LINOVISION

Semi-industrial LoRaWAN® Gateway
IOT-G65
Quick Guide (V2.13/2025-12-24)

Preface

Thanks for choosing Linovision IOT-G65 LoRaWAN® gateway. IOT-G65 delivers tenacious connection over network with full-featured design such as automated failover/failback, extended operating temperature, hardware watchdog, VPN, Gigabit Ethernet and beyond.

This guide shows you how to configure and operate the IOT-G65 LoRaWAN® gateway. You can refer to it for detailed functionality and gateway configuration.

Readers

This guide is mainly intended for the following users:

- Network Planners
- On-site technical support and maintenance personnel
- Network administrators responsible for network configuration and maintenance

Related Documents

Document	Description
IOT-G65 Datasheet	Datasheet for IOT-G65 LoRaWAN® gateway.
IOT-G65 Quick Start Guide	Quick Installation Guide for IOT-G65 LoRaWAN® gateway.

Declaration of Conformity

IOT-G65 is in conformity with the essential requirements and other relevant provisions of the CE, FCC, and RoHS.

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Document Revision History

Date	Doc Version	Description
Aug. 31, 2020	V1.0	Initial version
Dec. 10, 2020	V2.0	Layout replace
Apr. 30, 2021	V2.1	1. Support LoRaWAN® Class B 2. Add Node-RED feature 3. Add Noise-Analyzer feature 4. Add Multicast Group feature 5. Add application examples
Aug. 24, 2021	V2.2	1. Support Yeastar Workplace platform integration 2. Delete Package Forward status page 3. Phone & Email webpage update
Dec. 15, 2021	V2.3	1. Add AS923-3&AS923-4 2. Change network server channel mask box to channel 3. Add device channel setting in profile
Feb. 18, 2022	V2.4	1. Add batch backup 2. Log in webpage update 3. Change default antenna type to external antenna 4. Adjust time of Class C ACK timeout
Jun. 1, 2022	V2.5	1. Support VLAN Trunk client 2. Add System Name in SNMP 3. Add Use L2TP Peer DNS option
Dec.26, 2022	V2.6	1. Add BACnet Server feature 2. Add Payload Codec feature 3. Add Reset and all flows export feature on Node-RED 4. Add data retransmission feature on Packet Forward
Feb. 21, 2024	V2.7	1. Compatible with Linovision Development Platform 2. Update default secondary ICMP and DNS server address 3. Add cellular IMS and custom MTU feature 4. Add 8 pre-set device profiles 5. Add beacon time offset setting

June 7, 2024	V2.8	1. Support to import ovpn file for OpenVPN connection; 2. Support packet filter feature; 3. Add default WLAN connection password; 4. Add username on SMTP client setting; 5. Add BACnet object types, support object instance customization.
Oct. 31, 2024	V 2.9	1. Add WireGuard feature; 2. Add MQTT data re-transmission and retain option; 3. Add metadata option under Application page; 4. Add Node-RED SSL access option; 5. Add BACnet object event detection feature; 6. Add network packet analyzer feature; 7. Compatible with DeviceHub 2.0; 8. Add cellular subnet mask and DNS server customization.
Jan. 8, 2025	V 2.10	1. Add object mapping function on Payload Codec page; 2. Remove BACnet/IP option under Application page; 3. Update BACnet object web GUI; 4. Add Modbus server feature.
April 3, 2025	V 2.11	1. Add FUOTA feature; 2. Add MQTT Last Will Message feature; 3. Update application key options when adding a device; 4. Update metadata option; 5. Update WAN default connection type as DHCP; 6. Update web GUI access steps.
May 29, 2025	V 2.11.1	1. Add device timeout parameter; 2. BACnet server is enabled by default, update default device ID; 3. Change Activated item to Status item on device list; 4. Support adding BACnet global objects; 5. Support automatically adding BACnet object; 6. Expand the max number of BACnet and Modbus object to 10,000; 7. Support adding a independent HTTP API account.
August 13, 2025	V 2.12	1. Add data item on Packet Forwarder-Traffic page' 2. Add page configuration for object mapping function of Custom payload codec; 3. Add ADR option in device profile; 4. Support exporting all device info; 5. Add download queue clear feature on packets page; 6. Add BACnet global object types; 7. Add Modbus global object feature and server ID type.
Dec. 24, 2025	V 2.13	1. Add MQTT configuration via HTTP; 2. Add SSL Secure option for MQTT TLS authentication;

		3. Add BACnet/SC feature; 4. Support bulk importing and selecting all Modbus objects; 5. Add HTTP proxy feature; 6. Add web password limitation and change prompt; 7. Add HTTP API password encrypted feature.

Contents

Chapter 1 Product Introduction

1.1 Overview

IOT-G65 is a robust 8-channel indoor LoRaWAN® gateway. Adopting SX1302 LoRa chip and high-performance quad-core CPU, IOT-G65 supports connection with more than 2000 nodes. IOT-G65 has line of sight up to 15 km and can cover about 2 km in urbanized environment, which is ideally suited to smart office, smart building and many other indoor applications.

IOT-G65 supports not only multiple back-haul backups with Ethernet, Wi-Fi and cellular, but also has integrated mainstream network servers (such as The Things Industries, ChirpStack, etc.) and built-in network server for easy deployment.

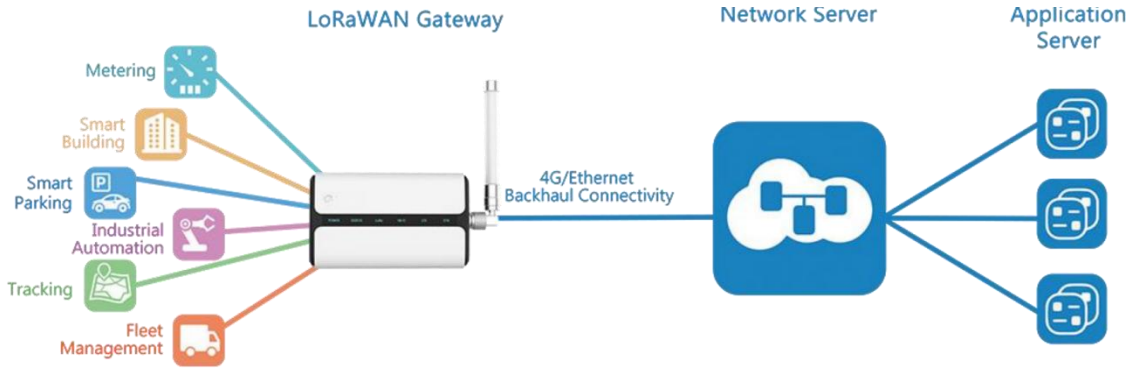


Figure 1-1

1.2 Advantages

Benefits

- Built-in industrial CPU and big memory
- Ethernet, 2.4GHz Wi-Fi and global 2G/3G/LTE options make it easy to get connected
- Embedded network server and compliant with several third party network servers
- MQTT(s) or HTTP(s) protocol for data transmission to application server
- Rugged enclosure, optimized for wall or pole mounting
- 3-year warranty included

Security & Reliability

- Automated failover/failback between Ethernet and Cellular
- Enable unit with security frameworks like IPsec/OpenVPN/GRE/L2TP/PPTP/DMVPN/WireGuard

- Embedded hardware watchdog to automatically recover from various failures and ensure highest level of availability

Easy Maintenance

- Linovision DeviceHub and Linovision Development Platform provide easy setup, mass configuration, and centralized management of remote devices
- The user-friendly web interface design and various upgrading options help administrator to manage the device as easy as pie
- Web GUI and CLI enable the admin to achieve quick configuration and simple management among a large quantity of devices
- Users can efficiently manage the remote devices on the existing platform through the industrial standard SNMP

Capabilities

- Link remote devices in an environment where communication technologies are constantly changing
- Industrial quad core 64-bit ARM Cortex-A53 processor, high-performance operating up to 1.5 GHz with low power consumption, and 8GB eMMC available to support more applications
- Support wide operating temperature ranging from -40°C to 70°C/-40°F to 158°F

Chapter 2 Access to Web GUI

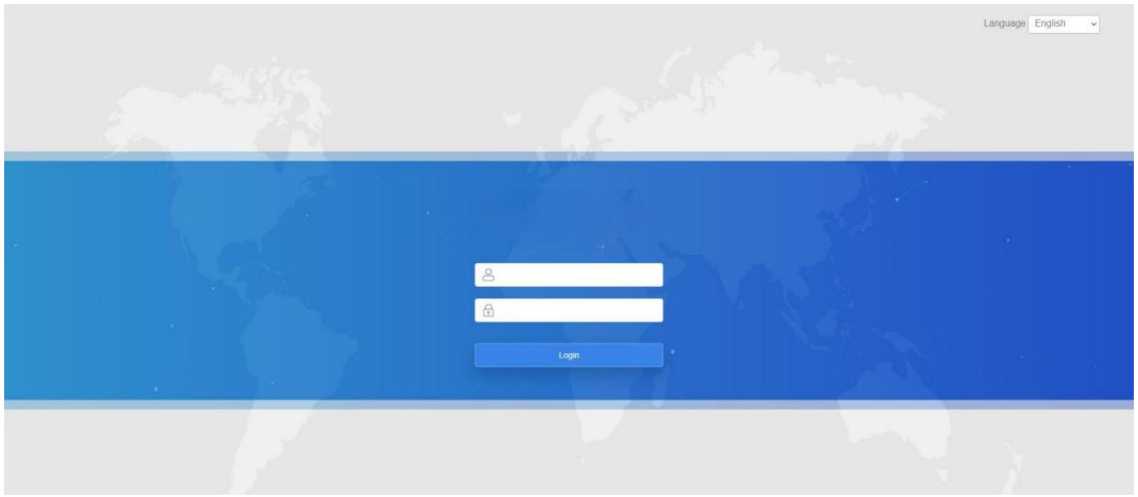
This chapter explains how to access to Web GUI of the IOT-G65.

Username: admin
Password: password
Configuration Steps:

1. Enable Wireless Network Connection on your computer and search for access point Gateway_XXXXXX(=last 6 digits of WLAN MAC address) to connect it, the default Wi-Fi password is iotpassword.

2. Open a Web browser on your PC (Chrome is recommended) and type in the IP address https://192.168.1.1 to access the web GUI.

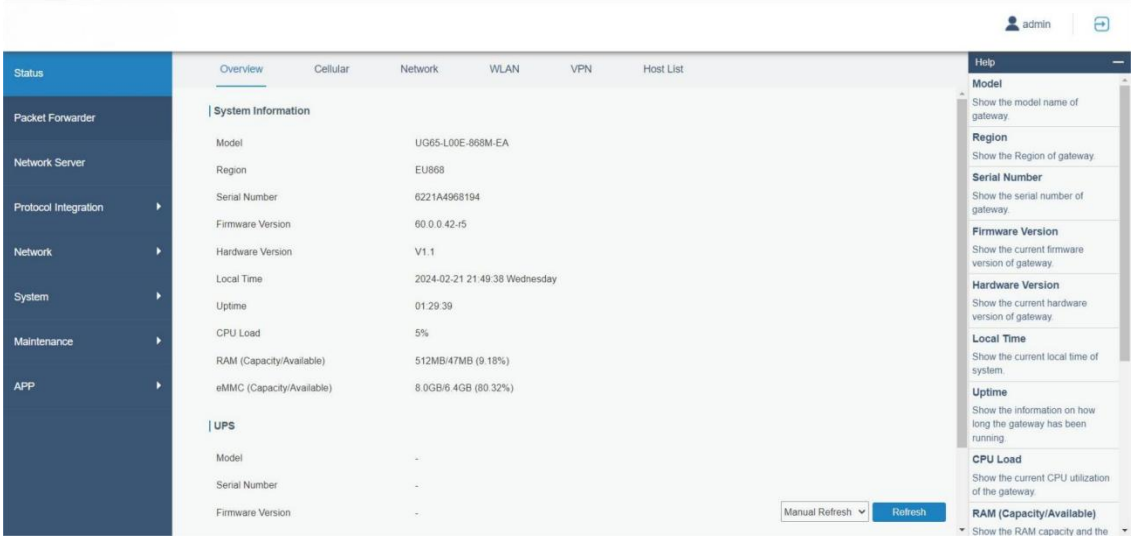
3. Enter the username and password, then click “Login”.



If you enter the username or password incorrectly more than 5 times, the login page will be locked for 10 minutes.

4. After logging the web GUI, it is necessary to change the web GUI password for the first time. The password must contain at least one letter and one number.

5. Use the new password to log in to the web GUI again. After logging the web GUI, you can view system information and perform configuration of the gateway.

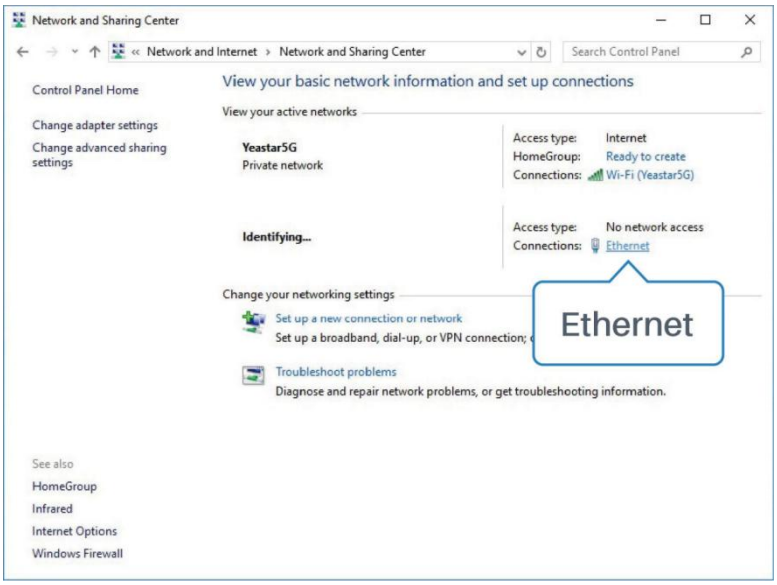


Note: For v60.0.0.46 or previous versions, the gateway also supports wired access.

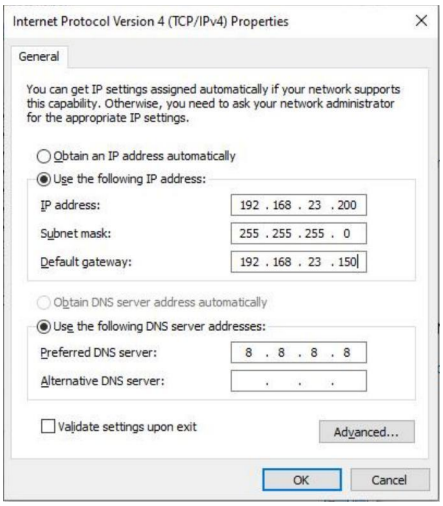
1. Connect PC to IOT-G65 ETH port directly or through PoE injector.

2. Assign the IP address to your computer manually. Take Windows 10 system as an example,

A. Go to “Control Panel” → “Network and Internet” → “Network and Sharing Center”, then click “Ethernet” (May have different names).



B. Go to “Properties” → “Internet Protocol Version 4(TCP/IPv4) ”and select “Use the following IP address”, then assign a static IP manually within the same subnet of the gateway.



3. Open a Web browser on your PC (Chrome is recommended) and type in the IP address 192.168.23.150 to access the web GUI.

Chapter 3 Web Configuration

3.1 Status

3.1.1 Overview

You can view the system information of the gateway on this page.

Figure 3-1-1-1

System Information	
Item	Description
Model	Show the model name of gateway.
Region	Show the LoRaWAN® used frequency of gateway.
Serial Number	Show the serial number of gateway.
Firmware Version	Show the currently firmware version of gateway.
Hardware Version	Show the currently hardware version of gateway.
Local Time	Show the currently local time of system.
Uptime	Show the information on how long the gateway has been running.
CPU Load	Show the current CPU utilization of the gateway.
RAM (Capacity/Available)	Show the RAM capacity and the available RAM memory.
eMMC (Capacity/Available)	Show the eMMC capacity and the available eMMC memory.

Table 3-1-1-1 System Information

When Linovision UPS is connected to the device, the UPS basic information will also show on the Status page. For more details please refer to *Linovision UPS User Guide*.

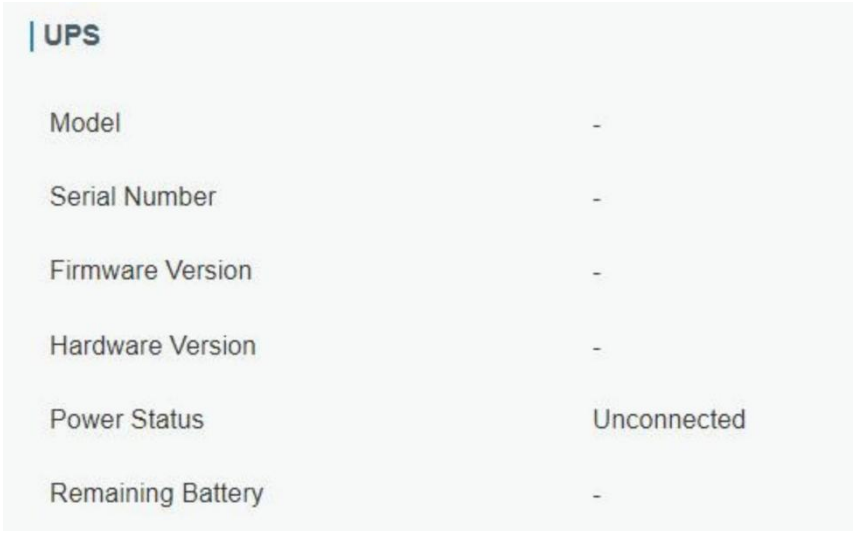


Figure 3-1-1-2

3.1.2 Cellular

You can view the cellular network status of gateway on this page.

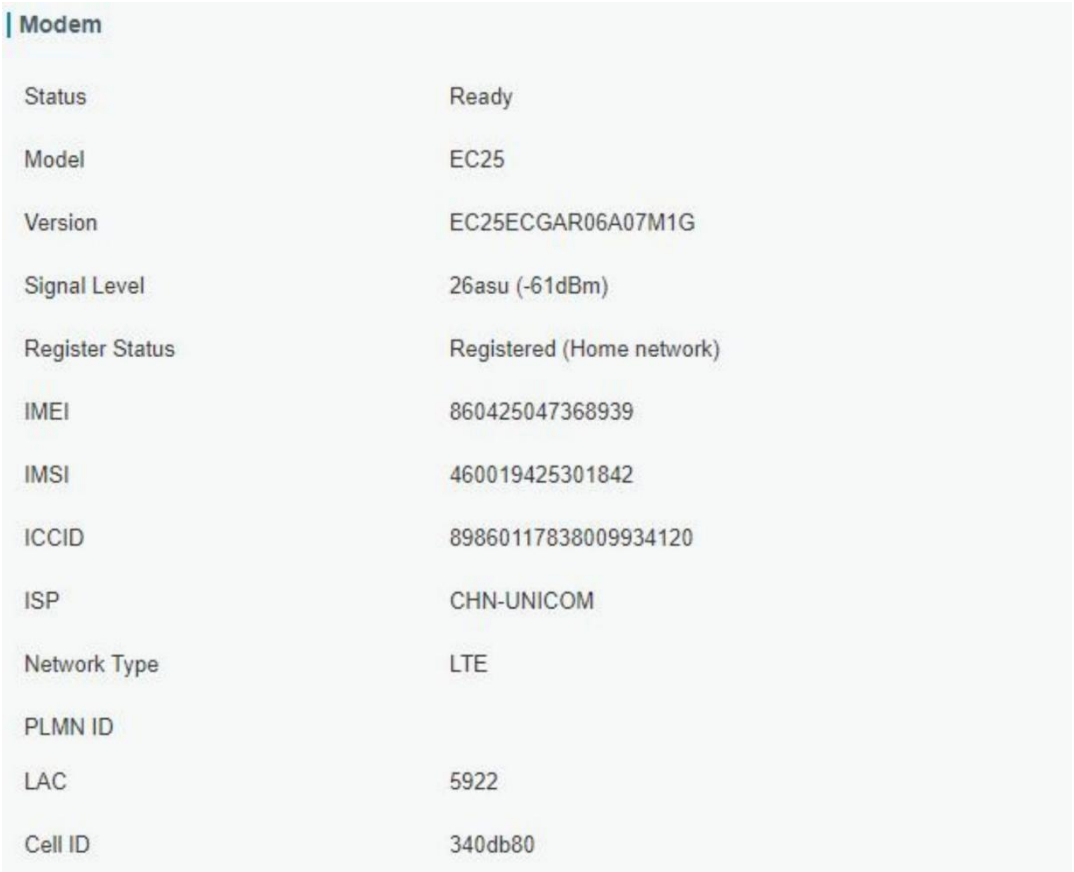


Figure 3-1-2-1

Modem Information	
Item	Description
Status	Show corresponding detection status of module and SIM card.
Model	Show the model name of cellular module.
Version	Show the version of cellular module.
Signal Level	Show the cellular signal level.
Register Status	Show the registration status of SIM card.
IMEI	Show the IMEI of the module.
IMSI	Show IMSI of the SIM card.
ICCID	Show ICCID of the SIM card.
ISP	Show the network provider which the SIM card registers on.
Network Type	Show the connected network type, such as LTE, 3G, etc.
PLMN ID	Show the current PLMN ID, including MCC, MNC, LAC and Cell ID.
LAC	Show the location area code of the SIM card.
Cell ID	Show the Cell ID of the SIM card location.

Table 3-1-2-1 Modem Information

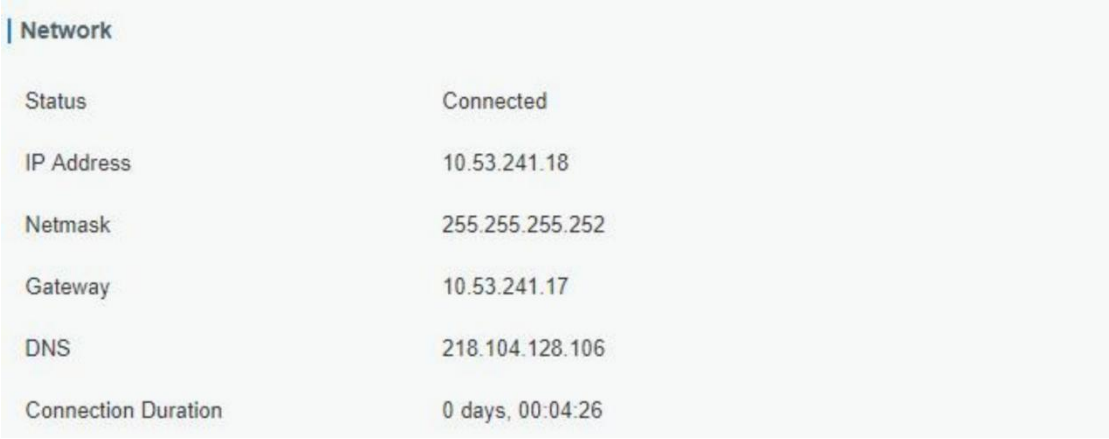


Figure 3-1-2-2

Network Status	
Item	Description
Status	Show the connection status of cellular network.
IP Address	Show the IP address of cellular network.
Netmask	Show the netmask of cellular network.
Gateway	Show the gateway of cellular network.
DNS	Show the DNS of cellular network.
Connection Duration	Show information on how long the cellular network has been connected.

Table 3-1-2-2 Network Status

3.1.3 Network

On this page you can check the Ethernet port status of the gateway.

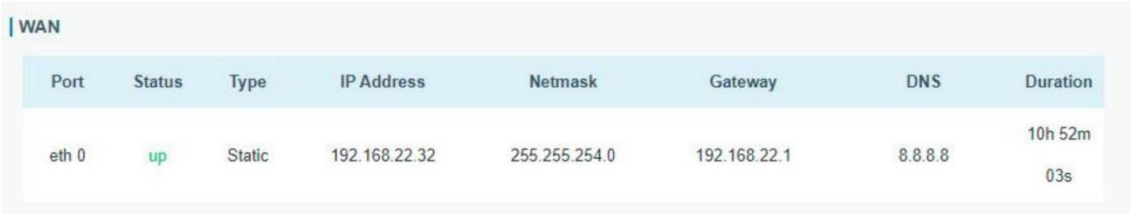


Figure 3-1-3-1

Network	
Item	Description
Port	Show the name of the Ethernet port.
Status	Show the status of the Ethernet port. "Up" refers to a status that WAN is enabled and Ethernet cable is connected. "Down" means Ethernet cable is disconnected or WAN function is disabled.
Type	Show the dial-up type of the Ethernet port.
IP Address	Show the IP address of the Ethernet port.
Netmask	Show the netmask of the Ethernet port.
Gateway	Show the gateway of the Ethernet port.
DNS	Show the DNS of the Ethernet port.
Duration	Show the information about how long the Ethernet cable has been connected to the Ethernet port when the port is enabled. Once the port is disabled or Ethernet cable is disconnected, the duration will stop.

Table 3-1-3-1 WAN Status

3.1.4 WLAN

You can check Wi-Fi status on this page, including the information of access point and client.

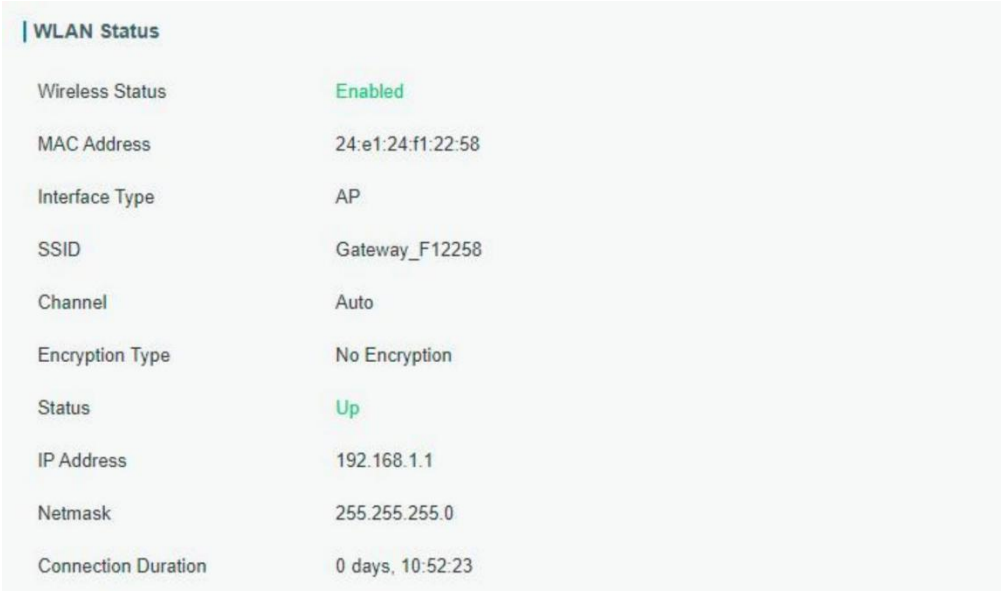


Figure 3-1-4-1

WLAN Status	
Item	Description

Wireless Status	Show the wireless status.
MAC Address	Show the MAC address.
Interface Type	Show the interface type, such as "AP" or “Client".
SSID	Show the SSID.
Channel	Show the wireless channel.
Encryption Type	Show the encryption type.
Status	Show the connection status.
IP Address	Show the IP address of the gateway.
Netmask	Show the wireless MAC address of the gateway.
Gateway	Show the gateway address in wireless network.
Connection Duration	Show information on how long the Wi-Fi network has been connected.

Table 3-1-4-1 WLAN Status

Figure 3-1-4-2

Associated Stations	
Item	Description
IP Address	Show the IP address of access point or client.
MAC Address	Show the MAC address of the access point or client.
Connection Duration	Show information on how long the Wi-Fi network has been connected.

Table 3-1-4-2 WLAN Status

3.1.5 VPN

You can check VPN status on this page, including PPTP, L2TP, IPsec, OpenVPN and DMVPN.

Figure 3-1-5-1

Figure 3-1-5-2

Figure 3-1-5-3

VPN Status	
Item	Description
Name	Show the name of the VPN tunnel.
Status	Show the status of the VPN tunnel.
Local IP	Show the local tunnel IP of VPN tunnel.
Remote IP	Show the remote tunnel IP of VPN tunnel.

Table 3-1-5-1 VPN Status

3.1.6 Host List

You can view the host information on this page.

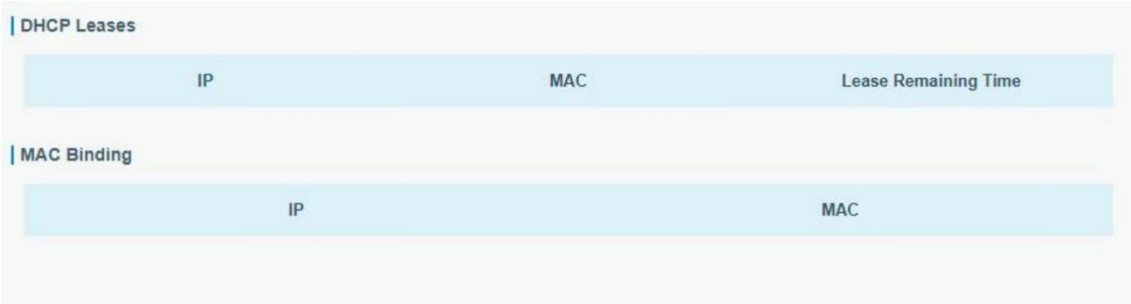
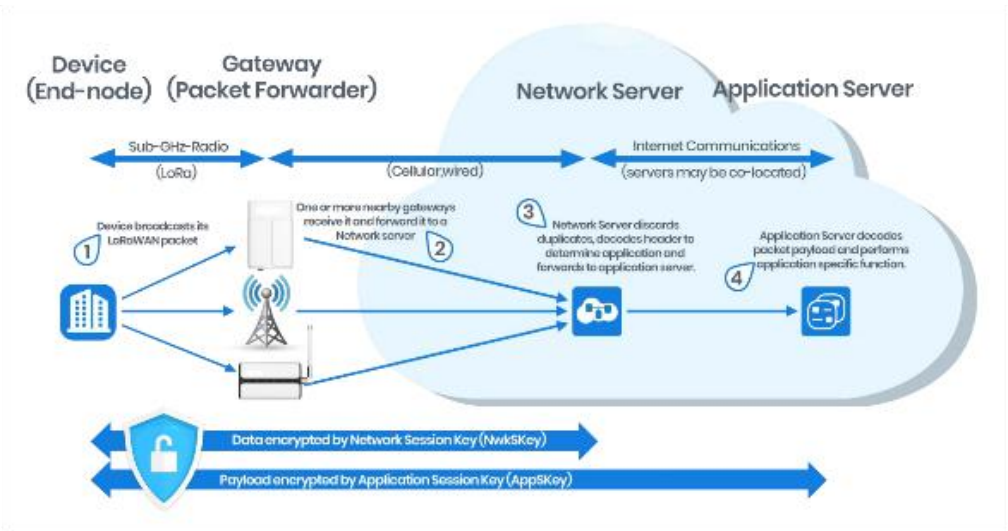


Figure 3-1-6-1

Host List	
Item	Description
DHCP Leases	
IP Address	Show IP address of DHCP client
MAC Address	Show MAC address of DHCP client
Lease Time Remaining	Show the remaining lease time of DHCP client.
MAC Binding	
IP & MAC	Show the IP address and MAC address set in the Static IP list of DHCP service.

Table 3-1-6-1 Host List Description

3.2 LoRaWAN



3.2.1 Packet Forwarder

3.2.1.1 General

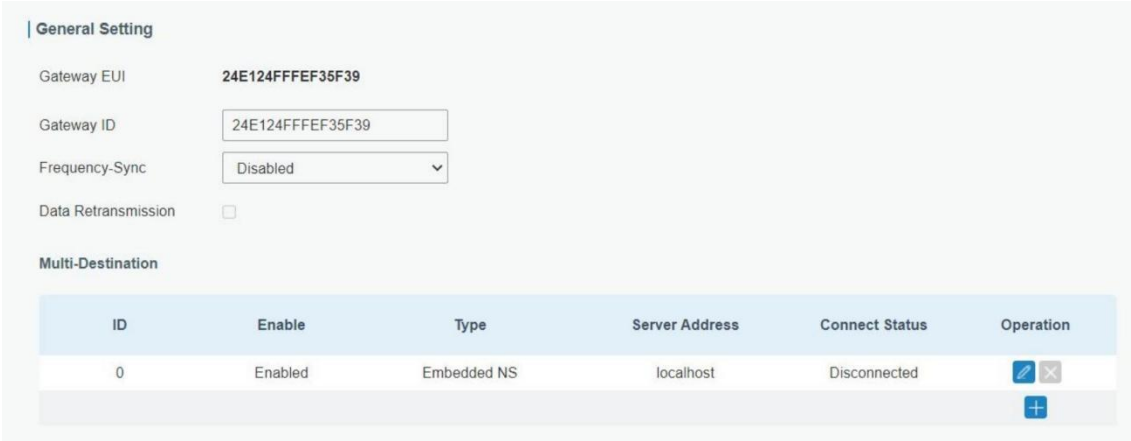


Figure 3-2-1-1

General Settings	
Item	Description
Gateway EUI	Show the unique identifier of the gateway and it's non-editable. Format: ETH port MAC address + "FFFE" in the middle
Gateway ID	Fill in the corresponding ID which you've used for registering the gateway to the remote network server. It is usually the same as gateway EUI and can be changed.
Frequency-Sync	Sync frequency configurations from the network server by selecting the corresponding multi-destination ID.
Data Retransmission	When the gateway connects to a single Chirpstack/Semtech/Remote Embedded NS/Basic Station type package forwarder, it supports data storage of up to 1 million pieces of data when the network is disconnected and re-transmits the data after network recovery.
Multi-Destination	The gateway will forward the data to the network server address that was created and enabled in the list.
Connection Status	Show the connection status of the package forwarder.

Table 3-2-1-1 General Setting Parameters

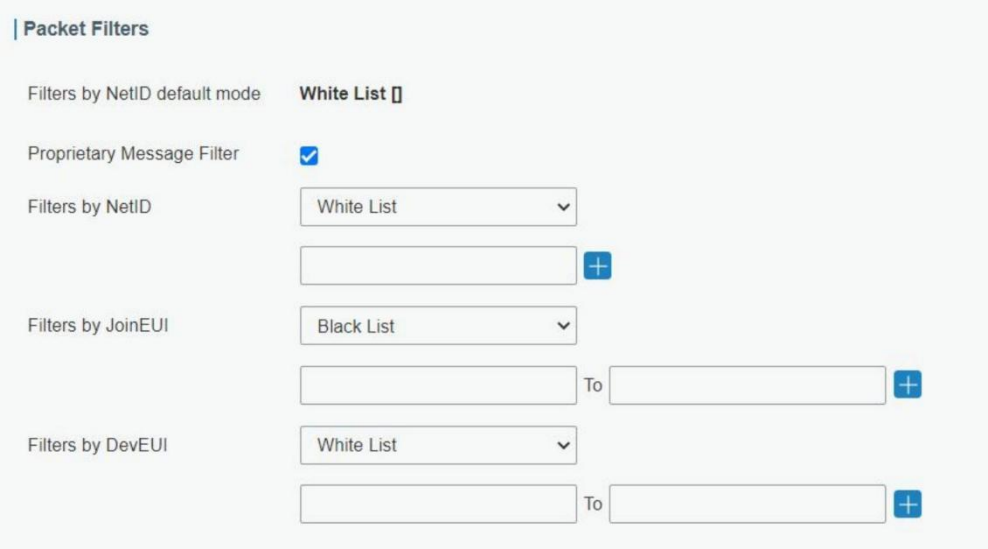


Figure 3-2-1-2

Packet Filters	
Parameters	Description
Filters by NetID Default Mode	Select the filter mode as black list or white list. White List: Only forward the packets on this list to the network server. Black List: Only forward the packets except this list to the network server.
Proprietary Message Filter	Enable to not forward the proprietary message packets (Mtype=111).
Filters by NetID	Forward/Not forward the uplink packets that match the NetID.
Filters by JoinEUI	Forward/Not forward the join request packets that match the JoinEUI range.
Filters by DevEUI	Forward/Not forward the join request packets that match the DevEUI range.
List	Set the specific filtering value or range list. Every condition supports to add 5 lists at most.

Table 3-2-1-2 Packet Filters Parameters

Note:

1. When join EUI and dev EUI are both configured, only packets that match both conditions will be forwarded.
2. This feature is not supported when the packet forwarder type is Loriot or Everynet.
3. When a third-party network server assigns filter condition to gateway, the gateway will use network server settings in priority.

Related Configuration Example

Packet forwarder configuration

3.2.1.2 Radios

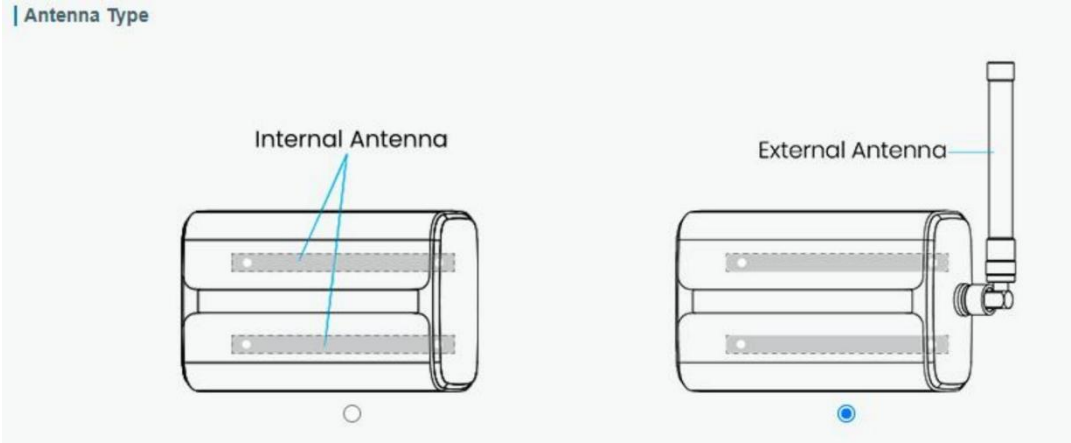


Figure 3-2-1-3

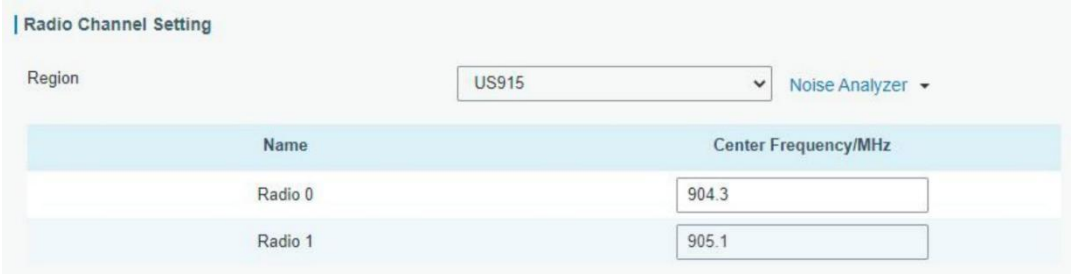


Figure 3-2-1-4

Radios-Radio Channel Setting	
Item	Description
Antenna Type	Select the transmission type of antennas when using EA version. Note: Some sub-models do not support this feature, please refer to corresponding datasheets.
Region	Choose the LoRaWAN® frequency plan used for the upstream and downlink frequencies and datarates. Available channel plans depend on the gateway's model.
Center Frequency	Change the frequencies to receive packets from LoRaWAN® nodes.

Table 3-2-1-3 Radio Channels Setting Parameters

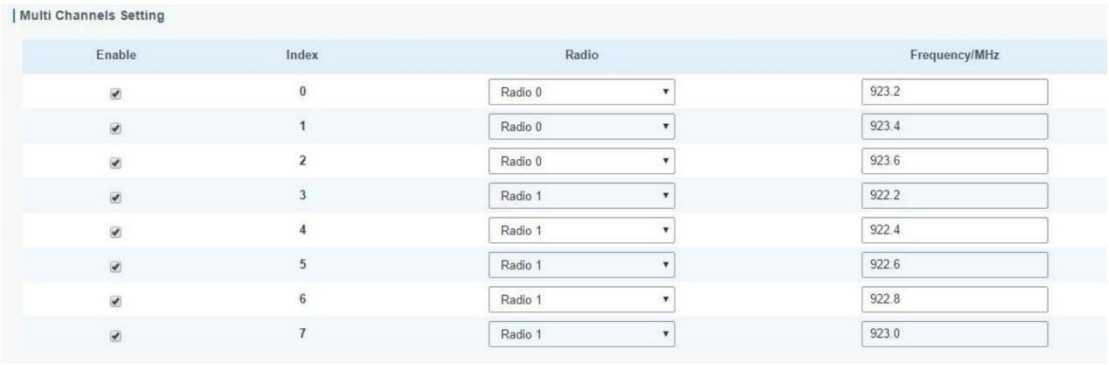


Figure 3-2-1-5

Radios-Multi Channel Setting

Item	Description
Enable	Click to enable this channel to transmit packets.
Index	Indicate the ordinal of the list.
Radio	Choose Radio 0 or Radio 1 as center frequency.
Frequency/MHz	Enter the frequency of this channel. Range: center frequency±0.4625.

Table 3-2-1-4 Multi Channel Setting Parameters

Figure 3-2-1-6

Radios-LoRa Channel Setting	
Item	Description
Enable	Click to enable this channel to transmit packets.
Radio	Choose Radio 0 or Radio 1 as center frequency.
Frequency/MHz	Enter the frequency of this channel. Range: center frequency±0.9.
Bandwidth/MHz	Enter the bandwidth of this channel.
Spread Factor	Choose the selectable spreading factor. The channel with large spreading factor corresponds to a low rate, while the small one corresponds to a high rate.

Table 3-2-1-5 LoRa Channel Setting Parameters

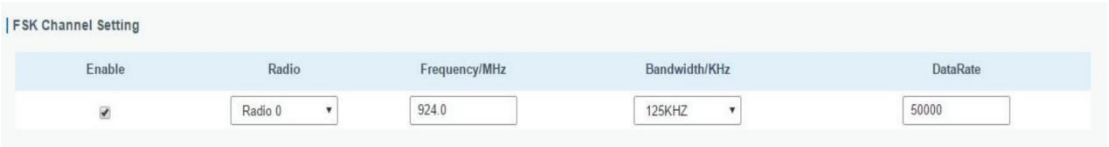


Figure 3-2-1-7

Radios-FSK Channel Setting	
Item	Description
Enable	Click to enable this channel to transmit packets.
Radio	Choose Radio 0 or Radio 1 as center frequency.
Frequency/MHz	Enter the frequency of this channel. Range: center frequency±0.9.
Bandwidth/MHz	Enter the bandwidth of this channel. Recommended value: 125KHz, 250KHz, 500KHz
Data Rate	Enter the data rate. Range： 500-25000.

Table 3-2-1-6 FSK Channel Setting Parameters

3.2.1.3 Noise Analyzer

Noise analyzer is used for scanning the noise of every frequency channel and giving a diagram for users to analyze the environment interference condition and select best deployment. RSSI indicates the sensitivity for every channel. Lower the RSSI value, better

the signal. It's not suggested to enable this feature when using package forwarder since it will affect the downlink transmission.

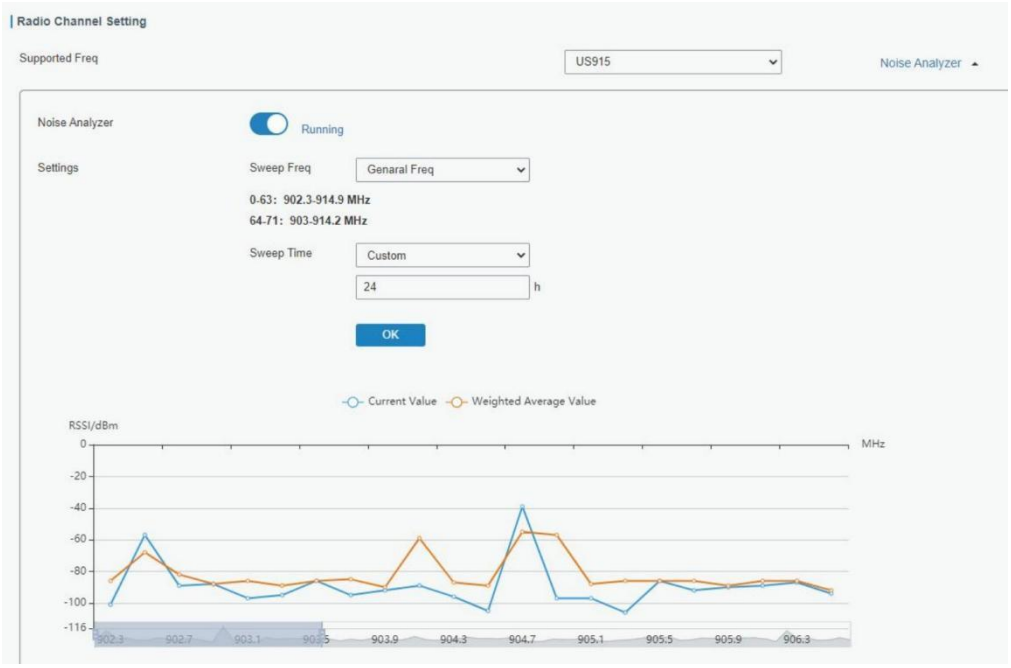


Figure 3-2-1-8

Noise Analyzer		
Item	Description	Default
Enable	Click to enable noise analyzer feature.	Disabled
Sweep Freq	Select the frequency sweeping range. General Freq: frequencies based on the LoRaWAN® regional parameters document Custom: custom the frequency range	General Feq
Sweep Time	Enable the noise analyzer continuously or within a period of time. If Custom is selected, the noise analyzer will stop automatically after the pre-configured time. Note: It's suggested to custom the time since noise analyzer feature will affect the normal data transmission.	Custom/24h

Table 3-2-1-7 Noise Analyzer Setting Parameters

3.2.1.4 Advanced

This section is about settings in details of beacon transmitting and validating.

