

# This webinar brought to you by the Relion<sup>®</sup> product family

## Relion. Thinking beyond the box.

Designed to seamlessly consolidate functions, Relion relays are smarter, more flexible and more adaptable. Easy to integrate and with an extensive function library, the Relion family of protection and control delivers advanced functionality and improved performance.



# ABB Protective Relay School Webinar Series

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ABB Protective Relay School Webinar Series

# Introduction to PCM600

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8-13-2015

# Presenter



Jared is a Customer Support Engineer for the Relion family 670 and 650 product series along with the other items in the Substation Automation Products Portfolio. He is located in Raleigh, North Carolina. Jared has been part of the NAM SA Products team since January 2014. Prior to this he participated in the ABB Power and Automation Leaders Program from 2011-2013 holding roles as an Application Engineer with the Smart Grid Center of Excellence, Support and Product Management with PPMV, and as a Research Engineer with the US Corporate Research Group. Jared graduated from Missouri University of Science and Technology with a B.S. in Electrical Eng and is currently working on his M.S. in Electrical Eng with a concentration in Power Systems from the same institution.

# Learning objectives

This webinar will cover the use of the PCM600 software to configure the Relion relays.

- Introduction
- PCM600
- Application Configuration Tool
- Parameter Setting Tool
- Graphic Display Editor
- IEC61850
- Questions

# Introduction Overview



## PCM600

- Configure ABB relays
- Interact with ABB IED's
- Build systems
- Communications
- Project Management
- And much more...

*“That sounds simple...so I should be able to just download PCM600 and begin configuring a relay?”*

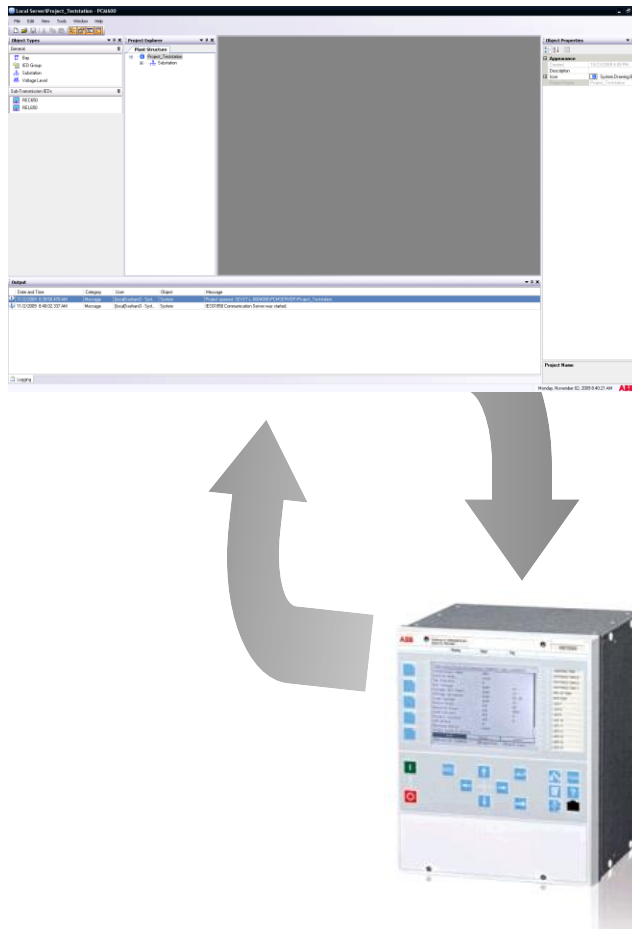
# Introduction Overview



## PCM600 components

- IED connectivity packages
  - Enables support for specific IED series in PCM600
  - Contains “IED modules” for specific IED types and versions
- Communication connectivity packages
  - Enables support for different communication protocols in PCM600 (communication between PCM600 and the IED)
- These packages can be found in the Update Manager which is downloaded whenever PCM600 is installed

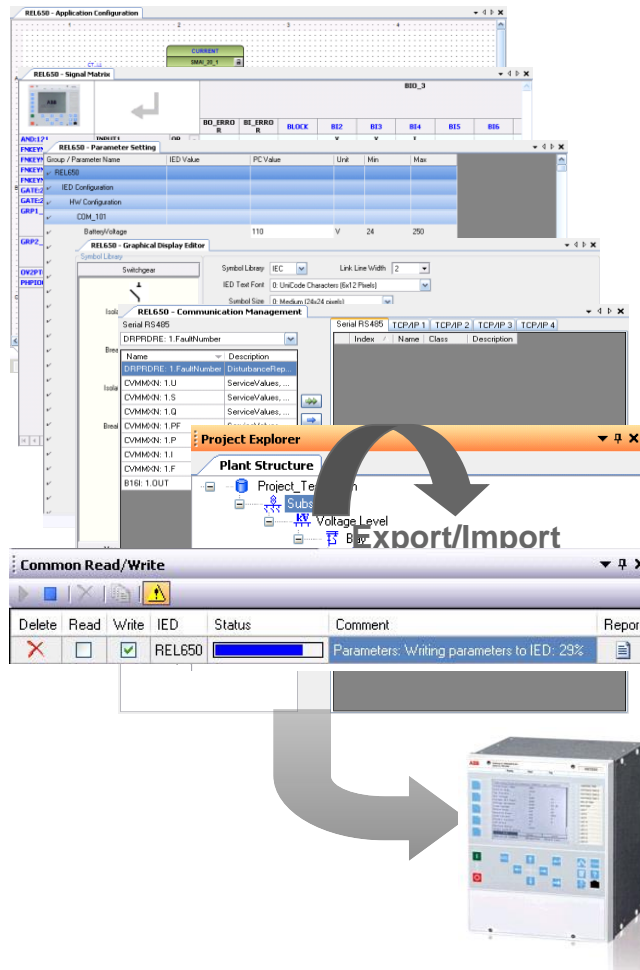
# Introduction Overview



- PCM600 2.6 together with the 650/670 series includes
  - Engineering tools
  - Monitoring tools
  - Project Tools



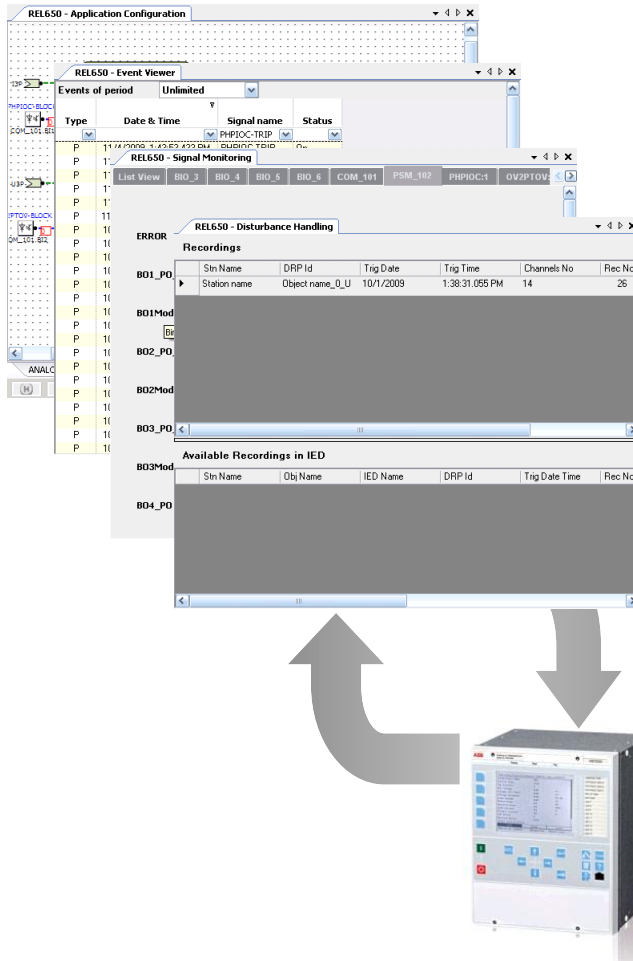
# Introduction Engineering Tools



- Hardware Configuration
- Application configuration
- Signal matrix
- Parameter setting
- Graphical display
- Communication management
  - DNP 3.0
- IEC61850 Configuration Tool
- Communication PCM600/IED
  - Common Read/Write Tool
  - Read/Writes all configuration data with one mouse-click

# Introduction

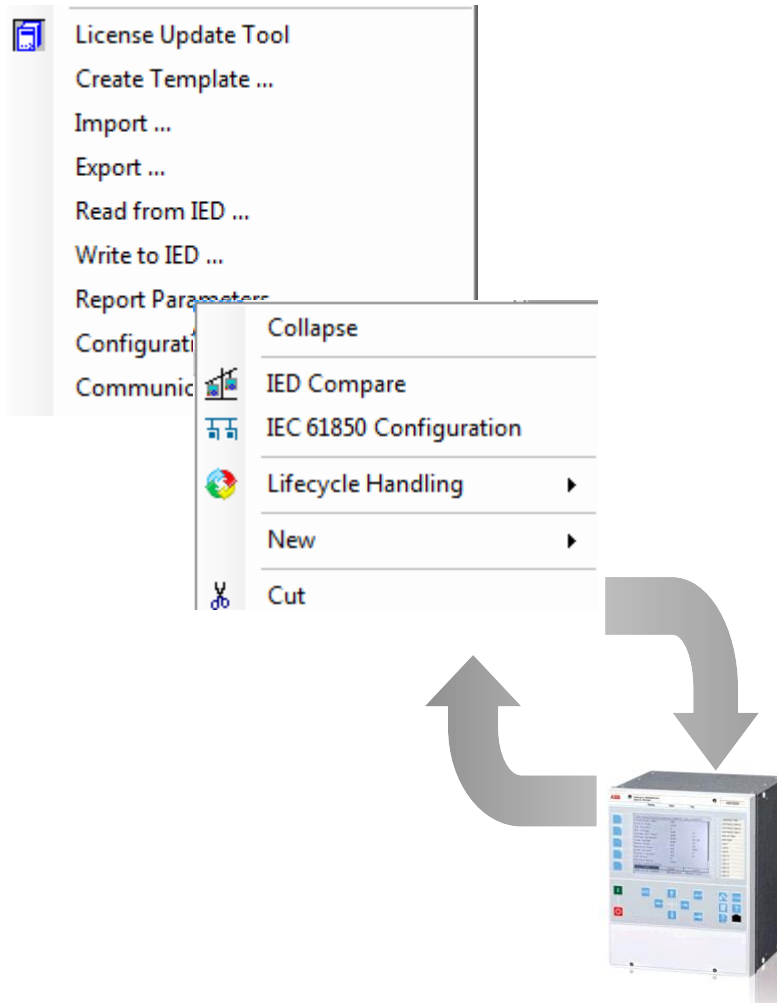
## Monitoring Tools



- ACT online monitoring
- Event viewer
- Signal monitoring
- Disturbance handling

# Introduction

## Project Tools



- Import/Export
- Read/Write to Relay
- License Update Tool
- IED Compare

# Introduction

## Downloading Software

Industries and utilities > Power T&D Solutions > Substation Automation and Protection > Software Library

Home	<h3>Welcome to the ABB Substation Automation Software Library</h3> <p><b>ABB now provides you with an easy way to get Substation Automation software. Via the license server we can offer you software free of charge or enable you to upgrade your existing trial versions to commercial versions.</b></p> <p>At time the Substation Automation license server is the place for you when you need to download free (or evaluation) version av PCM600 Protection and Control IED Manager. The server also handles the license registration when you update to the commercial versions (Engineering and Engineering Pro) of PCM600.</p> <p>When you have registrated we can provide you information about new releases of software, enable downloads of critical updates and and trial versions.</p>
Library	
Activate	

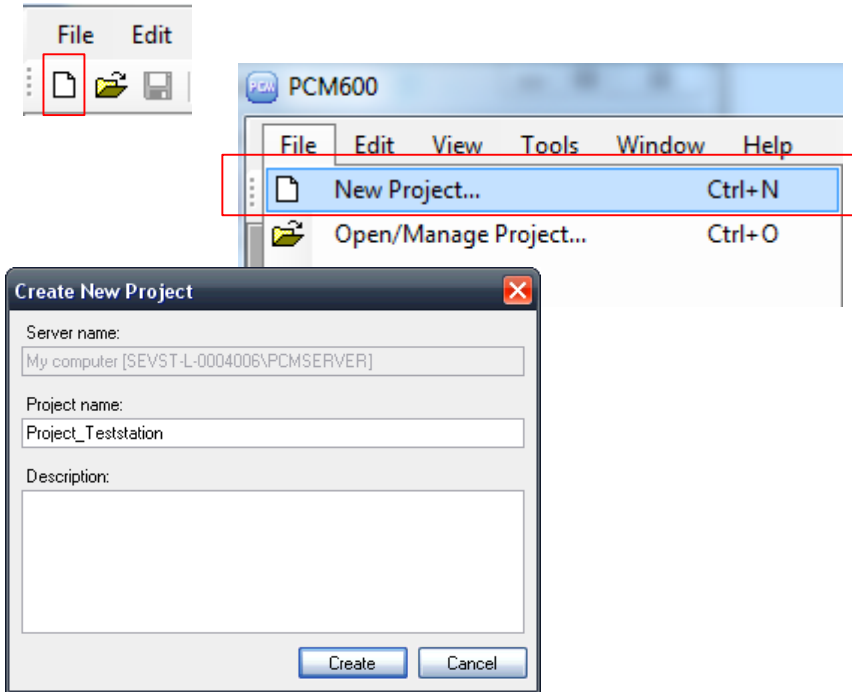
- Current Version: PCM600 v2.6 – No License Necessary
- Software managed by “ABB Substation Automation Software Library”.
  - To access the Software Library, go to <https://www143.abb.com/SoftwareLibrary>
  - Need to register as a user and create an account

# Agenda

- Introduction
- PCM600
- Application Configuration Tool
- Parameter Setting Tool
- Graphic Display Editor
- IEC61850
- Questions

# PCM600

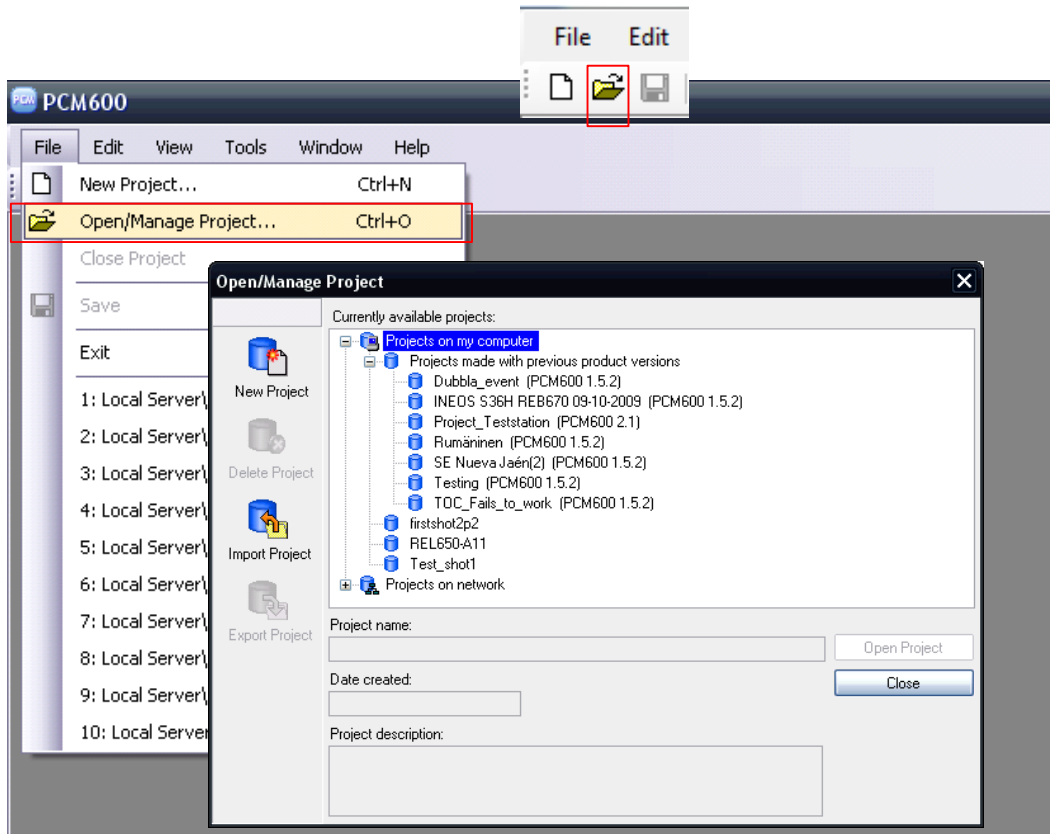
## Create a New Project



- Create New Project
  - As name suggest, only provides the option to Create a New Project.
- Entry Fields
  - Project Name
  - Description

# PCM600

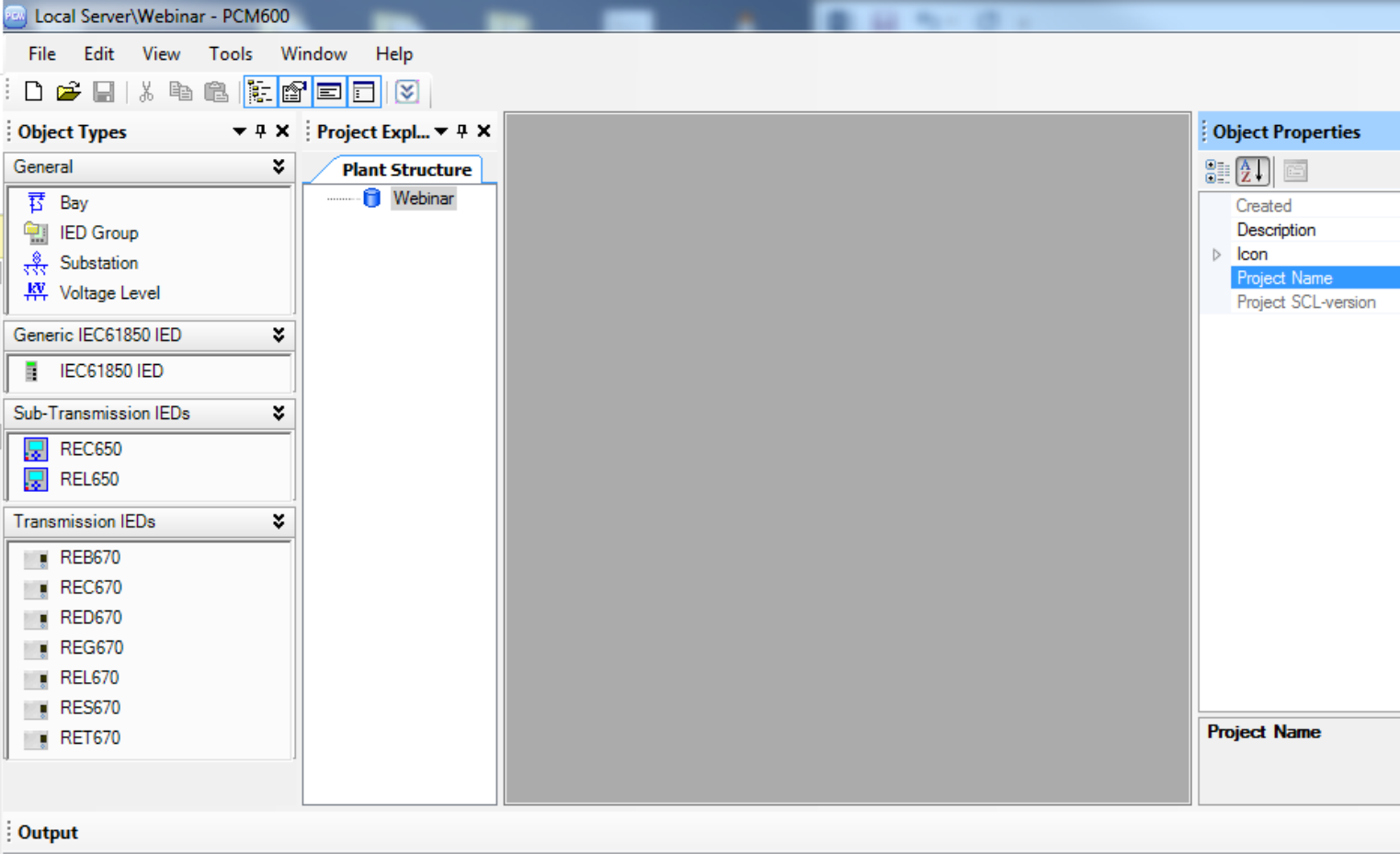
## Open/Manage Project



### Open/Manage projects

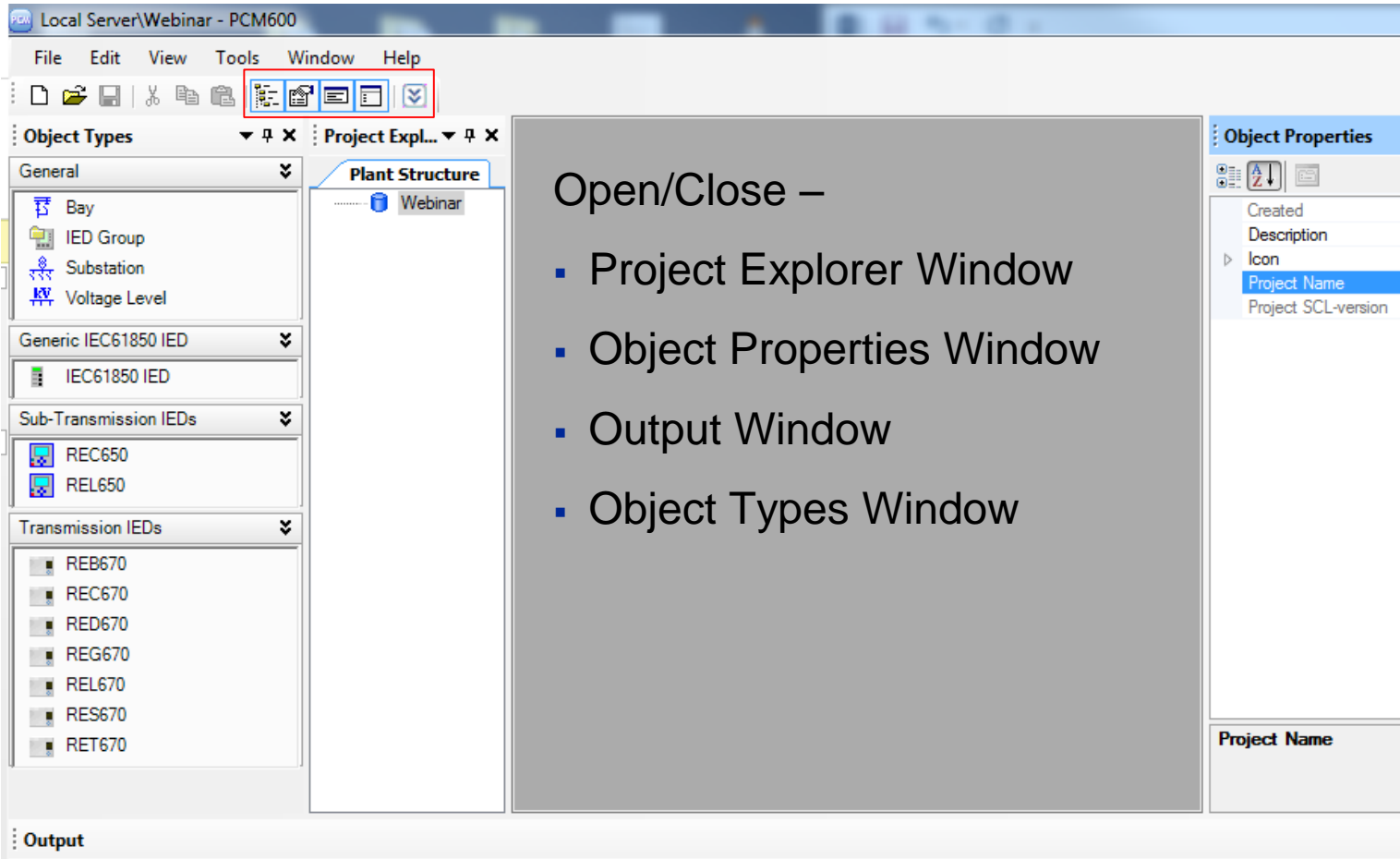
- Create projects
- Delete projects
- Export projects
  - All data within the PCM600 project is exported to a file with extension “.pcmp”. Used for back-up purposes.
- Import projects
  - Use earlier exported .pcmp file
- Rename projects

