



Standards Based Engineering of Protection Schemes and Systems

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Engineering Requirements

- Improvements in quality
- Improvements in efficiency

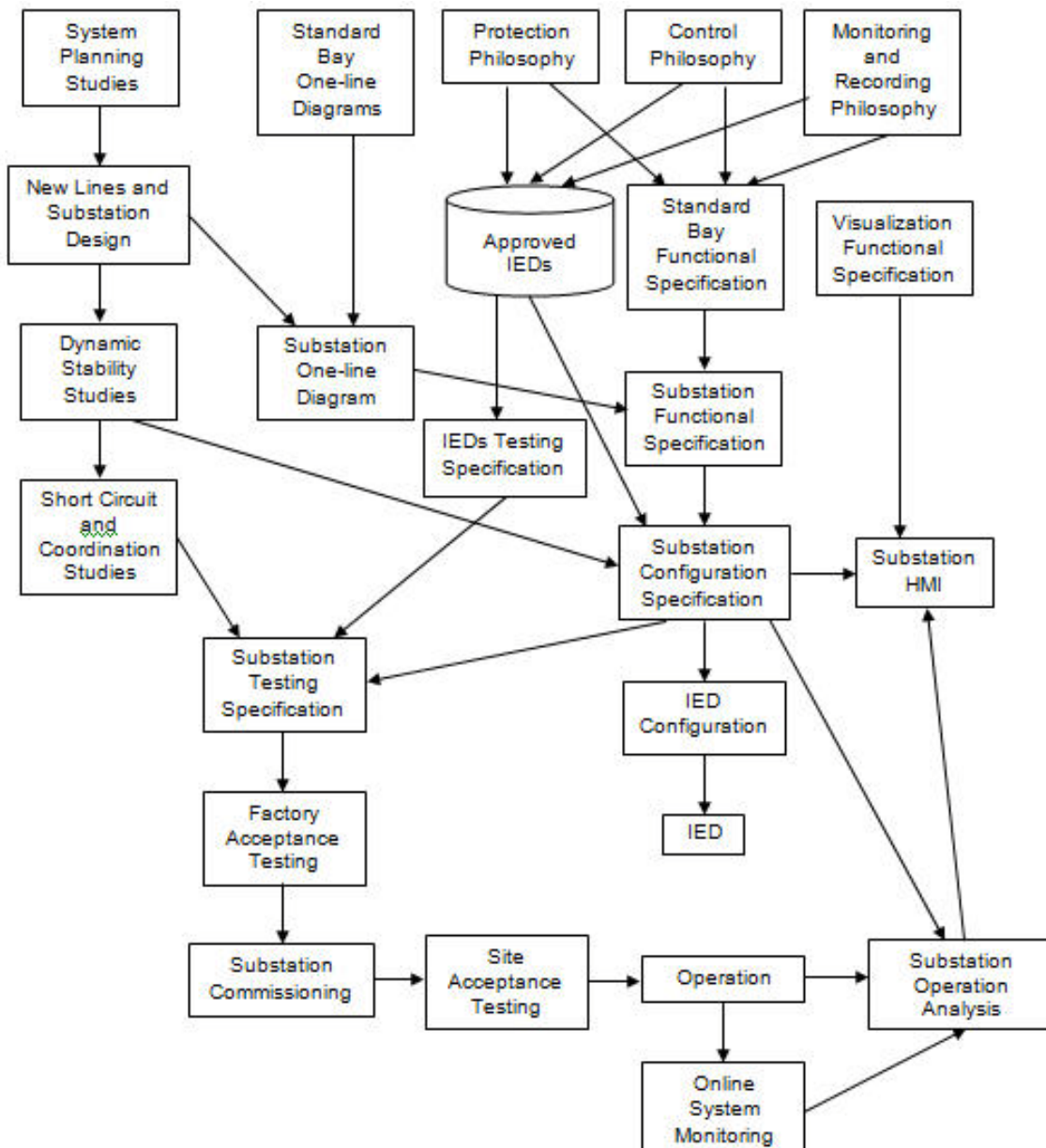
Efficiency

- Effectiveness – the degree to which objectives are achieved, without consideration of the resources being used.
- Efficiency – the extent to which a resource is used in order to effectively achieve an objective.

