GE

Grid Solutions

MCP IEC 61850 MMS Server

User Guide

SWM0124

Version 3.10 Revision 0

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Table of Contents

Figures

Tables

About this Document

Purpose

This document describes the MCP IEC 61850 Server Functionality and provides guidelines on how to enable and configure the IEC 61850 Server.

This document applies only to:

MCP v3.00 when used in conjunction with IEC 61850 Server.

This document is a supplement to the Additional Documentation listed below, and assumes the reader has collateral knowledge from the Additional Documentation.

Throughout this document the term “legacy” refers to “non-IEC 61850”.

Screen captures may show G100 or G500 in some areas, however the workflow applies to products in the MCP family (G100/G500), unless otherwise indicated.

Screen captures may show different specific version numbers, however the workflow and instructions remain valid and same.

Intended Audience

This document is targeted for End Users, Projects and System Integrators personnel responsible to configure IEC 61850 Server in **MCP v3.00**.

A strong understanding of IEC 61850 data modelling is required.

Prerequisites

1. Computer having Windows 10x64 operating system.
2. DS Agile Studio v3.00
3. IEC 61850 Server CID Tool
4. DSAS MCP package v3.00
5. MCP Firmware Version v3.00
6. IEC 61850 Server Product License for MCP firmware v3.00 (SGA0088)

Additional Documentation

For further information about the MCP family (G100/G500) refer to the latest versions of the following documents:

- G100 Substation Gateway Instruction Manual (994-0155)
- G500 Substation Gateway Instruction Manual (994-0152)
- MCP Software Configuration Guide (SWM0101)
- MCP HMI Online Help
- DS Agile MCP Studio Online Help
- G100 Quick Start Guide (SWM0116)
- G500 Quick Start Guide (SWM0106)
- Configuring UEFI Settings on G100 User Guide (SWM0122)
- Configuring UEFI Settings on G500 User Guide (SWM0110)

Product Support

Full Support

If you need help with any other module or aspect of your GE Grid Solutions product, you can:

- Access the GE Grid Solutions Web site
- Search the GE Technical Support library
- Contact Technical Support

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Region	E-mail	Telephone
Global Contact Centre	ga.support@ge.com	+44 1785 250070
Central and East Asia and Pacific	ga.supportCEAP@ge.com	+61 414 730 964
India	ga.supportIND@ge.com	+91 44 22648000
Middle East, North Africa and Turkey	ga.supportMENAT@ge.com	+971 42929467
Europe, Russia, CIS and Sub-Saharan Africa	ga.supportERCIS@ge.com	+34 94 4858854
North America	ga.supportNAM@ge.com	+1 877 605 6777
Latin America	ga.supportLAM@ge.com	+55 11 36187308

1. Overview

1.1 Product Perspective

The IEC 61850 MMS Server provides an interface to one or more clients using the IEC 61850 MMS communications protocol suite.

It can function as several distinct IEC 61850 Server Instances. Each instance is called a Logical Remote Unit (LRU) and appears as a single IEC 61850 Server Access Point and Physical Device Name to any IEC 61850 client host communicating with it.

Note: The IEC 61850 Server can be configured using only the Offline Editor on DS Agile (MCP) Studio.

1.2 Product Functions

The MCP IEC 61850 MMS Server supports the following functions:

- Multiple server instantiation (multiple LRU), with only one server instance per Ethernet LAN interface
- Communication using IEC 61850 MMS protocol with multiple clients (up to 8 for each LRU)
- Support for IEC 61850 data models as specified in IEC 61850-7-4:2007 & IEC 61850-7-3:2007
- Support for Buffered and Un-buffered Report Control Blocks (BRCB, URCB)
- Accumulator freeze processing
- Control Model: Direct with Normal Security or SBO with Normal Security
- MCP deployment as Single or Warm-Standby or Hot-Hot redundancy
- IEC 61850 Server is NOT supported in v3.00 for Hot-Standby redundancy, use instead Hot-Hot mode.

When configuring MCP IEC 61850 server – DS Agile MCP Studio and the CID Tool support the following functions:

- Custom assignment of object references to define the IEC 61850 Model for legacy data, directly in the legacy communication protocols client maps
- Automatic assignment of IEC 61850 object references to database pseudo-points
- Automatic use of IEC 61850 Model from IEDs configured with IEC 61850 MMS communications (configured using Loader)
- Automatic addition of mandatory data objects specified in 61850-7IEC 61850-7-4:2007
- Automatic generation of datasets, buffered and unbuffered report control blocks based on pre-defined rules

1.2.1 IEC 61850 Server in Warm-Standby Redundant Mode

In warm-standby mode the IEC 61850 Server is active and accepts connections only in the MCP Active unit.

The IEC 61850 Client communicating with the MCP will only talk to one MCP unit at a time, that being the Active one.

There are no special requirements for the IEC 61850 Client.

The failover / switchover time will be similar to a power-on sequence and will be associated with the time it takes the IEC 61850 Server to finish initialization in the standby unit when it becomes active.

There will be re-initialization data events generated when MCP fails / switch over (i.e. is not bumpless).

In this mode the IP address of the IEC 61850 Server must be configured as one of the Active IP address(es).

In the IEC 61850 Server:

`LD0/LPHD1.RedSt = True` indicates the Device is "Active"

In Standby unit IEC 61850 Server doesn't run so False state will not occur.

1.2.2 IEC 61850 Server in Hot-Hot Redundant Mode

In hot-hot redundant mode the IEC 61850 Server can be configured in two different operational modes:

1.2.2.1 Hot-Hot Communication (hot-hot checkbox is selected)

In this mode the IEC 61850 Server is active and accepts connections in both MCP A and B devices.

It is up to the IEC 61850 Client to determine which IEC 61850 Server will be selected and used. This is referred to as "IEC 61850 Client Control Redundancy", where Client shall decide the 'Active' and 'Standby' MCP based on 'RedSt' data from both MCP devices.

There will be bumpless data transfer when MCP fails / switch over.

In this mode non-active IP address of each MCP (IP Address A and IP Address B) are used to configure the IP Address of the IEC 61850 Server.

In the IEC 61850 Server:

`LD0/LPHD1.RedSt = True` indicates the Device is "Active"

`LD0/LPHD1.RedSt = False` indicates the Device is "Standby"

Control operations shall be done only on 'Active' MCP.

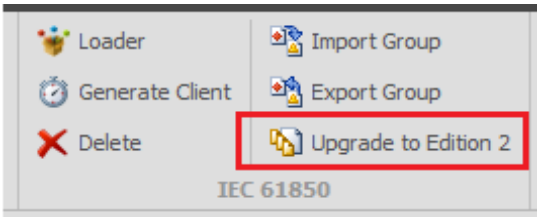
1.2.2.2 Warm- Standby Communication (hot-hot checkbox is not selected)

In this mode the IEC 61850 Server is active and operates same as in Warm-Standby Redundant Mode.

1.3 High Level Workflow

The high-level workflow steps to configure and run the IEC 61850 MMS Server are:

1. Request a license and enable IEC 61850 Server in MCP Firmware v3.00
2. Use a MCP v3.00 device in the DS Agile Studio v3.00 project
3. If this is a device upgraded from a previous version of D400/MCP – click on the button "*Upgrade to Edition 2*" to set the IEC 61850 schema to Ed.2 (in the Project page, with the device selected). This is required for IEC 61850 Server configuration. The MCP will continue to communicate with the previously configured IEC 61850 IEDs, even if they were Ed.1



4. Enable IEC 61850 Server in Device Properties
5. Open Offline Editor for this device
6. Instantiate required IEC 61850 IED Connections and map associated data using Loader
7. Instantiate required Legacy Connections and map associated legacy data using Offline Editor
8. Associate IEC 61850 Object References to legacy data as required, in the Client Maps
9. Finalize all Automation applications configurations
10. Finalize all Legacy Server connections and configurations
11. Instantiate required IEC 61850 Server connections and create the corresponding CID file for each instance
12. Save offline editor session
13. Synch to device
14. Use the IID file to configure the other IEC 61850 Clients as needed.

Note: MCP v3.00 and DS Agile Studio v3.00 do not support the IEC 61850 system tool workflow where the SCD file created by the system tool is used to update the MCP IEC 61850 Server configuration with communication configuration (e.g., IED name and communication addresses) and data flow configuration (e.g., control blocks and data sets).

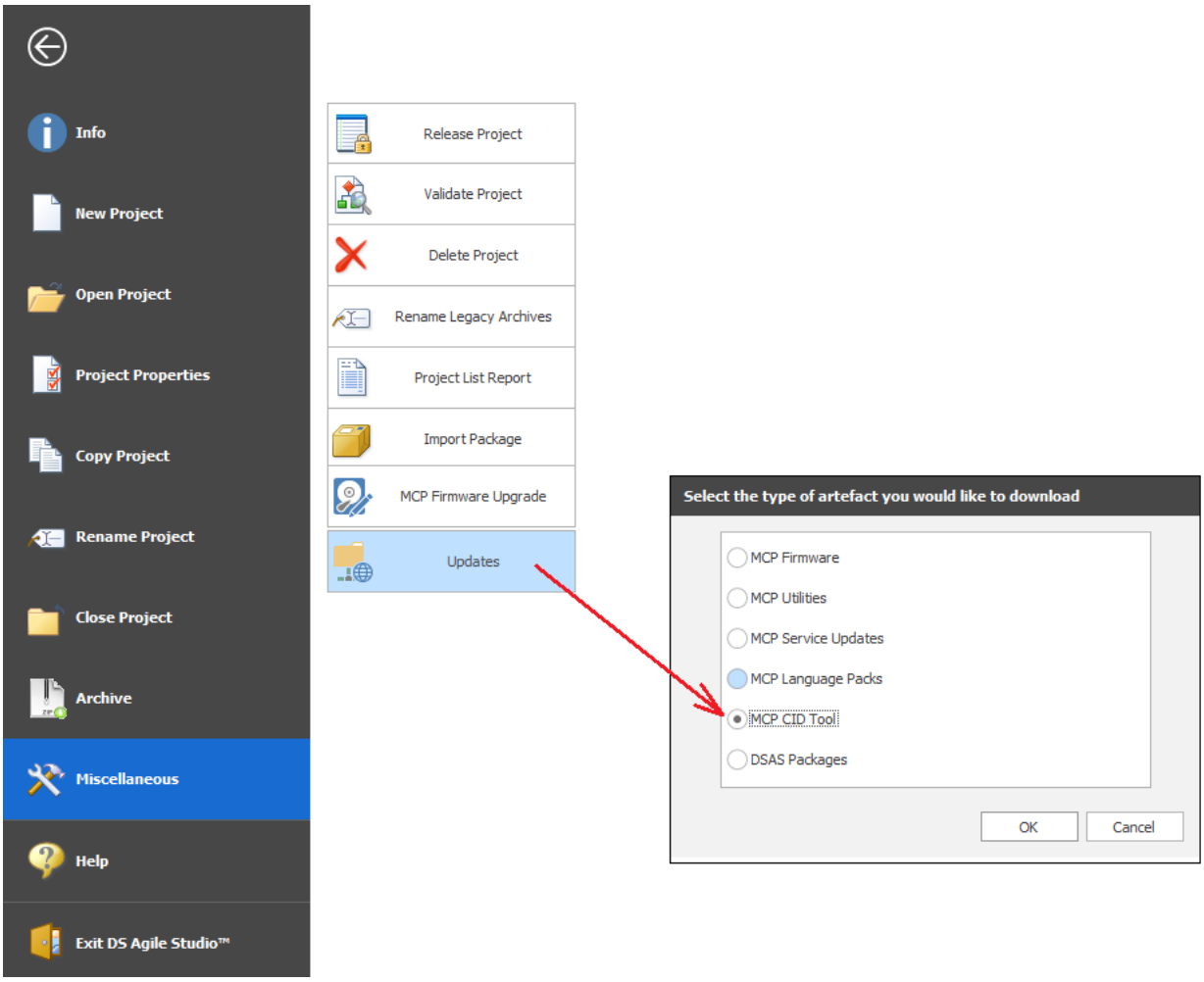
1.4 CID Tool

Please note:

- The CID Tool requires the `Anaconda` framework to run.
- GE cannot re-distribute the `Anaconda Distribution Package`; this must be obtained and installed directly by end user.
- Even if the `Anaconda Distribution Package` is downloaded separately – step 11 requires online Internet availability for a one time setup, after which online Internet access is not required anymore.
- It is strongly recommended that only users authorized as administrator or supervisor on the MCP should be permitted to use the CID_Tool in a production environment. This means there should be controls in place to enforce user authentication and authorization on the computer / engineering workstation on which the CID_Tool is installed.
- The "cid_tool" environment created in the installation instructions has a specific version of python only for the purposes of running the CID_Tool. It is not recommended to use the "cid_tool" environment for general purposes. The base environment should be used for general purposes as it has the latest version of python.

1.4.1 CID Tool Installation

The CID Tool is provided by GE and can be obtained using DSAS MCP Studio "Updates" utility:



Steps required to be performed by an *Administrator*:

1. Download the IEC 61850 Server CID Tool installer provided by GE, and save it to any location in your computer. The installer file name is in the form of:

   `SetupCIDTool_vx.y.z.n.exe`

   where x.y.z.n are the version of the tool, **x** being the major version.

   The associations of CID Tool Versions with MCP Versions are below:

   - MCP v2.70 requires CID Tool v5.*
   - MCP v2.80 requires CID Tool v6.*
   - MCP v3.00 requires CID Tool v8.*

   Ensure you use the correct major version of the CID Tool, according to the MCP Version you have. More than one CID Tool major version can be installed in same computer.

2. Run the installer and follow the prompts.

   - The CID Tool v5.* is deployed as a full Python ZIP file, to be extracted by user in any folder, and doesn't require Anaconda framework to run, this is an internal GE restricted distribution version.
   - The CID Tool v6.* is deployed in the folder: `C:\CID_Tool`
   - The CID Tool v8.* is deployed in the folder: `C:\CID_Tool_v8`

   The target folder cannot be changed during installation.

   If you need to have both CID Tool versions 5.* and 6.* in same computer – install v5 first, rename the folder to be: `C:\CID_Tool_v5`

   and then install v6 and rename the folder to be: `C:\CID_Tool_v6`

1.4.1 Anaconda Installation

Steps required to be performed by an *Administrator*:

1. Proceed to install the `Anaconda Distribution Package`, download it from here:

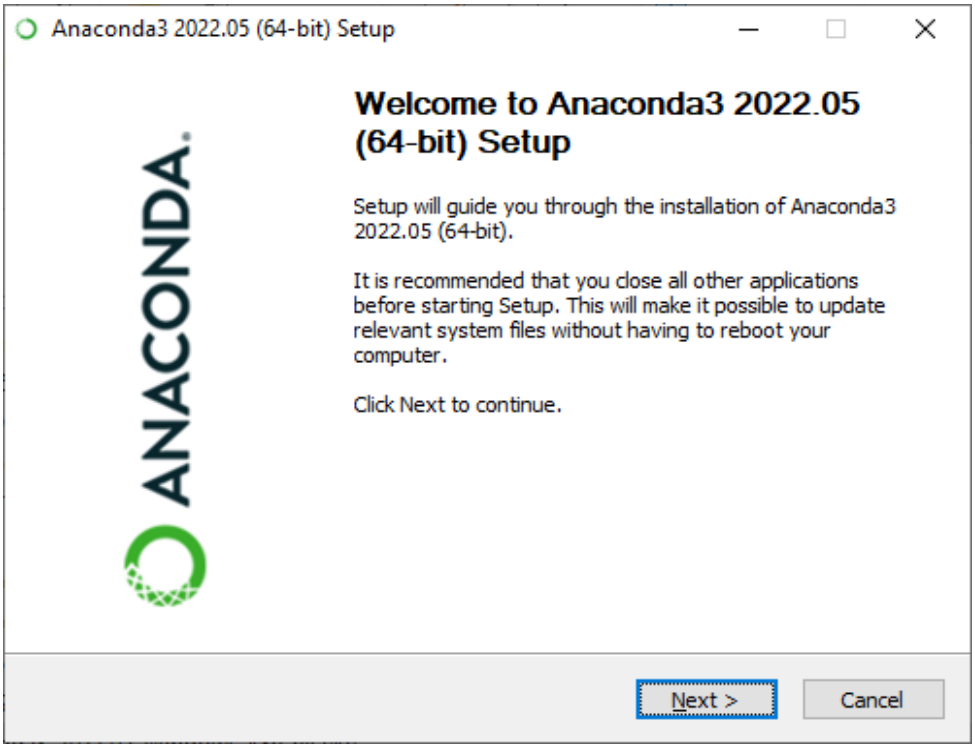
   https://www.anaconda.com/products/distribution

   (No need to sign up for Jupyter Notebook when prompted. If your organization has a commercial agreement with (Data Science) Anaconda for Anaconda version 3.9 or higher, then use the package version approved by that agreement instead of the latest package version available on the Internet. For example, if your organization has a package called Data Science Anaconda 3.9.7, then use that package rather than the latest package available on the Internet.)

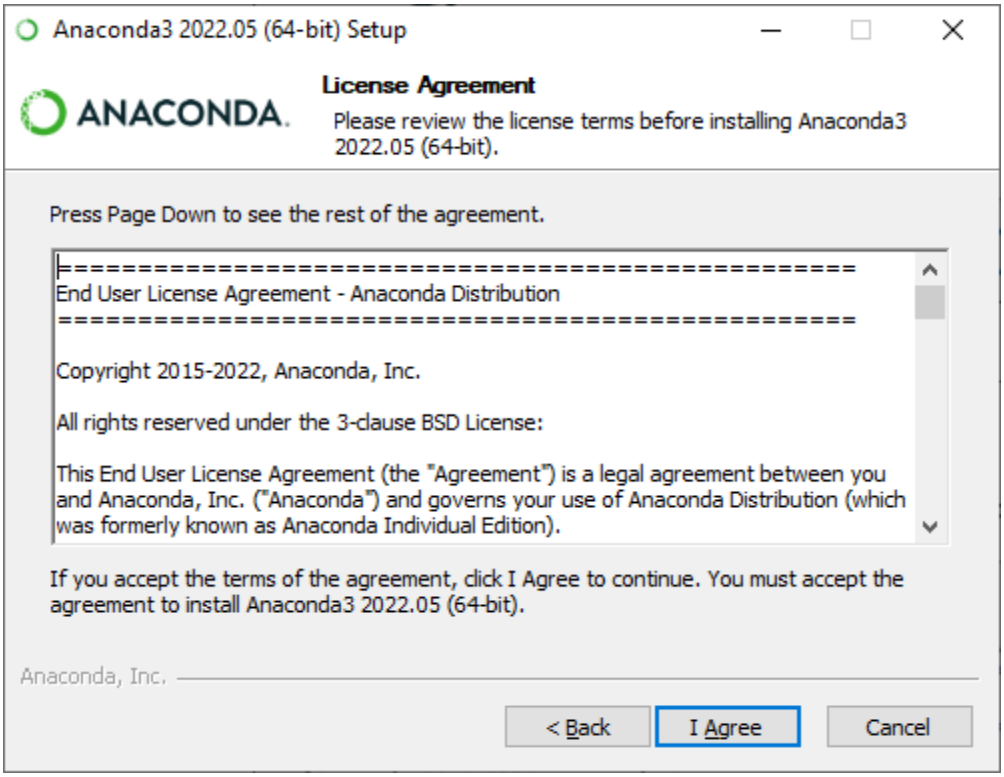
   Result: package file is downloaded, exact versions may be different, e.g.:

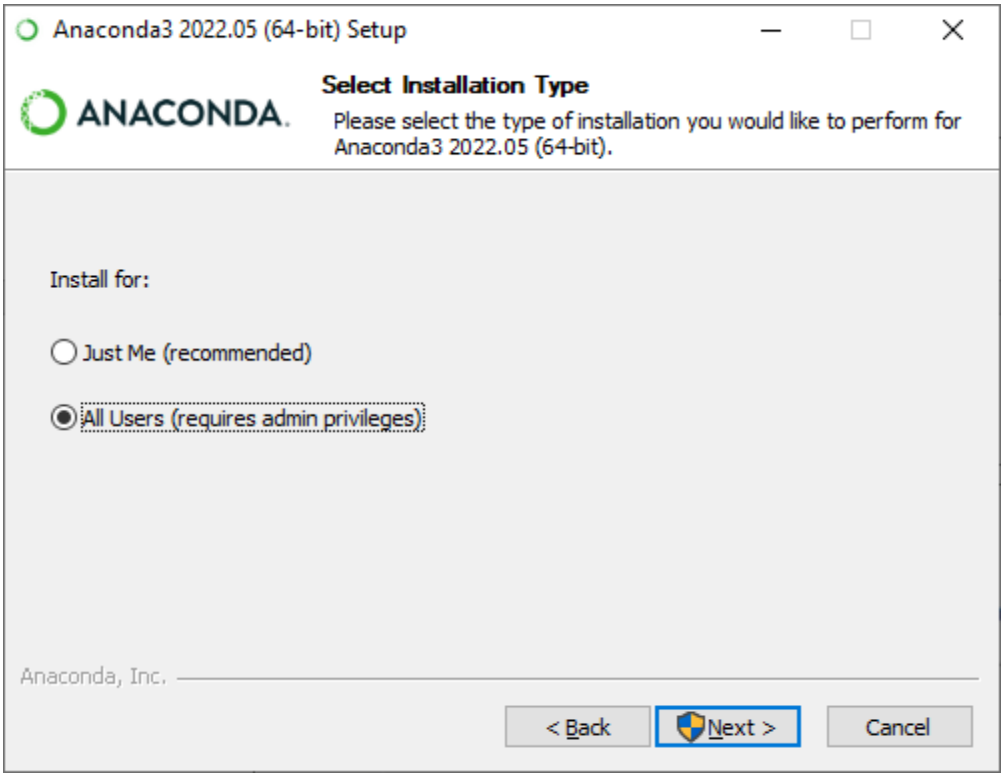
   "`Anaconda3-2022.05-Windows-x86_64.exe`"

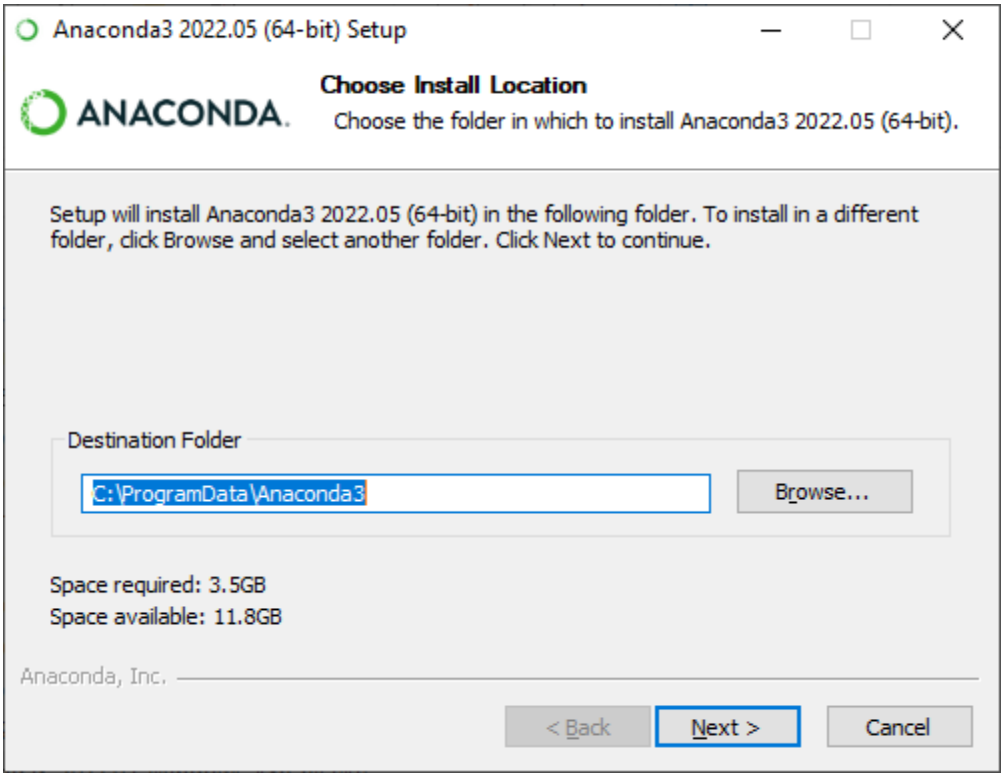
2. Install the downloaded package following these screen shots:

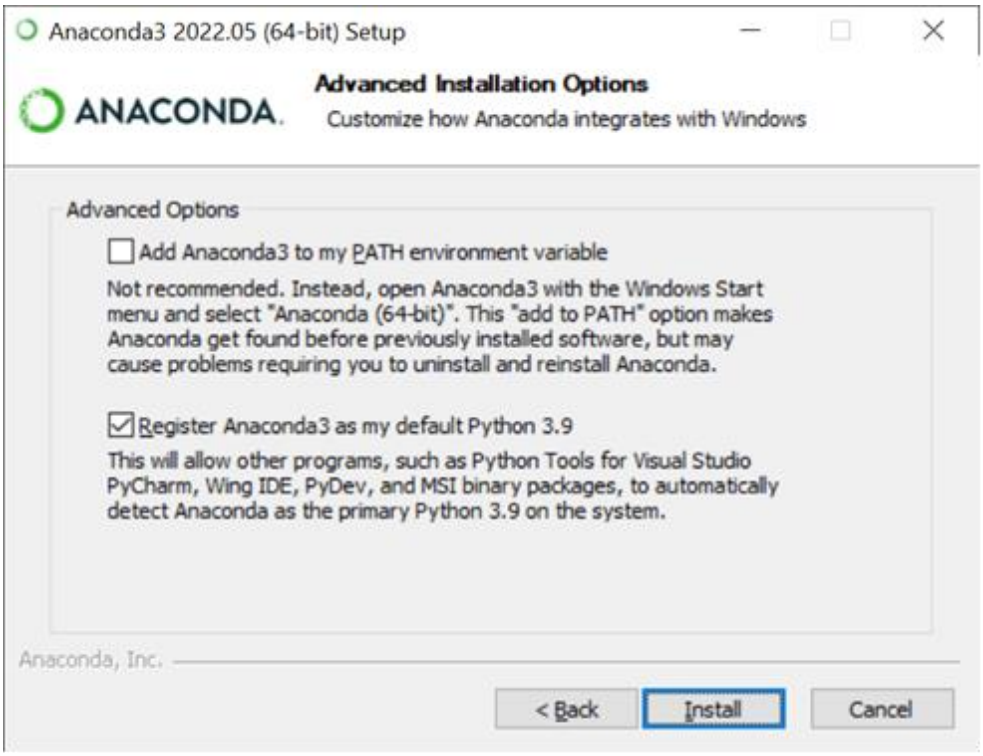


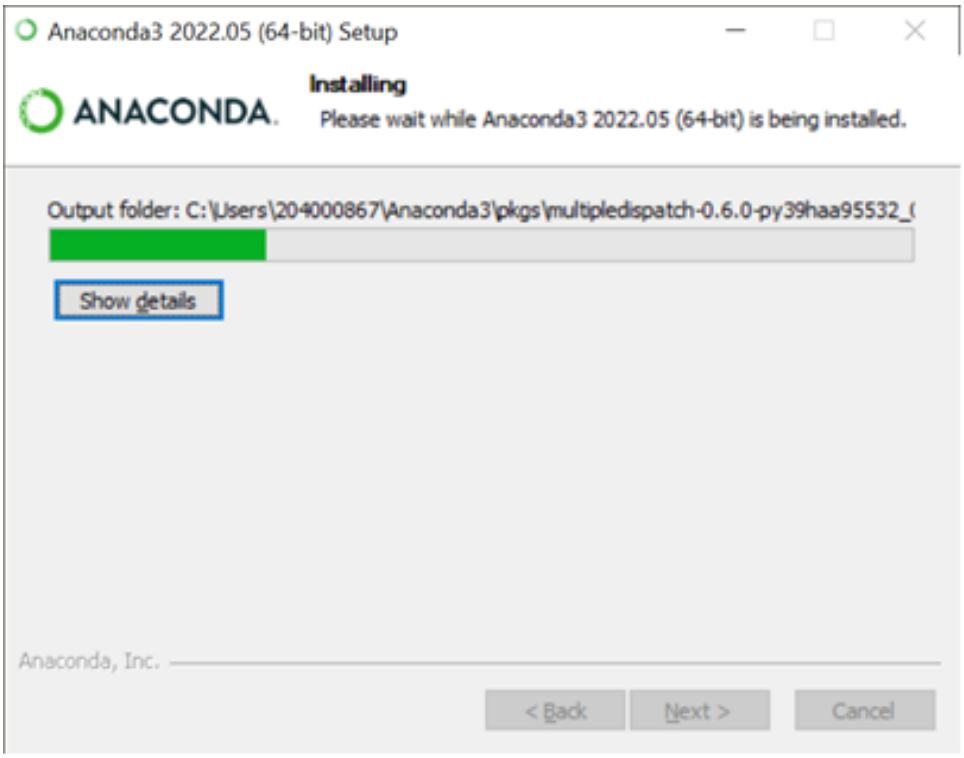
3. Read, Review and Accept the EULA between yourself and Anaconda:





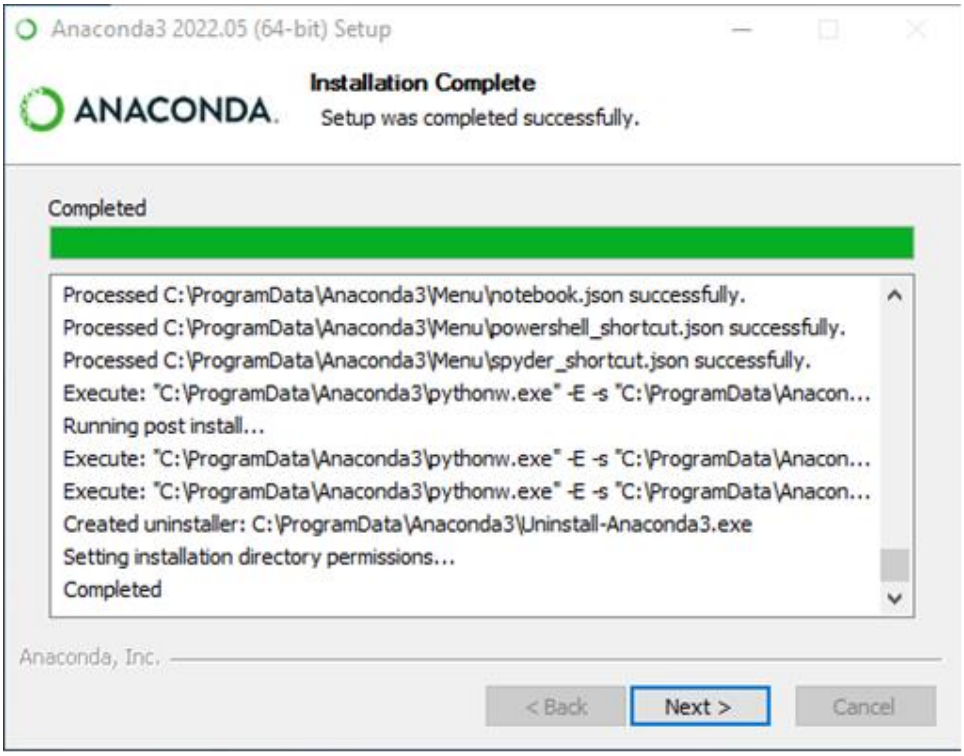

Anaconda3 2022.05 (64-bit) Setup
ANACONDA.
Choose Install Location
Choose the folder in which to install Anaconda3 2022.05 (64-bit).
Setup will install Anaconda3 2022.05 (64-bit) in the following folder. To install in a different folder, click Browse and select another folder. Click Next to continue.
Destination Folder
C:\ProgramData\Anaconda3
Browse...
Space required: 3.5GB
Space available: 11.8GB
Anaconda, Inc.
< Back
Next >
Cancel

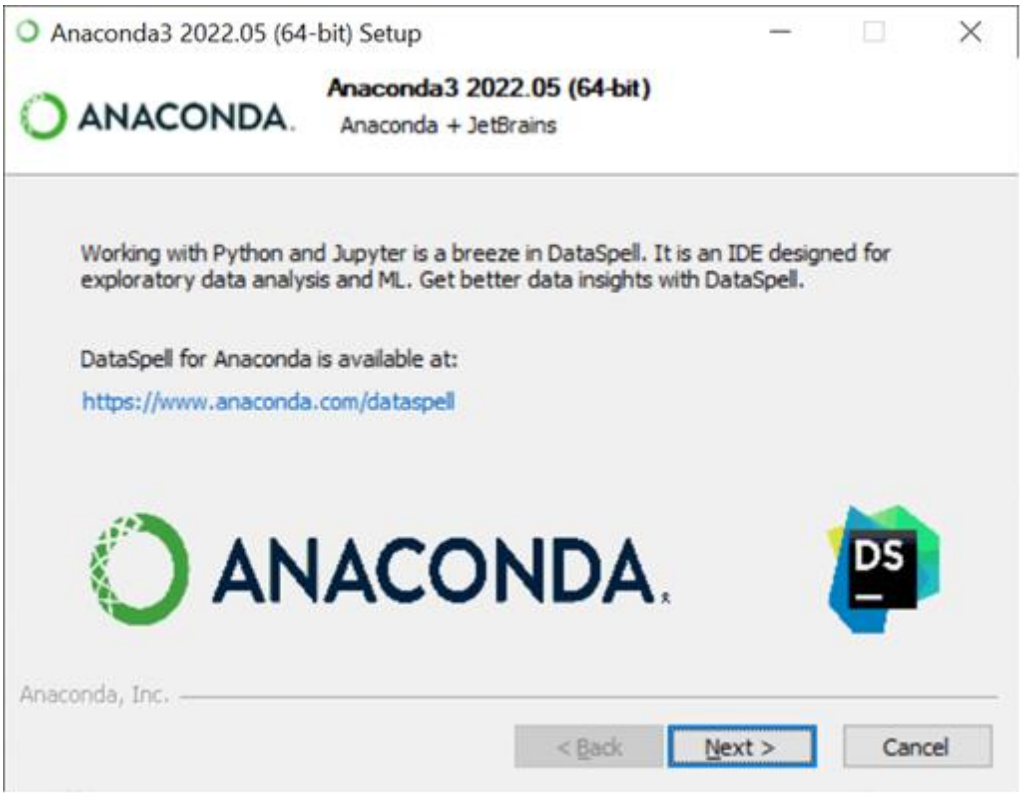

Anaconda3 2022.05 (64-bit) Setup
ANACONDA.
Advanced Installation Options
Customize how Anaconda integrates with Windows
Advanced Options
Add Anaconda3 to my PATH environment variable
Not recommended. Instead, open Anaconda3 with the Windows Start menu and select "Anaconda (64-bit)". This "add to PATH" option makes Anaconda get found before previously installed software, but may cause problems requiring you to uninstall and reinstall Anaconda.
Register Anaconda3 as my default Python 3.9
This will allow other programs, such as Python Tools for Visual Studio PyCharm, Wing IDE, PyDev, and MSI binary packages, to automatically detect Anaconda as the primary Python 3.9 on the system.
Anaconda, Inc.
< Back
Install
Cancel



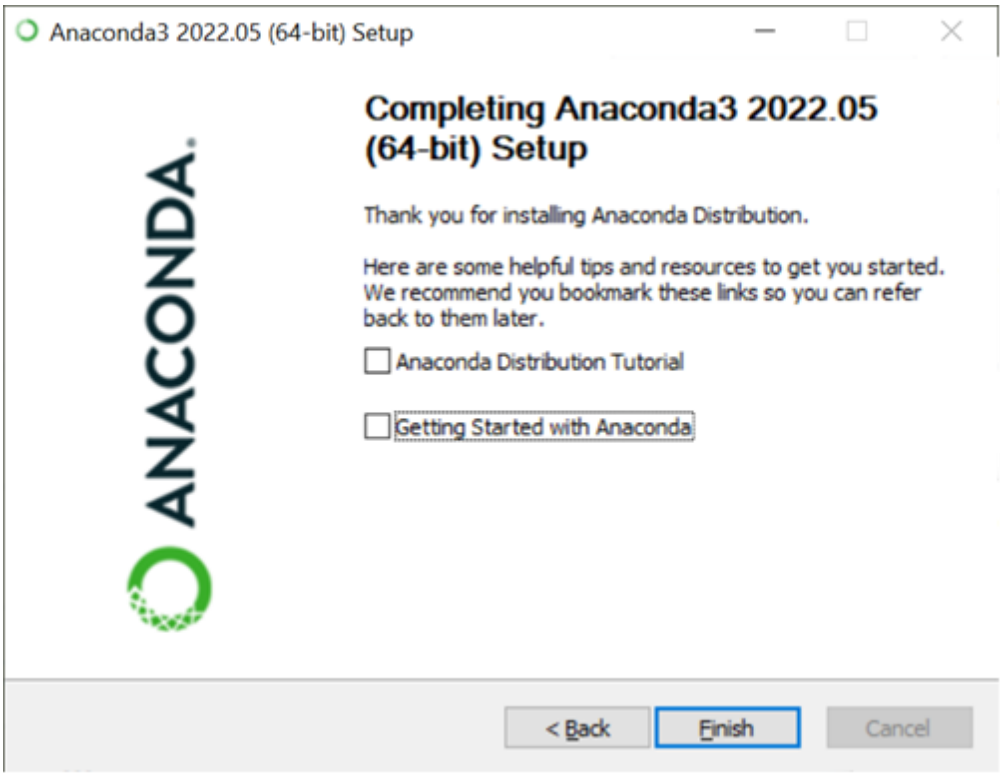
Note: It may take a long time to complete the installation (10-15 minutes, depending on the computer environment).

Click "Next" when completed.





4. Uncheck boxes:

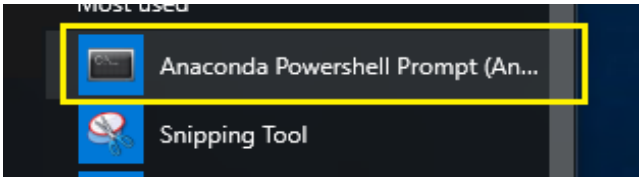


1.4.2 CID Tool Environment setup

Steps required to be performed by an *Administrator*, once for each CID Tool major version:

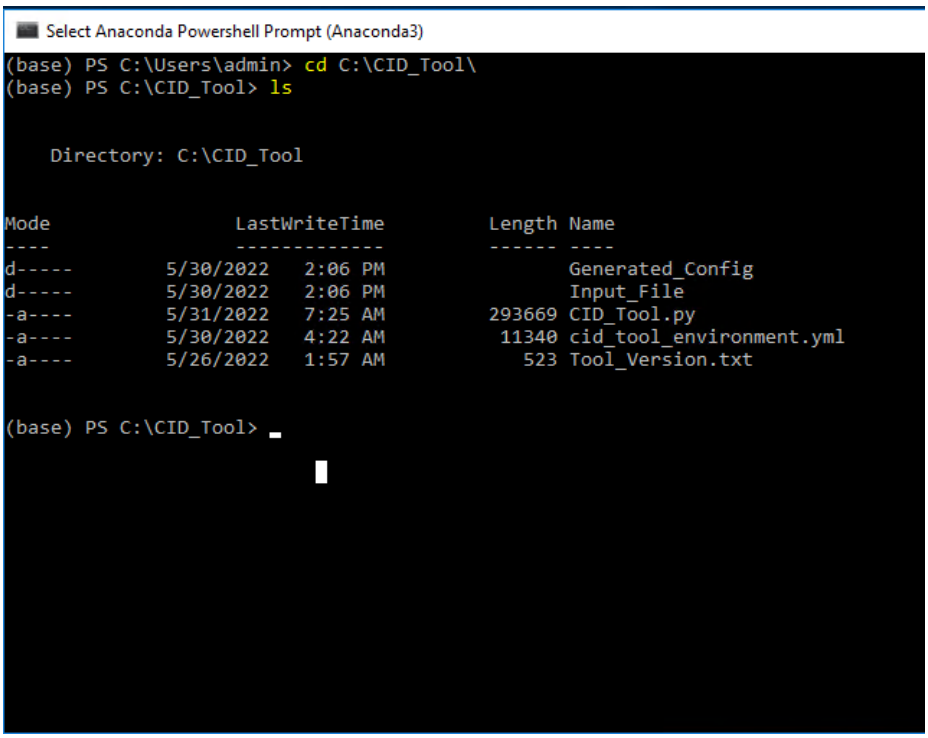
1. From Windows Start Menu:

   Start the Anaconda Powershell Prompt (Anaconda3)



2. Change directory to the CID_Tool folder, for e.g.:

   `cd C:\CID_Tool`



3. Next is the environment setup, an Internet connection is required for next step.
4. If your network uses a proxy server to access the Internet, set the proxy environment variables as follows, where <PITC-Zscaler-Global-ZEN.proxy.corporate.ge.com:80> is an example that should be replaced with your company's proxy.

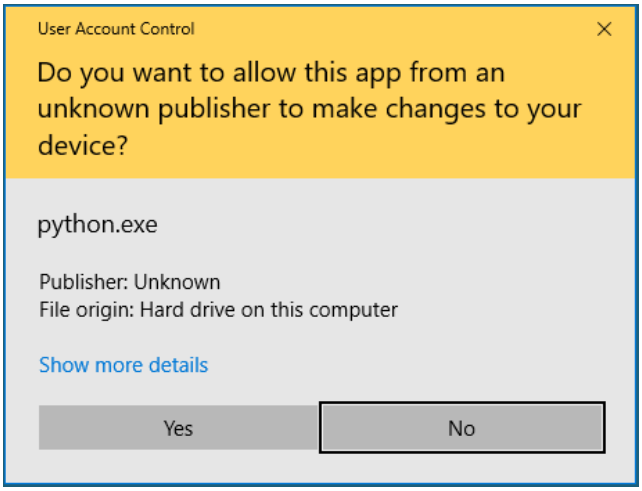
   `conda config --set proxy_servers.http http://PITC-Zscaler-Global-ZEN.proxy.corporate.ge.com:80`

   `conda config --set proxy_servers.https http://PITC-Zscaler-Global-ZEN.proxy.corporate.ge.com:80`

5. Type the following in the Anaconda powershell:

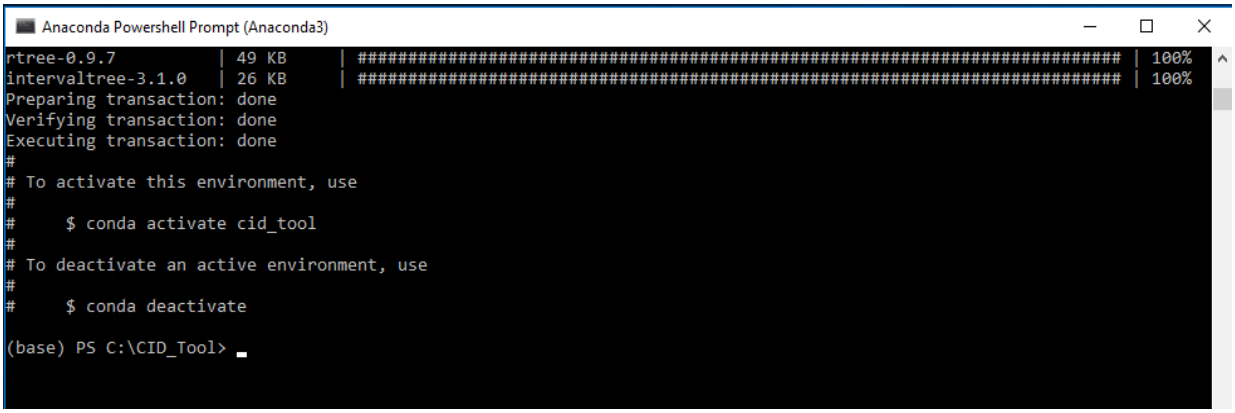
   `conda env create -f cid_tool_environment.yml`

6. Accept all the elevated rights requests:



Note: It may take a long time to complete the environment setup (10-15 minutes, depending on the Internet speed and computer environment).

