

IEC-61850

Client Communication Protocol

Summary

1. GENERAL INFORMATION	1
1.1 Summary.....	1
1.2 Objects and Services Supported	1
1.3 General Operation	2
2. CHANNEL SETTINGS	3
2.1 Protocol Options.....	3
2.2 Interfaces.....	3
3. NODES SETTINGS.....	4
3.1 TCP-IP Communication	4
3.2 Parameters.....	4
4. POINTS SETTINGS.....	5
4.1 Introduction to IEC61850 Data Objects.....	5
4.2 Points Types	8
4.3 Point Address	8
5. BROWSER.....	11
5.1 General	11
5.2 Data Sources	12
5.3 Remote IED Connection	12
5.4 SCL files	12
5.5 Data Objects	13
5.6 DataSets.....	13
5.7 Reports.....	13
5.8 Report Attribute Window	14

1. GENERAL INFORMATION

1.1 Summary

Communication Driver Name: IEC61850

Current Version: 1.0

Implementation DLL: T.ProtocolDriver. IEC61850.dll

Protocol: IEC-61850 Client communication protocol

Interface: TCP/IP

Description: IEC61850 Action.NET Client implements the part of the standard IEC61850 responsible for ACSI core services, as defined in part 8.1 of IEC61850 standard. Uses encapsulation of ISO/OSI transport layer into TCP/IP transport layer. Communicates with IEDs (Intelligent Electronic Devices), RTUs (Remote Terminal Units) and IO devices that support this protocol, acting as the client workstation.

Protocol Options: Timers for protocol control messages.

Max number of nodes: User defined

PC Hardware requirements: Standard PC Ethernet interface board;

PC Software requirements: Action.NET system.

1.2 Objects and Services Supported

The table below lists the objects and services supported in this implementation:

MMS OBJECT	IEC61850 OBJECT	USED MMS SERVICES
Application Process VMD	Server	Initiate Conclude Abort Reject Cancel
Named Variable Objects	Logical Nodes and Data	Read Write InformationReport GetVariableAccessAttribute GetNameList
Named Variable List Objects	Data Sets	GetNamedVariableListAttributes GetNameList DefineNamedVariableList DeleteNamedVariableList GetNameList Read Write InformationReport
Domain Objects	Logical Devices	GetNameList GetDomainAttributes StoreDomainContents

For the end user, the way services are used is transparent. It is only necessary to know how to set up the user-friendly configuration interfaces for running IEC61850 Action.Net Client.

1.3 General Operation

The IEC61850 Action.NET Client works, basically, in the following manner:

- 1 – For points setting, the “Browsing” feature is available, targeting remotes IEDS, or SCL IEC61850 description/configuration files: CID, ICD, SSD and SCD;
- 2 – Establish a TCP-IP connection with one or more IEC61850 servers;
- 3 – Does real time browsing for each remote server to get the details of its IEC61850 internal tree of objects and settings (used to configure the operation of its clients in real time). If there is no success in this step, try again (the number of retries is set by the user);
- 4 – Configures remotes IEDs Control Blocks attributes writing configuration values set by the user. These values are set by the user through “Browsing” feature module (introduced in section 5);
- 5 – Does data integrity requests to each remote server through reading of all DataSets (IEC61850 group of objects as defined in the standard). If there is no success in this step, try again (the number of retries is set by the user);
- 6 – If IEC61850 Reports (unsolicited data messages containing the updated values of objects that have changed) usage is enabled, requests enrollment for each one with corresponding configured remote servers. Note: as defined in the standard, to each report on a remote server, there will be only one registered client.
- 7 – Several actions are performed as an “infinity loop”, in order of availability of these actions, until there is a condition of disconnection, restart or finish:
 - Check connection status. In case of disconnection go back to step 2;
 - If enabled, execute individual sample readings of IEC61850 objects. Obtain state, value, timestamp and quality of these objects;
 - Does Report treatment in case of arrival of a new one. Note: The report may contain outdated information in case the client has already obtained updated values through solicited readings. For this scenario, the received outdated values will not go to the Action.Net operation screen, but only for events and trends databases. One case where such situation happens is the loss of communication with the remote server, causing it to accumulate the reports in its Report "buffer" (if buffered). These Reports are sent to Action.Net client as communication resumes;
 - If DataSet pooling is enabled, it periodically does sample readings of objects contained in the DataSets;
 - Does integrity requests;
 - Sends commands as a user or script request them;

2. CHANNEL SETTINGS

2.1 Protocol Options

Parameter	Value
Timeout Connection(ms)	3000
Max retries	2
ServerName	SIEMENS
Use Scl file	Disabled
Scl File	
Password for commands	12345

Figure 1 – Protocol Options

t0 – Timeout Connection (ms) –Maximum acceptable time, in seconds, for the TCP/IP connection establishment with the server IED. After this time, closes the connection and tries again.

t1 – Max retries – Maximum number of attempts. Parameter used in various features of the code to indicate, in case of a failed attempt, if there are going to be new operation tries, before identifying functionality fail.

