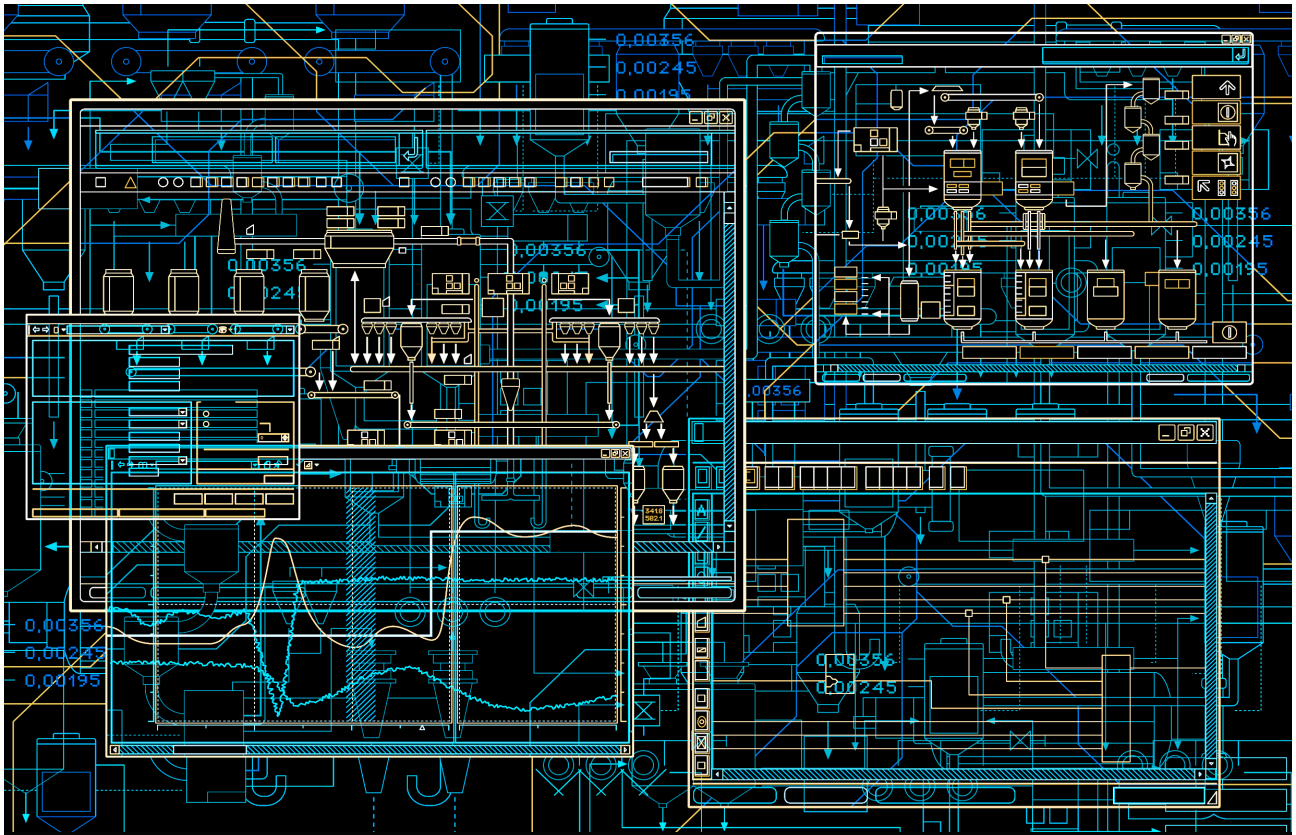

System 800xA

IEC 61850

Connect Configuration

System Version 5.1

Power and productivity
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System 800xA

IEC 61850
Connect Configuration

System Version 5.1

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Revision History

About This User Manual

Any security measures described in this User Manual, for example, for user access, password security, network security, firewalls, virus protection, etc., represent possible steps that a user of an 800xA System may want to consider based on a risk assessment for a particular application and installation. This risk assessment, as well as the proper implementation, configuration, installation, operation, administration, and maintenance of all relevant security related equipment, software, and procedures, are the responsibility of the user of the 800xA System.

This user manual describes the configuration of the IEC 61850 Connect in 800xA.

The main topics covered in this user manual are:

- Introduction to IEC 61850 Connect.
- Workflow for Configuration of IEC 61850 Connect OPC Server.
- IEC 61850 Uploader Tool Workflow.
- Alarm and Event Configuration.
- Workflow for Addition/Modification of Graphic Elements.
- Guidelines for Import and Export.
- Backup Restore Guidelines.
- Reconfiguration of SCD files.
- Guidelines for Creating User Defined BU Specific Libraries.

The user should have adequate knowledge of the 800xA control system and IEC 61850 protocol in general.

The application engineers or the engineers who plan the design or implementation of IEC 61850 as a part of substation automation, are intended to use this user manual. The users should be familiar with the hardware and software functionalities of the 800xA system products.

The following are included in this user manual.

Section 1, Introduction, provides a brief overview of 800xA IEC 61850 Connect.

Section 2, 800xA IEC61850 OPC Server, describes the functionality of IEC 61850 Connect OPC Server and Configuration.

Section 3, 800xA IEC 61850 Uploader, describes the functionality and working procedure of IEC 61850 Uploader aspect of Plant Explorer.

Section 4, 800xA IEC 61850 Alarm and Event Configuration, describes the configuration of alarms and events with 800xA IEC 61850 Connect.

Section 5, Addition and Modification of Graphic Elements, describes how to create and modify user defined Faceplates and Graphic Elements.

Section 6, Guidelines to Import and Export, describes the guidelines on using Import and Export.

Section 7, Reconfiguration, describes the reconfiguration of SCD files.

Section 8, Object Type Specific Graphics for BAY, describes the development of Object type specific faceplate for BAY.

Section 9, Object Type Specific Graphics for IED, describes the development of Object type specific faceplate for IED.

Section 10, Guidelines for Creating User Defined/BU Specific Libraries, describes the guidelines for Creating User Defined BU Specific Libraries.

Section 11, SCD Information, describes provides the SCD information for the IEC 61850 Uploader and the OPC Server.

User Manual Conventions

Microsoft Windows conventions are normally used for the standard presentation of material when entering text, key sequences, prompts, messages, menu items, screen elements, etc.

Feature Pack

The Feature Pack content (including text, tables, and figures) included in this User Manual is distinguished from the existing content using the following two separators:

Feature Pack Functionality

<Feature Pack Content>

Feature Pack functionality included in an existing table is indicated using a table footnote (*):

*Feature Pack Functionality

Unless noted, all other information in this User Manual applies to 800xA Systems with or without a Feature Pack installed.

Warning, Caution, Information, and Tip Icons

This User Manual includes Warning, Caution, and Information where appropriate to point out safety related or other important information. It also includes Tip to point out useful hints to the reader. The corresponding symbols should be interpreted as follows:

Electrical warning icon indicates the presence of a hazard that could result in *electrical shock.*

Warning icon indicates the presence of a hazard that could result in *personal injury.*

Caution icon indicates important information or warning related to the concept discussed in the text. It might indicate the presence of a hazard that could result in *corruption of software or damage to equipment/property.*

Information icon alerts the reader to pertinent facts and conditions.

Tip icon indicates advice on, for example, how to design your project or how to use a certain function

Although Warning hazards are related to personal injury, and Caution hazards are associated with equipment or property damage, it should be understood that operation of damaged equipment could, under certain operational conditions, result in degraded process performance leading to personal injury or death. Therefore, fully comply with all Warning and Caution notices.

Terminology

A complete and comprehensive list of Terms is included in the *System 800xA, Engineering Concepts Instruction (3BDS100972*)*. The listing includes terms and definitions that apply to the 800xA System where the usage is different from commonly accepted industry standard definitions and definitions given in standard dictionaries such as Webster's Dictionary of Computer Terms. Terms that uniquely apply to this User Manual are listed in the following table.

Term/Acronym	Description
800xA	ABB automation system (eXtended Automation).
AC 800M	ABB Controller 800M series, general purpose process controller series by ABB.
AC 800M Controller	Any controller constructed from the units and units connected to the AC 800M hardware platform.
AE	Alarm and Event.
Append	Function for creating objects (based on Object Types) in the 800xA *Control Structure*.
CCT	Communication Configuration Tool.
CDC	Common Data Class.
CET	Communication Engineering Tool.
DA	Data Access.
FBD	Feeder Block Diagram.
GCB	GOOSE Control Block.
ICD	IED Capability Description. A type of SCL file.

Term/Acronym	Description
IEC	International Electrotechnical Commission.
IEC 61850	IEC standard for Communication Networks and Systems in Substations. • 800xA IEC 61850-Ed1 (Edition1) reference to the Edition1 of the specification is supported • Ed2 reference to the Edition 2. Parts of the specification are updated time by time and indicated with a new edition number.
IED	Intelligent Electronic Device.
IET	Integrated Engineering Tool.
LD	Logical Device: A virtual device which enables aggregation of Logical Nodes and Data sets for communication purposes. Additionally, Logical Devices contain convenient lists of frequently accessed or referred to information. For example, data sets.
LN	Logical Node.
LON	A communication protocol.
MMS	Manufacturing Message Specification (MMS) is an international standard (ISO 9506) dealing with messaging system for transferring real time process data and supervisory control information between networked devices and/or computer applications.
Node	A computer communicating on a network, for example the Internet, Plant, Control or IO network. Each node typically has a unique node address with a format depending on the network it is connected to.
OCS	Open Control System.
OPC	OLE for Process Control. A set of standard interfaces based on COM technology.
OT	Object Type, object template in Object Type Structure in 800xA.

Term/Acronym	Description
PPA	Process Portal A.
RCB	Report Control Block
Retrieve	Function for collecting information regarding a control network.
SA	Substation Automation.
SCD	Substation Configuration Description, type of SCL file.
SCL	Substation Configuration Language.
SLD	Single Line Diagram.
SPA	ABB proprietary communication protocol used in substation automation.
Upload	Retrieve + Append.
XML	eXtensible Markup Language.

Released User Manuals and Release Notes

A complete list of all User Manuals and Release Notes applicable to System 800xA is provided in *System 800xA Released User Manuals and Release Notes (3BUA000263*)*.

System 800xA Released User Manuals and Release Notes (3BUA000263)* is updated each time a document is updated or a new document is released. It is in pdf format and is provided in the following ways:

- Included on the documentation media provided with the system and published to ABB SolutionsBank when released as part of a major or minor release, Service Pack, Feature Pack, or System Revision.
- Published to ABB SolutionsBank when a User Manual or Release Note is updated in between any of the release cycles listed in the first bullet.

A product bulletin is published each time *System 800xA Released User Manuals and Release Notes (3BUA000263*)* is updated and published to ABB SolutionsBank.

Section 1 Introduction

IEC stands for International Electrotechnical Commission and IEC 61850 is an IEC standard for Communication Networks and Systems in Substations.

800xA IEC 61850 Connect Package

800xA IEC 61850 Connect integrates the IEC 61850 network with 800xA system. The solution is based on the Standard Connectivity functionality in 800xA where the subsystems are integrated to the 800xA system using the OPC Servers (Data Access and Alarm and Event). The IEC 61850 Connect uses the IEC 61850 OPC Server.

This section gives an overview of IEC 61850 Connect. The IEC 61850 Objects include the logical node objects that are specified in the IEC 61850 -Ed1 (Edition1) standard. It also includes additional generic objects and functional objects such as breakers and transformers, which represent the substation functional view in the 800xA. These object types act as a database for creation of communication structure and Substation structure of SCD file in 800xA. An Uploader creates these structures in 800xA system automatically by reading the SCD file. The IEC 61850 OPC Server provides data from IEC 61850 network to 800xA.

The IEC 61850 Connect is included as a system extension and the object types are bundled within this system extension. Configuration Wizard is used to load this system extension onto 800xA.

The following are the components of the IEC 61850 Connect package:

1. IEC 61850 OPC Server

   IEC 61850 OPC Server consists of the IEC 61850 OPC DA Server and the IEC 61850 OPC AE Server. It also contains the Communication Engineering Tool (CET) which is used to configure the OPC Server.

2. IEC 61850 Connect

   a. 800xA Object types representing IEC 61850 entities such as Substation, Voltage Level, Substation Network, IED, Conducting Equipments, Logical devices, Logical Nodes, and OPC Servers.

   b. The **Uploader** Aspect.

   c. Default Alarm Collection Definition Aspect.

   d. All the above and other associated functionalities are delivered as IEC 61850 Connect system extension.

3. SCL Model Components

   SCL Model components contain a set of libraries that are used to parse the SCD file during upload.

IEC 61850 OPC Server requires the SCD file describing the IEDs and the IEC 61850 subnetwork. The IEDs are expected to support reporting and control services.

Object Types

The IEC 61850 Object Type Library contains the following object types:

- Substation Object

  This object contains an Control Connection aspect, which consists of attributes of the Substation.

- Voltage level Object

  This object contains an Control Connection aspect, which consists of attributes of the Voltage level.

- OPC Server Object

  This is the topmost object in the hierarchy, which contains the IEC 61850 **Uploader** aspect and **OPC Data Source Definition** aspects.

- Subnetwork Object

  This represents IEC 61850 Subnetwork in 800xA. This contains **Control Connection** aspect, which consists of attributes of the Subnetwork.

- IED Object

This object type contains a **Control Connection** aspect, which consists of IED's attributes.

- Logical Node Object

  These object types are as per the IEC 61850-Ed1 standard. Each defined logical node type is mapped to an object type.

- Generic Logical Node Object

  This serves as a generic object for Logical Nodes.

- Logical Device Object

  This object contains an **Control Connection** aspect.

- Conducting Equipment Object

  This object contains object types corresponding to the Functional Objects and the Conducting Equipment Objects.

Figure 1 shows a sample screen shot of Object Type Structure displaying the IEC 61850 Base Library with all objects.

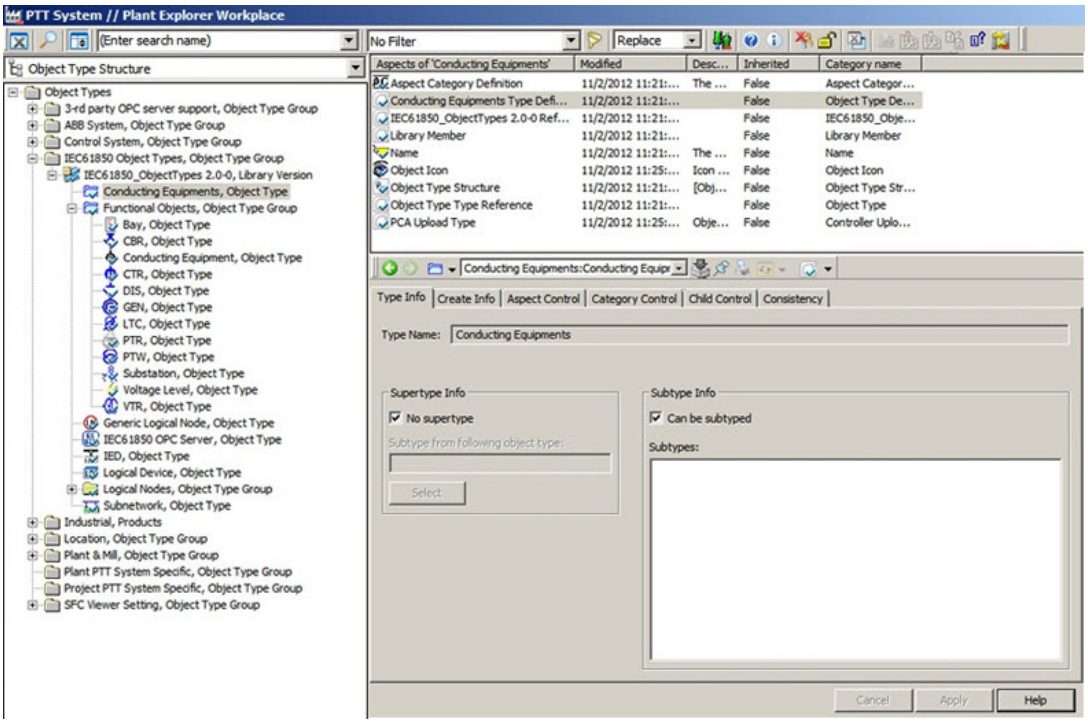


Figure 1. IEC 61850 Base Library displaying all objects

IEC 61850 Connect System Topology

800xA IEC 61850 Connect integrates the IEC 61850 Network and 800xA systems using the IEC 61850 OPC Server. The data of the various IEDs on the IEC 61850 network is read by the IEC 61850 OPC Server facilitating the vertical communication as defined in the IEC 61850 -Ed1 standard. Only the MMS (Manufacturing Message Specification) based signals on the IEC 61850 bus are read by the IEC 61850 OPC Server and given to the 800xA client. Figure 2 shows the typical IEC 61850 Connect System Topology.

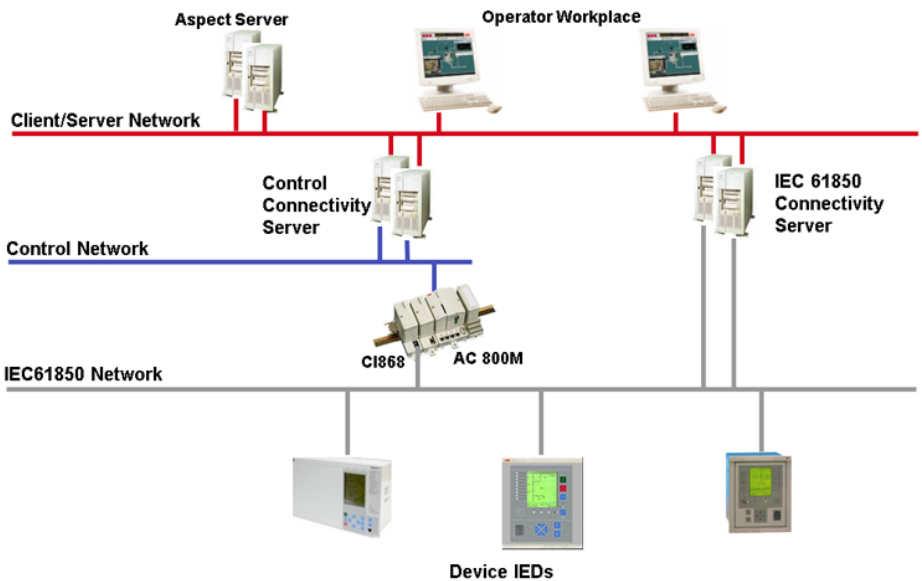


Figure 2. IEC 61850 Connect System Topology

Section 2 800xA IEC61850 OPC Server

The IEC61850 OPC Server enables Operator workplaces as 800xA OPC clients to access the process data from IEC 61850 IEDs, such as protection and control devices communicating through the IEC 61850 protocol.

The OPC Server implements both the DA (Data Access) and AE (Alarm and Events) functionality. To create a common data interface between the OPC server and the operator workplace in 800xA or IEC 61850 IED, the process data is modelled using the IEC 61850 protocol.

The IEC 61850 specifies the usage of Manufacturing Message Specification (MMS, ISO 9506) over TCP/IP as communication between the IEC 61850 server and client (device/IEC 61850 OPC Server).

After the IEC 61850 OPC Server and other required components have been installed, the SCD file containing hierarchically structured models of a substation can be imported into IEC 61850 OPC Server using the Communication Engineering Tool (CET).

The configuration data is stored in SCL (XML based) format. After the IEC 61850 OPC Server has been launched, it reads the configuration file and establishes communication with the IEC 61850 devices through the IEC 61850 protocol stack. Configured IEC 61850 devices and their data are then exposed to OPC clients through an OPC Data Access (DA) server and device reported changes in data with DA subscription are reported to OPC clients.

IEC 61850 OPC Server Features

The IEC 61850 -Ed1 OPC Server supports the following features:

- OPC Data Access v. 1.0/2.0.
- OPC Alarms and Events specifications v. 1.10.

- Communication diagnostics.
- IEC 61850 data modeling.
- System supervision:
  - IEC 61850 device communication
- Command handling:
  - The IEC 61850 OPC Server supports the IEC 61850 command services.
- IEC 61850 -Ed1 data objects:
  - SPS, DPS, INS, ACT, ACD, SEC, BCR, MV, CMV, SAV, WYE, DEL, SEQ, SPC, DPC, BSC, ISC, APC, SPG, ING, ASG, CURVE, DPL, LPL.
- IEC 61850 buffered and unbuffered reporting services.
- IEC 61850 File Transfer.
- Automatic Disturbance Recording upload using IEC 61850 file transfer or FTP.
- Time synchronization:
  - The IEC 61850 OPC Server can act as an SNTP client and server for time synchronization. When the IEC 61850 OPC Server is configured for receiving time synchronization, it updates the operating system time of the PC.
- Multiple instance support when installed on the same hardware platform.

CET Alarm and Event Object Properties

Event Categories

Event Categories are defined in the **Common Event Settings** node below the **Computer Node** object. Event categories are assigned to event definitions with the corresponding **Simple Event Category** and **Condition Event Category** properties on the event definition objects.

It is possible to create custom event categories and assign to event definitions. Based on the categories, OPC A&E clients filter events, such as process or system events.

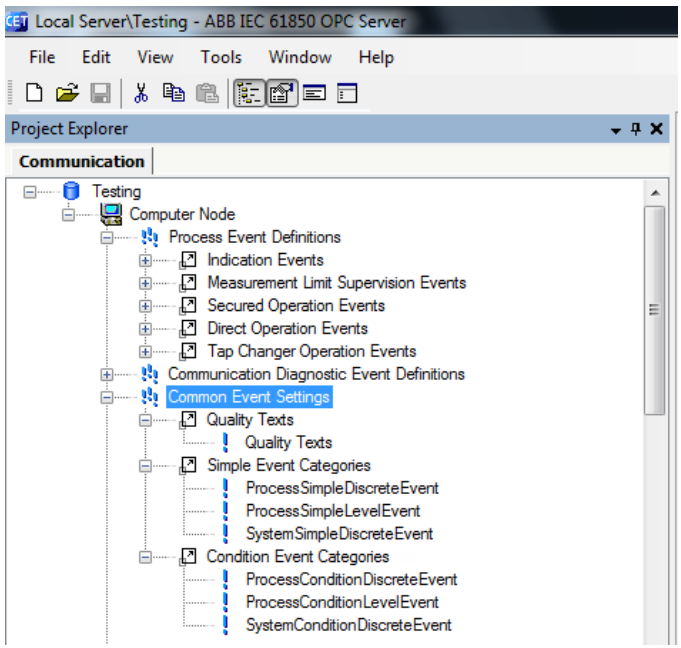


Figure 3. Event Categories Definition

Event categories must be created for each event type (simple or condition). For example, categories **Process Simple Event** and **Process Condition Event** must be created for process events.

Event Definitions

Event definitions specify the type of events that are created for HMI event and alarm lists. It can be configured whether an event appears only on the event list, on both event and alarm lists, or none. Event texts can be added for the events specify whether alarms must be acknowledged by the user.

To create event definition:

1. Right-click any Events group in CET.
2. Select **New** > **Event classes**.
3. Select the event class to add.

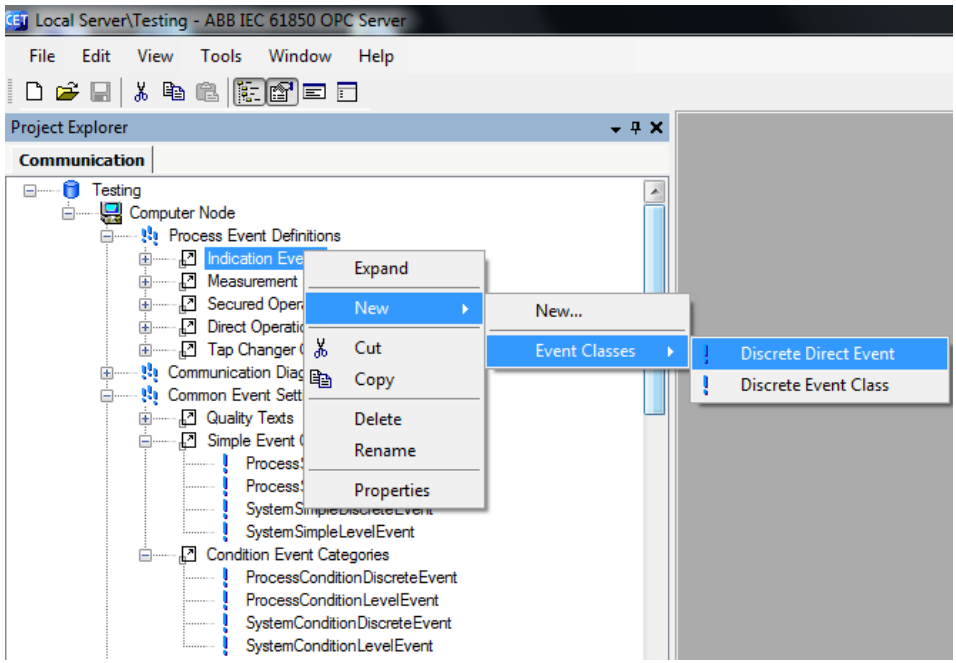


Figure 4. Example of Event Definitions - Event Class

The new event class appears in the Process Definitions below the selected event group. Enter a unique name for the event class by right-clicking it and selecting **Rename**. The new event class can be configured and connected to a data object.

To configure event definitions:

1. Select an event to configure in the object tree.
2. The object properties appear in the Object Properties window.

3. Assign the event with parameter values.

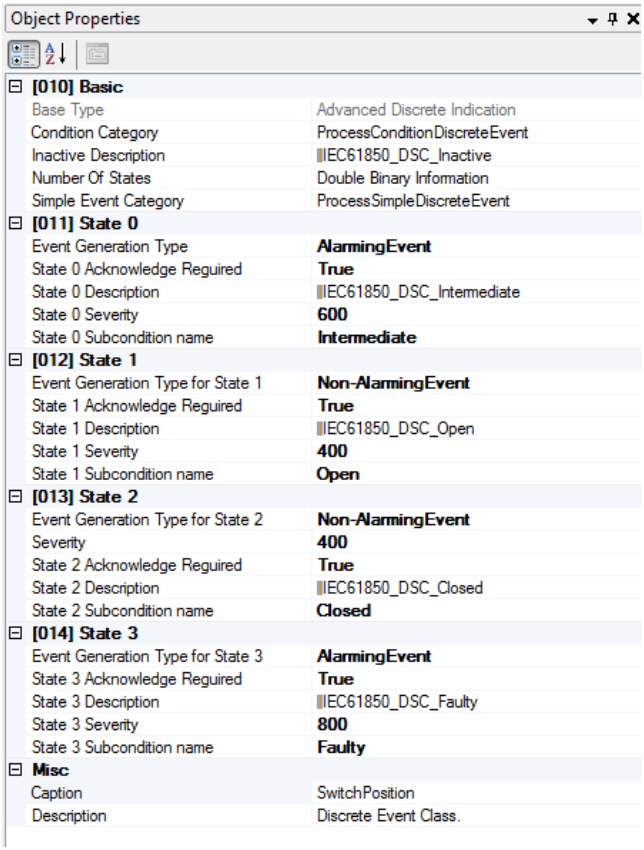


Figure 5. Example of Event Definition Properties

Event definitions are linked to data objects by configuring the event properties available for data objects. When importing IED configurations from IED SCL description files, event definitions are linked to data objects by default. For example switch position data object CSWIx.Pos is linked by default to switch position event definition. The default linking rules are specified in a *DOParamsDefaults.xml* file located in the *\Program Files\ABB\61850 OPC Server\CET\bin\Tools\SCLImport* in the computer where CET is installed.

CET Objects Properties

Object properties of all imported objects can be configured from CET.

Perform the following steps to configure an object:

1. Select an object in the Communication structure's object tree and all available properties are listed on the right side window.
2. Select the required property to be configured.

According to the property value type, manually configure or select a predefined value from a drop-down combo box.

Objects with configuration from an existing SCD file can be imported using SCL import function.

IEC 61850 OPC Server Object Properties

Table 1 lists the configurable IEC 61850 OPC Server object properties and value ranges for them.

Table 1. IEC 61850 OPC Server Object Properties

Name	Value/Value Range	Description
Basic		
AE Prog ID	-/-	Prog ID for OPC Alarm and Event Server (Automatically generated by management function).
DA Prog ID	-/-	Prog ID for OPC Data Access Server (Automatically generated by management function).
Enable reading of dattribute (description) from IED	True False Default: False	Specifies whether the d attribute (description) is read from the IED. Normally d is not reported from the IED. It is only read if read operation is requested e.g. with Online Diagnostics. When set to false, the text of the data object Description property is used.
SNTP Client		

Table 1. IEC 61850 OPC Server Object Properties (Continued)

Name	Value/Value Range	Description
Address for SNTP Server	-/-	IP address or node name for SNTP Server (Primary). There are four sets applicable for this property.
Port Number	(1..65535) Default: 123	TCP/IP port number of SNTP Server. There are four sets applicable for this property.
Synchronization Interval	(0..3600) Default: 15	Time synchronization interval in seconds. If value is 0, no time synchronization will be done. There are four sets applicable for this property.
SNTP Enable Client	True False Default: True	Controls if time synchronization client is initially in use or not.
SNTP Server		
Enable Time Synchronization server	True False Default: True	Controls if time synchronization server is initially in use or not.
Port Number For Time Synchronization Server	(1...65535) Default: 123	Port number for time synchronization server.
Communication Control		
Report Control Identity	Default: Client1	Report Control Identity is the OPC server name and it must identical with the name given under each IED Report control Block configuration. Only when the names are equal the communication between IED server and OPC client will be established.

Table 1. IEC 61850 OPC Server Object Properties (Continued)

Name	Value/Value Range	Description
Server Originator Category	Control operation issued from an operator using a client located at **station level**. Control operation issued from an **unknown location**. Control operation from a remote operator **outside the substation** (for example network control center). Default: Control operation issued from an operator using a client located at **station level**.	Specifies the default originator category that is used for changing values and IEC 61850 control services. This can be overridden by the OPC Client for DPC control.

Table 1. IEC 61850 OPC Server Object Properties (Continued)

Name	Value/Value Range	Description
Server Originator Identification	Free string (max length 64 characters). For numeric values hex code can be used (starting with "0x" e.g. 0xABB). Default: ABB	Specifies the default originator identification that is used for IEC 61850 control services.
System Event Level	Disabled Level 1 (main operation and errors) Level 2 (time synchronization errors) Level 3 (time synchronization done) Level 4 (reported local updates from devices) Level 5 (reported unconfigured updates from devices) Default: Disabled	Level of system event that are sent from the OPC Server. Amount of events sent is cumulative, higher level also contains lower level events. System event level configuration at OPC Server level overrides definitions at subnetwork and device levels.

IEC 61850 Subnetwork Object Properties

Table 2 lists the IEC 61850 Subnetwork object properties that can be configured and value ranges for them.

Each IEC 61850 node of the system must have a unique subnet / node address.

Table 2. IEC 61850 Subnetwork Object Properties

Property	Value / Value range	Description
Basic		
In Use	In Use Not In Use Default: In Use	Controls whether the device communication is initially in use or not.
Communication Port		
IP Address	127.0.0.1	IP Address for communication channel. Dotted decimal to be used. It is updated from scd file during import.

Table 2. IEC 61850 Subnetwork Object Properties (Continued)

Property	Value / Value range	Description
Communication Control		
System Event Level	Disabled Level 1 (main operation and errors) Level 2 (time synchronization errors) Level 3 (time synchronization done) Level 4 (reported local updates from devices) Level 5 (reported unconfigured updates from devices) Default: Disabled	Level of system events (OPC AE events) can be viewed with an OPC AE client or with a CET Diagnostic AE client for OPC Server. Amount of events sent is cumulative: higher level also contains lower level events. System event level configuration at subnetwork overrides definitions at device level. Same or higher event level must be set for Subnetwork as for IED. System events can be used for debugging and event flow monitoring. Event level can be changed during the runtime by using the Diagnostic events level attribute, IEC 61850 line attributes.
TCP/IP Keepalive Time-out	(1..3600) Default: 15	TCP/IP Keepalive time-out in seconds.

IEC 61850 Device Object Properties

Table 3 lists the configurable properties for IEC 61850 Devices (used for ABB protection and control devices) and value ranges for these properties.

Each IEC 61850 node of the system must have a unique subnet / node address.

Table 3. IEC 61850 Device Object Properties

Name	Value / Value range	Description
Basic		
In Use	In use Not in use Default: In use	Controls if the device communication is initially in use or not.

Table 3. IEC 61850 Device Object Properties (Continued)

Name	Value / Value range	Description
Simulation Mode	True False Default: False	Defines if the device is in simulation mode.
System Event Level	Level0=Disabled Level1=Level 1 (main operation, error replies, errors) Level2=Level 2 (information reports, OK replies, RCB initializing) Level3=Level 3 (sent requests (connect, read, write), transparent SPA messages) Level4=Level 4 (reported local updates) Level5=Level 5 (reported unconfigured updates)	Level of system events (OPC AE events) can be viewed with a CET Diagnostic AE client for OPC Server or with an OPC AE client. Amount of events sent is cumulative: higher level also contains lower level events. System event level configuration at subnetwork overrides definitions at device level. The same or higher event level must be set for Subnetwork as for IED. System events can be used for debugging and event flow monitoring. Event level can be changed during the run time by using the Diagnostic events level attribute, IEC 61850 device attributes.
Addresses		
IP Address	127.0.0.1	IEC 61850 Node Number of the device. It is updated from scd file during import.
OSI ACSE AE Qualifier	23	IEC 61850 Subnet Number of the device.
OSI ACSE AP Title Value	1,3,9999,23	OSI ACSE AP Title Value as defined in IEC 61850-8-1.

Table 3. IEC 61850 Device Object Properties (Continued)

Name	Value / Value range	Description
OSI Presentation Selector	00000001	OSI Presentation Selector as defined in IEC 61850-8-1.
OSI Session Selector	0001	OSI Session Selector as defined in IEC 61850-8-1.
OSI Transport Selector	0001	OSI Transport Selector as defined in IEC 61850-8-1.
Communication Control		
Configuration Revision Check Enabled	True False Default: False	If enabled, checks configuration revisions from all logical devices (LDx.LLN0.NamPlt.configRev). If configuration revisions do not match between configuration and IED, communication to the IED is not established.
Dynamically Create Data Sets	True False Default: False	Specifies whether data sets and reporting are initialized dynamically. Using static data sets is recommended. The IED needs to support this feature. If enabled, all configured data sets in CET are created and report control blocks configured at runtime to the IED after connecting. The dynamic data sets must be configured with the Dataset Editor and designated to available report control blocks. The report control blocks must be configured and dedicated for the IEC 61850 OPC Server instance. Data sets used with buffered reporting are created once when the BRCB is first initialized. Data sets used with unbuffered reporting are created every time the URCB is initialized. Dynamic data sets are not removed.

Table 3. IEC 61850 Device Object Properties (Continued)

Name	Value / Value range	Description
Enable EntryID Check	True False Default: False	Enable reporting EntryID check. Report EntryIDs are used as sequence numbers for buffered reporting. A gap in sequence numbers will cause a restart of reporting, starting from lost sequence number.
MMS Request Timeout	0...60000 0 = disabled Default: 5000	Specifies the timeout for the MMS request in milliseconds (msec). If 0 it is not in use.
Report Control Block Initialize	True False Default: True	Initialize to report control blocks and enable reporting.
Send Single Message MMS Writes	True False Default: False	Sends single message MMS writes.
Use 32 Bit Entry ID	True False Default: False	Enables or disables usage of 32 bit EntryIDs for information report sequence. The IEC 61850 standard defines 64 bit EntryID, but SPA-ZC 40x uses 32 bit EntryID.
Use Sequence Number Check	True False Default: False	Enables or disables sequence number checking information reports for the IEC 61850 OPC server.

Table 3. IEC 61850 Device Object Properties (Continued)

Name	Value / Value range	Description
Polling		
Polling Timeout	(0..3600) Default: 0 (disabled)	Polling Timeout in seconds. If the device does not support reporting, ST and MX attributes can be polled with this interval.
Control Authorization		
Disable Interlockcheck for All Controls	True False Default: False	Disables interlockcheck condition check for all select and operate controls.
Disable Synchrocheck for All Controls	True False Default: False	Disables synchrocheck condition check for all select and operate controls.
Interlock Override Supported	True False Default: False	Specifies whether Interlock Override is supported by this IED.
Station/Remote Switch OPC Path		OPC path of the station remote switch position to be used with this device. The format is #ProgID For OPC Server#Channel Name\\IED Name\\Logical Device Name\\Logical Node Name\\Data Object Name. For example, #ABB.IEC61850_OPC_DA_Server.Instance[1] 1#Channel1\\IED1\\LD1\\GGIO1\\loc
Synchrocheck Override Supported	True False Default: False	Specifies whether Synchrocheck Override is supported by this IED.
OPC Alarm and Event		
Area Name		Specifies which area this IED belongs to.

Table 3. IEC 61850 Device Object Properties (Continued)

Name	Value / Value range	Description
Area Description		Description of area.
Device Connection Status Class	Default: Device Connection Status	Device Connection Status Class definition used with current device.
Measurement Limit Supervision	IED Based limit supervision OPC Server based limit supervision	Specifies whether measurement limit supervision is performed by the IEC 61850 OPC Server.
Authentication		
Is Authentication Disabled	True False Default: True	Is Authentication Disabled?
Is Password used	True False Default: False	Is Password used?
Password	Default: None	Password used for authentication.
SPA Access		
SPA parameter for Close Password		SPA parameter for close Password.
SPA value for Open Password		SPA parameter value for open Password.
SPA Store parameter name		SPA store parameter name.
SPA Store parameter value	0...65536	SPA store parameter value.
SPA Value for Close Password	0...65536	SPA value for close password.

Table 3. IEC 61850 Device Object Properties (Continued)

Name	Value / Value range	Description
SPA value for Open Password	0...65536	SPA value for open password.
Disturbance Recording		
Disturbance Recorder Delete Recordings	Default: False	Specifies whether DRs are deleted from IED after upload.
Disturbance Recorder Enabled	Default: False	Specifies whether DR upload is enabled.
Disturbance Recorder Local Directory		Specifies the folder where all disturbance recordings will be stored in the running computer. If left empty "C:\COMTRADE\IEDName" will be used.
Disturbance Recorder Maximum Total File Size	0 - 2147483647 0: no limit Default: 0	Specifies maximum size for folder where uploaded DRs are locally stored for this IED.
Disturbance Recorder Polling Period	0 - 2147483647 0: disabled Default: 120	DR polling period in seconds
Disturbance Recorder Remote Directory		Specifies the folder where all disturbance recordings will be stored in this IED.
Disturbance Recording via FTP		
Disturbance Recorder FTP Password		FTP password to be used with DR functionality
Disturbance Recorder FTP User Name		FTP username to be used with DR functionality
Disturbance Recorder Read Via FTP	False: MMS (IEC 61850) True: FTP Default: False	Specifies whether DRs will be read using FTP

Table 3. IEC 61850 Device Object Properties (Continued)

Name	Value / Value range	Description
Web Server Enabled	True False Default: False	Specifies whether IED Web Server is accessible from COM600 HMI.
Web Server IP Address		IP Address for Web Server. Dotted decimal or DNS name to be used. If omitted and Web Server is enabled, IED IP address is used.

Logical Device Object Properties

The logical devices are configured, whenever they are imported with IEC 61850 Devices. *Table 4* lists the configurable Logical Device object properties.

Table 4. Logical Device Object Properties

Name	Value / Value range	Description
Transparent SPA		
SPA Address	(0..999) Default: 0	The SPA address of the device connected via TCP/IP. By setting value >0 enables the built in TCP/SPA client, which can be used through the Transparent SPA attribute, IEC 61850 logical device attributes.
SPA TCP Port	(1..65535) Default: 7001	SPA TCP Port.
SPA TCP Timeout	(1..65535) Default: 3	SPA TCP Timeout in seconds.
Control Authorization		

Table 4. Logical Device Object Properties (Continued)

Name	Value / Value range	Description
Station/Remote Switch OPC Path		Station/Remote Switch OPC Path OPC path of the station remote switch position to be used with this device. The format is Node#ProgID For OPC Server#Channel Name\IED Name\Logical Device Name\Logical Node Name\Data Object Name. For example, GW#ABB.IEC61850_OPC_DA_Server.Instance[1]#Channel1\IED1\LD1\GGIO1\loc.
SPA Access		
SPA parameter for Close Password		SPA parameter for close Password.
SPA value for Open Password		SPA parameter value for open Password.
SPA Store parameter name		SPA store parameter name.
SPA Store parameter value	0...65536	SPA store parameter value.
SPA Value for Close Password	0...65536	SPA value for close password.
SPA value for Open Password	0...65536	SPA value for open password.

Supported IEC 61850-Ed1 Data Objects

IEC 61850 OPC Server supports data objects for status, measurand, controllable status, and controllable analog information. The IEC 61850 OPC Server supports 28 data object types for an IEC 61850 Device. The data objects are configured whenever they are imported with IEC 61850 devices. The configurations can be monitored with Data Object and Attribute Viewer on Page 45.

Data classes for status information:

- Single point status (SPS)
- Double point status (DPS)
- Integer status (INS)
- Protection activation information (ACT)
- Directional protection activation information (ACD)
- Security violation counter (SEC)
- Binary counter reading (BCR)

Data classes for measurand information:

- Measured value (MV)
- Complex measured value (CMV)
- Sampled value (SAV)
- WYE
- Delta (DEL)
- Sequence (SEQ)

Data classes for controllable status information:

- Controllable single point (SPC)
- Controllable double point (DPC)
- Controllable integer status (INC)
- Binary controlled step position information (BSC)
- Integer controlled step position information (ISC)

Data classes for controllable analog information:

- Analog set point (APC)

Data objects classes for status settings:

- Single setting point (SPG)
- Integer status setting (ING)

Data classes for analogue settings:

- Analogue setting (ASG)
- Setting curve (CURVE)

Data classes for description information:

- Device name plate (DPL)
- Logical Node name plate (LPL)

Data classes for internal status information:

- Integer status (Internal INS)
- Single point status (Internal SPS)
- Controllable single point (Internal SPC)

The parameters are stored in object properties in CET. The actual configuration for data objects is not supported.

Data Object and Attribute Viewer

The configured data object types, data attribute types and enumerated attributes can be viewed with the provided viewers for IEC 61850 OPC Server.

To view data object type viewer:

1. Right-click the IEC 61850 OPC Server.
2. Select **DOType Viewer** from the context menu.

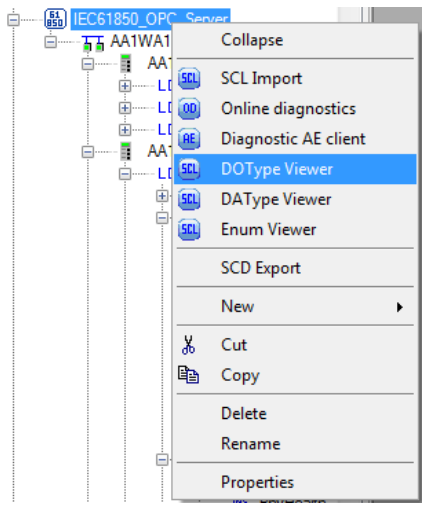


Figure 6. DOType Viewer

With DOType Viewer the attributes of the DOtypes can be viewed under the IEC 61850 OPC Server in the communication structure. From the DOType drop-down menu, select the data object types to view.

To view data attribute type viewer:

1. Right-click the IEC 61850 OPC Server.
2. Select **DAType Viewer** from the context menu.

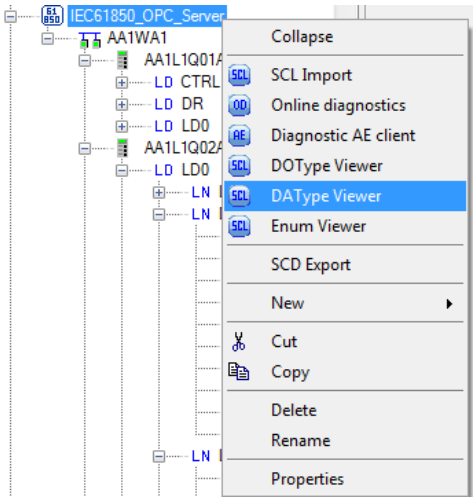


Figure 7. DAType Viewer

With DAType Viewer, the attributes of the DAtypes can be viewed under the IEC 61850 OPC Server in the communication structure. From the DAType drop-down menu, select the data attribute types to view.

To view enumerated basic type attributes:

1. Right-click the IEC 61850 OPC Server.
2. Select **Enum Viewer** from the context menu.

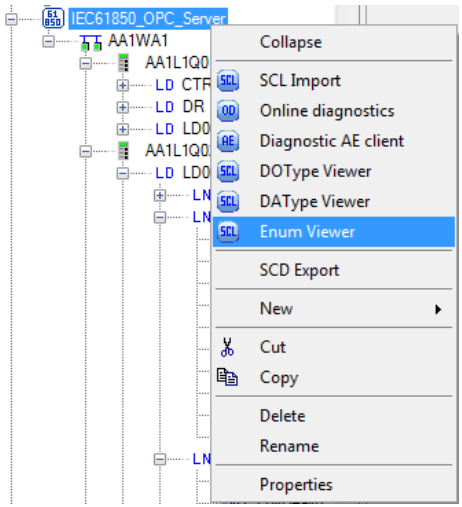


Figure 8. Enum Viewer

With Enum Viewer, the enumeration of EnumTypes can be viewed under the IEC 61850 OPC Server in the communication structure. From the EnumType drop-down menu, select the enumerated basic type attributes to view.

With DOI Editor, the data object's default values are overridden if necessary. Refer to IEC standards IEC 61850-6 and IEC 61850-7-3.

Measurement

Measurement Limit Supervision

Configuring OPC Server based measurement limit supervision and units:

Measurement limit value supervision is done by the IEC 61850 IED with the specified LNs. If the IED does not support limit value supervision or does not provide units for the measurements, it is possible to configure the OPC server instead to handle the limit value supervision and to publish units for the measurements to realize a common IEC 61850 substation supervision functionality for the 800xA operator workplaces. Supervision mode (IED or OPC) can be

configured with the Measurement Limit Supervision property of the IEC61850 device for each IED. If the IED based supervision mode is selected, the limit values can be configured with the properties described in the following sections.

The data objects MV, CMV, SEQ, DEL and WYE support measurement limit supervision. MV, CMV, SAV, SEQ, DEL and WYE measurement data objects support overriding unit and multiplier information. The configurable properties for the data objects are presented in the following sections.

Common Data Class Object Properties

MV, CMV, DEL Properties

Table 5 Configurable limit supervision properties for the MV, CMV DEL object.

Table 5. Configuring MV, CMV, DEL properties

Property	Type
[060] Limit Value Supervision	
Max	float
High-High	float
High	float
Low	float
Low-Low	float
Min	float
[050] Scale and Unit	
Multiplier	Enum
Scale	Enum
SI Unit	Enum

SAV Properties

Table 6 Configurable limit supervision properties for the SAV object.

Table 6. Configuring SAV properties

Property	Type
[050] Scale and Unit	
SI Unit	Enum
Multiplier	Enum

SEQ Properties

Table 7 Configurable limit supervision properties for the SEQ object.

