User Manual of DG-A Series Gateway Products

Shanghai Digigrid Information Technology Co., Ltd.

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Contents

1. Product Introduction

1.1. Overview

- **DG-A2/A4**

DG-A2/A4 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, DG-A2/A4 can communicate with the master station as IEC61850 IED proxy device (node), so as to simplify the communication process of automation system.

Figure 1.1 Schematic diagram of DG-A4

- **DG-A8**

DG-A8 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, DG-A8 is an ideal device that serves as the data acquisition and conversion core of automation system of intelligent station.

Figure 1.2 Schematic diagram of DG-A8

1.2. Packing information and open-box inspection

- **Packing information**

  See the packing list for details.

- **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 DG-A series gateway products from scattering out after the box is opened.

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

1.3. Features

DG-A 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^{TM}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. DG-A series gatewayis 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	A2	A4
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 or optional 85~265V AC/100~375V DC	12~24V DC or optional 85~265V AC/100~375V DC
Power consumption	<5W	<5W
Weight	0.5kg	0.5kg
Dimensions(W*H*D)	48mmx138mmx86mm	54mmx139mmx118mm
Mounting	DIN rail	DIN rail
Operating Temperature	-40℃~+85℃	-40℃~+85℃

Item	A8	A16
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	85~265V AC/100~375V DC	85~265V 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℃~+85℃	-40℃~+85℃

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 DG-A2/A4; rack mounting is preferred to DG-A8/A16.

2.2. Installation of DG-A2/A4

DG-A2/A4 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 DG-A2/A4 device is well earthed.

2.3. Wiring of DG-A2/A4

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 DG-A2/A4 device;
- Check status of PSW indicator lamp for DG-A2/A4 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 DG-A2/A4 device before connection with network and serial devices.

2.3.2. Network connection

DG-A2 device provides one independent 10/100Base-T Ethernet interface in its standard configuration, and the default factory configuration is as follows:

Ethernet port	IP address	Subnet mask
ETH0	192.168.0.111	255.255.255.0

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

Ethernet port	IP address	Subnet mask
ETH0	192.168.0.111	255.255.255.0
ETH1	192.168.1.111	255.255.255.0

2.3.3. Serial connection

Terminals of RS485/RS232 serial communication ports from DG-A2/A4 are defined as follows.

PIN	Pin	Device Type
1	RS485-1A,RS232-1RX(jumper selection)	DG-A2/A4
2	RS485-1B,RS232-1TX(jumper selection)	DG-A2/A4
3	Signal GND	DG-A2/A4
4	RS485-2A,RS232-2RX(jumper selection)	DG-A2/A4
5	RS485-2B,RS232-2TX(jumper selection)	DG-A2/A4
6	Signal GND	DG-A2/A4
7	RS485-3A,RS232-3RX(jumper selection)	DG-A4
8	RS485-3B,RS232-3TX(jumper selection)	DG-A4
9	Signal GND	DG-A4
10	RS485-4A,RS232-4RX(jumper selection)	DG-A4
11	RS485-4B,RS232-4TX(jumper selection)	DG-A4
12	Signal GND	DG-A4

2.4. Installation of DG-A8/A16

DG-A8/A16 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.

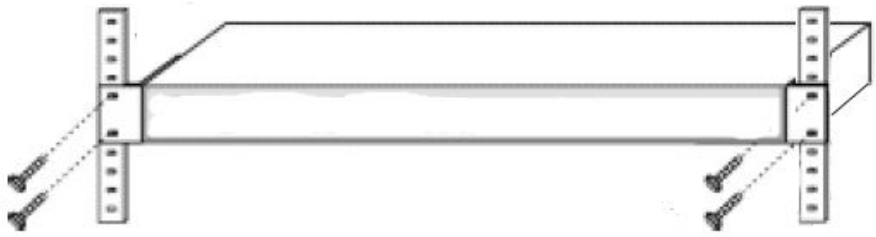


Figure 2.1 Schematic diagram of rack mounting of DG-A8 device

2.5. Wiring of DG-A8/A16

2.5.1. Power connection

The standard input voltage of DG-A8/A16 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 DG-A8 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.

PIN	Pin
1	N(Neutral line of power source)
2	L(Live line of power source)
3	E(Earth wire of power source casing)

☆ Note: It's recommended to complete the power connection and debugging of DG-8 device before connection with network and serial devices.

2.5.2. Network connection

DG-A8/A16 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
ETH0	192.168.0.111	255.255.255.0
ETH1	192.168.1.111	255.255.255.0
ETH2	192.168.2.111	255.255.255.0
ETH3	192.168.3.111	255.255.255.0

2.5.3. Serial connection

DG-A8/A16 supports 8/16 channels of RS485/RS232 serial port communication, and the terminals of its communication ports are defined as follows:

A8 Slot PIN	Description	Port Name
1	RS485-1A,RS232-1RX (jumper selection)	COM 1
2	RS485-1B,RS232-1TX (jumper selection)	
3	Signal GND	
4	RS485-2A,RS232-2RX (jumper selection)	COM 2
5	RS485-2B,RS232-2TX (jumper selection)	
6	Signal GND	

7	RS485-3A,RS232-3RX (jumper selection)	COM 3
8	RS485-3B,RS232-3TX (jumper selection)	
9	Signal GND	
10	RS485-4A,RS232-4RX (jumper selection)	COM 4
11	RS485-4B,RS232-4TX (jumper selection)	
12	Signal GND	
1	RS485-5A,RS232-5RX (jumper selection)	COM 5
2	RS485-5B,RS232-5TX (jumper selection)	
3	Signal GND	
4	RS485-6A,RS232-6RX (jumper selection)	COM 6
5	RS485-6B,RS232-6TX (jumper selection)	
6	Signal GND	
7	RS485-7A,RS232-7RX (jumper selection)	COM 7
8	RS485-7B,RS232-7TX (jumper selection)	
9	Signal GND	
10	RS485-8A,RS232-8RX (jumper selection)	COM 8
11	RS485-8B,RS232-8TX (jumper selection)	
12	Signal GND	

A16 Slot#1 PIN	Description	Port Name
1	RS485-1A	COM 1
2	RS485-1B	
3	RS485-2A	COM 2
4	RS485-2B	
5	RS485-3A	COM 3
6	RS485-3B	
7	RS485-4A	COM 4
8	RS485-4B	
9	RS485-5A	COM 5

10	RS485-5B	
11	RS485-6A	COM 6
12	RS485-6B	
13	RS485-7A	COM 7
14	RS485-7B	
15	RS485-8A	COM 8(Multiplex)
16	RS485-8B	
17	RS485-9A	COM 9(Multiplex)
18	RS485-9B	
19	RS485-10A	COM 10(Multiplex)
20	RS485-10B	
21	RS485-11A	COM 11(Multiplex)
22	RS485-11B	
23	RS485-12A	COM 12(Multiplex)
24	RS485-12B	
25	RS485-13A	COM 13(Multiplex)
26	RS485-13B	
27	RS485-14A	COM 14(Multiplex)
28	RS485-14B	
29	RS485-15A	COM 15(Multiplex)
30	RS485-15B	
31	RS485-16A	COM 16(Multiplex)
32	RS485-16B	

A16 Slot#2 PIN	Description	Port Name
1	RS232 RX	COM 9(Multiplex)
2	RS232 TX	
3	Signal GND	
4	RS232 RX	COM 10(Multiplex)

5	RS232 TX	
6	Signal GND	
7	RS232 RX	COM 11(Multiplex)
8	RS232 TX	
9	Signal GND	
10	RS232 RX	COM 12(Multiplex)
11	RS232 TX	
12	Signal GND	
1	RS232 RX	COM 13(Multiplex)
2	RS232 TX	
3	Signal GND	
4	RS232 RX	COM 14(Multiplex)
5	RS232 TX	
6	Signal GND	
7	RS232 RX	COM 15(Multiplex)
8	RS232 TX	
9	Signal GND	
10	RS232 RX	COM 16(Multiplex)
11	RS232 TX	
12	Signal GND	

Pin definition of CAN bus:

1	CAN1H
2	CAN1L
3	CAN2H
4	CAN2L

3. Product Application

3.1. Conversion of communication protocol

DG-A 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:

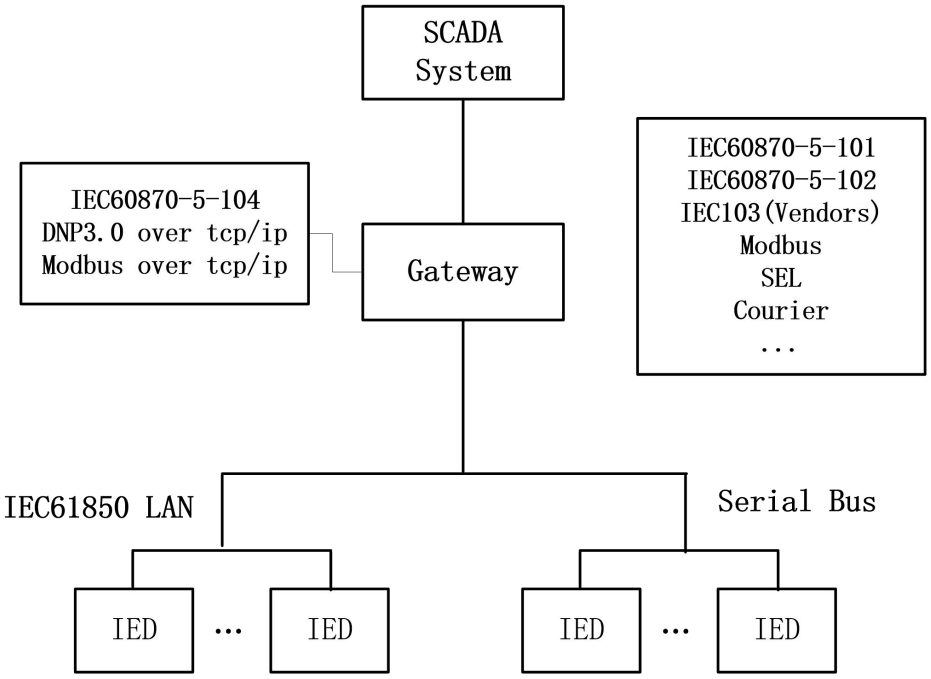


Figure 3.1 Application of DG-A series gateway in conversion of communication protocol

3.2. Integrated automation of power station

- Data acquisition and storage

Any communication port of DG-A 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

DG-A 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, DG-A 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.

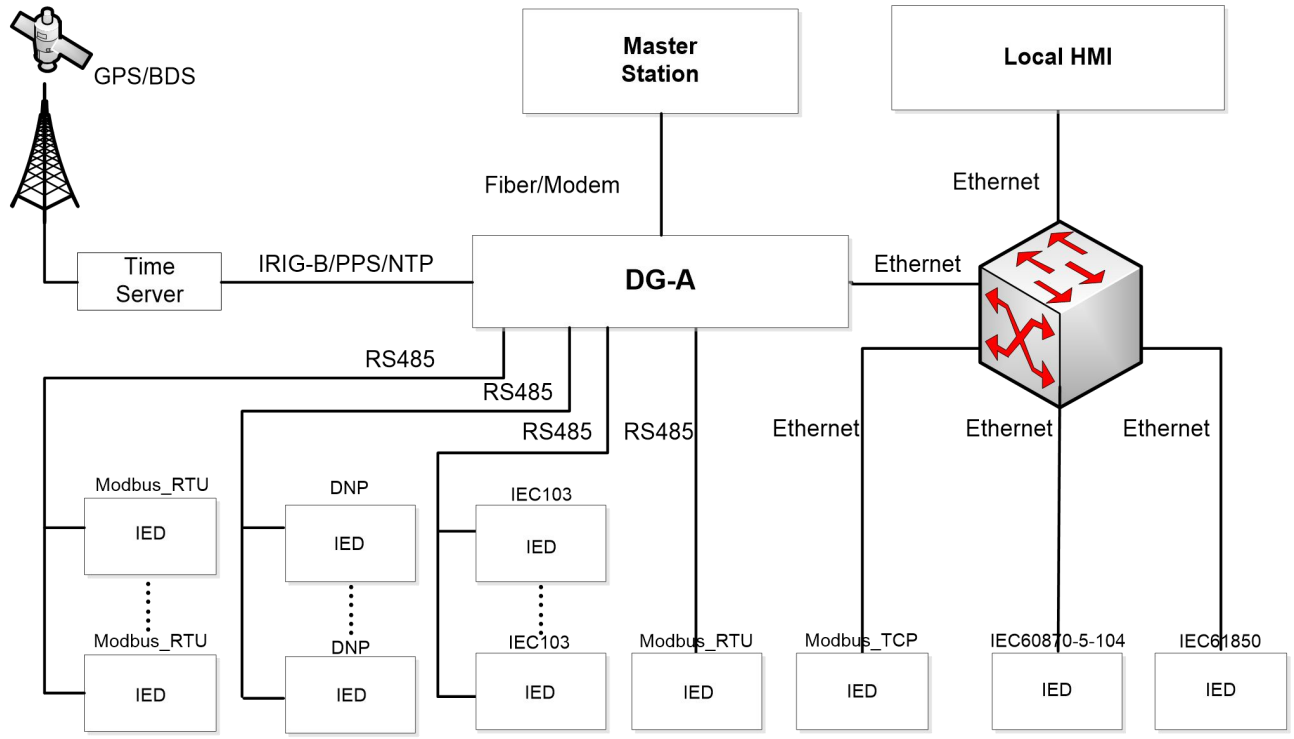


Figure 3.2 Application of DG-A series gateway in integrated automation system of power station

3.3. Virtual port connection

DG-A 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.

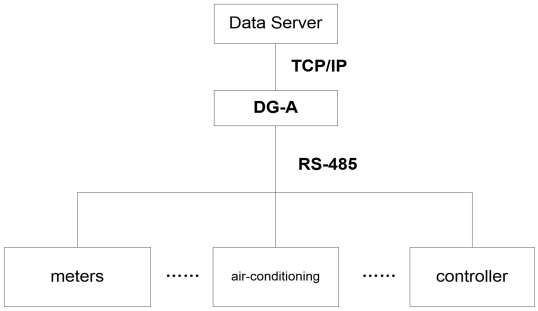


Figure 3.3 Block diagram of application of DG-A series gateway in virtual port connection

3.4. IEC 61850 client/server services

DG-A 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:

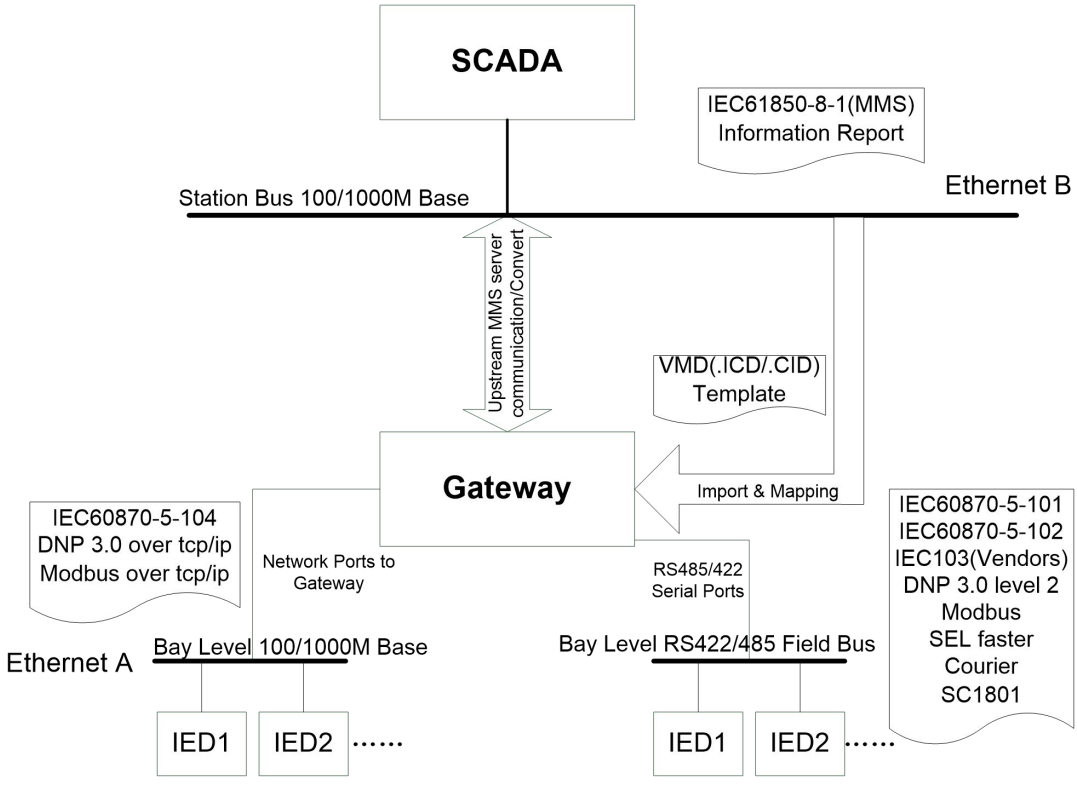


Figure 3.4 Schematic diagram of application of DG-A series gateway in IEC 61850 server

3.5. Soft PLC application

DG-A 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.

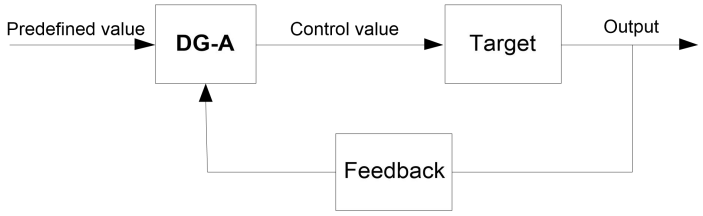


Figure 3.5 Block diagram of application of DG-A series gateway in advanced applications

4. ICE Toolset Software

4.1. Overview

EDPS ICE –anintegrated configuration environment tool allows the user to realize simple configuration in DG gateway products. The user can realize one-key installation by accessing the accompanying optical disk via friendly UI. ***EDPS ICE***now supports such installation platforms as Win2000/WinXp/Win7/Win8/Win10. ***EDPS ICE*** installation disk 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 of ***EDPS IEC***.

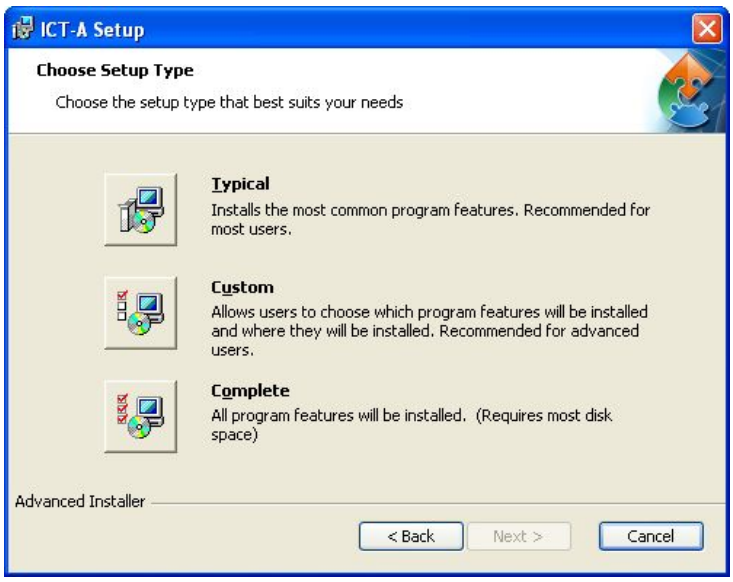
4.2. ICE Toolset installation

The installation is realized by the following steps:

1. Insert the installation disk into the computer's CD driver, find the installation file ICE A Toolset.msi or ICE A Toolset.exe in the corresponding directory, and execute the file to install ICE Toolset program.
2. After the software tests the current operating system, the system automatically pops up the dialog box of welcome and wizard page.

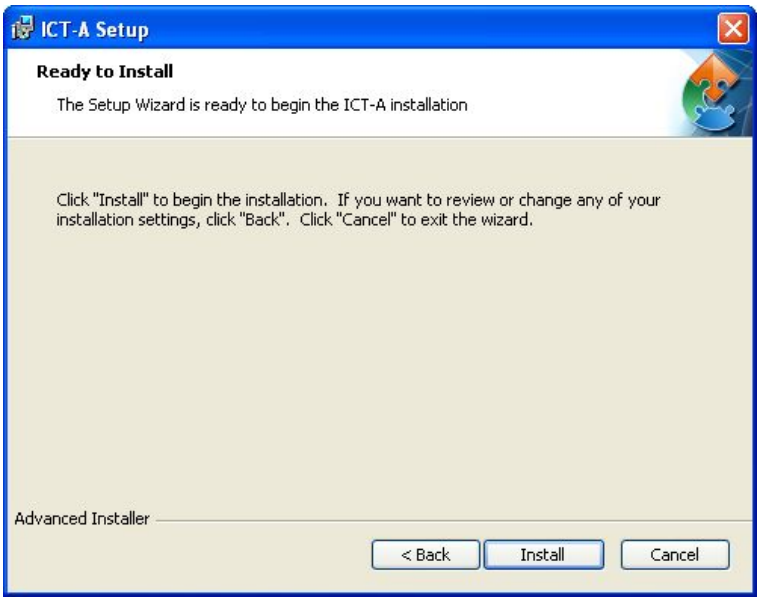
Note: The system automatically selects currently required software components to complete installation.

3. Click Next (N) to continue installation.

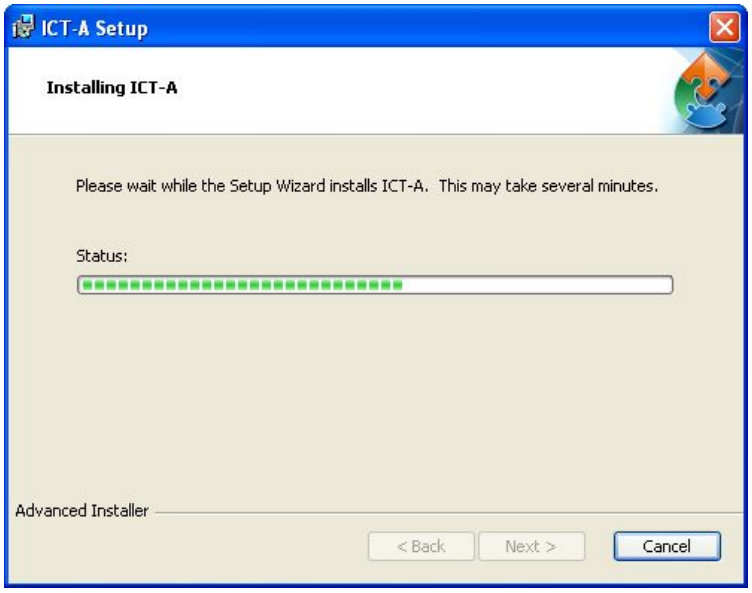


During installation, the user can select one of the three installation types “Typical”, “User-defined” and “Overall” as needed. When selecting “Typical”, the default installation path is C:\Program Files\, and the software also provides user-defined installation directory; click “Next” after confirmation.

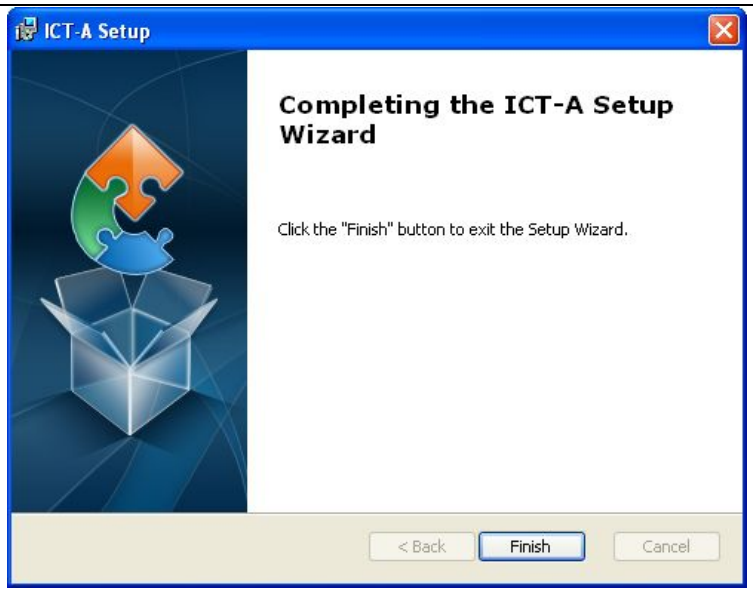
4. Click “Install” to install the software, or click “Cancel”.



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.

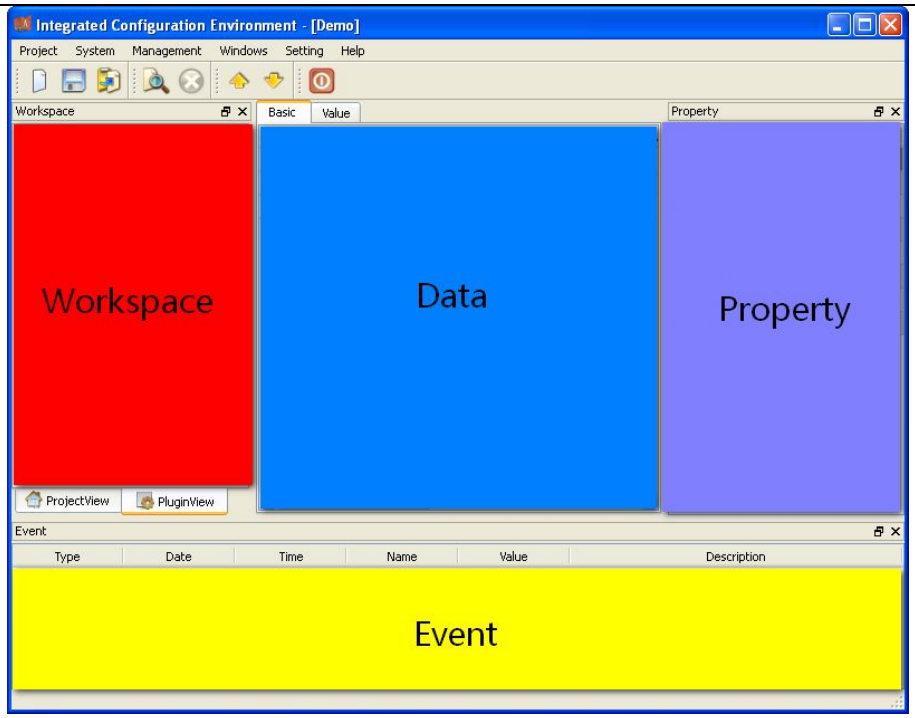


Note: After the software is installed successfully, the user can uninstall the software or repair the previous installation by running the setup program again.

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 ICE 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: east, south, west and north. A dock window has such independent features as dock, float, show, hide and close. The use of dock window can bring three-dimensional visual impact to the user, and can independently control the operations within its own working scope.



Menu bar	Provide basic menu operation functions of windows
Tool bar	Provide basic tool bar operation functions of windows
Project area	Manage project data information
Data area	Basic area for displaying data
Attribute area	Basic area for displaying attributes
Event area	Basic area for displaying events

5. Protocol Configuration

5.1. MODBUS protocol configurationModbus acquisition configuration

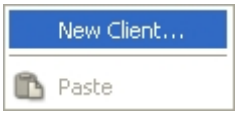
5.1.1.1. Driver information

Overview Describe detailed configuration information of acquisition driver

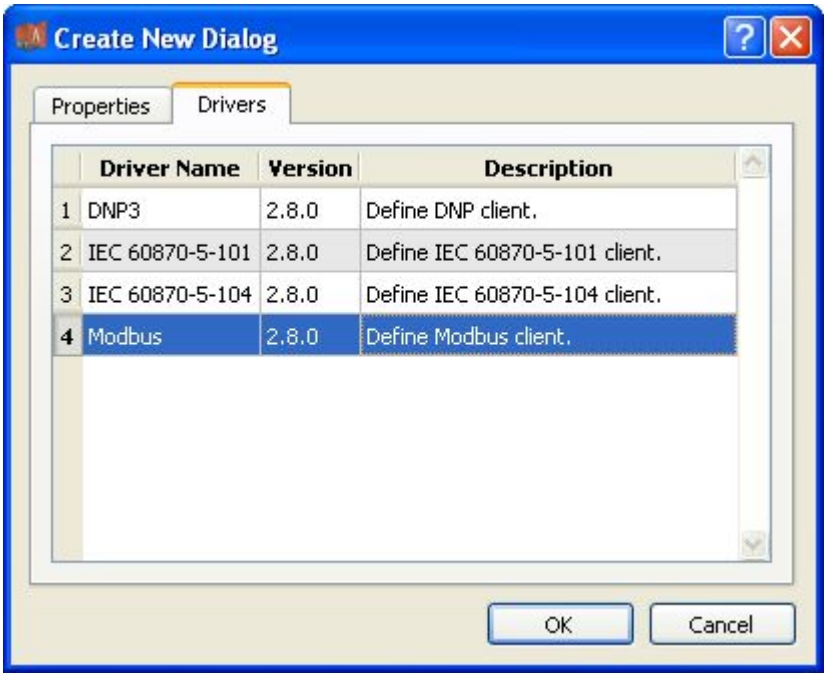
Create Create Modbus acquisition driver

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

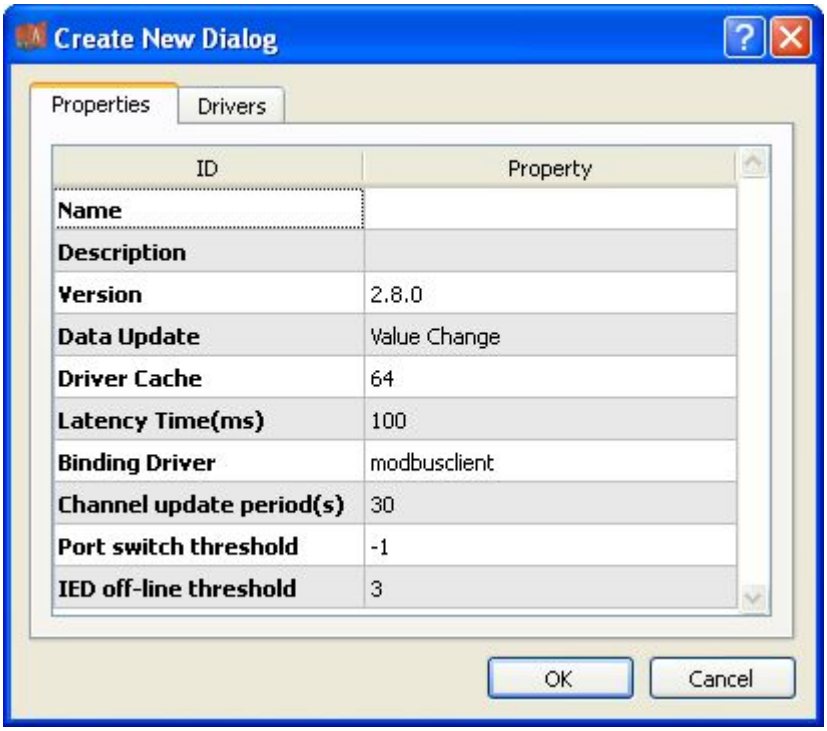
4. Right click in the blank space, and select the menu option “New acquisition service” to pop up the “Create driver dialog”;



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;

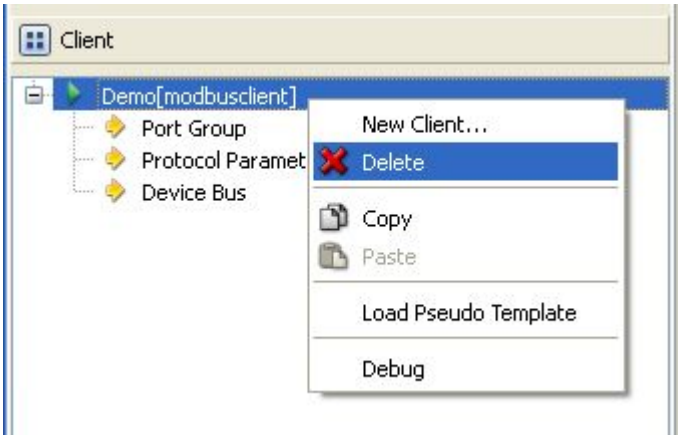
Note: Driver information

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 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

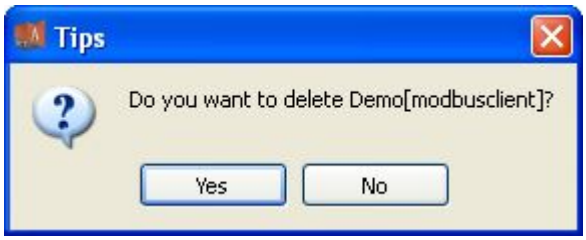
		port. -1 indicates port switching is deactivated.
10	IED off-line threshold	Define the offline threshold of IED device; when the number of consecutive communication failures reaches the threshold, the device is switched to offline state.

