NovaTech, LLC
13555 West 107th Street
Lenexa, KS 66215
(913) 451-1880
www.novatechweb.com
orion.support@novatechweb.com
orion.sales@novatechweb.com

DISCLAIMER

This manual contains information that is correct to the best of NovaTech's knowledge. It is intended to be a guide and should be used as such. It should not be considered a sole source of technical instruction, replacing good technical judgment, since all possible situations cannot be anticipated. If there is any question as to the installation, configuration, or use of this product, contact NovaTech, LLC at (913) 451-1880.

To ensure that the equipment described in this User Manual, as well as all equipment connected to and used with it, operates in a satisfactory and safe manner, all applicable local and national codes that apply to installing and operating the equipment must be followed. Since these codes can vary geographically and can change with time, it is the user's responsibility to determine which codes and standards apply, and to comply with them.

Failure to follow the instructions provided in this manual, and/or failure to comply with applicable codes and safety standards can result in damage to this equipment, damage to connected devices, and/or serious injury to personnel.

All links to external websites have been verified as correct and appropriate at the time of the publication of this document. However, these links and websites, being outside of NovaTech LLC's control, are subject to change and may no longer be correct. In this case, please contact:

orion.support@novatechweb.com

The documentation for the OrionLX and OrionLXm is structured as follows.

Manual name (see cover page of each manual)	Purpose
Quick Startup Guide	Describes out-of-the-box setup for quick installation.

Orion LX User Manual or OrionLXm User Manual	• Description of OrionLX/OrionLXm hardware.
	• Setup of configuration using NCD (NovaTech Configuration Director)
	• OrionLX/OrionLXm:
	    ○ Configuration of OrionLX/OrionLXm features
	    ○ Runtime features
	• Functions of Orion MMI console
	• Setup and operation of the video option (-MMB) (OrionLX only)

OrionLX Applications Manual	Specific setup and operation of OrionLX features, such as firewall, SFTP access, installation of SSL certificate, access to OrionLX's SQL database with Microsoft Access® and Excel®, and others.
Software Manuals	Software manuals explain all aspects of setup and operation of protocols such as DNP3 master and software options (Archive, Logic, DA Logic, etc.)
Tech Notes	Tech Notes provide solutions for general integration, such as scaling or setup of RS-485 networks.
Field Instructions	Field Instructions provide step-by-step instructions for installation of new hardware or software in the field.

Styles and Symbols

In this document, fonts, text styles and symbols are used to distinguish standard text from keyboard input, program text, GUI messages, and hyperlinks as follows. Warnings and safety notices are indicated with ANSI symbols.

Displayed text or symbol	Description
This is normal text.	Standard text.
See OrionLX Setup	Hyperlink to text in same document.
www.novatechweb.com	Hyperlink to website.
orion.support@novatechweb.com	Clicking on this link starts email client on PC.
See *OrionLX User Manual*	Document name.
`Minimum value`	Menu item or text displayed by software.
`Name of the data point`	Text to be entered in input field or window.
Save	GUI button to be clicked.
`if frequency < 60.0 then`	Program code.
<Enter>, <Ctrl>+<G>, <G>	Key to be pressed.
⚠	This yellow triangle indicates a warning that must observed by the users in order to avoid possible equipment damage or personal injury.
⚡	This yellow triangle indicates an electrical hazard.
(ESD symbol)	Electrostatic sensitive device requires proper handling and grounding procedures to avoid equipment damage.
⚠ DANGER	DANGER indicates a hazardous situation which, if not avoided, will result in death or serious injury.
⚠ WARNING	WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury.
⚠ CAUTION	CAUTION indicates a hazardous situation which, if not avoided, may result in minor or moderate injury.

Note that depending on the Windows® display settings on the computer running NCD, some of the screen shot details may appear differently than those shown in this manual. The screen shots in this manual have been taken using the setting "Windows Classic" which is available on Windows XP®, Windows Vista® and Windows 7®.

Table of Contents

List of Figures

List of Tables

A. Introduction

Introduction to IEC 61850 Server Module

The IEC 61850 Server module enables the OrionLX to assign Orion points to any data attribute modeled in an SCL file. You can use features in NCD to create, modify, and export SCL files that follow the IEC 61850 file structure and naming conventions.

NCD uses two modes specifically designed to manage IEC 61850 Server files and points: the IEC 61850 Model Builder and the NCD Server mode for IEC 61850, accessible in the IEC61850 Master Port window. These two modes work in tandem to create and model SCL files (Model Builder) and to assign Orion master points to the created SCL files (NCD Server Mode).

NCD facilitates the creation of SCL files according to the specifications required by the IEC 61850 standard. This procedure contains the following three main phases.

- **Model Builder Phase.** In Model Builder, a mode available in NCD, you configure and model the hierarchal data structure of an IEC 61850 file according to the specifications in the standard. In this mode, you can also configure various descriptive settings and create and assign functional constraints, DataSets, Report Control Blocks, and GOOSE Control Blocks. After this phase, export the file as an ICD file.

- **Third-Party SCT Software Phase.** This phase may or may not be necessary for your environment. In this phase, the ICD file created in the preceding phase is imported into a third-party System Configuration Tool (SCT). Use this application to instantiate the classes defined in the IED SCL files and create one system SCL file. With the SCT, you can create multiple instances of an IED with one ICD file, name each individual IED in the file, and modify other settings. After making the required configuration changes, export the file to a SCD file.

- **NCD Server Phase.** In this phase, in the Server mode of the IEC 61850 protocol in NCD, import the file. This mode allows you to map configured Orion points from any master protocol to the data attributes defined in the imported SCL file. After this phase, the Orion points assigned to the IED 61850 Server are saved to an NCD file and the configured data structure is saved to an NCZ file. After this phase, send the generated NCD and NCZ files to the Orion.

The IEC 61850 Server modes in NCD are designed to facilitate the creation and modification of SCL files while following the conventions required by IEC 61850. The following figure represents the procedure for creating an SCL file using the 61850 Server module.
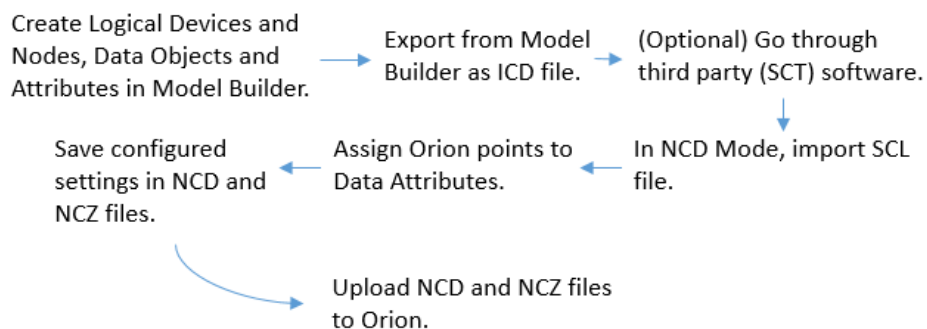
Figure A-1: Initial File Creation Procedure Diagram

Within NCD, IEC 61850 Server Mode reads an SCL file and can assign any point created in an Orion master port to data attributes in the SCL file.

The IEC 61850 Server Module is available on all devices in the OrionLX family with the exception of the standard OrionLX device. When the term "OrionLX" is used in this manual, it refers to any device in the OrionLX family except the standard OrionLX model.

The following sections describe some useful conceptual information for configuring IEC 61850. For general information regarding IEC 61850 which is beyond the scope of this manual, refer to the International Electromechanical Commission (IEC) website: www.iec.ch.

About File Types Compatible with IEC 61850 Server

The Model Builder and Server Mode modes in NCD support various types of SCL files specifically modeled for use with an IEC 61850 environment. These file types include SCL, ICD, CID, and SCD files and must use the XML structural hierarchy and naming conventions required by the IEC 61850 standard. When you create a new file using the Model Builder application, you ensure that the resulting file follows the required file structure.

An ICD file is usually a generic file that can be configured for various RTU devices. This file type can only have one generic IED name, and only one IP address. All files exported by the Model Builder application have the ICD file type. You can use a third party SCT application to create multiple IEDs using the models in the ICD file, to export to other file types (such as CID or SCD), and to set the IED names and IP addresses included in the file.

An SCD file is often used to describe all of the devices in the substation and is generated by a third-party SCT application. The file may contain several sections; one for each IED name configured for the file. Each IED in the file represents a corresponding device in the substation.

When the term "SCL file" is used in this manual, it refers to any compatible file, such as ICD, CID, SCD, and SCL files.

About IEC 61850 Point Naming Conventions and Hierarchy

Both the object data structures in the SCL file and the resulting attributes follow a specific hierarchal order, as required by the basic communication structure section of the IEC 61850 standard. The hierarchy is implemented using the following elements, with each element modeled under the preceding element level. These elements are modeled in the Model Builder mode in NCD.

LD: Logical Device
LN: Logical Node
DO: Data Object (Also SDO)
DA: Data Attribute (Also BDA)

Points modeled in the file use the following naming format, visible in the IEC 61850 Client and Server protocols: `IEDnameLD/LN/DO.SDO.SDO/DA.BDA.BDA[FC]`, where [FC] represents the functional constraint configured for the point. For example:

`M571_103Measurements/DmdMHAI1/TddA.phsB/q[MX]`

The SDO and BDA elements only display in the point name when such classes are modeled for the point. The above example displays the SDO `phsB`. Multiple SDA and BDA elements can be modeled for one point.

For information about configuring these elements, view the Model Data Objects and Data Attributes under a Logical Node section.

Overview of the IEC 61850 Server for OrionLX Manual

Section	Title	Content
A	Introduction	General description and background information regarding the IEC 61850 server applications.
B	Model and Configure a New SCL File	Describes the procedure for generating and assigning points to a new SCL file. This section describes how to use the Model Builder and NCD Server Mode applications to set up an IEC 61850 environment.
C	Modify an Existing SCL File	Describes the workflow process required for modifying the modeling structure of an existing, configured SCL file.
D	Additional Resources	Contains appendices and a list of external documents that may be helpful in setting up an IEC 61850 environment.

Table A-1: Manual Overview

B. Model and Configure a New SCL File

About Creating and Assigning Points to a New SCL File

You must use two modes in NovaTech Configuration Director (NCD) to create a new SCL file to represent the IED in your substation and to assign Orion data points to attributes in the SCL file. The two modes, Model Builder and IEC 61850 Server Mode, are included in NCD in versions 3.30 or higher.

To generate a new SCL file and assign Orion data points to attributes in the file, you must complete the following three phases in sequential order.

- Model Builder Phase
- SCT Phase (although the standard allows the use of an SCT, some users do not use an SCT)
- NCD Server Mode Phase

If you already have an existing SCL, ICD, or SCD file and you would like to assign Orion points to the attributes modeled in the file, proceed to the Modify an Existing SCL File chapter.

Model Builder Phase

The first phase of creating a new SCL file is to create a file using NCD IEC 61850 Model Builder. In Model Builder, you can create an SCL file and model and configure the logical devices (LD), logical nodes (LN), data objects (DO), and data attributes (DA). In addition, you can create DataSets and associate them with Report Control Blocks (RCB) and Goose Control Blocks (GCB) for each LLN0 logical node modeled (for more information, refer to About Unique Node Classes). You can also assign each logical node with a string prefix, a numerical suffix, and a type that determines which data objects and data attributes are contained in the logical node.

The procedures described above are detailed further in the following subsections. This chapter of the manual is designed to serve as a tutorial, and is intended to be completed in the given order.

- Create a New SCL File
- Set Primary IED Options
- Set Communication Options
- Set Services Options
- Add a Logical Device
- Modify Logical Device Settings
- Add a DataSet to an LLN0 Node
- **Error! Reference source not found.**
- Add a GOOSE Control Block to an LLN0 Node
- Add a New Logical Node
- Modify Logical Node Options
- Model Data Objects and Data Attributes under a Logical Node
- Model Data Objects on a Node Type
- Export the File

After you finish modeling the data, you export it to an ICD file, which you can either import in a third party SCT application to configure a complete substation description or import in NCD Server Mode for Orion point assignment.

Create a New SCL File

To open Model Builder from NCD, complete the following steps.

1. In NCD, in the `File` menu, select `IEC 61850 Model Builder`.
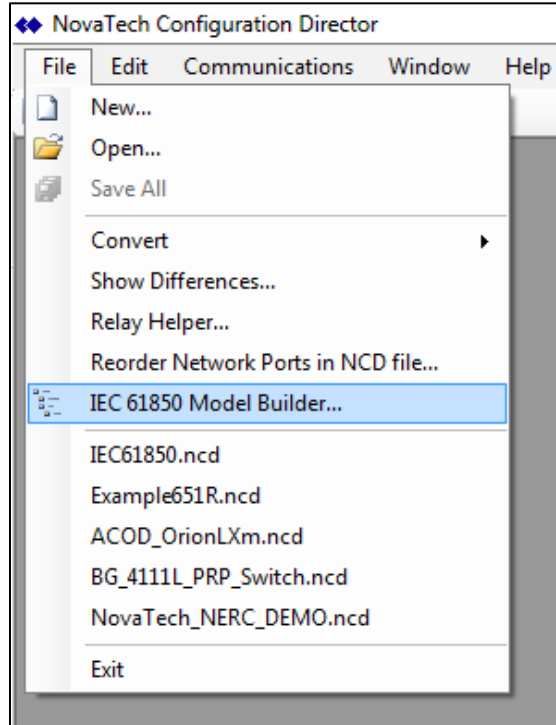
Figure B-1: Open Model Builder

2. On the Model Builder landing page, you can either import an existing SCL file or create a new SCL file. To create an SCL file, Click `Create New .SCL File`.
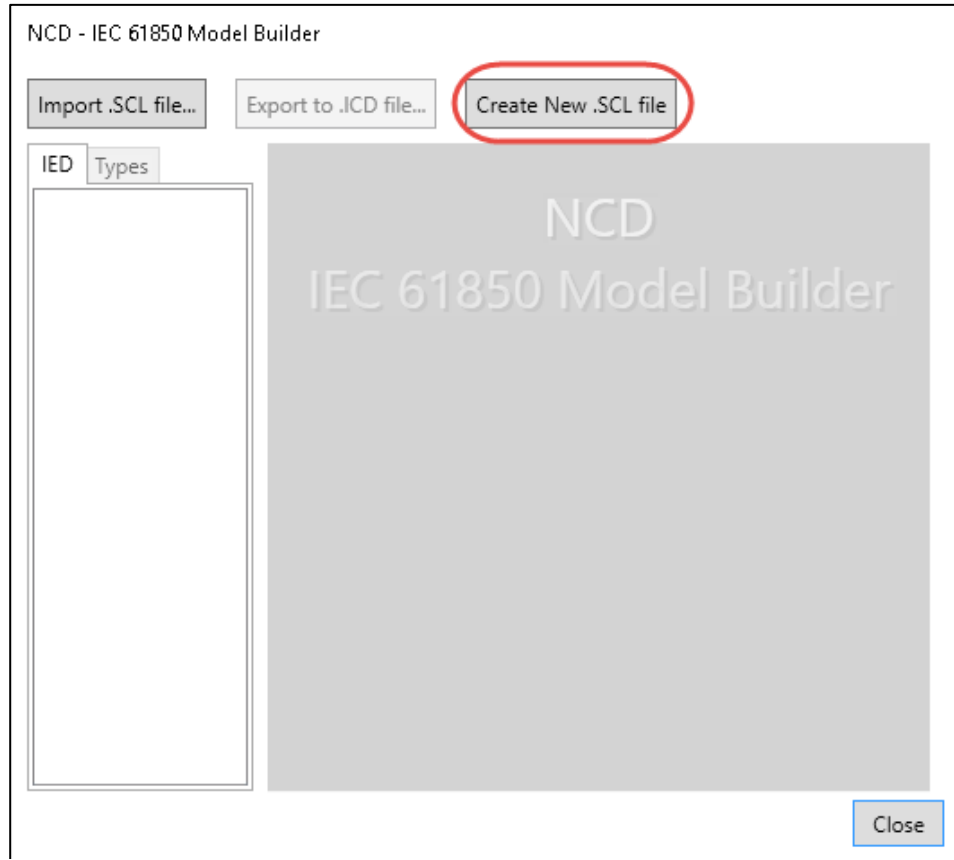
Figure B-2: Create New SCL File

As a result, the IED Options page displays ([Figure B-3](#)).

Set IED Options

Next, before modeling any data structures, you can set various IED options on the IED Options page of Model Builder. In Model Builder, you can only create one IED per SCL file. As a result, the settings on this page apply to the only IED in the SCL file.

Other than adding a logical device, none of the available actions on this page are required. However, some of the available options may help document your application. If you do not want to set IED Options, skip to the Add a Logical Device procedure.
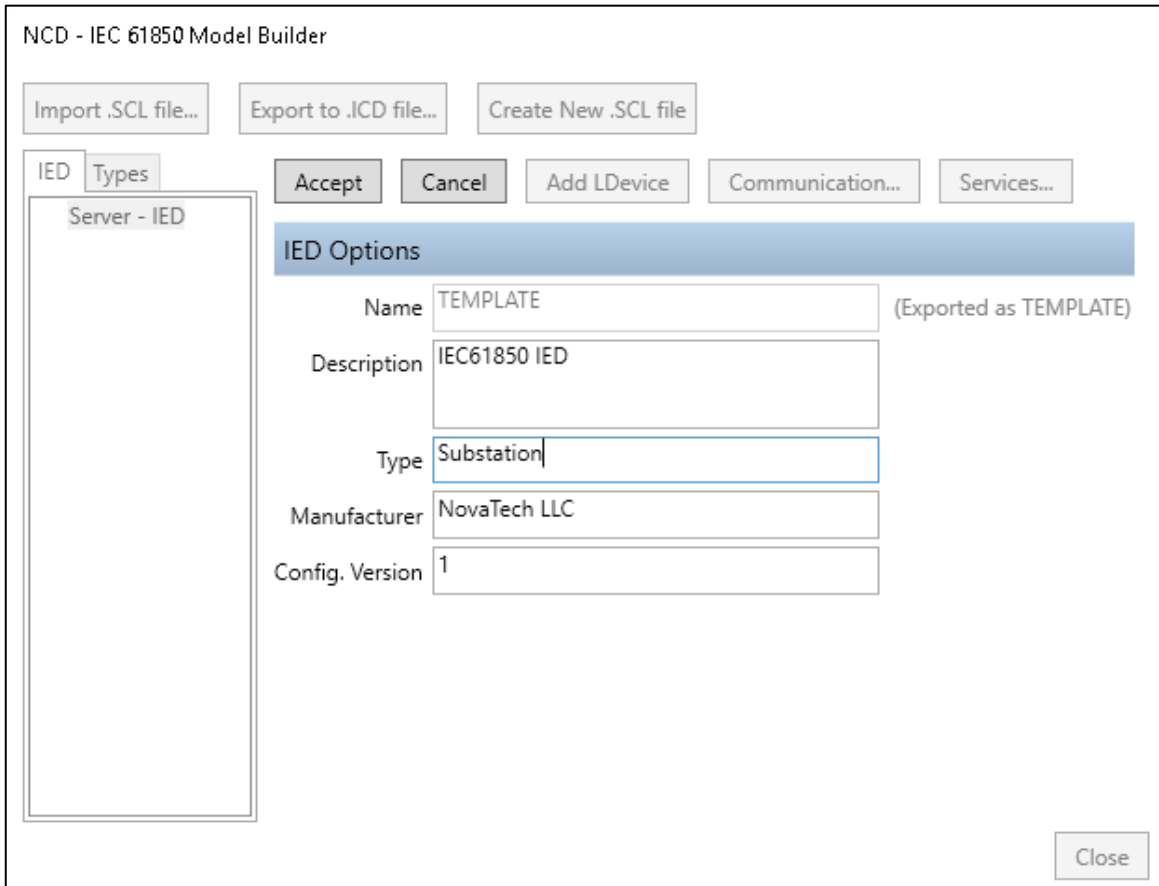
Figure B-3: IED Options Page

Set Primary IED Options

To set descriptive settings for the newly created IED, complete the following optional steps. Note that, in Model Builder, the `Name` field for the IED can only be set to "TEMPLATE," due to the limitations of the exported ICD format. This name cannot be modified in Model Builder.

1. In the `Description` field, type a description for the IED. The default value is `IEC61850 IED`.
2. In the `Type` field, type an organizational descriptor for the IED. This field is blank by default.
3. In the `Manufacturer` field, type the name of the manufacturer for the device represented by the IED. The default value is `NovaTech LLC`.
4. In the `Config. Version` field, type the iteration number for the IED. The default value is `1`.
5. Click `Accept`.

Set Communication Options

Each IED contains a section labeled `Communication`, which contains various elements associated with device addresses and connections. In Model Builder, you can set the values configured for each attribute contained in the `Communication` section. All attributes in this section are optional.

For more information about the purpose of the attributes contained in the `Communication` section, refer to the official *IEC 61850 Technical Report* document.