Table 7. Configuring SEQ properties

Property	Type
[060] C1 Limit Value Supervision	
Max	float
High-High	float
High	float
Low	float
Low-Low	float
Min	float
[060] C2 Limit Value Supervision	
Max	float
High-High	float
High	float
Low	float
Low-Low	float

Table 7. Configuring SEQ properties

Property	Type
Min	float
[060] C3 Limit Value Supervision	
Max	float
High-High	float
High	float
Low	float
Low-Low	float
Min	float
[050] Scale and Unit	
C1 Multiplier	Enum
C1 SI Unit	Enum
C2 Multiplier	Enum
C2 SI Unit	Enum
C3 Multiplier	Enum
C3 SI Unit	Enum

WYE Properties

Table 8 Configurable limit supervision properties for the WYE object.

Table 8. Configuring SEQ properties

Property	Type
[060] Phase Limit Value Supervision	
Max	float
High-High	float

Table 8. Configuring SEQ properties

Property	Type
High	float
Low	float
Low-Low	float
Min	float
[060] Net Limit Value Supervision	
Max	float
High-High	float
High	float
Low	float
Low-Low	float
Min	float
[060] Neutral Limit Value Supervision	
Max	float
High-High	float
High	float
Low	float
Low-Low	float
Min	float
[060] Res Limit Value Supervision	
Max	float
High-High	float
High	float
Low	float

Table 8. Configuring SEQ properties

Property	Type
Low-Low	float
Min	float
[050] Scale and Unit	
Net Multiplier	Enum
Net SI Unit	Enum
Neut Multiplier	Enum
Neut SI Unit	Enum
Phase Multiplier	Enum
Phase SI Unit	Enum
Res Multiplier	Enum
Res SI Unit	Enum

Other Common Data Class Object Properties

Common Data Class Specifications for Status Information

Single Point Status (SPS)

Table 9 defines the common data class of single point status.

Table 9. Single Point Status

Name	Type	FC	Value/Value range	M/O/C	OPC Data Type
stVal	BOOLEAN	ST	TRUE FALSE	M	VT_BOOL
q	Quality	ST		M	VT_I4
t	TimeStamp	ST		M	VT_DATE

Table 9. Single Point Status (Continued)

Name	Type	FC	Value/Value range	M/O/C	OPC Data Type
subEna	BOOLEAN	SV		O	VT_BOOL
subVal	BOOLEAN	SV	TRUE FALSE	O	VT_BOOL
subQ	Quality	SV		O	VT_I4
subID	VISIBLE STRING64	SV		O	VT_BSTR
d	VISIBLE STRING64	DC	Text	O	VT_BSTR
dU	UNICODE STRING255	DC		O	VT_BSTR
cdcNs	UNICODE STRING255	EX		O	VT_BSTR
cdcName	UNICODE STRING255	EX		O	VT_BSTR
dataNs	UNICODE STRING255	EX		O	VT_BSTR

Double Point Status (DPS)

Table 10 defines the common data class of double point status.

Table 10. Double Point Status

Name	Type	FC	Value/Value range	M/O	OPC Data Type
stVal	CODED ENUM	ST	intermediatestate (0) off (1) on (2) bad-state (3)	M	VT_I4
q	Quality	ST		M	VT_I4
t	TimeStamp	ST		M	VT_DATE
subEna	BOOLEAN	SV		O	VT_BOOL
subVal	CODED ENUM	SV	intermediatestate (0) off (1) on (2) bad-state (3)	O	VT_I4
subQ	Quality	SV		O	VT_I4
subID	VISIBLE STRING64	SV		O	VT_BSTR
d	VISIBLE STRING255	DC	Text	O	VT_BSTR
dU	UNICODE STRING255	DC		O	VT_BSTR
cdcNs	VISIBLE STRING255	EX		O	VT_BSTR
cdcName	VISIBLE STRING255	EX		O	VT_BSTR
dataNs	VISIBLE STRING255	EX		O	VT_BSTR

Integer Status (INS)

Table 11 defines the common data class of Integer status.

Table 11. Integer Status

Name	Type	FC	Value/Value range	M/O	OPC Data Type
stVal	INT32	ST		M	VT_I4
q	Quality	ST		M	VT_I4
t	TimeStamp	ST		M	VT_DATE
subEna	BOOLEAN	SV		O	VT_BOOL
subVal	INT32	SV		O	VT_I4
subQ	Quality	SV		O	VT_I4
subID	VISIBLE STRING64	SV		O	VT_BSTR
d	VISIBLE STRING255	DC		O	VT_BSTR
dU	UNICODE STRING255	DC		O	VT_BSTR
cdcNs	VISIBLE STRING255	EX		O	VT_BSTR
cdcName	VISIBLE STRING255	EX		O	VT_BSTR
dataNs	VISIBLE STRING255	EX		O	VT_BSTR

Protection Activation information (ACT)

Table 12 defines the common data class of protection activation information.

Table 12. Protection Activation Information

Name	Type	FC	Value/Value range	M/O	OPC Data Type
general	BOOLEAN	ST		M	VT_BOOL
phsA	BOOLEAN	ST		O	VT_BOOL
phsB	BOOLEAN	ST		O	VT_BOOL
phsC	BOOLEAN	ST		O	VT_BOOL
neut	BOOLEAN	ST		O	VT_BOOL
q	Quality	ST		M	VT_I4
t	TimeStamp	ST		M	VT_DATE
operTm	TimeStamp	CF		O	VT_DATE
d	VISIBLE STRING255	DC		O	VT_BSTR
dU	UNICODE STRING255	DC		O	VT_BSTR
cdcNs	VISIBLE STRING255	EX		O	VT_BSTR
cdcName	VISIBLE STRING255	EX		O	VT_BSTR
dataNs	VISIBLE STRING255	EX		O	VT_BSTR

Directional Protection Activation Information (ACD)

Table 13 defines the common data class of Directional protection activation information.

Table 13. Directional Protection Activation Information

Name	Type	FC	Value/Value range	M/O	OPC Data Type
general	BOOLEAN	ST		M	VT_BOOL
dirGeneral	ENUMERATED	ST	unknown (3) forward (1) backward (2)	M	
phsA	BOOLEAN	ST		O	VT_BOOL
dirPhsA	ENUMERATED	ST	unknown (3) forward (1) backward (2)	O	
phsB	BOOLEAN	ST		O	VT_BOOL
dirPhsB	ENUMERATED	ST	unknown (3) forward (1) backward (2)	O	
phsC	BOOLEAN	ST		O	VT_BOOL
dirPhsC	ENUMERATED	ST	unknown (3) forward (1) backward (2)		
neut	BOOLEAN	ST		O	VT_BOOL
dirNeut	ENUMERATED	ST	unknown (3) forward (1) backward (2)	O	
q	Quality	ST		M	VT_I4
t	TimeStamp	ST		M	VT_DATE

Table 13. Directional Protection Activation Information (Continued)

Name	Type	FC	Value/Value range	M/O	OPC Data Type
d	VISIBLE STRING255	DC		O	VT_BSTR
dU	UNICODE STRING255	DC		O	VT_BSTR
cdcNs	VISIBLE STRING255	EX		O	VT_BSTR
cdcName	VISIBLE STRING255	EX		O	VT_BSTR
dataNs	VISIBLE STRING255	EX		O	VT_BSTR

Security Violation Counter (SEC)

Table 14 defines the common data class of Security violation counting information.

Table 14. Security Violation Counting

Name	Type	FC	Value/Value range	M/O	OPC Data Type
cnt	INT32U	ST		M	VT_I4
sev	ENUMERATED	ST	unknown (0) critical (1) major (2) minor (3) warning (4)	M	VT_I4
t	TimeStamp	ST		M	VT_DATE

Table 14. Security Violation Counting (Continued)

Name	Type	FC	Value/Value range	M/O	OPC Data Type
addr	OCTET STRING64	ST		O	VT_BSTR
d	VISIBLE STRING255	DC	Text	O	VT_BSTR
dU	UNICODE STRING255	DC		O	VT_BSTR
cdcNs	VISIBLE STRING255	EX		O	VT_BSTR
cdcName	VISIBLE STRING255	EX		O	VT_BSTR
dataNs	VISIBLE STRING255	EX		O	VT_BSTR

Binary Counter Reading (BCR)

Table 15 defines the common data class of binary counter reading information.

Table 15. Binary Counter Reading

Name	Type	FC	Value/Value range	M/O	OPC Data Types
actVal	INT128	ST		M	VT_I4
frVal	INT128	ST		O(1)	VT_I4
frTm	TimeStamp	ST		O(1)	VT_DATE
q	Quality	ST		M	VT_I4
t	TimeStamp	ST			VT_DATE
units	Unit	CF		O	VT_R4

Table 15. Binary Counter Reading (Continued)

Name	Type	FC	Value/Value range	M/O	OPC Data Types
pulsQty	FLOAT32	CF		M	VT_BOOL
frEna	BOOLEAN	CF		O(1)	VT_DATE
strTm	TimeStamp	CF		O(1)	VT_DATE
frPd	INT32	CF		O(1)	VT_BOOL
frRds	BOOLEAN	CF		O(1)	VT_BSTR
d	VISIBLE STRING255	DC	Text	O	VT_BSTR
dU	UNICODE STRING255	DC		O	VT_BSTR
cdcNs	VISIBLE STRING255	EX		O	VT_BSTR
cdcName	VISIBLE STRING255	EX		O	VT_BSTR
dataNs	VISIBLE STRING255	EX		O	VT_BSTR

(1) All or none of these items must be present.

Common Data Class Specifications for Controllable Status Information

Controllable Single Point (SPC)

Table 16 defines the common data class of controllable single point.

Table 16. Controllable Single Point

Name	Type	FC	Value/Value range	M/O	OPC Data Type
lastApplError	ApplicationError Code	MX	Refer to Application Error Codes on Page 297	O[(a)]	VT_I4
ctlVal	BOOLEAN	CO	off (FALSE) on (TRUE)	M	VT_BOOL
operTm	TimeStamp	CO		O	VT_DATE
origin	Originator	CO, ST			
ctlNum	INT8U	CO, ST	0..255	O	VT_I4
stVal	BOOLEAN	ST	FALSE TRUE	M	VT_BOOL
q	Quality	ST		M	VT_I4
t	TimeStamp	ST		M	VT_DATE
stSeld	BOOLEAN	ST	FALSE TRUE	O	VT_BOOL
subEna	BOOLEAN	SV		O	VT_BOOL
subVal	BOOLEAN	SV	FALSE TRUE	O	VT_BOOL
subQ	Quality	SV		O	VT_I4
subID	VISIBLE STRIN64	SV		O	VT_BSTR
pulseConfig	PulseConfig	CF		O	

Table 16. Controllable Single Point

Name	Type	FC	Value/Value range	M/O	OPC Data Type
ctlModel	ENUMERATED	CF	Status-only (0) directwithnormalsecurity (1) sbowithnormalsecurity (2) directwithenhanced security(3) sbowithenhancedsecurity(4)	M	VT_I4
sboTimeout	INT32U	CF		O	VT_I4
sboClass	ENUMERATED	CF	operate-once (0) operatemany (1)	O	VT_I4
d	VISIBLE STRING255	DC	Text	O	VT_BSTR
dU	UNICODE STRING255	DC		O	VT_BSTR
cdcNs	VISIBLE STRING255	EX		O	VT_BSTR
cdcName	VISIBLE STRING255	EX		O	VT_BSTR
dataNs	VISIBLE STRING255	EX		O	VT_BSTR

Mapping of controls

- Direct Control with Normal Security:
  ctlVal: MMS Write.request to Oper structure with value.

- SBO with Normal Security:
  ctlVal: MMS Write.request to ctlVal with value. IEC61850 OPC Server will do the select before operate.
- Direct Control with Enhanced Security:
  tlVal: MMS Write.request to Oper structure with value.
- SBO with Enhanced Security:
  ctlVal: MMS Write.request to ctlVal with value. IEC61850 OPC Server will do the select before operate.

Controllable Double Point (DPC)

Table 17 defines the common data class of controllable double point.

Table 17. Controllable Double Point

Name	Type	FC	Value/Value range	M/O	OPC Data Type
ctlSelOn	AbbCommand Bitmask			M	VT_I4
ctlSelOff	AbbCommand Bitmask			M	VT_I4
ctlOperOn	AbbCommand Bitmask			M	VT_I4
ctlOperOff	AbbCommand Bitmask			M	VT_I4
ctlCan	AbbCommand Bitmask			M	VT_I4
ctlOper	AbbCommand Bitmask			M	VT_I4
lastApplError	ApplicationErrorCode		Refer to Application Error Codes on Page 297	M	VT_I4
ctlVal	BOOLEAN	CO	off (FALSE) on (TRUE)	M	VT_BOOL

Table 17. Controllable Double Point

Name	Type	FC	Value/Value range	M/O	OPC Data Type
operTm	TimeStamp	CO		O	VT_DATE
origin	Originator	CO, ST			
ctlNum	INT8U	CO, ST	0..255	O	VT_I4
stVal	CODED ENUM	ST	intermediatestate(0) off (1) on (2) bad-state (3)	M	VT_I1
q	Quality	ST		M	VT_I4
t	TimeStamp	ST		M	VT_DATE
stSeld	BOOLEAN	ST	FALSE TRUE	O	VT_BOOL
subEna	BOOLEAN	SV		O	VT_BOOL
subVal	BOOLEAN	SV	intermediatestate(0) off (1) on (2) bad-state (3)	O	VT_I1
subQ	Quality	SV		O	VT_I4
subID	VISIBLE STRIN64	SV		O	VT_BSTR
pulseConfig	PulseConfig	CF		O	
ctlModel	ENUMERATED	CF	Status-only (0) directwithnormalsecurity (1) sbowithnormalsecurity (2) directwithenhancedsecurity(3) sbowithenhancedsecurity(4)	M	VT_I4

Table 17. Controllable Double Point

Name	Type	FC	Value/Value range	M/O	OPC Data Type
sboTimeout	INT32U	CF		O	VT_I4
sboClass	ENUMERATED	CF	operate-once (0) operatemany (1)	O	VT_I4
d	VISIBLE STRING255	DC	Text	O	VT_BSTR
dU	UNICODE STRING255	DC		O	VT_BSTR
cdcNs	VISIBLE STRING255	EX		O	VT_BSTR
cdcName	VISIBLE STRING255	EX		O	VT_BSTR
dataNs	VISIBLE STRING255	EX		O	VT_BSTR

- **ctlOperOn**: This attribute determines the control activity operation in direction On/Close.
- **ctlOperOff**: This attribute determines the control activity operation in direction Off/Open.
- **ctlSelOn**: This attribute determines the selection with direction On/Close.
- **ctlSelOff**; This attribute determines the selection with direction Off/Open.
- **ctlCan**: This attribute determines the cancellation of the selection
- **ctlOper**: This attribute determines the selection with direction

Mapping of controls

- Direct Control with Normal Security:
  - ctlSelOn: (not used)

  - ctlSelOff: (not used)
  - ctlOperOn: MS Write.request to Oper structure with value ON.
  - ctlOperOff: MMS Write.request to Oper structure with value OFF.
  - ctlCan: (not used)
  - ctlOper: (not used)

The ctlSelOn, ctlSelOff, ctlCan, selCause, cmdTermCause, stSeld and the bits in ControlValues are not applicable.

- SBO with Normal Security:
  - ctlSelOn: MMS Read.request to SBO structure (to perform select).
  - ctlSelOff: MMS Read.request to SBO structure (to perform select).
  - ctlOperOn: MMS Write.request to Oper structure with value ON (to operate).
  - ctlOperOff: MMS Write.request to Oper structure with value OFF (to operate).
  - ctlCan: MMS Write.request ro Cancel structure
  - ctlOper: MMS Write.request to Oper structure with value ON/OFF according to previous direction of select.
- Direct Control with Enhanced Security:
  - ctlSelOn: (not used)
  - ctlSelOff: (not used)
  - ctlOperOn: MMS Write.request to Oper structure with value ON.
  - ctlOperOff: MMS Write.request to Oper structure with value OFF.
  - ctlCan: MMS Write.request ro Cancel structure
  - ctlOper: (not used)
- SBO with Enhanced Security:
  - ctlSelOn: MMS Read.request to SBOw structure.
  - ctlSelOff: MMS Read.request to SBOw structure.

– ctlOperOn: MMS Write.request to Oper structure with value ON.
– ctlOperOff: MMS Write.request to Oper structure with value OFF.
– ctlCan: MMS Write.request to Cancel structure
– ctlOper: MMS Write.request to Oper structure with value ON/OFF according to previous direction of select.

Controllable Integer Status (INC)

Table 18 defines the common data class of controllable integer status.

Table 18. controllable integer status

Name	Type	FC	Value/Value range	M/O	OPC Data Type
lastApplError	ApplicationErrorCode		Refer to Application Error Codes on Page 297		VT_I4
ctlVal	INT32	CO		M	VT_I4
operTm	TimeStamp	CO		O	VT_DAT
orCat	ENUMERATED			O	VT_I4
orIdent	OCTET STRING64			O	VT_BSTR
ctlNum	INT8U	CO, ST	0..255	O	VT_I4
stVal	INT32	ST		M	VT_I4
q	Quality	ST		M	VT_I4
t	TimeStamp	ST		M	VT_DATE
stSeld	BOOLEAN	ST	FALSE TRUE	O	VT_BOOL
subEna	BOOLEAN	SV		O	VT_BOOL
subVal	INT32	SV		O	VT_I4
subQ	Quality	SV		O	VT_I4

Table 18. controllable integer status

Name	Type	FC	Value/Value range	M/O	OPC Data Type
subID	VISIBLE STRING64	SV	Text	O	VT_BSTR
ctlModel	ENUMERATED	CF	Status-only (0) directwithnormalsecurity (1) sbowithnormalsecurity (2) directwithenhancedsecurity(3) sbowithenhancedsecurity(4)	M	VT_I4
sboTimeout	INT32U	CF		O	VT_I4
sboClass	ENUMERATED	CF	operate-once (0) operatemany (1)	O	VT_I4
minVal	INT32	CF		O	VT_I4
maxVal	INT32	CF		O	VT_I4
stepSize	INT32U	CF	1 ... (maxVal - minVal)	O	VT_I4
d	VISIBLE STRING255	DC	Text	O	VT_BSTR
dU	UNICODE STRING255	DC		O	VT_BSTR
cdcNs	VISIBLE STRING255	EX		O	VT_BSTR
cdcName	VISIBLE STRING255	EX		O	VT_BSTR
dataNs	VISIBLE STRING255	EX		O	VT_BSTR

Mapping of controls

- Direct Control with Normal Security:

  - ctlVal: MMS Write.request to Oper structure with value.
- SBO with Normal Security:
  - ctlVal: MMS Write.request to Oper structure with value. IEC61850 OPC Server will do the select before operate.
- Direct Control with Enhanced Security:
  - ctlVal: MMS Write.request to Oper structure with value.
- SBO with Enhanced Security:
  - ctlVal: MMS Write.request to Oper structure with value. IEC61850 OPC Server will do the select before operate.

Binary Controlled Step Position Information (BSC)

Table 19 defines the common data class of binary controlled step position information.

Table 19. Binary Controlled Step Position Information

Name	Type	FC	Value/Value range	M/O	OPC Data Type
lastApplError	ApplicationErrorCode		Refer to Application Error Codes on Page 297		VT_I4
ctlVal	ENUMERATED		stop (0) lower (1) higher (2) reserved (3)	M	VT_I4
operTm	TimeStamp	CO		O	VT_DAT

Table 19. Binary Controlled Step Position Information

Name	Type	FC	Value/Value range	M/O	OPC Data Type
orCat	ENUMERATED		not-supported bay-control station-control remote-control automatic bay automatic-station automaticremote maintenance process	O	VT_I4
orIdent	OCTET STRING64			O	VT_BSTR
ctlNum	INT8U	CO, ST	0..255	O	VT_I4
valWTr.posVal	INT8	ST		M	VT_I4
valWTr.transInd	BOOLEAN	ST		M	VT_BOOL
q	Quality	ST		M	VT_I4
t	TimeStamp	ST		M	VT_DATE
stSeld	BOOLEAN	ST	FALSE TRUE	O	VT_I4
q	Quality	ST		M	VT_BOOL
t	TimeStamp	ST		M	VT_DATE
stSeld	BOOLEAN	ST	FALSE TRUE	O	VT_BOOL
subEna	BOOLEAN	SV		O	VT_BOOL

Table 19. Binary Controlled Step Position Information

Name	Type	FC	Value/Value range	M/O	OPC Data Type
subVal	INT32	SV		O	VT_I4
subQ	Quality	SV		O	VT_I4
subID	VISIBLE STRING64	SV	Text	O	VT_BSTR
ctlModel	ENUMERATED	CF	Status-only (0) directwithnormalsecurity (1) sbowithnormalsecurity (2) directwithenhancedsecurity(3) sbowithenhancedsecurity(4)	M	VT_I4
sboTimeout	INT32U	CF		O	VT_I4
sboClass	ENUMERATED	CF	operate-once (0) operatemany (1)	O	VT_I4
minVal	INT8	CF		O	VT_I4
maxVal	INT8	CF		O	VT_I4
stepSize	INT8	CF	1 ... (maxVal - minVal)	O	VT_I4
d	VISIBLE STRING255	DC	Text	O	VT_BSTR
dU	UNICODE STRING255	DC		O	VT_BSTR
cdcNs	VISIBLE STRING255	EX		O	VT_BSTR
cdcName	VISIBLE STRING255	EX		O	VT_BSTR
dataNs	VISIBLE STRING255	EX		O	VT_BSTR

Mapping of controls

- Direct Control with Normal Security:
  - ctlVal: MMS Write.request to Oper structure with value.
- SBO with Normal Security:
  - ctlVal: MMS Write.request to Oper structure with value.
  - IEC61850 OPC Server will do the select before operate.
- Direct Control with Enhanced Security:
  - ctlVal: MMS Write.request to Oper structure with value.
- SBO with Enhanced Security:
  - ctlVal: MMS Write.request to Oper structure with value.
  - IEC61850 OPC Server will do the select before operate.

Integer Controlled Step Position Information (ISC)

Table 20 defines the common data class of integer controlled step position information.

Table 20. Integer Controlled Step Position Information

Name	Type	FC	Value/Value range	M/O	OPC Data Type
lastApplError	ApplicationErrorCode		Refer to Application Error Codes on Page 297		VT_I4
ctlVal	INT8	CO	-64 … 63	M	VT_I4
operTm	TimeStamp	CO		O	VT_DAT

Table 20. Integer Controlled Step Position Information

Name	Type	FC	Value/Value range	M/O	OPC Data Type
orCat	ENUMERATED		not-supported bay-control station-control remote-control automatic bay automatic-station automaticremote maintenance process	O	VT_I4
orIdent	OCTET STRING64			O	VT_BSTR
ctlNum	INT8U	CO, ST	0..255	O	VT_I4
valWTr.posVal	INT8	ST		M	VT_I4
valWTr.transInd	BOOLEAN	ST		M	VT_BOOL
q	Quality	ST		M	VT_I4
t	TimeStamp	ST		M	VT_DATE
stSeld	BOOLEAN	ST	FALSE TRUE	O	VT_I4
subEna	BOOLEAN	SV		O	VT_BOOL
subVal	INT32	SV		O	VT_I4
subQ	Quality	SV		O	VT_I4
subID	VISIBLE STRING	SV	Text	O	VT_BSTR

Table 20. Integer Controlled Step Position Information

Name	Type	FC	Value/Value range	M/O	OPC Data Type
ctlModel	ENUMERATED	CF	Status-only (0) directwithnormalsecurity (1) sbowithnormalsecurity (2) directwithenhancedsecurity(3) sbowithenhancedsecurity(4)	M	VT_I4
sboTimeout	INT32U	CF		O	VT_I4
sboClass	ENUMERATED	CF	operate-once (0) operatemany (1)	O	VT_I4
minVal	INT8	CF		O	VT_I4
maxVal	INT8	CF		O	VT_I4
stepSize	INT8	CF	1 ... (maxVal - minVal)	O	VT_I4
d	VISIBLE STRING255	DC	Text	O	VT_BSTR
dU	UNICODE STRING255	DC		O	VT_BSTR
cdcNs	VISIBLE STRING255	EX		O	VT_BSTR
cdcName	VISIBLE STRING255	EX		O	VT_BSTR
dataNs	VISIBLE STRING255	EX		O	VT_BSTR

Mapping of controls

- Direct Control with Normal Security:
  - ctlVal: MMS Write.request to Oper structure with value.

- SBO with Normal Security:
  - ctlVal: MMS Write.request to Oper structure with value.
  - IEC61850 OPC Server will do the select before operate.
- Direct Control with Enhanced Security:
  - ctlVal: MMS Write.request to Oper structure with value.
- SBO with Enhanced Security:
  - ctlVal: MMS Write.request to Oper structure with value.
  - IEC 61850 OPC Server will do the select before operate.

Common Data Class Specifications for Controllable Analogue Information

Analogue Set Point (APC)

Table 21 defines the common data class of analogue set point.

Table 21. Analogue Set Point

Name	Type	FC	Value/Value range	M/O	OPC Data Type
lastApplError	ApplicationErrorCode		Refer to Application Error Codes on Page 297		VT_I4
setMag	AnalogueValue	SP, MX		M	VT_R4
origin	Originator	SP, MX		O	
operTm	TimeStamp	SP		O	VT_DAT
q	Quality	ST		M	VT_I4
t	TimeStamp	ST		M	VT_DATE
ctlModel	ENUMERATED	CF	direct-with-normal-security (1)	M	VT_I4
units	Unit	CF		O	
sVC	ScaledValueConfig	CF		O	
minVal	AnalogueValue	CF		O	VT_R4

Table 21. Analogue Set Point (Continued)

Name	Type	FC	Value/Value range	M/O	OPC Data Type
maxVal	AnalogueValue	CF		O	VT_R4
stepSize	AnalogueValue	CF	1 ... (maxVal - minVal)	O	VT_R4
d	VISIBLE STRING255	DC	Text	O	VT_BSTR
dU	UNICODE STRING255	DC		O	VT_BSTR
cdcNs	VISIBLE STRING255	EX		O	VT_BSTR
cdcName	VISIBLE STRING255	EX		O	VT_BSTR
dataNs	VISIBLE STRING255	EX		O	VT_BSTR

Mapping of controls

- Direct Control with Normal Security:
  - setMag: MMS Write.request to Oper structure with value.
- SBO with Normal Security:
  - setMag: MMS Write.request to Oper structure with value. IEC61850 OPC Server will do the select before operate.
- Direct Control with Enhanced Security:
  - setMag: MMS Write.request to Oper structure with value.
- SBO with Enhanced Security:
  - setMag: MMS Write.request to Oper structure with value. IEC61850 OPC Server will do the select before operate.

Common Data Class Specifications for Status Settings

Single Point Setting (SPG)

Table 22 defines the common data class of single point setting.

Table 22. Single Point Setting

Name	Type	FC	Value/Value range	M/O	OPC Data Type
setVal	BOOLEAN	SP	off (FALSE) on (TRUE)	M	VT_BOOL
d	VISIBLE STRING255	DC	Text	O	VT_BSTR
dU	UNICODE STRING255	DC		O	VT_BSTR
cdcNs	VISIBLE STRING255	EX		O	VT_BSTR
cdcName	VISIBLE STRING255	EX		O	VT_BSTR
dataNs	VISIBLE STRING255	EX		O	VT_BSTR

Integer Status Setting (ING)

Table 23 defines the common data class of integer status setting.

Table 23. Integer Status Setting

Name	Type	FC	Value/Value range	M/O	OPC Data Type
setVal	INT32	SP		M	VT_I4
minVal	INT32	CF		O	VT_I4
maxVal	INT32	CF		O	VT_I4

Table 23. Integer Status Setting (Continued)

Name	Type	FC	Value/Value range	M/O	OPC Data Type
stepSize	INT32	CF	1 ... (maxVal - minVal)	O	VT_I4
d	VISIBLE STRING255	DC	Text	O	VT_BSTR
dU	UNICODE STRING255	DC		O	VT_BSTR
cdcNs	VISIBLE STRING255	EX		O	VT_BSTR
cdcName	VISIBLE STRING255	EX		O	VT_BSTR
dataNs	VISIBLE STRING255	EX		O	VT_BSTR

Common Data Class Specifications for Analogue Settings

Analogue Setting (ASG)

Table 24 defines the common data class of analogue setting.

Table 24. Analogue Setting

Name	Type	FC	Value/Value range	M/O	OPC Data Type
setMag	AnalogueValue	SP, MX		M	VT_I4
units	Unit	CF		O	
sVC	ScaledValueConfig	CF		O	
minVal	AnalogueValue	CF		O	VT_I4
maxVal	AnalogueValue	CF		O	VT_I4

Table 24. Analogue Setting (Continued)

Name	Type	FC	Value/Value range	M/O	OPC Data Type
stepSize	AnalogueValue	CF	1 ... (maxVal - minVal)	O	VT_I4
d	VISIBLE STRING255	DC	Text	O	VT_BSTR
dU	UNICODE STRING255	DC		O	VT_BSTR
cdcNs	VISIBLE STRING255	EX		O	VT_BSTR
cdcName	VISIBLE STRING255	EX		O	VT_BSTR
dataNs	VISIBLE STRING255	EX		O	VT_BSTR

Setting Curve (CURVE)

Table 25 defines the common data class of Setting curve.

Table 25. Setting Curve

Name	Type	FC	Value/Value range	M/O	OPC Data Type
setCharact	ENUMERATED	SP		M	VT_I4
setParA	FLOAT32	SP		O	VT_R4
setParB	FLOAT32	SP		O	VT_R4
setParC	FLOAT32	SP		O	VT_I4
setParD	FLOAT32	SP		O	VT_I4
setParE	FLOAT32	SP		O	VT_I4
setParF	FLOAT32	SP		O	VT_I4

Table 25. Setting Curve (Continued)

Name	Type	FC	Value/Value range	M/O	OPC Data Type
d	VISIBLE STRING255	DC	Text	O	VT_BSTR
dU	UNICODE STRING255	DC		O	VT_BSTR
cdcNs	VISIBLE STRING255	EX		O	VT_BSTR
cdcName	VISIBLE STRING255	EX		O	VT_BSTR
dataNs	VISIBLE STRING255	EX		O	VT_BSTR

Common Data Class Specifications for Description Information

Device Name Plate (DPL)

Table 26 defines the common data class of device name plate. Data of this common data class are used to identify entities like primary equipment or physical devices.

Table 26. Device Name Plate

Name	Type	FC	Value/Value range	M/O	OPC Data Type
vendor	VISIBLE STRING255	DC		M	VT_BSTR
hwRev	VISIBLE STRING255	DC		O	VT_BSTR
swRev	VISIBLE STRING255	DC		O	VT_BSTR

Table 26. Device Name Plate

Name	Type	FC	Value/Value range	M/O	OPC Data Type
serNum	VISIBLE STRING255	DC		O	VT_BSTR
model	VISIBLE STRING255	DC		O	VT_BSTR
location	VISIBLE STRING255	DC		O	VT_BSTR
cdcNs	VISIBLE STRING255	EX		O	VT_BSTR
cdcName	VISIBLE STRING255	EX		O	VT_BSTR
dataNs	VISIBLE STRING255	EX		O	VT_BSTR

Logical Node Name Plate (LPL)

Table 27 defines the common data class of logical node name plate. Data of this common data class are used to identify logical nodes.

Table 27. Logical Node Name Plate

Name	Type	FC	Value/Value range	M/O	OPC Data Type
vendor	VISIBLE STRING255	DC		M	VT_BSTR
hwRev	VISIBLE STRING255	DC		M	VT_BSTR
d	VISIBLE STRING255	DC	Text	M	VT_BSTR

Table 27. Logical Node Name Plate

Name	Type	FC	Value/Value range	M/O	OPC Data Type
dU	VISIBLE STRING255	DC		O	VT_BSTR
configRev	VISIBLE STRING255	DC		O	VT_BSTR
ldNs	VISIBLE STRING255	EX	will be included only in LLN0	O	VT_BSTR
lnNs	VISIBLE STRING255	EX		O	VT_BSTR
cdcNs	VISIBLE STRING255	EX		O	VT_BSTR
cdcName	VISIBLE STRING255	EX		O	VT_BSTR
dataNs	VISIBLE STRING255	EX		O	VT_BSTR

Report Control Block Object Properties

Data Sets

A data set is an ordered group of data objects and data attributes organized as a single collection for the convenience of the client. Data sets are used to define the values of data to be transmitted in case a value of a data set member changes. A data set is used for data reporting and GOOSE messaging.

Data Reporting

Data changes are used as a trigger for reporting. This information is grouped using a data set. The data set is the content basis for reporting. Reporting uses information

reports to transmit data. The data configured in a data set is transmitted in information reports. Reporting is controlled by report control blocks.

Report Control Block

Report control describes the conditions for generating information reports based on parameters set by configuration or by a client. Report Control Blocks control the procedures that are required for reporting values of data from logical nodes to one client.

There are buffered and unbuffered report control blocks:

- In a Buffered Report Control Block (BRCB) internal events issue immediate sending of reports, or buffer the events for transmission. This way the values of a data object are not lost due to transport flow control constraints or loss of connection. BRCB provides sequence-of-events functionality.
- In an Unbuffered Report Control Block (URCB) internal events issue immediate sending of reports on a best efforts basis. If no association exists, or if the transport data flow is not fast enough to support it, events may be lost.

Table 28. Report Control Block object properties

Property	Value / Value range	Description
Basic		
Buffer Time	Default: 0 milliseconds	With this value, RCB can be configured to wait for other events after the first change before sending the report. Value 0 means that a new change is immediately reported to the client. Configurable.
Buffered	True False Default: True	Controls if the RCB is buffered or unbuffered
Configuration Revision	0...2147483647	Configuration revision of the data set referenced by this RCB. Every modification in the data set increases the Configuration Revision property by one.

Table 28. Report Control Block object properties (Continued)

Property	Value / Value range	Description
Data Set		The name of the data set to be sent by the report control block.
Indexed	True False Default: True	Indicates if this RCB is configured with indexed naming convention.
Integrity period	0...214748647 Default: 0	Integrity period in milliseconds. If this attribute has a value > 0 ms, an integrity report with all data listed in the data set is sent periodically in this interval. By default, this feature is not enabled, because it generates an unnecessary load to the server and network. If this feature is used, the Trigger Option 'Period' in RCB needs to be enabled. Configurable
Report ID		Used as identification in information reports to specify that the report is from this RCB. By default report control block MMS path name is used. Configurable.
Option Fields		Defines what information is sent with the information report. Configurable.
Config Reference	True False Default: False	Config Reference
Data Ref	True False Default: False	Data Ref
Data Set	True False Default: False	Data Set

Table 28. Report Control Block object properties (Continued)

Property	Value / Value range	Description
Entry ID	True False Default: True	Entry ID
Reason Code	True False Default: True	Reason Code
Sequence Number	True False Default: True	Sequence Number
Time Stamp	True False Default: False	Time Stamp
Trigger Options		Defines the triggering conditions for creating reports.
Data change	True False Default: True	Specifies whether a report entry will be generated due to a change of the value of the data attribute.
Data Update	True False Default: False	Specifies whether a report entry will be generated due to freezing the value of an unfreezable attribute or updating the value of any other attribute. An updated value may have the same value as the old value.

Table 28. Report Control Block object properties (Continued)

Property	Value / Value range	Description
Period	True False Default: False	Specifies whether a report entry will be generated on the expiration of the integrity period.
Quality Change	True False Default: True	Specifies whether a report entry will be generated due to a change of the value of the quality attribute.

CET Project Configuration

A new CET project is created to configure the IEC 61850 OPC Server. Perform the following steps to create CET project and configure the IEC 61850 OPC Server:

1. Double-click the **CET** icon on the desktop or select **Start > ABB > IEC61850 OPC Server > Communication Engineering Tool**.
2. In **File** menu, select **File > Open/Manage Project**.

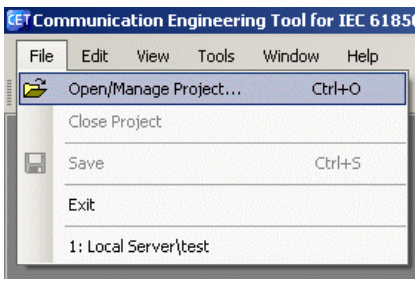


Figure 9. Open/Manage Project in CET

3. In the **Open/Manage Project** dialog box, click **New Project**.

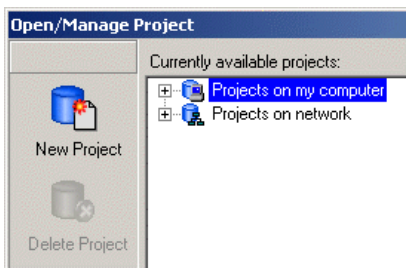


Figure 10. Open/Manage Project Dialog Box

4. In the **New Project** dialog box, enter the Project name and the Description.

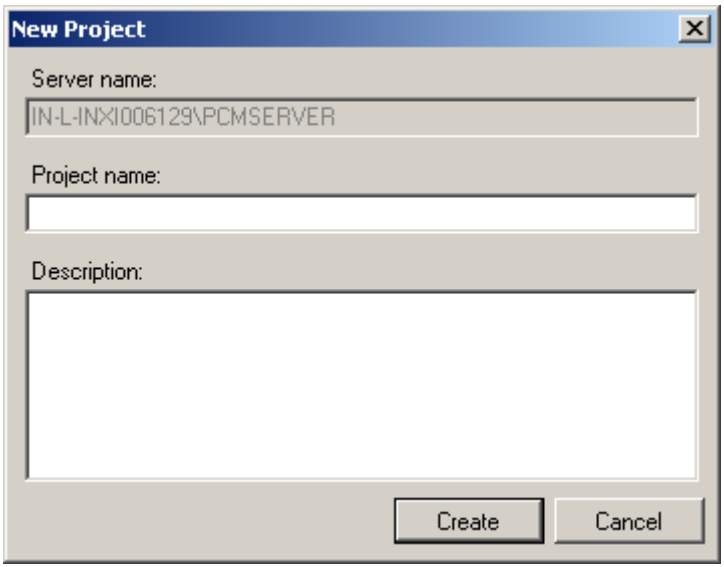


Figure 11. New Project Dialog Box

If the user want to open an existing project, in Step 3, locate the project in currently available projects list and click **Open Project**.

Adding Computer Node Object

5. Select the newly created project.

6. Right-click new project name and select **New > Communication > Computer Node.** Figure 12 shows the new Computer Node created in the Communication structure.

Figure 12. Computer Node Selection

Adding OPC Server Object

7. Right-click Computer Node object and select **New > IEC61850 > IEC61850 OPC Server**.

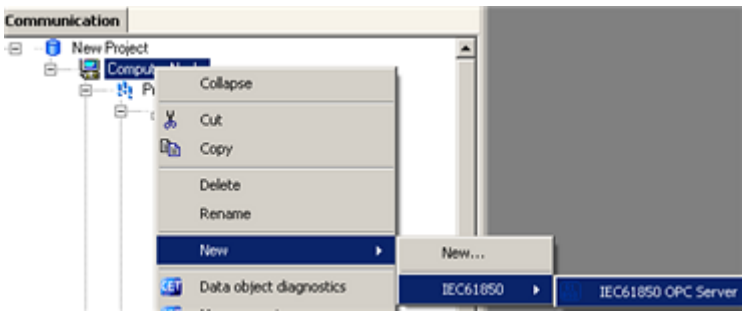


Figure 13. OPC Server Selection

8. Right-click OPC Server instance and select **Properties**.

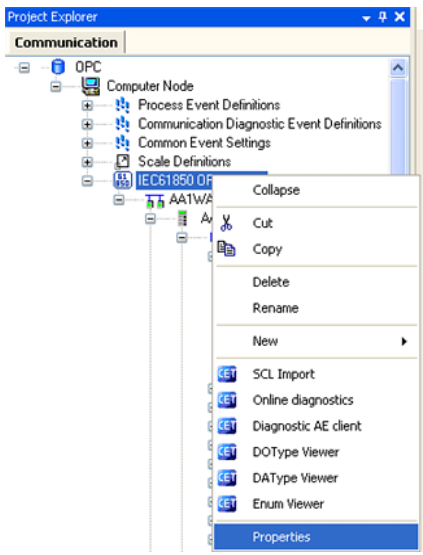


Figure 14. Properties Selection

9. In the right-side pane, under **Basic**:

   a. For **AE ProgID,**

      enter **ABB.IEC61850_OPC_AE_Server.Instance[*n*]**, where **n** is OPC Server instance number and n=1,2,3,4,……32.

   b. For **DA ProgID,**

      enter **ABB.IEC61850_OPC_DA_Server.Instance[*n*]**, where **n** is OPC Server instance number and n=1,2,3,4,……32.

   c. For **Instance Number**, enter ***n***, where ***n*** is same as mentioned in Step a and Step b.

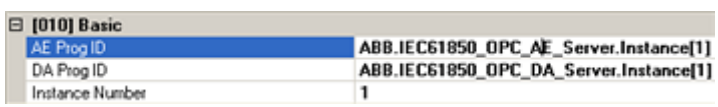


Figure 15. Basic

Ensure that in Step a, Step b and Step c, ***n*** must be the same. For example, if n=1 for step a, then n=1 for steps b and c respectively.

Ensure that the OPC Server Instance number running on Connectivity Server is unique across the 800xA System. Exception to this is if redundancy pair exists.

AE ProgID, **DA ProgID** and **Instance Number** for the first connectivity server are created automatically on selecting **Update and Reload configuration**. However, note that the OPC Server instance number starts from one and in sequence for each Connectivity Server.

Table 29 illustrates the instance number for each Connectivity Servers. Automatic creation of instance number is recommended only for the first connectivity server and its redundant pair if exists.

Table 29. OPC Server Instance Numbering

800xA Connectivity Server	OPC Server	OPC Server - Redundant
1 - Redundant	1,2,3,4	1,2,3,4
2 - Non Redundant	5,6,7,8	-
3 - Non Redundant	9,10,11,12	-
4 - Redundant	13,14,15,16	13,14,15,16
5 - Redundant	17, 18,19,20	17, 18,19,20
6 - Non Redundant	21,22,23,24	-
7 - Redundant	25,26,27,28	25,26,27,28
8 - Non Redundant	29,30,31,32	-

Once the OPC Server instance is created, it is recommended not to change the **AE ProgID**, the **DA ProgID**, and the **Instance Number**.

SCL Import

After adding an IEC 61850 OPC Server object, perform the following steps to import the scd file:

1. Select an IEC 61850 OPC Server instance that needs to be configured.
2. Right-click IEC 61850 OPC Server object and select **SCL Import**.

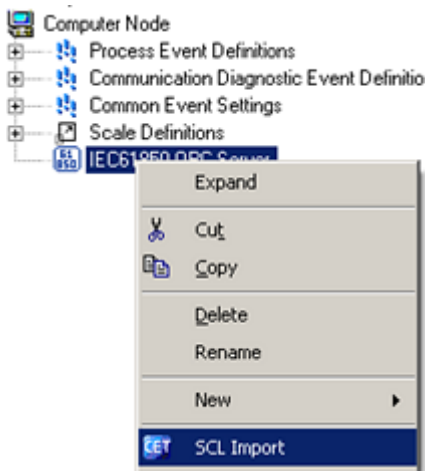


Figure 16. SCL Import Selection

3. Click **Choose File**.

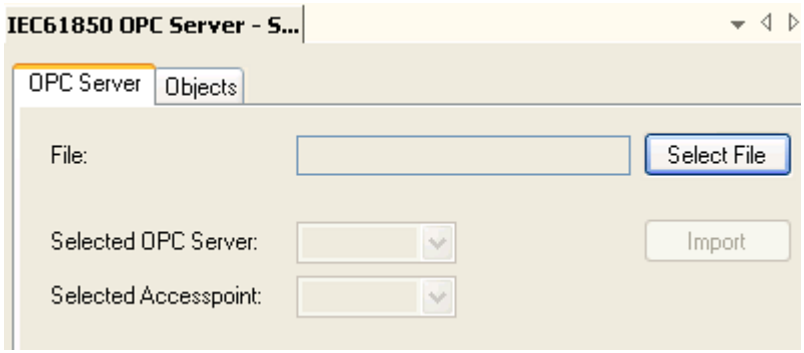


Figure 17. Choose File

4. Browse and select the required SCD File in the file browser dialog and click **Open**.

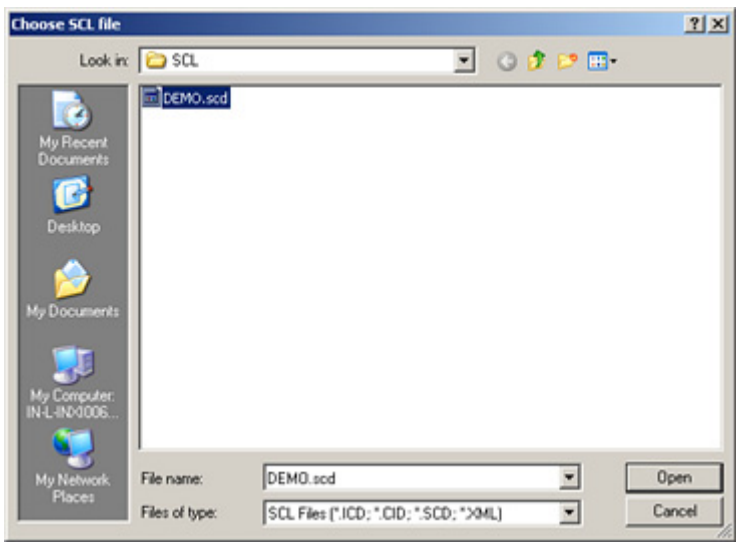


Figure 18. Choose SCL File Dialog Box

5. Select the OPC Server (Substation) that points to the subnetwork from the **Selected OPC Server** drop-down and click **Import**.

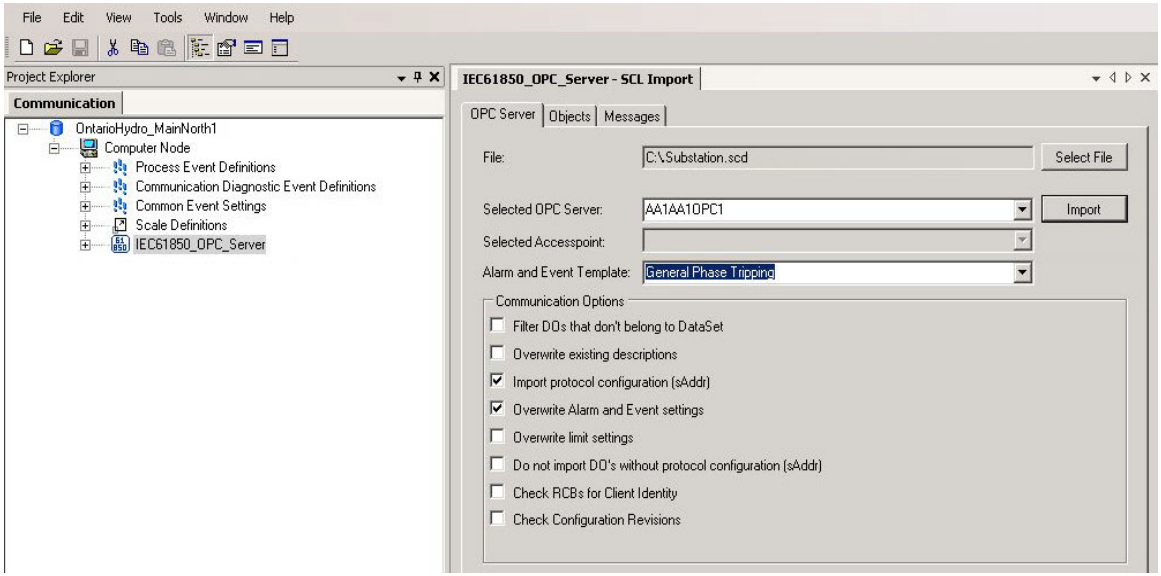


Figure 19. Subnetwork Selection

Table 30 provides descriptions on the SCL Import screen:

Table 30. Subnetwork selection field details

Subnetwork Field Labels	Description
Filter DOs that don't belong to the DataSet:	Enhance the performance by selecting this option, as it limits the amount of data objects being imported. If a data object does not belong to any data set, it will not be imported. Some IEDs can provide large amounts of data that is not reported, that is, not updated in COM600 HMI.
Overwrite existing descriptions	All existing descriptions of objects affected by the import operation are overwritten. Select this option only if you know that the file to be imported contains better descriptions than your current configuration.
Import protocol configuration (sAddr)	Both the object tree and protocol configuration are created. If you do not select this option, only the object tree structure is created. While re-importing the SCD, the checkbox **Import Protocol Configuration (sAddr)** must be cleared to avoid overwriting of the existing event definition mappings of Data objects in the CET project.
Overwrite Alarm and Event settings	All configured alarm and event settings are overwritten and the default settings are assigned to them. Select this option only if customized Alarm and Event settings is available on the existing configuration.
Overwrite Limit settings	All configured unit and limit configurations are overwritten and the values from the SCL file are assigned to them.
Do not import DO's without protocol configuration (sAddr)	None of the data objects without communication information are created to the object tree.

