Chengdu Ebyte Electronic Technology Co.,Ltd

Wireless Modem

User Manual

E870-L915LG12



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目录

1. Features 3
2. Quick Start 3
2.1. Preparation for start-up 3
2.2. Hardware connections 4
2.3. Web access 5
3. Product introduction 6
3.1. Basic parameters 6
3.2. Dimensions & Interface Description 6
4. Function setting 8
4.1. Menu at a glance 8
5. Functional Overview 9
5.1. Status 9
5.2. Systems 9
5.2.1. Hostname and time zone settings 9
5.2.2. User name login password setting 10
5.2.3. Restoring factory settings and upgrading 10
5.2.4. Rebooting 11
5.3. Services 12
5.3.1. Frp intranet penetration 12
5.3.2. Dynamic DNS 15
5.3.3. WAN/LAN 15
5.3.4. WIFI Scheme 16
5.4. Network 16
5.4.1. Interfaces 17
5.4.2. Wireless 18
5.4.3. Switches 20
5.4.4. DHCP/DNS 20
5.4.5. Hostnames 21
5.4.6. Load balancing 22
5.4.7. Firewalls 24

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5.4.8. Network Diagnostics 25
5.4.9. Flow control management (Qos) 25
5.5. LoRaWAN network setup 26
5.5.1. LoRaWAN band settings 26
5.5.2. LoRaWAN gateway setup 28
5.5.3. LoRaWAN Status 29
6. Equipment panel identification and function settings 30
6.1. LED indicators 30
6.2. Key settings 30
6.3. Other markings 30
7. Revision history 31
8. About us 31

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1. Features

- Supports 1 wired WAN port with switchable LAN port
- Supports LORAWAN gateway
- Support LED status monitoring (display of power PWR, LINK, ETH, WLAN, LoRaRX, LoRaTX;)
- Support for Web platform management configuration methods.
- One-click recovery of factory settings.
- Support 10/100Mbps rate for both wired network ports.
- Support wired and wireless online at the same time, multi-network intelligent switching.
- Support firmware upgrade and firmware configuration backup function.
- Firewall, NAT, DMZ host, black and white list of access control, IP speed limit.
- QOS, traffic service, can limit the speed according to the interface.
- Support for VPN clients.
- Support load balancing multi-network port flow control settings, with network port priority, enable, flow control ratio and other working methods.

2. Quick Start

To ensure that the product the user gets in the first place is qualified, here we provide a simple testing process for the user to refer to throughout the process, while also allowing the customer to act as a quick start.

2.1.Preparation for start-up

Before working on the LORAWAN gateway, the user needs to prepare at least one PC, one network cable and product supporting devices.

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2.2.Hardware connections



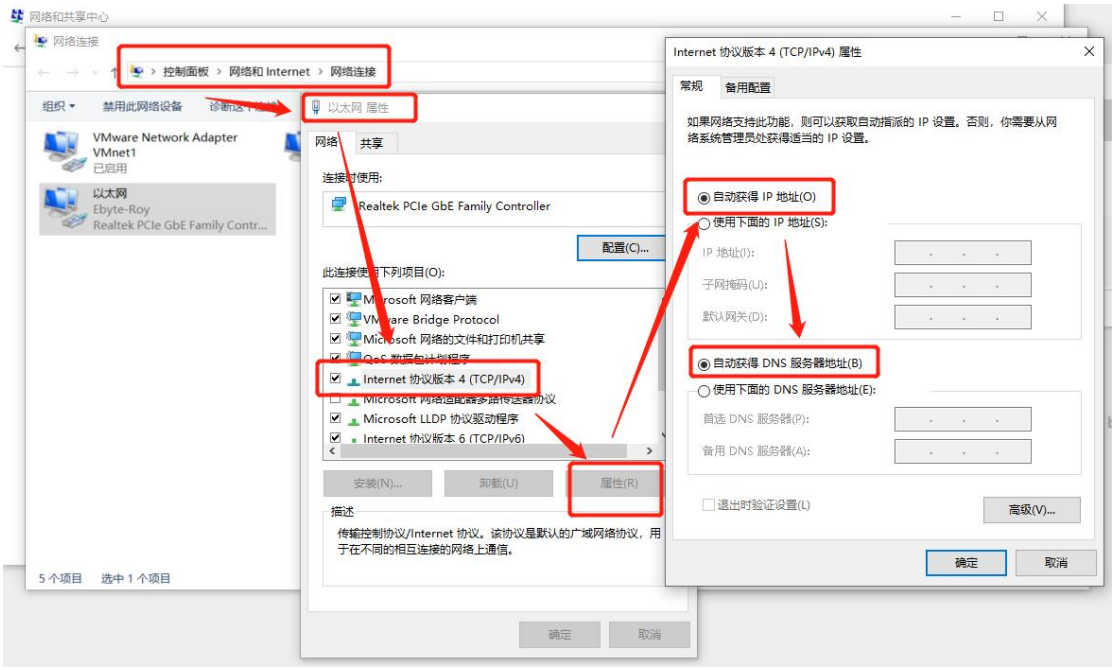
Connect the WIFI antenna, and LoRa antenna, respectively, to the SMA connector under the device panel logo, as shown above, before powering up the device (the power-up location is identified at the panel). After the above steps have been completed, use the power supply that came with the device and then power up the gateway. Connect the computer to the WIFI of the device (WIFI name E890-XXXX) and the WAN port of the device to Ethernet.

After power on, wait for about 1 minute or so, the WORK indicator on the panel is always on, which indicates that the power on is complete, in addition, on the panel, the LoRa signal indicator and the indicator in the network properties also start to work properly.

To ensure that the computer can access the WEB management interface via the LAN, the customer needs to ensure that the computer's network properties are to automatically obtain an IP address, as well as to automatically obtain a DNS server address, as shown in the figure below.

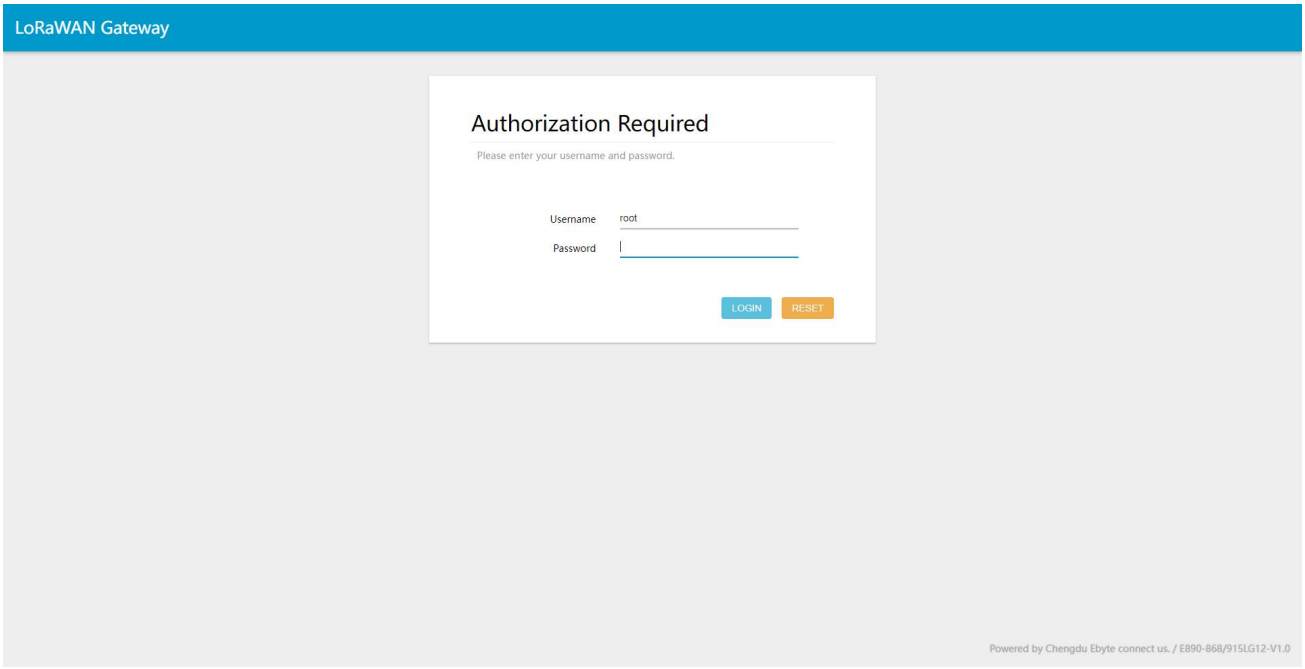
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2.3. Web access

After the PC is connected to the device through the WIFI connection, on the PC, open any browser and enter: 192.168.10.1 to enter our gateway web login interface, as shown below.



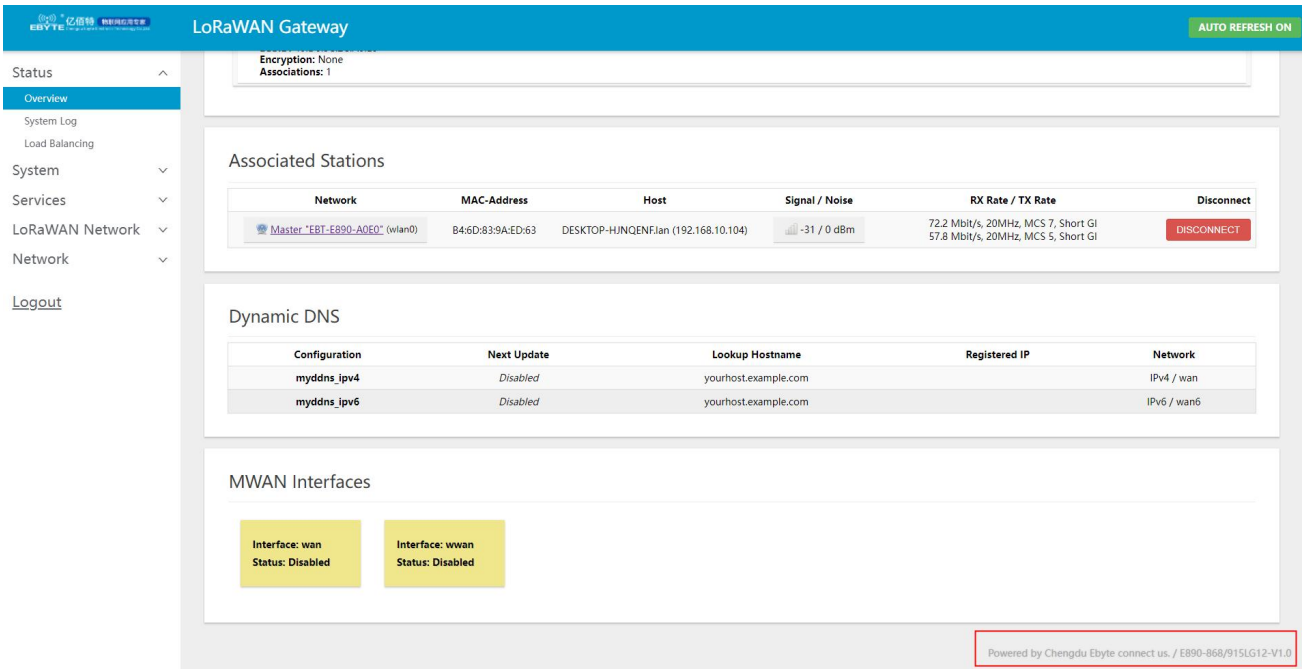
Here, our default password is: root

Once you have entered your password, you will be taken to our web administration interface.

At the bottom right of the web page, you can click on the following link to access our website, which verifies that the device is successfully connected to the external network.

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Well, after the above steps, if there are no faults generated, it means that the device is working properly. In addition, if customers want to know the current network speed, they can carry out a network test with the help of relevant software.