# PCM600 Layout





# PCM600 Layout



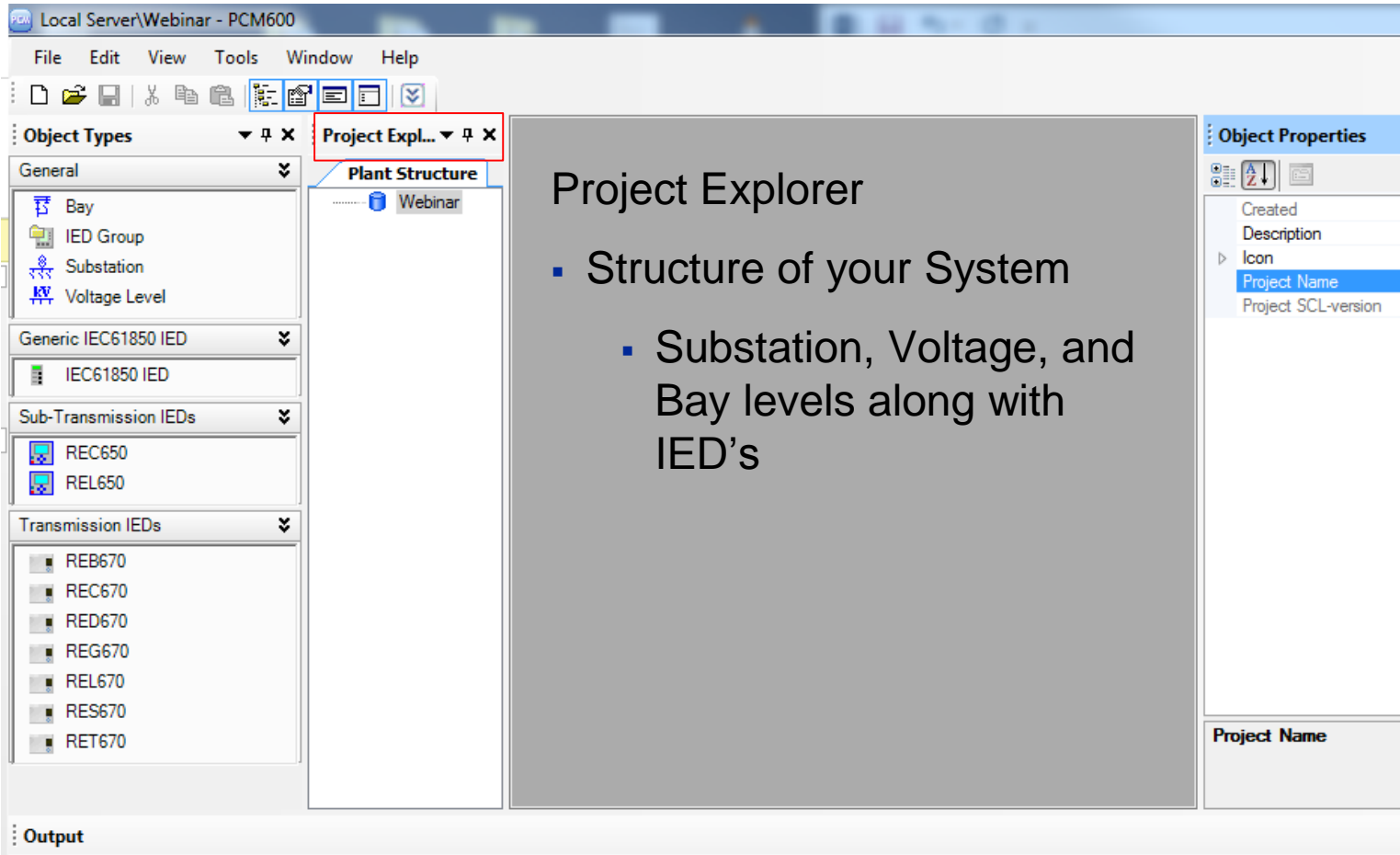
The screenshot displays the PCM600 software interface. The main window is titled "Local Server\Webinar - PCM600". The menu bar includes File, Edit, View, Tools, Window, and Help. The toolbar contains various icons, with a red box highlighting the Project Explorer, Object Properties, and Output window icons. The interface is divided into several panes:

- Object Types:** A list of object types including Bay, IED Group, Substation, Voltage Level, Generic IEC61850 IED (IEC61850 IED), Sub-Transmission IEDs (REC650, REL650), and Transmission IEDs (REB670, REC670, RED670, REG670, REL670, RES670, RET670).
- Project Explorer:** A tree view showing the project structure, currently displaying "Webinar".
- Object Properties:** A pane showing properties for the selected object, including Created, Description, Icon, Project Name, and Project SCL-version.
- Output:** A pane at the bottom left for displaying output messages.

A central grey box contains the text "Open/Close –" followed by a list of windows:

- Project Explorer Window
- Object Properties Window
- Output Window
- Object Types Window

# PCM600 Layout



Local Server\Webinar - PCM600

File Edit View Tools Window Help

Object Types Project Expl... ▾ ▹ ✕

General ▾

- Bay
- IED Group
- Substation
- Voltage Level

Generic IEC61850 IED ▾

- IEC61850 IED

Sub-Transmission IEDs ▾

- REC650
- REL650

Transmission IEDs ▾

- REB670
- REC670
- RED670
- REG670
- REL670
- RES670
- RET670

Plant Structure

- Webinar

Object Properties

- Created
- Description
- Icon
- Project Name
- Project SCL-version

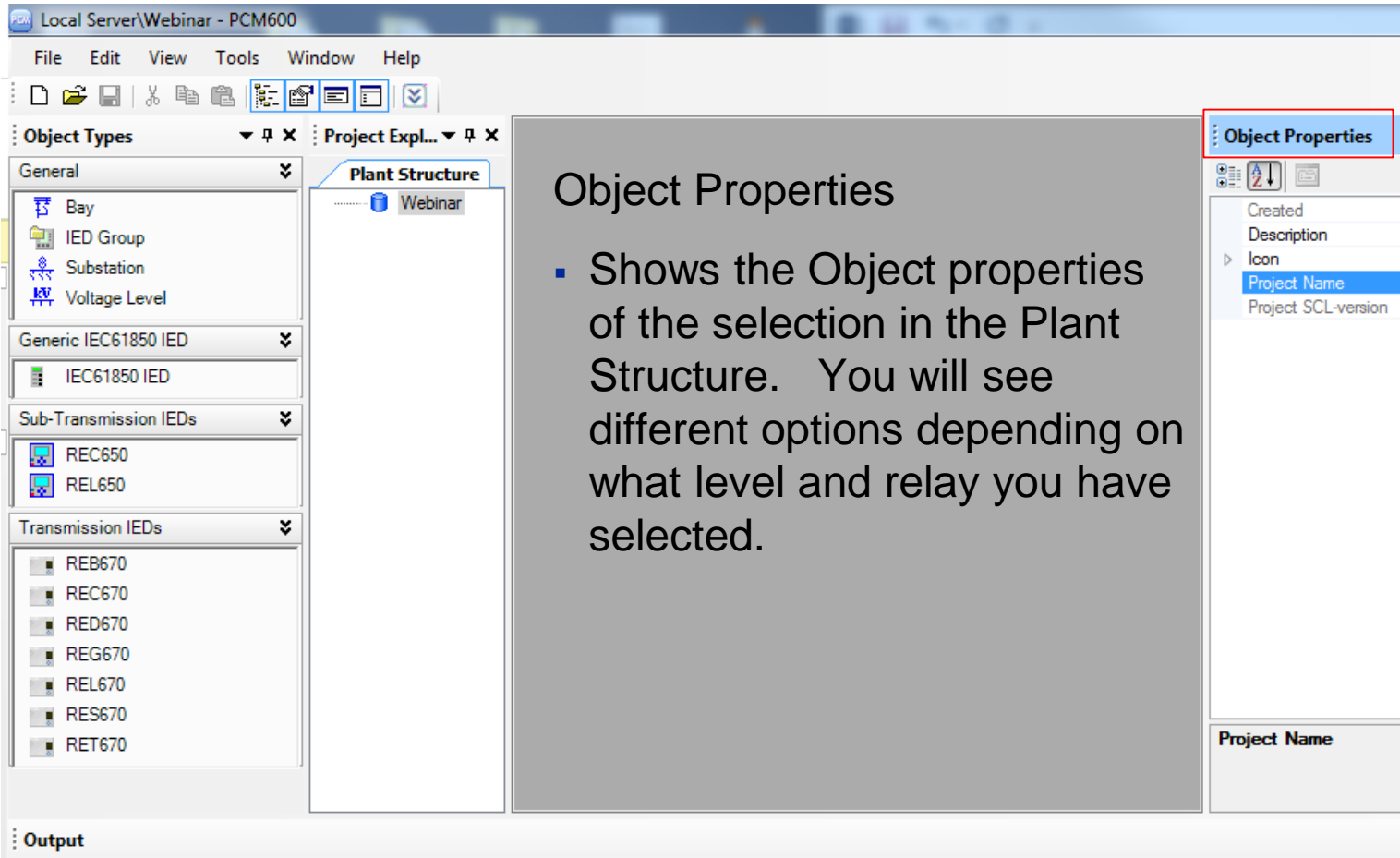
Project Name

Output

## Project Explorer

- Structure of your System
  - Substation, Voltage, and Bay levels along with IED's

# PCM600 Layout



The screenshot displays the PCM600 software interface. The main window is titled "Local Server\Webinar - PCM600". The menu bar includes File, Edit, View, Tools, Window, and Help. The toolbar contains various icons for file operations and editing. The "Object Types" panel on the left is expanded to show "Plant Structure", which contains a "Webinar" object. The "Object Properties" panel on the right is highlighted with a red box and shows the following properties:

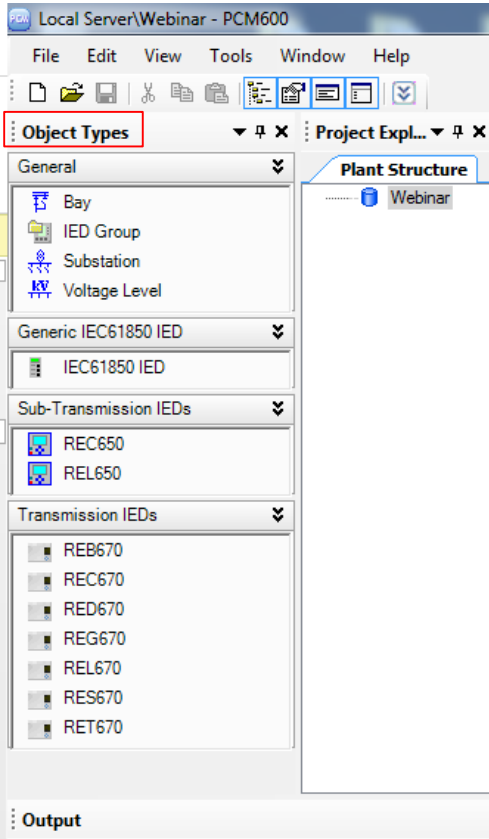
- Created
- Description
- Icon
  - Project Name
  - Project SCL-version

The "Project Name" property is currently selected and highlighted in blue. Below the "Object Properties" panel, there is a section labeled "Project Name".

**Object Properties**

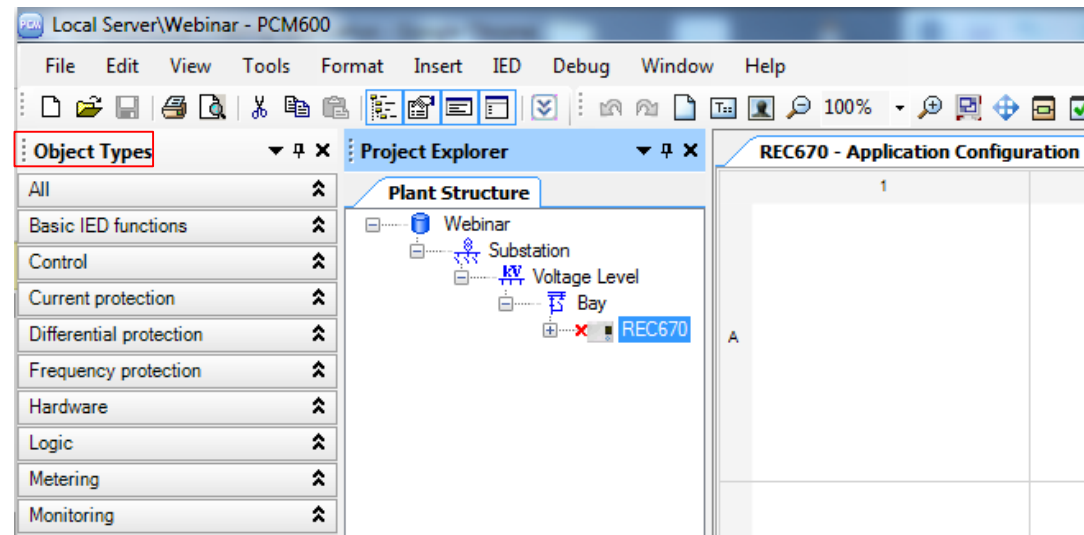
- Shows the Object properties of the selection in the Plant Structure. You will see different options depending on what level and relay you have selected.

# PCM600 Layout

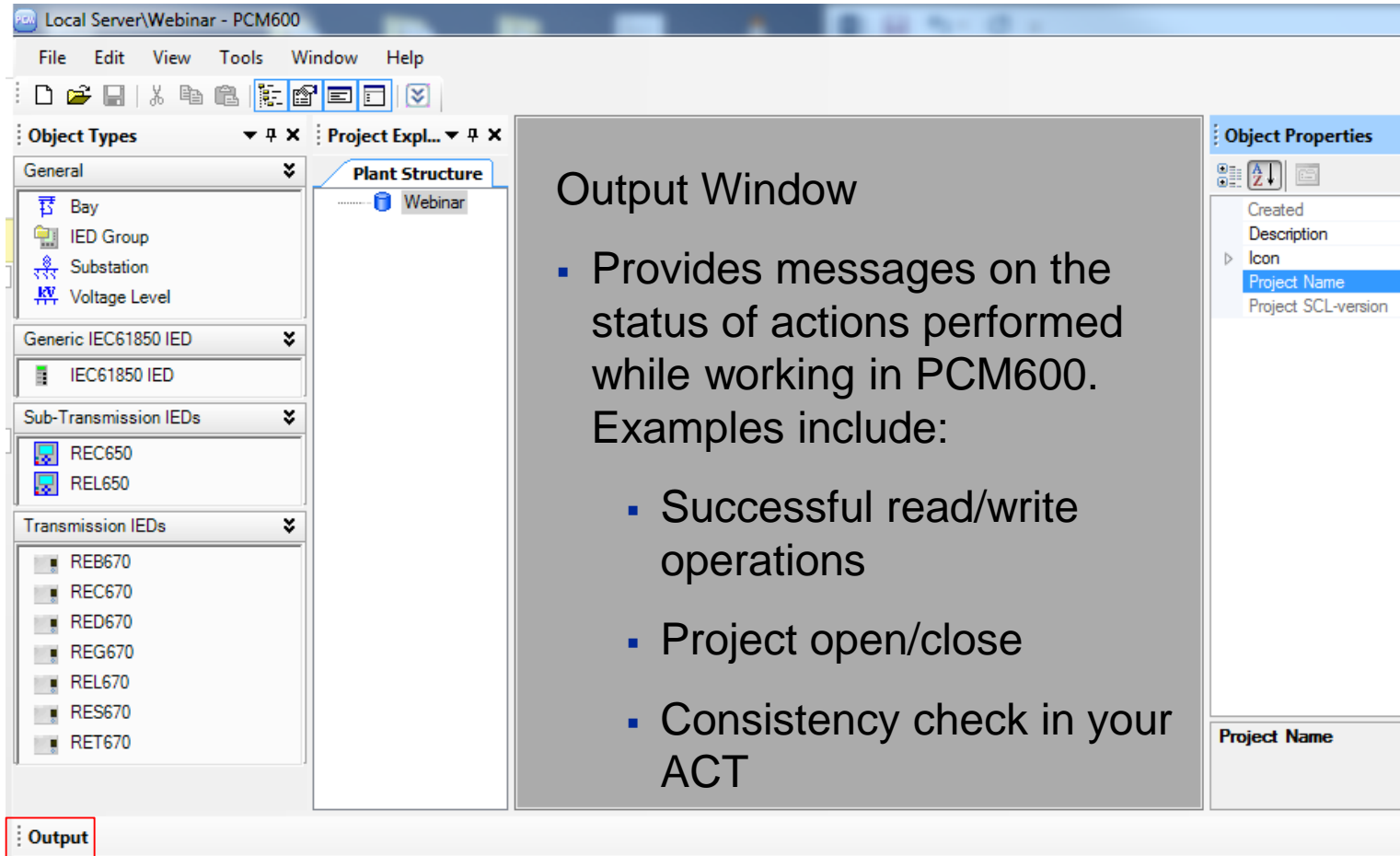


## Object Types

- While in the Plant Structure it provides the building blocks for building the system.
- When you are in the ACT of a relay it provides you with the function blocks available for building your logic configuration



# PCM600 Layout



The screenshot displays the PCM600 software interface. The main window is titled "Local Server\Webinar - PCM600". The menu bar includes File, Edit, View, Tools, Window, and Help. The interface is divided into several panes:

- Object Types:** A tree view showing various object categories:
  - General: Bay, IED Group, Substation, Voltage Level
  - Generic IEC61850 IED: IEC61850 IED
  - Sub-Transmission IEDs: REC650, REL650
  - Transmission IEDs: REB670, REC670, RED670, REG670, REL670, RES670, RET670
- Project Explorer:** Shows the "Plant Structure" with a "Webinar" project.
- Object Properties:** A panel on the right showing properties for the selected object, including Created, Description, Icon, Project Name, and Project SCL-version.
- Output Window:** A panel at the bottom left, highlighted with a red box, which is the focus of the text overlay.

**Output Window**

- Provides messages on the status of actions performed while working in PCM600. Examples include:
  - Successful read/write operations
  - Project open/close
  - Consistency check in your ACT

# PCM600 Layout

The screenshot displays the PCM600 software interface with the Project Explorer on the left and several context menus open over different levels of the project structure. The Project Explorer shows a hierarchy: Plant Structure > Webinar > Substation > Voltage Level > Bay > REC670.

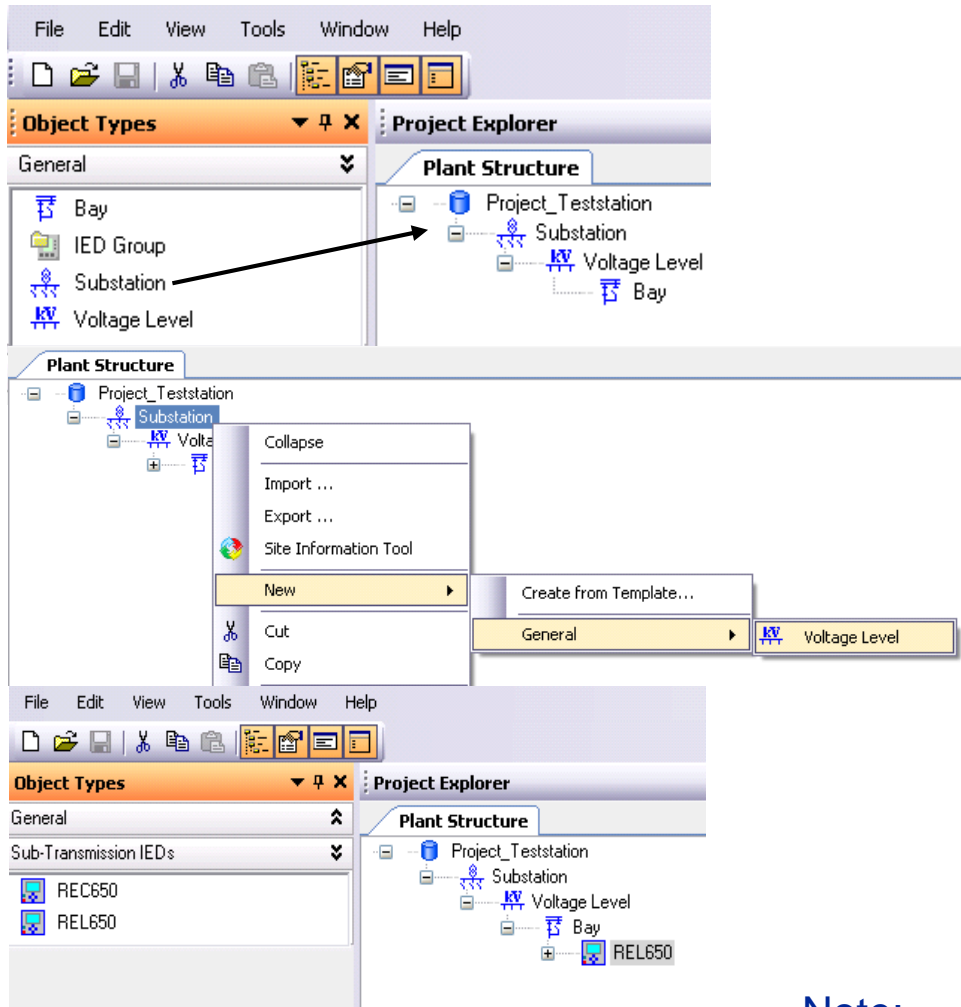
The context menus are as follows:

- Webinar:** Collapse, New, Properties.
- Substation:** Expand, IED Compare, IEC 61850 Configuration, Import ..., Export ..., Lifecycle Handling, New, Cut, Copy, Delete, Rename, Properties.
- Voltage Level:** Expand, IED Compare, IEC 61850 Configuration, Lifecycle Handling, New, Cut, Copy, Delete, Rename, Properties.
- Bay:** Expand, IED Compare, IEC 61850 Configuration, Import ..., Lifecycle Handling, New, Cut, Copy, Delete, Rename, Properties.
- REC670:** Expand, Signal Monitoring, Disturbance Handling, Event Viewer, Parameter Setting, Application Configuration, Signal Matrix, Graphical Display Editor, Hardware Configuration, Migrate Configuration, IED Users, IED Compare, IEC 61850 Configuration, Communication Management, License Update Tool.

Right-click on the different levels to see what features and tools are available. Each level provides different options available to the user. For instance, the Substation Level provides an Import/Export option for SCD files which does not exist on other levels. The relay level provides all the tools for engineering and monitoring.

# PCM600

## Creating the Plant Structure



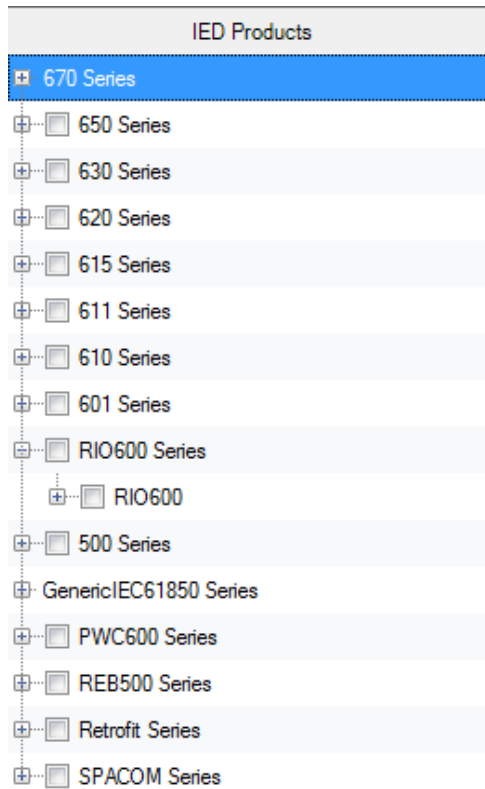
- Two ways to create objects;
  - Drag and drop from Object Types
  - Right click on object, select “New”

Note:  
Only one substation level is allowed

# PCM600

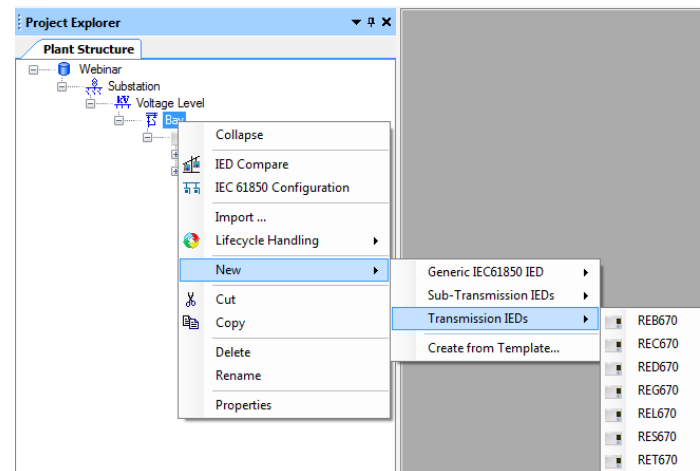
## IED Objects

IED Objects that work in PCM600 can be seen from the following list:



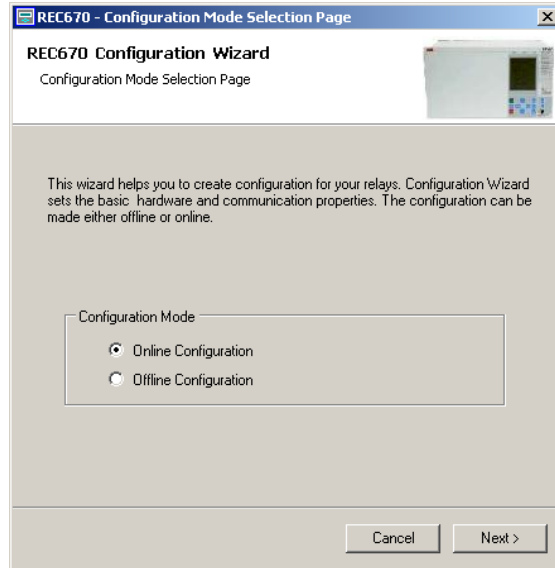
If you want to add an IED Object into PCM600 then it is necessary that you have the connectivity package installed on your computer.

