

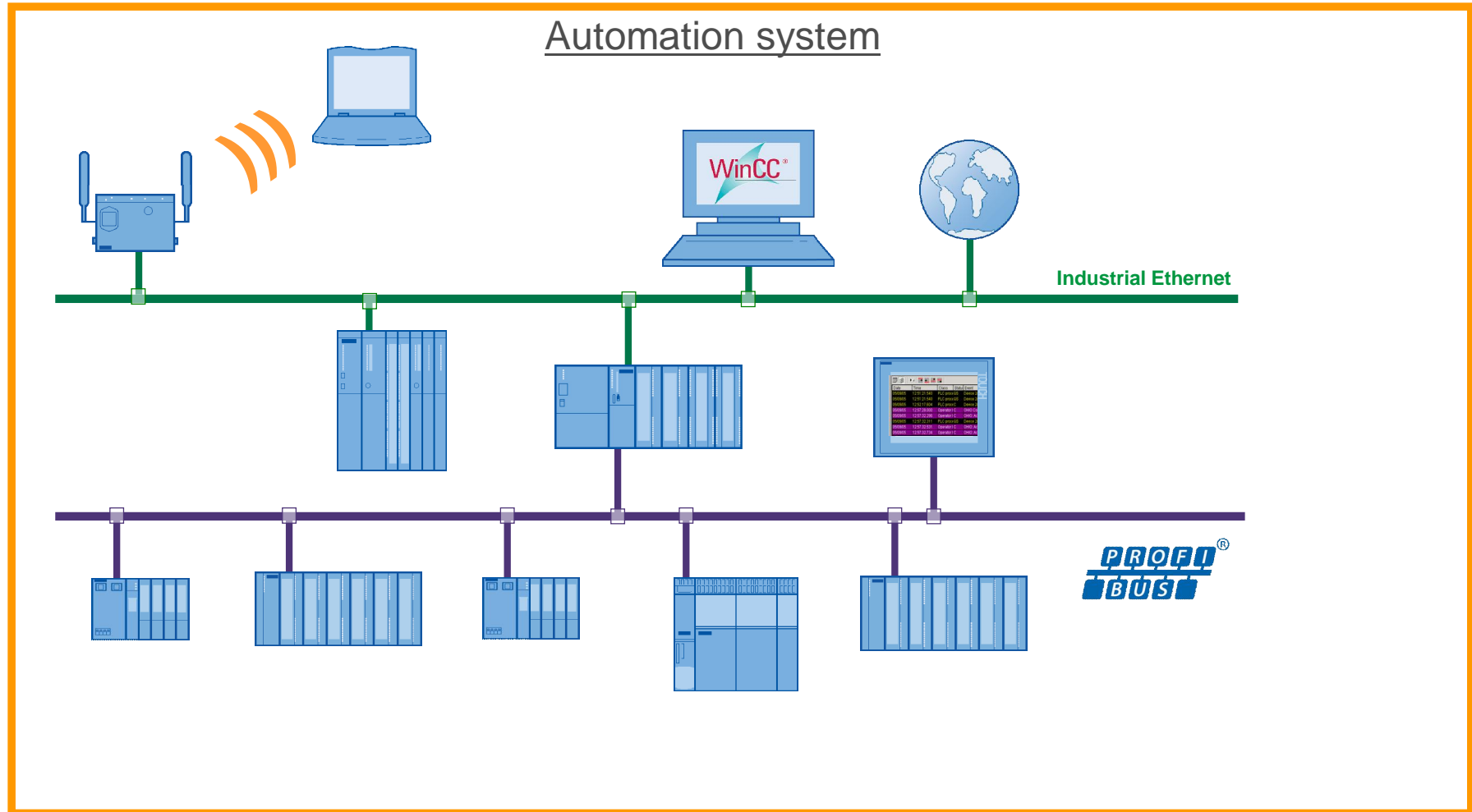
PROFINET
The leading
Industrial
Ethernet
Standard

