# UM01811

## RHF2S308 User Manual

**V1.0**

## Document information

| Info | Content |
|---|---|
| **Keywords** | *RisingHF, LoRa Gateway, Instruction, web-based utility* |
| **Abstract** | This document describes how to use RHF2S308, which includes content about configuration, development and so on. |

# Content

# Figure

# 1 Preface

RHF2S308 is an IoT gateway/concentrator which integrates GPS, WiFi and LoRa, designed and manufactured by RisingHF.

This document will describe how to use and configure RHF2S308, for end-user and developer usage. Covers:

- Quick start
  - Get to know about your gateway
  - Setup your gateway
  - Log into your gateway
  - Connecct a LoRaWAN server
- The device file system
- Detailed descriptions of the web-based utility of the gateway
- How to connect to LoRaWAN server?
  - General Packet Forwarder server
  - IoTSquare server
  - Loriot server
- How to do scanning to check the noise floor before installation
- How to select a network for backhaul
  - Wired 10/100m ethernet
- How to use the GPS information
- How to get remote support from risinghf with rssh service
- FAQs

# 2 Quick Start

This chapter introduces apperance of the gateway and show how to setup your gateway and connect it to a cloud LoRaWAN server.

## 2.1 Get to know about your gateway

RisingHF RHF2S308 LoRaWAN gateway integrates a high performance high reliabitliy ARM cortex A53, 1 or 2xSX1301 LoRa core processor, a GPS module, a WiFi module, temperature monitor, RTC, and power management unit. Rather than logging into the gateway and doing operation with command in the linux environment, a web-based utility is built in which help customer use the device much easier. There are 4 antenna ports, a external power input port, a RJ45 port, and a USB debug port for the device.

ANT1: LoRa antenna.

ANT2: Back up.

ANT3: GPS antenna.

ANT4: WiFi Antenna.

Power: External power supply input port, DC12 to 24V.

RJ45: RJ45 port, ethernet port.

USB: USB port for debug.


**Figure 2-1 Appearance of RHF2S308**

## 2.2 Set up your gateway

Please set up your gateway like Figure 2-2 shown below.

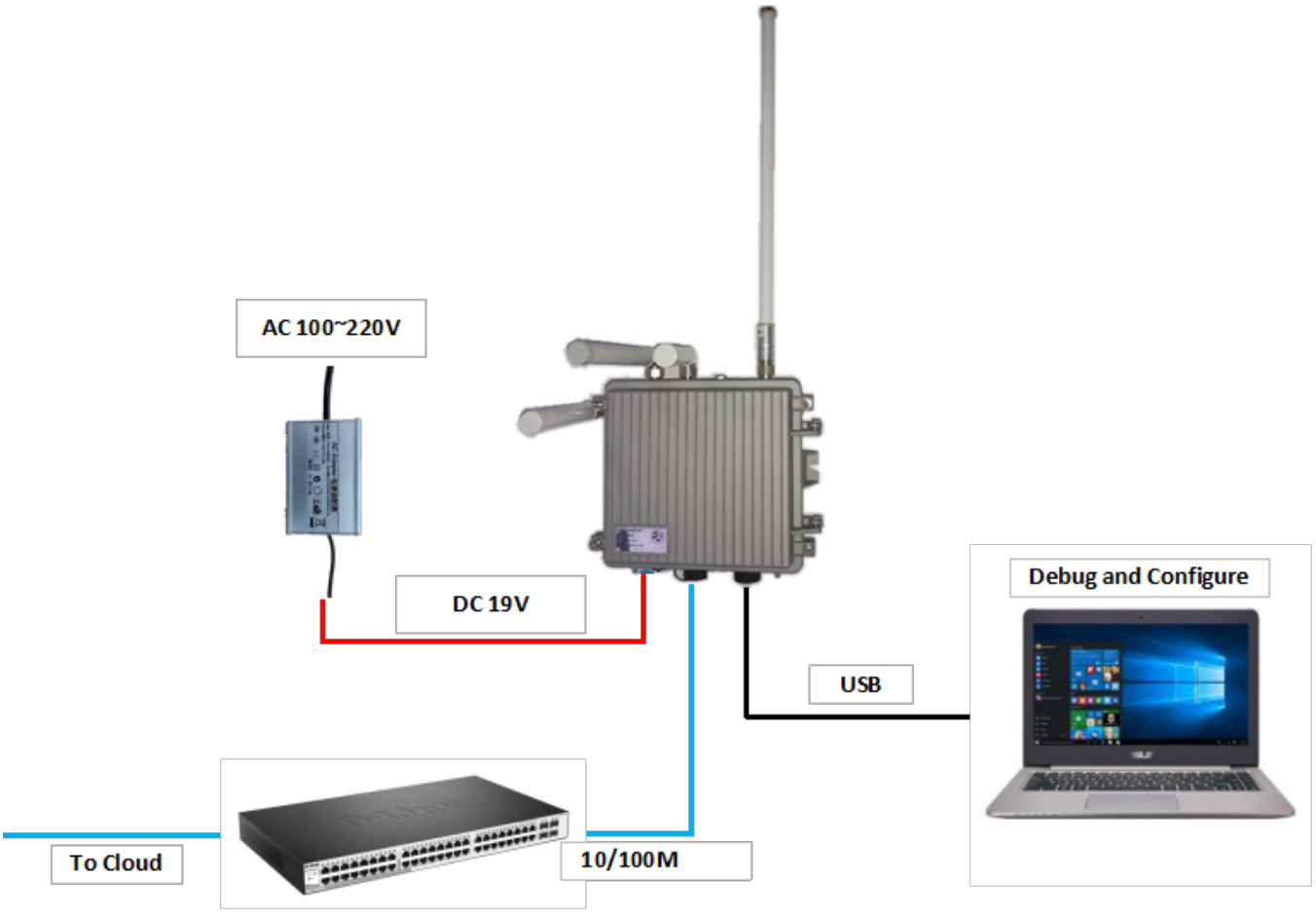



**Figure 2-2 Set up your gateway**

### 2.2.1 Networking

A cable is needed to be connected to a router to use the 10/100m ethernet.

### 2.2.2 Debug and Configure

Several debug interface could be used:
1) Connect the gateway to your PC with USB to UART interface
2) DHCP in a LAN
3) Wireless access via WiFi
Please use **ExtraPutty** to access into your gateway and debug and configure it.

## 2.3 Log into your gateway

You can log into your gateway with UART, DHCP or WiFi.
Default account information:

```
User:       rxhf
Password:   risinghf
```

### 2.3.1 Login with COM port

Before connecting your gateway to the PC, please install FTDI USB to UART driver. Connect your gateway to PC with a type A female to type A female USB cable and you will find a COM port. Open the ExtraPutty and select “Serial” connection type with COM3 port for example and baudrate=115200.

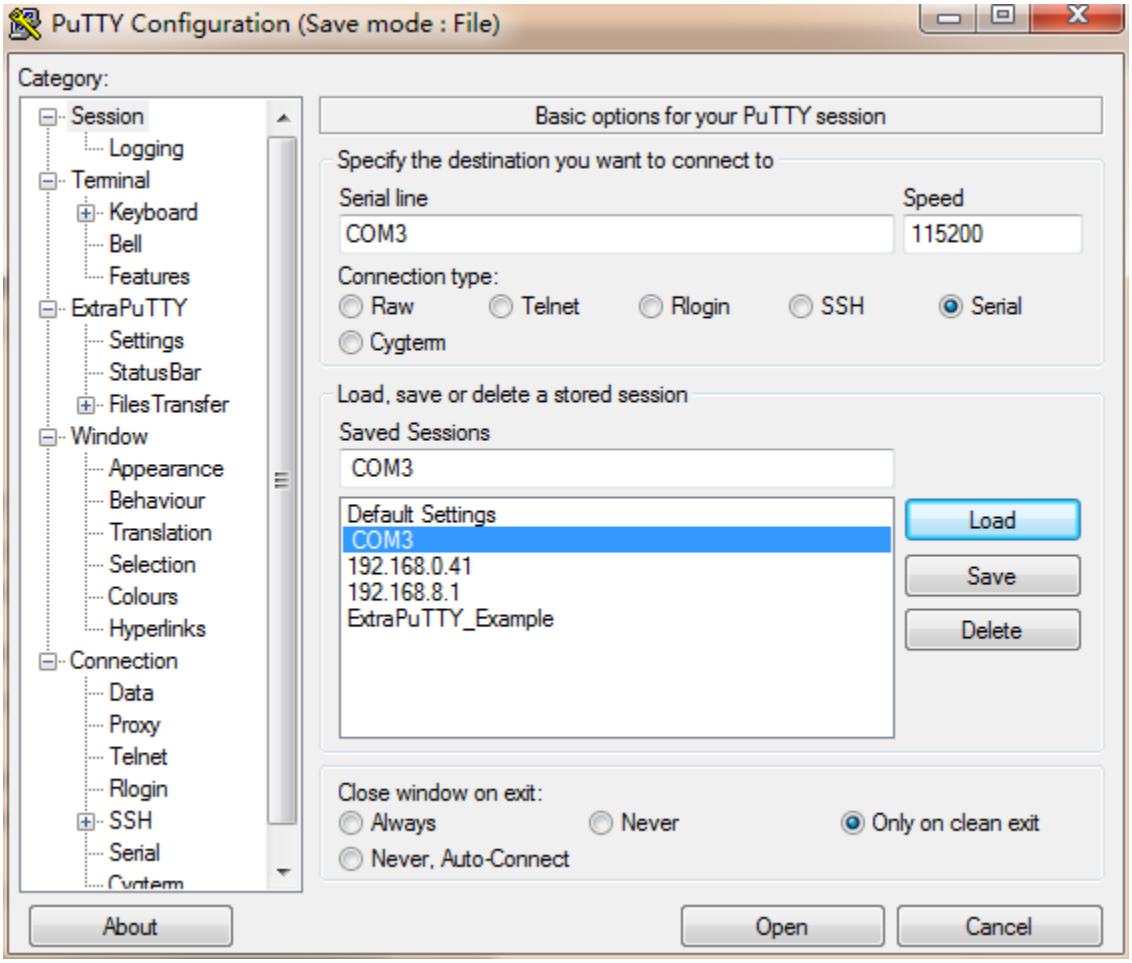



**Figure 2-3 Login with COM port**

Then input user name “rxhf” and password “risinghf” to log into the system.

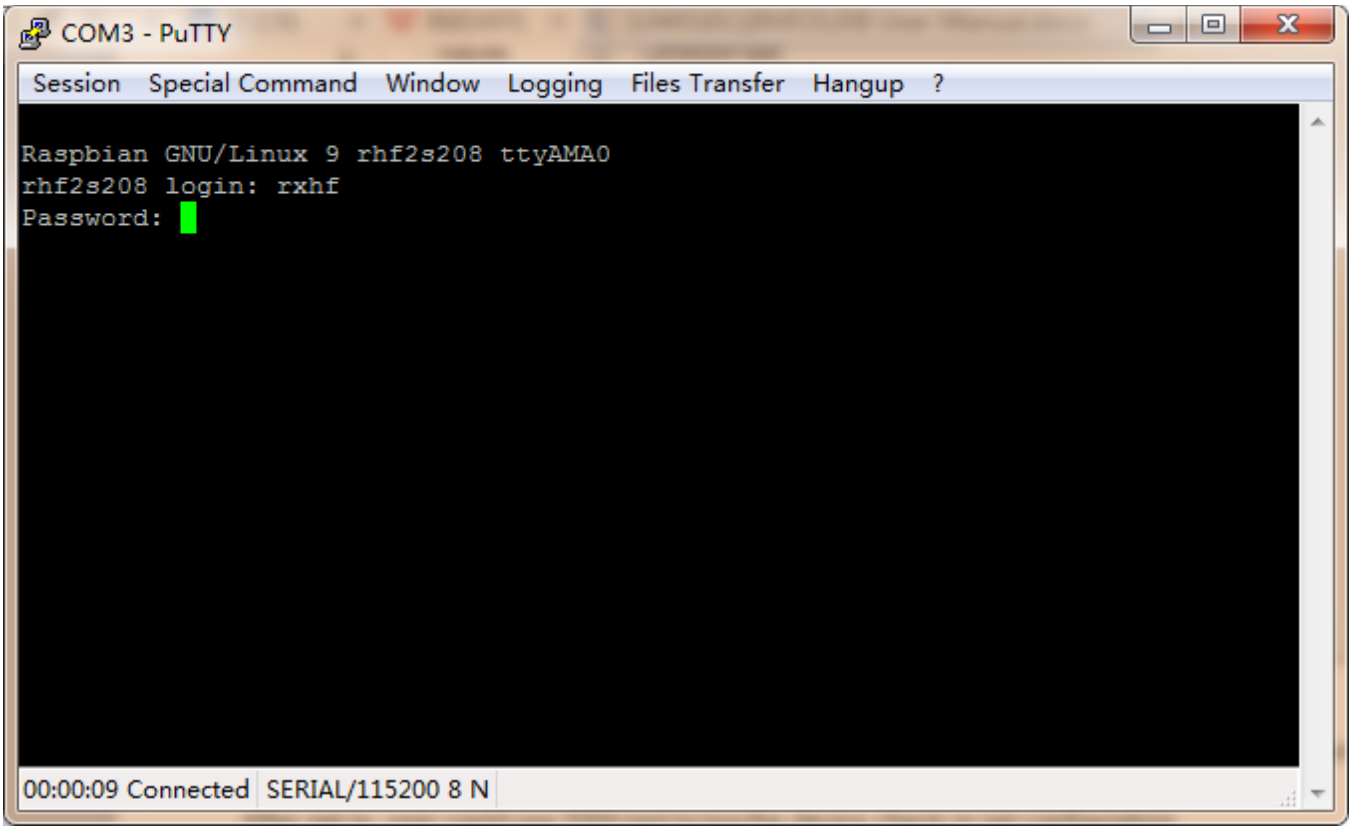



**Figure 2-4 Login with user name and password**

### 2.3.2 Login with DHCP

Connect your gateway with DHCP router, log in router or scan IP to get RHF2S308 ip. Hostname of your gateway is "RHF2S308".

After get ip, user could use SSH tool to log the device check or set configuration.
For example, use PuTTY under Windows and use ssh command under Linux. SSH port is 22.

To log in device of whose ip is 192.168.0.182.
Windows:

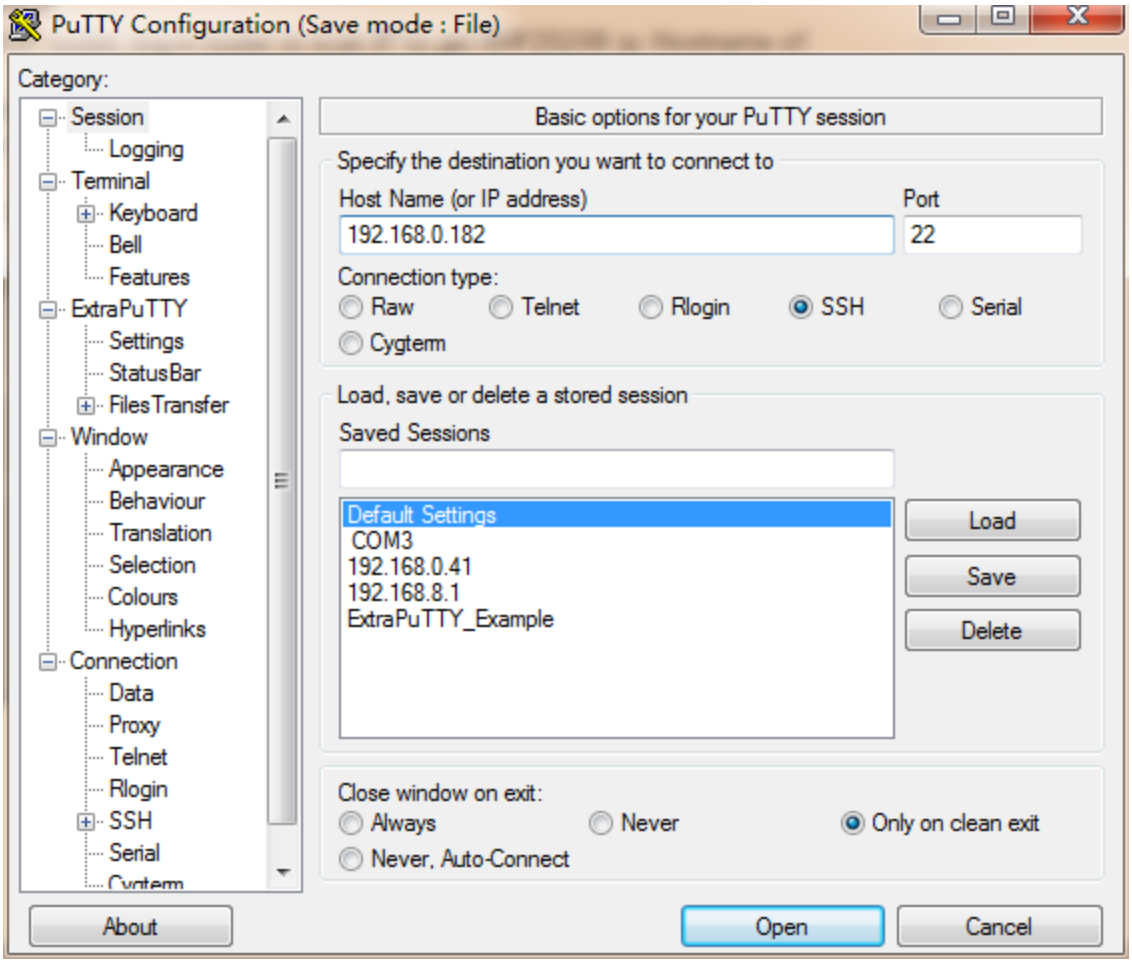



**Figure 2-5 Login with DHCP**

Linux

```
ssh rxhf@192.168.0.182
```

### 2.3.3 Login with WiFi

Scan the WiFi SSID with your PC and you will find your gateway whose SSID is RHF2S308_XXXXXX end with the last 3 bytes of the MAC address of the gateway. Connect your gateway to this WiFi. The default ip of the WiFi gateway is 192.168.8.1. Use putty to access into your device after your PC connected to WiFi successfully with ip 192.168.8.1 and ssh por 22.