Delete Delete Modbus acquisition driver

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



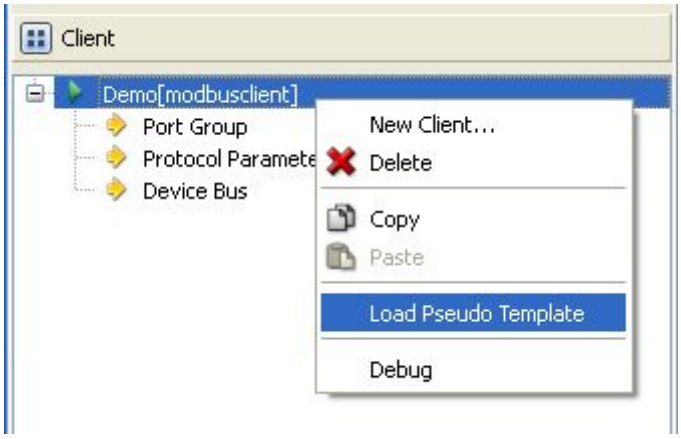
9. It prompts whether to delete;



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

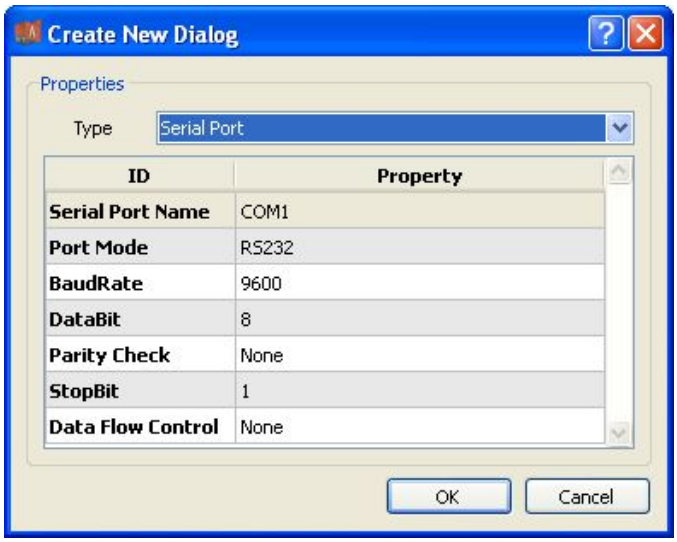
No.	Name	Description
1	Running status	Observe the running state information of the driver.
2	Authority	Observe the authorization state of the driver.

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

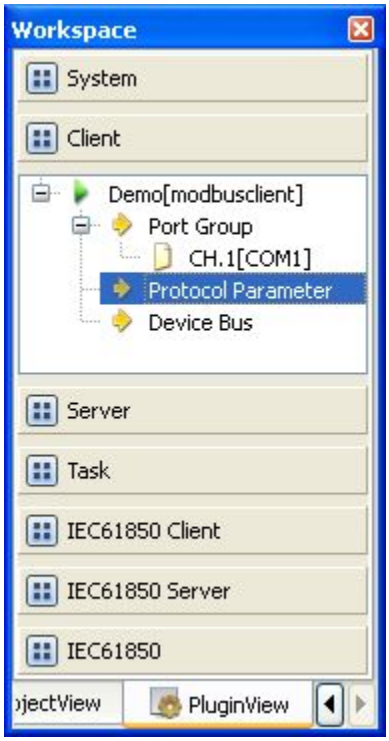
3. Right click a channel number and click “Delete”, and select “Yes” to complete deletion.

5.1.1.3. Protocol parameter

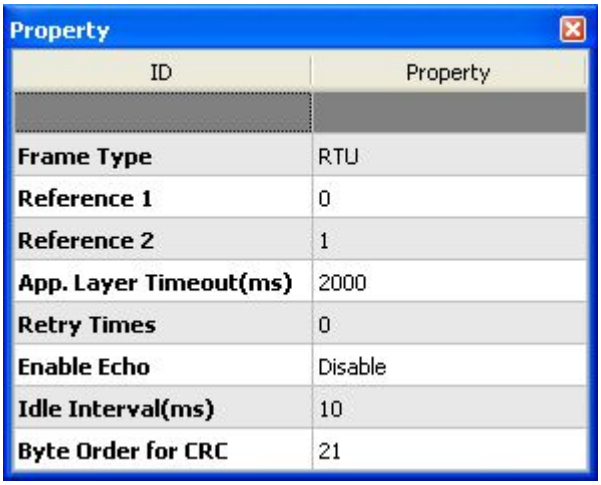
Overview Define communication protocol parameter of protocol

Attribute View protocol parameter attributes of ***EDPS ICE***

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



4. View protocol parameter attributes



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

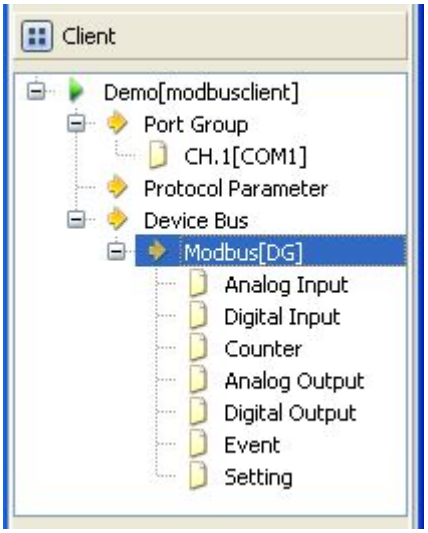
4	App.layer timeout (ms)	Define the timeout interval of waiting for response of application layer, in ms
5	Retry times	Define the times for which the application layer resends request for data when failing to receive valid data within the time allowed
6	Enabled echo	Define whether to judge whether Echo 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

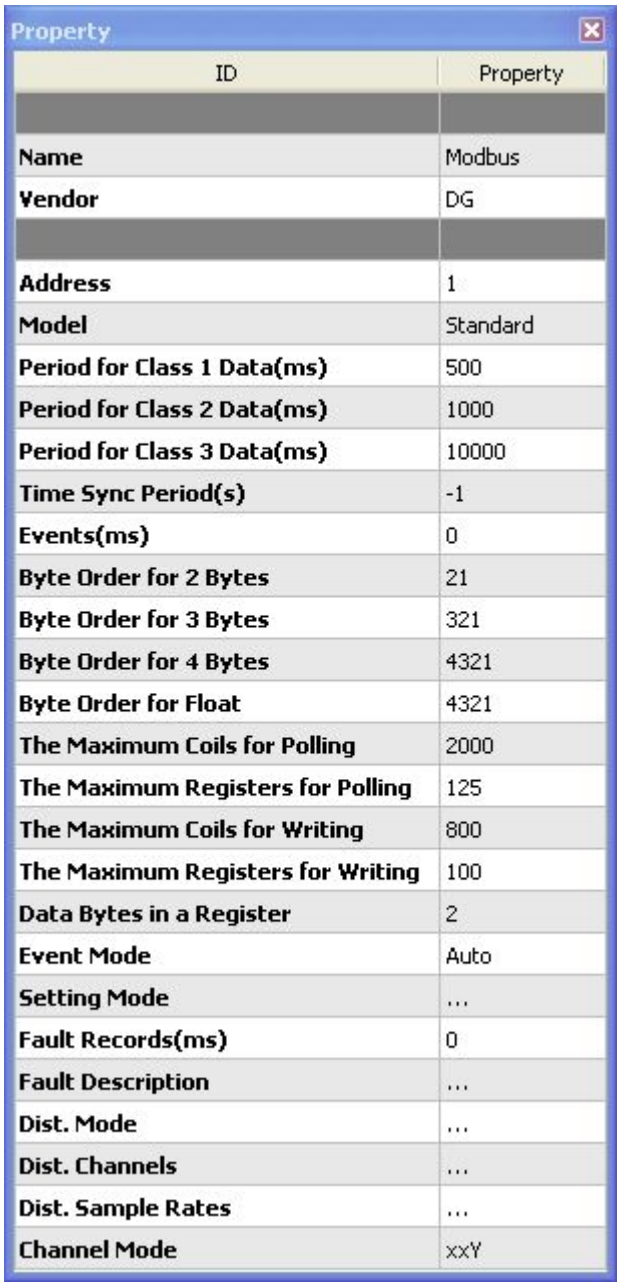
OverviewDefine device parameter of protocol

AttributeView device parameter attributes

1. Open a project, and select the plugin management page in the management area of ***EDPS ICE***;
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 ICE***;



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 sync period (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 2 bytes	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 disturbancedata in the device
26	Channel mode	Define the mode of reading channel, which is only valid for 2-series device of AREVA

Virtual point attribute View the data area of ***EDPS ICE***

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 ICE***.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 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.

Priority Define the processing priority of information point.
- Class 1 data
- Class 2 data
- Class 3 data

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

5.1.1.5.2. State input

Function code Define the function code of reading information point.
- 1－Coil Status
- 2－Input Status
- 3－Holding Register
- 4－Input Register
- 7－Exception Status

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.

Priority Define the processing priority of information point.
- Class 1 data
- Class 2 data
- Class 3 data

5.1.1.5.3. Cumulant input

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.

Priority Define the processing priority of information point.
- Class 1 data
- Class 2 data
- Class 3 data

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

5.1.1.5.4. Analog output

Function code Define the function code of reading information point. 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.
Priority	Define the processing priority of information point. • Class 1 data • Class 2 data • Class 3 data
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
Writing function code	Define the function code of writing information point. • 6-Preset Register • 16-Preset Multiple Registers

5.1.1.5.5. State output

Function code	Define the function code of reading information point. • 5－Force Coil • 15－Force Multiple Coils • 6－Preset Register • 10－Preset Multiple 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.
Pulse number	Define the number of pulses.It's valid when the control mode is pulse mode.
High-level time	Define the duration of rising edge at pulse output mode
Low-level time	Define the duration of falling edge at pulse output mode
Open command value	Define the substituted value for executing open command.
Close command value	Define the substituted value for executing close command.

5.1.1.5.6. Event

Event code	Define the serial number of event code.It's used to retrieve event information.

5.1.1.5.7. Setting

Function code	Define the function code of reading information point. • 3－Holding Register • 4－Input Register
Register address	Define the address of register.

Starting position	Define the start byte position of the information point in the register.
Data length	Define the data length of information point.
Value type	Define the data length of information point. • Discrete type • Integer • Unsigned integer • Floating-point type
Writing function code	Define the function code of writing information point. • 6- Force Register

5.1.2. Modbus forwarding configuration

5.1.2.1. Driver information

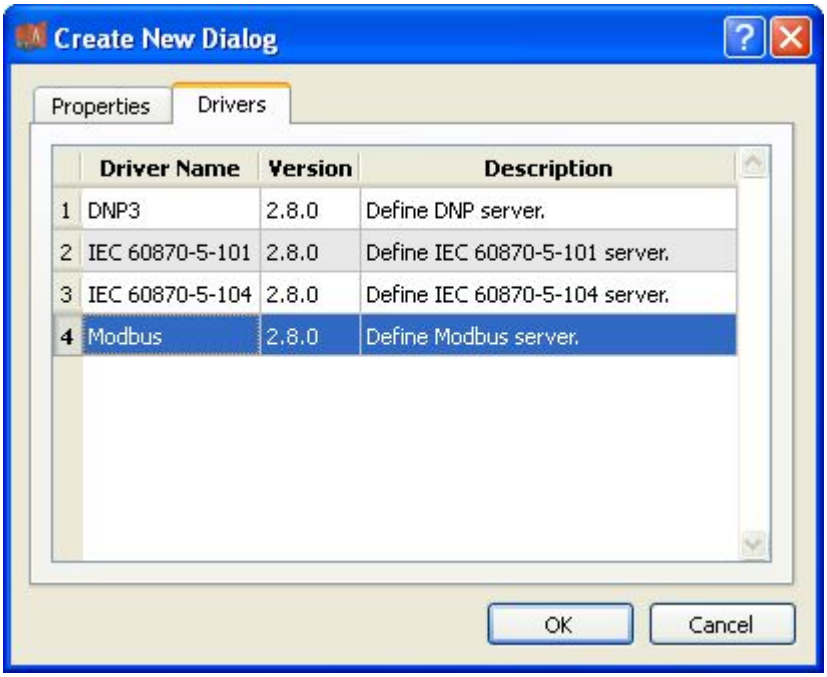
Overview Describe detailed configuration information of forwarding driver

Create Create Modbus forwarding driver

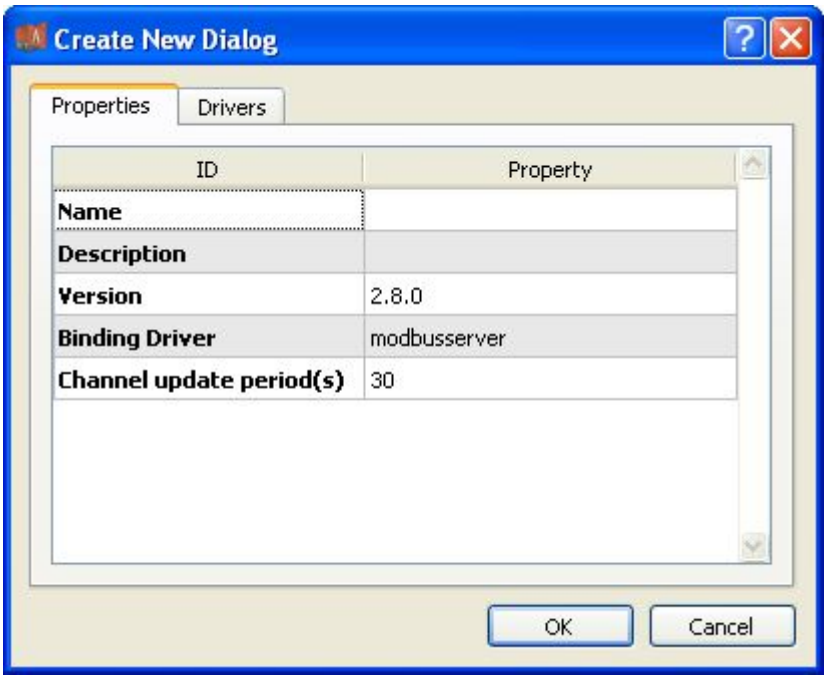
1. Open a project file;
2. Select the plugin management page in the management area of ***EDPS ICE***;
3. Activate the forwarding service plugin;

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;

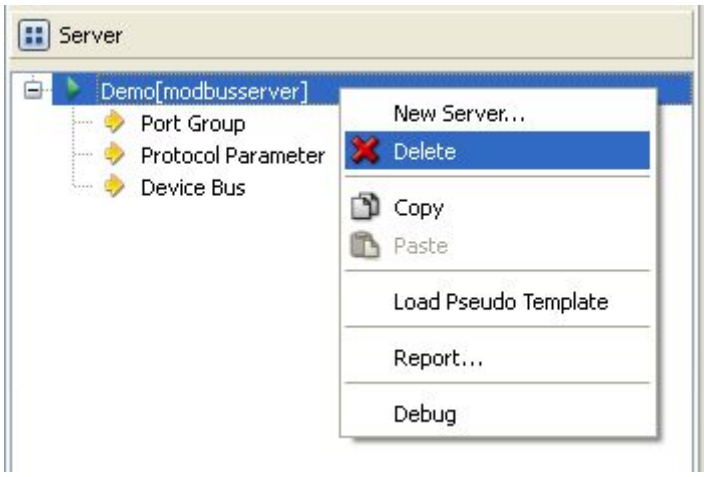
Note: Driver information

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.

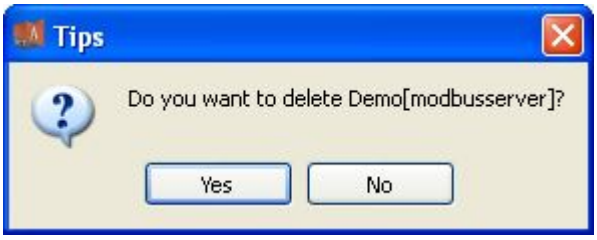
5	Channel update period(s)	Define the cycle of updating IED communication times.

Delete Delete Modbus forwarding driver

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



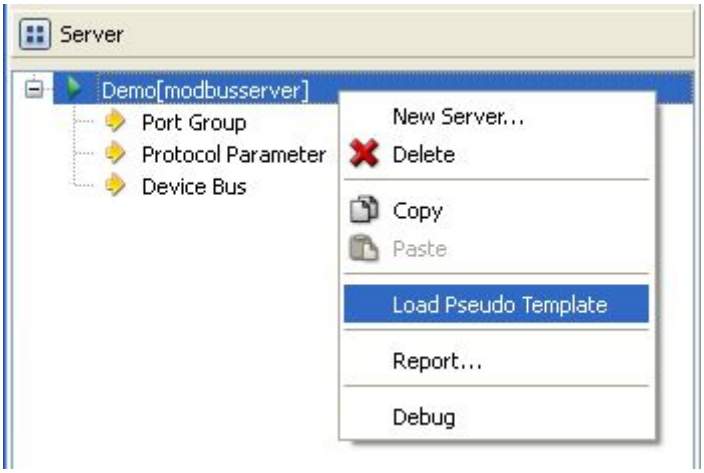
9. It prompts whether to delete;



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

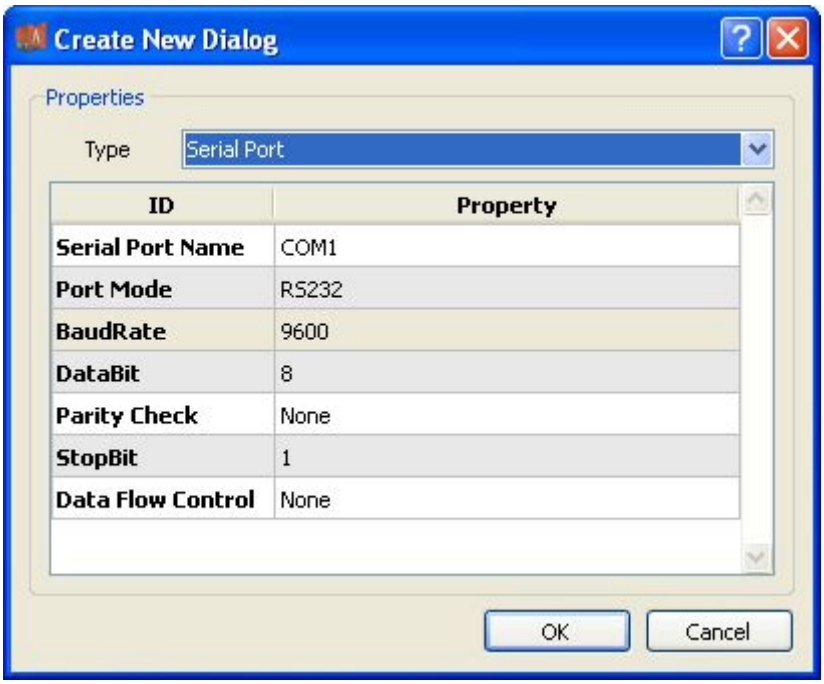
No.	Name	Description
1	Running status	Observe the running state information of the driver.
2	Authority	Observe the authorization state of the driver.

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;

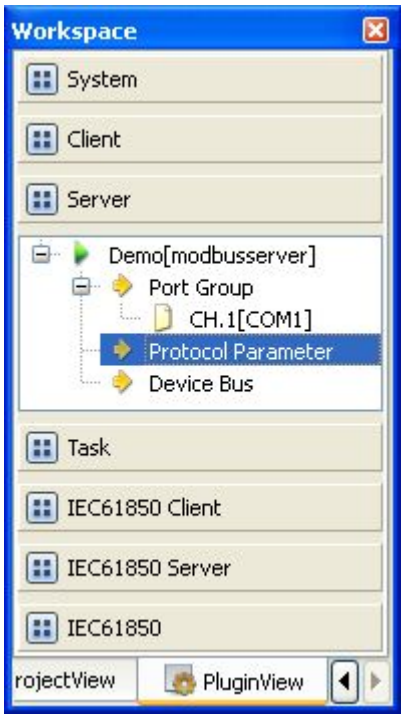
Delete Delete communication channel

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

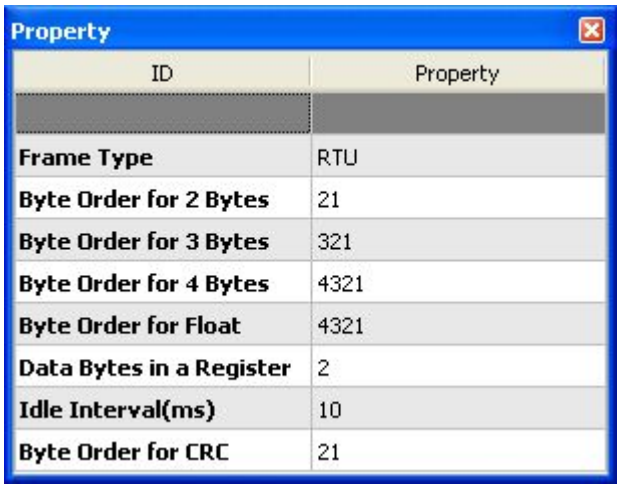
5.1.2.3. Protocol parameter

Overview Define communication protocol parameter of protocol

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



4. View protocol parameter attributes



Note: Protocol parameter information

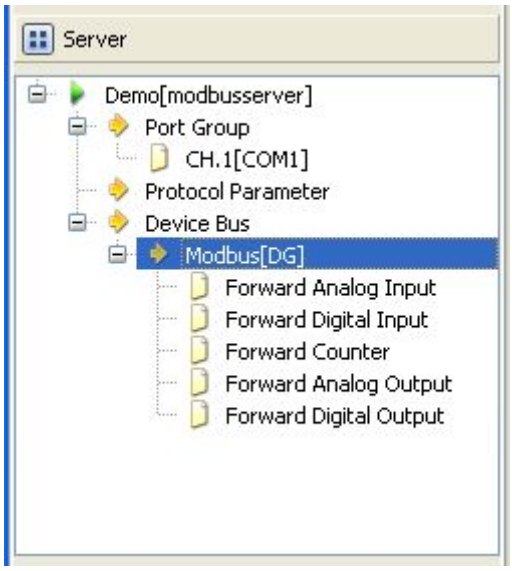
No.	Name	Description
1	Frame type	Define the format of communication data frame
2	Byte order for 2 bytes	Define the arrangement order of 2 bytes in the device
3	Byte order for 3 bytes	Define the arrangement order of 3 bytes in the device
4	Byte order for 4 bytes	Define the arrangement order of 4 bytes 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 ICE***;
2. Activate the forwarding service plugin;
3. Select any child node under the node of device bus in the management area with mouse;



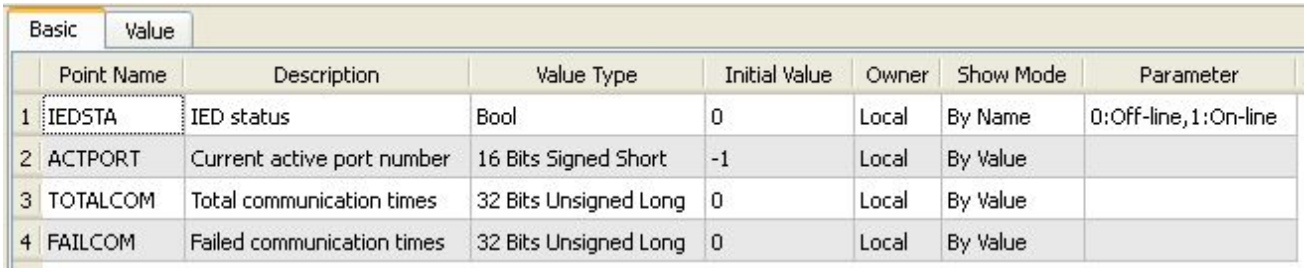
4. View the attribute area of ***EDPS ICE***;

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 ICE



	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 ICE***. 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
- 4－Input Register

Register address Define the address of register.

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

Data length Define the length of data.

Value type	Define the value type of data. • 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.

5.1.2.5.2. State input

Function code	Define the function code of reading information point. • 1－Coil Status • 2－Input Status • 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.

5.1.2.5.3. Cumulant input

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.

5.1.2.5.4. 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 ICE*** 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 ICE*** provides a concise and fast way to help the user to conduct configuration.

5.2.1. IEC101 acquisition configuration

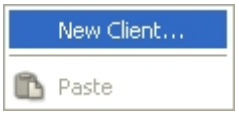
5.2.1.1.Driver information

Overview Describe detailed information of acquisition driver

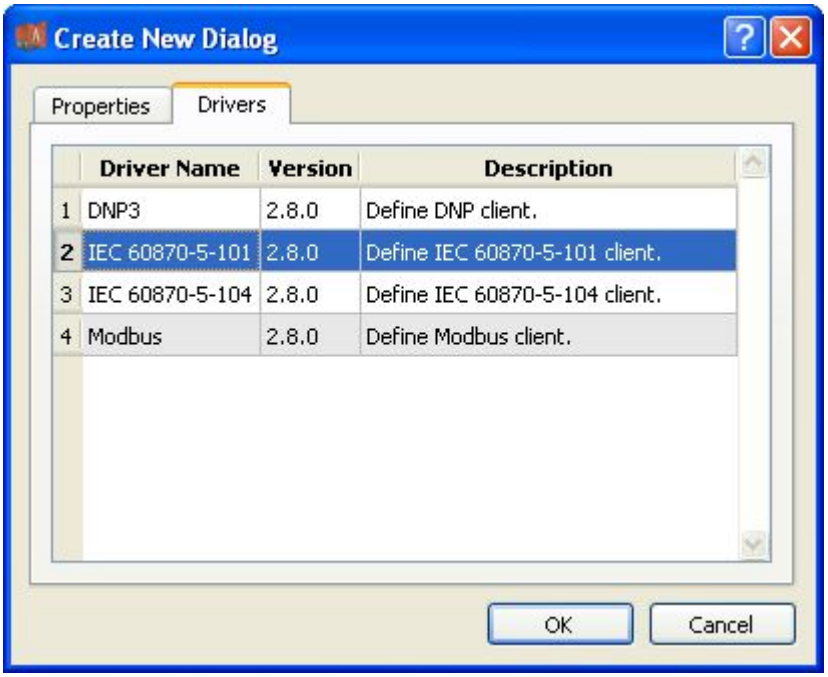
Create Create IEC101 acquisition driver

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

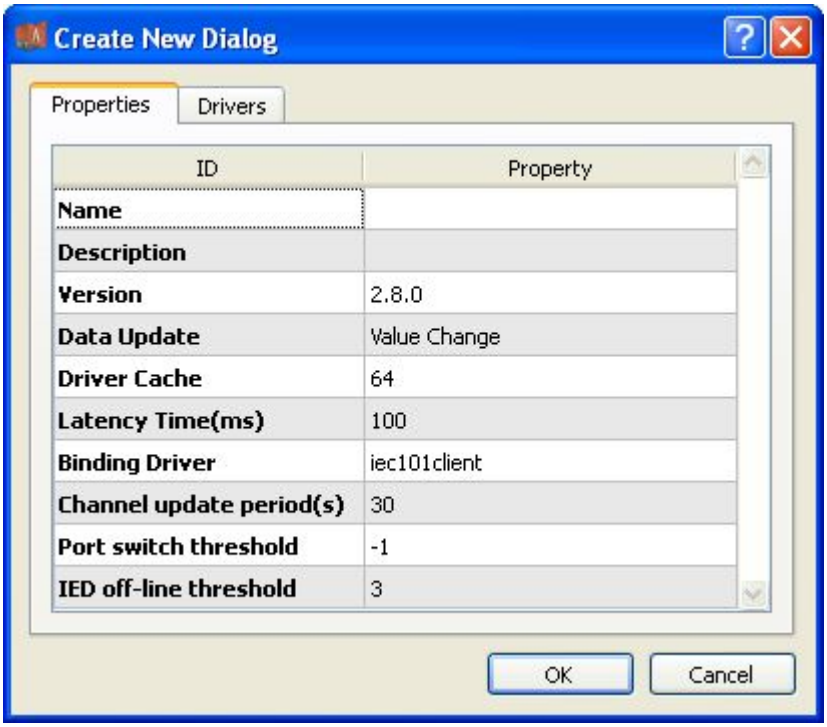
4. Right click in the blank space, and select the menu option “New acquisition service” to pop up the “Create driver dialog”;



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;

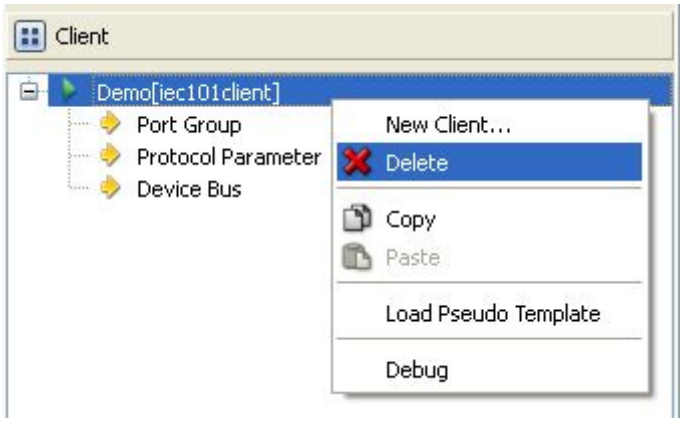
Note: Driver information

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 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”;

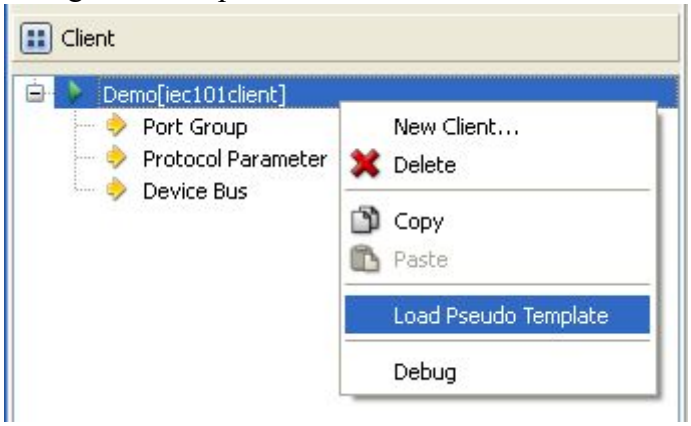


9. It prompts whether to delete;

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

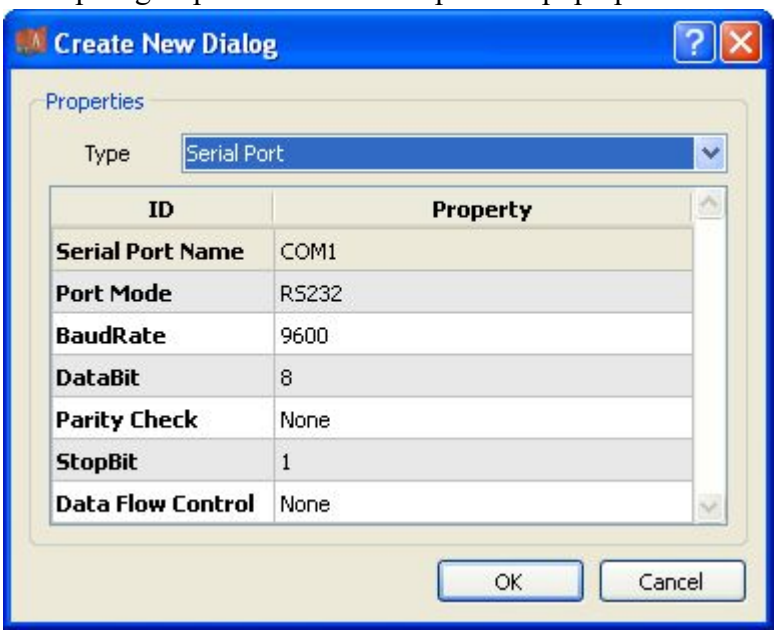
1	Running status	Observe the running state information of the driver.
2	Authority	Observe the authorization state of the driver.

