The ABB - SIEMENS IEC 61850 interoperability projects

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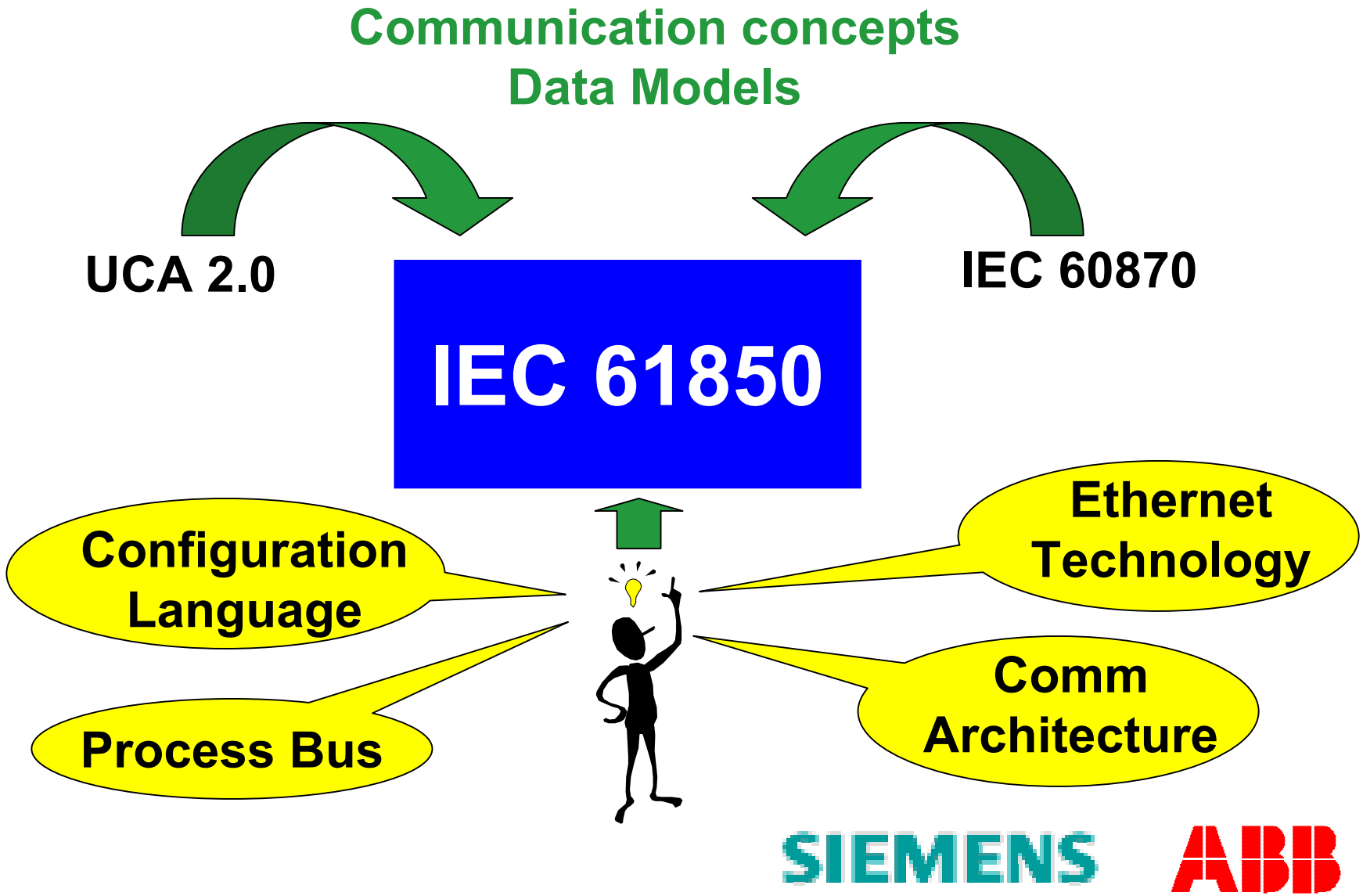
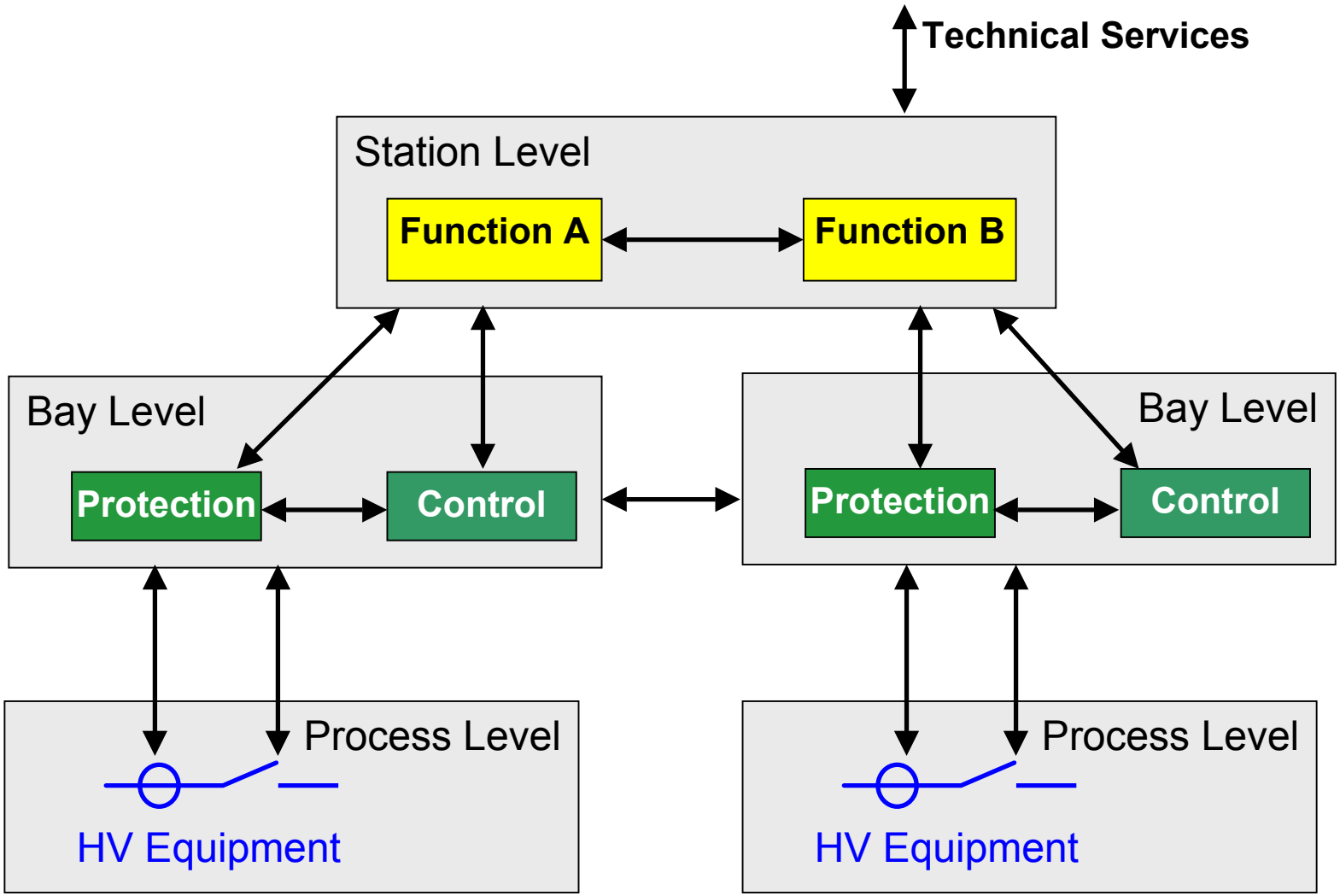
ABB

