# ASDU-LS Intelligent Gateway User Manual

## (V1.1)


**Heyuan Intelligence Technology Co., Ltd**

## IMPORTANT DECLARATIONS

Please read this manual carefully before the product is operated. And once you start operating the product, you'll be considered to have read this manual and accept all our terms. Heyuan shall not be responsible or liable for any damages or injuries caused by improper product installation and/or operation.

Attention: the following symbols in this manual refer to meanings as follows

The product must be installed and operated by one who has experience with high-voltage devices or has qualifications. Please connect the meter to correct voltage before operating the product. Please install and use the meter according to the user manual. Heyuan shall not be responsible or liable for any damages or injuries caused without following the instructions in the user manual.

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# Chapter 1 Product Overview

ASDU-LS Intelligent Gateway adopts industrial-grade NXP Cortex-A7 processor and loads an embedded Linux real-time multitasking operating system. It supports a variety of communication protocols and can realize the functions of information transmission, synthesis, editing, management and monitoring among various devices, such as automation equipment, smart power meters, intelligent auxiliary equipment of substation and host computer systems. It can be applied in large and demanding integrated automation system, dispatching automation system and distribution automation system etc. It is used for information interaction among intelligent electronic equipment, such as substation microcomputer, and substation host systems to achieve information exchange between remote power stations and host computer.

ASDU-LS Intelligent Gateway can also be used as the general control sub-station and the front-end processor of the integrated automation system to form the middle layer of the automatic system. It can communicate upward with each system such as master station and communicate downward with the terminal equipment in the area, which achieves the data collection and transmission of the terminal equipment. Therefore, it can completely replace the microcomputer sub-station or the front-end processor.


# Chapter 2 Functional Overview

- Communication implementation and management among all kinds of automation equipment
- Communication implementation and management among all kinds of smart power meters
- Communication implementation and management among intelligent auxiliary equipment of substation (such as DC power communication)
- Communication implementation and management for substation host computer systems
- Communication implementation and management of tele-control systems and centralized control center
- Communication inspection and monitoring for devices and equipment

# Chapter 3 Technical Parameters

### 3.1 System Parameters

Processor: 528MHz industrial-grade NXP Cortex-A7 processor
System Memory: 256M DDR3
Storage: 4GB eMMC

### 3.2 Interfaces & Extension

Ethernet: 2* independent Ethernet ports, 10/100Mbps
USB: 1*USB OTG
Serial Ports: 4* isolated RS485
CAN: 1*isolated CAN2.0
Extension: 1*Mini-PCIe (2G/3G/GPRS/4G optional)

### 3.3 Power Supply

Power Supply: DC8~36V
Power Consumption: <15W

### 3.4 Software Configuration

Linux 4.1
Embedded various communication protocols: Modbus-RTU Protocol, Modbus-TCP/IP Protocol, DL/T-645 Protocol, IEC60870-102,103,104 Protocol, MQTT Protocol, HTTP Protocol etc.
OEM&ODM protocols are available as well.

### 3.5 Ambient Requirement

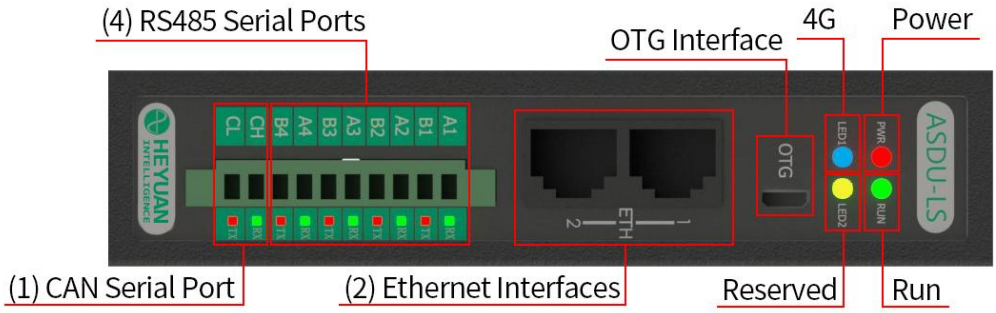
Working Temperature: -30℃~70℃, 5%~95%;
Storage Temperature: -40℃~85℃, 5%~95%;

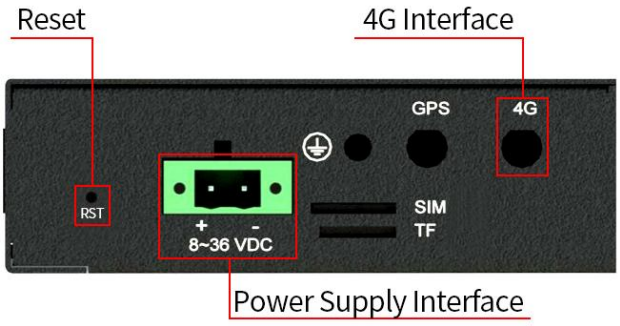
### 3.6 Installation

Din rail or rack mounting

## Chapter 4 Hardware Instruction

### 4.1 Hardware Interface




- **Indicator Lights**

Indicator lights of front power, running

| No. | Indicator Light | Functions | No. | Indicator Light | Functions |
|---|---|---|---|---|---|
| 1 | PWR | Red light, indicating power | 4 | LED2 | Yellow light, reserved |
| 2 | RUN | Green light, indicating running | 5 | RX | Indicating receiving data |
| 3 | LED1 | Blue light, indicating 4G state | 6 | TX | Indicating transmitting data |

- **USB Interface**

1*OTG for debugging

- **Ethernet Interface**

2*independent rear Ethernet interfaces, 10/100Mbps self-adaptive

- **Serial and CAN Ports**

4* isolated RS485 interfaces; 1*isolated CAN interface

| No. | Item | Function |
|---|---|---|
| 1 | A1 | 1st RS485 communication |
| 2 | B1 | |
| 3 | A2 | 2nd RS485 communication |
| 4 | B2 | |
| 5 | A3 | 3rd RS485 communication |
| 6 | B3 | |
| 7 | A4 | 4th RS485 communication |
| 8 | B4 | |
| 9 | CH | CAN communication |
| 10 | CL | |

- **Button “RST”**

1) Factory Reset:

Hold on the button”RST(Reset) and supply electricity, it will restore the factory settings.

2) Network Card Reset:

Press the button”RST(Reset) when the gateway is running, it will restore default IP address.

- **External Antenna and SIM card**

External two antenna ports(optional)

| No. | Item | Function |
|---|---|---|
| 1 | 4G | 2G/3G/GPRS/4G antenna |
| 2 | GPS | GPS antenna |
| 3 | SIM | Standard SIM card for 4G |

- **TF**

Extensible TF card

- **Power Supply**

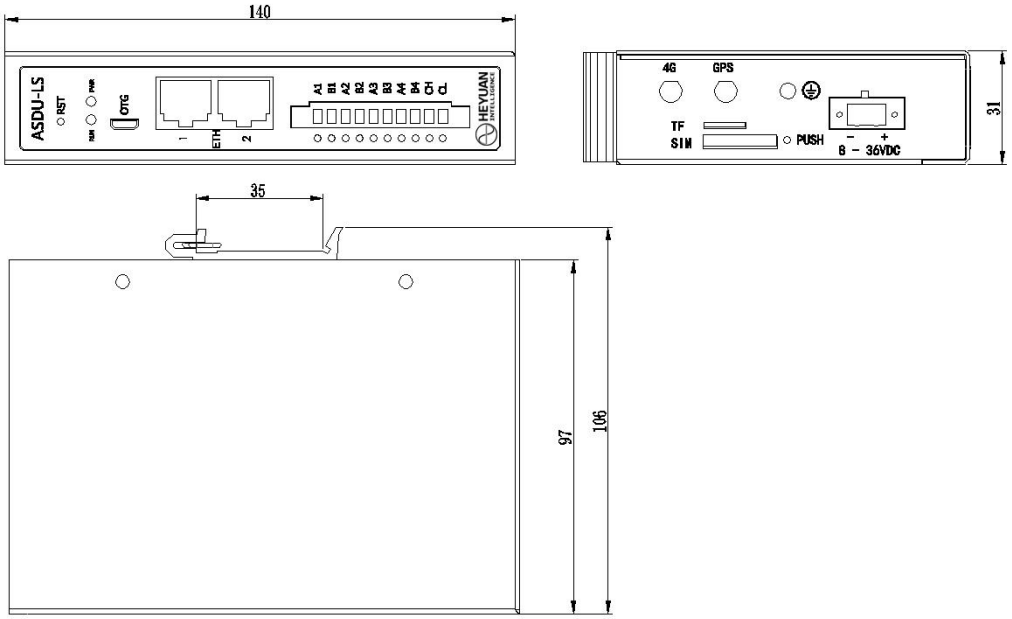
Power Supply: DC8~36V

"-" connected to the negative pole of power supply, "+" connected to the positive pole of power supply.

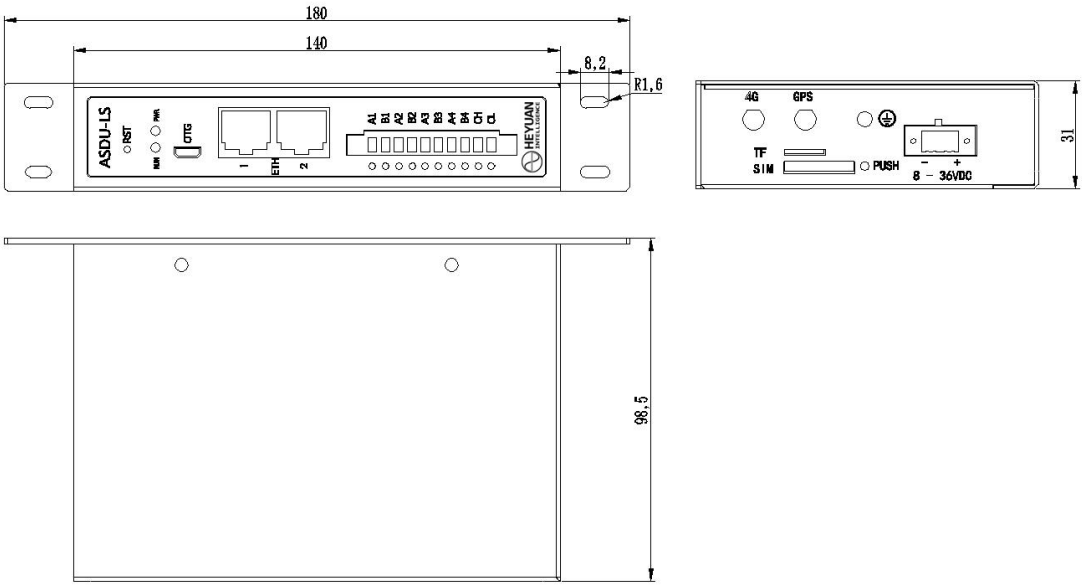
# Chapter 5 Dimension & Installation

## 5.1 Dimension

### A. Din-rail Mounting Dimension (Unit: mm)




### B. Rack-mounting Dimension (Unit: mm)




## 5.2 Installation

### 5.2.1 Inspection Before Installation

Generally, open-case inspection is forbidden because ASDU-LS Intelligent Gateway is well

manufactured and highly integrated without any adjustable devices. Before power supply, it is required to check whether the device and appearance are intact or not, whether terminals are tight or not, whether parameters labeled on nameplate comply with the requirements or not, whether power connection is correct or not, whether input voltage is correct or not.