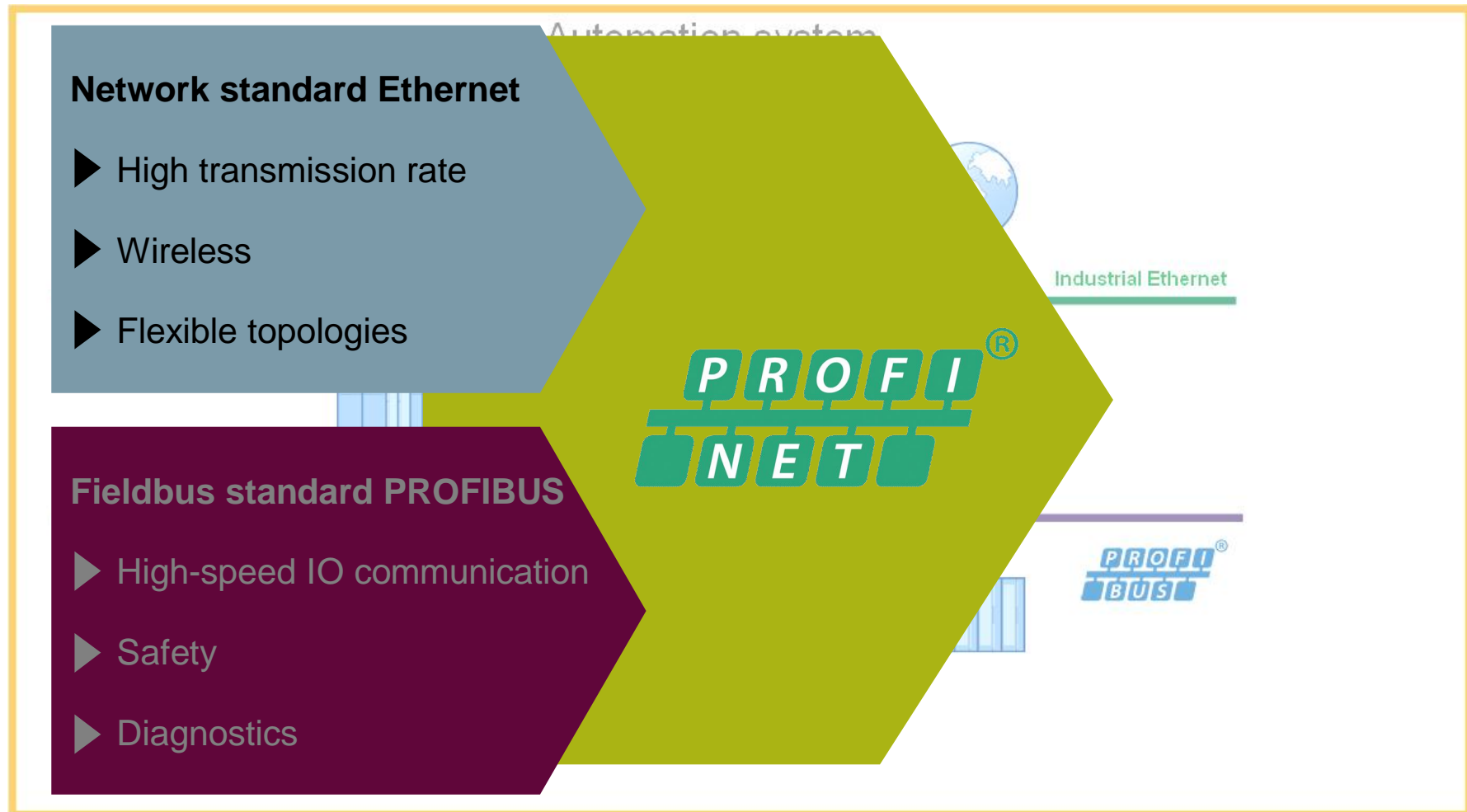


The Benefits of
PROFINET

Automation Structure

2





The answer - PROFINET

4



**PROFINET is the open Industrial Ethernet standard
from PROFIBUS & PROFINET International (PI), Vendor neutral**

PROFINET is based on Industrial Ethernet

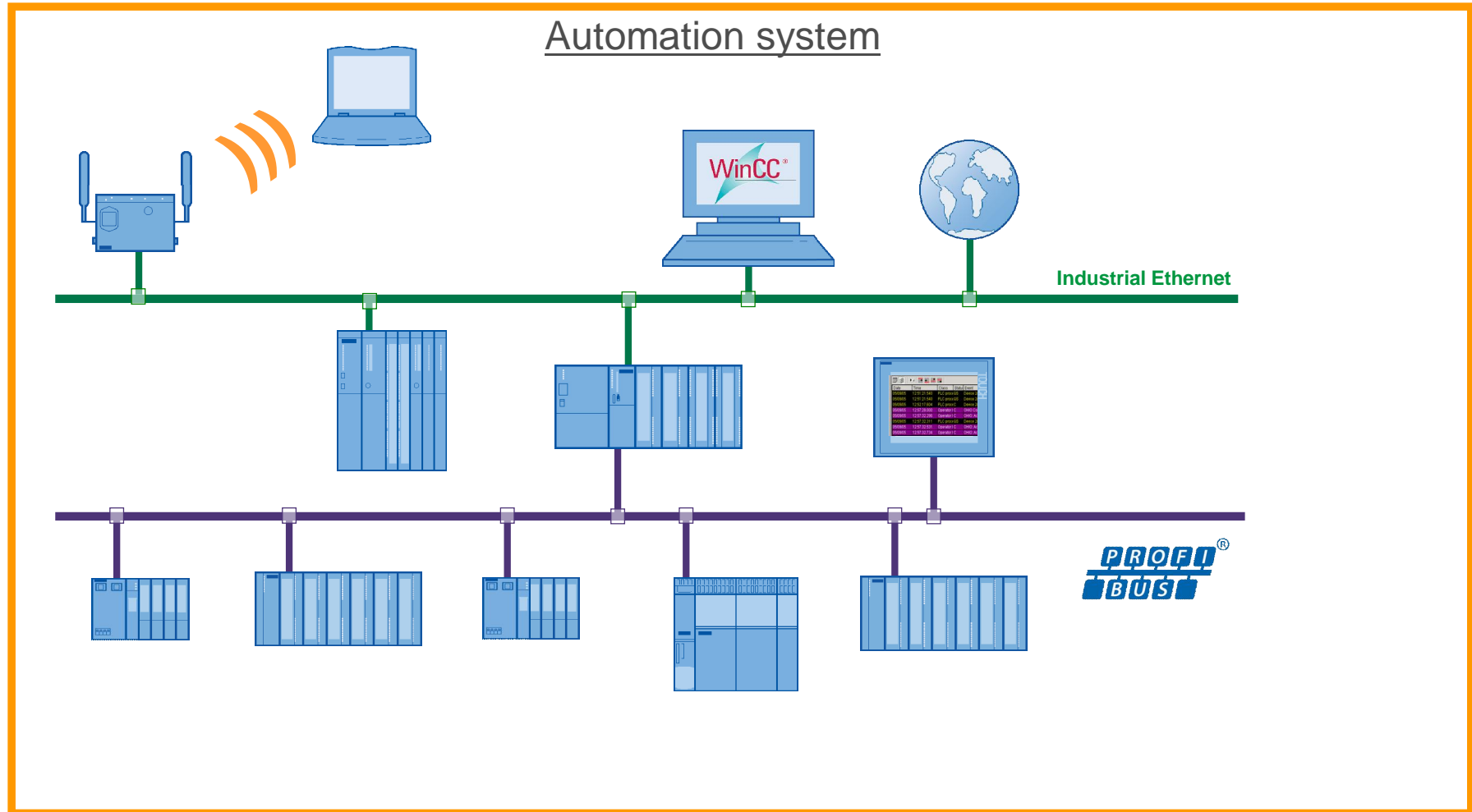
PROFINET utilizes TCP/IP and IT-Standards