3. Product introduction

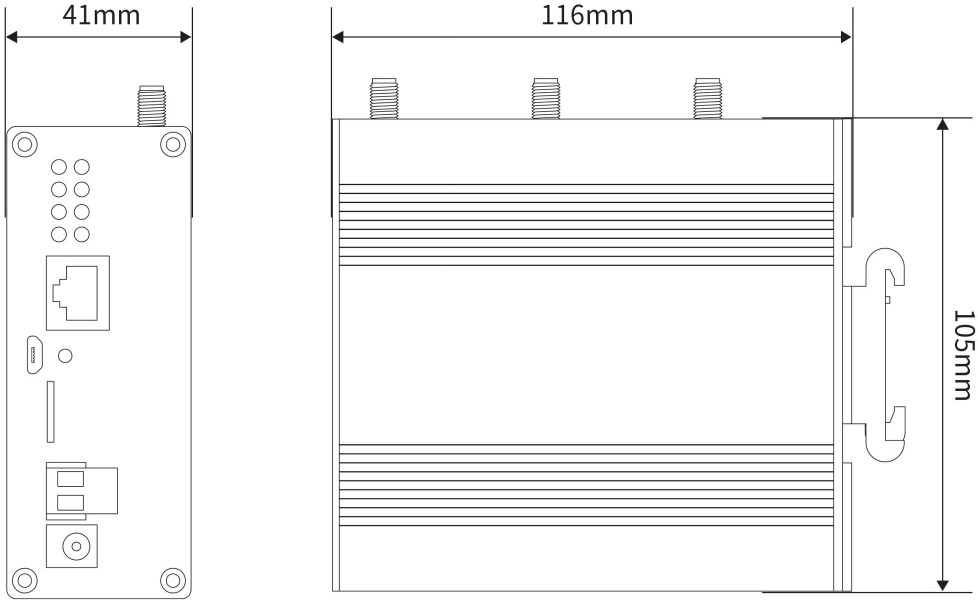
3.1. Basic parameters

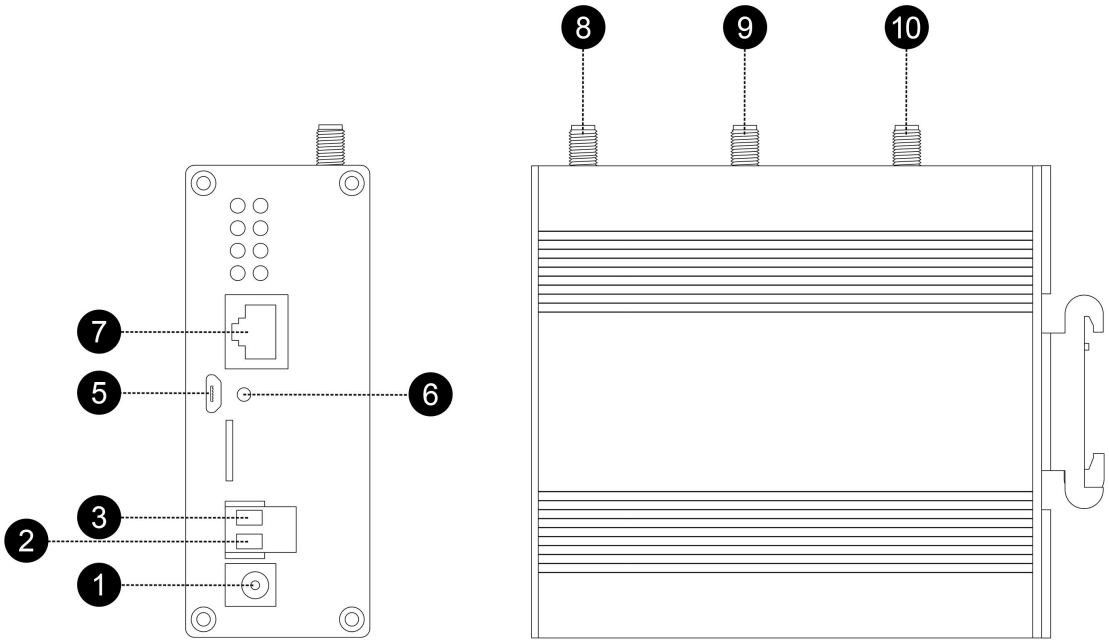
	Projects	Indicators
Hardware parameters	Product size(H*W*D)	110*105*41
	Product weight	417±5g
	Operating temperature	-40° C~+85° C
	Storage temperature	-40° C~+85° C
	Working humidity	5% ~ 95%
	Storage humidity	1% ~ 95%
	Operating voltage	8V~28V
	Current consumption	120mA@12V (room temperature)
	Precision	0.2%

3.2.Dimensions & Interface Description

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The hardware interfaces are described as follows.

Interface serial number	Name	Remarks
1	DC8~28V	Power supply range DC8~28V, standard 5.5*2.1 power socket

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2	DC-IN+	Power supply range DC:8~28V, positive power terminal
3	DC-IN-	Power supply range DC:8~28V, negative power terminal
4	Vacant	Vacant
5	USB	USB debugging interface
6	Restore	Press and hold for more than 5s and then release to restore factory settings
7	WAN/LAN	WAN port, Wide Area Network Interface, 10/100Mbps, Auto MDI/MDIX support
8	WIFI-M antenna	WIFI main antenna SMA interface (STA mode)
9	WIFI-D antenna	WIFI auxiliary antenna SMA interface (AP mode)
10	LoRa antennas	LoRa antenna SMA interface

4. Function setting

In this section, we will go through the function menus on the web interface, where, for reasons of space, we will focus on some of the function options, and we will choose to outline some of the less common and less important functions.

4.1.Menu at a glance

In the web management interface, users can set up the functions they need or view the relevant status. Through the menu bar on the left side of the web page, they can set up specific functions or information as well as make enquiries, and they can see the directory tree structure of the menu as shown in the table below.

Submenu \ menu	**Status**	**Systems**	**Services**	**Network**	**LORAWAN network setup**
1	General overview	Systems	Frp intranet penetration	Interface	**LORAWAN** band settings
2	System log	Management rights	Dynamic DNS	Wireless	**LORAWAN** Gateway Setup
3	Load Balancing	Planned tasks	WAN/LAN	Switches	
4		Backups/Upgrades	WIFI Scheme	DHCP/DNS	
5		Reboot		Host Name	
6				Firewalls	
7				Network	

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				Diagnostics	
8				Qos Features	
9				Load Balancing	
10				Static routing	

5. Functional Overview

5.1.Status

In the "Status" menu column, the user can view the current status of the gateway, including the firewall. The gateway, the system internal work log, and the real-time refresh of network-related information, etc. The user cannot set anything in this column. Here, the user can query the content of the relevant sub-menu according to their needs.

5.2.Systems

In the system bar, we can set the administrative parameters of the gateway, etc. These include the login password for the web pages, the host name, upgrades and other functions.

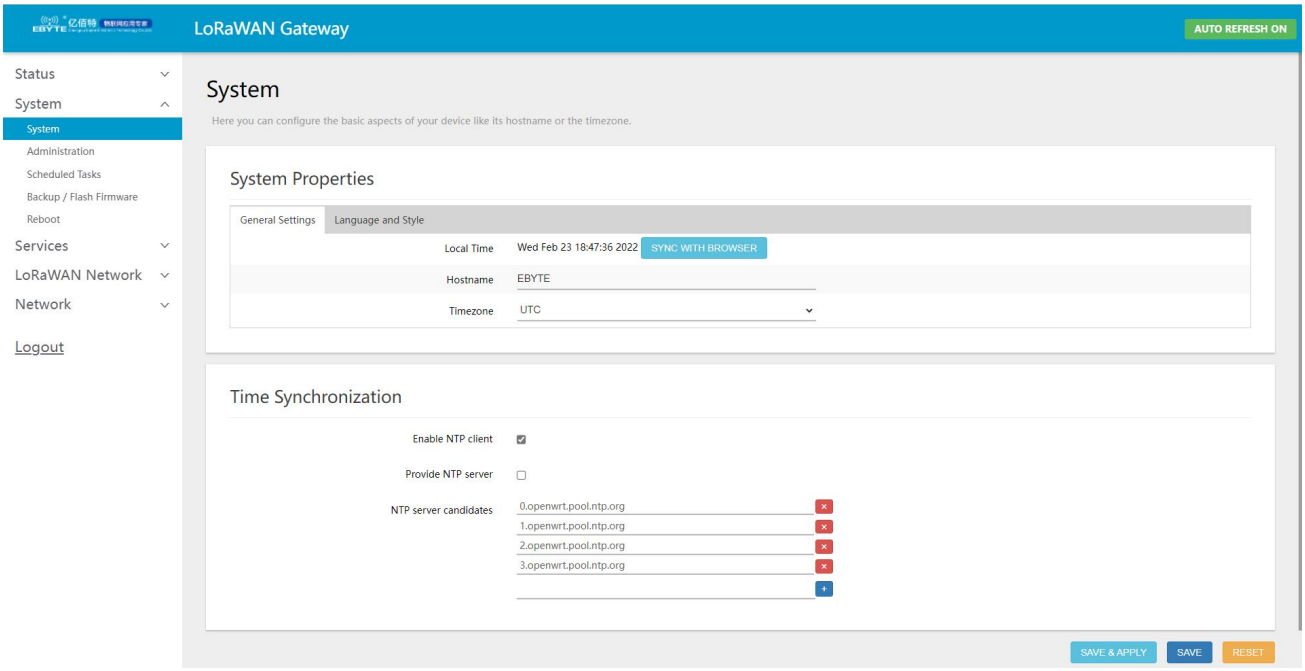
5.2.1. Hostname and time zone settings

In the System->System Properties->Basic Settings option, the user can set the host name of the module and also modify the time zone, here, our default host name is: EBYTE , the time zone used is UTC (if the product is used in China, it can be set to: Asia/Shanghai).

Set the host name as shown below.

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In addition, users can set the language of the web interface (Chinese/English) as well as different style themes. Here, our default language is Chinese and the style used is our Tech Blue theme.

5.2.2. User name login password setting

In the System-> Admin Rights-> Host Password option, set the Web Login screen, the host password setting needs to be at least one character, then click the Save button, the login password can be set. This is shown in the image below.

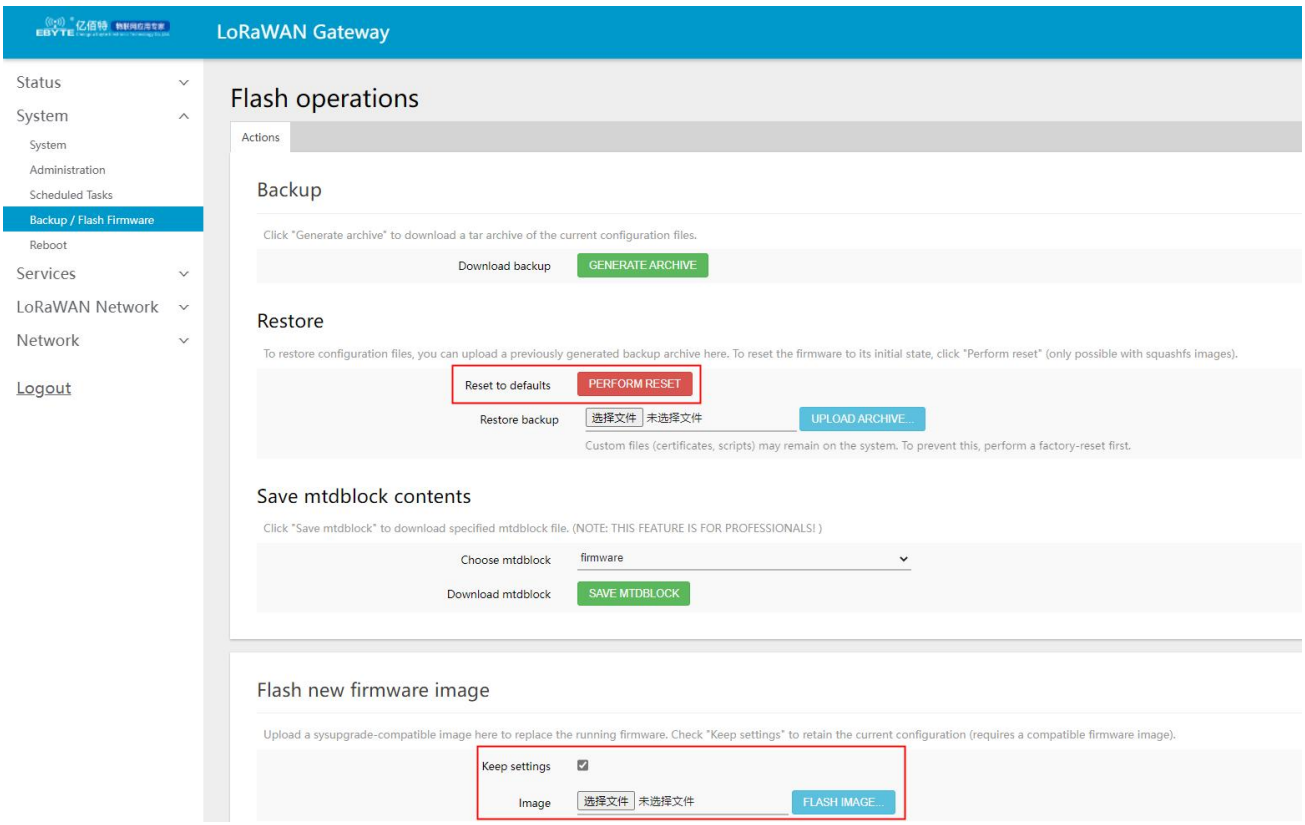


5.2.3. Restoring factory settings and upgrading

In the System -> Backup/Upgrade option, you can perform the Restore Factory Settings button to ensure that the user can return to the initial state after setting up the gateway with the wrong operation so that it can be used normally. At the same time, we have reserved the upgrade function so that when we update the new version of firmware, the user can perform the upgrade operation by themselves so that they can experience more functions. The factory settings can be restored and upgraded as shown below.

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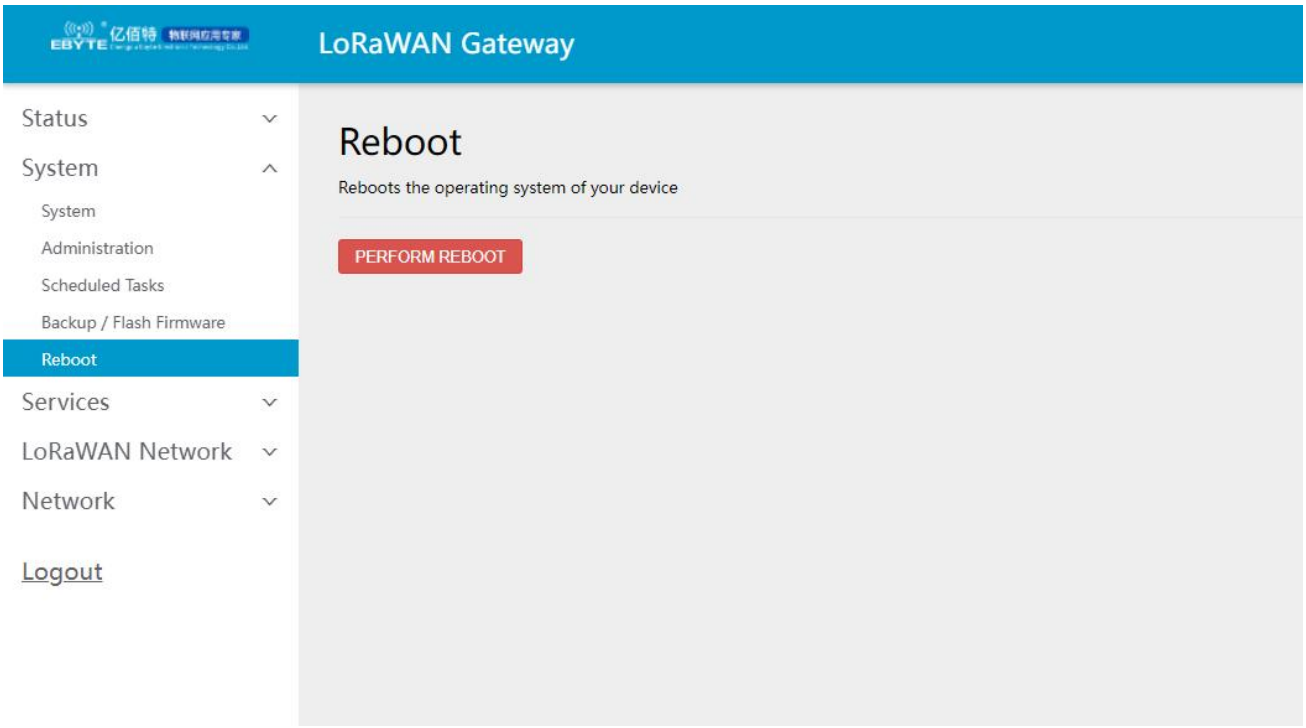
It should be noted here that when the user upgrades the firmware, please do not disconnect the power, load the firmware that you have browsed to on the page, click on the firmware swipe and wait for more than 10 seconds before the next window pops up, click on execute and wait for a few minutes, the web page will automatically return to the login screen and the upgrade will be successful at this point.