Right-clicking the Bay Level and navigating the selections as seen below will show you what you have available to use. If you do not see the relay you wish to configure then close PCM600, open the Update Manager, and Download the connectivity package.

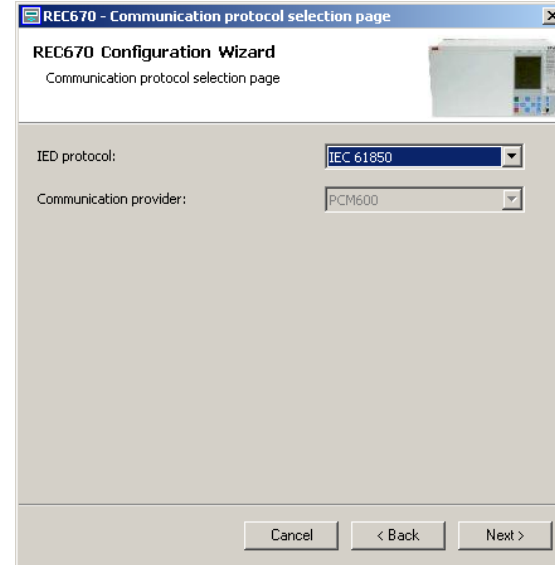




# PCM600 IED Objects



- Configuration modes
  - Online configuration
    - IED available
  - Offline configuration
    - No IED available
    - Use order files
- Import



- Select the protocol to use for the PCM600/IED communication

Note: Not possible to communicate between PCM600 and IED via SPA and LON for the 650 series

# PCM600

## IED Objects – Online Configuration

REC670 Configuration Wizard  
IEC 61850 communication protocol

PCM600 communication

Port:

IP address:

Cancel < Back Next >

REC670 Configuration Wizard  
Version Selection Page

Online Mode

Online Scan

IED Name:

IED Version:

Scan

Cancel < Back Next >

REC670 Configuration Wizard  
Housing Selection Page

Display Type Select

Display Type:

Housing Type Select

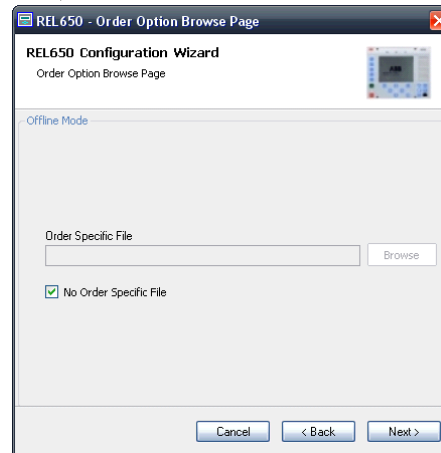
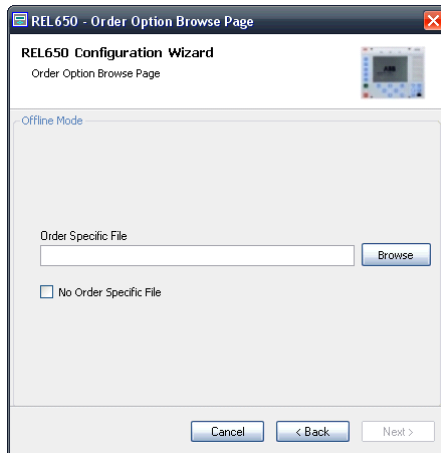
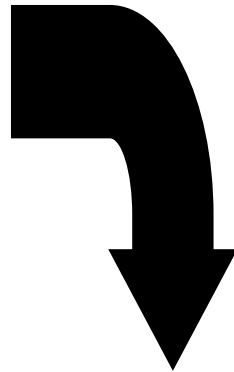
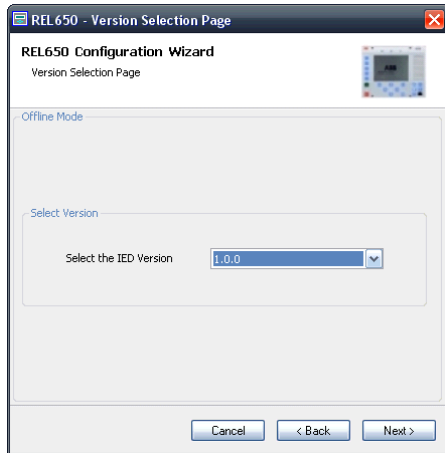
Housing Type:

Cancel < Back Next >

- Set IP address to use
- Different default values for “Front” and “Rear” port, otherwise no meaning with the “Port” selection
- IED type, version, display type (Local HMI) and housing (size of the IED) is automatically detected in online mode (Use the “Scan” button)

# PCM600

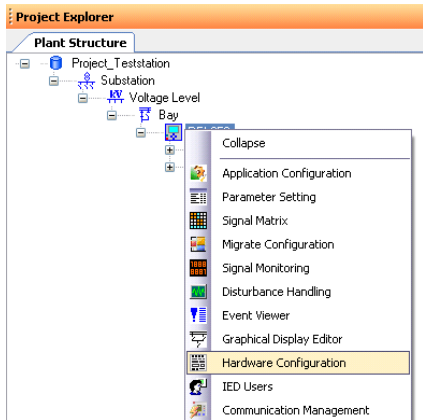
## IED Objects – Offline Configuration



- IED version must be selected manually
- Order option file available
  - Enables only ordered SW and HW in PCM600
    - No need to synchronize PCM600 and physical IED
- No order option file available
  - Enables all functionality in PCM600
    - Need to synchronize PCM600 and physical IED, use the License Update Tool
    - Possible to configure functionality in PCM600 that later will not be accepted by the IED

# PCM600

## Hardware Configuration

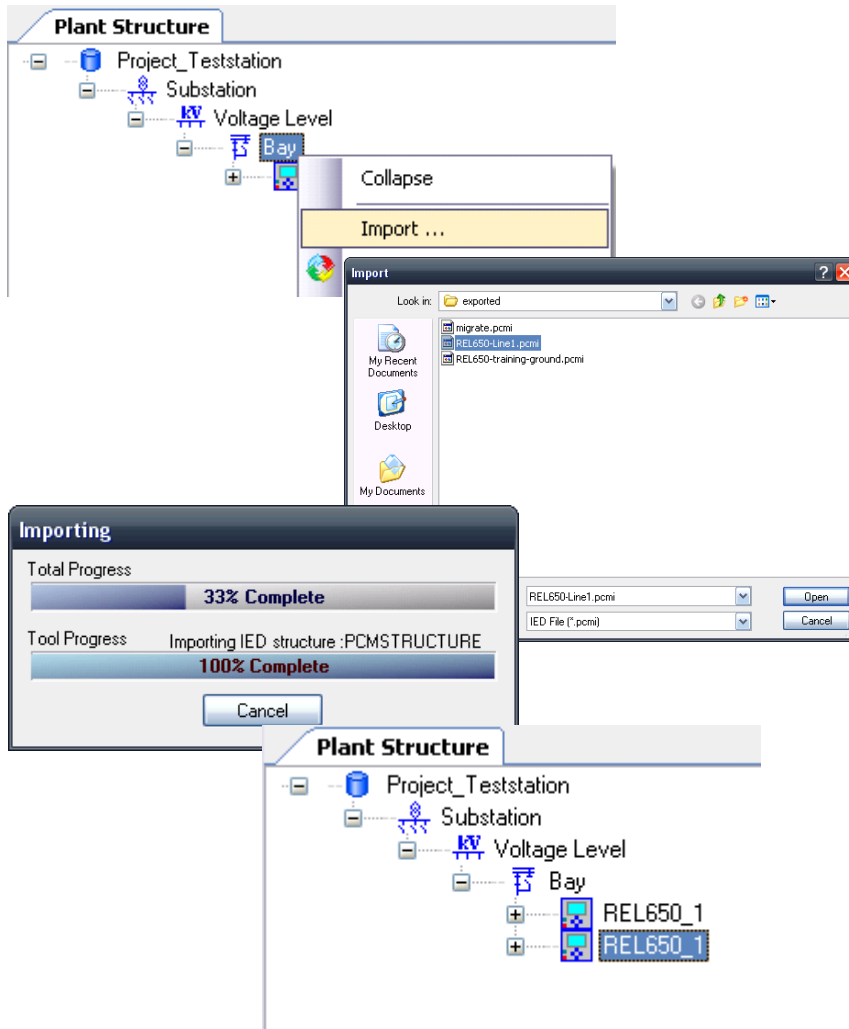


Card Space	Card Type	Card Identifier
p3	BIM	BIM_3
p4	BIM	BOM_4
p5	BOM	
p6	IOM	
p7	MIM	
p8	SOM	
p9	GSM	
p10		
p11		
p12		
p13		
p14		
p15		
p16		
p31	TRM_9I_3U	TRM_9I_3U_31

- Possible to manually configure HW/slot positions
  - This information is already available if you have created the IED object in “online mode”
- Select correct card type in correct slot position

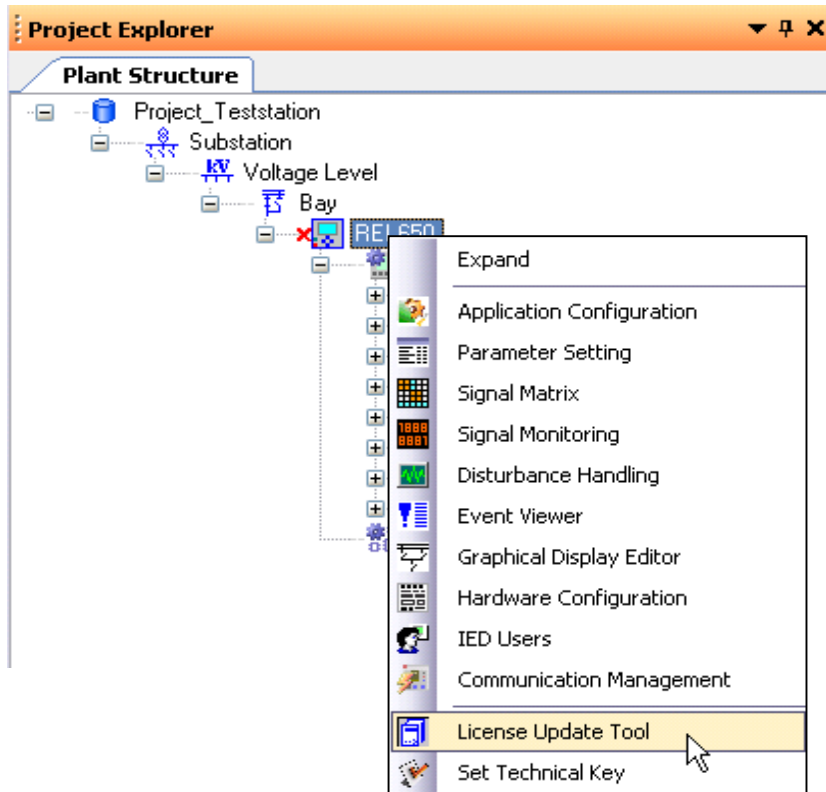
# PCM600

## IED Objects – Import



- Purpose: To reuse a previously configured IED object (pcmi file)
- Import of pcmi files can be made at the “Bay” level object in PCM600

# PCM600 License Update Tool



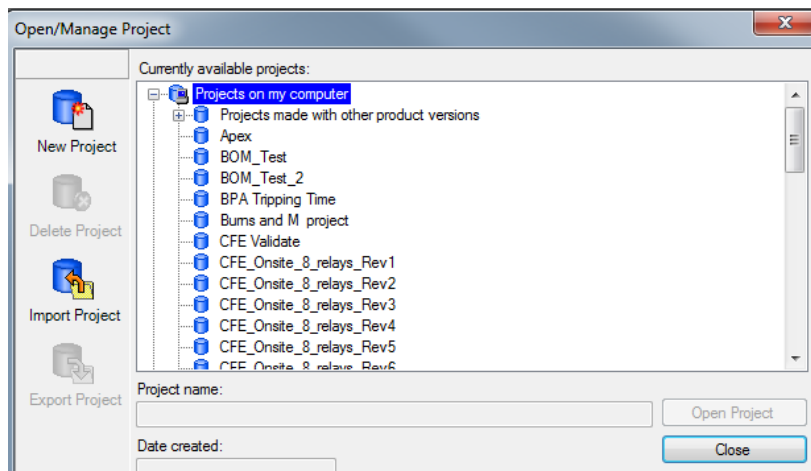
- Synchronizes PCM600 IED object with physical IED capabilities when it comes to;
  - Function options
  - Hardware options

# PCM600

## File Types

### PCMP

The PCMP is the complete project file. It contains your entire project structure, including relays with their configurations and communications. This file is managed from the “Open/Manage Projects” location discussed earlier. From this location it is possible to Import/Export the file. When bringing a project from an older version of PCM600 to a new release, you will find the project in the drop down titled “Projects made with other product versions”.



- Always make a back-up prior to upgrading a project file.
- Most upgrades will occur without a problem but if you run into any issues please contact your RTM or the SA Products Support Team.

# PCM600

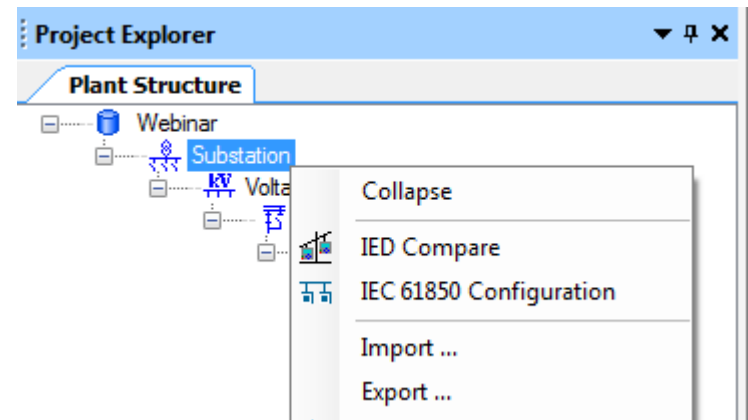
## File Types

### PCMI

- The PCMI file represents the entire relay configuration.
- IEC61850 Datasets are also included in this file.
- If you are using IEC61850 Goose in your project these connections will not be included when importing/exporting the file
- Import or Export pcmi files from the Bay Level

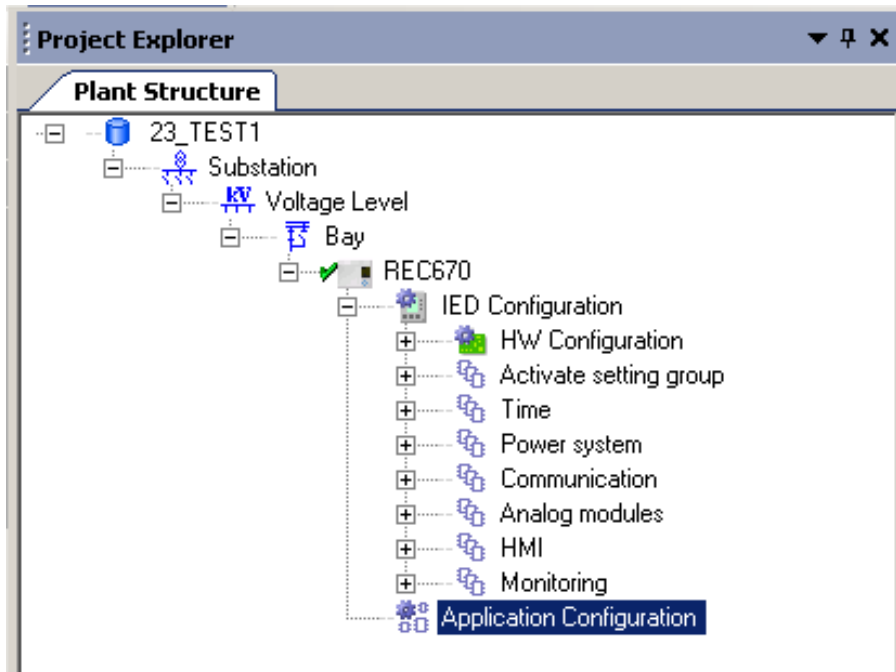
### SCD

- Substation Configuration Description
- Import or Export from the Substation Level





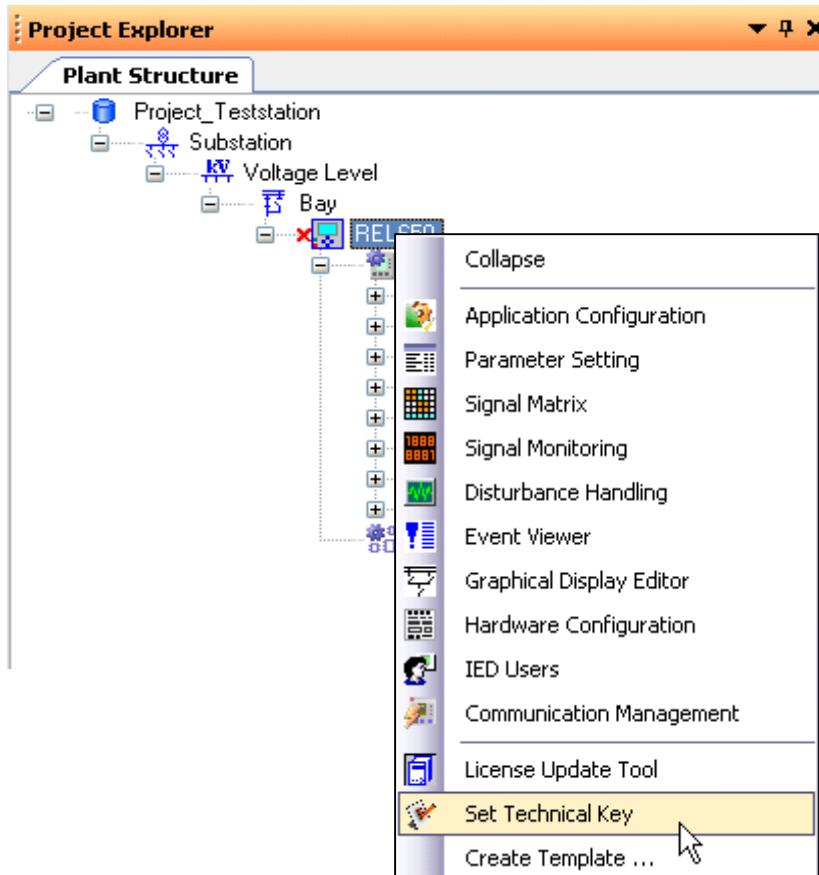
# PCM600 Plant Structure



- Two main sections
  - IED configuration structure
    - Contains basic functionality such as communication addresses and HW
  - Application configuration structure
    - Contains the configuration data from the ACT.
    - Synchronized with the Main Application structure configured with ACT.

# PCM600

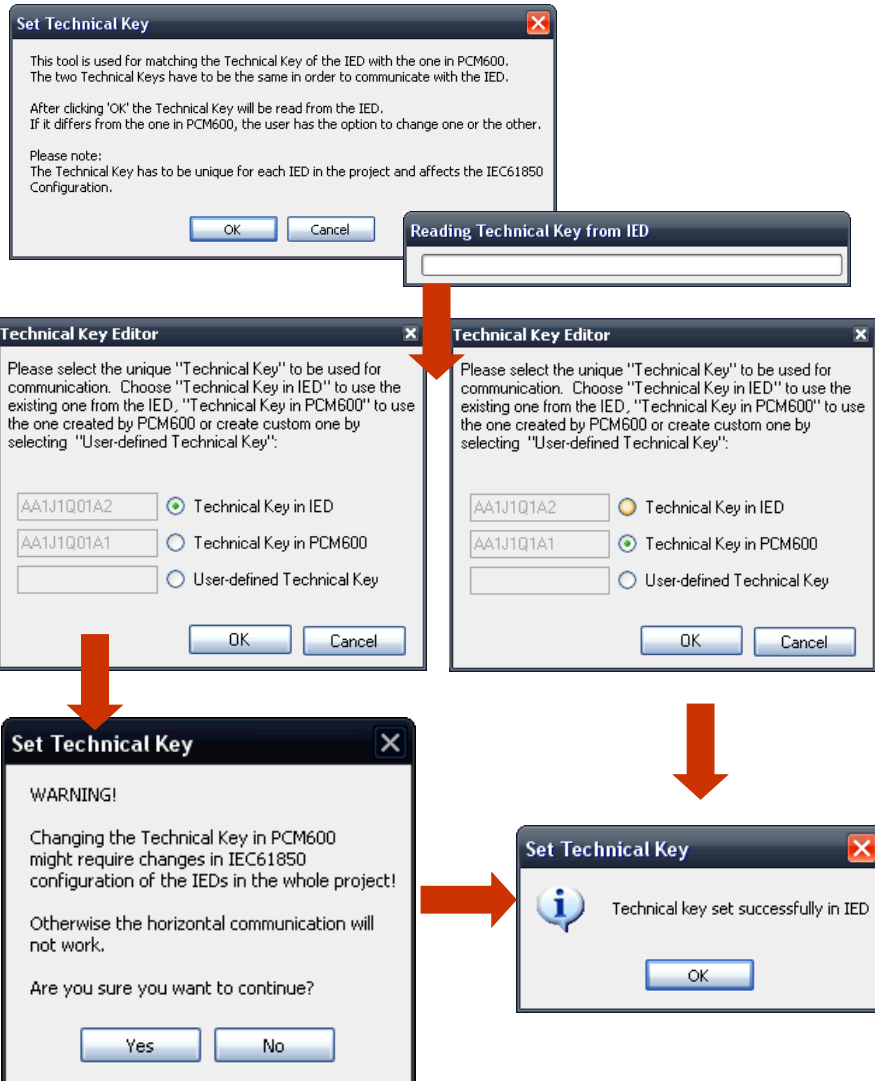
## Technical Key



- Is used for security reasons, more difficult to communicate with the wrong IED since the technical key at IED object in PCM600 and in physical IED must match.
- Unique** identifier for each object in the Plant Structure
  - Is set automatically by PCM600
  - Can be modified by the user
- To synchronize PCM600 and IED technical key, use the “Set Technical Key” Tool
- To change the technical key in PCM600 only, go to object properties for the IED object

# PCM600

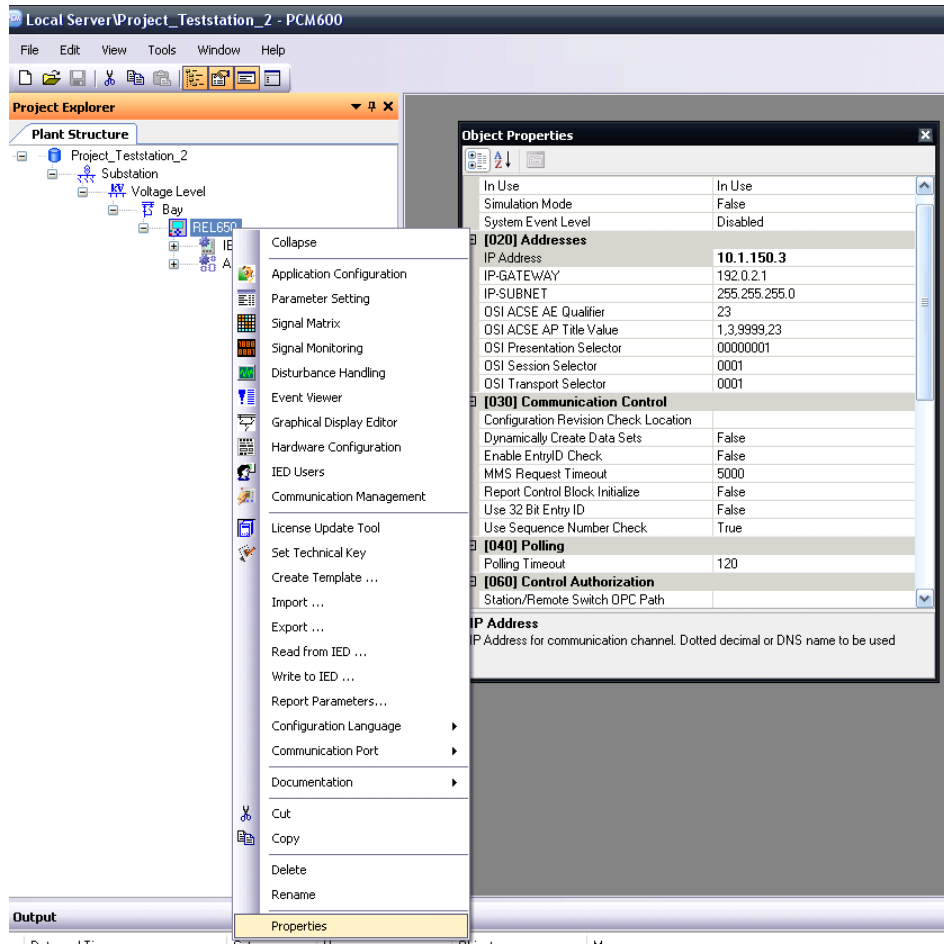
## Technical Key



- Technical key options
  - Use IED Technical key
  - Use PCM600 Technical key
  - User-defined Technical key
    - No special characters
    - Max length 13 characters
    - No numbers in the beginning
  
