

Ethernet and IEC 61850

The Communication Standard for
Power Distribution and Transmission



Let's Begin with a Question:



Which benefits do you expect from the use of the IEC 61850 standard?



Surely **These Benefits:**



- Reduced engineering costs
 - + Reliable operation
 - + High investment security
 - + Established technology
-
- = **Reduced total cost of ownership**

Agenda

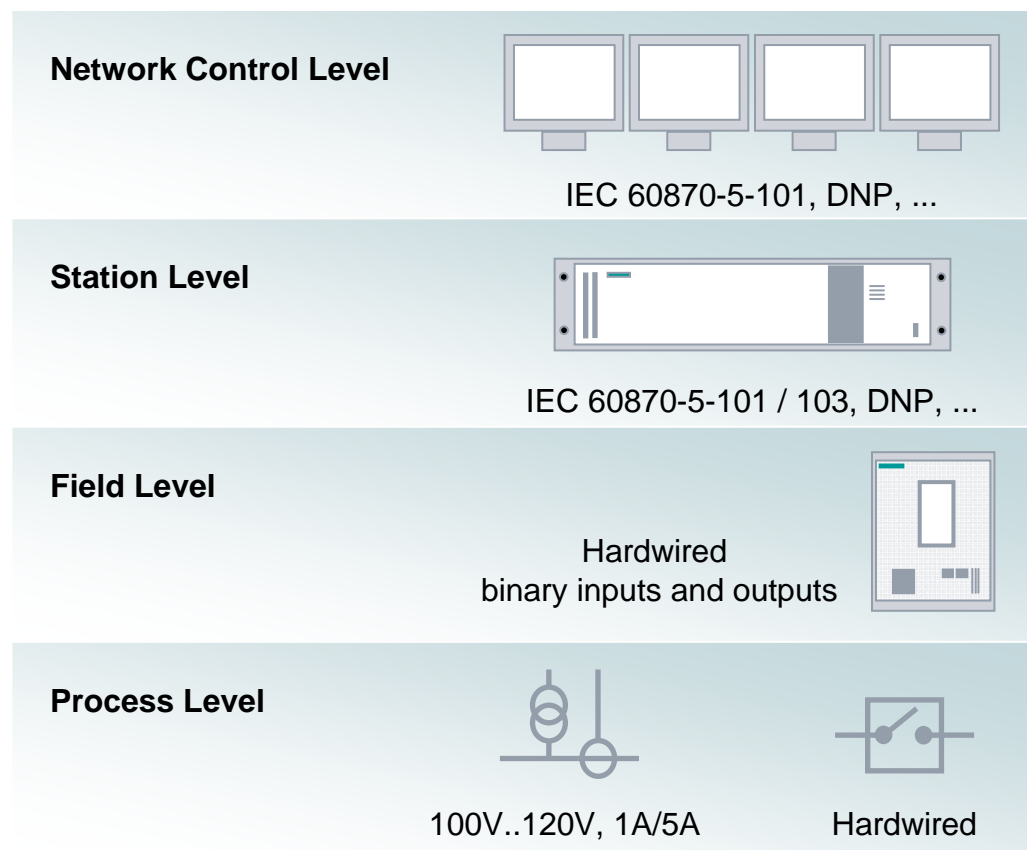


- Change in Communication
- Plus Points
- Solutions and Visions

**“Take part in the change in
communication.”**

Ethernet and IEC 61850

The Initial Situation

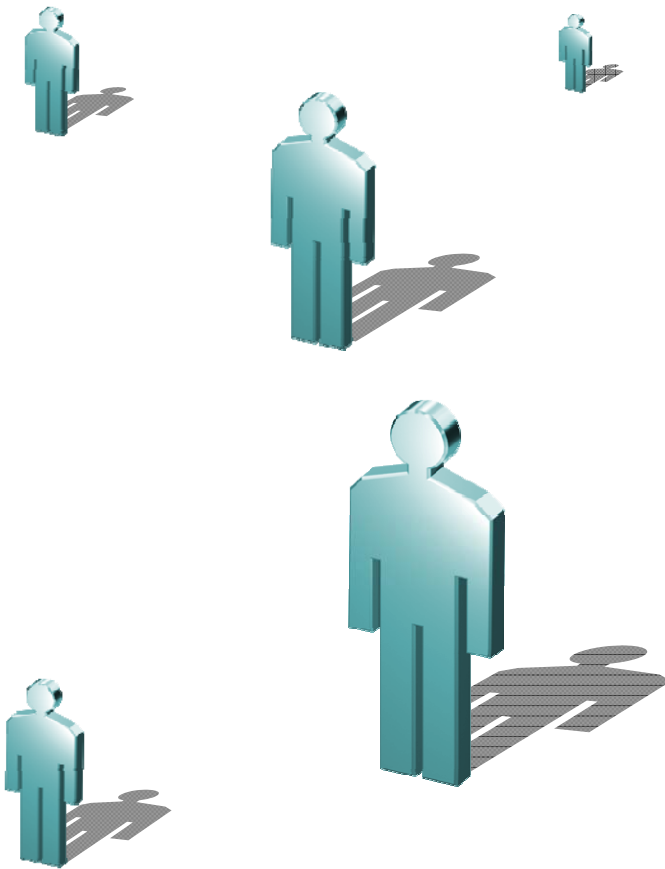


- Devices communicate with one another through wiring.
- Slow serial communications protocols are used (master-slave technique).
- Within a switchgear system, diverse, in part proprietary communications protocols are used.
- Frequently, a cost-intensive data conversion is necessary.
- Redundancy can only be achieved by doubling the communication (two busses).

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The **User's** Needs

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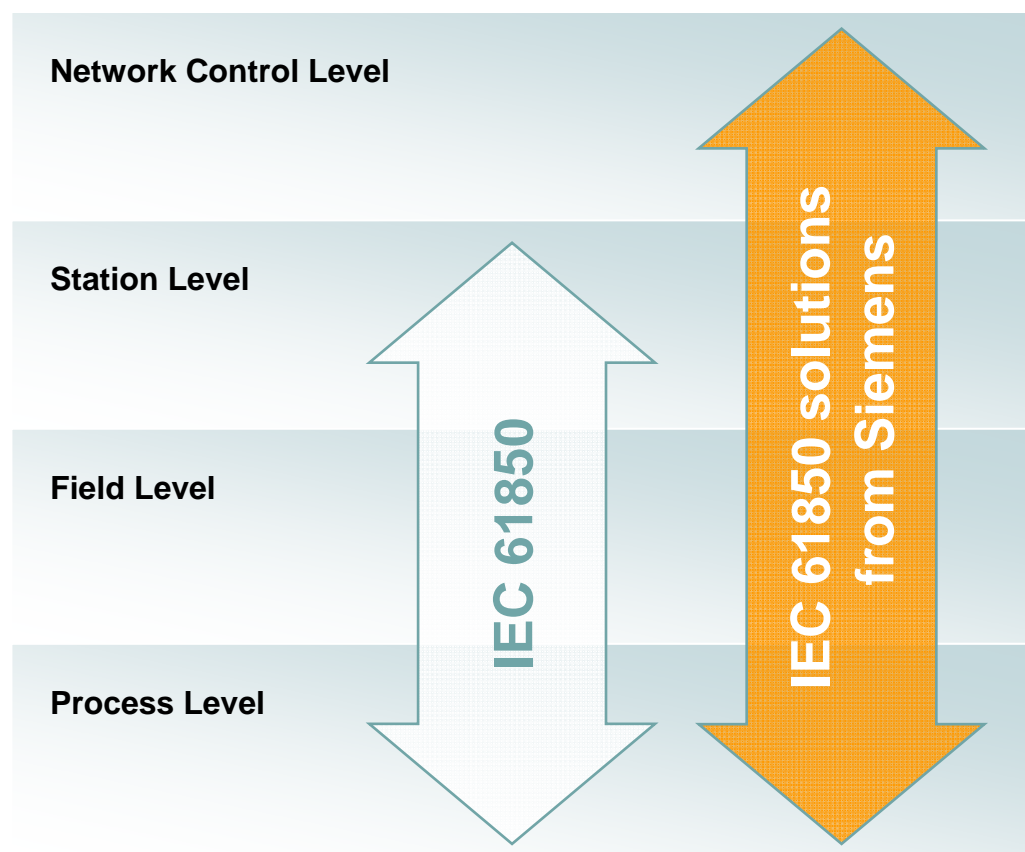


- Integration in engineering, communication and documentation
- Support of modern service concepts
- Long-term expandability
- Flexibility in the selection of components
- Cost optimization

Ethernet and IEC 61850

The **Solution**

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- Currently, an integrated communication without protocol conversion is possible up to the Station Level.
- Siemens masters and implements communication up to the Network Control Level and brings this experience into the continuous standardization.
- IEC 61850 uses the standard Ethernet.
- The standard supplies thought-out migration concepts, even for heterogeneous systems.
- The data model is future-oriented, independent of innovation advancements.