Table 30. Subnetwork selection field details (Continued)

Subnetwork Field Labels	Description
Check RCBs for Client Identity	IEDs are imported from the given file in which the client identity of the Report Control Blocks matches the selected OPC Server.
Check Configuration Revisions	Configuration revision attributes of the project are compared to the SCL file to be imported.

6. The SCD file contents is populated into CET as shown in Figure 20.

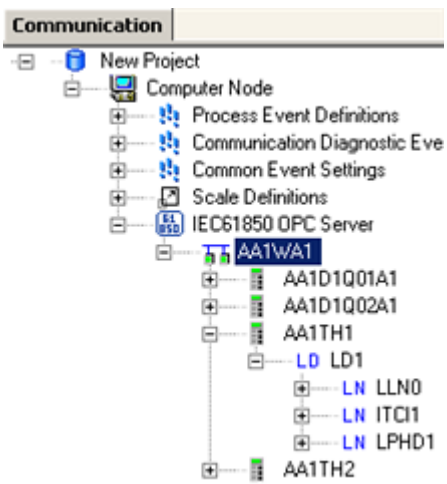


Figure 20. CET Project Explorer

Table 31. SCD File Information for IEC 61850 OPC Server

SCD File Information	Description
Communication Section Subnetwork (Name, IP address)	The Name, IP address field of subnetwork used from SCD file by IEC 61850 OPC Server. For more information, refer to IEC 61850 Subnetwork Object Properties on Page 33.
IED Section (Name, Type, IP address, Manufacturer, configVersion, OSI-AP-Title, OSI-AE-Qualifier, OSI-TSEL, OSI-PSEL, OSI-SSEL)	The Name, Type, IP address, Manufacturer, configVersion, OSI-AP-Title, OSI-AE-Qualifier, OSI-TSEL, OSI-PSEL, OSI-SSEL field of IED used from SCD file by IEC61850 OPC server. For more information, refer to IEC 61850 Device Object Properties on Page 35.
Logical Device under IED>LD (Name)	The Name field of Logical Device used from SCD file by IEC61850 OPC server. For more information, refer to Logical Device Object Properties on Page 42.
Logical Node under IED>LD>LN. (Name, lnClass, lnInst, prefix, cdc, DOI name, DAI name)	The Name,lnclass,lninst,prefix,cdc,DOIName,DAI Name field of Logical Node used from SCD file by IEC61850 OPC Server.
Report Control Block under IED>LD0.	The RCB field is used from SCD file by IEC61850 OPC server.
DataSet Section (ldInst, prefix, lnInst, lnClass, DO name, fc)	The Dataset editor field is used from SCD file by IEC61850 OPC server. For more information, refer to Sequence of Events on Page 204.

Update and Reload Configuration

After the configurable objects in the object tree have been created, the configuration must be updated to the IEC61850 OPC Server(s). This is done by using the Management function.

To activate the update and activate the configuration:

1. Right-click **Computer Node** and select **Management**. Management Dialog window opens as shown in Figure 22.

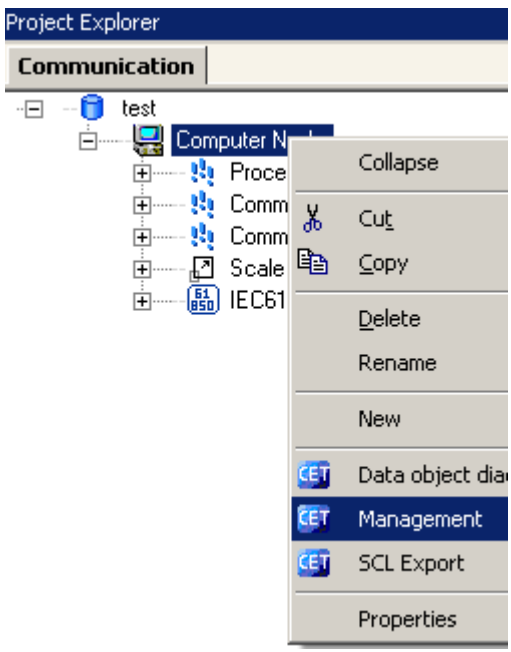


Figure 21. Management Selection

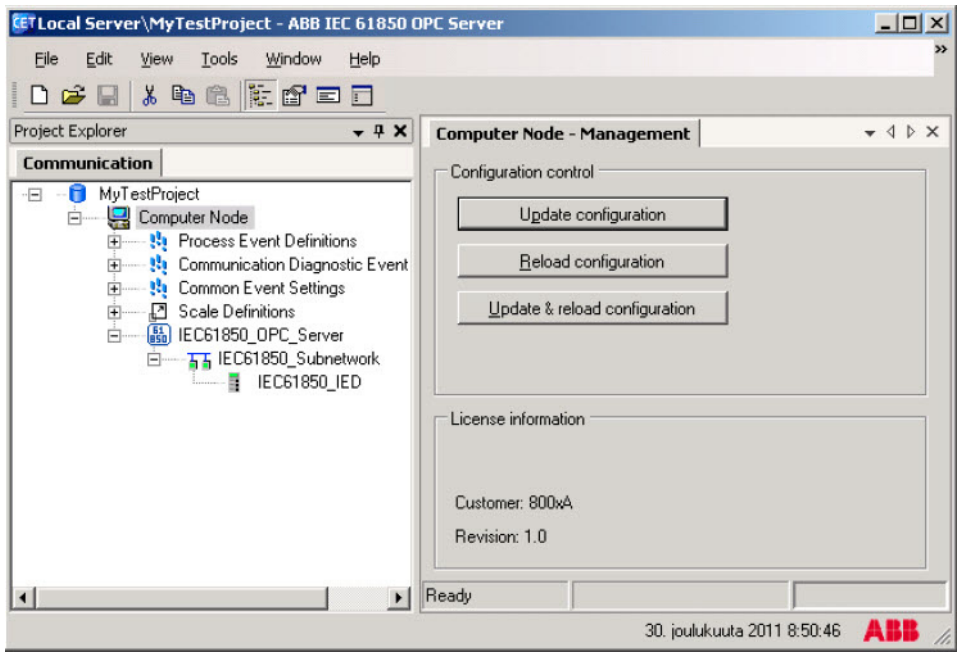


Figure 22. Computer Node - Management Function

2. Click **Update configuration** followed by **Reload configuration** or **Update & Reload configuration**.

After Update/Reload of CET is done, due to OPC server restart, alarms that were in RTN status prior to Update/Reload action disappears.

3. This completes the configuration of OPC Server instance and the OPC Server is ready to support OPC DA and AE for 800xA as configured in CET.

In some scenarios (for example. Computer crash while configuration of IEC 61850 OPC Server), the CET project database gets corrupted and cannot be opened again from IEC 61850 Server CET tool after restarting the computer.

To recover the CET project, perform the following steps:

1. Restart the machine.
   Fresh instance of the OPC server instance is running in the task manager.
2. Copy the system.xml file from the relevant OPC server instance folder to any other folder as backup. Ensure the correct system.xml is copied as backup.
   The *system.xml* file under the IEC 61850 installation folder contains the entire project configuration. The system.xml file for each OPC server is stored in the respective instance folder under the following path: *C:\Program files\ABB\61850 OPC server\OPC_61850\bin\OPCS_IEC61850_x*, where x is the OPC server instance number.
3. Create a new project in CET Tool and click OK in the pop-up error message window.
4. Create a new computer node and a new IEC 61850 OPC Server.
5. Navigate to the scl import option and import the relevant system.xml file for that OPC Server instance.
6. For an additional OPC server, repeat Step 2 and Step 5.
7. Update and reload the configuration.

Redundant IEC 61850 OPC Server Configuration

Perform the following steps to handle the OPC Server redundancy:

1. Create CET project in Primary IEC connect machine and configure all required configuration such as Alarms and events.
2. Configure Report client identity properties for OPC instance as primary OPC name (PrimOPC).
3. Export the CET project as **.pcmp*.
4. Import the **.pcmp* CET project in secondary OPC machine.
5. Change the Report client identity properties for OPC instance as Secondary OPC name (SecOPC).

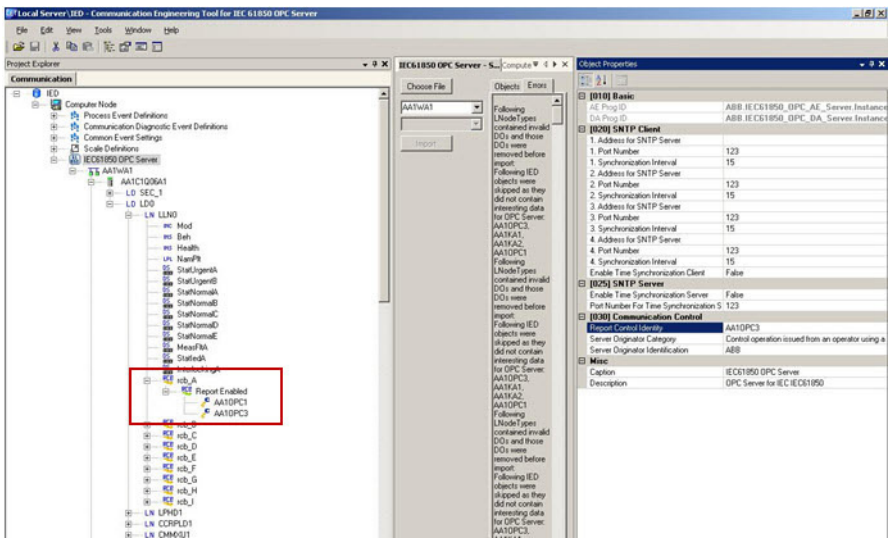


Figure 23. Redundant OPC Server

6. Select **Computer Node** object and open the **Computer Management** Tab.

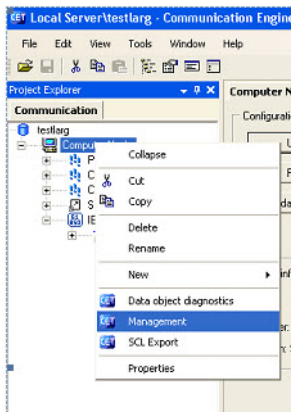


Figure 24. Computer Node - Management

7. Click **Update configuration** and followed by **Reload configuration**.

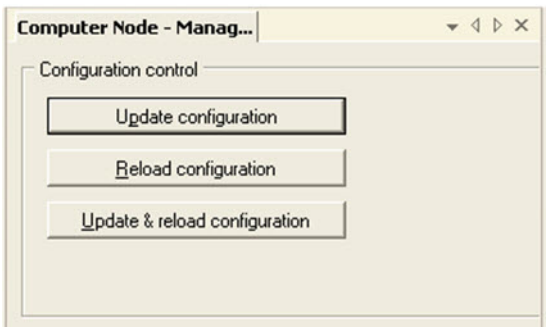


Figure 25. Computer Node - Update Configuration

8. This completes the configuration of the redundant OPC Server on the secondary connectivity server.

Affinity Configuration for IEC 61850 Projects with IEC 61850 Redundant Connectivity Server

In an 800xA System with Redundant IEC61850 Connectivity Server nodes, Affinity configuration is recommended. Affinity configuration have Aspect Server (containing Alarm Manager subscribing to Event Collectors in Connectivity Servers) and All Operator Workplaces (clients subscribing to Connectivity Server OPC DA) configured to prefer Primary Connectivity Server node.

Such configuration ensures that Alarm Manager and Operator Workplaces are subscribed to the same IEC 61850 DA and AE server instance running in Primary Connectivity Server node and thereby all OPC events arising from any Client DA activity being detected by Alarm manager without any loss of events in PPA Alarm and Event list.

In case of Primary Connectivity Server fails, the affinity preference for Alarm Manager and Operator Workplaces moves to Secondary Connectivity Server node.

PPA Automatic Load Balancing algorithm will be disabled when affinity configuration is deployed.

For details on configuring affinity, refer to *System 800xA Post Installation (3BUA000156*)* Manual.

CET Feature Pack Update

Updated Event Categories

All alarms/ event belonging to the IED object type is either part of system alarms or events. In this feature pack update normal process alarms coming via LN-GGIO during some configuration also have possibility to define them as **System Alarm**. This is used for additional monitored equipment assigned to the IED as an interface to the system.

The intention behind this update is to differentiate System and Process alarms from the IEDs to improve the display on PPA with the different alarm page definition.

- Process Alarm monitors the running process.
- System Alarm monitors the installed equipment.

Alarms/ events belonging to primary equipment like CBR is defined as process alarms/ events, which also includes GGIOs configured for these object types. These process alarms/ events appear in the process alarm/ event lists.

Existing CET contains Event Categories

- For Events :
  - Simple Discrete Event
  - Simple level Event
- For Alarms:
  - Condition Discrete Event
  - Condition Level Event

In Feature Pack release, CET contains following additional Event categories to categorize as Process Alarms/Events and System Alarms/Events, as shown in Figure 26.

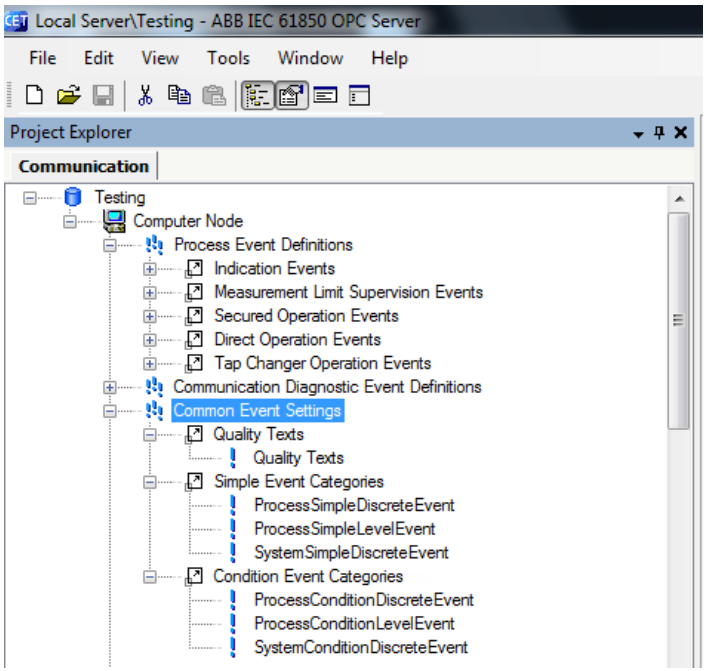


Figure 26. Process and System Alarms or Events

- For Events :
  - Process Simple Discrete Event
  - Process Simple Level Event
  - System Simple Discrete Event
- For Alarms :
  - Process Condition Discrete Event
  - Process Condition Level Event
  - System Condition Discrete Event.

The above Event categories are further introduced in 800xA Alarm Collection Definition aspect to map to 800xA Category groups.

Further, a new event class *DeviceHealth* is introduced under Indication Events. The Condition Event category and Simple Event category of DeviceHealth is System Condition Discrete Event and System Simple Discrete Event by default.

The DeviceHealth Indication event can be configured for each IED in *IED -> LD0 -> LPHD -> PhyHealth* Data object to monitor the health of IED and generate System Alarm / Event in case of fault in IED .

For each OPC server instance, the Simple Event Categories and Condition Event Categories under Common Event Settings will be listed as *Category Name properly mapped with Category Group* in the *Alarm Collection Definition* aspect, only if those Categories are configured as OPC Alarm and Event to Data attributes of the Logical nodes with event class (Indication Events and Measurement limit Supervision Events).

Area Name and Area Description Configuration

This update is intended to bring in Alarm and Event page consistence with 800XA standard. A new item **Area** on 800XA Alarm and Event page filters alarms and events based on the substation area.

Two new attributes as shown in Table 32 are added to all CET generated events by default. CET users can create and configure Area Name and corresponding Area Description according to the project. The pre-configured Area Names is assigned to each IED. 800XA client will be able to filter the Alarms and Events based on the Area Name and Area Description attributes.

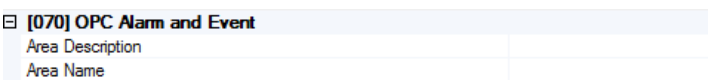


Figure 27. Area Name and Area Description

Table 32. OPC Alarm Event

Name	Value/ Default	Description
Area Name		Specifies which area this IED belongs to.
Area Description		Description of area.

System Consistency Check during SCD file import

System Consistency Check is intended to be used with IEC 61850 protocol to check that the IED configurations are consistent with the compared IED configurations. According to the IEC61850 standard, IEDs can have two configuration revisions: one for data model and one for reporting. Configuration revision for data model is modeled on the LD0\LLN0\NamPlt\configRev object. It is the most important indicator of the configuration revision. Additionally, each Report Control block has a confRev attribute that defines the revision and the DataSet of RCB. System Consistency Check checks each LDs LLN0\NamPlt\configRev and confRev of each RCB.

The GUI tool is divided into two tabs: The **System Consistency Check** tab gives an overview of the project with the configuration consistency status of the IEDs as shown in Figure 28. The **Options** tab is used for setting the options for the update procedure as shown in Figure 28. Additionally, by clicking Details, a dialog on

consistency differences is shown.

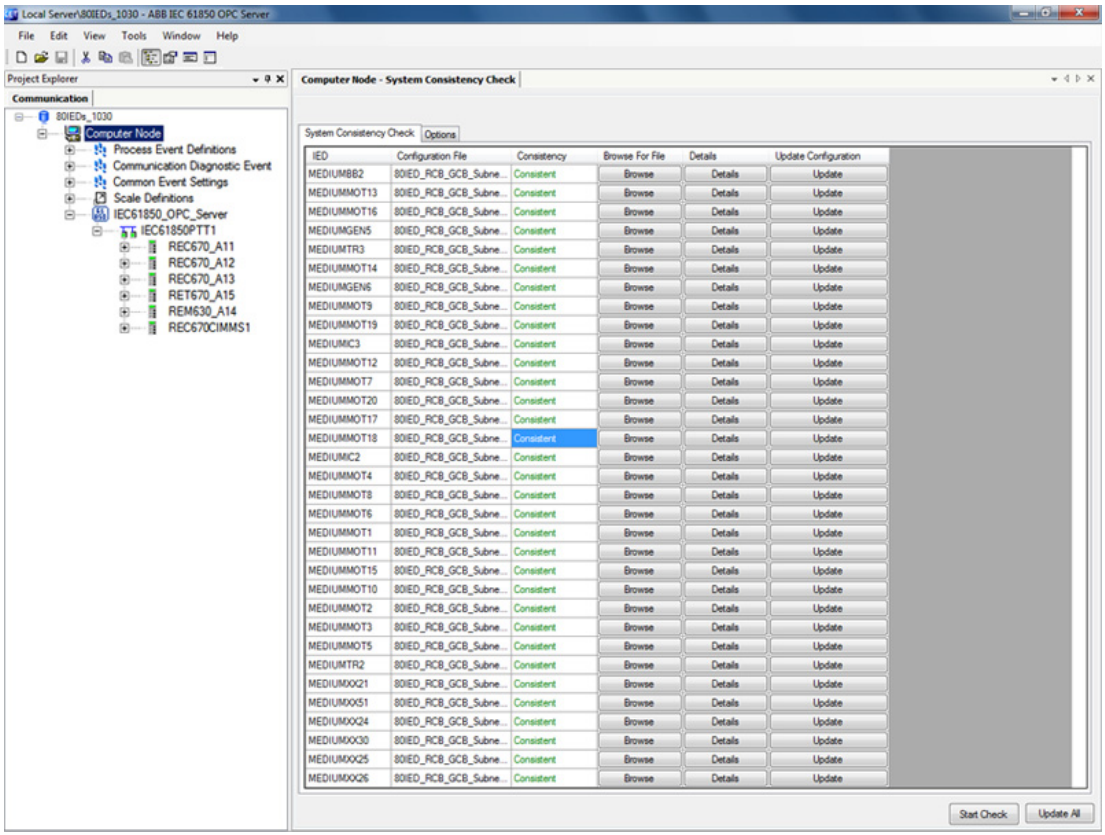


Figure 28. System Consistency Check

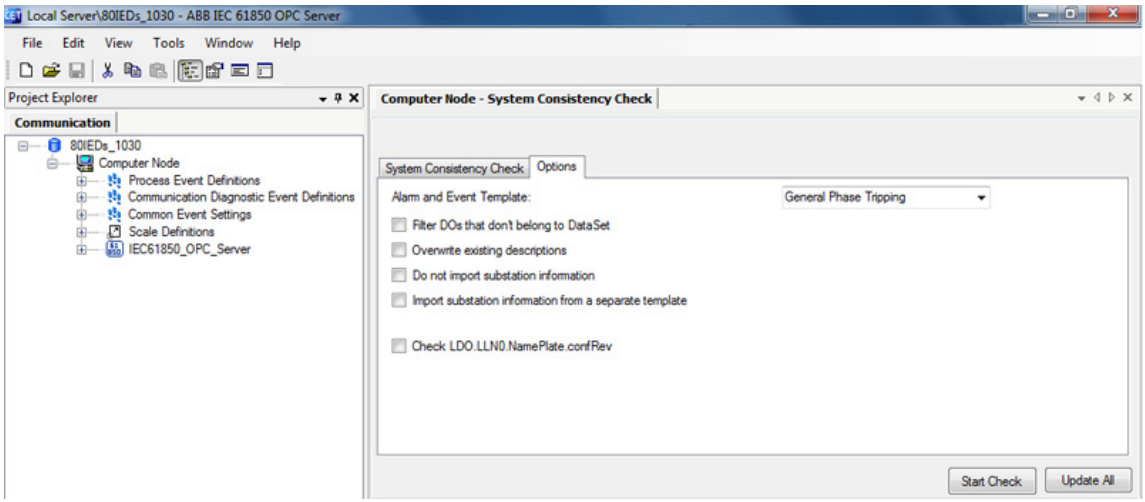


Figure 29. System Consistency Check - Options tab

When the tool is started, it will automatically perform the offline check. In the offline mode, the IED configuration revisions used in the CET project are compared to the specified IED configuration files. When the IED configuration file is imported to CET, the file name and location are saved, and the information is later used by the System Consistency Check tool. To enable the correct result of the comparison, always store the changed configuration files with the same name to the same location as the originals. If the location or the file name has changed, you can browse the new file with the Browse button. If the configuration is inconsistent, click the Details button for more detailed information. Finally, an individual configuration can be updated using the Update button. The Update All button updates all inconsistent configurations.

The **Options** view allows you to select same importing options that are available in the **SCL Import** tool. It is recommended that same options are used with both functions.

The **Details** view shows added or deleted LDs and RCBs. Additionally, it shows the modifications to the content of LD or RCB.

System Consistency Check tool does not list the IEDs from earlier version of CET because the information about the original files is not known to the System Consistency Check tool, hence the file name is empty.

It is recommended to run System Consistency Check function for CET projects created with CET version containing System Consistency Check tool.

Event Template Tool

Event Template Tool at Computer Node Level

The Computer Node level Event Template tool allows export of configured Process Event Definitions in CET project into an Event Template file. The Event template can then be imported and reused into Process Event Definitions of same type in other CET projects.

The Event Template Tool is launched from context menu at Computer Node level as shown in Figure 30 and Figure 31.

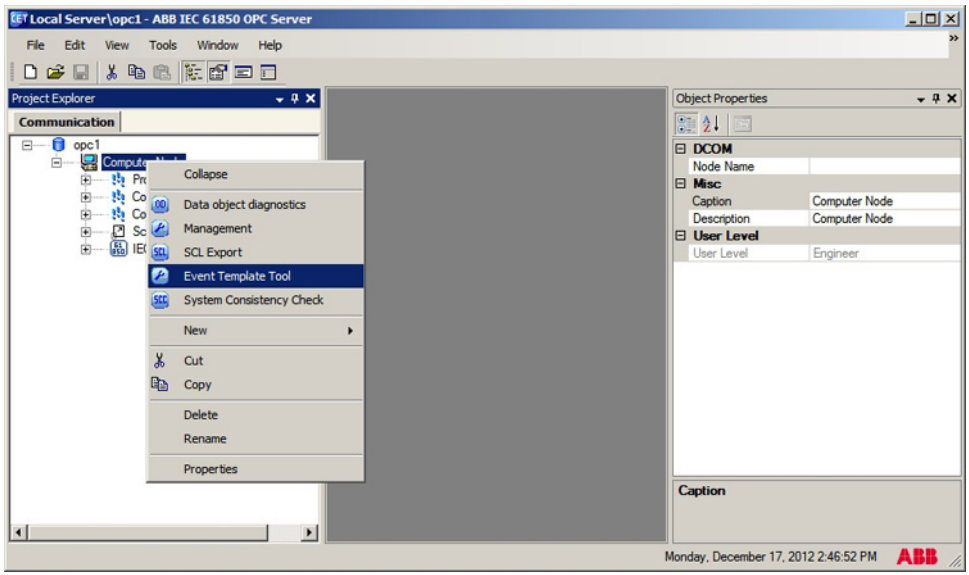


Figure 30. Event Template Tool - Context menu, Computer node level

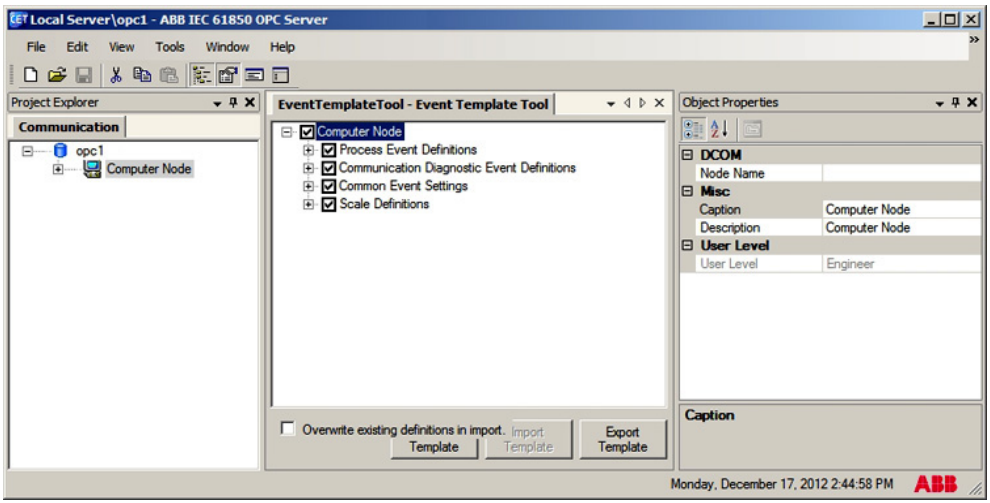


Figure 31. Event Template Tool

Overwrite Existing definitions in import option must be selected in the Event Template Tool for overwriting the existing Process Event Definition property values in the system.

Event Template Tool at IED Level

The IED Event Template tool allows export of configured IED in CET project into an IED Template file. The IED template can then be imported and reused into IEDs of same type in other CET projects.

The Event Template tool is launched from context menu at IED level as shown in Figure 32 and Figure 33.

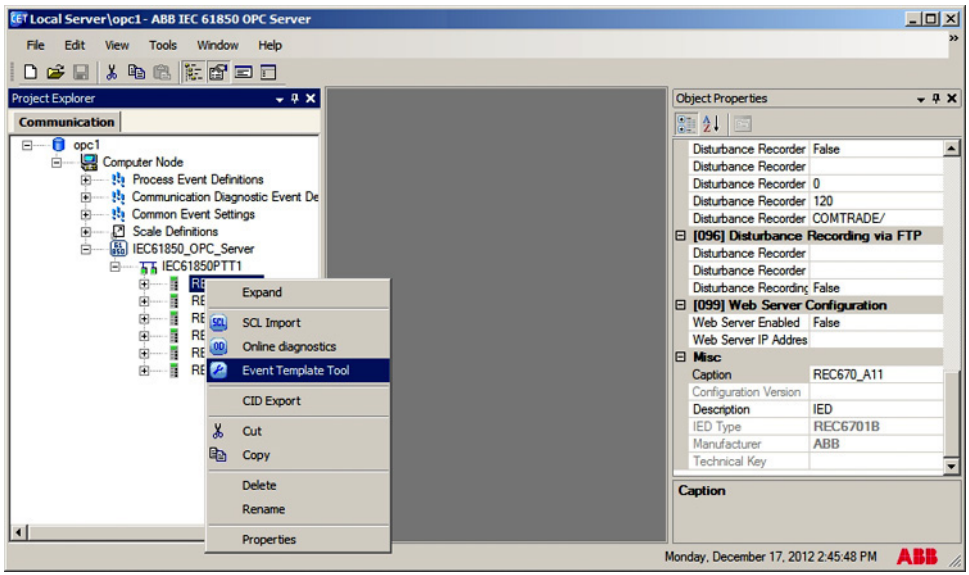


Figure 32. Event Template Tool - Context menu, IED level

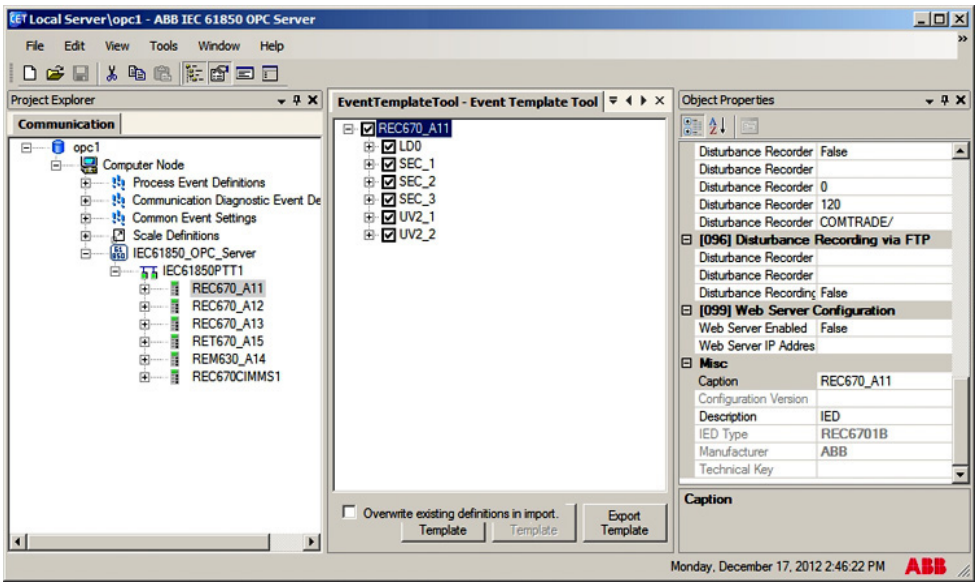


Figure 33. Event Template Tool

Following three possible scenarios applicable for IED Template import:

- CET Project does not contain Event Definition which is in IED Template file:

  Event Definition is created, mappings are set, *Overwrite existing definitions in import* option is not used regardless of the selected value.

- CET Project contains Event Definition which is in IED Template file, *Overwrite existing definitions in import* option is Not set:

  Existing event definition property values are not overwritten.

- CET Project already contains Event Definition which is in IED Template file, *Overwrite existing definitions in import* option is set:

  Existing Event Definition property values are overwritten in CET Project, *Overwrite existing event definition* option is used.

Analog Alarm Limit Configuration

This update is intended to configure and display Operator Limits, Units and ranges of Analog values on Faceplates and Trends.

In case of limit violations, analog values is also displayed for the limit value and physical unit. New fields are added for High High, Low Low, High, Dim, Max Range and Min Range.

If SCD file:

- contains limit configuration and units of analog signals, the same limit/units is shown in CET and OPC server.
- does not contain limit configuration and units of analog signals, default / empty limits/ units is shown in CET and OPC server.

Disturbance Recording

Disturbance Recording is the function of an IED which records the disturbances occurring due to interruptions in the received signals.

OPC Server can be configured to automatically scan for and transfer disturbance recording files to a specified directory on the Connectivity Server using IEC 61850 OPC Server.

Disturbance Recorder items (included in the IED object type Control Connection Aspect) can be used to display the current disturbance recording settings of IEC61850 CET OPC server.

The following are the two methods to upload the disturbance recording file from the IED.

Disturbance Recording via MMS

1. Open CET.
2. In CET:
   a. Expand **Computer Node > OPC Server > Subnetwork > IED**.

b. Right-click and select **Properties**

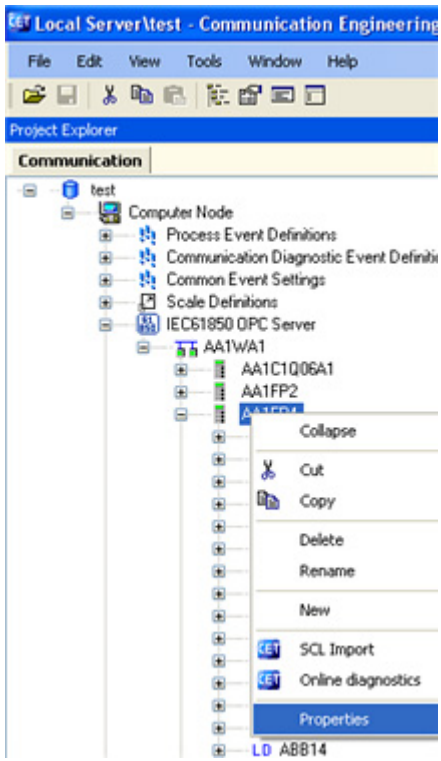


Figure 34. IED With Properties Selected

3. In the right-side Properties pane, update the fields mentioned in the Table 3 under **Disturbance Recording** column. Set the **Disturbance Recorder Enabled** option to **True**.

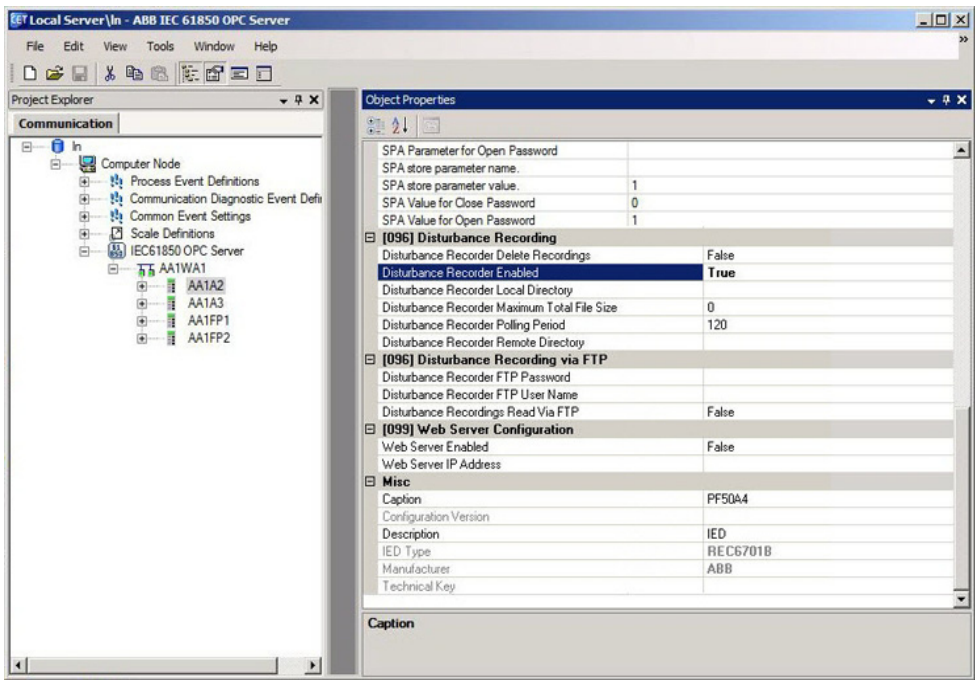


Figure 35. Sample IED Object Properties of RE_670 Series via MMS

4. Set Disturbance Recorder Local Directory path of your choice. By default, it will be:

   OPC Server Install Drive\COMTRADE

Disturbance Recording via FTP

1. Open CET.
2. In CET:
   a. Expand **Computer Node > OPC Server > Subnetwork > IED**.

b. Right-click and select **Properties**.

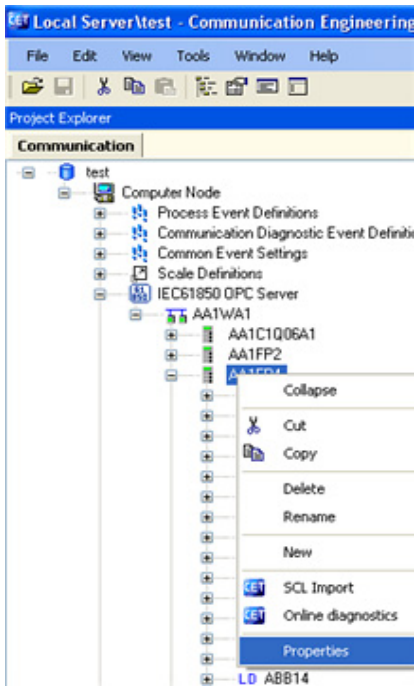


Figure 36. IED With Properties Selected

3. In the right-side Properties pane, update the fields mentioned in Table 3, IEC 61850 Device Object Properties on Page 35, under **Disturbance Recording via FTP** column.
   - Provide the Username and Password as **Administrator**.
   - Set the **Disturbance Recordings Read Via FTP** option to **True**.

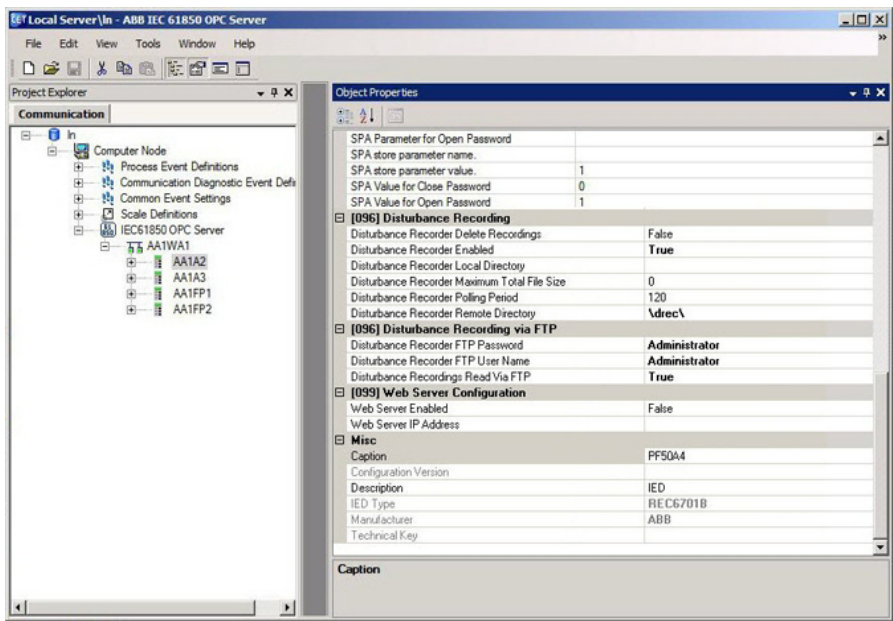


Figure 37. Sample IED Object Properties of RE_670 Series via FTP

Table 33 and Table 34 details the recommended disturbance recording settings for different IEDs.

Table 33. Disturbance Recording settings via FTP

	SPA-ZC40x	RE_615 Series	RE_615 Series 2.x	RE_630 Series	RE_670 Series
[096]Disturbance Recording					
Disturbance Recorder Delete Recording	False	False	False	False	False
Disturbance Recorder Enabled	True	True	True	True	True
Disturbance Recorder Local Directory	-	-	-	-	-
Disturbance Recorder Maximum Total File Size	0	0	0	0	0
Disturbance Recorder Polling Period	120	120	120	120	120
Disturbance Recorder Remote Directory	c:\comtrade\	\COMTRADE	\COMTRADE\	\drec	\drec\
[096]Disturbance Recording via FTP					
Disturbance Recorder FTP Password	abb	remote0004	remote0004	Administrator	Administrator
Disturbance Recorder FTP User Name	abb	ADMINISTRATOR	ADMINISTRATOR	Administrator	Administrator
Disturbance Recordings Read Via FTP	True	True	True	True	True

Table 34. Disturbance Recording settings via MMS

	SPA-ZC40x	RE_615 Series	RE_615 Series 2.x	RE_630 Series	RE_670 Series
[096]Disturbance Recording					
Disturbance Recorder Delete Recording	False	False	False	False	False
Disturbance Recorder Enabled	True	True	True	True	True
Disturbance Recorder Local Directory	-	-	-	-	-
Disturbance Recorder Maximum Total File Size	0	0	0	0	0
Disturbance Recorder Polling Period	120	120	120	120	120
Disturbance Recorder Remote Directory	c:\comtrade\	-	\COMTRADE\	-	-
[096]Disturbance Recording via FTP					
Disturbance Recorder FTP Password	-	-	-	-	-
Disturbance Recorder FTP User Name	-	-	-	-	-
Disturbance Recordings Read Via FTP	False	False	False	False	False

CET Project Maintenance

This section describes the guidelines to be followed while using the CET tool to Import and Export CET project.

Export CET Project

Before exporting, take a backup of the OPC configuration using the CET tool.

1. Open the CET tool.
2. Select **File > Open/Manage** project. Select the project the user want to export.
3. Click **Export Project** and click **Open Project**.

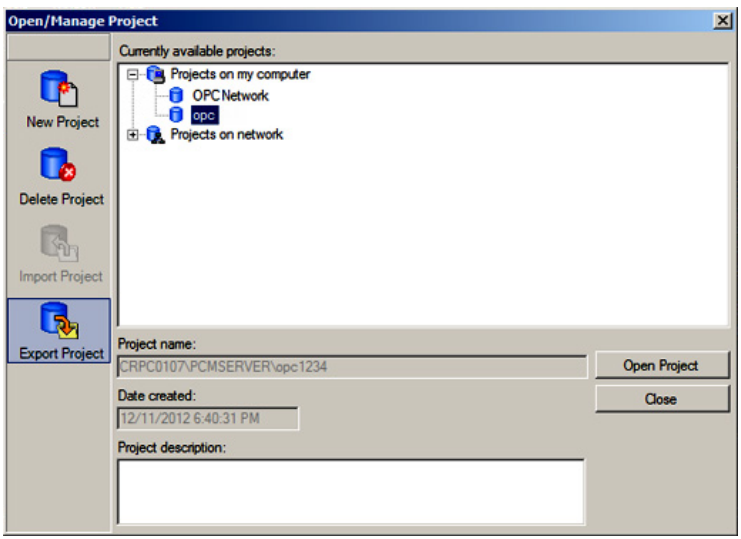


Figure 38. Open/Manage Project

4. Save the exported file.

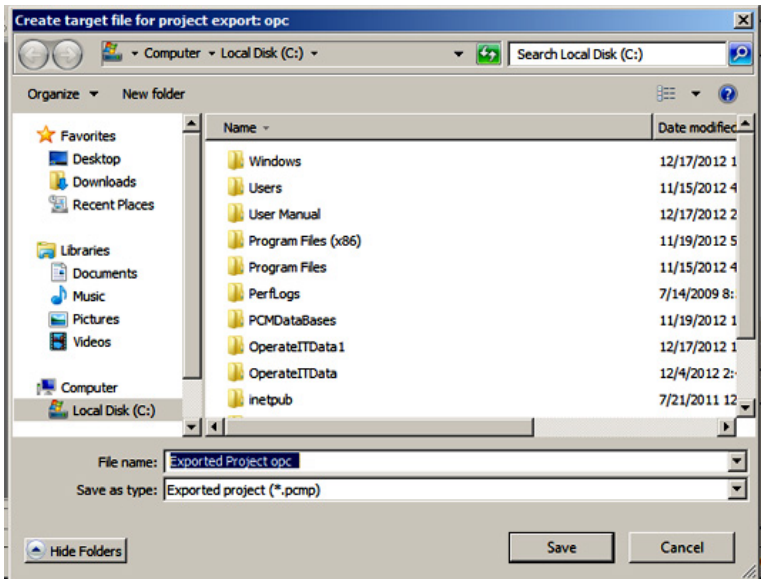


Figure 39. Target File for Project Export

Import CET Project into Same CET Versions

Before importing, restore the OPC configuration using the CET tool.

1. Open the CET tool. Ensure that there are no open projects.
2. Select **File > Open/Manage** project.

3. Click **Import Project**.

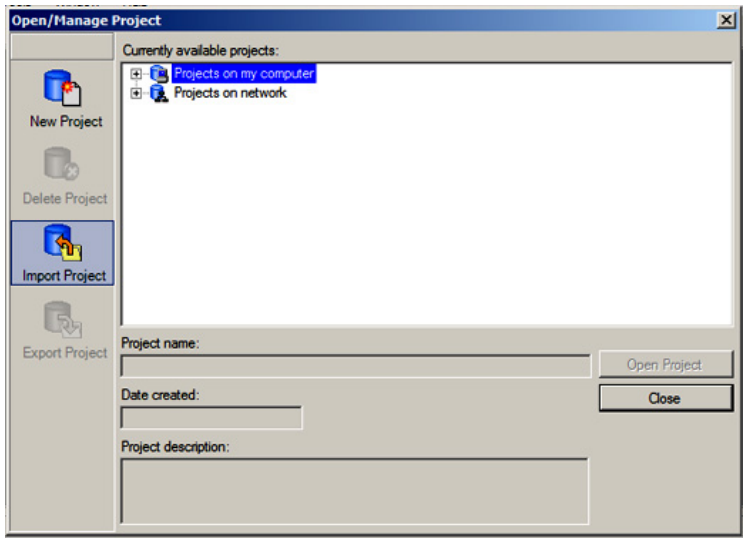


Figure 40. Open/Manage Project Dialog Box

4. Browse for CET OPC Server Project backup *.pcmp* file to be imported. Import the project that was exported from the CET tool.