ServerName – Alias name of the remote server. There is no need to match any manufacturer-configured name.

Use SCL File – If a SCL file is going to be used for reading, enable this option. Disable otherwise.

SCL File – Name of the SCL file if the option above is enabled. The standard directory of the SCL file is Action.NET Projects. In case the user intends to use another directory, he should indicate the complete path of it.

Password for commands – To raise security in commands dispatch, normally initiated by a state change in a tag, it is possible to specify a password of 9 digits at most, which will be verified by the communication module against the present value the attribute **EstimatedValue** of the tag involved in the command when the command is received. This way, for an operation of command dispatch through window, script, etc, this number shall be loaded in this attribute. The communication module, after executing the command, will turn the value contained in **EstimatedValue** to ZERO. Leaving this option filled with a zero will result in no verification.

2.2 Interfaces

Interface:

- Custom TCP/IP: This option should be chosen for the protocol in question.

3. NODES SETTINGS

Each node corresponds to a remote IED.

3.1 TCP-IP Communication

IP Address – Remote's IED IP Address.

Port – Port number used for the connection. The standard one is 102, MMS default port.

3.2 Parameters

Digital Sample Time – Period, in milliseconds, to sample remote IEC61850 objects that were mapped as Action.Net digital inputs points. If zero, no sampling will be done.

Analog Sample Time – Period, in milliseconds, to sample remote IEC61850 objects that were mapped as Action.Net analog inputs points. If zero, no sampling will be done.

Report Flag Sample Time – Checking this option will make the Action.NET client activate all Reports whose names are included Action.NET points table as RP type objects. Reports are unsolicited data dispatch functions defined in IEDs DataSets settings.

Buffered Report Flag Sample Time – Checking this option will make the Action.NET client activate all Reports whose names are included Action.NET points table as BR type objects. Reports are unsolicited data dispatch functions defined in IEDs DataSets settings.

Automatic DataSets Sample Time – Length of time, in milliseconds, between two consecutive DataSets integrity requests. Each request will contain every registered DataSet into Action.NET points table.

DataSet Sample Time (G1 a G4) – Each timer, G1 to G4, can comprise a group of Datasets. As a timer interval, defined in milliseconds, expires, a request containing its DataSets is done.

Use Reports – Enabling this option indicates that Reports will be used as source for reading points of the remote server.

Backup Station – The same settings made to the main station can be made to one backup workstation (alternative IED) if there is one in the facility.

4. POINTS SETTINGS

4.1 Introduction to IEC61850 Data Objects

One of the advantages introduced by the standard IEC61850 is the fact that elements internal to an IED are not addressed by raw number addresses, as in many other protocols, but are organized as hierarchical named objects. The standard defines a large group of predefined substation application specific classes whose must be instantiated into objects to represent the actual target substation. As example, there are classes for describing circuit breakers and switches.

The following figure shows an example of IEC61850 hierarchy mappings. In the left frame, following the IED name, named IEC61850 in this example, each level contains an IEC61850 object.

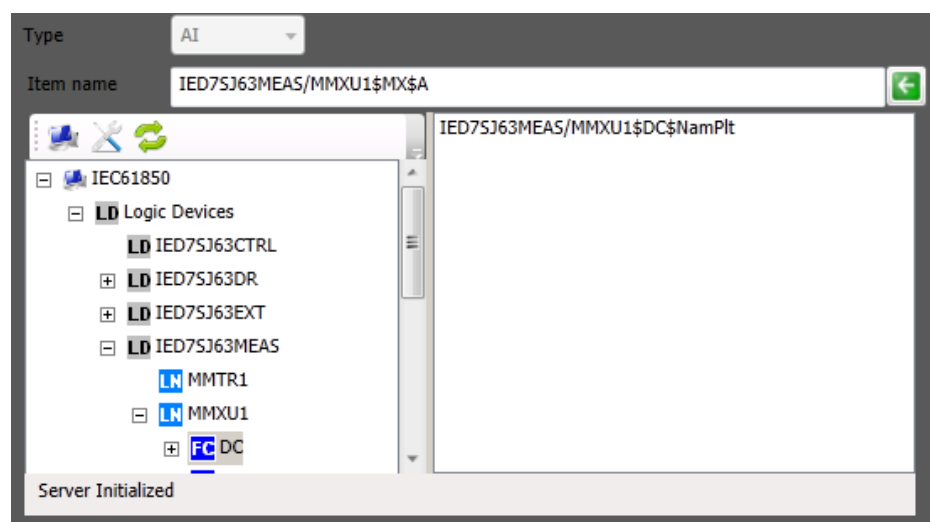


Figure 2 – IEC61850 hierarchy tree.

