

61850 SCD Builder

System Configuration Tool

User guide

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INFO TECH sp.j.

- ❑ Experts in the field of communication solutions for power automation and industrial automation.
- ❑ Renowned supplier of protocol software libraries and tools for communication testing and device simulation.
- ❑ As of May 2024, the licensed INFO TECH software is the basis for implementing IEC 61850 interfaces in the products of 55 companies and institutions from 15 countries of Europe, Asia and North America.
- ❑ INFO TECH offers also:
 - **Software development services,**
 - **Hands-on trainings** on IEC 61850 communication,
 - **Conformance testing** of the IEC 61850 interfaces,
 - **Audits and diagnostics of systems** using IEC 61850 communication.

Product from the renowned supplier of communication software libraries and testing tools for automation systems

Widely used INFO TECH products from this area:

- ❑ **IEC 61850 Software Library (source code)**
- ❑ **61850 CCC** – IEC 61850 client DLL for PC/MS Windows
- ❑ **61850 SCC** – IEC 61850 server DLL for PC/MS Windows
- ❑ **61850 Avenue** – toolset including IEC 61850 client, relay simulator, GOOSE tools, SV tools, file transfer tool, ICD editor
- ❑ **61850 SCL Runner** – simulator of IEC 61850 server devices based on their description in SCL files
- ❑ **61850 GOOSE System Viewer** – visualization and monitoring of GOOSE communication based on SCD file
- ❑ **ProTester** – simulation tools for master and slave stations of protocols operating on serial and TCP/IP based networks (DNP3, IEC-104, IEC-101, IEC-103, Modbus, SPA-bus)

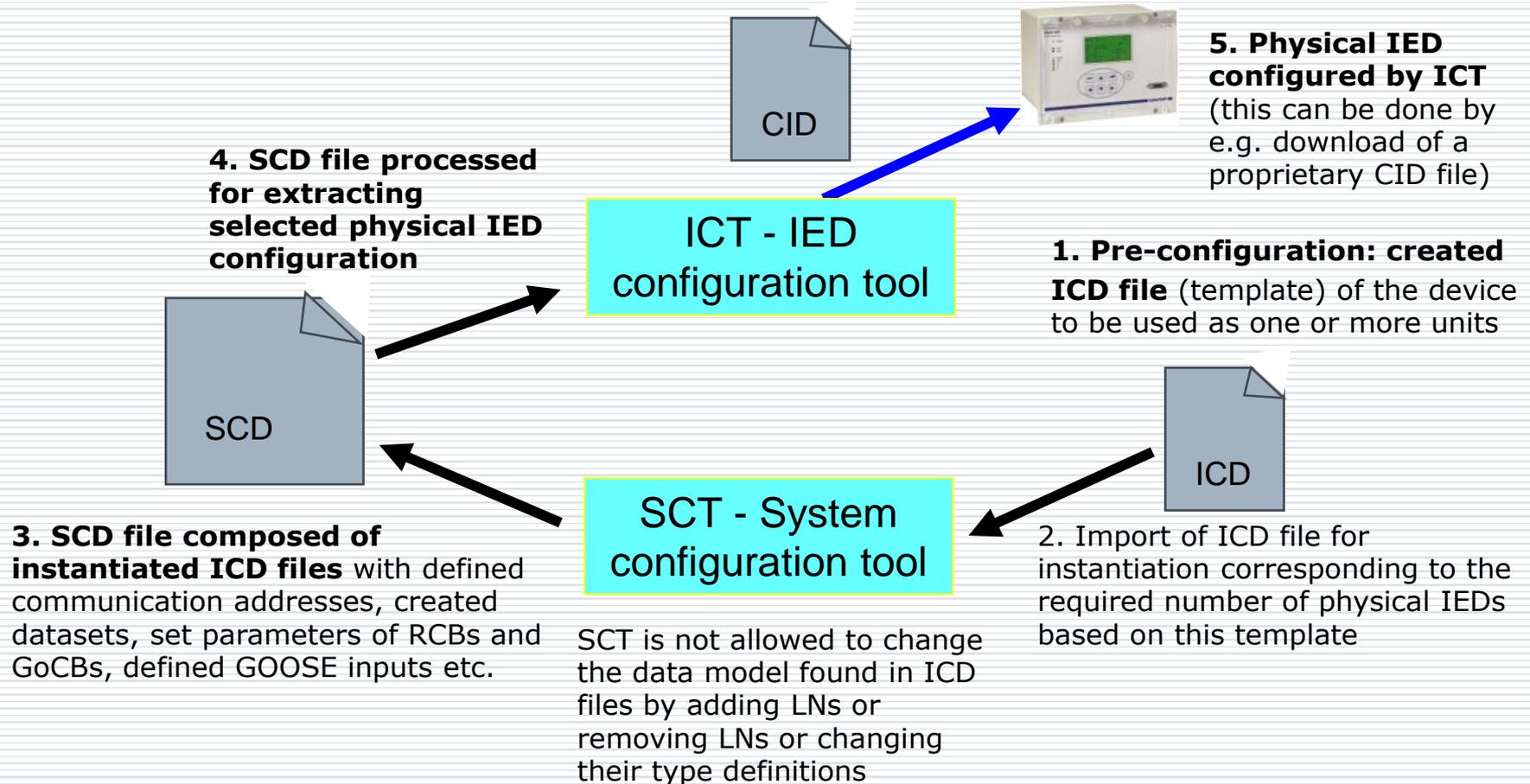
System engineering in accordance with IEC 61850



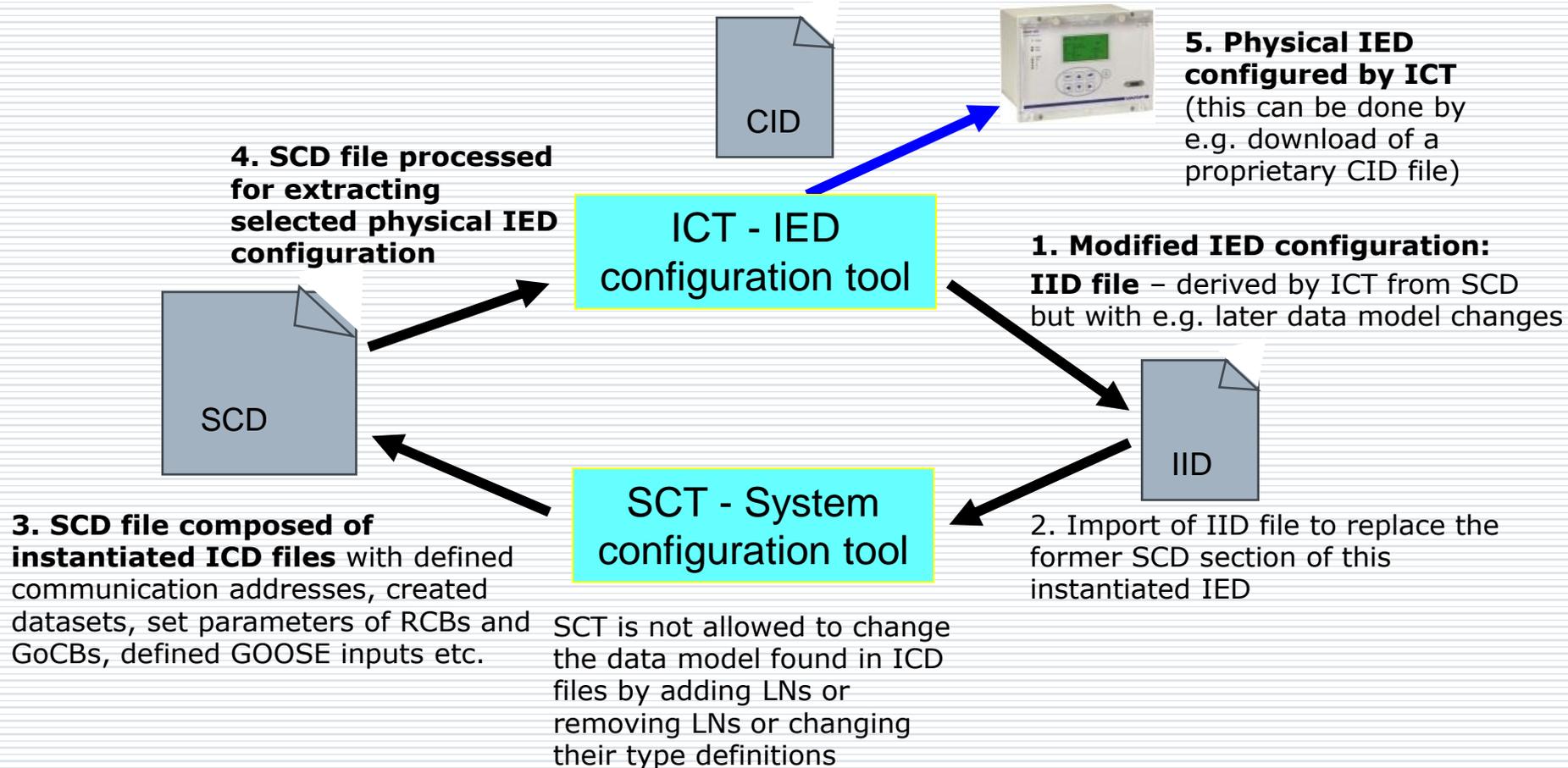
SCL files of the engineering process defined in the IEC 61850-6

- **S**ystem **s**pecification: defining Single Line Diagram and functions required on it
 - **SSD** document
- IED specification: what **I**ED **c**apabilities are needed to fulfill the requirements
 - **ICD** document
- **S**ystem **c**onfiguration: how IEDs will interact over the network
 - **SCD** document (filled in with imported and instantiated ICD files)
- IED configuration: **c**onfiguration of **I**EDs to perform in accordance with the system configuration
 - **CID** / **IID** document

IED configuration in accordance with system requirements



Next iteration of IED configuration (specified in Ed.2)



SCD file importance

- **System Configuration Description** file created by SCT is the most essential document of the IEC 61850 based installation. It is the only document providing:
 - Descriptions of all components (IEDs).
 - Descriptions of all interactions between components (reporting to clients, GOOSE data flow, SV data flow).
 - All communication addresses assigned to components.
 - History of system configuration changes.
- SCD maintenance is mandatory for consistency of any future changes and extensions to the deployed system installation.
- The set of component descriptions (ICD/CID/IID files) can not replace the SCD file. Individually created (by different vendor specific ICTs) component descriptions will not provide a complete system-level view and will not assure consistency of later system changes and extensions.
- Investors shall demand SCD files among deliverables.

61850 SCD Builder

- ❑ **System Configuration Tool** allowing to create SCD files (System Configuration Description) from ICD files (IED Capability Description) of components using the bottom-up approach of system engineering in accordance with the IEC 61850-6 standard.
- ❑ 61850 SCD Builder tool supports the SCD creation process in accordance with **Edition 1, Edition 2 and Amendment 1 to Edition 2 (Ed. 2.1)** of the IEC 61850 standard.
- ❑ The produced SCD file is fully conformant with SCL scheme of the chosen standard edition.
- ❑ 61850 SCD Builder is IED vendor independent. The IEC 61850 standard is the reference and the common denominator for interoperability.

Applicability of the tool

- 61850 SCD Builder is suitable for:
 - Building SCD files required for the complete system configuration and documentation in the system engineering process defined by the IEC 61850 standard.
 - Creating preliminary versions of SCD files that can be used for the simulation of the target installation using such toolsets like INFO TECH 61850 SCL Runner.
 - Modifying SCD files in accordance with the required changes in the installed system.
 - Learning the IEC 61850 engineering process.
- Truly easy to learn and apply ...
- Includes the **context help function** invocable with **F1** key.

Installation procedure

Supported platforms:

PC running

MS Windows

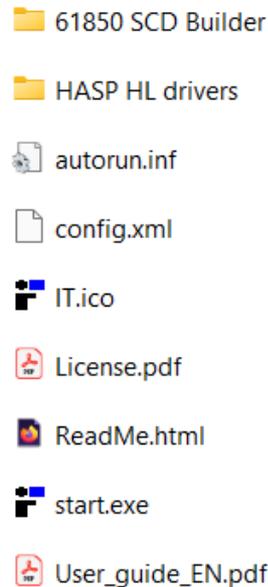
7, 8, 10 and 11.



To install the software

From the supplied CD: possible start in autorun mode.

Alternatively: invoke the program **start.exe** from the installation package directory



License

- ❑ **Before installing the software please learn and accept the licensing terms described in the paper note attached or in the file **License.pdf****
- ❑ Please acknowledge the following notice concerning the USB license key:
 - The supplied license key represents the value you have purchased. Please take care of it and protect it from losing or damaging like any other object of value. Please understand that we cannot replace lost, corrupted or physically damaged keys.

Third party components

- **HASP HL drivers** – to manage the USB license key

61850 SCD Builder – let's start!



Initial view after the start-up of 61850 SCD Builder tool

Program icons:

Project: New, Open, Save.

Add to system: IED based on ICD, Client IED based on name and IP address, Time Server.