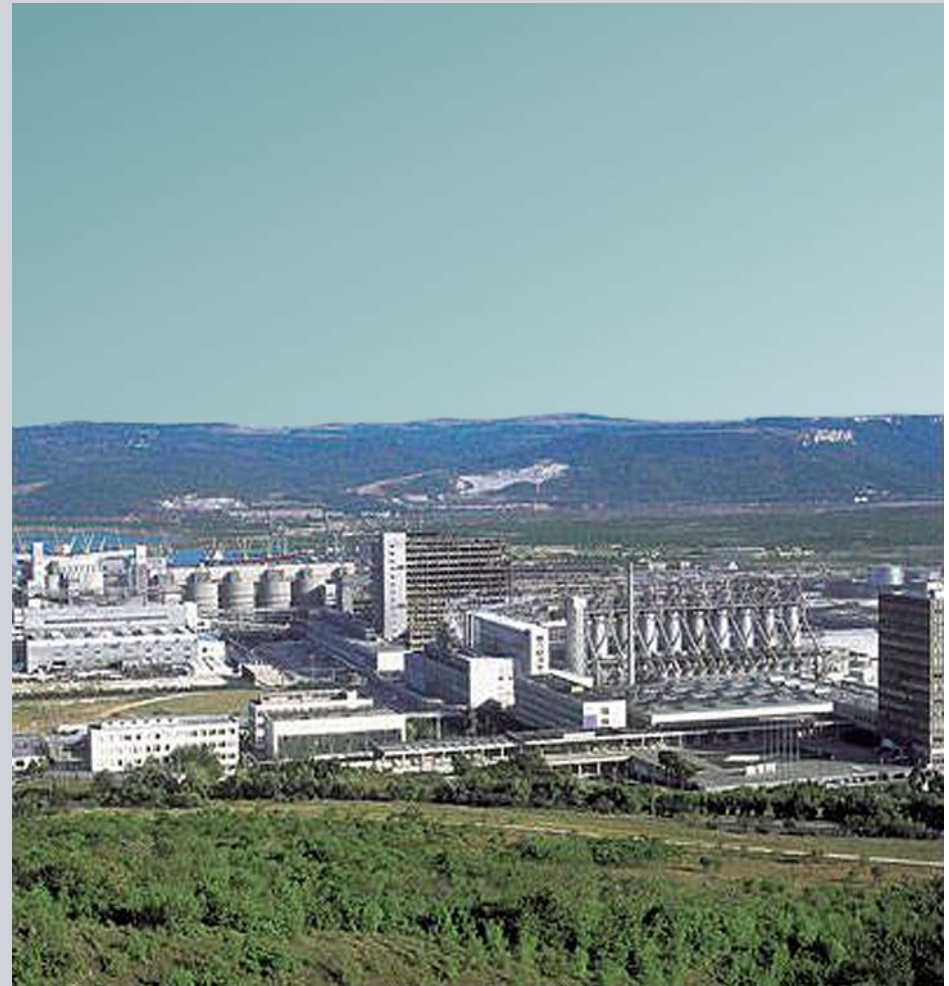
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Project Industry

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Solvay Group: International Chemical and Pharmaceutical Company

- Operation of high, medium and low voltage systems
- Worldwide systems in use with IEC 61850 up to the network control level, others being planned



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Project Industry - Motivation

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Motivation to Use IEC 61850

- Worldwide accepted, manufacturer-neutral standard
- Object-oriented, self-describing data model
- Future-oriented data model
- High performance
- Great flexibility in case of changes and expansions



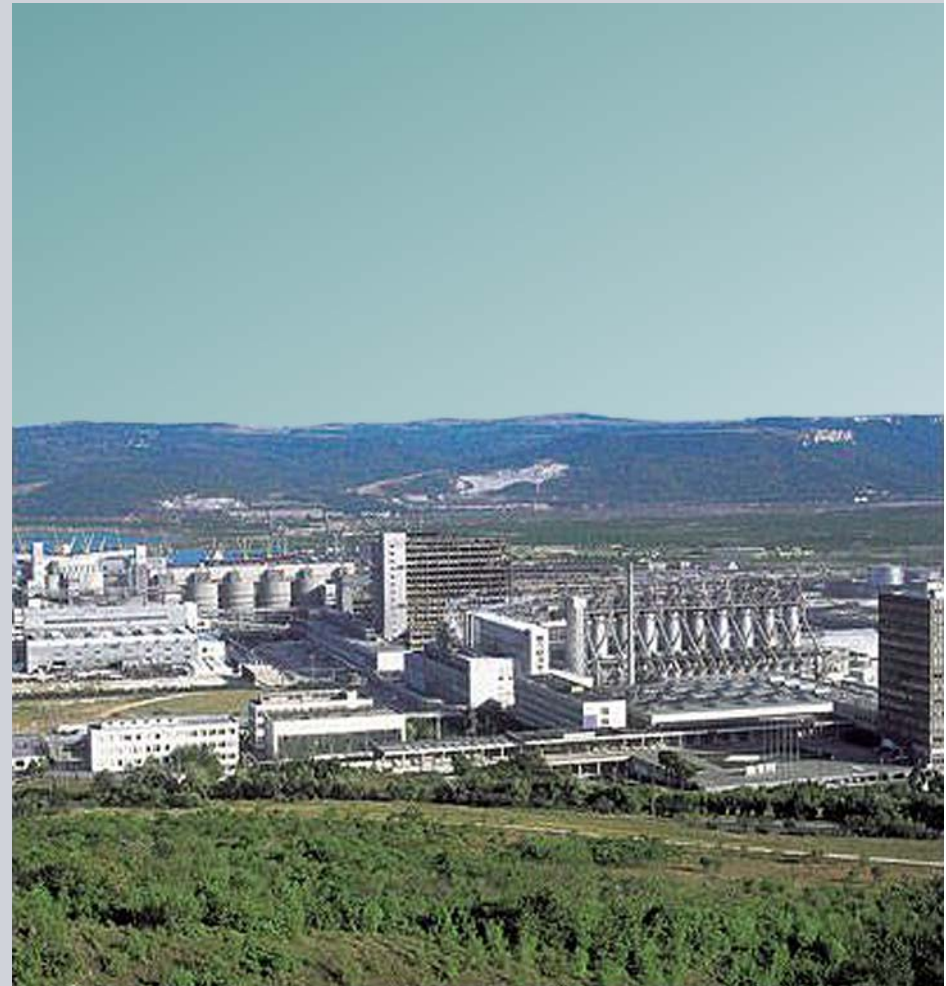
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Ethernet and IEC 61850 Project Industry - **Experiences**

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Customer's Experiences

- “The export of IED configuration data (SCL) and the subsequent import in a data management tool simplifies the engineering considerably and reduces the testing effort significantly.”
- “IEC 61850 enables easy remote maintenance and support of service locally.”