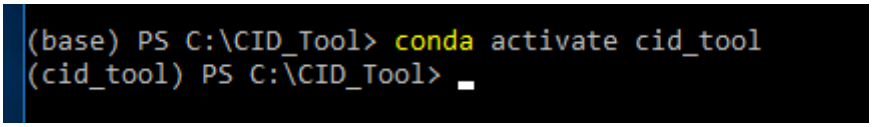
7. At the conclusion of the environment setup, you should see this message if successful:




```
#
# To activate this environment, use
#
#     $ conda activate cid_tool
#
# To deactivate an active environment, use
#
#     $ conda deactivate
```

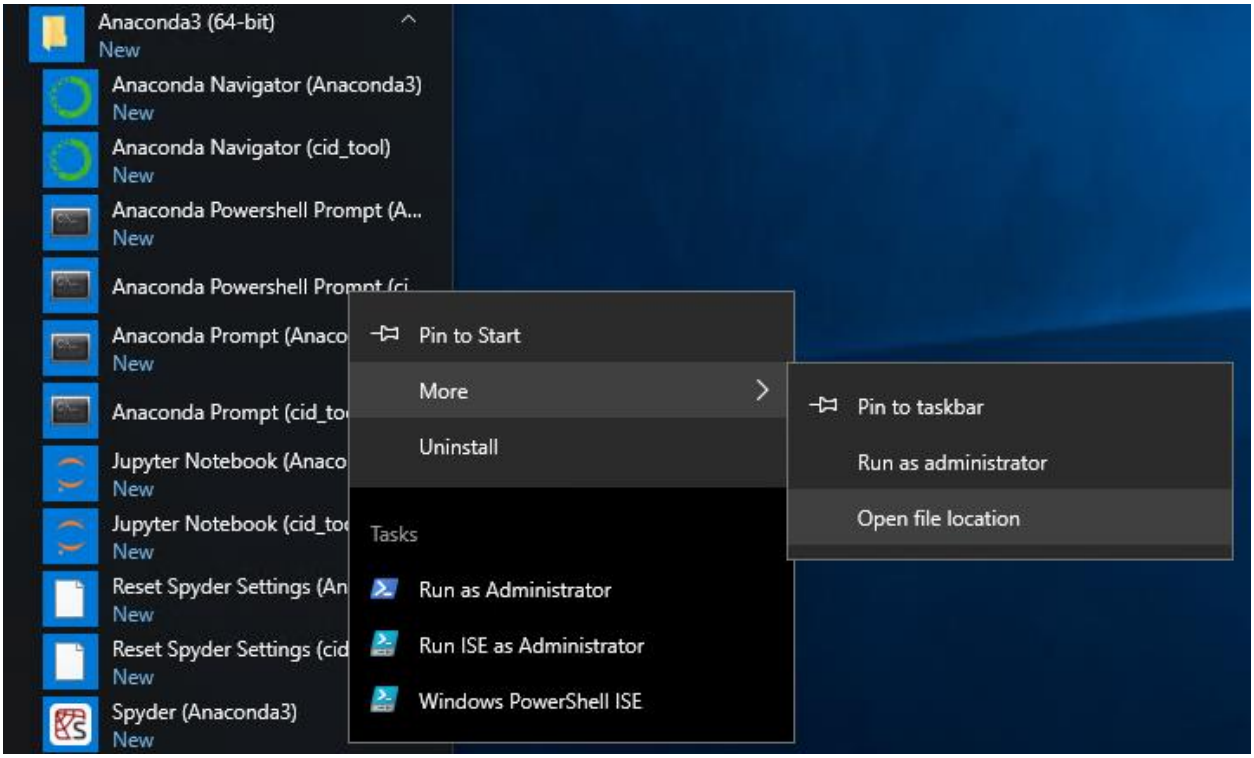
8. Type the following command:

```
conda activate cid_tool
```

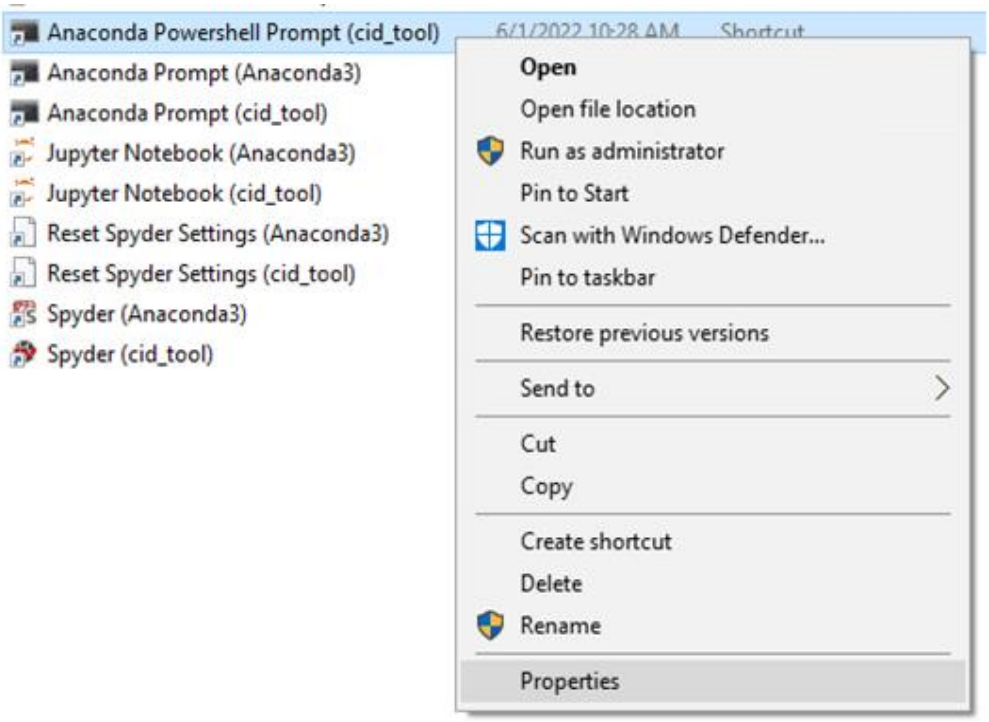


9. Associate shortcut with CID Tool folder

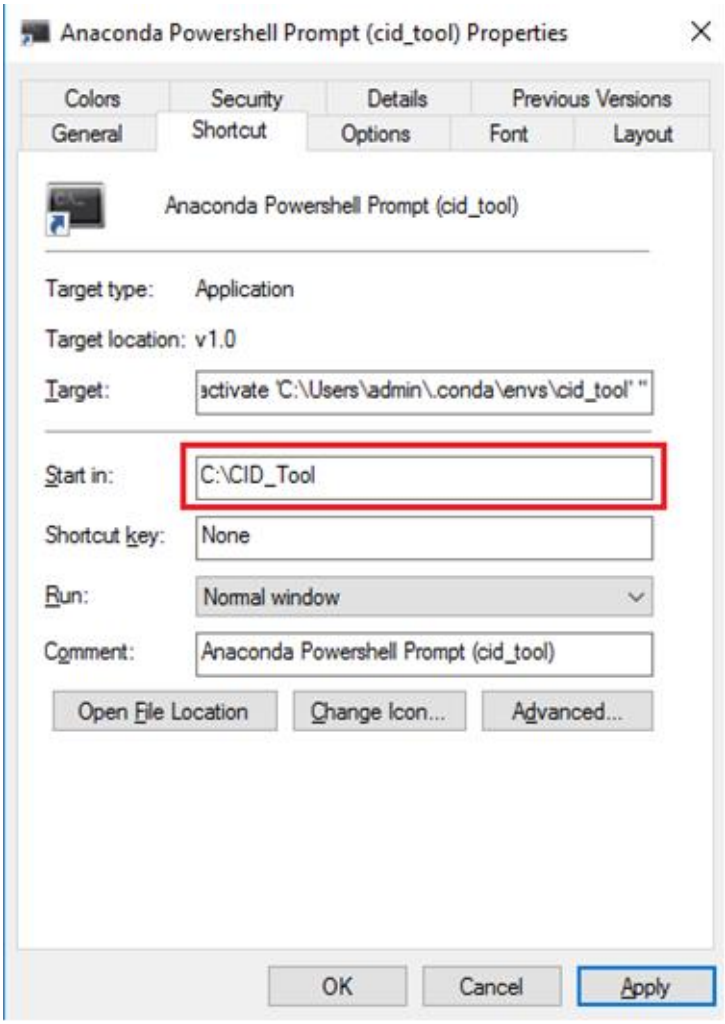
   Open Windows Start Menu and find the shortcut for "Anaconda Powershell Prompt (cid_tool)". Right click on it and Open File Location:



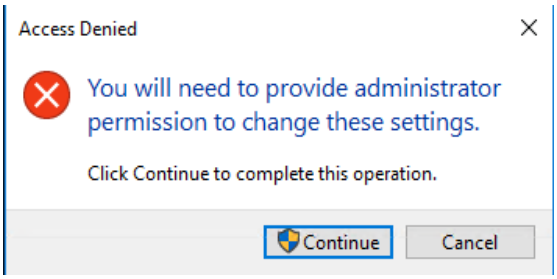
   Right click and select Properties:



Set the Start In value to the full path of the CID Tool folder:



Click Apply and accept the elevated rights prompt with Continue:



Click OK to close the shortcut properties.

Close all open windows.

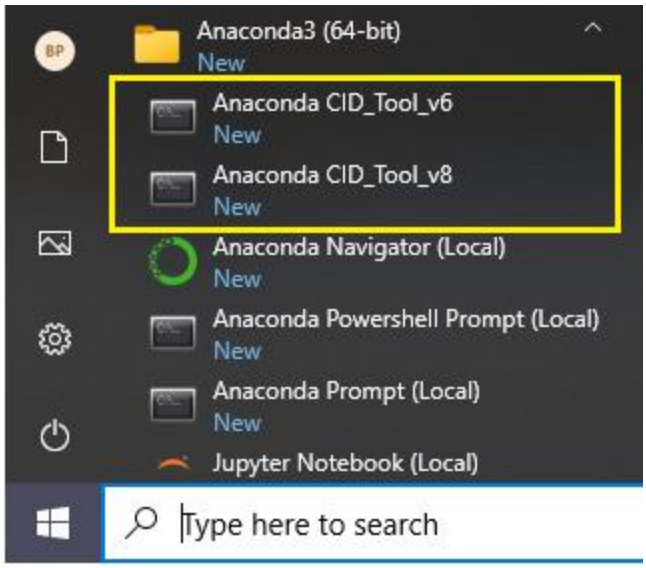
If more than one major version of the CID Tool is installed – repeat all steps 1-9 for each CID Tool folder, replacing for e.g. `C:\CID_Tool` with `C:\CID_Tool_v8`

Your computer is now set to run the CID Tool.

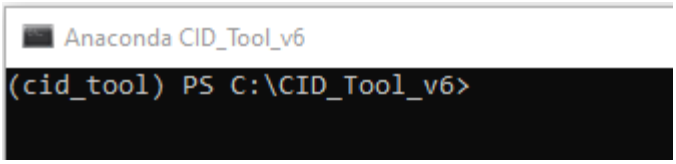
There is no requirement for an Internet connection from now on.

1.4.3 CID Tool run

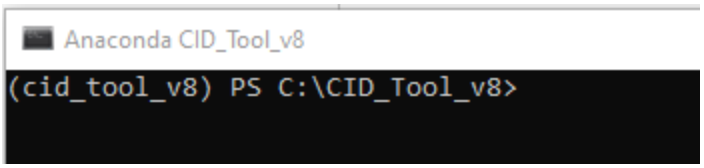
To run the CID Tool, launch first the Anaconda environment from Windows Start Menu > Anaconda Powershell Prompt (cid_tool *version you need*) :



CID Tool v6.* should have:

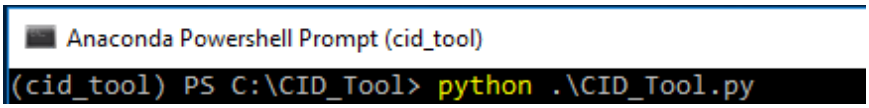


CID Tool v8.* should have:



Use the following command in the open window:

```
python .\CID_Tool.py
```



2. MCP IEC 61850 MMS Server Model

The MCP IEC 61850 MMS Server presents an IEC 61850 model to clients for monitoring and control of a substation. It is organized in a hierarchy composed of Logical Device (LD), Logical Node (LN), Data Object (DO) and Data Attribute (DA). The model also includes Datasets and Report Control Blocks (RCB). Datasets contain a collection of Data Objects. The reporting of Datasets to clients is controlled by RCBs.

2.1 Background Summary

This section provides a background summary of the IEC 61850 modelling. IEC 61850 experienced users can skip over this.

The Abstract Communications Service Interface (ACSI) is defined in 61850-7IEC 61850-7-2, 61850-7-3, and 61850-7-4. A fundamental component of ACSI is its information model, which defines the ACSI names of signals, and attaches a "semantic" to name parts. A semantic is a usually brief description of what the named item represents.

For instance, the name part "stVal" has the defined semantic "Status value of the data". The figure shows the information model that organizes the native device signals.

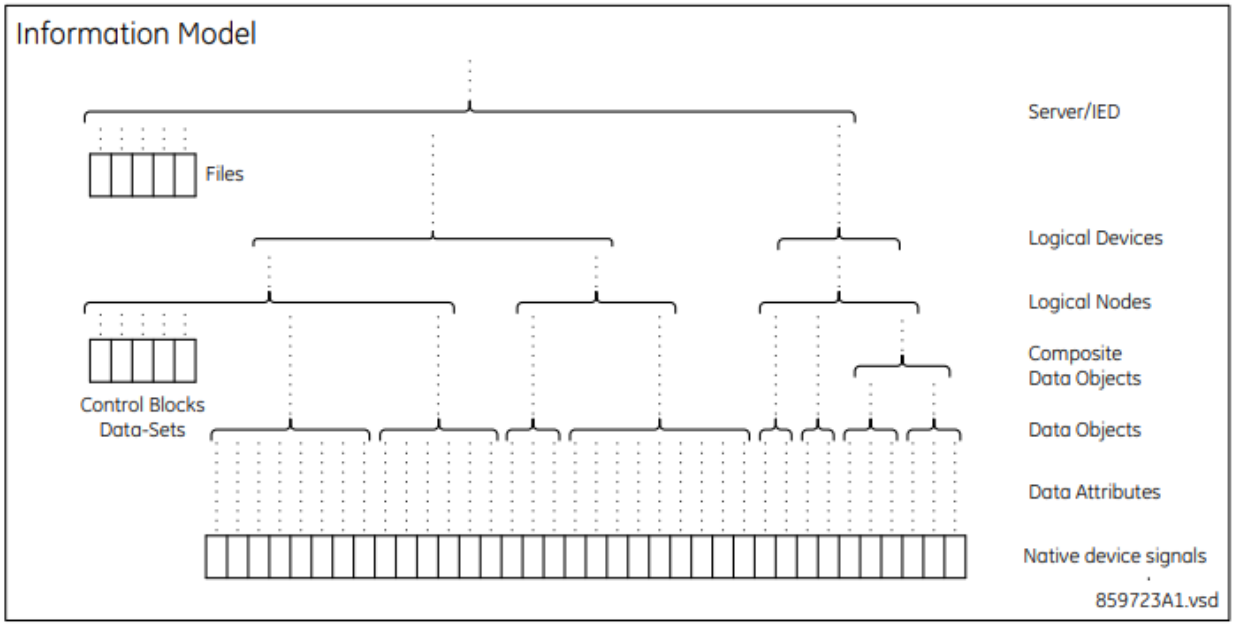


Figure 1: ASCI Block

The native IED signals (Legacy IED's, Pseudo points etc.) are assigned to entities known as Data Attributes (DAs). Data Attributes typically contain the value of a single signal, most often with a Boolean, Float or Enumerated value. Alternatively, a data attribute can have meta-data related to another data attribute, such as the quality, timestamp, and range of the other attributes. Data attributes have defined names and semantic as defined in IEC 61850-7-3:2010 clause 8. There are 15 pages of these in the standard, so they are not listed here.

A few representative data attributes are as follows:

- stVal — Status value of the data
- t — Timestamp of the last change in one of the attribute(s) representing the value of the data or in the q attribute

- q — Quality of the attribute(s) representing the value of the data

A collection of related data attributes is combined into an entity at the next level up in the hierarchy known as a Data Object (DO). Data objects are required to be formed in accordance with one of the Common Data Class (CDC) definitions in IEC 61850-7-3:2010 clause 7. A CDC defines what data attributes an implementing data object is required to contain and which data objects an implementing data object can optionally contain. CDCs also define the functional constraint (FC) of each data attribute. An FC is a two-letter code with additional information, such as ST (status information). For instance, the Single point status CDC, which is named SPS, requires data attributes stVal, q, and t, and it allows certain data attributes concerned with the substitution model, value update blocking, and description. The data attribute stVal is required by the CDC to be a Boolean value, q is required to be a code for the quality of stVal, and t is required to be the time at which stVal last changed state. Thus, an SPS data object contains an amalgamation of information about a Boolean condition, for instance the thermal alarm status of a thermal overload protection.

In some cases, data objects are constructed from data objects and data attributes. These are known as constructed data objects. An example is the Phase to ground/neutral related measured values of a three-phase system (WYE) CDC that is constructed of data objects implementing the Complex measured value (CMV) CDC. The complex measured values here are the individual phase and neutral phasor value measurements.

A collection of related data objects is combined into an entity at the next level up in the hierarchy known as a Logical Node. Logical nodes are required to be formed in accordance with one of the individual logical node class specifications in IEC 61850-7-4:2010 clause 5, as well as conforming to the common logical node class specifications in clause 5.3.3. A logical node class defines what kind of function an implementing logical node models (its "semantic"), what data objects an implementing logical node is required to contain, and which data objects an implementing logical node can optionally contain. A logical node class also defines the name and CDC of each of its data objects. IEC 61850-7-4:2010 clause 6 defines the semantic of standard data object names. For instance, the Instantaneous overcurrent logical node class, which has class name PIOC, requires an Op data object with the following CDC Protection activation information (ACT) and semantic:

"Operate (common data classes ACT) indicates the trip decision of a protection function (LN). The trip itself is issued by PTRC."

Logical node class PIOC also requires the mandatory data object Beh (Behaviour, meaning on, off, test, and so on) and permits the optional data objects Str (Start), OpCntRs (Resettable operation counter), StrVal (Start value setting) and several others from the common logical node class. It is possible for a device manufacturer to add data objects in addition to those specified by a logical node class, but the expansion rules in IEC 61850-7-1:2011 clause 14 must be followed. MCP devices do extend the standard logical nodes in some cases; the data objects implemented are as tabulated in the MICS.

Logical node names are required to be formed from the four-character logical node class name that it implements, a prefix text, and a suffix instance number. An example is PhsIocPIOC1, in which "PIOC" is the implemented logical node class name, "PhsIoc" is the prefix, and "1" is the instance number.

A collection of related logical nodes is combined into an entity at the next level up in the hierarchy known as a Logical Device. Logical devices are required to have one logical node implementing logical node LLN0, which addresses common issues for the containing logical device. Logical devices can also contain as many logical nodes as desired.

Note: The symbol "LDName" is used in standard documents to represent either the function related or product-related name as appropriate to the context, while "ldName" is used to define the function-related name. Upper/lower case is critically significant in many 61850 names.

The complete set of logical devices in an IED are combined into an entity at the next level up in the hierarchy known as a Server.

When a particular data attribute or data object needs to be referenced by an SCL configuration file, in many cases the name of each level in the information hierarchy are independently specified. For instance, to specify the reception of the power of AC source 1 from an external IED, SCL can contain the following:

```
<ExtRef iedName="Fdr1" ldInst="Meter" prefix="ACsrc" lnClass="MMXU"
lnInst="1" doName="TotW" daName="mag.f" fc="MX" />
```

In other cases, an ObjectReference is used to identify the data attribute. An ObjectReference concatenates the names of each hierarchical level with defined delimiting characters. For instance, the ObjectReference for the previous example looks like the following:

`Fdr1Meter/ACsrcMMXU1.TotW.mag.f`

This format is known as the ACSI ObjectReference format, which is used exclusively in SCL, and in communication messages where the value of a data attribute containing an ObjectReference is being transmitted.

However, in communications messages where an ObjectReference is a reference to the entity whose value is being communicated, it is reformatted according to the MMS addressing scheme specified in IEC 61850 8-1. Thus, on the wire, one can see a message requesting the present value of source 1 power identifying the requested data attribute as

`Fdr1Meter/ACsrcMMXU1$MX$TotW$mag$f`

MCP has functionality which results in signal types that have no equivalence to the IEC 61850 standard name space. In such cases a GE name space was used, and these custom definitions are marked in the System Object Reference tables, Column "MCP Custom LN/DO" as either LN (for custom LN class) and/or DO (custom DO).

2.2 Logical Devices and Hierarchy

The MCP 61850 Server Model uses product-related naming according to IEC 61850-90-2 subsection 7.1.3.3.2. Product-related naming means that Logical Device names are constructed by concatenating the "Physical Device Name" of the IEC 61850 Server Logical Remote Unit (LRU) defined in the "Connection" page of DSAS Offline Editor with the resulting construct of Logical Device names defined in the System Points mapped to the LRU.

`<PhysDevName><Construct of LD Names>`

The `<Construct of LD Names>` in the MCP Data Model in the 61850 MMS Server is as below:

2.2.1 System logical devices

These model MCP system and automation related data and controls, originated in the MCP database (i.e. not from IEDs). These are database points originated from MCP Pseudo-points, Data Translation Applications (DTA), or Automations.

- Data associated with DTA points uses Logical Device "`LD0_`" for all the Gateway originated points, the LD Instance name associated with all DTA pseudo points are named as: `<LD0_+Application_ID>` (e.g. LD0_CALC, LD0_HAMA, etc.).
  These are enforced to be unique and start with LD0_
  These **cannot** be changed when modeled in the IEC 61850 Server.

- Data associated with IED (Client, DCA) connection status has the LD represented in the MCP database as `<IED_Physical_Device_Name>/GWComms`
  These are enforced to be unique and do not start with LD0_
  These **cannot** be changed when modeled in the IEC 61850 Server

- Data associated with Master (Server, DPA) connection status has the LD represented in the MCP database as `<Master_Assigned_LD_Name>/GWComms`
  These are enforced to be unique and do not start with LD0_
  These **cannot** be changed when modeled in the IEC 61850 Server.

2.2.2 Proxy logical devices

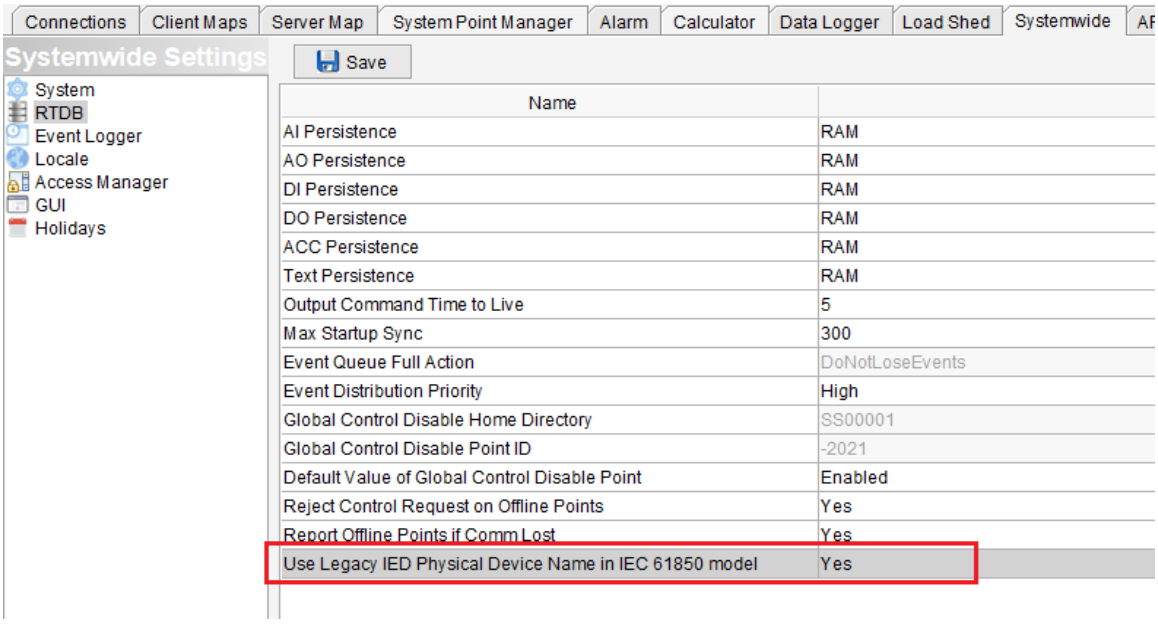
These model MCP data received from IEDs via "Client" applications (DCA).

- Data from IEC 61850 IEDs (via Loader) inherits the model of the IED. The LD is represented in the MCP database as a construct of: `<IED_Physical_Device_Name><IED_LD>`
  These are enforced to be unique.
  These **cannot** be changed when modeled in the IEC61850 Server.

- Data from non-IEC 61850 IEDs ("legacy") can have the LD represented according to two different naming models:
  - **Product-related** naming
  - **Function-related** naming

Only for non-IEC 61850 IEDs ("legacy") is possible to use either product-related or function-related naming according to IEC 61850-90-2 subsection 7.1.3.3.3.

- The naming model for legacy IEDs is set for the entire MCP device in offline editor under: `Systemwide > RTDB >` **`"Use Legacy IED Physical Device Name in IEC 61850 model"`** `(Yes/No).`



  - If set to **Yes**, is product-related naming and the Physical Device Name will be used to compose the overall LD Name.
  - If set to **No**, is function-related naming and the Physical Device Name will be ignored.

2.2.2.1 Product-related naming for Legacy IEDs

The LD is represented in the MCP database as a construct of:

<IED_Physical_Device_Name>{IED_LD} where {IED_LD} is optional.

This ensures automatic uniqueness of Object References from legacy IEDs, but will prevent mixing data from different legacy IEDs under the same LD.

Example of Product-related naming:

I have a station with 2 bus sections and 3 feeders in each bus section. Each feeder is served by one legacy device (e.g. here D.20C IO) – making 6 legacy devices in total.

I need to report Active Power (W) in each feeder based on product related naming, under the LD = MEAS.

In the legacy client map I have one ObjRef: `MMXU1.TotW.mag.f[MX]` and no overrides:

IEC 61850 Reference	LN Instance	DO Instance	IEC 61850 LD Override	IEC 61850 Prefix Override
MMXU.TotW.mag.f[MX]	1			

In connections I have the 6 legacy devices.

I would configure in Connections as below, all with same map file:

Map File	IEC 61850 Physical Device Name	IEC 61850 LD	IEC 61850 LN Prefix
D20C1_01_ACC.xml	D20_C1_1	MEAS	
D20C1_01_ACC.xml	D20_C1_2	MEAS	
D20C1_01_ACC.xml	D20_C1_3	MEAS	
D20C1_01_ACC.xml	D20_C1_4	MEAS	
D20C1_01_ACC.xml	D20_C1_5	MEAS	
D20C1_01_ACC.xml	D20_C1_6	MEAS	

In this example the resulting ObjRefs for the IEC61850 Server Model will be:

D20_C1_1MEAS/MMXU1.TotW.mag.f[MX]

D20_C1_2MEAS/MMXU1.TotW.mag.f[MX]

D20_C1_3MEAS/MMXU1.TotW.mag.f[MX]

D20_C1_4MEAS/MMXU1.TotW.mag.f[MX]

D20_C1_5MEAS/MMXU1.TotW.mag.f[MX]

D20_C1_6MEAS/MMXU1.TotW.mag.f[MX]

2.2.2.2 Function-related naming for Legacy IEDs

By not using `<IED_Physical_Device_Name>` in the LD Construct – this allows mixing data from different legacy IEDs under the same LD.

The LD is represented in the MCP database as

`<IED_LD>` which is mandatory in this model.

These **can** be changed at the Connections level for IEC61850 Server modelling.

In this mode:

- user must enter LD Names for all IED LD fields in Connection tab.
- the MCP configuration tool cannot automatically enforce the uniqueness of Object References from legacy IEDs and the user is responsible to check uniqueness in Mapper.
- using LD Name and Prefix overrides in the legacy IED client map and then use this same client map for IEDs with same LD Name in Connections tab – will result in multiple identical Object References (duplicates); this must be resolved by users by changing at least one element of the Object Reference build.
- if the application requires some legacy IEDs to be modelled using their `<IED_Physical_Device_Name>` then user must manually enter the `<IED_Physical_Device_Name>` in the `<IED_LD>` field in Connections, only for those IEDs.

Example of Function-related naming with separate prefixes:

I have a station (AA1) with 2 bus sections (E1, E2) and 3 feeders (Q1, Q2, Q3) in each bus section. Each feeder is served by one legacy device (e.g. here D.20C IO) – making 6 legacy devices in total.

I need to report Active Power (W) in each feeder grouped into two LD, e.g. E1 and E2 as LD Name, and Q1, Q2, Q3 as prefixes.

In the legacy client map I have one ObjRef: `MMXU1.TotW.mag.f[MX]` and no overrides:

IEC 61850 Reference	LN Instance	DO Instance	IEC 61850 LD Override	IEC 61850 Prefix Override
MMXU.TotW.mag.f[MX]	1			

In connections I have the 6 legacy devices that I need to group into 2x LD Names in the model (3 devices in each).

I would configure in Connections as below, all with same map file:

Map File	IEC 61850 Physical Device Name	IEC 61850 LD	IEC 61850 LN Prefix
D20C1_01_ACC.xml	D20_C1_1	AA1E1	Q1
D20C1_01_ACC.xml	D20_C1_2	AA1E1	Q2
D20C1_01_ACC.xml	D20_C1_3	AA1E1	Q3
D20C1_01_ACC.xml	D20_C1_4	AA1E2	Q1
D20C1_01_ACC.xml	D20_C1_5	AA1E2	Q2
D20C1_01_ACC.xml	D20_C1_6	AA1E2	Q3

In this example the resulting ObjRefs for the IEC61850 Server Model will be:

AA1E1/Q1MMXU1.TotW.mag.f[MX]

AA1E1/Q2MMXU1.TotW.mag.f[MX]

AA1E1/Q3MMXU1.TotW.mag.f[MX]

AA1E2/Q1MMXU1.TotW.mag.f[MX]

AA1E2/Q2MMXU1.TotW.mag.f[MX]

AA1E2/Q3MMXU1.TotW.mag.f[MX]

More details on creating these models are described in the subsequent sections.

Except for Legacy IEDs in function-related naming mode - DS Agile MCP Studio generates internally in the MCP database a unique `LD_Instance_name` for each instance of DCAs, DPAs and DTAs, based on the LD Uniqueness Rules presented above.

The MCP 61850 MMS server can support any number of Logical Devices (LD), limited only by process memory.

The MCP IEC 61850 MMS Server Performance Data is documented in the MCP v3.00 Release Notes (*MIS-0109 MCP Firmware Release Notes V300*).

The logical devices are organized in a two-level hierarchy: one logical device (Root LD/LD0 in this case) is referenced by all other LDs as a higher-level logical device.

The root LD contains the following value (refer to LLN0/ LPHD Initialization for more details):

`LLN0.NamPlt, LLN0.Beh, LLN0.Health, LLN0.Mod, LPHD1.PhyNam, LPHD1.Proxy, LPDH1.RedSt`

The root logical device have the data `LPHD.Proxy.stVal` of the LPHD logical node set to "False". If instantiated in other logical devices, `LPHD.Proxy.stVal` shall be set to "True" and system point mapping is not allowed for that attribute.

2.3 Logical Nodes

The MCP IEC61850 MMS Server supports:

2.3.1 System logical nodes

These represent the MCP system and automation related data and controls, originated in the MCP database (i.e. not from IEDs).

- Database points originated from MCP owned Data Translation Applications (DTA), or Automations.
- Pseudo points associated with DCAs and DPAs (e.g. communication status, device status, etc.). These do not include actual points originated in IEDs.
- These **cannot** be changed when modeled in the IEC61850 Server.

2.3.2 Proxy logical nodes

These represent data in MCP received from IEDs via "Client" applications (DCA).

- Data from IEC 61850 IEDs (via Loader) inherits the LN and Object Reference of the IED. If data acquired from IEC 61850 IEDs contains custom data models, e.g. custom LN or DAO names – these will NOT be processed into the MCP 61850 Server CID file. Please ensure you do not use custom data in the IEC 61850 IEDs.
  These **cannot** be changed when modeled in the IEC 61850 Server.
- Data from non-IEC 61850 IEDs ("legacy") can be associated by the user, in the legacy client map, with custom LN as per IEC 61850 standard rules.
  These **can** be changed at the Client Map level for IEC61850 Server modelling.

3. Database Associations for IEC 61850

MCP applications *without* IEC 61850 MMS Server

MCP can be configured and used without IEC 61850 MMS Server associated data models.

This applies to legacy applications where the reporting of data is performed exclusively to non-IEC 61850 collection points (e.g. to Master Stations using DNP3, IEC 60870-5-101/104, MODBUS).

In this case there is no need to visualize or to associate IEC 61850 models to the database.

For data collected from IEC 61850 IEDs – the MCP database will indeed inherit the IEC 61850 model from those IEDs, but for legacy collection points this is not required further.

Same, for the MCP automation related data, and communication pseudo points originated in the MCP itself – there is no need to associate it with IEC 61850 models when reporting of data is performed exclusively to non-IEC 61850 collection points.

Therefore – to aid and simplify the MCP database organization for all applications **without** IEC 61850 MMS Server – the IEC 61850 Model is disabled at database level by default.

MCP applications *with* IEC 61850 MMS Server required

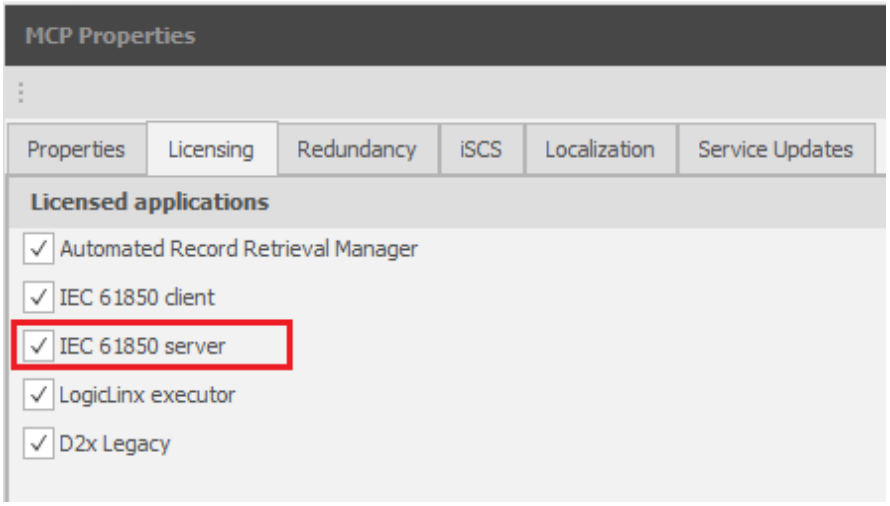
In applications with IEC 61850 MMS Server, the IEC 61850 Model at database level must be present and visible. This allows the MCP to create an IEC 61850 MMS Server model for:

- All data originated from IEC 61850 IEDs (if any),
- All or subsets of data originated from legacy IEDs,
    - Conceptually – the association of legacy data points with IEC 61850 ACSI Object References is done directly in the IED templates (client maps), which simplifies and automates greatly the IEC 61850 modelling
    - Not all legacy data has to be associated with IEC 61850 models, only the data desired to be present in the IEC 61850 MM Server models
- All data originated in the MCP itself (e.g. Automation data, communications pseudo points, other internal MCP data)

Therefore – to configure and operate the MCP with an IEC 61850 MM Server – this must be enabled by the user in *MCP Device Properties* > *Licensing* tab. Below are the requirements to be met.

3.1 Enabling the IEC 61850 Server license in Device Properties

For IEC 61850 Server Configurations – the associated IEC 61850 Server license must be enabled in the MCP Device Properties > Licensing tab:



Note: User has the option to later disable IEC 61850 Server by clearing the "IEC 61850 Server" license checkbox in Device Properties. When disabled, any configuration and IEC 61850 models previously associated with legacy client maps will be retained and will be reverted if the option is Enabled again. However, configuration may be out of sync depending on the configuration workflow, for e.g. a legacy signal may have changed from being a "voltage" to being a "current", but the previously associated IEC 61850 Object Reference will still indicate a "voltage" type. It is expected the user will re-check the cross-associations in legacy client maps in this case.

3.2 Uniqueness Rules for Device Names

In the IEC 61850 MMS Server data model – the Automation (DTA, System) LD Names are automatically assigned by the configuration tool as: `LD0_+Application_ID` making these inherently unique.

For all devices connected to the MCP (DCA, DPA), *Uniqueness Rules* are implemented which ensure a unique LD name is associated with each Connection and each IED, except when using function-related naming. These rules are applicable to the Connections page of the MCP Offline Configuration tool.

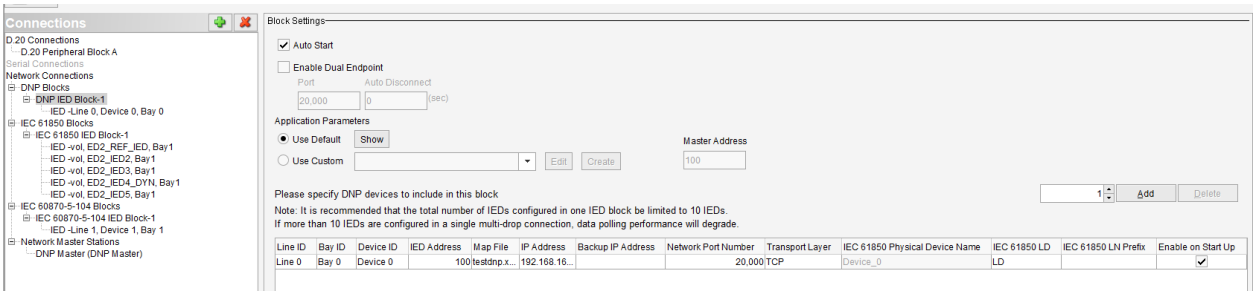
3.2.1 IEC 61850 Physical Device Name

Each instantiated IED must have a unique assigned `IEC 61850 Physical Device Name` which is then used by the IEC 61850 MMS Server model.

This is automatically generated from the `Device ID` based on the rules below to comply with the naming convention in the standards IEC 61850-7-2 and IEC 61850-6. All characters are retained except below:

1. 'whitespace' - ~ \ / [ ] { } ( ) become all _ ("underscore")
2. ! becomes 1
3. ? becomes 2
4. # becomes 3
5. + becomes 4
6. ^ becomes 6
7. * becomes 8

8. < > become 0 and 9 respectively



Notes:

If the first letter of the `Device ID` is a number, it is converted to [a-j] based on the [0-9] equivalence.

The IEC 61850 MMS Server model requires that each `Physical Device Name` is unique within a given MCP configuration space. If the `Device ID` is not unique, then the `Physical Device Name` appends the Home Dir at the end to make it unique.

If a specific `Physical Device Name` is desired in the IEC 61850 MMS Server model – then ensure that `Device ID` is configured to be that specific value, and is unique.

The character replacement rules above should apply when working with legacy MCP configurations, before enabling the IEC 61850 MMS Server.

When working with new MCP configurations in presence of IEC 61850 MMS Server – the `Device ID` should be assigned upfront as IEC 61850 compliant and unique.

4. Assigning IEC 61850 Object References to Legacy Devices

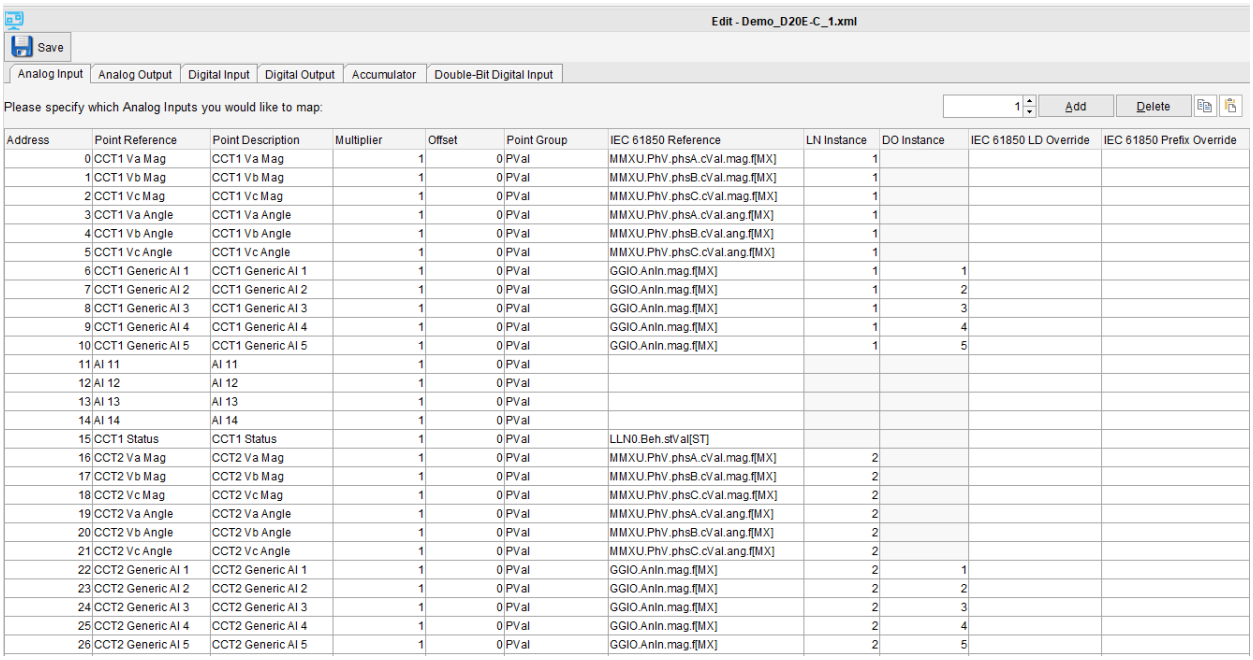
This section describes how IEC 61850 Object References (ObjRef) are assigned to Legacy IED Devices (Modbus, DNP etc.) in the MCP database.

The IEC 61850 columns are visible in the Client Map files only when IEC 61850 Server is enabled in Device Properties > Licensing tab.

- IEC 61850 Reference
- LN Instance
- DO Instance
- IEC 61850 LD Override
- IEC 61850 Prefix Override

4.1 Legacy Client Map Files

Below is the snapshot of a Legacy DNP Client Map file configured in MCP with IEC61850 server enables as mentioned in the above section



Edit - Demo_D20E-C_1.xml

Save

Analog Input | Analog Output | Digital Input | Digital Output | Accumulator | Double-Bit Digital Input

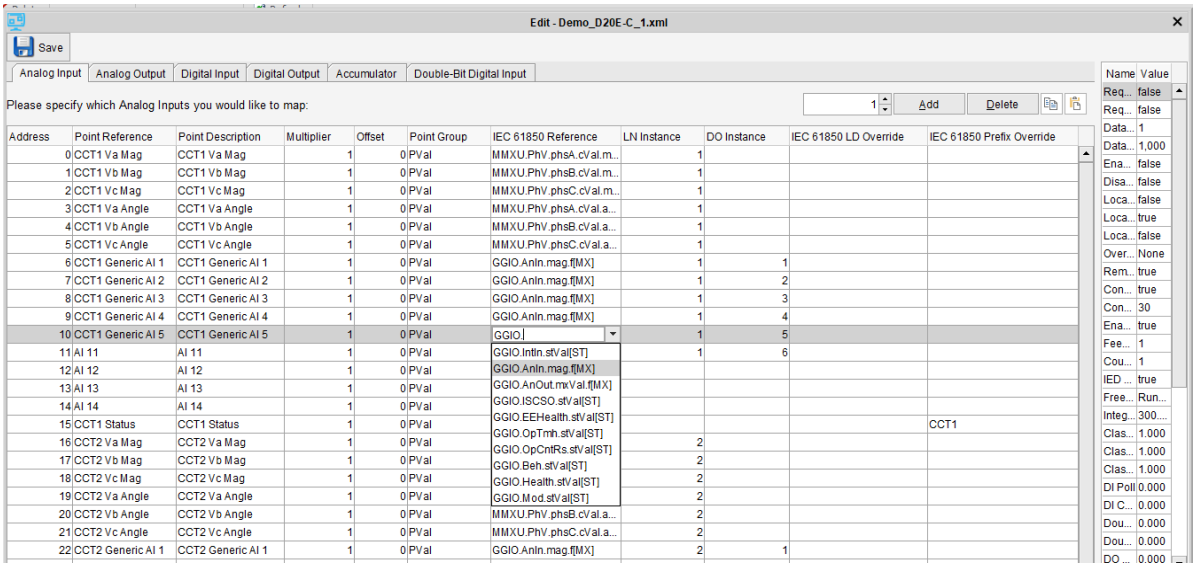
Please specify which Analog Inputs you would like to map: 1 Add Delete

Address	Point Reference	Point Description	Multiplier	Offset	Point Group	IEC 61850 Reference	LN Instance	DO Instance	IEC 61850 LD Override	IEC 61850 Prefix Override
0	CCT1 Va Mag	CCT1 Va Mag	1	0	PVal	MMXU.PhV.phsA.cVal.mag.f[MX]	1			
1	CCT1 Vb Mag	CCT1 Vb Mag	1	0	PVal	MMXU.PhV.phsB.cVal.mag.f[MX]	1			
2	CCT1 Vc Mag	CCT1 Vc Mag	1	0	PVal	MMXU.PhV.phsC.cVal.mag.f[MX]	1			
3	CCT1 Va Angle	CCT1 Va Angle	1	0	PVal	MMXU.PhV.phsA.cVal.ang.f[MX]	1			
4	CCT1 Vb Angle	CCT1 Vb Angle	1	0	PVal	MMXU.PhV.phsB.cVal.ang.f[MX]	1			
5	CCT1 Vc Angle	CCT1 Vc Angle	1	0	PVal	MMXU.PhV.phsC.cVal.ang.f[MX]	1			
6	CCT1 Generic AI 1	CCT1 Generic AI 1	1	0	PVal	GGIO.AnIn.mag.f[MX]	1	1		
7	CCT1 Generic AI 2	CCT1 Generic AI 2	1	0	PVal	GGIO.AnIn.mag.f[MX]	1	2		
8	CCT1 Generic AI 3	CCT1 Generic AI 3	1	0	PVal	GGIO.AnIn.mag.f[MX]	1	3		
9	CCT1 Generic AI 4	CCT1 Generic AI 4	1	0	PVal	GGIO.AnIn.mag.f[MX]	1	4		
10	CCT1 Generic AI 5	CCT1 Generic AI 5	1	0	PVal	GGIO.AnIn.mag.f[MX]	1	5		
11	AI 11	AI 11	1	0	PVal					
12	AI 12	AI 12	1	0	PVal					
13	AI 13	AI 13	1	0	PVal					
14	AI 14	AI 14	1	0	PVal					
15	CCT1 Status	CCT1 Status	1	0	PVal	LLN0.Beh.stVal[ST]				
16	CCT2 Va Mag	CCT2 Va Mag	1	0	PVal	MMXU.PhV.phsA.cVal.mag.f[MX]	2			
17	CCT2 Vb Mag	CCT2 Vb Mag	1	0	PVal	MMXU.PhV.phsB.cVal.mag.f[MX]	2			
18	CCT2 Vc Mag	CCT2 Vc Mag	1	0	PVal	MMXU.PhV.phsC.cVal.mag.f[MX]	2			
19	CCT2 Va Angle	CCT2 Va Angle	1	0	PVal	MMXU.PhV.phsA.cVal.ang.f[MX]	2			
20	CCT2 Vb Angle	CCT2 Vb Angle	1	0	PVal	MMXU.PhV.phsB.cVal.ang.f[MX]	2			
21	CCT2 Vc Angle	CCT2 Vc Angle	1	0	PVal	MMXU.PhV.phsC.cVal.ang.f[MX]	2			
22	CCT2 Generic AI 1	CCT2 Generic AI 1	1	0	PVal	GGIO.AnIn.mag.f[MX]	2	1		
23	CCT2 Generic AI 2	CCT2 Generic AI 2	1	0	PVal	GGIO.AnIn.mag.f[MX]	2	2		
24	CCT2 Generic AI 3	CCT2 Generic AI 3	1	0	PVal	GGIO.AnIn.mag.f[MX]	2	3		
25	CCT2 Generic AI 4	CCT2 Generic AI 4	1	0	PVal	GGIO.AnIn.mag.f[MX]	2	4		
26	CCT2 Generic AI 5	CCT2 Generic AI 5	1	0	PVal	GGIO.AnIn.mag.f[MX]	2	5		

As shown in the above snapshot, user can choose to add IEC 61850 References only to data points that need to be populated in the IEC 61850 model. Points (rows) left blank in the IEC 61850 columns will continue to operate normal but without an IEC 61850 association.

