



RAK7248 Raspberry Pi LoRaWAN Gateway User Guide

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7248 Raspberry Pi Lora WAN Gateway
User Guide




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RAK7248 Raspberry Pi Lora WAN Gateway

What Do You Need?

1. RAK7248/RAK7248C/RAK7248P Westgate Developer D4H Gateway
2. 16 GB SD Card + Card Reader
3. 5 V at least 2.5 A Micro USB Power Supply
4. A Windows/Mac OS/Linux Computer
5. Latest RAK7248 Firmware 

What's Included in the Package?




Figure 2: RAK7248/P Westgate Developer D4H Gateway package contents



Figure 3: RAK7248C Was Gate Developer D4H Gateway package contents

Product Configuration

After burning the firmware image onto the SD Card, make sure you have inserted the SD Card into the RAK7248 Westgate Developer D4H Gateway and have the Lora, and GPS Antenna connected. Refer to the guide on how to burn the image  .

⚠ WARNING

Before powering the Raspberry Pi 4, you should connect the Lora, LTE (only in the Cellular variant), and the GPS antennas. Not doing so might damage the boards.

After the antennas are attached and the SD card is inserted into the Raspberry Pi, you can safely power on the gateway.

Wi-Fi AP Mode

By default, the gateway will work in Wi-Fi AP Mode, which means you can find an SSID named Rakwireless_XXXX on your PC Wi-Fi Network List.

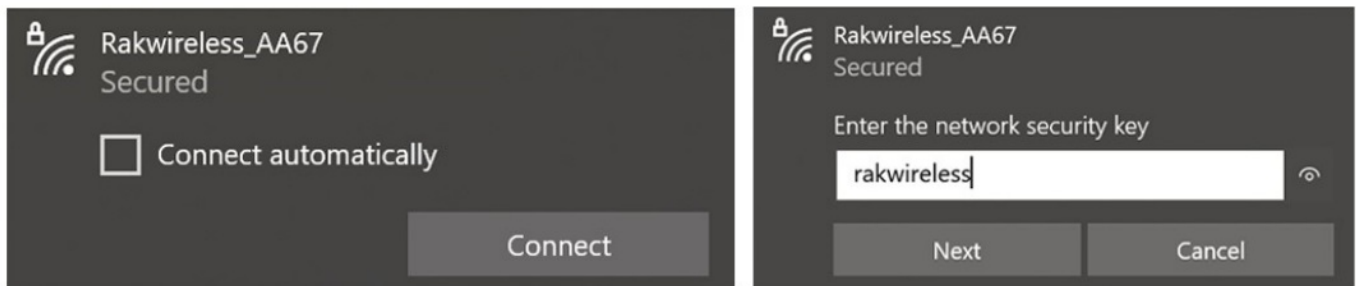


Figure 4: RAKwireless access point

NOTE

XXXX is the last 2 bytes of your RAK7248's WIFI MAC address. Connect to this Wi-Fi SSID using the password provided below. Take note of the default IP address of the gateway provided below as this will be needed in connecting via SSH. By default, the gateway will work in Wi-Fi AP Mode, which means you can find an SSID named Rakwireless_XXXX on your PC Wi-Fi Network List.

- Wi-Fi Password: rakwireless
- Default IP Address: 192.168.230.1

Raspberry Pi 4 Ethernet Port

You can also connect your PC with the gateway through an Ethernet cable. By default, the IP address of the gateway's Ethernet interface is 192.168.10.10 , so you need to set the IP address of your PC's Ethernet to the same network segment, for example, 192.168.10.20 .

1. To do this on a Windows PC, go to **Control Panel -> Network and Internet -> Network** and Sharing Center and click Ethernet.

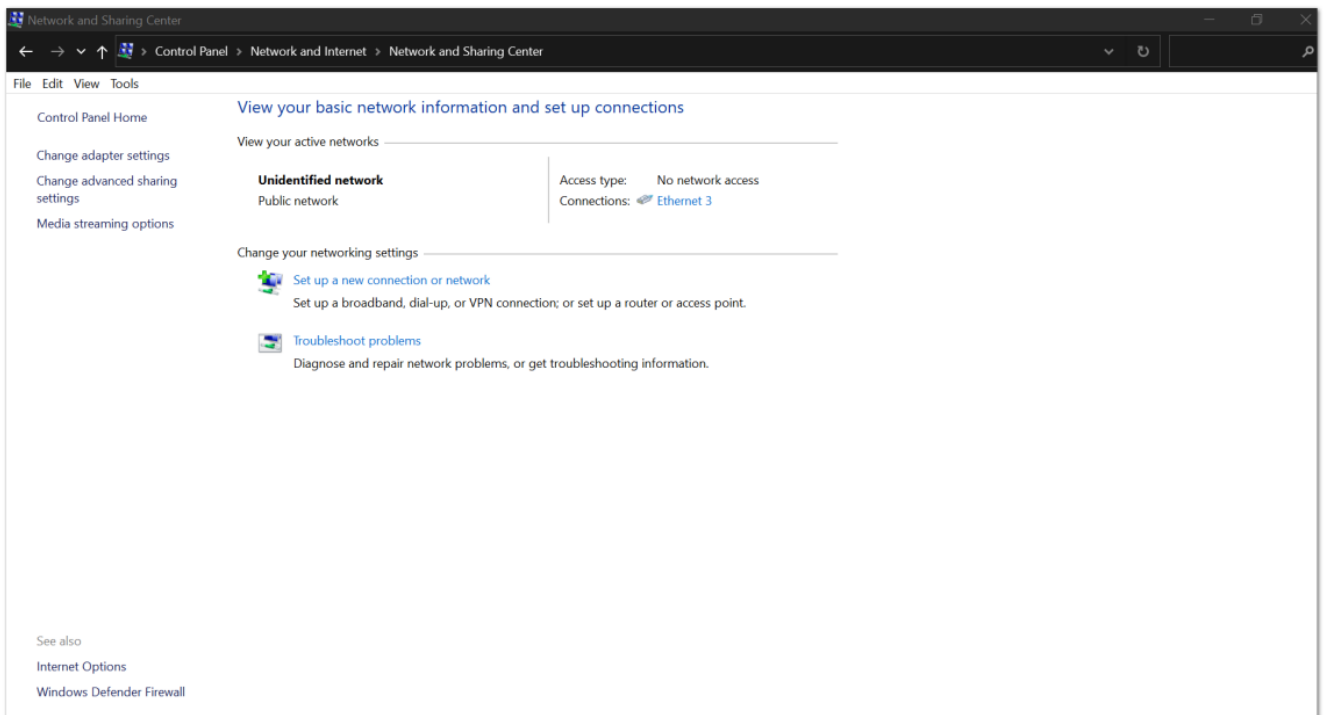


Figure 5: Network and sharing center

2. Click Properties, then select Internet Protocol Version 4 (TCP/IPv4).

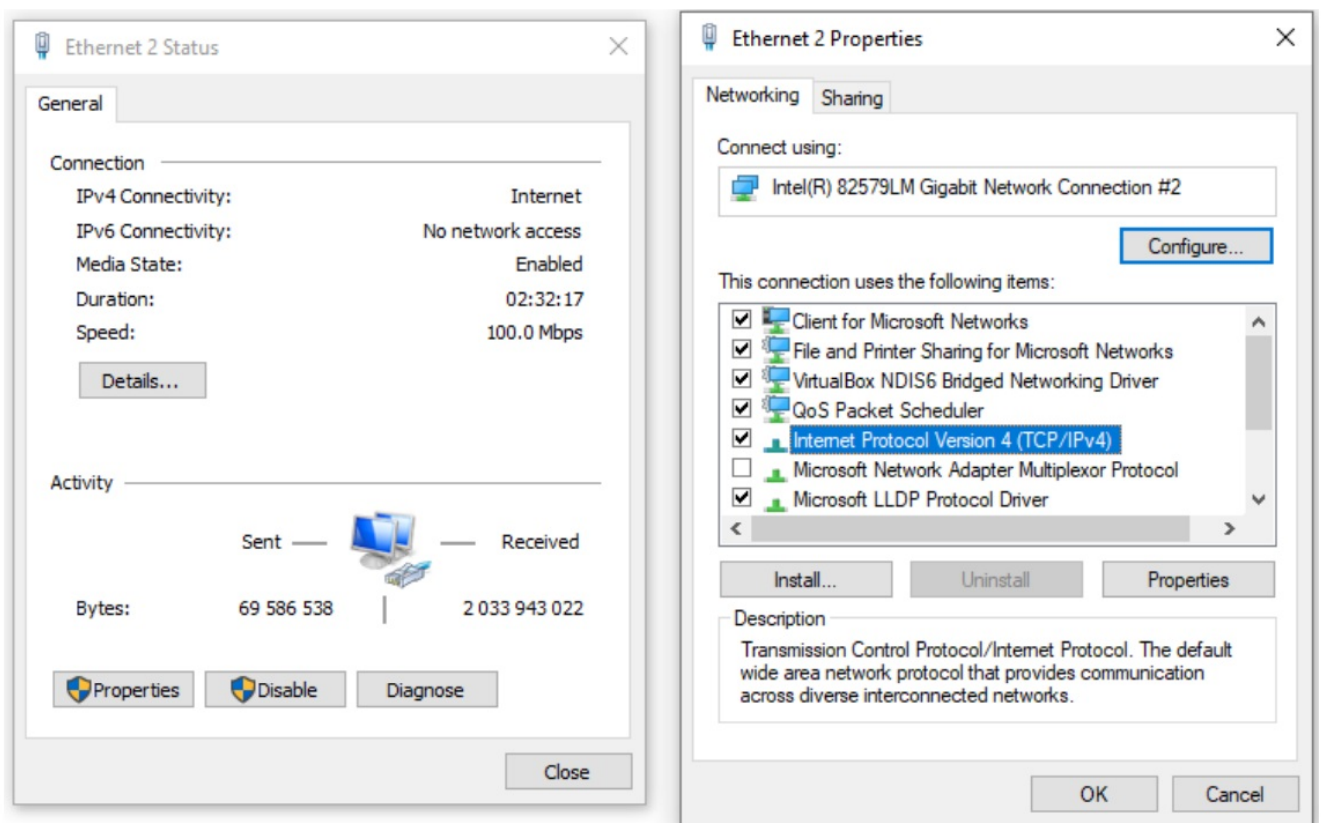


Figure 6: Ethernet properties

3. By default, the PC will obtain an IP Address automatically. Click Option Use the following IP Address and enter the IP address 192.168.0.10.20 then press OK.