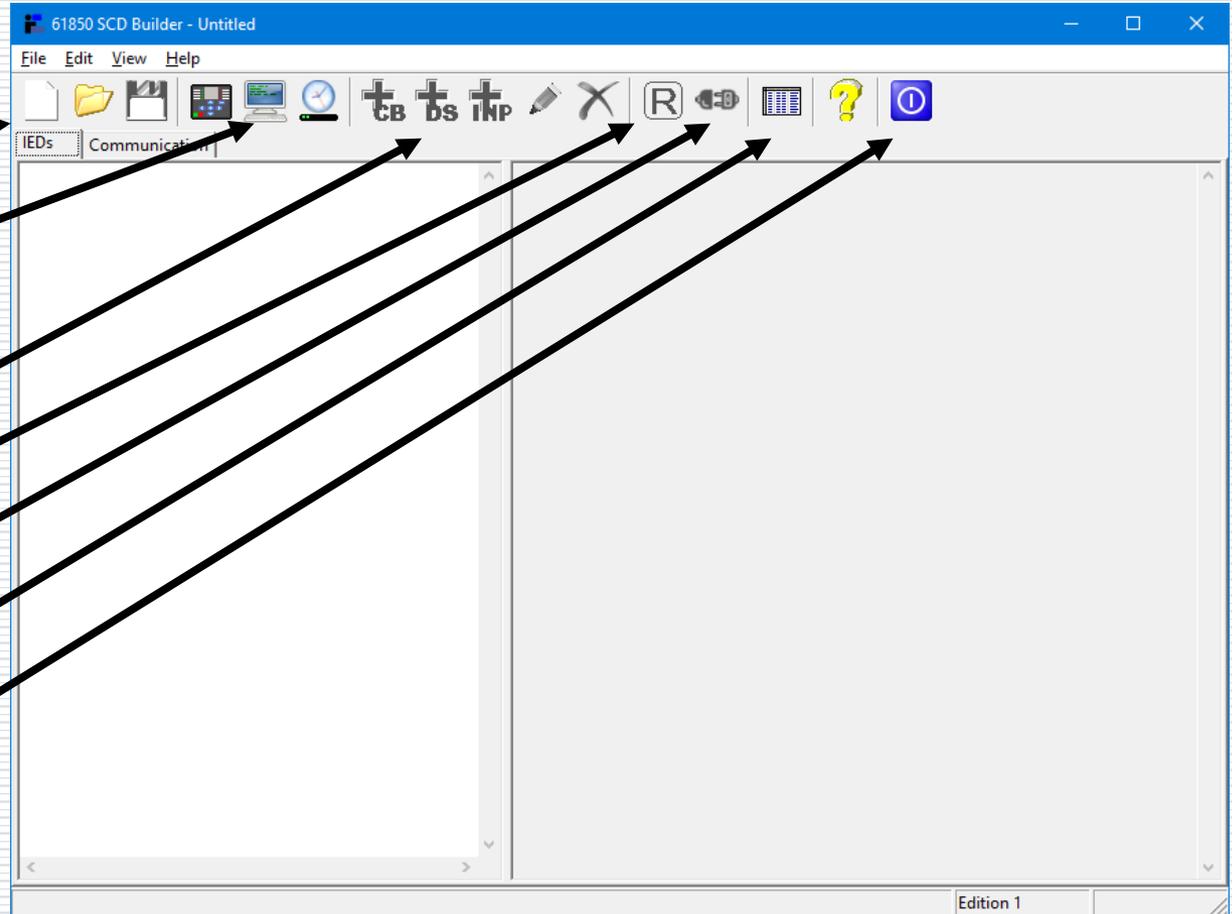
Operations on the created SCD file (adding or removing data model elements).

RCB reservation

GOOSE or SV binding

XML level editor/checker

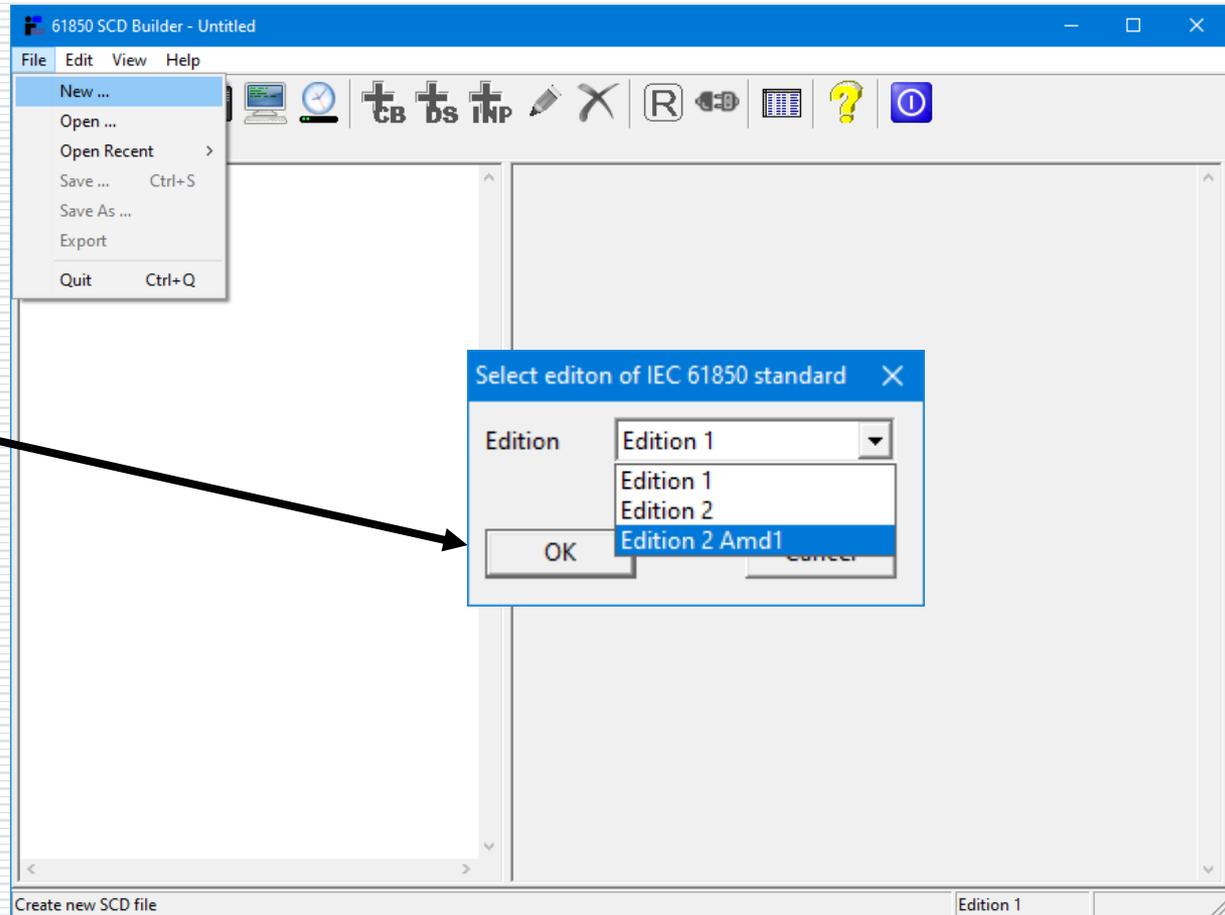
Help and Exit



New system project

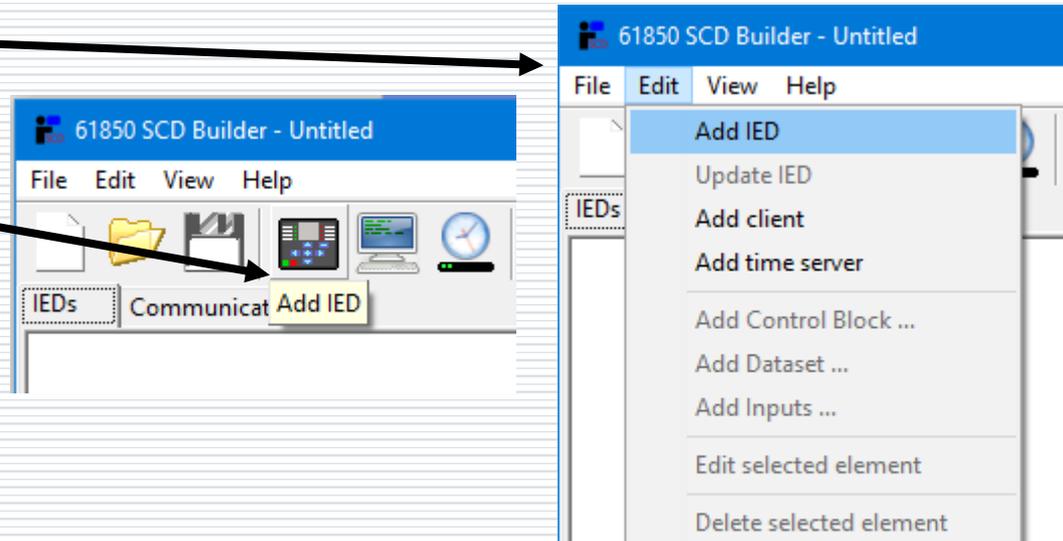
Project: New

Selection of the standard edition to be applied (the created SCD file and the input ICD files shall be of the same edition).

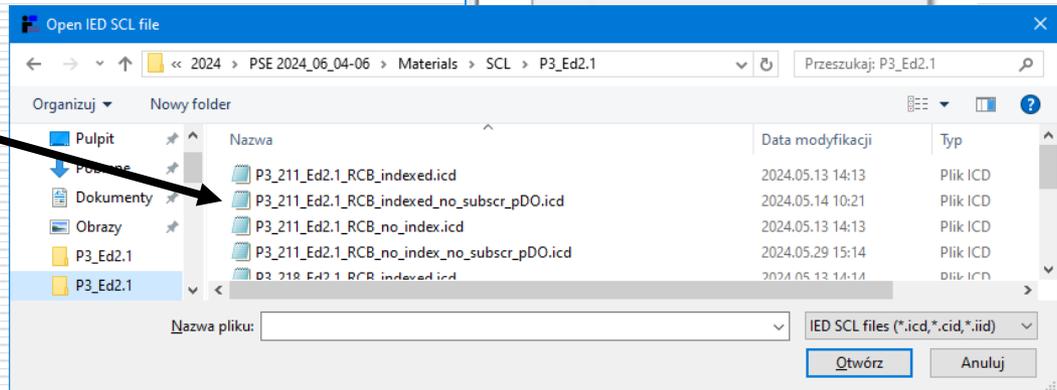


Adding IEDs based on ICD files

Use Edit menu item
or
Icon.

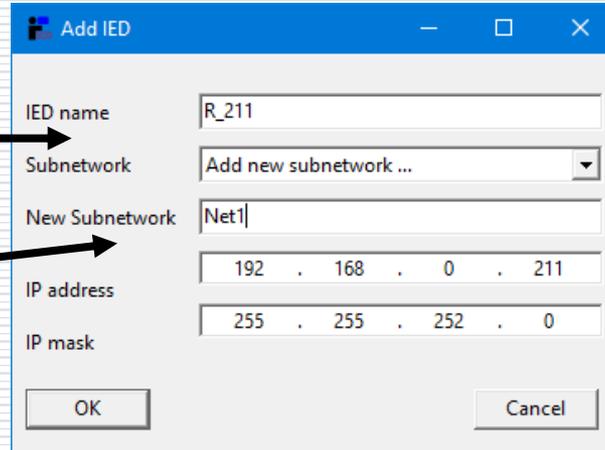


Then
select an appropriate ICD file
to be instantiated.



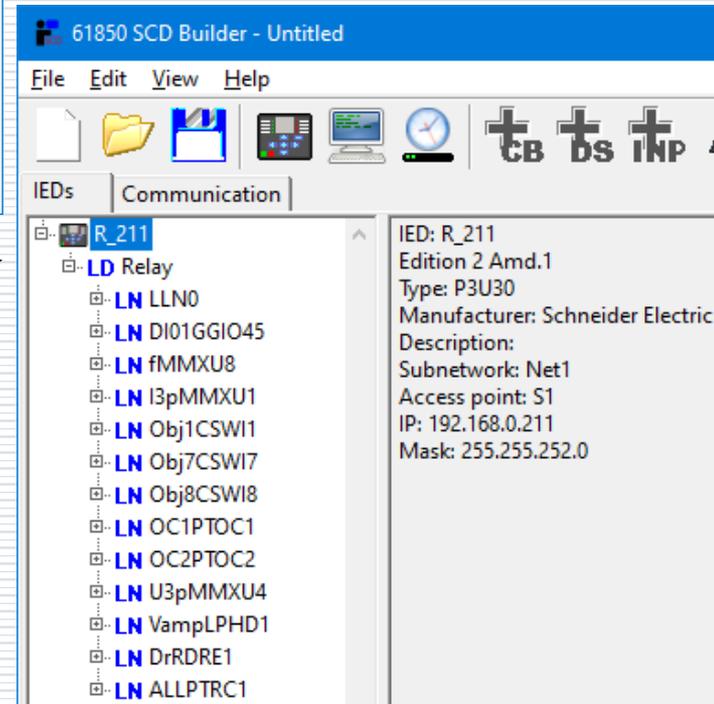
IED instantiated from an ICD file

For the instantiated ICD file (new IED of the system) set its unique IED name, unique IP address and assign to Subnetwork (for the first IED a New Subnetwork must be defined by name).