1. To select the IEC 61850 Reference for a data point, a user-friendly UI has been built with following features:

   a. User can start typing the LN name, or DO names, or words like: Voltage, Current, Frequency, Alarm, Recorder, etc. – and a list filtered for supported Object References is displayed when expanding the drop down button, as shown below:



   User can scroll the drop down to select the relevant Object Reference with the mouse – at which point the drop down filtered list is closed.

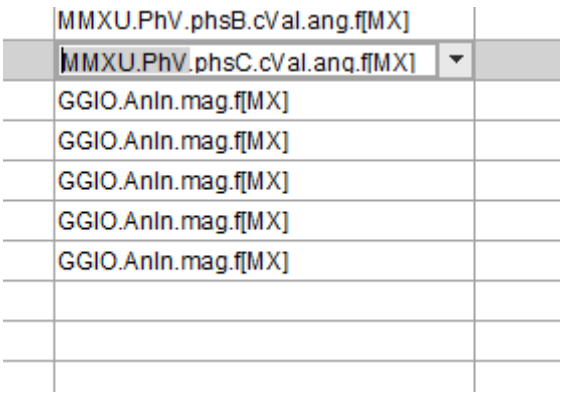
   The filter is based on the point type (AI, DI, etc.) and on background searching of everything associated with a given IEC 61850 object reference class and type, including the description associated with it, as listed in the standard in English language.

   b. User can select partial strings (mouse click + drag) in an Object Reference from a previously instantiated data point, copy it (CTRL+C) and paste it (CTRL+V) to a new blank field, then immediately click the arrow down which will expand a filtered list based on the pasted string. Do not simply navigate away or press <Enter> right after the paste operation, because the string will be incomplete and invalid at that time and an error message will be displayed.

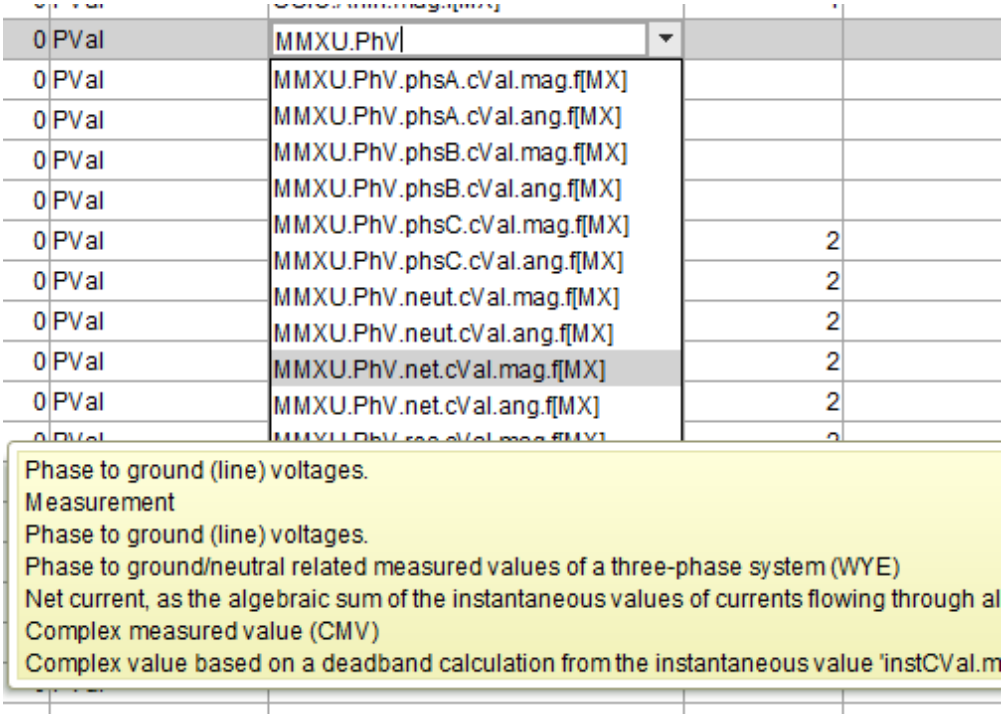
   - Example 1:

     In this example I want to repeat the same LN Class but for a slightly different DO.

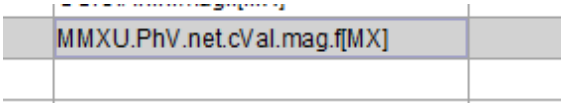
     Select and copy the first string part of the existing Object Reference, here the MMXU Phase Voltage part:



Paste it in a new empty row and immediately click on drop down – only Object References starting with the pasted string will be shown, move your mouse above the entries, the tooltip will explain each one (do not yet click mouse):



Select with mouse what entry is desired, the list closes and selection is finalized:

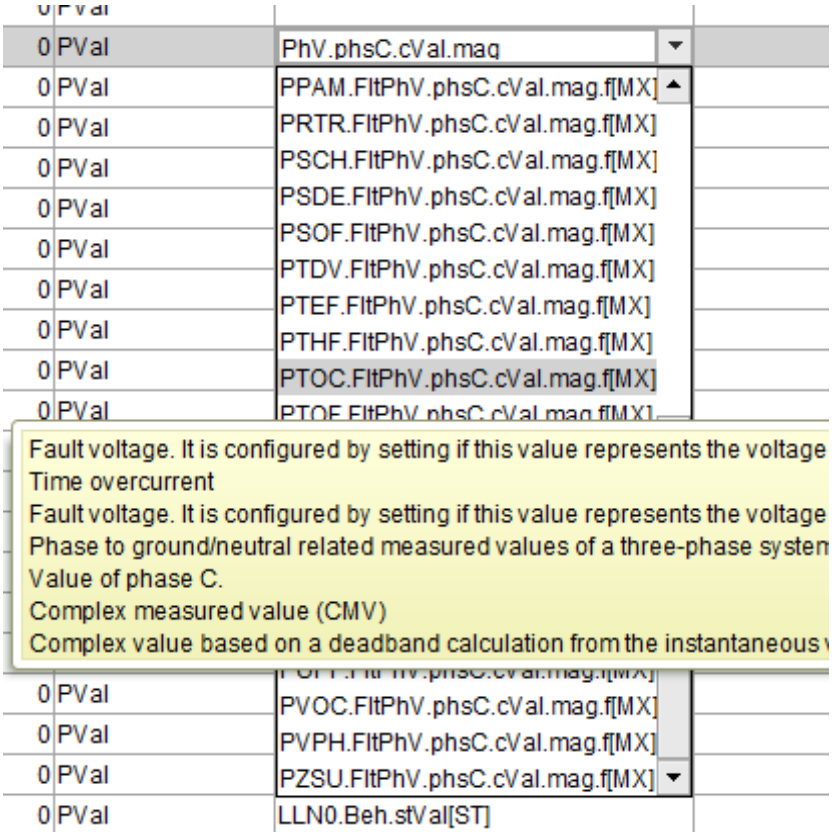


- Example 2:

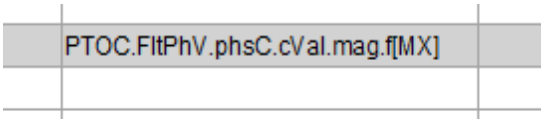
  In this example I want to find other LN classes that contain V Phase C magnitude, so the selected string is in the middle of the Object Reference:

  Select and copy the data referencing V Phase C, magnitude:

  Paste it in a new empty row and immediately click on drop down – only Object References containing the pasted string will be shown. As seen in the example, this will list all possible LN classes that have Voltage Phase C magnitude. Move your mouse above the entries, the tooltip will explain each one (do not yet click mouse):



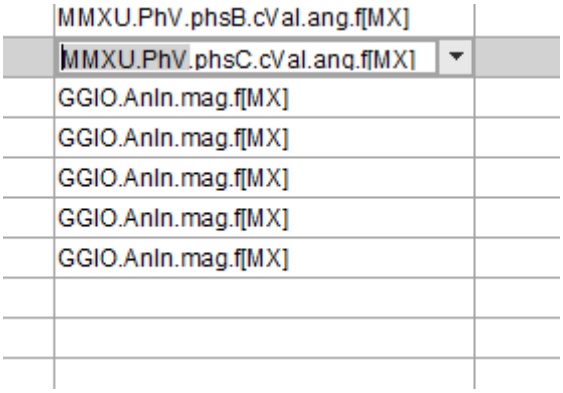
Perhaps I am now interested in a different LN class, e.g. PTOC; select with mouse what entry is desired, the list closes and selection is finalized:



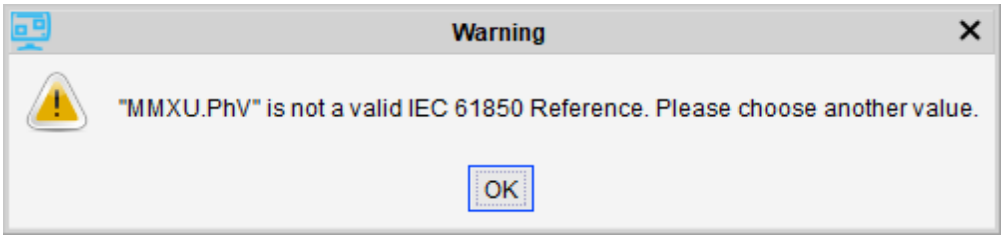
- Example 3:

  This is an example when paste was not followed by drop down list action, but instead was <Return> - resulting in an incorrect action.

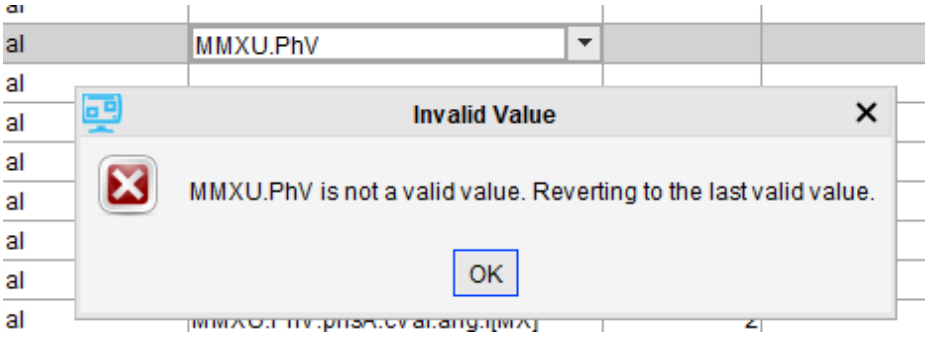
  Select and copy the first string part of the existing Object Reference, here the MMXU Phase Voltage part:



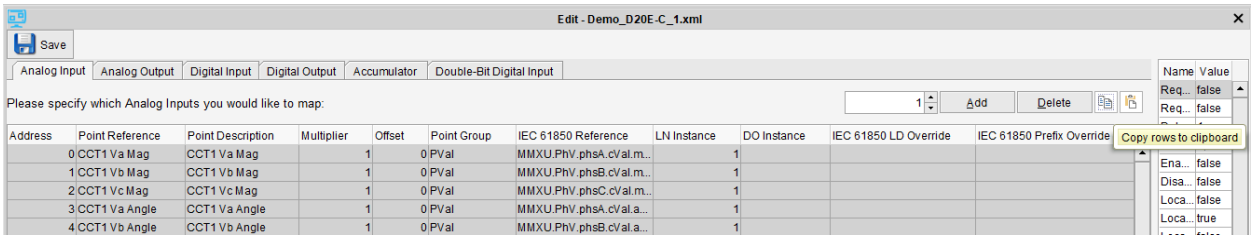
Paste it in a new empty row and then Enter (on keyboard):



or navigate away:

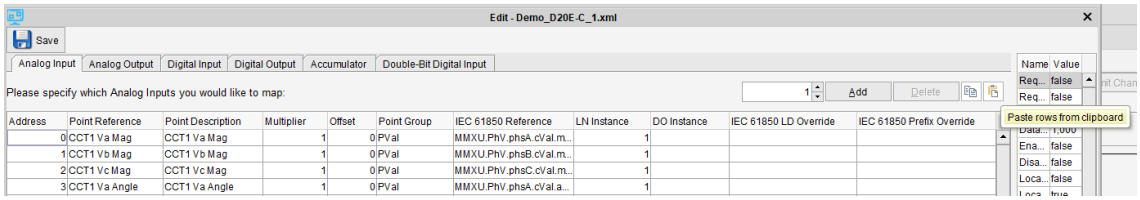


c. User can copy all the columns in the client map file to an Excel sheet by using the copy button and pasting the same in excel

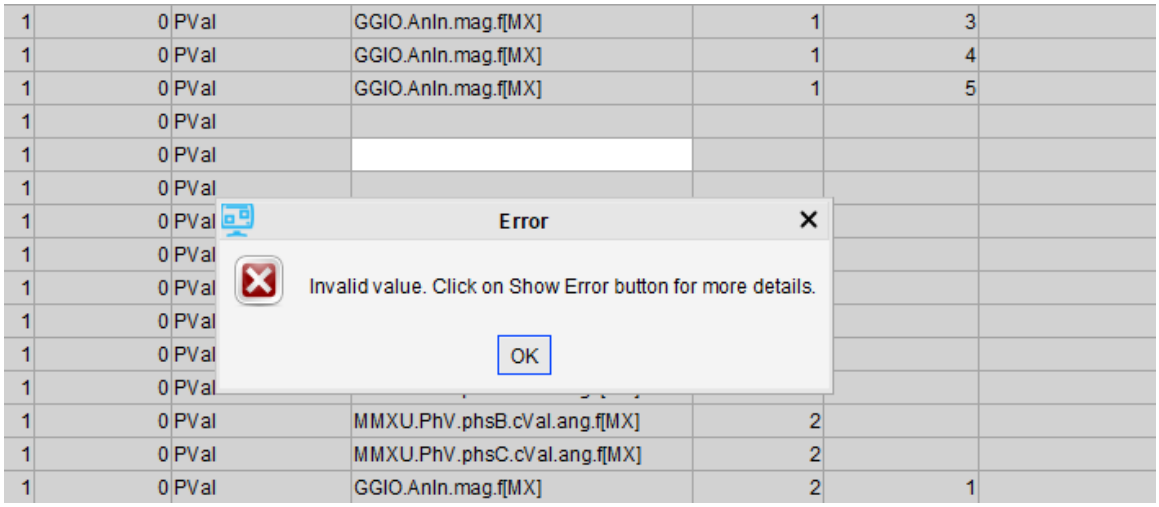


User can then use excel features to update the columns, for e.g. LN and adding DO instances, etc. It is not recommended to use Excel to manipulate the Object Reference strings because there is no data validation performed in Excel, for this reason – leave this as was pasted into Excel.

After updating the data in Excel user can copy the Excel content (all range must be selected) and paste it back to DSAS Offline configurator using the below Paste option



Invalid pasted data will be removed or replaced with defaults:



1	0	PVal	GGIO.AnIn.mag.f[MX]	1	3
1	0	PVal	GGIO.AnIn.mag.f[MX]	1	4
1	0	PVal	GGIO.AnIn.mag.f[MX]	1	5
1	0	PVal			
1	0	PVal			
1	0	PVal			
1	0	PVal			
1	0	PVal			
1	0	PVal			
1	0	PVal			
1	0	PVal			
1	0	PVal			
1	0	PVal	MMXU.PhV.phsB.cVal.ang.f[MX]	2	
1	0	PVal	MMXU.PhV.phsC.cVal.ang.f[MX]	2	
1	0	PVal	GGIO.AnIn.mag.f[MX]	2	1

2. LN instance is a mandatory field for all LNs except LLN0 (LLN0 must be left blank). By default, LN Instance is set to 1 and user can modify it based on the configuration needs. Same or different instances can be configured as needed by the application. Maximum value is 99.
3. DO instances are mandatory for DOs that support multiple instances. For e.g. by Logical Nodes for Generic References (LN Group: G). By default, the value is set to 1. Same or different instances can be configured as needed by the application.

   For all other LNs, DO instance is set to blank and read only.
4. Multiplier and Offset must be configured in the Client Map file to reflect the correct engineering value in the database.

   There is no option for scaling at the Server Level.
5. If the LD Override field is left empty, then LD entered in "Connections" page is used (refer to Legacy Connections section next). However, users can override the LD coming from "Connections" page if the client map is for a sub-level data concentrator IED.
6. If the Prefix Override field is left empty, then LN Prefix entered in "Connections" page is used. However, users can override the LN prefix coming from "Connections" page if the client map is for a sub-level data concentrator IED.
7. If the LN class is LLN0 – the Prefix Override must be left blank.

Best Practice - User must ensure there are no duplicates inside the same client map. If user needs same Object Reference, LN Instance and DO instance for multiple points, they need to use the override options and make sure that the combination is unique. There is no automated check for duplicates inside a client map.

Assignment of Object References to Double Bit Digital Input Points

Client maps for DNP3 and IEC 101/104 protocols support Double Bit Digital Input Point definitions.

When in the Double Bit Digital Input tab - each row has a pair of binary input points: one for OFF and one for ON.

The IEC 61850 Object References for Data Objects with double bit assignments contain (1) or (2) at the end, for e.g.:

```
XCBR.Pos.stVal[ST](1)
XCBR.Pos.stVal[ST](2)
```

The bit which is selected in the IEC 61850 Reference cell is associated with the OFF Point, and the paired bit with the ON Point.

Only one selection is required – either (1) or (2).

Address	Off Point Ref	Off Point ON St...	Off Point OFF State	On Point Ref	On Point ON State	On Point OFF State	Point Group	IEC 61850 Reference
0	DBDI 0A	ON	OFF	DBDI 0B	ON	OFF	PVal	XCBR.Pos.stVal[ST](1)

Normally the object reference would be picked as (1), in which case:

- Bit (1) is associated with the OFF legacy bit (LSB).
- Bit (2) is associated with the ON legacy bit (MSB).

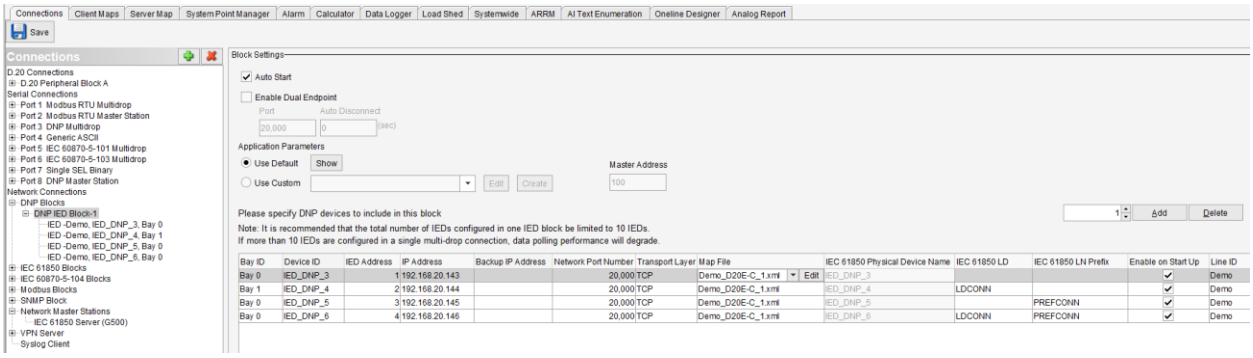
Assigning the Object Reference in reverse will swap the LSB and MSB bits in the IEC 61850 model and:

- Bit (2) is associated with the OFF legacy bit (LSB).
- Bit (1) is associated with the ON legacy bit (MSB).

Address	Off Point Ref	Off Point ON St...	Off Point OFF State	On Point Ref	On Point ON State	On Point OFF State	Point Group	IEC 61850 Reference
0	DBDI 0A	ON	OFF	DBDI 0B	ON	OFF	PVal	XCBR.Pos.stVal[ST](2)

4.2 Legacy Connections

Map files created in the earlier section are instantiated in the "Connections" page. Below are the details:



1. The IEC 61850 LD and the IEC 61850 LN Prefix are not mandatory to satisfy the model rules, but should be set to reflect the system application, the type of data acquired and substation element name being interfaced with.
    - Normally, each legacy IED should be of a given type (e.g. meter, etc.) and tied to a given substation element (a feeder, bus, incomer line, etc.)
    - In cases where data inside the same IED must reflect either different LD (data categories) or substation elements (e.g. when reading from some data concentrator type of device, or IEDs which cover more than one Bay), the user has the choice to enter the override LD and override LN Prefix into the client map file, on a per point basis (as described in the previous section).
2. Once these devices are instantiated, at the database level, an IEC 16850 Object Reference is generated which becomes the Model in Server ICD file.

3. For data coming from IEC 61850 Client IEDs – all IEC 61850 LD, LN Prefix and Object References are assigned according to the 61850 model subscribed in the Loader (as MMS Client).
4. The remaining IEC 61850 publisher (MMS Server) elements (like LDName, RCB Name, triggers, datasets) are created automatically by the *CID Points Mapping Tool*.

The advantage of this architecture is that signals coming from any device (including from DTAs) are automatically assigned to IEC 61850 structures, essentially adding 61850 "assignments" to any RTDB point right at the acquisition level, which are then inherited and templated across the system. This eliminates the need for the user to open the entire database and to start assigning IEC 61850 structures one by one, for every point, repeating the process for all points even if they are of similar type.

4.2.1 IEC 61850 Object References assigned to Legacy Connection status

The MCP database has points that indicate the connection status of each instantiated connection (DCA, DPA).

To satisfy IEC 61850 rules – each instantiated connection must have a unique assigned `LD Name`, which is then used by the IEC 61850 MMS Server model.

When a new legacy connection is created, a default unique `LD Name` is assigned to it.

Users can later change it as desired, as long as remains unique across all Connections.

When performing a Save operation in the Connections tab: if the connection assigned `LD Name` is found duplicated, it will have the last characters as the home directory of the duplicated connection, to ensure uniqueness.

The rules for constructing the **initial default** Connection LD names are:

- For Serial DCA connections (applies to Generic ASCII, IEC 101 multidrop, IEC 103 multidrop):

  <protocol>_<serialport>

- For Network DCA connection blocks (applies to IEC 104 multidrop, D.20 connection):

  <protocol>BLK<block>

- For Master (DPA) connections:

  <protocol>{S|N}M<nn>

Where:

<protocol> is the Protocol abbreviation:

MB = Modbus

DNP = DNP3

I101 = IEC101

I104 = IEC104

I61850 = IEC61850

GASC = Generic ASCII

D20 = D.20

TEJASV = Tejas V

<serialport> is the serial port number of the connection.

<block> is the block number of the connection.

{S|N} is optional, only when the protocol abbreviation allows either serial or network. Applies to MODBUS and DNP.

S = Serial

N = Network

BLK are letters denoting a Block connection.

M is letter M denoting a Master connection for all protocols except Tejas V.

Tejas V uses letters **A,B,C,...,Z** where each letter is assigned in ascending order to instantiated connections.

<nn> is the instance, a consecutive number within the same **<protocol>{S|N}M** construct. This allows for at least two digits (may be longer for shorter names, but will be 2 for IEC61850).

Examples of Connection Assigned LD:

I104BLK1 = IEC104 (DCA) Block 1

D20BLKA = D.20 Block A

GASC_005 = Generic ASCII DCA on serial port 5

I103_006 = IEC103 DCA on serial port 6

MBSM1 = Modbus RTU Serial Master 1

MBNM1 = Modbus TCP Master 1

I104M2 = IEC104 Master 2

I16850M1 = IEC61850 Master 1

DNPSM3 = DNP3 Serial Master 3

DNPNM2 = DNP3 Network Master 2

TEJASVA01 = Tejas V Master connection 1, LRU 1

TEJASVD12 = Tejas V Master connection 4, LRU 12

4.3 Assigning IEC 61850 Object References to DCAs

This section describes the assignments of IEC 61850 Object References to Data Collection Applications

4.3.1 D.20 Network Client

4.3.1.1 D.20 Global Application Points (D_20Client)

Point Type	Point ID	Point Reference	Object Reference	LN Instance	CDC	DO	Do Instance	MCP Custom LN/DO	FC	DA
ACC	-4133	Total Number of Message Failures	ConnName+HomeDir / GWCommsLCCH1.TotFail.actVal	1	BCR	TotFail		DO	ST	actVal
ACC	-4132	Total Number of Message Retries	ConnName+HomeDir / GWCommsLCCH1.TotRe.actVal	1	BCR	TotRe		DO	ST	actVal
ACC	-4131	Total Number of Message Received	ConnName+HomeDir / GWCommsLCCH1.RxCnt.actVal	1	BCR	RxCnt			ST	actVal
ACC	-4130	Total Number of Message Sent	ConnName+HomeDir / GWCommsLCCH1.TxCnt.actVal	1	BCR	TxCnt			ST	actVal
AI	-1106	Alternate Link Devices	ConnName+HomeDir / GWCommsLCCH1.AltnLinkDev.stVal	1	INS	AltnLinkDev		DO	ST	stVal
AI	-1107	Total Number of Peripherals	ConnName+HomeDir / GWCommsLCCH1.TotNumPrph.stVal	1	INS	TotNumPrph		DO	ST	stVal

Point Type	Point ID	Point Reference	Object Reference	LN Instance	CDC	DO	Do Instance	MCP Custom LN/DO	FC	DA
DI	-81	DeviceDisabled	ConnName+HomeDir / GWCommsLCCH1.DevDsa.stVal	1	SPC	DevDsa		DO	ST	stVal
DI	-17	DCAStatus	ConnName+HomeDir /GWCommsLCCH1.DCASt.stVal	1	SPS	DCASt		DO	ST	stVal
DO	-2001	DisableDevice	ConnName+HomeDir / GWCommsLCCH1.DevDsa.Oper.ctlVal	1	SPC	DevDsa		DO	CO	Oper.ctlVal
DO	-2009	ClearStats	ConnName+HomeDir /GWCommsLCCH1.ClrStat.Oper.ctlVal	1	SPC	ClrStat		DO	CO	Oper.ctlVal

4.3.1.2 D.20 Device Points

Point Type	Point ID	Point Reference	Object Reference	LN Instance	CDC	DO	Do Instance	MCP Custom LN/DO	FC	DA
ACC	-4139	D.20 Channel 2 Failures	PhyDevName /LCCH1.ChFail2.actVal	1	BCR	ChFail	2	DO	ST	actVal
ACC	-4138	D.20 Channel 1 Failures	PhyDevName /LCCH1.ChFail1.actVal	1	BCR	ChFail	1	DO	ST	actVal
ACC	-4137	D.20 Channel 2 Retries	PhyDevName /LCCH1.ScndPortRe1.actVal	1	BCR	ScndPortRe	1	DO	ST	actVal
ACC	-4136	D.20 Channel 1 Retries	PhyDevName /LCCH1.PrimPortRe1.actVal	1	BCR	PrimPortRe	1	DO	ST	actVal

Point Type	Point ID	Point Reference	Object Reference	LN Instance	CDC	DO	Do Instance	MCP Custom LN/DO	FC	DA
ACC	-4135	D.20 Channel 2 Transactions	PhyDevName /LCCH1.RedRxCnt.actVal	1	BCR	RedRx Cnt			ST	actVal
ACC	-4134	D.20 Channel 1 Transactions	PhyDevName /LCCH1.RxCnt.actVal	1	BCR	RxCnt			ST	actVal
ACC	-4123	Total Failures	PhyDevName /LCCH1.TotFail1.actVal	1	BCR	TotFail	1	DO	ST	actVal
ACC	-4122	Total Retries	PhyDevName /LCCH1.TotRe1.actVal	1	BCR	TotRe	1	DO	ST	actVal
ACC	-4121	Total Transactions	PhyDevName /LCCH1.TotTrns1.actVal	1	BCR	TotTrns	1	DO	ST	actVal
DI	-164	D.20 Channel 2 Active	PhyDevName/GWCommsLCCH1.RedChLiv.stVal	1	SPS	RedCh Liv			ST	stVal
DI	-163	D.20 Channel 1 Active	PhyDevName/GWCommsLCCH1.ChLiv.stVal	1	SPS	ChLiv			ST	stVal
DI	-162	D.20 Channel 2 Internal Health	PhyDevName/GWCommsLCCH1.ChHealth2.stVal	1	SPS	ChHea lth	2	DO	ST	stVal
DI	-161	D.20 Channel 1 Internal Health	PhyDevName/GWCommsLCCH1.ChHealth1.stVal	1	SPS	ChHea lth	1	DO	ST	stVal
DI	-160	D.20 Channel 2 Retries Alarm Pseudo Point	PhyDevName/GWCommsLCCH1.ChReAlm2.stVal	1	SPS	ChReA lm	2	DO	ST	stVal
DI	-159	D.20 Channel 1 Retries Alarm Pseudo Point	PhyDevName/GWCommsLCCH1.ChReAlm1.stVal	1	SPS	ChReA lm	1	DO	ST	stVal
DI	-152	AI Reference Calibration Required	PhyDevName/GWCommsLCCH1.AIRefCbrReq1.stVal	1	SPS	AIRefC brReq	1	DO	ST	stVal
DI	-151	Peripheral Trouble Status	PhyDevName/GWCommsLCCH1.PrphTrobSt1.stVal	1	SPS	PrphTr obSt	1	DO	ST	stVal

Point Type	Point ID	Point Reference	Object Reference	LN Instance	CDC	DO	Do Instance	MCP Custom LN/DO	FC	DA
DI	-150	Peripheral Communication Failed	PhyDevName/GWCommsLCCH1.PrphComFail1.stVal	1	SPS	PrphComFail	1	DO	ST	stVal
DI	-121	Peripheral in Local Mode	PhyDevName/GWCommsLCCH1.PrphLocMod1.stVal	1	SPS	PrphLocMod	1	DO	ST	stVal
DI	-120	Peripheral Online	PhyDevName/GWCommsLCCH1.PrphOnline1.stVal	1	SPS	PrphOnline	1	DO	ST	stVal

4.3.2 DNP DCA

Point Type	Point ID	Point Reference	Object Reference	LN Instance	CDC	DO	Do Instance	MCP Custom LN/DO	FC	DA
ACC	-4010	OperationsFailed	PhyDevName/GWCommsLCCH1.OpFail.actVal	1	BCR	OpFail		DO	ST	actVal
ACC	-4009	OperationsRequested	PhyDevName/GWCommsLCCH1.OpReq.actVal	1	BCR	OpReq		DO	ST	actVal
ACC	-4008	MsgError	PhyDevName/GWCommsLCCH1.MsgErr.actVal	1	BCR	MsgErr		DO	ST	actVal
ACC	-4003	MsgTimeOuts	PhyDevName/GWCommsLCCH1.MsgTmOut.actVal	1	BCR	MsgTmOut		DO	ST	actVal
ACC	-4002	MsgReceived	PhyDevName/GWCommsLCCH1.RxCnt.actVal	1	BCR	RxCnt			ST	actVal

Point Type	Point ID	Point Reference	Object Reference	LN Instance	CDC	DO	Do Instance	MCP Custom LN/DO	FC	DA
ACC	-4001	MsgSent	ConnName+HomeDir / GWCommsLCCH1.TxCnt.actVal	1	BCR	TxCnt			ST	actVal
ACC	-4001	MsgSent	PhyDevName/GWCommsLCCH1.TxCnt.actVal	1	BCR	TxCnt			ST	actVal
ACC	-4000	UpdateCount	PhyDevName/GWCommsLCCH1.UpdCnt.actVal	1	BCR	UpdCnt		DO	ST	actVal
DI	-170	PollingEnabled	PhyDevName/GWCommsLCCH1.PollEna.stVal	1	SPC	PollEna		DO	ST	stVal
DI	-169	DeviceEnabled	PhyDevName/GWCommsLCCH1.DevEna.stVal	1	SPC	DevEna		DO	ST	stVal
DI	-168	Peer Device Online	PhyDevName/GWCommsLCCH1.PrDevOnline.stVal	1	SPS	PrDevOnline		DO	ST	stVal
DI	-24	PollingDisabled	PhyDevName/GWCommsLCCH1.PollDsa.stVal	1	SPC	PollDsa		DO	ST	stVal
DI	-23	UnsolicitedResponse	PhyDevName/GWCommsLCCH1.UnsolRsp.stVal	1	SPS	UnsolRsp		DO	ST	stVal
DI	-22	DeviceDisable	PhyDevName/GWCommsLCCH1.DevDsa.stVal	1	SPC	DevDsa		DO	ST	stVal
DI	-21	BackupPortHealthStatus	PhyDevName/GWCommsLCCH1.BckHealthSt.stVal	1	SPS	BckHealthSt		DO	ST	stVal
DI	-20	PrimaryPortHealthStatus	PhyDevName/GWCommsLCCH1.PriHealthSt.stVal	1	SPS	PriHealthSt		DO	ST	stVal
DI	-19	BackupPortActiveStatus	PhyDevName/GWCommsLCCH1.RedChLiv.stVal	1	SPS	RedChLiv			ST	stVal
DI	-18	PrimaryPortActiveStatus	PhyDevName/GWCommsLCCH1.ChLiv.stVal	1	SPS	ChLiv			ST	stVal

Point Type	Point ID	Point Reference	Object Reference	LN Instance	CDC	DO	Do Instance	MCP Custom LN/DO	FC	DA
DI	-17	DCAStatus	PhyDevName/GWCommsLCCH1.DCASt.stVal	1	SPS	DCASt		DO	ST	stVal
DI	-16	IEDCommAllStations	PhyDevName/GWCommsLCCH1.CommSta.stVal	1	SPS	CommSta		DO	ST	stVal
DI	-15	IEDCommAlreadyExec	PhyDevName/GWCommsLCCH1.CommExec.stVal	1	SPS	CommExec		DO	ST	stVal
DI	-14	IEDCommBufferOverFlow	PhyDevName/GWCommsLCCH1.CommBufOv.stVal	1	SPS	CommBufOv		DO	ST	stVal
DI	-13	IEDCommParamError	PhyDevName/GWCommsLCCH1.CommErr.stVal	1	SPS	CommErr		DO	ST	stVal
DI	-12	IEDCommObjectUnknown	PhyDevName/GWCommsLCCH1.CommObjUk.stVal	1	SPS	CommObjUk		DO	ST	stVal
DI	-11	IEDCommBadFunc	PhyDevName/GWCommsLCCH1.CommBadFun.stVal	1	SPS	CommBadFun		DO	ST	stVal
DI	-10	IEDCommDeviceTrouble	PhyDevName/GWCommsLCCH1.CommDevTrb.stVal	1	SPS	CommDevTrb		DO	ST	stVal
DI	-9	IEDCommLocal	PhyDevName/GWCommsLCCH1.CommLoc.stVal	1	SPS	CommLoc		DO	ST	stVal
DI	-8	IEDCommNeedTime	PhyDevName/GWCommsLCCH1.CommNdsTm.stVal	1	SPS	CommNdsTm		DO	ST	stVal
DI	-7	IEDCommBadConfig	PhyDevName/GWCommsLCCH1.CommBadConf.stVal	1	SPS	CommBadConf		DO	ST	stVal
DI	-6	IEDCommDeviceRestart	PhyDevName/GWCommsLCCH1.CommReStr.stVal	1	SPS	CommReStr		DO	ST	stVal
DI	-2	Device Online	PhyDevName/GWCommsLCCH1.DevOnline.stVal	1	SPS	DevOnline		DO	ST	stVal

Point Type	Point ID	Point Reference	Object Reference	LN Instance	CDC	DO	Do Instance	MCP Custom LN/DO	FC	DA
DO	-2048	EnablePolling	PhyDevName/GWCommsLCCH1.PollEna.Oper.ctlVal	1	SPC	PollEna		DO	CO	Oper.ctlVal
DO	-2047	EnableDevice	PhyDevName/GWCommsLCCH1.DevEna.Oper.ctlVal	1	SPC	DevEna		DO	CO	Oper.ctlVal
DO	-2009	ClearStats	PhyDevName/GWCommsLCCH1.ClrStat.Oper.ctlVal	1	SPC	ClrStat		DO	CO	Oper.ctlVal
DO	-2008	SwitchChannel	PhyDevName/GWCommsLCCH1.SwCh.Oper.ctlVal	1	SPC	SwCh		DO	CO	Oper.ctlVal
DO	-2007	ClassPoll	PhyDevName/GWCommsLCCH1.ClassPoll.Oper.ctlVal	1	SPC	ClassPoll		DO	CO	Oper.ctlVal
DO	-2006	IntegrityPoll	PhyDevName/GWCommsLCCH1.IPoll.Oper.ctlVal	1	SPC	IPoll		DO	CO	Oper.ctlVal
DO	-2005	DisablePolling	PhyDevName/GWCommsLCCH1.PollDsa.Oper.ctlVal	1	SPC	PollDsa		DO	CO	Oper.ctlVal
DO	-2004	EnableUnsolicited	PhyDevName/GWCommsLCCH1.UnsolEna.Oper.ctlVal	1	SPC	UnsolEna		DO	CO	Oper.ctlVal
DO	-2003	SendRestart	PhyDevName/GWCommsLCCH1.TxReStr.Oper.ctlVal	1	SPC	TxReStr		DO	CO	Oper.ctlVal
DO	-2002	SendTimeSync	PhyDevName/GWCommsLCCH1.TxTmSyn.Oper.ctlVal	1	SPC	TxTmSyn		DO	CO	Oper.ctlVal
DO	-2001	DisableDevice	PhyDevName/GWCommsLCCH1.DevDsa.Oper.ctlVal	1	SPC	DevDsa		DO	CO	Oper.ctlVal
Text	-5004	DeviceInfo_BayID	PhyDevName/GWCommsLCCH1.DevIaBayID.stVal	1	VSS	DevIaBayID		DO	ST	stVal
Text	-5003	DeviceInfo_DeviceAddress	PhyDevName/GWCommsLCCH1.DevAddr.stVal	1	VSS	DevAddr		DO	ST	stVal

Point Type	Point ID	Point Reference	Object Reference	LN Instance	CDC	DO	Do Instance	MCP Custom LN/DO	FC	DA
Text	-5002	DeviceInfo_DeviceType	PhyDevName/GWCommsLCCH1.DevIaDevTyp.stVal	1	VSS	DevIaDevTyp		DO	ST	stVal
Text	-5001	DeviceInfo_DeviceID	PhyDevName/GWCommsLCCH1.DevIaDevID.stVal	1	VSS	DevIaDevID		DO	ST	stVal
Text	-5000	DeviceInfo_LineID	PhyDevName/GWCommsLCCH1.DevIaLinID.stVal	1	VSS	DevIaLinID		DO	ST	stVal

4.3.3 Modbus DCA

Point Type	Point ID	Point Reference	Object Reference	LN Instance	CDC	DO	Do Instance	MCP Custom LN/DO	FC	DA
Text	-5004	DeviceInfo_BayID	PhyDevName/GWCommsLCCH1.DevIaBayID.stVal	1	VSS	DevIaBayID		DO	ST	stVal
Text	-5003	DeviceInfo_DeviceAddress	PhyDevName/GWCommsLCCH1.DevAddr.stVal	1	VSS	DevAddr		DO	ST	stVal
Text	-5002	DeviceInfo_DeviceType	PhyDevName/GWCommsLCCH1.DevIaDevTyp.stVal	1	VSS	DevIaDevTyp		DO	ST	stVal
Text	-5001	DeviceInfo_DeviceID	PhyDevName/GWCommsLCCH1.DevIaDevID.stVal	1	VSS	DevIaDevID		DO	ST	stVal
Text	-5000	DeviceInfo_LineID	PhyDevName/GWCommsLCCH1.DevIaLinID.stVal	1	VSS	DevIaLinID		DO	ST	stVal
ACC	-4051	Events Logged	PhyDevName/GWCommsLCCH1.EvtLog.actVal	1	BCR	EvtLog		DO	ST	actVal
ACC	-4050	Events Received	PhyDevName/GWCommsLCCH1.EvtRx.actVal	1	BCR	EvtRx		DO	ST	actVal
ACC	-4049	Controls Failed	PhyDevName/GWCommsLCCH1.CtlFail.actVal	1	BCR	CtlFail		DO	ST	actVal
ACC	-4048	Controls Received	PhyDevName/GWCommsLCCH1.CtlRx.actVal	1	BCR	CtlRx		DO	ST	actVal
ACC	-4003	MsgTimeOuts	PhyDevName/GWCommsLCCH1.MsgTmOut.actVal	1	BCR	MsgTmOut		DO	ST	actVal
ACC	-4002	MsgReceived	PhyDevName/GWCommsLCCH1.RxCnt.actVal	1	BCR	RxCnt			ST	actVal
ACC	-4001	MsgSent	PhyDevName/GWCommsLCCH1.TxCnt.actVal	1	BCR	TxCnt			ST	actVal
ACC	-4000	UpdateCount	PhyDevName/GWCommsLCCH1.UpdCnt.actVal	1	BCR	UpdCnt		DO	ST	actVal

Point Type	Point ID	Point Reference	Object Reference	LN Instance	CDC	DO	Do Instance	MCP Custom LN/DO	FC	DA
AI	-168	Peer Device Online	PhyDevName/GWCommsLCCH1.PrDevOnline.stVal	1	SPS	PrDevOnline		DO	ST	stVal
AI	-2001	DisableDevice	PhyDevName/GWCommsLCCH1.DevDsa.Oper.ctlVal	1	SPC	DevDsa		DO	CO	Oper.ctlVal
AI	-1099	Secure Connection State	PhyDevName/GWCommsLCCH1.SecConnSt.stVal	1	INS	SecConnSt		DO	ST	stVal
AI	-1035	LF_FREQUENCY	PhyDevName/GWCommsLCCH1.LFHz.stVal	1	INS	LFHz		DO	ST	stVal
AI	-1034	LF_DURATION	PhyDevName/GWCommsLCCH1.LFDur.stVal	1	INS	LFDur		DO	ST	stVal
AI	-1033	LF_CURRENT	PhyDevName/GWCommsLCCH1.LFA.stVal	1	INS	LFA		DO	ST	stVal
AI	-1032	LF_DISTANCE	PhyDevName/GWCommsLCCH1.LFDis.stVal	1	INS	LFDis		DO	ST	stVal
AI	-1031	LF_MSEC	PhyDevName/GWCommsLCCH1.LFMs.stVal	1	INS	LFMs		DO	ST	stVal
AI	-1030	LF_SEC	PhyDevName/GWCommsLCCH1.LFs.stVal	1	INS	LFs		DO	ST	stVal
AI	-1029	LF_MIN	PhyDevName/GWCommsLCCH1.LFM.stVal	1	INS	LFM		DO	ST	stVal
AI	-1028	LF_HOUR	PhyDevName/GWCommsLCCH1.LFh.stVal	1	INS	LFh		DO	ST	stVal
AI	-1027	LF_DAY	PhyDevName/GWCommsLCCH1.LFDay.stVal	1	INS	LFDay		DO	ST	stVal
AI	-1026	LF_MONTH	PhyDevName/GWCommsLCCH1.LFMonth.stVal	1	INS	LFMonth		DO	ST	stVal
AI	-1025	LF_YEAR	PhyDevName/GWCommsLCCH1.LFYear.stVal	1	INS	LFYear		DO	ST	stVal
DI	-50	DIGLF_N	PhyDevName/GWCommsLCCH1.DIGLFN.stVal	1	SPS	DIGLFN		DO	ST	stVal
DI	-35	DIGLF_G	PhyDevName/GWCommsLCCH1.DIGLFG.stVal	1	SPS	DIGLFG		DO	ST	stVal
DI	-34	DIGLF_C	PhyDevName/GWCommsLCCH1.DIGLFC.stVal	1	SPS	DIGLFC		DO	ST	stVal

Point Type	Point ID	Point Reference	Object Reference	LN Instance	CDC	DO	Do Instance	MCP Custom LN/DO	FC	DA
DI	-33	DIGLF_B	PhyDevName/GWCommsLCCH1.DIGLFB.stVal	1	SPS	DIGLFB		DO	ST	stVal
DI	-32	DIGLF_A	PhyDevName/GWCommsLCCH1.DIGLFA.stVal	1	SPS	DIGLFA		DO	ST	stVal
DI	-22	DeviceDisable	PhyDevName/GWCommsLCCH1.DevDsa.stVal	1	SPC	DevDsa		DO	ST	stVal
DI	-5	SecondaryPortStatus	PhyDevName/GWCommsLCCH1.RedChLiv.stVal	1	SPS	RedChLiv			ST	stVal
DI	-4	PrimaryPortStatus	PhyDevName/GWCommsLCCH1.ChLiv.stVal	1	SPS	ChLiv			ST	stVal
DI	-2	Device Online	PhyDevName/GWCommsLCCH1.DevOnline.stVal	1	SPS	DevOnline		DO	ST	stVal