To set the options in the communication section for the IED, complete the following optional steps.

1. On the `IED Options` page ([Figure B-3](#)), click `Communication`.
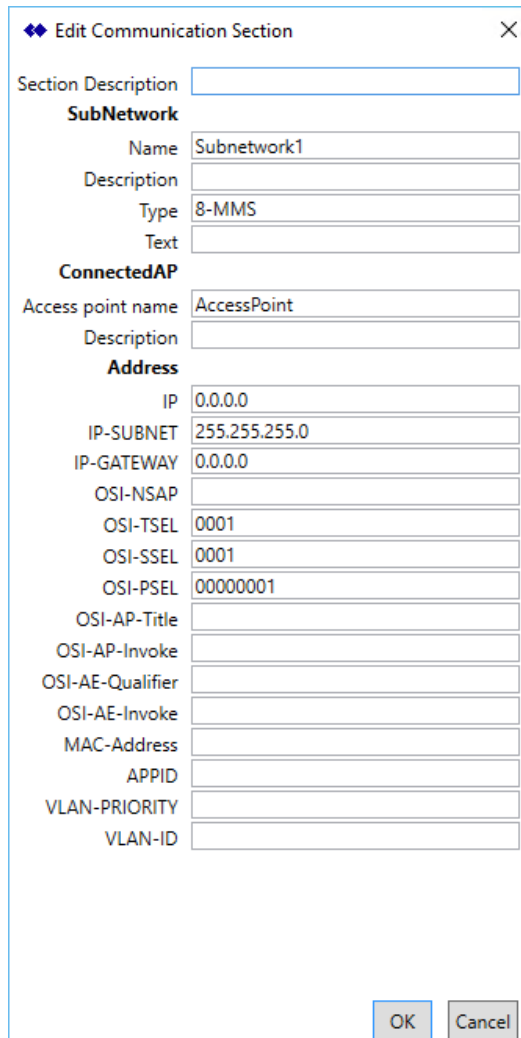
Figure B-4: Edit Communication Section

2. In the `Edit Communication Section` dialog box, enter the desired text in each field that you want to configure. Empty fields are not included in the generated SCL file.

3. Click `OK`.

Set Services Options

Each IED contains a section labeled `Services`, which contains various configurable attributes. In Model Builder, you can determine the values configured for each attribute contained in the `Services` section. All attributes in this section are optional.

For more information about the purpose of the elements contained in the `Services` section, refer to the official *IEC 61850 Technical Report* document.

To set the options in the services section for the IED, complete the following optional steps.

1. On the `IED Options` page ([Figure B-3](#)), click `Services`.

Figure B-5: Edit Services Section

2. In the `Edit Services Section` dialog box, enter the desired text in each field that you want to configure. Empty fields and unmarked check boxes are not included in the generated SCL file.

3. Click `OK`.

Add a Logical Device

Logical devices are the highest class level in the IEC 61850 class hierarchy. Logical devices usually act as a container for every logical node assigned to a particular IED. To add a logical device, complete the following step.

1. On the `IED Options` page ([Figure B-3](#)), click `Add LDevice`.

As a result, three new rows are added to the IED tree in the left pane in Model Builder ([Figure B-6](#)): the LDevice, the unique LLN0 logical node (for more information, refer to [About Unique Node Classes](#)), and the unique LPHD logical node. The LPHD node is automatically selected.
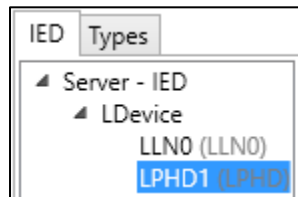
Figure B-6: Left Tree Pane

Modify Logical Device Settings

After adding a logical device, to modify its descriptive settings, complete the following steps.

1. In the IED tree in the left pane, select `LDevice`.
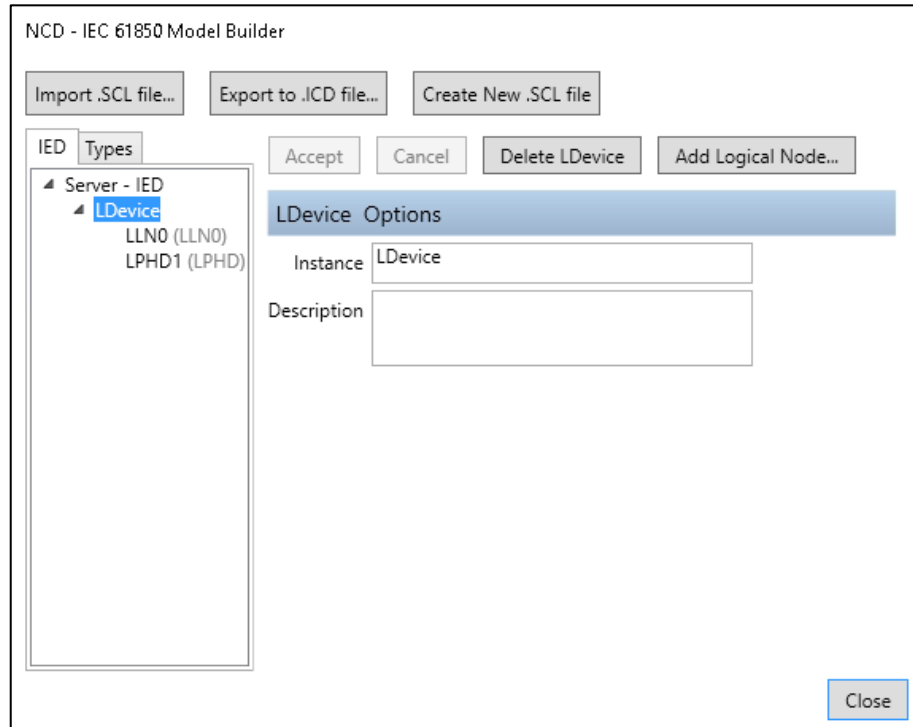
Figure B-7: Modify Logical Device Settings

2. On the `LDevice Options` page, to modify the name of the logical device, in the `Instance` field, type a name. This name displays in the IED tree in the left pane and in the exported file.

3. In the `Description` field, enter a description for the logical device.

4. Click `Accept` to apply your changes.

On this page, you can also delete this logical device or Add a New Logical Node.

About Logical Nodes

Logical nodes act as the second level in the 61850 hierarchy; logical nodes are modeled under a logical device, and logical nodes contain data objects, which contain data attributes. The following example displays several logical nodes under the logical device "LDevice."

The Model Builder mode automatically creates two logical nodes for every created logical device: the LLN0 node and the LPHD node, which are associated with the LLN0 class and the LPHD class, respectively.
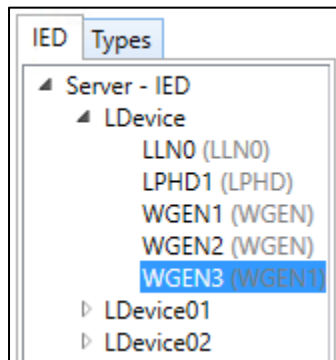
Figure B-8: Logical Nodes in Tree

Each logical node is permanently associated with a node class and a node type. For example, in Figure B-8, the logical node WGEN3 is associated with the node type "WGEN1," indicated by the parenthetical text. WGEN3 is also associated with the node class "WGEN," although this association is not directly indicated on the IED tab.

About Node Types

Every logical node has a permanently assigned type. In the left pane, a logical node's assigned type is displayed in gray, parenthetical text next to the node's name.
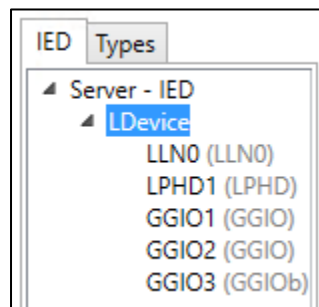
Figure B-9: Node Types on IED Tab

A type can have any number of individual logical nodes assigned to it. For example, the GGIO1 and GGIO2 logical nodes in Figure B-9 share the same type, GGIO. The GGIO3 node is associated with a different type: GGIOb.
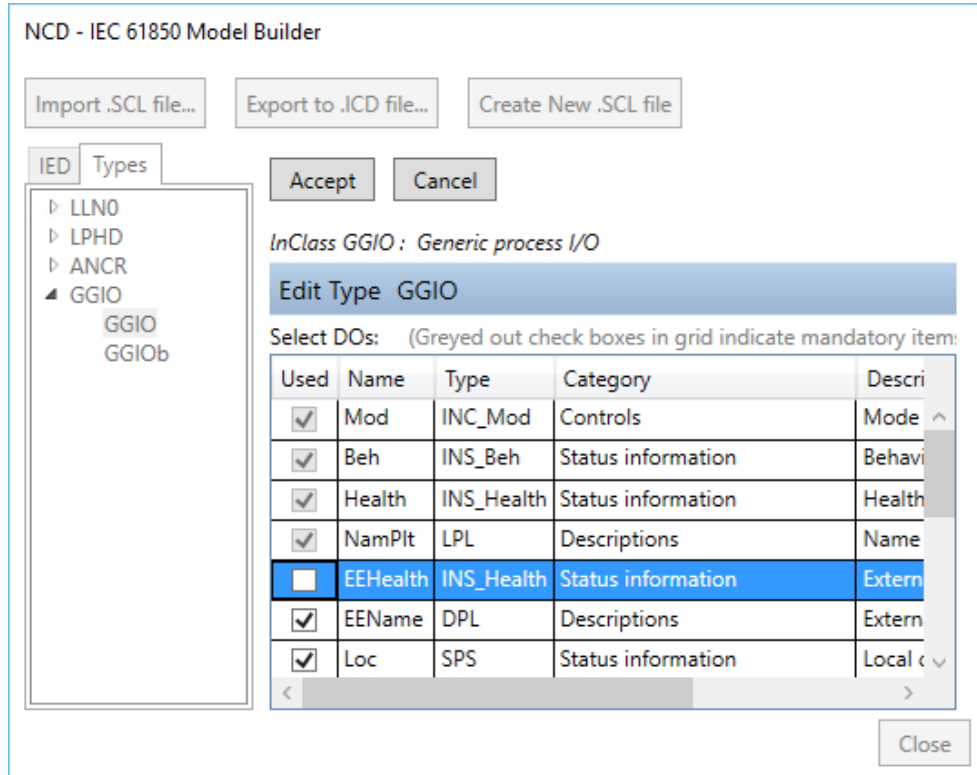
Figure B-10: Remove Data Object

On the `Types` tab in the left pane, you can modify the data objects and data attributes available to model for a type. These changes apply to all nodes assigned with the modified type. For example, if you remove the "EEHealth" data object (Figure B-10) from the GGIO type, then the GGIO1 and GGIO2 logical nodes (Figure B-9) would be unable to assign the "EEHealth" object. The GGIO3 logical node would be unaffected by this change, however, because it is not associated with the GGIO type; it is associated with the GGIOb type.

Using the same node type as another existing node can be beneficial when you want the logical node to use a customized modeling setup, or when you want to make modeling changes to several nodes simultaneously.

Unlike any other node types, the node types associated with the LLN0 class and the LPHD class can each be assigned a maximum of one logical node. For more information, view the About Unique Node Classes section.

Due to the complexity of the modeling functionality, you can only assign a node type when you first create a logical node. For more information, refer to the Add a New Logical Node procedure.

About Node Classes

All node types (and, by extent, all logical nodes) are each associated with one node class. A node class can be associated with any number of dependent node types. Node classes are preconfigured and read-only in Model Builder; you cannot create, rename, or delete node classes. Every node class is associated with a range of specific data objects. Every logical node associated with the node class can potentially model these data objects. You can determine which of these eligible data objects can be modeled for each node type associated with the node class.

For example, the RDRS node class allows associated logical nodes to model the `Mod`, `Beh`, `Health`, `NamPlt`, `AutoUpLod`, and `DltRcd` data objects, as indicated in the following image.

Figure B-11: Data Objects associated with Node Class

As indicated by the dark check boxes, the `AutoUpLod` and `DltRcd` data objects can be turned on or off for nodes with the node type (`RDRS1`, in this example) created in this window.

In the following image, which displays the `Types` tab of the left pane in Model Builder, the node classes are represented by the top layer (LLN0, LPHD, and WGEN). The associated node types are listed below each class.
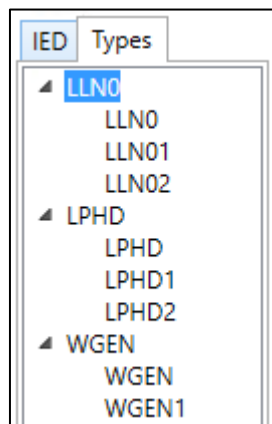
Figure B-12: Node Classes and Node Types

Due to the complexity of the modeling functionality, you can only assign a node class when you first create a logical node. For more information, refer to the Add a New Logical Node procedure.

About Unique Node Classes

Every logical device created in Model Builder automatically has one logical node with the LLN0 class and one logical node with the LPHD class. Although you can delete these nodes, which is not recommended, you cannot model more than one LLN0 logical node or LPHD logical node per logical device. In addition, you can only have one logical node per node type with a LLN0 or LPHD classes. As a result, every LLN0 or LPHD logical node in the file is associated with a node type only available to that logical device.
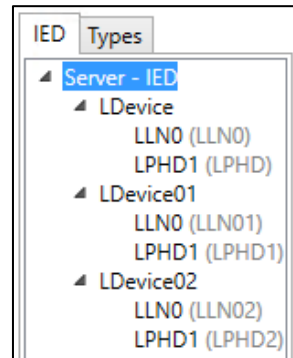
Figure B-13: Nodes with Unique Classes in Multiple Devices

For example, if you add three logical devices in the file, each device automatically gains an LLN0 node and an LPHD node. The resulting six nodes are automatically associated with six unique node types (LLN0, LPHD, LLN01, LPHD1, LLN02, and LPHD2, as displayed in Figure B-13). Each of the six node types can only be associated with a single node.

The following figure displays the `Logical Node Options` page for an LLN0 class logical node.
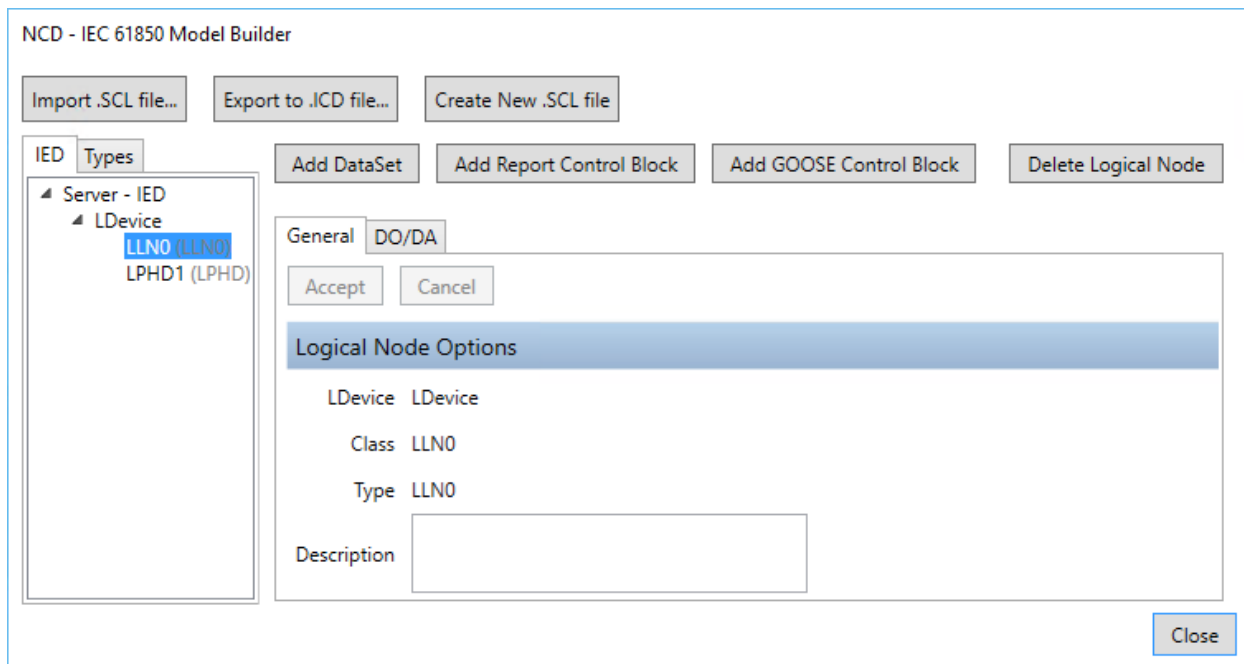
Figure B-14: LLN0 Class Logical Node Options

Unique among all other classes of logical nodes, the LLN0 node is the only location where you can Add a DataSet, **Error! Reference source not found.**, and Add a GOOSE Control Block. Most applications require configured Report Control Blocks or GOOSE Control Blocks for event reporting, and both types of control blocks contain DataSets.

Other than the ability to create DataSets and control blocks, nodes with unique node classes operate similarly to other types of logical nodes. However, you cannot add a prefix or instance number to an LLN0 logical node.

Add a DataSet to an LLN0 Node

DataSets are collections of object names. You can only add DataSets to logical nodes with the LLN0 class. DataSets are a prerequisite for Report Control Blocks and GOOSE Control Blocks. When you add a DataSet, you must associate it with at least one functional constraint data attribute (FCDA) currently modeled in the SCL file. After including data in the DataSet, to ensure DataSet functionality, be careful to avoid removing the data attribute from the file.

To add a DataSet to a logical node in the LLN0 class, complete the following steps.

1. In the left pane, on the `IED` tab, select the LLN0 logical node where you want to add a DataSet.

2. On the `Logical Node Options` page (Figure B-14), click `Add DataSet`. If the warning about FCDAs being mandatory displays, click `OK`.
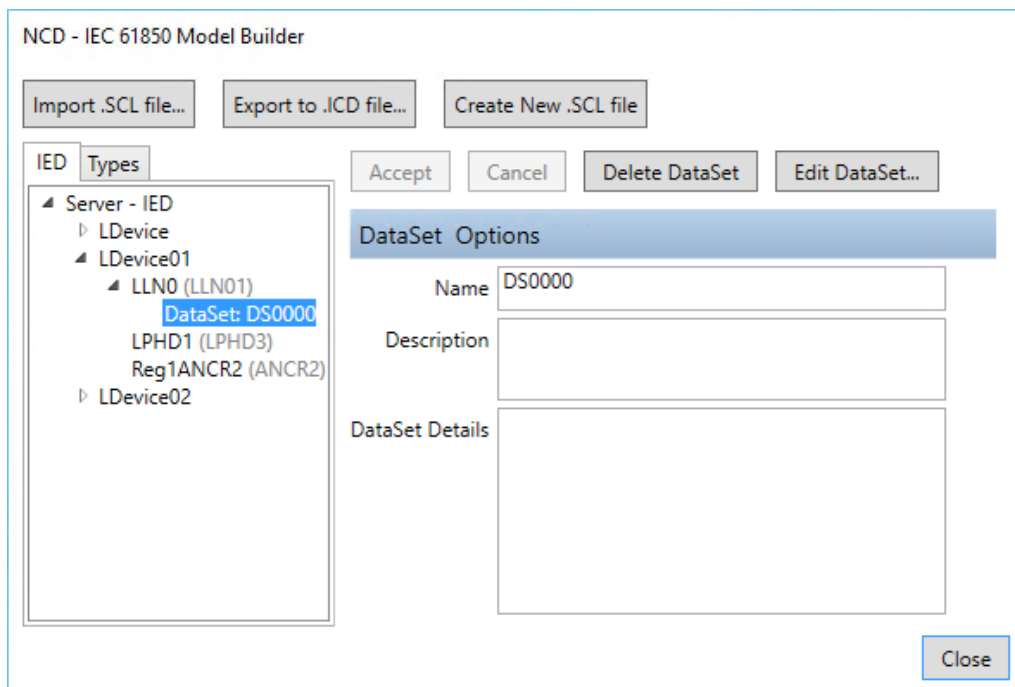
Figure B-15: DataSet Options Page

3. Optional. On the `DataSet Options` page, add values to the `Name` and `Description` fields and click `Accept`. You cannot manually modify the `DataSet Details` setting.