IEC 61850 - proven technology and innovation



IEC 61850 - system architecture



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Prototyping activities - Overview

- OCIS, 1998 - 2000: Communication between Station and Bay Level
- GOOSE demo, 2001: Transmission of trip - signals over serial communication
- IEC 61850-9-1 interoperability, 2001 - 2002: Communication between CT/VT's and protection relays

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The OCIS - Project

Project goals

- Assist the standardization process to reach one world-wide standard IEC 61850
- Assist the harmonization process between IEC 61850 and UCA.2
- Test and compare original IEC 61850 and UCA.2 drafts with respect to feasibility, applicability and efficiency
- Test the independence of IEC 61850 from the communication stack (Verify the basic communication architecture)

Project duration

- The project started in 1998 and terminated with a conference in 2000

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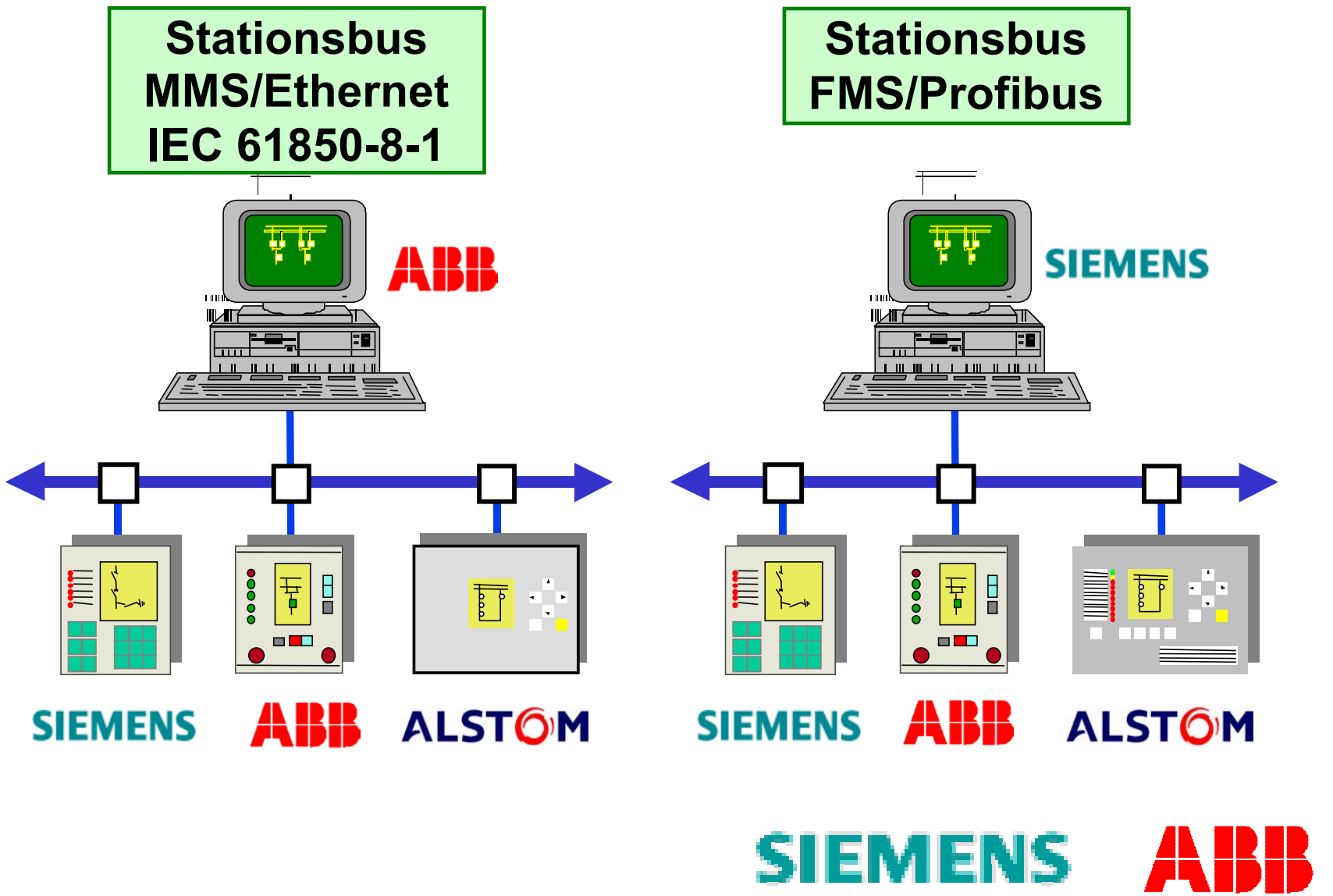
Test setup



