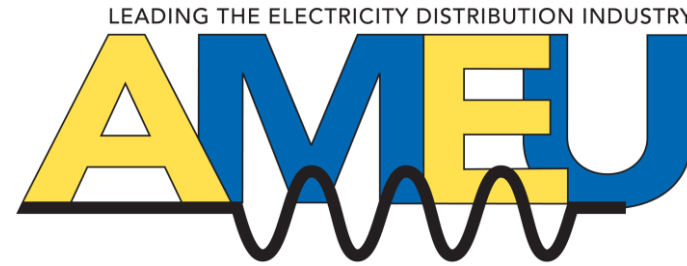


Ingeteam



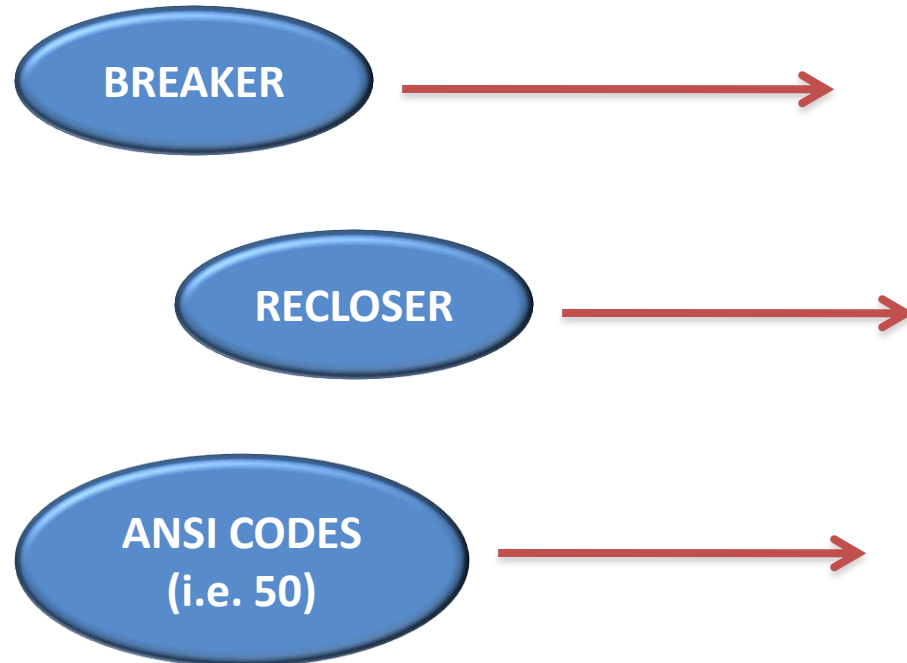
Minimizing the impact of IEC 61850 in the new automation projects. How the appropriate tools can help the user to cope with IEC 61850 standard

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INTRODUCTION

- What degree of knowledge of the IEC 61850 standard needs each user?



Not all the users need to understand the details of the IEC 61850 standard but a basic knowledge is recommended

USER VIEW OF THE INFORMATION

The screenshot displays the Ingeteam software interface. On the left, a 'Model Hierarchy' tree shows the structure of a project named 'ZT1e'. The tree is expanded to show 'PROT' (Protection) settings, including 'TOC Phases' (Unit 1, 2, 3), 'IOC Phases', 'TOC Neutral', 'IOC Neutral', 'TOC Ground', 'IOC Ground', 'TOQ Unbalance', 'IOQ Unbalance', 'Broken conductor', 'Second Harmonic Restraint', 'Stub bus', 'Diff. Stub bus Phases', 'Diff Stub bus Neutral', 'Undercurrent', '21 (Z)', 'Thermal Image', and 'Voltage' (Phases Overvoltage, Timed Unit, Instantaneous Unit 1, Instantaneous Unit 2, V0 Overvoltage).

A blue callout box highlights the text: **IED+LDName/LNName.DataName.Attribute**
i.e. **ZT1/PROT.PTOC3.Op.phsA**

The main window shows a settings table for various protection units. The table lists the unit name, its status (Enabled/Disabled), and various parameters such as Operation type, Start value (A), Operating Curve Type, Time dial, Delay, Torque control, and General Trip.

Unit Name	Enabled	Operation type	Start value (A)	Operating Curve Type	Time dial	Delay\minimum time (ms)	Torque control	Time delay cancel Input	General Trip
LN : TOC Phase (51) U3 - 9/ 15 Setting(s)	YES	Trip	5	ANSI Extremely...	0.05	0	Non Directional	Undefined	YES
LN : IOC Phase (50) U1 - 8/ 13 Setting(s)	YES	Trip	8		0		Non Directional	Undefined	YES
LN : IOC Phase (50) U2 - 8/ 13 Setting(s)	NO								
LN : IOC Phase (50) U3 - 8/ 13 Setting(s)	NO								
LN : TOC Neutral (51N) U1 - 9/ 15 Setting(s)	YES	Trip	5	ANSI Extremely...					