### 5.2.2 Power-on Inspection

ASDU-LS Intelligent Gateway will start working once it is power on. The power indicator light “PWR” lights up and the run light “RUN” flashes regularly, which shows power is correctly on and ASDU-LS is working normally.

## Chapter 6 Key Performance Indicator

### 6.1 Capacity for ASDU-LS Intelligent Gateway

| Item | | Unit | System Capacity |
|---|---|---|---|
| Quantity of Connected Smart Devices | quantity of simultaneously connected smart devices for each communication interface | set | 32 |
| Historical Data Storage Capacity | historical data storage time | day | 7 |

### 6.1 System Reliability Indicators

| Item | Unit | System Parameters |
|---|---|---|
| Telemetry Accuracy | % | 100 |
| Telecontrol Accuracy | % | 100 |
| Energy Accuracy | % | 100 |
| Control and Operation Accuracy | % | 100 |
| Mean Time Between Failures | h | ≥20000 |

## Chapter 7 Running Configuration Requirement

### 7.1 Hardware Environment Requirement

#### 7.1.1 Intelligent Gateway Programs: Minimum Configuration List

| No. | Item | Configuration Parameters |
|---|---|---|
| 1 | CPU | single-core Cortex-A7, 500MHz |
| 2 | Memory | 256MB DDR3 |
| 3 | Disk | 2GB EMMC |
| 4 | Network Card | 2* independent Ethernet |

#### 7.1.2 Host Computer Programs: Minimum Configuration List

| No. | Item | Configuration Parameters |
|---|---|---|
| 1 | CPU | 13 2GHz |
| 2 | Memory | 2G |
| 3 | Disk | 500T |
| 4 | Network Card | 100/1000M, self-adaptive |

### 7.2 Software Environment Requirement

#### 7.2.1 Intelligent Gateway Programs

| No. | Item | Configuration Parameters |
|---|---|---|
| 1 | Operating System | Linux 4.1 ubuntu 16.04 |
| 2 | Database | Sqlite3 |

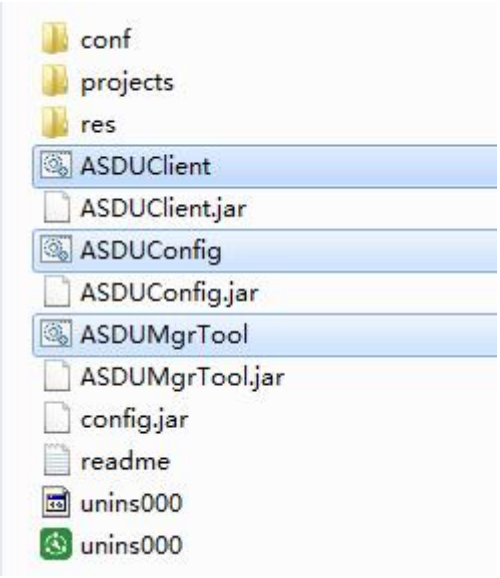
#### 7.2.1 Host Computer Programs

| No. | Item | Configuration Parameters |
|---|---|---|
| 1 | Operating System | Windows x86/x64 |
| 2 | Database | Sqlite3 |

## Chapter 8 Configuration Tool Installation

### 8.1 File content

ASDUMgrTool.jar is the gateway management tool;
ASDUConfig.jar is data configuration tool;
ASDUClient.jar is real-time monitoring & debugging tool.
Please don't delet the files for keeping the tool work normally.




### 8.2 Working Environment

System: windows、MAC、Linux etc, 32-bit or 64-bit is ok.
Note: IEC algorithm function only supports Windows 7 systems and above.
Minimum resolution: 1280 * 720
JAVA environment: support JDK( or JRE)1.8 version and above, if it is windows version, the user can directly install the installation package with a running environment, or visit the official website to download the suitable running environment (this software supports 32-bit or 64-bit).
The Java official website: https://java.com/en/download/manual.jsp

**Windows system 64-bit version:**

Windows | Which should I choose?

| | | |
|---|---|---|
| Windows Online filesize: 1.97 MB | Instructions | After installing Java, you may need to restart your browser in order to enable Java in your browser. |
| Windows Offline filesize: 65.52 MB | Instructions | |
| Windows Offline (64-bit) filesize: 73.73 MB | Instructions | |

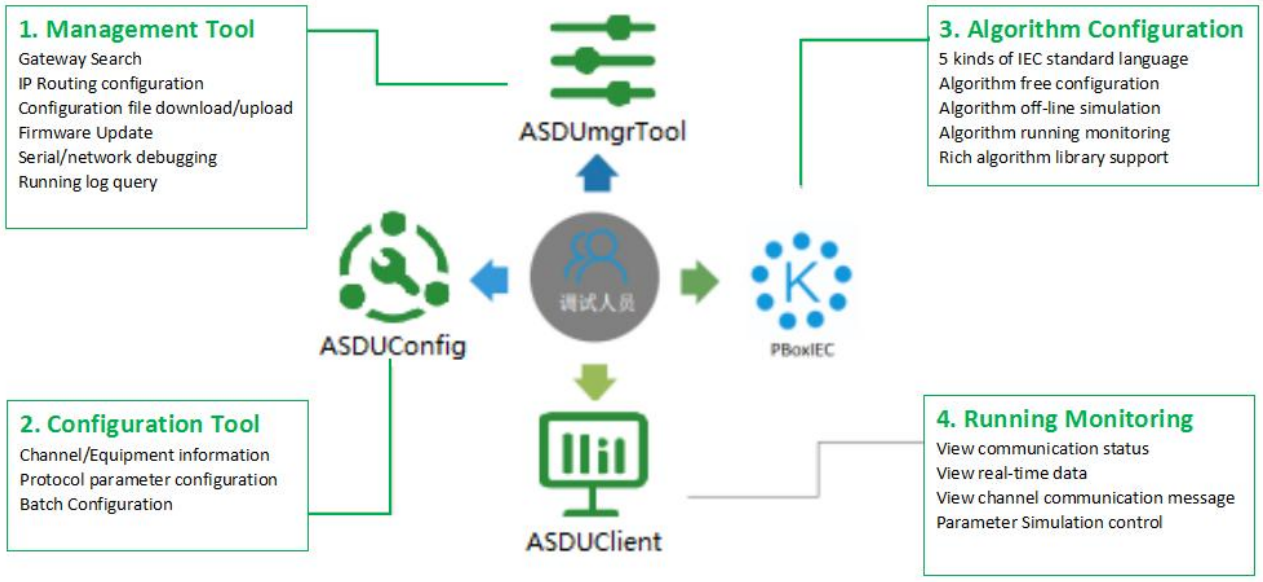
**Linux system 64-bit version:**

Linux

| | | |
|---|---|---|
| Linux RPM filesize: 68.41 MB | Instructions | After installing Java, you will need to enable Java in your browser. |
| Linux filesize: 84.22 MB | Instructions | |
| Linux x64 filesize: 83.49 MB | Instructions | |
| Linux x64 RPM filesize: 67.6 MB | Instructions | |

# Chapter 9 Configuration Software

## 9.1 Software Tool Introduction




1. Management Tool: ASDUMgrTool

Search for gateways within the LAN;

IP/routing configuration for the gateway;

Configuration file download/upload;

Serial port/network debugging;

Log query;

Firmware upgrade;

Clock synchronization, etc.

2. Configuration Tool: ASDUConfig

Management of collection, forwarding, and computing points;

Management of channels, devices, test points, and scripts

3. Algorithm Configuration Tool: ASDUIEC

Algorithm configuration programming, building logic for automatic calculation.

After the construction is completed, it can be compiled and simulated to confirm whether the algorithm is correct. The algorithm will not take effect until it is compiled and downloaded to the gateway.

4. Running Monitoring Tool: ASDUClient

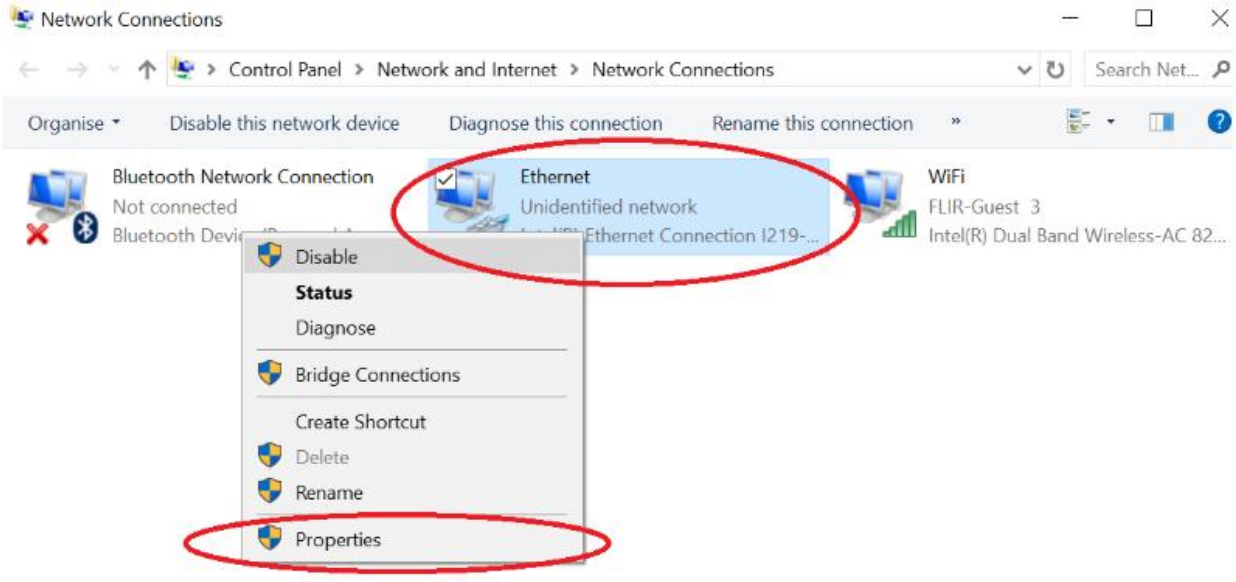
View the configured files and download to the gateway. Through this tool, the user can view the real-time data/channel communication message. The tool is used for visually checking the correctness of data configuration, algorithm calculation, etc.