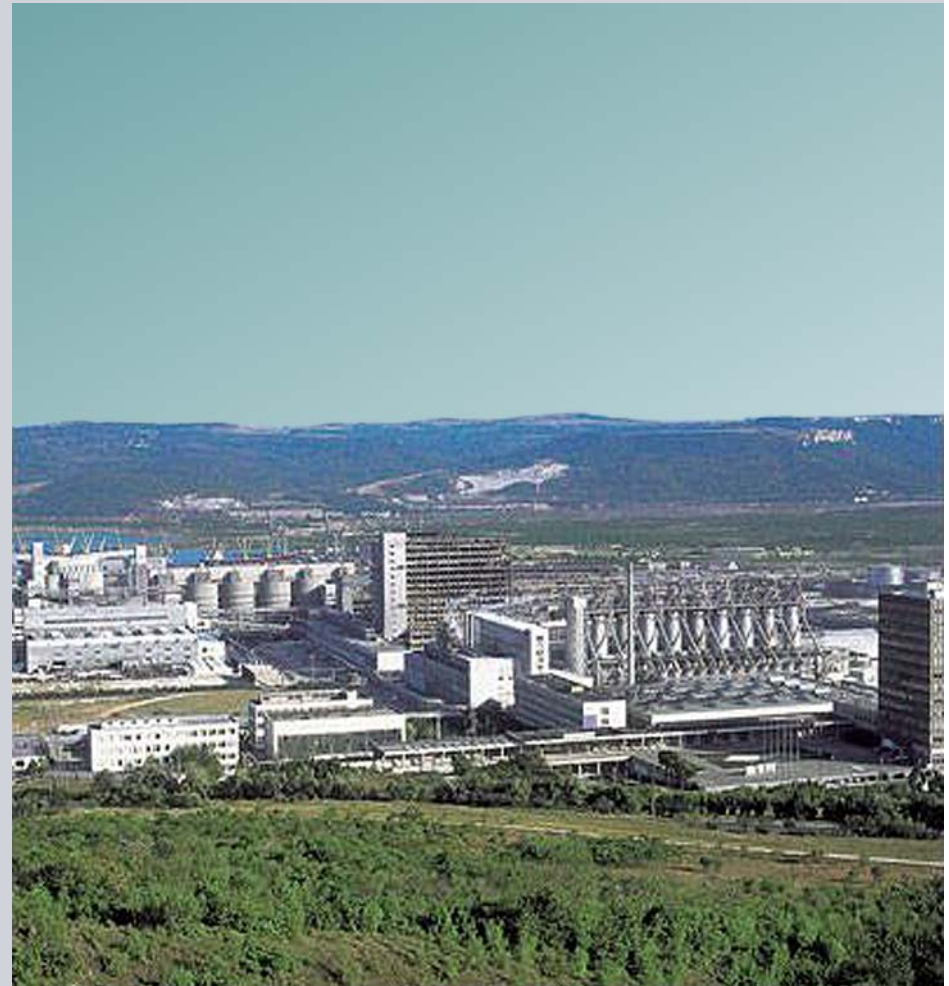


Ethernet and IEC 61850 Project Industry - **Experiences**

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Customer's Experiences

- “A central and extremely exact time synchronization is ensured through GPS/SNTP.”
- “With slight changes to an IED, you have to pay attention to the consistency of the configuration data.”



**“Collect the plus points with
IEC 61850 and Ethernet.”**

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The **Plus Points** at a Glance

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Modular hardware

Variable system topologies

Parallel processing of services

High interoperability

Standardized engineering

Efficient service concepts

Ethernet
+ IEC 61850

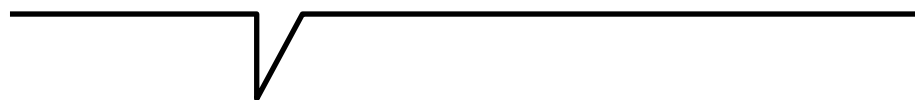


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Plus Point: Modular Hardware

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Select the Ethernet interface that fits
your application!

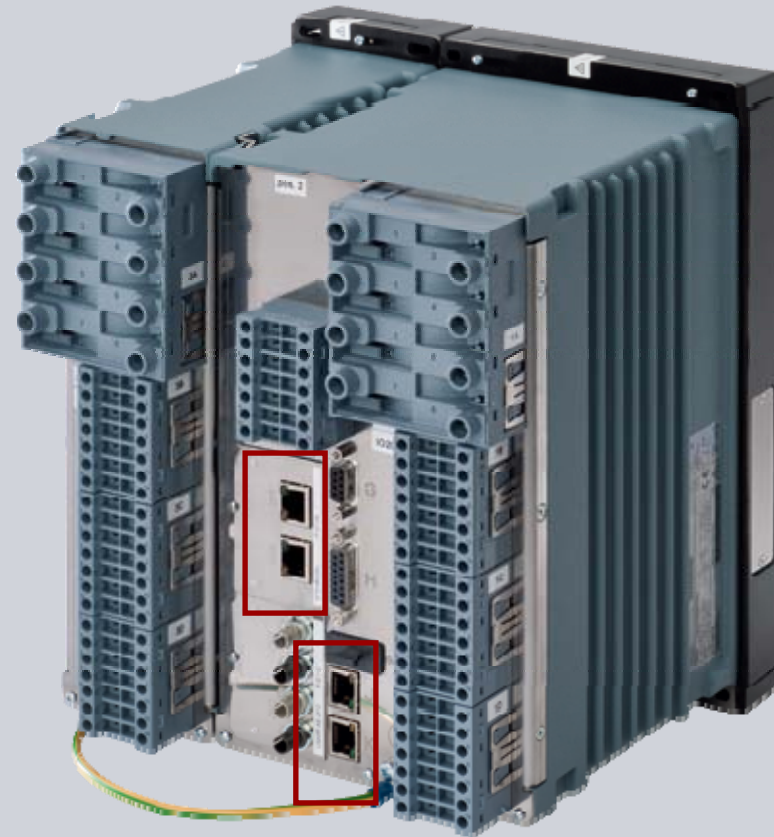
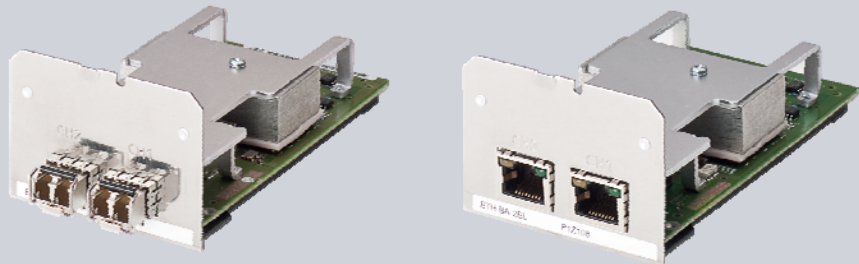


Ethernet and IEC 61850 SIPROTEC 5 Ethernet Ports



The Ethernet system interfaces for SIPROTEC 5 enable a retroaction-free communication, independent of protective functions and control functions.

You choose between optical and electrical versions.

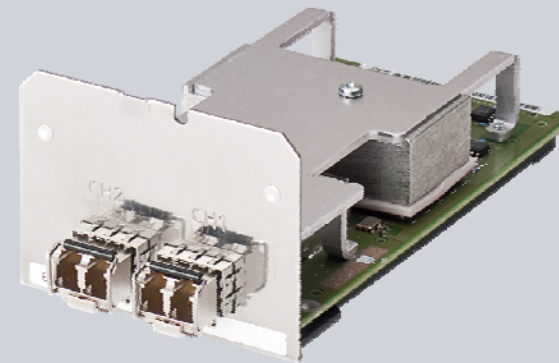


Ethernet and IEC 61850 Ethernet Module



Essential Properties of the Ethernet Modules:

- **Line** operating mode:
Only one of the two interfaces is active, the other is passively monitored.
- **Switch** operating mode:
You implement connections between SIPROTEC devices without additional external switches.



