

# **Intellectual Gateway PT5000 Series User's Guide**

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# 1. Product Introduction

## 1.1. Overview

### ● PT5001/PT5002

PT5001/PT5002 is a compact embedded type intelligent communication gateway designed for meeting the IEC61850 consistent communication standard and applying to system integration. It can be deployed in any automation systems as distributed intelligent communication node to collect various data through its RS485/RS232 serial ports and Ethernet ports. By importing any predefined IEC61850 SCL template file -.icd/.cid file via special configuration tool, and mapping object data to internally collected data, PT5001/PT5002 can communicate with the master stations as IEC61850 IED proxy device (node), so as to simplify the communication process of automation system.



Figure 1.1 General view of PT5001/PT5002

### ● PT5004R/PT5004AR

PT5004R/PT5004AR intelligent communication gateway is a centralized data acquisition unit device designed for meeting the IEC61850 consistent communication standard, which adopts the 1U, 19" standard rack mounting structure; it can be deployed in power automation systems as intelligent communication node to collect various data through a number of RS485/RS232 serial ports and Ethernet ports; By importing any predefined IEC

61850 template file -.icd/.cid file via special configuration tool, and mapping object data to internally collected data information, PT5004R/PT5004AR is an ideal device that serves as the data acquisition and conversion core of automation system of intelligent station.



Figure 1.2 General view of PT5004R/PT5004AR

## 1.2. Packing information and open-box inspection

### 1.2.1. Packing information

See the packing list for details.

### 1.2.2. Open-box inspection

Before unpacking, place the box on a stable surface and pay attention to the orientation of packing box with right side up, so as to prevent PT5000 series gateway products from scattering out after the box is opened.

After unpacking, count the quantity of PT5000 gateway (including main device, device accessories, user manual etc.) according to the packing list, and inspect the appearance of PT5000 gateway.

## 1.3. Features

PT5000 series gateway products adopt low-power embedded TI Stara AM3352 CPU module. AM3352 adopts ARM Cortex A8 processor, with the dominant frequency of 800MHz and the processing capacity of 795MIPS, integrates NEON™ processor for multimedia and signal processing, and contains 32K instruction/32K data L1 Cache and 256K L2 Cache. The design architecture guarantees the high efficiency of parallel execution and processing

performance of the system. Different from x86 CPU module, the architecture based on ARM features high performance and low power consumption, which is particularly applicable to high-end industrial sector with severe environment. PT5000 series gateway is provided with power source with output short-circuit/overvoltage/undervoltage protection functions to adapt to complex operation conditions in industrial environment.

## 1.4. Specifications and parameters

Items	PT5001	PT5002
Console port	RS232, RJ45	RS232, RJ45
Serial ports	2 x RS232/RS485(Isolated)	4 x RS232/RS485(Isolated)
Ethernet	1 x 10/100M RJ45	2 x 10/100M RJ45
GPRS Module	1 x 3G Optional	1 x 3G Optional
Build-in storage	512M Nand Flash	512M Nand Flash
Extra storage	N/A	8G/64G Micro SD
Hardware Watchdog	Configurable	Configurable
Time synchronization	NTP	NTP
Power supply	12~24V DC/85~264V AC	12~24V DC/85~264V AC
Power consumption	<5W	<5W
Weight	0.5kg	0.5kg
Dimensions(W*H*D)	48mmx138mmx86mm	54mmx139mmx118mm
Mounting	DIN rail	DIN rail
Operating Temperature	-40°C~+85°C	-40°C~+85°C

Item	PT5004R	PT5004AR
Console port	RS232, RJ45	RS232, RJ45
Serial ports	8xRS232/RS485(Isolated)	8xRS232/RS485(Isolated)+8xRS485
Ethernet	4 x 10/100M RJ45	4 x 10/100M RJ45
Field Bus	2 x CAN Bus Ports	1 x CAN Bus port
Build-in storage	512M Nand Flash	512M Nand Flash
Extra storage	8G/64G Micro SD	8G/64G Micro SD
Hardware Watchdog	Configurable	Configurable
Time synchronization	NTP	NTP and IRIG-B DC
Power supply	85~264V AC/100~375V DC	85~264V AC/100~375V DC
Power consumption	< 8W	< 8W
Weight	3 kg	3 kg
Dimensions(W*H*D)	483mm x 45mm x 200mm	483mm x 45mm x 200mm
Mounting	1U, 19"rack-mount	1U, 19"rack-mount
Operating Temperature	-40°C~+85°C	-40°C~+85°C

## 2. Installation and Wiring

### 2.1. Overview

This chapter mainly describes how to install and connect the product effectively. Din rail mounting is preferred to PT5001/PT5002; rack mounting is preferred to PT5004R/PT5004AR.

### 2.2. Installation of PT5001/PT5002

PT5001/PT5002 device can be directly installed on DIN rail to the wall or inside a cabinet. After installation, communication ports and power interfaces shall be protected against such dangerous events as splashing of liquid or wetting; in case of such events, turn off the power or directly unplug the power cord as soon as possible, and place the device at a well-ventilated place for natural drying; if it still cannot start, please seek technical support from our company.

After the device is installed, it shall be ensured that the shellgrounding terminal of PT5001/PT5002 device is well earthed.

### 2.3. Wiring of PT5001/PT5002

#### 2.3.1. Power connection

Make sure the correct input power, please connect the power source to the device in strict accordance with the following steps:

- Connect the power line and earth wire to the power socket of PT5001/PT5002 device;
- Check status of PSW indicator lamp for PT5001/PT5002 working power supply;

In case of any abnormality, please turn off the power or directly unplug the power cord as soon as possible, and then seek for technical support from our company.



★ **Note: It's recommended to complete the power connection and**

***debugging of PT5001/PT5002 device before connection with network and serial devices.***

### **2.3.2. Network connection**

PT5001 device provides one independent 10/100Base-T Ethernet interface in its standard configuration, and the default factory configuration is as follows:

<b>Ethernet port</b>	<b>IP address</b>	<b>Subnet mask</b>
<b>ETH0</b>	192.168.0.111	255.255.255.0

PT5002 device provides two independent 10/100Base-T Ethernet interfaces in its standard configuration, and the default factory configuration is as follows:

<b>Ethernet port</b>	<b>IP address</b>	<b>Subnet mask</b>
<b>ETH0</b>	192.168.0.111	255.255.255.0
<b>ETH1</b>	192.168.1.111	255.255.255.0

### **2.3.3. Serial connection**

Terminals of RS485/RS232 serial communication ports from PT5001/PT5002 are defined as follows.

<b>PIN</b>	<b>Pin</b>	<b>Device Type</b>
<b>1</b>	RS485-1A,RS232-1RX(jumper selection)	PT5001/PT5002
<b>2</b>	RS485-1B,RS232-1TX(jumper selection)	PT5001/PT5002
<b>3</b>	Isolator	PT5001/PT5002
<b>4</b>	RS485-2A,RS232-2RX(jumper selection)	PT5001/PT5002
<b>5</b>	RS485-2B,RS232-2TX(jumper selection)	PT5001/PT5002
<b>6</b>	Isolator	PT5001/PT5002
<b>7</b>	RS485-3A,RS232-3RX(jumper selection)	PT5002
<b>8</b>	RS485-3B,RS232-3TX(jumper selection)	PT5002
<b>9</b>	Isolator	PT5002
<b>10</b>	RS485-4A,RS232-4RX(jumper selection)	PT5002

<b>11</b>	RS485-4B,RS232-4TX(jumper selection)	PT5002
<b>12</b>	Isolator	PT5002

## 2.4. Installation of PT5004R/PT5004AR

PT5004R/PT5004AR device can be directly installed on a standard 19" rack. Fix the device to the vertical mounting rails at both sides of the rack with four screws, and ensure good earthing between the shell ground terminal of device and the earth wire of rack, as shown below.

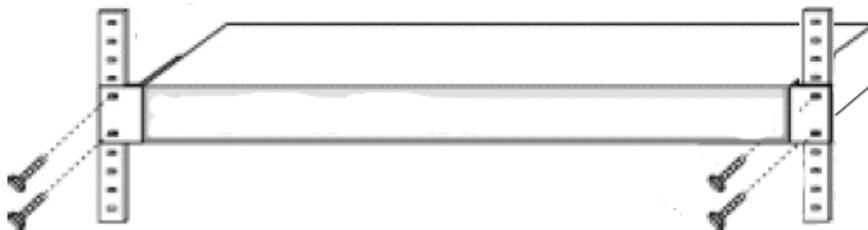


Figure 2.1 Schematic diagram of rack mounting of PT5004R/PT5004AR device

## 2.5. Wiring of PT5004R/PT5004AR

### 2.5.1. Power connection

The standard input voltage of PT5004R/PT5004AR device is 85~264V AC, and please connect the power source of the device in strict accordance with the following steps:

- Connect the power line and earth wire to the power socket of the device;
- Check status of PSW indicator lamp for PT5004R working power supply;
- In case of any abnormality, please turn off the power or directly unplug the power cord as soon as possible, and then seek for technical support from our company.



☆ **Note:** *It's recommended to complete the power connection and debugging of PT5004R/PT5004AR device before connection with network and serial devices.*

### 2.5.2. Network connection

PT5004R/PT5004AR device provides four independent 10/100Base-T Ethernet interfaces in

its standard configuration, and the default factory configuration is as follows:

Ethernet port	IP address	Subnet mask
<b>ETH0</b>	192.168.0.111	255.255.255.0
<b>ETH1</b>	192.168.1.111	255.255.255.0
<b>ETH2</b>	192.168.2.111	255.255.255.0
<b>ETH3</b>	192.168.3.111	255.255.255.0

### 2.5.3. Serial connection

PT5004R/PT5004AR supports 8/16 channels of RS485/RS232 serial communication, and the terminals of its communication ports are defined as follows:

Slot#1	PIN	Pin	Type
<b>1</b>		RS485-1A,RS232-1RX (jumper selection)	PT5004R/PT5004AR
<b>2</b>		RS485-1B,RS232-1TX (jumper selection)	PT5004R/PT5004AR
<b>3</b>		Isolator	PT5004R/PT5004AR
<b>4</b>		RS485-2A,RS232-2RX (jumper selection)	PT5004R/PT5004AR
<b>5</b>		RS485-2B,RS232-2TX (jumper selection)	PT5004R/PT5004AR
<b>6</b>		Isolator	PT5004R/PT5004AR
<b>7</b>		RS485-3A,RS232-3RX (jumper selection)	PT5004R/PT5004AR
<b>8</b>		RS485-3B,RS232-3TX (jumper selection)	PT5004R/PT5004AR
<b>9</b>		Isolator	PT5004R/PT5004AR
<b>10</b>		RS485-4A,RS232-4RX (jumper selection)	PT5004R/PT5004AR
<b>11</b>		RS485-4B,RS232-4TX (jumper selection)	PT5004R/PT5004AR
<b>12</b>		Isolator	PT5004R/PT5004AR

Slot#2	PIN	Pin	Type
<b>1</b>		RS485-5A,RS232-5RX (jumper selection)	PT5004R/PT5004AR
<b>2</b>		RS485-5B,RS232-5TX (jumper selection)	PT5004R/PT5004AR

<b>3</b>	Isolator	PT5004R/PT5004AR
<b>4</b>	RS485-6A,RS232-6RX (jumper selection)	PT5004R/PT5004AR
<b>5</b>	RS485-6B,RS232-6TX (jumper selection)	PT5004R/PT5004AR
<b>6</b>	Isolator	PT5004R/PT5004AR
<b>7</b>	RS485-7A,RS232-7RX (jumper selection)	PT5004R/PT5004AR
<b>8</b>	RS485-7B,RS232-7TX (jumper selection)	PT5004R/PT5004AR
<b>9</b>	Isolator	PT5004R/PT5004AR
<b>10</b>	RS485-8A,RS232-8RX (jumper selection)	PT5004R/PT5004AR
<b>11</b>	RS485-8B,RS232-8TX (jumper selection)	PT5004R/PT5004AR
<b>12</b>	Isolator	PT5004R/PT5004AR

Slot#3 PIN	Pin	Type
<b>1</b>	RS485-9A	PT5004AR
<b>2</b>	RS485-9B	PT5004AR
<b>3</b>	Isolator	PT5004AR
<b>4</b>	RS485-10A	PT5004AR
<b>5</b>	RS485-10B	PT5004AR
<b>6</b>	Isolator	PT5004AR
<b>7</b>	RS485-11A	PT5004AR
<b>8</b>	RS485-11B	PT5004AR
<b>9</b>	Isolator	PT5004AR
<b>10</b>	RS485-12A	PT5004AR
<b>11</b>	RS485-12B	PT5004AR
<b>12</b>	Isolator	PT5004AR

Slot#4 PIN	Pin	Type
<b>1</b>	RS485-13A	PT5004AR
<b>2</b>	RS485-13B	PT5004AR
<b>3</b>	Isolator	PT5004AR

<b>4</b>	RS485-14A	PT5004AR
<b>5</b>	RS485-14B	PT5004AR
<b>6</b>	Isolator	PT5004AR
<b>7</b>	RS485-15A	PT5004AR
<b>8</b>	RS485-15B	PT5004AR
<b>9</b>	Isolator	PT5004AR
<b>10</b>	RS485-16A	PT5004AR
<b>11</b>	RS485-16B	PT5004AR
<b>12</b>	Isolator	PT5004AR

Pin definition of CAN bus:

<b>1</b>	CAN1H
<b>2</b>	CAN1L
<b>3</b>	CAN2H
<b>4</b>	CAN2L

### 3. Product Application

#### 3.1. Conversion of communication protocol

PT5000 series gateway is applicable to the integration of various automation systems to complete data acquisition and conversion of communication protocol. The device performs data communication with such devices as relay protection, fault recorder, watt hour meter, and DC panel via any serial interface or Ethernet port, and then performs data communication with a third-party system via corresponding network or serial port in accordance with the communication standard designated by the system after internal processing. The device can be widely applied in various automation systems, distributed data acquisition and protocol conversion, and the topographic graph of its typical application is as shown in Figure 3.1:

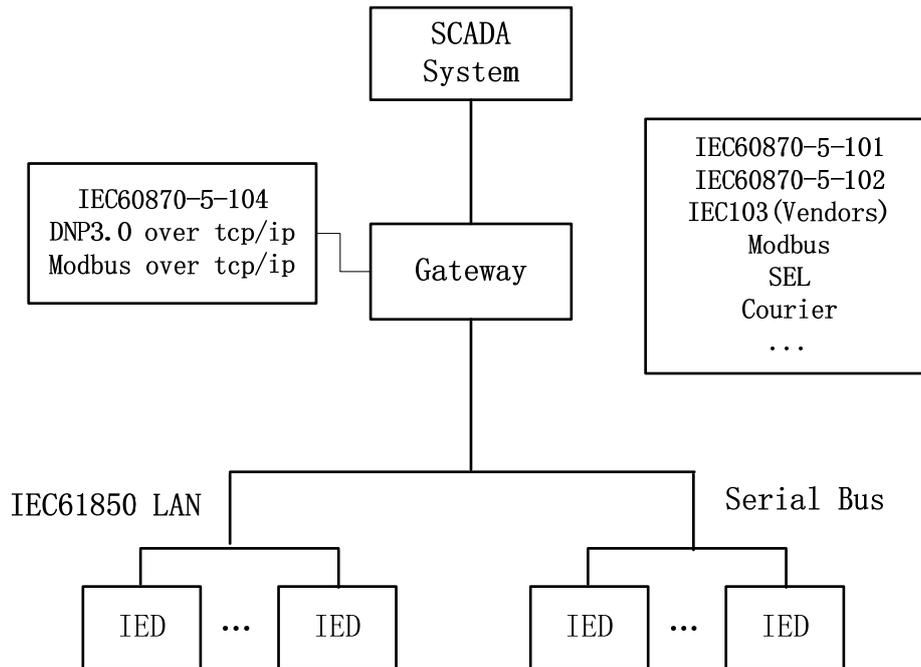


Figure 3.1 Application of PT5000 series gateway in conversion of communication protocol

### 3.2. Integrated automation of power station

- **Data acquisition and storage**

Any communication port of PT5000 series communication gateway can be flexibly configured with corresponding data acquisition protocol, to collect all kinds of communication data from protective devices, measuring and control devices, instruments, fault recorders, and intelligent sensors, and forward the collected real-time data synchronously online while storing such data into local real-time database, thus largely simplifying the communication topology structure of automation system.

- **Control and operation functions**

PT5000 series communication gateway also supports the forwarding of control commands of main station end in different communication links to realize control operation to different devices at field. It can also support such functions as batch control, sequence control, and condition control through logic programming.

- **Accurate real-time online monitoring function**

By relying on the high-precision time service function provided by clock server, PT5000 series gateway can conduct time synchronization in many ways such as NTP/SNTP protocol to guarantee time accuracy in the device and realize transmission of local events and data

with time mark, which offers help for subsequent data analysis and fault handling, as shown in Figure 3.2 below.

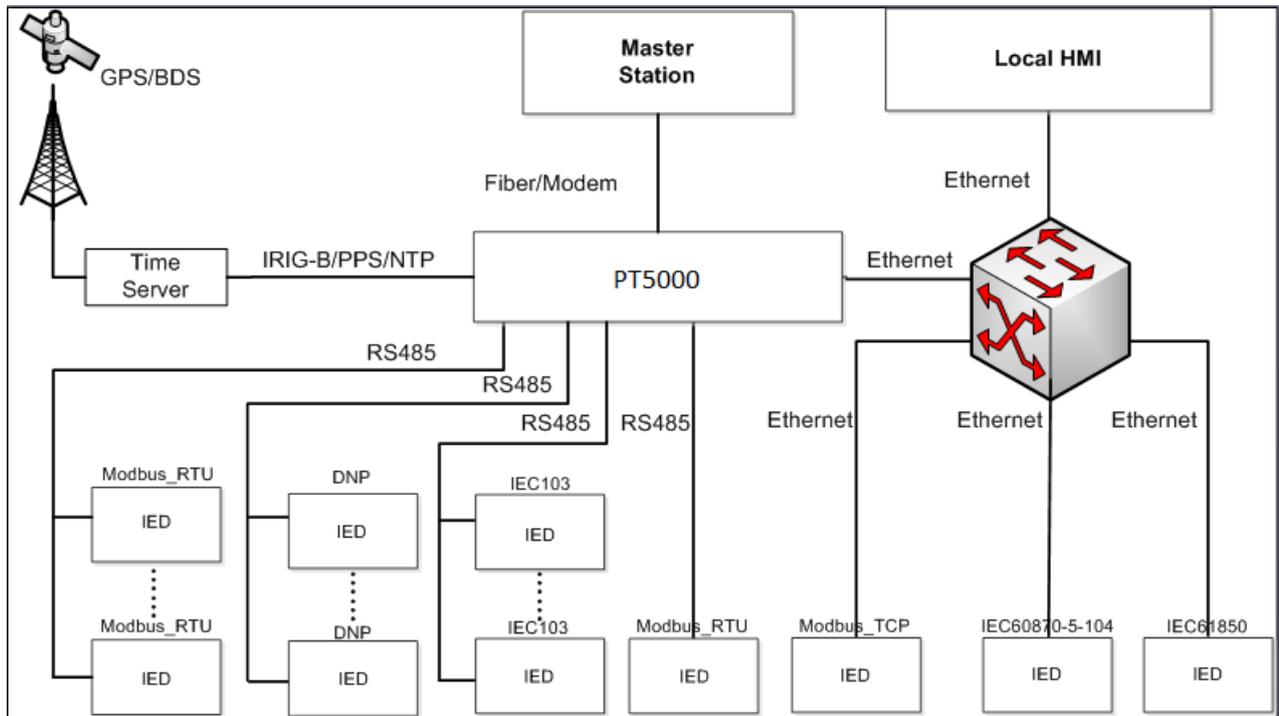


Figure 3.2 Application of PT5000 series gateway in integrated automation system of power station

### 3.3. Virtual port connection

PT5000 series gateway also supports the configuration of any serial port virtual connection (terminal server) link layer service, so that it can convert serial data into TCP/IP network data, and realize two-way transparent transmission of serial data and TCP/IP network data, which makes serial devices can directly perform data communication with network applications based on TCP/IP, and facilitates telecommunication of a large number of legacy serial devices.

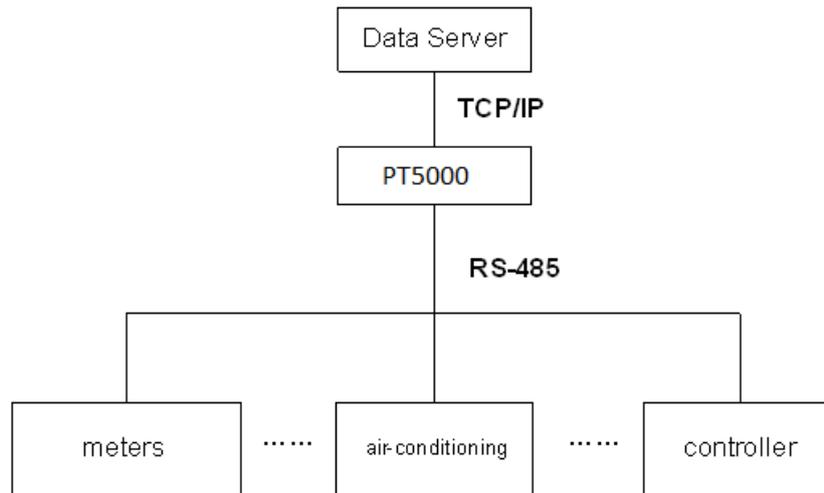


Figure 3.3 Block diagram of application of PT5000 series gateway in virtual port connection

### 3.4. IEC 61850 client/server services

PT5000 series gateway supports data acquisition and forwarding based on IEC 61850 Standard. It can be configured as an abstract virtual IEC 61850 communication proxy device (VMD) by importing any SCL (.icd/.cid) template file, to provide IEC 61850 data server services for traditional IED devices, and can also serve as IEC 61850 client to collect IEC 61850 IED data and convert the data into traditional protocol-based data according to the requirements of third parties; this feature provides flexible, convenient, economical and efficient solutions for traditional devices to realize IEC 61850 communication and for IEC 61850 IED to exchange data with traditional data collectors; the typical application is as shown in Figure 3.4 below:

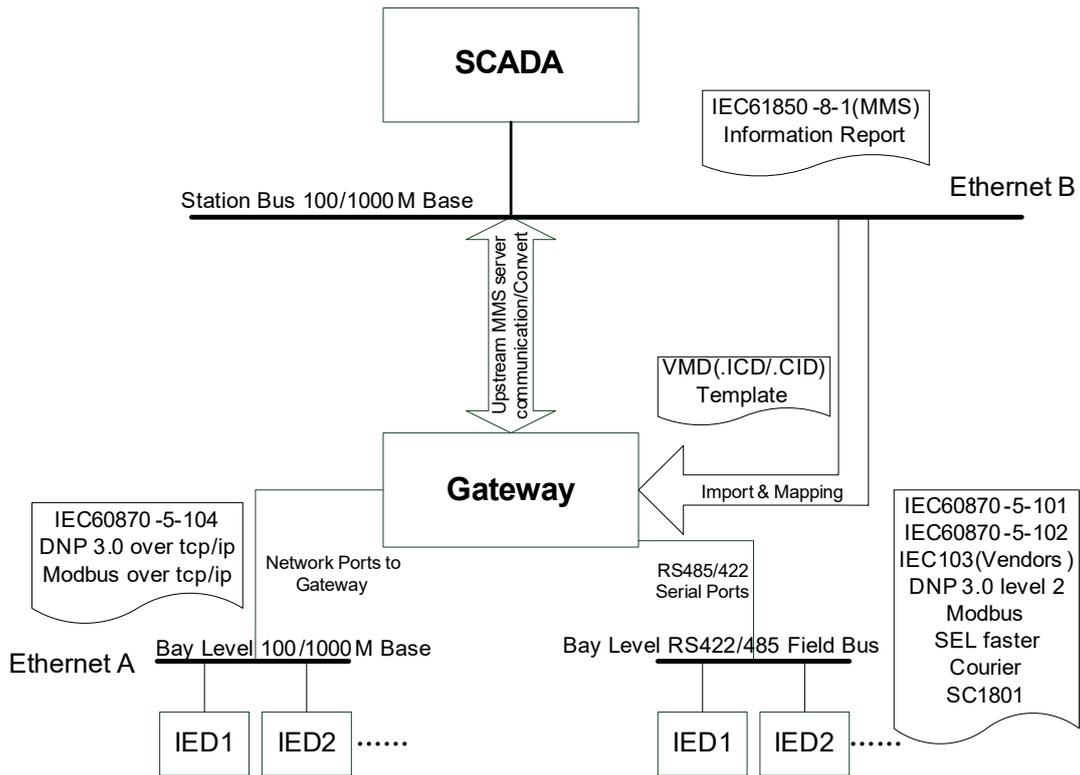


Figure 3.4 Schematic diagram of application of PT5000 series gateway in IEC 61850 server

### 3.5. Soft PLC application

PT5000 series gateway is provided with C-type scripting language that is easily understood to meet the requirements of various engineering applications such as online computation, logical judgment, and arithmetical operation. The soft PLC function is widely applied in such aspects as information point synthesis and computation, data volume accumulation, batch processing control, closed-loop control, timed execution, and conditional block, in which the detecting and scanning frequency of logical operation can reach millisecond level.

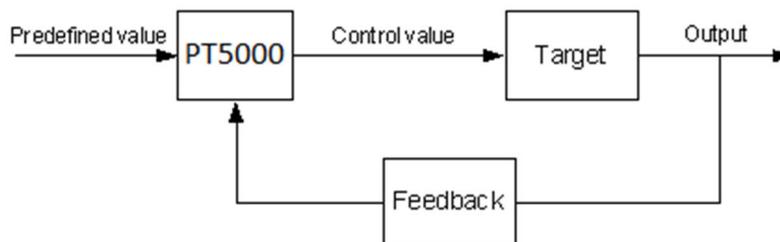


Figure 3.5 Block diagram of application of PT5000 series gateway in advanced applications

## 4. ICT-S+ Software

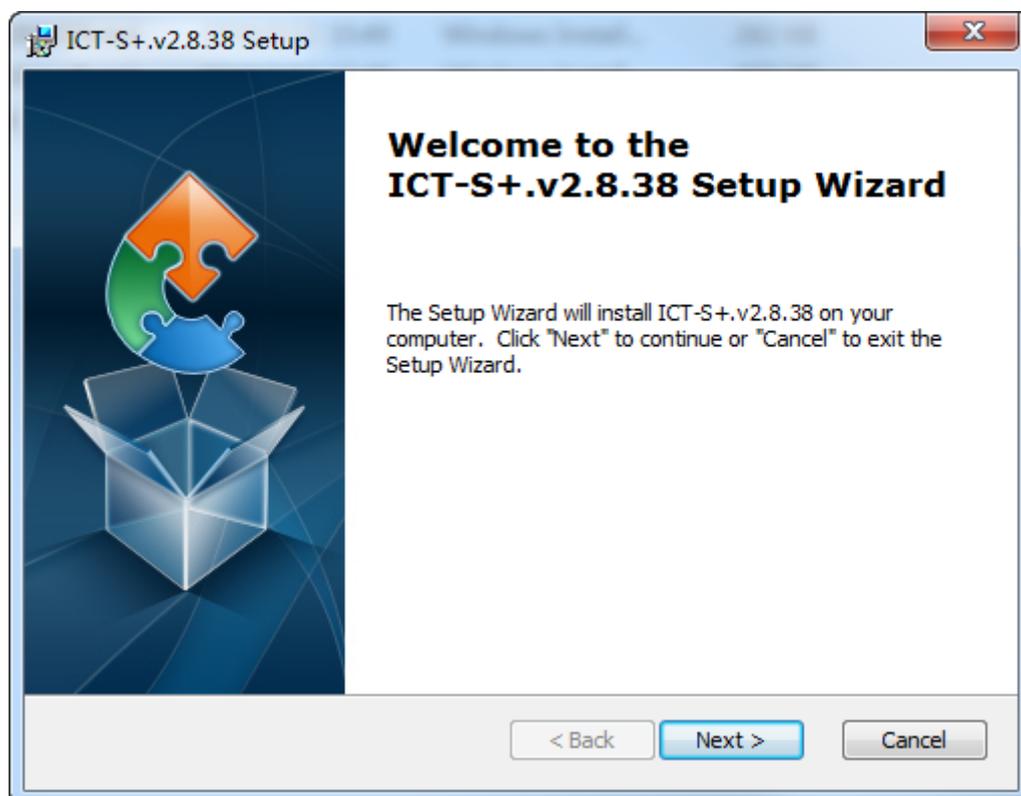
## 4.1. Overview

**EDPS ICT-S+** –an integrated configuration environment tool allows the user to perform simple configuration in PT5000 gateway products. **EDPS ICT-S+** now supports such installation platforms as Win2000/WinXp/Win7/Win8/Win10. **EDPS ICT-S+** installation includes executable files, configuration files, language package and firmware package. The firmware package is an operating file provided by the system for target devices, which can be transferred to any target device that meets conditions through the tool.

## 4.2. ICT-S+ installation

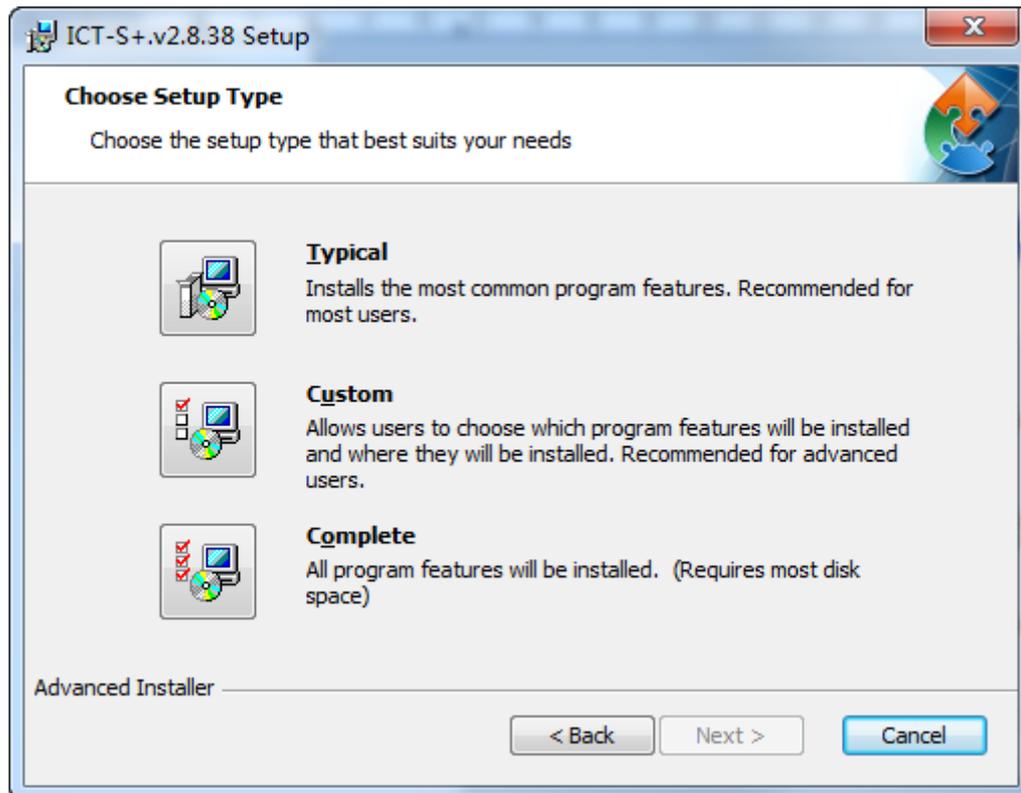
**The installation is performed by the following steps:**

1. Insert the installation media to the PC and find the installation file ICT-S+.msi or ICT-S+.exe and execute the file to install ICT-S+ Toolset program.
2. After the software tests the current operating system, the system automatically pops up the dialog box of welcome and wizard page.



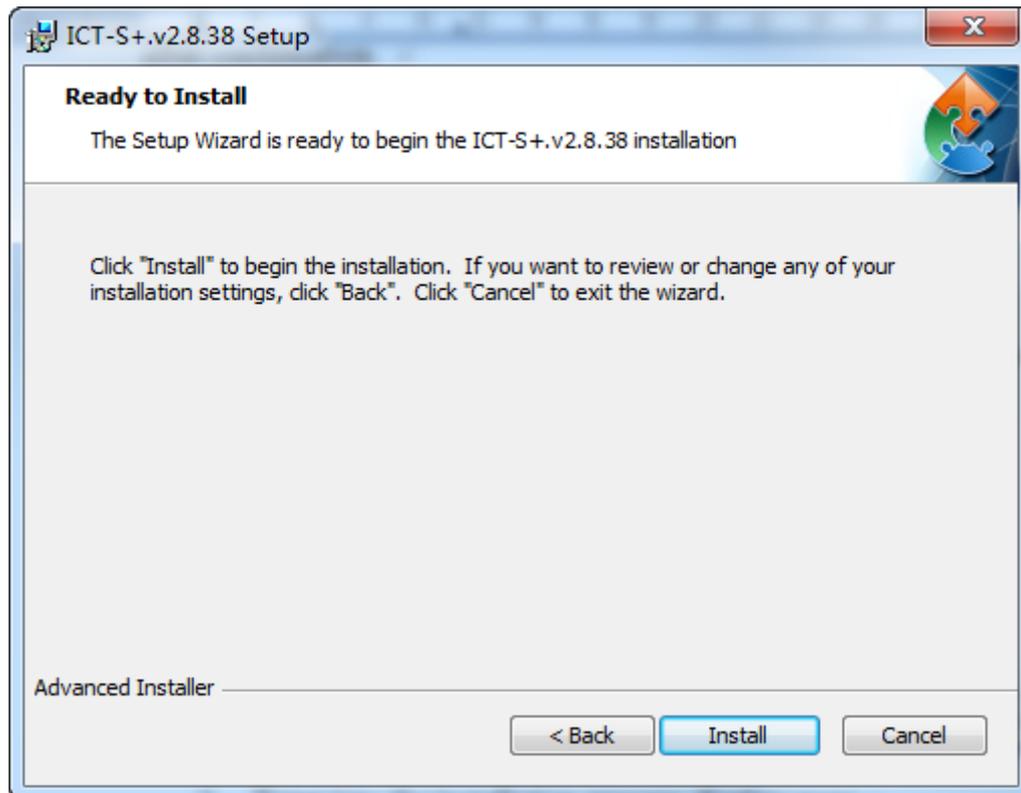
Note: The system automatically selects currently required software components to complete installation.

3. Click Next (N) to continue installation.

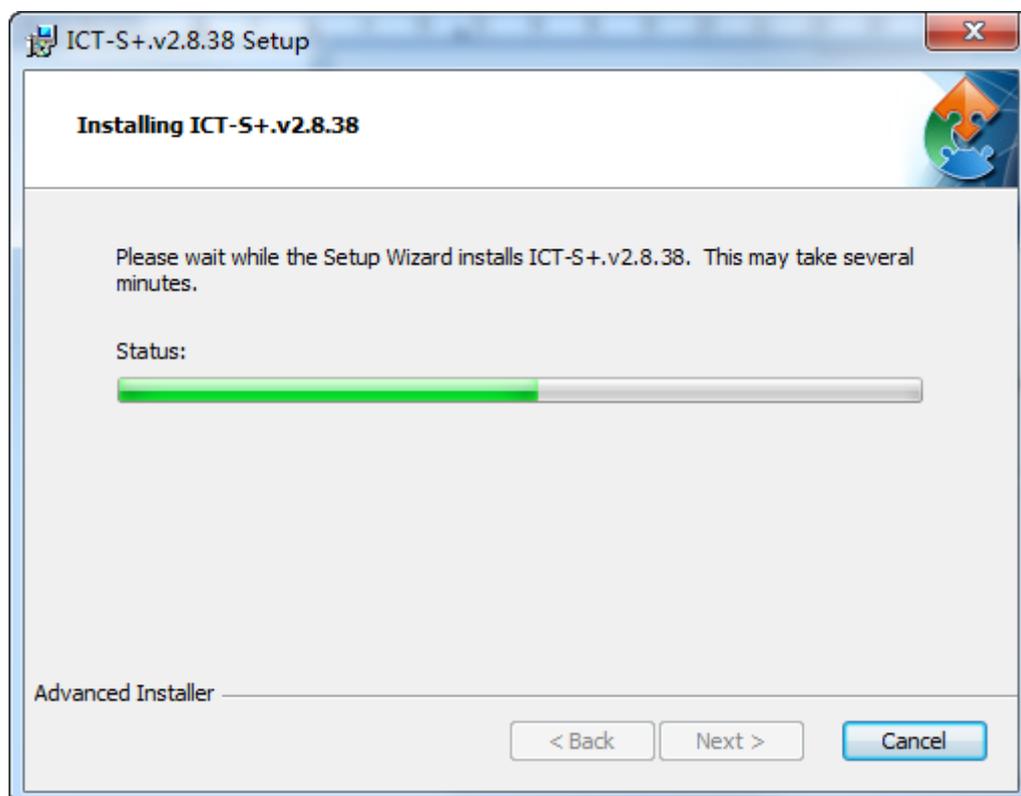


During installation, the user can select one of the three installation types “Typical”, “Custom” and “Complete” as needed. When selecting “Typical”, the default installation path is C:\Program Files. The software also provides user-defined installation directory; click “Next” after confirmation.

4. Click “Install” to install the software, or click “Cancel”.

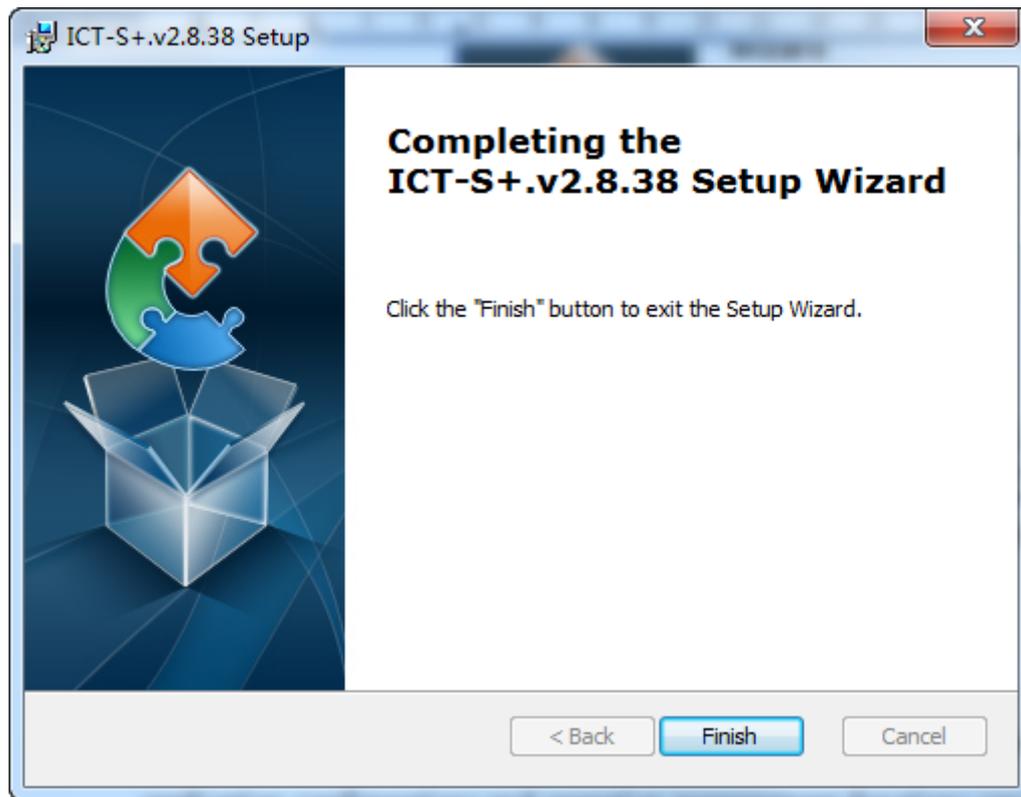


5. Enter into the installation process display page.



6. After the installation is completed, the system displays the completion page, and prompt the user whether to start the application immediately. Click "Complete" after

confirmation.

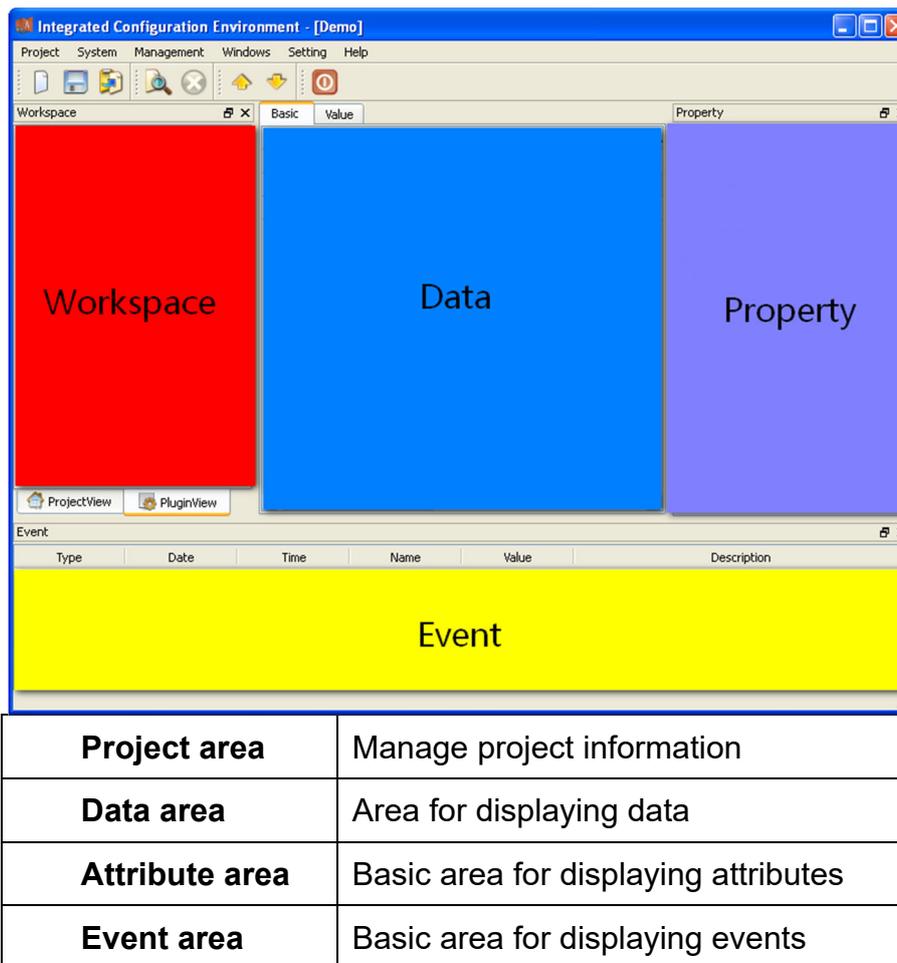


**Note:** After the software is installed successfully, the user can uninstall the software or repair the previous installation by running the setup program again.

### 4.3. Interface layout

The user must be familiar with the overall layout of the software before use. Multiple application configurations and operation management functions can be realized through every layout structure.

**EDPS ICT-S+** adopts the typical dock-mode window structure. The so-called dock window is a type of window docked in an area of the main window, and the dock area of window includes four areas: left, right, top and bottom. A dock window has such independent features as dock, float, show, hide and close.



