

GW5000E LoRaWAN Gateway

User Manual



1 DESCRIPTION	3
1.1 PRODUCT DESCRIPTION	3
1.2 FEATURES	3
1.3 TECHNICAL PARAMETERS	4
2 PRODUCT STRUCTURE	7
2.1 DIMENSION	7
2.2 INTERFACES	8
2.3 PACKING LIST	9
3 INSTALLATION	10
3.1 INSTALLATION NOTES	10
3.2 INSTALLATION STEPS	11
3.3 POWER SUPPLY	13
4 CONFIGURATION	14
4.1 CONFIGURATION NOTES	14
4.2 QUICK CONFIGURATIONS	14
4.2.1 <i>Connecting the Gateway</i>	14
4.2.2 <i>Configuring the MQTT Server</i>	14
4.2.3 <i>Configuring the UDP Server</i>	16
4.2.4 <i>Configuring the uplink and downlink ports</i>	17
4.2.5 <i>Configuring the central frequency of RF 0 (SX1255)</i>	17
4.2.6 <i>Configuring the center frequency of RF 1 (SX1255)</i>	17
4.2.7 <i>Configuring TX Power</i>	17
4.3 VIEW CONNECTION STATUS	18
4.4 NETWORK INTERFACE SETTINGS	18
4.4.1 <i>WAN Port Setting</i>	19
5 THE USE OF APPLICATION PLATFORM	20
6 FAQ	22
6.1.GATEWAY TROUBLESHOOTING PROCESS	22
6.2.DESCRPTION OF 4G NETWORK	23

1 Description

1.1 Product Description

The GW5000E is an IoT gateway that operates on the low-power, wide-area LoRaWAN protocol. It incorporates a high-performance Semtech transceiver chip with 8 channels, enabling full-duplex communication and connectivity for thousands of nodes. Known for its extensive coverage and robust penetration, the gateway maintains reliable connections even in challenging environments.

Uplink data from nodes can be sent to external LoRaWAN servers like Winext IoT-Vision, Tencent IOT, The Things Network (TTN), or ChirpStack through various carriers including 3G/4G, WIFI, or Ethernet. Alternatively, it can be configured to utilize an integrated server (NS) for seamless application platform integration.

Designed for flexible installation, the gateway can be wall-mounted or pole-mounted. It is ideally suited for a range of applications including industrial plants, warehouses, offices, and server rooms.

1.2 Features

- Utilizes Qualcomm platform and Semtech SX 1302 chip ;
- 8 uplink channels and 1 downlink channel , Supports full-duplex transmission ;
- Compliant with the standard LoRaWAN protocol versions 1.0.X (1.0.2, 1.0.3, 1.0.4) and 1.1.;
- Supports noise floor scanning, making channel selection simpler and more efficient;
- On-demand switching between embedded server (NS) or external LoRaWAN server ;
- Supports WiFi connection to gateway to view gateway status, modify gateway configuration, and view node real-time data;
- Supports remote configuration, firmware updates, remote restarts, remote maintenance, and power failure alerts for maintenance and management.

1.3 Technical Parameters

1.3.1 Hardware Parameters

Items	Descriptions
Controller	Qualcomm chip, 128M memory, 16M Flash
Power Supply	DC 9~24V or standard PoE (Power over Ethernet)
LoRaFrequency Bands	CN470-510/EU863-870/US902-928/AS923-1~4/AU915-928/KR920-923/RU864-870/IN865-867/CN470 (Optional)
LoRa Communication Rate	292bps~5.4kbps , supports spreading factors SF7 to SF12
LoRa Tx Power	20dBm (30dBm max)
LoRa Rx Sensitivity	-142dBm@SF12 half-duplex (full-duplex optional), supports noise floor scanning
LoRa Antenna Gain	2/5dBi (optional)
LoRa Antenna Type	Omnidirectional
Channels	Semtech 1302 chip , 8 concurrent uplink channels, 1 downlink channel
LoRa Mode	Full-duplex/Half-duplex (optional)
Base Station Timing	Network
LTE Standards	China 4G module supported bands include: : LTE-TDD : B38/B39/B40/B41 LTE-FDD: B1/B3/B5/B7/B8 TD-SCDMA: B34/B39 UMTS:B1/8 EVDO: 800MHz CDMA1x: 800MHz GSM: 850/900/1800/1900 European/Korean/Thai/Indian 4G module supported bands include: FDD LTE: B1/B3/B5/B8/B20 TDD LTE: B38/B40/B41 WCDMA: B1/B5/B8 GSM: B3/B8 North American 4G module supported bands include: FDD LTE:B2/B4/B5/B12/B13/B14/B66/B71B WCDMA: B2/B4/B5 Latin American/Australian/New Zealand 4G module supported bands include: LTE-FDD:B1/B2/B3/B4/B5/B7/B8/B28 LTE-TDD:B40

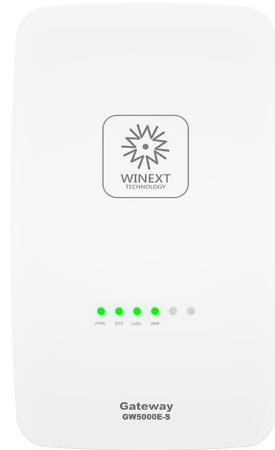
	WCDMA:B1/B2/B5/B8 GSM/EDGE:B2/B3/B5/B8 Global 4G module supported bands include: LTE-FDD: B1/B2/B3/B4/B5/B7/B8/B12/B13/B18/B19/B20/B25/B26/B28 LTE-TDD: B38/B39/B40/B41 WCDMA: B1/B2/B4/B5/B6/B8/B19 GSM: B2/B3/B5/B8
WiFi	2.4GHz , AP mode , Max Power 20dBm
Data Transmission	10/100M Ethernet and 3G/4G
Debugging Interface	WiFi, LAN, Serial Port
Operating Temperature	-20℃ ~ 65℃
Power Consumption	4W (normal operation)
Dimension	231mm*136mm*42mm(without antenna)
Interfaces	Supports TF card and SIM card, with convenient replacement without removing the casing
Net Weight	657g

1.3.2 Software Parameters

Items	Description
Core	OpenWrt 23.05
Data packet forwarding	Supports UDP (GWMP) / MQTT (GWMP) / built-in NS / WSS (based on the CUPS and LNS protocols of Basic Station)
External NS	Winext IOT, Tencent IOT, Alibaba IOT, Amazon Platform (Amazon LPWAN), TTN Platform (The Things Network), Open Source Projects (chirpstack, lorawan-stack)
LoRa Protocol	LoRaWAN V1.1 and is backward compatible with V1.0.X, supports Class A/C
Internal NS	Supports 100 terminal access, supports MQTT/HTTP push decryption, and data analysis after decryption
Modbus TCP	Supports up to 5 client access, supports function code 03, reading node temperature, humidity, voltage, and other data
User Interface	User-friendly WEB interface
Language	Chinese/English, with or without LOGO, neutral interface
3G/4G Dial-up Networking	Supports Qualcomm general dial-up QMI
IPV6	4G supports IPV6, LAN and Wi-Fi provide IPV6 relay function
Local Time Synchronization	Supports NTP client, can set different time zones, can set local NTP server
WAN Port Protocol	Static, DHCP client, PPPOE
Upgrade and Flashing	Supports firmware flashing via WEB interface upload, OTA remote updates
WiFi Debugging Connection	2.4GHz , 802.11bgn, WPA2 PSK encryption, supports STA+AP mode
Firewall	NftableV1.0.9, supports custom rule addition or modification, has SYN-flood defense
Local Log Management	Optional, supports TF to record daily communication logs, clears the oldest logs when TF is almost full
Failure Self-detection	Supports system failure self-detection, self-repair, and timely reporting to the server
Data Reporting	Supports scheduled reporting of gateway status (WAN, 4G, WiFi, LoRa, TF card)
Remote Management	Supports remote configuration, remote upgrade, remote restart, remote maintenance, power failure alerts, and other maintenance management