5.2.4. Rebooting

In the System -> Reboot option, you will be brought to the following interface, click on Execute Action to execute the reboot, wait for about 40 seconds, the WORK indicator of the device panel is often on, at this time, the reboot is successful.

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5.3.Services

5.3.1. Frp intranet penetration

For intranet users without public IP, it is an awkward problem to remotely manage the gateway under the intranet or other ports of the gateway, intranet penetration can realize accessing the devices under the intranet (such as this machine) through the public network There are many intranet penetration tools nowadays, FRP intranet penetration with its high-performance reverse proxy application not only allows customers to easily perform intranet penetration and provide services to the external network, but also has stable performance Efficient, supports multiple protocol types, etc.

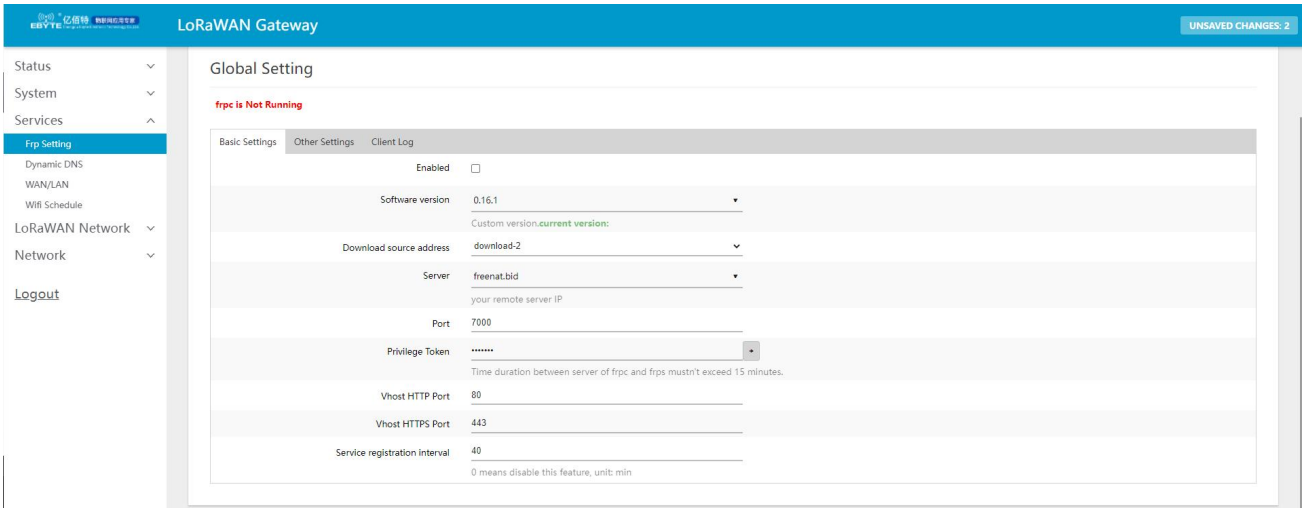
The use of Frp intranet penetration requires the use of a Frp server, which can be set up by the user or purchased from a Frp server provider according to their needs. Please refer to the "Frp Server Construction Tutorial" for the process of setting up your own.

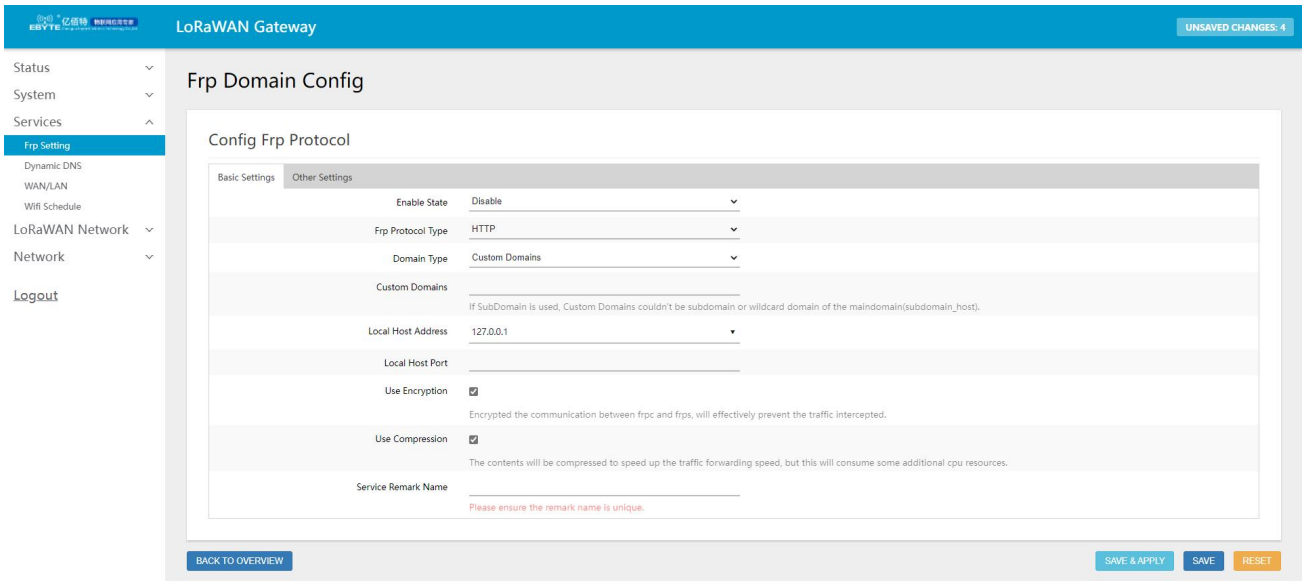
Here is an example of how to use the intranet penetration service with a set up Frp server.

1 Open the frp intranet penetration interface of the gateway and set it as follows

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Note: The configuration will not take effect immediately when first configured and will require a reboot.

2 Add HTTP, configure relevant parameters

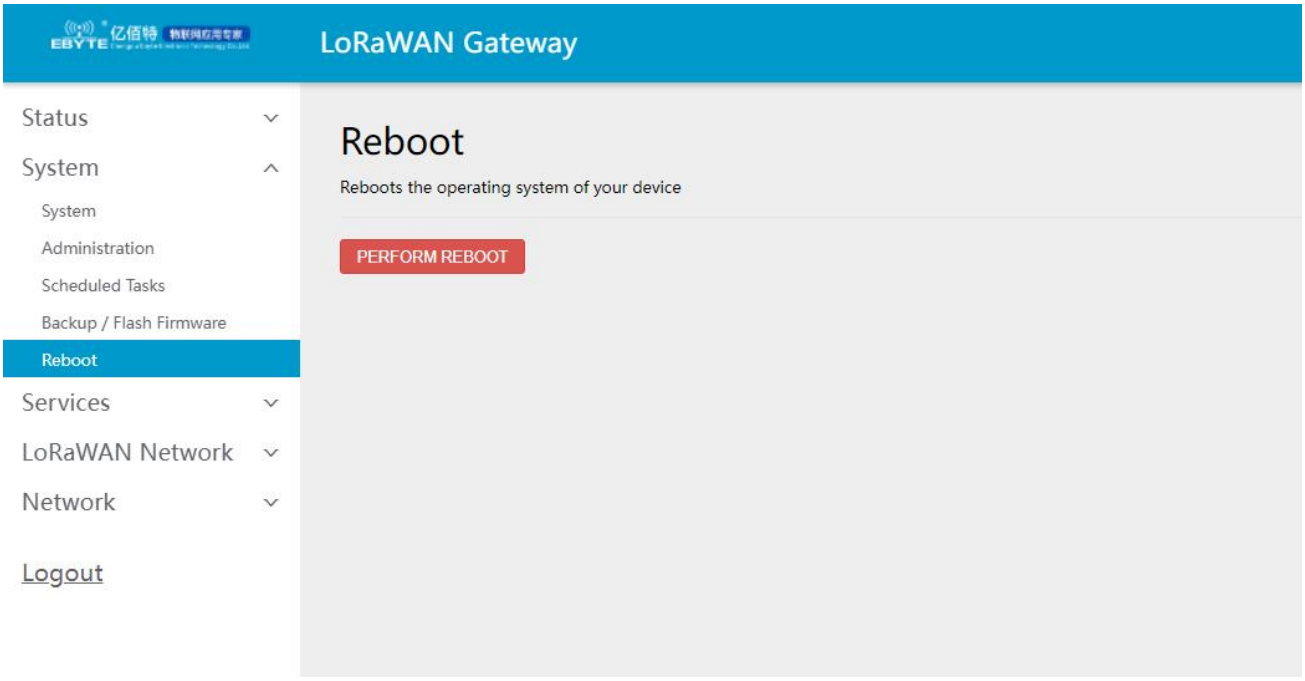
Caution.

The domain name type should be selected as a sub-domain, e.g. if the server is set to xxx.com, the actual mapped domain name will be frptest.xxx.com

3 Reboot the gateway device

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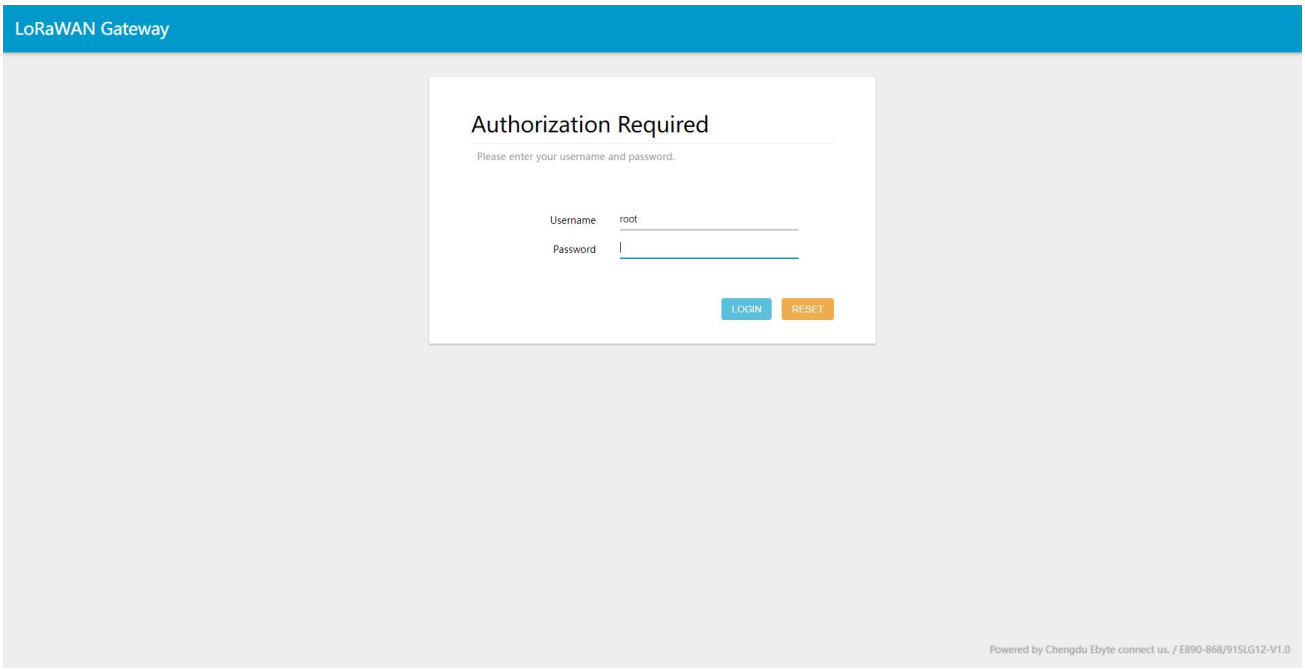
4 View client logs after reboot

```
2021/09/28 17:25:53: frpc ok...
2021/09/28 09:25:54 [I] [service.go:304] [c924e4aa37012578] login to server success, get run id [c924e4aa37012578], server udp port [0]
2021/09/28 09:25:54 [I] [proxy_manager.go:144] [c924e4aa37012578] proxy added: [test]
2021/09/28 09:25:54 [I] [control.go:180] [c924e4aa37012578] [test] start proxy success
```

Frp in operation



Open the secondary domain:Here is http://frptest.ebyte.com/ to access the gateway configuration page.

