Remote Maintenance Testing of Protection Devices and Schemes – Why We Need It and How We Can Do It?

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Questions

- What are we doing?
- Why are we doing it?
- How are we doing it?

What are we doing?

- Improving the efficiency of testing

Why are we doing it?

- To improve the reliability of the electric power system
- To reduce the duration of outages
- To improve the efficiency of the use of the time of testing crews
- To improve safety

Why do we need remote testing?

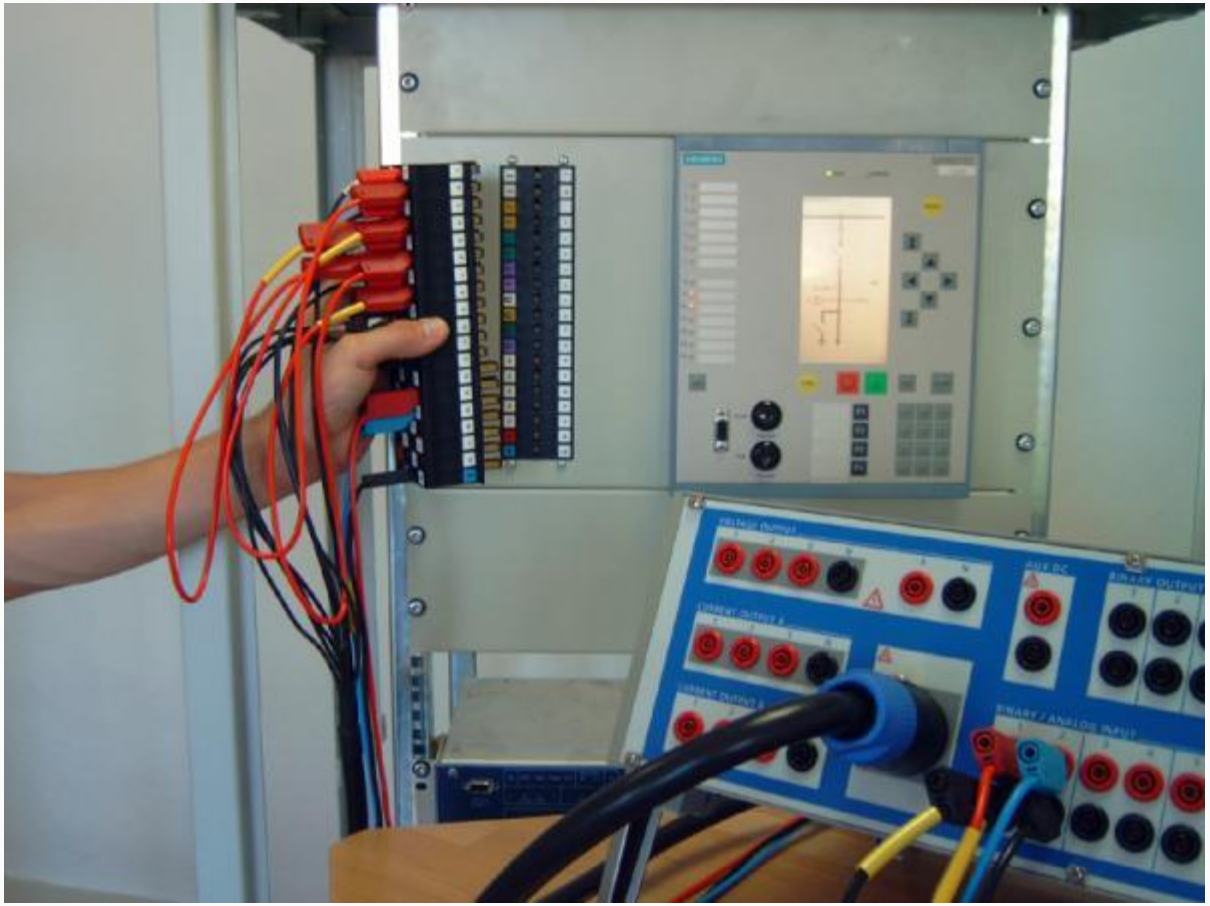
The benefits

- No travel time
- Minimum setup time
- Independent of weather conditions
- Improved PACS availability
- Reduced outage time