4. Click `Edit DataSet`.
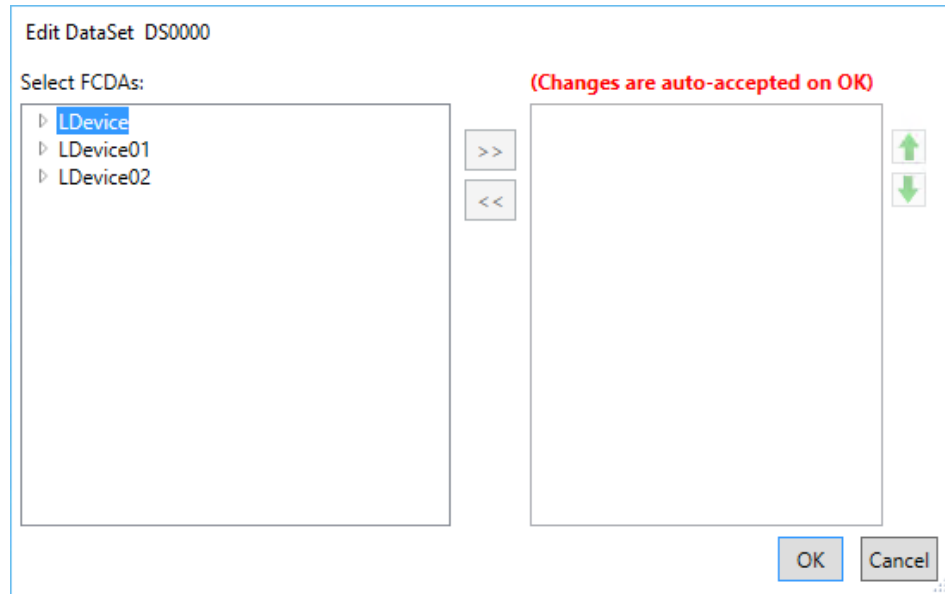
Figure B-16: Edit DataSet Dialog Box

5. In the `Edit DataSet` dialog box, in the left pane, navigate your configured data hierarchy to display the data attributes that you want to associate with the DataSet.

6. For each desired attribute, select the data attribute in the left pane and click the `Right Arrow` button. In the following example, the `PhyHealth [ST]` and `d [DC]` attributes are included in the DataSet.
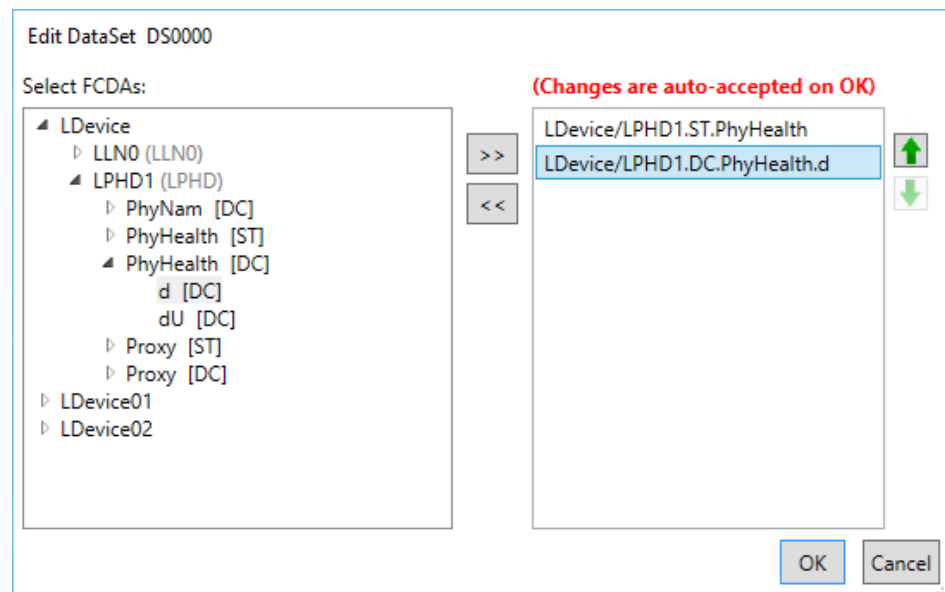
Figure B-17: Associated FCDAs

7. Optional. To modify the order of associated data attributes, use the green arrow buttons to move the selected data attribute.

8. After adding the desired data attributes, click `OK`.

Add a Report Control Block to an LLN0 Node

You can only add Report Control Blocks to logical nodes with the LLN0 class. Report Control Blocks configure the OrionLX to issue event reports when data changes. To function properly, Report Control Blocks must contain at least one DataSet.

To add a Report Control Block to a LLN0 logical node, complete the following steps.

1. In the left pane, on the `IED` tab, select the LLN0 logical node where you want to add a Report Control Block.

2. Click `Add Report Control Block`.

3. If a warning about an associated DataSet being mandatory displays, click `OK`. This warning only displays the first time you click the `Add Report Control Block` button during this session of NCD.
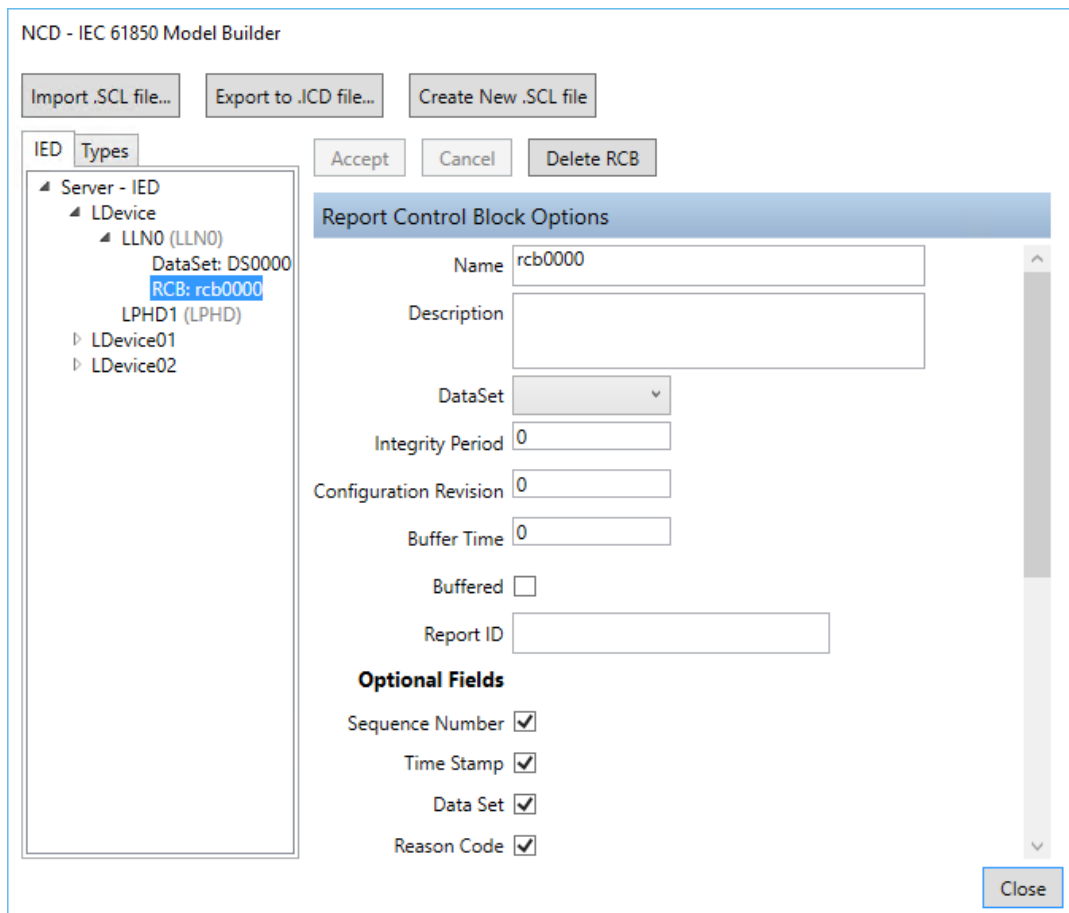
Figure B-18: Report Control Block Options Page

4. On the `Report Control Block Options` page, configure the various options available for the Report Control Block. For more information regarding these settings, refer to the *IEC 61850 Technical Report*.

5. Click `Accept`.

Add a GOOSE Control Block to an LLN0 Node

You can only add GOOSE Control Blocks to logical nodes with the LLN0 class. GOOSE Control Blocks are used to send high speed multicast data over the network to client devices. To function properly, GOOSE Control Blocks must be configured with a DataSet.

To add a GOOSE Control Block to a LLN0 logical node, complete the following steps.

1. In the left pane, on the `IED` tab, select the LLN0 logical node where you want to add a GOOSE Control Block.

2. Click `Add GOOSE Control Block`.

3. If a warning about an associated DataSet being mandatory displays, click `OK`. This warning only displays the first time you click the `Add GOOSE Control Block` button during this session of NCD.
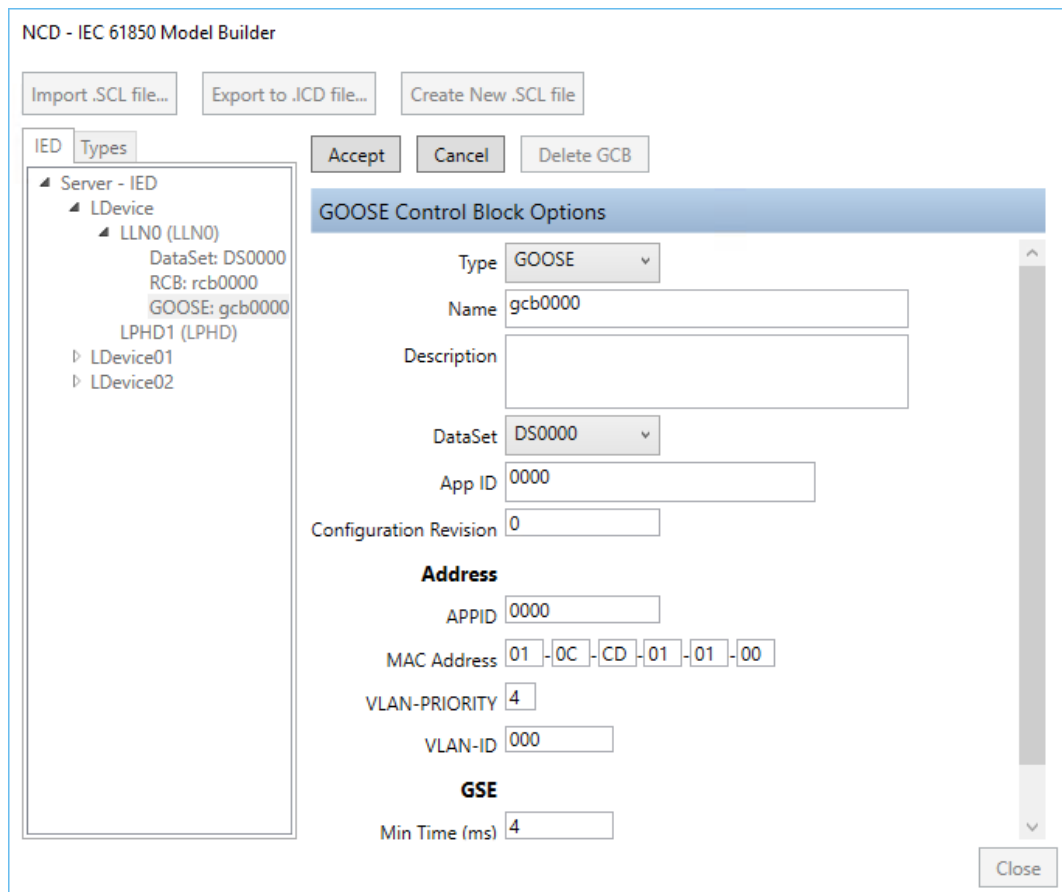
Figure B-19: GOOSE Control Block Options Page

4. On the `GOOSE Control Block Options` page, configure the various options available for the GOOSE Control Block. For more information regarding these settings, refer to the *IEC 61850 Technical Report*.

5. Click `Accept`.

Add a New Logical Node

You can add any number of logical nodes to a logical device. When you create a logical node, you must select from a list of preconfigured node classes and you must set a new or existing node type. Node classes and node types are permanently associated with a created node. Nodes are always labeled with an instance number suffix. You can also add prefix text to act as a label for the node.

Note: If the selected logical device does not contain an LLN0 or an LPHD logical node, this procedure only permits you to create a new LLN0 or LPHD logical node. Otherwise, you cannot create LLN0 or LPHD nodes in this window.

To add a new logical node to a logical device, complete the following steps.

1. In the left pane, on the `IED` tab, select the logical device where you want to add a logical node.
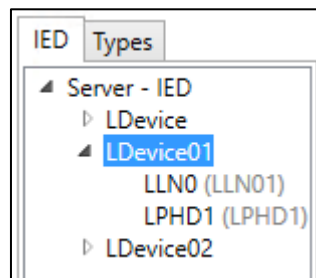
Figure B-20: Select Logical Device

2. On the `LDevice Options` page, click `Add Logical Node`. The following window displays.

Figure B-21: Add Logical Node Window

3. In the upper left corner of the window, select one of the following methods.

- **From Existing.** This method allows you to assign the logical node to a previously created node type. When using this window for the first time, you cannot use this method.
- **Create New Type Based On.** This method allows you to assign the logical node to a new node type created in this window.

4. In the `Class` field, select a node class from the dropdown list. As a result, the grid in the window updates to display the data objects associated with the selected node class. For information about the data objects available in each node class, view Appendix A – Data Objects Available to Each Node Class.

5. In the grid, mark the check boxes for any data objects you want to be configurable for the node type and the logical node you create in this window. Grayed out check boxes indicate mandatory data objects. This step is not available if you use the `From Existing` method.

6. In the `Type Name` field, select or type the name of the node type assigned to the logical node created in this window.

7. In the `inst` field, type a numerical suffix for the logical node created in this window. This instance number appears in the name of the logical node and helps to differentiate the logical node from other nodes.

8. Optional. In the `prefix` field, enter prefix text for the logical node created in this window. This field only allows alphanumeric characters.

9. Click `OK`.

As a result, in the left pane, on the `IED` tab, the new logical node displays under the selected logical device.
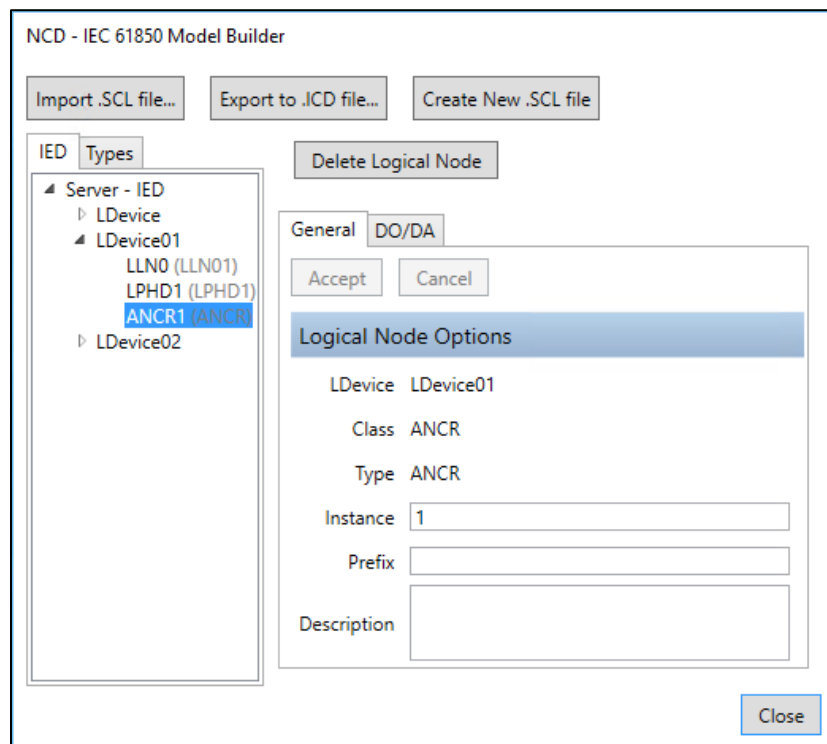
Figure B-22: Logical Node Added

Modify Logical Node Options

On the `Logical Node Options` pane for a selected logical node, you can modify the node's instance number, prefix, and description. This pane also displays the logical device, node class, and node type assigned to the logical node, although these settings cannot be modified. To modify a logical node's optional settings, complete the following steps.

1. In the left pane, on the `IED` tab, expand the logical device and select the logical node you want to modify.
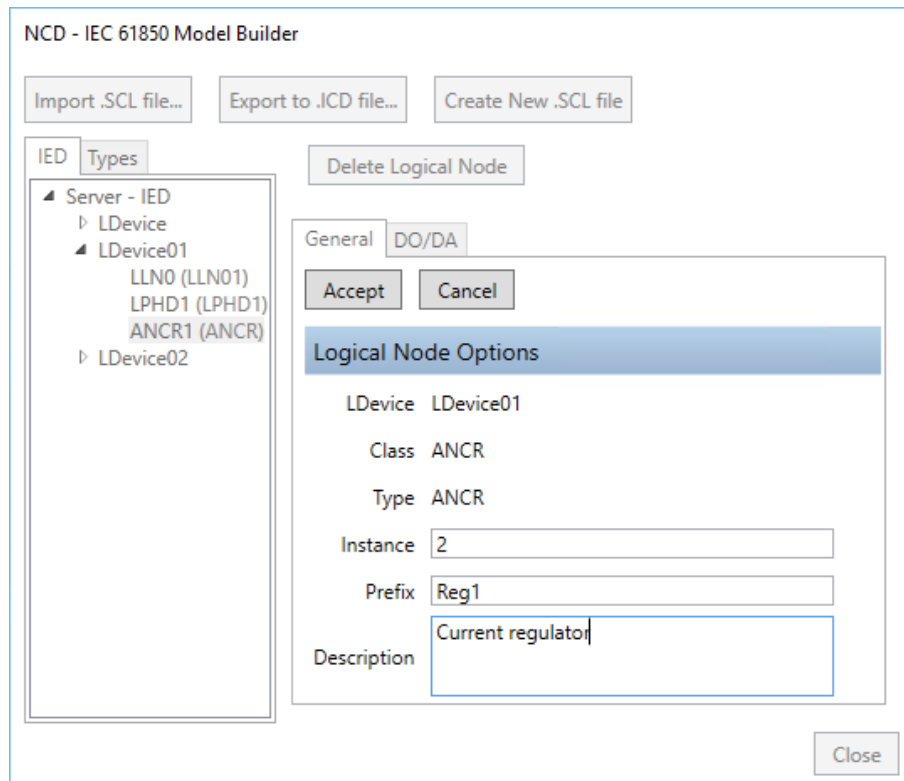
Figure B-23: Modify Logical Node Options

2. On the `Logical Node Options` pane, in the `Instance` field, type a two-digit numerical suffix for the logical node name.

3. In the `Prefix` field, type a prefix for the logical node name using up to six alphanumeric characters.

4. In the `Description` field, type a description for the logical node.

5. Click `Accept` to apply your changes.
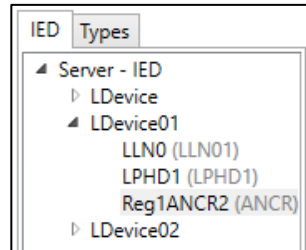
Figure B-24: Modified Logical Node Name

About Deleting Logical Nodes and Node Types

On this pane, you can also delete the logical node. Note that you cannot recover a deleted logical node. In addition, if you delete every logical node associated with a node type, the node type is permanently removed from the file and from the Model Builder application. If you accidentally delete content, close the window without exporting the file, reopen Model Builder, and import a prior version of the file.

Model Data Objects and Data Attributes under a Logical Node

After you create a logical node, adjust settings for the data objects and data attributes that you want to include under the logical node. This procedure allows you to adjust the `Modeled`, `Writable`, and `Value` settings for data objects and data attributes.

Changes made to the `Modeled` setting are applied to all logical nodes with the same node type as the displayed logical node. Changes made to the `Writable` and `Value` settings only apply to the displayed logical node. Any changes made to data objects and attributes are automatically accepted without further user validation.

To modify the modeled data objects and data attributes in a logical node, complete the following steps.

