M300 Application Guide

Catalogs

1. Products

M300 is a high-performance expandable comprehensive edge gateway. The product integrates edge data collection, calculation, active reporting and data reading/writing, linkage control, IO collection and control, etc. The collection protocols include standard Modbus protocols and a variety of common PLC protocols, as well as industry-specific protocols; the active reporting adopts the group reporting method, and the customized Json reporting template quickly realizes the docking of the server data format. At the same time, the product also has routing and VPN and graphical programming functions, graphical module design edge calculation function to meet the customer's own design needs. The product supports TCP/MQTT(S) protocol communication, support for multiple connections; support for Modbus RTU/TCP and OPC UA protocol conversion and other functions, the product is to support Ali cloud and AWS, Huawei cloud and other commonly used platforms such as rapid access.

The product adopts Linux kernel, the main frequency is up to 1.2Ghz; the network adopts WAN/LAN plus 4G cellular design, the uplink transmission is more reliable, at the same time, the LAN port can be connected to external cameras and other devices, combined with its own routing function can realize the functional application; the hardware integrates 2-channel DI, 2-channel DO and 2-channel AI and 2-channel RS485, which not only realizes the control and collection needs of the industrial field, but also realizes the linkage control according to the data or status of various collection points. It can not only realize the industrial site control and collection requirements, but also realize the linkage control according to the data or status of various collection points. It can be widely used in smart farming, smart factory and other industrial intelligent programs.

The product adopts expandable design in the structure, which can be combined and applied by expanding modules with different functions to better meet the needs of different scenarios for the number of IOs and communication interfaces. Convenient and cost saving .

2. Hardware

2.1. mounting

M300 supports both rail and lug mounting as shown below:
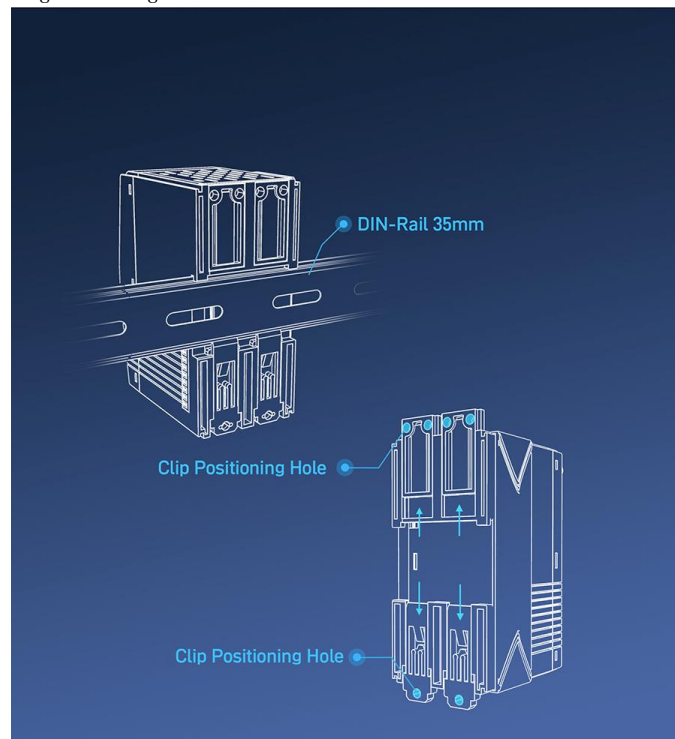
2.2. Installation Precautions

Power supply requirements: power supply range 9 ~ 36VDC, it is recommended that the standard 12V/1A power supply adapter, such as connecting the expansion machine is recommended to use 12V/2A power supply.

Environmental requirements: M300 working temperature is -25℃～75℃, storage temperature: -40℃～85℃, the surface of the device may be high temperature, the installation needs to consider the surrounding environment.

Installation: the installation of the rail and lugs, according to the actual needs of the choice, the rail standard 35mm, need to pay attention to the width of the rail.

Avoid direct sunlight, stay away from heat sources or areas with strong electromagnetic interference, if you can't avoid strong interference areas, you can choose to add isolation equipment according to the actual situation.

Before installation, you need to check whether the wiring harness and connectors required for the installation have been fixed and led out to ensure that the device can be wired and installed directly after it is snapped into the rail.

2.3. hardware connection

2.3.1. SIM card installation

　　SIM1 is external card, under the device side labeling bezel, push open the bezel to see the SIM card slot.M300's SIM1 is MicroSIM (Medium Card).

2.3.2. Antenna

　　The M300 antenna connector is an SMA connector, align the screw holes of the antenna with the antenna connector of the device, and gently rotate the movable part of the SMA connector of the antenna by hand until it cannot be rotated in position.

2.3.3. Power

　　M300 adopts one-piece terminal, the power supply part is 2PIN one-piece terminal, when using, the power supply can be connected to the product according to the positive and negative corresponding wires. If it is a soft wire, you need to press the white part on the terminal first, then put it into the wire body, and finally release it to press the power cord.
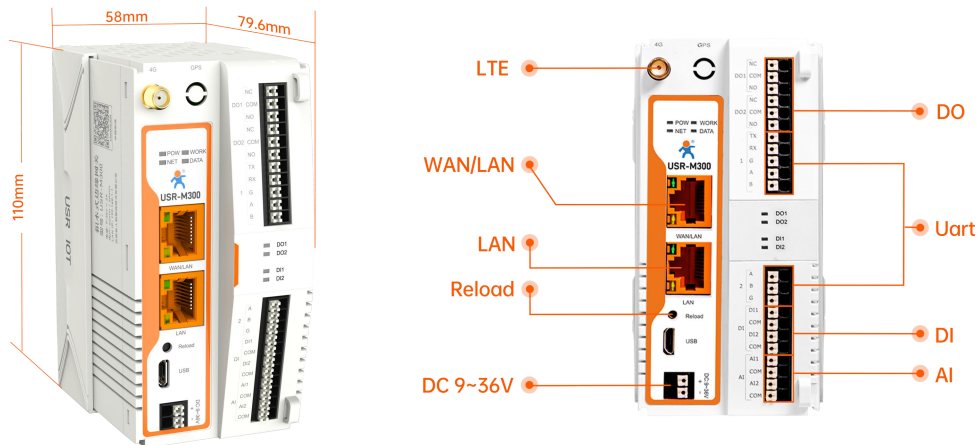
　　Power terminals can be connected to wire diameter 1.0 to 1.5 mm.

　　　The M300 supports grounding, and on the bottom of the unit, there are grounding screws with a logical hole diameter of 2.5mm and a screw length of 6mm.

2.3.4. Hardware Interface

　　M300 dimensions and hardware interfaces are shown below:

3. Equipment Configuration

3.1. built-in webpage

The parameter configuration of M300 needs to be carried out by entering the built-in web page of the device. After connecting the computer to the LAN port of M300 through the network cable, open the browser and follow the steps below:

1. Ensure that the computer has obtained an IP from the M300, if not, you need to configure the computer to enable automatic IP address acquisition.
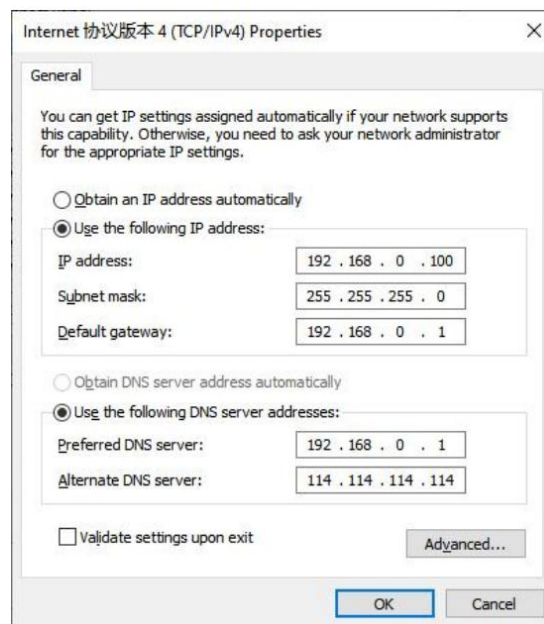
2. After making sure your computer has gotten an IP from the M300, open your browser, type 192.168.1.1 and hit enter.
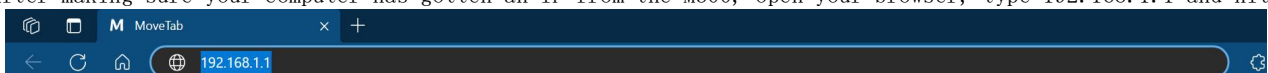
3. Enter the username, password, both defaulted to admin.

4. Click the login button to go to the built-in web page

Note: If you can't access the built-in web page, you can turn off the extra network card and try again.

3.2. Skim through

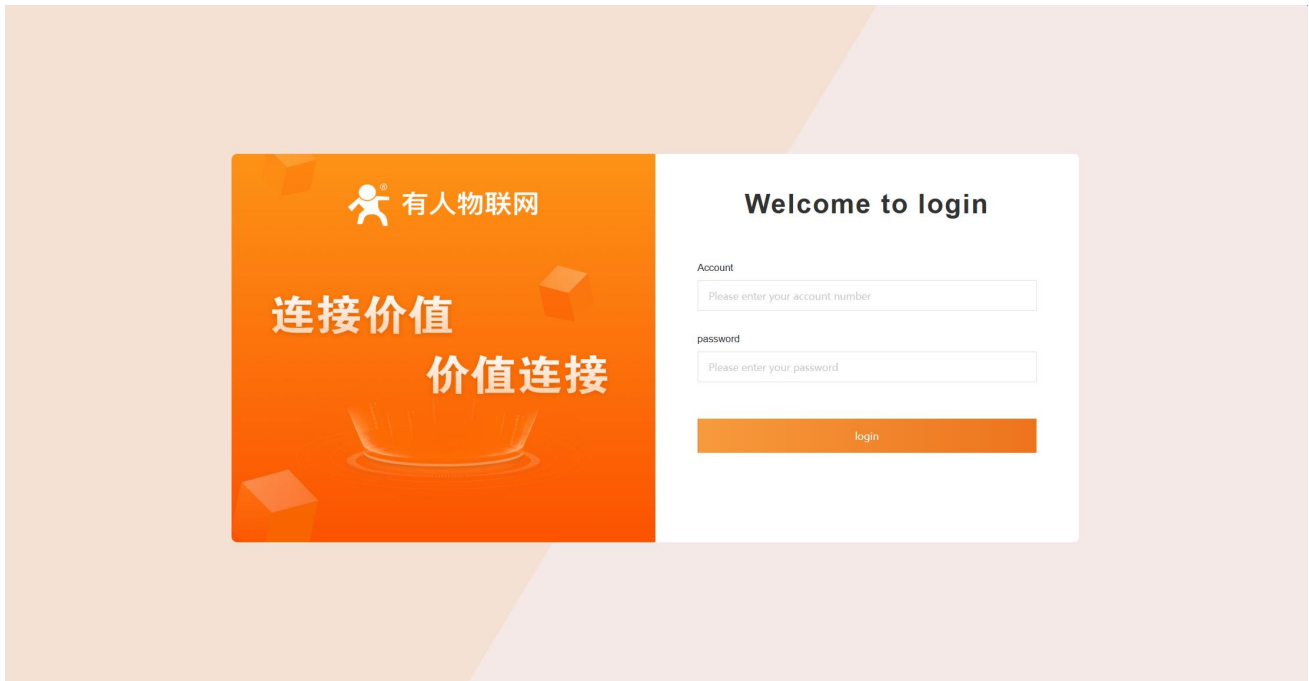The "Overview" page shows the network connection status, system information and data usage of M300, through which you can quickly understand the operation of the gateway. The "Overview" page is displayed by default after logging into M300 WEB page, or click "Overview" to enter this page, the information displayed on the page is as follows:

1. System Information, click Settings to modify the host name of the product.

2. Traffic monitoring to show the current day and month's traffic consumption, you can also set the alarm traffic value,

when the consumption exceeds the warning, the traffic data will change to red font.

3. Device performance, mainly shows the current CPU utilization, memory and flash of the device.

4. Ethernet Interface Connection Status

5. Cellular Network Connection Status

4. reticulation

The USR-M300 supports both Ethernet and cellular networks, and both networks can be operated at the same time. the M300 supports the free cooperation of the two networks to meet different needs.

4.1. Network Switching

Network switching function is mainly to set up the preferred network, when the preferred network can not be networked, through the set rules to detect the network timeout in order to quickly realize network switching. Network switching is mainly through the PING method for his test. The configuration method is as follows:

1. Go to the built-in webpage and find the Network -> Network Switching interface.
2. Set parameters such as network priority and probe server address, and click Apply to complete the configuration.

Parameter Description:
- Network Priority: The network that prioritizes data transmission in case of multiple networks, 4 modes are selectable.
- Detection Mode: type of detection destination address, either Custom or Gateway.
- Detection Address: When Custom is selected for Detection Mode, you need to set the target address for detection.
- Probe Period: the interval between probe packet transmissions.

- Ping packet size: the data length of the probe packet.
- Ping Timeout Time: After the probe message is sent out, no reply after timeout is considered as probe failure.

4.2. cellular network

Configuration method:

1. Go to the built-in webpage and find the "Network -> Cellular" screen.
2. Enable the cellular network, configure the corresponding parameters, click Apply to complete the configuration of the cellular network, the configuration takes effect immediately without rebooting.
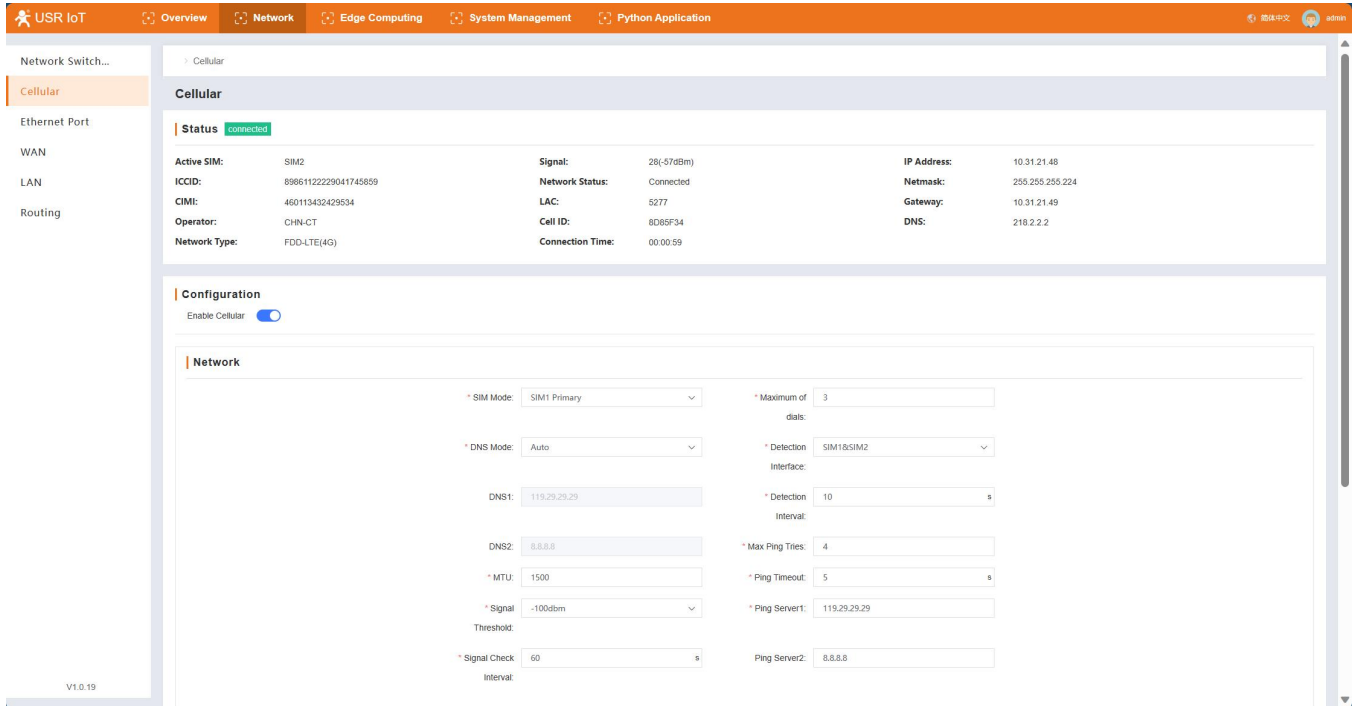
Parameter Description:

- Dual SIM mode: set the SIM that prioritizes the connection to the network.
- DNS acquisition method: the acquisition method of DNS server address, you can choose to acquire it automatically or configure it manually.
- DNS1 and DNS2: When manual setting is selected for DNS acquisition method, you need to fill in the address of the DNS resolution server.
- MTU: Maximum Transmission Unit, in bytes.
- Signal Threshold: The minimum value to confirm the signal stability, if the detected signal is lower than this value, the signal is considered unstable, and the network will be switched when it is unstable for several times.
- Signal query interval: the interval between single signal detections.
- Maximum dialing times: When SIM1 has not dialed successfully within the set maximum dialing times, the device will switch to SIM2 for dialing.
- Link Probe: Selects the network channel to probe.
- Probe Interval: the interval between each probe message sent.
- Detection Count: Maximum number of retries in case of detection failure.
- Detection Timeout Time: If no response packet is received within the set detection timeout time, the detection is considered to have failed.
- Probe Address: the address at which the device probes the interaction.

