

# Get Start with RAK2245 & RAK831 RPI LoRa Gateway

Version V1.0 | May 2019

**[www.RAKwireless.com](http://www.RAKwireless.com)**

*Visit our website for more document.*

33 PAGES

# Table of Contents

1. Overview.....	3
2. What do you need to prepare?.....	3
3. Burn the latest firmware into SD card.....	3
4. Connect the LoRa gateway.....	4
4.1 Wi-Fi AP mode.....	4
4.2 Ethernet cable.....	4
5. Log into the LoRa gateway through SSH.....	4
5.1 Your PC's OS is Windows.....	4
5.2 Your PC's OS is Mac OS.....	7
5.3 Your PC's OS is Linux.....	10
6. Configure your LoRa Gateway.....	10
6.1 Set a new password for the LoRa gateway.....	11
6.2 Config the frequency and the LoRa server.....	13
6.2.1 Server is TTN.....	14
6.2.2 Server is LoRaServer.....	15
6.3 Connect the LoRa gateway to a router.....	16
6.3.1 Connect to router through Wi-Fi.....	17
6.3.2 Connect to router through Ethernet cable.....	19
7. Connect the LoRa gateway with TTN.....	21
8. Connect the LoRa gateway with LoRaServer.....	26
8.1 A built-in LoRaServer.....	26
8.2 An independent LoRaServer.....	28
9. Where is the source code?.....	32
10. Revision History.....	33
11. Document Summary.....	33

## 1. Overview

This document can be used for RAK2245 Pi HAT, RAK831, RAK7243 without LTE.

More document please access RAK official website:

<https://www.rakwireless.com/en/download>.

## 2. What do you need to prepare?

RAK2245 Pi HAT + RPi 3B+, or RAK831 + RPi 3B+, or RAK Pilot Gateway, or RAK Pilot Gateway pro (no LTE);

You can buy them from RAK online store:

<https://store.rakwireless.com/>

A 16G SD card, and a card reader, and a PC;

Install a writing software on the PC which can be used to burn firmware into SD card, for example, you can use Etcher, which can be download freely from here:

<https://www.balena.io/etcher/>

Install a SSH tool on the PC if the OS of the PC is Windows. You can use Putty, which can be download freely from here:

<https://www.chiark.greenend.org.uk/~sgtatham/putty/latest.html>

If the OS of the PC is Linux or Mac OS, there is a built-in SSH tool already.

Download the latest firmware from RAK website:

<https://www.rakwireless.com/en/download/LoRa/RAK2245-Pi-HAT#Firmware>

## 3. Burn the latest firmware into SD card

You can refer to this document to burn the latest firmware which you download from RAK website into SD card:

[http://docs.rakwireless.com/en/LoRa/RAK2245-Pi-HAT/Tool/How\\_to\\_write\\_LoRa\\_Gateway\\_Image\\_to\\_Micro\\_SD.pdf](http://docs.rakwireless.com/en/LoRa/RAK2245-Pi-HAT/Tool/How_to_write_LoRa_Gateway_Image_to_Micro_SD.pdf)

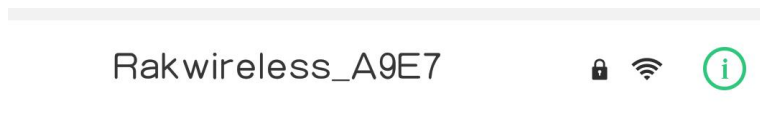
When you complete it, insert the SD card into your LoRa gateway, and power on.

## 4. Connect the LoRa gateway

There are two ways to connect your PC with the LoRa gateway:

### 4.1 Wi-Fi AP mode

By default, the LoRa gateway will work in Wi-Fi AP mode which means that you can find a SSID named like “Rakwireless\_XXXX” on your PC Wi-Fi network list, for example:



You can connect this Wi-Fi SSID by using “rakwireless” as the default password. The default IP address of the LoRa gateway’s Wi-Fi is 192.168.12.1, and your PC will obtain an IP address automatically from DHCP if it connects successfully;

### 4.2 Ethernet cable

You can also connect your PC with the LoRa gateway through a Ethernet cable. By default, the IP address of the LoRa gateway’s Ethernet 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.

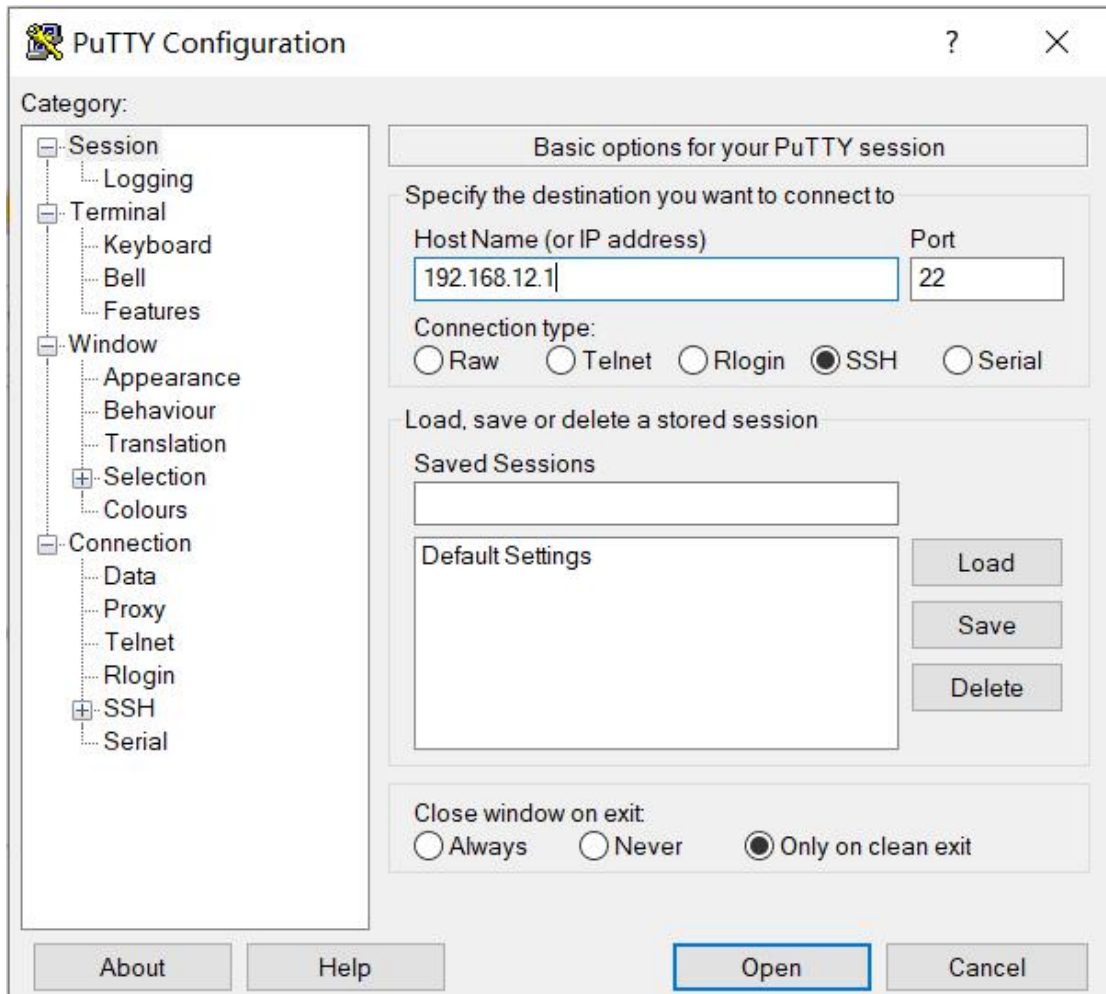
OK, now, you should be able to ping the LoRa gateway from your PC successfully. If it is, you can log into the LoRa gateway through SSH from your PC.

## 5. Log into the LoRa gateway through SSH

There are 3 cases of your PC.

### 5.1 Your PC’s OS is Windows

Open the SSH tool on your PC, in this document, we assume you use Putty, and connect with the LoRa gateway through Wi-Fi AP mode which means the IP address of SSH is 192.168.12.1, as the following picture shows:



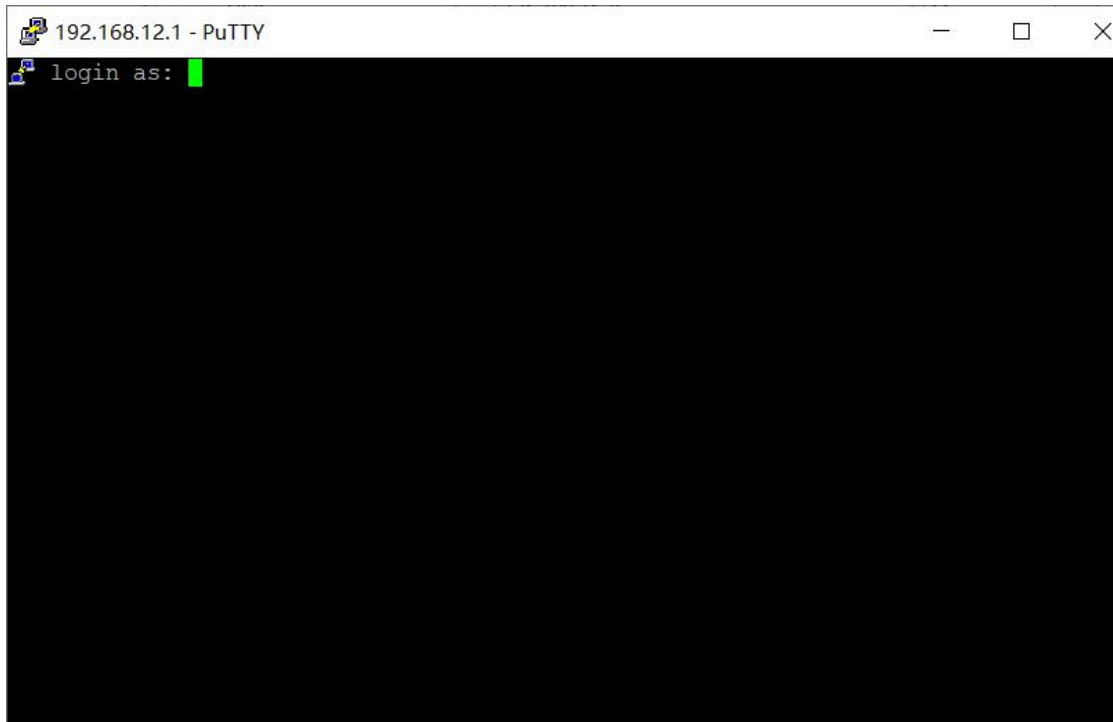
The image shows the PuTTY Configuration window. On the left is a tree view under 'Category:' with the following items: Session, Logging, Terminal, Keyboard, Bell, Features, Window, Appearance, Behaviour, Translation, Selection, Colours, Connection, Data, Proxy, Telnet, Rlogin, SSH, and Serial. The 'SSH' item is selected. The main area is titled 'Basic options for your PuTTY session'. It contains the following fields and options:

- 'Specify the destination you want to connect to' section:
  - 'Host Name (or IP address)' text box containing '192.168.12.1'
  - 'Port' text box containing '22'
- 'Connection type:' section:
  - Radio buttons for Raw, Telnet, Rlogin, SSH (selected), and Serial.
- 'Load, save or delete a stored session' section:
  - 'Saved Sessions' list box (empty).
  - 'Default Settings' text box.
  - 'Load', 'Save', and 'Delete' buttons.
- 'Close window on exit:' section:
  - Radio buttons for Always, Never, and Only on clean exit (selected).

At the bottom are buttons for 'About', 'Help', 'Open' (highlighted with a blue border), and 'Cancel'.