## 5. Protocol Configuration

### 5.1. MODBUS protocol configuration

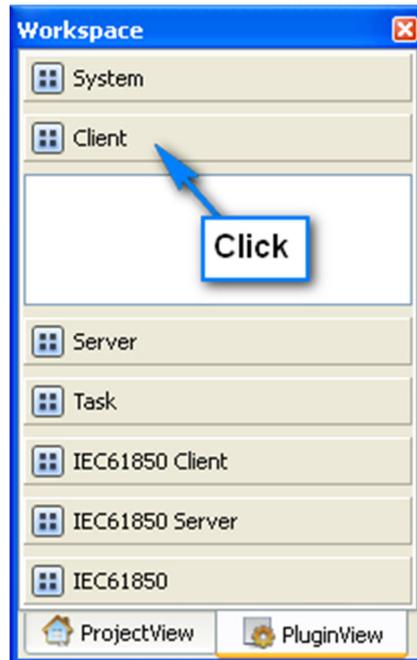
#### 5.1.1. Modbus acquisition configuration

##### 5.1.1.1. Driver information

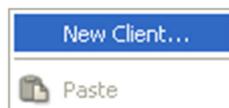
**Overview** Describe detailed configuration information of acquisition driver

**Create** Create Modbus acquisition driver

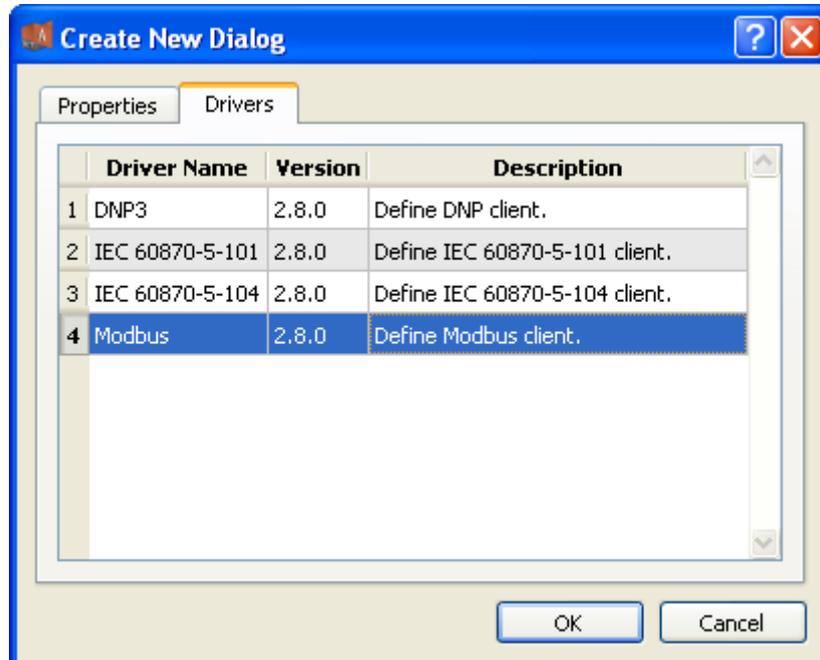
1. Open a project file;
2. Select the plugin management page in the management area of **EDPS ICT-S+**;
3. Activate the acquisition service plugin;



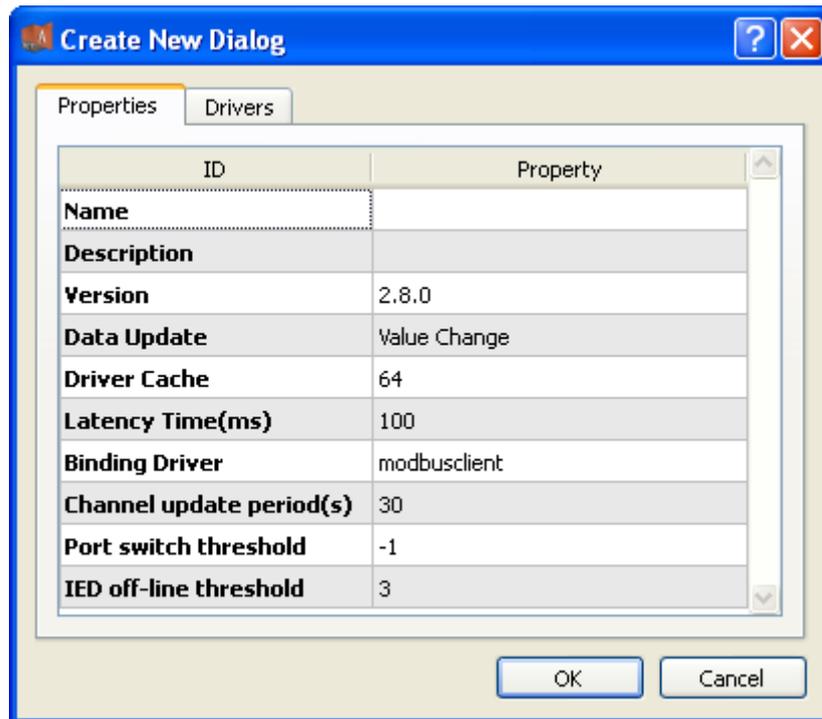
4. Right click in the blank space, and select the menu option “New acquisition service” to pop up the “Create driver dialog”;



5. Select the driver to be created in the driver page;



6. Configure basic attributes of the target driver in the attribute page;



7. Click "OK" to complete creation;

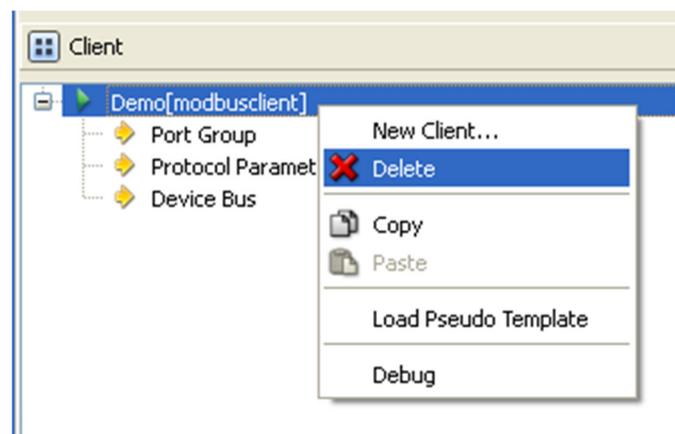
Note: Driver information

No.	Name	Description
1	Name	Define the display name of driver.
2	Description	Define the description information of driver.
3	Version	Define the version information of driver.
4	Data update	Define the data updating mode. Value change – The system updates the database and notifies other driver protocols only when a value changes; Time change – The system updates the database and notifies other driver protocols no matter whether a value or time changes; Time update – The system updates the database no matter whether a value or time changes, and notifies other driver protocols only when a value changes;
5	Driver cache	Define the cache size of driver.
6	Latency time(ms)	Define the delay time of updating real-time database. The system shall write raw data into the real-time database after a delay of the time defined.
7	Binding driver	Define the name of driver module, which is unique and cannot be modified.
8	Channel update	Define the cycle of updating IED communication times.

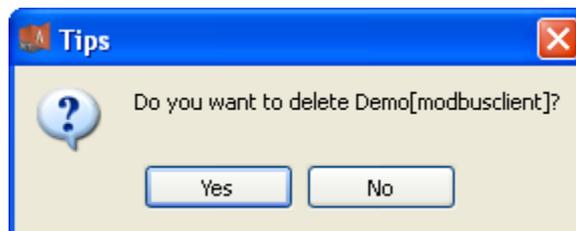
	period (s)	
9	Port switch threshold	Define the switching conditions among multiple ports; when the number of consecutive communication failures of the primary port reaches the threshold, it's switched to another port. -1 indicates port switching is deactivated.
10	IED off-line threshold	Define the offline threshold of IED device; when the number of consecutive communication failures reaches the threshold, the device is switched to offline state.

**Delete** Delete Modbus acquisition driver

8. Right click and select the menu option "Delete";



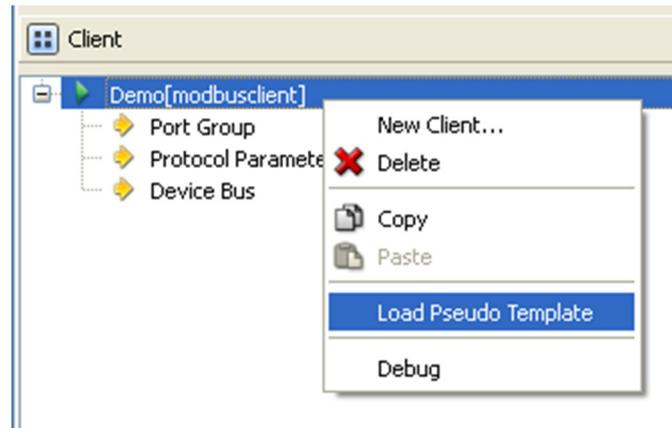
9. It prompts whether to delete;



10. Click "Yes" to complete deletion;

**Virtual point template** Load virtual point of driver from the system template library

11. Right click the driver bar, and select the menu option "Load virtual point template" to complete loading of virtual point of driver.

**Note:**

Basic		Value					
Point Name	Description	Value Type	Initial Value	Owner	Show Mode	Parameter	
1	DRVSTA	Running status	16 Bits Unsigned Short	0	Local	By Name	0:Exit, 1:Running, 2:Paused, 3:StandBy
2	DRVAUTH	Authority	Bool	0	Local	By Name	0:Demo, 1:Authority

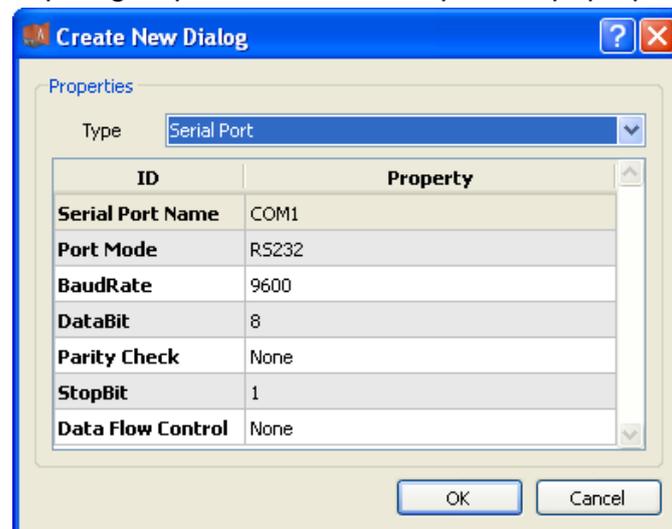
No.	Name	Description
1	Running status	Observe the running state information of the driver.
2	Authority	Observe the authorization state of the driver.

**5.1.1.2. Port group information**

**Overview** Describe communication channel configuration information

**Create** Create communication channel

1. Right click a port group and select “New port” to pop up the “Create port dialog”;



2. Select serial port or network port according to actual situation;

**Notes:** Attributes of serial channel

No.	Name	Description
1	Serial port name	Set the name of serial port;
2	Port mode	Set the work mode of serial port;

3	Baud rate	Set the Baud rate of serial port;
4	Data bit	Set the data bits of serial port;
5	Parity check	Set the check bit of serial port;
6	Stop bit	Set the stop bit of serial port;
7	Data flow control	Set the data flow control mode of serial port;

## Attributes of network channel

No.	Name	Description
1	Port mode	Set the work mode of network port;
2	Service IP	Set the IP address at TCP server/UDP destination address;
3	Port number	Set the work port number of network port;
4	Broadcast address	Set the broadcast address of network port;

**Delete** Delete communication channel

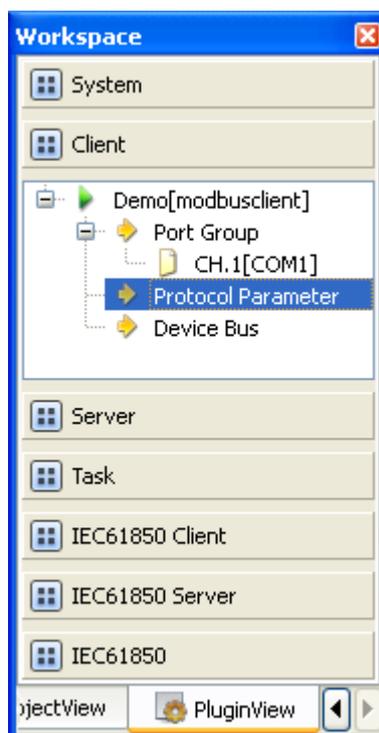
3. Right click a channel number and click "Delete", and select "Yes" to complete deletion.

### 5.1.1.3. Protocol parameter

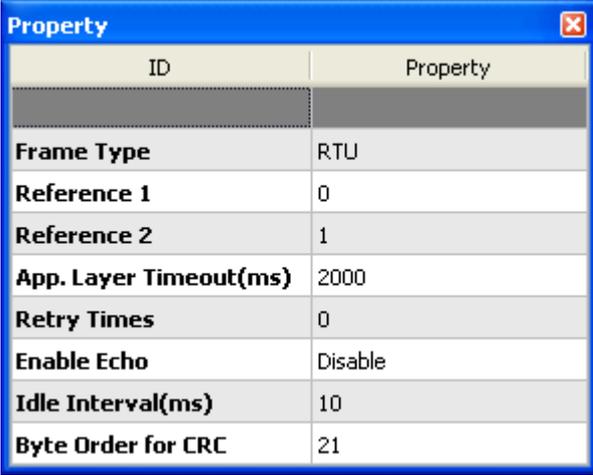
**Overview** Define communication protocol parameter of protocol

**Attribute** View protocol parameter attributes of **EDPS ICT-S+**

1. Open a project, and select the plugin management page in the management area of **EDPS ICT-S+**;
2. Activate the acquisition service plugin;
3. Select the protocol parameter node in the management area;



4. View protocol parameter attributes



ID	Property
<b>Frame Type</b>	RTU
<b>Reference 1</b>	0
<b>Reference 2</b>	1
<b>App. Layer Timeout(ms)</b>	2000
<b>Retry Times</b>	0
<b>Enable Echo</b>	Disable
<b>Idle Interval(ms)</b>	10
<b>Byte Order for CRC</b>	21

**Note:** Protocol parameter information

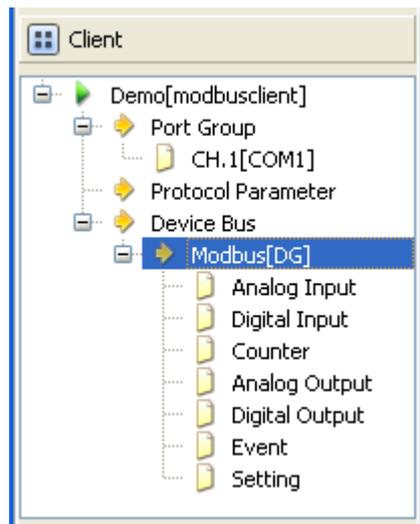
No.	Name	Description
1	Frame type	Define the format of communication data frame
2	Reference 1	Define the first reference parameter of TCP frame type
3	Reference 2	Define the second reference parameter of TCP frame type
4	App.layertimeout (ms)	Define the timeout interval of waiting for response of application layer, in ms
5	Retry times	Define the times for which the application layer resends request for data when failing to receive valid data within the time allowed
6	Enabled echo	Define whether to judge whether Echo data bits receive valid data.
7	Idle interval (ms)	Define the idle time interval of communication, in ms
8	Byte order for CRC	Define the arrangement order of CRC check code

#### 5.1.1.4. Device parameter

**Overview** Define device parameter of protocol

**Attribute** View device parameter attributes

1. Open a project, and select the plugin management page in the management area of **EDPS ICT-S+**;
2. Activate the acquisition service plugin;
3. Select any child node under the node of device bus in the management area with mouse;



4. View the attribute area of **EDPS ICT-S+**;

ID	Property
<b>Name</b>	Modbus
<b>Vendor</b>	DG
<b>Address</b>	1
<b>Model</b>	Standard
<b>Period for Class 1 Data(ms)</b>	500
<b>Period for Class 2 Data(ms)</b>	1000
<b>Period for Class 3 Data(ms)</b>	10000
<b>Time Sync Period(s)</b>	-1
<b>Events(ms)</b>	0
<b>Byte Order for 2 Bytes</b>	21
<b>Byte Order for 3 Bytes</b>	321
<b>Byte Order for 4 Bytes</b>	4321
<b>Byte Order for Float</b>	4321
<b>The Maximum Coils for Polling</b>	2000
<b>The Maximum Registers for Polling</b>	125
<b>The Maximum Coils for Writing</b>	800
<b>The Maximum Registers for Writing</b>	100
<b>Data Bytes in a Register</b>	2
<b>Event Mode</b>	Auto
<b>Setting Mode</b>	...
<b>Fault Records(ms)</b>	0
<b>Fault Description</b>	...
<b>Dist. Mode</b>	...
<b>Dist. Channels</b>	...
<b>Dist. Sample Rates</b>	...
<b>Channel Mode</b>	xxY

**Note:** Device attribute information

No.	Name	Description
1	Name	Set name information
2	Vendor	Set device manufacturer information
3	Address	Define the address information of device
4	Model	Define the model information of device Standard AREVA Px2x AREVA Px3x AREVA Px4x WIT Mx

5	Period for class 1 data (ms)	Define the cycle of querying Class 1 data, in ms
6	Period for class 2 data (ms)	Define the cycle of querying Class 2 data, in ms
7	Period for class 3 data (ms)	Define the cycle of querying Class 3 data, in ms
8	Time syncperiod (s)	Define the cycle of performing time synchronization to device, in s
9	Events (ms)	Define the cycle of performing time reading to device, in ms Min: 0ms Max: 3600000ms
10	Byte order for 2bytes	Define the arrangement order of 2 bytes in the device
11	Byte order for 3 bytes	Define the arrangement order of 3 bytes in the device
12	Byte order for 4bytes	Define the arrangement order of 4 bytes in the device
13	Byte order for float	Define the arrangement order of floating-point number bytes
14	The maximum coils for polling	Define the maximum number of query coils
15	The maximum registers for polling	Define the maximum number of query registers
16	The maximum coils for writing	Define the maximum number of writing coils
17	The maximum registers for writing	Define the maximum number of writing registers
18	Data bytes in a register	Define the number of bytes occupied by each register
19	Event mode	Define the mode of acknowledging event, which is only valid for 2-series device of AREVA
20	Setting mode	Define the mode of processing setting
21	Fault records (ms)	Define the cycle of performing fault query to device, in ms
22	Fault description	Define the fault description of device and carry out IEEE standardization
23	Dist. mode	Define the mode of processing disturbance data
24	Dist.channels	Define the channel information of disturbance data in the device
25	Dist.sample rates	Define the sampling rate information of disturbedata in the device

26	Channel mode	Define the mode of reading channel, which is only valid for 2-series device of AREVA
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**Virtual point attribute**View the data area of **EDPS ICT-S+**

Basic		Value				
Point Name	Description	Value Type	Initial Value	Owner	Show Mode	Parameter
1 IEDSTA	IED status	Bool	0	Local	By Name	0:Off-line, 1:On-line
2 ACTPORT	Current active port number	16 Bits Signed Short	-1	Local	By Value	
3 TOTALCOM	Total communication times	32 Bits Unsigned Long	0	Local	By Value	
4 FAILCOM	Failed communication times	32 Bits Unsigned Long	0	Local	By Value	

No.	Name	Description
1	IED status	Describe the communication state of the current device. The user can view whether the device is online or offline by the value of the information point.
2	Current active port number	Display which communication port is used by the current channel for communication. For a link with multiple ports, the user can easily find the running port by the value of the information point.
3	Total communication times	Display the total number of communication times at present.
4	Failed communication times	Display the number of failures during current communication process. Failure means that data are not sent successfully or the received data are incorrect, etc.

**5.1.1.5. IO parameter**

**Overview** The user can view IO parameters of each kind of information point on the IO information page in the data area of **EDPS ICT-S+**. For IO parameters of each kind of data, accurate marginal check and data verification have been provided in the system according to setup parameters, which can effectively reduce the error rate of configuration data in the user's input process.

**5.1.1.5.1. Analog input**

**Function** Define the function code of reading information point.

<b>code</b>	<ul style="list-style-type: none"> <li>• 3—Holding Register</li> <li>• 4—Input Register</li> </ul>
<b>Register address</b>	Define the address information of register of information point.
<b>Starting position</b>	Define the start byte position of the current information point in the register.
<b>Priority</b>	Define the processing priority of information point. <ul style="list-style-type: none"> <li>• Class 1 data</li> <li>• Class 2 data</li> <li>• Class 3 data</li> </ul>
<b>Data length</b>	Define the data length of information point in the register.
<b>Value type</b>	Define the value type in the register. <ul style="list-style-type: none"> <li>• Discrete type</li> <li>• Integer</li> <li>• Unsigned integer</li> <li>• Floating-point number</li> </ul>

#### 5.1.1.5.2. State input

<b>Function code</b>	Define the function code of reading information point. <ul style="list-style-type: none"> <li>• 1—Coil Status</li> <li>• 2—Input Status</li> <li>• 3—Holding Register</li> <li>• 4—Input Register</li> <li>• 7—Exception Status</li> </ul>
<b>Register address</b>	Define the address information of register of information point.
<b>Starting position</b>	Define the start byte position of the current information point in the register.
<b>Priority</b>	Define the processing priority of information point. <ul style="list-style-type: none"> <li>• Class 1 data</li> <li>• Class 2 data</li> <li>• Class 3 data</li> </ul>

#### 5.1.1.5.3. Cumulant input

<b>Function code</b>	Define the function code of reading information point. <ul style="list-style-type: none"> <li>• 3—Holding Register</li> <li>• 4—Input Register</li> </ul>
<b>Register address</b>	Define the address information of register of information point.
<b>Starting position</b>	Define the start byte position of the current information point in the register.

<b>Priority</b>	Define the processing priority of information point. <ul style="list-style-type: none"> <li>• Class 1 data</li> <li>• Class 2 data</li> <li>• Class 3 data</li> </ul>
<b>Data length</b>	Define the data length of information point in the register.
<b>Value type</b>	Define the value type in the register. <ul style="list-style-type: none"> <li>• Discrete type</li> <li>• Integer</li> <li>• Unsigned integer</li> <li>• Floating-point number</li> </ul>

#### 5.1.1.5.4. Analog output

<b>Function code</b>	Define the function code of reading information point. Define the function code of reading information point. <ul style="list-style-type: none"> <li>• 3—Holding Register</li> <li>• 4—Input Register</li> </ul>
<b>Register address</b>	Define the address information of register of information point.
<b>Starting position</b>	Define the start byte position of the current information point in the register.
<b>Priority</b>	Define the processing priority of information point. <ul style="list-style-type: none"> <li>• Class 1 data</li> <li>• Class 2 data</li> <li>• Class 3 data</li> </ul>
<b>Data length</b>	Define the data length of information point in the register.
<b>Value type</b>	Define the value type in the register. <ul style="list-style-type: none"> <li>• Discrete type</li> <li>• Integer</li> <li>• Unsigned integer</li> <li>• Floating-point number</li> </ul>
<b>Writing function code</b>	Define the function code of writing information point. <ul style="list-style-type: none"> <li>• 6-Preset Register</li> <li>• 16-Preset Multiple Registers</li> </ul>

#### 5.1.1.5.5. State output

<b>Function code</b>	Define the function code of reading information point. <ul style="list-style-type: none"> <li>• 5—Force Coil</li> <li>• 15—Force Multiple Coils</li> <li>• 6—Preset Register</li> <li>• 10—Preset Multiple Register</li> </ul>
<b>Register</b>	Define the address information of register of information

<b>address</b>	point.
<b>Starting position</b>	Define the start byte position of the current information point in the register.
<b>Pulse number</b>	Define the number of pulses.It's valid when the control mode is pulse mode.
<b>High-level time</b>	Define the duration of rising edge at pulse output mode
<b>Low-level time</b>	Define the duration of falling edge at pulse output mode
<b>Open command value</b>	Define the substituted value for executing open command.
<b>Close command value</b>	Define the substituted value for executing close command.

#### 5.1.1.5.6. **Event**

<b>Event code</b>	Define the serial number of event code.It's used to retrieve event information.
-------------------	---

#### 5.1.1.5.7. **Setting**

<b>Function code</b>	Define the function code of reading information point. <ul style="list-style-type: none"> <li>• 3—Holding Register</li> <li>• 4—Input Register</li> </ul>
<b>Register address</b>	Define the address of register.
<b>Starting position</b>	Define the start byte position of the information point in the register.
<b>Data length Value type</b>	Define the data length of information point.
<b>Writing function code</b>	Define the function code of writing information point. <ul style="list-style-type: none"> <li>• 6- Force Register</li> </ul>

### 5.1.2.Modbus forwarding configuration

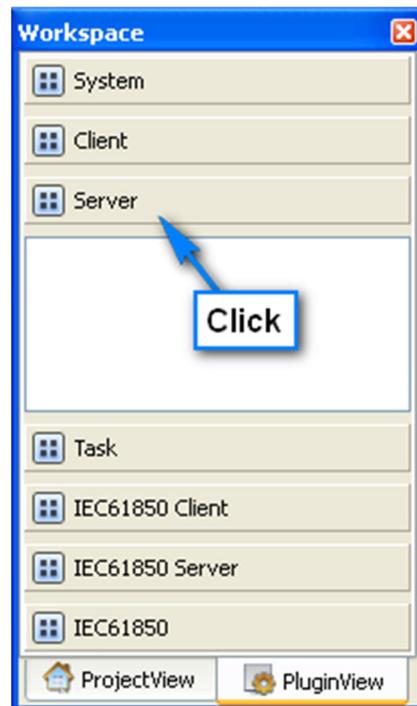
#### 5.1.2.1. Driver information

**Overview** Describe detailed configuration information of forwarding driver

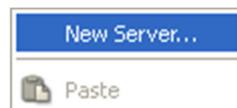
**Create** Create Modbus forwarding driver

1. Open a project file;

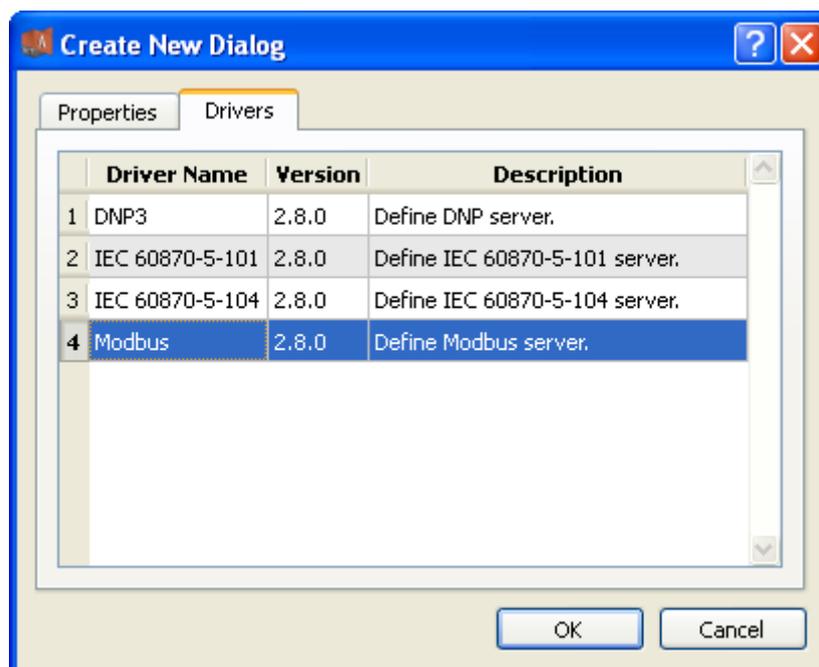
2. Select the plugin management page in the management area of **EDPS ICT-S+**;
3. Activate the forwarding service plugin;



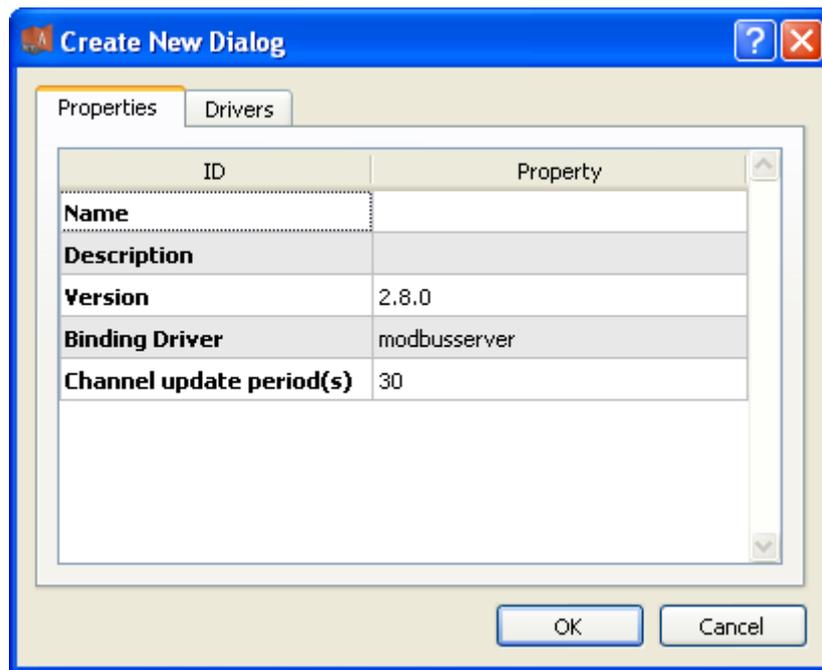
4. Right click in the blank space, and select the menu option “New forwarding service” to pop up the “Create driver dialog”;



5. Select the driver to be created in the driver page;



6. Configure basic attributes of the target driver in the attribute page;



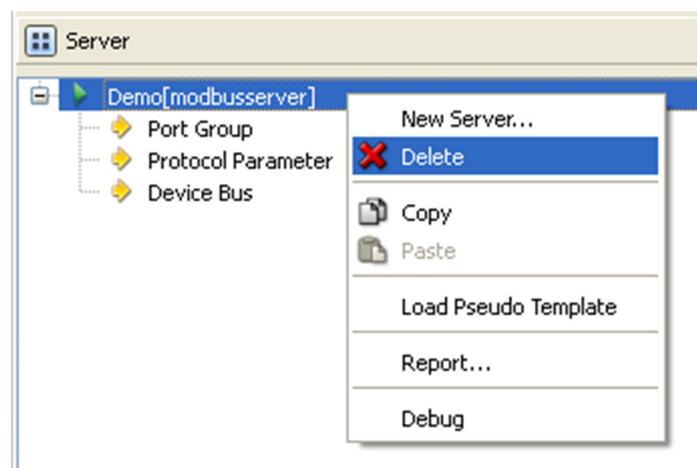
7. Click “OK” to complete creation;

**Note:** Driver information

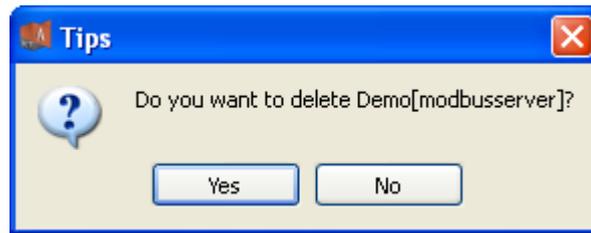
No.	Name	Description
1	Name	Define the display name of driver.
2	Description	Define the description information of driver.
3	Version	Define the version information of driver.
4	Binding driver	Define the name of binding module, which is unique and cannot be modified.
5	Channel update period(s)	Define the cycle of updating IED communication times.

**Delete** Delete Modbus forwarding driver

8. Right click and select the menu option “Delete”;



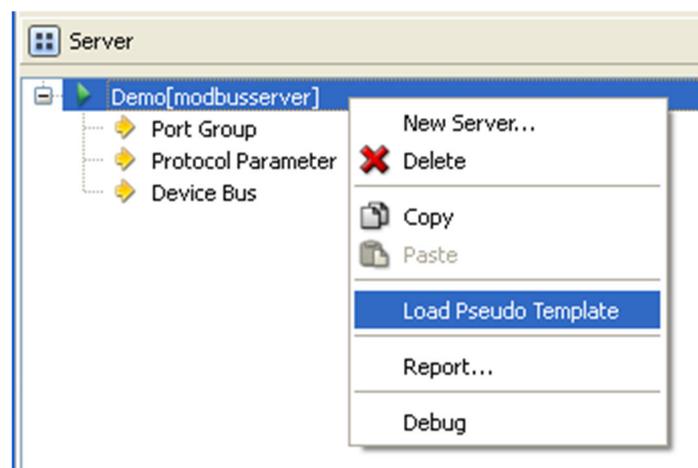
9. It prompts whether to delete;



10. Click “Yes” to complete deletion;

## Virtual point template

11. Right click the driver bar, and select the menu option “Load virtual point template” to complete loading of virtual point of driver.



### Note:

Basic		Value					
	Point Name	Description	Value Type	Initial Value	Owner	Show Mode	Parameter
1	DRVSTA	Running status	16 Bits Unsigned Short	0	Local	By Name	0:Exit,1:Running,2:Paused,3:StandBy
2	DRVAUTH	Authority	Bool	0	Local	By Name	0:Demo,1:Authority

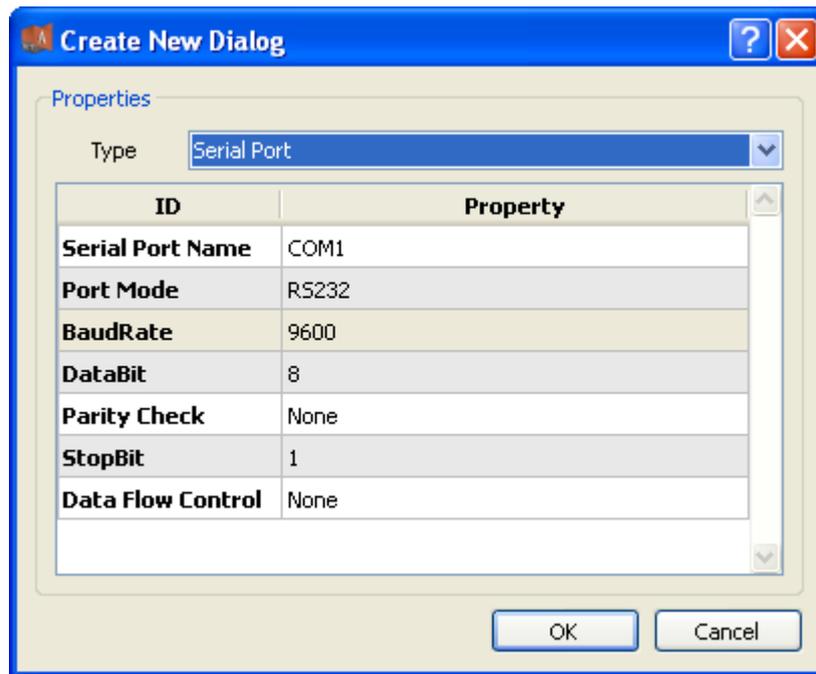
No.	Name	Description
1	Running status	Observe the running state information of the driver.
2	Authority	Observe the authorization state of the driver.

### 5.1.2.2. Port group information

**Overview** Describe communication channel information

**Create** Create communication channel

1. Right click a port group and select “New port” to pop up the “Create port dialog”;



2. Select serial port or network port according to actual situation;

Notes: Attributes of serial channel

No.	Name	Description
1	Serial port name	Set the name of serial port;
2	Port mode	Set the work mode of serial port;
3	Baud rate	Set the Baud rate of serial port;
4	Data bit	Set the data bits of serial port;
5	Parity check	Set the check bit of serial port;
6	Stop bit	Set the stop bit of serial port;
7	Data flow control	Set the data flow control mode of serial port;

Attributes of network channel

No.	Name	Description
1	Port mode	Set the work mode of network port;
2	Service IP	Set the IP address at TCP server/UDP destination address;
3	Port number	Set the work port number of network port;
4	Broadcast address	Set the broadcast address of network port;

**Delete** Delete communication channel

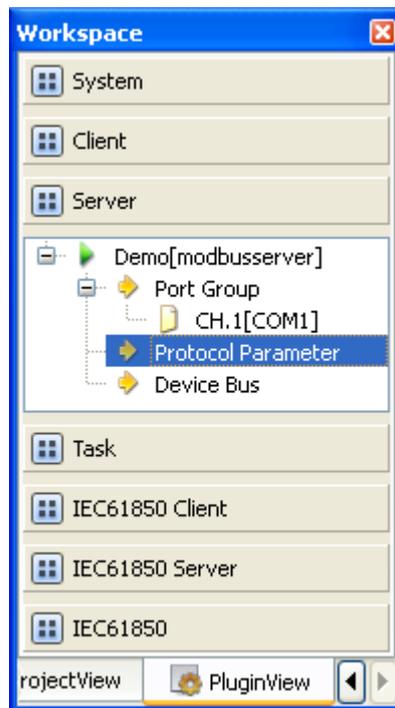
3. Right click a channel number and click "Delete", and select "Yes" to complete deletion.

### 5.1.2.3. Protocol parameter

**Overview** Define communication protocol parameter of protocol

1. Open a project, and select the plugin management page in the management

- area of **EDPS ICT-S+**;
2. Activate the forwarding service plugin;
  3. Select the protocol parameter node in the management area;



4. View protocol parameter attributes

ID	Property
<b>Frame Type</b>	RTU
<b>Byte Order for 2 Bytes</b>	21
<b>Byte Order for 3 Bytes</b>	321
<b>Byte Order for 4 Bytes</b>	4321
<b>Byte Order for Float</b>	4321
<b>Data Bytes in a Register</b>	2
<b>Idle Interval(ms)</b>	10
<b>Byte Order for CRC</b>	21

Note: Protocol parameter information

No.	Name	Description
1	Frame type	Define the format of communication data frame
2	Byte order for 2bytes	Define the arrangement order of 2 bytes in the device
3	Byte order for 3 bytes	Define the arrangement order of 3 bytes in the device
4	Byte order for 4 bytes	Define the arrangement order of 4 bytes in the device

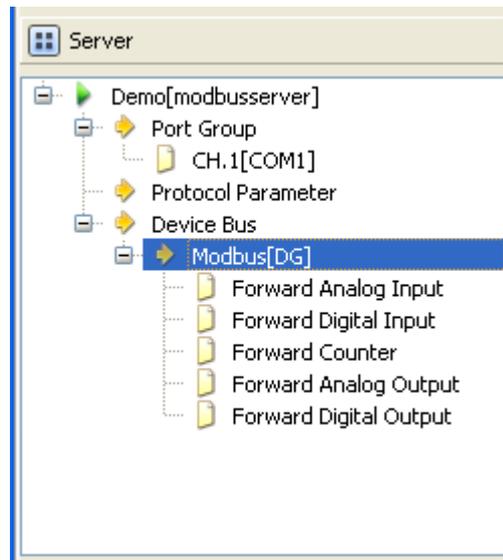
5	Byte order for float	Define the arrangement order of floating-point number bytes
6	Data bytes in a register	Define the number of bytes occupied by each register
7	Idle interval (ms)	Define the idle time interval of communication, in ms
8	Byte order for CRC	Define the arrangement order of CRC check code

#### 5.1.2.4. Device parameter

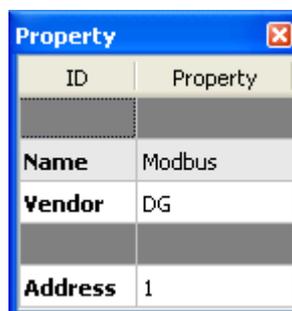
**Overview** Define device parameter of protocol

**Attribute** View device parameter attributes

1. Open a project, and select the plugin management page in the management area of **EDPS ICT-S+**;
2. Activate the forwarding service plugin;
3. Select any child node under the node of device bus in the management area with mouse;



4. View the attribute area of **EDPS ICT-S+**;



Note: Device attribute information

No.	Name	Description
1	Name	Define the name of device

2	Vendor	Define the manufacturer of device.
3	Address	Define the address information of device.

### Virtual point attribute View the data area of ICT-S+

Basic		Value					
	Point Name	Description	Value Type	Initial Value	Owner	Show Mode	Parameter
1	IEDSTA	IED status	Bool	0	Local	By Name	0:Off-line,1:On-line
2	ACTPORT	Current active port number	16 Bits Signed Short	-1	Local	By Value	
3	TOTALCOM	Total communication times	32 Bits Unsigned Long	0	Local	By Value	
4	FAILCOM	Failed communication times	32 Bits Unsigned Long	0	Local	By Value	

No.	Name	Description
1	IED status	Describe the communication state of the current device. The user can view whether the device is online or offline by the value of the information point.
2	Current active port number	Display which communication port is used by the current channel for communication. For a link with multiple ports, the user can easily find the running port by the value of the information point.
3	Total communication times	Display the total number of communication times at present.
4	Failed communication times	Display the number of failures during current communication process. Failure means that data are not sent successfully or the received data are incorrect, etc.

#### 5.1.2.5. IO parameter

**Overview** The user can view IO parameters of each kind of information point on the IO information page in the data area of **EDPS ICT-S+**. For IO parameters of each kind of data, accurate marginal check and data verification have been provided in the system according to setup parameters, which can effectively reduce the error rate of configuration data in the user's input process.

##### 5.1.2.5.1. Analog input

**Function code** Define the function code of reading information point.

- 3—Holding Register

	<ul style="list-style-type: none"> <li>• 4—Input Register</li> </ul>
<b>Register address</b>	Define the address of register.
<b>Starting position</b>	Define the start byte position of the current information point in the register.
<b>Data length</b>	Define the length of data.
<b>Value type</b>	Define the value type of data. <ul style="list-style-type: none"> <li>• Discrete type</li> <li>• Integer</li> <li>• Unsigned integer</li> <li>• Floating-point number</li> </ul>
<b>Offset</b>	Define the offset of numerical value of information point.
<b>Divisor</b>	Define the division factor required in case of data change at the information point.

#### 5.1.2.5.2. State input

<b>Function code</b>	Define the function code of reading information point. <ul style="list-style-type: none"> <li>• 1—Coil Status</li> <li>• 2—Input Status</li> <li>• 3—Holding Register</li> <li>• 4—Input Register</li> </ul>
<b>Register address</b>	Define the address information of register of information point.
<b>Starting position</b>	Define the start byte position of the current information point in the register.

#### 5.1.2.5.3. Cumulant input

<b>Function code</b>	Define the function code of reading information point. <ul style="list-style-type: none"> <li>• 3—Holding Register</li> <li>• 4—Input Register</li> </ul>
<b>Register address</b>	Define the address information of register of information point.
<b>Starting position</b>	Define the start byte position of the current information point in the register.
<b>Data length</b>	Define the data length of information point in the register.
<b>Value type</b>	Define the value type in the register. <ul style="list-style-type: none"> <li>• Discrete type</li> <li>• Integer</li> <li>• Unsigned integer</li> <li>• Floating-point number</li> </ul>
<b>Offset</b>	Define the offset of numerical value of information point.

**Divisor** Define the division factor required in case of data change at the information point.

#### 5.1.2.5.4. Analog output

**Function code** Define the function code of reading information point.

- 3—Holding Register
- 4—Input Register

**Register address** Define the address information of register of information point.

**Starting position** Define the start byte position of the current information point in the register.

**Data length** Define the data length of information point in the register.

**Value type** Define the value type in the register.

- Discrete type
- Integer
- Unsigned integer
- Floating-point number

**Offset** Define the offset of numerical value of information point.

**Divisor** Define the division factor required in case of data change at the information point.

#### 5.1.2.5.5. State output

**Function code** Define the function code of reading information point.

- 5—Force Coil
- 15—Force Multiple Coils

**Register address** Define the address information of register of information point.

## 5.2. IEC60870-5-101 protocol configuration

This chapter mainly describes how **EDPS ICT-S+** configures IEC60870-5-101 acquisition and forwarding driver modules. The configuration manual mainly describes driver information, protocol parameter information, device parameter information, and IO parameter information of various information points. IEC60870-5-101 acquisition and forwarding modules of EDPS completely match the standard protocol text, and **EDPS ICT-S+** provides a concise and fast way to help the user to conduct configuration.