Summary of results

- The **communication concepts** as defined in IEC 61850 drafts fulfill the requirements of substation communication
- The **object model** of UCA needs extensions to be applicable by the European market
- **Ethernet** is suitable as station bus
- IEC 61850 based applications are independent from the communication stack and therefore **future proof**
- IEC 61850 provides **interoperability** between devices from multiple vendors

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The GOOSE Demo

GOOSE:

Generic **O**bject **O**riented **S**ystem **E**vent

Project goals

- Verify the concepts of the IEC enhanced GOOSE
- Verify the basic concepts of the substation configuration language
- Demonstrate interoperability and configurability between multiple vendors

Project duration

- Project start January 2001
- Demonstration at Utility Initiative Meeting in Vancouver, May 24, 2001

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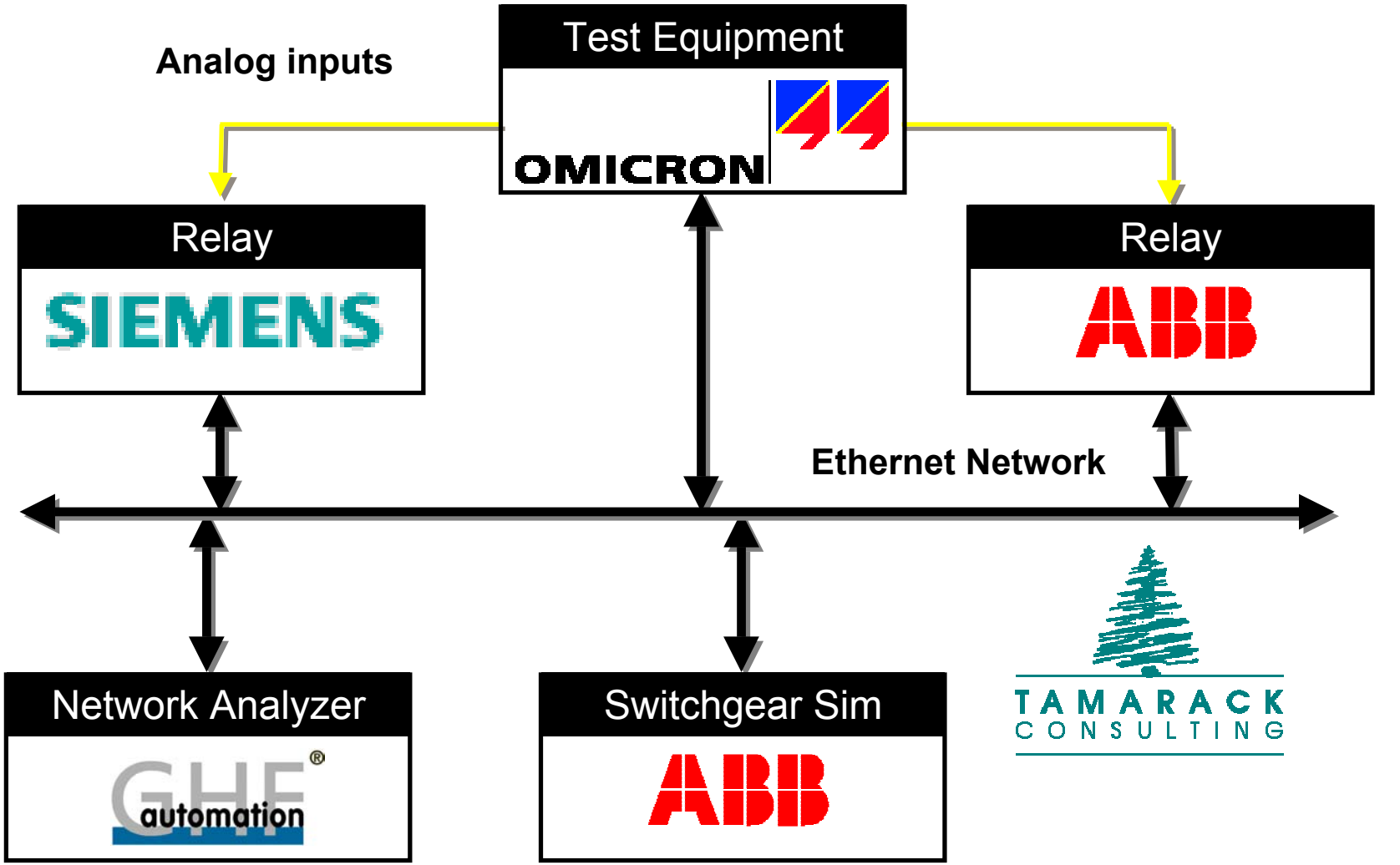
Basic Demo setup



