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IED Modeler/Designer

Version 2016X

User Guide
Part 4: IED Model Validation
Windows 7/8 32/64bit

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For more information please visit http://iedmodeler.com or contact us at info@fuhuatech.com.

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1 Introduction

The IED Modeler/Designer is a comprehensive IED oriented SCL modelling tool for IEC 61850/61400 and companion standards. It has been designed to keep pace with the evolution of standards. Model Designer has been designed to address the diverse requirements of different types of users. It can be used by IEC 61850 Standard developers, IED vendors, stack vendors, researchers, engineers, utilities companies and people who are interested in applying Model Driven Architecture in system design. Feedback from this broad user base is allowing the product to evolve and we are continually adding new features to simplify the introduction of IEC 61850/61400 into production environments.

This user manual is delivered in four independent documents which need not be read in sequence.

Part One: IED Model Design

This section is fundamental and provides details on installation, GUI layout, system settings, project management, create/import/modify/export ICD/CID/IID, extract CID from SCD, and generation of TEMPLATE ICD etc., The Intelligent Creation feature greatly reduces the time and effort required to build error-free IED models. It assists in customizing data types, creation of LNs of different LNodeTypes, creation of DataSet and Control Blocks, initializing DOI values and configuring Communication parameters etc. These tasks can be conveniently completed with the help of user friendly Wizards. Batch editing of Attribute Values and Element Values is also now possible using external tools like Excel. Search Utilities allow convenient searching for project items. They use a Fuzzy search algorithm, allowing context search of documentation for each Element and Attribute.

Part Two: Domain Design

This section introduces simplified high level Domain design utilizing UML technologies. Like other UML tools in the market, Domain design is based on Diagrams. Here we introduce Data Type Diagrams and Domain Diagrams. These are much like Class Diagrams and Component Diagrams in UML but more powerful and convenient. The tool will remove the need for third party Domain support. It can simplify the creation of an Edition 2.0 package for Wind Power to a one-two hour task or even faster if worked on by an IEC member who is in charge of designing this domain.

Part Three: IED Model Extension

This section explains how to embed private model information into SCL without breaking any rules defined in IEC 61850-6. This capability is needed since SCL is often missing information e.g PLC logic equations and internal mappings etc., SCL usually does not address non-IEC 61850 and vendor-specific parameters configuration, all of which can be essential to running an application. Introducing this information requires model extension according to IEC 61850-6. Model Designer provides a cutting-edge, vendor-independent, flexible and programmable way to accomplish this task.

Part Four: IED Model Validation

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This section introduces Schema Check, Integrity Check and Semantic Check against rules defined by IEC 61850 Standards. Schema Check is the most popular feature used in most commercially available tools to confirm that SCL is error free. However experience shows that Schema checking alone is insufficient to catch many errors in SCL dynamic structures and semantic constraints.

Consider the following example:

<FCDA lnClass="MMXU" fc="MX" daName="PhV.phsA.cVal.mag.i" lnInst="1" ldInst="LDPQ"/>

<FCDA lnClass="MMXU" fc="MX" daName="A.phsA.cVal.mag.i" lnInst="1" ldInst="LDPQ"/>

The Schema Check is OK for the two DataSet entries above. However they are actually incorrect according to IEC 61850-6. PhV.phsA is DO.SDO, not DA. They should be corrected to:

<FCDA lnClass="MMXU" fc="MX" doName=" PhV.phsA" daName="cVal.mag.i" lnInst="1" ldInst="LDPQ"/>

<FCDA lnClass="MMXU" fc="MX" doName="A.phsA" daName="cVal.mag.i" lnInst="1" ldInst="LDPQ"/>

Schema Check is blind to these errors and tools from many vendors "accept" these errors. This results in IEDs arriving in production and not following rules defined in IEC 61850-6.

IED Model Validation is a critical. Model Designer implements Integrity Check which can detect errors that are blind to Schema Check.

Semantic Check is a feature under development and will be available in later releases.