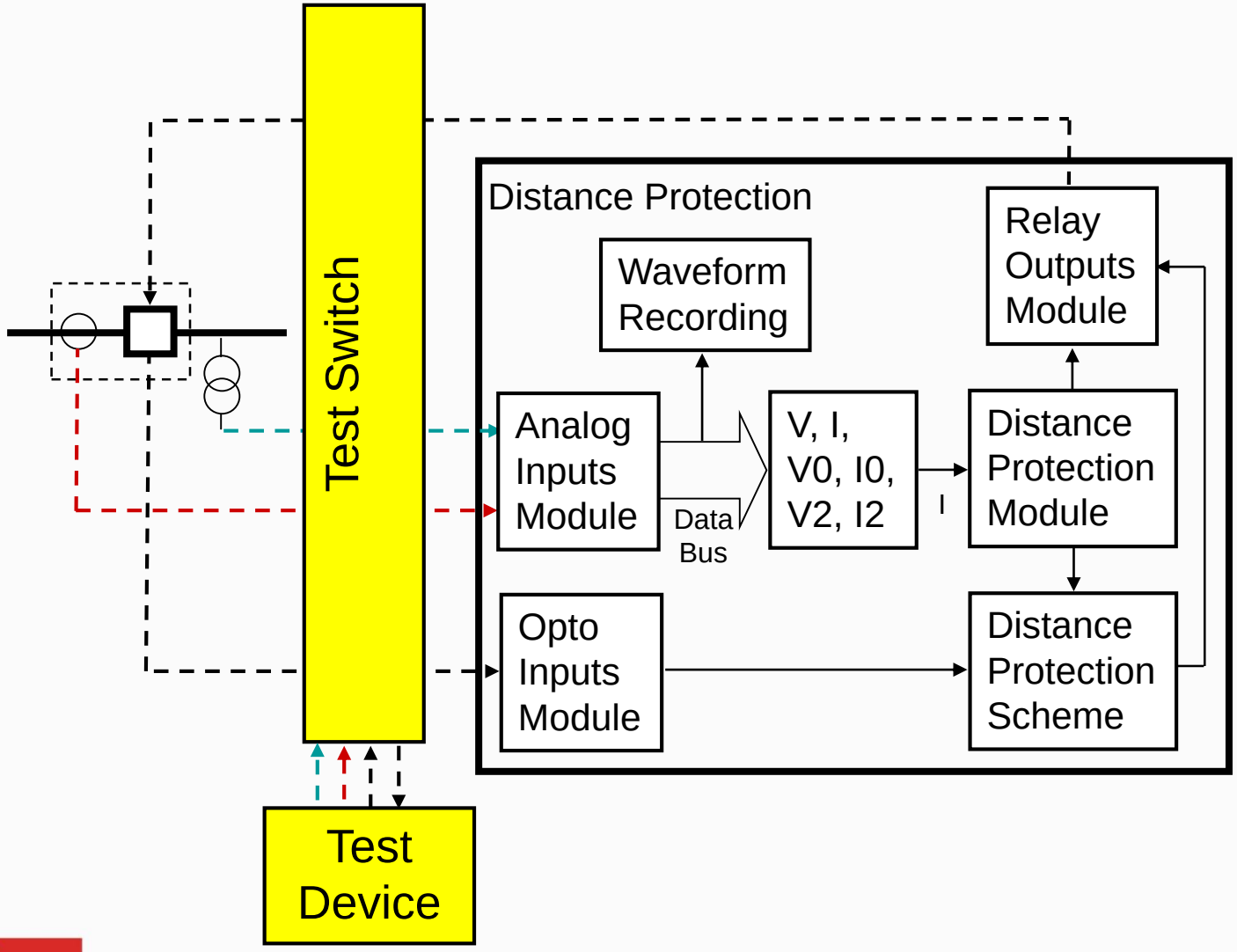
The challenges

- Changes in test philosophy
- Changes in test procedures
- Test object and test system isolation
- Test equipment availability in the substation
- Remote access capability
- Cyber security