SIM card parameter description

- APN: Used to identify the service type of the WCDMA/LTE network
- User name: Specifies the user name of the user accessing the external PDN network. Provided by the operator.
- Password: Specifies the password for users accessing the external PDN network. Provided by the operator.
- Network mode: user selects the type of mobile network used by the device, AUTO/4G/3G/2G can be selected
- PIN Code: The PIN code is the personal identification number of the SIM card. If PIN Code is enabled, the device

fails to dial when PIN Code is not set or is set incorrectly;
- Authentication Method:
    - NONE: Automatically selects an authentication method
    - PAP: Password Authentication Protocol, which provides a simple plaintext authentication method through two handshakes.
    - CHAP: Challenge Handshake Authentication Protocol, which confirms the digest information through three handshakes for secure authentication.
    - PAP& CHAP:Support the above two authentication methods.

4.3. Network Port

M300 is equipped with two Ethernet interfaces, RJ45 standard, supporting 10M/100M, of which network port 1 is WAN port by default, network port 2 is LAN port, network port 1 supports switching to LAN.
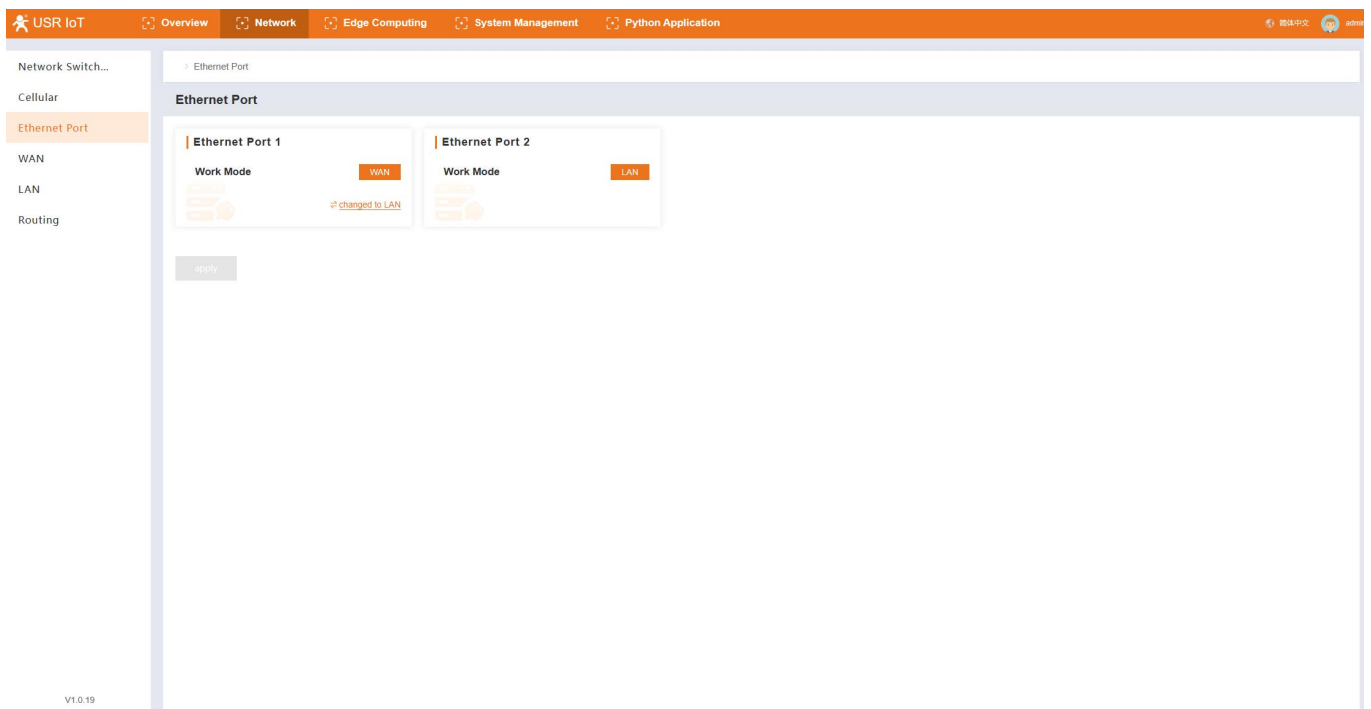
4.4. WAN

Such parameters are used when network port 1 is used as a WAN port. There will be two pieces of Ethernet connection status information and parameter configuration in the WAN port interface as follows:

1.Go to the built-in web page and find the "Network -> WAN" screen.
2.Configure the corresponding parameters and click Apply to complete the WAN configuration, which takes effect immediately without rebooting.
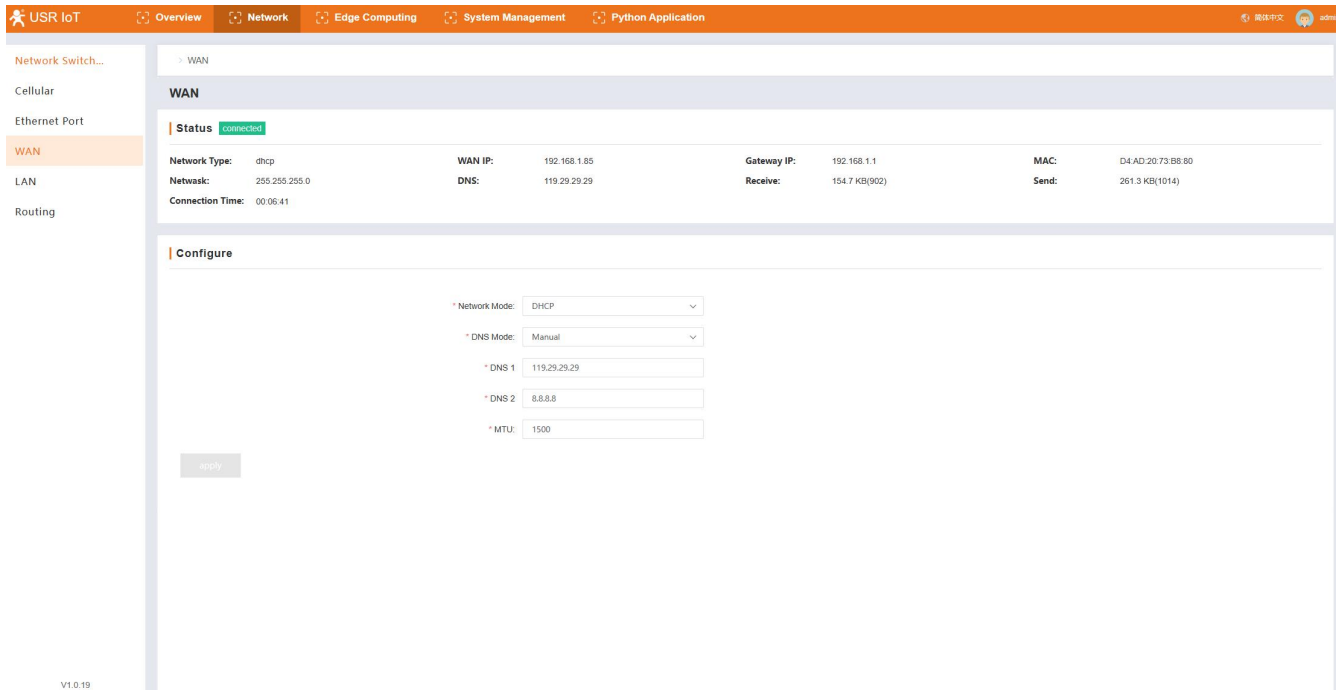
Parameter Description:

- Network Mode: the way for Ethernet to get local IP, default DHCP, can also be modified to static IP address.
- Static address: IP address of the Ethernet interface, the default value of the WAN port is 192.168.0.7
- Subnet Mask: Subnet mask of the Ethernet interface.
- Gateway: subnet mask of the Ethernet interface.
- DNS acquisition method: the acquisition method of DNS server address, you can choose to acquire it automatically or configure it manually.
- DNS server:When you select manual setting for DNS acquisition method, you need to fill in the address of DNS resolution server.
- MTU: Maximum Transmission Unit, in bytes.

4.5. LAN

The two network ports of M300, network port 1 can be set to LAN mode, and network port 2 supports only LAN mode by default, and the two network ports share a common set of LAN configuration.The LAN function supports the DHCP IP assignment function, and the device accessing the LAN can obtain an IP address from the gateway.

The operation process is as follows:

1. Go to the built-in web page and find the "Network -> LAN" screen.
2. Configure the corresponding parameters and click Apply to complete the LAN configuration, which takes effect immediately without rebooting.

3. The IP address assigned to the LAN port device can be viewed in the "DHCP Service List".

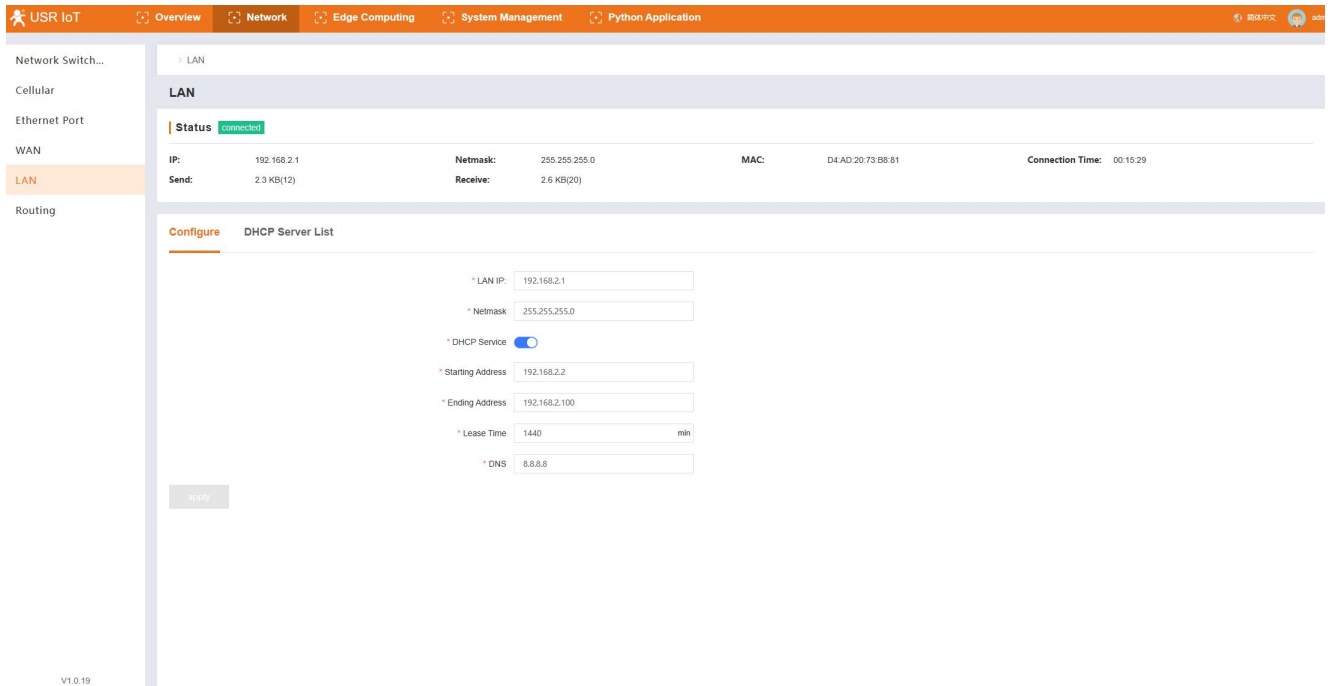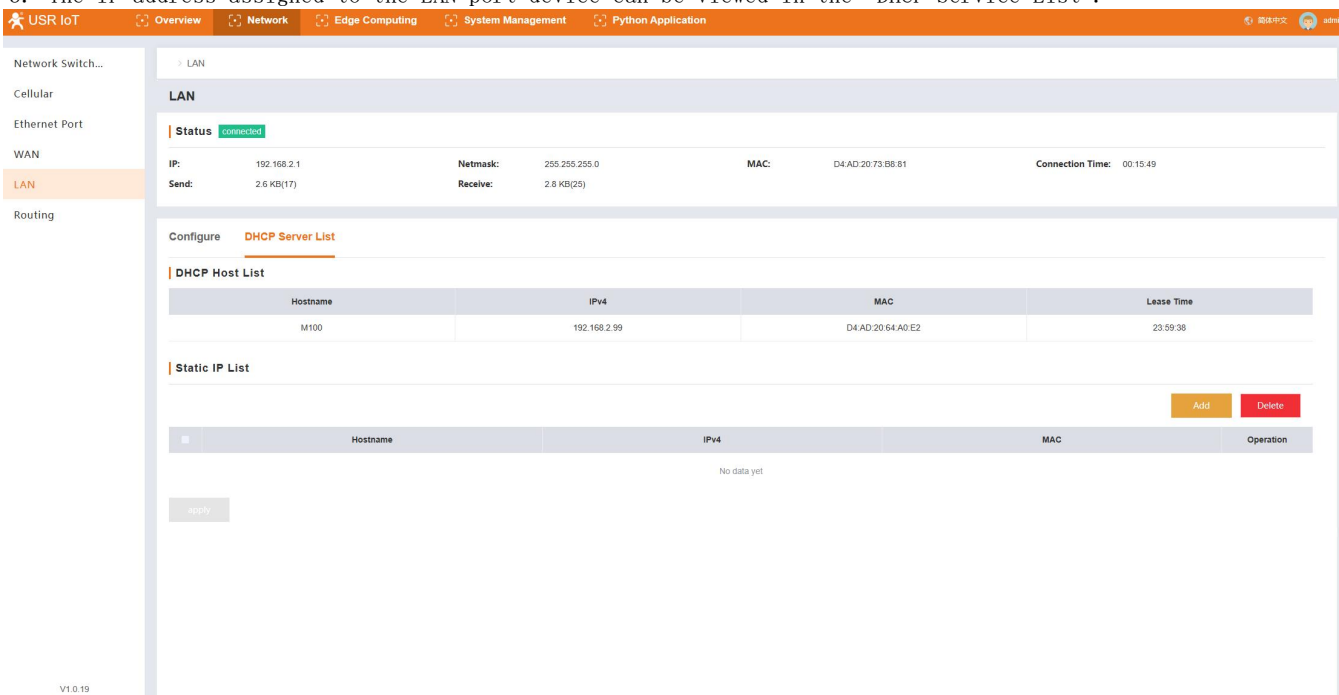4. If you need to assign a static IP address to the LAN port device, in the "Static Address Assignment List" of the "DHCP List", click the Add button, and fill in the device host name, MAC address and the desired static IP address.

