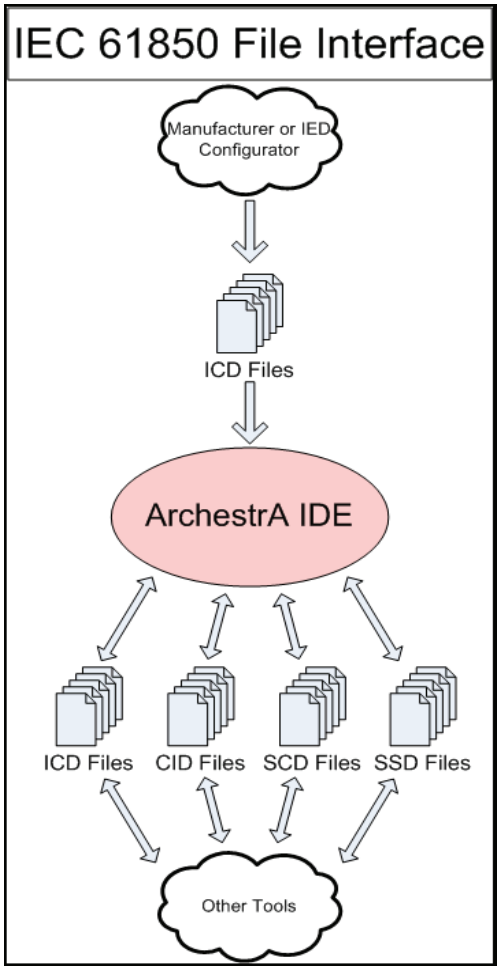
Substation Automation Configuration for ArchestrA® IDE



BACKGROUND

The IEC 61850 standard for communications in substations allows the development of multi-functional Intelligent Electronic Devices (IEDs) for substation protection, monitoring and control systems.

The Substation Configuration Language (SCL) defined in IEC 61850 allows a standardized description for substation configuration and for IED communications and configuration.

The SCL is a complex language based on the eXtensible Markup Language (XML) and complies with the IEC 61850 XML schema. It is used to define four types of configuration files:

- IED Capability Description (ICD)
- Configured IED Description (CID)
- Substation Configuration Description (SCD)
- System Specification Description (SSD).

The IED vendor supplies the ICD file or the proprietary configuration tool that is used to configure the IED parameters and produce the CID file. However, using this tool for creation and configuration of the CID, SCD, and SSD files can be tedious and error-prone.

The Substation Automation Configuration software is an add-on module for the ArchestrA® IDE (Integrated Development Environment) that provides an integrated solution to easily create and configure those files.

INTRODUCTION

The Substation Automation Configuration software extends the capabilities of ArchestrA IDE to handle the configuration of IEC 61850 devices and substations. This software consists of the following:

- IEC 61850 IDE Extension
- IEC 61850 Device Application Object
- IEC 61850 Substation Application Object.

FEATURES

- Windows based Graphical User Interface (GUI) providing user-friendly data entry and editing.
- Intuitive techniques, such as tree-view, list-view, copy and paste, drag and drop, and pull-down/pop-up menus.
- Efficient ICD file management that converts an CID file created by other tools into an ICD file.
- Easy IED configuration of Services, a Data Object Instance (DOI), a Generic Object Oriented Substation Event (GOOSE), a Generic Substation Status Event (GSSE), a Report Control Block, Datasets, Logical Devices, Logical Nodes and Data Types.
- Designing ICD file that represents the RTU as a IEC 61850 server device and provides an intelligent tool for mapping RTU points to data object attributes in the logical node.
- Visual configuration tool that guides users in substation SLD (Single Line Diagram) composition. The tool produces a drawing file that is compatible with the popular Microsoft Visio® 2003. The SLD can be exported as an SSD file or extracted from the SCD or SSD file.
- Standard ICD, CID and SCD file production. The SCD file can be uploaded to the System Configurator for the creation of the SCD5200 configuration file.