IED name: R_211
Subnetwork: Add new subnetwork ...
New Subnetwork: Net1
IP address: 192 . 168 . 0 . 211
IP mask: 255 . 255 . 252 . 0

An instantiated IED will appear in the IEDs view of the system under construction. Its data model can be expanded and later also configured.



61850 SCD Builder - Untitled

File Edit View Help

IEDs Communication

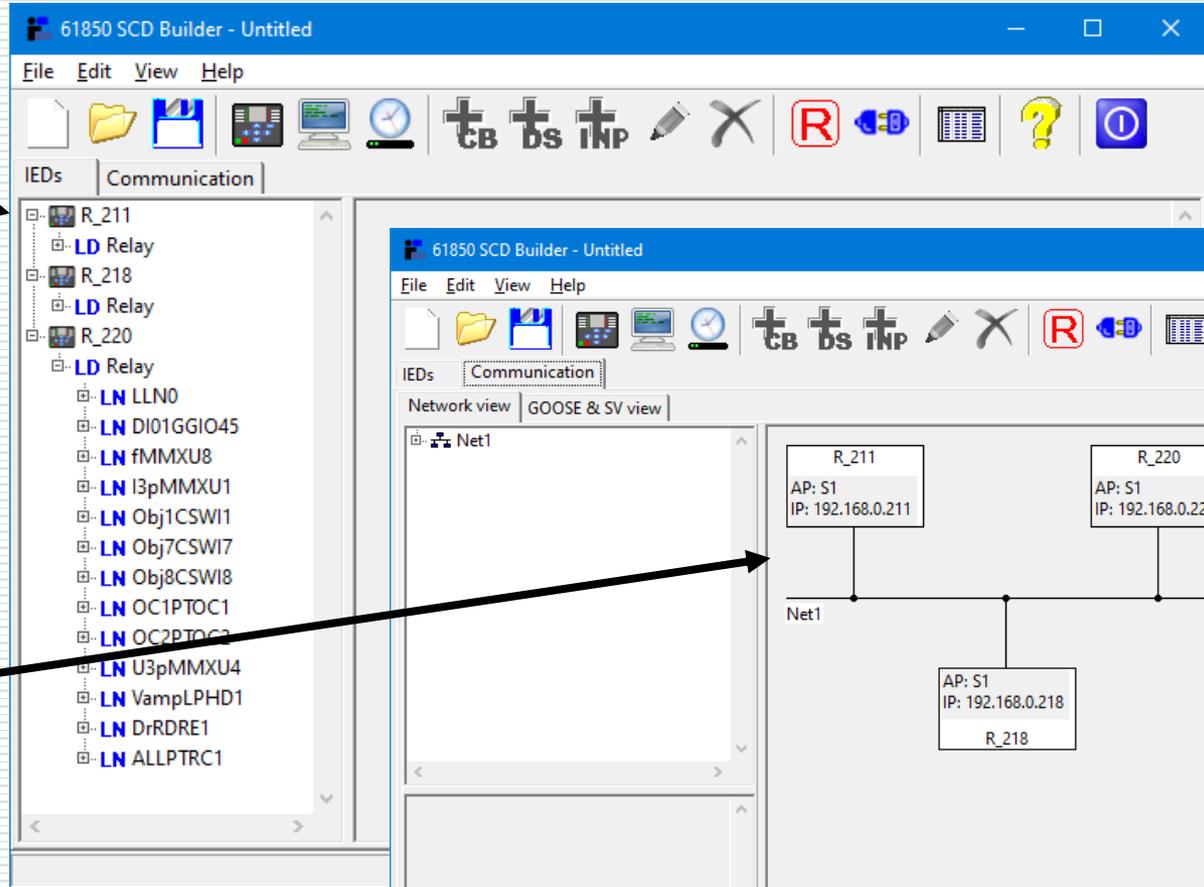
R_211

- LD Relay
 - LN LLN0
 - LN DI01GGIO45
 - LN fMMXU8
 - LN I3pMMXU1
 - LN Obj1CSWI1
 - LN Obj7CSWI7
 - LN Obj8CSWI8
 - LN OC1PTOC1
 - LN OC2PTOC2
 - LN U3pMMXU4
 - LN VampLPHD1
 - LN DrRDRE1
 - LN ALLPTRC1

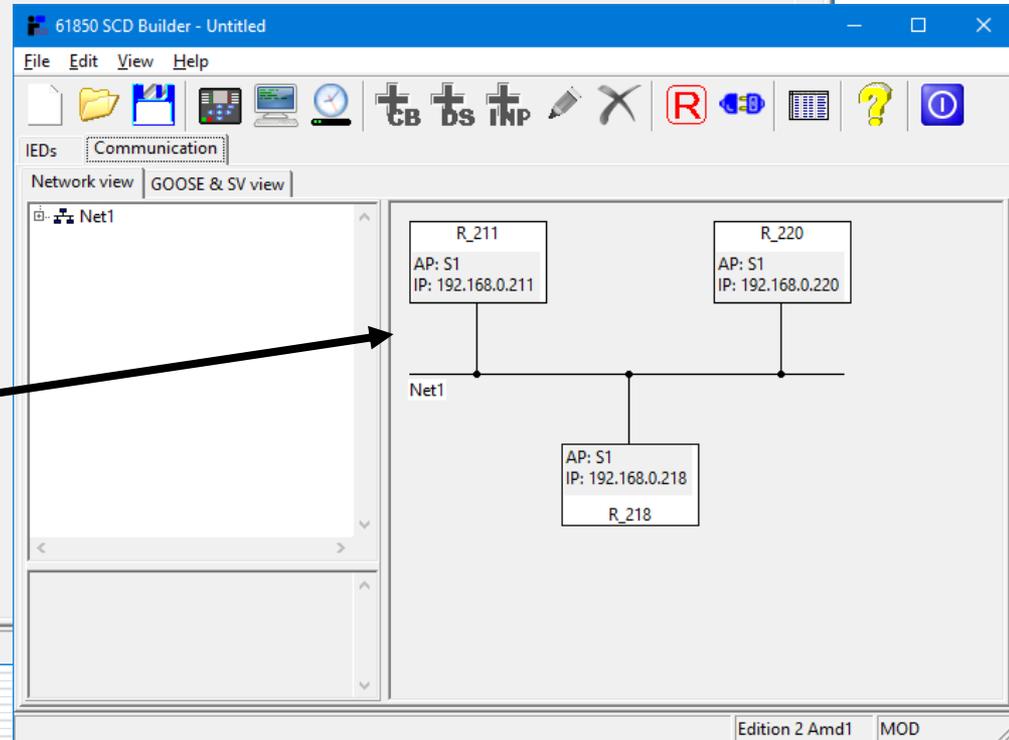
IED: R_211
Edition 2 Amd.1
Type: P3U30
Manufacturer: Schneider Electric
Description:
Subnetwork: Net1
Access point: S1
IP: 192.168.0.211
Mask: 255.255.252.0

After adding further IEDs

IEDs view

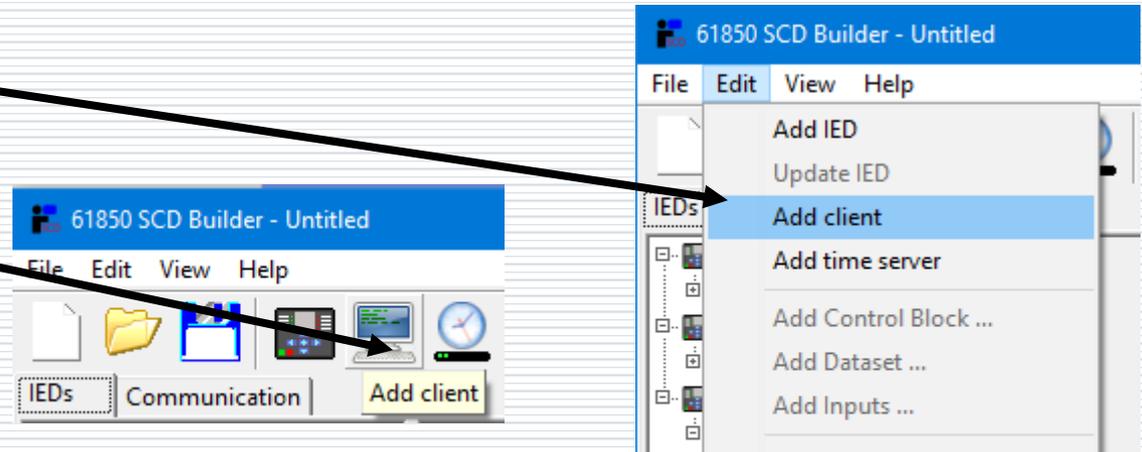


Communication view

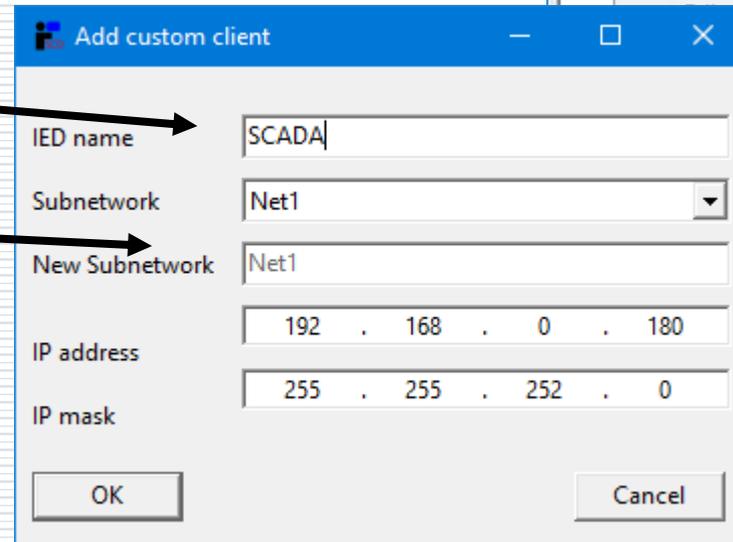


Adding client devices without ICD (default description)

Use Edit menu item or Icon.

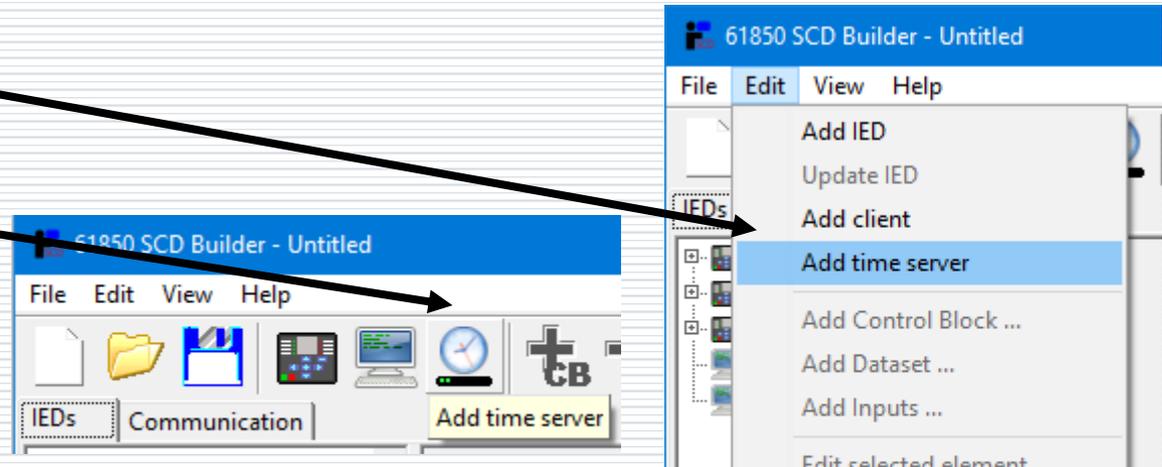


For the added client IED set its unique IED name, unique IP address and assign to Subnetwork



Adding time server without ICD (default description)

Use Edit menu item
or
Icon.