Parameter Description:

● LAN IP: the IP address of the LAN, you can access the built-in web page of the gateway by changing the address

● Subnet Mask: The subnet mask of the LAN port.

● Gateway: subnet mask of the LAN port.

● DHCP service: the function of assigning IPs to LAN devices

● Starting Address: the minimum address to assign an IP address range to a LAN port device.

● End Address: the maximum address of the IP address range assigned to the LAN port device.

● Validity period: the valid time for the gateway to assign an address to the LAN port device.

● DNS server address: the server address used for domain name resolution of the LAN port device.

4.6. routing

The M300 supports the routing function as follows:

1. Go to the built-in web page and find the "Network -> Routing" interface.

2. You can see the current routing table supported by the gateway in the routing interface.

3. If you want to create a routing rule, you can click the "Add" button in the "Static IPv4 Route" column to configure it.

4. For example, the WAN ports of Routers A and B are both connected to the 192.168.0.0 network, Router A's LAN port is subnetted to 192.168.2.0, and Router B's LAN is subnetted to 192.168.1.0. Now, if we want to make a route on Router A, so that when we access the 192.168.1.x address, it will be forwarded to Router B automatically. Since it is going to all 192.168.1.x segments, the subnet mask is set to 255.255.255.0 when adding the route, or 255.255.255.255 if the destination IP is set to a fixed IP address, such as 192.168.1.7.

5. Edge Gateway

Edge gateway function mainly means that M300 acts as a host, actively sends polling acquisition commands, periodically acquires the point data of serial and network port devices as well as the data acquired by IO interfaces, calculates the results according to the formula set for each point and saves them to the virtual registers of M300, and then, according to the grouping of the report, report conditions and Json template set in advance, actively reports the data to the server. Meanwhile, the edge gateway is also equipped with protocol conversion and linkage functions to meet the server's function of actively collecting equipment point table and the demand of local fast closed-loop management and agile alarm.The prerequisite for the realization of M300 edge gateway function is that customers configure the slave and point information

of the equipment to be collected in advance, and configure the related serial port, network port and link parameters to ensure the smoothness of the physical channel and the network channel.

The data of M300 native IO interface and expanded IO interface will be automatically added and saved to the point list, the device internal self-retrieval to get the data, IO points and edge points use the same set of point list for data calculation and data reporting.

Edge Gateway Usage Flow:

1. Select the mode of edge computing, using fixed logic edge computing, into the configuration parameters can be, if you need to customize the logic, you need to turn on the graphical programming mode.

2. The steps for computing operations using fixed logic edges are performed as follows:

a. Configure the data point location, the data point location information is mainly used by the gateway for active polling use.

b. Configure the communication link to establish a data channel between the gateway and the server.

c. Configure the serial port parameters to establish a data channel between the gateway and the serial picked device.

d. Configure the reporting group, the user according to the expectation, the points will be grouped and according to the set conditions of the data collected by the gateway will be reported to the server.

e. Configure the protocol conversion or data read/write function to establish a channel for the server to issue commands and realize the server to read and write data.

f. Choose whether or not to configure the IO function according to the user's own expectations.

g. Once the configuration is complete, save and restart to enable data collection and reporting.

5.1. Model management

M300 supports two edge computing modes, an edge gateway function with default logic of the gateway, and an edge gateway function with user-defined logic developed using graphical design. Users can choose the current edge computing mode of M300 according to their actual needs.

The procedure is as follows:

1. Go to the built-in webpage and find the "Edge Computing -> Mode Management" interface.

2. Just select the appropriate edge computing mode and click Apply.

3. If you choose "Graphical Edge", after clicking "Apply", you need to reboot the device to take effect, after rebooting and entering the built-in webpage, wait for about 2min, wait for the graphical design program to finish launching, then in the mode management interface, find the "Graphical Design" button, click on it. Enter the graphical design interface to develop the function logic of graphical edge.
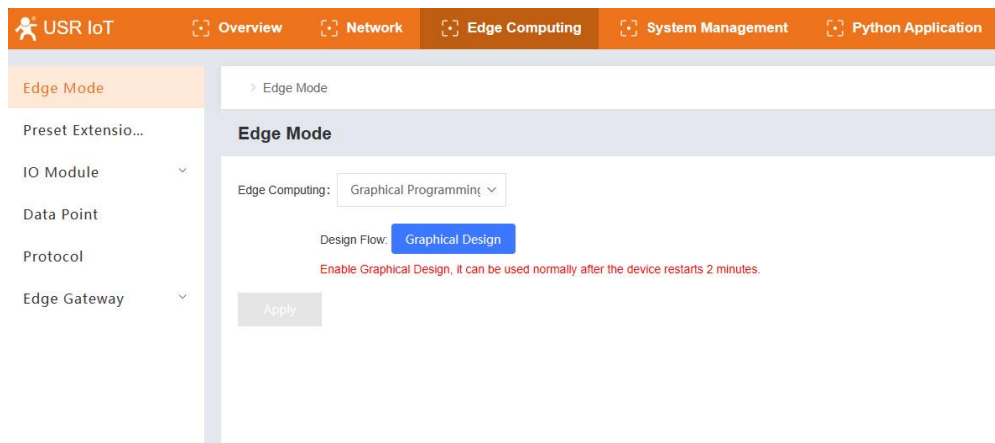
5.2. expander

M300 supports the access of expanders, and the time sequence of expanders can be automatically recognized. To ensure the correct installation of the application, it is necessary to configure the time sequence of expanders before use, so that the gateway automatically recognizes the sequence of the installed expanders and compares it with the set sequence, and if the corresponding position of the expander does not correspond to the preset type, the expander in the corresponding position will carry out a positional error alarm through the indicator. Error Alarm.

When the position is wrong, the host word light and the word light of the expander will flash at the same time with high

frequency, flashing once in 0.25s, going out for 2s after flashing 4, and then carrying out high-frequency flashing at the same time. If the position is correct, the indicator light flashes on and off according to a 1s cycle.

Procedure for adding an expander:

1. Go to the built-in webpage and find the "Edge Computing -> Extender Management" interface.

2. Click the "+" sign in the interface to add expanders according to the sequence. Currently, M300 internal expanders only support three models, and the models will be added through firmware upgrade later.

3. After adding, click Apply and reboot to take effect.
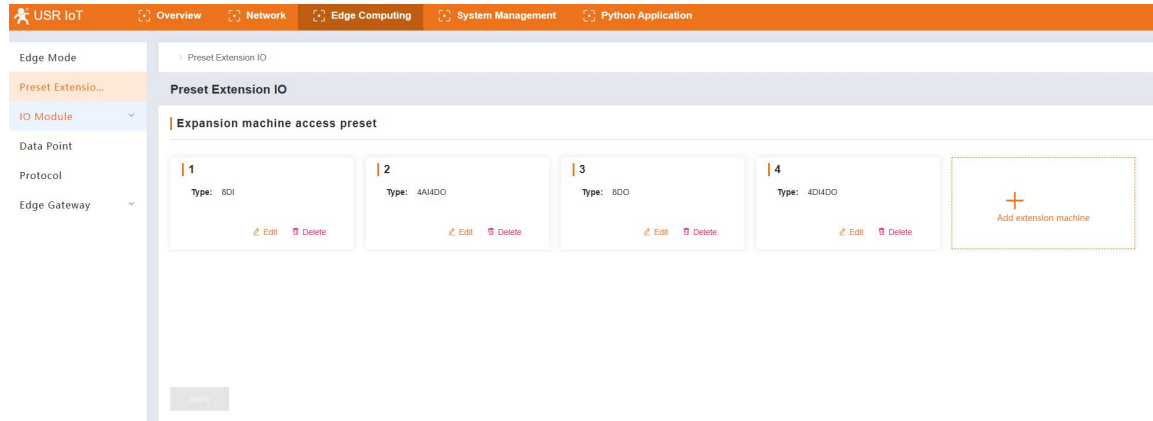
After the expander is added, all the functions related to the expander IO will be automatically displayed from the web page, which mainly involves the IO management interface as well as the data representation, and will be described in detail in the section on related functions.

5.3. IO function

IO function mainly contains DI function and DO function, DI is mainly the detection mode setting, can be set to switch detection, can also be set to counting mode, rapid detection of pulse changes to realize the counting function.

The main operation logic of the DI function setting:

1. Go to the built-in webpage and find the "Edge Computing -> IO Management -> IO Functions" interface.
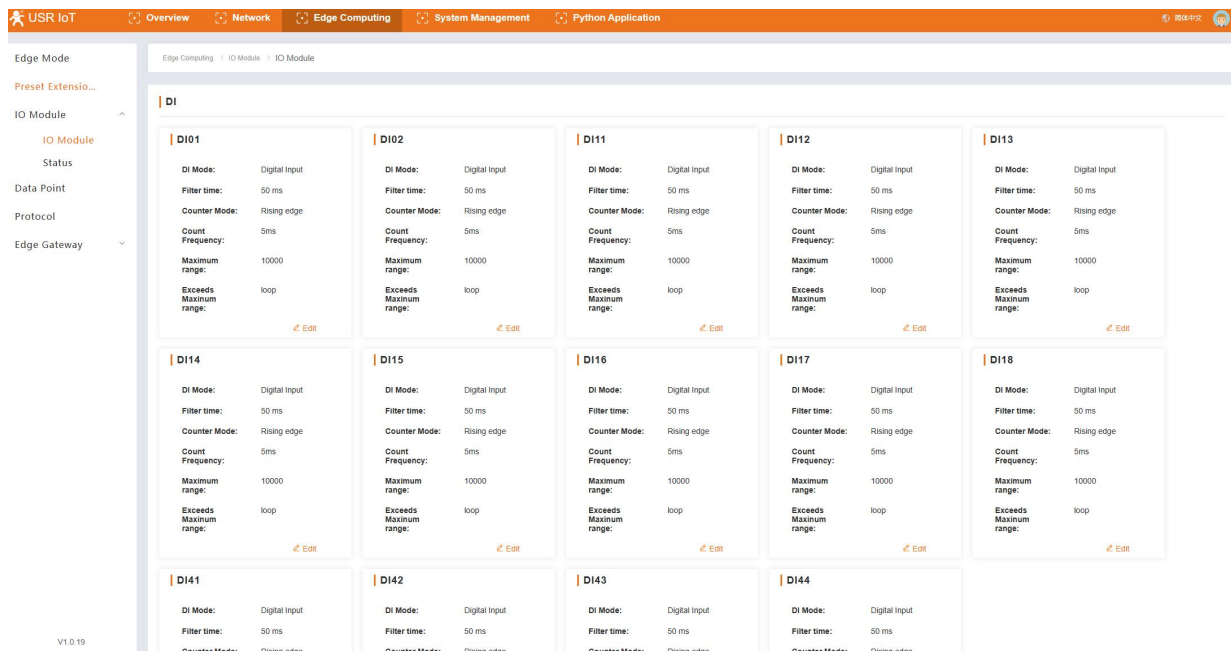
2. Modify the input mode of each DI and the corresponding parameters of the mode according to the actual needs of users. There is an "Edit" button on each DI function tab, after clicking it, it will enter the DI configuration interface, and you can select switching or counting mode.

Edit ×

* DI Mode: ○ Digital Input   ◉ Counter

* Counter Mode: ◉ Rising edge   ○ falling edge

* Count Frequency: [5   ms]

* Maximum range: [10000   ]

* Exceeds Maximun range: ◉ loop   ○ Stop

[cancel] [sure]

3. Once the configuration is complete, click OK to finish configuring the DI features.

4. DO Function: DO Function Currently M300 only supports reboot hold function, reboot hold means that after soft reboot, DO still maintains the state before reboot. After selecting Enable, all DOs will support this function, including the DOs of the expander and the host.The reboot hold function is off by default, and you can choose to turn it on.

5.4. IO state

IO status means that you can view the IO status parameters, DO switching status, DI input status, as well as DI count value and AI acquisition value in the M300's built-in web page.

The IO status interface is mainly for the convenience of the user to view the status of the IO, in which DO can realize the status view and control.

5.5. Data Points

The data point table is the core database of the edge gateway function, the data and data related information used in the edge gateway's collection, reporting, data reading and writing, protocol conversion and linkage control are all obtained from this point table. Therefore, it is especially important to add all the point data information that needs to be processed in detail in the process of using.

The data point table contains two main elements, slaves and points. Up to 20 slaves can be added, two of which are fixed slaves, the IO slave and the virtual point slave. The remaining 18 slaves can be added on demand. Corresponding data points can be added under each slave, and the total number of points under all slaves except the virtual slave is up to 2000. The points under each slave are actively polled and collected from the corresponding interface according to the protocol specified by the slave, and the collected data are stored in the virtual registers in the product.

Because each slave corresponds to a different protocol, the parameters required for adding points are also different,

so you can configure them according to the actual situation. Among them, IO points can only be added to IO slaves, computing points can only be added to virtual slaves, and a maximum of 500 computing points can be added to virtual slaves.

Fixed Slave Introduction:

name (of a thing)	Parameter Description	point
IO slave	Mainly add the IO interface data of M300 mainframe and expander as point data for other functions of the edge gateway, and the analog data can be added to the calculation formula.	Number of slave points up to the number of M300 IOs, included in the range of 2000 real points

Add a description of the slave parameters:

name (of a thing)	Parameter Description	default parameter
Slave Name	1-64 bytes, as the slave's unique identifier, non-repeatable	unoccupied
Slave Description	Supports 1-64 bytes, including alphanumeric, Chinese, underscore and ligatures	unoccupied
Acquisition Protocol	Protocols used for active rounds of slave point acquisition, supporting Modbus and a variety of PLC protocols	Modbus TCP
pre-waiting time	Waiting time before each point acquisition command is sent, range 0~65535ms	unoccupied
merged capture	Several points with consecutive addresses in a single slave are combined into a single command for acquisition.	write out (a prescription, check, invoice etc)
slave address	Slave code of the lower device, some protocol settings	1
serial port serial number	The number of the serial port used for point acquisition commands sent to the serial port device, and some of the protocol settings	1
IP	When collecting from the network port, M300 acts as Client and needs to fill in the target IP and some protocol settings.	192.168.1.1
ports	When collecting from the network port, M300 is used as Client, you need to fill in the target port and some protocol settings.	102

Introduction to Point General Parameters:

name (of a thing)	Parameter Description	default parameter
Point Name	1-64 bytes, point uniquely identified, all point names under all slaves are not repeatable	unoccupied
Number of points	Points with consecutive addresses under the same slave can be added in batches	unoccupied
Read/Write Status	Read/write status of points, different point types support different read/write types	fill out or in (information on a form)
prioritization	When all points are polled, the high priority points are prioritized to ensure that they are collected according to the cycle training rotation, ensuring that the high priority points are collected in real time.	unoccupied
data computation	Point calculation formula, the collected data is calculated according to the formula inside the device and then provided to other functions.	unoccupied
timeout	The maximum time to wait for a reply after issuing a command during the point polling acquisition process, the timeout automatically abandons this acquisition, does not update the historical data and executes the next acquisition command.	2000ms
unit (of measure)	Non-mandatory parameters, set as needed	unoccupied

Note: Prioritization feature under development.