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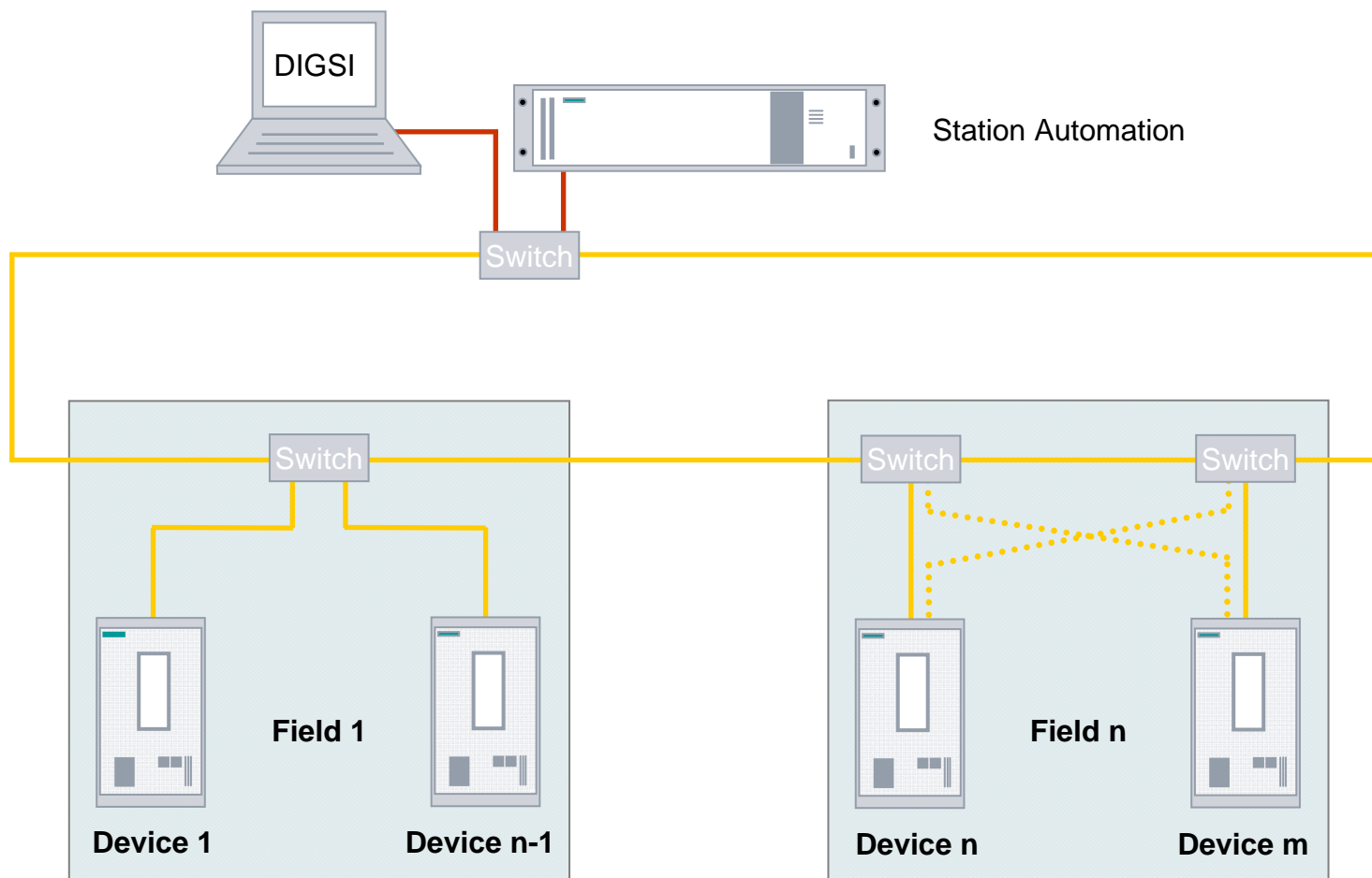
Plus Point: **Variable System Topologies**

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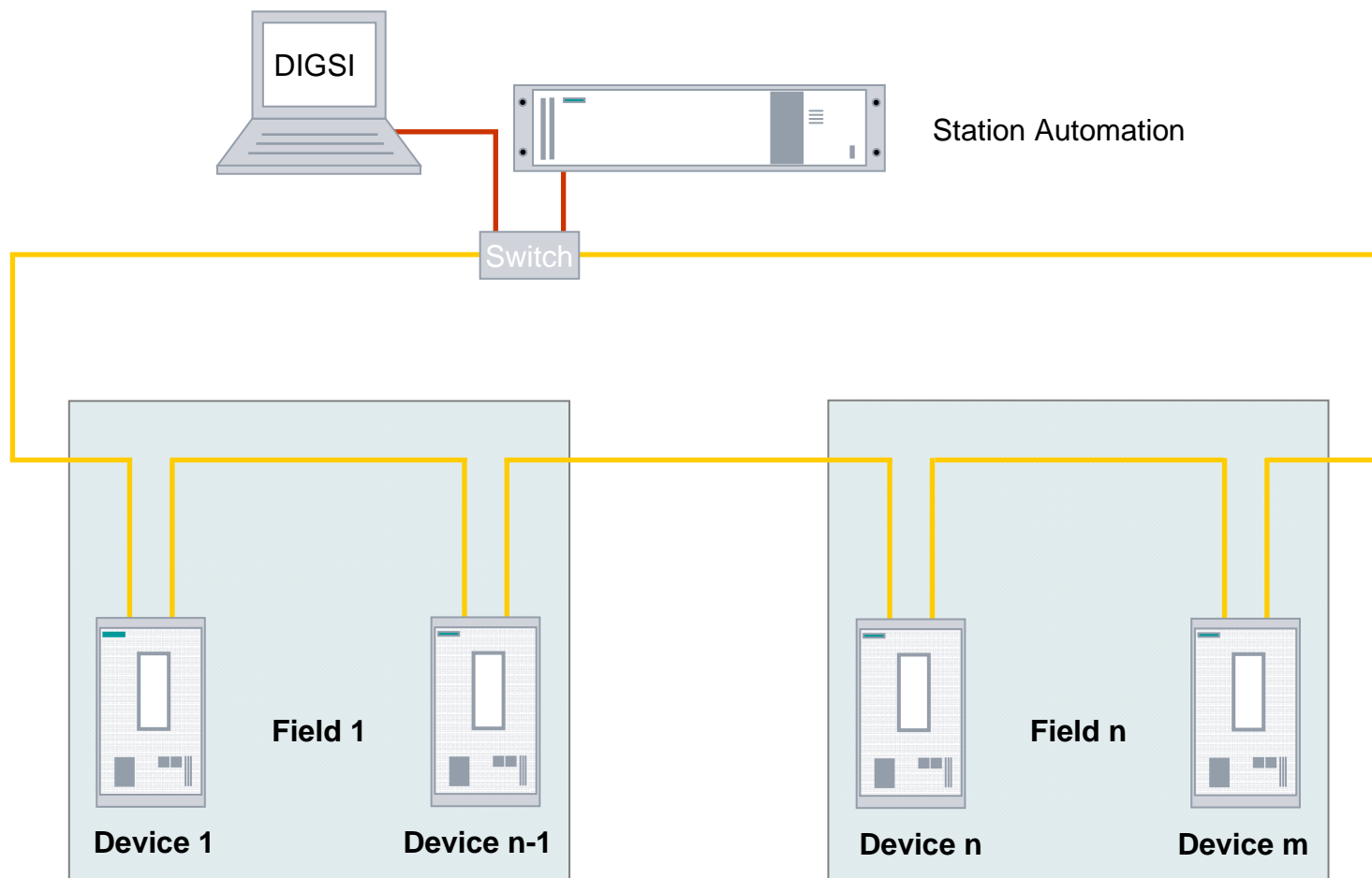


Design topologies to fit the local requirements and the desired redundancy!

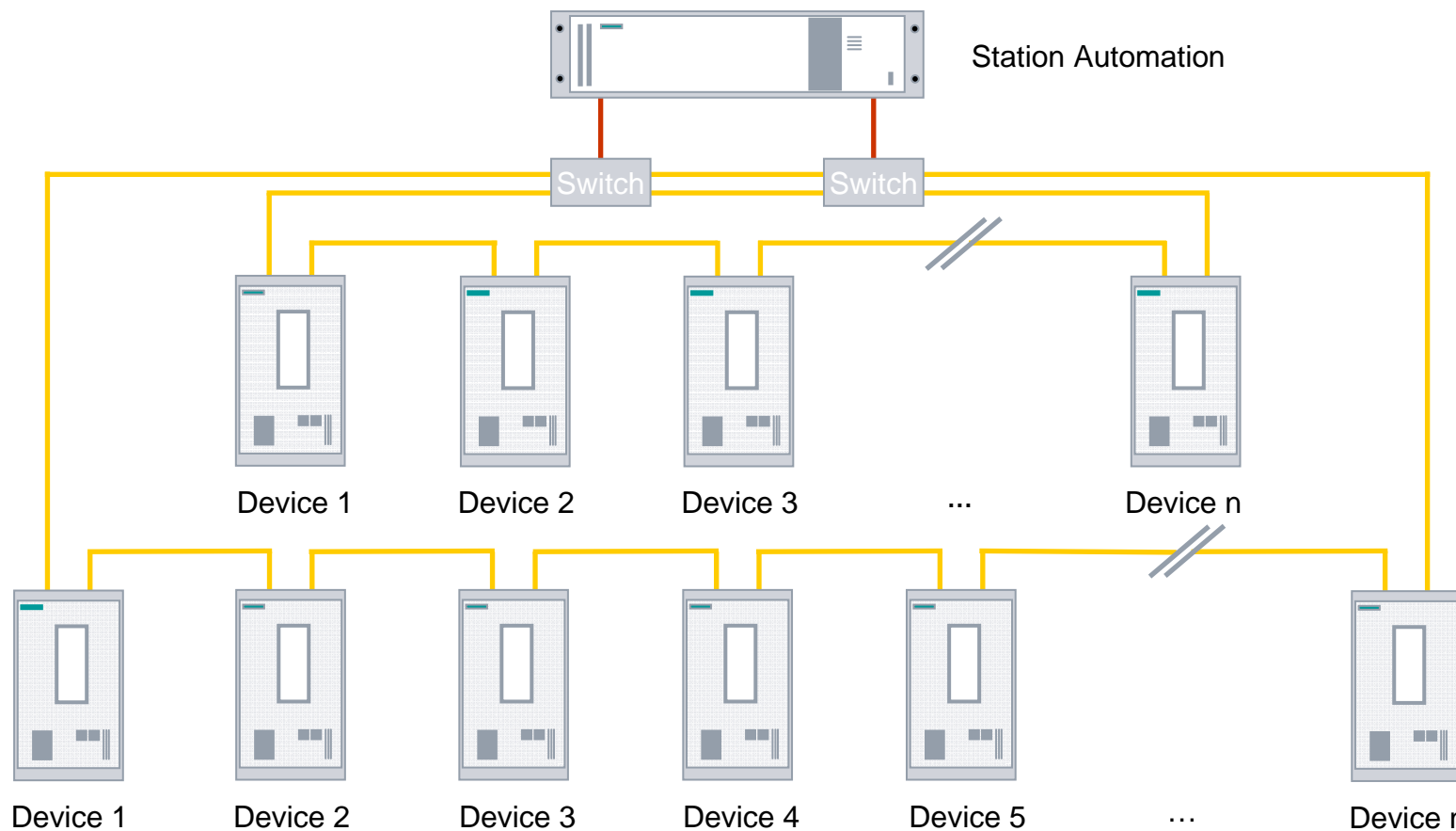
Ethernet and IEC 61850 Ring Structure with External Switches



