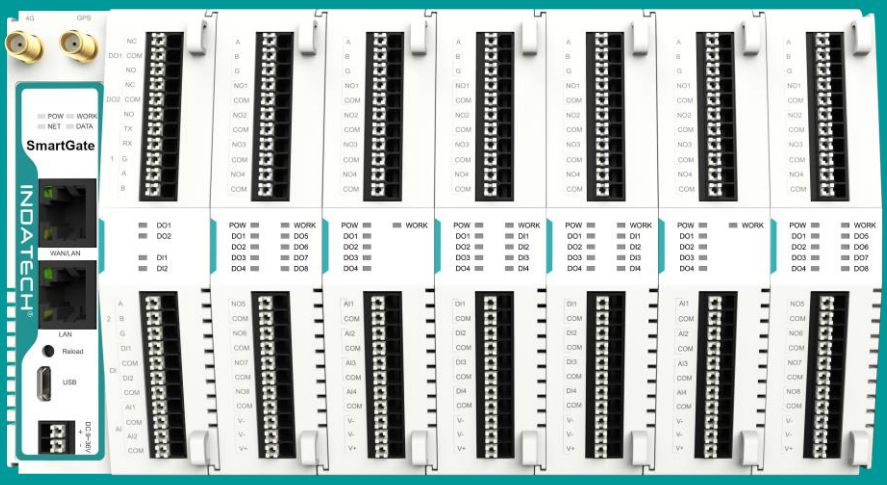
INDATECH®

USER MANUAL
SmartGate



www.indatech.it

1. Introduction

1.1. Overview

SmartGate is a high-performance and scalable Edge IoT gateway. This device integrates edge collection, data calculation, data reading and writing, active reporting, linkage control, IO collection and control and other functions. The collection protocol includes standard Modbus protocol and a variety of common PLC protocols, as well as industry-specific protocols. At the same time, the product also has routing and VPN as well as graphical programming functions to ensure data transmission security. Using graphical programming, users can develop independently to achieve the required functions.

SmartGate is embedded in Linux kernel, with a main frequency of up to 1.2Ghz. It can access the Internet via Ethernet port and LTE cat4 cellular network to achieve easy network deployment.

It is widely used in various industrial intelligent solutions such as industrial robot, smart factories, smart agriculture, smart water management system etc.

1.2. Features

- Dual-core professor with ultra-high performance, the main frequency is up to 1.2Ghz, providing high performance processing resources for edge computing.
- Supports Python development, for developing user custom applications.
- Supports graphical programming to facilitate user development.
- LTE 4G and Ethernet network serve as backups for each other to ensure stable network transmission without downtime.
- Integrated 1*WAN/LAN and 1*LAN Ethernet port, VPN and firewall protection to ensure safe data transmission.
- Integrated 2 serial ports: 1*RS232/485, 1*RS485, which can transform traditional serial devices into IoT devices.
- Comes with IO interface: 2*DI, 2*DO, 2*AI, flexible expandable IO module is supported.
- Powerful edge gateway function: supports edge collection, edge computing, group reporting, and supports real-time collection of up to 2000 points.
- Supports major industrial protocols including Modbus TCP/RTU, PLC protocols and OPC UA Server.
- Support 2 socket channels, each channel supports TCP(SS)/UDP, MQTT(S) protocols.
- Cloud support: MQTT via AWS IOT, Alibaba Cloud, and INDATECH Cloud.

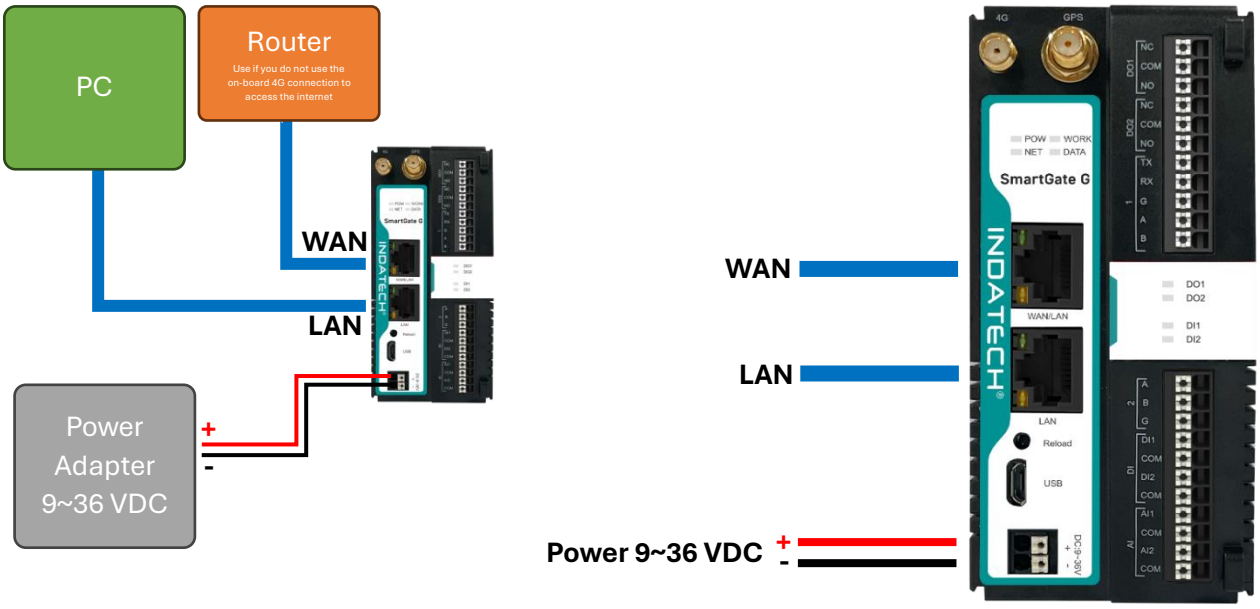
2. Get Started

2.1. Hardware connection

Preparation:

Power adapter 12V/1A * 1
Network cable * 1

The hardware connection diagram is like the following:



2.2. Login Gateway

Power on the **SmartGate**, connect PC to **SmartGate** via LAN port, users can login the gateway via Chrome or the other browser. The default network parameters are shown in the following table:

LAN IP:	192.168.1.1
Username:	admin
Password:	admin

Open the browser, enter 192.168.1.1 in the URL blank, and press Enter, it will navigate to the following webpage.

After entering the login password, clicking login, the web page will show configuration page of **SmartGate**.

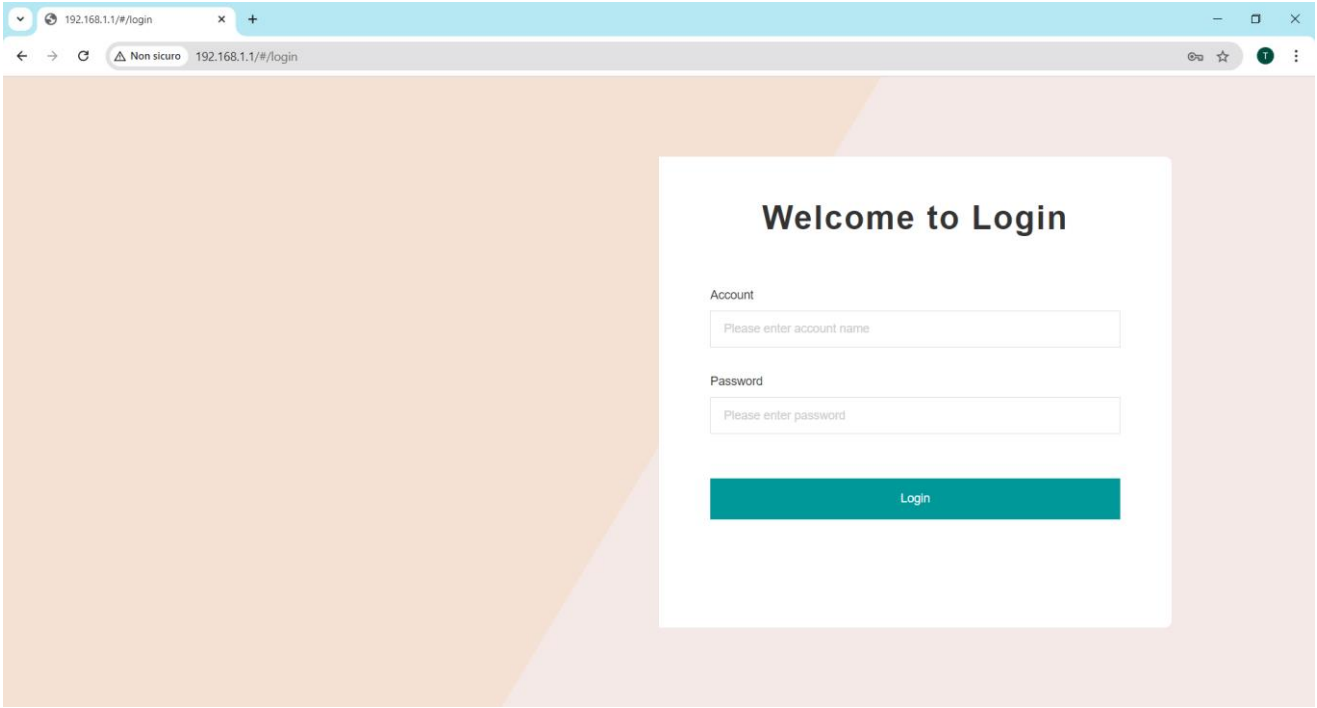


Figure 1. Login webpage

2.3. Brief introduction of the webpage

There are several tabs on the top of the webpage, users can set parameters of **SmartGate** on the tab pages.

Overview: On this page, users can quickly learn about the running status of the gateway, like system information, device status, cellular information and etc.

Network: In this interface, there are many categories related to network connection. Users can set parameters such as WAN port, LAN port and cellular network.

Edge Computing: With this functionality, the **SmartGate** gateway serves as host and actively sends the polling acquisition command to periodically obtain the point data of the serial and Ethernet devices and the data collected by the I/O interface.

System Management: In this webpage, users can check the log information, and set the system time and so on.

Python Application: With this functionality, users can deploy Python applications.

3. Overview Information

In this page, it includes system information, device status, cellular information, flow usage monitoring and performance of processor chipset.

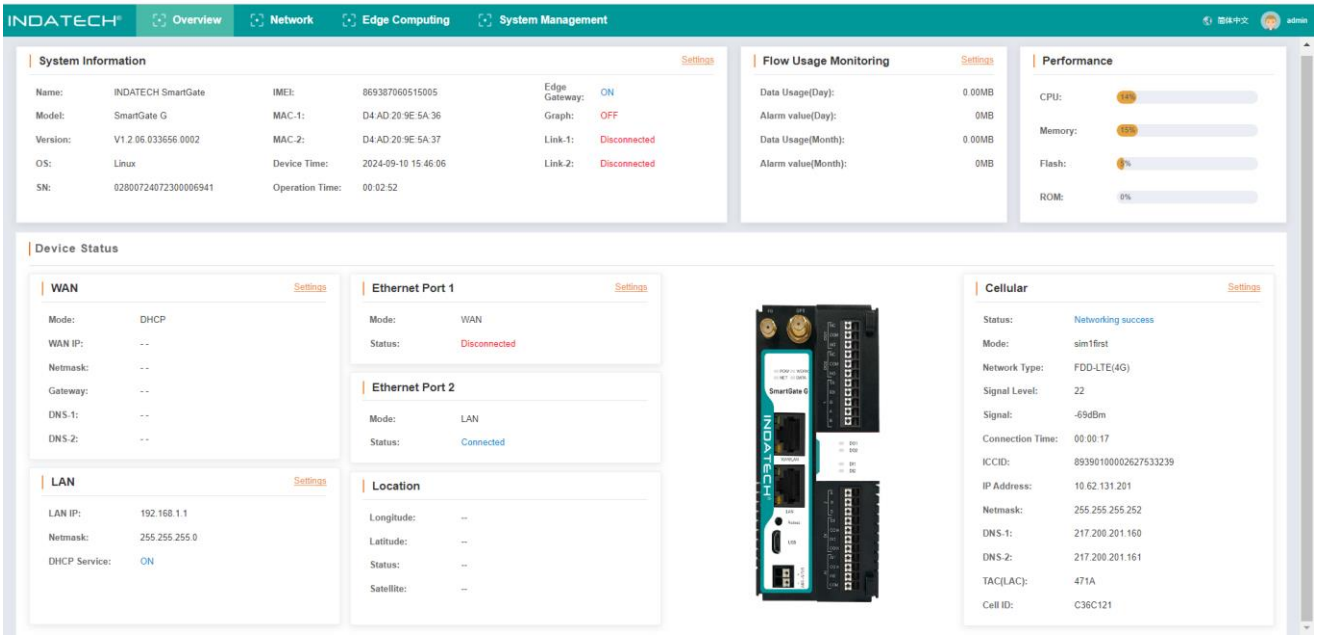


Figure 2. Status / Overview webpage

4. Network

4.1. Network switching

On this page, users can select the Internet connectivity priority, and can also set the information of PING detection.

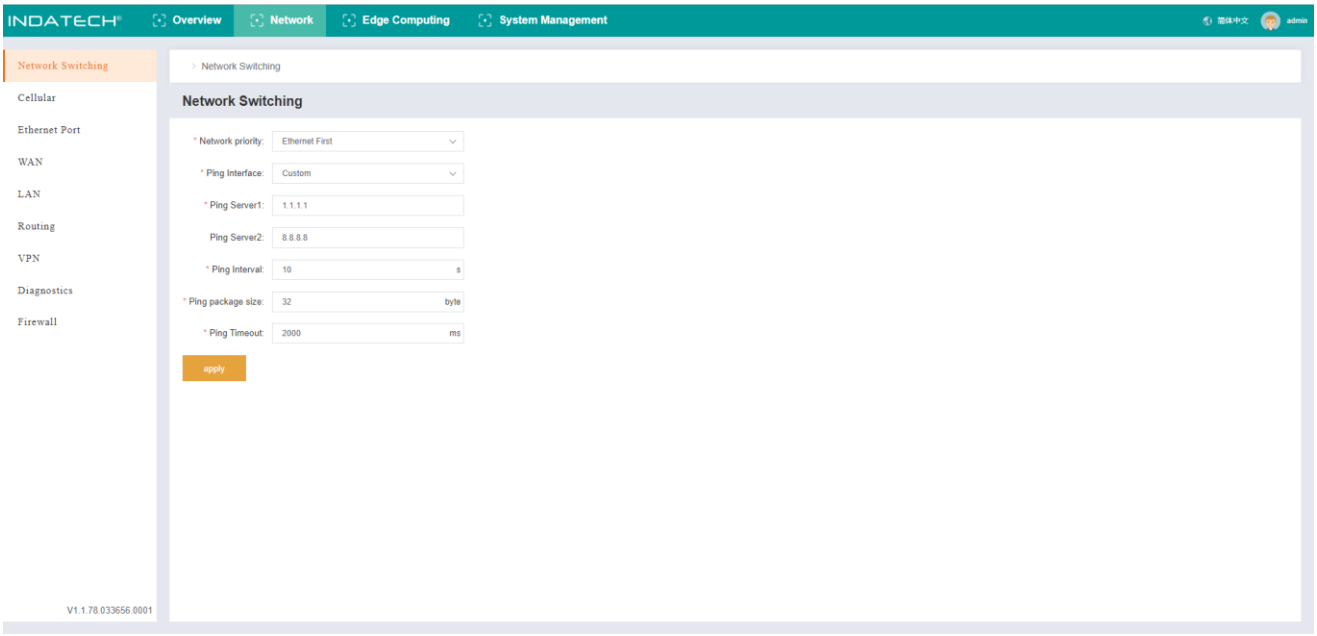


Figure 3. Network Switching

4.2. Cellular

On this page, users can check the cellular information like the signal strength, IP address and so on. The APN information can be set in this page also.

