LoRa Indoors RAK Gateway configuration

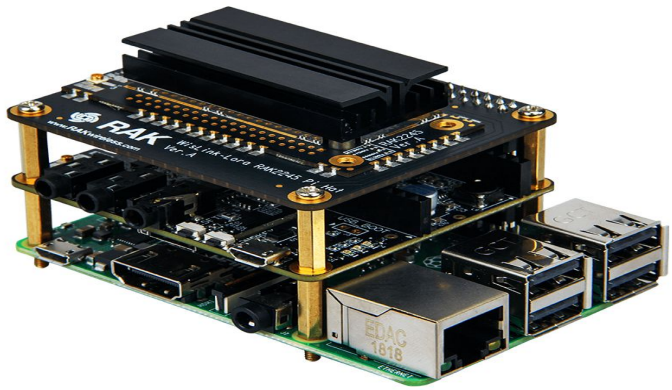


Figure 1: Raspberry Pi , RAK2013, and RAK2245 Pi Hat

What do you need?

1. RRAK7243C LoRaWAN™ Developer Gateway
2. 16GB SD Card + Card Reader (we don't need the card reader)
3. 5V at least 2A Micro USB Power Supply
4. A Windows/Mac OS/Linux Computer

What's included in the Package?

Figure 2: What's Included in the Package

Since there is no LTE radio in our configuration, the LTE antenna port can be left unplugged

Accessing your Gateway

After burning the image into the SD Card, make sure you have inserted the SD Card with the Latest Firmware installed into the **RAK7243C LoRaWAN™ Developer Gateway** slot, with the LoRa and GPS connected. Then you can safely power on the gateway. In this document, several ways to access the gateway are provided.

(the SD Card has already been burned with the latest firmware image)

1. Wi-Fi AP Mode

By default, the LoRaWAN™ Gateway will work in Wi-Fi AP Mode which means that you can find an SSID named like "**Rakwireless_XXXX**" on your PC Wi-Fi Network List.

Figure 1: RAKWireless Access Point

2. Via the Ethernet Port on the Raspberry Pi 3B+

You can also connect your PC with the LoRaWAN™ Gateway through an Ethernet cable. By default, the IP address of the LoRaWAN™ 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`.

- To do this in Windows, go to Control Panel -> Network and Internet -> Network and Sharing Center and Click **Ethernet**

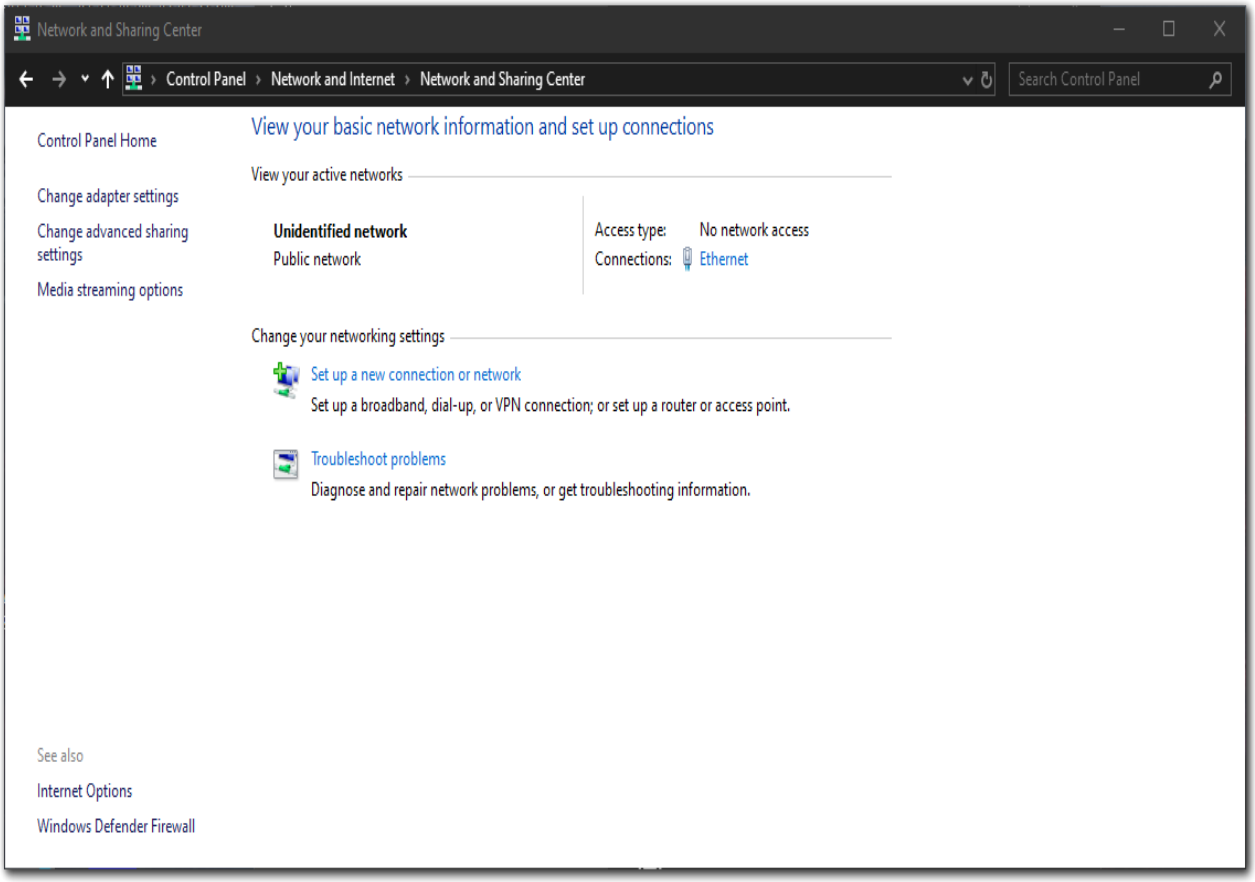


Figure 2: Network and Sharing Center

- Click **Properties** then Choose **Internet Protocol Version 4 (TCP/IPv4).**

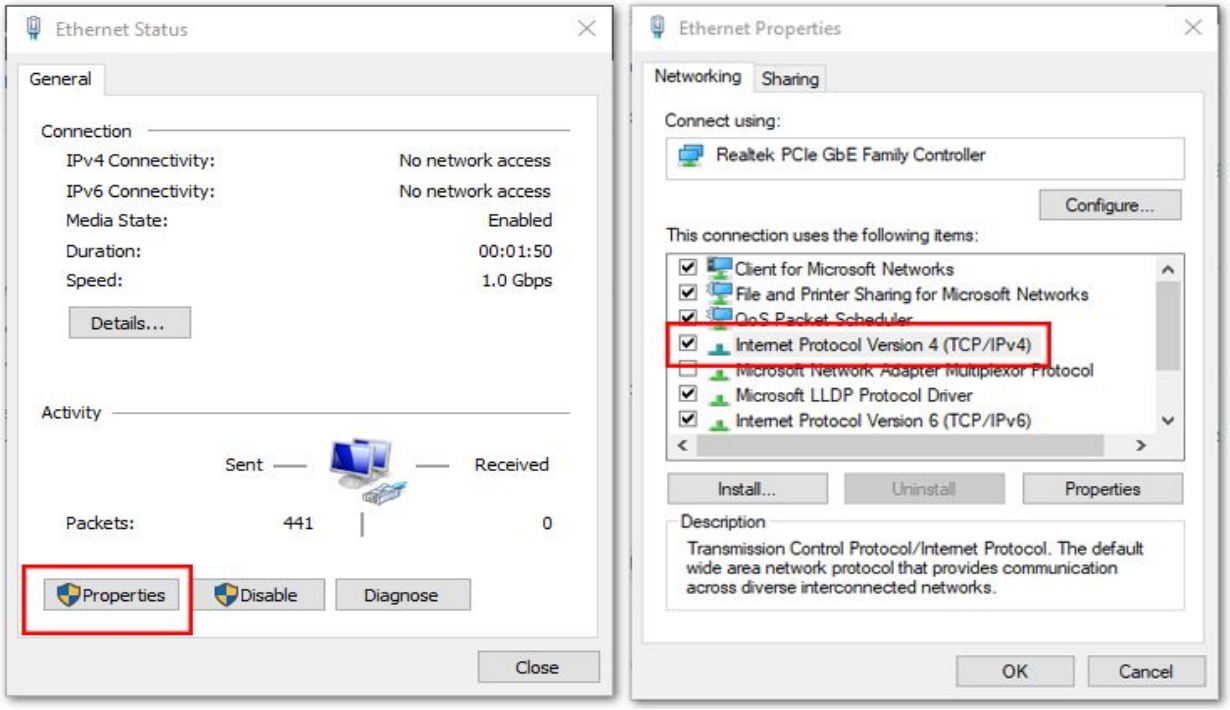


Figure 3: Ethernet Properties

- By default, it will obtain an IP Address automatically. Click the Option "Use the following IP Address" and enter the IP Address: `192.168.10.20` and press OK.

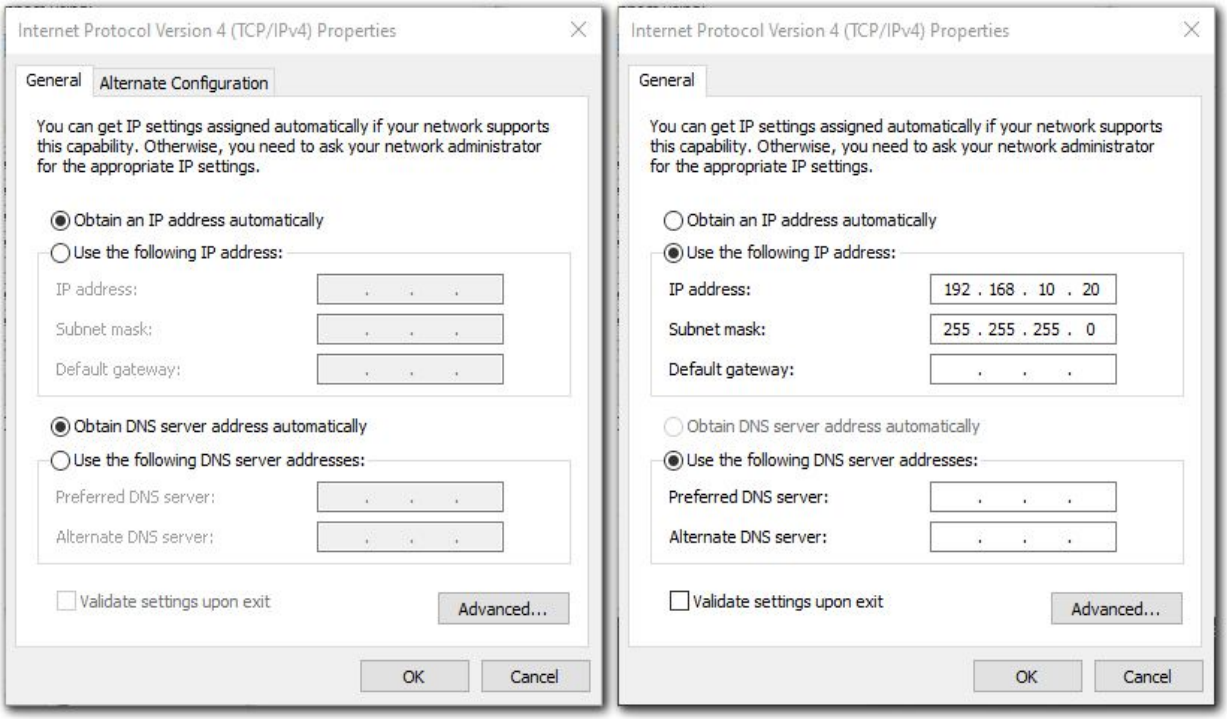


Figure 4: TCP/IPv4 Properties

Now , you should be able to access your LoRaWAN™ Gateway from your PC using the IP Address `192.168.10.10` through SSH.