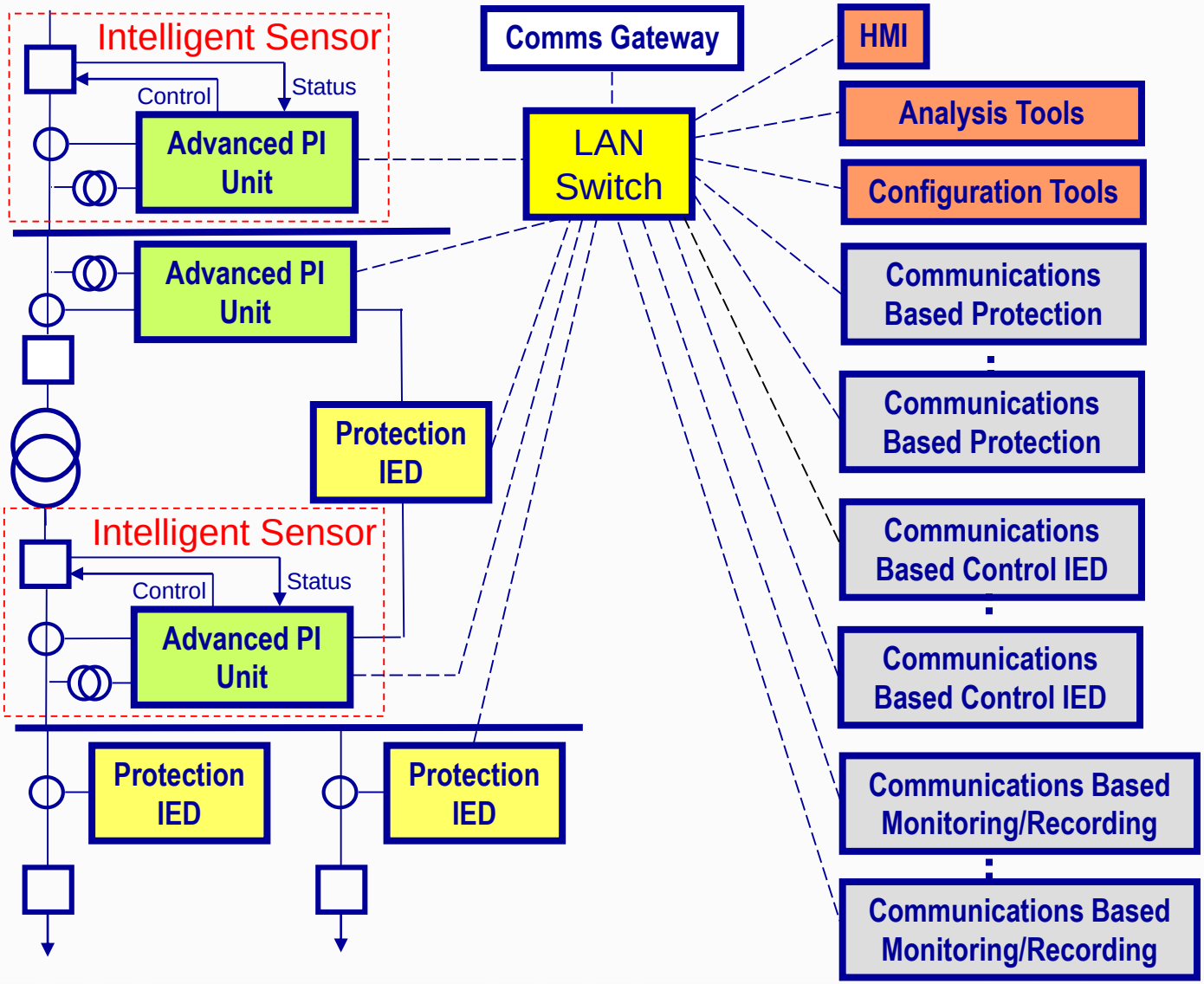
Conventional Isolation



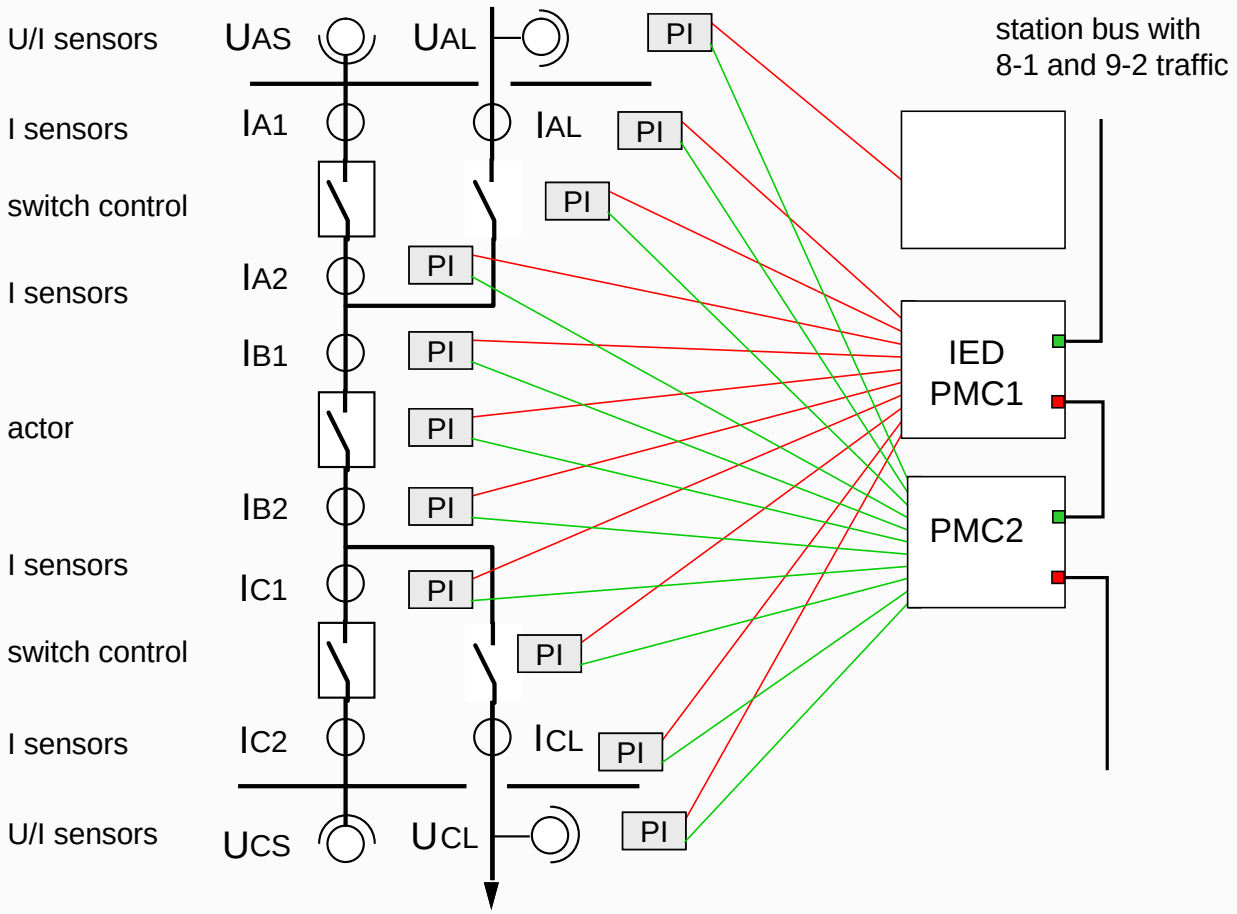
Distance Protection Testing