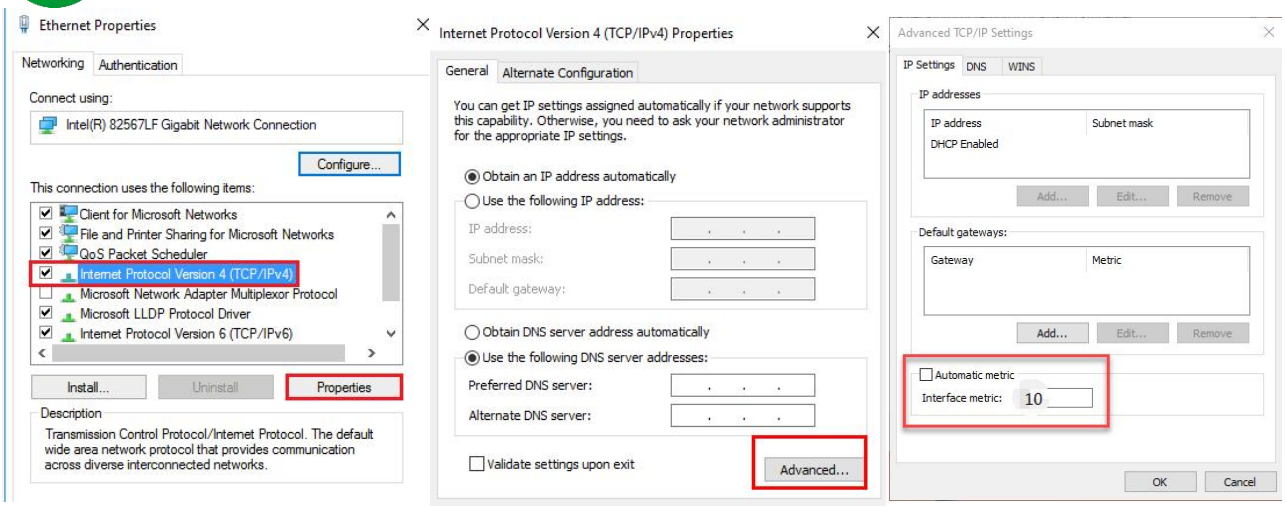
### 9.2 Configuration Step

**Step 1: IP setting**

Use the managemet tool(ASDUMgrTool) to search all equipments within the LAN.

Note: if the gateway cannot be searched, the user can release this process ASDUMgrTool in the computer firewall settings or temporarily close the firewall. If you still cannot find it, you can set the interface metric of the network card connected to the gateway to manual, 10 is ok, as shown in the following figure:






After searching for a gateway, please modify the IP of the user computer to ensure that the computer IP is in the same network segment as the gateway IP, and perform a PING test through the CMD command.

After the PING is enabled, the user can continue other operations on the gateway.

**Step 2: Parameter configuration**

Use the configuration tool(ASDUConfig) to set parameters:

Select protocols, build measuring points/ transfering points etc.

After all configuration is finished, please save it.

**Step 3(optional):**

Use the Algorithm Configuration Tool(ASDUIEC) to realize automatic control of algorithms and logic operations, automatically calculate requirements, support graphical algorithm simulation, and verify the correctness of algorithm execution. After the algorithm is built, save and compile it.

**Step 4: Restart Gateway**

Use the managemet tool(ASDUMgrTool) to download the configured file, then restart the gateway.

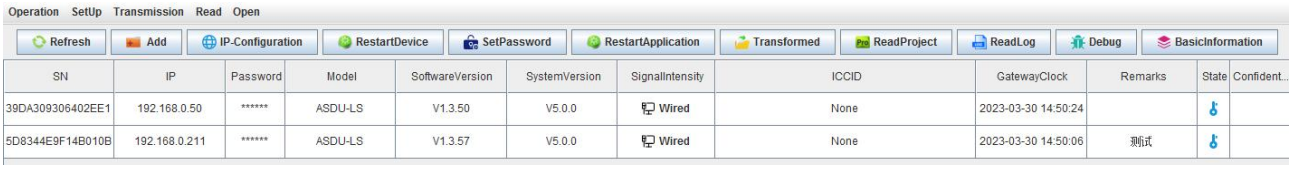
**Step 5:View &Monitor**

Use the Monitoring Tool( ASDUClient), input the gateway IP. After connecting, the gateway will shown the real-time data. The time will automatically refresh.

The user can manually control each controllable point. If the data is wrong, the user can view the communication messages during the collection or forwarding process. For some common errors, such as wrong CRC and connection failure, a prompt will be provided.

# Chapter 10 Management Tool

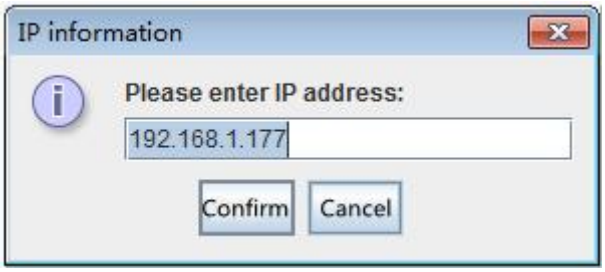
## 10.1 Screen Display



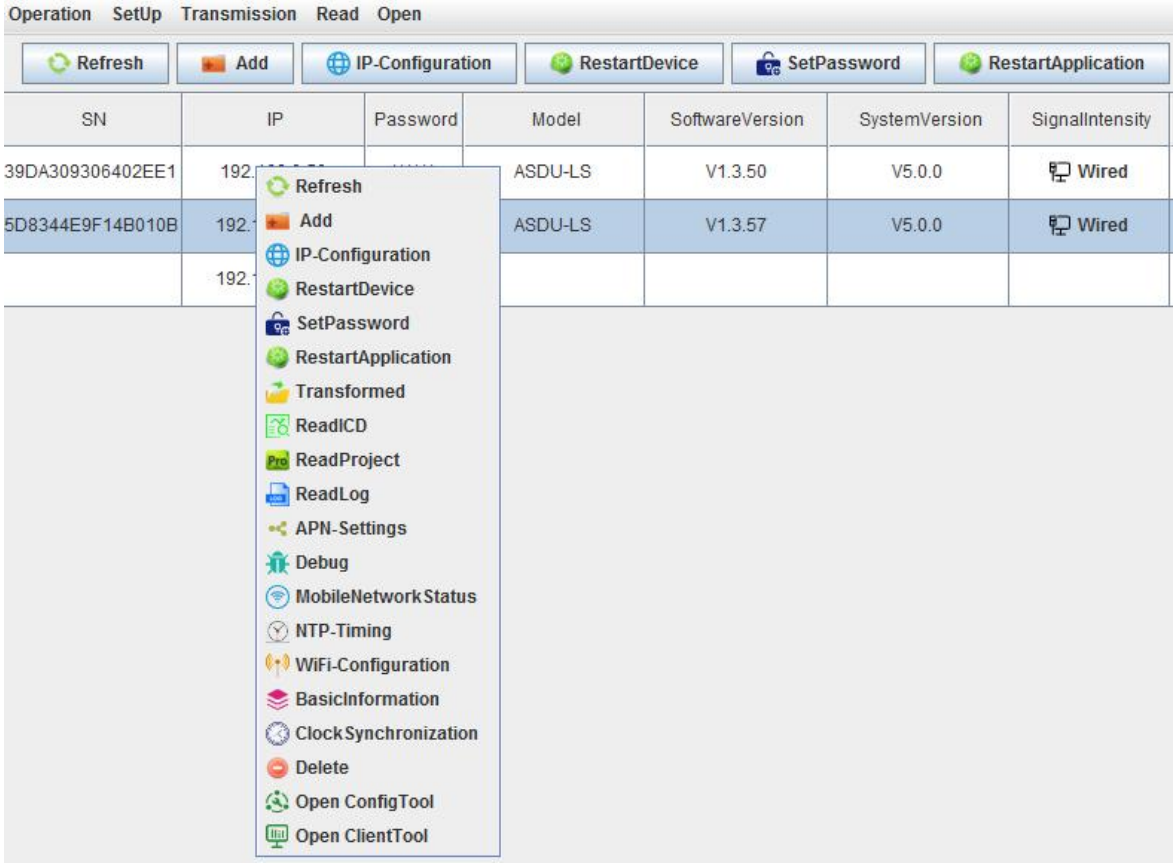

## 10.2 Refresh and Add

Double click the managemet tool(ASDUMgrTool), it will automatically search for gateways within the LAN. If there is no any data in the gateway list, please click “refresh” to search gateways manually.