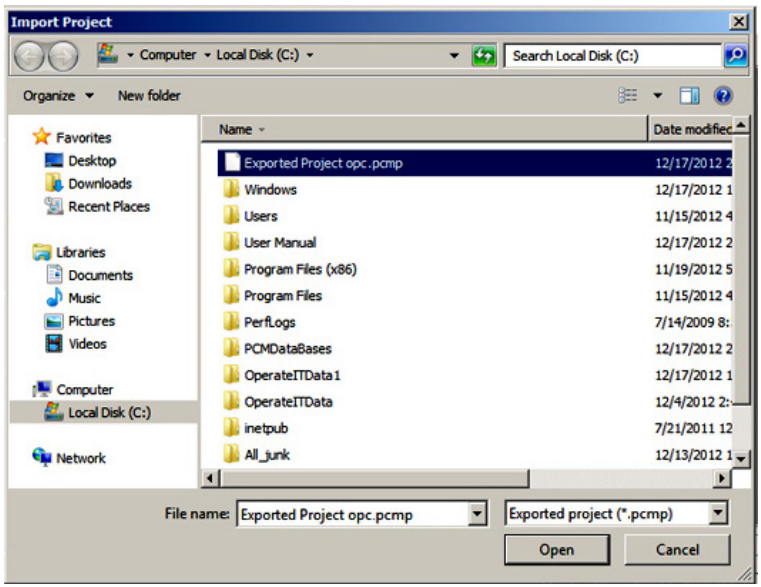


Figure 41. Import BackupProject

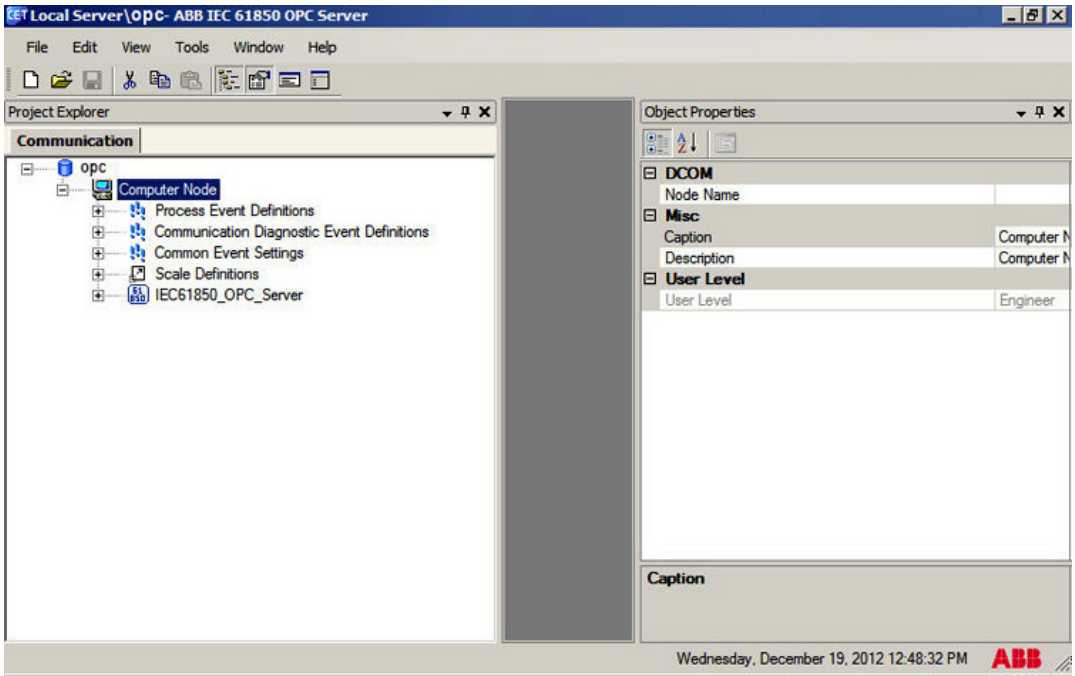


Figure 42. CET OPC Server Project

5. Perform CET Update / Reload to initialize OPC Server.

Import CET Project into Newer CET Versions

To migrate the Backup CET OPC Server Project to new version perform the steps as follows:

1. In **Open / Manage** Project dialog, Select the project under **Projects made with previous product versions** as shown in Figure 43. In this example **HTY (ABB IEC 61850 OPC Server 1.1.2)** is the project with older version.

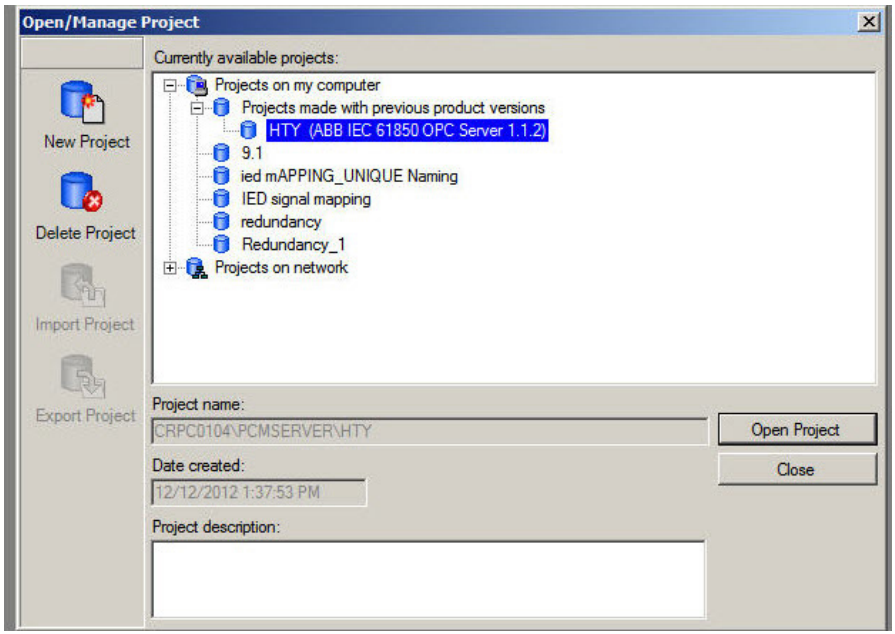


Figure 43. Open / Manage project

2. Click **Open Project**.

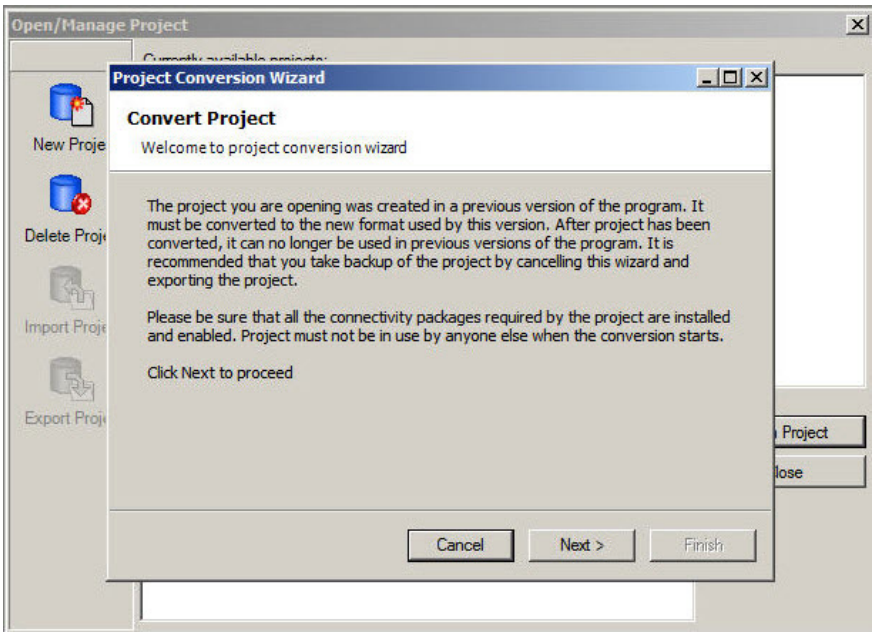


Figure 44. Project Conversion Wizard

3. Click **Next** to view **Project Conversion Wizard** summary window.

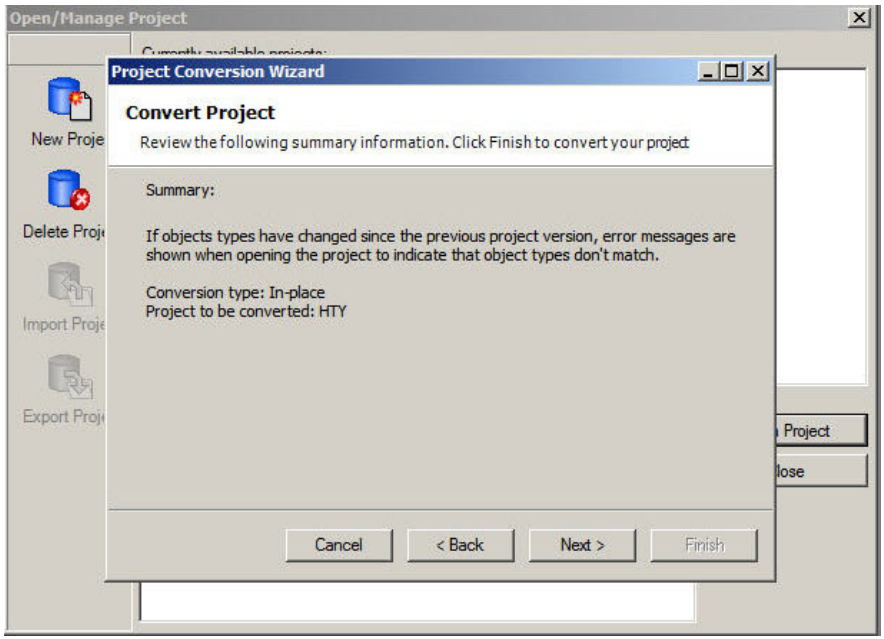


Figure 45. Project Conversion Wizard - Summary

4. Click **Next** to view **Project Conversion Wizard** status window.

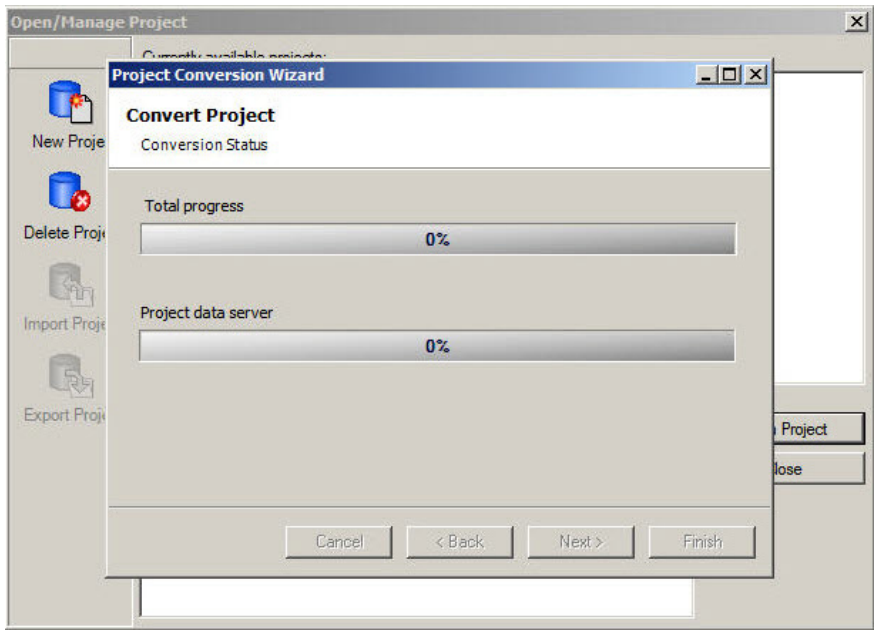


Figure 46. Project Conversion Wizard - Status

5. In Select version dialog, Select new version and Click **Ok**.

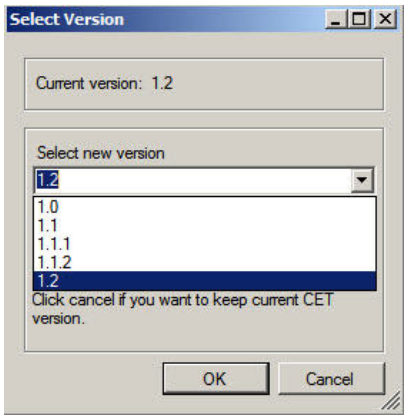


Figure 47. Project Conversion Wizard

For revision releases, the **Select Version** window will display versions 3.x.

6. Click **Finish**.

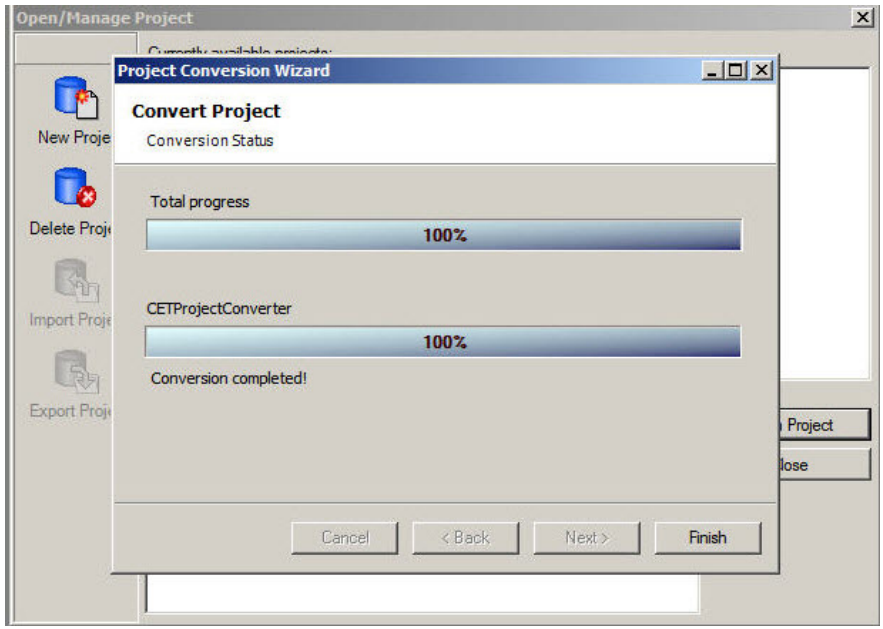


Figure 48. Project Conversion Complete

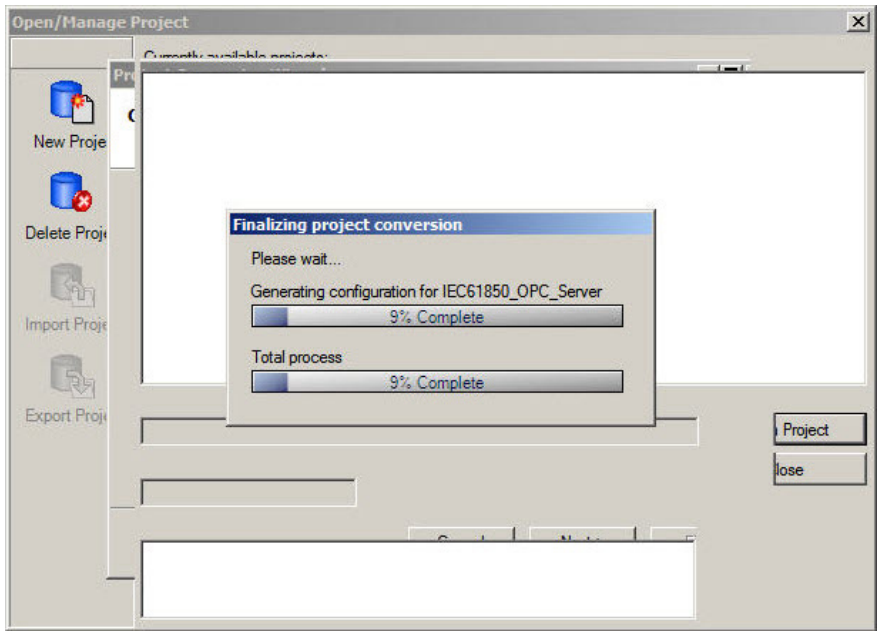


Figure 49. Finalizing Project Conversion

7. CET OPC Server Project Conversion is completed.

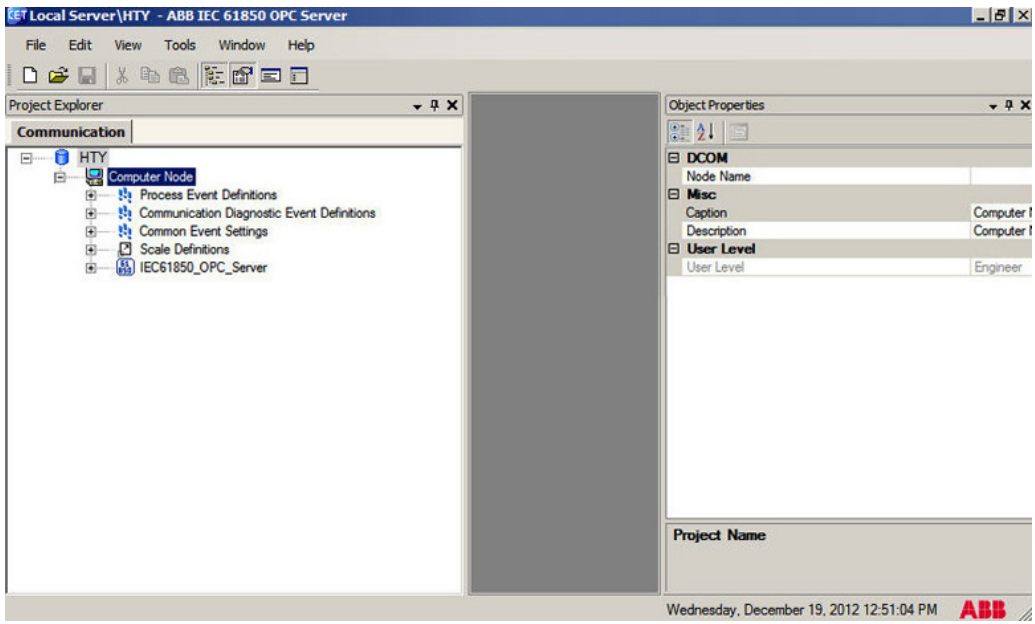


Figure 50. CET OPC Server Project

Step 8 through Step 14 is applicable only for feature pack release.

The newly introduced CET *Event Categories* is not available in the migrated project in CET version 1.2.

To obtain the *Event Categories,* follow the below steps additionally:

8. Open *Event Template Tool* from Computer Node context Menu.
9. Click **Open Template** and browse *\Program Files (x86)\ABB\61850 OPC Server* to import *CETEventCategories.xml.*
10. Ensure *Overwrite existing Definitions in import* option is selected.

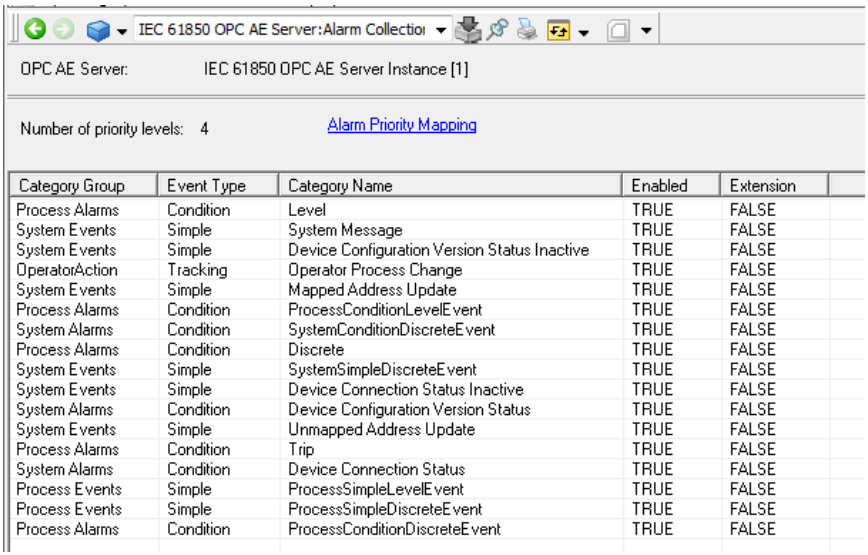
    This will update only default *Event Classes* with New *Event Categories*.

Condition Category and *Simple Event Category* of *User Defined Event Classes* must be updated accordingly by the user.

11. Click **Import Template**.
12. Update & reload the new CET project.
13. Restart the Connectivity Server Node.
14. Perform the following steps only after Primary and Secondary Connectivity servers are updated.
    a. In Plant Explorer, Navigate to Service Structure > Event Collector, Service Perform an Upload for all IEC61850 Alarm and Event Service Groups.
    b. In Plant Explorer, Navigate to Library Structure > Alarm & Event > Alarm Collection Definitions, Alarm Collection Definition and check all IEC61850 Alarm Collection Definition Objects.

       If any Category Group is uncategorized, then manually categorize the group using respective Alarm Collection Definition Aspect.

For details on applying the categories, refer to Figure 51.



Category Group	Event Type	Category Name	Enabled	Extension
Process Alarms	Condition	Level	TRUE	FALSE
System Events	Simple	System Message	TRUE	FALSE
System Events	Simple	Device Configuration Version Status Inactive	TRUE	FALSE
OperatorAction	Tracking	Operator Process Change	TRUE	FALSE
System Events	Simple	Mapped Address Update	TRUE	FALSE
Process Alarms	Condition	ProcessConditionLevelEvent	TRUE	FALSE
System Alarms	Condition	SystemConditionDiscreteEvent	TRUE	FALSE
Process Alarms	Condition	Discrete	TRUE	FALSE
System Events	Simple	SystemSimpleDiscreteEvent	TRUE	FALSE
System Events	Simple	Device Connection Status Inactive	TRUE	FALSE
System Alarms	Condition	Device Configuration Version Status	TRUE	FALSE
System Events	Simple	Unmapped Address Update	TRUE	FALSE
Process Alarms	Condition	Trip	TRUE	FALSE
System Alarms	Condition	Device Connection Status	TRUE	FALSE
Process Events	Simple	ProcessSimpleLevelEvent	TRUE	FALSE
Process Events	Simple	ProcessSimpleDiscreteEvent	TRUE	FALSE
Process Alarms	Condition	ProcessConditionDiscreteEvent	TRUE	FALSE

Figure 51. Alarm Collection Definition - Category Group

IEC 61850 OPC Server Performance Data

Substation with more than 80 IEDs can have two OPC server in a single SCD file. Each OPC server can have up to 16 subnetworks with a maximum number of 80 IEDs in mixed combinations.

For example, if one Subnetwork has more than 80 IEDs, split them across two OPC Server so that more than 80 IEDs are distributed across two OPC Servers.

For more details on IEC 61850 OPC Server Performance Data, refer to *System 800xA System Guide Technical Data and Configuration (3BSE041434*)* Manual.

CET Diagnostics

IEC 61850 OPC Server Diagnostics

After the IEC 61850 OPC Server has been installed and configured, you can, for example, monitor and control the condition of connections in an IEC 61850 network.

To access Online Diagnostics function in CET:

- Select **Tools > Online Diagnostics** as shown in Figure 52

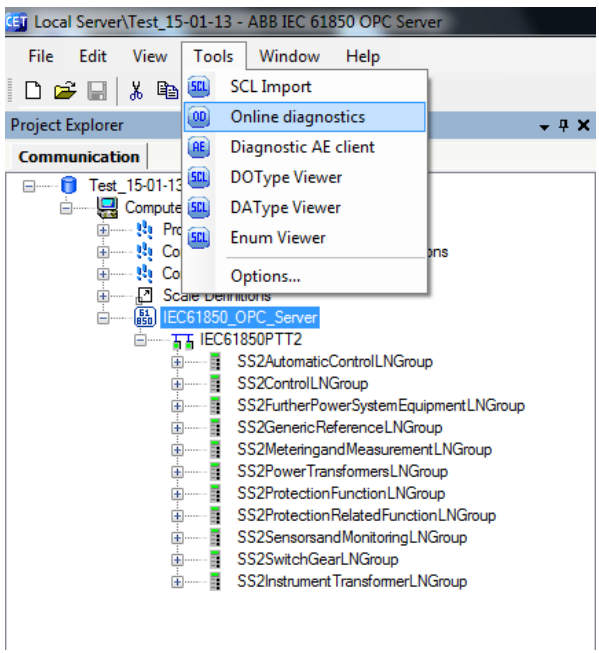


Figure 52. Online Diagnostics from Tools menu

- Select the object, right-click IEC 61850 Server object and select **Online Diagnostics** from the context menu as shown in Figure 53.

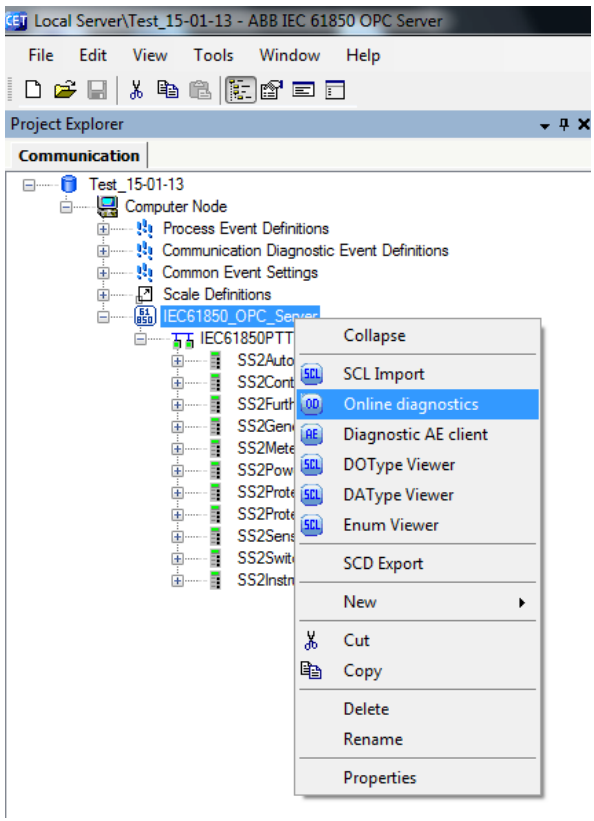


Figure 53. Online Diagnostics from context menu

The server, a device, or data object is dragged and dropped from the Project Explorer's Communication structure under the Online Diagnostics function. Select Project Explorer from the **View** menu if it is not already open.

Following options are available to:

- reset counters (restart the OPC server)
- view the event log file
- clear the log file

- enable or disable the SNTP client
- reconnect the online diagnostics

Diagnostic AE Client

Diagnostic events can be monitored and controlled using the Diagnostic AE Client function.

To enable diagnostic events:

1. Right-click the device.
2. Select **Diagnostic AE client**.

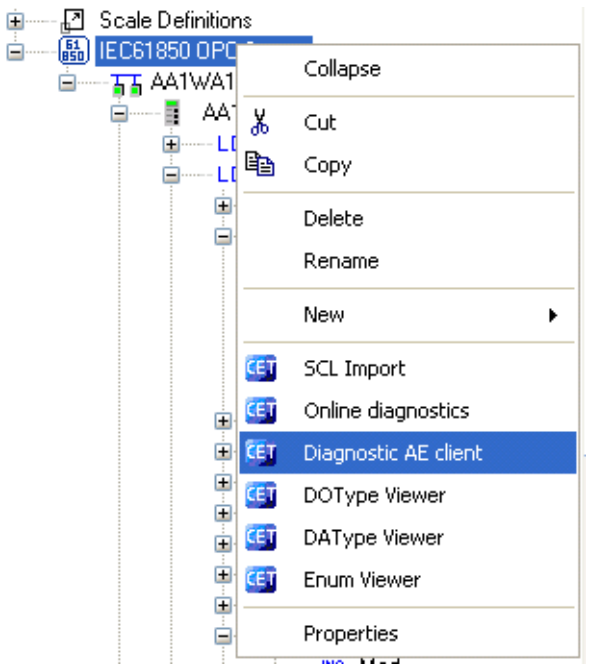


Figure 54. Diagnostic AE client Selected

3. Click **Refresh** to update the status information. To receive events from a certain device, the diagnostic events must be enabled for the selected device.

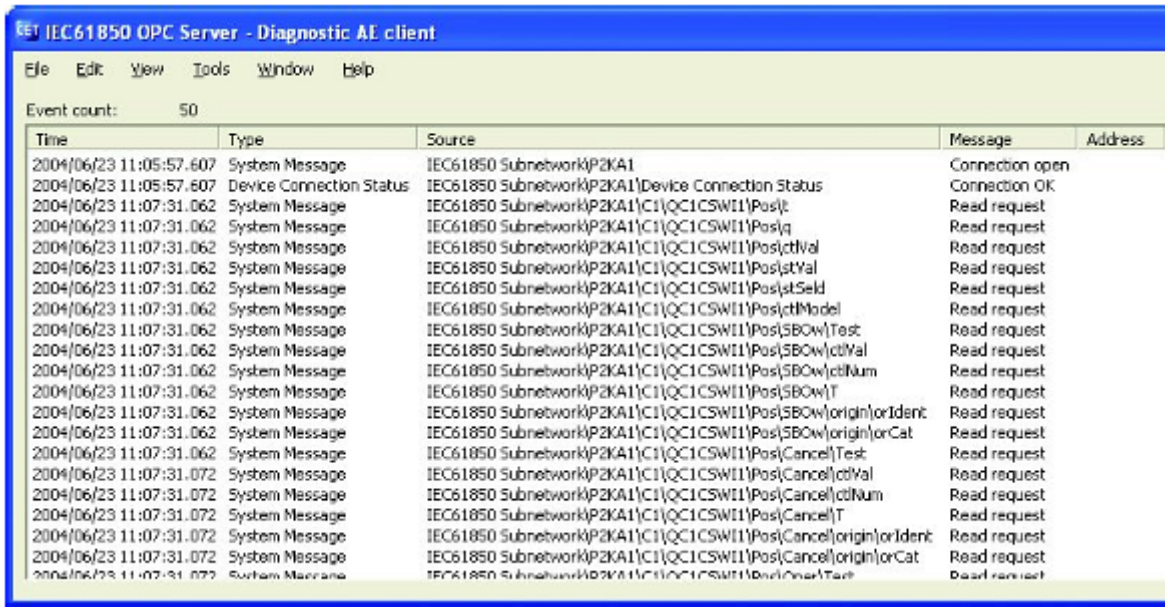


Figure 55. Diagnostic AE client Dialog Box

Monitoring and Controlling IEC 61850 Subnetwork Activity

The IEC 61850 subnetwork activity can be monitored with the Online Diagnostics function.

To monitor and control IEC 61850 subnetwork activity:

1. Select a subnetwork you want to monitor in the object tree of CET.
2. Right-click the channel.

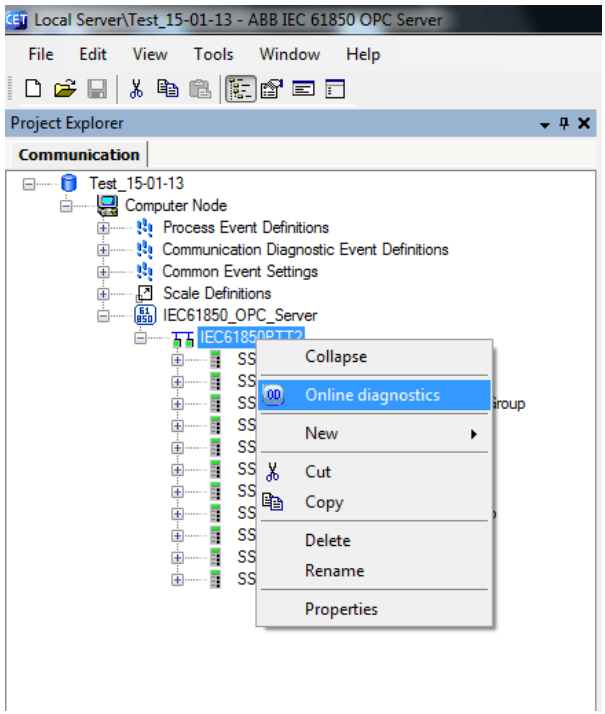


Figure 56. Online Diagnostics from context menu

3. Select **Online Diagnostics**.

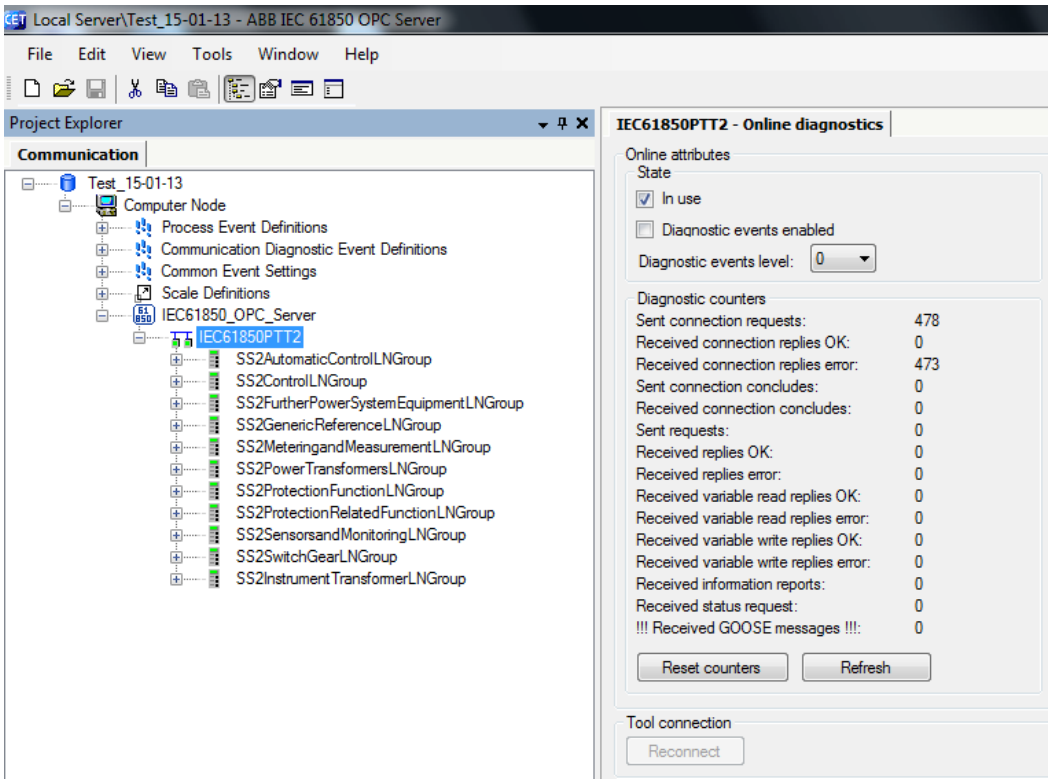


Figure 57. Online Diagnostics of Subnetwork

In the **Diagnostic counters** field, you can monitor the subnetwork activity and the available properties. To reset Diagnostic counters, click **Reset counters**.

Allow IEC 61850 subnetwork into use by selecting the In use check box. On clearing the check box takes the subnetwork out of use. To update the diagnostic counters click **Refresh**.

Monitoring and Controlling IEC 61850 Device Communication

The IEC 61850 device communication can be monitored with the Online Diagnostics function.

To monitor and control IEC 61850 device communication:

1. Select a device you want to monitor in the object tree of CET.
2. Right-click the device.

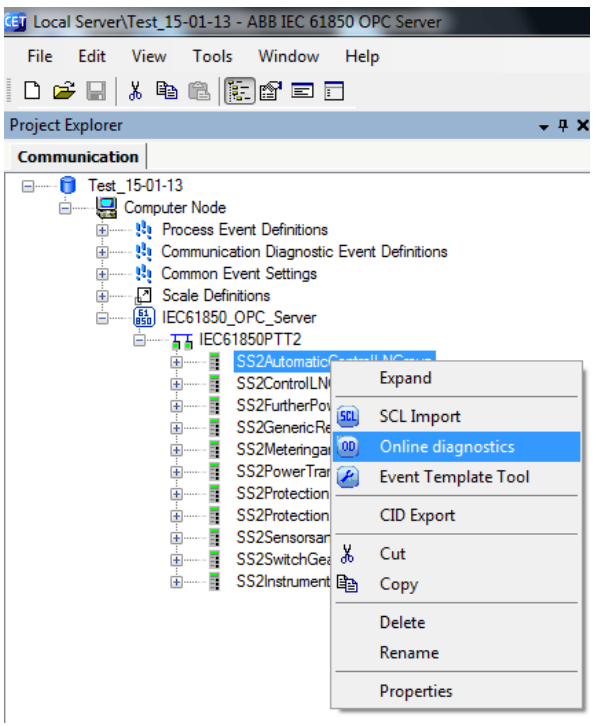


Figure 58. Online Diagnostics from context menu.

3. Select **Online Diagnostics**.

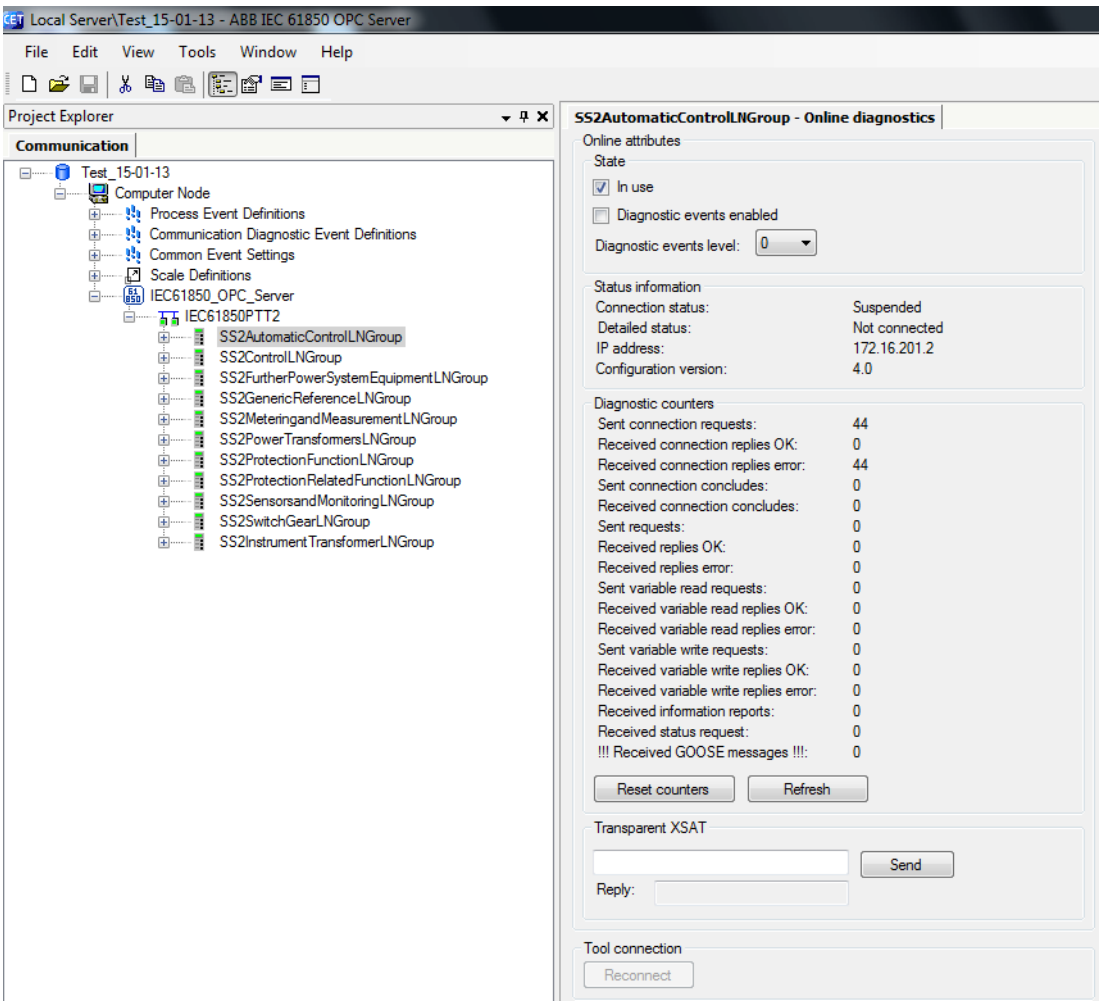


Figure 59. Online Diagnostics of Device

In the **Status information** field, you can monitor the device status. The **Diagnostic counters** field provides information on device activity. To reset diagnostic counters, click **Reset** counters. To update the diagnostic counters click **Refresh**.

Allow an IEC 61850 device into use by selecting the **In Use** check box. On clearing check box, the device is taken out of use.

Monitoring and Controlling IEC 61850 Data Object Communication

The IEC 61850 data object diagnostics can be monitored with the Online Diagnostics function.

To monitor and control IEC 61850 data object communication:

1. Select a data object you want to monitor in the object tree.

2. Right-click the device.

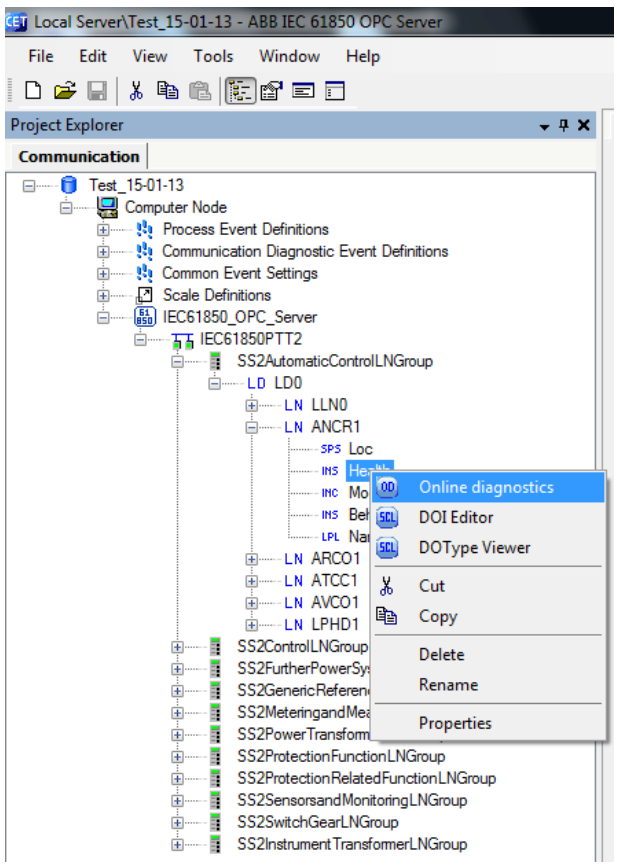


Figure 60. Online Diagnostics from context menu

3. Select **Online Diagnostics**.

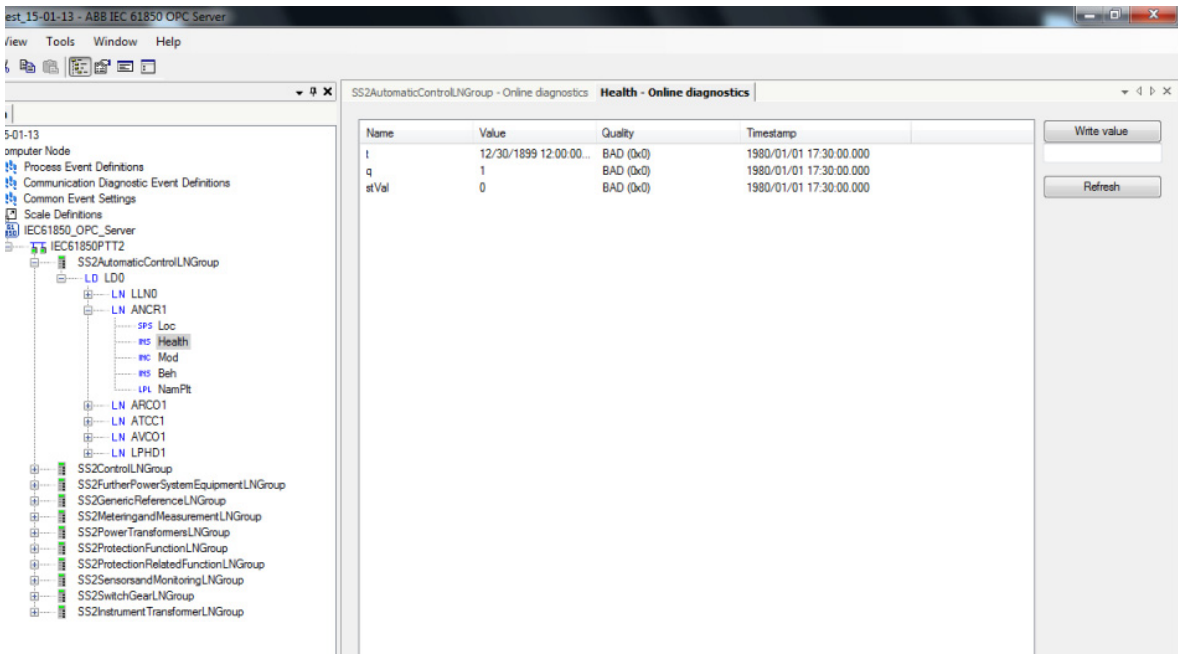


Figure 61. Online Diagnostics of Data Object

In the **Status information** field, you can monitor and set attribute values and use control services. The Diagnostic counters field provides information on device activity.

Alarm and Event Configuration

Perform the following steps to configure alarms and events in CET:

1. Expand **Computer Node > Process Event Definitions > Indication Events.** In this example select **AlarmState** as shown in Figure 62.

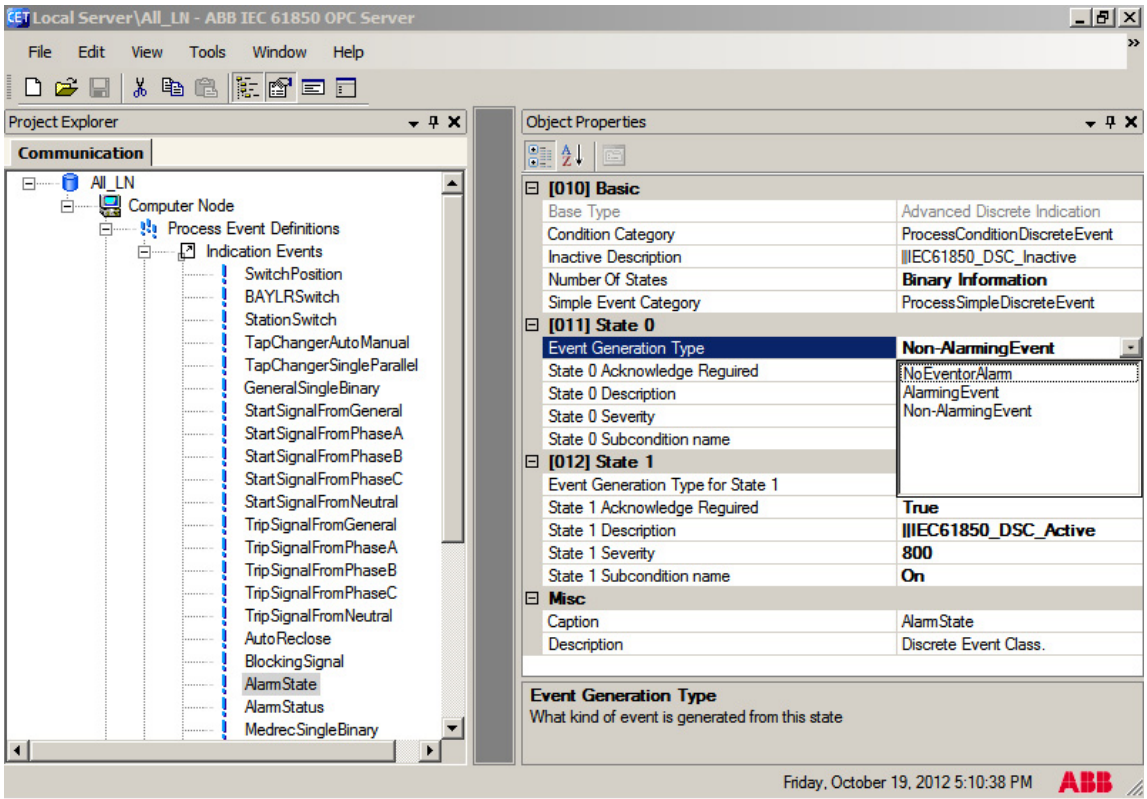


Figure 62. Tree Structure with AlarmState Selected

2. Expand the tree structure and select the attribute under the Logical Node. In **Object Properties**, under **[040] OPC Alarm and Event**, select **AlarmState** for **Indication Event** Type as shown in Figure 63.