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

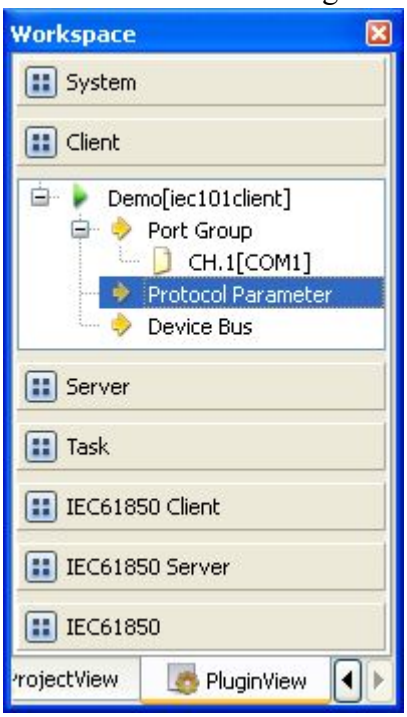
3. Right click a channel number and click “Delete”, and select “Yes” to complete deletion.

5.2.1.3. Protocol parameter

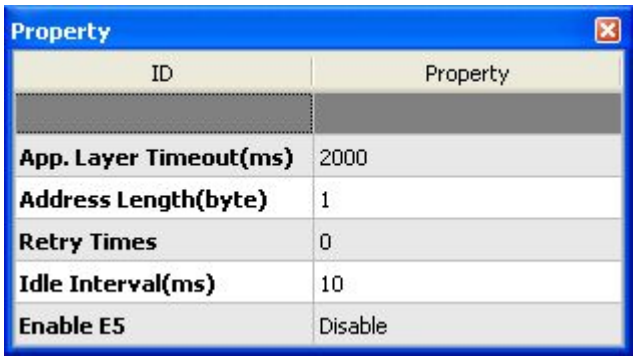
Overview Define communication protocol parameter of protocol

Attribute View protocol parameter attributes of ***EDPS ICE***

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



4. View protocol parameter attributes



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

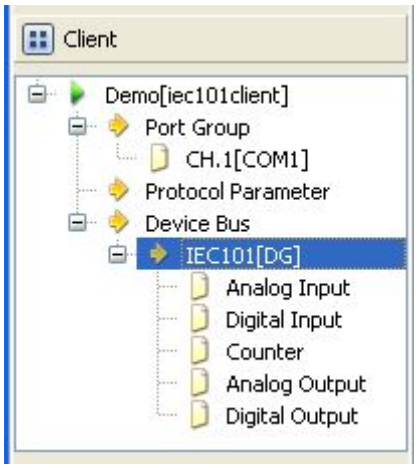
		communication processes in the system.A complete communication process means from sending request for data to receiving all valid data.
5	Enable E5	Define whether to process E5 when IEC60870-5-101 processes data.

5.2.1.4. Device parameter

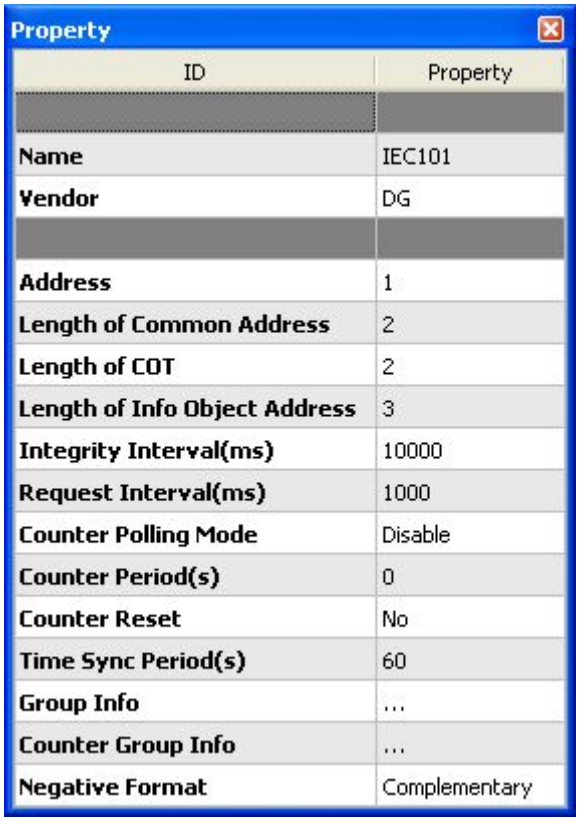
Overview Define device parameter of protocol

Attribute View device parameter attributes

1. Open a project, and select the plugin management page in the management area of ***EDPS ICE***;
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 ICE***;

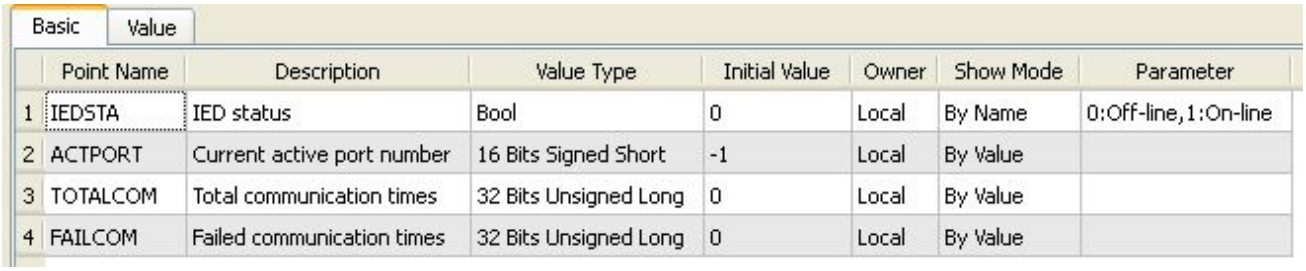


Note: Device attribute information

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	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	Counter period (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 ICE***



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 ICE***. 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

Public address Define the public address in communication process.

Point number Define the information object address of information point.

Output coding Define the mode of executing command. See IEC60870-5-101 protocol text for details.

- Undefined
- Short pulse
- Long pulse
- Continuous output

Output type Define ASDU type of command. See IEC60870-5-101 protocol text for details.

- Single-point command

- Two-point command
- Step position command

5.2.2. IEC101 forwarding configuration

5.2.2.1. Driver information

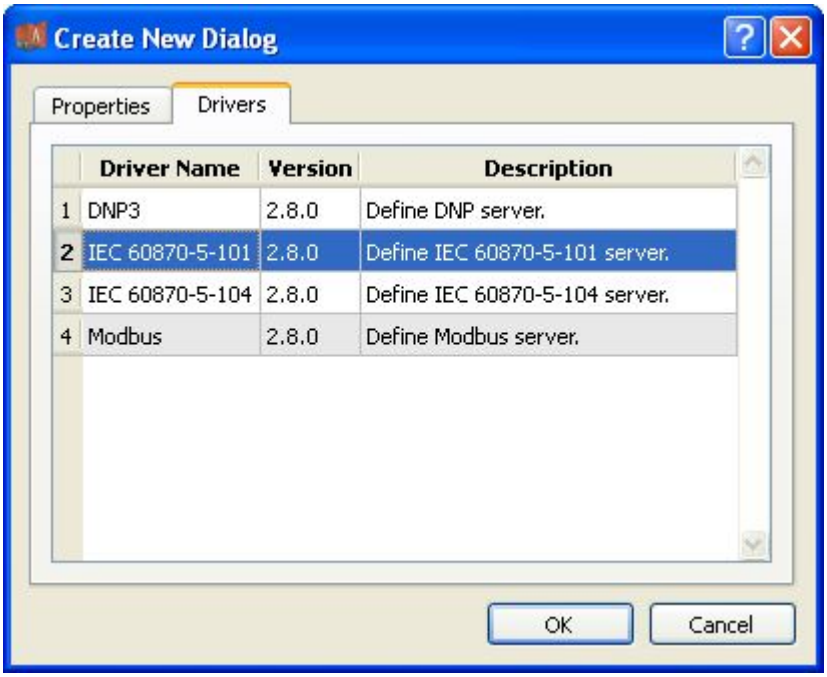
Overview Describe detailed information of forwarding driver

Create Create IEC101 forwarding driver

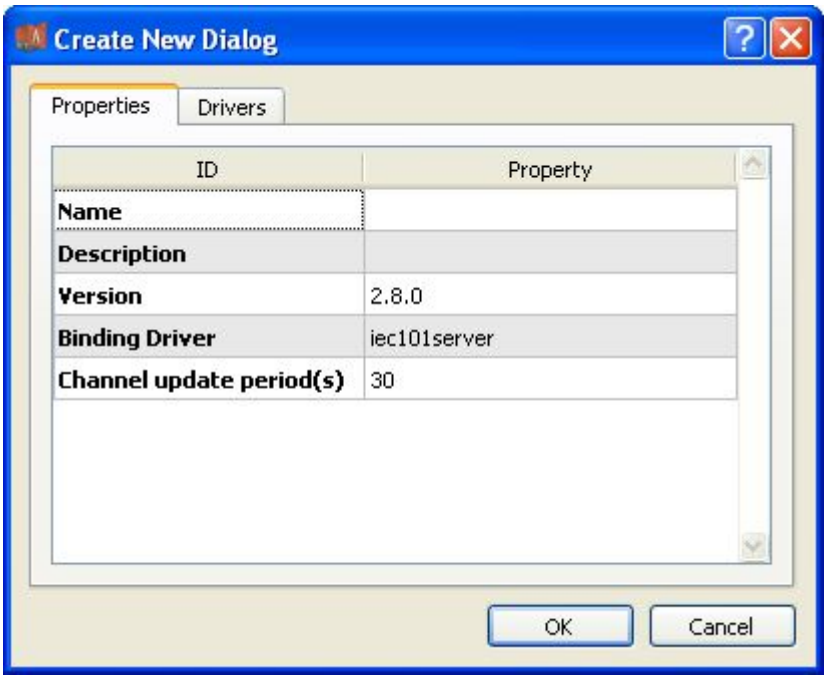
1. Open a project file;
2. Select the plugin management page in the management area of ***EDPS ICE***;
3. Activate the forwarding service plugin;

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;

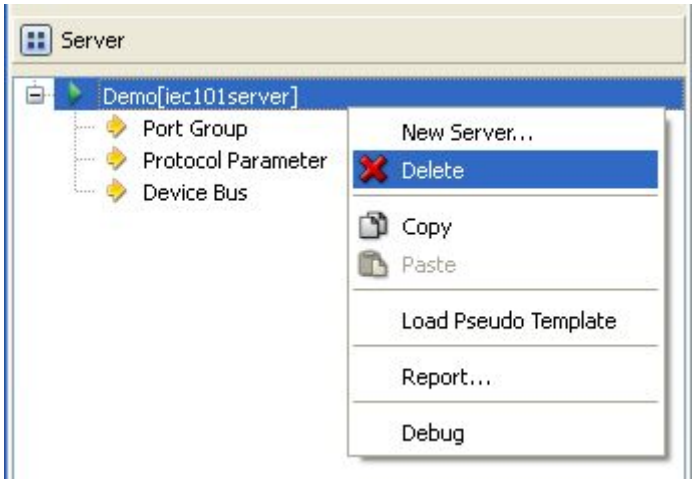
Note: Driver information

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.

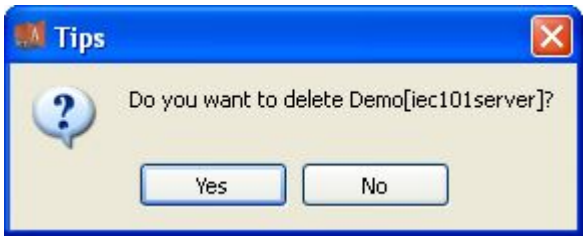
5	Channel update period (s)	Define the cycle of updating IED communication times.

Delete Delete IEC101 forwarding driver

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



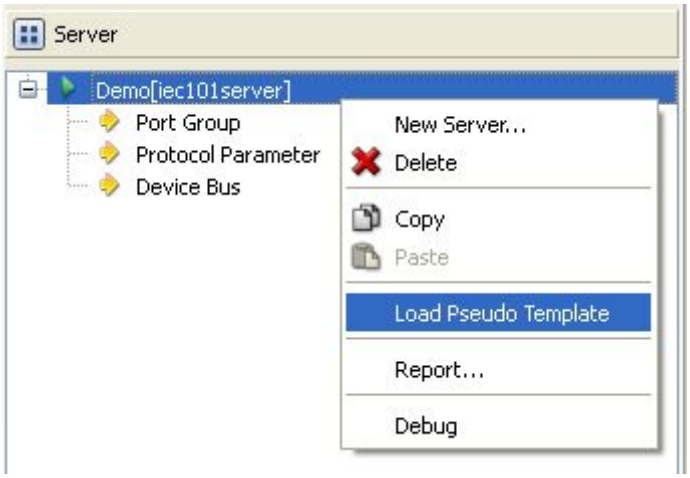
9. It prompts whether to delete;



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

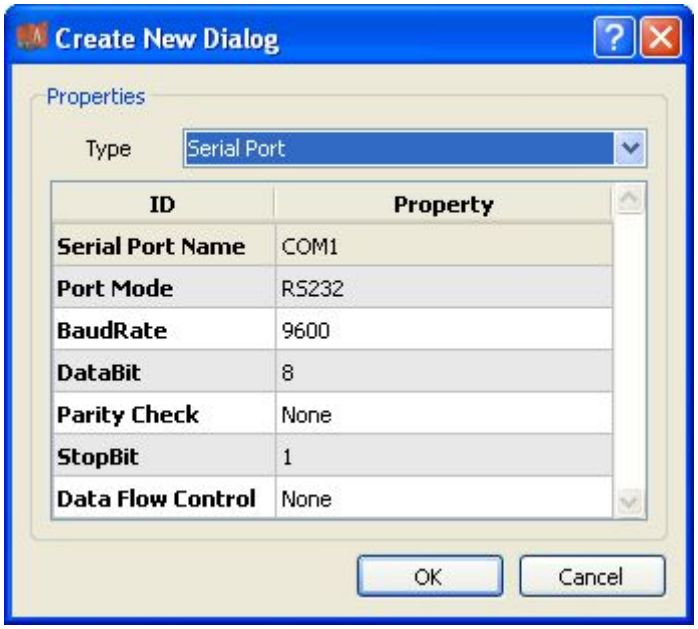
No.	Name	Description
1	Running status	Observe the running state information of the driver.
2	Authority	Observe the authorization state of the driver.

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;

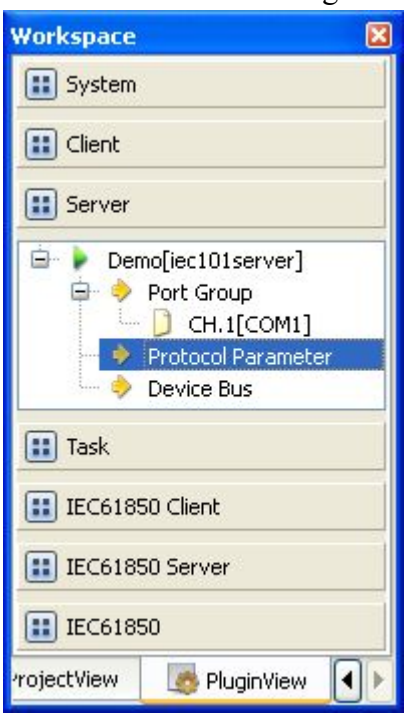
Delete Delete communication channel

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

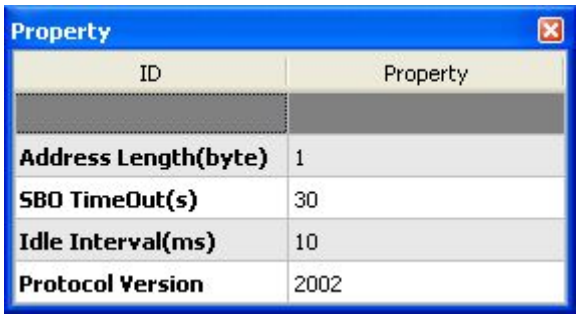
5.2.2.3. Protocol parameter

Overview Define communication protocol parameter of protocol

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



4. View protocol parameter attributes



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

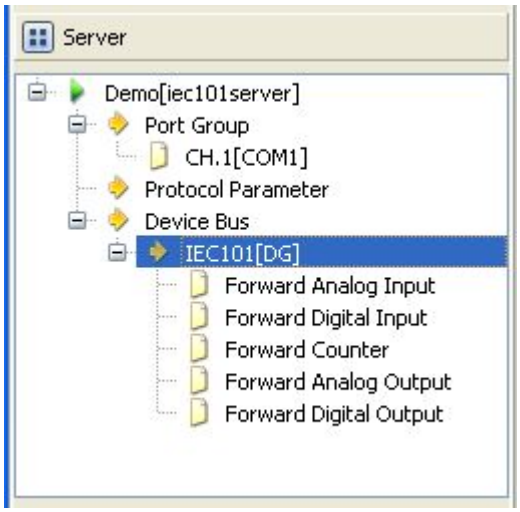
4	Protocol version	Define the working version number of communication protocol

5.2.2.4. Device parameter

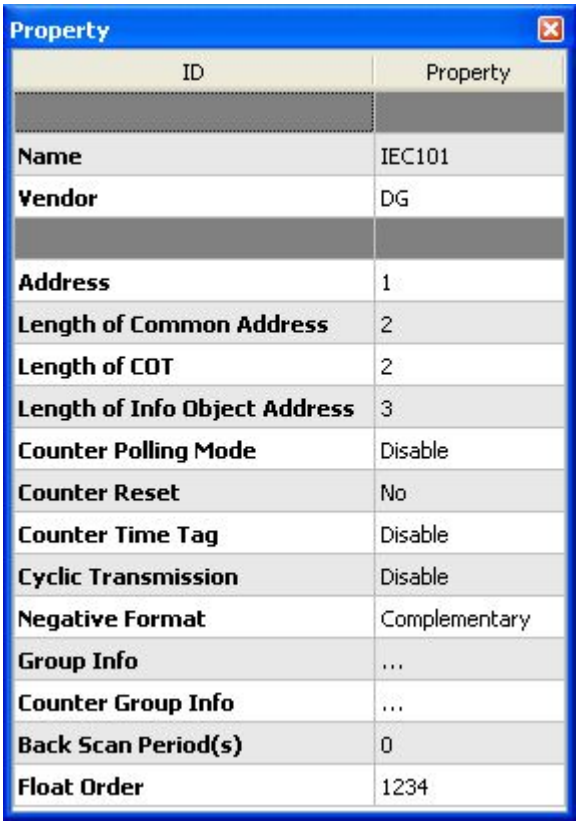
Overview Define device parameter of protocol

Attribute View device parameter attributes

1. Open a project, and select the plugin management page in the management area of ***EDPS ICE***;
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 ICE***;

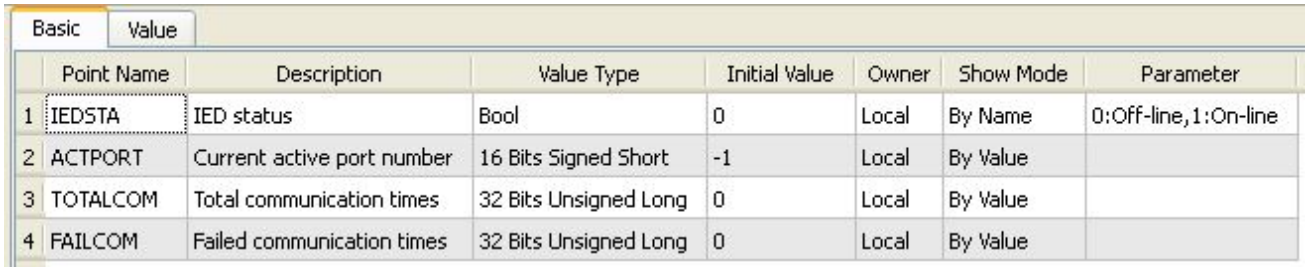


Note: Device attribute information

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 ICE***



	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.

5.2.2.5.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 ICE***. 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

Public address Define the public address in communication process.

Point number Define the point number of information point.

ASDU type Define the application function type of information point.

- M_ME_NA_1 (normalized value)

- M_ME_NB_1 (scale value)
- M_ME_NC_1 (short floating-point number)
- M_ME_ND_1 (normalized value with quality)
- M_ST_NA_1 (step position information)

Working mode Define the working mode of information point.
- Cyclic
- Burst

Time mark Define whether an information point is provided with time mark in transmission frame.

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

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

Dead zone value 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.

5.2.2.5.2. 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.
Divisor	Define the division factor for computing raw data at the information point.

5.2.2.5.4. Analog output

Public address	Define the public address in communication process.
Point number	Define the point number of information point.
ASDU type	Define the application function type of information point.
Output type	● Normalized value ● Scale value ● Short floating-point number
Offset	Define the offset for computing raw data at the information point.
Divisor	Define the division factor for computing raw data at the information point.

5.2.2.5.5. State output

Public address	Define the public address in communication process.
Point number	Define the point number of information point.
Control mode	Define the mode of executing control operation command at the information point. ● Direct execution ● Remote control selection

5.3. IEC60870-5-104 protocol configuration

Appendix D mainly describes how ***EDPS ICE*** 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 ICE*** provides a concise and fast way to help the user to conduct configuration.

5.3.1. IEC104 acquisition configuration

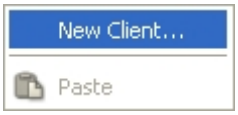
5.3.1.1.Driver information

Overview Describe detailed information of acquisition driver

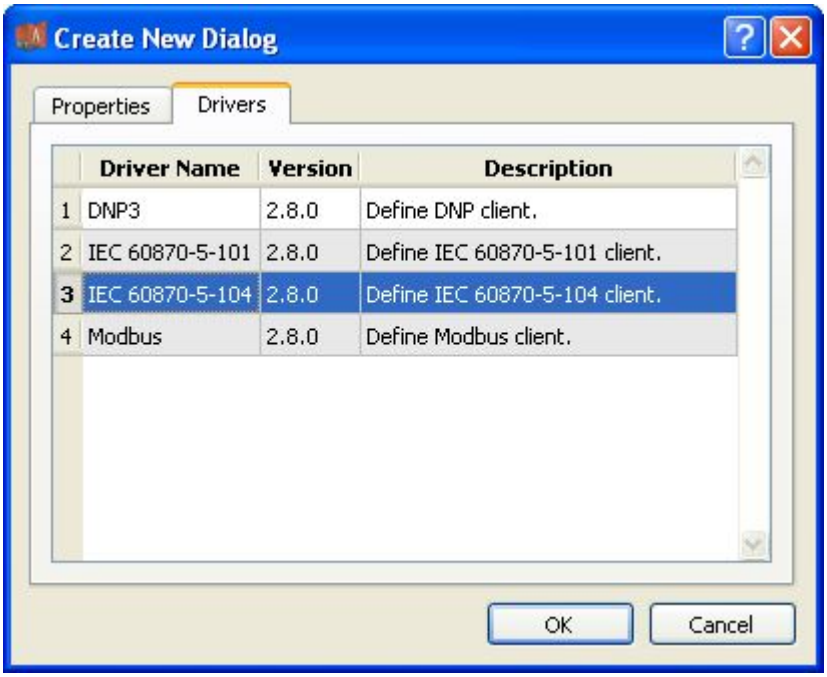
Create Create IEC104 acquisition driver

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

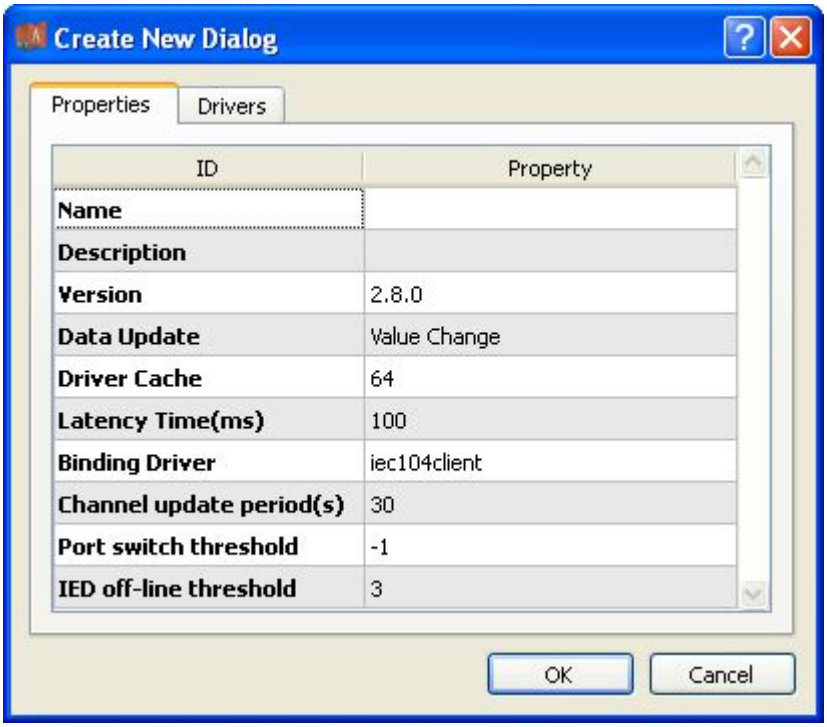
4. Right click in the blank space, and select the menu option “New acquisition service” to pop up the “Create driver dialog”;



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;

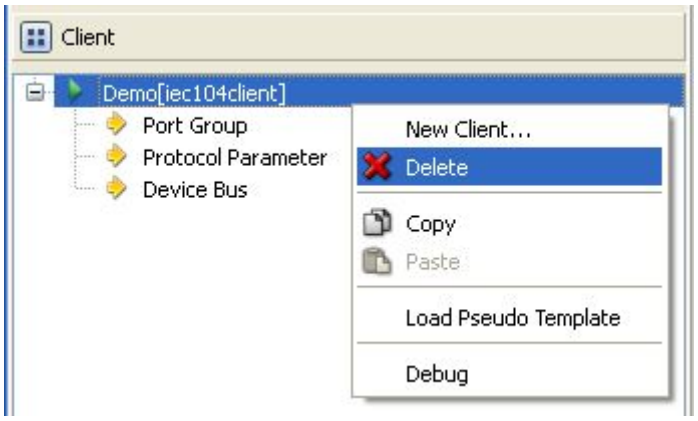
Note: Driver information

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 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”;

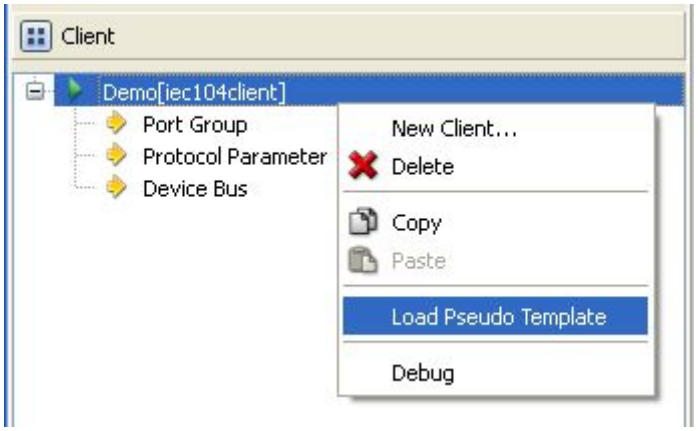


9. It prompts whether to delete;

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

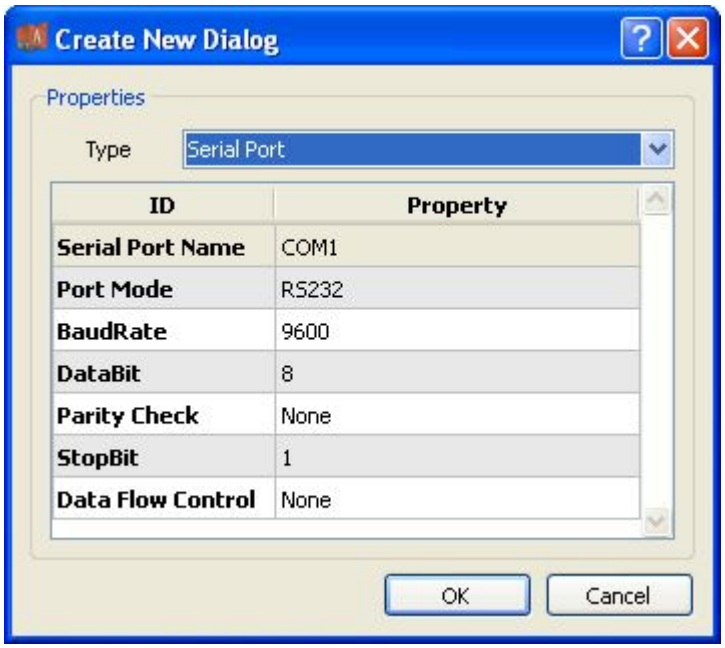
No.	Name	Description
1	Running status	Observe the running state information of the driver.
2	Authority	Observe the authorization state of the driver.