- Note that changing the Technical key might have an impact on the IEC61850 configuration in your system

# PCM600

## Ethernet Port Settings

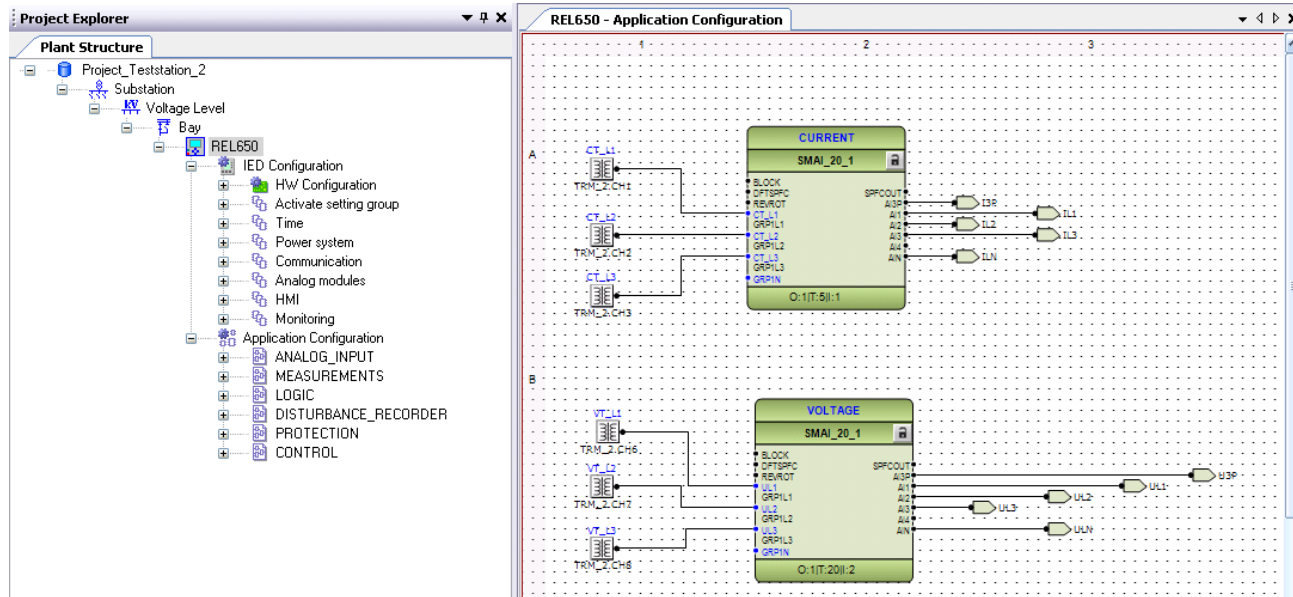


- The IP address of the IED object in PCM600 can be set in two ways;
  - When creating the IED object in PCM600, the IP address can be set in the “Configuration Wizard”
  - Opening “Properties” at IED level object and changing the “IP Address” property

# Agenda

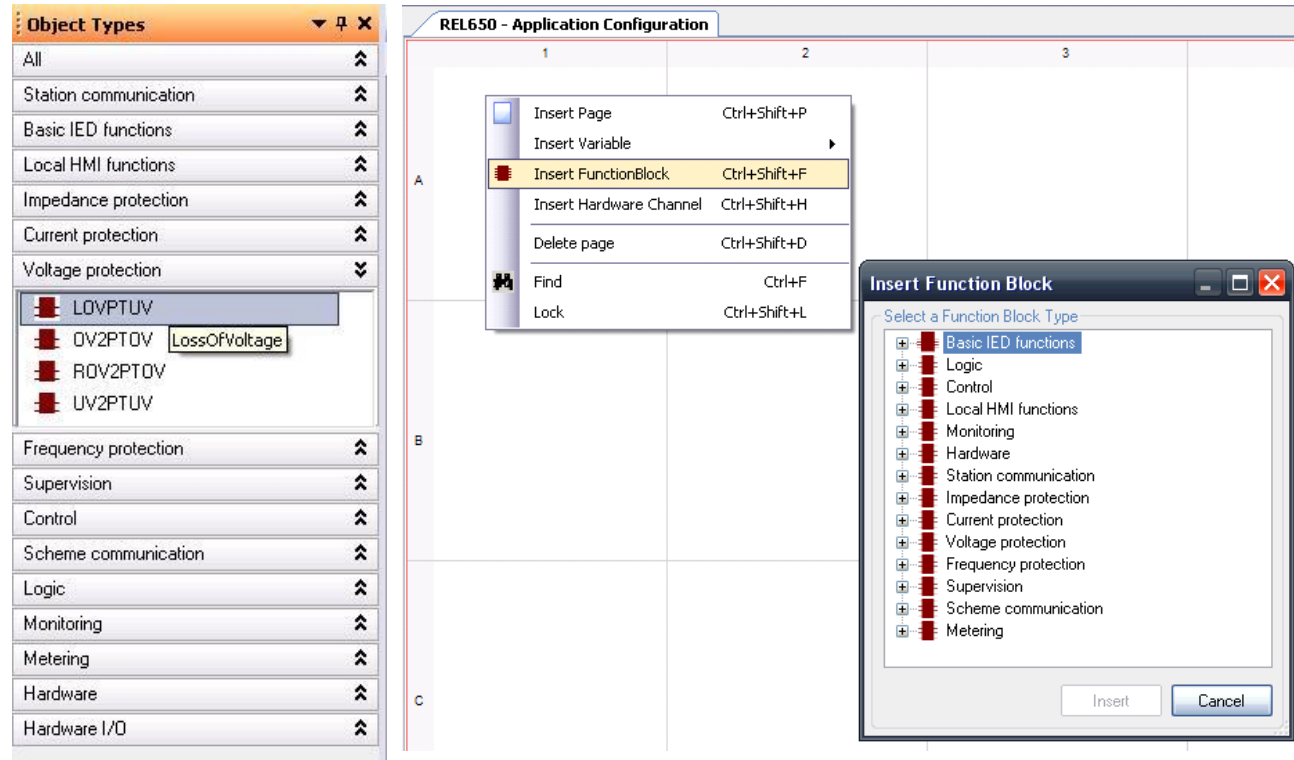
- Introduction
- PCM600
- Application Configuration Tool
- Parameter Setting Tool
- Graphic Display Editor
- IEC61850
- Questions

# Application Configuration Tool Overview



- The main part of the application engineering is done with ACT
  - Graphical programming tool to instantiate function blocks and make connections between function block outputs/inputs
  - With ACT you configure the core functionality of the IED

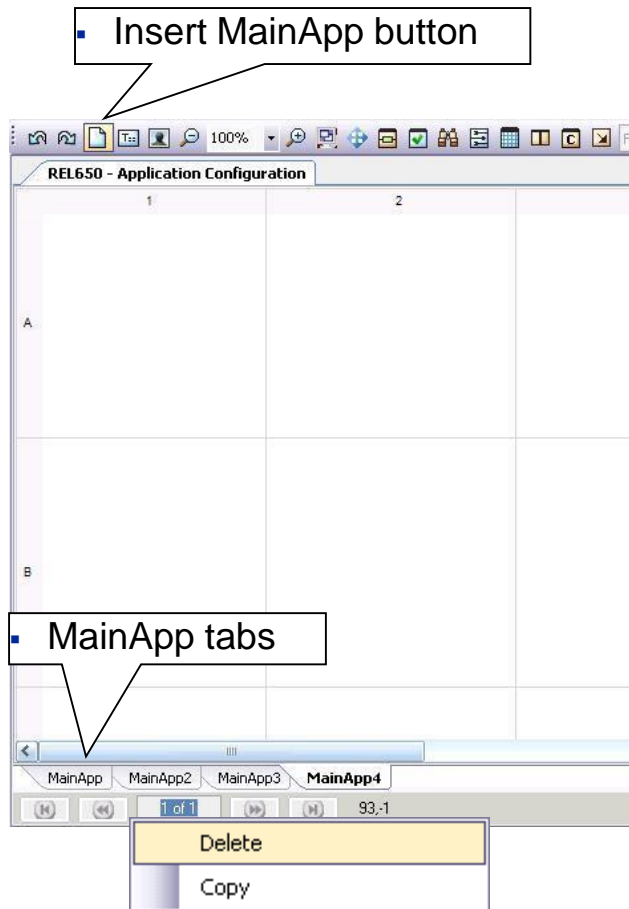
# Application Configuration Tool Function Library



- Contains the possible function block types for the IED type you are working with
- Two ways to access and use function blocks:
  - Function library at Object Types window
    - Drag & Drop into the ACT workspace
  - Right mouse click in ACT workspace → Insert Function Block
    - Select the function type to instantiate

# Application Configuration Tool

## Main Applications

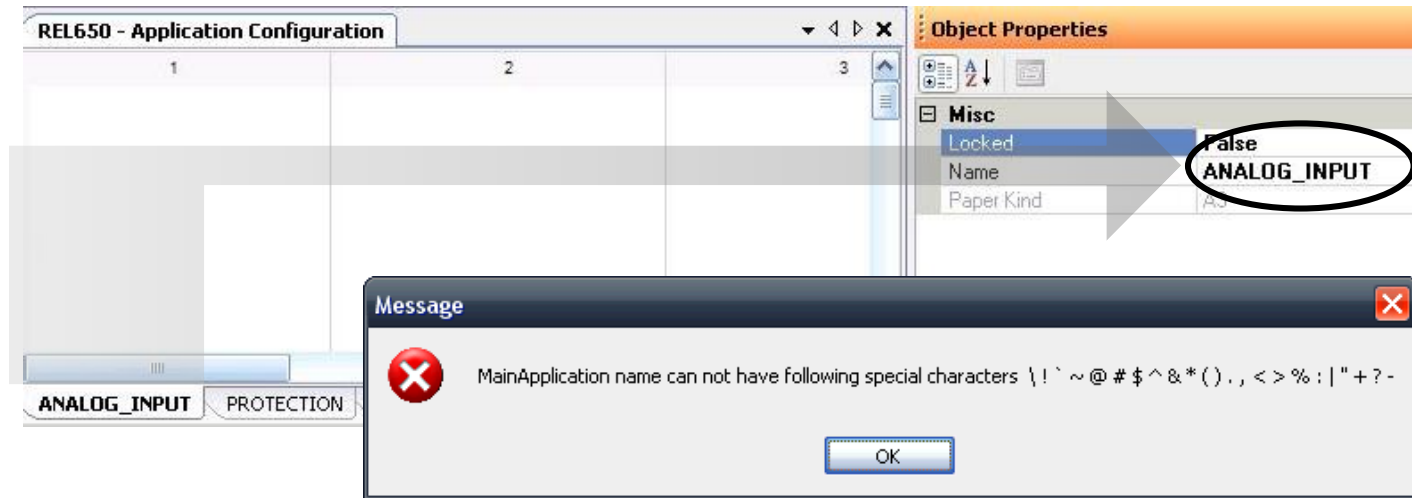


- Use Main Applications to create a logical structure of the configuration
- Insert Main Applications
  - Max 255 Main applications/IED
- Delete and copy
  - Can't delete default MainApp tab
    - Contains hidden basic system logic
  - Copying MainApps
    - Note that function blocks are not pasted if there are no free instances left to use
- Rearranging MainApp tabs possible
  - Like in MS Excel, drag the Main Application to the correct position



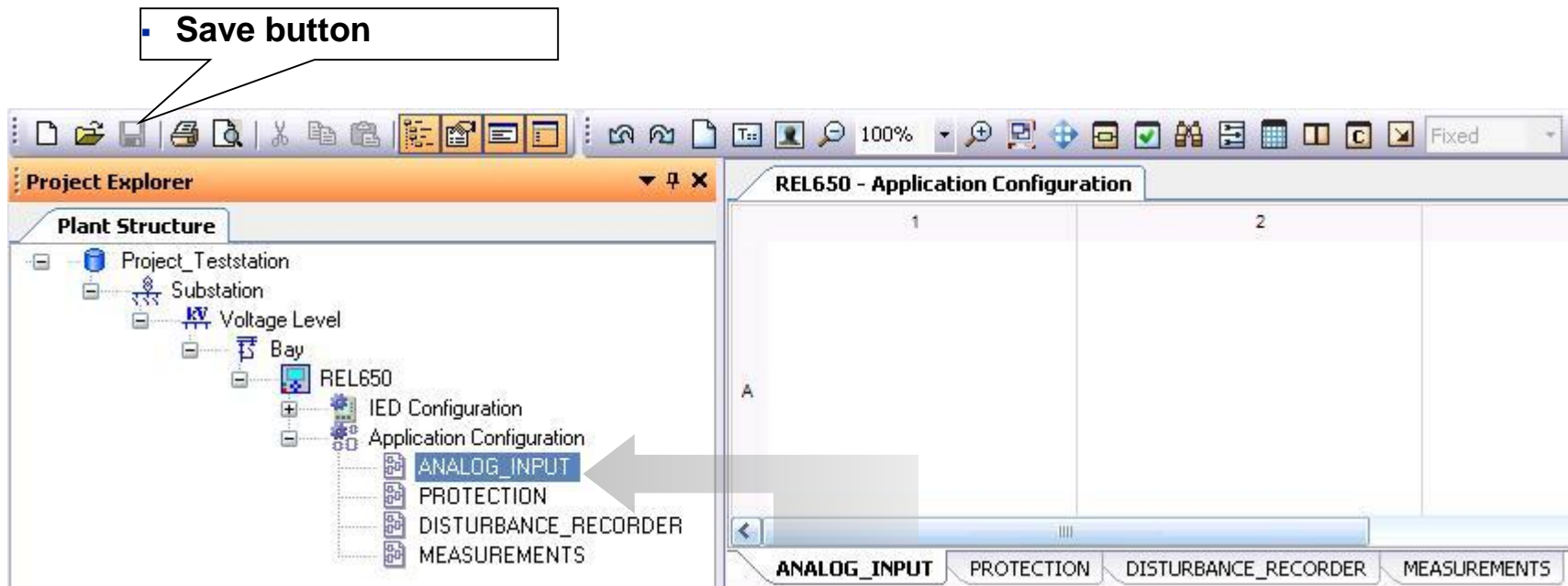
# Application Configuration Tool

## Renaming Main Applications



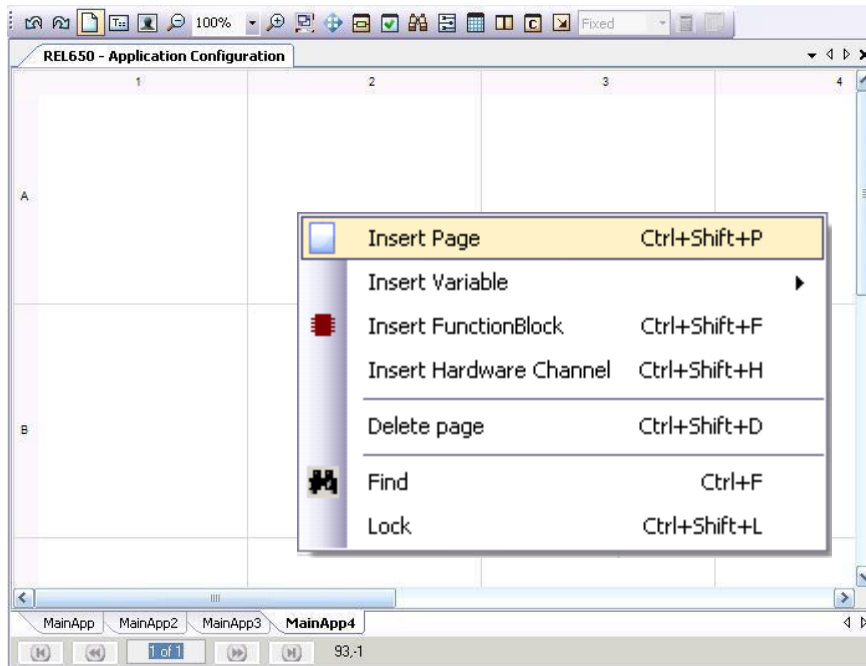
- Renaming is done in Object Properties
- Maximum number of characters: 50
- No special characters are allowed

# Application Configuration Tool Plant Explorer



- The Main Applications are also shown in the Plant Explorer
  - Synchronized when the configuration in ACT is saved

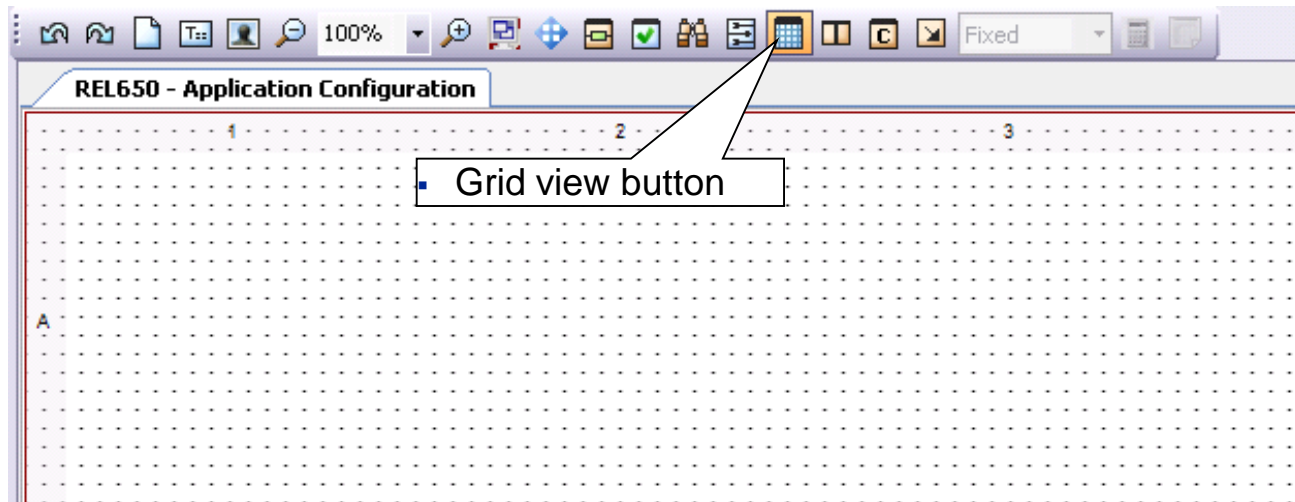
# Application Configuration Tool Pages



- Depending on the size of a configuration (number of function blocks used), one or several pages within one Main Application might be needed
- Each Main Application can have up to 255 pages

# Application Configuration Tool

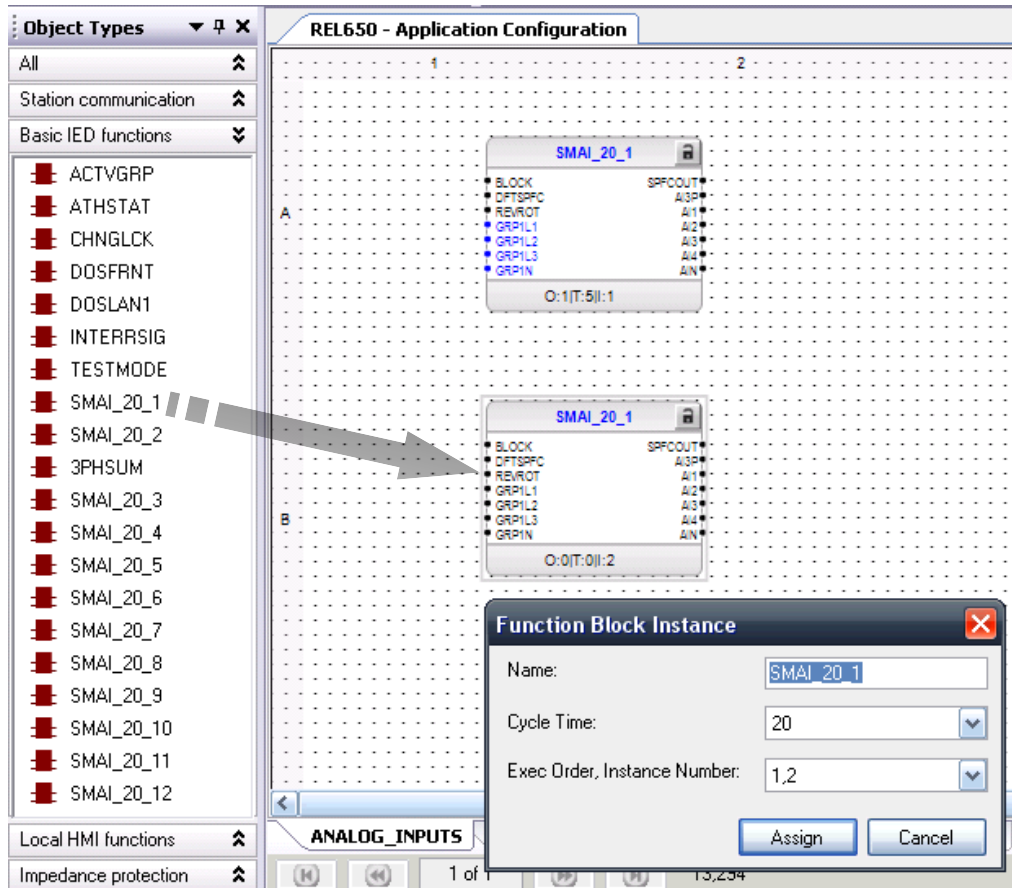
## Grid View



- Enable grid view
  - From Toolbar
- For easier layout (aligning) of function blocks
  - Function blocks snapping to the grid
- Grid width is fixed

# Application Configuration Tool

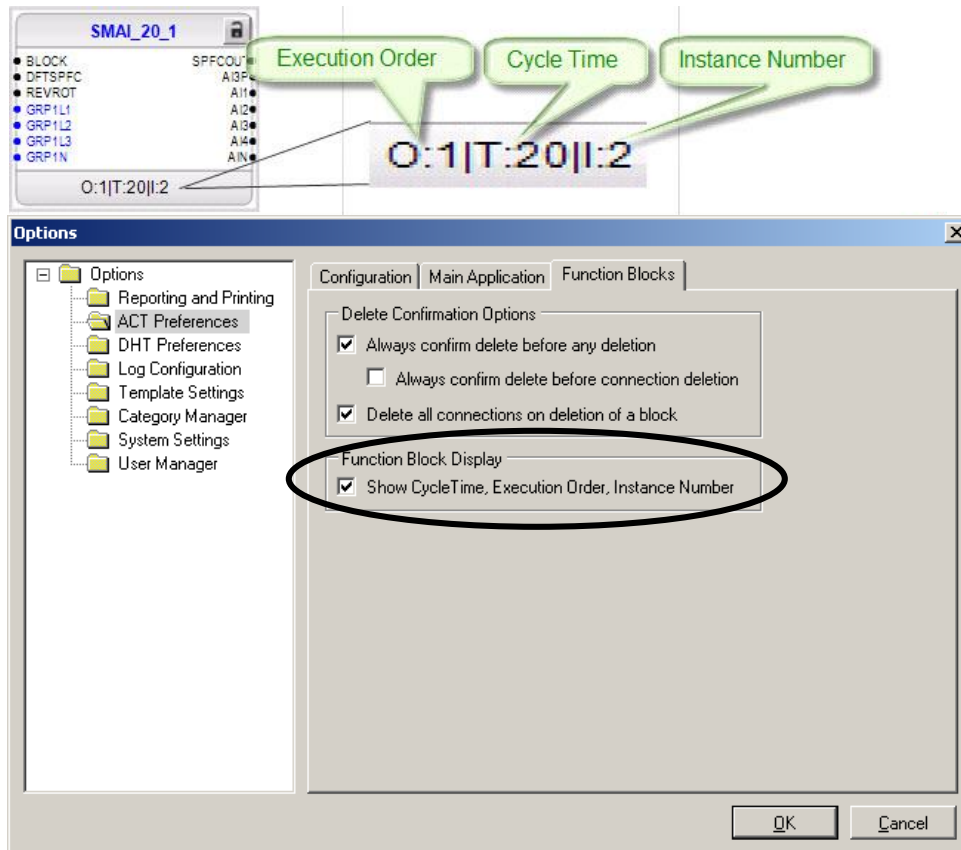
## Inserting Function Blocks



- Parameterization to do when inserting function blocks
  - User defined name (optional)
    - Not possible for all function block types
  - Cycle time (ms)
  - Execution order and Instance number