1. In the left pane, on the `IED` tab, expand a logical device and select the logical node you want to modify.

2. On the `Logical Node Options` page, open the `DO/DA` tab.
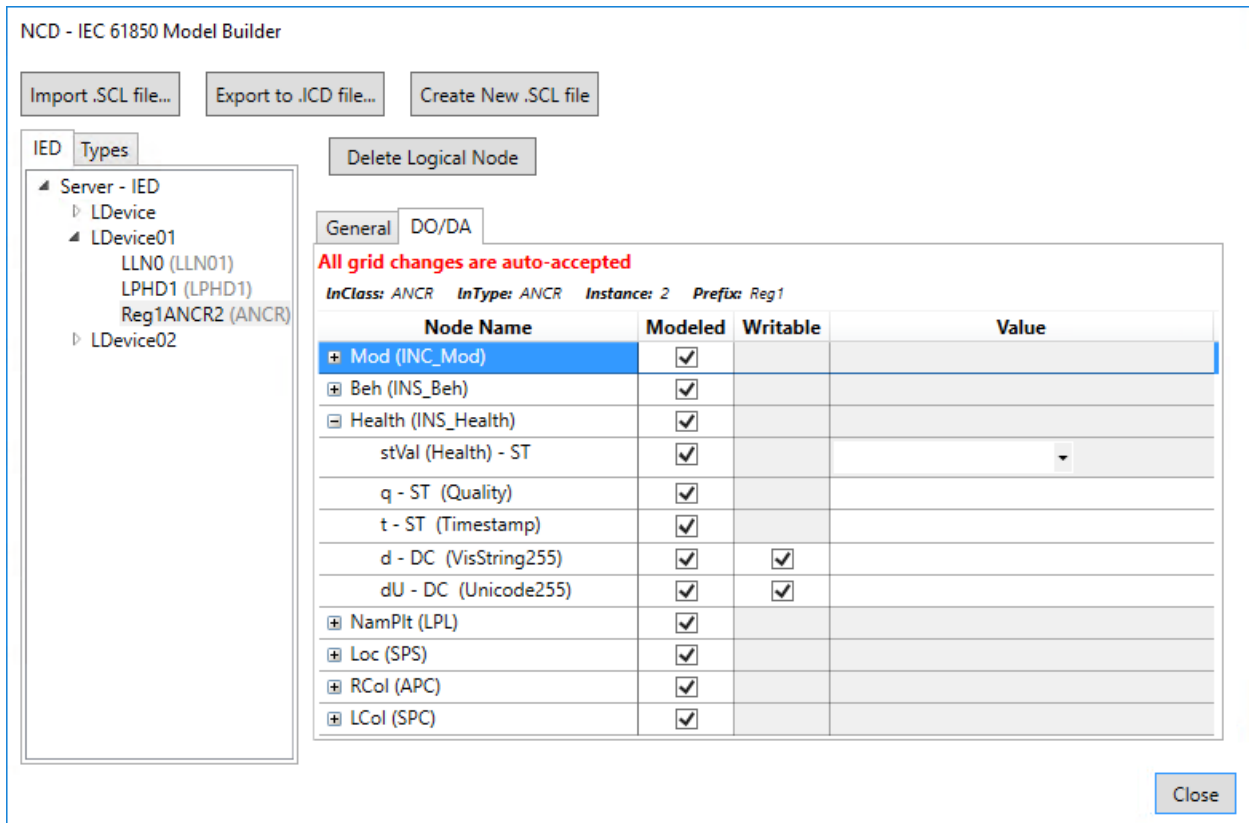
Figure B-25: DO/DA Tab

3. In the grid, to remove a modeled data object or a modeled data attribute, unmark the checkbox on the corresponding grid row. As a result, the row is immediately removed from the grid for the current logical node, as well as for all logical nodes with the same node type.

Data objects are displayed in the outer layer of the grid, such as `Beh` or `Health` in Figure B-25. Data attributes are displayed in the inner layers, such as `q`, `t`, and `d` in Figure B-25.

When you unmark a data object or data attribute, the row and all contained layers disappear from the grid for both the displayed node and for all other nodes with the same node type. For example, if you remove the `RCol` data object from a node with the type ANCR2, the `RCol` data object is removed from all other logical nodes with the ANCR2 type. You can restore the removed row on the `Types` tab.

Figure B-26: Removing a Required Attribute

When you attempt to remove a data attribute that is currently being referenced as a functional constraint by one or more DataSets, the `Modeled` column displays red. In this situation, to ensure that the DataSets have accurate functional constraint references, we recommend marking the check box again to restore the referenced data attribute to the logical node.

4. To modify the `Writable` setting for a data attribute, mark or unmark the check box in the `Writable` column in the corresponding grid row.

Figure B-27: Writable Setting

If the `Writable` setting is not marked, the data attribute becomes read-only. Users cannot manually modify the value of a read-only data attribute at runtime. However, in Model Builder, users may define the `Value` setting for a read-only data attribute.

In addition, only certain data attributes allow the `Writable` setting to be marked. Data attributes without a check box in the `Writable` column (such as `stVal`, `q`, and `t` in Figure B-27) are always read-only attributes.

5. To set an initial value for the data attribute, in the `Value` column, enter a value.

Figure B-28: Value Setting

The value column contains one of the following components: a dropdown list of available options (A), a white field allowing you to enter a string value (B), or a gray field indicating that you cannot set a value for the data attribute (C). Values set in this column are not displayed in the IEC 61850 server mode window in NCD. Values can only be set for leaf nodes, described in the following section.

About Leaf Nodes

After you export the file from Model Builder and open it in the NCD Server Mode, you can only assign Orion points to leaf nodes in the data hierarchy. The term "leaf node" refers to the deepest level of each branch of the hierarchy. Leaf nodes may either be data attributes or sub-data attributes; a data attribute is considered a leaf node when no further data attributes are modeled under it in the hierarchy.

For example, in Figure B-28, the data attributes `q`, `t`, and `ctlModel` are all considered leaf nodes because they cannot be further expanded. As another example, in the point `NT_M871Records/DrxRDRE2/MemUsed/q[ST]`, the leaf node is `q`, the deepest layer of the point (ignoring the functional constraint `[ST]`, which is not part of the hierarchy).

Because the configurable points in the exported file are limited to leaf nodes, it is important to model the specific data objects and data attributes that you want to be available for point assignment in the NCD Server Mode.

Certain types of data attributes, including Quality and Timestamp data attributes, cannot be configured with an Orion point even if the data attribute is a leaf node. The Orion automatically sets `q` and `t` based on the internal attributes of the point in the Orion database.

Model Data Objects on a Node Type

In Model Builder, on the `Types` tab, you can add or remove data objects for each node type being used. This menu is the only location in Model Builder where you can add compatible data objects to an existing node type. Changes made to a node type in this menu apply to all logical nodes with the modified node type.

To add or remove data objects on an existing node type, complete the following steps.

1. In the left pane, on the `Types` tab, expand a node class and select the node type you want to modify.
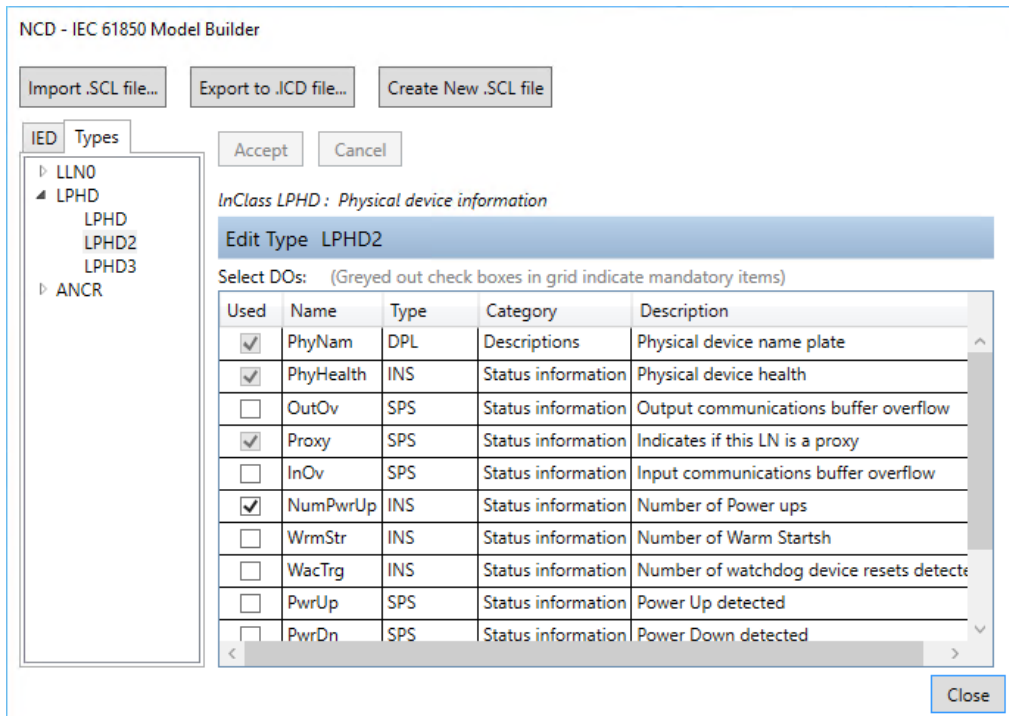
Figure B-29: Types Tab

2. To add a data object, mark the check box in the corresponding grid row. To remove a data object, unmark the checkbox in the corresponding grid row.
    Note: A gray check box indicates a mandatory data object, which cannot be removed from the node type.

3. Click `Accept` to implement your changes.

Export the File

After you finish modeling data hierarchy for your application, you can export the file. You can also export an incomplete file at any time to save the file's current settings and structure. If you export a file, you can import the file for further modification at any time using the procedure described in the Import an Existing File in Model Builder section. You can only export the file as an ICD file. To export the file, complete the following steps.

1. Click the `Export to .ICD file` button.
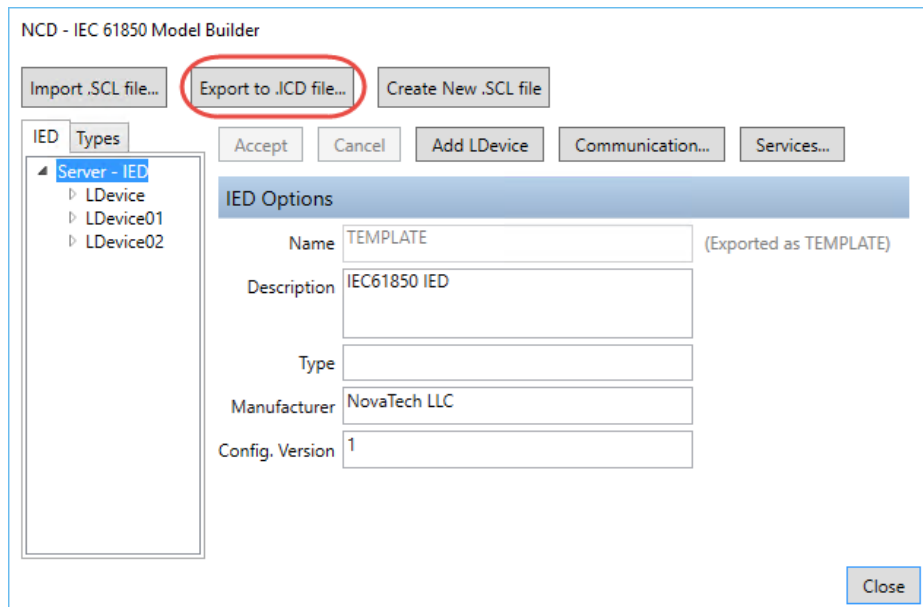
Figure B-30: Export to ICD File

2. In the `Save As` window, navigate to the directory where you want to save the generated ICD file.
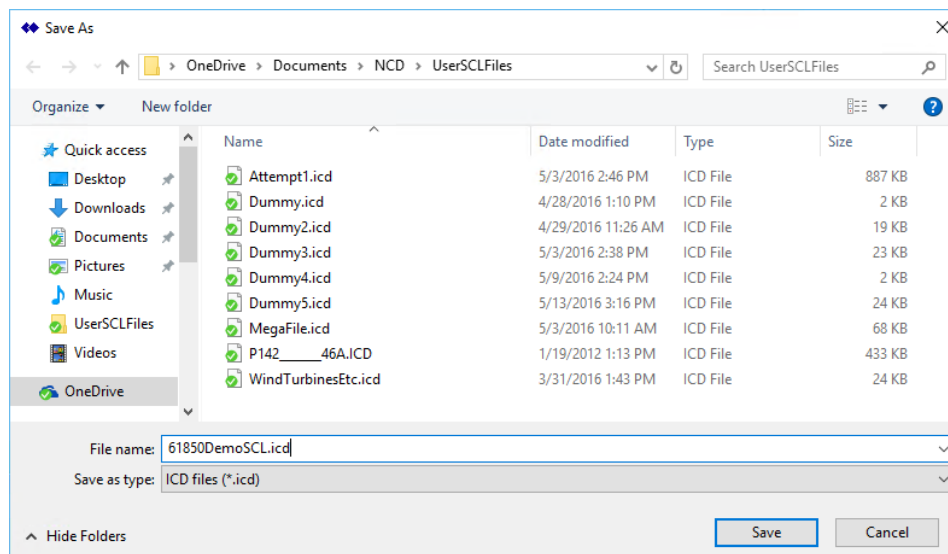
Figure B-31: Save Exported File

3. Enter a name for the ICD file and click `Save`.

SCT Phase

At this step, you have finished using Model Builder to create an ICD file with the Orion's 61850 data attributes. You can now either import the file into an SCT application to configure additional substation IEDs or you can import the file into NCD Server Mode to assign Orion points to 61850 data attributes. The SCT phase may or may not be necessary, depending on the requirements of your environment.

If you elect to use an SCT application, you can import multiple ICD files and create a substation configuration description (SCD) file that is specific to your application. When you import the generic ICD template file into a SCT application, you can accomplish the following.

- Create multiple instances of imported IED templates, such as SCD files for multiple similar physical devices.
- Assign a customized IED name for each instance.
- Set IP addresses for IEDs (The Orion server does not use this setting, but this label is used by IEC 61850 clients to locate a server and is helpful for network documentation).
- Create a substation configuration description (SCD) file.
- Optionally document the oneline diagram for a complete IEC 61850 project.

NCD Server Mode Phase

After generating an SCL file in Model Builder and, optionally, an SCT application, you must import the file into the IEC 61850 Server Mode protocol in NCD to assign OrionLX points to modeled 61850 data attributes. At the end of this phase, you save your settings in an NCD file and a CID file that is zipped in a NCZ file and send the files to the OrionLX, concluding the configuration procedure.

Note that, despite sharing the same protocol window, the IEC 61850 Client Mode and Server Mode do not have any automatic interactions. Actions performed in Server Mode do not affect settings in Client Mode, and actions performed in Client Mode do not affect settings in Server Mode. Because these modes operate independently from each other, you never need to access Client Mode while performing the file configuration actions in this tutorial.

Open the Server Mode Protocol for IEC 61850

To create IEC 61850 Server Mode in NCD, complete the following steps.

1. In NCD, open or create an NCD file where you want to configure IEC 61850 settings.

2. Open `Configure > Network > Configure New Port`.
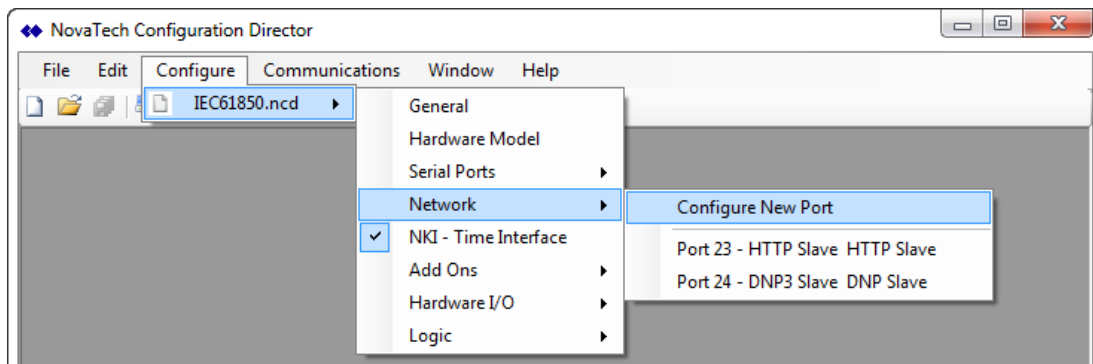
Figure B-32: Configure New Port

3. In the `Protocol Selection Port` dialog box, select `IEC61850` and click `OK`. Note that you can only configure one IEC61850 protocol port (which may contain a Client and/or a Server module) per NCD file.
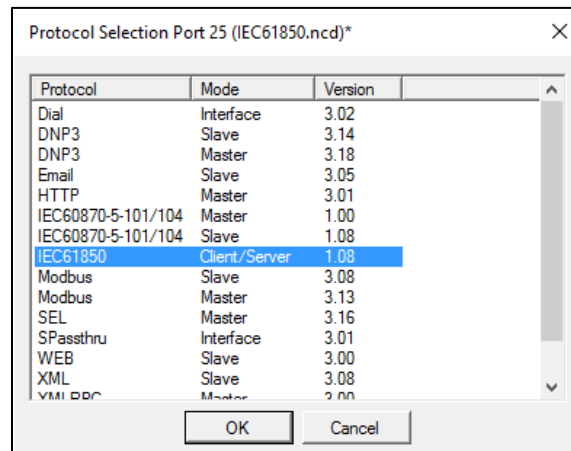
Figure B-33: Configure IEC 61850 Port

4. In the `IEC61850 Master Port` window, select `Server – IED`.
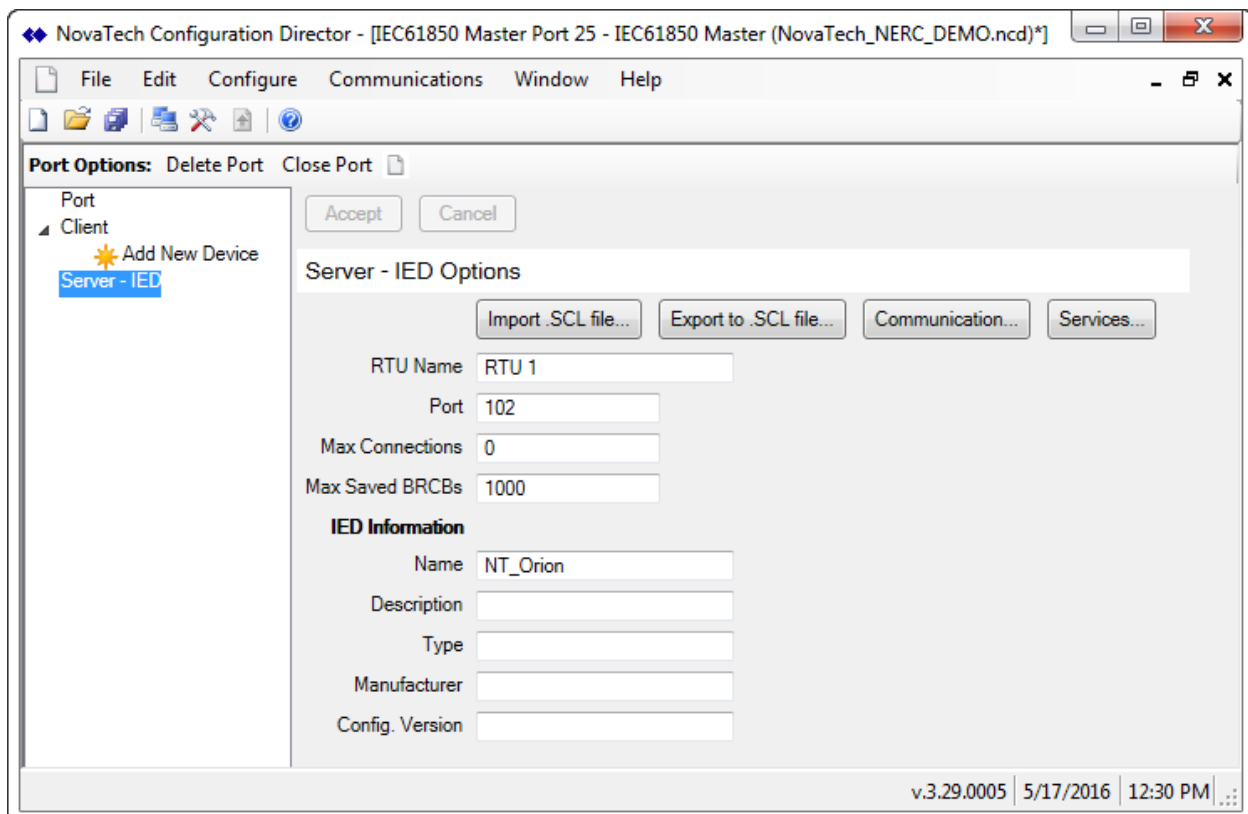
Port Settings

After the IEC61850 protocol is selected, the Port menu is displayed for configuring the general port options for IEC61850. At the top of the above menu, as well as the other IEC 61850 menus, the `Port Options` menu is displayed.

Port Options: Delete Port Close Port 📄
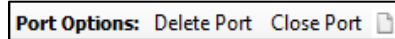
Figure B-34: Port Options

Command	Description
`Delete Port`	Removes the IEC 61850 Client and Server and all points on the port from the configuration.
`Close Port`	Closes the IEC 61850 Client menu.

Table B-1: Port Options Commands

Import SCL File

Next, you must import the SCL file that you want to configure. Files with the extensions SCL, ICD, SCD, and CID are compatible with IEC 61850 Server Mode.

1. On the `Server - IED Options` page, click `Import .SCL file`.

2. In the `Choose file to import` dialog box, navigate to the directory where the file is saved.

3. Select the file and click `Open`. The following dialog box displays.
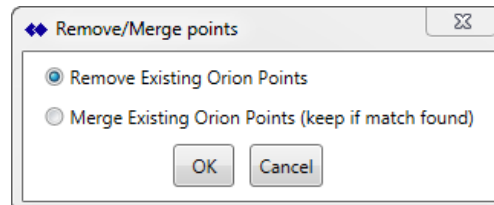
Figure B-35: Remove or Merge Points

This dialog box contains two methods used to integrate the contents of the SCL file with the settings in NCD Server Mode.