5.3.1.2. Port group information

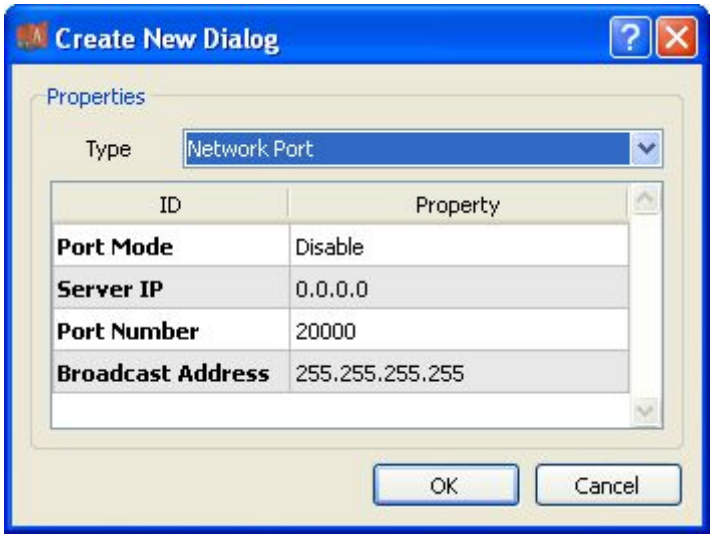
Overview Describe communication channel information

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

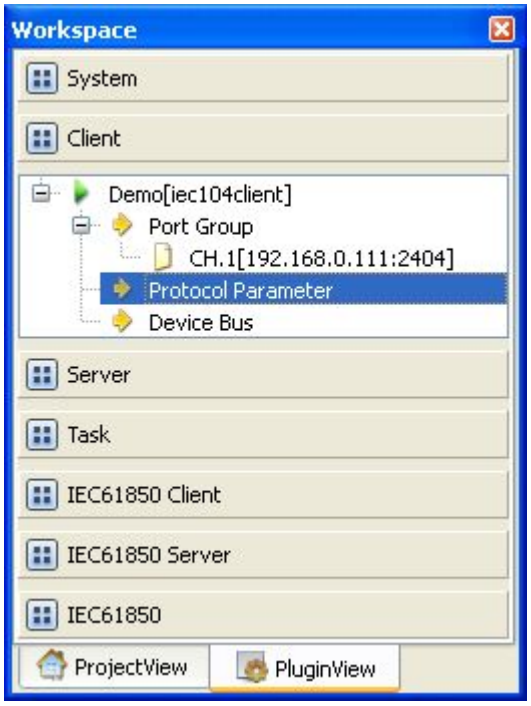
3. Right click a channel number and click “Delete”, and select “Yes” to complete deletion.

5.3.1.3. Protocol parameter

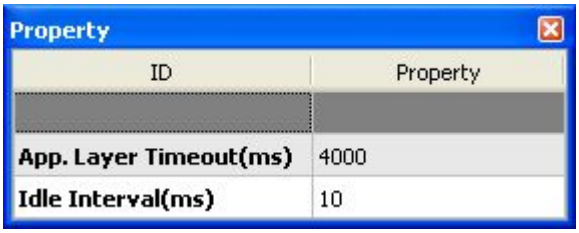
Overview Define communication protocol parameter of protocol

Attribute View protocol parameter attributes of ***EDPS ICE***

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



4. View protocol parameter attributes



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

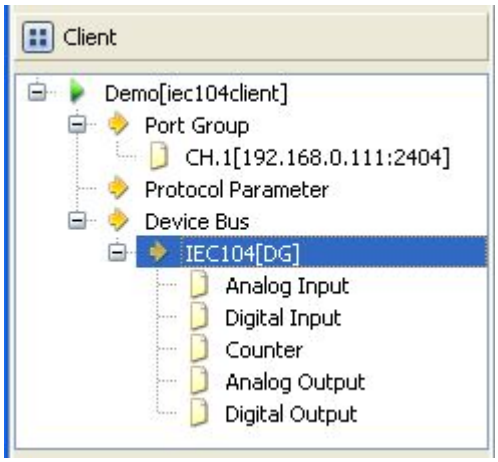
		communication process means from sending request for data to receiving all valid data.

5.3.1.4. Device parameter

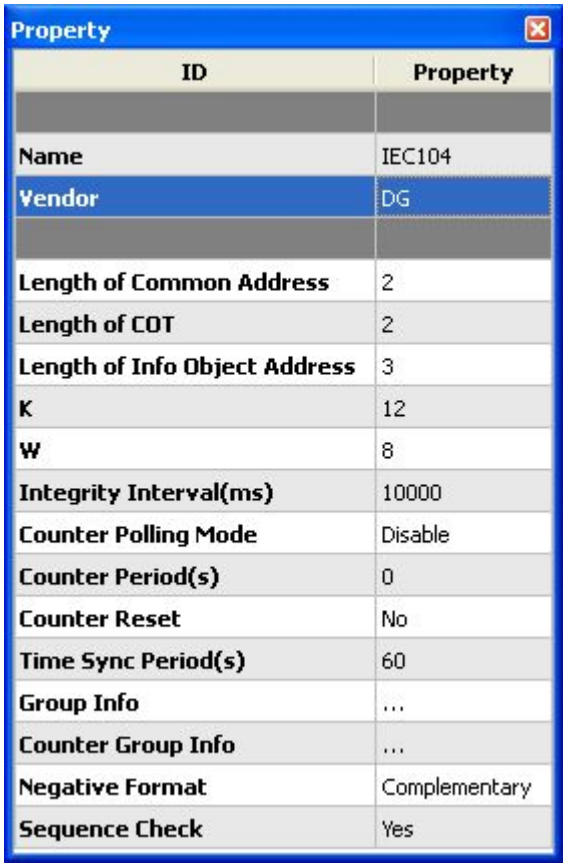
Overview Define device parameter of protocol

Attribute **View device parameter attributes**

1. Open a project, and select the plugin management page in the management area of ***EDPS ICE***;
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 ICE***;



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 ICE***

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.

5.3.1.5.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 ICE***. 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

Public address Define the public address in communication process.

Point number Define the information object address of information point.

5.3.1.5.2. State input

Public address Define the public address in communication process.

Point number Define the information object address of information point.

5.3.1.5.3. Cumulant input

Public address Define the public address in communication process.

Point number Define the information object address of information point.

5.3.1.5.4. 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)

5.3.1.5.5. State output

Public address Define the public address in communication process.

Point number Define the information object address of information point.

Output coding Define the mode of executing command. See IEC60870-5-101 protocol text for details.

- Undefined
- Short pulse
- Long pulse
- Continuous output

Output Define ASDU type of command. See IEC60870-5-101 protocol text for

type details.

- Single-point command
- Two-point command
- Step position command

5.3.2. IEC104 forwarding configuration

5.3.2.1. Driver information

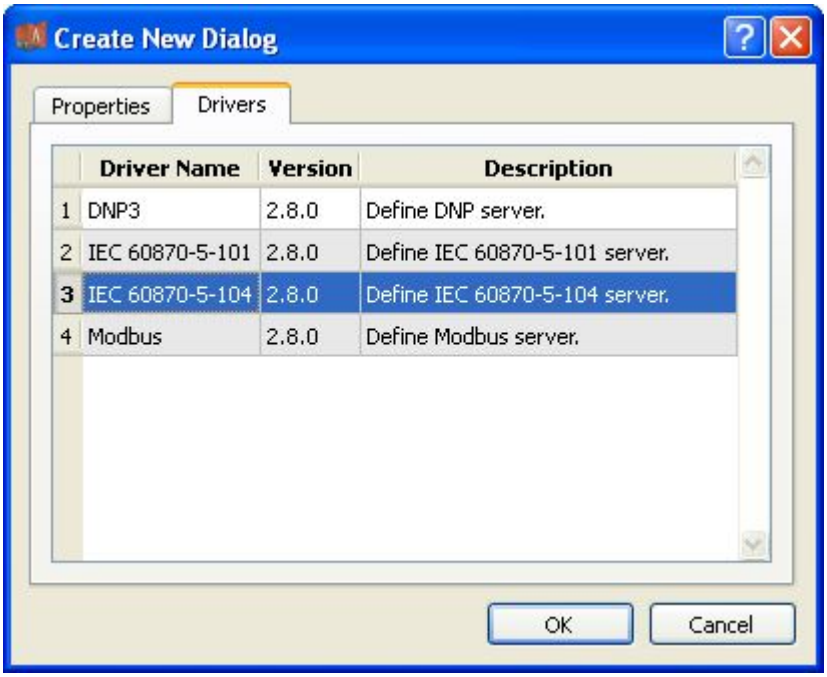
Overview Describe detailed information of forwarding driver

Create Create IEC104 forwarding driver

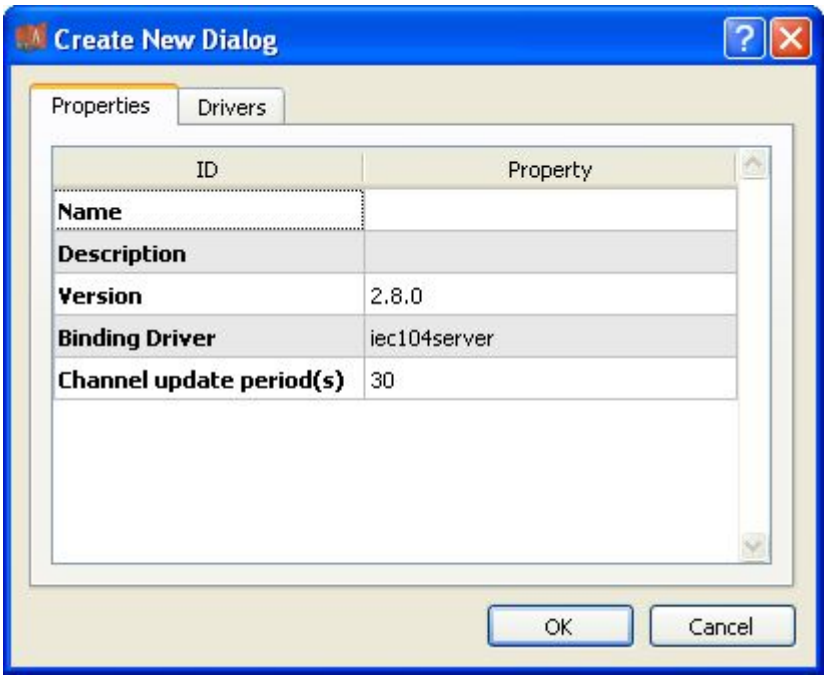
1. Open a project file;
2. Select the plugin management page in the management area of ***EDPS ICE***;
3. Activate the forwarding service plugin;

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;

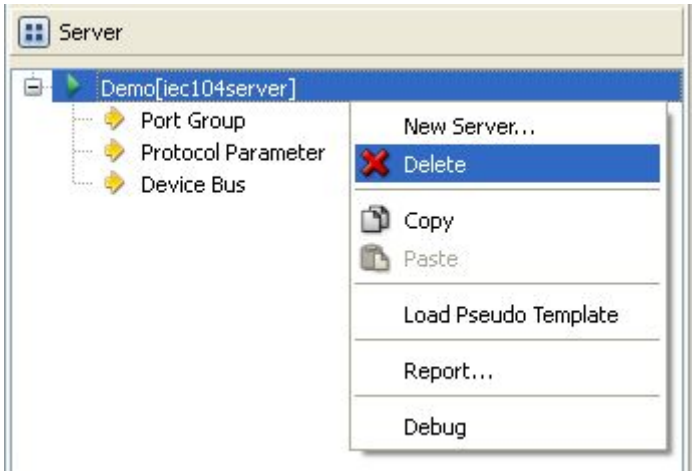
Note: Driver information

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.

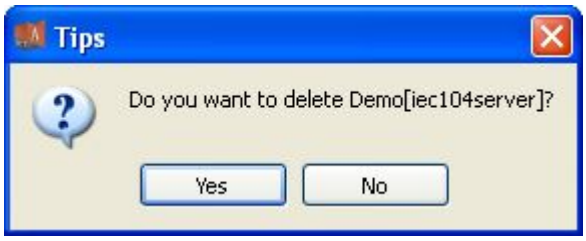
5	Channel update period (s)	Define the cycle of updating IED communication times.

Delete Delete IEC104 forwarding driver

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



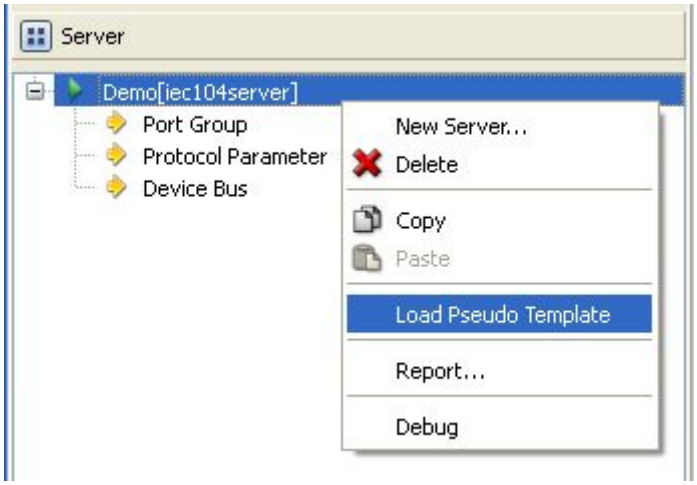
9. It prompts whether to delete;



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

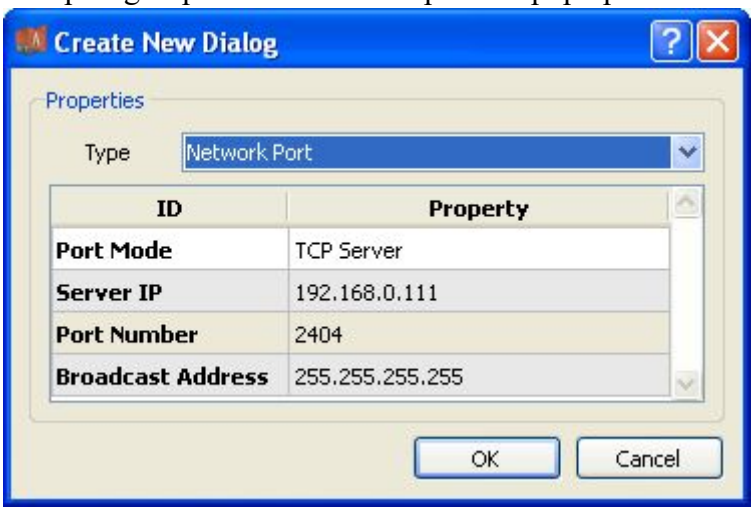
No.	Name	Description
1	Running status	Observe the running state information of the driver.
2	Authority	Observe the authorization state of the driver.

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;

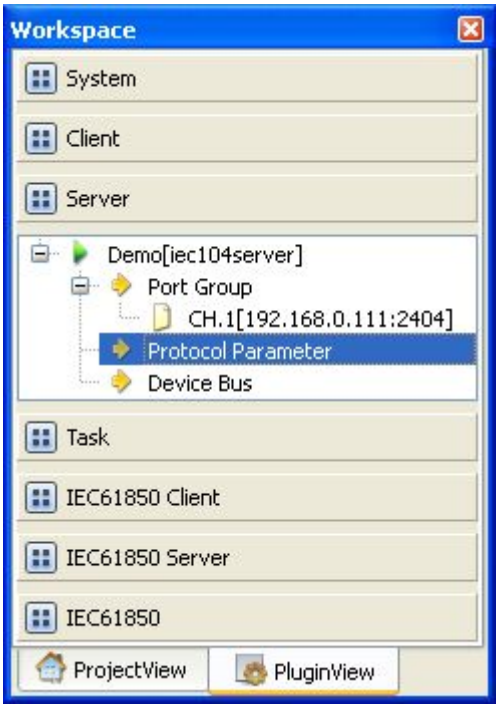
Delete Delete communication channel

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

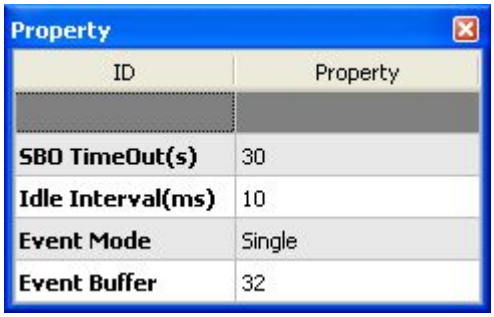
5.3.2.3. Protocol parameter

Overview Define communication protocol parameter of protocol

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



4. View protocol parameter attributes



Note: Protocol parameter information

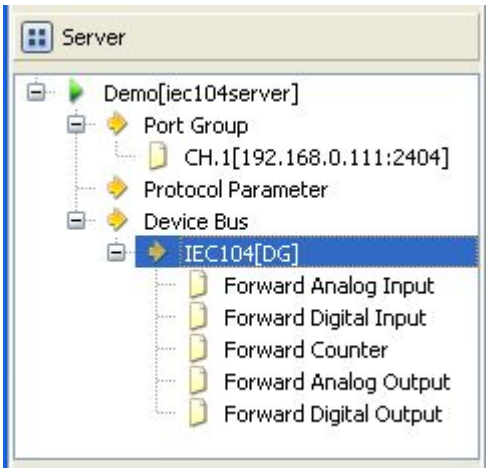
No.	Name	Description
1	SBO timeout (s)	Define the timeout interval of remote control selection command, in s
2	Idle interval (ms)	Define the idle time interval of communication, in ms
3	Event mode	Define the event handling mechanism; single channel for single connection and multichannel for all connections.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

5.3.2.4. Device parameter

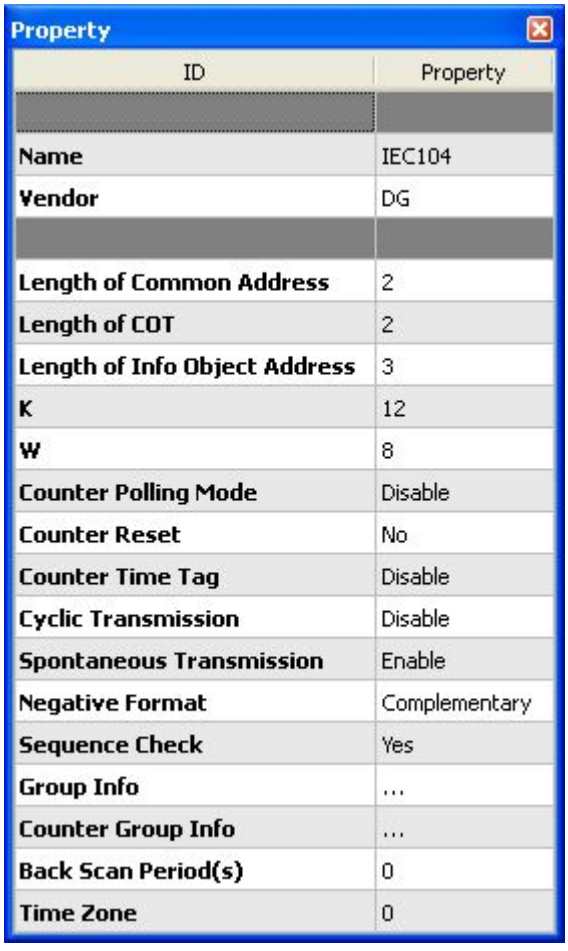
Overview Define device parameter of protocol

Attribute View device parameter attributes

1. Open a project, and select the plugin management page in the management area of ***EDPS ICE***;
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 ICE***;



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	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 ICE***

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 ICE***. 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

Public address Define the public address in communication process.

Point number Define the point number of information point.

ASDU type Define the application function type of information point.

- M_ME_NA_1 (normalized value)
- M_ME_NB_1 (scale value)
- M_ME_NC_1 (short floating-point number)
- M_ME_ND_1 (normalized value with quality)
- M_ST_NA_1 (step position information)

Working mode Define the working mode of information point.

- Cyclic
- Burst

Time mark Define whether an information point is provided with time mark in transmission frame.

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

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

Dead zone value 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

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.

5.3.2.5.3. 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.
Divisor	Define the division factor for computing raw data at the information point.

5.3.2.5.4. Analog output

Public address	Define the public address in communication process.
Point number	Define the point number of information point.
ASDU type	Define the application function type of information point. ● Normalized value ● Scale value ● Short floating-point number
Offset	Define the offset for computing raw data at the information point.
Divisor	Define the division factor for computing raw data at the information

point.

5.3.2.5.5. State output

Public address	Define the public address in communication process.
Point number	Define the point number of information point.
Control mode	Define the mode of executing control operation command at the information point. ● Direct execution ● Remote control selection

5.4. DNP3.0 protocol configuration

This chapter mainly describes how ***EDPS ICE*** 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 ICE*** provides a concise and fast way to help the user to conduct configuration.

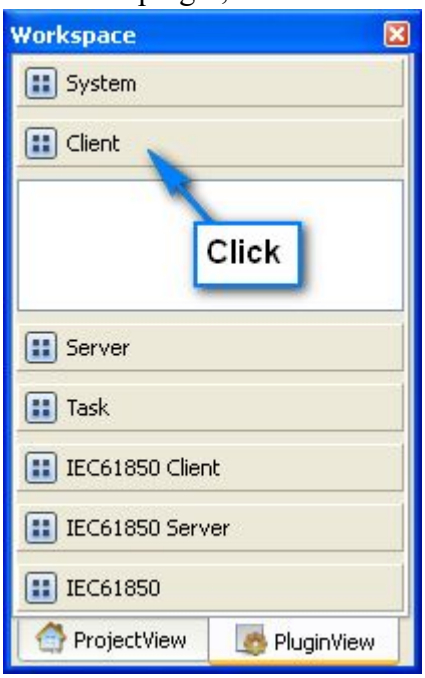
5.4.1. DNP3.0 acquisition configuration

5.4.1.1.Driver information

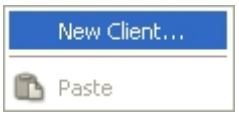
Overview Describe detailed information of acquisition driver

Create Create DNP protocol acquisition driver

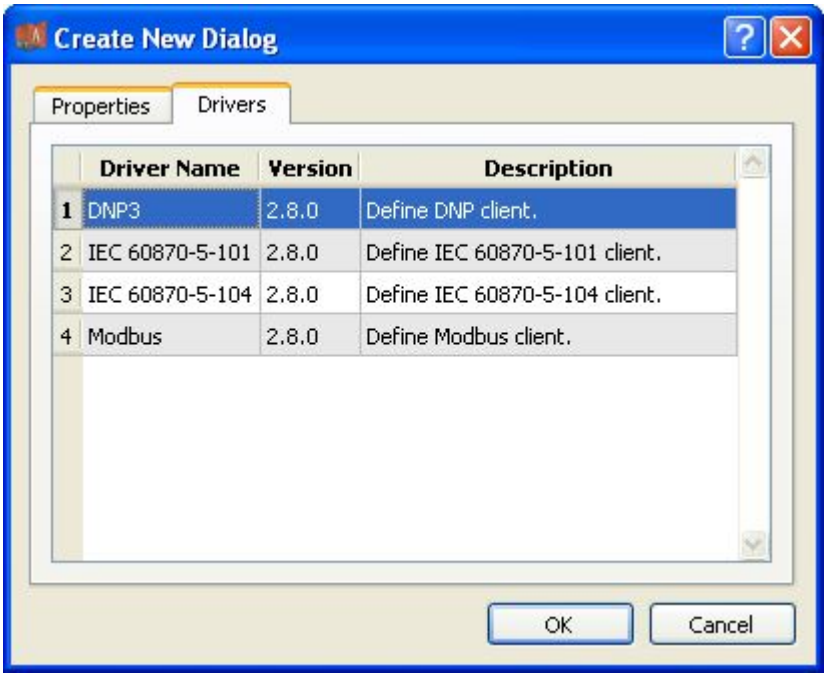
1. Open a project file;
2. Select the plugin management page in the management area of ***EDPS ICE***;
3. Activate the acquisition service plugin;



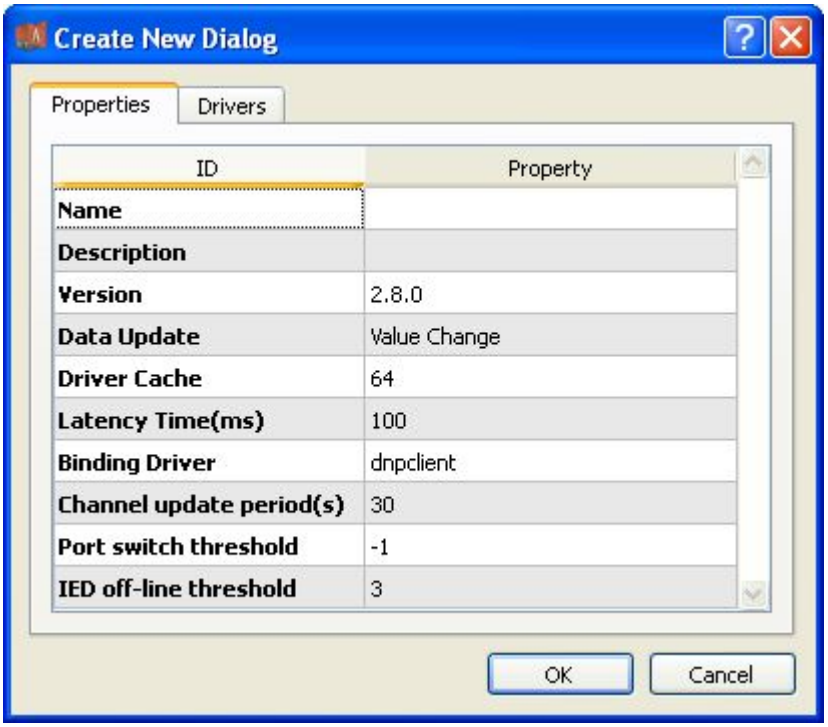
4. Right click in the blank space, and select the menu option “New acquisition service” to pop up the “Create driver dialog”;



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



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



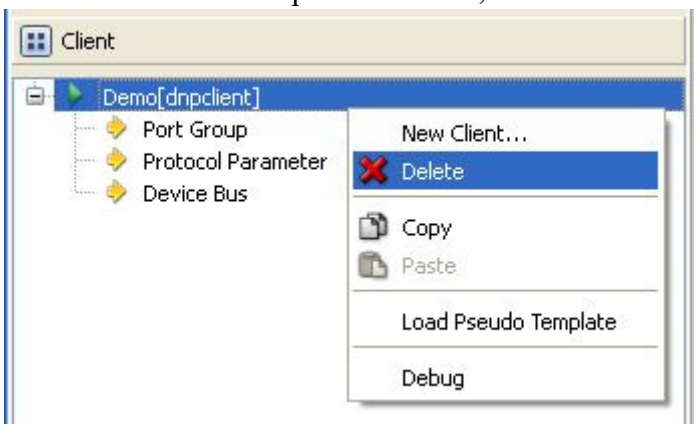
7. Click “OK” to complete creation;

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 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

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

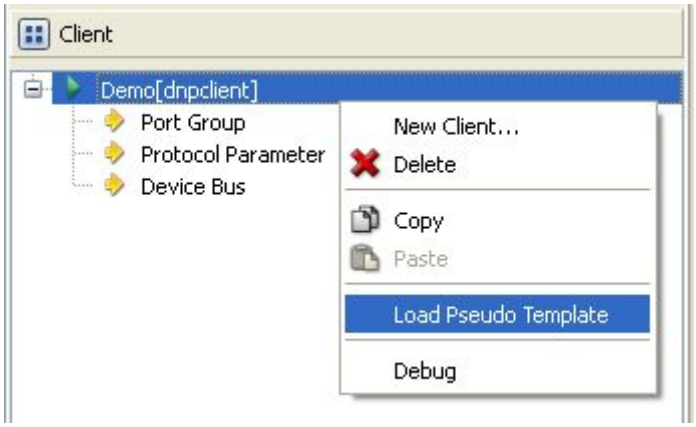


9. It prompts whether to delete;

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

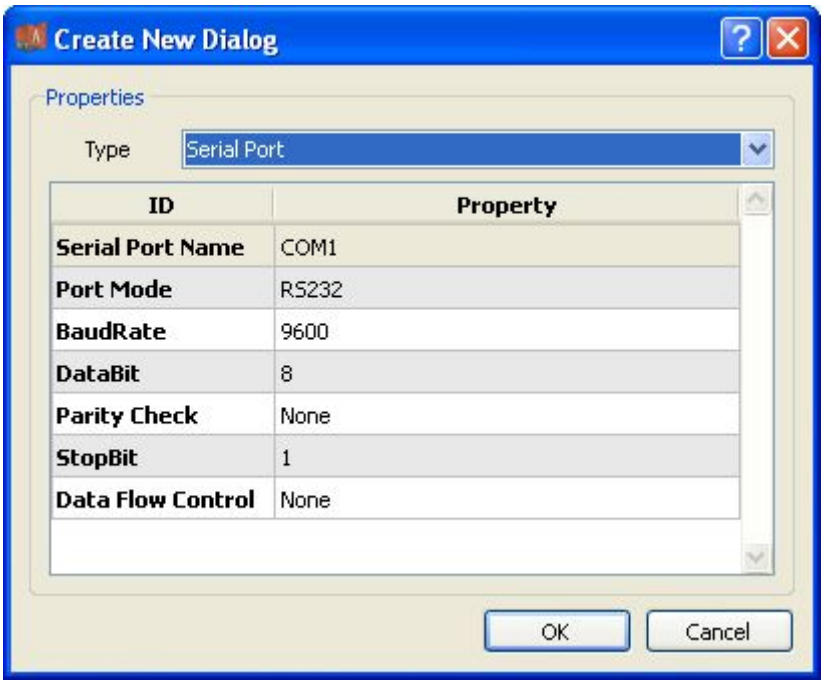
No.	Name	Description
1	Running status	Observe the running state information of the driver.
2	Authority	Observe the authorization state of the driver.