Note: If you connect with the LoRa gateway through Ethernet cable, the IP address of SSH should be 192.168.10.10.

Then enter the username and password:

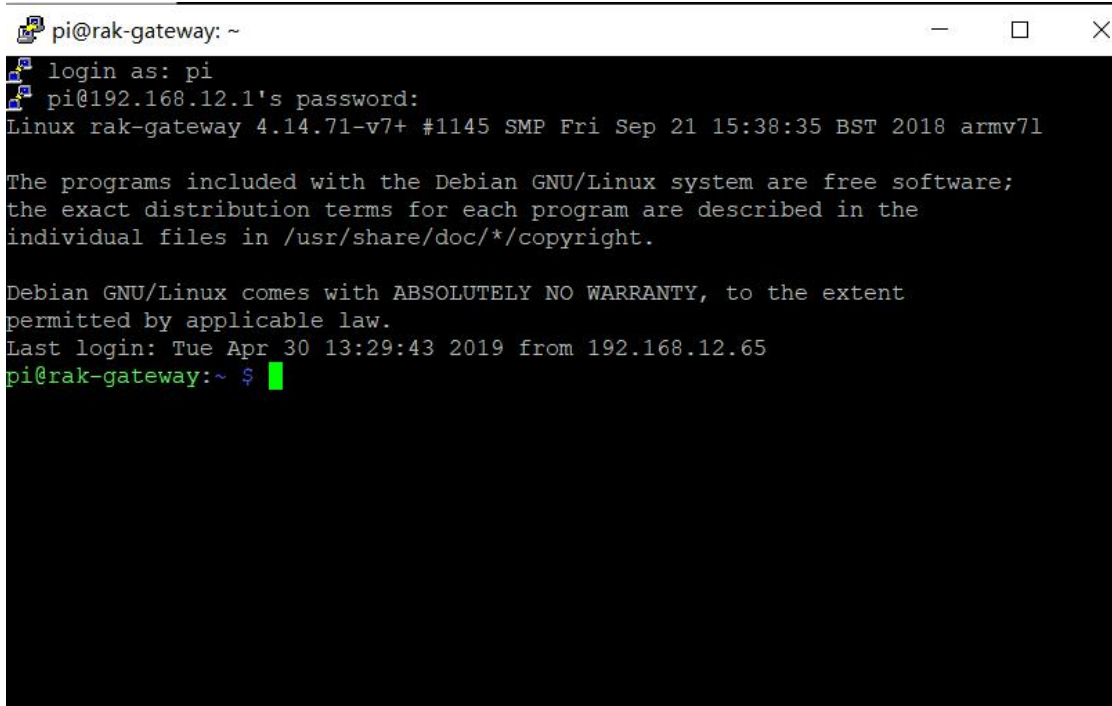


The default username is “pi”, and the default password is “raspberry”.



If there is a message to let you enter “yes” or “no”, just “yes”.

OK, now, you have logged into the LoRa gateway through SSH successfully:



```
pi@rak-gateway: ~  
login as: pi  
pi@192.168.12.1's password:  
Linux rak-gateway 4.14.71-v7+ #1145 SMP Fri Sep 21 15:38:35 BST 2018 armv7l  
  
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.  
Last login: Tue Apr 30 13:29:43 2019 from 192.168.12.65  
pi@rak-gateway:~ $
```

## 5.2 Your PC's OS is Mac OS

Open the terminal of Mac OS. If you don't know how to open it, please Google or Baidu.




```
rak — -bash — 80x24  
Last login: Wed May 8 15:24:42 on ttys000  
Mac-Pro:~ RAK$
```

If it is not in root mode, please enter “sudo -i”:



```
rak — sudo — 80x24
Last login: Wed May  8 15:24:42 on ttys000
[Mac-Pro:~ RAK$ sudo -i
Password: ]
```

Enter the password, and you can find it is in root mode now:



```
rak — sh — 80x24
Last login: Wed May  8 15:24:42 on ttys000
[Mac-Pro:~ RAK$ sudo -i
Password:
Mac-Pro:~ root# ]
```

Enter “ssh [pi@192.168.12.1](ssh://pi@192.168.12.1)” to logged into the LoRa gateway, the default password is “raspberry”:



```

rak — ssh — 80x24
Last login: Wed May  8 15:24:42 on ttys000
Mac-Pro:~ RAK$ sudo -i
Password:
Mac-Pro:~ root# ssh pi@192.168.12.1
pi@192.168.12.1's password:

```

Note: If you connect your PC with the LoRa gateway through Ethernet cable, you should enter “ssh [pi@192.168.10.10](https://192.168.10.10)” in this step.

OK, you have logged into the LoRa gateway through SSH successfully:

```

rak — pi@rak-gateway: ~ — ssh — 80x24
Last login: Wed May  8 15:24:42 on ttys000
Mac-Pro:~ RAK$ sudo -i
Password:
Mac-Pro:~ root# ssh pi@192.168.12.1
pi@192.168.12.1's password:
Linux rak-gateway 4.14.71-v7+ #1145 SMP Fri Sep 21 15:38:35 BST 2018 armv7l

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.
Last login: Tue Apr 30 09:55:41 2019 from 192.168.12.178

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:~ $

```

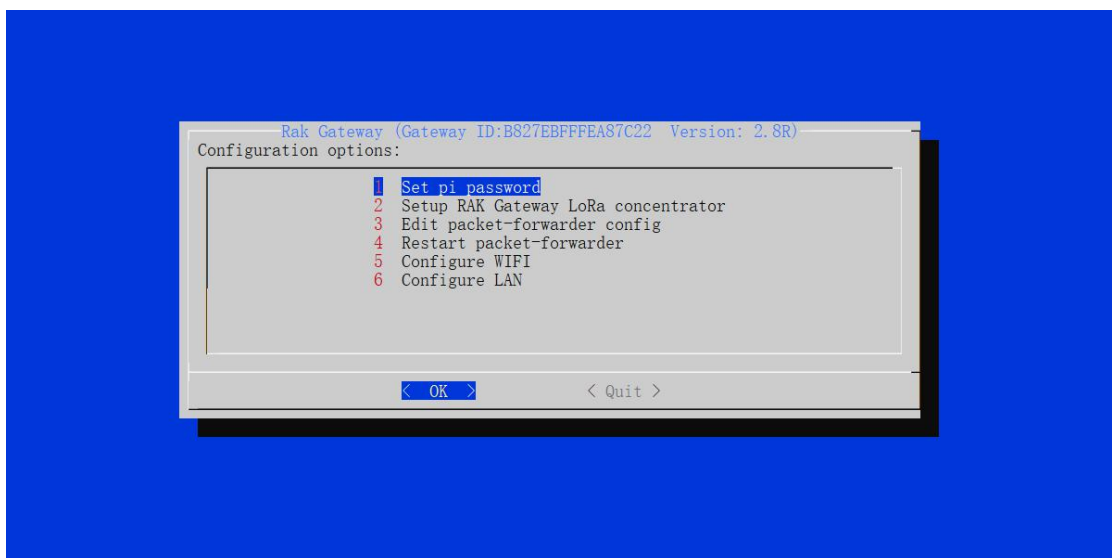
### 5.3 Your PC's OS is Linux

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

## 6. Configure your LoRa Gateway

Now, you have logged into the LoRa gateway through SSH.

Enter a command “sudo gateway-config”, then you will see a page like the following picture shows:



The item 1 is used to set a new password for the LoRa gateway.

The item 2 is used to config the frequency which the LoRa gateway will work on, and the LoRa server which the LoRa gateway will work with;

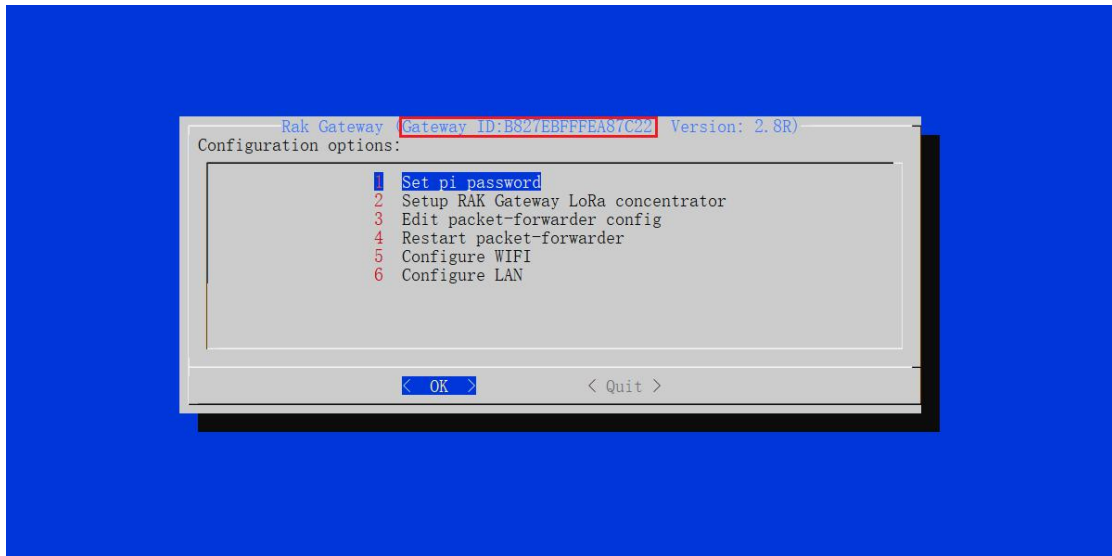
The item 3 is used to open the global\_conf.json file which includes almost all configurations about LoRaWAN;

The item 4 is used to restart the process of LoRa protocol named packet-forwarder;

The item 5 is used to config the Wi-Fi function;

The item 6 is used to config the IP address of Ethernet;

Please notice that, there is a very important information on this page, yes, it is “Gateway ID” which will be used when you register your LoRa gateway on a LoRa server:



Surely, there is another way to get “Gateway ID”, just enter a command “gateway-version”, then you will see it the as follow:

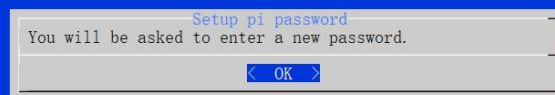
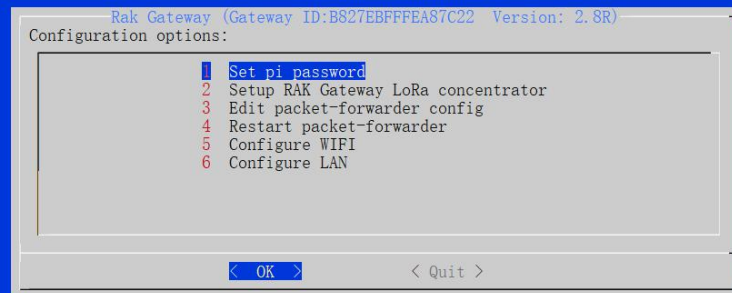
```
pi@rak-gateway: ~ $ gateway-version
Gateway ID:B827EBFFFEA87C22
rakwireless gateway 2245 version 2.8R
```

More details, you can see the following contents:

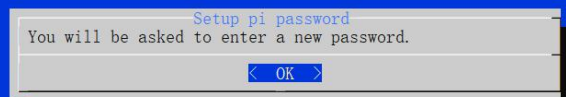
## 6.1 Set a new password for the LoRa gateway

The default password is “raspberry”, which is same with all Raspberry Pi devices, so you need to set a new password for your LoRa gateway because of security.