Improving Efficiency

- Standardization
- Integration
- Automation
- Testing versus Monitoring
- Documentation
- Object-Oriented Design (OOD)

Engineering Process



PACS Engineering Tools Functions

- Engineering is an important part of asset management
- Determine and document the application specific functionality
- Determine and document the integration of devices into the PACS
- Configure the system
- Test the system
- Monitor the system

SAS Engineering Tools

- Project design tools
- Configuration tools
- Documentation tools
- Testing tools
- Monitoring tools
- Analysis tools

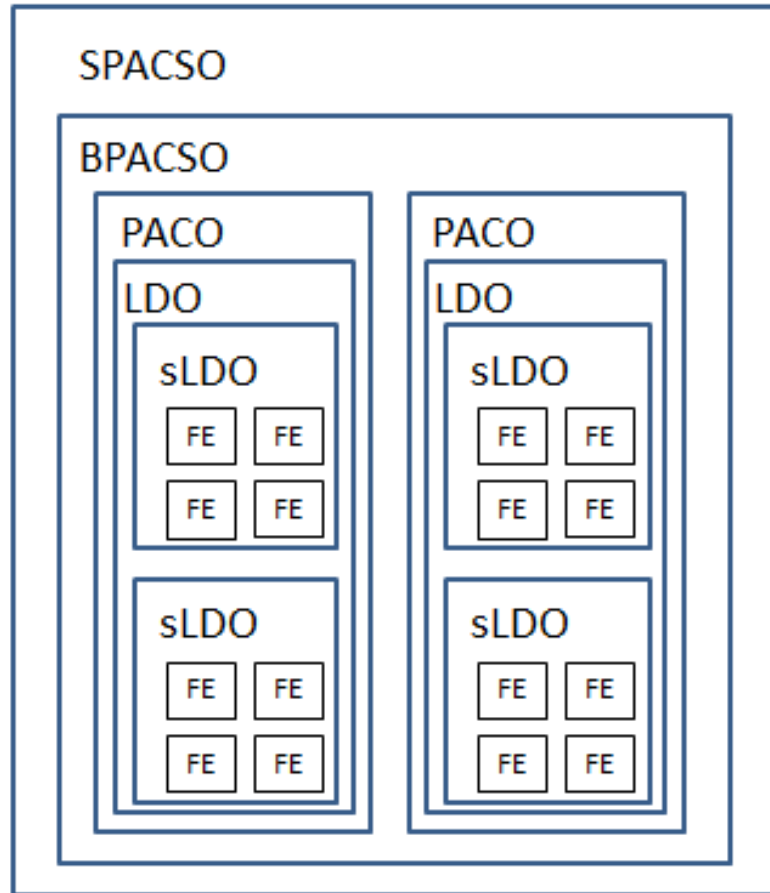
Engineering Tools Requirements

- Improvements in the engineering process is one of the key requirements for the success of IEC 61850
- Tools that support different steps in the engineering process are being developed
- The dream: completely automatic engineering process

