

# **LoRaWAN Gateway**

## **IoT-LG-801**

### **User Manual**



**Heyuan Intelligence Technology Co., Ltd**



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## **IMPORTANT DECLARATIONS**

1. This document is an instruction manual. Its content will change as product is upgraded without notice. Please contact with Heyuan Intelligence Technology Co., Ltd to get the latest product specifications if it is needed.
2. Heyuan shall not be responsible or liable for any damages or injuries caused by improper meter installation and/or operation.
3. Please read this manual carefully before the product is operated, and once you start, you'll be considered to have read this manual and accept all our terms.

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## Chapter 1 Product Introduction

IoT-LG-801 is a new intelligent LoRaWAN gateway developed by Heyuan. It can realize data transmission function, facilitate remote, wireless and networked communication, easily realize interconnection with the platform, greatly reduce the complex development process of wireless products, enable your products to enter the market quickly at a lower cost, and can be widely used in industrial Internet of Things applications.



Product Picture

## Chapter 2 Features and Function

### 2.1 Function Introduction

- **Power supply:** DC 9 ~ 28V
- **Supporting WIFI, Ethernet**
  - **Ready state:** When this method can obtain an IP, the network card is considered ready.
  - **Priority:** WIFI STA > Ethernet
  - **Network card selection logic:** The device will always select the ready network card with the highest priority for communication.

## ➤ Led Indicator

- **RF-LED:** LoRaWAN module is in receiving mode; it is always on when receiving and always off when transmitting.
- **SYS-LED:**
  - System started, LoRaWAN thread not started: On for 0.5 seconds, off for 0.5 seconds.
  - System started, LoRaWAN thread started: Always on.
- **WIFI-LED:**
  - WIFI STA not enabled: Always off.
  - WIFI STA searching for network: On for 0.5 seconds, off for 0.5 seconds.
  - WIFI STA connected: Always on.
- **LINK-LED:** Network port running normally; this light flashes.
- **SPD-LED:** Network port running normally; this light is always on.

## 2.2 Technical Parameter

	Parameters	Description
Power Supply	Power Supply	DC9-28V
	Standby Power	0.72W(12V)
Communication Port	Ethernet / WIFI(2.4G)	
LoRa Frequency	CN470MHz, EU868MHz, AU915MHz, AS915MHz, AS923MHz, IN865MHz	
Functions	NS connection	UDP Packet Forward
	Management Port	MQTT Native/Things Board
	Configuration	WEB 、MQTT remote configuration
	Upgrade	WEB, OTA

## Chapter 3 Configuration

### 3.1 AP parameters and access address

The device enters AP mode upon power-on. The AP mode configuration is as follows:

```
# AP mode WIFI configuration
SSID: LoRaGW-xxxxxx
password: lora-gwwifi
xxxxxx (SN's last 6 digits)
IP address: 192.168.4.1
```

### 3.2 Parameter Settings

#### 3.2.1 Frequency Point Configuration

The gateway has 8 channels, which are controlled by two radio chips (radio0 and radio1). The channel frequency settings are configured through radio0 and radio1. The frequency mapping of these 8 channels to radio0 and radio1 may vary by region. For details, see below

## ● CN470

CN470(the radio0 and radio1 with 800KHZ difference, default radio=470600000Hz,radio1=471400000Hz)  
freq0 = RADIO0-300KHz,default 470.3MHz  
freq1 = RADIO0-100KHz,default 470.5MHz  
freq2 = RADIO0+100KHz,default 470.7MHz  
freq3 = RADIO0+300KHz,default 470.9MHz  
freq4 = RADIO1-300KHz,default 471.1MHz  
freq5 = RADIO1-100KHz,default 471.3MHz  
freq6 = RADIO1+100KHz,default 471.5MHz  
freq7 = RADIO1+300KHz,default 471.7MHz

## ● IN865

IN865(default radio=865200000Hz,radio1=866385000Hz)

## ● EU868

EU868(default radio=867500000Hz,radio1=868500000Hz)  
freq0 = RADIO1-400KHz default 868.1MHz  
freq1 = RADIO1-200KHz default 868.3MHz  
freq2 = RADIO1 default 868.5MHz  
freq3 = RADIO0-400KHz default 867.1MHz  
freq4 = RADIO0-200KHz default 867.3MHz  
freq5 = RADIO0 default 867.5MHz  
freq6 = RADIO0+200KHz default 867.7MHz  
freq7 = RADIO0+400KHz default 867.9MHz

## ● US915

US915(default radio=904300000Hz,radio1=905000000Hz) //US915\_1  
freq0 = RADIO0-400KHz default 903.9MHz  
freq1 = RADIO0-200KHz default 904.1MHz  
freq2 = RADIO0 default 904.3MHz  
freq3 = RADIO0+200KHz default 904.5MHz  
freq4 = RADIO1-300KHz default 904.7MHz  
freq5 = RADIO1-100KHz default 904.9MHz  
freq6 = RADIO1+100KHz default 905.1MHz  
freq7 = RADIO1+300KHz default 905.3MHz  
chan\_LoRa\_Std = radio0+300KHz,default 904.6MHz

## ● AU915

AU915(default radio=915600000Hz,radio1=916300000Hz) //AU915\_0

freq0 = RADIO0-400KHz default 915.2MHz

freq1 = RADIO0-200KHz default 915.4MHz

freq2 = RADIO0default 915.6MHz

freq3 = RADIO0+200KHz default 915.8MHz

freq4 = RADIO1-300KHz default 916.0MHz

freq5 = RADIO1-100KHz default 916.2MHz

freq6 = RADIO1+100KHz default 916.4MHz

freq7 = RADIO1+300KHz default 916.6MHz

chan\_LoRa\_Std = radio0+300Khz,default 915.9MHz

## ● AS923

AS923(default radio=922300000Hz,radio1=923100000Hz) //AS923

freq0 = RADIO0-300KHz default 922.0MHz

freq1 = RADIO0-100KHz default 922.3MHz

freq2 = RADIO0+100KHz default 922.4MHz

freq3 = RADIO0+300KHz default 922.6MHz

freq4 = RADIO1-300KHz default 922.8MHz

freq5 = RADIO1-100KHz default 923.0MHz

freq6 = RADIO1+100KHz default 923.2MHz

freq7 = RADIO1+300KHz default 923.4MHz

chan\_LoRa\_Std = radio0+300Khz,default 922.6MHz

### 3.2.2 Common Frequency Points and Radio Mapping

Common Frequency Points	Frequency Range (MHz)	Radio0(Hz)	Radio1(Hz)
CN470_0	470.3-471.7	470600000	471400000
CN470_10	486.3-487.7	486600000	487400000
EU868	868.1,868.3,868.5,867.1, 867.3,867.5,867.7,867.9	867500000	868500000
EU433	433.175,433.375,433.575,433.775 433.975,434.175,434.375,434.575	433475000	434275000
US915_0	902.3-903.7	902700000	903400000
US915_1	903.9-905.3	904300000	905000000
AU915_0	915.2-916.6	915600000	916300000
AS923	922.0-923.4	922300000	923100000
IN865	865.0625, 865.2325, 865.4025, 865.985, 866.185, 866.385, 866.585, 866.785	865200000	866385000

### 3.2.3 LoRaWAN NS for Test

Domain Name:loransitw.com IP: 106.52.124.231

WEB address: 106.52.124.231:8080

Packet forwarding address:

- CN470\_0:106.52.124.231:1700
- CN470\_10:106.52.124.231:1704
- EU868:106.52.124.231:1701
- US915\_0:106.52.124.231:1702
- US915\_1:106.52.124.231:1703
- AU915:106.52.124.231:1705
- AS923:106.52.124.231:1706
- IN865:106.52.124.231:1707

#### Test Account:

WEB address: 106.52.124.231:8080

Test Account: test@loragw.com

Password: test123456

#### Note:

- 1.The account is for testing only*
- 2.Since the test account is publicly accessible and may be used by multiple users, please do not delete data from devices other than your own during use*
- 3.Please do not run important business data on the test NS, as it is not secure.*

## 3.3 WEB Configuration

If connecting to the gateway via AP mode, the WEB access address is http://192.168.4.1; otherwise, it is the IP assigned to the device.

### 3.3.1 General Overview

- **Menu bar:** Refresh and restart the gateway.
- **GW Info:** Gateway information page.
- **Configuration:** Gateway configuration page for viewing and modifying settings. Any configuration changes require a restart to take effect.
- **Maintenance:** Maintenance page for device upgrade and factory reset.