As the following picture shows, choose “1 Set pi password”:

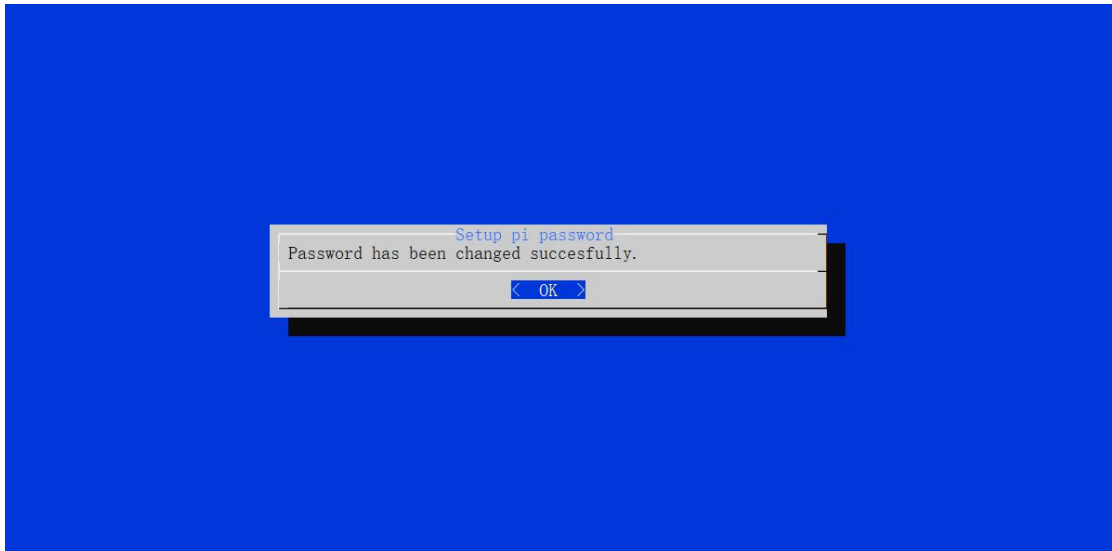


After OK, you need to enter a new password twice:

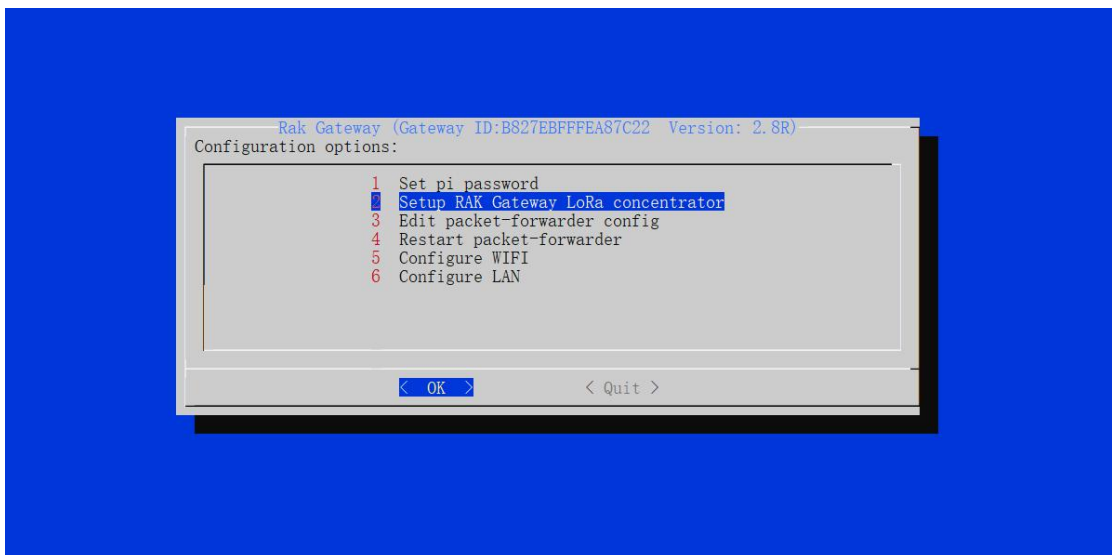


Enter new UNIX password:  
Retype new UNIX password:

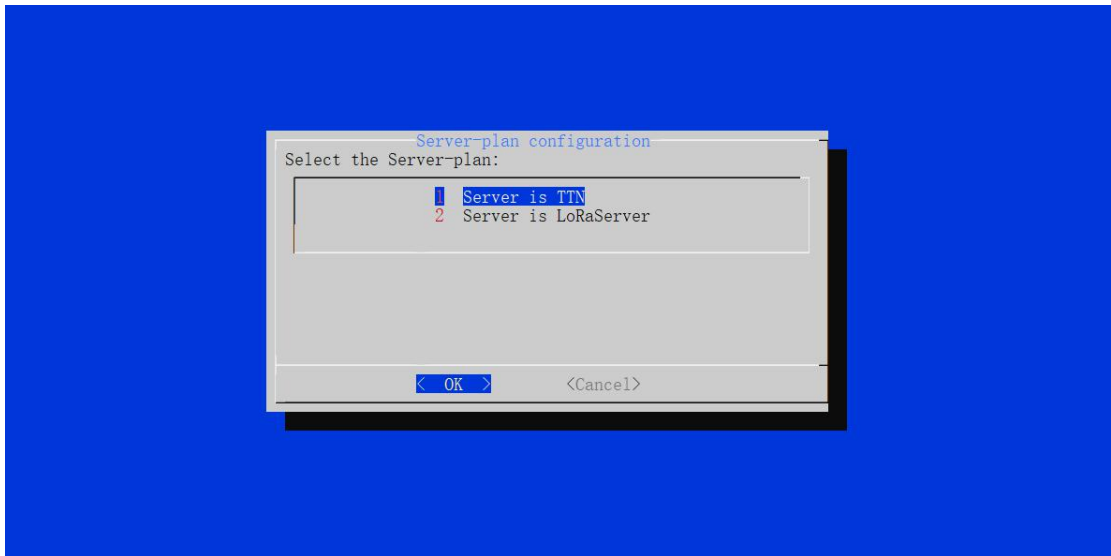
OK, you have set it successfully!



## 6.2 Config the frequency and the LoRa server



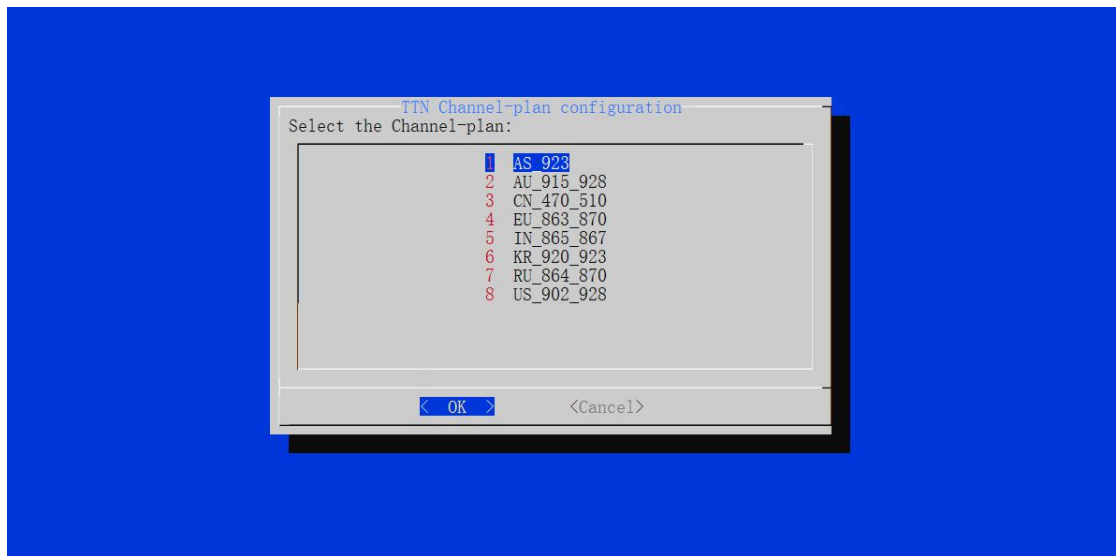
As the above picture shows, choose “Setup RAK831/RAK2245 LoRa concentrator”, then you will see the following page:



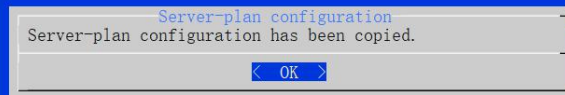
This is the page to choose LoRa server. Now, you can only choose TTN or LoRaServer as the LoRa server which the LoRa gateway will work with.

### 6.2.1 Server is TTN

If you choose TTN as the LoRa server, you will see the following page:



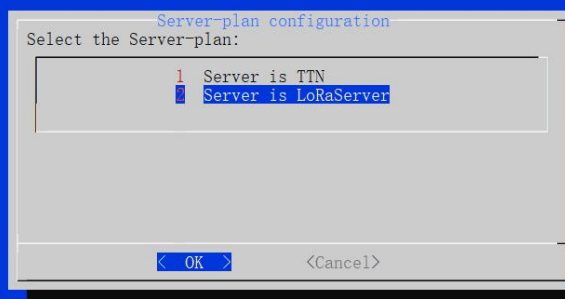
You can choose a frequency in this page.



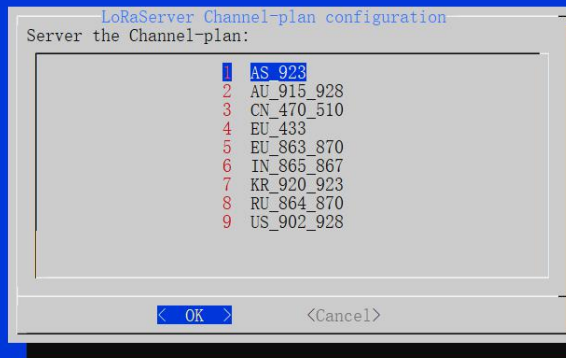
That's OK!

### 6.2.2 Server is LoRaServer

If you choos LoRaServer as the LoRa server:

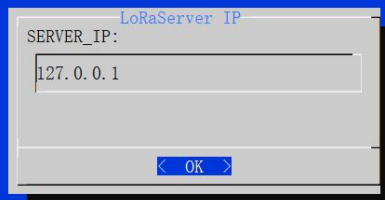


you will see the following page:



Just choose a frequency from them.

Next, you need to set an IP address of the LoRaServer which you want your LoRa gateway to work with:



The default IP address is “127.0.0.1” which means the built-in LoRaServer in the LoRa gateway. If you want to use an independent LoRaServer device or a cloud LoRaServer, you need to set it to a correct IP address.

### 6.3 Connect the LoRa gateway to a router

If you want to use TTN or an independent LoRaServer which may be deployed in local area network or Internet, you need to connect your LoRa gateway to a router firstly.