Repeat the Alarm and Event configuration for all Data Objects in all IEDs that generates Alarm and Event from OPC Server.

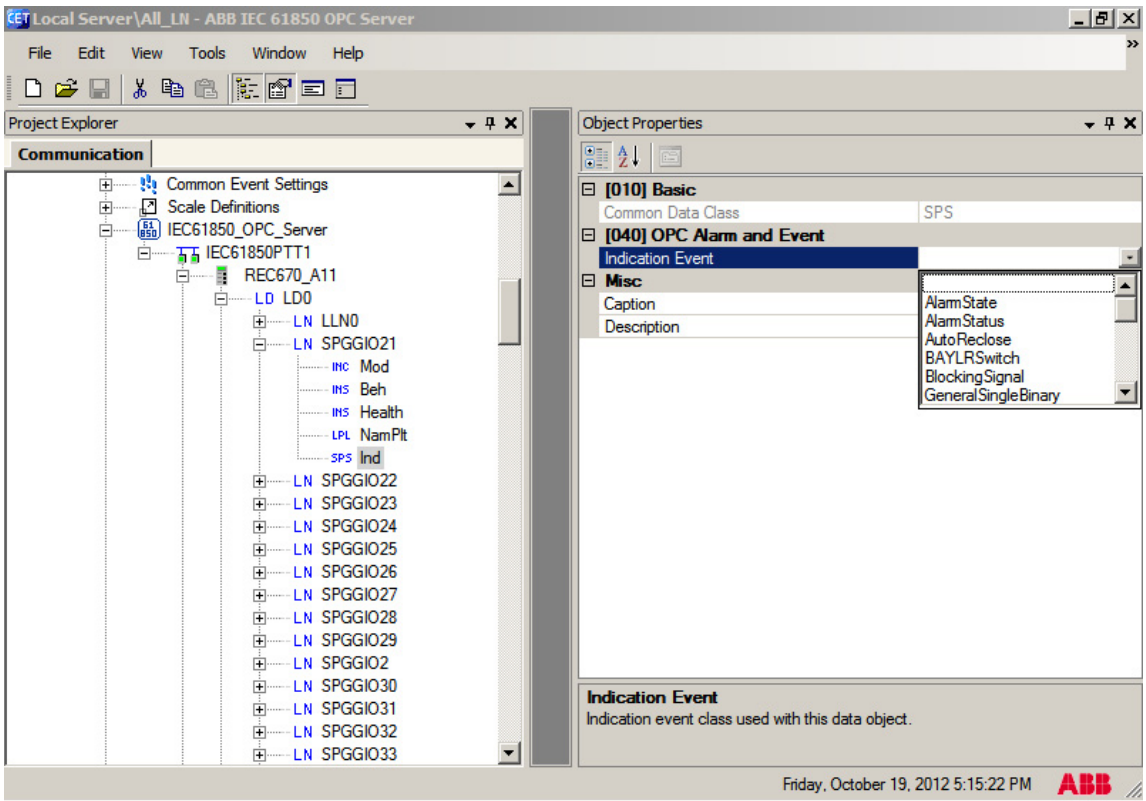


Figure 63. SCD File Populated in CET

Section 3 800xA IEC 61850 Uploader

This section describes how to work with IEC 61850 Uploader aspect user interface in 800x A Plant Explorer.

IEC 61850 Uploader aspect creates the communication and substation section of SCD file in *Control Structure* and *Functional Structure* of Plant Explorer respectively.

The Uploader creates the following:

- Objects in the 800xA *Control Structure* using information retrieved by the SCL Model component parsing the communication section of the SCD file. The control structure represents the communication of IED and connect OPC server in 800xA. For example, IED, Logical device, Logical Node are added to the *Control Structure*.
- Objects in the 800xA *Functional Structure* using information retrieved by the SCL Model component parsing the substation section of the SCD file. The Functional Structure represents the physical layout of the substation with power generation and distribution equipment. For example, Substation, Voltage Level, Bay and Conducting Equipment objects are added to the *Functional Structure*. The object types in the Functional Structure contain Faceplates and Graphic Elements, using which operators can monitor and control a substation.

IEC 61850 Uploader has three main components.

1. Uploader User Interface

   The Uploader user interface contains Standard and Advanced tab that allow user to set Upload options, select Object Type Library, select SCD file, and start upload operation and also view the status of the Upload progress.

During upload, all the log messages are written in to AppLog server. These log files can be viewed and analyzed using AfwAppLogViewer.

2. Retrieve

   Retrieve component uses the SCL component and parses communication and substation section of SCD file selected by the user. This SCD file is also used to configure the IEC 61850 OPC Server using CET Tool. The details of SCD file are parsed to OCS files, which is understandable by the Append Component of Uploader.

3. Append

   Append component reads the OCS files created by Retrieve component of an Uploader. The Append Component creates the IEC 61850 communication structure in *Control Structure* using the OCS file data.

Creating IEC 61850 OPC Server Node in Control Structure

Perform the following steps to upload an SCD file and create IEC 61850 OPC Server Node:

1. Select **Control Structure** in 800xA **Plant Explorer**.
2. Right-click **Root Domain** and select **New Object** from the context menu.
3. In the **New Object** dialog box, select **IEC61850 Object Types > IEC61850 OPC Server** and enter a name.

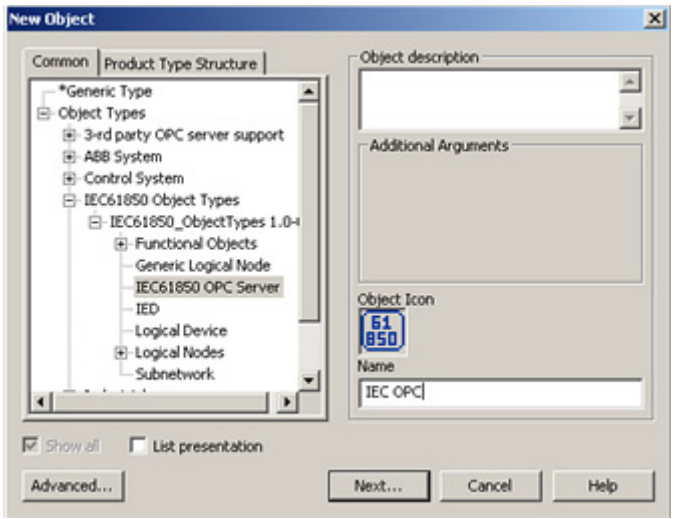


Figure 64. New Object Dialog Box

Always refresh the uploader aspect, whenever performing upload operation multiple times on a single OPC Server (to refresh the current uploader aspect, select another aspect and re-select the uploader aspect).

4. Click **Next.**

5. In the **Additional Arguments** dialog box, click **Add to** create an OPC Server service group in *Service Structure* to connect to the OPC Server.

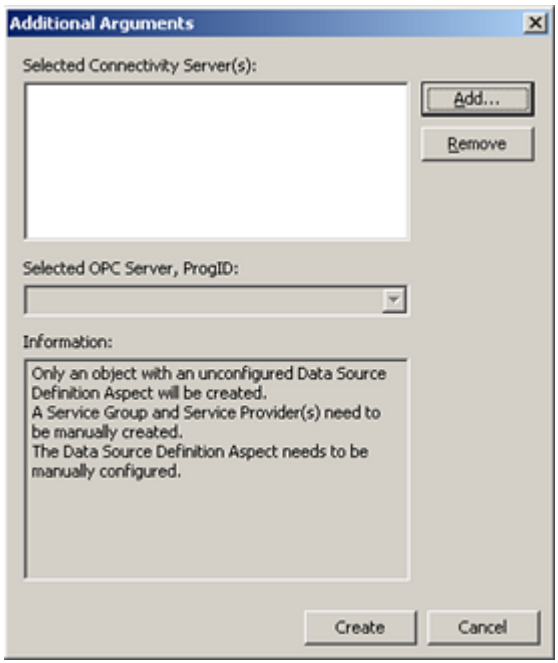


Figure 65. Additional Arguments Dialog Box

6. Select the Connectivity Server on which the OPC Server is configured and click **OK**.

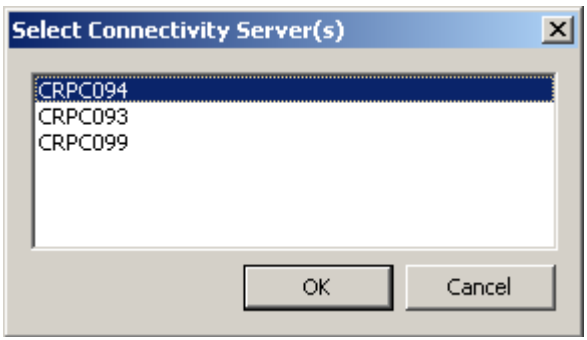


Figure 66. Select Connectivity Server(s) Dialog Box

For redundant configuration, select both Connectivity Server nodes that form the Primary and Secondary Connectivity Server nodes.

7. In the **Additional Arguments** dialog box, select an **OPC Server** from the **OPC Server, Prog ID** drop-down list.

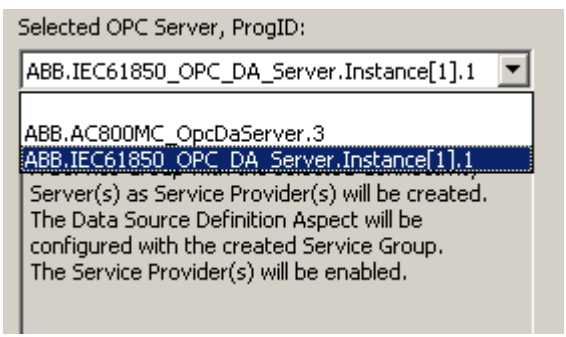


Figure 67. OPC Server ProgID Selection

8. Click **Create** to create a new IEC 61850 OPC Server.
9. This completes the creation and configuration of the OPC Server object in the Control Structure.

10. To confirm, go to the OPC Server object instance in Control Structure and check the **OPC Data Source Definition** Aspect. The aspect contains the details of the ProgID of the OPC Server to which the object is connected.

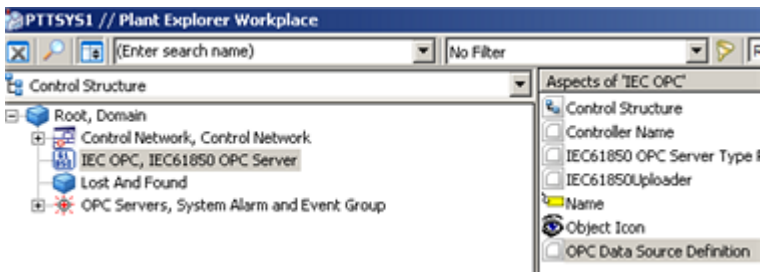


Figure 68. OPC Data Source Definition Selection

IEC 61850 Uploader Options

The **Uploader** aspect consists of *Standard* and *Advanced* tabs. The User performs upload either using the *Standard* tab or the *Advanced* tab. The following are the workflow details of using these two tabs:

Upload Using Standard Tab

1. In **Control Structure**, **OPC Server** Object, click **IEC61850Uploader** aspect.

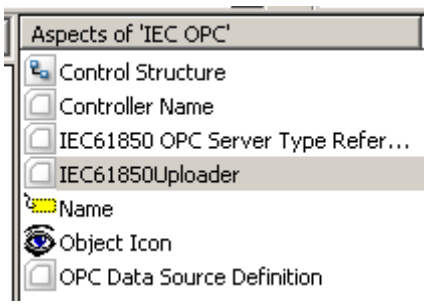


Figure 69. IEC61850Uploader

2. Select the **Standard** tab of the Uploader.

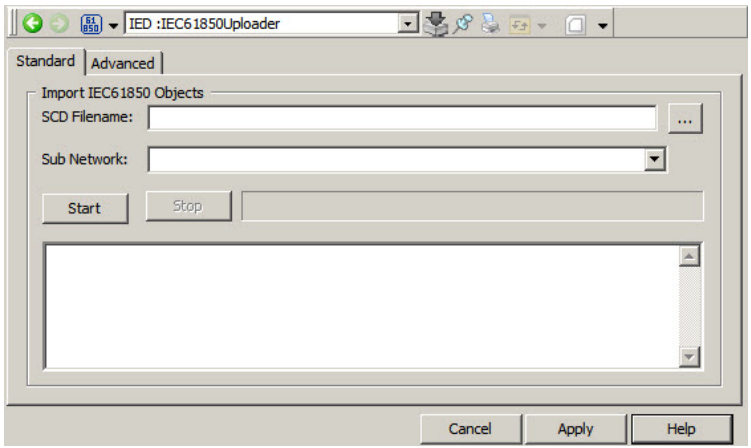


Figure 70. Standard Tab

3. Browse the SCD file which needs to be imported under the OPC Server object.

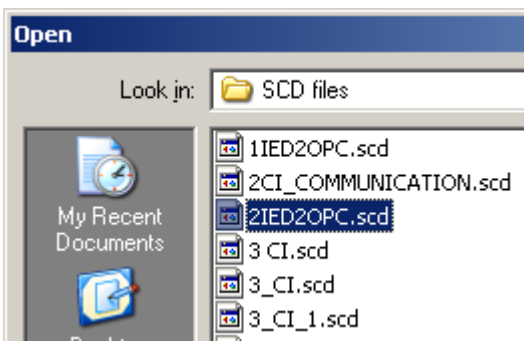


Figure 71. Browsing SCD File

Once the SCD file is selected, the Uploader parses the SCD file and lists the sub network in the SCD file in the **Sub Networks** drop-down list.

In the Selected SCD file, the Conducting Equipments should not contain LNs from different OPC servers, however Bay can contain LNs from different OPC servers.

Logical Nodes assigned to PTW object are not supported by the Uploader.

In case the uploaded SCD file is configured with PTW object, Uploader displays a warning message and completes the upload process without uploading PTW related LNs.

To upload from Standard Tab, user must select the required IEC 61850 Object Type Library in Advanced Tab.

4. Select the correct sub network from the drop-down list.

   Ensure that the same sub network that is imported in the OPC Server (to which the OPC data source definition Aspect of OPC Server object is pointing) is chosen here as well.

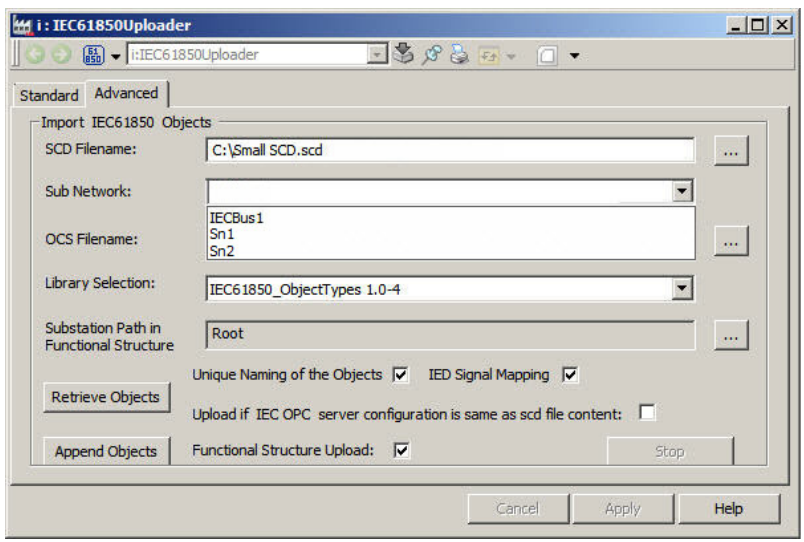


Figure 72. Sub Network Selection

5. Select the library in the Advanced tab.

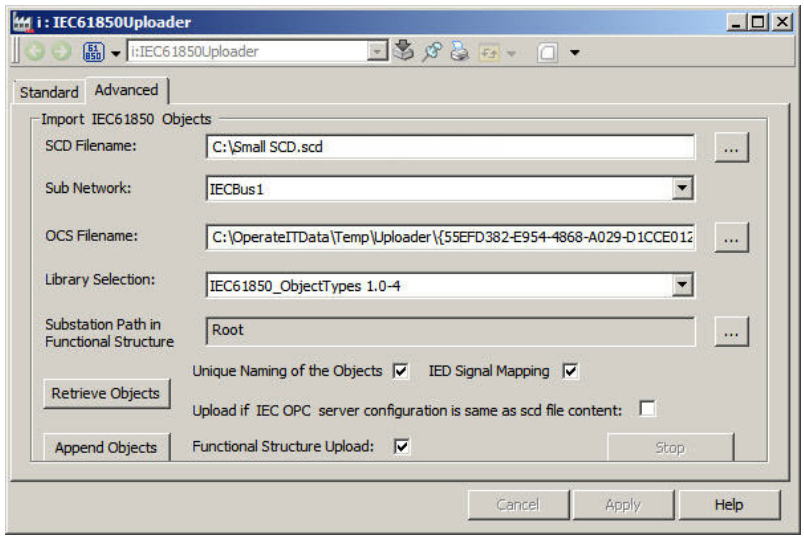


Figure 73. Library Selection in Advanced Tab

6. Click **Start** to start the Uploader operation.

This performs both *Functional Structure* and *Control Structure* upload.

Only One Upload operation must be performed at a time in a single 800xA System. Simultaneous upload must not be done from multiple nodes of 800xA System.

The objects displayed in the *Control Structure* are extracted from the Communication section of the SCD file and the objects displayed in *Functional Structure* are extracted from substation section. Hence it may be possible that the objects that are present in the *Control Structure* are not present in *Functional Structure* or objects that are present in the *Functional Structure* are not present in the *Control Structure*.

Upload Using Advanced Tab

1. Click **IEC61850Uploader** aspect.

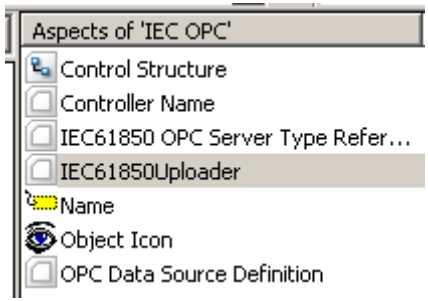


Figure 74. IEC61850 Uploader Aspect

2. Select the **Advanced** tab of the Uploader.

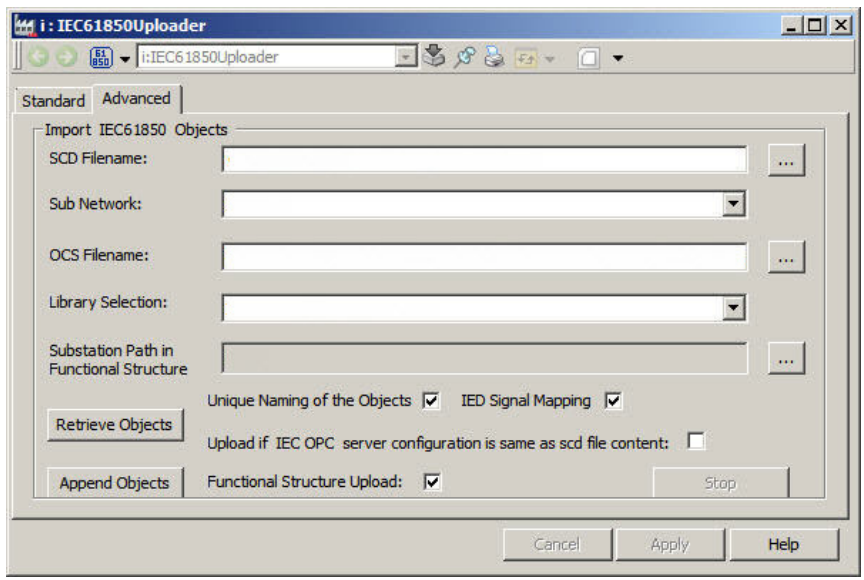


Figure 75. Uploader Advanced Tab

3. Browse the SCD file which needs to be imported under the OPC Server object.

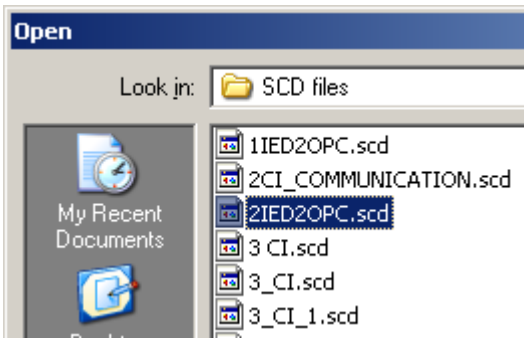


Figure 76. Browsing SCD File

4. Once the SCD file is selected the Uploader parses the SCD file and lists the sub network in the SCD file in the **Sub Network** drop-down list.

   SCD file having multiple OPC server instances with the same sub network can be uploaded.

   For example: Substation with more than 160 IEDs in a sub network can have two OPC server instances, hence an SCD file having 80 IEDs are distributed among the OPC Servers.

Ensure that a correct SCD file is uploaded. A caution, *`Invalid SCD File! Uploader will Abort`* message appears if the uploaded SCD file contains special character (& or Space) in the description of any Conducting Equipment or Bay.

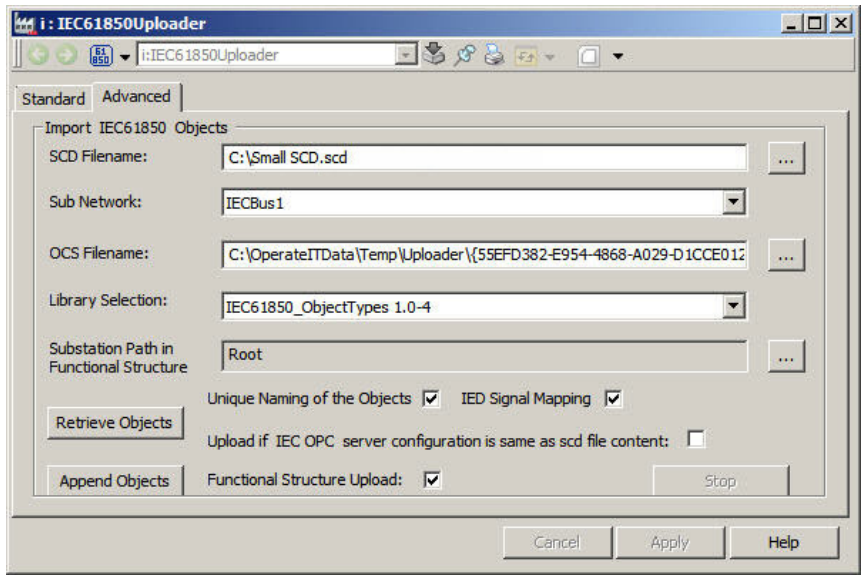


Figure 77. Uploader Advanced Tab

5. Select the correct sub network from the drop-down list. Ensure that the same sub network that is imported in the OPC Server (to which the OPC data source definition Aspect of OPC Server object is pointing) is chosen.

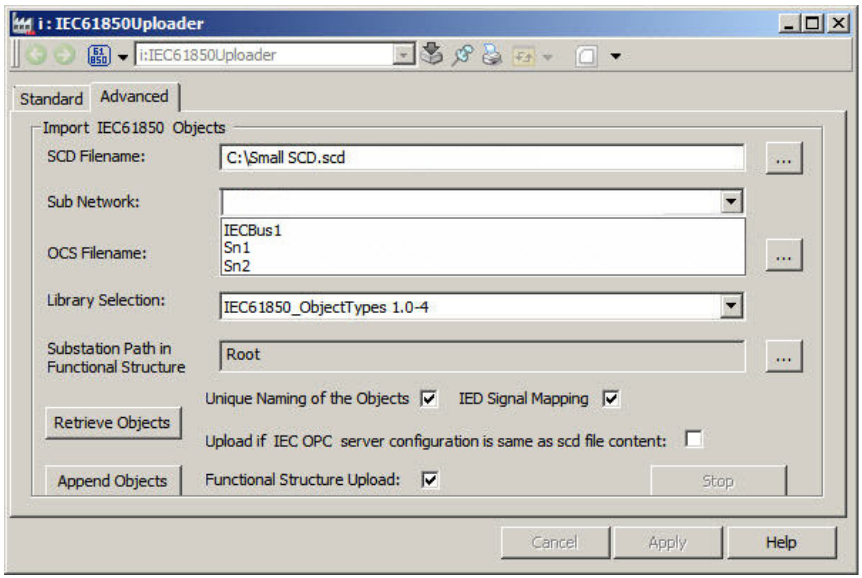


Figure 78. Sub Network Selection

OCS Filename: The Uploader assigns a unique OCS Filename in the Uploader Aspect of each OPC Server in Control Structure. The OCS Filename can also be modified by manually editing the filename.

It is recommended to take a backup of the existing OCS files, to prevent the Uploader from overwriting the files.

For SCD file with multiple subnetwork, the name of the subnetwork is suffixed with the OCS file name. For each subnetwork a new OCS file is created, hence for multiple subnetwork, multiple OCS files are created.

While uploading, retain the default ocs file name. If user specific ocs filename is provided as a default ocs file name, ensure that for multiple upload on different OPC server instances, the ocs filenames are unique.

During retrieve operation, Uploader creates an intermediate 800xA OCS file format. During Append operation, Uploader reads the selected OCS file and uploads the configuration details.

Multiple Retrieve operations can be performed sequentially for multiple OPC Server objects. In that case it is recommended that Filename specified in OCS Filename field is different for each OPC server while performing Retrieve operation. Otherwise the OCS file is overwritten with contents from the last retrieved SCD file

Library Selection: Select the object type library which contains the object types that has to be uploaded. If the user has created his own version of the OT library, then that library must be selected here.

Functional Structure Upload: The substation section of the SCD file needs to be represented in the *Functional Structure*. The Uploader provides an option for automatic creation of the substation section in the *Functional Structure*.

Select this option to create a substation tree structure in the *Functional Structure* of the plant explorer. For *Functional Structure* upload to work, the Substation section of the SCD file should be present.

In case the substation is not included in the configured SCD file, the *Functional Structure Upload* checkbox is disabled and unchecked to indicate that the SCD file does not contain Functional Structure objects (Substation) for upload. A message '*No objects found for Functional Structure retrieve'* is displayed while uploading the SCD file.

Upload if IEC OPC server configuration is same as SCD file content:

– If this option is selected, the upload action fails if any non matching object are found.

– If this option is not selected, Upload action proceeds, if any non matching objects are found. Upload continues with the matching objects.

Upload if IEC OPC server configuration is same as SCD file content is performed during retrieve operation.

Retrieve Objects: This starts the retrieve operation of the Uploader. During retrieve, the Uploader parses the SCD file and creates the OCS files.

Append Objects: Once retrieve operation is complete, click **Append Objects**.

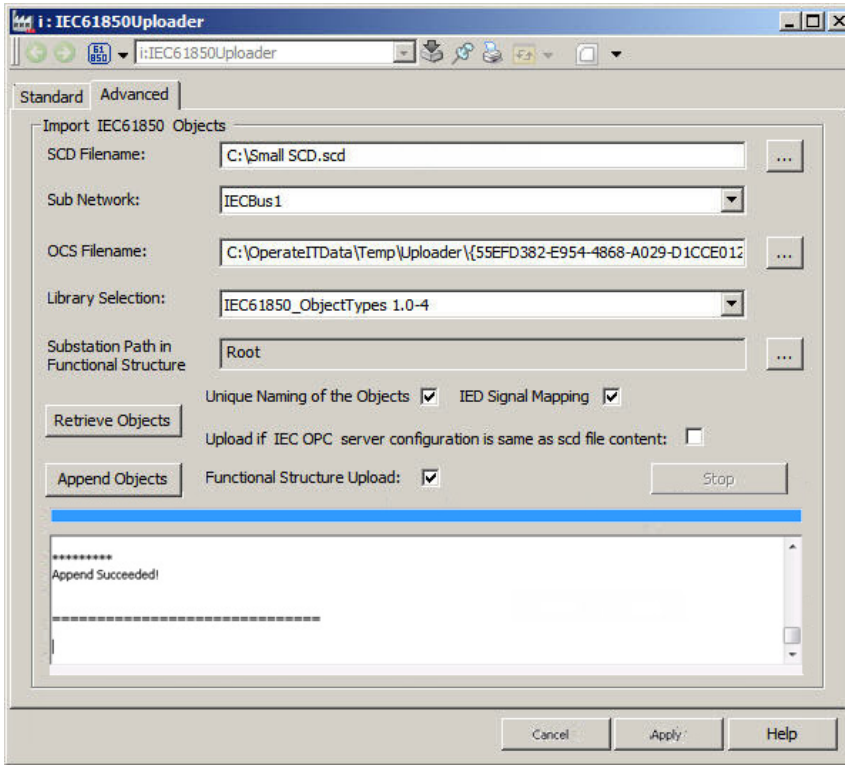


Figure 79. Advanced Tab - Retrieve and Append

Unique Naming, IED Signal Mapping, and *Functional Structure Upload* is performed during Append.

6. Now the *Control Structure* and *Function Structure* upload (if selected) is now complete.

In the *Functional Structure* there can be multiple objects with the same name in a single tree. These are not duplicates. For information on the location of such logical nodes in the IED, refer to **Controller Name** aspect.

IEC 61850 Uploader Options - Feature Pack Update

Substation Path in Functional Structure

The substation path shows the selected node in the functional structure under which the substation is appended. Browse and select the path for the substation in functional structure, the substation path text box displays the selected object path. After upload substation node is added under the path present in the substation path.

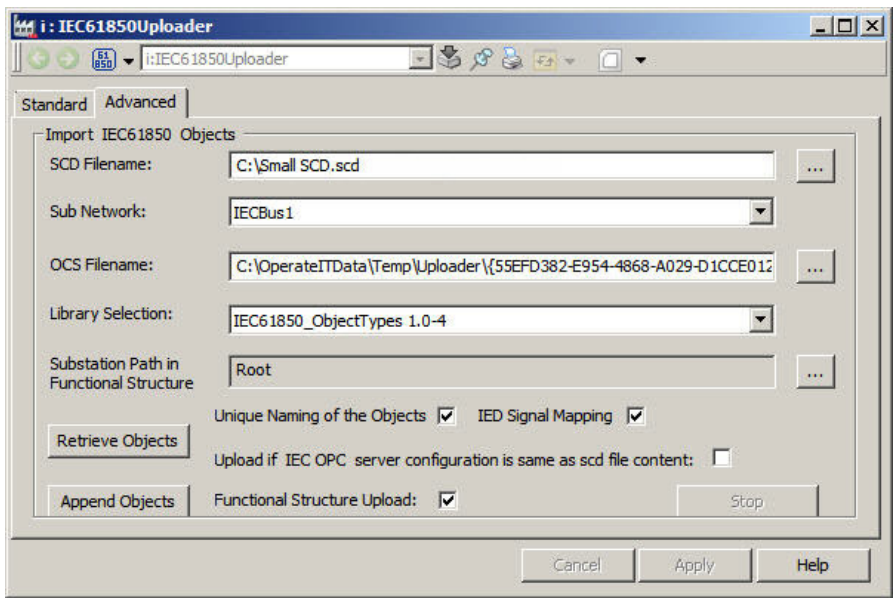


Figure 80. IEC 61850 Uploader Advanced tab

Unique Naming of the Objects

Unique Naming of the Objects option is available in the advanced tab of Uploader aspect and is used for unique naming of objects in the Control and Functional structure of Plant Explorer.

During Upload operation with the **Unique Naming of the Objects** option selected, the uploader modifies the LN names with the unique naming format as mentioned in Table 35 and the following message as shown in Figure 81 is displayed.

By default the Unique Naming option is unchecked.

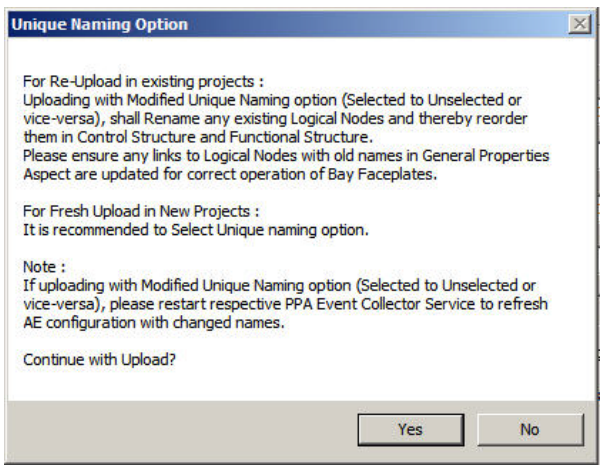


Figure 81. Unique Naming Pop up message during upload

Figure 82 shows screen shot of control structure after Unique Naming option is selected during Upload. For example, IED, Logical device, Logical Node and Conducting Equipment objects.

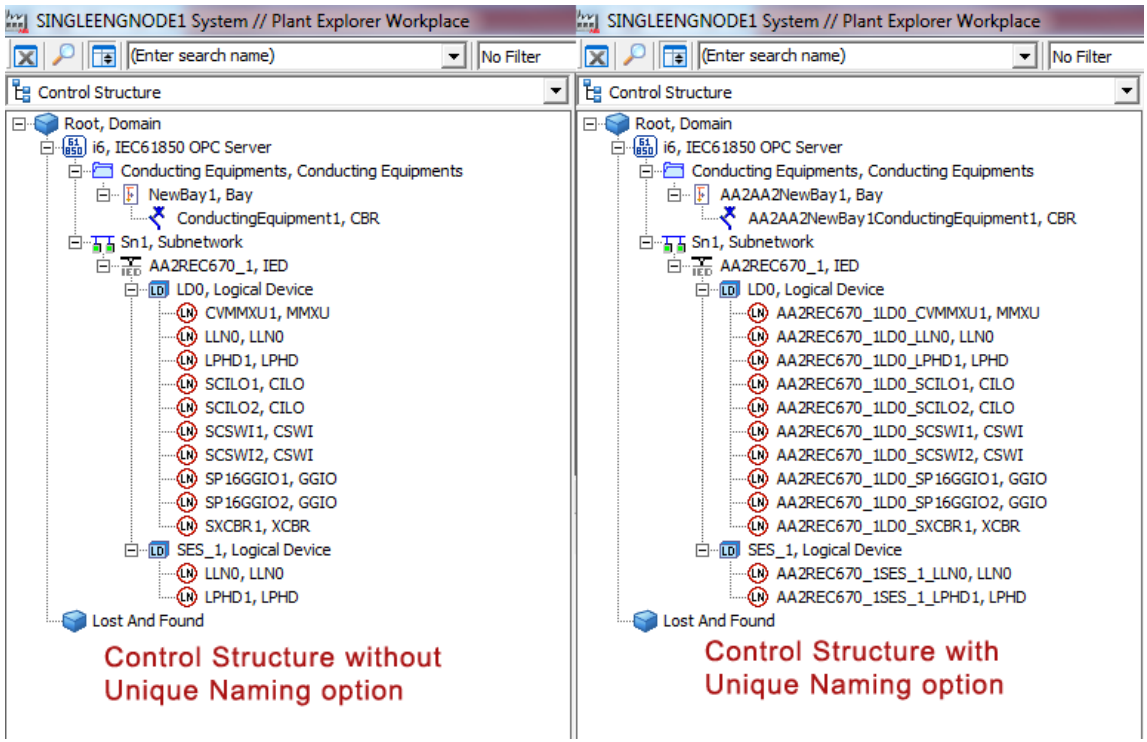


Figure 82. Unique naming of Primary Conducting Equipment in control structure

Figure 83 shows screen shot of functional structure, when Unique Naming option is selected during Upload. For example, Voltage Level, Bay and Conducting Equipment objects.

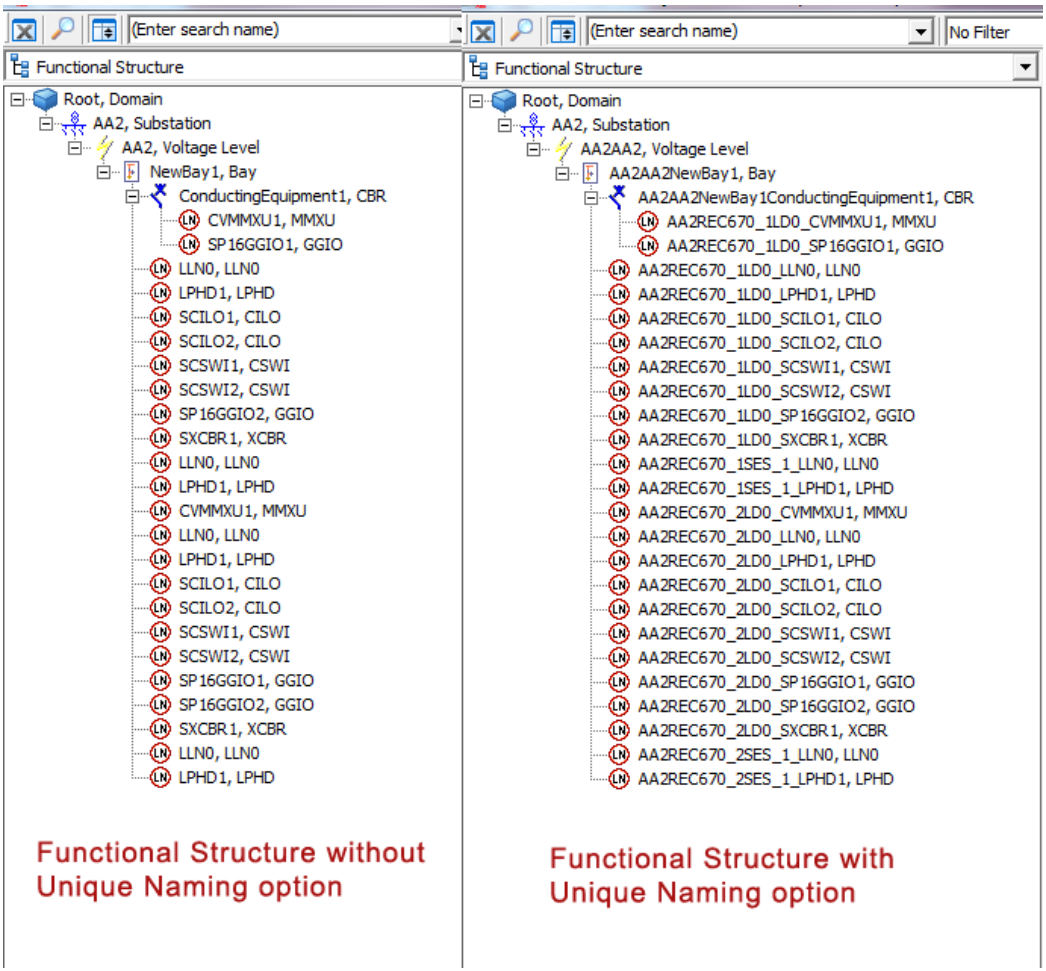


Figure 83. Unique naming of Secondary Equipment object in functional structure

Table 35 details the format for changing object name after applying the unique naming.

Table 35. Unique Naming Format for Conducting Equipment Objects

Object Type	Unique Naming Format	Example
Bay	Substation Name + Voltage Level Name + Bay	AA1AA1Q01, Bay
CBR	Substation Name + Voltage Level Name + Bay + CBR	AA1AA1Q01QA1, CBR
CE(Generic)	Substation Name + Voltage Level Name + Bay + CE	AA1AA1Q01BI1, Conducting Equipment
DIS	Substation Name + Voltage Level Name + Bay + DIS	AA1AA1Q01QB1, DIS
GEN	Substation Name + Voltage Level Name + Bay + GEN	AA1AA1Q01QC1, GEN
PTR	Substation Name + Voltage Level Name + Bay + PTR	AA1AA1Q01QD1, PTR
CTR	Substation Name + Voltage Level Name + Bay + CTR	AA1AA1Q01QE1, CTR
VTR	Substation Name + Voltage Level Name + Bay + VTR	AA1AA1Q01QF1, VTR
Voltage Level	Substation Name+ Voltage Level Name	AA1AA1, Voltage Level
LN	IED+LD+"_"+LN	AA1A1LD0_CVMMXU1, MMXU
Substation	Not part of unique naming.	Not Applicable
Subnetwork	Not part of unique naming.	Not Applicable
IED	Not part of unique naming.	Not Applicable
LD	Not part of unique naming.	Not Applicable

IED Signal Mapping

IED Signal Mapping aspect is available for each Conducting Equipment**,** Substation and Voltage Level, and, Bay in the Object Type Library**.**

Extended Object Type Library containing the IED Signal Mapping aspect can be used to deliver the projects with customized faceplates as per industry standards with variety of IEDs.

The **IED Signal Mapping aspect** is used for defining the properties and corresponding rules for the specified IED type (for example. REF615, REM615, REF630, REB670, REG670, and REL670). These properties are by default available in Control Connection aspect of the Conducting Equipment and are used for faceplate configuration.

On selecting **IED Signal Mapping** option during upload, uploader checks the properties of the IEDs available in the SCD file and appends the respective properties from IED Mapping Aspect to display Item IDs in the Control Connection Aspect for the Conducting Equipment and Bay.

Uploader ensures that all the properties in IED Signal Mapping aspect are available and matching with the properties of the Control Connection aspect, otherwise the uploader stops with an error message.

After upload, the properties are updated in the Control Connection aspect in the *Control Structure* and *Functional Structure* of the 800x A Plant Explorer. Figure 84 shows the IED Signal Mapping Aspect of Bay Conducting Equipment object in Object Type Structure.

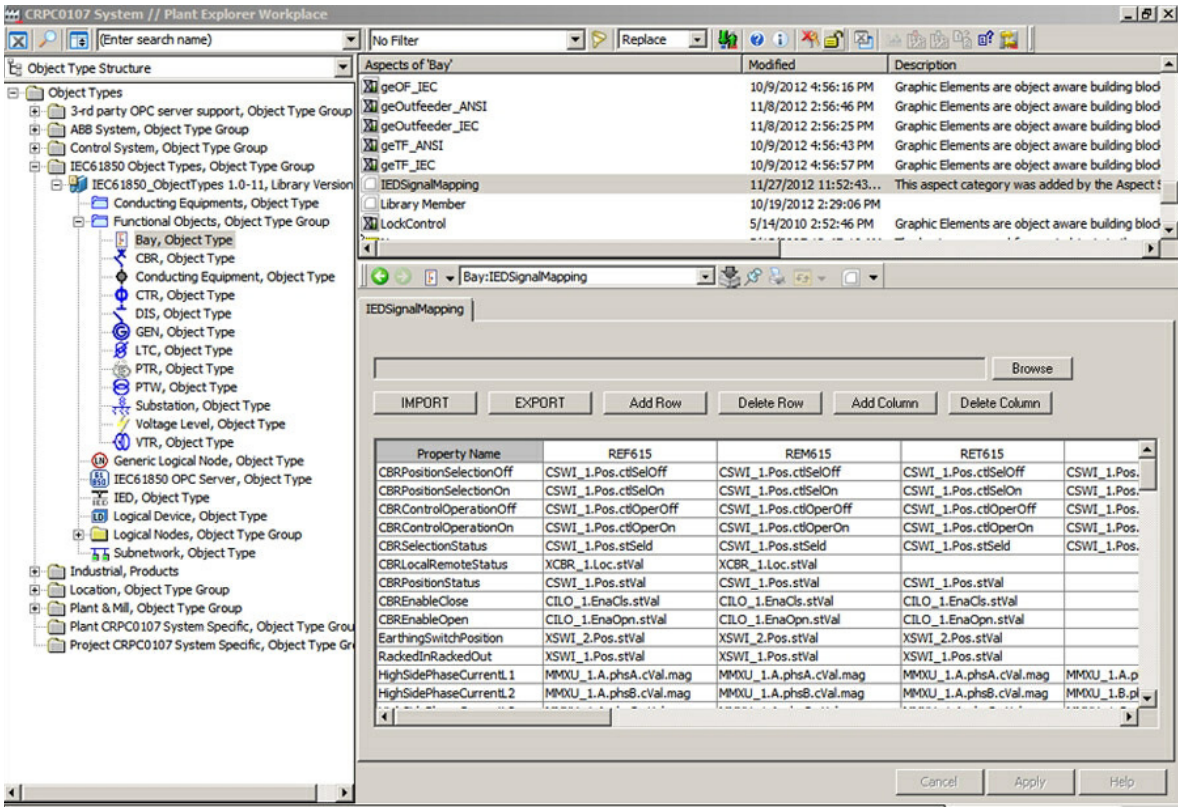


Figure 84. IED Signal Mapping Aspect

IED Signal Mapping aspect supports configuration of only one type of IED under a Bay and Conducting Equipment.

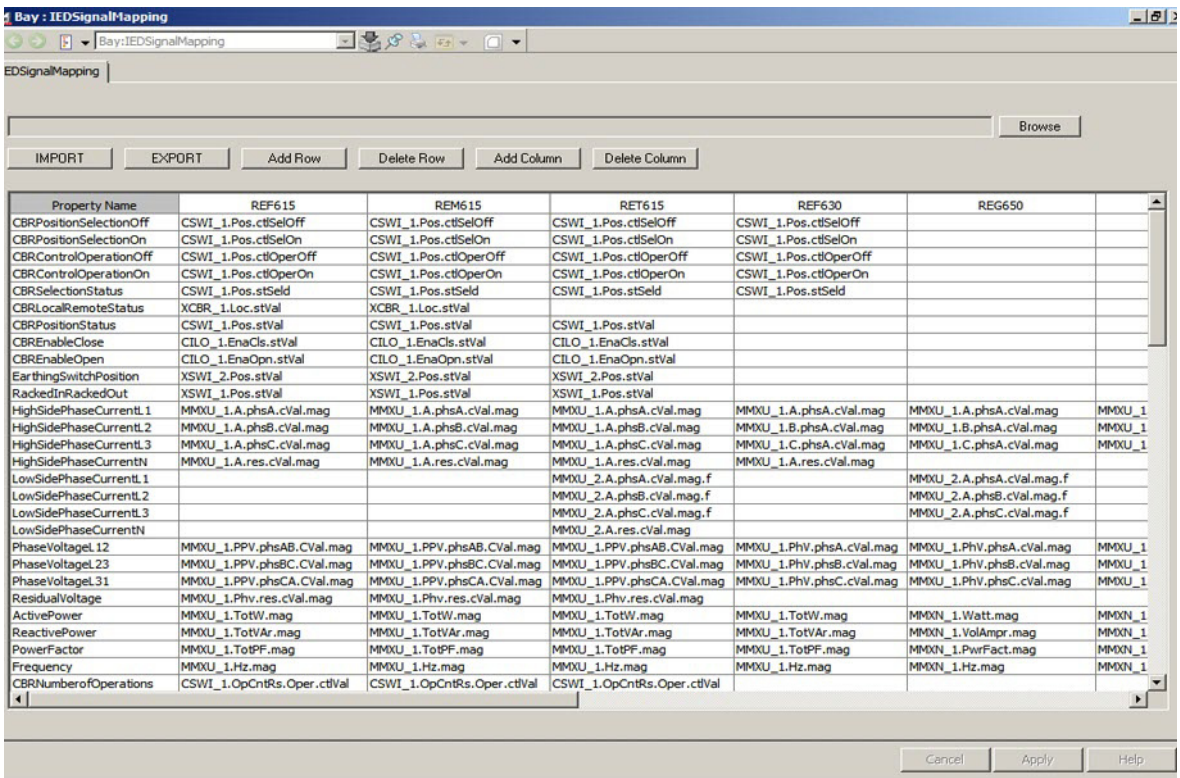
This is because only one set of properties can be accommodated for signals from an IED to display in Control Connection aspect.