LoRaWAN Gateway

GW Info

Configuration

Maintenance

GW Info

SN	84cd33ff493ae44	SW Ver	V1.0.1	HW Ver	V1.0.0
Longitude	0	Latitude	0	Altitude	0

Cellular Info

IMEI		IMSI		ICCID	
Link Status	NET_DOWN	IP	0.0.0.0	CSQ	0

Ethernet Info

Link Status	LINK_UP/NET_UP	MAC	96:eb:33:49:3ae47	IP	192.168.5.97
Mask	255.255.255.0	Gateway	192.168.5.1	DNS1	192.168.5.1
DNS2	192.168.5.1				

WiFi Info

Link Status	NET_UP	MAC	64:eb:33:49:3ae44	IP	192.168.5.100
Mask	255.255.255.0	Gateway	192.168.5.1	DNS1	192.168.5.1
DNS2	192.168.5.1				

### 3.3.2 Gateway Information

LoRaWAN Gateway

GW Info

Configuration

Maintenance

GW Info

SN	109e9effe0d6adc	SW Ver	v1.3.0	HW Ver	V1.0.0
Longitude	0	Latitude	0	Altitude	0
NS Status	DISCONNECTED	Current Time	2024-11-12 14:56:39 GMT	Run Time	00:00:06

Cellular Info

IMEI		IMSI		ICCID	
Link Status	NET_DOWN	IP	0.0.0.0	CSQ	0

Ethernet Info

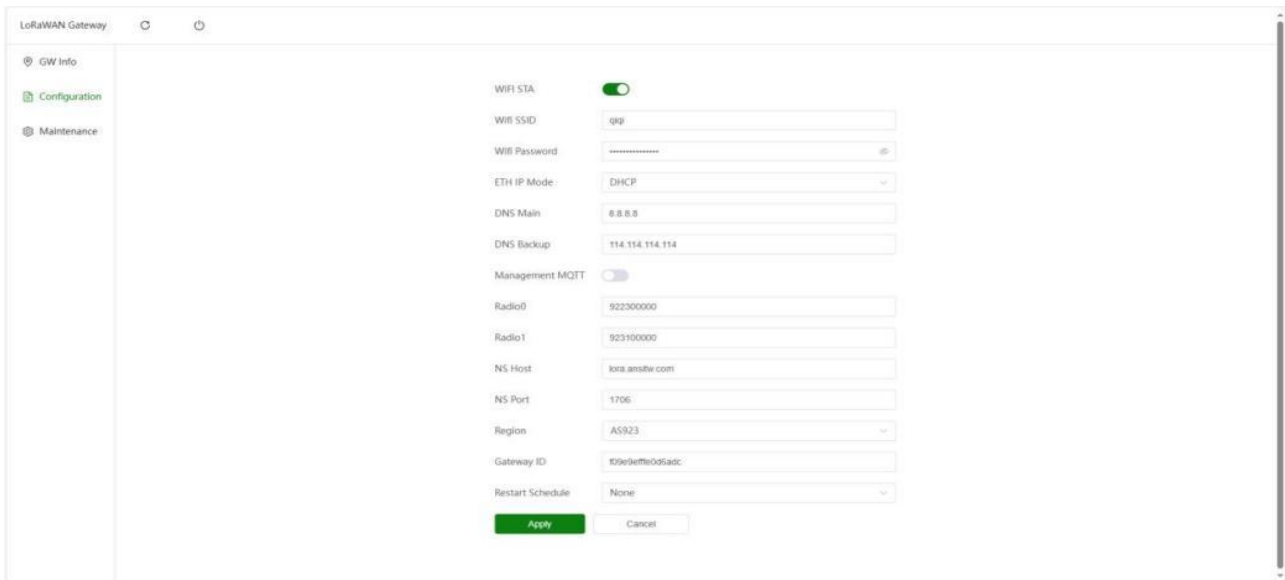
Link Status	LINK_UP/NET_UP	MAC	02:9e:9e:0d:6a:dc	IP	192.168.5.126
Mask	255.255.255.0	Gateway	192.168.5.1	DNS1	8.8.8.8
DNS2	114.114.114.114				

WiFi Info

Link Status	NET_UP	MAC	10:9e:9e:0d:6a:dc	IP	192.168.5.127
Mask	255.255.255.0	Gateway	192.168.5.1	DNS1	8.8.8.8
DNS2	114.114.114.114				

- The gateway's SN is generated based on the MAC address, which is unique to IEEE and therefore generally globally unique.
- The default Gateway ID (GWEUI) of the gateway is the same as the SN, and the Gateway ID can also be modified in the configuration page.
- WIFI Info displays the connection status of WIFI STA, which is not displayed by default and will be displayed after the WIFI STA function is enabled.
- IMEI is the unique ID of the cellular module, and ICCID is the SIM card number (not the phone number).

### 3.3.3 Configuration



- **WIFI STA:** Supports WIFI access point mode for network connection.
- **Management MQTT:** Used to configure MQTT parameters for the management channel.

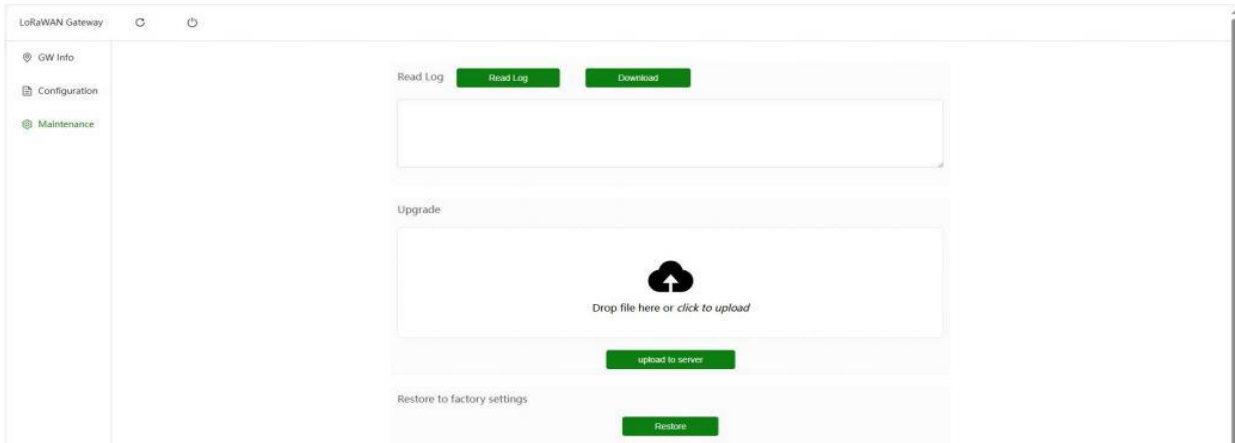


- Once enabled, gateway heartbeat packets will be received periodically (every 60 seconds) to maintain the gateway online status and synchronize gateway configurations simultaneously.
- Supports standard MQTT and ThingsBoard.
- Username, Password, and ClientID can be configured.
- MQTTS is not currently supported for the management channel.
- **Frequency Configuration:** Requires setting the Region, Radio0, and Radio1.
- **NS Direction:** Configured by modifying NS Host and NS Port, with the default pointing to the test NS.
  - Currently only supports UDP Packet Forward.
  - Major NS platforms such as Chirpstack, TTN, and Tencent Cloud all support UDP Packet Forward.

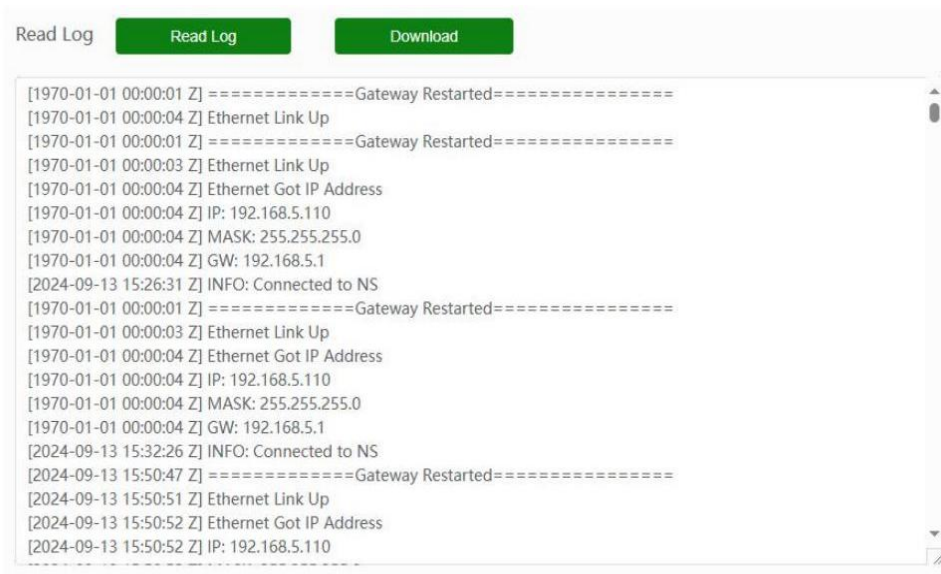
- **Restart Schedule:** Supports configuring a restart plan, allowing fixed-interval restarts or scheduled-time restarts.

**Note:** All modifications on the above page need to be applied by clicking "Apply" first and then restarted to take effect.

### 3.3.4 Maintenance



**Read Log:** The device saves simple logs, including restarts, network status changes, and NS connection status changes, which can be read from the device's stored LOG.



**Upgrade:** Drag the file or select the file to perform the upgrade.



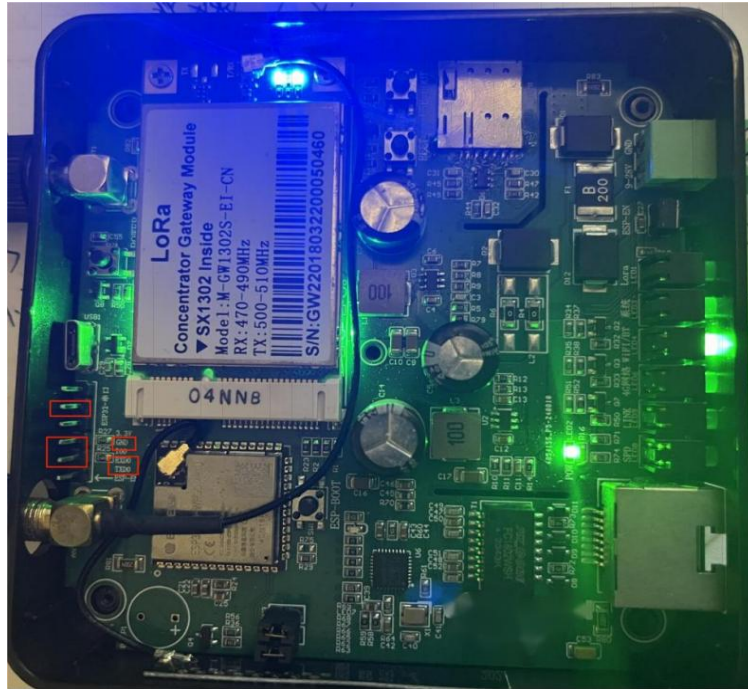
**Restore to factory settings**

### 3.4 Command Line Configuration

The device supports configuration via the command line, and in case of abnormalities, logs can be viewed through the serial port for troubleshooting.