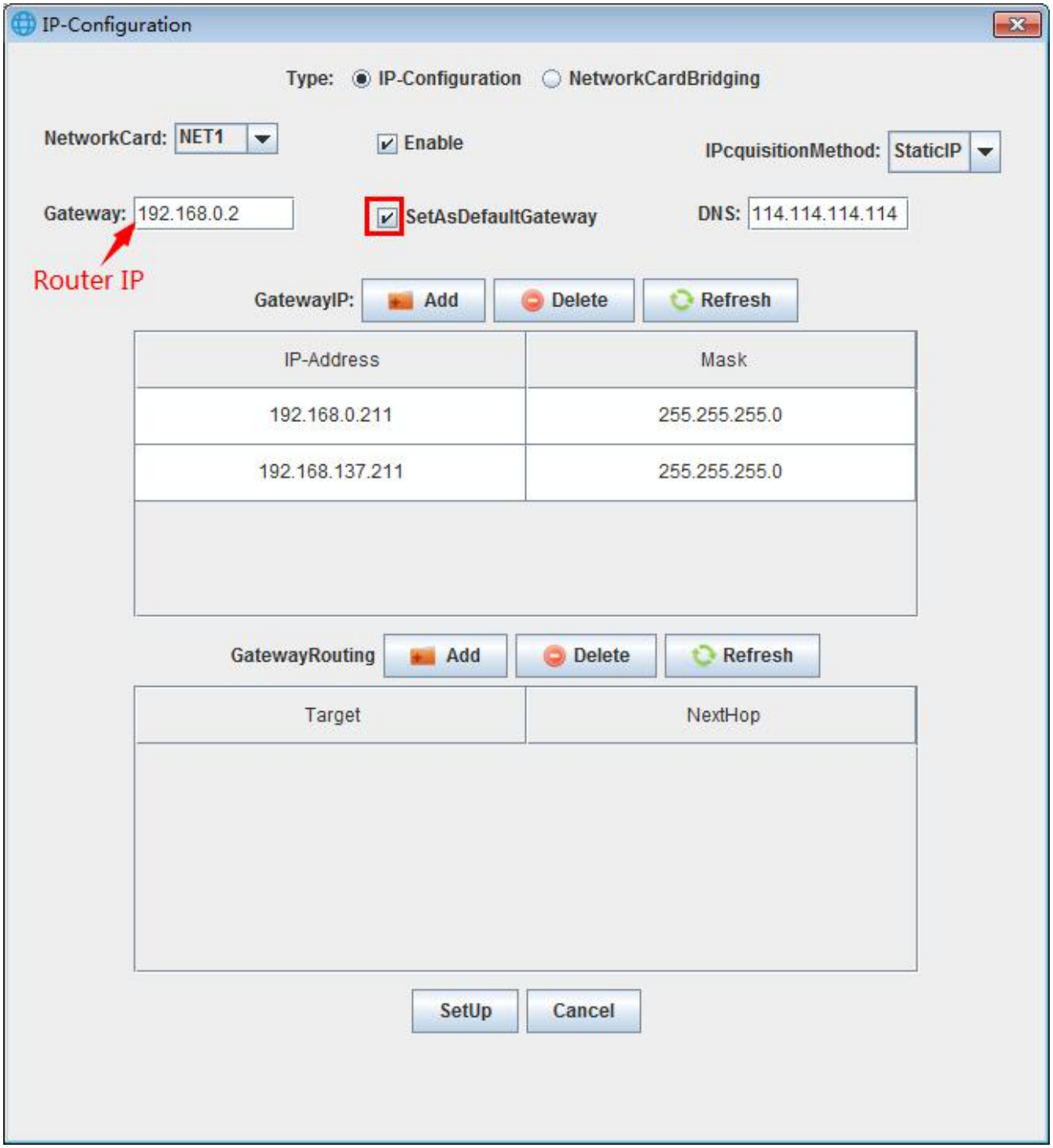
The user can also click “add” to build a new gateway, and input the IP address.




Right click on the selected gateway to view more details.



### 10.3 IP-Configuration




Properties introduction:

Network Card: refers to the Ethernet port settings.

Only one network card can be configured at a time.

IP Acquisition method: please select the “static IP”.

Gateway: here it refers to the router IP address within the LAN, not the device ASDU-LS.

Set as default gateway:

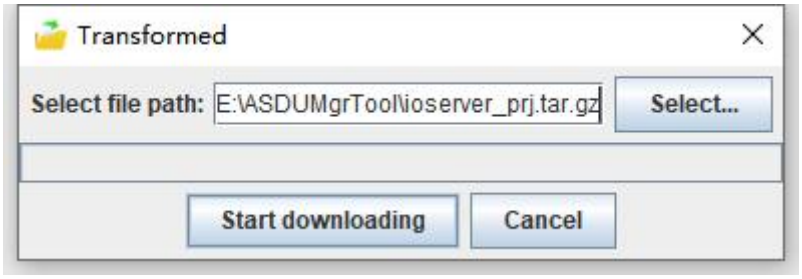
DNS: please keep the default setting.

Gateway IP(ASDU-LS IP): the max IP QTY is 10.

Gateway Routing:the max QTY is 10.

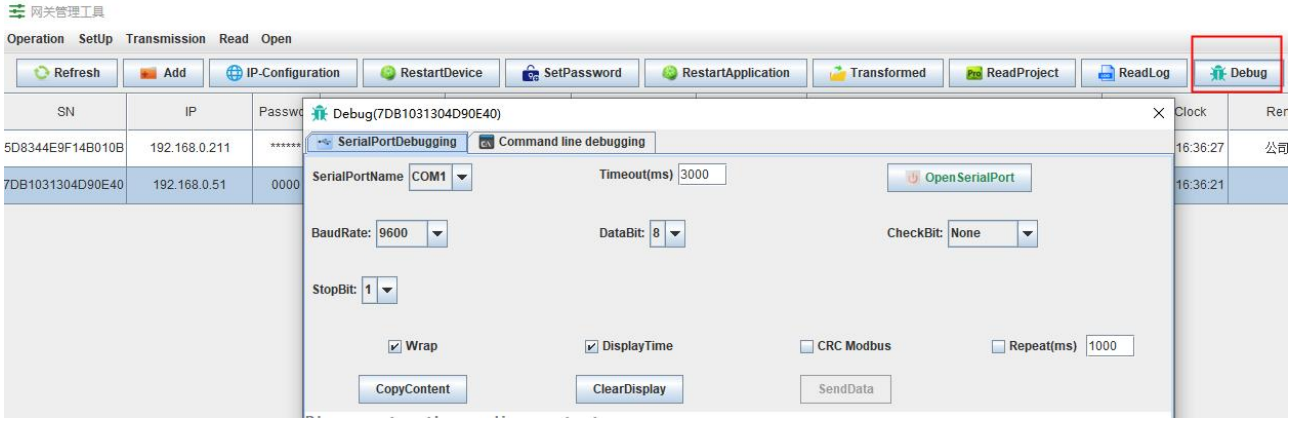
### 10.4 Restart and Transformed

Click “Transformed”, select the file path, after the downloading, please restart the device.