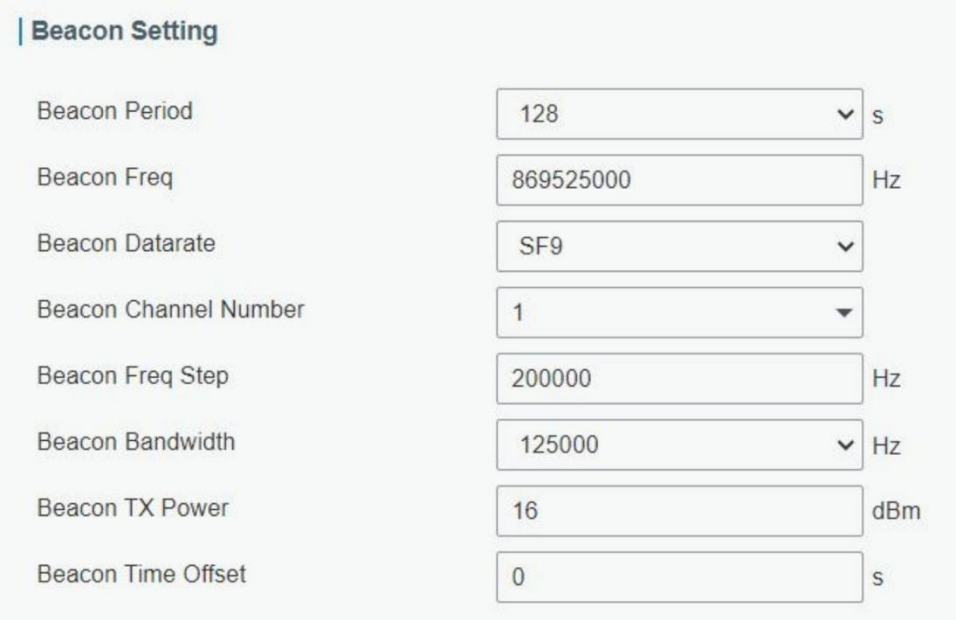


Figure 3-2-1-9

Advanced-Beacon Setting		
Item	Description	Default
Beacon Period	Interval of gateway sending beacons for Class B device time synchronization. 0 means the gateway will not send beacons.	0
Beacon Freq	The frequency of beacons.	Based on the supported frequency
Beacon Datarate	The datarate of beacons.	Based on the supported frequency
Beacon Channel Number	When selecting Custom, it allows users to custom range from 1 to 8.	1
Beacon Freq Step	Frequency interval of beacons.	200000
Beacon Bandwidth	The bandwidth of beacons. Unit: Hz	12500 Hz
Beacon TX Power	The TX power of beacons.	Based on the supported frequency
Beacon Time Offset	Add this offset to system time and assign the time result to class B devices. This can avoid the interference when multiple class B devices are close.	0

Table 3-2-1-8 Advanced-Beacon Parameters

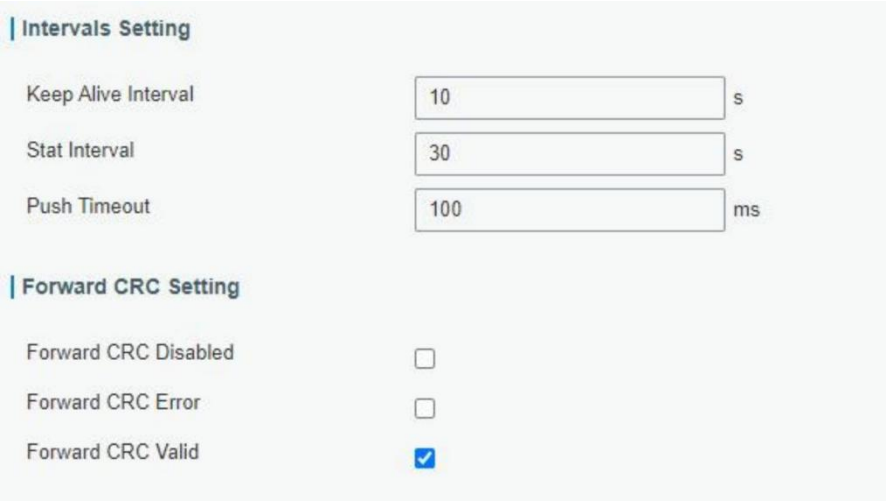


Figure 3-2-1-10

Item	Description	Default
Keep Alive Interval	Enter the interval of keepalive packet which is sent from gateway to network server to keep the connection stable and alive. Range: 1-3600.	10
Stat Interval	Enter the interval to update the network server with gateway statistics. Range: 1-3600.	30
Push Timeout	Enter the timeout to wait for the response from server after the gateway sends data of node. Rang: 1-1999.	100
Forward CRC Disabled	Enable to send packets received with CRC disabled to the network server.	Disabled
Forward CRC Error	Enable to send packets received with CRC errors to the network server.	Disabled
Forward CRC Valid	Enable to send packets received with CRC valid to the network server.	Enabled

Table 3-2-1-9 Advanced Parameters

3.2.1.5 Custom

When Custom Configuration mode is enabled, you can write your own packet forwarder configuration file in the edit box to configure packet forwarder. Click “Save” to save your custom configuration file content, and click “Apply” to take effect. You can click “Clear” to erase all content in the edit box. If you don’t know how to write configuration file, please click “Example” to go to reference page.

Note: customized configuration will overwrite the packet forward configurations of web GUI.

Figure 3-2-1-11

3.2.1.6 Traffic

When navigating to the traffic page, any recent traffic received by the gateway will display. To watch live traffic, click Refresh.

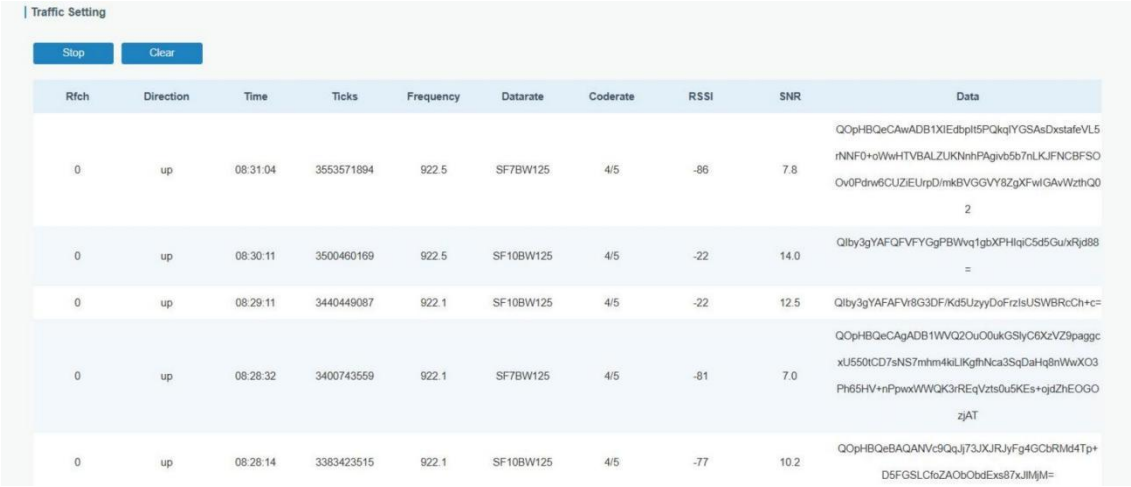


Figure 3-2-1-12

Item	Description
Refresh	Click to obtain the latest data.
Clear	Click to clear all data.
Rfch	Show the channel of this packet.
Direction	Show the direction of this packet.
Time	Show the receiving time of this packet.
Ticks	Show the ticks of this packet.
Frequency	Show the frequency of the channel.
Datarate	Show the datarate of the channel.

Coderate	Show the coderate of this packet.
RSSI	Show the received signal strength.
SNR	Show the signal-to-noise ratio of this packet.
Data	Show the payload (base64) of this packet. Note: This does not work with Loriot and Actility packet forwarders.

Table 3-2-1-10 Traffic Parameters

3.2.2 Network Server

3.2.2.1 General

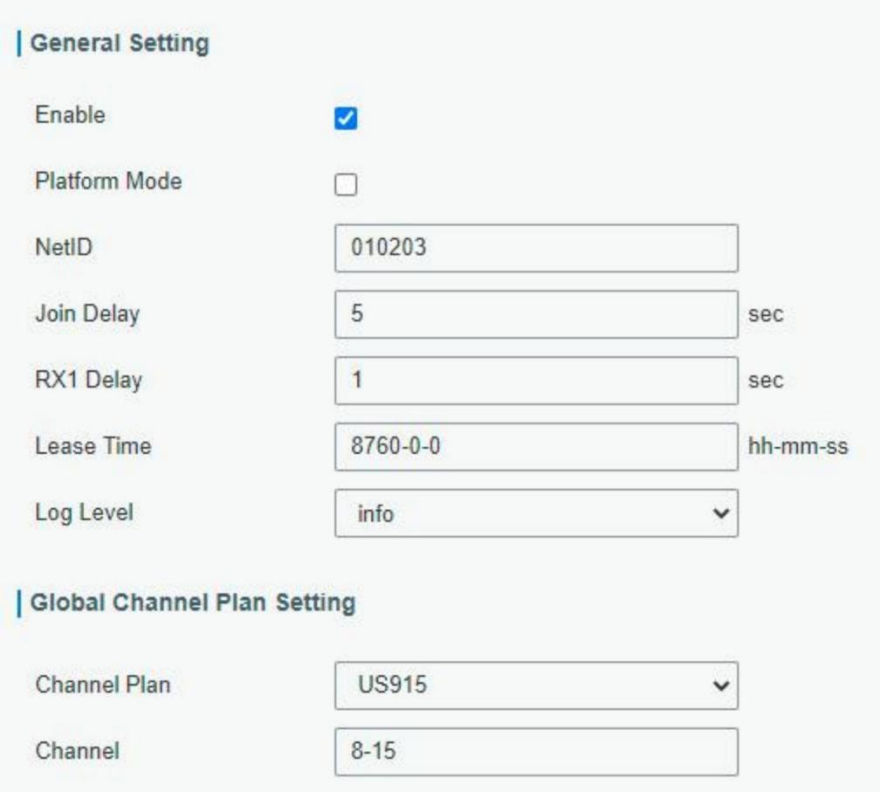


Figure 3-2-2-1

Item	Description	Default
General Setting		
Enable	Click to enable Network Server mode.	Enabled
Platform Mode	Enabled to connect gateway to Linovision IoT Cloud or Yeastar Workplace platform .	Disabled
NetID	Enter the network identifier.	010203
Join Delay	Enter the interval time between when the end-device sends a Join_request_message to network server and when the end-device prepares to open RX1 to receive the Join_accept_message sent from network server.	5
RX1 Delay	Enter the interval time between when the end-device sends uplink packets and when the	1

	end-device prepares to open RX1 to receive the downlink packet.	
Lease Time	Enter the amount of time till a successful join expires. The format is hours-minutes-seconds. If the join-type is OTAA, then the end-devices need to join the network server again when it exceeds the lease time.	876000-00-00
Log level	Choose the log level.	Info
Channel Plan Setting		
Channel Plan	Choose LoRaWAN® channel plan used for the upstream and downlink frequencies and datarates. Available channel plans depend on the gateway's model.	Depend on the gateway's frequency
Channel	Allow end devices to communicate with specific frequency channels. Leave it blank means using all the default standard usable channels specified in the LoRaWAN® regional parameters document. It allows to enter the index of the channels. Examples: 1, 40: Enabling Channel 1 and Channel 40 1-40: Enabling Channel 1 to Channel 40 1-40, 60: Enabling Channel 1 to Channel 40 and Channel 60	Depend on the gateway's frequency

Table 3-2-2-1 General Parameters

Note: For some regional variants, if allowed by your LoRaWAN® region, you can use Additional Plan to configure additional channels undefined by the LoRaWAN® Regional Parameters, like EU868 and KR920, as the following picture shows:

Figure 3-2-2-2

Additional Channels	
Item	Description
Frequency/MHz	Enter the frequency of the additional plan.
Max Datarate	Enter the max datarate for the end-device. The range is based on what is specified in the LoRaWAN® regional parameters document.
Min Datarate	Enter the min datarate for the end-device. The range is based on what is specified in the LoRaWAN® regional parameters document.

Table 3-2-2-2 Additional Plan Parameters

3.2.2.2 Application

An application is a collection of devices with the same purpose or of the same type. Users can add a series of devices to the same application which needs to send to the same server.

You can edit the application by clicking  or create a new application by clicking  .

Figure 3-2-2-3

Application	
Item	Description
Name	Enter the name of the application profile. E.g: smoker-sensor-app.
Description	Enter the description of this application. E.g: an application for smoker sensor.
Metadata	Enable to select the details to report with uplink packets automatically when the device adds the payload codec.
Data Transmission	Data will be sent to your custom server using the MQTT, HTTP or HTTPS protocol. One application can only add one MQTT transmission and one HTTP (HTTPS) transmission.

Table 3-2-2-3 Application Parameters

MQTT Integration

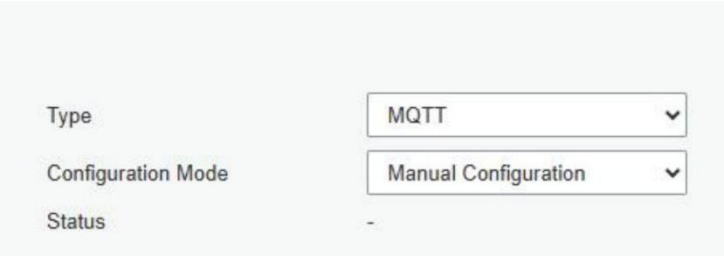


Figure 3-2-2-4

MQTT Settings	
Item	Description
Type	Select the type as MQTT.

Configuration Mode	Select the configuration mode. Manual Configuration: Configure the parameters via webpage. Get via HTTP: Send HTTP request to platform to get MQTT configuration parameters.
Status	Display MQTT connection status.
Get via HTTP	
Platform URL	Select the platform URL to send the HTTP request.
Custom Format	Customize the HTTP request content sent to the platform.

Table 3-2-2-4 MQTT Settings Parameters

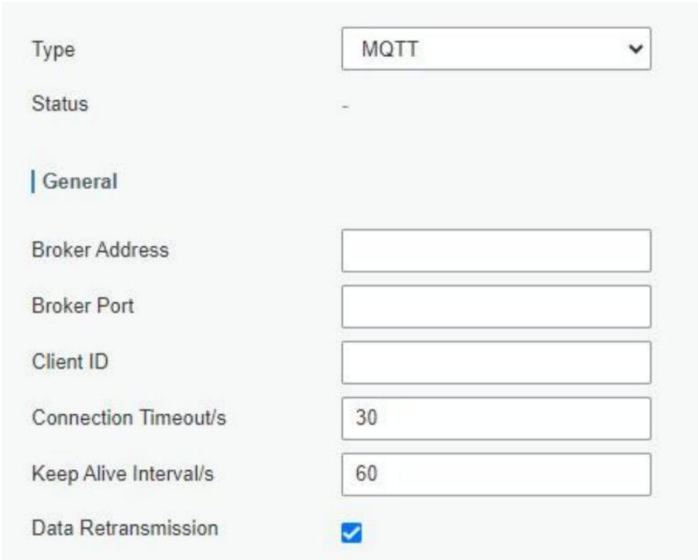


Figure 3-2-2-5

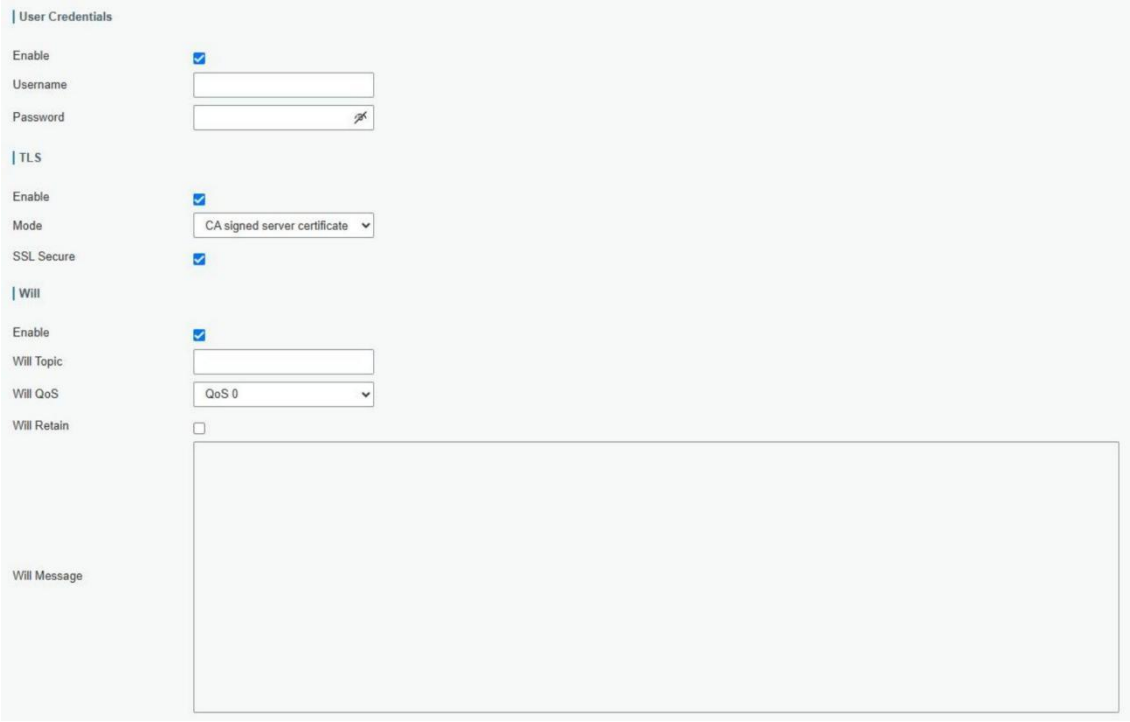


Figure 3-2-2-6

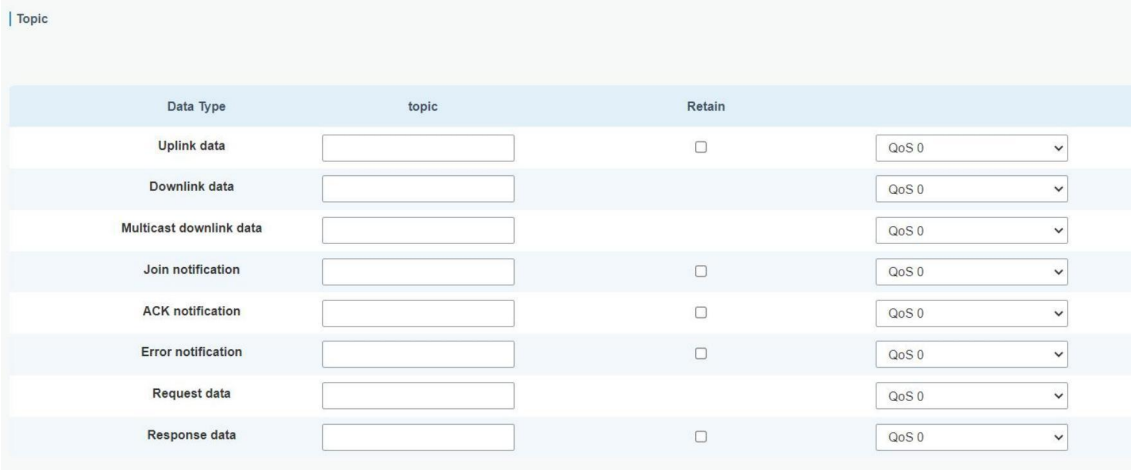


Figure 3-2-2-7

MQTT Settings - Manual Configuration	
Item	Description
General	
Broker Address	MQTT broker address to receive data.
Broker Port	MQTT broker port to receive data.
Client ID	Client ID is the unique identity of the client to the server. It must be unique when multiple clients are connected to the same server, and it is essential for handling messages at QoS 1 and 2.
Connection Timeout/s	If the client does not get a response after the connection timeout, the connection will be considered as broken. The Range: 1-65535.
Keep Alive Interval/s	After the client is connected to the server, the client will send heartbeat packet to the server regularly to keep alive. Range: 1-65535.
Data Restransmission	After enabled, it supports data storage of up to 10,000 pieces of data when the network is disconnected and re-transmits the data after network recovery.
User Credentials	
Enable	Enable user credentials.
Username	The username used for connecting to the MQTT broker.
Password	The password used for connecting to the MQTT broker.
TLS	
Enable	Enable the TLS encryption in MQTT communication. Note: if MQTT broker type is HiveMQ, please enable TLS and set the option as CA signed server certificate.
Mode	Select from “Self signed certificates”, “CA signed server certificate”. CA signed server certificate: verify with the certificate issued by Certificate Authority (CA) that pre-loaded on the device. Self signed certificates: upload the custom CA certificates(.crt or .pem), client Certificates(.crt) and secret key(.key) for verification.
SSL Secure	After enabled, the gateway will verify the certificate’s validity.

Will	
Enable	Last will message is automatically sent when the MQTT client is abnormally disconnected. It is usually used to send device status information or inform other devices or proxy servers of the device's offline status.
Will Topic	Customize the topic to receive last will messages.
Will QoS	QoS0, QoS1 or QoS2 are optional.
Will Retain	Enable to set last will message as retain message.
Will Message	Customize the last will message contents.
Topic	
Data Type	Data type to communicate with MQTT broker: Uplink Data: receive device uplink packets. Downlink Data: send downlink commands to devices. If you require to send downlink command to a single device, please add the wildcard "$deveui" to this topic and replace this as real device EUI when subscribing this topic. Multicast Downlink Data: send downlink commands to multicast group Join Notification: receive join notifications if he gateway sends join accept packets to allow the devices to join the network. ACK Notification: receive ACK packets from devices when sending downlink commands. Error Notification: receive error packets from devices. Request data: send requests to enquire and configure the gateway NS. Response data: receive the request responses.
Topic	Topic name of the data type used for publishing.
Retain	Enable to set the latest message of this topic as retain message.
QoS	QoS 0 – Only Once This is the fastest method and requires only one message. However, It is the least reliable mode. QoS 1 – At Least Once This level guarantees that the message will be delivered at least once, but may be delivered more than once. QoS 2 – Exactly Once QoS 2 is the highest level of service in MQTT. This level guarantees that each message is received only once by the intended recipients. QoS 2 is the safest and slowest quality of service level.

Table 3-2-2-5 MQTT Settings - Manual Configuration Parameters

HTTP/HTTPS Integration

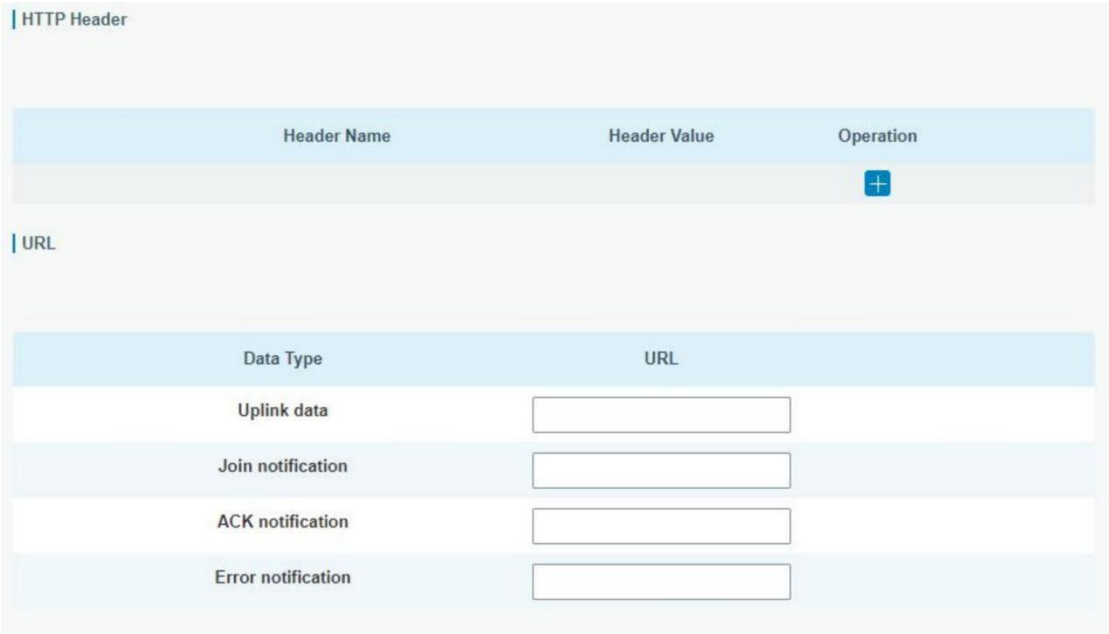


Figure 3-2-2-8

HTTP/HTTPS Settings	
Item	Description
HTTP Header	
Header Name	A core set of fields in the HTTP header.
Header Value	Value of the HTTP header.
URL	
Data Type	Data type sent to HTTP/HTTPS server. Uplink Data: receive device uplink packets Join Notification: receive join notifications if he gateway sends join accept packets to allow the devices to join the network ACK Notification: receive ACK packets from devices when sending downlink commands Error Notification: receive error packets from devices
Topic	Topic name of the data type used for publishing.
URL	HTTP/HTTPS server URL to receive data.

Table 3-2-2-6 HTTP/HTTPS Settings Parameters

Related Configuration Example

Application configuration

3.2.2.3 Payload Codec

Payload Codec provides the inbuilt payload codec library of Linovision LoRaWAN® devices to decode and encode the data easily. Users can also customize the payload codec of other brands of devices or adjust the uplink and downlink contents as requirements.

Inbuilt Payload Codec Library

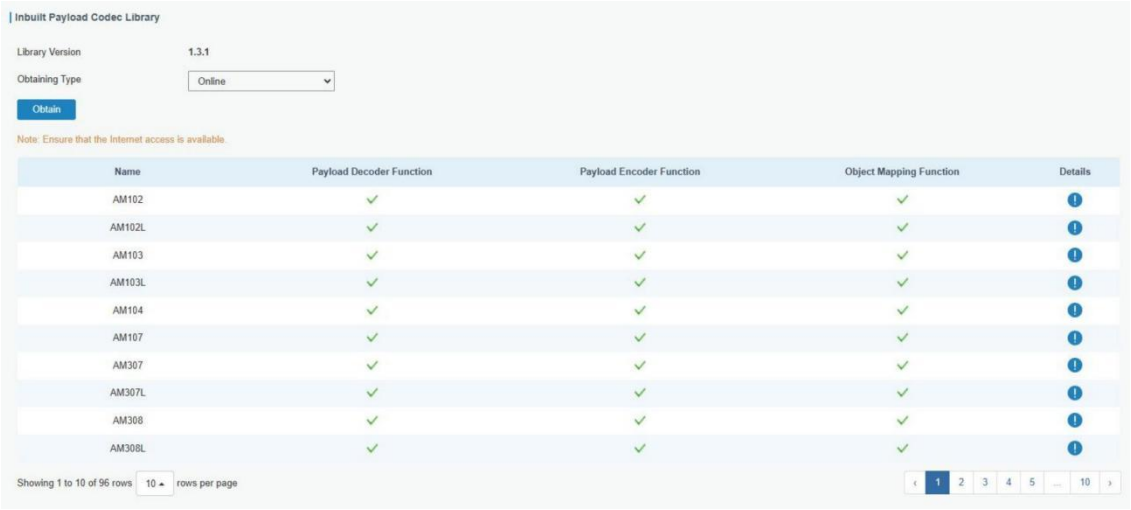


Figure 3-2-2-9

Inbuilt Payload Codec Library	
Item	Description
Library Version	Show the version of the Linovision device payload codec library.
Obtaining Type	Select the type to update the Linovision devices payload codec library. `Online:` update automatically if gateway detects there is version update every time gateway powers on and accesses the Internet. Users can also click `Obtain` button to check update status manually. `Local Upload:` click `Browse` to upload the zip format payload codec package and click `Import` to update the library. For Linovision payload codec package, please download here.
Name	Show the corresponding Linovision product model of the payload codec.
Payload Decoder Function	Show if decoders exist.
Payload Encoder Function	Show if encoders exist.
Object Mapping Function	Show if object mapping functions exist.
Details	Show the details of decoder and encoder. If this does not meet your requirement, please customize your payload codec.

Table 3-2-2-7 Inbuilt Payload Codec Library Parameters

Custom Payload Codec

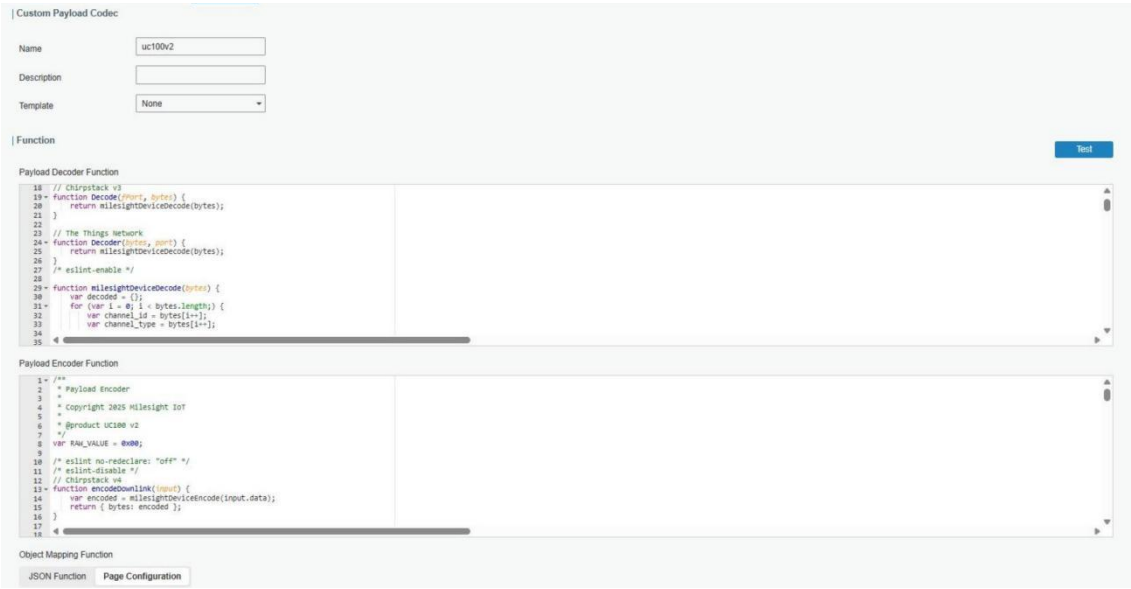


Figure 3-2-2-10

Custom Payload Codec	
Item	Description
Name	Enter the unique name of the custom payload codec.
Description	Enter the description of this payload codec.
Template	Select an existing inbuilt payload codec as a template.
Payload Decoder Function	Customize the device payload decoder to convert hex format data to JSON format. Note that the function header should be the same as the example on the blanks.
Payload Encoder Function	Customize the device payload encoder to convert JSON format message to hex format command. Note that the function header should be the same as the example on the blanks.
Object Mapping Function	Customize the mapping function to convert LoRaWAN® message to BACnet or Modbus objects. It provides two adding methods: JSON Function: Add the function as JSON format. Page Configuration: Add the function via page.
Test	Enable or disable payload codec test. Input: Enter the hex format raw data without blank spaces, or JSON format command. fPort: Application port of LoRaWAN® devices. It's 85 by default for Linovision devices. Decoder Test: Convert hex format raw data to json format result. Encoder Test: Convert JSON format command to hex format command. Decoder/Encoder Test Result: Display decoded or encoded result. Object Mapping Test Result: Check the object validity in the encoder or decoder.

Table 3-2-2-8 Custom Payload Codec Parameters

Note:

1. The supported JavaScript version of payload decoder and encoder is ES2020.
2. The variable names used in decoders and encoders of one Payload Codec must be the same if they point to the same items.

```
{
  "object":
    [ {
      "id": "ipso_version",
      "name": "IPSO Version",
      "value": "",
      "unit": "",
      "access_mode": "R",
      "data_type": "TEXT",
      "value_type": "STRING",
      "max_length": 6,
      "bacnet_type": "character_string_value_object",
      "bacnet_unit_type_id": 95,
      "bacnet_unit_type": "UNITS_NO_UNITS"
    },
        {
      "id": "temperature_unit",
      "name": "Temperature Unit",
      "value": "",
      "unit": "",
      "access_mode": "RW",
      "data_type": "ENUM",
      "value_type": "UINT8",
      "values": [
        { "value": 0, "name": "celsius" },
        { "value": 1, "name": "fahrenheit" }
      ],
      "bacnet_type": "multistate_value_object",
      "bacnet_unit_type_id": 95,
      "bacnet_unit_type": "UNITS_NO_UNITS",
      "reference": ["temperature_control_mode",
    "temperature_target"] }
```

```
    ]
}
```

<table>
<tr><th colspan="2">Object Mapping Function-JSON Configuration</th></tr>
<tr><th>Item</th><th>Description</th></tr>
<tr><td>id</td><td>This value must be the same as the variable names of decoders and encoders.</td></tr>
<tr><td>name</td><td>Leave blank or customize any content as required.</td></tr>
<tr><td>value</td><td>Unused. Leave blank.</td></tr>
<tr><td>unit</td><td>Leave blank or type the unit as required.</td></tr>
<tr><td>access_mode</td><td>Set the access mode of this object. Supported options and corresponding Modbus register types:
<table>
<tr><th>Option</th><th>Description</th><th>Modbus Register Type</th></tr>
<tr><td>R</td><td>Read-only</td><td>Discrete Input, Input Register</td></tr>
<tr><td>W</td><td>Write-only</td><td>Coil, Holding Register</td></tr>
<tr><td>RW</td><td>Read-write</td><td>Coil, Holding Register</td></tr>
</table></td></tr>
<tr><td>data_type</td><td>Define the value type of this variable. Supported options:
<table>
<tr><th>Option</th><th>Description</th><th>Modbus Register Type</th></tr>
<tr><td>TEXT</td><td>String type data, example: serial number</td><td>Input Register, Holding Register</td></tr>
<tr><td>NUMBER</td><td>Number type data including integer and float, example: temperature</td><td>Input Register, Holding Register</td></tr>
<tr><td>BOOL</td><td>Only 0 and 1 status, example: button status</td><td>Discrete Input, Coil</td></tr>
<tr><td>ENUM</td><td>Multiple values</td><td>Input Register, Holding Register</td></tr>
</table>
Note: if the data type is ENUM and the reference parameter is not blank, it is suggested to set Modbus register type as Input Register or Holding Register.</td></tr>
<tr><td>value_type</td><td>Supported options: UINT8, INT8, UINT16, INT16, UINT32, INT32, FLOAT, STRING.</td></tr>
<tr><td>values</td><td>Set the value range of this variable.</td></tr>
<tr><td>max_length</td><td>When the value type is STRING, set the maximum length of the strings or maximum length of Modbus registers.</td></tr>
<tr><td>bacnet_type</td><td>Supported options:
analog_value_object, analog_input_object, analog_output_object, binary_value_object, binary_input_object, binary_output_object, multistate_value_object, multistate_input_object, multistate_output_object</td></tr>
<tr><td>bacnet_unit_type_id</td><td>Type the BACnet unit ID which can be found here.</td></tr>
<tr><td>bacnet_unit_type</td><td>Type the BACnet unit type which can be found here (see Description).</td></tr>
</table>

reference	If this variable should be written together with other variables, add the variables array here.

Table 3-2-2-9 Object Mapping Function -JSON Function Parameters

Figure 3-2-2-11

Object Mapping Function-Page Configuration	
Item	Description
Add	Add a new object.
Object Name	Show the object name.
Data Type	Show the data type of this object.
Numeric Type	Show the numeric type when the data type is NUMBER.
Access Mode	Show the access mode of this object.
Unit	Show the unit of this object.
Reference	Show the related objects of this object.
Operation	: Edit the object. : Relate this object to other objects. After related, these objects should be written together. : Delete the object.

Table 3-2-2-10 Object Mapping Function -Page Configuration Parameters

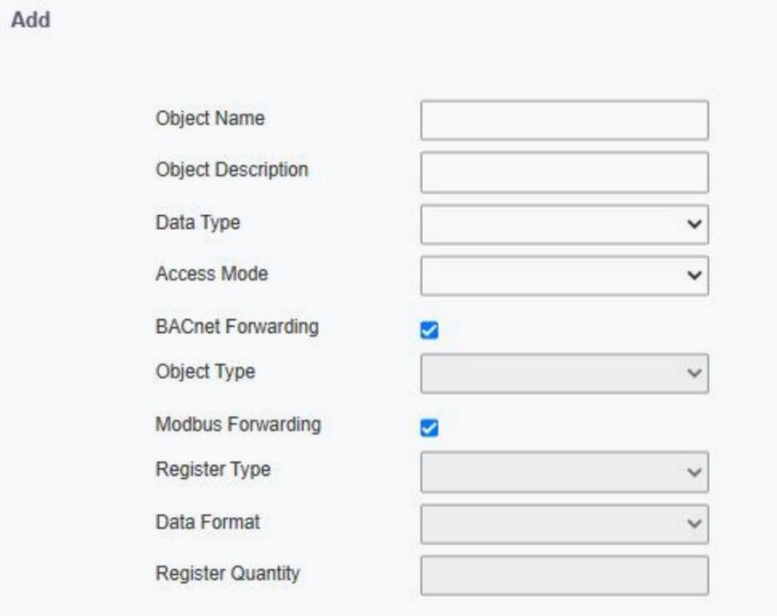


Figure 3-2-2-12

Object Mapping Function-Add an Object	
Item	Description
Object Name	The name must be the same as the variable name of decoder or encoder.
Object Description	The description of the object.
Data Type	The data type of this object.
Value 0/1	When data type is BOOL, set the value of 0 and 1 status.
Enumeration Number	When data type i ENUM, set the supported option quantity.
Numeric Type	When the data type is Numeric Type, set the number type.
Unit	When the data type is NUMBER, set the unit of the object.
Maximum Length	When data type is TEXT, set the maximum length of the text.
Access Mode	The access mode of this object.
BACnet Forwarding	Enable to show the BACnet object parameters details.These parameters will be typed automatically according to Data Type and Access Mode.
Modbus Forwarding	Enable to show the Modbus object parameters details. These parameters will be typed automatically according to Data Type and Access Mode.

Table 3-2-2-11 Object Mapping Function -Add Object Parameters

3.2.2.4 Profiles

A Profile defines the device capabilities and boot parameters that are needed by the Network Server for setting the LoRaWAN® radio access service. These information elements shall be provided by the end-device manufacturer. IOT-G65 has pre-configured 8 device files and users can also create a new device profile.

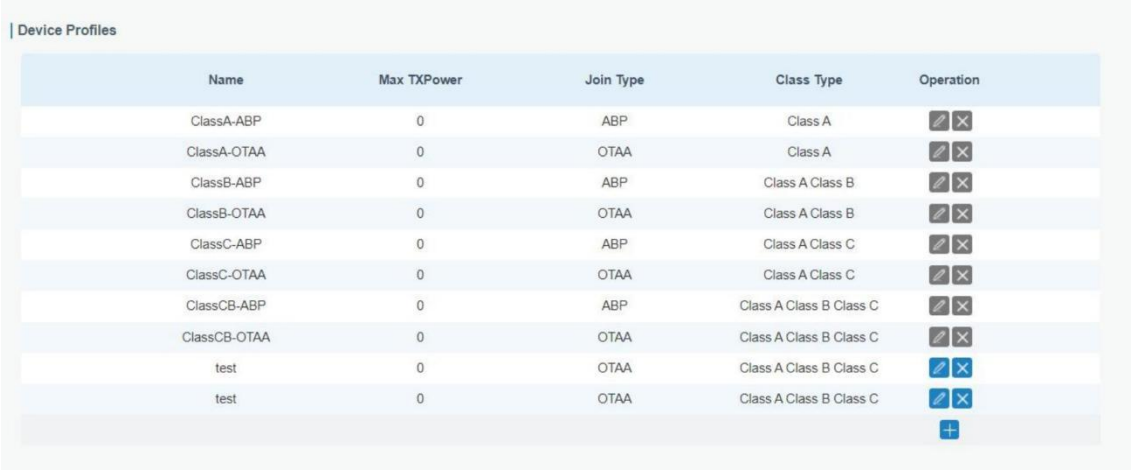


Figure 3-2-2-13

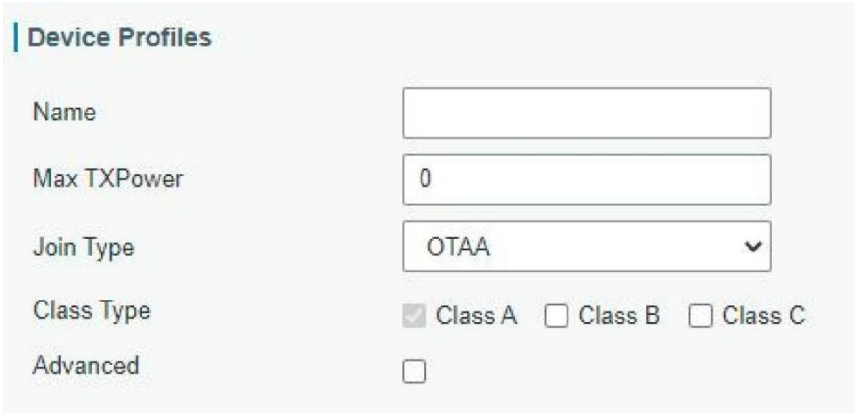


Figure 3-2-2-14

Device Profiles Settings	
Item	Description
Name	Enter the name of the device profile.
Max TXPower	Enter the maximum transmit power. The TXPower indicates power levels relative to the Max EIRP level of the end-device. 0 means using the max EIRP. EIRP refers to the Equivalent Isotropically Radiated Power.
Join Type	Select from: “OTAA” and “ABP”.
Class Type	Class A is fixed as enabled. Users can check the box of Class B or Class C to add the class type. Note: Beacon period should be set to nonzero value in Packet Forwarder > Advanced if using Class B.

Table 3-2-2-12 Device Profiles Setting Parameters

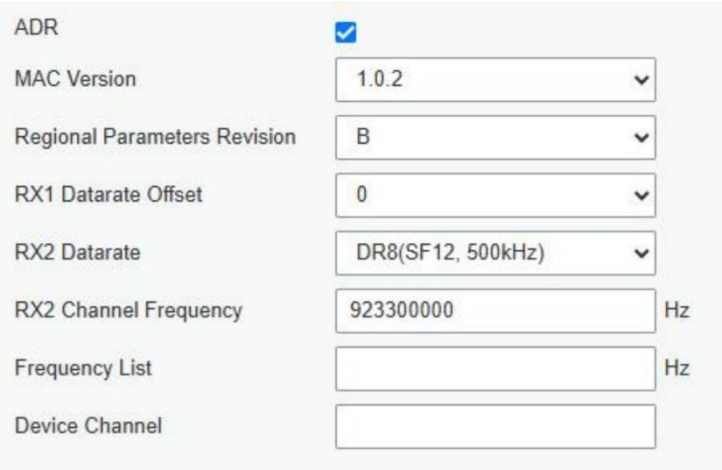


Figure 3-2-2-15

Device Profile Advanced Settings		
Item	Description	Default
ADR	Enable or disable the gateway network server to adjust the datarate of end devices.	Enable
MAC Version	Choose the version of the LoRaWAN® supported by the end-device.	1.0.2
Regional Parameter Revision	Revision of the Regional Parameters document supported by the end-device.	B
RX1 Datarate Offset	The offset which used for calculating the RX1 data-rate, based on the uplink data-rate.	Based on what is specified in the LoRaWAN® regional parameters document
RX2 Datarate	Enter the RX2 datarate which used for the RX2 receive-window.	
RX2 Channel Frequency	RX2 channel frequency which used for the RX2 receive-window.	
Frequency List	List of factory-preset frequencies. The range is based on what is specified in the LoRaWAN® regional parameters document.	Null
Device Channel	Change this device frequency channel by typing the channel indexs. When configured, it takes precedence over the global channel. This setting only works for CN470/US915/AU915.	Null
PingSlot Period	Period of opening the pingslot.	Every Second
PingSlot DataRate	Datarate of the node receiving downlinks.	Based on the supported frequency
PingSlot Freq	Frequency of the node receiving downlinks.	Based on the supported frequency
ACK Timeout	The time for confirmed downlink transmissions. This option is only applicable to class B and class	Class B: 10 Class C: 10

	C.	

Table 3-2-2-13 Device Profiles Advanced Setting Parameters

3.2.2.5 Device

A device is the end-device connecting to, and communicating over the LoRaWAN® network.

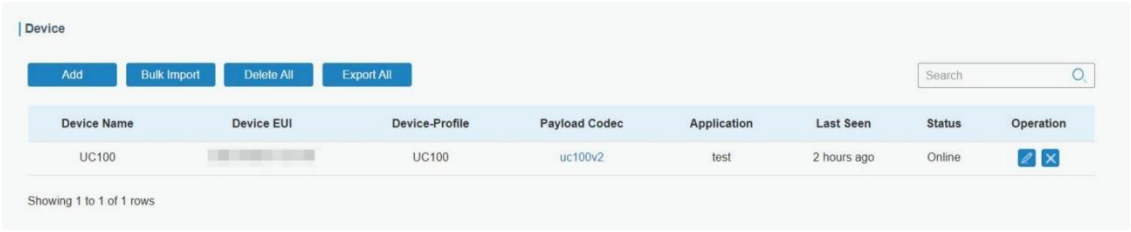


Figure 3-2-2-16

Item	Description
Add	Add a device.
Bulk Import	Download template and import multiple devices. Note: Do not delete the table header of the template file, each line contains the information of every device.
Delete All	Delete all devices in the list.
Export All	Export all device information as a CSV file.
Device Name	Show the name of the device.
Device EUI	Show the EUI of the device.
Device-Profile	Show the name of the device's device profile.
Payload Codec	Show the used payload codec of the device. Click to check the details of this payload codec.
Application	Show the name of the device's application.
Last Seen	Show the time of the last packet received.
Status	Show the status of the device. Never activated: the device never joined the network or sent any packets. Offline: the device did not send packet within the timeout. Online: the device has sent packets within the timeout.
Operation	Edit or delete the device.

Table 3-2-2-14 Device Parameters

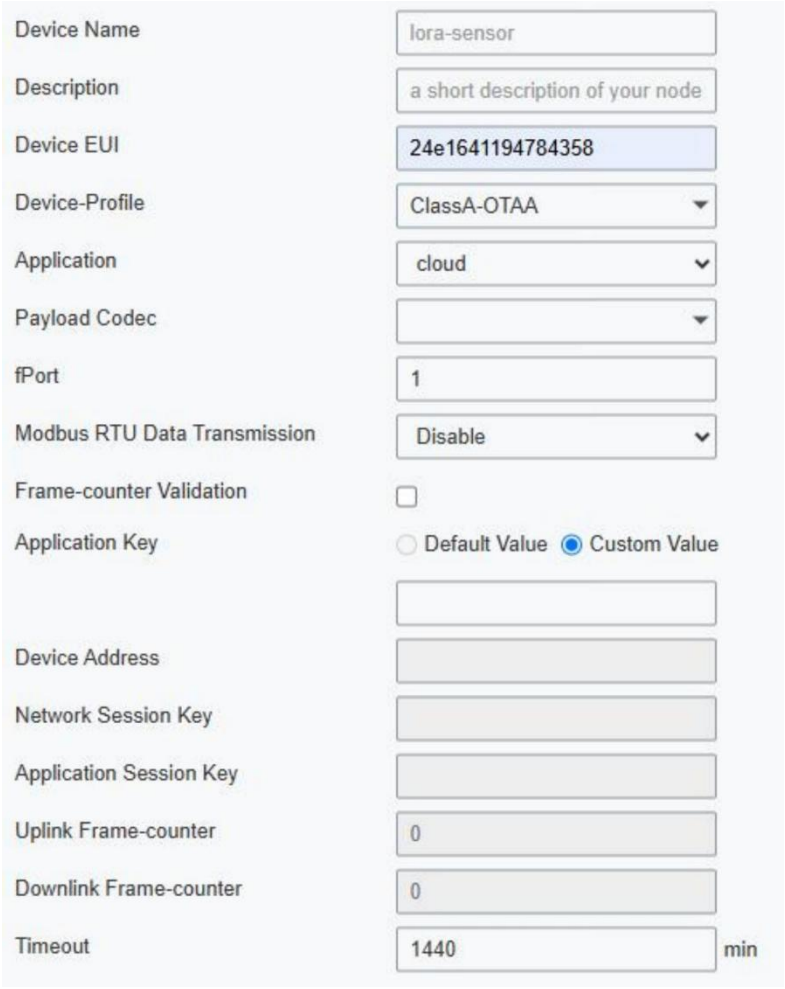


Figure 3-2-2-17

Device Configuration	
Item	Description
Device Name	Enter the name of this device.
Description	Enter the description of this device.
Device EUI	Enter the EUI of this device.
Device-Profile	Choose the device profile.
Application	Choose the application profile.
Payload Codec	Choose the payload codec that exists on Payload Codec page.
fPort	Enter the downlink port of device, it's 85 by default for Linovision devices.
Modbus RTU Data Transmission	Choose from: "Disable", "Modbus RTU to TCP", "Modbus RTU over TCP". This feature is only applicable to Linovision LoRaWAN® controllers. (UC501/UC300, etc.) Modbus RTU to TCP: TCP client can send Modbus TCP commands to ask for controller Modbus data. Modbus RTU over TCP: TCP client can send Modbus RTU commands to ask for controller Modbus data.
Modbus RTU Fport	Enter the LoRaWAN® frame port for transparent transmission between Linovision LoRaWAN® controllers and IOT-G65.