#### 3.4.1 Serial Port Connection

As shown in the figure, connect the TTL interface. The silk screen on the board corresponds to the pin header order one-to-one. Note that TX and RX should be cross-connected (i.e., TX->RX, RX->TX). If the pin header is not soldered on the board, it needs to be soldered manually. After the serial port is connected, the device will automatically output logs.



#### 3.4.2 Command Introduction

The device supports command-line configuration. Please use putty or XSHELL, and set the serial port configuration to 115200,8,N,1.

**Note:** Any parameter modification requires a restart to take effect, which means you need to enter the reboot command.

- help, view all commands

```
255MG-801> help
pkt_fwd [-h] [--restore] [--host=<UDP Host>] [--port=<UDP Port>] [--gwid=<gateway id>]
ESP32 packet forwarder based on sx1302_hal
--restore    clean NVS config
-h, --help  print help
--host=<UDP Host>  UDP Host
--port=<UDP Port>  UDP Port
--gwid=<gateway id>  Gateway Id
```

```

ifconfig
    printf network status
reboot
    reboot the system
wifi
    set wifi parameters
help [<string>]
    Print the summary of all registered commands if no arguments are given,
    otherwise print summary of given command.
    <string>    Name of command
  
```

It can be set via the device's `pkt_fwd` command.

- **pkt\_fwd**: Used to configure information related to the device's `pkt_fwd`, and can be used to set the NS address and port.
- **ifconfig**: Used to view information of all network cards.

```

255MG-801>
255MG-801> ifconfig
=====ifconfig=====
-----if:ppp prio:20-----
link:    NET_UP
ip:      10.145.122.176
mask:    255.255.255.255
gw:      10.64.64.64
dns1:    218.85.157.99
dns2:    218.85.157.99
IMEI:    860761079936981
IMSI:    460115210945489
ICCID:   89860322245923849833
CSQ/BER: 23/0
-----if:eth prio:50-----
link:    LINK_DOWN/NET_DOWN
MAC:     66:e8:33:49:ba:47
ip:      0.0.0.0
mask:    0.0.0.0
gw:      0.0.0.0
dns1:    218.85.157.99
dns2:    218.85.157.99
-----if:ap prio:10-----
MAC:     64:e8:33:49:ba:45
ip:      192.168.4.1
ssid:    esp32
pswd:    esp32wifi
=====ifconfig end=====
255MG-801>
  
```

- **wifi:** Can be used to view and set the wifi ssid and password.
  - **Read wifi configuration**

```
255MG-801> wifi
wifi_ssid:jjji
```

- **Configure wifi connection:** The format is wifi {ssid} {password}

```
255MG-801> wifi 255mesh 255mesh123456
set wifi_ssid: Done
set wifi_pswd: Done
set ns_host: Done
set ns_port: Done
set gw_id: Done
set wifi_mode: Done
set freq_region: Done
set freq_radio0: Done
set freq_radio1: Done
set mgt_enable: Done
set mgt_url: Done
set mgt_type: Done
set mgt_clientid: Done
set mgt_username: Done
set mgt_tsbd_tele: Done
set mgt_tsbd_req: Done
set mgt_tsbd_resp: Done
set mgt_uptopic: Done
set mgt_dntopic: Done
set cfg_initd: Done
set eth_cfg: Done
set restart_plan: Done
set dns_cfg: Done
Save config to NVS... Done

255MG-801> wifi
wifi_ssid:255mesh
wifi_pswd:255mesh123456
255MG-801>
```

- **reboot:** Used to restart the device. Any parameter modifications require a restart to take effect.

## Chapter 4 Verification Test Method

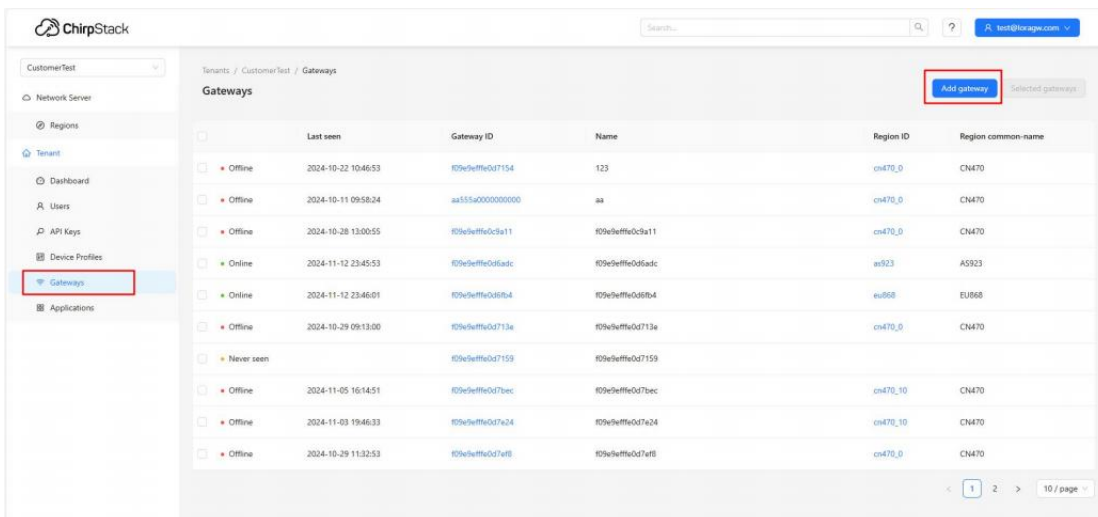
1. Power on the device.
2. Connect to the device's WIFI hotspot (ssid: LoRaGW-xxxxxx, password: loragwwifi), and enter (http://192.168.4.1) in the browser to access the device's configuration page.
3. Test the Ethernet: Connect the device to the router. If the device can obtain an IP address via DHCP, the Ethernet function is normal.
4. After the device is connected to the network, the SX1302 module starts. Enter the device's GWID (GWID is SN by default) into the NS server. If the gateway is online on the NS server, the SX1302 function is normal.
5. At this point, all hardware functions have been verified and the test is passed.

## Chapter 5 NS Connection

The gateway uses the UDP Packet-forward protocol to connect to the NS. This protocol is designed by Semtech and is widely used between LoRaWAN Gateways and NS.

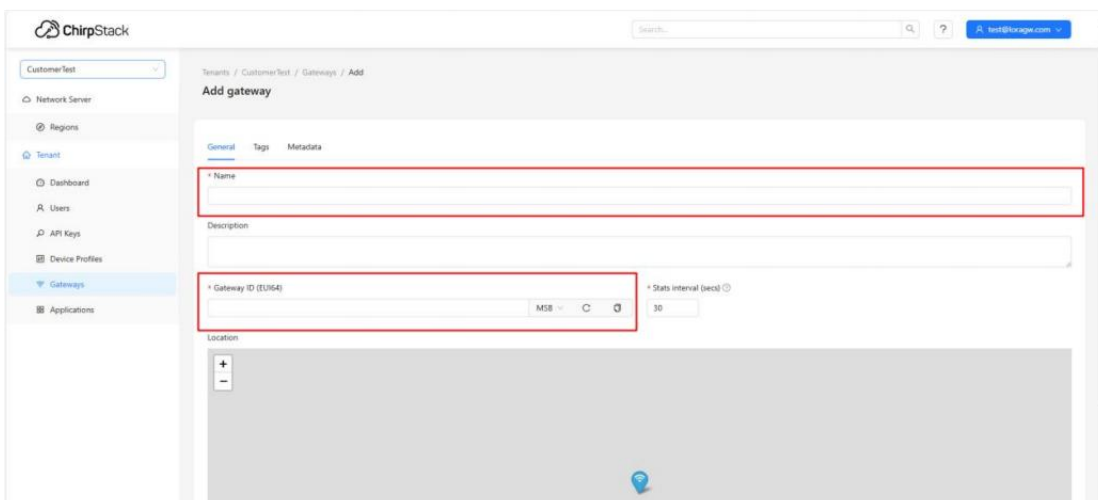
### 5.1 ChirpStack Connection

#### 5.1.1 Add a new Gateway



The screenshot shows the ChirpStack web interface. On the left is a sidebar with navigation links: Network Server, Regions, Tenant, Dashboard, Users, API Keys, Device Profiles, Gateways (highlighted with a red box), and Applications. The main content area is titled 'Gateways' and contains a table with the following columns: Last seen, Gateway ID, Name, Region ID, and Region common-name. The table lists several gateways with their status (Offline or Online), last seen timestamps, IDs, names, and region information. A red box highlights the 'Add gateway' button in the top right corner of the table area.