For the added time server IED
set its unique IED name,
unique IP address and assign
to Subnetwork

The 'Add custom time server' dialog box is shown. It contains the following fields and values:

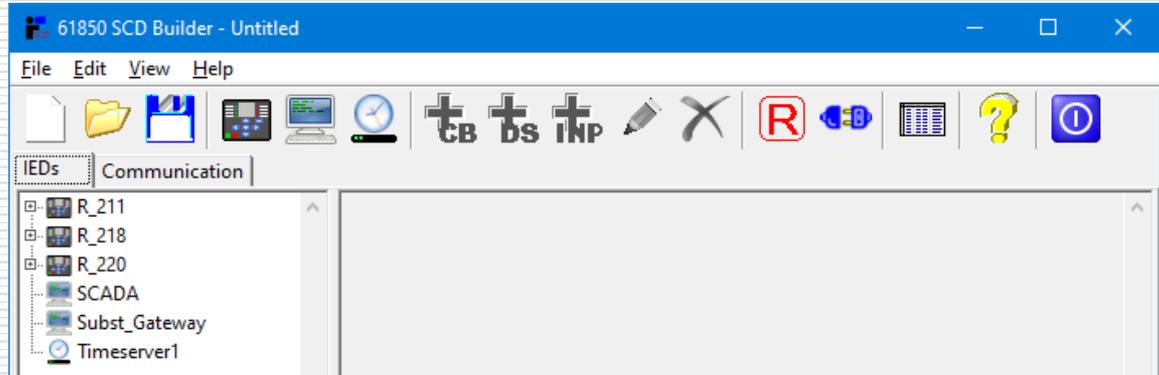
IED name	Timeserver1
Subnetwork	Net1
New Subnetwork	Net1
IP address	192 . 168 . 0 . 190
IP mask	255 . 255 . 252 . 0

Buttons: OK, Cancel

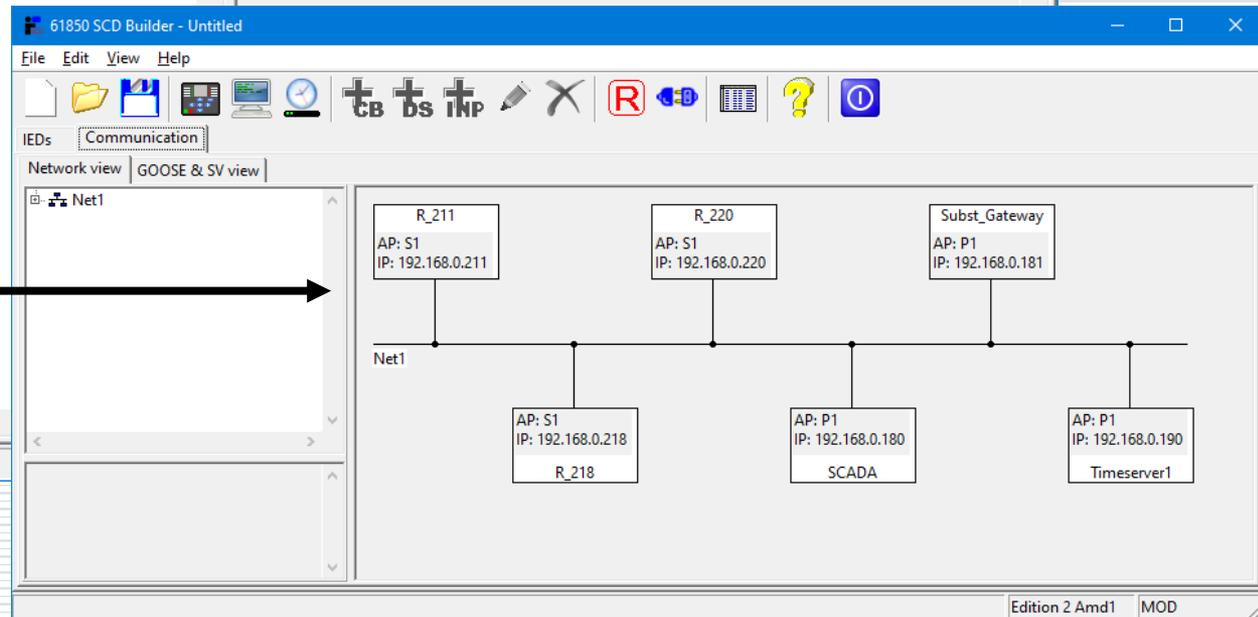
IEDs view.

Communication view: Network.

IEDs view



Communication view:
Network



Support of functional naming: LD

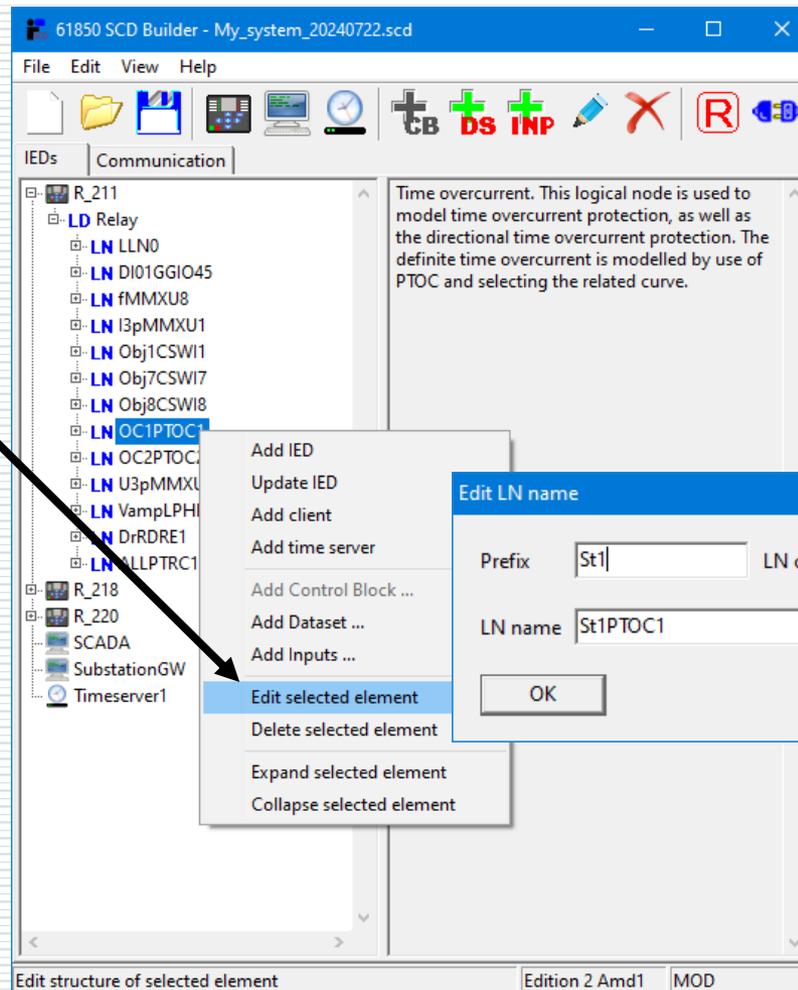
If the content of Services section allows (ConfLdName present), then the LD name can be changed in accordance with the system requirements.

The screenshot displays the 61850 SCD Builder interface. The main window shows a tree view of the project structure under 'Communication'. The 'LD Relay' element is selected, and a context menu is open with 'Edit selected element' highlighted. A dialog box titled 'Set LD name (functional naming)' is open, showing the 'LD name' field with the value 'Bay12'. The 'OK' button is visible. Below the dialog, the 'Properties' pane shows the details for the selected 'LD Relay' element:

- Logical device: Relay
- LD Name: Bay12
- Type: IEC 61850-7-4:2007B
- Logical Device for Substations and Feeder Equipment

Support of functional naming: LN

If the content of Services section allows (ConfLNs fixPrefix="false" fixLnInst="false"), then the prefix and instance number of logical nodes can be changed in accordance with system requirements.



Adding elements to IED data model

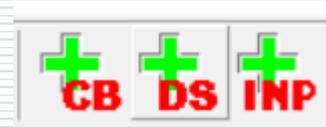
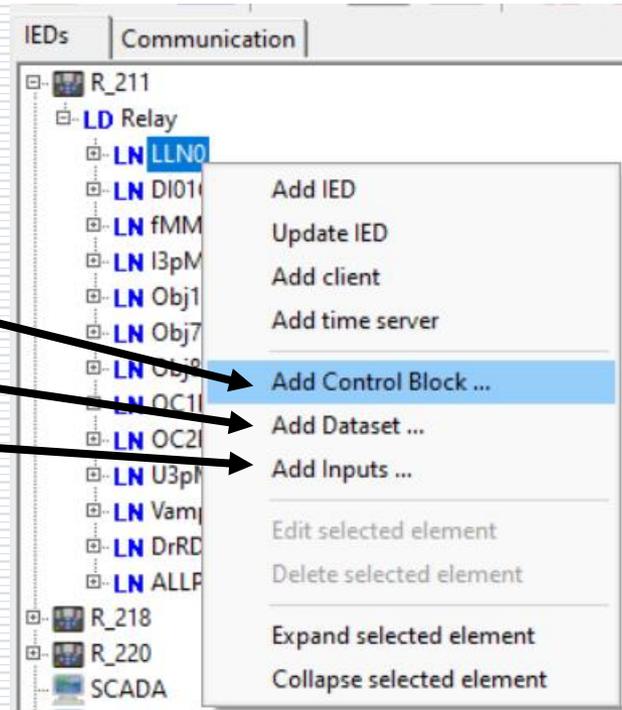
Depending on the content of Services section of the imported ICD file it may be possible to:

Add a new control block

Add a new data set

Add a new input (ExtRef in the Inputs section)

Use the context menu commands or icons.



Adding a new control block

Example:

Adding Buffered RCB
name BRCB_Alm
2 instances

Control Block Editor

Control block type: Buffered Report CB

Name: BRCB_Alm

DataSet: DS1

Report ID:

Buffering time: 1000

Integrity period: 0

Config revision: 1

Instances: 2

Option fields:

- Sequence number
- Time stamp
- DataSet reference
- Reason code
- Data reference
- Entry ID
- Configuration revision
- Buffer overflow

Triggering options:

- Data change
- Quality change
- Data update
- Integrity scan
- General interrogation

OK Cancel

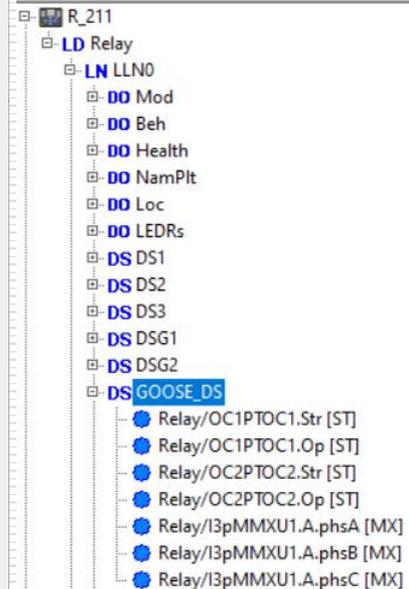
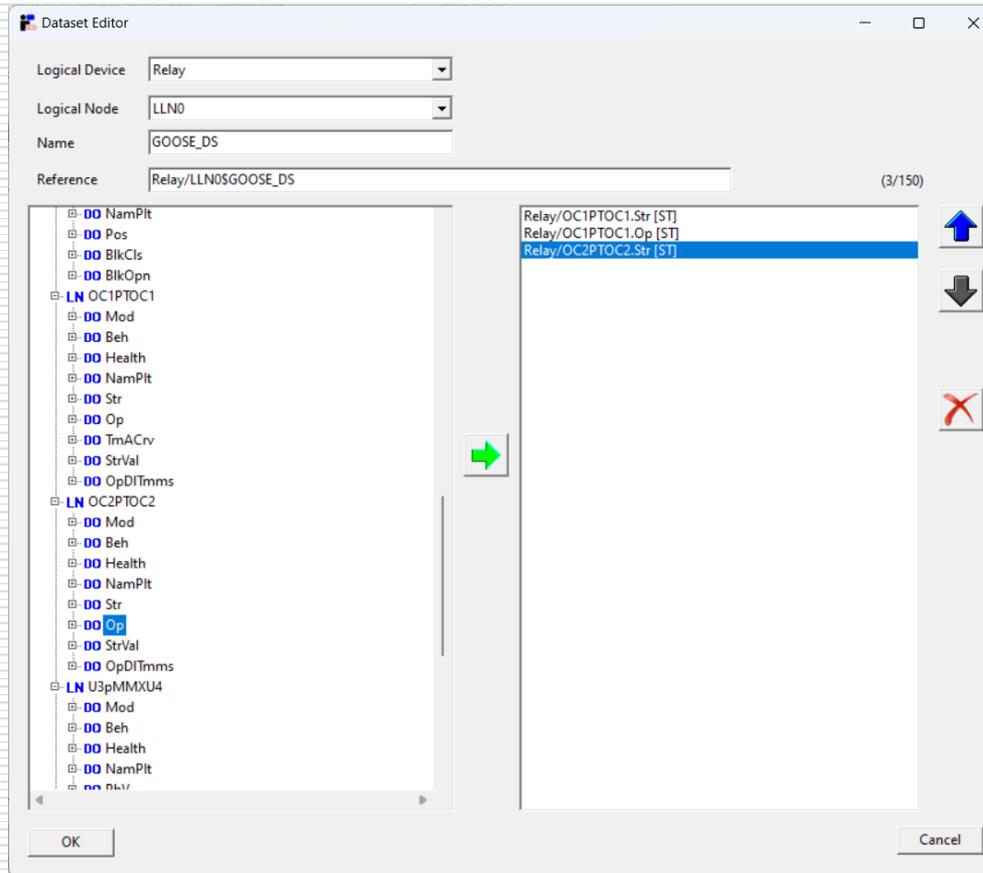
Adding a new data set

Example:

**New data set
Name GOOSE_DS**

**Data set elements can
be selected from the
data model tree.
Elements order can be
changed.
Data set elements can
be also deleted.**

**Note: Take care on
allowed FC (ST and MX)
when the created data
set shall be used by
GoCB.**



Adding a new input (ExtRef)

Example:

Added ExtRef

intAddr set to NI7

and

expected source data determined by the CDC of DO Op from LN PTOC (expected source data defined by pDO attribute is mandatory in Ed. 2.1).