2 Product Structure

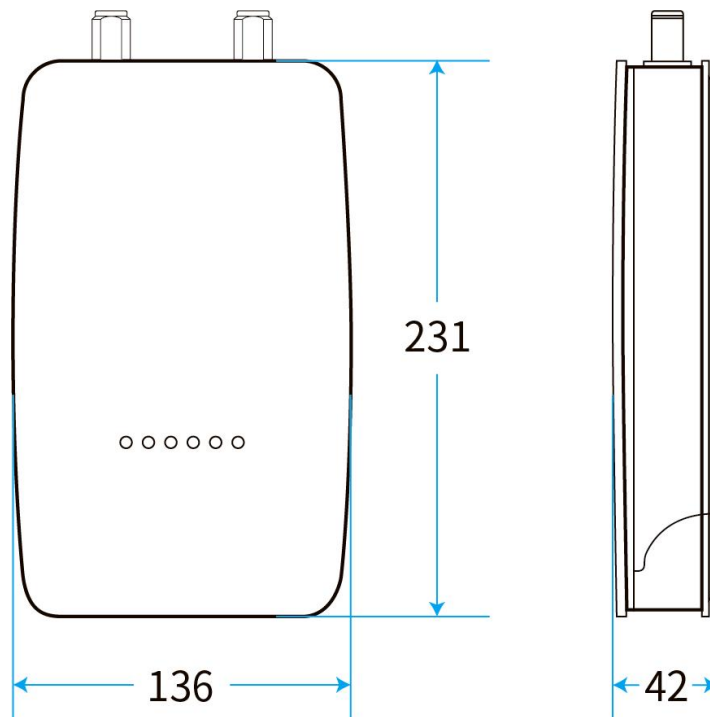
2.1 Dimension



GW5000E-S Front



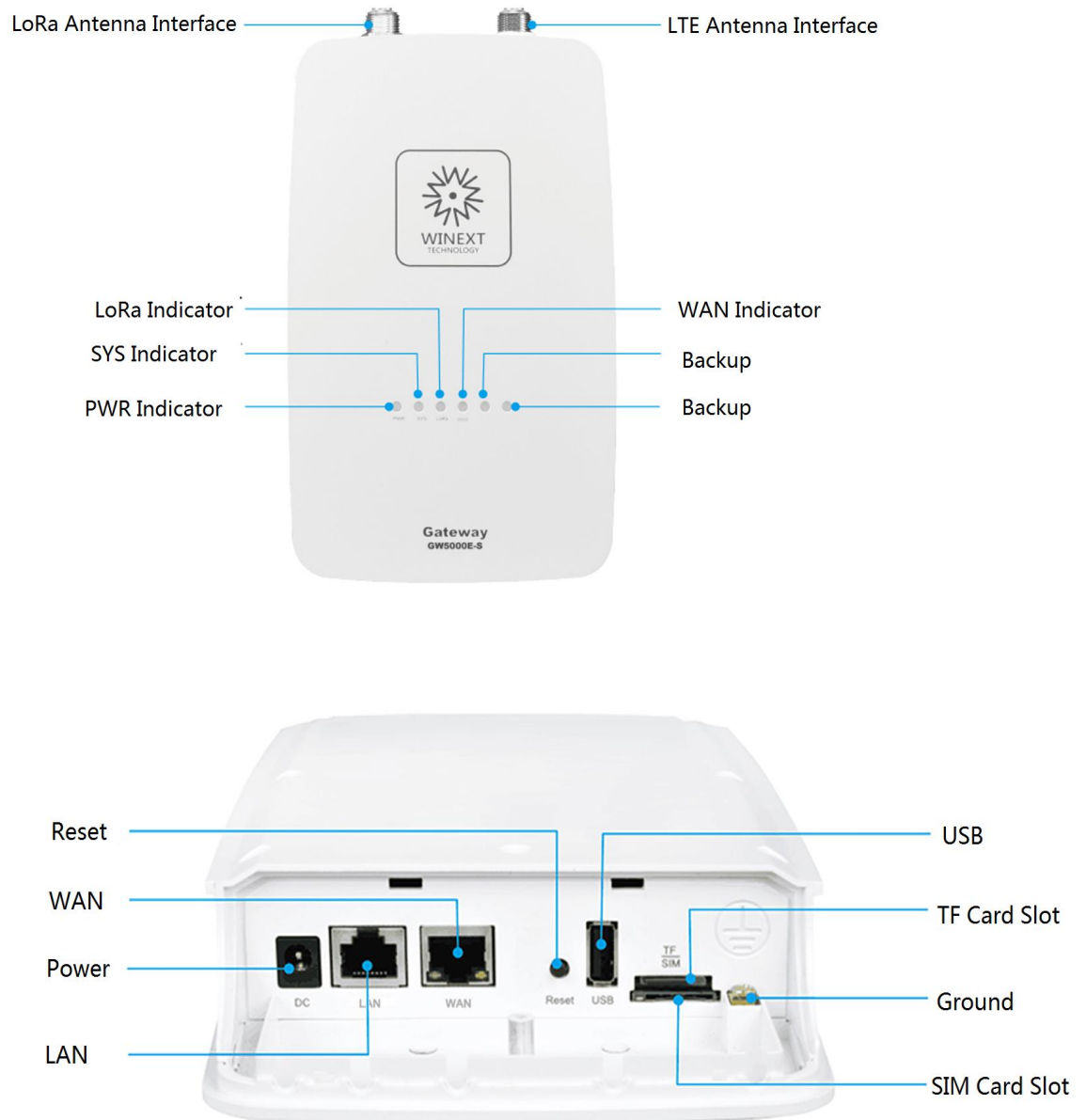
GW5000E-S Side



Unit: mm

Pic.2-1 : GW5000E-S Dimension

2.2 Interfaces

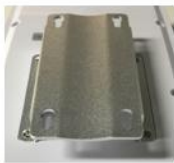


Pic.2-2 : GW5000E Interfaces

Indicator Light Status Description

Status Indicator Light	Flashing	Steady On	Off	Remark
PWR Light		Device is power on	Device is not powered on	
SYS Light	Booting up	System initialization is complete		
LoRa Light	Data transmission	LoRa is operating normally	LoRa faults	
WAN Light	Data transfer over network	Network cable is connected properly	Network cable is Not connected	