4.3.4 SELBIN DCA

Point Type	Point ID	Point Reference	Object Reference	LN Instance	CDC	DO	Do Instance	MCP Custom LN/DO	FC	DA
ACC	-4022	MsgTimeout	PhyDevName/GWCommsLCCH1.MsgTmOut.actVal	1	BCR	MsgTmOut		DO	ST	actVal
ACC	-4010	OperationsFailed	PhyDevName/GWCommsLCCH1.OpFail.actVal	1	BCR	OpFail		DO	ST	actVal
ACC	-4009	OperationsRequested	PhyDevName/GWCommsLCCH1.OpReq.actVal	1	BCR	OpReq		DO	ST	actVal
ACC	-4008	MsgError	PhyDevName/GWCommsLCCH1.MsgErr.actVal	1	BCR	MsgErr		DO	ST	actVal

Point Type	Point ID	Point Reference	Object Reference	LN Instance	CDC	DO	Do Instance	MCP Custom LN/DO	FC	DA
ACC	-4002	MsgReceived	PhyDevName/GWCommsLCCH1.RxCnt.actVal	1	BCR	RxCnt			ST	actVal
ACC	-4001	MsgSent	PhyDevName/GWCommsLCCH1.TxCnt.actVal	1	BCR	TxCnt			ST	actVal
ACC	-4000	UpdateCount	PhyDevName/GWCommsLCCH1.UpdCnt.actVal	1	BCR	UpdCnt		DO	ST	actVal
AI	-1035	LF_FREQUENCY	PhyDevName/GWCommsLCCH1.LFHz.stVal	1	INS	LFHz		DO	ST	stVal
AI	-1034	LF_DURATION	PhyDevName/GWCommsLCCH1.LFDur.stVal	1	INS	LFDur		DO	ST	stVal
AI	-1033	LF_CURRENT	PhyDevName/GWCommsLCCH1.LFA.stVal	1	INS	LFA		DO	ST	stVal
AI	-1032	LF_DISTANCE	PhyDevName/GWCommsLCCH1.LFDis.stVal	1	INS	LFDis		DO	ST	stVal
AI	-1031	LF_MSEC	PhyDevName/GWCommsLCCH1.LFMs.stVal	1	INS	LFMs		DO	ST	stVal
AI	-1030	LF_SEC	PhyDevName/GWCommsLCCH1.LFs.stVal	1	INS	LFs		DO	ST	stVal
AI	-1029	LF_MIN	PhyDevName/GWCommsLCCH1.LFM.stVal	1	INS	LFM		DO	ST	stVal
AI	-1028	LF_HOUR	PhyDevName/GWCommsLCCH1.LFh.stVal	1	INS	LFh		DO	ST	stVal
AI	-1027	LF_DAY	PhyDevName/GWCommsLCCH1.LFDay.stVal	1	INS	LFDay		DO	ST	stVal
AI	-1026	LF_MONTH	PhyDevName/GWCommsLCCH1.LFMonth.stVal	1	INS	LFMonth		DO	ST	stVal
AI	-1025	LF_YEAR	PhyDevName/GWCommsLCCH1.LFYear.stVal	1	INS	LFYear		DO	ST	stVal

Point Type	Point ID	Point Reference	Object Reference	LN Instance	CDC	DO	Do Instance	MCP Custom LN/DO	FC	DA
DI	-147	Pass Through In-Progress	PhyDevName/GWCommsLCCH1.PassThrPrg.stVal	1	SPS	PassThrPrg		DO	ST	stVal
DI	-146	File Retrieval In-Progress	PhyDevName/GWCommsLCCH1.FileRetInPrg.stVal	1	SPS	FileRetInPrg		DO	ST	stVal
DI	-141	Cev_cmd_support	PhyDevName/GWCommsLCCH1.CevCmdSupprt.stVal	1	SPS	CevCmdSupprt		DO	ST	stVal
DI	-140	Eve_cmd_support	PhyDevName/GWCommsLCCH1.EveCmd.stVal	1	SPS	EveCmd		DO	ST	stVal
DI	-139	His_cmd_support	PhyDevName/GWCommsLCCH1.HISCmdSpo.stVal	1	SPS	HISCmdSpo		DO	ST	stVal
DI	-38	BackupPortStatus	PhyDevName/GWCommsLCCH1.BckPortSt.stVal	1	SPS	BckPortSt		DO	ST	stVal
DI	-37	LoginStatus	PhyDevName/GWCommsLCCH1.LoginSt.stVal	1	SPS	LoginSt		DO	ST	stVal
DI	-36	IEDCommDevTroublE	PhyDevName/GWCommsLCCH1.ComDevTrb.stVal	1	SPS	ComDevTrb		DO	ST	stVal
DI	-35	DIGLF_G	PhyDevName/GWCommsLCCH1.DIGLFG.stVal	1	SPS	DIGLFG		DO	ST	stVal
DI	-34	DIGLF_C	PhyDevName/GWCommsLCCH1.DIGLFC.stVal	1	SPS	DIGLFC		DO	ST	stVal
DI	-33	DIGLF_B	PhyDevName/GWCommsLCCH1.DIGLFB.stVal	1	SPS	DIGLFB		DO	ST	stVal
DI	-32	DIGLF_A	PhyDevName/GWCommsLCCH1.DIGLFA.stVal	1	SPS	DIGLFA		DO	ST	stVal

Point Type	Point ID	Point Reference	Object Reference	LN Instance	CDC	DO	Do Instance	MCP Custom LN/DO	FC	DA
DI	-22	DeviceDisable	PhyDevName/GWCommsLCCH1.DevDsa.stVal	1	SPC	DevDsa		DO	ST	stVal
DI	-17	DCAStatus	PhyDevName/GWCommsLCCH1.DCASt.stVal	1	SPS	DCASt		DO	ST	stVal
DI	-4	PrimaryPortStatus	PhyDevName/GWCommsLCCH1.ChLiv.stVal	1	SPS	ChLiv			ST	stVal
DI	-2	Device Online	PhyDevName/GWCommsLCCH1.DevOnline.stVal	1	SPS	DevOnline		DO	ST	stVal
DO	-2012	ControlLockout	PhyDevName/GWCommsLCCH1.CtlLO.Oper.ctlVal	1	SPC	CtlLO		DO	CO	Oper.ctlVal
DO	-2001	DisableDevice	PhyDevName/GWCommsLCCH1.DevDsa.Oper.ctlVal	1	SPC	DevDsa		DO	CO	Oper.ctlVal
DO	-2046	Retrieve self-description file from IED	PhyDevName/GWCommsLCCH1.RetIEDDesc.Oper.ctlVal	1	SPC	RetIEDDesc		DO	CO	Oper.ctlVal
Text	Dynamic, Positive Value	Created from the Auto discovery file (retrieved from the IED) May be none, one or many – depends on the SEL IED. All are GGIO.	PhyDevName/DynamicGGIO6.SELInfo<Point ID 6 digit>.stVal	6	VSS	SELInfo	<Point ID 6 digit>	DO	ST	stVal
Text	-5006	PRF TEXT POINT	PhyDevName/GWCommsLCCH1.PRFTextPt.stVal	1	VSS	PRFTextPt		DO	ST	stVal
Text	-5004	DeviceInfo_BayID	PhyDevName/GWCommsLCCH1.DevIaBayID.stVal	1	VSS	DevIaBayID		DO	ST	stVal

Point Type	Point ID	Point Reference	Object Reference	LN Instance	CDC	DO	Do Instance	MCP Custom LN/DO	FC	DA
Text	-5003	DeviceInfo_DeviceAddress	PhyDevName/GWCommsLCCH1.DevAddr.stVal	1	VSS	DevAddr		DO	ST	stVal
Text	-5002	DeviceInfo_DeviceType	PhyDevName/GWCommsLCCH1.DevIaDevTyp.stVal	1	VSS	DevIaDevTyp		DO	ST	stVal
Text	-5001	DeviceInfo_DeviceID	PhyDevName/GWCommsLCCH1.DevIaDevID.stVal	1	VSS	DevIaDevID		DO	ST	stVal
Text	-5000	DeviceInfo_LineID	PhyDevName/GWCommsLCCH1.DevIaLinID.stVal	1	VSS	DevIaLinID		DO	ST	stVal

4.3.5 IEC 60870-5-103 DCA

Point Type	Point ID	Point Reference	Object Reference	LN Instance	CDC	DO	Do Instance	MCP Custom LN/DO	FC	DA
ACC	-4066	RxFrameErrors	ConnName+HomeDir /GWCommsLCCH1.RxFer.actVal	1	BCR	RxFer		DO	ST	actVal
ACC	-4065	RxUnknownLinkAddress	ConnName+HomeDir /GWCommsLCCH1.RxUkLinkAddr.actVal	1	BCR	RxUkLinkAddr		DO	ST	actVal
ACC	-4064	RxUnknownASDUAddress	ConnName+HomeDir /GWCommsLCCH1.RxUkASDUAddr.actVal	1	BCR	RxUkASDUAddr		DO	ST	actVal
ACC	-4022	MsgTimeout	ConnName+HomeDir / GWCommsLCCH1.MsgTmOut.actVal	1	BCR	MsgTmOut		DO	ST	actVal

Point Type	Point ID	Point Reference	Object Reference	LN Instance	CDC	DO	Do Instance	MCP Custom LN/DO	FC	DA
ACC	-4021	RxNACK	PhyDevName/GWCommsLCCH1.RxNAck.actVal	1	BCR	RxNAck		DO	ST	actVal
ACC	-4020	RxACK	PhyDevName/GWCommsLCCH1.RxAck.actVal	1	BCR	RxAck		DO	ST	actVal
ACC	-4019	RxBadObjectAddress	PhyDevName/GWCommsLCCH1.RxBadObjAddr.actVal	1	BCR	RxBadObjAddr		DO	ST	actVal
ACC	-4018	RxBadASDUSize	PhyDevName/GWCommsLCCH1.RxBadASDULen.actVal	1	BCR	RxBadASDULen		DO	ST	actVal
ACC	-4017	RxBadCOT	PhyDevName/GWCommsLCCH1.RxBadCOT.actVal	1	BCR	RxBadCOT		DO	ST	actVal
ACC	-4016	RxBadQualifier	PhyDevName/GWCommsLCCH1.RxBadQual.actVal	1	BCR	RxBadQual		DO	ST	actVal
ACC	-4015	RxBadTypeID	PhyDevName/GWCommsLCCH1.RxBadTypID.actVal	1	BCR	RxBadTypID		DO	ST	actVal
ACC	-4014	CommandsFailed	PhyDevName/GWCommsLCCH1.CmdFail.actVal	1	BCR	CmdFail		DO	ST	actVal
ACC	-4013	CommandsReceived	PhyDevName/GWCommsLCCH1.CmdRx.actVal	1	BCR	CmdRx		DO	ST	actVal
ACC	-4012	EventsReported	PhyDevName/GWCommsLCCH1.EvtRpt.actVal	1	BCR	EvtRpt		DO	ST	actVal
ACC	-4011	NewEventsReceived	PhyDevName/GWCommsLCCH1.NewEvtRx.actVal	1	BCR	NewEvtRx		DO	ST	actVal
ACC	-4008	MsgError	PhyDevName/GWCommsLCCH1.MsgErr.actVal	1	BCR	MsgErr		DO	ST	actVal

Point Type	Point ID	Point Reference	Object Reference	LN Instance	CDC	DO	Do Instance	MCP Custom LN/DO	FC	DA
ACC	-4003	MsgTimeOuts	PhyDevName/GWCommsLCCH1.MsgTmOut.actVal	1	BCR	MsgTmOut		DO	ST	actVal
ACC	-4002	MsgReceived	ConnName+HomeDir /GWCommsLCCH1.RxCnt.actVal	1	BCR	RxCnt			ST	actVal
ACC	-4002	MsgReceived	PhyDevName/GWCommsLCCH1.RxCnt.actVal	1	BCR	RxCnt			ST	actVal
ACC	-4001	MsgSent	ConnName+HomeDir /GWCommsLCCH1.TxCnt.actVal	1	BCR	TxCnt			ST	actVal
ACC	-4001	MsgSent	PhyDevName/GWCommsLCCH1.TxCnt.actVal	1	BCR	TxCnt			ST	actVal
ACC	-4000	UpdateCount	PhyDevName/GWCommsLCCH1.UpdCnt.actVal	1	BCR	UpdCnt		DO	ST	actVal
DI	-96	AllPollingDisabled	ConnName+HomeDir /GWCommsLCCH1.PollDsa.stVal	1	SPC	PollDsa		DO	ST	stVal
DI	-95	AllDevicesDisabled	PhyDevName/GWCommsLCCH1.DevDsa.stVal	1	SPC	DevDsa		DO	ST	stVal
DI	-27	DeviceRestarted	PhyDevName/GWCommsLCCH1.DevReStr.stVal	1	SPS	DevReStr		DO	ST	stVal
DI	-26	TimeSyncExecution	PhyDevName/GWCommsLCCH1.TmSynExec.stVal	1	SPS	TmSynExec		DO	ST	stVal
DI	-25	IntegrityPollExecution	PhyDevName/GWCommsLCCH1.IPollExec.stVal	1	SPS	IPollExec		DO	ST	stVal
DI	-24	PollingDisabled	PhyDevName/GWCommsLCCH1.PollDsa.stVal	1	SPC	PollDsa		DO	ST	stVal
DI	-22	DeviceDisable	PhyDevName/GWCommsLCCH1.DevDsa.stVal	1	SPC	DevDsa		DO	ST	stVal

Point Type	Point ID	Point Reference	Object Reference	LN Instance	CDC	DO	Do Instance	MCP Custom LN/DO	FC	DA
DI	-17	DCAStatus	ConnName+HomeDir /GWCommsLCCH1.DCASt.stVal	1	SPC	DCASt		DO	ST	stVal
DI	-2	Device Online	PhyDevName/GWCommsLCCH1.DevOnline.stVal	1	SPS	DevOnline		DO	ST	stVal
DO	-2032	TimeSyncAllDevices	ConnName+HomeDir /GWCommsLCCH1.TmSynDev.Oper.ctlVal	1	SPC	TmSynDev		DO	CO	Oper.ctlVal
DO	-2030	IntegrityPollAllDevices	ConnName+HomeDir /GWCommsLCCH1.IPollAllDev.Oper.ctlVal	1	SPC	IPollAllDev		DO	CO	Oper.ctlVal
DO	-2029	DisableAllDevices	ConnName+HomeDir /GWCommsLCCH1.DevDsa.Oper.ctlVal	1	SPC	DevDsa		DO	CO	Oper.ctlVal
DO	-2019	ForceControlsLockout	PhyDevName/GWCommsLCCH1.ForcCtlLO.Oper.ctlVal	1	SPC	ForcCtlLO		DO	CO	Oper.ctlVal
DO	-2010	TimeSync	PhyDevName/GWCommsLCCH1.TmSyn.Oper.ctlVal	1	SPC	TmSyn		DO	CO	Oper.ctlVal
DO	-2006	IntegrityPoll	PhyDevName/GWCommsLCCH1.IPoll.Oper.ctlVal	1	SPC	IPoll		DO	CO	Oper.ctlVal
DO	-2005	DisablePolling	PhyDevName/GWCommsLCCH1.PollDsa.Oper.ctlVal	1	SPC	PollDsa		DO	CO	Oper.ctlVal
DO	-2001	DisableDevice	PhyDevName/GWCommsLCCH1.DevDsa.Oper.ctlVal	1	SPC	DevDsa		DO	CO	Oper.ctlVal
Text	-5004	DeviceInfo_BayID	PhyDevName/GWCommsLCCH1.DevIaBayID.stVal	1	VSS	DevIaBayID		DO	ST	stVal
Text	-5002	DeviceInfo_DeviceType	PhyDevName/GWCommsLCCH1.DevIaDevTyp.stVal	1	VSS	DevIaDevTyp		DO	ST	stVal

Point Type	Point ID	Point Reference	Object Reference	LN Instance	CDC	DO	Do Instance	MCP Custom LN/DO	FC	DA
Text	-5001	DeviceInfo_DeviceID	PhyDevName/GWCommsLCCH1.DevIaDevID.stVal	1	VSS	DevIaDevID		DO	ST	stVal
Text	-5000	DeviceInfo_LineID	PhyDevName/GWCommsLCCH1.DevIaLinID.stVal	1	VSS	DevIaLinID		DO	ST	stVal

4.3.6 IEC 60870-5-101 DCA

Point Type	Point ID	Point Reference	Object Reference	LN Instance	CDC	DO	DO Instance	MCP Custom LN/DO	FC	DA
ACC	-4066	RxFrameErrors	ConnName+HomeDir /GWCommsLCCH1.RxFer.actVal	1	BCR	RxFer		DO	ST	actVal
ACC	-4065	RxUnknownLinkAddress	ConnName+HomeDir /GWCommsLCCH1.RxUkLinkAddr.actVal	1	BCR	RxUkLinkAddr		DO	ST	actVal
ACC	-4064	RxUnknownASDUAddress	ConnName+HomeDir / GWCommsLCCH1.RxUkASDUAddr.actVal	1	BCR	RxUkASDUAddr		DO	ST	actVal
ACC	-4021	RxNACK	PhyDevName/ GWCommsLCCH1.RxNAck.actVal	1	BCR	RxNAck		DO	ST	actVal
ACC	-4020	RxACK	PhyDevName/ GWCommsLCCH1.RxAck.actVal	1	BCR	RxAck		DO	ST	actVal
ACC	-4019	RxBadObjectAddress	PhyDevName/ GWCommsLCCH1.RxBadObjAddr.actVal	1	BCR	RxBadObjAddr		DO	ST	actVal

Point Type	Point ID	Point Reference	Object Reference	LN Instance	CDC	DO	DO Instance	MCP Custom LN/DO	FC	DA
ACC	-4018	RxBadASDUSize	PhyDevName/ GWCommsLCCH1.RxBadASDULen.actVal	1	BCR	RxBadASDULen		DO	ST	actVal
ACC	-4017	RxBadCOT	PhyDevName/ GWCommsLCCH1.RxBadCOT.actVal	1	BCR	RxBadCOT		DO	ST	actVal
ACC	-4016	RxBadQualifier	PhyDevName/ GWCommsLCCH1.RxBadQual.actVal	1	BCR	RxBadQual		DO	ST	actVal
ACC	-4015	RxBadTypeID	PhyDevName/ GWCommsLCCH1.RxBadTypID.actVal	1	BCR	RxBadTypID		DO	ST	actVal
ACC	-4014	CommandsFailed	PhyDevName/ GWCommsLCCH1.CmdFail.actVal	1	BCR	CmdFail		DO	ST	actVal
ACC	-4013	CommandsReceived	PhyDevName/ GWCommsLCCH1.CmdRx.actVal	1	BCR	CmdRx		DO	ST	actVal
ACC	-4012	EventsReported	PhyDevName/ GWCommsLCCH1.EvtRpt.actVal	1	BCR	EvtRpt		DO	ST	actVal
ACC	-4011	NewEventsReceived	PhyDevName/ GWCommsLCCH1.NewEvtRx.actVal	1	BCR	NewEvtRx		DO	ST	actVal
ACC	-4008	MsgError	PhyDevName/ GWCommsLCCH1.MsgErr.actVal	1	BCR	MsgErr		DO	ST	actVal
ACC	-4003	MsgTimeOuts	ConnName+HomeDir /GWCommsLCCH1.MsgTmOut.actVal	1	BCR	MsgTmOut		DO	ST	actVal

Point Type	Point ID	Point Reference	Object Reference	LN Instance	CDC	DO	DO Instance	MCP Custom LN/DO	FC	DA
ACC	-4003	MsgTimeOuts	PhyDevName/ GWCommsLCCH1.MsgTmOut.actVal	1	BCR	MsgTmOut		DO	ST	actVal
ACC	-4002	MsgReceived	ConnName+HomeDir / GWCommsLCCH1.RxCnt.actVal	1	BCR	RxCnt			ST	actVal
ACC	-4002	MsgReceived	PhyDevName/ GWCommsLCCH1.RxCnt.actVal	1	BCR	RxCnt			ST	actVal
ACC	-4001	MsgSent	ConnName+HomeDir / GWCommsLCCH1.TxCnt.actVal	1	BCR	TxCnt			ST	actVal
ACC	-4001	MsgSent	PhyDevName/ GWCommsLCCH1.TxCnt.actVal	1	BCR	TxCnt			ST	actVal
ACC	-4000	UpdateCount	PhyDevName/ GWCommsLCCH1.UpdCnt.actVal	1	BCR	UpdCnt		DO	ST	actVal
DI	-96	AllPollingDisabled	ConnName+HomeDir / GWCommsLCCH1.PollDsa.stVal	1	SPC	PollDsa		DO	ST	stVal
DI	-95	AllDevicesDisabled	ConnName+HomeDir / GWCommsLCCH1.DevDsa.stVal	1	SPC	DevDsa		DO	ST	stVal
DI	-94	CounterIntegrityPollExecution	PhyDevName/ GWCommsLCCH1.CntPollExec.stVal	1	SPS	CntPollExec		DO	ST	stVal
DI	-26	TimeSyncExecution	PhyDevName/ GWCommsLCCH1.TmSynExec.stVal	1	SPS	TmSynExec		DO	ST	stVal

Point Type	Point ID	Point Reference	Object Reference	LN Instance	CDC	DO	DO Instance	MCP Custom LN/DO	FC	DA
DI	-25	IntegrityPollExecution	PhyDevName/ GWCommsLCCH1.IPollExec.stVal	1	SPS	IPollExec		DO	ST	stVal
DI	-24	PollingDisabled	PhyDevName/ GWCommsLCCH1.PollDsa.stVal	1	SPC	PollDsa		DO	ST	stVal
DI	-22	DeviceDisable	PhyDevName/ GWCommsLCCH1.DevDsa.stVal	1	SPC	DevDsa		DO	ST	stVal
DI	-17	DCAStatus	ConnName+HomeDir / GWCommsLCCH1.DCASt.stVal	1	SPS	DCASt		DO	ST	stVal
DI	-2	Device Online	PhyDevName/ GWCommsLCCH1.DevOnline.stVal	1	SPS	DevOnline		DO	ST	stVal
DO	-2033	DisableAllPolling	ConnName+HomeDir / GWCommsLCCH1.PollDsa.Oper.ctlVal	1	SPC	PollDsa		DO	CO	Oper.ctlVal
DO	-2032	TimeSyncAllDevices	ConnName+HomeDir / GWCommsLCCH1.TmSynDev.Oper.ctlVal	1	SPC	TmSynDev		DO	CO	Oper.ctlVal
DO	-2031	CounterIntegrityPollAllDevices	ConnName+HomeDir / GWCommsLCCH1.CntIPoll.Oper.ctlVal	1	SPC	CntIPoll		DO	CO	Oper.ctlVal
DO	-2030	IntegrityPollAllDevices	ConnName+HomeDir / GWCommsLCCH1.IPollAllDev.Oper.ctlVal	1	SPC	IPollAllDev		DO	CO	Oper.ctlVal
DO	-2029	DisableAllDevices	ConnName+HomeDir / GWCommsLCCH1.DevDsa.Oper.ctlVal	1	SPC	DevDsa		DO	CO	Oper.ctlVal

Point Type	Point ID	Point Reference	Object Reference	LN Instance	CDC	DO	DO Instance	MCP Custom LN/DO	FC	DA
DO	-2028	CounterIntegrityPoll	PhyDevName/ GWCommsLCCH1.CntIPoll.Oper.ctlVal	1	SPC	CntIPoll		DO	CO	Oper.ctlVal
DO	-2010	TimeSync	PhyDevName/ GWCommsLCCH1.TmSyn.Oper.ctlVal	1	SPC	TmSyn		DO	CO	Oper.ctlVal
DO	-2006	IntegrityPoll	PhyDevName/ GWCommsLCCH1.IPoll.Oper.ctlVal	1	SPC	IPoll		DO	CO	Oper.ctlVal
DO	-2005	DisablePolling	PhyDevName/ GWCommsLCCH1.PollDsa.Oper.ctlVal	1	SPC	PollDsa		DO	CO	Oper.ctlVal
DO	-2001	DisableDevice	PhyDevName/ GWCommsLCCH1.DevDsa.Oper.ctlVal	1	SPC	DevDsa		DO	CO	Oper.ctlVal
Text	-5004	DeviceInfo_BayID	PhyDevName/ GWCommsLCCH1.DevIaBayID.stVal	1	VSS	DevIaBayID		DO	ST	stVal
Text	-5003	DeviceInfo_DeviceAddress	PhyDevName/ GWCommsLCCH1.DevAddr.stVal	1	VSS	DevAddr		DO	ST	stVal
Text	-5002	DeviceInfo_DeviceType	PhyDevName/ GWCommsLCCH1.DevIaDevTyp.stVal	1	VSS	DevIaDevTyp		DO	ST	stVal
Text	-5001	DeviceInfo_DeviceID	PhyDevName/ GWCommsLCCH1.DevIaDevID.stVal	1	VSS	DevIaDevID		DO	ST	stVal
Text	-5000	DeviceInfo_LineID	PhyDevName/ GWCommsLCCH1.DevIaLinID.stVal	1	VSS	DevIaLinID		DO	ST	stVal

4.3.7 IEC 60870-5-104 DCA

Point Type	Point ID	Point Reference	Object Reference	LN Instance	CDC	DO	Do Instance	MCP Custom LN/DO	FC	DA
ACC	-4084	IFrameDiscardedLinkInactive	ConnName+HomeDir /GWCommsLCCH1.LinkInActive.actVal	1	BCR	LinkInActive		DO	ST	actVal
ACC	-4083	RecieveBufferOverflowErrors	ConnName+HomeDir /GWCommsLCCH1.BufOv.actVal	1	BCR	BufOv		DO	ST	actVal
ACC	-4082	InvalidFrameTypeErrors	ConnName+HomeDir /GWCommsLCCH1.InVldFer.actVal	1	BCR	InVldFer		DO	ST	actVal
ACC	-4081	InvalidLengthFieldErros	ConnName+HomeDir /GWCommsLCCH1.InVldLenErr.actVal	1	BCR	InVldLenErr		DO	ST	actVal
ACC	-4080	ConnClosedByRemote	ConnName+HomeDir /GWCommsLCCH1.ConnClsRem.actVal	1	BCR	ConnClsRem		DO	ST	actVal
ACC	-4079	ConnClosedByLocal	ConnName+HomeDir /GWCommsLCCH1.ConnClsLoc.actVal	1	BCR	ConnClsLoc		DO	ST	actVal
ACC	-4078	OtherConnectErrors	ConnName+HomeDir /GWCommsLCCH1.ConnErr.actVal	1	BCR	ConnErr		DO	ST	actVal
ACC	-4077	T0ConnTimeOuts	ConnName+HomeDir /GWCommsLCCH1.ConnTmt.actVal	1	BCR	ConnTmt		DO	ST	actVal
ACC	-4076	ENOBUFSErrors	ConnName+HomeDir /GWCommsLCCH1.ENOBUFSErr.actVal	1	BCR	ENOBUFSErr		DO	ST	actVal
ACC	-4075	EADDRUNAVAILErrors	ConnName+HomeDir /GWCommsLCCH1.EADDRUnavErr.actVal	1	BCR	EADDRUnavErr		DO	ST	actVal
ACC	-4074	EHOSTUNREACHErrors	ConnName+HomeDir /GWCommsLCCH1.UrechblErr.actVal	1	BCR	UrechblErr		DO	ST	actVal

Point Type	Point ID	Point Reference	Object Reference	LN Instance	CDC	DO	Do Instance	MCP Custom LN/DO	FC	DA
ACC	-4073	ECONNREFUSEDErrors	ConnName+HomeDir /GWCommsLCCH1.ConnRejctErr.actVal	1	BCR	ConnRejctErr		DO	ST	actVal
ACC	-4072	ETIMEDOUTErrors	ConnName+HomeDir /GWCommsLCCH1.ETmtErr.actVal	1	BCR	ETmtErr		DO	ST	actVal
ACC	-4071	ECONNRESETErrors	ConnName+HomeDir /GWCommsLCCH1.ConnRsErr.actVal	1	BCR	ConnRsErr		DO	ST	actVal
ACC	-4070	TCPWriteFailures	ConnName+HomeDir /GWCommsLCCH1.TCPWriteFail.actVal	1	BCR	TCPWriteFail		DO	ST	actVal
ACC	-4069	TCPReadFailures	ConnName+HomeDir /GWCommsLCCH1.TCPReadFail.actVal	1	BCR	TCPReadFail		DO	ST	actVal
ACC	-4068	NumSequenceErrors	ConnName+HomeDir /GWCommsLCCH1.NumSeqErr.actVal	1	BCR	NumSeqErr		DO	ST	actVal
ACC	-4067	t1ConfirmTimeOuts	ConnName+HomeDir /GWCommsLCCH1.Cfmt1Tmt.actVal	1	BCR	Cfmt1Tmt		DO	ST	actVal
ACC	-4066	RxFrameErrors	ConnName+HomeDir / GWCommsLCCH1.RxFer.actVal	1	BCR	RxFer		DO	ST	actVal
ACC	-4064	RxUnknownASDUAddress	ConnName+HomeDir / GWCommsLCCH1.RxUkASDUAddr.actVal	1	BCR	RxUkASDUAddr		DO	ST	actVal
ACC	-4021	RxNACK	PhyDevName/ GWCommsLCCH1.RxNAck.actVal	1	BCR	RxNAck		DO	ST	actVal
ACC	-4020	RxACK	PhyDevName/ GWCommsLCCH1.RxAck.actVal	1	BCR	RxAck		DO	ST	actVal

Point Type	Point ID	Point Reference	Object Reference	LN Instance	CDC	DO	Do Instance	MCP Custom LN/DO	FC	DA
ACC	-4019	RxBadObjectAddress	PhyDevName/ GWCommsLCCH1.RxBadObjAddr.actVal	1	BCR	RxBadObjAddr		DO	ST	actVal
ACC	-4018	RxBadASDUSize	PhyDevName/ GWCommsLCCH1.RxBadASDULen.actVal	1	BCR	RxBadASDULen		DO	ST	actVal
ACC	-4017	RxBadCOT	PhyDevName/ GWCommsLCCH1.RxBadCOT.actVal	1	BCR	RxBadCOT		DO	ST	actVal
ACC	-4016	RxBadQualifier	PhyDevName/ GWCommsLCCH1.RxBadQual.actVal	1	BCR	RxBadQual		DO	ST	actVal
ACC	-4015	RxBadTypeID	PhyDevName/ GWCommsLCCH1.RxBadTypID.actVal	1	BCR	RxBadTypID		DO	ST	actVal
ACC	-4014	CommandsFailed	PhyDevName/ GWCommsLCCH1.CmdFail.actVal	1	BCR	CmdFail		DO	ST	actVal
ACC	-4013	CommandsReceived	PhyDevName/ GWCommsLCCH1.CmdRx.actVal	1	BCR	CmdRx		DO	ST	actVal
ACC	-4012	EventsReported	PhyDevName/ GWCommsLCCH1.EvtRpt.actVal	1	BCR	EvtRpt		DO	ST	actVal
ACC	-4011	NewEventsReceived	PhyDevName/ GWCommsLCCH1.NewEvtRx.actVal	1	BCR	NewEvtRx		DO	ST	actVal
ACC	-4008	MsgError	PhyDevName/ GWCommsLCCH1.MsgErr.actVal	1	BCR	MsgErr		DO	ST	actVal

Point Type	Point ID	Point Reference	Object Reference	LN Instance	CDC	DO	Do Instance	MCP Custom LN/DO	FC	DA
ACC	-4003	MsgTimeOuts	ConnName+HomeDir / GWCommsLCCH1.MsgTmOut.actVal	1	BCR	MsgTmOut		DO	ST	actVal
ACC	-4003	MsgTimeOuts	PhyDevName/ GWCommsLCCH1.MsgTmOut.actVal	1	BCR	MsgTmOut		DO	ST	actVal
ACC	-4002	MsgReceived	ConnName+HomeDir / GWCommsLCCH1.RxCnt.actVal	1	BCR	RxCnt			ST	actVal
ACC	-4002	MsgReceived	PhyDevName/ GWCommsLCCH1.RxCnt.actVal	1	BCR	RxCnt			ST	actVal
ACC	-4001	MsgSent	ConnName+HomeDir / GWCommsLCCH1.TxCnt.actVal	1	BCR	TxCnt			ST	actVal
ACC	-4001	MsgSent	PhyDevName/ GWCommsLCCH1.TxCnt.actVal	1	BCR	TxCnt			ST	actVal
ACC	-4000	UpdateCount	PhyDevName/ GWCommsLCCH1.UpdCnt.actVal	1	BCR	UpdCnt		DO	ST	actVal
DI	-96	AllPollingDisabled	ConnName+HomeDir / GWCommsLCCH1.PollDsa.stVal	1	SPC	PollDsa		DO	ST	stVal
DI	-95	AllDevicesDisabled	ConnName+HomeDir / GWCommsLCCH1.DevDsa.stVal	1	SPC	DevDsa		DO	ST	stVal
DI	-94	CounterIntegrityPollExecution	PhyDevName/ GWCommsLCCH1.CntPollExec.stVal	1	SPS	CntPollExec		DO	ST	stVal

Point Type	Point ID	Point Reference	Object Reference	LN Instance	CDC	DO	Do Instance	MCP Custom LN/DO	FC	DA
DI	-31	secondaryChannelStatus	PhyDevName/ GWCommsLCCH1.RedChLiv.stVal	1	SPS	RedChLiv			ST	stVal
DI	-30	PrimaryChannelStatus	PhyDevName/ GWCommsLCCH1.ChLiv.stVal	1	SPS	ChLiv			ST	stVal
DI	-29	secondaryChannelHealth	PhyDevName/ GWCommsLCCH1.ScndChHealth.stVal	1	SPS	ScndChHealth		DO	ST	stVal
DI	-28	PrimaryChannelHealth	PhyDevName/ GWCommsLCCH1.PriChHealth.stVal	1	SPS	PriChHealth		DO	ST	stVal
DI	-26	TimeSyncExecution	PhyDevName/ GWCommsLCCH1.TmSynExec.stVal	1	SPS	TmSynExec		DO	ST	stVal
DI	-25	IntegrityPollExecution	PhyDevName/ GWCommsLCCH1.IPollExec.stVal	1	SPS	IPollExec		DO	ST	stVal
DI	-24	PollingDisabled	PhyDevName/ GWCommsLCCH1.PollDsa.stVal	1	SPC	PollDsa		DO	ST	stVal
DI	-22	DeviceDisable	PhyDevName/ GWCommsLCCH1.DevDsa.stVal	1	SPC	DevDsa		DO	ST	stVal
DI	-17	DCAStatus	ConnName+HomeDir / GWCommsLCCH1.DCASt.stVal	1	SPS	DCASt		DO	ST	stVal
DI	-2	Device Online	PhyDevName/ GWCommsLCCH1.DevOnline.stVal	1	SPS	DevOnline		DO	ST	stVal

Point Type	Point ID	Point Reference	Object Reference	LN Instance	CDC	DO	Do Instance	MCP Custom LN/DO	FC	DA
DO	-2034	ForceAllDevicesOffPrimaryChannel	ConnName+HomeDir / GWCommsLCCH1.ForcPriCh.Oper.ctlVal	1	SPC	ForcPriCh		DO	CO	Oper. ctlVal
DO	-2033	DisableAllPolling	ConnName+HomeDir / GWCommsLCCH1.PollDsa.Oper.ctlVal	1	SPC	PollDsa		DO	CO	Oper. ctlVal
DO	-2032	TimeSyncAllDevices	ConnName+HomeDir / GWCommsLCCH1.TmSynDev.Oper.ctlVal	1	SPC	TmSynDev		DO	CO	Oper. ctlVal
DO	-2031	CounterIntegrityPollAllDevices	ConnName+HomeDir / GWCommsLCCH1.CntIPoll.Oper.ctlVal	1	SPC	CntIPoll		DO	CO	Oper. ctlVal
DO	-2030	IntegrityPollAllDevices	ConnName+HomeDir / GWCommsLCCH1.IPollAllDev.Oper.ctlVal	1	SPC	IPollAllDev		DO	CO	Oper. ctlVal
DO	-2029	DisableAllDevices	ConnName+HomeDir / GWCommsLCCH1.DevDsa.Oper.ctlVal	1	SPC	DevDsa		DO	CO	Oper. ctlVal
DO	-2028	CounterIntegrityPoll	PhyDevName/ GWCommsLCCH1.CntIPoll.Oper.ctlVal	1	SPC	CntIPoll		DO	CO	Oper. ctlVal
DO	-2011	ForceDeviceToAlternateChannel	PhyDevName/ GWCommsLCCH1.ForcAltnCh.Oper.ctlVal	1	SPC	ForcAltnCh		DO	CO	Oper. ctlVal
DO	-2010	TimeSync	PhyDevName/ GWCommsLCCH1.TmSyn.Oper.ctlVal	1	SPC	TmSyn		DO	CO	Oper. ctlVal
DO	-2006	IntegrityPoll	PhyDevName/ GWCommsLCCH1.IPoll.Oper.ctlVal	1	SPC	IPoll		DO	CO	Oper. ctlVal

Point Type	Point ID	Point Reference	Object Reference	LN Instance	CDC	DO	Do Instance	MCP Custom LN/DO	FC	DA
DO	-2005	DisablePolling	PhyDevName/ GWCommsLCCH1.PollDsa.Oper.ctlVal	1	SPC	PollDsa		DO	CO	Oper. ctlVal
DO	-2001	DisableDevice	PhyDevName/ GWCommsLCCH1.DevDsa.Oper.ctlVal	1	SPC	DevDsa		DO	CO	Oper. ctlVal
Text	-5004	DeviceInfo_BayID	PhyDevName/ GWCommsLCCH1.DevIaBayID.stVal	1	VSS	DevIaBayID		DO	ST	stVal
Text	-5003	DeviceInfo_DeviceAddress	PhyDevName/ GWCommsLCCH1.DevAddr.stVal	1	VSS	DevAddr		DO	ST	stVal
Text	-5002	DeviceInfo_DeviceType	PhyDevName/ GWCommsLCCH1.DevIaDevTyp.stVal	1	VSS	DevIaDevTyp		DO	ST	stVal
Text	-5001	DeviceInfo_DeviceID	PhyDevName/ GWCommsLCCH1.DevIaDevID.stVal	1	VSS	DevIaDevID		DO	ST	stVal
Text	-5000	DeviceInfo_LineID	PhyDevName/ GWCommsLCCH1.DevIaLinID.stVal	1	VSS	DevIaLinID		DO	ST	stVal

4.3.8 GENASCII DCA

Point Type	Point ID	Point Reference	Object Reference	LN Instance	CDC	DO	Do Instance	MCP Custom LN/DO	FC	DA
ACC	-4008	MsgError	PhyDevName/GWCommsLCCH1.MsgErr.actVal	1	BCR	MsgErr		DO	ST	actVal
ACC	-4003	MsgTimeOuts	PhyDevName/GWCommsLCCH1.MsgTmOut.actVal	1	BCR	MsgTmOut		DO	ST	actVal
ACC	-4002	MsgReceived	PhyDevName/GWCommsLCCH1.RxCnt.actVal	1	BCR	RxCnt			ST	actVal
ACC	-4001	MsgSent	PhyDevName/GWCommsLCCH1.TxCnt.actVal	1	BCR	TxCnt			ST	actVal
ACC	-4000	UpdateCount	PhyDevName/GWCommsLCCH1.UpdCnt.actVal	1	BCR	UpdCnt		DO	ST	actVal
AI	-1024	ConfigErrors	PhyDevName/GWCommsLCCH1.ConfErr.stVal	1	INS	ConfErr		DO	ST	stVal
DI	-147	Pass Through In-Progress	PhyDevName/GWCommsLCCH1.PassThrPrg.stVal	1	SPS	PassThrPrg		DO	ST	stVal
DI	-146	File Retrieval In-Progress	PhyDevName/GWCommsLCCH1.FileRetInPrg.stVal	1	SPS	FileRetInPrg		DO	ST	stVal
DI	-141	Cev_cmd_support	PhyDevName/GWCommsLCCH1.CevCmdSupprt.stVal	1	SPS	CevCmdSupprt		DO	ST	stVal
DI	-140	Eve_cmd_support	PhyDevName/GWCommsLCCH1.EveCmd.stVal	1	SPS	EveCmd		DO	ST	stVal
DI	-139	His_cmd_support	PhyDevName/GWCommsLCCH1.HISCmdSpo.stVal	1	SPS	HISCmdSpo		DO	ST	stVal
DI	-47	Polling Of IED Status	PhyDevName/GWCommsLCCH1.PollSt.stVal	1	SPS	PollSt		DO	ST	stVal
DI	-22	DeviceDisable	PhyDevName/GWCommsLCCH1.DevDsa.stVal	1	SPC	DevDsa		DO	ST	stVal

Point Type	Point ID	Point Reference	Object Reference	LN Instance	CDC	DO	Do Instance	MCP Custom LN/DO	FC	DA
DI	-19	BackupPortActiveStatus	PhyDevName/GWCommsLCCH1.RedChLiv.stVal	1	SPS	RedChLiv			ST	stVal
DI	-18	PrimaryPortActiveStatus	PhyDevName/GWCommsLCCH1.ChLiv.stVal	1	SPS	ChLiv			ST	stVal
DI	-2	Device Online	PhyDevName/GWCommsLCCH1.DevOnline.stVal	1	SPS	DevOnline		DO	ST	stVal
DO	-2014	Enable Polling Of IED	PhyDevName/GWCommsLCCH1.PollEna.Oper.ctlVal	1	SPC	PollEna		DO	CO	Oper.ctlVal
DO	-2009	ClearStats	PhyDevName/GWCommsLCCH1.ClrStat.Oper.ctlVal	1	SPC	ClrStat		DO	CO	Oper.ctlVal
DO	-2001	DisableDevice	PhyDevName/GWCommsLCCH1.DevDsa.Oper.ctlVal	1	SPC	DevDsa		DO	CO	Oper.ctlVal
Text	-5005	MapFile	PhyDevName/GWCommsLCCH1.MapFile.stVal	1	VSS	MapFile		DO	ST	stVal
Text	-5004	DeviceInfo_BayID	PhyDevName/GWCommsLCCH1.DevIaBayID.stVal	1	VSS	DevIaBayID		DO	ST	stVal
Text	-5003	DeviceInfo_DeviceAddress	PhyDevName/GWCommsLCCH1.DevAddr.stVal	1	VSS	DevAddr		DO	ST	stVal
Text	-5002	DeviceInfo_DeviceType	PhyDevName/GWCommsLCCH1.DevIaDevTyp.stVal	1	VSS	DevIaDevTyp		DO	ST	stVal
Text	-5001	DeviceInfo_DeviceID	PhyDevName/GWCommsLCCH1.DevIaDevID.stVal	1	VSS	DevIaDevID		DO	ST	stVal
Text	-5000	DeviceInfo_LineID	PhyDevName/GWCommsLCCH1.DevIaLinID.stVal	1	VSS	DevIaLinID		DO	ST	stVal

4.3.9 SNMP DCA

Point Type	Point ID	Point Reference	Object Reference	LN Instance	CDC	DO	Do Instance	MCP Custom LN/DO	FC	DA
ACC	-4008	MsgError	PhyDevName/GWCommsLCCH1.MsgErr.actVal	1	BCR	MsgErr		DO	ST	actVal
ACC	-4007	ControlsFailed	PhyDevName/GWCommsLCCH1.CtlFail.actVal	1	BCR	CtlFail		DO	ST	actVal
ACC	-4006	ControlsReceived	PhyDevName/GWCommsLCCH1.CtlRx.actVal	1	BCR	CtlRx		DO	ST	actVal
ACC	-4003	MsgTimeOuts	PhyDevName/GWCommsLCCH1.MsgTmOut.actVal	1	BCR	MsgTmOut		DO	ST	actVal
ACC	-4002	MsgReceived	PhyDevName/GWCommsLCCH1.RxCnt.actVal	1	BCR	RxCnt			ST	actVal
ACC	-4001	MsgSent	PhyDevName/GWCommsLCCH1.TxCnt.actVal	1	BCR	TxCnt			ST	actVal
ACC	-4000	UpdateCount	PhyDevName/GWCommsLCCH1.UpdCnt.actVal	1	BCR	UpdCnt		DO	ST	actVal
DI	-104	EGPNeghbourLoss	PhyDevName/GWCommsLCCH1.EGPNbourLos.stVal	1	SPS	EGPNbourLos		DO	ST	stVal
DI	-103	AuthenticationFailure	PhyDevName/GWCommsLCCH1.AutheFail.stVal	1	SPS	AutheFail		DO	ST	stVal
DI	-102	LinkDown	PhyDevName/GWCommsLCCH1.LinkDn.stVal	1	SPS	LinkDn		DO	ST	stVal
DI	-101	LinkUp	PhyDevName/GWCommsLCCH1.LinkUp.stVal	1	SPS	LinkUp		DO	ST	stVal
DI	-100	WarmStart	PhyDevName/GWCommsLCCH1.WrmSt.stVal	1	SPS	WrmSt		DO	ST	stVal
DI	-99	ColdStart	PhyDevName/GWCommsLCCH1.ColdSt.stVal	1	SPS	ColdSt		DO	ST	stVal
DI	-52	Backup Port Status	PhyDevName/GWCommsLCCH1.RedChLiv.stVal	1	SPS	RedChLiv			ST	stVal
DI	-51	Primary Port Status	PhyDevName/GWCommsLCCH1.ChLiv.stVal	1	SPS	ChLiv			ST	stVal