WiFi default SSID and key:

SSID: RHF2S308_XXXXXX

Key: RisingHF_XXXXXX

Note: “XXXXXX” ends with 3 bytes after the device's MAC address, and uppercase letters if there are letters.


**Figure 2-6 SCAN and find the WiFi SSID of your gateway**

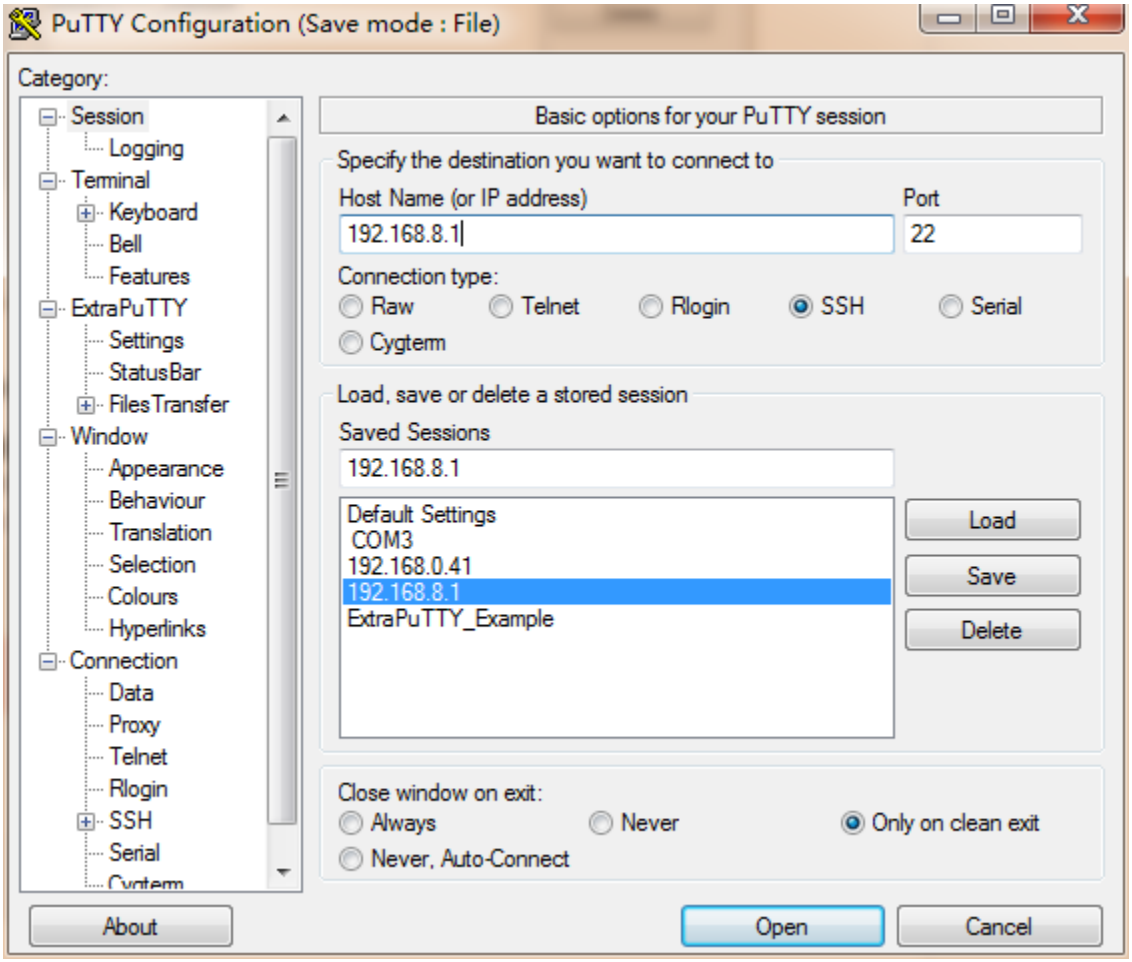



**Figure 2-7 Login with WiFi**

## 2.4 Connect to a LoRaWAN server

The RHF2S308 integrates the LoRa server program on the web interface, and the user can launch the corresponding LoRa service through the web UI.

1) Use the ip above to open the built-in web-based utility

a. Use the DHCP ip (192.168.xxx.xxx for example) of the gateway if both your PC and gateway is in the same LAN
b. Use the default ip 192.168.8.1 if you connect your PC to the WiFi of the gateway

2) Log into the gateway

```
User name: admin
Password: admin
```

### 2.4.1 Connect to a standard packet forwarder server

Standard Packet forwarder service is support by RHF2S308 series gateway. You could connect the gateway to any target server support packet forwarder interface. Please follow step below to set your gateway to connect to the server:

1) Select the "LoRaWAN Config-> Packet forwarder" menu.
2) Input gateway ID (note that different servers will use different gateway ID naming rules).
3) Input Server address
4) Input uplink and downlink port
5) Select global configuration json file
6) Click the "Start" button
7) Check that if the gateway is on line or not.

### 2.4.2 Connect to IoTSquare server

IoTSquare (https://iotsquare.xyz) The IoT platform is a dedicated LoRa device management platform developed by RisingHF. It has functions such as creating users, registering nodes, gateways, and multicast group management. Currently, the IoTSquare IoT platform only Supports Lora device access of lorawan version 1.0.2. IoTSquare now supports cn470, cn470prequel, eu868, as923, us915, au915 and other frequency bands. Users who want to use this server can send an email (support@risinghf.com) to request a test account.
Before using, please pay attention to the **IoTSquare IoT Platform User Manual**. If you already have the server account, please follow the steps below:

1) Get the Gateway ID of the gateway

Log in to the web interface of the gateway and go to the "Server Config -> IotSquare Bridge" menu. The "Gateway ID" text box on the page is the Gateway ID of the gateway. If the bridge does not start, the user needs to manually click the "Start" button to start.

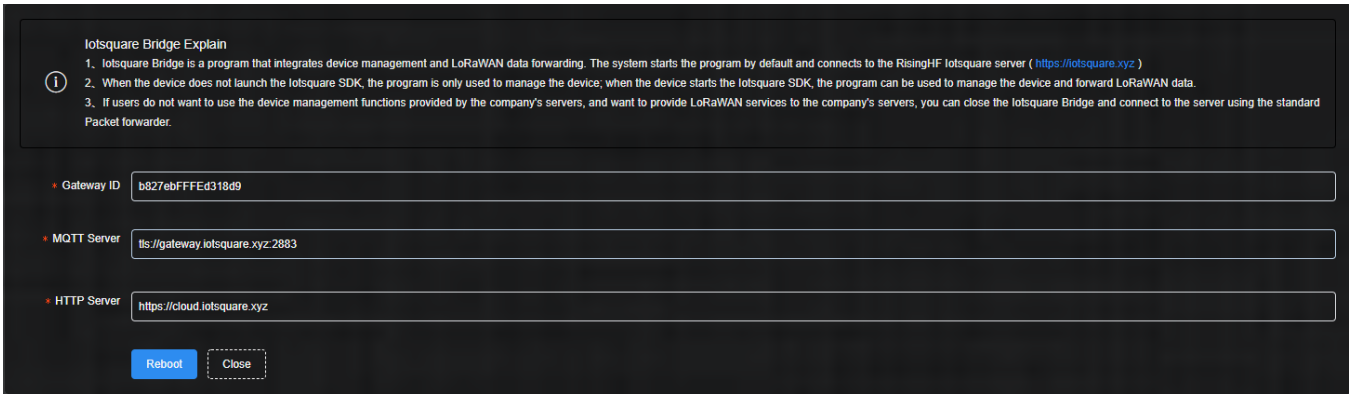



**Figure 2-8 IoTSquare Bridge interface management**

2) Register Gateway

Go to the IoTSquare server and go to the "GATEWAYS->Add Gateway" menu. Fill in the Gateway ID you just obtained to the gateway ID and click "Add" to register.

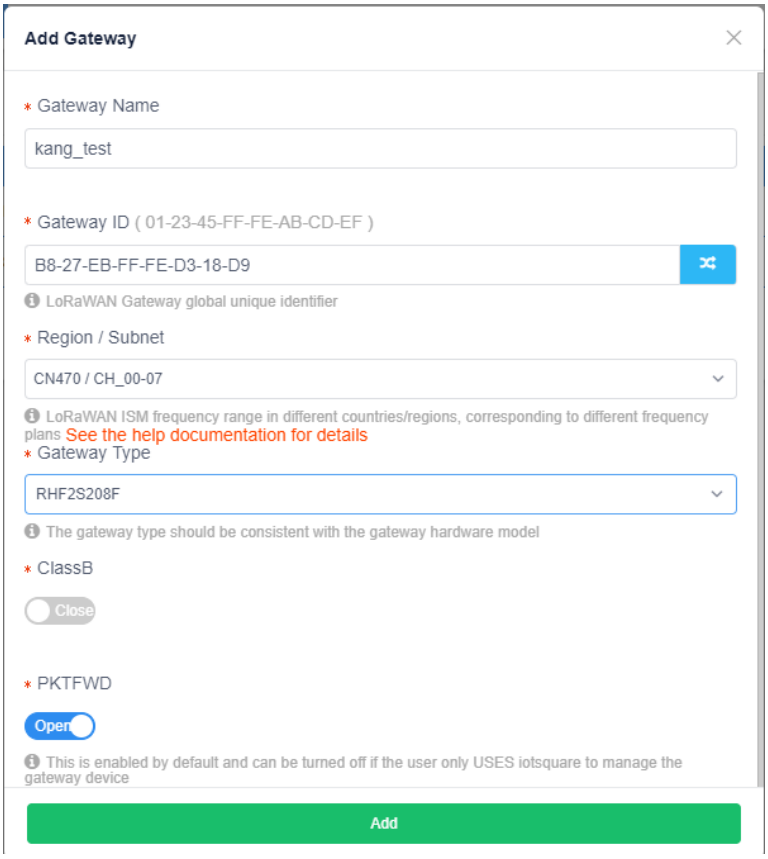



**Figure 2-9 IoTSquare server registration gateway**

3) Confirm if the gateway is online

After the gateway is successfully registered, you can see that the gateway displays online under the " GATEWAYS->Gateway List" menu.


**Figure 2-10 Gateway list**

4) Start LoRa service

Go to the "LoRaWAN Config->iotsquare" menu and click the Start button to start the LoRa service.


**Figure 2-11 Start the IoTSquare LoRa service**

### 2.4.3 Connect to loriot server

Loriot(http://www.loriot.io) is a LoRaWAN server supplier based at Switzerland, Loriot server supply free test account for user. Please note, free account has some limitation like active downlink, OTAA etc. Please read online documentation before get started https://cn1.loriot.io/documentation (Subdomain name will be different if you use other region servers).

1) Get MAC address

   A label with a MAC address will be attached to the side of the device. Or query the MAC address information by connecting to the device's WiFi and logging in to the device's built-in web interface.

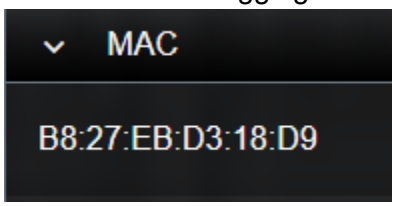



**Figure 2-12 Mac addr shown on web-based utility**

2) Access http://cn1.loriot.io register account, log in directly if you have already gotten one.
3) Click Dashboard -> Networks->Name(network name) -> Add Gateway, choose RHF2S008/RHF2S308.


**Figure 2-13 Loriot server registers RHF2S308 gateway**

4) Radio front-end configuration. Match the device type. Available options:
   a) 868/915 MHz (SX1257)
   b) 434/470/780 MHz (SX1255)

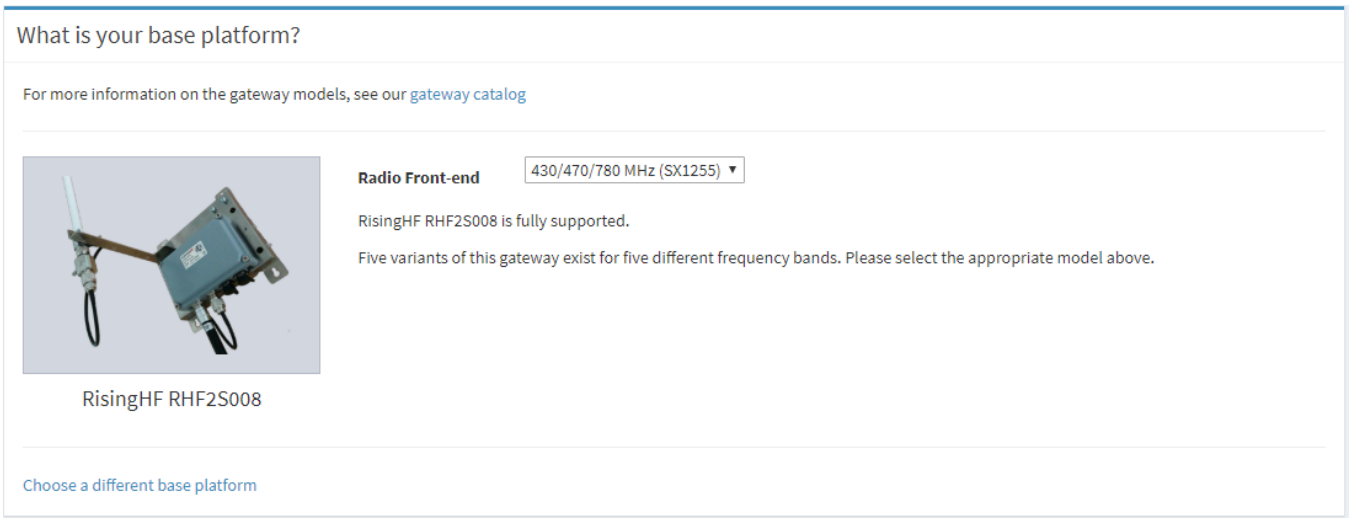



**Figure 2-14 Choose the right RF front end**

5) Scroll down, fill in MAC address, and set gateway location information.

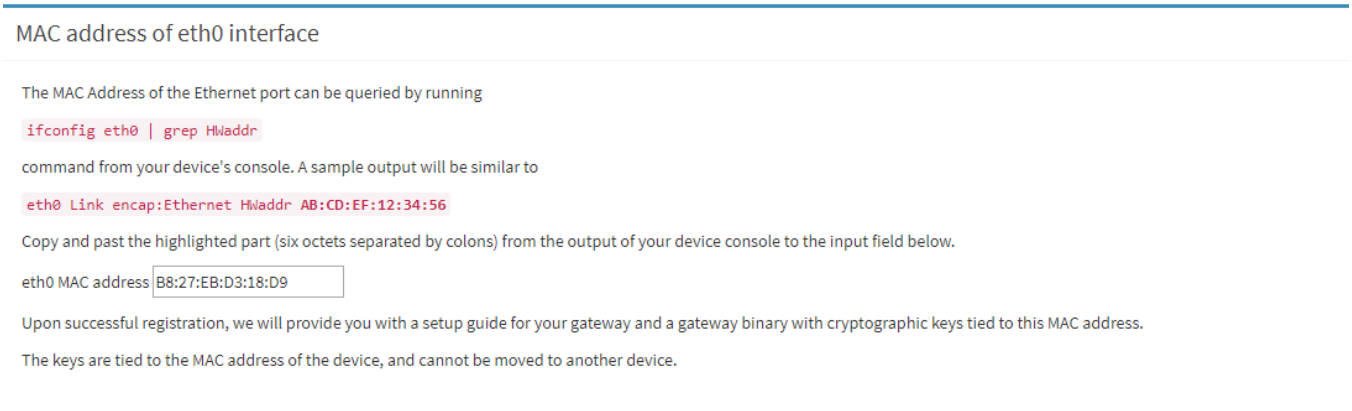



**Figure 2-15 Fill in the MAC address of the device**

**Figure 2-16 Select the installation location of the device**

6) Click "Register RisingHF RHF2S308 gateway" finish register.
7) Click " Gateways" list to enter gateway configuration page.

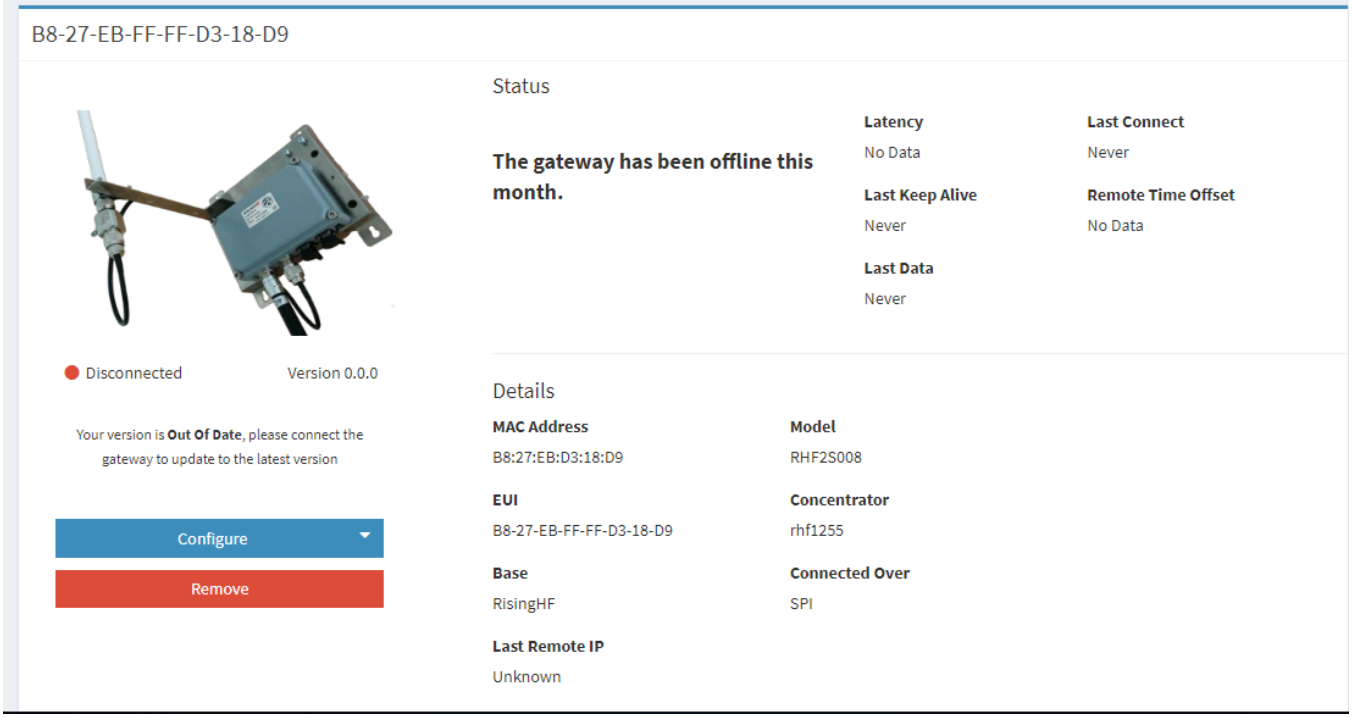



**Figure 2-17 Gateway configuration interface**

8) According to the gateway frequency band to choose a band. Contact support@risinghf.com if you need help.
9) Register gateway finish.
10) Launch the loriot LoRa service on the web interface of the device.