Last seen	Gateway ID	Name	Region ID	Region common-name
Offline 2024-10-22 10:46:53	809e9effe0d7154	123	cn470_0	CN470
Offline 2024-10-11 09:58:24	aa555a0000000000	aa	cn470_0	CN470
Offline 2024-10-28 13:00:55	809e9effe0dca11	809e9effe0dca11	cn470_0	CN470
Online 2024-11-12 23:45:53	809e9effe0d8adc	809e9effe0d8adc	as923	AS923
Online 2024-11-12 23:46:01	809e9effe0d88f4	809e9effe0d88f4	eu868	EU868
Offline 2024-10-29 09:13:00	809e9effe0d713a	809e9effe0d713a	cn470_0	CN470
Never seen	809e9effe0d7159	809e9effe0d7159		
Offline 2024-11-05 16:14:51	809e9effe0d7bec	809e9effe0d7bec	cn470_10	CN470
Offline 2024-11-03 19:46:33	809e9effe0d7a24	809e9effe0d7a24	cn470_10	CN470
Offline 2024-10-29 11:32:53	809e9effe0d7ef8	809e9effe0d7ef8	cn470_0	CN470



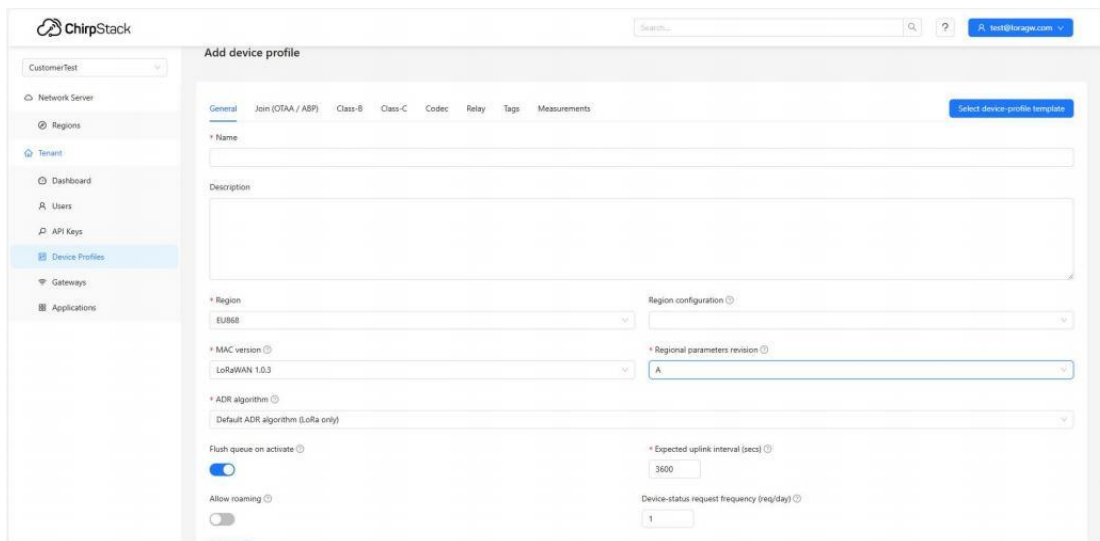
The screenshot shows the 'Add gateway' form in the ChirpStack web interface. The form has tabs for 'General', 'Tags', and 'Metadata'. The 'General' tab is active. It contains the following fields: 'Name' (highlighted with a red box), 'Description', 'Gateway ID (EUI64)' (highlighted with a red box), 'Status interval (secs)' (set to 30), and 'Location' (a map area). The 'Gateway ID (EUI64)' field has a dropdown menu showing 'EUI64' and a 'MSB' checkbox.

1. Name can be any string, or the same as Gateway ID.
2. For Gateway ID, just copy the Gateway ID of the gateway and fill it in.
3. After filling in, scroll the page and click Submit below to submit.

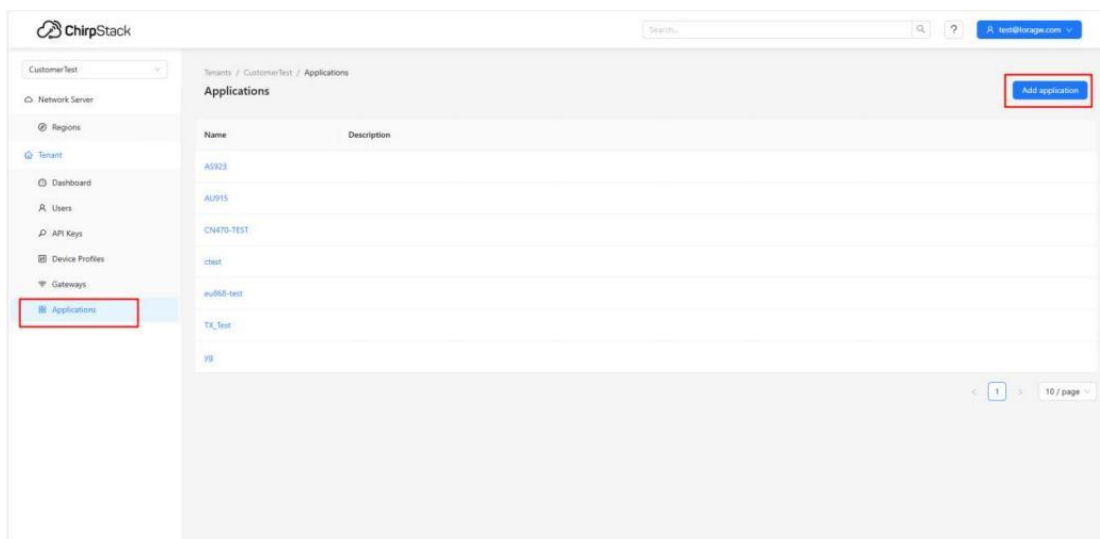
## 5.1.2 Add Devices

### ➤ Creat devices profiles

Just select the appropriate frequency band, network access method, and Class according to the device's situation.



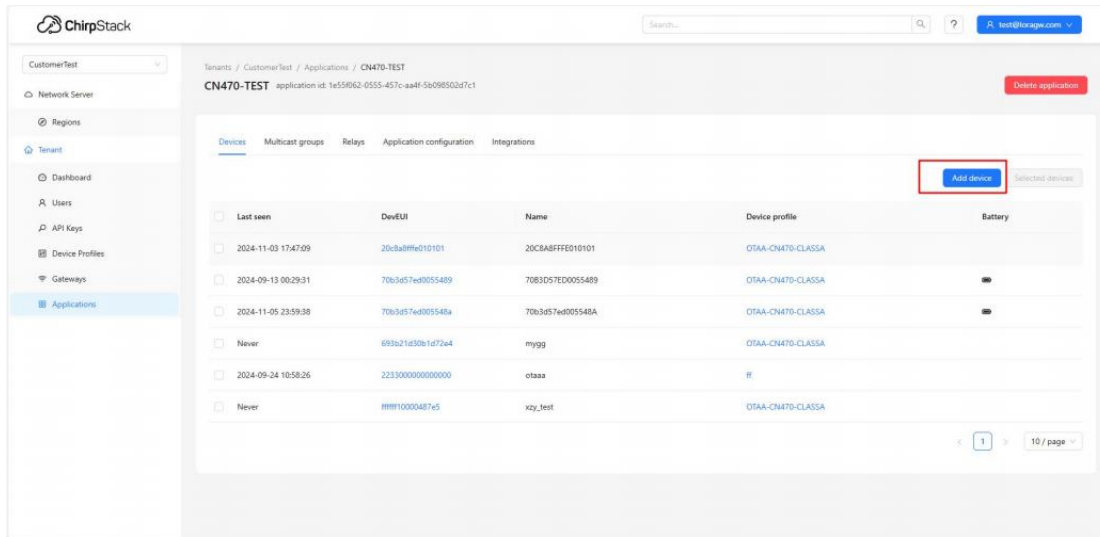
### ➤ Application



### ➤ Add Devices

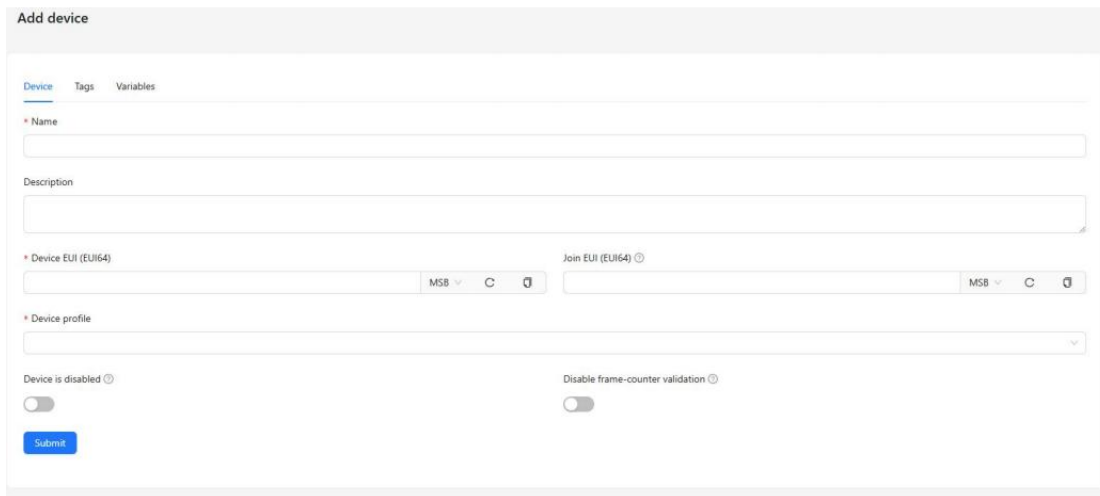


## Add Devices



ChirpStack interface showing the 'Add device' button highlighted in a red box. The interface displays a list of devices under the 'CN470-TEST' application.