	Range: 2-84, 86-223. Note: this value must be the same as the Linovision LoRaWAN® controller's fPort.
TCP Port	Enter the TCP port for data transmission between the TCP Client and IOT-G65 (as TCP Server).Range: 1-65535.
Frame-Counter Validation	If disable the frame-counter validation, it will compromise security as it enables people to perform replay-attacks.
Application Key	Whenever an end-device joins a network via over-the-air activation, the application key is used to derive the Application Session key. Default Value: The default value of Linovision end devices is 5572404C696E6B4C6F52613230313823 or Device EUI+Device EUI. Custom Value: Define the appkey according to the end devices.
Device Address	The device address identifies the end-device within the current network.
Network Session Key	The network session key is specific for the end-device. It is used by the end-device to calculate the MIC or part of the MIC (message integrity code) of all uplink data messages to ensure data integrity.
Application Session Key	The AppSKey is an application session key specific for the end-device. It is used by both the application server and the end-device to encrypt and decrypt the payload field of application-specific data messages.
Uplink Frame-counter	The number of data frames which sent uplink to the network server. It will be incremented by the end-device and received by the end-device. Users can reset the a personalized end-device manually, then the frame counters on the end-device and the frame counters on the network server for that end-device will be reset to 0.
Downlink Frame-counter	The number of data frames which received by the end-device downlink from the network server. It will be incremented by the network server. Users can reset a personalized end-device manually, then the frame counters on the end-device and the frame counters on the network server for that end-device will be reset to 0.
Timeout	The time to judge the device's online/offline status. Range: 1-4320 mins

Table 3-2-2-15 Device Setting Parameters

Related Configuration Example

Device configuration

3.2.2.6 FUOTA

Firmware Update Over the Air (FUOTA) is a standard for distributing firmware to end devices updates using unicast or multicast. Before using this feature, ensure the end device supports the standard LoRaWAN® FUOTA protocol.

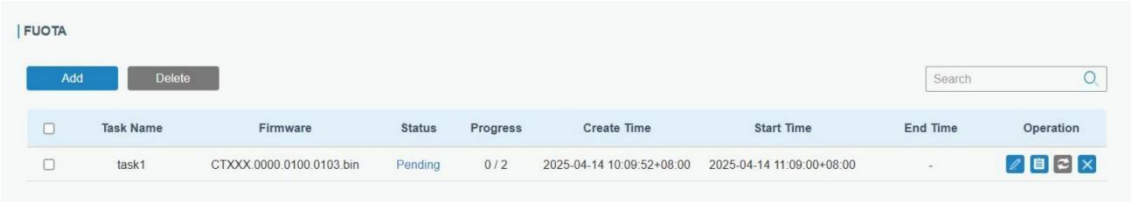


Figure 3-2-2-18

FUOTA	
Item	Description
Add	Click to add a task.
Delete	Check the boxes of the task list and click to delete these tasks.
Task Name	The task name.
Firmware	The firmware to upgrade in this task.
Status	The task status. Pending: Wait for the scheduled time to process the task. Waiting: Prepare to create the session for an upgrade. Executing: At least one device replies to the upgrade result. Finished: All devices reply the upgrade results including success and failure.
Progress	The device amount that is upgraded successfully/is planned to be upgraded.
Create Time	The time to create this task.
Start Time	The time to start this task.
End Time	The time to complete this task.
Operation	: Edit this task when task status is Pending. : Check task details, including the success and failure status of every device. Retry the task to devices which are upgraded failed when task status is Finished. : Delete this task when task status is Pending or Finished.

Table 3-2-2-16 FUOTA Parameters

Add FUOTA Tasks

1. Click Add button to add a FUOTA task.
2. Configure the task settings.

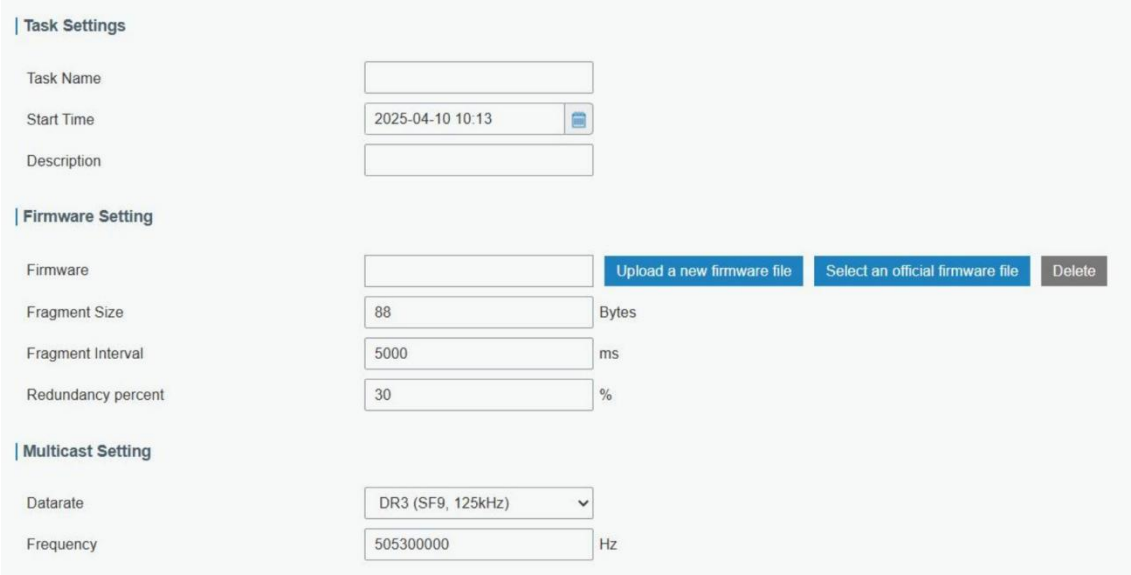
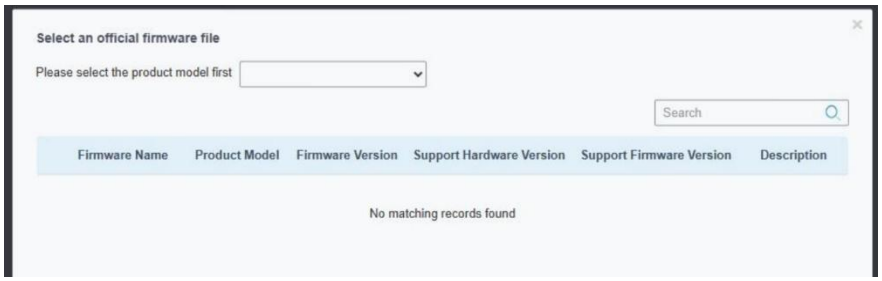


Figure 3-2-2-19

Add Task Settings	
Item	Description
Basic Information	
Task Name	Customize a task name.
Start Time	Set the time to start this task.
Description	Enter the description for this task.
Firmware Settings	
Firmware	Import the firmware to upgrade. `Upload a new firmware file:` Import a firmware locally. `Select an Official Firmware file:` Select the product model first and select the firmware to download from the official website. It requires the gateway to access the Internet. 
Fragment Size	The firmware file will be split as this size to assign to devices. Usually please keep this value as default. If the network environment is complex or bad, it is suggested to reduce this value to 64 or a lower value; if the network environment is good, this value can be added to increase to improve transmission speed.
Fragment Interval	The interval to assign firmware fragments to devices. Usually please keep this value as default. If the network environment is complex or bad, it is suggested to increase this value to 7-10s or a higher value; if the network

	environment is good, this value can be decreased to improve transmission speed.
Redundancy Percent	The device will send 30% redundancy packets for firmware file packet correction. Usually please keep this value as default. If the network environment is complex or bad, it is suggested to increase this value to 40%-50% or a higher value to improve transmission success; if the network environment is good, this value can be reduced.
Multicast Settings	
Datarate	Datarate to assign the firmware fragments to devices.
Frequency	Downlink frequency to assign the firmware fragments to devices.

Table 3-2-2-17 Task Parameters

3. Select the devices to execute this task. Please select the devices with the same model.

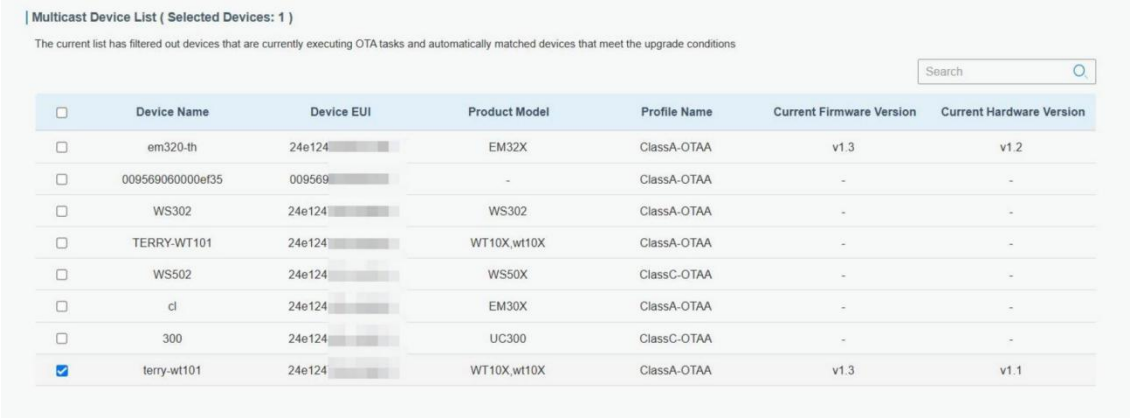


Figure 3-2-2-20

4. Click Save to save these task settings.

3.2.2.7 Multicast Groups

Linovision gateways support for creating Class B or Class C multicast groups to send downlink messages to a group of end devices. A multicast group is a virtual ABP device (i.e. shared session keys), does not support uplink, confirmed downlink nor MAC commands.

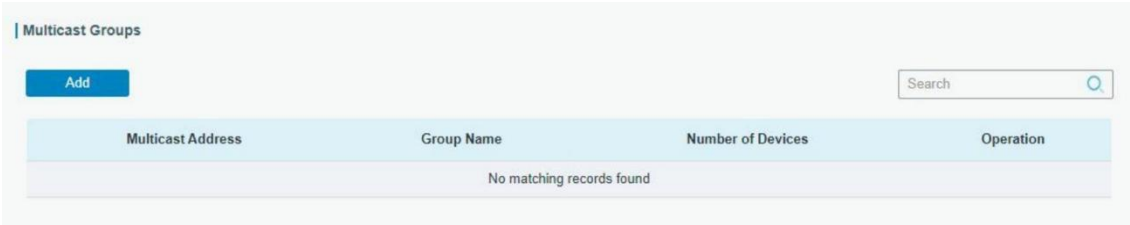


Figure 3-2-2-21

Item	Description

Add	Add a multicast group.
Group Name	Show the name of the group.
Number of Devices	Show the device number of the group.
Operation	Edit or delete the multicast group.

Table 3-2-2-18 Multicast Group Parameters

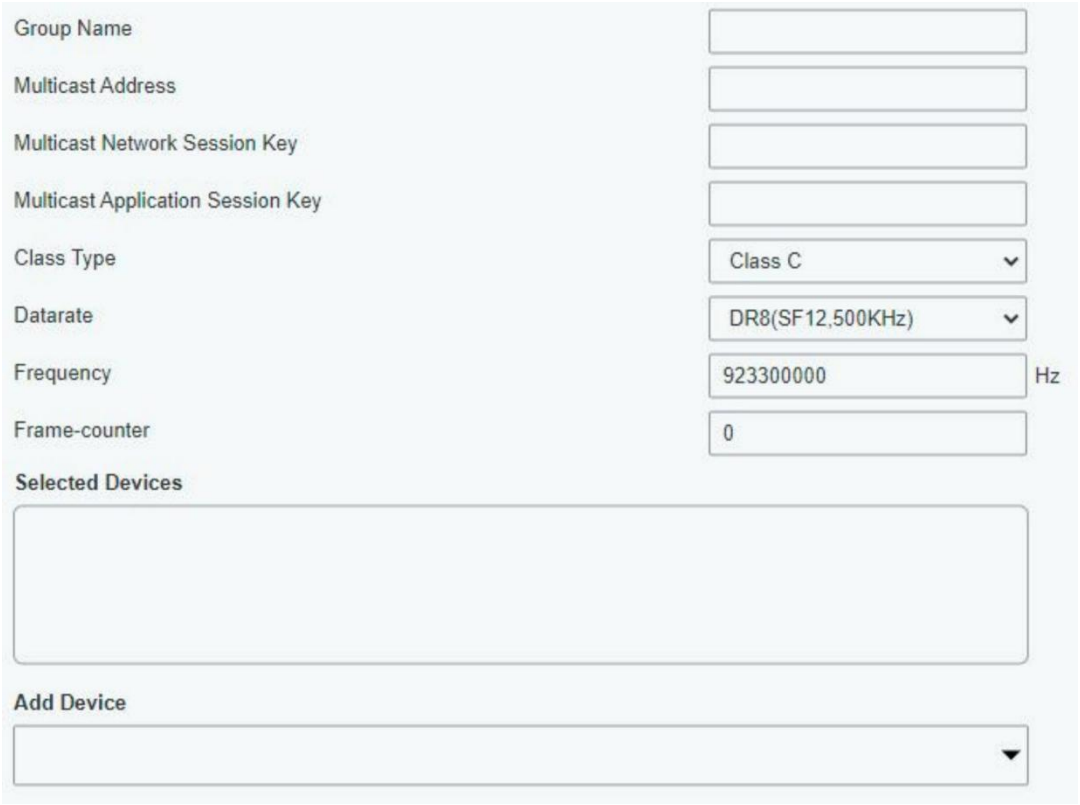


Figure 3-2-2-22

Multicast Group Configuration	
Item	Description
Group Name	Enter the name of this multicast group.
Multicast Address	Device address (Dev Addr) of all devices in this group.
Multicast Network Session Key	The network session key (Netwks Key) of all devices in this group.
Multicast Application Session Key	The application session key (AppSKey) of all devices in this group.
Class Type	Class B and Class C are optional.
Datarate	Datarate of the node receiving downlinks.
Frequency	Downlink frequency of all devices in this group.
Frame-counter	The number of data frames which received by the end-device downlink from the network server. It will be incremented by the network server.
Ping Slot Periodicity	Period of opening the pingslot. This is only applied to Class B end devices.

Selected Devices	Show all device names in this group.
Add Device	Add devices in the pull-down list.

Table 3-2-2-19 Multicast Group Setting Parameters

3.2.2.8 Gateway Fleet

Linovision gateways can connect to the gateway network server. A gateway supports to add 100 gateways at most.

Figure 3-2-2-23

Item	Description
Gateway ID	Show the gateway ID.
Name	Show the name of the gateway.
Status	Show the connection status of the gateway.
Last Seen	Show the time of last packet received.
Operation	Edit or delete the gateway.

Table 3-2-2-20 Gateway Fleet Parameters

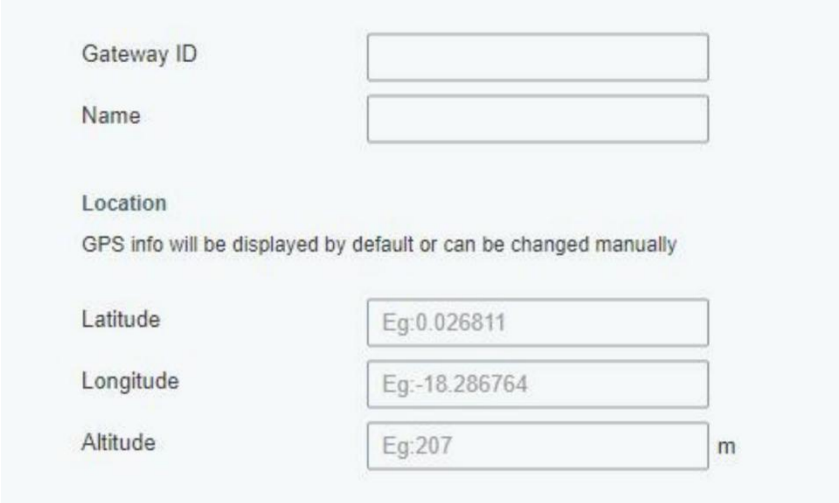


Figure 3-2-2-24

Item	Description
Gateway ID	Enter the unique gateway ID to recognize the gateway.
Name	Enter the name of this gateway.
Location	GPS data of the gateway can be edited here. If gateway sends GPS data it will replace your customized data.

Table 3-2-2-21 Gateway Setting Parameters

3.2.2.9 Packets

The gateway supports to display latest 1000 pieces of packets and send command to devices.

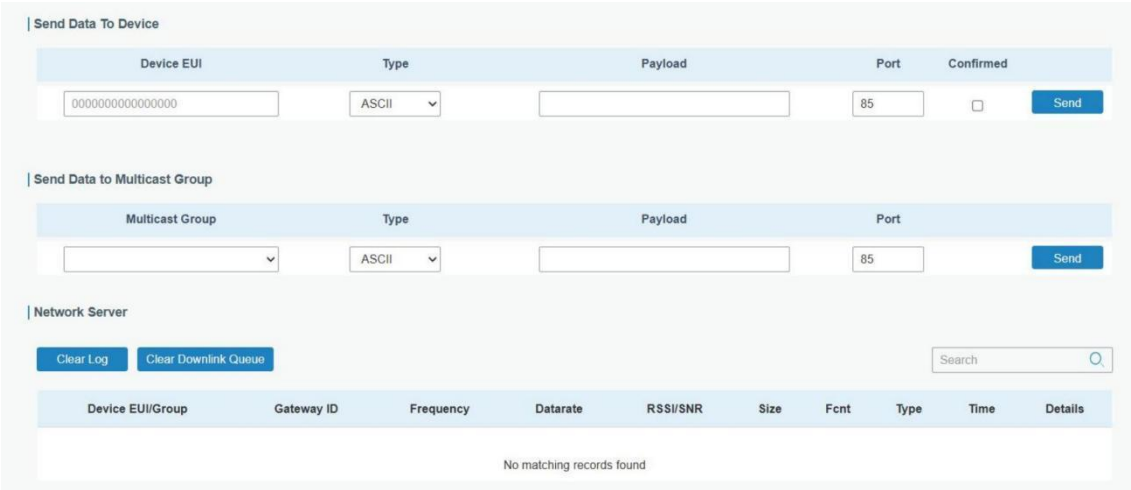


Figure 3-2-2-25

Send Data To Device/Multicast Group	
Item	Description
Device EUI	Enter the EUI of the device to receive the payload.
Multicast Group	Select the multicast group to send downlinks. Multicast groups can be added under Multicast Groups tab.
Type	Choose the payload type to enter in the payload Input box: ASCII, Hex, base64.
Payload	Enter the message to be sent to this device.
Port	Enter the LoRaWAN® frame port for packet transmission between device and Network Server.
Confirmed	After being enabled, the end device will receive downlink packet and should answer “confirmed” to the network server. The multicast feature does not support confirmed downlink.

Table 3-2-2-22 Send Data to Device Parameters

Network Server	
Item	Description
Clear Log	Clear the packet logs sent to the network server.
Clear Downlink Queue	Clear the downlink queue that is not sent to the device.
Device EUI/Group	Show the EUI of the device or multicast group.
Frequency	Show the used frequency to transmit packets.
Datarate	Show the used datarate to transmit packets.
SNR	Show the signal-noise ratio.
RSSI	Show the received signal strength indicator.
Size	Show the size of payload.
Fcnt	Show the frame counter.
Type	Show the type of the packet:

	JnAcc - Join Accept Packet JnReq - Join Request Packet UpUnc - Uplink Unconfirmed Packet UpCnf - Uplink Confirmed Packet - ACK response from network requested DnUnc - Downlink Unconfirmed Packet DnCnf - Downlink Confirmed Packet- ACK response from end-device requested
Time	Show the time of packet was sent or received.

Table 3-2-2-23 Packet Parameters

Click  to get more details about the packet. As shown:

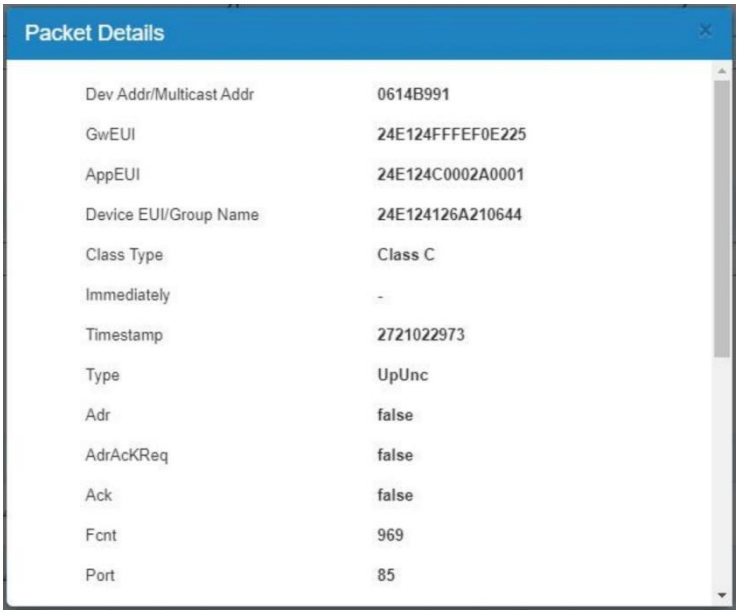


Figure 3-2-2-26

Item	Description
Dev Addr/Multicast Addr	Show the address of the device/multicast group.
GwEUI	Show the EUI of the gateway.
AppEUI	Show the App EUI of the end device.
DevEUI/Group Name	Show the EUI of the device/multicast group name.
Class Type	Show the class type of the device or multicast group.
Immediately	Whether to send this downlink packet immediately.
Timestamp	Show the time to receive this packet after packet forwarder starts running. Unit: ms
Type	Show the type of the packet: JnAcc - Join Accept Packet JnReq - Join Request Packet

	UpUnc - Uplink Unconfirmed Packet UpCnf - Uplink Confirmed Packet - ACK response from network requested DnUnc - Downlink Unconfirmed Packet DnCnf - Downlink Confirmed Packet- ACK response from end-device requested
Adr	True: The end-node has enabled ADR. False: The end-node has not enabled ADR.
AdrAcKReq	In order to validate that the network is receiving the uplink messages, nodes periodically transmit ADRACKReq message. This is 1 bit long. True: Network should respond in ADR_ACK_DELAY time to confirm that it is receiving the uplink messages. False: ADR is disabled or Network does not respond in ADR_ACK_DELAY.
Ack	True: This frame is ACK. False: This frame is not ACK.
Fcnt	Show the frame-counter of this packet.The network server tracks the uplink frame counter and generates the downlink counter for each end-device.
FPort	The FPort to transmit this packet. If this packet is MAC command, the port is 0; if this packet includes application data, the port is not 0 (1-233).
Modulation	LoRa means the physical layer uses the LoRa modulation.
Bandwidth	Show the bandwidth of this channel.
Spread Factor	Show the spread Factor of this channel.
Bitrate	Show the bitrate of this channel.
CodeRate	Show the coderate of this channel.
SNR	Show the SNR of this channel.
RSSI	Show the RSSI of this channel.
Power	Show the transmit power of the device.
Payload (b64)	Show the application payload of this packet.
Payload (hex)	Show the application payload of this packet.
Json	Show the data after decoding.
MIC	Show the MIC of this packet. MIC is a cryptographic message integrity code, computed over the fields MHDR, FHDR, FPort and the encrypted FRMPayload.

Table 3-2-2-24 Packets Details Parameters

Related Topic

Send Data to Device

3.3 Protocol Integration

3.3.1 BACnet Server

IOT-G65 can work as LoRaWAN to BACnet gateway, allowing easy integration with BMS system. Before using this feature, ensure the version of inbuilt payload codec library is latest and corresponding LoRaWAN® devices have added correct payload codec.

3.3.1.1 Server

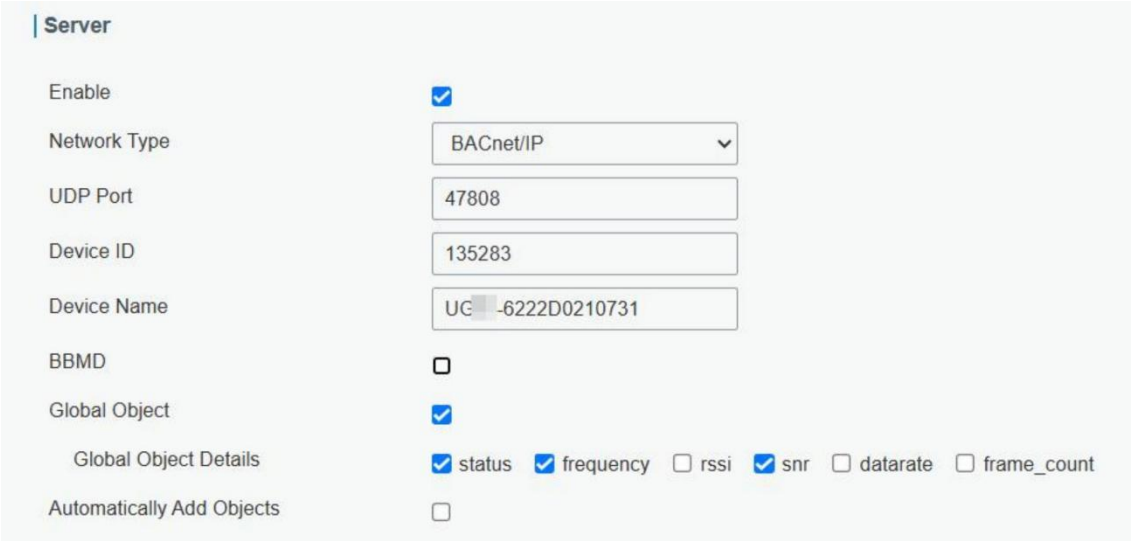


Figure 3-3-1-1

Server Settings	
Item	Description
Enable	Enable or disable BACnet server function.
Network Type	Select the network type as BACnet/IP or BACnet/SC.
Device ID	BACnet device ID of this gateway, must be unique on the BACet network.
Device Name	The unique name to represent the device in the BACnet network.
Global Object	After being enabled, the gateway will add the global objects for every device automatically. These global objects are not allowed to be deleted, unless this option is disabled. Status: device online/offline status Frequency: device uplink frequency Rssi: device uplink RSSI Snr: device uplink SNR Datarate: device uplink datarate Frame_count: device uplink frame count (FCNT)
Automatically Add Objects	After being enabled, the gateway will add objects according to the payload codec automatically when adding devices to network server.

Table 3-3-1-1 Server Parameters

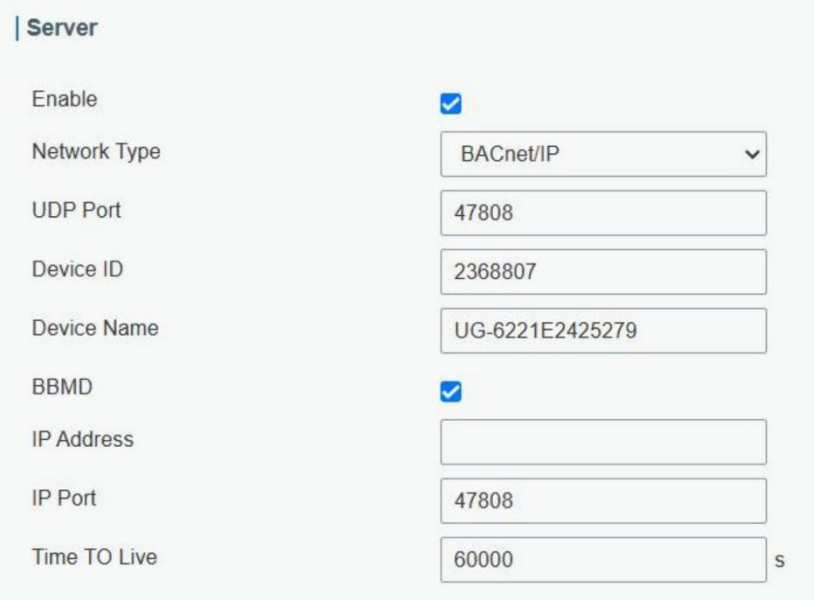


Figure 3-3-1-2

Server-BACnet/IP Settings	
Item	Description
UDP Port	Set communication port of BACnet/IP. Range: 1-65535. The default port is 47808.
BBMD	Enable BBMD (BACnet/IP Broadcast Management Device) if BACnet devices of different network subnets should work together. IP Address: Fill in the IP address of BBMD device or external device registrar. IP Port: Fill in the UDP/IP port for external device registration. Time TO Live: Number of seconds used on external device registration.

Table 3-3-1-2 Server-BACnet/IP Parameters

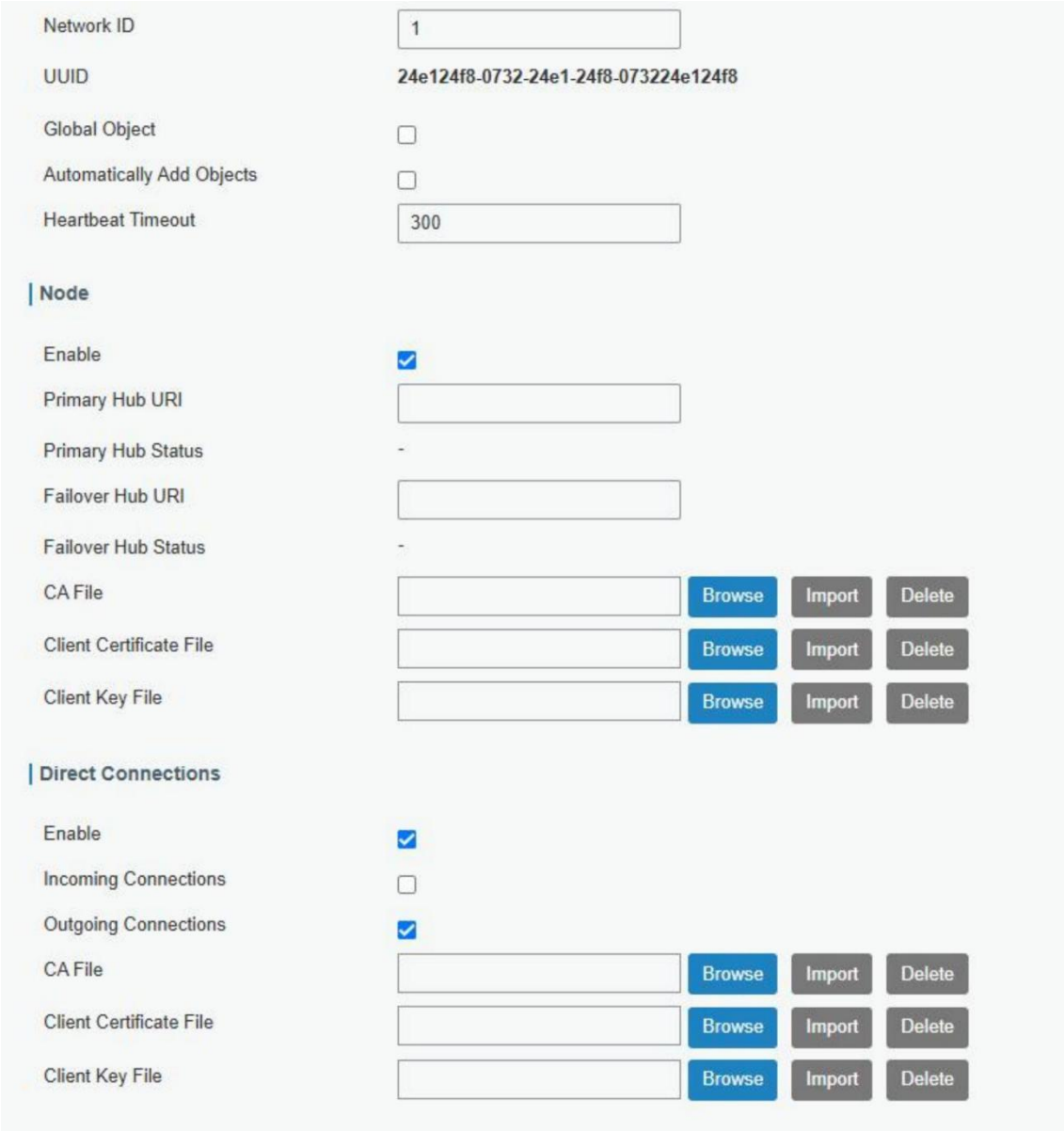


Figure 3-3-1-3

Server-BACnet/SC Settings	
Item	Description
Network ID	Set the network ID to identify the network. Only the devices with the same network ID can communicate with each other without routing.
UUID	Display the UUID of the gateway in the BACnet/SC network.
Heartbeat Timeout	Set the interval to send heartbeat packet to the hub or the node.
Node	
Enable	Enable or disable to work as a node
Primary Hub URI	Set the URI of the primary hub. URI format (address can be IP or domain name): *wss://address:port*
Primary Hub Status	Display the connection status between the node and the primary hub.
Failover Hub URI	Set the URI of the failover hub if the node fails to connect to the

	primary hub.
Failover Hub Status	Display the connection status between the node and the failover hub. URI format (address can be IP or domain name): *wss://address:port*
CA File Client Certificate File Client Key File	Click Browse to select the files from local path, then click Import to upload the files.
Direct Connections	
Enable	Enable or disable to set up connections with other nodes directly.
Incoming Connections	Enable or disable connections from other nodes. At maximum of 10 nodes can connect to this gateway. Port Number: Set the port number to allow the connection. CA File/Server Certificate File/Server Key File: Click Browse to select the files from local path, then click Import to upload the files. Device ID: Display the node device ID to connect to the gateway. UUID: Display the node device UUID to connect to the gateway. VMAC: Display the node device VMAC to connect to the gateway. Status: Display the connection status between the gateway and the node.
Outgoing Connections	Enable or disable to connect other nodes. A gateway can connect 10 nodes at most. CA File/Client Certificate File/Client Key File: Click Browse to select the files from local path, then click Import to upload the files. Name: Set the name of the node to connect. URI: Set the URI of the node to connect. URI format (address can be IP or domain name): *wss://address:port* Status: Display the connection status between the gateway and the node.

Table 3-3-1-3 Server-BACnet/SC Parameters

3.3.1.2 BACnet Object

Figure 3-3-1-2

Item	Description
Add Object	Click to select desired objects to add to this server. The gateway supports adding 10,000 objects at most.

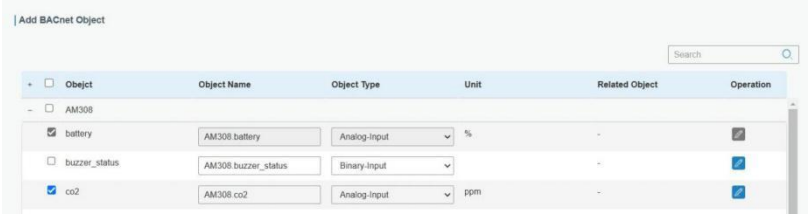
	Note: Ensure the content of payload codec is correct, and the device selects the correct payload codec. 
Add NC Object	Add a Notification-Class type object to determine the recipients of alarms. The gateway supports adding 200 NC objects at most.
Bulk Import	Download template to import multiple BACnet objects.
Bulk Export	Select desire objects to export as .xlsx format file.
Delete	Select desire objects to delete.
Object Name	Show the name of the BACnet object.
Object Type	Show the type of this object.
Object Instance Nr	Show the instance number of this object.
Present Value	Show the latest value of object.
Units	Show the unit of this object value.
Updates	Show the update times of this object value.
Update time	Show the time for this object to get and update the data.
COV	Show if COV (Change of value) is enabled.
Operation	Edit or delete the object.

Table 3-3-1-2 BACnet Object List Parameters

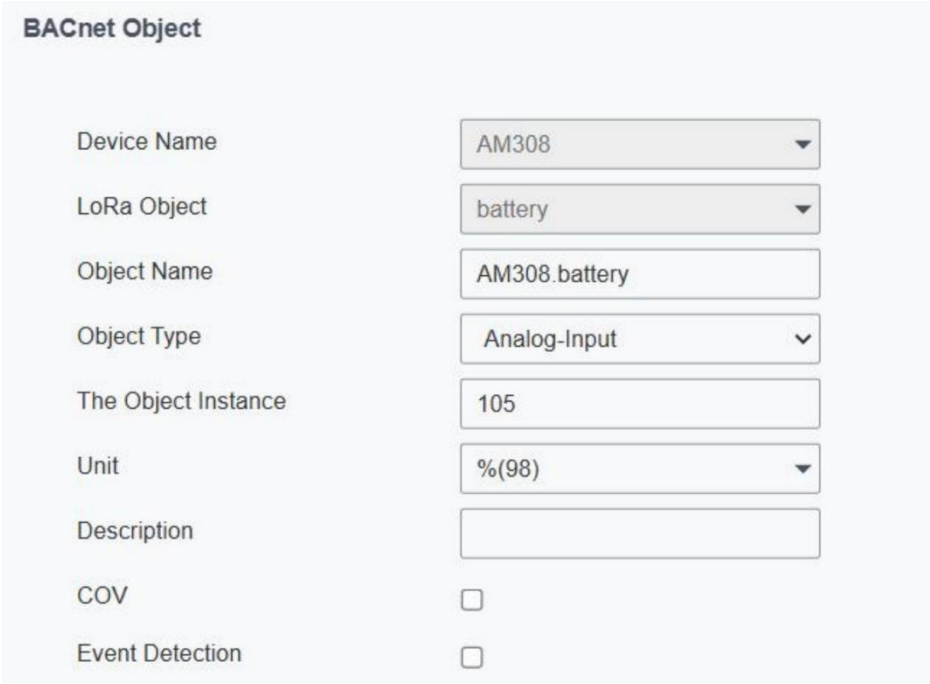


Figure 3-3-1-3

BACnet Object Configuration

Item	Description
Device Name	Show the name of devices.
LoRa Object	Show the corresponding name of LoRa object.
Object Name	Customize an unique name for this object.
Object Type	Select the object type as Binary Input/Output/Value, Analog Input/Output/Value, MultiState Input/Output/Value and CharacterString value.
The Object Instance	Customize the object instance.
Description	Enter the description of this object.
Event Detection	Enable to report the alarm of this value. It requires to define at least one notification class object first.
Analog Input/Output/Value	
Units	Select the unit of this object value.
COV	When object value changes, the BACnet server (gateway) will send notification of new value to BACnet client. This only applies to analog type objects.
COV Increment	Only when the object value reaches or over this increment, the BACnet server (gateway) will send the notification.
Relinquish Default	If there is no command, the analog output will be set as this relinquish default value.
Binary Input/Output/Value	
Polarity	Define the binary input/output status as Normal or Reverse.
Active Text	Characterize the intended effect of active state of binary type object value. Example: when a button is pressed and binary input is 1, active text can be defined as “Pressed”.
Inactive Text	Characterize the intended effect of inactive state of binary type object value. Example: for a button, inactive text can be defined as “Unpressed”.
Relinquish Default	If there is no command, the binary output will be set as this relinquish default value.
MultiState Input/Output/Value	
Number of States	Set the number of states and define the name of every state.
Relinquish Default	If there is no command, the multistate output will be set as this relinquish default value.
Event Detection	
Notification Class	Select the notification class to determine the recipients of this alarm.
Event	Select the event type to report.
Limit Event	When object type is analog type, select if reporting the event when reaching the high limit or low limit.
Deadband	Under To Offnormal status, when current value returns to (high

	limit-deadband) value or (low limit+deadband) lasting the delay time, the device will generate To Normal event. Only Analog types have this option.
Time Delay	Only when current value matches the threshold condition or is out of threshold for this time, the device will report the corresponding event.
Alarm Value	Report the To Offnormal event if the current value is equal to alarm value for delay time; report To Normal event if the current value is not equal to alarm value for delay time. Only Binary Input, Binary Value, Multi-State Input or Multi-State Value has this option.
Fault Value	Report the To Fault event if the current value is equal to fault value. Only Multi-State Input or Multi-State Value has this option.
Feedback Value	Report the To Offnormal event if the current value is equal to feedback value for delay time; report To Normal event if the current value is not equal to feedback value for delay time. Only Multi-State Output or Binary Output has this option.
Notification Type	Select the notification type as Alarm or Event.

Table 3-3-1-3 BACnet Object Configuration Parameters

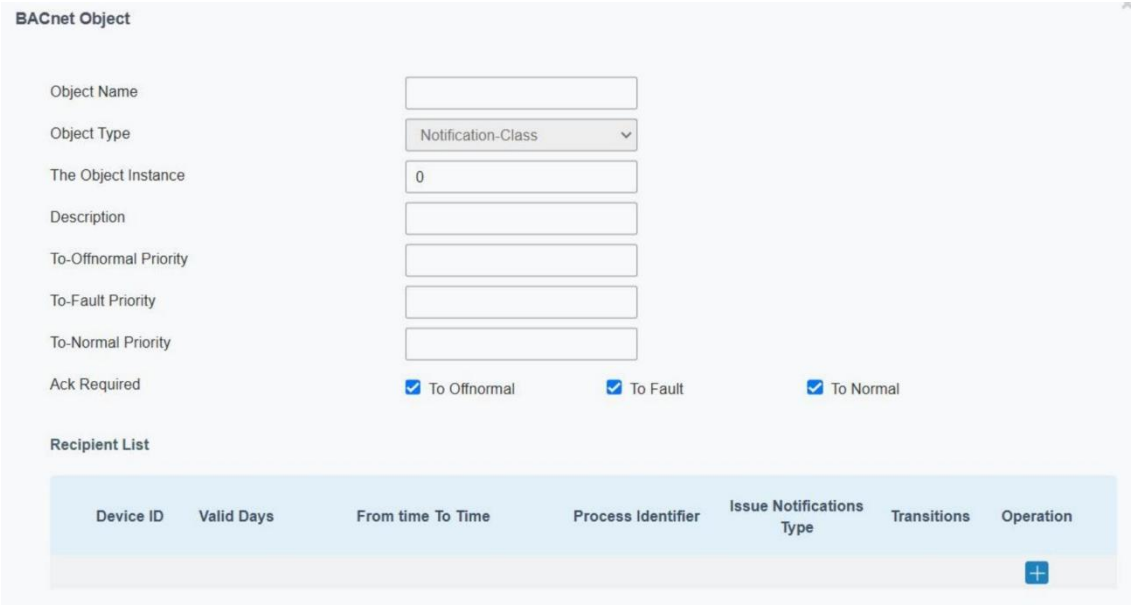


Figure 3-3-1-4

Notification Class BACnet Object Configuration	
Item	Description
Object Name	Customize a unique name for this object.
Object Type	It is fixed as Notification-Class.
The Object Instance	Customize the object instance.
Description	Enter the description of this object.
To-Offnormal	Set the priority number which is used by recipients to sort the event

Priority To-Fault Priority To-Normal Priority	notifications. Range: 0-255 (0 being most important, 255 least important)
Ack Required	Specify if this event requires the recipient to send the Acknowledgement Alarm message back to gateway.
Recipient List	When event detection is enabled and this notification class is selected, the event notification will be sent to recipients in this list. One list supports to add 10 recipients at most. Device ID: the target recipient device ID. Valid Days: valid days to send notifications. From time to time: valid time to send notifications. Process Identifier: the identifier to indicate what process the alarm is intended for. For example, maybe process identifier 1 means maintenance alarms, 2 means critical alarms and 3 means life safety alarms, etc. Issue Notifications Type: select the notification type as confirmed or unconfirmed. If the gateway does not receive the response of Confirmed notification, it will send the notification once again. Transitions: select the reported event types.

Table 3-3-1-4 Notification Class BACnet Object Configuration Parameters

3.3.2 Modbus Server

The gateway can work as Modbus server (slave) to receive Modbus RTU or Modbus TCP commands from PLC/BMS systems to read or write to LoRaWAN® devices. Before using this feature, ensure the version of inbuilt payload codec library is latest and corresponding LoRaWAN® devices have added correct payload codec.

3.3.2.1 Server

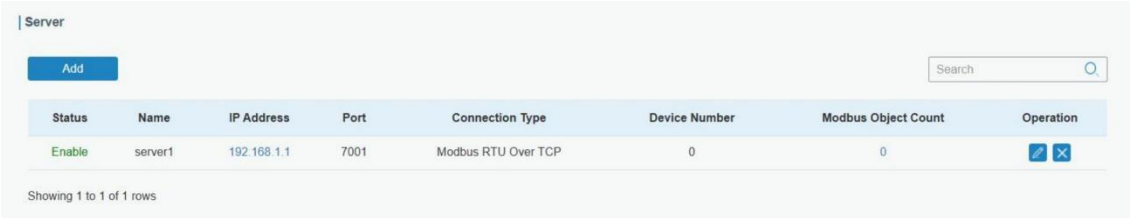


Figure 3-3-2-1

Item	Description
Add	Add a Modbus server (slave). One gateway supports to add 15 servers at most.
Status	Show the enable status of this server.
Name	Show the name of the server.
IP Address	Show the IP address of this server and click to check the details.
Port	Show the communication port of this server.

Connection Type	Show the connection type of this server.
Device Number	Show the device number of this server.
Modbus Object Count	Show the Modbus object amount of this server and click the number to check the details.
Operation	Edit or delete this server.

Table 3-3-2-1 Server Parameters

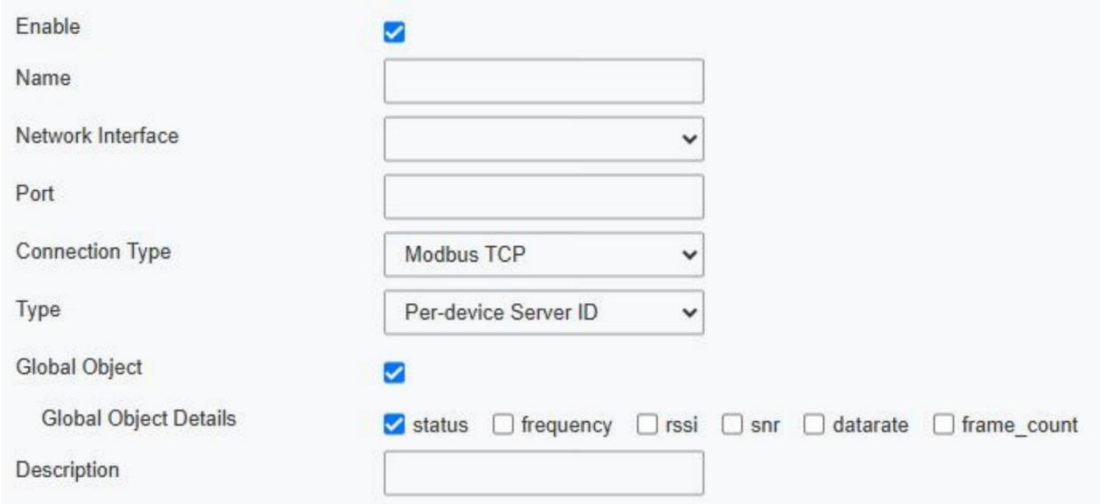


Figure 3-3-2-2

Server Settings	
Item	Description
Enable	Enable or disable this Modbus server.
Name	Customize a unique name to identify this server.
Network Interface	Select the network interface for this server to communicate with Modbus clients (master). The device supports to use different network interfaces to communicate with different remote platforms.
Port	Set communication port of this server. Range: 1-65535.
Connection Type	Select the connection type of this server. Modbus TCP: Modbus client will send Modbus TCP format commands to this Modbus server. Modbus RTU over TCP: Modbus client will send Modbus RTU format commands to this Modbus server.
Type	Set the server ID type of this Modbus server. This is used for Modbus client to identify every server. No server ID: all devices use any server ID. Per-device server ID: support configuring server ID for per device.
Global Object	After enabled, the gateway will add the global objects for every device automatically. These global objects is not allowed to delete, unless this option is disabled. Status: device online/offline status Frequency: device uplink frequency

	Rssi: device uplink RSSI Snr: device uplink SNR Datarate: device uplink datarate Frame_count: device uplink frame count (FCNT)
Description	Add description for this server.