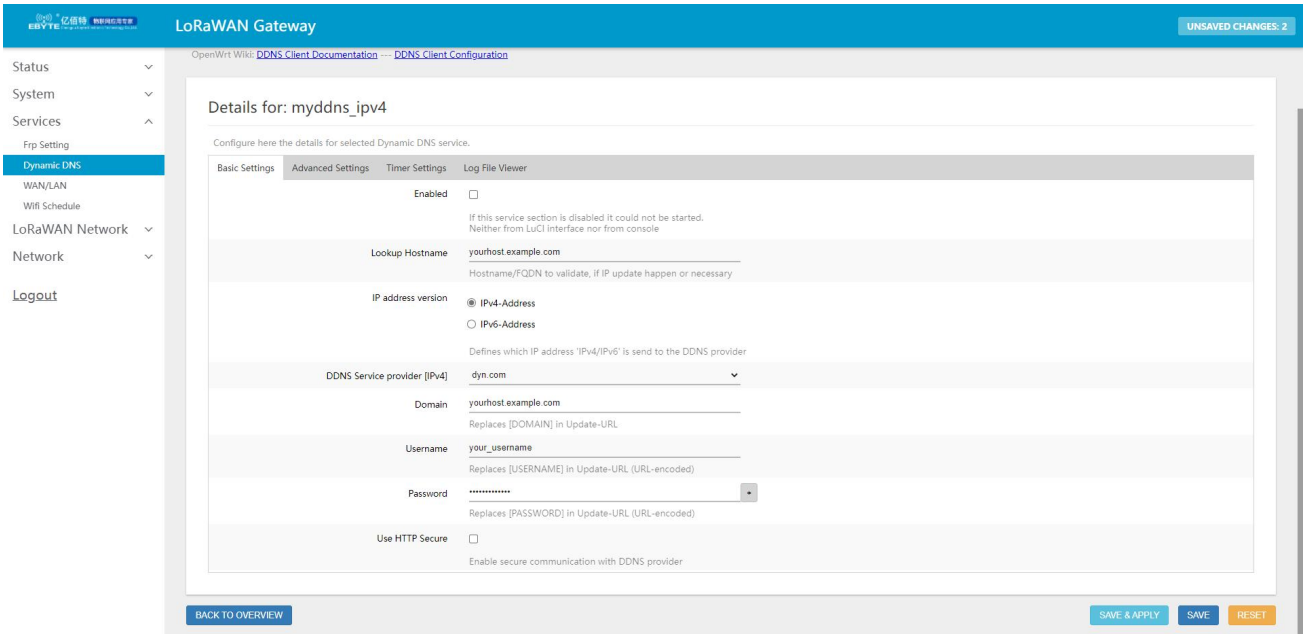


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5.3.2. Dynamic DNS

In the Services --> Dynamic DNS option, users can add a domain name resolution service to set up the gateway remotely, etc., as shown in the figure below.



In the dynamic settings interface, certain DDNS service providers are already pre-configured in the drop-down menu in DDNS Service Providers, if the DDNS service provider selected by the customer is not in the drop-down box, you can choose to customize it.

Dynamic DNS is not enabled by default, please click to enable it first before using this feature.

After modifying, please restart the gateway to ensure it works properly.

Customers need to strictly fill in the parameters filled in to set up DDNS to ensure that the network matches properly.

DDNS is also available under multi-level routing.

If the network where the gateway is located is not assigned a separate public IP, then this function will not work.

Off-site access to the gateway intranet can be achieved if the relevant port mapping is set up in the firewall.

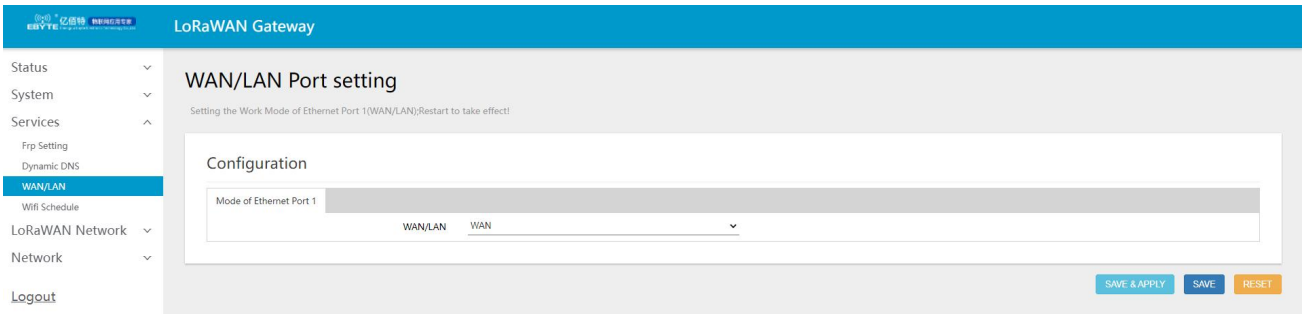
Multiple dynamic domain names can be added to the gateway.

5.3.3. WAN/LAN

In Service --> WAN/LAN option, user can set the working mode of Network Port 1 (default is WAN port) as WAN port or LAN port, click Save and Apply, the device will take effect after reboot. 4G mode can set Network Port 1 as LAN port to achieve LAN output. The specific settings are shown in the figure below.

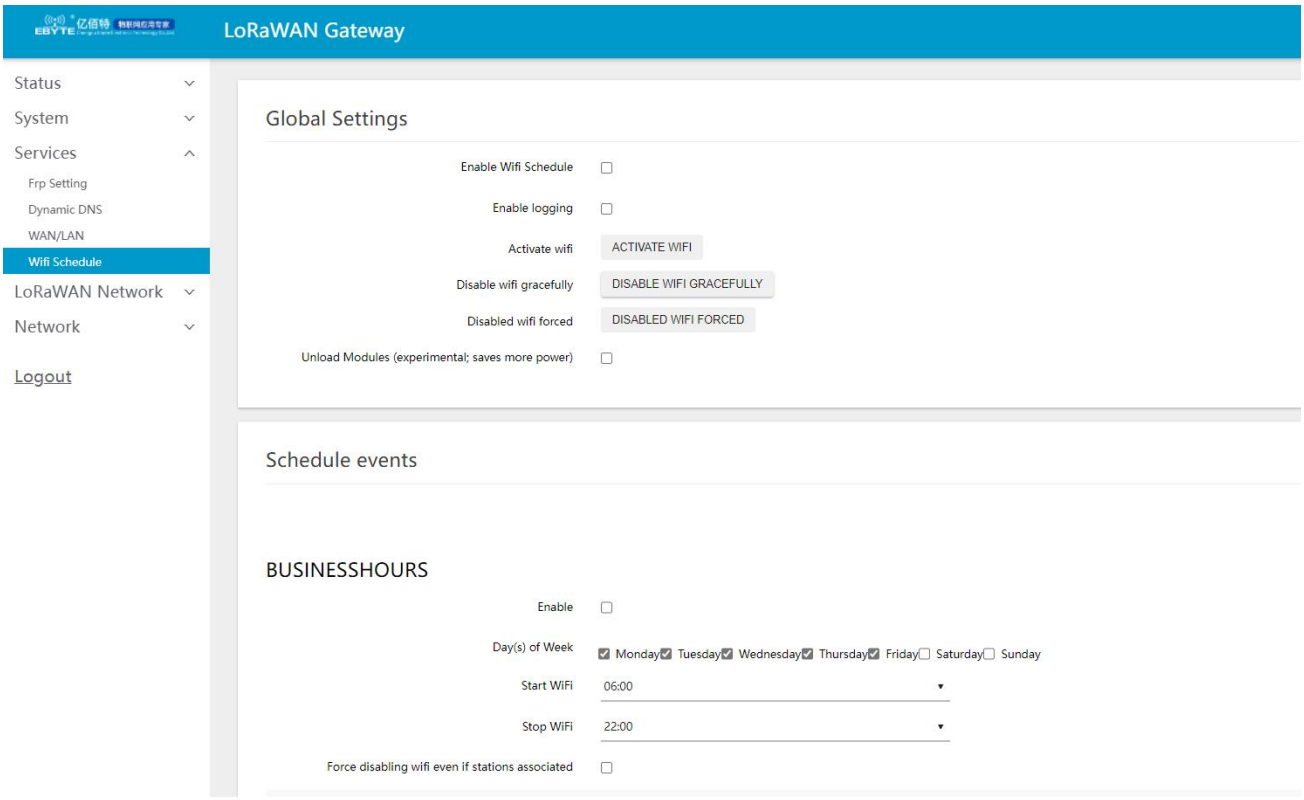
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5.3.4. WIFI Scheme

In the Services-->WIFI Plan option, users can set events related to wireless WIFI, such as wifi activation or deactivation, as shown below.



5.4. Network

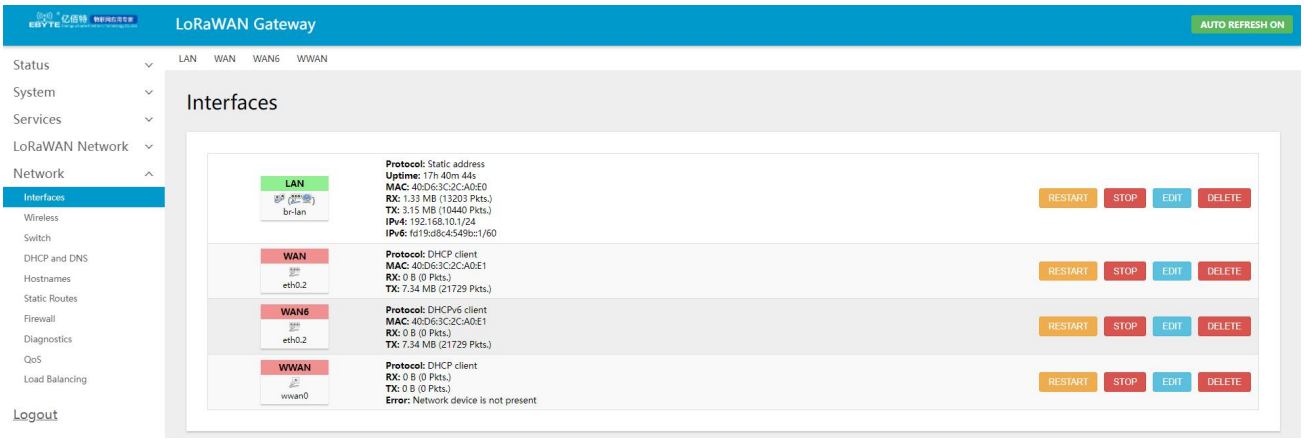
In the Network Settings section, users can set and query network related parameters such as login gateway settings, wifi settings, firewall, etc. The following will introduce some of the common setting options for users.

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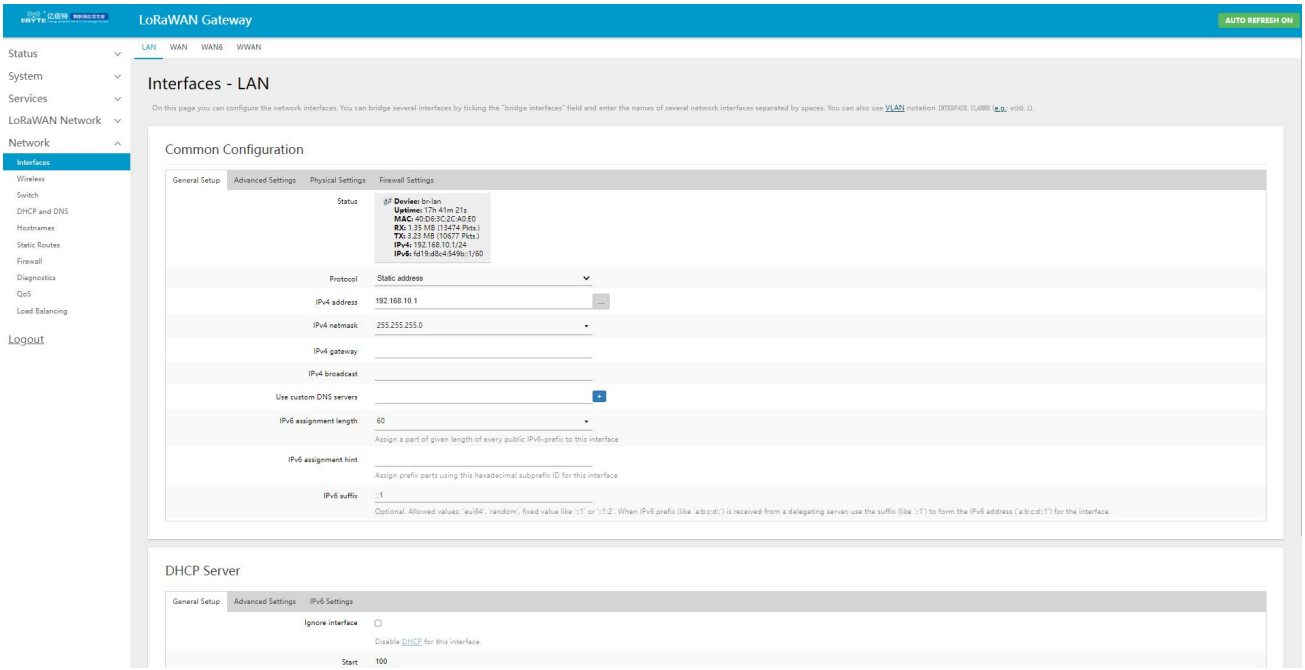
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5.4.1. Interfaces

In Network -> Interfaces, the user can set the relevant settings for the LAN port, WAN port, as shown in the following figure.



In the LAN option, you can set the gateway, subnet mask, etc., as well as the DHCP function for the relevant settings, as shown in the figure below.



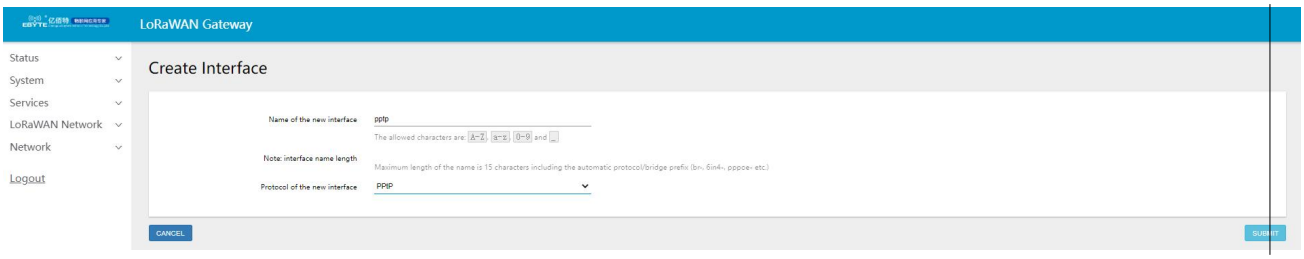
The default DHCP IP allocation range is 192.168.10.100 to 192.168.1.250, with a default lease period of 12h. Dynamic DHCP IP allocation is enabled by default, and users can choose to turn it off or off according to their needs.