Ethernet and IEC 61850 Ring Structure with **Integrated Switches**



Ethernet and IEC 61850 Ring Structure with multiple Rings



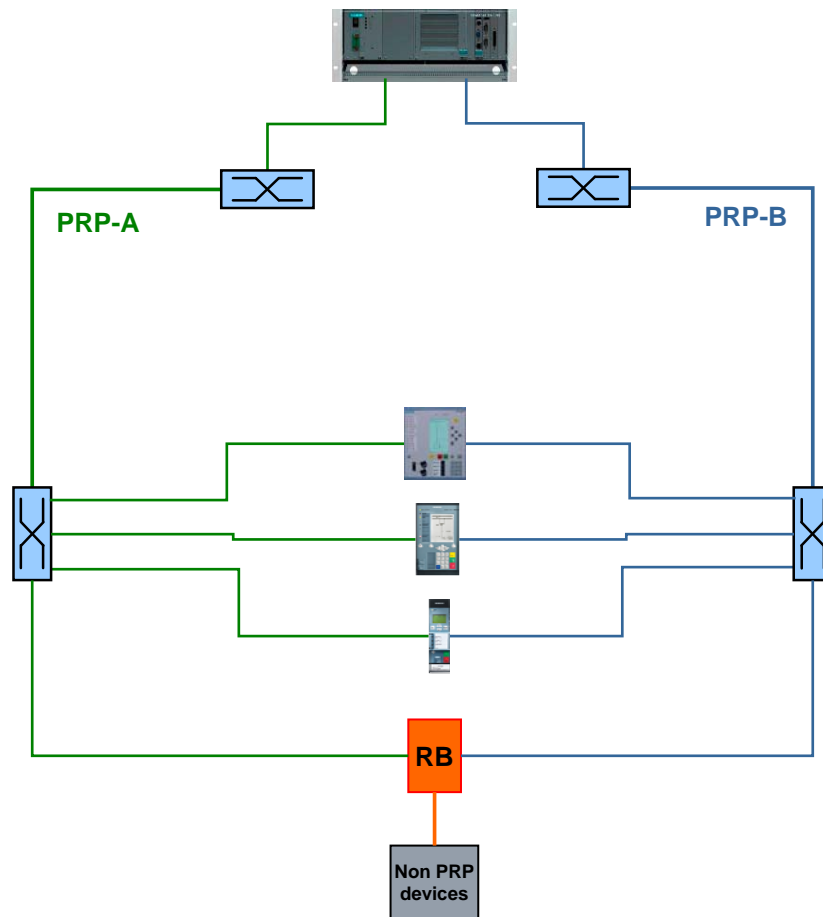
Ethernet and IEC 61850
Plus Point: Redundancy Configurations

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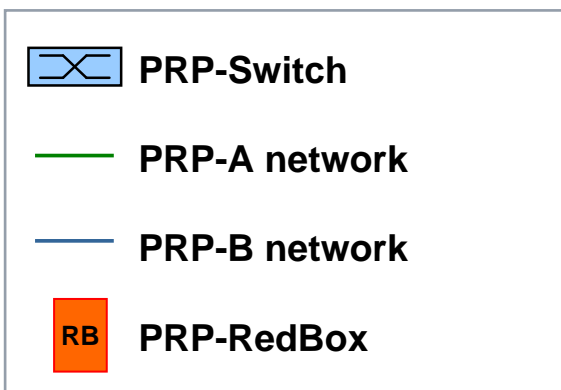
Seamless redundancy solutions with
PRP and HSR!

Principle of PRP - IEC 62439-3.4

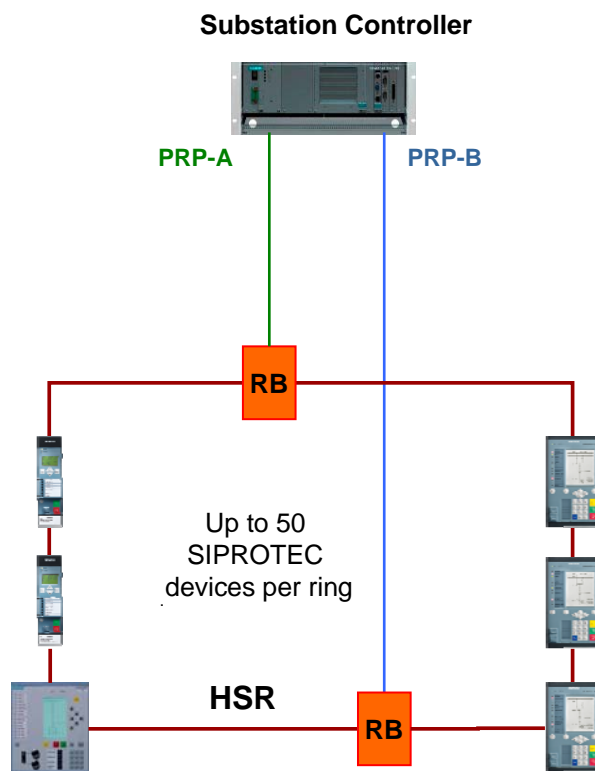


Field level

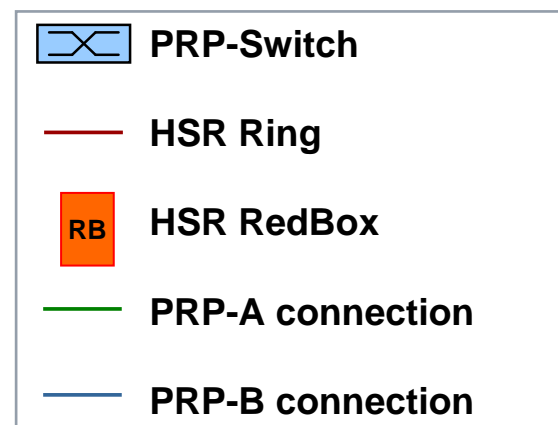
- Two parallel networks
- Device are connected to network PRP-A and PRP-B
- Devices send via both active links
- RedBox for connection of non PRP devices
- Seamless
- Interoperability tests done



Principle of HSR-Configuration – IEC 62439-3.5



- 2 Redboxes
 - SIPROTEC devices with integrated HSR switch
 - Rings with up to 50 devices
 - Redboxes distributed in the ring
 - Seamless
- Interoperability tests done