The IED Signal Mapping Aspect contains:

- *Property Name* to define a signal name,

- *IED* column containing the mapping of each signal to the respective IEC 61850 data attribute of a given IED type.

The *Property Name* and *IED* name of the IED Signal Mapping Aspect must be unique and the *Property Name field* must not be left blank.



Property Name	REF615	REM615	RET615	REF630	REG650	
CBRPositionSelectionOff	CSWI_1.Pos.ctlSelOff	CSWI_1.Pos.ctlSelOff	CSWI_1.Pos.ctlSelOff	CSWI_1.Pos.ctlSelOff		
CBRPositionSelectionOn	CSWI_1.Pos.ctlSelOn	CSWI_1.Pos.ctlSelOn	CSWI_1.Pos.ctlSelOn	CSWI_1.Pos.ctlSelOn		
CBRControlOperationOff	CSWI_1.Pos.ctlOperOff	CSWI_1.Pos.ctlOperOff	CSWI_1.Pos.ctlOperOff	CSWI_1.Pos.ctlOperOff		
CBRControlOperationOn	CSWI_1.Pos.ctlOperOn	CSWI_1.Pos.ctlOperOn	CSWI_1.Pos.ctlOperOn	CSWI_1.Pos.ctlOperOn		
CBRSelectionStatus	CSWI_1.Pos.stSeld	CSWI_1.Pos.stSeld	CSWI_1.Pos.stSeld	CSWI_1.Pos.stSeld		
CBRLocalRemoteStatus	XCBR_1.Loc.stVal	XCBR_1.Loc.stVal				
CBRPositionStatus	CSWI_1.Pos.stVal	CSWI_1.Pos.stVal	CSWI_1.Pos.stVal			
CBREnableClose	CILO_1.EnaCls.stVal	CILO_1.EnaCls.stVal	CILO_1.EnaCls.stVal			
CBREnableOpen	CILO_1.EnaOpn.stVal	CILO_1.EnaOpn.stVal	CILO_1.EnaOpn.stVal			
EarthingSwitchPosition	XSWI_2.Pos.stVal	XSWI_2.Pos.stVal	XSWI_2.Pos.stVal			
RackedInRackedOut	XSWI_1.Pos.stVal	XSWI_1.Pos.stVal	XSWI_1.Pos.stVal			
HighSidePhaseCurrentL1	MMXU_1.A.phsA.cVal.mag	MMXU_1.A.phsA.cVal.mag	MMXU_1.A.phsA.cVal.mag	MMXU_1.A.phsA.cVal.mag	MMXU_1.A.phsA.cVal.mag	MMXU_1
HighSidePhaseCurrentL2	MMXU_1.A.phsB.cVal.mag	MMXU_1.A.phsB.cVal.mag	MMXU_1.A.phsB.cVal.mag	MMXU_1.B.phsA.cVal.mag	MMXU_1.B.phsA.cVal.mag	MMXU_1
HighSidePhaseCurrentL3	MMXU_1.A.phsC.cVal.mag	MMXU_1.A.phsC.cVal.mag	MMXU_1.A.phsC.cVal.mag	MMXU_1.C.phsA.cVal.mag	MMXU_1.C.phsA.cVal.mag	MMXU_1
HighSidePhaseCurrentN	MMXU_1.A.res.cVal.mag	MMXU_1.A.res.cVal.mag	MMXU_1.A.res.cVal.mag	MMXU_1.A.res.cVal.mag		
LowSidePhaseCurrentL1			MMXU_2.A.phsA.cVal.mag.f		MMXU_2.A.phsA.cVal.mag.f	
LowSidePhaseCurrentL2			MMXU_2.A.phsB.cVal.mag.f		MMXU_2.A.phsB.cVal.mag.f	
LowSidePhaseCurrentL3			MMXU_2.A.phsC.cVal.mag.f		MMXU_2.A.phsC.cVal.mag.f	
LowSidePhaseCurrentN			MMXU_2.A.res.cVal.mag			
PhaseVoltageL12	MMXU_1.PPV.phsAB.CVal.mag	MMXU_1.PPV.phsAB.CVal.mag	MMXU_1.PPV.phsAB.CVal.mag	MMXU_1.PhV.phsA.cVal.mag	MMXU_1.PhV.phsA.cVal.mag	MMXU_1
PhaseVoltageL23	MMXU_1.PPV.phsBC.CVal.mag	MMXU_1.PPV.phsBC.CVal.mag	MMXU_1.PPV.phsBC.CVal.mag	MMXU_1.PhV.phsB.cVal.mag	MMXU_1.PhV.phsB.cVal.mag	MMXU_1
PhaseVoltageL31	MMXU_1.PPV.phsCA.CVal.mag	MMXU_1.PPV.phsCA.CVal.mag	MMXU_1.PPV.phsCA.CVal.mag	MMXU_1.PhV.phsC.cVal.mag	MMXU_1.PhV.phsC.cVal.mag	MMXU_1
ResidualVoltage	MMXU_1.Phv.res.cVal.mag	MMXU_1.Phv.res.cVal.mag	MMXU_1.Phv.res.cVal.mag			
ActivePower	MMXU_1.TotW.mag	MMXU_1.TotW.mag	MMXU_1.TotW.mag	MMXU_1.TotW.mag	MMXN_1.Watt.mag	MMXN_1
ReactivePower	MMXU_1.TotVAr.mag	MMXU_1.TotVAr.mag	MMXU_1.TotVAr.mag	MMXU_1.TotVAr.mag	MMXN_1.VolAmpr.mag	MMXN_1
PowerFactor	MMXU_1.TotPF.mag	MMXU_1.TotPF.mag	MMXU_1.TotPF.mag	MMXU_1.TotPF.mag	MMXN_1.PwrFact.mag	MMXN_1
Frequency	MMXU_1.Hz.mag	MMXU_1.Hz.mag	MMXU_1.Hz.mag	MMXU_1.Hz.mag	MMXN_1.Hz.mag	MMXN_1
CBRNumberofOperations	CSWI_1.OpCntRs.Oper.ctlVal	CSWI_1.OpCntRs.Oper.ctlVal	CSWI_1.OpCntRs.Oper.ctlVal			

Figure 85. IEC61850 IED Mapping Signal Aspects

The properties defined under IED Type Column in the IED Signal Mapping Aspect is defined using:

- Instance Number

where the first part of the property is *LNType_InstanceNumber* and format as shown:

MMXU_1.A.res.cVal.mag

XSWI_1.Pos.stVal

Table 36 describes the fields used in IED Signal mapping Aspect.

Table 36. IED Mapping Signal Aspect

Item Label	Description
Browse	Used for browsing the .csv file to either Import or Export the .csv file containing the properties. It is recommended to create a .csv file in the local folder, before exporting the properties.
IMPORT	Used for importing the properties from the .csv file and overwrite the data in the existing table of the IED Signal Mapping Aspect. Browse to the particular .csv file and then import the properties to override the existing properties of the IED Signal Mapping aspect.
EXPORT	Used for exporting the properties from the IED Signal Mapping Aspect to the .csv file. Browse and select a particular .csv file and then export the IED Signal Mapping Aspect properties.
Add Row	An empty row is added to the table of the IED Signal Mapping Aspect.
Delete Row	Selected row is deleted from the table of the IED Signal Mapping Aspect.

Table 36. IED Mapping Signal Aspect

Item Label	Description
Add Column	An empty column is added to the table of the IED Signal Mapping Aspect.
Delete Column	The selected IED type column is deleted from the table of the IED Signal Mapping Aspect. The *Property Name* cannot be removed from the IED Signal Mapping Aspect.

Figure 87 shows *Control Connection Aspect* in the *Control Structure* IED Signal Mapping option is selected during upload.

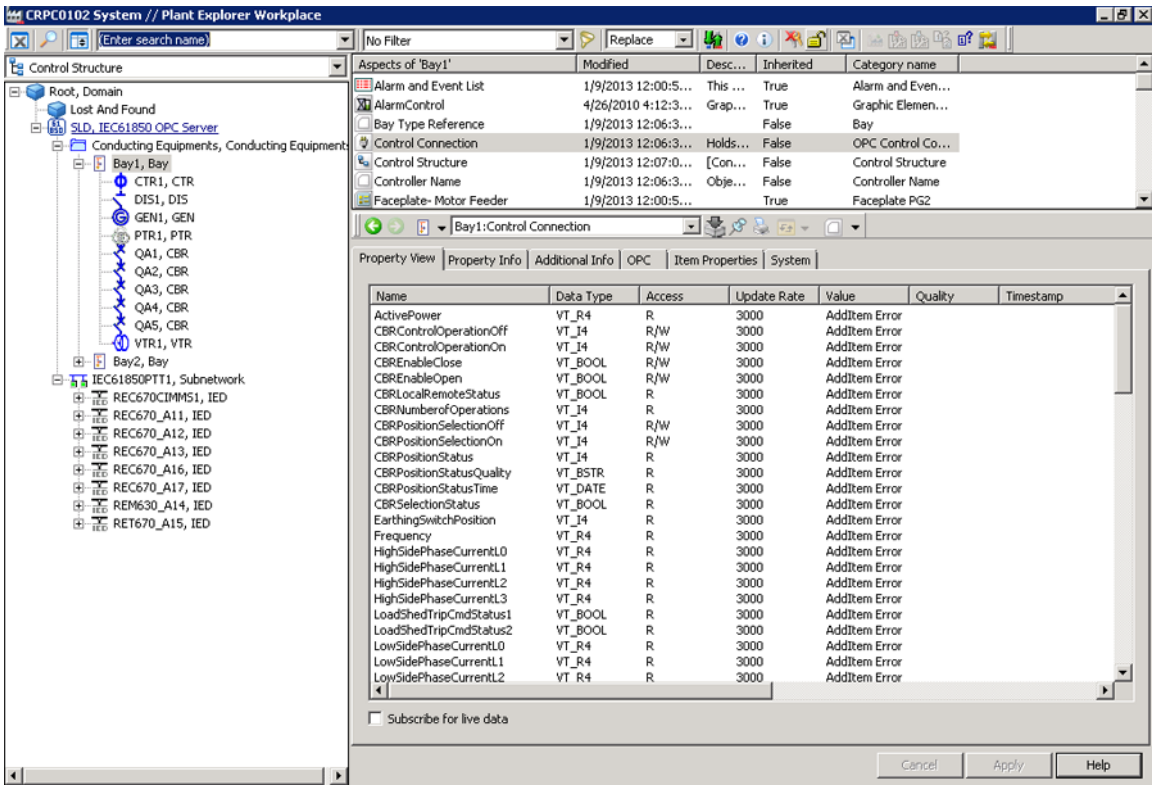


Figure 86. Control Structure - Control Connection Aspect

Figure 87 shows *Control Connection Aspect* in the *Functional Structure* IED Signal Mapping option is selected during upload.

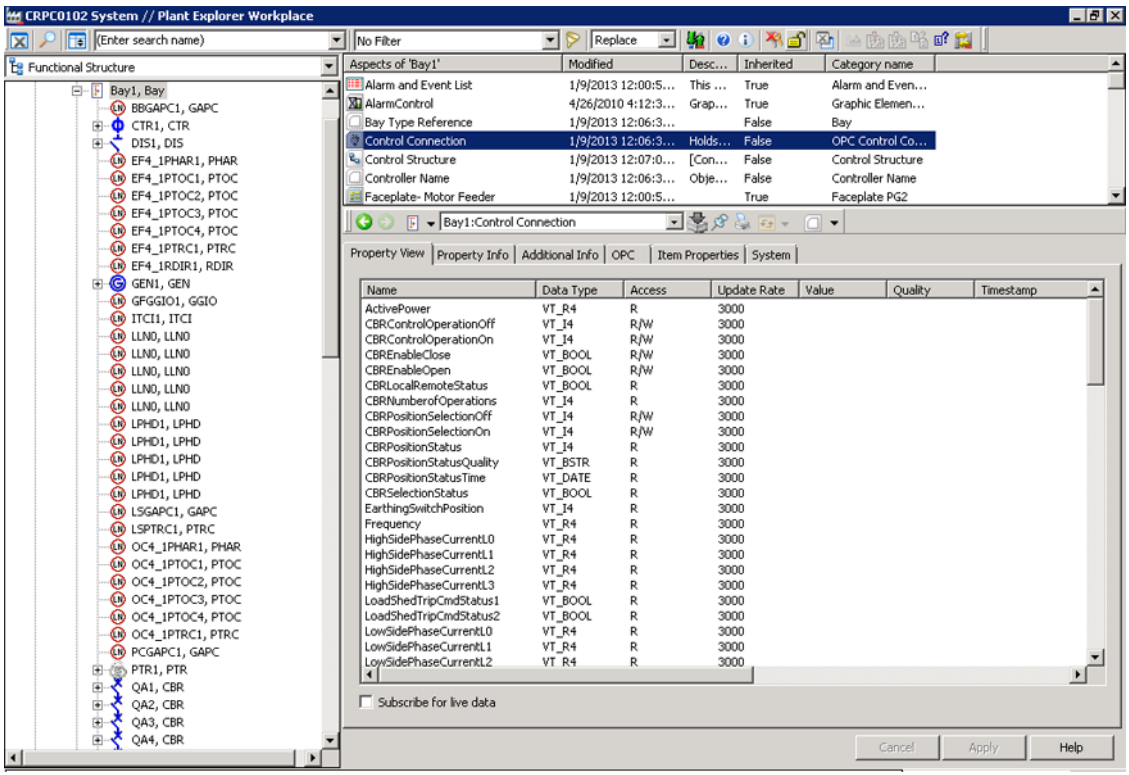


Figure 87. Functional Structure - Control Connection Aspect

Section 4 800xA IEC 61850 Alarm and Event Configuration

This section describes how to configure Alarms and Events in 800xA Plant Explorer using IEC 61850 OPC Server.

The IEC 61850 OPC Server forwards alarms and events from the IEC 61850 network to the 800xA system. The IEC 61850 OPC Server runs on Connectivity Server and is connected to 800xA using standard 800xA functionality for third party OPC A&E Servers.

To increase the level of integration, a specific Alarm Collection Definition object is included in IEC 61850 Connect. The Alarm Collection Definition object maps the following:

- The alarm severity attribute of IEC 61850 OPC Server to AE priority in 800xA.
- The IEC 61850 OPC Server event categories to 800xA category groups.

Alarm and Event List Configurations can be created for each business unit to adapt to the existing alarm and event concepts of the BU. One example feature used in other connectivities is to add the object description column to the alarm/event list. By adding one/more operator-friendly description of an object to the Description field of the **Name** aspect of an object, this information can be used in alarm/event lists instead of the "low-level" object name.

Configuring Alarms and Events in Plant Explorer

Once the AE server gets configured in CET and SCD file is imported in PPA, the following steps are to be performed to configure alarm and events for IEC 61850 Connect.

Perform the following steps to configure alarm and events:

1. Select **Service Structure** in **Plant Explorer**.
2. Right-click **Event Collector, Service** and select **New Object** from the context menu to create a service group.

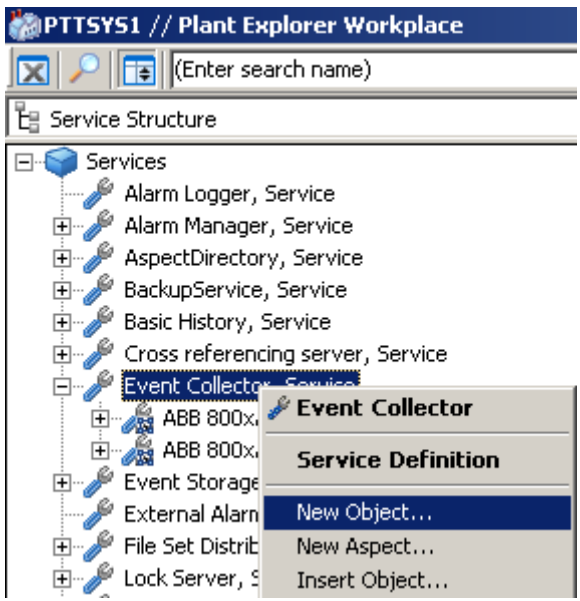


Figure 88. New Object Selection

3. In the **New Object** dialog box, enter the **Service Group** name and click **Create**.

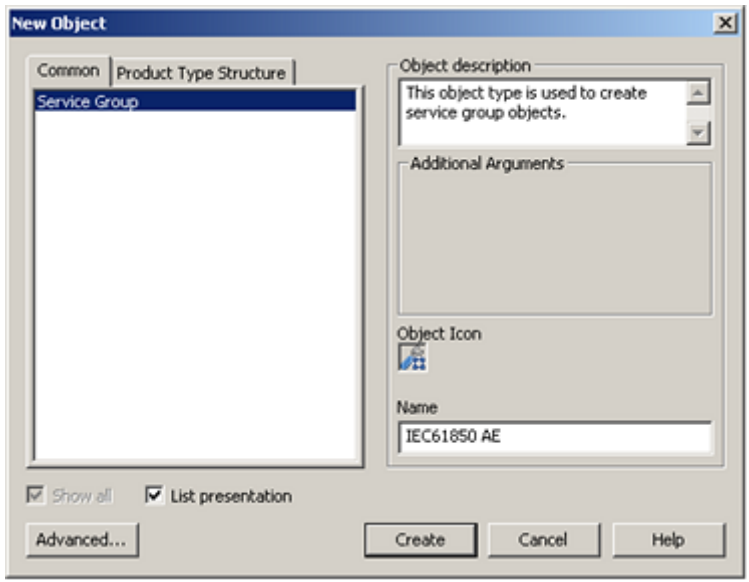


Figure 89. New Object Dialog Box

4. Right-click the previously created Service Group (IEC) and select **New Object** from the context menu to create a service provider object.

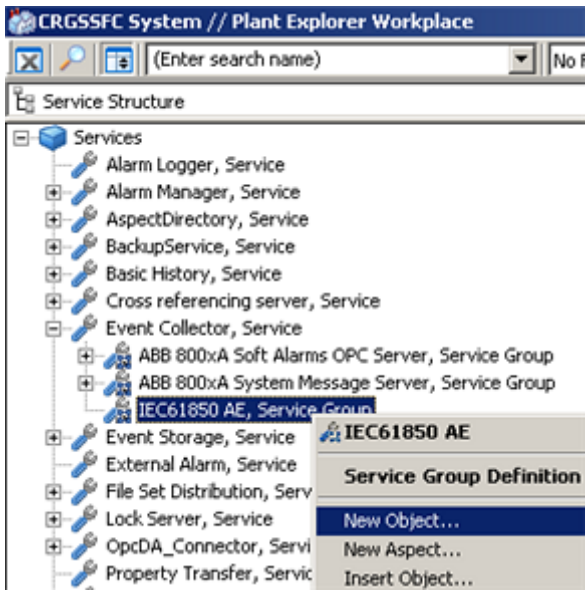


Figure 90. Service Provider Object

5. In the **New Object** dialog box, enter the service provider name and click **Create.**

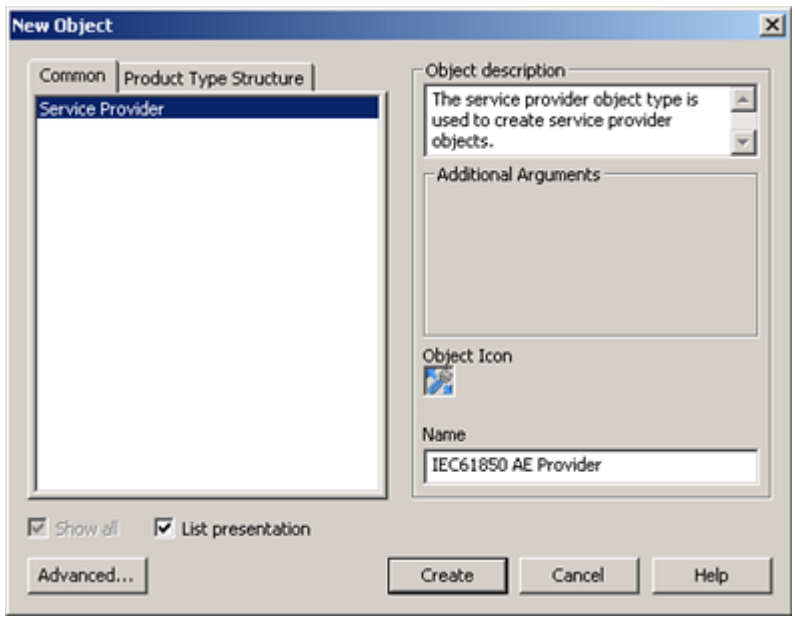


Figure 91. New Object Dialog Box With Service Provider

If there is a redundant AE server, then create a second provider object.

6. Select the created Service Provider object.

7. Select **Service Provider Definition** from the Aspects List.

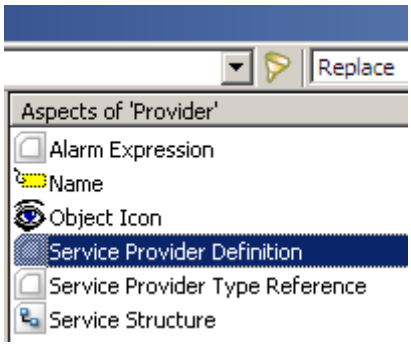


Figure 92. Service Provider Definition Aspect

8. Select the **Configuration** tab in Aspect Preview pane.
9. From the **Node** drop-down list, select a connectivity server on which the AE server resides and click **Apply**.

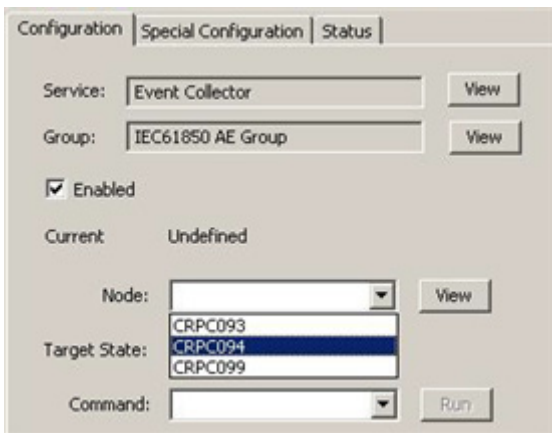


Figure 93. Connectivity Server Selection

10. Click **Special Configuration** tab.
11. Click **Override** located beside **Description of AE Server** drop-down list.

12. Select the description of AE Server from the **Description of AE Server** drop-down list.

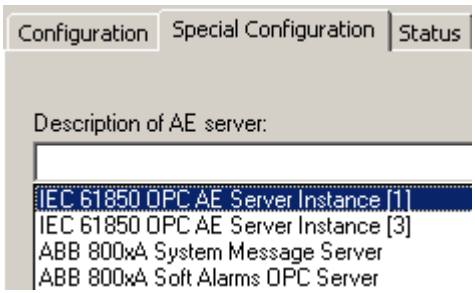


Figure 94. Special Configuration Tab

Ensure that the correct description of AE Server is selected. This must be the same as the ProgID of the AE Server to connect.

13. Select the service group created in Step 3.
14. Select **Service Group Definition** from the Aspects List.
15. Select the **Special Configuration** tab from the Aspect Preview pane.
16. Under **OPC A&E Server**, select alarm server from the **Alarm Server** drop-down list.

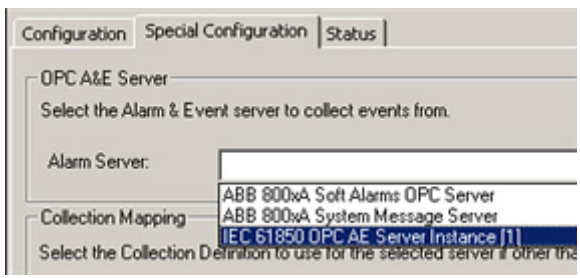


Figure 95. Alarm Server Selection

Ensure that the correct Alarm Server is selected. This must be the same as the ProgID of the AE Server to connect.

On selecting the alarm server, the collection definition appears automatically. If not, click the **New** button located beside the **Collection Definition** drop-down list as shown in Figure 96.

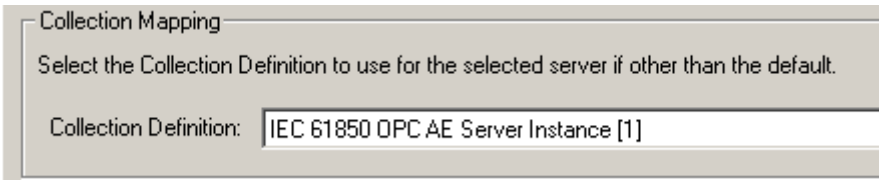


Figure 96. Collection Mapping

17. Under Source Object Handling, select **Tracking Source Object Interceptor** from the **Object Handler** drop-down list.

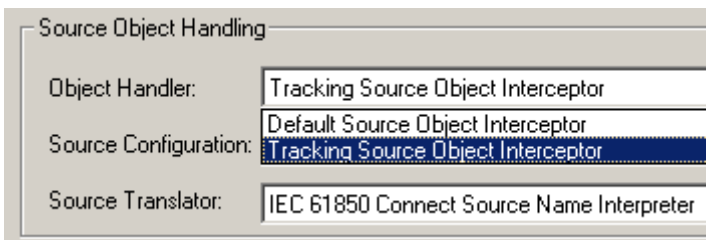


Figure 97. Source Object Interceptor Selection

18. Select **IEC 61850 Connect Source Name Interpreter** from the **Source Translator** drop-down list.

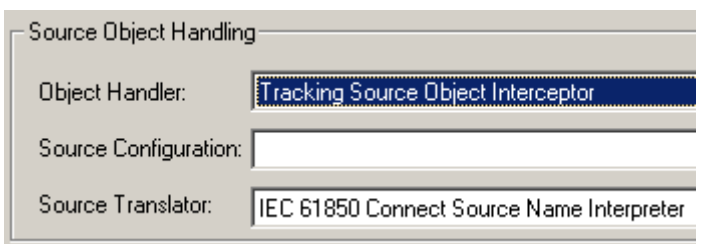


Figure 98. Source Object Handling

19. Click **Apply** to configure the above settings.
20. When the user clicks on **Apply**, the **Upload** button is enabled.
21. Click **Upload.** A new alarm collection aspect is created as shown in Figure 99. The alarm collection definition needs to be configured with reference to the alarm collection aspect provided by 61850 Connect**.**

The upload is now complete, and the 800xA system is now configured to receive alarm from the IEC 61850 AE Server. Optionally, the upload step can be skipped and the reference/default collection definition object provided with Connect can be used directly. This is possible only when the default event categories of the OPC Server are used (no changes have been made to the OPC Server event categories).

A new alarm definition object is created if more than one OPC Servers are used in the system. New alarm definition object is created in the below mentioned path:

Library Structure > Alarm & Event > Alarm Collection Definitions, Alarm Collection Definition > IEC 61850 OPC AE Server, Alarm Collection Definition.

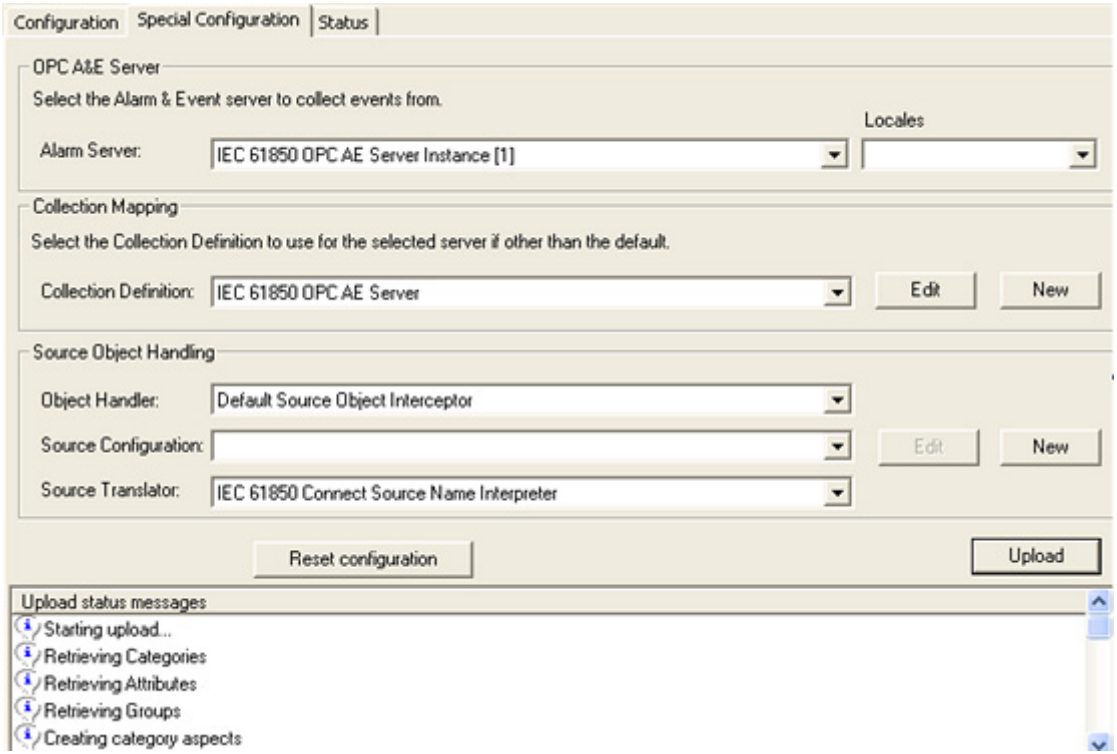


Figure 99. Special Configuration Tab

22. The *Category Group* of the newly created alarm collection definition must be categorized if required, as per the default alarm collection definition provided

by IEC 61850 Connect as shown in Figure 100.

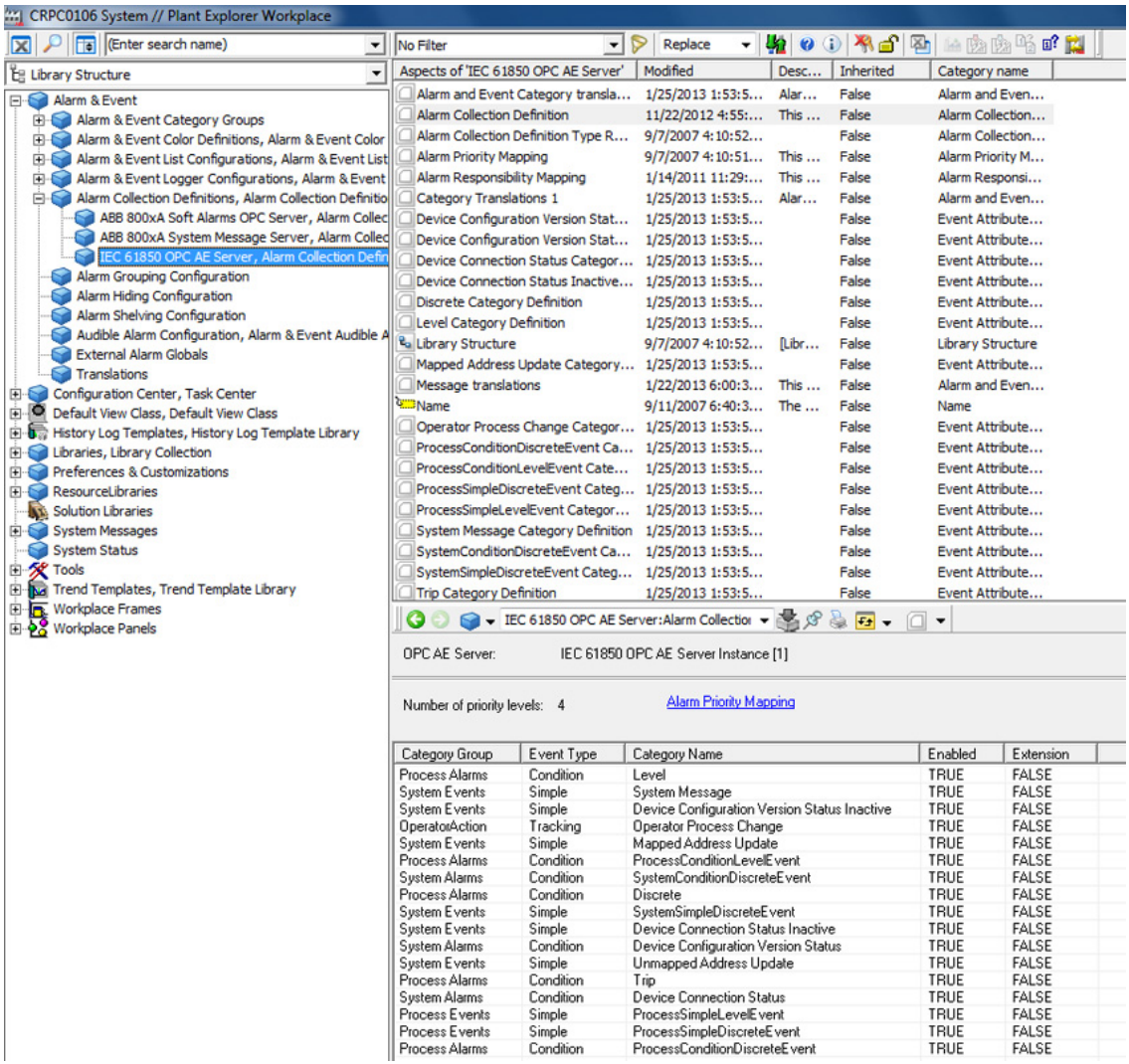


Figure 100. Default Alarm Collection Definition

23. In Service Structure, select **Services > Alarm Manager, Service > Basic, Service Group**.

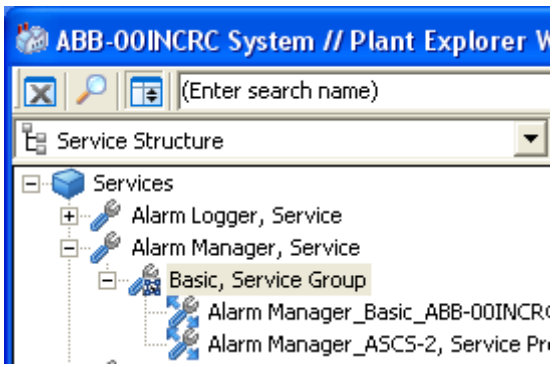


Figure 101. Service Group

24. In Aspects List pane, select **Service Group Definition**.

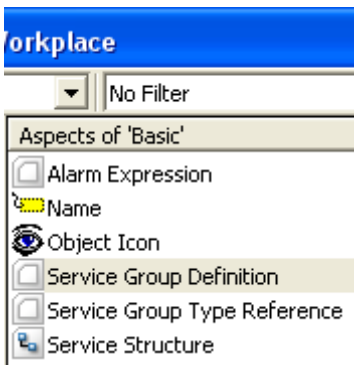


Figure 102. Service Group Definition

25. In Aspects pane, select the **Special Configuration** tab.

26. In the **Special Configuration** tab, check **Log Non state-related changes**.

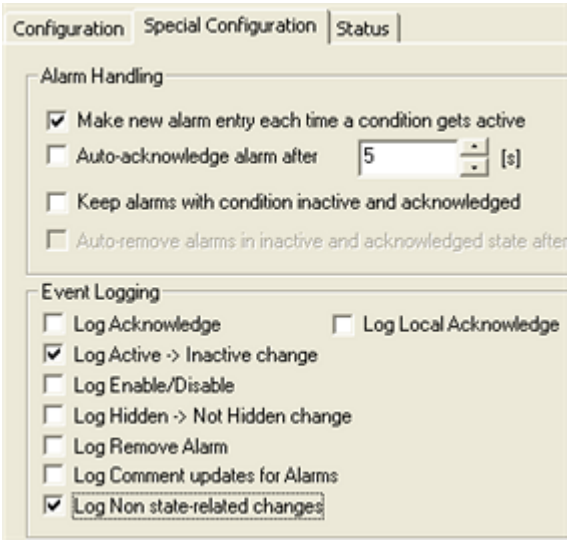


Figure 103. Log Non state-related changes in Special Configuration Tab

27. Click **Apply**.

The alarms list shows an alarm in a new row if there is a change in condition. If there is only a change in subcondition, then the new subcondition is displayed in the same row.

Alarm Priority Configuration

In 800xA, there are four default priority levels configured for alarms in the Alarm Collection Definition aspect of IEC 61850 OPC AE Server. The user can manually configure the alarm priority levels in the Plant Explorer and the severity levels in the IEC CET.

Alarm Priority Configuration in Plant Explorer

To configure the alarm priority levels, follow the steps below:

1. Open Plant Explorer.

2. Navigate to **Library Structure**.
3. Navigate to **Alarm & Event > Alarm Collection Definitions > IEC 61850 OPC AE Server**.
4. Select the **Alarm Collection Definition** aspect.

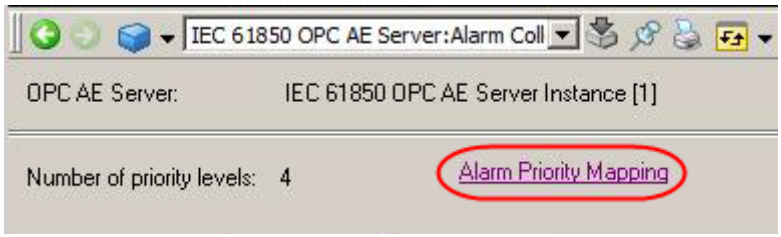


Figure 104. Alarm Priority Mapping Selection

5. In the aspect preview window, select **Alarm Priority Mapping**. The **Alarm Priority Mapping** dialog box appears.
6. In the **Alarm Priority Mapping** dialog box, the four default alarm priority levels will be displayed. The user can configure Priority Levels up to 32 levels.

The user can set the OPC Severity values for each Priority Level under **OPC Severity Range**.

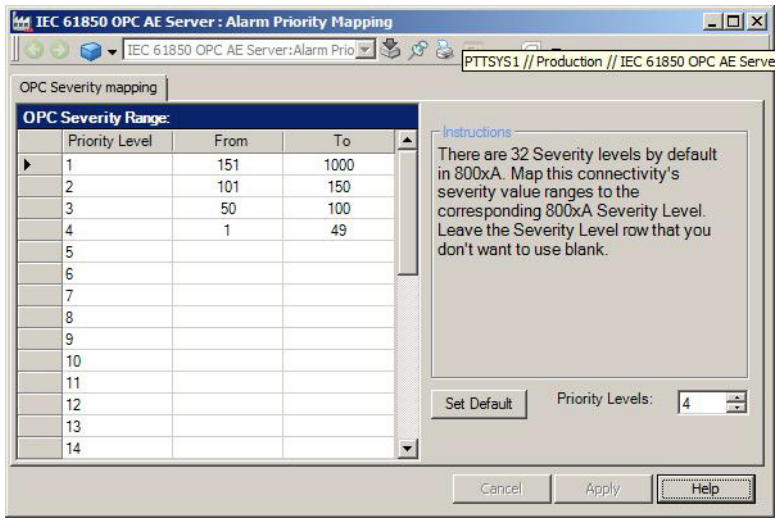


Figure 105. Alarm Priority Mapping Dialog Box

Alarm Shelving

To enable the Alarm Shelving feature create a new property in Aspect System Settings named Alarm Management and set the value to true as shown in

Figure 106.

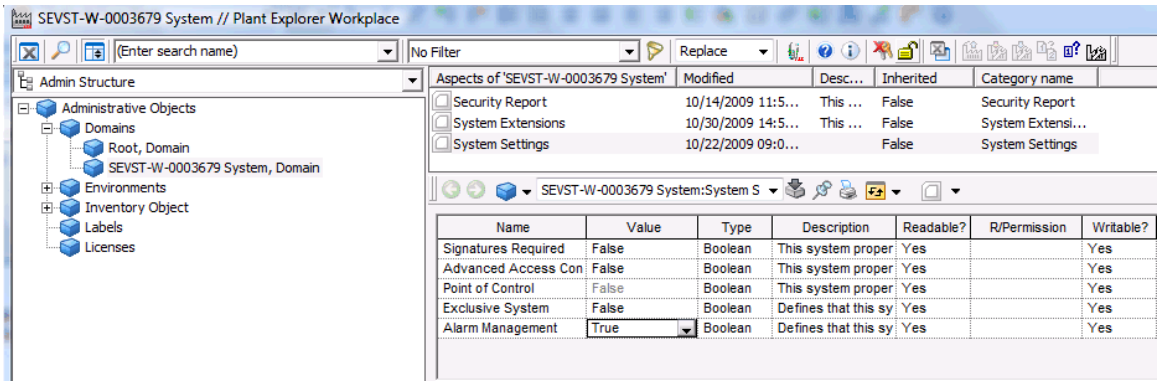


Figure 106. Alarm Shelving

Once the feature is enabled, Shelve is visible. Note that a license check will be performed when opening the alarm list. If the license is not available for Alarm Management, disturbance will be generated. This disturbance will not interrupt the Alarm Shelving.

800xA IEC 61850 Alarm and Event for Conducting Equipment

Alarms and events are related to the primary equipment objects that the operator works with. The alarms and events message includes the tag name of the related primary equipment object.

Currently, the Logical Node object in the IEC 61850 environment, which is the source of the alarm, transmits the alarms. From a usability point of view the Logical Node has no functional value on the alarm page for the operator as it represents only a logical function that can also be executed in a different equipment.

The Conducting Equipment (physical SA Component that is automated with one of several functions such as breaker, switch, motor, or pump) sends the alarm. So the Object Name column in the alarm list displays the conducting equipment name if

the alarm is generated from a Logical Node which is child of Conducting Equipment, else displays the Logical Node name.

Use the event list for generating High Warning and Low Warning messages on the PPA, as the Simple events are available only in the event list.

Figure 106 shows the Alarm and Event List Aspect for Bay Conducting Equipment.

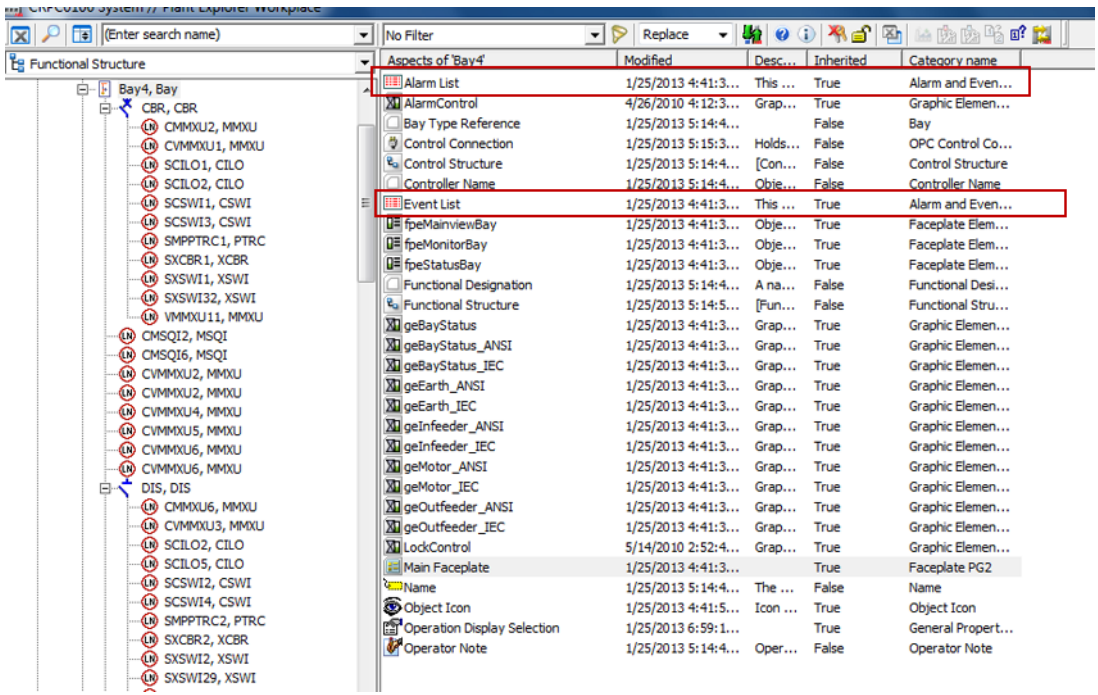


Figure 107. Alarm and Event List Aspect

Figure 106 shows High Alarm for Bay Conducting Equipment.

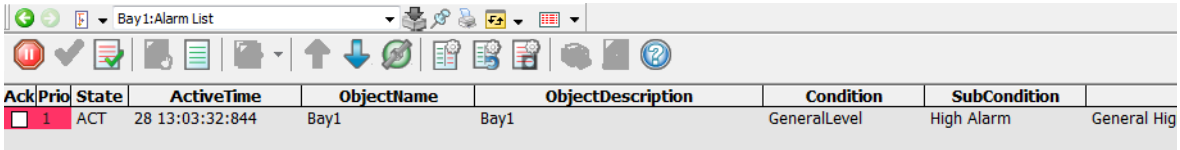


Figure 108. High Alarm

Redundant OPC AE Configuration

Before configuring Redundant OPC AE, pre-configuration steps has to be performed. For step-by-step procedure refer Alarm and Event Configuration on page 148.

Perform the following steps to configure OPC AE for redundancy:

1. Select **Service Structure** in **Plant Explorer**.
2. Right-click **Event Collector, Service** and select **New Object** from the context menu to create a service group.

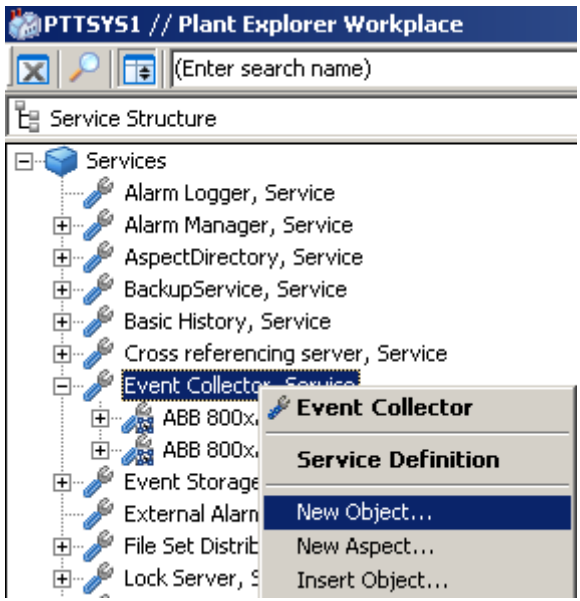


Figure 109. New Object Selection

3. In the **New Object** dialog box, enter a name and click **Create**.

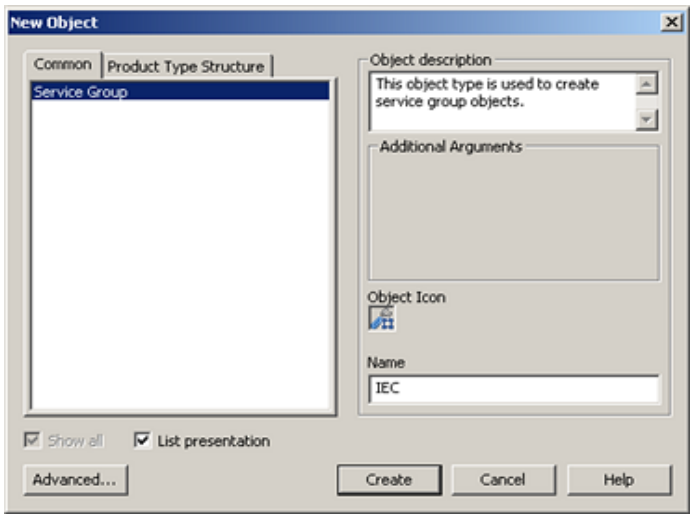


Figure 110. New Object Dialog Box

4. Click **Next.**

5. Right-click the previously created service group (IEC) and select **New Object** from the context menu to create a Service Provider object.