This device also supports VPN clients (pptp,l2tp protocol types). In the following, a demonstration of the VPN client will be given.

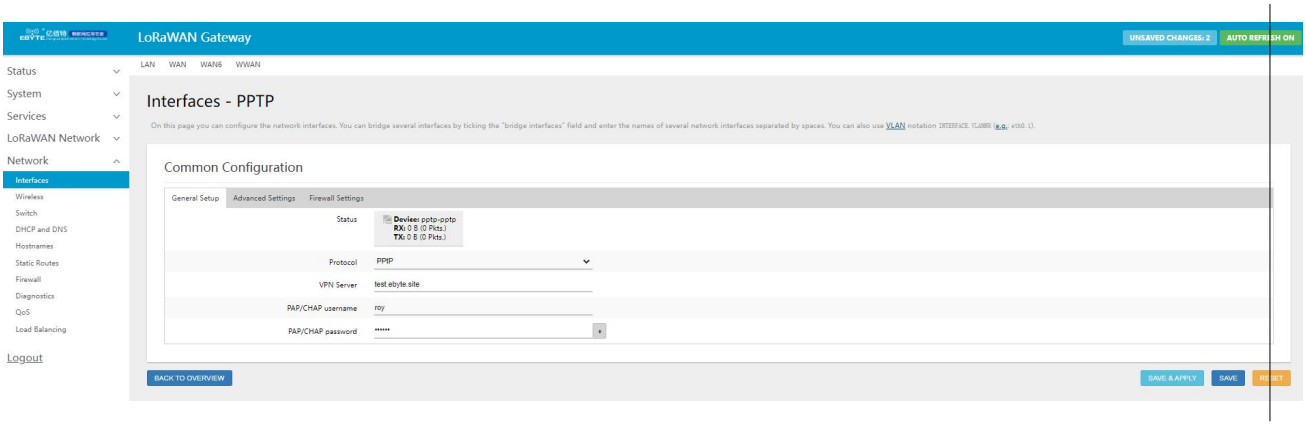
First, we click on Add New Interface and get the following information. Here, we set the name to PPTP and the protocol to PPtP.

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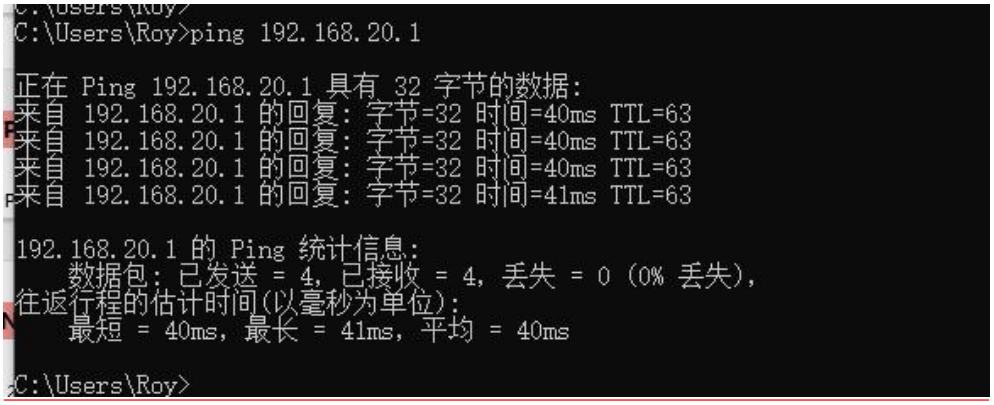


In the basic settings we enter the appropriate server IP, username and password and add the interface to the firewall and save and apply it.



Wait a little, then the VPN interface is assigned an IP address by the server, indicating that the remote VPN server has been connected.

At this point, we pinged the server's internal IP and were able to get through.



Again, the L2TP method of VPN and PPTP are set up in much the same way.

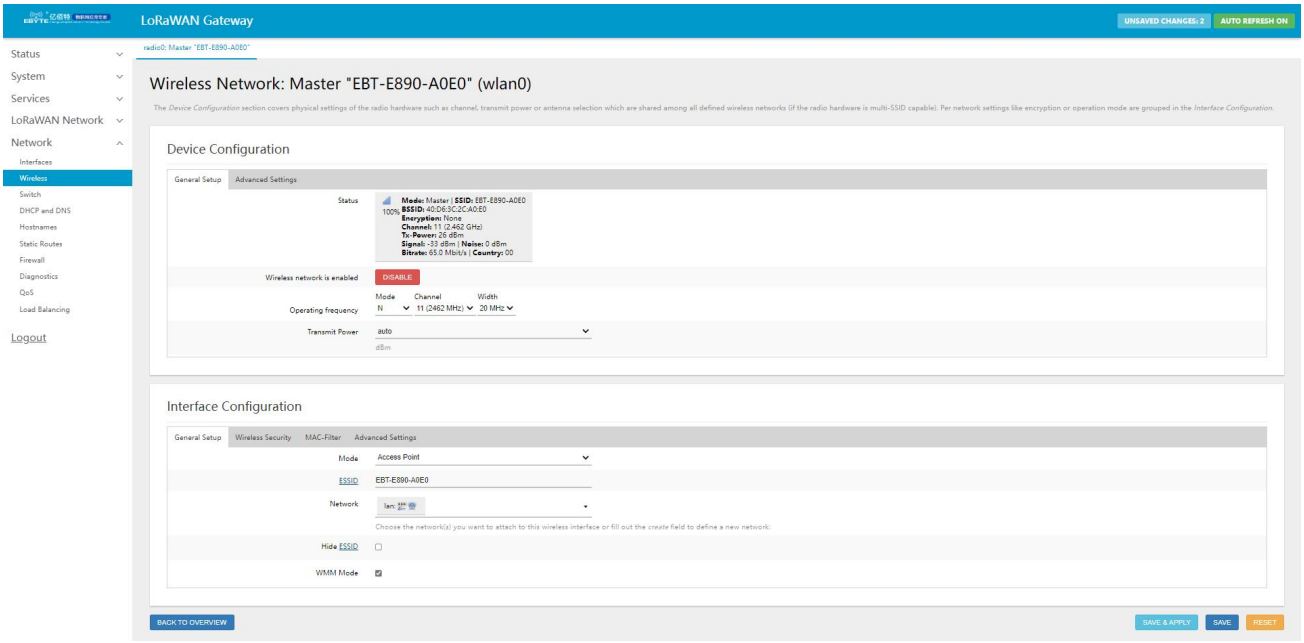
Here, we do not give an overview of other interfaces, and we also advise our customers not to set the relevant parameters of other interfaces, as easily as possible, if they do not have special needs or are professionals.

5.4.2. Wireless

In the Network --> Wireless --> Wireless Profile option, click on the Edit option to set and query wireless related parameters, such as setting wireless password, operating mode, MAC filtering, etc., as shown in the figure below.

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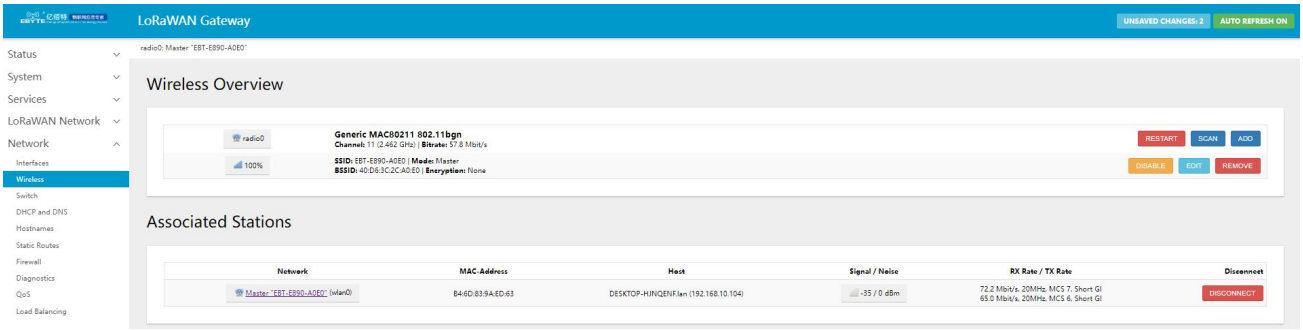


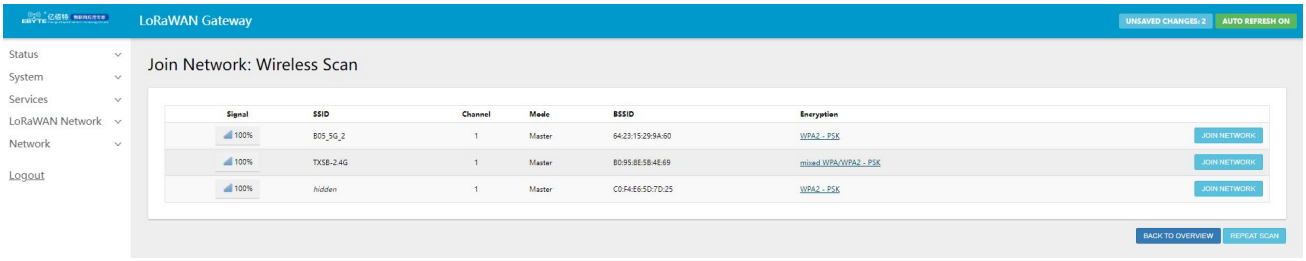
In wireless WIFI, the default WIFI name is: EBT-E890-XX:XX

where the next characters are the first four bits of the MAC address of the device.

WIFI password is empty by default

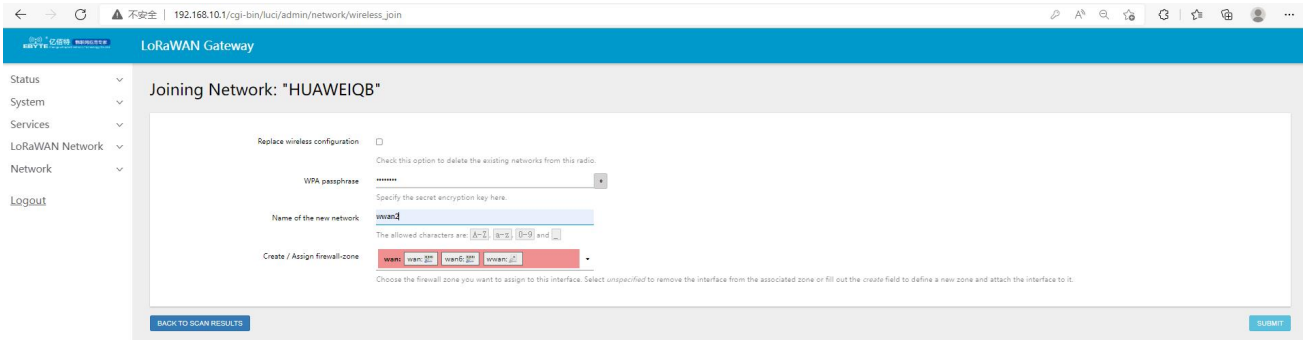
WiFi client mode is also supported. Configure the name of the WiFi you need to connect to and the key, save the parameters and the gateway will connect to the router.

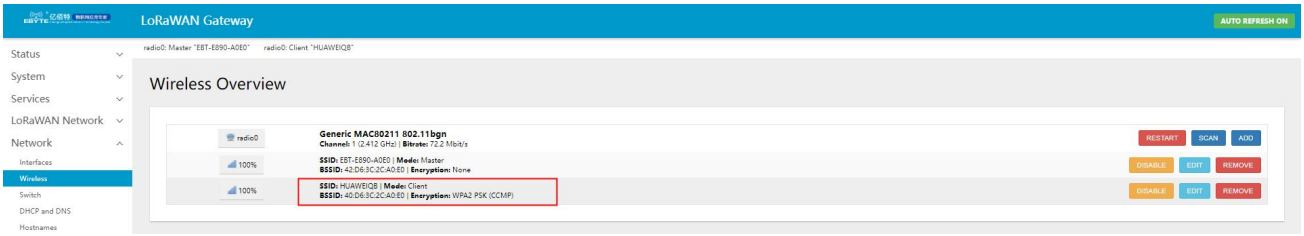




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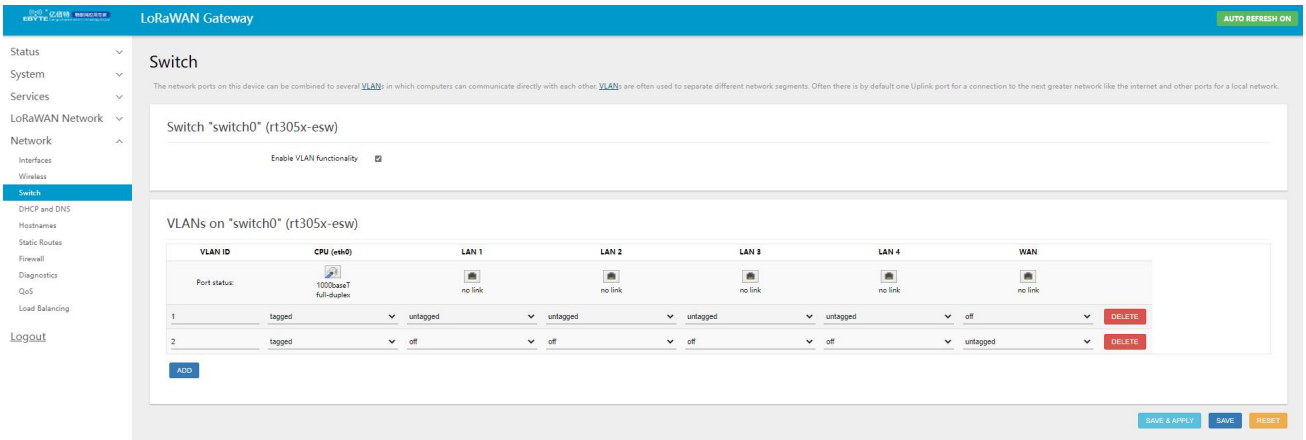
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5.4.3. Switches

In the Network -> Switch option, users can combine Network -> Interface to set the type of network port (such as LAN port or WAN port) or network port enable/disable, in the later version, it will be combined with load balancing to do related settings, the setting interface is shown in the figure below.