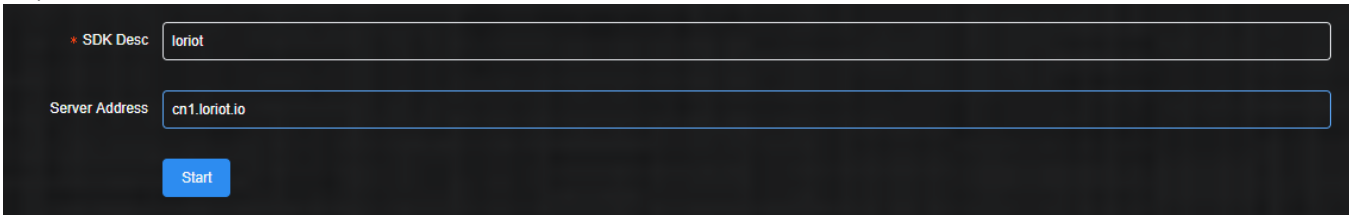



**Figure 2-18 Start the loriot LoRa service**

11) Refresh the gateway interface and confirm that the gateway is online.


**Figure 2-19 Gateway status**

# 3 Device File System

RHF2S308 firmware use systemd structure. User could use systemctl and journalctl to manage the integrated services and check log.

## 3.1 Log In

**User name: rxhf**
**Password: risinghf**

## 3.2 Device File System

/usr/local and /opt are very important directory for user.

### 3.2.1 /opt

/opt contains the working directory of most LoRaWAN serivices. And this will be updating when there is more services added.

```
total 40
drwxr-xr-x 3 root root 4096 Jul 23 05:10 aisenz
drwxr-xr-x 3 root root 4096 Jul 23 04:18 aliot
drwxr-xr-x 2 root root 4096 Jul 23 04:20 basicsta
drwxr-xr-x 3 root root 4096 Jul 23 04:20 fhsj
drwxr-xr-x 2 root root 4096 Jul 23 04:20 iotsh
drwxr-xr-x 2 root root 4096 Jul 23 04:20 loriot
lrwxrwxrwx 1 root root   10 Jul 23 04:20 orbiwise -> /opt/iotsh
drwxr-xr-x 3 root root 4096 Jul 23 06:19 pktfwd
drwxr-xr-x 2 root root 4096 Jul 23 05:10 rhf-bridge
drwxr-xr-x 2 root root 4096 Jul 23 04:20 shlpwan
drwxr-xr-x 7 root root 4096 Apr 18  2018 vc
```

**Figure 3-1 /opt file in gateway**

### 3.2.2 /usr/local

/usr/local contains most of internal services of the gateway.

```
total 84
drwxr-sr-x 2 root staff 4096 Jul 23 04:09 adc
drwxr-sr-x 2 root staff 4096 Jul 23 04:18 aliot
drwxr-sr-x 2 root staff 4096 Jul 23 04:09 backup
drwxrwsr-x 2 root staff 4096 Apr 18  2018 bin
drwxrwsr-x 2 root staff 4096 Apr 18  2018 etc
drwxr-sr-x 2 root staff 4096 Jul 23 04:20 fhsj
drwxr-sr-x 2 root staff 4096 Jul 23 04:08 firmware
drwxrwsr-x 2 root staff 4096 Apr 18  2018 games
drwxrwsr-x 2 root staff 4096 Apr 18  2018 include
drwxrwsr-x 4 root staff 4096 Jul 23 04:18 lib
drwxr-sr-x 3 root staff 4096 Jul 23 04:15 lora
drwxr-sr-x 2 root staff 4096 Jul 23 04:08 lte
lrwxrwxrwx 1 root staff    9 Apr 18  2018 man -> share/man
drwxr-sr-x 2 root staff 4096 Jul 23 04:08 power_manage
drwxr-sr-x 2 root staff 4096 Jul 23 04:20 qingniao
drwxr-sr-x 2 root staff 4096 Jul 23 04:13 rtc
drwxrwsr-x 2 root staff 4096 Jul 23 04:21 sbin
drwxrwsr-x 6 root staff 4096 Apr 18  2018 share
drwxrwsr-x 2 root staff 4096 Apr 18  2018 src
drwxr-sr-x 2 root staff 4096 Jul 23 04:21 test
drwxr-sr-x 2 root staff 4096 Jul 23 04:13 tools
drwxr-sr-x 2 root staff 4096 Jul 23 04:14 wifi
```

**Figure 3-2 /usr/local file in gateway**

Web-based utility

With the web-based utility, it is easily to configure and manage your gateway.

```
user name: admin
password: admin
```

There are two ways to open the built-in web of your gateway:

1) Connect your PC to the WiFi of your gateway and use 192.168.8.1 to open the built-in web with the web browser.

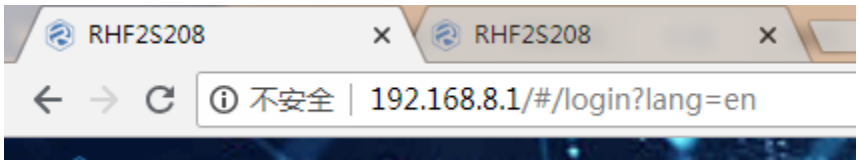



**Figure 3-3 Open built-in web with 192.168.8.1 via WiFi**

2) Connect both your gateway and PC to a same router, and get the ip of the gateway in the LAN. Use this ip to open the built-in web with the web browser. Here use 192.168.0.182 for example.


**Figure 3-4 Open built-in web with gateweay ip in LAN**

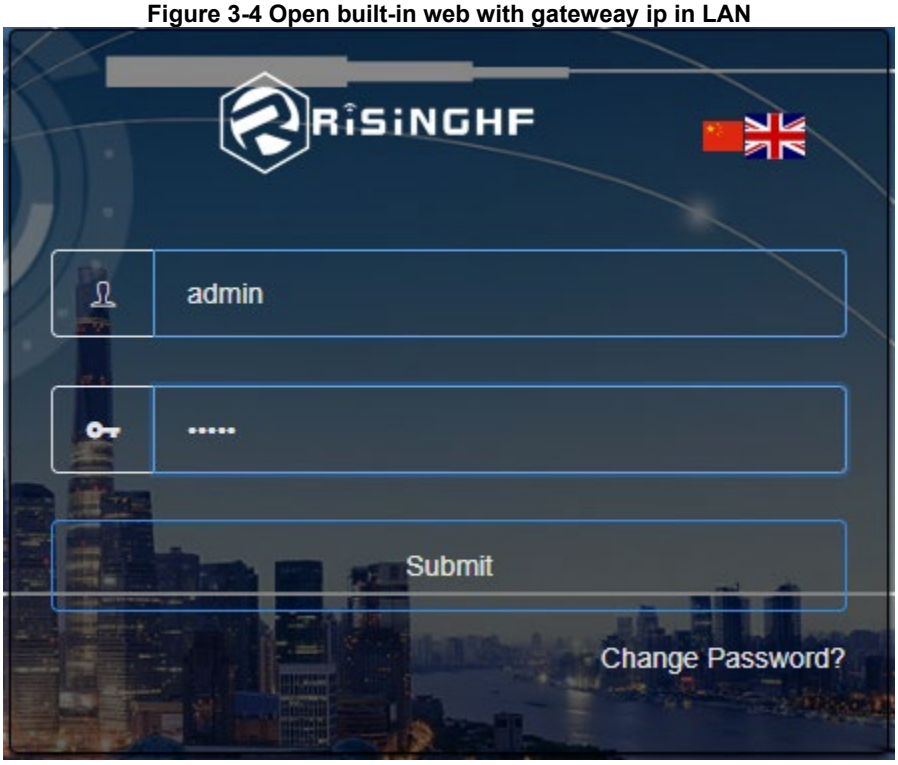



**Figure 3-5 Login on the web**

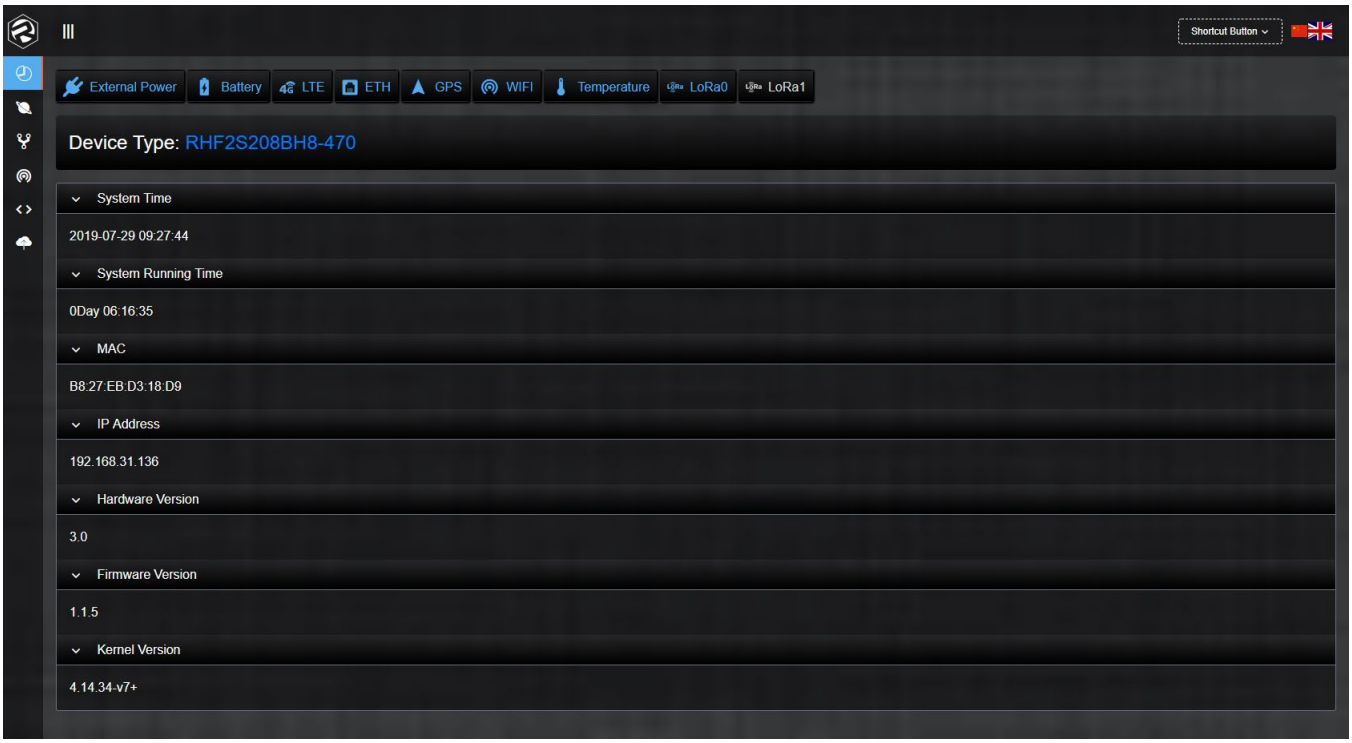



**Figure 3-6 Built-in Web page after login**

## 3.3 Status bar

A status bar show some key status of the hardware. Users could have a quick glimpse to check status of the hardware of your gateway. Each parameters on the status bar have 3 status with different color.
**Green** bar means OK;
**Red** bar means Error or Warning;
**Grey** bar means hardware is absent.
Below it is a example for “External Power Supply”:

## 3.4 Navigation bar

Navigation bar include most of the main configurations and management of the gateway:
Device Info: Some basic information of the gateway.
LoRaWAN Config: Connect to LoRaWAN server or do noise scanning.
Server Config: Connect to IoTSquare server management.
WiFi Config: Network function configuration.
Download Log: Download the working log of the gateway.
Firmware Upgrades: Upgrade firmware.

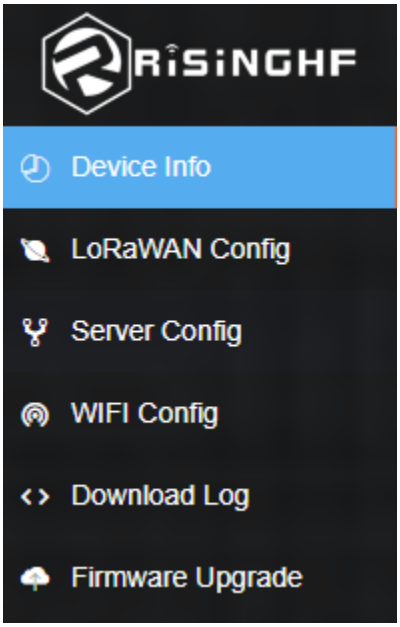



**Figure 3-7 Navigation bar**

### 3.4.1 Device information

Device information show the basic information of the gateway.

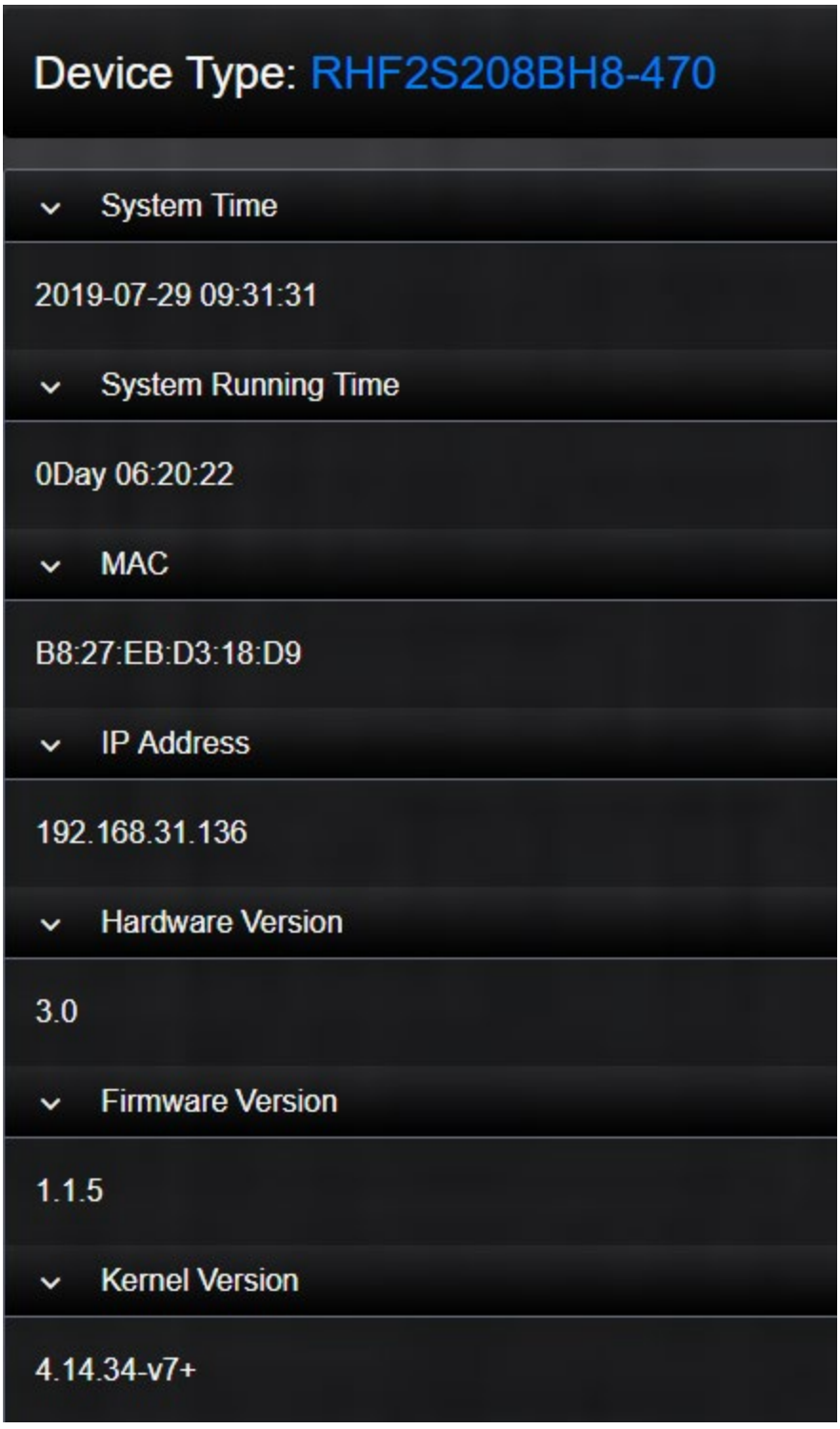



**Figure 3-8 Device information of RHF2S308**

### 3.4.2 LoRaWAN Configuration

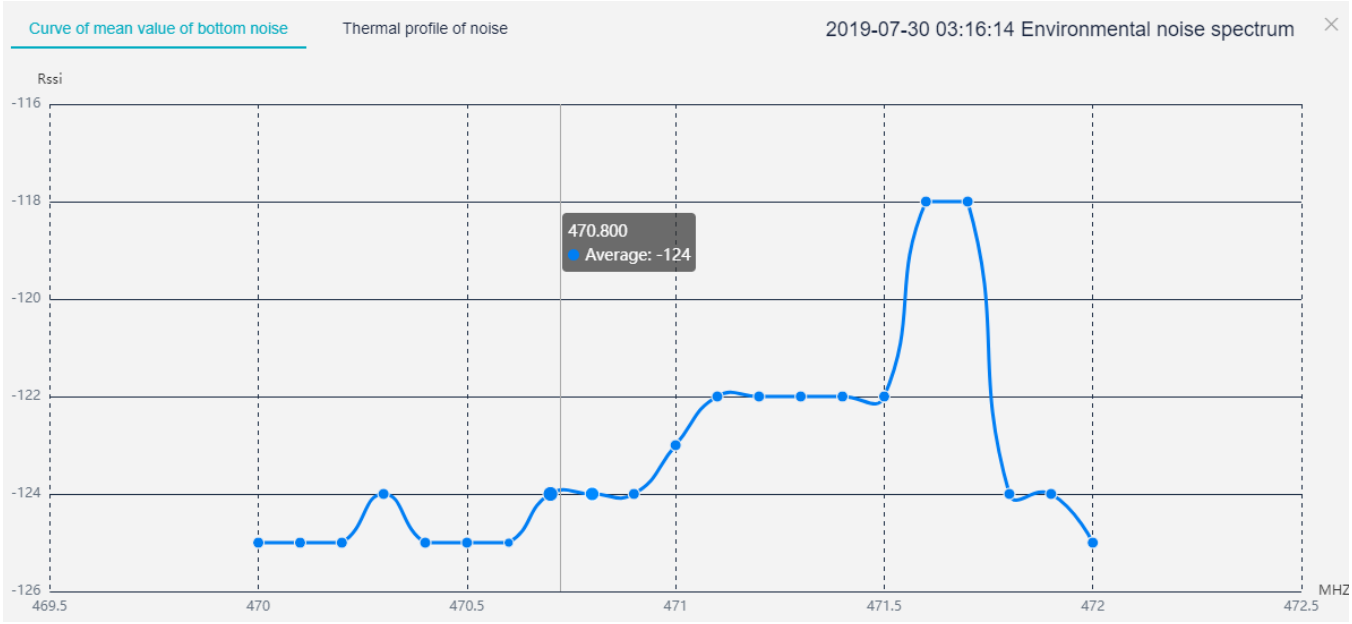
With LoRaWAN Configuration you could do:

1) Noise floor scanning

Noise floor scanning is a very useful tool when you want to check that there is some interference or noise in the band your gateway work.
Please fill in the Start Frequency and Stop Frequency and click “Start Scanning” to start noise scan. The default scanning band is 2MHz if you just input start frequency. Default step is 100kHz. The band you scan is bigger, the time is longer. Scanning band 2MHz or 5MHz which could cover the target operation band of your gateway is strongly suggested.