Table 3-3-2-2 Server Settings Parameters

3.3.2.2 Modbus Object

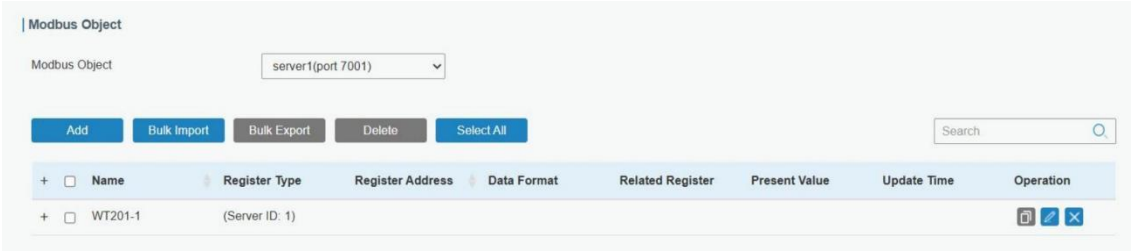
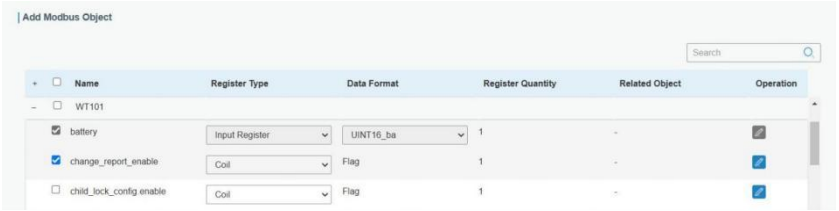


Figure 3-3-2-3

Item	Description
Modbus Object	Select the Modbus server to add and edit the objects.
Add	Click to select desired objects to add to this server. The gateway supports adding 10,000 objects at most. Note: Ensure the content of payload codec is correct, and the device selects the correct payload codec. 
Bulk Import	Download template to import multiple Modbus objects.
Bulk Export	Select desire objects to export as .xlsx format file.
Delete	Select desire objects to delete.
Select All/Deslect All	Select/Deselect all objects.
Name	Show the name of this object.
Register Type	Show the register type of this object.
Register Address	Show the register address of this object.
Data Format	Show the data format of this object.
Related Object	Show the related objects.
Present value	Show the latest value of object.
Update time	Show the time for this object to get and update the data.
Operation	: Edit the object. : Delete the object. : Select the objects that need to be copied, click this icon to add

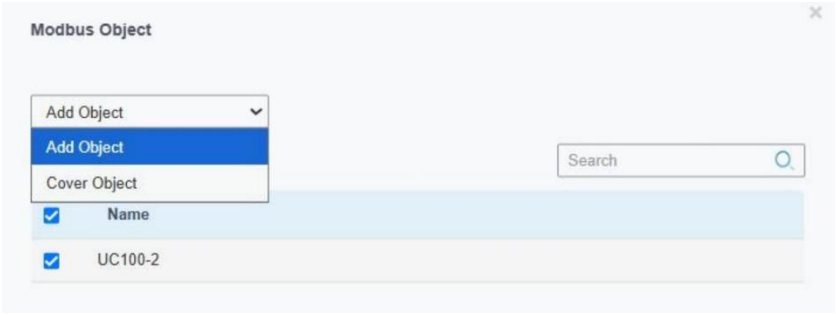
	or cover the objects to other same model devices. Add Object: add the objects to select devices. Cover Object: cover the objects to selected devices, and the original object settings of selected devices will be cleared. 

Table 3-3-2-3 Modbus Object List Parameters

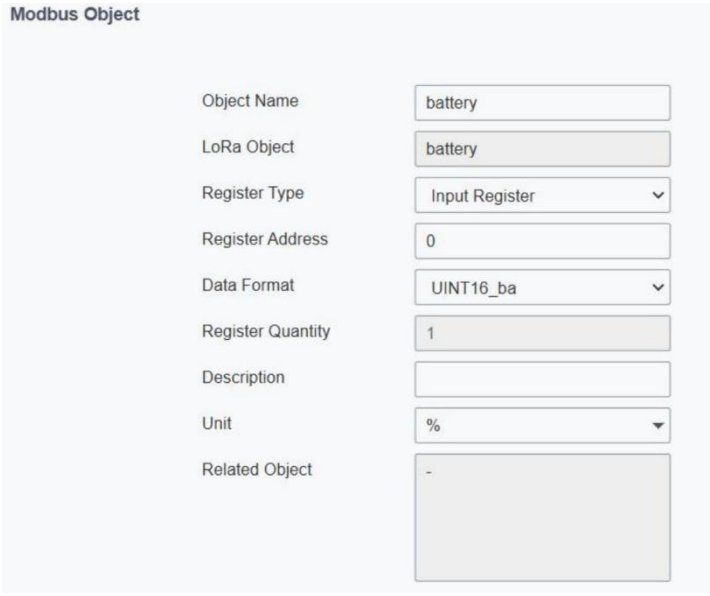


Figure 3-3-2-4

Modbus Object Configuration	
Item	Description
Object Name	Customize a unique name for this object.
LoRa Object	Show the corresponding name of LoRa object.
Object Name	Customize a unique name for this object.
Register Type	Select the Modbus register type. Discrete Input: read-only, only including 0 and 1 status. Coil: read-write, only including 0 and 1 status. Holding Register: read-write, including analog values, strings, etc. Input Register: read-only, including analog values, strings, etc.
Register Address	When adding an object, this address will generate automatically. And this address supports to change. Range: 0-65535 Note: 1) The address of the same register type must be different in one

	Modbus server. 2) The address is related to register quantity. If the address of this object is 0 and register quantity is 2, the address of next object must be 2(0+2) or higher values.
Data Format	Show or select the data format of this object.
Register Quantity	Show the register occupied quantity of this object.
Description	Enter the description of this object.
Unit	Select the unit of this object.
Related Register	Show the related registers. When writing this object, related registers should be written together. Otherwise, this object will fail to change.

Table 3-3-2-4 Modbus Object Configuration Parameters

3.4 Network

3.4.1 Interface

3.4.1.1 Port

The Ethernet port can be connected with Ethernet cable to get Internet access. It supports 3 connection types.

- Static IP: configure IP address, netmask and gateway for Ethernet WAN interface.
- DHCP Client: configure Ethernet WAN interface as DHCP Client to obtain IP address automatically.
- PPPoE: configure Ethernet WAN interface as PPPoE Client.

Figure 3-4-1-1

Port Setting		
Item	Description	Default
Port	The port that is fixed as eth0 port and enabled.	eth 0
Connection Type	Select from "Static IP", "DHCP Client" and "PPPoE".	DHCP
MTU	Set the maximum transmission unit.	1500
Primary DNS Server	Set the primary DNS.	8.8.8.8
Secondary DNS Server	Set the secondary DNS.	223.5.5.5
Enable NAT	Enable or disable NAT function. When enabled, a private IP can be translated to a public IP.	Enable

Table 3-4-1-1 Port Parameters

Related Configuration Example

Ethernet Connection

1. Static IP Configuration

If the external network assigns a fixed IP for the Ethernet port, user can select “Static IP” mode.

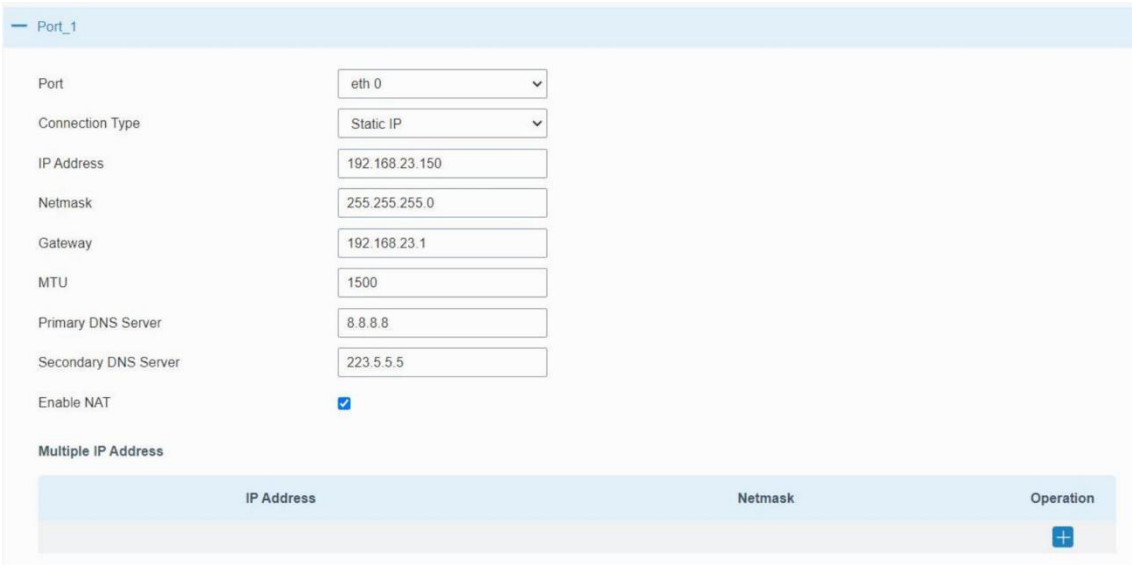


Figure 3-4-1-2

Static IP		
Item	Description	Default
IP Address	Set the IP address which can access Internet.	192.168.23.150
Netmask	Set the Netmask for Ethernet port.	255.255.255.0
Gateway	Set the gateway's IP address for Ethernet port.	192.168.23.1
Multiple IP Address	Set the multiple IP addresses for Ethernet port.	Null

Table 3-4-1-2 Static IP Parameters

2. DHCP Client

If the external network has DHCP server enabled and has assigned IP addresses to the Ethernet WAN interface, user can select “DHCP client” mode to obtain IP address automatically.

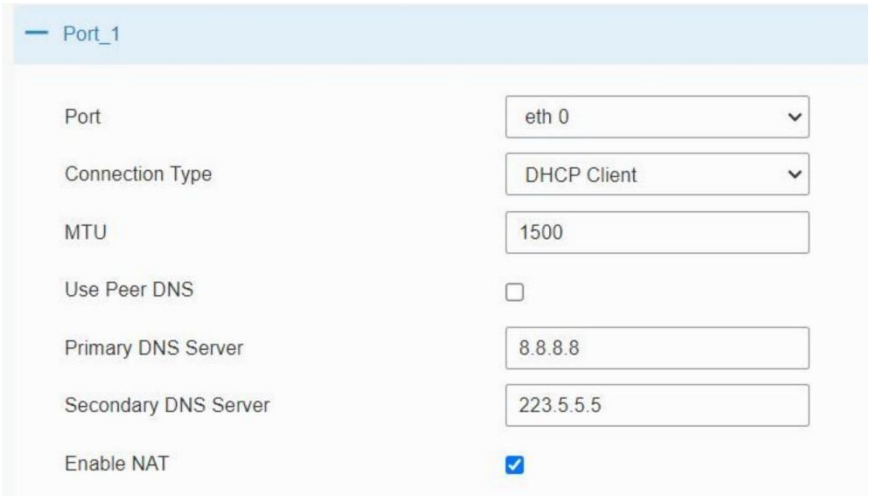


Figure 3-4-1-3

DHCP Client	
Item	Description
Use Peer DNS	Obtain peer DNS automatically during PPP dialing. DNS is necessary when user visits domain name.

Table 3-4-1-3 DHCP Client Parameters

3. PPPoE

PPPoE refers to a point to point protocol over Ethernet. User has to install a PPPoE client on the basis of original connection way. With PPPoE, remote access devices can get control of each user.

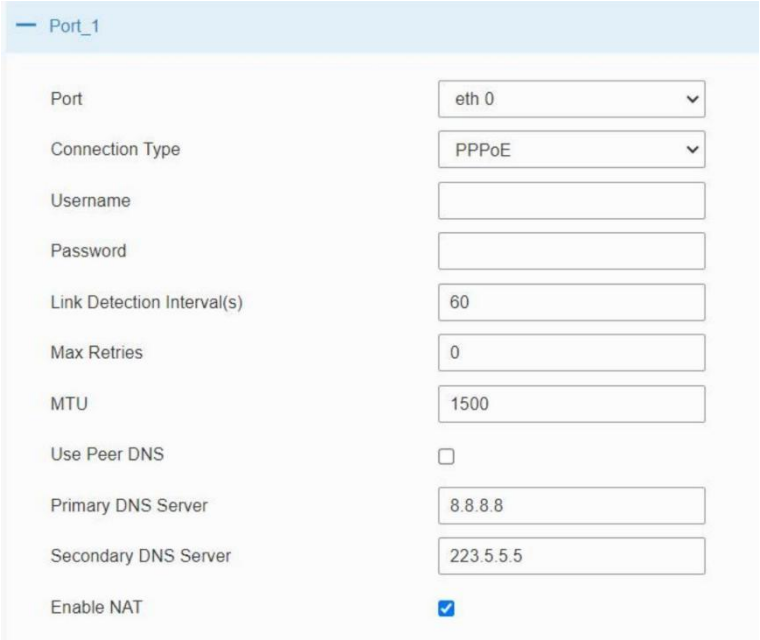


Figure 3-4-1-4

PPPoE	
Item	Description
Username	Enter the username provided by your Internet Service Provider (ISP).
Password	Enter the password provided by your Internet Service Provider (ISP).
Link Detection Interval (s)	Set the heartbeat interval for link detection. Range: 1-600.
Max Retries	Set the maximum retry times after it fails to dial up. Range: 0-9.
Use Peer DNS	Obtain peer DNS automatically during PPP dialing. DNS is necessary when user visits domain name.

Table 3-4-1-4 PPOE Parameters

3.4.1.2 WLAN

This section explains how to set the related parameters for Wi-Fi network. IOT-G65 supports 802.11 b/g/n, as AP or client mode.

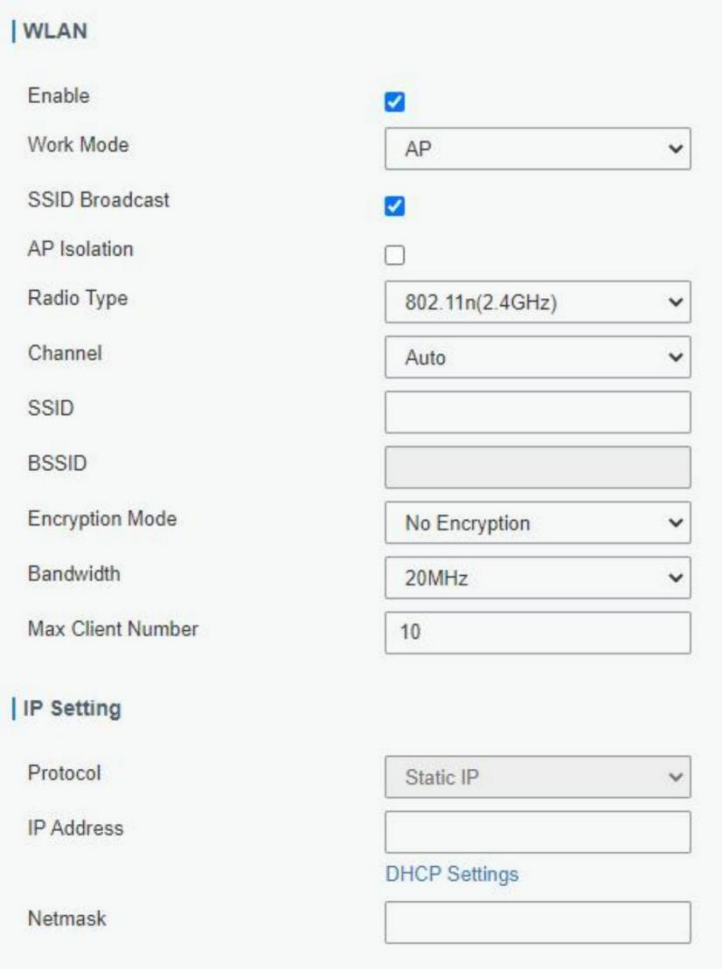


Figure 3-4-1-5

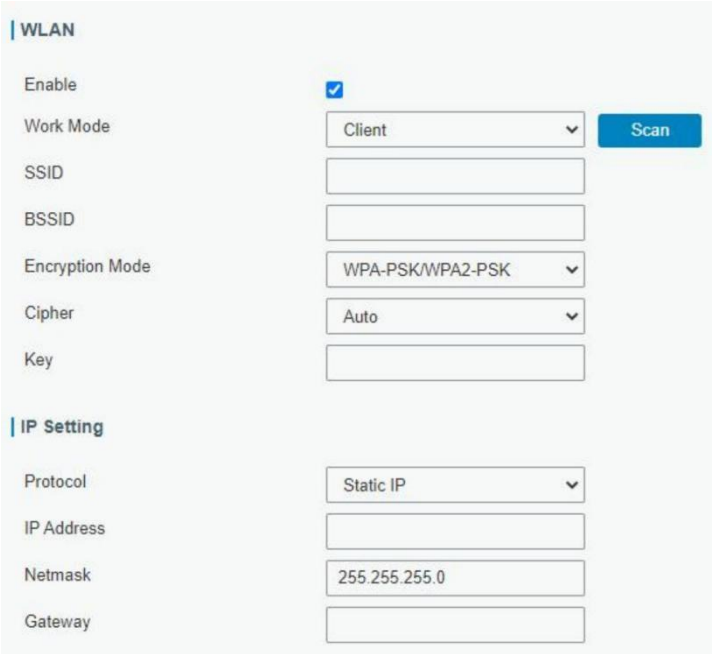


Figure 3-4-1-6

WLAN	
Item	Description

Enable	Enable/disable WLAN.
Work Mode	Select work mode. The options are "Client" or "AP".
AP Mode	
BSSID	Show the MAC address of this WLAN interface.
Radio Type	Select Radio type. The options are “802.11b (2.4 GHz)", “802.11g (2.4 GHz)", “802.11n (2.4 GHz)”.
Channel	Select wireless channel. The options are "Auto", "1", "2"....."11".
Bandwidth	Select bandwidth. The options are "20MHz" and "40MHz".
SSID	Fill in the SSID of the access point.
Encryption Mode	Select encryption mode. The options are “No Encryption", “WEP Open System", “WEP Shared Key", “WPA-PSK", “WPA2-PSK" and “WPA-PSK/WPA2-PSK".
Cipher	Select cipher of WPA encryption. The options are “Auto", “AES", “TKIP" and “AES/TKIP".
Key	Fill the key to connect to this access point. The default key is iotpassword.
Max Client Number	Set the maximum number of clients to access.
IP Setting	
Protocol	It’s fixed as Static IP.
IP Address	Set the IP address in wireless network.
Netmask	Set the netmask in wireless network.
Client Mode	
Scan	Click to scan the access points around this device.
SSID	Fill in the SSID of the access point.
BSSID	Fill in the MAC address of the access point. Either SSID or BSSID can be filled to join the network.
Encryption Mode	Select encryption mode. The options are “No Encryption", “WEP Open System", “WEP Shared Key", “WPA-PSK", “WPA2-PSK", “WPA-PSK/WPA2-PSK", “WPA-Enterprise”, “WPA2-Enterprise” and “WPA-Enterprise/WPA2-Enterprise”.
Cipher	Select cipher of WPA encryption. The options are “Auto", “AES", “TKIP" and “AES/TKIP".
Key	Fill the key to connect to this access point.
Xsupplicant Type	Select from “Peap”, “Leap”, “TLS” and “TTLS”.
User	Fill the username of WPA/WPA2-Enterprise.
Anonymous Identity	Fill the anonymous identity of WPA/WPA2-Enterprise.
Phase 2	Fill the phase of WPA/WPA2-Enterprise.
Public Server Certificate	The public server certificate used for verifying with WPA/WPA2-Enterprise access point.
IP Setting	
Protocol	Set the protocol to get the WLAN IP address.

IP Address	Set the IP address in wireless network when protocol is Static IP.
Netmask	Set the netmask in wireless network when protocol is Static IP.
Gateway	Set the gateway in wireless network when protocol is Static IP.
Primary DNS Server	Set the primary IPv4 DNS server.
Secondary DNS Server	Set the secondary IPv4 DNS server.

Table 3-4-1-5 WLAN Parameters

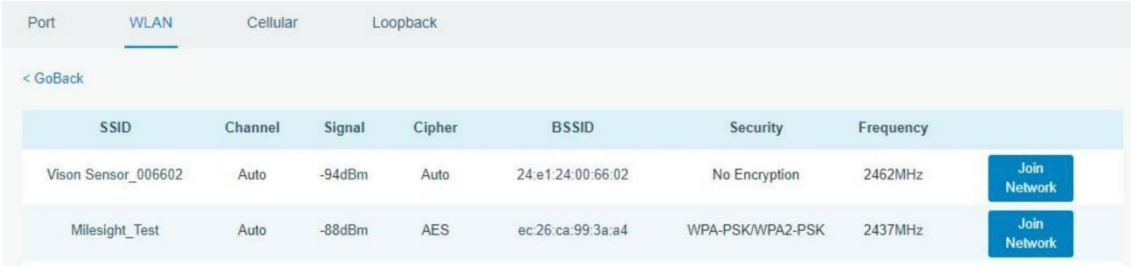


Figure 3-4-1-7

Client Mode-Scan	
SSID	Show SSID.
Channel	Show wireless channel.
Signal	Show wireless signal.
BSSID	Show the MAC address of the access point.
Security	Show the encryption mode.
Frequency	Show the frequency of radio.
Join Network	Click the button to join the wireless network.

Table 3-4-1-6 WLAN Scan Parameters

Related Topic

Wi-Fi Application Example

3.4.1.3 Cellular (Cellular Version Only)

This section explains how to set the related parameters for cellular network.

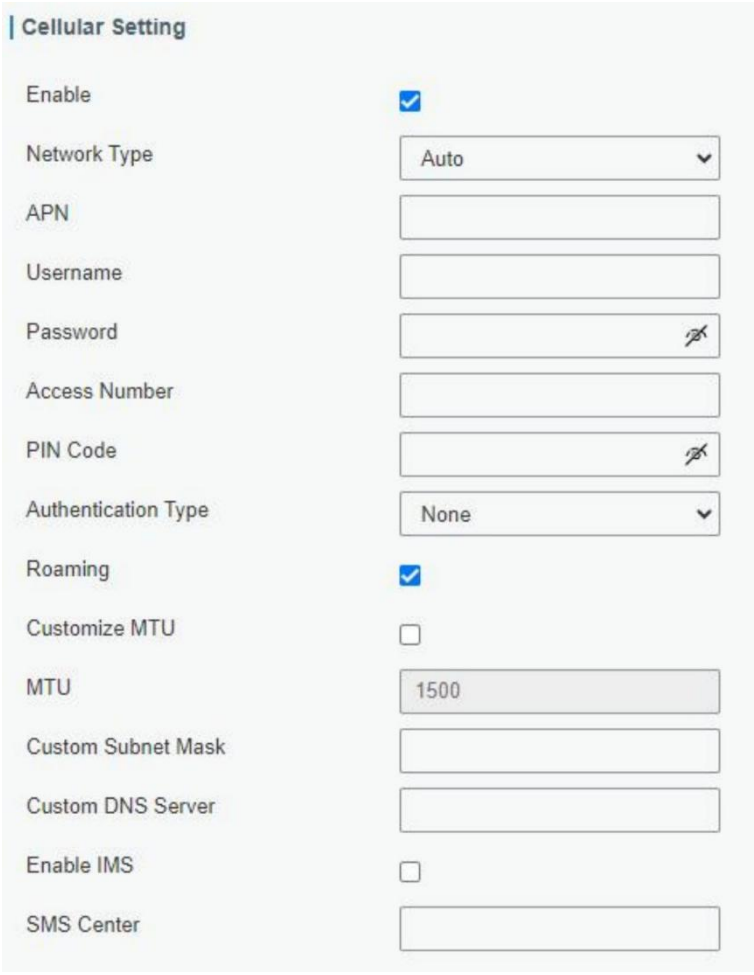


Figure 3-4-1-8

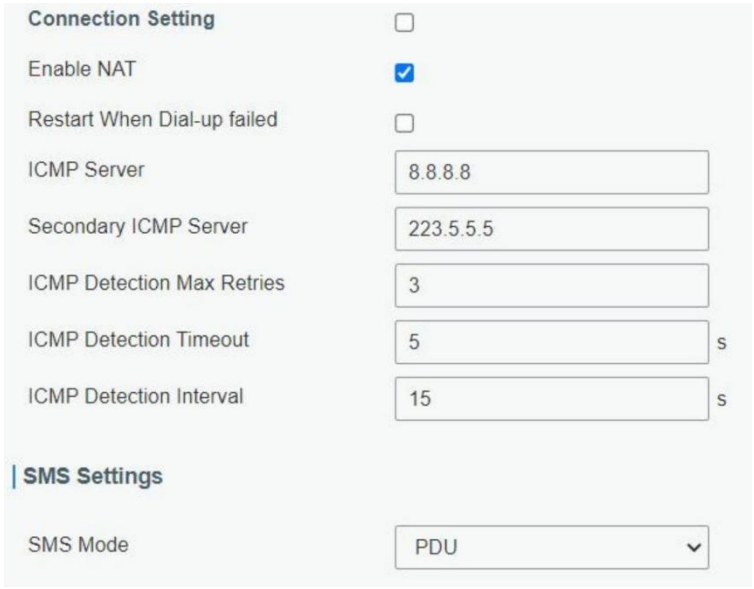


Figure 3-4-1-9

General Settings	
Item	Description
Enable	Check the option to enable cellular feature.

Network Type	Select from "Auto", "Auto 3G/4G", "4G Only" and "3G Only". Auto: connect to the network with the strongest signal automatically. 4G Only: connect to 4G network only. And so on.
APN	Enter the Access Point Name for cellular dial-up connection provided by local ISP.
Username	Enter the username for cellular dial-up connection provided by local ISP.
Password	Enter the password for cellular dial-up connection provided by local ISP.
Access Number	Enter the dial-up center NO. For cellular dial-up connection provided by local ISP.
PIN Code	Enter a 4-8 characters PIN code to unlock the SIM.
Authentication Type	Select from "None", "PAP", "CHAP".
Roaming	Enable or disable roaming.
Customized MTU	Enable or disable to customize the maximum transmission units. When disabled, the device will use operator's MTU settings.
MTU	Set the maximum transmission units. Range: 68-1500.
Custom Subnet Mask	Customize the cellular subnet mask. If blank, the device will use the subnet mask provided by the cellular base station. Note: this feature is only supported by parts of cellular modules.
Custom DNS Server	Customize the cellular DNS server. If blank, the device will use the DNS server provided by the cellular provider.
Enable IMS	Enable or disable IMS function.
SMS Center	Enter the local SMS center number for storing, forwarding, converting and delivering SMS message. Note: Some sub-models do not support this feature, please refer to corresponding datasheets.
Enable NAT	Enable or disable NAT function.
Restart When Dial-up failed	When this function is enabled, the gateway will restart automatically if the dial-up fails several times.
ICMP Server	Set the ICMP detection server's IP address. Note: Please get in touch with the ISP to determine whether ping detection is allowed and get the correct ICMP server addresses. If ping detection is not allowed, leave this sever address blank.
Secondary ICMP Server	Set the secondary ICMP detection server's IP address.
ICMP Detection Max Retries	Set max number of retries when ICMP detection fails.
ICMP Detection Timeout	Set timeout of ICMP detection.

ICMP Detection Interval	Set interval of ICMP detection.
SMS Mode	Select SMS mode from “TEXT” and “PDU”.

Table 3-4-1-7 Cellular Parameters

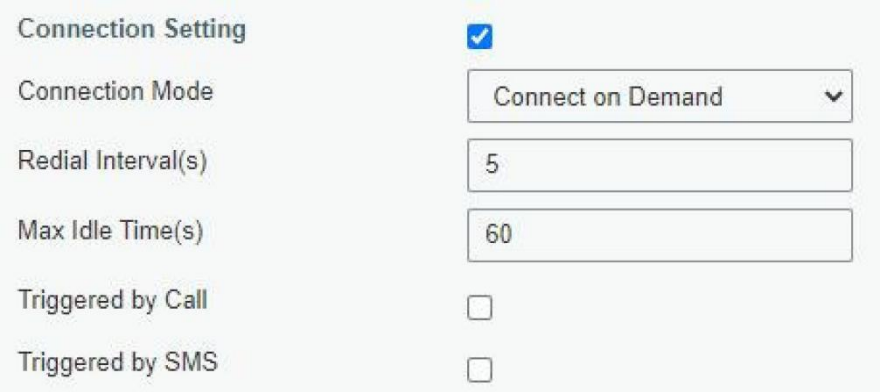


Figure 3-4-1-10

Item	Description
Connection Mode	
Connection Mode	Select from "Always Online" and "Connect on Demand".
Redial Interval(s)	Set the time interval between redials. Range: 0-3600.
Max Idle Time(s)	Set the maximum duration of the gateway when current link is under idle status. Range: 10-3600.
Triggered by Call	The gateway will switch from offline mode to cellular network mode automatically when it receives a call from the specific phone number.
Call Group	Select a call group for call trigger. Go to System > General Settings > Phone to set up phone group.
Triggered by SMS	The gateway will switch from offline mode to cellular network mode automatically when it receives a specific SMS from the specific mobile phone.
SMS Group	Select a SMS group for trigger. Go to System > General Settings > Phone to set up SMS group.
SMS Text	Fill in the SMS content for triggering.

Table 3-4-1-8 Cellular Parameters

Related Topics

Cellular Connection Application Example

Phone Group

3.4.1.4 Loopback

Loopback interface is used for replacing gateway's ID as long as it is activated. When the interface is DOWN, the ID of the gateway has to be selected again which leads to long convergence time of OSPF. Therefore, Loopback interface is generally recommended as the ID of the gateway.

Loopback interface is a logic and virtual interface on gateway. Under default conditions,

there's no loopback interface on gateway, but it can be created as required.

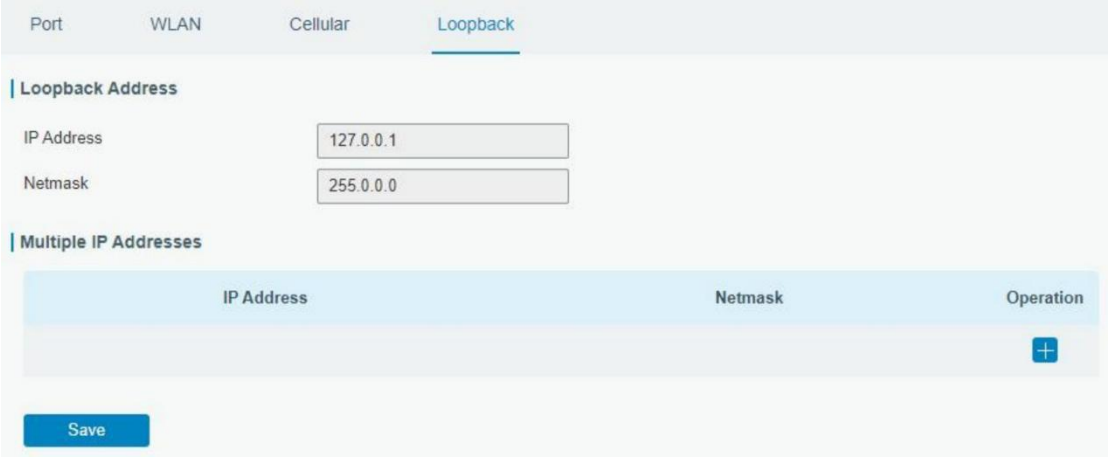


Figure 3-4-1-11

Loopback		
Item	Description	Default
IP Address	Unalterable	127.0.0.1
Netmask	Unalterable	255.0.0.0
Multiple IP Addresses	Apart from the IP above, user can configure other IP addresses.	Null

Table 3-4-1-9 Loopback Parameters

3.4.1.5 VLAN Trunk

IOT-G65 gateway supports the Ethernet port working as VLAN Trunk client and be assigned a VLAN ID, which easy to traffic classification. When VLAN ID is set, port on "Network" > "Interface" > "Port" can be chosen as eth0.x with x being VLAN ID. VLAN Setting is blank by default, you can add a new VLAN label to certain interface by clicking  .

Figure 3-4-1-12

VLAN Trunk	
Item	Description
Interface	Select the VLAN interface, it's fixed as eth0.
VID	Set the label ID of the VLAN. Range: 1-4094.

Table 3-4-1-10 VLAN Trunk Parameters

3.4.2 Firewall

This section describes how to set the firewall parameters, including website block, ACL,

DMZ, Port Mapping and MAC Binding.

The firewall implements corresponding control of data flow at entry direction (from Internet to local area network) and exit direction (from local area network to Internet) according to the content features of packets, such as protocol style, source/destination IP address, etc. It ensures that the gateway operate in a safe environment and host in local area network.

3.4.2.1 Security

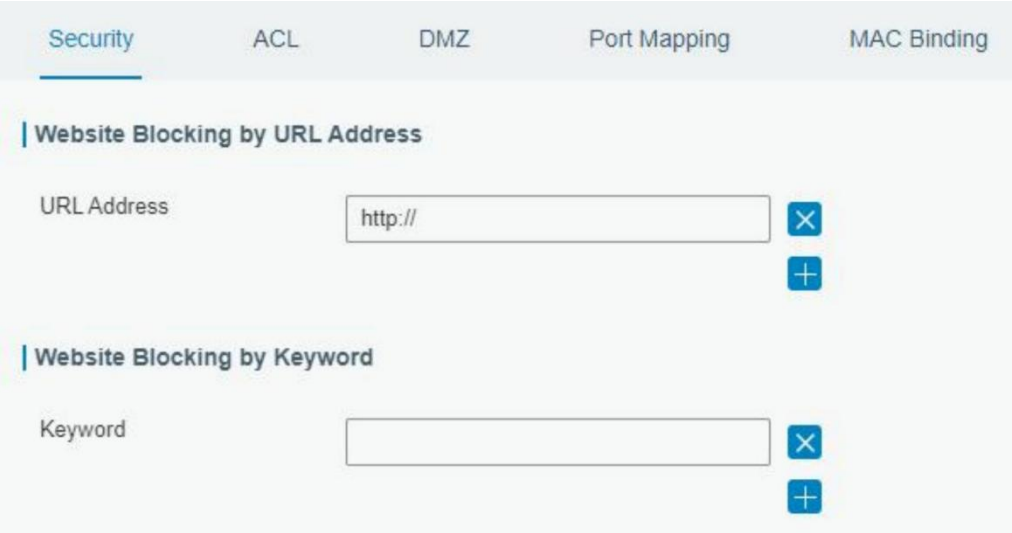


Figure 3-4-2-1

Website Blocking	
URL Address	Enter the HTTP address which you want to block.
Keyword	You can block specific website by entering keyword. The maximum number of character allowed is 64.

Table 3-2-2-1 Security Parameters

3.4.2.2 ACL

Access control list, also called ACL, implements permission or prohibition of access for specified network traffic (such as the source IP address) by configuring a series of matching rules so as to filter the network interface traffic. When gateway receives packet, the field will be analyzed according to the ACL rule applied to the current interface. After the special packet is identified, the permission or prohibition of corresponding packet will be implemented according to preset strategy.

The data package matching rules defined by ACL can also be used by other functions requiring flow distinction.

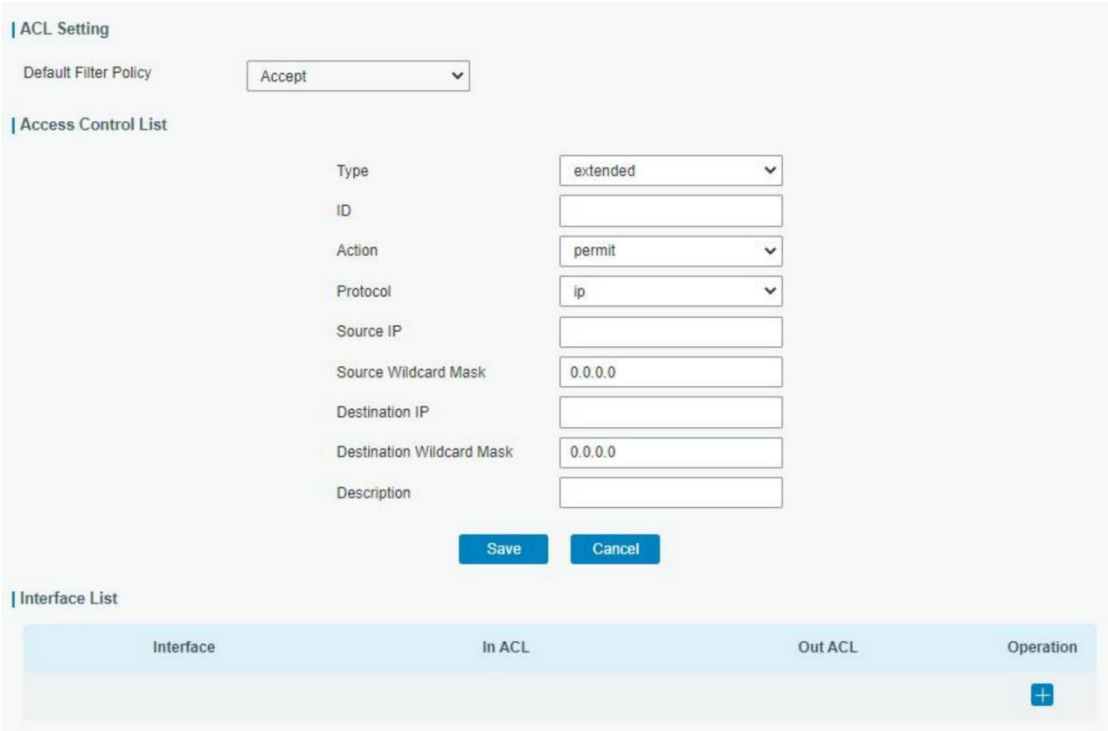


Figure 3-4-2-2

Item	Description
ACL Setting	
Default Filter Policy	Select from "Accept" and "Deny". The packets which are not included in the access control list will be processed by the default filter policy.
Access Control List	
Type	Select type from "Extended" and "Standard".
ID	User-defined ACL number. Range: 1-199.
Action	Select from "Permit" and "Deny".
Protocol	Select protocol from "ip", "icmp", "tcp", "udp", and "1-255".
Source IP	Source network address (leaving it blank means all).
Source Wildcard Mask	Wildcard mask of the source network address.
Destination IP	Destination network address (0.0.0.0 means all).
Destination Wildcard Mask	Wildcard mask of destination address.
Description	Fill in a description for the groups with the same ID.
ICMP Type	Enter the type of ICMP packet. Range: 0-255.
ICMP Code	Enter the code of ICMP packet. Range: 0-255.
Source Port Type	Select source port type, such as specified port, port range, etc.
Source Port	Set source port number. Range: 1-65535.
Start Source Port	Set start source port number. Range: 1-65535.
End Source Port	Set end source port number. Range: 1-65535.

Destination Port Type	Select destination port type, such as specified port, port range, etc.
Destination Port	Set destination port number. Range: 1-65535.
Start Destination Port	Set start destination port number. Range: 1-65535.
End Destination Port	Set end destination port number. Range: 1-65535.
More Details	Show information of the port.
Interface List	
Interface	Select network interface for access control.
In ACL	Select a rule for incoming traffic from ACL ID.
Out ACL	Select a rule for outgoing traffic from ACL ID.

Table 3-4-2-2 ACL Parameters

3.4.2.4 Port Mapping (DNAT)

When external services are needed internally (for example, when a website is published ext ernally), the external address initiates an active connection. And, the router or the gateway on the firewall receives the connection. Then it will convert the connection into the an internal connection. This conversion is called DNAT, which is mainly used for external and interval services.

Click  to add a new port mapping rules.

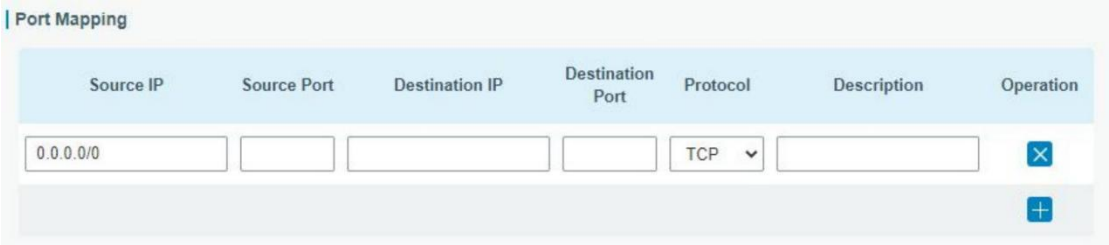


Figure 3-4-2-4

Port Mapping	
Item	**Description**
Source IP	Specify the host or network which can access local IP address. 0.0.0.0/0 means all.
Source Port	Enter the TCP or UDP port from which incoming packets are forwarded. Range: 1-65535.
Destination IP	Enter the IP address that packets are forwarded to after being received on the incoming interface.
Destination Port	Enter the TCP or UDP port that packets are forwarded to after being received on the incoming port(s). Range: 1-65535.
Protocol	Select from "TCP" and "UDP" as your application required.
Description	The description of this rule.

Table 3-4-2-4 Port Mapping Parameters

Related Configuration Example

NAT Application Example

3.4.2.3 DMZ

DMZ is a host within the internal network that has all ports exposed, except those forwarded ports in port mapping.

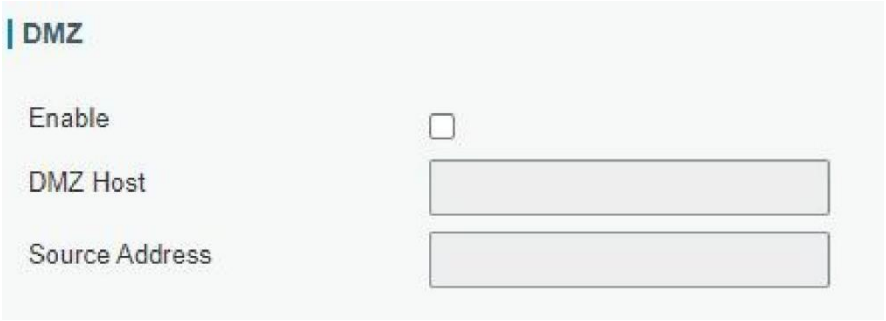


Figure 3-4-2-3

DMZ	
Item	Description
Enable	Enable or disable DMZ.
DMZ Host	Enter the IP address of the DMZ host on the internal network.
Source Address	Set the source IP address which can access to DMZ host. "0.0.0.0/0" means any address.

Table 3-4-2-3 DMZ Parameters

3.4.2.5 MAC Binding

MAC Binding is used for specifying hosts by matching MAC addresses and IP addresses that are in the list of allowed outer network access.

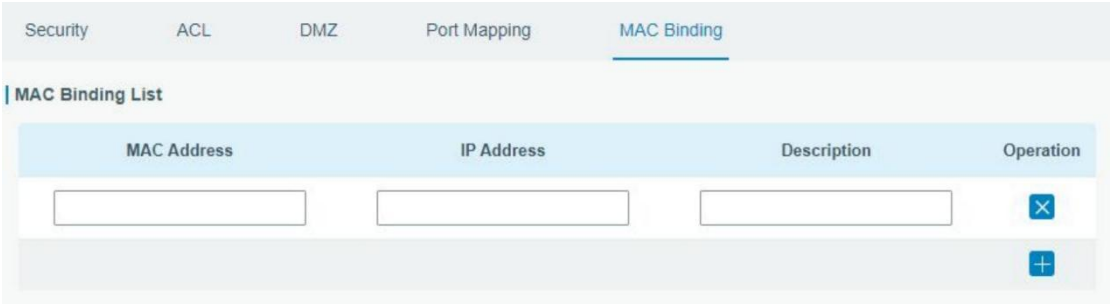


Figure 3-4-2-5

MAC Binding List	
Item	Description
MAC Address	Set the binding MAC address.
IP Address	Set the binding IP address.
Description	Fill in a description for convenience of recording the meaning of the binding rule for each piece of MAC-IP.

Table 3-4-2-5 MAC Binding Parameters

3.4.3 DHCP

IOT-G65 can be set as a DHCP server to distribute IP address when Wi-Fi work as AP mode.

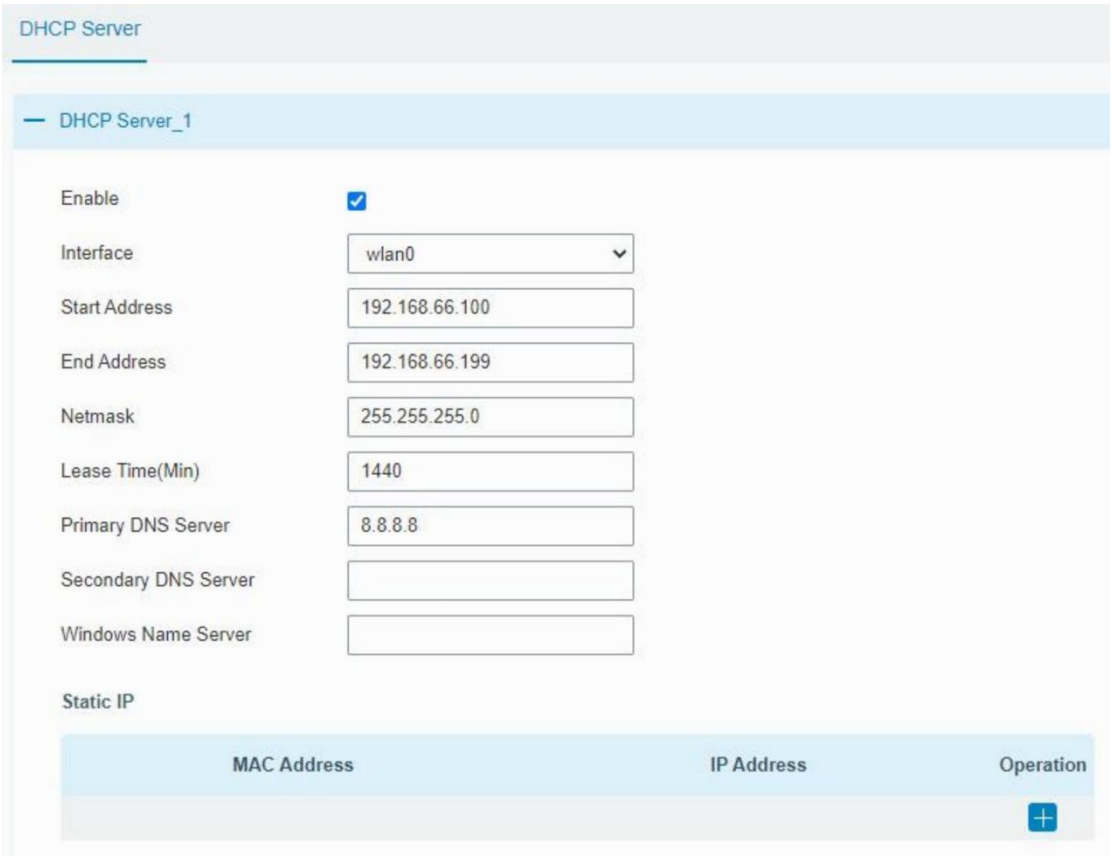


Figure 3-4-3-1

DHCP Server		
Item	Description	Default
Enable	Enable or disable DHCP server.	Enable
Interface	Only wlan interface is allowed to distribute IP addresses.	wlan0
Start Address	Define the beginning of the pool of IP addresses which will be leased to DHCP clients.	192.168.1.100
End Address	Define the end of the pool of IP addresses which will be leased to DHCP clients.	192.168.1.199
Netmask	Define the subnet mask of IP address obtained by DHCP clients from DHCP server.	255.255.255.0
Lease Time (Min)	Set the lease time on which the client can use the IP address obtained from DHCP server. Range: 1-10080.	1440
Primary DNS Server	Set the primary DNS server.	8.8.8.8
Secondary DNS Server	Set the secondary DNS server.	Null
Windows Name	Define the Windows Internet Naming Service obtained by DHCP clients from DHCP sever. Generally you can	Null

Server	leave it blank.	
Static IP		
MAC Address	Set a static and specific MAC address for the DHCP client (it should be different from other MACs so as to avoid conflict).	Null
IP Address	Set a static and specific IP address for the DHCP client (it should be outside of the DHCP range).	Null

Table 3-4-3-1 DHCP Server Parameters

3.4.4 DDNS

Dynamic DNS (DDNS) is a method that automatically updates a name server in the Domain Name System, which allows user to alias a dynamic IP address to a static domain name.

DDNS serves as a client tool and needs to coordinate with DDNS server. Before starting configuration, user shall register on a website of proper domain name provider and apply for a domain name.