The following table shows the acquisition protocols supported by the M300:

communications protocol	PLC Brands	PLC model or description
Modbus	Delta, ABB, Hollis, Modicon	Delta DVP/AH500/AS200 Series, AC500 (ABB), LK Series (Holliday)
PPI	Siemens (company name)	S7-200
S7comm	Siemens (company name)	s7-200 smart, *s7-1200, *s7-1500, *s7-300, *s7-400

MPI	Siemens (company name)	*S7-300, *S7-400
FX Protocol	Mitsubishi, Huichuan	FX2N/FX3U (Mitsubishi), *H1UPLC/H2UPLC (Huichuan)
MC 3C/3E	Mitsubishi	*FX5U/FX5U network port
FINS TCP	Omron (brand)	*CP Series
FATEK	Yonghong prefecture in Yunnan (Dai and Jingpo autonomous prefecture)	FATEK Series (Serial, *TCP)
DVP Series	Delta (name)	DVP series (RTU, *TCP, *ASCII)
KV Uplink Protocol	Gaines (name)	*kv5500, *kv-121v, *kv-1000
Melsoft	Mitsubishi	*Q06H
Mevtocl serial port	Matsushita (name)	*FP-X series
virtual-point	Calculation point independent of the collection point	Virtual points can also be called calculation points, through the M300 internal collection of point calculation results for the assignment of the new points obtained, the maximum 500 virtual points, not in the range of 2000 real points

Note: Agreements marked with * are under development.

The specific procedure for adding slaves and points is as follows:

(1) Go to the built-in webpage and find: Edge Computing -> Data Points Interface.

(2) To add a slave, press the "Add" button in the upper right corner of the interface.
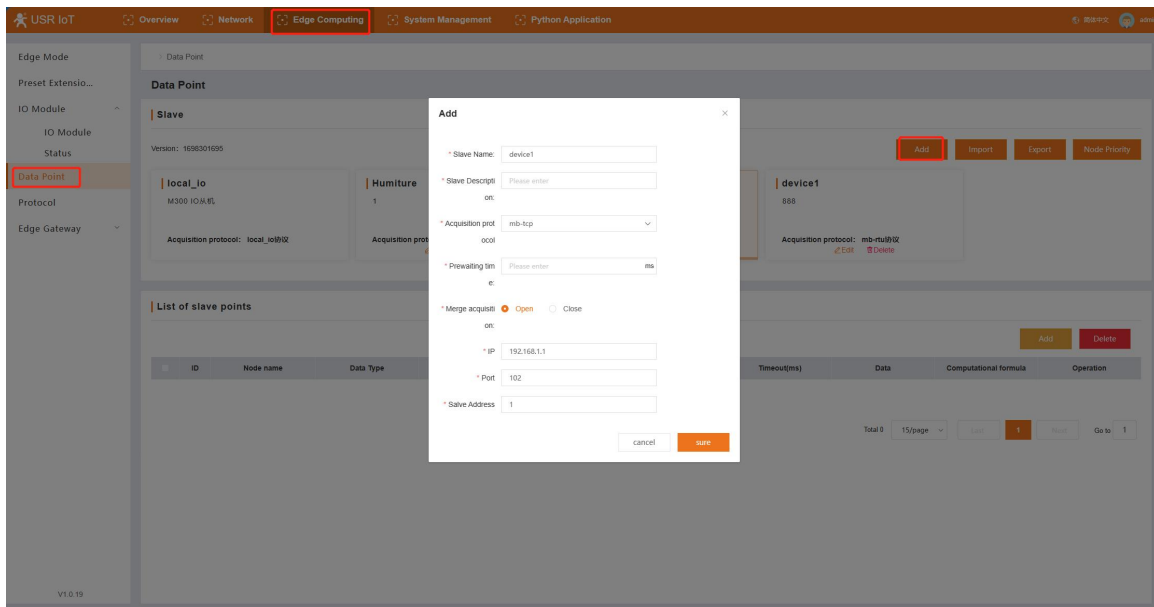
(3) Select the added slave, then add points in "Slave - Point List", you can add points in batch, the number of points option is automatically configured according to the number of points added, the point name will be automatically generated in sequence, if the point name is fixed, you can modify the point name after the addition is complete.
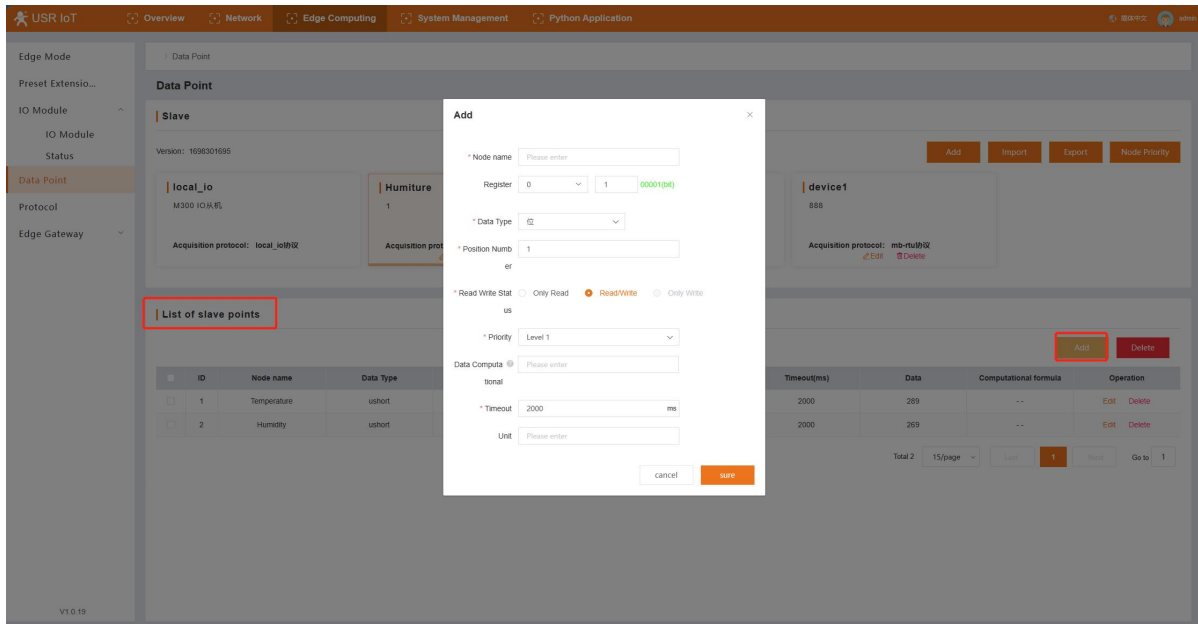
(4) After the points are added, if new slaves and points are needed, you can follow the above steps to repeat the operation and finalize the points.

(5) After the points are added, there will be a "reboot" prompt in the interface, if the configuration has been completed, you can r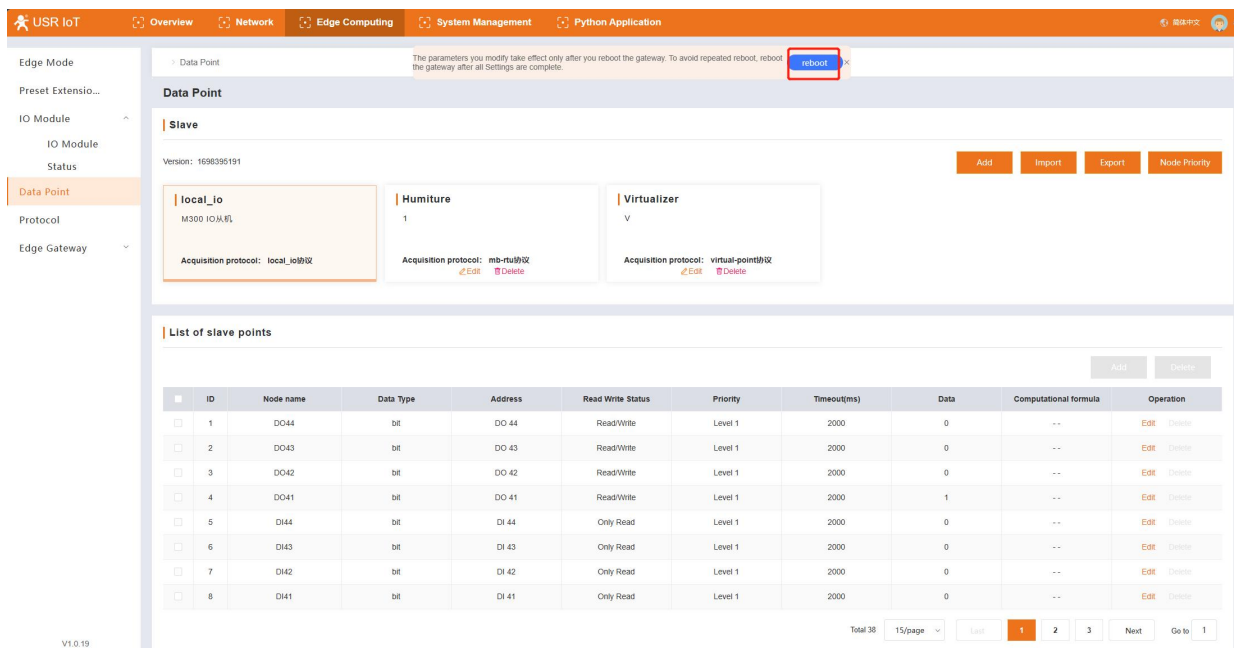eboot, if there are other configurations, you can also wait for all the configurations to be completed before rebooting.

5.6. protocol conversion

The protocol conversion function is mainly for the server to take the initiative for data collection, because the terminal slave devices have different protocols, the server can not all docking, so the M300 will convert all the slave devices point data into a unified protocol format, so as to facilitate the server to carry out a unified protocol for the collection of data.

Protocol conversion currently supports three protocols, Modbus RTU, Modbus TCP, and OPC UA (Server).

● Modbus RTU

The Modbus RTU protocol conversion function needs to add the points of different protocols in the data point table to the point mapping table of the function and assign the corresponding Modbus register address to each point, and after the addition is completed, the corresponding point data will be converted into standard Modbus protocol data. When receiving the Modbus RTU command from the server, the data of the corresponding address will be composed into a standard Modbus RTU packet to reply to the server, thus realizing that the server collects and controls the points of M300 through unified data.

Modbus RTU protocol conversion supports two kinds of data channels, one is socket connection, supporting TCP Client and TCP Server, and the other is RS485 communication, which is mainly used in the field to dock the 485 interface configuration screen.

Specific operational procedures:

1. Go to the built-in webpage, find "Edge Computing->Protocol Conversion->Modbus RTU", enable Modbus RTU;

2. Communication connection configuration, first select whether to enable RS485 connection, if there is an external RS485 screen you can turn on this function.

3. Configure server connection communications, select protocol channels, and other parameters.

4. Configure the Modbus slave address, which is the address of M300 as a slave, and is used when the server sends commands to collect data from M300. Click Apply to complete the basic configuration.
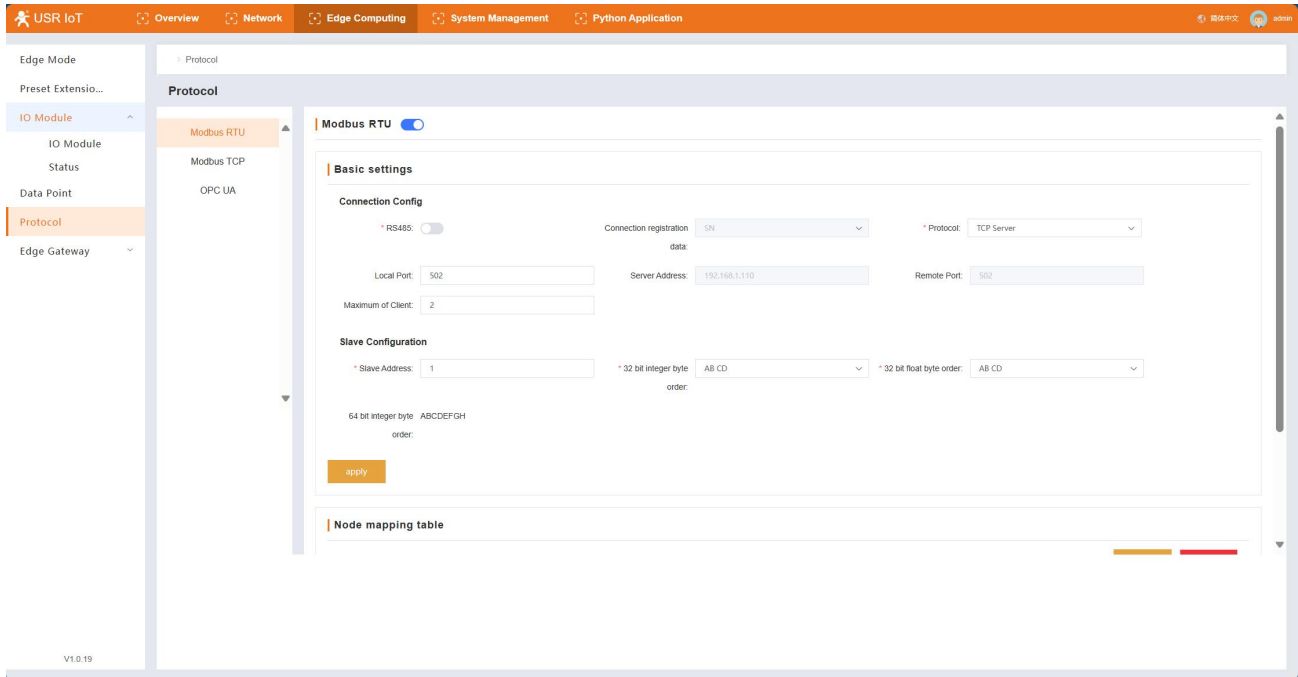
5. Add a point mapping table and pull the data points that need to do the protocol conversion from the already added data point table.