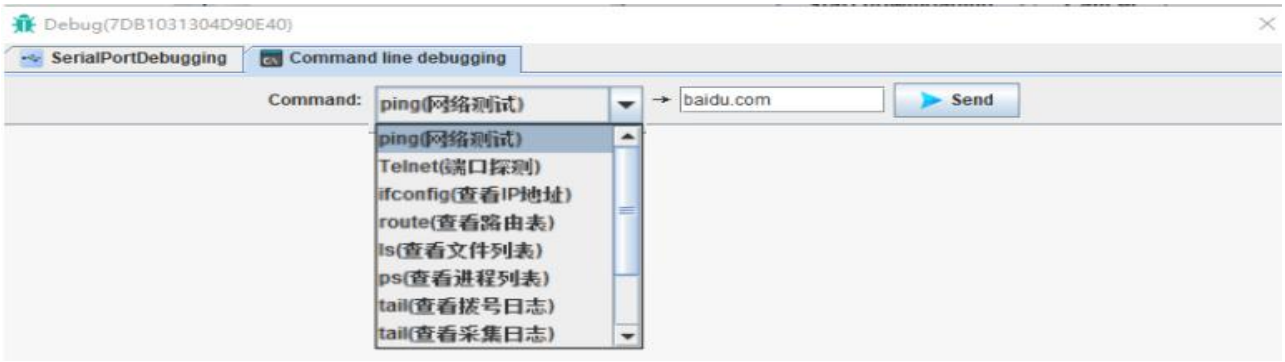




### 10.5 Debug

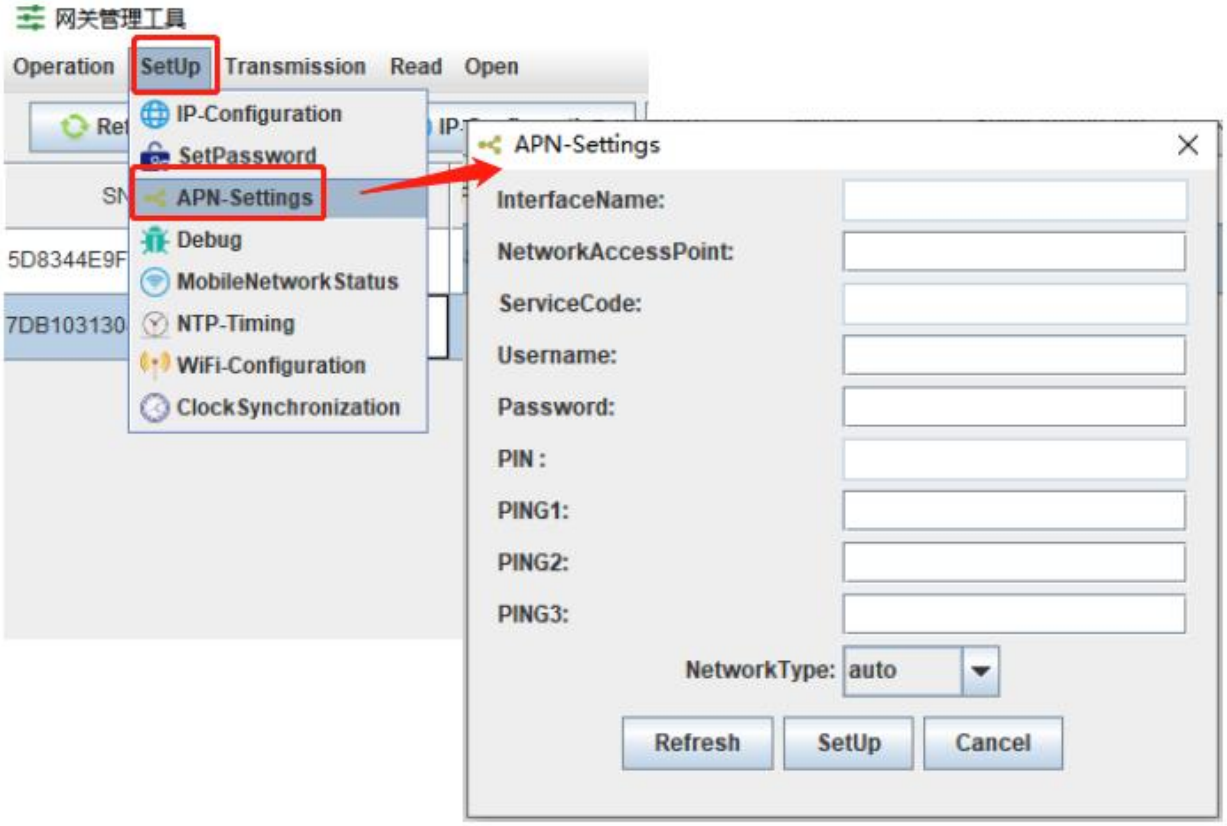
Click “Debug” to set parameters



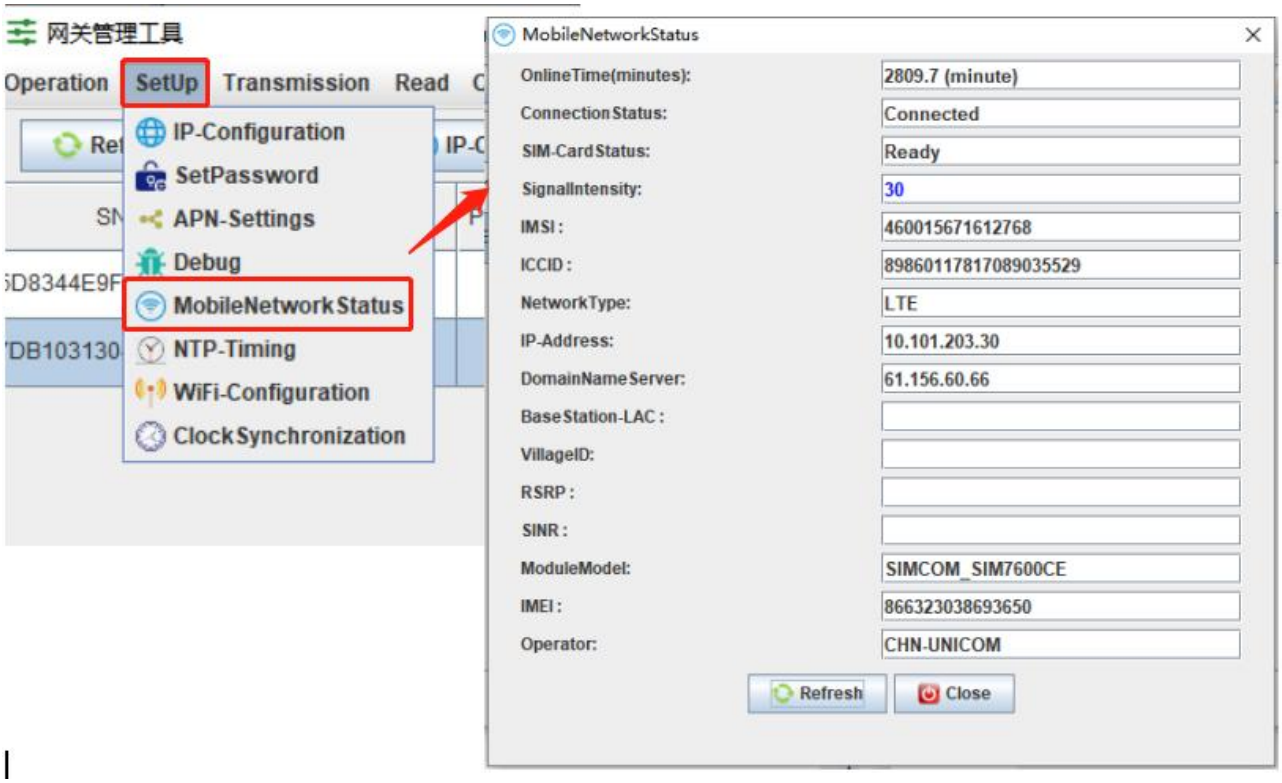

Select command line debugging to perform network testing, view logs, and other operations.



## 10.6 APN setting&Mobile Network Status

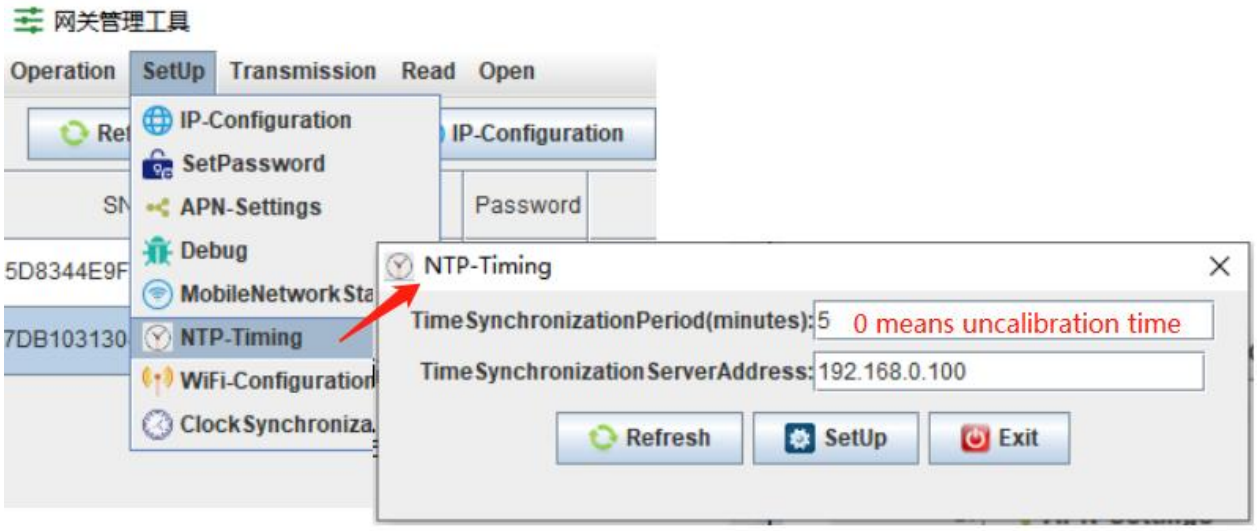



Mobile Network status



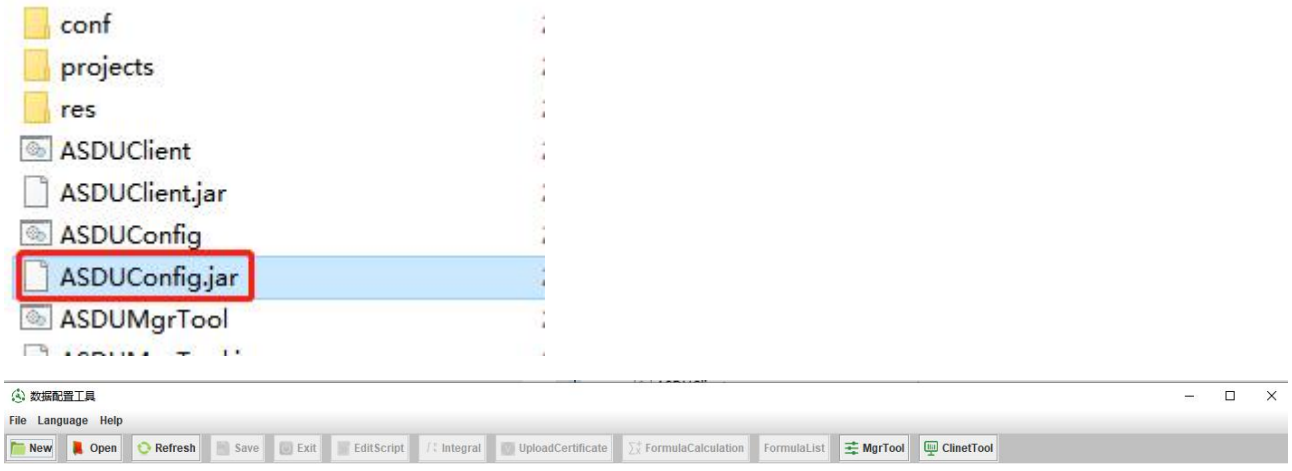
### 10.7 NTP Timing Setting

If ASDU-LS is in an intranet environment, the user can set time by the NTP timing button;
If ASDU-LS can access to external network, it can automatically calibrate the time.