PROFINET is Real-Time Ethernet

**PROFINET allows seamless integration
of fieldbus systems**

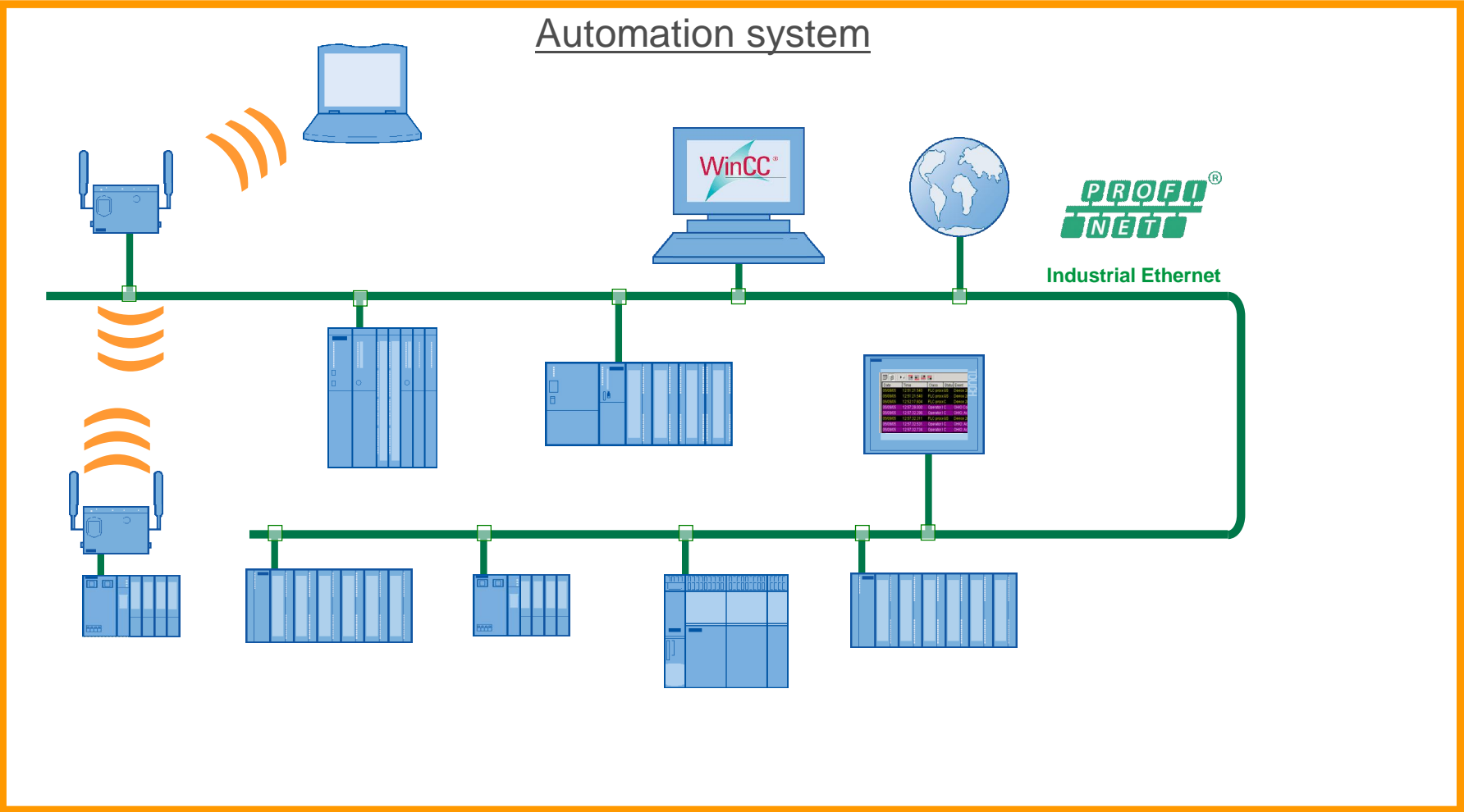
Automation Structure

5



Automation Structure

6



But if I do that, I need.....

7

- An additional switch
- IO-Modules with Industrial Ethernet/PROFINET interface
- PROFINET CPUs
- New methods of Programming



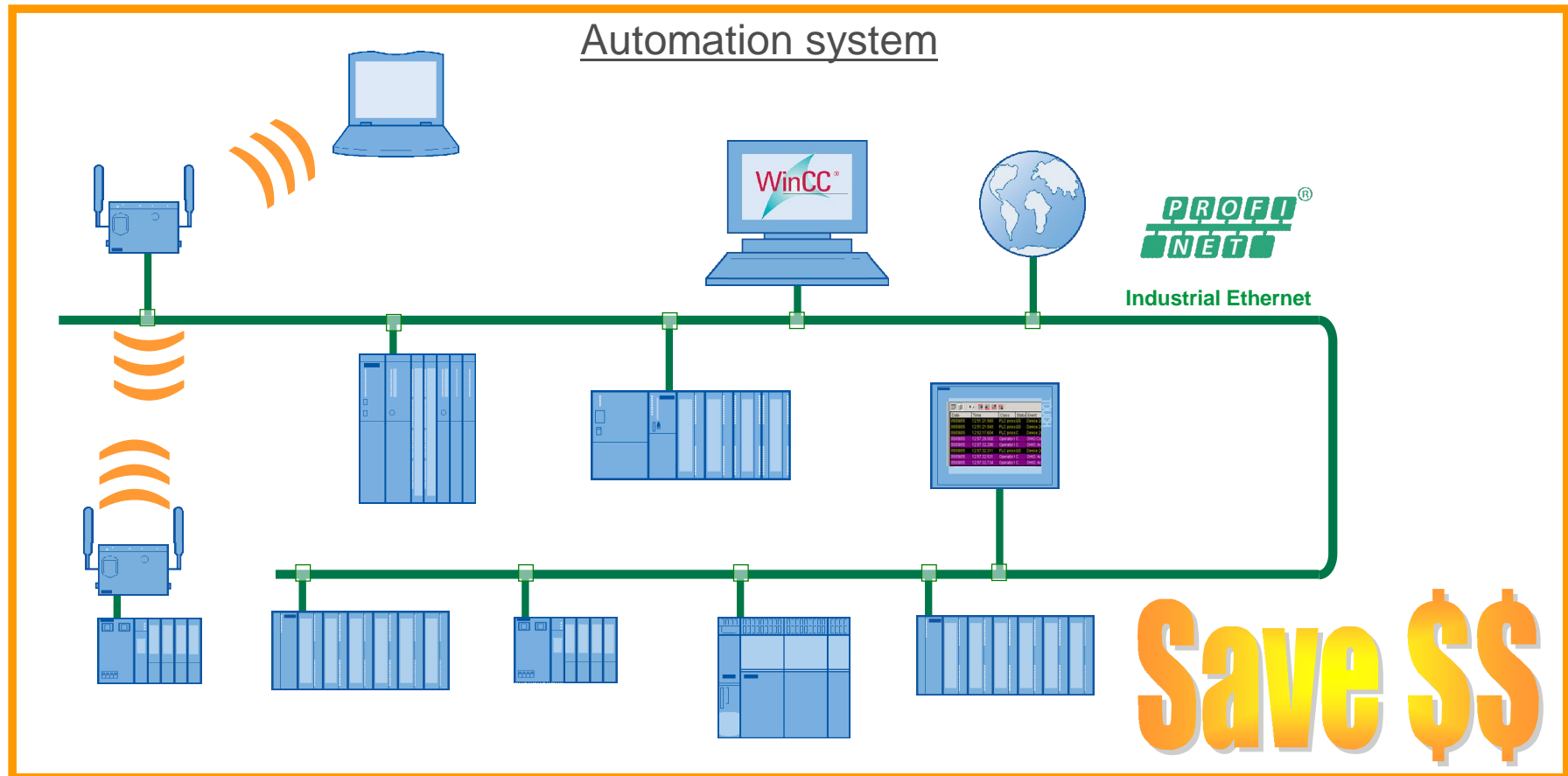
- ...and this is increasing the costs...