2.3 Packing List

GW5000E Gateway Accessory Kits					
Image	Name	QTY	Image	Name	QTY
	Gateway	1pc		Mount bracket(fixed on the mount already)	1pc
	DC adaptor	1pc		Shrinkable tube	2pcs
	LoRa antenna	1pc		Ground wire	1pc
	LTE antenna	1pc		Screw and expanding screw plug	4 sets
	Hoop	2pcs		Electrical tape	1pc

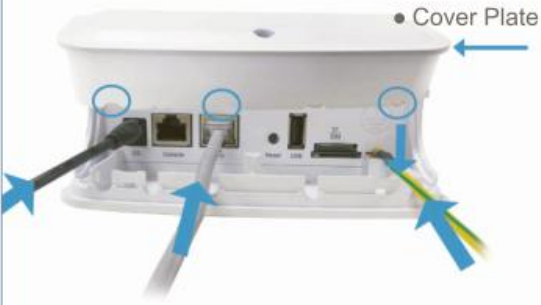
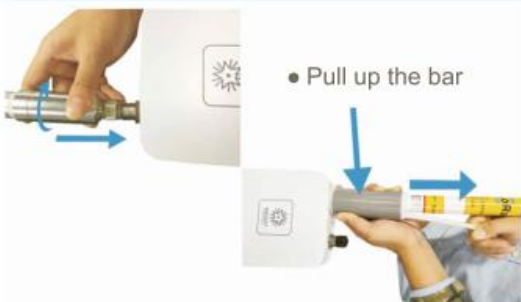
3 Installation

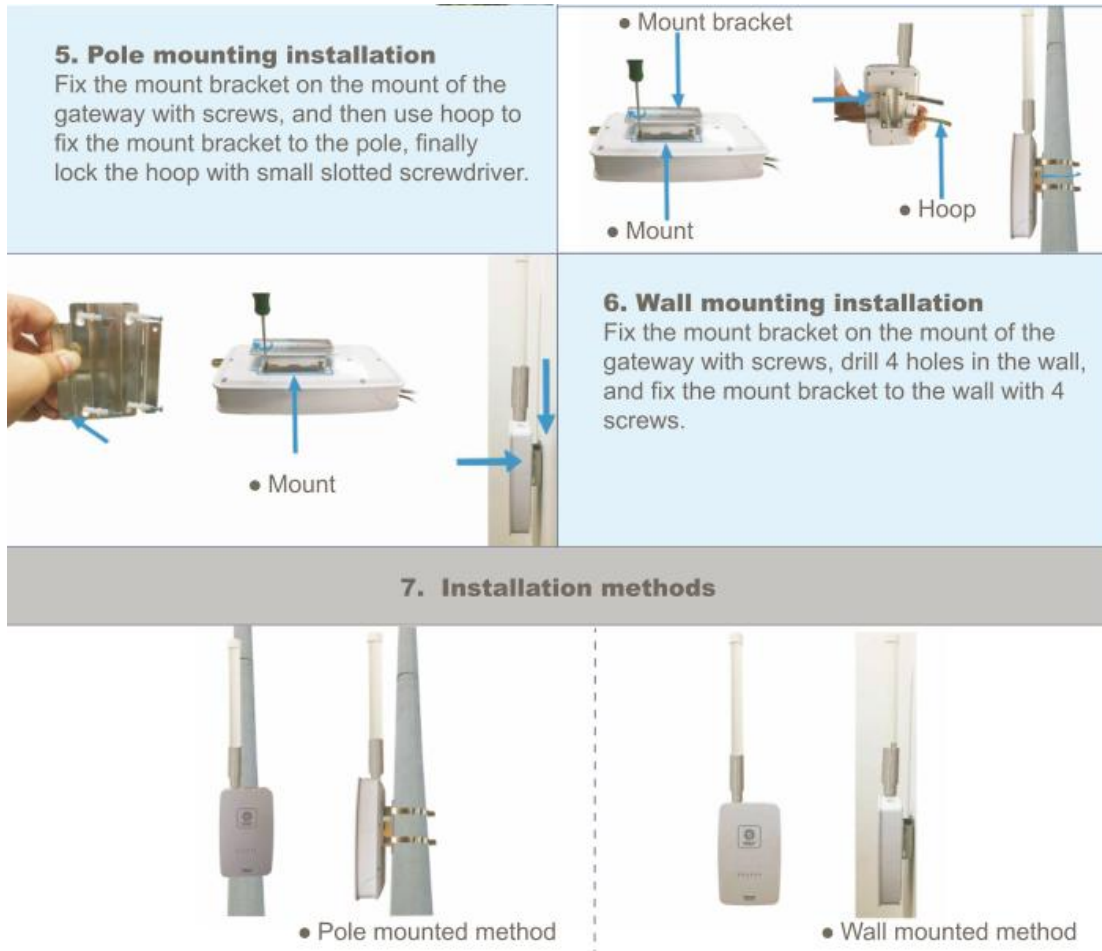
3.1 Installation Notes

To avoid damage to the equipment and signal attenuation due to improper installation, please follow the precautions below:

- Before installing the gateway, please check if all installation accessories are complete ;
- Ensure that the installation of the equipment complies with the standard requirements ;
- The installation of the equipment can only be carried out by professional installation personnel or authorized engineering representatives ;
- To ensure the safety of the construction personnel, please use professional and qualified installation tools ;
- The installation of the equipment should be away from fire sources and strong magnetic fields, as these may cause damage to the equipment ;
- When installing the LoRa antenna, keep it away from other antennas to avoid interference ;
- Ensure that cold shrink tubing is used for waterproof treatment of the antenna interface ;
- When installing the gateway outdoors, it is essential to take lightning protection and grounding measures.