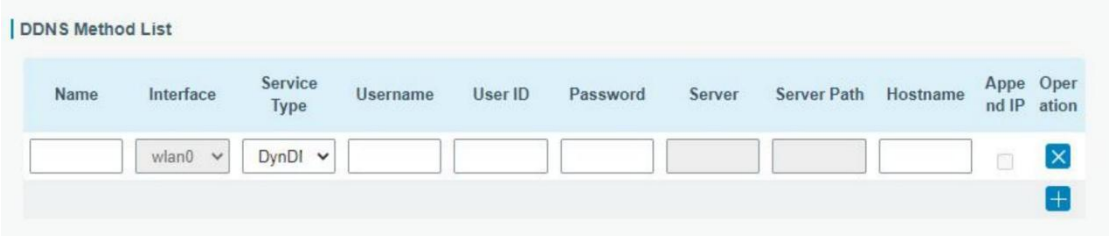


Figure 3-4-4-1

DDNS	
Item	Description
Name	Give the DDNS a descriptive name.
Interface	Set interface bundled with the DDNS.
Service Type	Select the DDNS service provider.
Username	Enter the username for DDNS register.
User ID	Enter User ID of the custom DDNS server.
Password	Enter the password for DDNS register.
Server	Enter the name of DDNS server.
Hostname	Enter the hostname for DDNS.
Append IP	Append your current IP to the DDNS server update path.

Table 3-4-4-1 DDNS Parameters

3.4.5 Link Failover

This section describes how to configure link failover strategies, such as VRRP strategies.

Configuration Steps

1. Define one or more SLA operations (ICMP probe).
2. Define one or more track objects to track the status of SLA operation.
3. Define applications associated with track objects, such as VRRP or static routing.

3.4.5.1 SLA

SLA setting is used for configuring link probe method. The default probe type is ICMP.

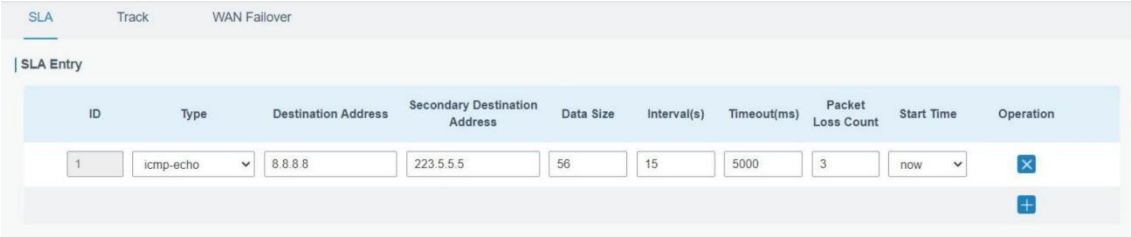


Figure 3-4-5-1

SLA		
Item	Description	Default
ID	SLA index. Up to 10 SLA settings can be added. Range: 1-10.	1
Type	ICMP-ECHO is the default type to detect if the link is alive.	icmp-echo
Destination Address	The detected IP address.	8.8.8.8
Secondary Destination Address	The secondary detected IP address.	223.5.5.5
Data Size	User-defined data size. Range: 0-1000.	56
Interval (s)	User-defined detection interval. Range: 1-608400.	30
Timeout (ms)	User-defined timeout for response to determine ICMP detection failure. Range: 1-300000.	5000
Packet Loss Count	Define packet loss count in each SLA probe. SLA probe fails when the preset packet loss count is exceeded.	5
Start Time	Detection start time; select from "Now" and blank character. Blank character means this SLA detection doesn't start.	now

Table 3-4-5-1 SLA Parameters

3.4.5.2 Track

Track setting is designed for achieving linkage among SLA module, Track module and Application module. Track setting is located between application module and SLA module with main function of shielding the differences of various SLA modules and providing unified interfaces for application module.

Linkage between Track Module and SLA module

Once you complete the configuration, the linkage relationship between Track module and SLA module will be established. SLA module is used for detection of link status, network performance and notification of Track module. The detection results help track status change timely.

- For successful detection, the corresponding track item is Positive.
- For failed detection, the corresponding track item is Negative.

Linkage between Track Module and Application Module

After configuration, the linkage relationship between Track module and Application module will be established. When any change occurs in track item, a notification that requires corresponding treatment will be sent to Application module.

Currently, the application modules like VRRP and static routing can get linkage with track module.

If it sends an instant notification to Application module, the communication may be interrupted in some circumstances due to routing's failure like timely restoration or other reasons. Therefore, user can set up a period of time to delay notifying application module when the track item status changes.

Figure 3-4-5-2

Item	Description	Default
Index	Track index. Up to 10 track settings can be configured. Range: 1-10.	1
Type	The options are "sla" and "interface".	SLA
SLA ID	Defined SLA ID.	1
Interface	Select the interface whose status will be detected.	cellular0
Negative Delay (s)	When interface is down or SLA probing fails, it will wait according to the time set here before actually changing its status to Down. Range: 0-180 (0 refers to immediate switching).	0
Positive Delay (s)	When failure recovery occurs, it will wait according to the time set here before actually changing its status to Up. Range: 0-180 (0 refers to immediate switching).	1

Table 3-4-5-2 Track Parameters

3.4.5.3 WAN Failover

WAN failover refers to failover between Ethernet WAN interface and cellular interface. When service transmission can't be carried out normally due to malfunction of a certain interface or lack of bandwidth, the rate of flow can be switched to backup interface quickly. Then the backup interface will carry out service transmission and share network flow so as

to improve reliability of communication of data equipment.

When link state of main interface is switched from up to down, system will have the pre-set delay works instead of switching to link of backup interface immediately. Only if the state of main interface is still down after delay, will the system switch to link of backup interface. Otherwise, system will remain unchanged.

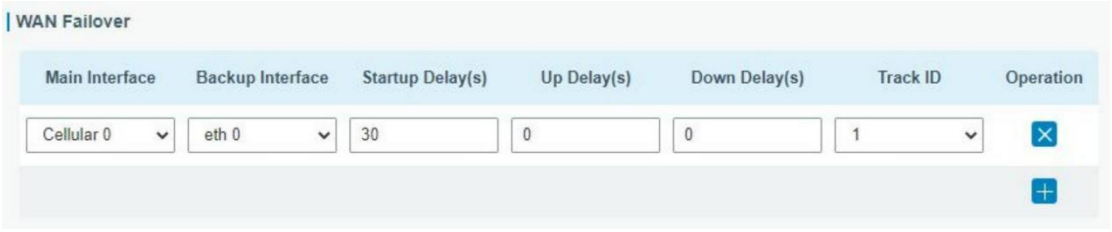


Figure 3-4-5-3

WAN Failover		
Parameters	Description	Default
Main Interface	Select a link interface as the main link.	--
Backup Interface	Select a link interface as the backup link.	--
Startup Delay (s)	Set how long to wait for the startup tracking detection policy to take effect. Range: 0-300.	30
Up Delay (s)	When the primary interface switches from failed detection to successful detection, switching can be delayed based on the set time. Range: 0-180 (0 refers to immediate switching)	0
Down Delay (s)	When the primary interface switches from successful detection to failed detection, switching can be delayed based on the set time. Range: 0-180 (0 refers to immediate switching).	0
Track ID	Track detection, select the defined track ID.	--

Table 3-4-5-3 WAN Failover Parameters

3.4.6 VPN

Virtual Private Networks, also called VPNs, are used to securely connect two private networks together so that devices can connect from one network to the other network via secure channels.

IOT-G65 supports DMVPN, IPsec, GRE, L2TP, PPTP, OpenVPN, as well as GRE over IPsec and L2TP over IPsec.

3.4.6.1 DMVPN

A dynamic multi-point virtual private network (DMVPN), combining mGRE and IPsec, is a secure network that exchanges data between sites without passing traffic through an organization's headquarter VPN server or gateway.

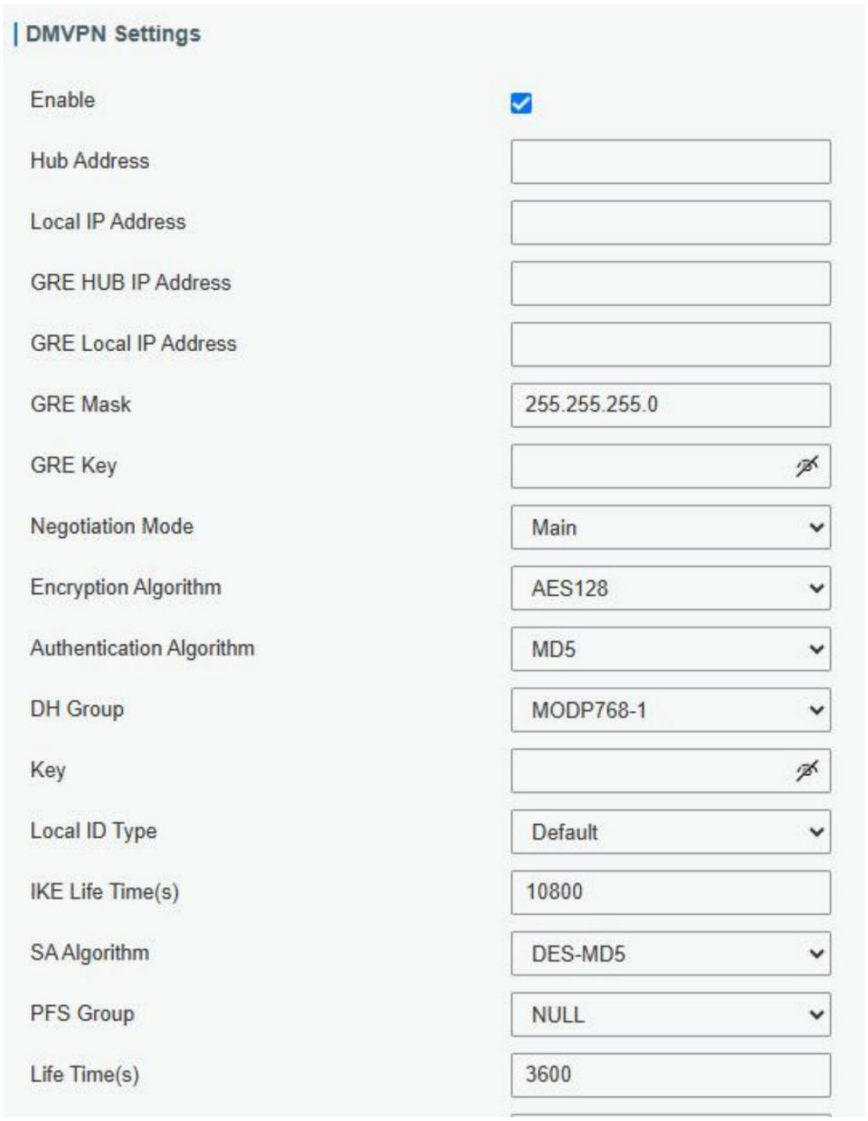


Figure 3-4-6-1

Figure 3-4-6-2

DMVPN	
Item	Description
Enable	Enable or disable DMVPN.
Hub Address	The IP address or domain name of DMVPN Hub.
Local IP address	DMVPN local tunnel IP address.
GRE Hub IP Address	GRE Hub tunnel IP address.
GRE Local IP Address	GRE local tunnel IP address.
GRE Netmask	GRE local tunnel netmask.

GRE Key	GRE tunnel key.
Negotiation Mode	Select from "Main" and "Aggressive".
Encryption Algorithm	Select from "DES", "3DES", "AES128", "AES192" and "AES256".
Authentication Algorithm	Select from "MD5" and "SHA1".
DH Group	Select from "MODP768_1", "MODP1024_2" and "MODP1536_5".
Key	Enter the preshared key.
Local ID Type	Select from "Default", "ID", "FQDN", and "User FQDN"
IKE Life Time (s)	Set the lifetime in IKE negotiation. Range: 60-86400.
SA Algorithm	Select from "DES_MD5", "DES_SHA1", "3DES_MD5", "3DES_SHA1", "AES128_MD5", "AES128_SHA1", "AES192_MD5", "AES192_SHA1", "AES256_MD5" and "AES256_SHA1".
PFS Group	Select from "NULL", "MODP768_1", "MODP1024_2" and "MODP1536-5".
Life Time (s)	Set the lifetime of IPsec SA. Range: 60-86400.
DPD Interval Time (s)	Set DPD interval time
DPD Timeout (s)	Set DPD timeout.
Cisco Secret	Cisco Nhrp key.
NHRP Holdtime (s)	The holdtime of Nhrp protocol.

Table 3-4-6-1 DMVPN Parameters

3.4.6.2 IPSec

IPsec is especially useful for implementing virtual private networks and for remote user access through dial-up connection to private networks. A big advantage of IPsec is that security arrangements can be handled without requiring changes to individual user computers.

IPsec provides three choices of security service: Authentication Header (AH), Encapsulating Security Payload (ESP), and Internet Key Exchange (IKE). AH essentially allows authentication of the senders' data. ESP supports both authentication of the sender and data encryption. IKE is used for cipher code exchange. All of them can protect one and more data flows between hosts, between host and gateway, and between gateways.

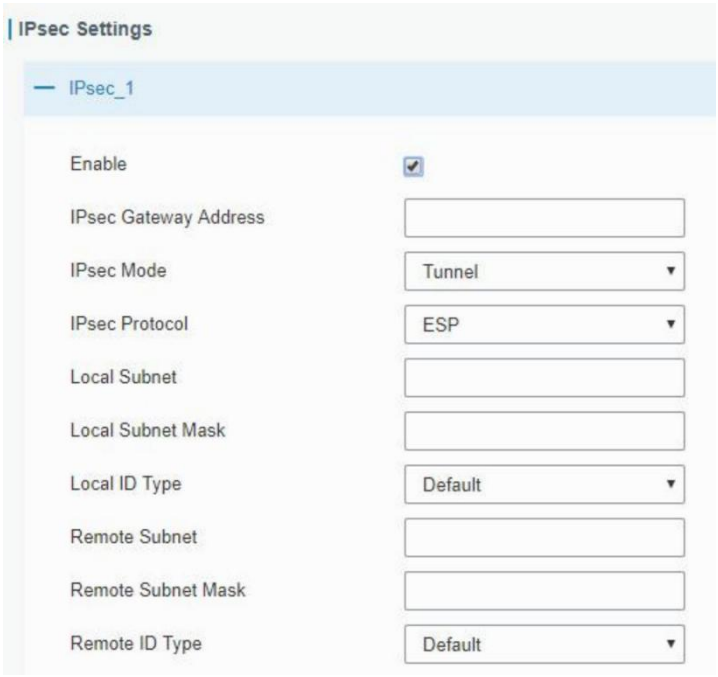


Figure 3-4-6-3

IPsec	
Item	Description
Enable	Enable IPsec tunnel. A maximum of 3 tunnels is allowed.
IPsec Gateway Address	Enter the IP address or domain name of remote IPsec server.
IPsec Mode	Select from "Tunnel" and "Transport".
IPsec Protocol	Select from "ESP" and "AH".
Local Subnet	Enter the local subnet IP address that IPsec protects.
Local Subnet Netmask	Enter the local netmask that IPsec protects.
Local ID Type	Select from "Default", "ID", "FQDN", and "User FQDN".
Remote Subnet	Enter the remote subnet IP address that IPsec protects.
Remote Subnet Mask	Enter the remote netmask that IPsec protects.
Remote ID type	Select from "Default", "ID", "FQDN", and "User FQDN".

Table 3-4-6-2 IPsec Parameters

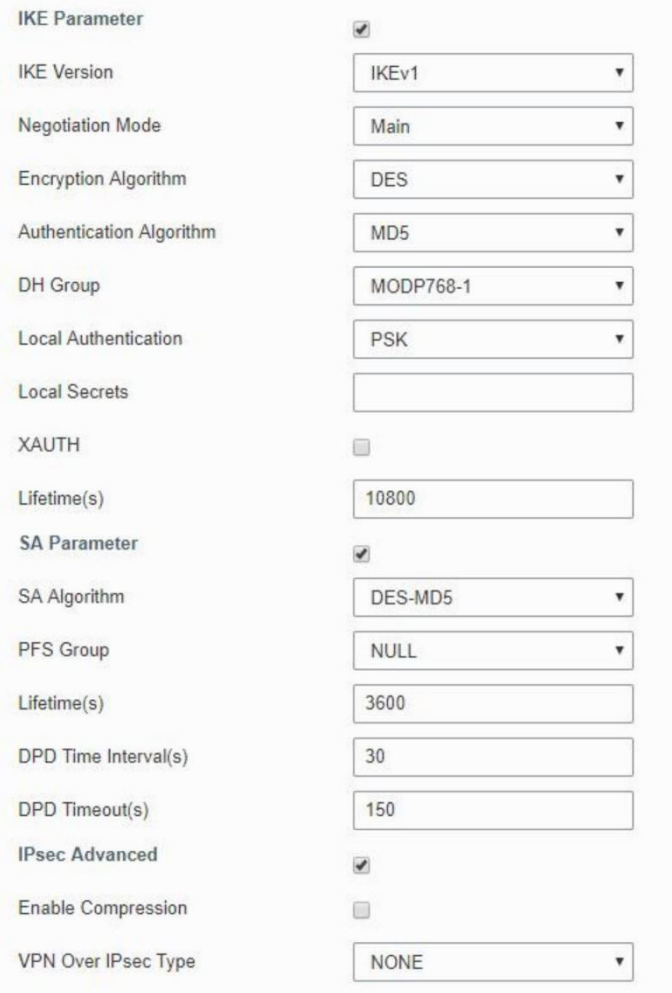


Figure 3-4-6-4

IKE Parameter	
Item	Description
IKE Version	Select from "IKEv1" and "IKEv2".
Negotiation Mode	Select from "Main" and "Aggressive".
Encryption Algorithm	Select from "DES", "3DES", "AES128", "AES192" and "AES256".
Authentication Algorithm	Select from "MD5" and " SHA1"
DH Group	Select from "MODP768_1", "MODP1024_2" and "MODP1536_5".
Local Authentication	Select from "PSK" and "CA".
Local Secrets	Enter the preshared key.
XAUTH	Enter XAUTH username and password after XAUTH is enabled.
Lifetime (s)	Set the lifetime in IKE negotiation. Range: 60-86400.
SA Parameter	
SA Algorithm	Select from "DES_MD5", "DES_SHA1", "3DES_MD5", "3DES_SHA1", "AES128_MD5", "AES128_SHA1", "AES192_MD5", "AES192_SHA1", "AES256_MD5" and "AES256_SHA1".
PFS Group	Select from "NULL", "MODP768_1" , "MODP1024_2" and "MODP1536_5".
Lifetime (s)	Set the lifetime of IPsec SA. Range: 60-86400.

DPD Interval Time(s)	Set DPD interval time to detect if the remote side fails.
DPD Timeout(s)	Set DPD timeout. Range: 10-3600.
IPsec Advanced	
Enable Compression	The head of IP packet will be compressed after it's enabled.
VPN Over IPsec Type	Select from "NONE", "GRE" and "L2TP" to enable VPN over IPsec function.

Table 3-4-6-3 IPsec Parameters

3.4.6.3 GRE

Generic Routing Encapsulation (GRE) is a protocol that encapsulates packets in order to route other protocols over IP networks. It's a tunneling technology that provides a channel through which encapsulated data message can be transmitted and encapsulation and decapsulation can be realized at both ends.

In the following circumstances the GRE tunnel transmission can be applied:

- GRE tunnel can transmit multicast data packets as if it were a true network interface. Single use of IPSec cannot achieve the encryption of multicast.
- A certain protocol adopted cannot be routed.
- A network of different IP addresses shall be required to connect other two similar networks.

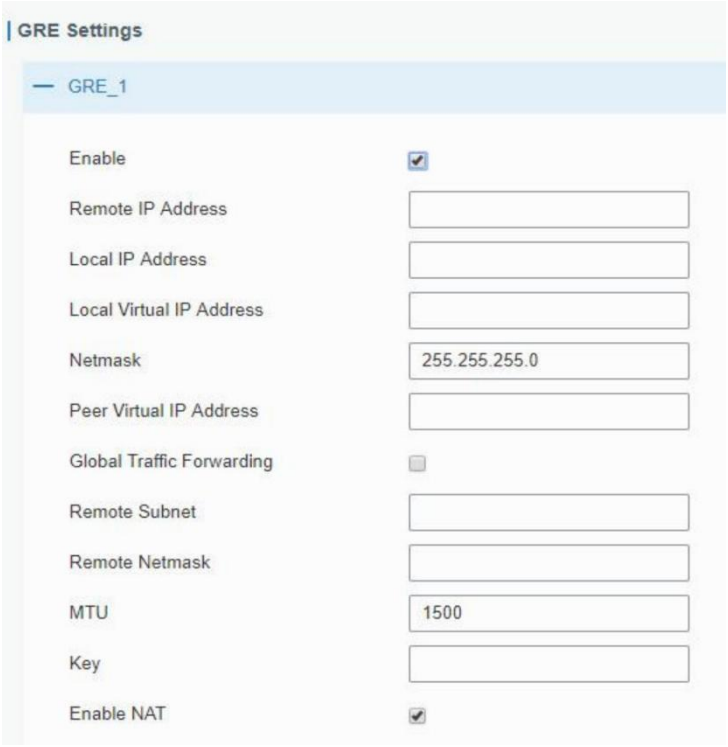


Figure 3-4-6-5

GRE	
Item	Description
Enable	Check to enable GRE function.
Remote IP Address	Enter the real remote IP address of GRE tunnel.

Local IP Address	Set the local IP address.
Local Virtual IP Address	Set the local tunnel IP address of GRE tunnel.
Netmask	Set the local netmask.
Peer Virtual IP Address	Enter remote tunnel IP address of GRE tunnel.
Global Traffic Forwarding	All the data traffic will be sent out via GRE tunnel when this function is enabled.
Remote Subnet	Enter the remote subnet IP address of GRE tunnel.
Remote Netmask	Enter the remote netmask of GRE tunnel.
MTU	Enter the maximum transmission unit. Range: 64-1500.
Key	Set GRE tunnel key.
Enable NAT	Enable NAT traversal function.

Table 3-4-6-4 GRE Parameters

3.4.6.4 L2TP

Layer Two Tunneling Protocol (L2TP) is an extension of the Point-to-Point Tunneling Protocol (PPTP) used by an Internet service provider (ISP) to enable the operation of a virtual private network (VPN) over the Internet.

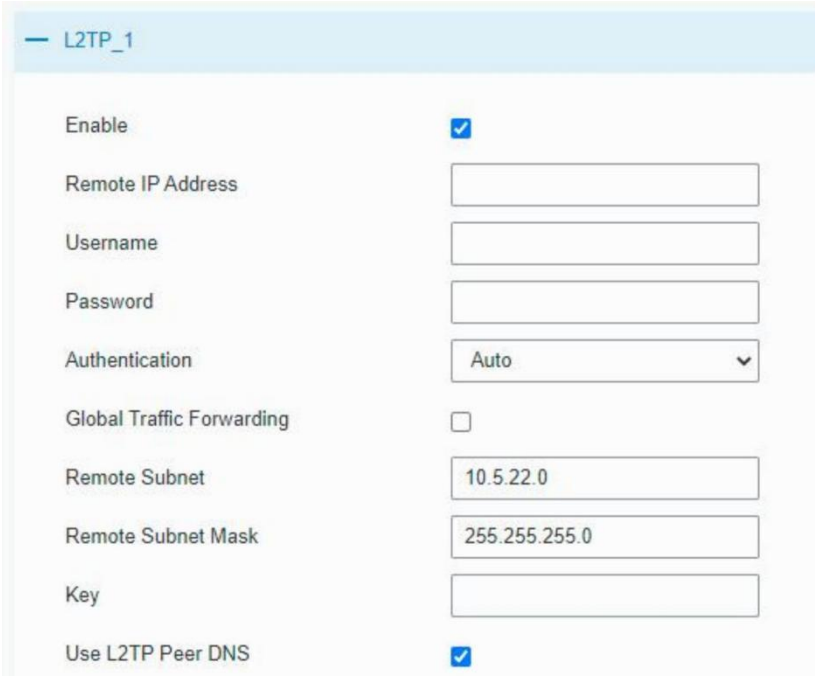


Figure 3-4-6-6

L2TP	
Item	Description
Enable	Check to enable L2TP function.
Remote IP Address	Enter the public IP address or domain name of L2TP server.
Username	Enter the username that L2TP server provides.
Password	Enter the password that L2TP server provides.
Authentication	Select from "Auto", "PAP", "CHAP", "MS-CHAPv1" and "MS-CHAPv2".

Global Traffic Forwarding	All of the data traffic will be sent out via L2TP tunnel after this function is enabled.
Remote Subnet	Enter the remote IP address that L2TP protects.
Remote Subnet Mask	Enter the remote netmask that L2TP protects.
Key	Enter the password of L2TP tunnel.
Use L2TP Peer DNS	Enable to use the DNS address of peer L2TP server .

Table 3-4-6-5 L2TP Parameters

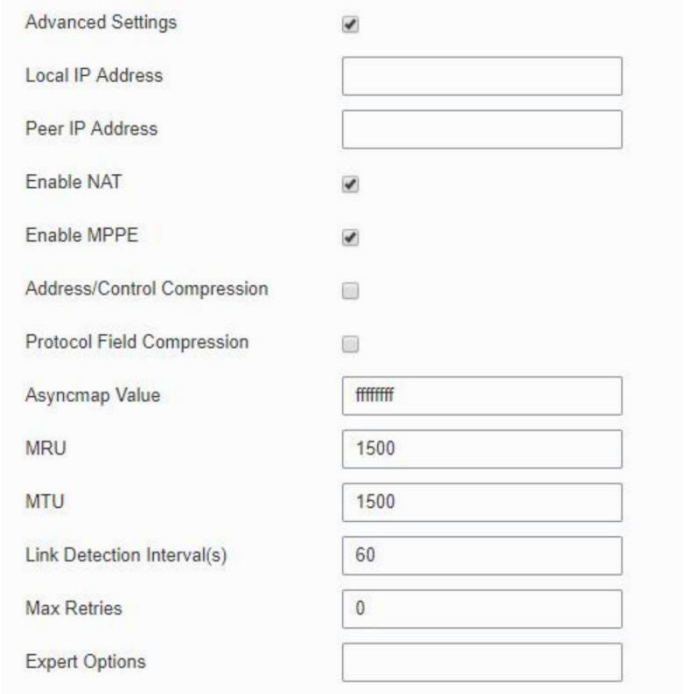


Figure 3-4-6-7

Advanced Settings	
Item	Description
Local IP Address	Set tunnel IP address of L2TP client. Client will obtain tunnel IP address automatically from the server when it's null.
Peer IP Address	Enter tunnel IP address of L2TP server.
Enable NAT	Enable NAT traversal function.
Enable MPPE	Enable MPPE encryption.
Address/Control Compression	For PPP initialization. User can keep the default option.
Protocol Field Compression	For PPP initialization. User can keep the default option.
Asyncmap Value	One of the PPP protocol initialization strings. User can keep the default value. Range: 0-ffffffff.
MRU	Set the maximum receive unit. Range: 64-1500.
MTU	Set the maximum transmission unit. Range: 128-1500
Link Detection Interval (s)	Set the link detection interval time to ensure tunnel connection. Range: 0-600.

Max Retries	Set the maximum times of retry to detect the L2TP connection failure. Range: 0-10.
Expert Options	User can enter some other PPP initialization strings in this field and separate the strings with blank space.

Table 3-4-6-6 L2TP Parameters

3.4.6.5 PPTP

Point-to-Point Tunneling Protocol (PPTP) is a protocol that allows corporations to extend their own corporate network through private "tunnels" over the public Internet. Effectively, a corporation uses a wide-area network as a single large local area network.

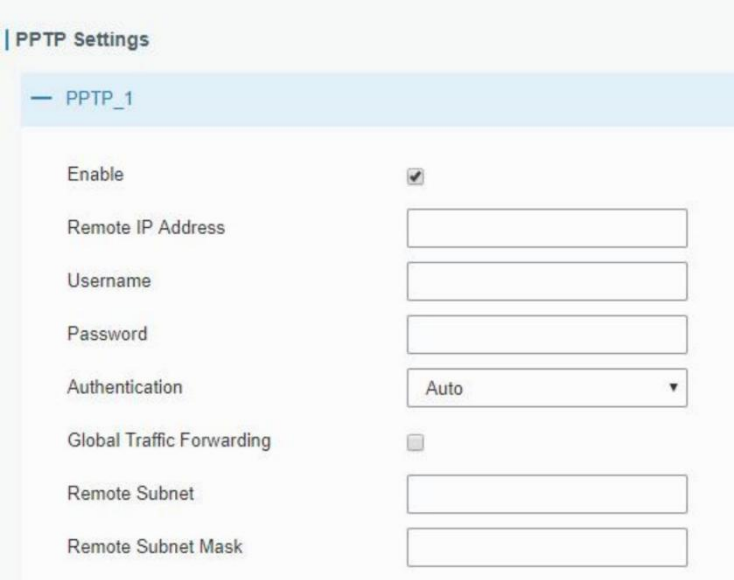


Figure 3-4-6-8

PPTP	
Item	Description
Enable	Enable PPTP client. A maximum of 3 tunnels is allowed.
Remote IP Address	Enter the public IP address or domain name of PPTP server.
Username	Enter the username that PPTP server provides.
Password	Enter the password that PPTP server provides.
Authentication	Select from "Auto", "PAP", "CHAP", "MS-CHAPv1", and "MS-CHAPv2".
Global Traffic Forwarding	All of the data traffic will be sent out via PPTP tunnel once enable this function.
Remote Subnet	Set the peer subnet of PPTP.
Remote Subnet Mask	Set the netmask of peer PPTP server.

Table 3-4-6-7 PPTP Parameters

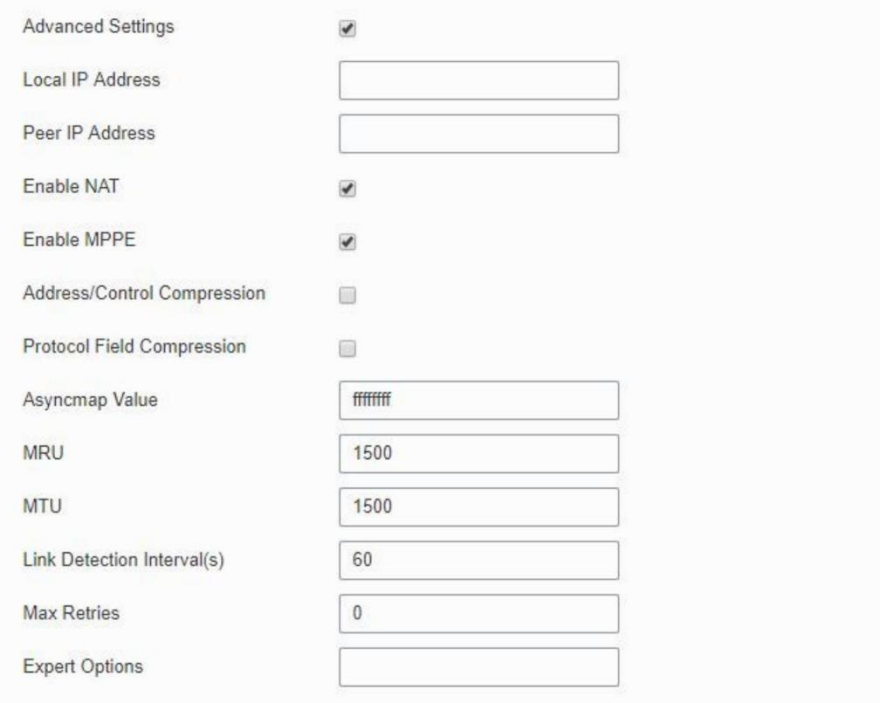


Figure 3-4-6-9

PPTP Advanced Settings	
Item	Description
Local IP Address	Set IP address of PPTP client.
Peer IP Address	Enter tunnel IP address of PPTP server.
Enable NAT	Enable the NAT faction of PPTP.
Enable MPPE	Enable MPPE encryption.
Address/Control Compression	For PPP initialization. User can keep the default option.
Protocol Field Compression	For PPP initialization. User can keep the default option.
Asyncmap Value	One of the PPP protocol initialization strings. User can keep the default value. Range: 0-ffffffff.
MRU	Enter the maximum receive unit. Range: 64-1500.
MTU	Enter the maximum transmission unit. Range: 128-1500.
Link Detection Interval (s)	Set the link detection interval time to ensure tunnel connection. Range: 0-600.
Max Retries	Set the maximum times of retrying to detect the PPTP connection failure. Range: 0-10.
Expert Options	User can enter some other PPP initialization strings in this field and separate the strings with blank space.

Table 3-4-6-8 PPTP Parameters

3.4.6.6 OpenVPN Client

OpenVPN is an open source virtual private network (VPN) product that offers a simplified security framework, modular network design, and cross-platform portability. IOT-G65

supports running at most 3 OpenVPN clients at the same time. You can import the ovpn file directly or configure the parameters on this page to set clients.

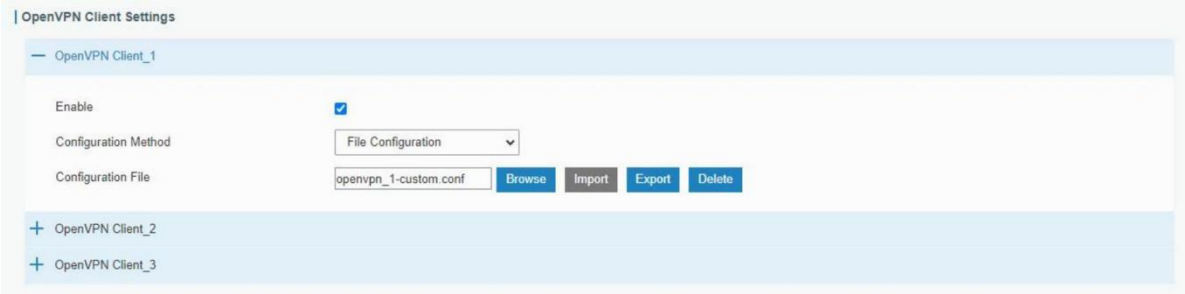


Figure 3-4-6-10

OpenVPN Client - File Configuration	
Item	Description
Browse	Click to browse the client configuration ovpn format file including the settings and certificate contents. Please refer to the client configuration file according to sample: client.conf
Edit	Click to edit the imported file.
Export	Export the server configuration file.
Delete	Click to delete the configuration file.

Table 3-4-6-9 OpenVPN Client Parameters

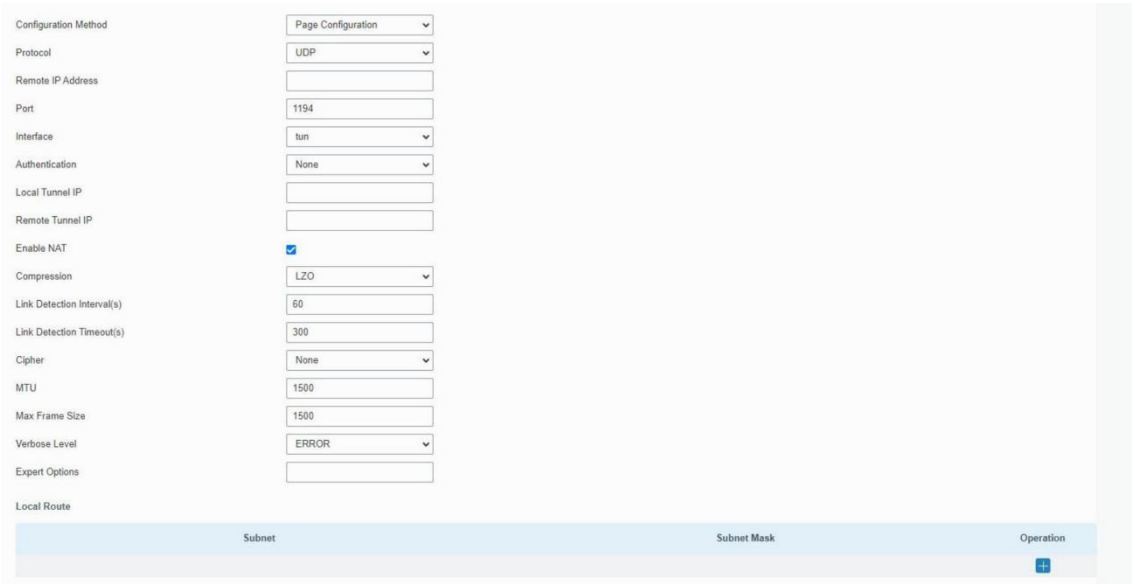


Figure 3-4-6-11

OpenVPN Client - Page Configuration	
Item	Description
Protocol	Select a transport protocol used by connecting UDP and TCP.
Remote IP Address	Enter remote OpenVPN server's IP address or domain name.
Port	Enter the TCP/UCP service number of remote OpenVPN server. Range: 1-65535.
Interface	Select virtual VPN network interface type from TUN and TAP. TUN

	devices encapsulate IPv4 or IPv6 (OSI Layer 3) while TAP devices encapsulate Ethernet 802.3 (OSI Layer 2).
Authentication Type	Select authentication type used to secure data sessions. Pre-shared: use the same secret key as server to complete the authentication. After selecting, go to Network > VPN > Certifications page to import a static.key to PSK field. Username/Password: use username/password which is preset in server side to complete the authentication. X.509 cert: use X.509 type certificate to complete the authentication. After selecting, go to Network > VPN > Certifications page to import CA certificate, client certificate and client private key to corresponding fields. X.509 cert + user: use both username/password and X.509 cert authentication type.
Local Virtual IP	Set local tunnel address when authentication type is None or Pre-shared.
Remote Virtual IP	Set remote tunnel address when authentication type is None or Pre-shared.
Global Traffic Forwarding	All the data traffic will be sent out via OpenVPN tunnel when this function is enabled.
Enable TLS Authentication	Disable or enable TLS authentication when authentication type is X.509 cert. After being enabled, go to Network > VPN > Certifications page to import a ta.key to TA field. Note: this option only supports tls-auth. For tls-crypt, please add this format string on expert option: tls-crypt /etc/openvpn/openvpn-client1-ta.key
Compression	Select to enable or disable LZO to compress data.
Link Detection Interval (s)	Set link detection interval time to ensure tunnel connection. If this is set on both server and client, the value pushed from server will override the client local values. Range: 10-1800 s.
Link Detection Timeout (s)	OpenVPN will be reestablished after timeout. If this is set on both server and client, the value pushed from server will override the client local values. Range: 60-3600 s.
Cipher	Select from NONE, BF-CBC, DES-CBC, DES-EDE3-CBC, AES-128-CBC, AES-192-CBC and AES-256-CBC.
MTU	Enter the maximum transmission unit. Range: 128-1500.
Max Frame Size	Set the maximum frame size. Range: 128-1500.
Verbose Level	Select from ERROR, WARING, NOTICE and DEBUG.
Expert Options	User can enter some initialization strings in this field and separate the strings with semicolon. Example: ncp-ciphers AES-128-GCM; key direction 1
Local Route	
Subnet	Set the local route's IP address.
Subnet Mask	Set the local route's netmask.

Table 3-4-6-10 OpenVPN Client Parameters

3.4.6.7 OpenVPN Server

IOT-G65 supports OpenVPN server to create secure point-to-point or site-to-site connections in routed or bridged configurations and remote access facilities. You can import the ovpn file directly or configure the parameters on this page to set this server.

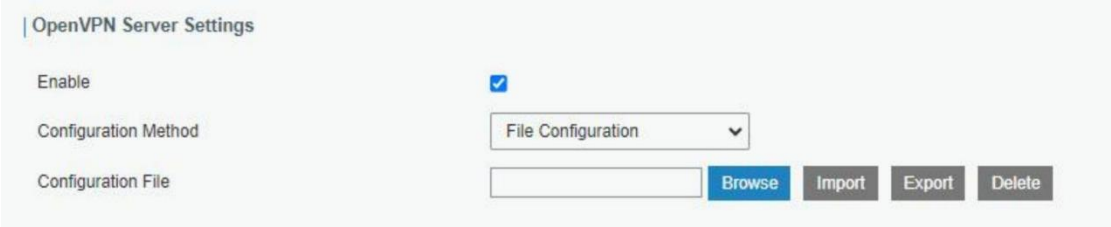


Figure 3-4-6-12

OpenVPN Server - File Configuration	
Item	Description
Browse	Click to browse the server configuration ovpn format file including the settings and certificate contents. Please refer to the server configuration file according to sample: server.conf
Edit	Click to edit the imported file.
Export	Export the server configuration file.
Delete	Click to delete the configuration file.

Table 3-4-6-11 OpenVPN Server Parameters

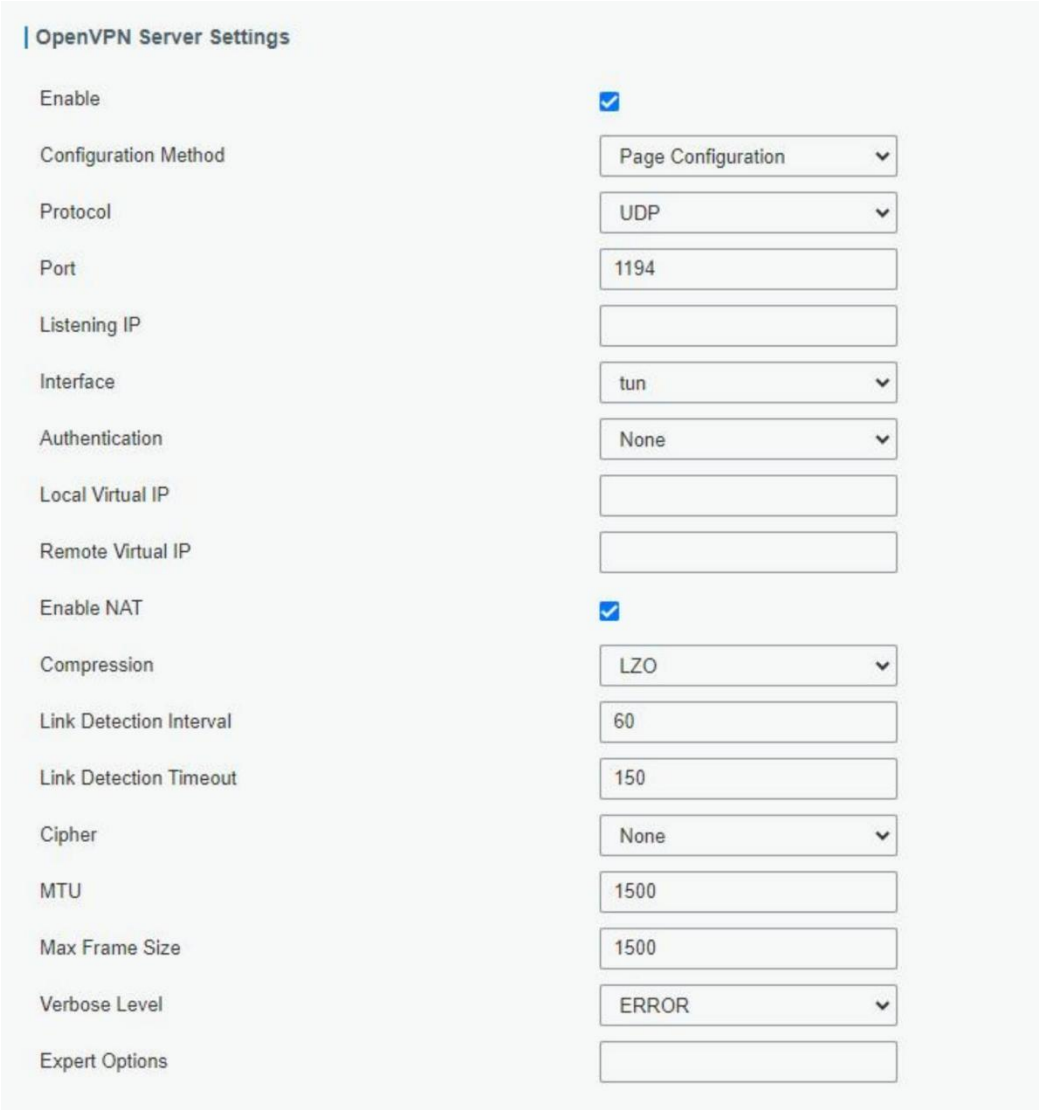


Figure 3-4-6-13

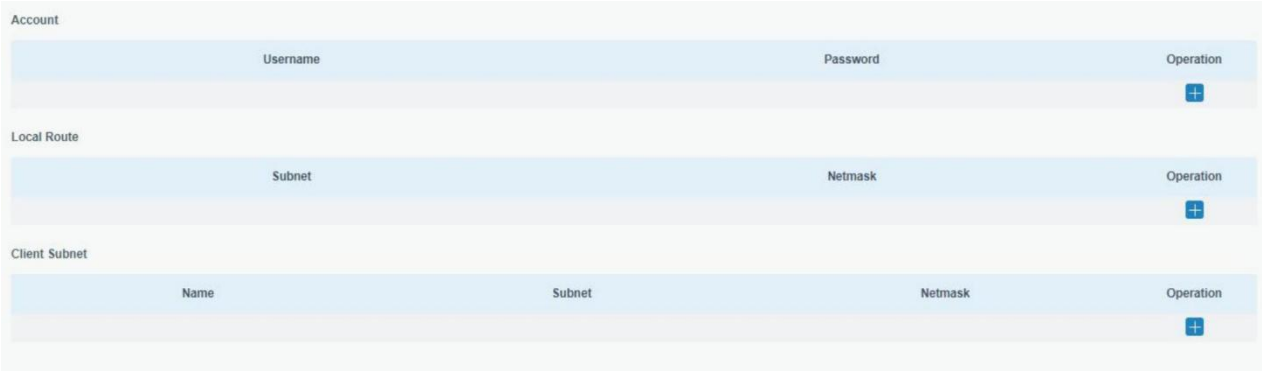


Figure 3-4-6-14

OpenVPN Server - Page Configuration	
Item	Description
Protocol	Select a transport protocol used by connection from UDP and TCP.
Listening IP	Enter the local hostname or IP address for bind. If left blank, OpenVPN server will bind to all interfaces.
Port	Enter the TCP/UCP service number for OpenVPN client connection.

	Range: 1-65535.
Interface	Select virtual VPN network interface type from TUN and TAP. TUN devices encapsulate IPv4 or IPv6 (OSI Layer 3) while TAP devices encapsulate Ethernet 802.3 (OSI Layer 2).
Authentication Type	Select authentication type used to secure data sessions. Pre-shared: use the same secret key as server to complete the authentication. After select, go to Network > VPN > Certifications page to import a static.key to PSK field. Username/Password: use username/password which is preset in server side to complete the authentication. X.509 cert: use X.509 type certificate to complete the authentication. After select, go to Network > VPN > Certifications page to import CA certificate, client certificate and client private key to corresponding fields. X.509 cert + user: use both username/password and X.509 cert authentication type.
Local Virtual IP	Set local tunnel address when authentication type is None or Pre-shared.
Remote Virtual IP	Set remote tunnel address when authentication type is None or Pre-shared.
Client Subnet	Define an IP address pool for openVPN client.
Client Netmask	Set the client subnet netmask to limit the IP address range.
Renegotiation Interval	Renegotiate data channel key after this interval. 0 means disable.
Max Clients	Limit server to a maximum of concurrent clients, range: 1-20. Note: please adjust log severity to Info if you need to connect many clients.
Enable CRL	Enable or disable CRL verify.
Enable Client to Client	When enabled, openVPN clients can communicate with each other.
Enable Dup Client	Allow multiple clients to connect with the same common name or certification.
Enable TLS Authentication	Disable or enable TLS authentication when authentication type is X.509 cert. After being enabled, go to Network > VPN > Certifications page to import a ta.key to TA field. Note: this option only supports tls-auth. For tls-crypt, please add this format string on expert option: tls-crypt /etc/openvpn/openvpn-client1-ta.key
Compression	Select to enable or disable LZO to compress data.
Link Detection Interval (s)	Set link detection interval time to ensure tunnel connection. If this is set on both server and client, the value pushed from server will override the client local values. Range: 10-1800 s.
Link Detection Timeout (s)	OpenVPN will be reestablished after timeout. If this is set on both server and client, the value pushed from server will override the client local values. Range: 60-3600 s.
Cipher	Select from NONE, BF-CBC, DES-CBC, DES-EDE3-CBC, AES-128-CBC, AES-192-CBC and AES-256-CBC.
MTU	Enter the maximum transmission unit. Range: 64-1500.