Log into the Gateway via SSH

1. 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**, **MobaXterm** and many more. Feel free to choose one that fits your needs, we will be using Putty for this guide.

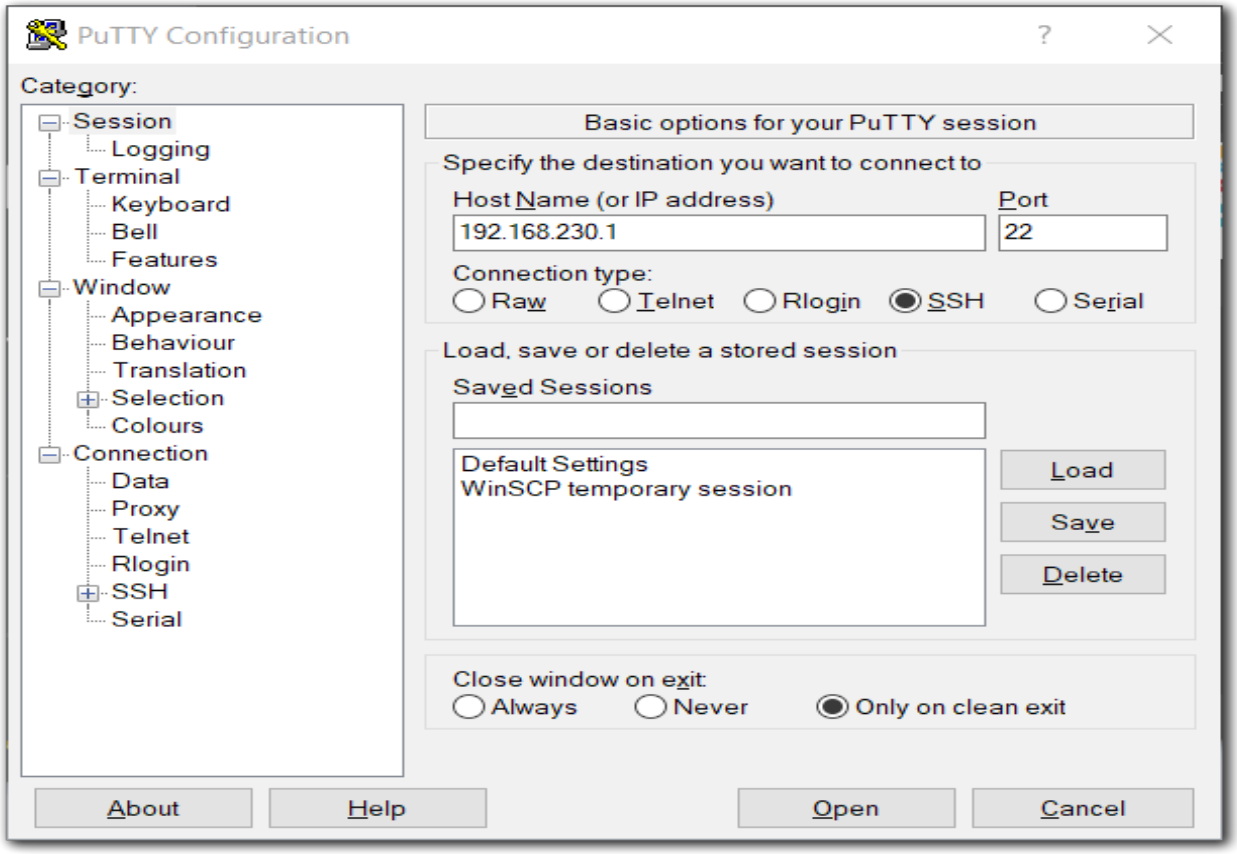
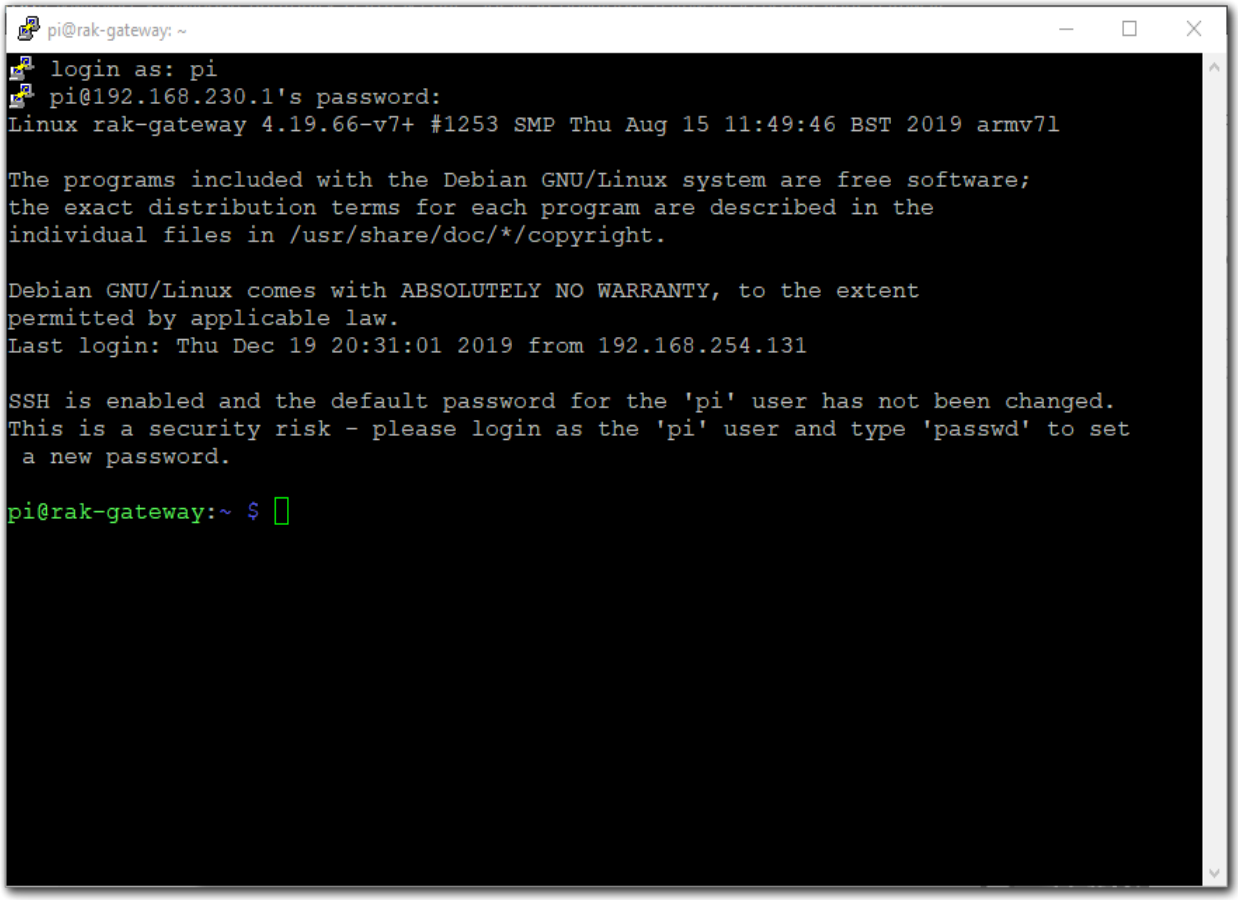


Figure 5: Putty Software for SSH in Windows

- If you have connected to the LoRaWAN™ Gateway through **Wi-Fi AP Mode**, the IP Address is `192.168.230.1`
- If you have connected to the LoRaWAN™ 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 is "**pi**" and the default password is "**raspberry**"



F

Figure 6: Command line after log in

2. Mac OS

Open the Terminal on Mac OS. Launch the **Terminal** application, which is found in "/Applications/ Utilities/" directory but you can also launch it from Spotlight by hitting **Command + Spacebar** and typing “Terminal” and then return:

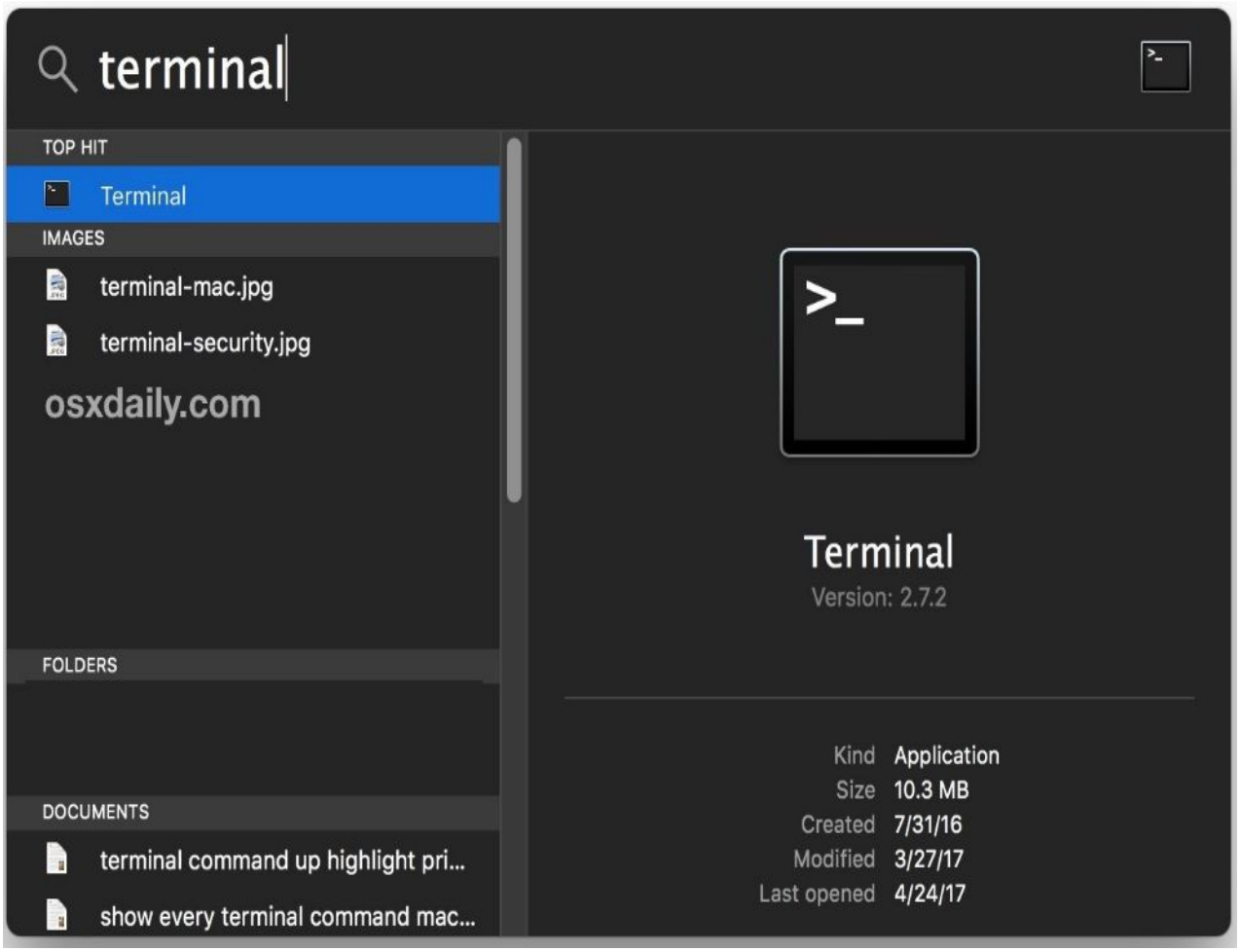


Figure 7: Opening Terminal in Mac OS

Open the terminal of Mac OS. Enter **root mode** by typing the following command: "`sudo -i`"