FUNCTIONAL DESCRIPTION

The Substation Automation Configuration software allows system engineers to design, configure, and maintain an IEC 61850 IED configuration. It provides the capability to:

- Design a ICD file, if desired
- Customize the ICD file with parameters to suit specific needs and produce the CID file
- Create the SCD file which describes the IEDs deployed in a substation
- Generate the SSD file containing the SLD of the system.

MAIN SCREEN (OVERVIEW)

The main ArchestrA IDE screen is divided into several areas:

- The top area contains the pull-down menu and tool-bar. Actions, such as ICD, CID and SCD file generation, on the selected object can be initiated from the pull-down menu.
- The left area consists of two panes:
  - The upper pane is the template toolbox that shows the Substation Automation Configuration tool set.
  - The lower pane shows the hierarchical views (model, deployment and derivation) of the object.
- The right area is the user interface for performing object configuration.
- The bottom area indicates the user and database details.

Figure 1 is a typical ArchestrA IDE screen. As shown, the Substation Automation Configuration toolset appears in the template toolbox and contains two application object templates:

- $IEC_61850_Device and
- $IEC_61850_Substation.

Figure 2 is a typical configuration session of the IEC 61850 device instance; Figure 3 is a typical configuration session of the IEC 61850 substation instance.

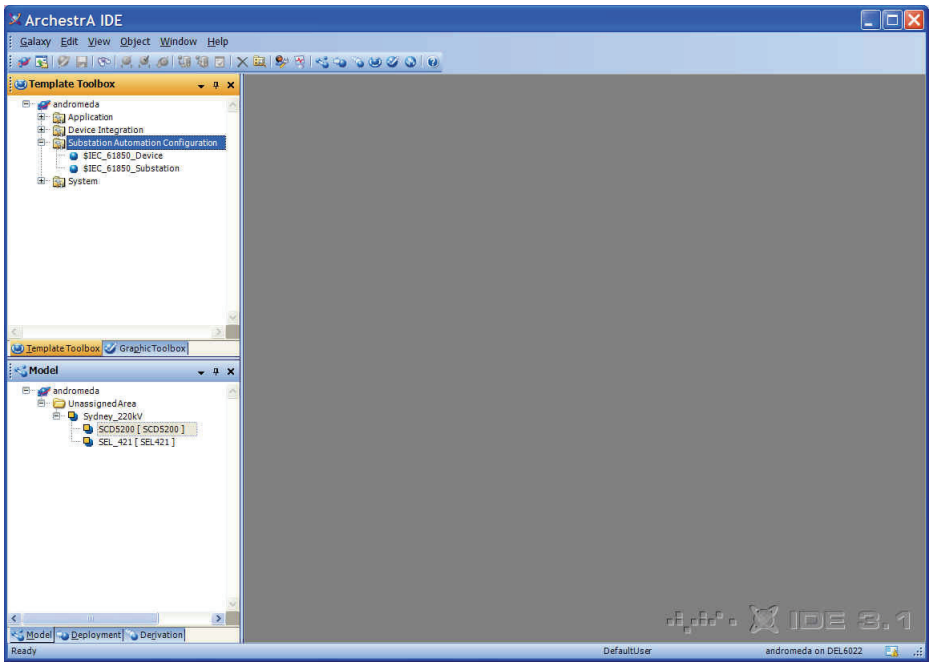


Figure 1. ArchestrA IDE Main Screen

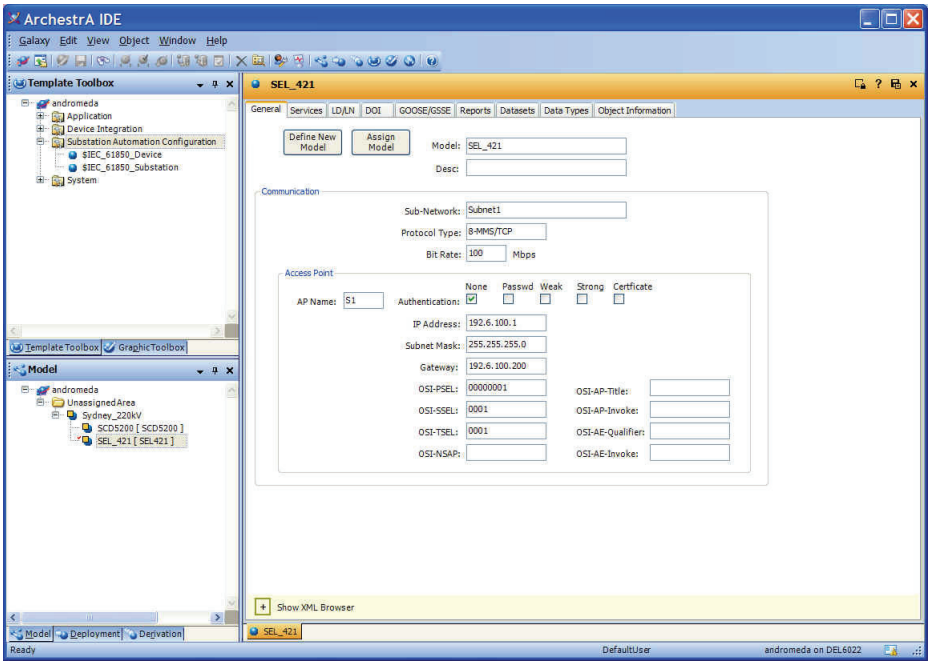


Figure 2. IEC 61850 Device Configuration

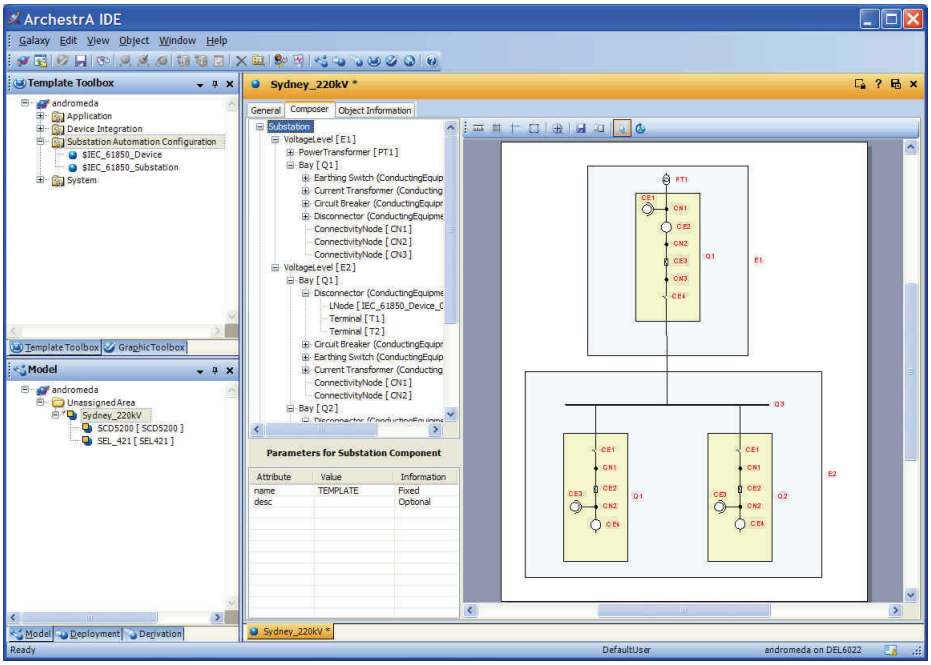


Figure 3. IEC 61850 Substation Configuration

ICD FILE MANAGEMENT

As the variety of IED models used by the substation expands, many ICD files from various vendors will be available.

The Substation Automation Configuration software helps manage large collections of ICD files at a central location. Simply register each of the ICD files for immediate availability for the IED configuration.

Figure 4 shows the pull-down menu from which to invoke ICD File Management. This option activates the snap-in window where the ICD file is registered. See Figure 5 and Figure 6.