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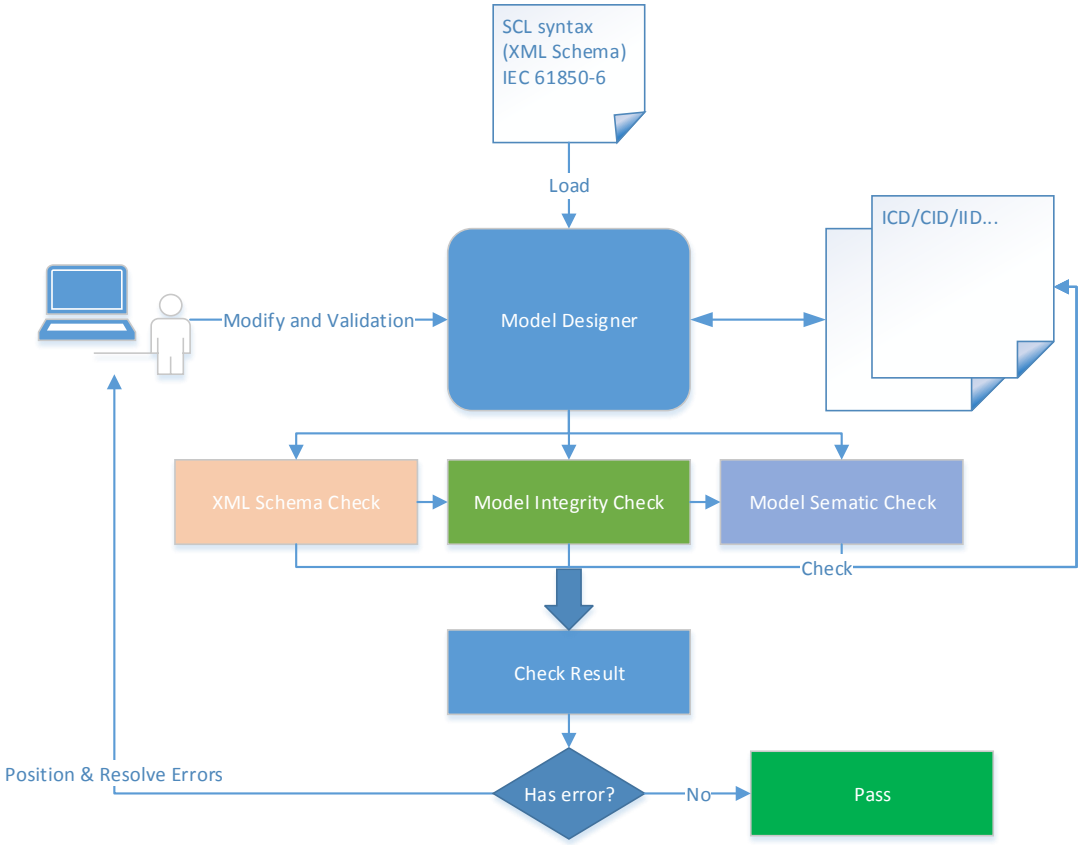
2 IED Model Validation



Model Designer currently supports XML Schema Check and Model Integrity Check. Model Semantic Check will be supported in the future.

The XML Schema Check is not bound to a fixed SCL Syntax. Users can supply a user specific variant and the Model Designer will load it dynamically when the Schema Check is triggered.

Model Integrity Check detects errors that cannot be detected by Schema Check. It confirms that the model does not have contradictions and potential mistakes that can lead to undefined behaviors and instability in derived applications.