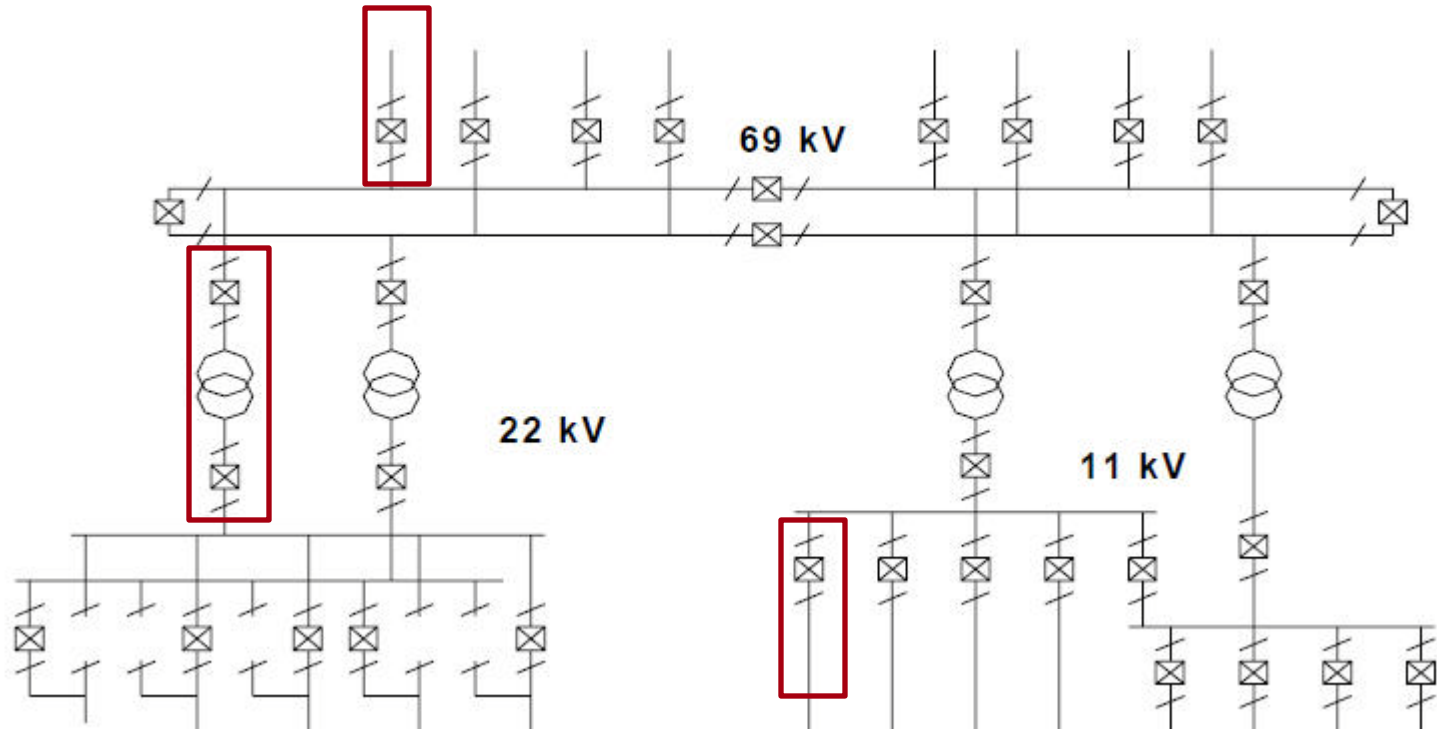
Engineering Process Requirements

- Requires the implementation of an engineering process based on:
 - Knowledge of the problem domain
 - Knowledge of the state-of-the-art technology
 - Utility standards
 - Industry standards
 - Object-oriented design
 - State-of-the-art tools