- Wrong!
- A switch in on board of the IO modules!
- IO-Modules with a PROFINET Interface are exactly the same costs as on PROFIBUS and only the head module needs to be changed, the IOs can be kept!
- PROFINET CPUs are used for Industrial Ethernet communication anyways
- The user program can be kept, there is no difference between PROFIBUS and PROFINET IO-Access!
- Even Redundancy is possible directly on the Products, no OLM, no FO!!



Automation Structure

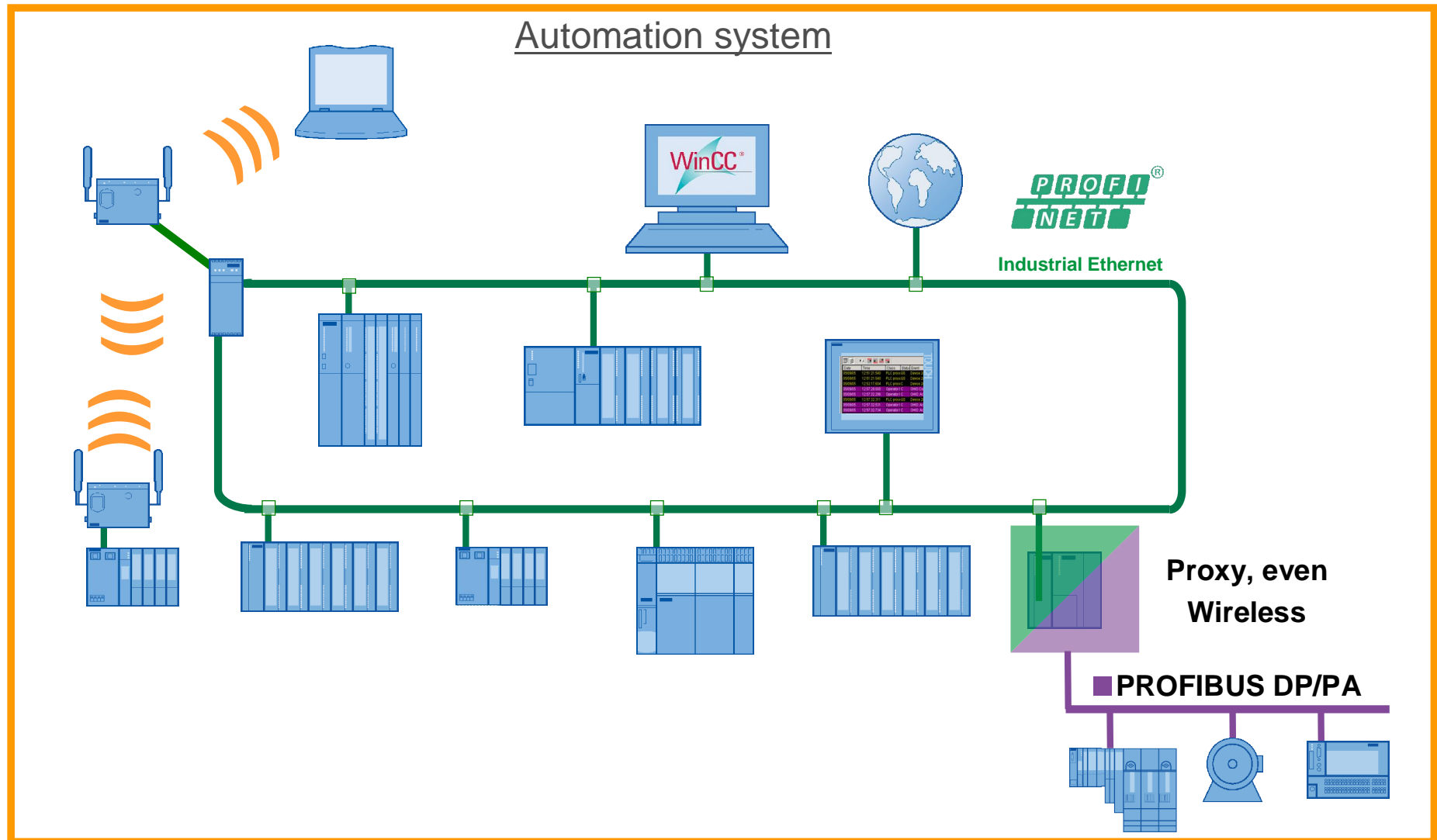
8



The only communication medium is Ethernet.
Reduction of Interfaces – Cabling – Connectors - Spare parts