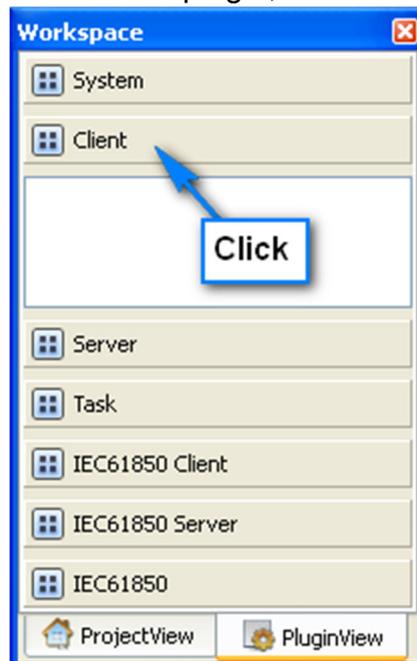
## 5.2.1. IEC101 acquisition configuration

### 5.2.1.1. Driver information

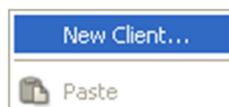
**Overview** Describe detailed information of acquisition driver

**Create** Create IEC101 acquisition driver

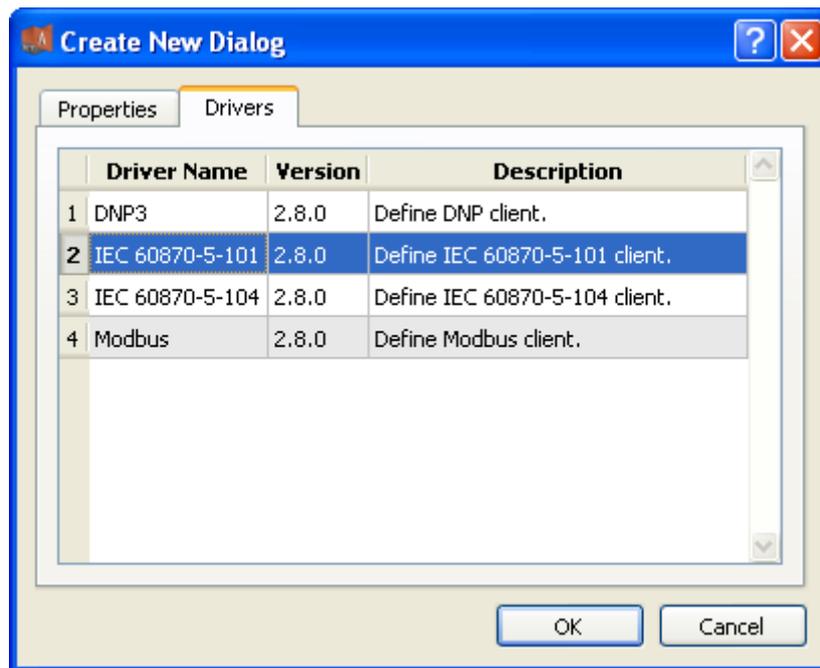
1. Open a project file;
2. Select the plugin management page in the management area of **EDPS ICT-S+**;
3. Activate the acquisition service plugin;



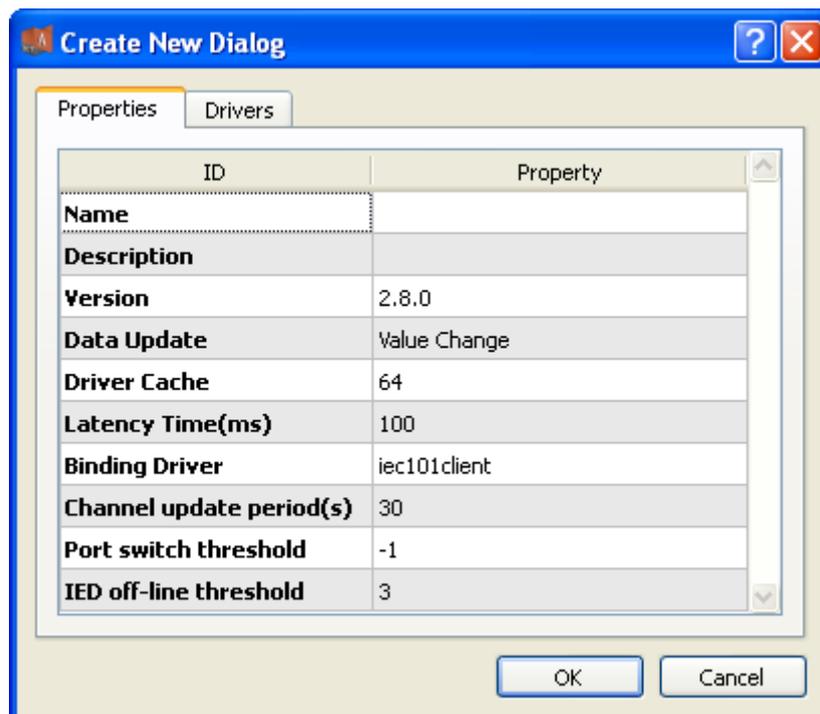
4. Right click in the blank space, and select the menu option "New acquisition service" to pop up the "Create driver dialog";



5. Select the driver to be created in the driver page;



6. Configure basic attributes of the target driver in the attribute page;



7. Click "OK" to complete creation;

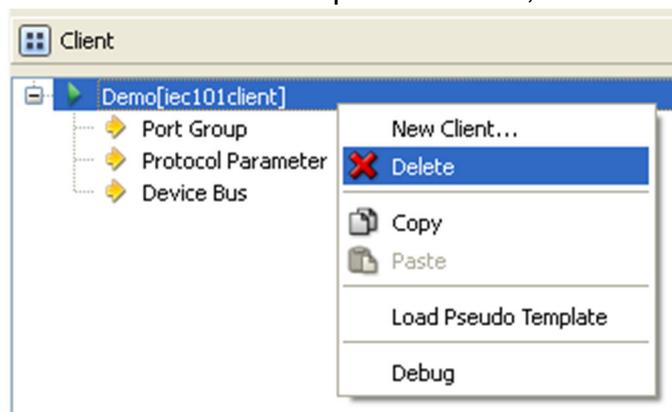
Note: Driver information

No.	Name	Description
1	Name	Define the display name of driver.
2	Description	Define the description information of driver.
3	Version	Define the version information of driver.
4	Data update	Define the data updating mode. Value change – The system updates the

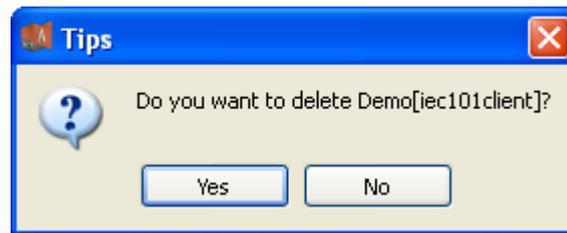
		<p>database and notifies other driver protocols only when a value changes;</p> <p>Time change – The system updates the database and notifies other driver protocols no matter whether a value or time changes;</p> <p>Time update – The system updates the database no matter whether a value or time changes, and notifies other driver protocols only when a value changes;</p>
5	Driver cache	Define the cache size of driver.
6	Latency time (ms)	<p>Define the delay time of updating real-time database.</p> <p>The system shall write raw data into the real-time database after a delay of the time defined.</p>
7	Binding driver	Define the name of driver module, which is unique and cannot be modified.
8	Channel update period (s)	Define the cycle of updating IED communication times.
9	Port switch threshold	Define the switching conditions among multiple ports; when the number of consecutive communication failures of the primary port reaches the threshold, it's switched to another port. -1 indicates port switching is deactivated.
10	IED off-line threshold	Define the offline threshold of IED device; when the number of consecutive communication failures reaches the threshold, the device is switched to offline state.

**Delete** Delete IEC101 acquisition driver

8. Right click and select the menu option “Delete”;



9. It prompts whether to delete;



10. Click “Yes” to complete deletion;

**Virtual point template** Load virtual point of driver from the system template library

11. Right click the driver bar, and select the menu option “Load virtual point template” to complete loading of virtual point of driver.



Note:

Basic		Value					
	Point Name	Description	Value Type	Initial Value	Owner	Show Mode	Parameter
1	DRVSTA	Running status	16 Bits Unsigned Short	0	Local	By Name	0:Exit,1:Running,2:Paused,3:StandBy
2	DRVAUTH	Authority	Bool	0	Local	By Name	0:Demo,1:Authority

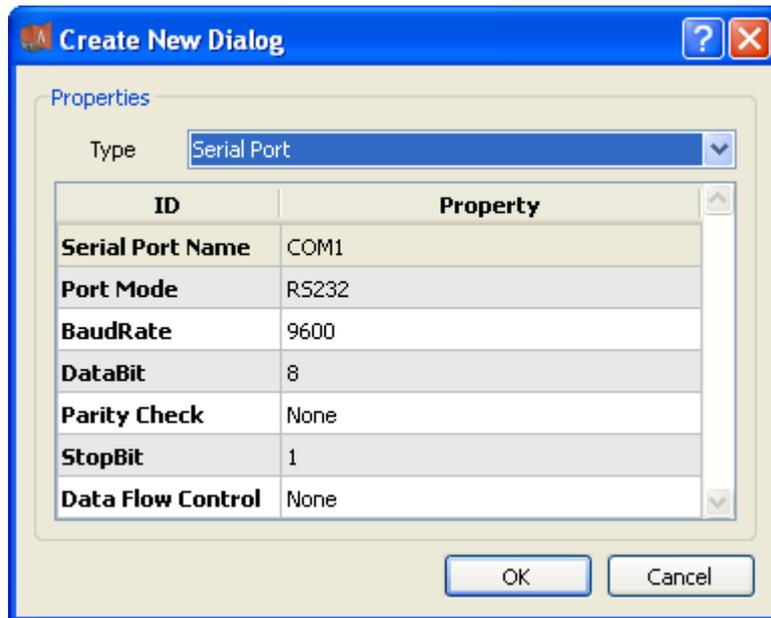
No.	Name	Description
1	Running status	Observe the running state information of the driver.
2	Authority	Observe the authorization state of the driver.

### 5.2.1.2. Port group information

**Overview** Describe communication channel information

**Create** Create communication channel

1. Right click a port group and select “New port” to pop up the “Create port dialog”;



2. Select serial port or network port according to actual situation;

Notes: Attributes of serial channel

No.	Name	Description
1	Serial port name	Set the name of serial port;
2	Port mode	Set the work mode of serial port;
3	Baud rate	Set the Baud rate of serial port;
4	Data bit	Set the data bits of serial port;
5	Parity check	Set the check bit of serial port;
6	Stop bit	Set the stop bit of serial port;
7	Data flow control	Set the data flow control mode of serial port;

Attributes of network channel

No.	Name	Description
1	Port mode	Set the work mode of network port;
2	Service IP	Set the IP address at TCP server/UDP destination address;
3	Port number	Set the work port number of network port;
4	Broadcast address	Set the broadcast address of network port;

**Delete** Delete communication channel

3. Right click a channel number and click “Delete”, and select “Yes” to complete deletion.

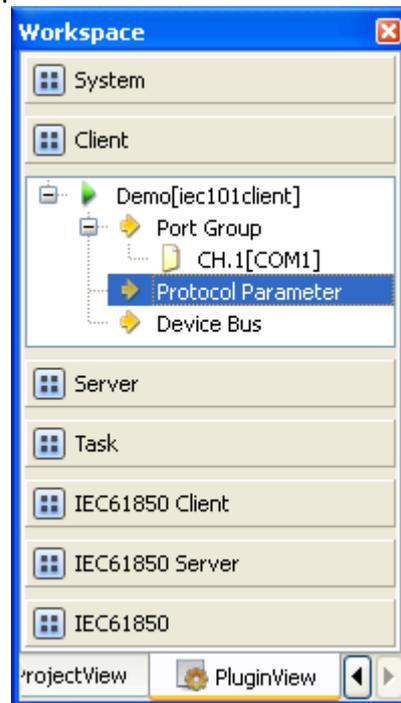
### 5.2.1.3. Protocol parameter

**Overview** Define communication protocol parameter of protocol

**Attribute** View protocol parameter attributes of **EDPS ICT-S+**

1. Open a project, and select the plugin management page in the management

- area of **EDPS ICT-S+**;
2. Activate the acquisition service plugin;
  3. Select the protocol parameter node in the management area;



4. View protocol parameter attributes

ID	Property
<b>App. Layer Timeout(ms)</b>	2000
<b>Address Length(byte)</b>	1
<b>Retry Times</b>	0
<b>Idle Interval(ms)</b>	10
<b>Enable E5</b>	Disable

Note: Protocol parameter information

No.	Name	Description
1	App. layer timeout (ms)	Define the timeout interval of waiting for response of application layer; when the system doesn't receive the response of application layer within the time interval, the system decided no response from the device.
2	Address length (byte)	Define the length of link address; the attribute is mainly used to enhance the compatibility of driver.
3	Retry times	Define the times for which the data need to be resent after data fail to be sent.
4	Idle interval (ms)	Define the idle waiting time interval between two complete communication processes in the

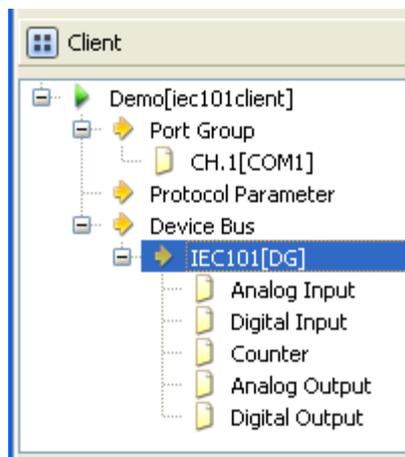
		system.A complete communication process means from sending request for data to receiving all valid data.
5	Enable E5	Define whether to process E5 when IEC60870-5-101 processes data.

#### 5.2.1.4. Device parameter

**Overview** Define device parameter of protocol

**Attribute** View device parameter attributes

1. Open a project, and select the plugin management page in the management area of **EDPS ICT-S+**;
2. Activate the acquisition service plugin;
3. Select any child node under the node of device bus in the management area with mouse;



4. View the attribute area of **EDPS ICT-S+**;

ID	Property
<b>Name</b>	IEC101
<b>Vendor</b>	DG
<b>Address</b>	1
<b>Length of Common Address</b>	2
<b>Length of COT</b>	2
<b>Length of Info Object Address</b>	3
<b>Integrity Interval(ms)</b>	10000
<b>Request Interval(ms)</b>	1000
<b>Counter Polling Mode</b>	Disable
<b>Counter Period(s)</b>	0
<b>Counter Reset</b>	No
<b>Time Sync Period(s)</b>	60
<b>Group Info</b>	...
<b>Counter Group Info</b>	...
<b>Negative Format</b>	Complementary

Note: Device attribute information

No.	Name	Description
1	Name	Define the name of device
2	Vendor	Define the manufacturer of device.
3	Address	Define the physical address of device.
4	Length of common address	Define the number of bytes occupied by public address in IEC101 communication byte stream.
5	Length of COT	Define the number of bytes occupied by transmission reason in IEC101 communication byte stream.
6	Length of infoobject address	Define the number of bytes occupied by information object address in IEC101 communication byte stream.
7	Integrity interval (ms)	Define the cycle of performing general interrogation to device, in ms
8	Request interval (ms)	Define the time interval of querying Class 2 data at nonequilibrium mode, in ms
9	Counter polling mode	Define the mode at which the device processes cumulant. It's divided into mode A/B/C/D. See 101 protocol text for details.
10	Counterperiod (s)	Define the cycle of sending cumulant calling command. It's only valid at mode B/C/D.0 means cyclic call is deactivated.

11	Counter reset	Define whether to reset cumulant when calling cumulant.
12	Time sync period (s)	Define the cycle of sending time synchronization command. -1 means it's invalid.0 means the system sends time synchronization command when starting up.
13	Group info	Define the detailed group information when calling group.
14	Counter group info	Define the detailed group information when calling cumulant group.
15	Negative format	Define the decoding method when the analog value is negative.

**Virtual point attribute**View the data area of **EDPS ICT-S+**

Basic		Value					
	Point Name	Description	Value Type	Initial Value	Owner	Show Mode	Parameter
1	IEDSTA	IED status	Bool	0	Local	By Name	0:Off-line,1:On-line
2	ACTPORT	Current active port number	16 Bits Signed Short	-1	Local	By Value	
3	TOTALCOM	Total communication times	32 Bits Unsigned Long	0	Local	By Value	
4	FAILCOM	Failed communication times	32 Bits Unsigned Long	0	Local	By Value	

No.	Name	Description
1	IED status	Describe the communication state of the current device. The user can view whether the device is online or offline by the value of the information point.
2	Current active port number	Display which communication port is used by the current channel for communication. For a link with multiple ports, the user can easily find the running port by the value of the information point.
3	Total communication times	Display the total number of communication times at present.
4	Failed communication times	Display the number of failures during current communication process. Failure means that data are not sent successfully or the received data are incorrect, etc.

**5.2.1.5. IO parameter**

**Overview** The user can view IO parameters of each kind of information point on the IO information page in the data area of **EDPS ICT-S+**. For IO parameters of each kind of data, accurate marginal check and data verification have been provided in the system according

to setup parameters, which can effectively reduce the error rate of configuration data in the user's input process.

#### 5.2.1.5.1. Analog input

**Public address** Define the public address in communication process.  
**Point number** Define the information object address of information point.

#### 5.2.1.5.2. State input

**Public address** Define the public address in communication process.  
**Point number** Define the information object address of information point.

#### 5.2.1.5.3. Cumulant input

**Public address** Define the public address in communication process.  
**Point number** Define the information object address of information point.

#### 5.2.1.5.4. Analog output

**Public address** Define the public address in communication process.  
**Point number** Define the information object address of information point.  
**Output type** Define the ASDU type of information point. See IEC60870-5-101 protocol text for details.

- C\_SE\_NA\_1 (scale value)
- C\_SC\_NB\_1 (normalized value)
- C\_SC\_NC\_1 (short floating-point number)

### 5.2.1.5.5. State output

<b>Public address</b>	Define the public address in communication process.
<b>Point number</b>	Define the information object address of information point.
<b>Output coding</b>	Define the mode of executing command. See IEC60870-5-101 protocol text for details. <ul style="list-style-type: none"><li>• Undefined</li><li>• Short pulse</li><li>• Long pulse</li><li>• Continuous output</li></ul>
<b>Output type</b>	Define ASDU type of command. See IEC60870-5-101 protocol text for details. <ul style="list-style-type: none"><li>• Single-point command</li><li>• Two-point command</li><li>• Step position command</li></ul>

## 5.2.2. IEC101 forwarding configuration

### 5.2.2.1. Driver information

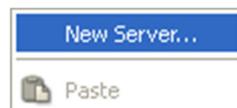
**Overview** Describe detailed information of forwarding driver

**Create** Create IEC101 forwarding driver

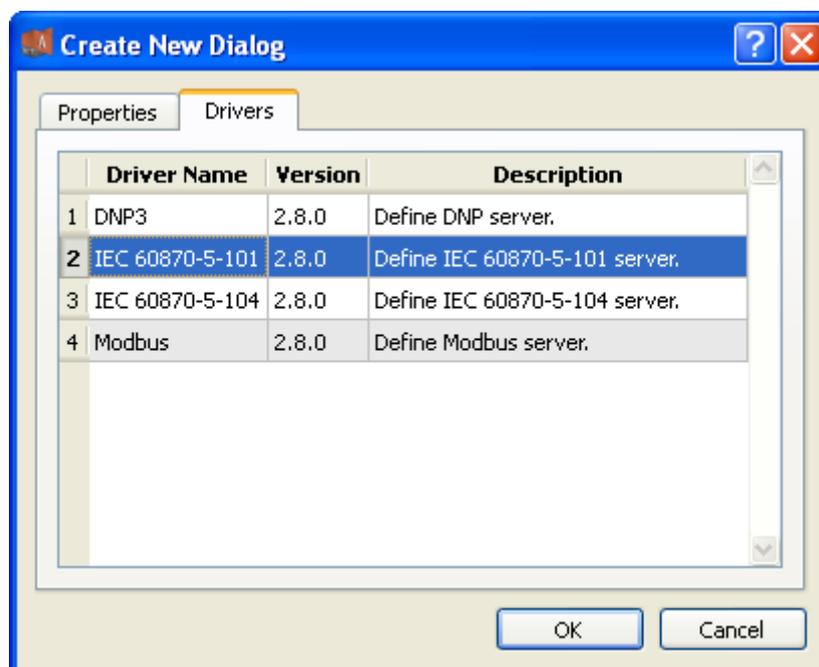
1. Open a project file;
2. Select the plugin management page in the management area of **EDPS ICT-S+**;
3. Activate the forwarding service plugin;



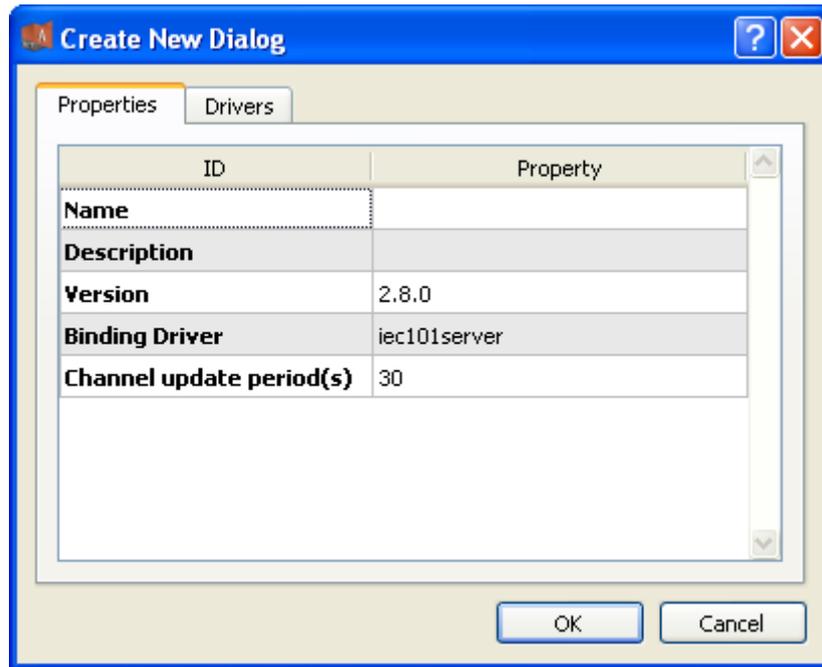
- Right click in the blank space, and select the menu option “New forwarding service” to pop up the “Create driver dialog”;



- Select the driver to be created in the driver page;



- Configure basic attributes of the target driver in the attribute page;



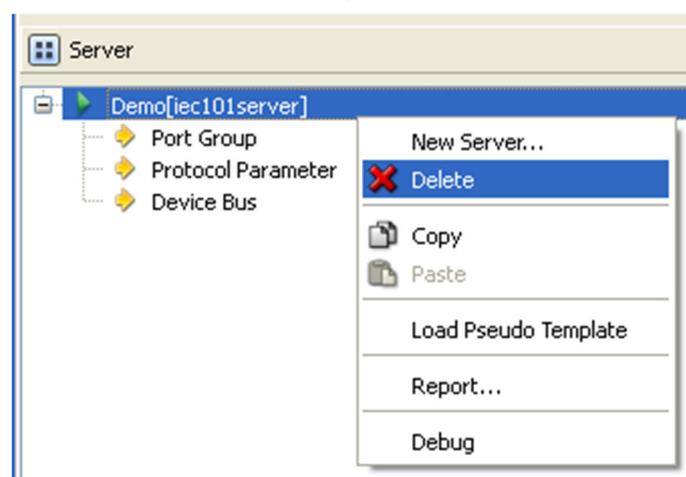
7. Click “OK” to complete creation;

Note: Driver information

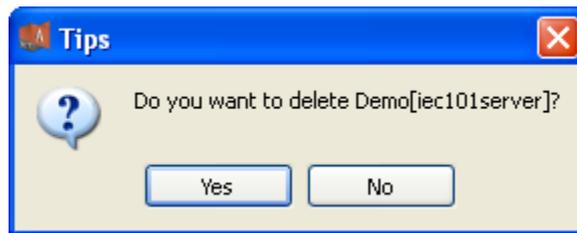
No.	Name	Description
1	Name	Define the display name of driver.
2	Description	Define the description information of driver.
3	Version	Define the version information of driver.
4	Binding driver	Define the name of binding module, which is unique and cannot be modified.
5	Channel update period (s)	Define the cycle of updating IED communication times.

**Delete** Delete IEC101 forwarding driver

8. Right click and select the menu option “Delete”;



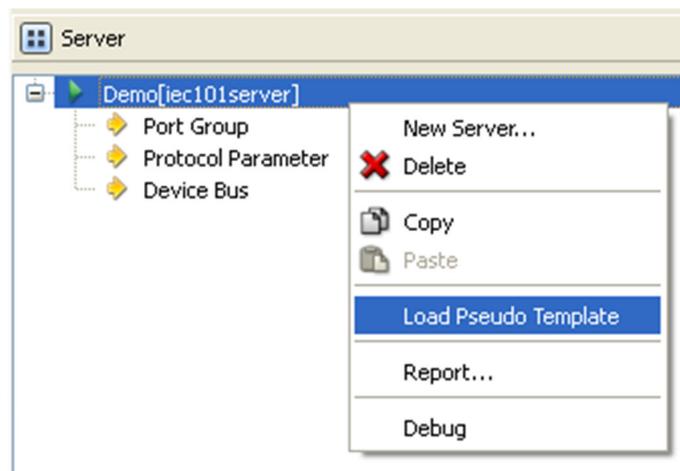
9. It prompts whether to delete;



10. Click “Yes” to complete deletion;

**Virtual point template** Load virtual point of driver from the system template library

11. Right click the driver bar, and select the menu option “Load virtual point template” to complete loading of virtual point of driver.



Note:

Basic		Value					
	Point Name	Description	Value Type	Initial Value	Owner	Show Mode	Parameter
1	DRVSTA	Running status	16 Bits Unsigned Short	0	Local	By Name	0:Exit,1:Running,2:Paused,3:StandBy
2	DRVAUTH	Authority	Bool	0	Local	By Name	0:Demo,1:Authority

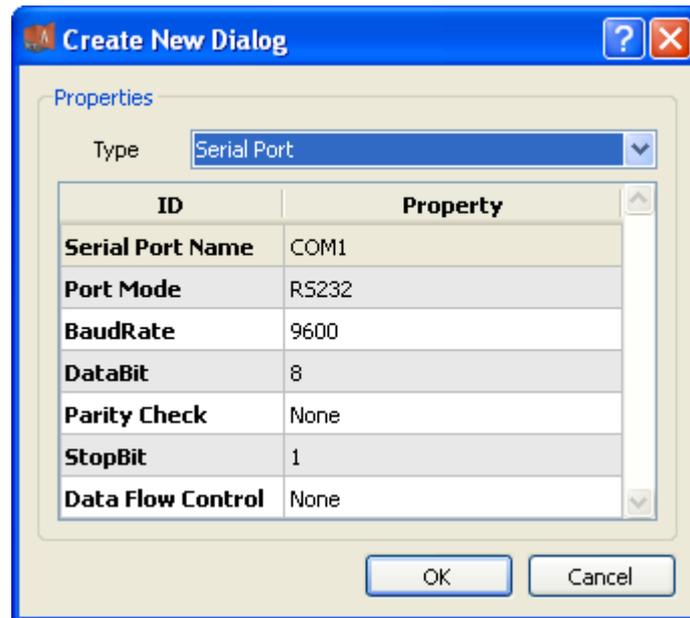
No.	Name	Description
1	Running status	Observe the running state information of the driver.
2	Authority	Observe the authorization state of the driver.

### 5.2.2.2. Port group information

**Overview** Describe communication channel information

**Create** Create communication channel

1. Right click a port group and select “New port” to pop up the “Create port dialog”;



2. Select serial port or network port according to actual situation;

Notes: Attributes of serial channel

No.	Name	Description
1	Serial port name	Set the name of serial port;
2	Port mode	Set the work mode of serial port;
3	Baud rate	Set the Baud rate of serial port;
4	Data bit	Set the data bits of serial port;
5	Parity check	Set the check bit of serial port;
6	Stop bit	Set the stop bit of serial port;
7	Data flow control	Set the data flow control mode of serial port;

Attributes of network channel

No.	Name	Description
1	Port mode	Set the work mode of network port;
2	Service IP	Set the IP address at TCP server/UDP destination address;
3	Port number	Set the work port number of network port;
4	Broadcast address	Set the broadcast address of network port;

**Delete** Delete communication channel

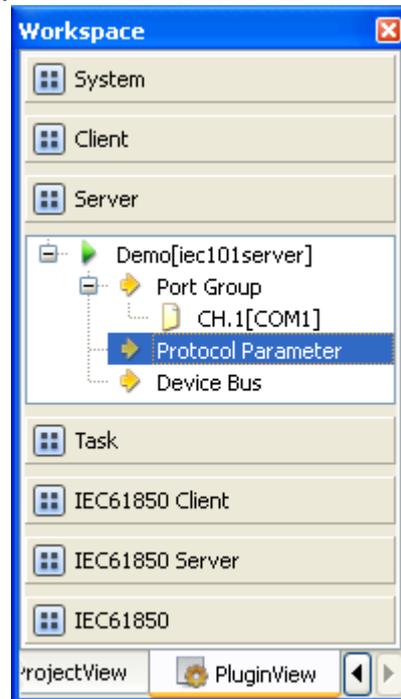
3. Right click a channel number and click “Delete”, and select “Yes” to complete deletion.

### 5.2.2.3. Protocol parameter

**Overview** Define communication protocol parameter of protocol

1. Open a project, and select the plugin management page in the management

- area of **EDPS ICT-S+**;
2. Activate the forwarding service plugin;
  3. Select the protocol parameter node in the management area;



4. View protocol parameter attributes

ID	Property
<b>Address Length(byte)</b>	1
<b>SBO TimeOut(s)</b>	30
<b>Idle Interval(ms)</b>	10
<b>Protocol Version</b>	2002

Note: Protocol parameter information

No.	Name	Description
1	Address length (byte)	Define the length of link address, in byte
2	SBO timeout (s)	Define the timeout interval of remote control selection command, in s
3	Idle interval (ms)	Define the idle time interval of communication, in ms
4	Protocol version	Define the working version number of communication protocol

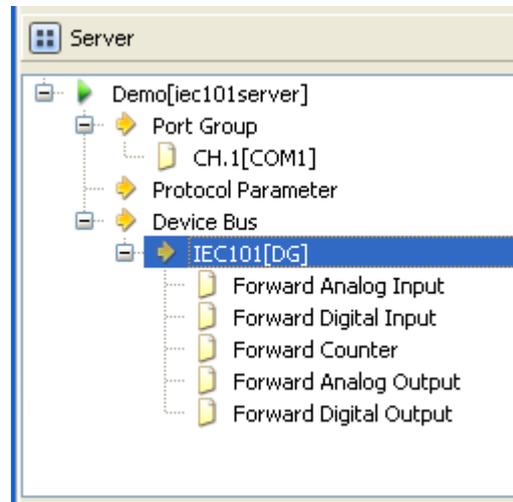
#### 5.2.2.4. Device parameter

**Overview** Define device parameter of protocol

**Attribute** View device parameter attributes

1. Open a project, and select the plugin management page in the management

- area of **EDPS ICT-S+**;
2. Activate the forwarding service plugin;
  3. Select any child node under the node of device bus in the management area with mouse;



4. View the attribute area of **EDPS ICT-S+**;

Property	
ID	Property
<b>Name</b>	IEC101
<b>Vendor</b>	DG
<b>Address</b>	1
<b>Length of Common Address</b>	2
<b>Length of COT</b>	2
<b>Length of Info Object Address</b>	3
<b>Counter Polling Mode</b>	Disable
<b>Counter Reset</b>	No
<b>Counter Time Tag</b>	Disable
<b>Cyclic Transmission</b>	Disable
<b>Negative Format</b>	Complementary
<b>Group Info</b>	...
<b>Counter Group Info</b>	...
<b>Back Scan Period(s)</b>	0
<b>Float Order</b>	1234

Note: Device attribute information

No.	Name	Description
1	Name	Define the name of device
2	Vendor	Define the manufacturer of device.

3	Address	Define the physical address of device.
4	Length of common address	Define the number of bytes occupied by public address in IEC101 communication byte stream.
5	Length of COT	Define the number of bytes occupied by transmission reason in IEC101 communication byte stream.
6	Length of info object address	Define the number of bytes occupied by information object address in IEC101 communication byte stream.
7	Counter polling mode	Define the mode at which the device processes cumulant. It's divided into mode A/B/C/D. See 101 protocol text for details.
8	Counter reset	Define whether it's allowed to reset cumulant
9	Counter time tag	Define whether to add time mark information to cumulant
10	Cyclic transmission	Define whether it's allowed to send data cyclically according to group definition information
11	Negative format	Define the decoding method when the value is negative.
12	Group info	Define the detailed group information when calling group.
13	Counter group info	Define the detailed group information when calling cumulant group.
14	Back scan period (s)	Define the cycle of sending background scanning data frame. 0 means no data are sent.
15	Float order	Define the coding sequence of floating-point number

**Virtual point attribute**View the data area of **EDPS ICT-S+**

Basic		Value					
Point Name	Description	Value Type	Initial Value	Owner	Show Mode	Parameter	
1 IEDSTA	IED status	Bool	0	Local	By Name	0:Off-line,1:On-line	
2 ACTPORT	Current active port number	16 Bits Signed Short	-1	Local	By Value		
3 TOTALCOM	Total communication times	32 Bits Unsigned Long	0	Local	By Value		
4 FAILCOM	Failed communication times	32 Bits Unsigned Long	0	Local	By Value		

No.	Name	Description
1	IED status	Describe the communication state of the current device. The user can view whether the device is online or offline by the value of the information point.
2	Current active port number	Display which communication port is used by the current channel for communication. For a link with multiple ports, the user can easily find the running port by the value of the information point.
3	Total	Display the total number of communication times at

	communication times	present.
4	Failed communication times	Display the number of failures during current communication process. Failure means that data are not sent successfully or the received data are incorrect, etc.

### 5.2.2.5. IO parameter

**Overview** The user can view IO parameters of each kind of information point on the IO information page in the data area of **EDPS ICT-S+**. For IO parameters of each kind of data, accurate marginal check and data verification have been provided in the system according to setup parameters, which can effectively reduce the error rate of configuration data in the user's input process.

#### 5.2.2.5.1. Analog input

<b>Public address</b>	Define the public address in communication process.
<b>Point number</b>	Define the point number of information point.
<b>ASDU type</b>	Define the application function type of information point. <ul style="list-style-type: none"> <li>● M_ME_NA_1 (normalized value)</li> <li>● M_ME_NB_1 (scale value)</li> <li>● M_ME_NC_1 (short floating-point number)</li> <li>● M_ME_ND_1 (normalized value with quality)</li> <li>● M_ST_NA_1 (step position information)</li> </ul>
<b>Working mode</b>	Define the working mode of information point. <ul style="list-style-type: none"> <li>● Cyclic</li> <li>● Burst</li> </ul>
<b>Time mark</b>	Define whether an information point is provided with time mark in transmission frame.
<b>Offset</b>	Define the offset for computing raw data at the information point.
<b>Division</b>	Define the division factor for computing raw data at the information point.
<b>Dead zone</b>	Define the dead zone value of producing event value; it's satisfied

**zone value** when the absolute value of the difference between the previous transmission value and the current value is greater than the dead zone value.

#### 5.2.2.5.2. State input

**Public address** Define the public address in communication process.

**Point number** Define the point number of information point.

**ASDU type** Define the ASDU transmission type of information point.

- M\_SP\_NA\_1 (single-point)
- M\_DP\_NA\_1 (two-point)

**Working mode** Define the working mode of information point.

- Cyclic
- Burst

**Automatic SOE** Define whether the system transmit change data as SOE according to settings after it receives shift information.

- Invalid
- Open enabled
- Close enabled
- Change enabled

**SOE** Define whether the system directly uses SOE data of device after it receives valid SOE data.

**COS** Define whether the system sends change information after it receives shift information.

#### 5.2.2.5.3. Cumulant input

**Public address** Define the public address in communication process.

**Point number** Define the point number of information point.

**Min. value** Define the minimum value of raw data.

**Max. value** Define the maximum value of raw data.

**Offset** Define the offset for computing raw data at the information point.

**Division** Define the division factor for computing raw data at the information point.

#### 5.2.2.5.4. Analog output

<b>Public address</b>	Define the public address in communication process.
<b>Point number</b>	Define the point number of information point.
<b>ASDU type</b>	Define the application function type of information point. <ul style="list-style-type: none"> <li>• Normalized value</li> </ul>
<b>Output type</b>	<ul style="list-style-type: none"> <li>• Scale value</li> <li>• Short floating-point number</li> </ul>
<b>Offset</b>	Define the offset for computing raw data at the information point.
<b>Divisor</b>	Define the division factor for computing raw data at the information point.

#### 5.2.2.5.5. State output

<b>Public address</b>	Define the public address in communication process.
<b>Point number</b>	Define the point number of information point.
<b>Control mode</b>	Define the mode of executing control operation command at the information point. <ul style="list-style-type: none"> <li>• Direct execution</li> <li>• Remote control selection</li> </ul>

### 5.3. IEC60870-5-104 protocol configuration

Appendix D mainly describes how **EDPS ICT-S+** configures IEC60870-5-104 acquisition and forwarding driver modules. The configuration manual mainly describes driver information, protocol parameter information, device parameter information, and IO parameter information of various information points. IEC60870-5-104 acquisition and forwarding modules of EDPS completely match the standard protocol text, and **EDPS ICT-S+** provides a concise and fast way to help the user to conduct configuration.

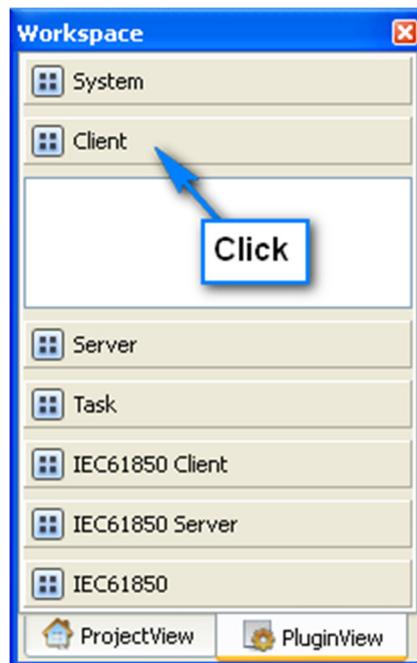
#### 5.3.1. IEC104 acquisition configuration

##### 5.3.1.1. Driver information

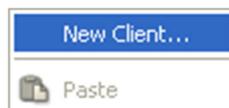
**Overview** Describe detailed information of acquisition driver

**Create** Create IEC104 acquisition driver

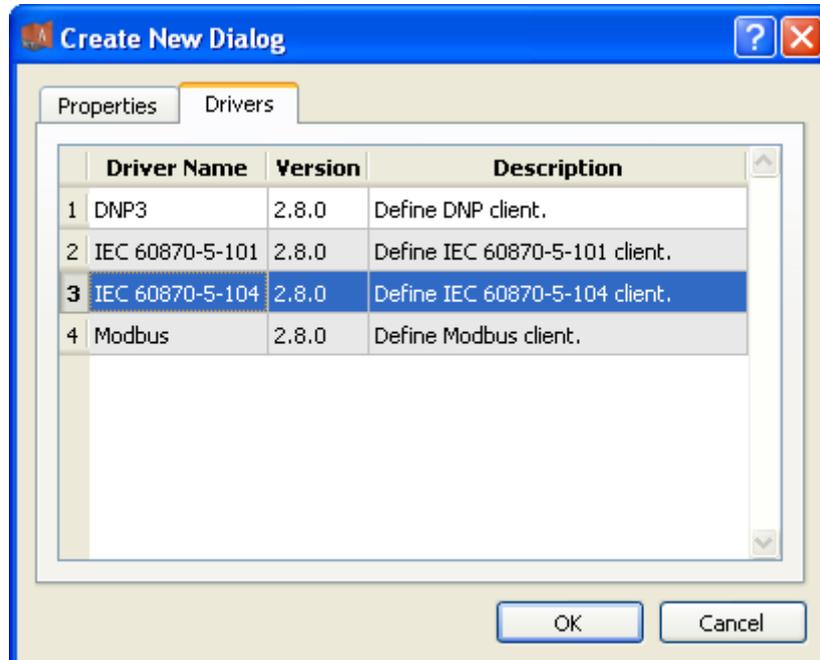
1. Open a project file;
2. Select the plugin management page in the management area of **EDPS ICT-S+**;
3. Activate the acquisition service plugin;



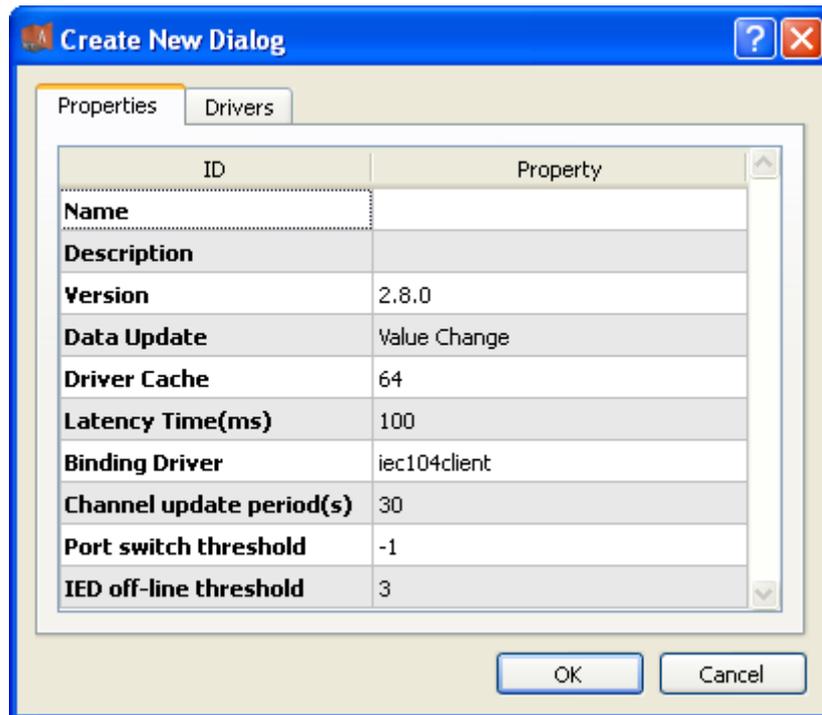
4. Right click in the blank space, and select the menu option “New acquisition service” to pop up the “Create driver dialog”;



5. Select the driver to be created in the driver page;



6. Configure basic attributes of the target driver in the attribute page;



7. Click "OK" to complete creation;

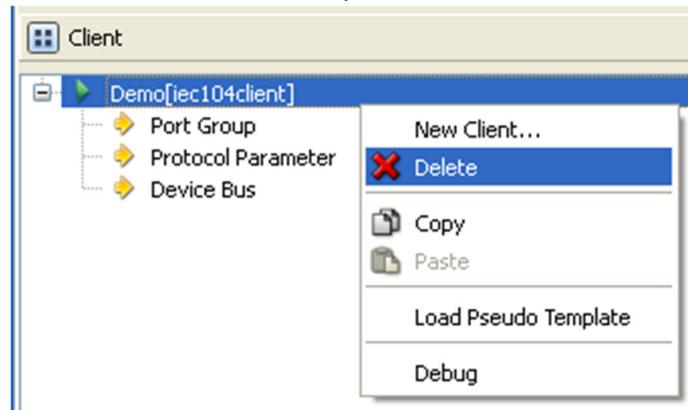
Note: Driver information

No.	Name	Description
1	Name	Define the display name of driver.
2	Description	Define the description information of driver.
3	Version	Define the version information of driver.
4	Data update	Define the data updating mode. Value change – The system updates the database and notifies other driver protocols only when a value changes; Time change – The system updates the database and notifies other driver protocols no matter whether a value or time changes; Time update – The system updates the database no matter whether a value or time changes, and notifies other driver protocols only when a value changes;
5	Driver cache	Define the cache size of driver.
6	Latency time (ms)	Define the delay time of updating real-time database. The system shall write raw data into the real-time database after a delay of the time defined.
7	Binding driver	Define the name of driver module, which is unique and cannot be modified.
8	Channel update	Define the cycle of updating IED communication

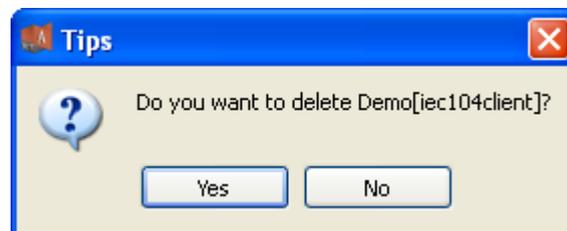
	period (s)	times.
9	Port switch threshold	Define the switching conditions among multiple ports; when the number of consecutive communication failures of the primary port reaches the threshold, it's switched to another port. -1 indicates port switching is deactivated.
10	IED off-line threshold	Define the offline threshold of IED device; when the number of consecutive communication failures reaches the threshold, the device is switched to offline state.

**Delete** Delete IEC101 acquisition driver

8. Right click and select the menu option "Delete";



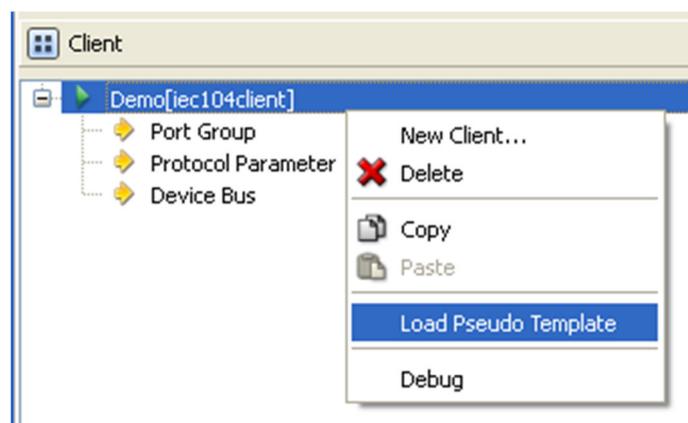
9. It prompts whether to delete;



10. Click "Yes" to complete deletion;

**Virtual point template** Load virtual point of driver from the system template library

11. Right click the driver bar, and select the menu option "Load virtual point template" to complete loading of virtual point of driver.