# Application Configuration Tool

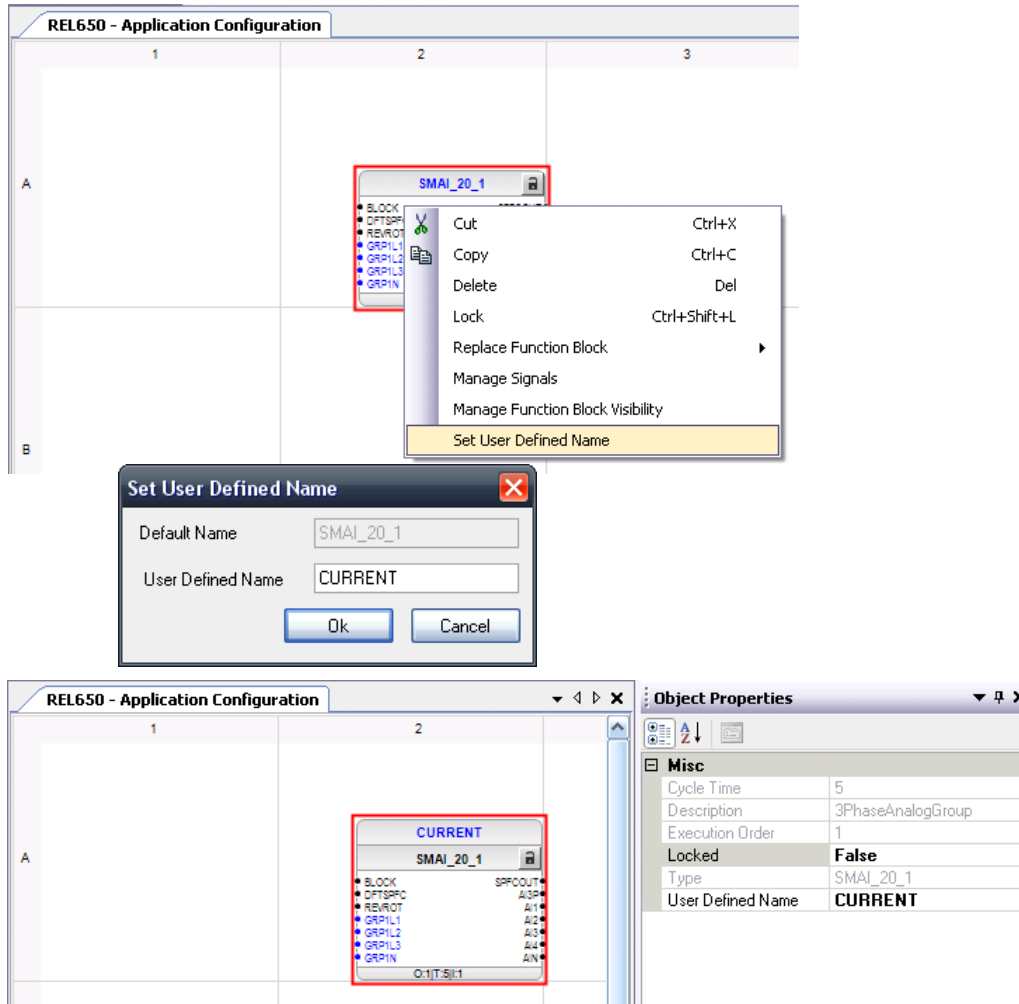
## Function Block Details



- Possibility to show/hide function block details
  - Execution order
  - Cycle time
  - Instance number
- Toggle display
  - Menu Tools->Options
  - General setting for all PCM600 projects

# Application Configuration Tool

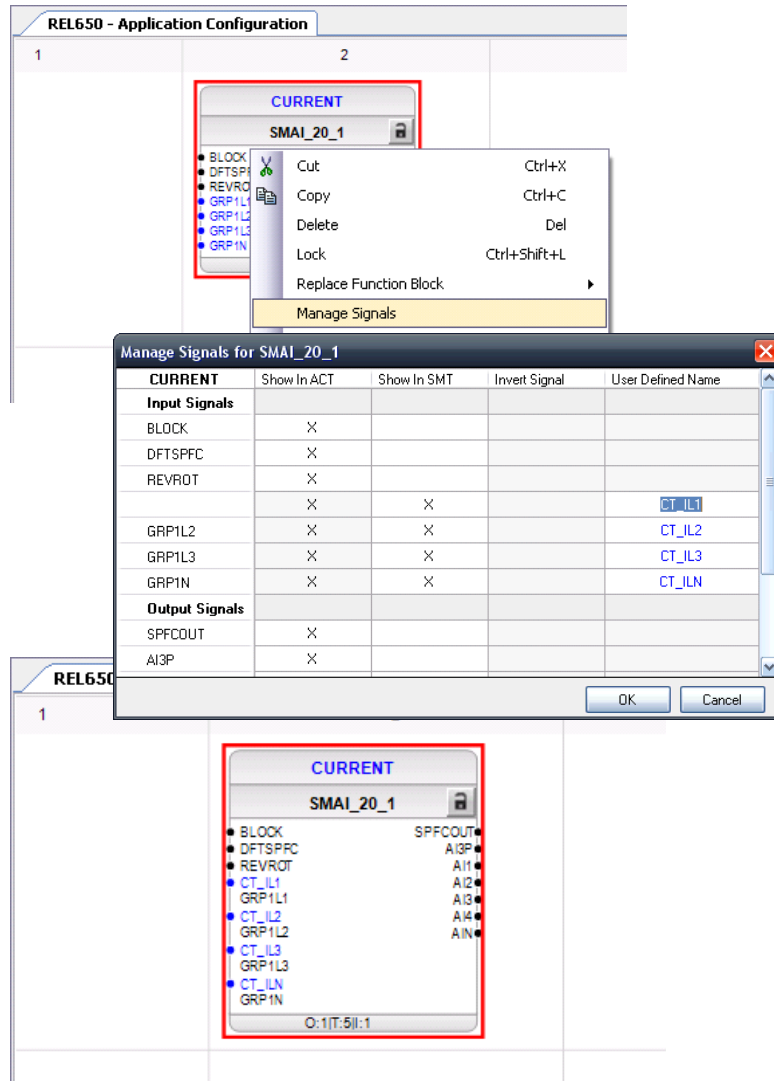
## User Defined Names



- General
  - Blue text color indicates that a user defined name can be set
  - User defined names will be shown also in other tools (like SMT, GDE etc)
  - Maximum number of characters 13
  - No special characters should be used
- How to set User Defined Names
  - Select function block and right click
  - Select *Set User Defined Name*
- How to revert to the default name
  - Delete the text

# Application Configuration Tool

## User Defined Names



- General
  - Blue text color indicates that a user defined name can be defined
  - User defined names will be displayed also in other tools
  - Maximum number of characters 13
  - No special characters should be used
- How to set User Defined Names for signals
  - Open the *Manage Signals* dialog for a function block
- How to revert to the default name
  - Delete the text



# Application Configuration Tool Hardware Channels

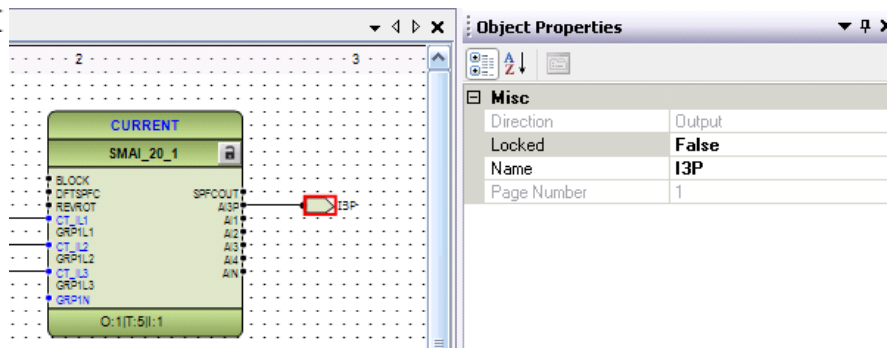
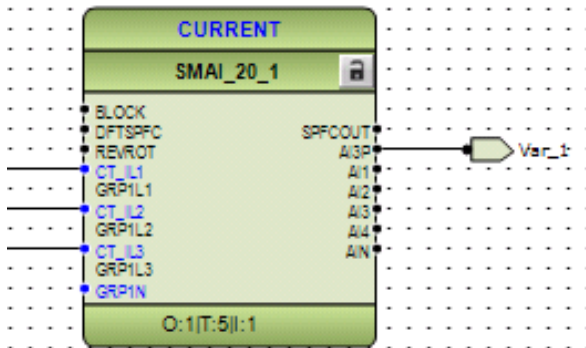
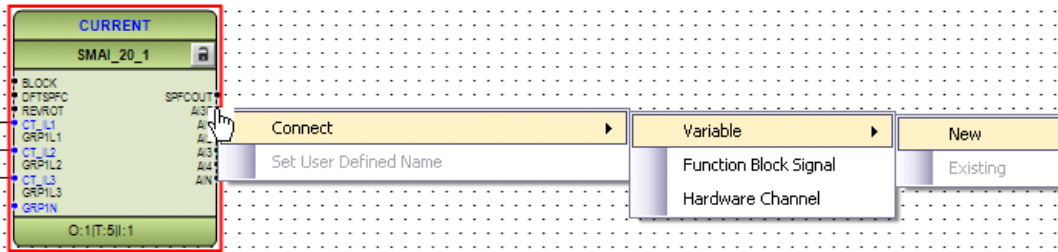
The screenshot displays the 'REL650 - Application Configuration' tool. On the left, the 'Object Types' menu is expanded to 'Hardware I/O', showing options for Binary Input, Binary Output, and Analog Input. The main workspace shows a grid with several hardware modules: CT\_L1, CT\_L2, CT\_L3, VT\_L1, and VT\_L2, each connected to a TRM\_2 module (CH1 to CH7). A 'CURRENT' configuration panel for SMAI\_20\_1 is visible, listing various hardware modules and their connections. A 'VOLTAGE' configuration panel for SMAI\_20\_1 is also visible, listing hardware modules and their connections. The 'Hardware Channel Allocation' dialog box is open, showing the following configuration:

- Hardware Module instance: TRM\_2
- Hardware Channel: CH8
- User Defined Name: VT\_L3
- Create unassigned Hardware Channel

Buttons for 'OK' and 'Cancel' are visible at the bottom of the dialog. The bottom of the screen shows tabs for 'ANALOG\_INPUTS', 'PROTECTION', 'DISTURBANCE\_RECORDER', and 'MEASUREMENT'.

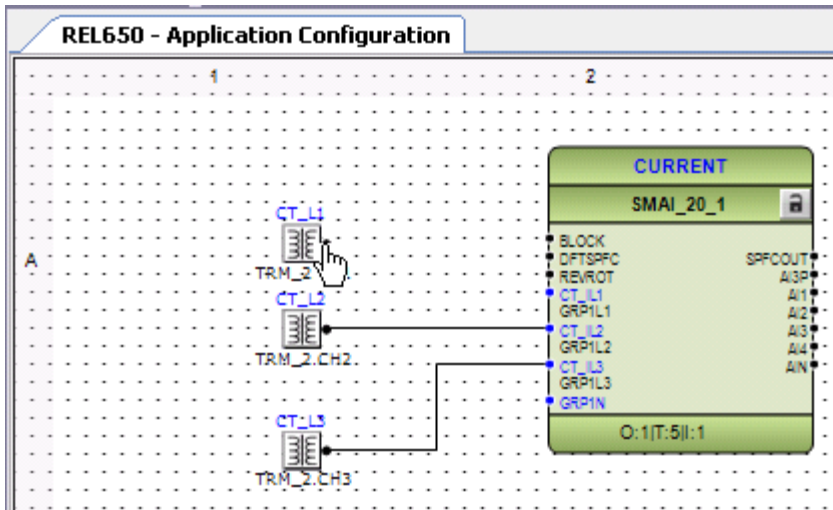
- Map hardware I/O directly in the Application Configuration Tool
  - Can also be done with SMT
  - Changes are transparent to both ACT and SMT
- Hardware Channel Allocation dialog
  - Select Hardware Module
  - Select Hardware Channel
  - Set a user defined name
- Unassigned Hardware channel
  - If IED is not available and HW allocation is not known

# Application Configuration Tool Variables

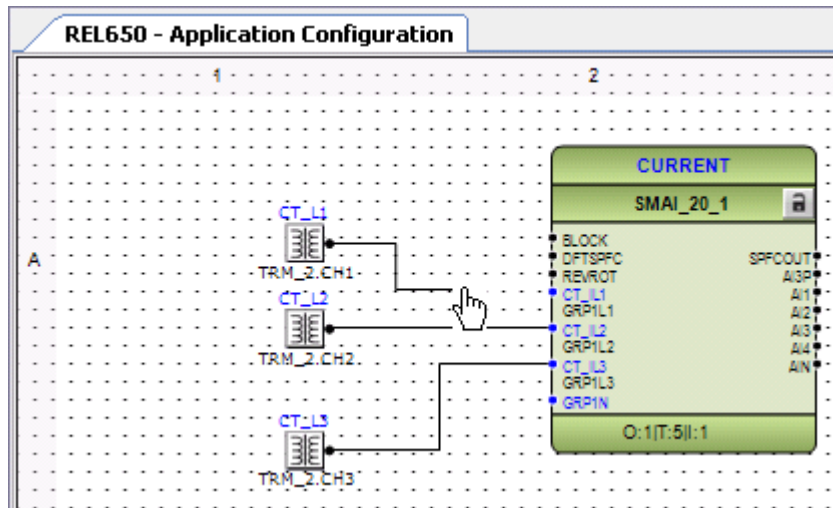


- Purpose of variables: To be able to make connections between function blocks residing on different pages or main applications
- Create and connect new variables
  - Place mouse pointer at the input/output in question
  - Right mouse click
  - Select Connect/Variable/New
- Rename variables
  - At Object Properties
- Copy/Paste variables
  - Output variables are renamed
  - Input variables keeps the same name

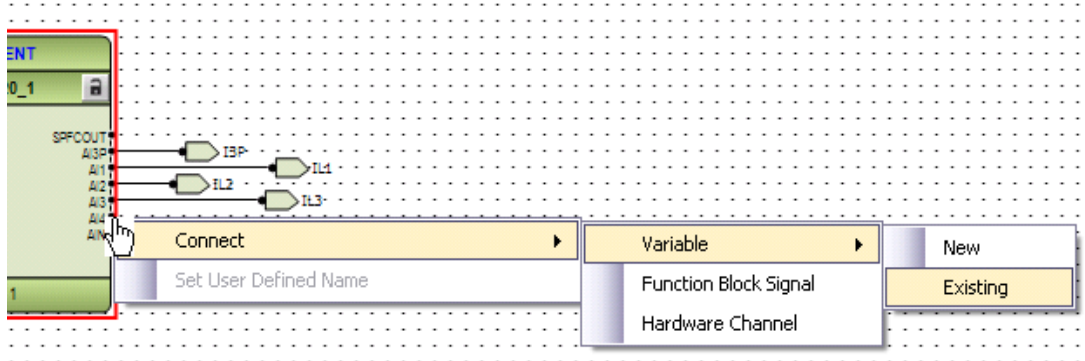
# Application Configuration Tool Connections



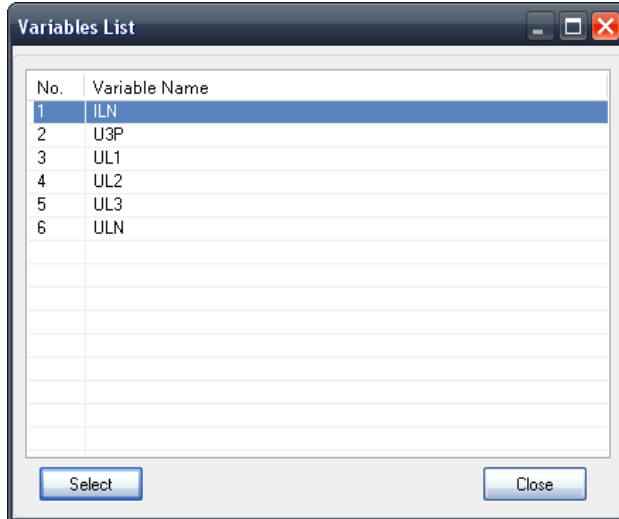
- Place mouse pointer at output
- Push down and hold left mouse button
- Drag and release mouse button at receiving function blocks input signal
- Not connected inputs
  - Inputs may be unconnected
    - If not mandatory
  - Uses the default value



# Application Configuration Tool Connections

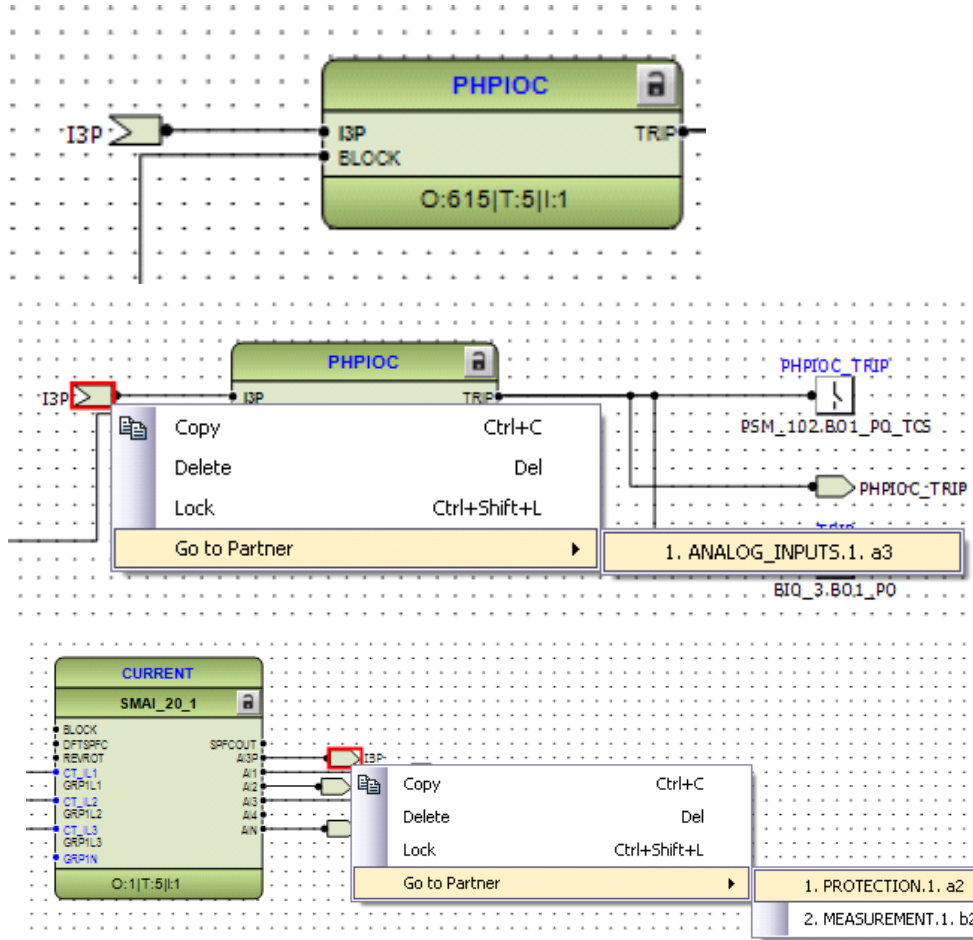


- Right click at input/output
- Select  
Connect/Variable/Existing
- Select suitable variable in list
  - Only “legal” variables are shown -> signal type sensitive



# Application Configuration Tool

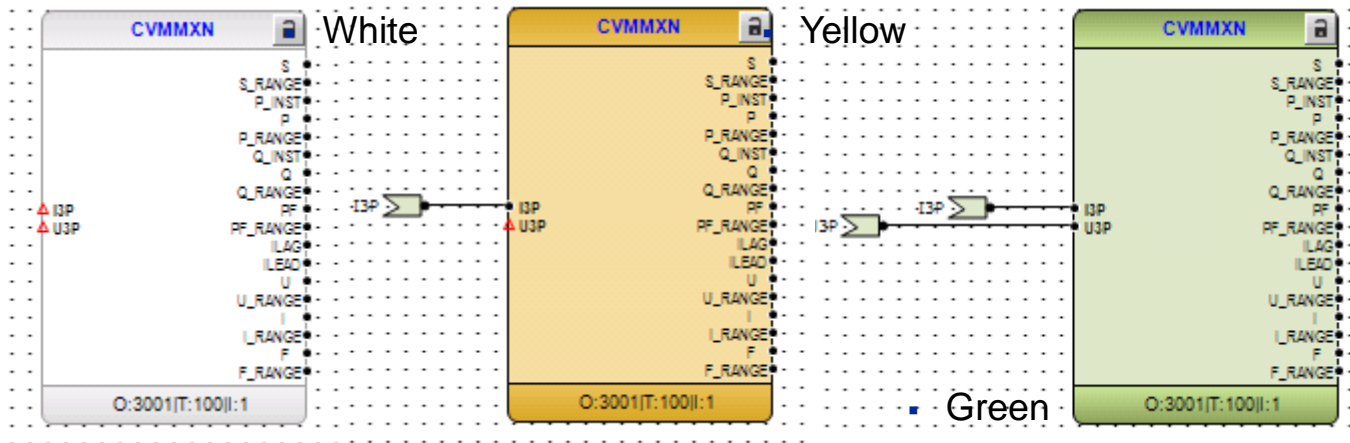
## Partner Variables



- The “Go to Partner” is used to easily find out all places where a specific variable is used
- Rename variable
  - All partner variables will be renamed
- Delete output variable
  - All partner (input) variables will also be deleted

# Application Configuration Tool

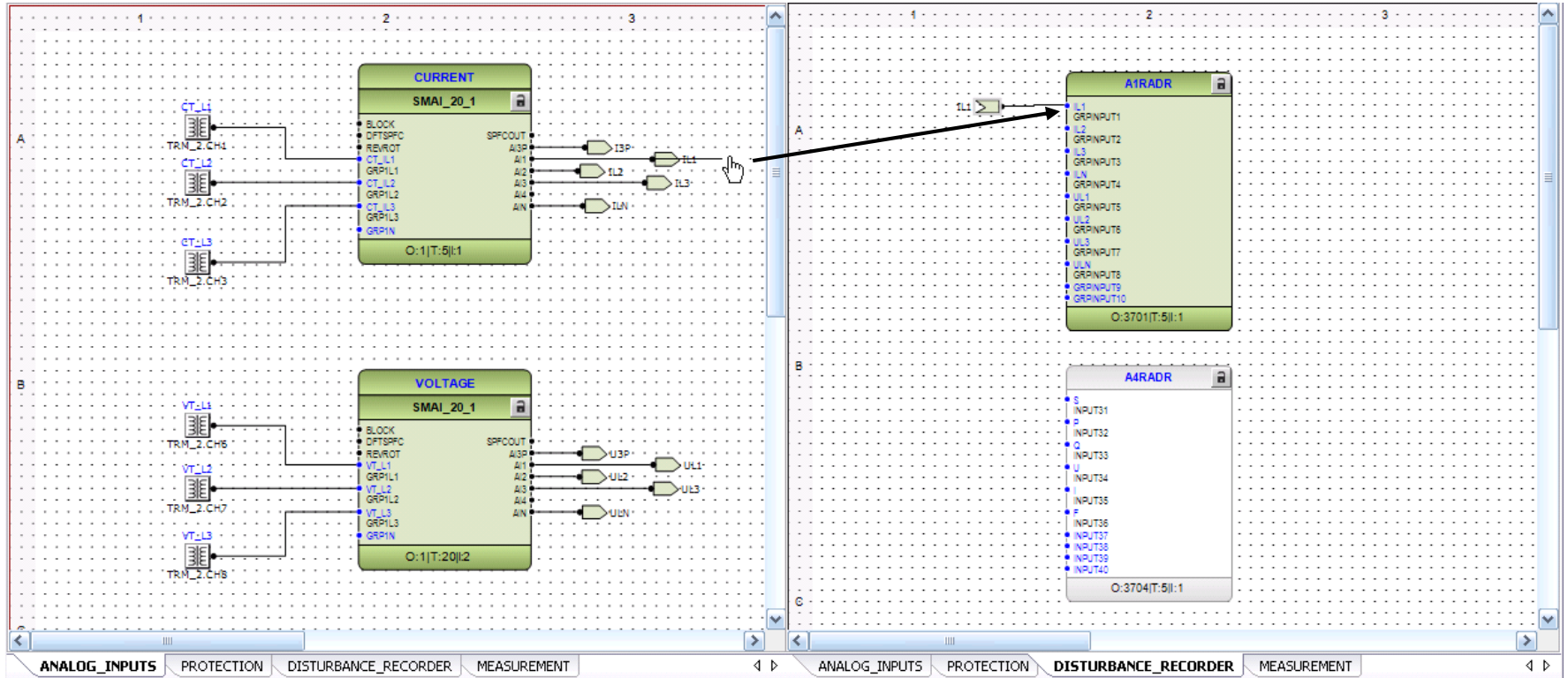
## Function Block Color Codes



- Three different colors for the function blocks connection status
  - White = unconnected
  - Yellow = partly connected
  - Green = fully connected
    - OK to write configuration to the IED
- Red triangle on input
  - Signals must be connected. Mandatory!