5.4.1.2. 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

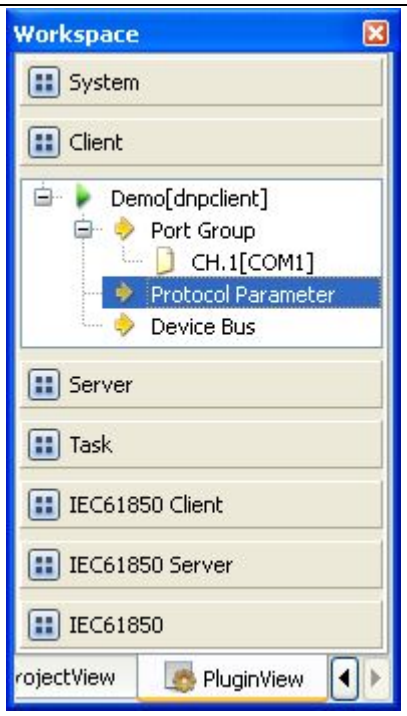
3. Right click a channel number and click “Delete”, and select “Yes” to complete deletion.

5.4.1.3. Protocol parameter

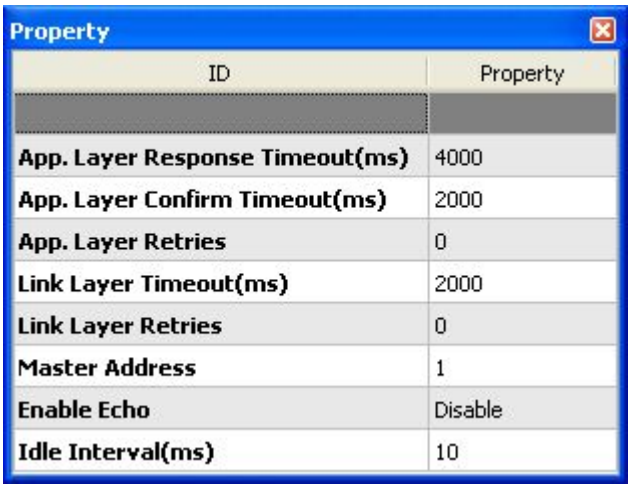
Overview Define communication protocol parameter of protocol

Attribute View protocol parameter attributes of ***EDPS ICE***

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



4. View protocol parameter attributes



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 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.
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

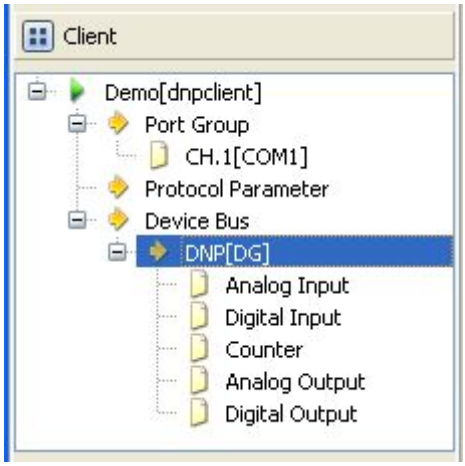
		within the time interval, the system decided that the communication fails.
5	Link layer retries	Define the times for which the link data need to be resent after link data fails to be processed.
6	Master address	Define the source station address of data communication.
7	Echo enabled	Define whether to 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

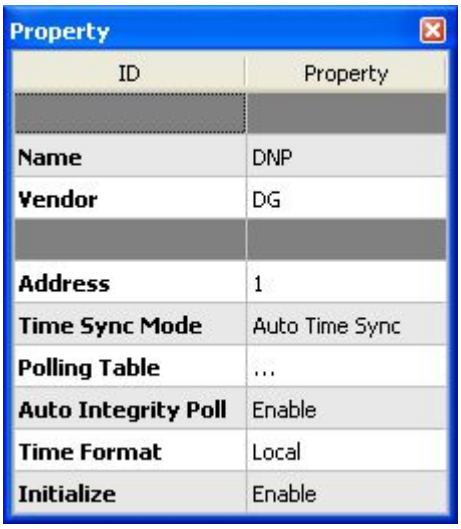
Overview Define device parameter of protocol

Attribute View device parameter attributes

1. Open a project, and select the plugin management page in the management area of ***EDPS ICE***;
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 ICE***;



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 ICE***

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 ICE***. 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

Point number Define the point number of information point.

5.4.1.5.2. State input

Point number Define the point number of information point.

5.4.1.5.3. Cumulant input

Object number Define the object number of cumulant processing.
- 20 - binary cumulant
- 21 - frozen cumulant

Point number Define the point number of cumulant input.

5.4.1.5.4. Analog output

Point number Define the point number of analog output.

Data length Define the data length of analog output.
- 16-bit integer
- 32-bit integer

5.4.1.5.5. State output

Point number	Define the point number of state output.
Output mode	Define the output mode of state output. • Open/close • Pulse • Block
Pulse number	Define the number of output pulses.
High-level time	Define the output duration of pulse rising time.
Low-level time	Define the output duration of pulse falling time.

5.4.2. DNP3.0 forwarding configuration

5.4.2.1. Driver information

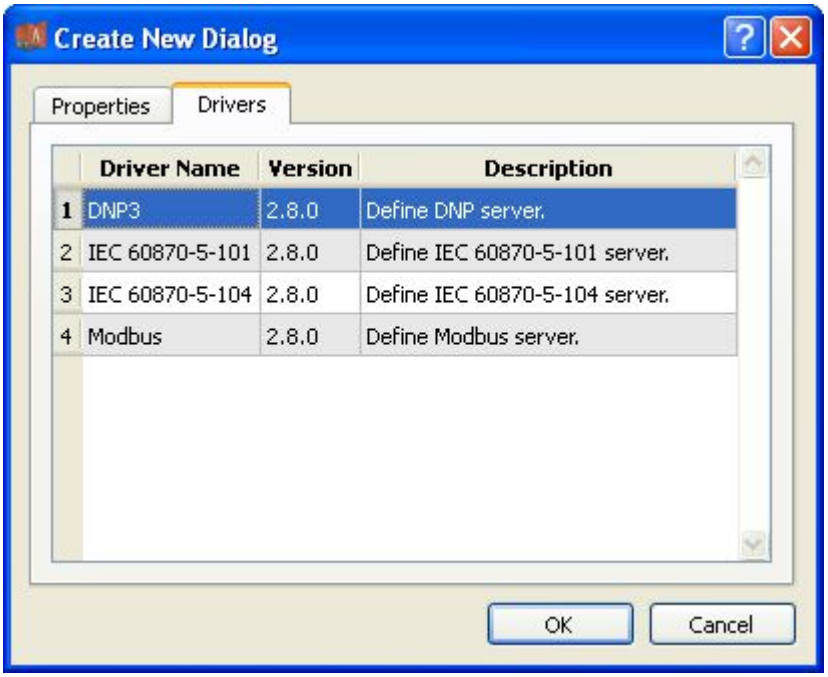
Overview Describe detailed information of forwarding driver

Create Create DNP forwarding driver

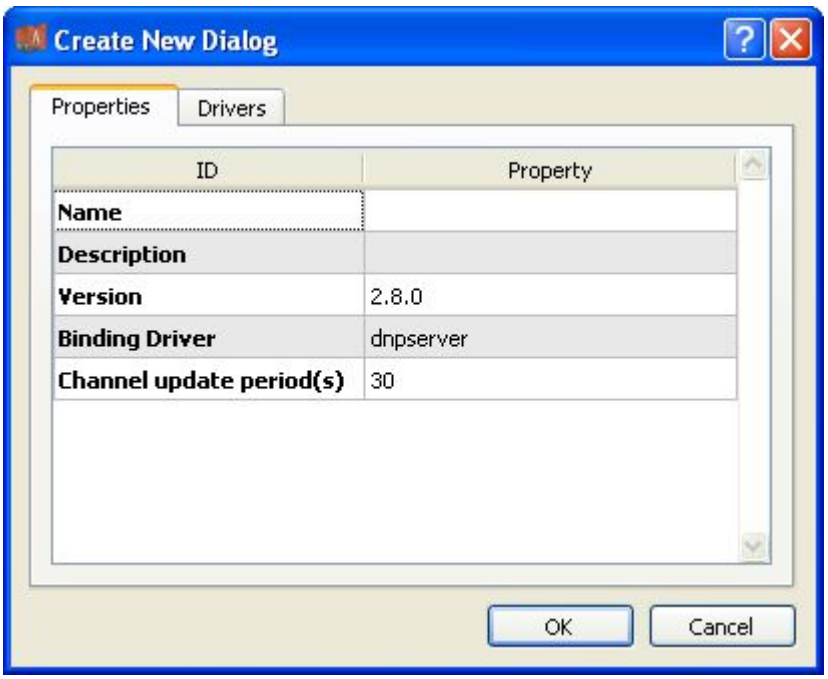
1. Open a project file;
2. Select the plugin management page in the management area of ***EDPS ICE***;
3. Activate the forwarding service plugin;

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;

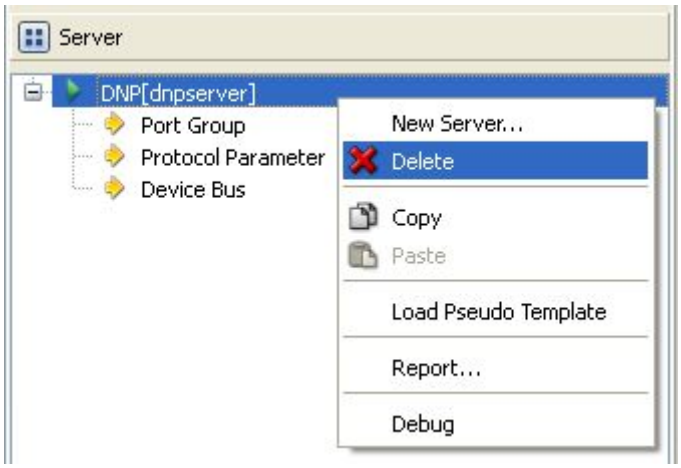
Note: Driver information

No.	Name	Description
1	Name	Define the display name of driver.
2	Description	Define how to describe the driver.

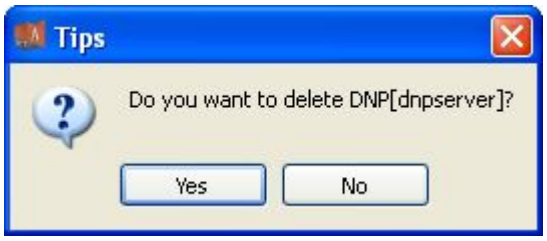
3	Version	Define the version information of driver.
4	Binding driver	Define the name of binding module, which is unique and cannot be modified.
5	Channel update period(s)	Define the cycle of updating IED communication times.

Delete Delete DNP forwarding driver

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



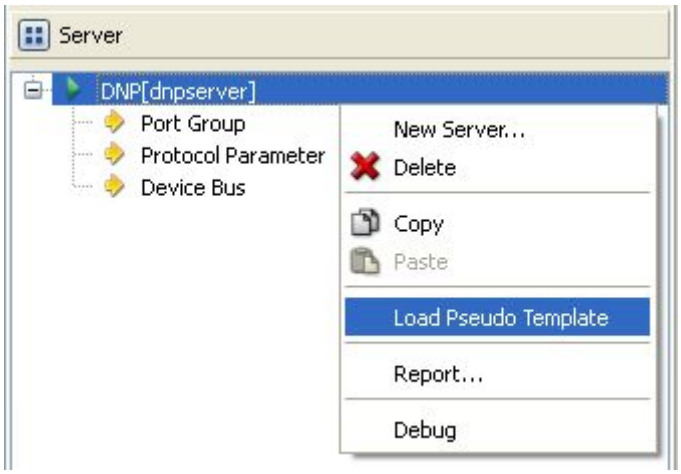
9. It prompts whether to delete;



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

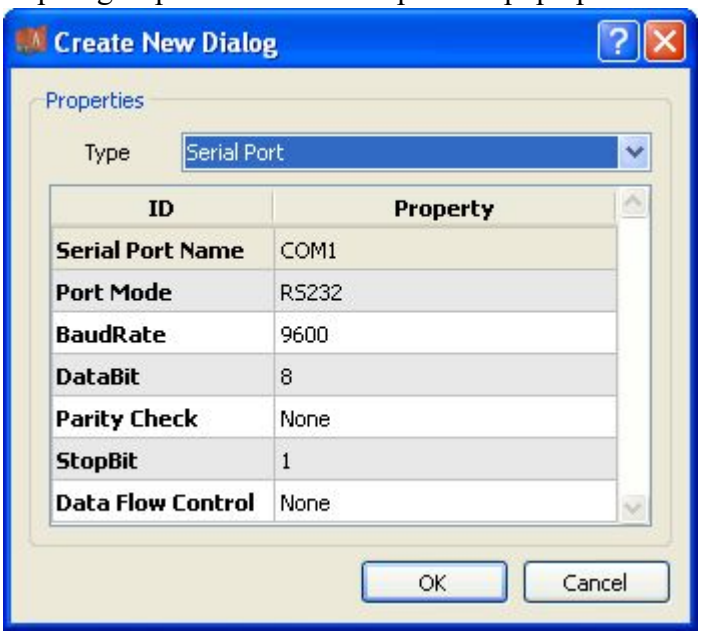
No.	Name	Description
1	Running status	Observe the running state information of the driver.
2	Authority	Observe the authorization state of the driver.

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;

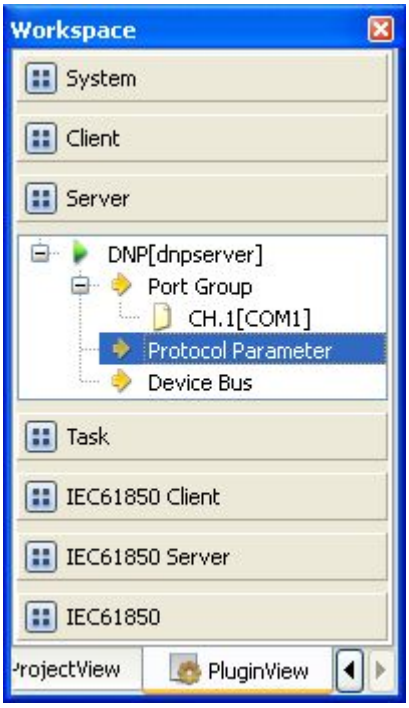
Delete Delete communication channel

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

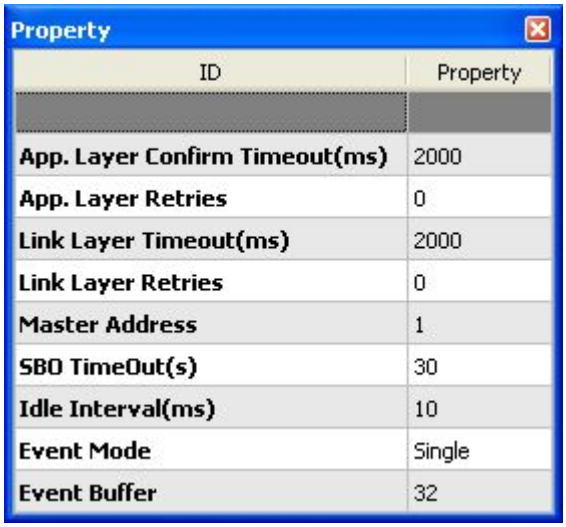
5.4.2.3. Protocol parameter

Overview Define communication protocol parameter of protocol

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



4. View protocol parameter attributes



Note: Protocol parameter information

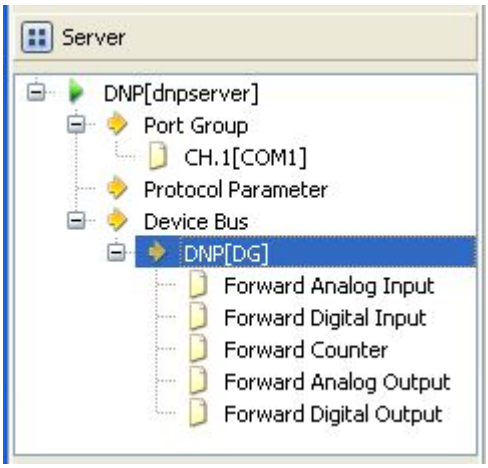
No.	Name	Description
1	App.layer confirm timeout (ms)	Define the timeout interval of acknowledgement frame; when the system doesn't receive the acknowledgement frame of application layer within the time interval, the system decided that the communication fails.
2	App.layer retries	Define the times for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

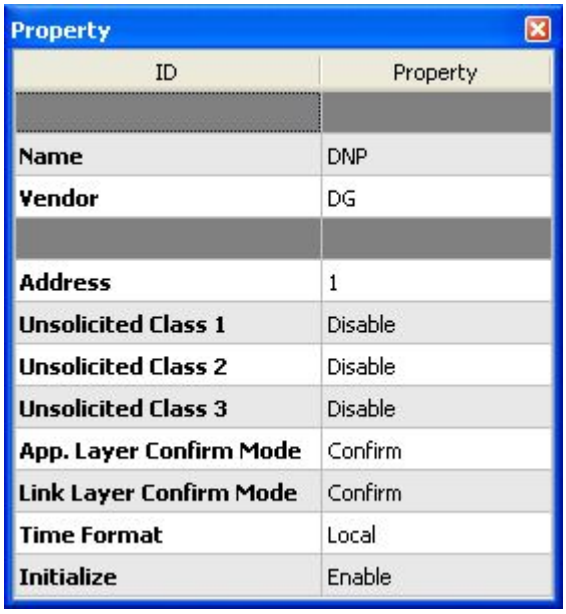
Overview Define device parameter of protocol

Attribute View device parameter attributes

1. Open a project, and select the plugin management page in the management area of ***EDPS ICE***;
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 ICE***;

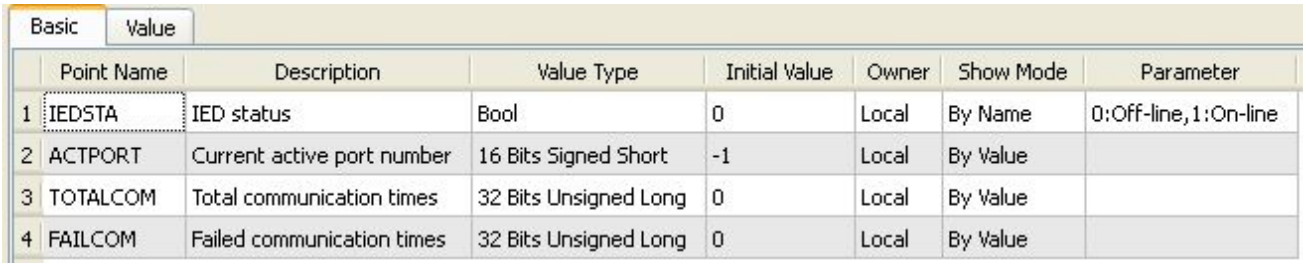


Note: Device attribute information

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 ICE***



	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 ICE***. 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

Point number Define the index number of information point.

Category Define the processing level of current information point.

- Invalid
- Class 1 data
- Class 2 data
- Class 3 data

Data length	Define the size of data. • 16-bit integer • 32-bit integer • 32-bit floating point • 64-bit double precision
Time mark	Define whether to perform time mark processing to data.
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.
Dead zone value	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

Point number	Define the index number of information point.
Category	Define the processing level of current information point. • Invalid • Class 1 data • Class 2 data • Class 3 data
Automatic SOE	Define whether the system transmits 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 forwards SOE after it receives valid SOE data.
Data length	Define the data length of information point. • 1-bit state • 2-bit state

5.4.2.5.3. Cumulant input

Point number	Define the index number of information point.
Category	Define the processing level of current information point. • Invalid • Class 1 data • Class 2 data • Class 3 data
Data type	Define the data type of information point. • Binary cumulant • Frozen cumulant

Data length	Define the size of data. • 16-bit integer • 32-bit integer
Min. value	Define the minimum value for data conversion at the information point.
Max. value	Define the minimum value for data conversion at the information point.
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.
Dead zone value	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

Point number	Define the index number of information point.
Data length	Define the processing level of current information point. • 16-bit integer • 32-bit integer
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.

5.4.2.5.5. State output

Point number	Define the index number of information point.

6. Frequently Asked Questions

6.1. Hardware Failures and Troubleshooting

6.1.1. 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
DG-A2/A4	12VDC	12~24VDC
DG-A2/A4A8/A16	220VAC/110V DC	85~265VAC/100~375V DC

- 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.

6.1.2. 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.

6.1.3. 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.

6.1.4. 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 table 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 120Ω 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.

6.2. Software problems and solutions

6.2.1. 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 first password is "ENG", the second password is "digigrid", and both of them are invisible.

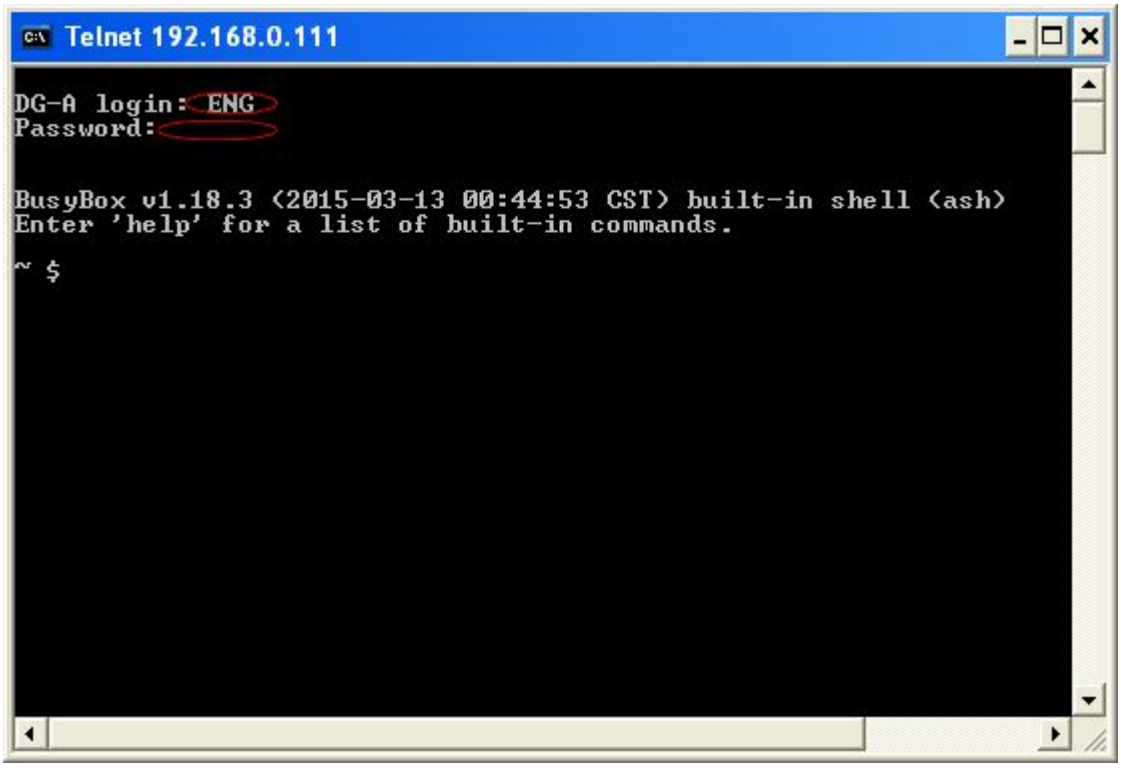


Figure 6.1 Telnet interface

6.2.2. 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

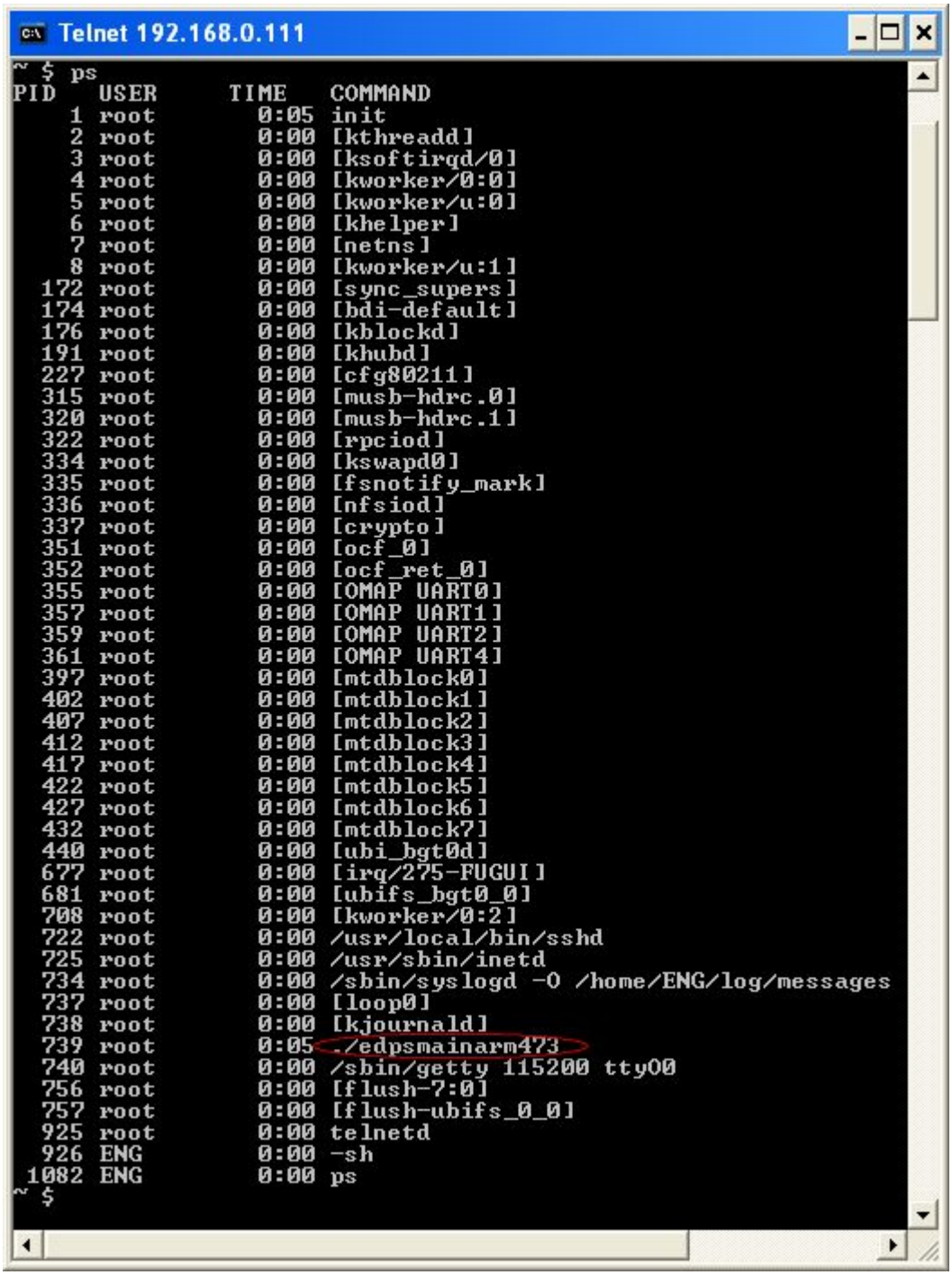


Figure 6.2 Main program running interface

6.2.3. 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

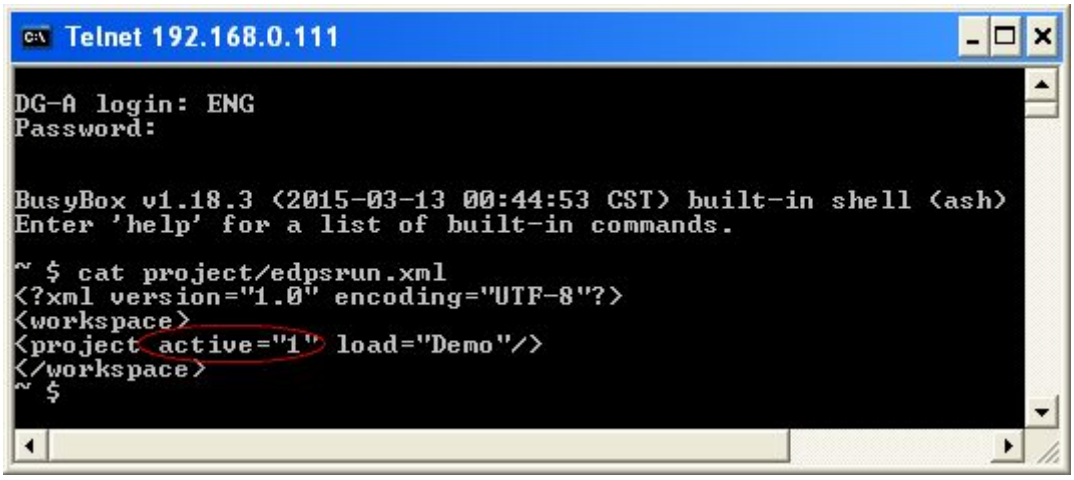


Figure 6.3 Currently running project interface

6.2.4. How to view and update driver files

Here introduce two methods of viewing drivers

View drivers via the ICE tool (integrated with configuration environment)

- Open the ICE 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 both the username and password are "root", as shown in Figure 6.4.