Figure 111. Service Provider Object

If there is a redundant AE server, then create a second Service Provider object.

6. Select the previously created Service Provider object.
7. Select **Service Provider Definition** from the Aspects list.
8. Click **Configuration** tab.
9. Select a connectivity server on which the AE server resides.

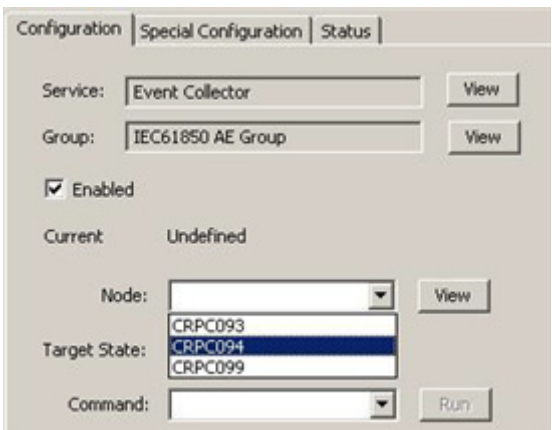


Figure 112. Connectivity Server Selection

10. Click **Service Group** and select the **Service Group Definition** from the Aspects list.
11. Click **Special Configuration** tab.

12. Under **OPC A&E Server**, select the alarm server from the **Alarm Server** drop-down list.

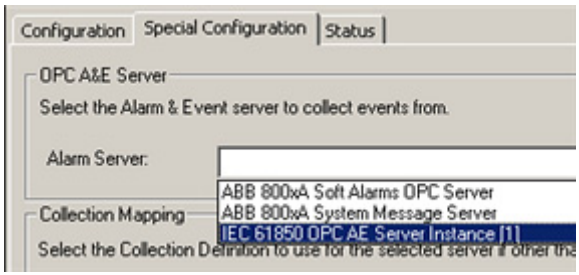


Figure 113. Alarm Server Selection

Once the alarm server is selected, the collection definition appears automatically. If not, select **IEC 61850 OPC AE Server Instance [1]** from the drop-down list.

13. Right-click the previously created service group (IEC) and select **New Object** (Redundant) from the context menu to create a service provider object.
14. Repeat the Step 6 to Step 12.
15. Click **Apply** to configure the above settings.
16. Click **Upload**.
17. In Library Structure expand **Alarm & Event > Alarm Collection Definitions**.

18. Select IEC 61850 OPC Server related Collection Definition.

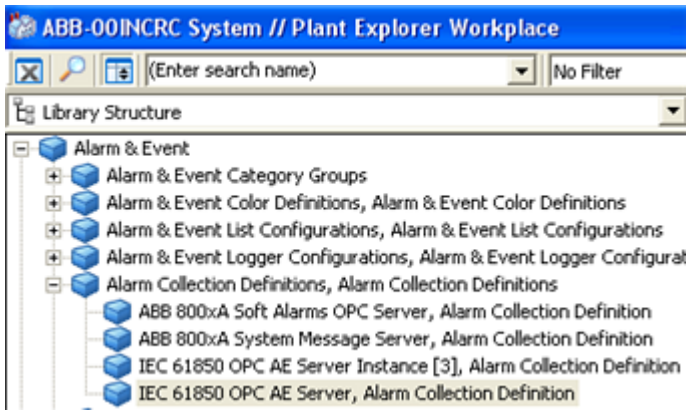


Figure 114. OPC AE Server

19. In the Aspects List, select **Alarm Collection Definition.**

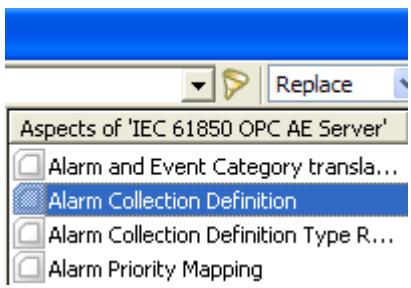


Figure 115. Alarm Collection Definition Aspect

20. In Aspect preview pane, change the view to Configuration View.
21. In the Configuration tab, select **Supports Refresh** and **Require Dual Acknowledge** check box. This check box is selected by default for the system created IEC 61850 OPC AE Server Instance, Alarm Collection Definition aspect**.**

For user created IEC 61850 OPC AE Server Instance, Alarm Collection Definition aspect, the Supports Refresh check box must be manually selected.

For redundant IEC 61850 OPC AE Server, Require Dual Acknowledge check box must be manually selected.

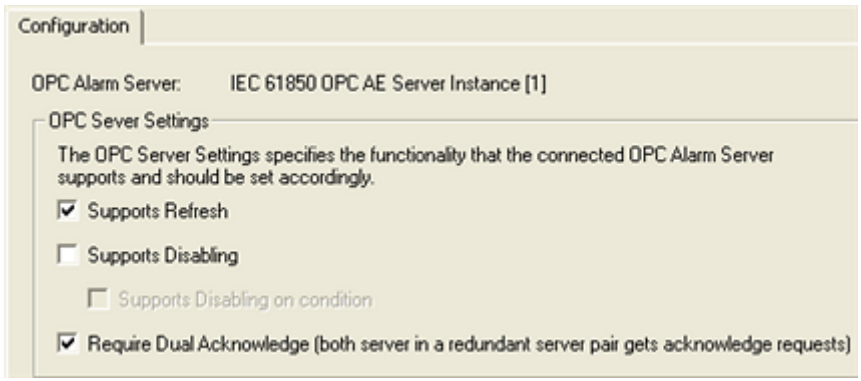


Figure 116. Configuration Tab

22. Click **Apply**.

The alarm limits or levels can only be set from IEDs. They cannot be read in Plant Explorer or written to IED.

Redundant OPC DA Configuration

Perform the following steps to achieve redundant configuration in a redundant OPC DA setup.

1. Create the OPC Server object under Root Domain in the *Control Structure*.
2. Create an OPC Server service group in service structure to connect to the OPC Server. To achieve this, in the **Additional Arguments** dialog box, click **Add.**

3. This action lists the PCs connected. Select the two Connectivity Servers (Both Primary and Redundant) and click **OK**.

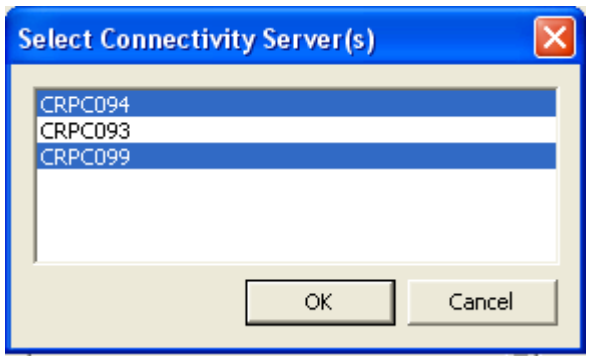


Figure 117. Connectivity Server Selection

4. In the **Additional Arguments** dialog box, select the OPC Server ProgID.

Figure 118. OPC Server ProgID Selection For Redundant Server

5. Check for the two OPC DA service providers that are created under the same OPC DA service Group.

6. The Configuration of Redundant OPC Servers in the Plant Explorer is now complete.

While creating **Redundant OPC Server** in **Control Structure**, the newly created **OPC Server Service Provider** in **Service Structure** does not change to **Service** state automatically.

In such cases, select **Special Configuration** tab of the erroneous Service Provider and click **Refresh**. Select the correct OPC DA Server instance and disable or enable service to bring the current status to **Service**.

7. Repeat all the steps mentioned in the subsections Upload Using Standard Tab on page 156 and Upload Using Advanced Tab on page 160.

After upload, there may be some objects which are present in *Control Structure* only and not in *Functional Structure* and some objects which are present in *Functional Structure* only and not in the *Control Structure.* In such cases, for the objects present only in *Control Structure* "**Control Structure"** aspect is present and for the objects present only in *Functional Structure* "**Functional Structure**" aspect is present.

Sequence of Events

The internal events (process values, corresponding trigger values that caused the event, time stamps and quality information) are used as a trigger foundation for reporting and logging. This information is grouped using a data set. The data set is the content basis for reporting and logging. The data set contain references to the data and the data attribute values.

The data set specifies which data is to be monitored and reported. The next task is to define when and how to report or log the information. The reporting model provides two kinds of s:

1) Unbuffered

2) Buffered

The buffered and unbuffered reporting starts with the configuration of the s.

The specific characteristic of the buffered is that it continues buffering the event data as they occur according to the enabled trigger options if there is, for example, a

communication loss. The reporting process continues as soon as the communication is available again. The buffered guarantees the Sequence-of-Events (SoE).

If there is loss of communication, the Unbuffered does not support the SoE. So, to support the SoE, correct data set and s must be configured while designing and generating the SCD file.

Section 5 Addition and Modification of Graphic Elements

This function is only supported and applicable for 800xA IEC 61850 releases before Feature Pack. This section must be ignored for Feature Pack release.

This section describes how to create and modify user defined faceplates and graphic elements containing only IEC 61850 data along with other connectivity data.

Faceplates and Graphic Elements Containing IEC 61850 Data

While creating faceplates or graphic elements for an object of existing default set of object types. Perform the following steps to create the faceplate/faceplate element/graphic element in the chosen object type:

Only the users with application engineer rights can create faceplates and graphic elements.

Graphic elements and faceplates must be created only for *Functional Structure* object types.

While creating a faceplate for an object type that is not part of the default set of object types, create a new object type under the 'Functional Objects' folder. The new object type name and type name in SCD file must be the same.

Perform the following steps, to create/edit a faceplate for an object type:

1. Open the Plant Explorer.
2. Navigate to **Library Structure > Libraries, Library Collection > IEC61850_ObjectTypes_GraphicsExtLib, Extension Library >**

IEC61850_ObjectTypes_GraphicsExtLib 1.0.0, Extension Library Version.

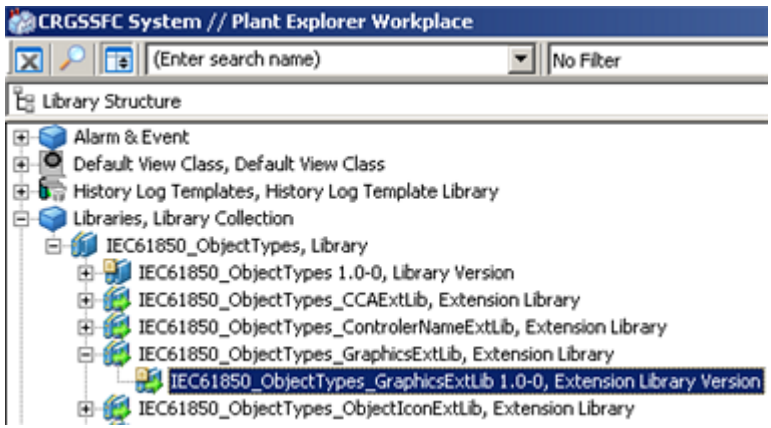


Figure 119. Plant Explorer With Extension Library Selected

3. Select the **Extension Library Version Definition** aspect from the Aspects List.

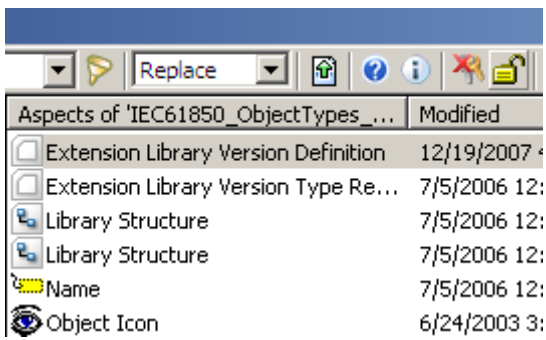


Figure 120. Aspects List With Extension Library Version Definition Selected

4. Click **New Version** in Aspect Preview.

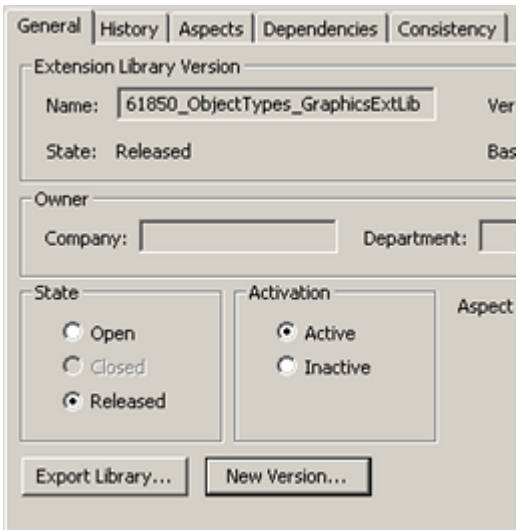


Figure 121. Aspect Preview With New Version Selected

5. In the **New Version** dialog box, select the number in Major version and click **Create**.

Ensure that the number for major version is greater than 1.

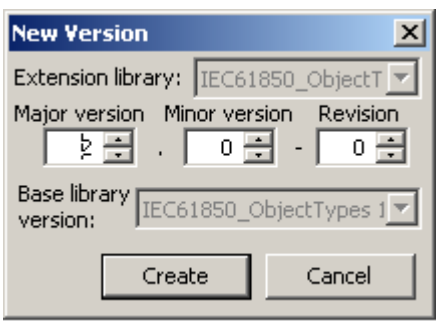


Figure 122. New Version Dialog Box

6. **IEC61850_ObjectTypes_GraphicsExtLib 2.0-0, Extension Library Version** is created under **Library Structure > Libraries, Library Collection > IEC61850_ObjectTypes_GraphicsExtLib, Extension Library**.
7. Navigate to the object type in the *Object Type Structure*.
8. Select the object on which you want to create/edit the faceplate (For example, the DIS, Object Type).

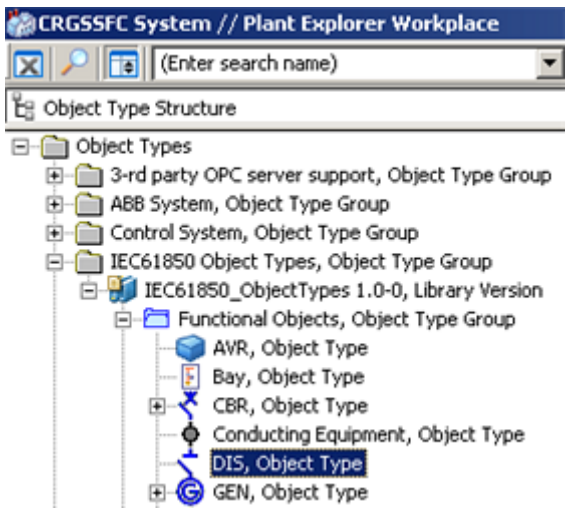


Figure 123. Object Type Group With Object Selected

9. Add/edit faceplate elements, faceplates, and graphic elements in the Aspect List.

   For more information, refer to *System 800xA Engineering Process Graphics (3BSE049230*)*.

Faceplates and Graphic Elements Containing Data from Other Connectivity

The faceplates and graphic elements have to be created on the instances in *Functional Structure* using standard 800xA functionalities.

All graphic elements and faceplates created are customizable using standard 800xA functionalities.

For more information on addition and modification of graphic elements, refer to *System 800xA Engineering Process Graphics (3BSE049230*).*

Configuring the Control Connection Aspect of Functional Objects

The **Control Connection** aspect of the functional objects can have predefined attributes for use in the faceplates/graphic elements. These predefined attributes can be made to obtain data from a particular type of logical node, which are associated with a functional object. For example, a functional object CBR can be associated with LNs XCBR and CILO. The predefined attribute in the CBR object can be configured to get data from XCBR logical node. This can be achieved by providing a name syntax for the predefined attribute of the functional object (CBR in the above example). The following is the syntax:

<LN name>_<instance number>.<attribute of the LN>.

Example

A predefined attribute in the **Control Connection** aspect of CBR Object Type can contain an attribute like ‘XCBR_1.BlkOpn.stVal’.

This means that the attribute ‘XCBR_1.BlkOpn.stVal’, refers to ‘Blkopn.stVal’ attribute of the first instance of the XCBR Logical Node (first instance under the functional object CBR).

During upload, the Uploader parses this syntax and puts the appropriate OPC Item ID for this attribute.

Use the above syntax to predefine the **Control Connection** aspect of the functional objects and use this predefined attribute in the faceplate element/graphic element.

Figure 124 shows a snapshot of an example of **Control Connection** aspect in the CBR Object Type.

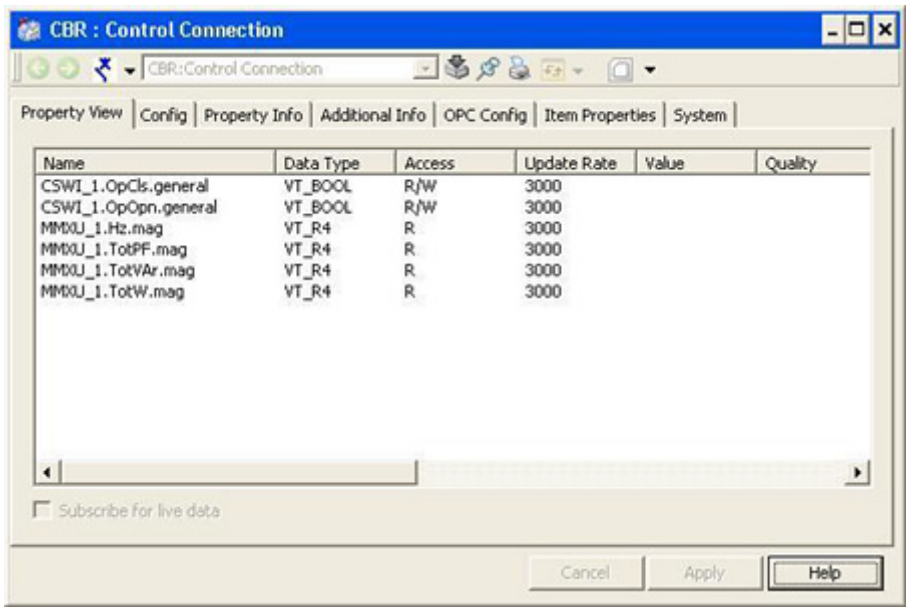


Figure 124. Example of Control Connection Aspect Configuration in a Functional Object.

Figure 125 shows an example of OPC Item ID that is added by the Uploader, by parsing the name given in the **Control Connection** aspect.

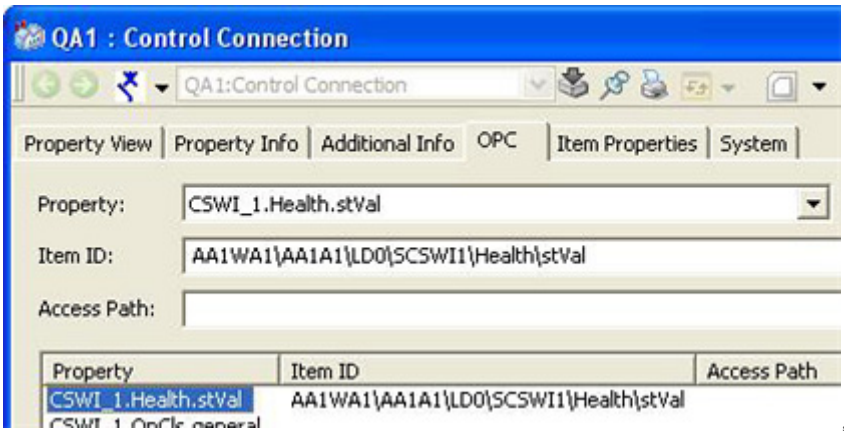


Figure 125. Example of OPC Item ID Addition by Uploader

Section 6 Guidelines to Import and Export

This section describes the guidelines to be followed to Import and Export the 800xA IEC 61850 Project (*.scd* files).

Exporting 800xA IEC 61850 Project

To export the SCD files, consider the following guidelines:

It is recommended to do *Functional Structure* export and *Control Structure* export, and store them in the same *.afw* file.

1. Go to **Start > Programs > ABB Industrial IT 800xA > System > Import Export**.
2. Open the Plant Explorer and select the *Functional Structure*.
3. Drag and drop the *Functional Structure* to the **Import / Export** dialog box.
4. Select the option **Include Dependencies** in **Add Item** dialog box and click **OK**.
5. In the **Import / Export** dialog box, click **Save** to save the *.afw* files to the desired location.

First export the *Functional Structure* starting from the "Substation" Object.

6. Select the **Control Structure**.
7. Drag and drop the **Control Structure** to the **Import / Export** dialog box.
8. Select the option **Include Dependencies** in **Add Item** dialog box and click **OK**.

9. In the **Import / Export** dialog box, click **Save** to save the *.afw* files to the desired location.

Export the *Control Structure* starting from the IEC 61850 OPC Server object.

If the *Control Structure* has dependencies, the OPC DA Service associated with the OPC Server object is not exported. The user must manually create the new OPC DA Service and assign the newly created service to the OPC Server object. Refer to this procedure in Import CET Project into Same CET Versions on page 124.

After import or restore, manually configure the OPC DA Connector Service.

Importing 800xA IEC 61850 Project

To import *the IEC 61850 Connect Structure* files into the Plant Explorer:

Import *Functional Structure* before importing *Control Structure*.

1. Browse to the *Functional Structure* ***.afw*** files.
2. Double-click on *.afw* file to open **Import Export.**
3. The progress of loading file appears. Click **Done** when finished.
4. In the **Import / Export** dialog box,
   a. Select the **Structure View** button.
   b. Right-click **Functional Structure** and select **Import**.
5. In the **Import objects and aspects** dialog box, click **Finish**.
6. Browse to the *Control Structure* ***.afw*** files.
7. Double-click *.afw* file to open Import Export.
8. The progress of loading file appears. Click **Done** when finished.
9. In the **Import / Export** dialog box,
   a. Select the **Structure View** button.

b. Right-click **Control Structure** and select **Import**.

10. In the **Import objects and aspects** dialog box,

    a. Select the **Import Options** tab.

    b. Under **Overwrite Existing Data**, select **Yes**.

    c. Click **Finish**.

11. Go to *Service Structure*. Create a New Service Group and Service Provider for IEC 61850 OPC DA Server (Example: SG and SP) as shown in Figure 126.

Ensure that the exact node name and the ProgID from the **Configuration** and **Special Configuration** tabs are selected respectively.

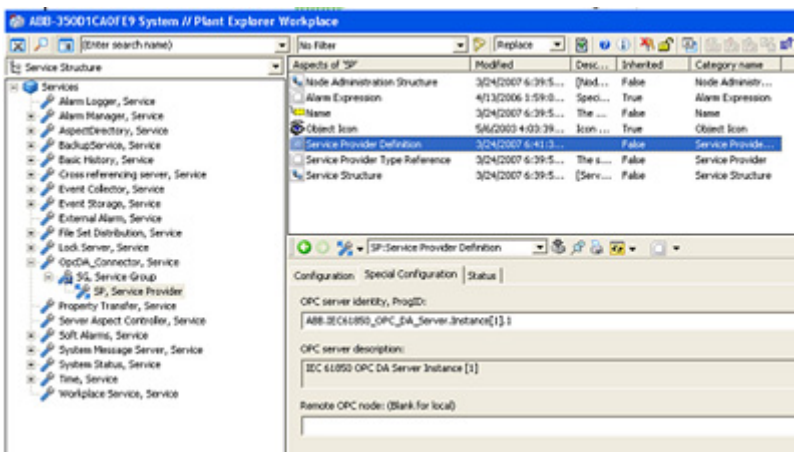


Figure 126. Service Group 1

12. Go to **OPC Server Object** and refer this Service in the **OPC Data Source Definition** aspect.

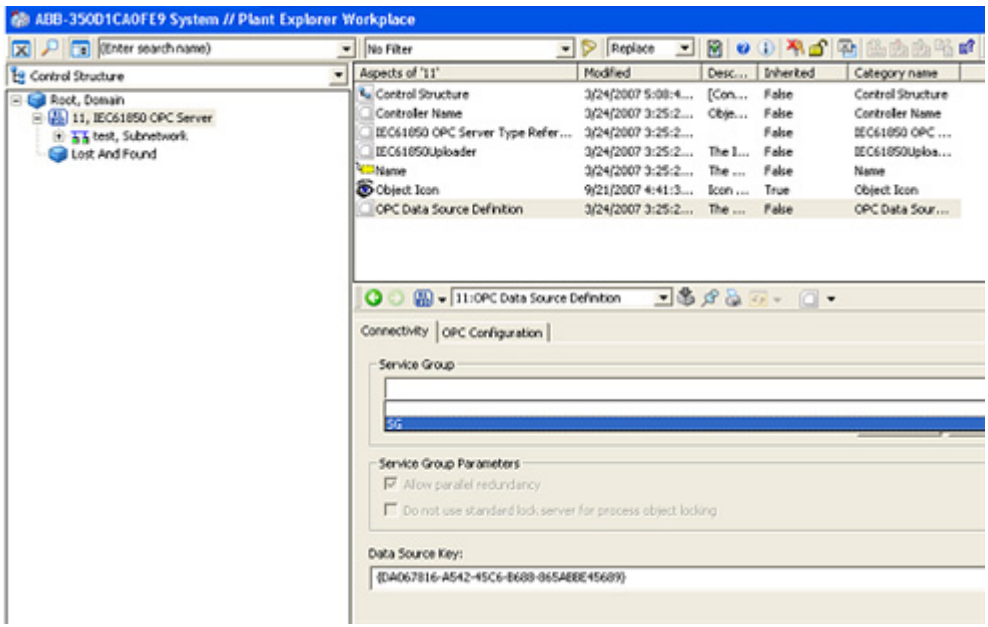


Figure 127. Service Group 2

Section 7 Reconfiguration

This section describes the reconfiguration of SCD files, importing reconfigured SCD file to the IEC 61850 OPC Server and uploading the reconfigured SCD files to the Plant Explorer.

Overview

When the user re-configures the substation or communication section, it is assumed that a new version of the SCD file is generated. The user uploads the new version of the SCD file. The Uploader preserves all the aspects that are added by the user on the existing object instances.

If some of the objects are added, deleted and renamed in the updated SCD file, then the Uploader adds, deletes, and renames the corresponding object instances in the Plant Explorer.

Reconfiguring SCD Files

To make changes to the existing uploaded SCD Files in Plant Explorer, follow the instructions provided in *Section 2, Working with SCD Files* of *System 800xA - AC 800M IEC 61850 Configuration (9ARD171385*).*

Importing Reconfigured SCD File to the IEC 61850 OPC Server

To import the reconfigured SCD file to IEC 61850 Connect OPC Server, follow the instructions provided in SCL Import on page 93.

During the reconfiguration of the SCD files, if objects are added and the reconfigured SCD files are imported in the CET, the SCD files are populated over the existing objects.

After renaming or deleting objects in SCD files, delete the existing configuration present in CET tool and import the modified SCD file to the CET. To perform this action, follow the instructions provided in SCL Import on page 93.

If the default library is used during direct upload and the user defined library is used during reconfiguration, then only the changed object belongs to the user defined library.

Uploading Reconfigured SCD File to the Plant Explorer

To upload reconfigured SCD file to the Plant Explorer, follow the instructions provided in Upload Using Standard Tab on page 156 and Upload Using Advanced Tab on page 160.

The corresponding object name in the SCD file is saved in the **Controller Name** aspect of the Plant Explorer. So, if the object name is changed in the Plant Explorer, then the Uploader preserves the name of the object instances.

Each Logical Node object is uniquely identified. The following is the naming convention for Logical Node Objects:

Subnetwork\IED\Logical Device\Logical Node.

These Logical Node objects are shared among *Control Structure* and *Functional Structure*. While uploading in *Functional Structure*, if the Logical Node exists in *Control Structure*, the same object is inserted in *Functional Structure* and if the Logical Node exists in the *Functional Structure*, the same object is inserted in the *Control Structure*. Else, it creates a new Logical Node object.

Renaming an object in SCD configuration creates a new object in the Plant Explorer after uploading, if that particular object does not exist in the Plant Explorer.

Adding, deleting, and renaming of the IED, the Logical Devices, the Logical Nodes, the Voltage Levels, the Bay, the Conducting Equipment, the Child Logical Nodes of Bay and the Child Logical Nodes of the conducting equipment is supported in the Uploader.

Section 8 Object Type Specific Graphics for BAY

This functionality provides the development of an object type specific faceplate for Bay. The object type specific faceplate in the Bay level is able to access data from different conducting equipments and logical nodes. The faceplates included in the Bay object types must have conducting equipment or logical node references. The Uploader provides the complete path for each reference during instantiation or upload. So, the business unit faceplate/library developer can define the properties for Bay object in the *Object Type Structure*. The Uploader sets the complete path for each property during the upload operation.

Configuration

This section describes the configuration of the object type specific graphics for Bay and guides an user to obtain the values in Bay level faceplate.

Perform the following steps to get values in the Bay level faceplate:

1. Define property at Bay level for the conducting equipment or logical node.
2. Latebind mechanism to refer to attributes of the process object.
3. Set the complete path of conducting equipment or logical node to each property reference during the upload operation.

Define Property at Bay Level

The application engineer defines the properties for conducting equipment and logical nodes that are required for the faceplate development. This section explains the procedure to define the property for the conducting equipments/logical nodes.

A property must be defined for each conducting equipment or logical node. The property is an unresolved reference for the conducting equipment/logical node in the *Object Type Structure*. The unresolved references are used in the faceplate expression builders and are required to bind with the appropriate process objects during runtime.

Procedure to Define Property

Perform the following steps to define the properties:

1. Open Plant Explorer.
2. Navigate to *Library Structure*.
3. Create a new major version of the library and associate below mentioned extension libraries to this version.
   - IEC61850_ObjectTypes_UploaderExtLib
   - IEC61850_ObjectTypes_CCAExtLib

User cannot delete the newly created version of Extension library IEC61850_CCAExtLib because it is a part of main IEC 61850 base library 1.0.0.

To delete the new version of CCA extension library, make the base extension library of CCAExtnLib active.

- IEC61850_ObjectTypes_ControllerNameExtLib
- IEC61850_ObjectTypes_PCAUploadExtLib
- IEC61850_ObjectTypesGraphicsExt

The above mentioned extension libraries are the minimum required extension libraries. The user can associate all other extension libraries if required.

For information on guidelines for creating user defined/BU specific libraries, refer to Section 10, Guidelines for Creating User Defined/BU Specific Libraries.

4. Navigate to **Object Type Structure > IEC61850 Object Types, Object Type Group**.
5. Select the new library version of IEC61850 Object Types.
6. Select Functional Objects and select Bay.

7. Add **General Properties** aspect to the Bay object.
8. Right-click the **General Properties** aspect and select **Details**.

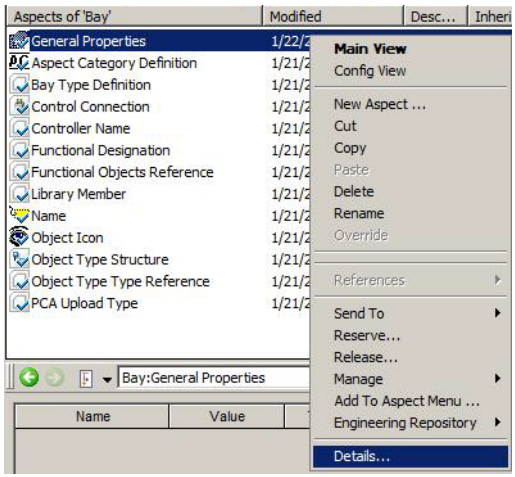


Figure 128. General Properties Details Selection

9. In the **Details** dialog box,
   a. Select the **Aspect Info** tab.
   b. Clear the **Inheritance enabled** check box.
   c. Click **Add** to add the aspect key.
   d. In the next window, select **Auto-instantiate Aspect** and click **OK**.

e. Click **Apply**.

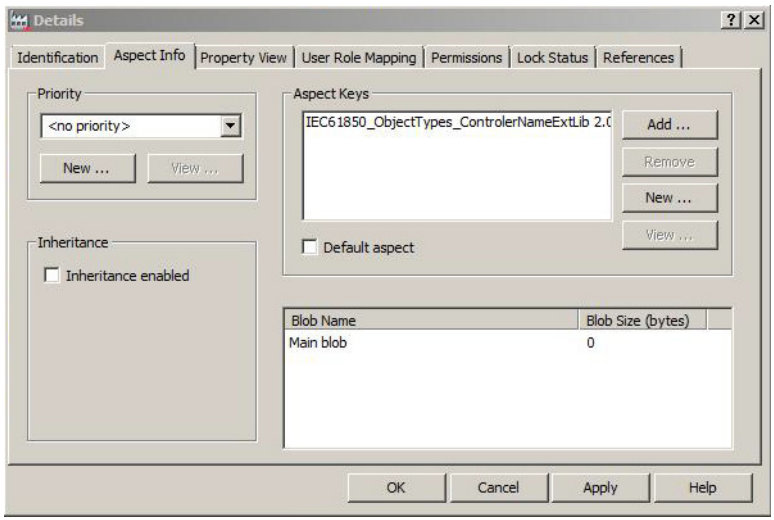


Figure 129. Details Dialog Box

10. Right-click the **General Properties** aspect and select **Config View**.

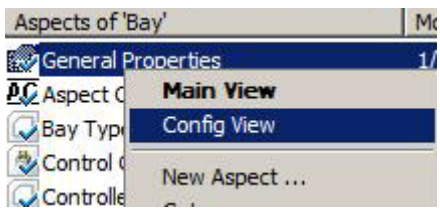


Figure 130. General Properties Config View Selection

11. In the **General Properties** dialog box,
    a. Click **Add** to add properties.
    b. Enter the Name as per the syntax: CE-CBR_1.

c. Enter the other fields as shown in Figure 131.

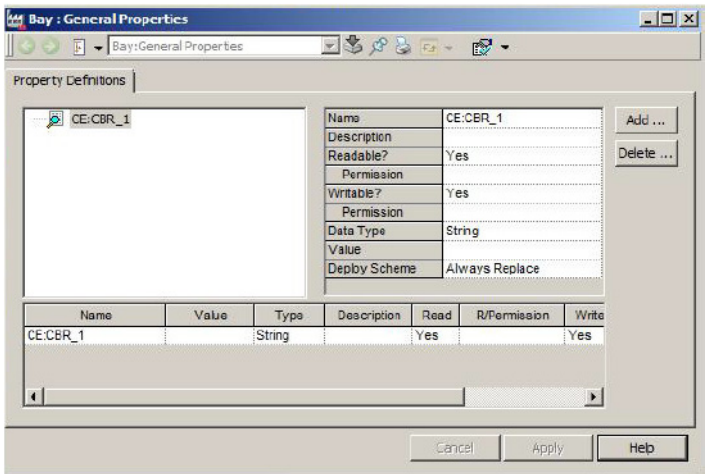


Figure 131. General Properties Dialog Box

The General Properties aspect of the Bay object is used to define the properties and the type. Each property must be a string. It must have both read and write permission. Figure 131 defines the property CE-CBR_1.

Configuring Properties to Obtain Data from Conducting Equipment

The **General Properties** aspect of the Bay objects can have predefined properties which are referred in faceplates/graphics elements. These predefined properties can be made to obtain data from a particular conducting equipment.

The conducting equipment is referred by the object type and the instance. The instance can be a reference to the type of conducting equipment, object type, or the instances of the object type under a particular Bay.

Table 37 lists the various scenarios to add properties to the **General Properties** aspect of the Bay to refer the conducting equipments.

Table 37. Add Properties to Refer to The Conducting Equipments.

Instance	Description
CE-CBR_2	A part of property name which specifies “CBR_2” is from the conducting equipments. This property is a symbolic reference to the second instance of type CBR.
CE-CBR_2N	A part of property name which specifies “CBR_2N” is from the conducting equipments. This property is a symbolic reference to the second instance of a conducting equipment and its name starts with CBR.
CE-CBR_2T	A part of property name which specifies “CBR_2T” is from the conducting equipments. This property is a symbolic reference to the second instance of type CBR.
CE-CBR100	A part of property name which specifies “CBR100” is from the conducting equipments. This property is a symbolic reference of a conducting equipment and its name is CBR100 which is present in a particular Bay.

In case of item id filling in the General Properties aspect of a Bay.

When updating the General Properties aspect of a Bay, there is a limitation for type based and name based convention. The identifier (name/type) referring to the Logical Nodes & Conducting Equipments must not contain an underscore character (_) in the identifier.

The workaround is to follow the direct naming of the Logical Nodes & Conducting Equipments.

Configuring Properties to Obtain Data from a Logical Node

The **General Properties** aspect of the Bay objects can have predefined properties which are referred in faceplate/graphic elements. These predefined properties may be used to obtain data from a particular Logical Node.

The Logical Node is referred by the object type and the instance. The instance can be a reference to the type of the Logical Node, Object type, or the Instances of the Logical Node under a particular Bay.

Table 38 lists the various scenarios to add properties to the **General Properties** aspect of the Bay to refer the Logical Nodes.

Table 38. Add Properties to Refer to The Logical Nodes

Instance	Description
LN-XCBR_2	A part of property name specifies “XCBR_2” is from Logical Nodes. This property is a symbolic reference of second instance of type XCBR.
LN-XCBR_2N	A part of property name specifies “XCBR_2N” is from Logical Nodes. This property is a symbolic reference of second instance of a Logical Node and its name starts with CBR.
LN-XCBR_2T	A part of property name specifies “XCBR_2T” is from Logical Nodes.This property is a symbolic reference of second instance of type XCBR.
LN-XCBR100	A part of property name specifies “XCBR100” is from Logical Nodes.This property is a symbolic reference of a Logical Node and its name is XCBR100 comes and is present in a particular Bay.

Configuring Properties to Obtain Data from Logical Node (Child of Conducting Equipment)

The **General Properties** aspect of the Bay object have predefined properties which are referred in faceplates/graphic elements. These predefined properties are made to obtain data from a particular Logical Node which is the child of specific conducting equipment.

Table 39 lists the 16 different ways of defining property.

Table 39. Add Properties to General Aspect to Refer to Logical Nodes

Test Case	Property Name
Case 1	CE-CBR_1-XCBR_1
Case 2	CE-CBR_1-XCBR_1N
Case 3	CE-CBR_1-XCBR_1T
Case 4	CE-CBR_1-XCBR100
Case 5	CE-CBR_1N-XCBR_1
Case 6	CE-CBR_1N-XCBR_1N
Case 7	CE-CBR_1N-XCBR_1T
Case 8	CE-CBR_1N-XCBR100
Case 9	CE-CBR_1T-XCBR_1
Case 10	CE-CBR_1T-XCBR_1N
Case 11	CE-CBR_1T-XCBR_1T
Case 12	CE-CBR_1T-XCBR100
Case 13	CE-CBR100-XCBR_1
Case 14	CE-CBR100-XCBR_1N
Case 15	CE-CBR100-XCBR_1T
Case 16	CE-CBR100-XCBR100

Latebind Mechanism

Latebind Mechanism to Refer to Attributes of Conducting Equipment

During the faceplate development, the business unit faceplate/library developer can utilize the Latebind mechanism provided by PG2 graphics to refer to the attributes of conducting equipment or logical node.

It is not possible to bind the system entities during the configuration process. The Graphics Builder can be accessed through Expression Functions. The functions locate the entities based on the names that implement late binding.

The following is an example function for latebinding:

LateBoundPropertyRef

Returns reference to a property found based on the specified parameters, or null. The function also activates a subscription to property by the rate of updateRate. aspectSpec may be left empty on all aspects of the object.

The following are the parameters for this function:

- String objectPath: A string that refers to the target object,
- String aspectSpec: The name of the aspect or “(empty string)”.
- String propName: The name of the data entity being referred to.
- Boolean unique.
- Integer updateRate.

In AspectSpecifier, a search is done with respect to the name specified or on all objects if it is specified as ““.

Single reference functions return a single value. All single reference functions possess a property called the **Boolean Unique**. This property enables the user to decide if the search yields a unique value.

If the Unique is set to **True** and there is more than one reference based on the function parameters, the function returns a null value.

If the Unique is set to **False**, the function arbitrarily returns one value of several candidates found.

Figure 132 shows how the input field control in graphics editor can be binded to different object during runtime.

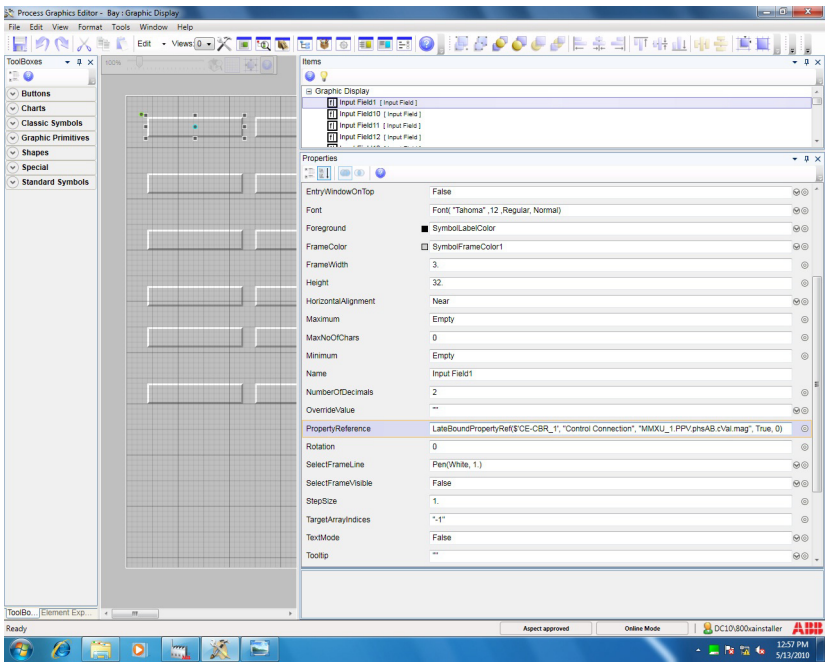


Figure 132. Process Graphic Editor

Input field control can be dragged and dropped into the New Graphic editor.

Select the properties of input field.

The value for “propertyreference” is LateBoundPropertyRef.

The following are the parameters bind the Input field to a specific OPC attribute:

- CE\:CBR_1 specifies a specific process object. The Uploader sets the value for CE\:CBR_1 in **General properties** aspect, which specifies the complete path of process object.
- Control Connection provides Aspect information.
- CILO_1.Mod.ctlVal, True, 0 specifies the attribute from the Aspect.

Example for the late bind reference:

LateBoundPropertyRef($'.:General Properties:CE-CBR_1', "Control Connection", "MMXU_1.PPV.phsAB.cVal.mag", True, 0)

Set Complete Path

Set the Complete Path of Conducting Equipment to Each Property

During the upload operation, the IEC Connect Uploader sets value for each property.

Path:

[Functional Structure]Root/AA1/E/Q1/CBR1

Examples of value set value by the Uploader are:

Q1 is a Bay with the **General Properties** aspect. The following are the properties of Q1:

1. CE-CBR_1
2. CE-CBR_2

The Uploader sets the following value for the property “CE-CBR_1”:

[Functional Structure]Root/AA1/E/Q1/CBR1

The Uploader sets the following value for the property “CE-CBR_2”:

[Functional Structure]Root/AA1/E/Q1/CBR2

Limitation

LateBound functions cannot differentiate if multiple objects with the same name are present in the same path and if LateBound functions are used for accessing data from same properties of the same aspect.

When multiple logical nodes with same name are assigned to a single Bay, using Latebinding mechanism it is not possible to ascertain which LN data is used in the Property value of the General properties aspect.

For example. A Bay having two CVMMXU1 Logical Nodes are assigned from different sources and with the Property value containing path to CVMMXU1, it is not possible to ascertain which LN value will be used in runtime.

Section 9 Object Type Specific Graphics for IED

This functionality provides for the development of the Object Type Specific Faceplate for IED.

Configuration

This section describes the configuration of the ObjectType Specific Graphics for the IED.

Object type specific graphics for IED

Object type specific graphics for IED to refer attribute from Logical Nodes. The **Control Connection** aspect of the IED has predefined attributes for use in the faceplate/graphic element. These predefined attributes can be configured to obtain data from a particular type of the logical node that is associated with a logical device. The data type of these IED level attributes must match the data type referring attributes. This must be achieved by providing a name syntax for the predefined attribute of the IED. There are eight different ways to define property.

Table 40 describes the syntax for defining property:

Table 40. Add Properties to CCA of IED

Test Case	Property Name
Case 1	LD_1-XCBR_1.BlkOpn.stVal
Case 2	LD_1-XCBR_1T.BlkOpn.stVal
Case 3	LD_1-XCBR_1N.BlkOpn.stVal

Table 40. Add Properties to CCA of IED (Continued)

Test Case	Property Name
Case 4	LD_1-XCBR100.BlkOpn.stVal
Case 5	LD100- XCBR_1.BlkOpn.stVal
Case 6	LD100- XCBR_1T.BlkOpn.stVal
Case 7	LD100- XCBR_1N.BlkOpn.stVal
Case 8	LD100- XCBR100.BlkOpn.stVal

Figure 133 shows a predefined attribute in the **Control Connection** aspect of the IED Object Type.

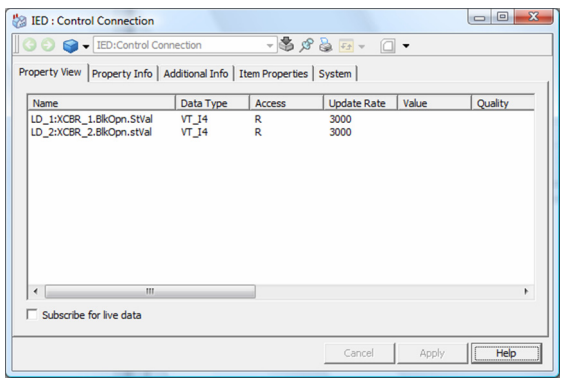


Figure 133. IED Control Connection

Case 1

LD_1-XCBR_1.BlkOpn.stVal

or

LD_1-XCBR_1T.BlkOpn.stVal

This refers to the ‘BlkOpn.stVal’ attribute of the first instance of the XCBR type Logical Node (child of first instance of the Logical Device).

During upload, the Uploader parses this syntax and puts the appropriate OPC Item ID for this attribute.

Case 5

LD100- XCBR_1.BlkOpn.stVal

or

LD100- XCBR_1T.BlkOpn.stVal

This refers to the ‘BlkOpn.stVal’ attribute of the first instance of the XCBR type Logical Node (child of the Logical Device named LD100).