Max Frame Size	Set the maximum frame size. Range: 64-1500.
Verbose Level	Select from ERROR, WARING, NOTICE and DEBUG.
Expert Options	User can enter some initialization strings in this field and separate the strings with semicolon. Example: ncp-ciphers AES-128-GCM; key direction 1
Account	
Username & Password	Set username and password for OpenVPN client when authentication type is username/password.
Local Route	
Subnet	Set the local route's IP address.
Subnet Mask	Set the local route's netmask.
Client Subnet	
Name	Set the name as OpenVPN client certificate common name.
Subnet	Set the subnet of OpenVPN client.
Subnet Mask	Set the subnet netmask of OpenVPN client.

Table 3-4-6-12 OpenVPN Server Parameters

3.4.6.8 Certifications

When working as OpenVPN server, OpenVPN client or IPsec Server, user can import/export necessary certificate and key files to this page according to the authentication types.

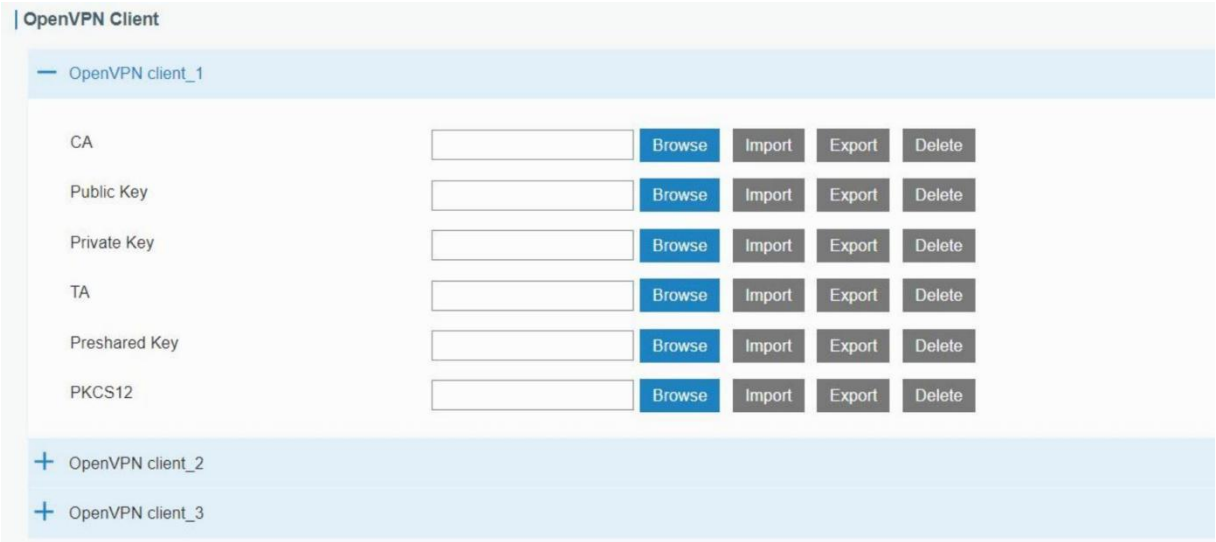


Figure 3-4-6-15

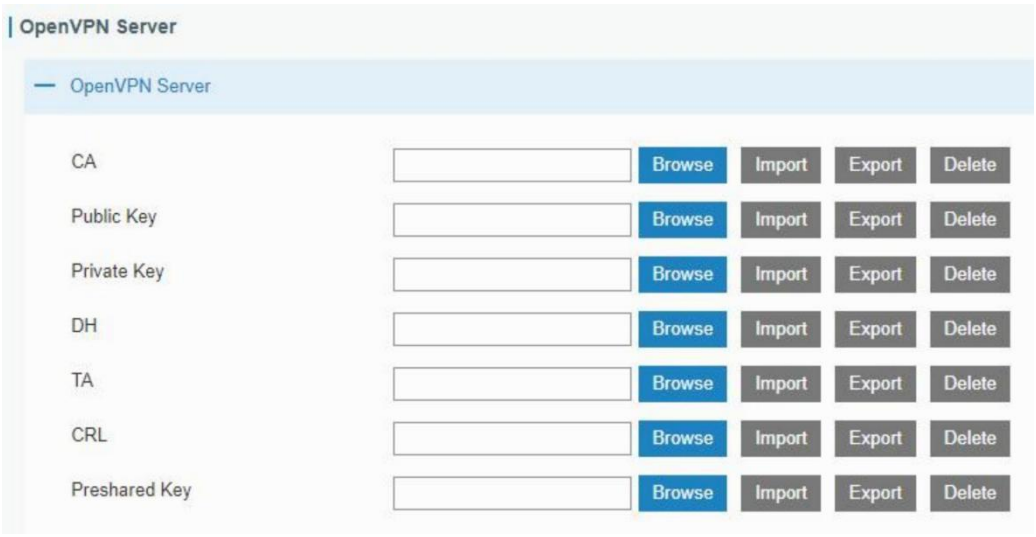


Figure 3-4-6-16

Figure 3-4-6-17

3.4.6.9 WireGuard

WireGuard is an extremely simple yet fast and modern VPN that utilizes state-of-the-art cry ptography. WireGuard passes traffic over UDP protocol.

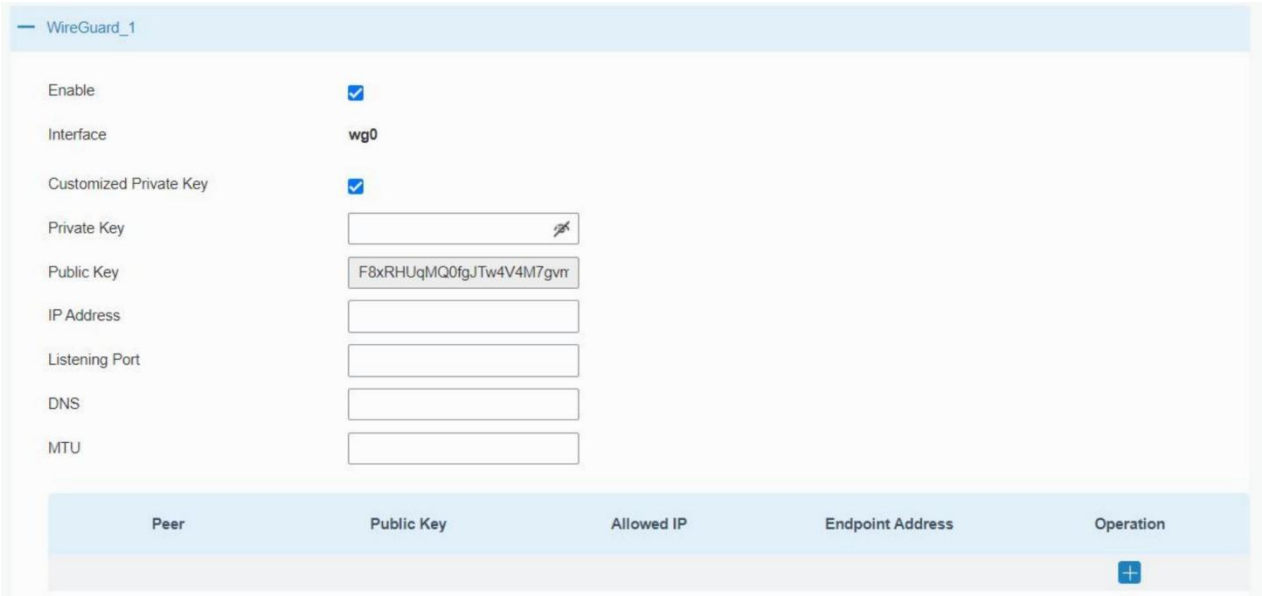


Figure 3-4-6-18

WireGuard	
Item	Description
Enable	Enable WireGuard interface. A maximum of 3 WireGaurd interfaces is allowed.
Interface	Show the WireGuard interface name.
Customized Private Key	Enable or disable to customize the private key of this WireGuard interface. If disabled, the client will use the private key generated by this router.
Public Key	Show the public key generated by the private key.
IP Address	Set the local virtual IP address and netmask. Example: 10.8.0.2/24
Listening Port	Set the port to send or receive WireGuard packets. The port numbers of different WireGuard interfaces should be different.
DNS	Set the DNS server address of this WireGuard interface. If left blank, the router will use DNS server address of common network interfaces (WAN, cellular, etc.).
MTU	Set the maximum transmission unit of this WireGuard interface. If left blank, the router will use MTU of common network interfaces (WAN, cellular, etc.).
Peer Table	Click “+” to add WireGuard peers of this WireGuard interface. One WireGuard interface can add 20 peers at most.

Table 3-4-6-13 WireGuard Parameters

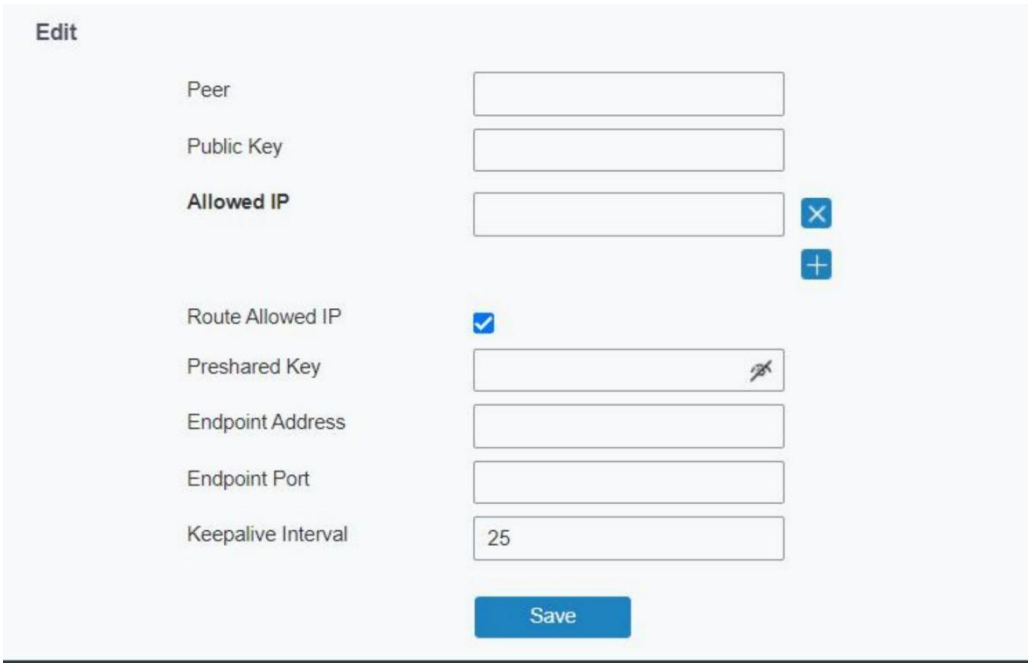


Figure 3-4-6-19

WireGuard-Peer	
Item	Description
Peer	Set a WireGuard peer name. This name should be unique in this

	WireGuard client.
Public Key	Set the public key of WireGuard peer server/client.
Allowed IP	Set the real IP address and netmask of WireGuard peer's LAN network. Example: 192.168.1.0/24 One WireGuard peer supports to add 8 allowed IP addresses.
Route Allowed IP	Enable or disable to add static routings of allowed IP addresses.
Preshared Key	Set the presahred key and both this interface and peer interface should set the same key value.
Endpoint Address	Set IP address or domain name of WireGuard peer server/client.
Endpoint Port	Set the destination port of WireGuard peer server/client.
Keepalive Interval	After the connection is established, this WireGuard interface will send heartbeat packet regularly to keep alive. 0 means disabled.

Table 3-4-6-13 WireGuard-Peer Parameters

3.4.7 HTTP Proxy

The gateway can connect to an HTTP proxy server to communicate with target Internet sites while hiding the real IP addresses for security purposes.

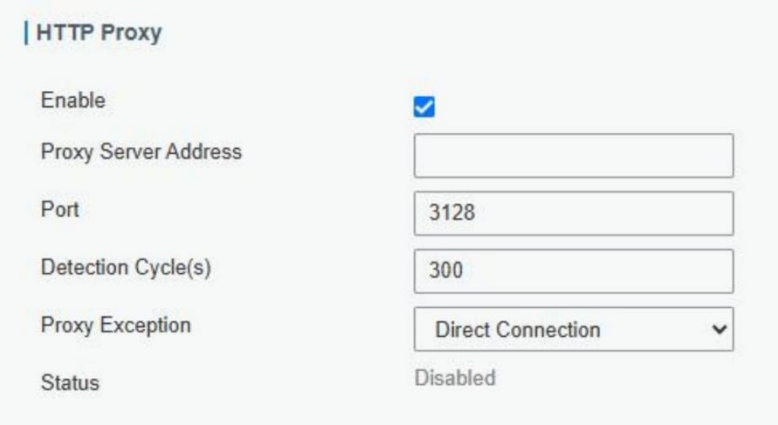


Figure 3-4-7-1

HTTP Proxy	
Item	Description
Enable	Enable or disable HTTP proxy feature.
Proxy Sever Address	Set the proxy server address (IP/domain name) to send the request.
Port	Set the proxy server port to send the request.
Detection Cycle	Set the retry interval when failing to connect to the HTTP proxy server.
Proxy Exception	Select the traffic mode if failing to connect to the proxy server: Direct Connection: Send traffic to target without proxy. Traffic Interception: Intercept traffic until the connection with proxy server is restored.
Status	Display the connection status between the gateway and the proxy server.

Table 3-4-7-1 HTTP Proxy Parameters

3.5 System

This section describes how to configure general settings, such as administration account, access service, system time, common user management, SNMP, event alarms, etc.

3.5.1 General Settings

3.5.1.1 General

General settings include system info, access service and HTTPS certificates.

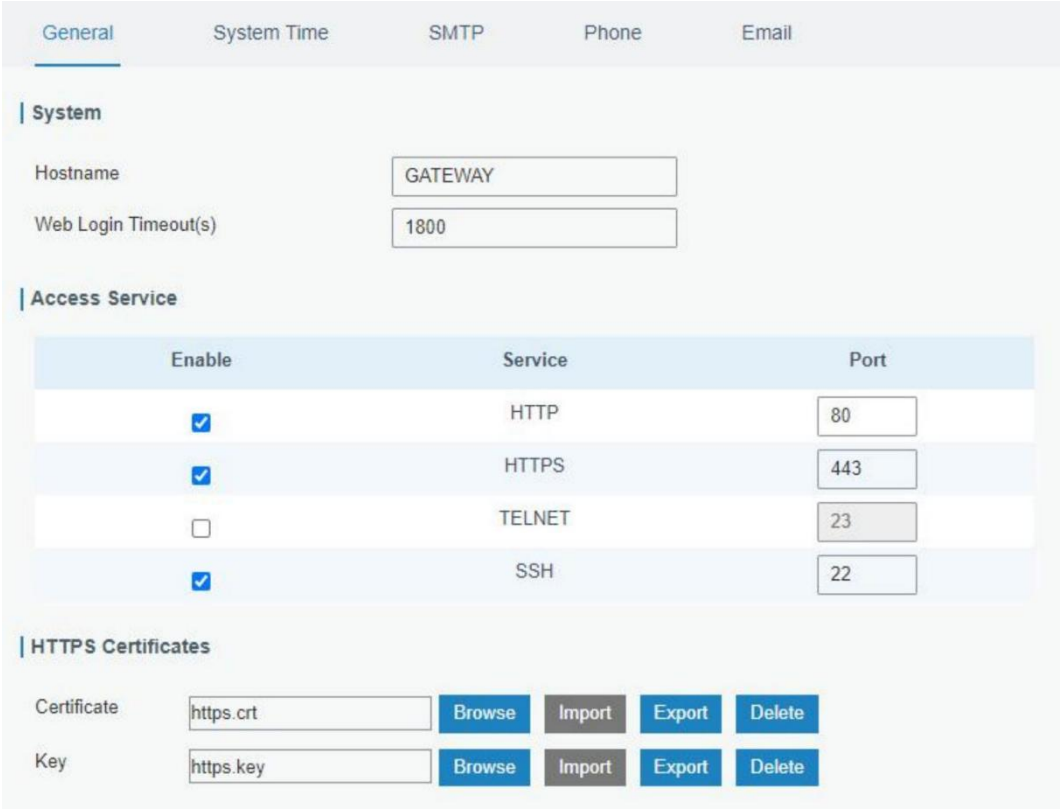


Figure 3-5-1-1

General		
Item	Description	Default
System		
Hostname	User-defined gateway name, needs to start with a letter.	GATEWAY
Web Login Timeout (s)	You need to log in again if it times out. Range: 100-3600.	1800
Access Service		
Port	Set port number of the services. Range: 1-65535.	--
HTTP	Users can log in the device locally via HTTP to access and control it through Web after the option is checked.	80
HTTPS	Users can log in the device locally and remotely via HTTPS to access and control it through Web after option is checked.	443
TELNET	Users can log in the device locally and remotely via	23

	TELNET to access and control it through Web after option is checked.	
SSH	Users can log in the device locally and remotely via SSH after the option is checked.	22
HTTPS Certificates		
Certificate	Click "Browse" button, choose certificate file on the PC, and then click "Import" button to upload the file into gateway. Click "Export" button will export the file to the PC. Click "Delete" button will delete the file.	--
Key	Click "Browse" button, choose key file on the PC, and then click "Import" button to upload the file into gateway. Click "Export" button will export file to the PC. Click "Delete" button will delete the file.	--

Table 3-5-1-1 General Setting Parameters

3.5.1.2 System Time

This section explains how to set the system time including time zone and time synchronization type.

Note: to ensure that the gateway runs with the correct time, it's recommended that you set the system time when configuring the gateway.

Figure 3-5-1-2

System Time	
Item	Description
Current Time	Show the current system time.
Time Zone	Click the drop down list to select the time zone you are in.
Sync Type	Click the drop down list to select the time synchronization type. Sync with Browser: Synchronize time with browser. Sync with NTP Server: Synchronize time with NTP Server. Set up Manually: configure the time manually.
Sync with NTP Server	
NTP Server Address	Set NTP server address (domain name/IP).
Enable NTP Server	After checked, NTP client on the network can achieve time

	synchronization with gateway.

Table 3-5-1-2 System Time Parameters

3.5.1.3 SMTP

SMTP, short for Simple Mail Transfer Protocol, is a TCP/IP protocol used in sending and receiving e-mail. This section describes how to configure email settings.

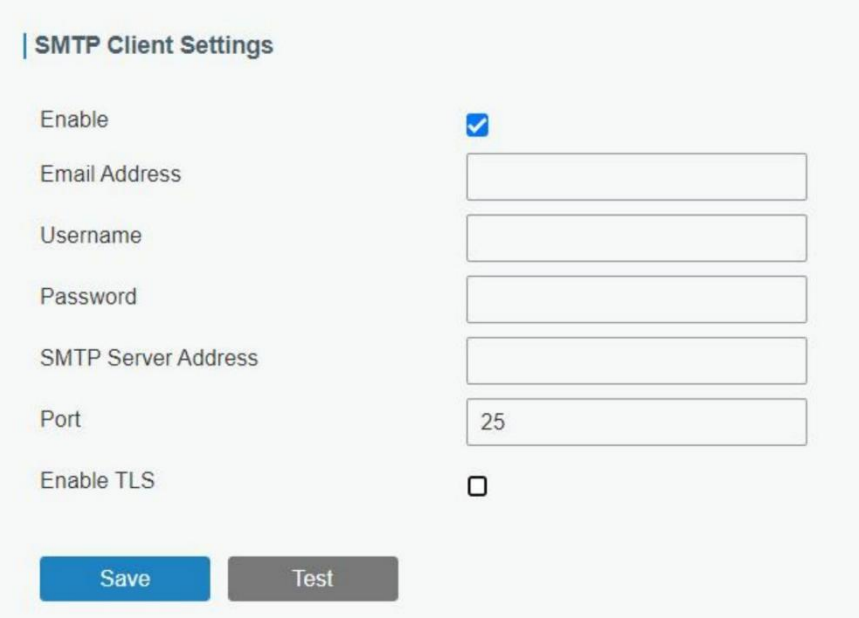


Figure 3-5-1-3

SMTP	
Item	Description
SMTP Client Settings	
Enable	Enable or disable SMTP client function.
Email Address	Enter the sender's email address.
Username	Enter the sender's email username.
Password	Enter the sender's email password.
SMTP Server Address	Enter SMTP server's domain name.
Port	Enter SMTP server port. Range: 1-65535.
Enable TLS	Enable or disable TLS encryption.

Table 3-5-1-3 SMTP Setting

Related Topics

Events Setting

3.5.1.4 Phone

Phone settings involve in call/SMS trigger and SMS alarm for events. This is only applied to parts of gateway models with cellular feature.

Figure 3-5-1-4

Phone	
Item	Description
Phone Number List	
Name	Set phone group name.
Number	Enter the telephone number. Digits, "+" and "-" are allowed. You can divide multiple numbers by “;”.

Table 3-5-1-4 Phone Settings

Related Topic

Connect on Demand

3.5.1.5 Email

Email settings involve email alarm for events.

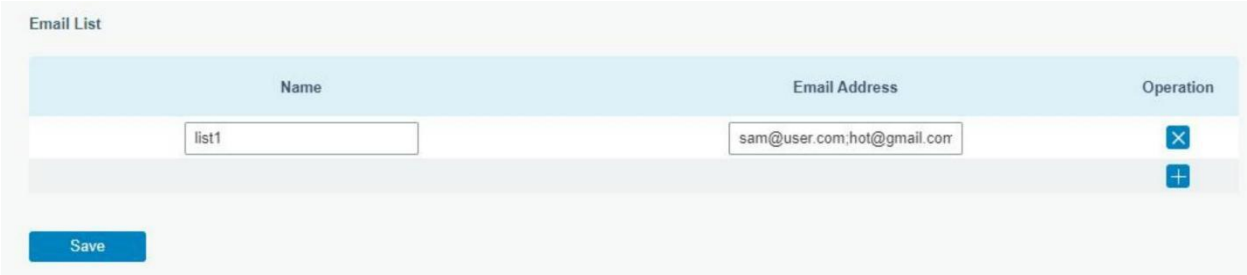


Figure 3-5-1-5

Email	
Item	Description
Email List	
Name	Set Email group name.
Email Address	Enter the Email address. You can divide multiple Email addresses by “;”.

Table 3-5-1-5 Email Settings

3.5.2 User Management

3.5.2.1 Account

Here you can change the login username and password of the administrator.

Note: it is strongly recommended that you modify them for the sake of security.

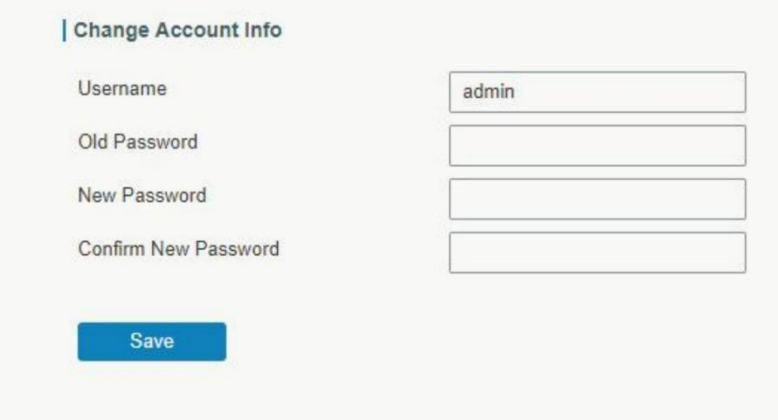


Figure 3-5-2-1

Account	
Item	Description
Username	Enter a new username. You can use characters such as a-z, 0-9, "_", "-". The first character can't be a digit.
Old Password	Enter the old password.
New Password	Enter a new password to include any ASCII characters except blanks. The password must contain at least one letter and one number, with a length of 5-31 characters.
Confirm New Password	Enter the new password again.

Table 3-5-2-1 Account Information

3.5.2.2 User Management

This section describes how to create common user accounts.

The common user permission includes Read-Only and Read-Write.

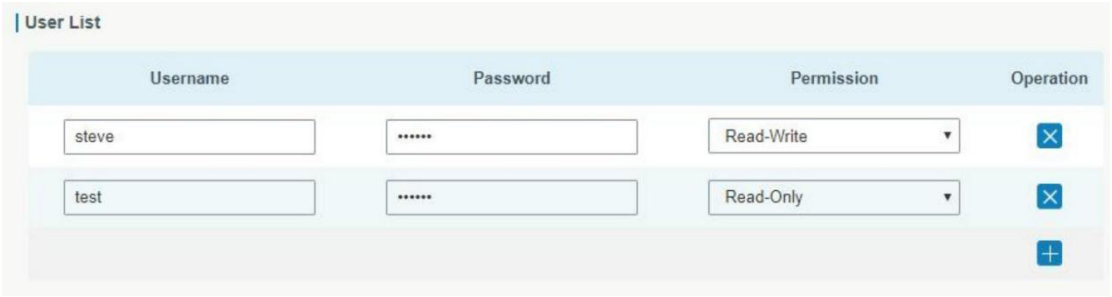


Figure 3-5-2-2

User Management	
Item	Description
Username	Enter a new username. You can use characters such as a-z, 0-9, "_", "-". The first character can't be a digit.
Password	Set the password to include any ASCII characters except blanks. The password must contain at least one letter and one number, with a length of 5-31 characters.
Permission	Select user permission from “Read-Only” and “Read-Write”.

	- Read-Only: users can only view the configuration of gateway in this level. - Read-Write: users can view and set the configuration of gateway in this level.

Table 3-5-2-2 User Management

3.5.2.3 HTTP API Management

This section describes how to configure the HTTP API account information.

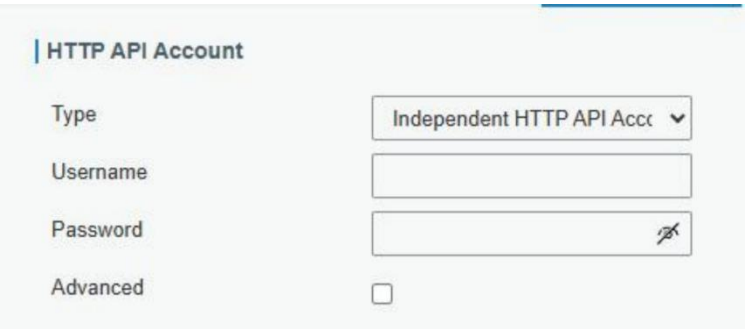


Figure 3-5-2-3

User Management	
Item	Description
Type	Select the HTTP API account information the same as web GUI account or use an independent account.
Username	Enter a new username that is different from any other account info. You can use characters such as a-z, 0-9, "_", "-". The first character can't be a digit.
Password	Set the password to include any ASCII characters except blanks.
Advanced	
Password	Enter the current password and click Transform to display the encrypted password for HTTP API login credentials.

Table 3-5-2-3 HTTP API Management

3.5.3 SNMP

SNMP is widely used in network management for network monitoring. SNMP exposes management data with variables form in managed system. The system is organized in a management information base (MIB) which describes the system status and configuration. These variables can be remotely queried by managing applications.

Configuring SNMP in networking, NMS, and a management program of SNMP should be set up at the Manager.

Configuration steps are listed as below for achieving query from NMS:

1. Enable SNMP setting.
2. Download MIB file and load it into NMS.
3. Configure MIB View.

4. Configure VCAM.

3.5.3.1 SNMP

IOT-G65 supports SNMPv1, SNMPv2c and SNMPv3 version. SNMPv1 and SNMPv2c employ community name authentication. SNMPv3 employs authentication encryption by username and password.

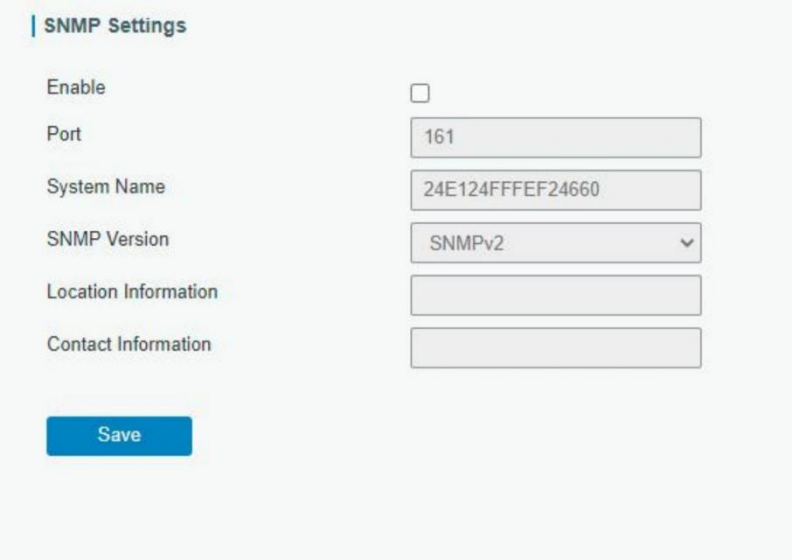


Figure 3-5-3-1

SNMP Settings	
Item	Description
Enable	Enable or disable SNMP function.
Port	Set SNMP listened port. Range: 1-65535. The default port is 161.
System Name	Fill in the system name to represent the gateway.
SNMP Version	Select SNMP version; support SNMP v1/v2c/v3.
Location Information	Fill in the location information.
Contact Information	Fill in the contact information.

Table 3-5-3-1 SNMP Parameters

3.5.3.2 MIB View

This section explains how to configure MIB view for the objects.

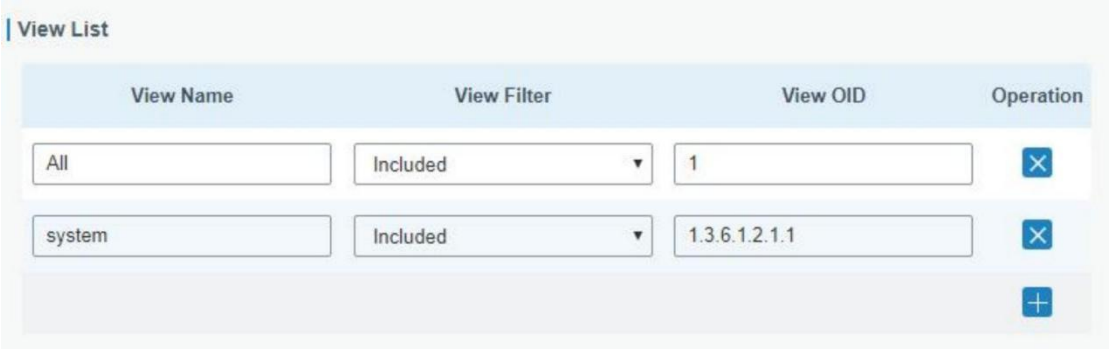


Figure 3-5-3-2

MIB View	
Item	Description
View Name	Set MIB view's name.
View Filter	Select from "Included" and "Excluded".
View OID	Enter the OID number.
Included	You can query all nodes within the specified MIB node.
Excluded	You can query all nodes except for the specified MIB node.

Table 3-5-3-2 MIB View Parameters

3.5.3.3 VACM

This section describes how to configure VCAM parameters.

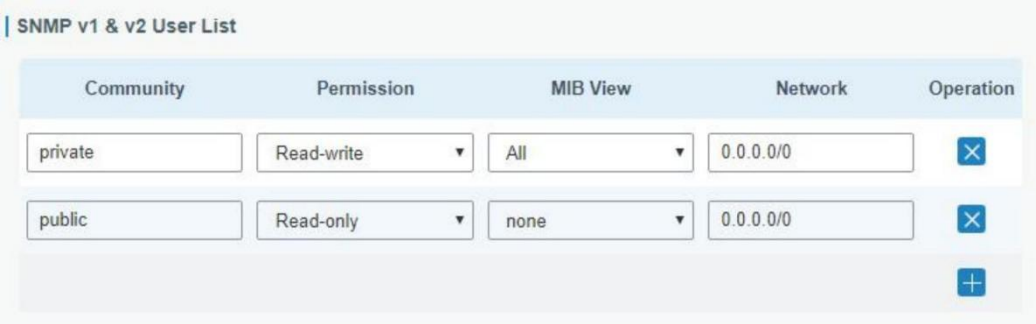


Figure 3-5-3-3

VACM	
Item	Description
SNMP v1 & v2 User List	
Community	Set the community name.
Permission	Select from "Read-Only" and "Read-Write".
MIB View	Select an MIB view to set permissions from the MIB view list.
Network	The IP address and bits of the external network accessing the MIB view.
Read-Write	The permission of the specified MIB node is read and write.
Read-Only	The permission of the specified MIB node is read only.
SNMP v3 User List	
Group Name	Set the name of SNMPv3 group.
Security Level	Select from "NoAuth/NoPriv", "Auth/NoPriv", and " Auth/Priv".

Read-Only View	Select an MIB view to set permission as "Read-only" from the MIB view list.
Read-Write View	Select an MIB view to set permission as "Read-write" from the MIB view list.
Inform View	Select an MIB view to set permission as "Inform" from the MIB view list.

Table 3-5-3-3 VACM Parameters

3.5.3.4 Trap

This section explains how to enable network monitoring by SNMP trap.

Figure 3-5-3-4

SNMP Trap	
Item	Description
Enable	Enable or disable SNMP Trap function.
SNMP Version	Select SNMP version; support SNMP v1/v2c/v3.
Server Address	Fill in NMS's IP address or domain name.
Port	Fill in UDP port. Port range is 1-65535. The default port is 162.
Name	Fill in the group name when using SNMP v1/v2c; fill in the username when using SNMP v3.
Auth/Priv Mode	Select from "NoAuth & No Priv", "Auth & NoPriv", and "Auth & Priv".

Table 3-5-3-4 Trap Parameters

3.5.3.5 MIB

This section describes how to download MIB files.

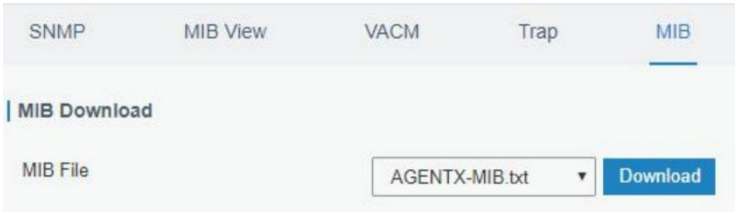


Figure 3-5-3-5

MIB	
Item	Description
MIB File	Select the MIB file you need.

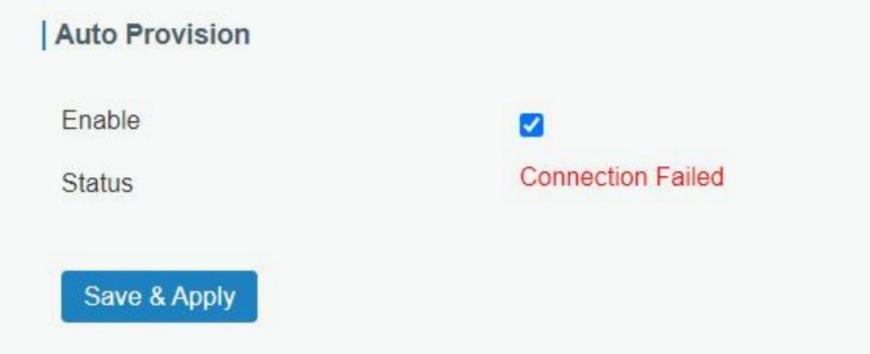
Download	Click "Download" button to download the MIB file to PC.

Table 3-5-3-5 MIB Download

3.5.4 Device Management

3.5.4.1 Auto Provision

Users can customize and select the configuration profile from Linovision Development Platform. When Auto Provision is enabled and the device is connected to Internet, the device will receive the profile to achieve initial configuration. This feature will work even the device does not configure to connect Linovision Development Platform.



3.5.4.2 Management Platform

You can connect the device to the DeviceHub or Linovision Development Platform on this page so as to manage the gateway centrally and remotely.

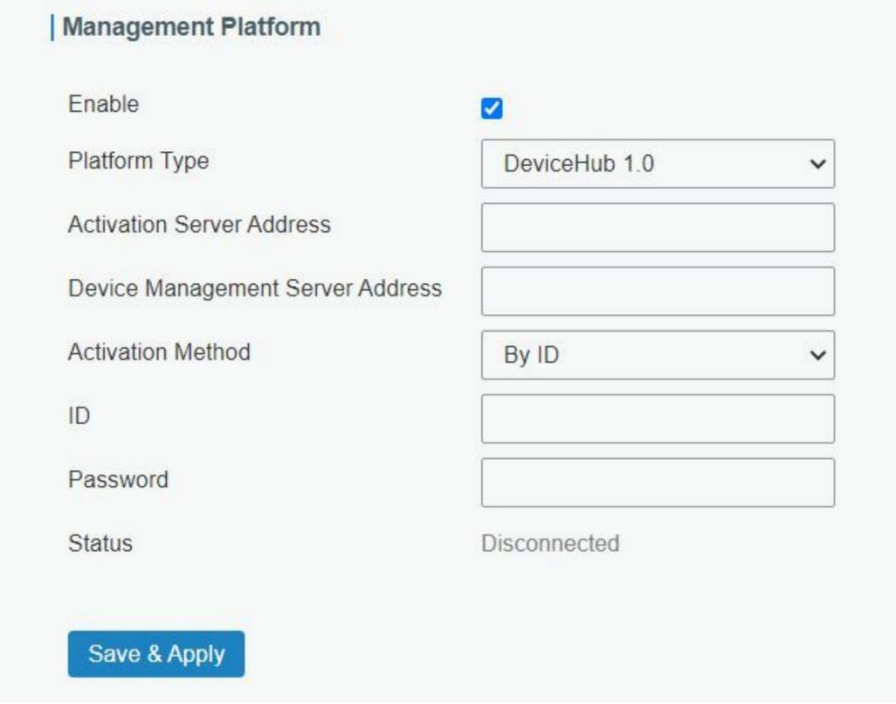


Figure 3-5-4-1

Management Platform

Item	Description
Enable	Enable or disable to connect gateway to management platform.
Platform Type	Linovision DeviceHub 1.0, Linovision DeviceHub 2.0 or Linovision Development Platform is optional.
Status	Show the connection status between the gateway and the management platform.
DeviceHub 1.0	
Activation Server Address	IP address or domain of the DeviceHub.
DeviceHub Management Address	The URL address for the device to connect to the DeviceHub, e.g. http://220.82.63.79:8080/acs.
Activation Method	Select activation method to connect the gateway to the DeviceHub server, options are "By Authentication ID" and "By ID".
Authentication Code	Fill in the authentication code generated from the DeviceHub.
ID	Fill in the registered DeviceHub account (email) and password.
Password	
DeviceHub 2.0	
Server Address	IP address or domain of the DeviceHub.

Table 3-5-4-1

3.5.5 Events

Event feature is capable of sending alerts by Email when certain system events occur.

3.5.5.1 Events

You can view alarm messages on this page.

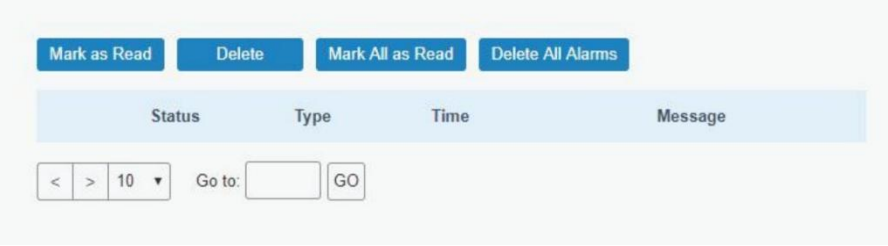


Figure 3-5-5-1

Events	
Item	Description
Mark as Read	Mark the selected event alarm as read.
Delete	Delete the selected event alarm.
Mark All as Read	Mark all event alarms as read.
Delete All Alarms	Delete all event alarms.
Status	Show the reading status of the event alarms.
Type	Show the event type that should be alarmed.
Time	Show the alarm time.
Message	Show the alarm content.

Table 3-5-5-1 Events Parameters

3.5.5.2 Events Settings

In this section, you can decide what events to record and whether you want to receive email and SMS notifications when any change occurs.

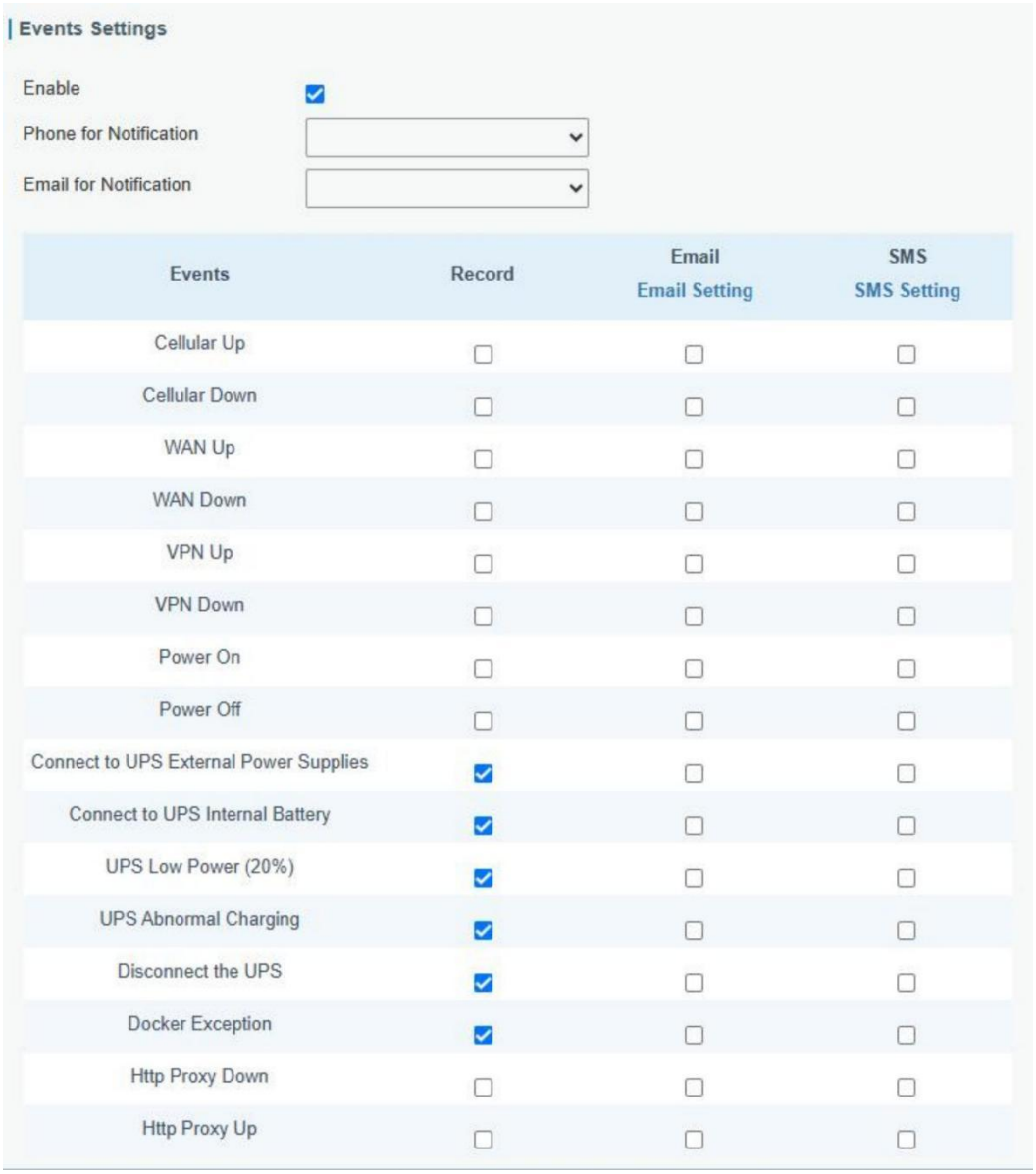


Figure 3-5-5-2

Event Settings	
Item	Description
Enable	Check to enable "Events Settings".
Phone for Notification	Select phone group to receive SMS alarm.
Email for Notification	Select Email group to receive Email alarm.
Events	Event type the gateway supports to record.

Record	The relevant content of event alarm will be recorded on "Event" page if this option is checked.
Email	The relevant content of event alarm will be sent out via email if this option is checked.
Email Setting	Click and you will be redirected to the page "Email" to configure the Email group.
SMS	The relevant content of event alarm will be sent out via SMS if this option is checked.
SMS Setting	Click and you will be redirected to the page of "Phone" to configure phone group list.
Phone Group List	Select phone group to receive SMS alarm.
Email Group List	Select Email group to receive Email alarm.

Table 3-5-5-2 Events Parameters

Related Topics

Email Setting

Phone Setting

3.6 Maintenance

This section describes system maintenance tools and management.

3.6.1 Tools

Troubleshooting tools includes ping and traceroute.

3.6.1.1 Ping

Ping tool is engineered to ping outer network.

Figure 3-6-1-1

PING	
Item	Description
Host	Ping outer network from the gateway.

Table 3-6-1-1 IP Ping Parameters

3.6.1.2 Traceroute

Traceroute tool is used for troubleshooting network routing failures.

Figure 3-6-1-2

Traceroute	
Item	Description
Host	Address of the destination host to be detected.

Table 3-6-1-2 Traceroute Parameters

3.6.1.3 Packet Analyzer

Packet Analyzer is used for capturing the packet of different interfaces.

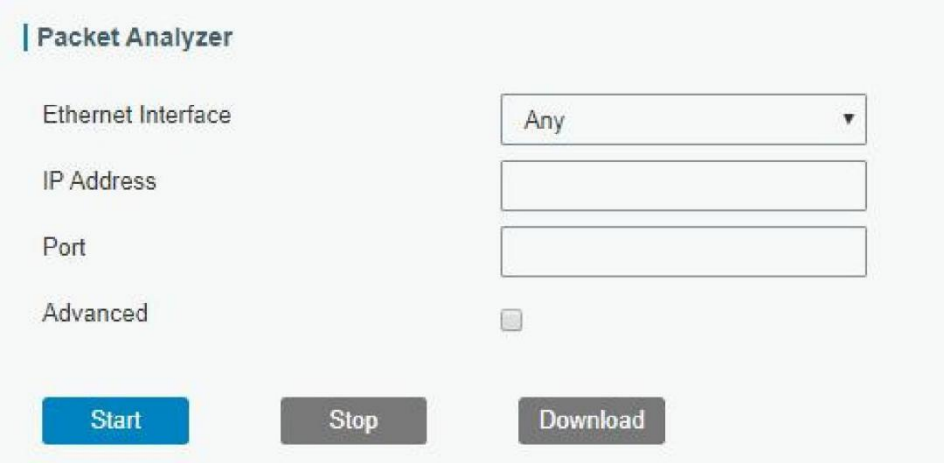


Figure 3-6-1-3

Packet Analyzer	
Item	Description
Ethernet Interface	Select the interface to capture packages.
IP Address	Set the IP address that the router will capture.
Port	Set the port that the router will capture.
Advanced	Set the rules for sniffer. The format is tcpdump.

Table 3-6-1-3 Packet Analyzer Parameters

3.6.1.4 Qxdmlog

This section allow collecting diagnostic logs of cellular module via QXDM tool.

Figure 3-6-1-4

3.6.2 Schedule

This section explains how to configure scheduled reboot on the gateway.

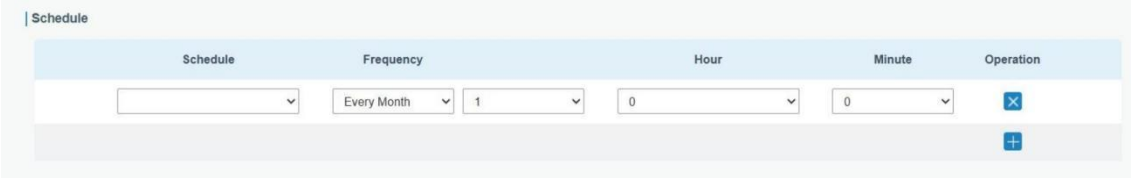


Figure 3-6-2-1

Schedule	
Item	Description
Schedule	Select schedule event: Reboot: Reboot the gateway regularly.
Frequency	Select the frequency to execute the schedule.

Table 3-6-2-1 Schedule Parameters

3.6.3 Log

The system log contains a record of informational, error and warning events that indicates how the system processes. By reviewing the data contained in the log, an administrator or user troubleshooting the system can identify the cause of a problem or whether the system processes are loading successfully. Remote log server is feasible, and gateway will upload all system logs to remote log server such as Syslog Watcher.