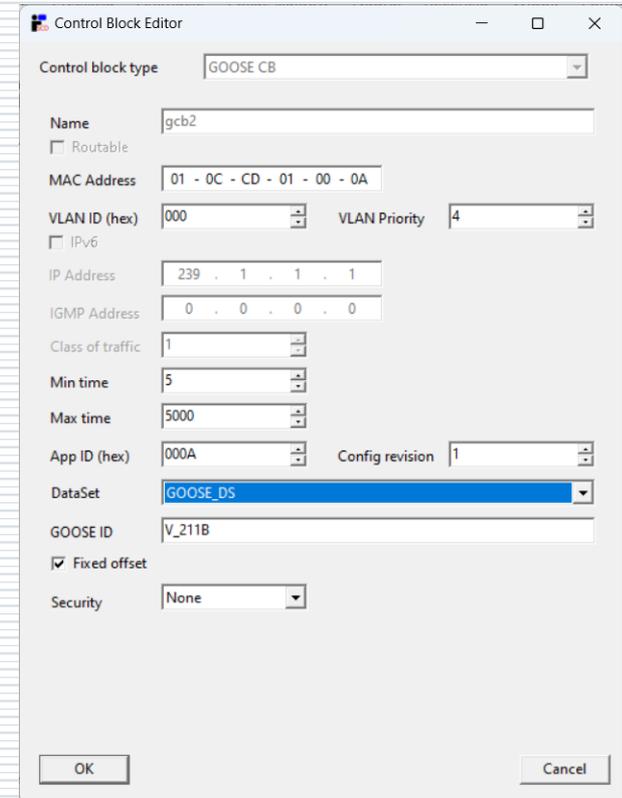
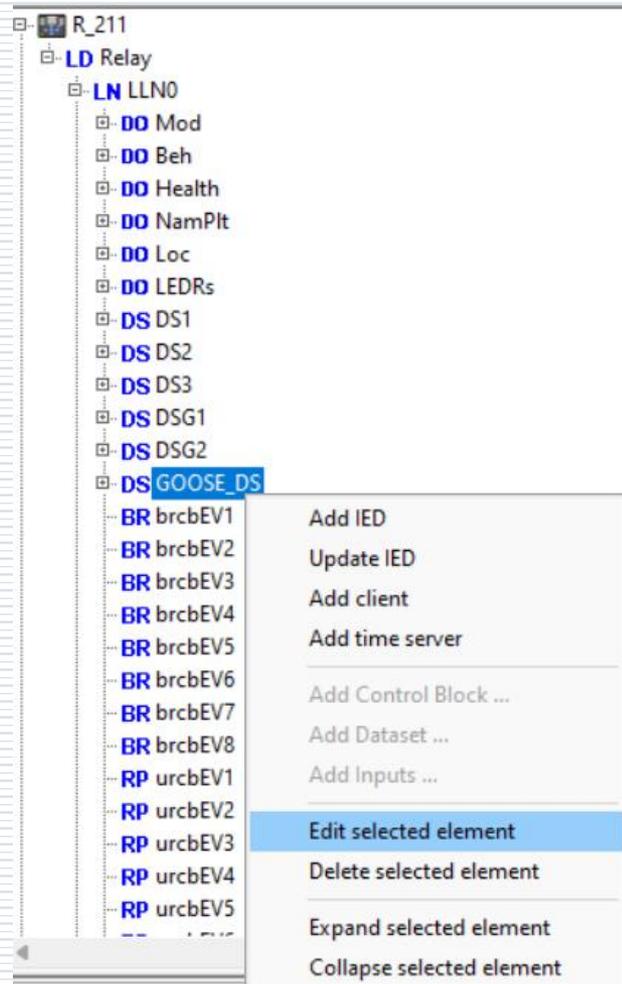
The screenshot shows the 'Inputs editor' dialog box with the following configuration:

- Internal address: NI7
- Data source definition:
 - IED name: [empty]
 - LD instance: [empty]
 - Logical Node:
 - Prefix: [empty]
 - Class: [empty]
 - Instance: 1
- DO name: [empty]
- DA name: [empty]
- Description: [empty]
- Transmission source definition:
 - Service type: [empty]
 - LD instance: [empty]
 - Logical Node:
 - Prefix: [empty]
 - Class: [empty]
 - Instance: 1
- CB name: [empty]
- Predefined source type definition:
 - Service type: [empty]
 - Class: PTOC
 - DO name: Op
 - DA name: [empty]

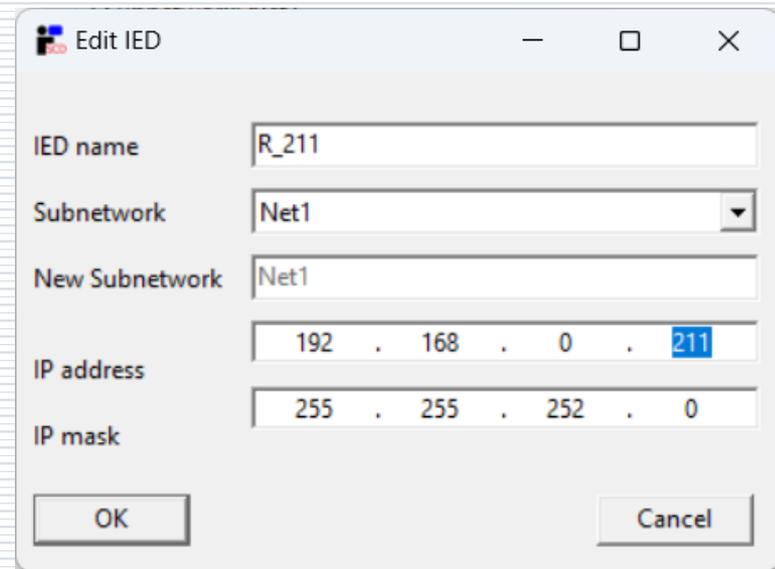
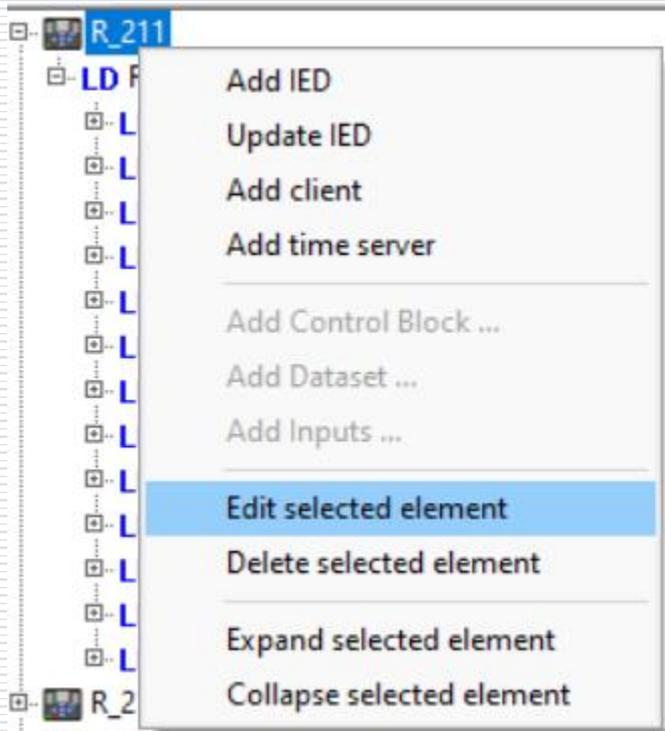
The list of inputs on the right side of the dialog shows [NI1] through [NI7], with [NI7] selected.

Further modifications

Depending on the content of Services section of the imported ICD such elements like control blocks, data sets, inputs can be also edited or deleted.



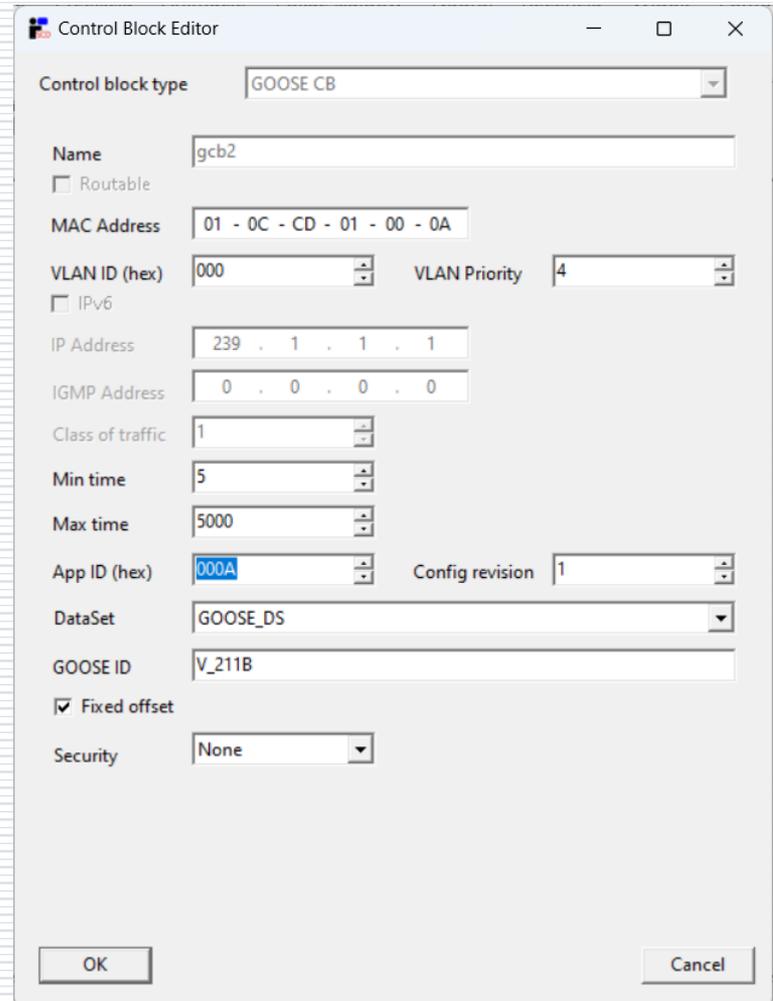
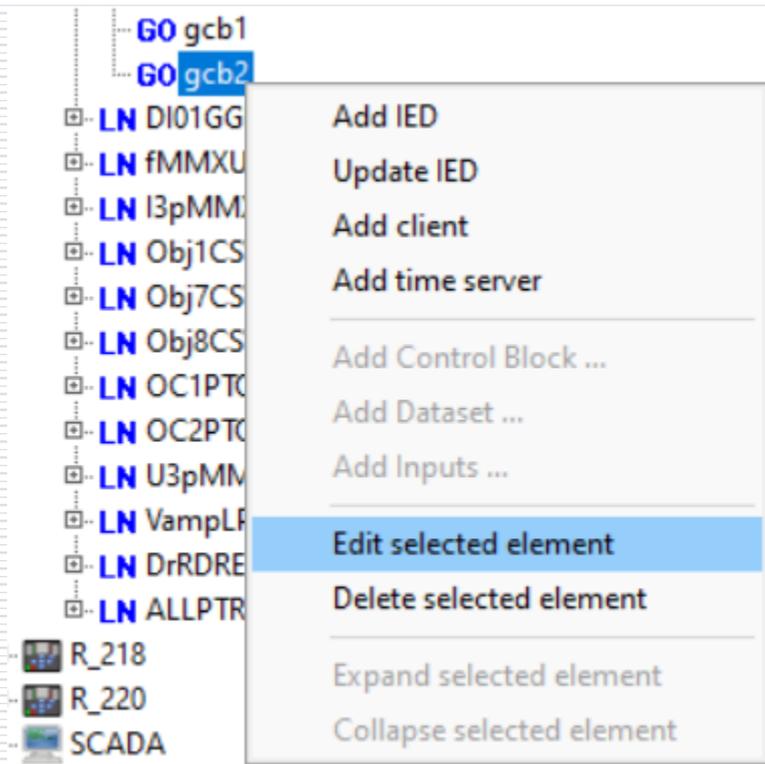
Configuration of communication addresses of IEDs