During upload, the Uploader parses this syntax and puts the appropriate OPC Item ID for this attribute.

When updating the Control Connection aspect of an IED, there is a limitation for type based and name based convention. The identifier (name/type) referring to the LD or LN must not contain an underscore character (_) in the identifier.

The workaround is to follow the direct naming of the Logical Device/Logical Node.

Section 10 Guidelines for Creating User Defined/BU Specific Libraries

This section provides the guidelines for creating user defined/BU specific libraries.

Guidelines for Creating User Defined/BU Specific Libraries

This section describes the guidelines to create a new version of the base library *IEC61850_ObjectTypes*. To use this new library, create a new version of all the extension libraries and link these new extension libraries to the newly created base library version.

Ensure that the following extension libraries are mandatorily created:

- IEC61850_ObjectTypes_UploaderExtLib - This contains the **Uploader** aspect.
- IEC61850_ObjectTypes_CCAExtLib - This contains the **Control Connection** aspect.
- IEC61850_ObjeVctTypes_ControlerNameExtLib - This contains the **Controller Name** aspect.
- IEC61850_ObjectTypes_PCAUploadExtLib - This contains the PCA **Upload Type** aspect.

If the above extension libraries are not created, then an error occurs during the upload operation.

It is recommended to develop customized faceplates in *Object Type Structure* after creating user defined library in *Library Structure*. Upload the SCD file, selecting the user defined library to get the customized faceplates on all instances of respective objects.

When a new library version is created, the control connection elements of faceplate within the new library still point to properties of main library version.

For proper faceplate reconfiguration, click on "." in the object column of the reconfiguration dialog and select correct object.

While making the new version of libraries and extension libraries, ensure that a major version of the base and extension libraries is created. Create major versions such as 2.0-0 or 3.0-0 and not minor or revisions of base libraries like 1.1-0 or 1.0-1. This is because the IEC 61850 Connect delivers only minor versions and revisions (1.0-0) of the base library in future. If the user creates the minor versions or revisions of the library, there is a potential risk that the libraries delivered by the IEC 61850 Connect overwrites the user defined libraries.

At the instance level, the user must not modify the **Controller Name** aspect.

Navigate to the *Object Type Structure* and open the newly created base library. Add new object types to this library. When new object types are created, ensure that the name of the object types is the same as the name with which it is identified in the SCD file. The Uploader reads the type information in the SCD file and looks for the object type with the same name. So if the above procedure is not followed, the Uploader does not recognize the new object types.

When the new object types are created, the following aspects must be mandatorily added to the newly created object types.

- **Control Connection** aspect
- **Controller Name** aspect.
- **PCA Upload Type** aspect.

During upload in the Uploader, select the newly created object type library to upload. The Uploader has a user interface to select this newly created library. Refer to Figure 134.

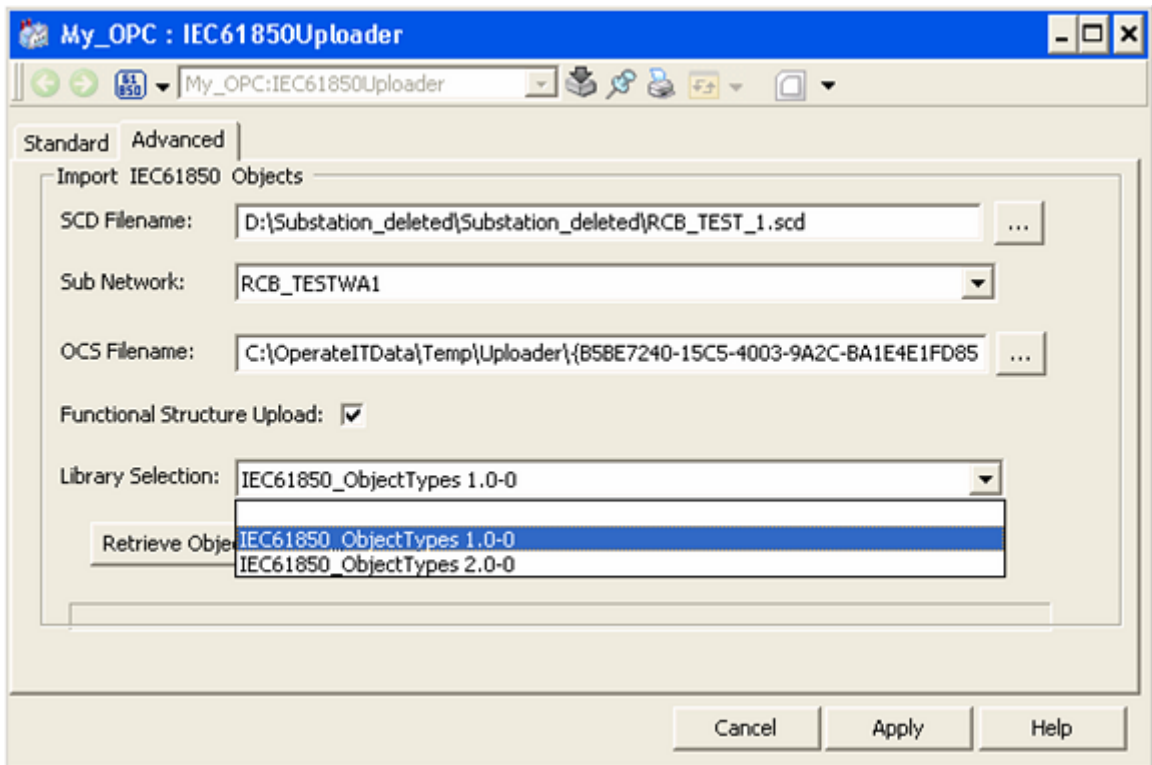


Figure 134. Library Selection

For more details on Library handling refer to *System 800xA 5.1 Configuration (3BDS011222*).*

While creating a new user library, the faceplates and Graphics elements appear as undeployed (VB related) and as Unapproved (PG2 related).

User needs to run display tool to deploy those elements. Alternatively deployment can be done via context menu on each element. Uploader operation is recommended to be performed after deploy.

Section 11 SCD Information

This section provides the SCD information for the IEC 61850 Uploader and the OPC Server.

SCD File Information for IEC 61850 Uploader

Communication Section (*Control Structure*)

The Uploader creates objects in the *Control Structure* using information retrieved by the SCL Model component parsing the communication section of the SCD file. For example: IED, Logical device, Logical Node are added to the *Control Structure*. The following table lists the description of each parameter of the SCD file.

SCD Information	Description
Subnetwork (Name, Description)	The Name and Description field of subnetwork is used from the SCD file by IEC 61850 Uploader.
IED (Name, Description)	The Name and Description field of IED is used from SCD file by the IEC 61850 Uploader.
Logical Device (Name, Description)	The Name and Description field of Logical Device is used from the SCD file by the IEC 61850 Uploader.
Logical Node (Name, Description)	The Name and Description field of Logical Node is used from the SCD file by the IEC 1850 Uploader.
Conducting Equipments (Name, Description)	The Name and Description field of Conducting Equipments is used from the SCD file by the IEC 61850 Uploader.

Substation Section (*Functional Structure*)

The Uploader creates objects in the *Functional Structure* using information retrieved by the SCL Model component parsing the substation section of the SCD file. For example: Substation, Voltage Level, Bay and Conducting Equipment objects are added to the *Functional Structure.* The following table lists the description of each parameter of the SCD file.

SCD Information	Description
Subnetwork (Name, Description)	The Name and Description field of substation is used from the SCD file by the IEC 61850 Uploader.
Voltage Level (Name, Description)	The Name & Description field of Voltage Level used from the SCD file by the IEC61850 Uploader.
Bay (Name, Description)	The Name & Description field of BAY used from the SCD file by the IEC61850 Uploader.
Logical Node (Name, Description)	The Name and Description field of Logical Node is used from the SCD file by the IEC 1850 Uploader.
Conducting Equipments (Name, Description)	The Name and Description field of Conducting Equipments is used from the SCD file by the IEC 61850 Uploader.
Conducting Equipments with Child LN. (Name, Description)	The Name and Description field of Conducting Equipments with Child LN is used from the SCD file by the IEC 61850 Uploader.

The *Functional Structure* objects such as Isolator and Breaker is instantiated by the IEC61850 Uploader in the *Functional Structure* and is based on substation section of the SCD file. The *Functional Structure* objects contain the faceplates. The operators use these faceplates to operate the respective devices. Based on the application requirements, the faceplates and Object Types can be further engineered.

Private Section Handling in SCD file

For small extensions either by a manufacturer or for a specific project, the private parts can be used. The advantage of private parts is that the data content is preserved at data exchange between tools.

Private data entities appear on several levels of the SCL. The contents of these XML elements is as seen from the SCL, transparent text. If the private part contains XML data, then it must use an explicit name space, which cannot be the SCL name space. The Private element allows also to reference other files by means of an URL at its source attribute.

The handling within tools is as follows:

The private data is owned by a tool respective by a tool category (for example, a picture generator). The owner is allowed to modify its contents, and normally is the only one able to interpret the data. All other tools, which read private data, have to preserve (store) its contents on SCL import, and regenerate it at the same place if an SCL file containing this part is produced/exported.

Data Subscription

For data subscription, OPC Server need to be assigned as a client to RCB () as shown in the Figure 135.

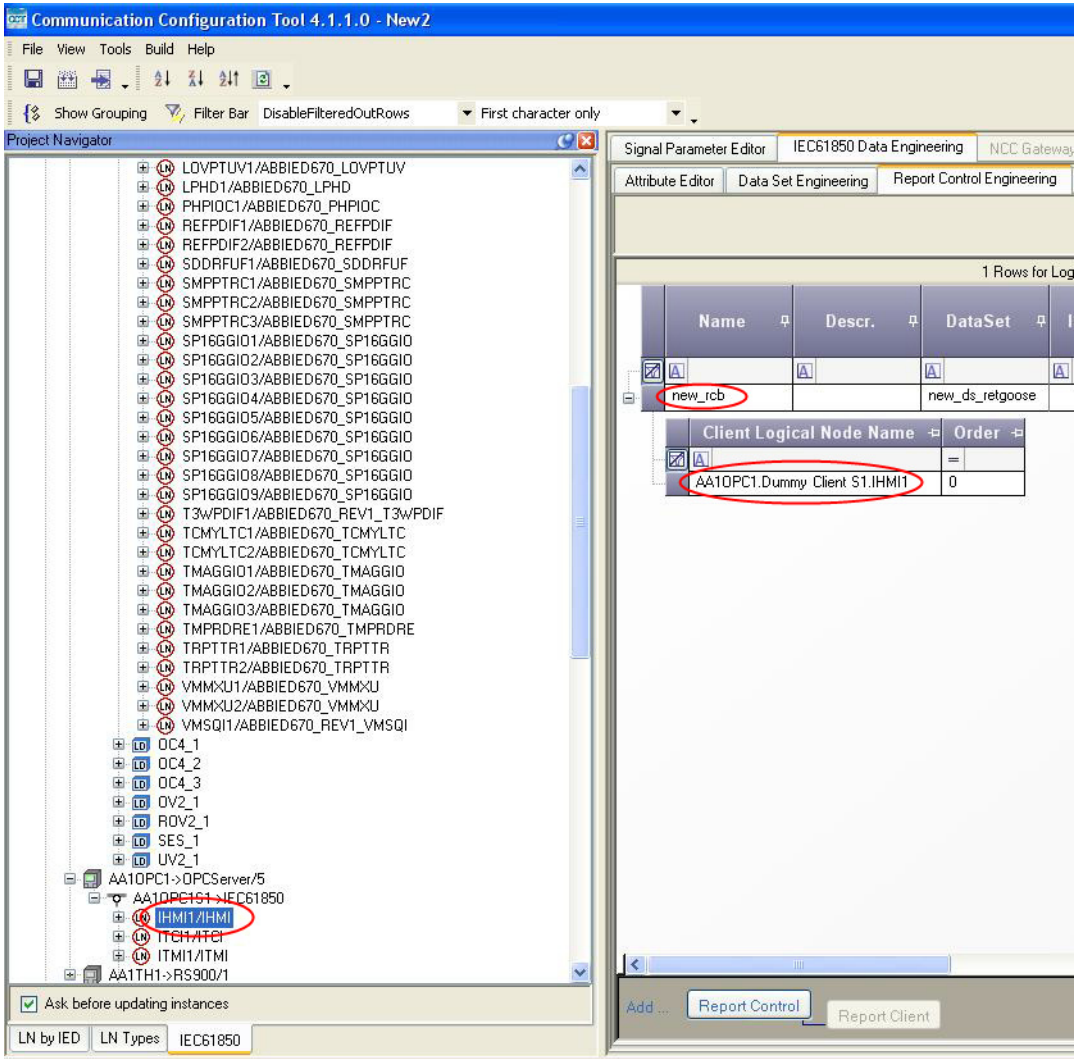


Figure 135. Data Subscription

Data Format / Data Set

It is a grouping of all required data attributes present in the IED which needs the data subscription from the OPC Server. Refer to the following Figure 136 to form the data set.

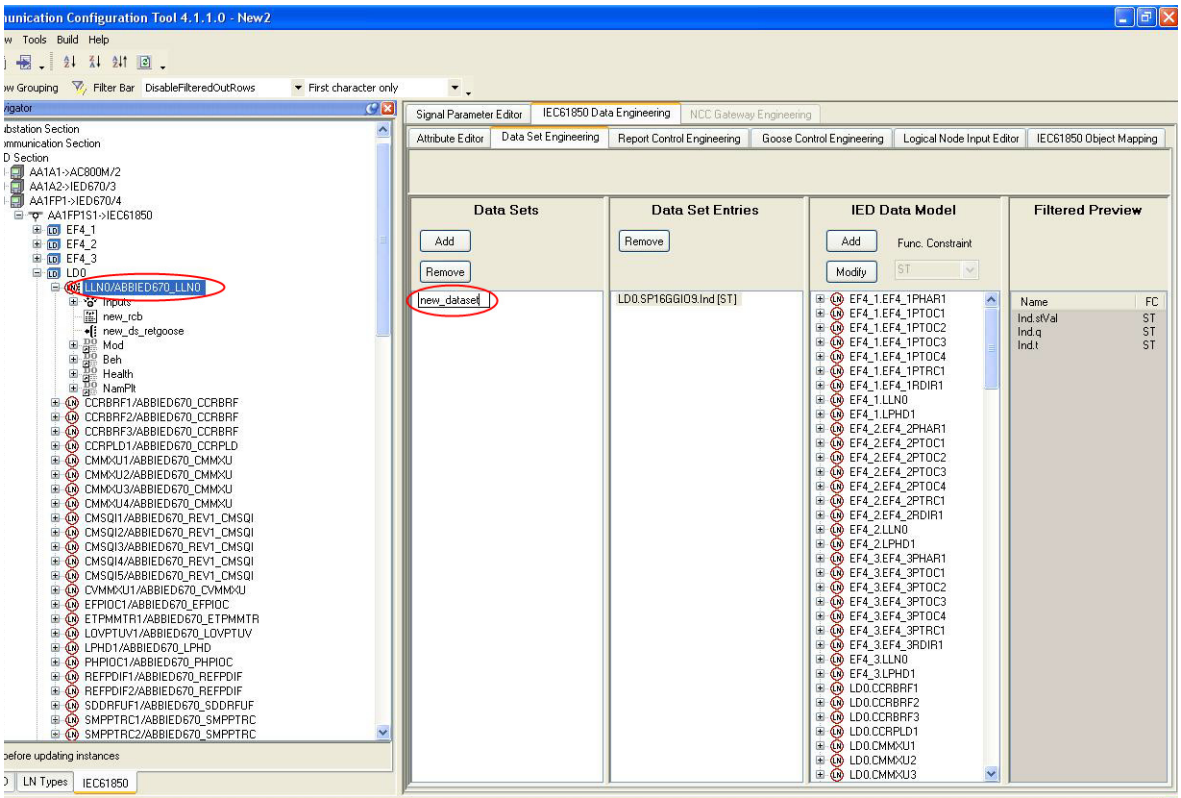


Figure 136. Data Format / Data Set

Version Handling of SCD File

User should make sure that same version of SCD file is used across all the nodes in the system.

Appendix A Renaming Object Names

This appendix provides the information on how to rename the Logical Nodes.

It is recommended that the renaming must be done from the *Functional Structure* and not from the *Control Structure*.

Renaming Object Names

Perform the following steps to rename the object:

1. Select the object to be renamed.
2. Select the **Name** Aspect from the Aspects list.
3. In the **Name** text box, rename the existing name.

Example of the objects that can be renamed.

- Substation
- Voltage Level
- Bay
- Logical Node

It is recommended not to rename the IED name. The source name is not changed if the user has changed the object names in the functional structure.The source name in the Alarm list is displayed as per the configuration in the OPC Server.

Appendix B Deleting OPC Server Instance

This appendix provides the procedure to delete the OPC Server instance.

Deleting OPC Server Instance

Perform the following steps to delete the OPC Server instance using the CET tool:

1. Select the OPC Server instance to be deleted.
2. Right-click and select **Delete**.

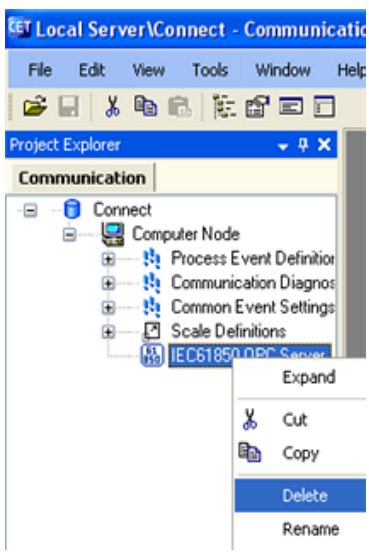


Figure 137. Delete Selection

3. Right-click Computer Node object and Select **Management**.

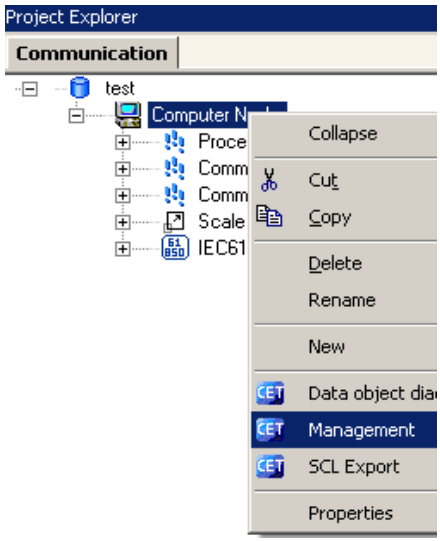


Figure 138. Management Selection (Redundant)

4. In the Management pane, click **Update & reload configuration**.

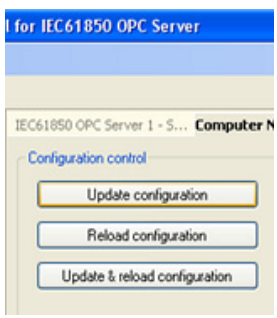


Figure 139. Update & reload configuration Button

Deleting IEC 61850 OPC Server from 800xA System

While deleting the OPC Server Object from Control Structure, it is recommended to delete the corresponding OPC DA Service from the Service Structure.

Perform the following steps to delete the Service in Service Structure:

1. Navigate to **Service Structure > OpcDA_Connector > Service**.
2. Navigate to the **Service Group** for that IEC61850 OPC server object.
3. Right-click and delete the corresponding **Service Group**.

Deleting Unused IEC 61850 OPC Server Instances

Unused OPC Server instances appear during configuration of IEC61850 Service Providers > Special Configuration in PPA Service structure. It is recommended to remove unused OPC Server instances during configuration.

Perform the following steps to remove the unused OPC Server instances:

1. Locate current CLSIDs.

   Locate current OPC server CLSID from instance.ini file (located in sys default *C:\sc\prog\61850_OPC_Server\IEC61850 OPC Server\bin\OPCS_IEC61850_1\instance.ini*)

   For example. mys instance.ini:

   [Instance]

   DAServerClsId={B3828BEA-9DCF-4E96-896C-7CCF766B95B0}

   AEServerClsId={0076A00C-D18F-422E-9E2D-A4E6C0FE218A}

2. Remove unnecessary OPC Server instances from registry.

   Search through registry using **regedit** command from HKEY_LOCAL_MACHINE for **ABB.IEC61850_OPC_**. This will find for both DA and AE server.

   The entries will be located in:

   (The two following two keys may or may not exist in registry, depending on the installed product.)

ABB.IEC61850_OPC_DA_Server.Instance[1] in *HKEY_LOCAL_MACHINE\SOFTWARE\Classes*. If the CLSID key under this key is **not** among the CLSIDs in instance.ini, the **ABB...** key can be deleted.

ABB.IEC61850_OPC_AE_Server.Instance[1] in *HKEY_LOCAL_MACHINE\SOFTWARE\Classes*. If the CLSID key under this key is **not** among the CLSIDs in instance.ini, the **ABB...** key can be deleted.

(The following will be found in registry)

Next set of keys is found in; *HKEY_LOCAL_MACHINE\SOFTWARE\Classes\CLSID\ (e.g. HKEY_LOCAL_MACHINE\SOFTWARE\Classes\CLSID\{B3828BEA-9DCF-4E96-896C-7CCF766B95B0}\ProgID)*. The entries is found for both DA and AE servers. If the CLSID is **not** among the CLSIDs in instance.ini, the "{...}" key can be deleted.

3. Remove unused DCOM registrations.

   Start **dcomcnfg** (**Run > dcomcnfg**). Navigate to **Component Services > Computers > My Computer > DCOM Config**. In the list locate the multiple instances of *IEC 61850 OPC DA Server Instance [1]*. Delete the DCOM registrations **without** the current CLSID as Application ID.

Appendix C Sequence for Faceplates

This appendix provides the deployment sequence of the graphic elements\ faceplate elements for circuit breaker, transformer, and generator faceplates.

This function is only supported and applicable for 800xA IEC 61850 releases before Feature Pack. This section must be ignored for Feature Pack release.

Deployment Sequence for Circuit Breaker Faceplate

Table 41 lists the deployment sequence for circuit breaker faceplate.

Table 41. Deployment Sequence for Circuit Breaker Faceplate

Serial No.	Aspect Name	Aspect Type
1	CB Measurement	Faceplate Element
2	geCircuitbreakerReducedCB	Graphic Element
3	fpeBlockingInterlockCB	Faceplate Element
4	fpeMainviewCB	Faceplate Element
5	geAlarmSquareCB	Graphic Element
6	fpeAlarm_CB_User	Faceplate Element
7	fpeBlockingCB	Faceplate Element
8	fpeEditInterlockTextCB	Faceplate Element
9	fpeInterlockCB	Faceplate Element
10	fpeMeasurement16CB	Faceplate Element

Table 41. Deployment Sequence for Circuit Breaker Faceplate (Continued)

11	fpeParametersCB	Faceplate Element
12	fpeSimulationCB	Faceplate Element
Serial No.	**Aspect Name**	**Aspect Type**
13	fpeStatusCB	Faceplate Element
14	fpeStatusExt16CB	Faceplate Element
15	geAlarmControlCB	Graphic Element
16	geFeedbackCB	Graphic Element
17	geMeasurementCB	Graphic Element
18	Alarm Control	Graphic Element

Deployment Sequence for Transformer Faceplate

Table 42 lists the deployment sequence for transformer faceplate.

Table 42. Deployment Sequence for Transformer Faceplate

Serial No.	Aspect Name	Aspect Type
1	TFR Measurement	Faceplate Element
2	geTransformerTR	Graphic Element
3	fpeBlockingInterlockTR	Faceplate Element
4	fpeMainviewTR	Faceplate Element
5	geAlarmSquareTR	Graphic Element
6	fpeAlarms16TR	Faceplate Element
7	fpeBlockingTR	Faceplate Element
8	fpeEditInterlockTextTR	Faceplate Element

Table 42. Deployment Sequence for Transformer Faceplate (Continued)

9	fpeInterlockTR	Faceplate Element
10	fpeMeasurement16TR	Faceplate Element
Serial No.	**Aspect Name**	**Aspect Type**
11	fpeParametersTR	Faceplate Element
12	fpeSimulationTR	Faceplate Element
13	fpeStatusTR	Faceplate Element
14	fpeStatusExt16TR	Faceplate Element
15	geAlarmControlTR	Graphic Element
16	Alarm Control	Graphic Element

Deployment Sequence for Generator Faceplate

Table 43 lists the deployment sequence for generator faceplate.

Table 43. Deployment Sequence for Generator Faceplate

Serial No.	Aspect Name	Aspect Type
1	Generator Measurement	Faceplate Element
2	geGeneratorGEN	Graphic Element
3	geGeneratorReducedGEN	Graphic Element
4	geGeneratorUsedwithReducedGEN	Graphic Element
5	fpeMainviewGEN	Faceplate Element
6	geAlarmSquareGEN	Graphic Element
7	fpeAlarms16GEN	Faceplate Element
8	fpeAVRBlockingGEN	Faceplate Element

Table 43. Deployment Sequence for Generator Faceplate (Continued)

9	fpeAVRModeHandlerGEN	Faceplate Element
Serial No.	**Aspect Name**	**Aspect Type**
10	fpeAVRModesGEN	Faceplate Element
11	fpeCapDiaParamGEN	Faceplate Element
12	fpeDirAdjustGEN	Faceplate Element
13	fpeDirAdjustParamGEN	Faceplate Element
14	fpeEditModeTextGEN	Faceplate Element
15	fpeGOVBlockingGEN	Faceplate Element
16	fpeGOVModeHandlerGEN	Faceplate Element
17	fpeGOVModesGEN	Faceplate Element
18	fpeInterlocksGEN	Faceplate Element
19	fpeLocalModeHandlerGEN	Faceplate Element
20	fpeMeasurements16GEN	Faceplate Element
21	fpeModeIndGEN	Faceplate Element
22	fpeSetpointParamGEN	Faceplate Element
23	fpeSimulationGEN	Faceplate Element
24	fpeStastopHandlerGEN	Faceplate Element
25	fpeStatusExt16GEN	Faceplate Element
26	fpeSyncGEN	Faceplate Element
27	geCapDiaGEN	Graphic Element
28	gdGeneratorGEN	Graphic Element
29	geAlarmcontrolGEN	Graphic Element
30	Alarm control	Graphic Element

Table 43. Deployment Sequence for Generator Faceplate (Continued)

Serial No.	Aspect Name	Aspect Type
32	geFeedbackGEN	Graphic Element
33	geGenTagNameGEN	Graphic Element
34	geMeasActPowBargraph	Graphic Element
35	geMeasRePowBargraph	Graphic Element
36	geMeasurementGEN	Graphic Element

Appendix D System Status Viewer

This appendix provides information on the system status viewer.

The function system status adds the functionality for providing and displaying status for IED and Logical Node objects. The user navigates to the **System Status Viewer** aspect on the OPC Server Object to check for the individual status of each IED and the Logical Nodes under them.

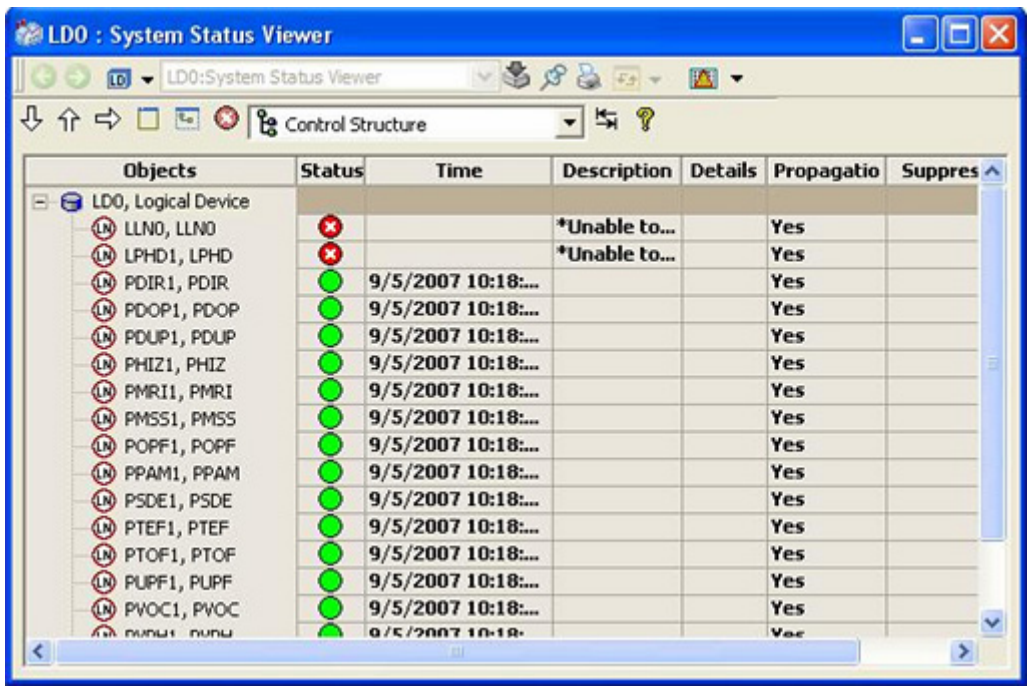


Figure 140. System Status Viewer

The 'Health' attribute, a part of 'Common Logical Node' node object (and hence a part of all logical nodes) provides the status of the Logical Nodes. A property translation aspect is used to translate the 'Health.StVal' attribute to 'S_Status' which is understandable by the system status viewer.

While CCT engineering, RCB dataset of LPHD LN for the physical devices to include Health.stVal, PhyHealth.stval attributes. This ensures proper updation of device status in System Status Viewer.

Table 44 shows the Values of 'Helath.StVal' and the corresponding values of 'S_Status' and their status as seen on the System Status Viewer aspect.

Table 44. Status Seen in System Status Viewer

Health.Stval	S_Status	Status seen on 'System Status Viewer' aspect
1	0	
3	1	
2	2	

The Time column in Figure 140 displays the time and date of the last change in status. The attribute "Health.t" in control connection of all the Logical Node Object Type is mapped to 'S_Time' attribute by the **Property Translator** aspect. The **System Status Reporter** aspect reports this 'S_Time' attribute to the System Status to display in the Time column.

The real time values of the above mentioned attributes such as 'Health.Stval' and 'Health.t' are available from the IEC 61850 OPC Server for all the Logical Node objects.

The Generic Logical Node object do not carry the support for the System Status Viewer. The Generic Logical Node Object Type is present to cater to non-standard Logical Nodes/User defined Logical Nodes. As we do not know the health information of these Logical Nodes, the System Status reporter variables cannot be mapped. Hence this Generic Logical Node Object Type does not carry the **System Status Reporter** aspect.

To get the System Status Reporter functionality, configure this manually.

System Status Reporter for IED Object

The Status of the IED in an IEC 61850 network is represented by the attribute 'PhyHealth.stVal' of the LPHD Logical Node of the IED. So, the **System Status Reporter** aspect uses this attribute to report the status of the IED to the System Status Viewer.

The real time value of the above mentioned attribute 'PhyHealt.stVal' is available from the IEC 61850 OPC Server on the LPHD object for each IED.

The System Status Viewer Aspect

The **System Status Viewer** aspect is on the following Object Types:

- Sub network Object Type
- IED Object Type
- Logical Device(LD) Object Type

For subnetworks having large number of IEDs (around 50 or more), opening System status viewer at Subnetwork, IED or LD level causes 100% CPU load for 2 to 3 minutes.

It is recommended not to perform other runtime operations on that machine while Opening System Status Viewer aspect.

Appendix E Logical Nodes and Primary Object

Logical nodes can be connected to Primary objects according to the following table. If no specific function is written in the Comment column, the connection is used for displaying the substation structure based on identification for the events and alarms.

Table 45. Logical Node Classes and Primary Objects

Primary Object	Logical Node Class	Mandatory	Comment
Substation			
	LLN0 (Logical Node Device)		Loc data used for station/ remote switch state.
	SIMG (Insulation Medium Supervision (gas))		LN to supervise the insulation medium, for example the gas volumes of GIS (Gas Insulated Switchgear) regarding density, pressure, temperature, etc.

Table 45. Logical Node Classes and Primary Objects

Primary Object	Logical Node Class	Mandatory	Comment
	CALH (Alarm Handling)		For the communication, there is no difference between alarms and events if a time tag is added to any data transmitted. If several events or alarms have to be combined to group alarms, a separate, configurable function is needed. The related LN may be used to calculate new data out of individual data from different logical nodes. Remote acknowledgement with different priority and authority shall be possible. The definition and handling of alarms is an engineering issue.
	M*		Metering and Measurement
	G*		Generic references.
	Q*		
Voltage Level			
	SIMG (Insulation Medium Supervision (gas))		

Table 45. Logical Node Classes and Primary Objects

Primary Object	Logical Node Class	Mandatory	Comment
	CALH (Alarm Handling)		For the communication, there is no difference between alarms and events if a time tag is added to any data transmitted. If several events or alarms have to be combined to group alarms, a separate, configurable function is needed. The related LN may be used to calculate new data out of individual data from different logical nodes. Remote acknowledgement with different priority and authority shall be possible. The definition and handling of alarms is an engineering issue.
	M* (Metering and Measurement)		
	G*		Generic references.
	Q*		
Bay			
	LLN0 (Logical Node Device)		Loc data used for bay remote switch state.
	LPHD (Physical Device Information)		
	SIMG (Insulation Medium Supervision (gas))		
	SARC (Monitoring and diagnostics for arcs)		LN to supervise the gas volumes of GIS (Gas Insulated Switchgear) regarding arcs switching or fault arcs.

Table 45. Logical Node Classes and Primary Objects

Primary Object	Logical Node Class	Mandatory	Comment
	SIML (Insulation medium supervision)		LN to supervise the insulation medium, for example the gas volumes of GIS (Gas Insulated Switchgear) regarding density, pressure, temperature, etc.
	SPDC (Monitoring and diagnostics for partial discharges)		LN to supervise the gas volumes of GIS (Gas Insulated Switchgear) regarding signatures of partial discharges.
	CALH (Alarm Handling)		For the communication, there is no difference between alarms and events if a time tag is added to any data transmitted. If several events or alarms have to be combined to group alarms, a separate, configurable function is needed. The related LN may be used to calculate new data out of individual data from different logical nodes. Remote acknowledgement with different priority and authority shall be possible. The definition and handling of alarms is an engineering issue.
	M*		Metering and Measurement
	P*		Protection functions.
	R*		Protection related functions.
	G*		Generic references.
	T*		Instrument transformers.
	Q*		
Circuit Breaker (CBR)			

Table 45. Logical Node Classes and Primary Objects

Primary Object	Logical Node Class	Mandatory	Comment
	XCBR (Circuit Breaker)		This LN is used for modelling switches with short circuit breaking capability. Additional LNs for example SIMS, etc. may be required to complete the logical modelling for the breaker being represented.
	CSWI (Switch Controller)	Mandatory	The switch control LN handles all switchgear operations from the operators and from related automatics. It checks the authorization of the commands. It supervises the command execution and gives an alarm in case of an improper ending of the command. It asks for releases from interlocking, synchrocheck, autoreclosure, etc. if applicable.
	RREC (Automatic reeclosing)		AC closing relay is a relay that controls the automatic reclosing and locking out of an AC circuit interrupter (IEEE C37.2- 1996). After any successful protection trip, the automatic reclosing tries 1 to 3 times to reclose the open breaker again with different time delays assuming a transient fault.

Table 45. Logical Node Classes and Primary Objects

Primary Object	Logical Node Class	Mandatory	Comment
	RSYN (Synchrocheck/synchronizing or Synchronism check)		Synchronizing or synchronism-check device is a device that operates when two AC circuits are within the desired limits of frequency, phase-angle and voltage, to permit or to cause the paralleling of these two circuits (IEEE C37.2-1996). To avoid stress for the switching device and the network, closing of the circuit breaker is allowed by the synchrocheck only, if the differences of voltage, frequency and phase angle are within certain limits.
	CILO (Interlocking function at bay level)		Interlocking may be totally centralized or totally decentralized. Since the interlocking rules are basically the same on bay level based on all related position indications, the different interlocking LNs may be seen as instances of the same LN class Interlocking (IL). All interlocking rules referring to a bay are included in this LN. Releases or blockings of requested commands are issued. In the case of status changes affecting interlocking, blocking commands are issued.
	PTRC (Protection Trip Conditioning)		This LN is used to connect the “operate” outputs of one or more protection functions to a common “trip” to be transmitted to XCBR. In addition or alternatively, any combination of “operate” outputs of the protection functions may be combined to a new “operate” of PTRC.

Table 45. Logical Node Classes and Primary Objects

Primary Object	Logical Node Class	Mandatory	Comment
	SIML (Insulation medium supervision)		LN to supervise the insulation medium, for example the gas volumes of GIS (Gas Insulated Switchgear) regarding density, pressure, temperature, etc.
	CALH (Alarm Handling)		For the communication, there is no difference between alarms and events if a time tag is added to any data transmitted. If several events or alarms have to be combined to group alarms, a separate, configurable function is needed. The related LN may be used to calculate new data out of individual data from different logical nodes. Remote acknowledgement with different priority and authority shall be possible. The definition and handling of alarms is an engineering issue.
	G*		Generic references.
Disconnector (DIS)			
	XSWI (Circuit Switch)		This LN is used for modelling switches without short circuit breaking capability, for example disconnectors, air break switches, earthing switches, etc. Additional LNs, SIMS, etc. may be required to complete the logical model for the switch being represented. The closing and opening commands is subscribed from CSWI. If no services with real-time capability are available between CSWI and XSWI, the opening and closing commands are performed with a GSE-message.

Table 45. Logical Node Classes and Primary Objects

Primary Object	Logical Node Class	Mandatory	Comment
	CSWI (Switch Controller)	Mandatory	The switch control LN handles all switchgear operations from the operators and from related automatics. It checks the authorization of the commands. It supervises the command execution and gives an alarm in case of an improper ending of the command. It asks for releases from interlocking, synchrocheck, autoreclosure, etc. if applicable.
	RREC (Automatic reeclosing)		AC closing relay is a relay that controls the automatic reclosing and locking out of an AC circuit interrupter (IEEE C37.2- 1996). After any successful protection trip, the automatic reclosing tries 1 to 3 times to reclose the open breaker again with different time delays assuming a transient fault.
	RSYN (Synchrocheck/synchronizing or Synchronism check)		Synchronizing or synchronism-check device is a device that operates when two AC circuits are within the desired limits of frequency, phase-angle and voltage, to permit or to cause the paralleling of these two circuits (IEEE C37.2-1996). To avoid stress for the switching device and the network, closing of the circuit breaker is allowed by the synchrocheck only, if the differences of voltage, frequency and phase angle are within certain limits.

Table 45. Logical Node Classes and Primary Objects

Primary Object	Logical Node Class	Mandatory	Comment
	CILO (Interlocking function at bay level)		Interlocking may be totally centralized or totally decentralized. Since the interlocking rules are basically the same on bay level based on all related position indications, the different interlocking LNs may be seen as instances of the same LN class Interlocking (IL). All interlocking rules referring to a bay are included in this LN. Releases or blockings of requested commands are issued. In the case of status changes affecting interlocking, blocking commands are issued.
	PTRC (Protection Trip Conditioning)		This LN is used to connect the “operate” outputs of one or more protection functions to a common “trip” to be transmitted to XCBR. In addition or alternatively, any combination of “operate” outputs of the protection functions may be combined to a new “operate” of PTRC.
	SIML (Insulation medium supervision)		LN to supervise the insulation medium, for example the gas volumes of GIS (Gas Insulated Switchgear) regarding density, pressure, temperature, etc.

Table 45. Logical Node Classes and Primary Objects

Primary Object	Logical Node Class	Mandatory	Comment
	CALH (Alarm Handling)		For the communication, there is no difference between alarms and events if a time tag is added to any data transmitted. If several events or alarms have to be combined to group alarms, a separate, configurable function is needed. The related LN may be used to calculate new data out of individual data from different logical nodes. Remote acknowledgement with different priority and authority shall be possible. The definition and handling of alarms is an engineering issue.
	G*		Generic references.
Voltage Transformer (VTR)			
	TVTR(Voltage Transformer)		There is one instance per phase. These three/four instances may be allocated to different physical devices mounted in the instrument transformer per phase.
	CALH (Alarm Handling)		For the communication, there is no difference between alarms and events if a time tag is added to any data transmitted. If several events or alarms have to be combined to group alarms, a separate, configurable function is needed. The related LN may be used to calculate new data out of individual data from different logical nodes. Remote acknowledgement with different priority and authority shall be possible. The definition and handling of alarms is an engineering issue.
	G*		Generic references.

Table 45. Logical Node Classes and Primary Objects

Primary Object	Logical Node Class	Mandatory	Comment
Current Transformer (CTR)			
	TCTR (Current Transformer)		There is one instance per phase. These three/four instances may be allocated to different physical devices mounted in the instrument transformer per phase.
	SARC(Monitoring and diagnostics for arcs)		LN to supervise the gas volumes of GIS (Gas Insulated Switchgear) regarding arcs switching or fault arcs.
	SPDC (Monitoring and diagnostics for partial discharges)		LN to supervise the gas volumes of GIS (Gas Insulated Switchgear) regarding signatures of partial discharges.
	CALH (Alarm Handling)		For the communication, there is no difference between alarms and events if a time tag is added to any data transmitted. If several events or alarms have to be combined to group alarms, a separate, configurable function is needed. The related LN may be used to calculate new data out of individual data from different logical nodes. Remote acknowledgement with different priority and authority shall be possible. The definition and handling of alarms is an engineering issue.
	G*		Generic references.
	Q*		
Power Overhead Line (LIN)			
	ZLIN (Power Overhead Line)		Supervised overhead line.

Table 45. Logical Node Classes and Primary Objects

Primary Object	Logical Node Class	Mandatory	Comment
	CALH (Alarm Handling)		For the communication, there is no difference between alarms and events if a time tag is added to any data transmitted. If several events or alarms have to be combined to group alarms, a separate, configurable function is needed. The related LN may be used to calculate new data out of individual data from different logical nodes. Remote acknowledgement with different priority and authority shall be possible. The definition and handling of alarms is an engineering issue.
	G*		Generic references.
Rotating Reactive Component (RRC)			
	ZRRC (Rotating Reactive Component)		This LN controls reactive power flow.
	CALH (Alarm Handling)		For the communication, there is no difference between alarms and events if a time tag is added to any data transmitted. If several events or alarms have to be combined to group alarms, a separate, configurable function is needed. The related LN may be used to calculate new data out of individual data from different logical nodes. Remote acknowledgement with different priority and authority shall be possible. The definition and handling of alarms is an engineering issue.
	G*		Generic references.
Surge Arrestor (SAR)			

Table 45. Logical Node Classes and Primary Objects

Primary Object	Logical Node Class	Mandatory	Comment
	ZSAR (Surge Arrestor)		Generic node for information exchange with surge arrestors.
	CALH (Alarm Handling)		For the communication, there is no difference between alarms and events if a time tag is added to any data transmitted. If several events or alarms have to be combined to group alarms, a separate, configurable function is needed. The related LN may be used to calculate new data out of individual data from different logical nodes. Remote acknowledgement with different priority and authority shall be possible. The definition and handling of alarms is an engineering issue.
	G*		Generic references.
Thyristor Controlled Frequency Converter (TCF)			
	ZTCF (Thyristor controlled frequency convertor)		Frequency conversion including AC/DC conversion.
	CALH (Alarm Handling)		For the communication, there is no difference between alarms and events if a time tag is added to any data transmitted. If several events or alarms have to be combined to group alarms, a separate, configurable function is needed. The related LN may be used to calculate new data out of individual data from different logical nodes. Remote acknowledgement with different priority and authority shall be possible. The definition and handling of alarms is an engineering issue.

Table 45. Logical Node Classes and Primary Objects

Primary Object	Logical Node Class	Mandatory	Comment
	G*		Generic references.
Thyristor Controlled Reactive Component (TCR)			
	ZTCR (Thyristor controlled reactive component)		Controls reactive power flow.
	CALH (Alarm Handling)		For the communication, there is no difference between alarms and events if a time tag is added to any data transmitted. If several events or alarms have to be combined to group alarms, a separate, configurable function is needed. The related LN may be used to calculate new data out of individual data from different logical nodes. Remote acknowledgement with different priority and authority shall be possible. The definition and handling of alarms is an engineering issue.
	G*		Generic references.
Power Transformer Winding (PTW)			
	G*		Generic references.
Incoming Feeder Line (IFL) Powered rules for the Incoming Feeder Link can be configured in the SLD editor.			

Table 45. Logical Node Classes and Primary Objects

Primary Object	Logical Node Class	Mandatory	Comment
	CALH (Alarm Handling)		For the communication, there is no difference between alarms and events if a time tag is added to any data transmitted. If several events or alarms have to be combined to group alarms, a separate, configurable function is needed. The related LN may be used to calculate new data out of individual data from different logical nodes. Remote acknowledgement with different priority and authority shall be possible. The definition and handling of alarms is an engineering issue.
	G*		Generic references.
	Q*		
Generator Powered rules for the Generator can be configured in the SLD editor.			
	ZGEN (Generator)		Generic node for information exchange with generators.
	G*		Generic references.

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Revision History

This section provides information on the revision history of this User Manual.

The revision index of this User Manual is not related to the 800xA 5.1 System Revision.

The following table lists the revision history of this User Manual.

Revision Index	Description	Date
-	Published for 800xA 5.1	June 2010
A	Published for 800xA 5.1 Rev A.	May 2011
B	Published for 800xA 5.1 Feature Pack 4.	February 2013
C	Published for 800xA 5.1 Rev D.	December 2013
D	Published for 800xA 5.1 Rev E.	July 2015

Updates in Revision Index A

The following table shows the updates made in this User Manual for 800xA 5.1 Rev A.

Updated Section/Sub-section	Description of Update
Section 3 Working with Uploader User Interface	Multiple changes across the section.

Updates in Revision Index B

The following table shows the updates made in this User Manual for 800xA 5.1 Feature Pack 4.

Updated Section/Sub-section	Description of Update
Section 2 800xA IEC61850 OPC Server	Included CET OPC Server related Information.
Section 3 Working with Uploader User Interface	IEC 61850 Uploader Options - Feature Pack Update
Section 5 Addition and Modification of Graphic Elements	A caution is provided to restrict the user from referring the usage of graphic elements for Feature Pack release.
All Sections	Multiple changes across all sections.
Appendix E - Sequence for Faceplates	A caution is provided to restrict the user from referring the usage of graphic elements for Feature Pack release.
Appendix E - Logical Nodes and Primary Object	Contains the list of Logical Nodes connected to Primary objects.

Updates in Revision Index C

The following table shows the updates made in this User Manual for 800xA 5.1 Rev D.

Updated Section/Sub-section	Description of Update
The System Status Viewer Aspect	A caution is provided restricting user not to perform other runtime operations while opening System Status Viewer aspect.
Update and Reload Configuration	Steps provided to recover the CET project when computer crashes.

Updated Section/Sub-section	Description of Update
Upload Using Advanced Tab	A caution is provided to upload a correct SCD file, if the SCD file contains special character (& or Space) in the description of any Conducting Equipment or Bay.
Latebind Mechanism	Provided limitations regarding Late Binding using General Properties.

Updates in Revision Index D

The following table shows the updates made in this User Manual for 800xA 5.1 Rev E.

Updated Section/Sub-section	Description of Update
Section 2 800xA IEC61850 OPC Server	Information added on CET migration for revision releases.

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