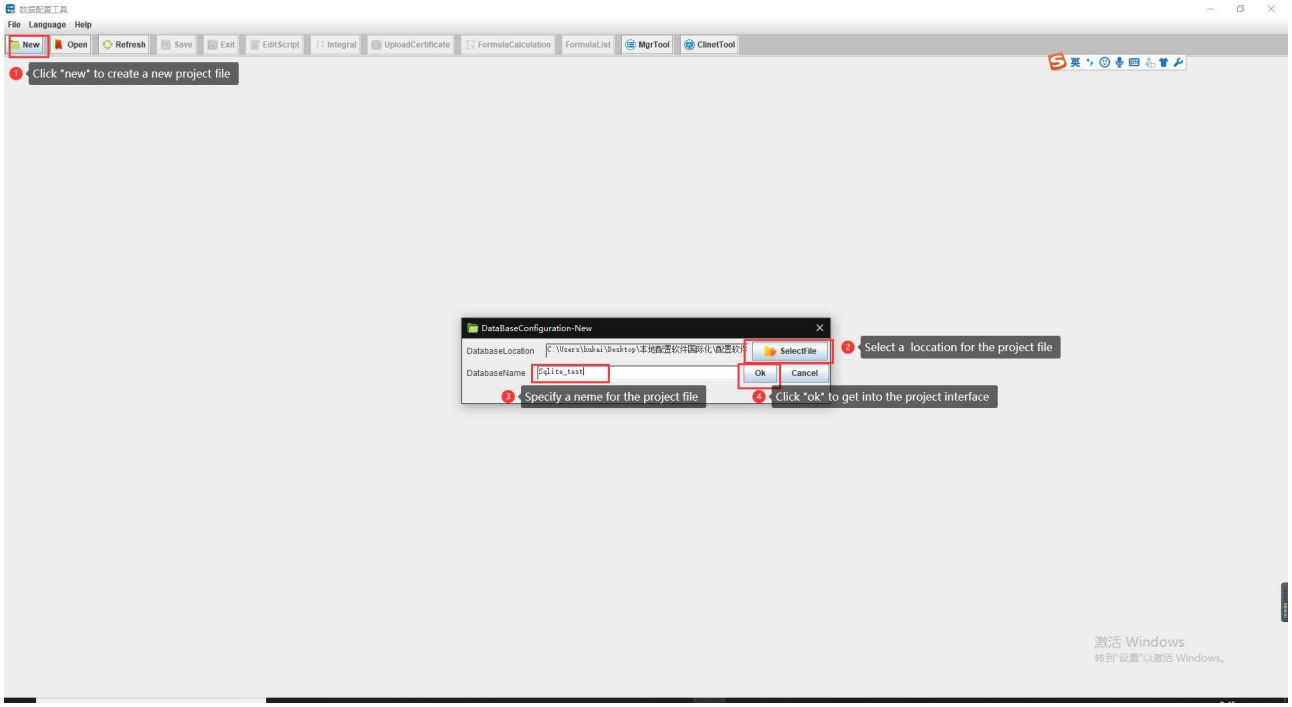


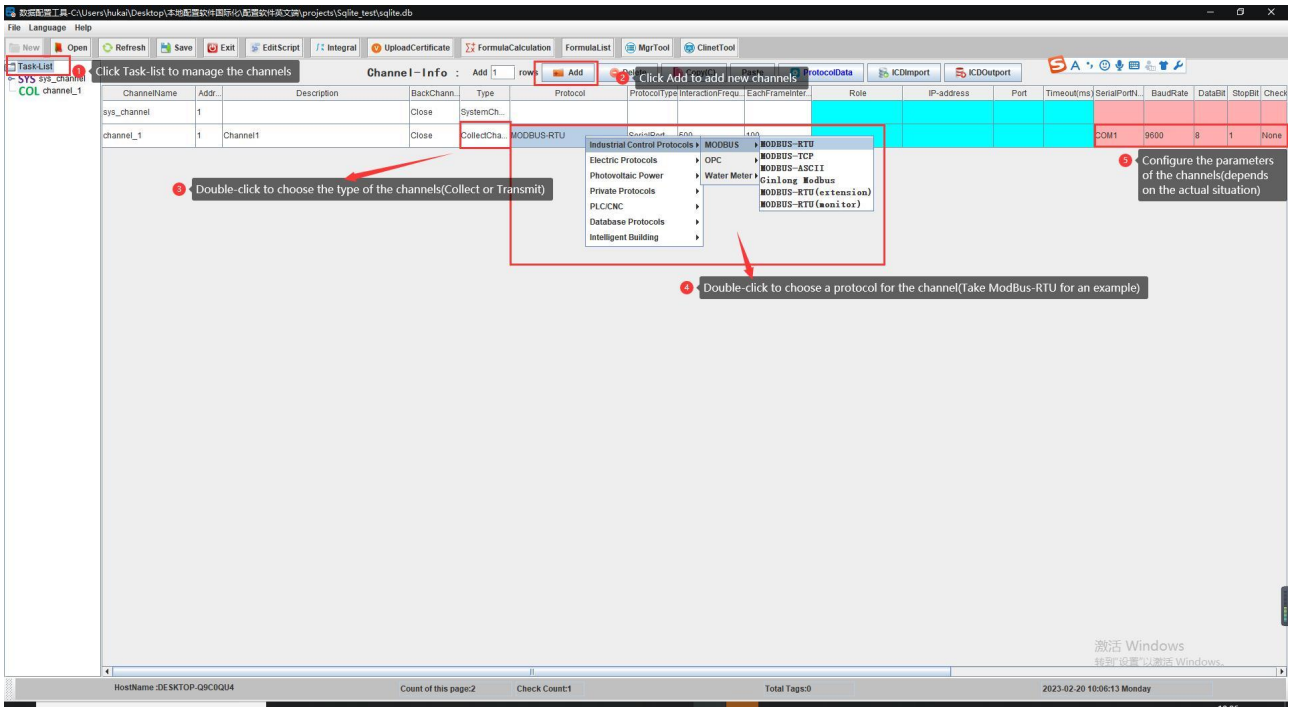

## Chapter 11 Configuration Steps

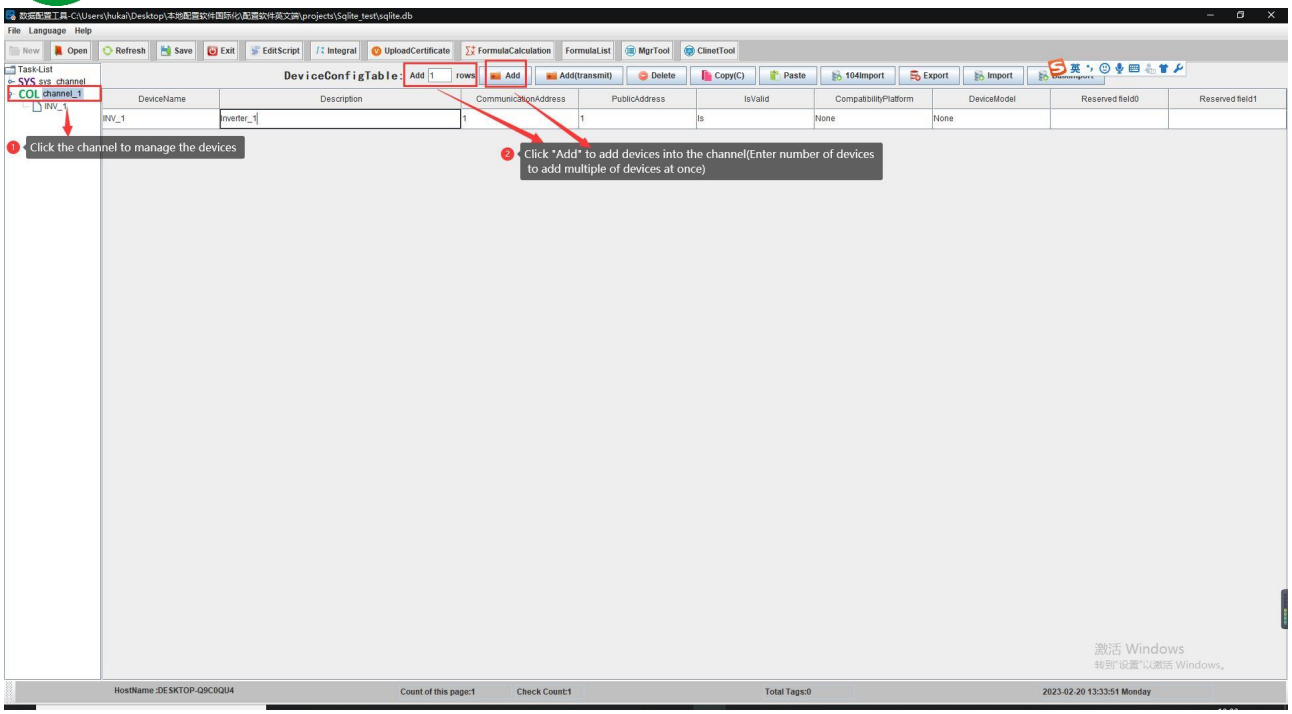
Double click “ ASDUConfig.jar” to open configuration tool

