



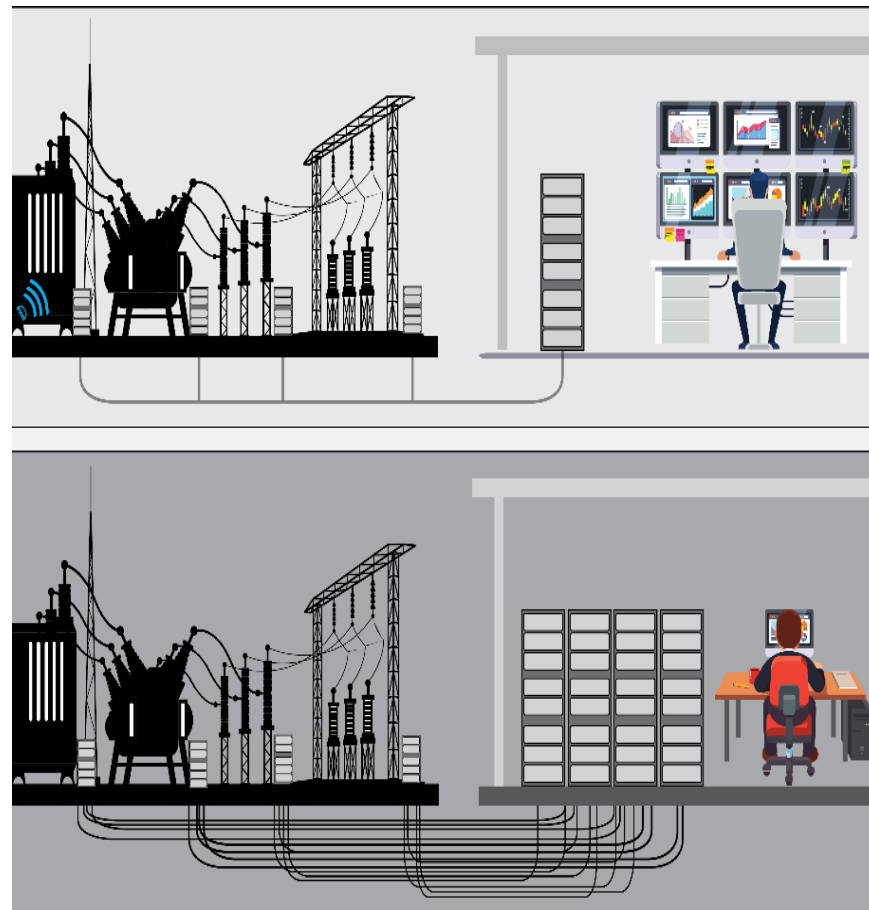
# Statnett pilot project Digital Substation with IEC 61850 process bus

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IEC 61850 NÄTVERKSTRÄFF-II 2019  
26th of November 2019, Stockholm