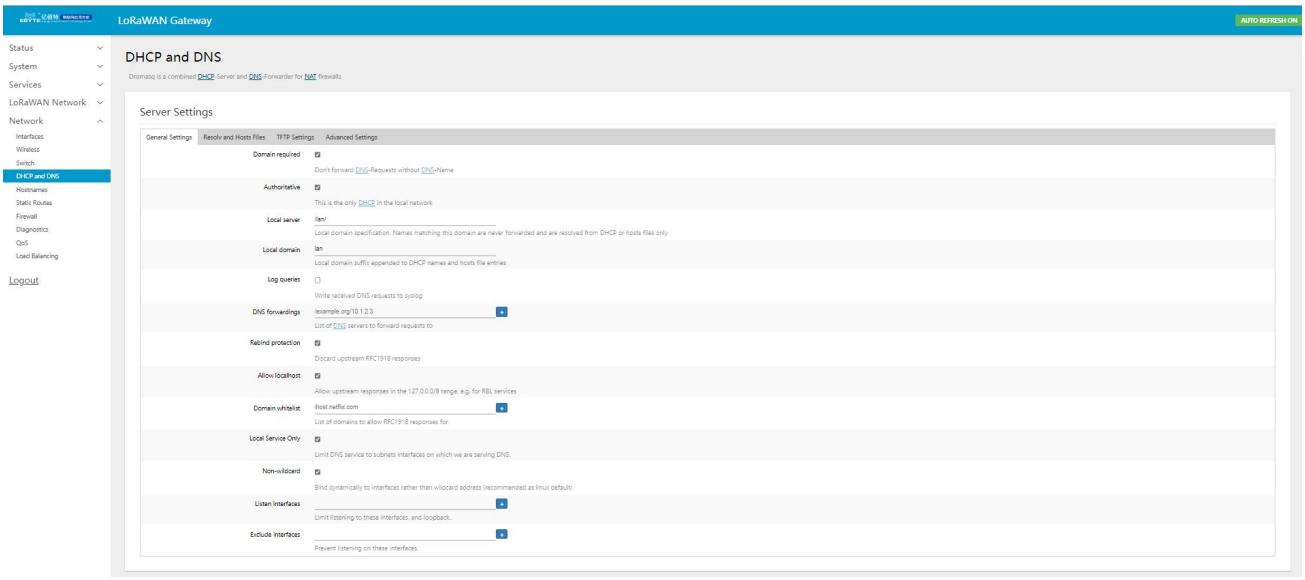


5.4.4. DHCP/DNS

In the Network->DHCP/DNS option, use MAC-Address to identify the host, IPv4-Address to assign an address, and Hostname to assign a logo. Static address assignment: set at "Network->DHCP/DNS-> Basic Settings". This function is an extension of the DHCP settings for the LAN interface and is used to assign fixed IP addresses and host identifiers to DHC clients. Only the assigned hosts can connect and the interface must be non-dynamically configured.

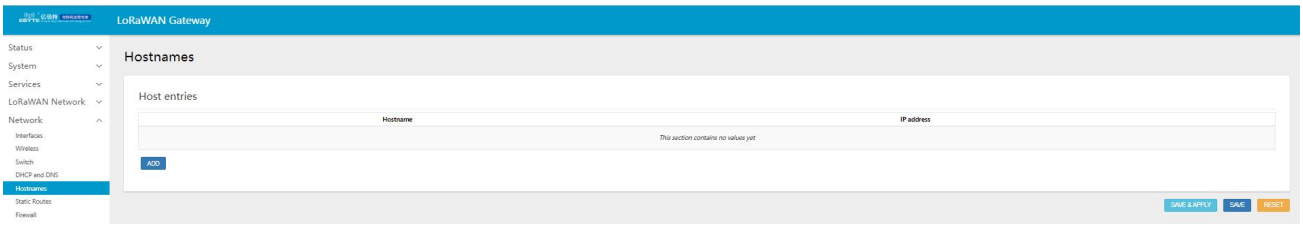
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5.4.5. Hostnames

In the Network-> Hostname option, you can implement a custom domain name resolution, users can fill in any host name (domain name) they want, here we set "EBYTE-4G-ROUTER" as the host name, the corresponding IP address is 192.168.10.109. This enables the mapping between hostname and IP address, so that when the EBYTE-4G-ROUTER is resolved locally it actually resolves to the 192.168.10.109 address.



Then, we ping the hostname at the windows command line as follows.

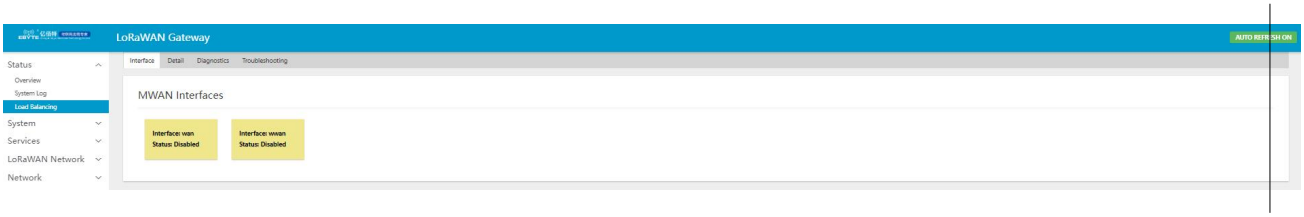


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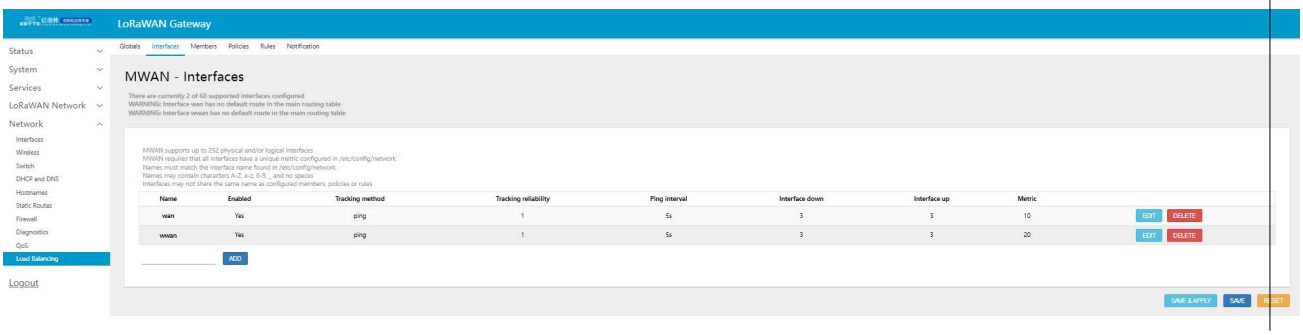
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5.4.6. Load balancing

The load balancing function dynamically assigns priority, enablement and even traffic ratios between network ports for multiple network interfaces of the gateway (e.g. wired Ethernet and 4G wireless). It enables the user to make the allocation mechanism relevant to the actual network environment. In the following, we will explain the load balancing function. On our gateway, we have access to two network interfaces wan (wired Ethernet) and wwan (4G wireless). When we switch on the gateway, we can check the operational status of the two interfaces in Status -> Load Balancing Selection.



Here, the user can handle exceptions or set some parameters for some interfaces through other sub-options. In the option Network -> Load balancing, the user can set the parameters related to load balancing, as shown in the figure below.

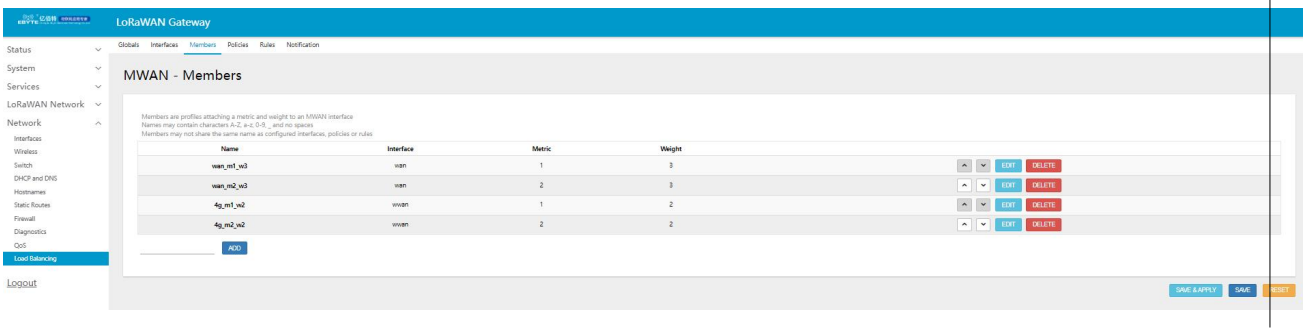


In this device, we have set up the load balancing configuration of 2 multiple interfaces for users by default. In the following, we make a brief explanation of the relevant sub-options of this function for the load balancing constituted by these two interfaces respectively, so that users can learn to configure their own rules after understanding them.

Interfaces：

Members：

This is used to set the number of leap points (i.e. interface priority) and the weighting of each MWAN interface. The general naming convention for members is: "interface_name_leap_point_weighting_ratio". This is shown in the diagram below.



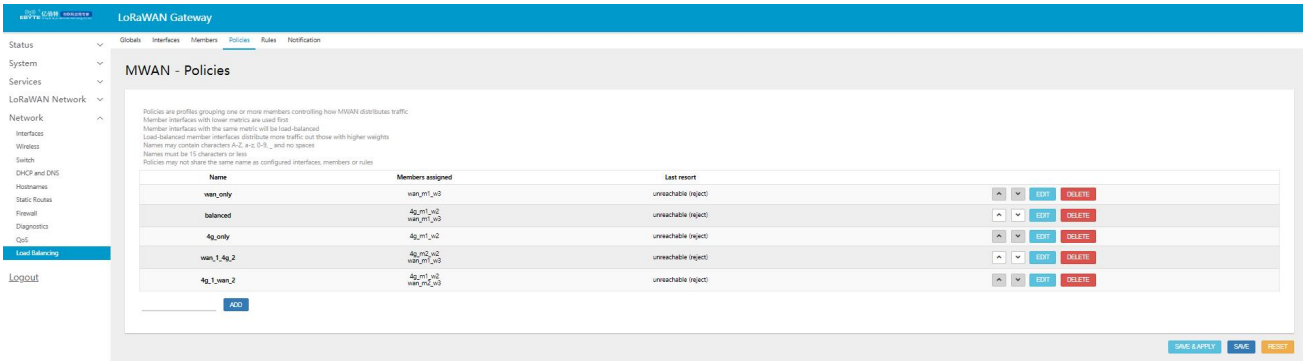
The above defines four members, each with a different combination of leap points and weights, which serve the strategies that follow.

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Strategy.

This is used to group members together and tell MWAN how to allocate the traffic in the "rules" that use this policy. Members with a lower number of leap points will be used first. Members with the same number of leap points will have their traffic divided proportionally according to their weight. Members with a higher weighting between load-balanced members will be allocated more traffic. The device defaults to five policies, as shown in the diagram below.



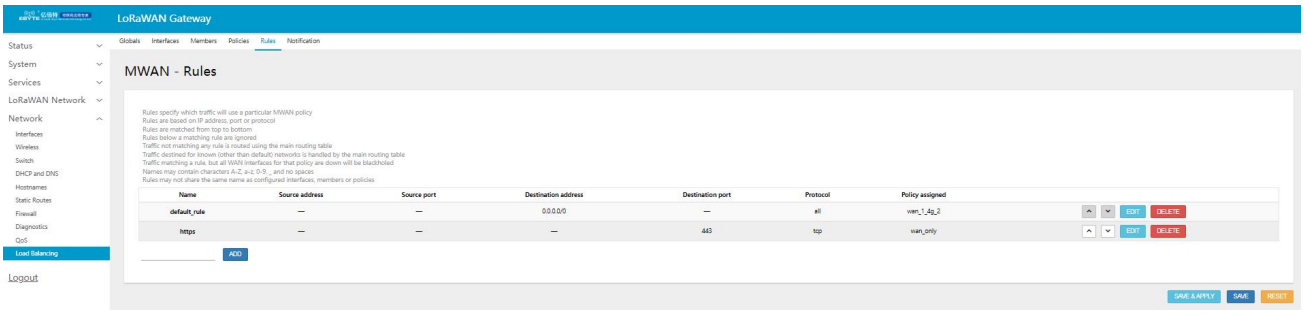
The explanatory notes are shown in the table below.

Name	Description
wan_only	Use only traffic from the wired Ethernet interface
balanced	Traffic from both the Ethernet and 4G wireless interfaces are used and captured in a 3:2 ratio
4g_only	Wired first, 4G spare capacity
wan_1_4g_2	Wired preferred, 4G back-up
4g_1_wan_2	4G first, wired back-up

Rules.

It classifies traffic into a specified "policy" based on IP address, protocol and port. The rules are matched in order from top to bottom. All rules are ignored except for the first rule that matches a single communication. Traffic that does not match any rule will be routed by the system default routing table.

