	
1/11	-	-	-	-	-	-	
1/12	-	-	-	-	-	-	
1/13	-	-	-	-	-	-	
1/14	-	-	-	-	-	-	
1/15	-	-	-	-	-	-	
1/16	-	-	-	-	-	-	
1/21	-	-	-	-	-	-	
1/22	-	-	-	-	-	-	
1/23	-	-	-	-	-	-	
1/24	-	-	-	-	-	-	

The following table describes the labels in this screen.

Table 286 Management > Port Status > DDMI

LABEL	DESCRIPTION
SLOT	This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack.
Port	This identifies the SFP port. In stacking mode, the first number represents the slot ID and the second is the port number. Please note that the default stacking ports (the last four ports of your Switch) cannot be configured. They are reserved for stacking only.
Vendor	This displays the vendor name of the optical transceiver.
Part Number	This displays the part number of the optical transceiver.
Serial Number	This displays the serial number of the optical transceiver.
Revision	This displays the revision number of the optical transceiver.
Date Code	This displays the date when the optical transceiver was manufactured.
Transceiver	This displays whether the connection to the optical network is up or down.

71.3.3 DDMI Details

Use this screen to view the real-time SFP (Small Form Factor Pluggable) transceiver information and operating parameters on the SFP port. The parameters include, for example, transmitting and receiving power, and module temperature.

Click a number in the **Port** column in the **DDMI** screen to view current transceivers' status.

Figure 482 Management > Port Status > DDMI > DDMI Details

DDMI Details

Transceiver Information

Port No: 6

Connector Type	-
Vendor	-
Part Number	-
Serial Number	-
Revision	-
Date Code	-
Transceiver	-

DDMI Information

Type	Current	High Alarm Threshold	High Warn Threshold	Low Warn Threshold	Low Alarm Threshold
Temperature(C)	-	-	-	-	-
Voltage(V)	-	-	-	-	-
TX Bias(mA)	-	-	-	-	-
TX Power(dbm)	-	-	-	-	-
RX Power(dbm)	-	-	-	-	-

The following table describes the labels in this screen.

Table 287 Management > Port Status > DDMI > DDMI Details

LABEL	DESCRIPTION
Transceiver Information	
Port No	This identifies the SFP port. In stacking mode, the first number represents the slot and the second the port number.
Connector Type	This displays the connector type of the optical transceiver.
Vendor	This displays the vendor name of the optical transceiver.
Part Number	This displays the part number of the optical transceiver.
Serial Number	This displays the serial number of the optical transceiver.
Revision	This displays the revision number of the optical transceiver.
Date Code	This displays the date when the optical transceiver was manufactured.
Transceiver	This displays details about the type of transceiver installed in the SFP slot.
Calibration	This field is available only when an SFP transceiver is inserted into the SFP slot. Internal displays if the measurement values are calibrated by the transceiver. External displays if the measurement values are raw data which the Switch calibrates.
DDMI Information	
Type	This displays the DDMI parameter.
Temperature (C/F)	This displays the temperature inside the SFP transceiver in degrees Celsius or Fahrenheit.
Voltage (V)	This displays the level of voltage being supplied to the SFP transceiver.
TX Bias (mA)	This displays the milliamps (mA) being supplied to the SFP transceiver's Laser Diode Transmitter.
TX Power (dbm)	This displays the amount of power the SFP transceiver is transmitting.
RX Power (dbm)	This displays the amount of power the SFP transceiver is receiving from the fiber cable.
Current	This displays the current status for each monitored DDMI parameter.

Table 287 Management > Port Status > DDMI > DDMI Details (continued)

LABEL	DESCRIPTION
High Alarm Threshold	This displays the high value alarm threshold for each monitored DDMI parameter. An alarm signal is reported to the Switch if the monitored DDMI parameter reaches this value.
High Warn Threshold	This displays the high value warning threshold for each monitored DDMI parameter. A warning signal is reported to the Switch if the monitored DDMI parameter reaches this value.
Low Warn Threshold	This displays the low value warning threshold for each monitored DDMI parameter. A warning signal is reported to the Switch if the monitored DDMI parameter reaches this value.
Low Alarm Threshold	This displays the low value alarm threshold for each monitored DDMI parameter. An alarm signal is reported to the Switch if the monitored DDMI parameter reaches this value.

71.3.4 Port Utilization

This screen displays the percentage of actual transmitted or received frames on a port as a percentage of the **Link** speed. To view port utilization, click **Management > Port Status > Port Utilization** to see the following screen. Alternatively, click **Status** from any Web Configurator screen and then the **Port Status** link in the **Quick Links** section of the **Status** screen to display the **Port Status** screen and then click the **Utilization** link tab.