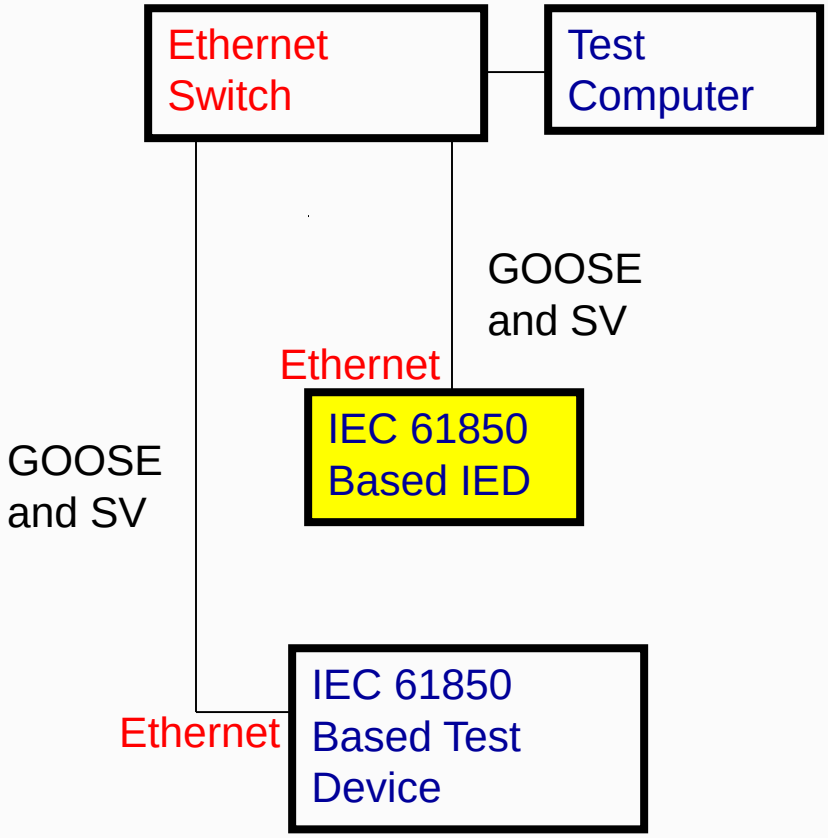
Digital substation



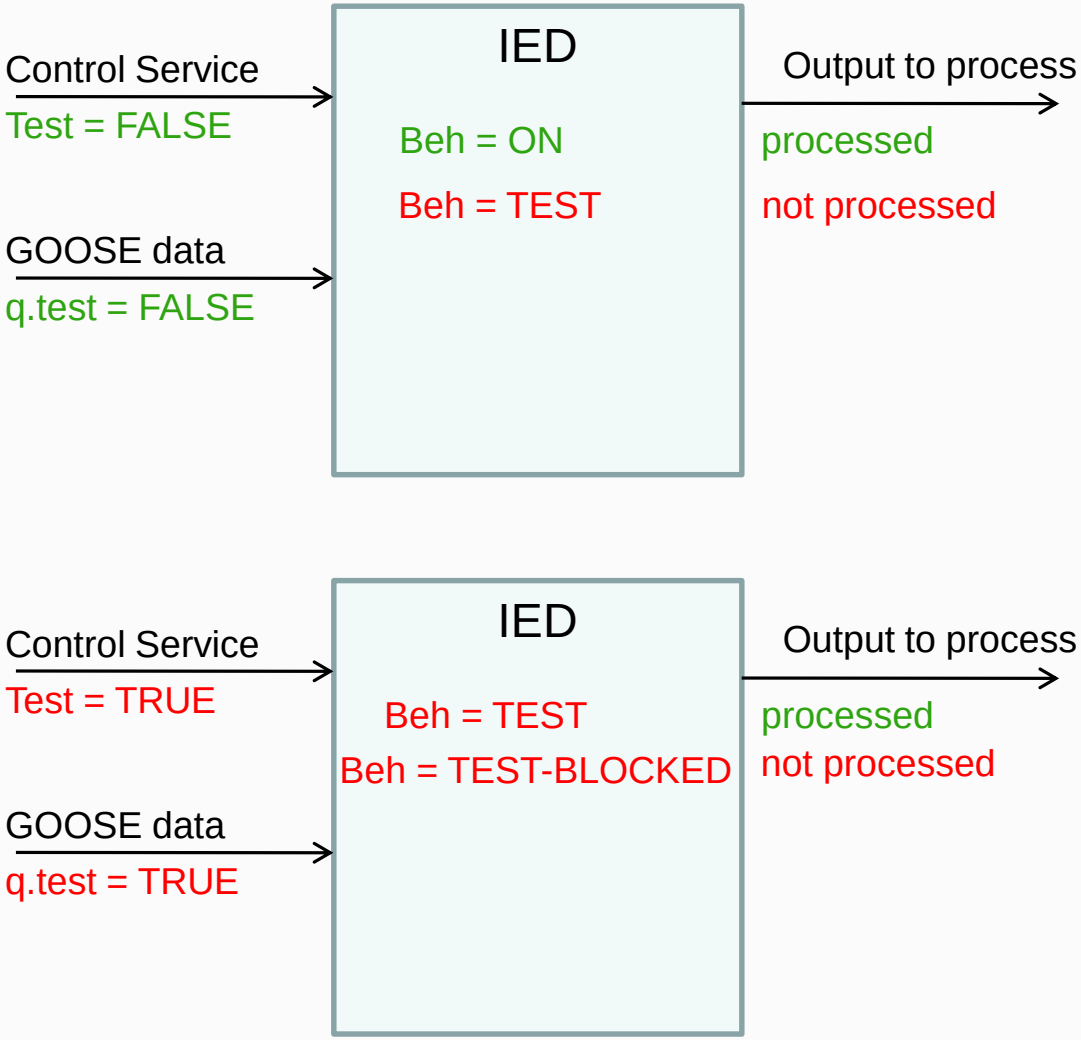
Process Bus interface



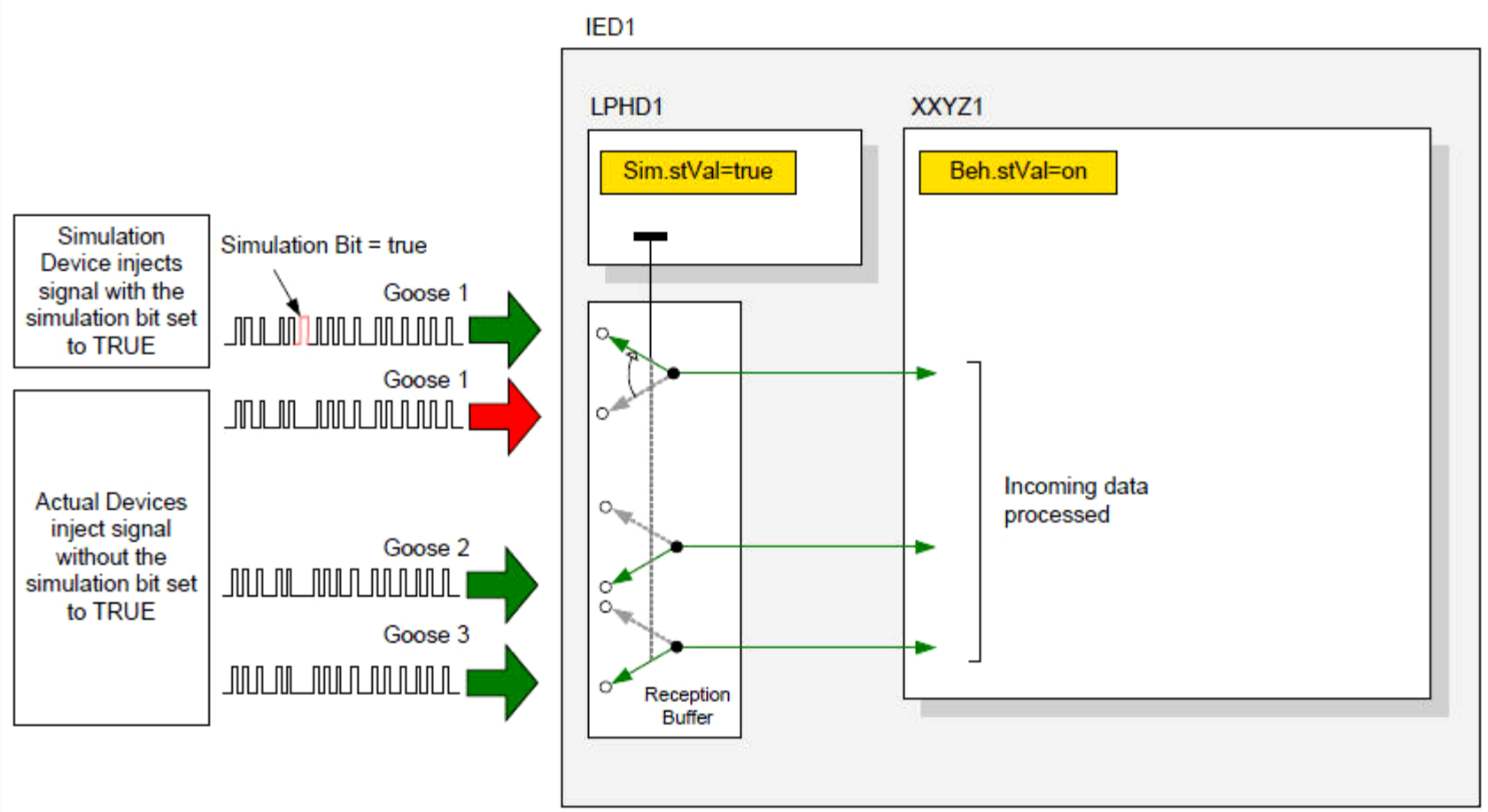
Test setup


Ethernet Switch
Test Computer
GOOSE and SV
Ethernet
IEC 61850 Based IED
GOOSE and SV
Ethernet
IEC 61850 Based Test Device