LD – Logical Devices – They are the logical devices inside this physical server, which act as functions "containers" (logical nodes, LNs) or even as "gateways" between LNs of different LDs. In the case of *Figure 2*, an LD named "IED75J63CTRL" is being treated. As naming conventions presented in the standard, generally the internal IED reference name is used as prefix, and indication of the major function of LD is used as suffix. Examples of suffixes CTRL, MEAS, etc.

LN – Logical Nodes – They are objects that implement well defined basic functions within the logical device. The names of Logical Nodes are standardized. Each LN contains Data Objects, DataSets, definitions of Reports, Logs, groups of parameters and services that implement objects and functions. For example, a switchgear, its state, its control, as shown within the name "QOCSWI1" in *Figure 3*. The LN is the case in CSWI - Switch controller. There is LN name formation rules defined in the standard. Other LN examples would be measurement functions (MMXU), a voltage transformer (TVTR), over current Protection (PTOC), thermal (PTTR). A complete list of LNs for use in substation IEDs is presented in standard IEC61850 Part 5.

FC – Functional Constraints – The function defined by LN contain several objects that are distributed in categories defined as FC-Functional Constraints. The figure shows "CO" objects (contain command), "ST" objects (contain digital status points), "RP" (contain Reports objects). The figure 3 shows measurement objects ("MX" category). The existing list of FCs is defined in the standard.

The following list of FCs was obtained in the standard IEC 61850 Part 7-2 - 2003 - Table 18 - In the original table for more details about each item.

ST	Status information
MX	Measurands (analogue values)
CO	Control DataAttribute shall be operated (control model) and read
SP	Setpoint DataAttribute shall represent a set-point : value may be controlled and read.
SV	Substitution DataAttribute shall represent a substitution
CF	Configuration DataAttribute shall represent a configuration
DC	Description DataAttribute shall represent a description
SG	Setting group Logical devices that implement the SGCB class
SE	Setting group
EX	Extended definition
BR	Buffered report
RP	Unbuffered report
LG	Logging Attribute shall represent a log control
GO	Goose control Attribute shall represent a goose control
GS	Gsse control Attribute shall represent a goose control
MS	Multicast sampled value control
US	Unicast sampled value control

DO – Data objects – Data Objects are data structures with standardized names, which contain the information itself. These objects can be as simple as the object "Pos" shown in the figure 2, which provides the position information of circuit breaker. There are more complex Data Objects as shown in the second figure, "A", which represents a three-phase current. It has four children objects, each of which, with current information of each phase and a neutral.

Into figures shown are presented the following types of points:

- Beh – Behavior of LN
- Health - state of the logical node related HW and SW.
- Loc - switchover between local and remote operation
- Mod – Mode and behavior: On, Blocked, Test, Test/Blocked, Off
- Pos – Switch position
- A – Current
 - neut – phase neutral
 - phsA, phsB,PhsC – phases A, B and C
- Hz - Frequency
- PPV - Phase to phase voltages.
- PhV - Phase to ground voltages for Phases 1, 2, and 3, including Angle.

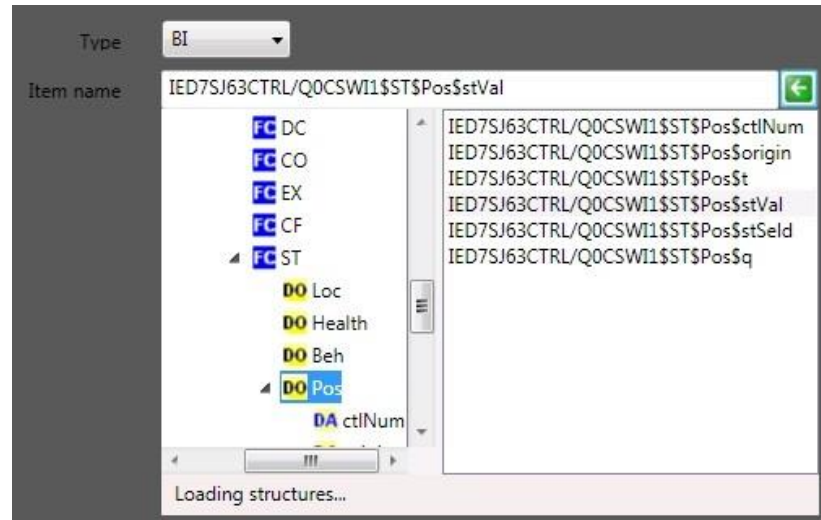


Figure 3 – IEC61850 hierarchy tree detailing Pos object

DA – Data attributes – Lower level objects below Data Objects, the *ctlNum* object (figure 3) or a phase current *phsC* (figure 4). They are a set of objects that presents the values information itself. Again, each of these Data Attributes has standardized names defined in the standard.