**Statnett**

# What is a digital substation?

- IEC 61850
- Station bus
- Process bus



# Goals for Digital substation pilot

## Smaller

- reduced footprint

## Smarter

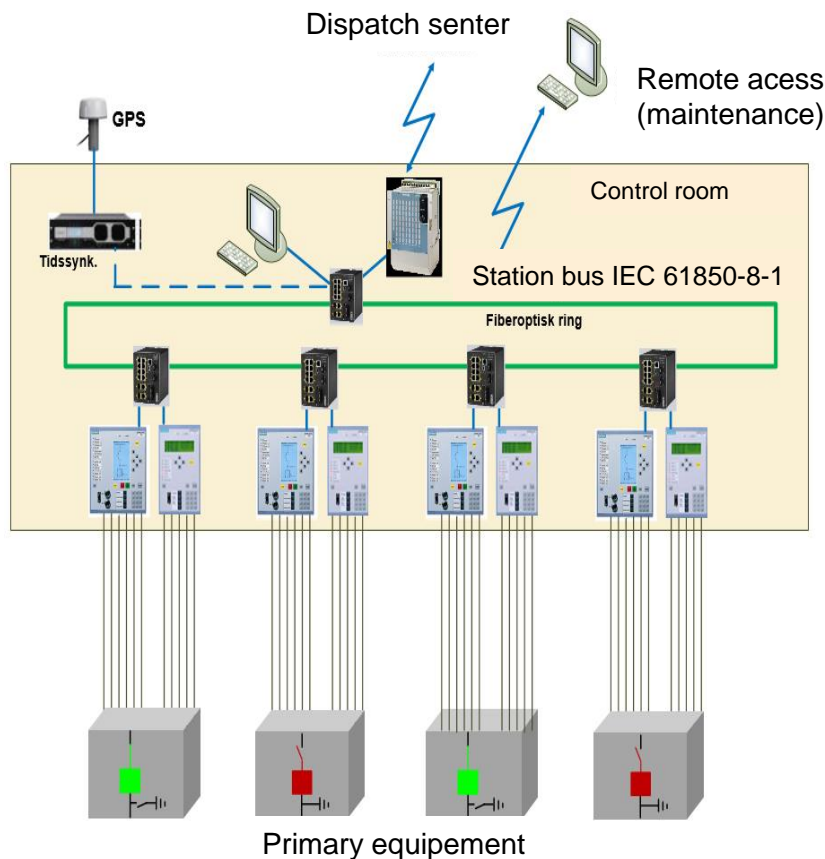
- datacollection

## Safer

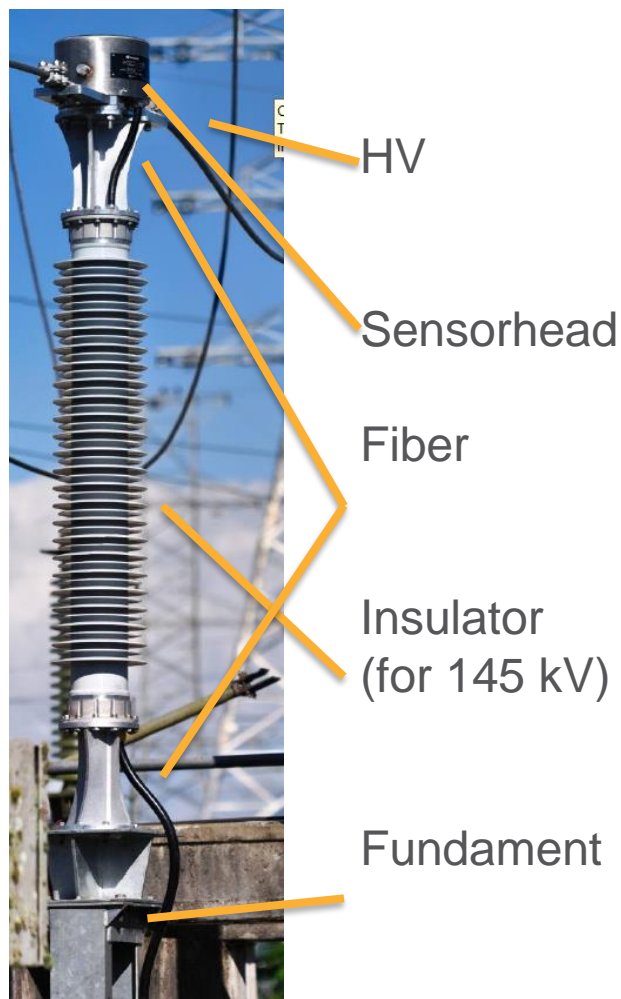
- New architecture



# Today's Control and protection system



# Optical current transformer NCIT CT



SHA;  
No current circuit  
Optical sensors

Lower weight -transport  
No oil

Integration with circuit  
breaker?



# Protection and control units (PCU)

## PCU 1 – Siemens

- Distance protection 1 for 2 bays
- Bay Control Unit 1 for 2 bays
- Fault recorder for 2 bays



## PCU 2 – Sprecher

- Linux based
- Distance protection 2 for 2 bays
- Bay Control Unit 2 for 2 bays
- Fault recorder for 2 bays