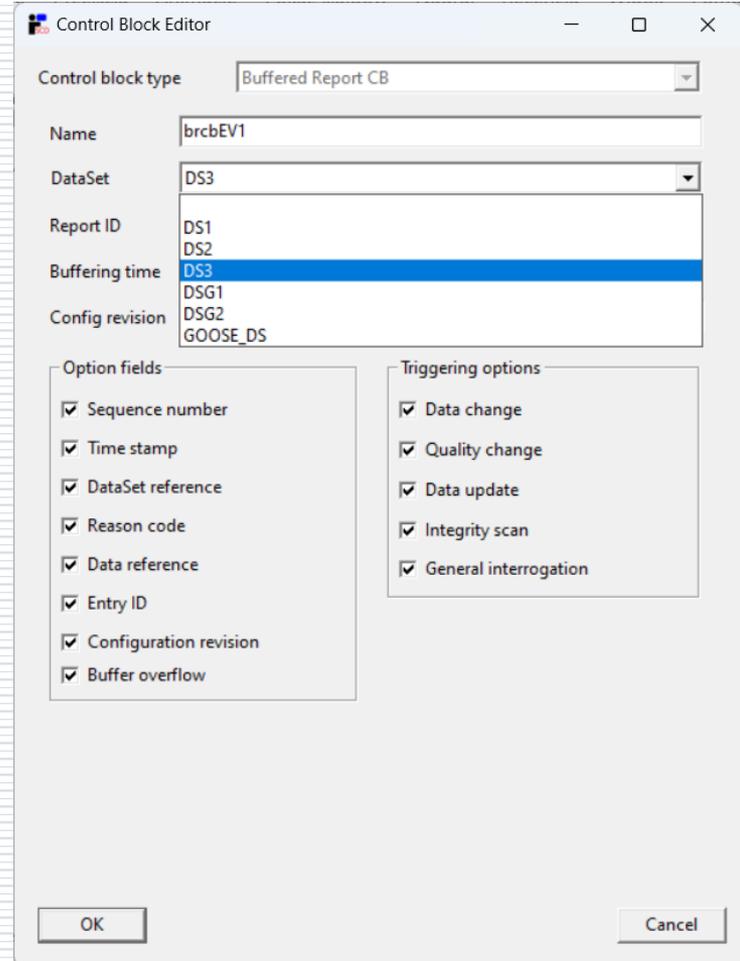
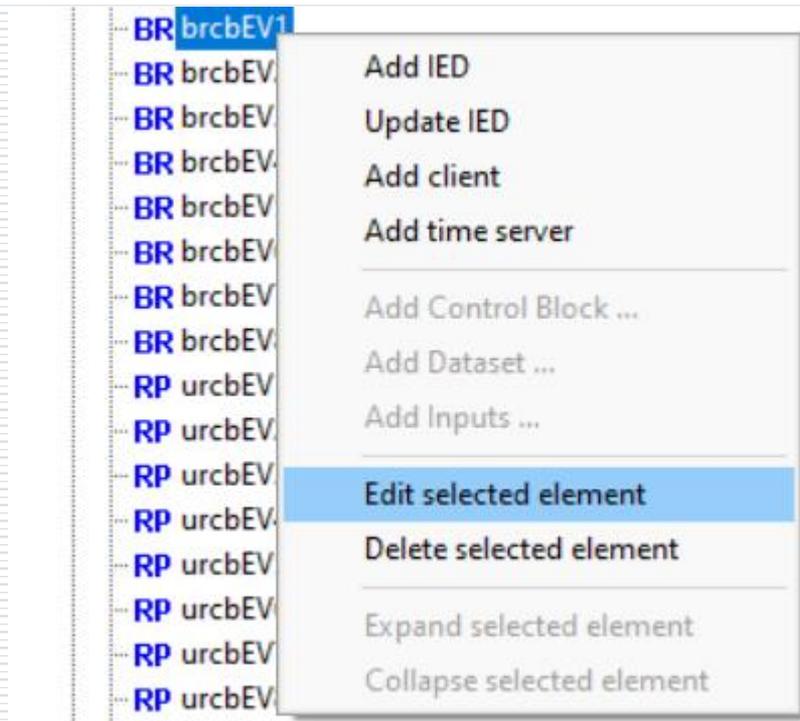
* **after** the name of the IED server device means **unsaved configuration.**

From **Server** menu select **New** command to define a new server device.

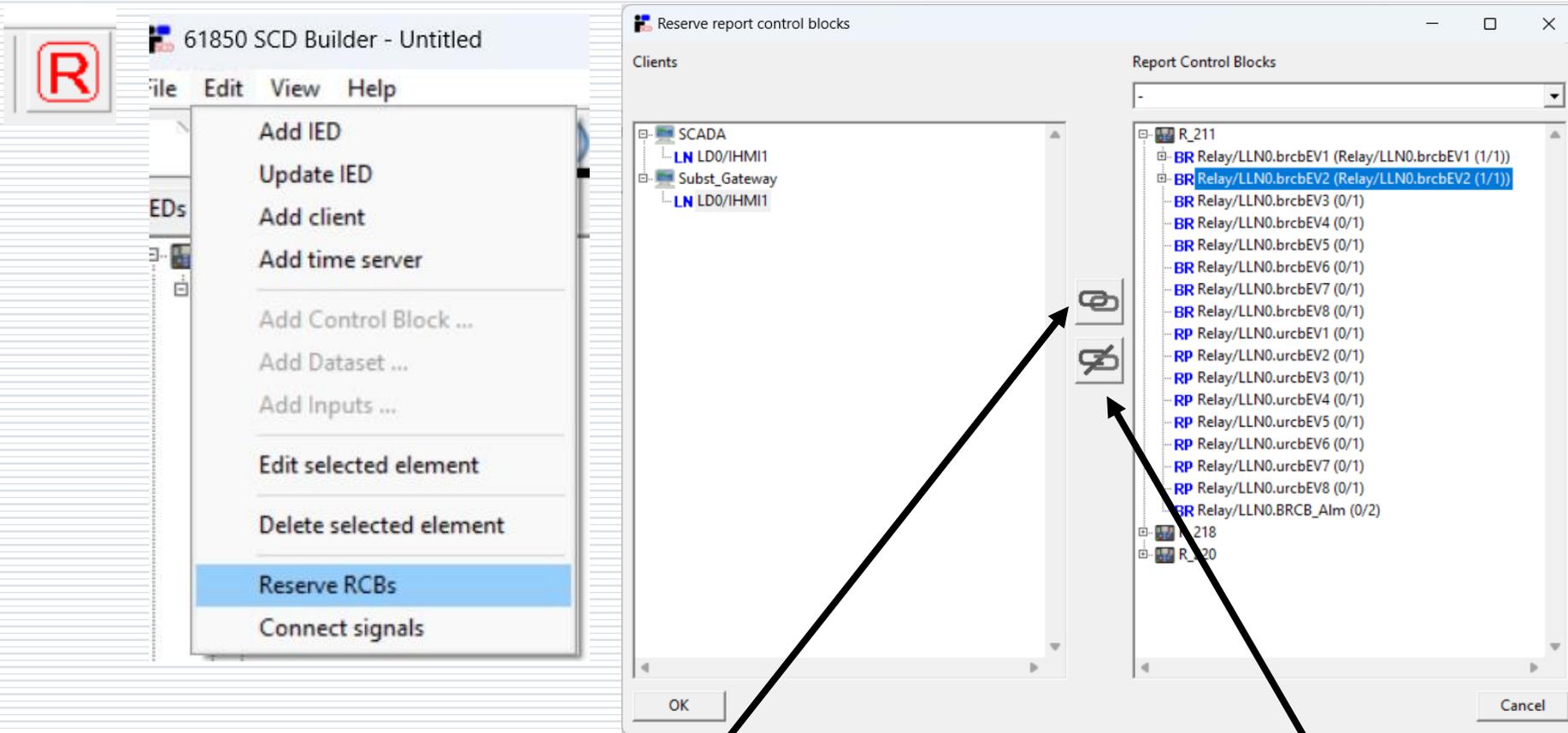
Configuration of GOOSE Control Blocks



Configuration of Report Control Blocks



Reservation of instantiated RCBs for clients



Bind the LN of the client IED with the RCB instance of the server IED.

This binding can also be cancelled.

GOOSE binding

61850 SCD Builder - Untitled

File Edit View Help

IEDs

- Add IED
- Update IED
- Add client
- Add time server
- Add Control Block ...
- Add Dataset ...
- Add Inputs ...
- Edit selected element
- Delete selected element
- Reserve RCBs
- Connect signals

Connect GOOSE and SV signals

Published signals

- R_211
 - Relay/Obj1CSW1.Pos.stVal@Relay/LLN0.gcb1
 - Relay/OC1PTOC1.Str@Relay/LLN0.gcb2
 - Relay/OC1PTOC1.Op@Relay/LLN0.gcb2
 - Relay/OC2PTOC2.Str@Relay/LLN0.gcb2
 - Relay/OC2PTOC2.Op@Relay/LLN0.gcb2
 - Relay/I3pMMXU1.A.phsA@Relay/LLN0.gcb2
 - Relay/I3pMMXU1.A.phsB@Relay/LLN0.gcb2
 - Relay/I3pMMXU1.A.phsC@Relay/LLN0.gcb2
- R_218
- R_220

Inputs

Hide already connected

- R_211
 - Relay/LLN0.NI001[NI1]<-0
 - Relay/LLN0.NI002[NI2]<-0
 - Relay/LLN0.NI003[NI3]<-0
 - Relay/LLN0.NI004[NI4]<-0
 - Relay/LLN0.NI005[NI5]<-0
 - Relay/LLN0.NI006[NI6]<-0
- R_218
 - Relay/LLN0.NI001[NI1]<-0
 - Relay/LLN0.NI002[NI2]<-0
 - Relay/LLN0.NI003[NI3]<-0
 - Relay/LLN0.NI004[NI4]<-0
 - Relay/LLN0.NI005[NI5]<-0
 - Relay/LLN0.NI006[NI6]<-0
- R_220
 - Relay/LLN0.NI001[NI1]<-0
 - Relay/LLN0.NI002[NI2]<-0
 - Relay/LLN0.NI003[NI3]<-0
 - Relay/LLN0.NI004[NI4]<-0
 - Relay/LLN0.NI005[NI5]<-0
 - Relay/LLN0.NI006[NI6]<-0

Bind the chosen pair.

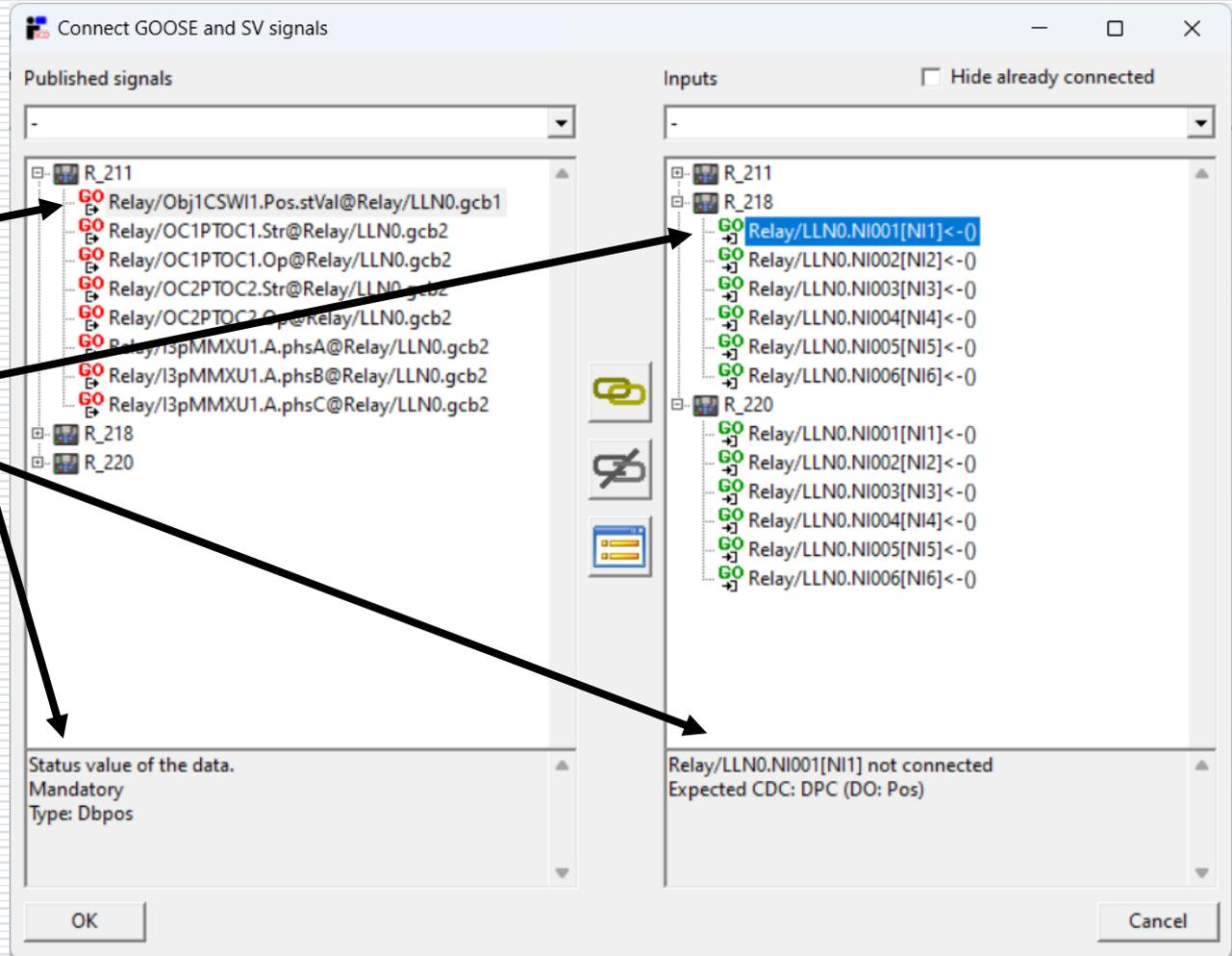
Unbind the chosen pair.