Figure 483 Management > Port Status > Utilization (Standalone Mode)

Port Utilization					Port Status
Port	Link	Tx kB/s	Tx Utilization%	Rx kB/s	Rx Utilization%
1	Down	0.0	0.0	0.0	0.0
2	Down	0.0	0.0	0.0	0.0
3	Down	0.0	0.0	0.0	0.0
4	Down	0.0	0.0	0.0	0.0
5	Down	0.0	0.0	0.0	0.0
6	Down	0.0	0.0	0.0	0.0
7	Down	0.0	0.0	0.0	0.0
8	Down	0.0	0.0	0.0	0.0
9	Down	0.0	0.0	0.0	0.0
10	Down	0.0	0.0	0.0	0.0
11	Down	0.0	0.0	0.0	0.0
12	Down	0.0	0.0	0.0	0.0
13	Down	0.0	0.0	0.0	0.0
14	Down	0.0	0.0	0.0	0.0
15	Down	0.0	0.0	0.0	0.0
16	Down	0.0	0.0	0.0	0.0
17	Down	0.0	0.0	0.0	0.0
18	1G/F	0.55	0.0	0.164	0.0
19	Down	0.0	0.0	0.0	0.0
20	1G/F	0.164	0.0	0.55	0.0
21	Down	0.0	0.0	0.0	0.0
22	Down	0.0	0.0	0.0	0.0
23	Down	0.0	0.0	0.0	0.0
24	Down	0.0	0.0	0.0	0.0
25	Down	0.0	0.0	0.0	0.0
26	Down	0.0	0.0	0.0	0.0
27	Down	0.0	0.0	0.0	0.0
28	Down	0.0	0.0	0.0	0.0

Figure 484 Management > Port Status > Utilization (Stacking Mode)

Port Utilization					Port Status
SLOT 1 ▼					
Port	Link	Tx kB/s	Tx Utilization%	Rx kB/s	Rx Utilization%
1/1	Down	0.0	0.0	0.0	0.0
1/2	Down	0.0	0.0	0.0	0.0
1/3	Down	0.0	0.0	0.0	0.0
1/4	Down	0.0	0.0	0.0	0.0
1/5	Down	0.0	0.0	0.0	0.0
1/6	Down	0.0	0.0	0.0	0.0
1/7	Down	0.0	0.0	0.0	0.0
1/8	Down	0.0	0.0	0.0	0.0
1/9	Down	0.0	0.0	0.0	0.0
1/10	Down	0.0	0.0	0.0	0.0
1/11	Down	0.0	0.0	0.0	0.0
1/12	Down	0.0	0.0	0.0	0.0
1/13	Down	0.0	0.0	0.0	0.0
1/14	Down	0.0	0.0	0.0	0.0
1/15	Down	0.0	0.0	0.0	0.0
1/16	Down	0.0	0.0	0.0	0.0
1/17	Down	0.0	0.0	0.0	0.0
1/18	1G/F	0.635	0.0	0.644	0.0
1/19	Down	0.0	0.0	0.0	0.0
1/20	Down	0.0	0.0	0.0	0.0
1/21	Down	0.0	0.0	0.0	0.0
1/22	Down	0.0	0.0	0.0	0.0
1/23	Down	0.0	0.0	0.0	0.0
1/24	Down	0.0	0.0	0.0	0.0

The following table describes the labels in this screen.

Table 288 Management > Port Status > Utilization

LABEL	DESCRIPTION
SLOT	This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack.
Port	This identifies the Ethernet port. In stacking mode, the first number represents the slot ID and the second is the port number. Please note that the default stacking ports (the last four ports of your Switch) cannot be configured. They are reserved for stacking only.
Link	This field displays the speed (either 100M for 100Mbps, 1G for 1 Gbps, 2.5G for 2.5 Gbps, 5G for 5 Gbps, or 10G for 10 Gbps) and the duplex (F for full duplex or H for half). It also shows the cable type (Copper or Fiber) for the combo ports. This field displays Down if the port is not connected to any device.
Tx kB/s	This field shows the transmission speed of data sent on this port in kilobytes per second.
Tx Utilization%	This field shows the percentage of actual transmitted frames on this port as a percentage of the Link speed.
Rx KB/s	This field shows the transmission speed of data received on this port in kilobytes per second.
Rx Utilization%	This field shows the percentage of actual received frames on this port as a percentage of the Link speed.

CHAPTER 72

Service Register

72.1 Service Register Overview

myZyxel is Zyxel's online services center where you can register your Switch and manage subscription services available for your Switch.