3.2 Installation Steps

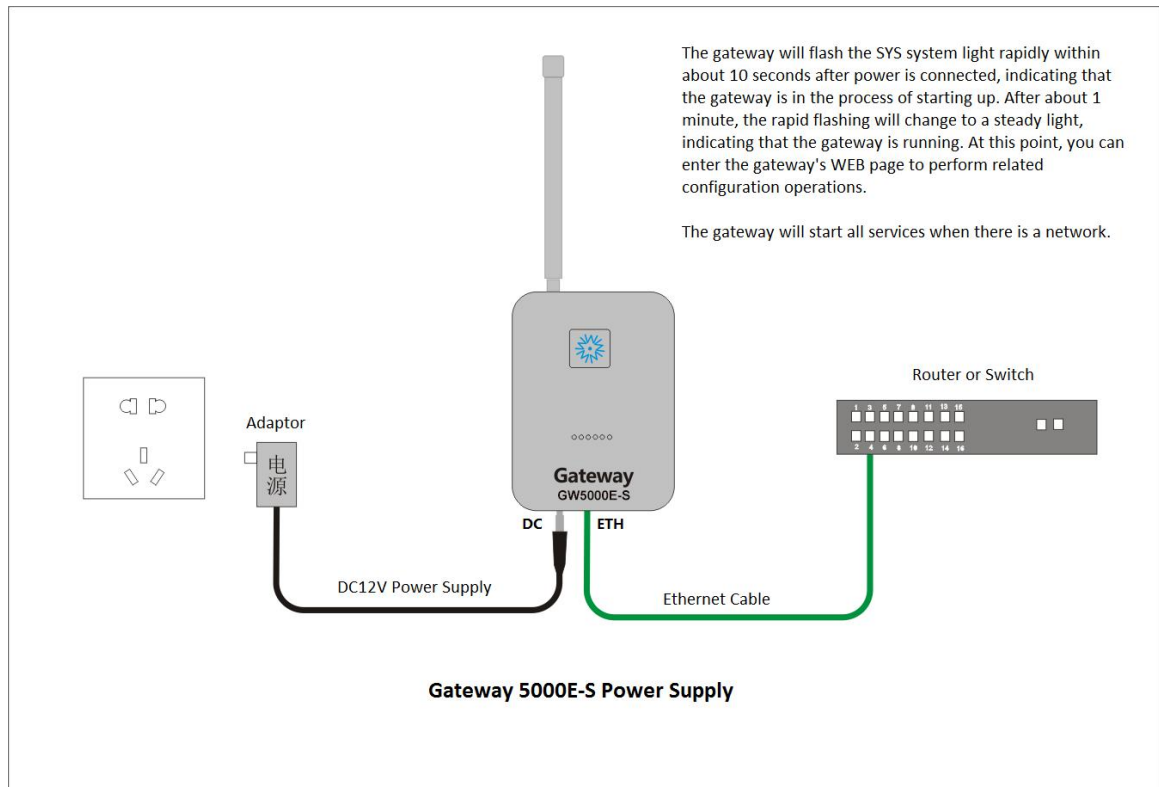
GW5000E Micro Gateway Quick Installation Guide	
1. How to open and close Open—Unscrew the screws at the back bottom with screwdriver. Press at the OPEN position and pull the lid down. Close—Cover the lid and tighten the screw.	
 • TF card  • SIM standard card	2. TF card and SIM card installation Insert TF card into the top card slot with its chip downward and notch inward, push it until there is a "click" sound. Note: SIM card should be with standard size, not mini card. Insert SIM card into the card slot (under TF card slot) with its chip upward and notch inward, push it until there is a "click" sound
3. Bottom panel wiring Connect the network cable with crystal head to the ETH port and the DC12V power cable to the DC port. Fix the grounding wire to the grounding end, fasten down the cover plate of the gateway, and use the diagonal plier to cut the notch on the cover plate for threading of the cable. Note: If the gap between the notch and cable is big, several layers of waterproof tape should be added to wrap the cable to make sure waterproof protection.	 • Cover Plate
 • Pull up the bar	4. Antennas installation and waterproof treatment Insert the antennas into the antennas port respectively and tighten them, then use the shrink tube for waterproof treatment, put the antenna into the shrink tube, pull up the white AL bar.



Pic. 3-1 GW5000E-S Installation Steps

3.3 Power Supply

Power on the GW5000E-S gateway by connecting the provided DC12V power supply to the mains. If the distance between the power socket and the gateway exceeds the length of the power cord, please use a standard cable to extend the connection. The joints must be soldered and properly wrapped with tape.



Pic.3-2 : GW5000E-S Power Supply

4 Configuration

4.1 Configuration Notes

1) Before configuration, install and deploy Winext "IOT-VISION" software and record the IP address or domain name of the cloud server, as well as the UDP port numbers for uplink and downlink. Alternatively, you can use test server at <http://iot.smartkit.io> for testing.

To quickly configure the GW5000E-S, you only need to set the following parameters: server address, uplink port, downlink port, gateway communication protocol with the server, MQTT protocol, MQTT port number, MQTT username and password, the center frequency of RF 0 (SX1255), and the center frequency of RF 1 (SX1255). Keep all other parameters at their default settings.

Note :

We defines channel planning combinations as "Ax/Bx," such as "A8/B8," where each combination has two center frequencies: the Ax center frequency and the Bx center frequency.

The center frequency of RF 0 (SX1255) corresponds to the Ax center frequency; the center frequency of RF 1 (SX1255) corresponds to the Bx center frequency ;

The center frequencies of RF 0 (SX1255) and RF 1 (SX1255) must be used in pairs. For example, if the center frequency of RF 0 (SX1255) selects the center frequency of A8, then the center frequency of RF 1 (SX1255) must select the center frequency of B8.

After the configuration is complete, be sure to click the "Save & Apply" button to make the settings take effect.

4.2 Quick Configurations

4.2.1 Connecting the Gateway

1) After powering on the gateway, use cellphone to open the Wi-Fi connection interface and search for a hotspot starting with "WiFi-05_".

2) Hotspot name: "WiFi-05_" followed by the last 6 characters of the gateway ID, for example: "WiFi-05_405b8d".

3) Connect to the Wi-Fi hotspot with the initial password: "gateway2018better".

4) Once your cellphone is successfully connected to the Wi-Fi hotspot, use the cellphone browser (Google Chrome or UC Browser is recommended) and enter "192.168.3.1" to open the login interface.

5) The default username is "root". Enter the initial login password "WelcomeTo2018" (be mindful of case sensitivity) and click to log in.

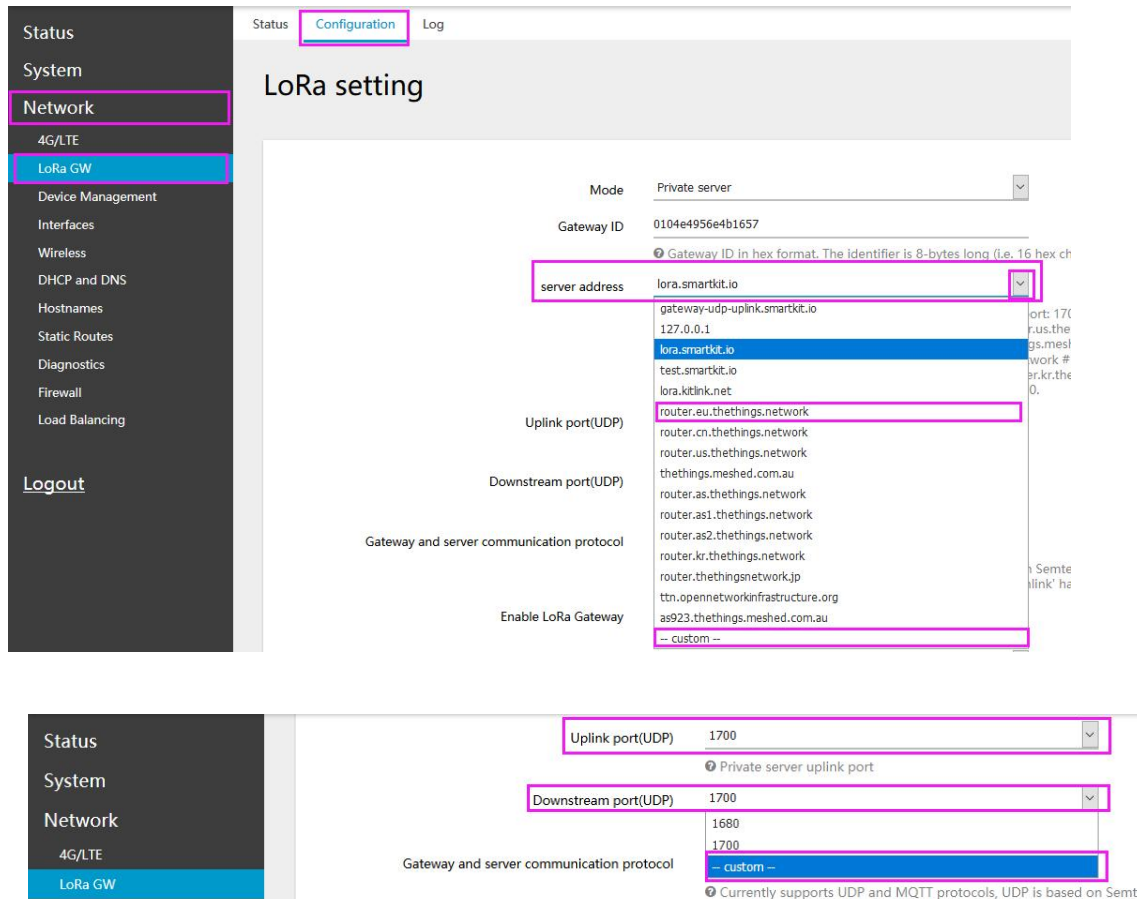
4.2.2 Configuring the MQTT server address (Winext Test Server)