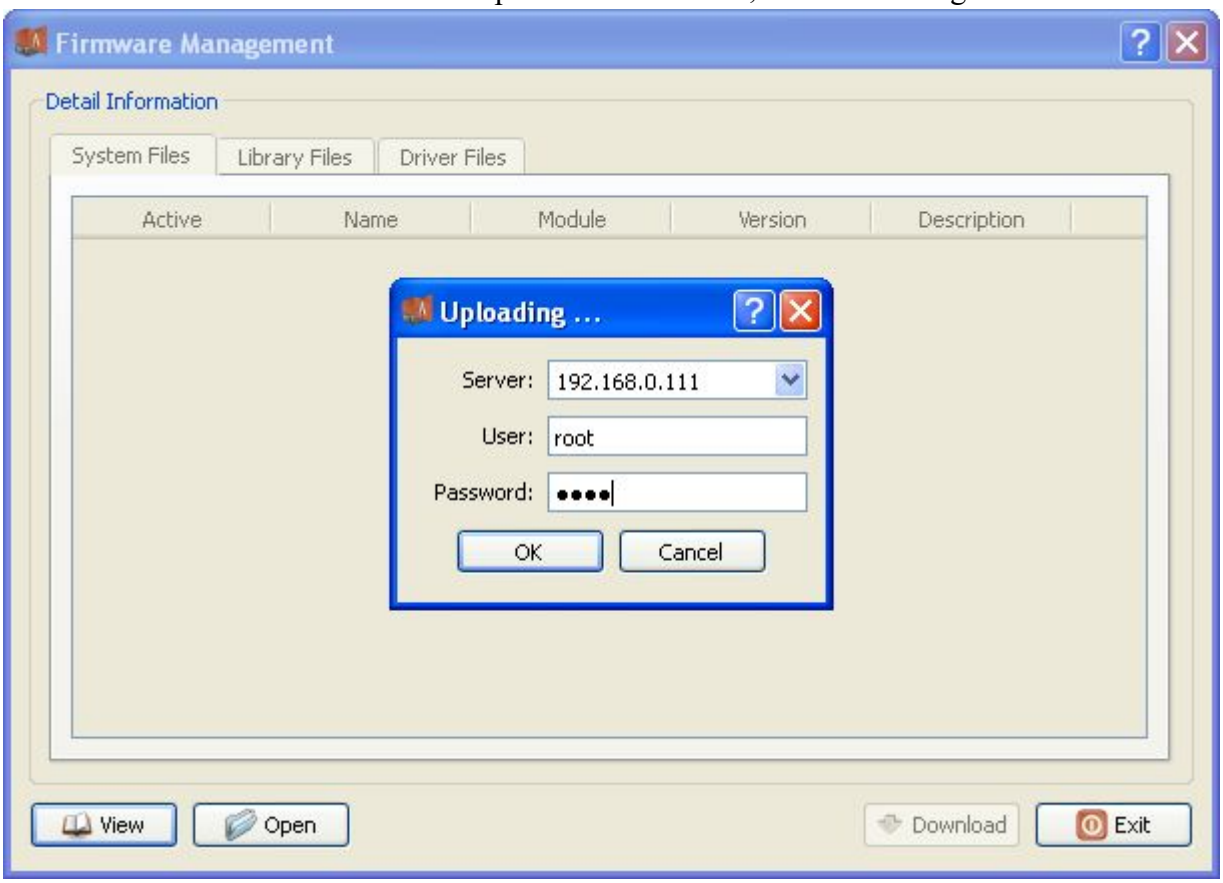
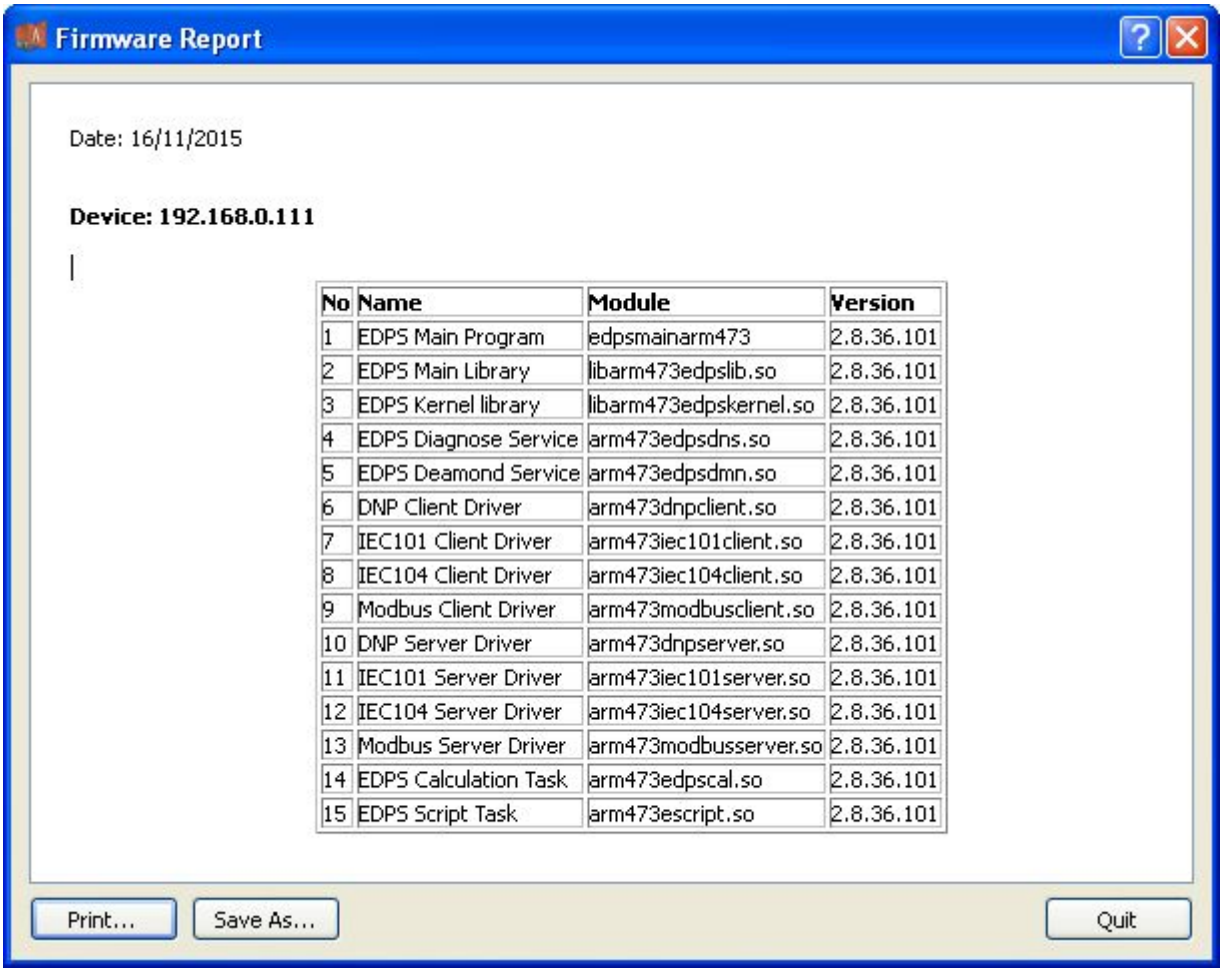


Figure 6.4 Query firmware

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

shown in Figure 6.5.



No	Name	Module	Version
1	EDPS Main Program	edpsmainarm473	2.8.36.101
2	EDPS Main Library	libarm473edpslib.so	2.8.36.101
3	EDPS Kernel library	libarm473edpskernel.so	2.8.36.101
4	EDPS Diagnose Service	arm473edpsdns.so	2.8.36.101
5	EDPS Deamond Service	arm473edpsdmn.so	2.8.36.101
6	DNP Client Driver	arm473dnpclient.so	2.8.36.101
7	IEC101 Client Driver	arm473iec101client.so	2.8.36.101
8	IEC104 Client Driver	arm473iec104client.so	2.8.36.101
9	Modbus Client Driver	arm473modbusclient.so	2.8.36.101
10	DNP Server Driver	arm473dnpserver.so	2.8.36.101
11	IEC101 Server Driver	arm473iec101server.so	2.8.36.101
12	IEC104 Server Driver	arm473iec104server.so	2.8.36.101
13	Modbus Server Driver	arm473modbusserver.so	2.8.36.101
14	EDPS Calculation Task	arm473edpscal.so	2.8.36.101
15	EDPS Script Task	arm473escript.so	2.8.36.101

Figure 6.5 Firmware information

Here introduces the method of updating drivers

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: digigrid).
- 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.

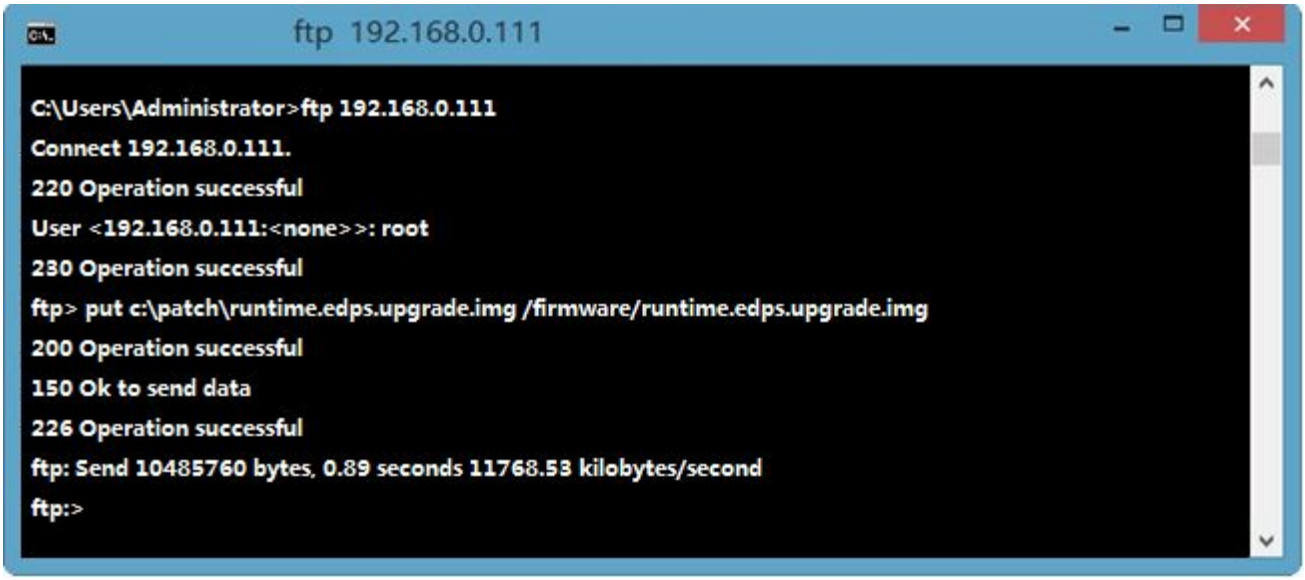


Figure 6.6 Driver updating

6.2.5. 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.

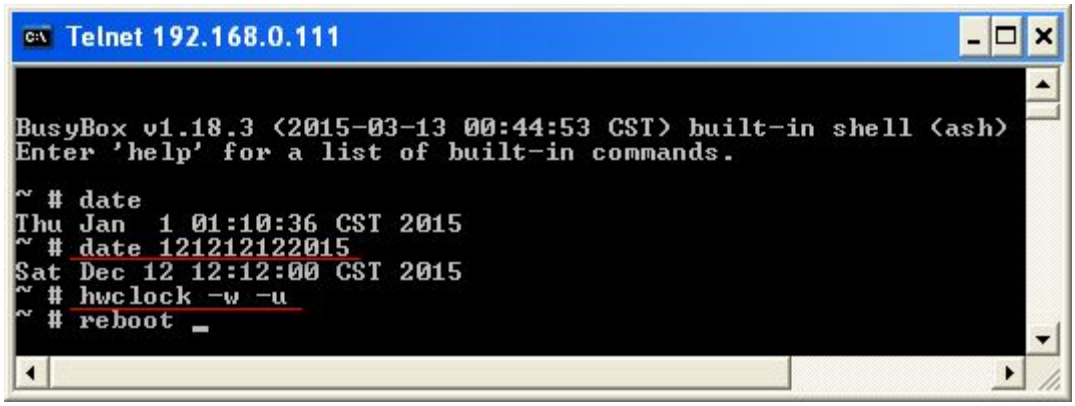


Figure 6.7 Modify system time

6.2.6. How to modify the IP address of device

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 ICE configuration tool

- Open the ICE 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

6.3. Manufacturer support

Thank you for your attention to Digigrid products and services, and please contact us if you have any questions or opinions:

Shanghai Digigrid Information Technology Co., Ltd.

Address: Floor 5~6, Building 2, No.1295 Xinjinqiao Road, Pudong New Area, Shanghai

Tel.: +86-21-6162-9238

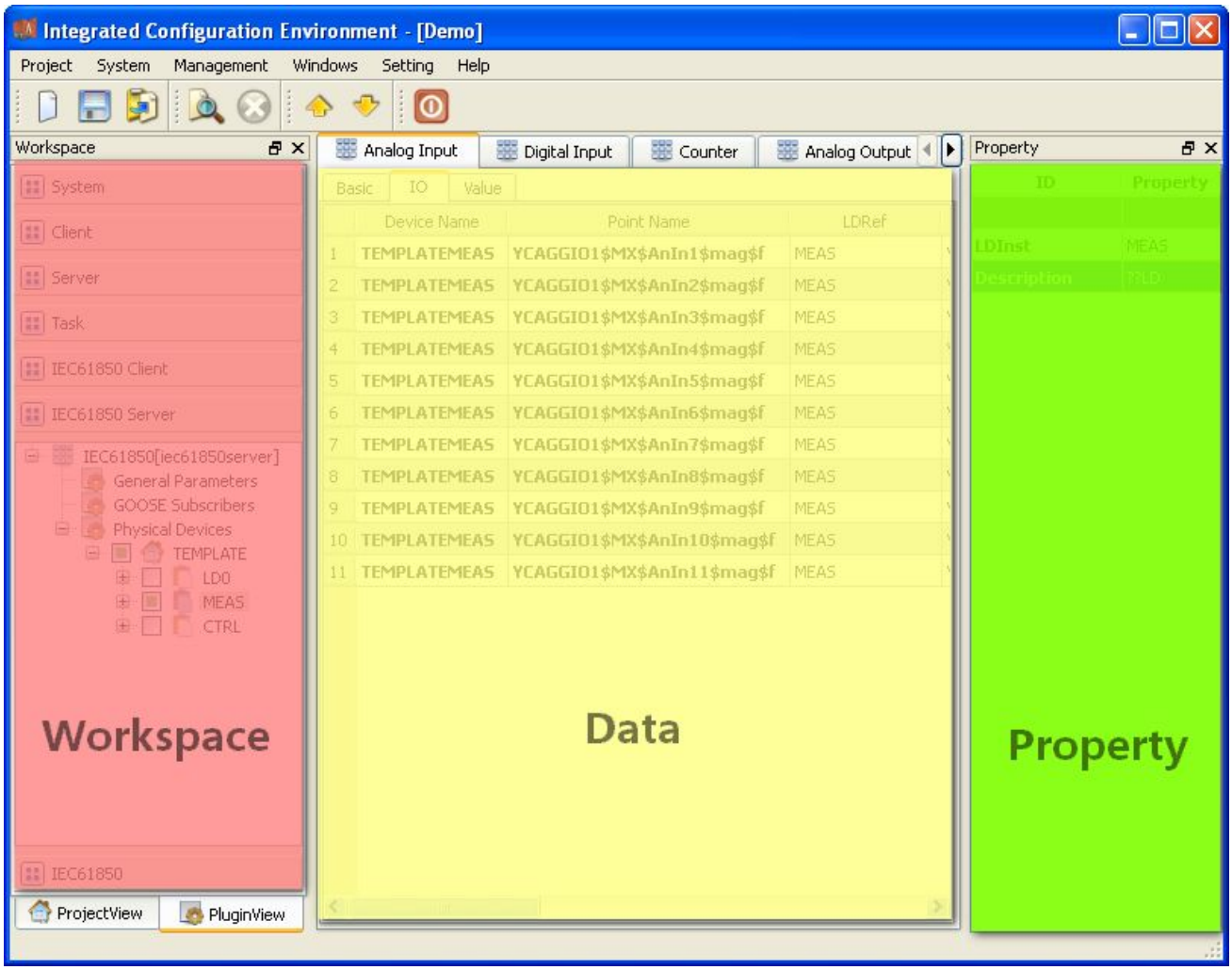
Fax: +86-21-6162-9213

Website: http://www.digigrid.com.cn

Appendix A IEC 61850 Configuration

Appendix A mainly describes how ***EDPS ICE*** configures IEC 61850 acquisition and proxy (forwarding) modules, and for the independence of IEC 61850 modules, ***EDPS ICE*** 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 ICE integrates configuration software by means of plugin. IEC 61850 plugins are ***EDPS ICE*** configuration plugins which meet ***EDPS ICE*** plugin interface and specially serve IEC 61850 proxy.Plugins are managed through the plugin manager of ***EDPS ICE***. ***EDPS ICE*** plugin has three view interfaces: management area, data area, and attribute area.



A.1. IEC 61850 acquisition

A.1.1.Driver management

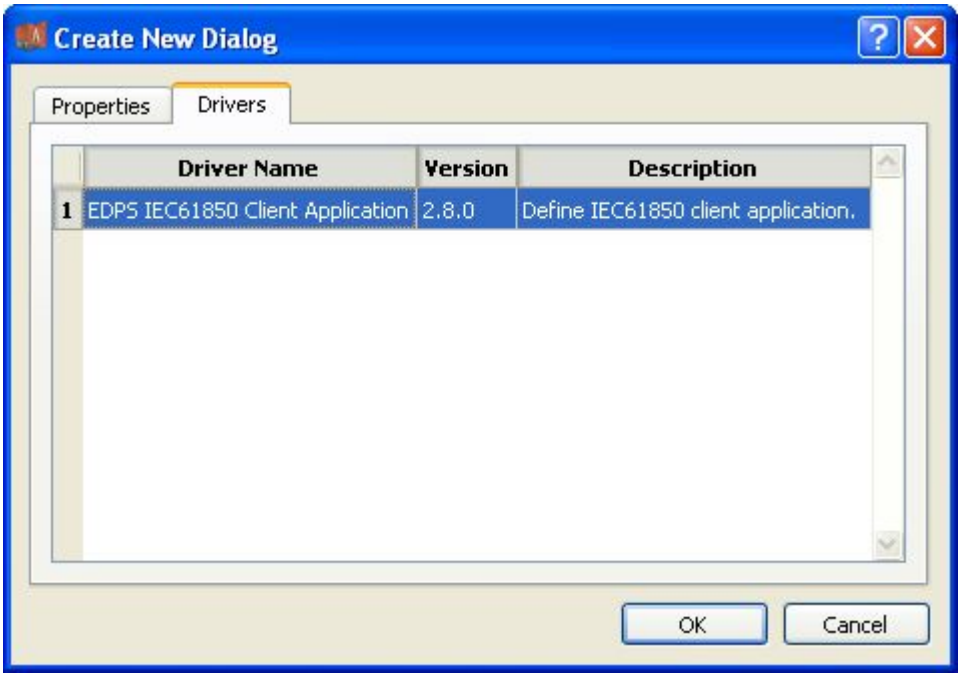
Create Create IEC 61850 acquisition driver

1. Open a project file;

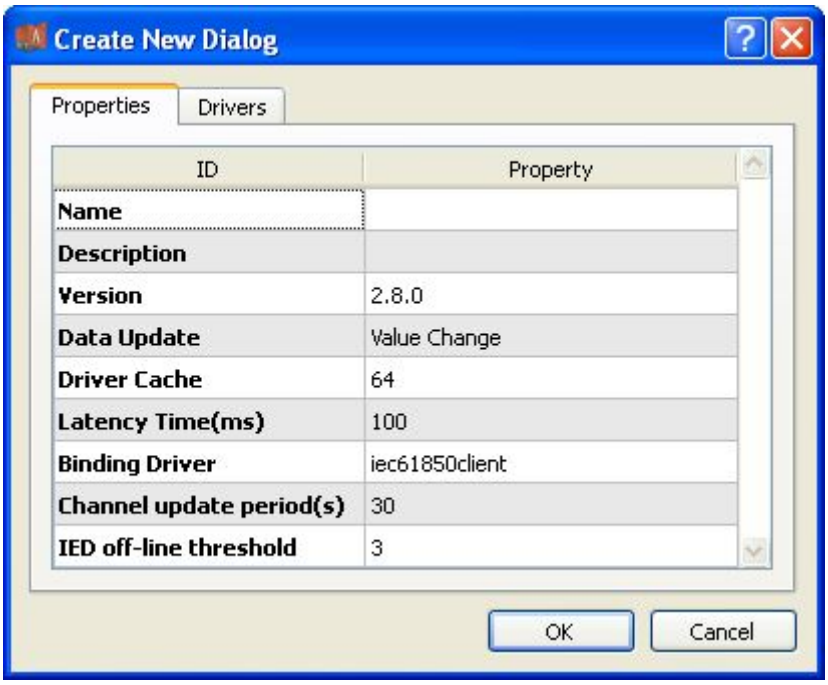
2. Select the plugin management page in the management area of ***EDPS ICE***;
3. Activate IEC 61850 acquisition plugin;

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

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;

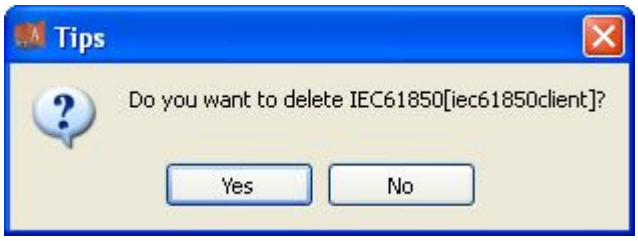
Note: Driver information

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 period (s)	Define the cycle of updating IED communication times.
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

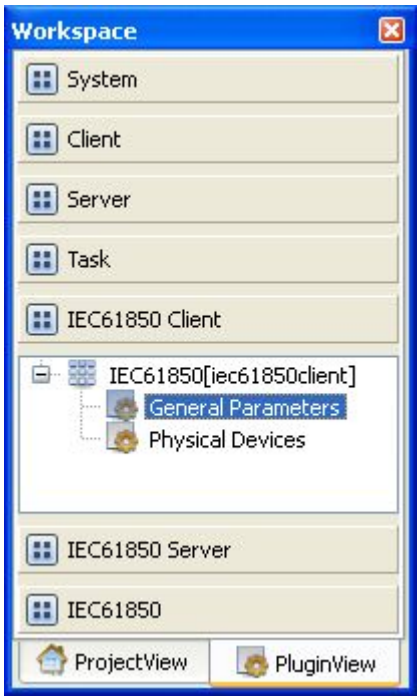
No.	Name	Description
1	Running status	Observe the running state information of the driver.
2	Authority	Observe the authorization state of the driver.

A.1.2. General parameters

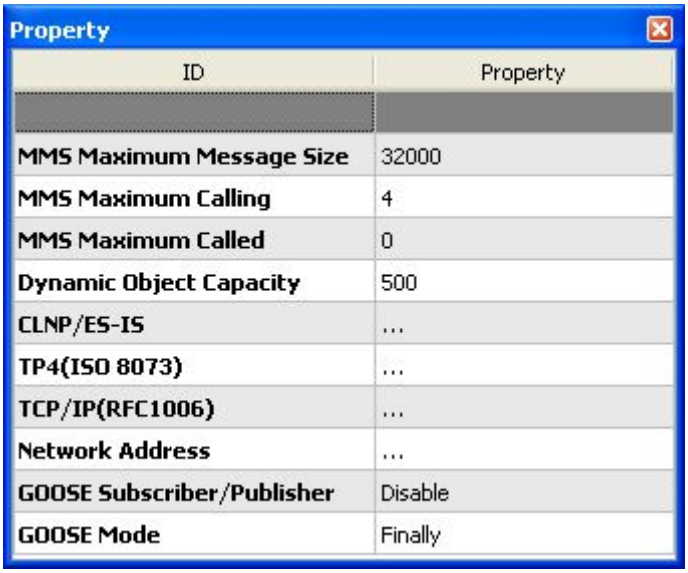
Overview View and configure general parameter information of IEC 61850 driver

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 ICE***;
3. Activate IEC 61850 acquisition plugin;
4. Select the general parameter node in the management area;



5. View the information in the attribute area;



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

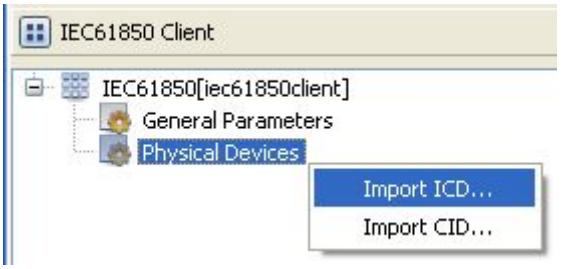
No.	Name	Description	Remarks
1	MMS Maximum message size	Define the maximum PDU length information.	Configure it with the default parameter
2	MMS Maximum calling	Define the maximum number of connections of MMS service	Configure it according to actual situation, or by referring to the figure

			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 actua l situation
10	GOOSE mode	Define the parsing mode of GOOSE information.	Configure it according to actual situation

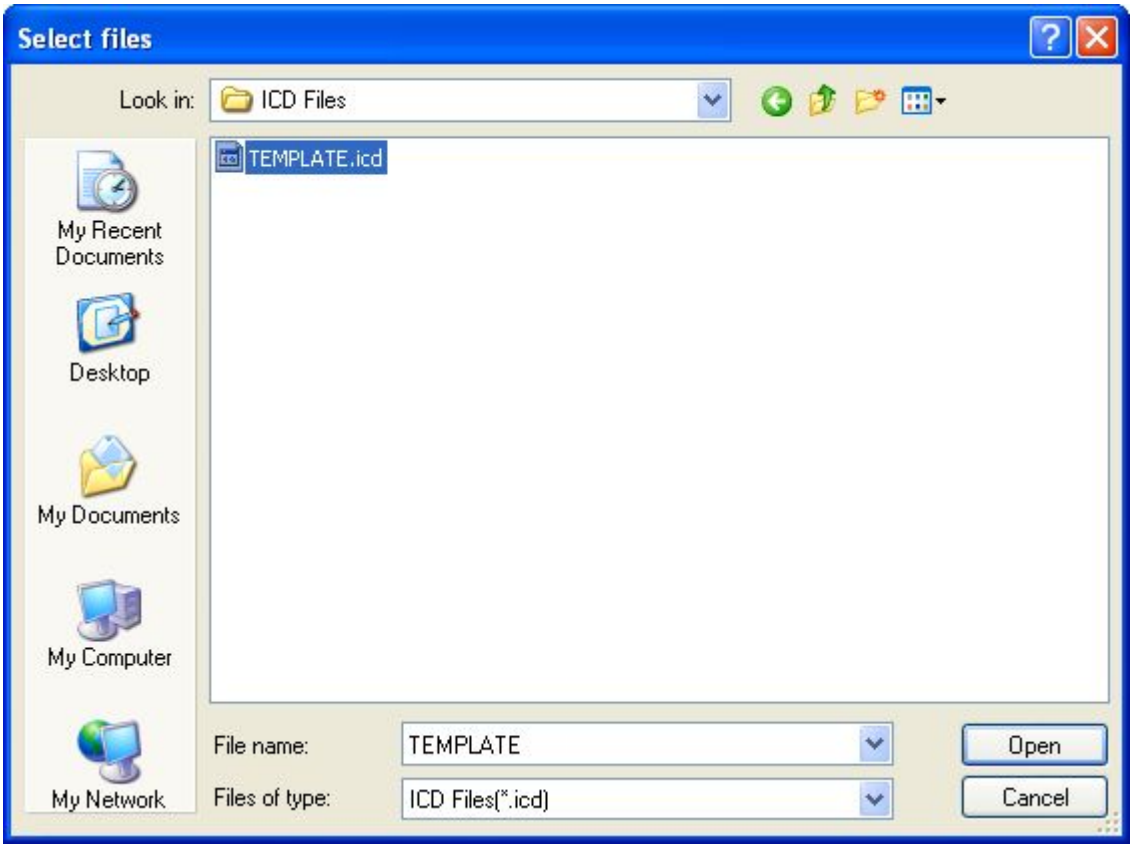
A.1.3. Physical device management

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

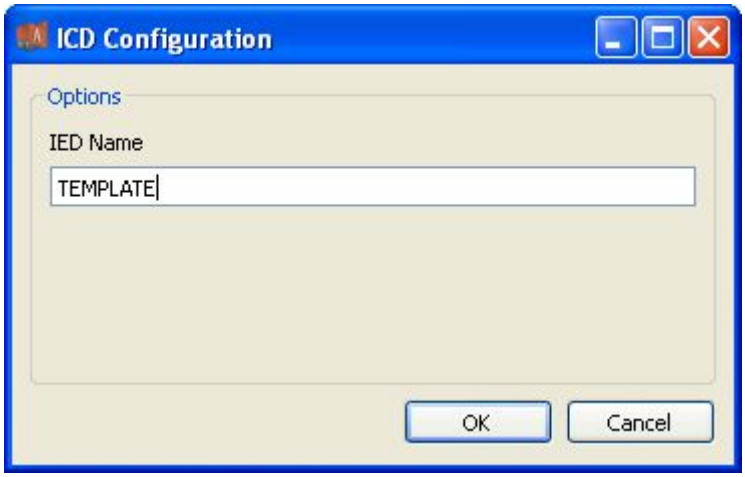
1. Open a project file;
2. Select the plugin management page in the management area of ***EDPS ICE***;
3. Activate IEC 61850 acquisition plugin;
4. Right click the node of physical device, and select "Import ICD";



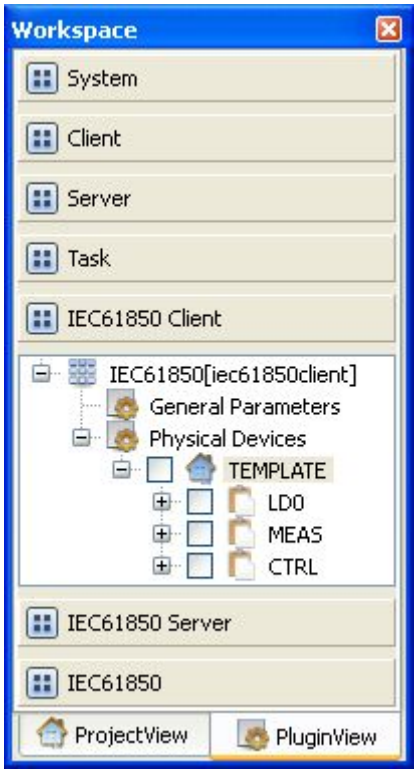
5. Open the selected file in the pop-up dialog box "Select file";