Ethernet and IEC 61850

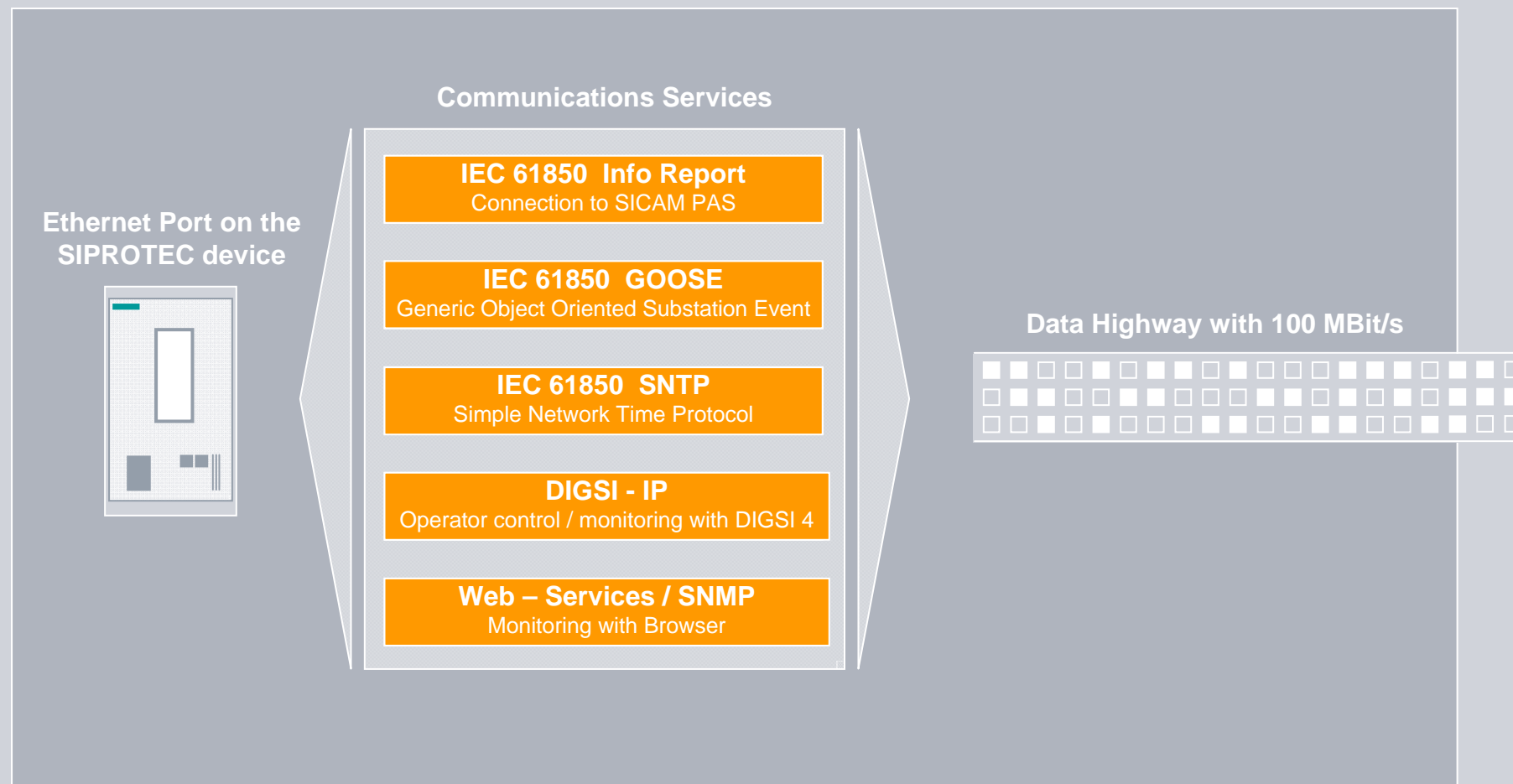
Plus Point: **Parallel Processing of Services**

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Use one and the same bus connection
for different communication services!

Ethernet and IEC 61850 Parallel Running **Communications Services**



Ethernet and IEC 61850

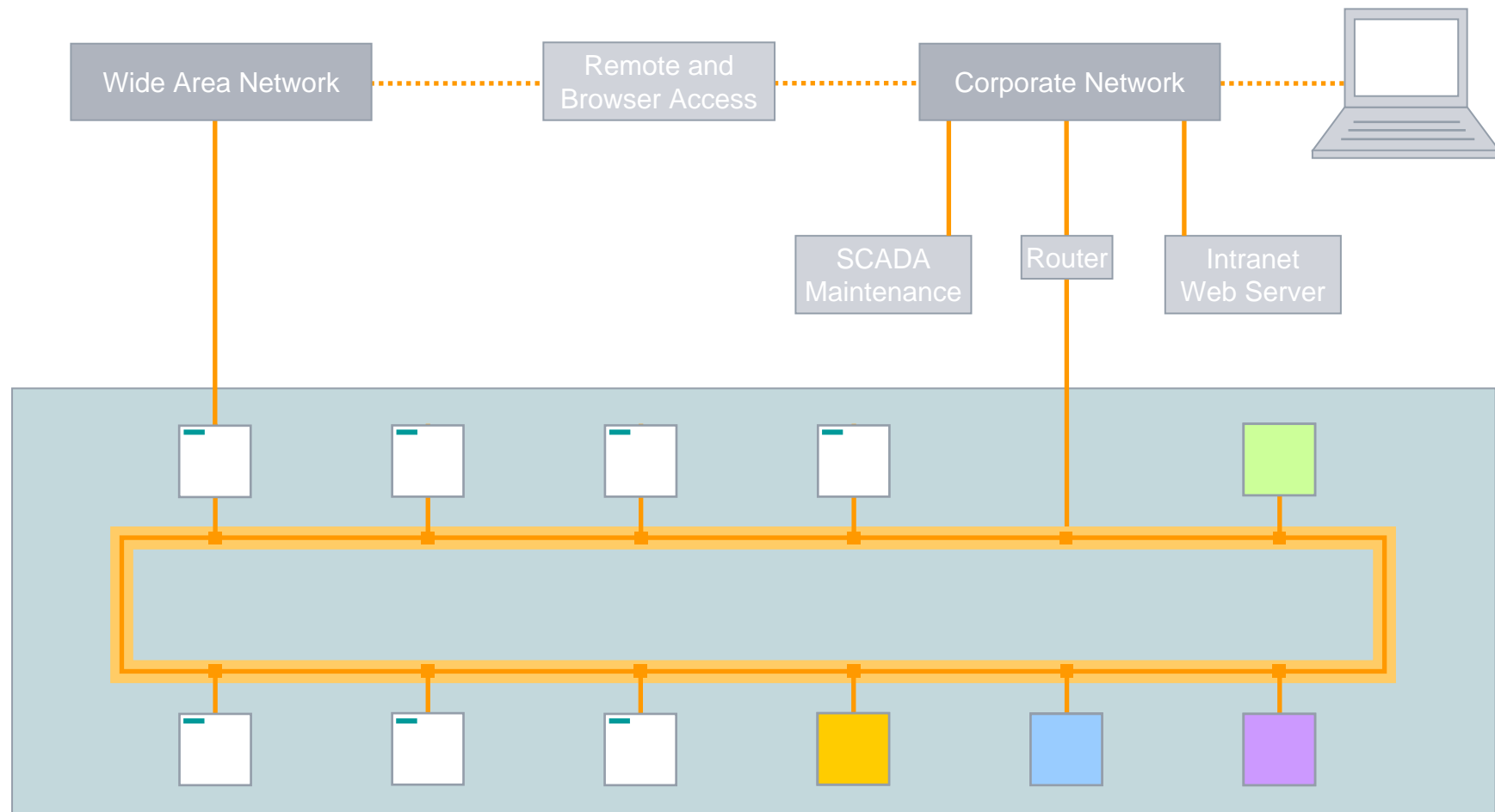
Plus Point: **High Interoperability**

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Combine different standard-conforming components in a system and let them communicate with each other!

Ethernet and IEC 61850 Interoperability



Ethernet and IEC 61850
Plus Point: Standardized Engineering

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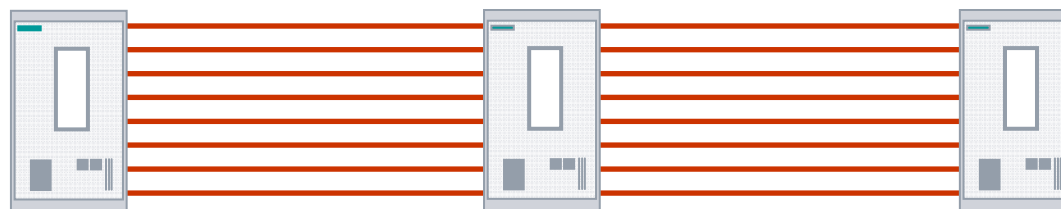
Replace wiring through data telegrams!