6. Click the Add button to add a point, set the mapped address type and mapped slave address of the point, and the server will determine the acquisition command to be issued based on this address.
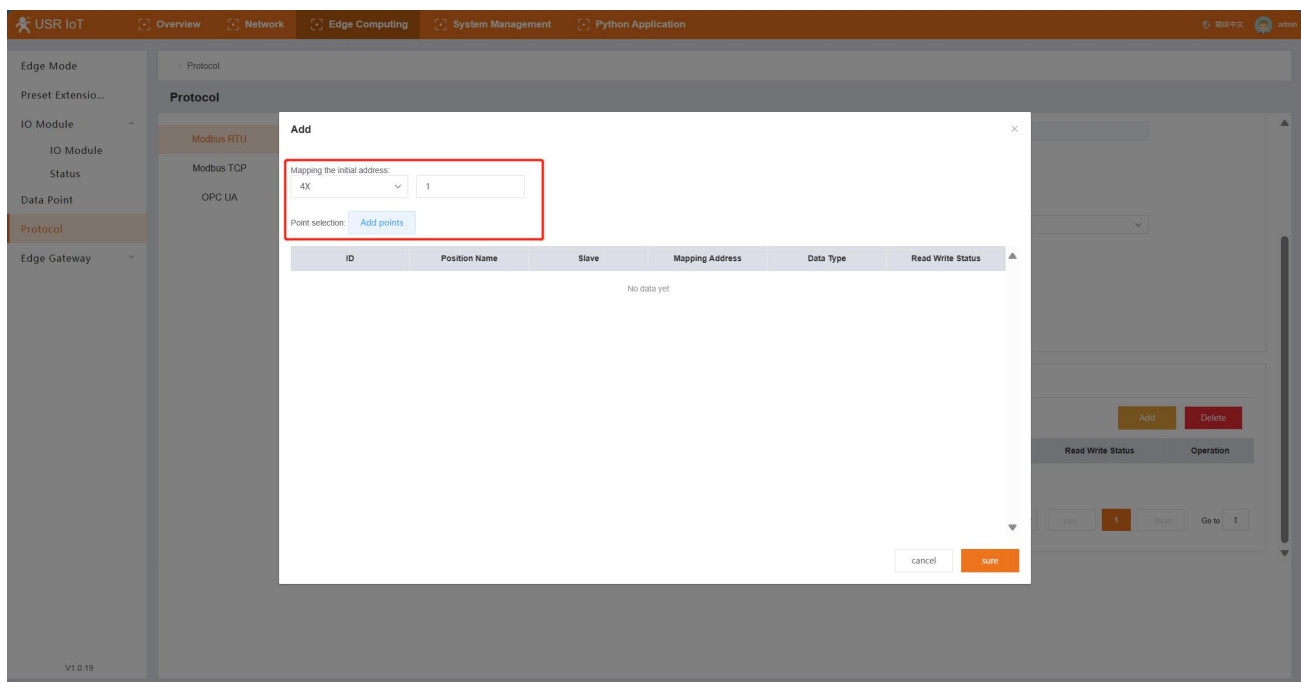
7. In the pop-up window, click the "Add Points" button, the point selection interface will pop up, select the corresponding slave under the point, and then click OK.
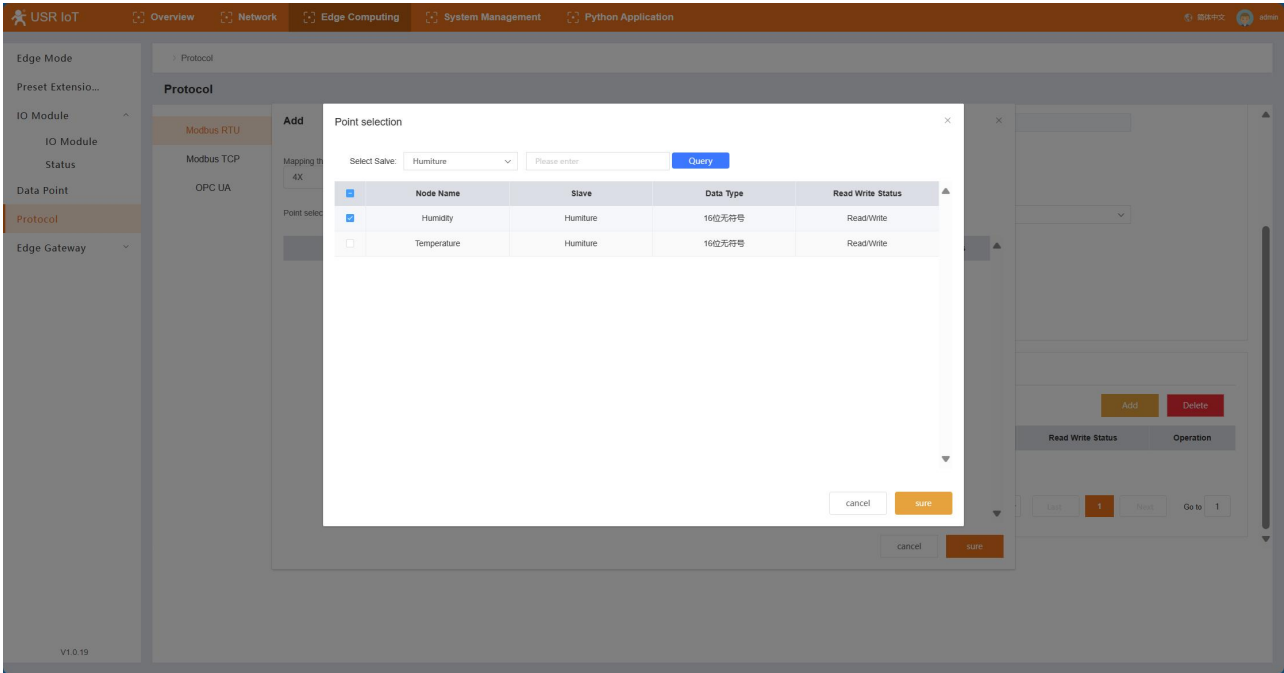
8. After the interface will be added to the point, confirm whether the point is added to complete, if not added to complete, you can repeat the previous step to continue to add, if you add a, click OK can be.

21
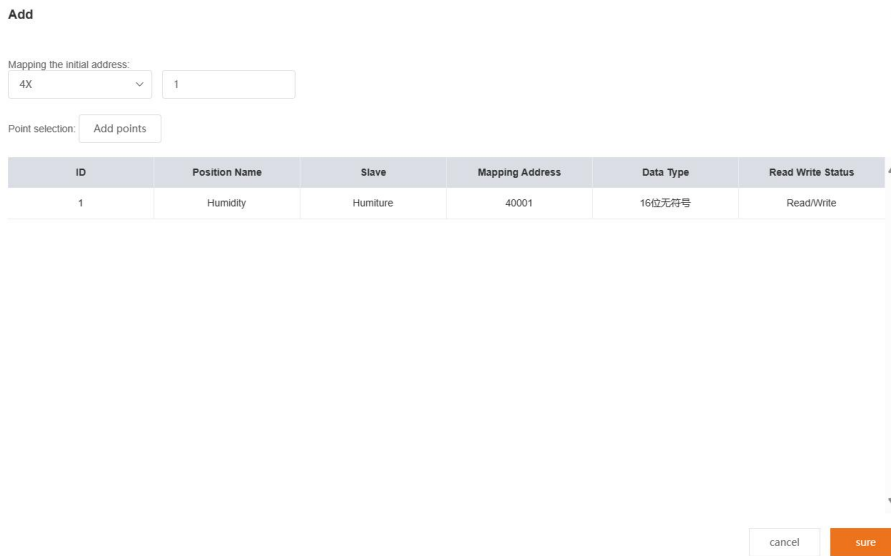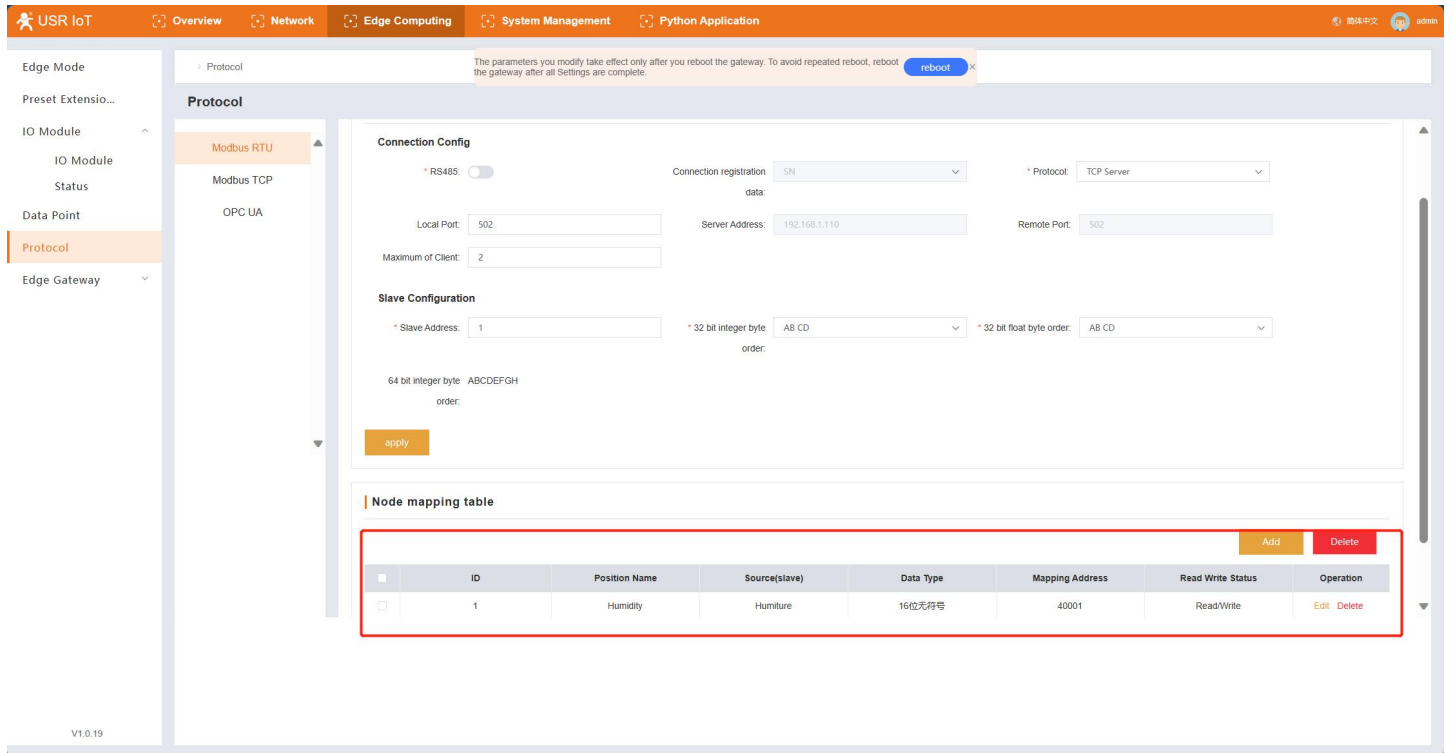
9. After completing the point addition, you need to reboot the device, and the application will take effect after the reboot.

● Modbus TCP

Modbus TCP and RTU for point operation is the same, are through the point mapping table for data points in the table of the point of the protocol conversion, but Modbus TCP only support Socket a data channel, support TCP Client and TCP Server.

Refer to the Modbus RTU operation procedure for operation.

● OPC UA

OPC UA is a protocol used more often in the industrial control industry, M300 mainly integrates the Server of OPC UA, and the data channel only needs to configure the local port. The data channel only needs to be configured with local ports. Add the points that need to be converted to the protocol to the point mapping table and you can use it.

The OPC UA usage process is relatively simple, with the following steps:

1. Go to the built-in webpage, find "Edge Computing->Protocol Conversion->OPC UA", enable OPC UA.

2. Configuring Communication Ports

3. Add a point mapping table and pull the data points that need to do the protocol conversion from the already added data point table.

4. Click the Add button to add a point, click the Add Point button in the pop-up window, the point selection interface will pop up, select the point under the corresponding slave, and then click OK.

5. Will be added to the point interface, confirm whether the point is added to complete, if not added to complete, you can repeat the previous step to continue to add, if you add a, click OK can be.
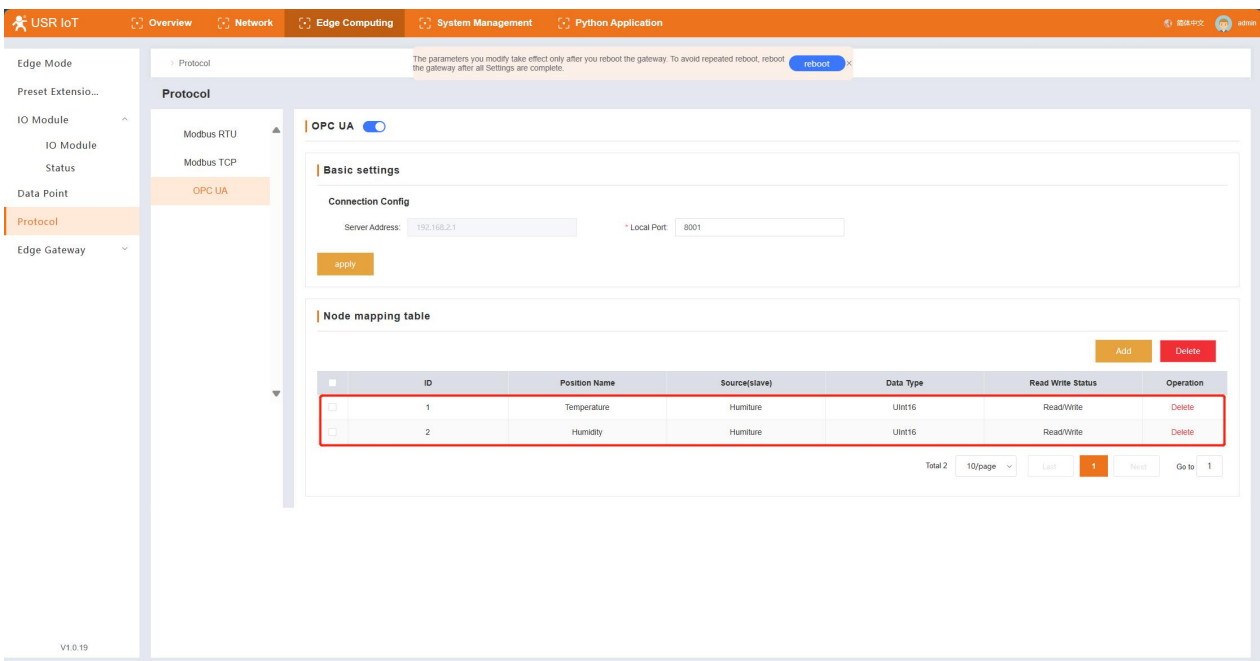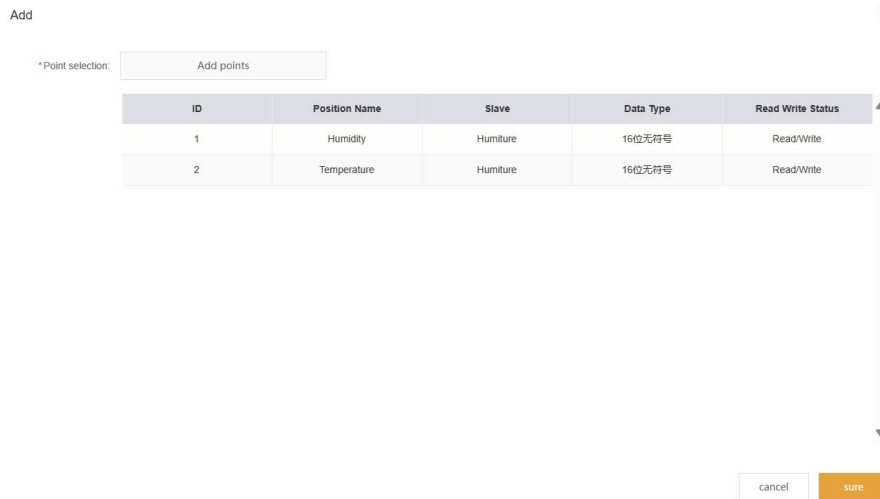
6. After completing the point addition, you need to reboot the device, and the application will take effect after the reboot.
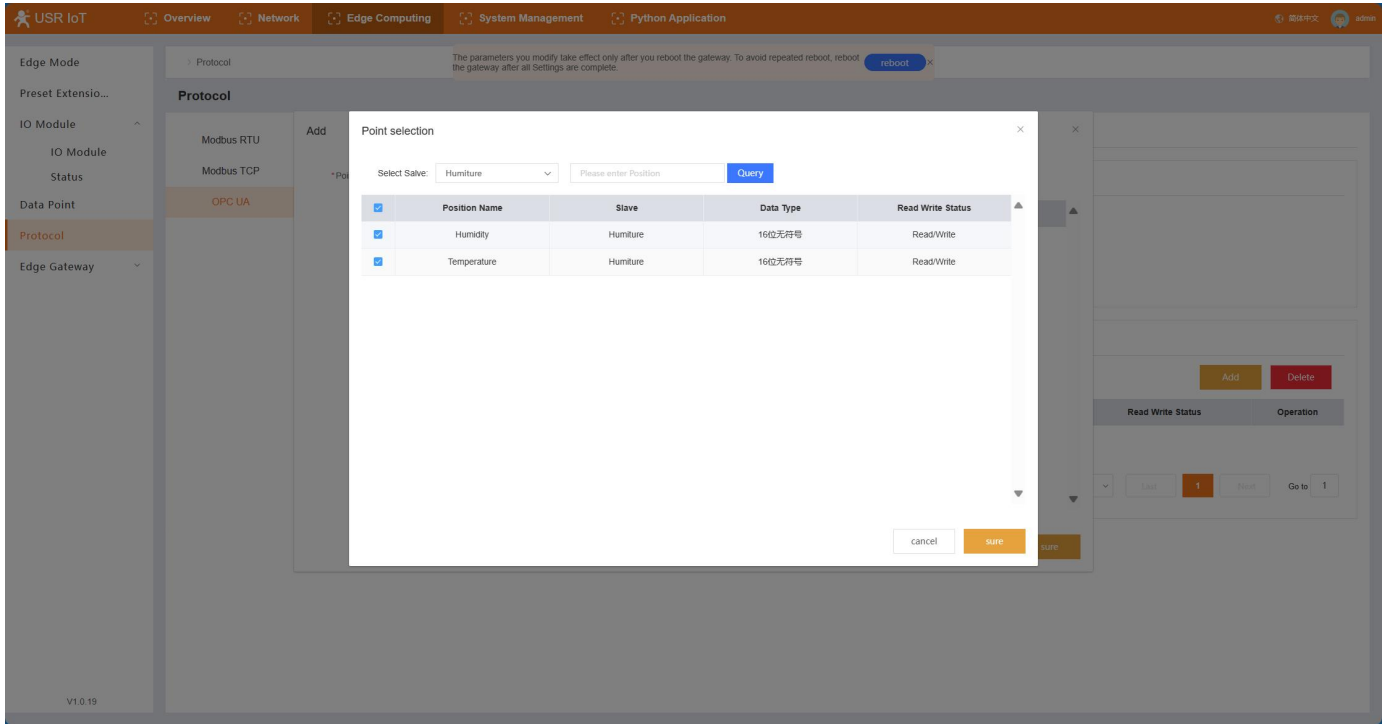
5.7. Serial Port Configuration