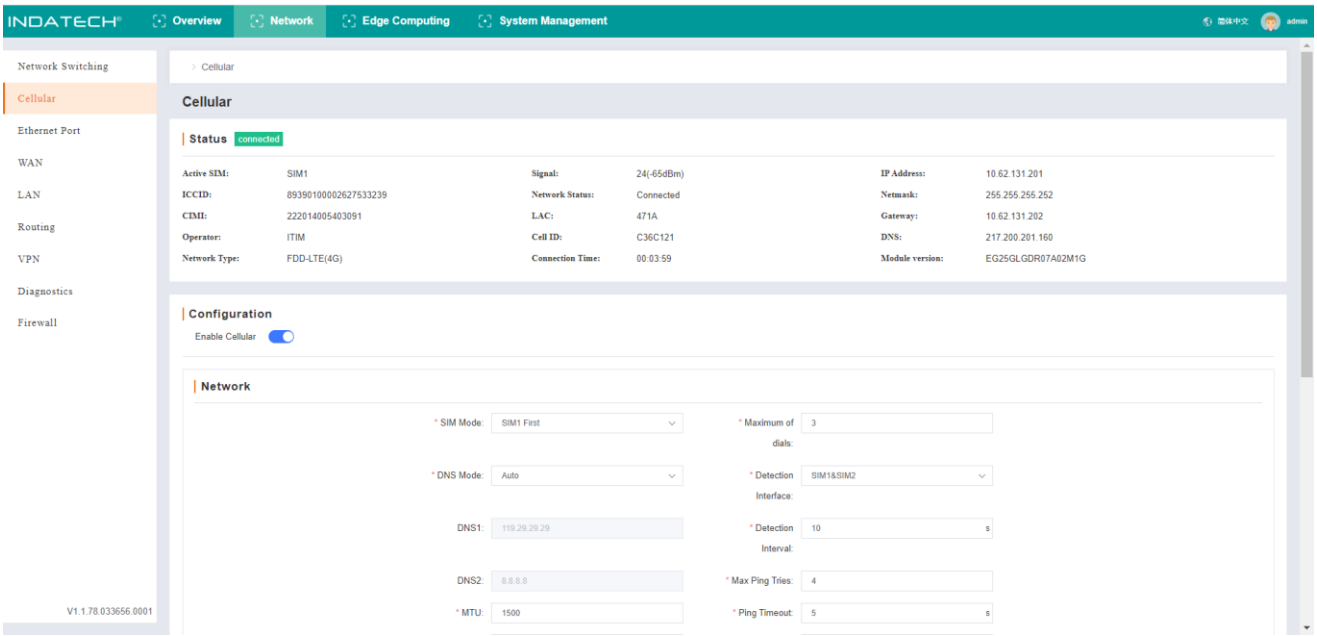


Figure 4. Cellular

4.3. Ethernet Port

On this page, users can change the work mode of Ethernet Port1. This port is WAN mode by default. And it can be changed to LAN mode. Then the users can get 2 Ethernet ports.

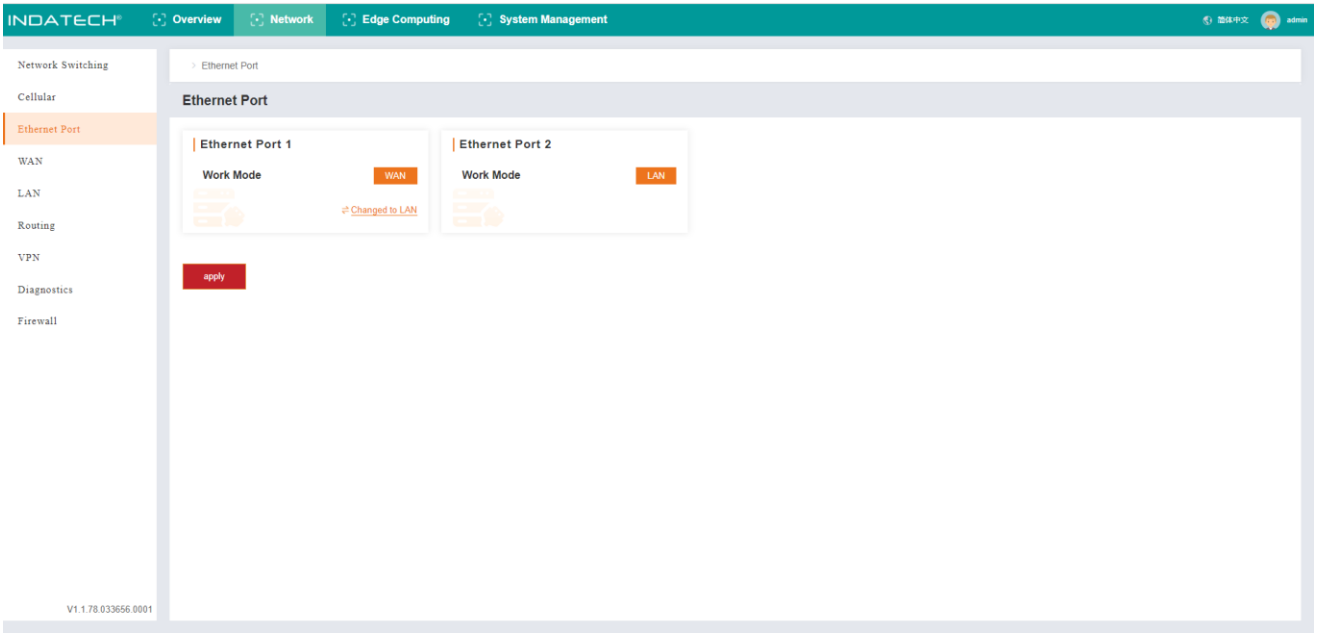


Figure 5. Ethernet Ports

4.4. WAN Interface

User can set the parameters of WAN port like network mode, DNS mode and MTU.

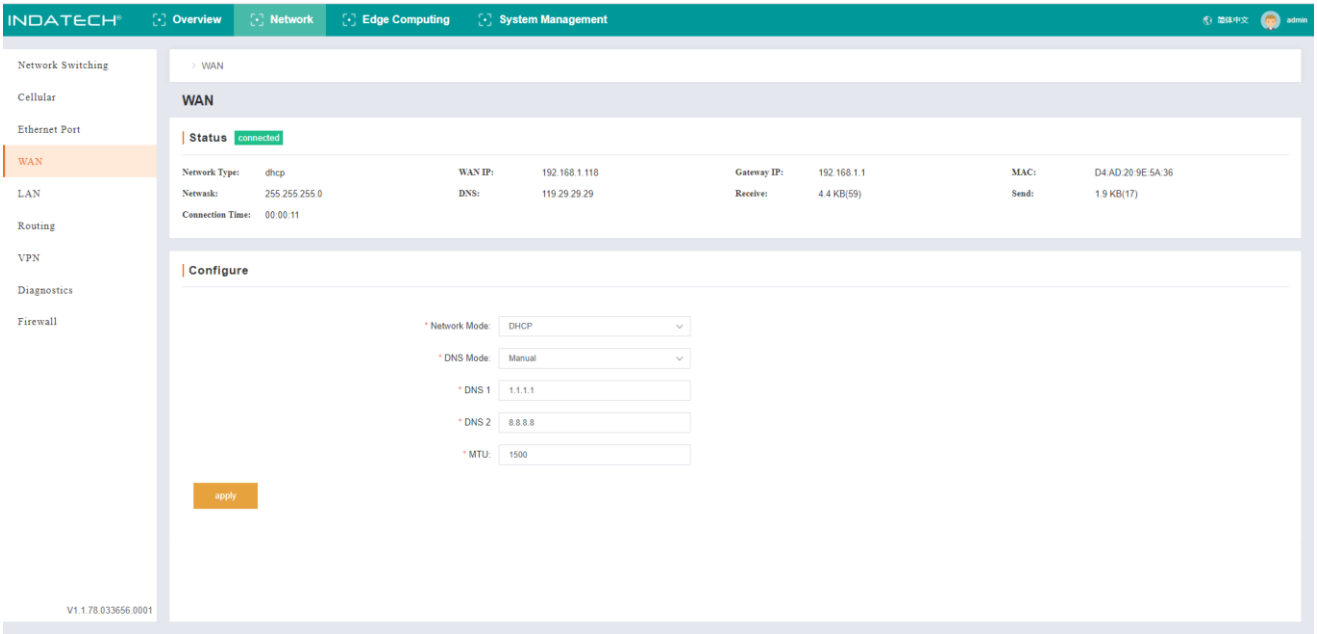


Figure 6. WAN

4.5. LAN Interface

Users can set the basic information of LAN port like IP address, netmask and DHCP service. When the **SmartGate** enables the DHCP service, it can assign IP address to the terminal device connected to **SmartGate** via LAN port.

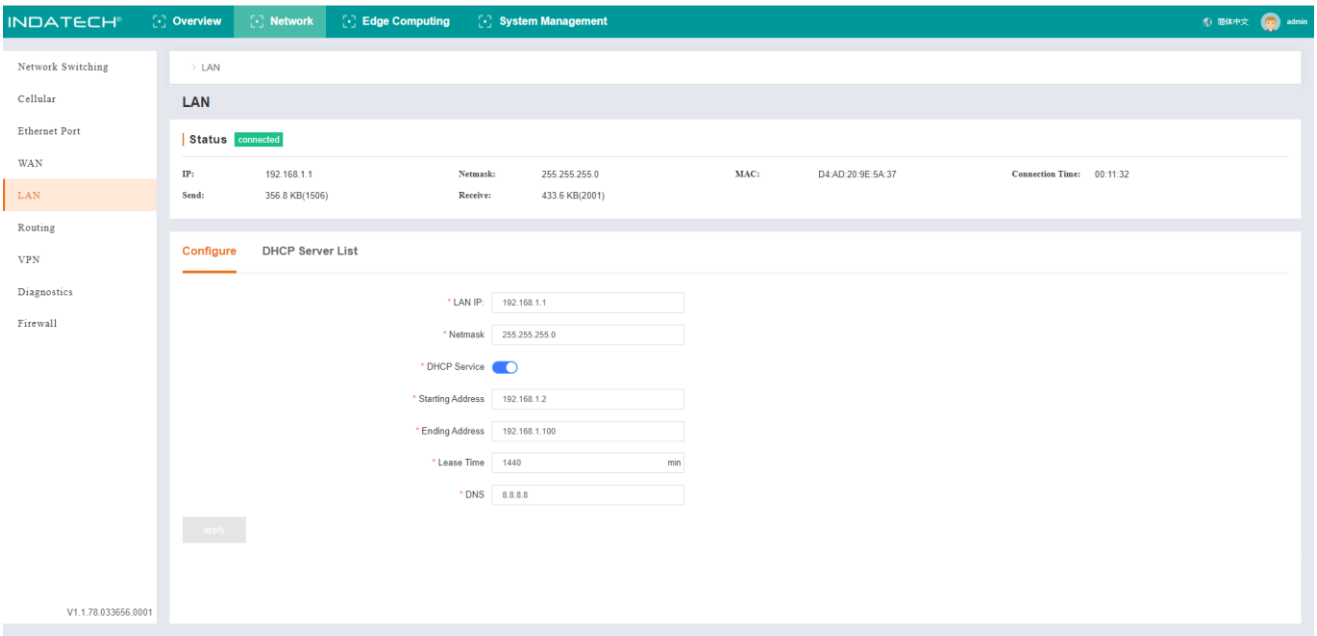


Figure 7. LAN

4.6. Routing

On this page, users can check the routing table and add needed static routing to **SmartGate**.

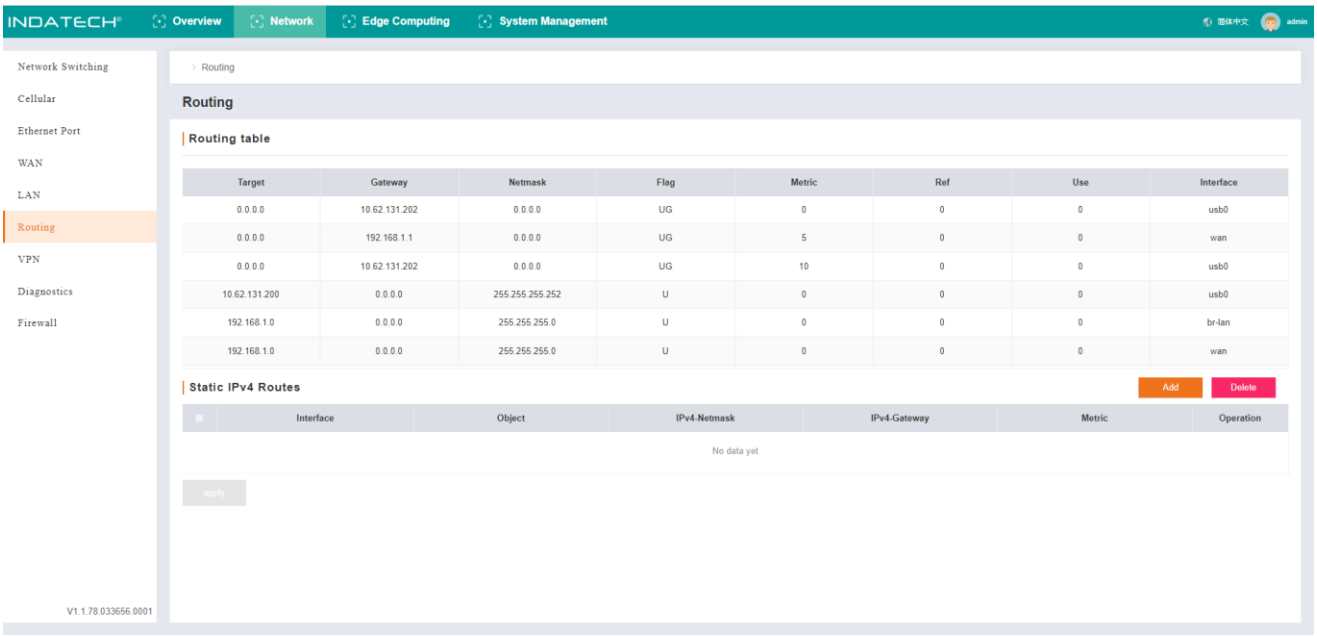


Figure 8. Routing

4.7. VPN

On this page users can configure PPTP, L2TP and OpenVPN.