1) After logging into the WEB configuration interface of GW5000E-S gateway, select "Network→LoRa Gateway→Configuration" to open the LoRa setting interface.

2) Click the "▼" button to select the corresponding server address, or click "Custom" in the bottom

to input your LoRa network server address manually (127.0.0.1).

- 3) Choose MQTT at Gateway and server communication protocol, and fill in the MQTT server address as gateway.mqtt.iot.vision.uplink.smartkit.io , and MQTT port 1885. Local or cloud server deployment platforms should fill in the address and port according to the actual address and port.



The image shows two screenshots of the 'LoRa setting' configuration page. The left screenshot shows the 'Configuration' tab with the 'Network' menu expanded and 'LoRa GW' selected. The right screenshot shows the 'LoRa setting' form with the following fields highlighted in red:

- Mode:** Private server
- Gateway ID:** 0104e4956e4b1657
- server address:** lora.smartkit.io (selected from a dropdown menu)
- Uplink port(UDP):** 1700 (selected from a dropdown menu)
- Downstream port(UDP):** 1700 (selected from a dropdown menu)
- Gateway and server communication protocol:** custom -- (selected from a dropdown menu)
- Enable LoRa Gateway:** custom -- (selected from a dropdown menu)

The right screenshot also shows the 'Uplink port(UDP)' and 'Downstream port(UDP)' fields set to 1700, and the 'Gateway and server communication protocol' set to custom --.

Pic. 4-1: Configuring Server Address

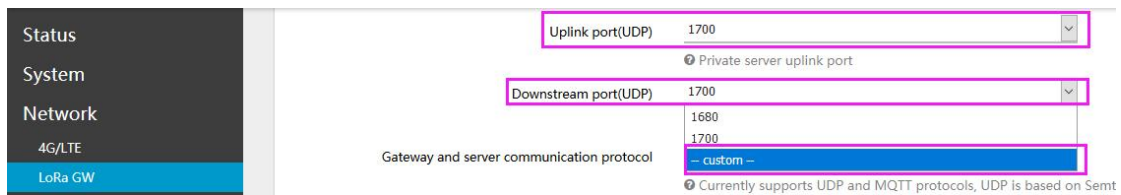
Pic. 4-2: Configuring Server Address

4.2.3 Configuring the UDP server address (connecting to a third-party NS server)

- 1) After logging into the WEB configuration interface of GW5000E-S gateway, select "Network→LoRa Gateway→Configuration" to open the LoRa setting interface.
- 2) Click the "▼" button to select the corresponding server address, or click "Custom" in the bottom to input your LoRa network server address manually. The address can be an IP or a domain name. The test server address "lora.smartkit.io" is used here as a test server.

4.2.4 Configuring the uplink and downlink ports

- 1) Uplink port, downlink port should comply with UDP port of the server. Click“▼”button to select Custom or input the UDP port number manually, default value: 1700.
- 2) Gateway and server communication protocol: UDP



Pic.4-3 : Configuring Uplink and Downlink Ports

4.2.5 Configuring the central frequency of RF 0 (SX1255)

The central frequency of RF 0 (SX1255) : the central frequency of the first SX1255 RF module (refer to the frequency table), we have set two center frequencies for each group of channel combinations, namely: the central frequency of RF 0 (SX1255); the central frequency of RF 1 (SX1255). You can click “▼”to make a selection, or you can choose to fill in the custom value.



Pic.4-4 : Configuring the central frequency of RF 0 (SX1255)

4.2.6 Configuring the central frequency of RF 1 (SX1255)

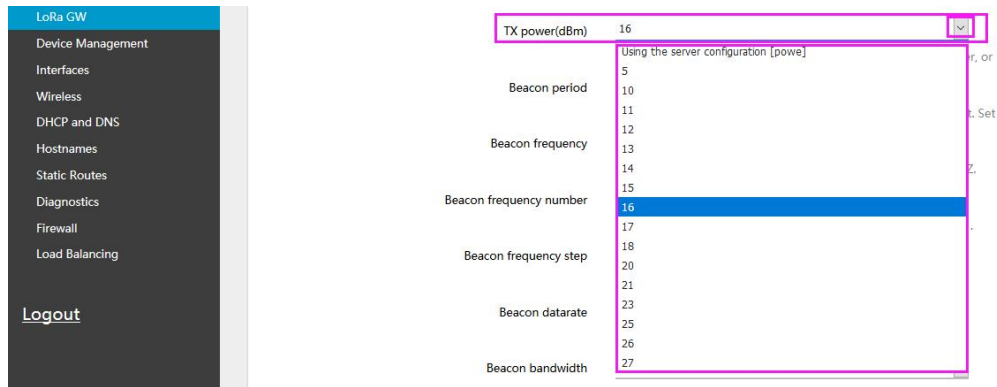
The central frequency of RF 1 (SX1255) : the central frequency of the first SX1255 RF module (refer to the frequency table), we have set two center frequencies for each group of channel combinations, namely: the central frequency of RF 0 (SX1255); the central frequency of RF 1 (SX1255). You can click “▼”to make a selection, or you can choose to fill in the custom value.