(1) Go to the built-in webpage and open the "Edge Computing->Edge Gateway->Serial Port Management" interface.

(2) Depending on the actual requirements, you can configure the relevant parameters for serial port 1 and serial port 2 of the device.
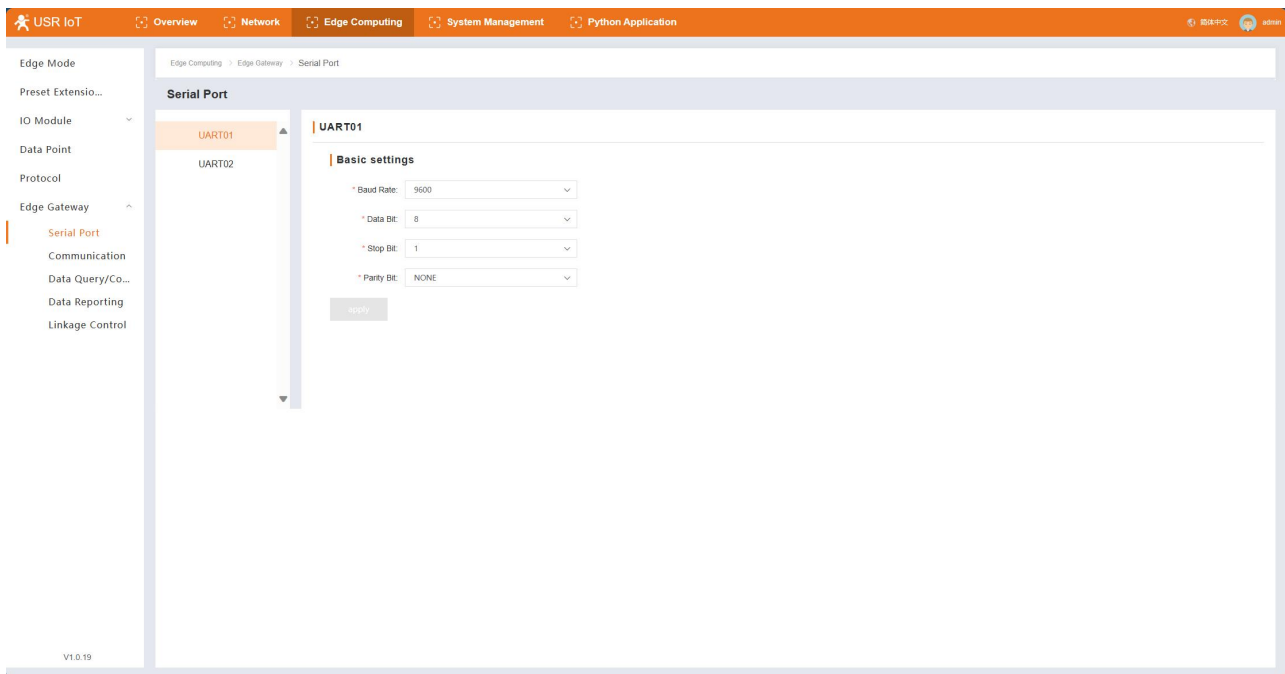
5.8. Communications link

Communication links are mainly used to create a data interaction channel between the gateway and the server. M300 supports a total of two communication links, which can be connected to two different servers for data interaction. The operation steps take link 1 as an example:

1. Go to the built-in webpage and open the "Edge Computing -> Edge Gateway -> Communication Link" interface.

2. Enable link 1, select the corresponding communication protocol, M300 supports TCP\UDP\HTTP\MQTT communication protocols

3. After determining the communication protocol, the corresponding configuration parameters will be displayed, and the parameters that do not correspond to the protocol will be hidden, you only need to configure the parameters that have been displayed, after the configuration is complete, click Apply.
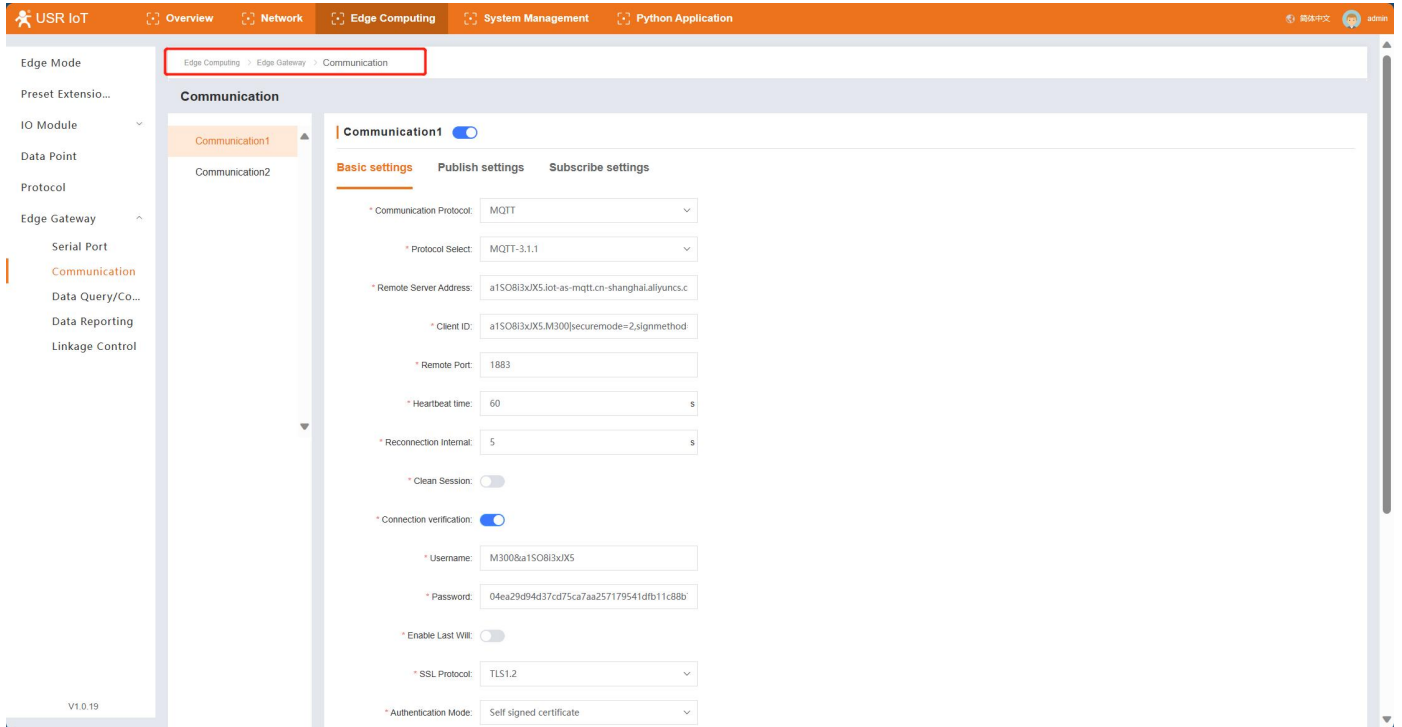
4. If you choose the MQTT protocol or AliCloud, AWS, etc., after configuring the corresponding connection parameters, you also need to configure the corresponding communication topics, and you can configure up to 8 publish topics and up to 8 subscribe topics. Both publish and subscribe topics are presented in a list.

5. Click the Add button, enter the theme name, if you need to substitute the MAC address, just fill in ${MAC} in the theme and configure the other parameters, then OK to generate the theme.

6. Subscribe to the topic the same configuration method.

7. After you finish configuring publish topics or subscribe topics, you need to click Apply. After all topics are configured and applied, you need to reboot the device to take effect.

5.9. data reading and writing

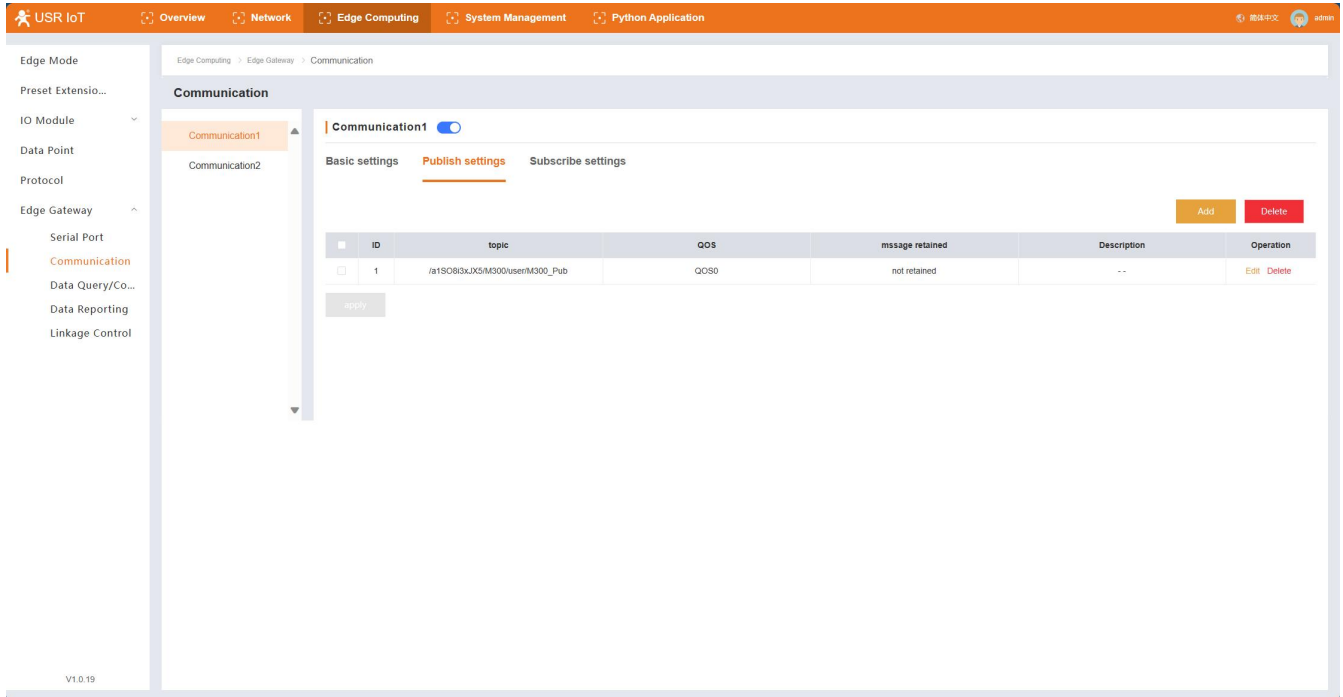Data reading and writing function and protocol conversion function have the same role, are used for the server to take the initiative to collect and control the M300 data, the difference is that the data reading and writing do not need to do the protocol conversion, only need to connect to the server through the link, the server sends out the JSON format of the command specified by the M300, you can realize the query and control of all the points in the point table data.

The data read/write function supports multi-link communication, just select the corresponding link to add, and the Json command format for read/write is as follows:

{"rw_prot": {"ver": "protocol_version", "dir": "data_toward", "id": "message_number", "r_data": [{"name": "point_name"}], "w_data": [{"name": "point_name", "value": "data"}]}}

Json read and write command field descriptions:

Field name	Field Description	Field Selection
rw_prot	Protocol header	
ver	protocol version	1.0.1
dir	The data goes, and the server sends the command to fill in the down	down: server down
id	The code of the data sent down from the server, which can be used as sequence identification	Customer customization, no changes to device responses
r_data	Data Reading Fields	
w_data	Data Control Fields	
name	The name of the point, and the name of the point in the point table can be substituted into the point	
value	Read and write commands only have a write with a value field, which is a valid value for the write	

Json read/write reply format:

{"rw_prot": {"ver": "protocol_version", "dir": "data_toward", "id": "message_number", "r_data": [{"name": "point_name", "value": "data", "err": "error_code"}]], "w_data": [{"name": "point_name"," value": "data", "err": "error code"}]}}

Json read/write reply field description:

Field name	Field Description	Field Selection
rw_prot	Protocol header	
ver	protocol version	1.0.1

dir	Data direction, equipment response content filling up	up: equipment response
id	Information identifiers to maintain consistency with issued orders	
r_data	Data Reading Fields	
w_data	Data Control Fields	
name	Point name, corresponding to the point in the point list	
value	Valid data corresponding to the point	Read error, valid value is null. Write error, value value is a historical value
err	error code	0: Data is executed normally 1: Data error execution

Json field error response:

1. Json format error: device does not respond

2. Any error in any of the three fields, ver, dir, id, is responded to according to the error protocol.

3. If the other fields are correct and only one of the r_data or w_data fields is incorrect, the incorrect field is discarded and the correct field is replied to; if both fields are incorrect, the reply is made according to the error protocol.

4. Error protocol: "rw_prot": {"Ver": "1.0.1", "dir": "up", "err": "1"}.

field name	Field Description	Field Selection
rw_prot	Protocol header	
ver	protocol version	1.0.1
dir	Data direction, both upward and downward	up: equipment response
err	error code	0: Normal execution 1: Erroneous execution

Description:

a. In case of read and write command error, the value value of the content of the read command reply is null, and the value value of the content of the write command reply is the value of the historical data.

b. The maximum limit of read/write operation is 5 data points each for read/write operation at the same time:

Specific procedures for reading and writing data:

1) Go to the built-in webpage and open the "Edge Computing -> Edge Gateway -> Data Read/Write" interface.