TYPES OF SOFTWARE TOOLS

- **Protective relay engineering tool**
 - IED model tool to create the ICD file
 - Users: Protection relay manufacturer (R&D engineer)

- **Protective relay configuration tool**
 - Vendor specific tool to configure the relay
 - i.e Settings, Communications (Datasets, Reports, Gooses)
 - Users: Protection engineer, System integrator, SCADA engineer, RTU engineer

- **Text or XML editor**

TYPES OF SOFTWARE TOOLS

- **System configuration tool**
 - IED independent system level tool
 - ICD/CID/SCD management
 - IED naming and network topology
 - Communications (Datasets, Reports, Gooses)
 - Users: System integrator, SCADA engineer, RTU engineer
- **Local SCADA or HMI configuration tool**
 - Local IEC 61850 client in the system for HMI
 - Users: SCADA engineer
- **RTU configuration tool**
 - Local IEC 61850 client in the system for Control centre communications configuration
 - Users: RTU engineer

TYPES OF SOFTWARE TOOLS

- **System commissioning tools**
 - **Emulation tools:**
 - IEC 61850 client software
 - IEC 61850 server software
 - Control center emulator
 - **Traffic analyzer or sniffer**
 - Users: System integrator, SCADA engineer, RTU engineer

TOOLS

USER	Required IEC 61850 knowledge		TOOLS
	Without appropriate tools	With optimized tools	
Protection relay manufacturer	High	Medium	<ul style="list-style-type: none"> • Text editor, Xml editor • SCL graphical editor • IED engineering specific tool
Protection engineer	High	Low	<ul style="list-style-type: none"> • Text editor , Xml editor • SCL graphical editor • IED engineering specific tool
SCADA engineer	Medium	Low	<ul style="list-style-type: none"> • System configuration tool • SCADA programming software • IEC 61850 commissioning tools
RTU engineer	Medium	Low	<ul style="list-style-type: none"> • System configuration tool • RTU configuration software • IEC 61850 commissioning tools • Control centre emulator software
System integrator	High	Medium	<ul style="list-style-type: none"> • IED configuration tool • System configuration tool.
System operator	Low	Low	No need of IEC 61850 specific tools

DESIRABLE CHARACTERISTICS IN A SW TOOL

- Import and export of normative configuration files (ICD/CID/SCD files).
- Graphical display of the information model either as a tree or a list of items with filter functionality.
- Easy creation of complex information models with modeling based on drag and drop actions.
- Internal repository of all the IEDs modeled.
- Reusability of created types available.
- Creation and modification of datasets and control blocks.
- Quick assignments of initial values and descriptions.
- Based on Classes & Objects concept

- SCL Implementation Conformance Statement (SICS)
 - Import/Export standard configuration files (ICD, CID, SCD)
 - Modify IED data model
 - Standard information:
 - Datasets, Reports, Gooses
 - Initial values: Settings, Configuration values
- Private parts must be maintained.
- Configuration based on IEC 61850 standard files (ICD/CID/SCD) instead in other formats (Excel, Text,)

INTEROPERABILITY

- Appropriate management of data classes

INS class					
Attribute Name	Attribute Type	FC	TrgOp	Value/Value Range	M/O/C
DataName	<code><DOType cdc="ENG" id="tdDaEd2ING_Restr_NSP_v0" iedType="Ingeteam_DA"></code>				
DataAttribut	<code><DA name="setVal" fc="SE" type="tdDaEd2INGRestr_v0" bType="Enum"/></code>				
	<code><DA name="d" fc="DC" bType="VisString255"/></code>				
stVal	<code><DA name="dataNs" fc="EX" bType="VisString255"></code>				
q	<code><Val>Ingeteam 2015</Val></code>				
t	<code></DA></code>				
subEna	<code></DOType></code>				
subVal	<code><DOType cdc="INS" id="tdDaEd2BasicINS_v0" iedType="Ingeteam_DA"></code>				
subQ	<code><DA name="stVal" fc="ST" bType="INT32" dchg="true"/></code>				
subID	<code><DA name="q" fc="ST" bType="Quality" qchg="true"/></code>				
d	<code><DA name="t" fc="ST" bType="Timestamp"/></code>				
dU	<code><DA name="subEna" fc="SV" bType="BOOLEAN"/></code>				
cdcNs	<code><DA name="subVal" fc="SV" bType="INT32"/></code>				
cdcName	<code><DA name="subQ" fc="SV" bType="Quality"/></code>				
dataNs	<code><DA name="subID" fc="SV" bType="VisString64"/></code>				
Services	<code><DA name="d" fc="DC" bType="VisString255"/></code>				
As defined in Table 13					

- Ready to manage big data models

DATA MODEL EXAMPLE (DISTANCE PROTECTION)

ZT1e [DATA_MODEL_EXAMPLE] - iedFactory

File Edit INGESYS® IT RTU UCS Ingeteam TD Tools Favorites Help

Data Object XX Text Filter...

eFS Settings eN ST Control Panel [EI0034T] Event log [EI0034T] Rebo...