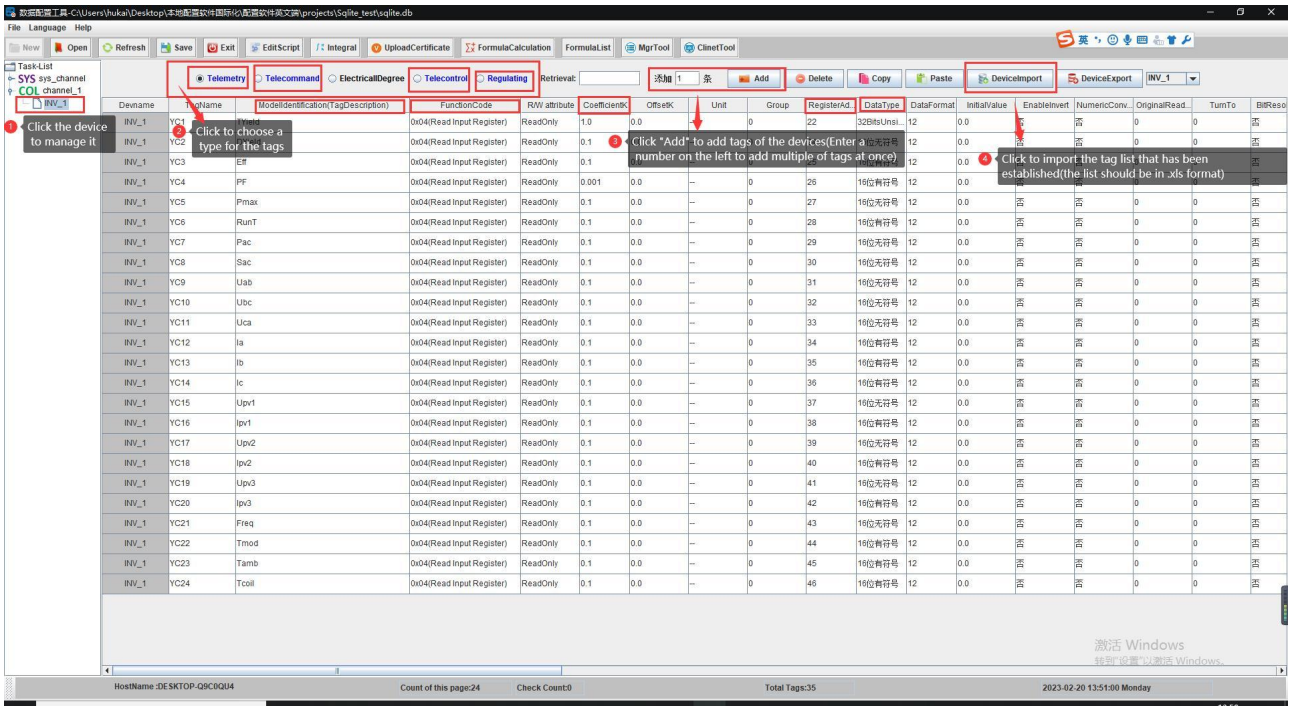


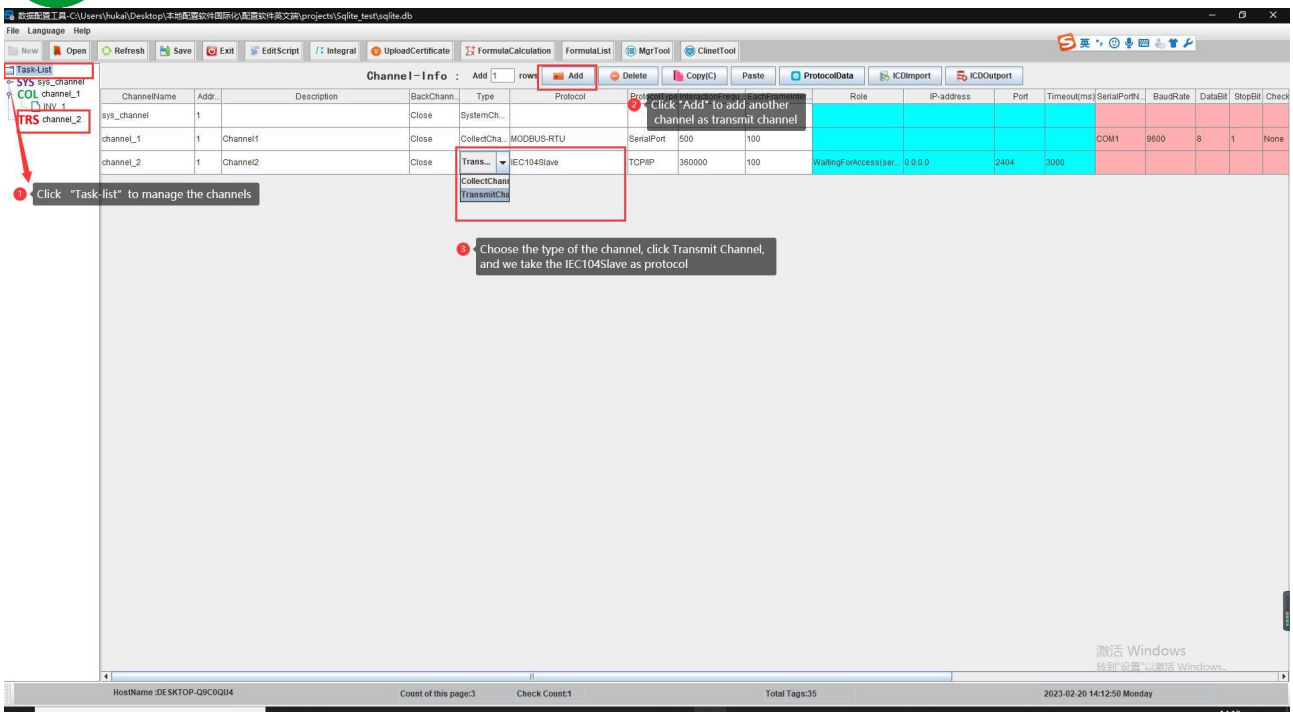
## 11.1 Create a New Project

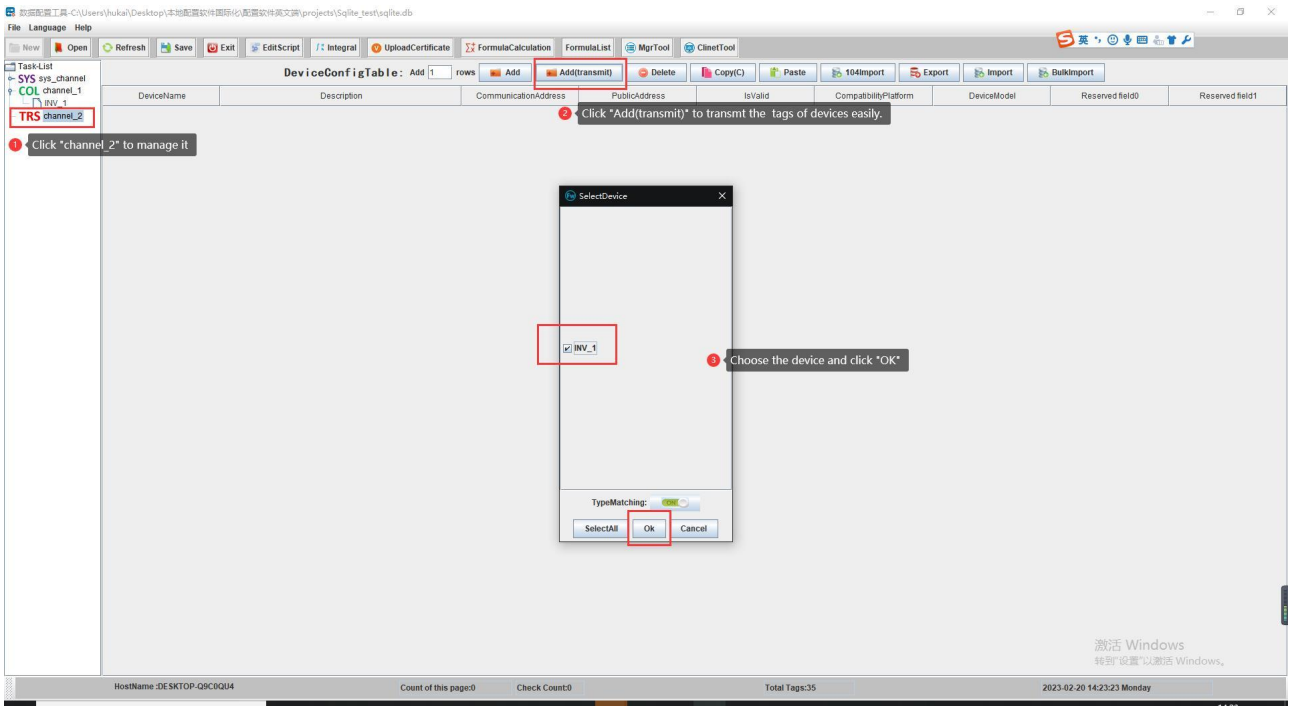


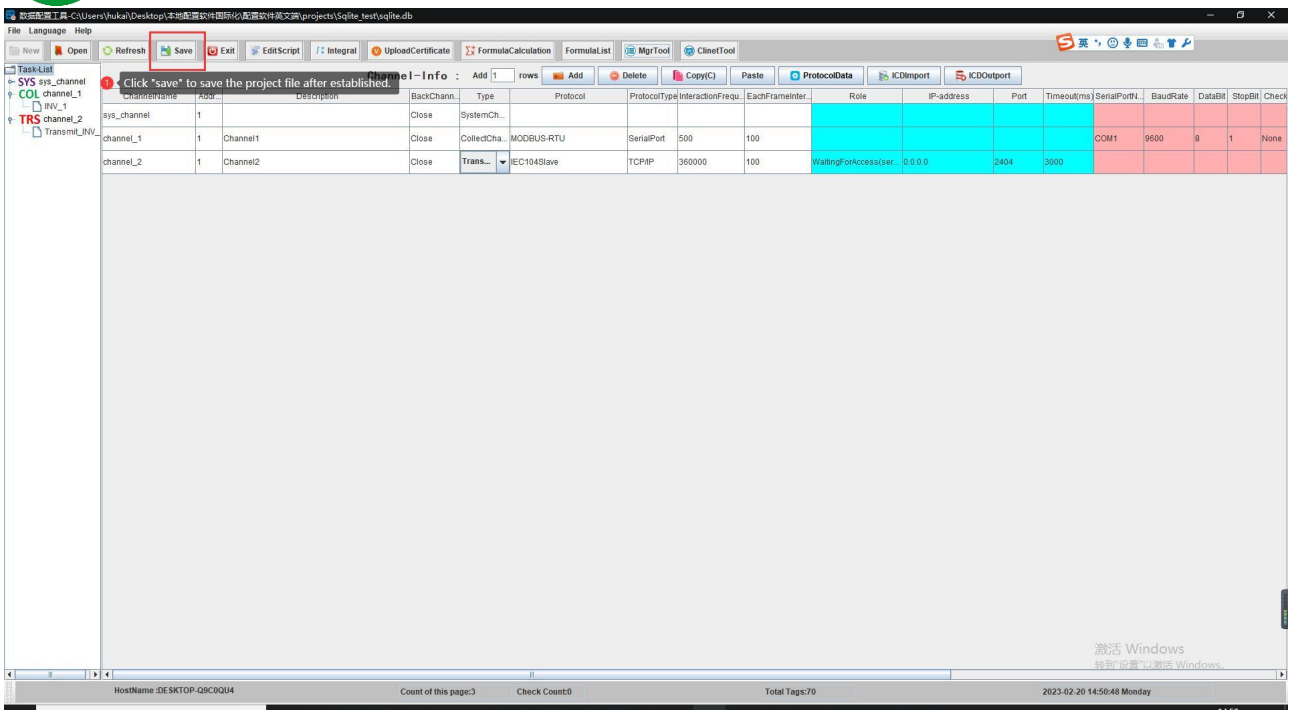




Click the channel to manage the devices
Click "Add" to add devices into the channel(Enter number of devices to add multiple of devices at once)

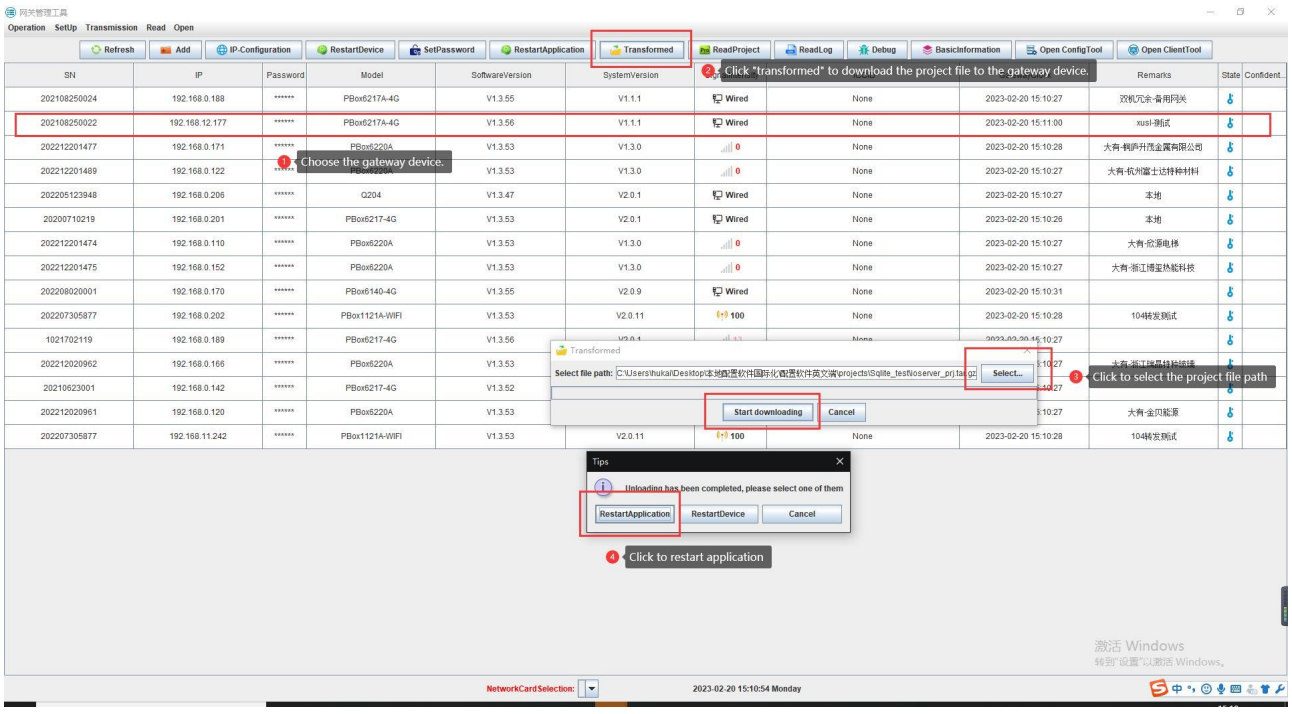

Click the device to manage it
Click to choose a type for the tags
Click "Add" to add tags of the devices(Enter a number on the left to add multiple of tags at once)
Click to import the tag list that has been established(the list should be in .xls format)