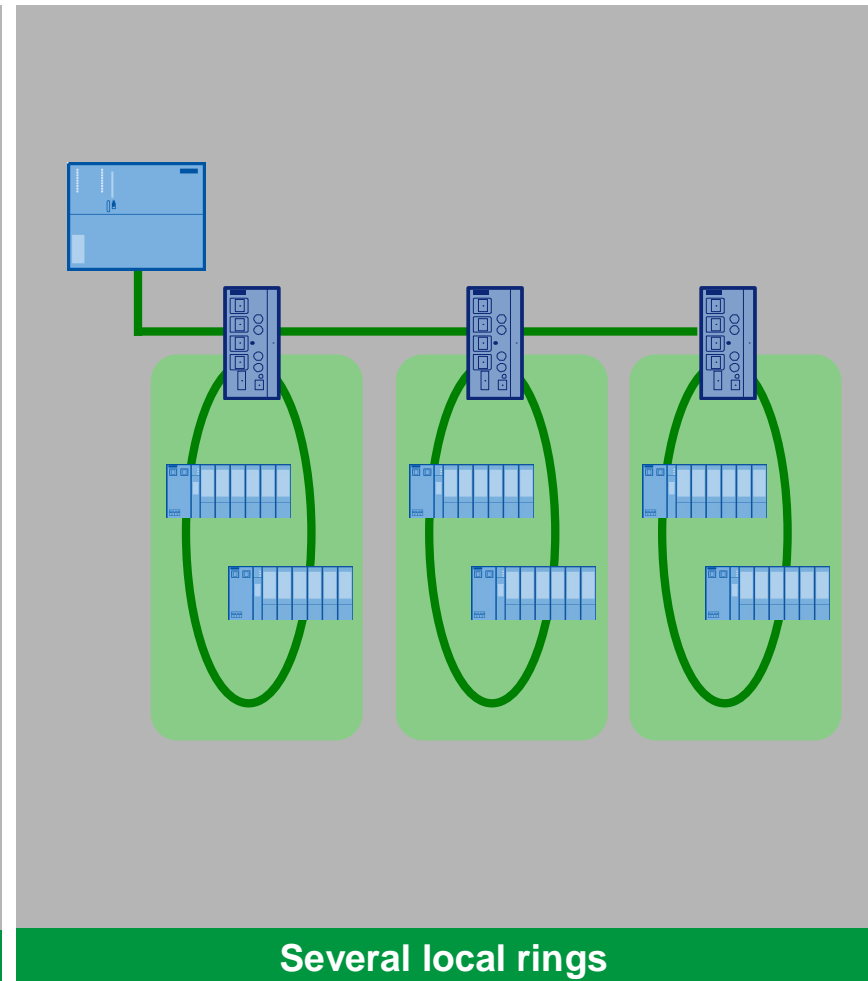
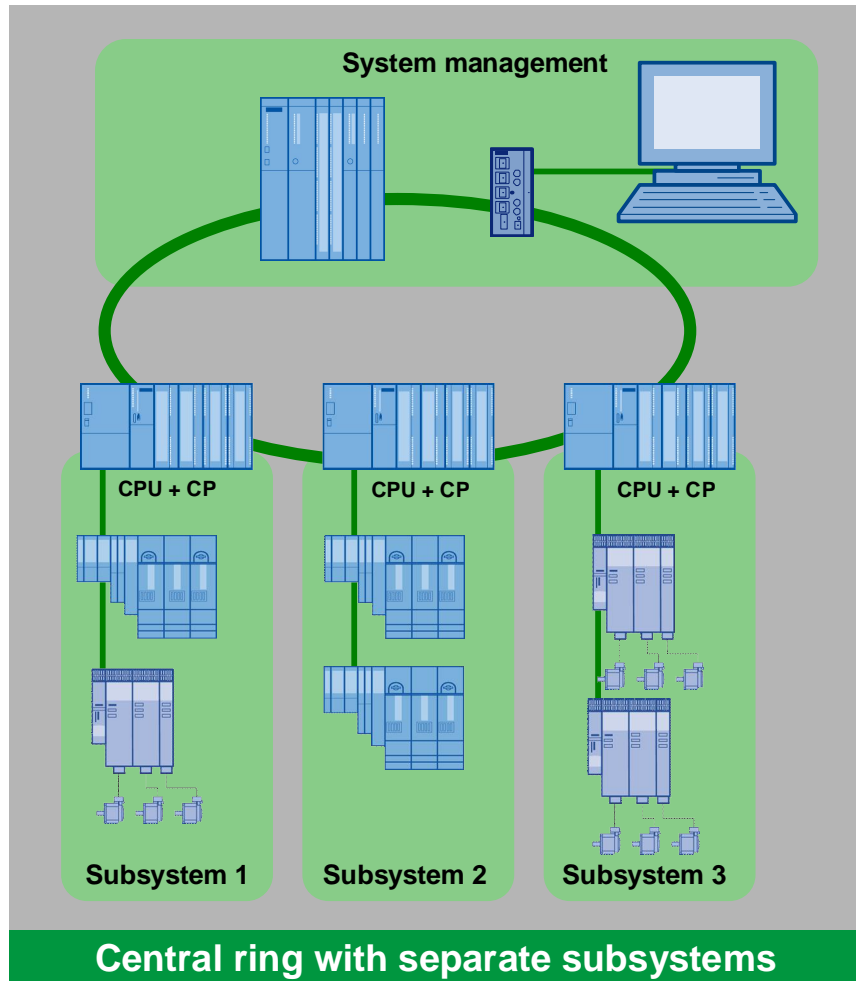
Automation Structure – higher availability with Fieldbus integration