Note:

Basic		Value					
	Point Name	Description	Value Type	Initial Value	Owner	Show Mode	Parameter
1	DRVSTA	Running status	16 Bits Unsigned Short	0	Local	By Name	0:Exit,1:Running,2:Paused,3:StandBy
2	DRVAUTH	Authority	Bool	0	Local	By Name	0:Demo,1:Authority

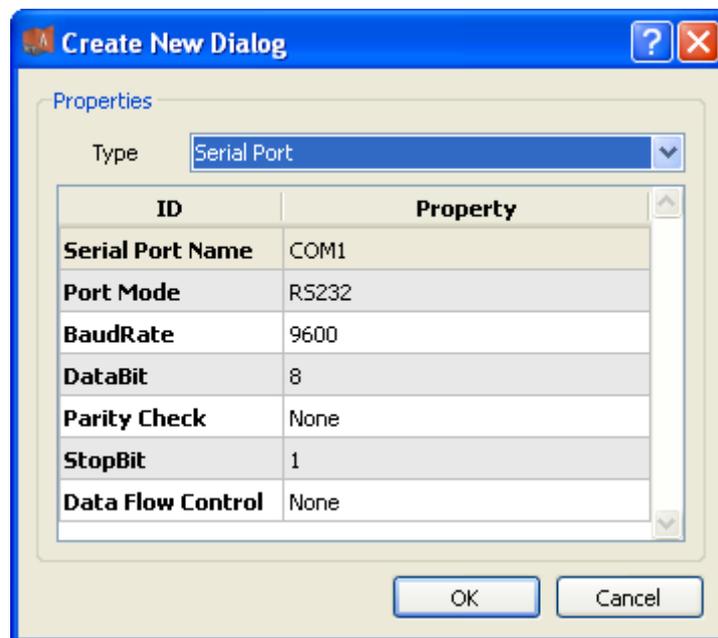
No.	Name	Description
1	Running status	Observe the running state information of the driver.
2	Authority	Observe the authorization state of the driver.

### 5.3.1.2. Port group information

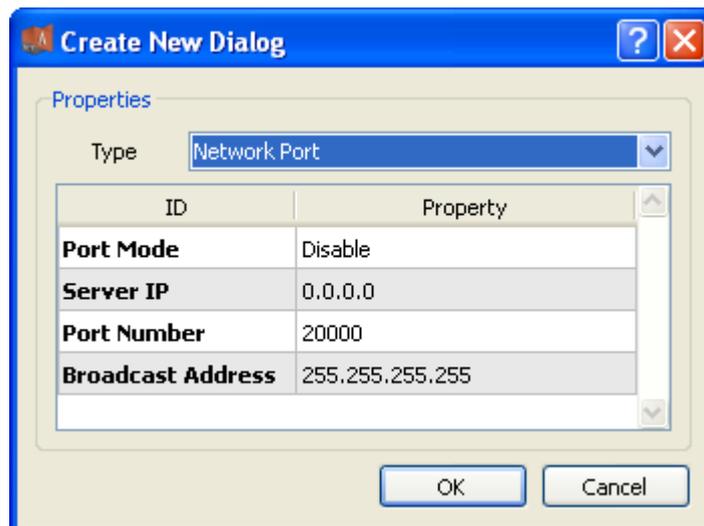
**Overview** Describe communication channel information

**Create** Create communication channel

1. Right click a port group and select “New port” to pop up the “Create port dialog”;



2. Select network port;



Note: Attributes of network channel

No.	Name	Description
1	Port mode	Set the work mode of network port;
2	Service IP	Set the IP address at TCP server/UDP destination address;
3	Port number	Set the work port number of network port;
4	Broadcast address	Set the broadcast address of network port;

Delete Delete communication channel

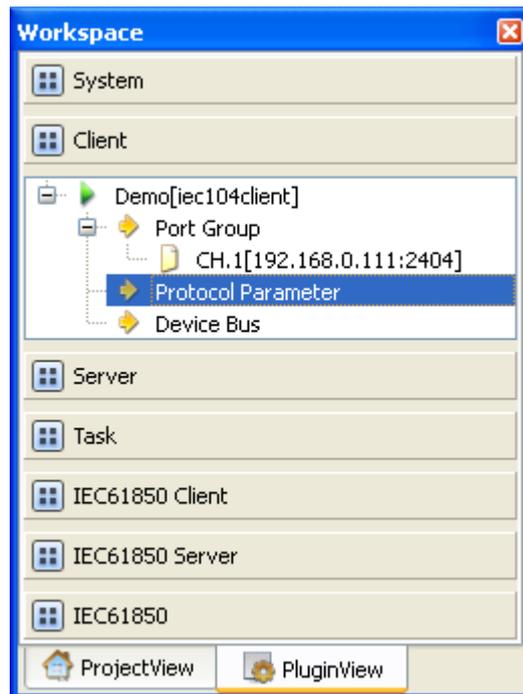
3. Right click a channel number and click "Delete", and select "Yes" to complete deletion.

### 5.3.1.3. Protocol parameter

**Overview** Define communication protocol parameter of protocol

**Attribute** View protocol parameter attributes of **EDPS ICT-S+**

1. Open a project, and select the plugin management page in the management area of **EDPS ICT-S+**;
2. Activate the acquisition service plugin;
3. Select the protocol parameter node in the management area;



#### 4. View protocol parameter attributes

The screenshot shows a 'Property' window with a table of attributes:

ID	Property
<b>App. Layer Timeout(ms)</b>	4000
<b>Idle Interval(ms)</b>	10

Note: Protocol parameter information

No.	Name	Description
1	App.layer timeout (ms)	Define the timeout interval of waiting for response of application layer; when the system doesn't receive the response of application layer within the time interval, the system decided no response from the device.
2	Idle interval (ms)	Define the idle waiting time interval between two complete communication processes in the system. A complete communication process means from sending request for data to receiving all valid data.

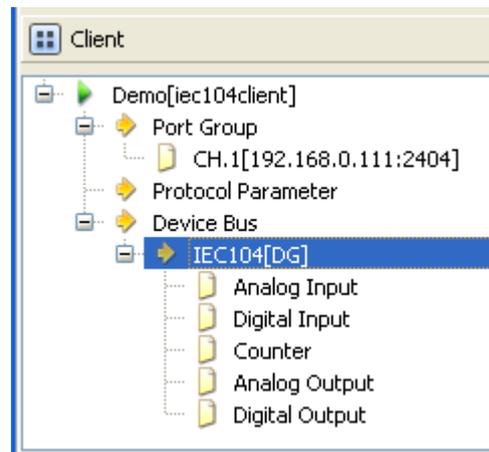
### 5.3.1.4. Device parameter

**Overview** Define device parameter of protocol

**Attribute** **View device parameter attributes**

1. Open a project, and select the plugin management page in the management area of **EDPS ICT-S+**;

2. Activate the acquisition service plugin;
3. Select any child node under the node of device bus in the management area with mouse;



4. View the attribute area of **EDPS ICT-S+**;

Property	
ID	Property
Name	IEC104
Vendor	DG
Length of Common Address	2
Length of COT	2
Length of Info Object Address	3
K	12
W	8
Integrity Interval(ms)	10000
Counter Polling Mode	Disable
Counter Period(s)	0
Counter Reset	No
Time Sync Period(s)	60
Group Info	...
Counter Group Info	...
Negative Format	Complementary
Sequence Check	Yes

Note: Device attribute information

No.	Name	Description
1	Name	Define the name of device
2	Vendor	Define the manufacturer of device.
3	Length of common address	Define the number of bytes occupied by public address in communication byte stream.

4	Length of COT	Define the number of bytes occupied by transmission reason in communication byte stream.
5	Length of info object address	Define the number of bytes occupied by information object address in communication byte stream.
6	K	Define the maximum number of frames unconfirmed in buffer.
7	W	Define the maximum number of frames that can be received in buffer before the device confirms. It's better not to exceed 2/3 of K value.
8	Integrity interval (ms)	Define the cycle of performing general interrogation to device.
9	Counter polling mode	Define the mode of querying cumulant. It's divided into mode A/B/C/D. See 104 protocol text for details.
10	Counter period (s)	Define the cycle of sending cumulant calling or freezing command. It's only valid at mode B/C/D. 0 means cyclic call is deactivated.
11	Counter t reset	Define whether to reset cumulant when calling cumulant.
12	Time sync period (s)	Define the cycle of performing time synchronization to device. -1 means it's invalid. 0 means the system sends time synchronization command when starting up.
13	Group info	Define the detailed group information when calling group.
14	Counter group info	Define the detailed group information when calling cumulant group.
15	Negative format	Define the decoding method when the analog value is negative.
16	Sequence check	Define whether to check whether the frame number of received frame matches with that of transmit frame.

**Virtual point attribute**View the data area of **EDPS ICT-S+**

Basic		Value					
No.	Point Name	Description	Value Type	Initial Value	Owner	Show Mode	Parameter
1	IEDSTA	IED status	Bool	0	Local	By Name	0:Off-line,1:On-line
2	ACTPORT	Current active port number	16 Bits Signed Short	-1	Local	By Value	
3	TOTALCOM	Total communication times	32 Bits Unsigned Long	0	Local	By Value	
4	FAILCOM	Failed communication times	32 Bits Unsigned Long	0	Local	By Value	

No.	Name	Description
-----	------	-------------

1	IED status	Describe the communication state of the current device. The user can view whether the device is online or offline by the value of the information point.
2	Current active port number	Display which communication port is used by the current channel for communication. For a link with multiple ports, the user can easily find the running port by the value of the information point.
3	Total communication times	Display the total number of communication times at present.
4	Failed communication times	Display the number of failures during current communication process. Failure means that data are not sent successfully or the received data are incorrect, etc.

### 5.3.1.5. IO parameter

**Overview** The user can view IO parameters of each kind of information point on the IO information page in the data area of **EDPS ICT-S+**. For IO parameters of each kind of data, accurate marginal check and data verification have been provided in the system according to setup parameters, which can effectively reduce the error rate of configuration data in the user's input process.

#### 5.3.1.5.1. Analog input

<b>Public address</b>	Define the public address in communication process.
<b>Point number</b>	Define the information object address of information point.

#### 5.3.1.5.2. State input

<b>Public address</b>	Define the public address in communication process.
<b>Point number</b>	Define the information object address of information point.

### 5.3.1.5.3. Cumulant input

<b>Public address</b>	Define the public address in communication process.
<b>Point number</b>	Define the information object address of information point.

### 5.3.1.5.4. Analog output

<b>Public address</b>	Define the public address in communication process.
<b>Point number</b>	Define the information object address of information point.
<b>Output type</b>	Define the ASDU type of information point. See IEC60870-5-101 protocol text for details. <ul style="list-style-type: none"> <li>● C_SE_NA_1 (scale value)</li> <li>● C_SC_NB_1 (normalized value)</li> <li>● C_SC_NC_1 (short floating-point number)</li> </ul>

### 5.3.1.5.5. State output

<b>Public address</b>	Define the public address in communication process.
<b>Point number</b>	Define the information object address of information point.
<b>Output coding</b>	Define the mode of executing command. See IEC60870-5-101 protocol text for details. <ul style="list-style-type: none"> <li>● Undefined</li> <li>● Short pulse</li> <li>● Long pulse</li> <li>● Continuous output</li> </ul>
<b>Output type</b>	Define ASDU type of command. See IEC60870-5-101 protocol text for details. <ul style="list-style-type: none"> <li>● Single-point command</li> <li>● Two-point command</li> <li>● Step position command</li> </ul>

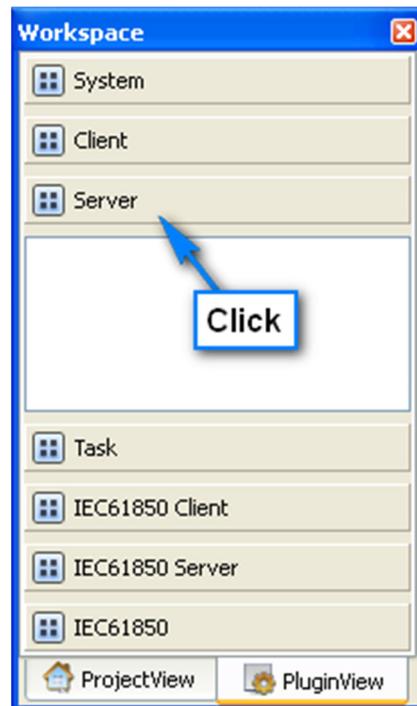
## 5.3.2. IEC104 forwarding configuration

### 5.3.2.1. Driver information

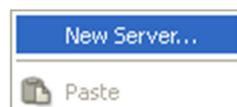
**Overview** Describe detailed information of forwarding driver

**Create** Create IEC104 forwarding driver

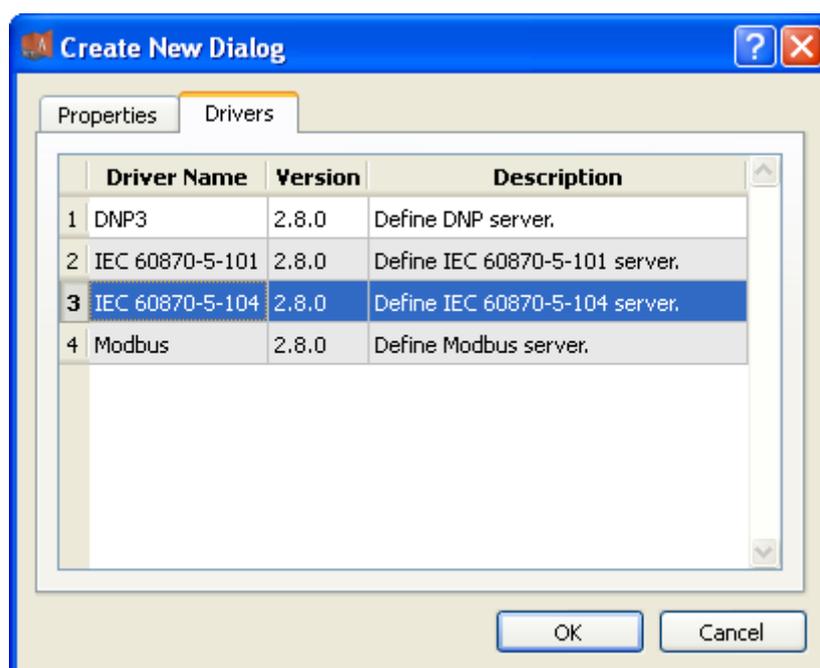
1. Open a project file;
2. Select the plugin management page in the management area of **EDPS ICT-S+**;
3. Activate the forwarding service plugin;



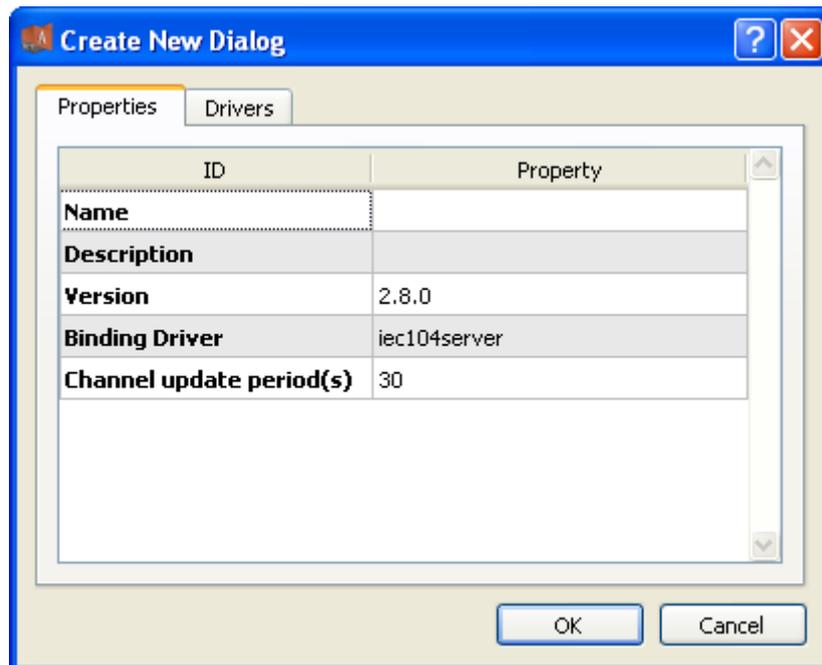
4. Right click in the blank space, and select the menu option “New forwarding service” to pop up the “Create driver dialog”;



5. Select the driver to be created in the driver page;



6. Configure basic attributes of the target driver in the attribute page;



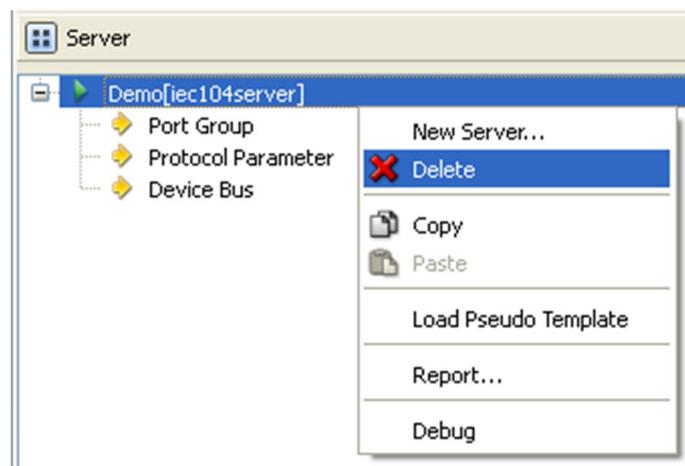
7. Click "OK" to complete creation;

Note: Driver information

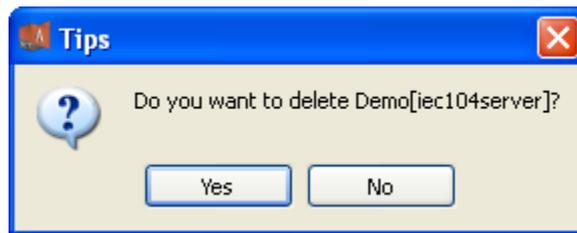
No.	Name	Description
1	Name	Define the display name of driver.
2	Description	Define how to describe the driver.
3	Version	Define the version information of driver.
4	Binding driver	Define the name of binding module, which is unique and cannot be modified.
5	Channel update period (s)	Define the cycle of updating IED communication times.

**Delete** Delete IEC104 forwarding driver

8. Right click and select the menu option "Delete";



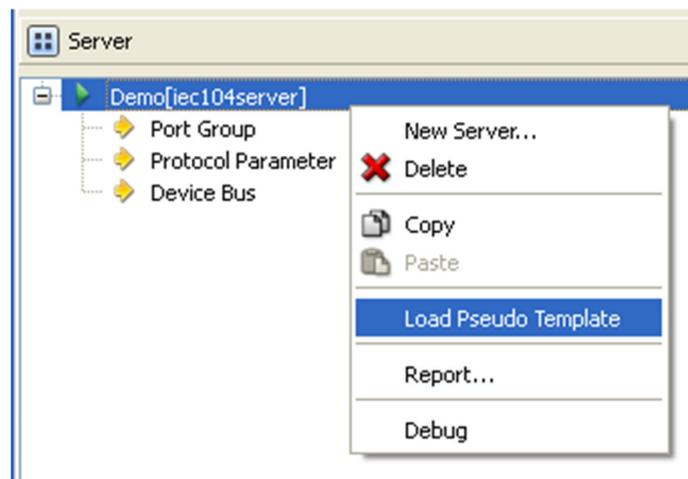
9. It prompts whether to delete;



10. Click “Yes” to complete deletion;

**Virtual point template** Load virtual point of driver from the system template library

11. Right click the driver bar, and select the menu option “Load virtual point template” to complete loading of virtual point of driver.



Note:

Basic		Value					
	Point Name	Description	Value Type	Initial Value	Owner	Show Mode	Parameter
1	DRVSTA	Running status	16 Bits Unsigned Short	0	Local	By Name	0:Exit,1:Running,2:Paused,3:StandBy
2	DRVAUTH	Authority	Bool	0	Local	By Name	0:Demo,1:Authority

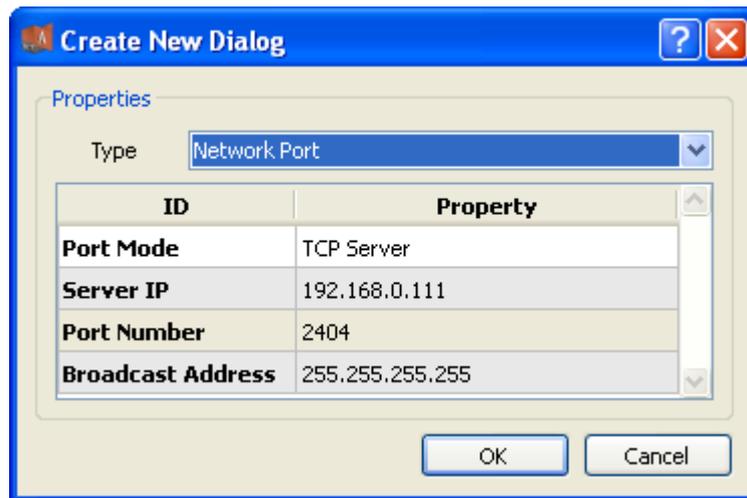
No.	Name	Description
1	Running status	Observe the running state information of the driver.
2	Authority	Observe the authorization state of the driver.

### 5.3.2.2. Port group information

**Overview** Describe communication channel information

**Create** Create communication channel

1. Right click a port group and select “New port” to pop up the “Create port dialog”;



2. Select network port;

Note: Attributes of network channel

No.	Name	Description
1	Port mode	Set the work mode of network port;
2	Service IP	Set the IP address at TCP server/UDP destination address;
3	Port number	Set the work port number of network port;
4	Broadcast address	Set the broadcast address of network port;

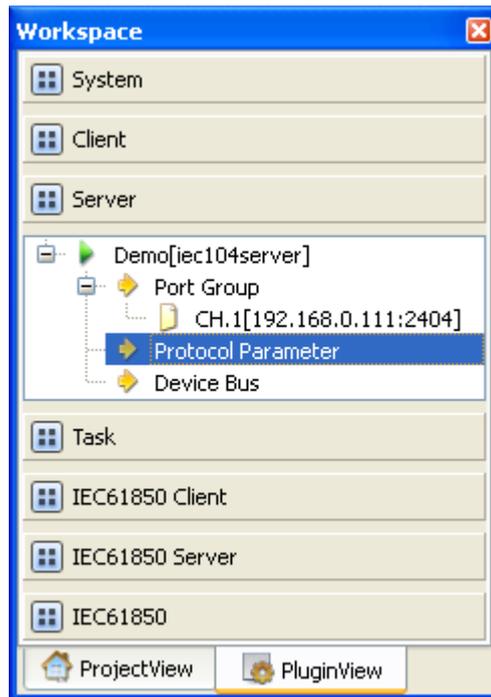
**Delete** Delete communication channel

3. Right click a channel number and click "Delete", and select "Yes" to complete deletion.

### 5.3.2.3. Protocol parameter

**Overview** Define communication protocol parameter of protocol

1. Open a project, and select the plugin management page in the management area of **EDPS ICT-S+**;
2. Activate the forwarding service plugin;
3. Select the protocol parameter node in the management area;



#### 4. View protocol parameter attributes

ID	Property
<b>SBO TimeOut(s)</b>	30
<b>Idle Interval(ms)</b>	10
<b>Event Mode</b>	Single
<b>Event Buffer</b>	32

Note: Protocol parameter information

No.	Name	Description
1	SBO timeout (s)	Define the timeout interval of remote control selection command, in s
2	Idle interval (ms)	Define the idle time interval of communication, in ms
3	Event mode	Define the event handling mechanism; single channel for single connection and multichannel for all connections.
4	Event buffer	Define the size of event buffer.

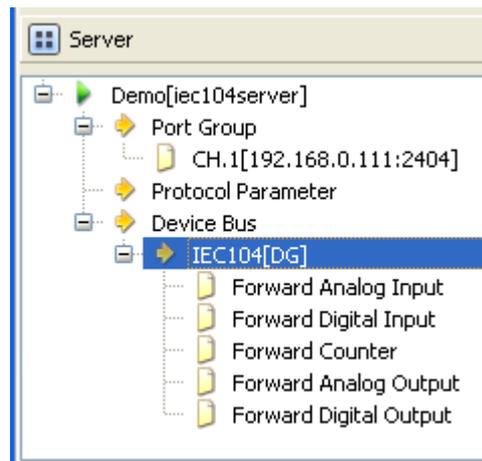
#### 5.3.2.4. Device parameter

**Overview** Define device parameter of protocol

**Attribute** View device parameter attributes

1. Open a project, and select the plugin management page in the management area of **EDPS ICT-S+**;
2. Activate the forwarding service plugin;
3. Select any child node under the node of device bus in the management area

with mouse;



4. View the attribute area of **EDPS ICT-S+**;

ID	Property
<b>Name</b>	IEC104
<b>Vendor</b>	DG
<b>Length of Common Address</b>	2
<b>Length of COT</b>	2
<b>Length of Info Object Address</b>	3
<b>K</b>	12
<b>W</b>	8
<b>Counter Polling Mode</b>	Disable
<b>Counter Reset</b>	No
<b>Counter Time Tag</b>	Disable
<b>Cyclic Transmission</b>	Disable
<b>Spontaneous Transmission</b>	Enable
<b>Negative Format</b>	Complementary
<b>Sequence Check</b>	Yes
<b>Group Info</b>	...
<b>Counter Group Info</b>	...
<b>Back Scan Period(s)</b>	0
<b>Time Zone</b>	0

Note: Device attribute information

No.	Name	Description
1	Name	Define the name of device
2	Vendor	Define the manufacturer of device.
3	Length of	Define the number of bytes occupied by public

	common address	address in communication byte stream.
4	Length of COT	Define the number of bytes occupied by transmission reason in communication byte stream.
5	Length of info object address	Define the number of bytes occupied by information object address in communication byte stream.
6	K	Define the maximum number of frames unconfirmed in buffer.
7	W	Define the maximum number of frames that can be received in buffer before the device confirms. It's better not to exceed 2/3 of K value.
8	Counter polling mode	Define the mode of querying cumulant. It's divided into mode A/B/C/D. See 104 protocol text for details.
9	Counter reset	Define whether to reset cumulant when calling cumulant.
10	Counter time tag	Define whether it's allowed to transmit cumulant with time mark.
11	Cyclic transmission	Define whether it's allowed to send data information cyclically according to group definition information.
12	Spontaneous transmission	Define whether burst transmission of data information is allowed.
13	Negative format	Define the decoding method when the analog value is negative.
14	Sequence check	Define whether to check whether the frame number of received frame matches with that of transmit frame.
15	Group info	Define the range of information object addresses to which data are transmitted by group.
16	Counter group info	Define the range of information object addresses to which cumulant data are transmitted by group.
17	Back scan period (s)	Define the scanning cycle of sending background scanning data.
18	Time zone	Define the time zone information of time.

**Virtual point attribute**

View the data area of **EDPS ICT-S+**

Basic		Value					
	Point Name	Description	Value Type	Initial Value	Owner	Show Mode	Parameter
1	IEDSTA	IED status	Bool	0	Local	By Name	0:Off-line,1:On-line
2	ACTPORT	Current active port number	16 Bits Signed Short	-1	Local	By Value	
3	TOTALCOM	Total communication times	32 Bits Unsigned Long	0	Local	By Value	
4	FAILCOM	Failed communication times	32 Bits Unsigned Long	0	Local	By Value	
5	TotalCli	Current Total Client	16 Bits Unsigned Short	0	Local	By Value	

No.	Name	Description
1	IED status	Describe the communication state of the current device. The user can view whether the device is online by the value of the information point.
2	Current active port number	Display which communication port is used by the current channel for communication. For a link with multiple ports, the user can easily find the running port by the value of the information point.
3	Total communication times	Display the total number of communication times at present.
4	Failed communication times	Display the number of failures during current communication process. Failure means that data are not sent successfully or the received data are incorrect, etc.
5	Current total client	Count the number of current clients.

### 5.3.2.5. IO parameter

**Overview** The user can view IO parameters of each kind of information point on the IO information page in the data area of **EDPS ICT-S+**. For IO parameters of each kind of data, accurate marginal check and data verification have been provided in the system according to setup parameters, which can effectively reduce the error rate of configuration data in the user's input process.

5.3.2.5.1. **Analog input**

<b>Public address</b>	Define the public address in communication process.
<b>Point number</b>	Define the point number of information point.
<b>ASDU type</b>	Define the application function type of information point. <ul style="list-style-type: none"> <li>● M_ME_NA_1 (normalized value)</li> <li>● M_ME_NB_1 (scale value)</li> <li>● M_ME_NC_1 (short floating-point number)</li> <li>● M_ME_ND_1 (normalized value with quality)</li> <li>● M_ST_NA_1 (step position information)</li> </ul>
<b>Working mode</b>	Define the working mode of information point. <ul style="list-style-type: none"> <li>● Cyclic</li> <li>● Burst</li> </ul>
<b>Time mark</b>	Define whether an information point is provided with time mark in transmission frame.
<b>Offset</b>	Define the offset for computing raw data at the information point.
<b>Divisor</b>	Define the division factor for computing raw data at the information point.
<b>Dead zone value</b>	Define the dead zone value of producing event value; it's satisfied when the absolute value of the difference between the previous transmission value and the current value is greater than the dead zone value.

5.3.2.5.2. **State input**

<b>Public address</b>	Define the public address in communication process.
<b>Point number</b>	Define the point number of information point.
<b>ASDU type</b>	Define the ASDU transmission type of information point. <ul style="list-style-type: none"> <li>● M_SP_NA_1 (single-point)</li> <li>● M_DP_NA_1 (two-point)</li> </ul>
<b>Working mode</b>	Define the working mode of information point. <ul style="list-style-type: none"> <li>● Cyclic</li> <li>● Burst</li> </ul>
<b>Automatic SOE</b>	Define whether the system transmit change data as SOE according to settings after it receives shift information. <ul style="list-style-type: none"> <li>● Invalid</li> <li>● Open enabled</li> </ul>

	<ul style="list-style-type: none"> <li>● Close enabled</li> <li>● Change enabled</li> </ul>
<b>SOE</b>	Define whether the system directly uses SOE data of device after it receives valid SOE data.
<b>COS</b>	Define whether the system sends change information after it receives shift information.

#### 5.3.2.5.3. Cumulant input

<b>Public address</b>	Define the public address in communication process.
<b>Point number</b>	Define the point number of information point.
<b>Min. value</b>	Define the minimum value of raw data.
<b>Max. value</b>	Define the maximum value of raw data.
<b>Offset</b>	Define the offset for computing raw data at the information point.
<b>Divisor</b>	Define the division factor for computing raw data at the information point.

#### 5.3.2.5.4. Analog output

<b>Public address</b>	Define the public address in communication process.
<b>Point number</b>	Define the point number of information point.
<b>ASDU type</b>	Define the application function type of information point. <ul style="list-style-type: none"> <li>● Normalized value</li> <li>● Scale value</li> <li>● Short floating-point number</li> </ul>
<b>Offset</b>	Define the offset for computing raw data at the information point.
<b>Divisor</b>	Define the division factor for computing raw data at the information point.

#### 5.3.2.5.5. State output

<b>Public address</b>	Define the public address in communication process.
<b>Point number</b>	Define the point number of information point.

<b>Control mode</b>	Define the mode of executing control operation command at the information point. <ul style="list-style-type: none"> <li>● Direct execution</li> <li>● Remote control selection</li> </ul>
---------------------	---

## 5.4. DNP3.0 protocol configuration

This chapter mainly describes how **EDPS ICT-S+** configures DNP3.0 acquisition and forwarding driver modules. The configuration manual mainly describes driver information, protocol parameter information, device parameter information, and IO parameter information of various information points. DNP3.0 acquisition and forwarding modules of EDPS completely match the standard protocol text, and **EDPS ICT-S+** provides a concise and fast way to help the user to conduct configuration.

### 5.4.1. DNP3.0 acquisition configuration

#### 5.4.1.1. Driver information

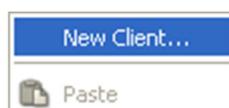
**Overview** Describe detailed information of acquisition driver

**Create** Create DNP protocol acquisition driver

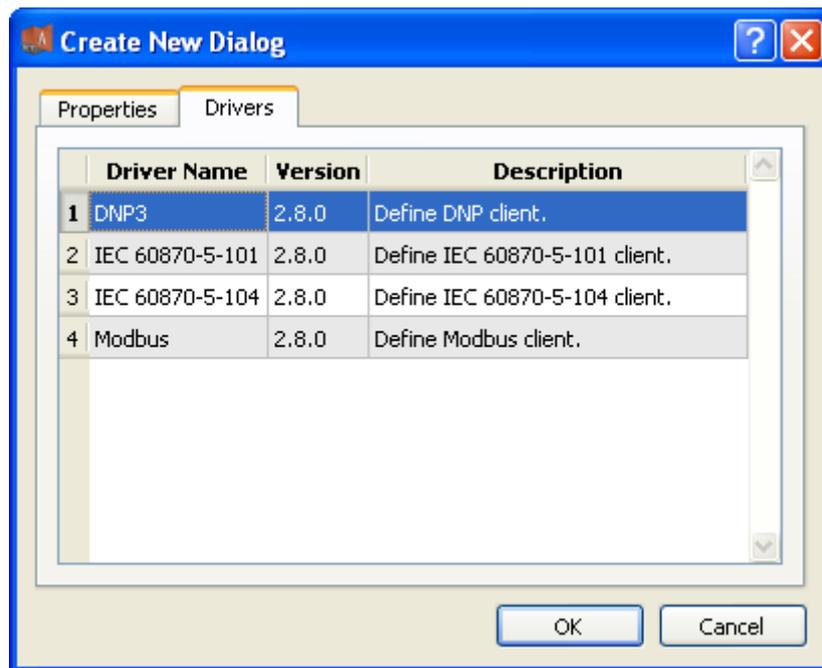
1. Open a project file;
2. Select the plugin management page in the management area of **EDPS ICT-S+**;
3. Activate the acquisition service plugin;



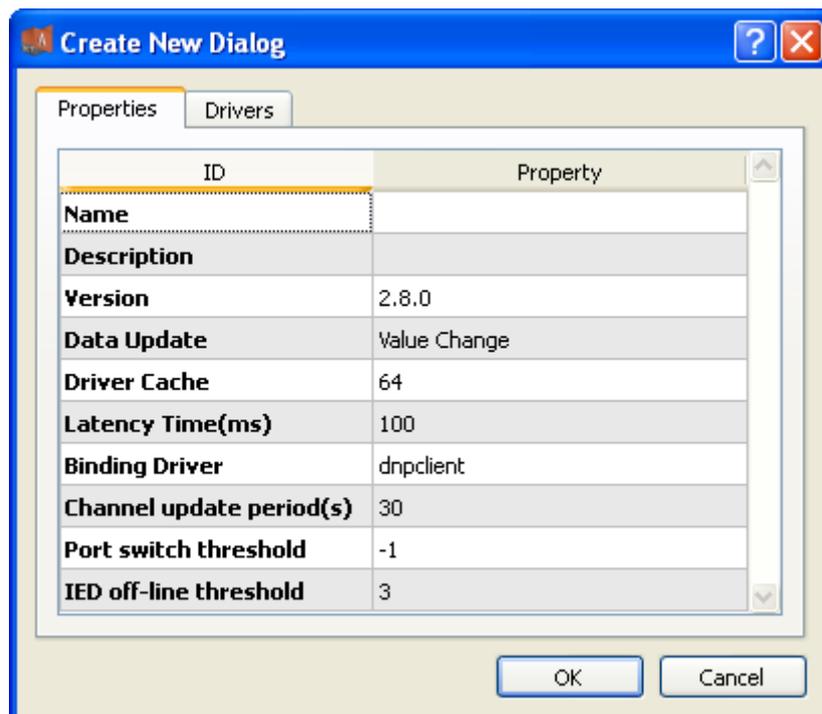
4. Right click in the blank space, and select the menu option “New acquisition service” to pop up the “Create driver dialog”;



5. Select the driver to be created in the driver page;



6. Configure basic attributes of the target driver in the attribute page;



7. Click "OK" to complete creation;

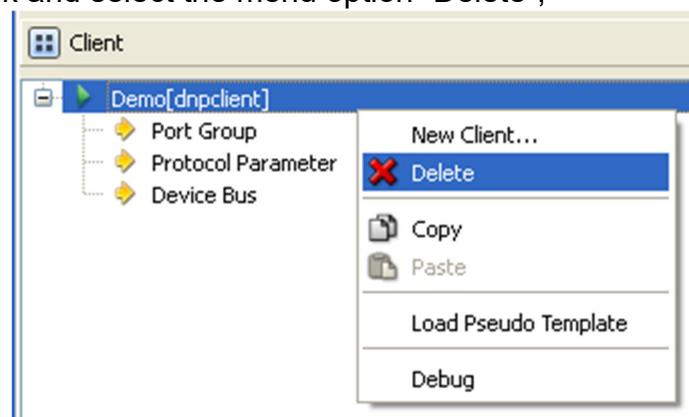
Note: Driver information

No.	Name	Description
1	Name	Define the display name of driver.
2	Description	Define the description information of driver.
3	Version	Define the version information of driver.
4	Data update	Define the data updating mode. Value change – The system updates the

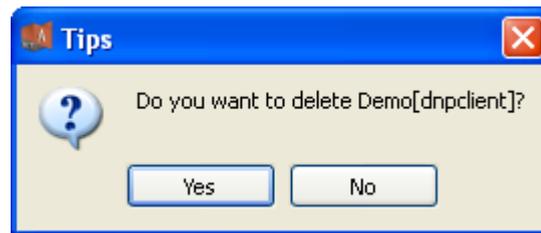
		<p>database and notifies other driver protocols only when a value changes;</p> <p>Time change – The system updates the database and notifies other driver protocols no matter whether a value or time changes;</p> <p>Time update – The system updates the database no matter whether a value or time changes, and notifies other driver protocols only when a value changes;</p>
5	Driver cache	Define the cache size of driver.
6	Latency time (ms)	<p>Define the delay time of updating real-time database.</p> <p>The system shall write raw data into the real-time database after a delay of the time defined.</p>
7	Binding Driver	Define the name of driver module, which is unique and cannot be modified.
8	Channel update period (s)	Define the cycle of updating IED communication times.
9	Port switch threshold	Define the switching conditions among multiple ports; when the number of consecutive communication failures of the primary port reaches the threshold, it's switched to another port. -1 indicates port switching is deactivated.
10	IED off-line threshold	Define the offline threshold of IED device; when the number of consecutive communication failures reaches the threshold, the device is switched to offline state.

### Delete Delete DNP acquisition driver

- Right click and select the menu option “Delete”;



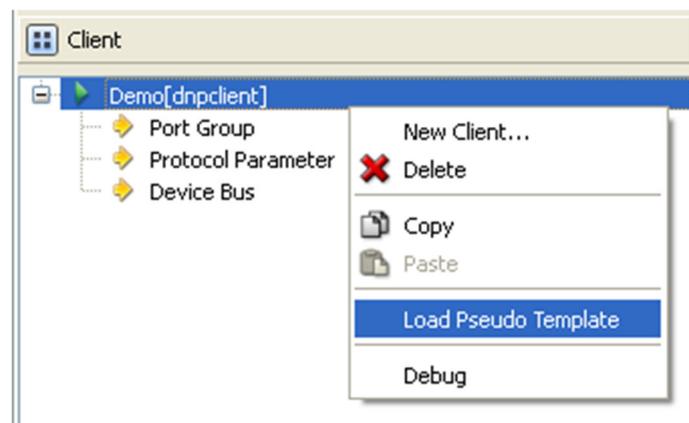
- It prompts whether to delete;



10. Click “Yes” to complete deletion;

**Virtual point template** Load virtual point of driver from the system template library

11. Right click the driver bar, and select the menu option “Load virtual point template” to complete loading of virtual point of driver.



Note:

Basic		Value					
	Point Name	Description	Value Type	Initial Value	Owner	Show Mode	Parameter
1	DRVSTA	Running status	16 Bits Unsigned Short	0	Local	By Name	0:Exit, 1:Running, 2:Paused, 3:StandBy
2	DRVAUTH	Authority	Bool	0	Local	By Name	0:Demo, 1:Authority

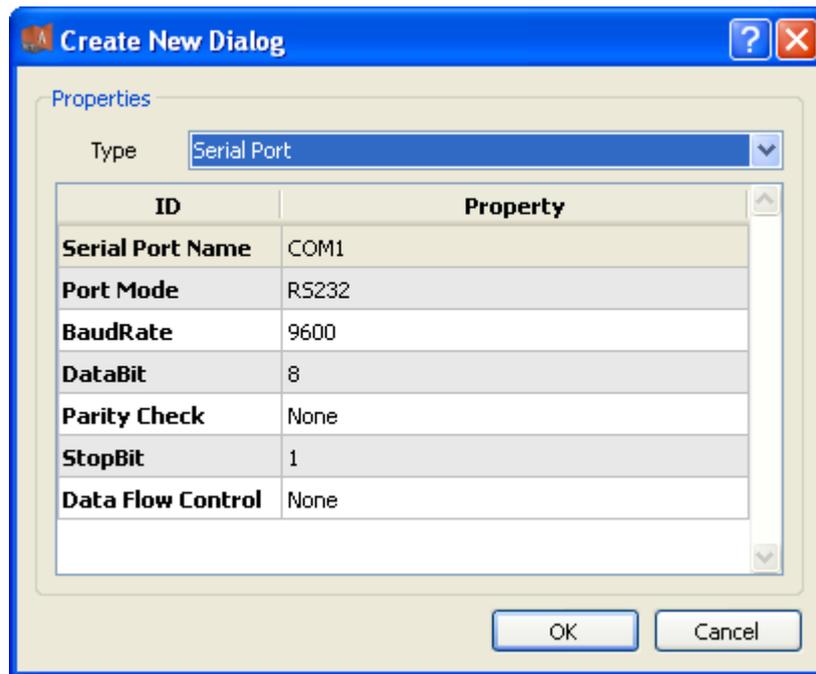
No.	Name	Description
1	Running status	Observe the running state information of the driver.
2	Authority	Observe the authorization state of the driver.

#### 5.4.1.2. Port group information

**Overview** Describe communication channel information

**Create** Create communication channel

1. Right click a port group and select “New port” to pop up the “Create port dialog”;



2. Select serial port or network port according to actual situation;

Notes: Attributes of serial channel

No.	Name	Description
1	Sserial port name	Set the name of serial port;
2	Port mode	Set the work mode of serial port;
3	Baud rate	Set the Baud rate of serial port;
4	Data bit	Set the data bits of serial port;
5	Parity check	Set the check bit of serial port;
6	Stop bit	Set the stop bit of serial port;
7	Data flow control	Set the data flow control mode of serial port;

Attributes of network channel

No.	Name	Description
1	Port mode	Set the work mode of network port;
2	Service IP	Set the IP address at TCP server/UDP destination address;
3	Port number	Set the work port number of network port;
4	Broadcast address	Set the broadcast address of network port;

**Delete** Delete communication channel

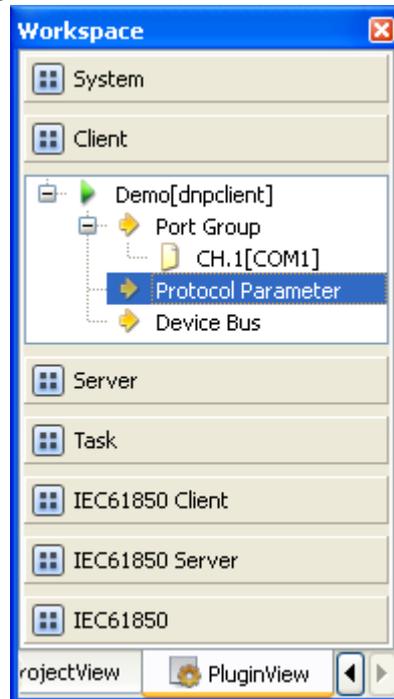
3. Right click a channel number and click "Delete", and select "Yes" to complete deletion.