INGESYS® IT Toolbar

Model Hierarchy Data Type Template

INGESYS® eFS

DATA_MODEL_EXAMPLE

- EF ZT1e
 - ID CTRL
 - ID GEN
 - ID PROT TCP-Protection
 - IN LLN0 Protection Basic Config
 - IN PROTLPHD1 Installation Names
 - IN TCTR1 CTs Ratios
 - IN TVTR1 VTs Characteristics
 - IN PTOC1 TOC Phase (51) U1
 - IN PTOC2 TOC Phase (51) U2
 - IN PTOC3 TOC Phase (51) U3
 - DO Mod
 - DO Beh
 - DO Health
 - DO NamPlt
 - DO Str TOC3 Phase Start
 - DO Op TOC3 Phase Trip
 - FC DC
 - FC ST
 - general
 - phsA
 - phsB

ZT1e.PROT.PTOC3.Op

View1

Nº	Reference	Description	sAddress	Value	Type	Class Type	Op
1	ZT1e.PROT.PTOC3.Mod		-		Data Object	tdEfINC_Mod	
2	ZT1e.PROT.PTOC3.Beh		-		Data Object	tdEfC_INS_Beh_v0	
3	ZT1e.PROT.PTOC3.Health		-		Data Object	tdEfC_INS_Health_v0	
4	ZT1e.PROT.PTOC3.NamPlt		-		Data Object	tdEfLPL	
5	ZT1e.PROT.PTOC3.Str	TOC3 Phase Start			Data Object	tdEfACD_v1	
6	ZT1e.PROT.PTOC3.Op	TOC3 Phase Trip			Data Object	tdEfACT_v0	
7	ZT1e.PROT.PTOC3.StEna	TOC3 Phase Start Enable			Data Object	tdEfSPS_v0	
8	ZT1e.PROT.PTOC3.PTOCEna	TOC3 Phase Trip Enable			Data Object	tdEfACT_v0	
9	ZT1e.PROT.PTOC3.OpType	TOC3 Phase Trip Type			Data Object	tdEfACT_TypePTOC	
10	ZT1e.PROT.PTOC3.StrVal	TOC3 Phase Start Value			Data Object	tdEfACD_v1	
11	ZT1e.PROT.PTOC3.ImACrv	TOC3 Phase Start Current			Data Object	tdEfACD_v1	
12	ZT1e.PROT.PTOC3.TmMult	TOC3 Phase Start Time Multiplier			Data Object	tdEfVSG_v0	
13	ZT1e.PROT.PTOC3.OpDITmms	TOC3 Phase Start Delay Time			Data Object	tdEfING_v0	
14	ZT1e.PROT.PTOC3.DirMod	Torque control			Data Object	DirMod	
15	ZT1e.PROT.PTOC3.FFailBeh	Behaviour with Fuse fail			Data Object	tdEfING_FFailBeh	
16	ZT1e.PROT.PTOC3.RstTyp	Reset type			Data Object	tdEfING_RstTyp	
17	ZT1e.PROT.PTOC3.MesTyp	Measurement type			Data Object	tdEfING_MesTyp	
18	ZT1e.PROT.PTOC3.LogInBlk	Blocking input			Data Object	tdEfVSG_SG_v0	
19	ZT1e.PROT.PTOC3.LogInCaTm	Time delay cancel input			Data Object	tdEfVSG_SG_v0	
20	ZT1e.PROT.PTOC3.GenTrip	General Trip			Data Object	tdEfSPG_v0	
21	ZT1e.PROT.PTOC3.TripPerm	Trip Permission			Data Object	tdEfING_v0	
22	ZT1e.PROT.PTOC3.ReclPerm	Reclosure Permission			Data Object	tdEfSPG_v0	
23	ZT1e.PROT.PTOC3.MaskEna	Mask Enable			Data Object	tdEfING_v0	
24	ZT1e.PROT.PTOC3.DDOrdBlk	Distance Protection Order Blocking			Data Object	tdEfING_v0	
25	ZT1e.PROT.PTOC3.DDOrdCaTm	Distance Protection Order Cancel Time			Data Object	tdEfING_v0	

218 Logical nodes

8855 Data objects

84158 Data attributes

DEVICE KEY FEATURES

- Is all the device information included in the ICD/CID file?
 - All data or a subset
- Are the protection settings included in the IEC 61850 services?
 - Settings can be configured with any tool
- Is the device configured with the CID file?
 - Configuration of standard parts with any tool
 - Test with emulation tools easier

CONCLUSIONS

- Reduction in the engineering of the system will only be achieved if a new set of powerful tools, designed to fulfil the standard requirements, are available.
- The degree of knowledge in IEC 61850 needed by each user depends on the IED capabilities and the optimization of the tools.
- With the IEC 61850 standardization the objective of reducing the number of tools needed in the configuration and maintenance of a SAS should be kept in mind.

Thank you for your attention