Last seen	DevEUI	Name	Device profile	Battery
2024-11-03 17:47:09	20c3a8fffe010101	20C3A8FFFE010101	OTAA-CN470-CLASSA	
2024-09-13 00:29:31	70c3d57ed0055489	7083D57ED0055489	OTAA-CN470-CLASSA	
2024-11-05 23:59:38	70c3d57ed005548a	70c3d57ed005548a	OTAA-CN470-CLASSA	
Never	693b21e30e1d72e4	mygg	OTAA-CN470-CLASSA	
2024-09-24 10:58:26	2233000000000000	otaa	#	
Never	ff00000000000000	xyz_test	OTAA-CN470-CLASSA	



Add device form with fields for Name, Description, Device EUI (EUI64), Join EUI (EUI64), Device profile, and checkboxes for Device is disabled and Disable frame-counter validation.

Form fields:

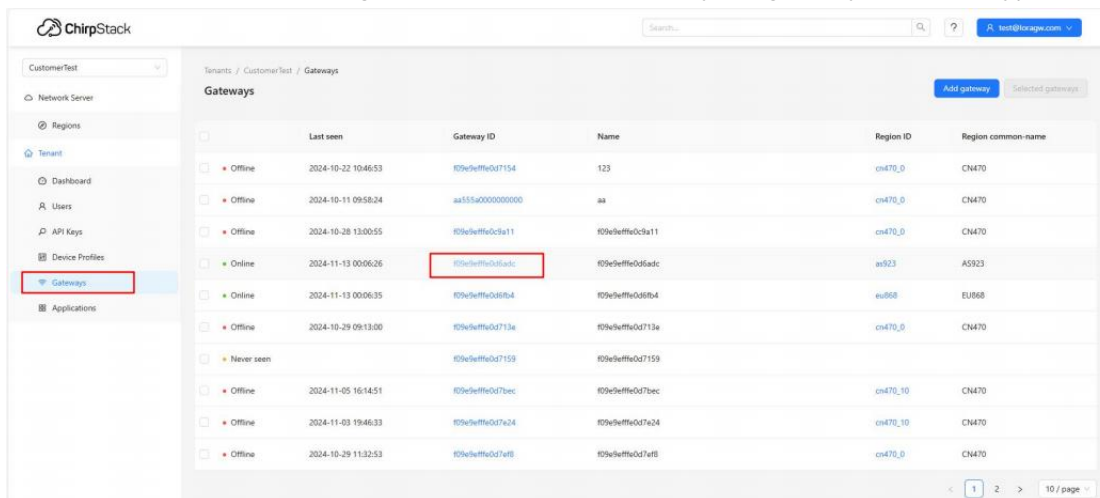
- Name:
- Description:
- Device EUI (EUI64):  MSB C Q
- Join EUI (EUI64):  MSB C Q
- Device profile:
- Device is disabled: ☐
- Disable frame-counter validation: ☐
- Submit:

- Note:**
1. When adding a device, a key is required. Different keys need to be entered for OTAA and ABP.
  2. The APPEUI (JoinEUI) of OTAA is in plaintext, so it does not need to be entered.

➤ Check Data

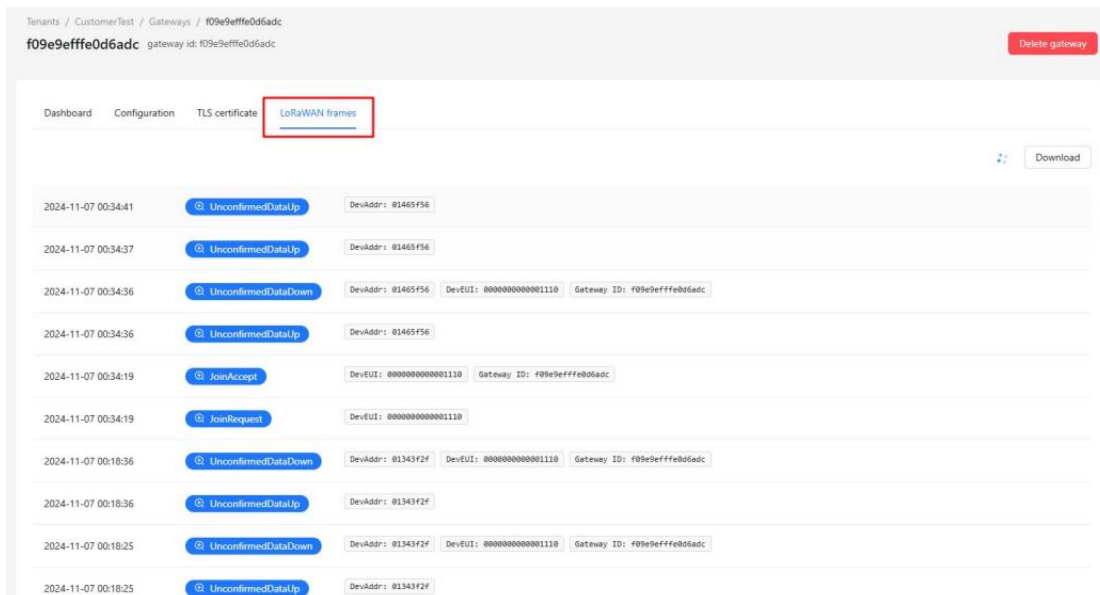
● Gateway Data

The data viewed here is the original data sent and received by the gateway, so it is encrypted.



ChirpStack interface showing the Gateway list. The table displays columns: Last seen, Gateway ID, Name, Region ID, and Region common name. The gateway ID f09e9efffe0d6adc is highlighted in red.

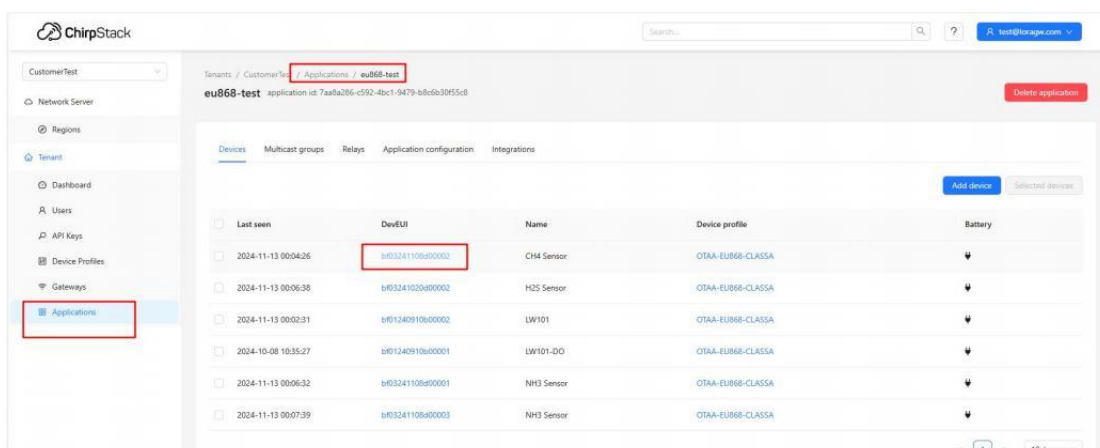
	Last seen	Gateway ID	Name	Region ID	Region common name
Offline	2024-10-22 10:46:53	f09e9efffe0d7154	123	cn470_0	CN470
Offline	2024-10-11 09:58:24	aa155a0000000000	aa	cn470_0	CN470
Offline	2024-10-28 13:00:55	f09e9efffe0c3a11	f09e9efffe0c3a11	cn470_0	CN470
Online	2024-11-13 00:06:26	f09e9efffe0d6adc	f09e9efffe0d6adc	eu868	AS923
Online	2024-10-11 00:06:35	f09e9efffe0d68b4	f09e9efffe0d68b4	eu868	EU868
Offline	2024-10-29 09:13:00	f09e9efffe0d713a	f09e9efffe0d713a	cn470_0	CN470
Never seen		f09e9efffe0d7159	f09e9efffe0d7159		
Offline	2024-11-05 16:14:51	f09e9efffe0d7bec	f09e9efffe0d7bec	cn470_10	CN470
Offline	2024-11-03 19:46:33	f09e9efffe0d7a24	f09e9efffe0d7a24	cn470_10	CN470
Offline	2024-10-29 11:32:53	f09e9efffe0d7af8	f09e9efffe0d7af8	cn470_0	CN470



ChirpStack interface showing the LoRaWAN frames for gateway f09e9efffe0d6adc. The table displays columns: Last seen, Action, DevAddr, DevEUI, and Gateway ID. The DevEUI 0000000000001110 is highlighted in red.