Ethernet and IEC 61850

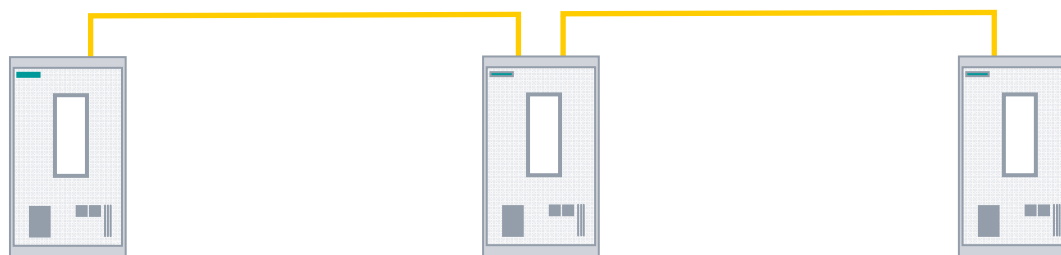
Simple Wiring saves Costs



Conventional Wiring

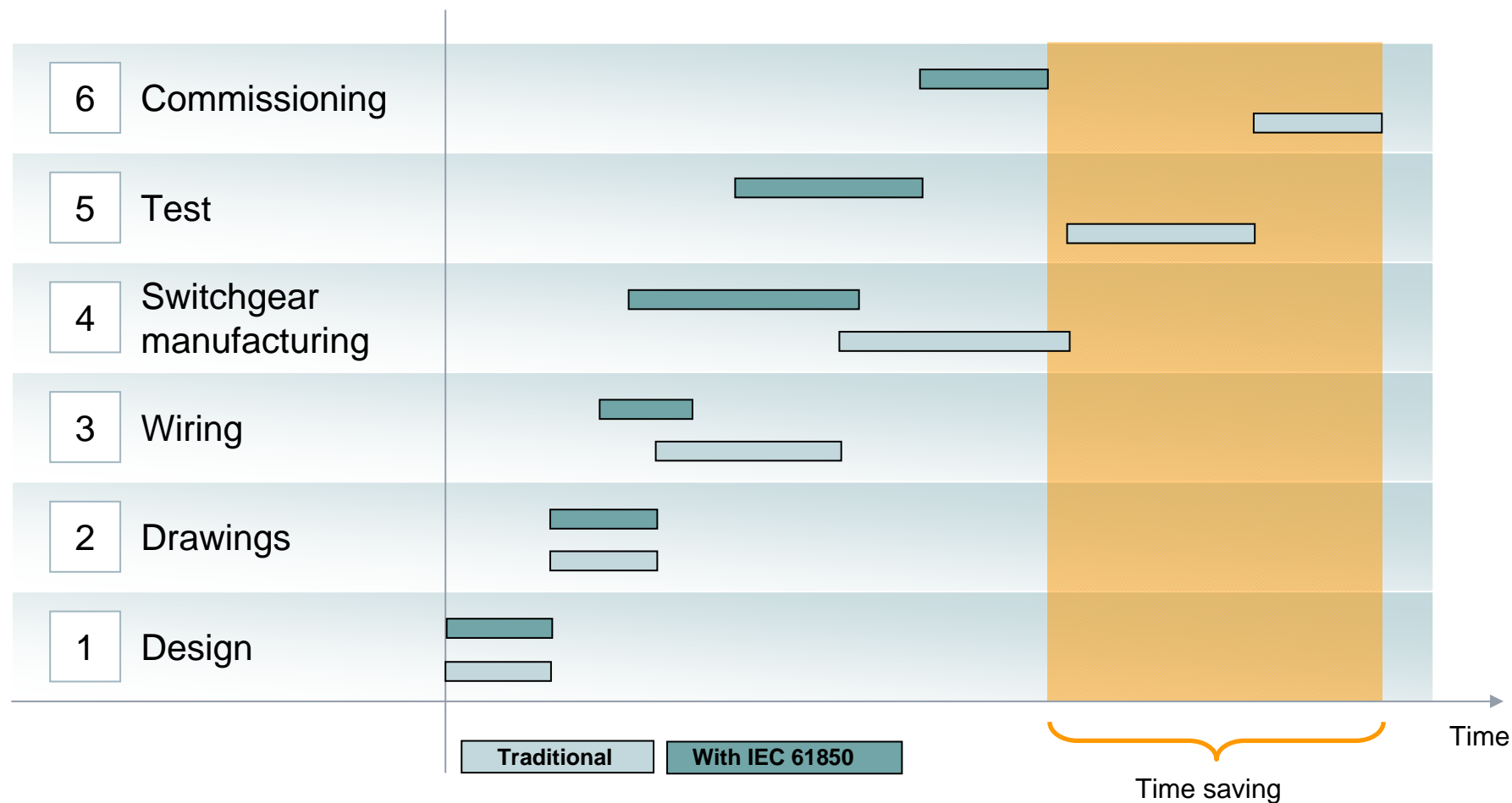


Wiring with IEC 61850



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Collaborative Engineering saves Time



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Plus Point: Efficient Service Concepts

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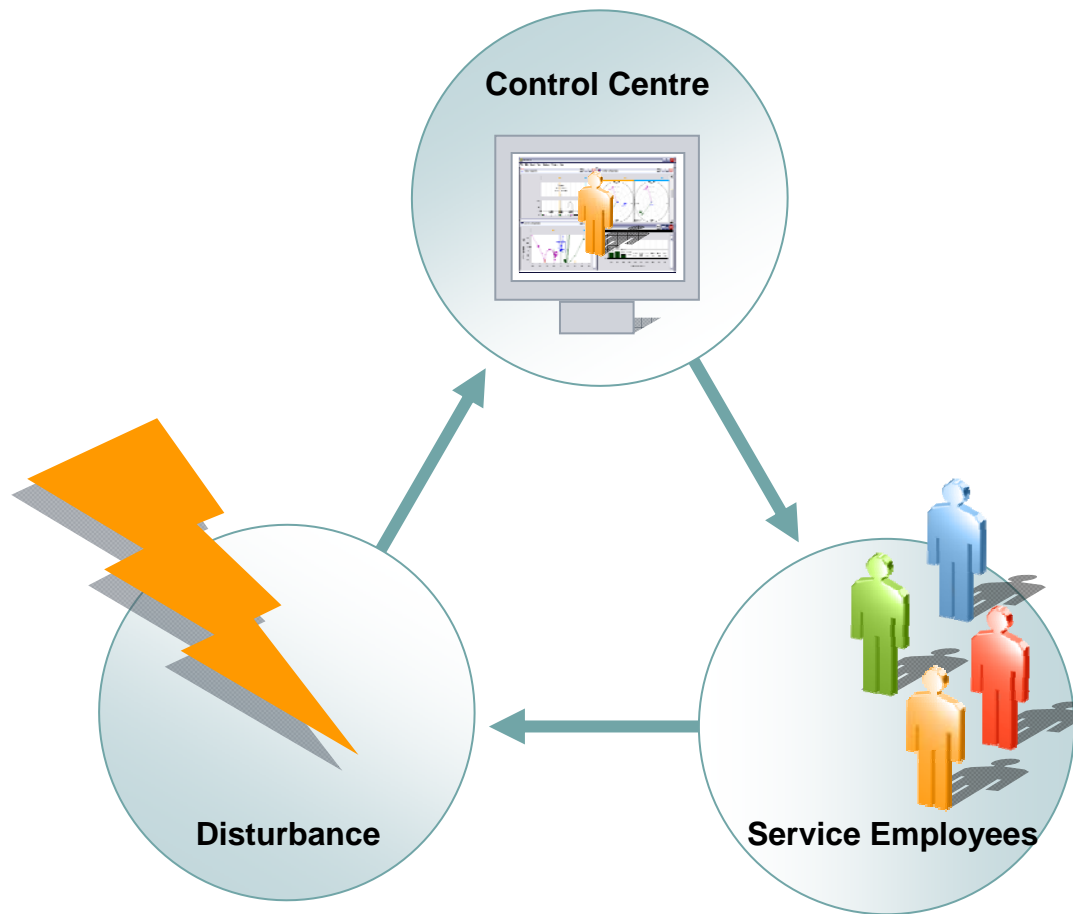


Use service resources exactly where you need them!