## PCU 3 – ABB

- Distance protection 3 for 2 bays
- PMU for one bay
- Fault recorder for 2 bays



## PCU 4 – Sprecher

- Distance protection 4 for 1 bays
- Fault recorder for 1 bays

# R&D -Workshops – Knowledge exchange



# Prosjekt partners

# Statnett



**SIEMENS**

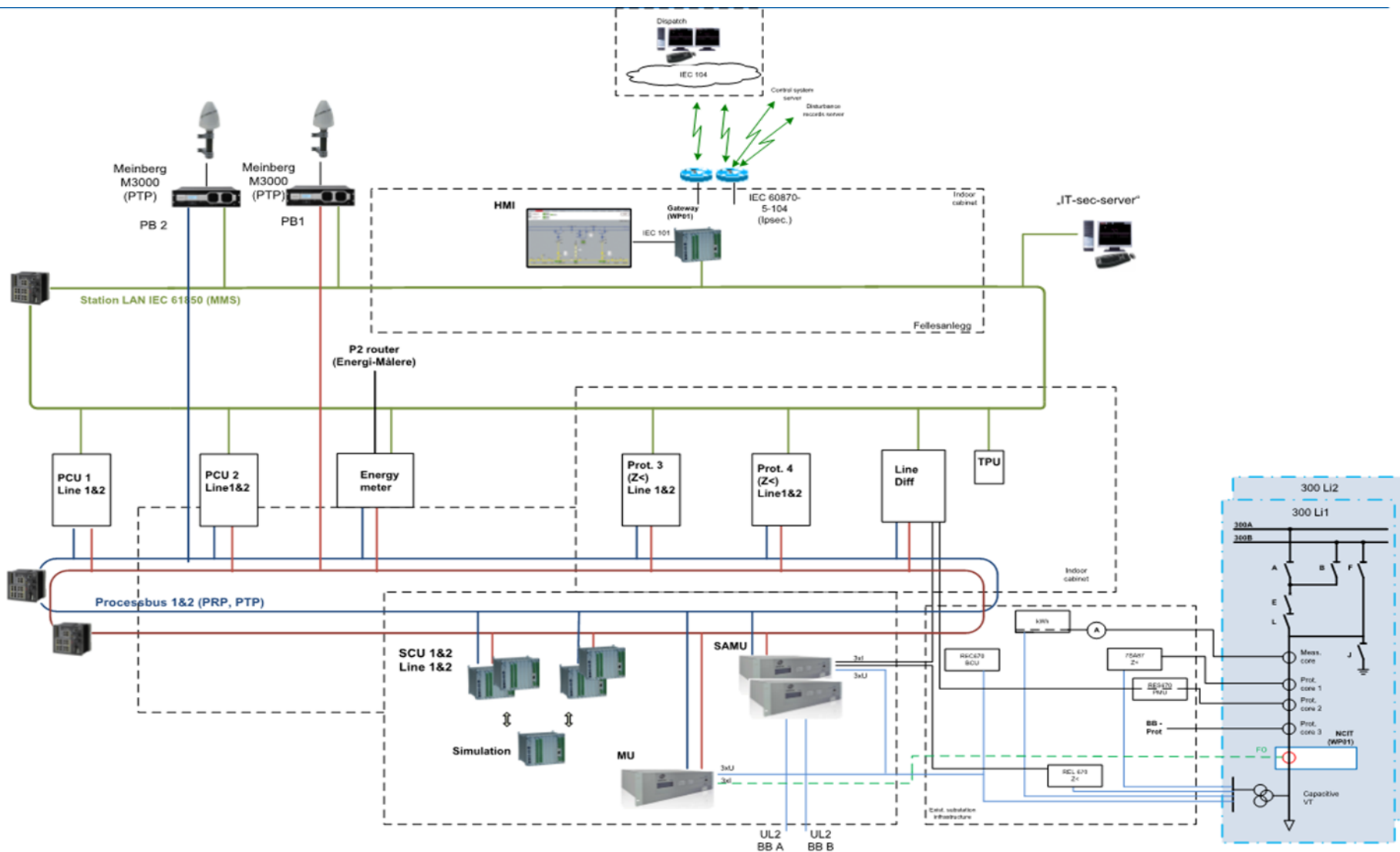


**ABB**



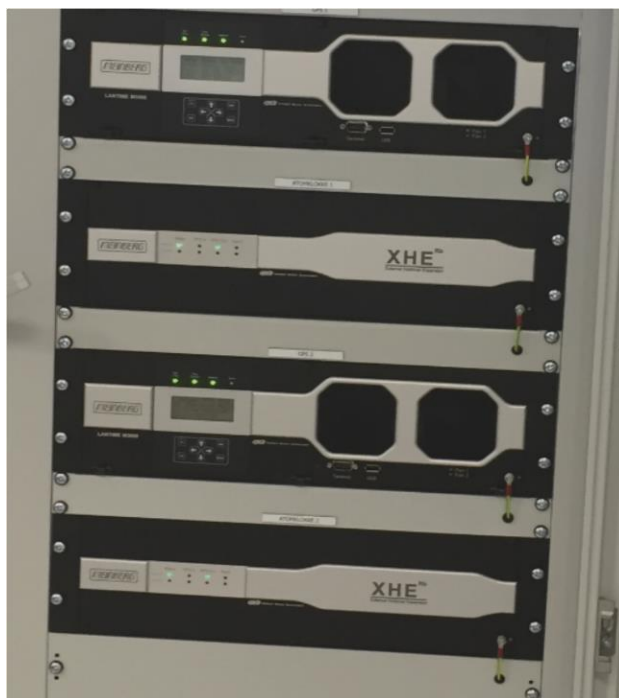


# Implementation of R&D pilot



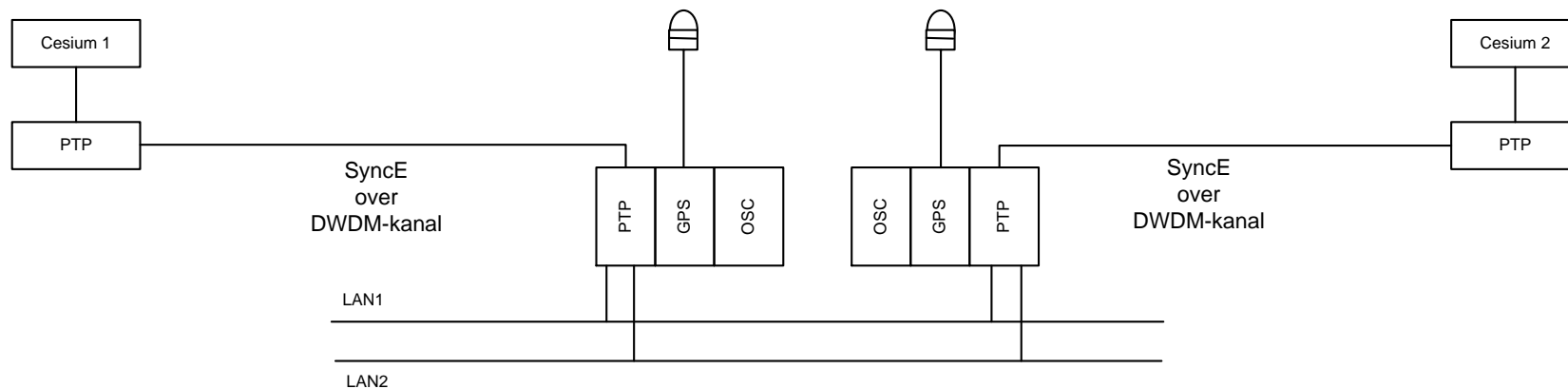
# Time synchronisation – Cosectime project

- Atomic clock with Micro sec
- Two PTP sources from two different Meinberg atomic clock for Prosessbus
- One PTP sources from one Meinberg atomic clock for Stationbus



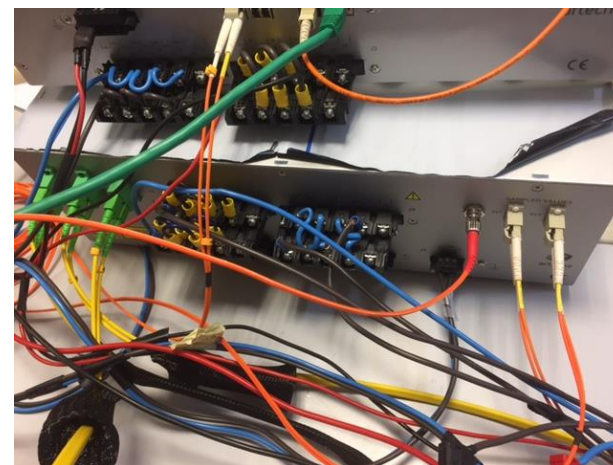
# Time synchronisation via external network

- Standard IEEE1588 PTP-connection (Precision Timing Protocol) from a PTP Master with time from Statnetts cesium clock via Statnetts optical network to R&D Digital Substation pilot Furuset.