### 5.4.1.3. Protocol parameter

**Overview** Define communication protocol parameter of protocol

**Attribute** View protocol parameter attributes of **EDPS ICT-S+**

1. Open a project, and select the plugin management page in the management area of **EDPS ICT-S+**;
2. Activate the acquisition service plugin;
3. Select the protocol parameter node in the management area;



4. View protocol parameter attributes

ID	Property
<b>App. Layer Response Timeout(ms)</b>	4000
<b>App. Layer Confirm Timeout(ms)</b>	2000
<b>App. Layer Retries</b>	0
<b>Link Layer Timeout(ms)</b>	2000
<b>Link Layer Retries</b>	0
<b>Master Address</b>	1
<b>Enable Echo</b>	Disable
<b>Idle Interval(ms)</b>	10

Note: Protocol parameter information

No.	Name	Description
1	App.layer response timeout (ms)	Define the timeout interval of waiting for response of application layer; when the system doesn't receive the response of application layer within the time interval, the system decided no response from the device.
2	App.layer confirm	Define the timeout interval of acknowledgement frame; when the system doesn't receive the

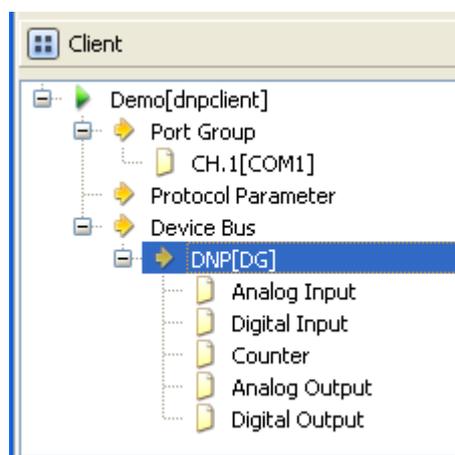
	timeout (ms)	acknowledgement frame of application layer within the time interval, the system decided that the communication fails.
3	App.layer retries	Define the times for which the data need to be resent after the application layer fails to process data.
4	Link layer timeout (ms)	Define the timeout interval for link layer to process data; when the system doesn't receive correct data of link layer within the time interval, the system decided that the communication fails.
5	Link layer retries	Define the times for which the link data need to be resent after link data fails to be processed.
6	Master address	Define the source station address of data communication.
7	Echo enabled	Define whether to process Echo frame that may occur during information communication. When it's defined not to process Echo, Echo data frame received will be regarded as communication error frame.
8	Idle interval (ms)	Define the idle waiting time interval between two complete communication processes in the system. A complete communication process means from sending request for data to receiving all valid data.

#### 5.4.1.4. Device parameter

**Overview** Define device parameter of protocol

**Attribute** View device parameter attributes

1. Open a project, and select the plugin management page in the management area of **EDPS ICT-S+**;
2. Activate the acquisition service plugin;
3. Select any child node under the node of device bus in the management area with mouse;



4. View the attribute area of **EDPS ICT-S+**;

ID	Property
<b>Name</b>	DNP
<b>Vendor</b>	DG
<b>Address</b>	1
<b>Time Sync Mode</b>	Auto Time Sync
<b>Polling Table</b>	...
<b>Auto Integrity Poll</b>	Enable
<b>Time Format</b>	Local
<b>Initialize</b>	Enable

Note: Device attribute information

No.	Name	Description
1	Name	Define the name of device
2	Vendor	Define the manufacturer of device.
3	Address	Define the physical address of device.
4	Time sync mode	Define the processing mode. Invalid mode Process time synchronization according to time change state (temporarily no processing) Process time synchronization according to IIN state Automatic time synchronization
5	Polling table	Define the query table of DNP processing.
6	Auto integrity poll	Set whether to perform general interrogation.
7	Time format	Define how to convert time at time operation. UTC mode Local mode
8	Initialize	Define whether to perform initialization of handshake link.

## Virtual point attribute

View the data area of **EDPS ICT-S+**

Basic		Value					
	Point Name	Description	Value Type	Initial Value	Owner	Show Mode	Parameter
1	IEDSTA	IED status	Bool	0	Local	By Name	0:Off-line,1:On-line
2	ACTPORT	Current active port number	16 Bits Signed Short	-1	Local	By Value	
3	TOTALCOM	Total communication times	32 Bits Unsigned Long	0	Local	By Value	
4	FAILCOM	Failed communication times	32 Bits Unsigned Long	0	Local	By Value	

No.	Name	Description
-----	------	-------------

1	IED status	Describe the communication state of the current device. The user can view whether the device is online or offline by the value of the information point.
2	Current active port number	Display which communication port is used by the current channel for communication. For a link with multiple ports, the user can easily find the running port by the value of the information point.
3	Total communication times	Display the total number of communication times at present.
4	Failed communication times	Display the number of failures during current communication process. Failure means that data are not sent successfully or the received data are incorrect, etc.

#### 5.4.1.5. IO parameter

**Overview** The user can view IO parameters of each kind of information point on the IO information page in the data area of **EDPS ICT-S+**. For IO parameters of each kind of data, accurate marginal check and data verification have been provided in the system according to setup parameters, which can effectively reduce the error rate of configuration data in the user's input process.

##### 5.4.1.5.1. Analog input

<b>Point number</b>	Define the point number of information point.
---------------------	---

##### 5.4.1.5.2. State input

<b>Point number</b>	Define the point number of information point.
---------------------	---

#### 5.4.1.5.3. Cumulant input

<b>Object number</b>	Define the object number of cumulant processing. <ul style="list-style-type: none"> <li>• 20 - binary cumulant</li> <li>• 21 - frozen cumulant</li> </ul>
<b>Point number</b>	Define the point number of cumulant input.

#### 5.4.1.5.4. Analog output

<b>Point number</b>	Define the point number of analog output.
<b>Data length</b>	Define the data length of analog output. <ul style="list-style-type: none"> <li>• 16-bit integer</li> <li>• 32-bit integer</li> </ul>

#### 5.4.1.5.5. State output

<b>Point number</b>	Define the point number of state output.
<b>Output mode</b>	Define the output mode of state output. <ul style="list-style-type: none"> <li>• Open/close</li> <li>• Pulse</li> <li>• Block</li> </ul>
<b>Pulse number</b>	Define the number of output pulses.
<b>High-level time</b>	Define the output duration of pulse rising time.
<b>Low-level time</b>	Define the output duration of pulse falling time.

### 5.4.2. DNP3.0 forwarding configuration

#### 5.4.2.1. Driver information

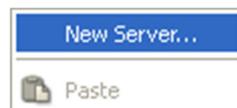
**Overview** Describe detailed information of forwarding driver

**Create** Create DNP forwarding driver

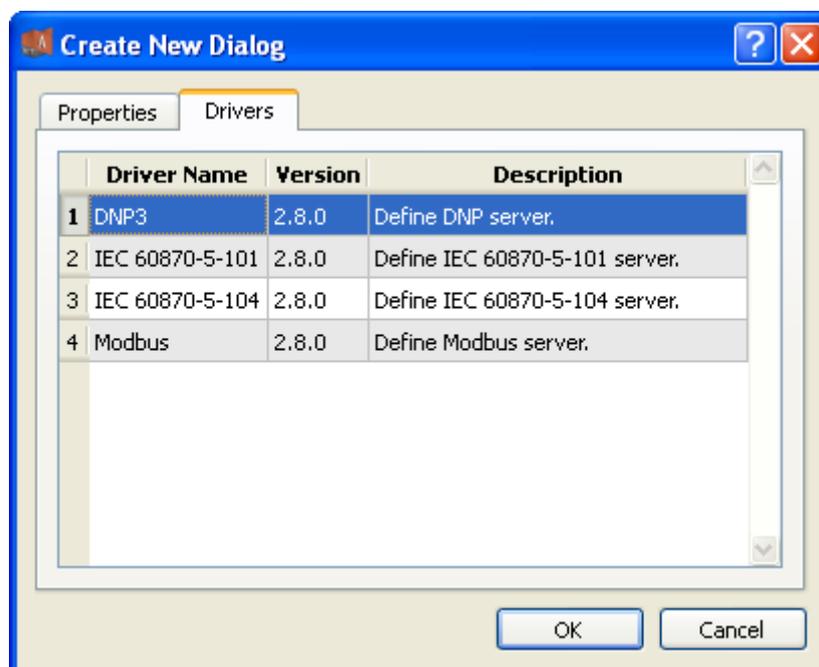
1. Open a project file;
2. Select the plugin management page in the management area of **EDPS ICT-S+**;
3. Activate the forwarding service plugin;



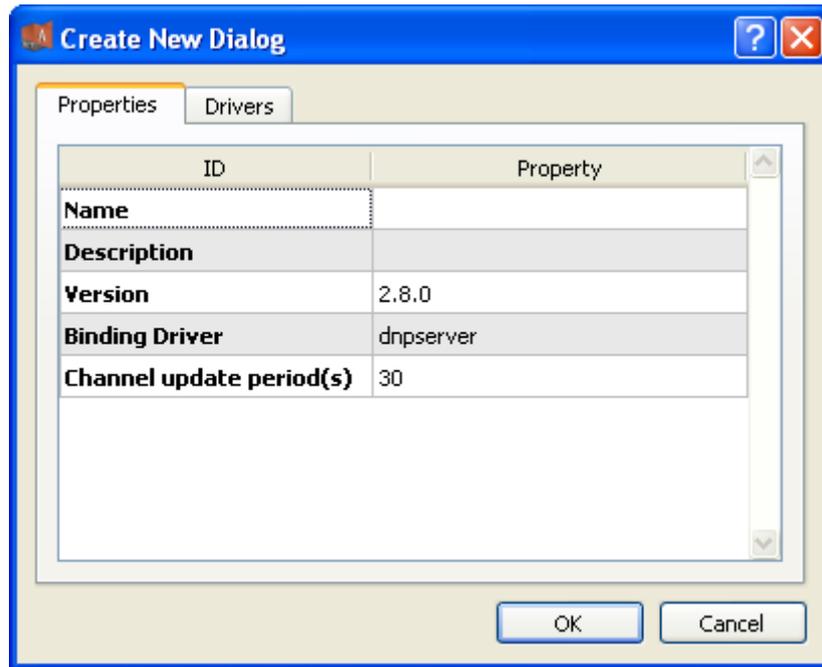
- Right click in the blank space, and select the menu option “New forwarding service” to pop up the “Create driver dialog”;



- Select the driver to be created in the driver page;



- Configure basic attributes of the target driver in the attribute page;



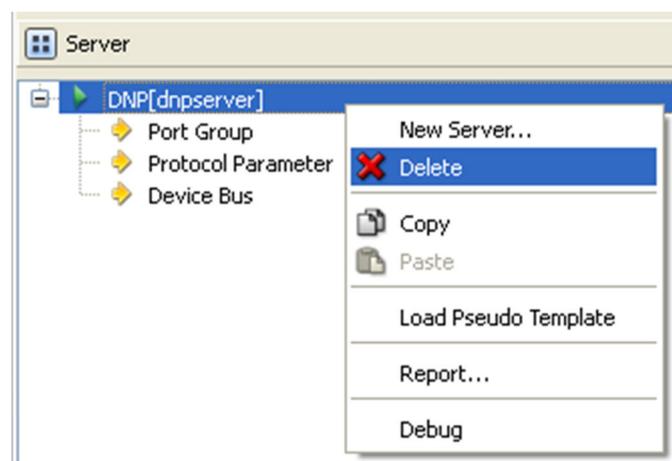
7. Click "OK" to complete creation;

Note: Driver information

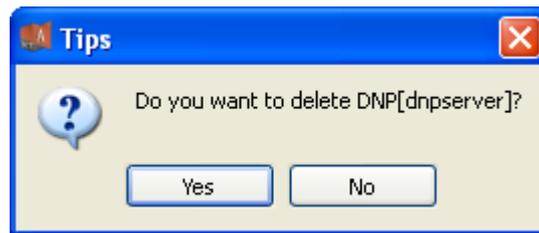
No.	Name	Description
1	Name	Define the display name of driver.
2	Description	Define how to describe the driver.
3	Version	Define the version information of driver.
4	Binding driver	Define the name of binding module, which is unique and cannot be modified.
5	Channel update period(s)	Define the cycle of updating IED communication times.

**Delete** Delete DNP forwarding driver

8. Right click and select the menu option "Delete";



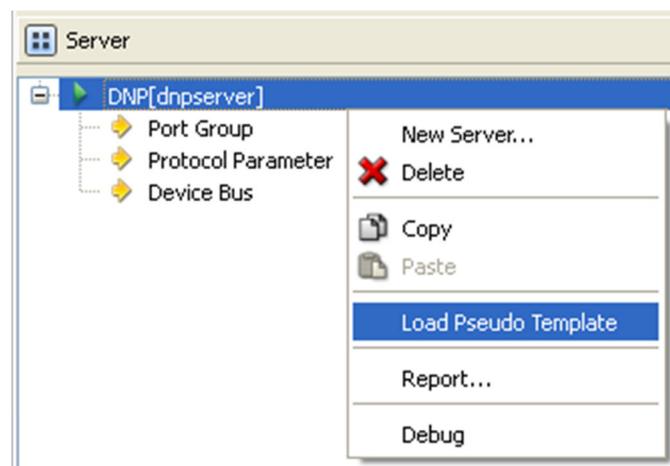
9. It prompts whether to delete;



10. Click “Yes” to complete deletion;

**Virtual point template** Load virtual point of driver from the system template library

11. Right click the driver bar, and select the menu option “Load virtual point template” to complete loading of virtual point of driver.



Note:

Basic		Value					
	Point Name	Description	Value Type	Initial Value	Owner	Show Mode	Parameter
1	DRVSTA	Running status	16 Bits Unsigned Short	0	Local	By Name	0:Exit, 1:Running, 2:Paused, 3:StandBy
2	DRVAUTH	Authority	Bool	0	Local	By Name	0:Demo, 1:Authority

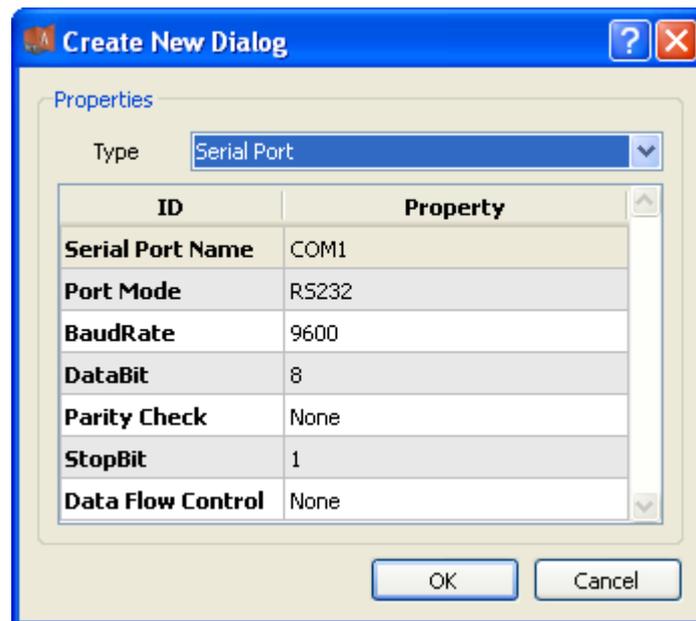
No.	Name	Description
1	Running status	Observe the running state information of the driver.
2	Authority	Observe the authorization state of the driver.

#### 5.4.2.2. Port group information

**Overview** Describe communication channel information

**Create** Create communication channel

1. Right click a port group and select “New port” to pop up the “Create port dialog”;



2. Select serial port or network port according to actual situation;

Notes: Attributes of serial channel

No.	Name	Description
1	Serial port name	Set the name of serial port;
2	Port mode	Set the work mode of serial port;
3	Baud rate	Set the Baud rate of serial port;
4	Data bit	Set the data bits of serial port;
5	Parity check	Set the check bit of serial port;
6	Stop bit	Set the stop bit of serial port;
7	Data flow control	Set the data flow control mode of serial port;

Attributes of network channel

No.	Name	Description
1	Port mode	Set the work mode of network port;
2	Service IP	Set the IP address at TCP server/UDP destination address;
3	Port number	Set the work port number of network port;
4	Broadcast address	Set the broadcast address of network port;

**Delete** Delete communication channel

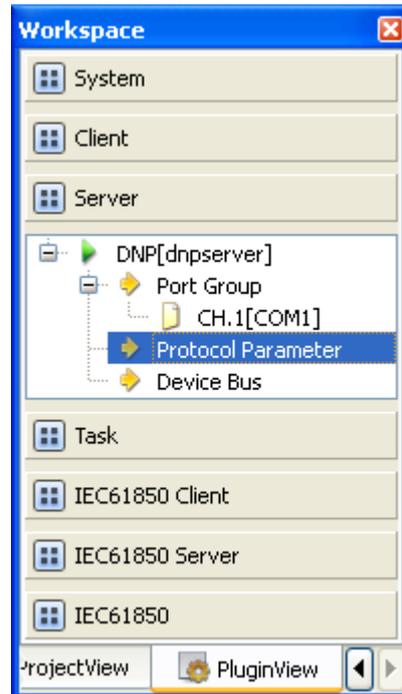
3. Right click a channel number and click “Delete”, and select “Yes” to complete deletion.

### 5.4.2.3. Protocol parameter

**Overview** Define communication protocol parameter of protocol

1. Open a project, and select the plugin management page in the management area of **EDPS ICT-S+**;

2. Activate the forwarding service plugin;
3. Select the protocol parameter node in the management area;



4. View protocol parameter attributes

ID	Property
<b>App. Layer Confirm Timeout(ms)</b>	2000
<b>App. Layer Retries</b>	0
<b>Link Layer Timeout(ms)</b>	2000
<b>Link Layer Retries</b>	0
<b>Master Address</b>	1
<b>SBO TimeOut(s)</b>	30
<b>Idle Interval(ms)</b>	10
<b>Event Mode</b>	Single
<b>Event Buffer</b>	32

Note: Protocol parameter information

No.	Name	Description
1	App.layer confirm timeout (ms)	Define the timeout interval of acknowledgement frame; when the system doesn't receive the acknowledgement frame of application layer within the time interval, the system decided that the communication fails.
2	App.layer retries	Define the times for which the data need to be resent after the application layer fails to process data.

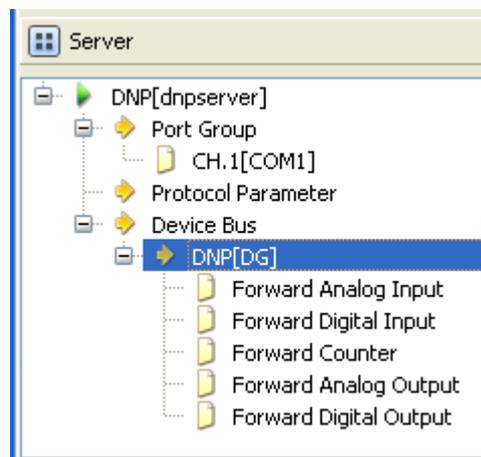
3	Link layer timeout (ms)	Define the timeout interval for link layer to process data; when the system doesn't receive correct data of link layer within the time interval, the system decided that the communication fails.
4	Link layer retries	Define the times for which the link data need to be resent after link data fails to be processed.
5	Master address	Define the source station address of data communication.
6	SBO timeout (s)	Define the timeout interval of executing remote control selection command.
7	Idle interval (ms)	Define the idle waiting time interval between two complete communication processes in the system. A complete communication process means from sending request for data to receiving all valid data.
8	Event mode	Define the event handling mechanism; single channel or multichannel.
9	Event buffer	Define the size of event buffer.

#### 5.4.2.4. Device parameter

**Overview** Define device parameter of protocol

**Attribute** View device parameter attributes

1. Open a project, and select the plugin management page in the management area of **EDPS ICT-S+**;
2. Activate the forwarding service plugin;
3. Select any child node under the node of device bus in the management area with mouse;



4. View the attribute area of **EDPS ICT-S+**;

ID	Property
<b>Name</b>	DNP
<b>Vendor</b>	DG
<b>Address</b>	1
<b>Unsolicited Class 1</b>	Disable
<b>Unsolicited Class 2</b>	Disable
<b>Unsolicited Class 3</b>	Disable
<b>App. Layer Confirm Mode</b>	Confirm
<b>Link Layer Confirm Mode</b>	Confirm
<b>Time Format</b>	Local
<b>Initialize</b>	Enable

Note: Device attribute information

No.	Name	Description
1	Name	Define the name of device
2	Vendor	Define the manufacturer of device.
3	Address	Define the physical address of device.
4	Unsolicited Class 1	Set whether to actively report Class 1 data.
5	Unsolicited Class 2	Set whether to actively report Class 2 data.
6	Unsolicited Class 3	Set whether to actively report Class 3 data.
7	App. Layer confirm mode	Set the acknowledge mode of communication of application layer; acknowledge by default.
8	Link layer confirm mode	Set the acknowledge mode of communication of link layer; acknowledge by default.
9	Time format	Define the clock format of device
10	Initialize	Define whether to perform initialization of handshake link.

Virtual point attribute

View the data area of **EDPS ICT-S+**

Basic		Value					
Point Name	Description	Value Type	Initial Value	Owner	Show Mode	Parameter	
1 IEDSTA	IED status	Bool	0	Local	By Name	0:Off-line,1:On-line	
2 ACTPORT	Current active port number	16 Bits Signed Short	-1	Local	By Value		
3 TOTALCOM	Total communication times	32 Bits Unsigned Long	0	Local	By Value		
4 FAILCOM	Failed communication times	32 Bits Unsigned Long	0	Local	By Value		

No.	Name	Description
1	IED status	Describe the communication state of the current device. The user can view whether the device is online

		or offline by the value of the information point.
2	Current active port number	Display which communication port is used by the current channel for communication. For a link with multiple ports, the user can easily find the running port by the value of the information point.
3	Total communication times	Display the total number of communication times at present.
4	Failed communication times	Display the number of failures during current communication process. Failure means that data are not sent successfully or the received data are incorrect, etc.

#### 5.4.2.5. IO parameter

**Overview** The user can view IO parameters of each kind of information point on the IO information page in the data area of **EDPS ICT-S+**. For IO parameters of each kind of data, accurate marginal check and data verification have been provided in the system according to setup parameters, which can effectively reduce the error rate of configuration data in the user's input process.

##### 5.4.2.5.1. Analog input

<b>Point number</b>	Define the index number of information point.
<b>Category</b>	Define the processing level of current information point. <ul style="list-style-type: none"> <li>• Invalid</li> <li>• Class 1 data</li> <li>• Class 2 data</li> <li>• Class 3 data</li> </ul>
<b>Data length</b>	Define the size of data. <ul style="list-style-type: none"> <li>• 16-bit integer</li> <li>• 32-bit integer</li> <li>• 32-bit floating point</li> <li>• 64-bit double precision</li> </ul>

<b>Time mark</b>	Define whether to perform time mark processing to data.
<b>Offset</b>	Define the offset of numerical value of information point.
<b>Divisor</b>	Define the division factor required in case of data change at the information point.
<b>Dead zone value</b>	Define the dead zone value of producing event value; it's satisfied when the absolute value of the difference between the previous transmission value and the current value is greater than the dead zone value.

#### 5.4.2.5.2. State input

<b>Point number</b>	Define the index number of information point.
<b>Category</b>	Define the processing level of current information point. <ul style="list-style-type: none"> <li>• Invalid</li> <li>• Class 1 data</li> <li>• Class 2 data</li> <li>• Class 3 data</li> </ul>
<b>Automatic SOE</b>	Define whether the system transmits change data as SOE according to settings after it receives shift information. <ul style="list-style-type: none"> <li>• Invalid</li> <li>• Open enabled</li> <li>• Close enabled</li> <li>• Change enabled</li> </ul>
<b>SOE</b>	Define whether the system directly forwards SOE after it receives valid SOE data.
<b>Data length</b>	Define the data length of information point. <ul style="list-style-type: none"> <li>• 1-bit state</li> <li>• 2-bit state</li> </ul>

#### 5.4.2.5.3. Cumulant input

<b>Point number</b>	Define the index number of information point.
<b>Category</b>	Define the processing level of current information point. <ul style="list-style-type: none"> <li>• Invalid</li> <li>• Class 1 data</li> <li>• Class 2 data</li> <li>• Class 3 data</li> </ul>
<b>Data type</b>	Define the data type of information point. <ul style="list-style-type: none"> <li>• Binary cumulant</li> </ul>

	<ul style="list-style-type: none"> <li>• Frozen cumulant</li> </ul>
<b>Data length</b>	Define the size of data. <ul style="list-style-type: none"> <li>• 16-bit integer</li> <li>• 32-bit integer</li> </ul>
<b>Min. value</b>	Define the minimum value for data conversion at the information point.
<b>Max. value</b>	Define the minimum value for data conversion at the information point.
<b>Offset</b>	Define the offset of numerical value of information point.
<b>Division</b>	Define the division factor required in case of data change at the information point.
<b>Dead zone value</b>	Define the dead zone value of producing event value; it's satisfied when the absolute value of the difference between the previous transmission value and the current value is greater than the dead zone value.

#### 5.4.2.5.4. Analog output

<b>Point number</b>	Define the index number of information point.
<b>Data length</b>	Define the processing level of current information point. <ul style="list-style-type: none"> <li>• 16-bit integer</li> <li>• 32-bit integer</li> </ul>
<b>Offset</b>	Define the offset of numerical value of information point.
<b>Division</b>	Define the division factor required in case of data change at the information point.

#### 5.4.2.5.5. State output

<b>Point number</b>	Define the index number of information point.
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## 6. AdvancedApplication

### 6.1. E-Script Culate

This chapter mainly describes how **EDPS ICT-S+** configures logic script advanced application module. The configuration manual mainly describes application information, parameter information, configuration information, and calculation information. The logic script advanced application module of EDPS adopts standard C Language Specification for

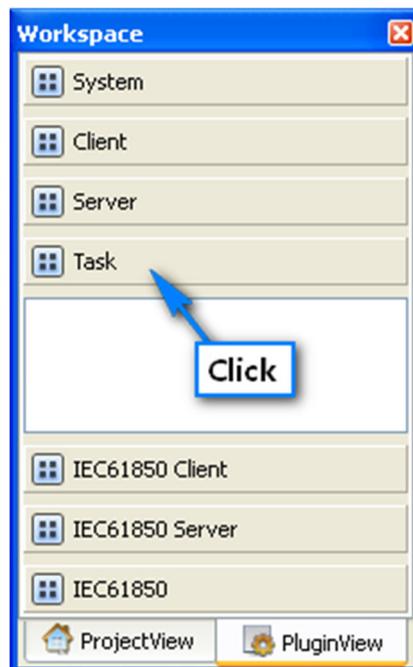
logic programming, and **EDPS ICT-S+** provides a concise and fast way to help the user to conduct configuration.

## Application Information

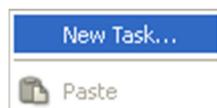
**Overview** Describe basic application information of driver and parameter of script calculation

**Create** Create script calculation driver

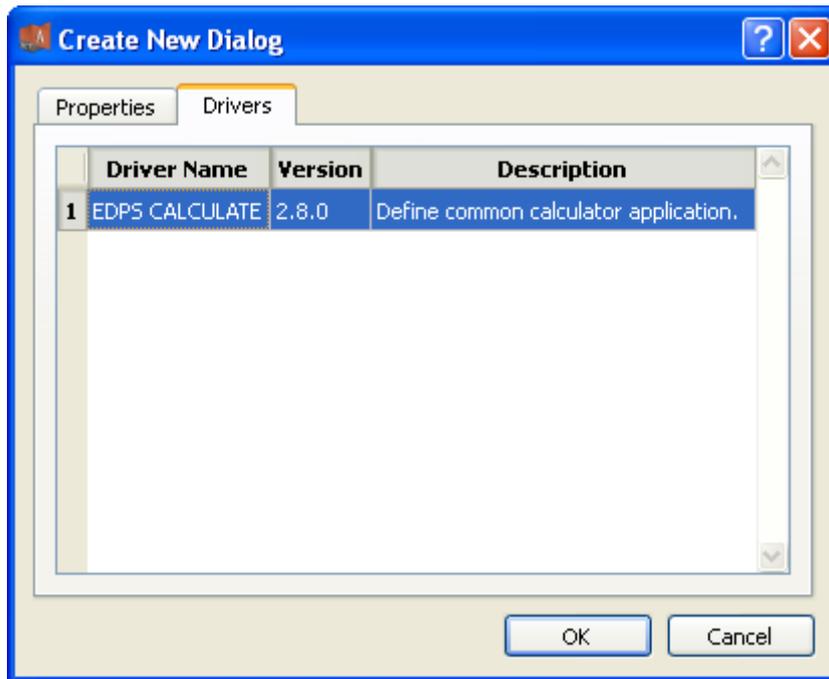
1. Open a project file;
2. Select the plugin management page in the management area of **EDPS ICT-S+**;
3. Activate the advanced application plugin;



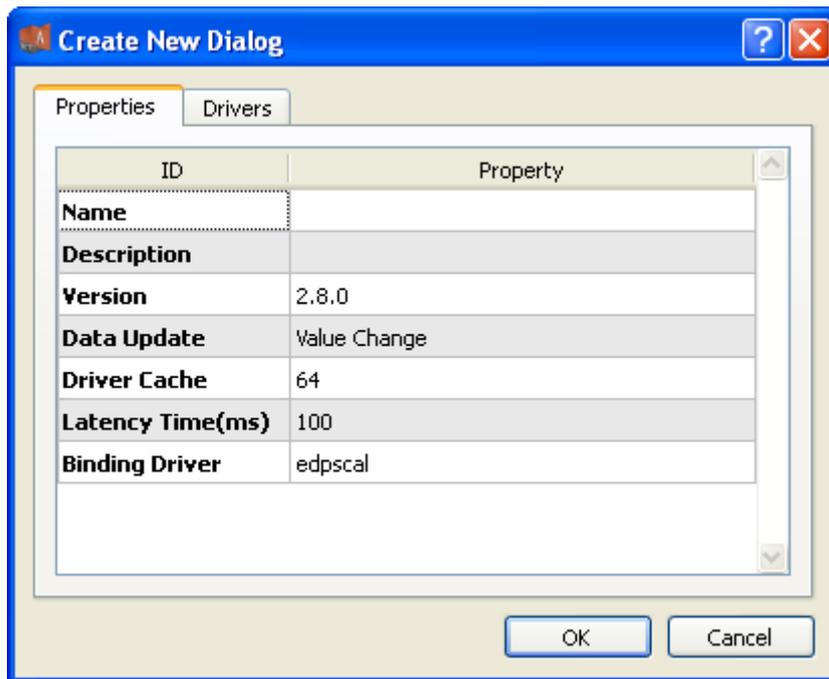
4. Right click in the blank space, and select the menu option "New task" to pop up the "Create driver dialog";



5. Select the driver to be created in the driver page;



6. Configure basic attributes of the target driver in the attribute page;



7. Click "OK" to complete creation;

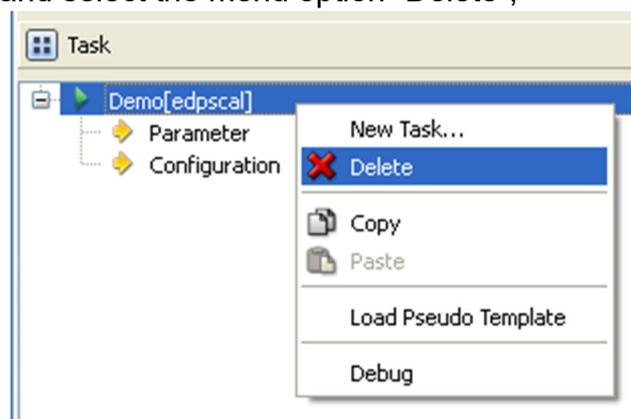
Note: Driver information

No.	Name	Description
1	Name	Define the display name of driver.
2	Description	Define how to describe the driver.
3	Version	Define the version information of driver.
4	Data update	Set the way of updating data to database. Value change – The system updates the database

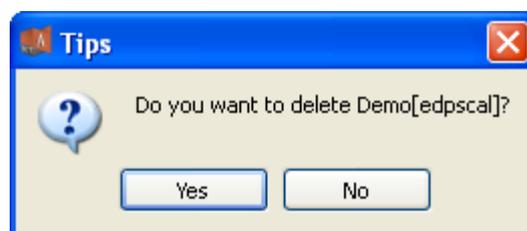
		and notifies other driver protocols only when a value changes; Time change – The system updates the database and notifies other driver protocols no matter whether a value or time changes; Time update – The system updates the database but doesn't notify other driver protocols if the value doesn't change but time changes;
5	Driver cache	Define the size of buffer.
6	Latency time (ms)	Define the delay time of updating real-time database. The system shall write raw data into the real-time database after a delay of the time defined.
7	Binding driver	Define the name of binding program, which is unique and cannot be modified.

### Delete Delete script calculation driver

8. Right click and select the menu option "Delete";



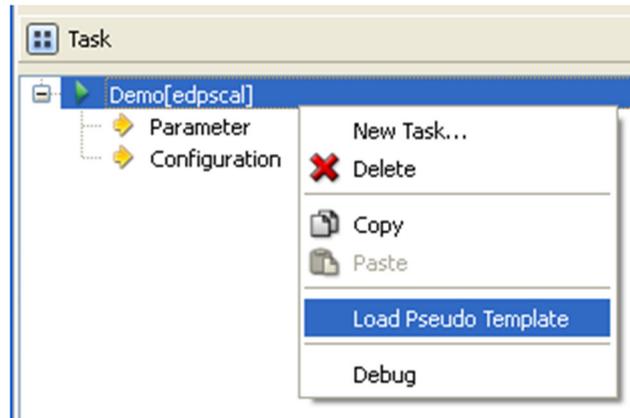
9. It prompts whether to delete;



10. Click "Yes" to complete deletion;

### Virtual point template Load virtual point of driver from the system template library

11. Right click the driver bar, and select the menu option "Load virtual point template" to complete loading of virtual point of driver.



Note:

Basic		Value					
	Point Name	Description	Value Type	Initial Value	Owner	Show Mode	Parameter
1	TSKSTA	Running status	16 Bits Unsigned Short	0	Local	By Name	0:Exit, 1:Running, 2:Paused, 3:StandBy
2	TSKAUTH	Authority	Bool	0	Local	By Name	0:Demo, 1:Authority

No.	Name	Description
1	Running status	Observe the running state information of the driver.
2	Authority	Observe the authorization state of the driver.

**Parameter information** Define the parameters of advanced application.  
View parameter attributes



Note: Operating parameter information

No.	Name	Description
1	Task mode	Define the operating mode of application, which is maximum performance by default. Normal Maximum performance

**Configuration information** Define the application information of configuration

Right click the configuration and click "New" to pop up the "Create configuration dialog", and click "Ok" to complete creation.

ID	Property
Name	Cal
Description	DG
Trigger Mode	Periodic
Trigger Period(ms)	1000
Trigger Condition	...
Trigger Timer	12:00

Note:

No.	Name	Description
1	Name	Define the name of script application.
2	Description	Describe the current script application.
3	Trigger mode	Define the mode of triggering script calculation task. Cyclic trigger Condition trigger Timing trigger
4	Trigger period (ms)	Define the time interval of cyclic trigger, in ms.
5	Trigger condition	Define the operating parameters of condition trigger.
6	Trigger time	Define the 24-hour-system time of timing trigger, accurate to minute, in the format of HH:MM.

## Calculation information

Right click the calculation and click "New information point", and click "Ok" to complete the creation of calculation point. Select and modify the value type as needed after creation; double-click the expression/script and edit it, and adopt standard C Language Specification for logic programming. Refer to Appendix D "The e-Script syntactic structure".

## 7. Frequently Asked Questions

### 7.1. Hardware Failures and Troubleshooting

#### 7.1.1. The PSW indicator for power supply on the panel doesn't light after the device is powered on

- The voltage of power supply is lower than the normal starting voltage. Before the power supply is started, use a multimeter to measure the voltage between the two ends PWR+ and PWR- of power source. If failing to reach the starting voltage, the input power needs to

be inspected.

At normal operation, the voltage range of power source is as shown below.

Device type	Standard voltage	Working range
<b>PT5002</b>	12VDC	12~24VDC
<b>PT5004R</b>	220VAC	85~265VAC

- Fuse blown  
Open the cover of device to see whether the fuse has blown after the power is disconnected. If yes, replace it with a new fuse. If not, check for short-circuit between PWR+ and PWR-.
- Power switch failure  
Use a multimeter to check the input end and output end of power switch after the power is disconnected.

### **7.1.2. The working power supply is normal but the mainboard doesn't work**

- The CPU board is not closely connected with the mainboard  
Re-plug the CPU board to make bus connection close.
- Problem in working power supply of mainboard  
Use a multimeter to measure the voltage at the mainboard to see if it's 3.3VDC.

### **7.1.3. Network and device communication interruption**

- Problem in network cable  
Check whether network cable is connected correctly.
- Wrong network connection method  
If the network port of notebook computer is not self-adaptive, use cross network cable to connect with the device or use two straight-through cables to connect with the device via Switch or HUB.
- Network not in the same segment  
Check whether the local network address of PC is in the same network segment as the device.
- Interference of wireless network  
Check whether the wireless network is in the same segment as the local network address; if yes, close wireless network or move it to another segment.

### **7.1.4. Serial communication is abnormal**

- Communication cable doesn't meet requirements  
The field communication environment is very harsh, so standard category 5+ cable must be used to basically meet technical requirements; the use of ordinary communication cable may cause unstable communication and bit error, etc.
- Communication distance is too long and there are too many devices  
Every communication method has strict requirements for the length of communication cable; the communication distance for RS485 is 1200m covering 32 devices in ideal conditions, but the actual situation on site is complicated and unlikely reaches the ideal requirements, so the extreme communication distance may be 400~500m covering about 10 devices.
- Terminal resistance is not provided

When adopting RS485 communication, there is more than one device in the communication link, and capacitance interference and echo signal are produced during communication, so it's necessary to add  $120\Omega$  terminal resistance at the receiving end of the last device in the communication link to eliminate interference.

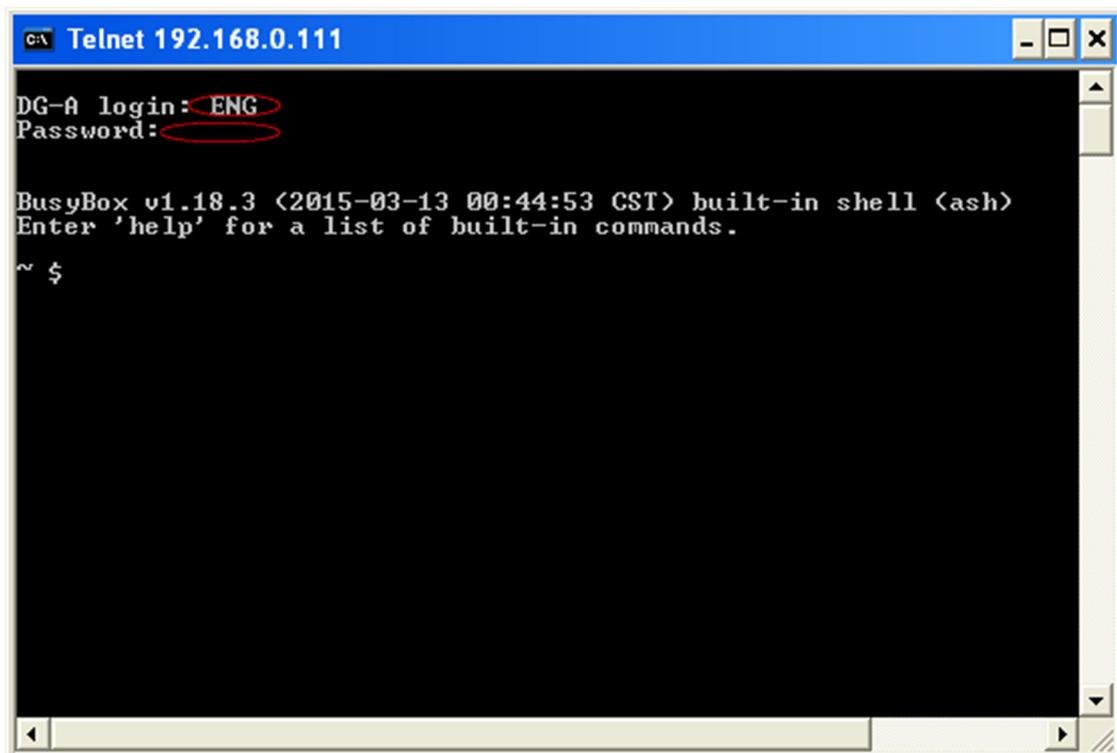
- Electrical level is unmatched  
The RS-485 communication port of outdated devices of some manufacturers adopts TTL level mode but not differential level mode, so an adapter is needed.
- The voltage at communication port is too low  
Protective devices of some manufacturers need 5V or 12V power source to supply power for communication port during communication, so a power source needs to be provided.
- The serial communication mode in software is not configured correctly  
The serial communication mode in configuration software is configured according to actual situation, and serial channels should be configured according to actual link.
- Attribute configuration of serial port doesn't match with devices  
Serial communication attributes adopted by different manufacturers/protocols are different, so the attributes of serial port should be configured according to actual situation of IED devices.

## 7.2. Software problems and solutions

### 7.2.1. How to telnet to and access the device

- Input "cmd" in "Running" to pop up the "Command prompt"
- Input "telnet 192.168.0.111" (Server IP)
- Input username and password as shown in Figure 6.1 to login the device

*Note: The user is "ENG", the password is "Admin123", and the password is invisible.*



```
Telnet 192.168.0.111
DG-A login: ENG
Password:
BusyBox v1.18.3 (2015-03-13 00:44:53 CST) built-in shell (ash)
Enter 'help' for a list of built-in commands.
~ $
```

Figure 6.1 Telnet interface

### 7.2.2.View whether the main program is running

- Telnet to the device
- Input “ps”; as shown in Figure 6.2, it indicates the main program “edpsmainarm473” is running

```

C:\ Telnet 192.168.0.111
~ $ ps
PID  USER      TIME  COMMAND
  1  root        0:05  init
  2  root        0:00  [kthreadd]
  3  root        0:00  [ksoftirqd/0]
  4  root        0:00  [kworker/0:0]
  5  root        0:00  [kworker/u:0]
  6  root        0:00  [khelper]
  7  root        0:00  [netns]
  8  root        0:00  [kworker/u:1]
 172  root        0:00  [sync_supers]
 174  root        0:00  [bdi-default]
 176  root        0:00  [kblockd]
 191  root        0:00  [khubd]
 227  root        0:00  [cfg80211]
 315  root        0:00  [mush-hdrc.0]
 320  root        0:00  [mush-hdrc.1]
 322  root        0:00  [rpciod]
 334  root        0:00  [kswapd0]
 335  root        0:00  [fsnotify_mark]
 336  root        0:00  [nfsiod]
 337  root        0:00  [crypto]
 351  root        0:00  [ocf_0]
 352  root        0:00  [ocf_ret_0]
 355  root        0:00  [OMAP UART0]
 357  root        0:00  [OMAP UART1]
 359  root        0:00  [OMAP UART2]
 361  root        0:00  [OMAP UART4]
 397  root        0:00  [mtdblock0]
 402  root        0:00  [mtdblock1]
 407  root        0:00  [mtdblock2]
 412  root        0:00  [mtdblock3]
 417  root        0:00  [mtdblock4]
 422  root        0:00  [mtdblock5]
 427  root        0:00  [mtdblock6]
 432  root        0:00  [mtdblock7]
 440  root        0:00  [ubi_bgt0d]
 677  root        0:00  [irq/275-FUGUI]
 681  root        0:00  [ubifs_bgt0_0]
 708  root        0:00  [kworker/0:2]
 722  root        0:00  /usr/local/bin/sshd
 725  root        0:00  /usr/sbin/inetd
 734  root        0:00  /sbin/syslogd -O /home/ENG/log/messages
 737  root        0:00  [loop0]
 738  root        0:00  [kjournald]
 739  root        0:05  ./edpsmainarm473
 740  root        0:00  /sbin/getty 115200 tty00
 756  root        0:00  [flush-7:0]
 757  root        0:00  [flush-ubifs_0_0]
 925  root        0:00  telnetd
 926  ENG         0:00  -sh
1082  ENG         0:00  ps
~ $

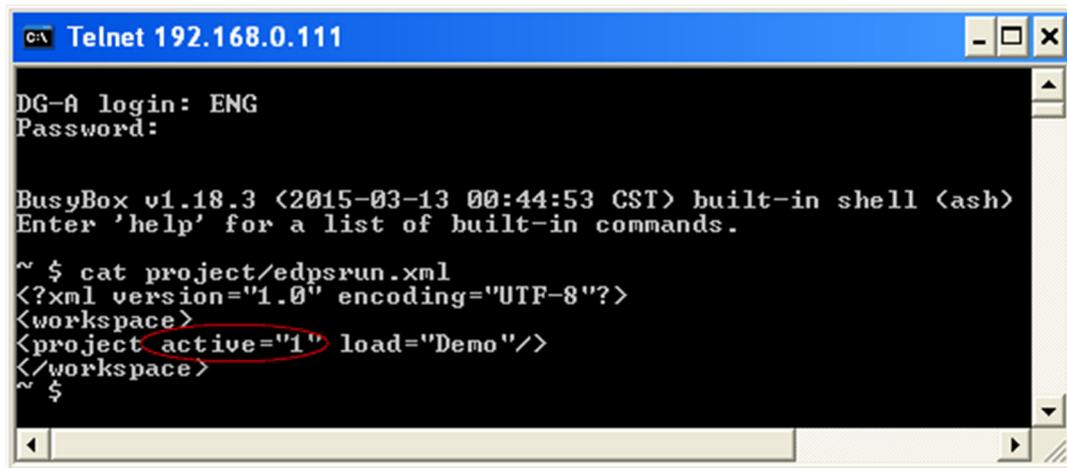
```

Figure 6.2 Main program running interface

### 7.2.3. View currently running projects

- Telnet to the device
- Input "cat project/edpsrun.xml" and press "Enter" to view running projects as shown in Figure 6.3

*Note: active= "1" means the project is running currently*

A screenshot of a Telnet window titled "Telnet 192.168.0.111". The window shows a login prompt "DG-A login: ENG" and "Password:". Below that, it displays "BusyBox v1.18.3 (2015-03-13 00:44:53 CST) built-in shell (ash)" and "Enter 'help' for a list of built-in commands.". The user has entered the command "~ \$ cat project/edpsrun.xml". The output is an XML snippet: "<?xml version='1.0' encoding='UTF-8'?>\n<workspace>\n<project active='1' load='Demo'/>\n</workspace>\n~ \$". The text "active='1'" is circled in red in the original image.

```
CA Telnet 192.168.0.111
DG-A login: ENG
Password:

BusyBox v1.18.3 (2015-03-13 00:44:53 CST) built-in shell (ash)
Enter 'help' for a list of built-in commands.

~ $ cat project/edpsrun.xml
<?xml version="1.0" encoding="UTF-8"?>
<workspace>
<project active="1" load="Demo"/>
</workspace>
~ $
```

Figure 6.3 Currently running project interface

### 7.2.4. How to view and update driver files

#### Method of viewing drivers

View drivers via the ICT-S+ tool (integrated with configuration environment)

- Open the ICT-S+ configuration tool, click "Management" ->"Firmware" ->"View" on the menu bar, and input the corresponding server (i.e. the IP address of network port), for which the username ENG and password Admin123, as shown in Figure 6.4.