The `Remove Existing Orion Points` method deletes all Orion points previously assigned to 61850 data attributes defined in the previously imported SCL file. This method should always be used when creating a new SCL file, as in this tutorial.

The `Merge Existing Orion Points` method re-imports the 61850 attributes and retains any existing assignments for Orion points to 61850 data attributes that exist in both the previously imported and newly imported SCL file. This method should be selected when it is desired to import model changes that have been made to the SCL file in Model Builder or in a SCT. This method may require a significant amount of time, depending on the number of points currently configured in IEC 61850 Server Mode.

4. In the `Remove/Merge Points` dialog box, select the method that you want to use and click `OK`.

If you import a SCD file containing multiple IEDs, the following dialog box displays a list of IEDs within the SCD file.
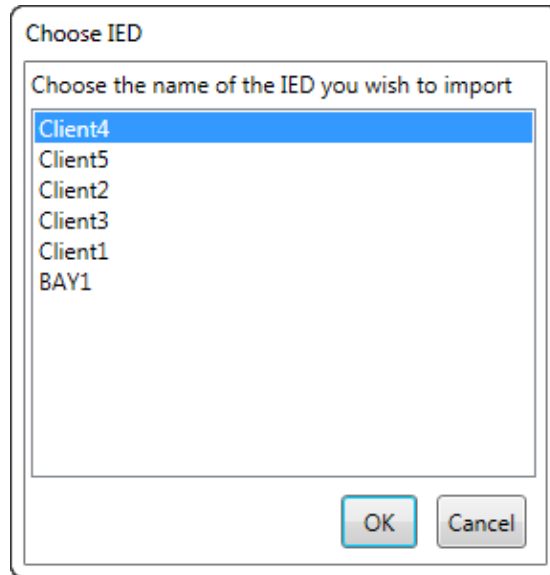
Figure B-36: Choose IED Dialog Box

5. If the `Choose IED dialog box` displays, select the server IED you want to configure in NCD. In this example, only BAY1 should be selected. Click `OK`.

Modify RTU Settings

To modify the descriptive settings for the RTU represented by the imported IED, complete the following steps.
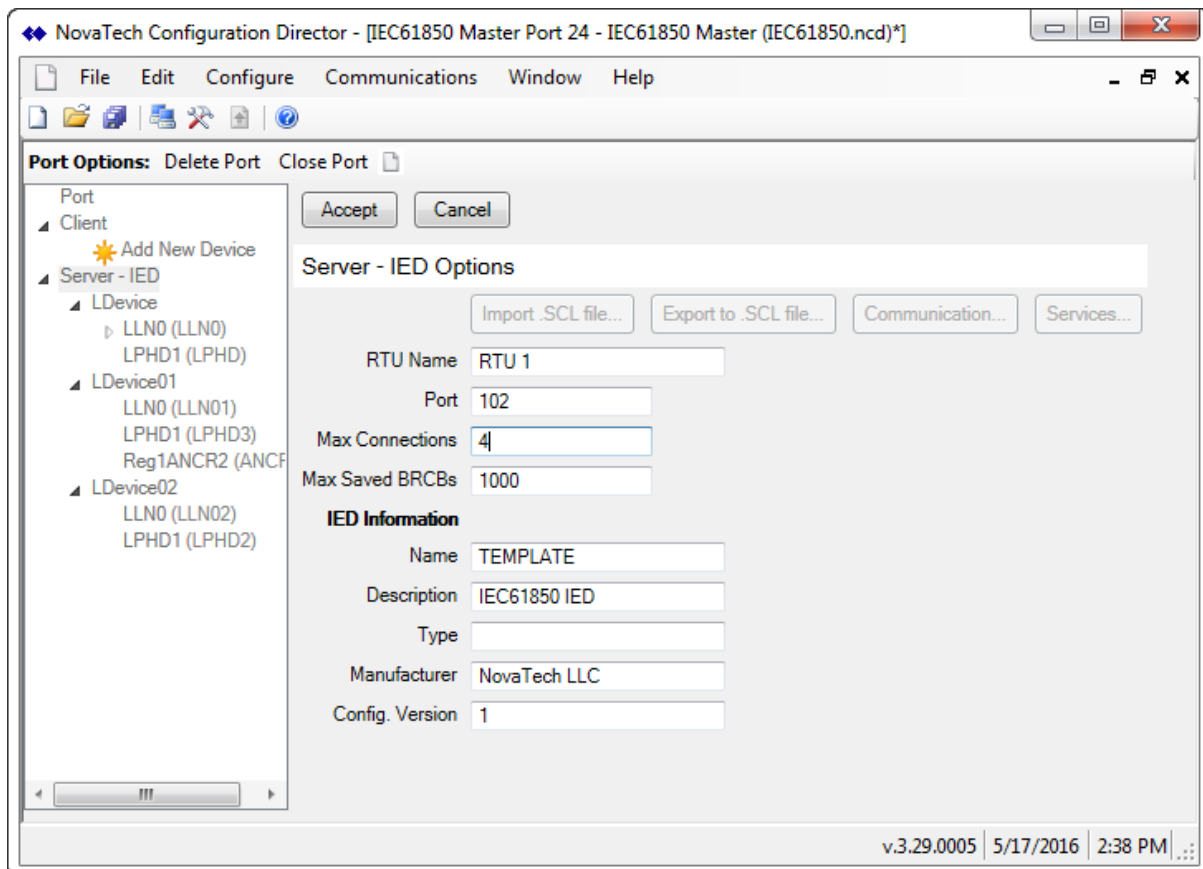
Figure B-37: Modify RTU Settings

1. On the `Server – IED Options` page, in the `RTU Name` field, enter a name for this RTU.

2. In the `Port` field, type the listening TCP Port number for this RTU.

3. In the `Max Connections` field, type the maximum number of connections this RTU will accept.

4. In the `Max Saved BRCBs` field, type the maximum number of saved buffered Report Control Blocks on the RTU.

5. Under `IED Information`, modify the `Name` setting. The other settings under `IED Information` are optional.

6. Click `Accept`.

IEC 61850 Modeling Options Available in NCD Server Mode

You can optionally perform any of the following model configuration steps in NCD Server Mode without needing to export the SCL file back to Model Builder. These actions are not required for this tutorial and are described in greater detail in Appendix B – NCD Server Mode Configuration Actions. These actions can also be performed in Model Builder.

- Modify IED Information
- Modify Communication Settings
- Modify Services Settings
- Modify LDevice Options
- Modify Logical Node Instance, Prefix and Description Options
- Add a DataSet to an LLN0 Node
- Add a Report Control Block to an LLN0 Node
- Add a GOOSE Control Block to an LLN0 Node

In NCD Server Mode, you cannot perform the following actions. These options can only be performed in Model Builder. For more information about the steps required before performing the following changes to an existing file, refer to the Modify an Existing SCL File section.

- Add or Remove a Logical Device
- Add or Remove a Logical Node (Includes Modifying Node Name, Class, and Type)
- Modify Modeled Data Objects or Data Attributes for a Logical Node or Logical Node Type

About Assigning Points from the NCD File to IEC 61850 Data Attributes

The key step in the NCD Server Mode Phase is assigning input and output points configured in various protocols in the NCD file to the data attributes modeled in the SCL file. This procedure operates similarly to point assignment in other protocols. Any points configured in other protocols in the NCD file can be assigned to the IEC 61850 data attributes. If any points do not display on the expected tab (either `Inputs` or `Outputs`), view the protocol where the point is located to ensure that the point is correctly configured.

Assign NCD Points to IEC 61850 Data Attribute

To assign input points, complete the following steps.

1. In the left pane, expand a logical device and select the logical node containing the data attributes that you want to configure. The logical node menu displays in the protocol window.
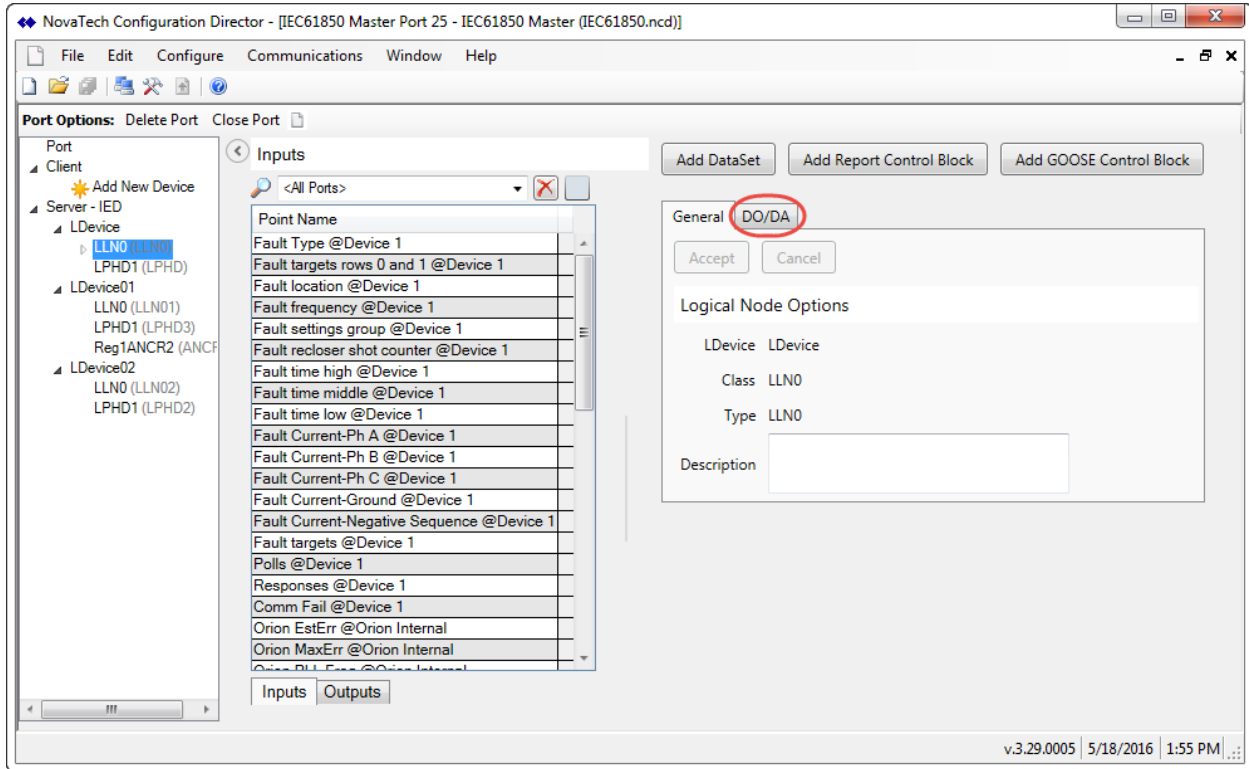
Figure B-38: NCD Logical Node Menu

2. Click the `DO/DA` tab to display the data objects and data attributes configured in the logical node.
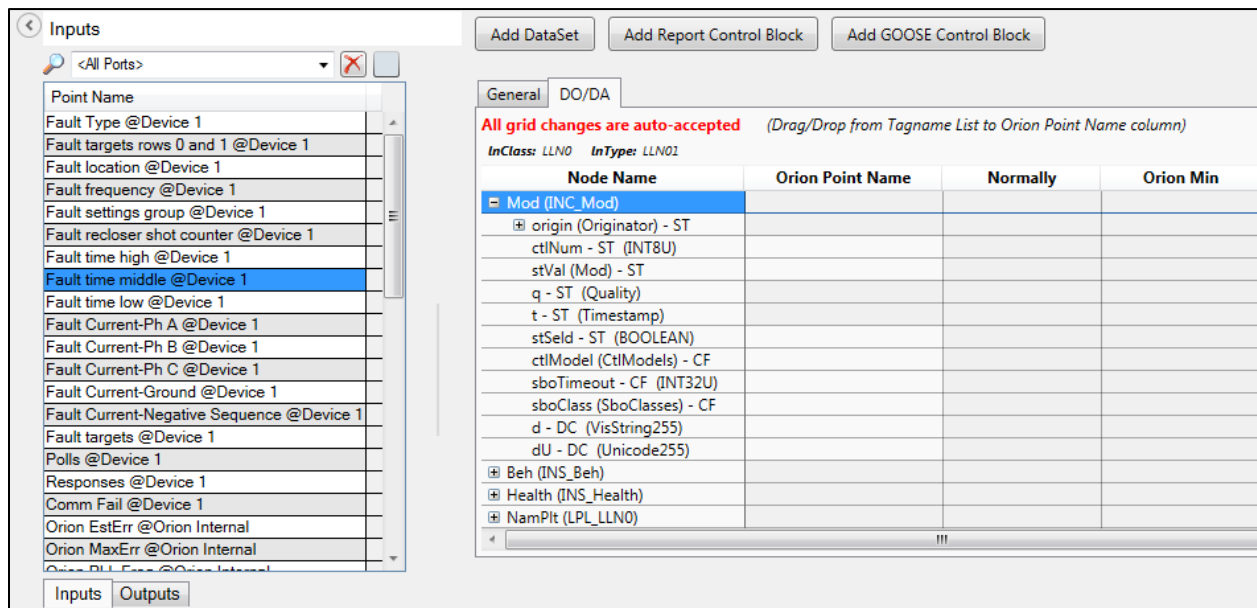
Figure B-39: NCD DO/DA Tab

Input points and output points can be assigned to any leaf node with a white space in the Orion Point Name column. If you cannot differentiate between the gray and white spaces on your screen, adjust the display settings on your local machine or screen.

3. On the left of the page, under the list of Orion points, select the `Inputs` tab or the `Outputs` tab to select the type of point you want to assign.
Note: Inputs are assigned to data attributes that will be read from the OrionLX 61850 Server. Outputs are assigned to data attributes that will be written to the OrionLX 61850 Server.

4. To further narrow the list of displayed points, in the search bar, enter all or part of a point name. Select the point from the search results.
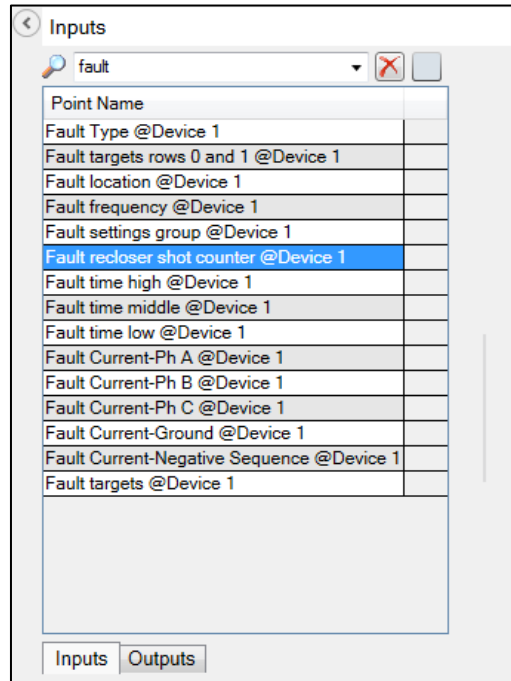
Figure B-40: Select Orion Point

5. In the `DO/DA` grid, expand the node hierarchy to display the data attribute you want to be associated with the selected Orion point.
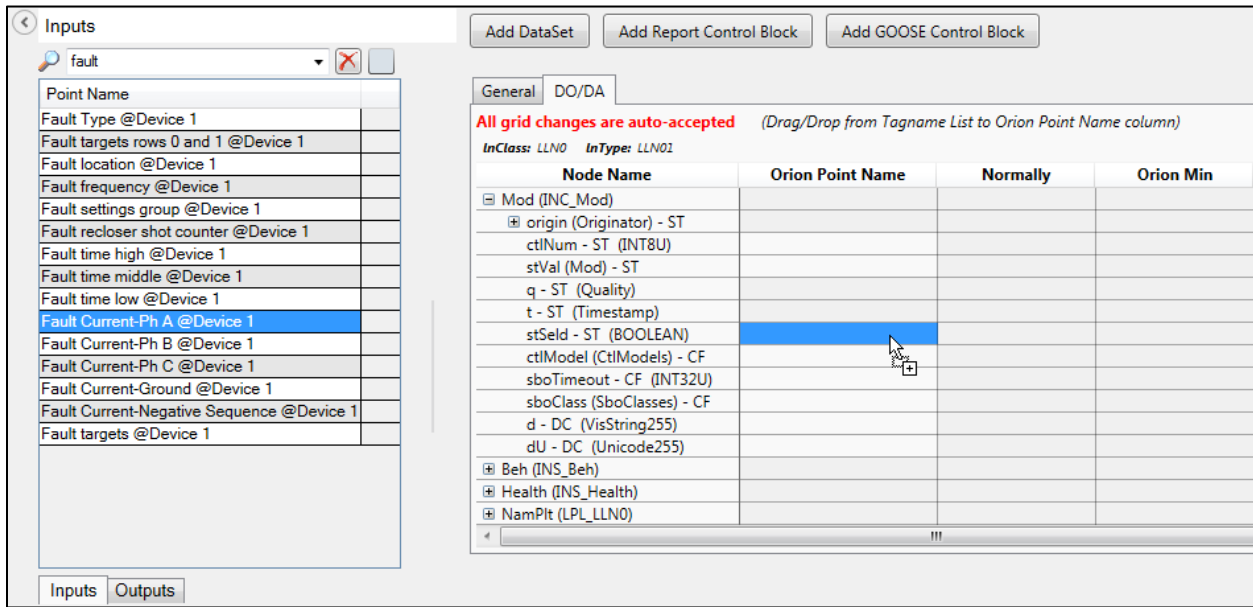
Figure B-41: Drag Orion Point to Leaf Node

6. Drag the point from the left point list to the white space for the desired data attribute in the `DO/DA` grid. The space turns blue when you hover the point over a configurable data attribute.
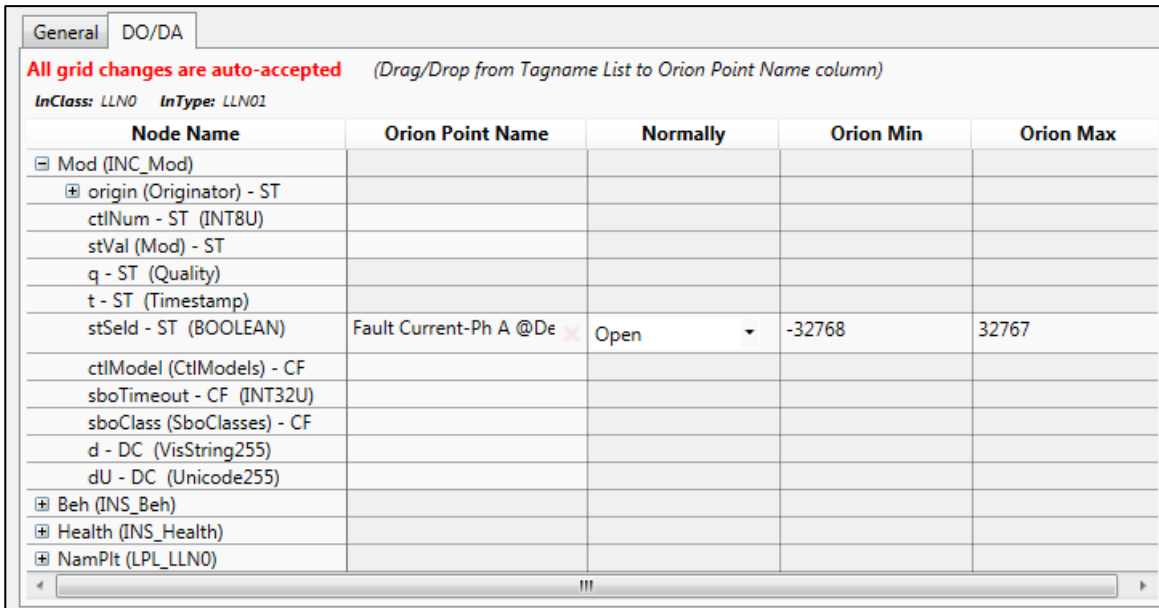
Figure B-42: Assigned Orion Point

7. Modify the following settings for the assigned Orion point.

Setting	Description
Orion Point Name	The name of the Orion point assigned to the data attribute. To remove the assignment, click the red X button in the field.
Alias	This setting displays the alias name for the Orion point if aliasing is active for the NCD file. You cannot modify the alias name from the protocol window.
Normally	This setting is only active for BOOLEAN data attributes. In the dropdown list, select the normal state for the point. The selectable values in this list are Open and Closed. When closed is selected, the reported 61850 status will be inverted. When the Orion point is a 1, 61850 Server will report a 0. When the Orion point is a 0, 61850 Server will report a 1. Open reports the same value as the Orion point.
Orion Min	The minimum numerical value possible for the point. The default value in this field depends on the Orion point associated with the leaf node. The min and max values are used to scale the data to the desired engineering units. If the Orion point is already in the desired 61850 engineering units, leave this value at the default value.
Orion Max	The maximum numerical value possible for the point. The default value in this field depends on the Orion point associated with the leaf node. The min and max values are used to scale the data to the desired engineering units. If the Orion point is already in the desired 61850 engineering units, leave this value at the default value.