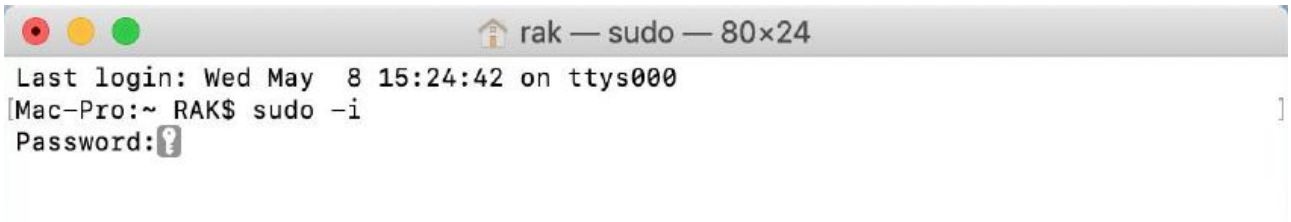


Figure 8: SSH in Mac OS

- If you are not in root mode, enter "`ssh pi@192.168.230.1`" in the terminal to login to your LoRaWAN™ Gateway, the default password is "**raspberry**".
- If you connect your PC with the LoRaWAN™ Gateway through Ethernet Cable, you should enter "`ssh pi@192.168.10.10`", the default password is "**raspberry**".

OK, you should have logged into the LoRaWAN™ Gateway through SSH successfully as per the image shown below:

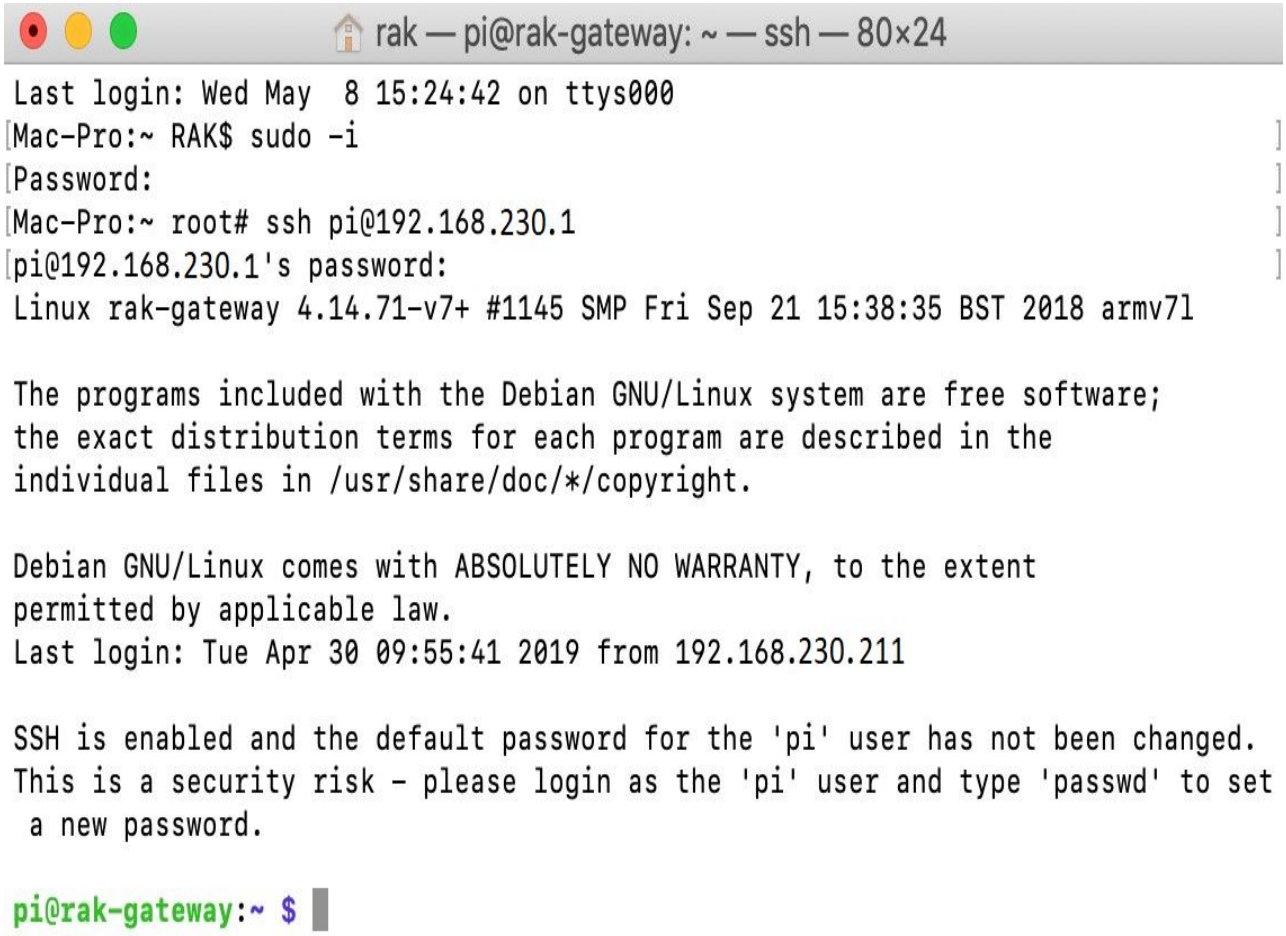


Figure 9: Log-in Successful Notification

3. Linux OS

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

Configuring the Gateway

Assuming you have successfully logged into your LoRaWAN™ Gateway using SSH, enter the following command in the command line:

```
sudo gateway-config
```

Copy

You will now then see a page like the following picture:

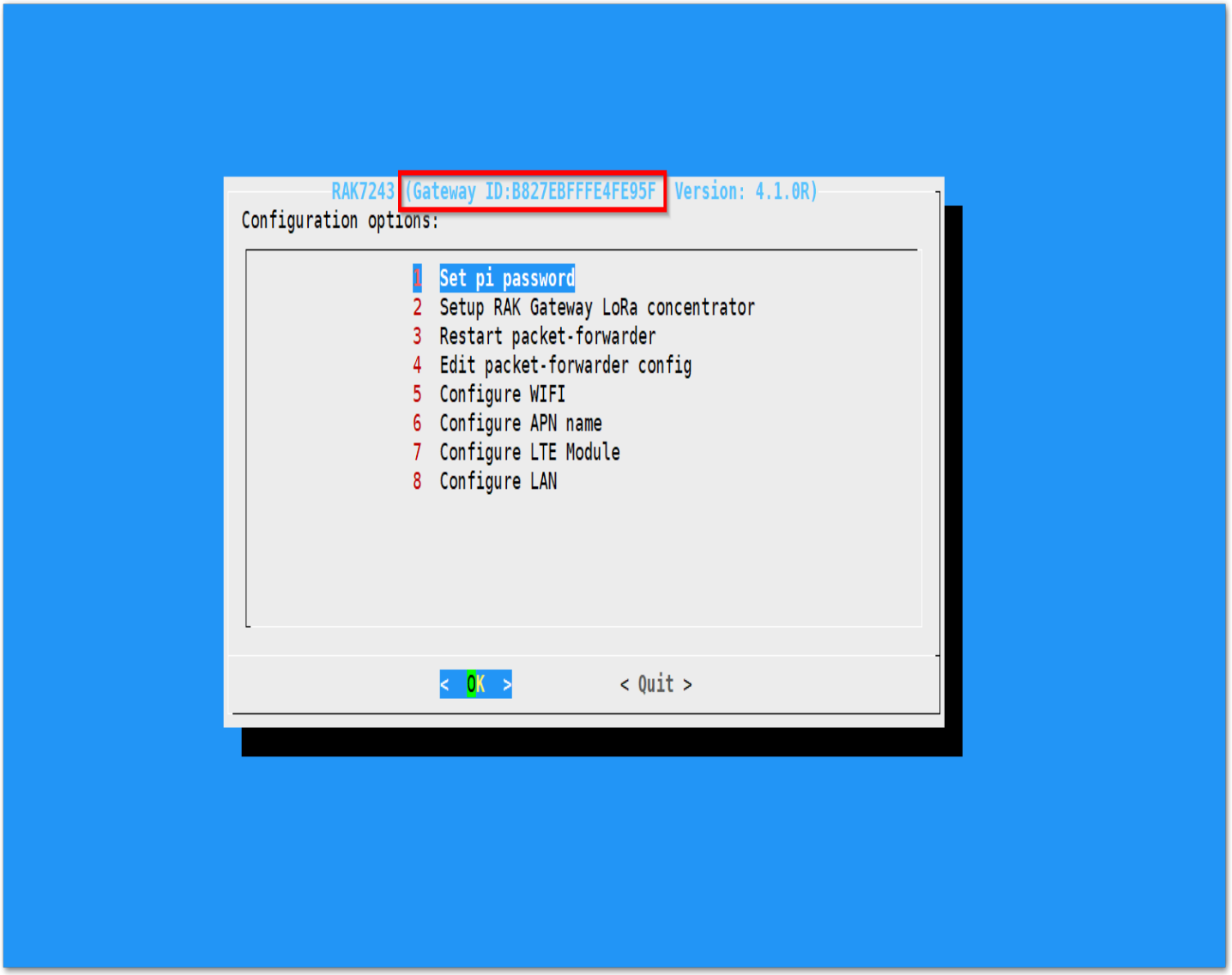


Figure 1: Configuration Options for the Gateway

1. **Set pi password** - used to set/change the password of the LoRaWAN™ Gateway.
2. **Set up RAK Gateway LoRa Concentrator** - used to configure the frequency, which the LoRaWAN™ Gateway will operate on, and the LoRaWAN™ Server which the LoRaWAN™ Gateway will work with.
3. **Restart packet -forwarder** - used to restart the LoRa® packet forwarded process.
4. **Edit packet-forwarder config-** used to open the global_conf.json file, in order to edit LoRaWAN™ parameters manually.
5. **Configure Wifi** - used to configure the Wi-Fi settings in order to connect to a network.
6. **Configure APN Name** - used to configure the APN name of pppd.
7. **Configure LTE Module -** (Online for the Cellular Version) - used to configure automatic LTE network connection on startup.
8. **Configure LAN** - used to configure the Ethernet adapter settings.