At the time of writing, you can enable the Basic Routing service license for the Switch, which allows you to use basic L3 routing features, such as RIP, OSPF, DVMRP, IGMP and loopback interface. Without the service license, you can still configure the L3 routing features, but they will not work.

72.2 Service Register Screen

Click **Management > Service Register** to display the screen as shown. Use this screen to display the status of your service registration. Go to myZyxel to activate or extend the subscription.

Figure 485 Management > Service Register

Service Register			
Status			
Service	Status	Type	Expiration
Basic Routing	Not Licensed	N/A	N/A
Update			
Note: Update device license information from Zyxel.com server. If you want to activate license, please go to https://portal.myzyxel.com			

The following table describes the labels in this screen.

Table 289 Management > Service Register

LABEL	DESCRIPTION
Service	This lists the name of the service that is available on the Switch.
Status	This field displays whether the service license is enabled at myZyxel (Licensed) or not (Not Licensed).
Type	This field displays whether you applied for a trial application (Trial) or registered a service (Standard) at myZyxel. It displays N/A if the service license is not enabled.

Table 289 Management > Service Register (continued)

LABEL	DESCRIPTION
Expiration	This field displays the amount of time remaining before your trial license expires. Note: You can enable a standard license at myZyxel if the trial license expires.
Update	Click this button to renew service license information (such as the registration status and expiration day). Note: It is recommended you use this button after you register for a new service.

PART III

Troubleshooting and Appendices

CHAPTER 73

Troubleshooting

This chapter offers some suggestions to solve problems you might encounter. The potential problems are divided into the following categories.

- [Power, Hardware Connections, and LEDs](#)
- [Switch Access and Login](#)
- [Switch Configuration](#)

73.1 Power, Hardware Connections, and LEDs

[The Switch does not turn on. None of the LEDs turn on.](#)

- 1 Make sure the Switch is turned on.
- 2 Make sure you are using the power adapter or cord included with the Switch.
- 3 Make sure the power adapter or cord is connected to the Switch and plugged in to an appropriate power source. Make sure the power source is turned on.
- 4 Turn the Switch off and on.
- 5 Disconnect and re-connect the power adapter or cord to the Switch.
- 6 If the problem continues, contact the vendor.

[One of the LEDs does not behave as expected.](#)

- 1 Make sure you understand the normal behavior of the LED. See [Section 3.3 on page 45](#).
- 2 Check the hardware connections. See [Section 3.1 on page 38](#).
- 3 Inspect your cables for damage. Contact the vendor to replace any damaged cables.
- 4 Turn the Switch off and on.
- 5 Disconnect and re-connect the power adapter or cord to the Switch.
- 6 If the problem continues, contact the vendor.

73.2 Switch Access and Login

I forgot the IP address for the Switch.

- 1 The default in-band IP address in standalone mode is **http://DHCP-assigned IP** (when connecting to a DHCP server) or **192.168.1.1**.
- 2 Use the NCC (Nebula Control Center) or the ZON utility to find the IP address.
- 3 Use the console port to log in to the Switch.
- 4 Use the **MGMT** port to log in to the Switch, the default IP address of the **MGMT** port is **192.168.0.1**.
- 5 If this does not work, you have to reset the device to its factory defaults. See [Section 4.7 on page 62](#).

I forgot the user name and/or password.

- 1 The default user name is **admin** and the default password is **1234**.
- 2 If this does not work, you have to reset the device to its factory defaults. See [Section 4.7 on page 62](#).

I cannot see or access the **Login** screen in the Web Configurator.

- 1 Make sure you are using the correct IP address.
 - The default in-band IP address in standalone mode is [http://DHCP-assigned IP](#) (when connecting to a DHCP server) or [192.168.1.1](#).
The default in-band IP address in stacking mode 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 it, see the troubleshooting suggestions for [I forgot the IP address for the Switch](#).
- 2 Check the hardware connections, and make sure the LEDs are behaving as expected. See [Section 3.3 on page 45](#).
- 3 Make sure your Internet browser does not block pop-up windows and has JavaScripts and Java enabled.
- 4 Make sure your computer is in the same subnet as the Switch. (If you know that there are routers between your computer and the Switch, skip this step.)
- 5 Reset the device to its factory defaults, and try to access the Switch with the default IP address. See [Section 4.7 on page 62](#).

- 6 If the problem continues, contact the vendor, or try the advanced suggestion.

Advanced Suggestion

- Try to access the Switch using another service, such as Telnet. If you can access the Switch, check the remote management settings to find out why the Switch does not respond to HTTP.

I can see the **Login** screen, but I cannot log in to the Switch.