9



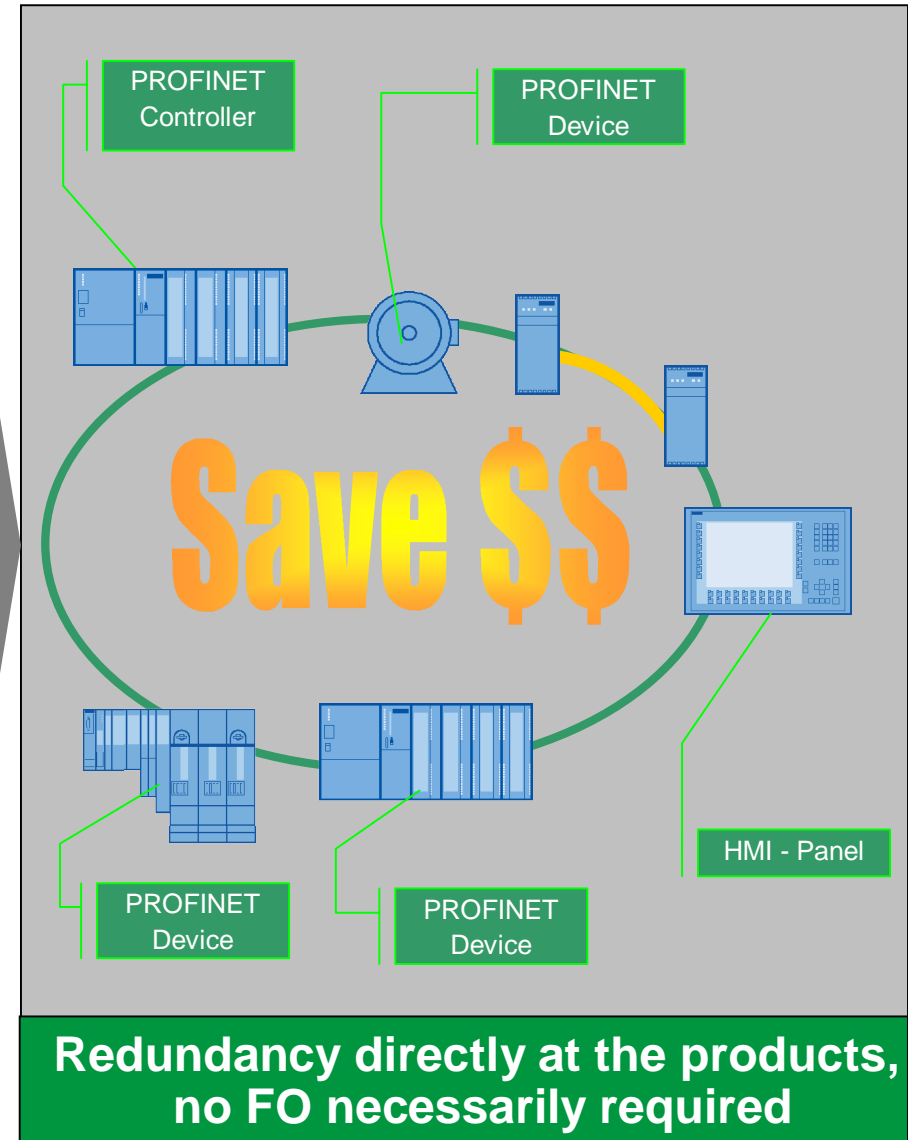
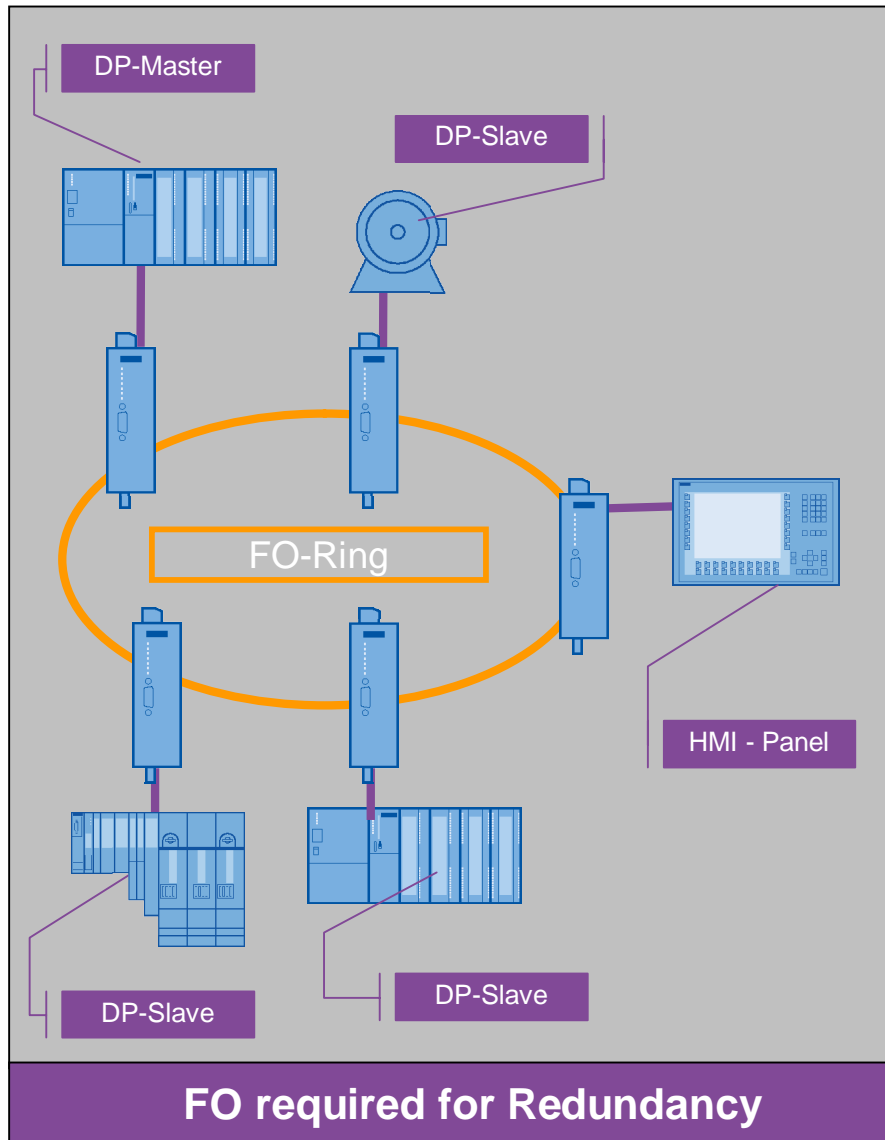
Even Redundant structures without a switch!

