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Process bus with SIPROTEC 5

Live demonstration

Substation Automation & Protection brugermøde 2020

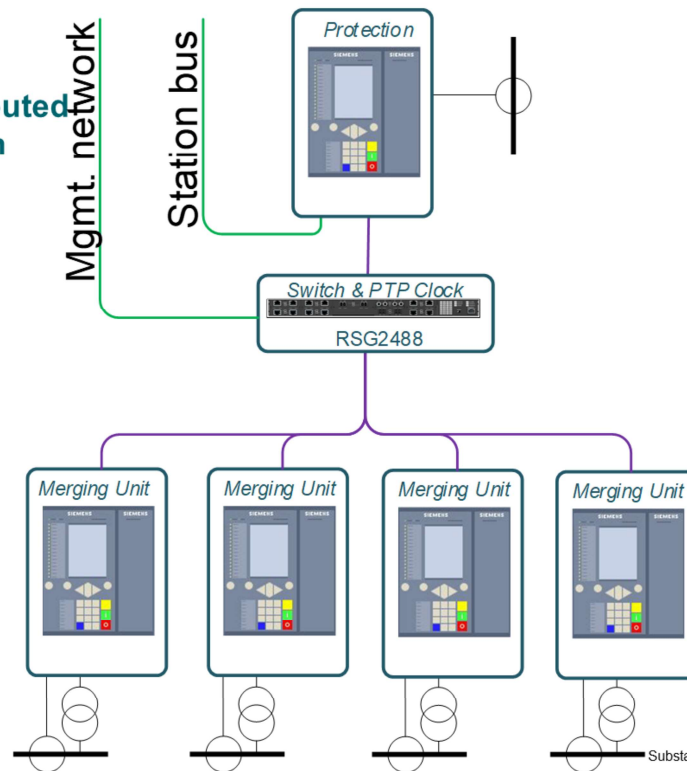
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- Examples of process bus network layouts
- Live demo of process bus system
- Testing of process bus systems
- Questions (also welcome earlier)

**Typ. process bus
system for distributed
busbar protection**

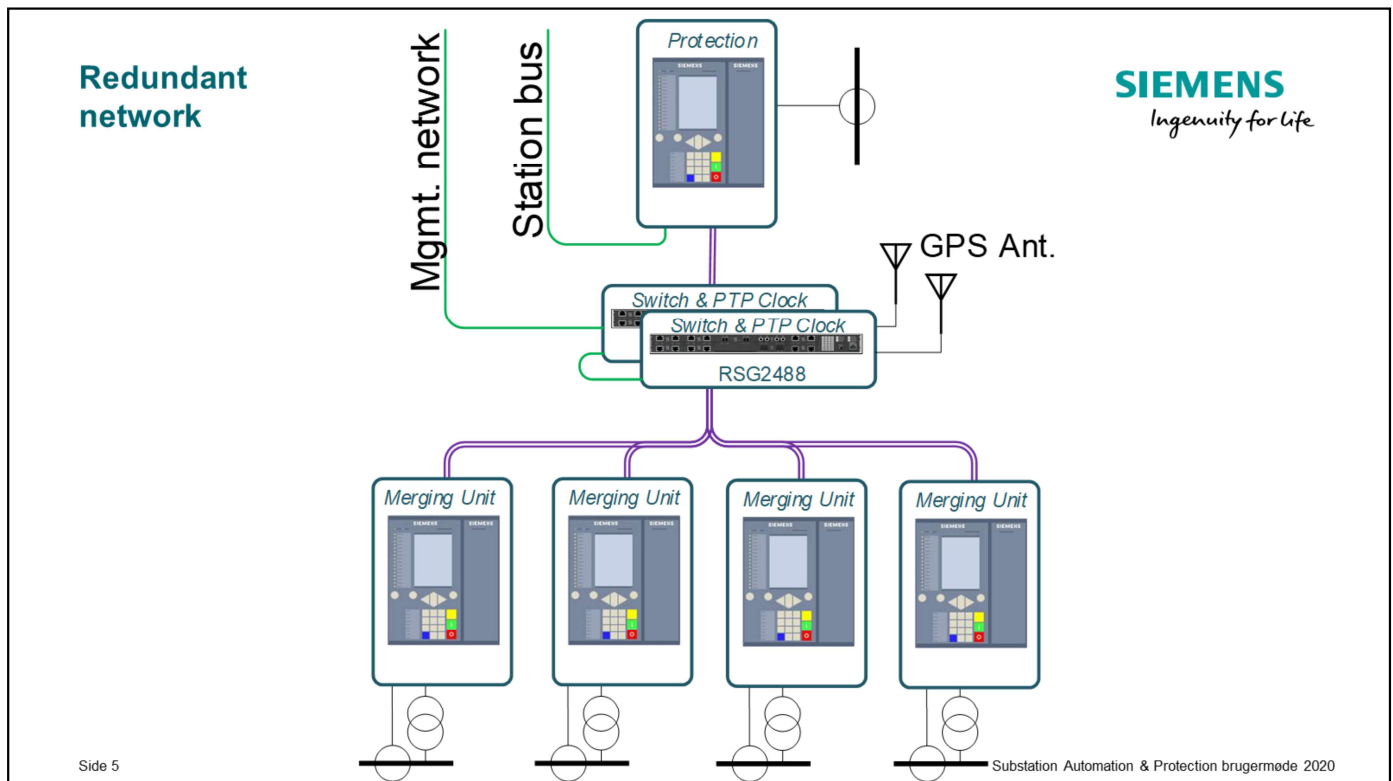
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Side 3