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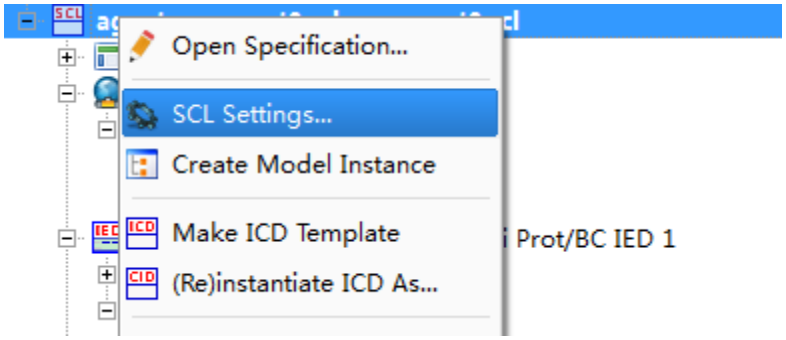
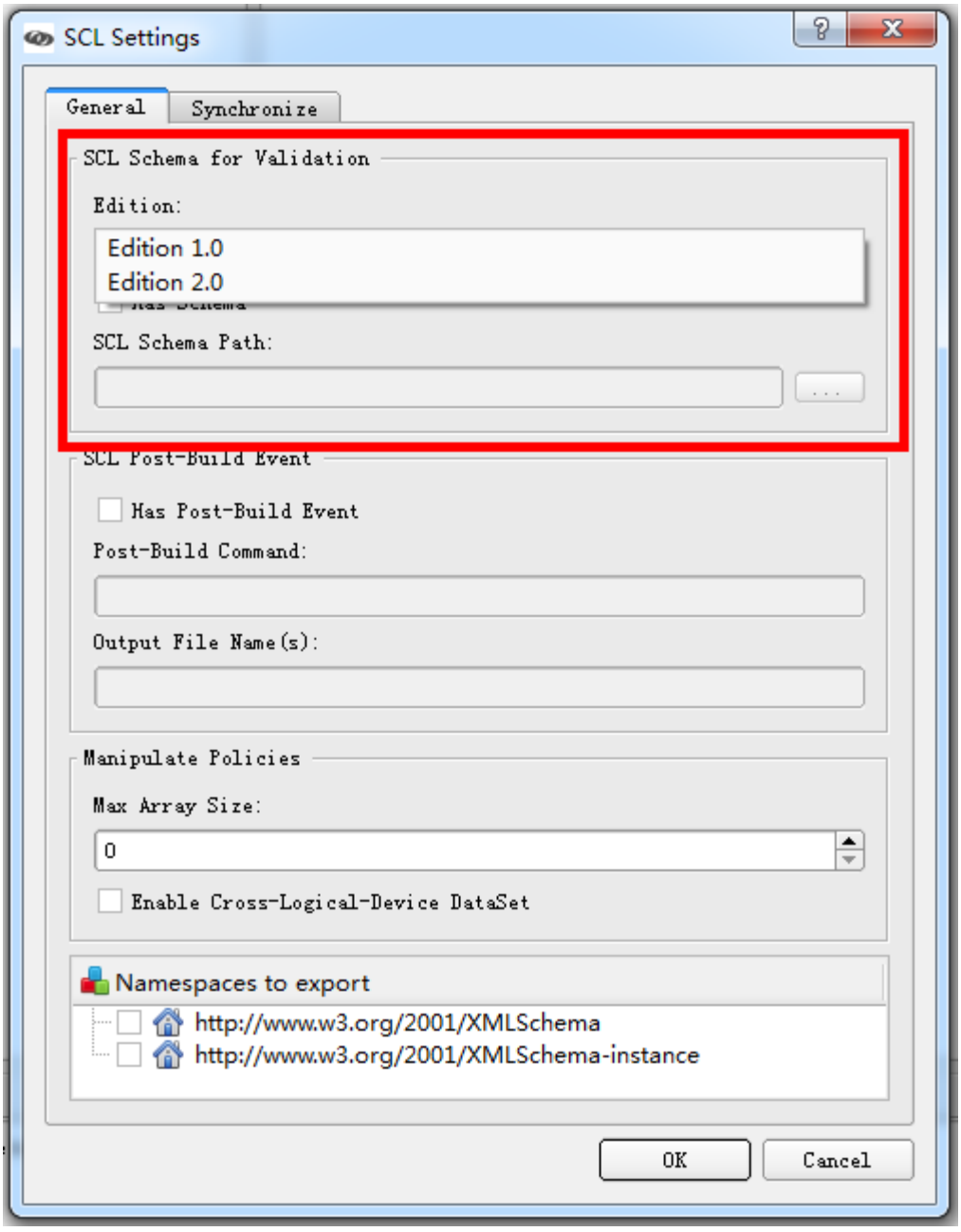
2.1 SCL Schema Check

SCL Schema Check is an application of XML technologies. It detects and resolves most common mistakes. Model Designer provides a user friendly way to locate errors.

2.1.1. SCL Schema Settings



SCL Settings Dialog:

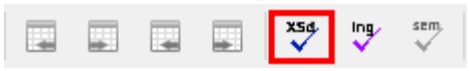


By default Model Designer will use internal SCL Syntax (Edition 1.0 or Edition 2.0).

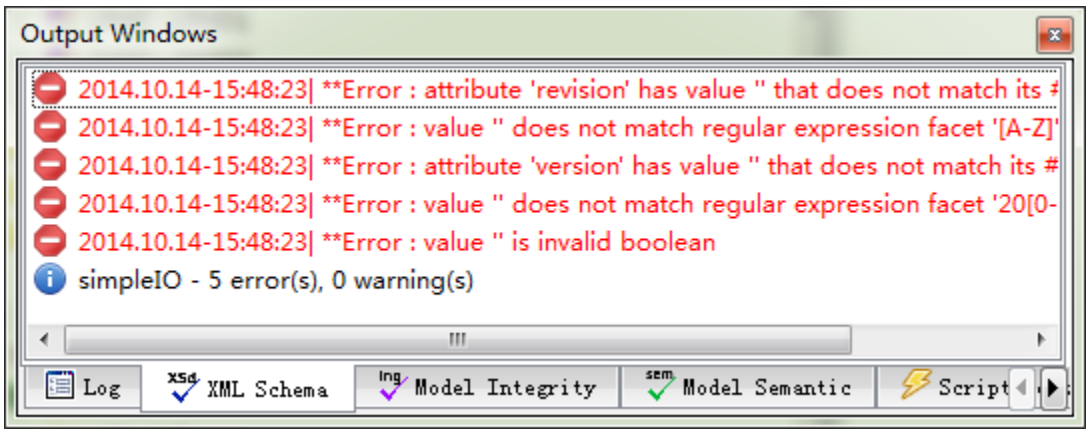
Users can use their own variants by setting the **SCL Schema Path**.