Table B-2: Orion Point Settings

8. Repeat steps 3 through 7 for every Orion point you want to assign to a data attribute.

Upload Files to OrionLX and Activate NCD File

After you finish assigning points and modifying settings in the NCD Server mode, the final step is to upload and activate your configuration settings on the OrionLX. To upload files to the OrionLX, complete the following steps.

1. Save the NCD file. An NCZ file with the same name as the current NCD file is either created or updated with your new settings.
   Note: The NCZ file is a zip file that contains the CID file required by the 61850 Server

2. Use your preferred method to upload the NCD file and the NCZ file to the OrionLX. For more information about this process, refer to the *OrionLX User Manual*.

3. Select the NCD file as the active configuration file.

C. Modify an Existing SCL File

Procedure to Modify an Existing SCL File

If you need to make any modeling changes to an SCL file after it has already gone through all or part of the procedure in the Model and Configure a New SCL File chapter, you must follow a specific procedure with multiple phases, summarized in the diagram below. The procedure ends when the file is reimported in NCD Server Mode and any final changes are applied and saved.
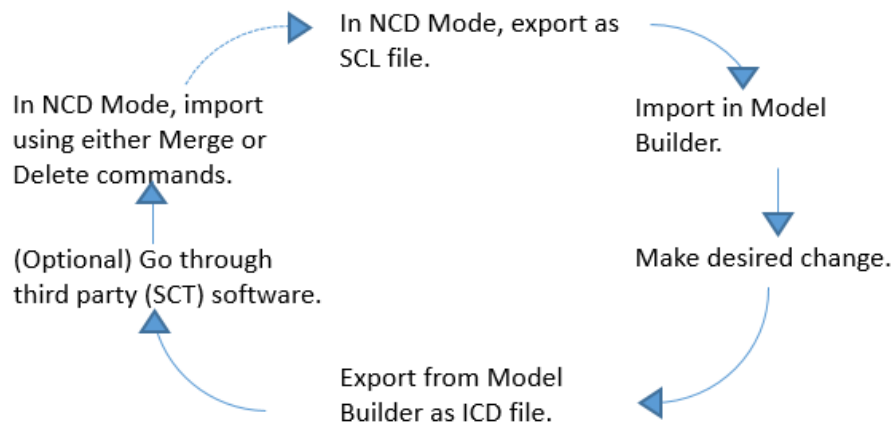
Figure C-1: Procedure to Modify an Existing SCL File

To enforce any changes made to an exported file using Model Builder or an SCT application, be sure to reimport the updated version in NCD Server Mode, save the file, and then send the configuration file to the OrionLX.

This procedure is required when you want to make one of the following changes to the SCL file, which are not available in NCD Server Mode.

- Add or Remove a Logical Device
- Add or Remove a Logical Node (Includes Modifying Node Name, Class, and Type)
- Modify Modeled Data Objects or Data Attributes for a Logical Node or Logical Node Type
- Modify Settings only Available in an SCT Application

To perform one of the above actions, complete the procedures described in the following sections in sequential order.

Import an Existing File in Model Builder

If you determine that modeling changes are required for your SCL file, you must first import the file in Model Builder. To import a file in Model Builder, complete the following steps.

1. In Model Builder, in the upper left corner of the window, click `Import .SCL File`.
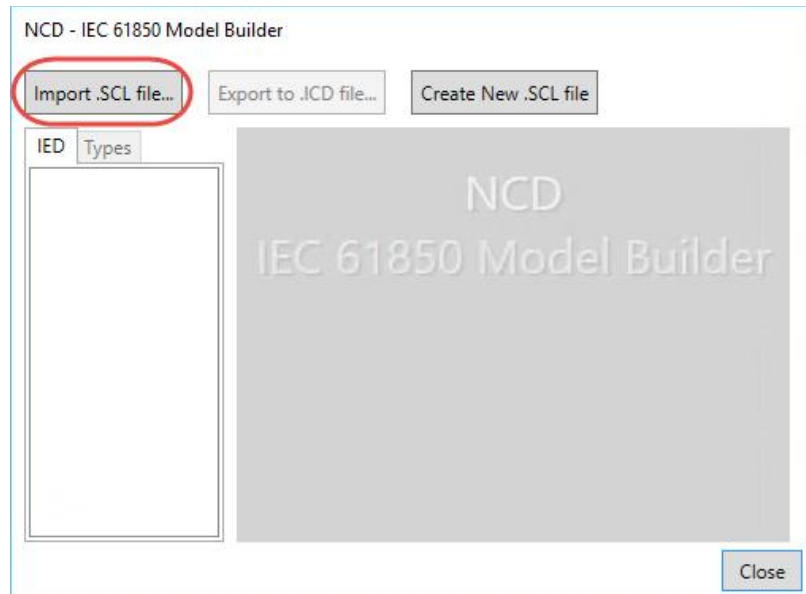
Figure C-2: Import SCL File

2. In the `Choose file to import` window, navigate to the directory where the desired file is saved, select the file, and click `Open`. Compatible file types include `SCL`, `ICD`, `CID`, and `SCD`.

3. When importing an SCD file, the `Choose IED` dialog box displays. Select the IED name that you want to import and modify. In Model Builder, you can only import one IED.
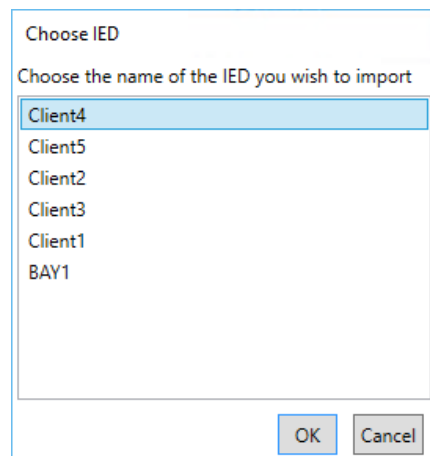
Figure C-3: Choose IED Dialog Box in Model Builder

Modify SCL File in Model Builder

After importing the file, you can perform any of the actions available in Model Builder. For a list of the actions available in Model Builder, view the Model Builder Phase section from the previous chapter.

After you perform all required modifications to the model, Export the File to your local machine as an ICD file.

Modify SCL File in SCT Application

After exporting the file from Model Builder, you can optionally use an SCT application to perform additional changes. Changes exclusive to the SCT phase include adding an IED, combining several ICD files into one SCL file, and modifying IED names.

We typically recommend only implementing SCT application changes following the Model Builder phase. Using Model Builder ensures that the file structure meets all IEC 61850 requirements and that the file is fully compatible with NCD Server Mode. However, if there are no required modeling changes for the file, you may skip the Model Builder phase for an existing file and proceed directly to the SCT phase.

After you perform all required modifications in the SCT application, export the file to your local machine (usually as an SCD file).

For more information about actions available in the SCT phase, refer to the SCT Phase section from the previous chapter.

Import SCL File in IEC 61850 Server Mode in NCD

After performing the procedures described in the previous sections, to import a modified file in NCD Server Mode, complete the following steps.

1. Open the IEC 61850 protocol in NCD.

2. In the left pane, click `Server - IED`.

3. Click the `Import .SCL File` button.

4. In the `Choose file to import` dialog box, navigate to the directory where the modified file was saved, select the modified file, and click `Open`. The following dialog box displays.
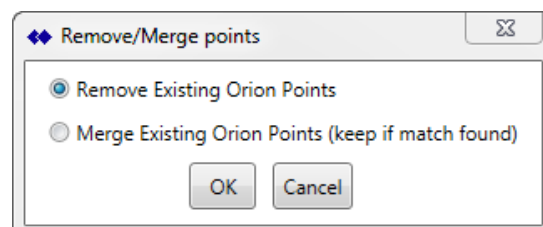
Figure C-4: Remove/Merge Points

5. Perform one of the following actions.
   - To delete all existing attribute to point assignments in NCD Server Mode, select `Remove Existing Orion Points`.
   - To retain all existing attribute to point assignments in NCD Server Mode, assuming attributes share the same name in the modified file, select `Merge Existing Orion Points`.

6. Click `OK`.

7. When importing an SCD file, the `Choose IED` dialog box displays. Select the IED name in the file that you want to import and modify. In NCD Server Mode, you can only assign Orion points to one IED at a time.

8. To configure points from additional IED names in NCD Server Mode, after modifying the contents of the first imported IED name, save the NCD file, import the file again using the `Import .SCL File` button, select the `Merge Existing Orion Points` option, and select a different IED name in the `Choose IED` dialog box.

Assign Orion Points to Attributes in Imported SCL File in NCD Server Mode

After importing the IED to which you want to assign Orion points, you can assign Orion points to any leaf node data attribute in the imported model structure. This procedure operates similarly to point assignment in other protocols. Any points configured in other protocols in the NCD file can be assigned to the IEC 61850 data attributes. If any points do not display on the expected tab (either `Inputs` or `Outputs`), view the protocol where the point is located to ensure that the point is correctly configured.

View the Assign NCD Points to IEC 61850 Data Attribute section in the previous chapter for the complete point assignment procedure.

Upload Files to OrionLX

After you finish assigning points and modifying settings in the NCD Server mode, the final step is to upload and activate your configuration on the OrionLX. To upload files to the OrionLX, complete the following steps.

1. Save the NCD file. An NCZ file with the same name as the current NCD file is either created or updated with your new settings.

2. Use your preferred method to send the NCD file and the NCZ file to the OrionLX. For more information about this process, refer to the OrionLX User Manual.

3. Select the NCD file as the active configuration file.

D. Additional Resources

Appendix A – Data Objects Available to Each Node Class

The following table lists the logical node classes available to configure in Model Builder, as well as the data objects available to model for each class. Logical nodes with these classes can be added using the Add a New Logical Node procedure. For a complete description of each logical node class, refer to the official *IEC 61850 Technical Report* issued by IEC.

Node Class	Node Class Description	Available Data Objects
ANCR	Neutral current regulator	Mod, Beh, Health, NamPlt, Loc, OpCntRs, TapChg, RCol, LCol, Auto
ARCO	Reactive power control	Mod, Beh, Health, NamPlt, Loc, OpCntRs, TapChg, Auto, VOvSt, NeutAlm, DschBlk
ATCC	Automatic tap changer control	Mod, Beh, Health, NamPlt, Loc, OpCntRs, TapChg, TapPos, ParOp, LTCBlk, LTCDragRs, VRed1, VRed2, CtlV, LodA, CircA, PhAng, HiCtlV, LoCtlV, HiDmdA, Auto, HiTapPos, LoTapPos, BndCtr, BndWid, CtlDlTmms, LDCR, LDCX, BlkLV, BlkRv, LimLodA, LDC, TmDlChr, LDCZ, VRedVal, TapBlkR, TapBlkL
AVCO	Voltage control	Mod, Beh, Health, NamPlt, Loc, OpCntRs, TapChg, Auto, BlkEF, BlkAOv, BlkVOv, LimAOv, LimVOv
CALH	Alarm handling	Mod, Beh, Health, NamPlt, GrAlm, GrWrn, AlmLstOv
CCGR	Cooling group control	Mod, Beh, Health, NamPlt, EEHealth, EEName, OpTmh, EnvTmp, OilTmpIn, OilTmpOut, FanFlw, FanA, CECtl, PmpCtlGen, PmpCtl, FanCtlGen, FanCtl, Auto, FanOvCur, PmpOvCur, PmpAlm, OilTmpSet
CILO	Interlocking	Mod, Beh, Health, NamPlt, EnaOpn, EnaCls
CPOW	Point-on-wave switching	Mod, Beh, Health, NamPlt, TmExc, StrPOW, OpOpn, OpCls, MaxDlTmms
CSWI	Switch controller	Mod, Beh, Health, NamPlt, Loc, OpCntRs, Pos, PosA, PosB, PosC, OpOpn, OpCls
GAPC	Generic automatic process control	Mod, Beh, Health, NamPlt, Loc, OpCntRs, SPCSO1, DPCSO1, ISCSO1, Auto, Str1, Op1, StrVal1

NovaTech®

Node Class	Node Class Description	Available Data Objects
GGIO	Generic process I/O	Mod, Beh, Health, NamPlt, EEHealth, EEName, Loc, OpCntRs, AnIn1, SPCSO1, DPCSO1, ISCSO1, IntIn1, Alm1, Ind1
GSAL	Generic security application	Mod, Beh, Health, NamPlt, OpCntRs, NumCntRs, AuthFail, AcsCtlFail, SvcViol, Ina
IARC	Archiving	Mod, Beh, Health, NamPlt, OpCntRs, NumCntRs, MemOv, MemUsed, NumRcd, MaxNumRcd, OpMod, MemFull
IHMI	Human machine interface	Mod, Beh, Health, NamPlt
ITCI	Telecontrol interface	Mod, Beh, Health, NamPlt
ITMI	Telemonitoring interface	Mod, Beh, Health, NamPlt
MDIF	Differential measurement	Mod, Beh, Health, NamPlt, OpARem, Amp1, Amp2, Amp3
MHAI	Harmonics or interharmonics	Mod, Beh, Health, NamPlt, EEHealth, EEName, Hz, HA, HPhV, HPPV, HW, HVAr, HVA, HRmsA, HRmsPhV, HRmsPPV, HTuW, HTsW, HATm, HKf, HTdf, ThdA, ThdOddA, ThdEvnA, TddA, TddOddA, TddEvnA, ThdPhV, ThdOddPhV, ThdEvnPhV, ThdPPV, ThdOddPPV, ThdEvnPPV, HCfPhV, HCfPPV, HCfA, HTif, HzSet, EvTmms, NumCyc, ThdAVal, ThdVVal, ThdATmms, ThdVTmms, NomA
MHAN	Non-phase-related harmonics or interharmonics	Mod, Beh, Health, NamPlt, EEHealth, EEName, Hz, HaAmp, HaVol, HaWatt, HaVolAmpr, HaVolAmp, HaRmsAmp, HaRmsVol, HaTuWatt, HaTsWatt, HaAmpTm, HaKFact, HaTdFact, ThdAmp, ThdOddAmp, ThdEvnAmp, TddAmp, TddOddAmp, TddEvnAmp, ThdVol, ThdOddVol, ThdEvnVol, HaCfAmp, HaCfVol, HaTiFact, HzSet, EvTmms, NumCyc, ThdAVal, ThdVVal, ThdATmms, ThdVTmms, NomA
MMTR	Metering 3 phase	Mod, Beh, Health, NamPlt, EEHealth, EEName, TotVAh, TotWh, TotVArh, SupWh, SupVArh, DmdWh, DmdVArh

Node Class	Node Class Description	Available Data Objects
MMXN	Non-phase-related measurement	Mod, Beh, Health, NamPlt, EEHealth, EEName, Amp, Vol, Watt, VolAmpr, VolAmp, PwrFact, Imp, Hz
MMXU	Measurement	Mod, Beh, Health, NamPlt, EEHealth, TotW, TotVAr, TotVA, TotPF, Hz, PPV, PhV, A, W, VAr, VA, PF, Z
MSQI	Sequence and imbalance	Mod, Beh, Health, NamPlt, EEHealth, EEName, SeqA, SeqV, DQ0Seq, ImbA, ImbNgA, ImbNgV, ImbPPV, ImbV, ImbZroA, ImbZroV, MaxImbA, MaxImbPPV, MaxImbV
MSTA	Metering statistics	Mod, Beh, Health, NamPlt, EEHealth, EEName, AvAmps, MaxAmps, MinAmps, AvVolts, MaxVolts, MinVolts, AvVA, MaxVA, MinVA, AvW, MaxW, MinW, AvVAr, MaxVAr, MinVAr, EvStr, EvTmms
PDIF	Differential	Mod, Beh, Health, NamPlt, OpnCntRs, Str, Op, TmASt, DifAClc, RstA, LinCapac, LoSet, HiSet, MinOpTmms, MaxOpTmms, RstMod, RsDlTmms, TmACrv
PDIR	Direction comparison	Mod, Beh, Health, NamPlt, OpnCntRs, Str, Op, RsDlTmms
PDIS	Distance	Mod, Beh, Health, NamPlt, OpnCntRs, Str, Op, PoRch, PhStr, GndStr, DirMod, PctRch, Ofs, PctOfs, RisLod, AngLod, TmDlMod, OpDlTmms, PhDlMod, PhDlTmms, GndDlMod, GndDlTmms, X1, LinAng, RisGndRch, RisPhRch, K0Fact, K0FactAng, RsDlTmms
PDOP	Directional overpower	Mod, Beh, Health, NamPlt, OpnCntRs, Str, Op, DirMod, StrVal, OpDlTmms, RsDlTmms
PDUP	Directional underpower	Mod, Beh, Health, NamPlt, OpnCntRs, Str, Op, StrVal, OpDlTmms, RsDlTmms, DirMod
PFRC	Rate of change of frequency	Mod, Beh, Health, NamPlt, OpnCntRs, Str, Op, BlkV, StrVal, BlkVal, OpDlTmms, RsDlTmms

Node Class	Node Class Description	Available Data Objects
PHAR	Harmonic restraint	`Mod, Beh, Health, NamPlt, OpnCntRs, Str, HaRst, PhStr, PhStop, OpDlTmms, RsDlTmms`
PHIZ	Ground detector	`Mod, Beh, Health, NamPlt, OpnCntRs, Str, Op, AStr, VStr, HVStr, OpDlTmms, RsDlTmms`
PIOC	Instantaneous overcurrent	`Mod, Beh, Health, NamPlt, OpnCntRs, Str, Op, StrVal`
PMRI	Motor restart inhibition	`Mod, Beh, Health, NamPlt, OpnCntRs, Op, StrInh, StrInhTmm, SetA, SetTms, MaxNumStr, MaxWrmStr, MaxStrTmm, EqTmm, InhTmm`
PMSS	Motor starting time supervision	`Mod, Beh, Health, NamPlt, OpnCntRs, Str, Op, SetA, SetTms, MotStr, LokRotTms`
POPF	Over power factor	`Mod, Beh, Health, NamPlt, OpnCntRs, Str, Op, BlkA, BlkV, StrVal, OpDlTmms, RsDlTmms, BlkValA, BlkValV`
PPAM	Phase angle measuring	`Mod, Beh, Health, NamPlt, OpnCntRs, Str, Op, StrVal`
PSCH	Protection scheme	`Mod, Beh, Health, NamPlt, OpnCntRs, ProTx, ProRx, Str, Op, CarRx, LosOfGrd, Echo, WeiOp, RvABlk, GrdRx, SchTyp, OpDlTmms, CrdTmms, DurTmms, UnBlkMod, SecTmms, WeiMod, WeiTmms, PPVVal, PhGndVal, RvAMod, RvATmms, RvRsTmms`
PSDE	Sensitive directional earthfault	`Mod, Beh, Health, NamPlt, OpCntRs, Str, Op, Ang, GndStr, GndOp, StrDlTmms, OpDlTmms, DirMod`
PTEF	Transient earth fault	`Mod, Beh, Health, NamPlt, OpnCntRs, Str, Op, GndStr, DirMod`
PTOC	Time overcurrent	`Mod, Beh, Health, NamPlt, OpnCntRs, Str, Op, TmASt, TmACrv, StrVal, TmMult, MinOpTmms, MaxOpTmms, OpDlTmms, TypRsCrv, RsDlTmms, DirMod`
PTOF	Overfrequency	`Mod, Beh, Health, NamPlt, OpnCntRs, Str, Op, BlkV, StrVal, BlkVal, OpDlTmms, RsDlTmms`

Node Class	Node Class Description	Available Data Objects
PTOV	Overvoltage	Mod, Beh, Health, NamPlt, OpnCntRs, Str, Op, TmVSt, TmVCrv, StrVal, TmMult, MinOpTmms, MaxOpTmms, OpDlTmms, RsDlTmms
PTRC	Protection trip conditioning	Mod, Beh, Health, NamPlt, OpnCntRs, Tr, Op, Str, TrMod, TrPlsTmms
PTTR	Thermal overload	Mod, Beh, Health, NamPlt, OpnCntRs, Amp, Tmp, TmpRl, LodRsvAlm, LodRsvTr, AgeRat, Str, Op, AlmThm, TmTmpSt, TmASt, TmTmpCrv, TmACrv, TmpMax, StrVal, OpDlTmms, MinOpTmms, MaxOpTmms, RsDlTmms, ConsTms, AlmVal
PTUC	Undercurrent	Mod, Beh, Health, NamPlt, OpnCntRs, Str, Op, TmASt, TmACrv, StrVal, OpDlTmms, TmMult, MinOpTmms, MaxOpTmms, RsDlTmms, DirMod
PTUF	Underfrequency	Mod, Beh, Health, NamPlt, OpnCntRs, Str, Op, BlkV, StrVal, BlkVal, OpDlTmms, RsDlTmms
PTUV	Undervoltage	Mod, Beh, Health, NamPlt, OpnCntRs, Str, Op, TmVSt, TmVCrv, StrVal, TmMult, MinOpTmms, MaxOpTmms, OpDlTmms, RsDlTmms
PUPF	Underpower factor	Mod, Beh, Health, NamPlt, OpnCntRs, Str, Op, BlkA, BlkV, StrVal, OpDlTmms, RsDlTmms, BlkValA, BlkValV
PVOC	Voltage controlled time overcurrent	Mod, Beh, Health, NamPlt, OpnCntRs, Str, Op, AVSt, TmASt, AVCrv, TmACrv, TmMult, MinOpTmms, MaxOpTmms, OpDlTmms, TypRsCrv, RsDlTmms
PVPH	Volts per Hz	Mod, Beh, Health, NamPlt, OpnCntRs, Str, Op, VHzSt, VHzCrv, StrVal, OpDlTmms, TypRsCrv, RsDlTmms, TmMult, MinOpTmms, MaxOpTmms
PZSU	Zero speed or underspeed	Mod, Beh, Health, NamPlt, OpnCntRs, Str, Op, StrVal, OpDlTmms, RsDlTmms