- 1 Make sure you have entered the user name and password correctly. The default user name is **admin**, and the default password is **1234**. These fields are case-sensitive, so make sure [Caps Lock] is not on.
- 2 You may have exceeded the maximum number of concurrent Telnet sessions. Close other Telnet sessions or try connecting again later.

Check that you have enabled logins for HTTP or Telnet. If you have configured a secured client IP address, your computer's IP address must match it. Refer to the chapter on access control for details.
- 3 Disconnect and re-connect the cord to the Switch.
- 4 If this does not work, you have to reset the device to its factory defaults. See [Section 4.7 on page 62](#).

Pop-up Windows, JavaScripts and Java Permissions

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

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

There is unauthorized access to my Switch via telnet, HTTP and SSH.

Click the **Display** button in the **System Log** field in the **Management > Diagnostic** screen to check for unauthorized access to your Switch. To avoid unauthorized access, configure the secured client setting in the **Management > Access Control > Remote Management** screen for telnet, HTTP and SSH (see [Section 59.6 on page 550](#)). Computers not belonging to the secured client set cannot get permission to access the Switch.

73.3 Switch Configuration

I lost my configuration settings after I restart the Switch.

Make sure you save your configuration into the Switch's non-volatile memory each time you make changes. Click **Save** at the top right corner of the Web Configurator to save the configuration permanently. See also [Section 58.2.2 on page 526](#) for more information about how to save your configuration.



I accidentally unplugged the Switch. I am not sure which configuration file will be loaded.

If you plug the power cable back to the Switch, it will reboot and load the configuration file that was used the last time. For example, if **Config 1** was used on the Switch before you accidentally unplugged the Switch, **Config 1** will be loaded when rebooting.

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 device.

See <https://www.zyxel.com/homepage.shtml> and also https://www.zyxel.com/about_zyxel/zyxel_worldwide.shtml for the latest information.

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 Corporation
- <http://www.zyxel.com>

Asia

China

- Zyxel Communications (Shanghai) Corp.
- Zyxel Communications (Beijing) Corp.
- Zyxel Communications (Tianjin) Corp.
- <https://www.zyxel.com/cn/zh/>

India

- Zyxel Technology India Pvt Ltd.
- <https://www.zyxel.com/in/en/>

Kazakhstan

- Zyxel Kazakhstan
- <https://www.zyxel.kz>

Korea

- Zyxel Korea Corp.
- <http://www.zyxel.kr>

Malaysia

- Zyxel Malaysia Sdn Bhd.
- <http://www.zyxel.com.my>

Pakistan

- Zyxel Pakistan (Pvt.) Ltd.
- <http://www.zyxel.com.pk>

Philippines

- Zyxel Philippines
- <http://www.zyxel.com.ph>

Singapore

- Zyxel Singapore Pte Ltd.
- <http://www.zyxel.com.sg>

Taiwan

- Zyxel Communications Corporation
- <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 BY
- <https://www.zyxel.by>

Belgium

- Zyxel Communications B.V.
- <https://www.zyxel.com/be/nl/>

- <https://www.zyxel.com/be/fr/>

Bulgaria

- Zyxel България
- <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/>

Estonia

- Zyxel Estonia
- <https://www.zyxel.com/ee/et/>

Finland

- Zyxel Communications
- <https://www.zyxel.com/fi/fi/>

France

- Zyxel France
- <https://www.zyxel.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
- <https://www.zyxel.com/it/it/>

Latvia

- Zyxel Latvia
- <https://www.zyxel.com/lv/lv/>

Lithuania

- Zyxel Lithuania
- <https://www.zyxel.com/lt/lt/>

Netherlands

- Zyxel Benelux
- <https://www.zyxel.com/nl/nl/>

Norway

- Zyxel Communications
- <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/>

Russia

- Zyxel Russia
- <https://www.zyxel.com/ru/ru/>

Slovakia

- Zyxel Communications Czech s.r.o. organizacna zlozka
- <https://www.zyxel.com/sk/sk/>

Spain

- Zyxel Communications ES Ltd.
- <https://www.zyxel.com/es/es/>

Sweden

- Zyxel Communications
- <https://www.zyxel.com/se/sv/>

Switzerland

- Studerus AG
- <https://www.zyxel.ch/de>
- <https://www.zyxel.ch/fr>

Turkey

- Zyxel Turkey A.S.
- <https://www.zyxel.com/tr/tr/>

UK

- Zyxel Communications UK Ltd.
- <https://www.zyxel.com/uk/en/>

Ukraine

- Zyxel Ukraine
- <http://www.ua.zyxel.com>

South America

Argentina

- Zyxel Communications Corporation
- <https://www.zyxel.com/co/es/>

Brazil

- Zyxel Communications Brasil Ltda.
- <https://www.zyxel.com/br/pt/>

Colombia

- Zyxel Communications Corporation
- <https://www.zyxel.com/co/es/>

Ecuador

- Zyxel Communications Corporation
- <https://www.zyxel.com/co/es/>

South America

- Zyxel Communications Corporation
- <https://www.zyxel.com/co/es/>

Middle East

Israel

- Zyxel Communications Corporation
- <http://il.zyxel.com/>

Middle East

- Zyxel Communications Corporation
- <https://www.zyxel.com/me/en/>

North America

USA

- Zyxel Communications, Inc. – North America Headquarters
- <https://www.zyxel.com/us/en/>