Point Type	Point ID	Point Reference	Object Reference	LN Instance	CDC	DO	Do Instance	MCP Custom LN/DO	FC	DA
DI	-24	PollingDisabled	PhyDevName/GWCommsLCCH1.PollDsa.stVal	1	SPC	PollDsa		DO	ST	stVal
DI	-22	DeviceDisable	PhyDevName/GWCommsLCCH1.DevDsa.stVal	1	SPC	DevDsa		DO	ST	stVal
DI	-3	DCA Status	PhyDevName/GWCommsLCCH1.ChLiv.stVal	1	SPS	ChLiv			ST	stVal
DI	-2	Device Online	PhyDevName/GWCommsLCCH1.DevOnline.stVal	1	SPS	DevOnline		DO	ST	stVal
DO	-2005	DisablePolling	PhyDevName/GWCommsLCCH1.PollDsa.Oper.ctlVal	1	SPC	PollDsa		DO	CO	Oper.ctlVal
DO	-2001	DisableDevice	PhyDevName/GWCommsLCCH1.DevDsa.Oper.ctlVal	1	SPC	DevDsa		DO	CO	Oper.ctlVal
Text	-5004	DeviceInfo_BayID	PhyDevName/GWCommsLCCH1.DevIaBayID.stVal	1	VSS	DevIaBayID		DO	ST	stVal
Text	-5003	DeviceInfo_Device Address	PhyDevName/GWCommsLCCH1.DevAddr.stVal	1	VSS	DevAddr		DO	ST	stVal
Text	-5002	DeviceInfo_Device Type	PhyDevName/GWCommsLCCH1.DevIaDevTyp.stVal	1	VSS	DevIaDevTyp		DO	ST	stVal
Text	-5001	DeviceInfo_Device ID	PhyDevName/GWCommsLCCH1.DevIaDevID.stVal	1	VSS	DevIaDevID		DO	ST	stVal
Text	-5000	DeviceInfo_LineID	PhyDevName/GWCommsLCCH1.DevIaLinID.stVal	1	VSS	DevIaLinID		DO	ST	stVal

4.3.10 IEC 61850 DCA

Point Type	Point ID	Point Reference	Object Reference	LN Instance	CDC	DO	Do Instance	MCP Custom LN/DO	FC	DA
ACC	-4049	Controls Failed	PhyDevName/GWCommsLCCH1.CtlFail.actVal	1	BCR	CtlFail		DO	ST	actVal
ACC	-4048	Controls Received	PhyDevName/GWCommsLCCH1.CtlRx.actVal	1	BCR	CtlRx		DO	ST	actVal
ACC	-4047	Update Count	PhyDevName/GWCommsLCCH1.UpdCnt.actVal	1	BCR	UpdCnt		DO	ST	actVal
ACC	-4046	Current Channel Checks	PhyDevName/GWCommsLCCH1.CurChChk.actVal	1	BCR	CurChChk		DO	ST	actVal
ACC	-4045	Alternate Channel Checks Failed	PhyDevName/GWCommsLCCH1.AltnChkFail.actVal	1	BCR	AltnChkFail		DO	ST	actVal
ACC	-4044	Alternate Channel Checks	PhyDevName/GWCommsLCCH1.AltnChChk.actVal	1	BCR	AltnChChk		DO	ST	actVal
ACC	-4043	TCP Connection Drops	PhyDevName/GWCommsLCCH1.TCPConnDrop.actVal	1	BCR	TCPConnDrop		DO	ST	actVal
ACC	-4042	TCP Connections Closed Remotely	PhyDevName/GWCommsLCCH1.ConnClsRem.actVal	1	BCR	ConnClsRem		DO	ST	actVal
ACC	-4041	TCP Connections Closed Locally	PhyDevName/GWCommsLCCH1.ConnClsLoc.actVal	1	BCR	ConnClsLoc		DO	ST	actVal
ACC	-4040	TCP Connection Attempts Failed	PhyDevName/GWCommsLCCH1.TCPConnFail.actVal	1	BCR	TCPConnFail		DO	ST	actVal
ACC	-4039	TCP Connection Attempts	PhyDevName/GWCommsLCCH1.TCPConnRe.actVal	1	BCR	TCPConnRe		DO	ST	actVal
ACC	-4038	MMS Information Reports Failed	PhyDevName/GWCommsLCCH1.MMSIaRptFail.actVal	1	BCR	MMSIaRptFail		DO	ST	actVal
ACC	-4037	MMS Information Reports Received	PhyDevName/GWCommsLCCH1.MMSIaRptRx.actVal	1	BCR	MMSIaRptRx		DO	ST	actVal

Point Type	Point ID	Point Reference	Object Reference	LN Instance	CDC	DO	Do Instance	MCP Custom LN/DO	FC	DA
ACC	-4036	MMS Request Indications Failed	PhyDevName/GWCommsLCCH1.MMSReqIndFld.actVal	1	BCR	MMSReqIndFld		DO	ST	actVal
ACC	-4035	MMS Request Indications Received	PhyDevName/GWCommsLCCH1.MMSReqIndRcd.actVal	1	BCR	MMSReqIndRcd		DO	ST	actVal
ACC	-4034	MMS Requests Failed	PhyDevName/GWCommsLCCH1.MMSReqFail.actVal	1	BCR	MMSReqFail		DO	ST	actVal
ACC	-4033	MMS Requests Sent	PhyDevName/GWCommsLCCH1.MMSReqTx.actVal	1	BCR	MMSReqTx		DO	ST	actVal
ACC	-4032	MMS Rejects Received	PhyDevName/GWCommsLCCH1.MMSRejctRx.actVal	1	BCR	MMSRejctRx		DO	ST	actVal
ACC	-4031	MMS Rejects Sent	PhyDevName/GWCommsLCCH1.MMSRejctTx.actVal	1	BCR	MMSRejctTx		DO	ST	actVal
ACC	-4030	Provider Abort Indications	PhyDevName/GWCommsLCCH1.AbortInd.actVal	1	BCR	AbortInd		DO	ST	actVal
ACC	-4029	User Abort Indications	PhyDevName/GWCommsLCCH1.UsrAbortInd.actVal	1	BCR	UsrAbortInd		DO	ST	actVal
ACC	-4028	MMS Concludes Indications Failed	PhyDevName/GWCommsLCCH1.MMSConcIndFl.actVal	1	BCR	MMSConcIndFl		DO	ST	actVal
ACC	-4027	MMS Concludes Indications	PhyDevName/GWCommsLCCH1.MMSConcldInd.actVal	1	BCR	MMSConcldInd		DO	ST	actVal
ACC	-4026	MMS Concludes Failed	PhyDevName/GWCommsLCCH1.MMSConcFail.actVal	1	BCR	MMSConcFail		DO	ST	actVal
ACC	-4025	MMS Concludes Sent	PhyDevName/GWCommsLCCH1.MMSConcTx.actVal	1	BCR	MMSConcTx		DO	ST	actVal

Point Type	Point ID	Point Reference	Object Reference	LN Instance	CDC	DO	Do Instance	MCP Custom LN/DO	FC	DA
ACC	-4024	MMS Calling Initiates Failed	PhyDevName/GWCommsLCCH1.MMSInitFail.actVal	1	BCR	MMSInitFail		DO	ST	actVal
ACC	-4023	MMS Calling Initiates Req Sent	PhyDevName/GWCommsLCCH1.MMSInitReqTx.actVal	1	BCR	MMSInitReqTx		DO	ST	actVal
ACC	-4008	MsgError	PhyDevName/GWCommsLCCH1.MsgErr.actVal	1	BCR	MsgErr		DO	ST	actVal
ACC	-4003	MsgTimeOuts	PhyDevName/GWCommsLCCH1.MsgTmOut.actVal	1	BCR	MsgTmOut		DO	ST	actVal
ACC	-4002	MsgReceived	PhyDevName/GWCommsLCCH1.RxCnt.actVal	1	BCR	RxCnt			ST	actVal
ACC	-4001	MsgSent	PhyDevName/GWCommsLCCH1.TxCnt.actVal	1	BCR	TxCnt			ST	actVal
DI	-168	Peer Device Online	PhyDevName/GWCommsLCCH1.PrDevOnline.stVal	1	SPS	PrDevOnline		DO	ST	stVal
DI	-48	Configuration Comparison Status	PhyDevName/GWCommsLCCH1.ConfCmprSt.stVal	1	SPS	ConfCmprSt		DO	ST	stVal
DI	-47	Polling Of IED Status	PhyDevName/GWCommsLCCH1.PollSt.stVal	1	SPS	PollSt		DO	ST	stVal
DI	-46	Retrieve All Data Sets From IED Status	PhyDevName/GWCommsLCCH1.RetAllDatSet.stVal	1	SPS	RetAllDatSet		DO	ST	stVal
DI	-45	Report Buffer Overflow	PhyDevName/GWCommsLCCH1.RptBufOv.stVal	1	SPS	RptBufOv		DO	ST	stVal
DI	-43	Secondary Channel Status	PhyDevName/GWCommsLCCH1.RedChLiv.stVal	1	SPS	RedChLiv			ST	stVal
DI	-42	Primary Channel Status	PhyDevName/GWCommsLCCH1.ChLiv.stVal	1	SPS	ChLiv			ST	stVal

Point Type	Point ID	Point Reference	Object Reference	LN Instance	CDC	DO	Do Instance	MCP Custom LN/DO	FC	DA
DI	-41	Secondary Channel Health	PhyDevName/GWCommsLCCH1.ScndChHealth.stVal	1	SPS	ScndChHealth		DO	ST	stVal
DI	-40	Primary Channel Health	PhyDevName/GWCommsLCCH1.PriChHealth.stVal	1	SPS	PriChHealth		DO	ST	stVal
DI	-39	Enable Polling of All IEDs Status	ConnName+HomeDir /GWCommsLCCH1.PollEna.stVal	1	SPC	PollEna		DO	ST	stVal
DI	-22	DeviceDisable	ConnName+HomeDir /GWCommsLCCH1.DevDsa.stVal	1	SPC	DevDsa		DO	ST	stVal
DI	-22	DeviceDisable	PhyDevName/GWCommsLCCH1.DevDsa.stVal	1	SPC	DevDsa		DO	ST	stVal
DI	-3	DCA Status	ConnName+HomeDir /GWCommsLCCH1.ChLiv.stVal	1	SPS	ChLiv			ST	stVal
DI	-2	Device Online	PhyDevName/GWCommsLCCH1.DevOnline.stVal	1	SPS	DevOnline		DO	ST	stVal
DO	-2043	Enable Test Flag in Controls	PhyDevName/GWCommsLCCH1.TestFlagEna.Oper.ctlVal	1	SPC	TestFlagEna		DO	CO	Oper.ctlVal
DO	-2018	Force All IEDs Off Primary Channel	ConnName+HomeDir /GWCommsLCCH1.ForcPriCh.Oper.ctlVal	1	SPC	ForcPriCh		DO	CO	Oper.ctlVal
DO	-2017	Enable Polling of All IEDs	ConnName+HomeDir /GWCommsLCCH1.PollEna.Oper.ctlVal	1	SPC	PollEna		DO	CO	Oper.ctlVal
DO	-2016	Retrieve All Data Sets from All IEDs	ConnName+HomeDir /GWCommsLCCH1.RetAllDatSet.Oper.ctlVal	1	SPC	RetAllDatSet		DO	CO	Oper.ctlVal
DO	-2015	Force IED to Alternate Channel	PhyDevName/GWCommsLCCH1.ForcAltnCh.Oper.ctlVal	1	SPC	ForcAltnCh		DO	CO	Oper.ctlVal
DO	-2014	Enable Polling Of IED	PhyDevName/GWCommsLCCH1.PollEna.Oper.ctlVal	1	SPC	PollEna		DO	CO	Oper.ctlVal

Point Type	Point ID	Point Reference	Object Reference	LN Instance	CDC	DO	Do Instance	MCP Custom LN/DO	FC	DA
DO	-2013	Retrieve All Data Sets	PhyDevName/GWCommsLCCH1.RetAllDatSet.Oper.ctlVal	1	SPC	RetAllDatSet		DO	CO	Oper.ctlVal
DO	-2001	DisableDevice	PhyDevName/GWCommsLCCH1.DevDsa.Oper.ctlVal	1	SPC	DevDsa		DO	CO	Oper.ctlVal
Text	-5004	DeviceInfo_BayID	ConnName+HomeDir / GWCommsLCCH1.DevIaBayID.stVal	1	VSS	DevIaBayID		DO	ST	stVal
Text	-5004	DeviceInfo_BayID	PhyDevName/GWCommsLCCH1.DevIaBayID.stVal	1	VSS	DevIaBayID		DO	ST	stVal
Text	-5003	DeviceInfo_Device Address	ConnName+HomeDir /GWCommsLCCH1.DevAddr.stVal	1	VSS	DevAddr		DO	ST	stVal
Text	-5003	DeviceInfo_Device Address	PhyDevName/GWCommsLCCH1.DevAddr.stVal	1	VSS	DevAddr		DO	ST	stVal
Text	-5002	DeviceInfo_Device Type	ConnName+HomeDir / GWCommsLCCH1.DevIaDevTyp.stVal	1	VSS	DevIaDevTyp		DO	ST	stVal
Text	-5002	DeviceInfo_Device Type	PhyDevName/GWCommsLCCH1.DevIaDevTyp.stVal	1	VSS	DevIaDevTyp		DO	ST	stVal
Text	-5001	DeviceInfo_Device ID	ConnName+HomeDir / GWCommsLCCH1.DevIaDevID.stVal	1	VSS	DevIaDevID		DO	ST	stVal
Text	-5001	DeviceInfo_Device ID	PhyDevName/GWCommsLCCH1.DevIaDevID.stVal	1	VSS	DevIaDevID		DO	ST	stVal
Text	-5000	DeviceInfo_LineID	ConnName+HomeDir / GWCommsLCCH1.DevIaLinID.stVal	1	VSS	DevIaLinID		DO	ST	stVal
Text	-5000	DeviceInfo_LineID	PhyDevName/GWCommsLCCH1.DevIaLinID.stVal	1	VSS	DevIaLinID		DO	ST	stVal

4.4 Assigning IEC 61850 Object References to DPAs

This section describes the assignments of IEC 61850 Object References to Data Processing Applications

4.4.1 DNP DPA

Point Type	Point ID	Point Reference	Object Reference	LN Instance	CDC	DO	Do Instance	MCP Custom LN/DO	FC	DA
ACC	-4057	BIChangeEventsOut	MasterName+HomeDir / GWCommsLCCH1.BIChgEvtOut.actVal	1	BCR	BIChgEvtOut		DO	ST	actVal
ACC	-4056	RemOperationsFailed	MasterName+HomeDir / GWCommsLCCH1.RemOpFail.actVal	1	BCR	RemOpFail		DO	ST	actVal
ACC	-4055	RemOperationRequests	MasterName+HomeDir / GWCommsLCCH1.RemOpReq.actVal	1	BCR	RemOpReq		DO	ST	actVal
ACC	-4054	RemMsgAckTimeouts	MasterName+HomeDir / GWCommsLCCH1.RemMsgAckTmt.actVal	1	BCR	RemMsgAck Tmt		DO	ST	actVal
ACC	-4053	MasterMsgOut	MasterName+HomeDir / GWCommsLCCH1.MstrMsgOut.actVal	1	BCR	MstrMsgOut		DO	ST	actVal
ACC	-4052	MasterMsgIn	MasterName+HomeDir / GWCommsLCCH1.MstrMsgIn.actVal	1	BCR	MstrMsgIn		DO	ST	actVal
AI	-1061	Application Identifier	MasterName+HomeDir /GWCommsLCCH1.ApplId.stVal	1	INS	ApplId		DO	ST	stVal
AI	-1048	Total Events in Queue	MasterName+HomeDir / GWCommsLCCH1.TotEvtQu.stVal	1	INS	TotEvtQu		DO	ST	stVal

Point Type	Point ID	Point Reference	Object Reference	LN Instance	CDC	DO	Do Instance	MCP Custom LN/DO	FC	DA
AI	-1018	DPA Process ID	MasterName+HomeDir / GWCommsLCCH1.DPAProcessID.stVal	1	INS	DPAProcessID		DO	ST	stVal
AI	-1017	MasterAdd	MasterName+HomeDir / GWCommsLCCH1.MstrAddr.stVal	1	INS	MstrAddr		DO	ST	stVal
DI	-78	BackPortStatus	MasterName+HomeDir / GWCommsLCCH1.RedChLiv.stVal	1	SPS	RedChLiv			ST	stVal
DI	-77	PriPortStatus	MasterName+HomeDir /GWCommsLCCH1.ChLiv.stVal	1	SPS	ChLiv			ST	stVal
DI	-76	DPAStatus	MasterName+HomeDir /GWCommsLCCH1.DPASt.stVal	1	SPS	DPASt		DO	ST	stVal
DI	-75	CommStatus	MasterName+HomeDir / GWCommsLCCH1.CommSt.stVal	1	SPS	CommSt		DO	ST	stVal
DO	-2039	Print Event Queue to File	PhyDevName/GWCommsLCCH1.PrnEvtQuFile.Oper.ctlVal	1	SPC	PrnEvtQuFile		DO	CO	Oper.ctlVal
DO	-2020	Clear Stats	MasterName+HomeDir / GWCommsLCCH1.ClrStat.Oper.ctlVal	1	SPC	ClrStat		DO	CO	Oper.ctlVal
DO	-2019	ForceControlsLockout	MasterName+HomeDir / GWCommsLCCH1.ForcCtlLO.Oper.ctlVal	1	SPC	ForcCtlLO		DO	CO	Oper.ctlVal

4.4.2 Modbus DPA

Point Type	Point ID	Point Reference	Object Reference	LN Instance	CDC	DO	Do Instance	MCP Custom LN/DO	FC	DA
ACC	-4059	LockAtproducerconsumerdpaptrtsFailed	MasterName+HomeDir / GWCommsLCCH1.LkdFail.actVal	1	BCR	LkdFail		DO	ST	actVal
ACC	-4058	MissedUpdates	MasterName+HomeDir / GWCommsLCCH1.MissUpd.actVal	1	BCR	MissUpd		DO	ST	actVal
ACC	-4056	RemOperationsFailed	MasterName+HomeDir / GWCommsLCCH1.RemOpFail.actVal	1	BCR	RemOpFail		DO	ST	actVal
ACC	-4055	RemOperationRequests	MasterName+HomeDir / GWCommsLCCH1.RemOpReq.actVal	1	BCR	RemOpReq		DO	ST	actVal
ACC	-4054	RemMsgAckTimeouts	MasterName+HomeDir / GWCommsLCCH1.RemMsgAckTmt.actVal	1	BCR	RemMsgAckTmt		DO	ST	actVal
ACC	-4053	MasterMsgOut	MasterName+HomeDir / GWCommsLCCH1.MstrMsgOut.actVal	1	BCR	MstrMsgOut		DO	ST	actVal
ACC	-4052	MasterMsgIn	MasterName+HomeDir / GWCommsLCCH1.MstrMsgIn.actVal	1	BCR	MstrMsgIn		DO	ST	actVal
ACC	-4000	UpdateCount	MasterName + HomeDir/ GWCommsLCCH1.UpdCnt.actVal	1	BCR	UpdCnt		DO	ST	actVal

Point Type	Point ID	Point Reference	Object Reference	LN Instance	CDC	DO	Do Instance	MCP Custom LN/DO	FC	DA
AI	-1061	Application Identifier	MasterName+HomeDir / GWCommsLCCH1.AppId.stVal	1	INS	AppId		DO	ST	stVal
AI	-1018	DPA Process ID	MasterName+HomeDir / GWCommsLCCH1.DPAProcessID.stVal	1	INS	DPAProcessID		DO	ST	stVal
DI	-76	DPAStatus	MasterName+HomeDir / GWCommsLCCH1.DPASt.stVal	1	SPS	DPASt		DO	ST	stVal
DI	-75	CommStatus	MasterName+HomeDir / GWCommsLCCH1.CommSt.stVal	1	SPS	CommSt		DO	ST	stVal
DI	-38	BackupPortStatus	MasterName+HomeDir / GWCommsLCCH1.BckPortSt.stVal	1	SPS	BckPortSt		DO	ST	stVal
DI	-4	PrimaryPortStatus	MasterName+HomeDir / GWCommsLCCH1.ChLiv.stVal	1	SPS	ChLiv			ST	stVal
DO	-2019	ForceControlsLockout	MasterName+HomeDir / GWCommsLCCH1.ForcCtlLO.Oper.ctlVal	1	SPC	ForcCtlLO		DO	CO	Oper.ctlVal

4.4.3 IEC 60870-5-101/104 DPA

Point Type	Point ID	Point Reference	Object Reference	LN Instance	CDC	DO	Do Instance	MCP Custom LN/DO	FC	DA
ACC	-4102	FileTransfersFailed	MasterName+HomeDir / GWCommsLCCH1.FileTrsFld.actVal	1	BCR	FileTrsFld		DO	ST	actVal
ACC	-4101	FileTransfersAttempted	MasterName+HomeDir / GWCommsLCCH1.FileTrsAtmpt.actVal	1	BCR	FileTrsAtmpt		DO	ST	actVal
ACC	-4100	AccumulatorCommandsFailed	MasterName+HomeDir / GWCommsLCCH1.CntCmdFail.actVal	1	BCR	CntCmdFail		DO	ST	actVal
ACC	-4099	AccumulatorCommandsSent	MasterName+HomeDir / GWCommsLCCH1.CntCmdTx.actVal	1	BCR	CntCmdTx		DO	ST	actVal
ACC	-4098	CommandFailuresDueToControlLockout	MasterName+HomeDir / GWCommsLCCH1.CmdFailCtlLO.actVal	1	BCR	CmdFailCtlLO		DO	ST	actVal
ACC	-4097	DOAndAOCommandFailuresDueToSBOTimeout	MasterName+HomeDir / GWCommsLCCH1.CmdFailSBO.actVal	1	BCR	CmdFailSBO		DO	ST	actVal
ACC	-4096	DOAndAOCommandFailures	MasterName+HomeDir / GWCommsLCCH1.DOAOCmdFail.actVal	1	BCR	DOAOCmdFail		DO	ST	actVal

Point Type	Point ID	Point Reference	Object Reference	LN Instance	CDC	DO	Do Instance	MCP Custom LN/DO	FC	DA
ACC	-4095	RtDBWriteRequests	MasterName+HomeDir / GWCommsLCCH1.RTDBWriteReq.actVal	1	BCR	RTDBWriteReq		DO	ST	actVal
ACC	-4094	RtDBReadFailures	MasterName+HomeDir / GWCommsLCCH1.RTDBReadFail.actVal	1	BCR	RTDBReadFail		DO	ST	actVal
ACC	-4093	RtDBReadRequests	MasterName+HomeDir / GWCommsLCCH1.RTDBReadReq.actVal	1	BCR	RTDBReadReq		DO	ST	actVal
ACC	-4092	BufferOverflows	MasterName+HomeDir / GWCommsLCCH1.BufOv.actVal	1	BCR	BufOv		DO	ST	actVal
ACC	-4091	ChangeEventsReceivedFromRtDB	MasterName+HomeDir / GWCommsLCCH1.ChgEvtRxRTDB.actVal	1	BCR	ChgEvtRxRTDB		DO	ST	actVal
ACC	-4090	ASDUControlResponsesSent	MasterName+HomeDir / GWCommsLCCH1.ASDUCtlRspTx.actVal	1	BCR	ASDUCtlRspTx		DO	ST	actVal
ACC	-4089	SpontaneousASDUDataMessagesNoACK	MasterName+HomeDir / GWCommsLCCH1.ASDUMsgNAck.actVal	1	BCR	ASDUMsgNAck		DO	ST	actVal
ACC	-4088	SpontaneousASDUDataMessagesSent	MasterName+HomeDir / GWCommsLCCH1.ASDUMsgTx.actVal	1	BCR	ASDUMsgTx		DO	ST	actVal

Point Type	Point ID	Point Reference	Object Reference	LN Instance	CDC	DO	Do Instance	MCP Custom LN/DO	FC	DA
ACC	-4087	ASDUDataResponsesSent	MasterName+HomeDir / GWCommsLCCH1.ASDURspTx.actVal	1	BCR	ASDURspTx		DO	ST	actVal
ACC	-4086	ASDUDataRequestsRejected	MasterName+HomeDir / GWCommsLCCH1.ASDUReqRejct.actVal	1	BCR	ASDUReqReject		DO	ST	actVal
ACC	-4085	ASDUDataRequestsReceived	MasterName+HomeDir / GWCommsLCCH1.ASDUReqRx.actVal	1	BCR	ASDUReqRx		DO	ST	actVal
ACC	-4056	RemOperationsFailed	MasterName+HomeDir / GWCommsLCCH1.RemOpFail.actVal	1	BCR	RemOpFail		DO	ST	actVal
ACC	-4055	RemOperationRequests	MasterName+HomeDir / GWCommsLCCH1.RemOpReq.actVal	1	BCR	RemOpReq		DO	ST	actVal
ACC	-4054	RemMsgAckTimeouts	MasterName+HomeDir / GWCommsLCCH1.RemMsgAckTmt.actVal	1	BCR	RemMsgAckTmt		DO	ST	actVal
ACC	-4053	MasterMsgOut	MasterName+HomeDir / GWCommsLCCH1.MstrMsgOut.actVal	1	BCR	MstrMsgOut		DO	ST	actVal
ACC	-4052	MasterMsgIn	MasterName+HomeDir / GWCommsLCCH1.MstrMsgIn.actVal	1	BCR	MstrMsgIn		DO	ST	actVal

Point Type	Point ID	Point Reference	Object Reference	LN Instance	CDC	DO	Do Instance	MCP Custom LN/DO	FC	DA
AI	-1061	Application Identifier	MasterName+HomeDir / GWCommsLCCH1.ApplId.stVal	1	INS	ApplId		DO	ST	stVal
AI	-1018	DPA Process ID	MasterName+HomeDir / GWCommsLCCH1.DPAProcessID.stVal	1	INS	DPAProcessID		DO	ST	stVal
DI	-98	EventBufferLow	MasterName+HomeDir / GWCommsLCCH1.EvtBufLow.stVal	1	SPS	EvtBufLow		DO	ST	stVal
DI	-97	EventBufferOverFlow	MasterName+HomeDir / GWCommsLCCH1.EvtBufOv.stVal	1	SPS	EvtBufOv		DO	ST	stVal
DI	-78	BackPortStatus	MasterName+HomeDir / GWCommsLCCH1.RedChLiv.stVal	1	SPS	RedChLiv			ST	stVal
DI	-77	PriPortStatus	MasterName+HomeDir / GWCommsLCCH1.ChLiv.stVal	1	SPS	ChLiv			ST	stVal
DI	-76	DPAStatus	MasterName+HomeDir / GWCommsLCCH1.DPASt.stVal	1	SPS	DPASt		DO	ST	stVal
DI	-75	CommStatus	MasterName+HomeDir / GWCommsLCCH1.CommSt.stVal	1	SPS	CommSt		DO	ST	stVal
DO	-2019	ForceControlsLockout	MasterName+HomeDir / GWCommsLCCH1.ForcCtlLO.Oper.ctlVal	1	SPC	ForcCtlLO		DO	CO	Oper.ctlVal

4.4.4 TEJAS V DPA

Point Type	Point ID	Point Reference	Object Reference	LN Instance	CDC	DO	Do Instance	MCP Custom LN/DO	FC	DA
ACC	-4056	RemOperationsFailed	MasterName+HomeDir / GWCommsLCCH1.RemOpFail.actVal	1	BCR	RemOpFail		DO	ST	actVal
ACC	-4055	RemOperationRequests	MasterName+HomeDir / GWCommsLCCH1.RemOpReq.actVal	1	BCR	RemOpReq		DO	ST	actVal
ACC	-4053	MasterMsgOut	MasterName+HomeDir / GWCommsLCCH1.MstrMsgOut.actVal	1	BCR	MstrMsgOut		DO	ST	actVal
ACC	-4052	MasterMsgIn	MasterName+HomeDir / GWCommsLCCH1.MstrMsgIn.actVal	1	BCR	MstrMsgIn		DO	ST	actVal
AI	-1061	Application Identifier	MasterName+HomeDir /GWCommsLCCH1.ApplId.stVal	1	INS	ApplId		DO	ST	stVal
AI	-1018	DPA Process ID	MasterName+HomeDir / GWCommsLCCH1.DPAProcessID.stVal	1	INS	DPAProcessID		DO	ST	stVal
DI	-78	BackPortStatus	MasterName+HomeDir / GWCommsLCCH1.RedChLiv.stVal	1	SPS	RedChLiv			ST	stVal
DI	-77	PriPortStatus	MasterName+HomeDir /GWCommsLCCH1.ChLiv.stVal	1	SPS	ChLiv			ST	stVal
DI	-76	DPAStatus	MasterName+HomeDir /GWCommsLCCH1.DPASt.stVal	1	SPS	DPASt		DO	ST	stVal
DI	-75	CommStatus	MasterName+HomeDir / GWCommsLCCH1.CommSt.stVal	1	SPS	CommSt		DO	ST	stVal

5. Assigning IEC 61850 Object References to Automation Applications

This section describes the assignments of IEC 61850 Object References to Automation Applications

5.1 LLN0/ LPHD Initialization

Name	Value
LLN0.NamPlt.vendor	GE Multilin
LLN0.NamPlt.swRev	3.0
LPHD1.PhyNam.vendor	GE Multilin
LPHD1.PhyNam.name	MyMCP (name attribute of the MasterStation element in DeviceConnnection.xml)
LPHD1.PhyNam.swRev	3.0
LPHD1.PhyNam.model	G500-AHU8-TUUUUU-AUUU-UUU-UUU-S-CAC0000-UUUUUUU (model number of the MCP device)

5.2 Hardware Asset Management Application (HAMA)

HAMA gathers live dynamic data (eg: network modes, serial port settings, temperature, real time utilization of various resources etc.) and represents this information in the Real time Database as Analog/ Digital/ Accumulator/ Text Points.

Point Type	Point ID	Point Reference	Object Reference	LN Instance	CDC	DO	DO Instance	MCP Custom LN/DO	FC	DA
ACC	1701	ETH1-2 PRP/HSR lreCntTxA	LD0_HAMA/NetLNET1.TxCntA.actVal	1	BCR	TxCntA		LN, DO	ST	actVal
ACC	1702	ETH1-2 PRP/HSR lreCntTxB	LD0_HAMA/NetLNET1.TxCntB.actVal	1	BCR	TxCntB		LN, DO	ST	actVal
ACC	1703	ETH1-2 PRP/HSR lreCntTxC	LD0_HAMA/NetLNET1.TxCntC.actVal	1	BCR	TxCntC		LN, DO	ST	actVal
ACC	1704	ETH1-2 PRP/HSR lreCntErrWrongLanA	LD0_HAMA/NetLNET1.ErrWrCntA.actVal	1	BCR	ErrWrCntA		LN, DO	ST	actVal
ACC	1705	ETH1-2 PRP/HSR lreCntErrWrongLanB	LD0_HAMA/NetLNET1.ErrWrCntB.actVal	1	BCR	ErrWrCntB		LN, DO	ST	actVal
ACC	1706	ETH1-2 PRP/HSR lreCntErrWrongLanC	LD0_HAMA/NetLNET1.ErrWrCntC.actVal	1	BCR	ErrWrCntC		LN, DO	ST	actVal
ACC	1707	ETH1-2 PRP/HSR lreCntRxA	LD0_HAMA/NetLNET1.RxCntA.actVal	1	BCR	RxCntA		LN, DO	ST	actVal
ACC	1708	ETH1-2 PRP/HSR lreCntRxB	LD0_HAMA/NetLNET1.RxCntB.actVal	1	BCR	RxCntB		LN, DO	ST	actVal
ACC	1709	ETH1-2 PRP/HSR lreCntRxC	LD0_HAMA/NetLNET1.RxCntC.actVal	1	BCR	RxCntC		LN, DO	ST	actVal
ACC	1710	ETH1-2 PRP/HSR lreCntErrorsA	LD0_HAMA/NetLNET1.ErrCntA.actVal	1	BCR	ErrCntA		LN, DO	ST	actVal
ACC	1711	ETH1-2 PRP/HSR lreCntErrorsB	LD0_HAMA/NetLNET1.ErrCntB.actVal	1	BCR	ErrCntB		LN, DO	ST	actVal
ACC	1712	ETH1-2 PRP/HSR lreCntErrorsC	LD0_HAMA/NetLNET1.ErrCntC.actVal	1	BCR	ErrCntC		LN, DO	ST	actVal
ACC	1716	ETH1-2 PRP/HSR lreCntDuplicateA	LD0_HAMA/NetLNET1.DuplCntA.actVal	1	BCR	DuplCntA		LN, DO	ST	actVal

Point Type	Point ID	Point Reference	Object Reference	LN Instance	CDC	DO	DO Instance	MCP Custom LN/DO	FC	DA
ACC	1717	ETH1-2 PRP/HSR lreCntDuplicateB	LD0_HAMA/NetLNET1.DuplCntB.actVal	1	BCR	DuplCntB		LN, DO	ST	actVal
ACC	1718	ETH1-2 PRP/HSR lreCntDuplicateC	LD0_HAMA/NetLNET1.DuplCntC.actVal	1	BCR	DuplCntC		LN, DO	ST	actVal
ACC	1731	ETH3-4 PRP/HSR lreCntTxA	LD0_HAMA/NetLNET3.TxCntA.actVal	3	BCR	TxCntA		LN, DO	ST	actVal
ACC	1732	ETH3-4 PRP/HSR lreCntTxB	LD0_HAMA/NetLNET3.TxCntB.actVal	3	BCR	TxCntB		LN, DO	ST	actVal
ACC	1733	ETH3-4 PRP/HSR lreCntTxC	LD0_HAMA/NetLNET3.TxCntC.actVal	3	BCR	TxCntC		LN, DO	ST	actVal
ACC	1734	ETH3-4 PRP/HSR lreCntErrWrongLanA	LD0_HAMA/NetLNET3.ErrWrCntA.actVal	3	BCR	ErrWrCntA		LN, DO	ST	actVal
ACC	1735	ETH3-4 PRP/HSR lreCntErrWrongLanB	LD0_HAMA/NetLNET3.ErrWrCntB.actVal	3	BCR	ErrWrCntB		LN, DO	ST	actVal
ACC	1736	ETH3-4 PRP/HSR lreCntErrWrongLanC	LD0_HAMA/NetLNET3.ErrWrCntC.actVal	3	BCR	ErrWrCntC		LN, DO	ST	actVal
ACC	1737	ETH3-4 PRP/HSR lreCntRxA	LD0_HAMA/NetLNET3.RxCntA.actVal	3	BCR	RxCntA		LN, DO	ST	actVal
ACC	1738	ETH3-4 PRP/HSR lreCntRxB	LD0_HAMA/NetLNET3.RxCntB.actVal	3	BCR	RxCntB		LN, DO	ST	actVal
ACC	1739	ETH3-4 PRP/HSR lreCntRxC	LD0_HAMA/NetLNET3.RxCntC.actVal	3	BCR	RxCntC		LN, DO	ST	actVal
ACC	1740	ETH3-4 PRP/HSR lreCntErrorsA	LD0_HAMA/NetLNET3.ErrCntA.actVal	3	BCR	ErrCntA		LN, DO	ST	actVal
ACC	1741	ETH3-4 PRP/HSR lreCntErrorsB	LD0_HAMA/NetLNET3.ErrCntB.actVal	3	BCR	ErrCntB		LN, DO	ST	actVal

Point Type	Point ID	Point Reference	Object Reference	LN Instance	CDC	DO	DO Instance	MCP Custom LN/DO	FC	DA
ACC	1742	ETH3-4 PRP/HSR lreCntErrorsC	LD0_HAMA/NetLNET3.ErrCntC.actVal	3	BCR	ErrCntC		LN, DO	ST	actVal
ACC	1746	ETH3-4 PRP/HSR lreCntDuplicateA	LD0_HAMA/NetLNET3.DuplCntA.actVal	3	BCR	DuplCntA		LN, DO	ST	actVal
ACC	1747	ETH3-4 PRP/HSR lreCntDuplicateB	LD0_HAMA/NetLNET3.DuplCntB.actVal	3	BCR	DuplCntB		LN, DO	ST	actVal
ACC	1748	ETH3-4 PRP/HSR lreCntDuplicateC	LD0_HAMA/NetLNET3.DuplCntC.actVal	3	BCR	DuplCntC		LN, DO	ST	actVal
ACC	1761	ETH5-6 PRP/HSR lreCntTxA	LD0_HAMA/NetLNET5.TxCntA.actVal	5	BCR	TxCntA		LN, DO	ST	actVal
ACC	1762	ETH5-6 PRP/HSR lreCntTxB	LD0_HAMA/NetLNET5.TxCntB.actVal	5	BCR	TxCntB		LN, DO	ST	actVal
ACC	1763	ETH5-6 PRP/HSR lreCntTxC	LD0_HAMA/NetLNET5.TxCntC.actVal	5	BCR	TxCntC		LN, DO	ST	actVal
ACC	1764	ETH5-6 PRP/HSR lreCntErrWrongLanA	LD0_HAMA/NetLNET5.ErrWrCntA.actVal	5	BCR	ErrWrCntA		LN, DO	ST	actVal
ACC	1765	ETH5-6 PRP/HSR lreCntErrWrongLanB	LD0_HAMA/NetLNET5.ErrWrCntB.actVal	5	BCR	ErrWrCntB		LN, DO	ST	actVal
ACC	1766	ETH5-6 PRP/HSR lreCntErrWrongLanC	LD0_HAMA/NetLNET5.ErrWrCntC.actVal	5	BCR	ErrWrCntC		LN, DO	ST	actVal
ACC	1767	ETH5-6 PRP/HSR lreCntRxA	LD0_HAMA/NetLNET5.RxCntA.actVal	5	BCR	RxCntA		LN, DO	ST	actVal
ACC	1768	ETH5-6 PRP/HSR lreCntRxB	LD0_HAMA/NetLNET5.RxCntB.actVal	5	BCR	RxCntB		LN, DO	ST	actVal
ACC	1769	ETH5-6 PRP/HSR lreCntRxC	LD0_HAMA/NetLNET5.RxCntC.actVal	5	BCR	RxCntC		LN, DO	ST	actVal

Point Type	Point ID	Point Reference	Object Reference	LN Instance	CDC	DO	DO Instance	MCP Custom LN/DO	FC	DA
ACC	1770	ETH5-6 PRP/HSR lreCntErrorsA	LD0_HAMA/NetLNET5.ErrCntA.actVal	5	BCR	ErrCntA		LN, DO	ST	actVal
ACC	1771	ETH5-6 PRP/HSR lreCntErrorsB	LD0_HAMA/NetLNET5.ErrCntB.actVal	5	BCR	ErrCntB		LN, DO	ST	actVal
ACC	1772	ETH5-6 PRP/HSR lreCntErrorsC	LD0_HAMA/NetLNET5.ErrCntC.actVal	5	BCR	ErrCntC		LN, DO	ST	actVal
ACC	1776	ETH5-6 PRP/HSR lreCntDuplicateA	LD0_HAMA/NetLNET5.DuplCntA.actVal	5	BCR	DuplCntA		LN, DO	ST	actVal
ACC	1777	ETH5-6 PRP/HSR lreCntDuplicateB	LD0_HAMA/NetLNET5.DuplCntB.actVal	5	BCR	DuplCntB		LN, DO	ST	actVal
ACC	1778	ETH5-6 PRP/HSR lreCntDuplicateC	LD0_HAMA/NetLNET5.DuplCntC.actVal	5	BCR	DuplCntC		LN, DO	ST	actVal
AI	300	Cause of Last Reset Reported by Hardware(Pnt Ref:Last Reset Cause)	<root>LDO/LPHD1.LastRsCause.stVal	1	ENS	LastRsCause		DO	ST	stVal
AI	310	Chassis Intrusion Status	<root>LDO/LPHD1.ChsIntruSt.stVal	1	ENS	ChsIntruSt		DO	ST	stVal
AI	400	Front Display State	<root>LDO/LPHD1.DispSt.stVal	1	ENS	DispSt		DO	ST	stVal
AI	501	Power Supply 1 (top) Status	LD0_HAMA/LPSU1.PwrTopHealth.stVal	1	ENS	PwrTopHealth		LN, DO	ST	stVal
AI	502	Power Supply 2 (bottom) Status	LD0_HAMA/LPSU1.PwrBotHealth.stVal	1	ENS	PwrBotHealth		LN, DO	ST	stVal
AI	601	Temperature Power Supply 1 (top) in degC	LD0_HAMA/LPSU1.PwrTopTmp.mag.f	1	MV	PwrTopTmp		LN, DO	MX	mag.f
AI	602	Temperature Power Supply 2 (bottom) in degC	LD0_HAMA/LPSU1.PwrBotTmp.mag.f	1	MV	PwrBotTmp		LN, DO	MX	mag.f

Point Type	Point ID	Point Reference	Object Reference	LN Instance	CDC	DO	DO Instance	MCP Custom LN/DO	FC	DA
AI	610	Temperature CPU in degC	<root>LDO/LPHD1.CPUTmp.mag.f	1	MV	CPUTmp		DO	M X	mag.f
AI	611	Temperature Memory(RAM) in degC	<root>LDO/LPHD1.RAMTmp.mag.f	1	MV	RAMTmp		DO	M X	mag.f
AI	615	Temperature FPGA LAN in degC	<root>LDO/LPHD1.FPGALANTmp.mag.f	1	MV	FPGALANTmp		DO	M X	mag.f
AI	621	Temperature Storage(SSD) in degC	<root>LDO/LPHD1.SSDTmp1.mag.f	1	MV	SSDTmp1		DO	M X	mag.f
AI	624	Slot 1 (UART exten card) Temperature in degC	<root>LDO/LPHD1.UARTTmp1.mag.f	1	MV	UARTTmp	1	DO	M X	mag.f
AI	625	Slot 2 (UART exten card) Temperature in degC	<root>LDO/LPHD1.UARTTmp2.mag.f	1	MV	UARTTmp	2	DO	M X	mag.f
AI	626	Temperature Display in degC	<root>LDO/LPHD1.DispTmp.mag.f	1	MV	DispTmp		DO	M X	mag.f
AI	1100	NET1-2 Redundancy Mode	LD0_HAMA/NetLNET1.RedMod.stVal	1	ENS	RedMod		LN, DO	ST	stVal
AI	1110	Unique value for each LRE - ETH1-2 PRP/HSR lreInterfaceStatsIndex	LD0_HAMA/NetLNET1.InfcStatIx.stVal	1	INS	InfcStatIx		LN, DO	ST	stVal
AI	1111	Number of nodes in the Nodes Table - Net1-2 PRP/HSR lreCntNodes	LD0_HAMA/NetLNET1.IreCntN.stVal	1	INS	IreCntN		LN, DO	ST	stVal
AI	1112	Number of nodes in the Proxy Node Table - ETH1-2 PRP/HSR lreCntProxyNodes	LD0_HAMA/NetLNET1.ProxyNCnt.stVal	1	INS	ProxyNCnt		LN, DO	ST	stVal

Point Type	Point ID	Point Reference	Object Reference	LN Instance	CDC	DO	DO Instance	MCP Custom LN/DO	FC	DA
AI	1300	NET3-4 Redundancy Mode	LD0_HAMA/NetLNET3.RedMod.stVal	3	ENS	RedMod		LN, DO	ST	stVal
AI	1310	Unique value for each LRE - ETH3-4 PRP/HSR lreInterfaceStatsIndex	LD0_HAMA/NetLNET3.InfcStatIx.stVal	3	INS	InfcStatIx		LN, DO	ST	stVal
AI	1311	Number of nodes in the Nodes Table - Net3-4 PRP/HSR lreCntNodes	LD0_HAMA/NetLNET3.IreCntN.stVal	3	INS	IreCntN		LN, DO	ST	stVal
AI	1312	Number of nodes in the Proxy Node Table - ETH3-4 PRP/HSR lreCntProxyNodes	LD0_HAMA/NetLNET3.ProxyNCnt.stVal	3	INS	ProxyNCnt		LN, DO	ST	stVal
AI	1500	NET5-6 Redundancy Mode	LD0_HAMA/NetLNET5.RedMod.stVal	5	ENS	RedMod		LN, DO	ST	stVal
AI	1510	Unique value for each LRE - ETH5-6 PRP/HSR lreInterfaceStatsIndex	LD0_HAMA/NetLNET5.InfcStatIx.stVal	5	INS	InfcStatIx		LN, DO	ST	stVal
AI	1511	Number of nodes in the Nodes Table - Net5-6 PRP/HSR lreCntNodes	LD0_HAMA/NetLNET5.IreCntN.stVal	5	INS	IreCntN		LN, DO	ST	stVal
AI	1512	Number of nodes in the Proxy Node Table - ETH5-6 PRP/HSR lreCntProxyNodes	LD0_HAMA/NetLNET5.ProxyNCnt.stVal	5	INS	ProxyNCnt		LN, DO	ST	stVal
AI	1521	PCIe 1 module type	LD0_HAMA/LCOM1.MdulTyp.stVal	1	ENS	MdulTyp		LN, DO	ST	stVal
AI	1522	PCIe 2 module type	LD0_HAMA/LCOM2.MdulTyp.stVal	2	ENS	MdulTyp		LN, DO	ST	stVal
AI	1523	PCIe 3 module type	LD0_HAMA/LCOM3.MdulTyp.stVal	3	ENS	MdulTyp		LN, DO	ST	stVal