Node Class	Node Class Description	Available Data Objects
RADR	Disturbance recorder channel analogue	Mod, Beh, Health, NamPlt, OpnCntRs, ChTrg, ChNum1, TrgMod, LevMod, HiTrgLev, LoTrgLev, PreTmms, PstTmms
RBDR	Disturbance recorder channel binary	Mod, Beh, Health, NamPlt, OpnCntRs, ChTrg, ChNum1, TrgMod, LevMod, PreTmms, PstTmms
RBRF	Breaker failure	Mod, Beh, Health, NamPlt, OpnCntRs, Str, OpEx, OpIn, FailMod, FailTmms, SPlTrTmms, TPTrTmms, DetValA, ReTrMod
RDIR	Directional element	Mod, Beh, Health, NamPlt, Dir, ChrAng, MinFwdAng, MinRvAng, MaxFwdAng, MaxRvAng, BlkValA, BlkValV, PolQty, MinPPV
RDRE	Disturbance recorder function	Mod, Beh, Health, NamPlt, OpCntRs, RcdTrg, MemRs, MemClr, RcdMade, FltNum, GriFltNum, RcdStr, MemUsed, TrgMod, LevMod, PreTmms, PstTmms, MemFull, MaxNumRcd, ReTrgMod, PerTrgTms, ExclTmms, OpMod
RDRS	Disturbance record handling	Mod, Beh, Health, NamPlt, AutoUpLod, DltRcd
RFLO	Fault locator	Mod, Beh, Health, NamPlt, OpCntRs, FltZ, FltDiskm, FltLoop, R1, X1, R0, X0, Z1Mod, Z1Ang, Z0Mod, Z0Ang, Rm0, Xm0, Zm0Mod, Zm0Ang
RPSB	Power swing detection/blocking	Mod, Beh, Health, NamPlt, OpnCntRs, Str, Op, BlkZn, ZeroEna, NgEna, MaxEna, SwgVal, SwgRis, SwgReact, SwgTmms, UnBlkTmms, MaxNumSlp, EvTmms
RREC	Autoreclosing	Mod, Beh, Health, NamPlt, OpnCntRs, BlkRec, ChkRec, Auto, Op, AutoRecSt, Rec1Tmms, Rec2Tmms, Rec3Tmms, PlsTmms, RclTmms
RSYN	Synchronism-check	Mod, Beh, Health, NamPlt, RHz, LHz, RV, LV, Rel, VInd, AngInd, HzInd, SynPrg, DifVClc, DifHzClc, DifAngClc, DifV, DifHz, DifAng, LivDeaMod, DeaLinVal, LivLinVal, DeaBusVal, LivBusVal, PlsTmms, BkrTmms

Node Class	Node Class Description	Available Data Objects
SARC	Monitoring and diagnostics for arcs	Mod, Beh, Health, NamPlt, EEHealth, EEName, OpCntRs, FACntRs, FADet, ArcCntRs, SwArcDet
SIMG	Insulation medium supervision	Mod, Beh, Health, NamPlt, EEHealth, EEName, Pres, Den, Tmp, InsAlm, InsBlk, InsTr, PresAlm, DenAlm, TmpAlm, InsLevMax, InsLevMin
SIML	Insulation medium supervision (liquid)	Mod, Beh, Health, NamPlt, EEHealth, EEName, Tmp, Lev, Pres, H2O, H2OTmp, H2, InsAlm, InsBlk, InsTr, TmpAlm, PresTr, PresAlm, GasInsAlm, GasInsTr, InsLevMax, InsLevMin, H2Alm, MstAlm
SPDC	Monitoring and diagnostics for partial discharges	Mod, Beh, Health, NamPlt, EEHealth, EEName, OpCnt, AcuPaDsch, PaDschAlm
TCTR	Current transformer	Mod, Beh, Health, NamPlt, EEHealth, EEName, OpTmh, Amp, ARtg, HzRtg, Rat, Cor, AngCor
TVTR	Voltage transformer	Mod, Beh, Health, NamPlt, EEHealth, EEName, OpTmh, Vol, FuFail, VRtg, HzRtg, Rat, Cor, AngCor
WALM	Wind power plant information	Mod, Beh, Health, AlmSt, EvtTm
WAPC	Wind power plant active power control	Mod, Beh, Health, NumOpTur, PlWLimEn, PlVAEn, PlGraEn, PlDelEn, PlWCap, PlW, PlVA, PlGra, PlWDel, PlWAtv, PlVAAtv, PlGraAtv, PlDelAtv, SetPlW, SetPlVA, SetPlWUpGra, SetPlWDoGra, SetPlDel
WCNV	Wind turbine converter information	Mod, Beh, Health, OpTmRs, CnvOpMod, ClSt, Hz, Torq, GnPPV, GnPhV, GnA, GnPF, GriPPV, GriPhV, GriA, GriPF, CnvTmpGn, CnvTmpDclink, CnvTmpGri, DclVol, DclAmp
WGEN	Wind turbine generator information	Mod, Beh, Health, OpTmRs, GnOpMod, ClSt, Spd, W, VAr, GnTmpSta, GnTmpRtr, GnTmpInlet, StaPPV, StaPhV, StaA, RtrPPV, RtrPhV, RtrA, RtrExtDC, RtrExtAC,

Node Class	Node Class Description	Available Data Objects
WMET	Wind power plant meteorological information	Mod, Beh, Health, MetAlt1Alt, MetAlt1HorWdSpd, MetAlt1VerWdSpd, MetAlt1HorWdDir, MetAlt1VerWdDir, MetAlt1Tmp, MetAlt1Hum, MetAlt1Pres
WNAC	Wind turbine nacelle information	Mod, Beh, Health, BecTmRs, BecBulbSt, WdHtSt, IceSt, AneSt, Dir, WdSpd, WdDir, ExTmp, IntlTmp, IntlHum, BecLumLev, Vis, Ice, DispXdir, DispYdir, SetBecMod, SetBecLev, SetFlsh
WROT	Wind turbine rotor information	Mod, Beh, Health, RotSt, BlStBl1, BlStBl2, BlStBl3, PtCtlSt, RotSpd, RotPos, HubTmp, PtHyPresBl1, PtHyPresBl2, PtHyPresBl3, PtAngSpBl1, PtAngSpBl2, PtAngSpBl3, PtAngValBl1, PtAngValBl2, PtAngValBl3, BlkRot, PtEmgChk
WRPC	Wind power plant reactive power control	Mod, Beh, Health, NumOpTur, PlVArMode, PlVAr, PlVArCapImp, PlVArCapExp, PlPF, PlV, PlVArAtv, SetPlVAr, SetPlVArUpGra, SetPlVArDoGra, SetPlV, SetPlVUpGra, SetPlVDoGra, SetPlDrp, SetPlPF
WTOW	Wind turbine tower information	Mod, Beh, Health, LiftSt, DehumSt, HtexSt, LiftPos, IntlHum
WTRF	Wind turbine transformer information	Mod, Beh, Health, TrfOpTmRs, TrfClSt, OilLevSt, MTPresSt, TrfTurPPV, TrfTurPhV, TrfTurA, TrfGriPPV, TrfGriPhV, TrfGriA, TrfTmpTrfTur, TrfTmpTrfGri, AtvGriSw
WTRM	Wind turbine transmission information	Mod, Beh, Health, BrkOpMod, LuSt, FtrSt, ClSt, HtSt, OilLevSt, OfFltSt, InlFltSt, TrmTmpShfBrg1, TrmTmpShfBrg2, TrmTmpGbxOil, TrmTmpShfBrk, VibGbx1, VibGbx2, GsLev, GbxOilLev, GbxOilPres, BrkHyPres, OfFlt, InlFlt

Node Class	Node Class Description	Available Data Objects
WTUR	Wind turbine general information	Mod, Beh, Health, AvlTmRs, OpTmRs, StrCnt, StopCnt, TotWh, TotVArh, DmdWh, DmdVArh, SupWh, SupVArh, TurSt, W, VAr, SetTurOp, VArOvW, VArRefPri, DmdW, DmdVAr, DmdPF
WYAW	Wind turbine yawing information	Mod, Beh, Health, CwTm, CcwTm, YwSt, YwBrakeSt, YwSpd, Tmp, YawAng, CabWup, SysGsLev, BrkPres, AtvYw
XCBR	Circuit breaker	Mod, Beh, Health, NamPlt, Loc, EEHealth, EEName, OpCnt, Pos, BlkOpn, BlkCls, ChaMotEna, SumSwARs, CBOpCap, POWCap, MaxOpCap
XCWI	Circuit switch	Mod, Beh, Health, NamPlt, Loc, EEHealth, EEName, OpCnt, Pos, BlkOpn, BlkCls, ChaMotEna, SwTyp, SwOpCap, MaxOpCap
YEFN	Earth fault neutralizer (Petersen coil)	Mod, Beh, Health, NamPlt, EEHealth, EEName, OpTmh, ECA, ColTapPos, ColPos
YLTC	Tap changer	Mod, Beh, Health, NamPlt, EEHealth, EEName, OpCnt, Torq, MotDrvA, TapPos, TapChg, EndPosR, EndPosL, OilFil
YPSH	Power shunt	Mod, Beh, Health, NamPlt, Loc, EEHealth, EEName, OpTmh, Pos, BlkOpn, BlkCls, ShOpCap, ChaMotEna, MaxOpCap
YPTR	Power transformer	Mod, Beh, Health, NamPlt, EEHealth, EEName, OpTmh, HPTmp, HPTmpAlm, HPTmpTr, OANL, OpOvA, OpOvV, OpUnV, CGAlm, HiVRtg, LoVRtg, PwrRtg
ZAXN	Auxiliary network	Mod, Beh, Health, NamPlt, EEHealth, EEName, OpTmh, Vol, Amp
ZBAT	Battery	Mod, Beh, Health, NamPlt, EEHealth, EEName, OpTmh, Vol, VolChgRte, Amp, BatTest, TestRsl, BatHi, BatLo, LoBatVol, HiBatVol
ZBSH	Bushing	Mod, Beh, Health, NamPlt, EEHealth, EEName, OpTmh, React, LosFact, Vol, RefReact, RefPf, RefV

Node Class	Node Class Description	Available Data Objects
ZCAB	Power cable	Mod, Beh, Health, NamPlt, EEHealth, EEName, OpTmh
ZCAP	Capacitor bank	Mod, Beh, Health, NamPlt, EEHealth, EEName, OpTmh, CapDS, DschBlk
ZCON	Converter	Mod, Beh, Health, NamPlt, EEHealth, EEName, OpTmh
ZGEN	Generator	Mod, Beh, Health, NamPlt, EEHealth, EEName, OpTmh, GnCtl, DExt, AuxSCO, StopVlv, ReactPwrR, ReactPwrL, GnSpd, GnSt, OANL, ClkRot, CntClkRot, OpUnExt, OpOvExt, LosOil, LosVac, PresAlm, DmdPwr, PwrRtg, VRtg
ZGIL	Gas insulated line	Mod, Beh, Health, NamPlt, EEHealth, EEName, OpTmh
ZLIN	Power overhead line	Mod, Beh, Health, NamPlt, EEHealth, EEName, OpTmh
ZMOT	Motor	Mod, Beh, Health, NamPlt, EEHealth, EEName, OpTmh, DExt, LosOil, LosVac, PresAlm
ZREA	Reactor	Mod, Beh, Health, NamPlt, EEHealth, EEName, OpTmh
ZRRC	Rotating reactive component	Mod, Beh, Health, NamPlt, EEHealth, EEName, OpTmh
ZSAR	Surge arrestor	Mod, Beh, Health, NamPlt, EEHealth, EEName, OpCnt, OPSA
ZTCF	Thyristor controlled frequency converter	Mod, Beh, Health, NamPlt, EEHealth, EEName, OpTmh, PwrFrq
ZTCR	Thyristor controlled reactive component	Mod, Beh, Health, NamPlt, EEHealth, EEName, OpTmh

Table D-1: Data Objects Available to Each Node Class

Appendix B – NCD Server Mode Configuration Actions

You can perform any of the following file configuration steps in NCD Server Mode. You can perform these actions on an existing SCL file in NCD without following the typical modification workflow described in the Procedure to Modify an Existing SCL File section. These actions can also be performed in Model Builder.

- Modify IED Information
- Modify Communication Settings
- Modify Services Settings
- Modify LDevice Options
- Modify Logical Node Instance, Prefix and Description Options
- Add a DataSet to an LLN0 Node
- Add a Report Control Block to an LLN0 Node
- Add a GOOSE Control Block to an LLN0 Node

Modify IED Information

To modify the IED Information settings in the SCL file, complete the following steps.

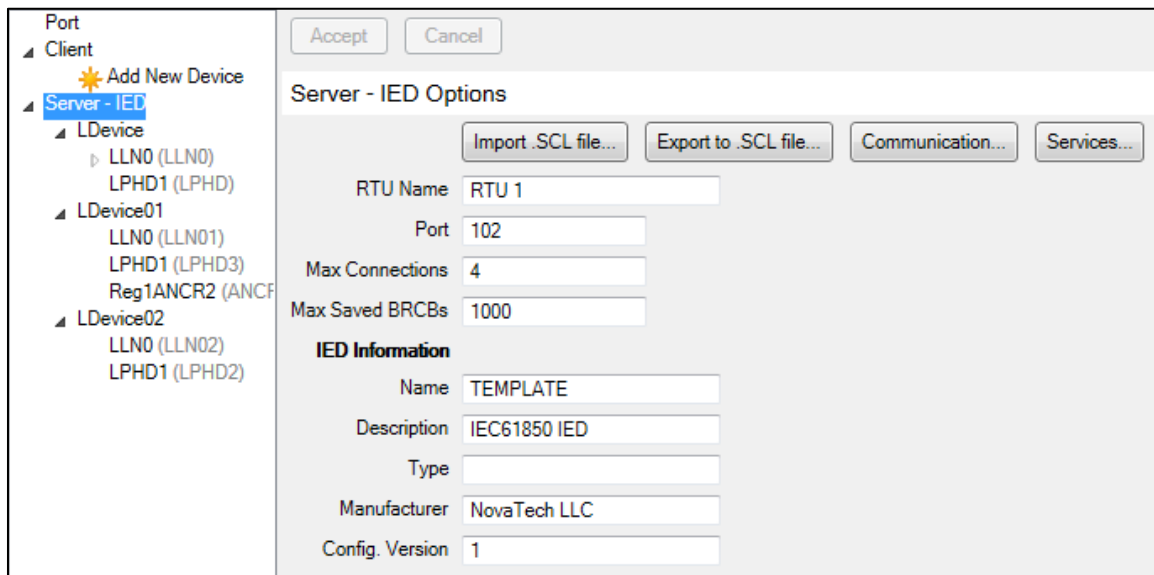1. In NCD Server mode, in the left pane, select `Server – IED`.

Figure D-1: Modify IED Information

2. Under `IED Information`, modify the `Name`, `Description`, `Type`, `Manufacturer`, and `Config. Version` settings as desired.

3. Click `Accept`.

Modify Communication Settings

To modify the settings in the `Communication` section of the SCL file in NCD, complete the following steps. For more information about the purpose of the attributes contained in the `Communication` section, refer to the official *IEC 61850 Technical Report* issued by IEC.

1. On the `Server – IED Options` page (Figure D-1), click `Communication`.

Figure D-2: Edit Communication Section

2. In the `Edit Communication Section` dialog box, enter the desired text in each field that you want to configure. Empty fields are not included in the SCL file.

3. Click `OK`.

Modify Services Settings

To modify the settings in the `Services` section of the SCL file in NCD, complete the following steps. For more information about the purpose of the attributes contained in the `Services` section, refer to the official *IEC 61850 Technical Report* issued by IEC.

1. On the `Server – IED Options` page (Figure D-1), click `Services`.

Figure D-3: Edit Services Section

2. In the `Edit Services Section` dialog box, enter the desired text in each field that you want to configure in the SCL file. Empty fields and unmarked check boxes are not included in the SCL file.

3. Click `OK`.

Modify LDevice Options

To modify the descriptive settings for a logical device in NCD, complete the following steps.

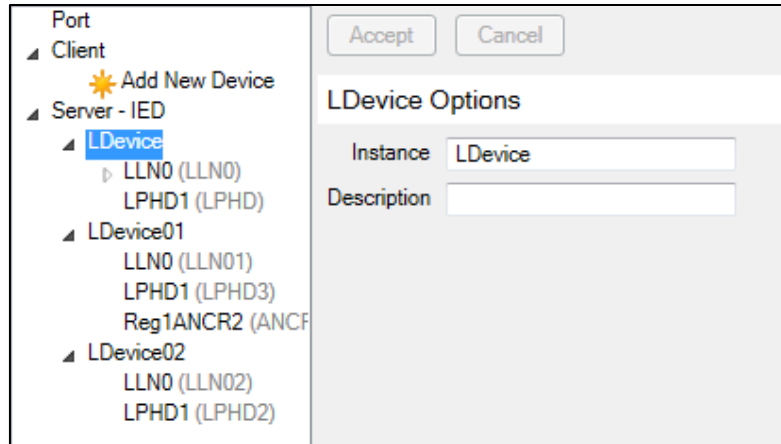1. In NCD Server Mode, in the left pane, select a logical device.

Figure D-4: Modify Logical Device Options

2. Under `LDevice Options`, modify the `Instance` and `Description` fields as desired.

3. Click `Accept`.

Modify Logical Node Instance, Prefix and Description Options

You can modify the instance number, prefix, and description for a logical node in NCD Server Mode. To modify display settings for a logical node and the logical node description in NCD, complete the following steps.

Important   If you imported an SCD file in NCD Server Mode, we do not recommend modifying the instance or prefix fields in this window. To ensure expected device communication, we recommend modifying these settings in an ICD file using Model Builder using the Modify Logical Node Options procedure. This warning does not apply if you imported an ICD, CID, or SCL file in NCD Server Mode.

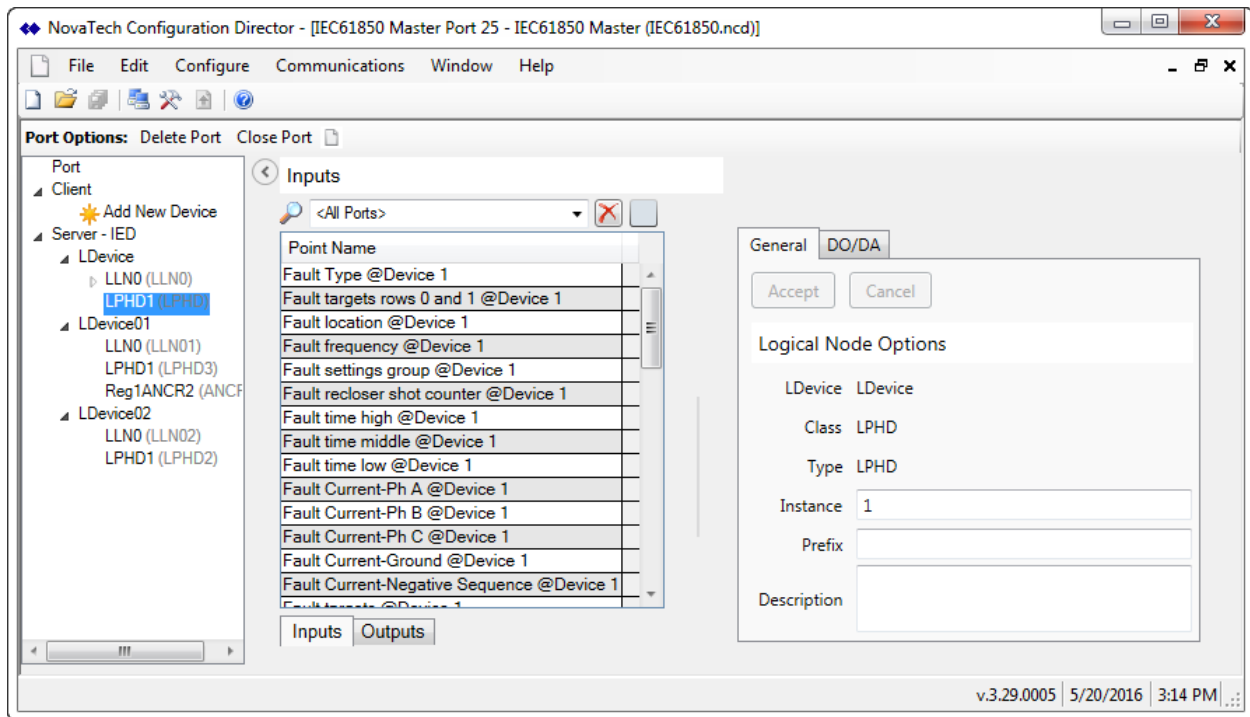1. In NCD Server Mode, in the left pane, select a logical node.