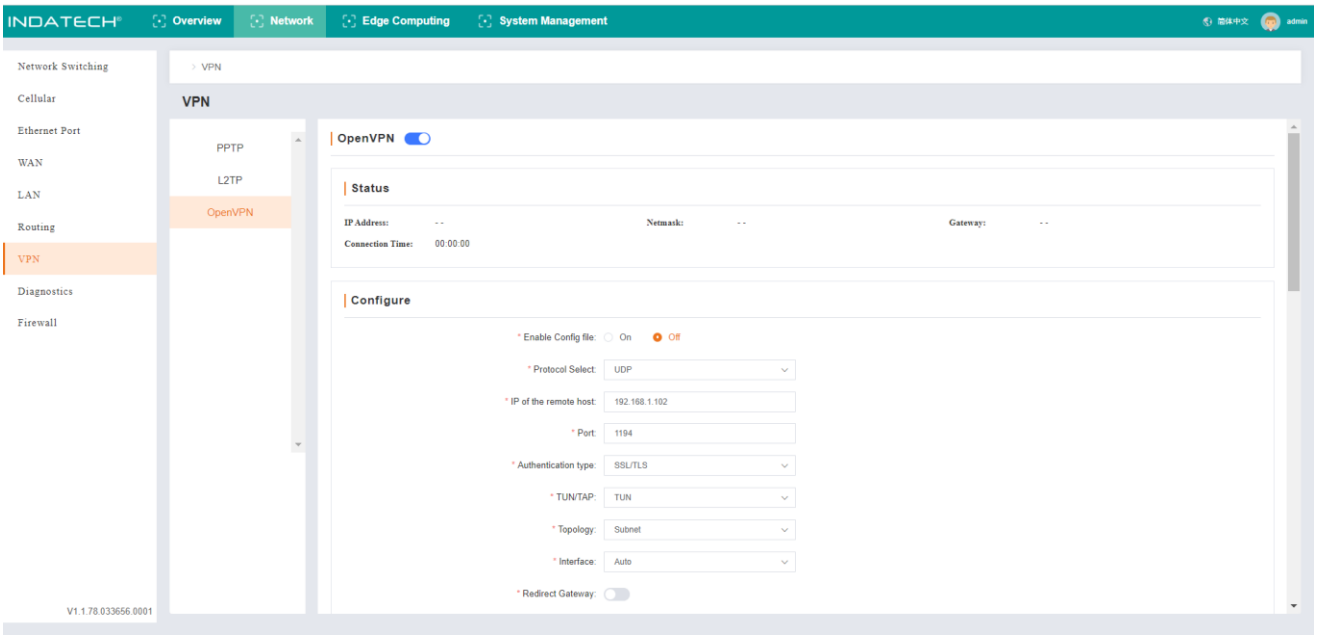


Figure 9. VPN

4.8. Diagnostics

On this page, users can perform network diagnostics such as Ping and Traceroute to a specific IP/HOST.

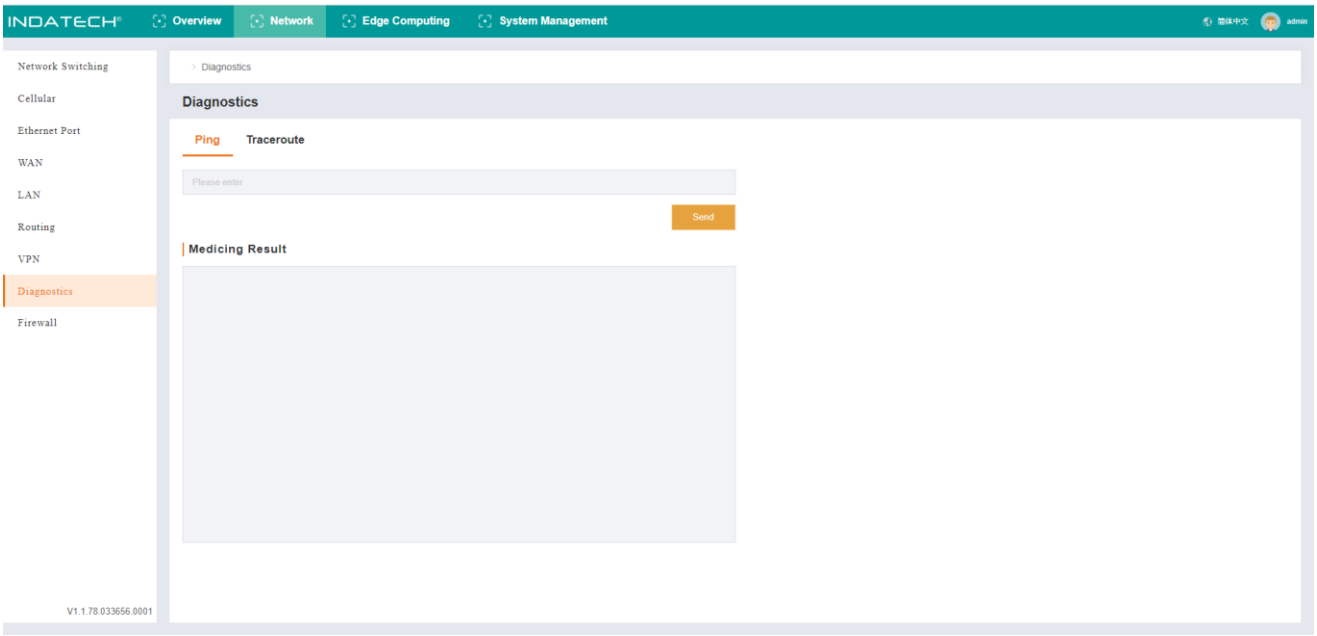


Figure 10. Network Diagnostics

4.9. Firewall

On this page, users can configure the firewall on **SmartGate**, including settings for port filtering, port mapping, port forwarding, and DMZ.

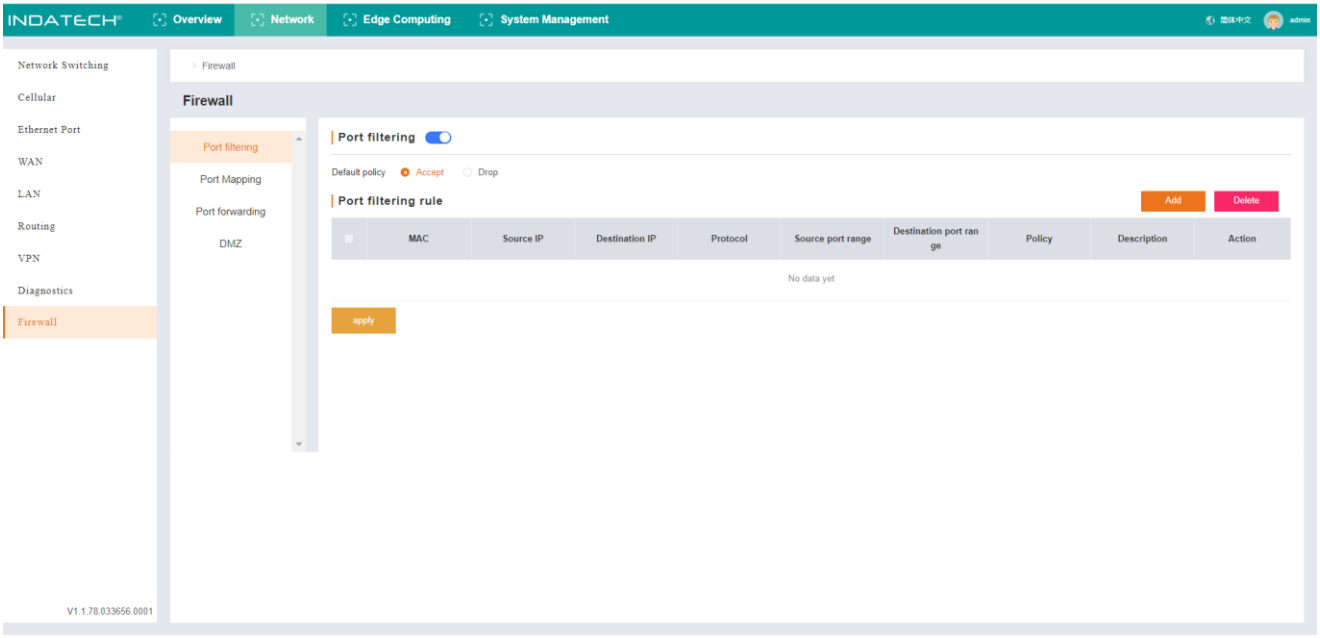


Figure 11. Firewall

5. Edge Computing

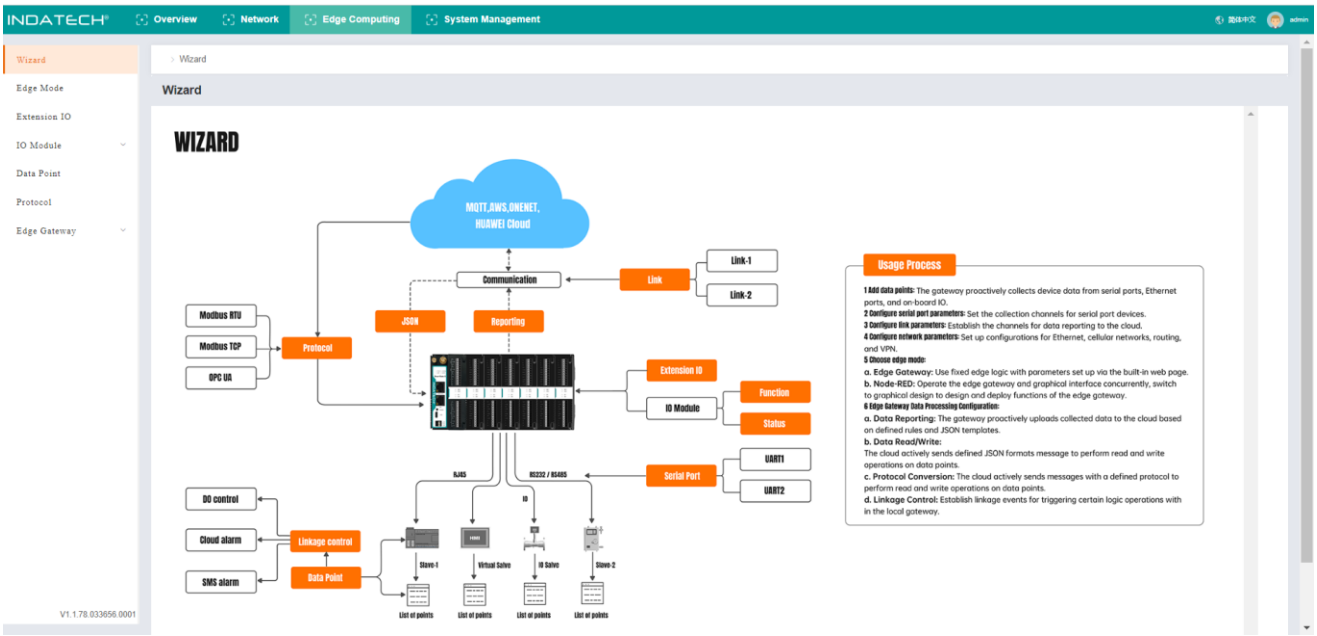


Figure 12. Wizard Edge Computing

5.1. Edge Mode

The edge mode is edge gateway by default. User can change the mode to Graphical Programming mode. The Graphical Programming is based on Node RED, in this mode, user can develop the application about the edge computing that they need.

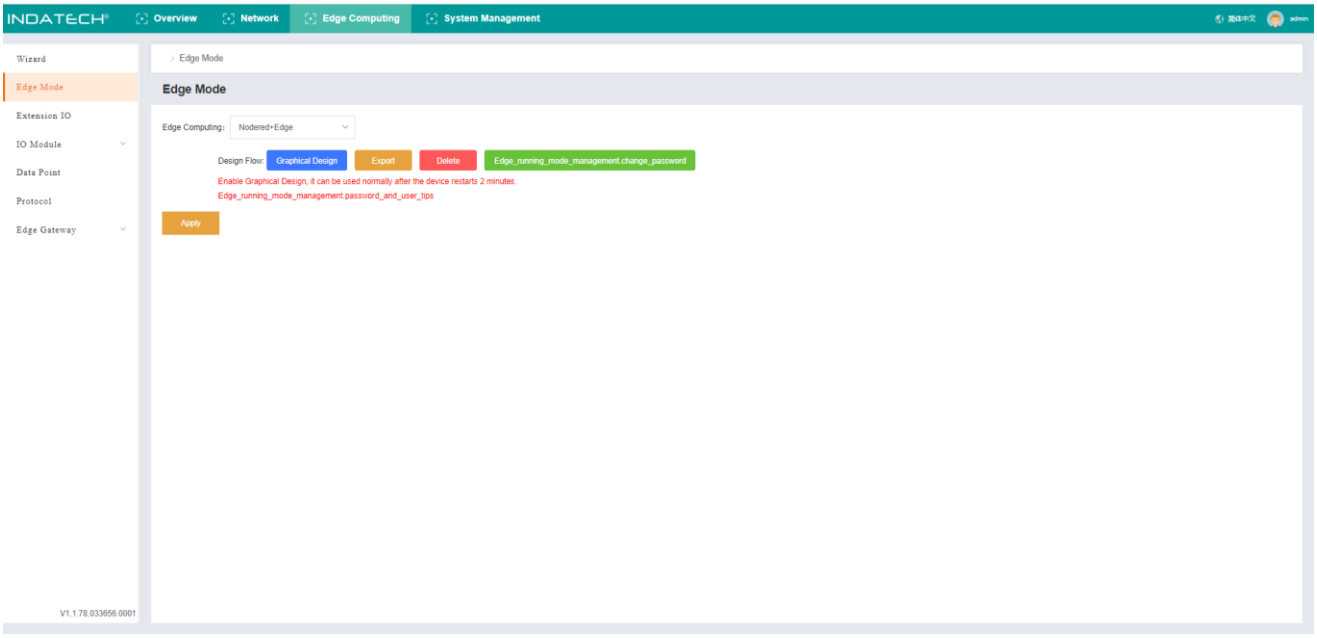


Figure 13. Edge Mode

*Note: This setting needs to reboot the **SmartGate**. Waiting another 2 minutes after the SMARGATE starting, then the Graphical Design page can be opened.*

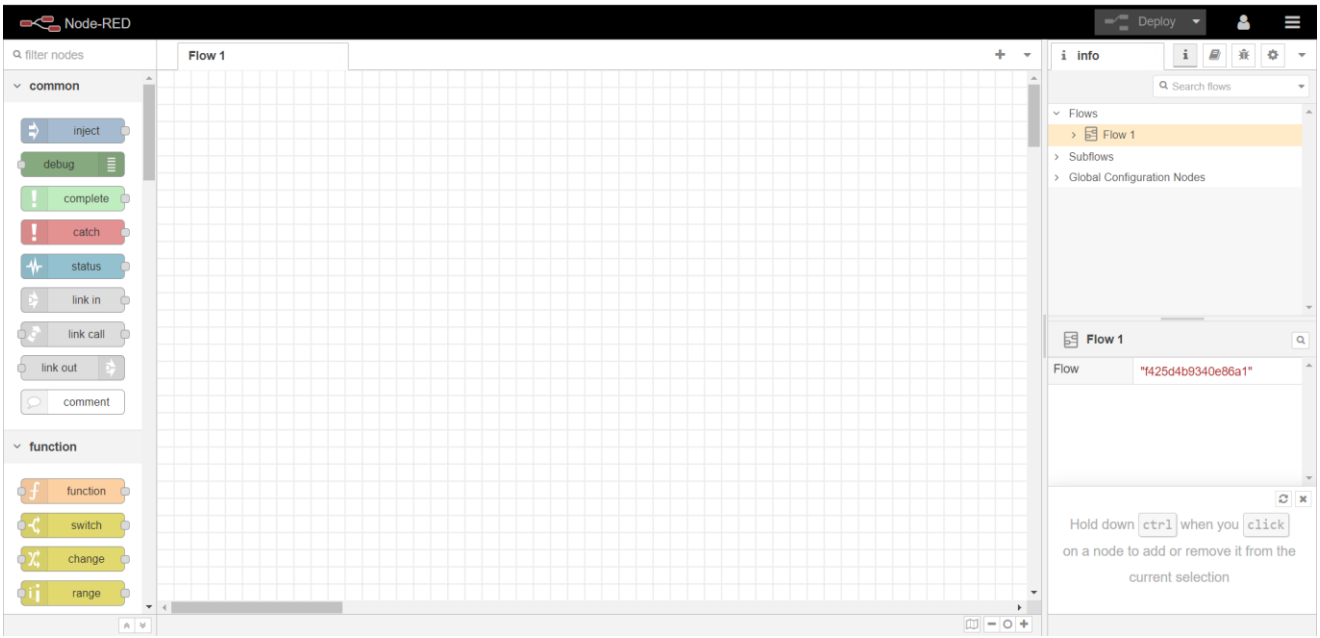


Figure 14. Node-RED

5.2. Extension IO

The **SmartGate** can work with extendable IO (**INDATECH SmartIOs**) module to extend the IO numbers. If the extendable IO modules are connected to **SmartGate**, users need to preset the IO modules on webpage. The IO modules sequence should be kept the same with the actual hardware sequence.
If the sequence on webpage is different from the hardware sequence of extendable IO modules, the work indicators on **SmartGate** will fast blink, and the work indicators on IO extendable modules will blink 4 times/s, then keep off for 2s.