10



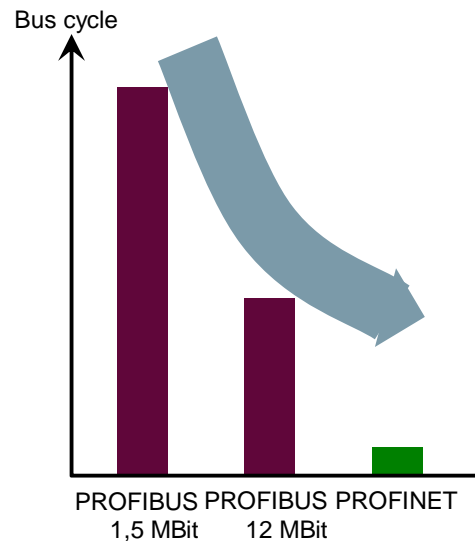
Comparison with PROFIBUS Solution

11



System comparison

12

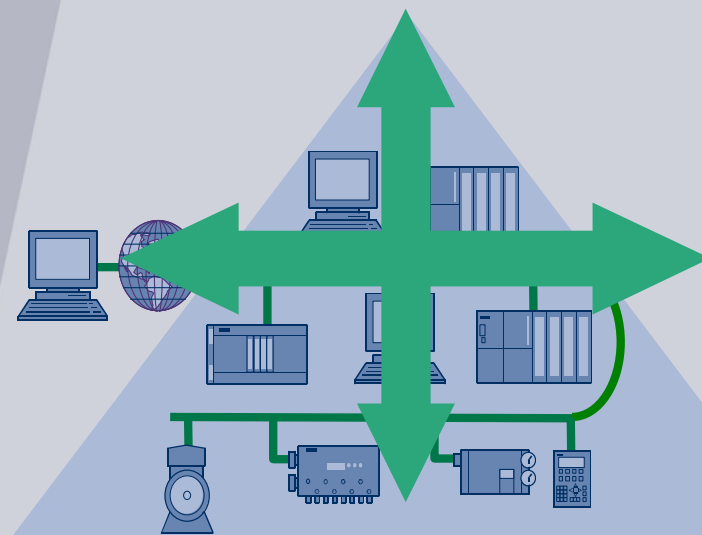


	PROFIBUS	PROFINET
Transmission Speed	12MBit/s	100MBit/s 1000MBit/s Backbone
Cycle time	Min. 300µs	Min. 31,25µs
Number of devices on ONE Controller	125 limited	256 (with CPUs) 128 (with CPs)
IO Data	244 Byte	1440 Byte

- Higher performance
- Devices with more IO-Data
- fast Parameterization / Diagnostic
- reduce interfaces and components.
- Higher quantity of devices, no limitation in the device number on a Ethernet network.

**PROFINET
offers ...**

**... more
continuity
(uniform
structures)**



In communication

PROFINET is Standard Ethernet

14

Introduction

Uniform
structures

Performance

Integration

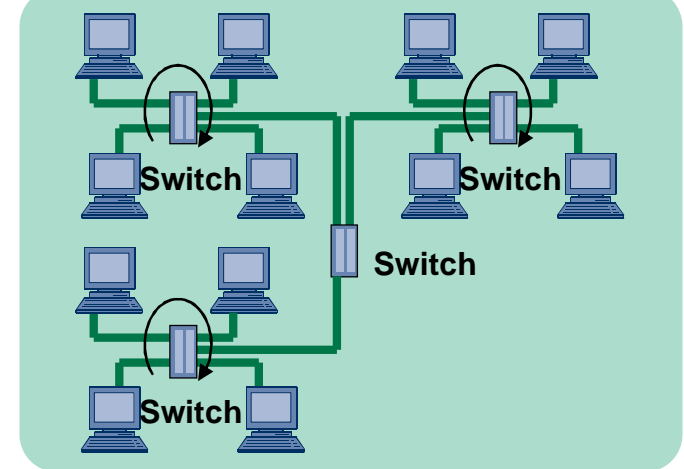
Innovations

Enhancement

Switching technology

- Simultaneous sending/receiving
- Parallel communications paths
- Unlimited number of devices
- Ultra short response times
- 1,440 bytes per frame
- Intelligent Network device