Oceania

Australia

- Zyxel Communications Corporation
- <https://www.zyxel.com/au/en/>

Africa

South Africa

- Nology (Pty) Ltd.
- <https://www.zyxel.com/za/en/>

APPENDIX B

Common Services

The following table lists some commonly-used services and their associated protocols and port numbers. For a comprehensive list of port numbers, ICMP type or code numbers and services, visit the IANA (Internet Assigned Number Authority) web site.

- **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**. Please refer to RFC 1700 for further information about port numbers.
 - 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 290 Commonly Used Services

NAME	PROTOCOL	PORT(S)	DESCRIPTION
AH (IPSEC_TUNNEL)	User-Defined	51	The IPSEC AH (Authentication Header) tunneling protocol uses this service.
AIM/New-ICQ	TCP	5190	AOL's Internet Messenger service. It is also used as a listening port by ICQ.
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	7648 24032	A popular videoconferencing solution from White Pines Software.
DNS	TCP/UDP	53	Domain Name Server, a service that matches web names (for example www.zyxel.com) 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.
FTP	TCP TCP	20 21	File Transfer Program, a program to enable fast transfer of files, including large files that may not be possible by email.
H.323	TCP	1720	NetMeeting uses this protocol.
HTTP	TCP	80	Hyper Text Transfer Protocol – a client or server protocol for the world wide web.

Table 290 Commonly Used Services (continued)

NAME	PROTOCOL	PORT(S)	DESCRIPTION
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 or routing 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.
IRC	TCP/UDP	6667	This is another popular Internet chat program.
MSN Messenger	TCP	1863	Microsoft Networks' messenger service uses this protocol.
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 or 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.
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 e-mail from a POP3 server through a temporary connection (TCP/IP or other).
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.
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	Simple File Transfer Protocol.
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.
SNMP	TCP/UDP	161	Simple Network Management Program.
SNMP-TRAPS	TCP/UDP	162	Traps for use with the SNMP (RFC:1215).

Table 290 Commonly Used Services (continued)

NAME	PROTOCOL	PORT(S)	DESCRIPTION
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.
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).
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.
TFTP	UDP	69	Trivial File Transfer Protocol is an Internet file transfer protocol similar to FTP, but uses the UDP (User Datagram Protocol) rather than TCP (Transmission Control Protocol).
VDOLIVE	TCP	7000	Another videoconferencing solution.

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 3.4×10^{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 `2001:0db8:1a2b: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`.

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 291 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 292 Predefined Multicast Address

MULTICAST ADDRESS	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 293 Reserved Multicast Address

MULTICAST ADDRESS
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 4 bits for each character (1 – 10, A – F). Each block's 16 bits are then represented by 4 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 294

MAC	00	:	13	:	49	:	12	:	34	:	56

Table 295

EUI-64	02	:	13	:	49	:	FF	:	FE	:	12	:	34	:	56

DHCPv6

The Dynamic Host Configuration Protocol for IPv6 (DHCPv6, RFC 3315) is a server-client protocol that allows a DHCP server to assign and pass IPv6 network addresses, prefixes and other configuration information to DHCP clients. DHCPv6 servers and clients exchange DHCP messages using UDP.

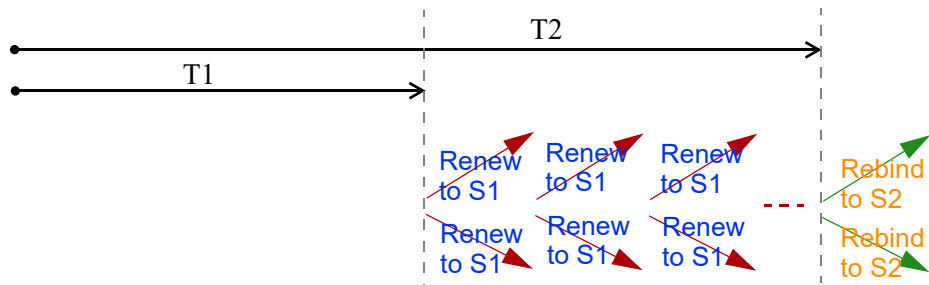
Each DHCP client and server has a unique DHCP Unique Identifier (DUID), which is used for identification when they are exchanging DHCPv6 messages. The DUID is generated from the MAC address, time, vendor assigned ID and/or the vendor's private enterprise number registered with the IANA. It should not change over time even after you reboot the device.