There is also another way to get your "Gateway ID", just enter the command below in the command line:

```
sudo gateway-version
```

Copy

```
pi@rak-gateway:~ $ sudo gateway-version
Gateway ID:B827EBFFFE4FE95F
RAKWireless gateway RAK7243 version 4.1.0R
pi@rak-gateway:~ $
```

Figure 2: Gateway ID using the command line

```
pi@rak-gateway:~/rak_common_for_gateway/lora $ sudo gateway-version
Gateway ID:B827EBFFFEA05447
RAKWireless gateway RAK7243 version 4.1.0R
pi@rak-gateway:~/rak_common_for_gateway/lora $
```

Setting a new password for the Gateway

It is a good security practice to change the default password "**raspberry**" which is the same on all Raspberry Pi devices.

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

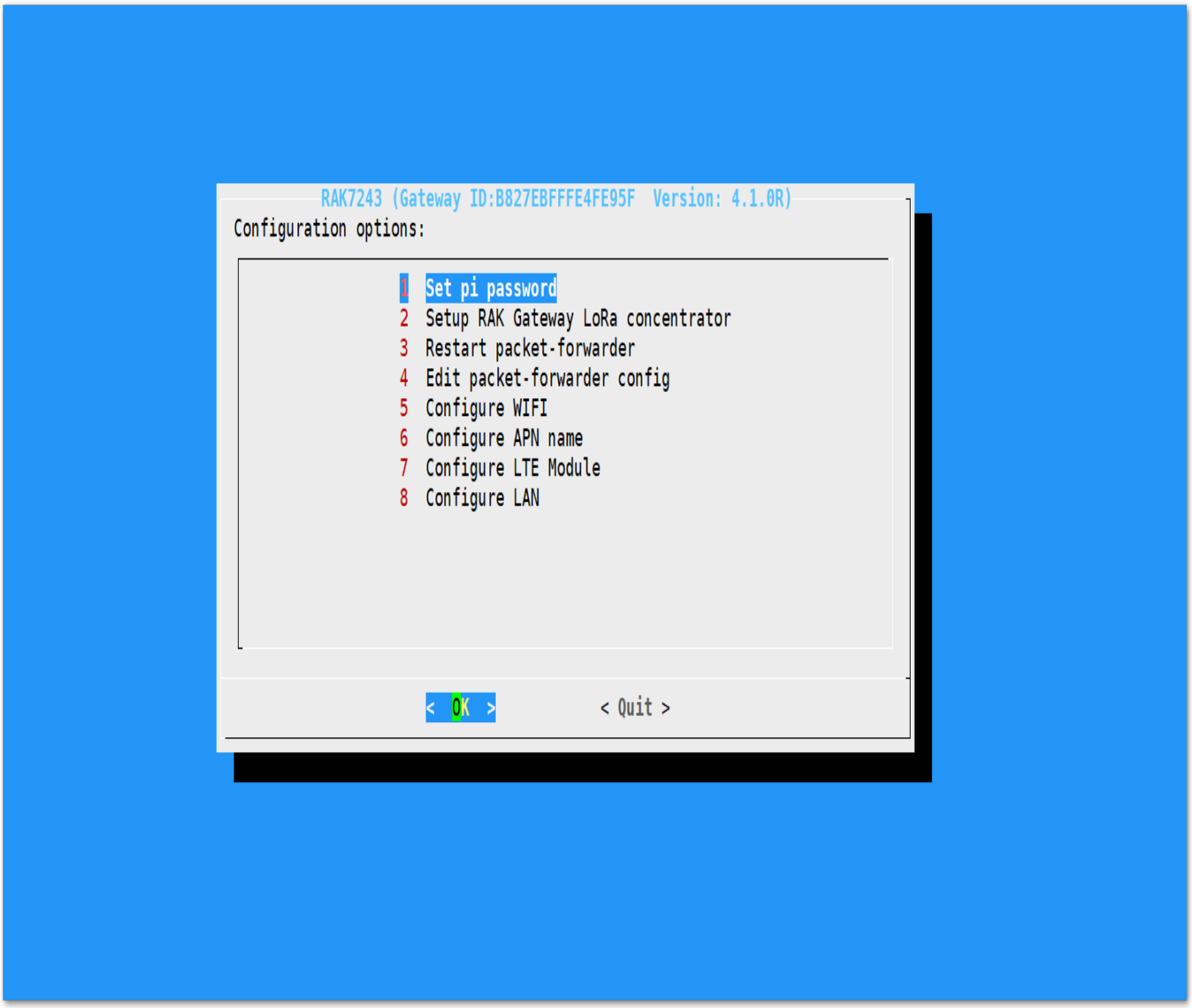


Figure 3: Set Pi Password

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

Figure 4: Confirm Password Change

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

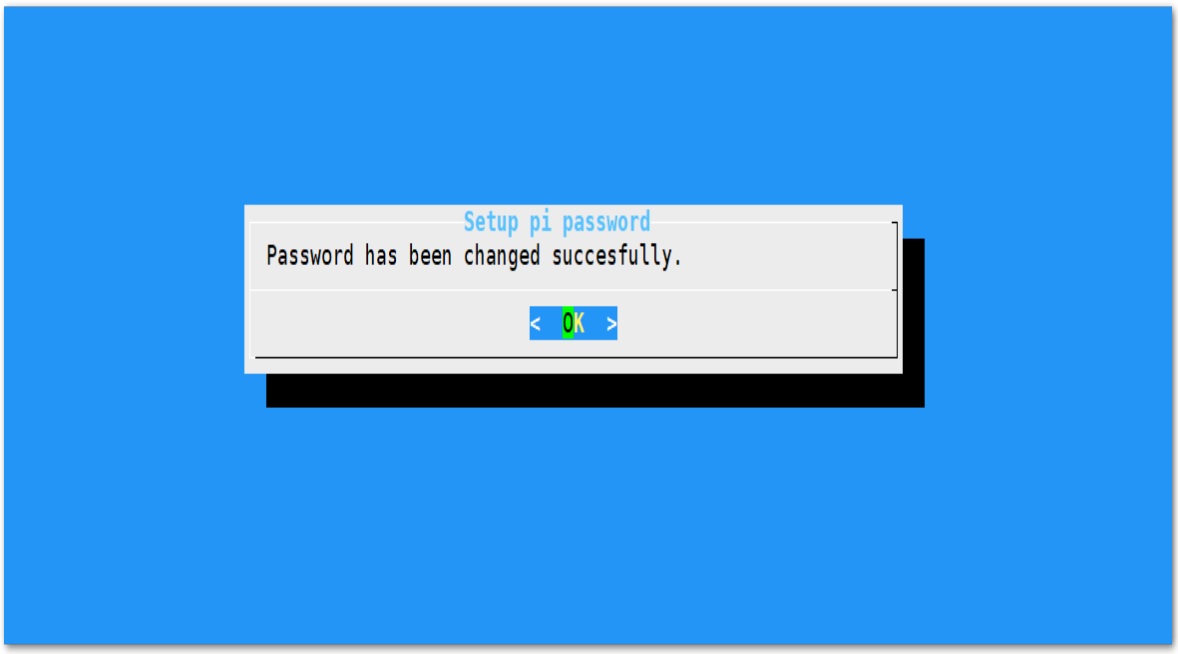


Figure 5: Successful Password Change

Set up RAK Gateway LoRa Concentrator

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 LoRa concentrator**"

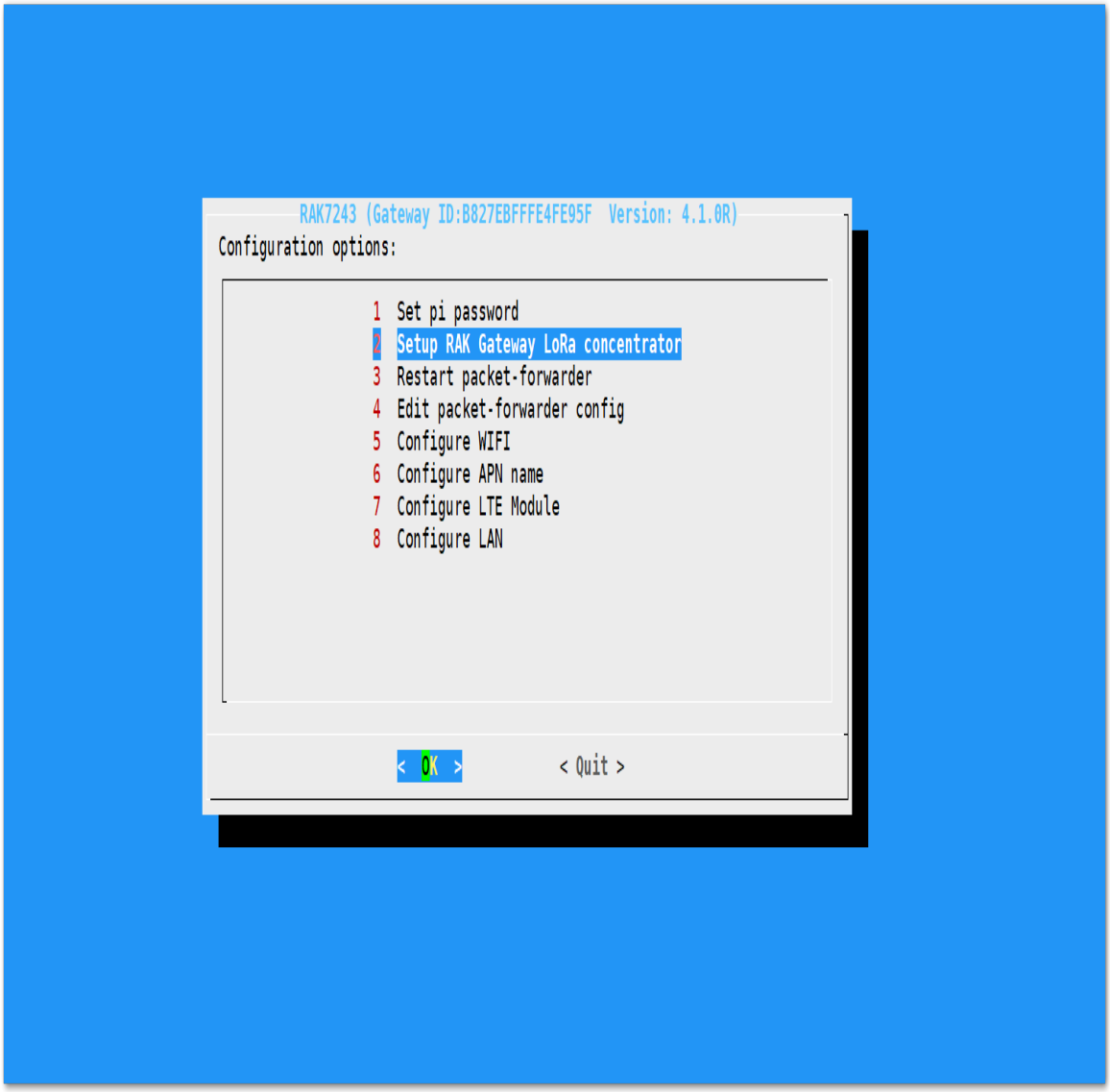


Figure 6: Choosing Setup RAK Gateway LoRa® concentrator

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

(we will only use TTN in the workshop)