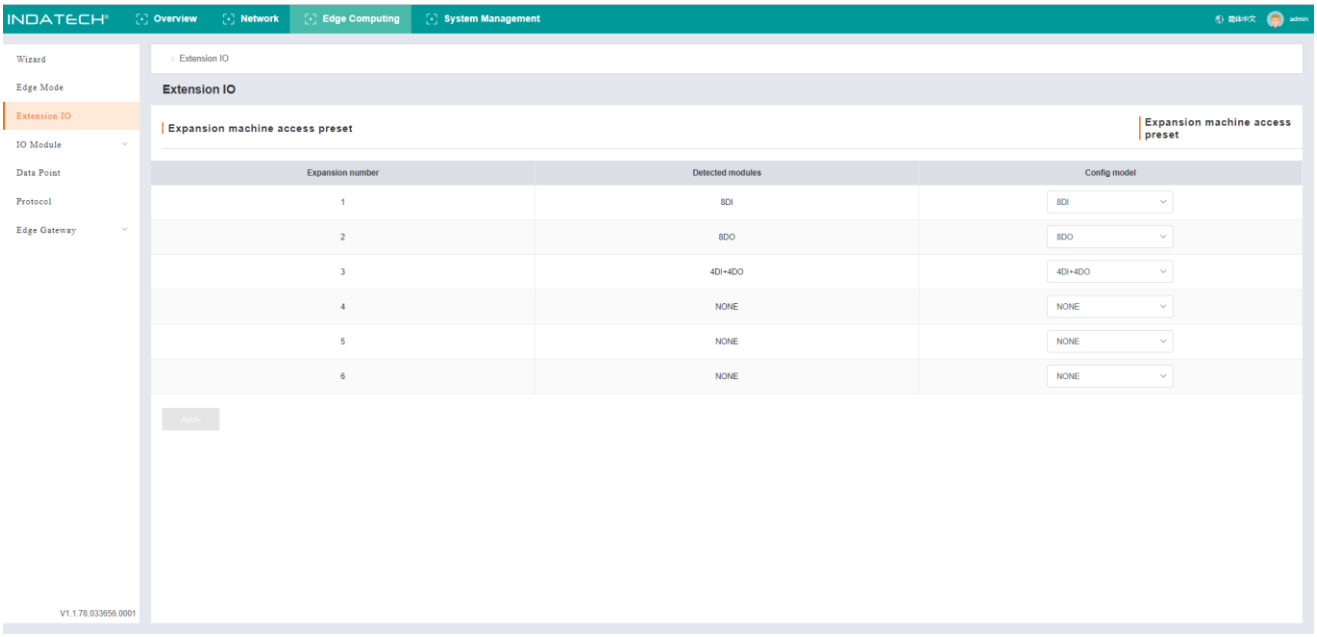


Figure 15. Extension IO

5.3. IO Module

There are 2 parts in this function, the detail information and the status of IO modules.

5.3.1. DI Interface

On this page, users can check the settings of digital input interfaces, and can also set the work mode of DI interfaces.

DI01: It means the first DI interface of **SmartGate**

DI22: It means the second DI input of the second extendable IO module.

DI27: It means the seventh DI input of the second extendable IO module.

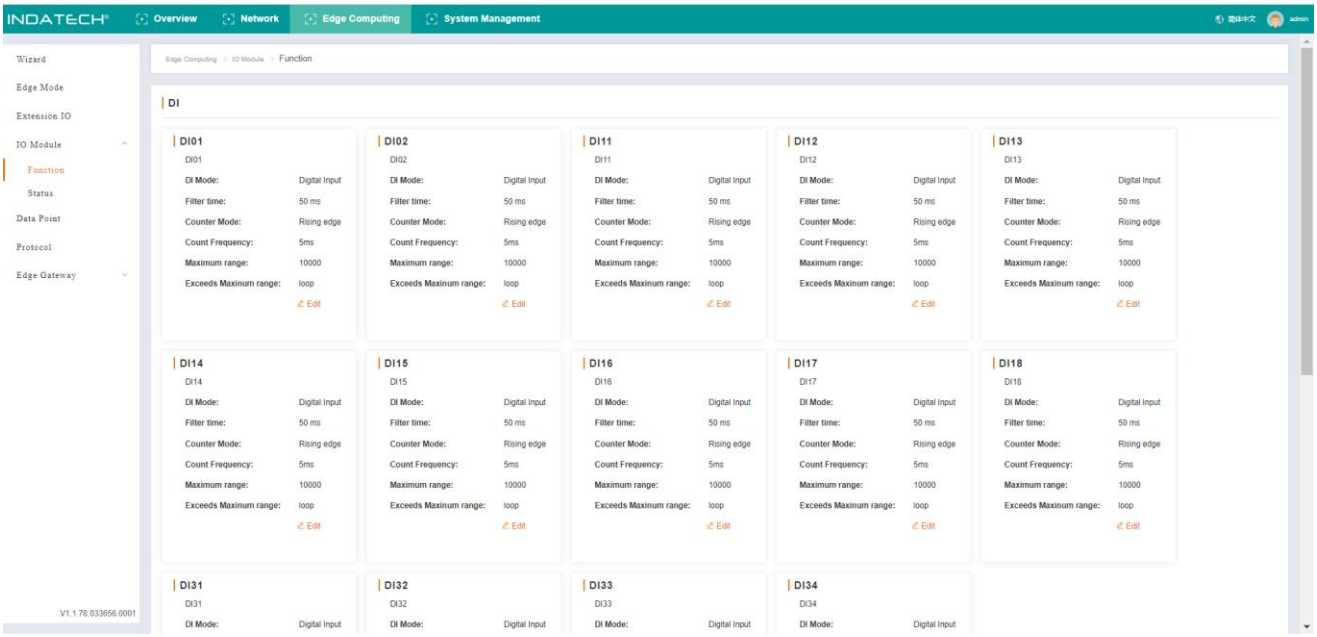


Figure 16. IO Module - Function

The default DI mode is Digital Input, users can click “Edit” to modify the settings.

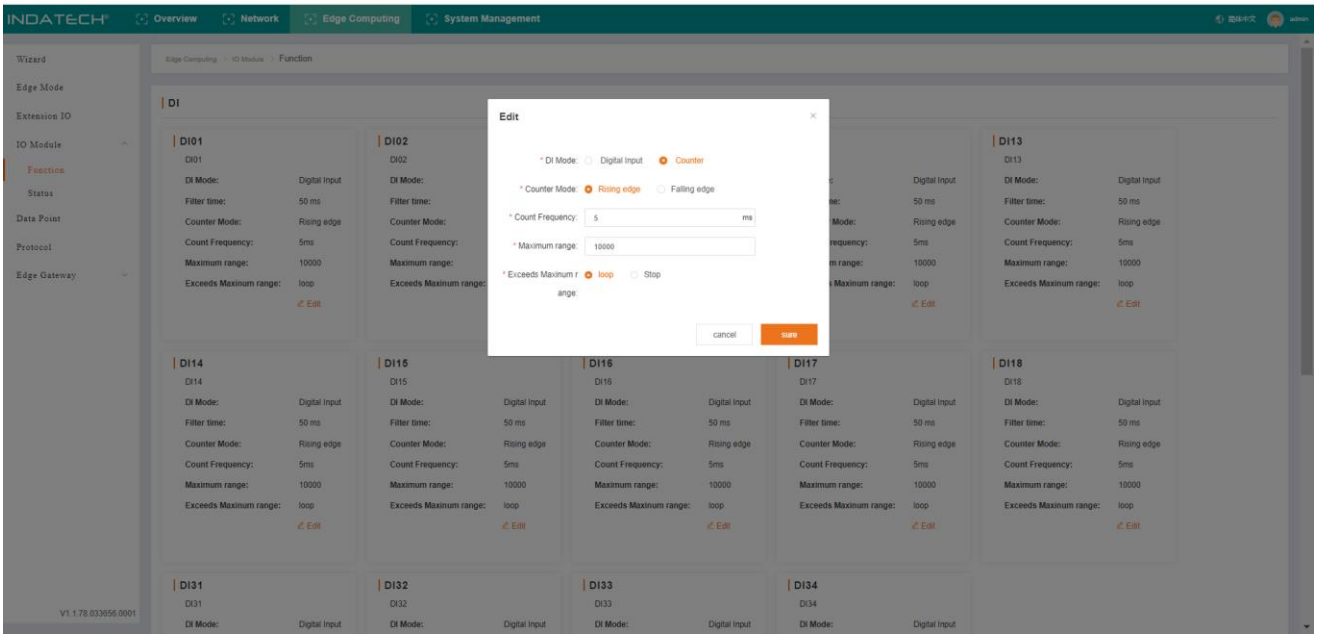


Figure 17. IO Module - Edit

Restart Hold of DO. This function is closed by default.
If the Restart Hold function is enabled, when we restart the **SmartGate**, the DO will remain in the state before the power outage.

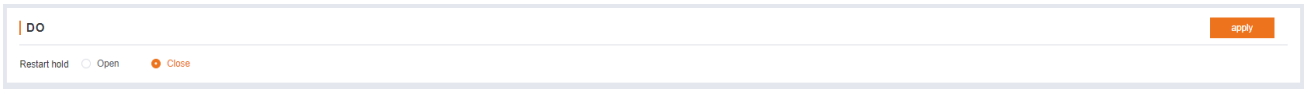


Figure 18. DO – Restart Hold

5.3.2. Status of IO modules

On this page, users can check the status of IO interface. And can also control the DO interface. Click the DO button, the indicators of DO will turn on or turn off.

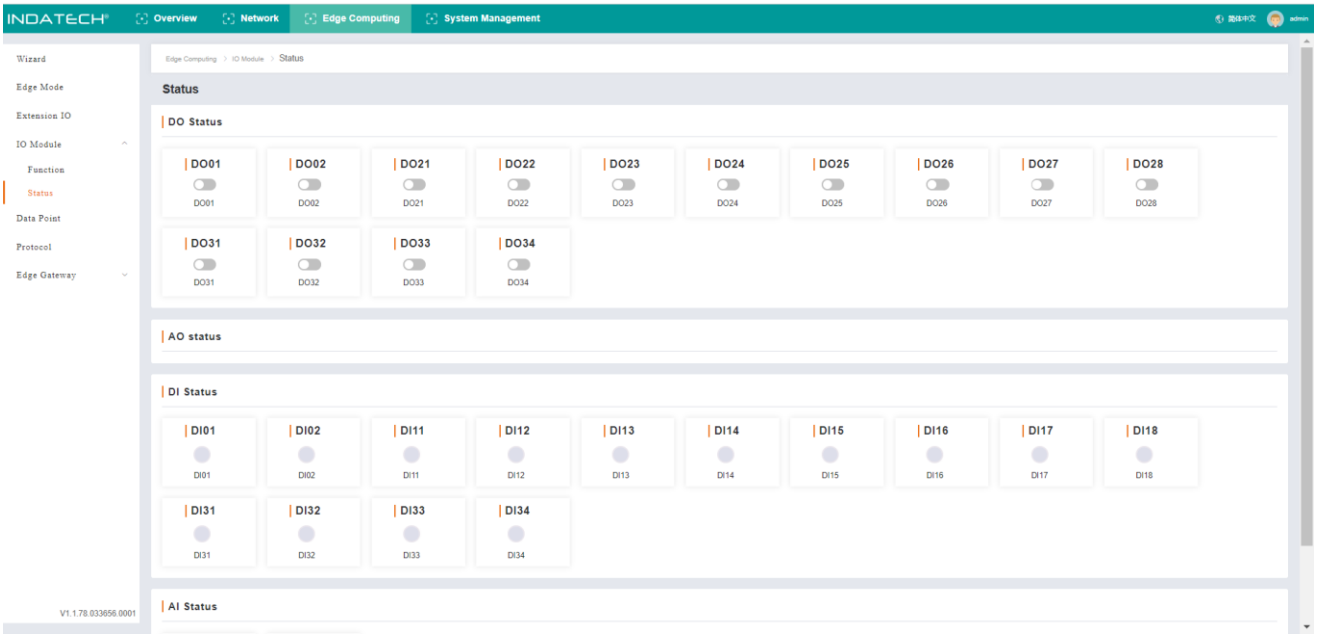


Figure 19. IO Status

5.4. Data Point

Data Point Table is the core database of the edge computing gateway. The data and data-related information used by the edge gateway for acquisition, reporting, data reading and writing, protocol conversion and linkage control are all obtained from this point table. Therefore, during use, it is very important to add the data point table correctly and in detail.

The data point table contains two main elements: slaves and data points. Up to 20 slaves can be added, IO slaves and virtual slaves are fixed. The remaining 18 Slaves can be added as needed. Corresponding data points can be added to each slave. Except for the virtual slave, the total number of data points of all other slaves is up to 2000. The data points of each slave are actively polled and collected from the corresponding interface according to the protocol specified when adding the slave, and the collected data is correspondingly stored in the virtual register in the product.

For virtual slaves, up to 500 points can be added.