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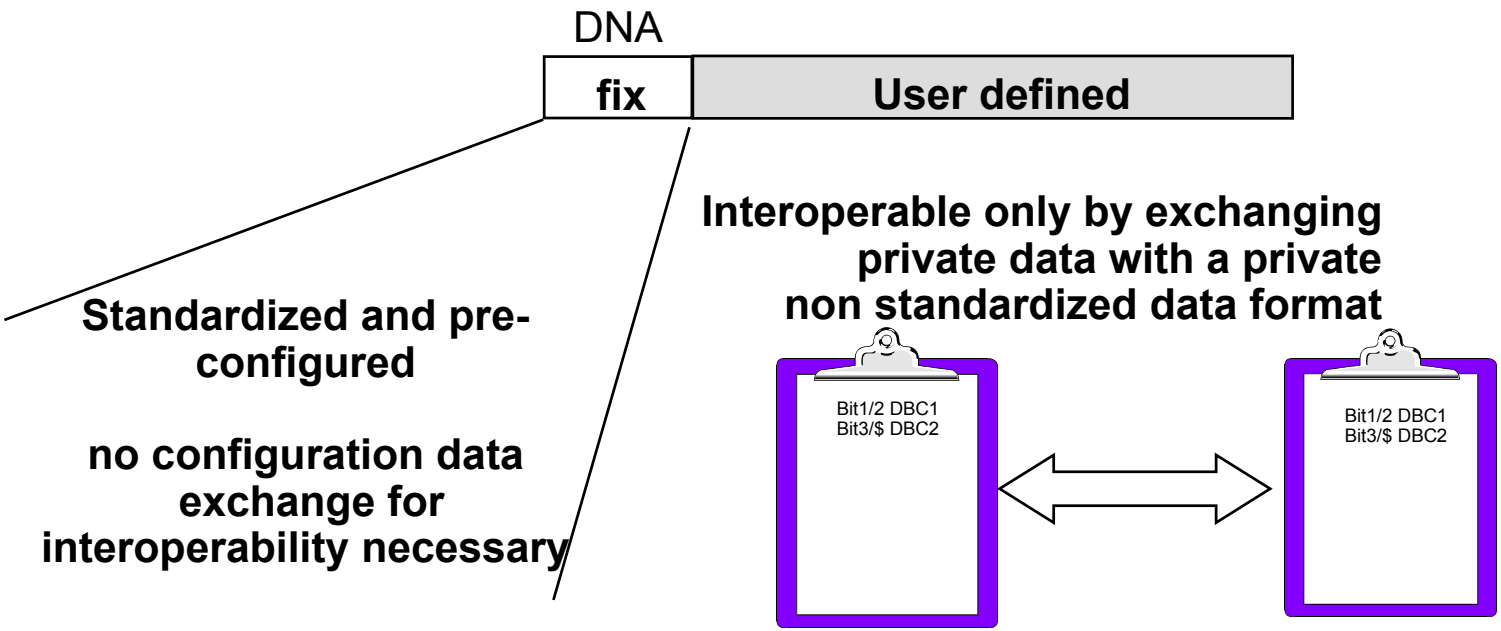
GOOSE - concepts: the UCA approach

- GOOSE: Generic Object Oriented Substation Event
- The message content in UCA - GOOSE is fixed and predefined



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GOOSE - concepts: IEC approach

- IEC - GOOSE added flexibility
- The message content is defined with a configurable dataset
- The configuration may be done either online (using MMS services) or offline (using XML)

```
<LN0 LNType="LLN0">
        <DataSet Ref="GOOSE_2" ConfRev="1">
                <DOName LNRef="1" LNClass="RREC" DORef="Oper" Attr="general" />
                <DOName LNRef="1" LNClass="RREC" DORef="Mode" Attr="stVal" />
        </DataSet>
        <GOOSEControl Ref="GOOSE_ABB_US_2" DataSetRef="GOOSE_2"
                MACAddress="0xBF FF FF E7 00 01" />
```


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Demo case 1 and 2: protection scenario

- The Omicron equipment simulates the power line
- One of the two relays simulates a protection relay, the other simulates the reclosing device
- The switchgear simulation simulates the circuit breaker

Content of GOOSE messages:

Switchgear
XCBR0.Pos.stVal XCBR0.Mode.stVal XSWI1.Pos.stVal XSWI1.Mode.stVal XSWI8.Pos.stVal XSWI8.Mode.stVal