Server is TTN

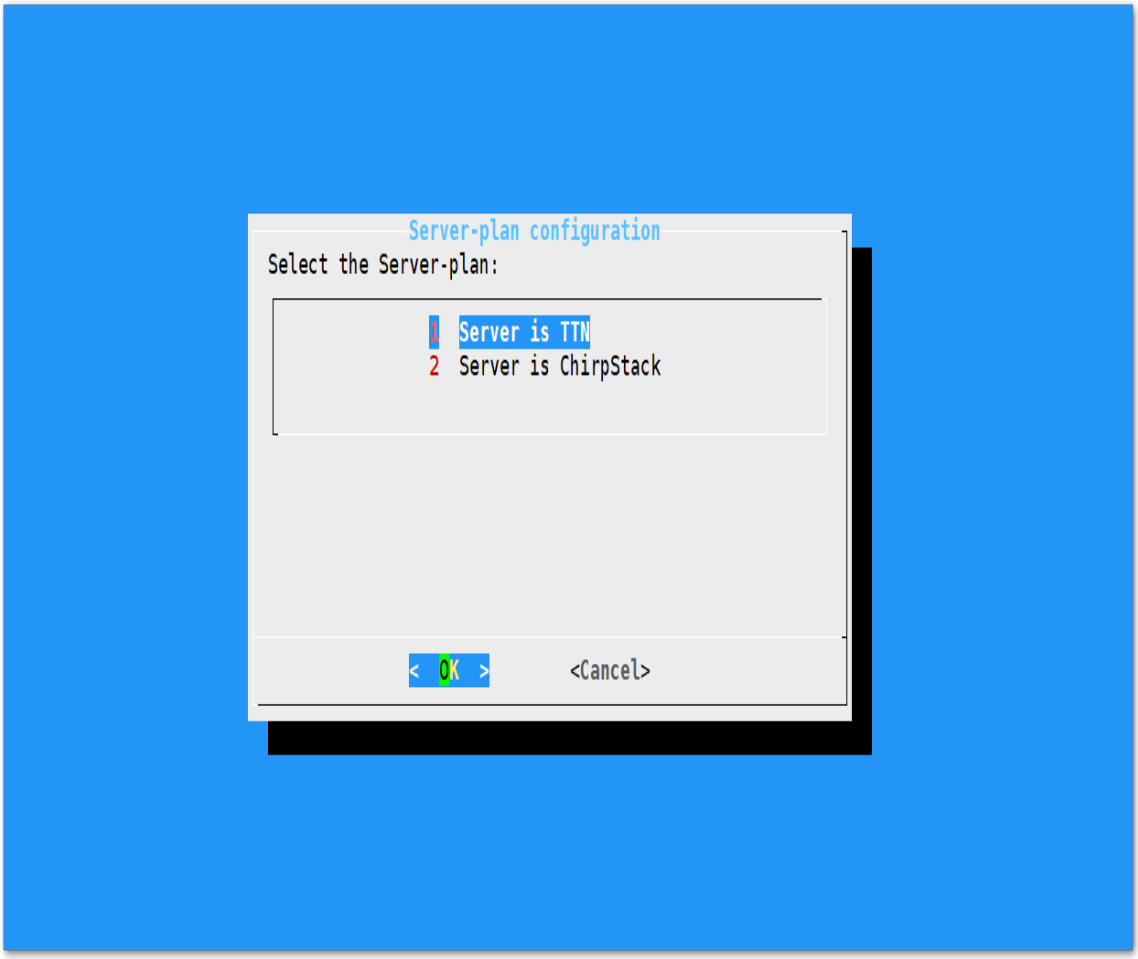


Figure 7: Server Is TTN

- **TTN (The Things Network)** - If you choose TTN as the LoRa® Server, you will see the following page. Visit this article for more information on your local TTN frequency plan. This will allow you to choose the correct plan.

  (Since Africa and Europe are both in ITU region 1, we will use the European plan)

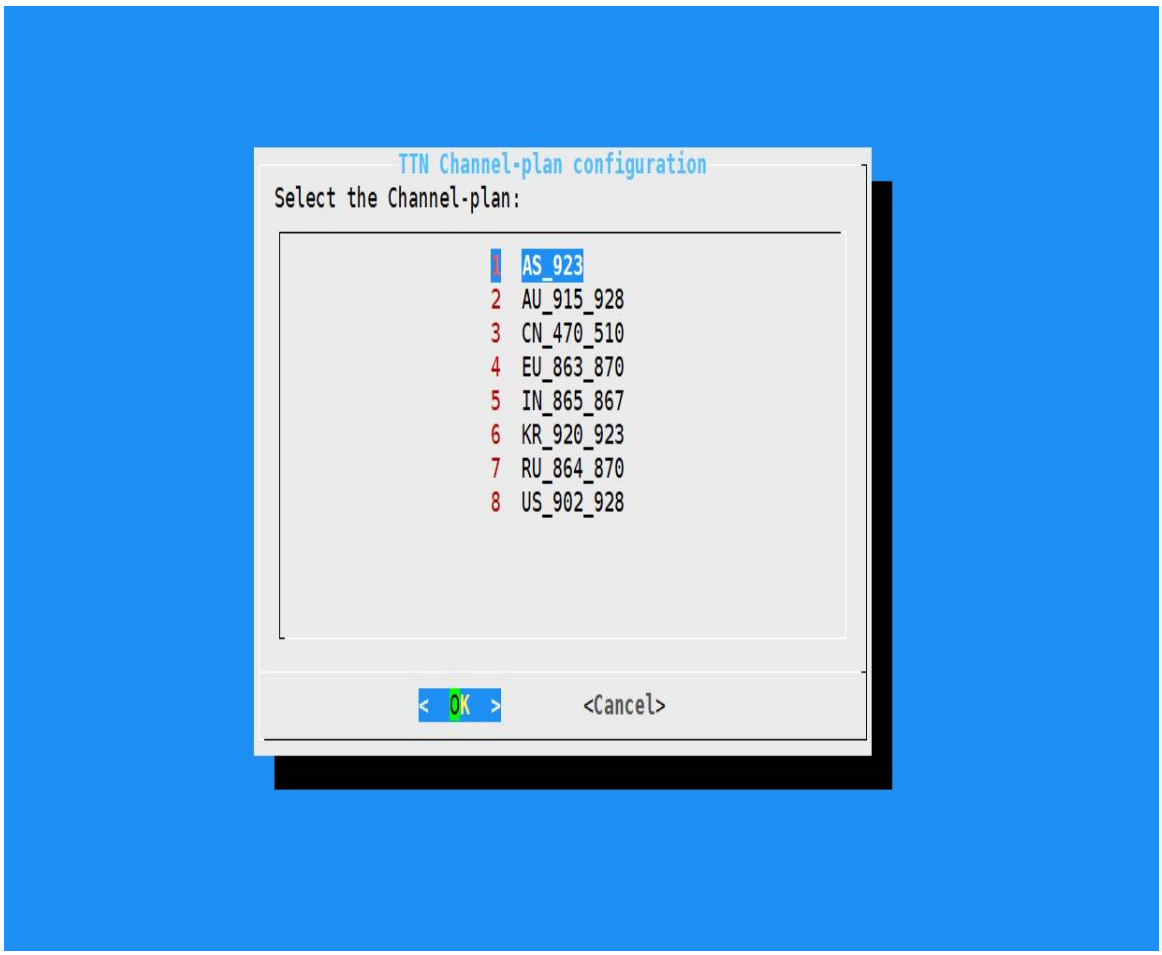


Figure 8: Selecting the TTN Channel Plan

After choosing the correct frequency, the success message will appear as shown below.

Figure 9: Successfully Changed the Frequency

In this workshop, we will only use TTN, so you can ignore the ChirpStack's related instructions

Connect the LoRaWAN™ Gateway to a Router

If you want to use TTN or an independent LoRaServer which may be deployed in a local area network or in the Internet, you need to connect your LoRaWAN™ Gateway to a router first.

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 3B+.

(Remember that you can use your smartphone WiFi connection for this section)

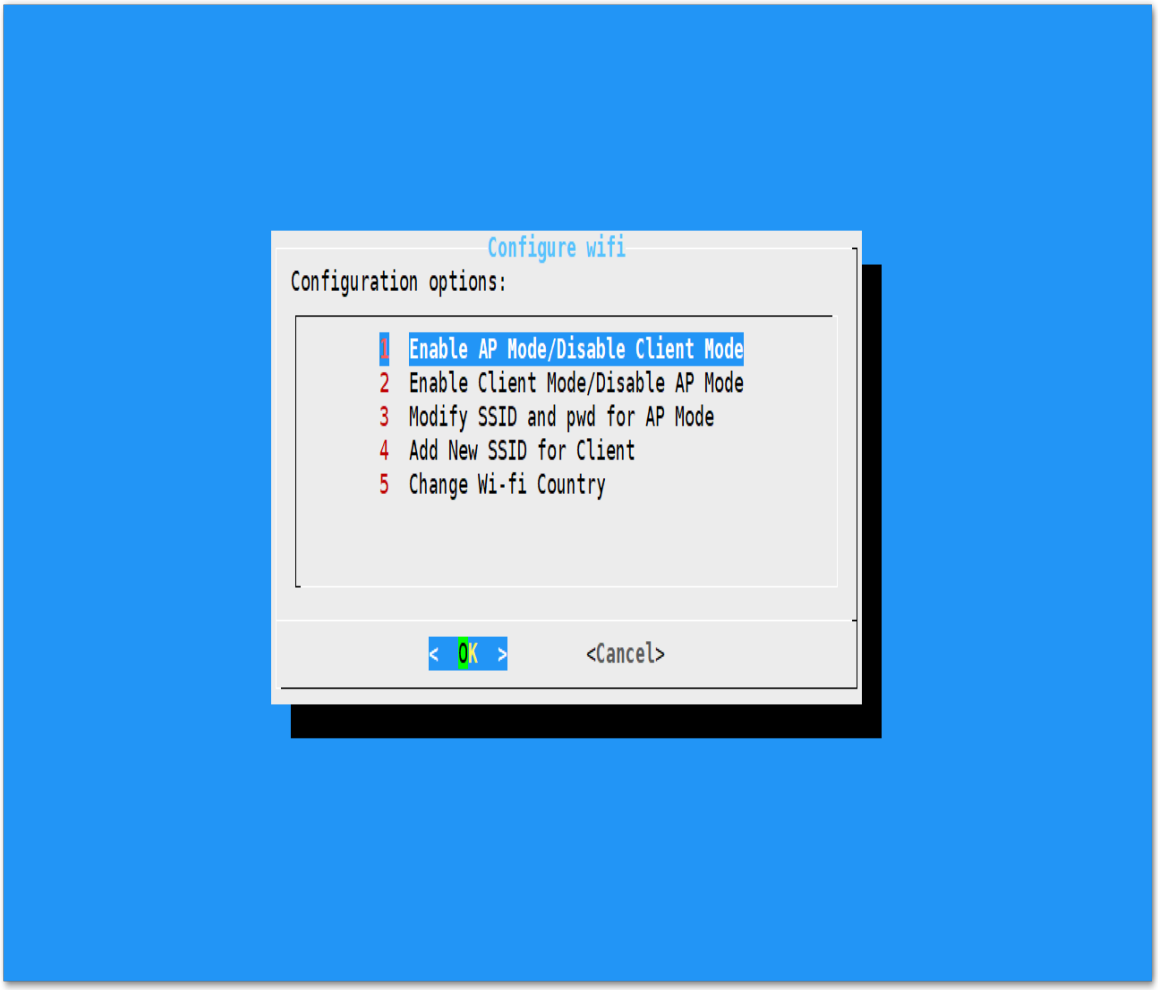


Figure 14: Configuration options for WIFI

There are 4 options to choose from in the Wi-Fi configuration menu:

1. **Enable AP Mode/Disable Client Mode** - the LoRaWAN™ 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 LoRaWAN™ 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 deployment country to match with corresponding Wi-Fi regulations.