Supported Downlink Protocols:

- Modbus TCP
- Modbus RTU
- DVP_RTU
- DLT-645-2007
- FATEK
- FINS-COM
- FINS-TCP
- FX1S
- FX2N(1N)
- FX3U
- FX5U
- S7-200 Smart
- S7-200 PPI
- S7-300
- S7-400
- S7-1200
- S7-1500

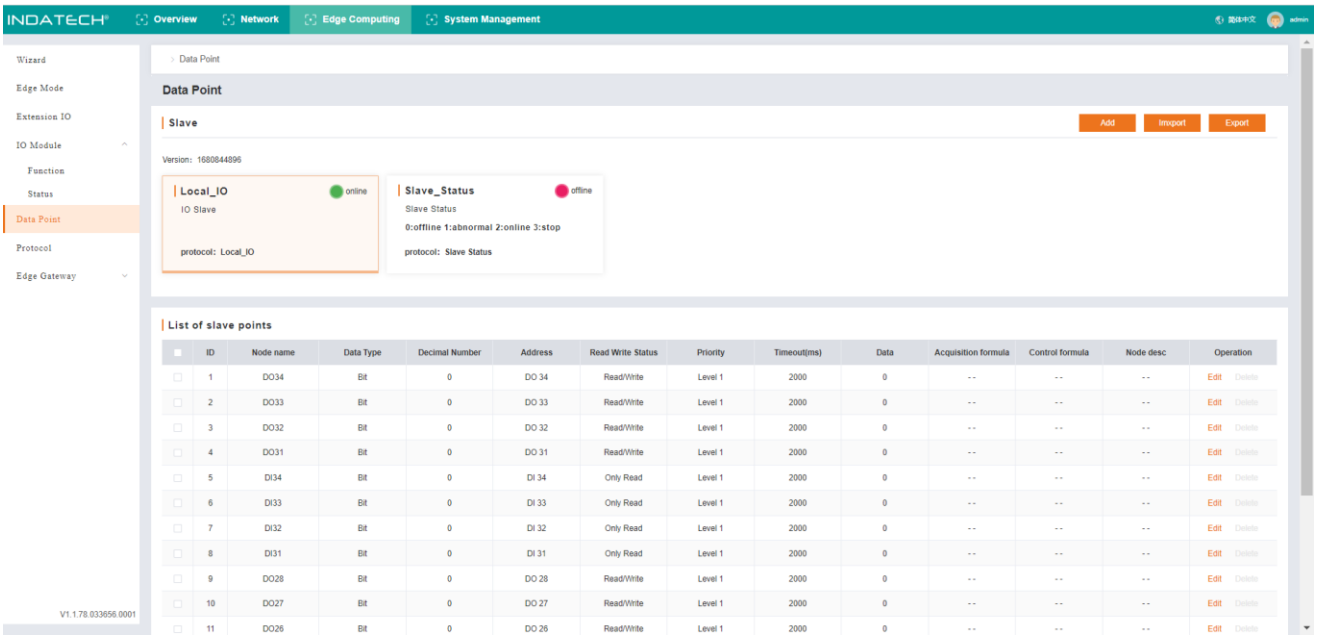


Figure 20. Data Point

Let's add a first slave as an example, in this case the Modbus TCP protocol is used.

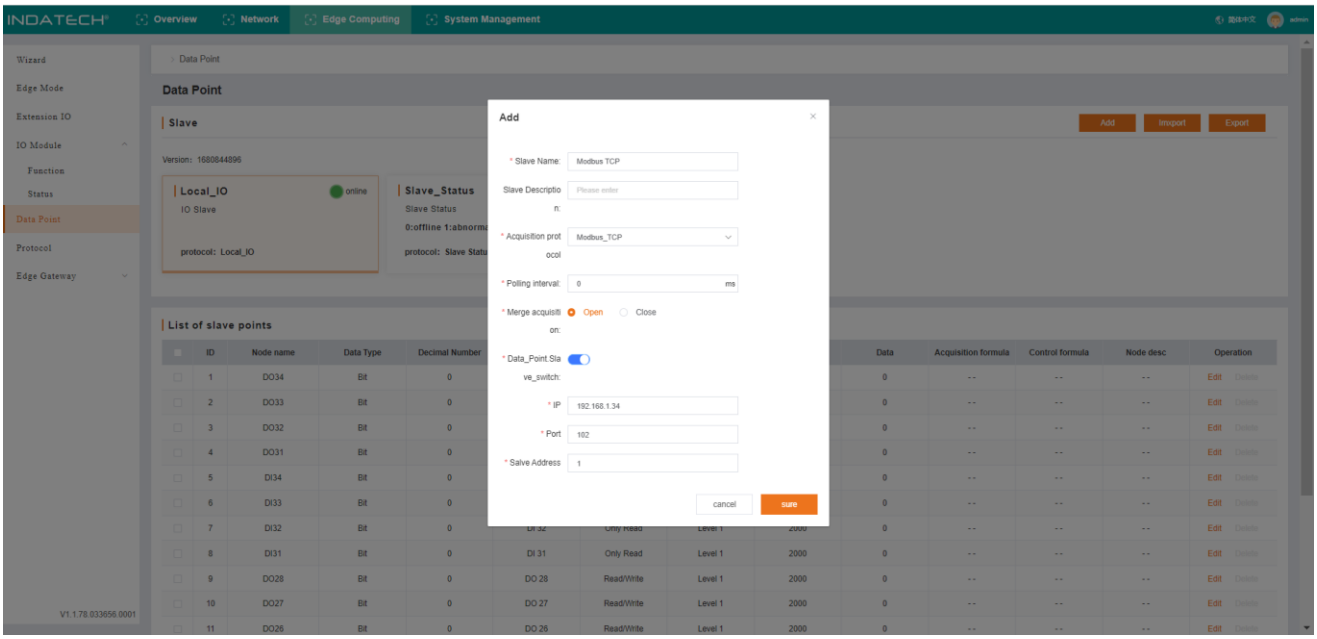


Figure 21. Data Point - Add Slave

Then add the data points of the Modbus TCP slave:

1. Click the Modbus TCP Slave
2. If we didn't add the data points before, the list of slave points is blank. Click the "Add" button to enter the point information.

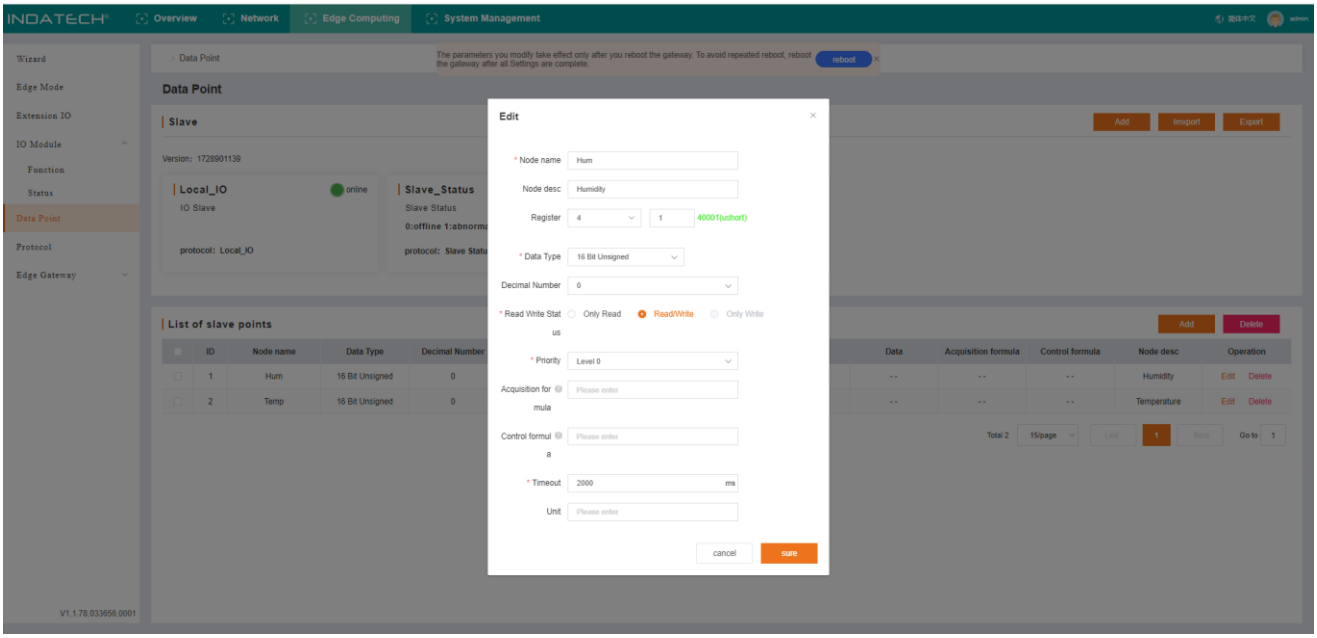


Figure 22. Add Slave points

3. Added slave and data points:

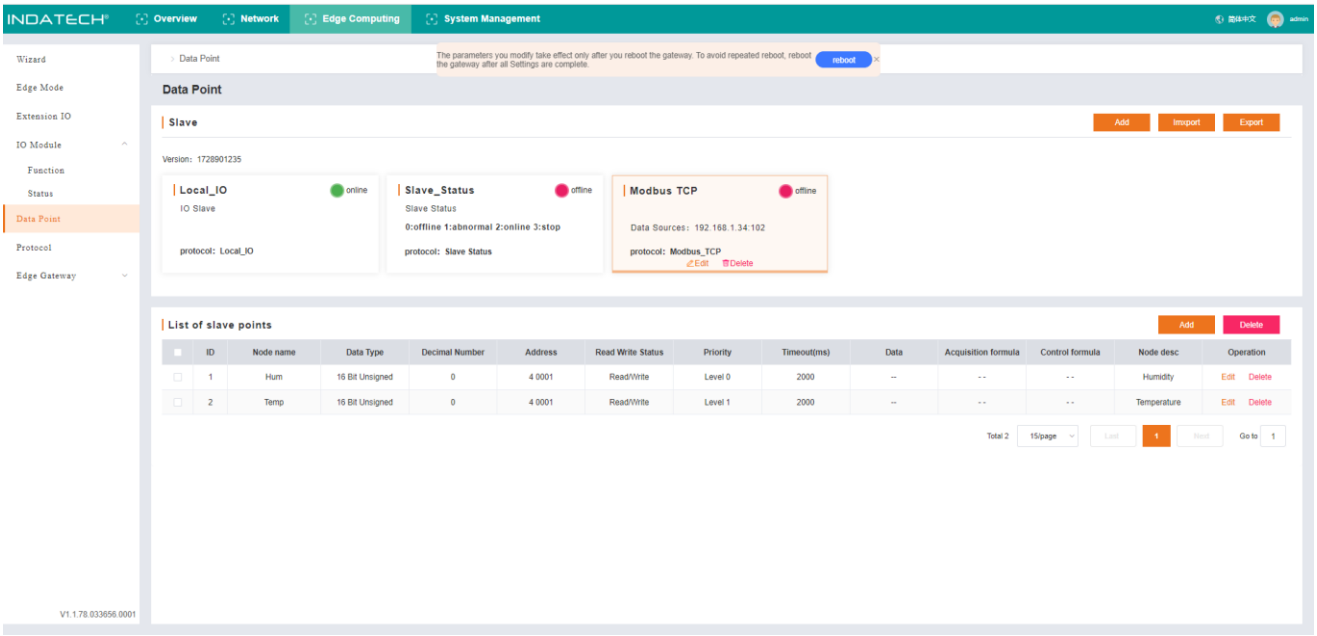


Figure 23. Data Points and Slaves

4. After all the slave and data points are added, and other settings are ok, please reboot the **SmartGate** to make the changed parameters take effect.

Figure 24. Reboot popup

5. Check the collected data.

5.5. Protocol

SmartGate supports mutual conversion between different protocols, such as Modbus RTU/TCP, OPC UA, Json and BACnet.

More protocol conversions are in development.

With this function, users no need to worry about being unable to communicate due to different protocols between the terminal device and the server, because the **SmartGate** will convert the point data of all slave devices into a unified protocol format, making it easier for the server to issue and collect data using a unified protocol.

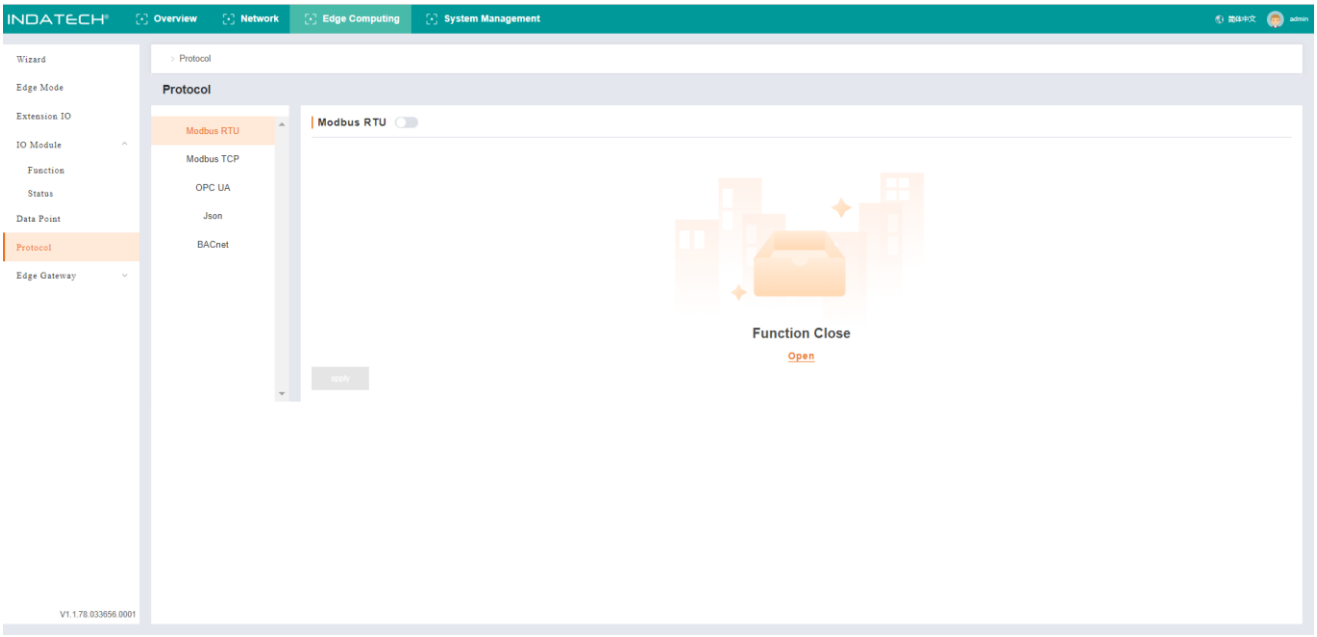


Figure 25. Uplink Protocols

We have added Modbus TCP slave in section 5.4. In this section, will convert Modbus RTU to Modbus TCP using the protocol conversion function.

Basic settings:

1. Enable Modbus RTU function,
2. Set protocol and local port, in this case, keep them the default parameters
3. Set the Slave address to 5, we add the 16-bit points in Section 5.4, so keep the 32-bit data the default parameters.
4. Click “Apply”, then the window will pop up prompting you to reboot **SmartGate** device. We can reboot device after setting all parameters.
   Then continue to set mapping point table parameters.