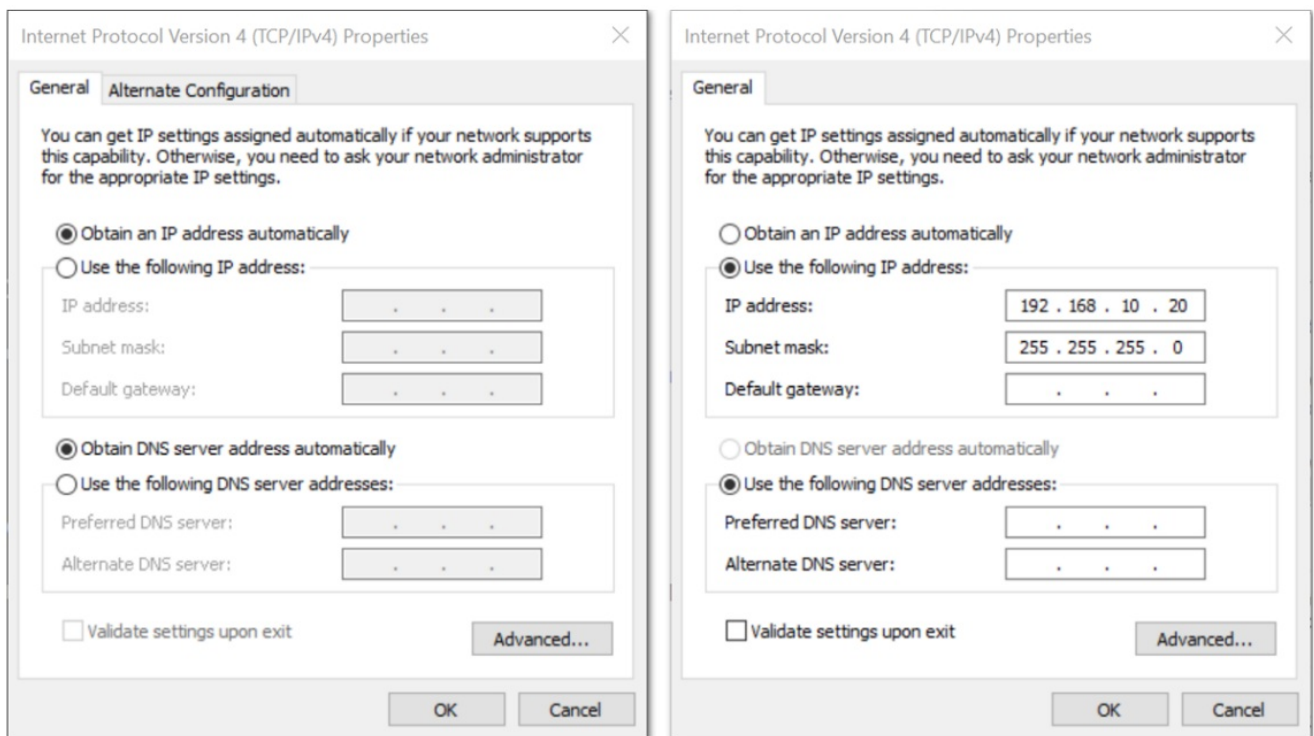


Figure 7: TCP/IPv4 Properties

Now, you should be able to access your gateway from your PC successfully using the IP Address 192.168.10.10 through SSH.

Log into the Gateway Windows OS

SSH (Secure Shell) is typically used to log in to a remote machine and execute commands. There are a lot of free and good SSH Clients out there, namely Putty , BitVise SSH Client , Maxterm and many more. Feel free to choose one that fits your needs, but for this guide, you will be using Putty

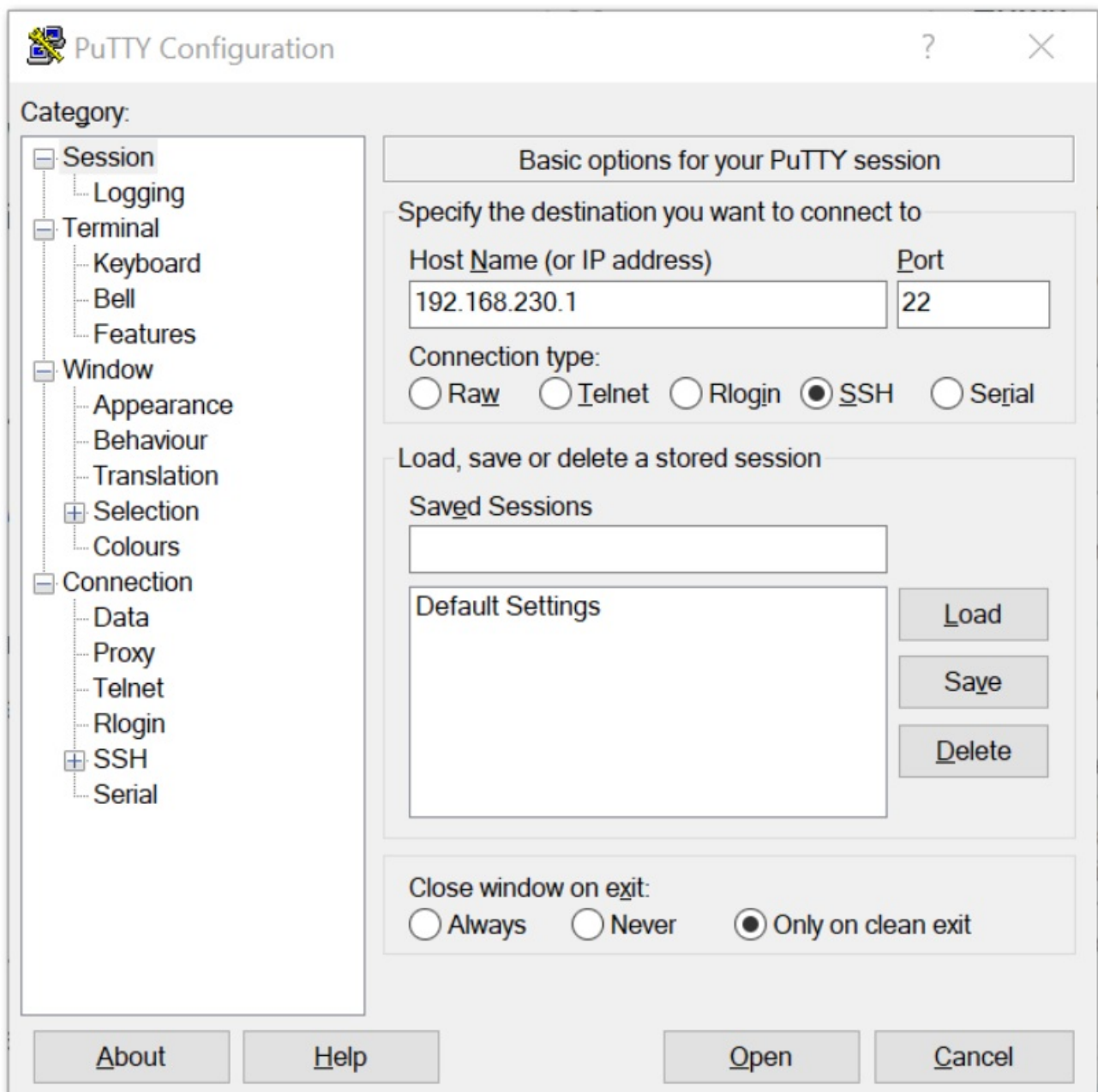


Figure 8: Putty Software for SSH in Windows

- If you have connected to the gateway through Wi-Fi AP Mode, the IP Address is 192.168.230.1
- If you have connected to the gateway through Ethernet, the IP Address is 192.168.10.10
- It will then prompt you to enter the username and password. The default username and password are:
- Username: pi
- Password: raspberry


```
The programs included with the Debian GNU/Linux system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*/copyright.

Debian GNU/Linux comes with ABSOLUTELY NO WARRANTY, to the extent
permitted by applicable law.

=====
IoT Made Easy
=====

Last login: Mon Nov  1 10:56:54 2021 from 192.168.0.112

SSH is enabled and the default password for the 'pi' user has not been changed.
This is a security risk - please login as the 'pi' user and type 'passwd' to set
a new password.

pi@rak-gateway:~ $
```

Figure 9: Command line after log in

Mac OS

Open the Terminal of Mac OS. Launch the Terminal application found in “the /Applications/Utilities/” directory. You can also launch it from Spotlight by hitting Command + Spacebar and typing Terminal, and then return:

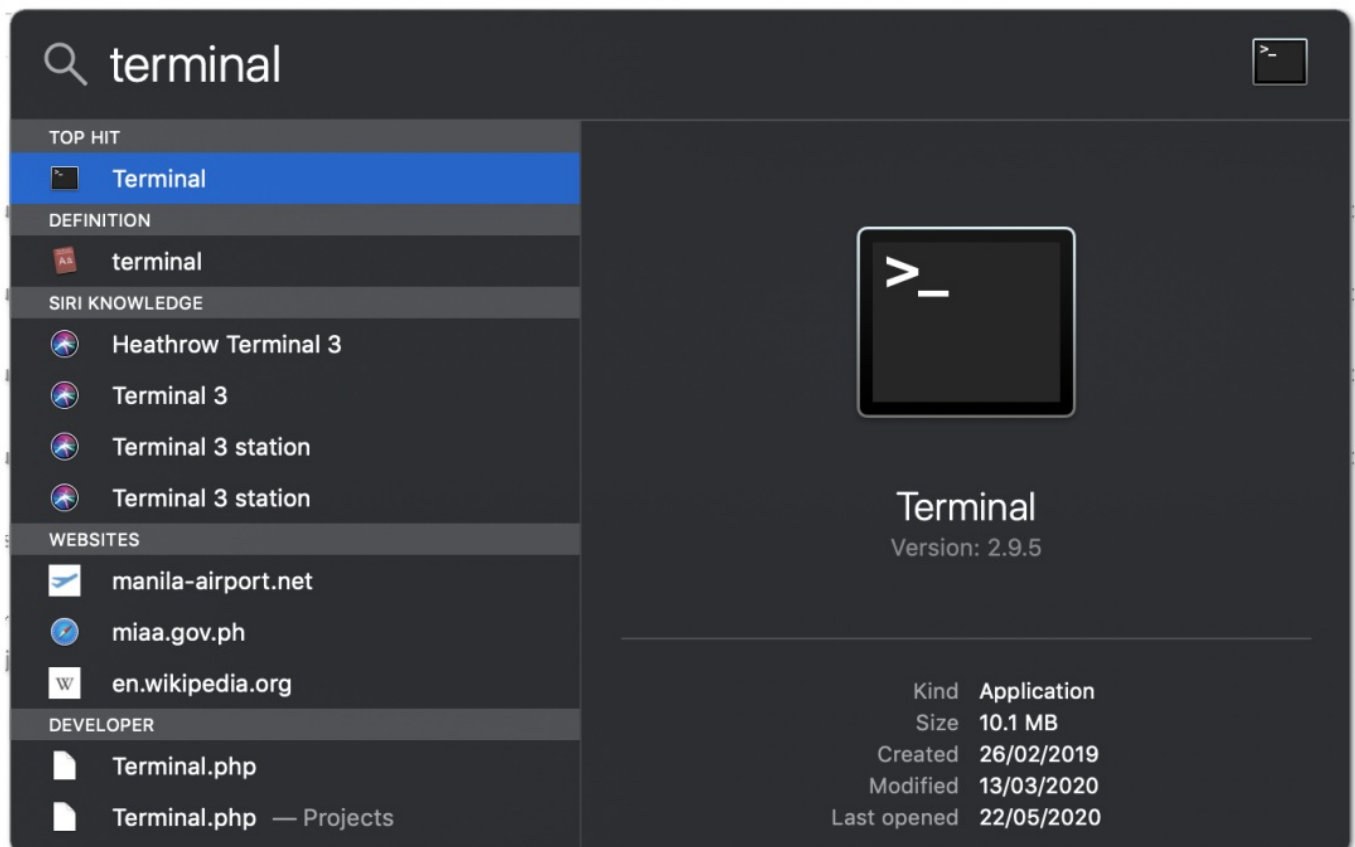


Figure 10: Opening terminal in Mac OS

Open the terminal of Mac OS. Enter root mode by typing the following command:

```
sudo -i
```

Linux OS

If the OS of your PC is Linux, you should do the same as the Mac OS, except the root mode.

Accessing the Internet

Assuming you have successfully logged into your gateway using SSH. Enter the following command in the command line:

```
sudo gateway-config
```

You will then see a page like the following picture:

Documentation Center

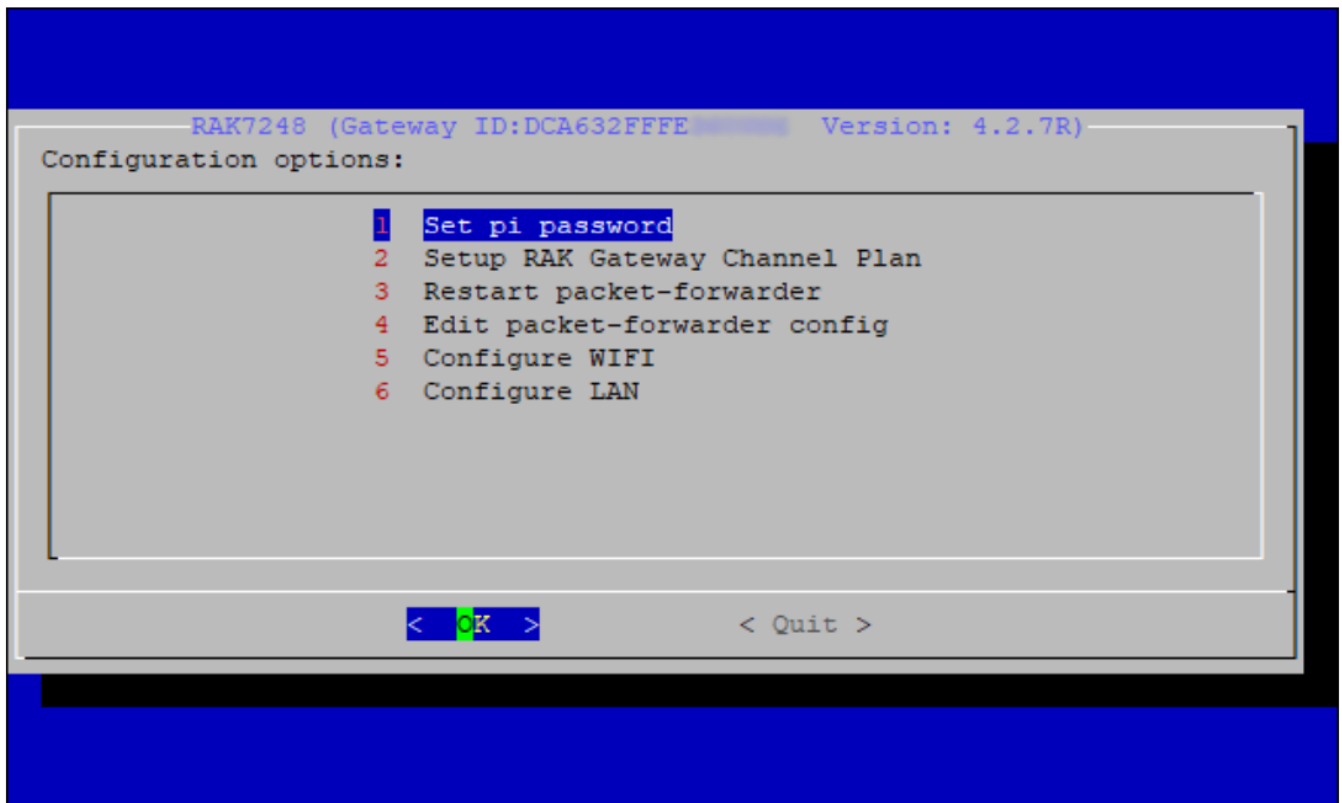


Figure 11: Configuration options for the gateway

1. Set pi password- used to set/change the password of the gateway.
2. Set RAK Gateway Channel Plan – used to configure the frequency, which the gateway will operate on, and the LoRaWAN Server which the gateway will work with.
3. Restart packet-forwarder – used to restart the LoRa packet forwarder.
4. Edit packet-forwarder config – used to open the global conf.json file, to edit LoRaWAN parameters manually.

5. Configure WIFI – used to configure the Wi-Fi settings in order to connect to a network.
6. Configure LAN – used to configure the Ethernet adapter settings.****

Connect through Wi-Fi

If you want to connect through Wi-Fi, it can easily be done with the Wireless capabilities of the Raspberry Pi 4 by choosing 5 Configure WIFI. By default, the RAK7248 WisGate Developer D4H Gateway works in Wi-Fi AP Mode. For the gateway to connect to the router, it must work in Wi-Fi Client Mode.

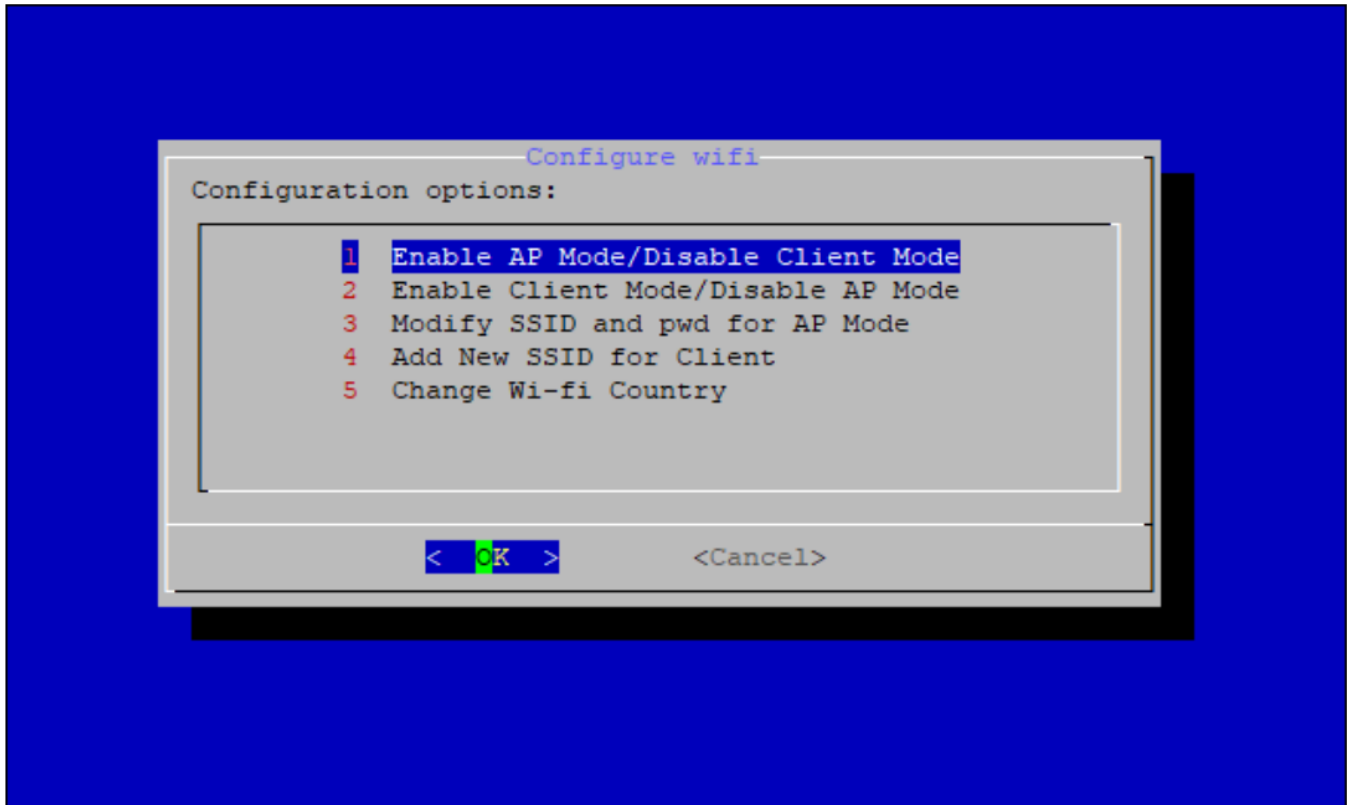


Figure 12: Configuration options for Wi-Fi

There are 5 options to choose from in the Wi-Fi configuration menu:

1. Enable AP Mode/Disable Client Mode – the gateway will work in Wi-Fi Access Point Mode after rebooting while the Wi-Fi Client Mode will be disabled (this is the default mode).
2. Enable Client Mode/Disable AP Mode – the gateway will work in Wi-Fi Client mode after rebooting, while Wi-Fi AP Mode will be disabled.
3. Modify SSID and pwd for AP Mode – used to modify the SSID and password of the Wi-Fi AP. Only works if the Wi-Fi AP Mode is enabled.
4. Add New SSID for Client – this is used if you want to connect to a new Wi-Fi Network. Only works in Wi-Fi Client mode.
5. Change Wi-Fi Country – this is used to modify the Resident Country to match Wi-Fi standards.