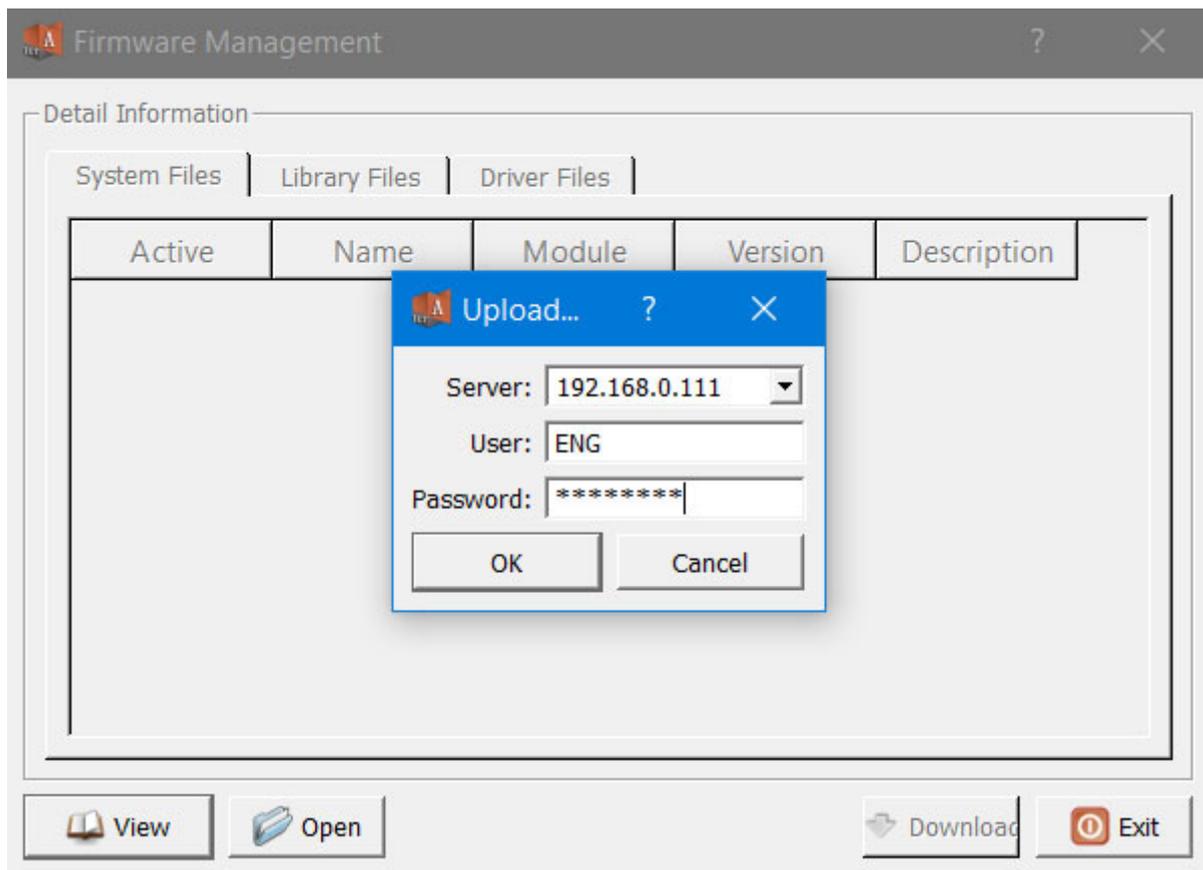


Figure 6.4 Query firmware

- Click "OK" to see the information of drivers/firmwares downloaded in the device, as shown in Figure 6.5.

Reminder: The picture shown below "Firmware Image Coding" is driver image package number, not the driver name.

The screenshot shows a window titled 'Firmware Report' with the following information:

Date: 30/03/2017

Device: 192.168.0.111

No	Name	Module	Version
1	Firmware Image Coding	A6_06_111111	2.8.37
2	EDPS Main Program	edpsmainarm473	2.8.37.754.743
3	EDPS Main Library	libarm473edpslib.so	2.8.37.754.743
4	EDPS Kernel Library	libarm473edpskernel.so	2.8.37.754.743
5	EDPS Diagnose Service	arm473edpsdns.so	2.8.37.754.743
6	EDPS Deasmond Service	arm473edpsdmn.so	2.8.37.754.743
7	DNP Client Driver	arm473dnpclient.so	2.8.37.754.780
8	IEC101 Client Driver	arm473iecl01client.so	2.8.37.754.743
9	IEC104 Client Driver	arm473iecl04client.so	2.8.37.754.743
10	Modbus Client Driver	arm473modbusclient.so	2.8.37.754.743
11	DNP Server Driver	arm473dnpserver.so	2.8.37.754.743
12	IEC101 Server Driver	arm473iecl01server.so	2.8.37.754.743
13	IEC104 Server Driver	arm473iecl04server.so	2.8.37.754.743
14	Modbus Server Driver	arm473modbusserver.so	2.8.37.754.743
15	EDPS Calculation Task	arm473edpscal.so	2.8.37.754.743
16	EDPS Script Task	arm473escript.so	2.8.37.754.743

Buttons at the bottom: Print..., Save As..., Quit

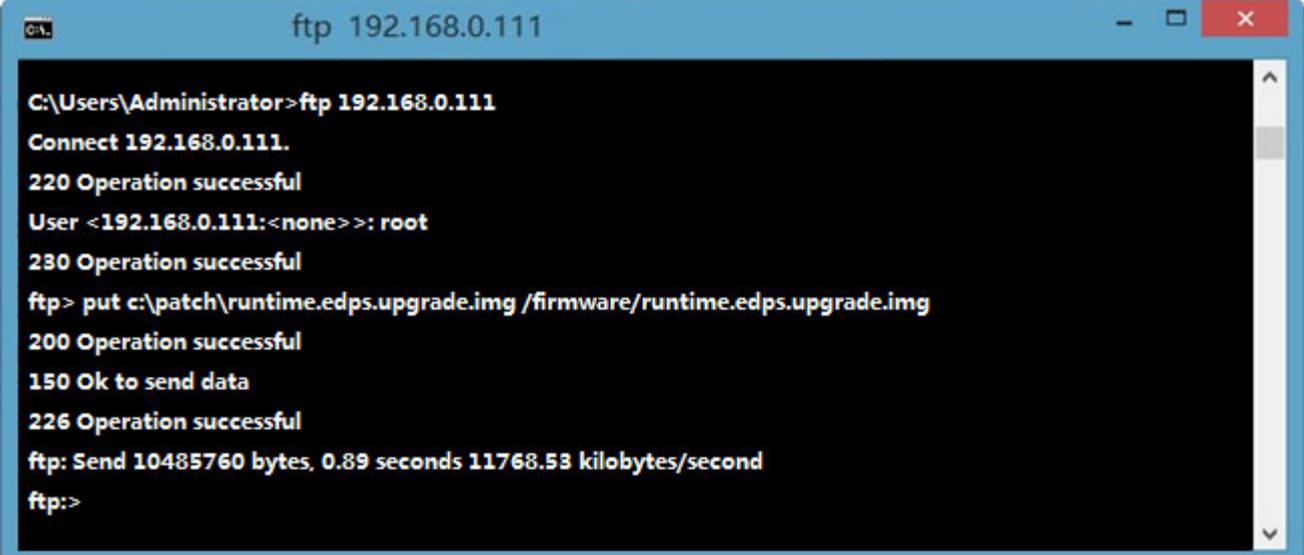
Figure 6.5 Firmware information

## Here introduce the method of updating drivers

### Method 1:

Update driver file by using FTP command in the DOS window, and take the driver updating file runtime.edps.upgrade.img in the local directory C:\patch as example. See Figure 6.6 for reference.

- Open the start menu of Windows, select "Run" command, input "cmd" in the dialog box, and click "OK" to switch to the DOS window, where command prompt appears.
- Input the command ftp 192.168.0.111 (for example, the gateway IP is 192.168.0.111)  
Input the user name and password and wait for verification (user name: ENG, password: Admin123).
- Upload the file and input the command:  
ftp>put c:\patch\runtime.edps.upgrade.img /firmware/runtime.edps.upgrade.img  
Restart the device when it prompts the transmission is completed.



```

CA. ftp 192.168.0.111
C:\Users\Administrator>ftp 192.168.0.111
Connect 192.168.0.111.
220 Operation successful
User <192.168.0.111:<none>>: root
230 Operation successful
ftp> put c:\patch\runtime.edps.upgrade.img /firmware/runtime.edps.upgrade.img
200 Operation successful
150 Ok to send data
226 Operation successful
ftp: Send 10485760 bytes, 0.89 seconds 11768.53 kilobytes/second
ftp:>

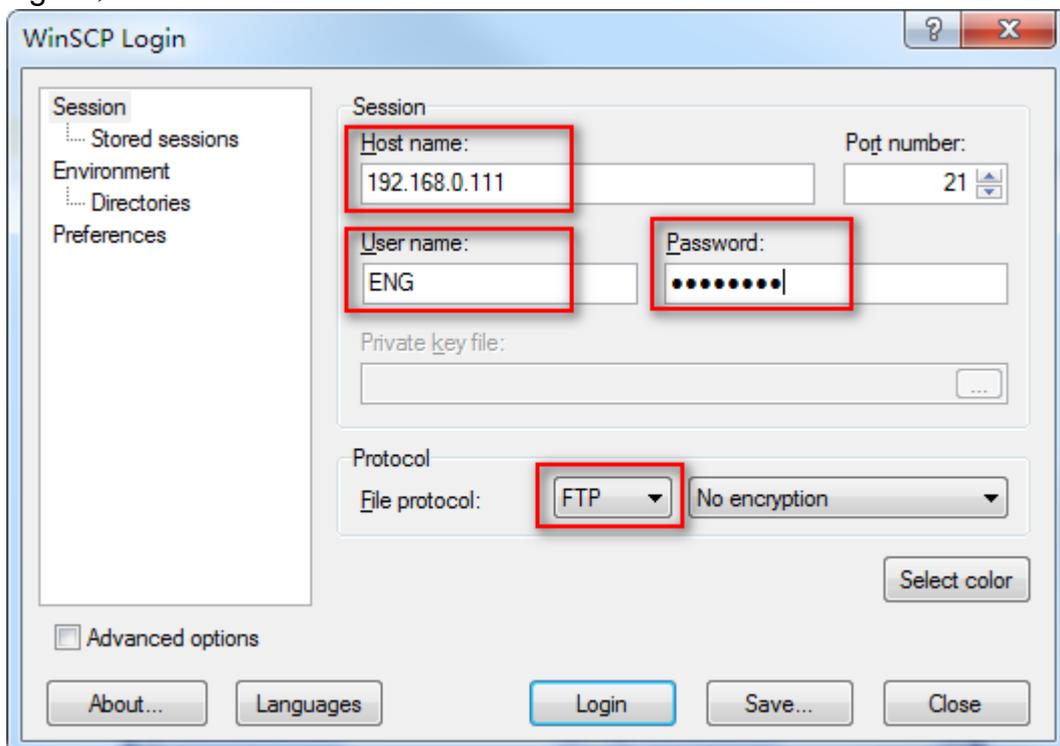
```

Figure 6.6 Driver updating

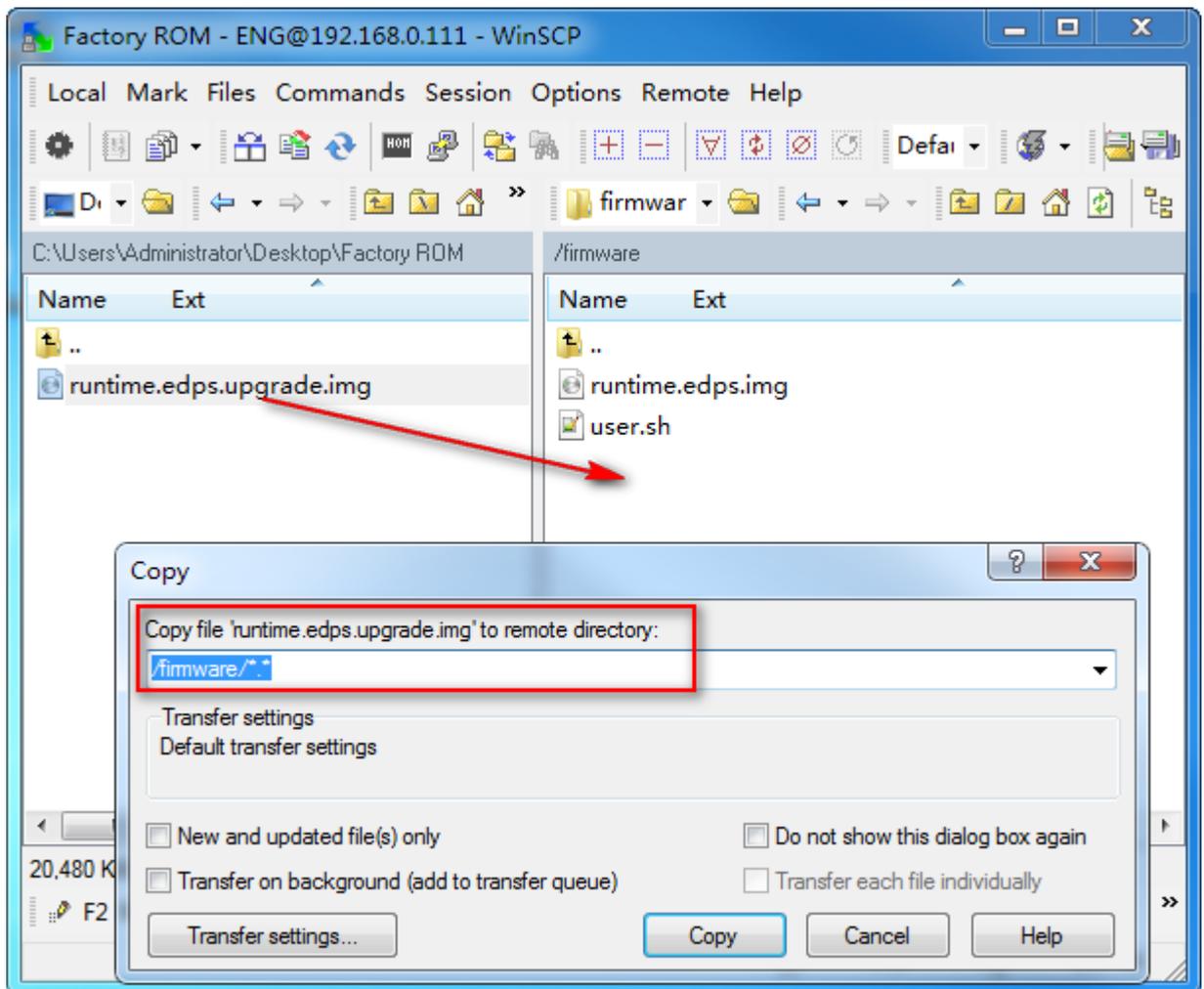
**Method 2:**

Update driver file by using the FTP tool to copy the driver files directly to the device.

- Open the “FTP” tool , the “Host name” for the network IP address, user name for “ENG”, password for “Admin123”, Protocol for “FTP”, as shown in the following Figure;



- Copy the " runtime.edps.upgrade.img" in the local folder to the /firmware/ directory, and then reboot the device, as shown in the following Figure.



### 7.2.5. How to modify system time

Use the command in the figure to modify system time

*Note: The format of date is: MMDDHHMMYYYY (M-month, D-day, H-hour, M-minute, Y-year); the system time of device adopts UTC time as reference.*

```

C:\ Telnet 192.168.0.111

BusyBox v1.18.3 <2015-03-13 00:44:53 CST> built-in shell <ash>
Enter 'help' for a list of built-in commands.

~ # date
Thu Jan 1 01:10:36 CST 2015
~ # date 121212122015
Sat Dec 12 12:12:00 CST 2015
~ # hwclock -w -u
~ # reboot _

```

Figure 6.7 Modify system time

## 7.2.6. How to modify the IP address of device

### Method 1:

The default address of device is eth0: 192.168.0.111, eth1: 192.168.1.111.

Modify the address in the project configuration via the ICT-S+ configuration tool

- Open the ICT-S+ configuration tool, open "System information", and select "Property";
- Select the option "Network configuration" in the right attribute area, and double-click it to open the table editor;
- Click "New" and modify the IP address of corresponding network port, as shown in Figure 6.8
- Click "Ok" and save the project and download it to the device, and then reboot the device with power off;



Figure 6.8 Network configuration

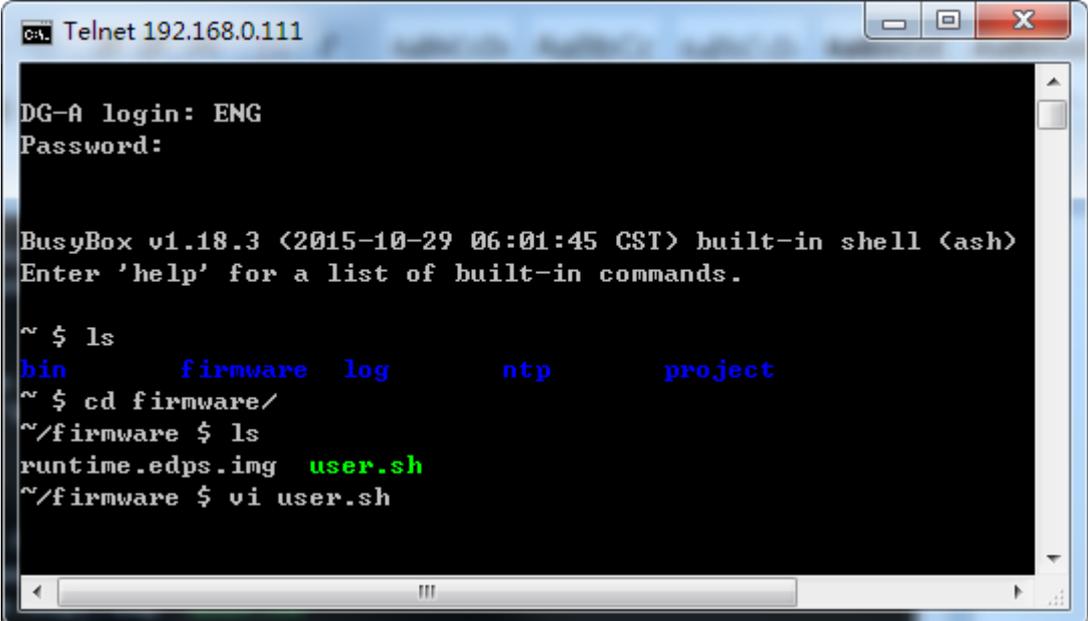
### Method 2:

Modify the IP address by logging on the device and editing script

- Log on the device through TELNET
- Edit the file "user.sh" in "firmware" directory and change the device IP address, e.g. change eth0 IP to 192.168.2.180 (see figure 6.9 and 6.10).
- After editing, save the script and reboot the device.

Hint: Procedures of text editing in Linux, take example of editing user.sh

- Use vi command, e.g. vi user.sh
- Press *insert* button or *i* button (the cursor on the bottom left corner will become | from \_ ), then you can edit the text, and you can use arrow button to move the cursor.
- Move cursor to the text line you want to edit (e.g. #server 192.168.0.111), delete the the leftmost sign #
- Press *ESC* button to quit editing mode (cursor will become \_ from | ), press *shift* and *:* until “:” is shown in the bottom left corner, then type *wq* and press enter button.



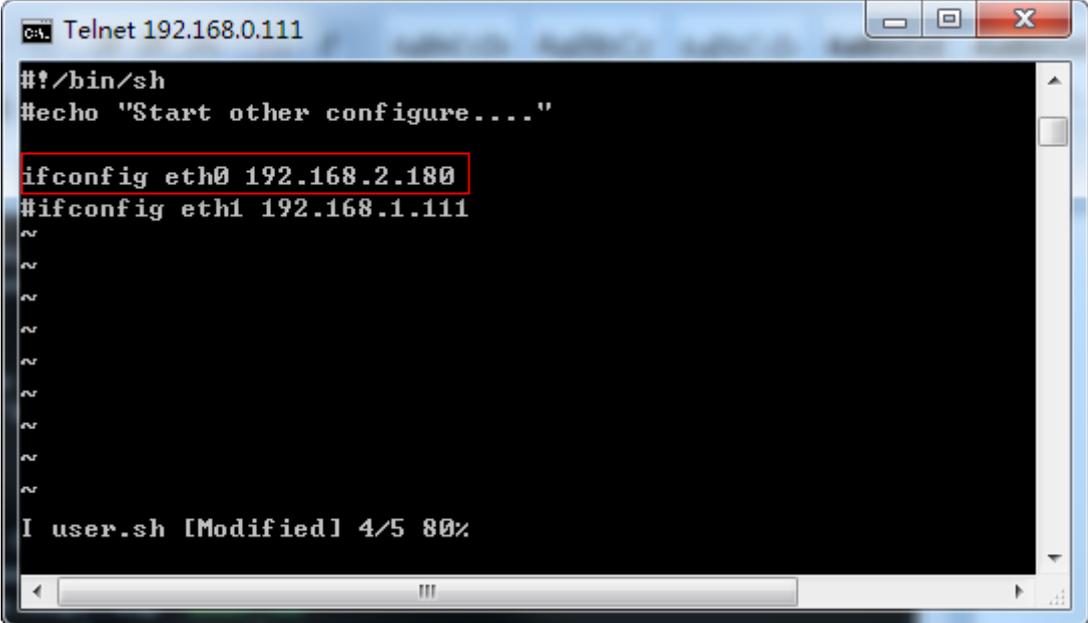
The screenshot shows a Telnet window titled "C:\> Telnet 192.168.0.111". The terminal output is as follows:

```
DG-A login: ENG
Password:

BusyBox v1.18.3 <2015-10-29 06:01:45 CST> built-in shell (ash)
Enter 'help' for a list of built-in commands.

~ $ ls
bin      firmware  log      ntp      project
~ $ cd firmware/
~/firmware $ ls
runtime.edps.img  user.sh
~/firmware $ vi user.sh
```

Figure 6.9 User Login

A screenshot of a Telnet window titled "Telnet 192.168.0.111". The window shows a shell prompt "#!/bin/sh" and the command "#echo 'Start other configure...'" being executed. Below that, the command "ifconfig eth0 192.168.2.180" is entered and highlighted with a red box. The next line shows "#ifconfig eth1 192.168.1.111". The output consists of several tilde characters "~". At the bottom, it shows "I user.sh [Modified] 4/5 80%".

```
CA: Telnet 192.168.0.111
#!/bin/sh
#echo "Start other configure..."
ifconfig eth0 192.168.2.180
#ifconfig eth1 192.168.1.111
~
~
~
~
~
~
~
~
~
~
I user.sh [Modified] 4/5 80%
```

Figure 6.10 IP modification

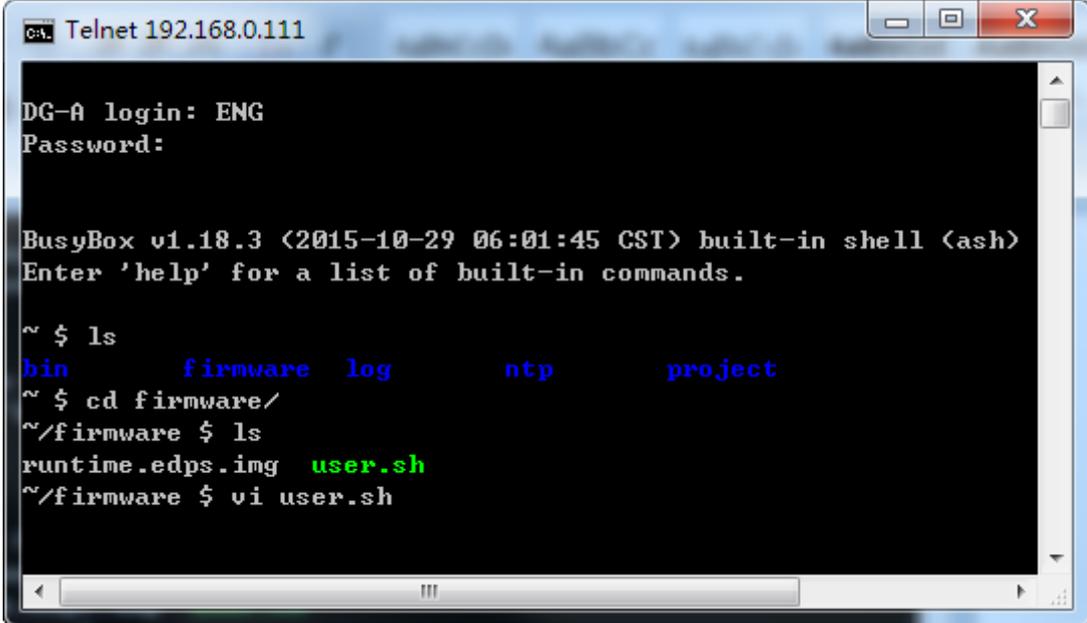
### 7.2.7. How to add gateway address

Add gateway address by logging on the device and editing script

- Log on the device via TELNET
- Edit the file "user.sh" in directory "firmware" and add gateway address. The command line is: `route add default gw xxx.xxx.xxx.xxx`, e.g. add gateway address of 172.16.1.1 (see figure 6.11 and 6.12).

*Hint: Gateway address and IP address must be within the same subnet*

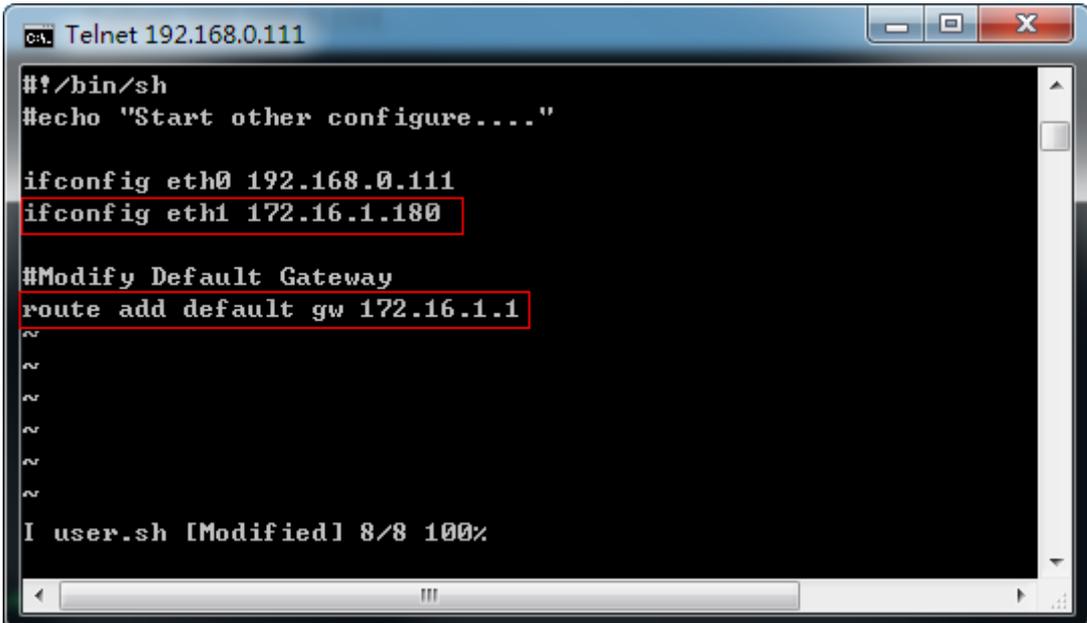
- After editing, save script and reboot the device.



```
CA: Telnet 192.168.0.111
DG-A login: ENG
Password:
BusyBox v1.18.3 (2015-10-29 06:01:45 CST) built-in shell (ash)
Enter 'help' for a list of built-in commands.

~ $ ls
bin      firmware  log      ntp      project
~ $ cd firmware/
~/firmware $ ls
runtime.edps.ing  user.sh
~/firmware $ vi user.sh
```

Figure 6.11 User login



```
CA: Telnet 192.168.0.111
#!/bin/sh
#echo "Start other configure...."

ifconfig eth0 192.168.0.111
ifconfig eth1 172.16.1.180

#Modify Default Gateway
route add default gw 172.16.1.1
~
~
~
~
~
~
I user.sh [Modified] 8/8 100%
```

Figure 6.12 Add gateway address

### 7.2.8.How to configure NTP

- Log on the device via TELNET
- Edit the file “ntp.enable.conf” in directory “ntp”, change the first parameter from 0 to 1 to enable NTP function, see figure below:

```

c:\ Telnet 192.168.0.111

DG-A login: ENG
Password:

BusyBox v1.18.3 (2015-10-29 06:01:45 CST) built-in shell (ash)
Enter 'help' for a list of built-in commands.

ENG@DG-A:~$ls
bin      firmware  log      ntp      project
ENG@DG-A:~$cd ntp/
ENG@DG-A:~/ntp$ls
ntp.conf  ntp.enable.conf  ntp.mainsrv.conf
ENG@DG-A:~/ntp$vi ntp.enable.conf

```

Figure 6.13 User Login

```

c:\ Telnet 192.168.0.111

1_300 -300
~
~
~
I ntp.enable.conf [Modified] 1/1 100%

```

**Enable NTP**

Figure 6.14 NTP enable parameters

- 1: Enable NTP function; 0: Disable NTP function
- 300 and -300: Offset threshold value
- Edit file “ntp.conf” to add NTP server IP address, see figure below:  
*Hint: multiple NTP servers can be added.*

```

CA. Telnet 192.168.0.111
ENG@DG-A:~/ntp$
ENG@DG-A:~/ntp$ls
ntp.conf          ntp.enable.conf  ntp.mainsrv.conf
ENG@DG-A:~/ntp$vi ntp.conf

```

```

CA. Telnet 192.168.0.111
#--# miscellaneous section #--#

#driftfile ntp.drift
statsdir /home/ENG/log/ntpstats/
filegen peerstats file peerstats type day enable
#filegen loopstats file loopstats type day enable
filegen clockstats file clockstats type day enable

#server time.nist.gov iburst
#server 127.127.1.0
#fudge 127.127.1.0 stratum 8
server 192.168.0.188 iburst
#server 192.168.1.177 iburst
#--# end of server/peer section #--#

#####
~
~
~
- ntp.conf 14/19 73%

```

NTP server IP address

you can configure NTP server IP here as well

- Edit file “ntp.mainsrv.conf” to add main server IP address.

```

CA. Telnet 192.168.0.111
~
ENG@DG-A:~/ntp$ls
ntp.conf          ntp.enable.conf  ntp.mainsrv.conf
ENG@DG-A:~/ntp$vi ntp.mainsrv.conf

```

A screenshot of a Telnet window titled "Telnet 192.168.0.111". The window shows a terminal interface with a black background and white text. The text displayed is: "192.168.0.188" (highlighted with a red box), followed by two tilde characters "~", and then a line indicating the configuration of "ntp.mainsrv.conf" as "1/1 100%". The window has standard OS window controls (minimize, maximize, close) in the top right and a scrollbar on the right side.

```
ca. Telnet 192.168.0.111
192.168.0.188
~
~
- ntp.mainsrv.conf 1/1 100%
```

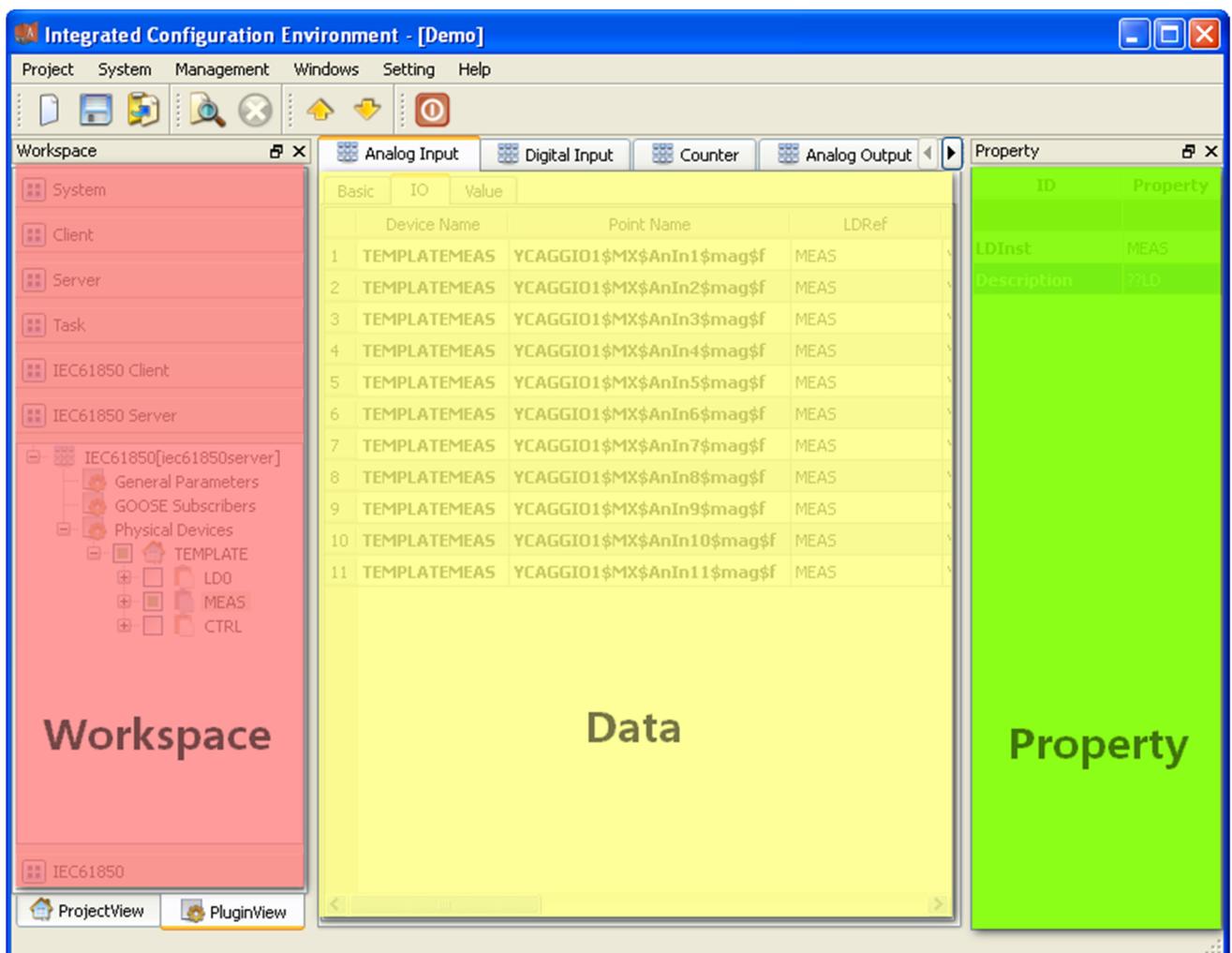
Figure 6.15 NPT main server configuration

- After editing, save script and reboot the device.

## Appendix A IEC 61850 Configuration

Appendix A mainly describes how **EDPS ICT-S+** configures IEC 61850 acquisition and proxy (forwarding) modules, and for the independence of IEC 61850 modules, **EDPS ICT-S+** will complete the customization and management of IEC 61850 acquisition or proxy data through independent customized plugin, i.e. IEC 61850 acquisition or proxy plugin. Meanwhile, the configuration manual will detail driver information, communication parameters, device parameters, and IO parameter information of various information points. Please refer to IEC 61850 specification documents for IEC 61850 related terms referred to in the configuration manual.

**EDPS ICT-S+** integrates configuration software by means of plugin. IEC 61850 plugins are **EDPS ICT-S+** configuration plugins which meet **EDPS ICT-S+** plugin interface and specially serve IEC 61850 proxy. Plugins are managed through the plugin manager of **EDPS ICT-S+**. **EDPS ICT-S+** plugin has three view interfaces: management area, data area, and attribute area.



### A.1. IEC 61850 acquisition

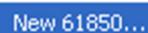
#### A.1.1. Driver management

**Create** Create IEC 61850 acquisition driver

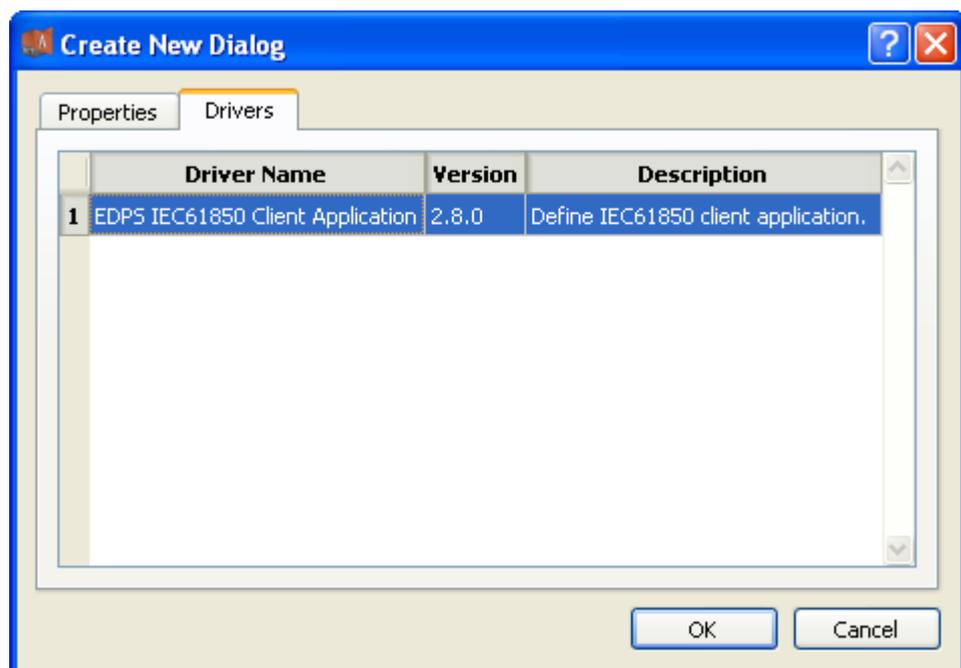
1. Open a project file;
2. Select the plugin management page in the management area of **EDPS ICT-S+**;
3. Activate IEC 61850 acquisition plugin;



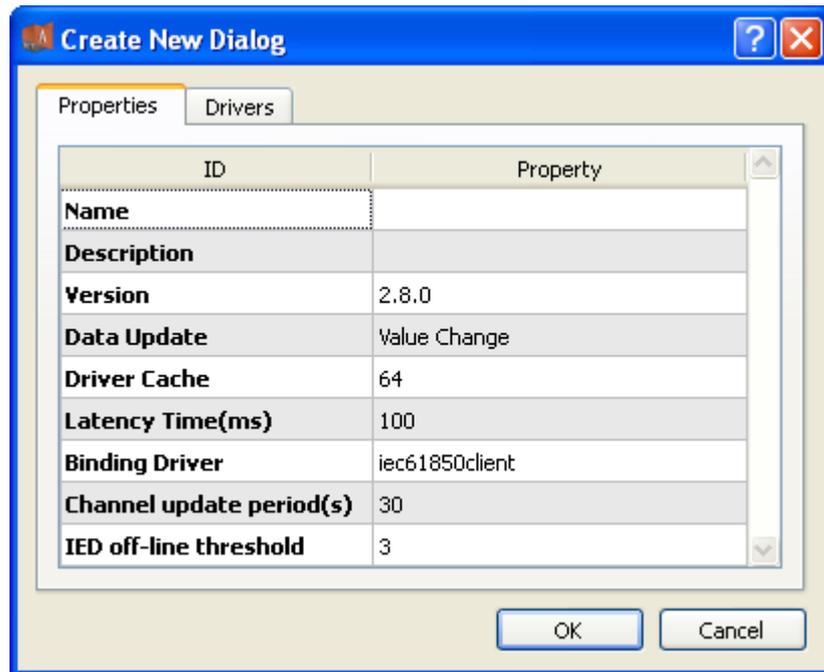
4. Right click in the blank space, and select the menu option "New 61850" to pop up the "Create driver dialog";

A blue button with the text 'New 61850...' in white.

5. Select the driver to be created in the driver page;



6. Configure basic attributes of the target driver in the attribute page;



7. Click "OK" to complete creation;

Note: Driver information

No.	Name	Description
1	Name	Define the display name of driver.
2	Description	Define the description information of driver.
3	Version	Define the version information of driver.
4	Data update	Define the data updating mode. Value change – The system updates the database and notifies other driver protocols only when a value changes; Time change – The system updates the database and notifies other driver protocols no matter whether a value or time changes; Time update – The system updates the database no matter whether a value or time changes, and notifies other driver protocols only when a value changes;
5	Driver cache	Define the cache size of driver.
6	Latency time (ms)	Define the delay time of updating real-time database. The system shall write raw data into the real-time database after a delay of the time defined.
7	Binding driver	Define the name of driver module, which is unique and cannot be modified.
8	Channel update	Define the cycle of updating IED communication times.

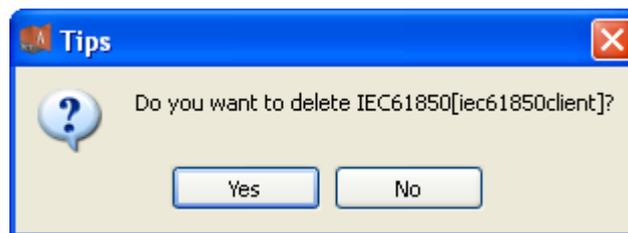
	period (s)	
9	IED off-line threshold	Define the offline threshold of IED device; when the number of consecutive communication failures reaches the threshold, the device is switched to offline state.