# Application Configuration Tool

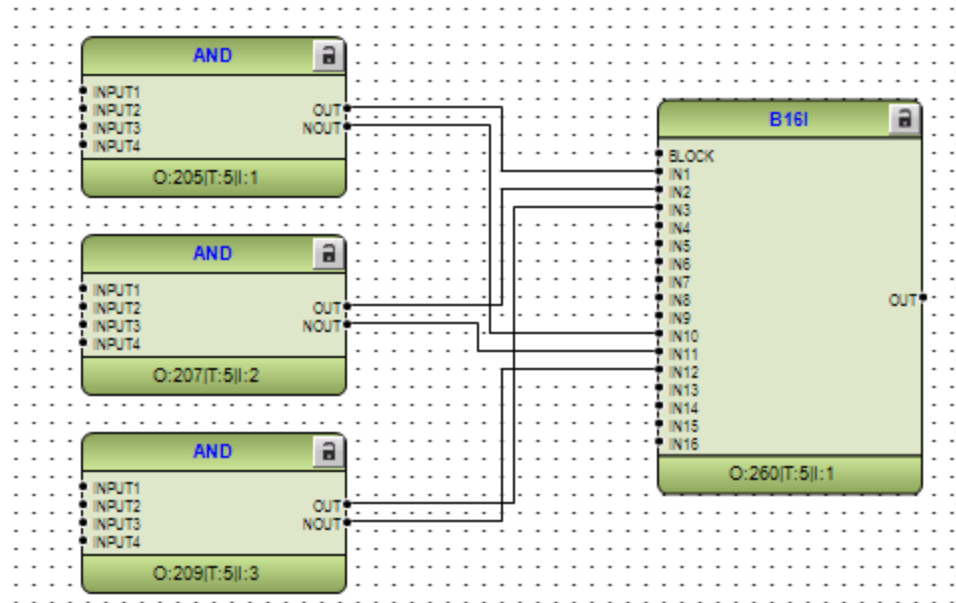
## Split Window



- With Split window active, it is possible to create a connection between function blocks on different pages/main applications as if they were residing on the same page/main application
- Only allowed to drag FROM output TO input
- Connection represented by variables
  - Variables are automatically created at output/input signals

# Application Configuration Tool

## Auto Routing Connections



- Connection lines
  - Automatically placed in the best possible way
- Auto routing can not be disabled
  - But connection lines can manually be moved
- Connection lines are rerouted if function blocks are moved
  - Do not spend time on manual reallocation of connection lines before your configuration is in the final phase



# Application Configuration Tool Validation

The screenshot shows the REL650 - Application Configuration tool interface. The main workspace displays a logic diagram with three AND blocks and a B16I block. On the left, four variables (Var\_1, Var\_2, Var\_3, Var\_4) are listed. Red error markers are present on Var\_1, Var\_2, and Var\_3. A black arrow points from the error messages in the Output window to these markers. The Output window at the bottom shows a table of errors and warnings.

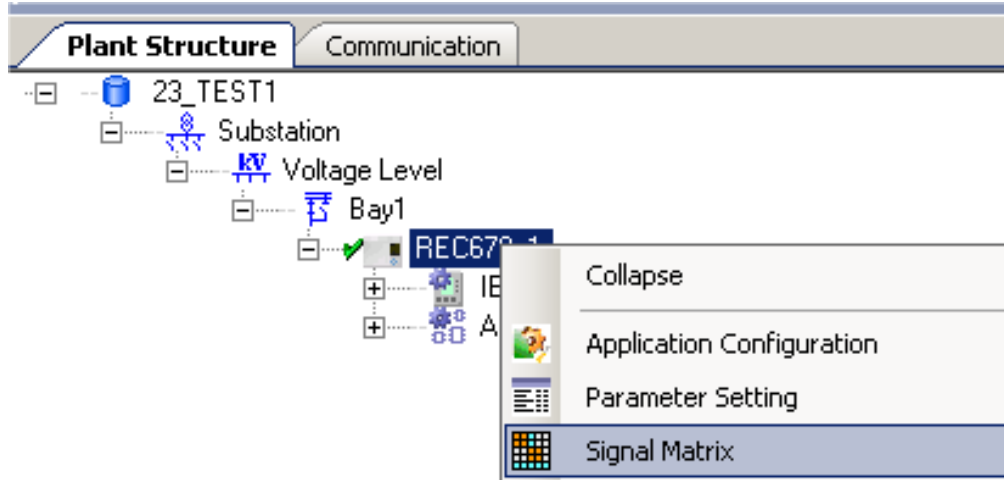
MainApplication Name	Page No	Description
LOGIC	2	Variable Var_1 has no partner in configuration!
LOGIC	2	Variable Var_2 has no partner in configuration!
LOGIC	2	Variable Var_3 has no partner in configuration!
LOGIC	2	Variable Var_4 has no partner in configuration!

- Purpose is to validate the configuration when it comes to
  - Not connected mandatory signals
  - Connections between function blocks running in different cycle times
  - Unconnected variables
- Errors and warnings are displayed in the Output window
  - Errors: Not possible to write configuration to the IED
  - Warnings: OK to write configuration to the IED but “be aware”
- Double click the error/warning in the output window to jump directly to the source in the configuration

# Agenda

- Introduction
- PCM600
- Application Configuration Tool
- Parameter Setting Tool
- Graphic Display Editor
- IEC61850
- Questions

# Signal Matrix Overview



REC670_1 - Signal Matrix			- BIM_3	STATUS	PIOC-BLOCK	PTOV-BLOCK	BI3	BI4
- OV2PTOV:1								
OV2PTOV:1	BLOCK					X		
- PHPIOC:1								
PHPIOC:1	BLOCK				X			

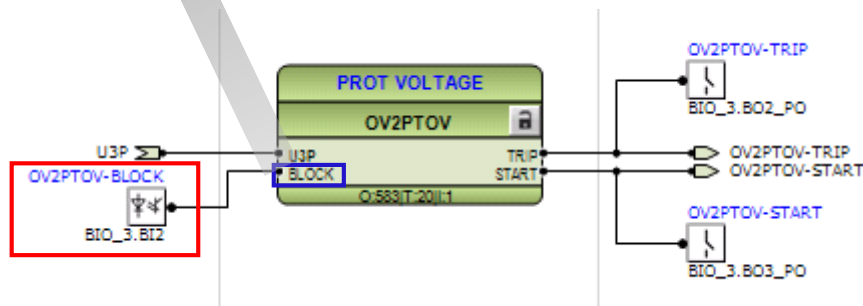
- The Signal Matrix Tool is used for
  - Mapping internal application configuration logic (SW IO) to physical I/O
    - Binary Inputs
    - Binary Outputs
    - Analog Inputs
  - Communication mapping
    - IEC61850 GOOSE
- Can run in parallel with ACT

# Signal Matrix

## Binary Inputs

REL650 - Signal Matrix

		Hardware Modules						
		BI_ERROR	BO_ERRO R	PHIOC- BLOCK	OV2PTOV- BLOCK	BI3	BI4	BI5
<b>Software Modules</b>								
+ AND:53								
+ AND:61								
- FNKEYMD1:1								
FNKEYMD1:1	LEDCTL1							
- FNKEYMD2:1								
FNKEYMD2:1	LEDCTL2							
+ FNKEYMD3:1								
+ FNKEYMD4:1								
+ GRP1_LED1:1								
+ GRP2_LED2:1								
+ GRP3_LED13:1								
+ GRP3_LED14:1								
+ GRP3_LED15:1								
+ PROT;PHIOC:1								
- PROT;OV2PTOV:1								
PROT;OV2PTOV:1	IBLOCK							X
+ PULSETIMER:1								



- Physical binary inputs
  - At the top of matrix
- Software I/O
  - At the left of matrix
  - Function block inputs
- To make a mapping
  - Select square
  - HW and SW channel are marked
  - Double left click for **X**
  - Double right click for **I**
    - Inverted channel
  - Press **X** or **I** on keyboard
    - No other keys are accepted

# Signal Matrix

## Binary Outputs

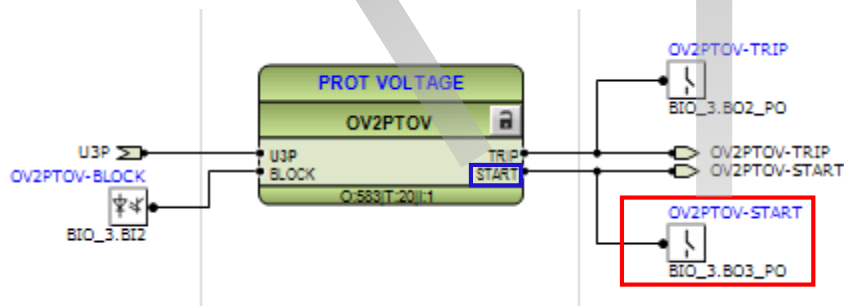
REL650 - Signal Matrix

BIO\_3

	BLOCK	PHPIOC-TRIP	OV2PTOV-TRIP	OV2PTOV-START	BO4_SO	BO5_SO
+ AND:61						
+ FNKEYMD1:1						
+ FNKEYMD2:1						
+ FNKEYMD3:1						
+ FNKEYMD4:1						
+ PROT CURRENT;PHPIOC:1						
- PROT VOLTAGE;OV2PTOV:1						
PROT VOLTAGE;OV2PTOV:1			X	X		
+ SRMEMORY:21						
+ SRMEMORY:22						
+ SRMEMORY:23						

Binary Inputs | Binary Outputs | Analog Inputs

- Physical binary outputs
  - At the top of the matrix
- Software I/O
  - At the left of the matrix
  - Function block outputs



# Signal Matrix

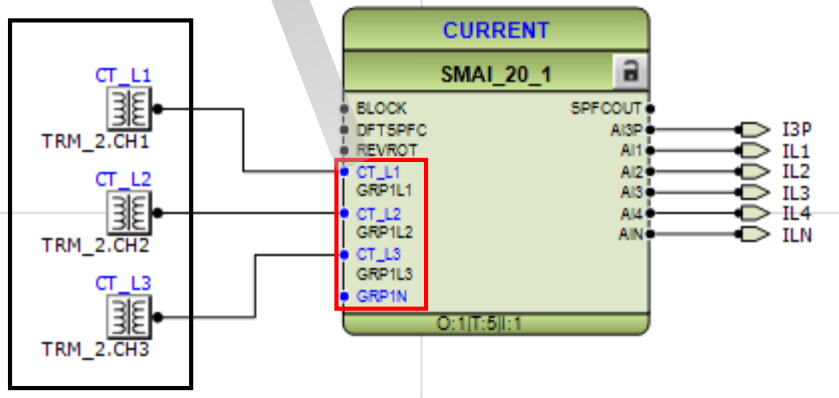
## Analog Inputs

REL650 - Signal Matrix

		TRM_2							
		CT_L1	CT_L2	CT_L3	CH4	CH5	VT_L1	VT_L2	VT_L3
- CURRENT;SMAI_20_1:1	CURRENT;SMAI_20_1:1	X							
	CT_L1								
	CT_L2		X						
	CT_L3			X					
	GRP1N								
- VOLTAGE;SMAI_20_1:2	VOLTAGE;SMAI_20_1:2						X		
	VT_L1								
	VT_L2							X	
	VT_L3								X
	GRP1N								

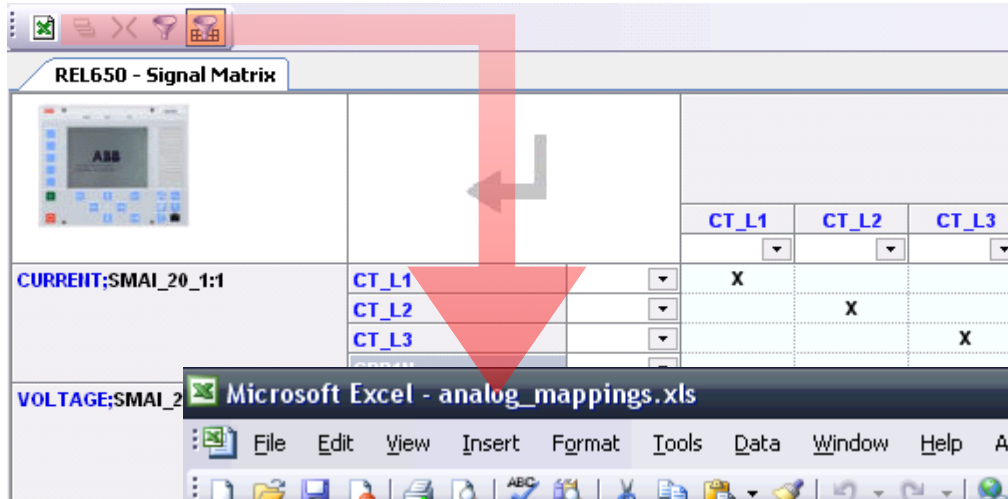
Navigation: Binary Inputs / Binary Outputs / Analog Inputs/

- Physical analog inputs
  - At the top of the matrix
- Virtual analog Inputs (SMAI)
  - At the left of the matrix
- SMAI block outputs
  - Group signal
    - Contains all 3-phases + Neutral
  - Phase signals
  - Neutral signals
    - Measured neutral – AI4
    - Calculated neutral - AIN



# Signal Matrix Excel Export

REL650 - Signal Matrix




	CT_L1	CT_L2	CT_L3
CURRENT;SMAI_20_1:1	X		
		X	
			X

- Export each mapping sheet
  - Binary inputs
  - Binary outputs
  - Analog inputs

Microsoft Excel - analog\_mappings.xls

File Edit View Insert Format Tools Data Window Help Adobe PDF

A1

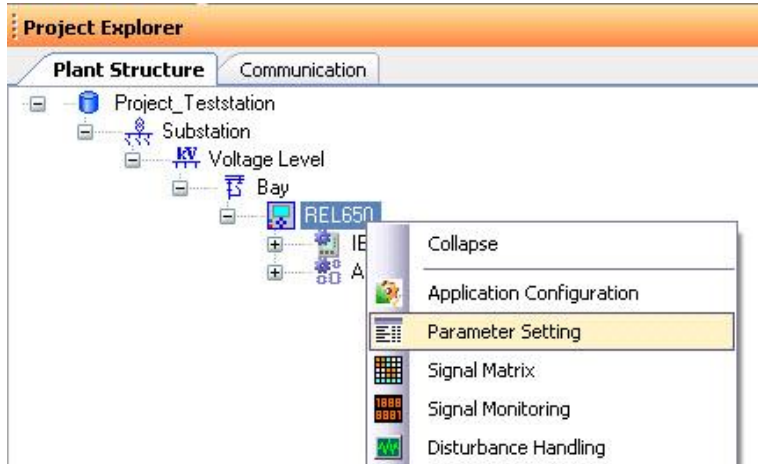
	A	B	C	D	E
1			TRM_2		
2			CT_L1	CT_L2	CT_L3
3	CURRENT;SMAI_20_1:	CT_L1	X		
4		CT_L2		X	
5		CT_L3			X
6		GRP1N			
7	VOLTAGE;SMAI_20_1:	UL1			
8		UL2			
9		UL3			
10		GRP1N			

# Agenda

- Introduction
- PCM600
- Application Configuration Tool
- Parameter Setting Tool
- Graphic Display Editor
- IEC61850
- Questions



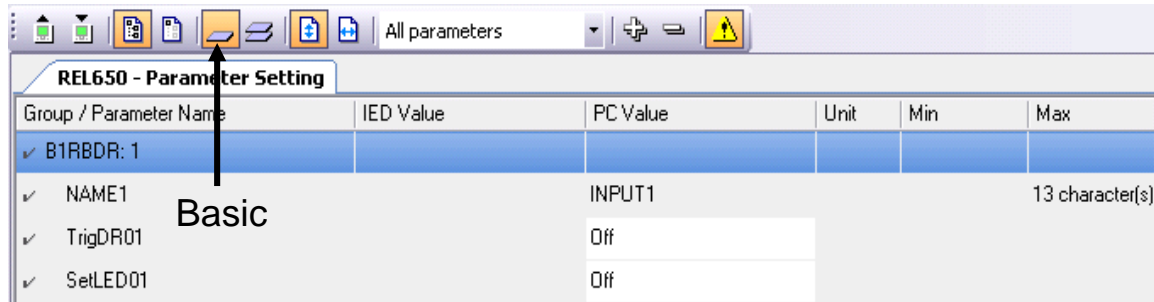
# Parameter Setting Tool Overview



REL650 - Parameter Setting					
Group / Parameter Name	IED Value	PC Value	Unit	Min	Max
✓ REL650					
✓ IED Configuration					
✓ HW Configuration					
✓ COM_101					
✓ BatteryVoltage		110	V	24	250
✓ BINAME1		BI1			13 character(s)
✓ Threshold1		65	%UB	6	900
✓ DebounceTime1		0.005	s	0.000	0.100
✓ OscillationCount1		0		0	255
✓ OscillationTime1		0.000	s	0.000	600.000
✓ BINAME2		BI2			13 character(s)
✓ Threshold2		65	%UB	6	900
✓ DebounceTime2		0.005	s	0.000	0.100
✓ OscillationCount2		0		0	255
✓ OscillationTime2		0.000	s	0.000	600.000
✓ BINAME3		BI3			13 character(s)

- PST is started by right clicking the IED object or any object below in the plant structure. PST shows parameters for selected object (and objects below) in the plant structure

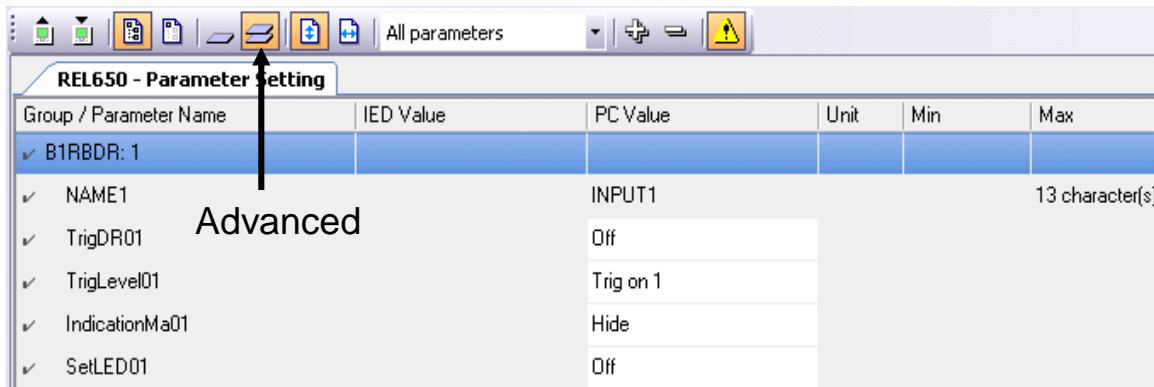
# Parameter Setting Tool Layers



REL650 - Parameter Setting

Group / Parameter Name	IED Value	PC Value	Unit	Min	Max
✓ B1RBDR: 1					
✓ NAME1		INPUT1			13 character(s)
✓ TrigDR01		Off			
✓ SetLED01		Off			

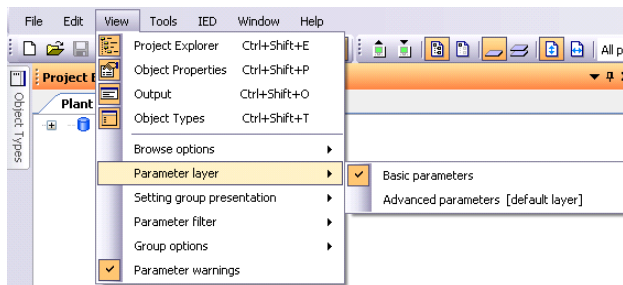
Basic



REL650 - Parameter Setting

Group / Parameter Name	IED Value	PC Value	Unit	Min	Max
✓ B1RBDR: 1					
✓ NAME1		INPUT1			13 character(s)
✓ TrigDR01		Off			
✓ TrigLevel01		Trig on 1			
✓ IndicationMa01		Hide			
✓ SetLED01		Off			

Advanced



- Hide/show specific parameters
  - Basic parameters
    - Subset of parameters
  - Advanced parameters
    - All parameters

# Parameter Setting Tool

## Filters

Group / Parameter Name	IED Value	PC Value	Unit	Min	Max
PHPIOC: 1					
GlobalBaseSel				1	6
Setting Group1					
Operation		On			
IP>>	200		%B	5	2500

Group / Parameter Name	IED Value	PC Value	Unit	Min	Max
PHPIOC: 1					
Setting Group1					
Operation		On			

- Filter options
  - Changed parameters
  - Default parameters
  - Visible parameters
  - Hidden parameters
  - Invalid parameters
  - IED value <=> PC value
    - Outside boundaries
  - IED Value <=> PC Value
    - Difference between IED and PC values
    - Read parameters from IED
    - Uncheck copy IED values to PC values

# Parameter Setting Tool Layout

Vertical presentation

Group / Parameter Name	IED Value	PC Value	Unit	Min	Max
✓ PHPIOC: 1					
✓ GlobalBaseSel		1		1	6
✓ Setting Group1					
✓ Operation		On			
✓ IP>>		200	%IB	5	2500
✓ Setting Group2					
✓ Operation		Off			
✓ IP>>		200	%IB	5	2500
✓ Setting Group3					
✓ Operation		Off			
✓ IP>>		200	%IB	5	2500

Horizontal presentation

Group / Parameter Name	IED Value [SG1/Common]	PC Value [SG1/Common]	IED Value [SG2]	PC Value [SG2]	IED Value [SG3]	PC Value [SG3]	Unit	Min	Max
✓ PHPIOC: 1									
✓ GlobalBaseSel		1						1	6
✓ Setting groups									
✓ Operation		On		Off		Off			
✓ IP>>		200		200		200	%IB	5	2500

Active setting group

- Two presentation views
  - Vertical
  - Horizontal
- “Check mark” sign indicates the active setting group
- Copy/Paste setting groups
  - Select group
  - Right click, copy/paste

# Parameter Setting Tool

## Setting Groups

The screenshot displays the 'Parameter Setting Tool' interface. On the left, the 'Plant Structure' tree shows a project named 'Project\_Teststation' containing a 'Substation' with a 'Voltage Level' and a 'Bay'. Under the 'Bay', there is a 'REL650' component with sub-items for 'IED Configuration', 'HW Configuration', 'Activate setting group', and 'SETGRPS: 1'. The main window shows the 'REL650 - Parameter Setting' table.

Group / Parameter Name	IED Value	PC Value	Unit	Min	Max
SETGRPS: 1					
ActiveSetGrp		SettingGroup1			
✓ MaxNoSetGrp		3		1	4

- The number of setting groups are set in PST
- Restart PST after changing the value

# Parameter Setting Tool

## Read/Write

**Read from IED**

**Write to IED**

Project Explorer: Project\_Teststation > Substation > Voltage Level > Bay > REL650

REL650 - Parameter Setting

Group / Parameter Name	IED Value	PC Value
CVMMXN: 1		
General		
General		
Operation		Off
GlobalBaseSel		1
Mode		L1, L2, L3
PowAmpFact		1.000
PowAngComp		0.0
k		0.00
Apparent power S		
General		
SDbReplnt		10
SZeroDb		500
SHIHlim		150.0
SHLim		120.0

- Read/Write of parameters
  - Single parameter
  - A group of parameters
  - All parameters

# Parameter Setting Tool

## Reading Parameters

Group / Parameter Name	IED Value	PC Value
CVMMXN: 1		
General		
✓ General		
✓ Operation		Off
✓ GlobalBaseSel		1
✓ Mode		L1, L2, L3
✓ PowAmpFact		1.000
✓ PowAngComp		
✓ k		
Apparent power S		
General		
SDbReplnt		
SZeroDb		
SHiHiLim		
SHiLim		
SLoLim		
SLoLowLim		

**Read parameters from REL 650**

Parameter range

CVMMXN: 1

General

Selected parameter

Parameter options

Copy IED values to PC value field

OK Cancel

- What to read
  - Parameters marked with the “check mark symbol” in left margin will be read
- Parameter option
  - Copy IED values to PC value field;
    - Uncheck if you would like to keep your settings made offline in PST.