⚠ WARNING

To enable Wi-Fi Client Mode, you have to disable AP Mode first.

Once Wi-Fi AP Mode has been disabled by choosing 2 Enable Client Mode/Disable AP Mode, you can now then connect to a new Wi-Fi Network by choosing 4 Add New SSID for Client.

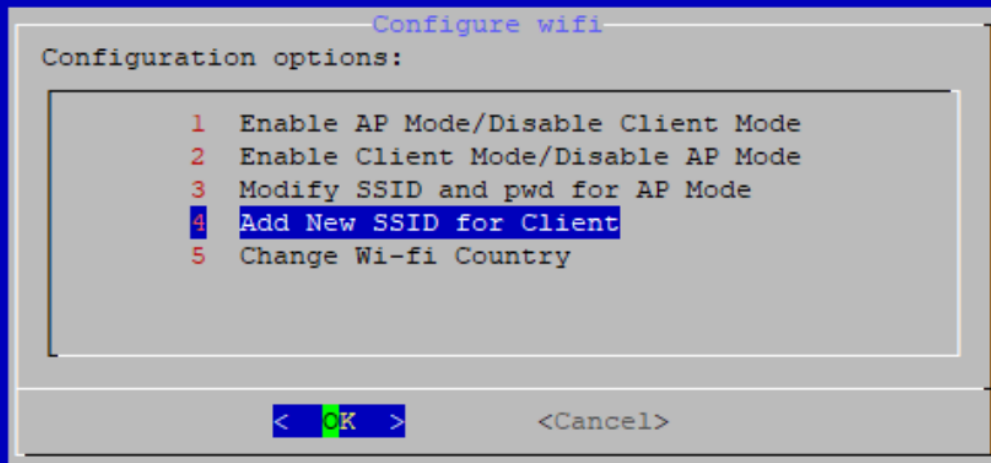


Figure 13: Add a new SSID

Start by selecting your country of residence:

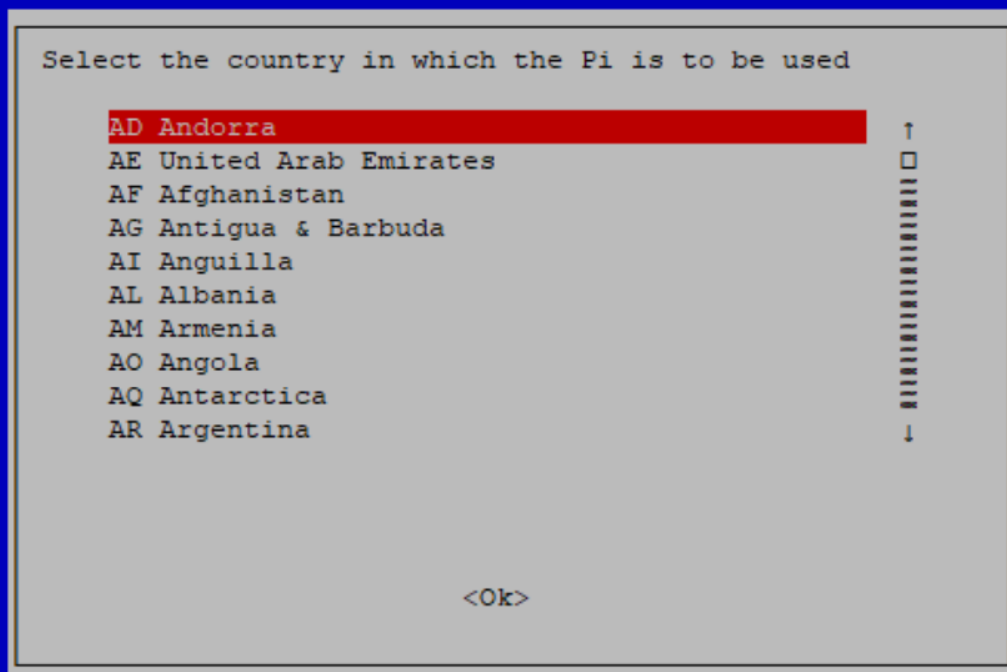


Figure 14: Selecting country of residence

Enter the SSID of the network you want to connect:

⚠ WARNING

Make sure to input the correct Wi-Fi SSID and Password, or you will not be able to connect to the RAK7248 again via SSH in Wi-Fi AP Mode. If stuck in this situation, follow the procedure listed in the Reverting to Wi-Fi AP Mode

section, which is applicable for all Raspberry Pi-based gateways to work again in Wi-Fi AP mode.

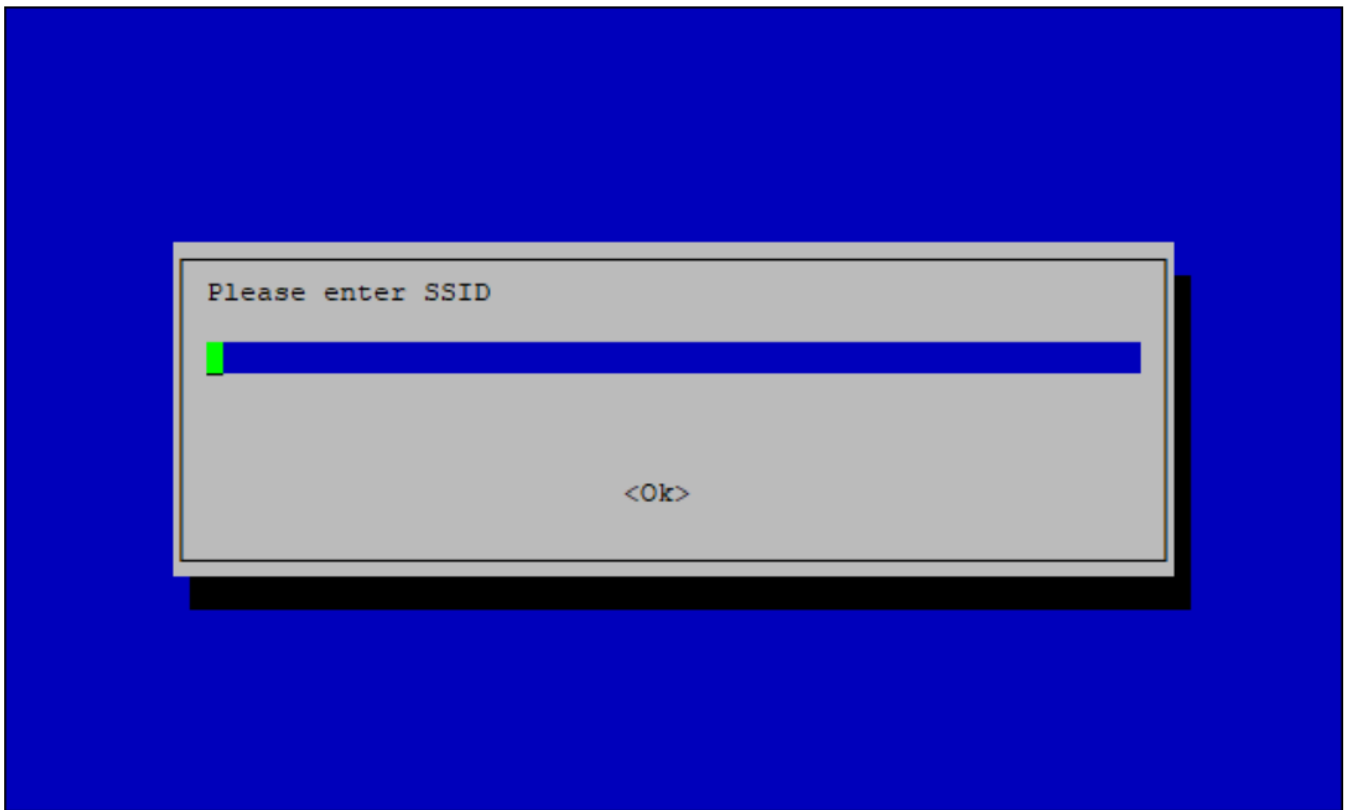


Figure 15: SSID of the Network you want to connect to

Type the password. If there is none, leave the field empty.