**Delete** Delete IEC 61850 acquisition driver

8. Right click the driver bar and select the menu option “Delete”;



9. Select the menu option "Delete"; It prompts whether to delete;



10. Click “Yes” to complete deletion;

**Virtual point template** Load virtual point of driver from the system template library

11. Right click the driver bar, and select the menu option “Load virtual point template”;



12. Select the menu option “Load virtual point template” to complete loading of virtual point of driver.

**Note:**

Basic		Value					
	Point Name	Description	Value Type	Initial Value	Owner	Show Mode	Parameter
1	IEC61850STA	Running status	16 Bits Unsigned Short	0	Local	By Name	0:Exit,1:Running,2:Paused,3:StandBy
2	IEC61850AUTH	Authority	Bool	0	Local	By Name	0:Demo,1:Authority

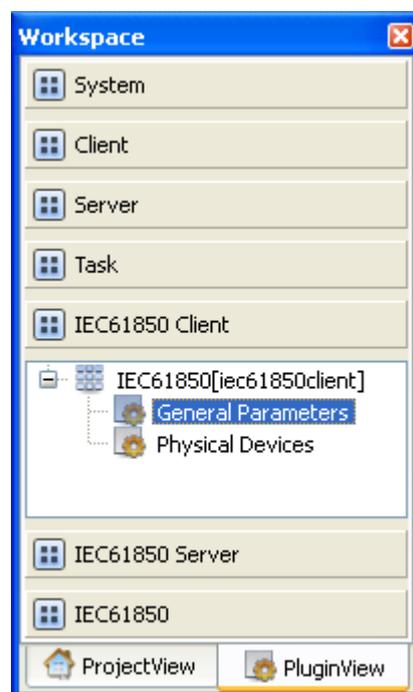
No.	Name	Description
1	Running status	Observe the running state information of the driver.
2	Authority	Observe the authorization state of the driver.

### A.1.2. General parameters

**Overview** View and configure general parameter information of IEC 61850 driver

**View and configure** View and configure communication parameter attributes

1. Open a project file;
2. Select the plugin management page in the management area of **EDPS ICT-S+**;
3. Activate IEC 61850 acquisition plugin;
4. Select the general parameter node in the management area;



5. View the information in the attribute area;

ID	Property
<b>MMS Maximum Message Size</b>	32000
<b>MMS Maximum Calling</b>	4
<b>MMS Maximum Called</b>	0
<b>Dynamic Object Capacity</b>	500
<b>CLNP/ES-IS</b>	...
<b>TP4(ISO 8073)</b>	...
<b>TCP/IP(RFC1006)</b>	...
<b>Network Address</b>	...
<b>GOOSE Subscriber/Publisher</b>	Disable
<b>GOOSE Mode</b>	Finally

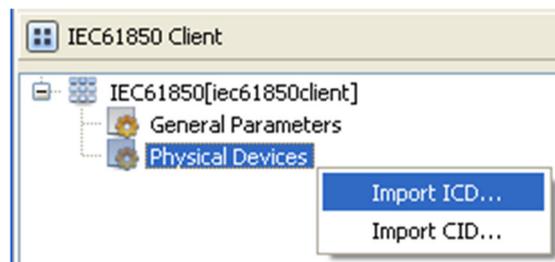
Note: Information in the attribute area (including configuration operation)

No.	Name	Description	Remarks
1	MMS Maximum message size	Define the maximum PDU length information.	Configure it with the default parameter
2	MMS Maximum calling	Define the maximum number of connections of MMS service	Configure it according to actual situation, or by referring to the figure above
3	MMS Maximum called	Define the maximum number of passive connections of MMS service	Configure it according to actual situation, or by referring to the figure above
4	Dynamic object capacity	Define the maximum number of dynamic objects	Configure it according to actual situation, or by referring to the figure above
5	CLNP/ES-IS	Define the configuration of network layer of OSI protocol stack	Create a new line and configure it with default parameter in the table editor
6	TP4(ISO 8073)	Define the configuration of transmission layer of OSI protocol stack	Configure in the same way as item 5
7	TCP/IP(RFC1006)	Define the configuration of TCP/IP protocol stack.	Configure in the same way as item 5
8	Network address	Define the configuration of local network address.	Configure in the same way as item 5
9	GOOSE subscription/publisher	Define whether to activate the GOOSE information subscription.	Configure it according to actual situation
10	GOOSE mode	Define the parsing mode of GOOSE information.	Configure it according to actual situation

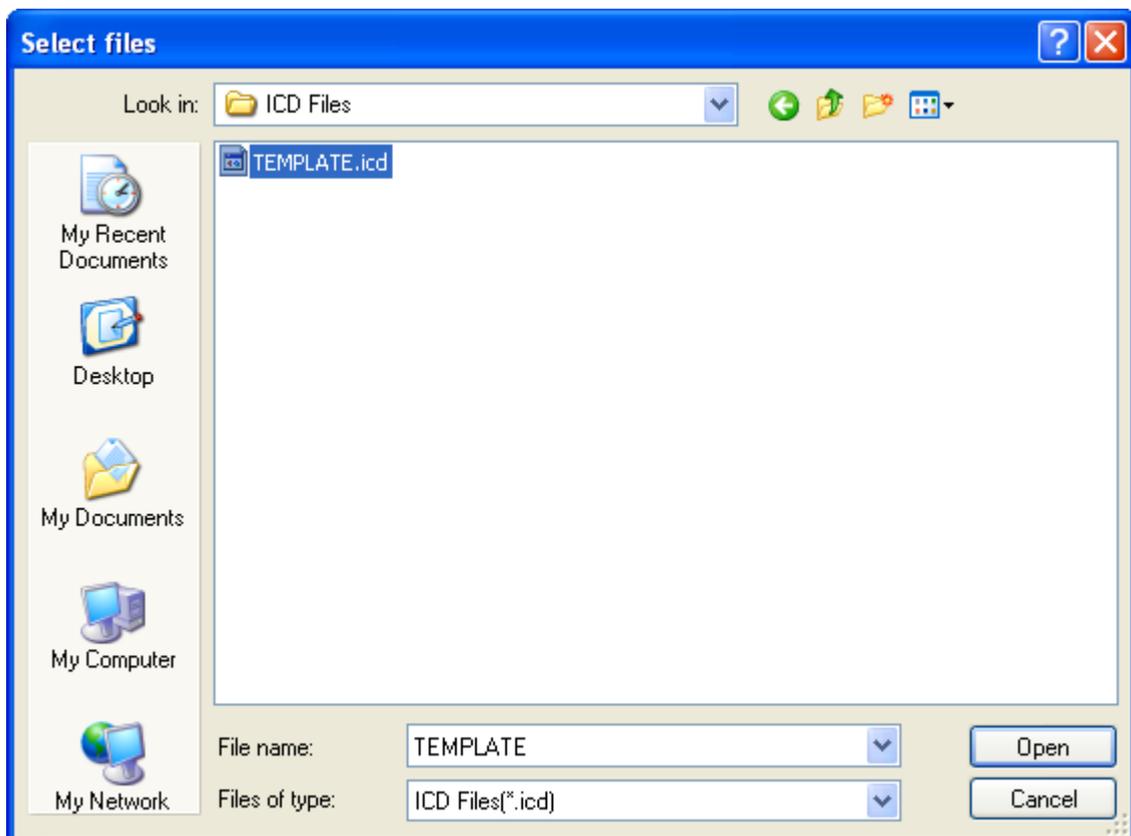
### A.1.3. Physical device management

**Import ICD file** Create IEC 61850 acquisition device by importing IEC 61850 ICD file

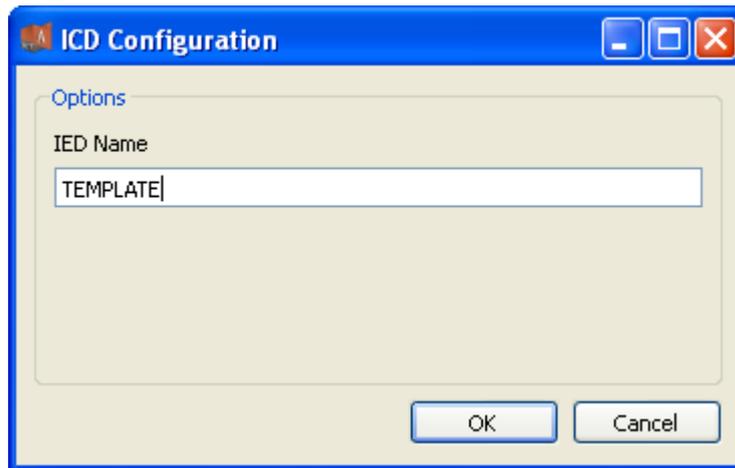
1. Open a project file;
2. Select the plugin management page in the management area of **EDPS ICT-S+**;
3. Activate IEC 61850 acquisition plugin;
4. Right click the node of physical device, and select "Import ICD";



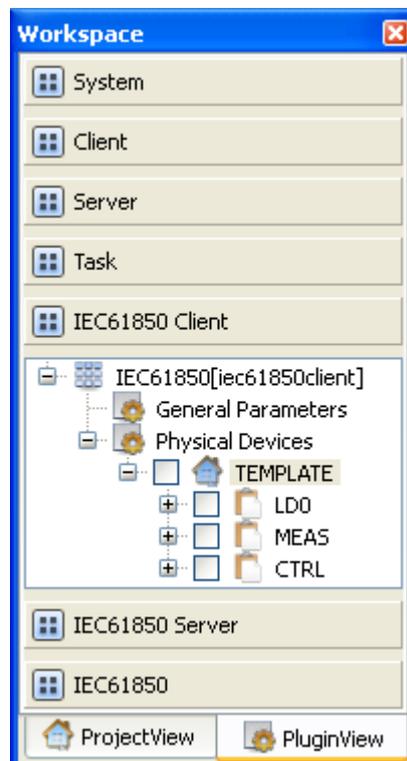
5. Open the selected file in the pop-up dialog box "Select file";



6. The system pops up the dialog box "ICD configuration";

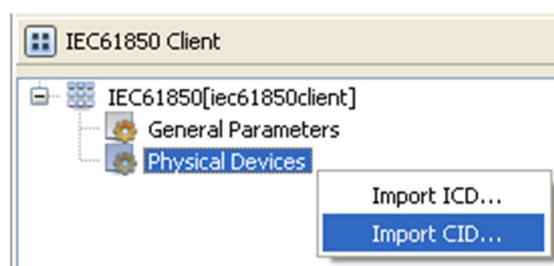


7. Edit the instance name of IED device and click "OK" to complete the creation of IEC 61850 device;

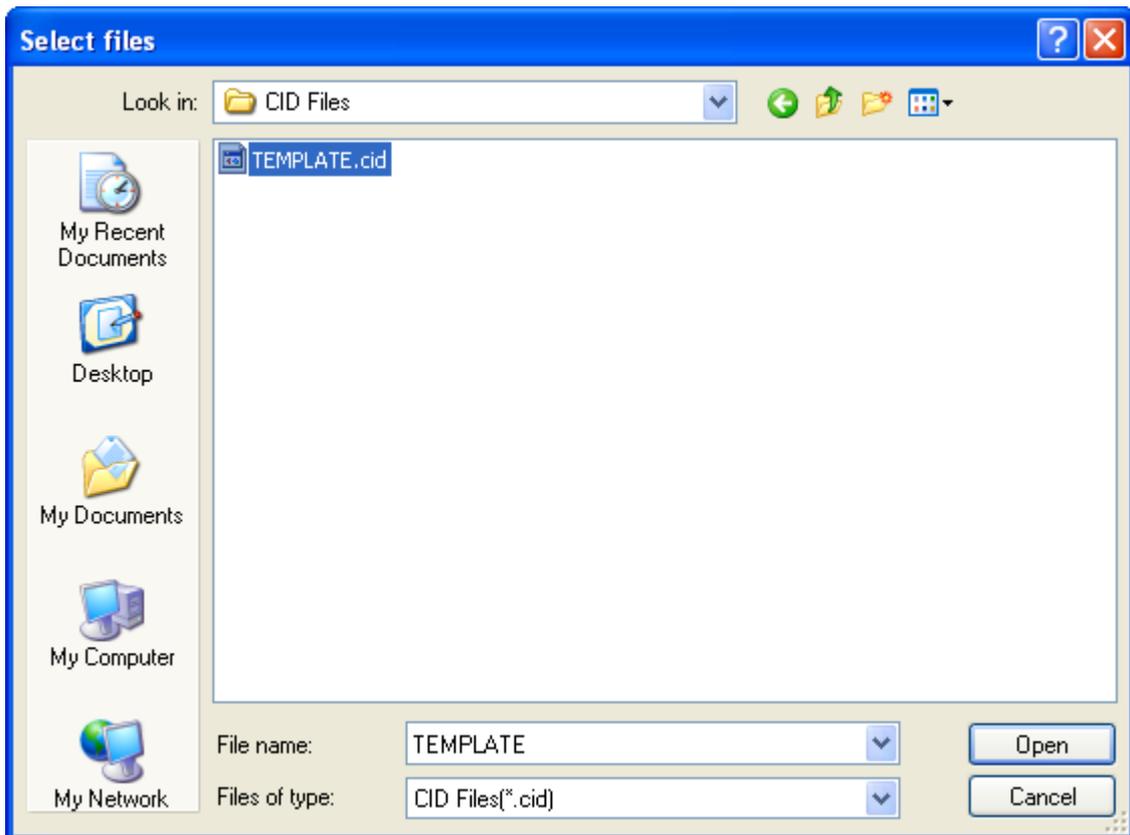


**Import CID file** Create IEC 61850 acquisition device by importing IEC 61850 CID file

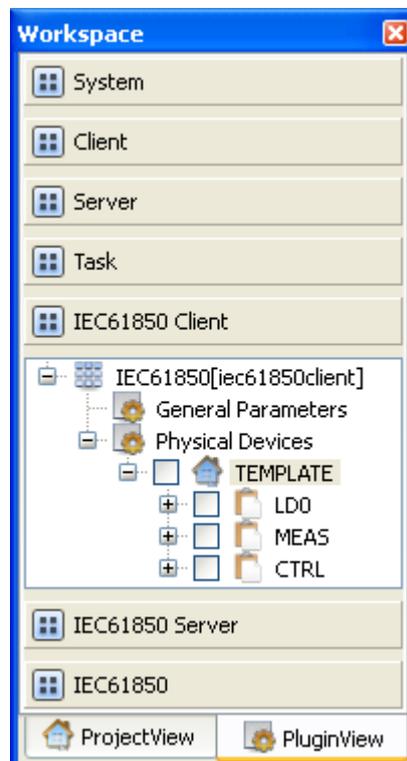
8. Right click the node of physical device, and select "Import CID";



9. Open the selected file in the pop-up dialog box "Select file";

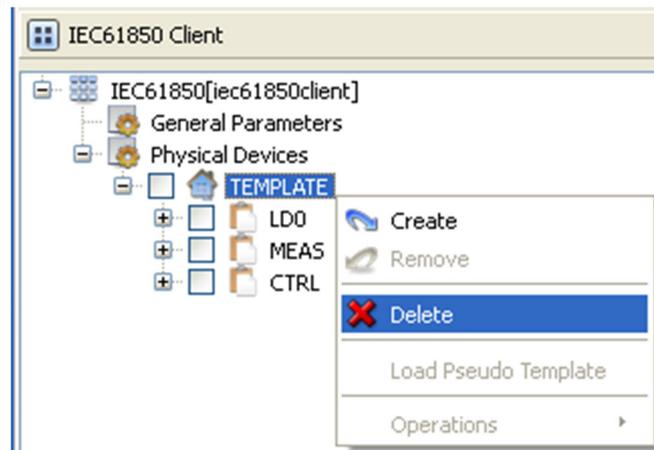


10. Click "OK" to complete creation of IEC 61850 device;

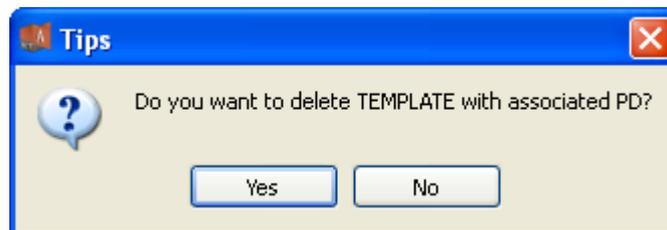


**Delete device** Completely delete the imported IEC 61850 device

11. Right click the first-level child node under the node of physical device;



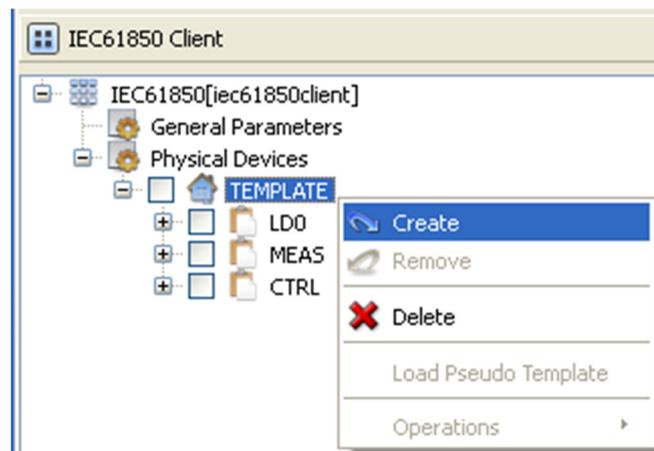
12. Select the menu option "Delete";



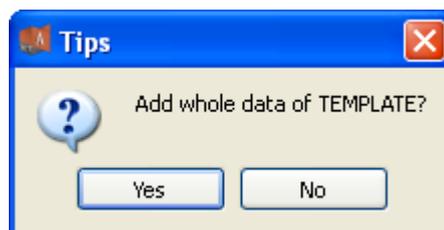
13. Click "Yes" to complete the deletion of IEC 61850 physical device;

**Create device** Establish mapping relation between IEC 61850 physical device and EDPS

14. Right click the first-level child node under the node of physical device;



15. Select the menu option "Add" to complete the mapping between IEC 61850 physical device and EDPS;



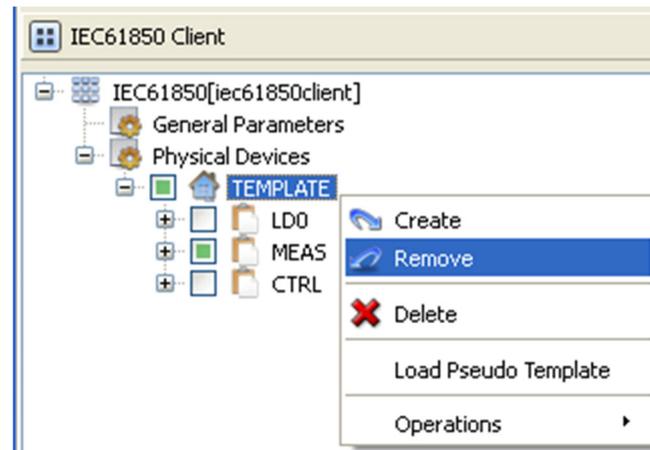
16. Click "Yes" to establish mapping relation between all information points in IEC 61850 device and EDPS;

**Note: Selectively add practical application information**

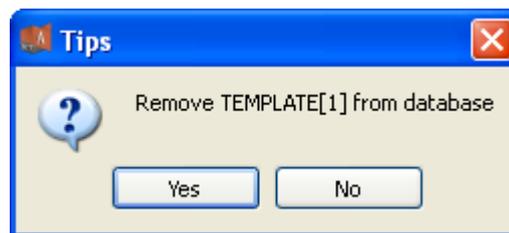
**points according to actual situation.**

**Remove device** Remove mapping relation between IEC 61850 physical device and EDPS

17. Right click the first-level child node under the node of physical device;



18. Select the menu option "Remove";



19. Click "Yes" to remove mapping relation between IEC 61850 physical device and EDPS

**Device parameters** Configure physical device parameters of IEC 61850 driver

20. Click the first-level child node under the node of physical device;

21. View virtual points in the data area of **EDPS ICT-S+**;

Point Name	Description	Value Type	Initial Value	Owner	Show Mode	Parameter
1 IEDSTA	IED status	Bool	0	Local	By Name	0:Off-line,1:On-line
2 MMSTOTALCOM	MMS total communication times	32 Bits Unsigned Long	0	Local	By Value	
3 MMSFAILCOM	MMS invalid communication times	32 Bits Unsigned Long	0	Local	By Value	
4 REPORTNUM	RCB total received times	32 Bits Unsigned Long	0	Local	By Value	
5 GOOSENUM	GOOSE total received times	32 Bits Unsigned Long	0	Local	By Value	

No.	Name	Description
1	IED state	Describe the communication state of the current device.
2	MMS total communication times	Count the number of MMS communication times
3	MMS invalid communication times	Count the number of MMS communication failures during communication process.

4	RCB total received times	Count the number of times of receiving event report.
5	GOOSE total received times	Count the number of times of receiving GOOSE information.

22. View the attribute area of **EDPS ICT-S+**;

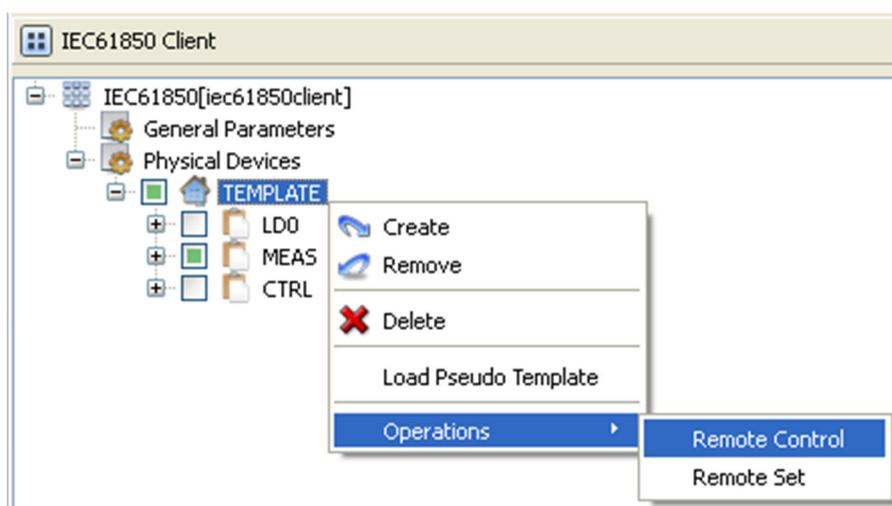
ID	Property
Name	TEMPLATE
Vendor	SAC
Description	TEMPLATE
Type	PSR660U
Version	1.0
AR Name	TEMPLATE
AP Title	1 3 9999 23
AE Qualifier	23
PSEL	00 00 00 01
SSEL	00 01
TSEL	00 01
Net Type	TCP(REF1006)
NSAP/IP	127.0.0.1
Idle Time(ms)	1000
Rep. Timeout(s)	60
RCB Configuration	...
GCB Configuration	...
UTC Time Zone	0

No.	Name	Description	Remarks
1	Name	Define the name of device	Edit it when importing ICD/CID files according to actual configuration
2	Vendor	Define the manufacturer of device.	Defined by ICD/CID file configuration
3	Description	Define the description information of device.	The same as item 2 above
4	Type	Define the type of device.	The same as item 2 above
5	Version	Define the version information of device.	The same as item 2 above
6	AR Name	Define the reference name of MMS application.	The same as item 1 above
7	AP title	Define the object identity named by network authorization organization to express prelude.	By default as shown in the figure above
8	AE qualifier	Define an optional integer to express the qualifier of application.	The same as item 7 above
9	PSEL	Define the access point of presentation layer of	Defined by ICD/CID file;

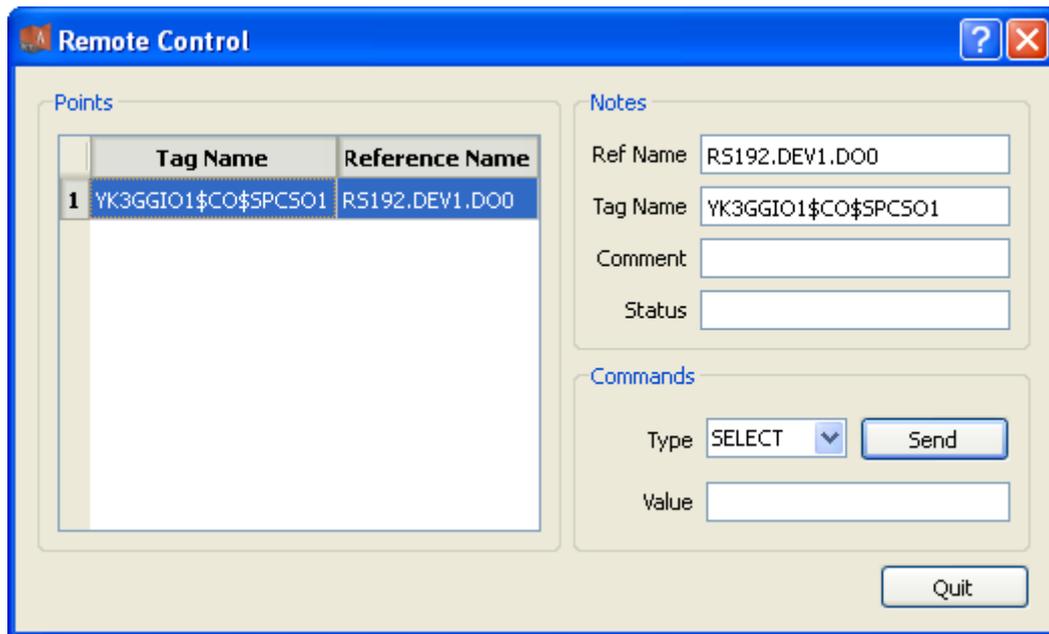
		OSI protocol stack, which is 4-byte by default.	keep the default value as shown in the figure above
10	SSEL	Define the access point of session layer of OSI protocol stack, which is 2-byte by default.	The same as item 9 above
11	TSEL	Define the access point of transmission layer of OSI protocol stack, which is 2-byte by default.	The same as item 9 above
12	Net type	Define whether the network address belongs to TP4 or TCP.	Select according to actual situation; keep the default value
13	NSAP/IP	Define network address. TP4 is expressed by 20 hexadecimal character strings TCP is expressed by network alias or IP address	Configure the IP address of actual device
14	Idle time (ms)	Define the idle time interval of MMS query, in ms.	Configure it according to actual situation
15	Rep. timeout (s)	Define the timeout interval of MMS's request for data, in s	Configure it according to actual situation
16	RCB configuration	Define the configuration information of Report Control Block.	Configure it according to actual situation
17	GCB configuration	Define the configuration information of GSE Control Block.	Configure it according to actual situation
18	UTC time zone	Define the UTC time zone correction value of device	Configure it according to actual situation

**Remote control/setting**      Send remote control/setting command to device via **EDPS ICT-S+**

23. Right click the first-level child node under the node of physical device;



24. Select the menu option "Remote control" to pop up the dialog box "Remote control";

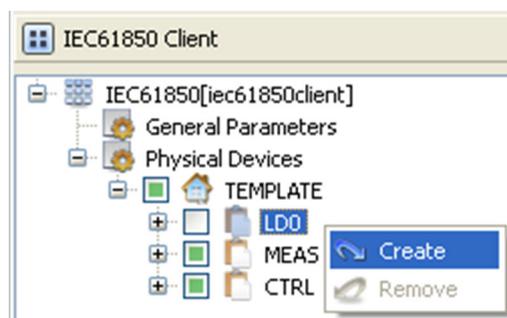


25. Select executing information point, control type and control value in turn;
26. Click the button "Send" to complete the operation of writing command and waiting for the executing result.

#### A.1.4. Information point management

**Create** EDPS Create information point to realize data mapping between IEC 61850 and

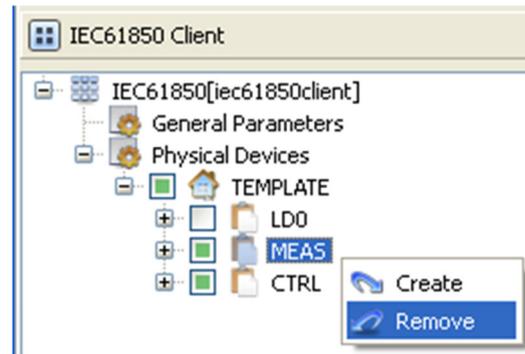
1. Open a project file;
2. Select the plugin management page in the management area of **EDPS ICT-S+**;
3. Activate IEC 61850 acquisition plugin;
4. Right click the data management node under the instance name of physical device;



5. Select the menu option "Add" to complete the creation of information point;

**Delete** and EDPS Delete information point to remove data mapping between IEC 61850

6. Right click the data management node under the instance name of physical device;



7. Select the option "Remove" to complete the deletion of information point;  
**View attributes** View the attributes of internal object of IEC 61850

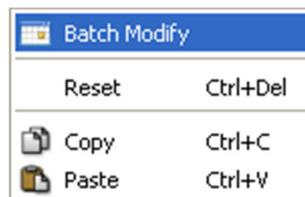
8. Select any child node under the instance name of physical device, and view the attributes of corresponding object in the attribute window.

### A.1.5. Data management

**Batch modify** Modify the data in the data area in batch

View the parameters of information point through different types of data in the data area of **EDPS ICT-S+**; device name and point name in basic information as well as IO information parameters are not editable, which are determined by IEC 61850 device.

1. Open a project file;
2. Select the plugin management page in the management area of **EDPS ICT-S+**;
3. Activate IEC 61850 acquisition plugin;
4. Select the basic information page of different types of data in the data area;
5. Right click an object and select the menu option "Batch modify" to pop up the dialog box "Modify";



6. Modify the data and confirm it to complete batch modifying;  
**Reset** Replace current value with initial value of table data attribute
7. Right click an object and select the menu option "Reset" to complete modification;

**Copy and paste** Copy and paste data

It's allowed to copy and paste data across plugins, links, devices and types.  
 It's allowed to copy and paste data between EXCEL and **EDPS ICT-S+**.  
 It's allowed to perform copy operation to all data areas.  
 It's allowed to perform paste operation to editable areas.

8. Right click an object and select "Copy/paste" to complete operation (Paste operation cannot be performed in non-editable areas).

Note: IO information parameters

<span>Analog Input</span> <span>Digital Input</span> <span>Counter</span> <span>Analog Output</span> <span>Digital Output</span>									
Basic <b>IO</b> Value									
	Device Name	Point Name	LDRef	LNRef	FC	DORef	DARef	BType	CDC
1	TEMPLATEMEAS	YCAGGIO1\$MX\$AnIn1\$mag\$f	MEAS	YCAGGIO1	MX	AnIn1	mag.f	FLOAT32	MV
2	TEMPLATEMEAS	YCAGGIO1\$MX\$AnIn2\$mag\$f	MEAS	YCAGGIO1	MX	AnIn2	mag.f	FLOAT32	MV
3	TEMPLATEMEAS	YCAGGIO1\$MX\$AnIn3\$mag\$f	MEAS	YCAGGIO1	MX	AnIn3	mag.f	FLOAT32	MV
4	TEMPLATEMEAS	YCAGGIO1\$MX\$AnIn4\$mag\$f	MEAS	YCAGGIO1	MX	AnIn4	mag.f	FLOAT32	MV
5	TEMPLATEMEAS	YCAGGIO1\$MX\$AnIn5\$mag\$f	MEAS	YCAGGIO1	MX	AnIn5	mag.f	FLOAT32	MV

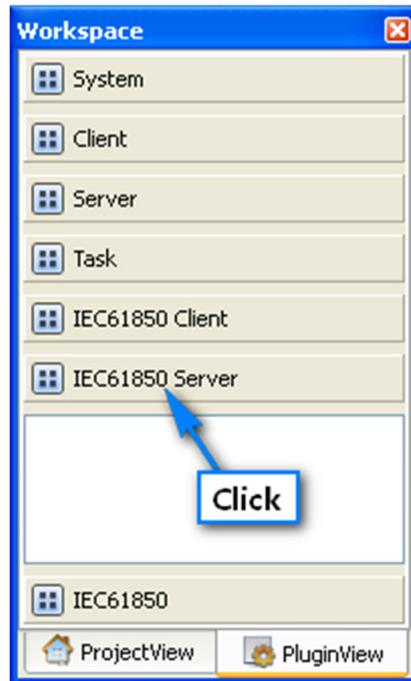
No.	Name	Description
1	Device name	Specify the instance name of logical device that the information point belongs to.
2	Point name	Specify the complete reference name of the information point in MMS index.
3	LDRef	Specify the reference name of logical device that the information point belongs to.
4	LNRef	Specify the reference name of logical node that the information point belongs to.
5	FC	Specify the functional constraint of information point.
6	DORef	Specify the reference name of data object of information point.
7	DARef	Specify the reference name of data attribute of information point.
8	BType	Specify the basic data type of information point.
9	CDC	Specify the common data class that the information point belongs to.

## A.2. IEC 61850 proxy

### A.2.1. Driver management

**Create** Create IEC 61850 proxy driver

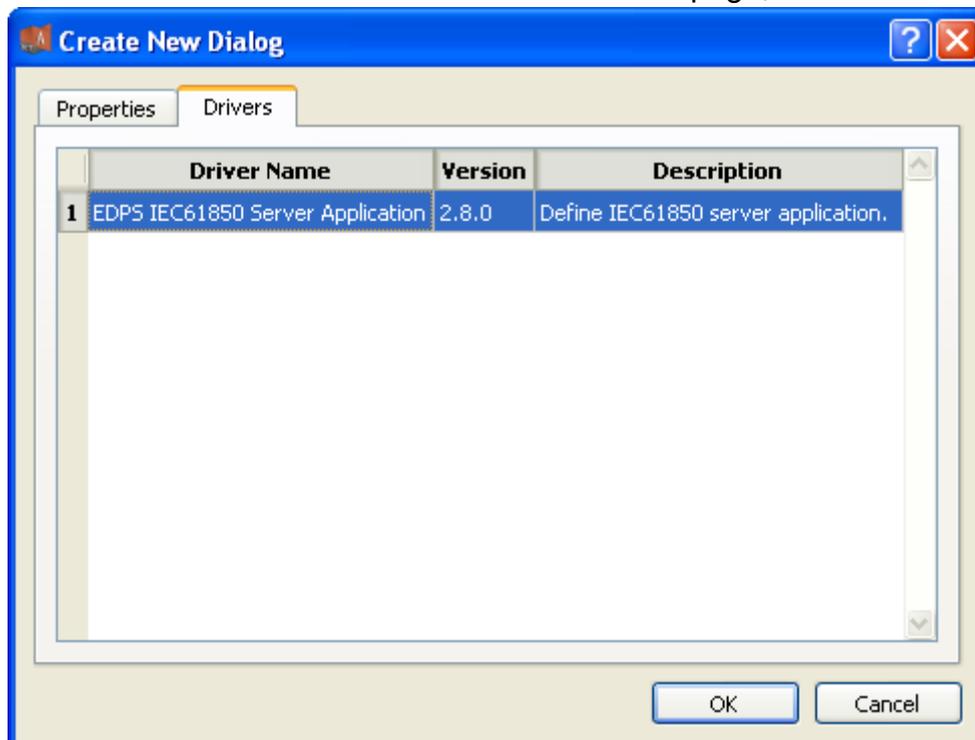
1. Open a project file;
2. Select the plugin management page in the management area of **EDPS ICT-S+**;
3. Activate IEC 61850 proxy plugin;



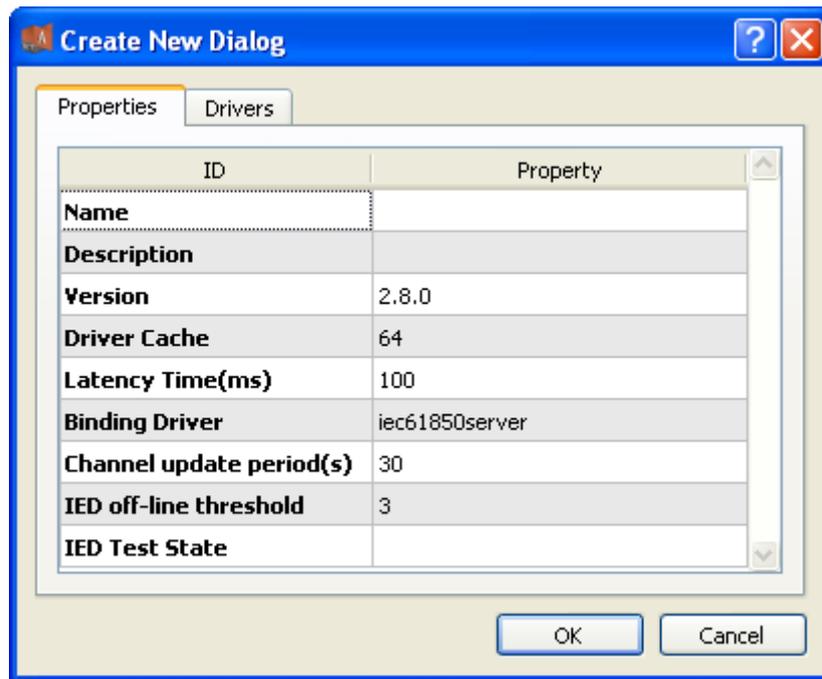
4. Right click in the blank space, and select the menu option “New 61850” to pop up the “Create driver dialog”;



5. Select the driver to be created in the driver page;



6. Configure basic attributes of the target driver in the attribute page;



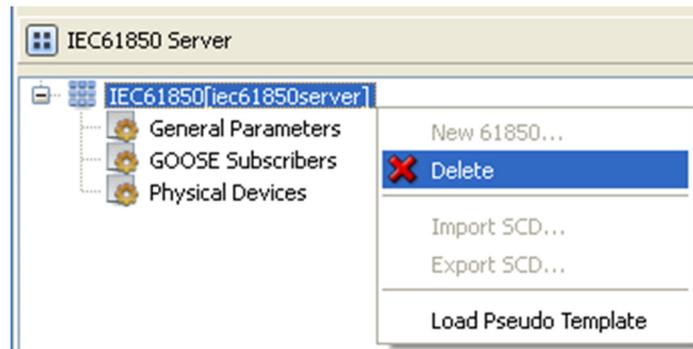
7. Click “OK” to complete creation;

Note: Driver information

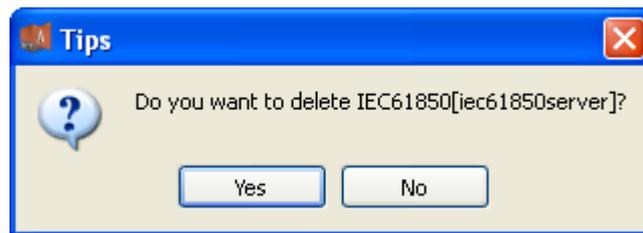
N o.	Name	Description
1	Name	User-defined name.
2	Description	Set name description information.
3	Version	Set the version information of module.
4	Driver cache	Set the buffer size of driver. 64KB by default and 128KB at most
5	Latency time(ms)	Define the delay time of updating real-time data, in ms.
6	Binding driver	It's unique and cannot be modified.
7	Channel update period(s)	Set the cycle of updating the channel communication state information, in s.
8	IED off-line threshold	Set the statistical threshold of device state; the device is switched to offline state when the number of consecutive errors in the channel exceeds the threshold.
9	IED test state	It's usually associated with internal maintenance state point of the device to be collected, and the maintenance state may influence the behavior of forwarding end.

Delete IEC 61850 proxy driver

8. Right click the driver bar and select the menu option “Delete”;



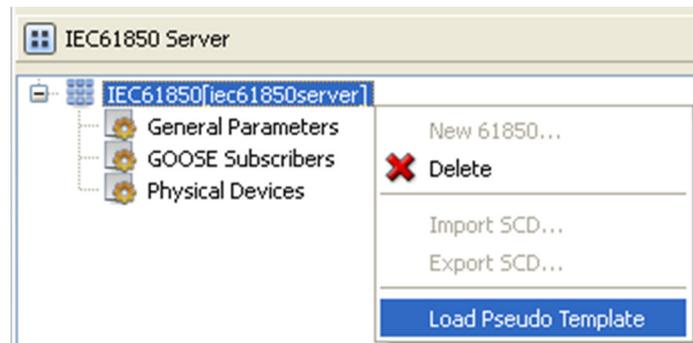
9. Select the menu option "Delete"; It prompts whether to delete;



10. Click "Yes" to complete deletion;

**Virtual point template** Load virtual point of driver from the system template library

11. Right click the driver bar, and select the menu option "Load virtual point template";



12. Select the menu option "Load virtual point template" to complete loading of virtual point of driver.

Note:

Basic		Value					
	Point Name	Description	Value Type	Initial Value	Owner	Show Mode	Parameter
1	IEC61850STA	Running status	16 Bits Unsigned Short	0	Local	By Name	0:Exit, 1:Running, 2:Paused, 3:StandBy
2	IEC61850AUTH	Authority	Bool	0	Local	By Name	0:Demo, 1:Authority
3	ConnectedOK	Connected OK	32 Bits Signed Long	0	Local	By Value	
4	ConnectedErr	Connected Error	32 Bits Signed Long	0	Local	By Value	
5	Indicated	Request Status	32 Bits Signed Long	0	Local	By Value	
6	RespOk	Response OK	32 Bits Signed Long	0	Local	By Value	
7	RespErr	Response Error	32 Bits Signed Long	0	Local	By Value	
8	InfoRpt	RCB Status	32 Bits Signed Long	0	Local	By Value	

N	Name	Description
o.		

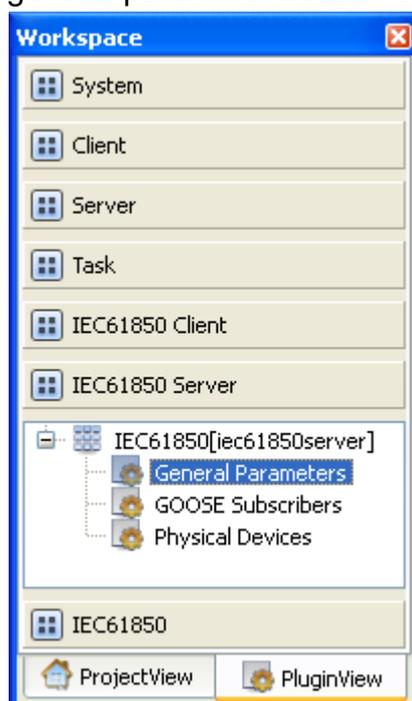
1	Running status	Observe the running state information of the driver.
2	Authority	Observe the authorization state of the driver.
3	Connected OK	Count the number of successful connections
4	Connected error	Count the number of fault connections.
5	Request status	Count the number of requests for service.
6	Response OK	Count the number of correct responses of service.
7	Response error	Count the number of error response of service.
8	RCB status	Count the number of information reports of BRCB/URCB.