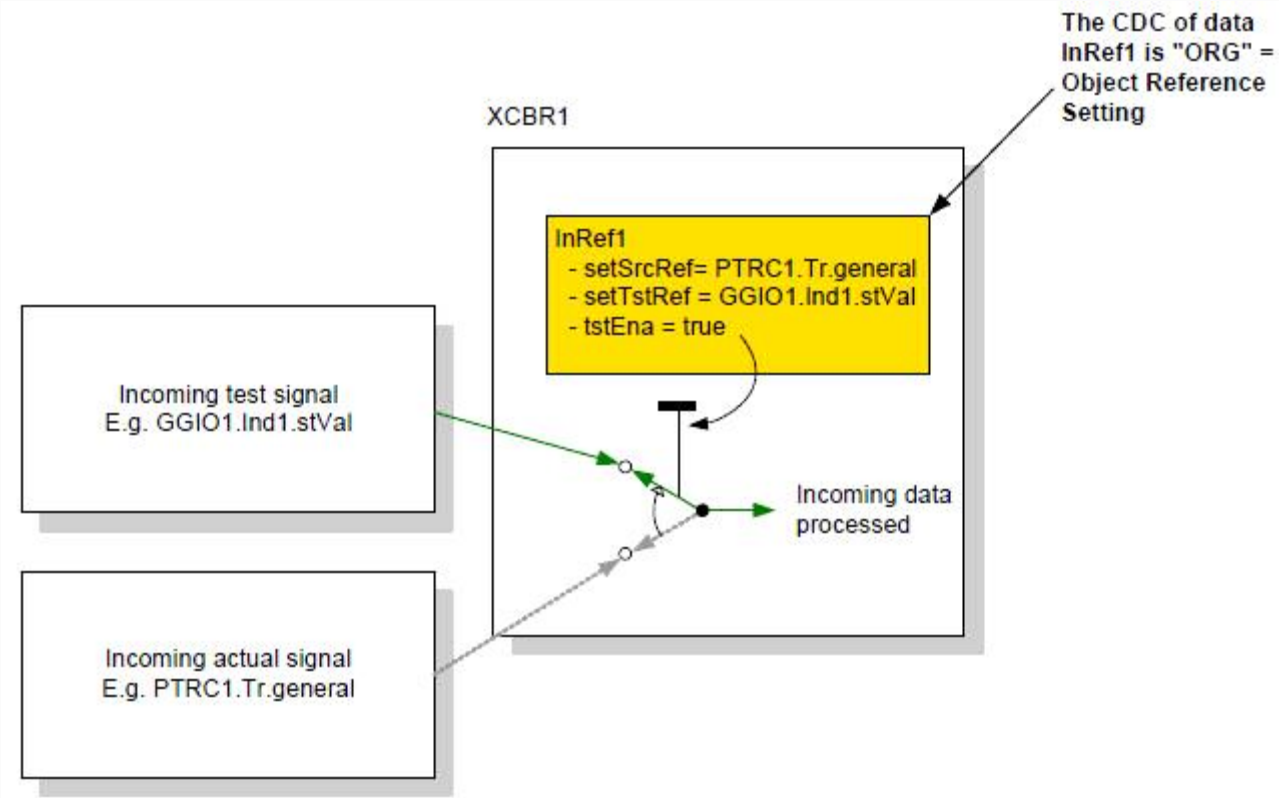
Separating Test and Normal information



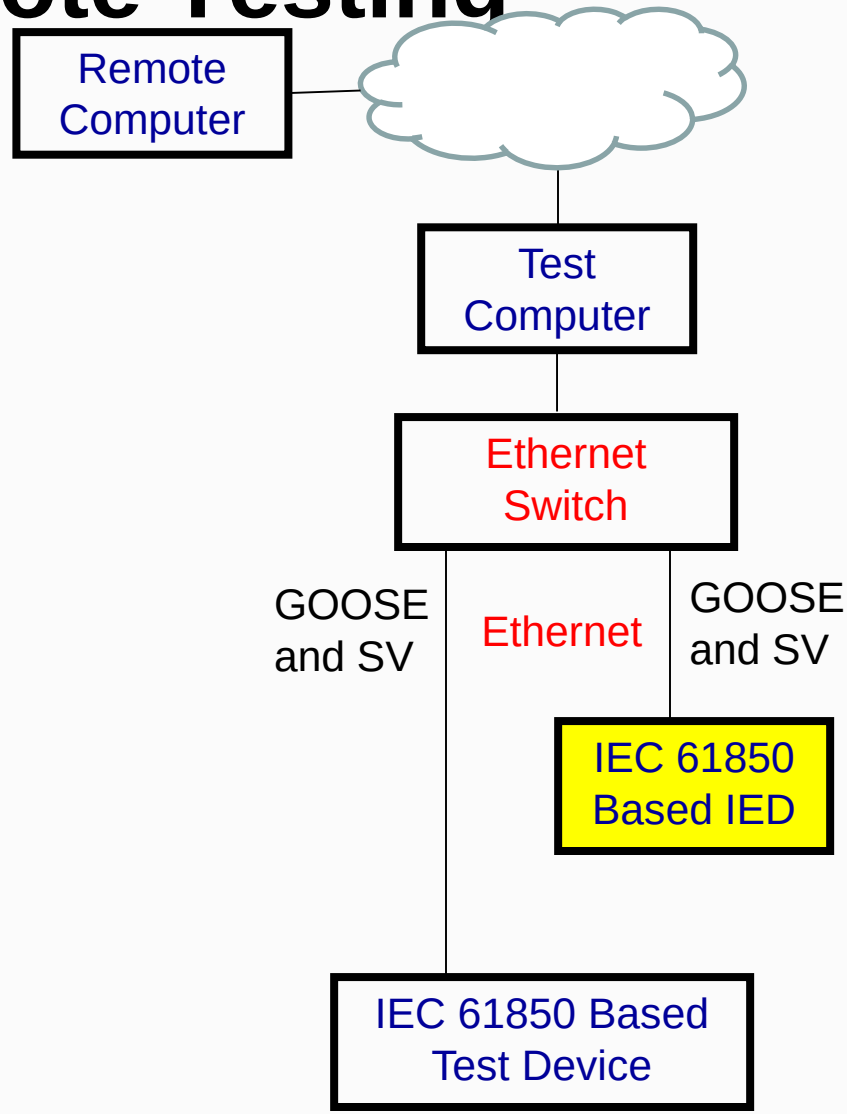
Simulation Bit



Input Reference



Remote Testing



Ed. 2 Mirroring Control Info

Conditions:

A. Command is sent to Data Object

B. Response is to set the Data Attribute “**opRcvd**”

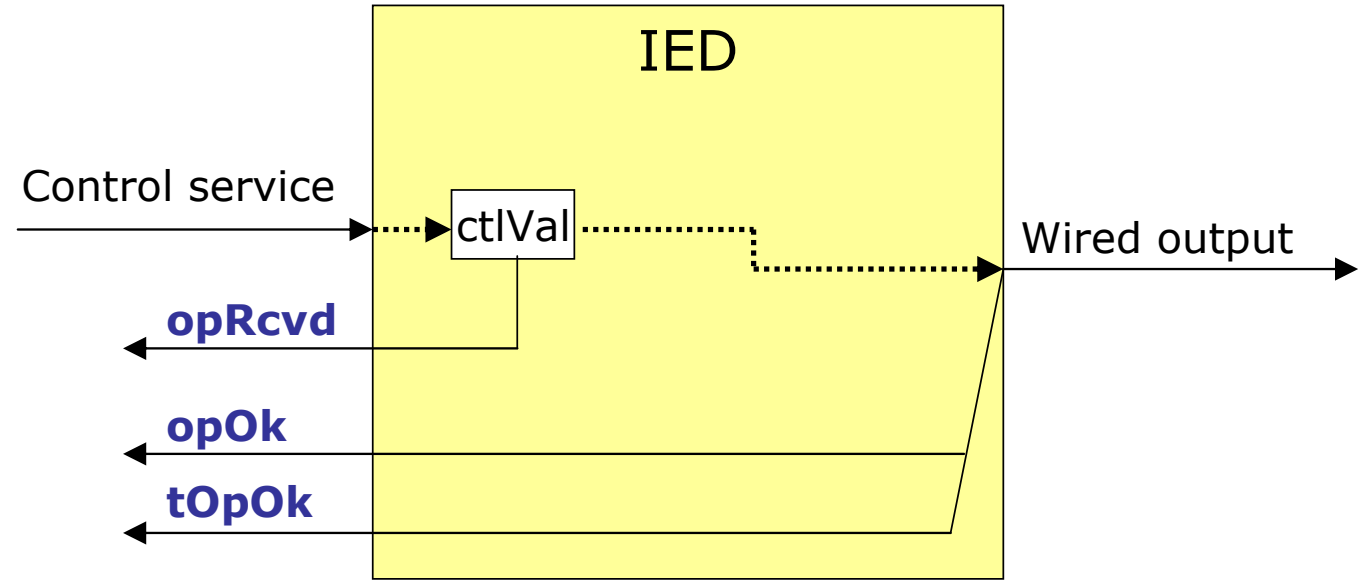
C. “**opOk**” is set with same timing as wired output

D. “**tOpOk**” has same time stamp as wired output and “**opOk**”.

E. The attributes are produced independent of the wired output

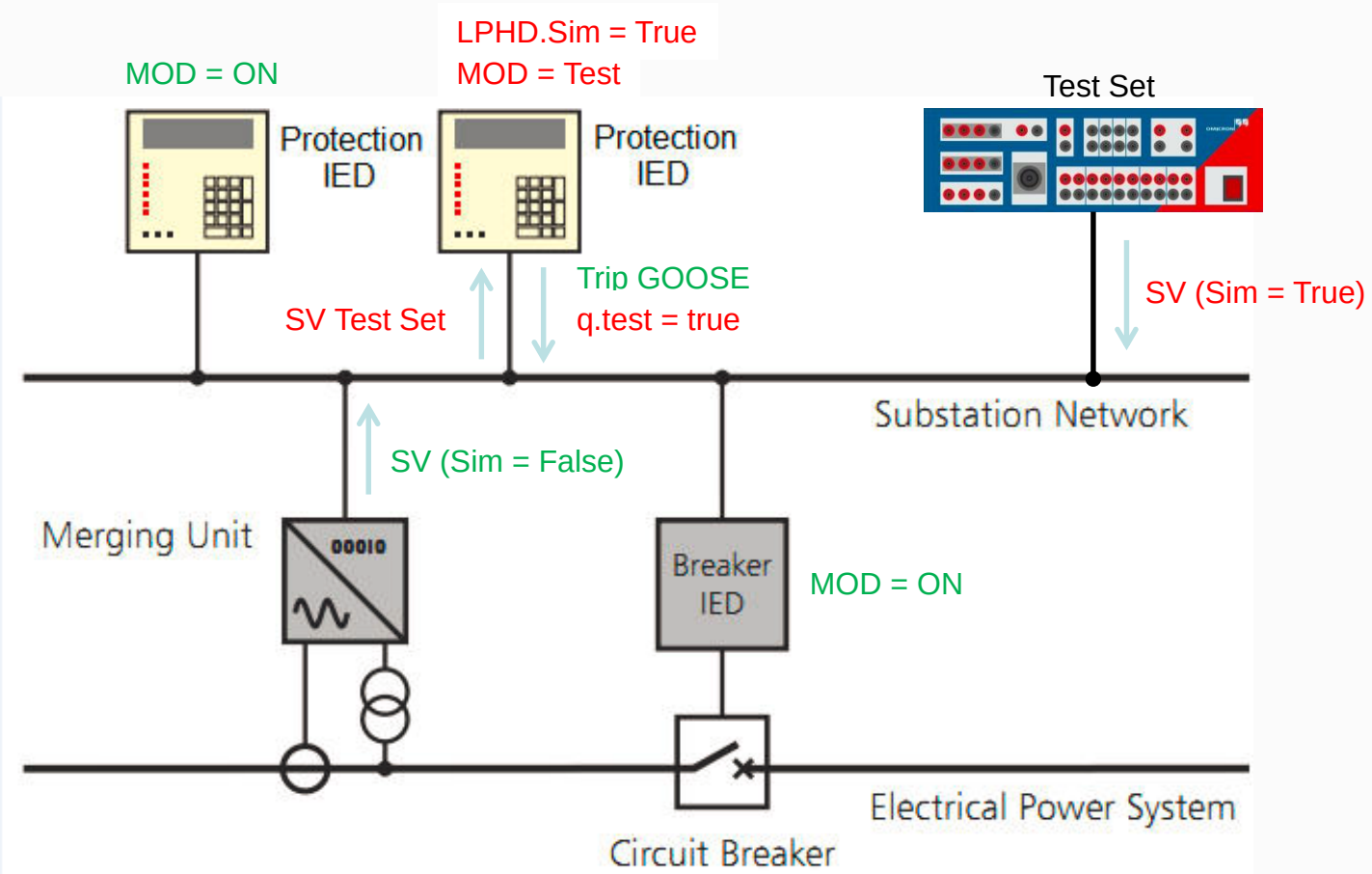
F. Wired Output is Not produced if **MOD**=TEST-BLOCKED.