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Simple system. Relevant for distributed BBP. No redundancy -> Not suited for main protection.
PTP time server included in the switch, not externally synced, so can't be used for inter-substation protection systems.
Management network same physical network as process bus network, optional on different VLAN.
Additional interface in central unit + VLAN segmentation of the PB needed if more than ~14 MUs in a subnet.
VTs + CTs can be connected both to MUs and Protection IEDs.



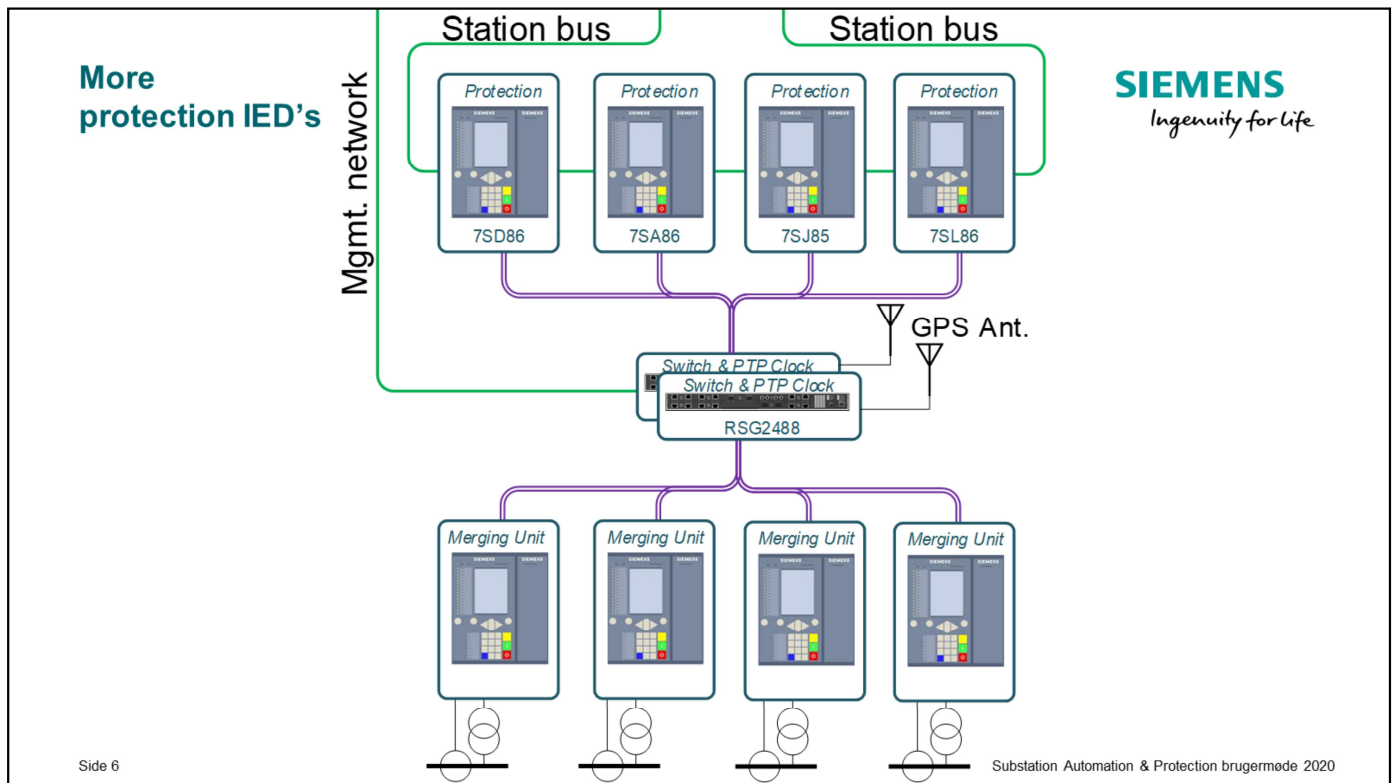
Side 5

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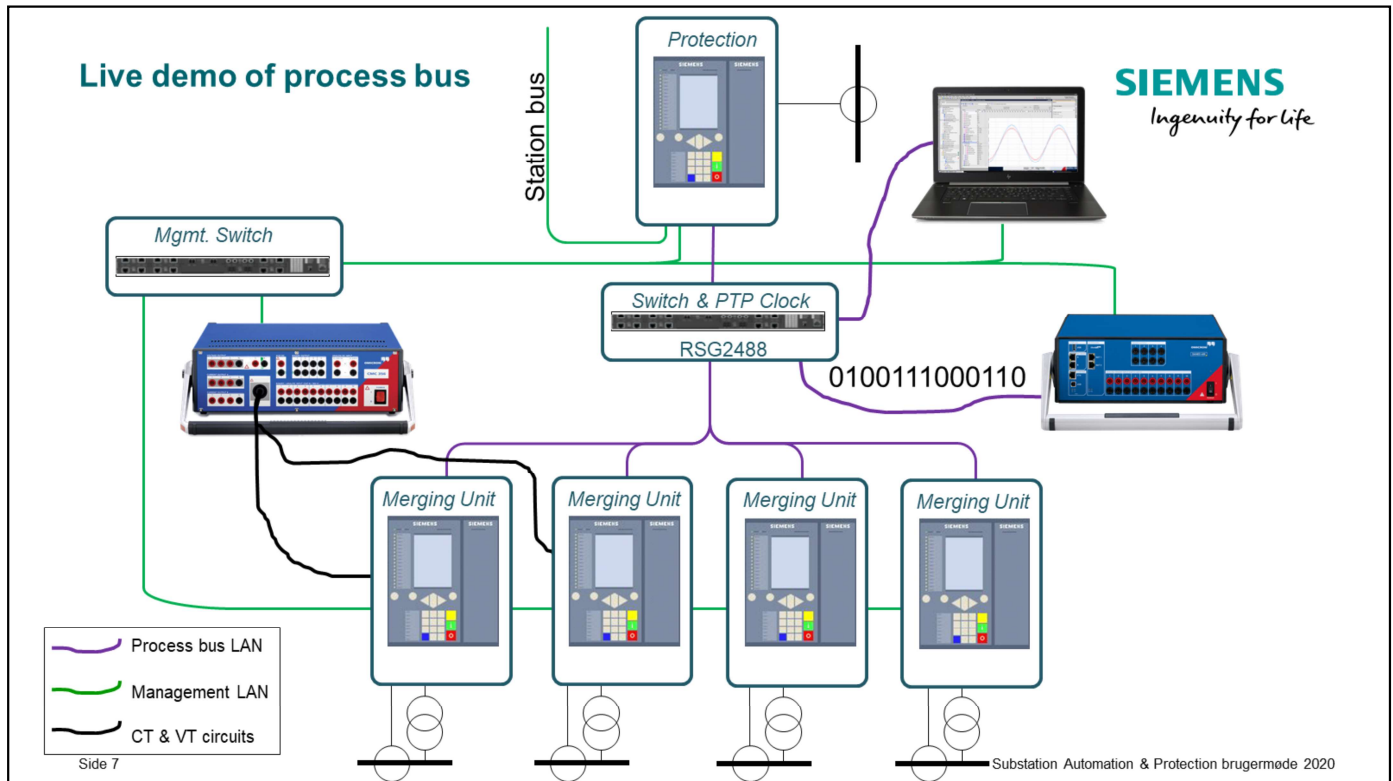
By using redundant network from MUs to Protection IEDs, the process bus can be used for main protection.