Protection
PSCH.Oper.general PSCH.Mode.stVal

Autorecloser
RREC.Oper.general RREC.Mode.stVal

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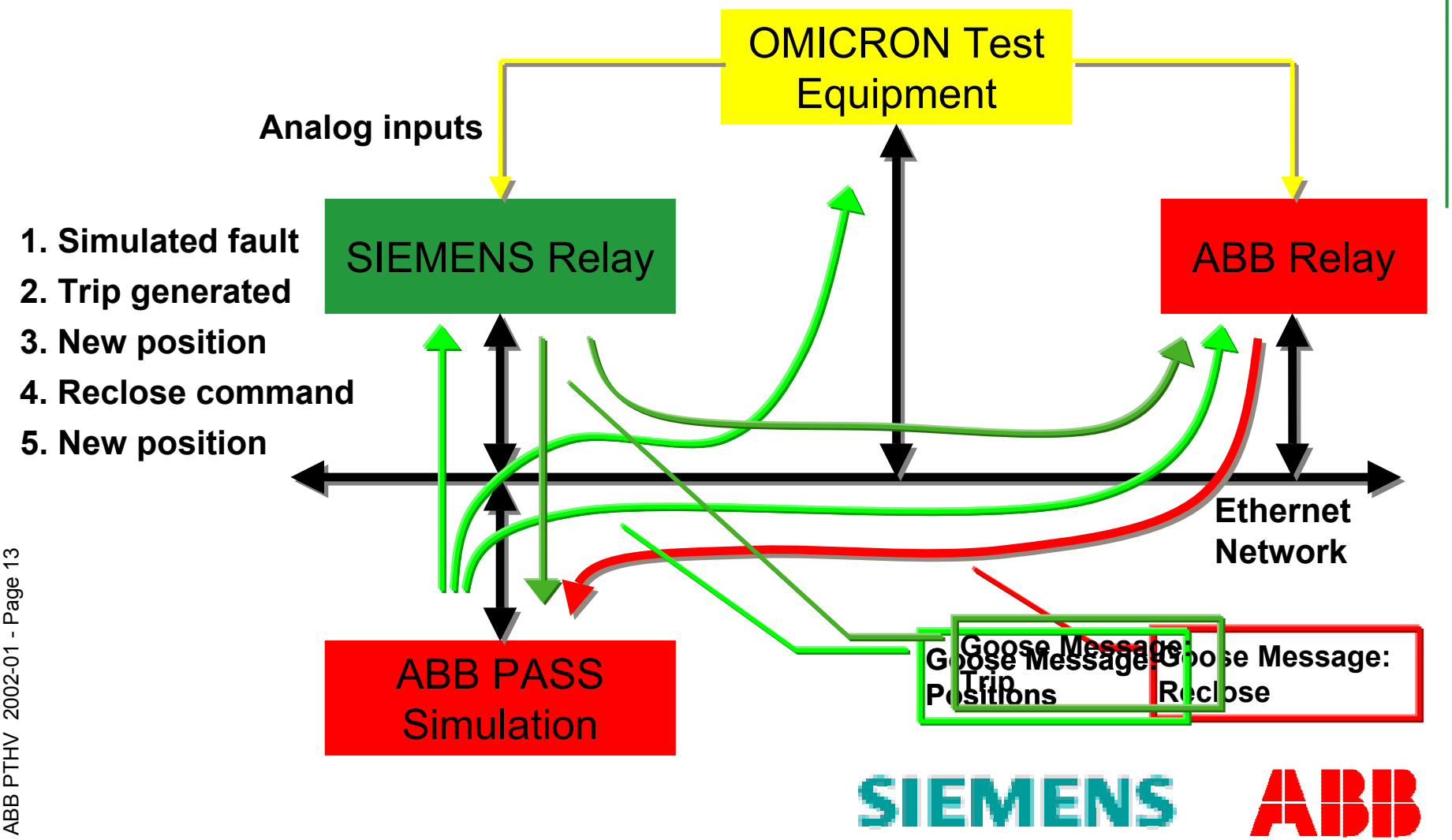
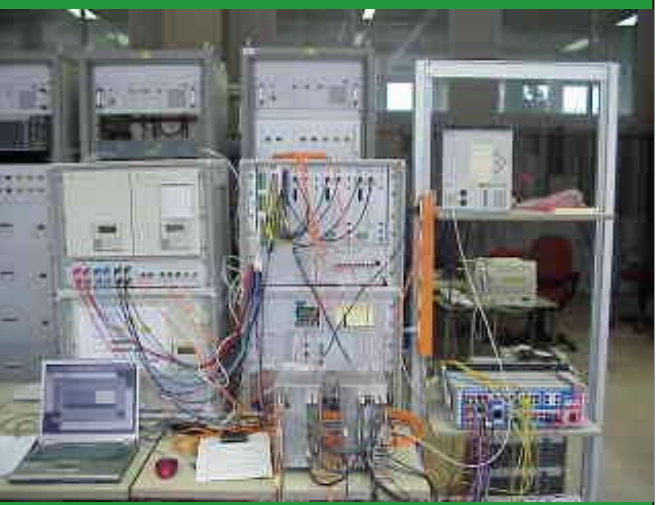
Case 1: Trip and auto-reclosing



IEC 61850-9-1 interoperability



Project goals

- demonstrate the **interoperability** between non conventional sensors, protection relays and revenue meters **achieved with IEC 61850-9-1**
- develop **first prototypes of devices** supporting IEC 61850-9-1