Once Wi-Fi AP Mode has been disabled by choosing Item 2, you can now connect to a new Wi-Fi Network by choosing Item 4:

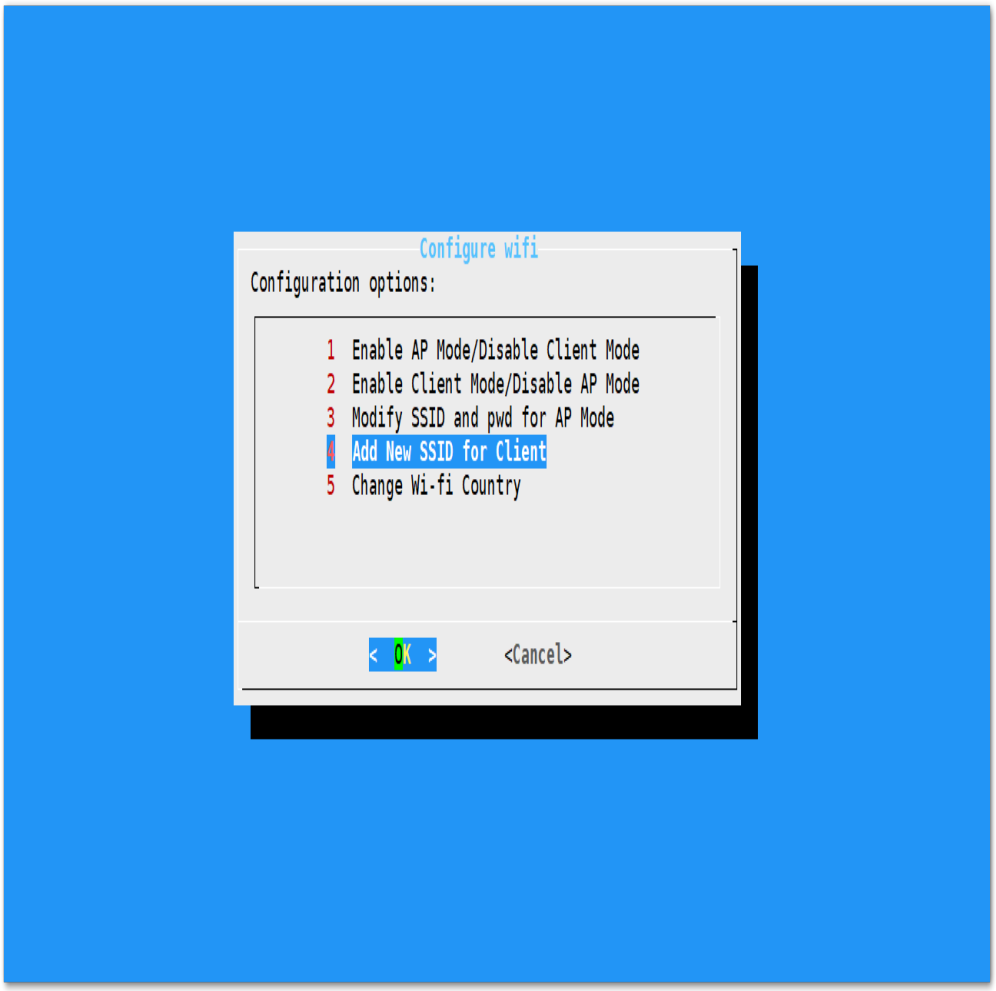


Figure 15: Add a new SSID

- Start by selecting the country in which the gateway will be installed, for instance Kenya, Mozambique, Tanzania or Uganda:

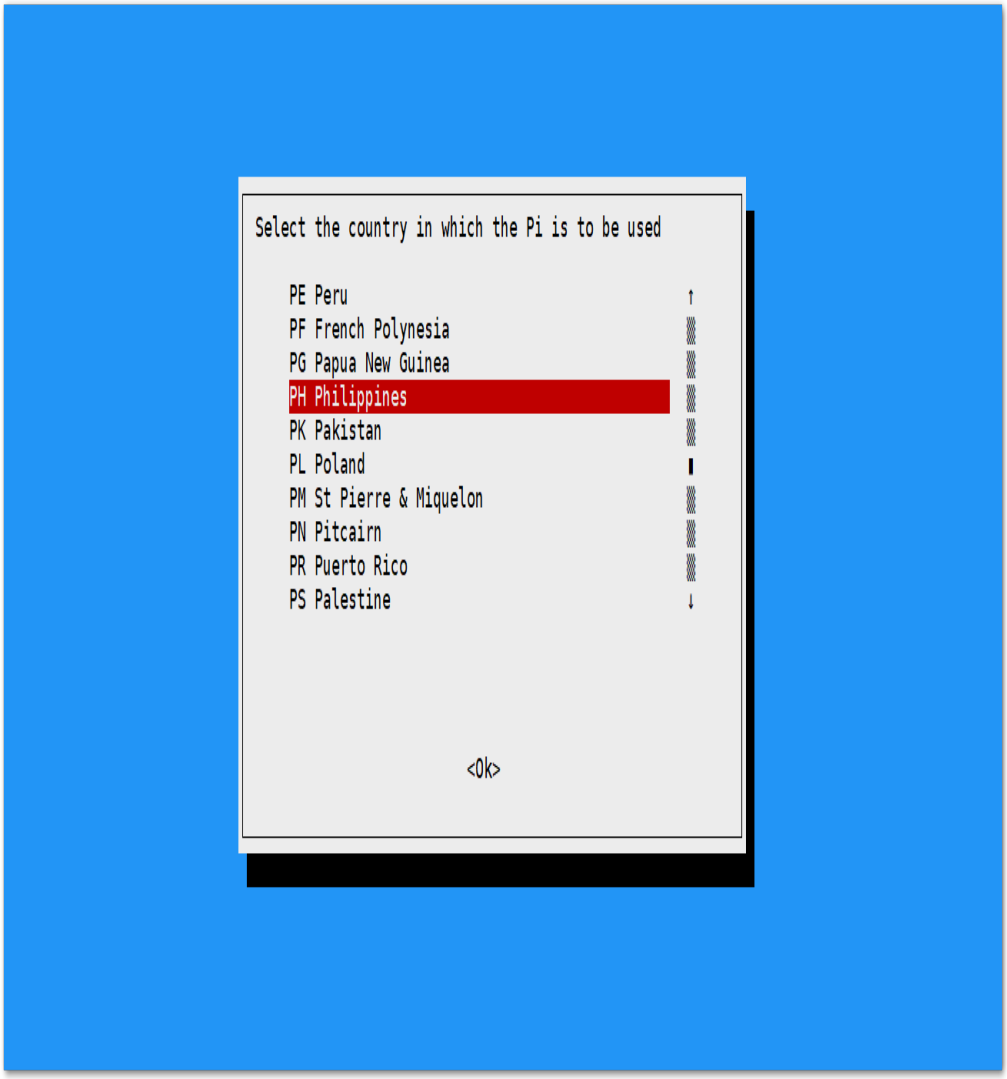


Figure 16: Selecting Country of Residence

- Enter the SSID of the network you want to connect:

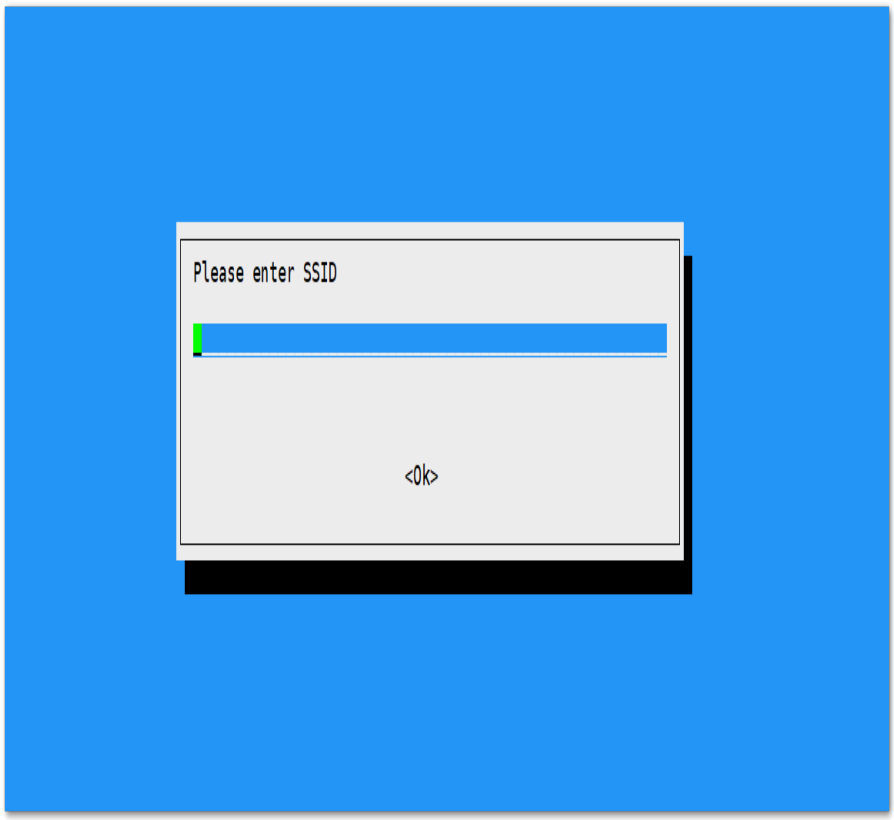


Figure 17: SSID of the Network you want to connect to.

- Enter also the password. Just leave it empty if None.