Generate binding list.

OK Cancel

Expected source DO in GOOSE binding (Ed. 2.1)

The program presents and checks the match between the published data type and the expected data type on the chosen input (pDO attribute of ExtRef).



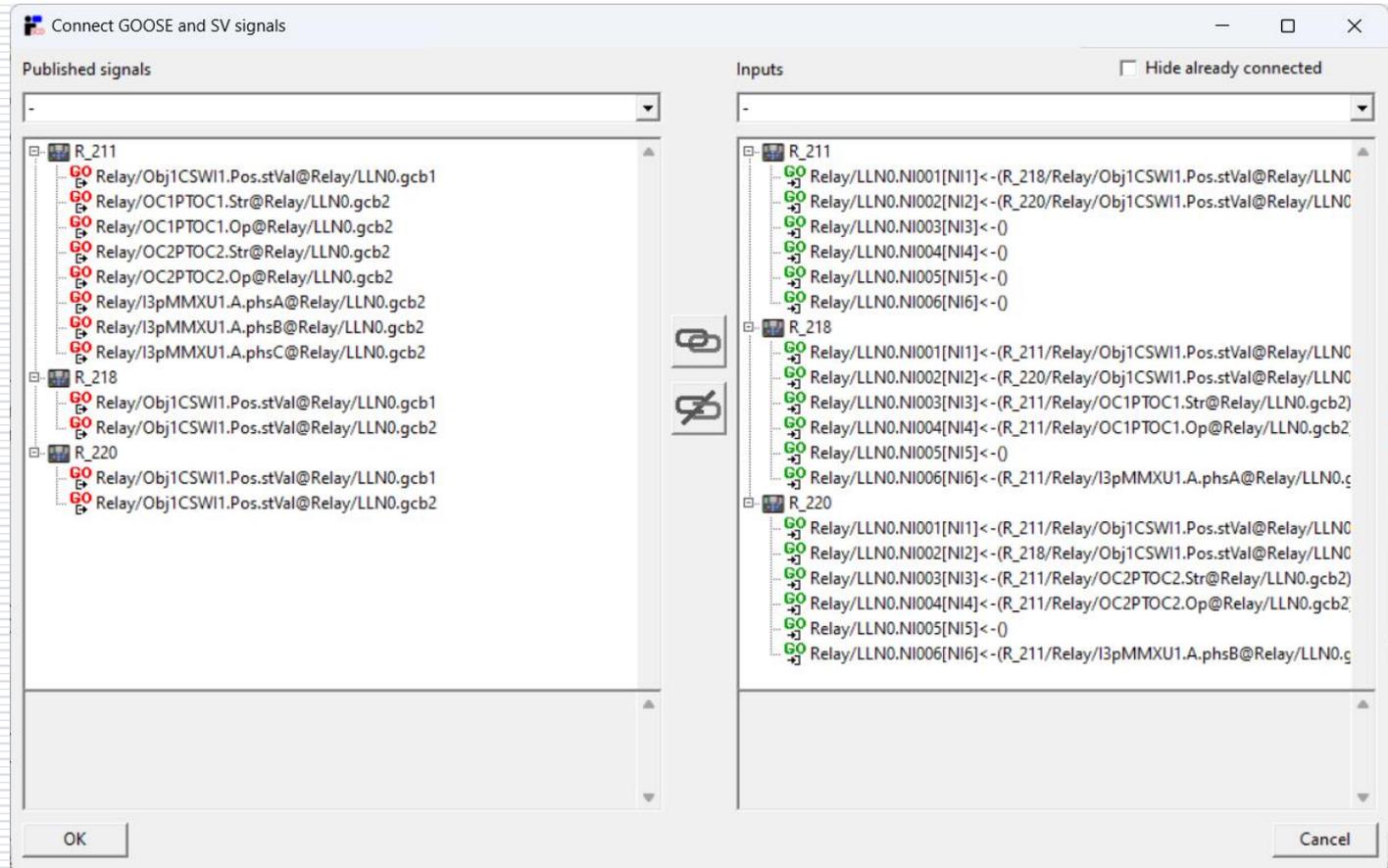
Expected source DO in GOOSE binding (Ed. 2.1)

A warning is issued in case of unmatching published data type and the expected data type on the chosen input, but the binding can still be enforced by the user.

The screenshot shows a software window titled "Connect GOOSE and SV signals". It is divided into two main panes: "Published signals" on the left and "Inputs" on the right. The "Published signals" pane lists several signals under the "R_211" and "R_218" categories, including "Relay/OC1PTOC1.Str@Relay/LLN0.gcb2". The "Inputs" pane lists signals under "R_211", "R_218", and "R_220", including "Relay/LLN0.NI004[NI4]<-0". A warning dialog box is overlaid on the interface, displaying a yellow warning icon and the following text: "Warning: Source signal common data class differ from expected! Source signal: Relay/OC1PTOC1.Str has cdc: ACD Expected cdc: ACT Connect signals anyway?". Below the text are "Yes" and "No" buttons. At the bottom of the main window, there is an "OK" button on the left and a "Cancel" button on the right. A status bar at the bottom right of the "Inputs" pane shows the message: "Relay/LLN0.NI004[NI4] not connected Expected CDC: ACT (DO: Op)".

Binding creation

Data from publishing IEDs assigned to inputs of subscribing IEDs.



GOOSE binding list generation



Press the button „Show connections list”.

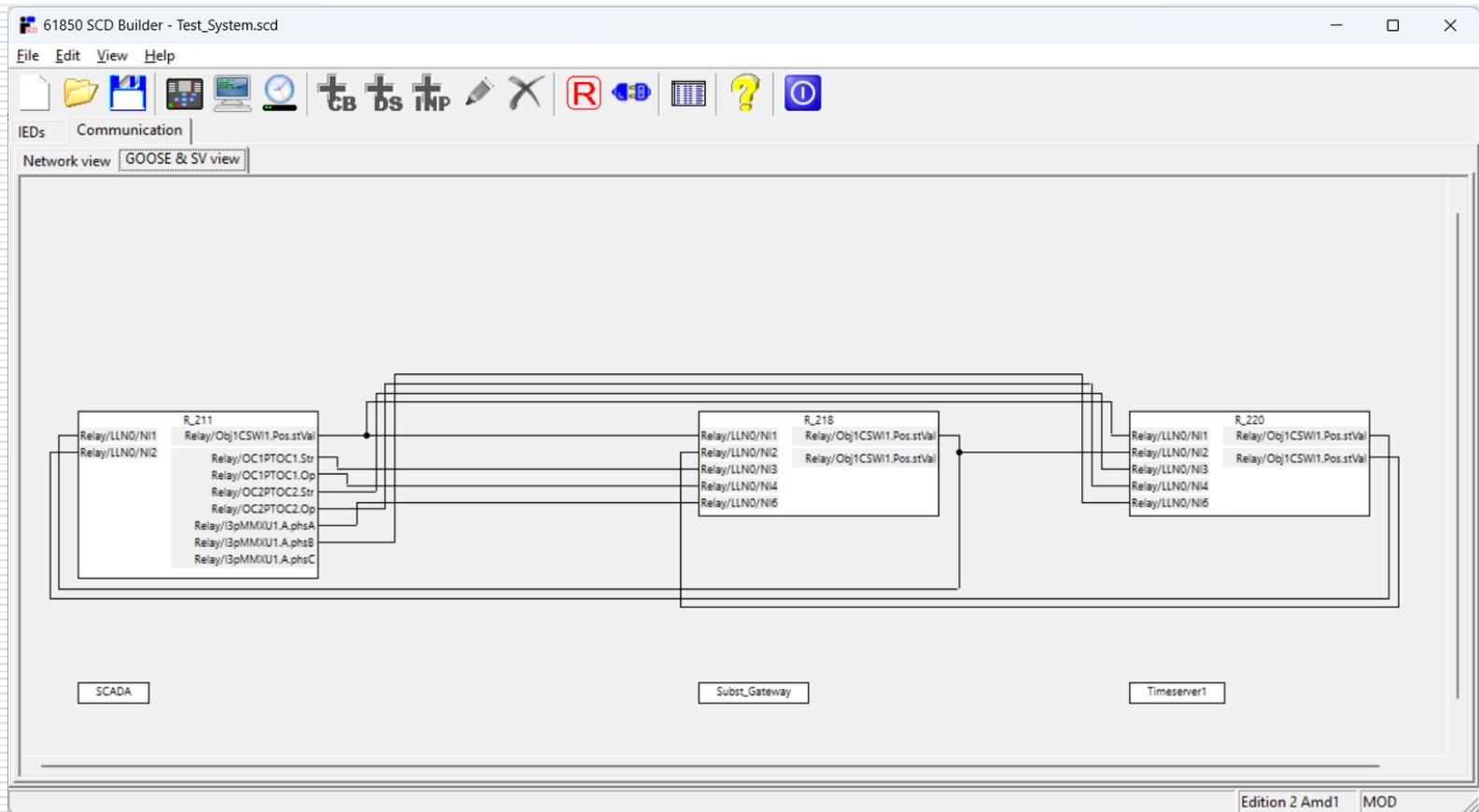
The list can be exported to a plain text document.

The dialog box 'List of GOOSE connections' contains the following data in its table:

Source	Destination
R_218Relay/Obj1CSWI1.Pos.stVal	R_211Relay.NI001[NI1]
R_220Relay/Obj1CSWI1.Pos.stVal	R_211Relay.NI002[NI2]
R_211Relay/Obj1CSWI1.Pos.stVal	R_218Relay.NI001[NI1]
R_220Relay/Obj1CSWI1.Pos.stVal	R_218Relay.NI002[NI2]
R_211Relay/OC1PTOC1.Str	R_218Relay.NI003[NI3]
R_211Relay/OC1PTOC1.Op	R_218Relay.NI004[NI4]
R_211Relay/I3pMMXU1.A.phsA	R_218Relay.NI006[NI6]
R_211Relay/Obj1CSWI1.Pos.stVal	R_220Relay.NI001[NI1]
R_218Relay/Obj1CSWI1.Pos.stVal	R_220Relay.NI002[NI2]
R_211Relay/OC2PTOC2.Str	R_220Relay.NI003[NI3]
R_211Relay/OC2PTOC2.Op	R_220Relay.NI004[NI4]
R_211Relay/I3pMMXU1.A.phsB	R_220Relay.NI006[NI6]

Communication view: GOOSE & SV binding

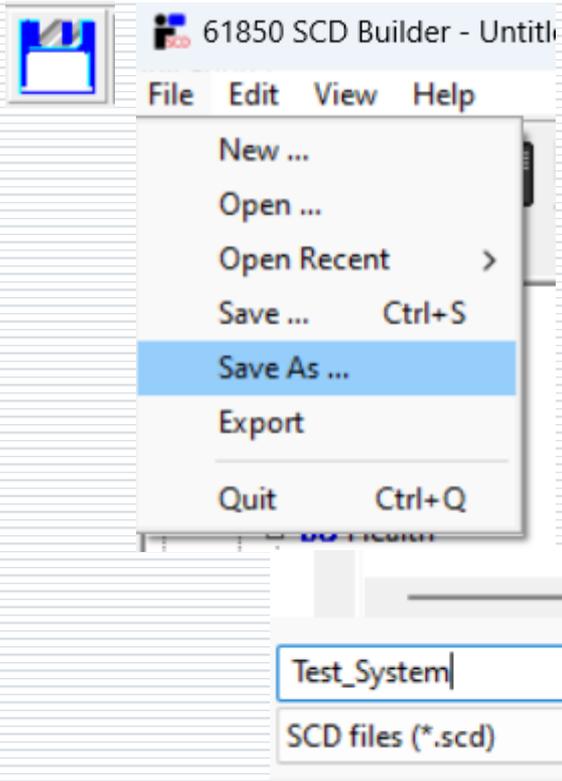
Data flow
in the
system.