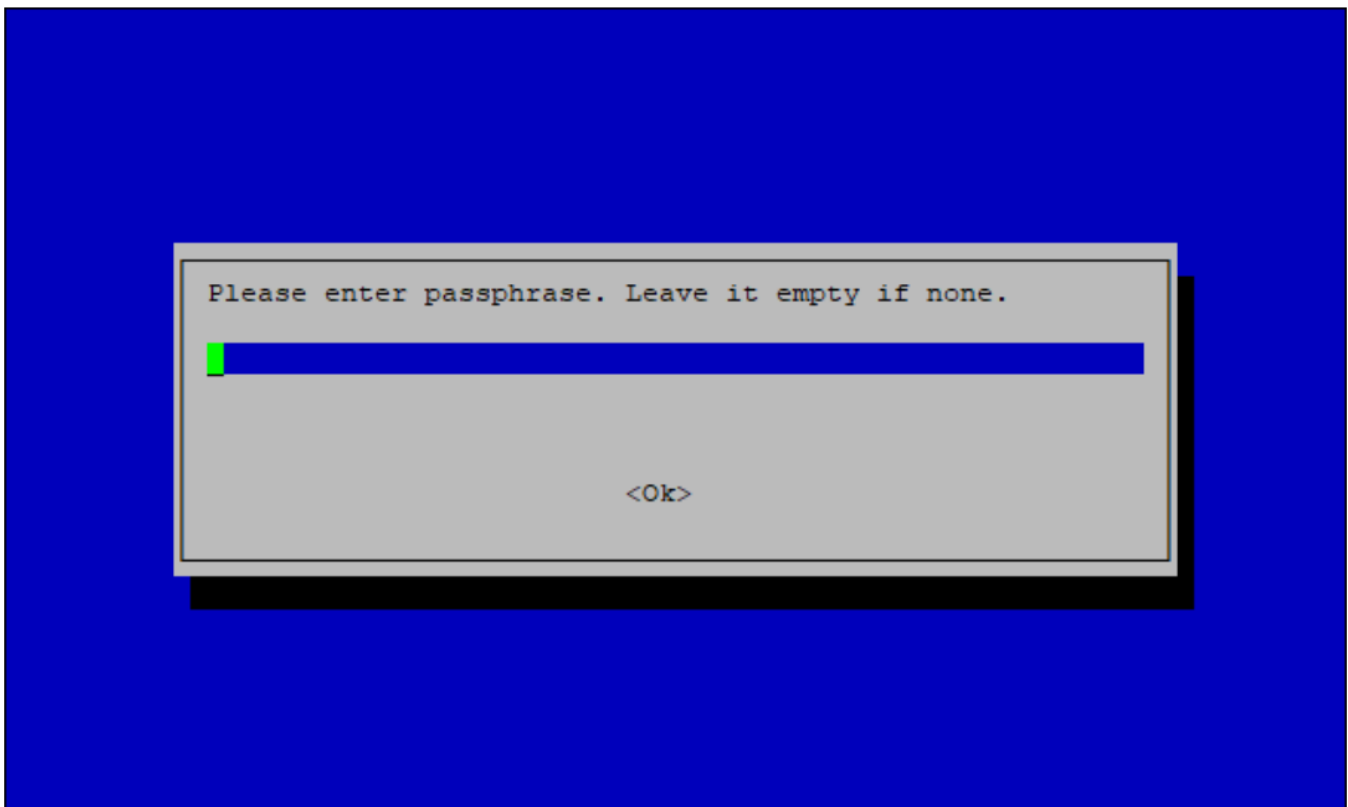


Figure 16: Wi-Fi password

Connect through Ethernet

- In the main configuration menu, choose 6 Configure LAN. This will let you set up a static IP address for the gateway's Ethernet adapter.
- Type a static IP Address according to the IP address of the router you want to connect to. Note that the gateway and the router must be in the same network segment. Otherwise, the connection will fail.
- By default, the IP Address of the gateway's Ethernet is 192.168.10.10 .

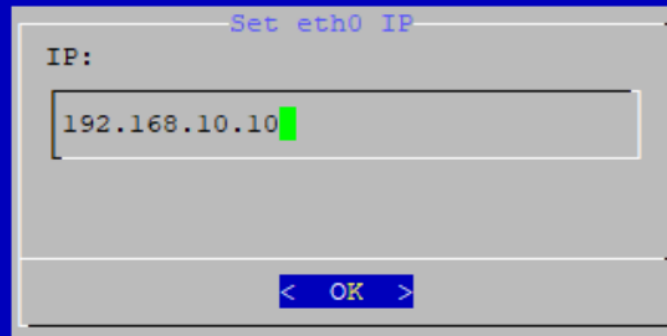


Figure 17: Default gateway Ethernet IP Address

Then configure the IP address of the router. This is the LAN interface IP address of the router.

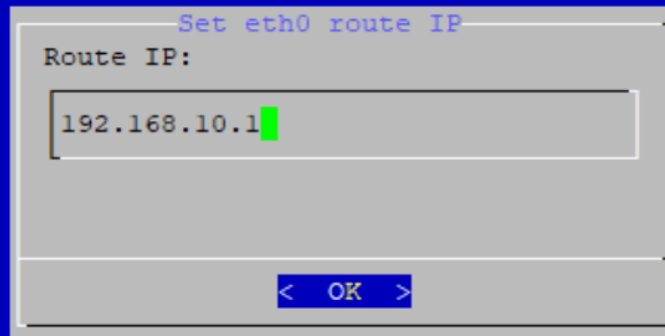


Figure 18: Router LAN IP

Press OK and the success message will appear.

After reboot, the gateway will connect to the router successfully through Ethernet.

Reboot

Lastly, reboot the gateway using the command shown below and put it in the command line.

```
sudo reboot
```

Optional Configuration

The configurations in this section are only optional and situational.

Reverting to Wi-Fi AP Mode

If you have entered either or both incorrect Wi-Fi SSID and Password in the Wi-Fi Client Mode setup for the RAK7248 WisGate Developer D4H Gateway to connect to the router, follow this set of steps to work again in Wi-Fi

AP Mode and redo the setup.

- Remove the SD Card from your RAK7248 WisGate Developer D4H Gateway and insert it into your PC. Your PC should be able to detect it the same way as on the image below:\

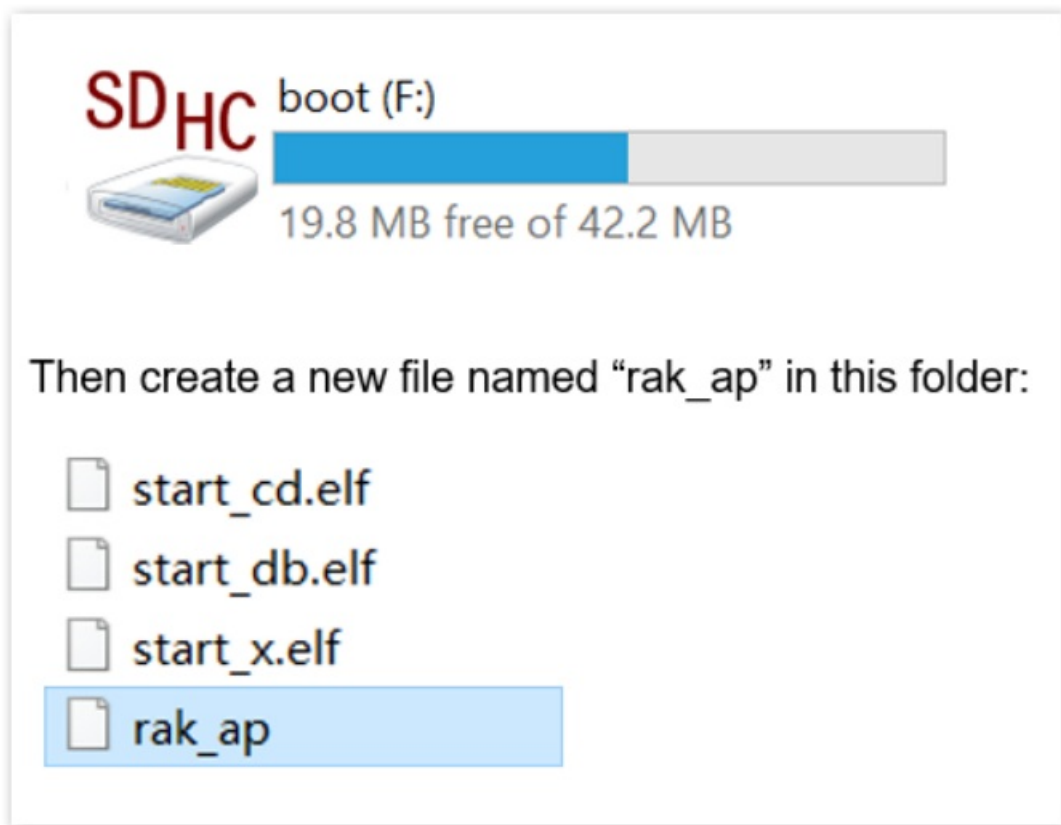


Figure 19: Creating rak_ap file to your SD Card

- Using your Command Prompt or Terminal, navigate to your SD Card and type the following command to generate the rakap file.
cd > rak_ap
- Check if the rak_ap file is created successfully. If so, re-insert the SD Card into your RAK7248 WisGate Developer D4H Gateway, and it should work again in Wi-Fi AP Mode.