Point Type	Point ID	Point Reference	Object Reference	LN Instance	CDC	DO	DO Instance	MCP Custom LN/DO	FC	DA
AI	2010	COM1 Mode	LD0_HAMA/LCOM0.SerPortMod1.stVal	0	ENS	SerPortMod	1	LN, DO	ST	stVal
AI	2020	COM2 Mode	LD0_HAMA/LCOM0.SerPortMod2.stVal	0	ENS	SerPortMod	2	LN, DO	ST	stVal
AI	2030	COM3 Mode	LD0_HAMA/LCOM0.SerPortMod3.stVal	0	ENS	SerPortMod	3	LN, DO	ST	stVal
AI	2040	COM4 Mode	LD0_HAMA/LCOM0.SerPortMod4.stVal	0	ENS	SerPortMod	4	LN, DO	ST	stVal
AI	2050	COM5 Mode	LD0_HAMA/LCOM0.SerPortMod5.stVal	0	ENS	SerPortMod	5	LN, DO	ST	stVal
AI	2060	COM6 Mode	LD0_HAMA/LCOM0.SerPortMod6.stVal	0	ENS	SerPortMod	6	LN, DO	ST	stVal
AI	2070	COM7 Mode	LD0_HAMA/LCOM0.SerPortMod7.stVal	0	ENS	SerPortMod	7	LN, DO	ST	stVal
AI	2080	COM8 Mode	LD0_HAMA/LCOM0.SerPortMod8.stVal	0	ENS	SerPortMod	8	LN, DO	ST	stVal
AI	2101	PCIe A- COM Mode 1	LD0_HAMA/LCOM1.SerPortMod1.stVal	1	ENS	SerPortMod	1	LN, DO	ST	stVal
AI	2102	PCIe A- COM Mode 2	LD0_HAMA/LCOM1.SerPortMod2.stVal	1	ENS	SerPortMod	2	LN, DO	ST	stVal
AI	2103	PCIe A- COM Mode 3	LD0_HAMA/LCOM1.SerPortMod3.stVal	1	ENS	SerPortMod	3	LN, DO	ST	stVal
AI	2104	PCIe A- COM Mode 4	LD0_HAMA/LCOM1.SerPortMod4.stVal	1	ENS	SerPortMod	4	LN, DO	ST	stVal
AI	2105	PCIe A- COM Mode 5	LD0_HAMA/LCOM1.SerPortMod5.stVal	1	ENS	SerPortMod	5	LN, DO	ST	stVal
AI	2106	PCIe A- COM Mode 6	LD0_HAMA/LCOM1.SerPortMod6.stVal	1	ENS	SerPortMod	6	LN, DO	ST	stVal
AI	2107	PCIe A- COM Mode 7	LD0_HAMA/LCOM1.SerPortMod7.stVal	1	ENS	SerPortMod	7	LN, DO	ST	stVal
AI	2108	PCIe A- COM Mode 8	LD0_HAMA/LCOM1.SerPortMod8.stVal	1	ENS	SerPortMod	8	LN, DO	ST	stVal
AI	2111	PCIe B- COM Mode 1	LD0_HAMA/LCOM2.SerPortMod1.stVal	2	ENS	SerPortMod	1	LN, DO	ST	stVal

Point Type	Point ID	Point Reference	Object Reference	LN Instance	CDC	DO	DO Instance	MCP Custom LN/DO	FC	DA
AI	2112	PCIe B- COM Mode 2	LD0_HAMA/LCOM2.SerPortMod2.stVal	2	ENS	SerPortMod	2	LN, DO	ST	stVal
AI	2113	PCIe B- COM Mode 3	LD0_HAMA/LCOM2.SerPortMod3.stVal	2	ENS	SerPortMod	3	LN, DO	ST	stVal
AI	2114	PCIe B- COM Mode 4	LD0_HAMA/LCOM2.SerPortMod4.stVal	2	ENS	SerPortMod	4	LN, DO	ST	stVal
AI	2115	PCIe B- COM Mode 5	LD0_HAMA/LCOM2.SerPortMod5.stVal	2	ENS	SerPortMod	5	LN, DO	ST	stVal
AI	2116	PCIe B- COM Mode 6	LD0_HAMA/LCOM2.SerPortMod6.stVal	2	ENS	SerPortMod	6	LN, DO	ST	stVal
AI	2117	PCIe B- COM Mode 7	LD0_HAMA/LCOM2.SerPortMod7.stVal	2	ENS	SerPortMod	7	LN, DO	ST	stVal
AI	2118	PCIe B- COM Mode 8	LD0_HAMA/LCOM2.SerPortMod8.stVal	2	ENS	SerPortMod	8	LN, DO	ST	stVal
AI	2121	PCIe C- COM Mode 1	LD0_HAMA/LCOM3.SerPortMod1.stVal	3	ENS	SerPortMod	1	LN, DO	ST	stVal
AI	2122	PCIe C- COM Mode 2	LD0_HAMA/LCOM3.SerPortMod2.stVal	3	ENS	SerPortMod	2	LN, DO	ST	stVal
AI	2123	PCIe C- COM Mode 3	LD0_HAMA/LCOM3.SerPortMod3.stVal	3	ENS	SerPortMod	3	LN, DO	ST	stVal
AI	2124	PCIe C- COM Mode 4	LD0_HAMA/LCOM3.SerPortMod4.stVal	3	ENS	SerPortMod	4	LN, DO	ST	stVal
AI	2125	PCIe C- COM Mode 5	LD0_HAMA/LCOM3.SerPortMod5.stVal	3	ENS	SerPortMod	5	LN, DO	ST	stVal
AI	2126	PCIe C- COM Mode 6	LD0_HAMA/LCOM3.SerPortMod6.stVal	3	ENS	SerPortMod	6	LN, DO	ST	stVal

Point Type	Point ID	Point Reference	Object Reference	LN Instance	CDC	DO	DO Instance	MCP Custom LN/DO	FC	DA
AI	2127	PCIe C- COM Mode 7	LD0_HAMA/LCOM3.SerPortMod7.stVal	3	ENS	SerPortMod	7	LN, DO	ST	stVal
AI	2128	PCIe C- COM Mode 8	LD0_HAMA/LCOM3.SerPortMod8.stVal	3	ENS	SerPortMod	8	LN, DO	ST	stVal
AI	3000	Time Sync Input Source	LD0_HAMA/LGTS1.TmSrc.stVal	1	ENS	TmSrc		LN, DO	ST	stVal
AI	3011	NET1-2 PTP Port State	LD0_HAMA/PTPLGTS1.PTPPortSt.stVal	1	ENS	PTPPortSt		LN, DO	ST	stVal
AI	3012	NET3-4 PTP Port State	LD0_HAMA/PTPLGTS3.PTPPortSt.stVal	3	ENS	PTPPortSt		LN, DO	ST	stVal
AI	3013	NET5-6 PTP Port State	LD0_HAMA/PTPLGTS5.PTPPortSt.stVal	5	ENS	PTPPortSt		LN, DO	ST	stVal
AI	3015	PTP OUT Quality	LD0_HAMA/PTPLGTS1.PTPOutQual.stVal	1	ENS	PTPOutQual		LN, DO	ST	stVal
AI	3021	PTP Clock Class	LD0_HAMA/PTPLGTS1.ClkClass.stVal	1	INS	ClkClass		LN, DO	ST	stVal
AI	3100	IRIG-B IN Type	LD0_HAMA/IRIGLGTS1.IRIGINTyp.stVal	1	ENS	IRIGINTyp		LN, DO	ST	stVal
AI	3101	IRIG-B IN Time Zone Offset to UTC	LD0_HAMA/IRIGLGTS1.TmZnOfs.stVal	1	INS	TmZnOfs		LN, DO	ST	stVal
AI	3150	NTP Time Offset	LD0_HAMA/NTPLGTS1.TmOfs.mag.f	1	MV	TmOfs		LN, DO	MX	mag.f
AI	3151	NTP IN Server Selected	LD0_HAMA/NTPLGTS1.NTPServSel.stVal	1	INS	NTPServSel		LN, DO	ST	stVal
AI	3152	NTP IN Servers Quality	LD0_HAMA/NTPLGTS1.NTPServQual.stVa l	1	ENS	NTPServQual		LN, DO	ST	stVal
DI	311	Chassis Intrusion State	<root>LDO/LPHD1.ChsIntru.stVal	1	SPS	ChsIntru		DO	ST	stVal

Point Type	Point ID	Point Reference	Object Reference	LN Instance	CDC	DO	DO Instance	MCP Custom LN/DO	FC	DA
DI	333	Needs Cold Reboot	<root>LDO/LPHD1.ColdRbt.stVal	1	SPS	ColdRbt		DO	ST	stVal
DI	420	Front Display Always ON	<root>LDO/LPHD1.DispOn.stVal	1	SPS	DispOn		DO	ST	stVal
DI	531	Power Supply 1 (top) Good	LD0_HAMA/LPSU1.PwrTopGood.stVal	1	SPS	PwrTopGood		LN, DO	ST	stVal
DI	532	Power Supply 2 (bottom) Good	LD0_HAMA/LPSU1.PwrBotGood.stVal	1	SPS	PwrBotGood		LN, DO	ST	stVal
DI	1524	PCIe Card 1 Status	LD0_HAMA/LCOM1.PCIeCardSt.stVal	1	SPS	PCIeCardSt		LN, DO	ST	stVal
DI	1525	PCIe Card 2 Status	LD0_HAMA/LCOM2.PCIeCardSt.stVal	2	SPS	PCIeCardSt		LN, DO	ST	stVal
DI	1526	PCIe Card 3 Status	LD0_HAMA/LCOM3.PCIeCardSt.stVal	3	SPS	PCIeCardSt		LN, DO	ST	stVal
DI	1600	Front Port Link Good	LD0_HAMA/FrontNetLNET1.ChLiv.stVal	1	SPS	ChLiv		LN	ST	stVal
DI	1610	NET1 Link Good	LD0_HAMA/NetLNET1.ChLiv.stVal	1	SPS	ChLiv		LN	ST	stVal
DI	1611	NET1 SFP IN	LD0_HAMA/NetLNET1.SFPIn.stVal	1	SPS	SFPIn		LN, DO	ST	stVal
DI	1620	NET2 Link Good	LD0_HAMA/NetLNET2.ChLiv.stVal	2	SPS	ChLiv		LN	ST	stVal
DI	1621	NET2 SFP IN	LD0_HAMA/NetLNET2.SFPIn.stVal	2	SPS	SFPIn		LN, DO	ST	stVal
DI	1630	NET3 Link Good	LD0_HAMA/NetLNET3.ChLiv.stVal	3	SPS	ChLiv		LN	ST	stVal

Point Type	Point ID	Point Reference	Object Reference	LN Instance	CDC	DO	DO Instance	MCP Custom LN/DO	FC	DA
DI	1631	NET3 SFP IN	LD0_HAMA/NetLNET3.SFPIn.stVal	3	SPS	SFPIn		LN, DO	ST	stVal
DI	1640	NET4 Link Good	LD0_HAMA/NetLNET4.ChLiv.stVal	4	SPS	ChLiv		LN	ST	stVal
DI	1641	NET4 SFP IN	LD0_HAMA/NetLNET4.SFPIn.stVal	4	SPS	SFPIn		LN, DO	ST	stVal
DI	1650	NET5 Link Good	LD0_HAMA/NetLNET5.ChLiv.stVal	5	SPS	ChLiv		LN	ST	stVal
DI	1651	NET5 SFP IN	LD0_HAMA/NetLNET5.SFPIn.stVal	5	SPS	SFPIn		LN, DO	ST	stVal
DI	1660	NET6 Link Good	LD0_HAMA/NetLNET6.ChLiv.stVal	6	SPS	ChLiv		LN	ST	stVal
DI	1661	NET6 SFP IN	LD0_HAMA/NetLNET6.SFPIn.stVal	6	SPS	SFPIn		LN, DO	ST	stVal
DI	3200	PTP/IRIG-B Clock Synchronized	LD0_HAMA/LGTS1.PTPIRIGSyn.stVal	1	SPS	PTPIRIGSyn		LN, DO	ST	stVal
DI	3210	PTP IN Enabled	LD0_HAMA/PTPLGTS1.InEna.stVal	1	SPS	InEna		LN, DO	ST	stVal
DI	3211	PTP IN Signal	LD0_HAMA/PTPLGTS1.TmChSt.stVal	1	SPS	TmChSt		LN	ST	stVal
DI	3212	PTP IN Quality	LD0_HAMA/PTPLGTS1.InQual.stVal	1	SPS	InQual		LN, DO	ST	stVal
DI	3300	IRIG-B In Enabled	LD0_HAMA/IRIGLGTS1.InEna.stVal	1	SPS	InEna		LN, DO	ST	stVal
DI	3301	IRIG-B IN Signal Fail	LD0_HAMA/IRIGLGTS1.TmChSt.stVal	1	SPS	TmChSt		LN	ST	stVal

Point Type	Point ID	Point Reference	Object Reference	LN Instance	CDC	DO	DO Instance	MCP Custom LN/DO	FC	DA
DI	3302	IRIG-B IN Quality	LD0_HAMA/IRIGLGTS1.InQual.stVal	1	SPS	InQual		LN, DO	ST	stVal
DI	3350	NTP IN Enabled	LD0_HAMA/NTPLGTS1.InEna.stVal	1	SPS	InEna		LN, DO	ST	stVal
DI	3351	NTP IN Signal	LD0_HAMA/NTPLGTS1.TmChSt.stVal	1	SPS	TmChSt		LN	ST	stVal
DI	3352	NTP IN Quality	LD0_HAMA/NTPLGTS1.InQual.stVal	1	SPS	InQual		LN, DO	ST	stVal
DI	3360	NTP OUT Enabled	LD0_HAMA/NTPLGTS1.OutEna.stVal	1	SPS	OutEna		LN, DO	ST	stVal
TEXT	201	PCIe 1 Serial No	<root>LDO/LPHD1.PCIeSerNum1.stVal	1	VSS	PCIeSerNum	1	DO	ST	stVal
TEXT	201	PCIe 1 FPGA Version	<root>LDO/LPHD1.PCIeFPGAVrs1.stVal	1	VSS	PCIeFPGAVrs	1	DO	ST	stVal
TEXT	201	PCIe 2 Serial No	<root>LDO/LPHD1.PCIeSerNum2.stVal	1	VSS	PCIeSerNum	2	DO	ST	stVal
TEXT	201	PCIe 2 FPGA Version	<root>LDO/LPHD1.PCIeFPGAVrs2.stVal	1	VSS	PCIeFPGAVrs	2	DO	ST	stVal
TEXT	201	PCIe 3 Serial No	<root>LDO/LPHD1.PCIeSerNum3.stVal	1	VSS	PCIeSerNum	3	DO	ST	stVal
TEXT	201	PCIe 3 FPGA Version	<root>LDO/LPHD1.PCIeFPGAVrs3.stVal	1	VSS	PCIeFPGAVrs	3	DO	ST	stVal
TEXT	330	FPGA_VER	<root>LDO/LPHD1.HwFPGARev.stVal	1	VSS	HwFPGARev		DO	ST	stVal
TEXT	331	CPLD_VER	<root>LDO/LPHD1.HwCPLDRev.stVal	1	VSS	HwCPLDRev		DO	ST	stVal

Point Type	Point ID	Point Reference	Object Reference	LN Instance	CDC	DO	DO Instance	MCP Custom LN/DO	FC	DA
TEXT	332	UEFI_VER	<root>LDO/LPHD1.SwUEFIRev.stVal	1	VSS	SwUEFIRev		DO	ST	stVal
TEXT	503	Power Supply 1 (top) Id	LD0_HAMA/LPSU1.PwrTopSerNum.stVal	1	VSS	PwrTopSerNum		LN, DO	ST	stVal
TEXT	504	Power Supply 2 (bottom) Id	LD0_HAMA/LPSU1.PwrBotSerNum.stVal	1	VSS	PwrBotSerNum		LN, DO	ST	stVal
TEXT	3800	PTP Grand Master clock ID	LD0_HAMA/PTPLGTS1.GmClkID.stVal	1	VSS	GmClkID		LN, DO	ST	stVal
TEXT	3801	PTP Master Clock ID	LD0_HAMA/PTPLGTS1.MstrClk.stVal	1	VSS	MstrClk		LN, DO	ST	stVal
TEXT	3802	PTP Output Clock ID	LD0_HAMA/PTPLGTS1.PTPOutClk.stVal	1	VSS	PTPOutClk		LN, DO	ST	stVal

5.3 System Status Manager

Point Type	Point ID	Point Reference	Object Reference	LN Instance	CDC	DO	Do Instance	MCP Custom LN/DO	FC	DA
DI	-166	Configuration Access	LD0_SSM/LSSM1.ConfAcs.stVal	1	SPS	ConfAcs		LN, DO	ST	stVal
DI	-167	Configuration Change	LD0_SSM/LSSM1.ConfChg.stVal	1	SPS	ConfChg		LN, DO	ST	stVal
DI	-149	Buzzer Sound is ON	LD0_SSM/LSSM1.BuzSoundON.stVal	1	SPS	BuzSoundON		LN, DO	ST	stVal
DI	-148	Buzzer Disabled	LD0_SSM/LSSM1.BuzDsa.stVal	1	SPC	BuzDsa		LN, DO	ST	stVal
DI	-113	AllControlsDisabled	<root>LD0/LLN0.Loc.stVal		SPS	Loc			ST	stVal

Point Type	Point ID	Point Reference	Object Reference	LN Instance	CDC	DO	Do Instance	MCP Custom LN/DO	FC	DA
DO	-2045	Buzzer Sound ON	LD0_SSM/LSSM1.BuzSoundON.Oper.ctlVal	1	SPC	BuzSoundON		LN, DO	CO	Oper.ctlVal
DO	-2044	Disable Buzzer	LD0_SSM/LSSM1.BuzDsa.Oper.ctlVal	1	SPC	BuzDsa		LN, DO	CO	Oper.ctlVal
DO	-2021	AllControlsDisabled	Not Available as IEC 61850 by design		-	-			-	-
Text	-5010	Last boot date and time	LD0_SSM/LSSM1.LastBootDate.stVal	1	VSS	LastBootDate		LN, DO	ST	stVal

5.4 Redundancy Manager

Point Type	Point ID	Point Reference	Object Reference	LN Instance	CDC	DO	DO Instance	MCP Custom LN/DO	FC	DA
AI	-1047	A/B Designation of this Gateway	LD0_RDNMGR/LRDN1.DesigThisGtw.stVal	1	ENS	DesigThisGtw		LN, DO	ST	stVal
AI	-1046	State of peer Gateway	LD0_RDNMGR/LRDN1.PeerGtwSt.stVal	1	ENS	PeerGtwSt		LN, DO	ST	stVal
AI	-1045	State of this Gateway	LD0_RDNMGR/LRDN1.ThisGtwSt.stVal	1	ENS	ThisGtwSt		LN, DO	ST	stVal
AI	-1109	Redundancy Type	LD0_RDNMGR/LRDN1.RedTyp.stVal	1	ENS	RedTyp		LN, DO	ST	stVal
DI	-119	Standby Code Out of Sync	LD0_RDNMGR/LRDN1.CodeOutSyn.stVal	1	SPS	CodeOutSyn		LN, DO	ST	stVal
DI	-118	HotstandbyDisabled	LD0_RDNMGR/LRDN1.HotStdbyDsa.stVal	1	SPS	HotStdbyDsa		LN, DO	ST	stVal
DI	-89	Standby Config Out of Sync	LD0_RDNMGR/LRDN1.ConfOutSyn.stVal	1	SPS	ConfOutSyn		LN, DO	ST	stVal

Point Type	Point ID	Point Reference	Object Reference	LN Instance	CDC	DO	DO Instance	MCP Custom LN/DO	FC	DA
DI	-88	Config Sync in Progress	LD0_RDNMGR/LRDN1.ConfSynPrg.stVal	1	SPS	ConfSynPrg		LN, DO	ST	stVal
DI	-87	GatewayBActive	LD0_RDNMGR/LRDN1.GtwBActive.stVal	1	SPS	GtwBActive		LN, DO	ST	stVal
DI	-86	GatewayAActive	LD0_RDNMGR/LRDN1.GtwAActive.stVal	1	SPS	GtwAActive		LN, DO	ST	stVal
DI	-85	StandbyGatewayNotAvailable	LD0_RDNMGR/LRDN1.StdbyGtwUnav.stVal	1	SPS	StdbyGtwUnav		LN, DO	ST	stVal
DI	-84	StandbyGatewayinService Mode	LD0_RDNMGR/LRDN1.StdbyGtwSvc.stVal	1	SPS	StdbyGtwSvc		LN, DO	ST	stVal
DI	-83	StandbyGatewayCommFail	LD0_RDNMGR/LRDN1.StdbyGtwFail.stVal	1	SPS	StdbyGtwFail		LN, DO	ST	stVal
DI	-82	SystemRedundant	LD0_RDNMGR/LRDN1.SysRed.stVal	1	SPS	SysRed		LN, DO	ST	stVal
DO	-2038	ShutdownStandby	LD0_RDNMGR/LRDN1.ShutDnStdby.Oper.ctlVal	1	SPC	ShutDnStdby		LN, DO	CO	Oper.ctlVal
DO	-2037	ShutdownActive	LD0_RDNMGR/LRDN1.ShutDnActive.Oper.ctlVal	1	SPC	ShutDnActive		LN, DO	CO	Oper.ctlVal
DO	-2027	SyncConfig	LD0_RDNMGR/LRDN1.SynConf.Oper.ctlVal	1	SPC	SynConf		LN, DO	CO	Oper.ctlVal
DO	-2026	RebootStandby	LD0_RDNMGR/LRDN1.RbtStdby.Oper.ctlVal	1	SPC	RbtStdby		LN, DO	CO	Oper.ctlVal
DO	-2025	RebootActive	LD0_RDNMGR/LRDN1.RbtActive.Oper.ctlVal	1	SPC	RbtActive		LN, DO	CO	Oper.ctlVal
DO	-2024	RestartStandby	LD0_RDNMGR/LRDN1.ReStrStdby.Oper.ctlVal	1	SPC	ReStrStdby		LN, DO	CO	Oper.ctlVal
DO	-2023	RestartActive	LD0_RDNMGR/LRDN1.ReStrActive.Oper.ctlVal	1	SPC	ReStrActive		LN, DO	CO	Oper.ctlVal
DO	-2000	StartChangeOver	LD0_RDNMGR/LRDN1.StrChgOver.Oper.ctlVal	1	SPC	StrChgOver		LN, DO	CO	Oper.ctlVal

Point Type	Point ID	Point Reference	Object Reference	LN Instance	CDC	DO	DO Instance	MCP Custom LN/DO	FC	DA
Text	-5003	DeviceInfo_DeviceAddress	LD0_RDNMGR/LRDN1.DevAddr.stVal	1	VSS	DevAddr		LN, DO	ST	stVal
Text	-5002	DeviceInfo_DeviceType	LD0_RDNMGR/LRDN1.DevIaDevTyp.stVal	1	VSS	DevIaDevTyp		LN, DO	ST	stVal
Text	-5001	DeviceInfo_DeviceID	LD0_RDNMGR/LRDN1.DevIaDevID.stVal	1	VSS	DevIaDevID		LN, DO	ST	stVal
Text	-5000	DeviceInfo_LineID	LD0_RDNMGR/LRDN1.DevIaLinID.stVal	1	VSS	DevIaLinID		LN, DO	ST	stVal

5.5 System Point Manager

The System Point Manager enables user to configure a variety of advanced automation functions as described below

5.5.1 Accumulator Freeze

This feature enables user to create groups of accumulator points whose values are frozen periodically or on demand.

Point Type	Point ID	Point Reference	Object Reference	LN Instance	CDC	DO	Do Instance	MCP Custom LN/DO	FC	DA
ACC	-10002	FrzTime_AccFreezeGrpx	LD0_ACCFRZ/ GAPC|(Group ID/100)|.FrzTm.actVal	|(Group ID/100)|	BCR	FrzTm	|Group ID%100|	DO	ST	actVal
ACC		ACCFRZ Owned Point	LD0_ACCFRZ/ GGIO5.CntVal<Point ID 6 digit>.actVal	5	BCR	CntVal	<Point ID 6 digit>		ST	actVal

Group ID is a unique non-editable reference identifier for an Accumulator Group. It starts with 1 and increments by 1 for each configured Accumulator group.

FrzTime_AccFreezeGrpx is a dynamic pseudo point created for every Accumulator group configured. The LN instance is incremented by 1 for every 100 Accumulator groups starting with 0. The DO instance increments from 1 and resets to 0 for every 100 groups.

5.5.2 Analog Value Selection

This feature allows user to define a group of prioritized analog input points. Valid points with highest priority are reported to a single analog input point.

Point Type	Point ID	Point Reference	Object Reference	LN Instance	CDC	DO	Do Instance	MCP Custom LN/DO	FC	DA
AI	-10002	Group Point_Grp x	LD0_AISEL/ GAPC|(Group ID/100)|.GrPt.stVal	|(Group ID/100)|	INS	GrPt	|Group ID%100|	DO	ST	stVal

Group ID is a unique non-editable reference identifier for an AI Selection Group. It starts with 1 and increments by 1 for each configured AI Selection group.

Group Point_Grp x is a dynamic pseudo point created for every AI Selection group configured. The LN instance is incremented by 1 for every 100 AI Selection groups starting with 0. The DO instance increments from 1 and resets to 0 for every 100 groups.

5.5.3 Control Lockout

This feature helps configure controls in a way that, only a single master station can access a group of controls at one time and lock out groups of local controls for maintenance purpose

Point Type	Point ID	Point Reference	Object Reference	LN Instance	CDC	DO	Do Instance	MCP Custom LN/DO	FC	DA
AI	-10008	GroupOwner_LclGrpx	LD0_CGLO/ LCLGRPGAPC|(Group ID/100)|.GrOwn|Group ID%100|.stVal	|(Group ID/100)|	INS	GrOwn	|Group ID%100|	DO	ST	stVal
AI	-10004	GroupOwner_RmtGrpx	LD0_CGLO/ GAPC|(Group ID/100)|.GrOwn.stVal	|(Group ID/100)|	INS	GrOwn	|Group ID%100|	DO	ST	stVal
DI	-10007	Locked_LclGrpx	LD0_CGLO/GAPC|(Group ID/100)|.GrLkd.stVal	|(Group ID/100)|	SPS	GrLkd	|Group ID%100|	DO	ST	stVal
DI	-10006	Active_LclCrpx	LD0_CGLO/GAPC|(Group ID/100)|.GrActive.stVal	|(Group ID/100)|	SPS	GrActive	|Group ID%100|	DO	ST	stVal

Point Type	Point ID	Point Reference	Object Reference	LN Instance	CDC	DO	Do Instance	MCP Custom LN/DO	FC	DA
DI	-10003	Locked_RmtGrpx	LD0_CGLO/ GAPC|(Group ID/100)|.GrLkd.stVal	|(Group ID/100)|	SPS	GrLkd	|Group ID%100|	DO	ST	stVal
DI	-10002	Active_RmtGrpx (x is group number)	LD0_CGLO/ GAPC|(Group ID/100)|.GrActive.stVal	|(Group ID/100)|	SPS	GrActive	|Group ID%100|	DO	ST	stVal
DO	-10009	GroupLockout_LclGrpx	LD0_CGLO/ LCLGRPGAPC|(Group ID/100)|.GrLO|Group ID%100|.Oper.ctlVal	|(Group ID/100)|	SPC	GrLO	|Group ID%100|	DO	CO	Oper. ctlVal
DO	-10005	GroupLockout_RmtGrpx	LD0_CGLO/ GAPC|(Group ID/100)|.GrLO.Oper.ctlVal	|(Group ID/100)|	SPC	GrLO	|Group ID%100|	DO	CO	Oper. ctlVal

Group ID is a unique non-editable reference identifier for a Local/ Remote Group. It starts with 1 and increments by 1 for each of the configured Local/ Remote group separately.

Dynamic pseudo point created for every Local/ Remote group configured, as defined in the table. The LN instance is incremented by 1 for every 100 Local / Remote groups starting with 0. The DO instance increments from 1 and resets to 0 for every 100 groups.

5.5.4 Double Points

This feature associates two digital input points to form a double point indication. They will be part of the source point files.

5.5.5 Input Point Suppression

This feature suppresses reporting of input points while they are unavailable during maintenance.

Point Type	Point ID	Point Reference	Object Reference	LN Instance	CDC	DO	Do Instance	MCP Custom LN/DO	FC	DA
DI	-10002	Quality_Grpx	LD0_IPSPR/ GAPC|(GroupID/100)|.QualGr|Group ID%100|.stVal	|(Group ID/100)|	SPS	QualGr	|Group ID%100|	DO	ST	stVal
DO	-10003	Grpx_<candidate>_Apply Suppression	LD0_IPSPR/GAPC<xx>.Supr<yyy>.Oper.ctlVal	<xx>	SPC	Supr<yyy>		DO	CO	Oper.ctlVal

Group ID is a unique non-editable reference identifier for an Input Suppression Group. It starts with 1 and increments by 1 for each of the configured groups

Dynamic pseudo point is created for every group configured, as defined in the table. The LN instance is incremented by 1 for every 100 groups starting with 0. The DO instance increments from 1 and resets to 0 for every 100 groups.

For the point Dynamic point, Grpx_<candidate>_Apply Suppression, xxyyy is the Group ID (from 1 to 99999)

xx represents the “thousands” in the above number (as the LN instance between 0 and 99)

yyy is always 3 characters representing the last 3 digits of the group number, with leading zeroes.

A few examples for IPS:

LD0_IPSPR/HMIGAPC0.Supr001 - this is IPS group 1 for HMI candidate

LD0_IPSPR/LDC_MSTR1GAPC1.Supr005 - this is IPS group 1005 for the master with the IEC 61850 name LDC_MSTR1

5.5.6 Redundant I/O

This feature allows user to specify a secondary data point for any MCP point. This secondary point is used to report the value and quality when the associated primary points is invalid/ questionable.

Point Type	Point ID	Point Reference	Object Reference	LN Instance	CDC	DO	Do Instance	MCP Custom LN/DO	FC	DA
DI	-10001	Secondary SourceDI_I/O Group x	LD0_RDNIO/ GAPC|(Group ID/100)|.ScndSrcGr|Group ID%100|.stVal	|(Group ID/100)|	SPC	ScndSrcGr	|Group ID%100|	DO	ST	stVal
DO	-10002	Secondary SourceDO_I/O Group x	LD0_RDNIO/ GAPC|(Group ID/100)|.ScndSrcGr|Group ID%100|.Oper.ctlVal	|(Group ID/100)|	SPC	ScndSrcGr	|Group ID%100|	DO	CO	Oper.ctlVal

Group ID is a unique non-editable reference identifier for an I/O Group. It starts with 1 and increments by 1 for each of the configured groups.

Dynamic pseudo point is created for every group configured, as defined in the table. The LN instance is incremented by 1 for every 100 groups starting with 0. The DO instance increments from 1 and resets to 0 for every 100 groups.

5.5.7 Control In Progress

This feature allows user to trace if a control command on a digital output point is in progress or not. This feature also provides the information about the application that has issued the command and the control command type

Point Type	Point ID	Point Reference	Object Reference	LN Instance	CDC	DO	Do Instance	MCP Custom LN/DO	FC	DA
AI	-10009	Last Comand Issuer on <Member Reference>	LD0_CTRLPRG/ GAPCGroup ID.CmdIs<Point ID 5 digit>.stVal	Group ID	INS	CmdIs	<Point ID 5 digit>	DO	ST	stVal

Point Type	Point ID	Point Reference	Object Reference	LN Instance	CDC	DO	Do Instance	MCP Custom LN/DO	FC	DA
AI	-10008	Last Issue Command Type on <Member Reference>	LD0_CTRLPRG/ GAPCGroup ID.CmdTyp<Point ID 5 digit>.stVal	Group ID	INS	CmdTyp	<Point ID 5 digit>	DO	ST	stVal
DI	-1007	InProgress <Member Reference>	LD0_CTRLPRG(Inherited from IED 61850 LD)/ Inherited from IEDInherited from IEDInherited from IED.Inherited from IED.Inherited the feedback from IED	Inherited from IED	Inherited from IED	Inherited from IED		DO	Inherit the feedback from IED	Inherit the feedback from IED

Group ID is a unique non-editable reference identifier for an InProgress Group. It starts with 1 and increments by 1 for each of the configured groups.

The Pseudo Point InProgress<member reference>, the Object Reference is Inherited from the feedback from source IED from which it is mapped by appending it with LD0_CTRLPRG to show that it is a Control In Progress point. If the input signal does not have an Object Reference, then this pseudo will not have one either, it means the user is not interested to model either of them in 61850.

5.6 Alarms- Digital Event Manager (DEM)

This feature allows user to configure and modify how alarms are processed and reported by MCP. Digital input points must be configured in a Map File before they can be selected as alarmable points

Point Type	Point ID	Point Reference	Object Reference	LN Instance	CDC	DO	Do Instance	MCP Custom LN/DO	FC	DA
AI	-10010	TotalAlarmsRef-GrpDefault	LD0_DEM/ CALH256.TotAlmRef.stVal	256	INS	TotAlmRef		DO	ST	stVal
AI	-10010	TotalAlarmsRef-Grp<x>	LD0_DEM/ CALHGroup ID.TotAlmRef.stVal	Group ID	INS	TotAlmRef		DO	ST	stVal
AI	-10004	TotalAlarmsRef-GrpCritical	LD0_DEM/ CALH255.TotAlmRef.stVal	255	INS	TotAlmRef		DO	ST	stVal
AI	-1105	Total Number of UnAck Alarms	LD0_DEM/ GLOBALCALH1.TotUnAckAlm.stVal	1	INS	TotUnAckAlm		DO	ST	stVal
AI	-1022	Total Number of Alarms	LD0_DEM/ GLOBALCALH1.TotNumAlm.stVal	1	INS	TotNumAlm		DO	ST	stVal
DI	-10012	GroupInAlarmReFlashRef-GrpDefault	LD0_DEM/ CALH256.InAlmReFlash.stVal	256	SPS	InAlmReFlash		DO	ST	stVal
DI	-10012	GroupInAlarmReFlashRef-Grp<x>	LD0_DEM/ CALHGroup ID.InAlmReFlash.stVal	Group ID	SPS	InAlmReFlash		DO	ST	stVal
DI	-10008	GroupInAlarmRef-GrpDefault	LD0_DEM/ CALH256.GrAlm.stVal	256	SPS	GrAlm		DO	ST	stVal

Point Type	Point ID	Point Reference	Object Reference	LN Instance	CDC	DO	Do Instance	MCP Custom LN/DO	FC	DA
DI	-10008	GroupInAlarmRef-Grp<x>	LD0_DEM/ CALHGroup ID.GrAlm.stVal	Group ID	SPS	GrAlm		DO	ST	stVal
DI	-10007	GroupUnAckRef-GrpDefault	LD0_DEM/ CALH256.GrWrn.stVal	256	SPS	GrWrn		DO	ST	stVal
DI	-10007	GroupUnAckRef-Grp<x>	LD0_DEM/CALHGroup ID.GrWrn.stVal	Group ID	SPS	GrWrn		DO	ST	stVal
DI	-10006	GroupInAlarmReFlashRef-GrpCritical	LD0_DEM/ CALH255.InAlmReFlash.stVal	255	SPS	InAlmReFlash		DO	ST	stVal
DI	-10002	GroupInAlarmRef-GrpCritical	LD0_DEM/ CALH255.GrAlm.stVal	255	SPS	GrAlm		DO	ST	stVal
DI	-10001	GroupUnAckRef-GrpCritical	LD0_DEM/ CALH255.GrWrn.stVal	255	SPS	GrWrn		DO	ST	stVal
DI	-92	Points Suppressed	LD0_DEM/ GLOBALCALH1.PtSupr.stVal	1	SPS	PtSupr		DO	ST	stVal
DI	-91	Points in Alarm	LD0_DEM/ GLOBALCALH1.GrAlm.stVal	1	SPS	GrAlm			ST	stVal
DI	-90	Unacknowledged Alarms	LD0_DEM/ GLOBALCALH1.GrWrn.stVal	1	SPS	GrWrn			ST	stVal

Point Type	Point ID	Point Reference	Object Reference	LN Instance	CDC	DO	Do Instance	MCP Custom LN/DO	FC	DA
DI	-10148	GroupName-PointName	LD0_DEM_(Inherited from IED 61850 LD)/Inherited from IEDInherited from IEDInherited from IED.Inherited from .Inherited from IED	Inherited from IED	Inherited from IED	Inherited from IED			Inherited from IED	Inherited from IED
DO	-10009	GroupAckRef-GrpDefault	LD0_DEM/ CALH256.GrAckRef.Oper.ctlVal	256	SPC	GrAckRef		DO	CO	Oper.ctlVal
DO	-10009	GroupAckRef-Grp<x>	LD0_DEM/ CALHGroupID.GrAckRef.Oper.ctlVal	GroupID	SPC	GrAckRef		DO	CO	Oper.ctlVal
DO	-10003	GroupAckRef-GrpCritical	LD0_DEM/ CALH255.GrAckRef.Oper.ctlVal	255	SPC	GrAckRef		DO	CO	Oper.ctlVal
DO	-2040	Acknowledge Orphan Alarms	LD0_DEM/ GLOBALCALH1.AckOrphAlm.Oper.ctlVal	1	SPC	AckOrphAlm		DO	CO	Oper.ctlVal

Group ID is a unique non-editable reference identifier for an Alarm Group. It starts with 1 and increments by 1 for each of the configured groups.

Individual Alarm Indication when enabled, digital input pseudo point is created for each alarm in the group (Note that redundant pseudo points are created if alarms are assigned to multiple groups)

This is indicated in the above table by the pseudo point GroupName-PointName. For this point, the Object reference is inherited from the source IED.

e.g. the DI point which is part of the alarm group has IED1PROT/BRKAA1PDIF1.Op and this creates in turn an individual alarm point in DEM (if the option is enabled in DEM).

This shall be represented as LD0_DEM_IED1PROT/BRKAA1PDIF1.Op which is a direct relation to the original signal, but shows as a DEM point (the remote 61850 client looking at this dataset shall see the actual signal's Object Reference and when it became alarmed based on the DEM configuration).

If the input signal does not have an Object Reference, then this pseudo will not have one either, it means the user is not interested to model either of them in 61850.

For edge cases where the source IED+LD is already at the maximum length, adding LD0_DEM in front will exceed the max limit. In this case, the RTDB shall truncate such that the last 5 characters are replaced by *_dddd* with *dddd* being a number assigned in sequence, as it is identified in order.

For e.g.

IEDLONGLONGNAME1PROTLDLONGLONGLONG/BRKAA1PDIF1.Op was mapped to DEM and creates an individual alarm point in DEM.

This should become:

LD0_DEM_ IEDLONGLONGNAME1PROTLDLONGLON_0001/BRKAA1PDIF1.Op

5.7 Calculator

This application is used to carry out the following functions:

- Perform mathematical, Logical, or Timer based operations on selected system data points
- Automatically operate one or more digital or analog outputs when certain conditions are met

Point Type	Point ID	Point Reference	Object Reference	LN Instance	CDC	DO	Do Instance	MCP Custom LN/DO	FC	DA
ACC	-4062	TxdCommandsFailed	LD0_CALC/GAPC1.TxCmdFail.actVal	1	BCR	TxCmdFail		DO	ST	actVal
ACC	-4061	CommandsTxd	LD0_CALC/GAPC1.CmdTx.actVal	1	BCR	CmdTx		DO	ST	actVal
ACC	-4060	RxdCommandsFailed	LD0_CALC/GAPC1.RxCmdFail.actVal	1	BCR	RxCmdFail		DO	ST	actVal
ACC	-4013	CommandsReceived	LD0_CALC/GAPC1.CmdRx.actVal	1	BCR	CmdRx		DO	ST	actVal
ACC		Calculator Owned Point	LD0_CALC/GGIO5.CntVal<Point ID 6 digit>.actVal	5	BCR	CntVal	<Point ID 6 digit>		ST	actVal
AI	-1020	CalcPointCount	LD0_CALC/GAPC1.CalcPtCnt.stVal	1	INS	CalcPtCnt		DO	ST	stVal
AI	-1019	TimerCount	LD0_CALC/GAPC1.TmrCnt.stVal	1	INS	TmrCnt		DO	ST	stVal
AI		Calculator Owned Point	LD0_CALC/GGIO4.AnIn<Point ID 6 digit>.mag.f	4	MV	AnIn	<Point ID 6 digit>		MX	mag.f
AO		Calculator Owned Point	LD0_CALC/GGIO3.AnOut<Point ID 6 digit>.Oper.ctlVal.f	3	APC	AnOut	<Point ID 6 digit>		CO	Oper.ctlVal.f
DI	-81	DeviceDisabled	LD0_CALC/GAPC1.DevDsa.stVal	1	SPC	DevDsa		DO	ST	stVal
DI	-80	CalcStatus	LD0_CALC/GAPC1.CalcSt.stVal	1	SPS	CalcSt		DO	ST	stVal
DI	-79	ConfigError	LD0_CALC/GAPC1.ConfErr.stVal	1	SPS	ConfErr		DO	ST	stVal
DI		Calculator Owned Point	LD0_CALC/GGIO1.Ind<Point ID 6 digit>.stVal	1	SPS	Ind	<Point ID 6 digit>		ST	stVal

Point Type	Point ID	Point Reference	Object Reference	LN Instance	CDC	DO	Do Instance	MCP Custom LN/DO	FC	DA
DO	-2001	DisableDevice	LD0_CALC/GAPC1.DevDsa.Oper.ctlVal	1	SPC	DevDsa		DO	CO	Oper.ctlVal
DO		Calculator Owned Point	LD0_CALC/GGIO2.SPCSO<Point ID 6 digit>.Oper.ctlVal	2	SPC	SPCSO	<Point ID 6 digit>		CO	Oper.ctlVal

5.8 Data Logger

This application allows user to graphically monitor and record data from devices connected to MCP. User can also save and review historical reports created by the application

Point Type	Point ID	Point Reference	Object Reference	LN Instance	CDC	DO	Do Instance	MCP Custom LN/DO	FC	DA
AI	-10106	Out of Range Report x: Storage	LD0_DLOG/ ORRIARC|(Report ID/100)|.RptSto|Report ID%100|.stVal	|(Report ID/100)|	INS	RptSto	|Report ID%100|	DO	ST	stVal
AI	-10103	Periodic Report x: Storage	LD0_DLOG/ PERIARC|(Report ID/100)|.RptSto|Report ID%100|.stVal	|(Report ID/100)|	INS	RptSto	|Report ID%100|	DO	ST	stVal
AI	-10100	Continuous Report x: Storage	LD0_DLOG/ CONTIARC|(Report ID/100)|.RptSto|Report ID%100|.stVal	|(Report ID/100)|	INS	RptSto	|Report ID%100|	DO	ST	stVal
AI	-1037	Active Report Count	LD0_DLOG/GLOBALIARC1.ActiveRptCnt.stVal	1	INS	ActiveRptCnt		DO	ST	stVal
DI	-106	Configuration Error	LD0_DLOG/GLOBALIARC1.ConfErr.stVal	1	SPS	ConfErr		DO	ST	stVal

Point Type	Point ID	Point Reference	Object Reference	LN Instance	CDC	DO	Do Instance	MCP Custom LN/DO	FC	DA
DI	-105	Application Status	LD0_DLOG/GLOBALIARC1.ApplSt.stVal	1	SPS	ApplSt		DO	ST	stVal
DO	-10108	Out of Range Report x: Reset	LD0_DLOG/ ORRIARC|(Report ID/100)|.RptRs|Report ID%100|.Oper.ctlVal	|(Report ID/100)|	SPC	RptRs	|Report ID%100|	DO	CO	Oper.ctlVal
DO	-10107	Out of Range Report x: Disable	LD0_DLOG/ ORRIARC|(Report ID/100)|.RptDsa|Report ID%100|.Oper.ctlVal	|(Report ID/100)|	SPC	RptDsa	|Report ID%100|	DO	CO	Oper.ctlVal
DO	-10105	Periodic Report x: Reset	LD0_DLOG/ PERIARC|(Report ID/100)|.RptRs|Report ID%100|.Oper.ctlVal	|(Report ID/100)|	SPC	RptRs	|Report ID%100|	DO	CO	Oper.ctlVal
DO	-10104	Periodic Report x: Disable	LD0_DLOG/ PERIARC|(Report ID/100)|.RptDsa|Report ID%100|.Oper.ctlVal	|(Report ID/100)|	SPC	RptDsa	|Report ID%100|	DO	CO	Oper.ctlVal
DO	-10102	Continuous Report x: Reset	LD0_DLOG/ CONTIARC|(Report ID/100)|.RptRs|Report ID%100|.Oper.ctlVal	|(Report ID/100)|	SPC	RptRs	|Report ID%100|	DO	CO	Oper.ctlVal
DO	-10101	Continuous Report x: Disable	LD0_DLOG/ CONTIARC|(Report ID/100)|.RptDsa|Report ID%100|.Oper.ctlVal	|(Report ID/100)|	SPC	RptDsa	|Report ID%100|	DO	CO	Oper.ctlVal
DO	-2036	Reset All Logs	LD0_DLOG/IARC1.RsAllLog.Oper.ctlVal	1	SPC	RsAllLog		DO	CO	Oper.ctlVal
DO	-2035	Disable Logging	LD0_DLOG/IARC1.LogDsa.Oper.ctlVal	1	SPC	LogDsa		DO	CO	Oper.ctlVal

Report ID is a unique non-editable reference identifier for a Datalogger Group. It starts with 1 and increments by 1 for each of the configured Local/ Remote group separately.

Dynamic pseudo point created for every Report configured, as defined in the table. The LN instance is incremented by 1 for every 100 Reports starting with 0. The DO instance increments from 1 and resets to 0 for every 100 reports.

5.9 Load Shed

This application allows user to configure sets of feeders and load shed zones. Inputs to the MCP can be used to trigger the opening of feeders in order to shed load on the system. Load shedding can also be referred to as Demand Side Management or Load Management.

Point Type	Point ID	Point Reference	Object Reference	LN Instance	CDC	DO	Do Instance	MCP Custom LN/DO	FC	DA
DO	-10006	Zone<x>	LD0_LDSHED/GAPC|(Zone ID/100)|.ZnSt.Oper.ctlVal	|(Zone ID/100)|	SPC	ZnSt	|Zone ID%100|	DO	CO	Oper.ctlVal
AO	-10003	Feeder<x>	LD0_LDSHED/GAPC|(Feeder ID/100)|.FedSt.Oper.ctlVal	|(Feeder ID/100)|	INC	FedSt		DO	CO	Oper.ctlVal
AI	-10002	Feeder<x>	LD0_LDSHED/GAPC|(Feeder ID/100)|.FedID.stVal	|(Feeder ID/100)|	INS	FedID	|Feeder ID%100|	DO	ST	stVal
ACC	-4063	Controls Sent	LD0_LDSHED/GLOBALGAPC1.CtlTx.actVal	1	BCR	CtlTx		DO	ST	actVal
ACC	-4049	Controls Failed	LD0_LDSHED/GLOBALGAPC1.CtlFail.actVal	1	BCR	CtlFail		DO	ST	actVal
ACC	-4048	Controls Received	LD0_LDSHED/GLOBALGAPC1.CtlRx.actVal	1	BCR	CtlRx		DO	ST	actVal
DO	-2022	Control Disable	LD0_LDSHED/GLOBALGAPC1.CtlDsa.Oper.ctlVal	1	SPC	CtlDsa		DO	CO	Oper.ctlVal
DO	-2001	DisableDevice	LD0_LDSHED/GLOBALGAPC1.DevDsa.Oper.ctlVal	1	SPC	DevDsa		DO	CO	Oper.ctlVal

Zone ID/ Feeder ID are a unique non-editable reference identifier for a Zones and Feeder respectively. It starts with 1 and increments by 1 for each of the configured Zone/ Feeder separately.