2.1.2. Errors Positioning

Execute SCL Schema Check：



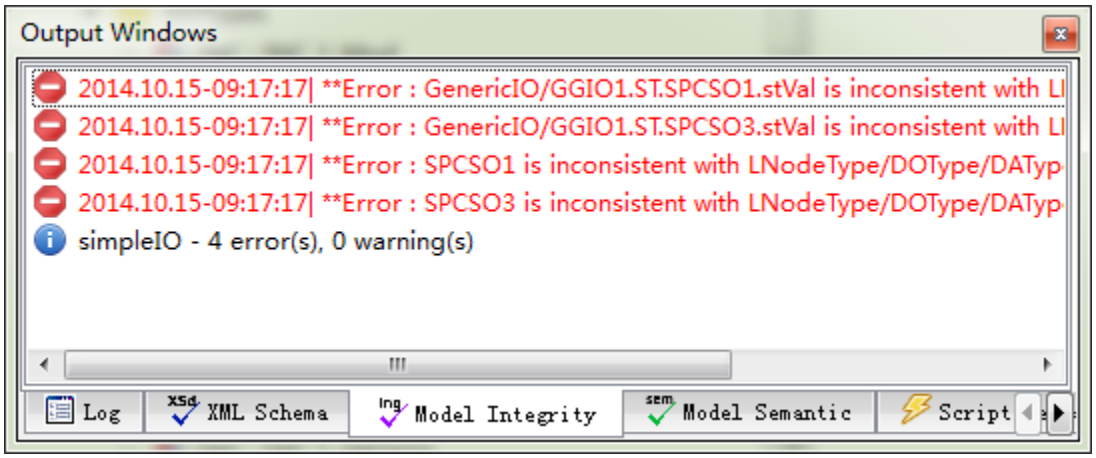
Errors Output Window：



Double Click to locate the errors.

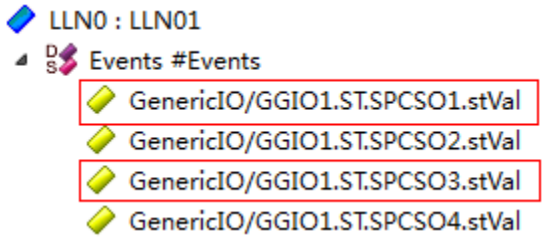
2.2 SCL Integrity Check

Not all the errors/mistakes can be checked/detected by SCL Schema. The Model Integrity check can help.

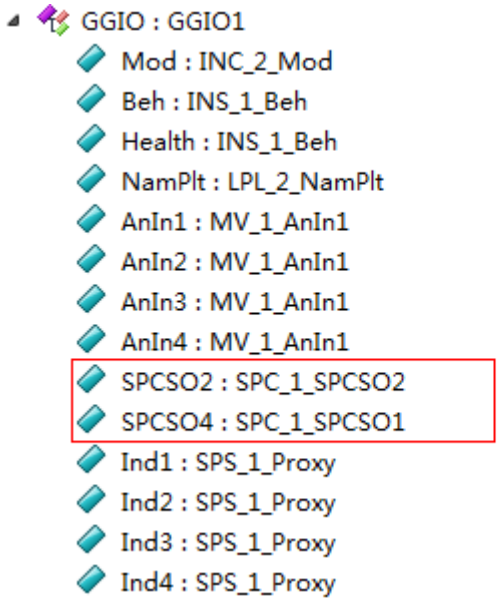


2.2.1. FCDA Integrity

In the **Model Integrity** output window, row #1 and row #2 are FCDA errors. These reference invalid **Data Attributes**.



The causes of errors can be found by going to the definition of Logical Node **GGIO**. In the picture below there are no DO definitions named SPCS01 or SPCS03.



2.2.2. DOI Integrity

In the **Model Integrity** output window, row #3 and row #4 are DOI errors.

2.3 SCL Semantic Check

Not supported in this release.