Configuring the Gateway

If you have successfully logged into your gateway using SSH, enter the following command in the command line:
`sudo gateway-config`

You will see the following page:

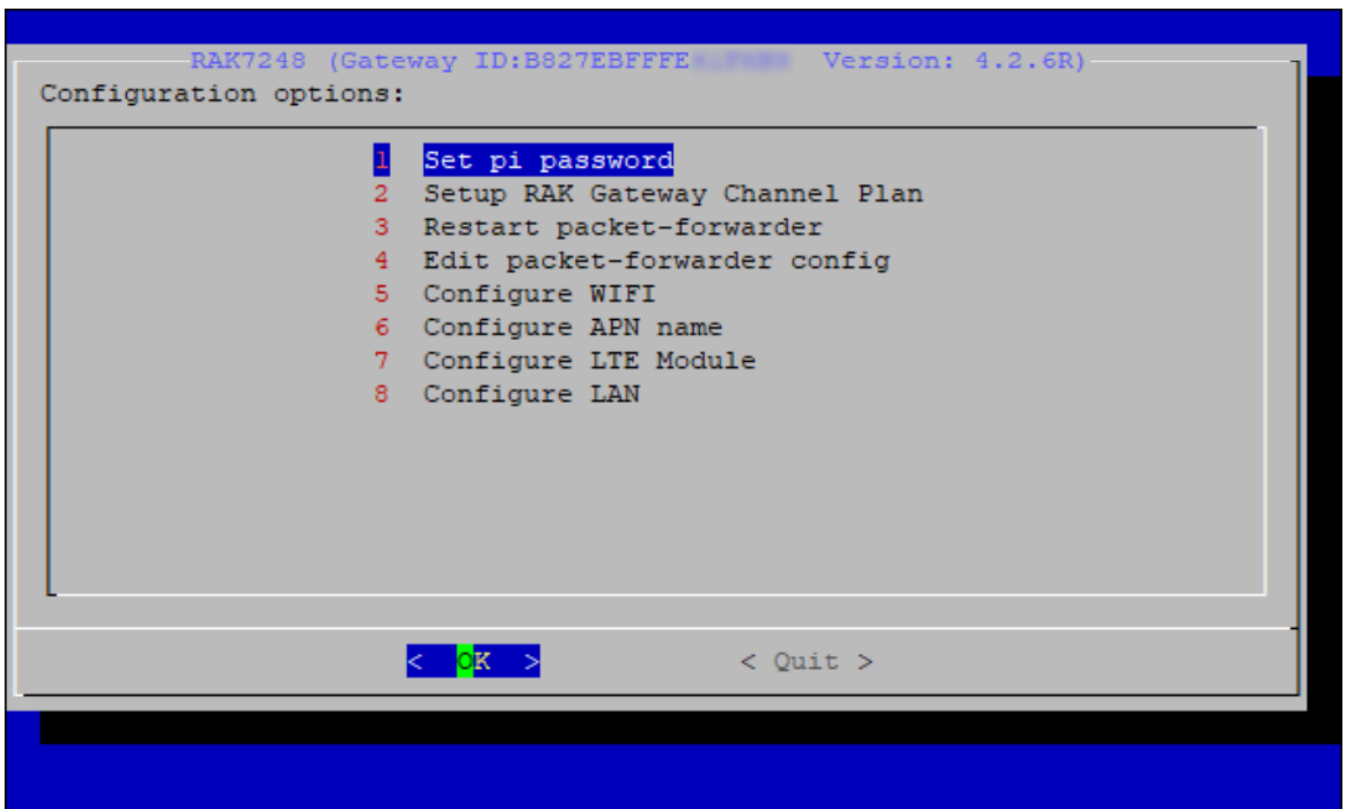


Figure 20: Configuration options for the gateway

1. Set pi password – used to set/ change the password of the gateway.
2. Set up RAK Gateway Channel Plan – used to configure the frequency, which the gateway will operate on, and the LoRaWAN Server which the gateway will work with.
3. Restart packet-forwarder- used to restart the LoRa packet forwarder.
4. Edit packet-forwarder config – used to open the global_conf.json file, to edit LoRaWAN parameters manually.
5. Configure WIFI – used to configure Wi-Fi settings in order to connect to a network.
6. Configure LAN – used to configure the Ethernet adapter settings.

NOTE

A unique ID will be generated for the gateway. This is also called gateway EUI in the figure above, and it is essential for registering the gateway with any LoRa Network Server (TTN, ChirpStack).

There is yet another way to get your Gateway ID, by just entering the following command in the command line.

```
sudo gateway-config
```

When generating the ID by using the command, you will see the following:

```
pi@rak-gateway:~ $ gateway-version
Raspberry Pi 4 Model B Rev 1.1, OS "10 (buster)", 5.4.79-v7l+.
RAKWireless gateway RAK7248 no LTE version 4.2.7R install from firmware.
Gateway ID: DCA632FFFE .
pi@rak-gateway:~ $
```

Figure 21: Gateway ID using the command line

Setting a New Password for the Gateway

It is a good security practice to change the default password Raspberry Pi which is the same for all Raspberry Pi devices.

1. First, choose 1 Set pi password option referred to on the image below.

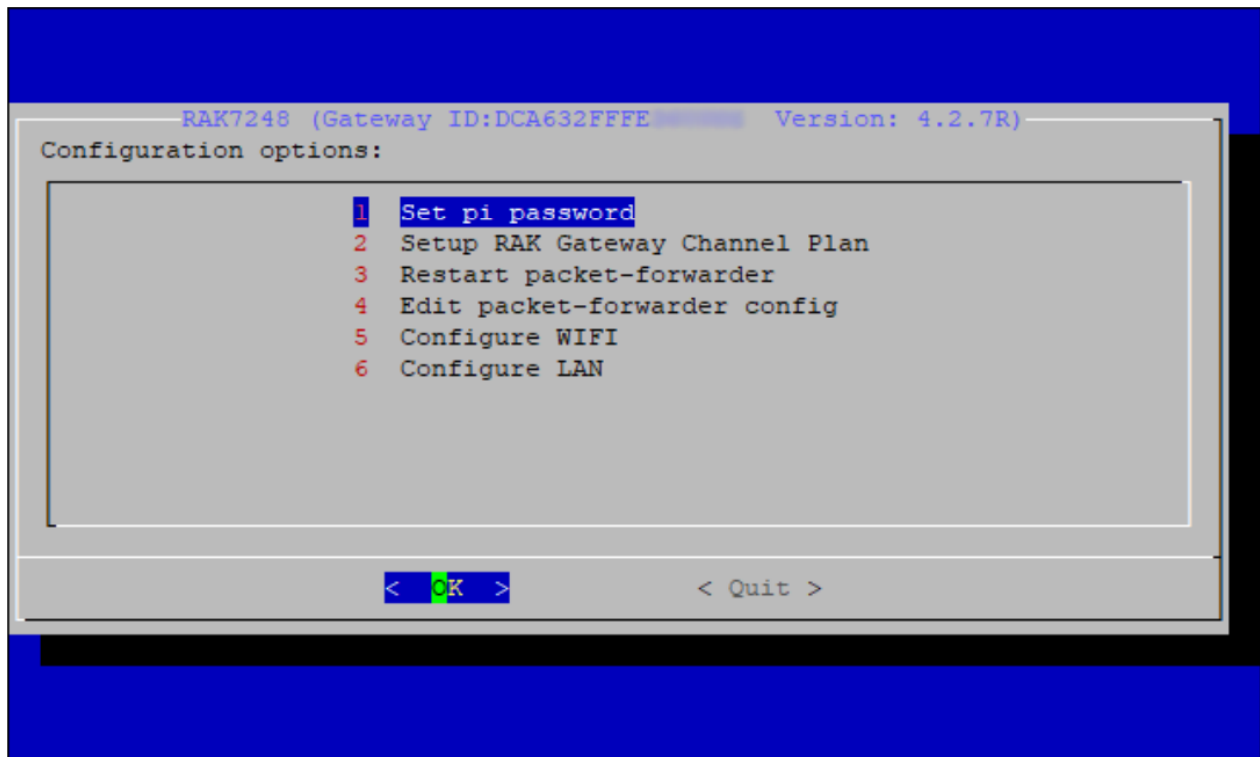


Figure 22: Set Pi password

2. Next, press Yes, and you will be asked to enter your new password twice then click Enter.

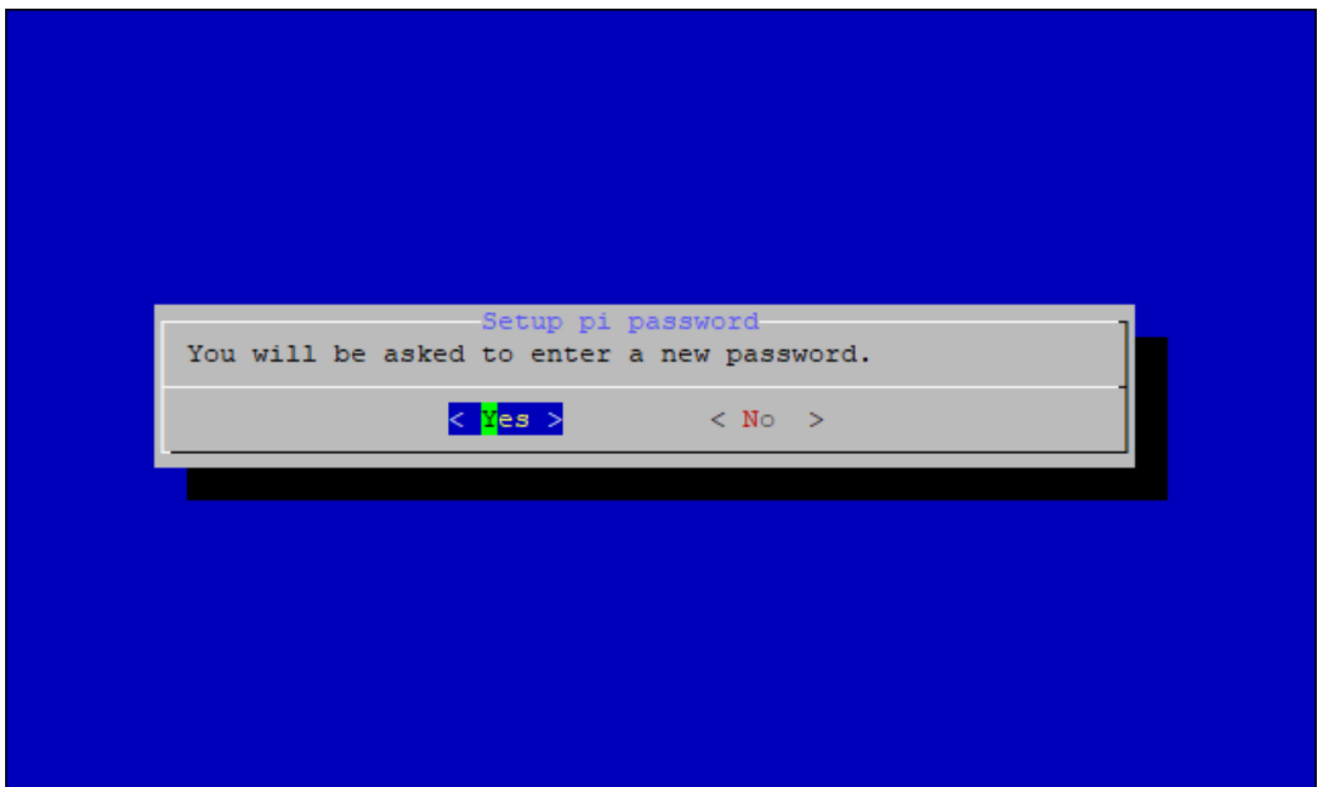


Figure 23: Confirm password change

3. The success message for changing the password will then pop up.

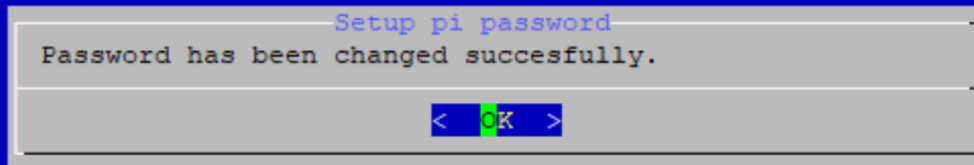


Figure 24: Successful password change

Setup RAK Gateway Channel Plan

This menu allows you to select your LoRa frequency band and one of the two available Networks Server options by choosing 2 Setup RAK Gateway Channel Plan.