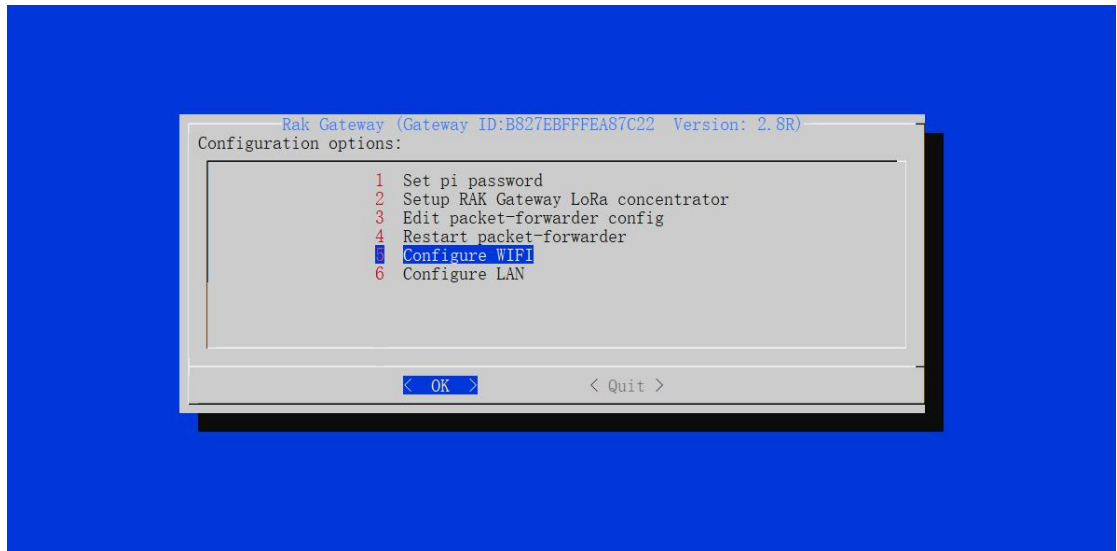


There are 2 ways to connect your LoRa gateway to a router:

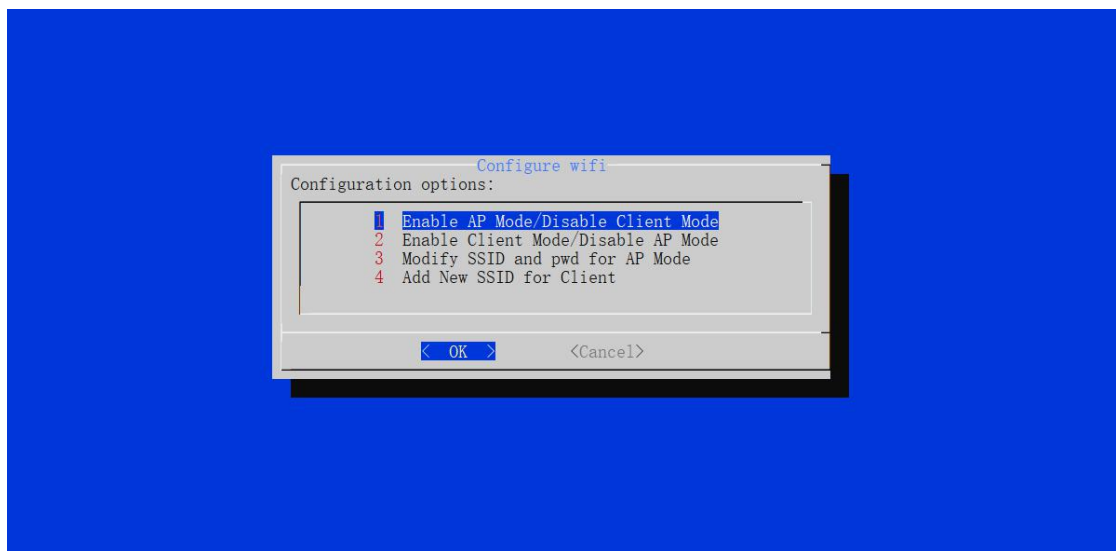
### 6.3.1 Connect to router through Wi-Fi

If you want to connect to router through Wi-Fi, just do as follow:

Choose “5 Configure WiFi”:



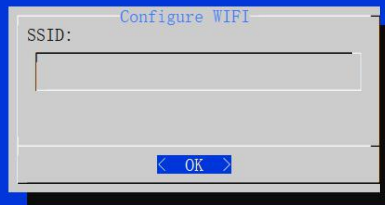
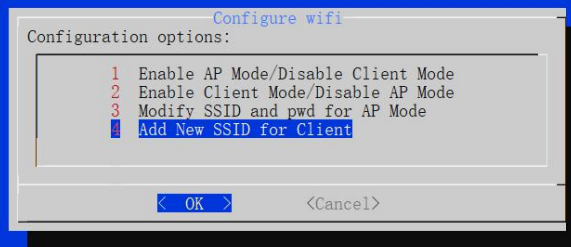
You will see the following page:

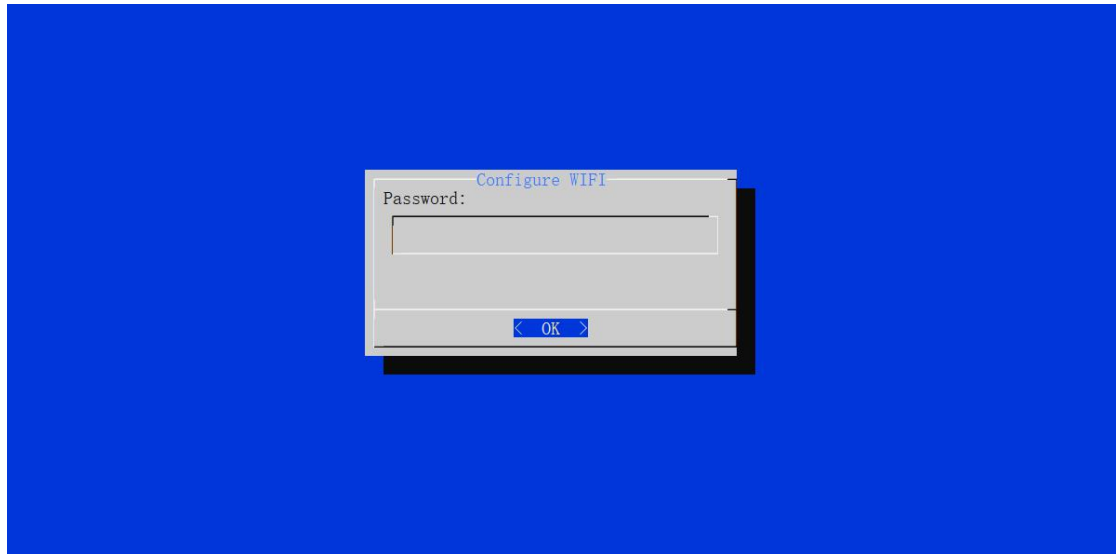


**Note:** The item 1 and the item 2 are used to set the Wi-Fi mode which the LoRa gateway work in. If you choose the item 1, it means that the LoRa gateway will work in Wi-Fi AP mode after rebooting, while the Wi-Fi client mode will be disabled. If you choose the item 2, it means that the LoRa gateway will work in Wi-Fi client mode after rebooting, while Wi-Fi AP mode will be disabled. The item 3 is used to modify the SSID and password of Wi-Fi AP, and it is valid when the LoRa gateway works in Wi-Fi AP mode. The item 4

is used to config the Wi-Fi SSID and password which the LoRa gateway will connect after rebooting if the LoRa gateway works in Wi-Fi client mode.

Choose the item 2 to enable the Wi-Fi client mode, then choose the item 4 to config the Wi-Fi SSID and password you want to connect.





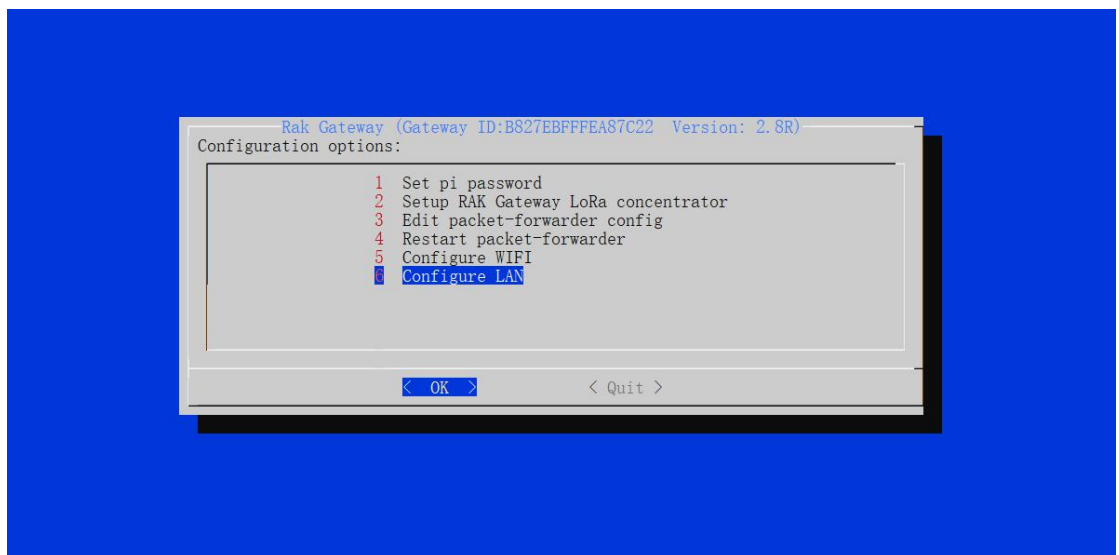
Just fill in them according to your router's Wi-Fi network configuration.

OK, you can reboot the LoRa gateway now, and it will connect to router through Wi-Fi automatically.

### 6.3.2 Connect to router through Ethernet cable

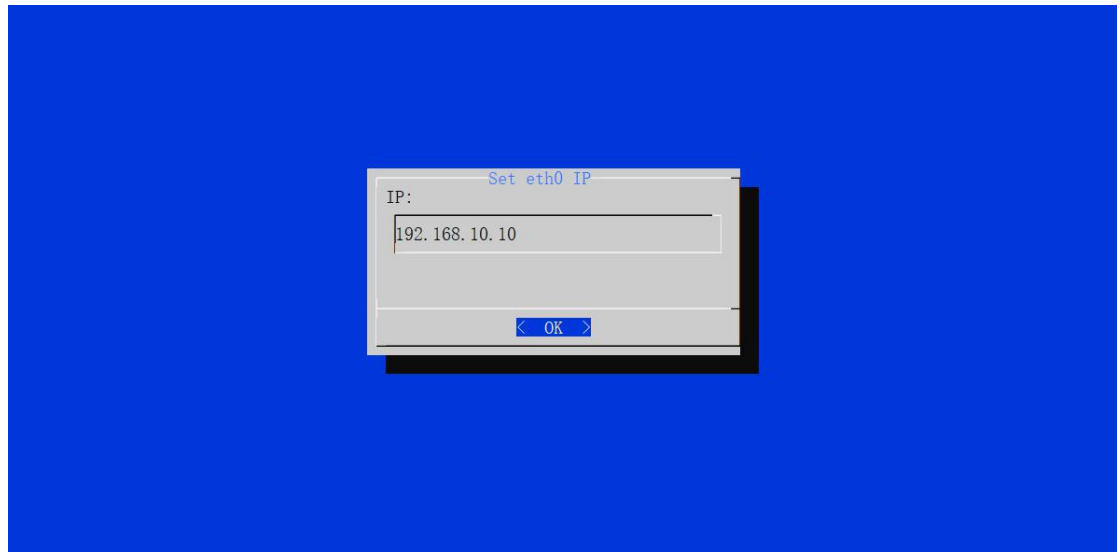
If you want to connect to router through Ethernet cable, just do as follow:

Connect the LoRa gateway and the router with an Ethernet cable, then choose "6 Configure LAN" to config a static IP address of the LoRa gateway's Ethernet.