**Figure 3-9 Noise floor scanning**

After the gateway scanning finished, the noise floor will be shown in two mode: the transient noise distribution diagram and the average value diagram.
The transient noise distribution diagram show the transient noise or interference when scanning;
The average value diagram show the average value in the whole scanning.



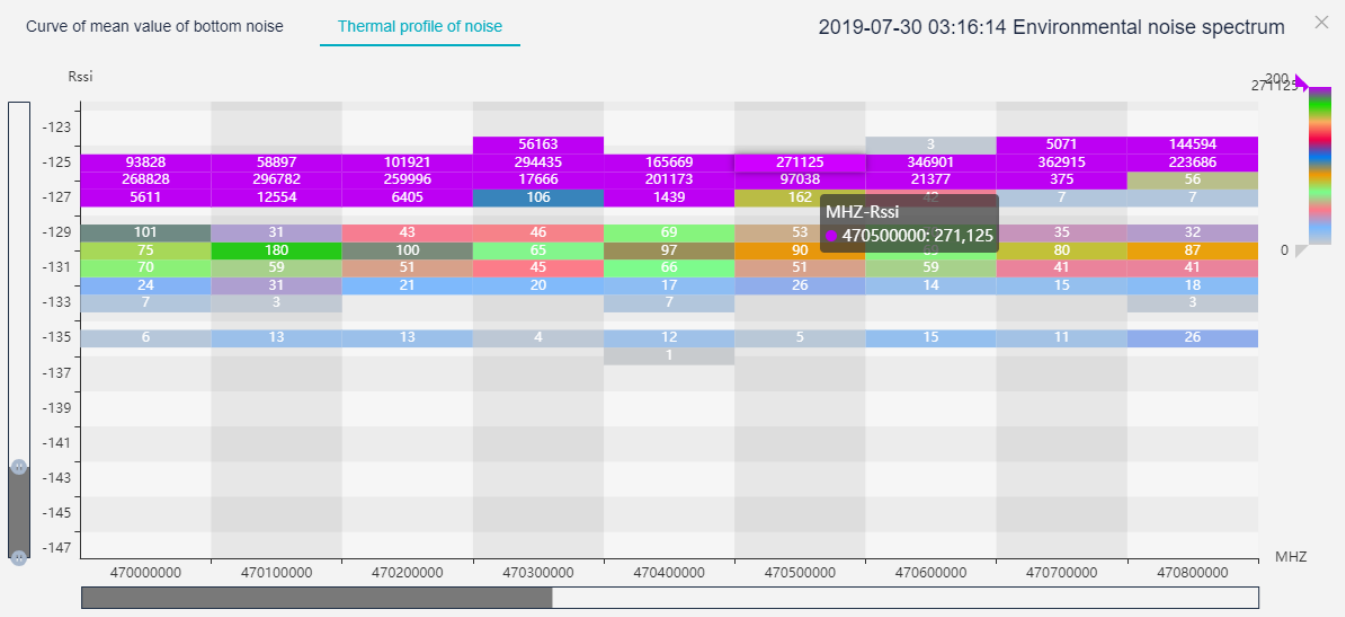



**Figure 3-10 Noise cannning example @470 to 472MHz**

2) Packet forwarder

Gateway ID: fill in the gateway ID (note that different servers will use different gateway ID naming rules).

Server Address: fill in the target server address.

Port: fill in the uplinik port and downlink port.

Global Config: please select the right global config which your gateway support. Different Part Number support different band. You could find the detailed information that the band your gateway could support in datasheet “[DS01828]RHF2S308 Product Specification”.

Click the "Start" button to start the program. If the device launches other LoRa related services, the system will shut down other LoRa services and start the program.

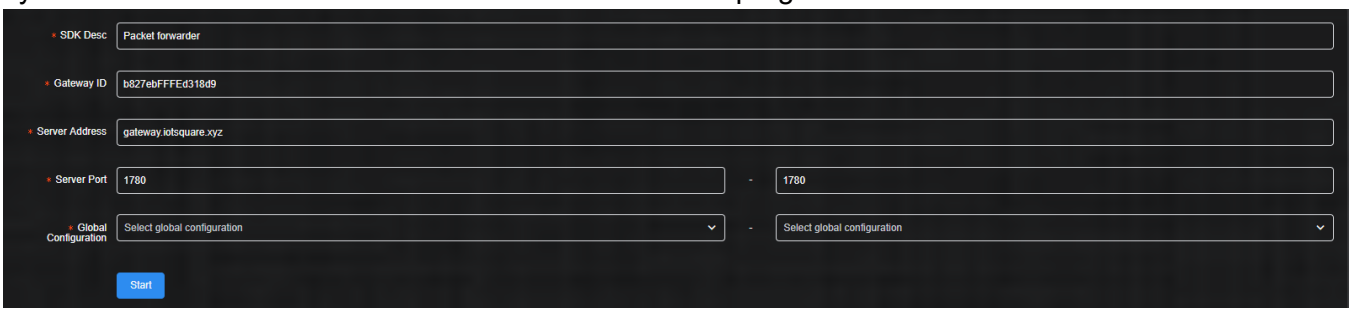



**Figure 3-11 Packet forwarder configuration**

3) IoTSquare

IoTSquare (https://IoTSquare.xyz) is a program for connecting to the IoTSquare server. Users need to register the "Gateway ID" of the "Server Config->Iotsquare Bridge" menu to the IoTSquare server and click the "Start" button to start the program. If the device launches other LoRa related services, the system will shut down other LoRa services and start the program.

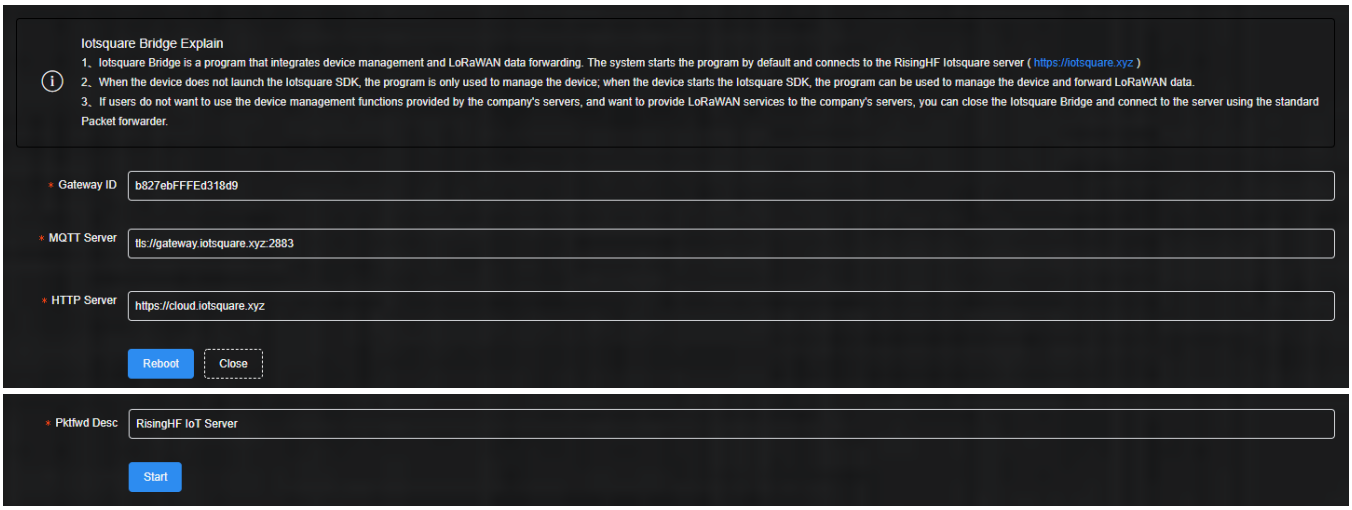



**Figure 3-12 IoTSquare configuration**

4) Orbiwise

Orbiwise is a network server operator in India that provides a LoRaWAN server. The server does not need to register a gateway. It only needs to contact the server manufacturer for authentication to connect to the server. The user only needs to click on the "Start" button program. If the device launches other LoRa related services, the system will shut down other LoRa services and start the program.


**Figure 3-13 Orbiwise configuration**

5) Loriot

Loriot (https://loriot.io) is a network server operator that provides LoRaWAN servers in Switzerland. Users only need to register the MAC address to the server. According to the server address of the registered gateway, the server address needs to be filled in. The gateway defaults. Is the cn1.loriot.io server address and click the "Start" button to start the program. If the device launches other LoRa related services, the system will shut down other LoRa services and start the program.


**Figure 3-14 Loriot configuration**

6) Aliot LinkWAN

LinkWAN (https://linkwan.aliyun.com) is a LoRaWAN server under the Alibaba Cloud platform. Users need to apply for the gateway triplet registration to the LinkWAN server from Alibaba, and fill in the gateway triplet information to the gateway.

product_key: The product_key of the gateway triplet.

device_name: The device_name of the gateway triplet.

device_secret: The device_secret of the gateway triplet.

Gateway ID: Generally consistent with the device_name of the gateway triplet.

Global configuration: Select the frequency profile supported by the gateway.

Click the "Start" button to start the program. If the device launches other LoRa related services, the system will shut down other LoRa services and start the program.


**Figure 3-15 Aliot LinkWAN configuration**

### 3.4.3 Server Config

1) IoTSquare Bridge

Connect to the IoTSquare server for gateway management and data forwarding. The default is on. After opening, the IoTSquare server periodically queries the status information of the gateway and facilitates remote debugging of the gateway and so on. If the IoTSquare SDK is connected to the IoTSquare server for LoRaWAN data interaction, the IoTSquare Bridge must be started. If the gateway is a third-party server that starts the LoRaWAN data interaction service, you can also start the IoTSquare Bridge for device management, or you can choose Close and manage the device by the customer.

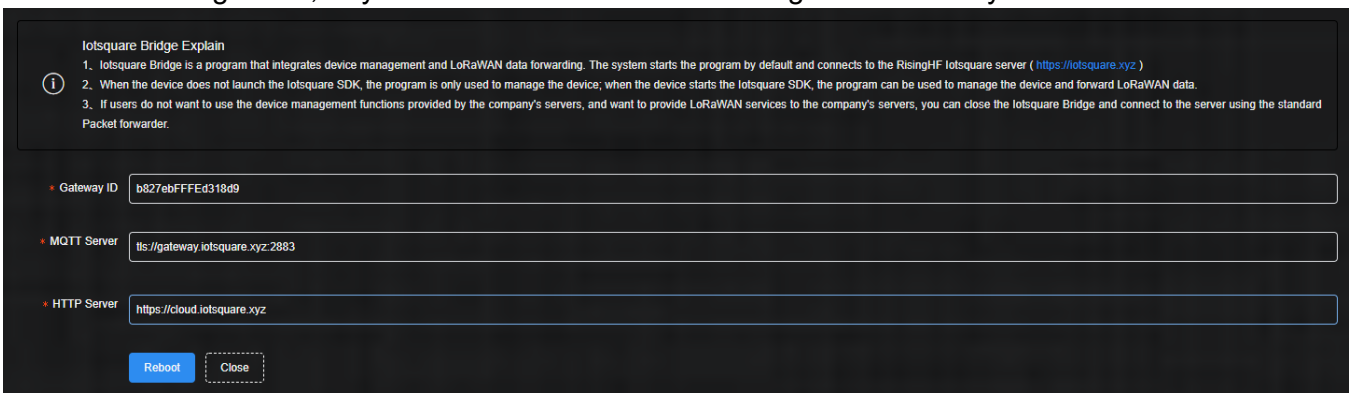



**Figure 3-16 IoTSquare Bridge configuration**

### 3.4.4 Network Configuration

1) WiFi Config

The network configuration panel is for WiFi configuration. You could re-configure the ip address of the WiFi router from default 192.168.8.1 to any you want. SSID name and password also could be modified as you want.


**Figure 3-17 WiFi configuration**

2) RSSH Operation

This page is the port number for remote debugging of the management gateway. When the user gateway needs remote assistance, the RSSH function can be enabled. The port number can be sent to the company's technical support to remotely log in to the gateway. Remember to turn off RSSH after debugging is complete. After all, turning on remote debugging will increase the security risk.

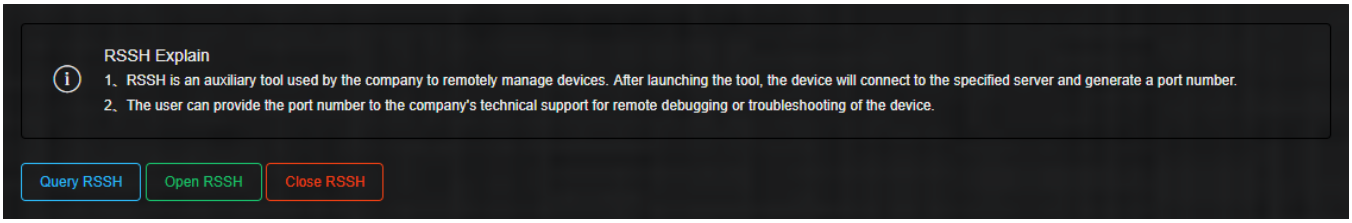



**Figure 3-18 RSSH Operation**

3) Ping

This page is used to detect whether the device can access the Internet normally. Test whether the gateway can directly connect to the gw.risinghf.com server. Users can customize their own server address.

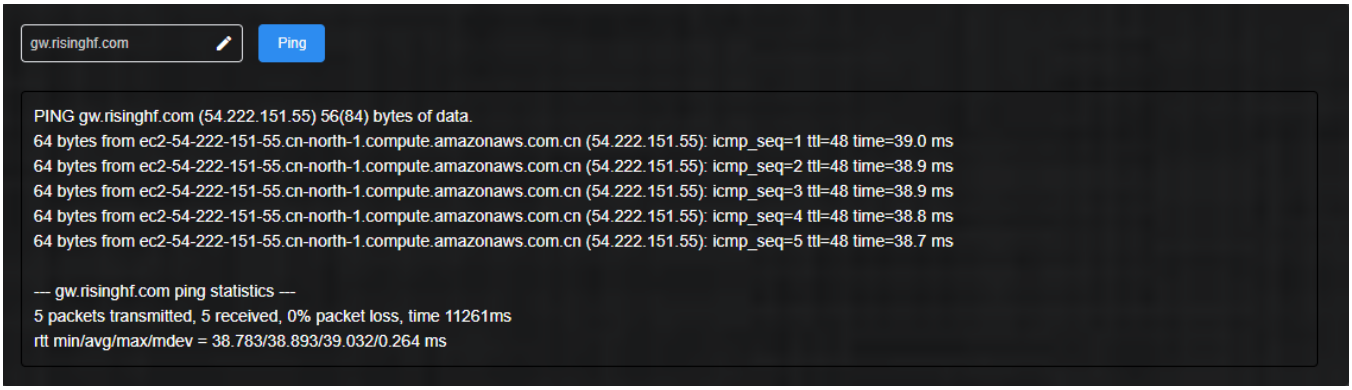



**Figure 3-19 Ping network diagnosis**

4) Traceroute

This page is used to detect whether the device can access the Internet normally. Test whether the gateway can directly connect to the gw.risinghf.com server. Users can customize their own server address.