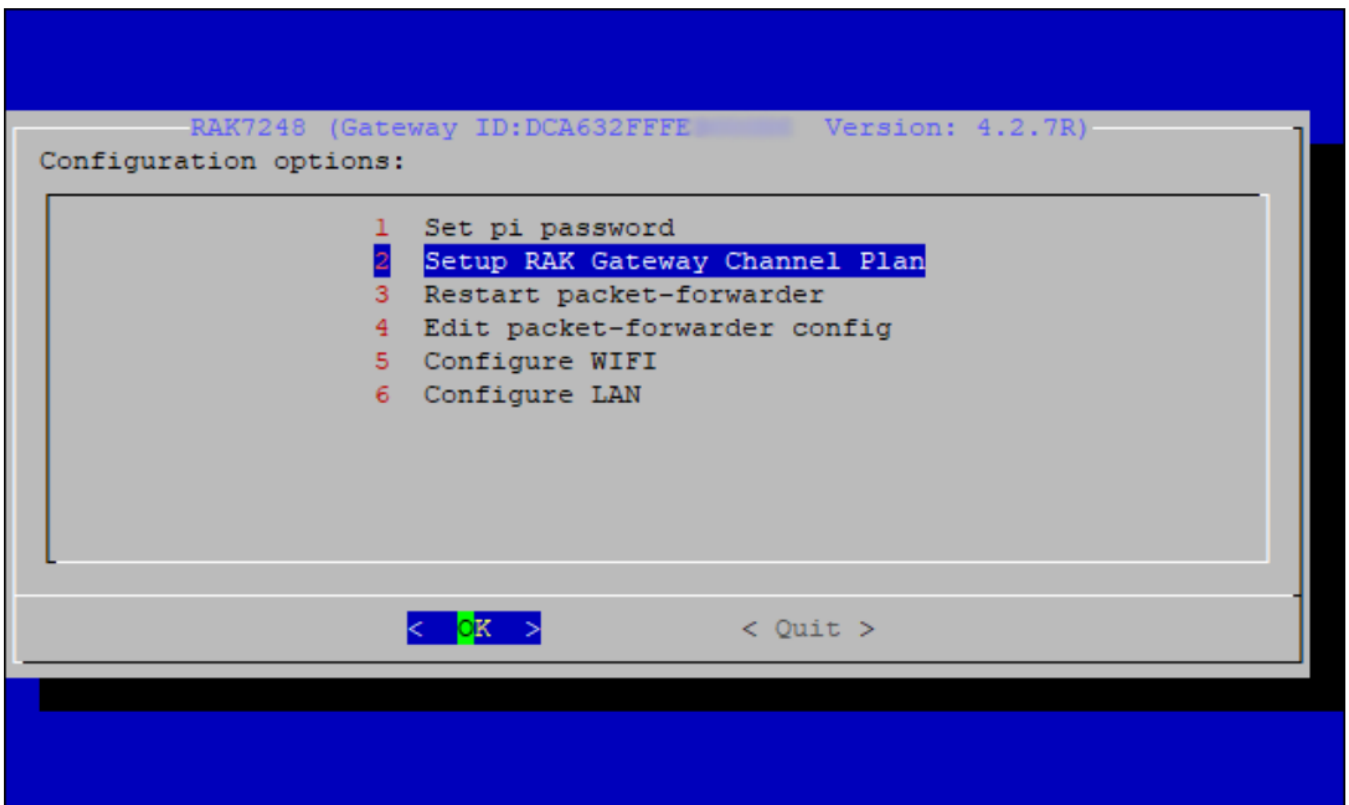


Figure 25: Choosing Setup RAK Gateway Channel Plan

You can choose one of two supported LoRa Servers: TTN or ChirpStack.

Server is TTN

NOTE: If you want to use the ChirpStack for your Network server, head to the next section: Server is ChirpStack

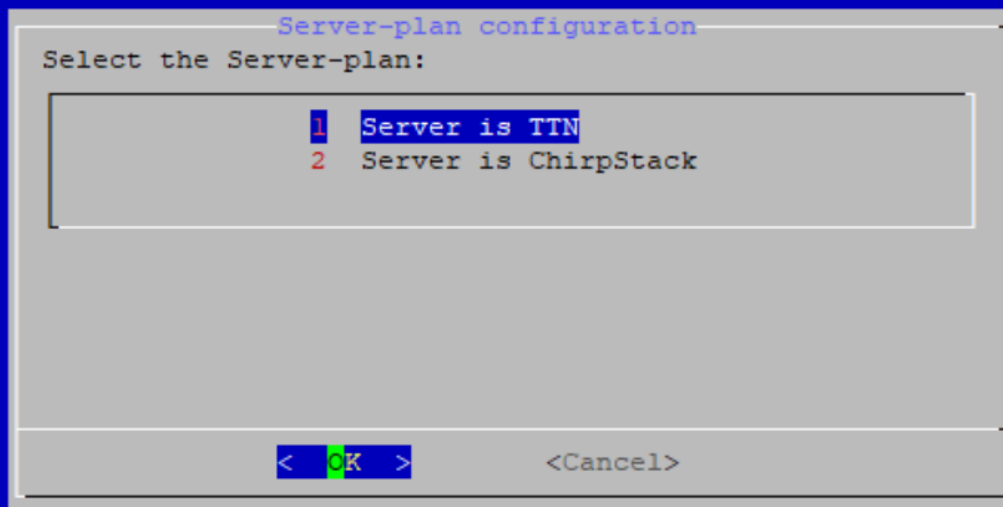


Figure 26: Server is TTN

If you choose TTN as the LoRa Server, you will see the same page, as shown in Figure 27. Visit the LoRa Alliance Regional Parameter for more information on your local frequency plan. This will allow you to choose the correct plan.

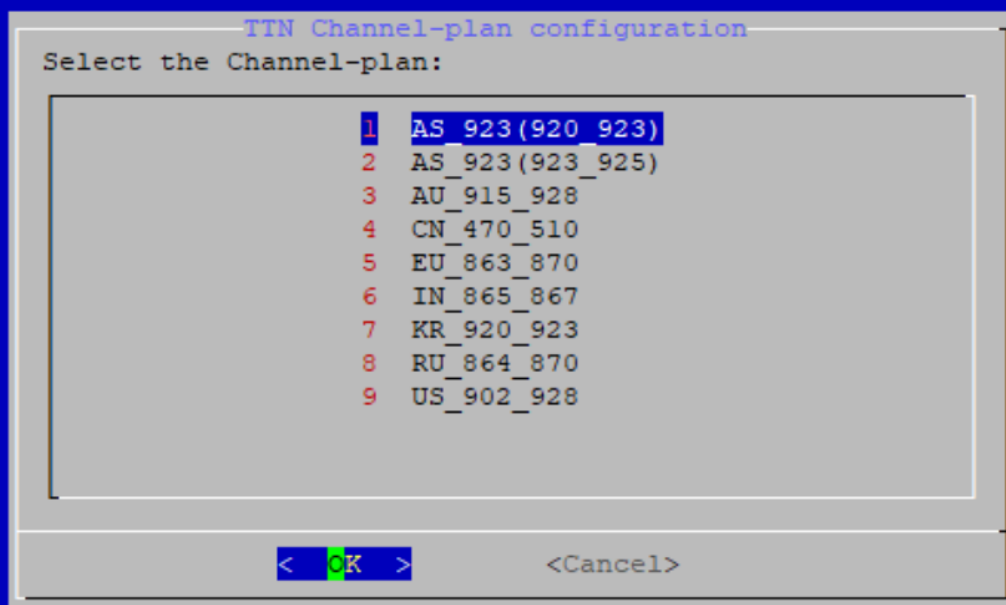


Figure 27: Selecting the TTN channel plan

After choosing the correct frequency, the success message will appear, as shown in Figure 28.

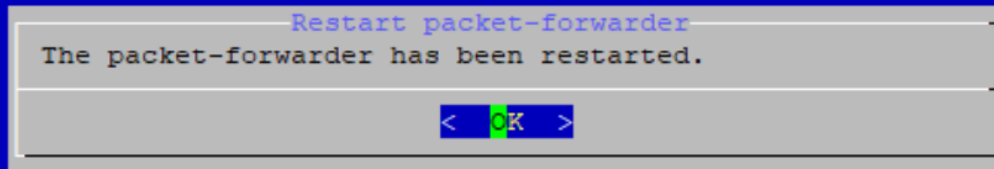


Figure 28: Selecting the TTN channel plan

NOTE

- When a Channel plan is selected, the gateway is configured to connect to the nearest cluster to the region. If new clusters are presented, the channel plans will be updated. For now, the only available clusters are:
eu1.cloud.thethings.network (European)
au1.cloud.thethings.network (Australian)
nam1.cloud.thethings.network (North American)
- If you want to use another cluster, you can change the server address by selecting 4 Edit packet-forwarder config.
- If you want to use TTN for the LoRa Network server, you can skip the If the Server is ChirpStack section and head to registering the gateway in TTN.