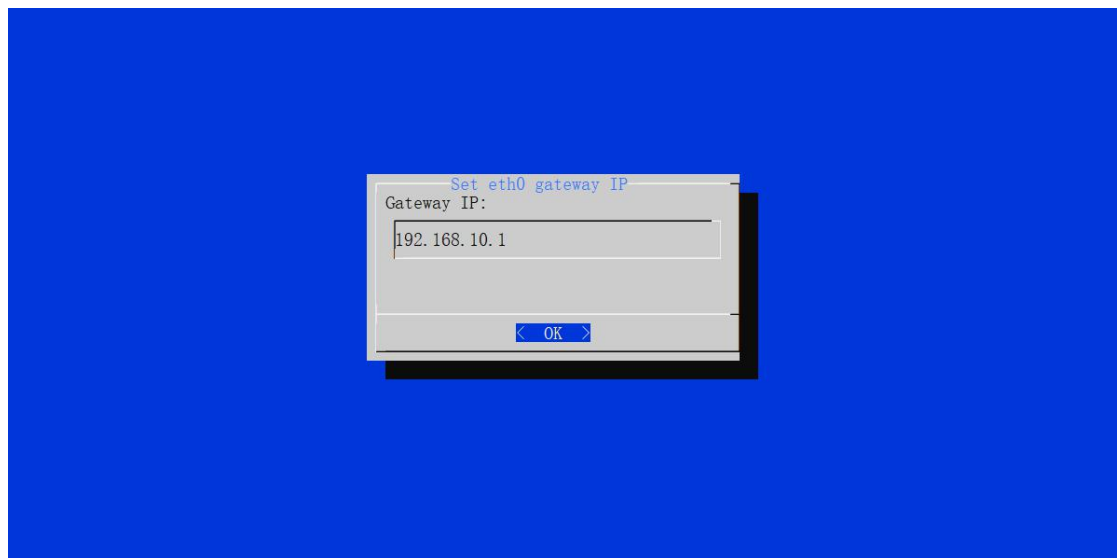


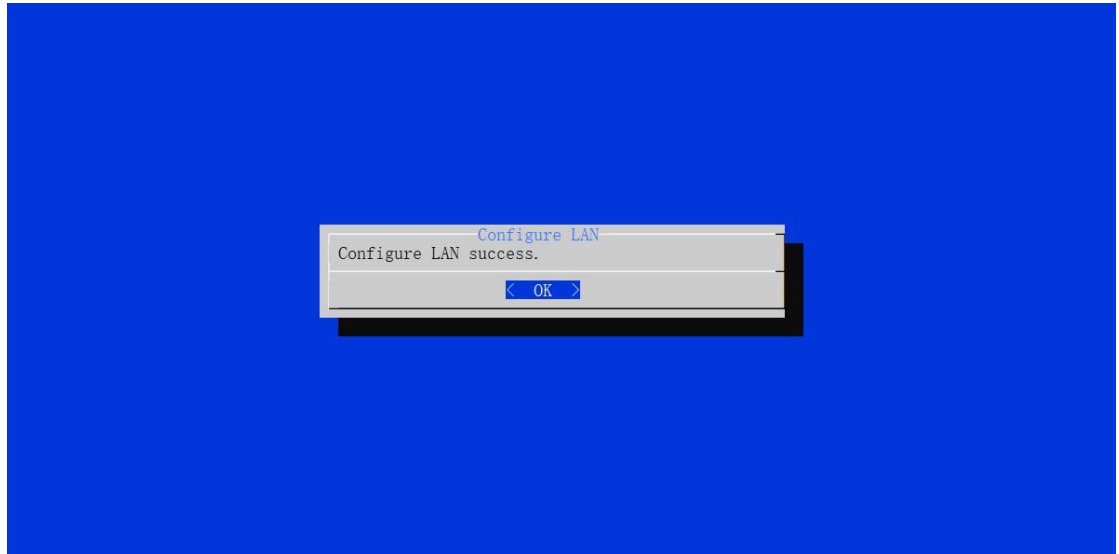
You can see the following page, just fill a static IP address according to the IP address of the router you want to connect. Please notice that the LoRa gateway and the router must be in a same network segment, otherwise the

connection will fail. By default, the IP address of the LoRa gateway's Ethernet is 192.168.10.10:



Then config the router's IP address. It must be the true IP address of the router:





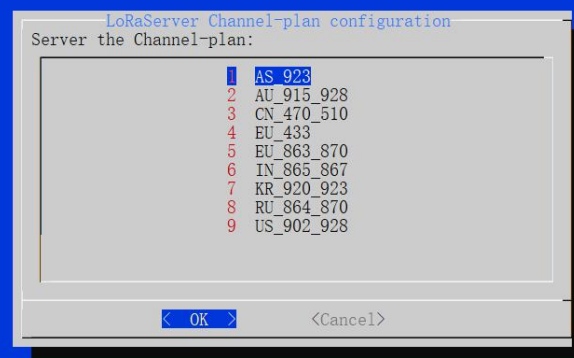
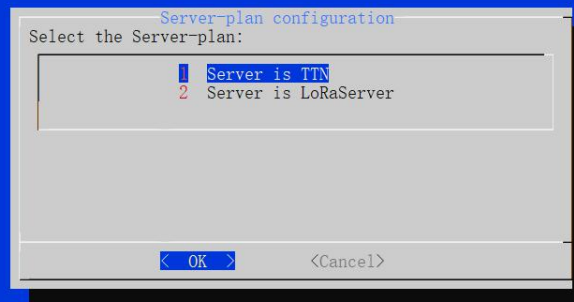
Now, just reboot the LoRa gateway and it will connect to the router successfully through Ethernet cable.

OK! Let's do some application examples to show the whole process of usage.

## 7. Connect the LoRa gateway with TTN

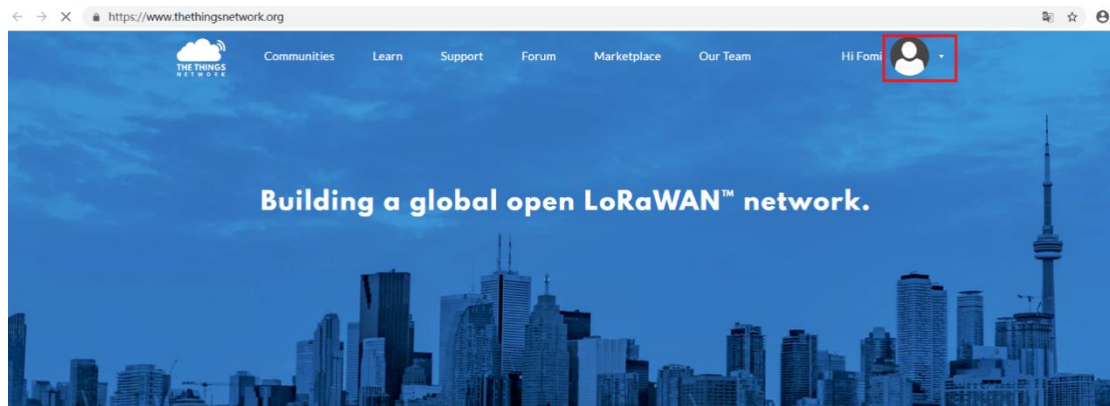
Firstly, connect your LoRa gateway to the router in order to access internet according to the method which has been introduced in the “Configure your LoRa Gateway” section of this document.

Secondly, config your LoRa gateway and choose TTN as the LoRa server and choose a correct frequency according to the method which has been introduced in the “Configure your LoRa Gateway” section of this document:

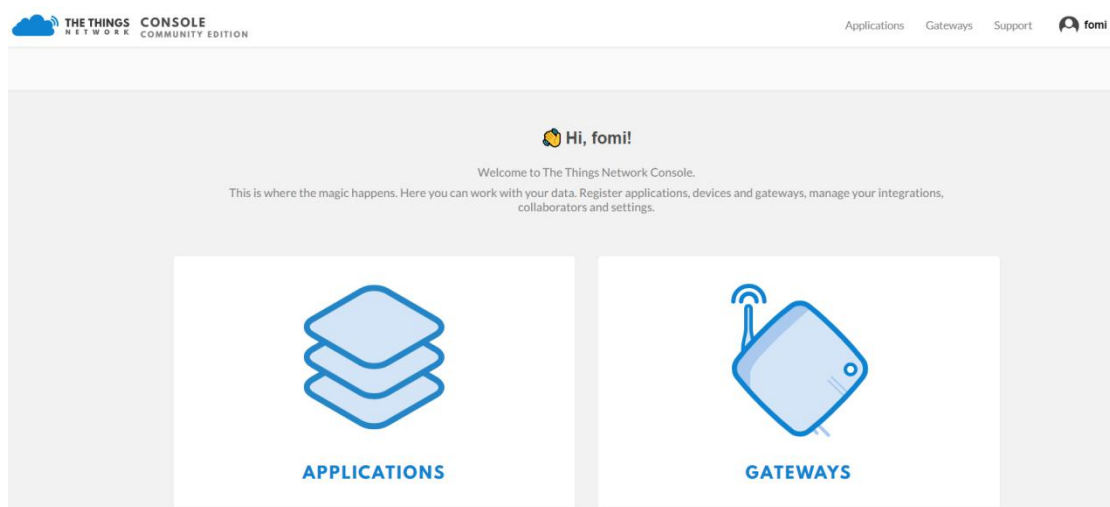


In this example, we choose TTN as the LoRa server and EU868 frequency (EU\_863\_870).

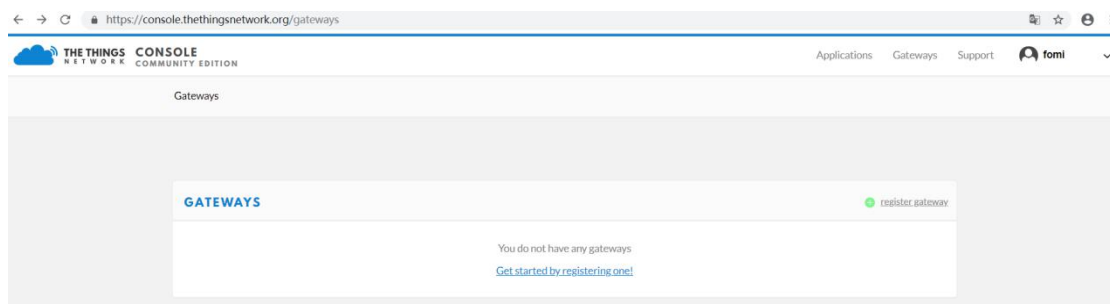
Now, open the TTN website <https://www.thethingsnetwork.org/>, and log in, then you will see the following page. Just click “Console” in the drop-down menu of red box.



Can you see this page?



Click "GATEWAYS":



Click "register gateway"

← → ↻ https://console.thethingsnetwork.org/gateways/register

THE THINGS NETWORK CONSOLE COMMUNITY EDITION Applications Gateways Support fomi

Gateways > Register

### REGISTER GATEWAY

**Gateway ID**  
A unique, human-readable identifier for your gateway. It can be anything so be creative!

☐ I'm using the legacy packet forwarder  
Select this if you are using the legacy [Semtech packet forwarder](#).

**Description**  
A human-readable description of the gateway

**Frequency Plan**  
The [frequency plan](#) this gateway will use

Fill in them one by one:

THE THINGS NETWORK CONSOLE COMMUNITY EDITION Applications Gateways Support fomi

Gateways > Register

### REGISTER GATEWAY

**Gateway EUI**  
The EUI of the gateway as read from the LoRa module

☒ I'm using the legacy packet forwarder  
Select this if you are using the legacy [Semtech packet forwarder](#).