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 Switch 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 Switch 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 Switch maintains and updates its IPv6 caches constantly using the information from response messages. In IPv6, the Switch 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 Switch also sends out a neighbor solicitation message. When the Switch receives a neighbor advertisement in response, it stores the neighbor's link-layer address in the neighbor cache. When the Switch 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 Switch creates an entry in the default router list cache if the router can be used as a default router.

When the Switch 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 Switch 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 onlink, the address is considered as the next hop. Otherwise, the Switch determines the next-hop from the default router list or routing table. Once the next hop IP address is known, the Switch looks into the neighbor cache to get the link-layer address and sends the packet when the neighbor is reachable. If the Switch 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 XP/2003/Vista

By default, Windows XP and Windows 2003 support IPv6. This example shows you how to use the `ipv6 install` command on Windows XP or 2003 to enable IPv6. This also displays how to use the `ipconfig` command to see auto-generated IP addresses.

```
C:\>ipv6 install
Installing...
Succeeded.

C:\>ipconfig

Windows IP Configuration

Ethernet adapter Local Area Connection:

    Connection-specific DNS Suffix  . : 
    IP Address. . . . . : 10.1.1.46
    Subnet Mask . . . . . : 255.255.255.0
    IP Address. . . . . : fe80::2d0:59ff:feb8:103c%4
    Default Gateway . . . . . : 10.1.1.254
```

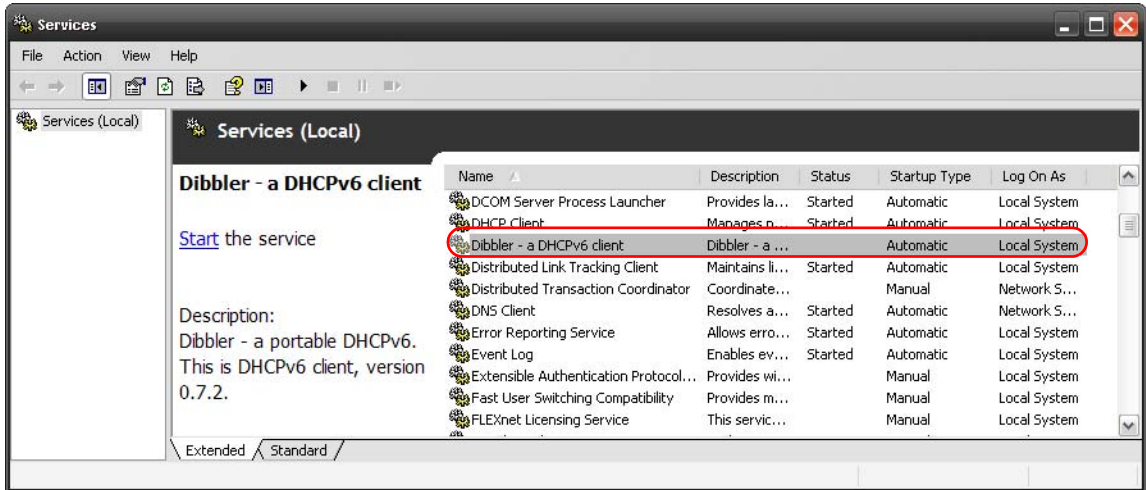
IPv6 is installed and enabled by default in Windows Vista. Use the `ipconfig` command to check your automatic configured IPv6 address as well. You should see at least one IPv6 address available for the interface on your computer.

Example – Enabling DHCPv6 on Windows XP

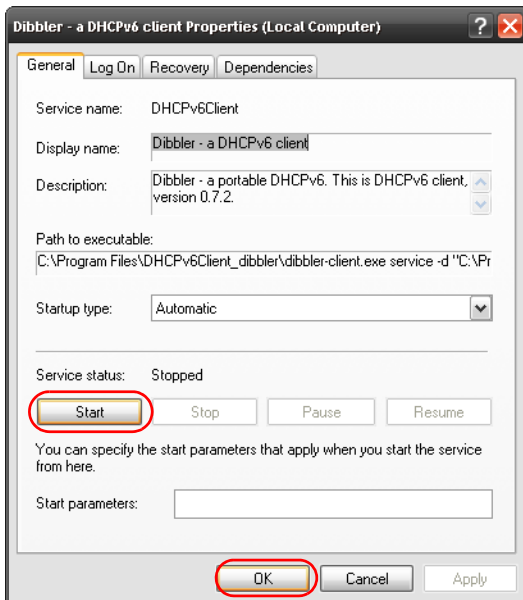
Windows XP does not support DHCPv6. If your network uses DHCPv6 for IP address assignment, you have to additionally install a DHCPv6 client software on your Windows XP. (Note: If you use static IP addresses or Router Advertisement for IPv6 address assignment in your network, ignore this section.)