Server is ChirpStack

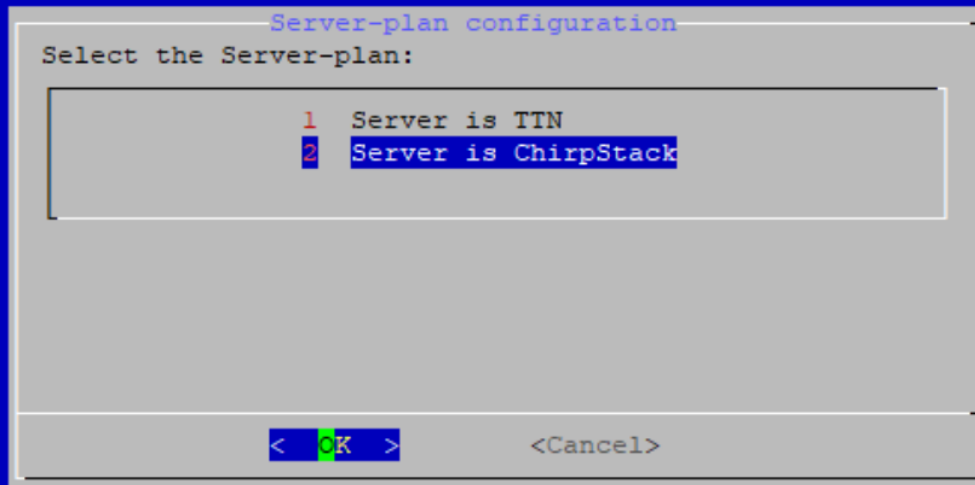


Figure 29: Server is ChirpStack

If you choose ChirpStack as your LoRa Server, you will see the following page with two options available:

1. ChirpStack Channel Plan Configuration – used to configure your Regional Frequency Band.
2. ChirpStack ADR Configure – used to enable/disable the Adaptive Data Rate (ADR) functionality.

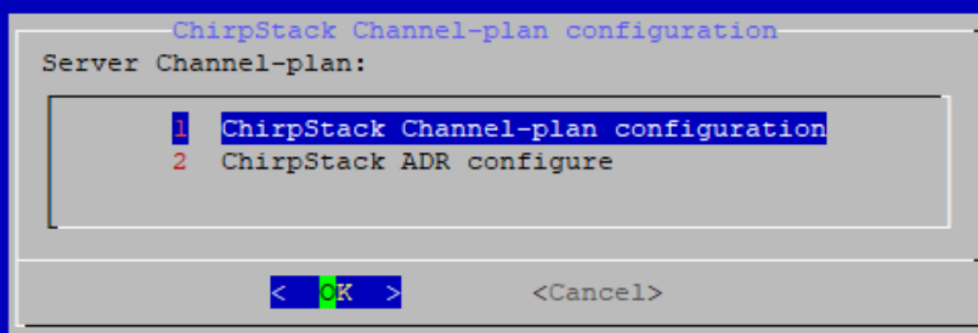


Figure 30: Configure ChirpStack channel plan

First, select 1 ChirpStack Channel-plan configuration for configuring your frequency channel. Then, set the IPaddress of the ChirpStack.

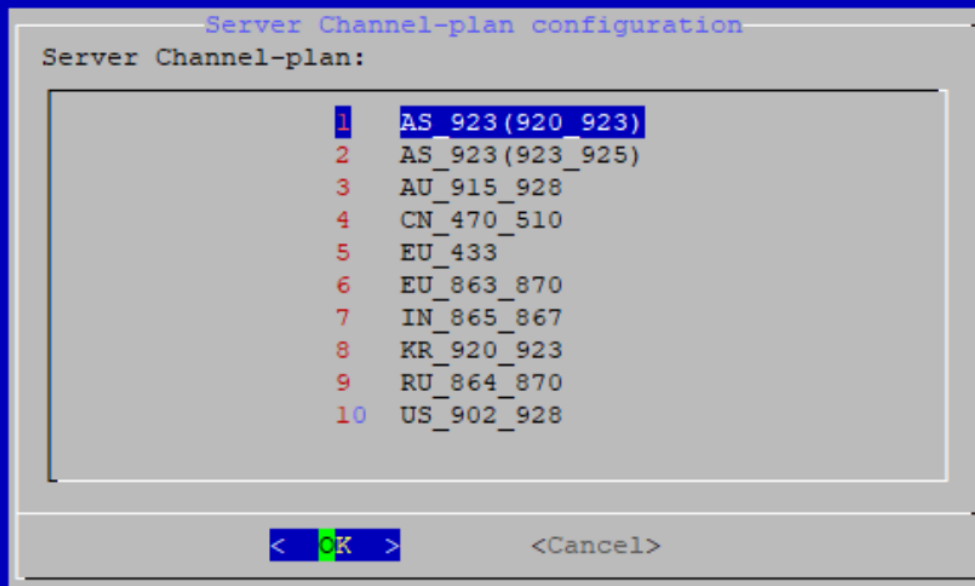


Figure 31: Regional Frequency Band Option

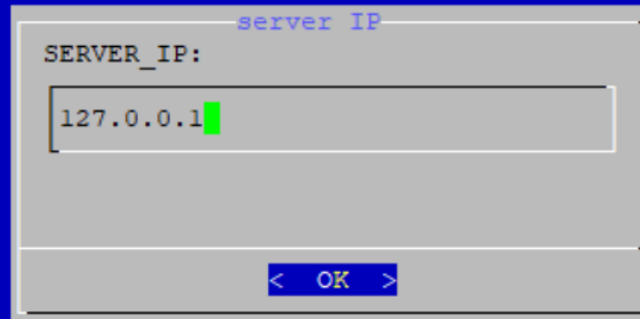


Figure 32: Default ChirpStack IP Address

NOTE

The default IP Address is 127.0.0.1 . The latest firmware/GitHub repository installs ChirpStack on the Raspberry Pi.

- If you want to use an external ChirpStack, you need to set it to its IP Address.
- If you have selected ChirpStack ADR Configure instead, you can enable/disable the Adaptive Data Rate (ADR) functionality:

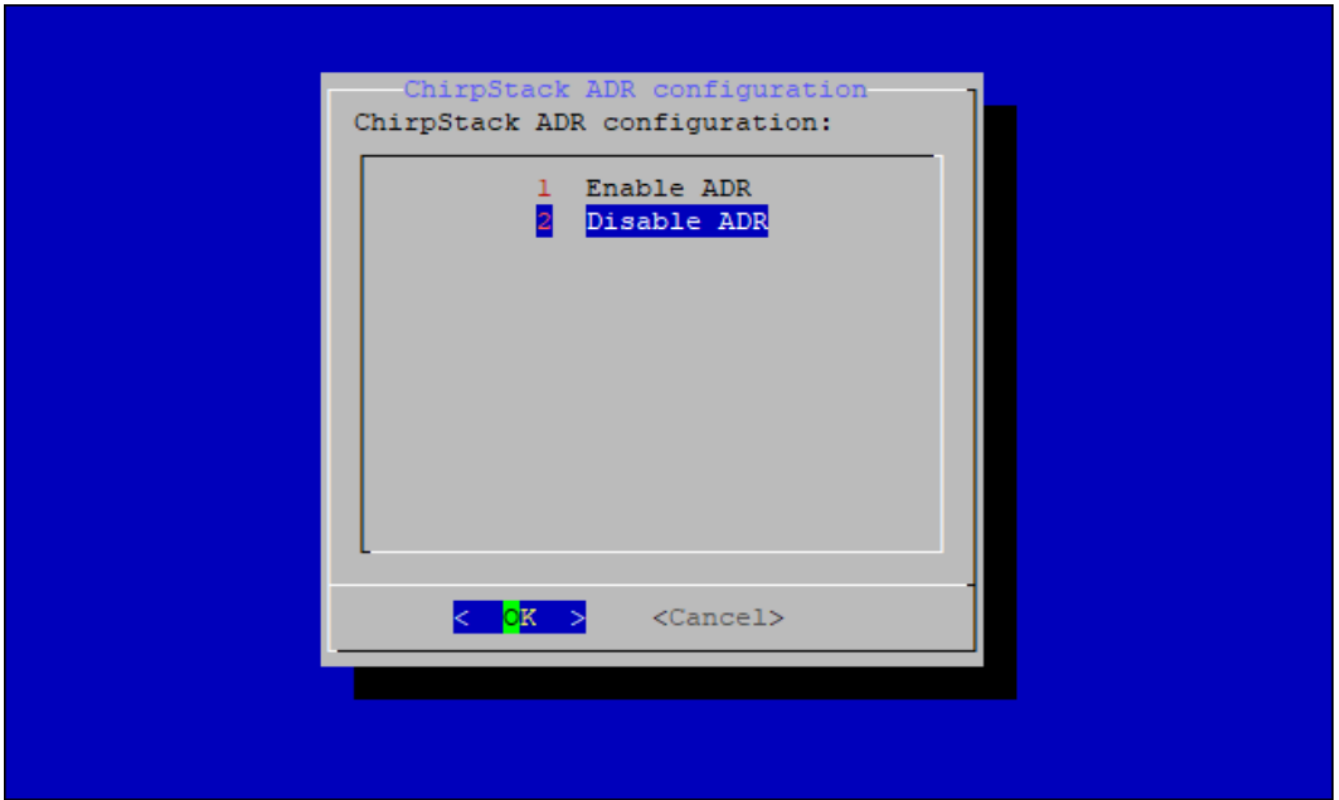


Figure 1: ChirpStack ADR Enable/Disable

- If you want to use ChirpStack for the LoRa Network server, you can head to registering the gateway inChirpStack.



Last Updated: 7/29/2022, 10:17:19 PM

Documents / Resources

	<p>RAK RAK7248 Raspberry Pi LoRaWAN Gateway [pdf] User Guide RAK7248, RAK7248C, RAK7248P, RAK7248 Raspberry Pi LoRaWAN Gateway, Raspberry Pi LoRaWAN Gateway, Pi LoRaWAN Gateway, LoRaWAN Gateway, Gateway</p>
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References

- [WisGate Developer Gateway Firmware Setup | RAKwireless Documentation Center](#)
- [RAK7248 WisGate Developer D4H Gateway Datasheet | RAKwireless Documentation Center](#)
- [RAK7248 Supported LoRa Network Servers | RAKwireless Documentation Center](#)
- [MobaXterm free Xserver and tabbed SSH client for Windows](#)
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