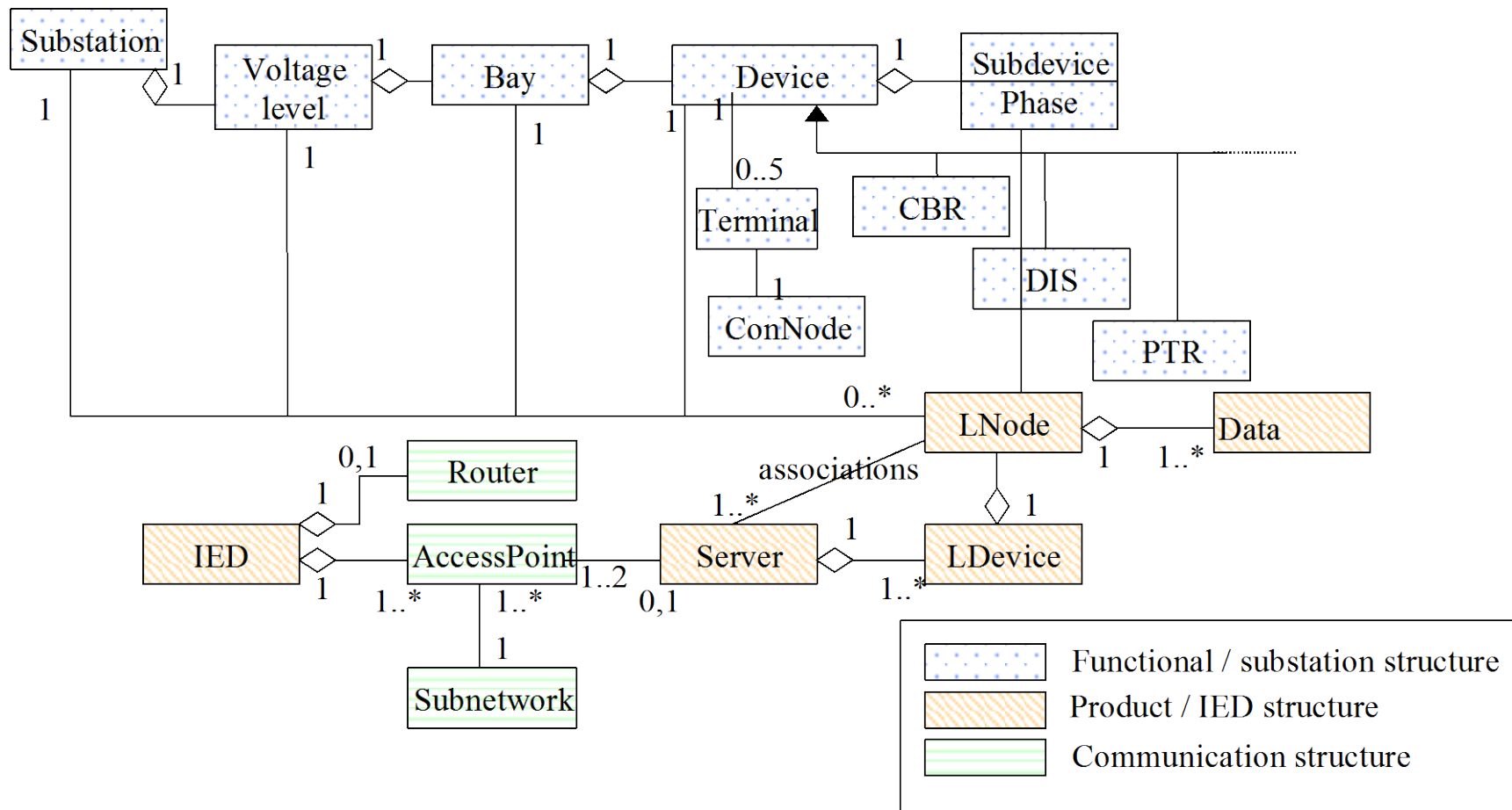
Object-Oriented Engineering



Bay examples



Substation Assets Model



SCL Files

- Substation Specification Description ***.SSD**
- IED Capability Description ***.ICD**
- Substation Configuration Description ***.SCD**
- Instantiated IED Description ***.IID**
- Configured IED Description ***.CID**
- *IED Specification Description *.ISD*

Improving Engineering Efficiency

- Need for some further development, including:
- Completion of the settings parts of the logical nodes class models
- Inclusion of the settings in the ICD and CID files
- Harmonization between the CIM model and the IEC 61850 model

Improving Engineering Efficiency

- Extensions in the system model to cover the needs of coordination and analysis tools
- Extensions of the system model to cover the complete communications architecture
- Addition of IED setting configuration functions in the System Configuration tools