**Reading parameters from REL650**

Current parameter:  
 (257/981) DebounceTime1

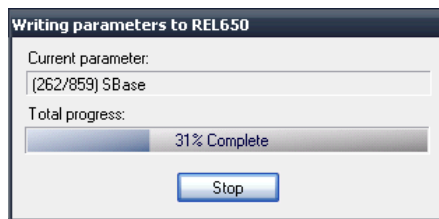
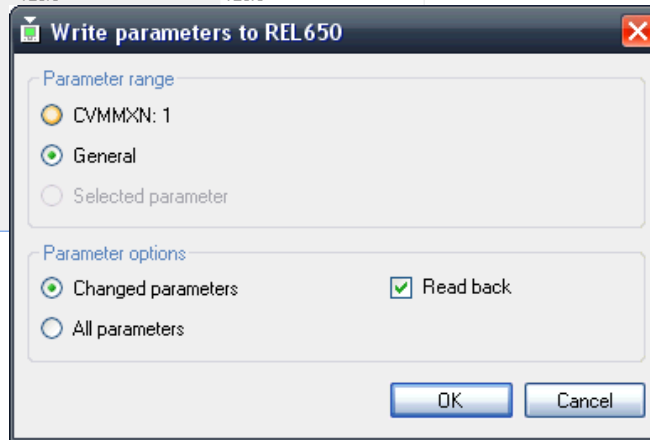
Total progress:  
 26% Complete

Stop

# Parameter Setting Tool

## Writing Parameters

Group / Parameter Name	IED Value	PC Value
Active power P		
General		
✓ PDbReplnt	10	<b>20</b>
✓ PZeroDb	500	<b>1000</b>
✓ PHiHiLim	150.0	150.0
✓ PHiLim	120.0	120.0
✓ PLowLim		
✓ PLowLowLim		
✓ PMin		
✓ PMax		
✓ PRepTyp		
✓ PLimHyst		

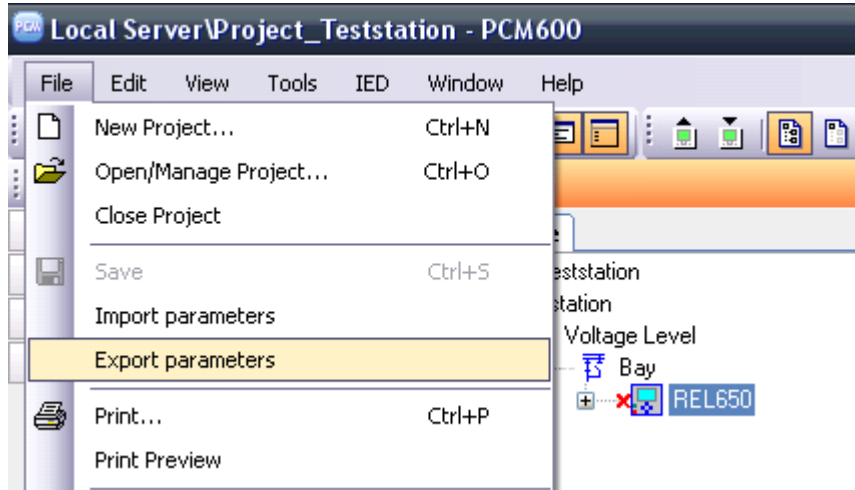


- Parameter option
  - Write all or changed values
    - Changed values = unsaved settings
  - Read back
    - If you want to be really sure...
- PC value in bold text
  - Indicates unsaved settings
- IED value exclamation mark
  - IED and PC value differs



# Parameter Setting Tool

## Import/Export Parameters



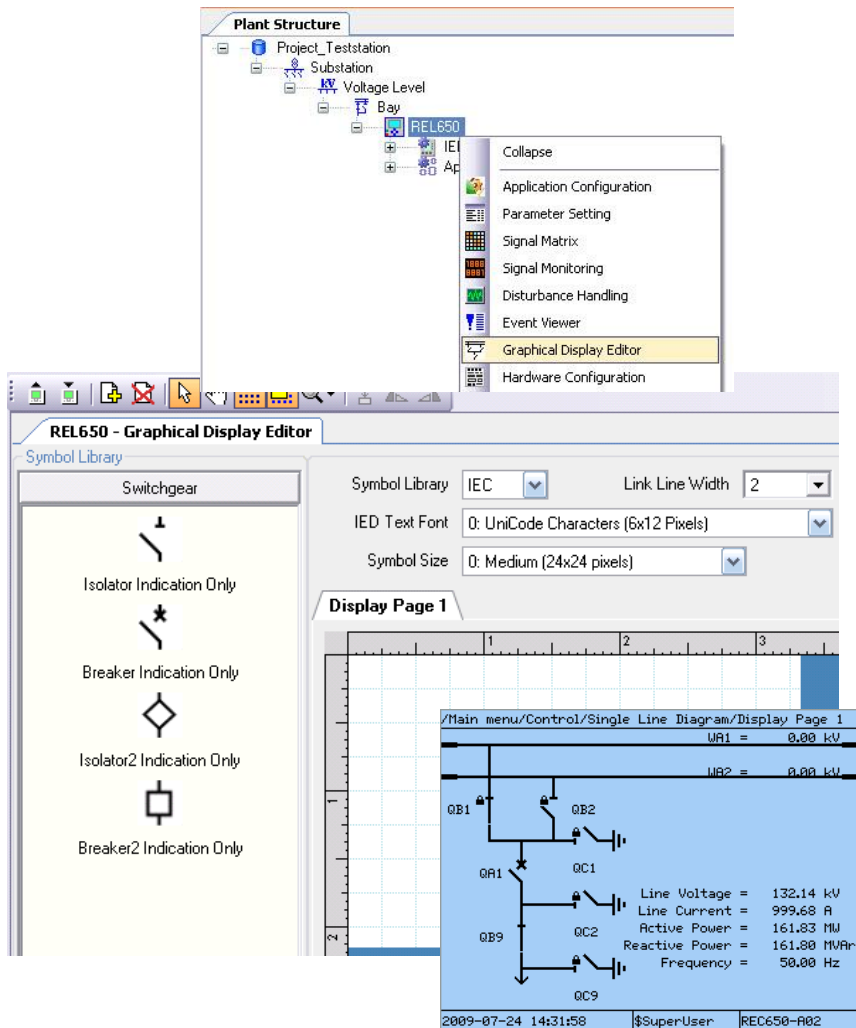
- Export/Import to/from XRIO file
  - Only all parameters possible to export/import, no subsets.

# Agenda

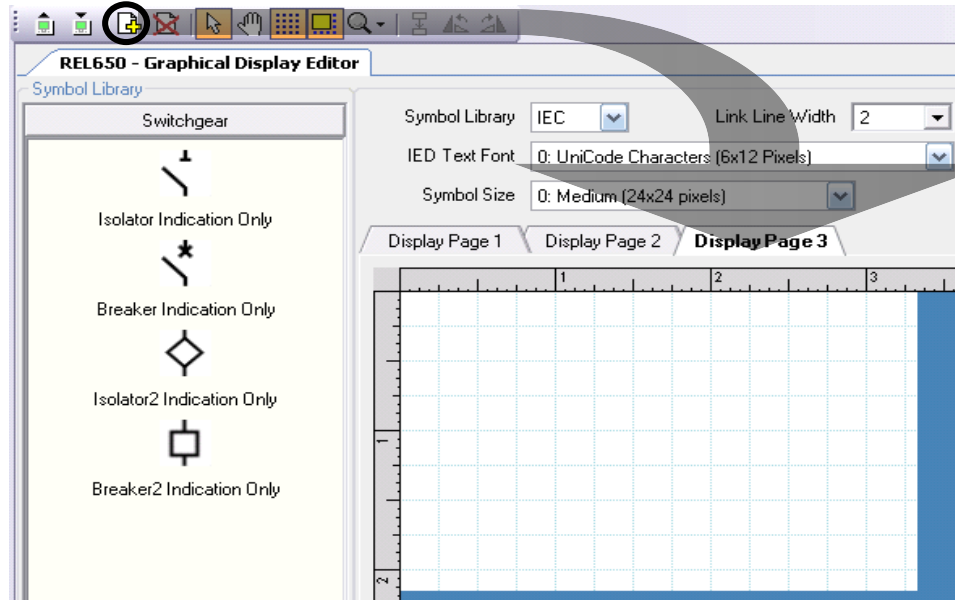
- Introduction
- PCM600
- Application Configuration Tool
- Parameter Setting Tool
- Graphic Display Editor
- IEC61850
- Questions

# Graphic Display Editor Overview

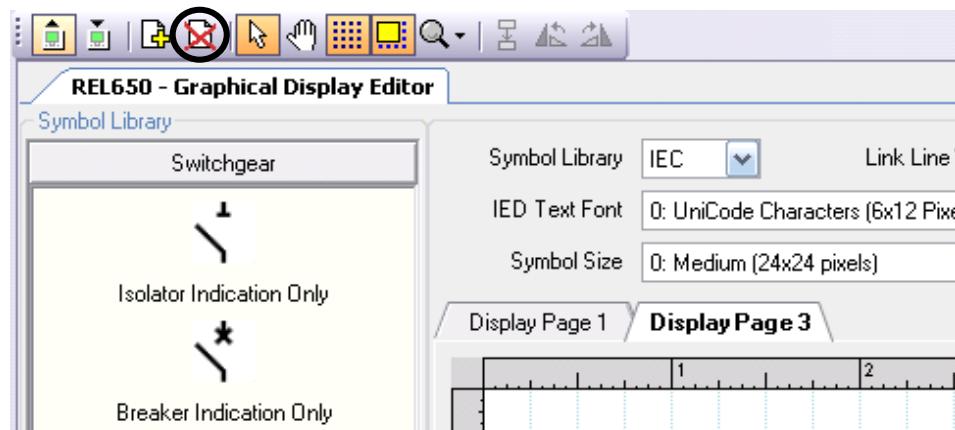
- To engineer the single line diagram
  - For LHMI of the IED
  - Demands that function blocks are configured
    - Breaker objects
    - Disconnecter objects
    - Measurements



# Graphic Display Editor Pages

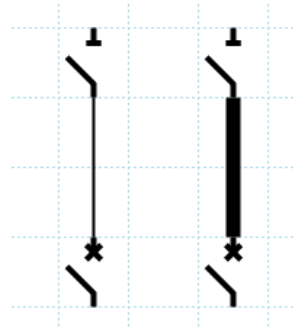
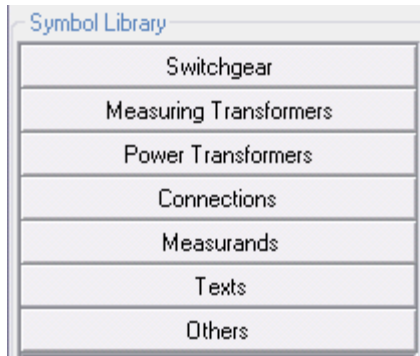


- Multiple pages
  - Add pages
  - Delete pages

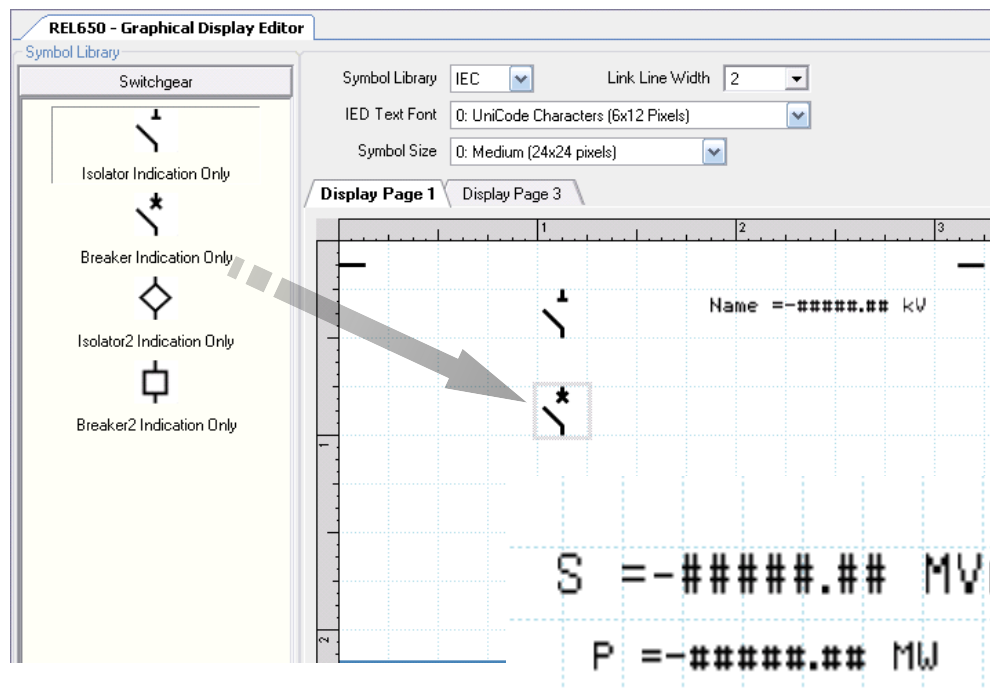


# Graphic Display Editor

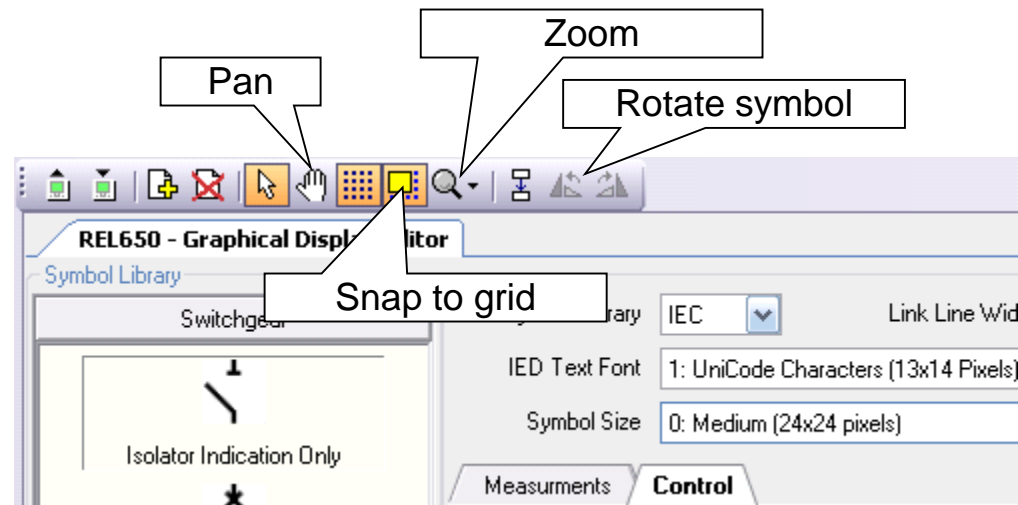
## Insert Symbol



- Symbol Library
  - Fixed set of symbols
  - IEC and ANSI
- Custom symbols not possible
- Drag and drop
- IED Text font
  - Two font sizes
- Symbol size
  - Only one size
- Link line width



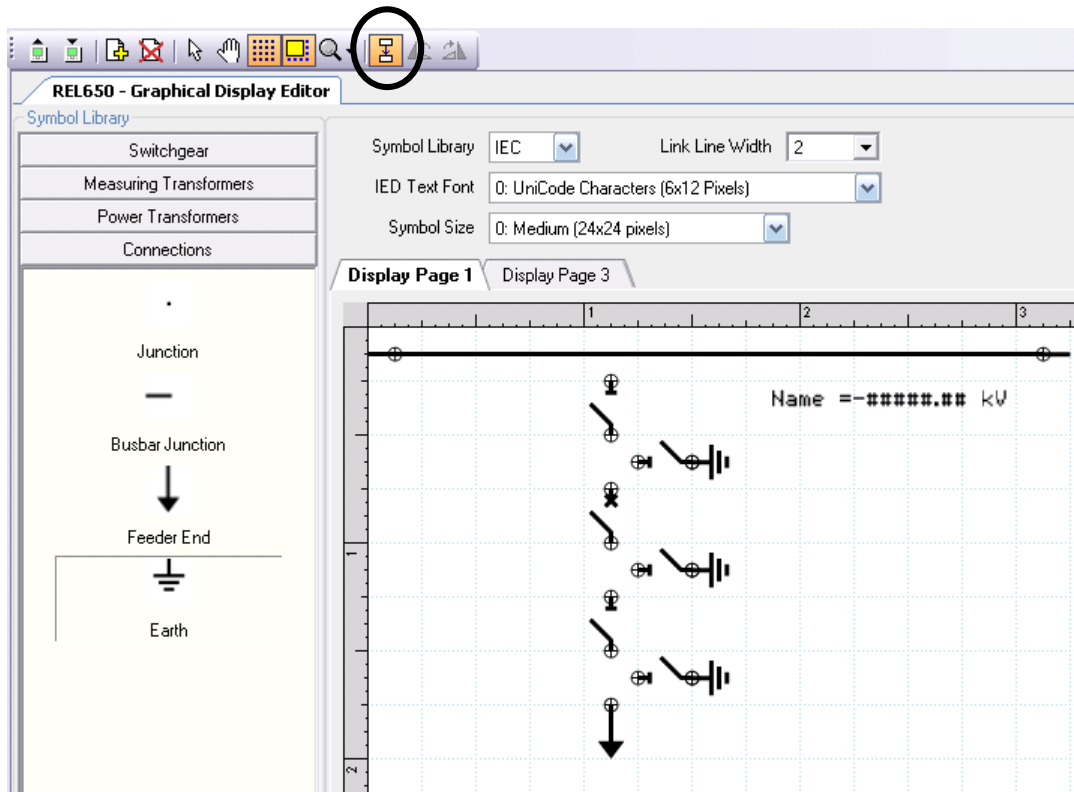
# Graphic Display Editor Symbol Handling



- Snap to grid
- Zoom
- Pan
  - Toggle between Pan and pointer
- Rotate left and right

# Graphic Display Editor

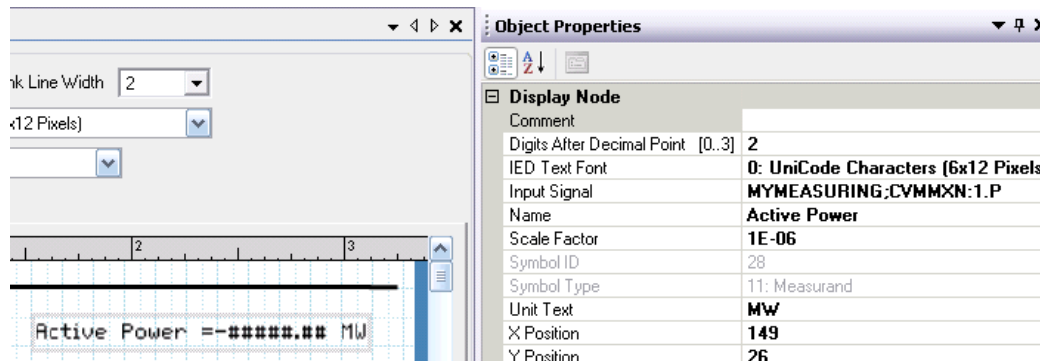
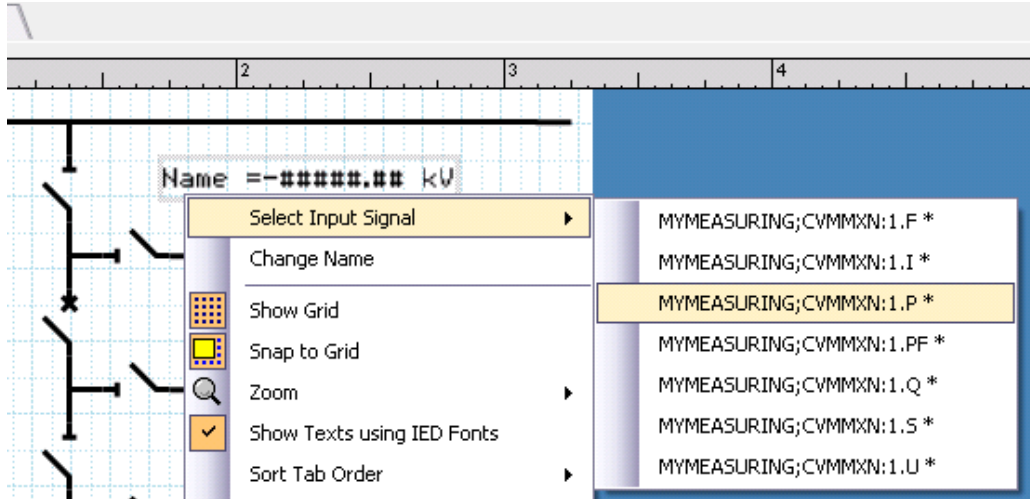
## Link Symbols



- Make linking active
- Draw link
  - Place mouse over first point
  - Left click once
  - Draw to second point
  - Left click once

# Graphic Display Editor

## Associate Symbols

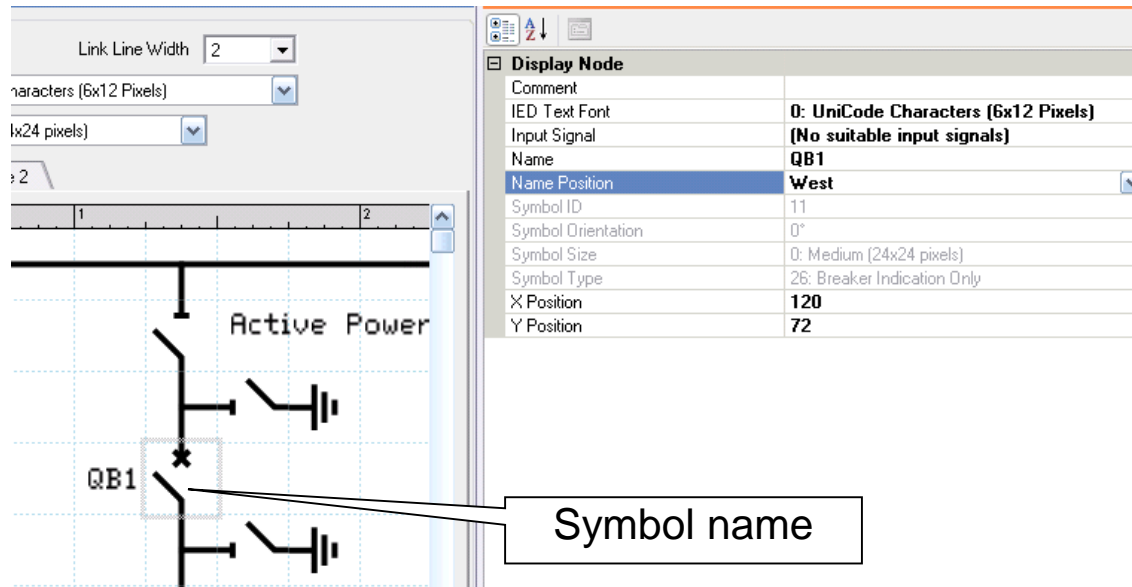


- Associate symbols with functions
  - Measuring functions
  - Control functions
  - User Defined name shown
- Make association
  - Select object
  - Right click
  - Select Input Signal
- Object Properties
  - Make association
  - Renaming
  - Scaling
  - Unit Text



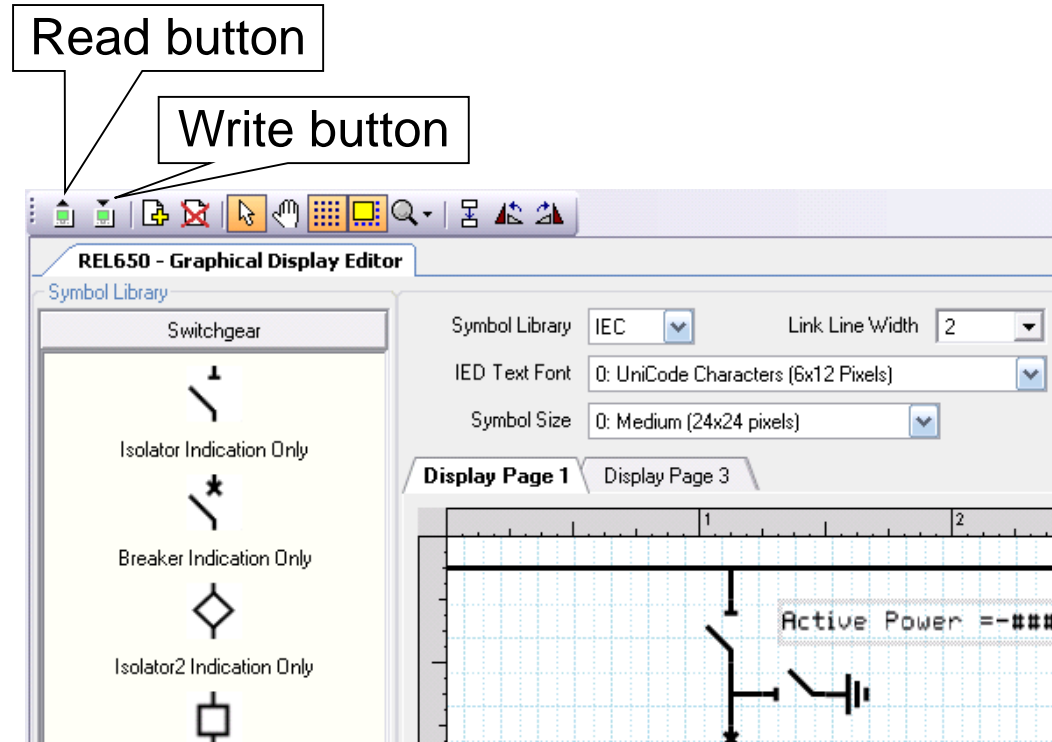
# Graphic Display Editor

## Symbol Name Positioning



- 5 positions
  - Center
  - North
  - East
  - South
  - West
- Position in Object Properties