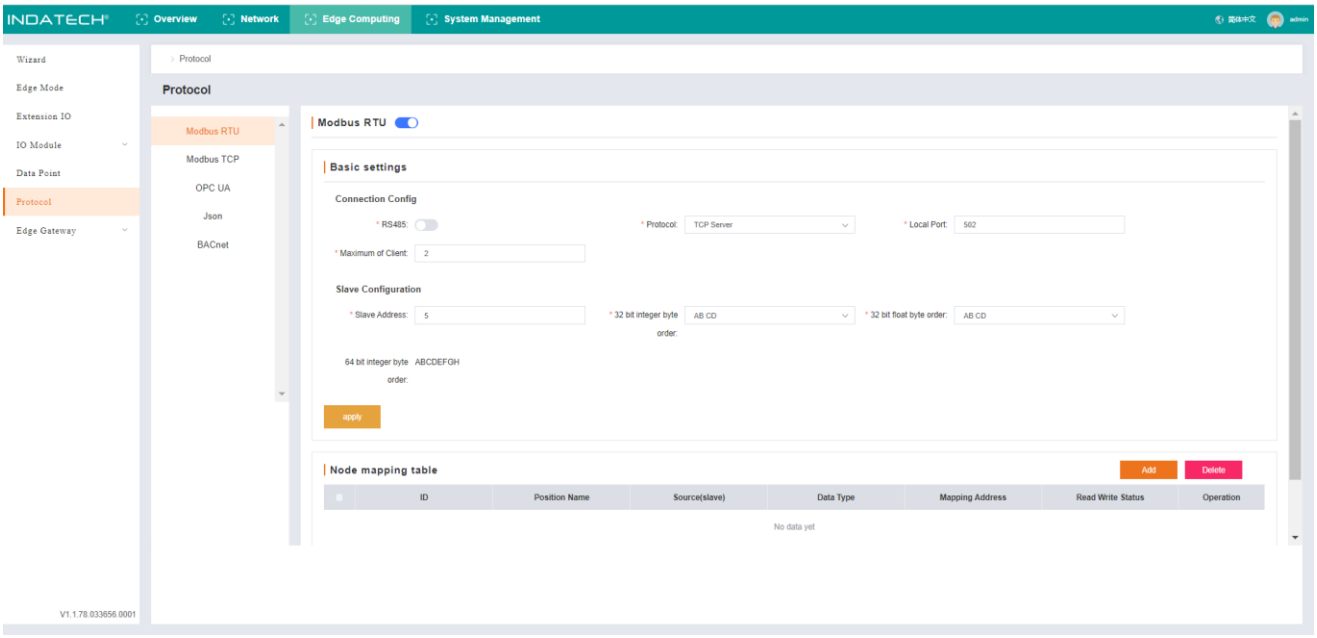


Figure 26. Modbus RTU Protocol configuration

Node mapping table:

1. Click “Add” button,
2. Select the register type and enter the initial register address,
3. Click “Add points”,
4. Select the slave just added: Modbus TCP,
5. Select the needed data points,
6. Click “Sure”
7. Reboot **SmartGate**

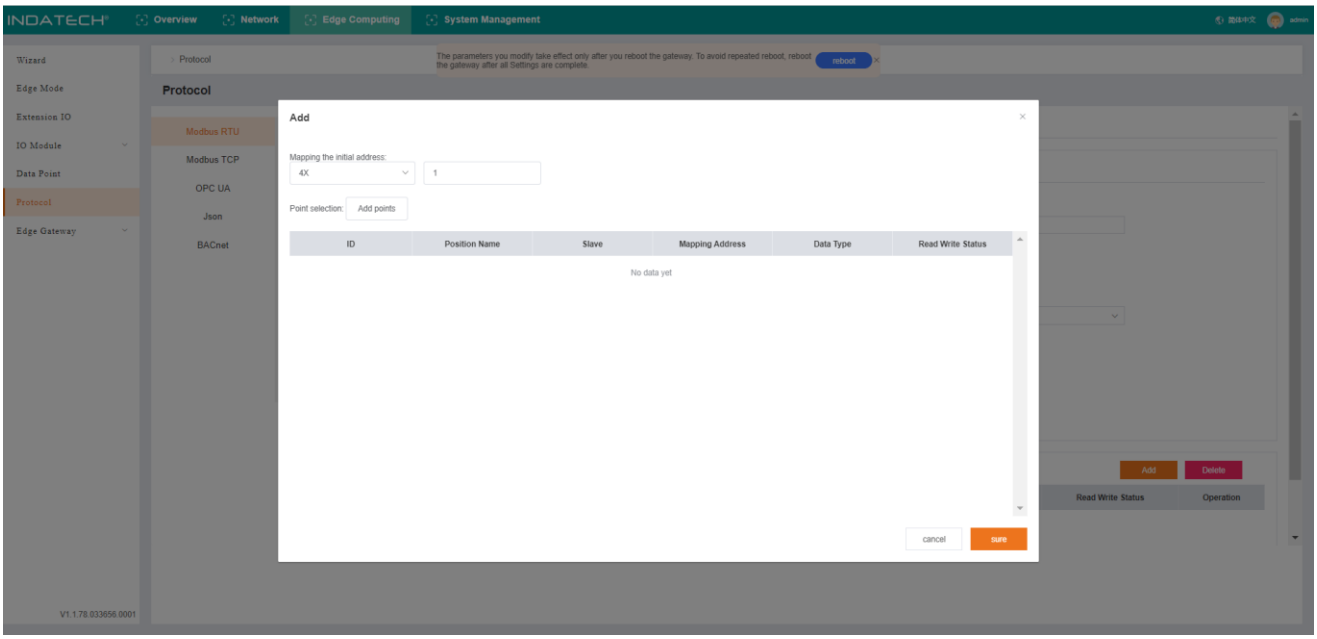


Figure 27. Add Slave - Data Point, part 1

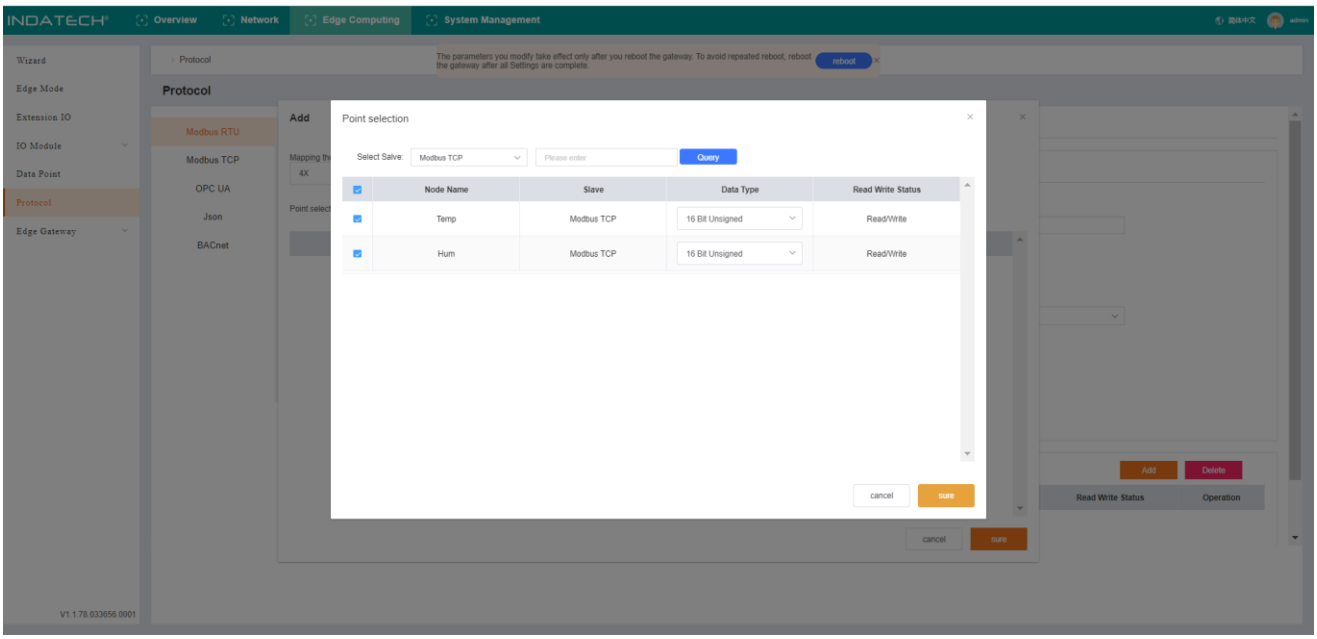


Figure 28. Add Slave - Data Point, part 2

5.6. Edge Gateway

5.6.1. Serial Port

On this page, users can set the basic parameters of UART, like baud rate, data bit, stop bit and parity bit.

For UART2, it has one more parameter: Serial Function. The default is “Downlink”.

Downlink: The device connected to the serial port is Slave device,

Uplink: The device connected to the serial port is Master device.

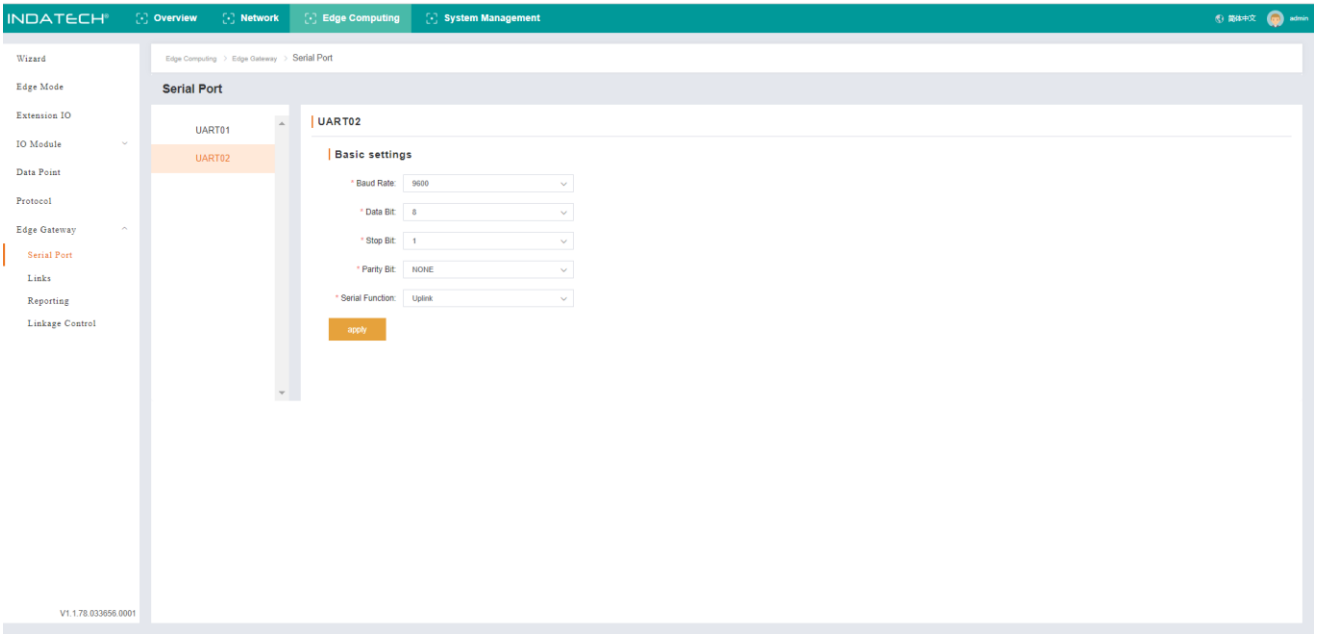


Figure 29. UART2 - Serial Function - Downlink/Uplink

5.6.2. Links

SmartGate supports 2 independent communication channels, Links. It provides multiple communication modes like TCP client/TCP server/UDP/MQTT client/http client. It has the AWS cloud built-in; users can use it conveniently. In this case, we set the communication parameters like the following picture.

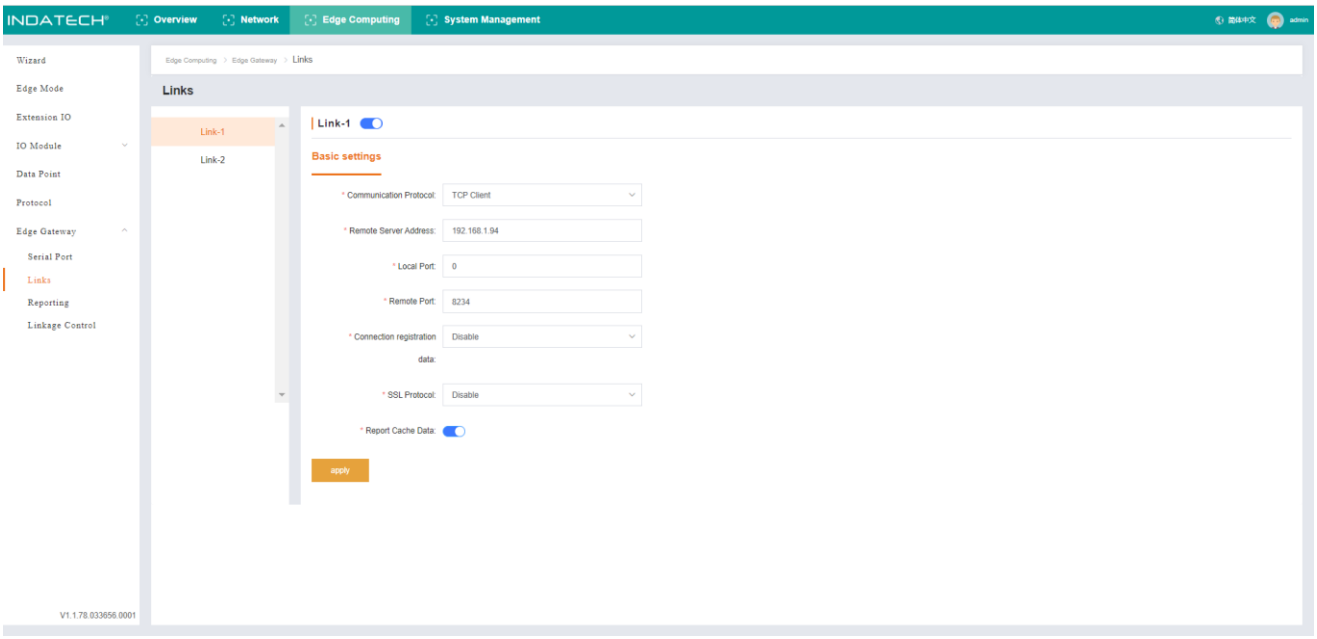


Figure 30. Links - communication channels

5.6.3. Data Query/Control

With this function, users can query and control data points via Json format. Click “Add” to add link channel, in this case, we choose the Link1.

The Json command format is like the following:

```
{
        "rw_prot": {
                "Ver": "Protocol Version",
                "dir": "Data Direction",
                "id": "Information ID",
                "r_data": [{
                        "name": "Node Name"}],
                "w_data": [{
                        "name": "Node Name",
                        "value": "data"}]
        }
}
```

Description of items:

Field Name	Description
rw_prot	Protocol Header
Ver	Protocol Version
dir	Data Direction
id	User defined parameter. The id is same in query/control and response data. Sometimes, the query/control data is high frequency, the response data may be disordered. The program in network can confirm the relevant response data by the id.

r_data	The data load for querying data
w_data	The data load for controlling data
name	The node name descripted on section 5.4
value	Means the data need to be sent to the data points described

In section 5.4, the added data points have data already, now we can collect the data to the server. Set the Network Assistant as TCP server, the local port is 8234, **SmartGate** work as TCP client to connect the TCP server.
Then send Json command to collect the temperature and Humidity data, to control the level data at the same time. User can copy the Json command sample and change the query and control command based on the sample.

5.6.4. Data Reporting

The data reporting function will report the collected data on data point page to server actively. Users can send the data in different methods.

The Reporting Template will be introduced later.

Then add the data points that need to be reported.