Pic.4-5 : Configuring the central frequency of RF 1 (SX1255)

4.2.7 Configuring TX Power

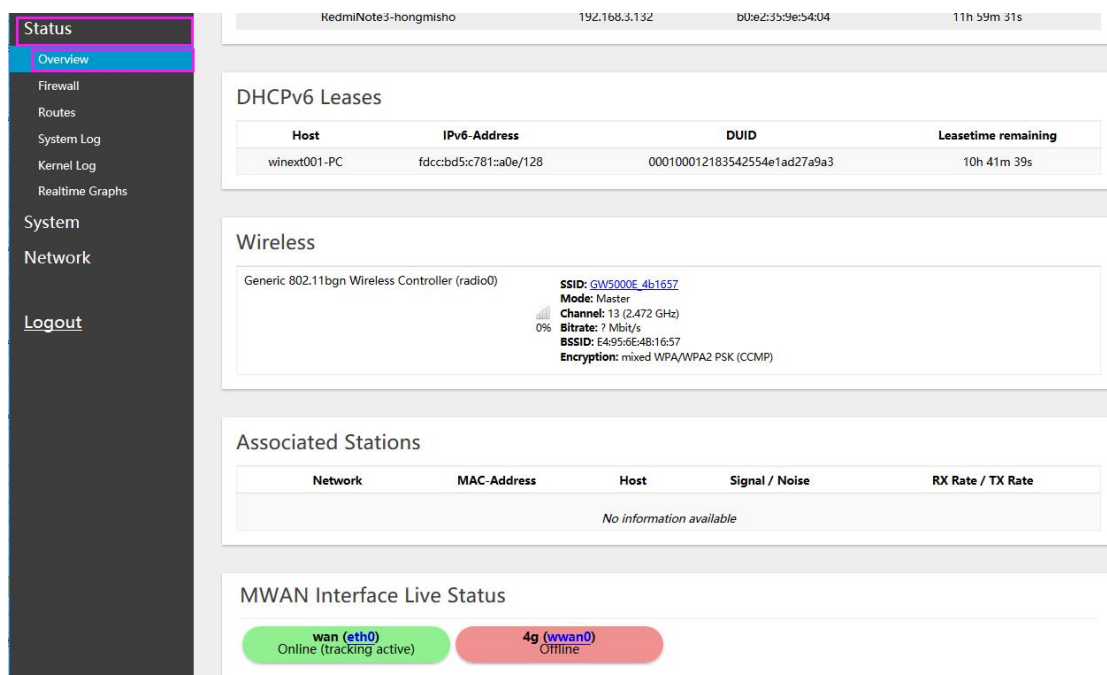
- 1) The default transmit power is different for different frequency points, you can choose to use the default value here, or you can click“▼”to choose freely.
- 2) After completing the configuration, be sure to click on 'Save & Apply' to make the settings take effect. (If the GW5000E-S gateway is an SX1301 FDD full-duplex, you need to wait for 1 minute to calibrate the RX and TX radio frequencies. Only after 1 minute will the parameters take effect, and the gateway will be able to receive LoRa node data normally.)



Pic.4-6 : Configuring Tx Power

4.3 View connection status

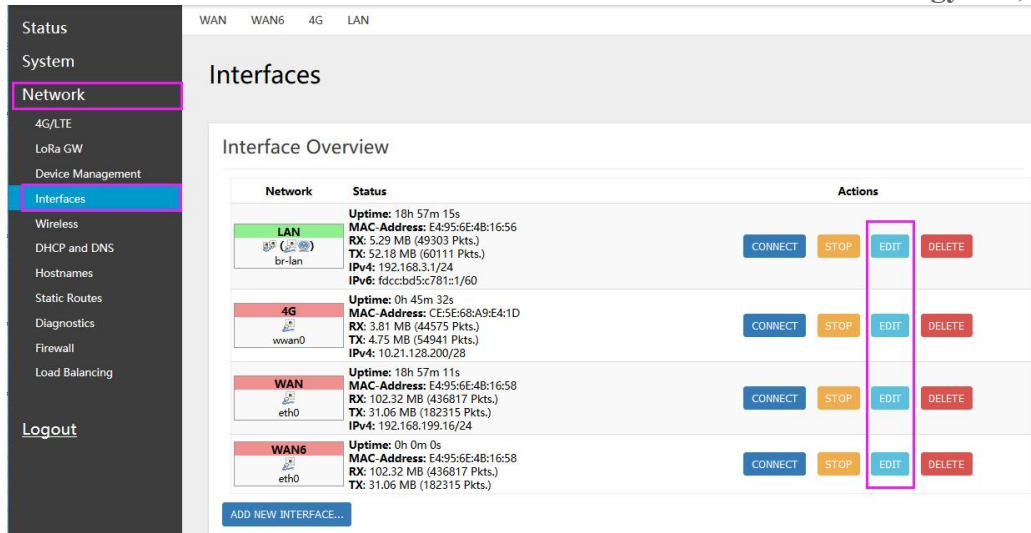
1) Click on "Status → Overview → MWAN Interface Live Status" to check the connection status of the WAN port with the 4G network. If it shows "Green Status" and "Online" for an extended period (over 15 seconds), it indicates that the network connection is normal. "Red Status" and "Offline" indicate that the connection has been interrupted. When both the WAN port and 4G are connected normally, the WAN port network is used by default, with 4G serving as the backup network.



Pic.4-7 : Network Connection Status

4.4 Network Interface Settings

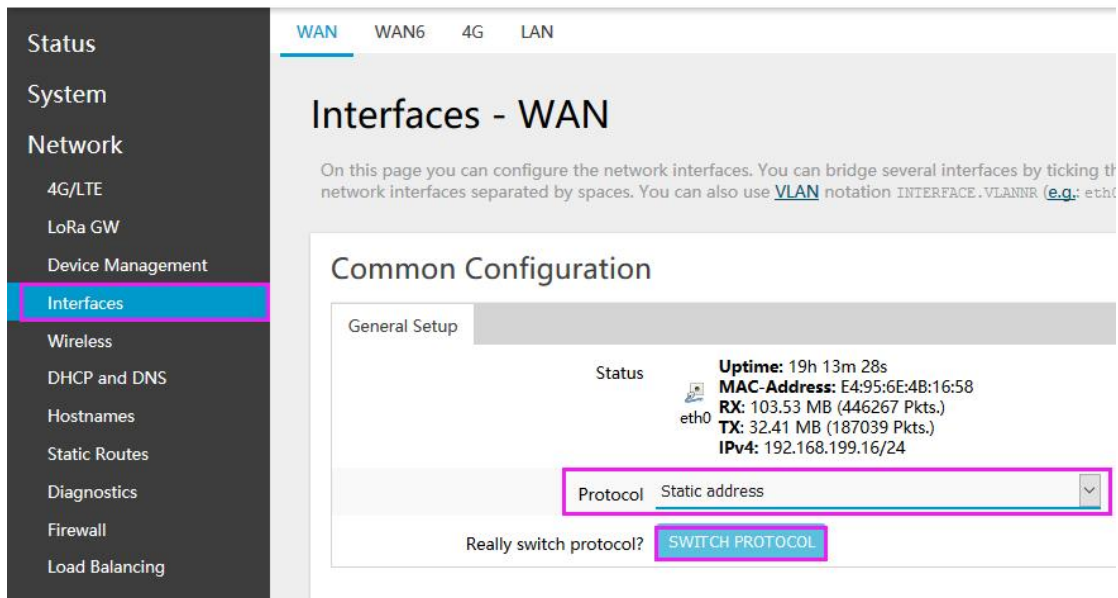
Click on **Network→Interfaces**, you can see all network ports connection status here.