Click "Task-list" to manage the channels
Click "Add" to add another channel as transmit channel
Choose the type of the channel, click Transmit Channel, and we take the IEC104Slave as protocol

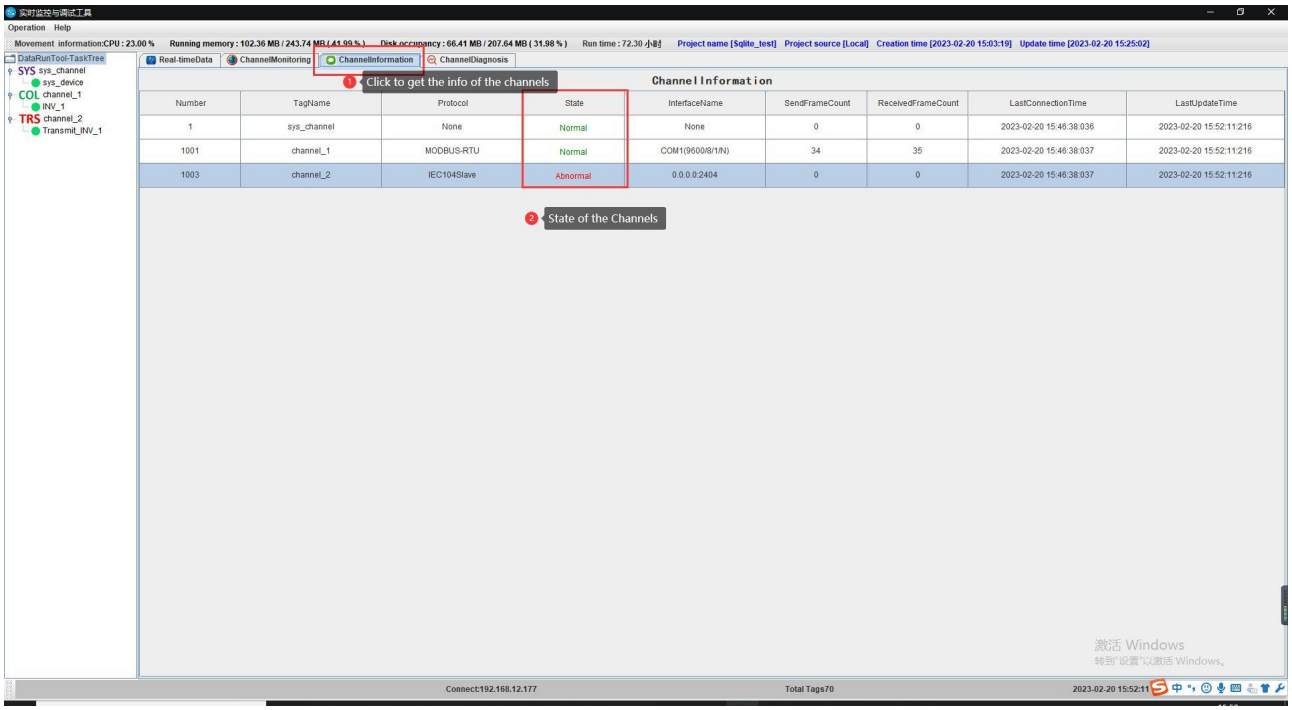

Click "channel_2" to manage it
Click "Add(transmit)" to transmt the tags of devices easily.
Choose the device and click "OK"

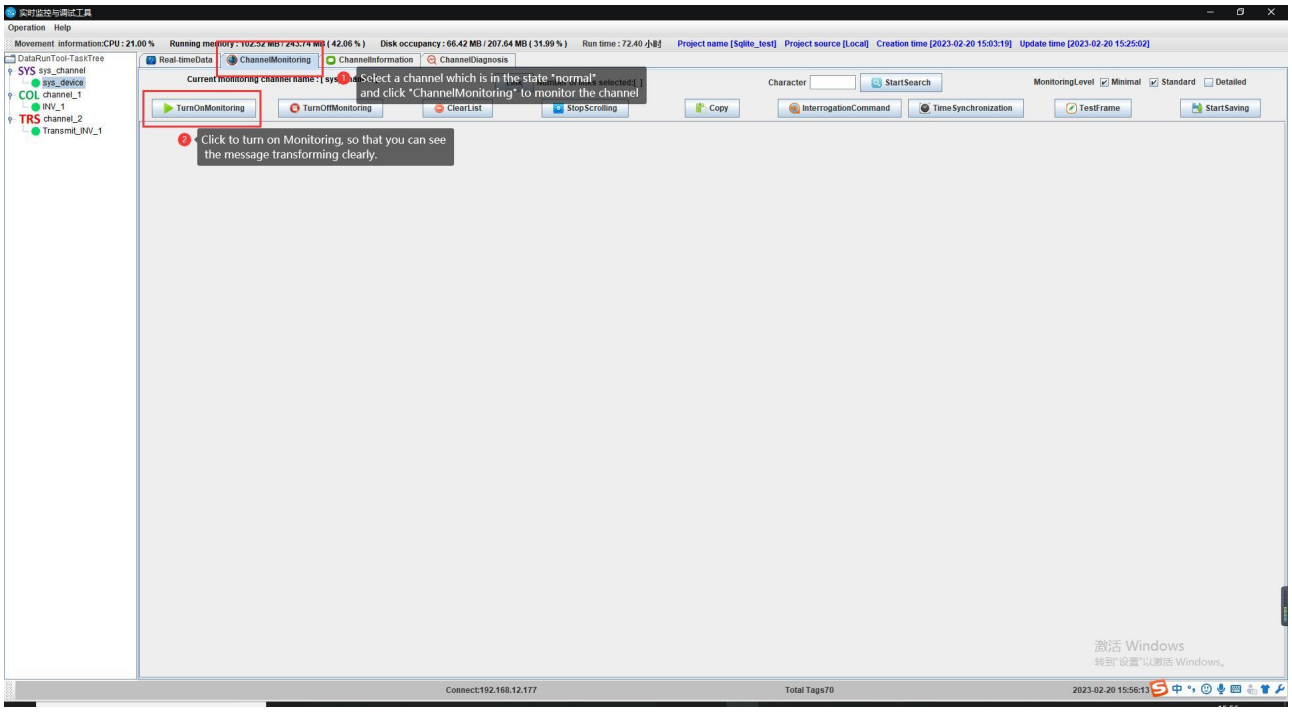


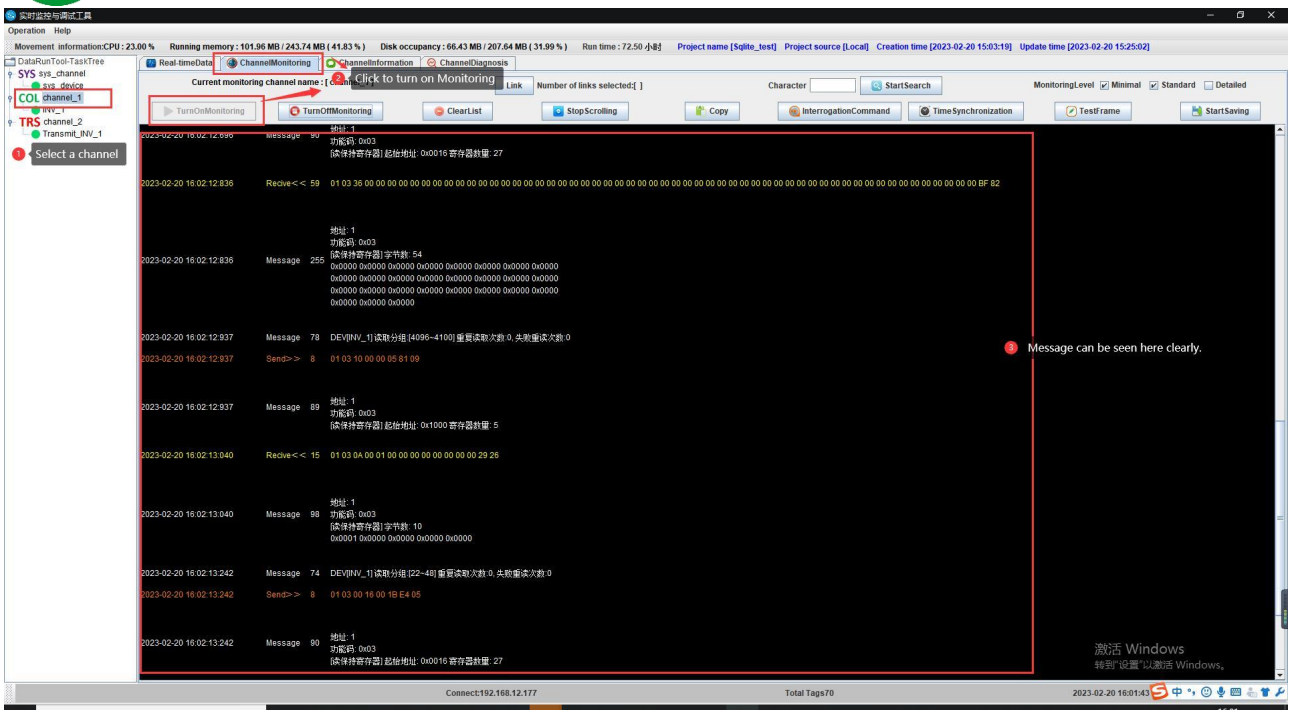

## 11.2 Download the project to the ASDU-LS gateway



## 11.3 MonitorTheStatuOfTheChannels






# Chapter 12 Application Instruction

## 12.1 Application Fields


Screen 12-2 Application Fields

# Chapter 13 After-sales Service

**Product Warranty**

1. The product warranty period is one year.
2. The company is responsible for free maintenance or exchange within one-year warranty period.
3. The cost of the components and freight shall be charged for improper meter installation and/or operation.

4. Over the warranty period, part of the maintenance cost according to actual situation will be charged.

**Service Guarantee**

1. Product technical consulting and quality complaints will be replied within 12 hours.
2. Solutions for quality complaints will be provided within 24 hours.
3. Except statutory holidays and force majeure.

## Chapter 14 Contact Us

Headquarter Add.: 7F No.1 Aosheng Building, 1166 Xinluo Street, High-tech Development Zone, Jinan, P.R. China 250101
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Website:www.heyuanintel.com