Figure D-5: Modify Logical Node Options

2. On the `General` tab, under `Logical Node Options`, modify the `Instance`, `Prefix`, and `Description` fields as desired. For more information regarding the functions of the `Instance` and the `Prefix` fields, refer to the Add a New Logical Node section.

3. Click `Accept`.

Add a DataSet to an LLN0 Node

To add a DataSet to a logical node in the LLN0 class in NCD, complete the following steps.

1. In the left pane, on the `IED` tab, select the LLN0 logical node where you want to add a DataSet.
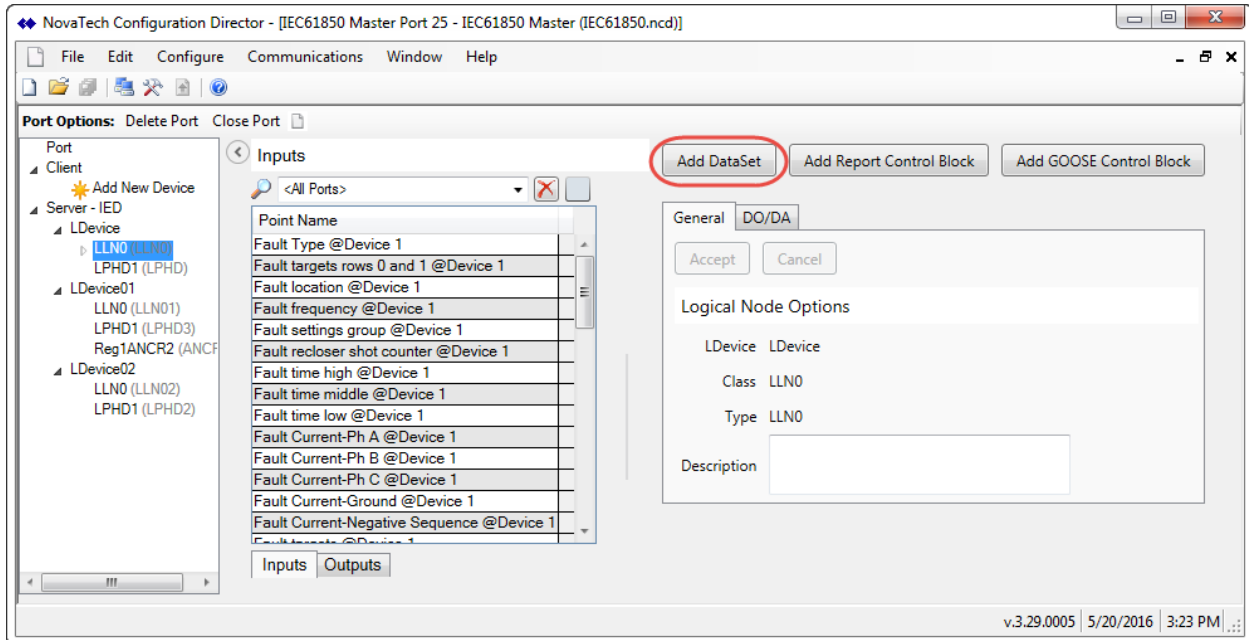

Figure D-6: Add DataSet in NCD

2. Click `Add DataSet`. If the warning about FCDAs being mandatory displays, click `OK`.

3. Optional. On the `DataSet Options` page, add values to the `Name` and `Description` fields and click `Accept`. You cannot manually modify the `DataSet Details` setting.
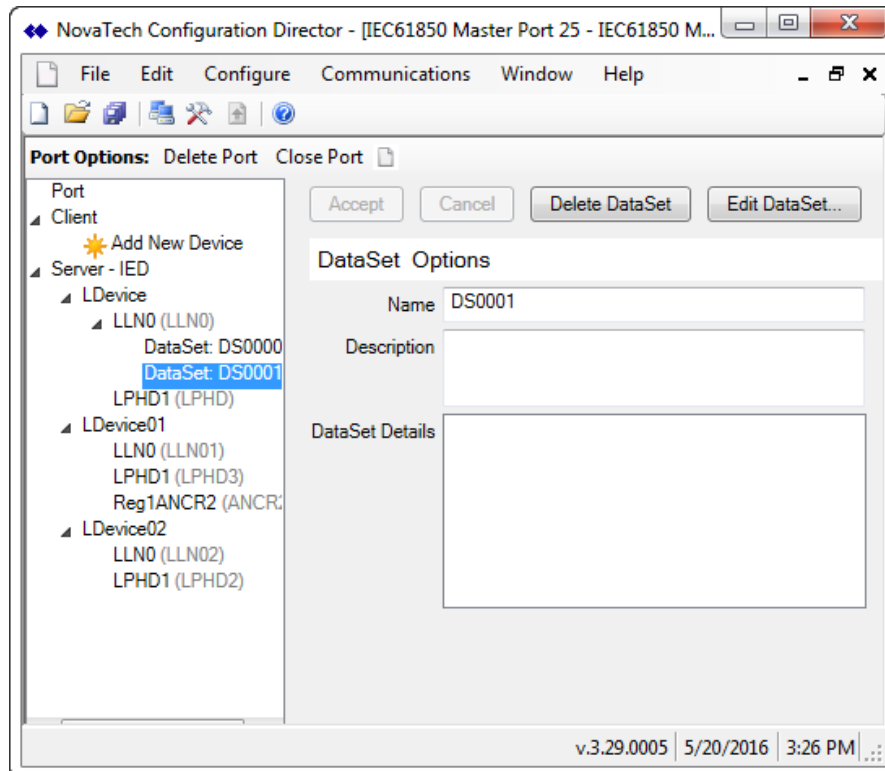

Figure D-7: DataSet Options Page in NCD

4. Click `Edit DataSet`.

5. In the `Edit DataSet` dialog box, in the left pane, navigate your configured point hierarchy to display the data attributes that you want to associate with the DataSet.

6. For each desired attribute, select the data attribute in the left pane and click the `Right Arrow` ⧉ button. In the following example, the `PhyHealth [ST]` and `d [DC]` attributes were associated with the DataSet.
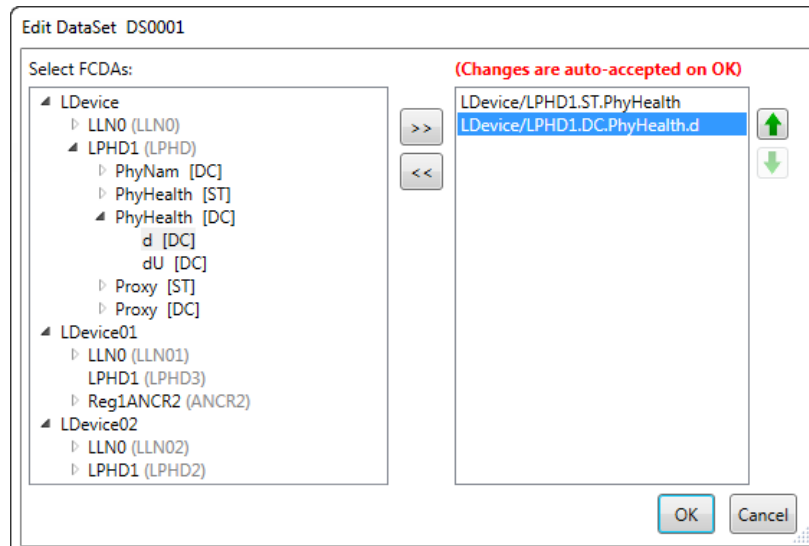

Figure D-8: Edit DataSet Dialog Box in NCD

7. Optional. To modify the order of associated data attributes, use the green arrow buttons to move the selected data attribute.

8. After adding the desired data attributes, click `OK`.

Add a Report Control Block to an LLN0 Node

To add a Report Control Block to a logical node with the LLN0 class in NCD, complete the following steps.

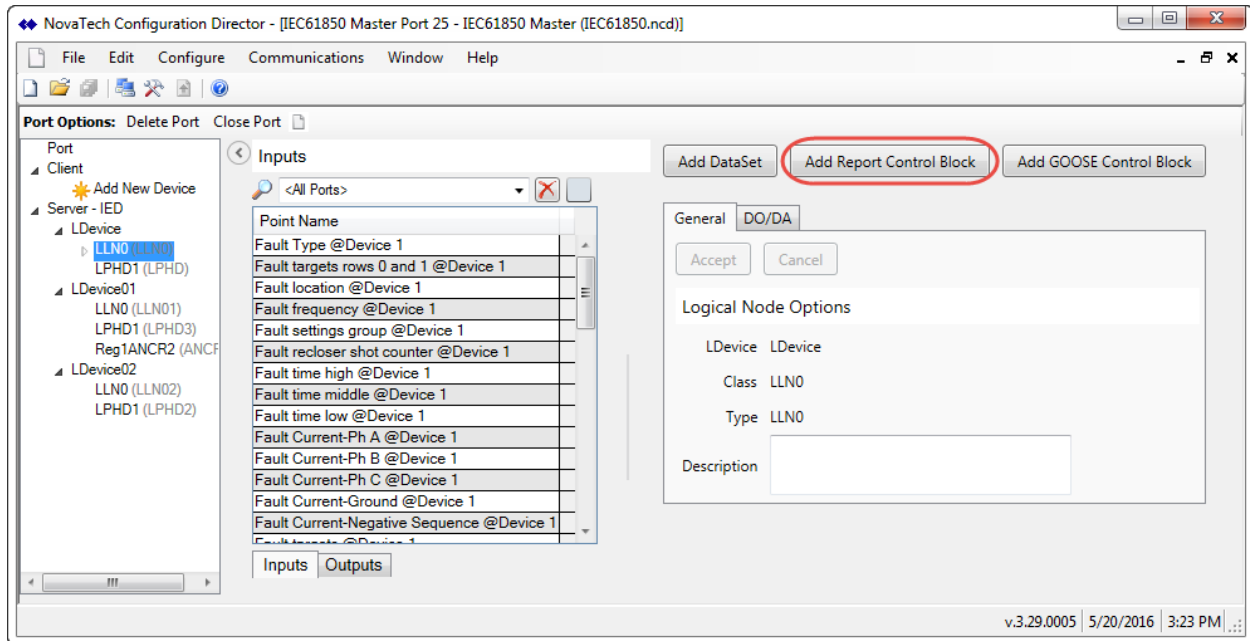1. In the left pane, select the LLN0 logical node where you want to add a `Report Control Block`.

Figure D-9: Add Report Control Block in NCD

2. Click `Add Report Control Block`.

3. If a warning about an associated DataSet being mandatory displays, click `OK`. This warning only displays the first time you click the `Add Report Control Block` button during this session of `NCD`.
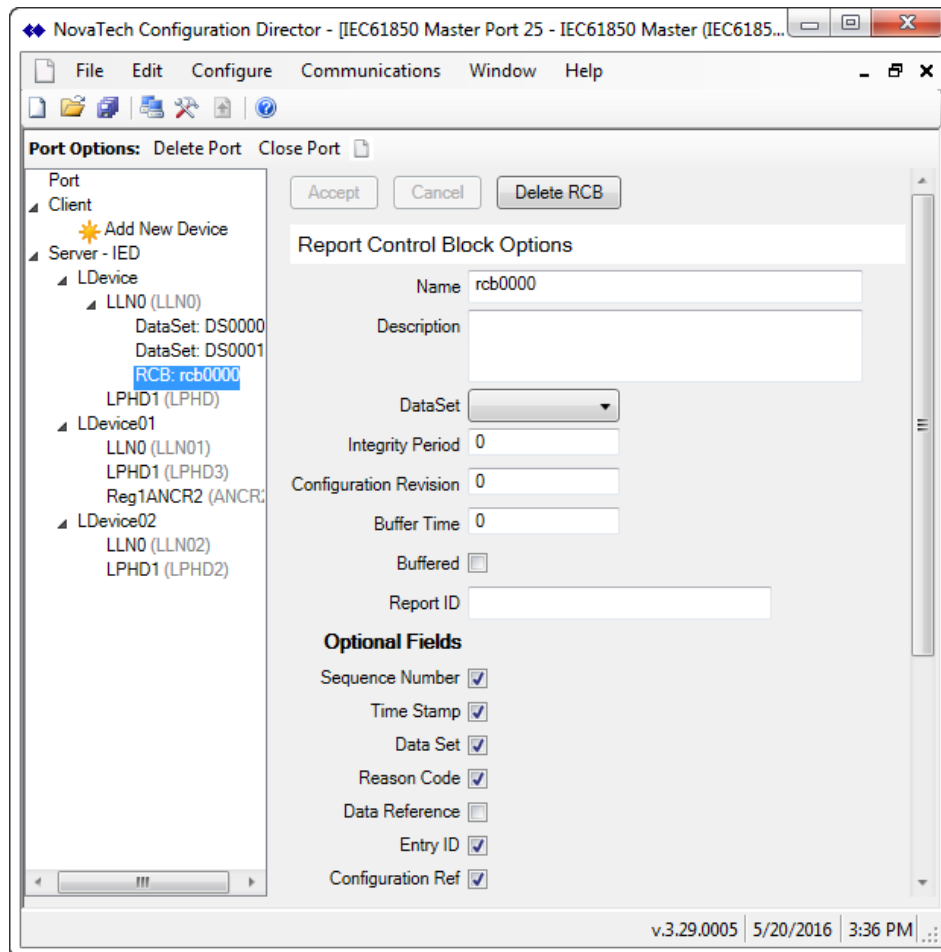

Figure D-10: Report Control Block Options Page

4. On the `Report Control Block Options` page, configure the various options available for the Report Control Block. For more information regarding these settings, refer to the *IEC 61850 Technical Report* from the official IEC website.

5. Click `Accept`.

Add a GOOSE Control Block to an LLN0 Node

To add a GOOSE Control Block to a logical node with the LLN0 class in NCD, complete the following steps.

1. In the left pane, select the LLN0 logical node where you want to add a GOOSE Control Block.
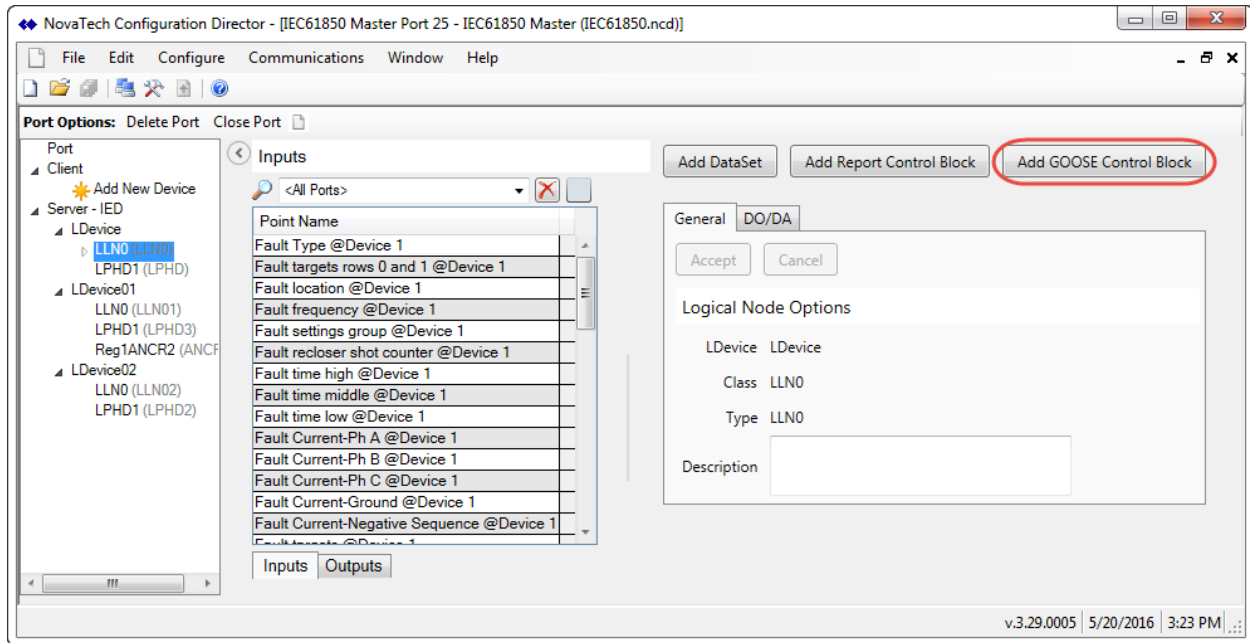

Figure D-11: Add GOOSE Control Block in NCD

2. Click `Add GOOSE Control Block`.

3. If a warning about an associated DataSet being mandatory displays, click `OK`. This warning only displays the first time you click the `Add GOOSE Control Block` button during this session of NCD.
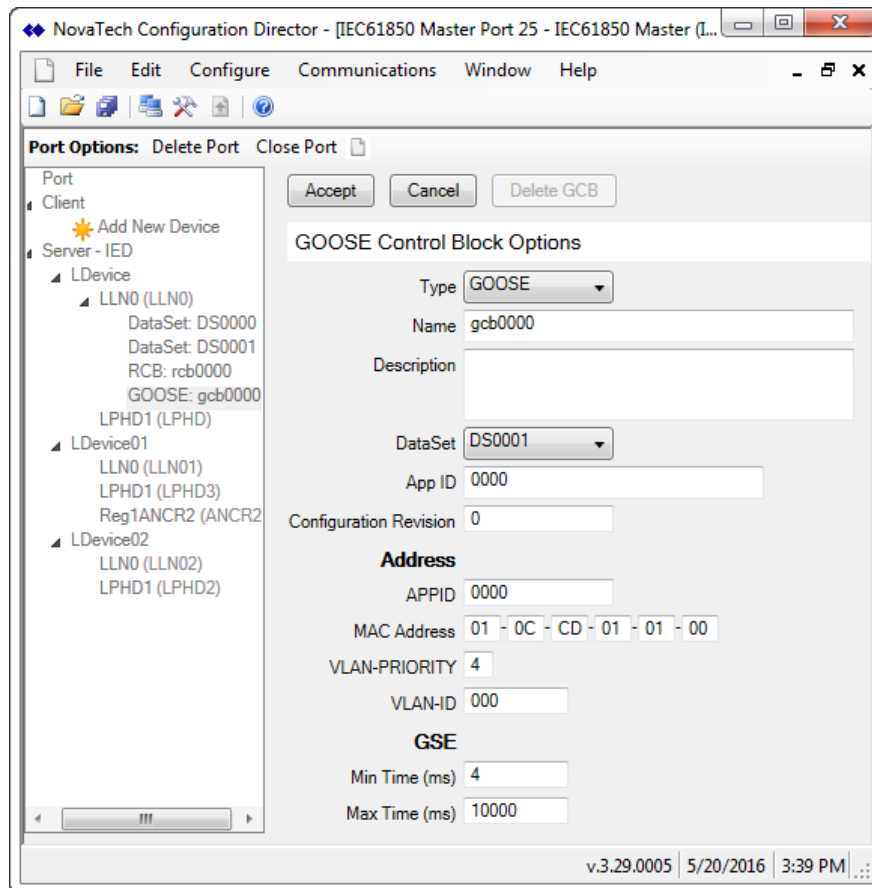

Figure D-12: GOOSE Control Block Options Page in NCD

4. On the `GOOSE Control Block Options` page, configure the various options available for the GOOSE Control Block. For more information regarding these settings, refer to the *IEC 61850 Technical Report* from the official IEC website.

5. Click `Accept`.

Appendix C – Additional Documentation

The following additional documentation may be required for setting up and operating the OrionLX. In addition, for each specified NovaTech protocol, the respective manual is included on the installation CD.

The default NCD installation stores the NovaTech documentation files in `C:\Program Files (x86)\NovaTech LLC\NCD3\Docs`. Third-Party documentation is not included on the NovaTech installation CD and cannot be verified as accurate by NovaTech.

Document Title	File Name
OrionLX User Manual	OrionLX_User_Manual.pdf
OrionLXm User Manual	OrionLXm_User_Manual.pdf

Table D-2: NovaTech Documentation

For additional information related to the IEC61850 protocol, refer to the International Electromechanical Commission (IEC) website: www.iec.ch.

Revision	Date	Changes
A	07/22/16	Initial Release. NF