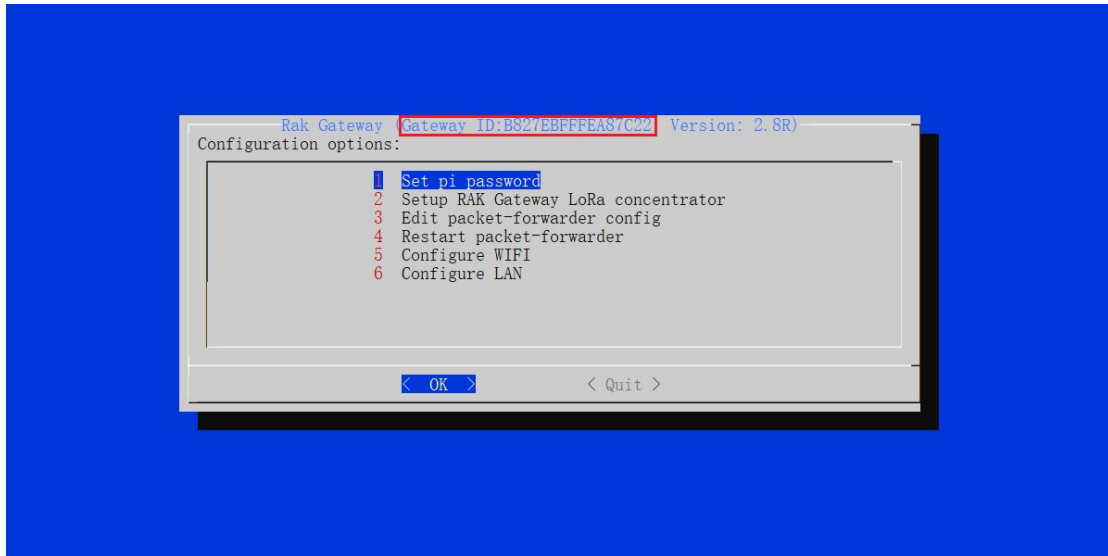
**Description**  
A human-readable description of the gateway

**Frequency Plan**  
The [frequency plan](#) this gateway will use

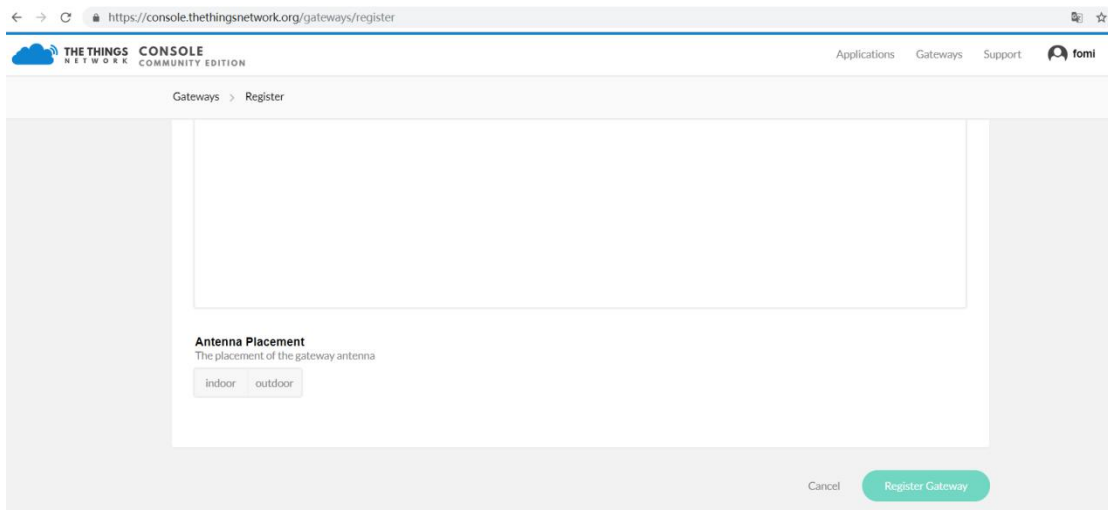
**Router**  
The router this gateway will connect to. To reduce latency, pick a router that is in a region which is close to the location of the gateway.

**Note:** Please notice that the “Frequency Plan” is the frequency you want to use, and it must be same with LoRa gateway and LoRa node. The “Gateway EUI” is the one you have ever met in the following page, it must be same with the LoRa gateway’s true “Gateway ID”, otherwise, you will fail to register your LoRa gateway on TTN:

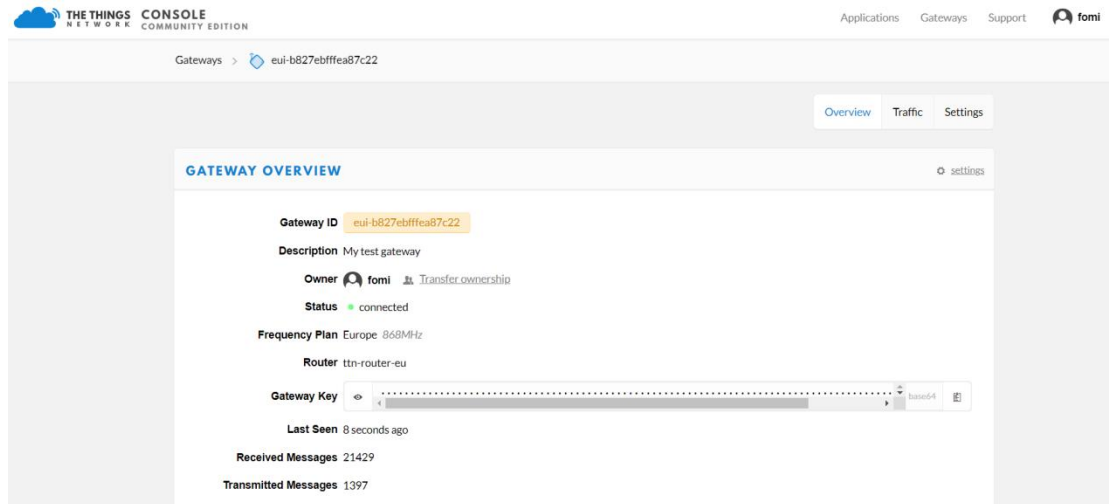




OK, click "Register Gateway" to register.



Do you see the page like as the following picture?



If the “Status” is “connected”, it means your LoRa gateway has connected with TTN!  
Otherwise, please check the network and the configurations of your LoRa gateway.

## 8. Connect the LoRa gateway with LoRaServer

LoRaServer is an open source LoRa server, which you can find in <https://www.loraserver.io/>.

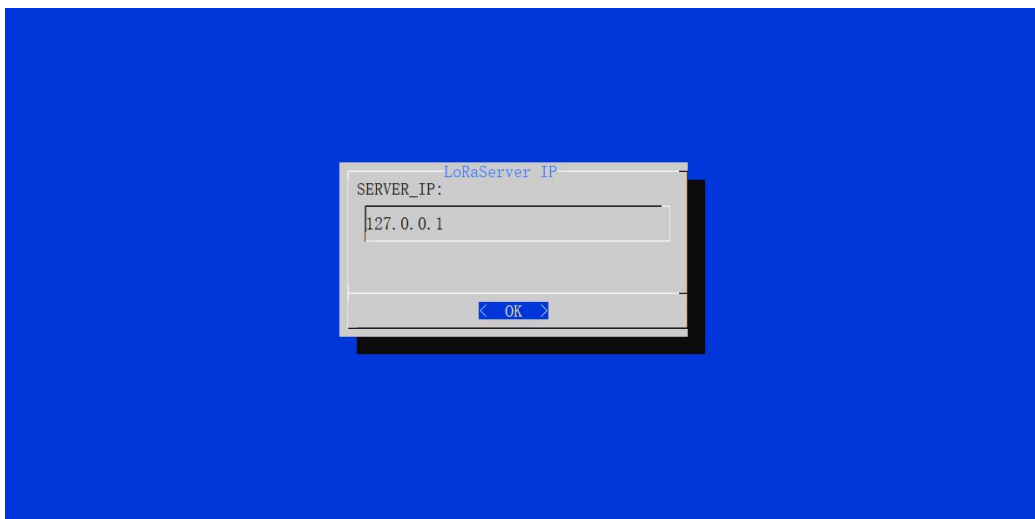
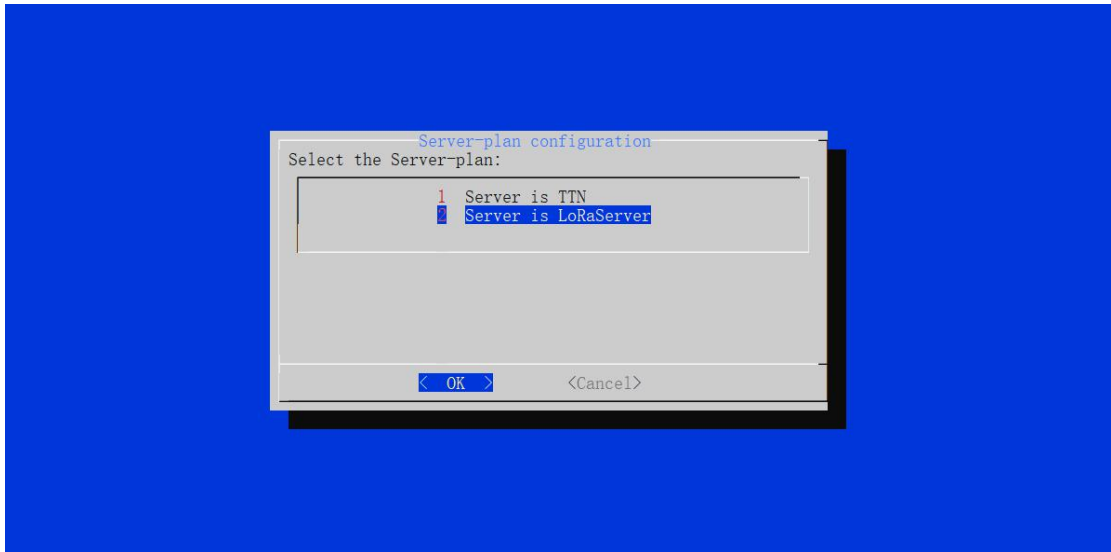
For RAK RPi LoRa gateway, there are 2 ways to use LoRaServer:

### 8.1 A built-in LoRaServer

There is a built-in LoRaServer in every RAK RPi LoRa gateway if you use the latest firmware.

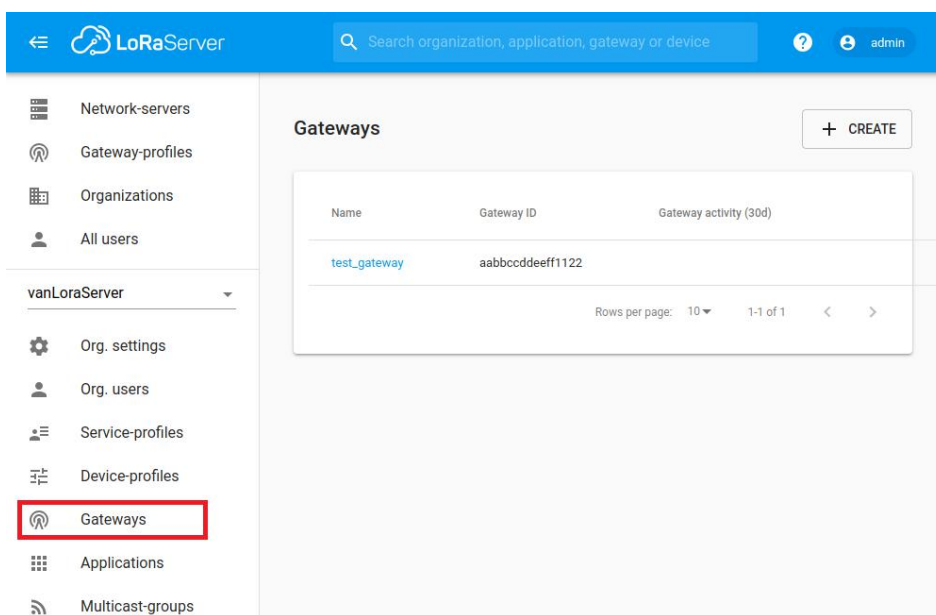
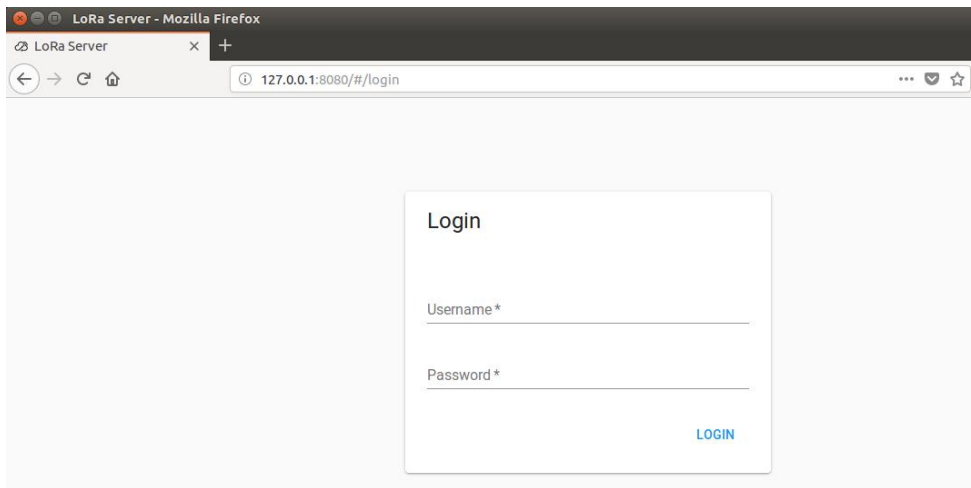
When you use it at the first time after burning the latest firmware, the LoRa gateway will work in EU868 frequency and use the built-in LoRaServer as its LoRa server. In this case, if you don’t want to change the frequency or LoRa server, you needn’t to do anything, because it will be configured automatically when the LoRa gateway starts.