Project duration

- Cooperation of ABB and SIEMENS to support IEC 61850-9-1 announced at CIGRE 2000 meeting
- Interoperability between ABB and SIEMENS verified end of October 2001
- Interoperability tests at KEMA November 19 - 23, 2001 ongoing

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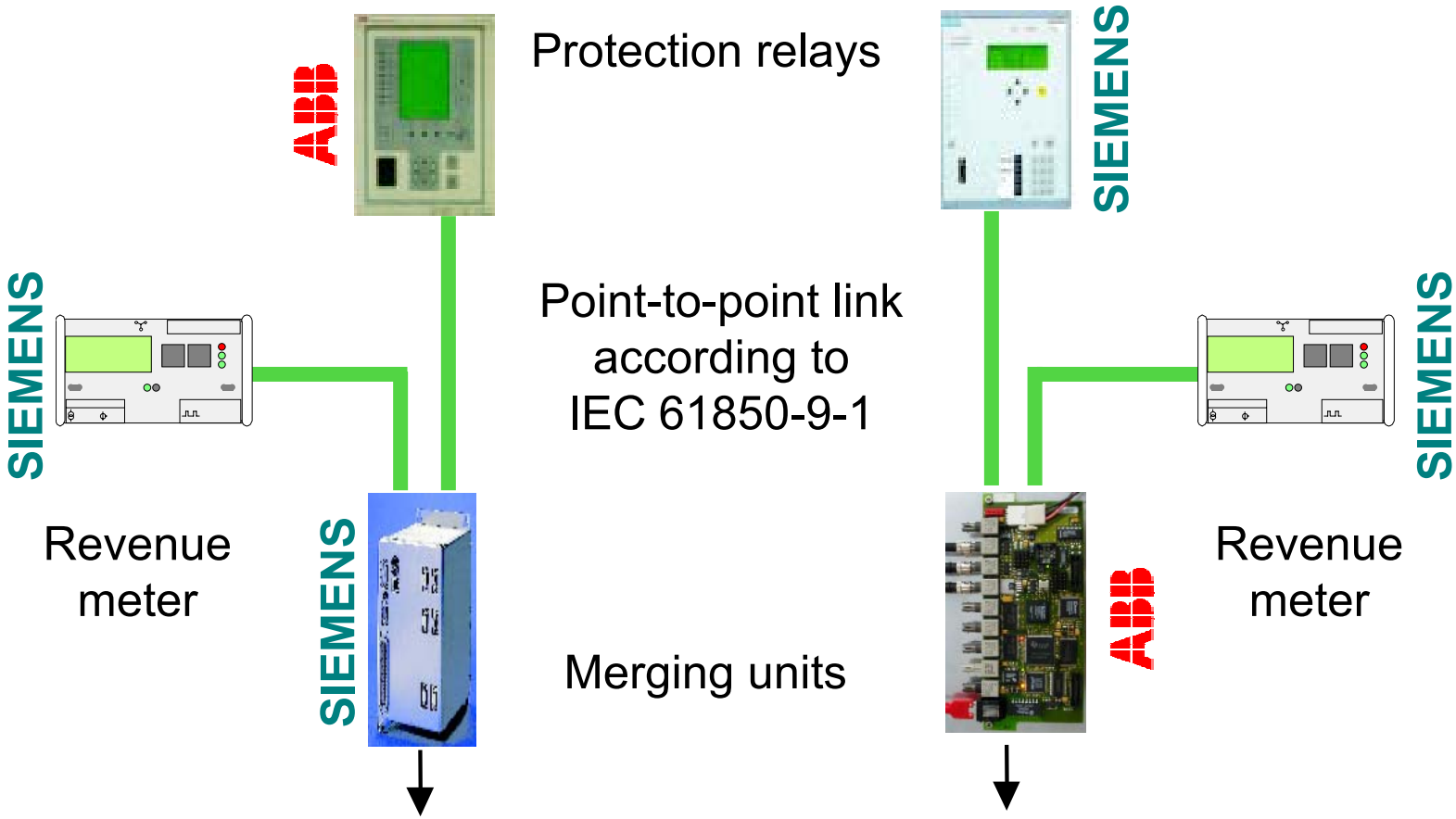
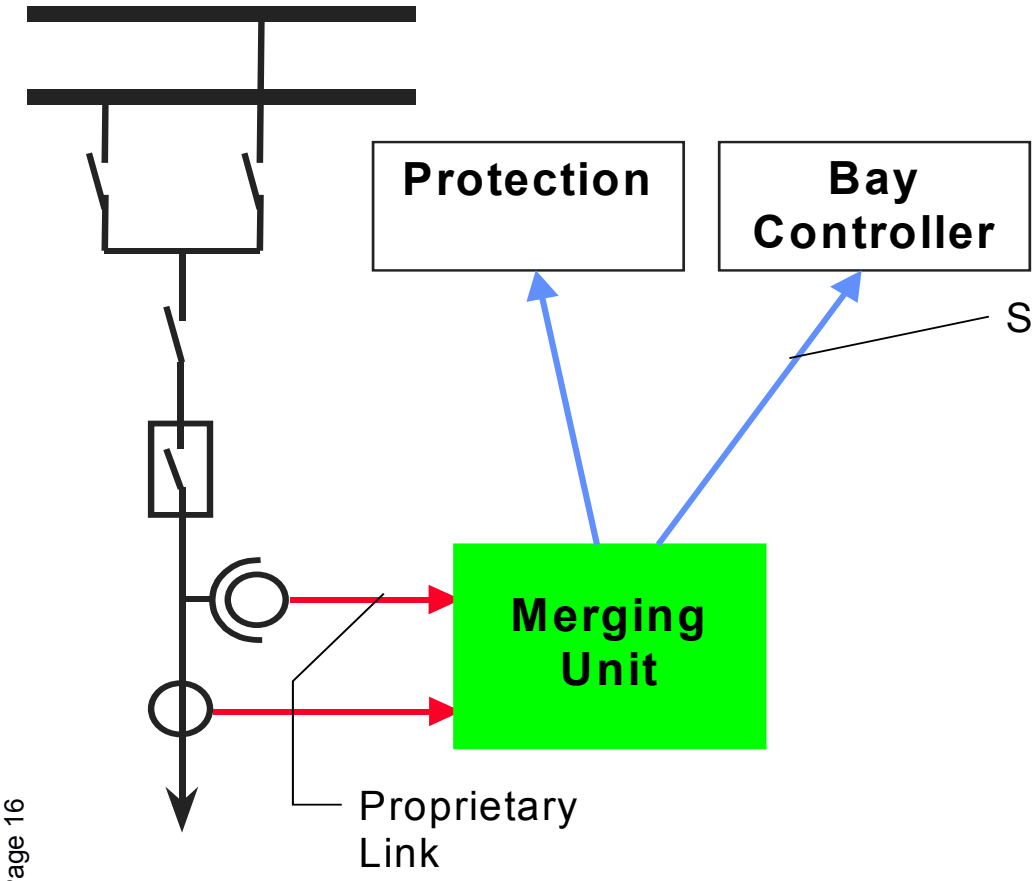
Basic test setup