Ed. 2 Mirroring Control Info



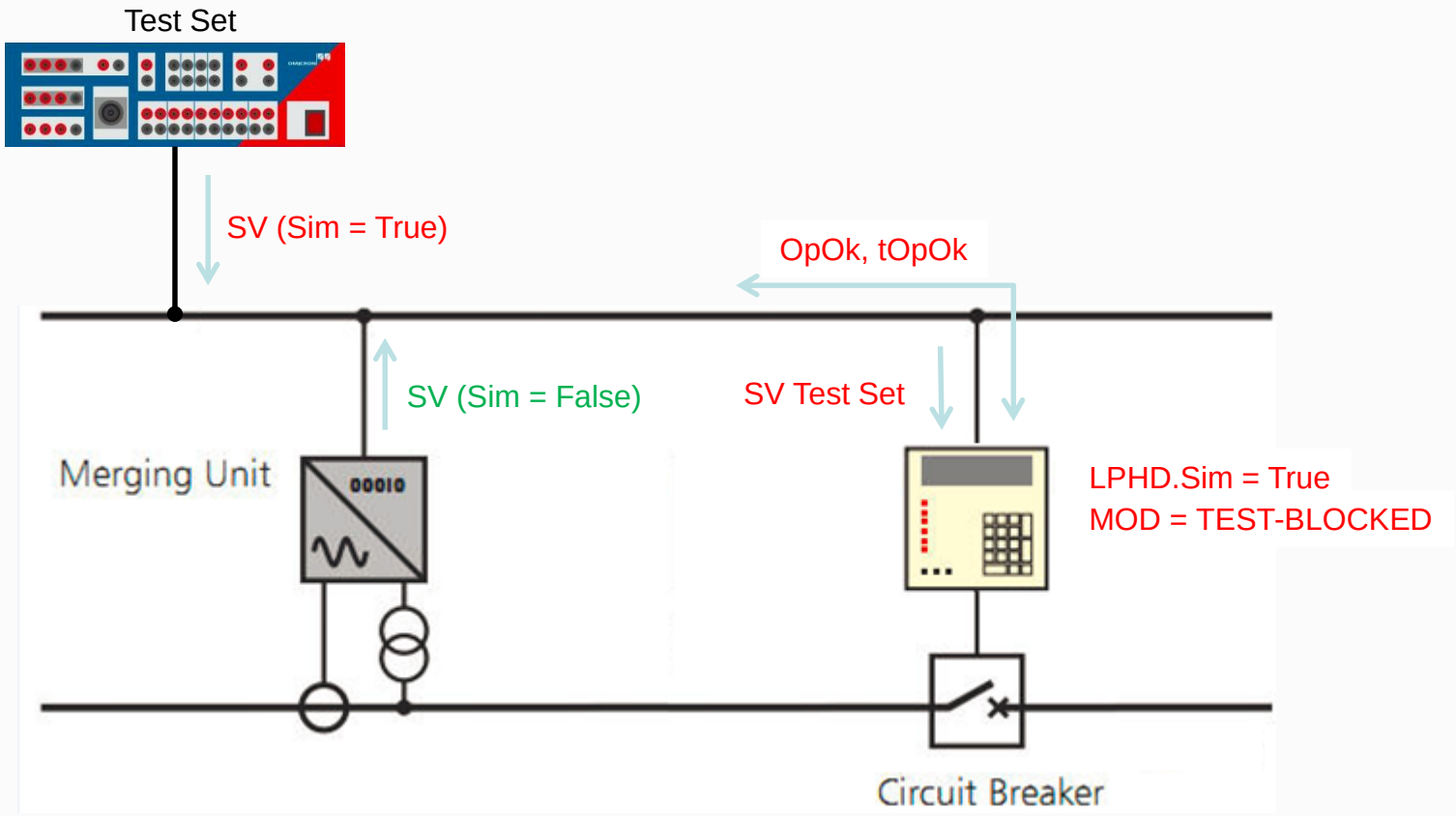
Complete Test Isolation

- Simulation Flag and Test Mode



Complete Test Isolation

- Simulation Flag, Test Mode & Mirroring Control



Conclusions

- Just do it!