Several protection functions can be supported in one protection IED, even protection of several bays.

Redundant protection IED and/or redundant MUs can be used for extra redundancy.



The same process bus network can support many protection IEDs and MUs if the switches are engineered correctly using VLANs and static MAC address tables. In this way, the traffic will be guided to the correct ports in the switch and not flooding the whole network.

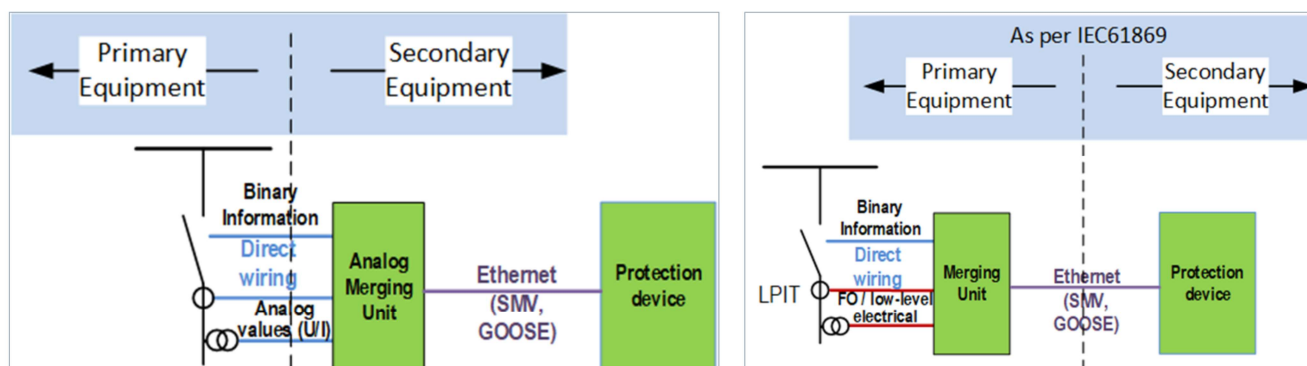


This is our demo setup today.

We are using SAMUs (Stand Alone Merging Units), meaning they are connected to CTs and VTs using 1-5A & 100-110V, so we can inject with e.g. a CMC as we normally do with protection IEDs. We can see the measured values in the MU, the Protection IED (online in DIGSI or web UI), but also by looking at the network streams with e.g. a DANEO 400 or using Wireshark.

Test interfaces

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Side 8

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Stand Alone Merging Unit (SAMU) still traditional interface between primary and secondary equipment exists:

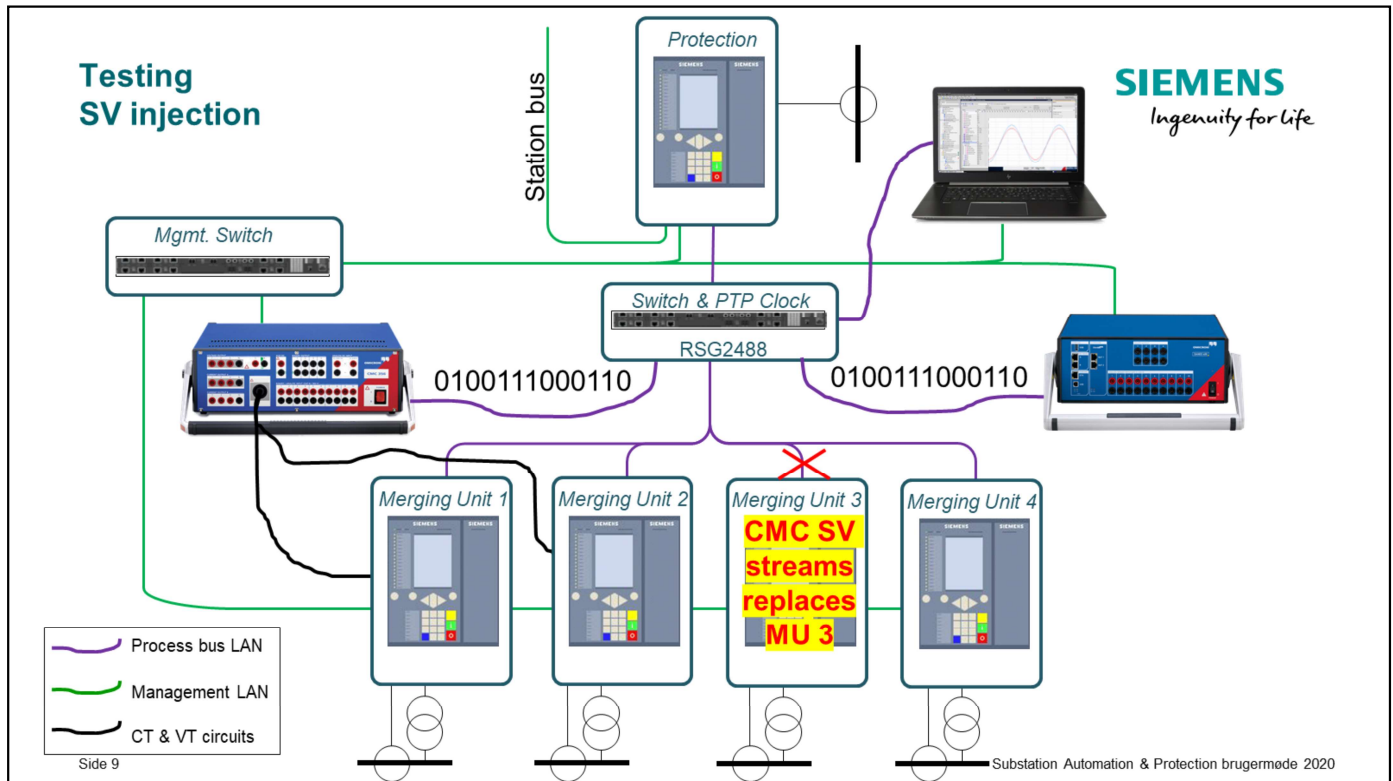
- Test procedures with secondary injections by OMICRON (or any other tool suitable for commissioning) are the same like on standard substations
- Additional process bus functionality needs to be verified

MU with LPIT inputs:

As per IEC standard Merging Units belong to primary equipment - interface between primary and secondary equipment shifts into process bus.

- Instead of secondary injections now SMVs to be injected in process
- Process bus functionality needs to be verified

This approach is only applicable provided that Merging Units (MU) and their connected LPITs are **calibrated** (refer to previous session), that means that each MU/LPIT, when getting the same primary input, publishes the same SMV output on its process bus interface.



A Merging unit can be simulated by test sets from several vendors. Here we are using a CMC356-6 from Omicron.

As with the secondary injection into the MU, we can have a look at the network traffic on the process bus. This can be done via Wireshark network analyzer software, by Omicrons DANEO400 and by many other kinds of SW and HW. The live demo shows the SV streams in Wireshark and DANEO 400 coming from both the 6MU85's and simulated by the CMC 356-6.

Testing of process bus systems



Network test – What to do?

The network is now an integrated part of the protection system!
Therefore it must be tested.

- Time sync
- Redundancy
- Performance
 - Latency
 - Bandwidth
 - Segmentation
 - Filtering

Testing of process bus systems



When & where to test

- LPITs and their MUs are tested together at GIS FAT or LPIT primary test.
- SAMUs can be tested together with PB and protection IEDs as a whole system
- Or they can be tested separately like the with MUs connected to LPITs

Side 11

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LPIT = Low Power Instrument Transformer: The new type of CT and VT

MU = Merging unit

SAMU = Stand Alone Merging Unit (1-5A & 100-110V input from conv. CTs/VTs)

FAT = Factory Acceptance Test

PB = Process bus

IED = Intelligent Electronic Device, e.g. a SIPROTEC device.

SV = Sampled Values

Testing of process bus systems

How to test

Several possibilities:

- Inject current and voltage in (SA)MU and verify behavior of protection IED
- Inject current and voltage in (SA)MU and verify measurements of the process bus then later inject SV into protection IED to verify its behavior.
- When testing only requires network connection, then remote testing becomes possible thus saving travel cost
- Testing with less wiring makes it faster to set up, so testing becomes easier.

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ANY
QUESTIONS?



Kontaktøplysninger

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