If it is not the first time and you want to use the built-in LoRaServer as the LoRa server, just do something according to “Config your LoRa Gateway” section of this document.



That’s all about the built-in LoRaServer!

If you want to check data on the built-in LoRaServer, just open a browser and enter “IP address:8080”, then enter the default username and the default password, they are both “admin”:



## 8.2 An independent LoRaServer

There are 2 ways that you can get an independent LoRaServer: use RAK's cloud testing LoRaServer or setup an independent LoRaServer by yourself.

If you want to use RAK's cloud testing LoRaServer, you can contact with RAK technical support in the forum: <https://forum.rakwireless.com/>

If you want to setup an independent LoRaServer by yourself, you can get the image from RAK website

<https://www.rakwireless.com/en/download/LoRa/LoRa-Server-OS> and install it on a X86 PC according to this document:

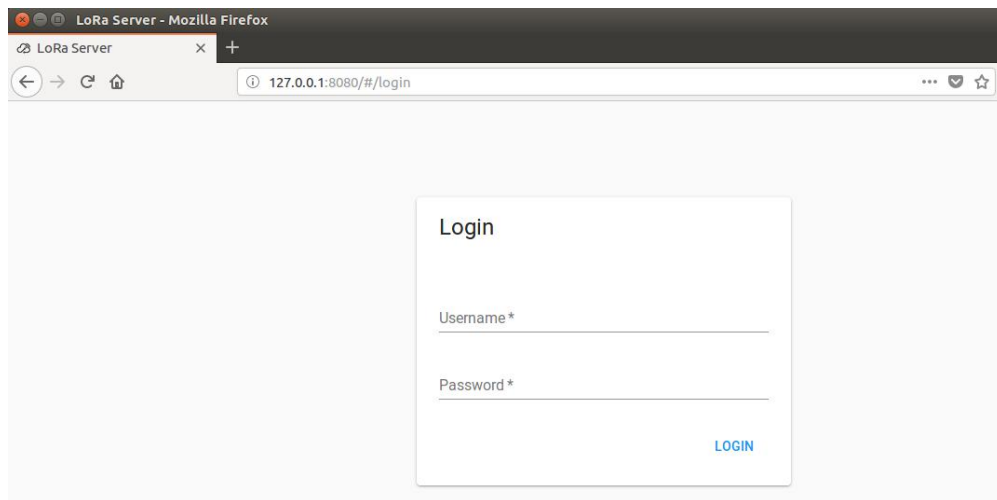
[http://docs.rakwireless.com/en/LoRa/LoRa-Server-OS/guide/Build\\_an\\_independent\\_LoRaServer\\_by\\_yourself.pdf](http://docs.rakwireless.com/en/LoRa/LoRa-Server-OS/guide/Build_an_independent_LoRaServer_by_yourself.pdf) .

Please notice that it is a whole ubuntu OS and it will erase all of old data on your disk of this PC.

OK, we assume you have an independent LoRaServer now!

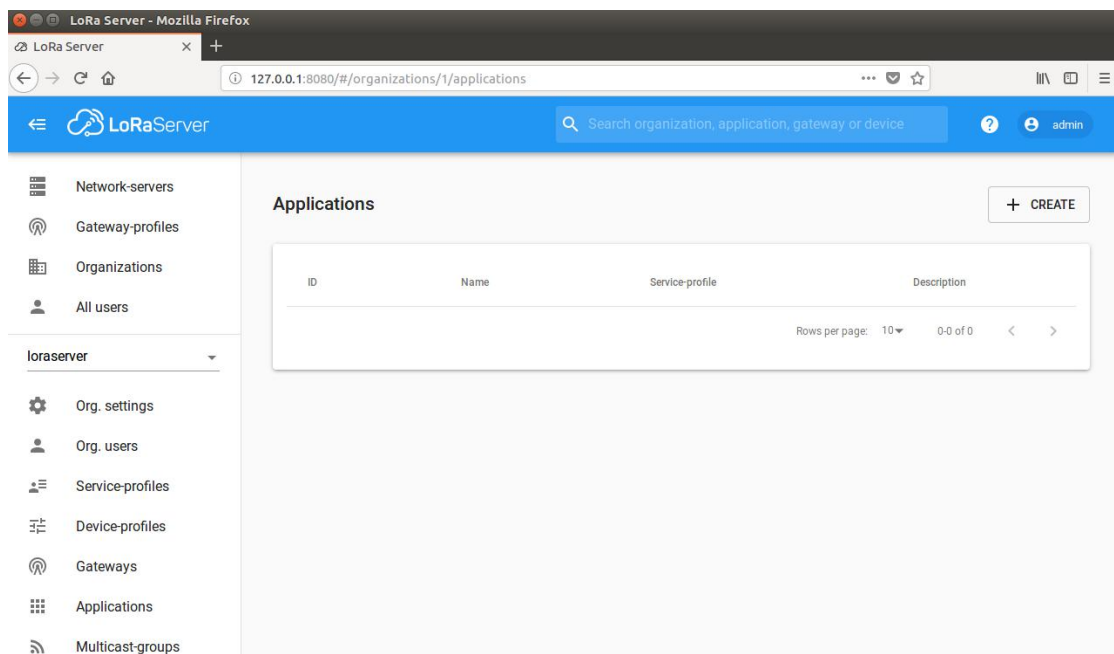
Let's log into the LoRaServer to register your LoRa gateway.

Firstly, open the LoRaServer's web page on a browser by enter "IP address:8080". "IP address" is your independent LoRaServer's true IP address. For example:

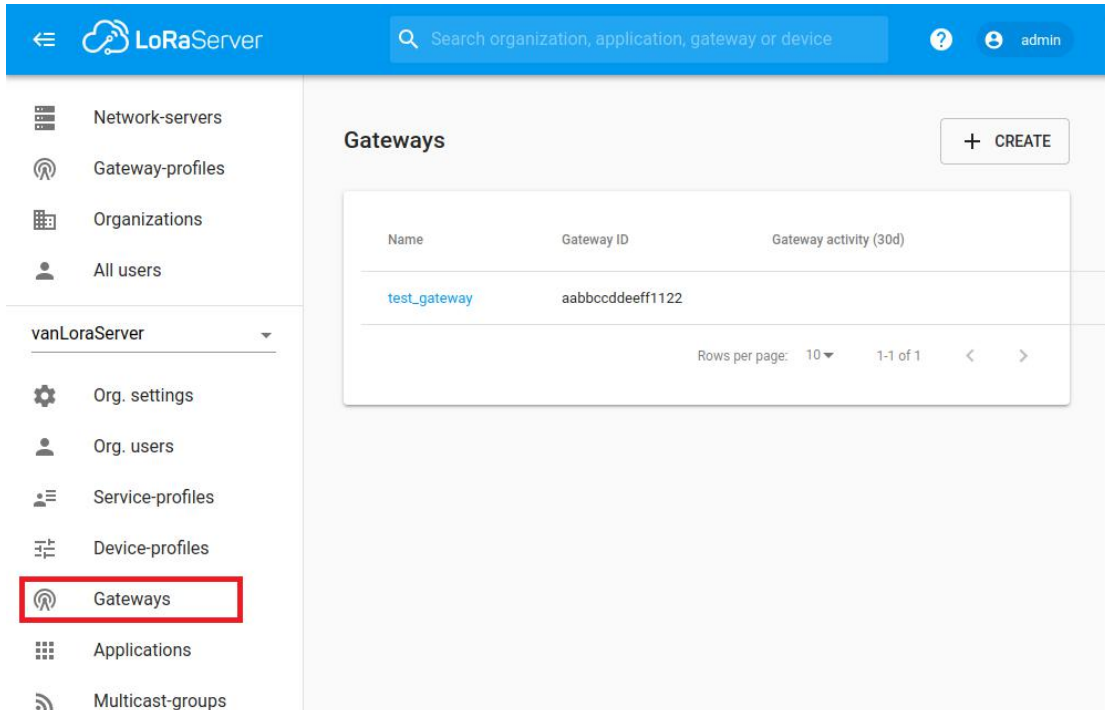


Just log into it, the default username and password are both "admin".

Then you can see a page like this:



Click "Gateways" on the left tree of this page:



LoRaServer

Search organization, application, gateway or device

admin

- Network-servers
- Gateway-profiles
- Organizations
- All users
- vanLoraServer
  - Org. settings
  - Org. users
  - Service-profiles
  - Device-profiles
  - Gateways**
  - Applications
  - Multicast-groups

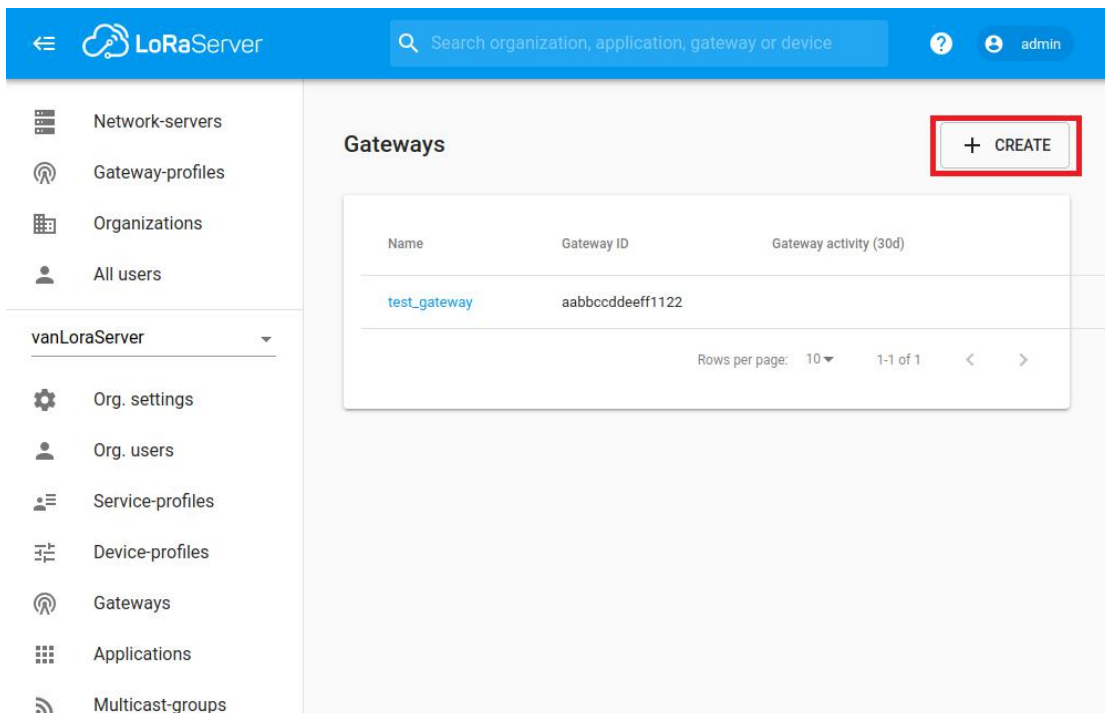
### Gateways

+ CREATE

Name	Gateway ID	Gateway activity (30d)
test_gateway	aabbccddeeff1122	

Rows per page: 10 1-1 of 1

Click “CREATE” on the right page:



LoRaServer

Search organization, application, gateway or device

admin

- Network-servers
- Gateway-profiles
- Organizations
- All users
- vanLoraServer
  - Org. settings
  - Org. users
  - Service-profiles
  - Device-profiles
  - Gateways
  - Applications
  - Multicast-groups

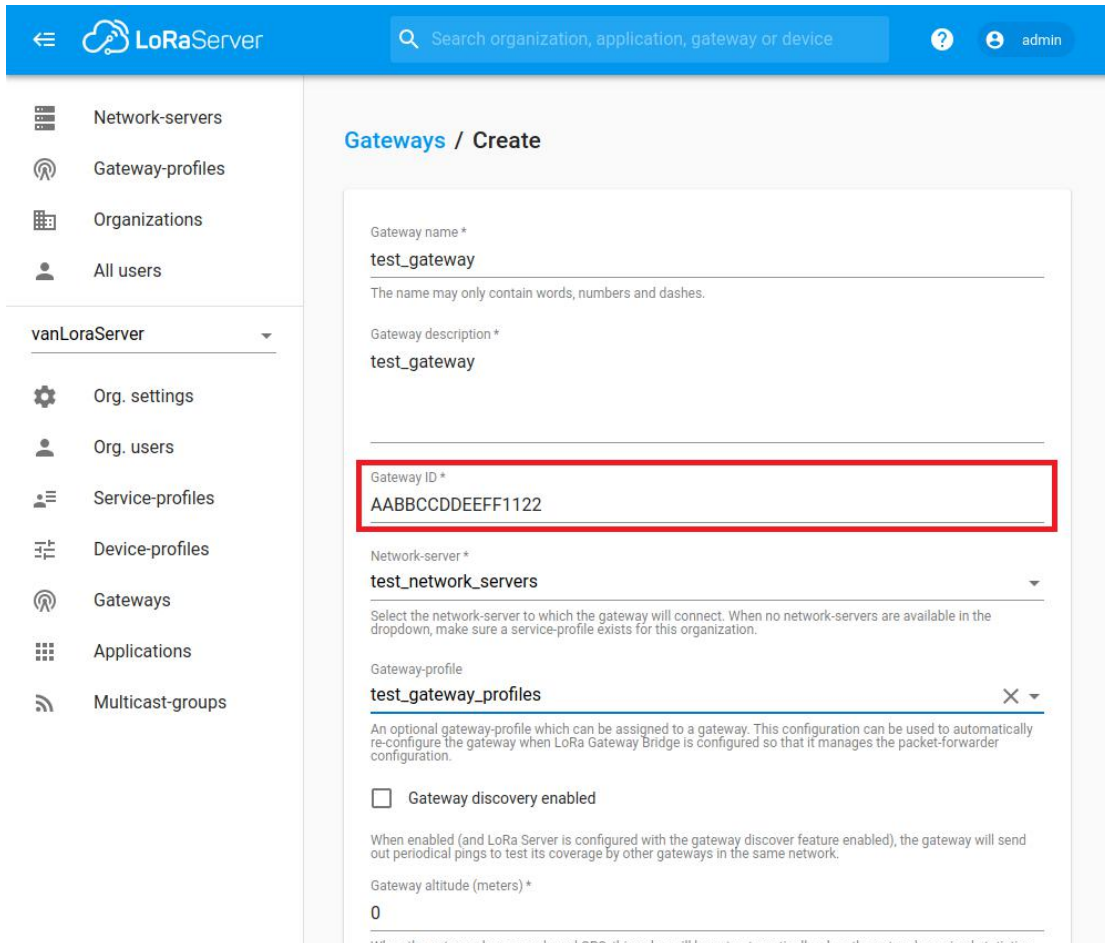
### Gateways

**+ CREATE**

Name	Gateway ID	Gateway activity (30d)
test_gateway	aabbccddeeff1122	

Rows per page: 10 1-1 of 1

Then fill in them:



LoRaServer

Search organization, application, gateway or device

admin

Network-servers

Gateway-profiles

Organizations

All users

vanLoraServer

Org. settings

Org. users

Service-profiles

Device-profiles

Gateways

Applications

Multicast-groups

### Gateways / Create

Gateway name \*

test\_gateway

The name may only contain words, numbers and dashes.

Gateway description \*

test\_gateway

Gateway ID \*

AABBCCDDEEFF1122

Network-server \*

test\_network\_servers

Select the network-server to which the gateway will connect. When no network-servers are available in the dropdown, make sure a service-profile exists for this organization.

Gateway-profile

test\_gateway\_profiles

An optional gateway-profile which can be assigned to a gateway. This configuration can be used to automatically re-configure the gateway when LoRa Gateway Bridge is configured so that it manages the packet-forwarder configuration.

☐ Gateway discovery enabled

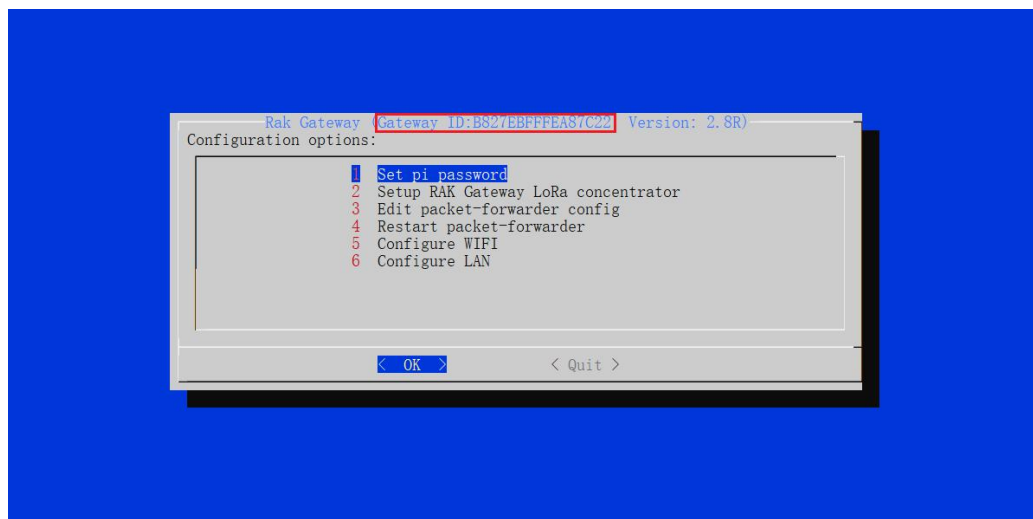
When enabled (and LoRa Server is configured with the gateway discover feature enabled), the gateway will send out periodical pings to test its coverage by other gateways in the same network.

Gateway altitude (meters) \*

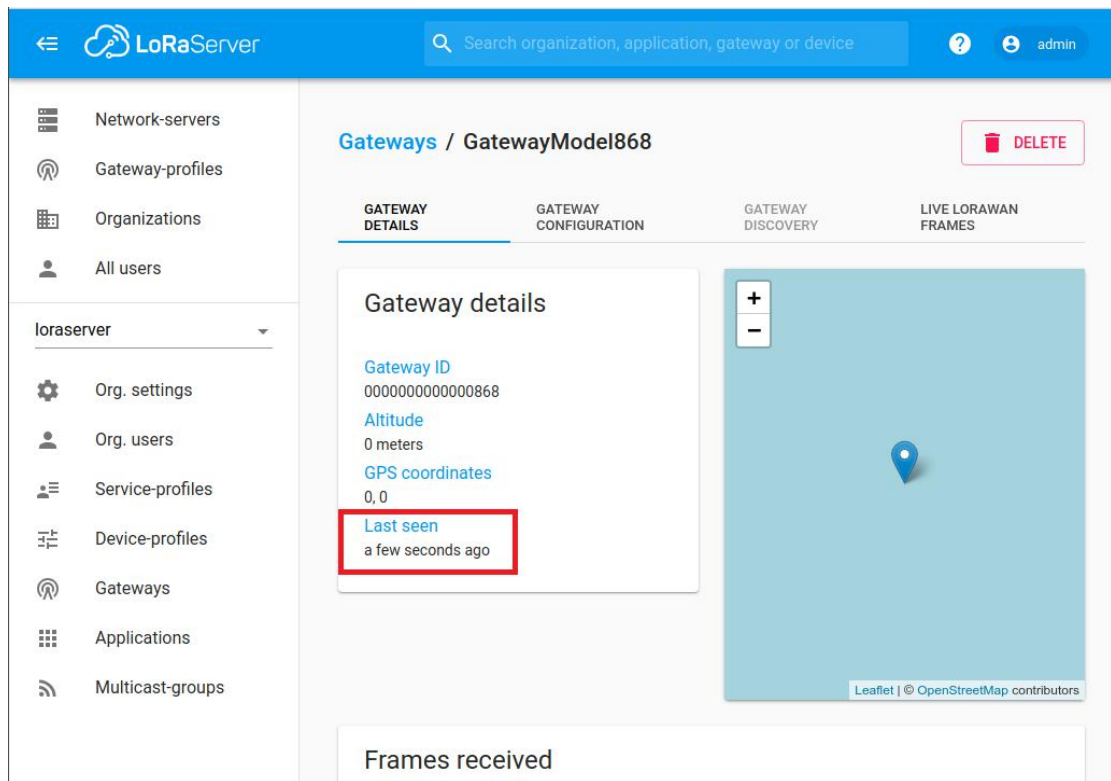
0

When the gateway has an onboard GPS, this value will be set automatically when the network receiver starts.

What you need to notice is the red box in the above page, it should be the true “Gateway ID” of your LoRa gateway. Do you remember that we have ever met it in the “Config your LoRa Gateway” section?



OK, if you have done the correct configuration on your LoRa gateway and the network between the independent LoRaServer and your LoRa gateway works well, you should see the following page and status:



Great! It means that you have connected your LoRa gateway to an independent LoRaServer successfully!

## 9. Where is the source code?

RAK supply a fully open source project for the firmware which you download from RAK official website, you can find the source code on Github:

<https://github.com/RAKWireless/RAK2245-RAK831-LoRaGateway-RPi-Raspbian-OS>

**Please contact us if you need technical support or want to know more information.**

**Support center:** <https://forum.rakwireless.com/>

**Email us:** [info@rakwireless.com](mailto:info@rakwireless.com)



## 10. Revision History

Revision	Description	Date
1.0	Initial version	2019-05-23

## 11. Document Summary

Prepared by	Checked by	Approved by
Fomi	Penn&Fomi	



### About RAKwireless:

RAKwireless is the pioneer in providing innovative and diverse cellular and LoRa connectivity solutions for IoT edge devices. It's easy and modular design can be used in different IoT applications and accelerate time-to-market.

For more information, please visit RAKwireless website at [www.rakwireless.com](http://www.rakwireless.com).