The “Pos” example Data Object presents 4 Data Attributes:

- stVal* – circuit breaker status
- q* – quality
- t* – timestamp
- ctlNum* – status change sequence number

The “*phsC*” is a Data Attribute, and has 4 children Data Attributes too:

- cVal* – current value
- instCval* – Last Instantaneous measured value
- q* – quality
- t* – timestamp.

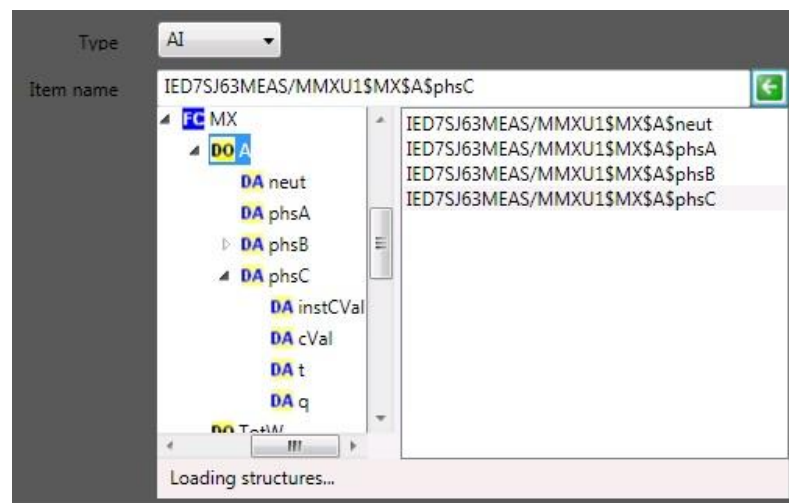


Figure 4 – IEC61850 hierarchy tree detailing phsC object.

The right frame presents the IEC61850 target points, which can be used in Action.NET points table, below the chosen object in the left tree. These points name formation match the following rule:

<logical device> / <Logical node>\${FC}\${data name}\${[data name]...}\${data attribute}

4.2 Points Types

In the Action.Net points table, the following types of points can be used:

Acronym	Signal Type	Input/Output	Description
AI	Analog	Input	Analog Inputs
BI	Digital	Input	Digital Inputs
AO	Analog	Output	Writing "setpoints" for remotes IEDs. Write the current value of point in float format (32 bits). Uses IEC61850 APC Common Data Class Model.
BO	Digital	Output	Outputs – Send to remote corresponding point the output parameter set to this point (16-bit integer). Uses IEC61850 SPC and DPC Common Data Class Models.
RP	Digital	Intern	Points of this type serve to indicate the Action.Net the name of an "Unbuffered Report" that should be activated.
BR	Digital	Intern	Points of this type serve to indicate to Action.Net the name of a "Buffered Report" that should be activated.
SY	Digital	Intern	Points for indication of communication failure.
RPF	Digital/Analog	Input/Output	This type used to represent attributes of an "Unbuffered Reports" control block.
BRF	Digital/Analog	Input/Output	This type used to represent attributes of a "Buffered Reports" control block.
DS	Digital	Input	Points of this type serve to indicate to the communication module the name of a DataSet whose reading will be periodically required.
INC	32 bits integer	Output	Writing of a 32 bits integer set-point, following the IEC61850 Data Class Model INC – Controllable Integer Status
BSC	8 bits integer	Output	Writing of Raise and Lower control, following the model BSC – Binary Step Controlled position. Possible states: 0=stop; 1=Lower; 2=Higher; 3=Reserved.
ISC	Signed 8 bits integer	Output	Writing of a position with values between - 64 and 63. Uses IEC61850 Common Data Class Model Integer controlled step position information (ISC)

Table 1 – Types of Points Specification

4.3 Point Address

The addressing in the points table is made using the following two fields as a composed unique key that defines a point:

Node – The Node name for the desired server must be placed here.

Address – Is the complete text of identification of the chosen object.

Status Specification

In the case of status objects follows the general rule mentioned above, one point for each Data Object desired. The reading will retrieve together all the related Data Attributes (example: stVal, q (quality) and timestamp t. The Action.Net will use stVal to update the state the state of the point. The attribute q (quality) and t (timestamp) will be used for point status and the time stamp of the point.

Circuit Breakers and Switchgears

In the case of signaling circuit breakers and switchgears is defined in Action.NET a digital point for the desired Data Object, which can be single or multiple digital (depending on the type of signaling on the object defined in IED server). Attribute Data stVal will be the source of information for the state signaling. The attribute q (quality) and t (timestamp) will be used for point status and the time stamp.

For the remote control, two points are defined in the Action.NET points table, one for ON and one for OFF, with output parameters 1 and 0 respectively. The same Data Object is referenced on both, as shown below.