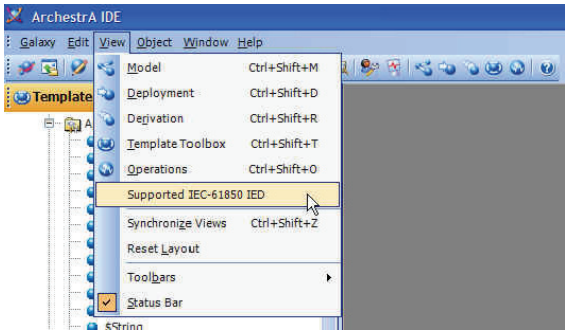


Figure 4. Invoking ICD File Management

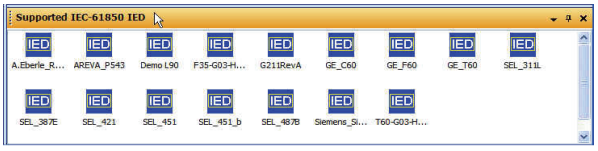


Figure 5. ICD File Management Icons View

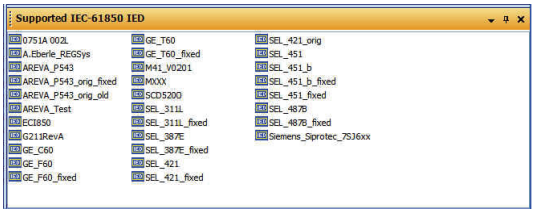


Figure 6. ICD File Management List View

IEC 61850 DEVICE

Depending on the IED model, many commonly modified or customized IED parameters can be configured, such as enable or disable services, networking addresses, GOOSE/GSSE, reports, datasets, and initial values of the IED data objects.

The following figures represent screens that appear during IED configuration.

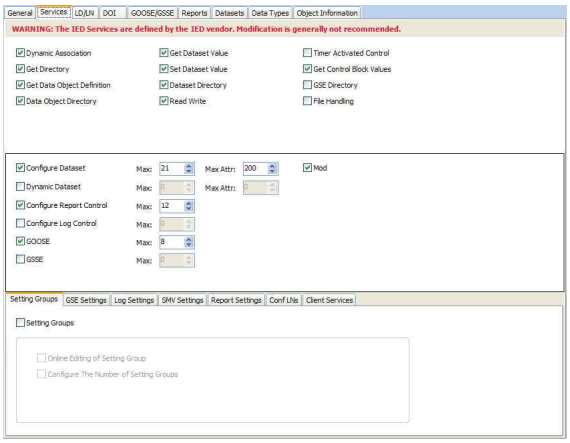


Figure 7. IED Services

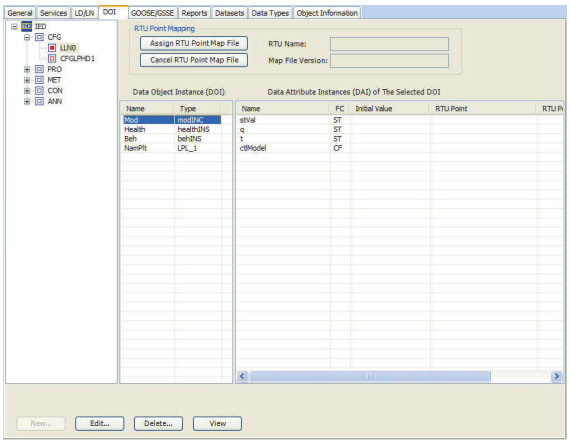


Figure 8. IED Data Object Instance (DOI)