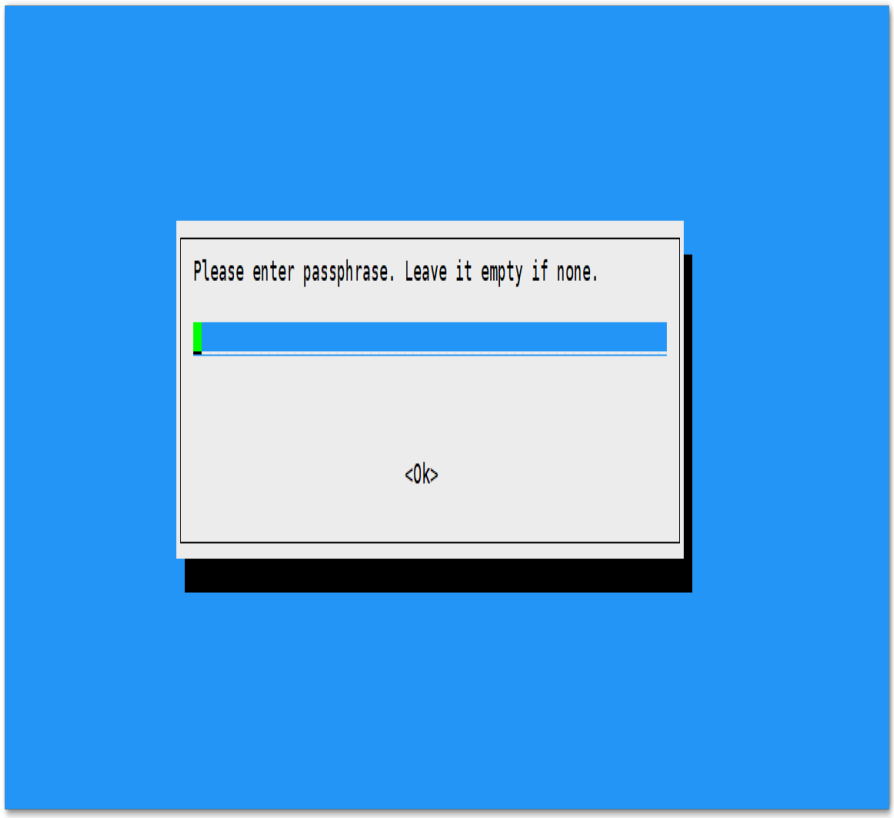


Figure 18: Password of the Wi-Fi

Connect through Ethernet

If you want to connect to the router through the Ethernet Cable, do the following steps:

- 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.
- Just fill a static IP Address according to the IP address of the router you want to connect. Please note that the LoRaWAN™ gateway and the router must be in the same network segment, otherwise the connection will fail.
- By default, the IP Address of the LoRaWAN™ Gateway's Ethernet is `192.168.10.10, but you must choose one on the same network segment as that of the router.`

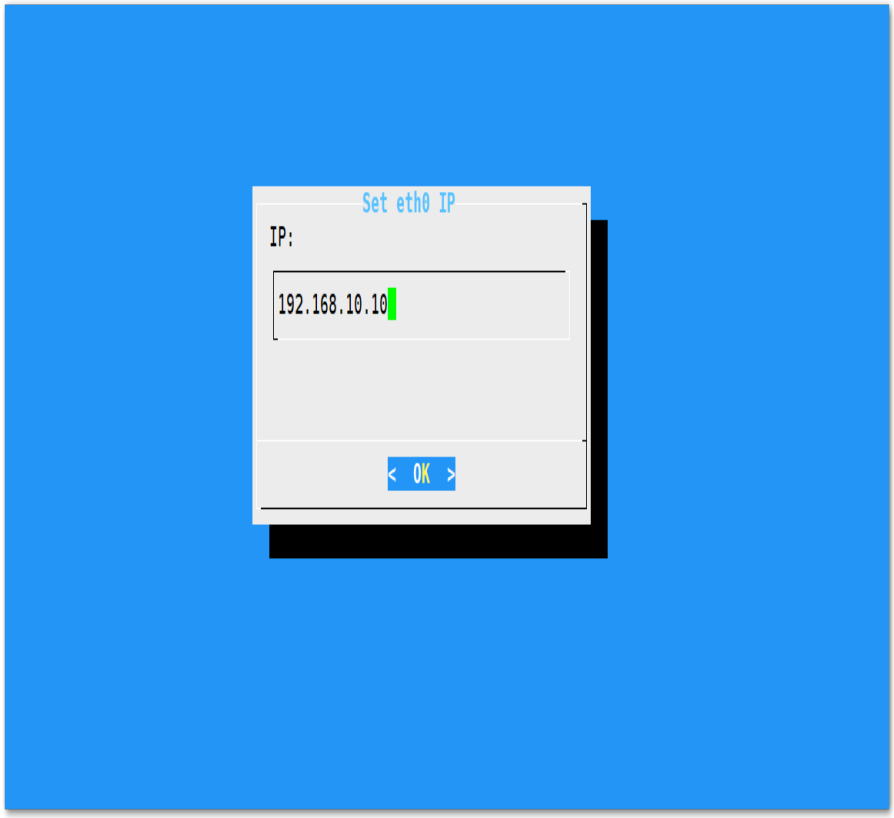


Figure 19: Default LoRaWAN™ Gateway Ethernet IP Address

- Then configure the IP address of the Router. This is the LAN Interface IP address of the router.

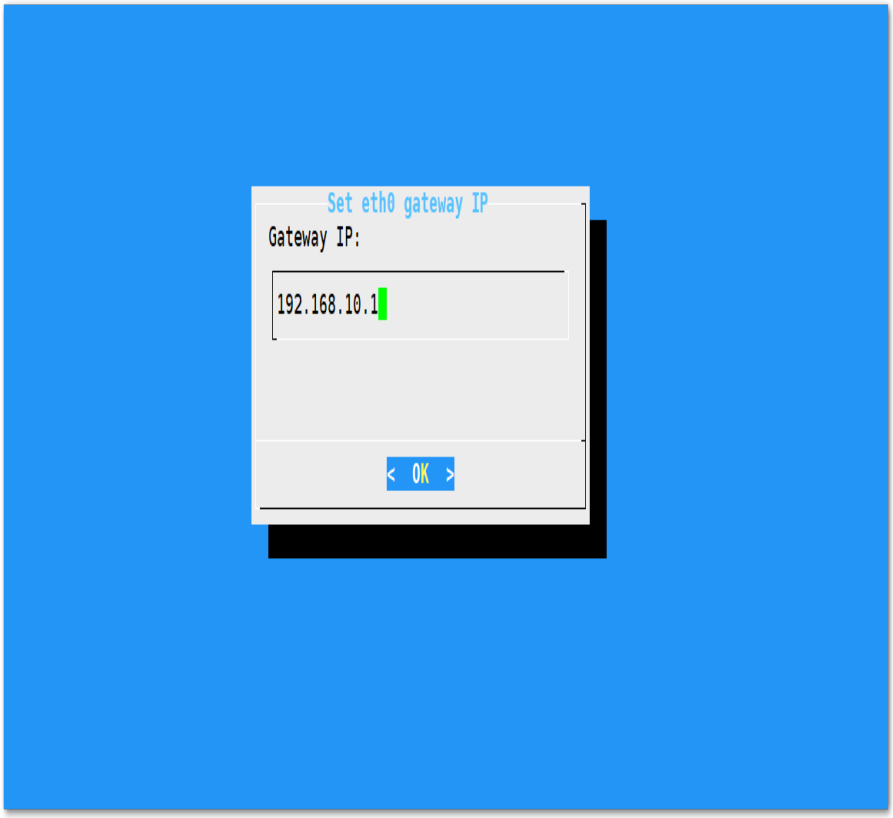


Figure 20: LAN Interface IP Address of the Router

- Press OK, then the success message will appear.
- Lastly, reboot the LoRaWAN™ Gateway using the command "`sudo reboot`" in the command line which will connect to the router through Ethernet.

Connecting to The Things Network (TTN)

The Things Network is about enabling low power devices to use existing gateways to connect to an open-source, decentralized network to exchange data with Applications. Learn more about the Things Network here.

- First, you should have connected your LoRaWAN™ Gateway to the router in order to access the internet according to the method which has been introduced in the “Configure your LoRaWAN™ Gateway” section of this document.
- Second, configure your LoRaWAN™ Gateway and choose TTN as the LoRa® Server and choose a correct frequency according to the method which has been introduced in the Configuring the Gateway section (in our case, the European frequency plan).
- Now go to the TTN Website: https://www.thethingsnetwork.org/ and Login. You will then see the following page:

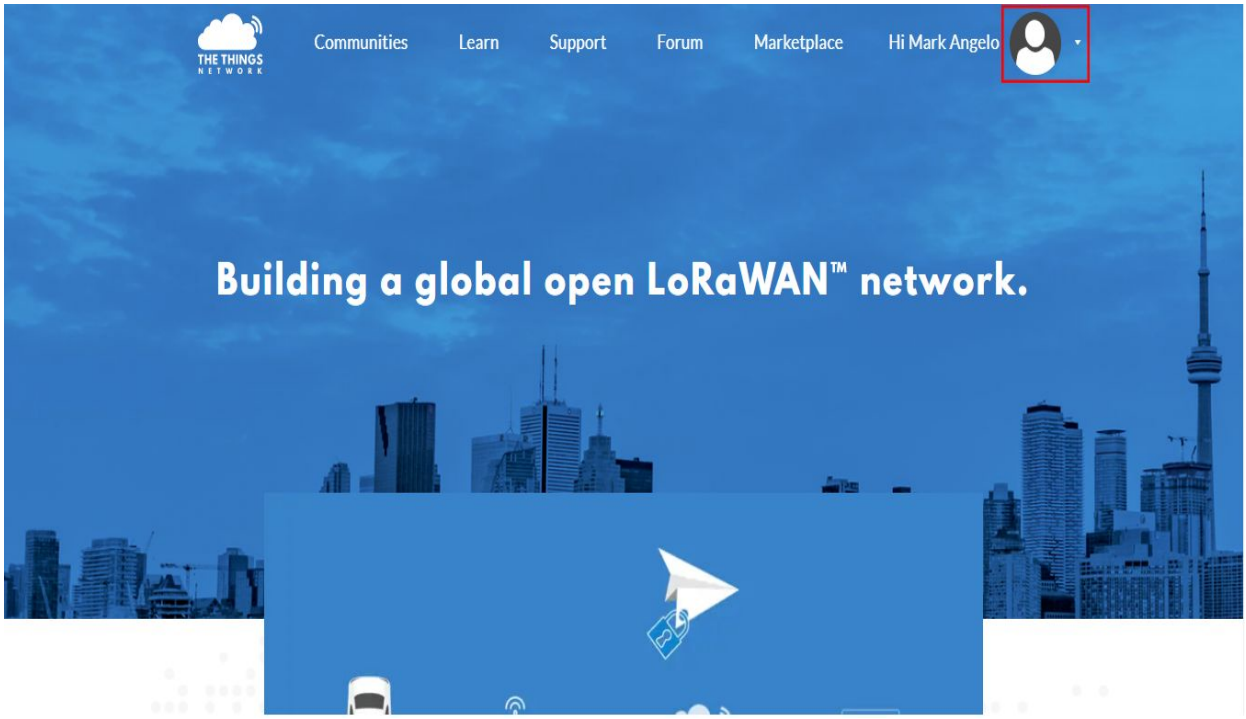


Figure 1: The Things Network Home Page

- Choose Console, then Click Gateway.