Dynamic pseudo point created for every Zone/Feeder configured, as defined in the table. The LN instance is incremented by 1 for every 100 Zones/ Feeders starting with 0. The DO instance increments from 1 and resets to 0 for every 100 Zones/ Feeders.

5.10 ARRM (Automated Record Retrieval Manager)

This feature retrieves and stores record files from devices connected to MCP.

Point Type	Point ID	Point Reference	Object Reference	LN Instance	CDC	DO	Do Instance	MCP Custom LN/DO	FC	DA
AI	-10005	Retrieval State for File Set - St<x>/Device <y>/ File Set <z>	LD0_ARRM/IARC1.RetSt.stVal	1	INS	RetSt	{ same instance for the same unique combination of xyz, then +1 }		ST	stVal
AI	-1036	Current Disk Usage	LD0_ARRM/IARC1.MemUse.stVal	1	INS	MemUse		DO	ST	stVal
DI	-10008	Connection Polling Enabled for File Set - St<x>/Device <y>/ File Set <z>	LD0_ARRM/IARC1.PollEna.stVal	1	SPC	PollEna	{ same instance for the same unique combination of xyz, then +1 }		ST	stVal
DI	-10002	Automatic Retrieval Disabled for File Set- St<x>/Device <y>/ File Set <z>	LD0_ARRM/IARC1.RetDsa.stVal	1	SPC	RetDsa	{ same instance for the same unique combination of xyz, then +1 }		ST	stVal
DO	-10006	Retrieve File Set - St<x>/Device <y>/ File Set <z>	LD0_ARRM/IARC1.RetCmd.Oper.ctlVal	1	SPC	RetCmd	{ same instance for the same unique combination of xyz, then +1 }		CO	Oper.ctlVal
DO	-10003	Clear Recorder Memory for File Set -	LD0_ARRM/IARC1.MemClr.Oper.ctlVal	1	SPC	MemClr	{ same instance for the same unique		CO	Oper.ctlVal

Point Type	Point ID	Point Reference	Object Reference	LN Instance	CDC	DO	Do Instance	MCP Custom LN/DO	FC	DA
		St<x>/Device <y>/ File Set <z>					combination of xyz, then +1 }			
DO	-10003	Disable Automatic Retrieval for File Set - St<x>/Device <y>/ File Set <z>	LD0_ARRM/IARC1.RetDsa.Oper.ctlVal	1	SPC	RetDsa	{ same instance for the same unique combination of xyz, then +1 }		CO	Oper.ctlVal
DO	-10003	Enable Connection Polling for File Set - St<x>/Device <y>/ File Set <z>	LD0_ARRM/IARC1.PollEna.Oper.ctlVal	1	SPC	PollEna	{ same instance for the same unique combination of xyz, then +1 }		CO	Oper.ctlVal

The DO instance can be explained as below:

For each unique combination of x,z,z an instance number is generated, starting with 1, regardless of what x,y,z may be. So, combination x1,y1,z1 has everything DO instance 1;
x1,y2,z3 has 2;
x3,y1,z777 has 3 and so on.

There is no intended calculation or automated association between x,y,z and the DO instance. IEC 61850 Server only identifies the unique sets of x,y,z and give them DO numbers in the order identified. DO instance numbers are assigned in order as, 1,2,3,4,5,6,7,..... etc.
Users can filter them in the mapper like in Excel (mapper is like Excel). And then can leave them as they are, or assign a prefix etc.

5.11 Analog Report

This application allows users to configure different sets of reports in the system.

Point Type	Point ID	Point Reference	Object Reference	LN Instance	CDC	DO	Do Instance	MCP Custom LN/DO	FC	DA
AI	-1060	Total Monthly Report Count	LD0_AIREP/IARC1.TotMonthCnt.stVal	1	INS	TotMonthCnt		DO	ST	stVal
AI	-1059	Total Weekly Report Count	LD0_AIREP/IARC1.TotWeekCnt.stVal	1	INS	TotWeekCnt		DO	ST	stVal
AI	-1058	Total Daily Report Count	LD0_AIREP/IARC1.TotDayRptCnt.stVal	1	INS	TotDayRptCnt		DO	ST	stVal
AI	-1057	Total Shift Report Count	LD0_AIREP/IARC1.TotShfRptCnt.stVal	1	INS	TotShfRptCnt		DO	ST	stVal
AI	-1056	Total Report Count	LD0_AIREP/IARC1.TotRptCnt.stVal	1	INS	TotRptCnt		DO	ST	stVal
AI	-1055	Days Until Storage Space Available	LD0_AIREP/IARC1.DayStoAvail.stVal	1	INS	DayStoAvail		DO	ST	stVal
AI	-1054	Current Percentage Disk Usage	LD0_AIREP/IARC1.CurDiskUse.stVal	1	INS	CurDiskUse		DO	ST	stVal
DI	-122	Storage Space Full	LD0_AIREP/IARC1.StoSpaceFull.stVal	1	SPS	StoSpaceFull		DO	ST	stVal
Text	-5003	DeviceInfo_DeviceAddress	LD0_AIREP/IARC1.DevAddr.stVal	1	VSS	DevAddr		DO	ST	stVal
Text	-5002	DeviceInfo_DeviceType	LD0_AIREP/IARC1.DevIaDevTyp.stVal	1	VSS	DevIaDevTyp		DO	ST	stVal
Text	-5001	DeviceInfo_DeviceID	LD0_AIREP/IARC1.DevIaDevID.stVal	1	VSS	DevIaDevID		DO	ST	stVal
Text	-5000	DeviceInfo_LineID	LD0_AIREP/IARC1.DevIaLinID.stVal	1	VSS	DevIaLinID		DO	ST	stVal

5.12 LogicLinx

Point Type	Point ID	Point Reference	Object Reference	LN Instance	CDC	DO	Do Instance	MCP Custom LN/DO	FC	DA
ACC	-4063	Controls Sent	LD0_LGLINX/GAPC1.CtlTx.actVal	1	BCR	CtlTx		DO	ST	actVal
ACC	-4049	Controls Failed	LD0_LGLINX/GAPC1.CtlFail.actVal	1	BCR	CtlFail		DO	ST	actVal
ACC	-4048	Controls Received	LD0_LGLINX/GAPC1.CtlRx.actVal	1	BCR	CtlRx		DO	ST	actVal
ACC		Logic Linx Owned Point	LD0_LGLINX/ GGIO5.CntVal<Point ID 6 digit>.actVal	5	BCR	CntVal	<Point ID 6 digit>		ST	actVal
AI	-1021	TotalLLPoints	LD0_LGLINX/GAPC1.TotLLPt.stVal	1	INS	TotLLPt		DO	ST	stVal
AI		Logic Linx Owned Point	LD0_LGLINX/GGIO4.AnIn<Point ID 6 digit>.mag.f	4	MV	AnIn	<Point ID 6 digit>		MX	mag.f
AO		Logic Linx Owned Point	LD0_LGLINX/GGIO3.AnOut<Point ID 6 digit>.Oper.ctlVal.f	3	APC	AnOut	<Point ID 6 digit>		CO	Oper.ctlVal.f
DI	-22	DeviceDisable	LD0_LGLINX/GAPC1.DevDsa.stVal	1	SPC	DevDsa		DO	ST	stVal
DI		Logic Linx Owned Point	LD0_LGLINX/GGIO1.Ind<Point ID 6 digit>.stVal	1	SPS	Ind	<Point ID 6 digit>		ST	stVal
DO	-2001	DisableDevice	LD0_LGLINX/GAPC1.DevDsa.Oper.ctlVal	1	SPC	DevDsa		DO	CO	Oper.ctlVal
DO		Logic Linx Owned Point	LD0_LGLINX/GGIO2.SPCSO<Point ID 6 digit>.Oper.ctlVal	2	SPC	SPCSO	<Point ID 6 digit>		CO	Oper.ctlVal

6. Configure IEC 61850 MMS Server

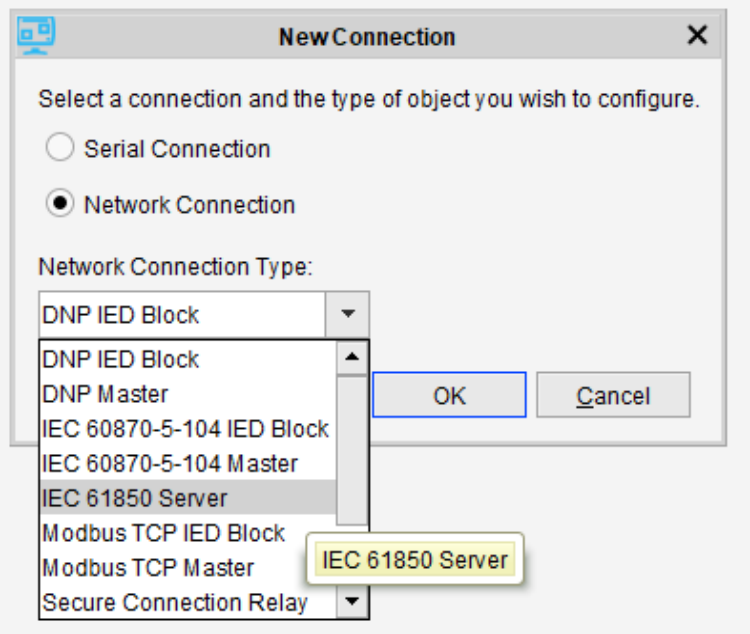
After all required IEC 61850 Object References assignments are completed, user can proceed to the configuration of the IEC 61850 MMS Server.

The workflow presented in this chapter applies only to MCP v3.00.

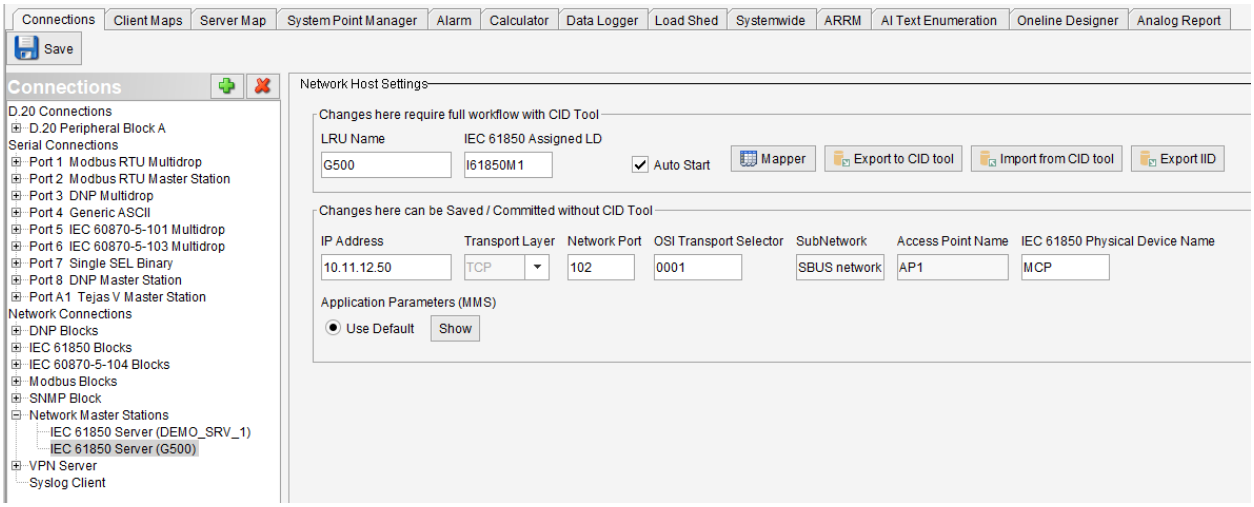
6.1 IEC 61850 Server Instances

6.1.1 Adding an IEC 61850 Server instance

Add an IEC 61850 Server Instance (LRU) using the Connections Page “green +” button, new Network Connection and Select IEC 61850 Server:



A new IEC 61850 Server connection is added:



The configuration is split into two workflow modes:

Changes which require full workflow with CID tool

This section refers to workflows involving parameters that require CID tool workflow, in addition to Save/Commit:

- LRU Name
- IEC 61850 Assigned LD
    - This field must respect IEC 61850 Naming rules and should be as short as possible because it will be prepended to database LD Names.
- Checkbox “Auto Start”; this should be always enabled, and disabled only for testing to prevent the IEC 61850 LRU start at runtime.
- Changes in the IEC 61850 Data Model

Note: The “Auto Start” checkbox is automatically disabled if an existing configuration has been upgraded between major MCP versions, due to changes in the data model. In this case – a CID Tool workflow (export / generate / import) is required to enable the “Auto Start” and save the Offline Editor session.

Changes which can be Saved/Committed without CID tool

This section refers to workflows involving parameters that are updated only with MCP Save/Commit operations (no CID tool workflow is required).

- IP address associated with the LRU
- The “Network Port” (102) and “OSI Transport Selector” (0001) should be left to their default values.
- “Transport Layer”, “SubNetwork”, “Access Point Name” and “Application Parameters (MMS)” are read only.
- “IEC 61850 Physical Device Name” field must respect IEC 61850 Naming rules and should be as short as possible because it will be prepended to database LD Names.

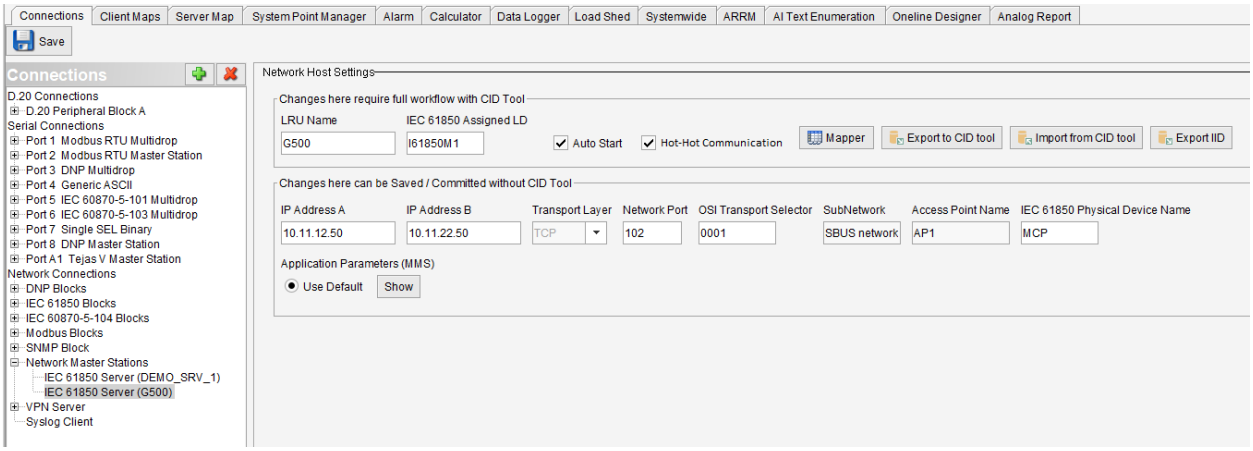
Repeat the process for additional IEC 61850 Server instances (LRUs).

“LRU Name”, “IEC 61850 Physical Device Name” should be unique across all instances for easy identification.

“Assigned LD” must be unique across all instances; if is repeated it will be replaced with an appended Home Directory number at the end when “Save”, to make it unique.

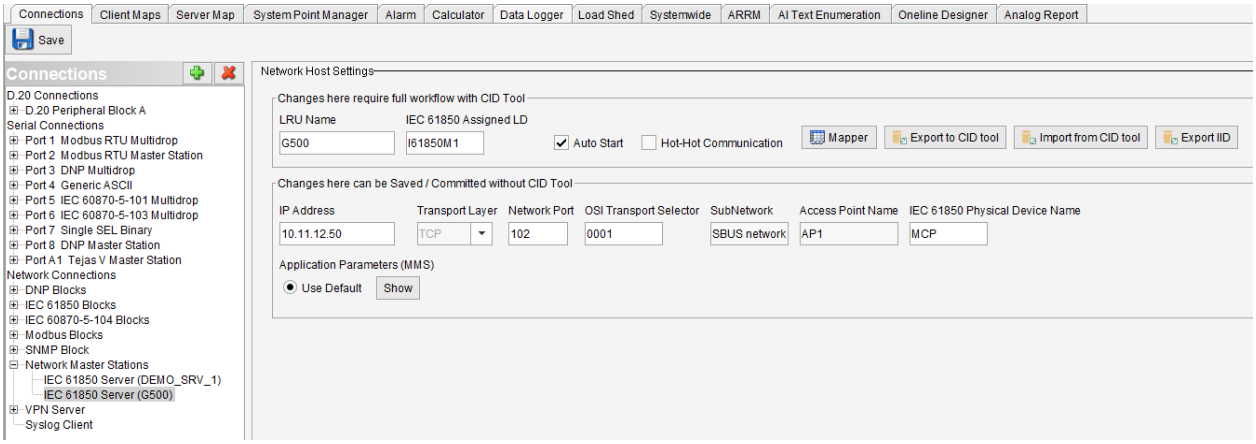
6.1.2 IEC 61850 Server Instances with Hot-Hot Redundancy

If MCP device is configured as Hot-Hot redundancy and "Hot-Hot Communication" is enabled – the IEC 61850 server has following different parameters for MCP A and MCP B:



- IP address associated with MCP A (not the Active Address)
- IP address associated with MCP B (not the Active Address)

If MCP device is configured as Hot-Hot redundancy and "Hot-Hot Communication" is **not** enabled – the IEC 61850 server has the same parameters as not being redundant.



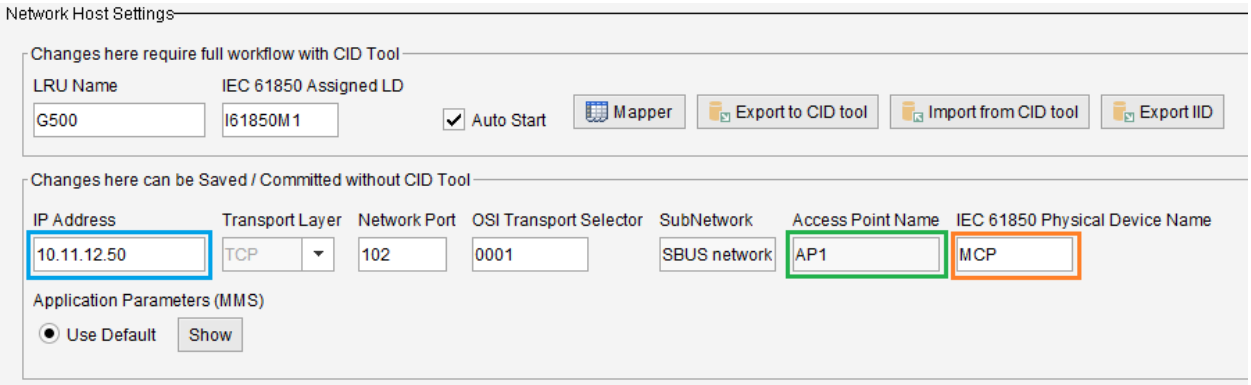
6.1.3 Parameters assignment to CID file

The IEC 61850 Server instance parameters in Connections will be used by the CID tool to create the CID file as following:

In the Communication section of CID file:

- "IEC 61850 Physical Device Name" is used for "iedName" and "IED name"
- "Access Point" is used for "apName" and "AccessPoint Name"
- "IP address" is used for "IP"

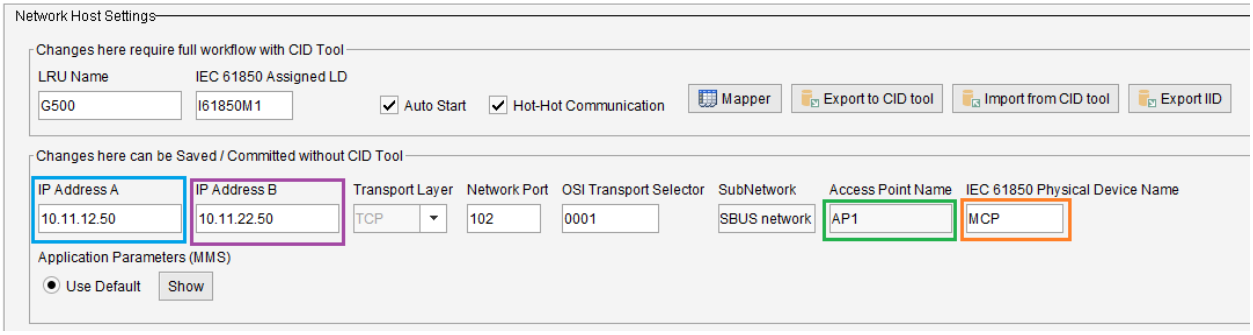
"IP-Subnet" is defaulted to /24 and "IP-Gateway" address is defaulted to x.x.x.1 and if necessary need to be changed manually in the CID file according to Network Interface settings and application.



Example of CID file communication section for non-hot-hot MCP:

```
<SCL xmlns="http://www.iec.ch/61850/2003/SCL" xmlns:sxy="http://www.ie
"http://www.gedigitalenergy.com/multilin">
  <Header id="BaseG500GatewayTemplate" version="1" revision="1" toolID
  <Communication>
    <SubNetwork name="subnetwork1" type="8-MMS" desc="">
      <Text>Station bus</Text>
      <BitRate unit="b/s">10</BitRate>
      <ConnectedAP iedName="MCP" apName="AP1">
        <Address>
          <P type="IP">10.11.12.50</P>
          <P type="IP-SUBNET">255.255.0.0</P>
          <P type="IP-GATEWAY">10.11.12.1</P>
          <P type="OSI-TSEL">0001</P>
          <P type="OSI-PSEL">00000001</P>
          <P type="OSI-SSEL">0001</P>
          <P type="OSI-AP-Title">1,1,9999,1,1</P>
          <P type="OSI-AE-Qualifier">12</P>
          <P type="OSI-AP-Invoke">000</P>
          <P type="OSI-AE-Invoke">000</P>
        </Address>
      </ConnectedAP>
    </SubNetwork>
  </Communication>
  <IED name="MCP" manufacturer="GE Multilin">
    <Services nameLength="64">
      <DynAssociation max="8" />
      <GetDirectory />
      <GetDataSetValue />
      <DataSetDirectory />
      <ReadWrite />
      <GetCBValues />
      <ConfLNs fixPrefix="true" fixLnInst="true" />
      <FileHandling />
      <DataObjectDirectory />
      <ConfReportControl max="1000" bufMode="both" bufConf="true" />
      <ReportSettings cbName="Conf" datSet="Conf" rptID="Dyn" optFielc
      <ValueHandling setToRO="false" />
    </Services>
    <AccessPoint name="AP1" desc="">
```

If MCP device is configured as Hot-Hot redundancy and "Hot-Hot Communication" is enabled – each MCP A and MCP B device have their own IP addresses, and the IED name has _A and respectively _B as suffix:



Example of CID file communication section for hot-hot MCP:

```
<SCL xmlns="http://www.iec.ch/61850/2003/SCL" xmlns:sxy="http://www.ie
  <Header id="BaseG500GatewayTemplate" version="1" revision="1" toolID
  <Communication>
    <SubNetwork name="subnetwork1" type="8-MMS" desc="">
      <Text>Station bus</Text>
      <BitRate unit="b/s" multiplier="M">100</BitRate>
      <ConnectedAP iedName="MCP_A" apName="AP1">
        <Address>
          <P type="IP">10.11.12.50</P>
          <P type="IP-SUBNET">255.255.255.0</P>
          <P type="IP-GATEWAY">10.11.12.1</P>
          <P type="OSI-TSEL">0001</P>
          <P type="OSI-PSEL">00000001</P>
          <P type="OSI-SSEL">0001</P>
          <P type="OSI-AP-Title">1,1,9999,1,1</P>
          <P type="OSI-AE-Qualifier">12</P>
          <P type="OSI-AP-Invoke">000</P>
          <P type="OSI-AE-Invoke">000</P>
        </Address>
      </ConnectedAP>
    </SubNetwork>
  </Communication>
  <IED name="MCP_A" manufacturer="GE Multilin">
    <Services nameLength="64">
      <DynAssociation max="8" />
      <GetDirectory />
      <GetDataSetValue />
      <DataSetDirectory />
      <ReadWrite />
      <GetCBValues />
      <ConfLNs fixPrefix="true" fixLnInst="true" />
      <FileHandling />
      <DataObjectDirectory />
      <ConfReportControl max="5000" bufMode="both" bufConf="true" />
      <ReportSettings cbName="Conf" datSet="Conf" rptID="Dyn" optField
      <ValueHandling setToRO="false" />
    </Services>
    <AccessPoint name="AP1" desc="">
```

```
<SCL xmlns="http://www.iec.ch/61850/2003/SCL" xmlns:sxy="http://www.ie
  <Header id="BaseG500GatewayTemplate" version="1" revision="1" toolID
  <Communication>
    <SubNetwork name="subnetwork1" type="8-MMS" desc="">
      <Text>Station bus</Text>
      <BitRate unit="b/s" multiplier="M">100</BitRate>
      <ConnectedAP iedName="MCP_B" apName="AP1">
        <Address>
          <P type="IP">10.11.22.50</P>
          <P type="IP-SUBNET">255.255.255.0</P>
          <P type="IP-GATEWAY">10.11.12.1</P>
          <P type="OSI-TSEL">0001</P>
          <P type="OSI-PSEL">00000001</P>
          <P type="OSI-SSEL">0001</P>
          <P type="OSI-AP-Title">1,1,9999,1,1</P>
          <P type="OSI-AE-Qualifier">12</P>
          <P type="OSI-AP-Invoke">000</P>
          <P type="OSI-AE-Invoke">000</P>
        </Address>
      </ConnectedAP>
    </SubNetwork>
  </Communication>
  <IED name="MCP_B" manufacturer="GE Multilin">
    <Services nameLength="64">
      <DynAssociation max="8" />
      <GetDirectory />
      <GetDataSetValue />
      <DataSetDirectory />
      <ReadWrite />
      <GetCBValues />
      <ConfLNs fixPrefix="true" fixLnInst="true" />
      <FileHandling />
      <DataObjectDirectory />
      <ConfReportControl max="5000" bufMode="both" bufConf="true" />
      <ReportSettings cbName="Conf" datSet="Conf" rptID="Dyn" optField
      <ValueHandling setToRO="false" />
    </Services>
    <AccessPoint name="AP1" desc="">
```

6.2 Operations

The IEC 61850 Server instance provides the following interactive buttons, which are operational if the device contains a Loader configuration upgraded to Edition 2.

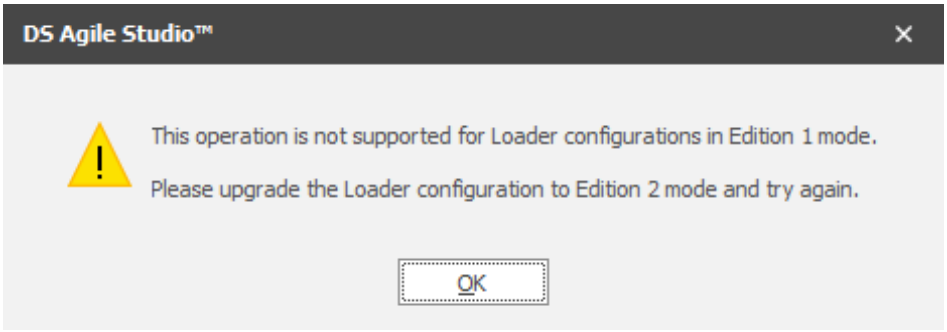
- Mapper
- Export to CID tool
- Import from CID tool
- Export IID

6.2.1 Cases when interactive buttons do not work

Clicking on the buttons may result in the following messages, depending on the environment setup:

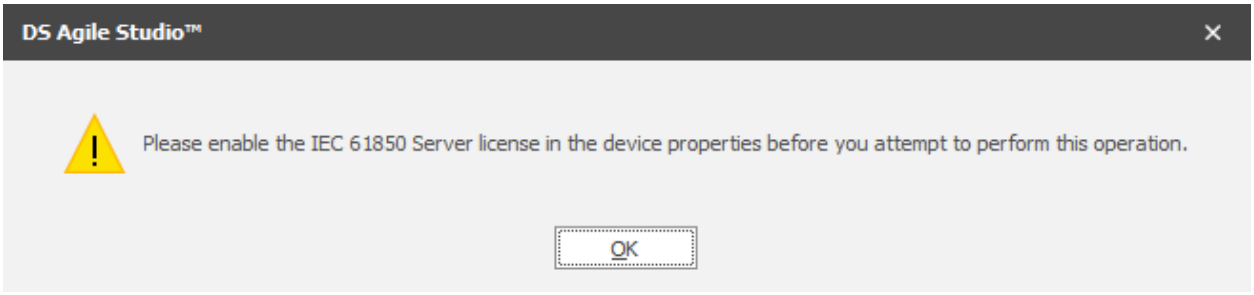
Loader configuration is not Edition 2

If the following message is shown – the Loader configuration must be upgraded to Edition 2 (see High Level Workflow):



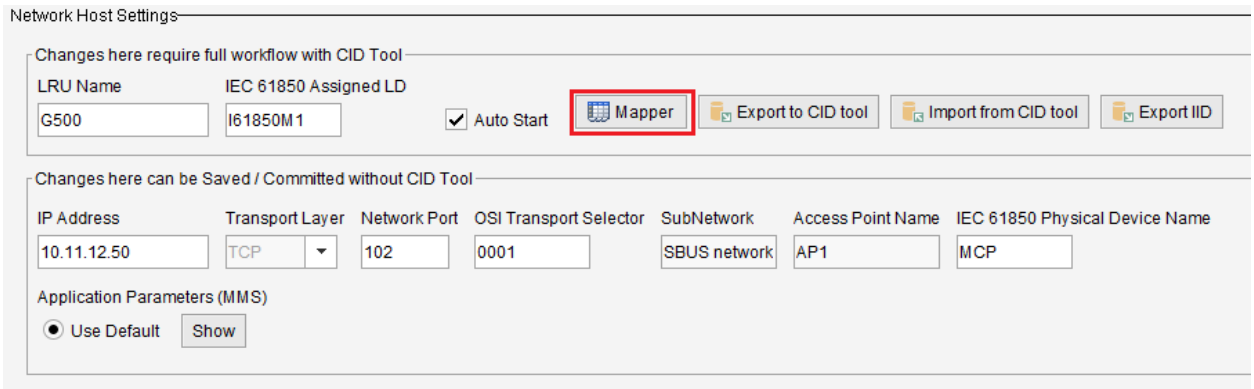
MCP Device Properties doesn't have the IEC 61850 Server enabled

If the IEC 61850 Server license is not enabled in the Device Properties > Licensing tab – the following message will be displayed:



6.3 Mapper View

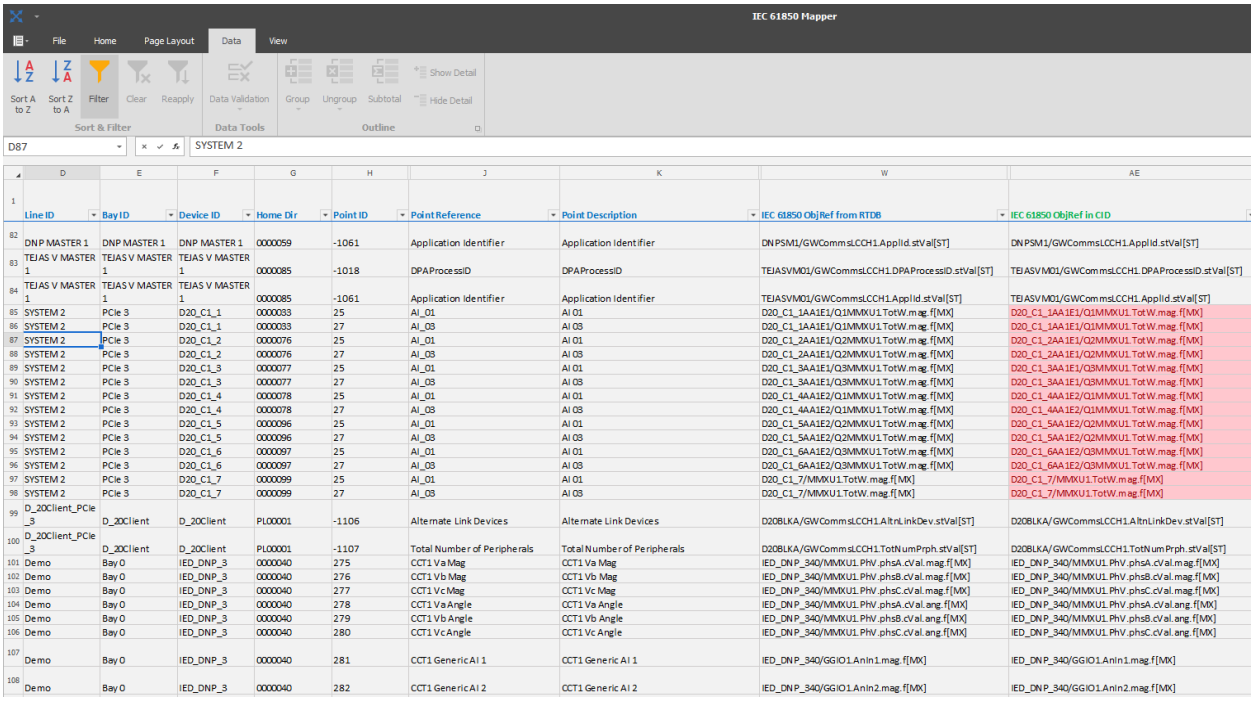
The "Mapper" button opens a grid table that contains all IEC 61850 Object References for all points in the MCP database.



In MCP v3.00 the only operations available in the Mapper are data viewing, filtering and export data to an Excel file.

Duplicate Object References are shown in red and user must resolve these in legacy IED Client Map files or in Connections to ensure uniqueness.

There is no persistency for changes.



	D	E	F	G	H	J	K	W	AE
1	Line ID	Bay ID	Device ID	Home Dir	Point ID	Point Reference	Point Description	IEC 61850 ObjRef from RTDB	IEC 61850 ObjRef in CID
82	DNP MASTER 1	DNP MASTER 1	DNP MASTER 1	0000059	-1061	Application Identifier	Application Identifier	DNPSM1/GWCommsLCCH1.AppId.stVal[ST]	DNPSM1/GWCommsLCCH1.AppId.stVal[ST]
83	TEJAS V MASTER 1	TEJAS V MASTER 1	TEJAS V MASTER 1	0000085	-1018	DPAProcessID	DPAProcessID	TEJASVM01/GWCommsLCCH1.DPAProcessID.stVal[ST]	TEJASVM01/GWCommsLCCH1.DPAProcessID.stVal[ST]
84	TEJAS V MASTER 1	TEJAS V MASTER 1	TEJAS V MASTER 1	0000085	-1061	Application Identifier	Application Identifier	TEJASVM01/GWCommsLCCH1.AppId.stVal[ST]	TEJASVM01/GWCommsLCCH1.AppId.stVal[ST]
85	SYSTEM 2	PCIe 3	D20_C1_1	0000033	25	AI_01	AI 01	D20_C1_1AA1E1/Q1MMXU1.TotW.mag.f[MX]	D20_C1_1AA1E1/Q1MMXU1.TotW.mag.f[MX]
86	SYSTEM 2	PCIe 3	D20_C1_1	0000033	27	AI_03	AI 03	D20_C1_1AA1E1/Q1MMXU1.TotW.mag.f[MX]	D20_C1_1AA1E1/Q1MMXU1.TotW.mag.f[MX]
87	SYSTEM 2	PCIe 3	D20_C1_2	0000076	25	AI_01	AI 01	D20_C1_2AA1E1/Q2MMXU1.TotW.mag.f[MX]	D20_C1_2AA1E1/Q2MMXU1.TotW.mag.f[MX]
88	SYSTEM 2	PCIe 3	D20_C1_2	0000076	27	AI_03	AI 03	D20_C1_2AA1E1/Q2MMXU1.TotW.mag.f[MX]	D20_C1_2AA1E1/Q2MMXU1.TotW.mag.f[MX]
89	SYSTEM 2	PCIe 3	D20_C1_3	0000077	25	AI_01	AI 01	D20_C1_3AA1E1/Q3MMXU1.TotW.mag.f[MX]	D20_C1_3AA1E1/Q3MMXU1.TotW.mag.f[MX]
90	SYSTEM 2	PCIe 3	D20_C1_3	0000077	27	AI_03	AI 03	D20_C1_3AA1E1/Q3MMXU1.TotW.mag.f[MX]	D20_C1_3AA1E1/Q3MMXU1.TotW.mag.f[MX]
91	SYSTEM 2	PCIe 3	D20_C1_4	0000078	25	AI_01	AI 01	D20_C1_4AA1E2/Q1MMXU1.TotW.mag.f[MX]	D20_C1_4AA1E2/Q1MMXU1.TotW.mag.f[MX]
92	SYSTEM 2	PCIe 3	D20_C1_4	0000078	27	AI_03	AI 03	D20_C1_4AA1E2/Q1MMXU1.TotW.mag.f[MX]	D20_C1_4AA1E2/Q1MMXU1.TotW.mag.f[MX]
93	SYSTEM 2	PCIe 3	D20_C1_5	0000096	25	AI_01	AI 01	D20_C1_5AA1E2/Q2MMXU1.TotW.mag.f[MX]	D20_C1_5AA1E2/Q2MMXU1.TotW.mag.f[MX]
94	SYSTEM 2	PCIe 3	D20_C1_5	0000096	27	AI_03	AI 03	D20_C1_5AA1E2/Q2MMXU1.TotW.mag.f[MX]	D20_C1_5AA1E2/Q2MMXU1.TotW.mag.f[MX]
95	SYSTEM 2	PCIe 3	D20_C1_6	0000097	25	AI_01	AI 01	D20_C1_6AA1E2/Q3MMXU1.TotW.mag.f[MX]	D20_C1_6AA1E2/Q3MMXU1.TotW.mag.f[MX]
96	SYSTEM 2	PCIe 3	D20_C1_6	0000097	27	AI_03	AI 03	D20_C1_6AA1E2/Q3MMXU1.TotW.mag.f[MX]	D20_C1_6AA1E2/Q3MMXU1.TotW.mag.f[MX]
97	SYSTEM 2	PCIe 3	D20_C1_7	0000099	25	AI_01	AI 01	D20_C1_7/MMXU1.TotW.mag.f[MX]	D20_C1_7/MMXU1.TotW.mag.f[MX]
98	SYSTEM 2	PCIe 3	D20_C1_7	0000099	27	AI_03	AI 03	D20_C1_7/MMXU1.TotW.mag.f[MX]	D20_C1_7/MMXU1.TotW.mag.f[MX]
99	D_20Client_PCIe_3	D_20Client	D_20Client	PL00001	-1106	Alternate Link Devices	Alternate Link Devices	D20BLKA/GWCommsLCCH1.AltnLinkDev.stVal[ST]	D20BLKA/GWCommsLCCH1.AltnLinkDev.stVal[ST]
100	D_20Client_PCIe_3	D_20Client	D_20Client	PL00001	-1107	Total Number of Peripherals	Total Number of Peripherals	D20BLKA/GWCommsLCCH1.TotNumPrph.stVal[ST]	D20BLKA/GWCommsLCCH1.TotNumPrph.stVal[ST]
101	Demo	Bay 0	IED_DNP_3	0000040	275	CCT1 Va Mag	CCT1 Va Mag	IED_DNP_340/MMXU1.PhV.phsA.cVal.mag.f[MX]	IED_DNP_340/MMXU1.PhV.phsA.cVal.mag.f[MX]
102	Demo	Bay 0	IED_DNP_3	0000040	276	CCT1 Vb Mag	CCT1 Vb Mag	IED_DNP_340/MMXU1.PhV.phsB.cVal.mag.f[MX]	IED_DNP_340/MMXU1.PhV.phsB.cVal.mag.f[MX]
103	Demo	Bay 0	IED_DNP_3	0000040	277	CCT1 Vc Mag	CCT1 Vc Mag	IED_DNP_340/MMXU1.PhV.phsC.cVal.mag.f[MX]	IED_DNP_340/MMXU1.PhV.phsC.cVal.mag.f[MX]
104	Demo	Bay 0	IED_DNP_3	0000040	278	CCT1 Va Angle	CCT1 Va Angle	IED_DNP_340/MMXU1.PhV.phsA.cVal.ang.f[MX]	IED_DNP_340/MMXU1.PhV.phsA.cVal.ang.f[MX]
105	Demo	Bay 0	IED_DNP_3	0000040	279	CCT1 Vb Angle	CCT1 Vb Angle	IED_DNP_340/MMXU1.PhV.phsB.cVal.ang.f[MX]	IED_DNP_340/MMXU1.PhV.phsB.cVal.ang.f[MX]
106	Demo	Bay 0	IED_DNP_3	0000040	280	CCT1 Vc Angle	CCT1 Vc Angle	IED_DNP_340/MMXU1.PhV.phsC.cVal.ang.f[MX]	IED_DNP_340/MMXU1.PhV.phsC.cVal.ang.f[MX]
107	Demo	Bay 0	IED_DNP_3	0000040	281	CCT1 Generic AI 1	CCT1 Generic AI 1	IED_DNP_340/GGIO1.AnIn1.mag.f[MX]	IED_DNP_340/GGIO1.AnIn1.mag.f[MX]
108	Demo	Bay 0	IED_DNP_3	0000040	282	CCT1 Generic AI 2	CCT1 Generic AI 2	IED_DNP_340/GGIO1.AnIn2.mag.f[MX]	IED_DNP_340/GGIO1.AnIn2.mag.f[MX]

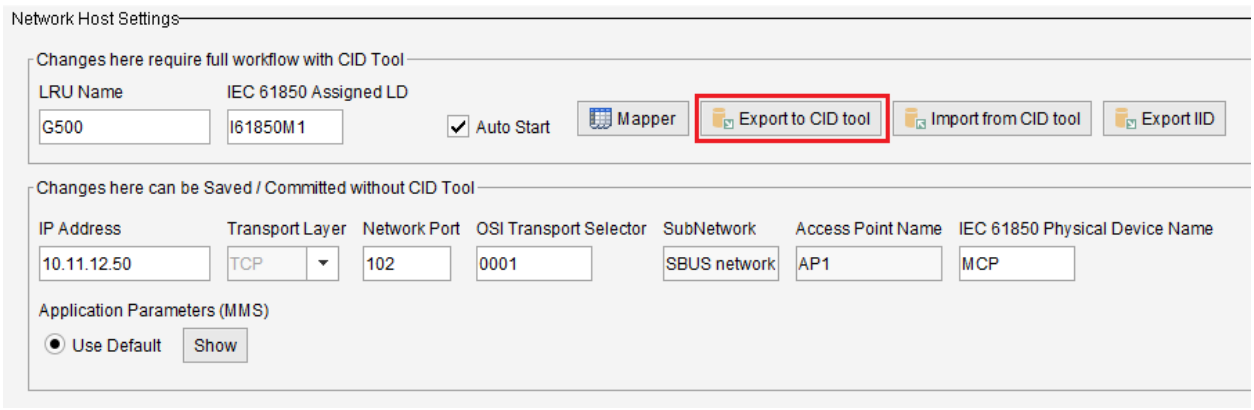
While the Mapper window is open, access to DSAS resources is blocked.

The Mapper window can be closed with the upper right X button.

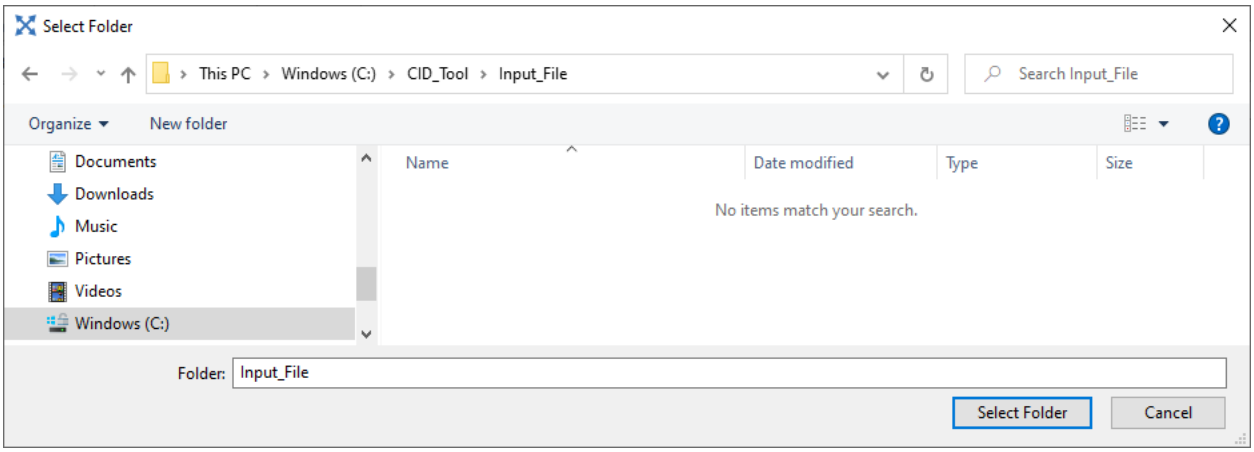
On clicking “File > Export To”, this IEC 61850 configuration can be saved as an Excel workbook to the local machine, for use outside of MCP Studio. This may be useful for point by point testing, configuration checking, signal tracing, etc.

6.4 Export to CID tool

The button “Export to CID tool” is used to transfer the IEC 61850 database data to the external CID creation tool.