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



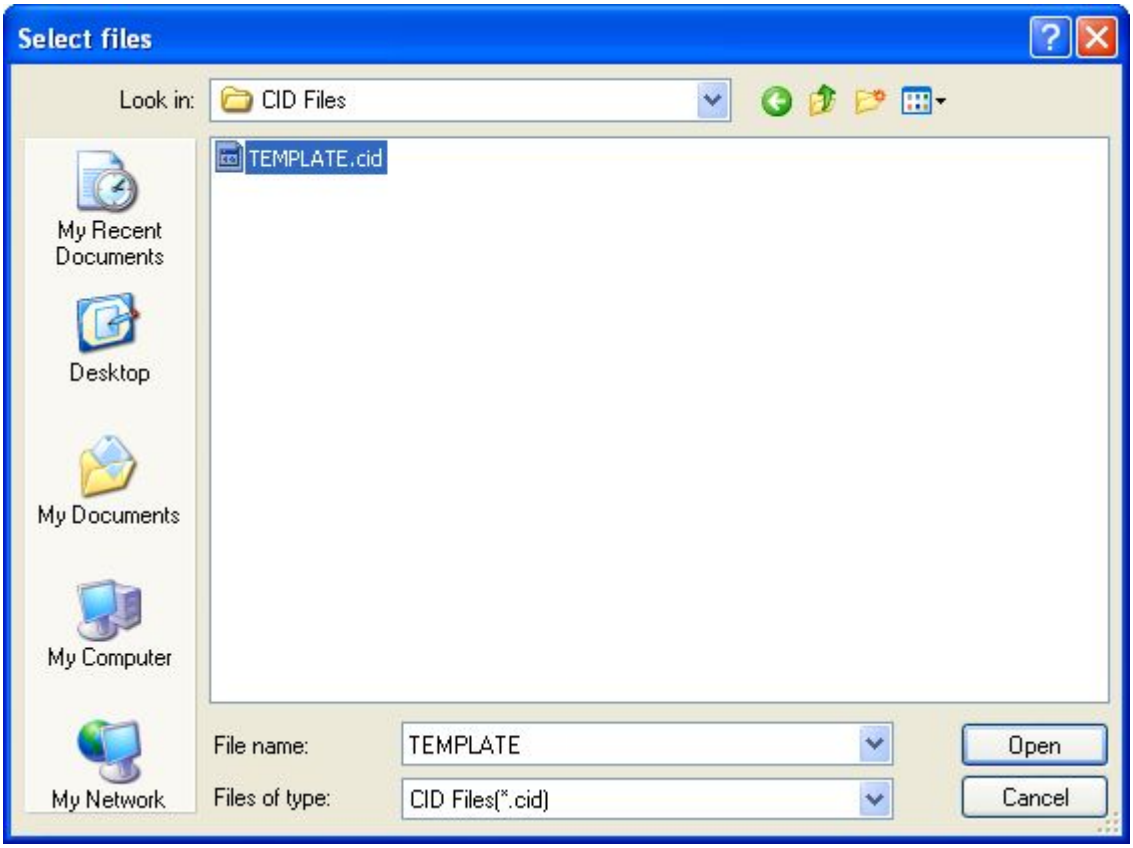
7. Edit the instance name of IED device and click "OK" to complete the creation of IEC 61850 device;



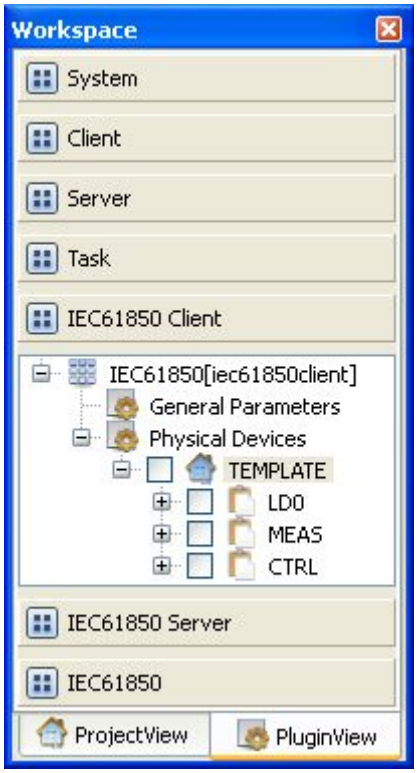
Import CID file Create IEC 61850 acquisition device by importing IEC 61850 CID file

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";

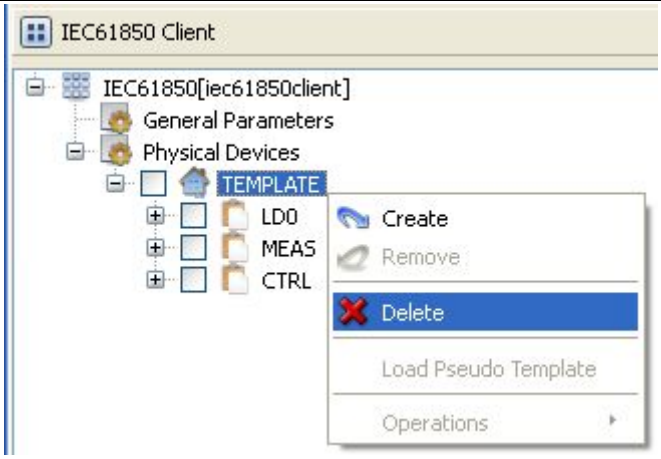


10. Click “OK” to complete creation of IEC 61850 device;

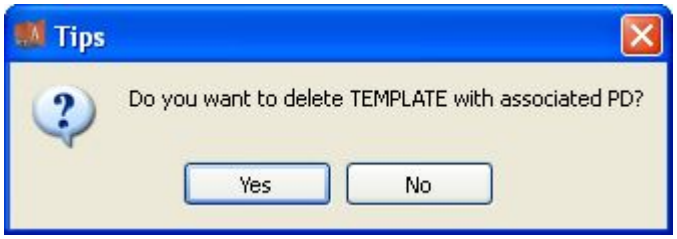


Delete device Completely delete the imported IEC 61850 device

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



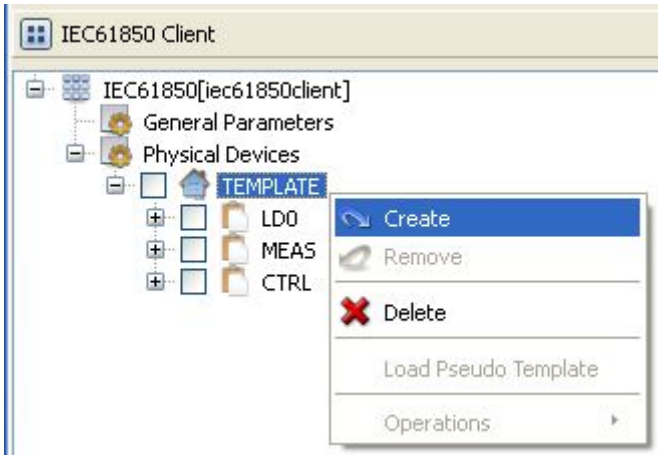
12. Select the menu option “Delete”;



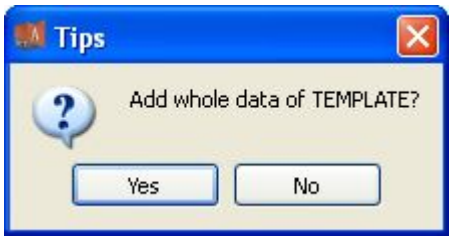
13. Click “Yes” to complete the deletion of IEC 61850 physical device;

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;



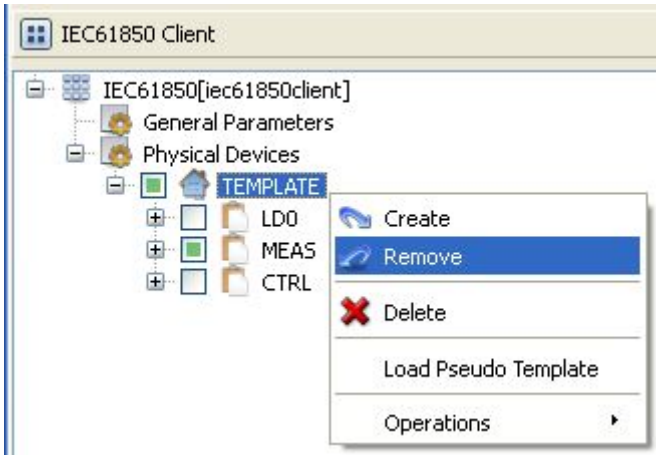
16. Click "Yes" to establish mapping relation between all information points in IEC 61850 device and EDPS;

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

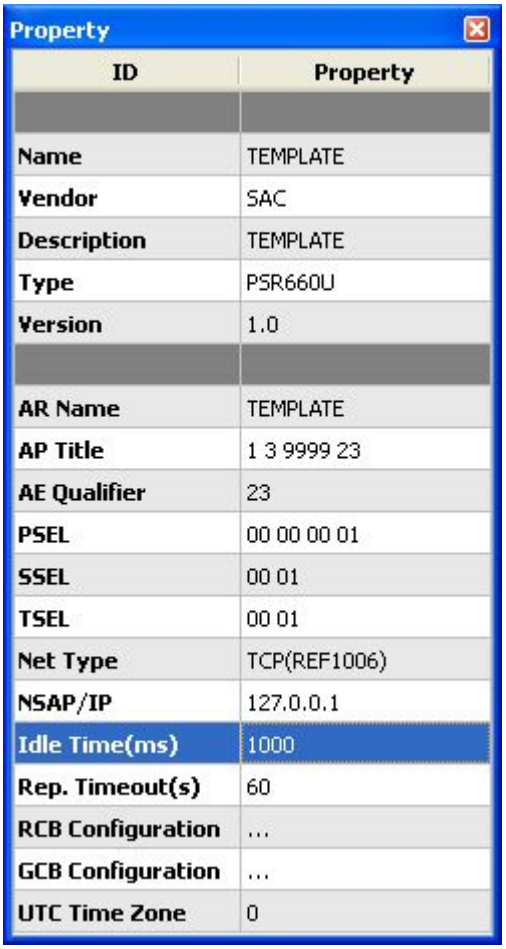
20. Click the first-level child node under the node of physical device;
21. View virtual points in the data area of ***EDPS ICE***;

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	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 ICE***;

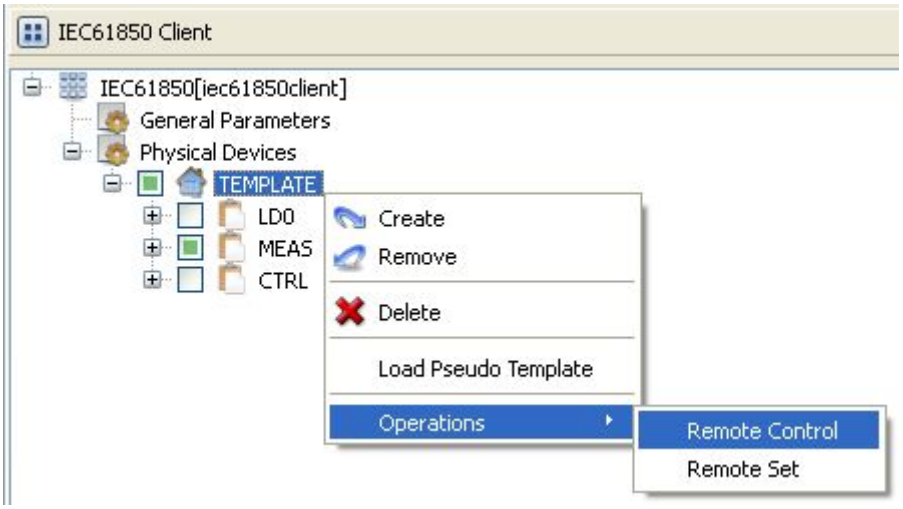


No.	Name	Description	Remarks
1	Name	Define the name of device	Edit it when importing ICD/CID files according to actual configuration
2	Vendor	Define the manufacturer of device.	Defined by ICD/CID file configuration
3	Description	Define the description information of device.	The same as item 2 above
4	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 OSI protocol stack, which is 4-byte by default.	Defined by ICD/CID file; 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

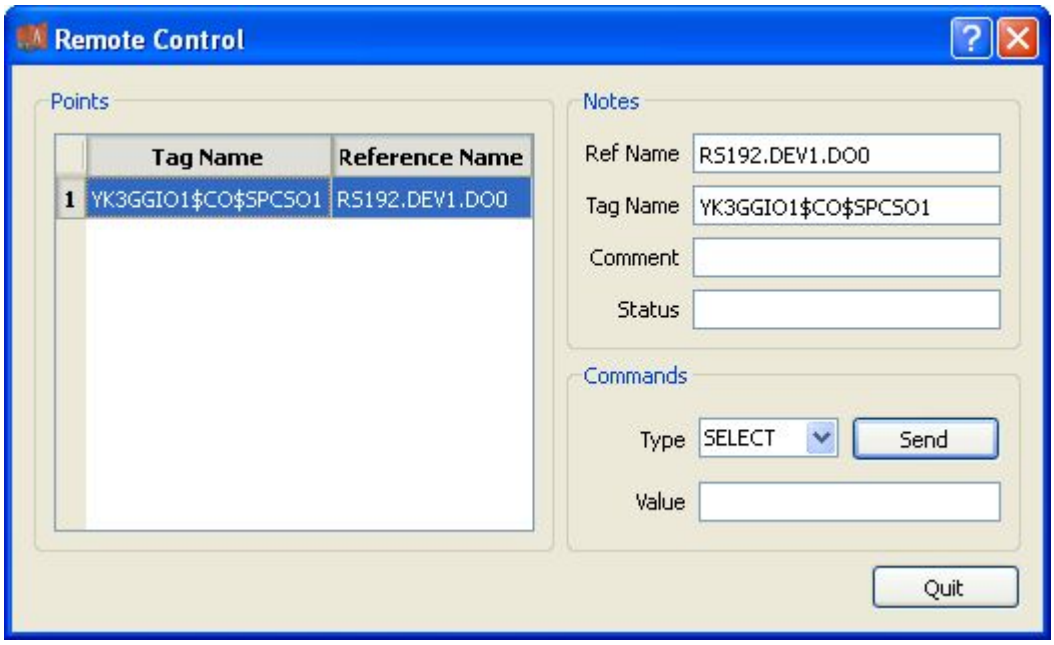
11	TSEL	Define the access point of transmission layer of OSI protocol stack, which is 2-byte by default.	The same as item 9 above
12	Net type	Define whether the network address belongs to TP4 or TCP.	Select according to actual situation; keep the default value
13	NSAP/IP	Define network address. ● TP4 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 ICE***

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";

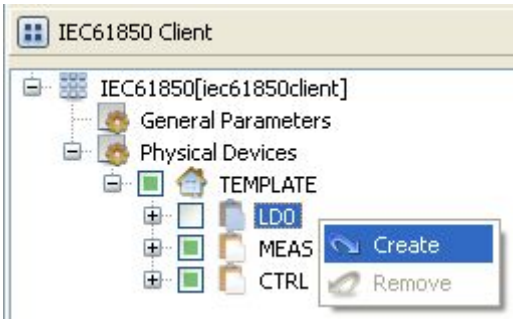


25. Select executing information point, control type and control value in turn;
26. Click the button "Send" to complete the operation of writing command and waiting for the executing result.

A.1.4. Information point management

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

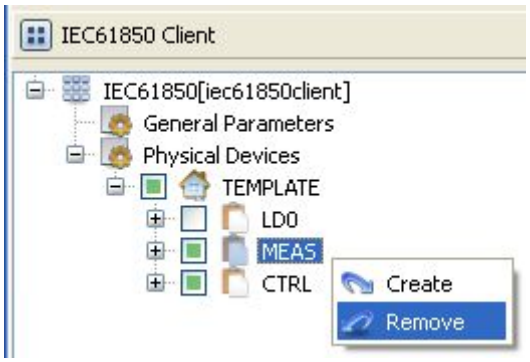
1. Open a project file;
2. Select the plugin management page in the management area of ***EDPS ICE***;
3. Activate IEC 61850 acquisition plugin;
4. Right click the data management node under the instance name of physical device;



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

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

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

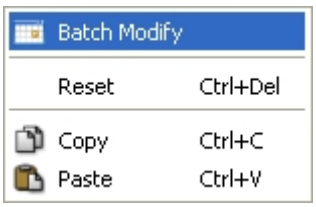
8. Select any child node under the instance name of physical device, and view the attributes of corresponding object in the attribute window.

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 ICE***; 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 ICE***;
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

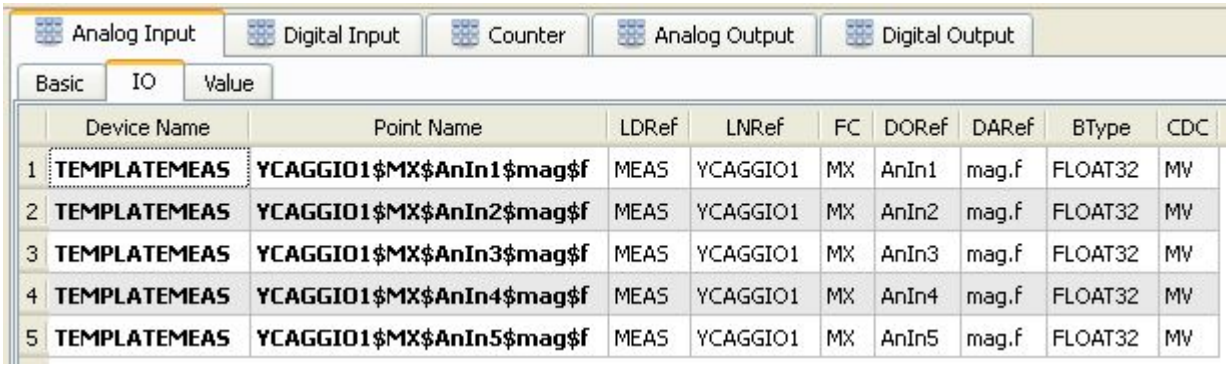
7. Right click an object and select the menu option "Reset" to complete modification;

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 ICE***.
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



	Device Name	Point Name	LDRef	LNRef	FC	DORef	DARef	BType	CDC
1	TEMPLATEMEAS	YCAGGIO1MXAnIn1magf	MEAS	YCAGGIO1	MX	AnIn1	mag.f	FLOAT32	MV
2	TEMPLATEMEAS	YCAGGIO1MXAnIn2magf	MEAS	YCAGGIO1	MX	AnIn2	mag.f	FLOAT32	MV
3	TEMPLATEMEAS	YCAGGIO1MXAnIn3magf	MEAS	YCAGGIO1	MX	AnIn3	mag.f	FLOAT32	MV
4	TEMPLATEMEAS	YCAGGIO1MXAnIn4magf	MEAS	YCAGGIO1	MX	AnIn4	mag.f	FLOAT32	MV
5	TEMPLATEMEAS	YCAGGIO1MXAnIn5magf	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

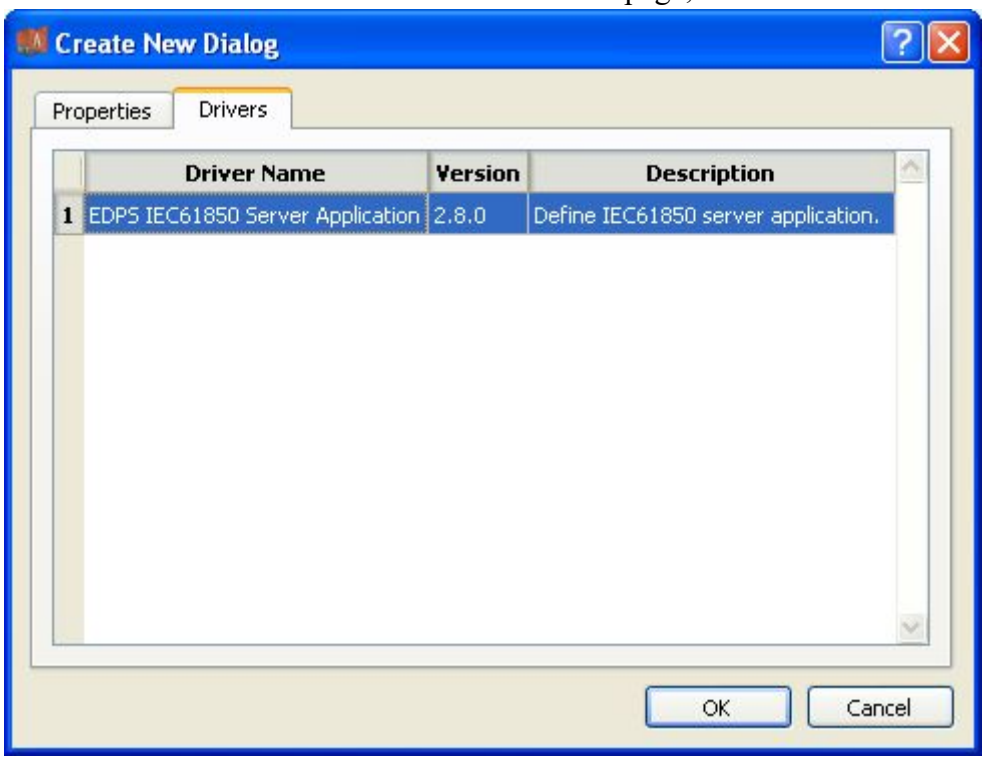
A.2.1. Driver management

Create Create IEC 61850 proxy driver

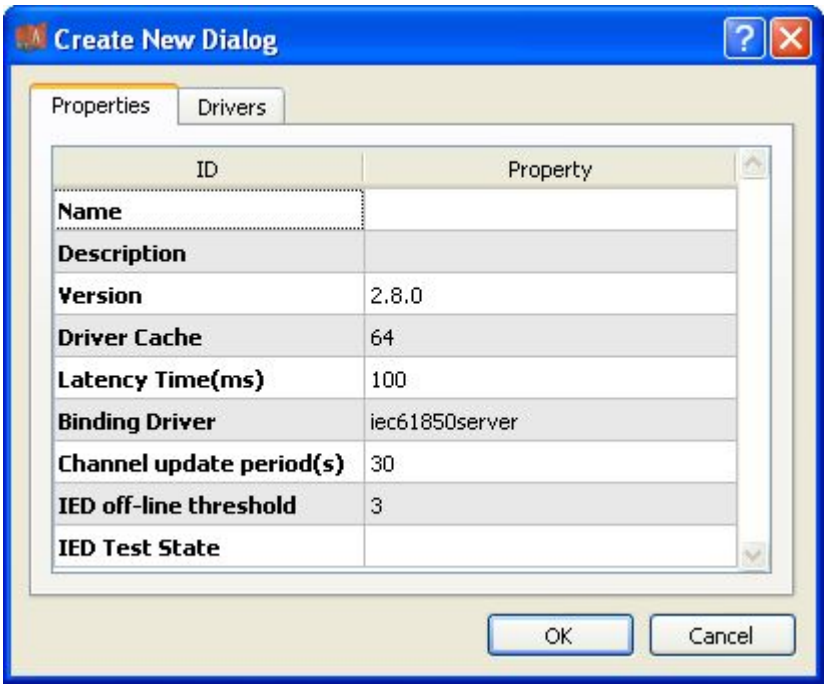
1. Open a project file;
2. Select the plugin management page in the management area of ***EDPS ICE***;
3. Activate IEC 61850 proxy plugin;

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;

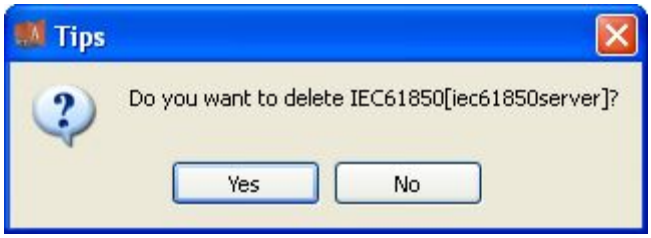
Note: Driver information

No.	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	

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

	status	
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.

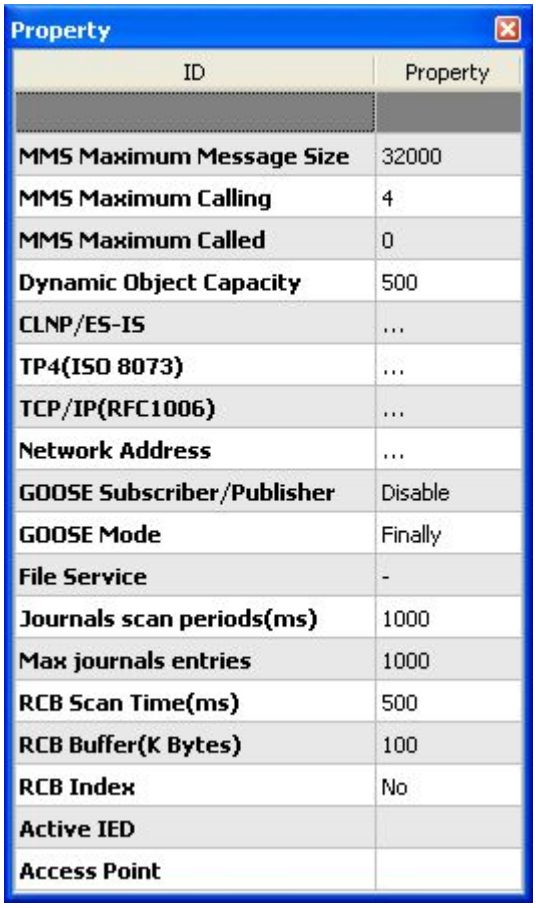
A.2.2. General parameters

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 ICE***;
3. Activate IEC 61850 proxy plugin;
4. Select the general parameter node in the management area;

5. View the information in the attribute area;



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

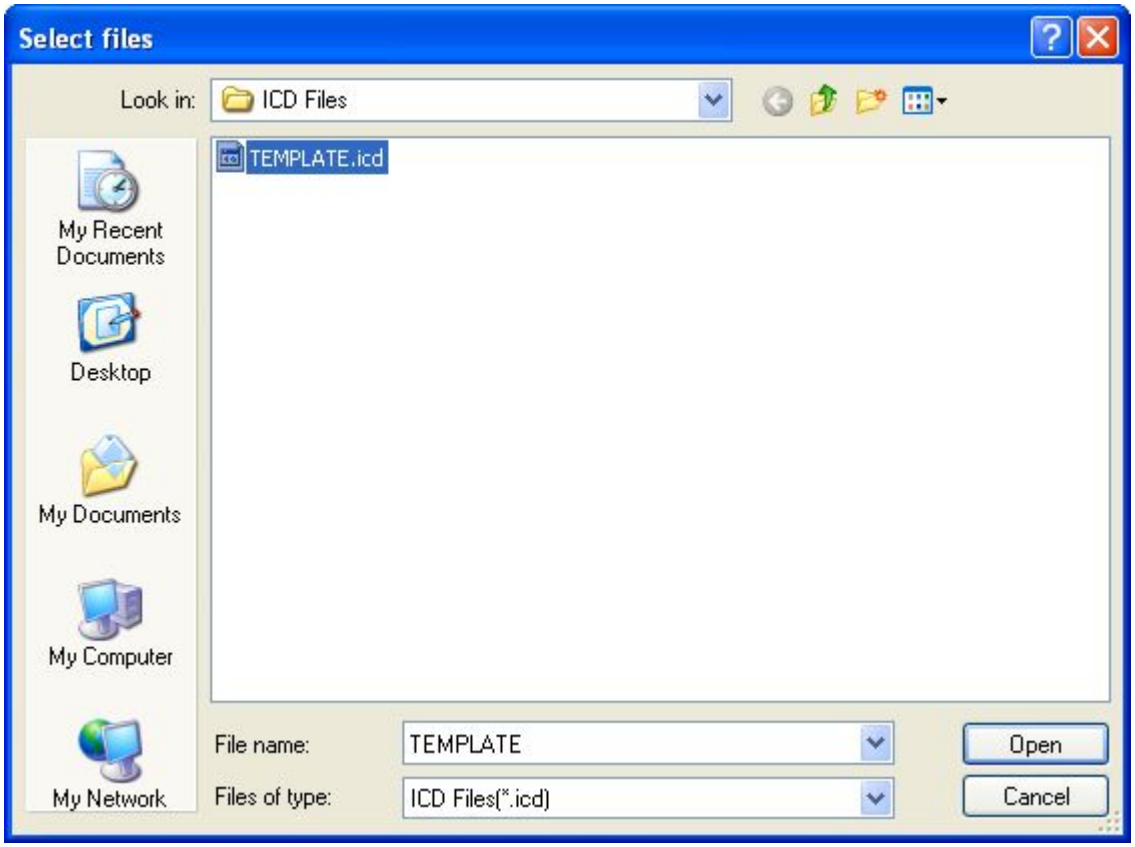
14	RCB scan time (ms)	Report scanning time, in ms; configure it according to actual situation
15	RCB buffer (K Bytes)	The default size of buffer for report with buffer, in K Bytes
16	RCB index	Automatically add RCB index suffix
17	Active IED	Set the name of device to be activated, which is usually the 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

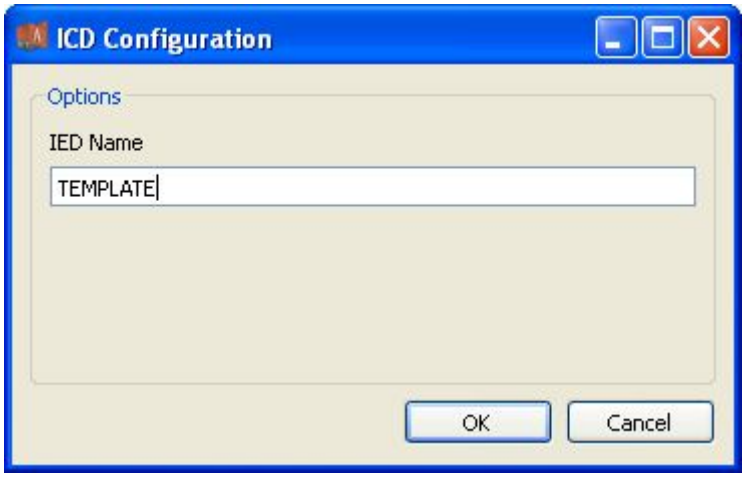
Import ICD file Create IEC 61850 proxy device by importing IEC 61850 ICD file