The concept of the 61850-9-1 link



- The message content is defined with a configurable dataset
- The configuration may be done either online (using MMS services) or offline (using XML)

DatSetRef	**List of Values**	Counter

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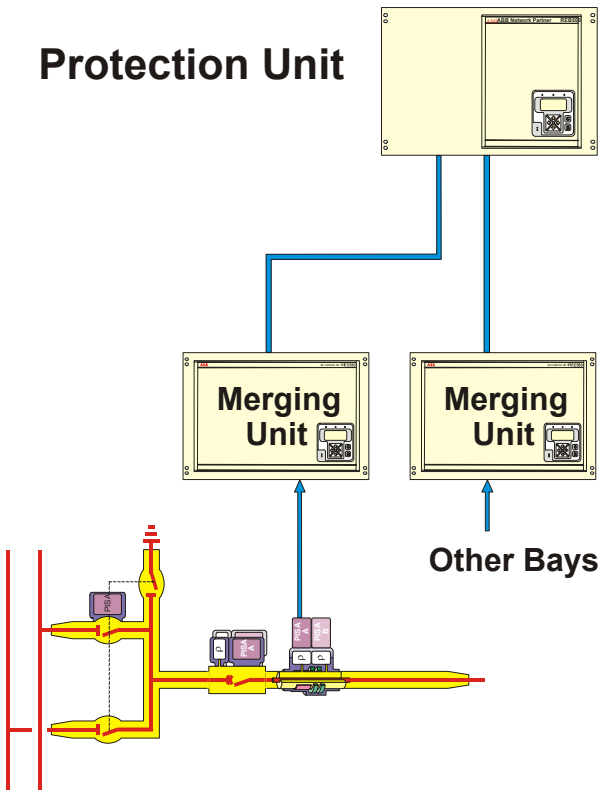
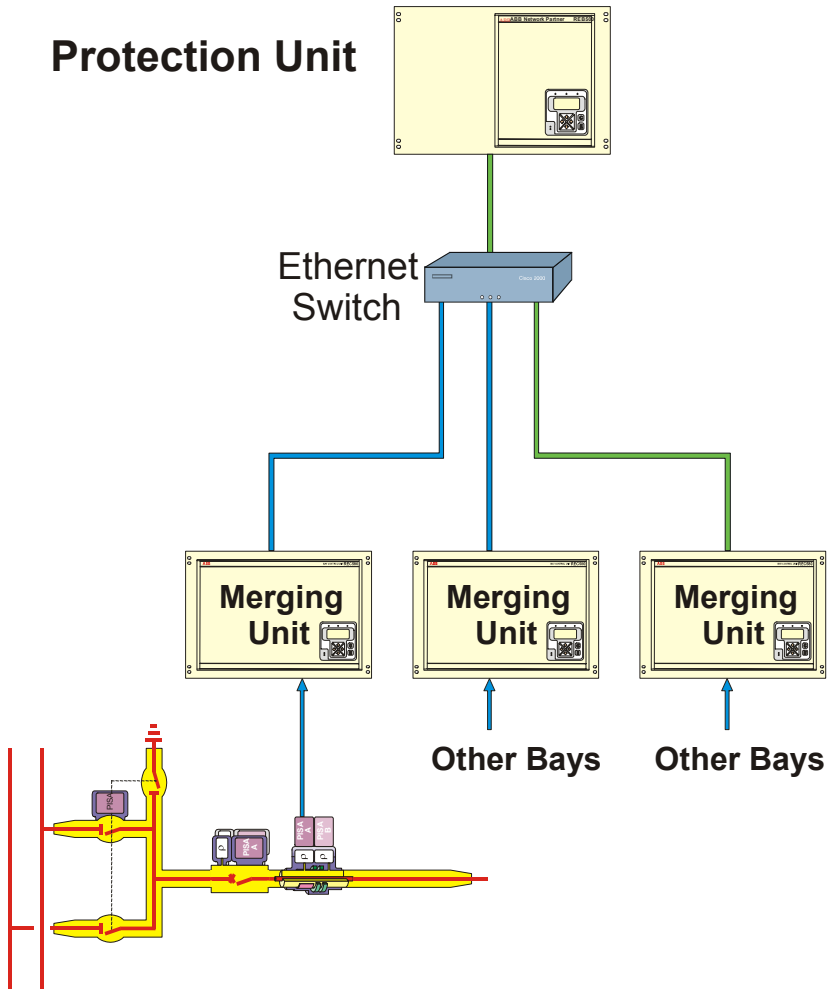
From point-to-point link to process bus