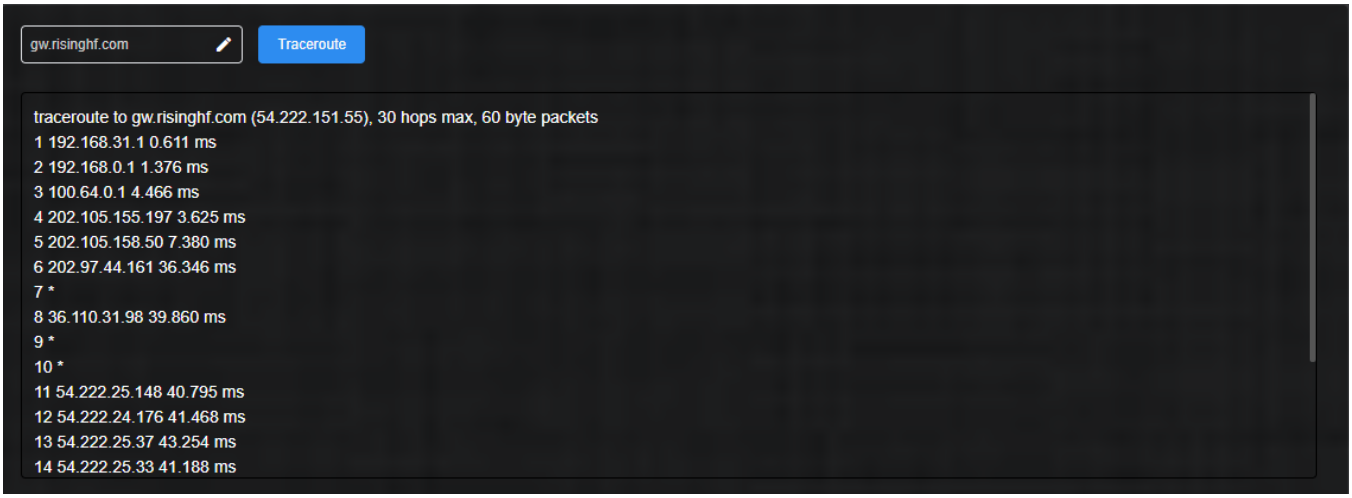



**Figure 3-20 Traceroute network diagnosis**

5) Host

This page is used to detect whether the device can access the Internet normally. Test the DNS server used by the gateway. Users can customize their own server address.


**Figure 3-21 Host network diagnosis**

### 3.4.5 Log Download

In log download page, you could check kinds of log of the gateway.

1) System Analysis Log

System analysis log is the record of the system of the gateway, which could be used to analyse the of the platform.


**Figure 3-22 System Analysis Log**

2) Ethernet Analysis Log

Ethernet analysis log record the connection and disconnection between the gateway and the ethernet.


**Figure 3-23 Ethernet Analysis Log**

3) Runtime Log

Each time the gateway power on or reboot will trigger a log, which we call runtime log. With this log, we could know that when the gateway is reboot or powered on.

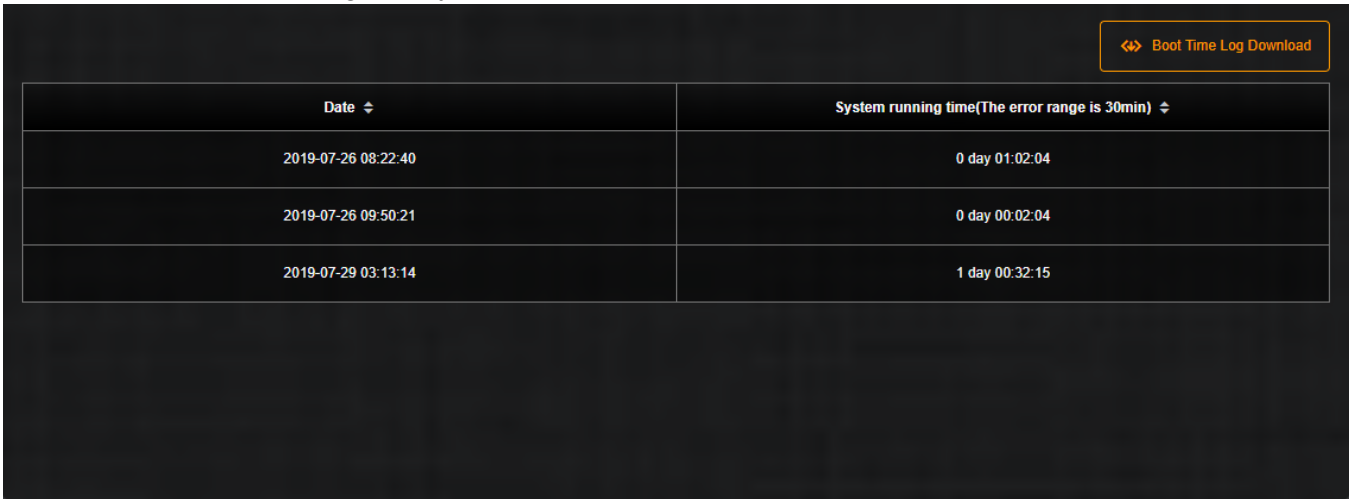



**Figure 3-24 Runtime Log**

4) LoRa/LoRaWAN Analysis Log

LoRa/LoRaWAN analysis log just record the abnormal event of the LoRaWAN progress. Nothing will be recorded if the LoRaWAN is OK.


**Figure 3-25 LoRa/LoRaWAN Analysis Log**

5) Temperature Analysis Log

A temperature sensor is inside the gateway. The temperature analysis log is the temperature record inside the gateway recorded every 15 minute.

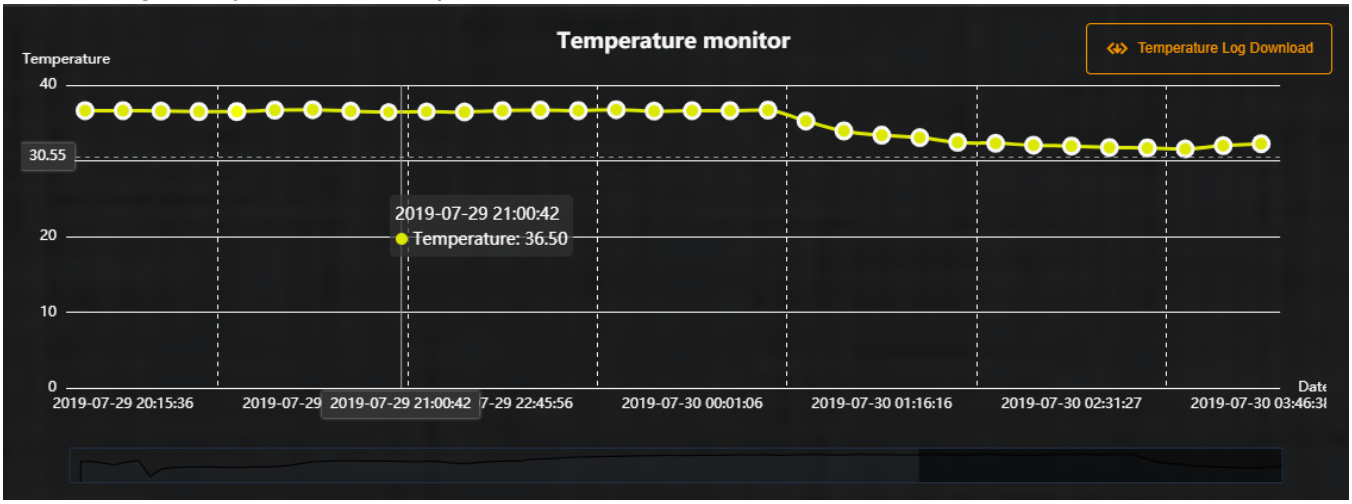



**Figure 3-26 Temperature Analysis Log**

6) Power Management Log

Power management log include the power on/off log and discharging log with battery supply. With this log, you could check it when the gateway is off or restart abnormally.

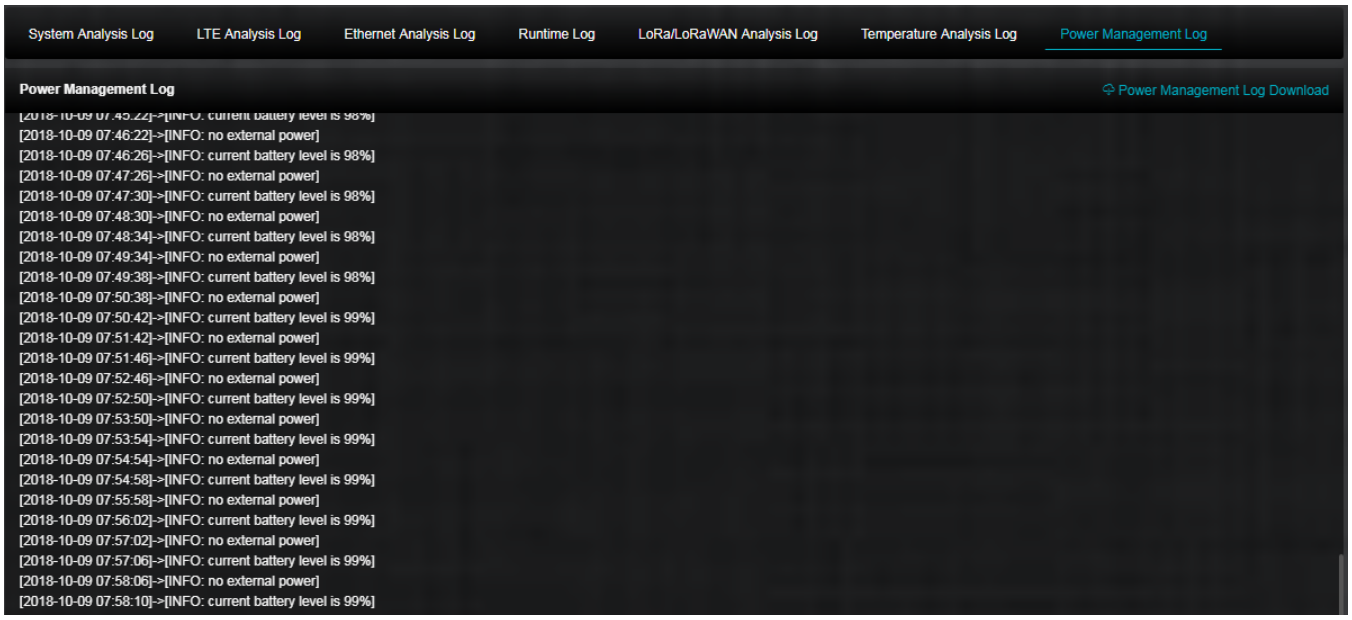



**Figure 3-27 Power Management Log**

### 3.4.6 Firmware Upgrade

Use application upgrades icon customer could upgrade the application of their gateway.

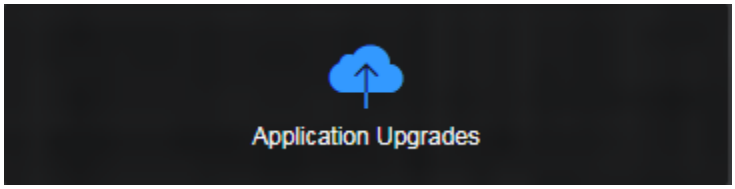



**Figure 3-28 Firmware Upgrade**

## 3.5 Shortcut button

There is a shortcut button list on the upper right corner of the web page. With this shortcut button list, you can do quick diagnosis, system reset, set priority of the backhaul networking and sign out.

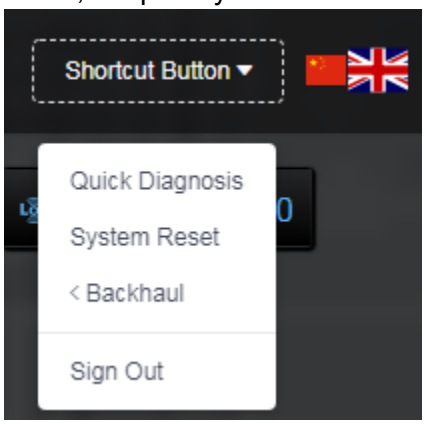



**Figure 3-29 Shortcut button**

### 3.5.1 Quick Diagnosis

With the Quick Diagnosis function, you can have a quick check for the hardware of the gateway. This function would be useful when the gateway is being installed in the field. The step below show the whole progress of the diagnosis:

1) Click quick diagnosis there will be a quick diagnosis window ask you : To Do Diagnosis?
2) A progress bar will be shown after you click OK on the diagnosis window.
3) The diagnosis results window will be shown when diagnosis is finished

The passed results are shown in green if all the self-test succeed. The failed parts are shown in red.

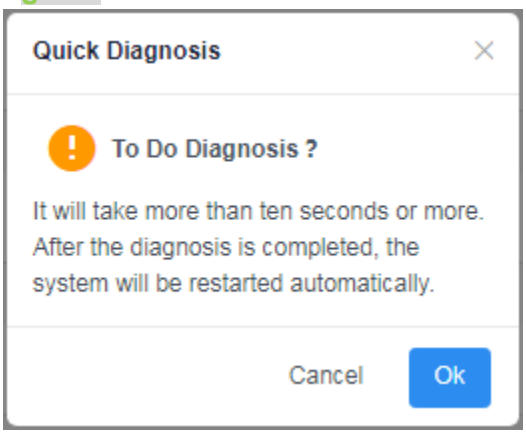



**Figure 3-30 Quick Diagnosis**

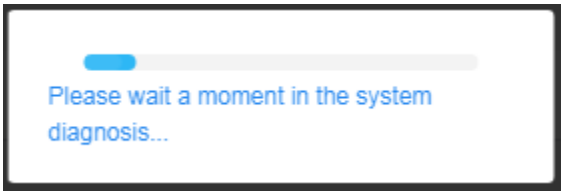



**Figure 3-31 Quick Diagnosis ongoing**

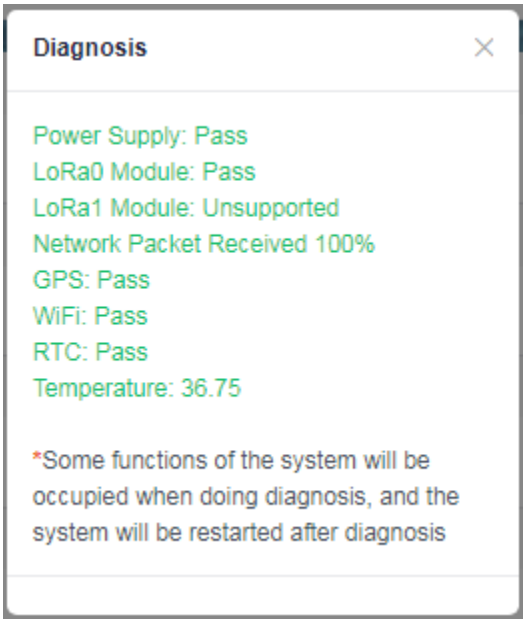



**Figure 3-32 Quick Diagnosis complete**

**NOTE: The system will be reboot after quick diagnosis.**

### 3.5.2 System Reset

System Reset is used to reset the system. When you click “system reset” bar on the shortcut button list, a “Whether To Restart The Gatway” question window will be shown. Click OK button the system will restart immediately and a progress bar will be shown. Please rejoin the WiFi network and access into the gateway again after you restart the system.

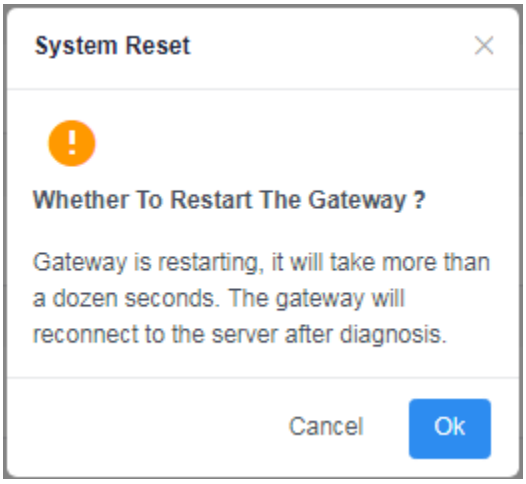



**Figure 3-33 System Reset window**

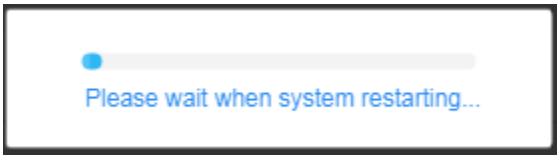



**Figure 3-34 System Reset progress ongoing**

### 3.5.3 Sign Out

Sign out button will make it return to the login web page.

# 4 LoRaWAN Server Solutions

According to the different request, user could choose which server to connect to. RHF2S308 integrates several third party manufacture's server like Loriot.io and Loraflow.io, and also preinstall the packet forwarder program for customer's convenience.
In addition to the above introduction to launching the LoRa service through the web interface, the device also supports the startup of the LoRa service through the command line method, which makes the secondary development more convenient. The following uses the standard Packet Forwarder, IoTSquare and loriot LoRa services as examples:
**NOTE: At the same time, a gateway can only connect to only one server. When user needs to switch between servers, it must be sure that service which is not used is not ruuning.**

## 4.1 Packet Forwarder

Packet Forwarder is the program required by RisingHF to provide the LoRaWAN gateway and server connection. It is compatible with all the functions of the standard Packet Forwarder and provides the most basic LoRa packet forwarding function. It does not handle the LoRaWAN protocol-related content.

Preinstalled Packet Forwarder locates at /opt/pktfwd directory.
*.json files under pkt service working directory are lora_pkt_fwd configuration files. Among the json files, global_conf.json and local_conf.json are files which are used by Packet Forwarder, when using it user could use symbol link to point global_conf.json and local_conf.json to specified json files to choose different frequency plan and server.

global_conf.json and local_conf.json are in the same format. local_conf.json has higher priority than global_conf.json, Packet Forwarder will use configurations contained by local_conf.json overwrite the global_conf.json ones.

You could find all the configuration json file in /opt/pktfwd/cfg for different bands, i.e. 434MHz, 470MHz, 780MHz, 868MHz, 915MHz.