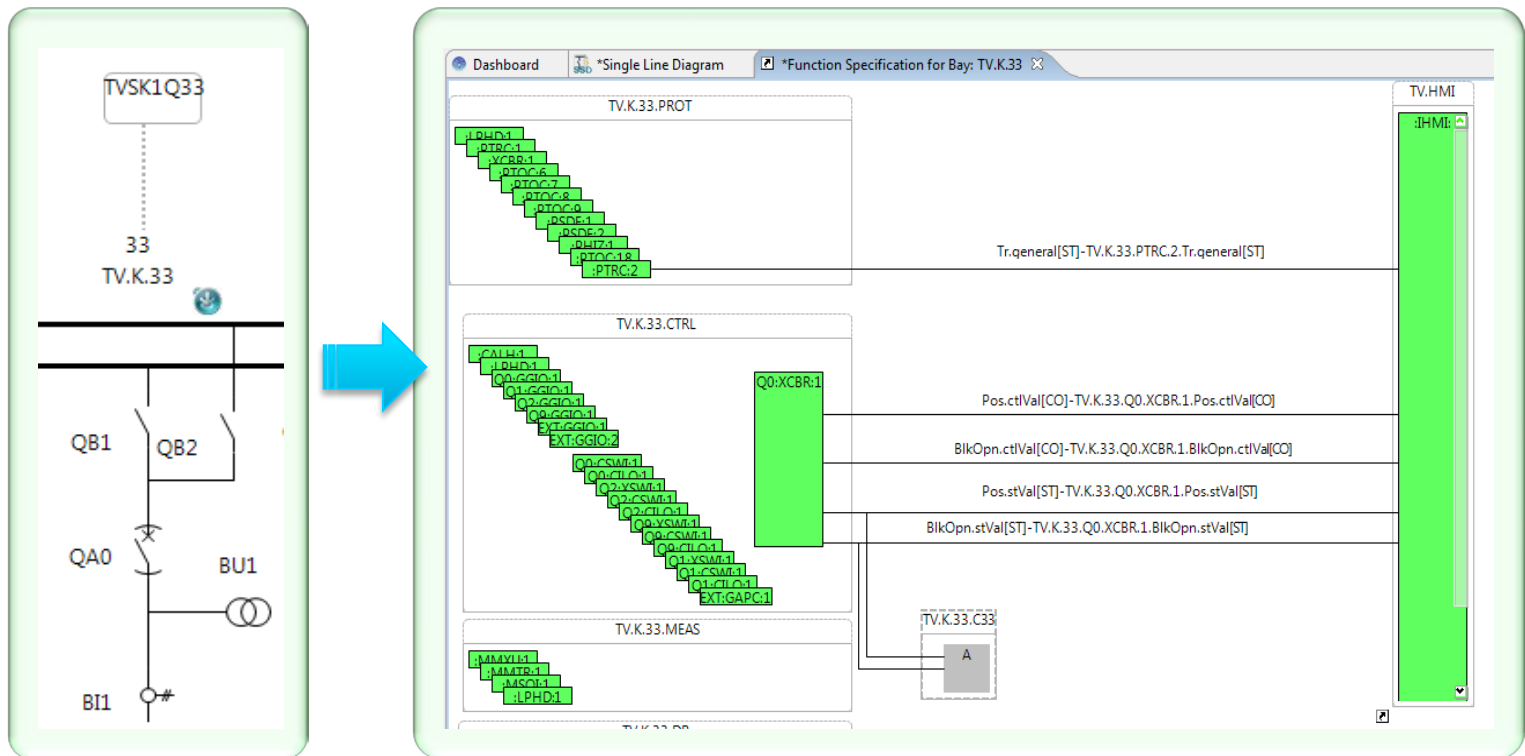
Improving Engineering Efficiency

- As a result it will be possible to extend the use of the SCD files for the following substation automation systems engineering tasks:
- Automatic creation of the graphical user interface from the SCD file, including the different screen layouts