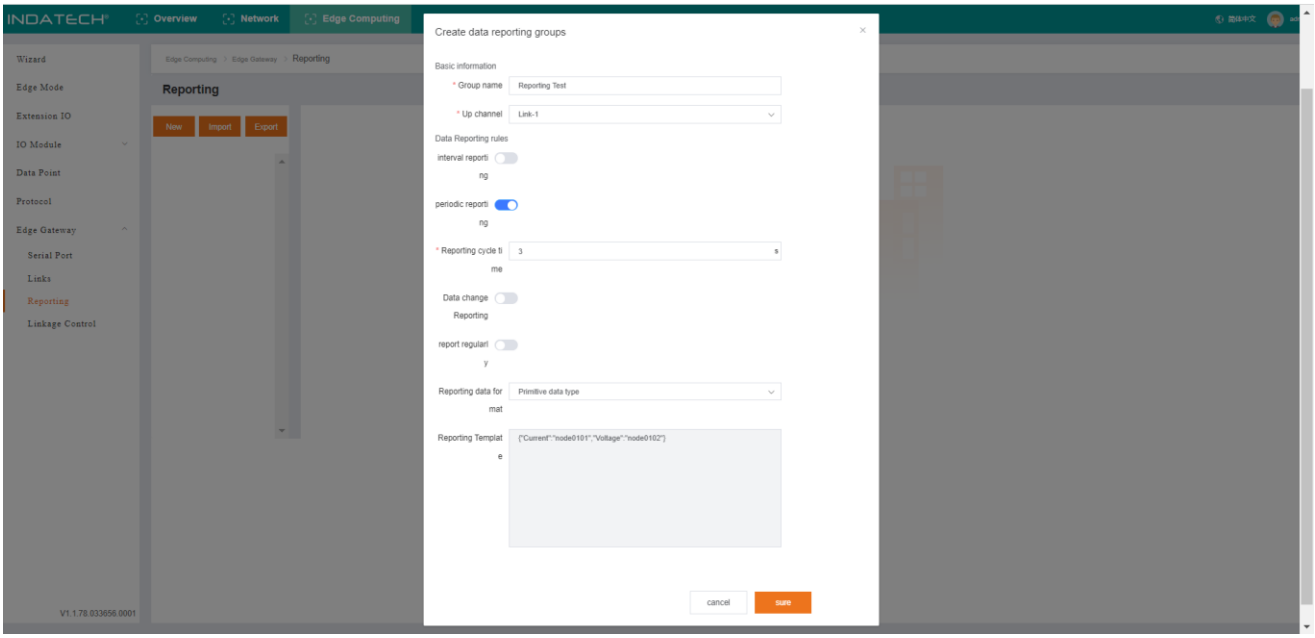


Figure 31. Data reporting - part 1

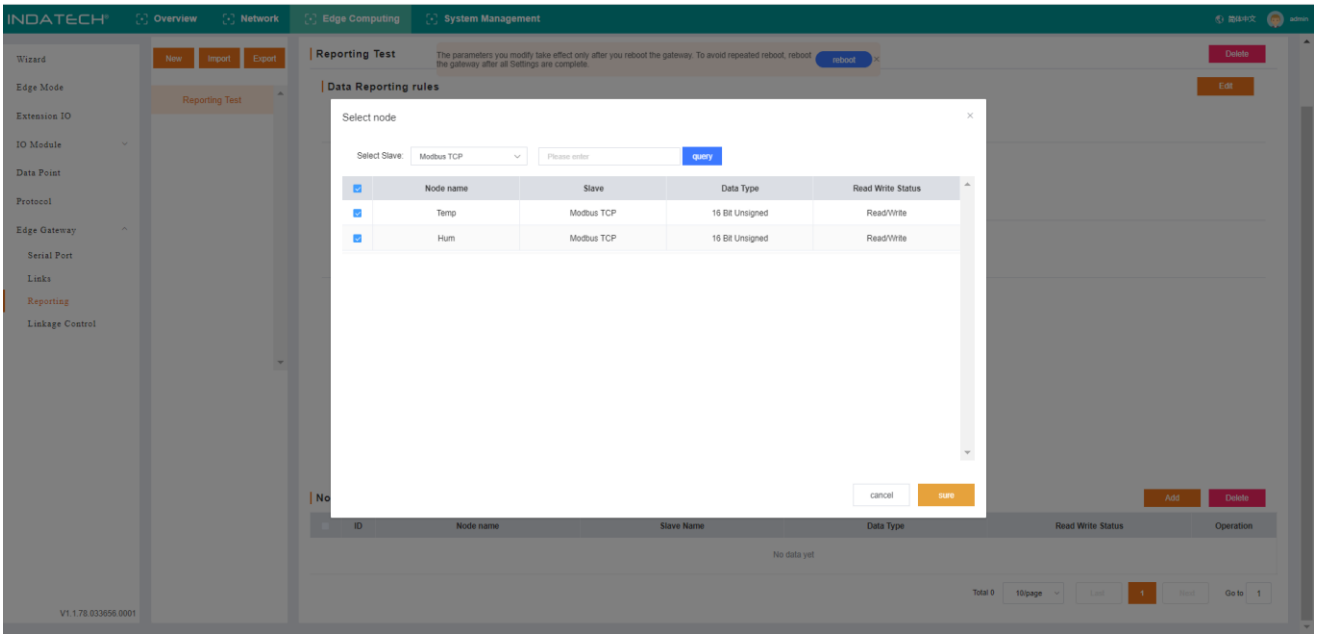


Figure 32. Data reporting - part 2

Json Template:

The data reporting function will upload point data to the server in Json format. Customers can customize the Json template according to the server's requirements to ensure that the uploaded data format meets the server's parsing requirements. The actual data points can be defined in the Json template.

In addition to data points, the Json template can also add some specific identifiers, such as the product's firmware version, SN, MAC and other parameters. These parameters can be processed as the unique identifier of the device. Directly add the relevant identification name in the value position of the Json template. During the reporting process, the device will substitute the data corresponding to the identification name and report it. For example, to report timestamp, set the Json template to {"time":"sys_local_time"},

Items	Description	Example
sys_ver	Firmware version	V1.2.06.033656.0002
sys_imei	IMEI	869387060515005
sys_sn	SN	02800724072300006941
sys_mac	MAC	XX:XX:XX:XX:XX:XX
sys_iccid	ICCID	89390100002627533239
sys_local_time	Local time	2024-10-15 23:22:31
sys_utc_time	UTC time	2024-10-15 23:22:31
sys_unix_time	Timestamp	1234567890

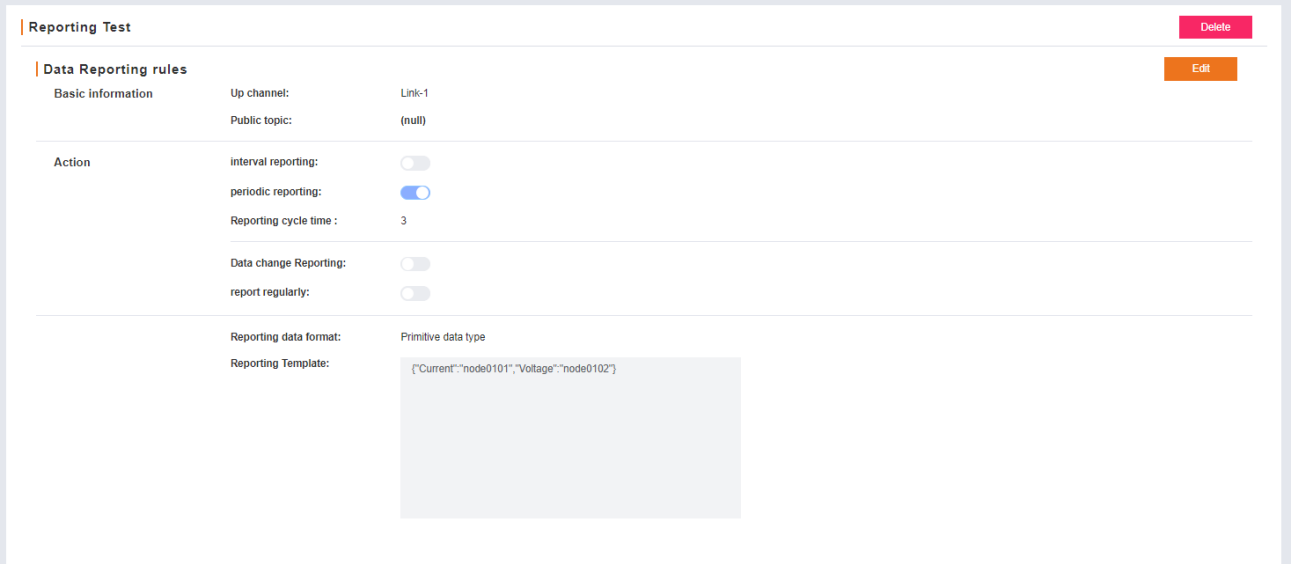


Figure 33. Json Reporting Template

The test result: **SmartGate** reports the collected data according to the period cycle time and the content of the Json template.

5.6.5. Linkage Control

The linkage function is mainly used to realize local closed-loop management, rapid alarm and emergency applications. The product can support 50 linkage events internally.

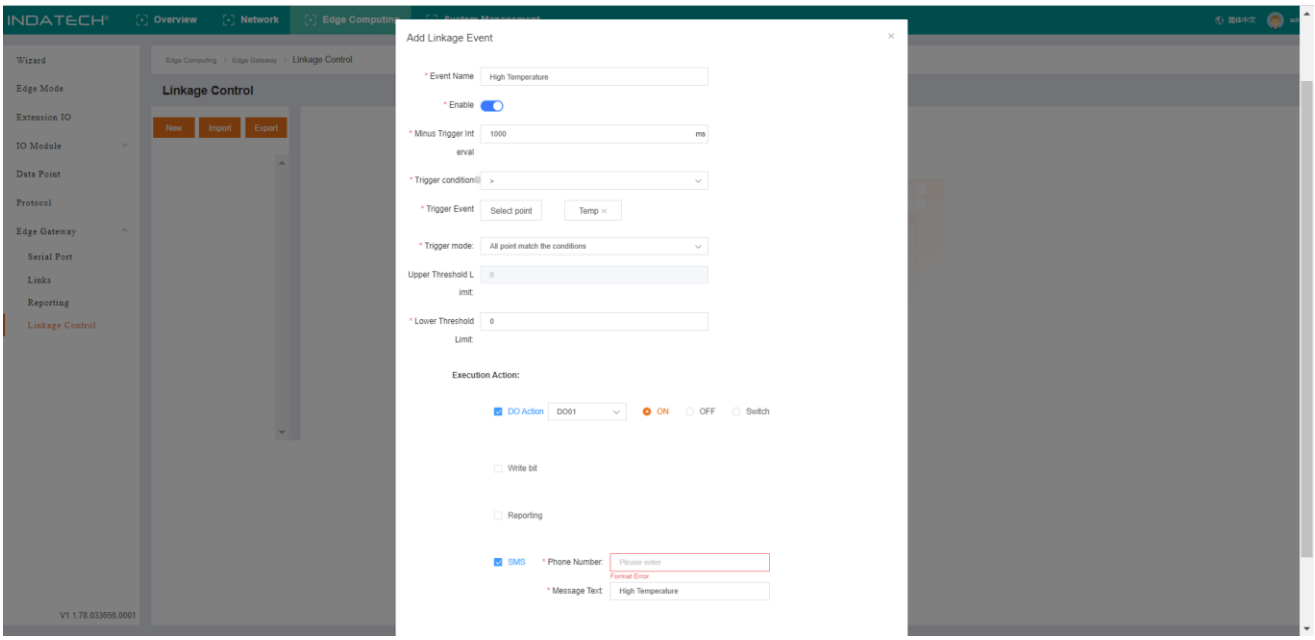


Figure 34. Linkage Control

Items	Description	Default Parameter
Event Name		None
Enable	Weather to enable the linkage control	Off
Minus Trigger Interval	When the trigger condition is met for several times in a short period, the trigger takes effect only when the interval between two triggers is greater than the set value.	None
Trigger condition	The action can be executed if the conditions are met, A total of 10 conditions are supported.	None
Trigger Event	Select the data point to start the trigger event.	None
Trigger mode	All points match the conditions, Any point matches the conditions	None
Upper Threshold Limit	The value range: 0~20000	None
Lower Threshold Limit	The value range: 0~20000	

Description of trigger condition：

Trigger condition	Description	Extro
Forward Follow	If DI is high level, DO outputs high level. If DI is low level, DO outputs low level.	Only available for coil value.
Reverse Follow	If DI is high level, DO outputs low level. If DI is low level, DO outputs high level.	Only available for coil value.
Greater than	The collected value exceeds the threshold, an action is triggered.	Only the lower of the thresholds need be set.
Equal or greater than	The collected value is greater than or equal to the threshold, an action is triggered.	Only the lower of the thresholds need be set.
Less than	The collected value is less than the threshold, an action is triggered.	Only the upper of the thresholds need be set.
Equal or less than	The collected value is less than or equal to the threshold, an action is triggered.	Only the upper of the thresholds need be set.
In the Range (Including boundary data)	An action is triggered when the collected value is within the threshold range, and an action is triggered each time the collected value is within the range.	Upper and lower limits of the thresholds need be set.
In the Range (Excluding boundary data)	An action is triggered when the collected value is within the threshold range, and an action is triggered each time the collected value is within the range.	Upper and lower limits of the thresholds need be set.
Out of the Range (including boundary data)	An action is triggered when the collected value is outside the threshold range, and an action is triggered each time the collected value is outside the range.	Upper and lower limits of the thresholds need be set.
Out of the Range (excluding boundary data)	An action is triggered when the collected value is outside the threshold range, and an action is triggered each time the collected value is outside the range.	Upper and lower limits of the thresholds need be set.

In this case, we add 2 events: High Temperature and Normal temperature,

In High Temperature, if the value of temperature is higher than 45, then turn on DO1.

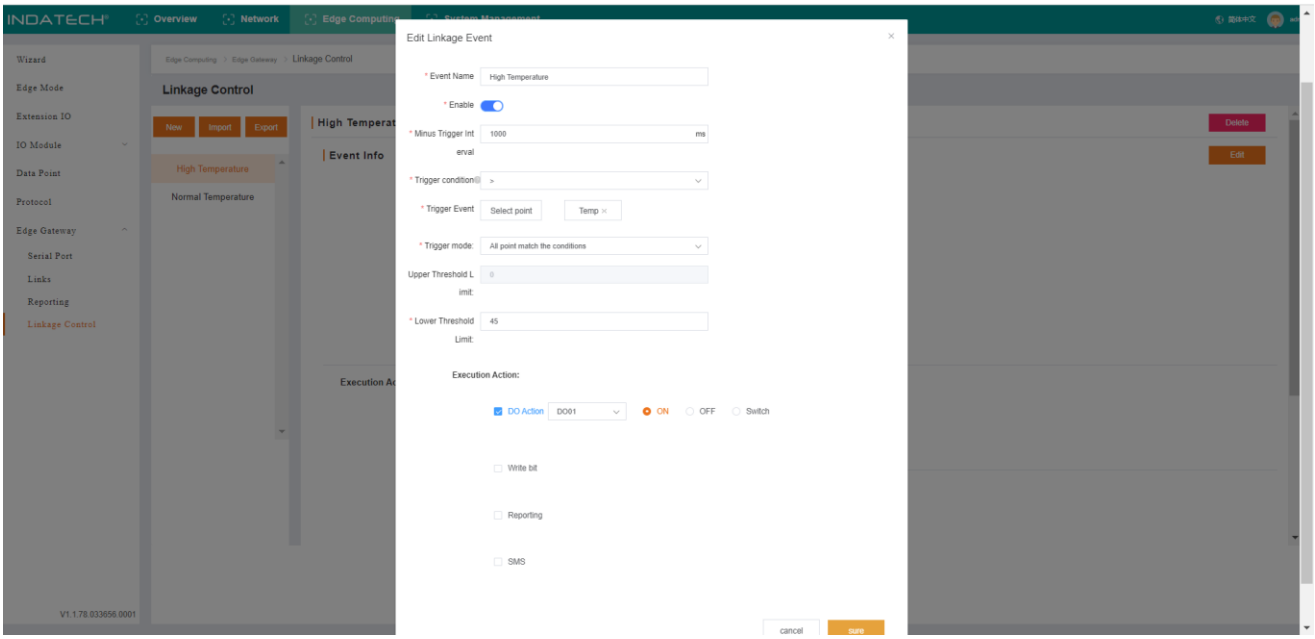


Figure 35. Linkage Control example - High Temperature

In Normal temperature, if the value of temperature is lower than 45, then turn off DO1.