**/opt/pktfwd**

```
rxhf@rhf2S308:/opt/pktfwd $ ls -l
total 708
drwxr-xr-x 7 root root   4096 Jul 23 04:18 cfg
-rw-r--r-- 1 root root   6522 Jul 24 02:16 global_conf.json
-rw-r--r-- 1 root root    185 Jul 23 06:19 local_conf.json
-rwxr-xr-x 1 root root 698940 Jul 23 04:18 lora_pkt_fwd
-rw-r--r-- 1 root root    226 Jul 23 04:18 pktfwd.conf
-rwxr-xr-x 1 root root   1200 Jul 23 04:18 update_gwid.sh
```

**/opt/pktfwd/cfg**

```
rxhf@rhf2S308:/opt/pktfwd/cfg $ ls -l
total 20
```

```
drwxr-xr-x 2 root root 4096 Jul 23 04:18 434
drwxr-xr-x 2 root root 4096 Jul 23 04:18 470
drwxr-xr-x 2 root root 4096 Jul 23 04:18 780
drwxr-xr-x 2 root root 4096 Jul 23 04:18 868
drwxr-xr-x 2 root root 4096 Jul 23 04:18 915
```

json configuration file example: (868MHz)

```
{
    "SX1301_conf": {
        "lorawan_public": true,
        "clksrc": 1,
        "antenna_gain": 0,
        "radio_0": {
            "enable": true,
            "type": "SX1257",
            "freq": 867500000,
            "rssi_offset": -166.0,
            "tx_enable": true,
            "tx_freq_min": 863000000,
            "tx_freq_max": 870000000
        },
        "radio_1": {
            "enable": true,
            "type": "SX1257",
            "freq": 868500000,
            "rssi_offset": -166.0,
            "tx_enable": false
        },

        // SX1301 MultiSF, standard LoRa and FSK channels
        "chan_multiSF_0": { "enable": true, "radio": 1, "if": -400000 },
        "chan_multiSF_1": { "enable": true, "radio": 1, "if": -200000 },
        "chan_multiSF_2": { "enable": true, "radio": 1, "if": 0 },
        "chan_multiSF_3": { "enable": true, "radio": 0, "if": -400000 },
        "chan_multiSF_4": { "enable": true, "radio": 0, "if": -200000 },
        "chan_multiSF_5": { "enable": true, "radio": 0, "if": 0 },
        "chan_multiSF_6": { "enable": true, "radio": 0, "if": 200000 },
        "chan_multiSF_7": { "enable": true, "radio": 0, "if": 400000 },
        "chan_Lora_std":  { "enable": true, "radio": 1, "if": -200000, "bandwidth": 250000, "spread_factor": 7 },
        "chan_FSK":       { "enable": true, "radio": 1, "if": 300000, "bandwidth": 125000, "datarate": 50000 },

        // RHF0M301-868
        "tx_lut_0":  { "rf_power": -1, "dig_gain": 0, "mix_gain": 8,  "pa_gain": 1 },
        "tx_lut_1":  { "rf_power": 2,  "dig_gain": 0, "mix_gain": 10, "pa_gain": 1 },
        "tx_lut_2":  { "rf_power": 5,  "dig_gain": 0, "mix_gain": 12, "pa_gain": 1 },
        "tx_lut_3":  { "rf_power": 6,  "dig_gain": 0, "mix_gain": 8,  "pa_gain": 2 },
        "tx_lut_4":  { "rf_power": 8,  "dig_gain": 0, "mix_gain": 9,  "pa_gain": 2 },
        "tx_lut_5":  { "rf_power": 9,  "dig_gain": 0, "mix_gain": 10, "pa_gain": 2 },
        "tx_lut_6":  { "rf_power": 11, "dig_gain": 0, "mix_gain": 11, "pa_gain": 2 },
        "tx_lut_7":  { "rf_power": 12, "dig_gain": 0, "mix_gain": 12, "pa_gain": 2 },
        "tx_lut_8":  { "rf_power": 14, "dig_gain": 0, "mix_gain": 13, "pa_gain": 2 },
        "tx_lut_9":  { "rf_power": 15, "dig_gain": 0, "mix_gain": 8,  "pa_gain": 3 },
        "tx_lut_10": { "rf_power": 17, "dig_gain": 0, "mix_gain": 9,  "pa_gain": 3 },
        "tx_lut_11": { "rf_power": 18, "dig_gain": 0, "mix_gain": 10, "pa_gain": 3 },
        "tx_lut_12": { "rf_power": 20, "dig_gain": 0, "mix_gain": 11, "pa_gain": 3 },
        "tx_lut_13": { "rf_power": 22, "dig_gain": 0, "mix_gain": 12, "pa_gain": 3 },
        "tx_lut_14": { "rf_power": 23, "dig_gain": 0, "mix_gain": 13, "pa_gain": 3 },
        "tx_lut_15": { "rf_power": 25, "dig_gain": 0, "mix_gain": 15, "pa_gain": 3 }

    },

    "gateway_conf": {
        "gateway_ID": "AA555A0000000000",

        /* change with default server address/ports, or overwrite in local_conf.json */
        "server_address": "localhost",
        "serv_port_up": 1680,
        "serv_port_down": 1680,

        /* adjust the following parameters for your network */
        "keepalive_interval": 10,
```

```
        "stat_interval": 3600,
        "push_timeout_ms": 100,
        "autoquit_threshold": 5,

        /* forward only valid packets */
        "forward_crc_valid": true,
        "forward_crc_error": false,
        "forward_crc_disabled": false,

        /* GPS reference coordinates */
        "ref_latitude": 0.0,
        "ref_longitude": 0.0,
        "ref_altitude": 0,

        /* Beaconing parameters */
        //"gps_tty_path": "/dev/ttyAMA0",
        "beacon_period": 128,
        "beacon_freq_hz": 869525000
    }
}
```

Packet Forwarder configuration itself is a json object (enclosed by "{" and "}"), the root object contains 2 sub-objects `SX1301_conf` and `gateway_conf`. `SX1301_conf` object is for LoRa radio configuration, `gateway_conf` is for network communication configuration (server address, gateway id etc).

Because global_conf.json file already contains all configurations of Packet Forwarder, local_conf.json is mostly used for items which need to be changed frequently (Eg. `gateway_ID`), like below:

local_conf.json example:

```
{
    "gateway_conf": {
        "gateway_ID": "AA555A0000000000",

        /* change with default server address/ports, or overwrite in local_conf.json */
        "server_address": "localhost",
        "serv_port_up": 1680,
        "serv_port_down": 1680
    }
}
```

In combination with description above, SX1301 has below features:

1. One SX1301 supports 2 Radios. SX1255 or SX1257 can be used .
2. One SX1301 could support maximum 10 channels, of which 8 Multi-SF channels, 1 standard channel and 1 FSK channel.
3. One single SX125x chip has below limitations.

| Lower Side Channel Bandwidth | Upper Side Channel Bandwidth | SX125x Bandwidth |
|---|---|---|
| **125KHz** | **125KHz** | 925KHz |
| **250KHz** | **250KHz** | 1MHz |
| **500KHz** | **500KHz** | 1.1MHz |
| **125KHz** | **250KHz** | 962.5KHz |
| **250KHz** | **125KHz** | 962.5KHz |
| **500KHz** | **250KHz** | 1.05MHz |
| **250KHz** | **500KHz** | 1.05MHz |
| **500KHz** | **125KHz** | 1.0125MHz |
| **125KHz** | **500KHz** | 1.0125MHz |

LoRa Module hardware structures:

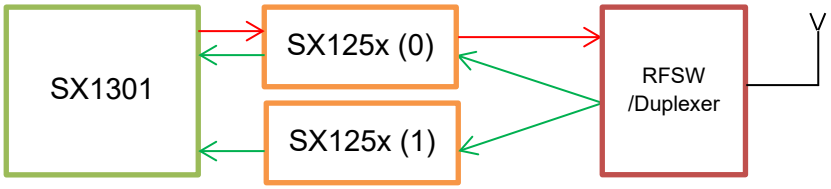



**Figure 4-1 LoRa Module hardware structures**

### 4.1.1 Customized channels

User could follow below principles to customize different frequency channel.

1. Split defined channels to two group for radio_0(radio_a) and radio_1(radio_b), calculate central frequency. Set `SX1301_conf.radio_0.freq` and `SX1301_conf.radio_1.freq` the new value.
2. Choose `SX1301_conf.radio_0.type` and `SX1301_conf.radio_1.type` depends on the new radio frequency. If it is higher than 520MHz set radio type `SX1257`, if it is less than 520MHz set radio type `SX1255`. (Note: real products have a narrow band support, please follow specified specification for the details)
3. Refer to the RHF-DS01603 document to get device configuration parameters, include RSSI offset and radio frequency TX power. Set `SX1301_conf.radio_0.rssi_offset` and `SX1301_conf.radio_1.rssi_offset` and `tx_lut_xxx` value
4. Calculate IF channel offset value. Modify `SX1301_conf.chan_multiSF_xxx`, `SX1301_conf.chan_Lora_std` 和 `SX1301_conf.chan_FSK` object. Channel configuration follows below rules.
   a) Each IF channel can be associated with either radio0 or radio1 freely.
   b) Each IF channel offset can't be out of range the SX125x bandwidth limitation, or the IF channel setting will be invalid.
   c) Each IF channel can be enable or disable independently .
5. So the example json file contains below channels:
   d) CH0 868.1MHz Multi-SF
   e) CH1 868.3MHz Multi-SF
   f) CH2 868.5MHz Multi-SF
   g) CH3 867.1MHz Multi-SF
   h) CH4 867.3MHz Multi-SF
   i) CH5 867.5MHz Multi-SF
   j) CH6 867.7MHz Multi-SF
   k) CH7 867.9MHz Multi-SF
   l) CH8 868.3MHz LoRa Standard SF7/250KHz
   m) CH9 868.8MHz FSK 50Kbps

### 4.1.2 Configure server address

Edit local_conf.json file. Modify `server_address` object to configure server address, modify `serv_port_up` object to configure uplink port, modify `serv_port_down` object to configure downlink port.

// local_conf.json file example:

```
{
    "gateway_conf": {
        "gateway_ID": "AA555A0000000000",
        "server_address": "localhost",
        "serv_port_up": 1680,
        "serv_port_down": 1680
```

```
    }
}
```

Some known packet forwarder serer address list:

| Address | Uplink Port | Downlink Port | Packet Forward Version | Supplier | Band |
|---|---|---|---|---|---|
| **gateway.IoTSquare.xyz** | 1780 | 1780 | V2 | RisingHF | ALL |
| **Iot.semtech.com** | 1680 | 1680 | V1/V2 | Semtech | EU868 |
| **us01-iot.semtech.com** | 1780 | 1780 | V1/V2 | Semtech | US915 |
| **cn1.loriot.io** | 1780 | 1780 | V1/V2 | Loriot | All |
| **ap1.loriot.io** | 1780 | 1780 | V1/V2 | Loriot | All |
| **au1.loriot.io** | 1780 | 1780 | V1/V2 | Loriot | All |
| **eu1.loriot.io** | 1780 | 1780 | V1/V2 | Loriot | All |
| **sa1.loriot.io** | 1780 | 1780 | V1/V2 | Loriot | All |
| **us1.loriot.io** | 1780 | 1780 | V1/V2 | Loriot | All |
| **router.eu.thethings.network** | 1700 | 1700 | V1 | TTN | EU433<br>EU868 |
| **router.us.thethings.network** | 1700 | 1700 | V1 | TTN | US915 |
| **router.cn.thethings.network** | 1700 | 1700 | V1 | TTN | CN470<br>CN780 |
| **router.au.thethings.network** | 1700 | 1700 | V1 | TTN | AU915 |

### 4.1.3 Choose preinstalled frequency plan

Use ln command to make global_conf.json file points to other json file to choose preinstalled frequency plan. User can also create their own json file depends on the previous defined json file.

```
sudo ln -sf cfg/xxx/global_conf_xxx.json global_conf.json
```

**NOTE:**

1. **Replace global_conf_xxx.json with the real file name**
2. **Other undocumented channels plans, user could calculate each channel frequency according to the previous description.**

| CH | eu868 | us915 | eu433 | cn780 | as920 | cn470 |
|---|---|---|---|---|---|---|
| **0** | 867.1 | 902.3 | 433.175 | 779.5 | 923.2 | 470.3 |
| **1** | 867.3 | 902.5 | 433.375 | 779.7 | 923.4 | 470.5 |
| **2** | 867.5 | 902.7 | 433.575 | 779.9 | 923.6 | 470.7 |
| **3** | 867.7 | 902.9 | 433.775 | 780.1 | 923.8 | 470.9 |
| **4** | 867.9 | 903.1 | 433.975 | 780.3 | 924.0 | 471.1 |
| **5** | 868.1 | 903.3 | 434.175 | 780.5 | 924.2 | 471.3 |
| **6** | 868.3 | 903.5 | 434.375 | 780.7 | 924.4 | 471.5 |
| **7** | 868.5 | 903.7 | 434.575 | 780.9 | 924.6 | 471.7 |
| **8** | 868.3<br>BW250<br>SF7 | 903.0<br>BW500<br>SF8 | OFF | OFF | OFF | OFF |

| CH | eu868 | us915 | eu433 | cn780 | as920 | cn470 |
|---|---|---|---|---|---|---|
| **9** | 868.8<br>FSK<br>50Kbps | OFF | OFF | OFF | OFF | OFF |

### 4.1.4 Start Packet Forwarder service

Execute commands below to start pktfwd service:

```
sudo systemctl enable pktfwd
sudo systemctl restart pktfwd
```

### 4.1.5 Stop Packet Forwarder service

Execute commands below to stop pktfwd service:

```
sudo systemctl disable pktfwd
sudo systemctl stop pktfwd
```

## 4.2 IoTSquare Server

IoTSquare (https://iotsquare.xyz) The IoT platform is a dedicated LoRa device management platform developed by RisingHF. It has functions such as creating users, registering nodes, gateways, and multicast group management. Currently, the IoTSquare IoT platform only Supports Lora device access of lorawan version 1.0.2. IoTSquare now supports cn470, cn470prequel, eu868, as923, us915, au915 and other frequency bands. Users who want to use this server can send an email (support@risinghf.com) to request a test account.
Before using, please pay attention to the **IoTSquare IoT Platform User Manual**. If you already have the server account, please follow the steps below:

### 4.2.1 Register RHF2S308 Gateway

1) Get the Gateway ID of the gateway

Log in to the web interface of the gateway and go to the "Server Config -> IotSquare Bridge" menu. The "Gateway ID" text box on the page is the Gateway ID of the gateway. If the bridge does not start, the user needs to manually click the "Start" button to start.

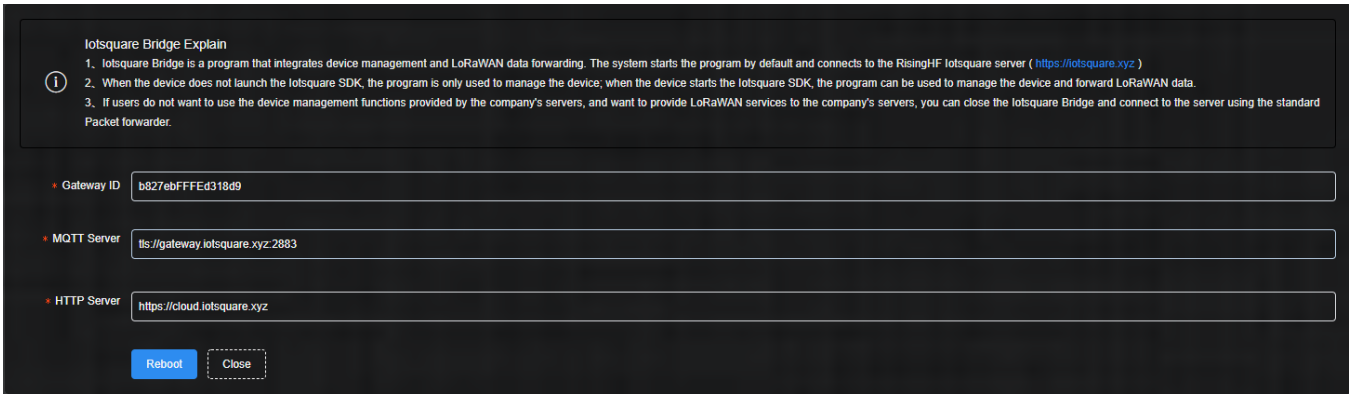



**Figure 4-2 IoTSquare Bridge interface management**

2) Register Gateway

Go to the IoTSquare server and go to the "GATEWAYS->Add Gateway" menu. Fill in the Gateway ID you just obtained to the gateway ID and click "Add" to register.

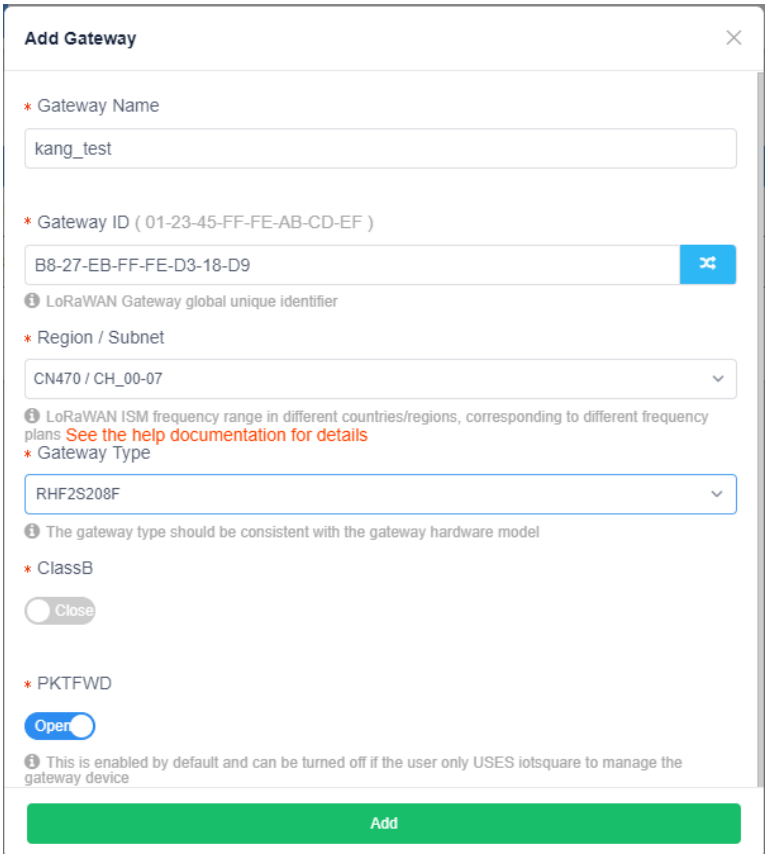



**Figure 4-3 IoTSquare server registration gateway**

3) Confirm if the gateway is online

After the gateway is successfully registered, you can see that the gateway displays online under the " GATEWAYS->Gateway List" menu. If you do not perform the 5.2.2 chapter command online, start the service.