3.6.3.1 System Log

This section describes how to download log file and view the recent log on web.

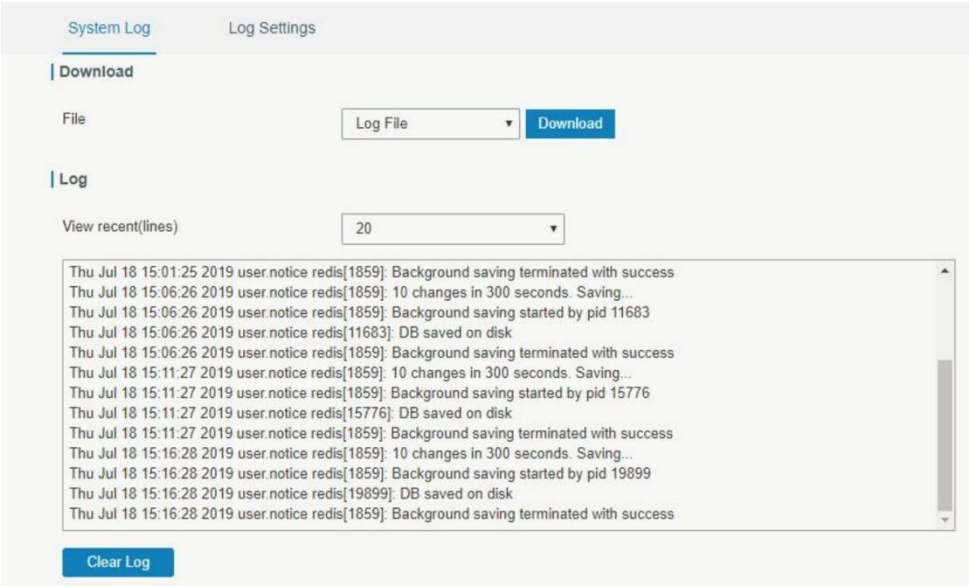


Figure 3-6-3-1

System Log

Item	Description
Download	Download log file.
View recent (lines)	View the specified lines of system log.
Clear Log	Clear the current system log.

Table 3-6-3-1 System Log Parameters

3.6.3.2 Log Settings

This section explains how to enable remote log server and local log setting.

Figure 3-6-3-2

Log Settings	
Item	Description
Remote Log Server	
Enable	With “Remote Log Server” enabled, gateway will send all system logs to the remote server.
Syslog Server Address	Fill in the remote system log server address (IP/domain name).
Port	Fill in the remote system log server port.
Local Log File	
Storage	User can store the log file in memory.
Size	Set the size of the log file to be stored.
Log Severity	The list of severities follows the syslog protocol.

Table 3-6-3-2 System Log Parameters

3.6.4 Upgrade

This section describes how to upgrade the gateway firmware via web. Generally you don’t need to do the firmware upgrade.

Note: any operation on web page is not allowed during firmware upgrade, otherwise the upgrade will be interrupted, or even the device will break down.

Figure 3-6-4-1

Upgrade	
Item	Description
Firmware Version	Show the current firmware version.
Reset Configuration to Factory Default	When this option is checked, the gateway will be reset to factory defaults after upgrade.
Upgrade Firmware	Click "Browse" button to select the new firmware file, and click "Upgrade" to upgrade firmware.

Table 3-6-4-1 Upgrade Parameters

Related Configuration Example

Firmware Upgrade

3.6.5 Backup and Restore

This section explains how to create a backup of the whole system configurations to a file, replicate parts of important configuration only for batch backup, restore the config file to the gateway and reset to factory defaults.

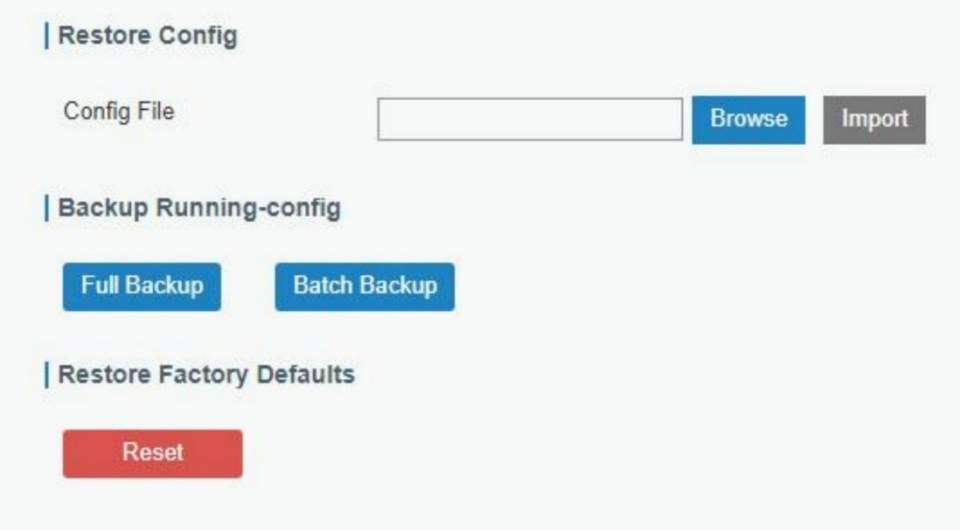


Figure 3-6-5-1

Backup and Restore	
Item	Description
Config File	Click "Browse" button to select configuration file, and then click "Import"

	button to upload the configuration file to the gateway.
Full Backup	Click "Full Backup" to export the current configuration file to the PC.
Batch Backup	Click “Batch Backup” to export current configuration except gateway ID of packet forwarder, all embedded NS settings, static IP address of WAN, WLAN settings, user management settings, DeviceHub authentication code, all APP settings.
Reset	Click "Reset" button to reset factory default settings. gateway will restart after reset process is done.

Table 3-6-5-1 Backup and Restore Parameters

Related Configuration Example

Restore Factory Defaults

3.6.6 Reboot

On this page you can reboot the gateway and return to the login page. We strongly recommend clicking “Save” button before rebooting the gateway so as to avoid losing the new configuration.

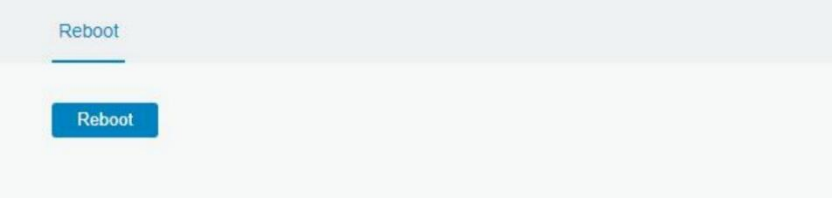


Figure 3-6-6-1

3.7 APP

3.7.1 Python

Python is an object-oriented programming language that has gained popularity because of its clear syntax and readability.

As an interpreted language, Python has a design philosophy that emphasizes code readability, notably using whitespace indentation to delimit code blocks rather than curly brackets or keywords, and a syntax that allows programmers to express concepts in fewer lines of code than it’s used in other languages such as C++ or Java. The language provides constructs and intends to enable writing clear programs on both small and large scale.

Users can use Python to quickly generate the prototype of the program, which can be the final interface of the program, rewrite it with a more appropriate language, and then encapsulate the extended class library that Python can call.

This section describes how to view the relevant running status such as App-manager, SDK version, extended storage, etc. Also you can change the App-manager configuration, and import the Python App package from here.

3.7.1.1 Python

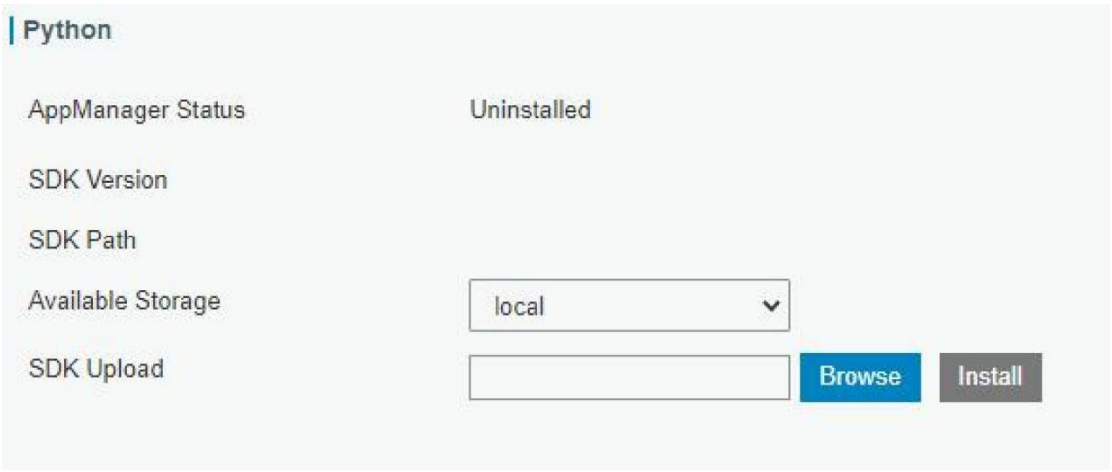


Figure 3-7-1-1

Python	
Item	Description
AppManager Status	Show AppManager's running status, like "Uninstalled", "Running" or "Stopped".
SDK Version	Show the version of the installed SDK.
SDK Path	Show the SDK installation path.
Available Storage	Select available storage to install SDK.
SDK Upload	Upload and install SDK for Python.
Uninstall	Uninstall SDK.
View	View application status managed by AppManager.

Table 3-7-1-1 Python Parameters

3.7.1.2 App Manager Configuration

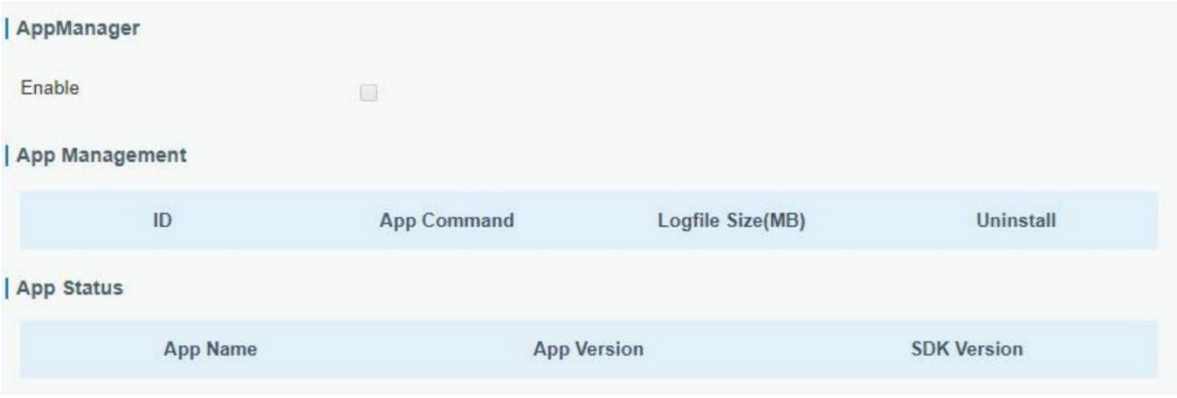


Figure 3-7-1-2

AppManager Configuration	
Item	Description
Enable	After enabling Python AppManager, user can click "View" button on the "Python" webpage to view the application status managed by AppManager.

App Management	
ID	Show the ID of the imported App.
App Command	Show the name of the imported App.
Logfile Size(MB)	User-defined Logfile size. Range: 1-50.
Uninstall	Uninstall APP.
App Status	
App Name	Show the name of the imported App.
App Version	Show the version of the imported App.
SDK Version	Show the SDK version which the imported App is based on.

Table 3-7-1-2 APP Manager Parameters

3.7.1.3 Python App

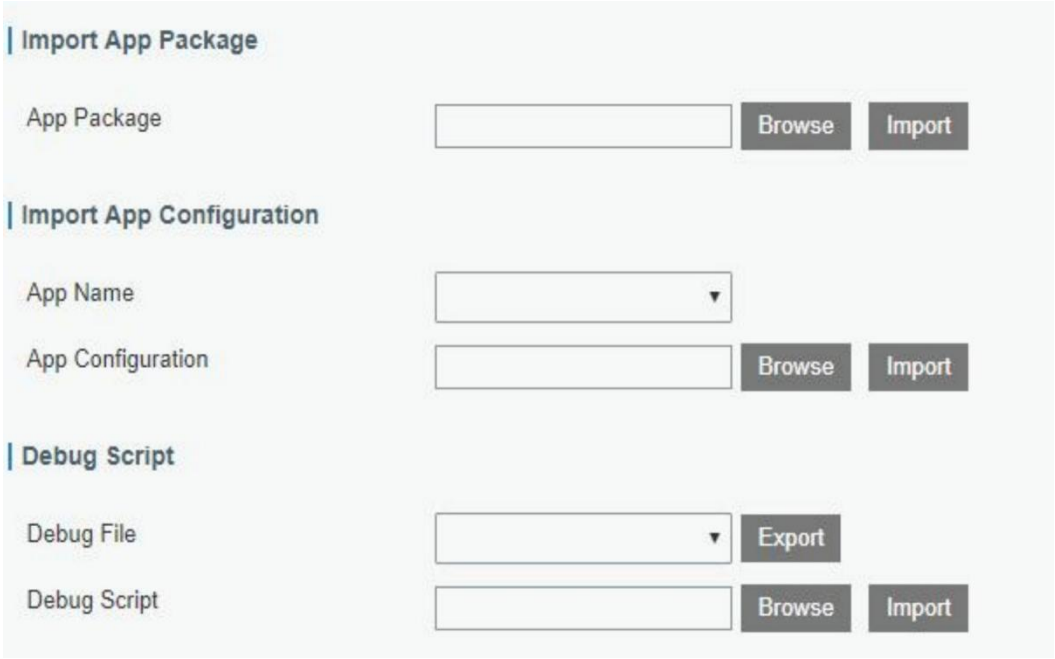


Figure 3-7-1-3

Python APP	
Item	Description
App Package	Select App package and import.
App Name	Select App to import configuration.
App Configuration	Select configuration file and import.
Debug File	Export script file.
Debug Script	Select Python script to be debugged and import.

Table 3-7-1-3 APP Parameters

3.7.2 Node-RED

Node-RED is a flow-based development tool for visual programming and wiring together

hardware devices, APIs and online services as part of the Internet of Things. Node-RED provides a web-browser-based flow editor, which can easily wire together flows using the wide range of nodes in the palette. For more guidance and documentation please refer to Node-RED official website.

3.7.2.1 Node-RED

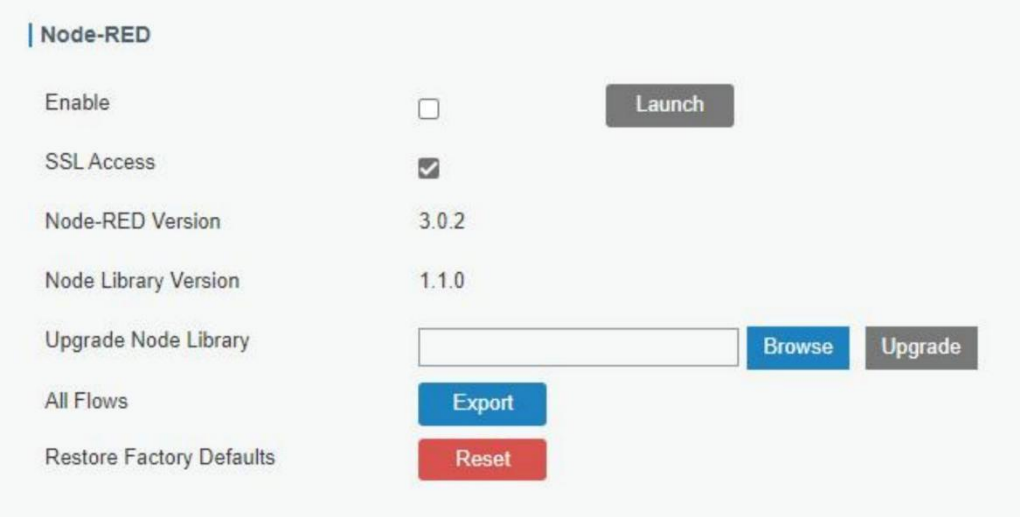


Figure 3-7-2-1

Node-RED	
Item	Description
Enable	Enable the Node-RED.
Launch	Click to launch the web GUI of Node-RED.
SSL Access	Enable to access the Node-RED web GUI via HTTPS service only.
Node-RED Version	Show the version of the Node-RED. The Node-RED version can be upgraded only when you upgrade the gateway.
Node Library Version	Show the version of the node library.
Upgrade Node Library	Upgrade the node library by importing the library package.
All Flows Export	Export all flows as a JSON format file.
Restore Factory Default	Erase all flow data of Node-RED.

Table 3-7-2-1 Node-RED Parameters

Linovision provides a customized node library to use the interfaces of the gateway.

Figure 3-7-2-2

Node Library	
Node	Description
LoRa Input	Receive LoRaWAN® packets from the gateway. This only works when the network server is enabled.
LoRa Output	Send downlink commands to LoRaWAN® nodes.
Device Filter	Filter out the data of one or more specific LoRaWAN® nodes via device EUIs.
GW Info	Monitor events of gateway, this needs to ensure the event detection is enabled in General > Events > Events Settings.
Email Output	Send an Email. If you select STMP option as “Same as the gateway”, it is necessary to go to System > General Settings > SMTP page to configure SMTP client settings.
SMS Input	Receive SMS message. This only works when the cellular is connected.
SMS Output	Send an SMS message. This only works when the cellular is connected.

Table 3-7-2-2 Node Library Parameters

Related Configuration Example

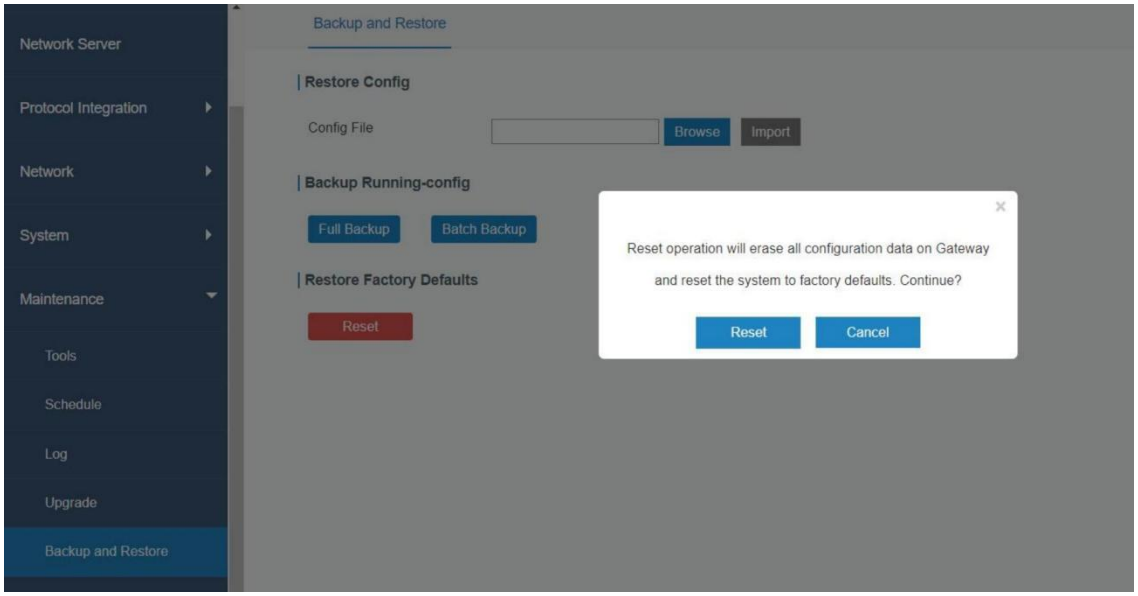
Node-RED

Chapter 4 Application Examples

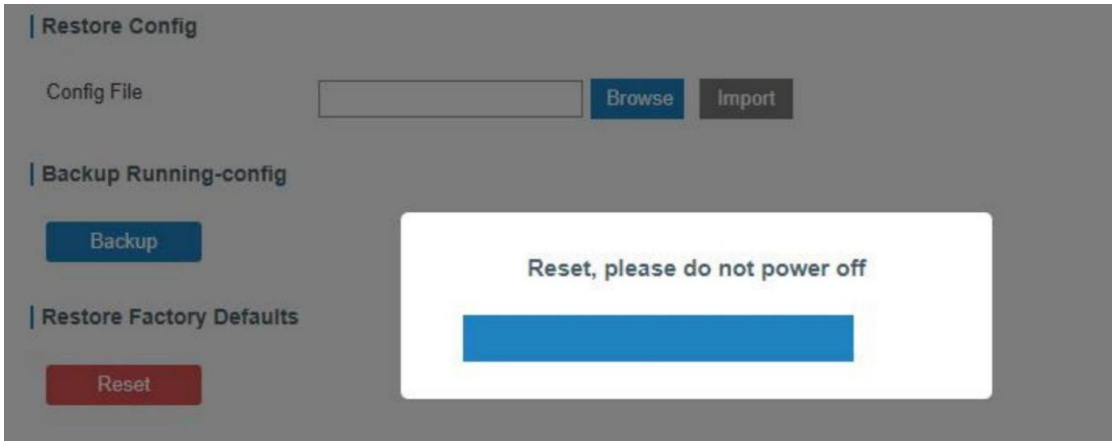
4.1 Restore Factory Defaults

Method 1:

Log in web interface, and go to Maintenance > Backup and Restore, click Reset button, you will be asked to confirm if you'd like to reset it to factory defaults. Then click Reset button.



Then the gateway will reboot and restore to factory settings immediately.



Please wait till STATUS light staticly and the login page pops up again, which means the gateway has already been reset to factory defaults successfully.

Related Topic

Restore Factory Defaults

Method 2:

Locate the reset button on the gateway, press and hold the reset button for more than 5s

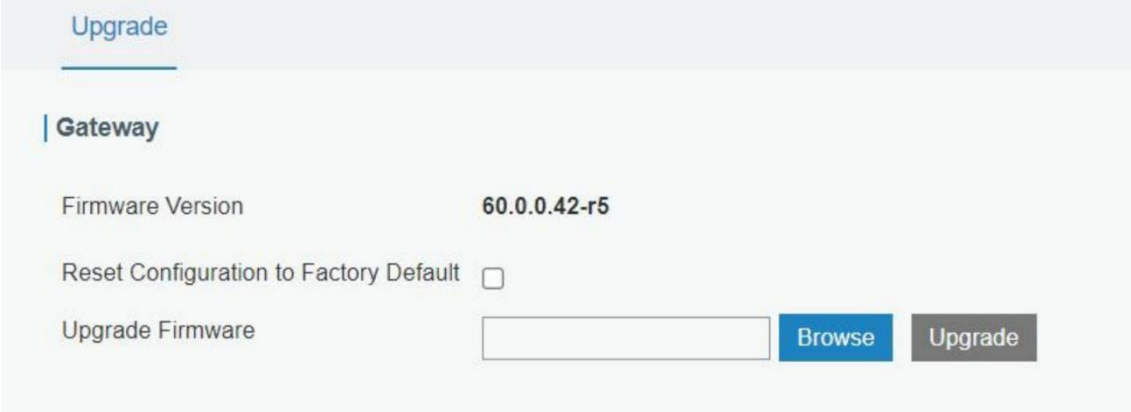
until the STATUS LED blinks.

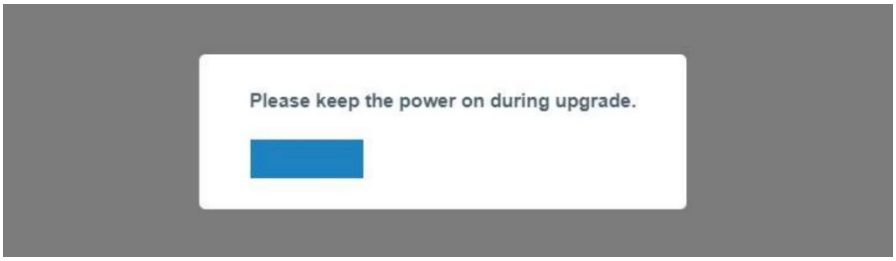
4.2 Firmware Upgrade

It is suggested that you contact Linovision technical support first before you upgrade gateway firmware. Gateway firmware file suffix is ".bin".

After getting firmware file please refer to the following steps to complete the upgrade.

1. Go to "Maintenance > Upgrade".
2. Click "Browse" and select the correct firmware file from the PC.
3. Click "Upgrade" and the gateway will check if the firmware file is correct. If it's correct, the firmware will be imported to the gateway, and then the gateway will start to upgrade.
4. After upgrade, open the gateway web GUI via browser to check if upgrade success. Before opening, it is suggested to clean the caches of browser.





Related Topic

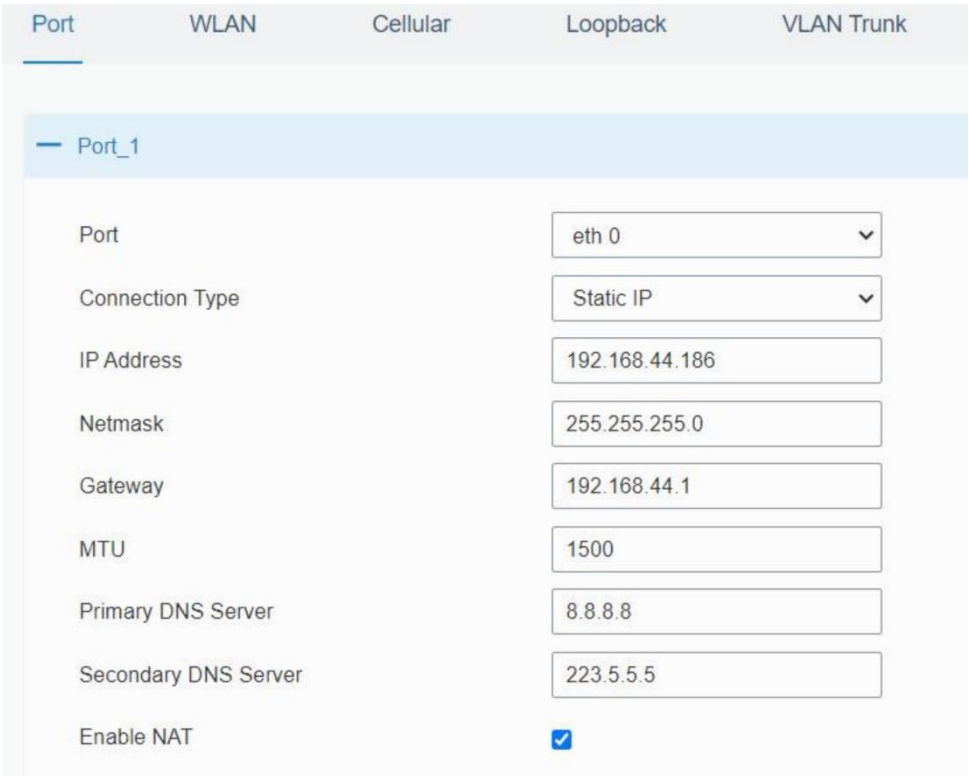
Upgrade

4.3 Network Connection

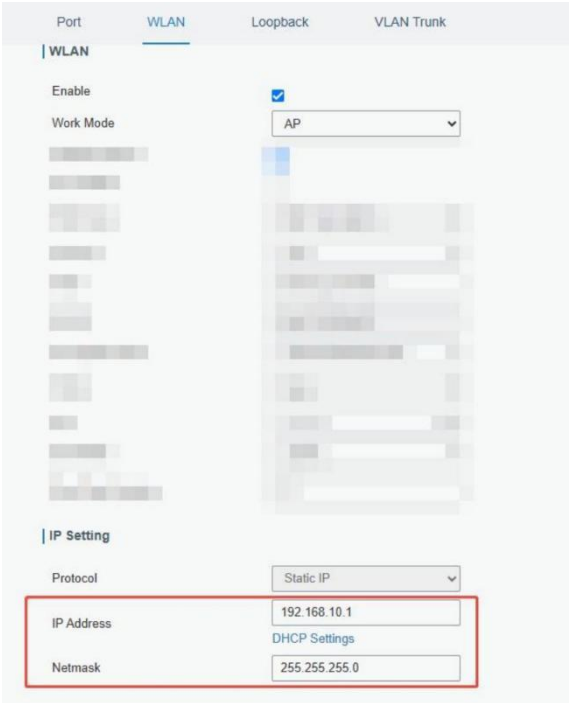
The gateway supports multiple methods to set up network connections.

4.3.1 Ethernet Connection

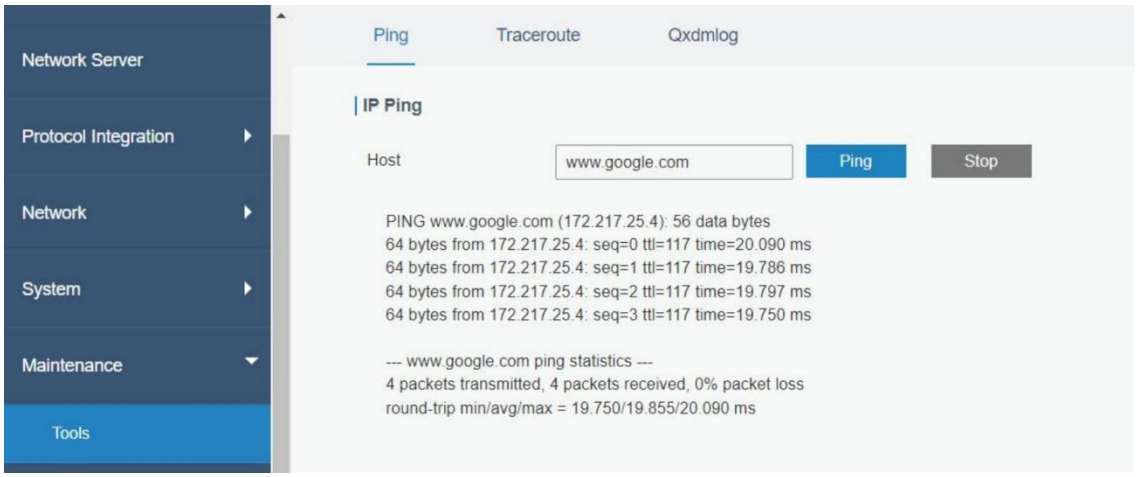
1. Go to "Network > Interface > Port" page to select the connection type and configure Ethernet port configuration, click "Save & Apply" for configuration to take effect.



Note: If there is IP conflict when changing the IP address of Ethernet port, please change the subnet of WLAN first.



2. Connect Ethernet port of gateway to devices like router or modem.
3. Go to “Maintenance > Tools > Ping” to check network connectivity.

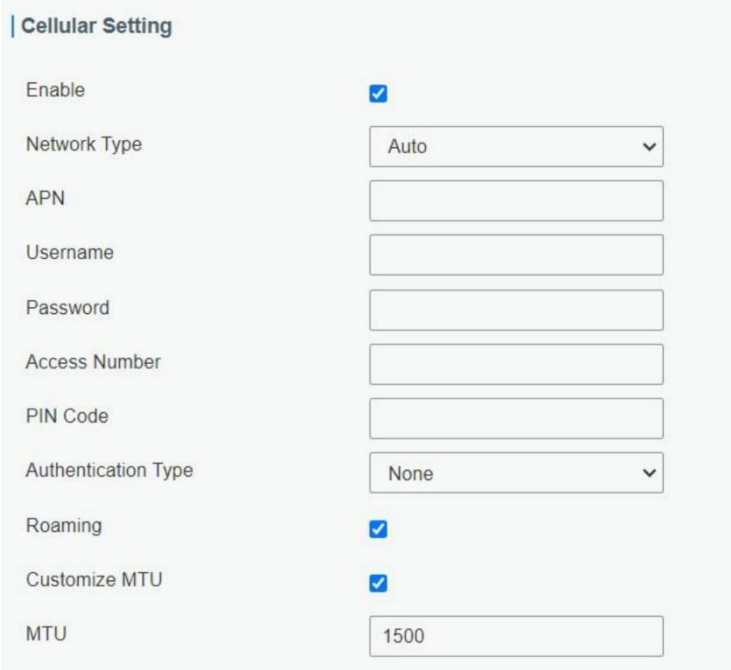


Related Topic

Port Setting

4.3.2 Cellular Connection (Cellular Version Only)

1. Go to “Network > Interface > Cellular > Cellular Setting” and configure the necessary cellular info of SIM card, click “Save” and “Apply” for configuration to take effect.



2. Go to “Status > Cellular” to view the status of the cellular connection. If it shows 'Connected', SIM has dialed up successfully.

Related Topic

Cellular Setting

Cellular Status

4.4 Wi-Fi Application Example

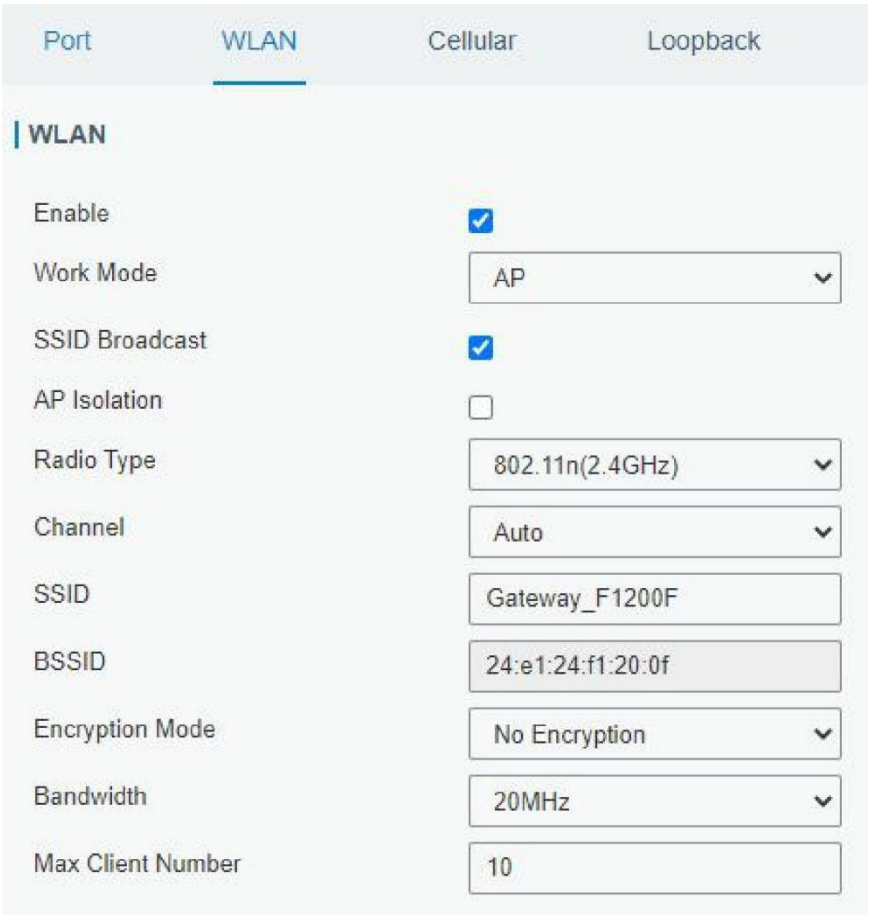
4.4.1 AP Mode

Application Example

Configure IOT-G65 as AP to allow connection from users or devices.

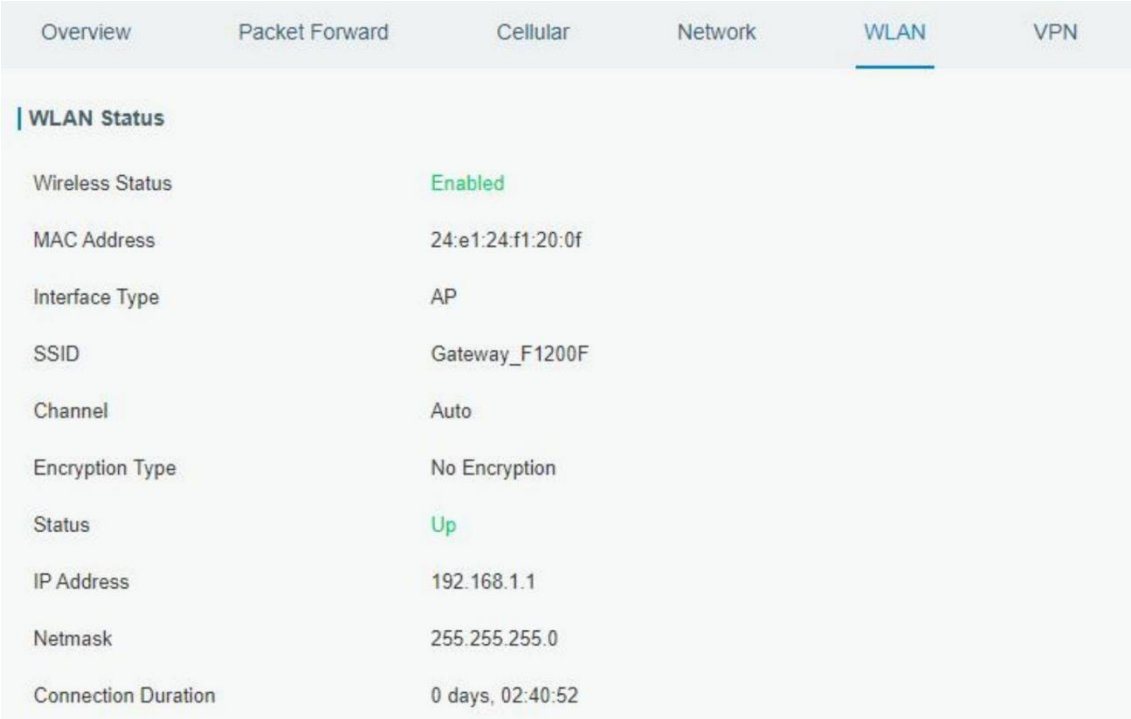
Configuration Steps

1. Go to “Network > Interface > WLAN” to configure wireless parameters as below.



Click “Save” and “Apply” buttons after all configurations are done.

2. Use a smart phone to connect the access point of gateway. Go to “Status > WLAN”, and you can check the AP settings and information of the connected client/user.



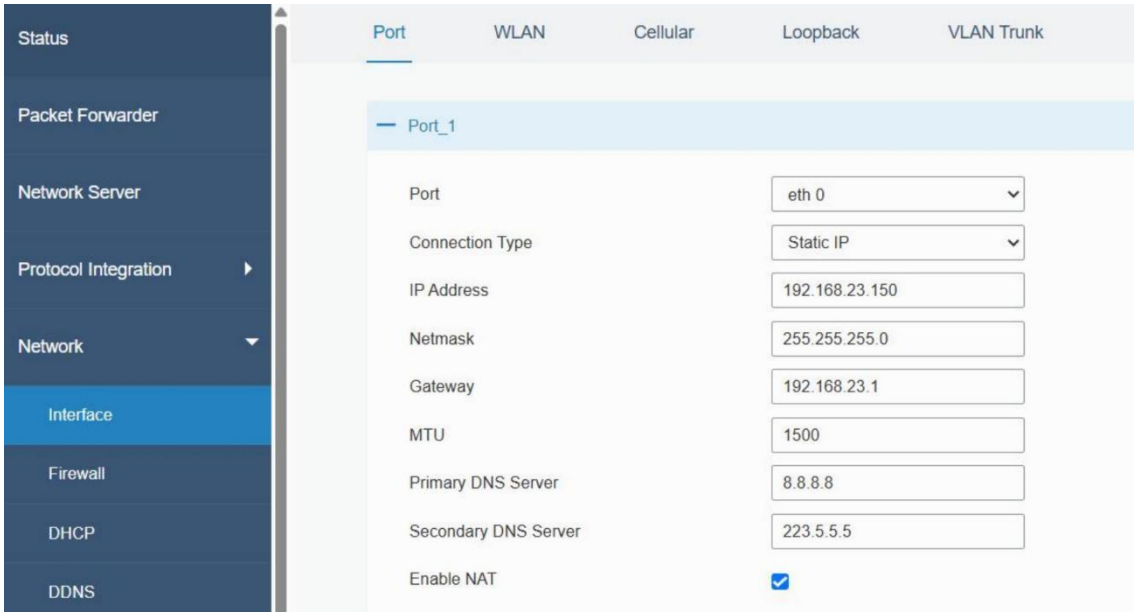
4.4.2 Client Mode

Application Example

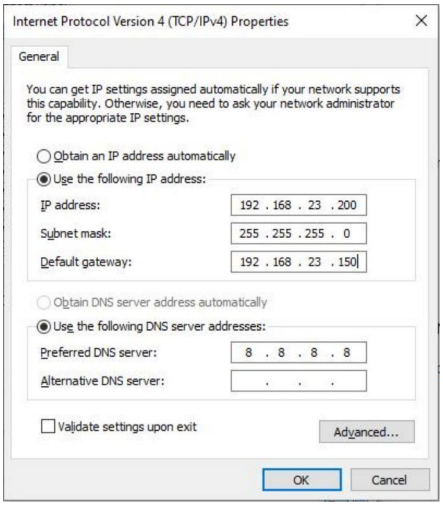
Configure IOT-G65 as Wi-Fi client to connect to an access point to have Internet access.

Configuration Steps

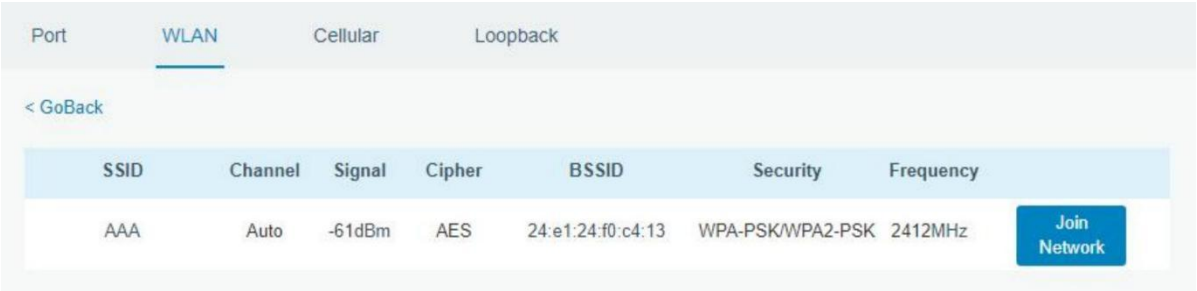
1. Go to **Network > Interface > Port** page to select connection type as **Static IP** and configure an IP address for the Ethernet WAN port.



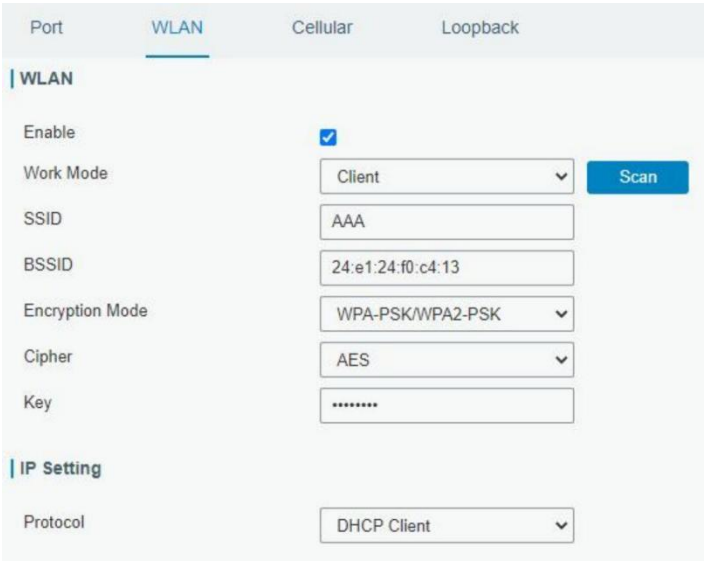
2. Connect PC to IOT-G65 ETH port directly or through PoE injector.
3. Assign the IP address to computer manually. Take Windows 10 system as an example:



4. Open a Web browser and type in the IP address of the Ethernet port to access the web GUI.
5. Go to **Network > Interface > WLAN** and click **Scan** to search for WiFi access point.

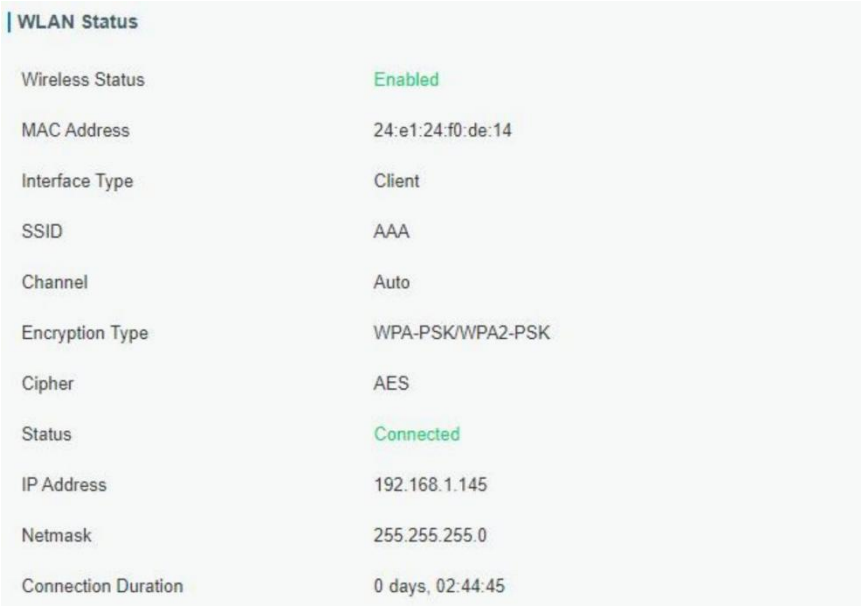


6. Select one access point and click `Join Network`, then type the password of the access point.

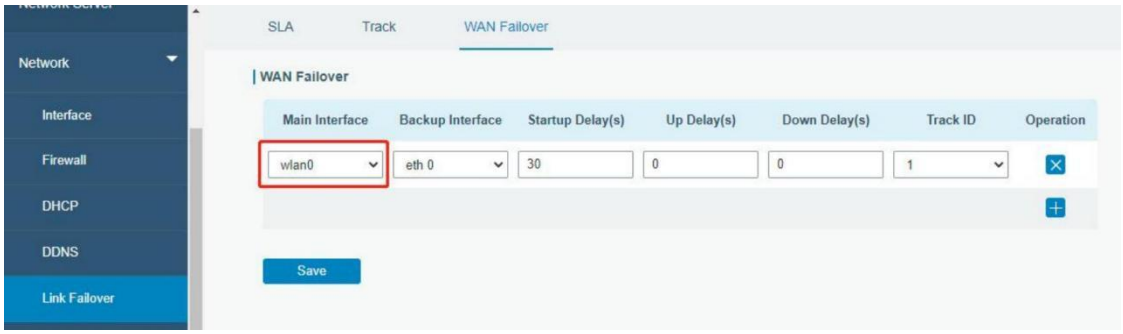


Click `Save` and `Apply` buttons after all configurations are done.

7. Go to `Status` > `WLAN` to check the connection status of the client.



8. Go to `Network` > `Failover` > `WAN Failover` to switch the wlan0 as main interface, then gateway can use the Wi-Fi to access the network.