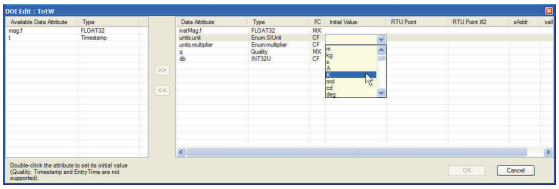


Figure 9. DOI Data Attributes

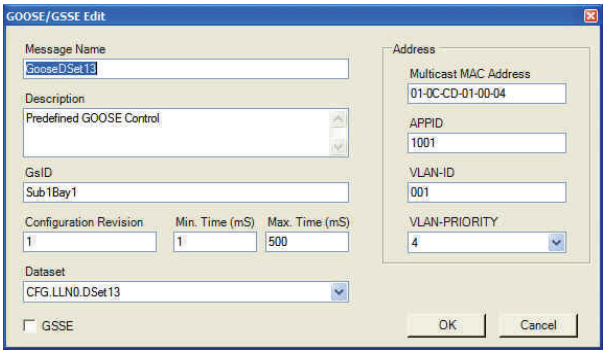


Figure 10. GOOSE/GSSE Parameters

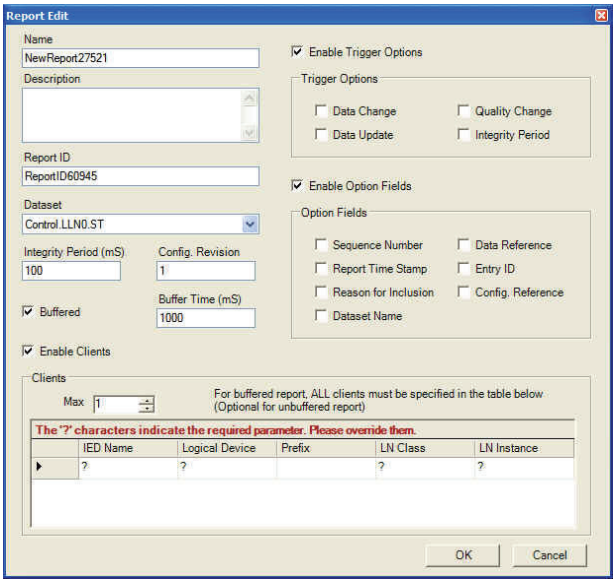


Figure 11. Report Parameters

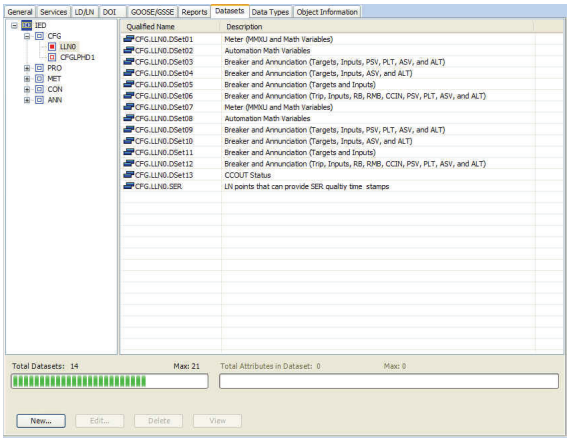


Figure 12. List of Datasets

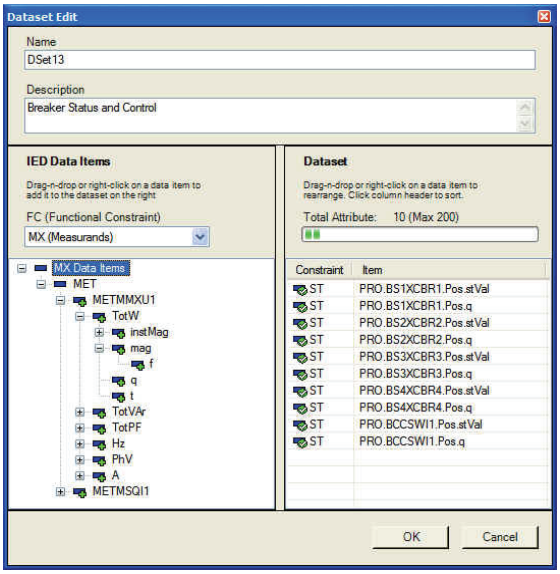


Figure 13. Datasets

IEC 61850 SUBSTATION

Using the drag and drop method in either the Model or Deployment view, you can configure a substation object and assign the IED to the substation. See the list of IEDs assigned to the substation in Figure 14.