TagName	Node	Address	DataType	Modifiers	AccessType
AN61_TH[4]	NO61850_TH	AI:IEDRelay1\$T1MMXU0\$MX\$TotVA:0	Native		Read
AN61_TH[3]	NO61850_TH	AI:IEDRelay1\$T1MMXU0\$MX\$A\$neut:0	Native		Read
AN61_TH[2]	NO61850_TH	AI:IEDRelay1\$T1MMXU0\$MX\$TotVA:0	Native		Read
AN61_TH[1]	NO61850_TH	AI:IEDRelay1\$T1MMXU0\$MX\$AR\$neut:0	Native		Read
AN61_TH[0]	NO61850_TH	AI:IEDRelay1\$T1MMXU0\$MX\$A\$phsB:0	Native		Read
CMDDIG61DB_L	NO61850	AI:IED7SJ63CTRL\$Q0CSWI1\$CO\$POSSBOW:1	Native		ReadWrite
CMDDIG61DB_D	NO61850	BO:IED7SJ63CTRL\$Q0CSWI1\$CO\$POSSBOW:0	Native		ReadWrite
CMDDIG61_D	NO61850	BO:IED7SJ63CTRL\$Q0GAPC2\$CO\$SPCSO\$SBOW:0	Native		ReadWrite
CMDDIG61_L	NO61850	BO:IED7SJ63CTRL\$Q0GAPC2\$CO\$SPCSO\$SBOW:1	Native		ReadWrite
ANA61[7]	NO61850	BR:IED7SJ63CTRL/LLN0\$BR\$BRCBA01	Native		Read
dig61[6]	NO61850	BI:IED7SJ63CTRL\$Q0GAPC2\$ST\$SPCSO	Native		Read

Figure 5 – Points Specification for analogical, circuit breakers and Status variables.

In the case of direct commands, OPER object should be chosen.

In the case of multiple stage commands such as Select Before Operate (SBO) or Select Before Operate With Value (SBOw). It’s only necessary to place the corresponding SBO or SBOw point in the points table, none additional points are required to perform the command operation.

Set Points

For points of the set-point kind (AO, INC, BCS and ISC), the implementation is as follows: for the table points, the **AccessType Write** must be used. The **Address** column must be edited to match the

TagName	Node	Address	DataType	Access...	Scaling
ATCC.STEP_CH	XTORM	BSC:Xtorm_ServerLogicalDevice/ATCC1\$CO\$TapChg\$Oper:0	Native	Write	None
ATCC.STEP_POS	XTORM	BI:Xtorm_ServerLogicalDevice/ATCC1\$ST\$TapChg\$valWTr\$posVal	Native	Read	None
ATCC.TAP_POS	XTORM	BI:Xtorm_ServerLogicalDevice/ATCC1\$ST\$TapPos\$valWTr\$posVal	Native	Read	None
ATCC.TAP_SP	XTORM	ISC:Xtorm_ServerLogicalDevice/ATCC1\$CO\$TapPos\$Oper:0	Native	Write	None
CTLV	XTORM	AI:Xtorm_ServerLogicalDevice/ATCC1\$MX\$CtlV	Native	Read	None
DJ_D	XTORM	BO:Xtorm_ServerLogicalDevice/GGIO1\$CO\$SPCSO\$Oper:0	Native	Write	None
DJ_L	XTORM	BO:Xtorm_ServerLogicalDevice/GGIO1\$CO\$SPCSO\$Oper:1	Native	Write	None
FREQ	XTORM	AI:Xtorm_ServerLogicalDevice/MMXU1\$MX\$Hz	Native	Read	None
T_INC	XTORM	INC:Xtorm_ServerLogicalDevice/GGIO1\$CO\$ISCSO\$Oper:0	Native	Write	None

correct type (AO, INC, BCS and ISC). On run time Action.NET mode, a value change into one of these points will trigger a command sending de just entered new value. The remaining fields in the control object, operT, origin, ctlNum, etc, are sent with default states and values.

Figure 6 – Set-point tags example

DataSets

A DataSet is an object that contains a list of names of Data Objects. The datasets are usually pre-configured in IEDs servers. The contents (state, measurement, timestamp, quality) of Data Objects in a dataset can be obtained in two ways:

- Directly requesting the DataSet read, making reference to its name. There should be the DataSet and its Data Objects points configured in the points table;
- By activating a Report that points to the DataSet, causing the unsolicited dispatch of these contents (as explained in the next item).

The parameter after the last colon sets wich DataSet Sample Timer (G1 to G4) the DataSet belongs.

TagName	Node	Address	DataType	Modifiers	AccessType
* ANA61[1]	NO61850	DS:IED7SJ63CTRL/LLN0\$DATASET1:0	Native		Read

Figure 7 – DataSet point record example.