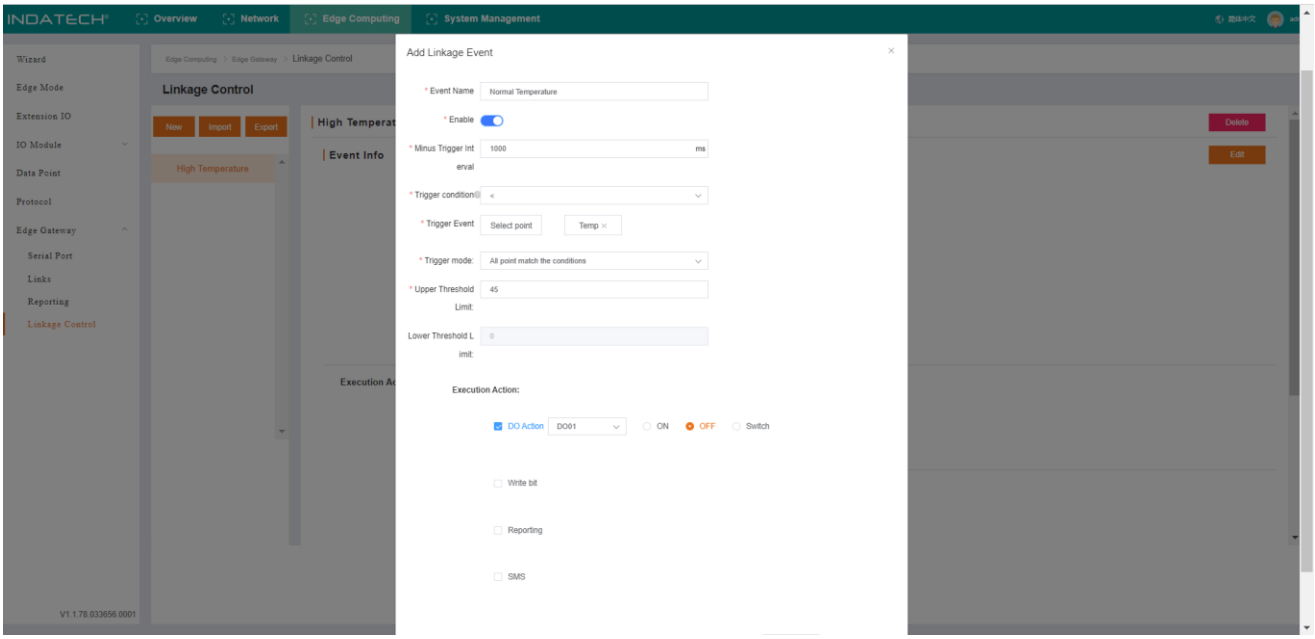


Figure 36. Linkage Control example - Normale Temperature

6. System Management

6.1. System Time

On this page, users can select Time Zone or set time manual. And can also set the NTP server.

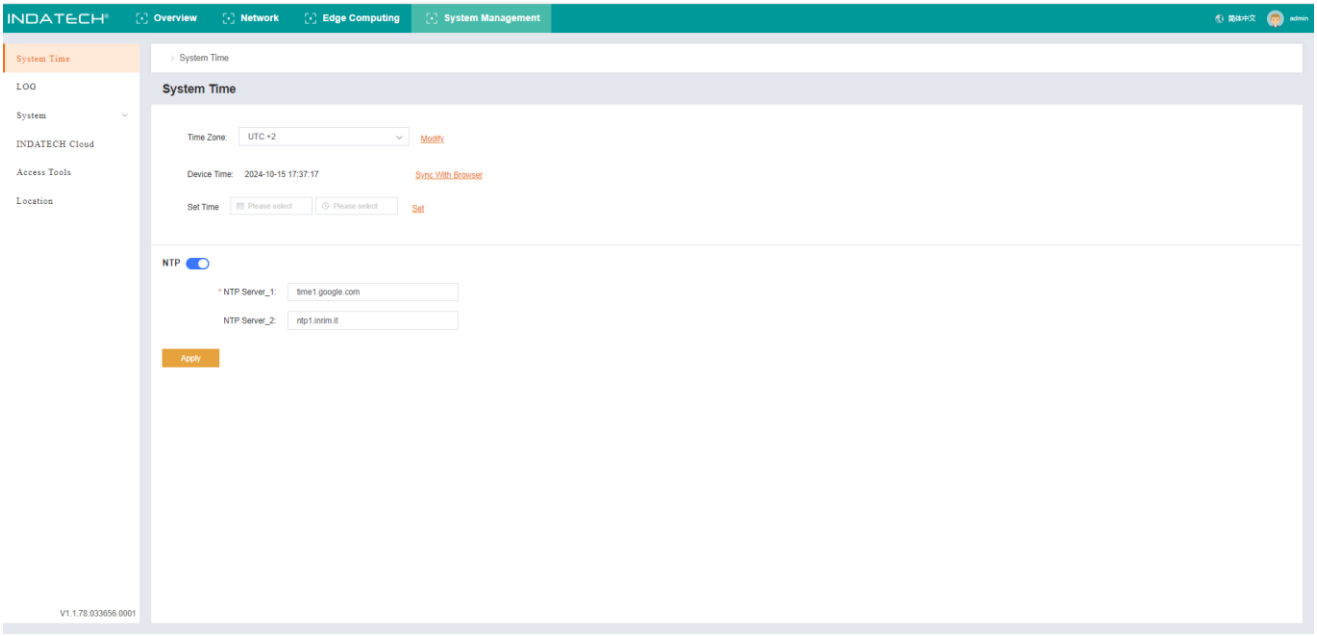


Figure 37. System Time

6.2. Log

Users can check and download log information on this page.

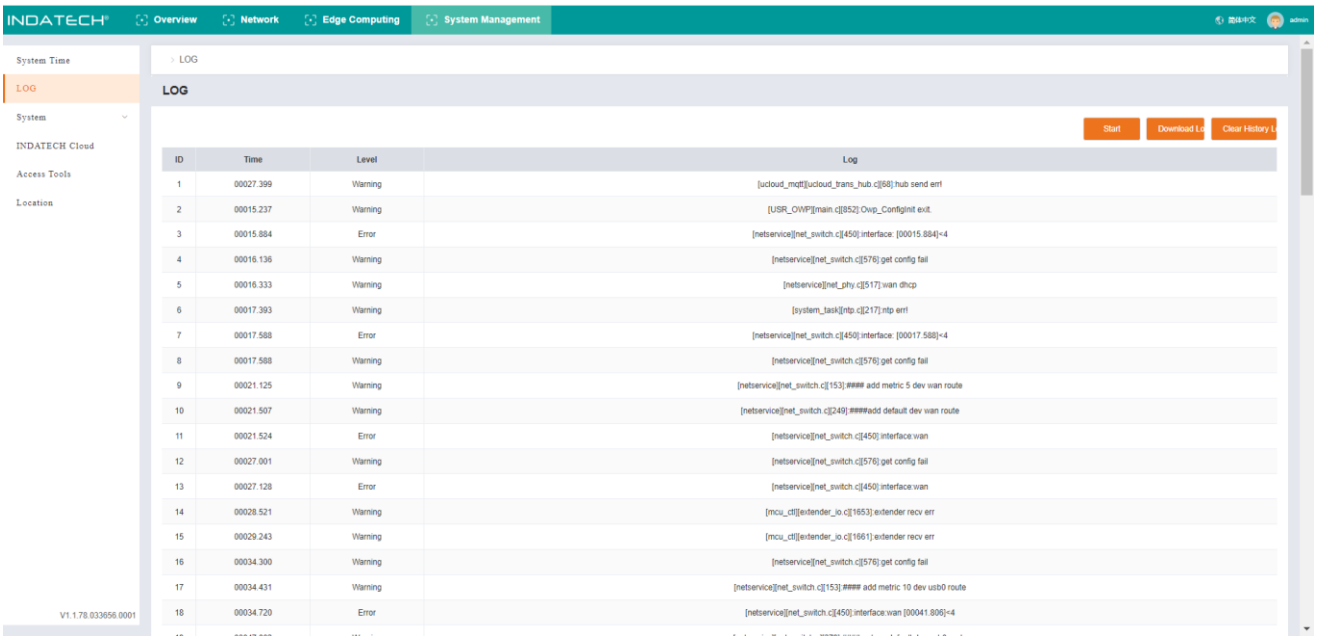


Figure 38. Logs

6.3. System

6.3.1. Configuration Management

System Config

This function mainly includes parameter export, import, and restore to factory settings. Using this function, users can quickly copy product parameters.

Edge Computing Config

The export point table will synchronously export the data point table, protocol conversion data point table, linkage control event table, and data reporting group table, and will be updated synchronously after importing.

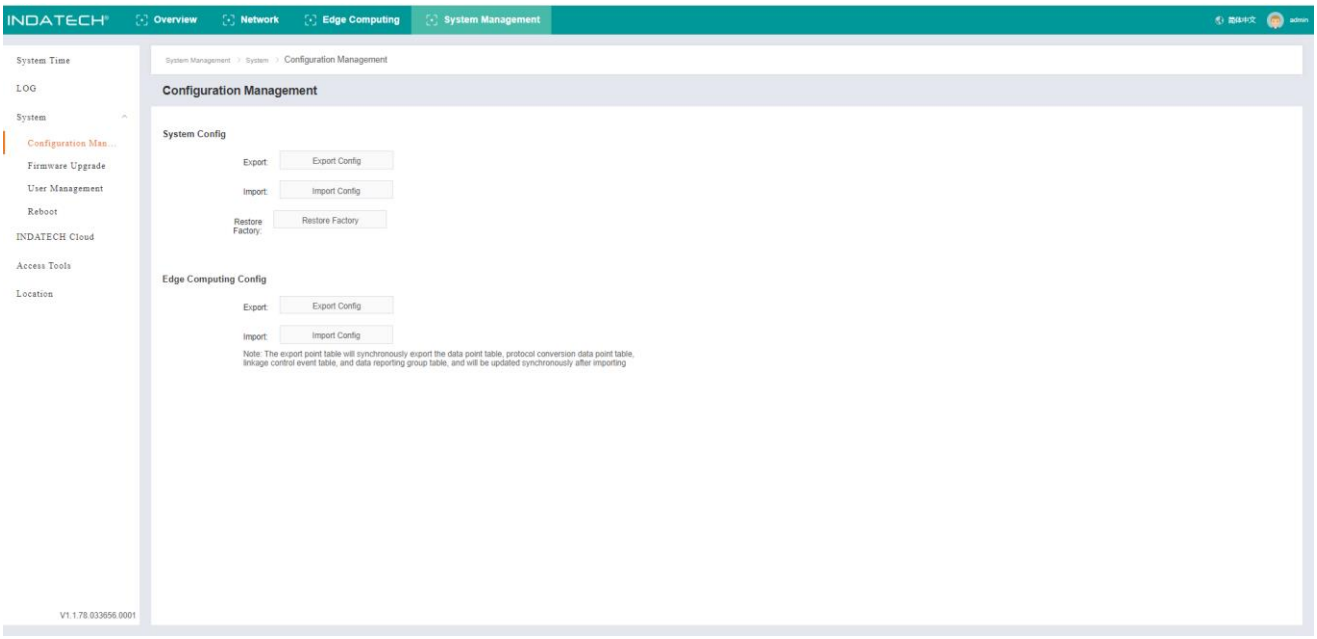


Figure 39. Configuration Management

6.3.2. Firmware Upgrade

On this page, the current firmware version is displayed, and it provides firmware upgrade operations. Select a valid firmware and click Start Upgrade to wait for the automatic upgrade of the product.

6.3.3. User Management

This function is mainly to set the username and password for logging in to the built-in web page. The username supports 4-30 characters, and the password supports 1-30 characters.

6.3.4. Reboot

Users can restart the device immediately or add a scheduled restart task and set the restart time on the same day. Restart tasks can be performed in 24 hours, accurate to the minute.

6.4. INDATECH Cloud Service - Coming Soon

This function is to facilitate customers to quickly connect to the public INDATECH platform, through which equipment maintenance can be carried out. If it is a private deployed INDATECH platform, users can enable the private deployment button and fill in the private IP address and port to connect.

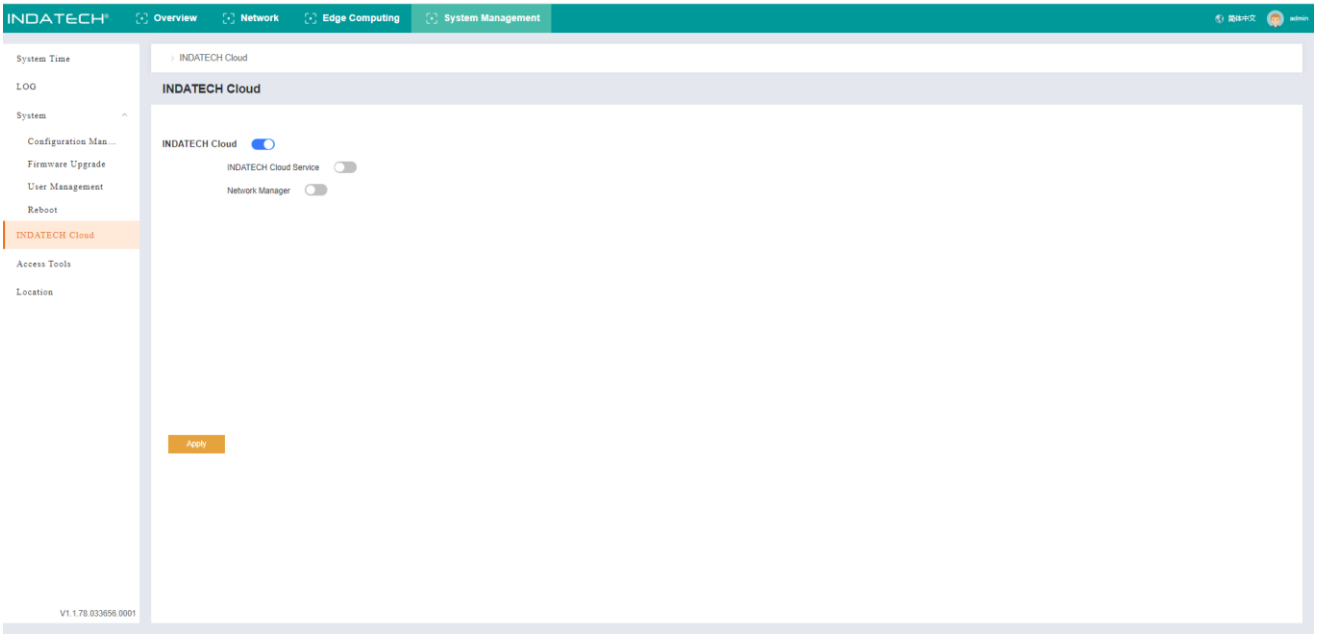


Figure 40. INDATECH Cloud service

6.5. Location

SmartGate supports both LBS location and GPS location. The location function is not enabled by default. Users can enable the LBS location or GPS location manually.

6.5.1. GNSS

Satellite: The number of satellites simultaneously observed by GPS system.
Status: “A” means successful GPS positioning,
“V” means GPS positioning failure.
Longitude: The longitude of the device's location.
Latitude: The latitude of the device's location.

Users can also send the GPS information to remote servers to achieve real-time monitoring of the **SmartGate** device.

7. Contact Us

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