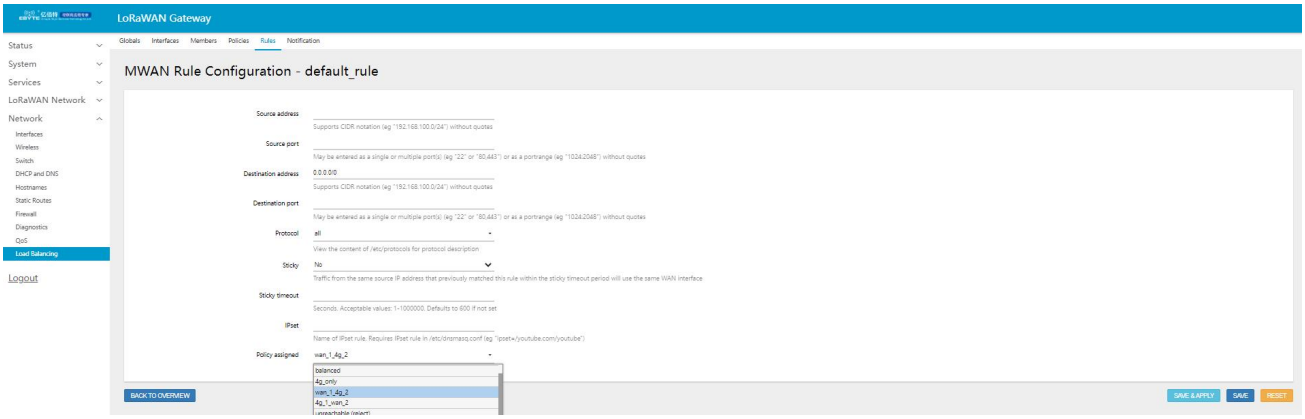
The diagram below characterises the policy of going wan_1_4g_2 for all destination addresses or protocols, i.e. giving priority to wired network data and getting traffic from the 4G interface when the wired Ethernet goes down or no data stream is available. When the first rule is not satisfied, match the following one, otherwise it will be ignored.



If the current policy type meets your needs, you can modify the policy by clicking the edit button on the default_rule rule in the diagram above.

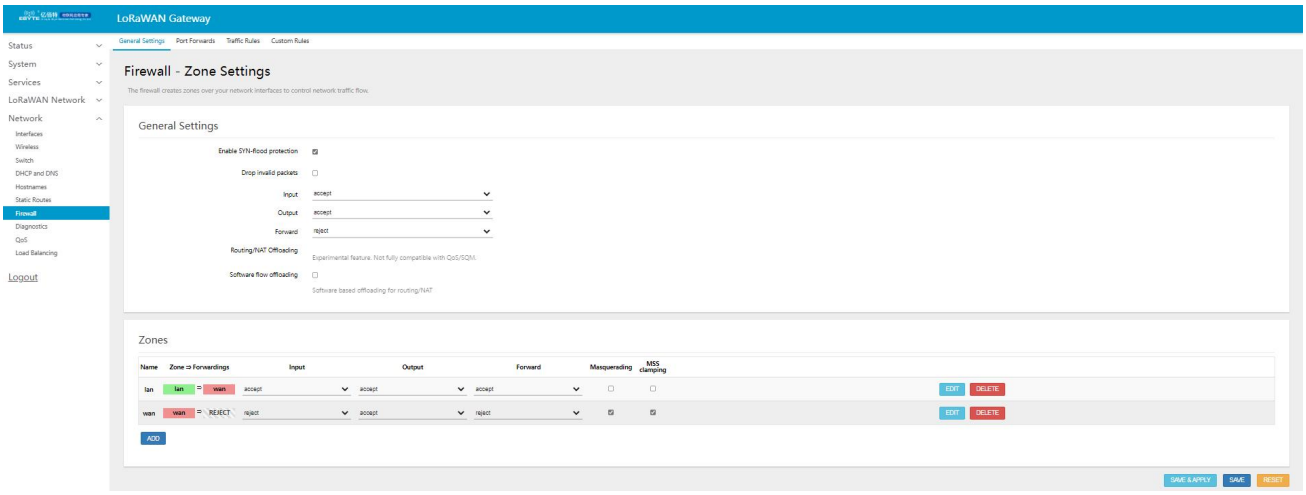
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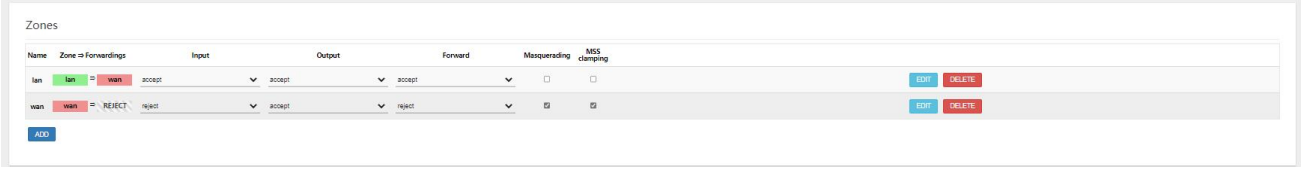
5.4.7. Firewalls

In the Network -> Firewall option, make settings related to network security and communication rules, as shown in the figure below.



1. IP Dynamic Masquerade (MASQ)

MASQ, also known as MASQUREADE, address masquerading, will leave the source IP of the packet into the IP address of an interface of the gateway, as shown in the figure check the IP dynamic masquerading, the system will modify the source IP address of the packet flowing out of the gateway to the IP address of the WAN port, here, the default way for IP dynamic masquerading on.



2. Communication rules (SNAT & DNAT)

In Network --> Firewall --> Communication Rules, there is a Source NAT column, Source NAT is a special form of packet disguise, change the source address of the packet leaving the gateway, for example, the source IP of the packet leaving the gateway address is fixed to 192.168.1.1 (real IP: 192.168.10.1), the setting interface is shown below, the

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name EBYTE for the display interface after the setting, named TEST, for the display interface when added.

In this device, Source NAT is not added by default, when using this function, the user can make the relevant settings according to the relevant requirements.

DNAT is destination address substitution, replacing the destination IP address of a packet whose destination address into the gateway is the WAN port IP with the IP address set by the user.

3. Port forwarding

Port forwarding allows computers from the Internet to access computers or services on a private LAN, e.g. forwarding TCP data from port 82 on the external network to port 82 on the internal network 192.168.10.119 would have the following settings.

5.4.8. Network Diagnostics

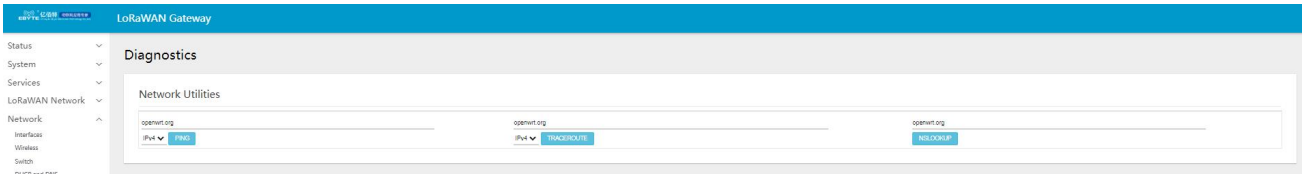
In the Network -> Network Diagnostics option, the online diagnostic function is supported.

Ping tool, directly on the gateway side, to perform a ping test to a specific address.

Gateway parsing tool to get the routing path through which the address is accessed.

DNS viewer tool that resolves domain names to IP addresses.

This is shown in the diagram below.

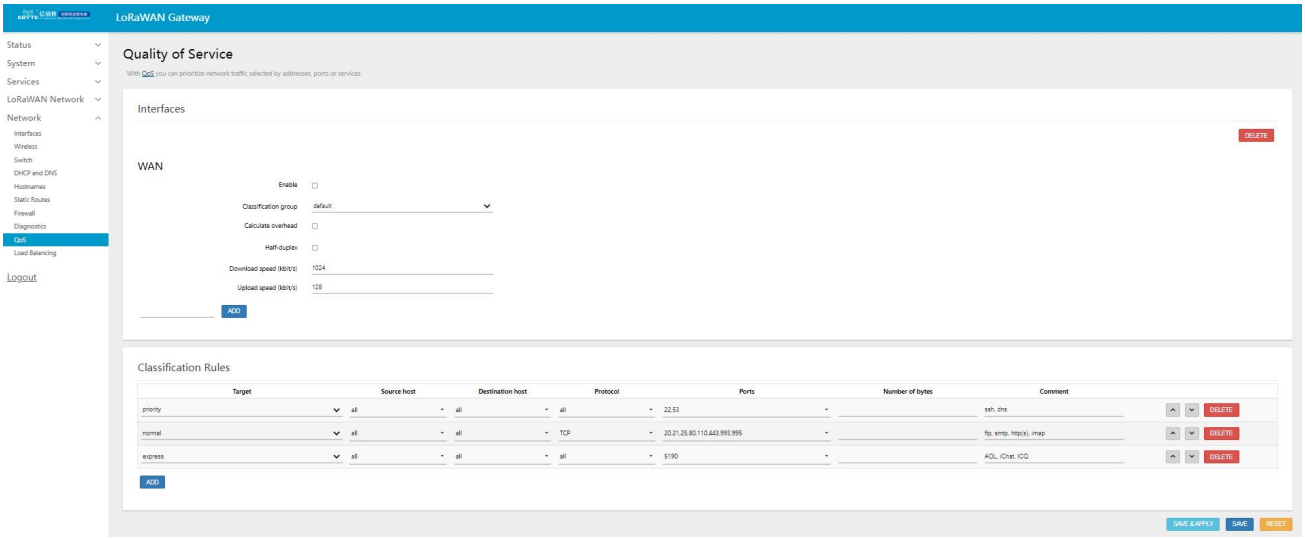


5.4.9. Flow control management (Qos)

In the Network -> Qos option, you can sort traffic packets according to network address, port or service, and apply network speed limits for a particular interface, among other functions. This is shown in the diagram below.

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5.5.LoRaWAN network setup

In the LoRaWAN network settings section, users can set and query the LoRaWAN frequency band, LoRaWAN gateway related parameters, and view the current status information. For example, the number of received and transmitted messages, current channel usage, RSSI & SNR, upstream and downstream packet time and airtime. Some of the common user settings options are described below.

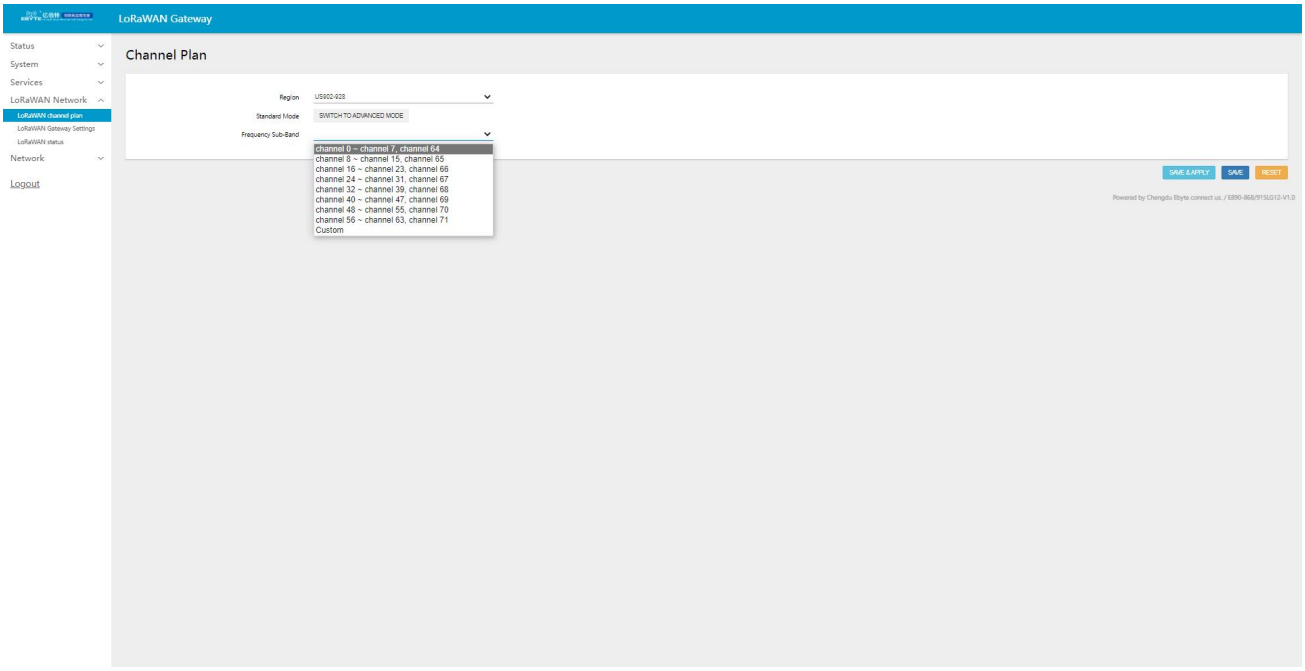
5.5.1. LoRaWAN band settings

LoRaWAN band settings are divided into band region and band settings.

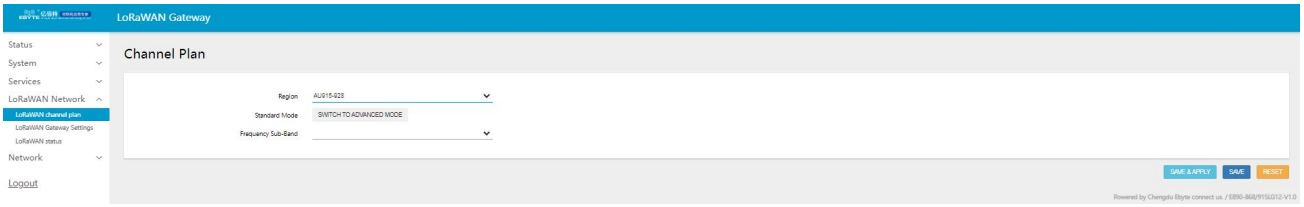
Band Region refers to the Regional Parameter specified in the LoRaWAN protocol, EU868/IN865/RU864/US915/AU915/AS923/KR920, this model supports four region files, US915/AU915/AS923/KR920, where the US915 band region is configured as follows.