Reports

For each "Report" configured on the server, for the Action.Net client to receive it, user must include a point record in points table. During real time operation this point indicates the current status of the report (0 - deactivated, 1-activated and normal, 2 - activated and delayed, 3 - activated and delay increasing). The activated or deactivated information is drawn from reading the current state of the attribute *\$RptEna* of the Report. The timing of this reading is set by the Node parameter Buffered Report Sample Time (Configuration Node session), in case of Buffered Report, or Report Sample Time parameter, in case of Unbuffered Reports.

The address to be placed at the point is actually the name of this Report Control Block, as shown in the server's object addressing space. In the addresses line there should be used BR types for buffered reports, and RP for unbuffered reports. The Action.Net run-time starting procedure will search within the remote server for control block attributes to gather information about the name of the control block DataSet. During this procedure it will also make writing the attribute "RptEna" Remote Server, enabling the report service on the server.

The *\$SqNum* attribute shows sequence number of reports, which enables for the user the perception of new reports arrival as this number is increased. When choosing this object, user must assign it to the points table, selecting BRF type (if Buffered Report) or RPF type (if Unbuffered Report).

Figure 8 – Reports Specification on the points table

TagName	Node	Address	DataType	Mo...	AccessType
* COMM1.ENTRYID	LINHA	BRF:IED7SJ63CTRL/LLN0\$BR\$brcbA01\$EntryID	Native		Read
COMM1.BRSEQ	LINHA	BRF:IED7SJ63CTRL/LLN0\$BR\$brcbA01\$SqNum:0	Native		Read
COMM1.BRSTAT	LINHA	BR:IED7SJ63CTRL/LLN0\$BR\$brcbA01	Native		Read

5. BROWSER

5.1 General

To facilitate the registration of remotes IEC61850 points into the Action.Net points table, is available the IEC61850 Browser feature, shown below.

User starts the feature through mouse clicking on a record into the points, steps 1 and 2 to open the browser.

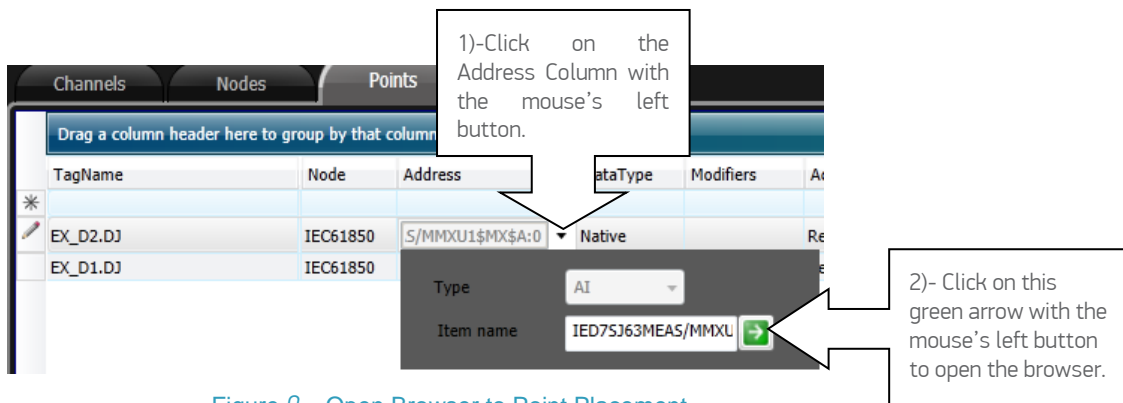


Figure 9 – Open Browser to Point Placement.

The browser may work over an IED (🖥️) or over a SCL file (🔧). This way, if the option File SCL is enabled and an IED IP was provided, the browser will initiate accessing the IED and the double arrows will alternate between selected choices.