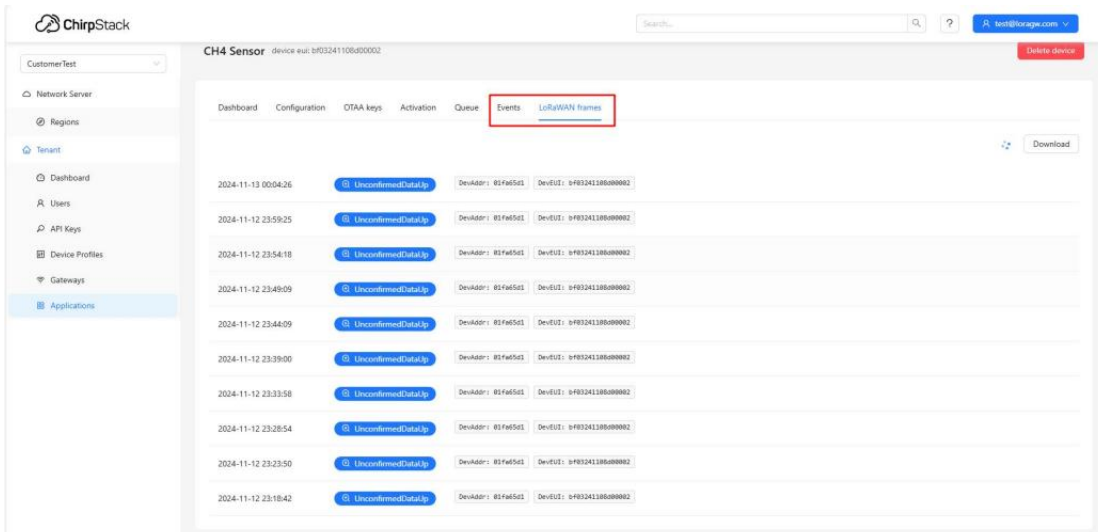
Last seen	Action	DevAddr	DevEUI	Gateway ID
2024-11-07 00:34:41	UnconfirmedDataUp	01465f56		
2024-11-07 00:34:37	UnconfirmedDataUp	01465f56		
2024-11-07 00:34:36	UnconfirmedDataDown	01465f56	0000000000001110	f09e9efffe0d6adc
2024-11-07 00:34:36	UnconfirmedDataUp	01465f56		
2024-11-07 00:34:19	JoinAccept		0000000000001110	f09e9efffe0d6adc
2024-11-07 00:34:19	JoinRequest		0000000000001110	
2024-11-07 00:18:36	UnconfirmedDataDown	01343f2f	0000000000001110	f09e9efffe0d6adc
2024-11-07 00:18:36	UnconfirmedDataUp	01343f2f		
2024-11-07 00:18:25	UnconfirmedDataDown	01343f2f	0000000000001110	f09e9efffe0d6adc
2024-11-07 00:18:25	UnconfirmedDataUp	01343f2f		

● Node data

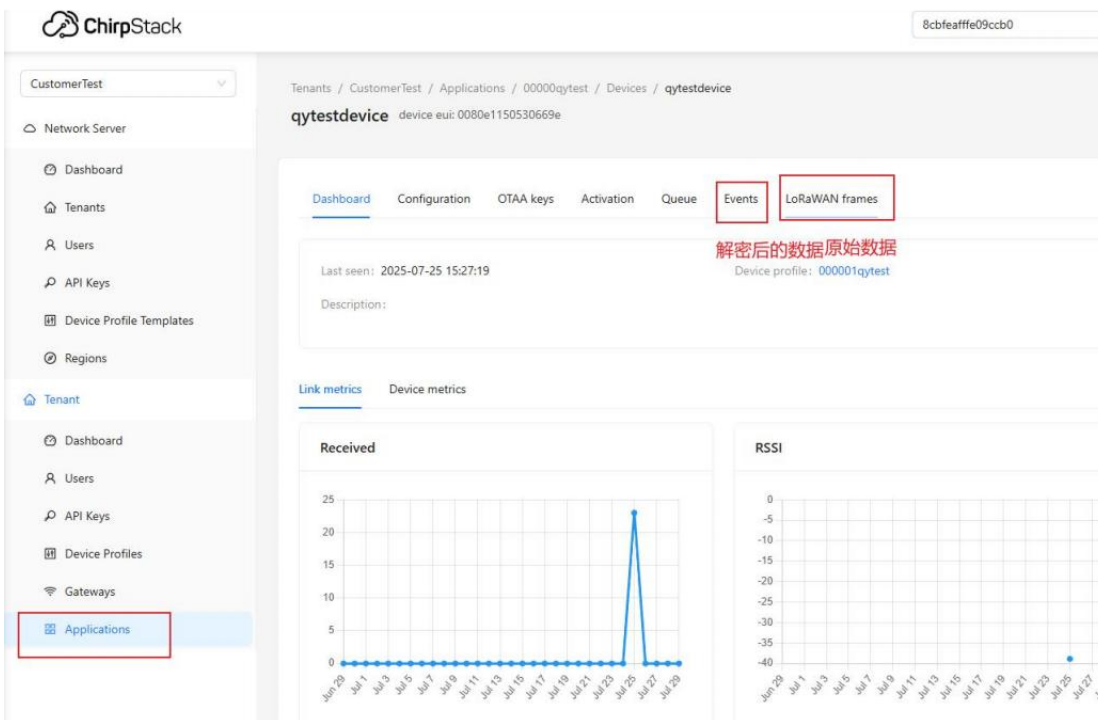


ChirpStack interface showing the Node list for application eu868-test. The table displays columns: Last seen, DevEUI, Name, Device profile, and Battery. The DevEUI b03241108a00002 is highlighted in red.

Last seen	DevEUI	Name	Device profile	Battery
2024-11-13 00:04:26	b03241108a00002	CH4 Sensor	OTAA-EU868-CLASSA	🔋
2024-11-13 00:06:38	b03241020a00002	H2S Sensor	OTAA-EU868-CLASSA	🔋
2024-11-13 00:02:31	b03240910a00002	LW101	OTAA-EU868-CLASSA	🔋
2024-10-08 10:35:27	b03240910a00001	LW101-DO	OTAA-EU868-CLASSA	🔋
2024-11-13 00:06:32	b03241108a00001	NH3 Sensor	OTAA-EU868-CLASSA	🔋
2024-11-13 00:07:39	b03241108a00003	NH3 Sensor	OTAA-EU868-CLASSA	🔋



The screenshot shows the ChirpStack web interface for a CH4 Sensor. The left sidebar contains a navigation menu with options like Network Server, Regions, Tenant, Dashboard, Users, API Keys, Device Profiles, Gateways, and Applications. The main content area has tabs for Dashboard, Configuration, OTAA keys, Activation, Queue, Events, and LoRaWAN frames. The Events tab is selected, showing a list of events with columns for timestamp, status (UnconfirmedDataUp), DevAddr, and DevEUI. The LoRaWAN frames tab is also visible and highlighted with a red box.



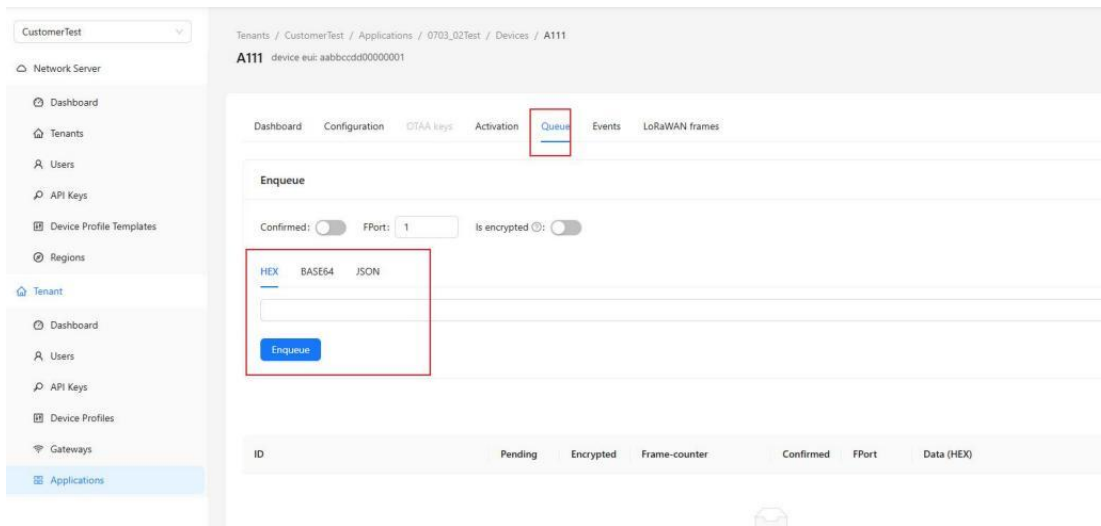
The screenshot shows the ChirpStack web interface for a device named qytestdevice. The left sidebar is similar to the previous one, but the Applications tab is highlighted with a red box. The main content area has tabs for Dashboard, Configuration, OTAA keys, Activation, Queue, Events, and LoRaWAN frames. The Events tab is selected, showing a list of events. The LoRaWAN frames tab is also visible and highlighted with a red box. Below the tabs, there is a section for Link metrics and Device metrics, including a Received signal strength graph and an RSSI graph.

Both uplink and downlink data of the device can be viewed in Events and LoRaWAN frames. The data in LoRaWAN frames is more original, showing every data transmission and reception, including ADR and other Mac Commands.

### Note:

Since ChirpStack will issue ADR to adjust the node's ChannelMask based on the frequency of the connected gateway after the node joins the network, if the gateway's frequency does not match the frequency represented by the actual port, the node will be modified to an unreachable frequency, resulting in communication errors.

