

Evolution to Virtual Substation

B5

PS2

Q2.01: What are the challenges in the development of digital substations and how to address the problems caused by the digitalization?

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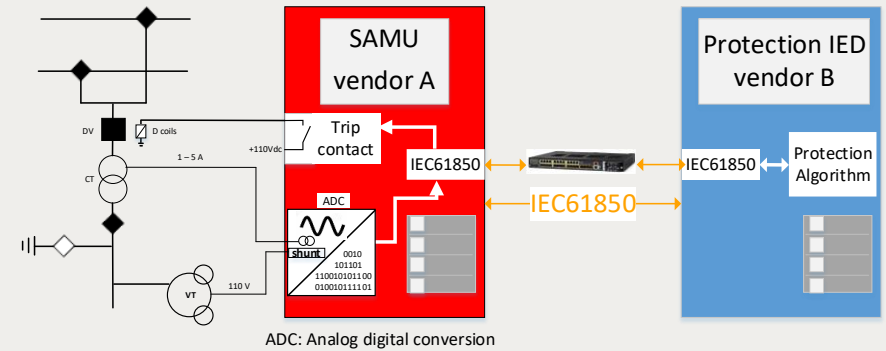
Group Discussion Meeting

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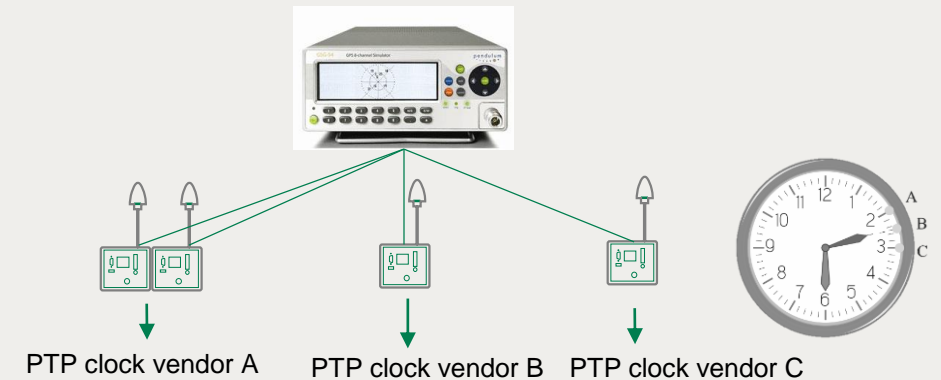
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What are the challenges in the development of digital substations? (1/3)

- **Availability** of PACS functional chain is **slightly reduced** by adding components
- **Alignment of behavior** for IED and MU/SCU with digital interface:
 - **MU characteristics** vs protection requirements (during transients)
 - **Test and simulation mode implementation**
 - Convention of **polarity** for I_N vs I_0
 - **GMC switchover** could **interrupt** protection and ongoing trip
 - **Interaction** between **internal functions, algorithms** and the **IEC 61850**
- **Retro-compatibility SV** requires detailed knowledge from users
 - SMV streams Ed 2.1 vs Ed2.0; IEC61850-9-2LE vs IEC61869-9
 - Should be possible to **specify supported** profiles in **SCL**
- **Time Synchronization** is crucial part of the Digital Substation
 - TSO's need to develop a general deployment strategy (Telecom, PMU, ...)
- **Network design**
 - Integrating Process and Station bus in same hardware is feasible
 - Multicast filtering required at process bus interfaces



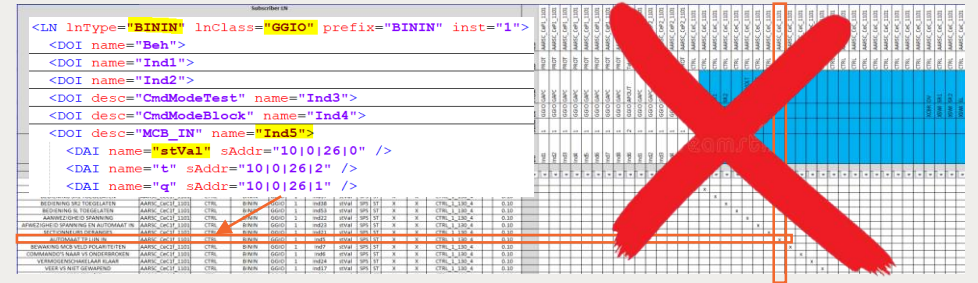
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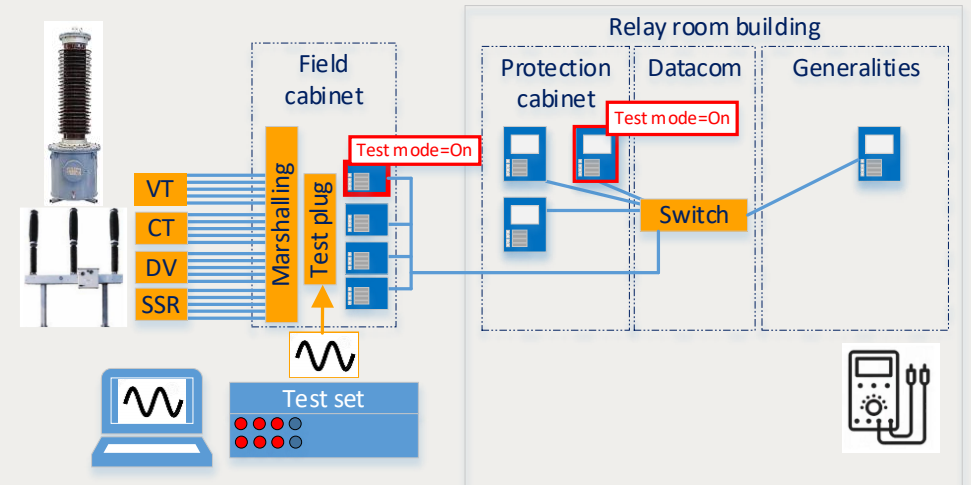
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What are the challenges in the development of digital substations? (2/3)

- **Efficient** specification process and up-to-date template database are required for large scale roll out in **TSO context**
 - Modelling of **templates of function** and **applications** (e.g. ASD; FSD; BehD) and **IED specification** (extended ISD)
 - In a **multivendor** environment the exchange and version management of configuration files is a **big challenge** today
- **User readable documentation** based on the SCL files
 - Use SCL as source to generate context dependent documentation (static, dynamic, live ...)
 - Lack of flexible documentation tools to visualize SCL to user friendly format
- **Testing** still requires too many **manual verification**
 - Large number of diverse testing tools required
 - Digital substation industry should facilitate automated testing
 - **Intelligent test scenarios** required that are re-usable **for multiple** particularized substations
- **MU near HV equipment**: ergonomics + safety



ANALOG INJECTING



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What are the challenges in the development of digital substations? (3/3)

- **Impact** on the organization
 - **Technical solutions** should support TSO's and their employees to **achieve their goals** (e.g. reduce lifetime, increased workload, ...)
 - **Step by step approach** of PACS generations facilitates the transformation
 - **Conventional substations** will remain on grid for **long time**
 - Knowledge of the **Electrical System** remains the **key competence**