To the resulting dialog select the CID Tool "*Input_File*" folder, e.g.: `C:\CID_Tool\Input_File`:

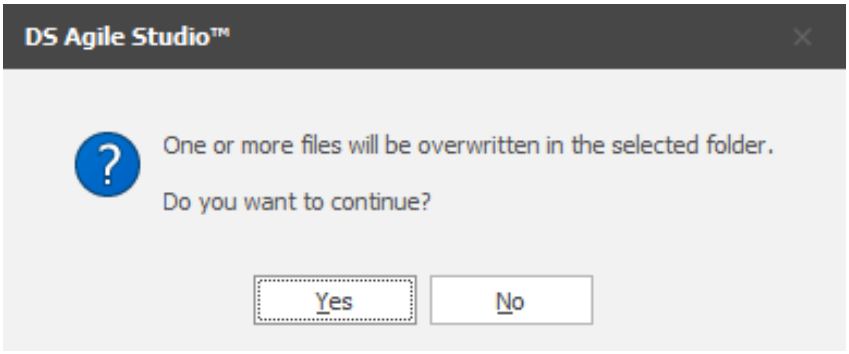


For MCP v3.00 the path will be:

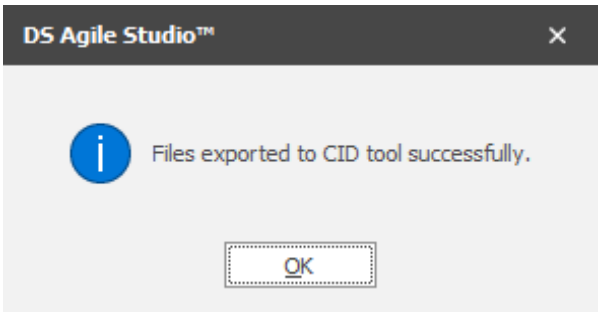
`C:\CID_Tool_v8\Input_File`:

Ensure you export the data to the compatible CID Tool version, otherwise an error message will be shown.

If prompted – select Yes to overwrite and continue:



Acknowledge the result:

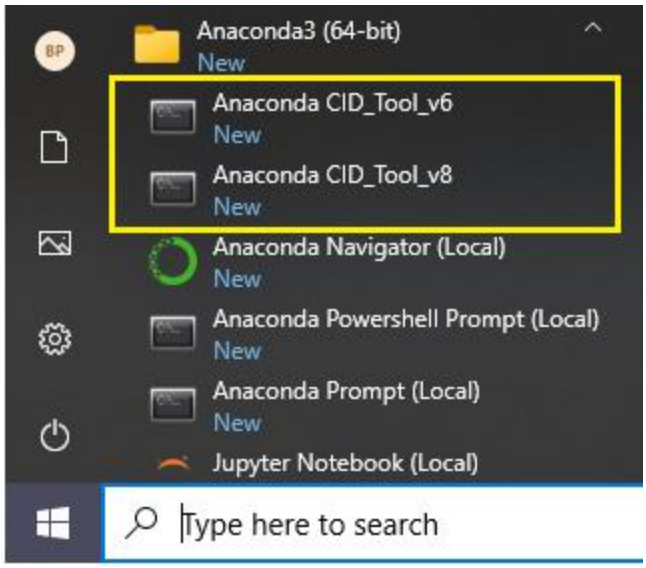


For more than one IEC 61850 LRU instance – you only need to Export to CID tool once, there will be prompts to select the LRU name when running the CID Tool.

Note: the export path is retained after a first successful operation and the data will always be exported to the last selected folder.

6.5 Run the CID tool

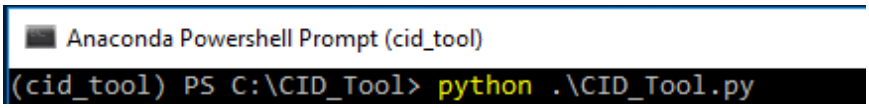
Launch first the Anaconda environment from Windows Start Menu > Anaconda, which matches the CID Tool version required:



6.5.1 Single IEC 61850 LRU instance

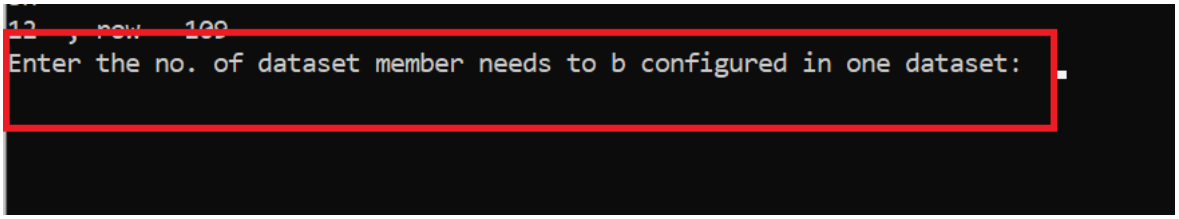
Use the following command in the open window:

```
python .\CID_Tool.py
```

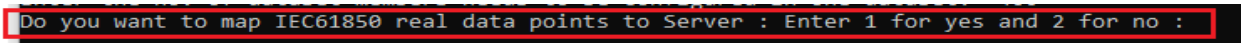


When prompted provide input for maximum Number of Dataset members to be configured in one dataset.

For example, if the input provided is “100”, the tool generates CID file with up to 100 dataset members in each dataset. A good value would be 400.



If the device has IEC 61850 IEDs configured in Loader – the tool will prompt to include the real data points from these IEDs in the IEC 61850 Server configuration.



The communication pseudo points associated with IEC 61850 IEDs are included regardless of the above answer.

Starting with MCP V3.00 (CID Tool v8.*) the tool will prompt for the security control model to be used:

```
Which type of normal security control model do you want to use? Enter 1 for SBO and 2 for Direct : 1
Enter the SBO Timeout value in seconds [30]: 50
```

1. SBO with Normal Security, followed by the timeout value in seconds (default is 30)
2. Direct

Wait for the tool to finish processing, it will return to the prompt.

```
CID and Servermap Files are generated
(cid_tool) PS C:\CID_Tool>
```

The CID tool generates the configuration for 61850 Server and associated CID file in the "*Generated_Config*" Folder. The CID file name and IEC 61850 DPA Point map file name are the "IEC 61850 Assigned LD" provided in the Connections page.

If needed – a log of the actions performed by the CID tool is in:

`\CID_Tool(_vx)\CID_Tool.log`

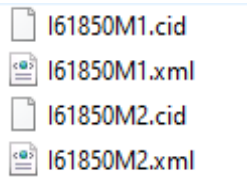
The log is reset every time the tool is ran.

6.5.2 Multiple IEC 61850 LRU instances:

For more than one IEC 61850 LRU instance – you need to run the CID tool once for each LRU instance, by using the "IEC 61850 Assigned LD" as parameter:

```
(cid_tool) PS C:\CID_Tool> python .\CID_Tool.py I61850M1
(cid_tool) PS C:\CID_Tool> python .\CID_Tool.py I61850M2
```

When finished each time, the CID tool generates the configuration for 61850 Server and associated CID file in the "*Generated_Config*" Folder with the CID file name and IEC 61850 DPA Point map file name being each "IEC 61850 Assigned LD".



6.6 Verify "IP-Subnet" and "IP-Gateway" values

Using a text editor (e.g. Notepad), open each generated .CID file and update if needed the "IP-Subnet" and "IP-Gateway" addresses to match the MCP Net adapter you configured for this connection.

Do NOT change anything else in the CID file.

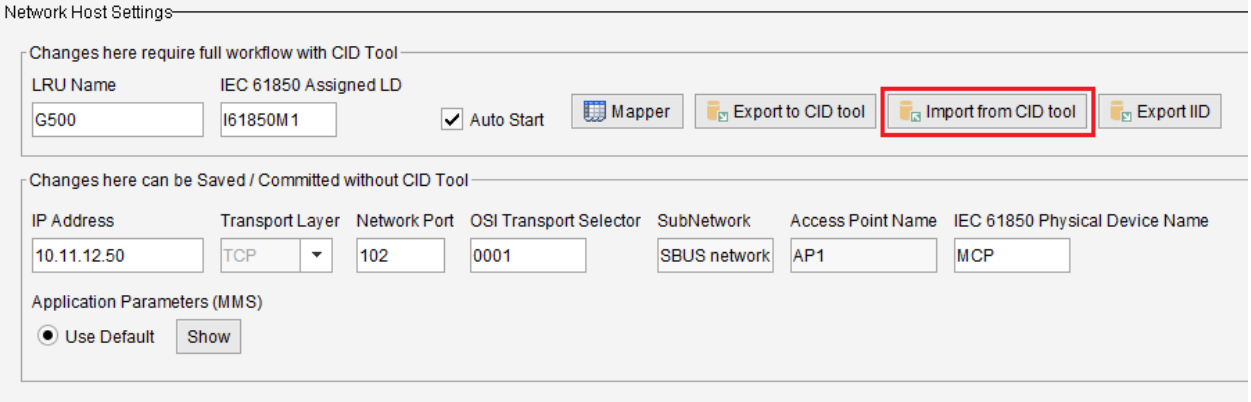
Save the file.

Note: Do not use Word to edit this file.

6.7 Import from CID tool

6.7.1 Single IEC 61850 LRU instance

The button "Import from CID tool" is used to import each CID file generated by the CID tool (one file for each IEC 61850 LRU).



In the resulting dialog navigate to the CID Tool "*Generated_Config*" folder and select it.

For MCP v3.00 the path will be:

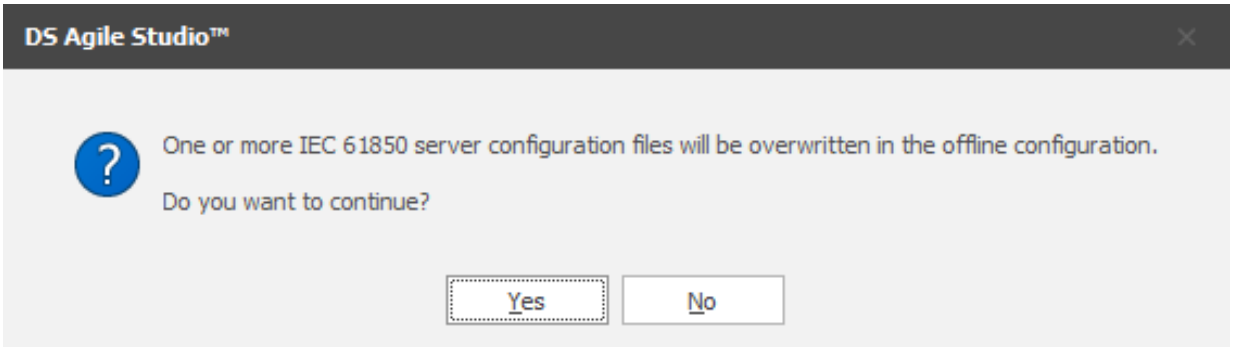
`C:\CID_Tool_v8\Generated_Config`

Ensure you select the compatible CID Tool version, otherwise an error message will be shown.

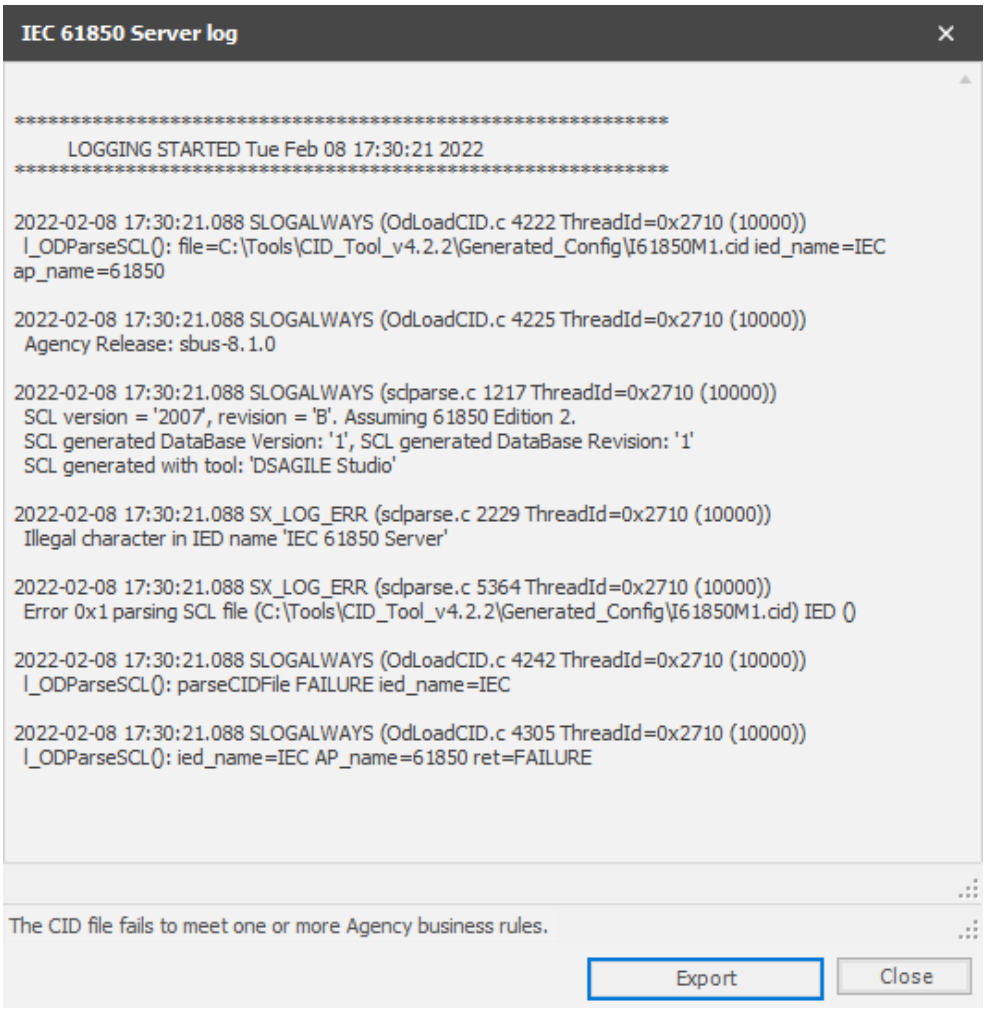
The .cid file with the same name as the "IEC 61850 Assigned LD" in the Server Instance you are working will be pre-filtered, if found.

If not found this indicates the CID Tool did not complete successfully (see previous steps).

If a previous import action was performed for same IEC 61850 LRU – select yes to override the configuration:



The resulting IEC 61850 Server Log shows the result of the import operation:

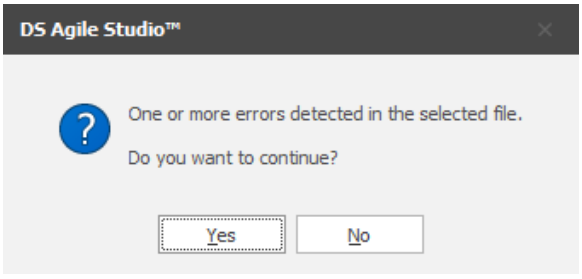


The log can be exported for further debugging, if needed please provide the log to your GE support contact.

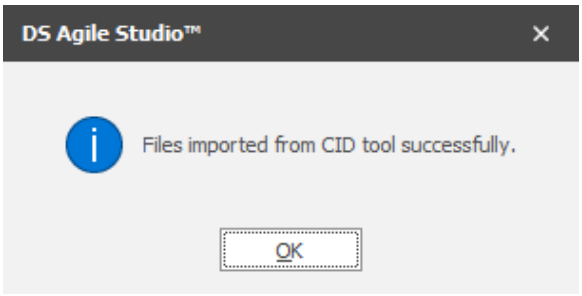
Note:

Messages related to absence of GOOSE are normal since GOOSE is not configured in this CID file.

If the log contains errors – choosing "Yes" in the following dialog will overwrite the current IEC 61850 Server instance configuration, but the IEC 61850 Server will not be operational at runtime.



The final dialog indicates success of importing the CID file from the CID tool:



Note: the import path is retained after a first successful operation and the CID file will always be imported from this path, if found.

6.7.2 Multiple IEC 61850 LRU instances:

For more than one IEC 61850 LRU instance – repeat the Import From CID tool operation once for each instance.

6.8 Synch to Device

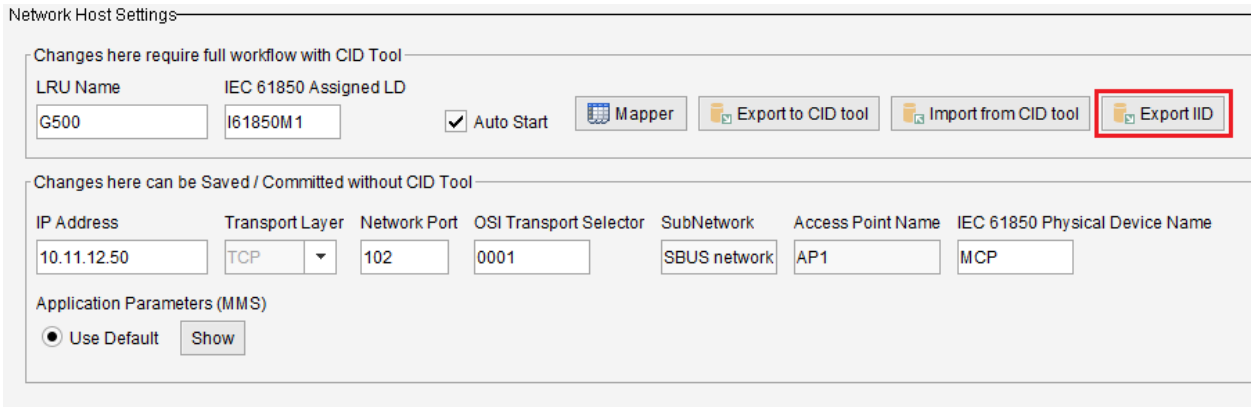
Save and Commit changes.

Save the offline Editor session, and proceed to synch to device.

After completion – open the firewall settings and verify that IEC 61850 Server TCP port 102 is enabled for the required network interface(s).

6.9 Export the IID file(s) for Clients

Each IID file associated with an IEC 61850 Server instance can be exported using the button "Export IID".



After clicking on the button select a folder where to export the IID file.

The default file name will be:

```
<IEC61850PhysicalDeviceName>_<IEC61850AssignedLD>.iid
```

If there is no present IID file for the LRU (meaning one was never imported from CID tool) - there will be a prompt that there is no IID file.

The exported IID file (one for each IEC 61850 LRU) can be provided to IEC 61850 Clients as configuration, to allow such Clients to be configured and communicate with the MCP.

If MCP device is configured as Hot-Hot redundancy and "Hot-Hot Communication" is enabled – the export to IID operation results in two IID files, one for each MCP_A and MCP_B:

```
<IEC61850PhysicalDeviceName>_<IEC61850AssignedLD>_A.iid
<IEC61850PhysicalDeviceName>_<IEC61850AssignedLD>_B.iid
```

"IP-Subnet" and "IP-Gateway" addresses need to be changed manually in the IID files according to the required network configuration of the IEC 61850 Client(s) that will use the IID file(s).

7. Runtime HMI

7.1 IEC 61850 Server Logs

At runtime, in the MCP Logs – the IEC 61850 Server is identified as "A047".

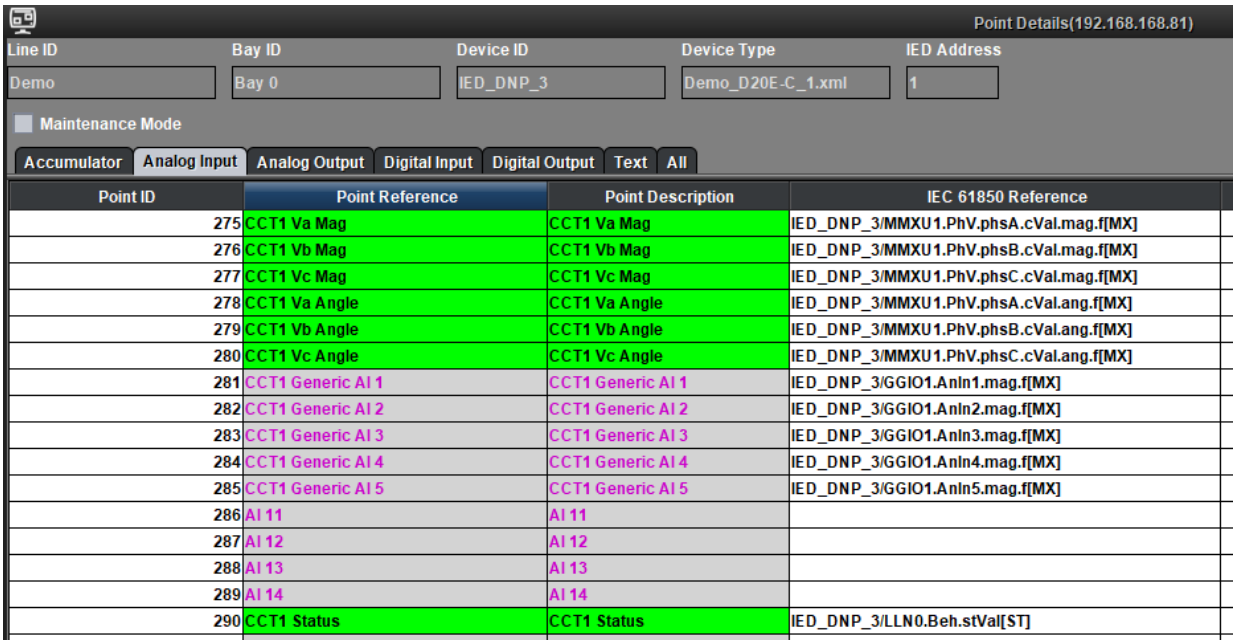
7.2 IEC 61850 Object Visibility

When the MCP configuration has IEC 61850 Server Enabled – at runtime a new column is visible in all Point Details screens in the Runtime HMI: "*IEC 61850 Reference*".

This new column shows the associated IEC 61850 Object Reference for each point in the database as following:

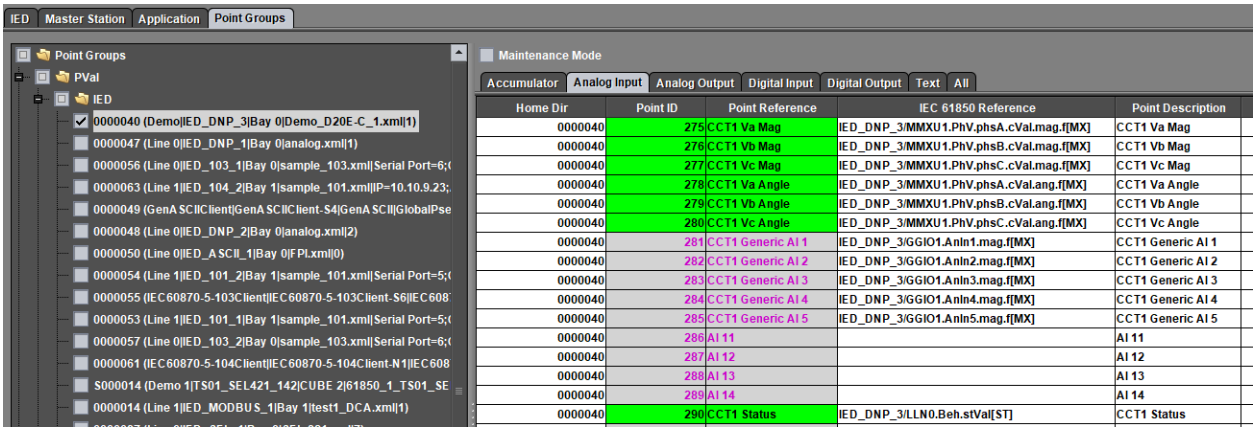
- All IEC 61850 IED originated points
- All pseudo points (DCA, DTA, DPA)
- All legacy points that have an associated IEC 61850 Object Reference in the client map.
- Legacy points that do not have an associated IEC 61850 Object Reference in the client map will not show anything in the IEC 61850 Reference column.

Example of AI tab in point details:



Point ID	Point Reference	Point Description	IEC 61850 Reference
275	CCT1 Va Mag	CCT1 Va Mag	IED_DNP_3/MMXU1.PhV.phsA.cVal.mag.f[MX]
276	CCT1 Vb Mag	CCT1 Vb Mag	IED_DNP_3/MMXU1.PhV.phsB.cVal.mag.f[MX]
277	CCT1 Vc Mag	CCT1 Vc Mag	IED_DNP_3/MMXU1.PhV.phsC.cVal.mag.f[MX]
278	CCT1 Va Angle	CCT1 Va Angle	IED_DNP_3/MMXU1.PhV.phsA.cVal.ang.f[MX]
279	CCT1 Vb Angle	CCT1 Vb Angle	IED_DNP_3/MMXU1.PhV.phsB.cVal.ang.f[MX]
280	CCT1 Vc Angle	CCT1 Vc Angle	IED_DNP_3/MMXU1.PhV.phsC.cVal.ang.f[MX]
281	CCT1 Generic AI 1	CCT1 Generic AI 1	IED_DNP_3/GGIO1.AnIn1.mag.f[MX]
282	CCT1 Generic AI 2	CCT1 Generic AI 2	IED_DNP_3/GGIO1.AnIn2.mag.f[MX]
283	CCT1 Generic AI 3	CCT1 Generic AI 3	IED_DNP_3/GGIO1.AnIn3.mag.f[MX]
284	CCT1 Generic AI 4	CCT1 Generic AI 4	IED_DNP_3/GGIO1.AnIn4.mag.f[MX]
285	CCT1 Generic AI 5	CCT1 Generic AI 5	IED_DNP_3/GGIO1.AnIn5.mag.f[MX]
286	AI 11	AI 11	
287	AI 12	AI 12	
288	AI 13	AI 13	
289	AI 14	AI 14	
290	CCT1 Status	CCT1 Status	IED_DNP_3/LLN0.Beh.stVal[ST]

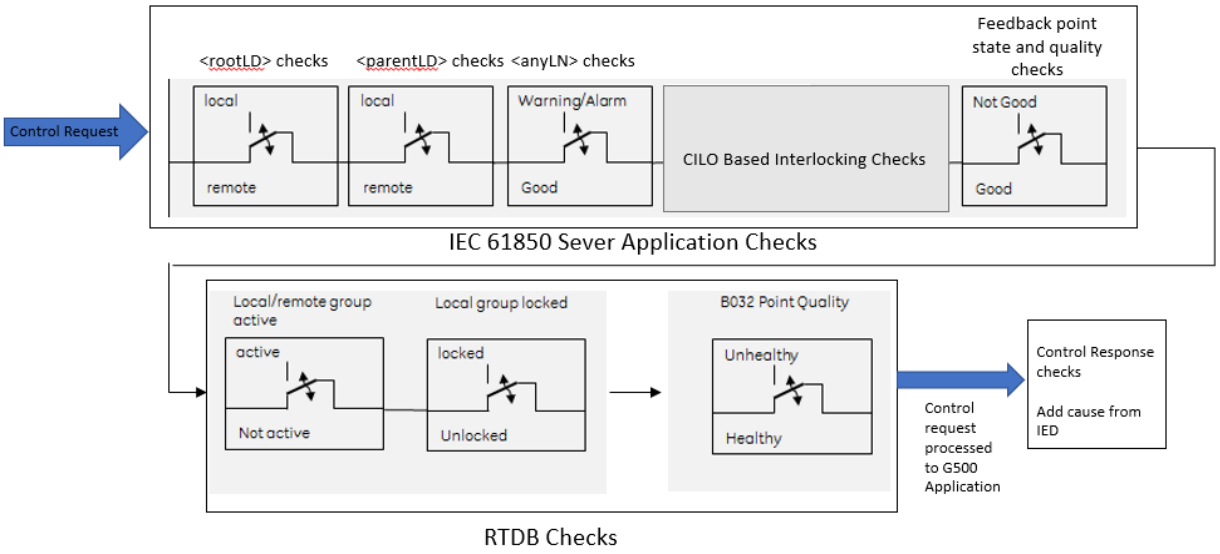
Example of AI tab in point groups:



8. IEC 61850 Server Controls Processing

8.1 Control Processing Workflow

MCP IEC 61850 Server processes the client control select and operate requests in the sequence illustrated below.



Each block in the diagram represents a level of check in the control process workflow.

In the MCP IEC 61850 Server - the control evaluation is split into two levels:

- Application Server Checks
- RTDB Checks

8.1.1 IEC 61850 Server Application Checks

When a control request is received, the IEC 61850 Server Performs the first level of checks to determine whether the control can be processed or not. If a check fails an appropriate add cause is returned as specified below.

- **<rootLD>** - this refers to LD0 – available in the default Object Reference Mapping
- **<parentLD>** - this refers to the Logical Device of the <anyLN> (user mapped)
- **<anyLN>** - this refers to the Logical Node that is being controlled (user mapped)
- **LocKey** – this data object represents the status of a mapped DI, e.g. a physical key switch tied to a local I/O and allows to take over the control authority within the substation. If `LocKey=false`, control commands are allowed.
- **Loc** – this data object represents the status of the control behavior allowed at the respective level; comes from IED. If `Loc=false`, control commands are allowed.
- **LocSta** – this data object shows the switching authority at station level. If `LocSta=false`, control commands are allowed from a remote control center.

At every level, if the point to be checked is not present, that check is performed considering the point value being FALSE.

S. No.	Control Check	Add Cause
Step 1 Check <rootLD>	OR condition of { <rootLD>.LLN0.Loc <rootLD>.LLN0.LocKey } (local/ remote for complete Substation) **Note:** If Loc is not present at a level, it is considered as False	If Local(1(true)), The Client control request to the 61850 server is inhibited (Refer to "AllControlsDisabled " in section System Status Manager) ADD CAUSE: BLOCKED-BY-SWITCHING-HIERARCHY (2) If Remote(0(false)), Step 2
Step 2 Check <parentLD>	OR condition of { <parentLD>.LLN0.Loc <parentLD>.LLN0.LocKey <parentLD>.<anyLN>.Loc <parentLD>.<anyLN>.LocKey } (local/ remote for complete bay/zone) **Note:** If Loc, LocKey is not present at a level, it is considered as False	If Local(1(true)), The client control request to the LD shall be inhibited ADD CAUSE: BLOCKED-BY-SWITCHING-HIERARCHY (2) If Remote(0(false)), Step 3
Step 3 Check <anyLN>	**If <Any LN> in the previous step is CSWI** OR condition of { <parentLD>.<matching XCBR>.Loc <parentLD>.<matching XCBR>.LocKey } (local/ remote for this point) **Note:** <Matching XCBR> refers to Loc or LocKey on XCBR with same Prefix and Instance as CSWI Ex: Control point MyCSWI1.Pos will have MyXCBR1.Loc,MyXCBR1.LocKey checked	If Local(1(true)), The client control request to this point shall be rejected ADD CAUSE: BLOCKED-BY-SWITCHING-HIERARCHY (2) If Remote(0(false)), Step 4
Step 4 Check <orCat>	OR condition of { <root LD>.LLN0.LocSta, <root LD>.ITCI.LocSta, <rootLD>.<anyLN>.LocSta <parentLD>.LLN0.LocSta <parentLD>.ITCI.LocSta <parentLD>.<anyLN>.LocSta }	If True, The orCat service parameter only allows: • Station-control • Automatic-station-Control If False, The orCat service parameter only allows: • Station-control

S. No.	Control Check	Add Cause
	Note: If LocSta is not present at a level, it is considered as False MltLev is not supported in the model and is assumed to be True	• Automatic-station-Control • Remote-Control • Automatic-Remote-Control • Maintenance-Control • If orCat check fails, Client control request to the LD shall be rejected ADD CAUSE: BLOCKED-BY-SWITCHING-HIERARCHY (2) Else, Step 5
Step 5 Check <Beh>, <Mod> state	Any of the points mapped to <anyLN>.Beh and <anyLN>.Mod are invalid/questionable/non-existing (orphaned points)	If True, ADD CAUSE: BLOCKED-BY-HEALTH (13) If False, Step 6
Step 6 Check <Beh>, <Mod> System Level	<anyLN>.Beh (Based on Mode and Beh at parent level, the <anyLN>.Beh is recalculated as per the truth table) Truth table for the behavior values as a function of mode is available below in section 8.1.1.1	If <resulting Beh of the truth table is off(5)> OR <if the Test Service parameter (test flag in the control request) is set and the resulting behavior is neither test/ test blocked > OR <if the test service parameter is clear and the resulting behavior is either test/ test blocked>, ADD CAUSE: BLOCKED-BY-MODE (8) Else, Step 7
Step 7 Check <Health>	<anyLN>.Health	If not equal to OK(1)/ Warning(2), ADD CAUSE: BLOCKED-BY-HEALTH (13) If equal to OK(1)/ Warning(2) Step 8
Step 8 Check <CILO> **Note:** Optional CmdBlk is not supported	CILO EnaCls OR CILO EnaOpn (refer to Section 8.1.1.2 Interlocking checks based on CILO with same Prefix/Inst)	If check fails, ADD CAUSE: BLOCKED-BY-INTERLOCKING (10) Else if the check passes, Step 9

S. No.	Control Check	Add Cause
Step 9 Check feedback	Feedback Point state and Quality	If, a) Feedback point Quality – Invalid/ Questionable ADD CAUSE: BLOCKED BY HEALTH (13) b) AI/DI in same state as control ADD CAUSE: POSITION REACHED (5) c)For DPC, if feedback state is Intermediate/ Bad and Invalid Position check configuration parameter is Enabled (see **Note ****) ADD CAUSE: INVALID POSITION (4) Else, Move to Step 10 in 8.1.2 RTDB Checks

Note ** : In MCP v3.00 Invalid Position check configuration parameter is always Disabled.

8.1.1.1 Resulting Behaviour Based on Mode

For correct operation, `Mod` and `Beh` should be present in the MCP database.

For IEC61850 Devices, `Mod` and `Beh` are proxied from the IEC 61850 IED (if mapped in Loader).

For Legacy Devices:

- `Beh` is always ON by default unless associated as Object Reference to AI points in Legacy Client Maps – in which case will follow the legacy point value and state.
- `Mod` is not available unless associated as Object Reference to AO points in Legacy Client Maps – in which case is assumed the Legacy IED has the capability of switching controls capabilities according to IEC 61850.

Beh is mandatory in the data model, Mod is not.

`Mode` is an Analog Output that is passed from the Master to the IED via the MCP. It can also be operated locally on the IED. The IED/ MCP will then recalculate the `Resulting Beh` according to the table below. The `Resulting Beh` is used for control checking.

Notes:

- For cases where <parentLD>/<anyLN>.Mod is not mapped, the resulting Beh of <parentLD>/<anyLN>.Beh will be equal to the <parentLD>/LLN0.Beh as defined in the table below
- For cases where <parentLD>/<LLN0>.Beh is not mapped, the resulting Beh of <parentLD>/<anyLN>.Beh will be equal to the <parentLD>/<anyLN>.Mod as defined in the table below

Set Mod at IED Level (Assumed as "on" if not mapped)	LD Beh at higher level (Read Only) (Initialized as "on" if not mapped)	Calculated Resulting Beh provided by the server at a level (read only) (The calculated Beh takes precedence over the mapped Beh, from the IED, for control processing)	
<anyLN>.Mod	**LLN0.Beh**	**<anyLN>.Beh**	**Value**
On	on	on	1
on	blocked	blocked	2
on	test	test	3
on	test/ blocked	test/ blocked	4
on	off	off	5
blocked	on	blocked	2
blocked	blocked	blocked	2
blocked	test	test/ blocked	4
blocked	test/ blocked	test/ blocked	4
blocked	off	off	5
test	on	test	3
test	blocked	test/ blocked	4
test	test	test	3
test	test/ blocked	test/ blocked	4
test	off	off	5
test/ blocked	on	test/ blocked	4
test/ blocked	blocked	test/ blocked	4
test/ blocked	test	test/ blocked	4
test/ blocked	test/ blocked	test/ blocked	4
test/ blocked	off	off	5
off	on	off	5
off	blocked	off	5
off	test	off	5
off	test/ blocked	off	5
off	off	off	5

Note: For the root LD, the values in LLN0.Mod and LLN0.Beh are the same.

The Enumerations for the column Value in the above table are as below:

Enumeration	Value
on	1
blocked	2
test	3
test/ blocked	4
off	5

8.1.1.2 Interlocking checks based on CILO with same Prefix/Inst

The check bits send by client in control service indicate if interlock check (Operative test) and synchrocheck (dynamic test) needs to be performed before accepting the command.
For each client control request, the IEC 61850 server performs interlock check conditions based on the status of interlock check bit and ignores the synchrocheck bit.

MCP IEC 61850 server performs interlock checks based on the associated permissive states as defined below:

If the controllable CDC maps digital outputs, IEC 61850 server supports:

- **`CILO EnaCls`** - indicates if ON/HIGHER command is permitted (if the mapped DI status is ON)
- **`CILO EnaOpn`** – indicates if OFF/LOWER command is permitted (if the mapped DI status is ON)

For the association of the `EnaOpn` and `EnaCls` permissive conditions to work correctly – the `CILO LN` must have:

- Same LD parent,
- Same LN Prefix and
- Same LN Inst

as the LN to which the permissive conditions are applicable.

For e.g.:

```
BCU01CONTROL1/QA1CILO5.Pos.stVal
BCU01CONTROL1/QA1CSWI5.Pos.stVal
BCU01CONTROL1/QA1XCBR5.Pos.stVal
```

For data obtained from IEC 61850 IEDs – the MCP inherits the model.

For data obtained from Legacy IEDs – the user can assign the Object References as per the above data model when CILO control interlocking is required.

Data from MCP automation applications cannot be assigned to CILO in v3.00.

Interlocking for Analog Outputs is not supported through this method.

The `EnaOpn` and `EnaCls` data objects are used as in the standard.

Data Object Name	Common Data Class	Explanation
EnaOpn	SPS	Enable Open
EnaCls	SPS	Enable Close

Note: The 'Interlock Check Bit' is set while issuing a control command from IEC 61850 client

The implication of this approach is that the whole LN is interlocked rather than points in the LN.

Below is the list of DO's that shall be supported for CILO based interlocking:

	LN Class Name	Data Object Name	CDC	Transient	M/O/C	Explanation
1	CPOW	Pos	DPC		O	Switch, general
2	CPOW	PosA	DPC		O	Switch L1
3	CPOW	PosB	DPC		O	Switch L2
4	CPOW	PosC	DPC		O	Switch L3
5	CSWI	Pos	DPC		M	Switch, general
6	CSWI	PosA	DPC		O	Switch L1
7	CSWI	PosB	DPC		O	Switch L2
8	CSWI	PosC	DPC		O	Switch L3
7	KVLV	Pos	DPC		O	Valve to full open or closed position
2	XCBR	Pos	DPC		M	Switch position
8	XSWI	Pos	DPC		M	Switch position
6	YPSH	Pos	DPC		M	Switch position
0						

If the associated CILO attributes are missing in above described data model, or is configured without binding to a DI – the IEC 61850 server uses the corresponding permissive DI status as ON and the command passes validation.

If associated CILO data model is valid as described above, and if `EnaCls/EnaOpn` are: offline, questionable, invalid or non-existing – the IEC 61850 server rejects the control with **AddCause: Blocked-by-Health (13)**.

For each of the above interlocking conditions being active, except as indicated above – the MCP 61850 server sends the negative response with **AddCause: Blocked-by-interlocking (10)**.

Example:

Configure CSWI and CILO with the same LD parent, LN Prefix and LN Inst

```
LD1/Q1CSWI1.Pos.StVal
```

The control commands for switch and breaker related logical nodes i.e. LN CSWI are processed or rejected based on the status of

```
LD1/Q1CILO1.EnaCls.stVal
LD1/Q1CILO1.EnaOpn.stVal
```

If:

`LD1/Q1CILO1.EnaCls.stVal = "True"` then all the ON control commands are processed successfully and are rejected if the status is "False"

`LD1/Q1CILO1.EnaOpn.stVal = "True"` then all the OFF control commands are processed successfully and are rejected if the status is "False"

8.1.2 RTDB Checks

Once the control evaluation passed the ***IEC 61850 Server Application Checks***, the evaluation proceeds to the next level: ***RTDB Checks***.

S. No.	Control Check	Add Cause
Step 10	RTDB Point Quality Check/ Non-Existing (i.e. Orphaned) Check	If Unhealthy, AO/DO point Quality – Invalid/ Questionable/ Control Inhibited ADD CAUSE: BLOCKED-BY-HEALTH (13) If Healthy, Step 11
Step 11	Is the Point Mapped to control Lockout Application	If True, Step 12 If False, Step 15
Step 12	If the client sends an Operate request, and if the output point control status is already active	If True, ADD CAUSE: COMMAND-ALREADY-IN-EXECUTION (12) If False, Step 13
Step 13	Local/ Remote group status	If Active, ADD CAUSE: 1-of-n-control (14) If not active, Step 14
Step 14	Local group locked	If True, ADD CAUSE: LOCKED-BY-OTHER-CLIENT (27) Else, Step 15
Step 15	Control Request processed	If control fails, ADD CAUSE: unknown Else, Control Success

In Step 15, if all the checks passed but RTDB returned the control as failure – then

```
AddCause: Unknown
```

is returned by the IEC 61850 Server.

If all the above checks are satisfied, then the control Request is processed, and the Control Response is checked by evaluation of Add Cause from IED in case of IEC 61850 Client and protocol status from other IED types.

Note: When the IEC 61850 Server receives an operate request, it shall issue an RTDB control initialized as follows:

ctlVal	CDC	cmdQual	Expected RTDB Control Type	Status
ON	SPC/DPC	persistent	Latch ON	
OFF	SPC/DPC	persistent	Latch OFF	
ON	SPC/DPC	pulse	Close	
OFF	SPC/DPC	pulse	Trip	
Higher	BSC	n/a	Close	
Lower	BSC	n/a	Trip	

This table is based on IEEE 1815.1 Table 27. CROB Mapping, Use Case (b).

8.2 CF Parameters

Below are the CF Parameters available in the Server Map File (Read-only, it is recommended not to change the default values of these parameters). This Server Map file is a ".xml" file that is auto generated by the CID tool and available in the "Generated_Config" folder as described in the *Run the CID tool*.

Point Type	Settings of 61850 Server and GOOSE	Description	Default Value
DO	*rangeCheckEnabled*	Determines whether minVal / maxVal check is performed by MCP device.	Disabled
DO	*initialNumPls*	Determines the number of state changes to cause the Control to execute when operated	1
DO	*initialOnDur*	Determines the time to hold a two-state Control in its on state, when pulsed.	1000 Units: ms
DO	*initialOffDur*	Determines the time to hold a two-state Control in its off state, when pulsed.	1000 Units: ms
DO	*cmdQual*	Determines whether the control will be executed as Latch On/Off (persistent) or Close/Trip (pulse)	Pulse
DO	*minVal*	This value represents the minVal of a Binary Controlled Step Position (BSC) object or Binary Analog Controlled (BAC) object.	1
DO	*maxVal*	This value represents the maxVal of a Binary Controlled Step Position (BSC) object or Binary Analog Controlled (BAC) object.	10
DO	*stepSize*		1

Point Type	Settings of 61850 Server and GOOSE	Description	Default Value
DO	*ctlModel*	Determines whether the digital output may be operated on Direct-With-Normal-Security or SBO-With-Normal-Security or Status-Only model. If control model is set to Status-Only, then the digital output cannot be operated. Refer to IEC 61850-7-2 for a description of the control models.	Direct-With-Normal-Security
AO	*multiplier*	Multiplier and offset are used to convert IEC 61850 requested value to an RTDB system value using the equation RTDB system value = [(IEC 61850 Requested Value)/10**unitsMultiplier - offset]/multiplier.	1
AO	*offset*	See multiplier description.	0
AO	*rangeCheckEnabled*	Determines whether minVal / maxVal check is performed by MCP device.	Disabled
AO	*minVal*	This value represents the minVal of an Integer Controlled Step Position (ISC) object, Integer Controlled (INC) object, or Analog Process Controlled (APC) object.	1
AO	*maxVal*	This value represents the maxVal of an Integer Controlled Step Position (ISC) object, Integer Controlled (INC) object, or Analog Process Controlled (APC) object.	10
AO	*stepSize*	This value represents the stepSize of an Analog Process Controlled (APC) object.	1
AO	*ctlModel*	Determines whether the analog output may be operated on Direct-With-Normal-Security or SBO-With-Normal-Security or Status-Only model. If control model is set to Status-Only, then the analog output cannot be operated. Refer to IEC 61850-7-2 for a description of the control models.	Direct-With-Normal-Security
AO	*units*	Determines the IEC 61850 specified SI Units the numerical value represents. This is informational data and has no effect on the operation of the application, other than to report the configured units to the Client.	None
AO	*unitsMultiplier*	See multiplier description. The IEC 61850 server “f” value is equal to the pval / 10unitsMultiplier.	0

9. List of Acronyms

Table 9.1: List of Acronyms

Abbreviation	Description
CID	Configured IED Description file
DA	IEC 61850 Data attributes
DCA	Data Collection Application
DO Instance	IEC 61850 Data Objects
DPA	Data Presentation Application
DTA	Data Translation Application
DSAS	DS Agile Studio
IEC	International Electrotechnical Commission
IEDs	Intelligent Electronic Devices
IP	Internet Protocol
LD	Logical Device
LN Class	IEC 61850 Logical Node Class
LN Instance	IEC 61850 Logical Node Instance
RTDB	Real Time Data Base

10. Modification Record

VERSION	REVISION	DATE	CHANGE DESCRIPTION
1.00	0	25th Feb, 2022	Initial release for G500 v2.70
2.80	0	24th June, 2022	Updated for CID Tool general distribution and G500 v2.80
	1	12th July, 2022	Updated firewall rule status screenshot for IEC61850 server
	2	05th August 2022	Updated Object References for IEC 60870-5-103/101/104 Updated LD Name behavior for Service Update: G500_280_01_20220729_LDNAME.DS7zip
3.00	0	12th March, 2023	Updated for MCP v3.00
3.10	0	02nd August, 2023	Updated the section **4.3.2 DNP DCA.** i.e., DI point IDs (-169, -170) and DO point IDs (-2047, -2048).