## ➤ Data Downlink



CustomerTest

Tenants / CustomerTest / Applications / 0703\_02Test / Devices / A111

A111 device eui: aabbccdd00000001

Dashboard Configuration OTAA keys Activation **Queue** Events LoRaWAN frames

Enqueue

Confirmed: ☐ FPort: 1 Is encrypted: ☐

HEX BASE64 JSON

Enqueue

ID	Pending	Encrypted	Frame-counter	Confirmed	FPort	Data (HEX)

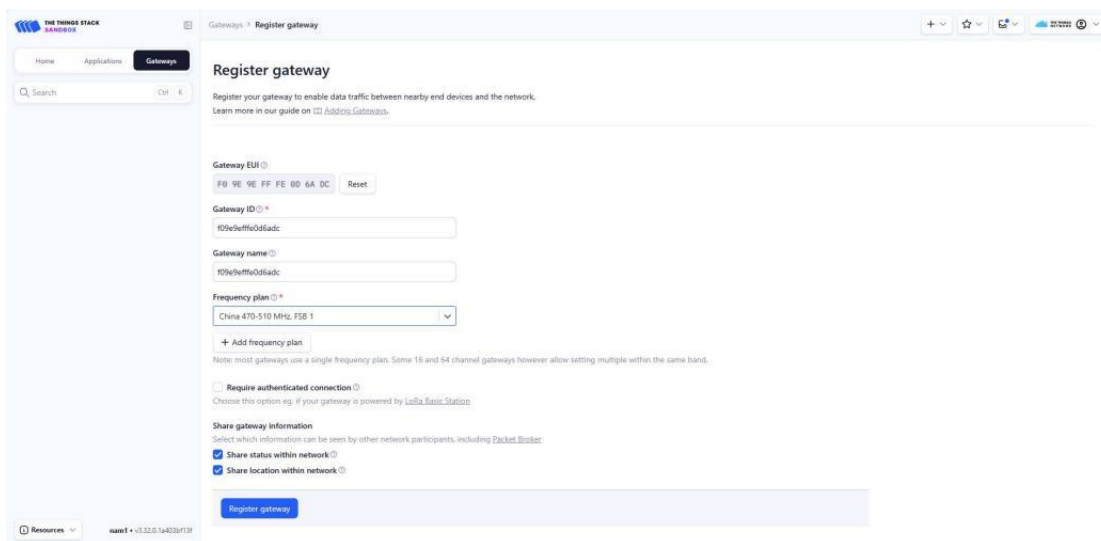
Fill in the data at the position shown in the figure and click "enqueue". The NS will enqueue the downlink data and then send it according to the time of issuance.

Depending on the CLASS type of the node:

- For Class A devices, the NS will send the data when the device has uplink data.
- For Class C devices, the NS will send data directly in RX2, which will be sent immediately.
- FPort: Similar to the Port of TCP/IP, NS and terminals can distinguish different data types through Port.
- Confirmed: Whether the data packet is in confirmation mode.

## 5.2 TTN Connection

### 5.2.1 Register Gateway



THE THING STACK  
 GATEWAYS

Gateways > Register gateway

Register gateway

Register your gateway to enable data traffic between nearby end devices and the network.  
 Learn more in our guide on [Adding Gateways](#).

Gateway EUI

Gateway ID

Gateway name

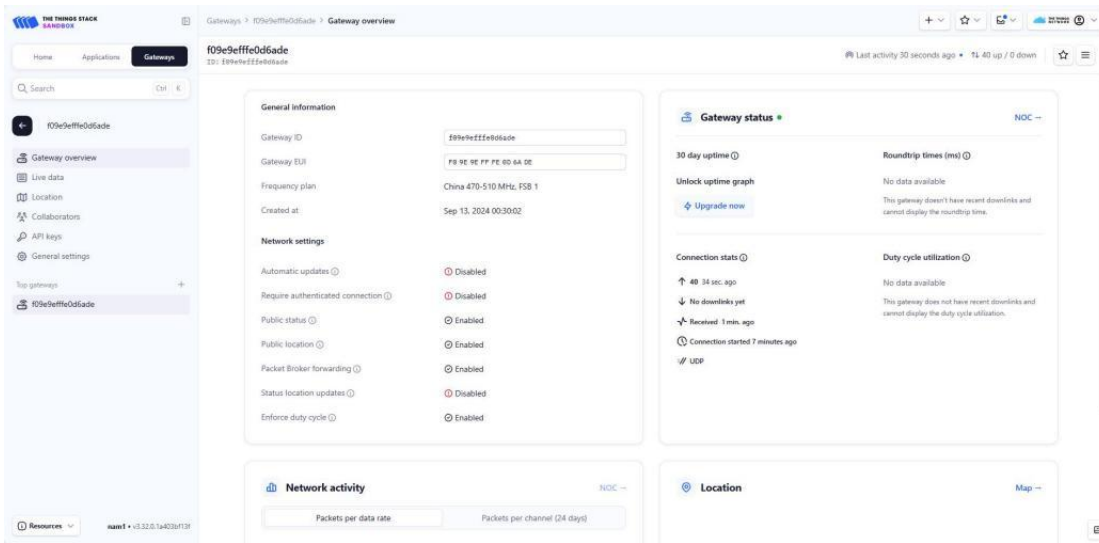
Frequency plan

☐ Require authenticated connection

☒ Share gateway information

register gateway

## 5.2.2 Gateway Overview



## Chapter 6 Gateway Channel Configuration

### 6.1 Standard MQTT Channel

The configuration channel performs data interaction via MQTT, where the channel from the device to the server is called the uplink channel, and the channel from the server to the device is called the downlink channel.

Among them:

- Uplink Topic: up/gw/{SN}/0
- Downlink Topic: dn/gw/{SN}/0

For example, if the gateway's SN is 64e833fffe5909d8, the uplink and downlink channels are as follows:

- Uplink Topic: up/gw/64e833fffe5909d8/0
- Downlink Topic: dn/gw/64e833fffe5909d8/0

The gateway periodically sends periodic heartbeat packets through the uplink channel, and the server can also send data to the gateway through the downlink channel.

#### 6.1.1 Periodic packet

```
{
  "pkt": "periodUplink",
  "GWInfo": {
    "SN": "64e833fffe5909d8",
    "SoftwareVersion": "V1.0.1",
    "HardwareVersion": "V1.0.0"
  },
}
```

```
"Staus": {
  "GPSValid": true,
  "Latitude": 24.000000,
  "Longitude": 120.000000,
  "Altitude": 0.000000,
  "Cellular": {},
  "Ethernet": {},
  "WIFI": {
    "Link": "NET_UP",
    "IPMode": "DHCP",
    "MAC": "64:e8:33:59:09:d8",
    "IP": "192.169.4.12",
    "Mask": "255.255.255.0",
    "GW": "192.169.4.1",
    "DNS1": "192.169.4.1",
    "DNS2": "192.169.4.1"
  }
}
```

### 6.1.2 Modify Gateway Configuration

Just modify the content in Configuration and send it down.

```
{
  "pkt": "downlink",
  "Configuration": {
    "STA": {
      "Enable": false,
      "SSID": "",
      "Password": ""
    },
    "Management": {
      "MQTT": {
        "Enable": true,
        "URL": "mqtt://broker.emqx.io",
        "ClientID": "64e833ffe5909d8",
        "UplinkTopic": "up/gw/64e833ffe5909d8/0",
        "DownlinkTopic": "dn/gw/64e833ffe5909d8/0"
      }
    },
    "LoRaWAN": {
      "Region": "cn470",
    }
  }
}
```

```

    "Radio0": "470600000",
    "Radio1": "enable",
    "NsHost": "lora.ansitw.com",
    "NsPort": "1700",
    "GatewayID": "64e833fffe5909d8"
  }
}

```

### 6.1.3 Reboot

```

{
  "pkt": "downlink",
  "cmd": {
    "reboot":
    true }
}

```

Response:

```

{
  "pkt": "downlinkResponse",
  "result": "success"
}

```

### 6.1.4 Upgrade

```

{
  "pkt": "downlink",
  "cmd": {
    "upgrade":
    "http://192.169.4.53/esp32_sx1302.bin" }
}

```

Response:

```

{
  "pkt": "downlinkResponse",
  "result": "success"
}

```

### 6.1.3 Reboot

```

{
  "pkt": "downlink",
  "cmd": {
    "reboot":
    true }
}

```

Response:

```
{
  "pkt": "downlinkResponse",
  "result": "success"
}
```

#### 6.1.4 Upgrade

```
{
  "pkt": "downlink",
  "cmd": {
    "upgrade":
    "http://192.169.4.53/esp32_sx1302.bin" }
}
```

Response: (Upgrade command received)

```
{
  "pkt": "downlinkResponse",
  "result": "success"
}
```

### 6.2 ThingsBoard MQTT Channel

There are two links:

1. Gateway actively sends data  
telemetry\_uplink
  - ◆ The device sends heartbeat packets at regular intervals;
  - ◆ The device sends configuration information when it is powered on and when the configuration information is changed
2. Cloud platform sends commands to the gateway
  - ◆ request\_downlink: The cloud platform sends commands to the gateway
  - ◆ response\_uplink: The gateway replies data to the cloud platform

Among them:

- telemetry\_uplink\_topic: v1/devices/me/telemetry
- request\_downlink\_topic: v1/devices/me/rpc/request/\${request\_id}
- response\_uplink\_topic: v1/devices/me/rpc/response/\${request\_id}

For example, if the request\_id of the current message of the gateway is 10001, then the uplink and downlink channels are respectively:

- telemetry\_uplink\_topic: v1/devices/me/telemetry
- request\_downlink: v1/devices/me/rpc/request/10001
- response\_uplink: v1/devices/me/rpc/response/10001

