

# RAK831 Pilot Gateway User Manual V1.2

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# 1. Overview

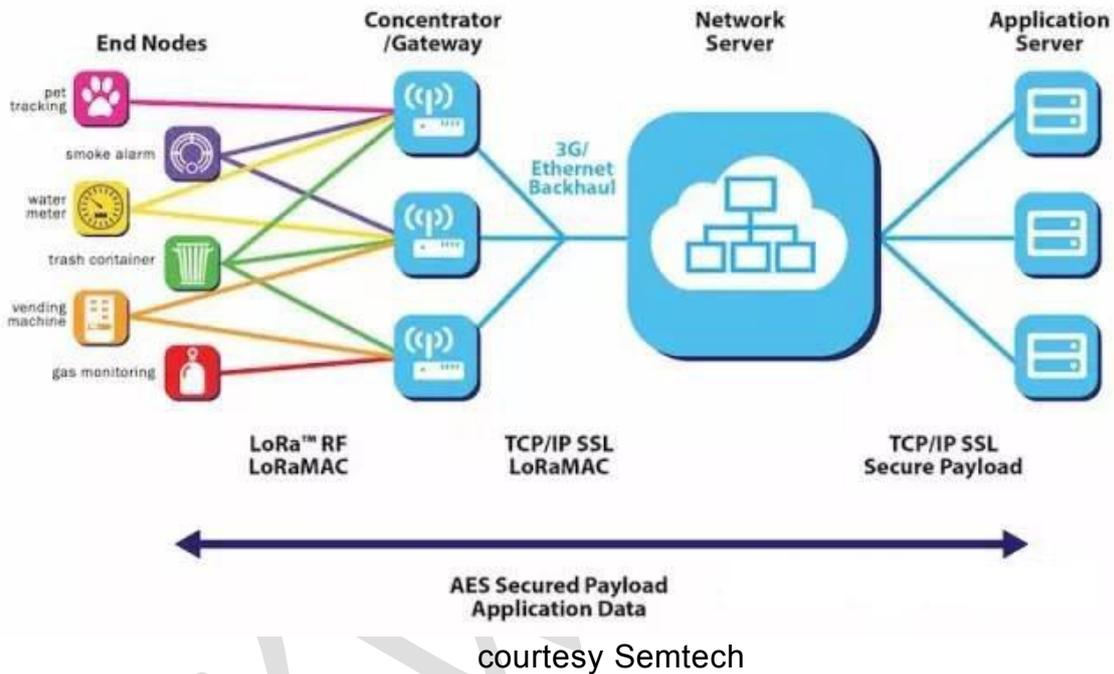
This documents are from a workshop held during the Things Network Conference 2018, in this workshop, many developers build a gateway based on RAK831 and a Raspberry Pi model 3. We can use this tutorial as the reference to understand how to connect RAK831 Pilot gateway to TTN.



**NOTE:** Never power on the gateway without the antenna connected as shown in the picture

## 2. LoRa Introduction

LoRaWAN is a low power wide area network protocol (LPWAN). LoRa technology has the characteristics of long distance, low power consumption (long battery life), multi-node and low cost. LPWAN is one of the LPWAN communication technologies, which is a kind of ultra-long-distance wireless transmission scheme based on spread spectrum technology adopted and promoted by Semtech Company in the United States. This scheme changes the traditional compromise between transmission distance and power consumption, provides users with a simple system that can achieve long-distance, long battery life and large capacity, and then expands the sensor network. At present, LoRa operates mainly in the free frequency bands around the world, including 433, 470, 868, 915, 865, 920, 923 MHz and so on.



The chart above shows the various parts of Lora's wireless architecture. LoRa network is mainly composed of terminal (built-in LoRa module), gateway (or base station), server and cloud. Application data can be transmitted bidirectionally.

### 3. How to Get the Gateway EUI

1. Insert SD card of Raspberry Pi system into RAK831 Pilot Gateway, connect gateway to a router through ethernet, and then power on the gateway.

2. Connect the PC to the same router.

3. Enter the configuration interface of the router in the PC's browser and check the MAC address of the device connected to the router. The MAC address of the device beginning with "B827EB" is the RAK831 Pilot Gateway. Save the MAC address of the gateway, such as B827EB7B80CD.

4. Add "FFFE" to the first six bits of MAC address, and the EUI: B827EBFFFE7B80CD of the gateway can be obtained.

Note: Or you can use the Xshell tool to login into the Raspberry Pi system (ssh account: **pi**, login password: **11111111** or **raspberrry**), next use the "ifconfig" command to get the MAC address, then you can get the gateway EUI.

## 4. How to Change the Frequency

**Step 1:** Go to <https://github.com/TheThingsNetwork/gateway-conf>, and download the global\_conf.json file you want.

**Note:** If there is some content about LBT in the global\_conf.json file which you want to use as follow:

```
"lbt_cfg": {  
    "enable": true,
```

You must set the value of "enable" to **false**.

These global\_conf.json files is used to connect to TTN server, if you want to use other servers like loraserver.io, you must modify some contents of the global\_conf.json file.