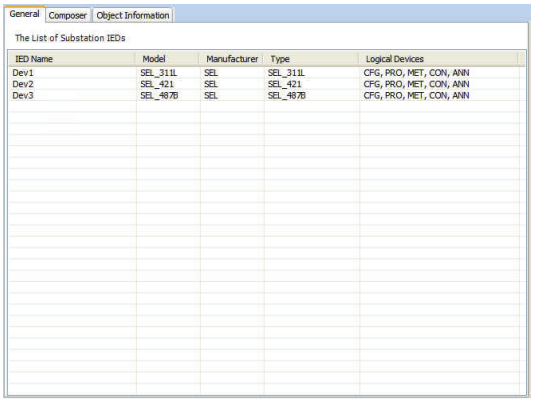


Figure 14. List of Substation IED

In addition, you can compose the single line diagram (voltage level, bay, and so forth) of the substation.

The substation composer shown in Figure 15 guides the building of the substation hierarchy using the intelligent context menu (Figure 16) to simplify the process.

As substation components (that is, switchyard equipments) are added and connected, their shapes are automatically drawn to quickly provide the visual composition.

Parameters of the substation components can also be customized, as shown in Figure 17.

The following figures illustrate screens shown during substation configuration.

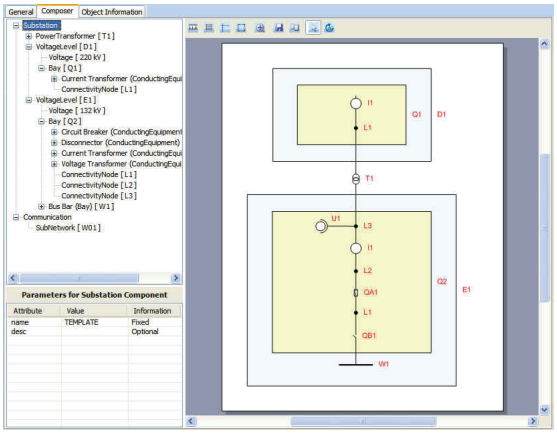


Figure 15. Substation Composer

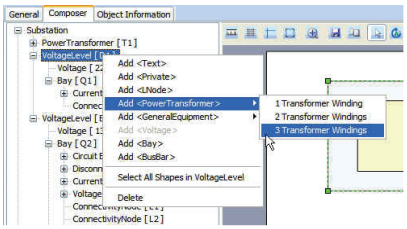


Figure 16. Building Substation Components

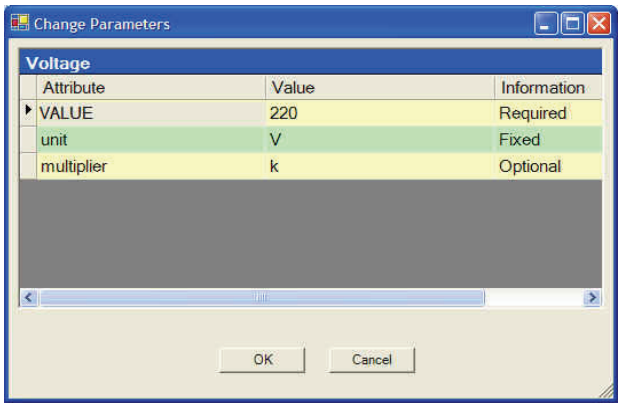


Figure 17. Component Attributes

With the IED assignments to the substation, the configuration of the substation component's LNode (Logical Node) is simplified by adding an LNode to the component and selecting the LN of the device (IED) to be associated with it. Throughout the process, LN parameters are presented. It is a matter of pointing and clicking the desired choices, eliminating the need to type in the LNode parameters. Figure 18 shows the LNode configuration screen.