# IT issues

- TPU-Tele Protection Unit  
GOOSE between TPU og IED
- Use of VLAN for Stationbus
  - GOOSE
- Use of VLAN for Prosesbus
  - GOOSE, SV
- PRP - RED box
- RBAC –Role Based Acces Control
- Interoperability
- Cooperation



# Testing and network analysis

## DANEO

- analysis of IEC 61850 system
- System verification
- Best Master Clock



# SAT September 2017



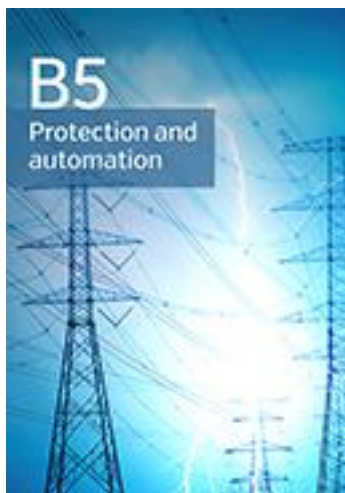
# Bay Cabinet- New design

- EMP protection
- Climatic condition
- Optimal Maintenance
- Cyber security



# Cigre WG B5.53

TECHNICAL BROCHURE 760  
TEST STRATEGY FOR PROTECTION, AUTOMATION  
AND CONTROL (PAC) FUNCTIONS IN A FULLY  
DIGITAL SUBSTATION BASED ON IEC 61850  
APPLICATIONS





# Questions?