2) Enable the data read/write function, add communication links, here you can only select the already configured communication links and the corresponding topics.

3) Links are added to the communication link for configuration, and commands issued by the server need to follow the Json format of the device, with examples on the built-in web page.
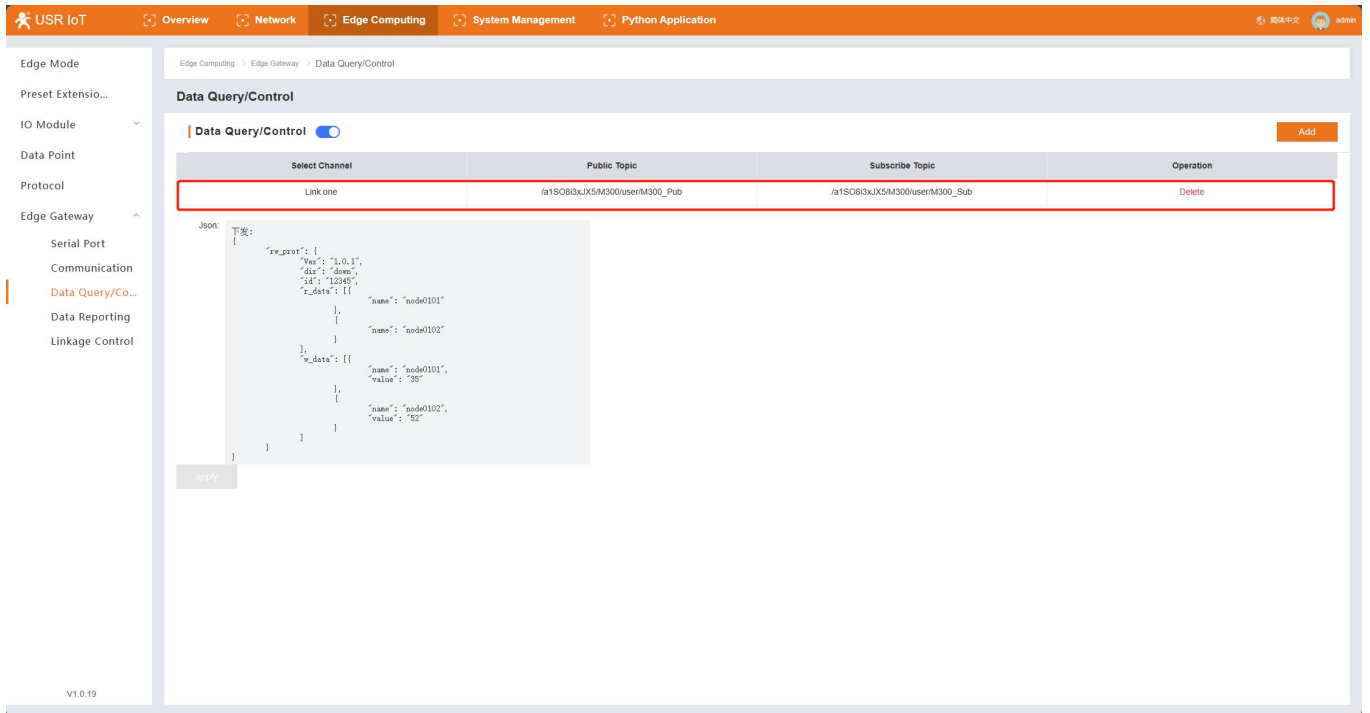
5.10. Data reporting

The data reporting function mainly refers to the data collected by the points configured in the point table through autonomous polling and reported to the server in batches through the reporting group.

The specific steps are as follows:

1) Go to the built-in webpage and open the "Edge Computing -> Edge Gateway -> Data Reporting" interface.
2) Click on the: Create button to create an escalation group, up to 2000 groups can be created.
3) Set the group name, select the server link and the corresponding topic for reporting, and set the reporting rules.
4) To set up the reporting template, the M300 reporting template can be customized, just fill in the name of the point in the value position.
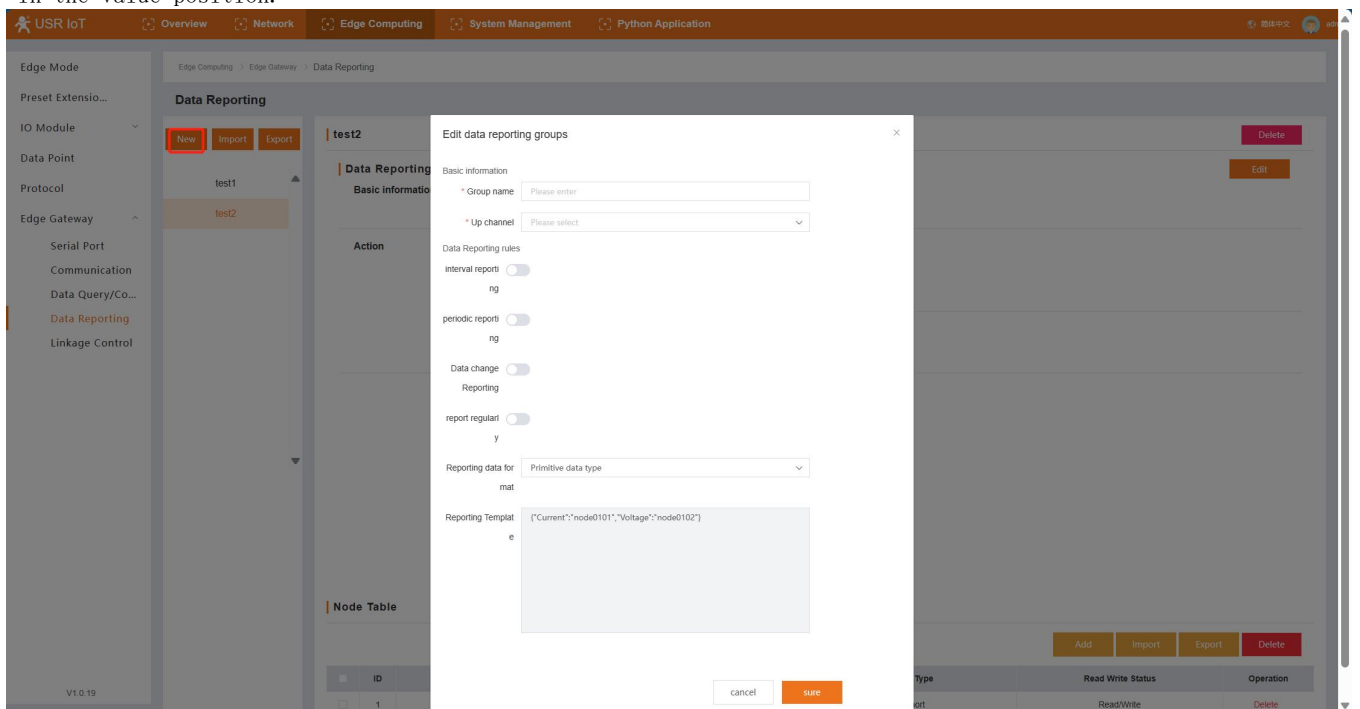
5) After the group is added, an empty point table will be generated, and the points that need to be reported in the group will be added, and the import of points will be pulled directly from the point table that has been added.
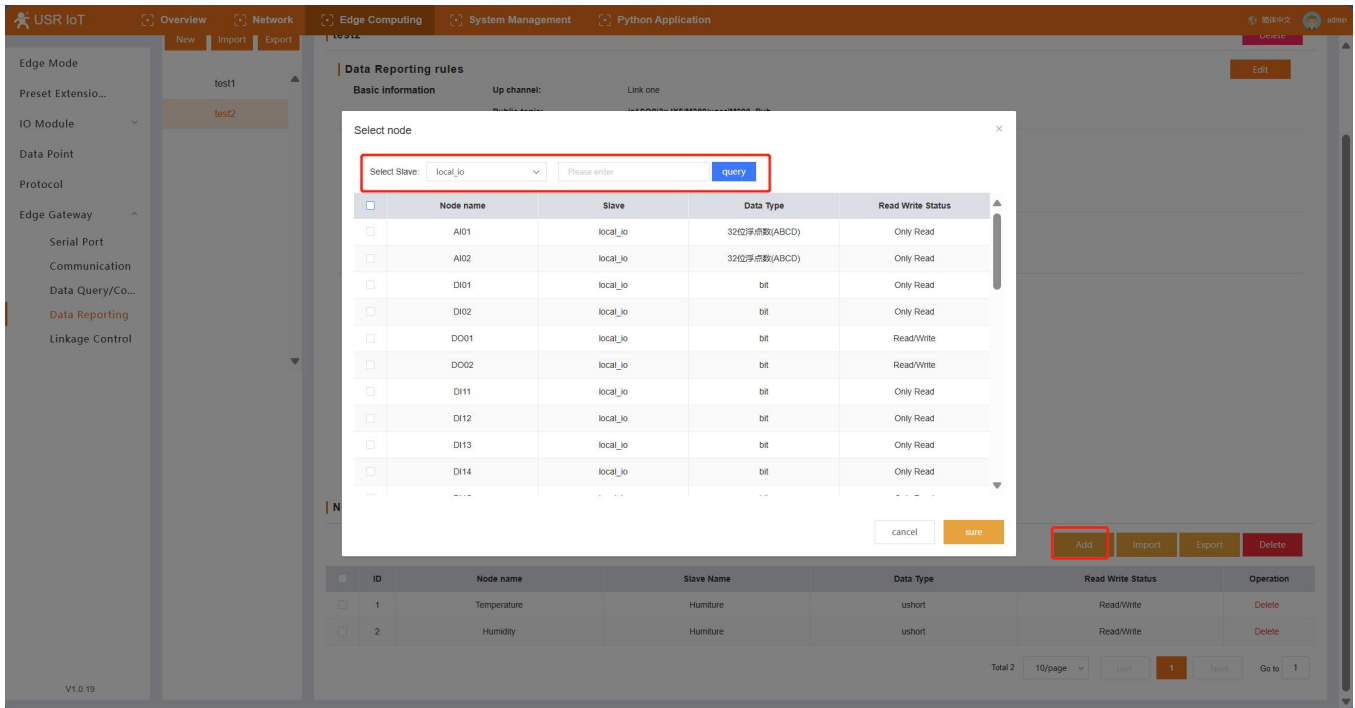
6) Once added, the point data will be reported to the server according to the fix and connection, and the grouping configuration needs to be restarted to take effect.

Json Templates

The data upload function will upload the point data to the server in Json format. Customers can customize the configuration of the Json template according to the server's requirements to ensure that the uploaded data format meets the server's parsing requirements, and the Json template can be defined in the actual name of the data point. However, the Json template configuration needs to pay attention to the following points:

1. The Json template in the grouping is empty by default, you can design your own to meet the Json format requirements;
2. Value in the Json template is of character type, you need to fill in the data point name, when the data is reported, the actual collection value corresponding to the point name will be substituted and replaced.
3. Example:

   Edge point locations node0101 and node0102 were acquired with values of 30 and 20, respectively;

   Json template set to {"Current": "node0101", "Voltage": "node0102"};

   The actual reported data format is: {"Current":30, "Voltage":20}.
4. Json template can be added in addition to the data points, but also add some specific identification, such as the product's firmware version, SN, MAC and other parameters, these parameters can be processed as a unique identification of the device or device identification information. In the value value position of the Json template directly add the relevant identification name, the device in the reporting process, the identification name will be reported after the corresponding data substitution. For example, to report the timestamp, set the Json template to {"time": "sys_time"}, and the actual data reported by the device is {"time": "2022-10-08T10:37:45.403Z"}. The list of identifiers that can be filled into the Json template is as follows:

Markings	Hidden meaning	Example of reporting content
sys_ver	Product Firmware Version Number	V1.0.14.000000.0000
sys_imei	IMEI	864452061930390
sys_sn	SN	02700122093000012356
sys_mac	MAC	D4AD20474662
sys_iccid	ICCID	89861122219045577705
sys_time	UTC time	2022-10-08T10:37:45.403z
sys_utc_time	timestamp	1681985788

5.11. linkage control

The linkage function is mainly for the realization of local closed-loop management, rapid alarm and emergency applications,

the product can support 50 internal linkage events, each linkage control can be set to judge the conditions, pull the trigger points, set the trigger mode. In the process of operation, the product is collected through the edge, and the data of the trigger points are calculated to confirm whether the linkage is to be executed according to the judgment conditions, and when the conditions are met, the execution action is processed according to the execution action set for each linkage event.

The parameters are described below:

name (of a thing)	Parameter Description	default parameter
Event Name	Linkage event name, user-defined	unoccupied
event switch	Enabling of linked events	mountain pass
Minimum Trigger Interval	When the linkage event meets the triggering conditions for a short period of time for many times, the minimum interval of triggering execution, the triggering within the minimum triggering time does not execute the action and is directly discarded.	unoccupied
trigger point	Linkage conditions to determine the source of the required data, supporting multiple point selection	unoccupied
trigger condition	The judgment conditions of the linked events, meet the conditions to execute the action, support a total of 10 kinds of conditions	unoccupied
trigger method	Trigger logic between multiple points when multiple trigger points are selected	unoccupied
upper threshold	Maximum value of the range of the threshold condition, range 0~20000	unoccupied
lower threshold limit	Minimum value of the range of the threshold condition, range 0~20000	unoccupied
execute an action	Actions to be performed after the linkage event meets the trigger conditions	unoccupied

The following table lists 10 triggering conditions for linkage events:

trigger condition	descriptive	clarification
forward following	If DI is closed, then DO is closed; if DI is disconnected, then DO is disconnected.	Trigger points only support switching
Reverse Follow	If DI is closed, then DO is disconnected; if DI is disconnected, then DO is closed.	Trigger points only support switching
greater than or equal to	Trigger action when the detection value is greater than or equal to the set threshold value.	Setting the lower threshold only
more than	Trigger action when the detection value is greater than the set threshold.	Setting the lower threshold only
less than or equal to	Trigger action when the detection value is less than or equal to the set threshold value.	Setting only the upper threshold limit
less than	Trigger action when the detection value is less than the set threshold.	Setting only the upper threshold limit
Within the zone (including boundaries)	Trigger an action when the detection value is within the threshold range, one action is triggered each time it enters the interval	Setting the upper and lower thresholds
Within the zone (excluding the border)	Trigger an action when the detection value is within the threshold range, one action is triggered each time it enters the interval	Setting the upper and lower thresholds
Outside the zone (including boundaries)	Trigger an action when the detection value is outside the threshold range, and trigger an action once in the out-of-range range.	Setting the upper and lower thresholds
Outside the zone (excluding the border)	Trigger an action when the detection value is outside the threshold range, and trigger an action once in the out-of-range range.	Setting the upper and lower thresholds

The linkage event trigger execution supports 4 operations, as shown in the following table:

trigger action	descriptive	clarification
DO action	You can select the DO that will perform the action and what state the selected DO will perform.	DO is single choice
Write Data Points	The current action supports sending commands through the serial port and controlling the action of serial devices.	Supports serial port 1 and serial port 2 only
Reporting platforms	Upload customized alarm information to the cloud platform	MQTT related links require a

	through the link to achieve fast alarms.	separate topic
send SMS messages	Send customized alarm information to cell phone via SMS to achieve quick alarms	SMS content is 70 bytes or less

Linkage control specific operating procedures:

1. Go to the built-in webpage and open the "Edge Computing -> Edge Gateway -> Linkage Control" interface.

2. Click the "Create Button" to create the linked events, you can create up to 50 groups of linked events.

3. Set the event name, enable the event, and then configure the event's trigger point, execution action, and auxiliary condition parameters.