This example uses Dibbler as the DHCPv6 client. To enable DHCPv6 client on your computer:

- 1 Install Dibbler and select the DHCPv6 client option on your computer.
- 2 After the installation is complete, select **Start > All Programs > Dibbler-DHCPv6 > Client Install as service**.
- 3 Select **Start > Control Panel > Administrative Tools > Services**.
- 4 Double click **Dibbler – a DHCPv6 client**.



- 5 Click **Start** and then **OK**.



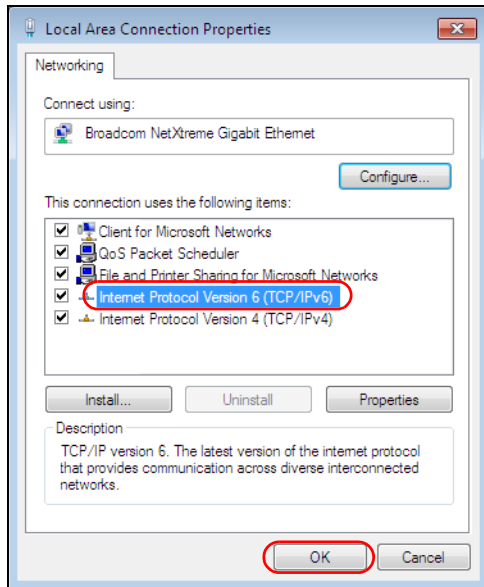
- 6 Now your computer can obtain an IPv6 address from a DHCPv6 server.

Example – Enabling IPv6 on Windows 7

Windows 7 supports IPv6 by default. DHCPv6 is also enabled when you enable IPv6 on a Windows 7 computer.

To enable IPv6 in Windows 7:

- 1 Select **Control Panel > Network and Sharing Center > Local Area Connection**.
- 2 Select the **Internet Protocol Version 6 (TCP/IPv6)** check box to enable it.
- 3 Click **OK** to save the change.