Pic.4-8 : Network Interface Status

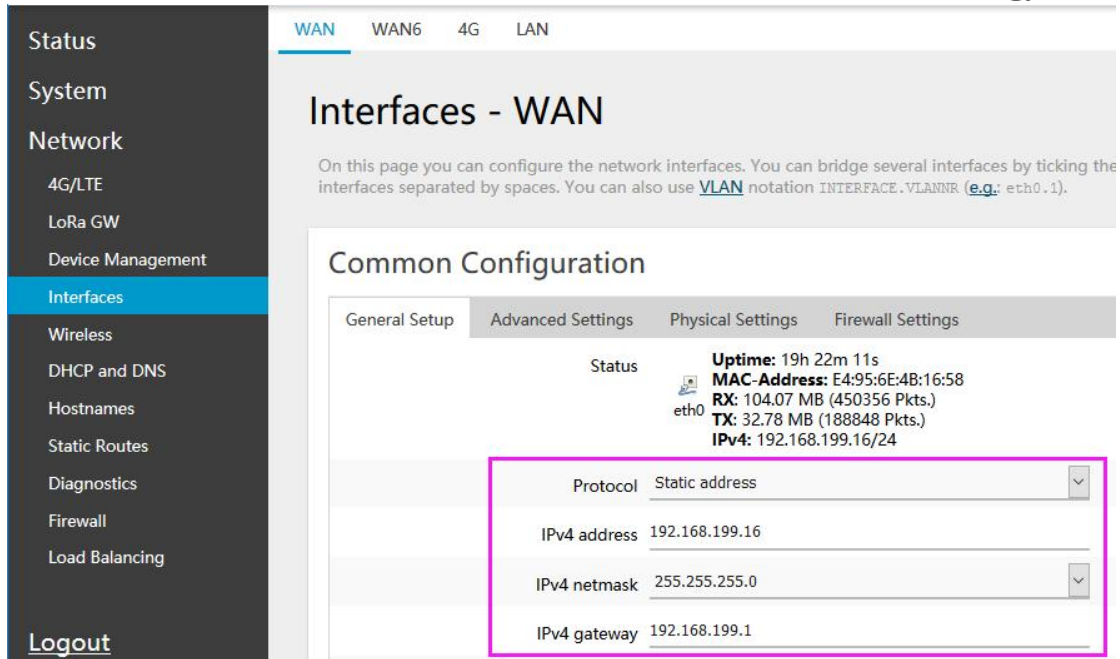
4.4.1 WAN Port Setting

1) The WAN port has the DHCP service enabled by default, which automatically obtains an IP address when connected to a router with an Ethernet cable. If you need to change it to a static IP address, click the 'Modify' button, then click on “▼” to select Static address and then click on “SWITCH PROTOCOL”.



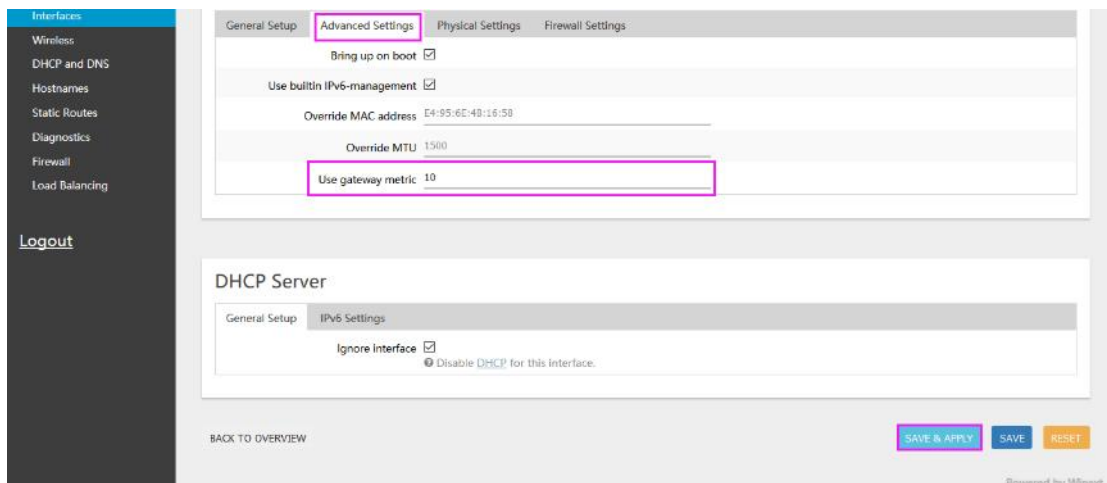
Pic.4-9 : WAN Port Setting 1

2) Fill in IP address, netmask and Gateway IP address, as below:



Pic.4-10 : WAN Port Setting 2

3) The gateway metric value is set as: 10. Click on SAVE&APPLY.

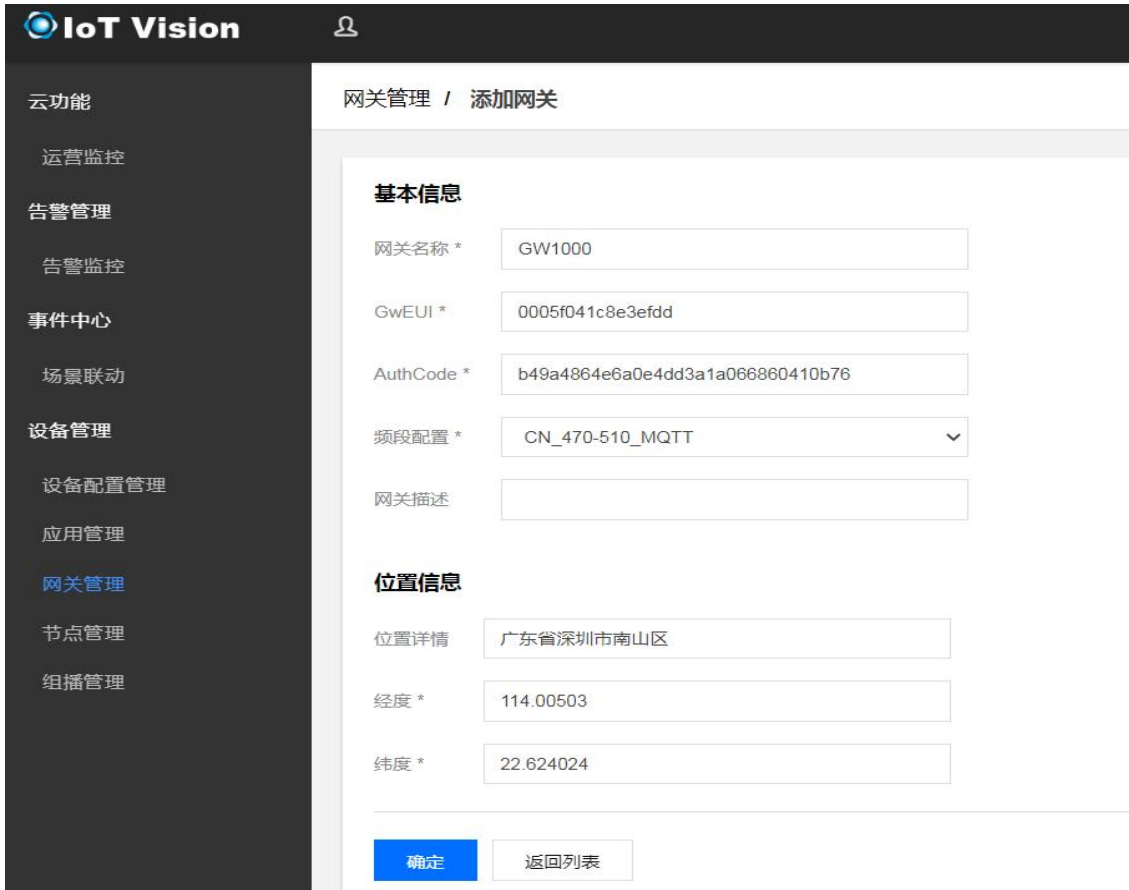


Pic. 4-11 : WAN Port Setting 3

5 The Use of Application Platform

After the gateway configuration is completed, log in to the server to add the gateway, here we take our test server as an example to demonstrate the use of the platform.