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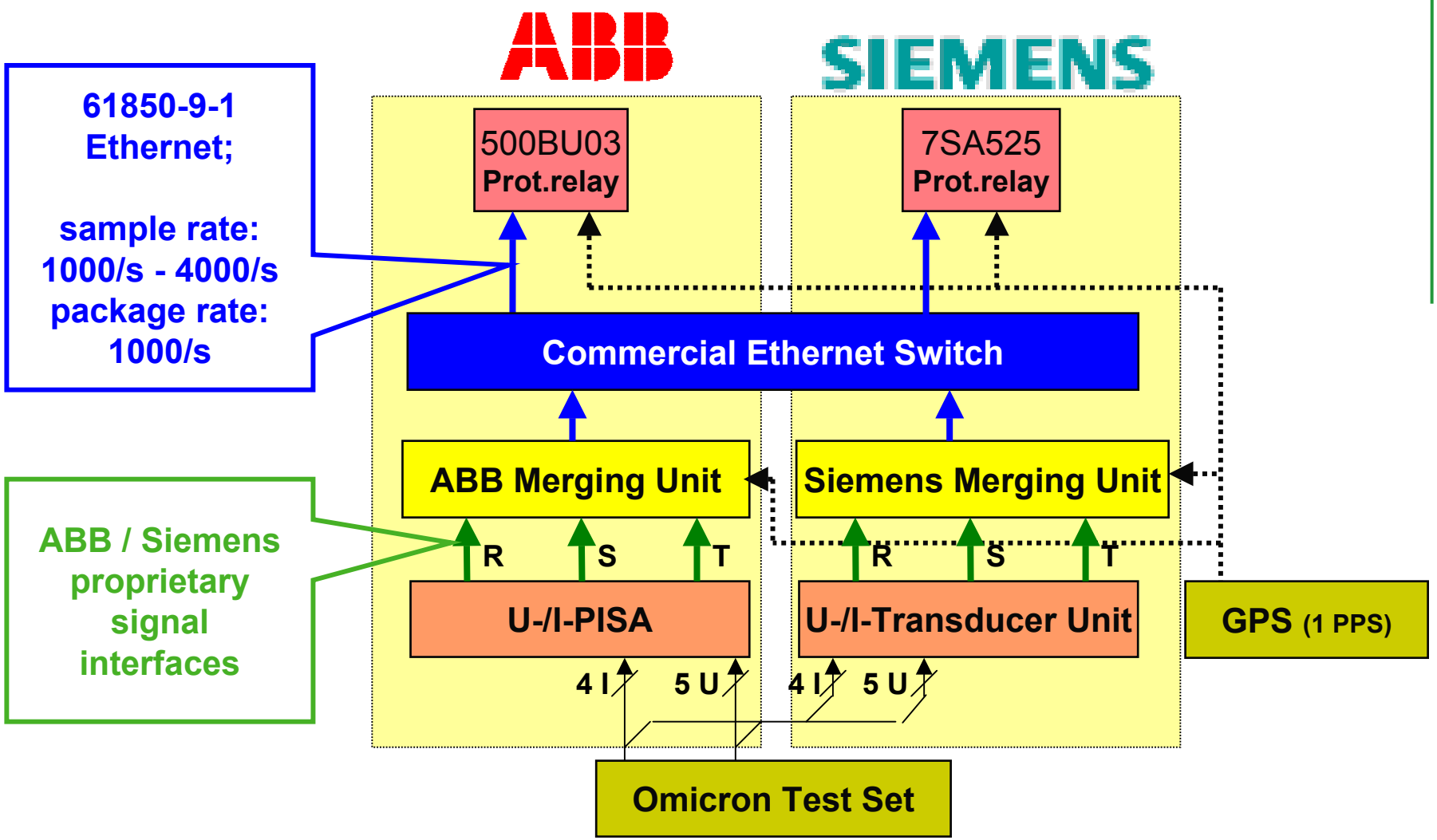
Detailed test setup



Summary and outlook

- The **concepts** of IEC 61850 have been verified
- The point - to - point link connecting non conventional instrumental transformers according to **IEC 61850-9-1** is ready to be used and **will be supported in future by ABB and SIEMENS**
- Communication links supporting IEC 61850-9-1 may be connected with an Ethernet switch implementing a **first step of a process bus** solution.

➔ *The verification of the real time behavior of a process bus approach will be the focus of future prototyping activities*

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