- 4 Click **Close** to exit the **Local Area Connection Status** screen.
- 5 Select **Start > All Programs > Accessories > Command Prompt**.
- 6 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:feaa:7125%11
                                172.16.100.254
```

APPENDIX D

Legal Information

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Regulatory Notice and Statement

United States of America



The following information applies if you use the product within USA area.

US Importer: Zyxel Communications, Inc., 1130 North Miller Street Anaheim, CA 92806-2001, <https://www.zyxel.com/us/en/>

Federal Communications Commission (FCC) EMC Statement

- This device complies with Part 15 of FCC rules. Operation is subject to the following two conditions:
 - (1) This device may not cause harmful interference.
 - (2) This device must accept any interference received, including interference that may cause undesired operations.
- Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.
- This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Canada

The following information applies if you use the product within Canada area.

Innovation, Science and Economic Development Canada ICES statement

CAN ICES-3 (A)/NMB-3(A)

European Union



The following information applies if you use the product within the European Union.

CE EMC statement

WARNING: This equipment is compliant with Class A of EN55032. In a residential environment this equipment may cause radio interference.

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	CR	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	Sweden	SE
Ireland	IE	Switzerland	CH
Italy	IT	Turkey	TR
Latvia	LV	United Kingdom	GB

Safety Warnings

- To avoid possible eye injury, do NOT look into an operating fiber-optic module's connector.
- Do NOT use this product near water, for example, in a wet basement or near a swimming pool.
- 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, use, 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 device or unit. Opening or removing 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 connecting cables carefully so that no one will step on them or stumble over them.
- Always 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 it to the right supply voltage (for example, 110V AC in North America or 230V AC in Europe). If the power adaptor or cord is damaged, it might cause electrocution. Remove it from the device and the power source, repairing the power adapter or cord is prohibited. Contact your local vendor to order a new one.
- Do NOT use the device outside, and make sure all the connections are indoors. There is a remote risk of electric shock from lightning.
- CAUTION: RISK OF EXPLOSION IF BATTERY IS REPLACED BY AN INCORRECT TYPE, DISPOSE OF USED BATTERIES ACCORDING TO THE INSTRUCTION. Dispose them at the applicable collection point for the recycling of electrical and electronic device. 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.
- Use ONLY power wires of the appropriate wire gauge for your device. Connect it to a power supply of the correct voltage.
- Fuse Warning! Replace a fuse only with a fuse of the same type and rating.
- The POE (Power over Ethernet) devices that supply or receive power and their connected Ethernet cables must all be completely indoors.
- 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 PERMANENTLY CONNECTED DEVICES, a readily accessible disconnect device shall be incorporated external to the device;
 - For PLUGGABLE DEVICES, the socket-outlet shall be installed near the device and shall be easily accessible.
- This device must be grounded by qualified service personnel. Never defeat the ground conductor or operate the device in the absence of a suitably installed ground conductor. Contact the appropriate electrical inspection authority or an electrician if you are uncertain that suitable grounding is available.
- If your device has an earthing screw (frame ground), connect the screw to a ground terminal using an appropriate AWG ground wire. Do this before you make other connections.
- If your device has no earthing screw, but has a 3-prong power plug, make sure to connect the plug to a 3-hole earthed socket.
- When connecting or disconnecting power to hot-pluggable power supplies, if offered with your system, observe the following guidelines:
 - Install the power supply before connecting the power cable to the power supply.
 - Unplug the power cable before removing the power supply.
 - If the system has multiple sources of power, disconnect power from the system by unplugging all power cables from the power supply.
- CLASS 1 LASER PRODUCT (for products with mini-GBIC slots or laser products, such as fiber-optic transceiver and GPON products).

- PRODUCT COMPLIES WITH 21 CFR 1040.10 AND 1040.11. (for products with mini-GBIC slots or laser products, such as fiber-optic transceiver and GPON products)
- APPAREIL À LASER DE CLASS 1 (for products with mini-GBIC slots or laser products, such as fiber-optic transceiver and GPON products).
- PRODUIT CONFORME SELON 21 CFR 1040.10 ET 1040.11. (for products with mini-GBIC slots or laser products, such as fiber-optic transceiver and GPON products)

Important Safety Instructions

- 1 Warning! Energy Hazard. Remove all metal jewelry, watches, and so on from your hands and wrists before serving this device.

- 2 Caution! The RJ-45 jacks are not used for telephone line connection.

- 3  Hazardous Moving Parts. Keep body parts away from fan blades.

- 4  Hot Surface. Do not touch.

- 1 Avertissement: Risque de choc électrique. Retirer tout bijoux en métal et votre montre de vos mains et poignets avant de manipuler cet appareil.

- 2 Attention: Les câbles RJ-45 ne doivent pas être utilisés pour les connections téléphoniques.

- 3  Mobilité des pièces détachées. S'assurer que les pièces détachées ne sont pas en contact avec les pales du ventilateur.

- 4  Surface brûlante. Ne pas toucher.

Environment Statement

European Union – 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銷售至台灣地區

- 這是甲類的資訊產品，在居住的環境中使用時，可能會造成射頻干擾，在這種情況下，使用者會被要求採取某些適當的對策。」

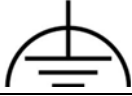
安全警告 – 為了您的安全，請先閱讀以下警告及指示：

- 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、食物或其他不合適的材料。
- 雷雨天氣時，不要安裝、使用或維修此設備。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。
- 如果更換不正確之電池型式，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。
- 請插在正確的電壓供給插座 (如：北美 / 台灣電壓 110V AC，歐洲是 230V AC)。
- 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。
- 設備必須接地，接地導線不允許被破壞或沒有適當安裝接地導線，如果不確定接地方式是否符合要求可聯繫相應的電氣檢驗機構檢驗。
- 如果您提供的系統中有提供熱插拔電源，連接或斷開電源請遵循以下指導原則：
 - 先連接電源線至設備連，再連接電源。
 - 先斷開電源再拔除連接至設備的電源線。
 - 如果系統有多個電源，需拔除所有連接至電源的電源線再關閉設備電源。
- 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): AC is an electric current in which the flow of electric charge periodically reverses direction.
	Direct current (DC): DC is the unidirectional flow or movement of electric charge carriers.
	Earth; ground: A wiring terminal intended for connection of a Protective Earthing Conductor.
	Class II equipment: 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. You may also refer to the warranty policy for the region in which you bought the device at http://www.zyxel.com/web/support_warranty_info.php.

Registration

Register your product online at www.zyxel.com to receive email notices of firmware upgrades and related information.

Trademarks

ZyNOS (Zyxel Network Operating System) and ZON (Zyxel One Network) are registered trademarks of Zyxel Communications, Inc. Other trademarks mentioned in this publication are used for identification purposes only and may be properties of their respective owners.

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