4. After all linked events are added, a reboot is required for them to take effect.
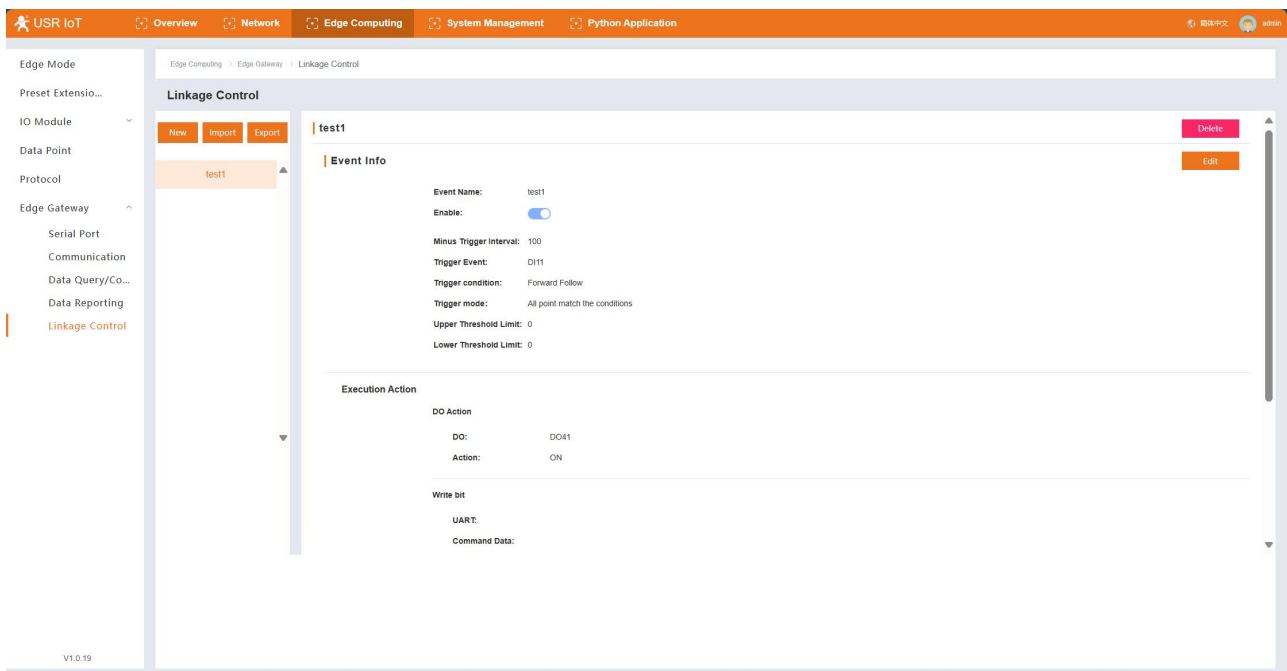
5.12. Import and export of edge computing point tables

M300 supports the import and export of data point tables related to edge computing, which mainly involves the data point tables of all data points used in collection, as well as the protocol conversion point tables, reporting group point tables and linkage event tables. These tables will be packaged and compressed in M300 and then exported. The exported point table does not support editing, but can be used for fast copying of parameters between devices.

Edge calculation point table import and export procedure:

1. Go to the built-in webpage and find the "System Management -> System Management -> Configuration Management" interface.
2. Configuration management interface, edge computing configuration export and import
3. The current import export is in zip form and does not support editing.
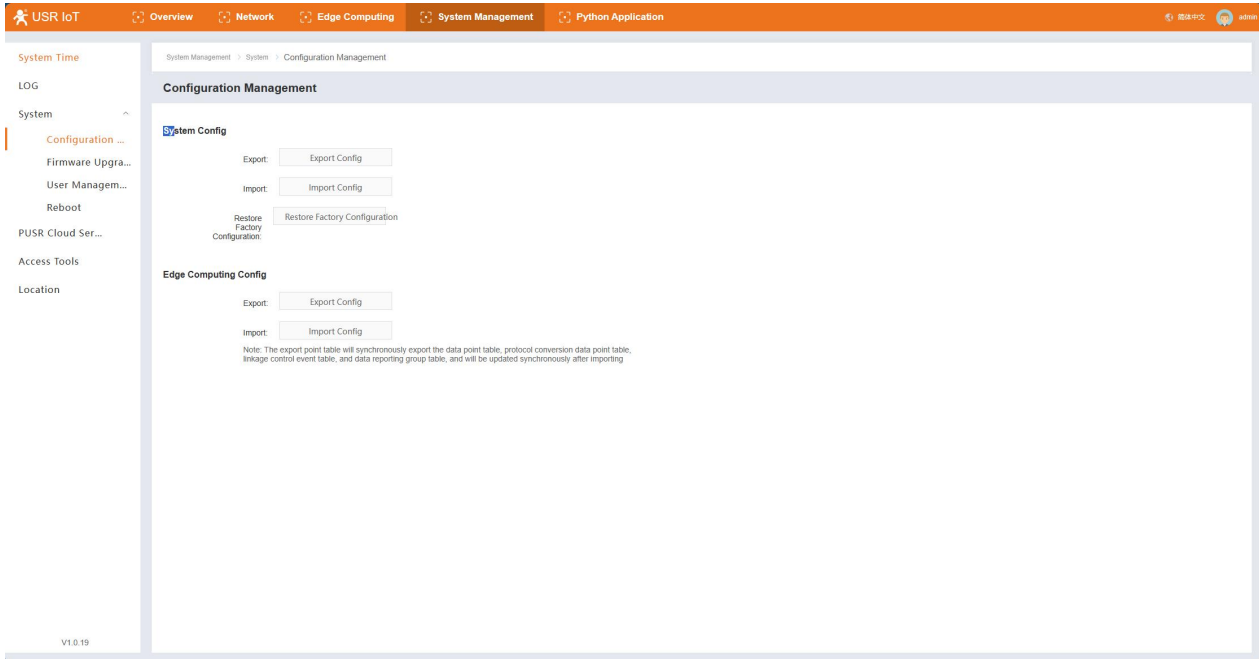


5.13. graphical programming

Graphical programming is mainly used in M300 for the secondary development of edge computing functions, when the edge computing mode is set to graphical edge, the design of secondary development can be carried out. The graphical design needs to be based on public resources that have been configured to work properly, such as IO functions, data point tables need to be configured in advance.

Graphical Edge Operation Procedure:

1. Go to the built-in webpage, find "Edge Computing -> Mode Management", select the edge computing mode as "Graphical Edge", click Apply and reboot the device.
2. After the device reboots, go to the built-in webpage, still find the "Edge Computing -> Mode Management" interface, network and wait for about two minutes.
3. Clicking on the "Graphical Design" button on the interface will jump you to the Graphical Design link.
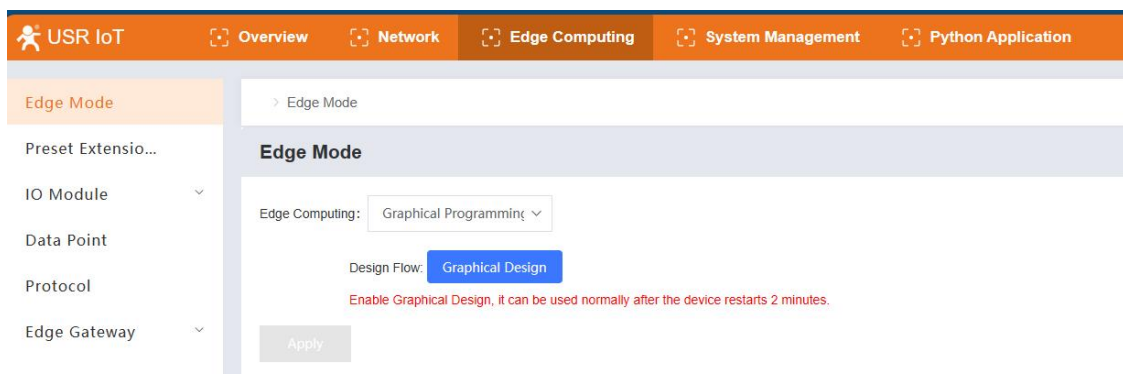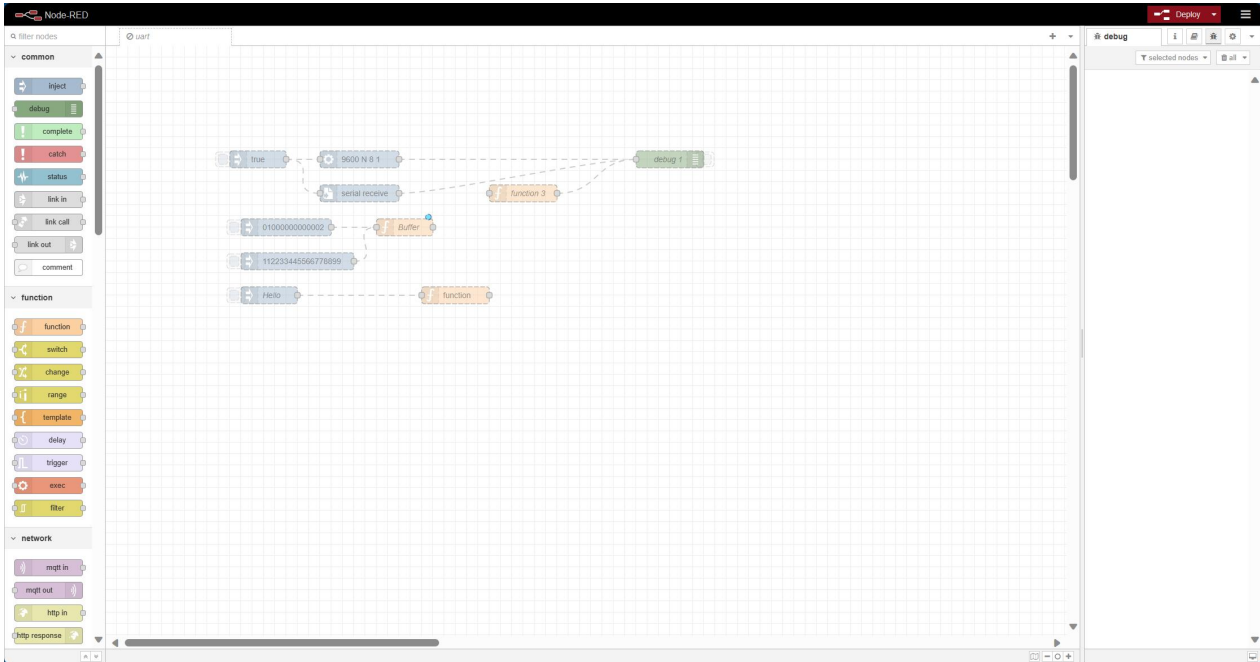
You can refer to specific tutorials for the specific use of graphical design.

# 6. system function

6.1. system time

In order to ensure that M300 and other devices work in coordination, and at the same time to ensure the accuracy of the customizer, users need to accurately configure the system time in advance when using the M300. The system time of the M300 supports three ways: NTP calibration, browser time synchronization, and manual configuration.

NTP Calibration: Get the accurate time to calibrate the system time through the network NTP server, NTP function is enabled by default, users need to change the available NTP server to use.

Manual calibration: Manually configure the system time through the set time function in the system time interface. After selecting the time, click the "Set" button to update the system time.

Browser Time Synchronization: In the system time interface, click "Synchronize Browser Time" button to synchronize system time and browser time.

Time zone setting: You can update the current time zone through the time zone option in the system time interface, after selecting the time zone, click the "Modify" button to take effect, and the system time will be updated to the corresponding time zone immediately after the time zone takes effect.
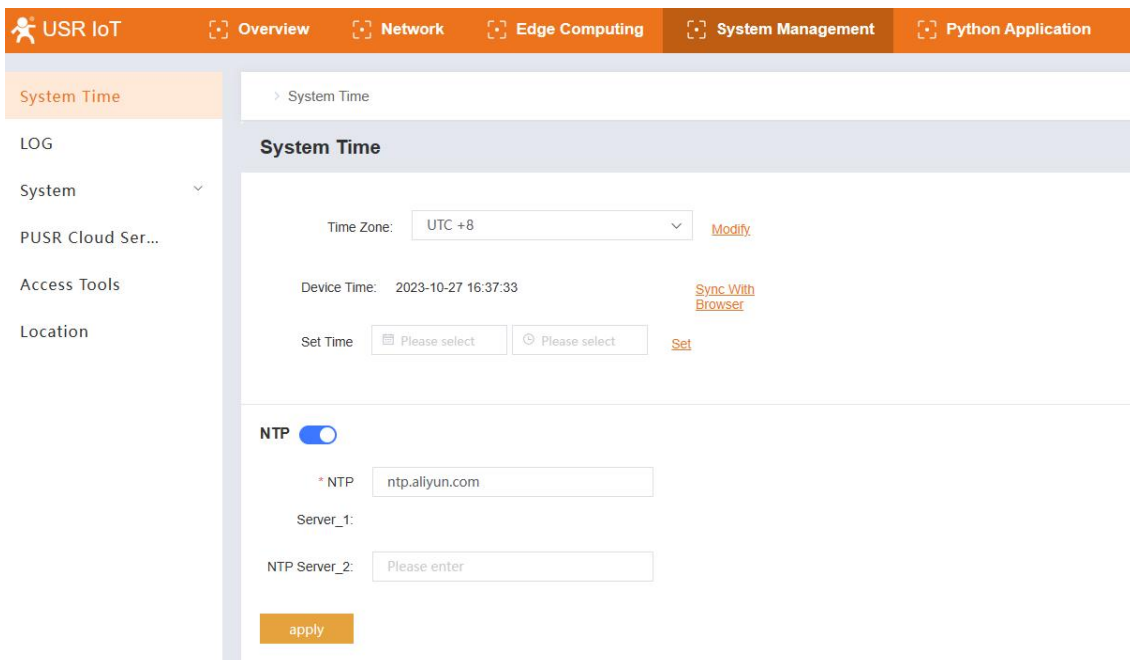
6.2. configuration management

Configuration management is mainly divided into system configuration and edge computing configuration.

- **System Configuration**

This includes the import, export and factory restore operations of the product's main parameters. Import and export files are mainly used for quick copying of product configuration, so users need to ensure the legitimacy of the files during the import and export process.

- **Restore Factory Settings**

Restore the M300 to its factory default configuration. After users use this operation, they need to reconfigure the parameters of the M300 to use it normally.

- **Edge Computing Configuration**

Edge Computing Configuration supports the import and export of documents related to edge functions, enabling the rapid replication of edge computing functions between products. The current Edge Computing import and export function documents do not support configuration and are only used as documents for passing parameters.

The Edge Computing Configuration export file contains a data point table file, a protocol conversion point mapping table file, a linkage control event table, and a data reporting grouping table.

6.3. Firmware Upgrade

Firmware upgrade function interface is used to display the current firmware version number and provide firmware upgrade operation, after selecting the legal firmware, click "Start Upgrade" to wait for the product to be automatically upgraded to complete.

6.4. user management

The user management function is mainly the user name and password setting function of the built-in web page of product login, user name supports 4-30 characters and password supports 1-30 characters.

6.5. system reboot

In the System Management->System Reboot interface, you can reboot the device immediately, or you can add a timed reboot task, set the reboot time point for the day, and apply it.

The restart task supports a 24-hour clock and is accurate to the minute.

6.6. Management tools

Currently, the management tool of M300 only supports SSH, which can be used by enabling it in the interface, and the default user name and password can be obtained by contacting the corresponding technical support.

6.7. positioning function

Positioning function when the forward open base station positioning, you can get the location information of the base station, GPS positioning function is under development, will be open in the next issue.