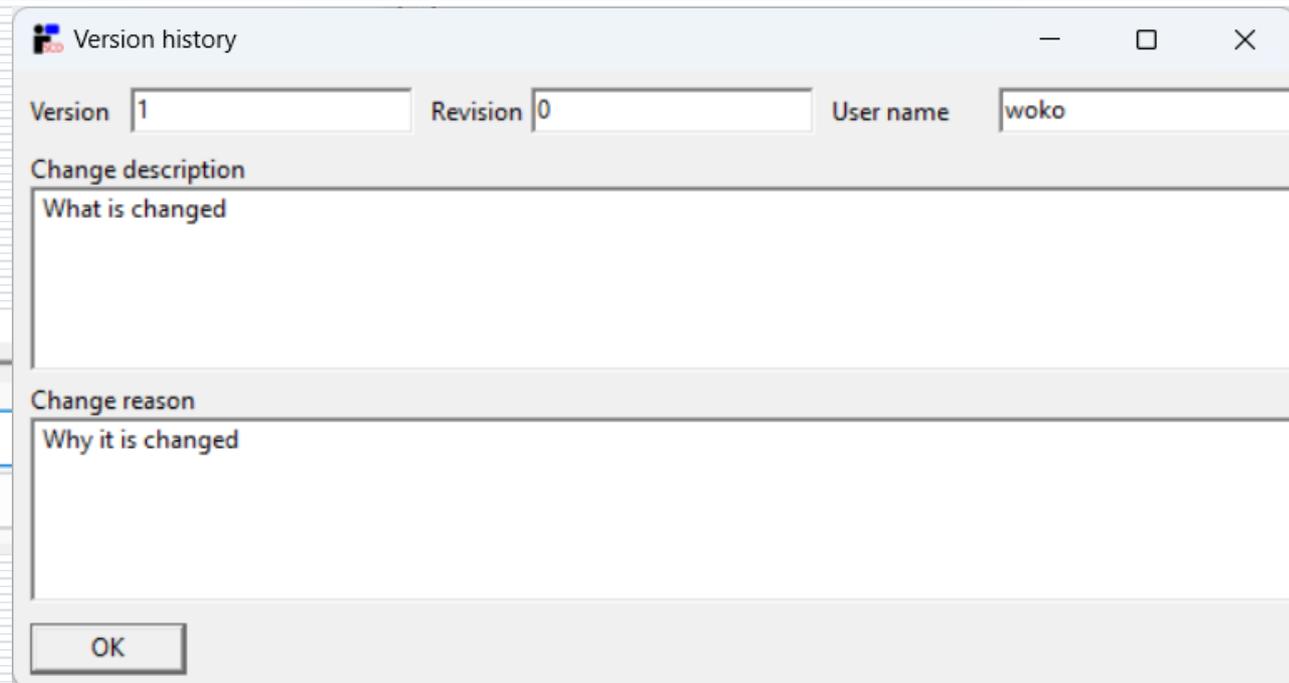
SV binding

The binding between published Sampled Values (elements of data sets of MSVCB in Merging Units) and Inputs of the receiving IEDs can be done in the same way as GOOSE binding.

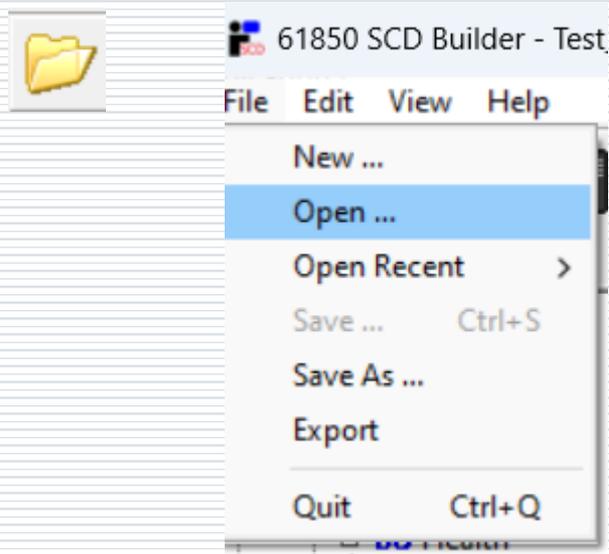
SCD file saving and version control



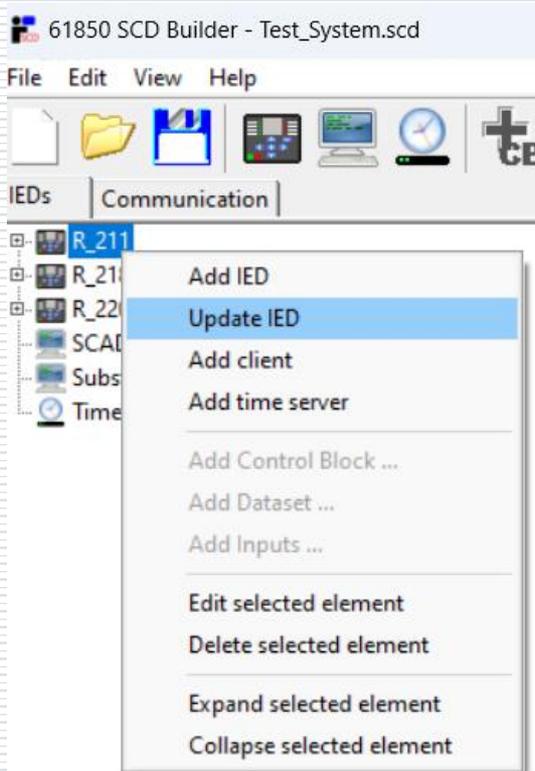
SCD document contains the version history.



Opening an existing SCD file



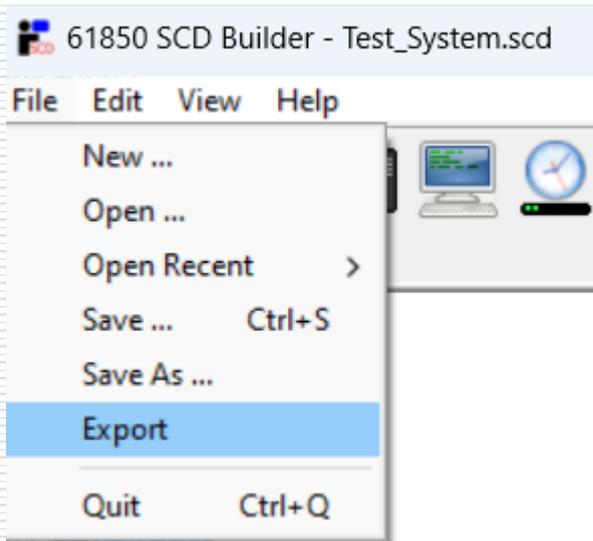
IID file import for an IED section revision



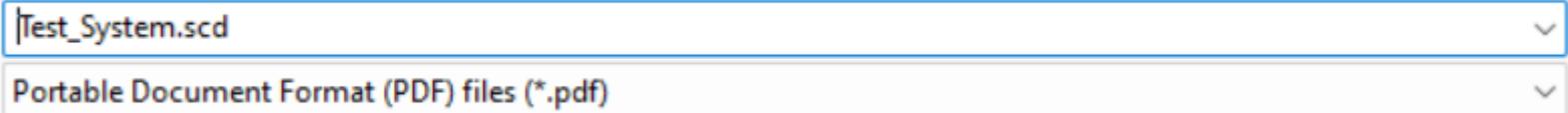
R_211_revised.iid

IED SCL files (*.icd,*.cid,*.iid)

Generation of system documentation



The program can produce the documentation of the created system configuration.



XML level editor and checker

The image shows two overlapping software windows. The background window is titled "61850 SCD Builder - Test_System.scd" and has a menu bar with "File", "Edit", "View", and "Help". The "File" menu is open, showing options like "Show SCD", "Expand selected element", and "Collapse selected element". The foreground window is titled "XML editor" and contains XML code. A toolbar at the top of the XML editor includes a green checkmark icon, a padlock icon, and other standard editing icons. Two black arrows point from text labels to these icons: one from "Check syntax" to the green checkmark, and another from "Unlock XML editing" to the padlock icon.

61850 SCD Builder - Test_System.scd

File Edit View Help

Show SCD

Expand selected element

Collapse selected element

IEDs

R_21

XML editor

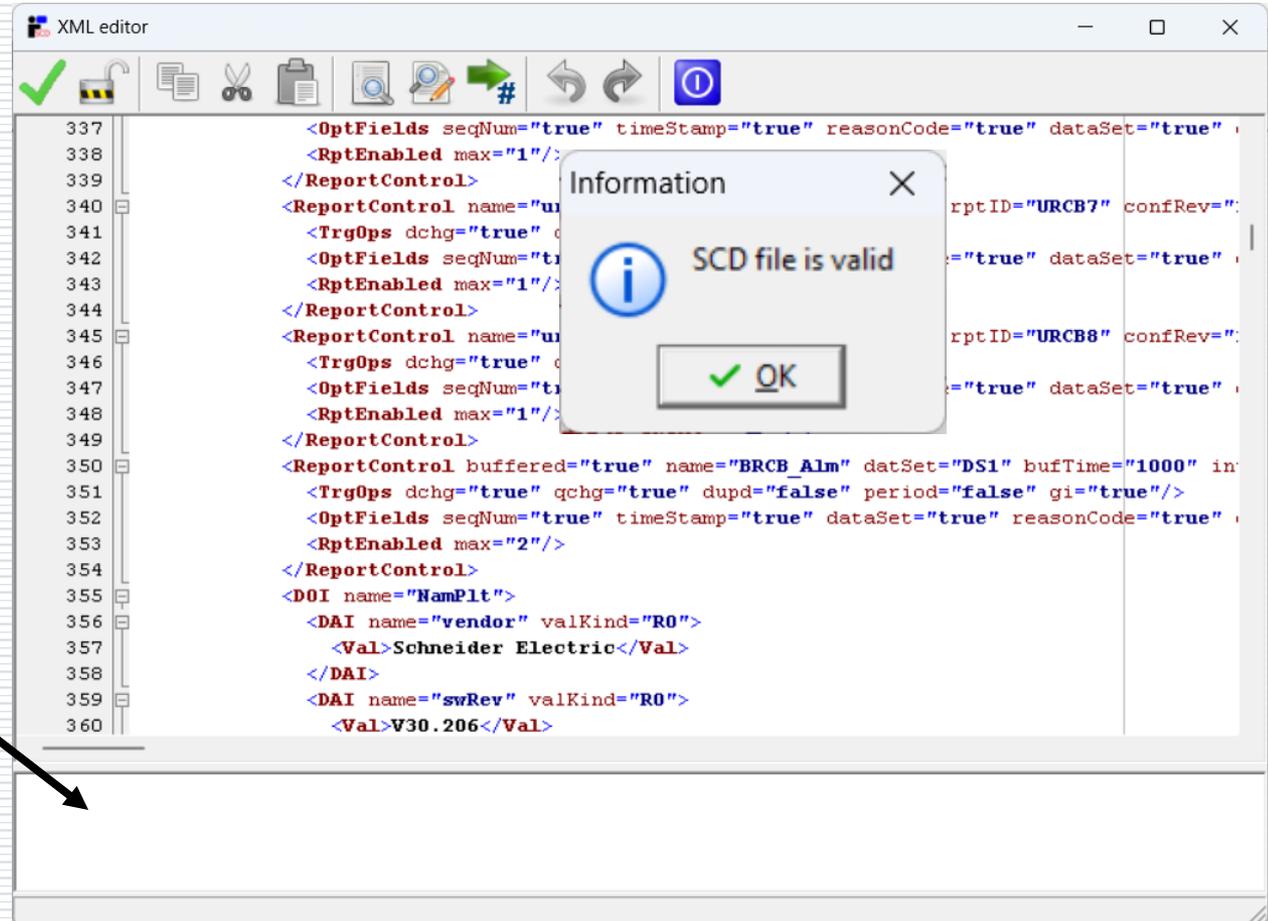
```
</DAI>
<DAI name="IdNs" valKind="R0">
  <Val>IEC 61850-7-4:2007B</Val>
</DAI>
</DOI>
<DOI name="LEDRs">
  <DAI name="ctlModel" valKind="R0">
    <Val>direct-with-normal-security</Val>
  </DAI>
</DOI>
<Inputs>
  <ExtRef serviceType="GOOSE" intAddr="NI1" pDO="Pos" iedName="R_211" ldInst=
  <ExtRef serviceType="GOOSE" intAddr="NI2" pDO="Pos"/>
  <ExtRef serviceType="GOOSE" intAddr="NI3" pDO="Str" iedName="R_211" ldInst=
  <ExtRef serviceType="GOOSE" intAddr="NI4" pDO="Op" iedName="R_211" ldInst=
  <ExtRef serviceType="GOOSE" intAddr="NI5" pDO="Alm1"/>
  <ExtRef serviceType="GOOSE" intAddr="NI6" pDO="A.phsA" iedName="R_211" ldIn=
</Inputs>
<GSEControl name="gcb1" type="GOOSE" appID="V_218" confRev="1" dataSet="DSG1"/:
<GSEControl name="gcb2" type="GOOSE" appID="V_218B" confRev="1" dataSet="DSG2"/:
</LNO>
<LN lnType="GGIO_0" lnClass="GGIO" prefix="DI01" inst="45">
  <DOI name="NamPlt">
    <DAI name="vendor" valKind="R0">
```

Check syntax

Unlock XML editing

Always check after editing

Press



Detected errors will be listed with the line information.

Try yourself – request the trial version of 61850 SCD Builder

... and, if satisfied, ask a quote for the licensed version.



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