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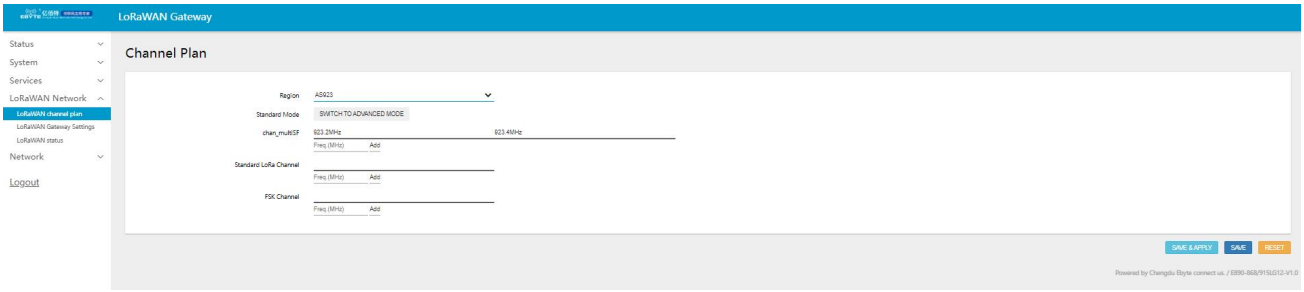
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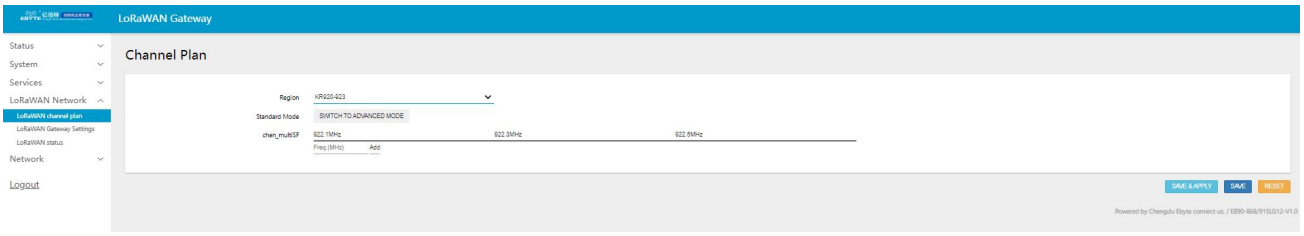
The AU915 default band area is configured as follows:



The default configuration for the AS923 band area is as follows.



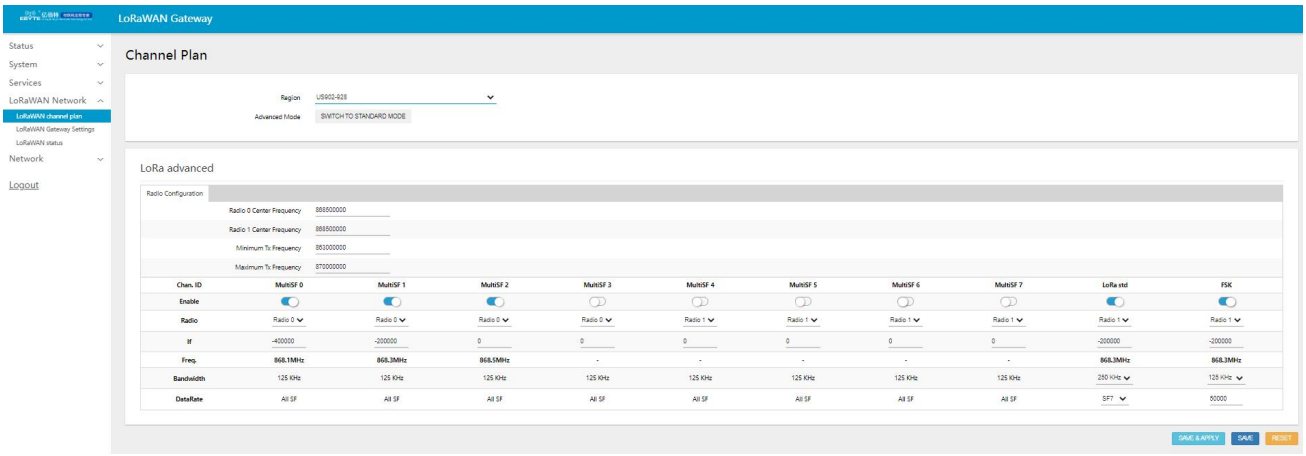
The default configuration for the KR920 band area is as follows.



In addition to the default configuration, there is also support for custom band settings, click on the interface can be custom band settings, you can custom add the desired band, each band interval of at least 0.2MHz, up to eight configuration.

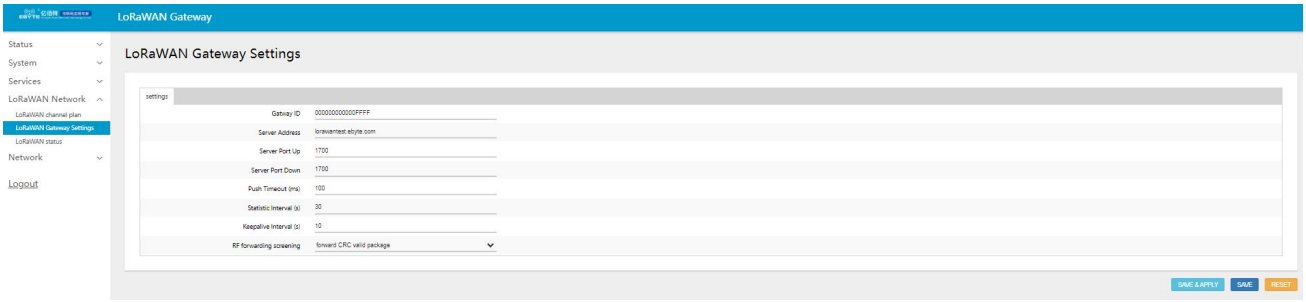
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5.5.2. LoRaWAN gateway setup

LoRaWAN gateway settings set the relevant parameters of the gateway



Gateway ID: Gateway identification number, ensure that the gateway ID set is not duplicated with the existing gateway ID of the server used, otherwise data loss and other problems may occur.

Server address: LoRaWAN server address

Server uplink port: data uplink port number

Server downstream port: Data downstream port number

Response timeout: gateway-server communication timeout

Statistical interval: gateway status reporting period

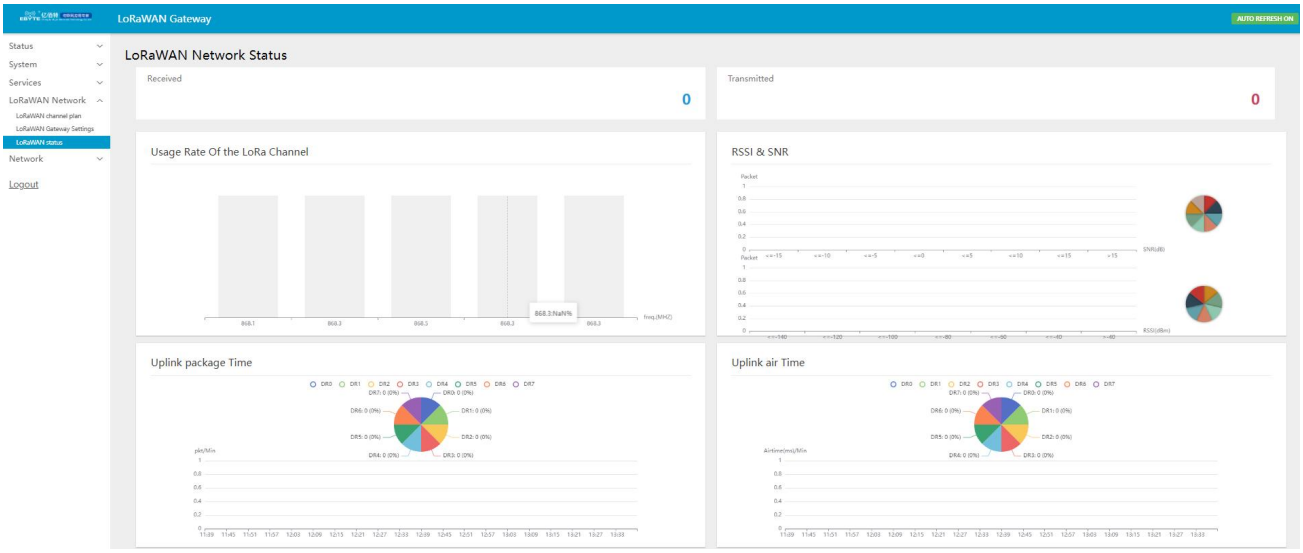
Heartbeat time: gateway heartbeat reporting period

Forwarding rules: gateway forwarding policy for corresponding LoRa packets

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5.5.3. LoRaWAN Status



Incoming messages: Shows the total number of LoRa messages received by the LoRaWAN gateway

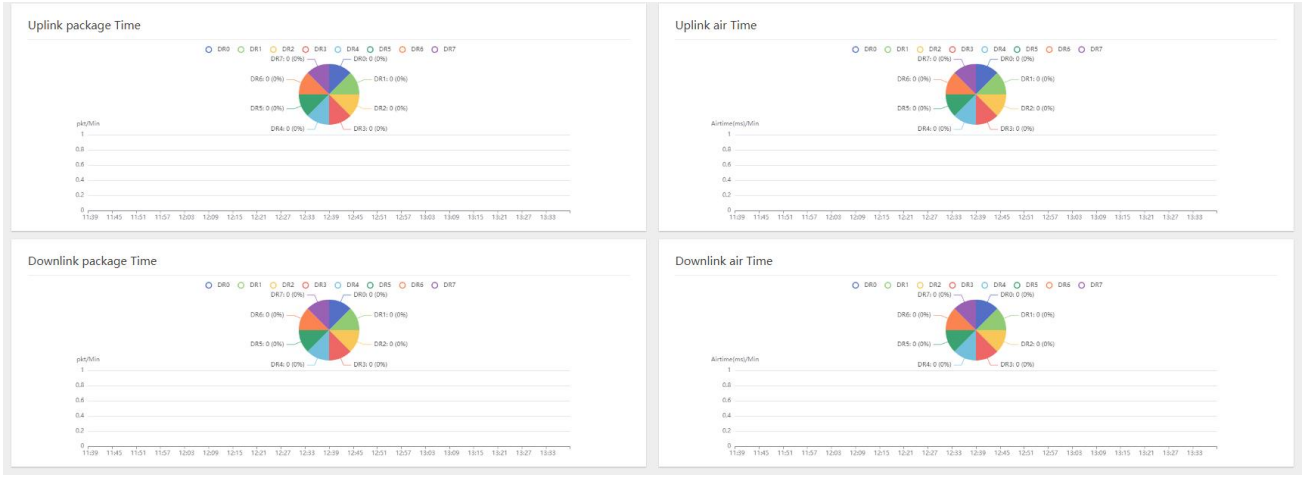
Send messages: shows the total number of LoRa messages sent by the LoRaWAN gateway

lora channel usage: The graph shows the occupancy rate of all channels over a 12 hour period, usually the 8 channels are evenly distributed, if one channel is much less used than the others, it means that the channel may be faulty.

RSSI & SNR.

The RSSI chart shows the statistical signal strength of the received messages, which can be used to determine the current environmental information, the smaller the RSSI value, the higher the sensitivity of the reception.

The SNR graph shows the statistical signal-to-noise ratio of the received message. The higher the SNR value, the lower the noise to signal ratio and the better the communication.



Uplink/Downlink Packet Time: Number of LoRa packets received/sent by the gateway per minute

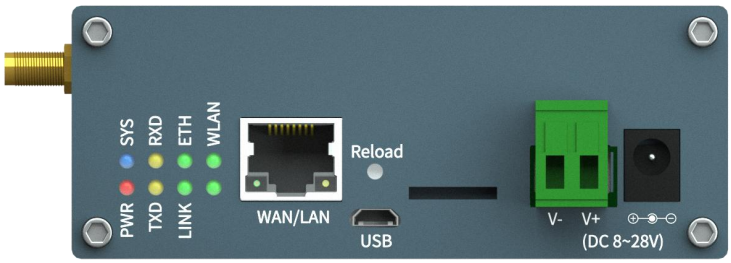
Uplink/Downlink Airtime: Airtime to receive/send LoRa packets

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6. Equipment panel identification and function settings

A physical view of the equipment panel (front view) is shown below.



6.1.LED indicators

In the panel, each LED indicator is described, as shown in the table below.

Name	Description
WLAN indicator	WiFi light flashes on power up
Indicator light	Vacant
ETH Indicator	Network cable connection lights up
LINK indicator	Always on when connected to the server
RXD light	Gateway Receive Data Light
TXD light	Gateway sending data light
SYS light	RF module and network always on for normal operation
PWR light	Always on when powered up

6.2.Key settings

In the panel, the function of each physical button and the description of its use are shown in the table below.

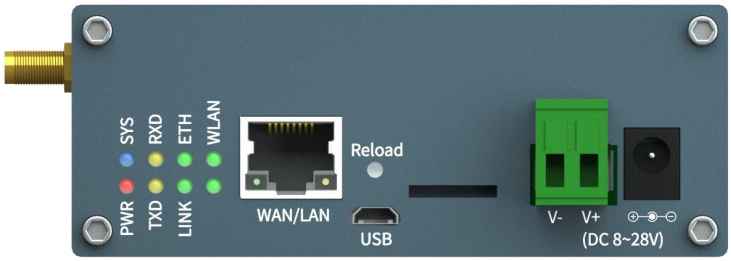
Name	Description
Restore	Press and hold the button for more than 5s to restore the factory settings

6.3.Other markings

In the panel, other markings are described, as shown in the diagram below.

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7. Revision history

Version	Date	Description	Issued by
1.0	2022-04-19	Initial version	LM
1.1	2023-02-25	Change picture	LM

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