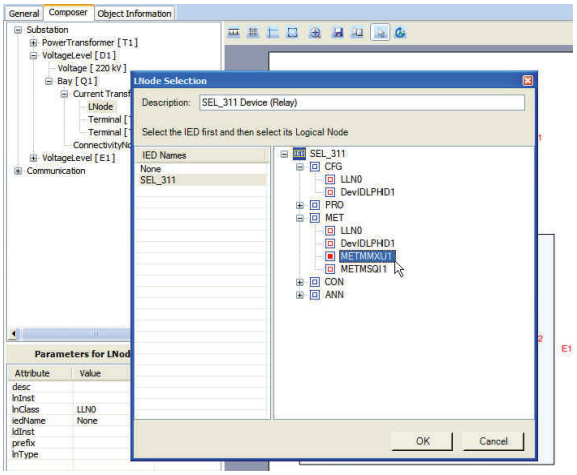


Figure 18. LNode Assignment

ICD, CID AND SCD FILE GENERATION

The function to generate the ICD, CID and SCD files, which captures all configured parameters, is invoked from the pull-down menu shown in Figure 19 or by activating the context menu for the selected object as shown in Figure 20.

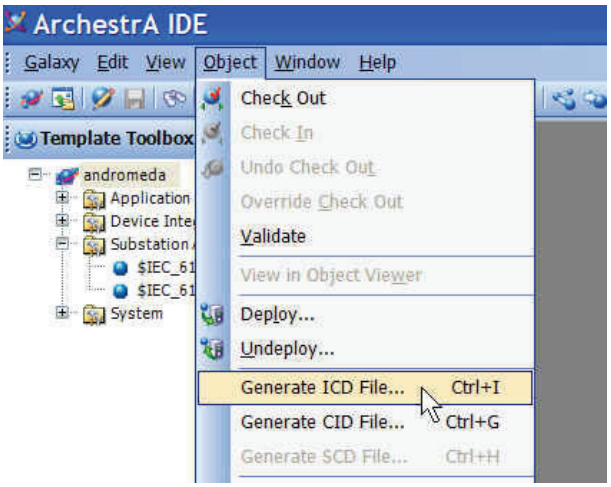


Figure 19. Pull-down Menu for CID File

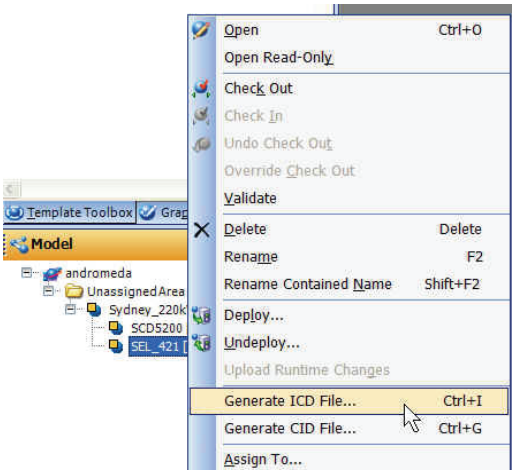


Figure 20. Context Menu for ICD File

FILE NAMES AND TYPES

ArchestrA IDE uses or generates the following files:

File Name Suffix	Description
.icd	IED Capability Description file.
.cid	Configured IED Description file.
.scd	Substation Configuration Description file.
.ssd	System Specification Description file.

SYSTEM REQUIREMENTS

Substation Automation Configuration software operates on the following two platforms:

- ArchestrA IDE and Wonderware® Application Server 3.1, SP1 or SP2
- InFusion™ Foundation Edition V2.0 and InFusion™ SCADA V2.0 or later.

The configuration software requires the following hardware and software:

- Windows-compatible PC
  (Recommended minimum: Intel Pentium®-D 3 GHz CPU or equivalent, 2 GB memory, 1 GB free hard disk space, standard VGA, monitor, mouse and keyboard)
- Windows Server® 2003 or Windows XP operating system
- ArchestrA IDE
  (Includes: Microsoft SQL Server® 2003 and Microsoft .NET 1.1)
- Microsoft Visio 2003. This is a prerequisite for only the Substation Automation Configuration – Advanced license.

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