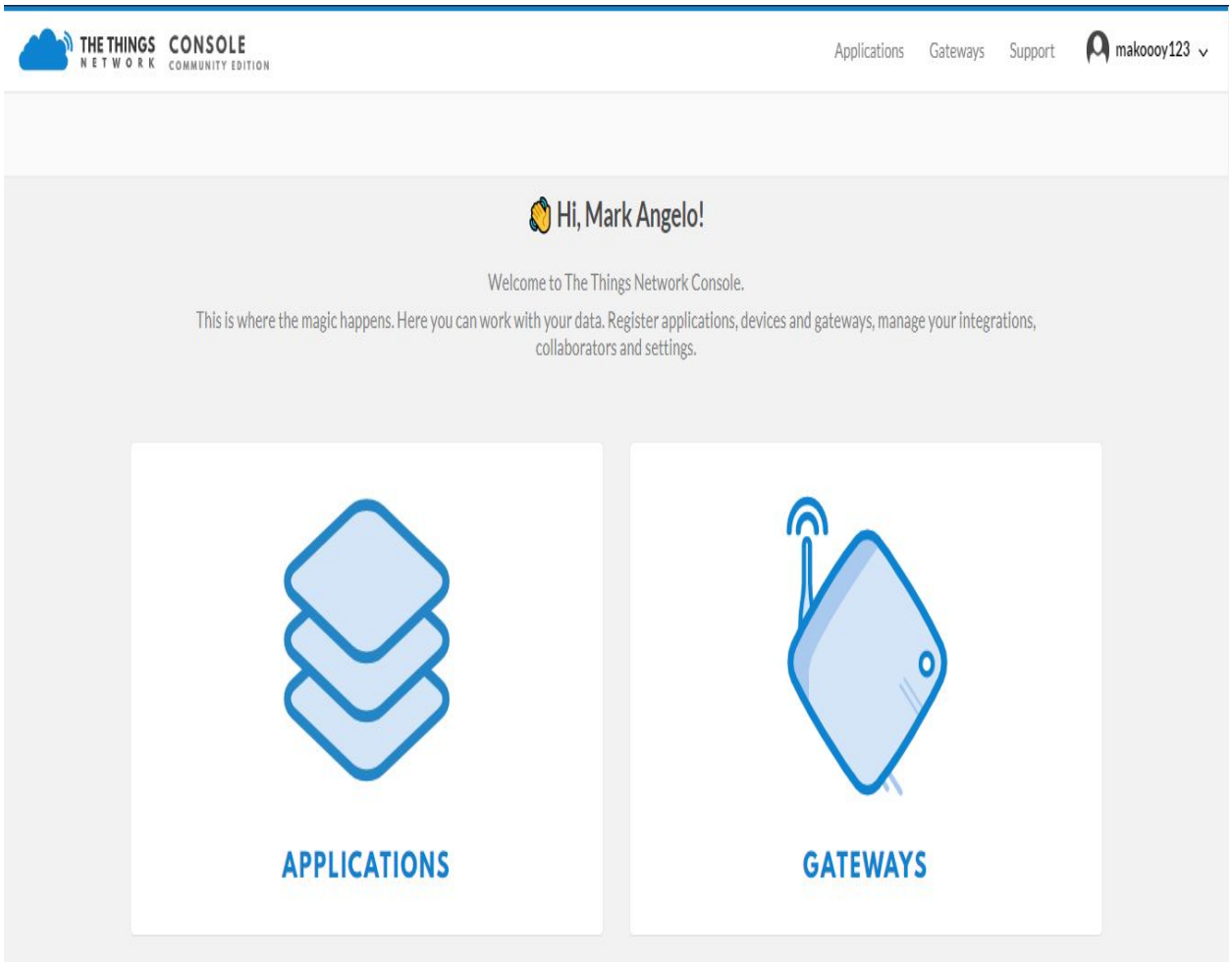


Figure 2: The Things Network Console Page

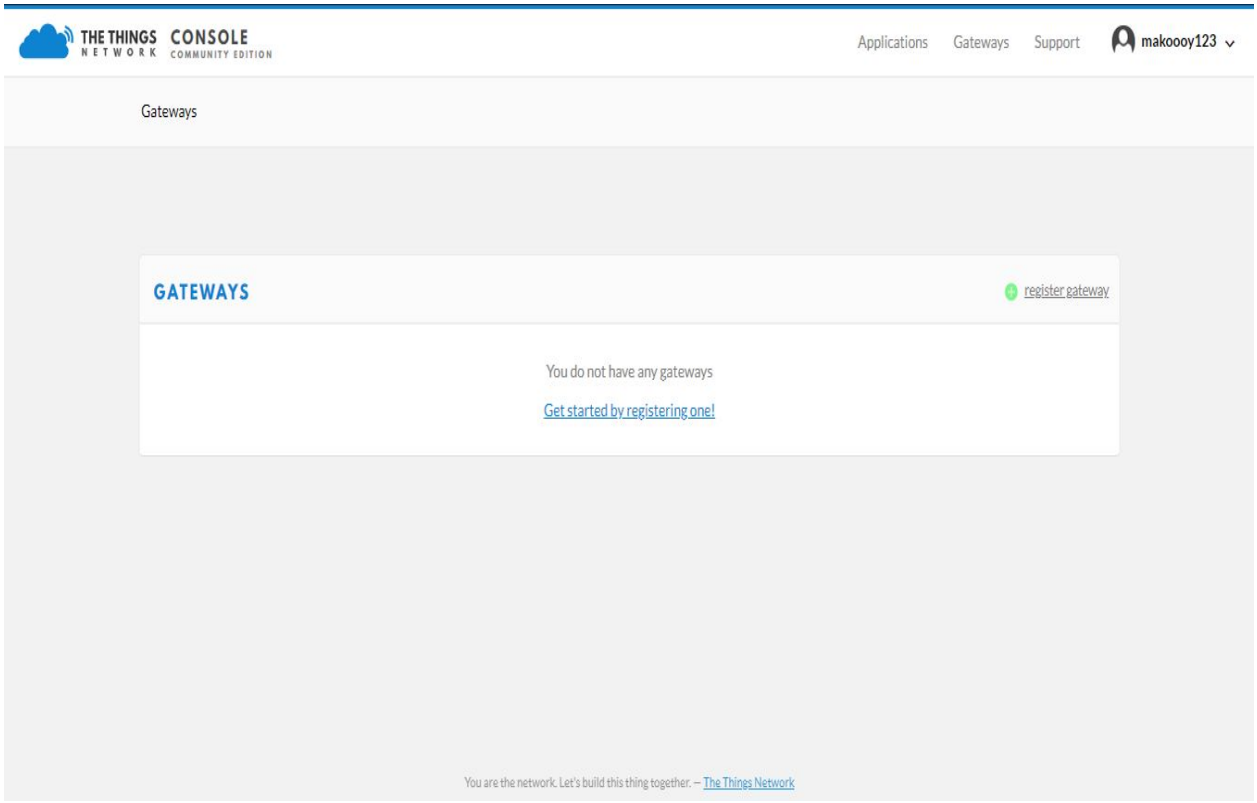


Figure 3: Adding a Gateway to TTN

- All of your Registered Gateways will be displayed here in this page. Click "register gateway"

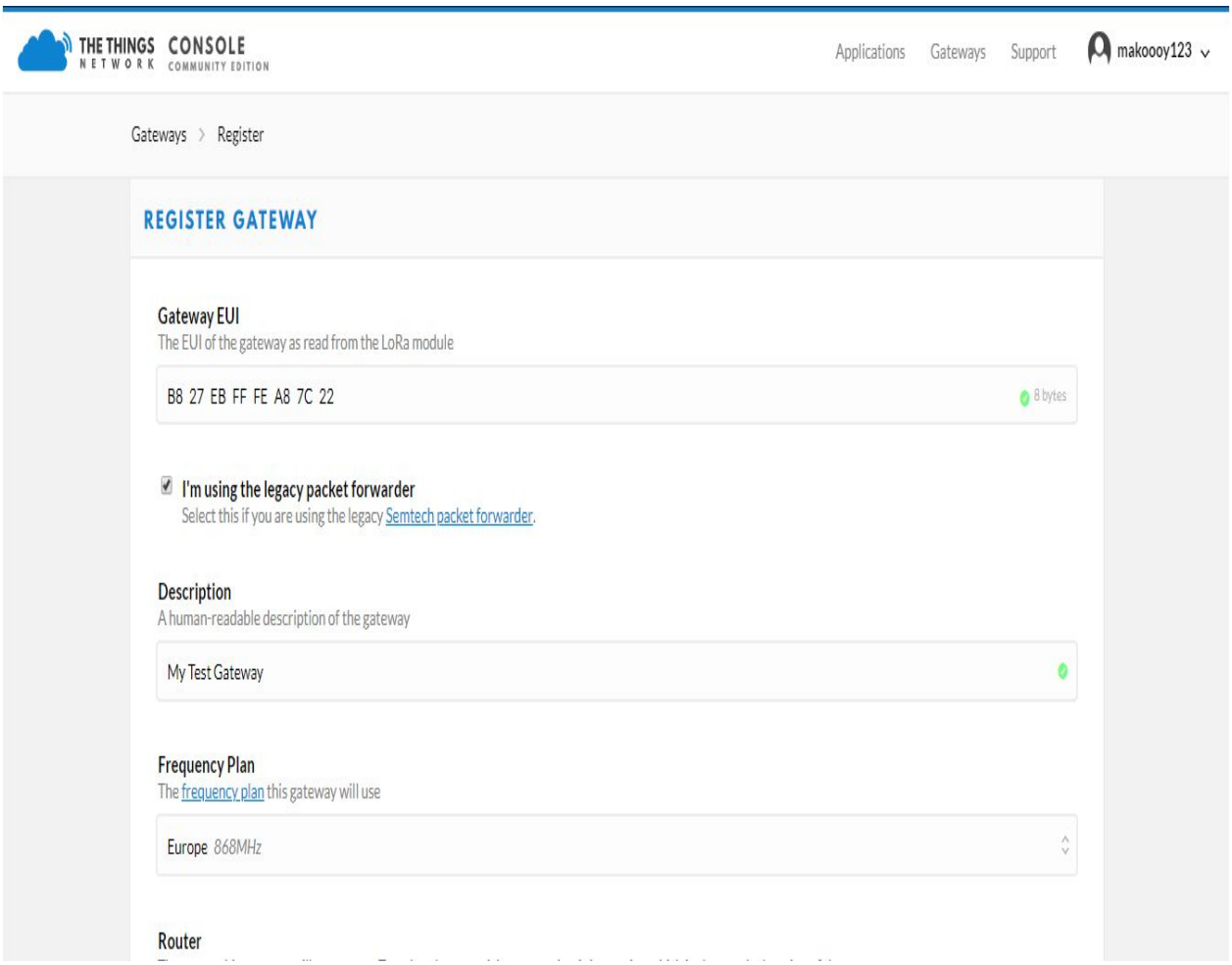


Figure 4: Registering your Gateway

- **Gateway EUI** - refers to the Gateway ID you obtained from the previous step. In case you forgot, just type "**gateway-version**" in the command line. This must be the same with the LoRaWAN™ Gateway's True Gateway ID otherwise you will fail to register your LoRaWAN™ Gateway on TTN.
- **Description** - A human readable description of your LoRaWAN™ Gateway.
- **Frequency Plan** - This is the frequency you want to use and it must be the same with LoRaWAN™ Gateway and the LoRa® Node.
- **Router** - The router this gateway will connect to. To reduce latency, pick a router that is in a region which is close to the location of the gateway.
- **Location** - Choose the location of the gateway by entering its coordinates. This is reflected on the Gateway World Map!
- **Antenna Placement** - refers to the location of your antenna whether indoor or outdoor.

Click Register Gateway, and wait a couple of minutes. If the status of your gateway is **Connected**, Congratulations! Your LoRaWAN™ Gateway is now connected to the The Things Network (TTN).