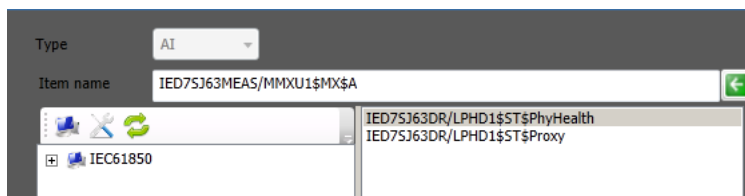


Figure 10 – Selection Between IED and SCL File

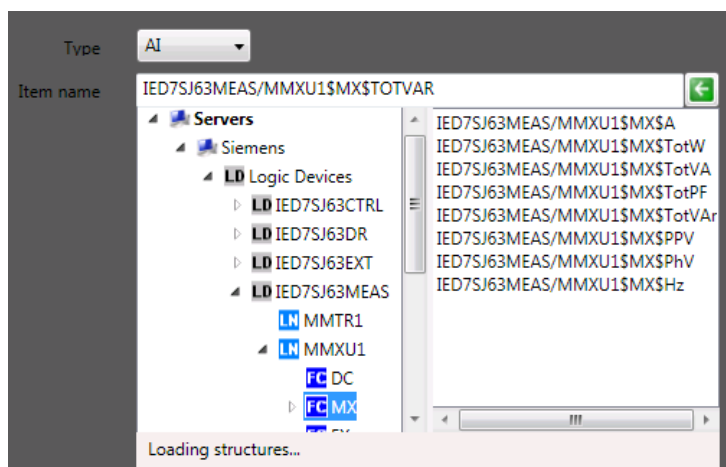


Figure 11 – Browsing Window Opening – Step 2

The window consists of two frames presented side by side. In the left frame is presented a hierarchical list in the form of a tree, with the IED objects. When you click on the branches of the tree in the left frame, under the right frame are listed the objects available for that hierarchical level.

This window when loaded, in the left frame, shows the server designated by the Node field of point record concerned. Clicking on the tree with the left mouse button on the server name will lead to the branch expansion, showing the IEC61850 objects that belongs to the concerned server.

The IEC61850 tree structure, briefly:

- LD – Logical Devices – Logical devices inside a physical device.
- LN – Logical Nodes – Implements functions inside a LD
- FC – Functional Constraints
- DO – Data objects
- DA – Data attributes

5.2 Data Sources

To load the objects on this window from Data Objects, Reports and DataSets configured in the IED server, user can make a direct connection with actual IED or reading a file that is supported by the language SCL (Substation Configuration Language). The supported files are ICD (IED Capability Description), SCD (Substation Configuration Description), CID (Configured IED Description) and SSD (Substation).

By clicking the right mouse button over the name of current server, user can choose the browsing option, via remote connection or via description file.

5.3 Remote IED Connection

If user chooses connection with the remote IED, when clicking on the name of a remote server for the first time since the window was open, the browser makes a connection attempt to this server. If the connection is successful, the tree expands showing the Logical Devices on the server. Clicking on each Logical Device will lead to the reading of all objects included in it. Sections BR, RP and DS are in the same tree. To Access them (BR, RP and DS) is necessary to load the LD branches first.

In case of delay in loading the data, there may be failure to communicate with the IED. In this case, messages like "Not connected" or "Time Out" will appear at the bottom of the "Browser" window. Therefore, in the tree, the icon of the server is changed to one with a red "X" indicating the connection failure. To make a new connection attempt click on the LD items (Logical Devices) again or close the screen and try again, for a full reset of the browser.

5.4 SCL files

To load the browser from reading a SCL file, this file name must have been specified in the Node configuration and the file must have been previously placed in the directory presented in the Node Settings section. The default directory is Action.NET projects directory. In this case, clicking on the server name will start the reading of the file, showing the Logical Devices found. Clicking on the LDs will execute the reading of all existing data objects hierarchically below the concerned LD.

5.5 Data Objects

When it comes to selecting the desired level of Data Object, it is only necessary to click on it in the right frame of the browser, pressing OK right after it, which will trigger the its transfer to the points table Address field, in the current field register. The Node field should be set with the name of the desired target Node. The list on the right side of the window allows user to select multiple objects. If user selected more than one item, after clicking on OK, new records will be created on the points table to hold all the selected items.

According to the FC (Functional Constraint) of the chosen point (the points in the figure has the "MX" FC, which means measures), Action.NET automatically suggests the point type for the *Types* column in the points table (in this case, the EA-type Analog Input will be suggested). The type suggested may be altered if necessary.

5.6 DataSets

In the tree, after the LD section, branches with Reports (buffered and unbuffered) and DataSets appear.

A DataSet is an object in the form of a set of Data Objects (DO), pre-configured in the IED.

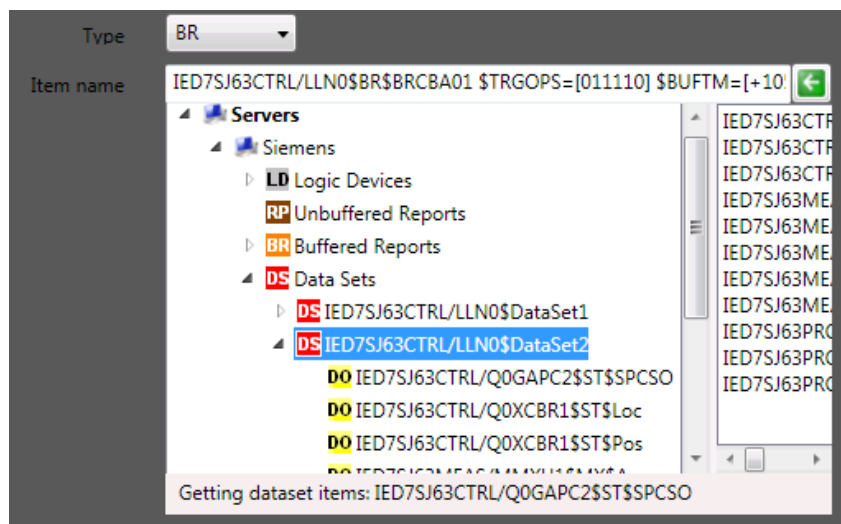


Figure 12 – DataSets Details on the Browser Window.