## A.2.2. General parameters

**Overview** View and configure general parameter information of IEC 61850 proxy driver

**View and configure** View and configure communication parameter attributes

1. Open a project file;
2. Select the plugin management page in the management area of **EDPS ICT-S+**;
3. Activate IEC 61850 proxy plugin;
4. Select the general parameter node in the management area;



5. View the information in the attribute area;

ID	Property
<b>MMS Maximum Message Size</b>	32000
<b>MMS Maximum Calling</b>	4
<b>MMS Maximum Called</b>	0
<b>Dynamic Object Capacity</b>	500
<b>CLNP/ES-IS</b>	...
<b>TP4(ISO 8073)</b>	...
<b>TCP/IP(RFC1006)</b>	...
<b>Network Address</b>	...
<b>GOOSE Subscriber/Publisher</b>	Disable
<b>GOOSE Mode</b>	Finally
<b>File Service</b>	-
<b>Journals scan periods(ms)</b>	1000
<b>Max journals entries</b>	1000
<b>RCB Scan Time(ms)</b>	500
<b>RCB Buffer(K Bytes)</b>	100
<b>RCB Index</b>	No
<b>Active IED</b>	
<b>Access Point</b>	

Note: Information in the attribute area

No.	Name	Description
1	MMS Maximum message size	Set the allowable maximum length of PDU in MMS
2	MMS Maximum calling	Set the maximum number of connections allowed by client, which must be configured 0 here
3	MMS Maximum called	Set the maximum number of passive connections allowed by server; configure it according to actual situation, or by referring to the figure above
4	Dynamic object capacity	Configure it according to actual situation, or by referring to the figure above
5	CLNP/ES-IS	Set the configuration of OSI network layer; create a new line and configure it with default parameter in the table editor
6	TP4(ISO 8073)	Set the configuration of OSI transmission layer; configure it in the same way as item 5 above
7	TCP/IP(RFC1006)	Set the configuration of TCP/IP protocol stack at RFC1006 mode; configure it in the same way as item 5 above
8	Network address	Set one network address at least; configure it in the same way as item 5 above
9	GOOSE subscription/publisher	Set whether to activate the GOOSE subscription/release function; configure it according to actual situation

10	GOOSE Mode	Set the mode of parsing GOOSE information: last receiving, real-time parsing; configure it according to actual situation
11	File service	Set the root path of file service; configure it according to actual situation
12	Journals scan time (ms)	Log scanning time, in ms; configure it according to actual situation
13	Max journals entries	Set the maximum number of logs saved; configure it according to actual situation
14	RCB scan time (ms)	Report scanning time, in ms; configure it according to actual situation
15	RCB buffer (K Bytes)	The default size of buffer for report with buffer, in K Bytes
16	RCB index	Automatically add RCB index suffix
17	Active IED	Set the name of device to be activated, which is usually the attribute "iedName" under the node "ConnectedAP" in the .ICD/CID instance file
18	Access point	Set the name of service access point, which is usually the attribute "apName" under the node "ConnectedAP" in the .ICD/CID instance file

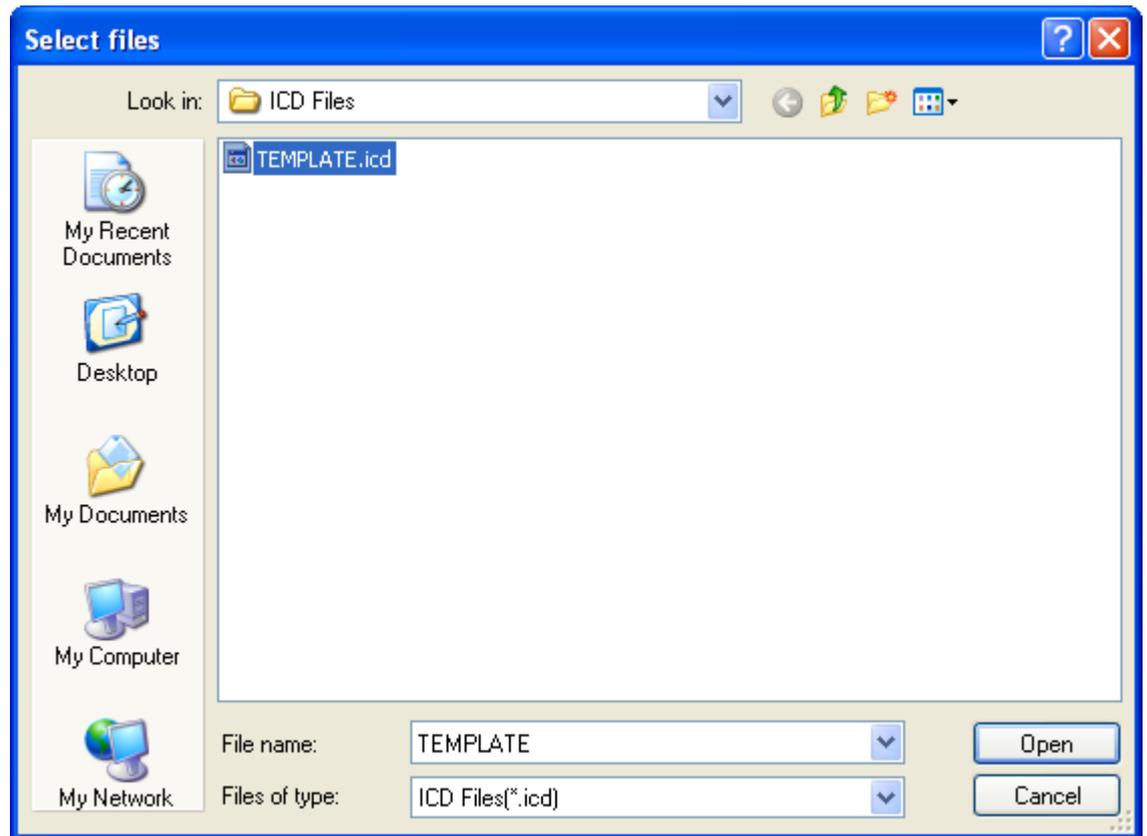
### A.2.3. Physical device management

**Import ICD file** Create IEC 61850 proxy device by importing IEC 61850 ICD file

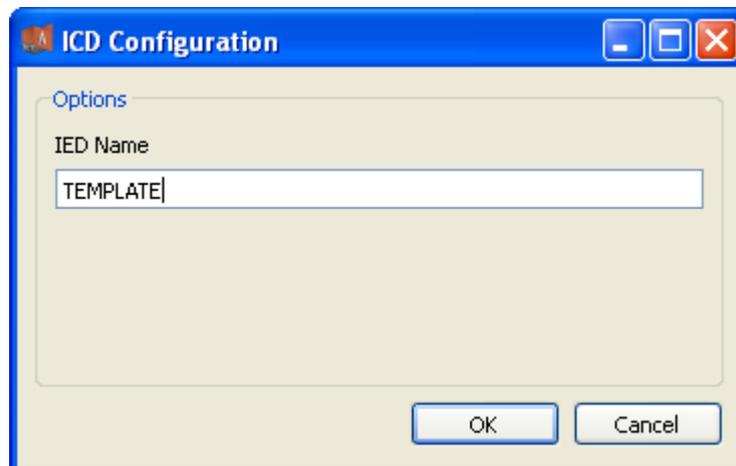
1. Open a project file;
2. Select the plugin management page in the management area of **EDPS ICT-S+**;
3. Activate IEC 61850 proxy plugin;
4. Right click the node of physical device, and select "Import ICD";



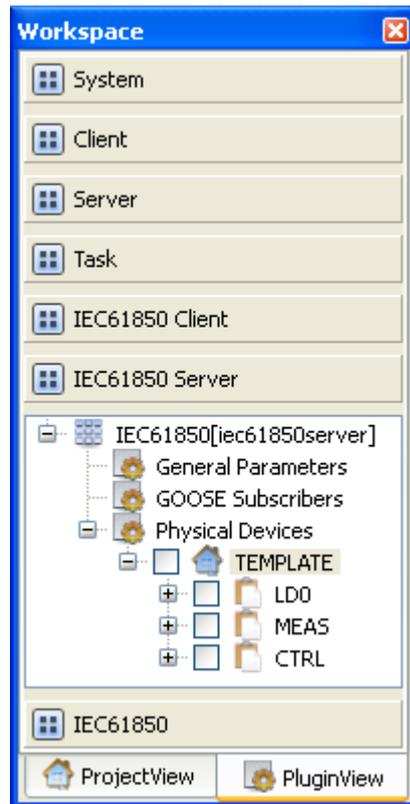
5. Open the selected file in the pop-up dialog box "Select file";



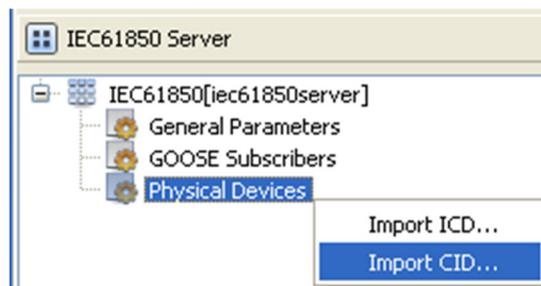
6. The system pops up the dialog box "ICD configuration";



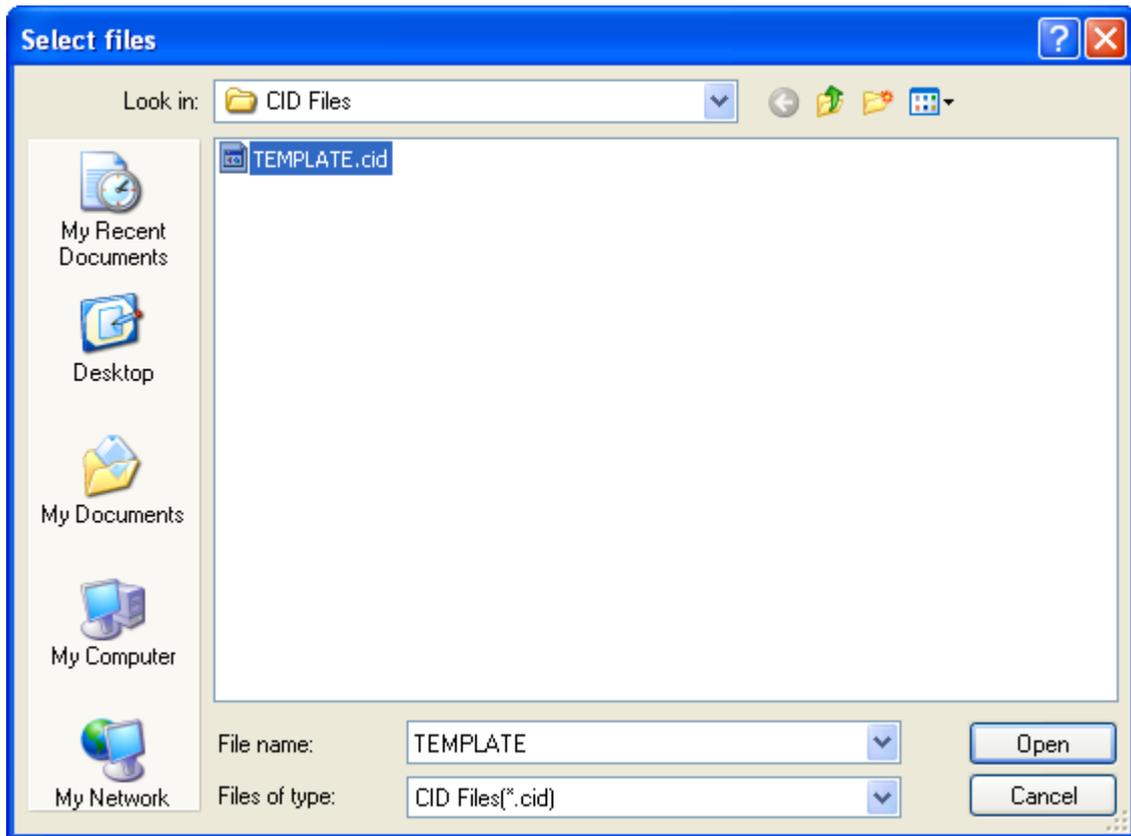
7. Edit the instance name of IED device and click "OK" to complete the creation of IEC 61850 device;



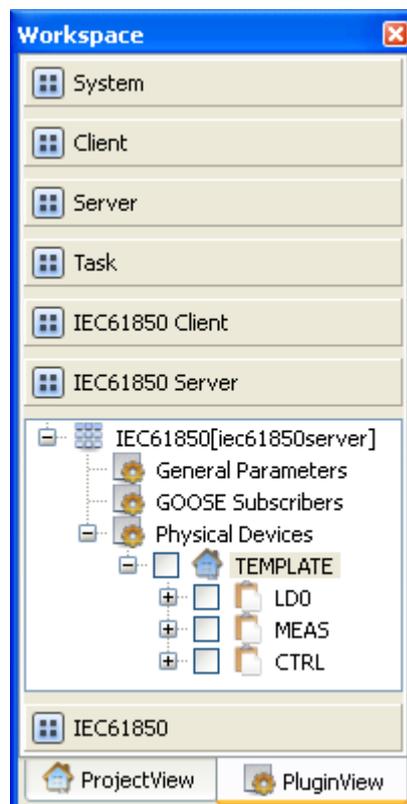
- Import CID file** Create IEC 61850 proxy device by importing IEC 61850 CID file
8. Right click the node of physical device, and select "Import CID";



9. Open the selected file in the pop-up dialog box "Select file";



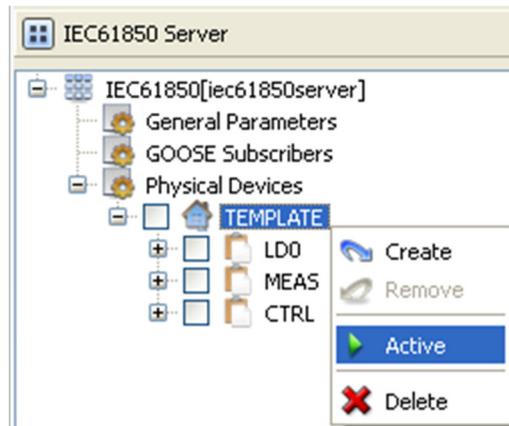
10. Click "OK" to complete creation of IEC 61850 device;



**Activate device** Complete activation of IEC 61850 physical device

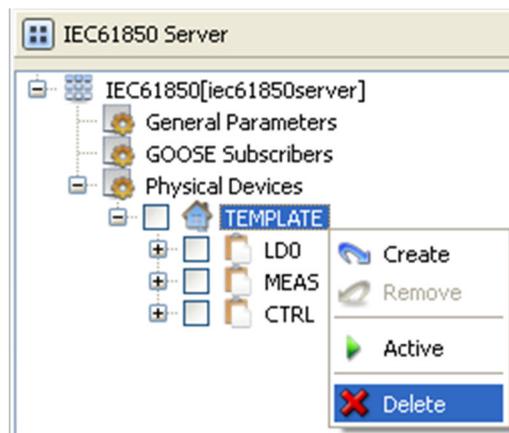
11. Right click a physical device, and select the menu option "Activate" to

complete the activation of physical device and access service point; view the activated device in the general parameter attribute area after activation;

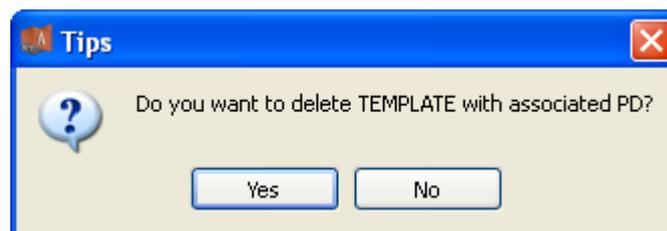


**Delete device** Completely delete the imported IEC 61850 device

12. Right click the first-level child node under the node of physical device;



13. Select the menu option "Delete";



14. Click "Yes" to complete the deletion of IEC 61850 physical device;

**Device parameters** View physical device parameters of IEC 61850 driver

15. View the attribute area of **EDPS ICT-S+**.

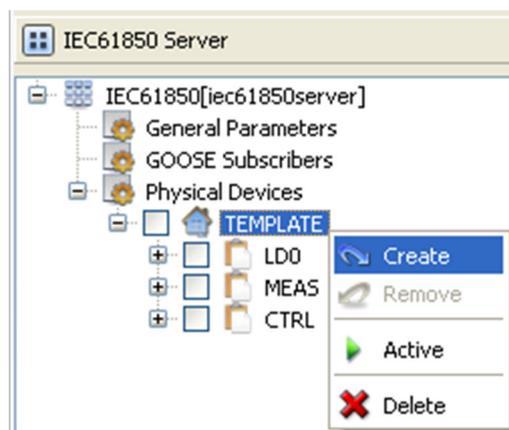
ID	Property
<b>Name</b>	TEMPLATE
<b>Vendor</b>	SAC
<b>Type</b>	PSR660U
<b>Version</b>	1.0
<b>Description</b>	TEMPLATE
<b>SCL File</b>	...

No.	Name	Description
1	Name	Set name information
2	Vendor	Set device manufacturer information
3	Type	Set type information
4	Version	Set version information
6	Description	Set description information
5	SCL File	Specify the SCL file associated with physical device

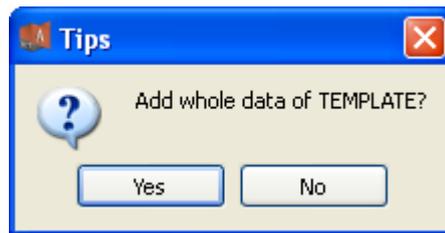
#### A.2.4. Information point management

**Create** Establish mapping relation between EDPS and IEC 61850 client

1. Open a project file;
2. Select the plugin management page in the management area of **EDPS ICT-S+**;
3. Activate IEC 61850 proxy plugin;
4. Right click the data management node under the instance name of physical device;



5. Select the menu option "Add" to complete the mapping between EDPS and IEC 61850 client;

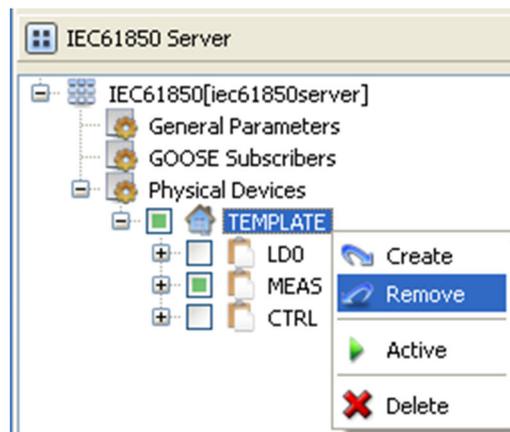


- Click "Yes" to establish mapping relation between all information points in IEC 61850 device and EDPS;

**Note: Selectively add practical application information points according to actual situation.**

**Delete** Remove the mapping relation between EDPS and IEC 61850 client

- Right click the data management node under the instance name of physical device;



- Click "Yes" to remove mapping relation between EDPS and IEC 61850 client;

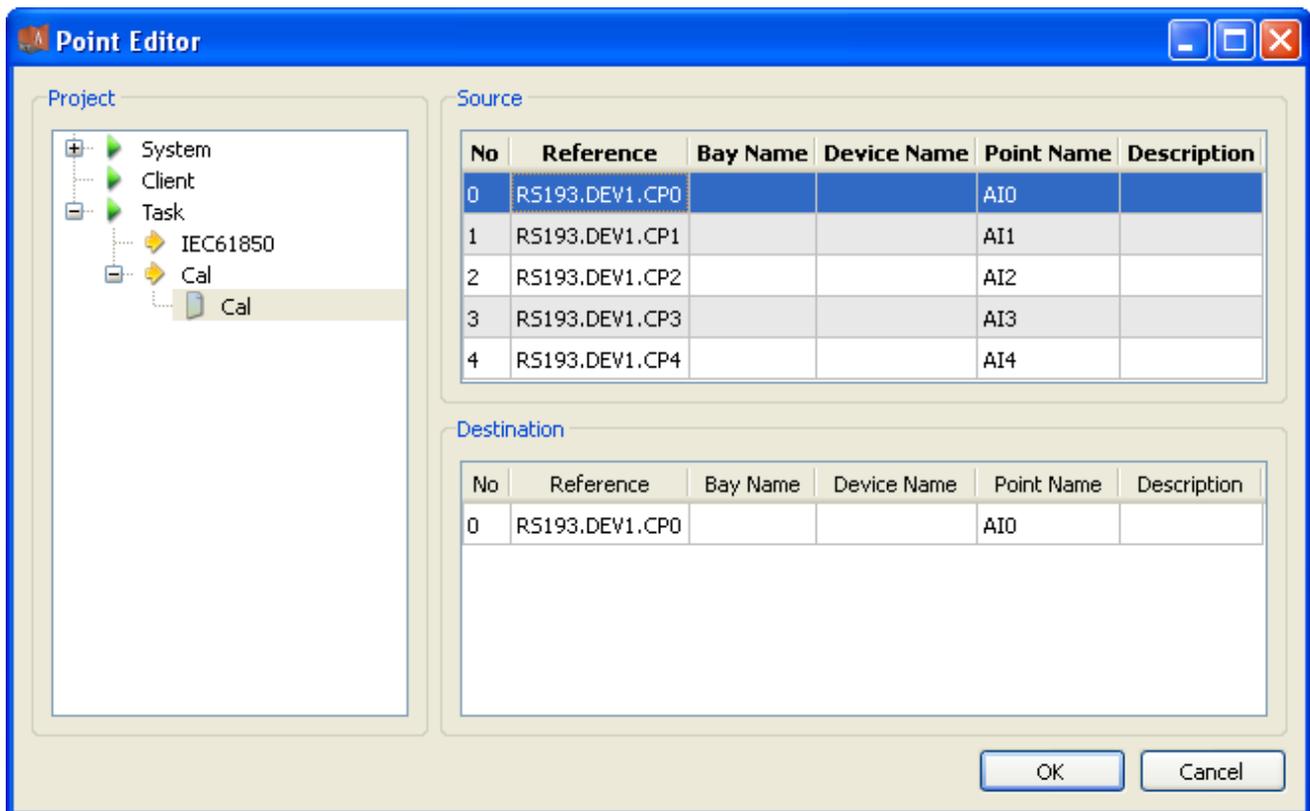
**Mapping** Create mapping between data point of traditional protocol and IEC 61850 data object

- Select any child node under the instance name of physical device, and view the mapping table in the data area of **EDPS ICT-S+**;

Analog Input			
Basic			
Device Name	Point Name	RTDB Point	
1	TEMPLATMEAS	YCAGGIO1\$MX\$AnIn1\$mag\$f	
2	TEMPLATMEAS	YCAGGIO1\$MX\$AnIn2\$mag\$f	
3	TEMPLATMEAS	YCAGGIO1\$MX\$AnIn3\$mag\$f	
4	TEMPLATMEAS	YCAGGIO1\$MX\$AnIn4\$mag\$f	
5	TEMPLATMEAS	YCAGGIO1\$MX\$AnIn5\$mag\$f	

- Click the edit box "Associated point" of data object;
- Select the corresponding traditional data point in the popup information

point editor;



- Click "Ok" to complete the mapping between traditional data point and IEC 61850 data object;

**View attributes** View the attributes of internal object of IEC 61850

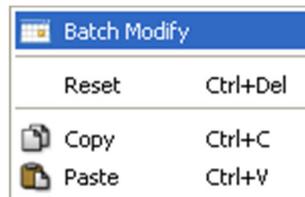
- Select any child node under the instance name of physical device, and view the attributes of corresponding object in the attribute window.

### A.2.5. Data management

**Batch modify** Modify the data in the data area in batch

View the parameters of information point through different types of data in the data area of **EDPS ICT-S+**; device name and point name in basic information as well as IO information parameters are not editable, which are determined by IEC 61850 device.

- Open a project file;
- Select the plugin management page in the management area of **EDPS ICT-S+**;
- Activate IEC 61850 proxy plugin;
- Select the basic information page of different types of data in the data area;
- Right click an object and select the menu option "Batch modify" to pop up the dialog box "Modify";



6. Modify the data and confirm it to complete batch modifying;  
**Reset** Replace current value with initial value of table data attribute
7. Right click an object and select the menu option "Reset" to complete modification;

**Copy and paste** Copy and paste data

It's allowed to copy and paste data across plugins, links, devices and types.  
 It's allowed to copy and paste data between EXCEL and **EDPS ICT-S+**.

It's allowed to perform copy operation to all data areas.

It's allowed to perform paste operation to editable areas.

8. Right click an object and select "Copy/paste" to complete operation (Paste operation cannot be performed in non-editable areas).

Note: IO information parameters

Analog Input									
Basic IO Value									
	Device Name	Point Name	LDRef	LNRef	FC	DORef	DARef	BType	CDC
1	TEMPLATEMEAS	YCAGGIO1\$MX\$AnIn1\$mag\$f	MEAS	YCAGGIO1	MX	AnIn1	mag.f	FLOAT32	MV
2	TEMPLATEMEAS	YCAGGIO1\$MX\$AnIn2\$mag\$f	MEAS	YCAGGIO1	MX	AnIn2	mag.f	FLOAT32	MV
3	TEMPLATEMEAS	YCAGGIO1\$MX\$AnIn3\$mag\$f	MEAS	YCAGGIO1	MX	AnIn3	mag.f	FLOAT32	MV
4	TEMPLATEMEAS	YCAGGIO1\$MX\$AnIn4\$mag\$f	MEAS	YCAGGIO1	MX	AnIn4	mag.f	FLOAT32	MV
5	TEMPLATEMEAS	YCAGGIO1\$MX\$AnIn5\$mag\$f	MEAS	YCAGGIO1	MX	AnIn5	mag.f	FLOAT32	MV

No.	Name	Description
1	Device name	Specify the instance name of logical device that the information point belongs to.
2	Point name	Specify the complete reference name of the information point in MMS index.
3	LDRef	Specify the reference name of logical device that the information point belongs to.
4	LNRef	Specify the reference name of logical node that the information point belongs to.
5	FC	Specify the functional constraint of information point.
6	DORef	Specify the reference name of data object of information point.
7	DARef	Specify the reference name of data attribute of information point.
8	BType	Specify the basic data type of information point.
9	CDC	Specify the common data class that the

		information point belongs to.
--	--	-------------------------------

### A.2.6. GOOSE subscription

Configure the information of IEC 61850 GOOSE module.

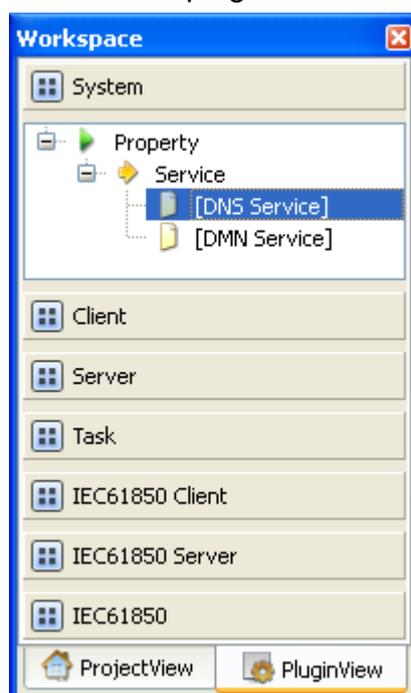
**Note: About the configuration of GOOSE subscription module, it's needed to import an ICD/CID file with GOOSE control block, add object points included in GOOSE block, and activate the control block; other operations are the same as those described in A.2.3 and A.2.4, and need not to be repeated here.**

## Appendix B DNS Service Configuration

Appendix B mainly describes the configuration of DNS service module by **EDPS ICT-S+**. DNS service is correctly loaded and used through configuration. The configuration manual mainly describes attribute information and virtual point information. **EDPS ICT-S+** provides a concise and fast way to help the user to conduct configuration.

**Operation** View service information

1. Open a project file;
2. Select the plugin management page in the management area of **EDPS ICT-S+**;
3. Activate the system information plugin;



4. Right click to select the node "DNS service".The node name can be modified by

the user.

**Attributes** View the attribute area of **EDPS ICT-S+**

ID	Property
<b>Name</b>	DNS Service
<b>Version</b>	2.8.0
<b>Binding Driver</b>	edpsdns
<b>Description</b>	System diagnose service.
<b>Service Port</b>	20085
<b>Authority Users</b>	...
<b>Response Timeout(s)</b>	10
<b>Heart Beat Max Interval(s)</b>	120

No.	Name	Description
1	Name	Define the name of service.
2	Version	Define the version information of service.
3	Binding driver	Define the name of binding module, which is unique and cannot be modified.
4	Description	Define the description information of service.
5	Service port	Define the parameters of communication port of the service.
6	Authority users	Define the authorized user.
7	Response timeout (s)	Define the maximum timeout interval of waiting for response after a DNS command is sent.
8	Heart beat max interval (s)	Define the maximum interval for the client to send heartbeat.

**Virtual point** View the data area of **EDPS ICT-S+**

Basic		Value					
	Point Name	Description	Value Type	Initial Value	Owner	Show Mode	Parameter
1	SRVSTA	Running status	16 Bits Unsigned Short	0	Local	By Name	0:Exit,1:Running,2:Paused,3:StandBy

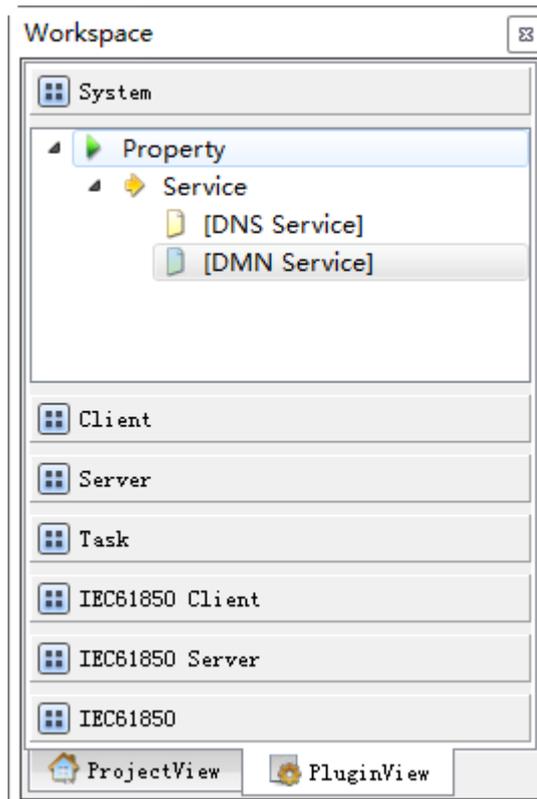
No.	Name	Description
1	Running status	Observe the running state information of the service.

## Appendix C DMN Service Configuration

Appendix C mainly describes the configuration of DMN service module by **EDPS ICT-S+**. DMN service is correctly loaded and used through configuration. The configuration manual mainly describes attribute information and virtual point information. **EDPS ICT-S+** provides a concise and fast way to help the user to conduct configuration.

**Operation** View service information

1. Open a project file;
2. Select the plugin management page in the management area of **EDPS ICT-S+**;
3. Activate the system information plugin;



4. Right click to select the node "DMN service". The node name can be modified by the user.

**Attributes** View the attribute area of **EDPS ICT-S+**

ID	Property
<b>Name</b>	DMN Service
<b>Version</b>	2.8.0
<b>Binding Driver</b>	edpsdmn
<b>Description</b>	System daemon service.
<b>Watch Dog</b>	Disable
<b>Run LED</b>	Flickering
<b>LED Toggle(ms)</b>	500
<b>IRIG-B Period(s)</b>	900
<b>WD Timeout(s)</b>	10

No.	Name	Description
1	Name	Define the name of service.
2	Version	Define the version information of service.
3	Binding driver	Define the name of binding module, which is unique and cannot be modified.
4	Description	Define the description information of service.
5	Watch Dog	Specify whether or not enable watchdog
6	Run LED	Specify display mode of LED
7	LED Toggle (ms)	Specify period in millisecond to toggle LED
8	IRIG-B Period (s)	Specify period in second to IRIG-B Sync
9	WD Timeout (s)	Specify Watchdog Timeout

### Virtual point View the data area of **EDPS ICT-S+**

Basic		Value					
	Point Name	Description	Value Type	Initial Value	Owner	Show Mode	Parameter
1	SRVSTA	Running status	16 Bits Unsigned Short	0	Local	By Name	0:Exit,1:Running,2:Paused,3:StandBy

No.	Name	Description
1	Running status	Observe the running state information of the service.

## Appendix D The E-Script syntactic structure

This chapter mainly describes syntax of e-Script program language.

### 1. E-Script Overview

E-Script is an interpreter program language which is internally used in the protocol gateway. Just like SoftPLC, It can support logical calculation, arithmetic calculation, batch control or definite and period execution jobs. It also has good fault tolerance due to its interpret characteristic. It is provided to users as an easy secondary development tool to handle advanced internal data process without needing modify original source code or low level programming.

### 2. E-Script Features

- Support syntax checking;
- Easily extending and portable;
- Similar with 'C' syntax structure, easy to learn;
- Support customer function call and function library;

### 3. E-Script Syntax

#### 3.1. E-script terminating symbol

Much like common 'C' program language, e-Script recognize ";" and "}" as statement terminating symbol, space is used as separator in statement.

##### 3.1.1. Key words

var	if	else	switch
case	break	while	do
for	return		

##### 3.1.2. Basic Data Type

Type	Key words	Description
Variant	var	e-Script defines the only variant type. eg: var. 'var' is the key word to define variable, the variable only get value type after the variable is assigned a value. e.g. var a; a = 100; here variable a is assigned by 100, integer type a = 100.01;

		here a is assigned by 100.01, float type
--	--	--

### 3.1.3. Variable Define

Variables in e-Script include global and local variable. As its naming, the global variable can be accessed in the whole system. While local variable can only be accessed during its own scope. The rules for define variable is:

*var identifier, ...*

*nonnumeric character*

`_ a b c d e f g h i j k l m n o p q r s t u v w x y z A B C D E F G H I J K L M N O P Q R S T U V W X Y Z`

*numeric character*

`0 1 2 3 4 5 6 7 8 9`

Comment:

The valid identifier must start with nonnumeric character, total length to identifier should within 31 characters. The identifier should not be defined as same as the e-Script key words.

Global variable should be defined outside of any function body, and the variable can be accessed inside any function. Local variable should be defined inside function body. And can only be accessed during the function body. e.g.

```

var gvar;
varmain() {
    var lvar;
    gvar = 100;
    lvar = gvar;
    return 0;
}

```

In this example defines the global variable 'gvar' and local variable 'lvar', and the global variable is accessed in 'main' function body.

### 3.1.4. Special Global Variable

Real-time data tags have their unique name in protocol gateway after doing the configuration. This unique tag name is used as the special global variable to e-Script programming language. Which means it is convenient to access each real-time tag's value by referencing the unique tag name. And then do any script operation.

e-Script common rules:

- 1) Run-time tag's name in protocol gateway can be directly referenced in e-Script without extra definition.
- 2) If user defines same variable name as the run-time tag's name, the access sequence priority by e-Script engine should be local variable -> global variable -> tag's unique name.

### 3.1.5. Variant action scope

Variant action scope means the valid or effective range for the variable to join any type of calculating. Once define, the global variable is valid during the whole script run-time period. While local variable has its scope range beginning with '{' and ending with '}'. Like 'C' programming language, the scope range of local variable can be nested.

### 3.1.6. Operator

E-Script support 4 kinds of operator.

#### 1) Assignment

value assign (=) ;

#### 2) Arithmetic operator

add (+) 、 sub (-) 、 multiply (\*) 、 division (/) 、 mod (%) 、 increase(++)、 decrease(--);

#### 3) Logical operator

great than (>) 、 great equal (>=) 、 less than (<) 、 less equal (<=) 、 equal (==) 、 not equal (!=) 、 logical and (&&) 、 logical or (||) 、 logical not (!) ;

#### 4) Bit operator

bit or (|) 、 bit and (&) 、 xor (^) 、 inverse (~) 、 shift left (<<) 、 shift right (>>)

See table 3-1 for priority of the operator

**Table 3-1: Operator priority (High → Low)**

Operator	Description	Priority
()++--	brackets、 suffix increase、 suffix decrease	Left →Right
++--~!+-	prefix increase (++)、 prefix decrease (---)、 bit inverse (~)、 logical not (!)、 negative (---)、 positive (+)	Left →Right
*/%	multiply (*)、 division (/)、 mod (%)	Left →Right
+--	add (+)、 sub (-)	Left →Right
<<>>	shift left (<<)、 shift right (>>)	Left →Right
<><=>==!=	less than (<)、 great than (>)、 less equal (<=)、 great equal (>=)、 equal (==)、 not equal (!=)	Left →Right
&	bit and (&)	Left →Right
^	xor (^)	Left →Right
	bit or ( )	Left →Right
&&	logical and (&&)	Left →Right

	logical or (&or)	Left ->Right
--	------------------	-----------------

Operators can apply to constant value or variant.

### 3.1.7. Statement define

Script is composed of one or several statement. Each statement must be terminated by ';' which means ending of this statement.

#### 1) Assignment statement

Assignment statement is used for variable assigning. The left operand should be the variable name, the right operand should be the expression. Where:

<assignment statement>:: <identifier> = <expression>

<expression>:: <arithmetic expression> | <logical expression>

<arithmetic expression>:: <identifier | constant><arithmetic operator|bit operator><identifier | constant>

<logical expression>:: <logical expression><logical operator | bit operator><logical operator>

<logical expression>:: <identifier|constant><logical operator><identifier|constant>

#### 2) Conditional judgment statement

<Conditional judgment statement >:: if (<logical expression>)

```
{
    (statement)
}
[else {
    (statement)
}]
```

#### 3) Conditional branch statement

<Conditional branch statement >:: switch(<arithmetic expression>)

```
{
case<constant>:
    {
        (statement)
    }
    break;
case<constant>:
    {
        (statement)
    }
    break;
...
}
```

Note: Not like 'C' programming language, here e-Script do not has default branch.

#### 4) while loop statement

```
<while loop statement>:: while (<loop condition>)
    {
        (statement)
    }
<loop condition>:: <logical expression>
```

#### 5) do-while loop statement

```
<do-while loop statement>:: do {
    (statement)
} while (<loop condition>)
<loop condition>:: <logical expression>
```

#### 6) for loop statement

```
<for loop statement>:: for ([initial condition]; [loop ending condition]; [condition expression])
    {
        (statement)
    }
<initial condition>:: [expression]
<loop ending condition>:: [logical expression]
<condition expression>:: [expression]
<expression>:: <arithmetic expression>|<logical expression>
```

### 3.1.8. Function Definition

```
<function define>:: <var><function name> (<parameter list>)
    {
        (statement)
    }
<parameter list>:: var identifier[, parameter list]
```

## 3.2. E-Script built-in function

Built-in function is more efficiency for called in e-Script programming language.

### 3.2.1. log function

#### 1. Instruction

Return value of logarithm base on E (approximately to 2.718)

#### 2. Grammar

log(number)

log function has parameters below:

“**number**” is must, positive real number

### 3. Example

Formula	Description	Result
$\log(86)$	the logarithm of 86 based on e.	4.4543473

#### 3.2.2. **log10 function**

##### 1. Instruction

Return the value of logarithm based on 10

##### 2. Grammar

$\log_{10}(\text{number})$

$\log_{10}$  function has parameters below

“number” is must. Calculate the positive real number of logarithm based on 10

##### 3. Example

Formula	Description	Result
$\log_{10}(10)$	the logarithm of 10 based in 10	1

#### 3.2.3. **exp function**

##### 1. Instruction

Return the value of e to power of n, e is 2.71828182845904, the base of natural logarithms

##### 2. Grammar

$\exp(\text{number})$

$\exp$  function has parameters below:

“number” is must, the exponent of base e.

##### 3. Example

Formula	Description	Result
$\exp(1)$	approximate value of e	2.7182818 3
$\exp(2)$	e to power of 2	7.3890561

#### 3.2.4. **pow10 function**

##### 1. Instruction

Return the value of power of 10

##### 2. Grammar

$\text{pow}_{10}(\text{number})$

$\text{pow}_{10}$  function has parameters below:

“number” is must, the exponent

##### 3. Example

Formula	Description	Result
$\text{pow}_{10}(2)$	square of 10	100

#### 3.2.5. **pow function**

##### 1. Instruction

Return the power of number

##### 2. Grammar

$\text{pow}(\text{number}, \text{power})$

powfunction has parameters below:

“*number*” is must, the base, can be any real number

“*power*” is must, the exponent

### 3. Example

Formula	Description	Result
pow(5,2)	Square of 5	25

### 3.2.6. acos function

#### 1. Instruction

Return the arc cosine of number. Arc cosine is the angle of cosine whose value is number. Return value is represented in arc, whose range of arc is from 0 to  $\pi$

#### 2. Grammar

acos(number)

acos function has parameters below:

“*number*” is must, the *cosine* of known angle, must between -1 and 1.

#### 3. Example

Formula	Description	Result
acos(-0.5)	<i>arc cosine</i> of number -0.5(represented in <i>arc</i> )	2.094395102

### 3.2.7. asin function

#### 1. Instruction

Return the arc sine of number. Arc sine is the angle of sine whose value is number. Return value is represented in arc, whose range is from  $-\pi/2$  to  $\pi/2$ .

#### 2. Grammar

asin(number)

asin function has parameters below:

“*number*” is must. The *sine* of known angle must between -1 and 1.

#### 3. Example

Formula	Description	Result
asin(-0.5)	<i>arc sine</i> of -0.5(represented in <i>arc</i> )	-0.523598776

### 3.2.8. atan function

#### 1. Instruction

The arc tangent of number. Arc tangent is the angle of tangent whose value is number. The return value is represented in arc, whose range is between  $-\pi/2$  and  $\pi/2$

#### 2. Grammar

atan(number)

atan function has parameters below:

“*number*” is must, the *tangent* of known angle.

#### 3. Example

Formula	Description	Result
atan(1)	<i>arc tangent</i> of 1(represented in <i>arc</i> )	0.785398163

### 3.2.9. atan2 function

## 1. Instruction

Return arc tangent of given value on x-axis and y-axis. arc tangent is the intersection angle between line  $(x\_num, y\_num)$  (0,0) and x-axis. The value is represented in arc, whose range is between  $-pi$  and  $pi$  excluding  $-pi$ ).

## 2. Grammar

$atan2(x\_num, y\_num)$

$atan2$  function has parameters below:

**$x\_num$**  is must, value of point on x-axis

**$y\_num$**  is must, value of point on y-axis

## 3. Example

Formula	Description	Result
$atan2(1,1)$	arc tangent of point (1, 1) (represented in arc)	0.785398163

## 3.2.10. cos function

## 1. Instruction

Return cosine of known angle

## 2. Grammar

$cos(number)$

cosfunction has parameters below:

“**number**” is must, the known angle. The value is represented in arc.

## 3. Example

Formula	Description	Result
$cos(1.047)$	Cosine of arc 1.047	0.5001711

## 3.2.11. sin function

## 1. Instruction

Return sine of known angle

## 2. Grammar

$sin(number)$

sinfunction has parameters below:

“**number**” is must, the known angle. The value is represented in arc.

## 3. Example

Formula	Description	Result
$sin(pi())$	sine of arc pi	0.0

## 3.2.12. tan function

## 1. Instruction

Return tangent of known angle

## 2. Grammar

$tan(number)$

tanfunction has parameters below:

“**number**” is must, the known angle. The value is represent in arc

## 3. Example

Formula	Description	Result

$\tan(0.785)$	tangent of arc 0.785	0.99920
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**3.2.13. cosh function**

## 1. Instruction

Return hyperbolic cosine of number

## 2. Grammar

$\cosh(\text{number})$

$\cosh$ function has parameters below:

**"number"** is must, the known real number.

## 3. Example

Formula	Description	Result
$\cosh(4)$	Hyperbolic cosine of 4	27.308233

**3.2.14. sinh function**

## 1. Instruction

Return *hyperbolic sine* of number

## 2. Grammar

$\sinh(\text{number})$

$\sinh$ function has parameters below:

**"number"** is must, any real number

## 3. Example

Formula	Description	Result
$\sinh(0)$	hyperbolic sine of 0	0

**3.2.15. tanh function**

## 1. Instruction

Return *hyperbolic tangent* of number

## 2. Grammar

$\tanh(\text{number})$

$\tanh$ function has parameters below:

**"number"** is must, any real number.

## 3. Example

Formula	Description	Result
$\tanh(-1)$	hyperbolic tangent of -1	-0.964028

**3.2.16. abs function**

## 1. Instruction

Return absolute value of number.

## 2. Grammar

$\text{abs}(\text{number})$

$\text{abs}$ function has parameters below:

**"number"** is must, any real number needs to be calculated

## 3. Example

Formula	Description	Result
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abs(2)	Absolute value of 2	2
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**3.2.17. ceil function**

## 1. Instruction

Return the most approximate integer larger than the number

## 2. Grammar

ceil(number)

ceil function has parameters below:

**"number"** is must, the required number

## 3. Example

Formula	Description	Result
ceil(3.7)	return the most approximate integer larger than 3.7	4

**3.2.18. floor function**

## 1. Instruction

Return the most approximate integer

## 2. Grammar

floor(number)

floorfunction has parameters below:

**"number"** is must, the required number

## 3. Example

Formula	Description	Result
floor(3.7)	Return the most approximate itener smaller than 3.7	3

**3.2.19. mod function**

## 1. Instruction

Return the remainder of division of two numbers. The sign is same as the divisor

## 2. Grammar

mod(number, divisor)

modfunction has parameters below:

**"number"** is must, the dividend

**"divisor"** is must, the divisor

## 3. Example

Formula	Description	Result
mod(3,2)	remainder of 3/2	1

**3.2.20. sqrt function**

## 1. Instruction

Return squre root of number

## 2. Grammar

sqrt(number)

sqrtfunction has parameters below:

“**number**” is must, the number needs to be calculated its square root

### 3. Example

Formula	Description	Result
sqrt(16)	square root of 16	4

#### 3.2.21. reboot function

##### 1. Instruction

Reboot the device

##### 2. Grammar

reboot(confirm)

reboot function has parameters below:

“**confirm**” is must, confirm whether reboot the device

**Warning: Please use this function with discretion, if needed, please contact our support staffs.**

### 3. Example

Formula	Description	Result
reboot(1)	Reboot the device	1

#### 3.2.22. val\_mask

##### 1. Instruction

To judge whether the value of certain bit of number is 1

##### 2. Grammar

val\_mask(number, position)

### 3. Example

Formula	Description	Result
val_mask(7, 0)	Judge whether the value on first bit (bit 0) is 1	1

### 3.3. E-script Script

E-script Script is defined as a language combination complied with grammar defined by E-Script or function set. Script can only define a **main()** function as execution entry for the whole script programme; If **main()** function is not defined, the script will be regarded as a single function executed from the first beginning.