Industrializing IEC61850: Designing an interoperable system which will reduce routine engineering, commissioning and maintenance effort
Introduction

The Problem
In the next few years our existing Engineering team will be confronted with a scale up of 50% in Substation Renewal Investment and existing resources will not be able to cope.

The Solution
Industrializing the SAS system such that optimum designs are replicated by an automated engineering process.

Why Industrialize?
Increased Productivity, Predictability, and Reliability lowering the Engineering and Testing costs and delivering investments on time and budget
Design Remit

Design Priorities
1. Industrialization & Process Efficiency
2. Edition 2
3. Data Quality
4. Cybersecurity
5. Open up Competition
6. Exportable
7. Future Proof

Project Scope
✓ New Substations
✓ Refurbishments
✓ Maintenance
✓ Cybersecurity
System Architecture - Gateway and HMI

### Major Design Decisions

- IEC 61850:104 Map is 1:1
- Redundant Gateway
- Separate Substation HMI
- No more HMI in IED
- HMI Configuration through SCD & Templates

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Local Area Network
RSTP vs PRP vs HSR
Local Area Network – What Method of Time Synchronisation

GPS

Red TC

UCS

IED

IED

Red TC

Gateway

SNTP 1

SNTP

IED

IED

Red TC

Gateway

SNTP 2

PTP 1

SNTP 2

Red TC

Gateway

SNTP

IED

IED
Specifying the IED

- Flexible Product Naming
- Configuration Hash Check
- Remote Firmware Management

- Later Binding Mechanism
- Sequence of Events, Tracking & Profile Logging
Automating the Engineering Process

SCADA system & global tools

Proprietary IED tool

SVG+ 61850 mapping

IID, IPs

Engineering tool (SCT)

SCD

HMI

Gateway/Server

IED

IID, IPs

SCT

Prot. settings

SCD

ICT

Proprietary IED tool

IED

BIN

Prot. settings
Engineering Process - The SCT tool

1. IBERDROLA ST position specification document
2. ICD Template Files
3. Topology (Single line diagram)
   - Logical function - IED mapping
   - IED name - IP addressing
   - Goose publish/subscription tables
4. Other configuration files:
   - Logic modules
   - Protection settings
5. SCD
6. ICT
7. CIDs
8. IEDs
9. IEDs

Engineering:
- Process IO & wiring
- Define control & protection
- Define HMI/gateway data
- Configure gateway
- Configure HMI
- Configure IEDs
- Engineer horizontal communication
- Engineer vertical communication
Interfacing with Corporate IT systems

Can we give more routine tasks to IT systems?
Which tool does what?
If the replacement IED is an exact copy in terms of communication hardware, protection and control software and communication software, additional engineering is not required. The device shall consume the old SCD (or CID) without making changes.

Question for IED Vendors!
when a replacement device is engineered and reconfigured this can have impact on GOOSE subscriptions on other IEDs, therefore it could be possible that a reload of the SCD in other IEDs is necessary.
Cost Benefit Analysis of Industrialization

✓ Faster Commissioning Projects
✓ Reduced Testing
✓ Reduced Engineering
✓ Outsourcing facilitated

Future Work Medium and Long Term
**New SAS System Exec Summary**

**Strategy**
- Stick to Standard WIN WIN for suppliers
- Highly Critical Insourced as much as possible
- Automated SCD file generation

**Method**
- Standardisation of Bay Types and SAS Architecture
- Customisation of SCT Engineering Software
- Integration with IT systems

** Desired Result**
- Capacity for Investment Ramp Up
- Increased Competition
- Decreased Testing Requirements
- Decreased Engineering Effort