#### 6.2.1 Gateway Information Packet

1. Sent when the device is powered on or when the configuration is modified
2. Sent by the device every 1 hour



```

{
  "ts":1451649600512,
  "values":
  {
    "pkt":"gw_info",
    "SN":"64e833fffe5909d8",          //Device SN
    "swver":"V1.0.1",                //Software Version
    "hwver":"V1.0.0",                //Hardware Version
    "longitude": "24.56789",          //Longitude
    "latitude": "118.56789",          //Latitude
    "altitude": "78.965",             //Altitude

"stat_cell_link":"","              // "stat" is the abbreviation of "status", and all items starting with "stat" are read-only. "cell" is the abbreviation of
"cellular", which refers to the cellular link status. "NET_UP" indicates a successful connection, and "NET_DOWN" indicates a connection failure.

    "stat_cell_ip": "",              //IP obtained by cellular
    "stat_cell_IMEI": "",            //IMEI of cellular module
    "stat_cell_IMSI": "",            //SIM card info
    "stat_cell_ICCID": "",           //SIM card info
    "stat_cell_CSQ": "",              //Cellular Signal Strength
    "stat_eth_link": "",              //Ethernet link status, in the format of LINK_UP/NET_UP, where LINK_UP indicates the network
cable is plugged in, LINK_DOWN indicates the network cable is not plugged in, NET_UP indicates a successful connection, and
NET_DOWN indicates a connection failure.

    "stat_eth_mac": "",               // Ethernet MAC Address
    "stat_eth_ip": "",                // Ethernet IP
    "stat_eth_mask": "",              // Ethernet Subnet Mask
    "stat_eth_gw": "",                //Ethernet Gateway
    "stat_eth_dns1": "",              //Ethernet DNS1
    "stat_eth_dns2": "",              //Ethernet DNS2

    "stat_sta_link": "",              //STA is the abbreviation of Wi-Fi Station, which refers to a device accessing a Wi-Fi AP in
station mode. This is the Wi-Fi link status, where NET_UP indicates a successful connection and NET_DOWN indicates a failed
connection.

    "stat_sta_mac": "",               //WIFI MAC Address
    "stat_sta_ip": "",                //WIFI IP
    "stat_sta_mask": "",              //WIFI Subnet Mask
    "stat_sta_gw": "",                //WIFI Gateway
    "stat_sta_dns1": "",              //WIFI DNS1
    "stat_sta_dns2": "",              //WIFI DNS2
    "conf_sta_enable":"","            //conf :configuration, sta : wifi station , sta_enable indicates whether to enable Wi-Fi Station,
where true means enabled and false means disabled.

    "conf_sta_ssid":"","              //The SSID of the configured Wi-Fi to access
    "conf_sta_password":"","          //The password of the configured Wi-Fi to access
  }
}

```

```

    "conf_lorawan_nshost":""," //The configured LoRaWAN NS host
    "conf_lorawan_nsport":""," //The configured LoRaWAN NS port
    "conf_lorawan_gatewayid":""," //The configured LoRaWAN gatewayid }
  }

```

## 6.2.2 Heartbeat

```

{
  "ts":1451649600512,
  "values":{
    "pkt":"heartbeat",
    "SN":"64e833ffe5909d8" }
}

```

## 6.2.3 Modify Gateway Configuration

Just modify the content in Configuration and send it down.

```

{
  "method": "modify_configuration", //gateway_reboot is command keywords
  "params": {
    "sta_enable": true,
    "sta_ssid": "",
    "sta_password": "",
    "mang_mqtt_url": "mqtt://thingsboard.com:6883",
    "mang_mqtt_clientid": "64e833ffe5909d8",
    "mang_mqtt_username": "",
    "mang_mqtt_password": "",
    "mang_mqtt_telemetry_topic": "v1/devices/me/telemetry",
    "mang_mqtt_request_topic": "v1/devices/me/rpc/request", // This path is only partial; when
    actually sending, a request_id needs to be concatenated
    "mang_mqtt_response_topic": "v1/devices/me/rpc/response", // This path is only partial; when
    actually sending, a request_id needs to be concatenated
    "lorawan_region": "cn470",
    "lorawan_radio0": "470600000",
    "lorawan_radio1": "471400000",
    "lorawan_nshost": "lora.ansitw.com",
    "lorawan_nsport": "1700",
    "lorawan_gatewayid": "471400000" }
}

```

Response:

```
{
  "result": "success",

  "resp": {                                // The returned result is placed in this structure.
    "method":
      "modify_configuration" }
}
```

#### 6.2.4 Query Gateway Status and Configuration

```
{
  "method": "query_gw_info", //gateway_reboot is command keywords
  "params": { }
}
```

Response:

```
{
  "result": "success",
  "resp": {
    "method": "query_gw_info",
    "pkt": "gw_info",
    "SN": "64e833ffe5909d8",           //Device SN
    "swver": "V1.0.1",                 //Software Version
    "hwver": "V1.0.0",                 //Hardware Version
    "longitude": "24.56789",           //Longitude
    "latitude": "118.56789",           //Latitude
    "altitude": "78.965",              //Altitude

    "stat_cell_link": "",              // "stat" is the abbreviation of "status", and all items starting with "stat" are read-only. "cell" is the abbreviation of
    // "cellular", which refers to the cellular link status. "NET_UP" indicates a successful connection, and "NET_DOWN" indicates a connection failure.

    "stat_cell_ip": "",                //IP obtained by cellular
    "stat_cell_IMEI": "",              //IMEI of cellular module
    "stat_cell_IMSI": "",              //SIM card info
    "stat_cell_ICCID": "",             //SIM card info
    "stat_cell_CSQ": "",               //Cellular Signal Strength
    "stat_eth_link": "",               //Ethernet link status, in the format of LINK_UP/NET_UP, where LINK_UP indicates the network
    // cable is plugged in, LINK_DOWN indicates the network cable is not plugged in, NET_UP indicates a successful connection, and
    // NET_DOWN indicates a connection failure.
  }
}
```

```

"stat_cell_ip": "", //IP obtained by cellular
"stat_cell_IMEI": "", //IMEI of cellular module
"stat_cell_IMSI": "", //SIM card info
"stat_cell_ICCID": "", //SIM card info
"stat_cell_CSQ": "", //Cellular Signal Strength
"stat_eth_link": "", //Ethernet link status, in the format of LINK_UP/NET_UP, where LINK_UP indicates the network
cable is plugged in, LINK_DOWN indicates the network cable is not plugged in, NET_UP indicates a successful connection, and
NET_DOWN indicates a connection failure.

"stat_eth_mac": "", // Ethernet MAC Address
"stat_eth_ip": "", // Ethernet IP
"stat_eth_mask": "", // Ethernet Subnet Mask
"stat_eth_gw": "", //Ethernet Gateway
"stat_eth_dns1": "", //Ethernet DNS1
"stat_eth_dns2": "", //Ethernet DNS2
"stat_sta_link": "", //STA is the abbreviation of Wi-Fi Station, which refers to a device accessing a Wi-Fi AP in
station mode. This is the Wi-Fi link status, where NET_UP indicates a successful connection and NET_DOWN indicates a failed
connection.

"stat_sta_mac": "", //WIFI MAC Address
"stat_sta_ip": "", //WIFI IP
"stat_sta_mask": "", //WIFI Subnet Mask
"stat_sta_gw": "", //WIFI Gateway
"stat_sta_dns1": "", //WIFI DNS1
"stat_sta_dns2": "", //WIFI DNS2
"conf_sta_enable": "", //conf :configuration, sta : wifi station , sta_enable indicates whether to enable Wi-Fi Station,
where true means enabled and false means disabled.

"conf_sta_ssid": "", //The SSID of the configured Wi-Fi to access
"conf_sta_password": "", //The password of the configured Wi-Fi to access
"conf_lorawan_region": "", //The configured LoRaWAN region
"conf_lorawan_radio0": "", //The configured LoRaWAN radio0
"conf_lorawan_radio1": "", //The configured LoRaWAN radio1
"conf_lorawan_nshost": "", //The configured LoRaWAN NS host
"conf_lorawan_nsport": "", //The configured LoRaWAN NS port
"conf_lorawan_gatewayid": "" //The configured LoRaWAN gatewayid

"mang_mqtt_url": "mqtt://thingsboard.com:6883", // "mang" is the abbreviation of "management". This item is the
MQTT URL of the management channel, with the format "mqtt://host:port".

"mang_mqtt_clientid": "64e833fffe5909d8", // MQTT clientID
"mang_mqtt_username": "", // MQTT username
"mang_mqtt_password": "", // MQTT password

```

```

    "mang_mqtt_telemetry_topic": "v1/devices/me/telemetry", // This item is the telemetry topic of ThingsBoard
    "mang_mqtt_request_topic": "v1/devices/me/rpc/request", //This item is the RPC request topic of ThingsBoard
    "mang_mqtt_response_topic": "v1/devices/me/rpc/response", //This item is the RPC response topic of ThingsBoard,
    which will be concatenated with the request_id
  }
}

```

### 6.2.5 Reboot

```

{
  "method": "gw_reboot", //gateway_reboot is command keywords
  "params": { }
}

```

Response

```

{
  "result": "success",
  "resp": { // If there is a returned result, place it in this structure.
    "method": "gw_reboot" }
}

```

### 6.2.6 Restore Factory Settings

```

{
  "method": "gw_restore", //gw_restore is command keywords
  "params": { }
}

```

Response

```

{
  "result": "success",
  "resp": { // If there is a returned result, place it in this structure.
    "method": "gw_restore" }
}

```

### 6.2.7 Upgrade

```

{
  "method": "gw_upgrade", //gateway_reboot is command keyword
  "params": {

    "url": "http://192.169.4.53/simple_ota.bin" //The device only supports HTTP URL. }
  }
}

```

Response

```
{
  "result": "success",

  "resp": {                                // If there is a returned result, place it in this structure.

    "method": "gw_upgrade" }
}
```

## Chapter 7 After-sales Service

### Product Warranty

1. The product warranty period is one year.
2. The company is responsible for free maintenance or exchange within one-year warranty period.
3. The cost of the components and freight shall be charged for improper meter installation and/or operation.
4. Over the warranty period, part of the maintenance cost according to actual situation will be charged.

### Service Guarantee

1. Product technical consulting and quality complaints will be replied within 12 hours.
2. Solutions for quality complaints will be provided within 24 hours.
3. Except statutory holidays and force majeure.

## Chapter 8 Contact Us

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