You can refer to the following link:

<https://www.thethingsnetwork.org/docs/gateways/packet-forwarder/semtech-udp.html>

**Step 2:** Open the folder "/opt/ttn-gateway/packet\_forwarder/lora\_pkt\_fwd" of RAK831 Pilot gateway, and use the global\_conf.json file you have prepared in Step 1 to replace the old one.

## 5. Source Code

RAK831 Pilot Gateway: <https://github.com/RAKWireless/RAK831-LoRaGateway-RPi>

## 6. Register the Gateway to the TTN

We need to register RAK831 Pilot Gateway with LoRa network service provider. Here we use the TTN for example. TTN (The Things Network) is a LoRaWAN network solutions provider and it is a proud contributor member of the LoRa Alliance.

First, you need to register a TTN account, and then add the gateway device. The ID of the gateway device should use the device EUI as previously remembered. If you are not sure how to register a device, please refer to the following link:

<https://www.thethingsnetwork.org/docs/gateways/registration.html>

Then check and input the Gateway EUI.



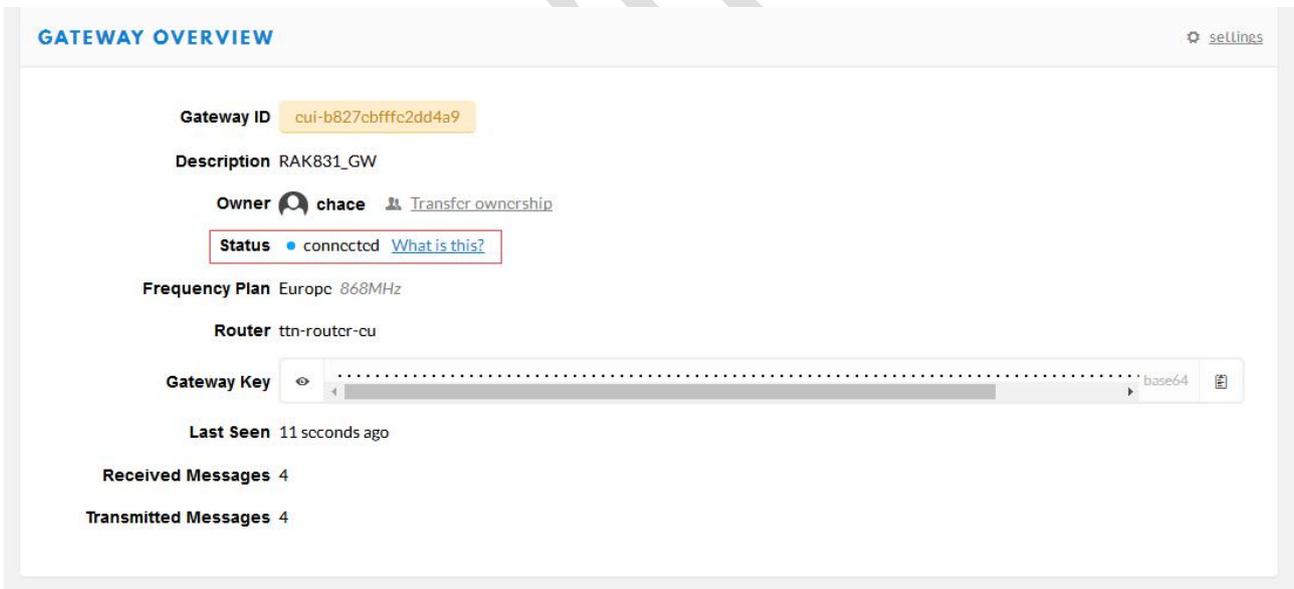
**Gateway EUI**  
The EUI of the gateway as read from the LoRa module

0 bytes

Gateway EUI must consist of exactly 8 bytes

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

Once the gateway is registered, you will see the gateway console page: (red box can show whether the gateway is connected). As shown in the following figure.



**GATEWAY OVERVIEW** ⚙ settings

**Gateway ID** cui-b827cbfffc2dd4a9

**Description** RAK831\_GW

**Owner** chace [Transfer ownership](#)

**Status** ● connected [What is this?](#)

**Frequency Plan** Europe 868MHz

**Router** ttn-router-cu

**Gateway Key**

**Last Seen** 11 seconds ago

**Received Messages** 4

**Transmitted Messages** 4

If a LoRa node sends an join request, the gateway page can receive the request information. As shown in the following figure.

**GATEWAY TRAFFIC** beta

uplink downlink join  X || pause 🗑 clear

time	frequency	mod.	CR	data rate	airtime (ms)	cnt
17:44:06	868.3		4/5	SF 7 BW 125	71.9	
17:44:01	868.3		4/5	SF 7 BW 125	61.7	app eui: 70 B3D5 7ED000 6E FD dev eui: 39 34 33 33 65 32 8F 00

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## 7. Contact Information

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## 8. Change Note

Version	Date	Modify content	Arthur
V1.0	2018/04/11	Create the document	Farce
V1.1	2018/11/22	Rewrite the document	Penn
V1.2	2018/12/24	Add change the frequency	Penn

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