Ethernet and IEC 61850

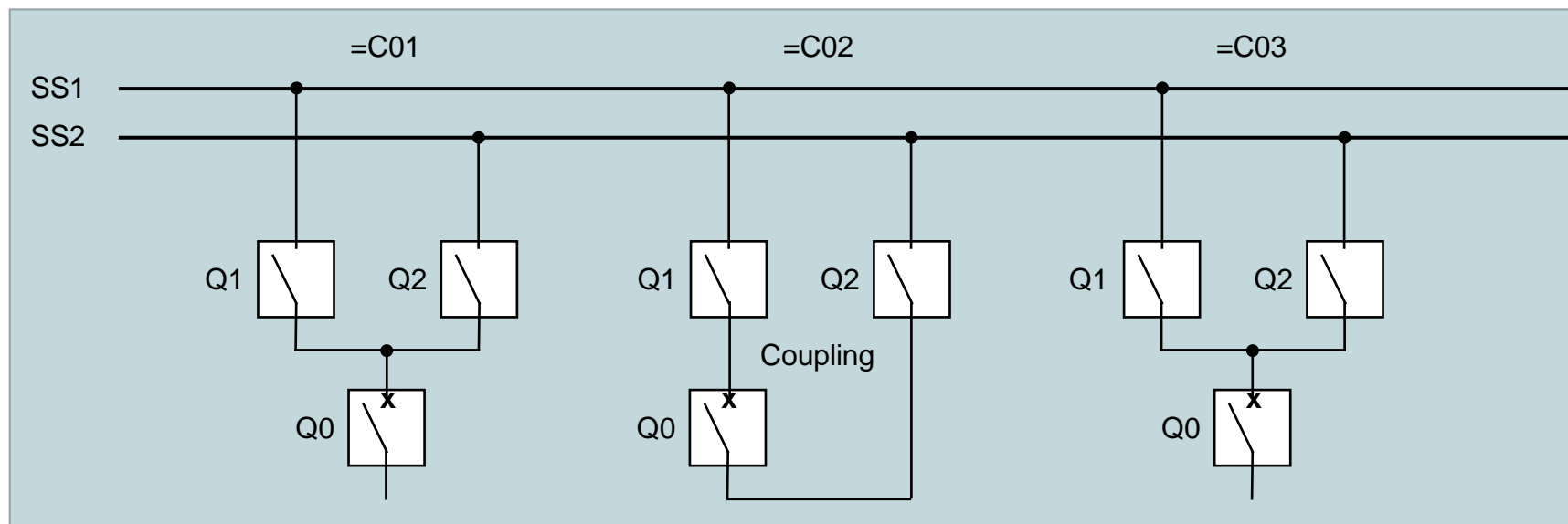
Fewer Resources, Faster Task Solutions



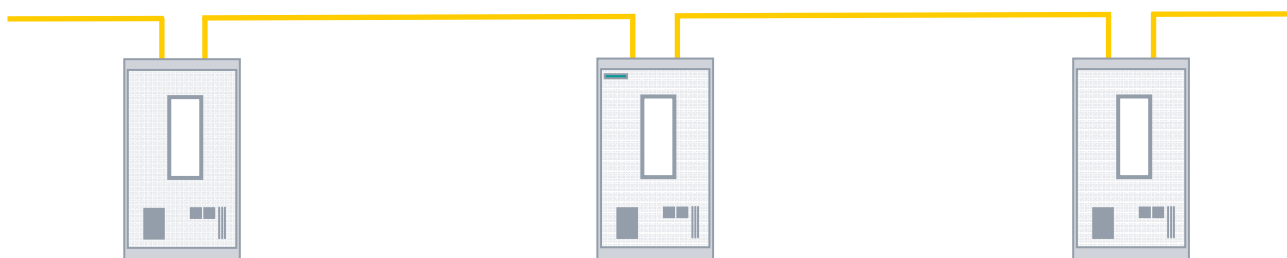
- The control centre detects an error from the remote location and evaluates it.
- The control centre decides which employee must go to the disturbance location and with what material.
- The employee goes to the location and completes his task.

“Profit from our solutions and our competence.”

Ethernet and IEC 61850 Switchgear Interlocking with IEC 61850-GOOSE

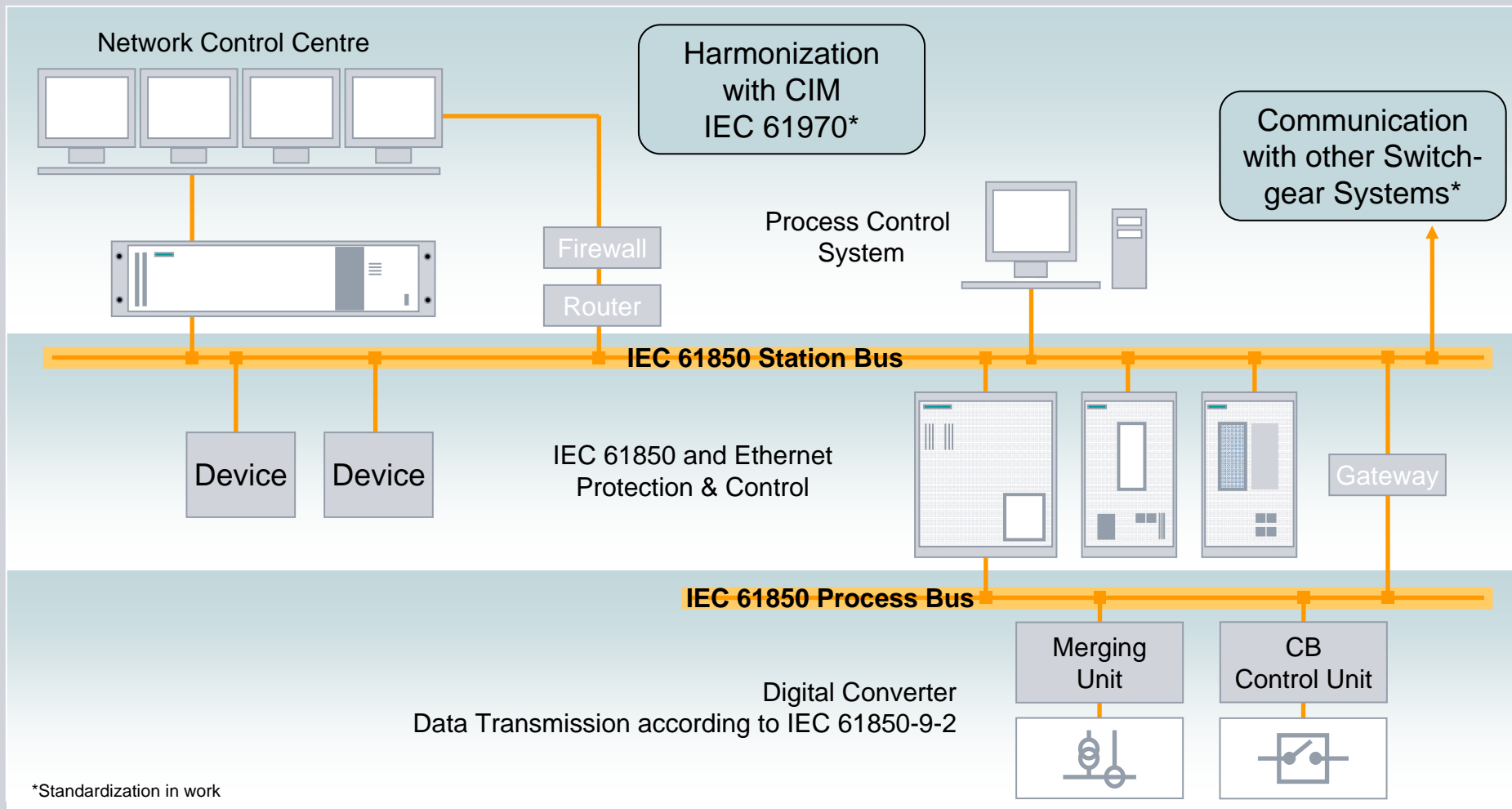


IEC 61850
- GOOSE



Ethernet and IEC 61850

We Think Beyond



*Standardization in work

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Ethernet and IEC 61850

Our **Solutions** in Use **Worldwide**

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Up to now more than 250.000 SIPROTEC devices with IEC 61850 Interface were delivered!

Reasons for IEC 61850-Technology from Siemens

▪ **Years of experience**

- More than 250.000 SIPROTEC devices speak for themselves



▪ **The full range of solutions**

- Full line provider of IEC 61850 server and client solutions since 2004
- All SIPROTEC protection and control devices support IEC 61850

▪ **The better engineering tool - DIGSI**

- Simple and comfortable IEC 61850 system configuration tool
- Support of IEC 61850 Edition 1 and 2
- Flexible Engineering of IEC 61850 structures

Reasons for IEC 61850-Technology from Siemens

▪ **Compatibility**

- IEC 61850 technology that has consistently been given the KEMA 's A Level certificate
- Support of Edition 1 and Edition 2

Meet the standard

IEC 61850

▪ **Availability**

- Support of redundant protocols
- Support of redundancy protocols RSTP, PRP and HSR

▪ **Guaranteed future**

- All SIPROTEC IEC 61850 protection devices that have been produced since 1998 can be easily upgraded for the IEC 61850 technology