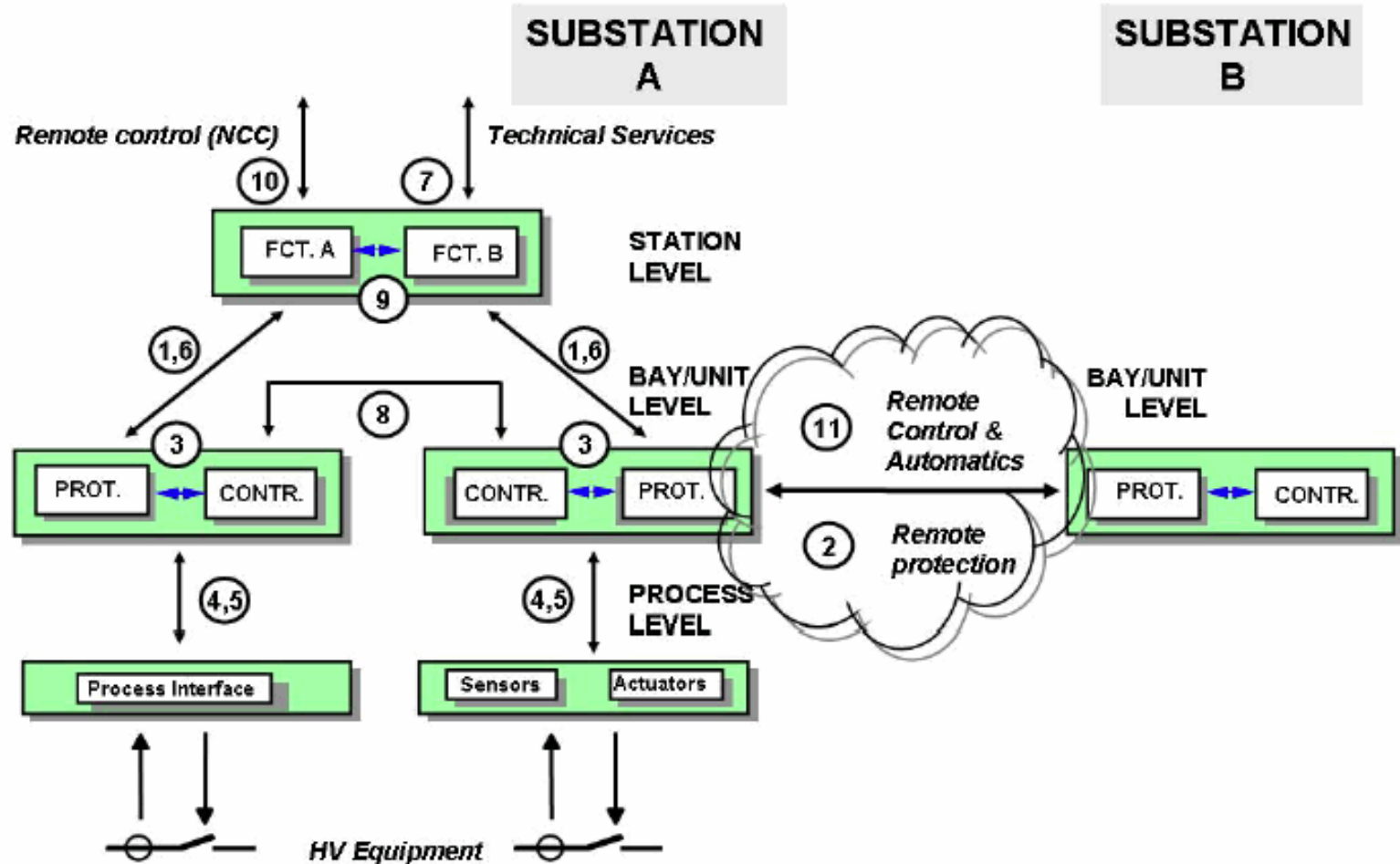
Improving Engineering Efficiency

- Automatic mapping of the different measurements and status information from the IEDs to the substation HMI
- Automatic configuration of the IED or substation protection and control system testing process
- Automatic substation event analysis