# Graphic Display Editor Read/Write

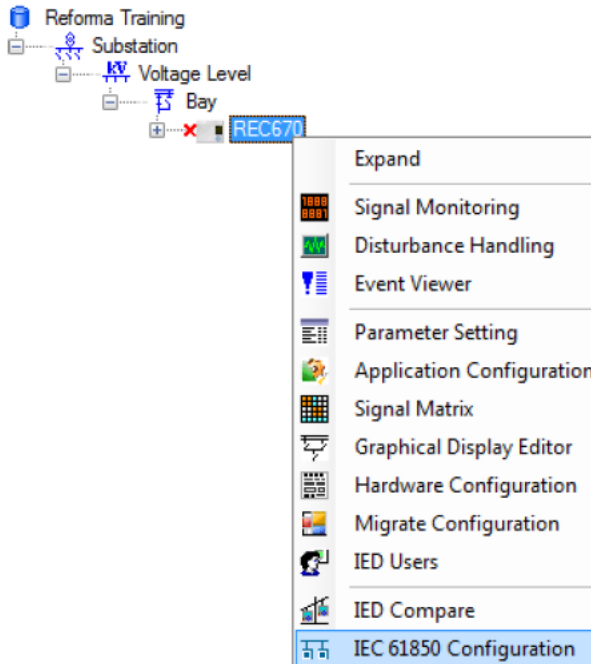


- This Read/Writes only the GDE data

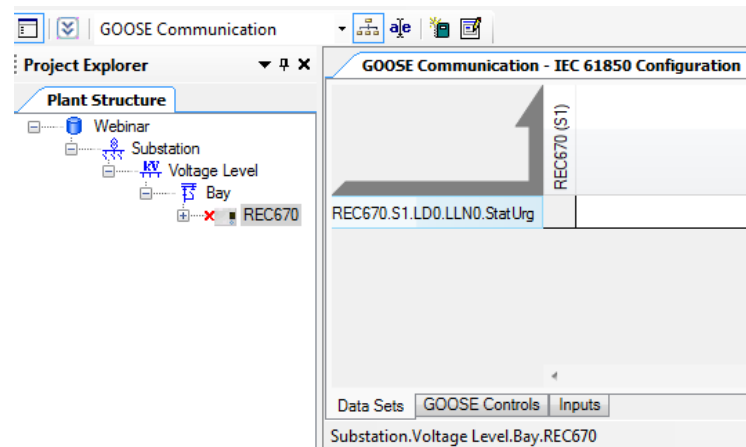
# Agenda

- Introduction
- PCM600
- Application Configuration Tool
- Parameter Setting Tool
- Graphic Display Editor
- IEC61850
- Questions

# IEC61850 Overview



- PCM600 allows users to edit the IEC61850 information of ABB 650 and 670 devices.
- As functions are added into the ACT, they IEC61850 information for Client/Server will updated
- To edit the IEC61850 information, Right-Click the relay and select “IEC61850 Configuration”
- Once opened the tool will look like the screenshot from below.

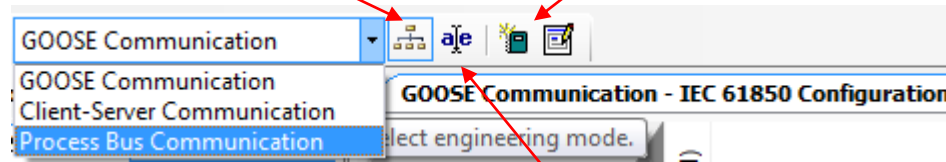


# IEC61850 Overview

Toggle On/Off Engineering Mode

- Must be on if you wish to edit

Create a New Object



Allows you to select between:

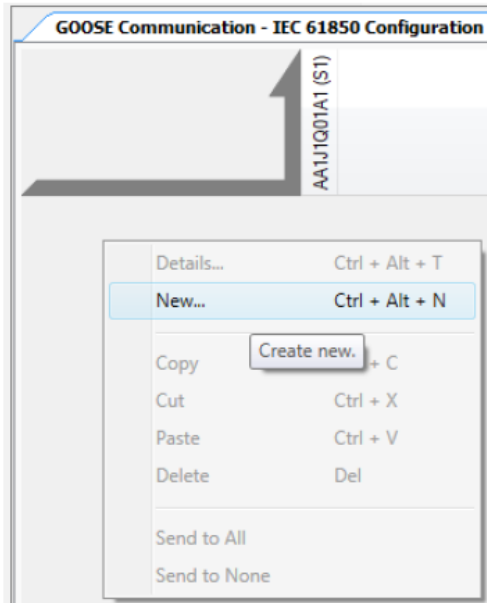
- Goose
- Client-Server
- Process Bus

Toggles between IEC61850 and user defined names

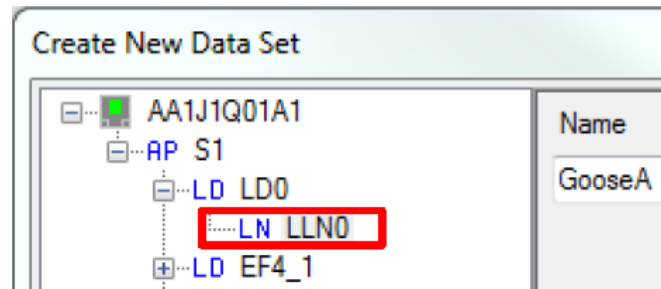
# IEC61850

## Create a Dataset

In order to add a Goose Dataset, Right-Click in the blank space and select “New...”

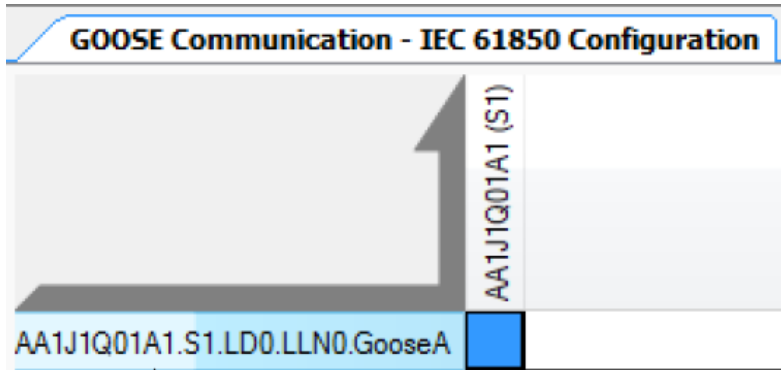


Expand the structure as seen below and select LLNO and then name the goose message before selecting “OK”

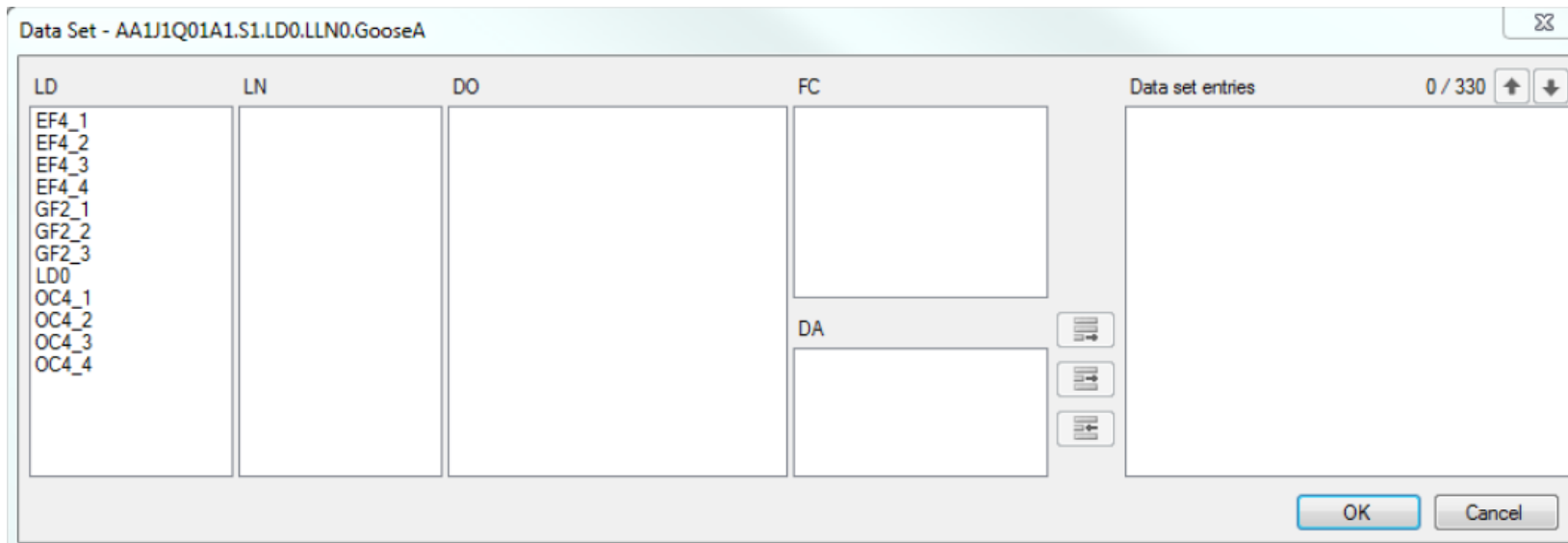


# IEC61850

## Create a Dataset



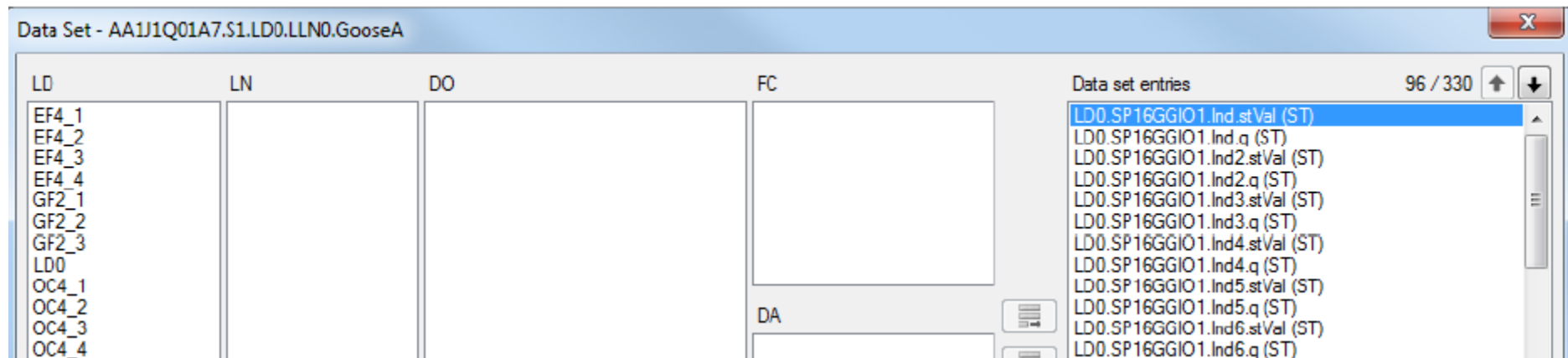
Double click on the goose message after it has been created and the following window will open



# IEC61850

## Create a Dataset

Add signals by making a selection in each of the columns until you reach the desired attribute. Once you have highlighted your desired attribute then select “Append selected” as highlighted by the red box below. Repeat until all desired attributes are connected into the Dataset.



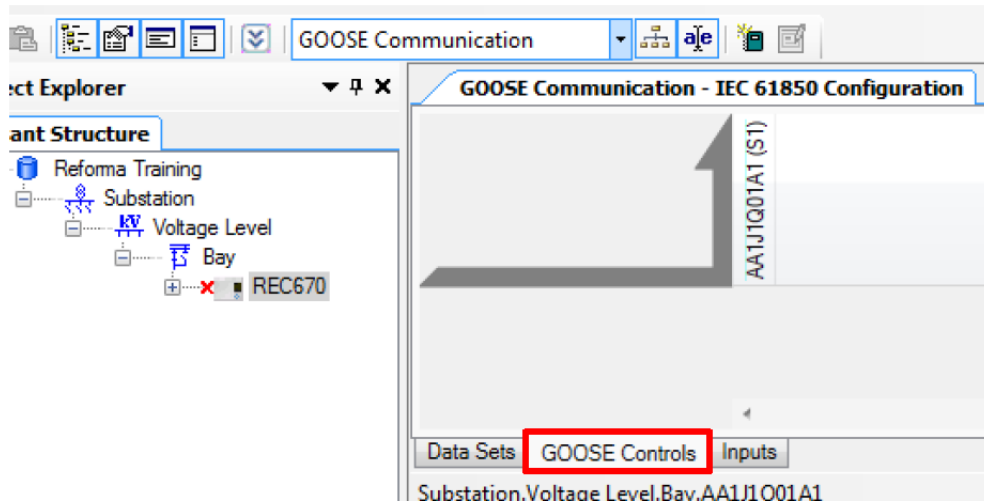
A maximum of 100 pieces of data (in Goose datasets) is allowed for each dataset therefore if you need to send more than it is necessary to make additional datasets. Goose messages require the stVal(status value) and q(quality) bits to be broadcasted. You can add these individually or you can select and add ST in the FC window and that will provided the necessary attributes as well as time for the ABB relay.



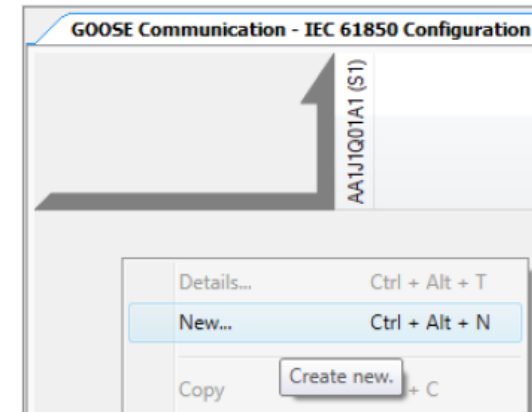
# IEC61850

## Create a GOOSE Control Block

In order to add a Goose Control Block, while in the Goose Communication window select the “Goose Controls” tab found at the bottom of the page.



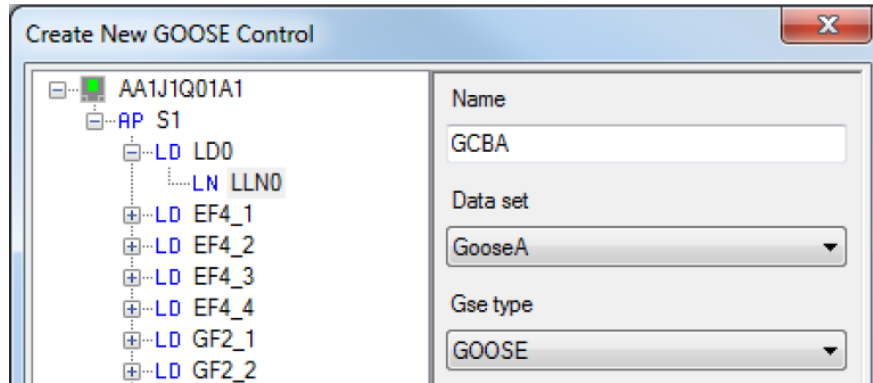
Similar to the dataset creation, right-click the blank area and select “New”



# IEC61850

## Create a GOOSE Control Block

Navigate to LLNO as seen below, create a name for the GCB, and then select the Data set you would like to be packaged with the GOOSE Control Block. In this example we have GooseA connected to GCBA. Once the selections are made hit “OK”



# IEC61850

## Subscribing Relays

- When multiple relays exist in a project and each have GOOSE Control Blocks, it is possible to subscribe to one another. By bring in another relay, we see the following table available. In order to see this view it is necessary to select the Bay Level or higher and to be in either the Data Sets or GOOSE Controls tab of the GOOSE Communication window.

The screenshot shows the 'GOOSE Communication - IEC 61850 Configuration' window. The 'Project Explorer' on the left shows the following structure:

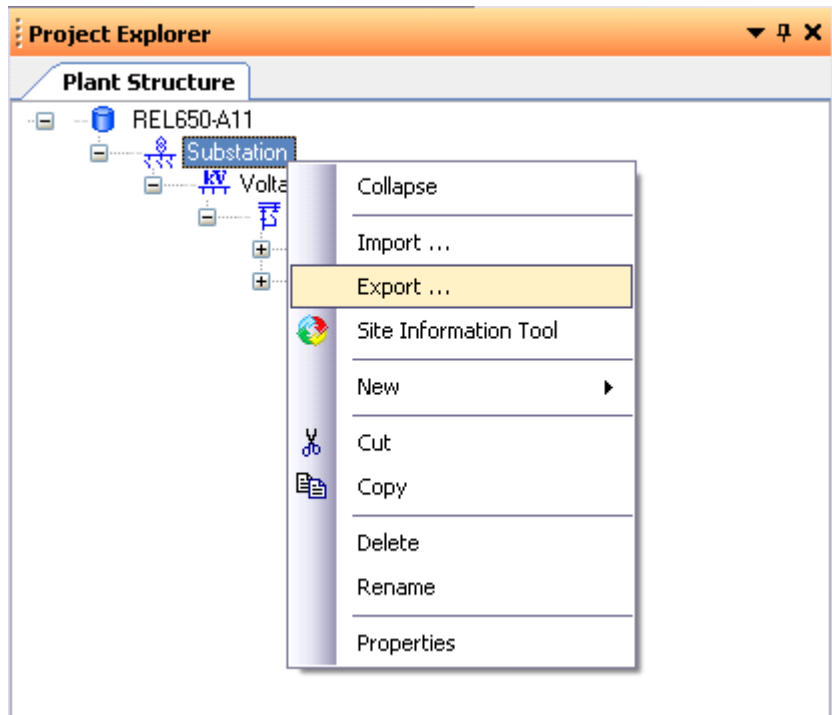
- Reforma Training
  - Substation
    - Voltage Level
      - Bay
        - REC670\_1
        - REC670\_2

The main window displays a table for GOOSE Communication with the following data:

	AA1J1Q01A1 (S1)	AA1J1Q01A2 (S1)
AA1J1Q01A1.S1.LD0.LLN0.GooseA	<input type="checkbox"/>	<input type="checkbox"/>
AA1J1Q01A2.S1.LD0.LLN0.GooseA	<input type="checkbox"/>	<input type="checkbox"/>

The window also has tabs for 'Data Sets', 'GOOSE Controls', and 'Inputs' at the bottom.

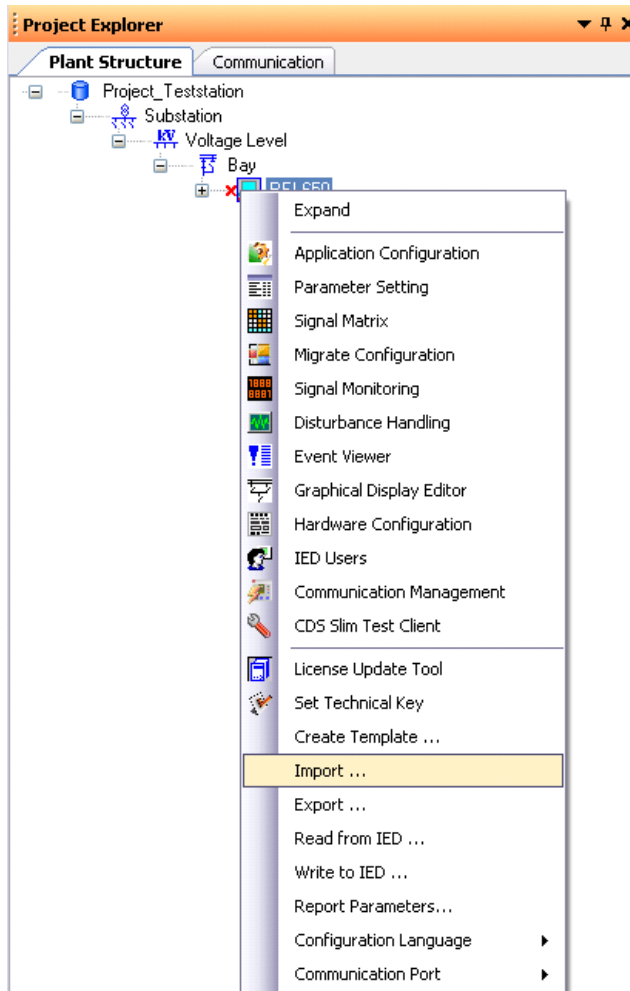
# IEC61850 SCD



- SCD file
  - Substations Configuration Description
- Contents
  - SCL information for all IED's within the substation
- Export/Import of SCD file
  - Done at Substation level
  - SCL engineering done outside PCM600, export/import functionality needed.

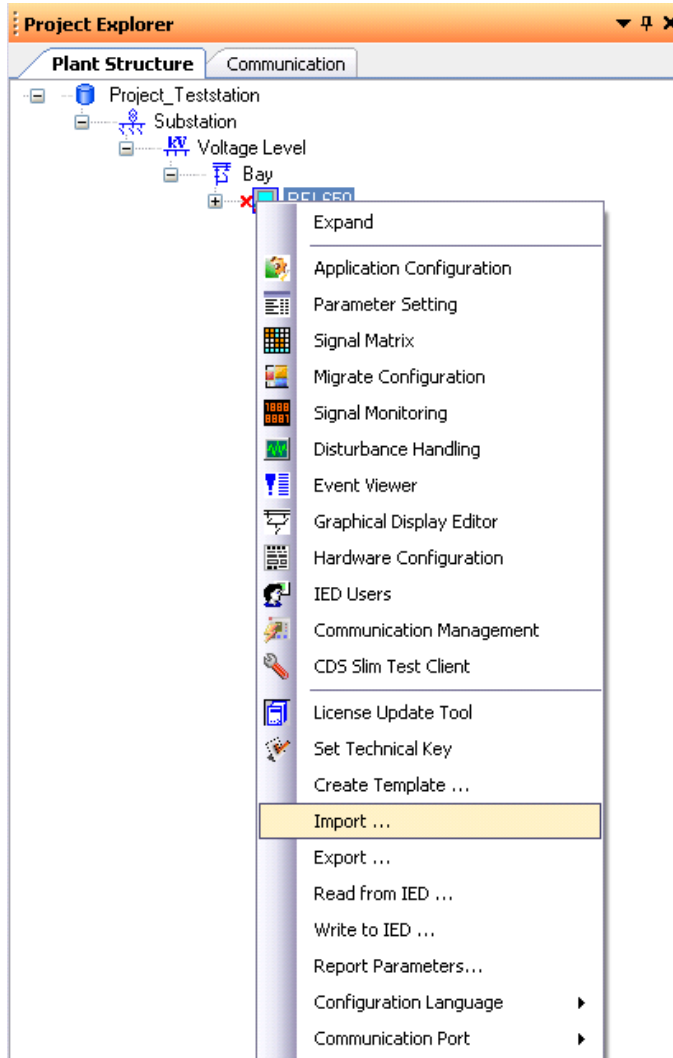
Note! When importing SCL files to PCM600, be sure to import an SCL file that correlates with the PCM600 project or you might loose data

# IEC61850 ICD



- ICD file
  - IED Capability Description
- Contents
  - All that's configured in the IED before the system configuration
  - No SA Section
  - No Communication section
  - IEDName = TEMPLATE
- Usage
  - System engineering
    - Merging to an SCD file
- Export/Import of ICD file
  - At IED level

# IEC61850 CID



- CID file
  - Configured IED Description
- Contents
  - Extract of the SCD file
  - SCL information for one specific IED
- Export/Import of ICD file
  - At IED level

# Agenda

- Introduction
- PCM600
- Application Configuration Tool
- Parameter Setting Tool
- Graphic Display Editor
- IEC61850
- Questions

# Questions

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