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

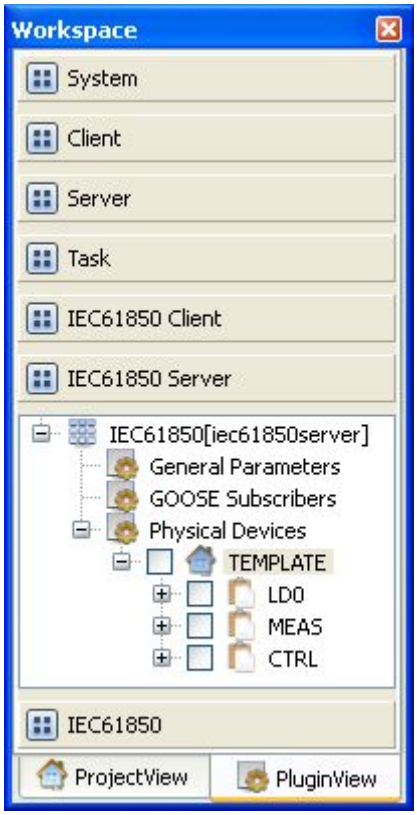
5. Open the selected file in the pop-up dialog box "Select file";



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



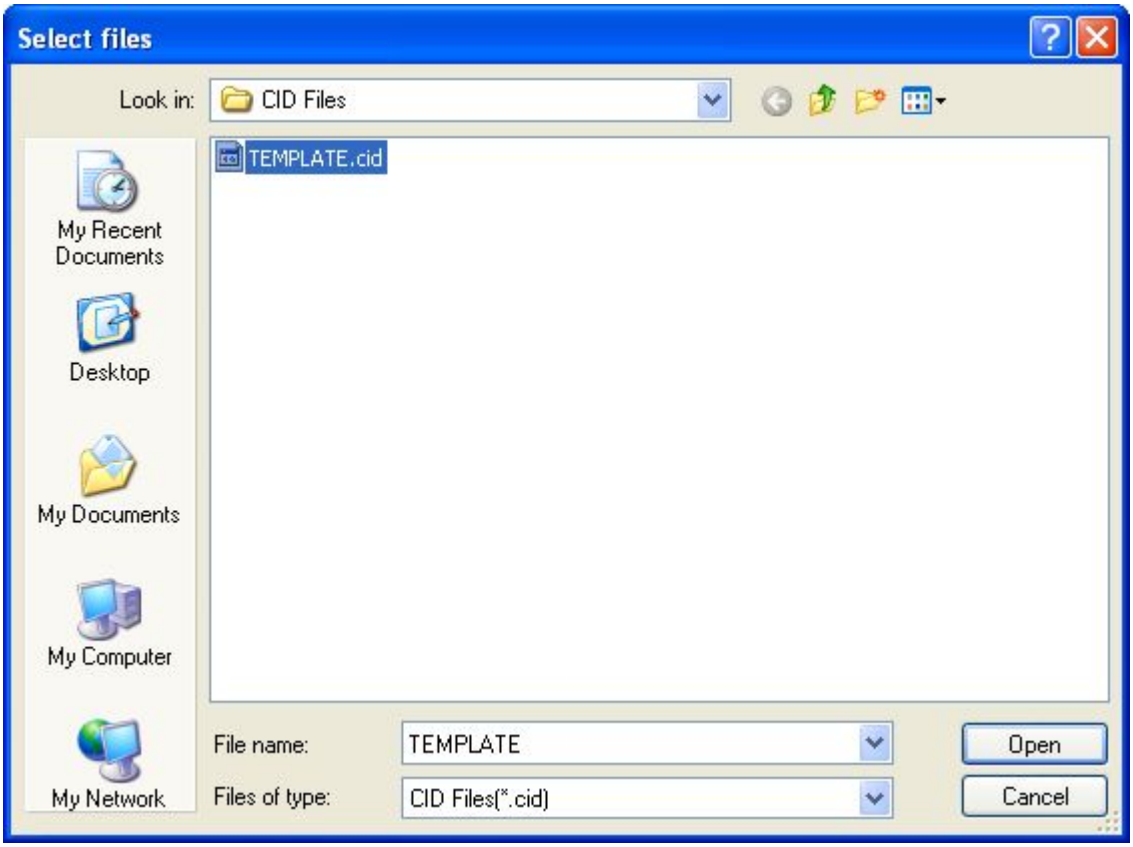
7. Edit the instance name of IED device and click "OK" to complete the creation of IEC 61850 device;



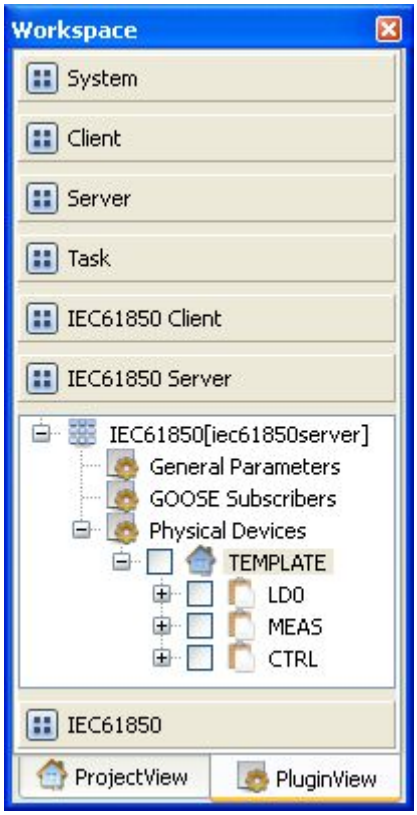
Import CID file Create IEC 61850 proxy device by importing IEC 61850 CID file

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";

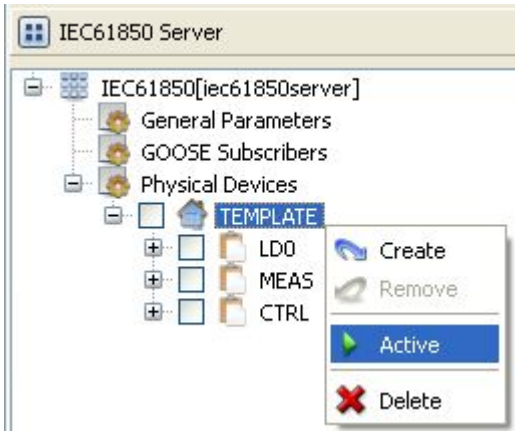


10. Click “OK” to complete creation of IEC 61850 device;



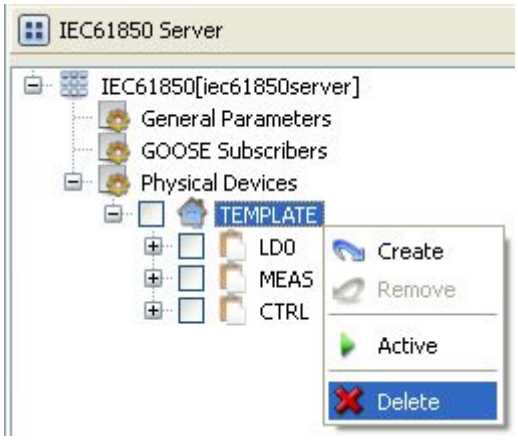
Activate device Complete activation of IEC 61850 physical device

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;

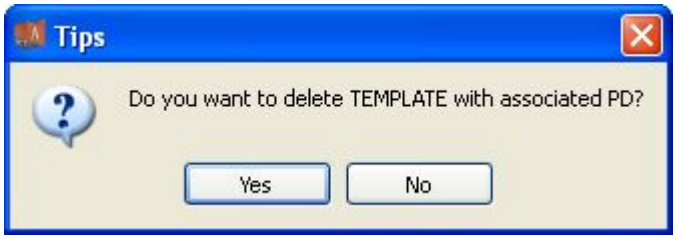


Delete device Completely delete the imported IEC 61850 device

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 ICE***.

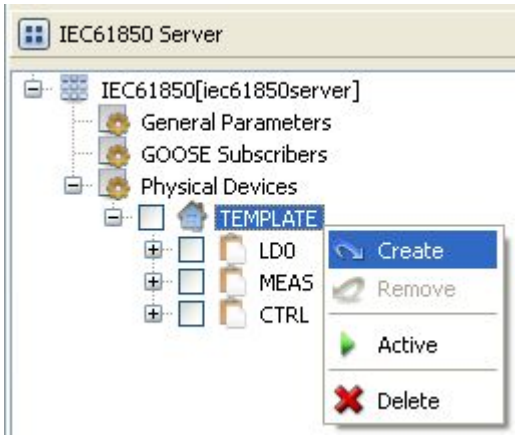
No.	Name	Description
1	Name	Set name information
2	Vendor	Set device manufacturer information
3	Type	Set type information
4	Version	Set version information
6	Description	Set description information
5	SCL File	Specify the SCL file associated with physical device

A.2.4. Information point management

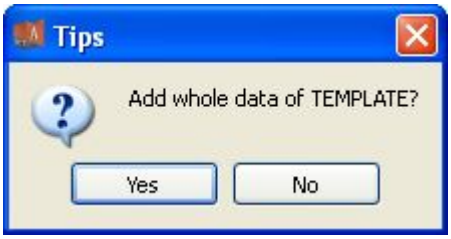
Create Establish mapping relation between EDPS and IEC 61850 client

1. Open a project file;

2. Select the plugin management page in the management area of ***EDPS ICE***;
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;

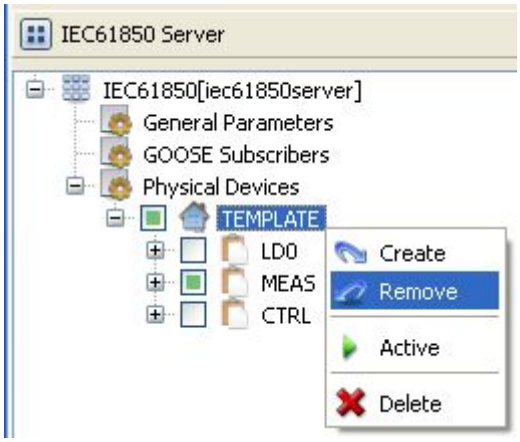


6. Click "Yes" to establish mapping relation between all information points in IEC 61850 device and EDPS;

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

Delete Remove the mapping relation between EDPS and IEC 61850 client

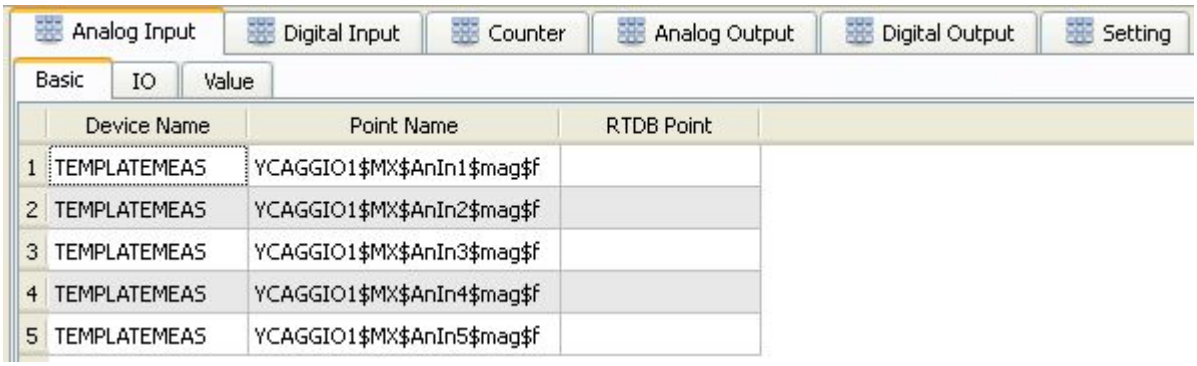
7. Right click the data management node under the instance name of physical device;



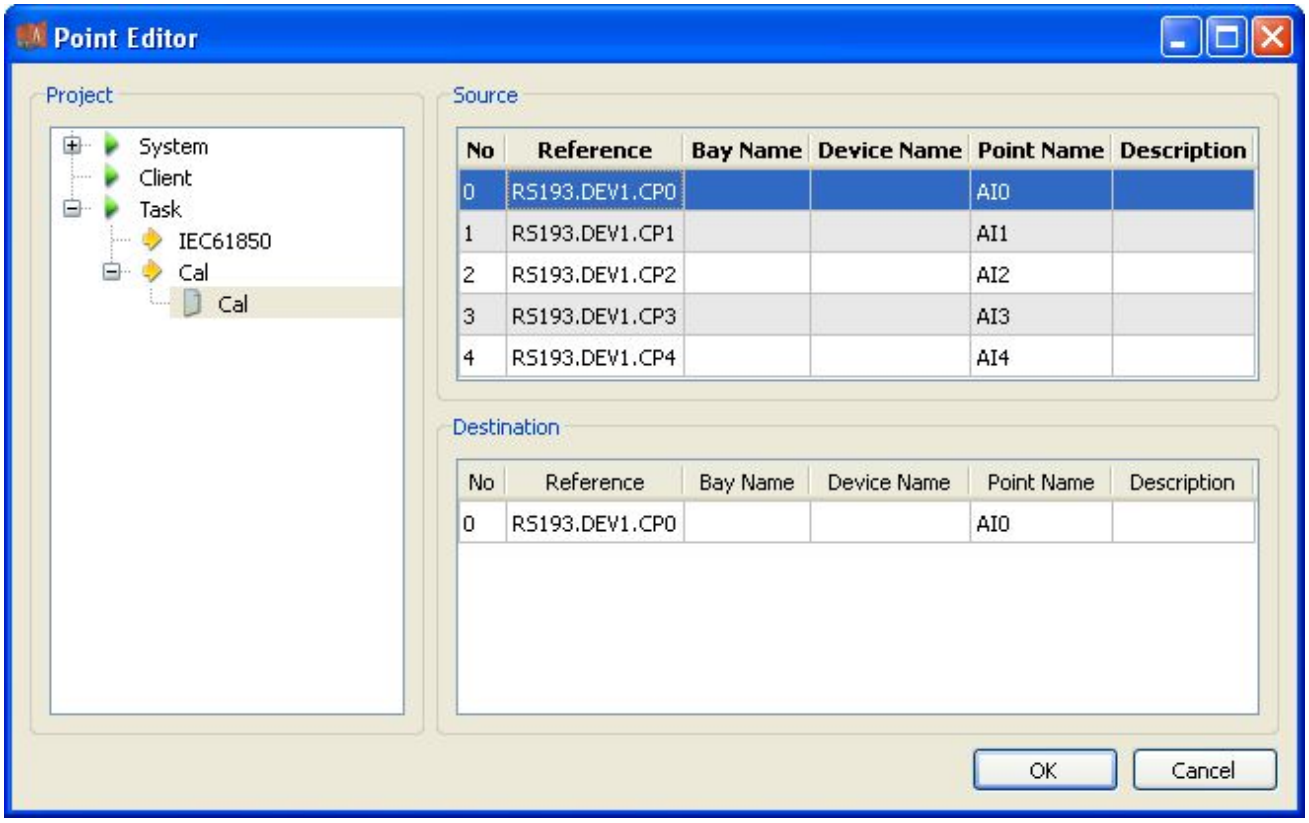
8. Click "Yes" to remove mapping relation between EDPS and IEC 61850 client;

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

9. Select any child node under the instance name of physical device, and view the mapping table in the data area of ***EDPS ICE***;



10. Click the edit box "Associated point" of data object;
11. Select the corresponding traditional data point in the popup information point editor;



12. 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

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

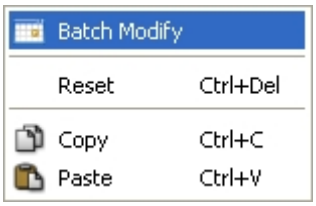
A.2.5. Data management

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 ICE***; 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 ICE***;
3. Activate IEC 61850 proxy 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

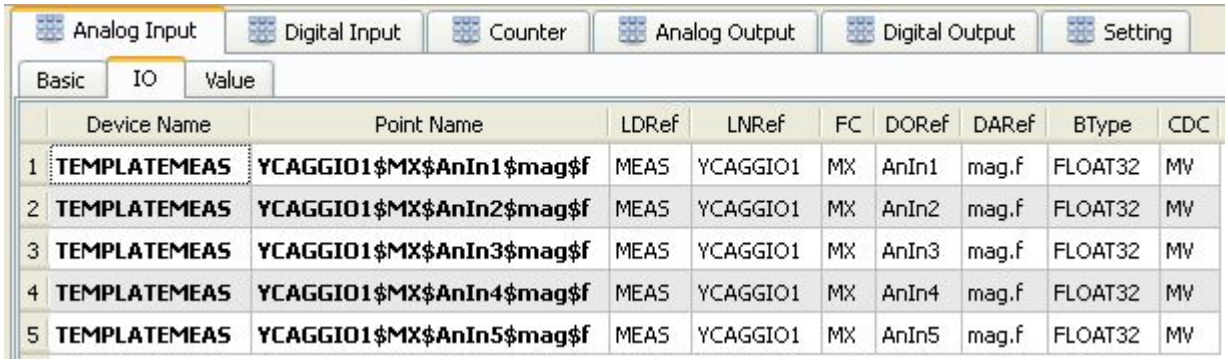
7. Right click an object and select the menu option "Reset" to complete modification;

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 ICE***.
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



	Device Name	Point Name	LDRef	LNRef	FC	DORef	DARef	BType	CDC
1	TEMPLATEMEAS	YCAGGIO1MXAnIn1magf	MEAS	YCAGGIO1	MX	AnIn1	mag.f	FLOAT32	MV
2	TEMPLATEMEAS	YCAGGIO1MXAnIn2magf	MEAS	YCAGGIO1	MX	AnIn2	mag.f	FLOAT32	MV
3	TEMPLATEMEAS	YCAGGIO1MXAnIn3magf	MEAS	YCAGGIO1	MX	AnIn3	mag.f	FLOAT32	MV
4	TEMPLATEMEAS	YCAGGIO1MXAnIn4magf	MEAS	YCAGGIO1	MX	AnIn4	mag.f	FLOAT32	MV
5	TEMPLATEMEAS	YCAGGIO1MXAnIn5magf	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.

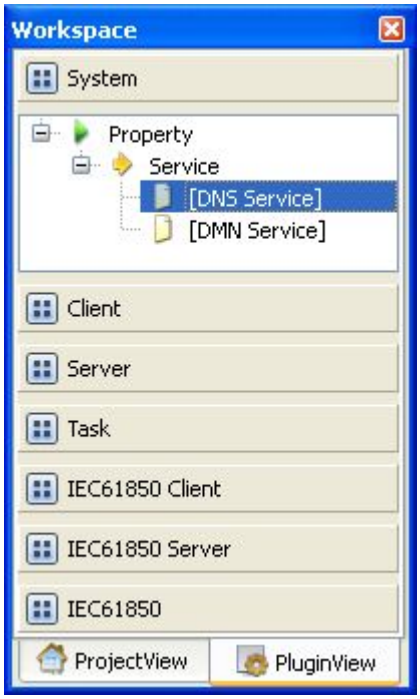
Note: About the configuration of GOOSE subscription module, it's needed to import an ICD/CID file with GOOSE control block, add object points included in GOOSE block, and activate the control block; other operations are the same as those described in A.2.3 and A.2.4, and need not to be repeated here.

Appendix B DNS Service Configuration

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

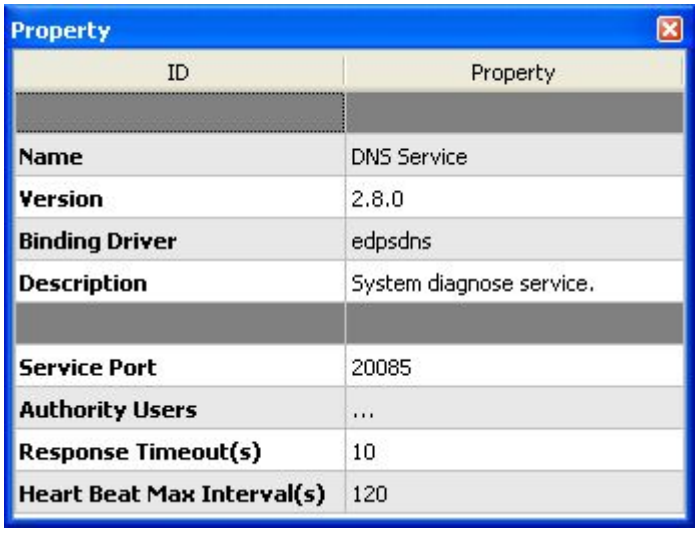
Operation View service information

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



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

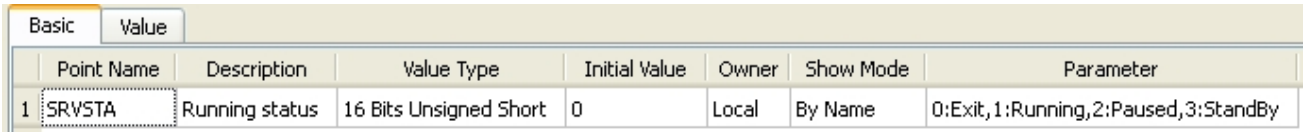
Attributes View the attribute area of ***EDPS ICE***



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 ICE***



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

Appendix C Script Calculation Application Configuration

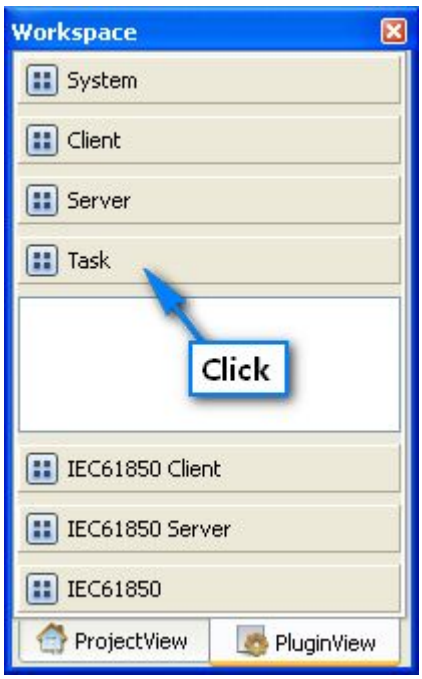
Appendix E mainly describes how ***EDPS ICE*** configures logic script advanced application module.The configuration manual mainly describes application information, parameter information, configuration information, and calculation information. The logic script advanced application module of EDPS adopts standard C Language Specification for logic programming, and ***EDPS ICE*** provides a concise and fast way to help the user to conduct configuration.

Application Information

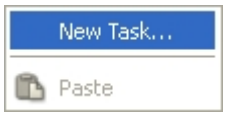
Overview Describe basic application information of driver and parameter of script calculation

Create Create script calculation driver

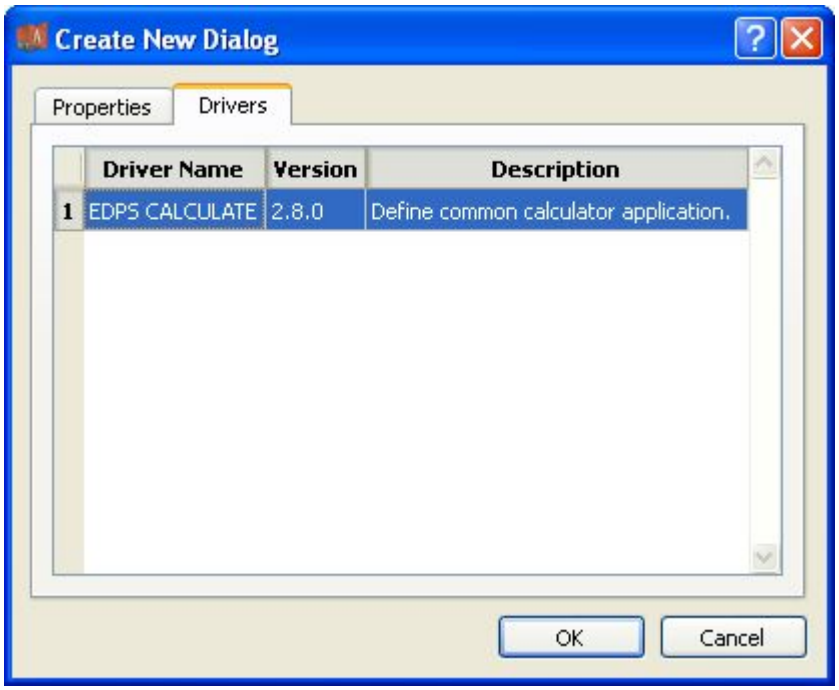
1. Open a project file;
2. Select the plugin management page in the management area of ***EDPS ICE***;
3. Activate the advanced application plugin;



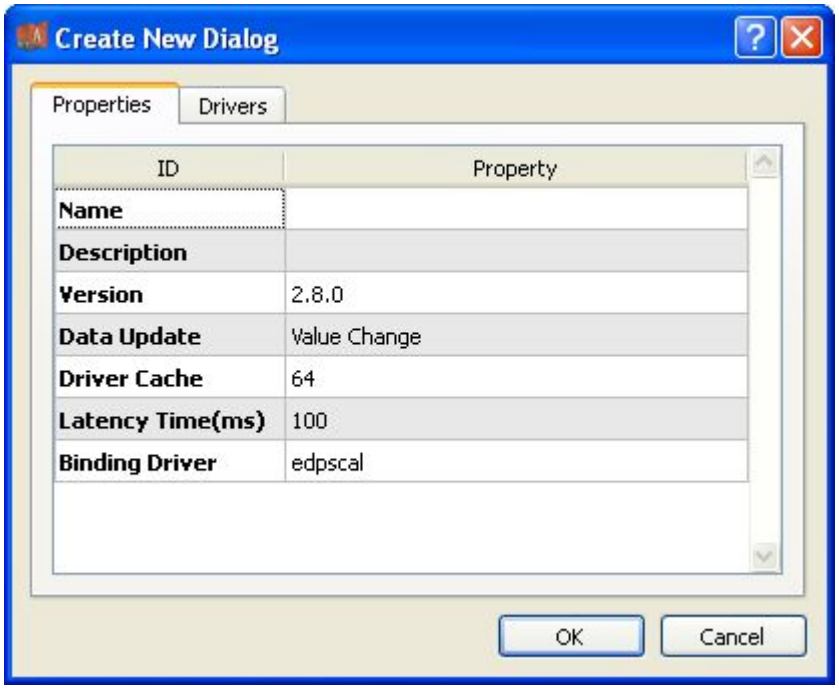
4. Right click in the blank space, and select the menu option “New task” to pop up the “Create driver dialog”;



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



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



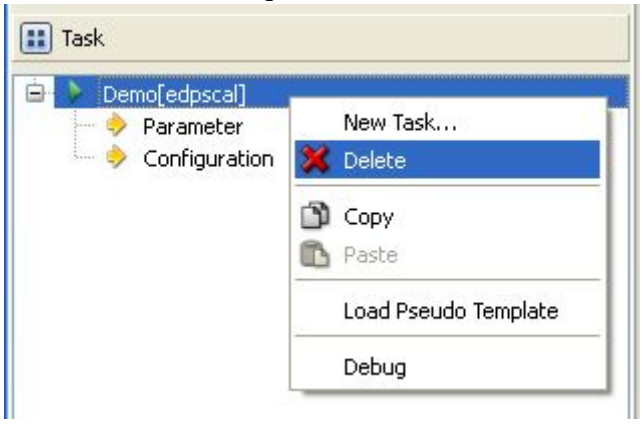
7. Click “OK” to complete creation;

Note: Driver information

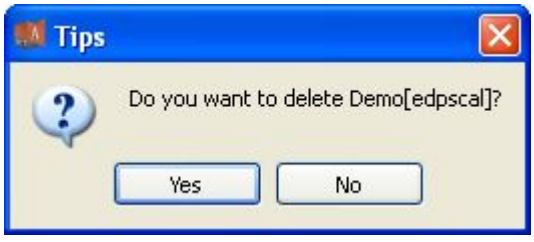
No.	Name	Description
1	Name	Define the display name of driver.
2	Description	Define how to describe the driver.
3	Version	Define the version information of driver.
4	Data update	Set the way of updating data to database. Value change – The system updates the database and notifies other driver protocols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



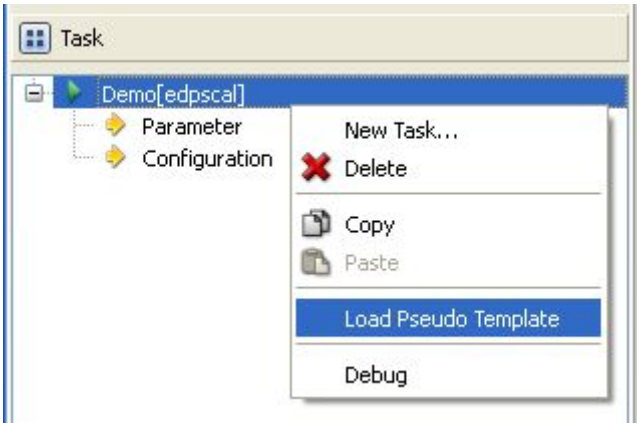
9. It prompts whether to delete;



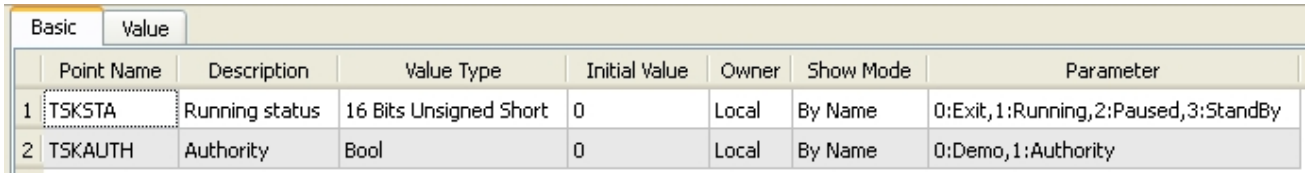
10. Click “Yes” to complete deletion;

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.

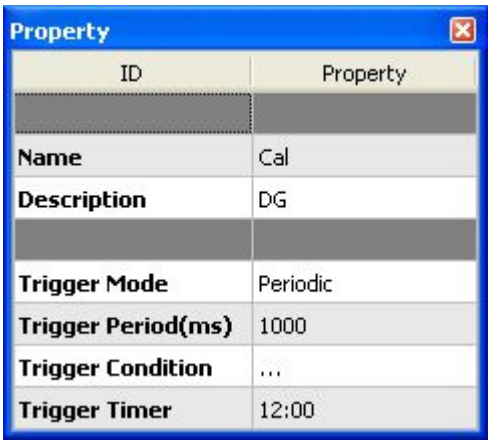
View parameter attributes

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.



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.