The figure above shows the list of defined datasets in IED server. Clicking on the name of the DataSets show the data objects (DO) that were set up in this DataSet. A list of these objects also appears in the right frame of the window.

To set DataSet readings by requested sampling, user should choose the name of the DataSet and create a record in the points table, as described in the configuration of points section.

5.7 Reports

Reports are actions consisting in dispatching unsolicited data, initiated by IEDs servers for clients who activated these Reports.

Each Report has its configuration attributes that define its behavior. One is the name of the DataSet to be sent by the Report. Each time a change into objects on a DataSet specified by the Report is sensed, a new instance of this Report is created and sent to the registered client.

When user clicks on the branches RP - Unbuffered Reports or BR - Buffered Reports, is obtained the expansion of these branches with the presentation of the Reports configured in the IED server.

Is required for the Reports to be shown, that the LDs that carry them have been previously loaded the LDs. In the case of SCL file reading, data load is always done by one round.

5.8 Report Attribute Window

Clicking on a Report, on BR or RP tree's Section, as indicated by the red arrow in figure 13, the control block attributes window of the Report (BRCB) is shown. (Figure 14).

On this window (Figure 14), the contents of the Report attributes are presented. The attribute names are on the left column (Data Objects). The central column (Current Values) shows the values currently read from the browser. The right column opens a window, with a click on the desired attribute, where the user can set a new value for it. The value will be loaded on the remote server for the next Action.Net client run.

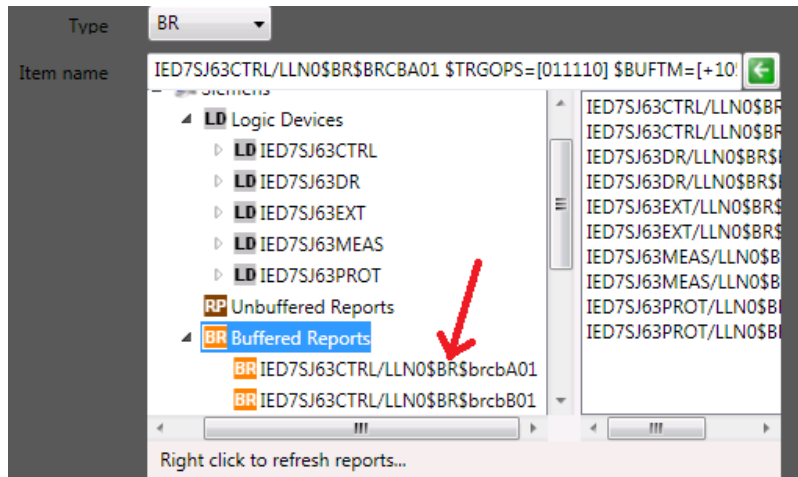


Figure 13 – Reports Details on the Browser Window.

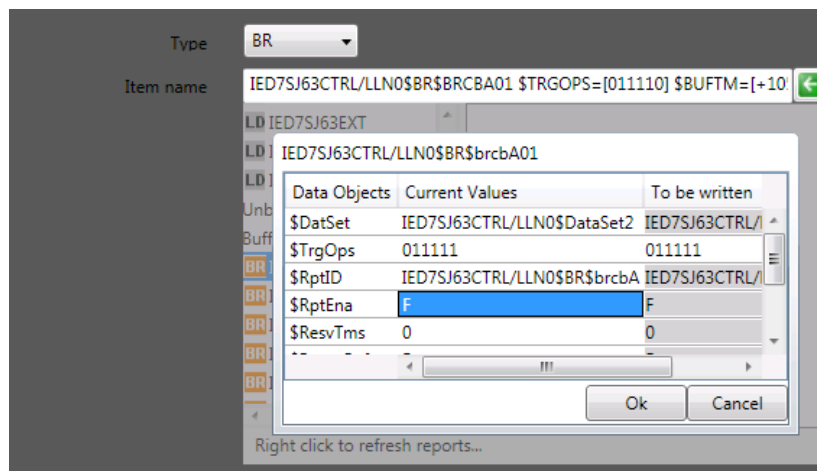


Figure 14 – Reports attributes on Browsing Window

In the example below (Figure 15), the attributes that have been modified are \$BufTm and \$TrgOps.

TagName	Node	Address	Date
ANA61[6]	NO61850	BR:IED7SJ63CTRL/LLN0\$BR\$BRCBA01 \$TRGOPS=[011110] \$BUFTM=[+105]	Nati

Figure 15 – Reports Attributes settings