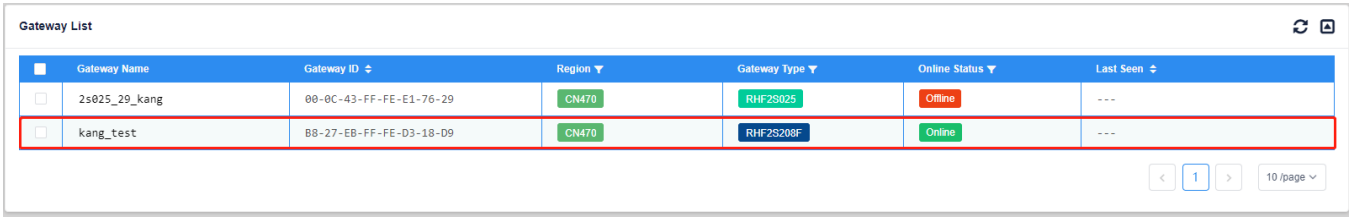



**Figure 4-4 Gateway list**

### 4.2.2 Start iotsquare service

Run the following command to start the iotsquare service:

sudo systemctl enable rhf-bridge
sudo systemctl restart rhf-bridge
sudo systemctl enable iotsquare-pktfwd
sudo systemctl restart iotsquare-pktfwd

### 4.2.3 Stop iotsquare service

Run the following command to stop the iotsquare service:
sudo systemctl disable iotsquare-pktfwd
sudo systemctl stop iotsquare-pktfwd

### 4.2.4 Add application

Go to the "APPLICATIONS->Add Application" menu, fill in the relevant field information and click "Add". If the application has already been added, the user can ignore this step.

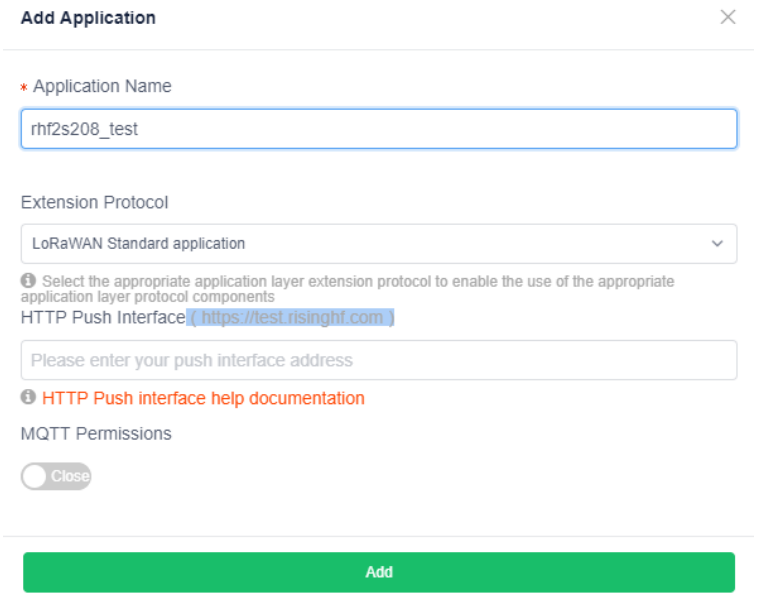



**Figure 4-5 Add application**

### 4.2.5 Register node

Go to the application you just added and click Add Device. Users can choose to add “Add ABP Device”, “Add OTAA Device” and “Bulk Import”. Here, select the "Add OATT Device" example, fill in the corresponding node information, and click "Add" to register the node.

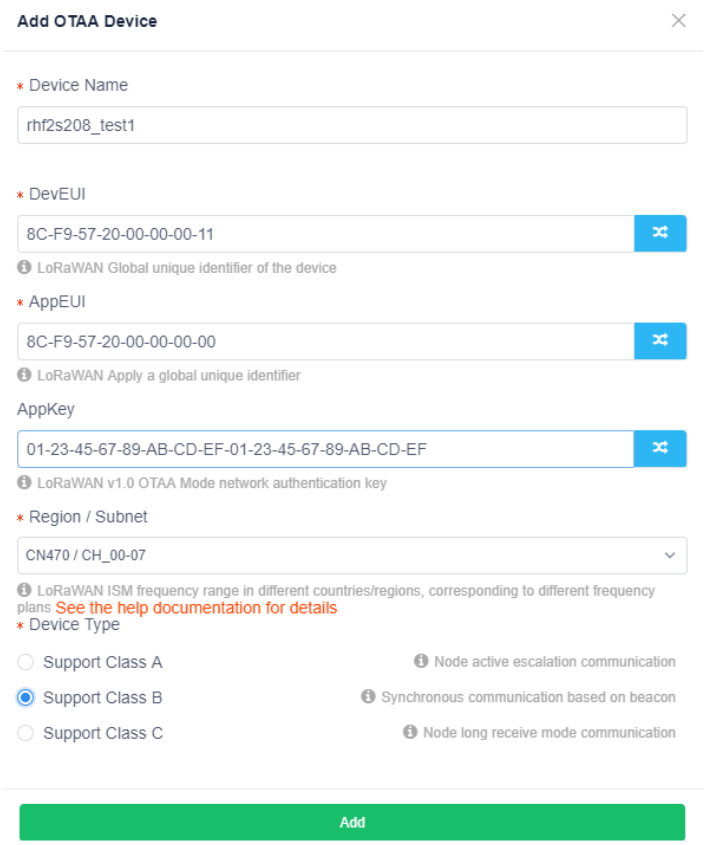



**Figure 4-6 Registration node**

### 4.2.6 Send and receive data

1) Set node parameters

The user connects to the node through the serial port and sends the following command to set the node:

AT+FDEFAULT
AT+ID=DEVEUI, 8CF9572000000011
AT+ID=APPEUI, 8CF9572000000000
AT+KEY=APPKEY, 0123456789ABCDEF0123456789ABCDEF
AT+MODE=LWOTAA
AT+DR=CN470
AT+CH=NUM,0-7
AT+JOIN

2) Send data node

AT+CMSG=111

```
[17:57:57.644]发→◇at+cmsg=111
□
[17:57:57.666]收←◆+CMSG: Start
+CMSG: Wait ACK

[17:57:58.747]收←◆+CMSG: ACK Received
+CMSG: RXWIN1, RSSI -21, SNR 7.3
+CMSG: Done
```

**Figure 4-7 Successfully receiving data**

### 4.2.7 Other feature

In addition to the most basic LoRaWAN uplink and downlink communication, the IotSquare server has expanded other functions. Such as: gateway information management, multicast management and IotSquare upgrades. For more detailed features, please refer to the IotSquare online documentation: https://doc.iotsquare.xyz/docs/manual/iotsquare.

## 4.3 Loriot Server

Loriot(http://www.loriot.io) is a LoRaWAN server supplier based at Switzerland, Loriot server supply free test account for user. Please note, free account has some limitation like active downlink, OTAA etc. Please read online documentation before get started https://cn1.loriot.io/documentation (Subdomain name will be different if you use other region servers).

### 4.3.1 Register RHF2S308 Gateway

1) Get MAC address, which is in format xx:xx:xx:xx:xx:xx. MAC address is sticky on the side of the RHF2S308 device. You could also use command ifconfig to get the MAC address or find it on the web-based utility.

```
rxhf@rhf2S308:~$ ifconfig
==========================================================================
eth0: flags=4099<UP,BROADCAST,MULTICAST>  mtu 1500
        ether b8:27:eb:d3:18:d9  txqueuelen 1000  (Ethernet)
        RX packets 0  bytes 0 (0.0 B)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 0  bytes 0 (0.0 B)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0
```

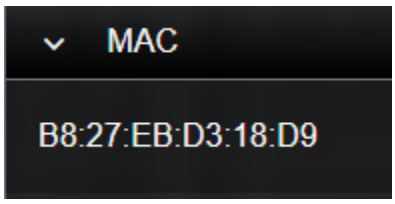



**Figure 4-8 Mac addr shown on web-based utility**

2) Access http://cn1.loriot.io register account, log in directly if you have already gotten one.
3) Click Dashboard -> Networks->Name(network name) -> Add Gateway, choose RHF2S008/RHF2S308.


**Figure 4-9 Loriot server registers RHF2S308 gateway**

4) Radio front-end configuration. Match the device type. Available options:
   a) 868/915 MHz (SX1257)
   b) 434/470/780 MHz (SX1255)

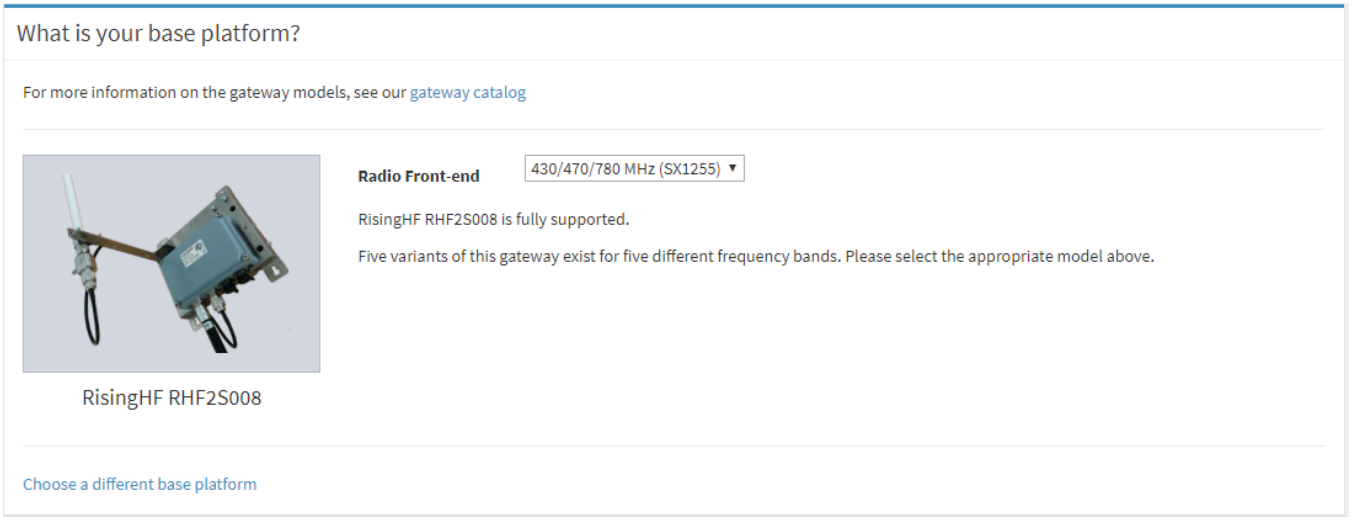



**Figure 4-10 Choose the right RF front end**

5) Scroll down, fill in MAC address, and set gateway location information.

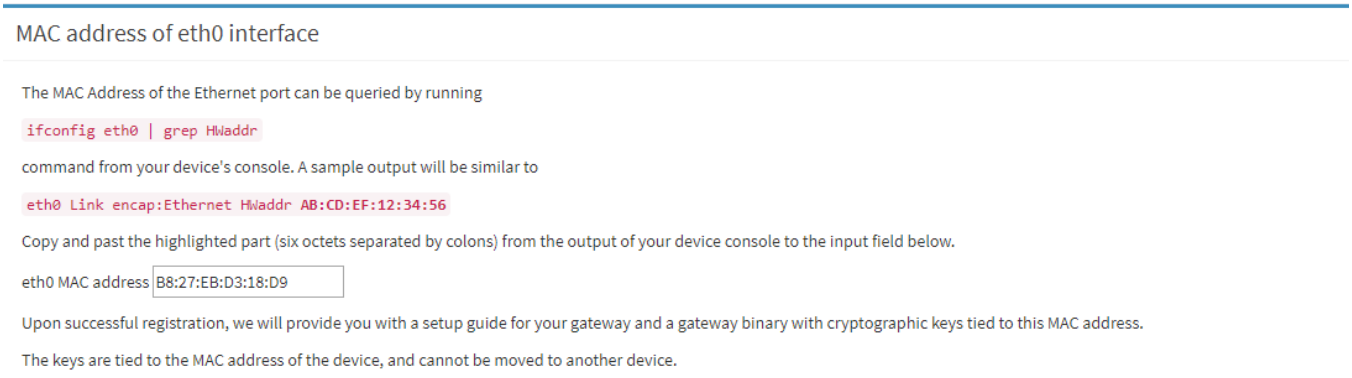


**Figure 4-11 Fill in the MAC address of the device**

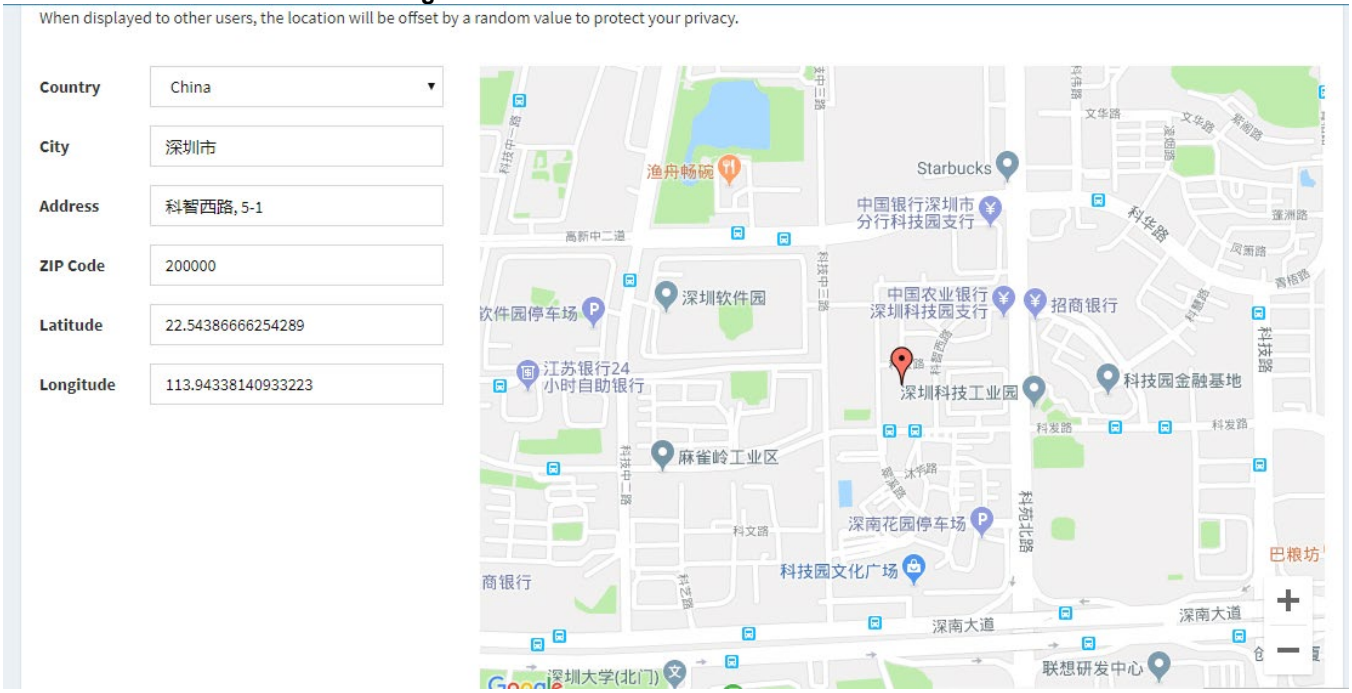



**Figure 4-12 Select the installation location of the device**

6) Click "Register RisingHF RHF2S308 gateway" finish register.
7) Click " Gateways" list to enter gateway configuration page.

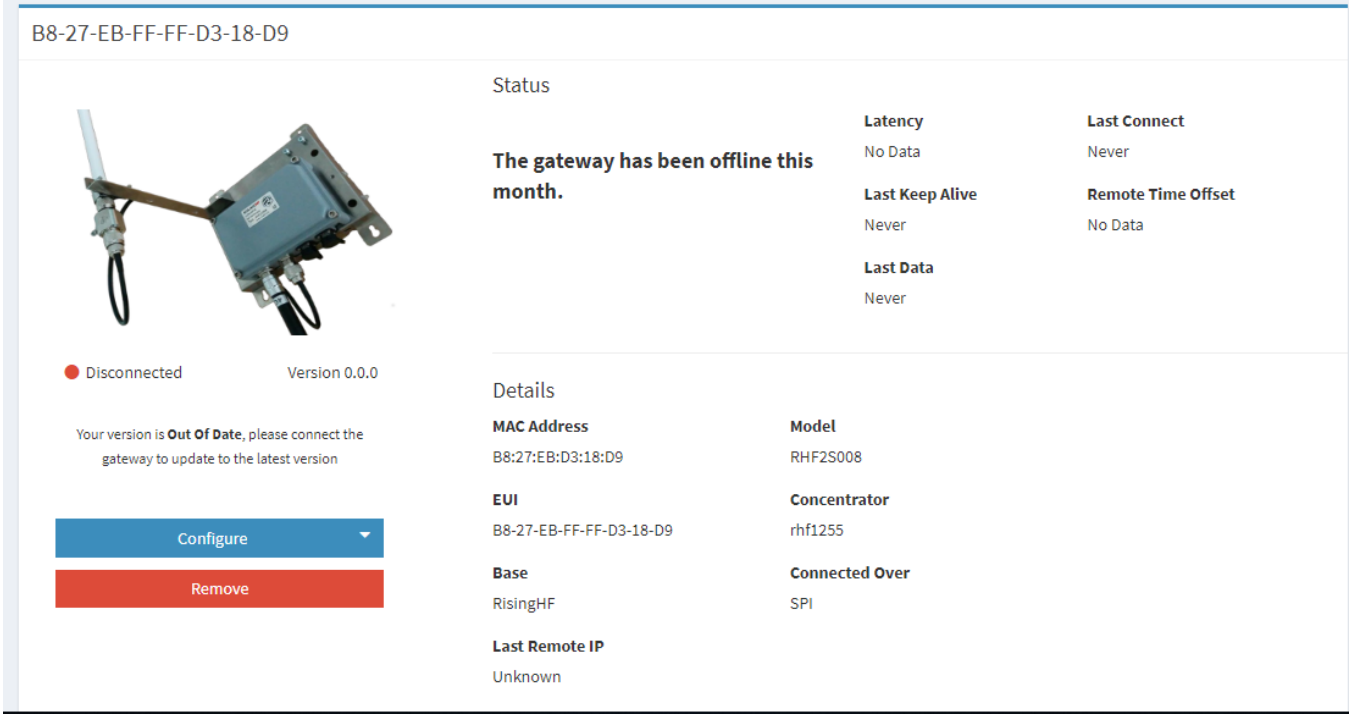



**Figure 4-13 Gateway configuration interface**

8) According to the gateway frequency band to choose a band. Contact support@risinghf.com if you need help.
9) Register gateway finish.
10) Log in to the gateway and start Loriot service and start test.