- 1) Use Google Chrome to enter the test server IP address or domain name: iot.smartkit.io;
- 2) Login to your account and enter the device management platform;
- 3) Click "Gateway Management→Create" to add a gateway.

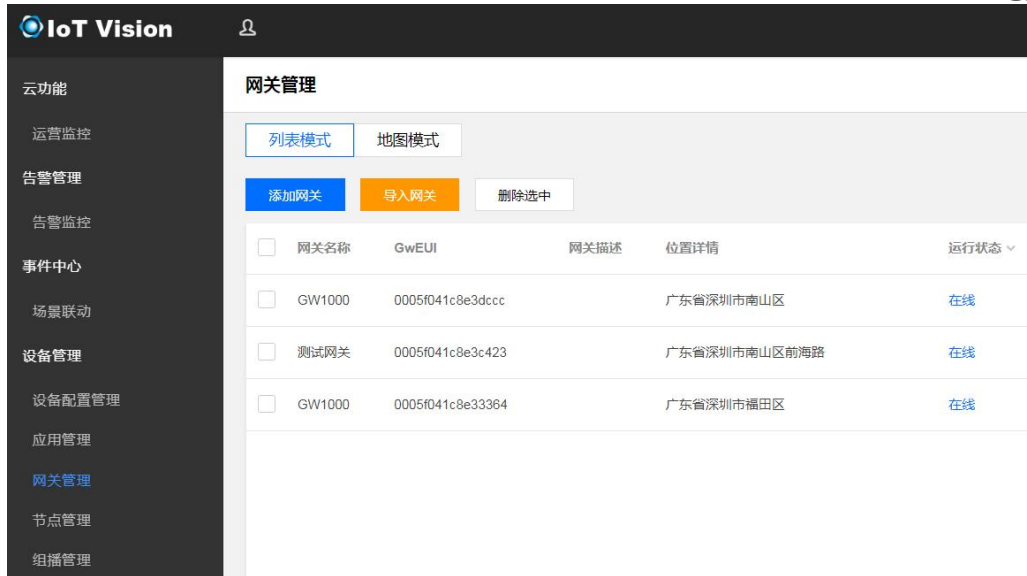


The screenshot shows the 'IoT Vision' web interface. On the left is a dark sidebar with a menu including '云功能', '运营监控', '告警管理', '告警监控', '事件中心', '场景联动', '设备管理', '设备配置管理', '应用管理', '网关管理' (highlighted in blue), '节点管理', and '组播管理'. The main content area is titled '网关管理 / 添加网关'. It contains two sections: '基本信息' (Basic Information) and '位置信息' (Location Information). The '基本信息' section has fields for '网关名称 *' (GW1000), 'GwEUI *' (0005f041c8e3efdd), 'AuthCode *' (b49a4864e6a0e4dd3a1a066860410b76), '频段配置 *' (CN_470-510_MQTT), and '网关描述'. The '位置信息' section has fields for '位置详情' (广东省深圳市南山区), '经度 *' (114.00503), and '纬度 *' (22.624024). At the bottom are two buttons: '确定' (Confirm) and '返回列表' (Return to List).

Pic.5-1 : Creating Gateway 1

4) Enter gateway name, gateway ID, verification code, band configuration (no such option for private deployment), latitude and longitude, and click "Confirm" to create the gateway. The gateway authorization code is provided by our company.

5) Click "Gateway Management" to view the operating status of the gateway, the normal operating status of the gateway is displayed as "Online".



Pic.5-2 : Viewing Gateway Status 1

6) Click “View” next to the corresponding gateway ID to open the debug information, where you can see the gateway status and the message sent by the gateway.



Pic.5-3 : Viewing Gateway Status 2

7) As shown above the gateway is working properly, next you can refer to the IOT-VISION platform user manual to add test nodes in the node management.

6 FAQ

6.1. Troubleshooting

- 1) Check if that the gateway is power on;
- 2) Check if the gateway is running. If the system light is constant on, it indicates the gateway is working. At a distance (within a 50-meter visual range), you can search for WiFi hotspots; the presence of a hotspot indicates that the gateway is operating;
- 3) Check if the gateway is connected to network. If the LoRaWAN server is deployed on a public network address, at least one of WAN or 4G should show 'Online'. If the LoRaWAN server is deployed on a local network, you need the WAN port to be connected with an Ethernet cable, and you should be able to ping the server host from the gateway side ;

- 4) If the downlink data node does not receive data, you can investigate through several methods:
- a. Check on the NS what's the TX ACK returned from gateway after sending json down data. If the error code is empty, it means the gateway can send that RF packet, , if not, pls refer to the error message ;
 - b. Confirm the network latency between the gateway and the server on the gateway side; the ping latency to the server should be less than 100ms, as high latency can cause the transmission to miss the reception window of Class A ;
 - c. Check the gateway logs to see if there is a reception of JSON downlink and a send_done. If both are present, it indicates that the gateway has already sent out the RF data ;
 - d. The node should be checked against the frequency point, rate, and I/Q inversion to ensure they are consistent with what the server sends down ;
- 5) If you need to check the gateway's historical logs for troubleshooting, you will need to compress and package the log files from the gateway's TF card and send them to the technical support of Winext.

6.2. Description of 4G Network

*If there is an outstanding payment, generally, the carrier will change the network mode to 3G or 2G standards.

*China Mobile, the normal mode is: LTE TDD, and it will change to: TDSCDMA or other modes if the payment is overdue ;

*China Unicom, the normal mode is: FDD LTE, and it will change to: WCDMA or other modes if the payment is overdue;

*China Telecom, the normal mode is: FDD LTE, and it will change to: EVDO or other modes if the payment is overdue.

Frequent switching of the 4G status, from Online to Offline, and from Offline to Online.

This happens because the gateway detects a SIM card, but the 4G network cannot access the internet. It will attempt to redial the 4G network every three minutes or so. By default, the redial with the 4G in a normal state (green Online), but after a few seconds to diagnose it cannot connect to the internet, and the status changes to red (Offline). When the 4G network redials a certain number of times, the gateway automatically resets the 4G network module, which then searches for the network again. After three resets, the 4G network is defaulted to an overdue payment status and no longer attempts to redial. If no SIM card is inserted, the gateway will not redial the 4G module. Therefore, it is necessary to observe for a long time. If it consistently shows Online for 15 seconds, then the 4G is functioning properly.

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