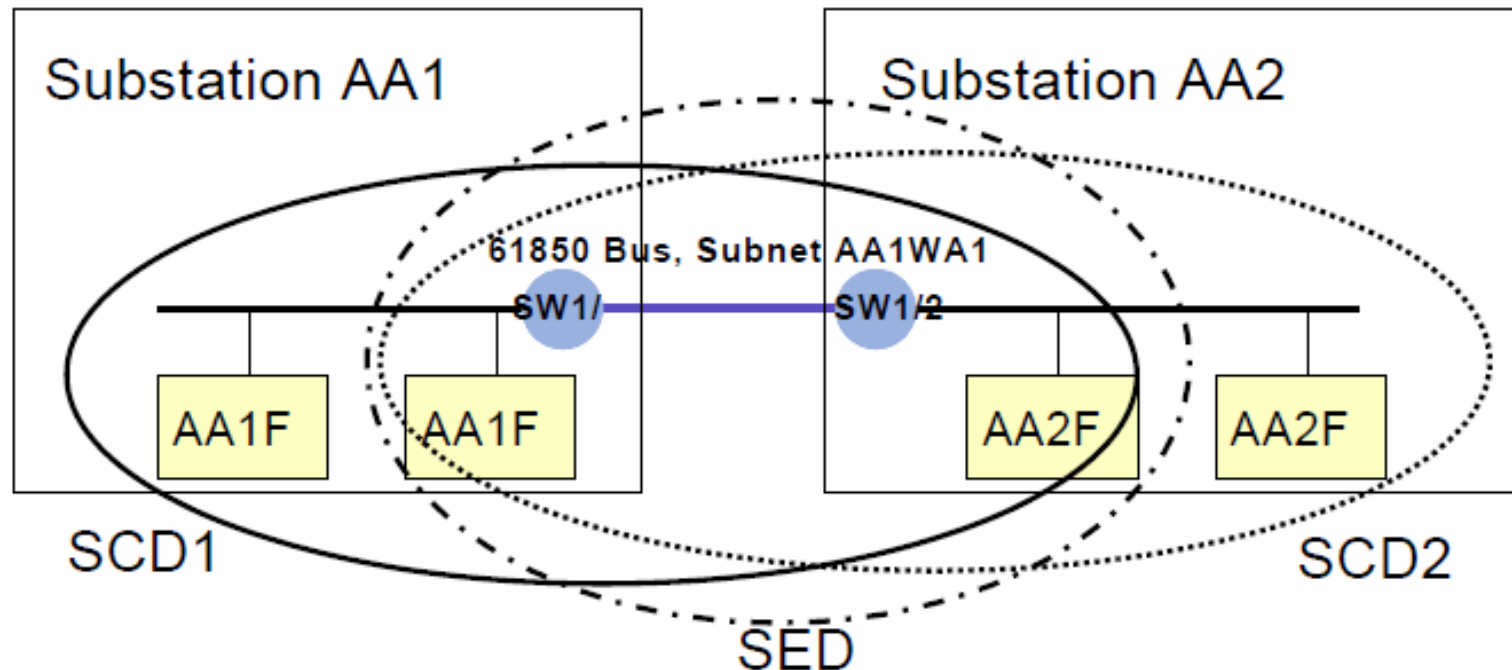
IEC 61850 Engineering Process



SS-SS Interfaces

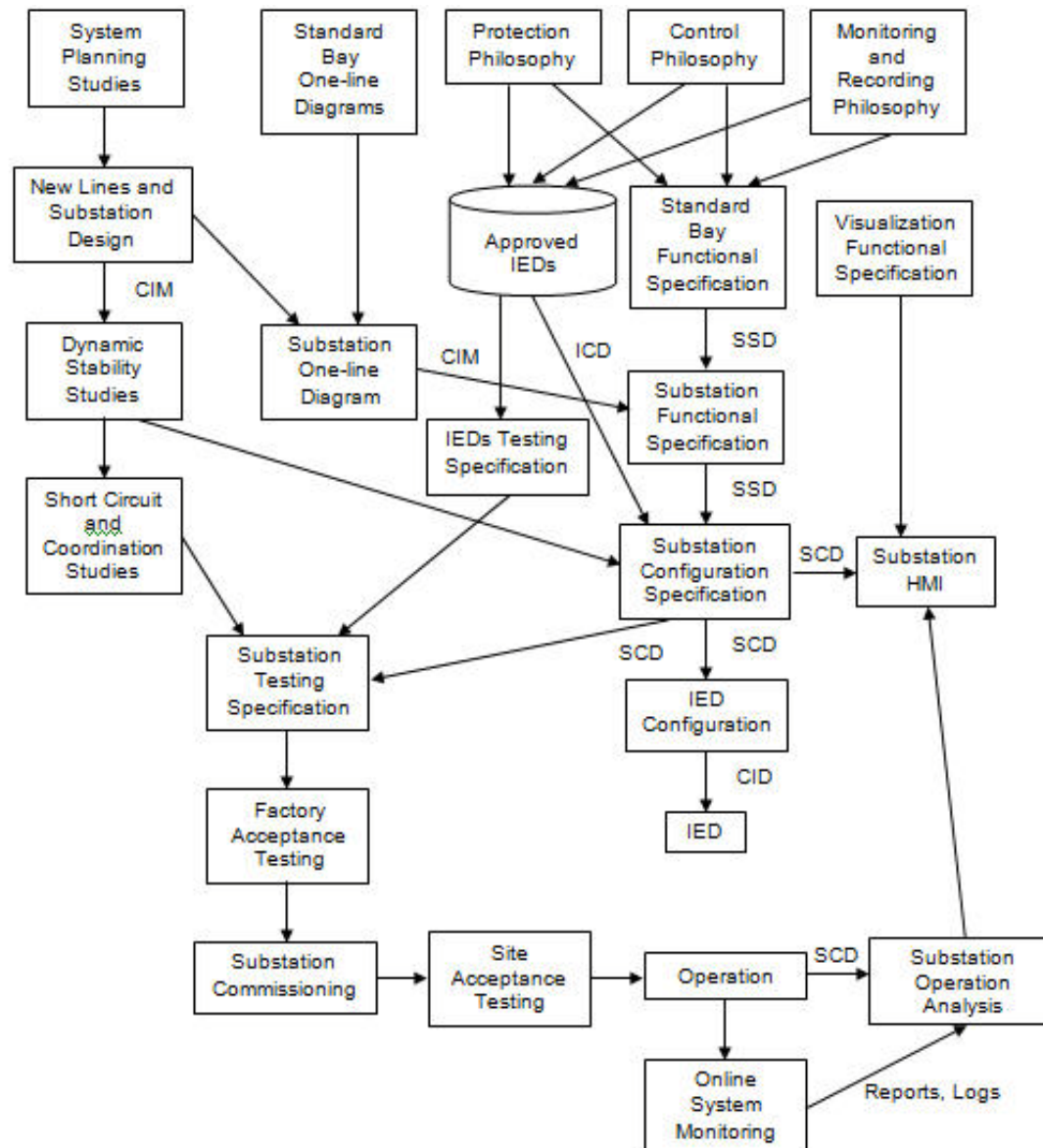


System interface Exchange Description (SED)



High bandwidth wide area connection 'looks like switch'

Engineering Process Using IEC 61850



Standardization Process

	Phase	Bay	PAC Devices	Plant Application / Substation	What it means
A	Standard scheme – template	G	G	G	Totally generic SSD , ISD
B	Standard scheme – defined	S	G	G	All HW interfaces fixed SSD
C	Standard scheme – applied	S	S	G	IEDs fixed ICD , IID
D 1 2	Standard scheme: Instantiated Instantiated with small variations	S	S	S	Everything fixed, also settings (= standard scheme applied in reality) SCD , CID

S = specific; G = generic; B and C can be one step.

Conclusions

- IEC 61850 creates the foundation for the development of a new way of engineering PAC systems
- Utility standards can significantly improve the efficiency and quality of the engineering process
- What we need is tools that can take advantage of this technology



Questions?