Related Topic

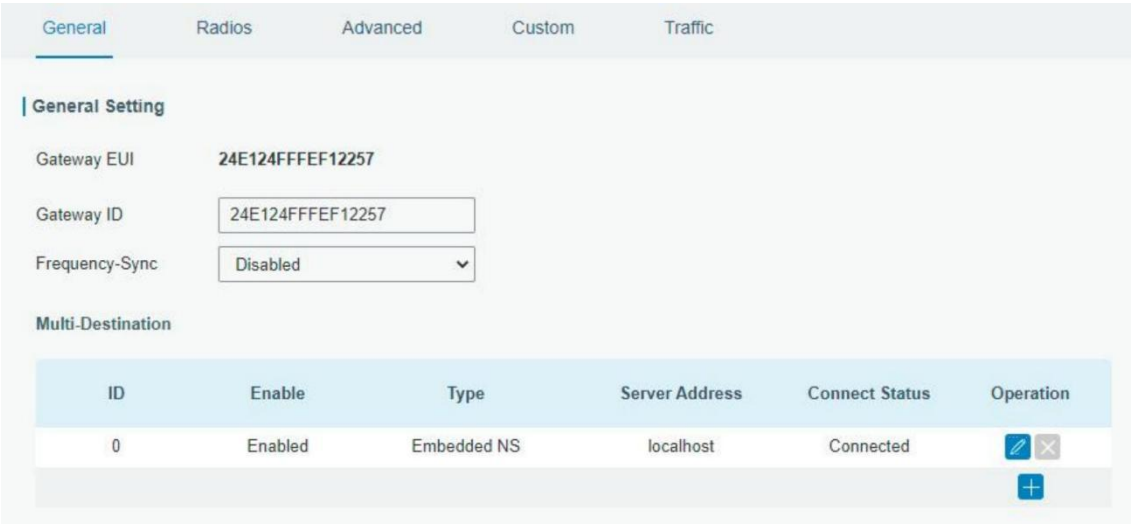
WLAN Setting

WLAN Status

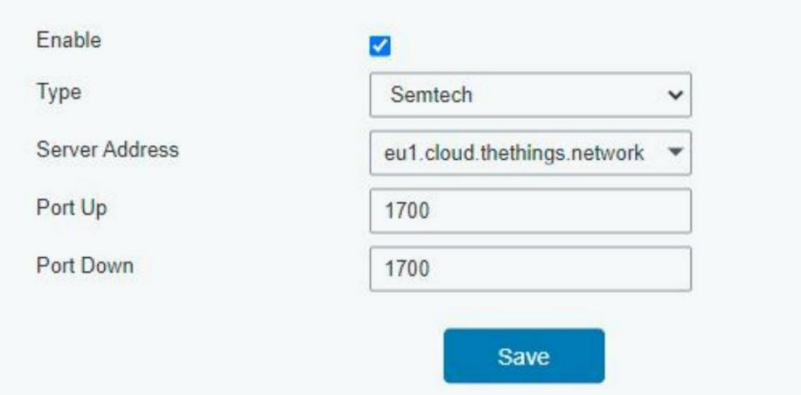
4.5 Packet Forwarder Configuration

IOT-G65 gateway has installed multiple packet forwarders including Semtech, Basic station, Chirpstack, etc. Before connecting make sure the gateway has connected to network.

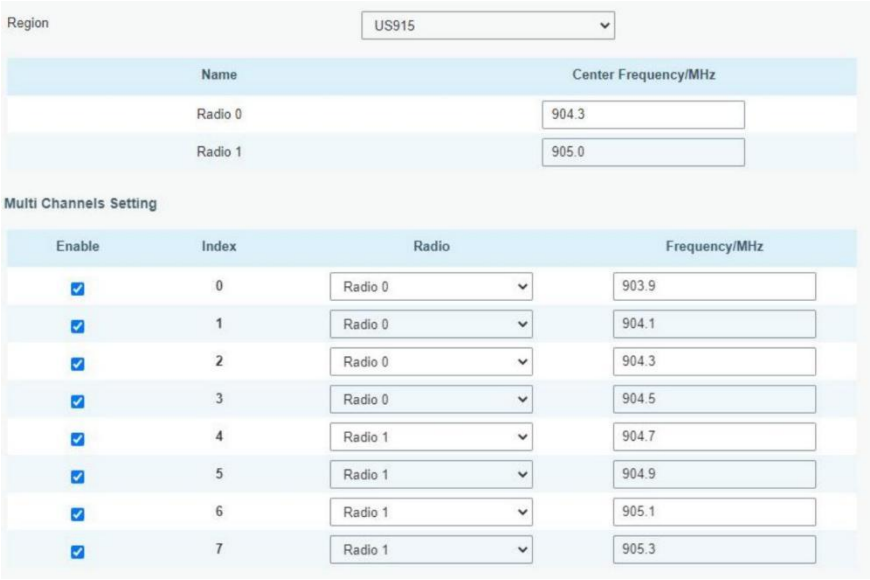
1. Go to Packet Forwarder > General.



2. Click  to add a new network server. Fill in the network server information and enable this server.



3. Go to Packet Forwarder > Radio page to configure the center frequency and channels. The channels of the gateway and network server need to be the same.



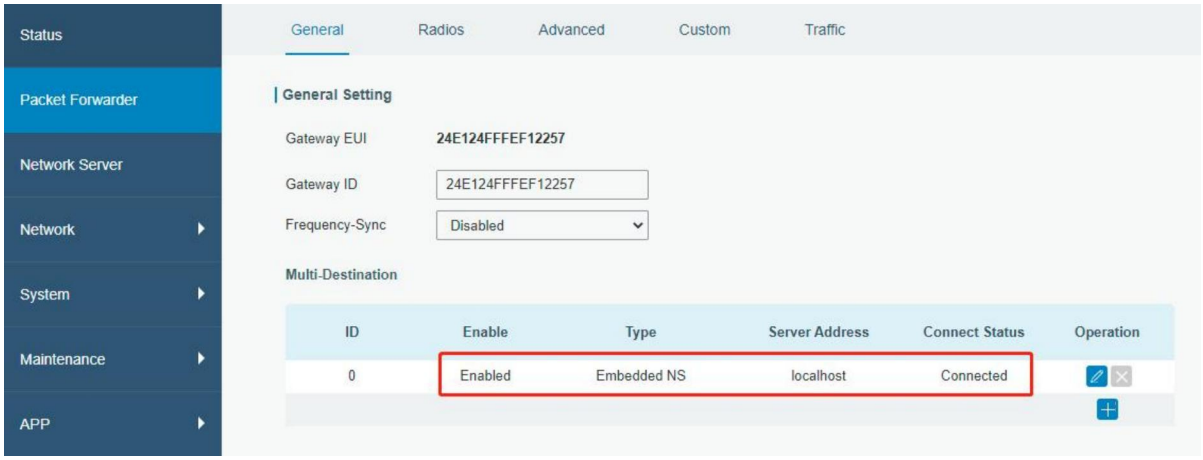
4. Add the gateway on network server page. For more details about the network server connection please refer to Linovision IoT Support portal.

4.6 Network Server Configuration

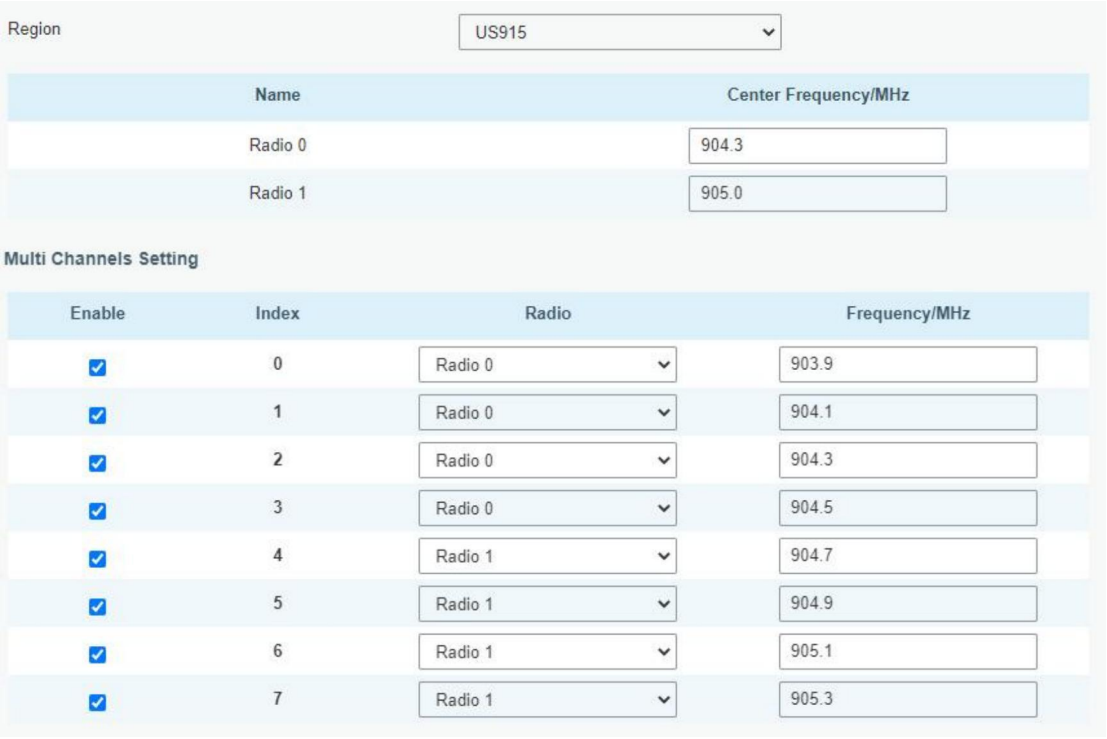
The gateway can work as a LoRaWAN® network server to receive and analyze the data of LoRaWAN® end devices, and then achieve the flexible integration with different systems.

4.6.1 Connect to Linovision IoT Cloud

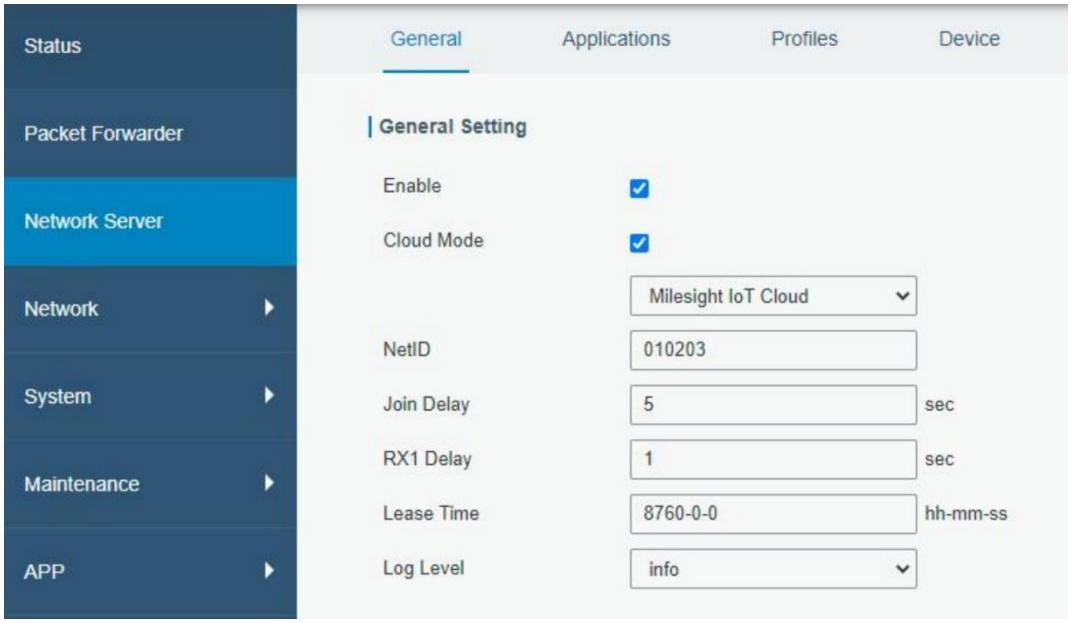
1. Go to Packet Forwarder > General page to enable the embedded network server.



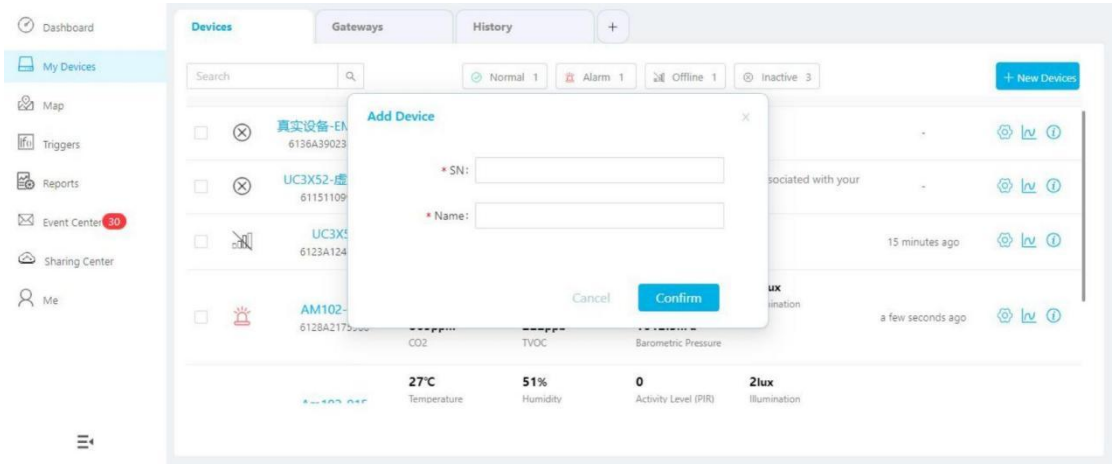
2. Go to Packet Forwarder > Radio page to select the antenna type, configure the center frequency and channels. The channels of the gateway and end devices need to be the same.



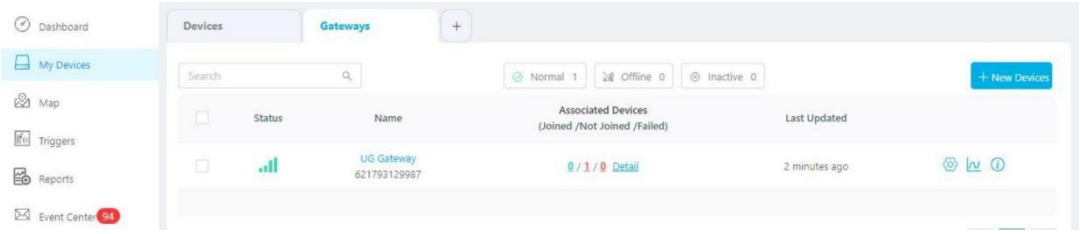
3. Go to Network Server > General page to enable the network server and “Cloud mode”, then select “Linovision IoT Cloud” mode.



4. Log in the Linovision IoT Cloud. Then go to `My Devices` page and click "+New Devices" to add gateway to Linovision IoT Cloud via SN. Gateway will be added under "Gateways" menu.

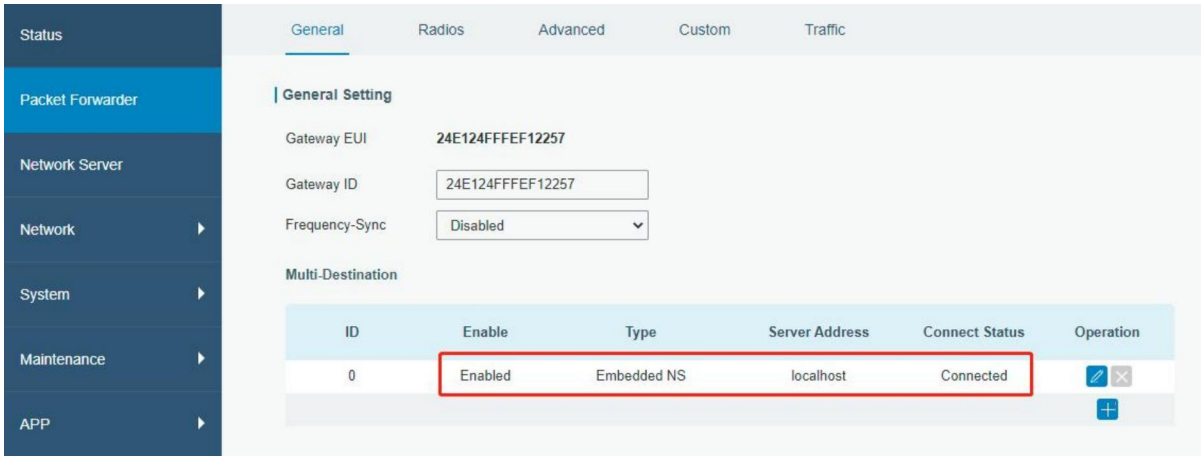


5. The gateway is online on Linovision IoT Cloud.

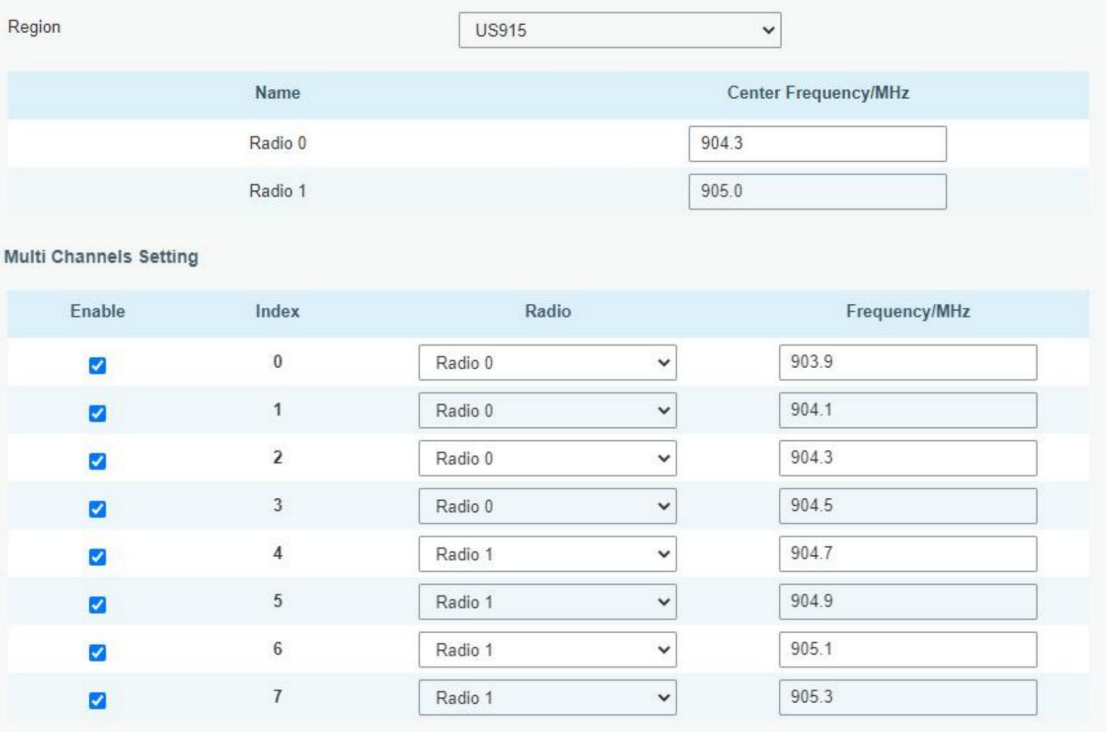


4.6.2 Add End Devices

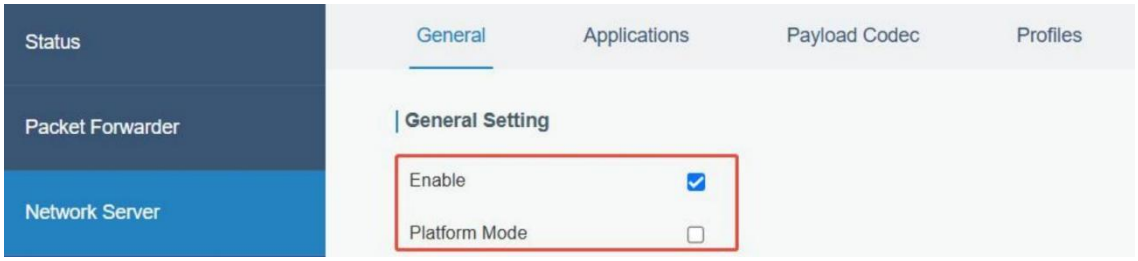
1. Go to `Packet Forwarder` > `General` page to enable the embedded NS.



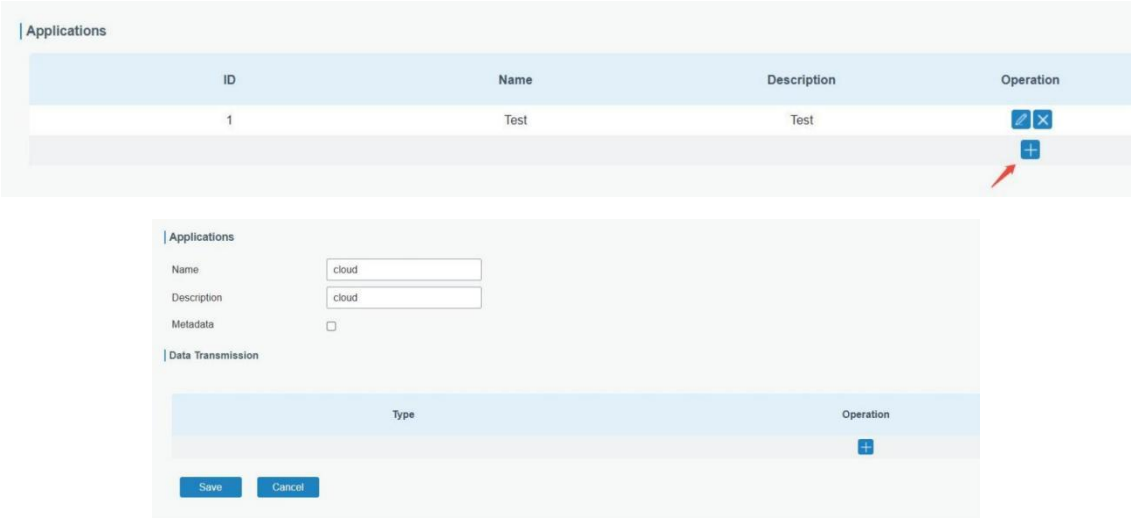
2. Go to `Packet Forwarder` > `Radio` page to configure the center frequency and channels. The channels of the gateway and end devices need to be the same.



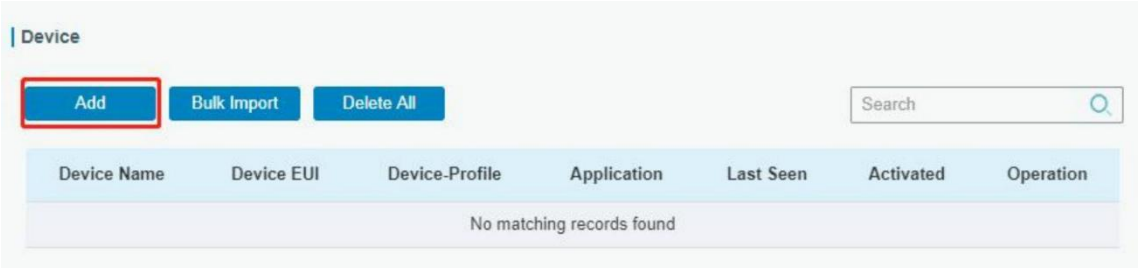
3. Go to `Network Server` > `General` page to enable the network server.



4. Go to `Network Server` > `Applications` page to add an application.

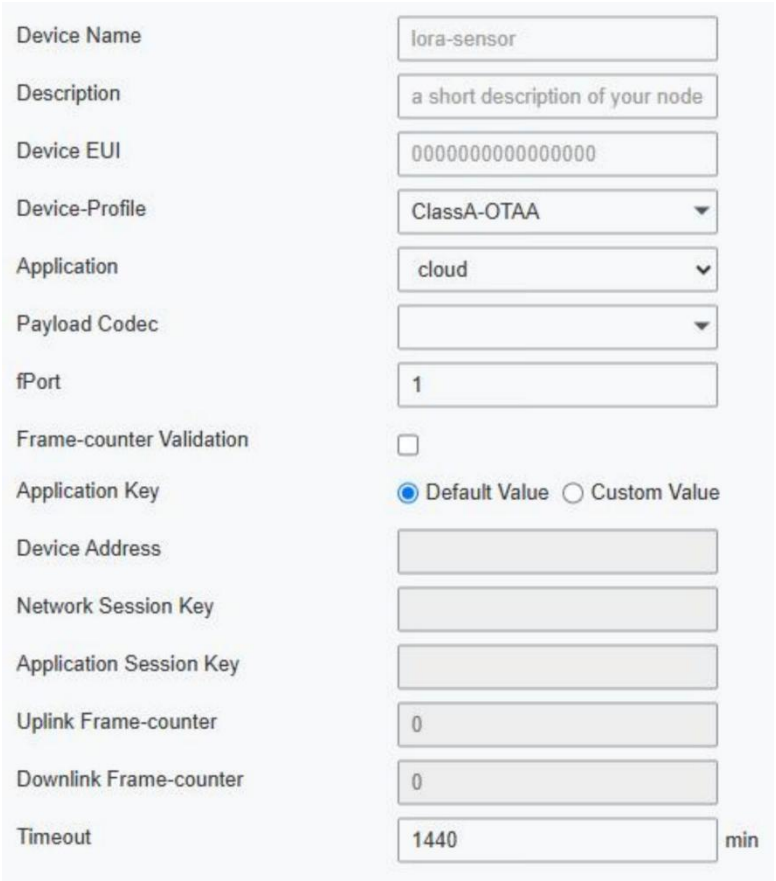


5. Go to `Network Server > Device` page and click `Add` to add a LoRaWAN® node device. You can also click `Bulk Import` to use template to add bulk devices at once.



6. Fill in the information of the end device and click `Save&Apply`. The information can be found on the end device's configuration page or from manufacturer's manuals. Here are the default settings of Linovision end devices:

- Device EUI: this can be found on the device.
- Device-Profile: OTAA type files
- Payload Codec: select the model
- fPort: 85
- Application Key: select Default Value. If you use random keys, please select Custom Value.
- Timeout: the time to judge the device online/offline status.

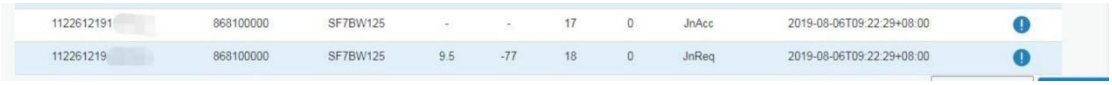


7. Go to `Network Server` > `Packets` page to check if any uplinks from this device.

Click `Details` to check packet details and decoded results.

4.6.3 Send Data to Device

1. Go to Network Server > Packets, check the packet in the network server list to make sure that the device has joined the network successfully.



2. Fill in the device EUI or select the multicast group which you need to send downlinks. Then fill in the downlink commands, ports.

3. Click “Send”.

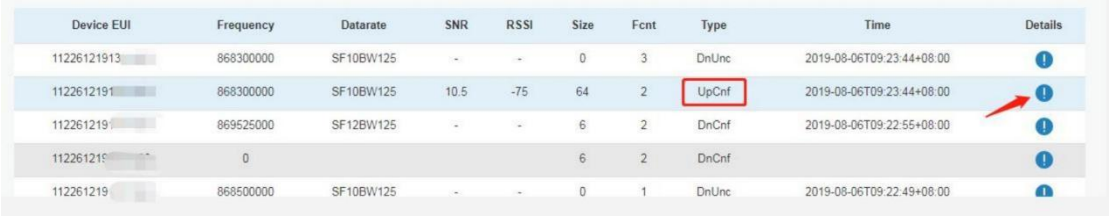
4. Check the packet in the network server list to make sure that the device has received this message successful. It’s suggested to enable “Confirmed”. Multicast feature does not support confirmed downlinks.

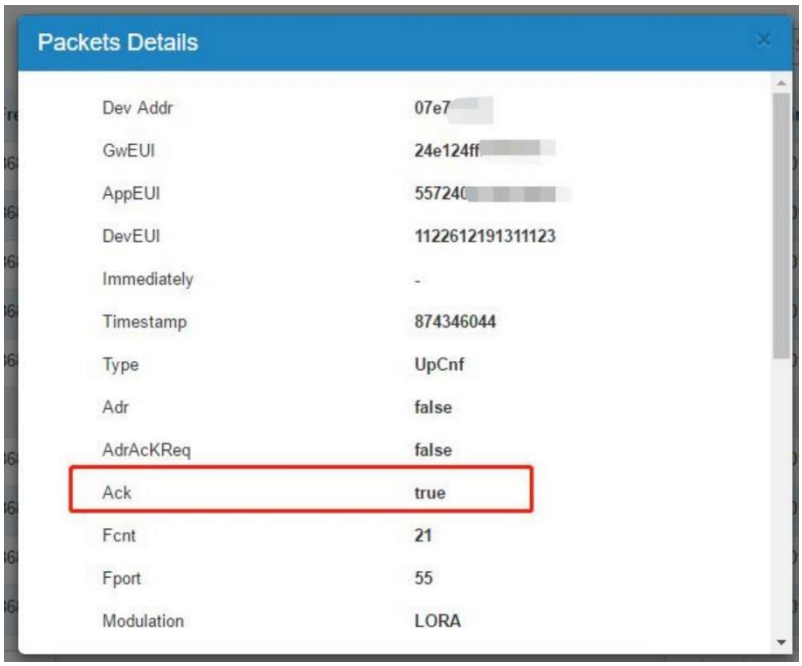
You can click “Refresh” to refresh the list or set automatic refreshing frequency for the list.
If the device’s class type is Class C, then the device will constantly receive packets.

This packet’s type is DnCnf (Downlink Confirmed Packet) and if the packet’s color is gray, then it means the packet cannot be transmitted now because at least one message has

been in the queue. If the packet record is white, it means the packet has been delivered successfully.

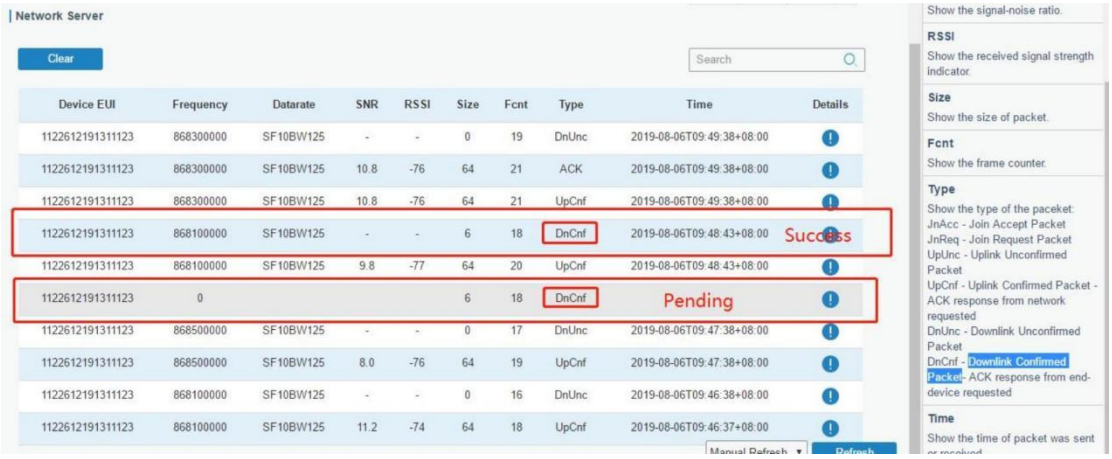
If the device receives this downlink confirmed packet, then the device will reply “ACK” when delivering next.

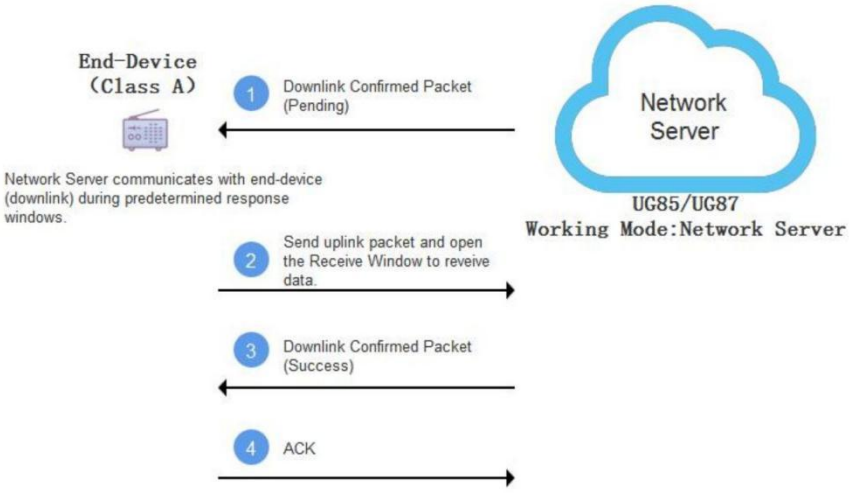


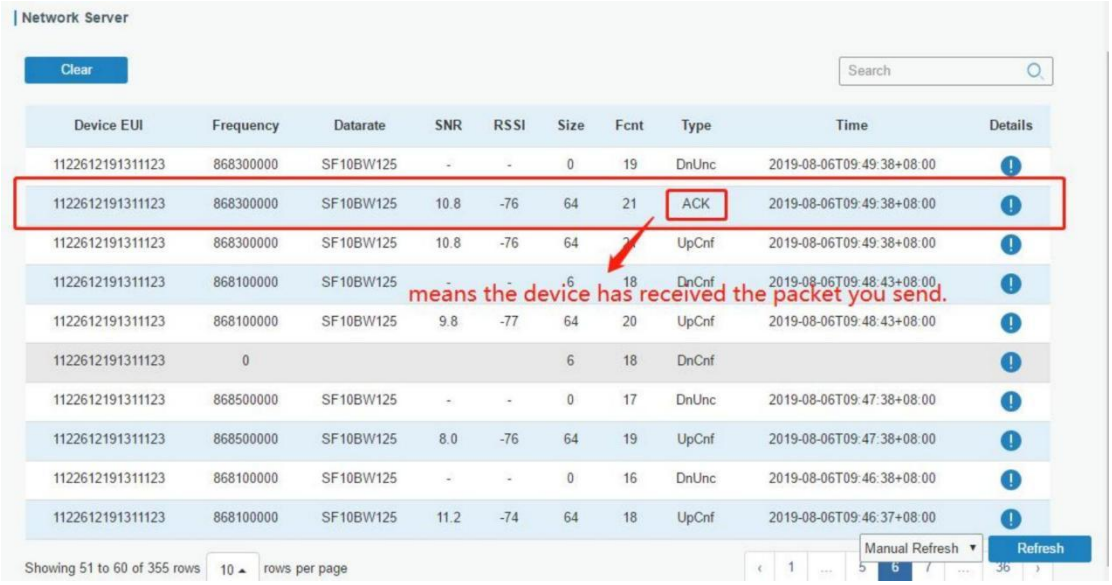


Ack is “true” means that the device has received this packet.

If the device’s class type is Class A, only after the device sends out an uplink packet will the network server sends out data to the device.







Related Topic
Packets

4.6.4 Connect to HTTP/MQTT Server

The gateway supports choosing the data transport protocol to send data to another server address using MQTT, HTTP or HTTPS protocol.

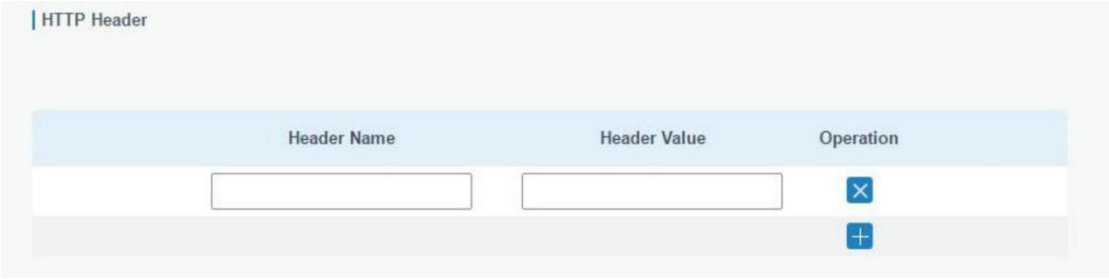
1. Go to Network Server > Application to select the application to edit.
2. Click  to add a data transmission type.

HTTP or HTTPS:

Step 1: select HTTP or HTTPS as transmission protocol.

Step 2: Enter the destination URL. Different types of data can be sent to different URLs.

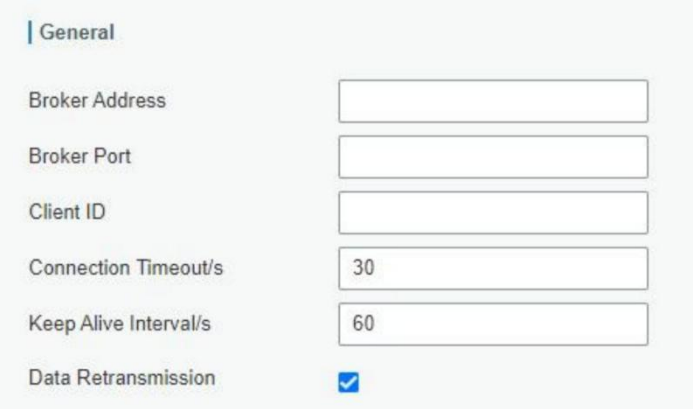
Enter the header name and header value if there is user credentials when accessing the HTTP(s) server.



MQTT:

Step 1: select the transmission protocol as MQTT and configuration mode as Manual Configuration.

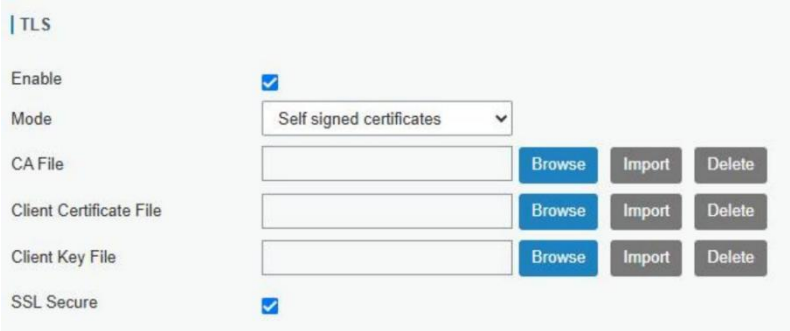
Step 2: Fill in MQTT broker general settings.



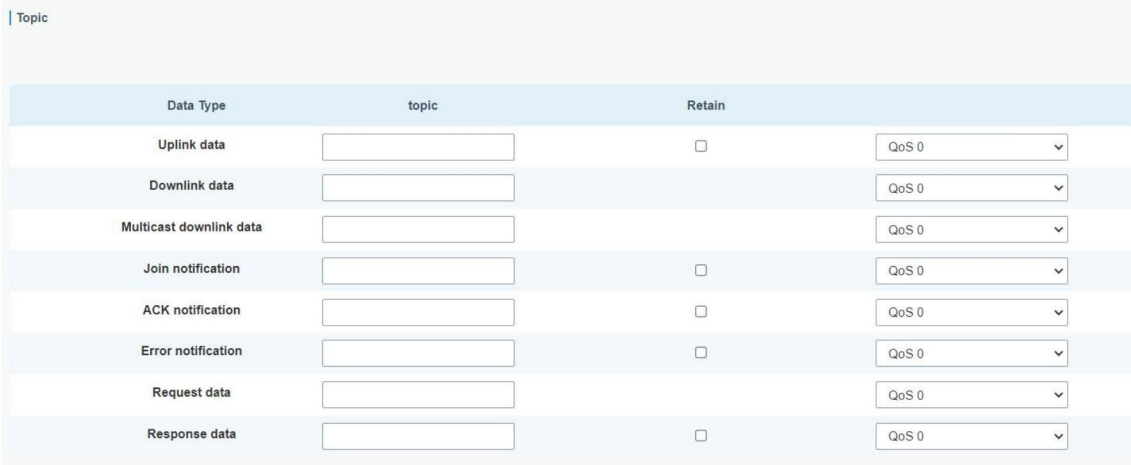
Step 3: Select the authentication method required by the server.

If you select user credentials for authentication, you need to enter the username and password for authentication.

If certificate is necessary for verification, please select mode and import CA certificate, client certificate and client key file for authentication.



Step 4: Enter the topic to receive data or send downlinks, and choose the QoS.

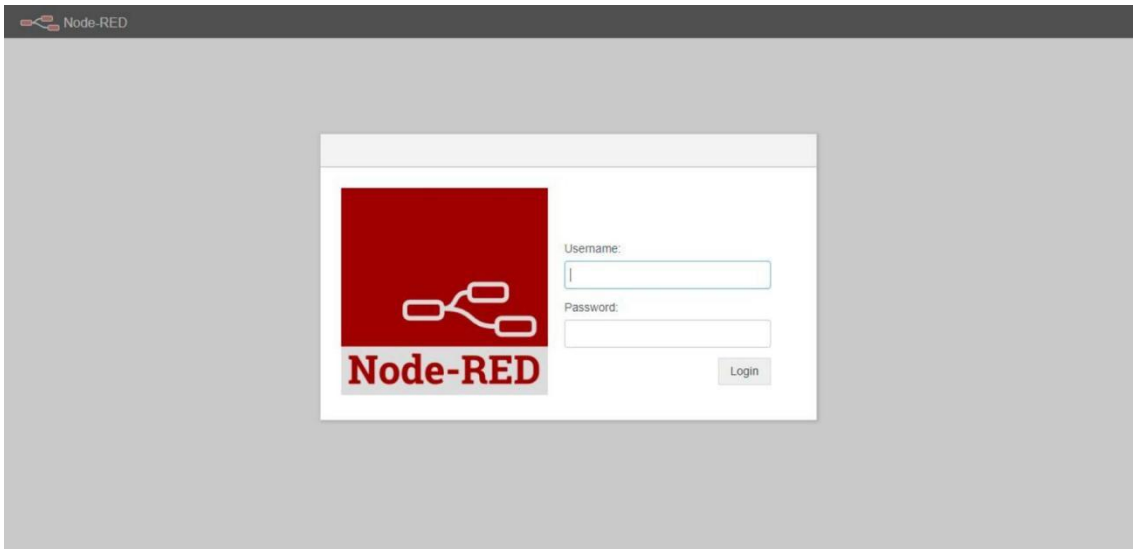


4.7 Node-RED

4.7.1 Start the Node-RED

1. Go to “App > Node-RED” to enable the Node-RED feature.

2. After enabled, click “Launch” to go to the Node-RED web GUI and to log in with the same username and password as gateway.



4.7.2 Send Data by Email

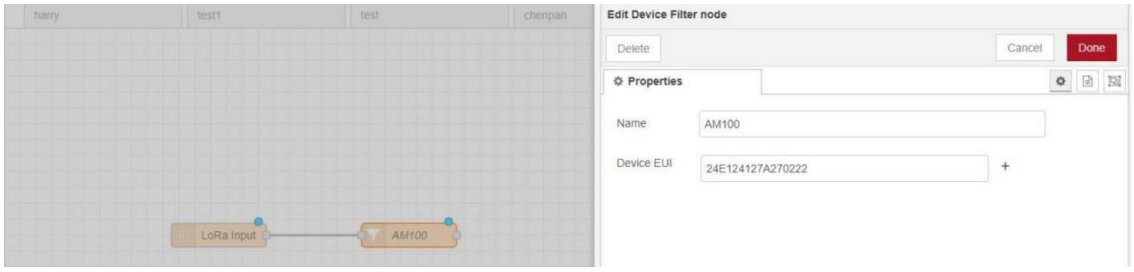
Application Example

Send AM102 device data by Email.

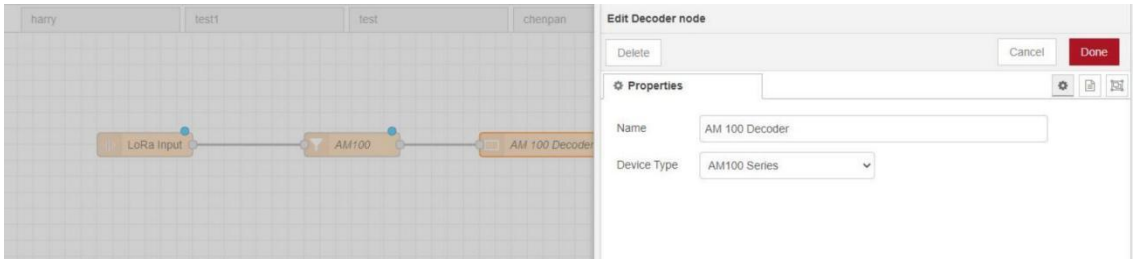
Configuration Steps

1. Add a “LoRa Input” node. Before adding please ensure network server mode is enabled and LoRaWAN devices have joined the network.

2. If you add many devices and only need one device data, add “Device Filter” node behind the “LoRa Input” and type the device EUI.

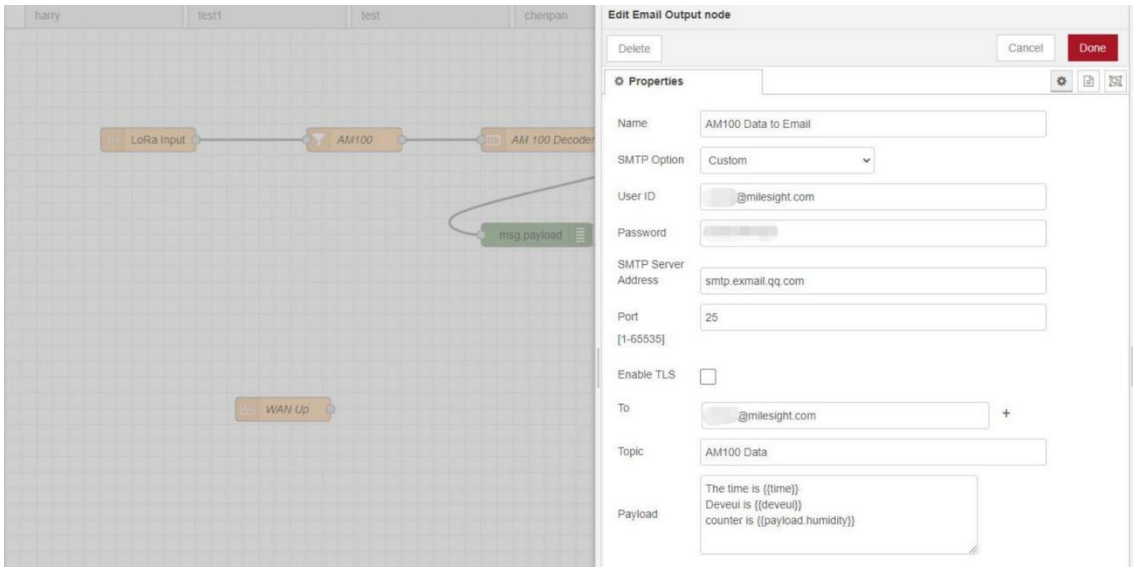


3. Add a “Decoder” node to decode the Linovision sensor data.



4. Add an “Email Output” and type the SMTP client settings, destination email address and contents. Example content:

The time is {{time}}
Deveui is {{deveui}}
Humidity is {{payload.humidity}}



Note:

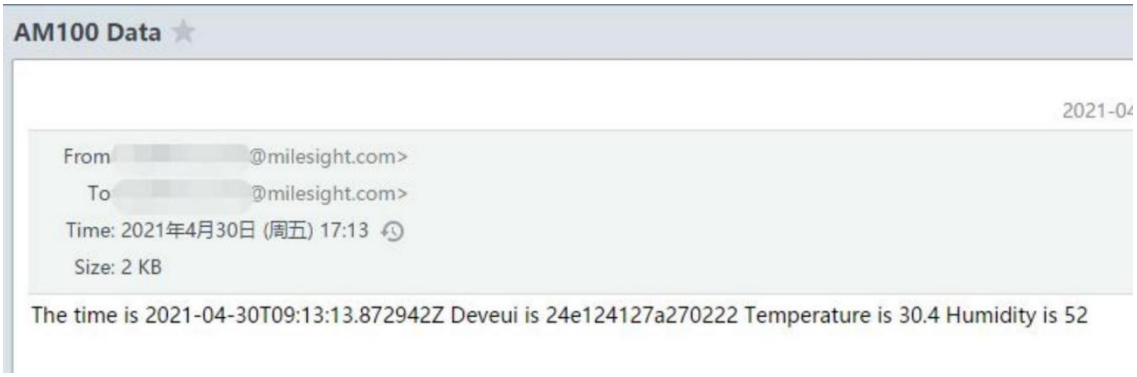
1) When you select SMTP Option as “Same as Gateway”, go to “System -> General Settings -> SMTP” to configure the SMTP clients.

2) Basic format to call LoRaWAN node data is *{{property name}}*, you can click “Help” page for more info about the Email or SMS payload format.

3) If you need to check the output content in every node, please add debug node.

5. After completing the configuration, click “Deploy” to save all your configuration.

6. When AM102 sends data to gateway, gateway will transfer the data to email.



Related Topic

Node-RED

[END]