### 4.3.2 Start Loriot Service

Run the following command to start the Loriot service:

```
sudo systemctl enable loriot-gw
sudo systemctl start loriot-gw
```

Run the following command to stop the Loriot service:

```
sudo systemctl stop loriot-gw
sudo systemctl disable loriot-gw
```

**NOTE: Once you set to auto start the service, please make sure disable the auto start of loriot-gw service. In case of the gateway service collision.**

### 4.3.3 Configure Gateway Frequency

Set gateway frequency, open loriot console find gateway page. Choose frequency plan. Check online documentation for more details.
https://cn1.loriot.io/home/documentation.html#docu/frequency-plan

### 4.3.4 Loriot Firmware Upgrade

Please download loriot-risinghf-RHF2S308-xxxxxx-SPI-0-latest.bin file, and replace /opt/loriot/loriot.

```
sudo su
cd /opt/loriot
wget URL -O loriot-gw
```

Please get the actual URL from the gateway page.

# 5 Advanced Usage

## 5.1 10/100m Ethernet

When you connect the gateway to the ethernet with wired cable, a eth0 interface is found. The gateway will get an ip in the lan. Please use ifconfig to check the ip. You could also use ping command to check the connection quality.

```
eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
        inet 192.168.0.182  netmask 255.255.255.0  broadcast 192.168.0.255
        inet6 fe80::5313:8f2a:b71b:7b85  prefixlen 64  scopeid 0x20<link>
        ether b8:27:eb:5a:8b:b8  txqueuelen 1000  (Ethernet)
        RX packets 215410  bytes 43613321 (41.5 MiB)
        RX errors 0  dropped 70  overruns 0  frame 0
        TX packets 29506  bytes 3671566 (3.5 MiB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0
```

**Figure 5-1 eth0 interface**

## 5.2 WiFi accessing

Please use your PC to scan the SSID RHF2S308_XXXXXX and connect to this WiFi device. The password is RisingHF_XXXXXX. The last 6 characters are same for both SSID and the password, which are the last 3 bytes of the MAC address in uppercase letters. Then you can use 192.168.8.1 to access into the gateway on the web-based utility.

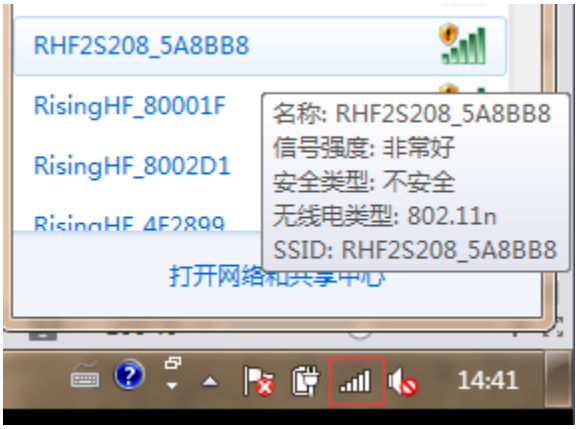



**Figure 5-2 Scan WiFi SSID of RHF2S308**

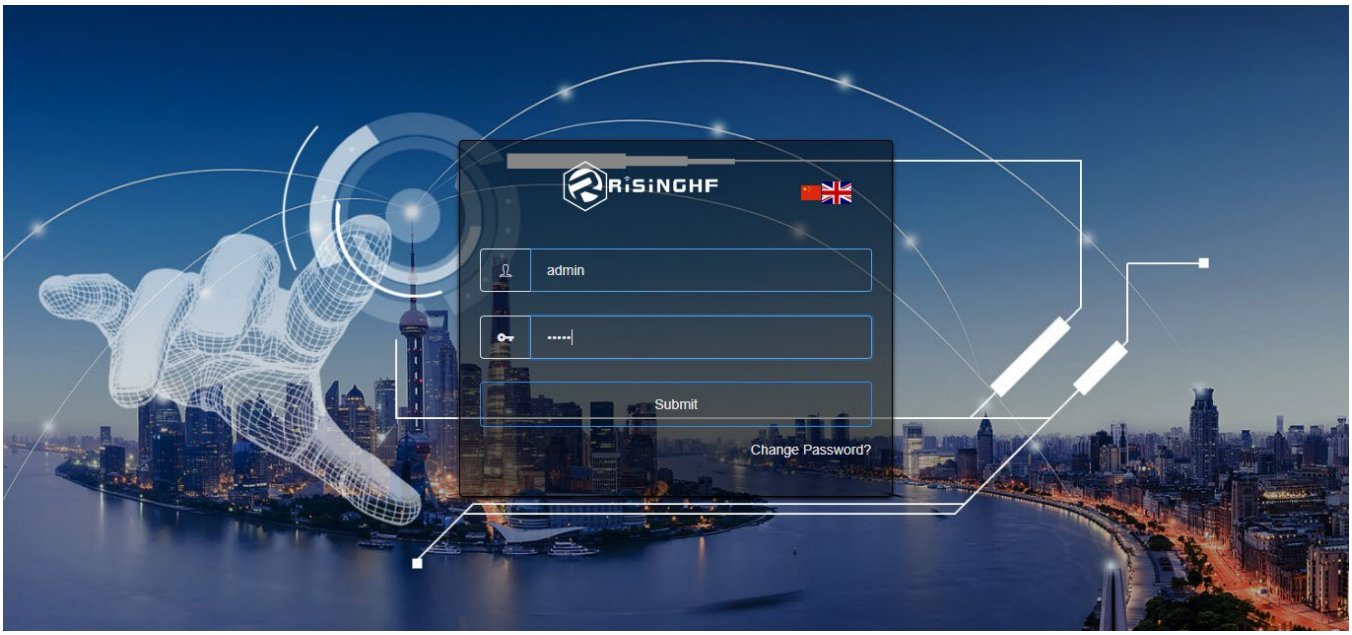



**Figure 5-3 login page with wifi**

You could also use command ifconfig to check the interface wlan0.

```
wlan0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
        inet 192.168.8.1  netmask 255.255.255.0  broadcast 192.168.8.255
        inet6 fe80::51f3:489a:17cf:184c  prefixlen 64  scopeid 0x20<link>
        ether 10:a4:be:d2:70:77  txqueuelen 1000  (Ethernet)
        RX packets 1668  bytes 231937 (226.5 KiB)
        RX errors 0  dropped 1  overruns 0  frame 0
        TX packets 1241  bytes 491420 (479.9 KiB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

rxhf@rhf2s208:~$
```

**Figure 5-4 Use command to check interface wlan0**

## 5.3 Use GPS module

RHF2S308 embedded on board GPS module (MAX-7Q), which is necessary for LoRaWAN Class B network. Access gps module through **`/dev/serial1`** device, default baud rate 9600.

Simply test GPS module by executing below commands:

**`sudo gpstest`**

It returns below messages:

```
$GPRMC,061417.00,A,2232.87469,N,11356.01189,E,0.245,,240719,,,D*7E
$GPVTG,,T,,M,0.245,N,0.455,K,D*21
$GPGGA,061417.00,2232.87469,N,11356.01189,E,2,05,3.67,69.1,M,-2.7,M,,0000*7F
$GPGSA,A,3,06,02,40,12,05,,,,,,,,8.61,3.67,7.79*00
$GPGSV,3,1,10,02,34,303,31,05,31,223,35,06,48,000,17,09,30,091,*71
$GPGSV,3,2,10,12,23,312,33,17,58,083,,19,63,049,,23,11,056,*79
$GPGSV,3,3,10,28,23,170,,40,20,257,29*78
$GPGLL,2232.87469,N,11356.01189,E,061417.00,A,D*6D
```

Note: When testing the GPS module function, please close other programs that use the GPS module. The LoRa process related services of the general equipment will occupy the GPS module.

## 5.4 Temperature monitor

A temperature monitor is integrated inside your gateway. You could use both command sudo get_temp to get the temperature or download the temperature log with the web-based utility.

```
sudo get_temp
40.25 // value return ℃
```

The temperature will be refreshed every minute and shown on the web-based utility. And you could also download the log which help you do some analysis when needed.

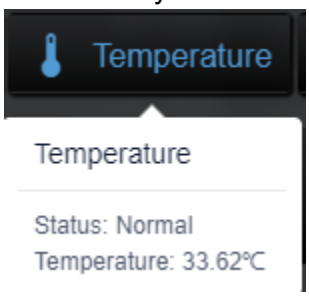



**Figure 5-5 Temperature shown on the web**

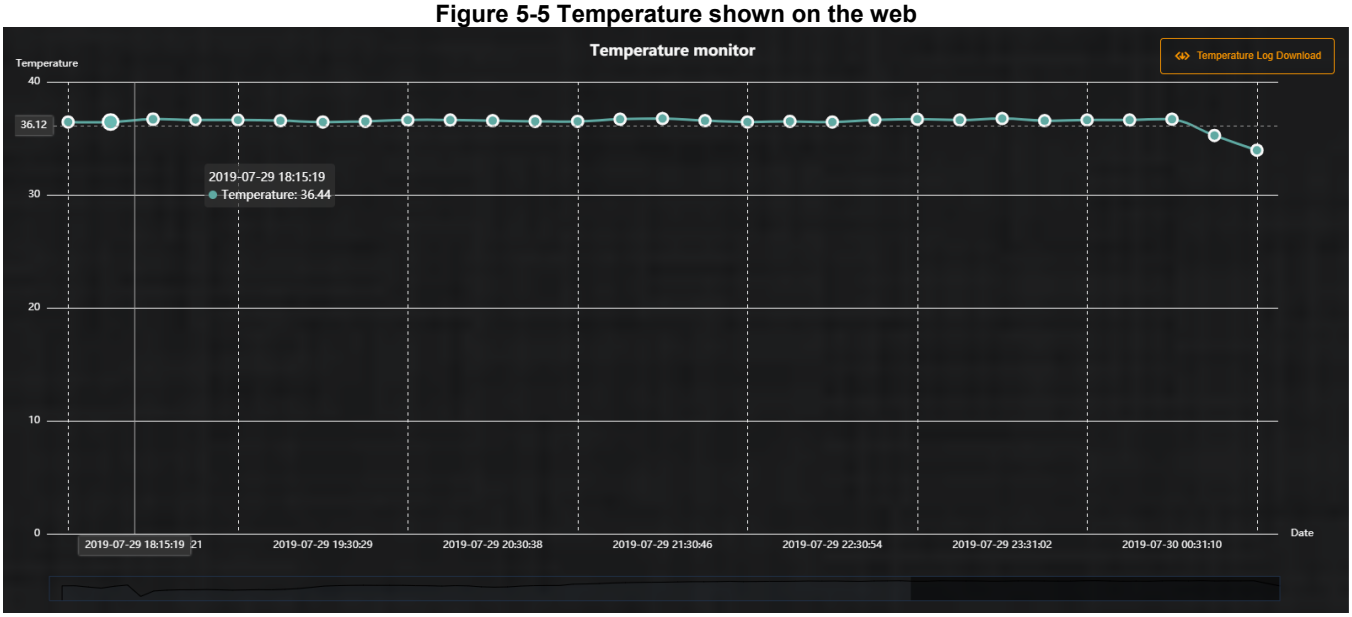



**Figure 5-6 Temperature Log**

## 5.5 RTC

The system time would be synchronized to UTC time with inside RTC. You can use command below to check the synchronized time.

```
sudo hwclock -r
2018-08-04 08:18:33.770069+0000 // synchronized time
```

## 5.6 Noise floor scanning

RHF2S308 integrate a noise analysis engine which could help noise pre-scan when operator want to do network optimization. Please access into the gateway on web-based utility when you want to do noise scanning. Please refer to 3.4.2.

Noise floor is a very important parameters you should know when you install your gateway in the field. To get a best coverage we want to have as low as possible noise. But actually there are lots of interference or noise signal in the environment. Target average noise floor is about -110dBm±5dB, but less than -100dB is also acceptable. When the average noise floor is higher than -95dBm or more, changing operation band is suggested.

## 5.7 Remote Support with rssh service

RHF2S308 integrates a rssh service, which could enable RisingHF to access your RHF2S308 device remotely. It is closed by default. (Note: this function can be only used by RisingHF to support customer when necessary)

Go to the " WIFI Config -> RSSH Operation" menu of the web interface, click the "Open RSSH" button, you will get the port number of the remote login. When asking remote support, please send your screenshot to support@risinghf.com, and explain your trouble, RisingHF technical support will help you diagnose.


**Figure 5-7 To get allocated port with rssh service**

Note: After the troubleshooting is complete, users are required to disable RSSH to reduce the risk of the device being attacked by the network.

# 6 Factory Default Restore

## 6.1 Download image

Contact support@risinghf.com to get image address.

## 6.2 Bootloader Mode

Set RHF2S308 to enter Bootloader mode

1) Cut off RHF2S308 power
2) Connect Micro USB cable let RHF2S308 to connect with PC
3) Restart RHF2S308
4) Bootloader mode enabled

## 6.3 Program

Check online document to burn RHF2S308 firmware. Link

# 7 FAQ

**Q1: Customized global_conf.json file can't be recognized by packet forwarder?**

A1: Check below rule. Every object must end with comma, except the last member of a object or array. ( // and /* */ are special comment format, no need consider it)

**Q2: One gateway receives 2 same packets at almost the same time**

A2: If the main channel receive packets at a high signal strength, in such case SX1301 chip is possible to receive mirror packet, server should compare the packets to filter the fake packet.
Semtech official explain: https://github.com/Lora-net/lora_gateway/issues/48

**Q3: Gateway TX packet is received back**

A3: SX1301+SX125x is full duplex chips with half duplex design. When gateway switch to TX mode the receiver is not closed, only switch is controlled, it is possible to receive such packet.

**Q5: ADR issue when connecting with Loriot server**

A5: Loriot server assumes that device enables 8 channels, if device has less channels it is possible to lead to the problem.

**Q6: Fail to connect to a LoRaWAN server**

A6: If you have succeded in connecting the gateway to a LoRaWAN server but you fail to connect to another server, please check if you have stopped previous service. Two competion service will make your gateway fail to connect to the target server.

If this is the first time to connect to the server, please make sure you have select the right operation band which should be compatible with the part number of your gateway.

**Q7: Fail to connect to Loriot server**

A7: Please check if you have selected the right radio front-end for your gateway when you register the gateway. Please select 434/470MHz (SX1255) for RHF2S308xxx-434 and RHF2S308xxx-470, and select 868/915MHz (SX1257) for RHF2S308xxx-868 and RHF2S308xxx-915.

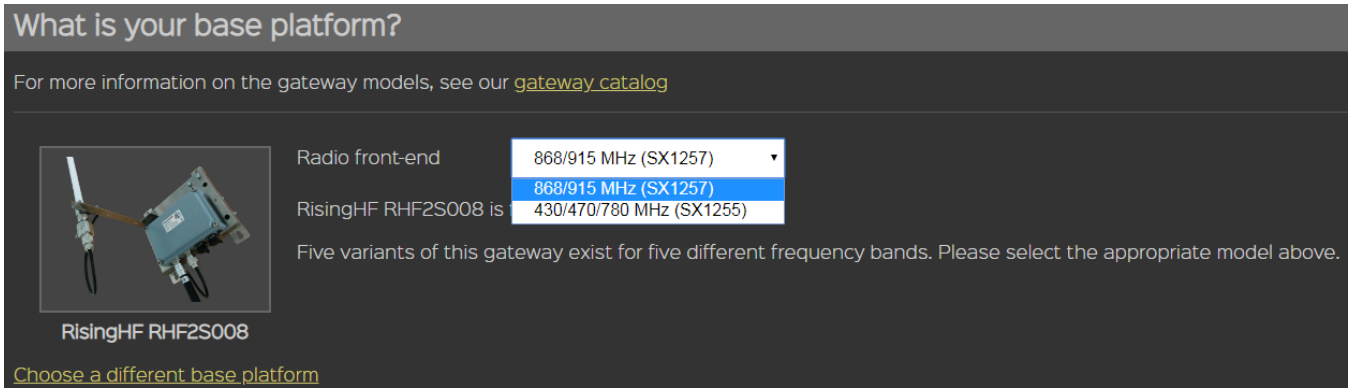



**Figure 7-1 select the right radio front-end for your gateway when registered in Loriot server**

**Q8: Forget the WiFi password**

A8: Please contact with support@risinghf.com to get help.

**Q9: Can I use WiFi for networking backhaul**

A9: No. WiFi is just for configuration and debugging at the moment.

**Q10: PER is very bad**

A10: Please check points below:

1) Make sure you haven't run two or more LoRaWAN service
2) Make sure you have configure the same channels for both gateway and nodes
3) Make sure there is no strong inteference or signal

# Revision

V1.0 2021-06-10

+ Initial creation

FCC STATEMENT :
This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:
(1) This device may not cause harmful interference, and
(2) This device must accept any interference received, including interference that may cause undesired operation.
Warning: Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.
NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:
Reorient or relocate the receiving antenna.
Increase the separation between the equipment and receiver.
Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
Consult the dealer or an experienced radio/TV technician for help.
FCC Radiation Exposure Statement:
This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body

CE STATEMENT :
Operating temperature: -40~75℃
Operating frequency range: 2402-2480MHz
Rated Power: 13.5 dBm
Operating frequency range: 2412-2472MHz
Rated Power: 9.5 dBm
Manufacturer information: Ruixing Hengfang network (Shenzhen) Co.,Ltd Address： Room 201, building 6 Software Park(Phase 1), Keji Mid 3nd Road, NanShan District, Shenzhen

China 518057

Declaration of Conformity
Hereby, [Ruixing Hengfang network (Shenzhen) Co.,Ltd] declares that the radio equipment type [IoT gateway based on LoRaWAN, RHF2S308] is in compliance with Directive 2014/53/EU.The full text of the EU declaration of conformity is available at the following internet address:www.risinghf.com

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