Parallel communications



PROFINET – innovative and future-proof

PROFINET is Real-time Ethernet

15

Introduction

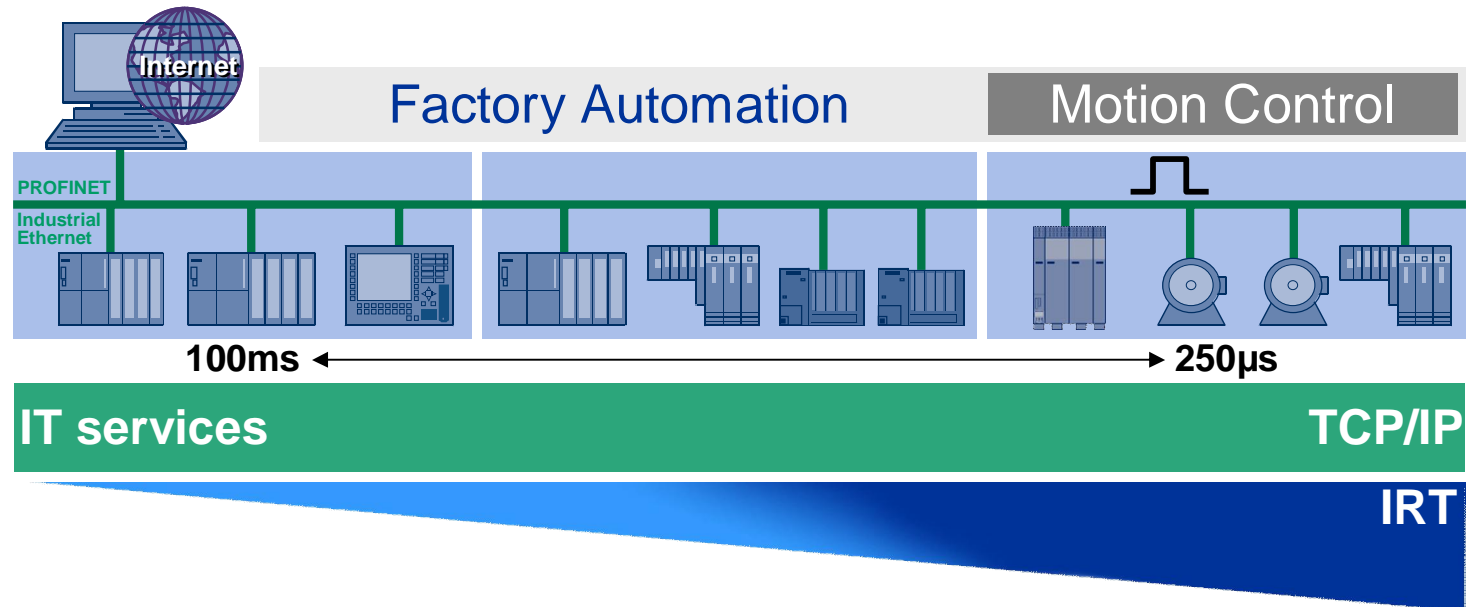
Uniform
structures

Performance

Integration

Innovations

Enhancement



Enables all this...

- ... direct online access to field devices
- ... maintenance and service from anywhere (even remote)
- ... lower costs for production/quality data monitoring

**Scalable Real-time for simultaneous,
unlimited IT communications**

PROFINET communications

16

Introduction

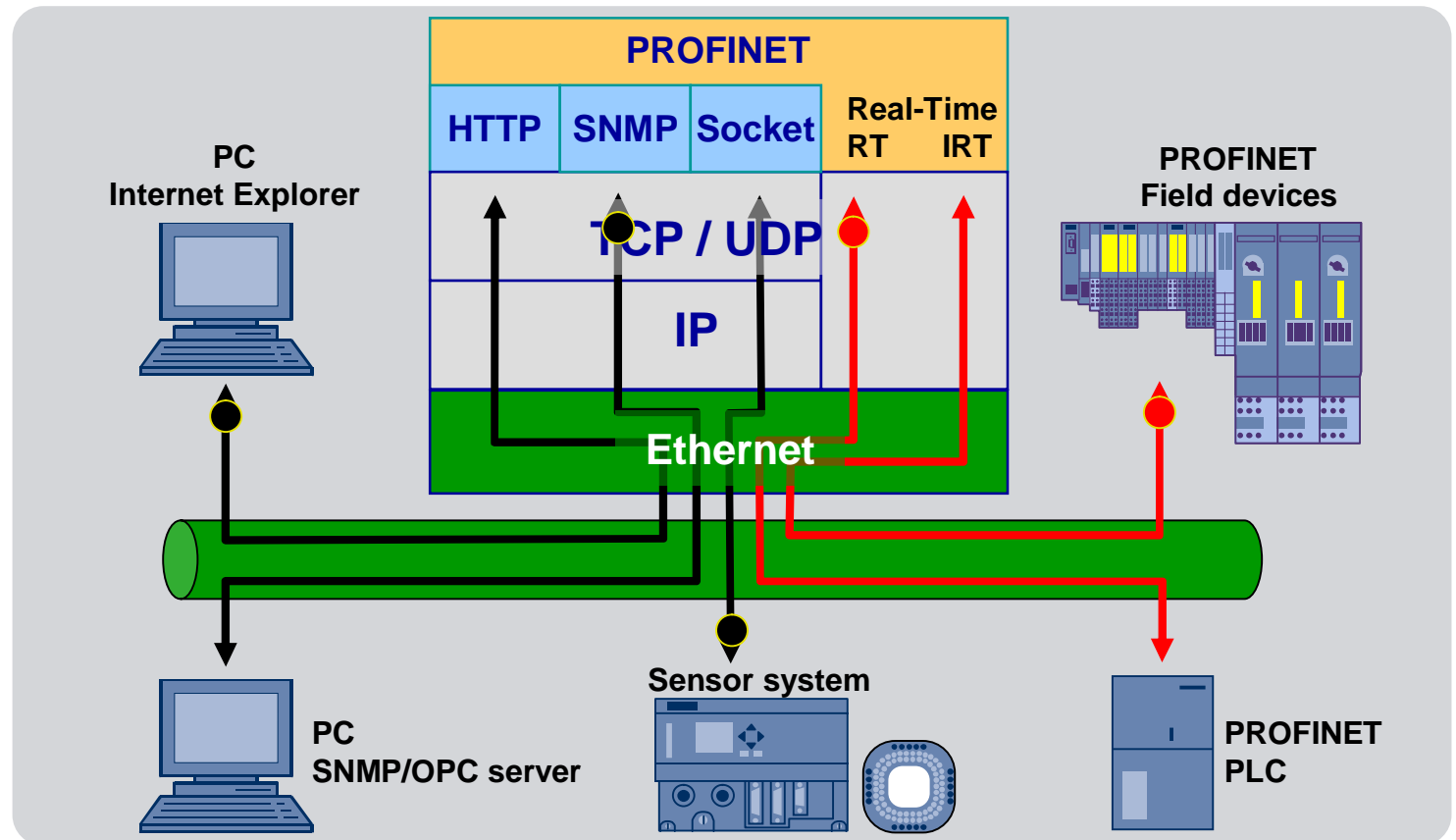
Uniform
structures

Performance

Integration

Innovations

Enhancement



PROFINET features standard TCP/IP communications in compliance with IEEE 802.3 and real-time communications

Field busses

17

Introduction

Uniform
structures

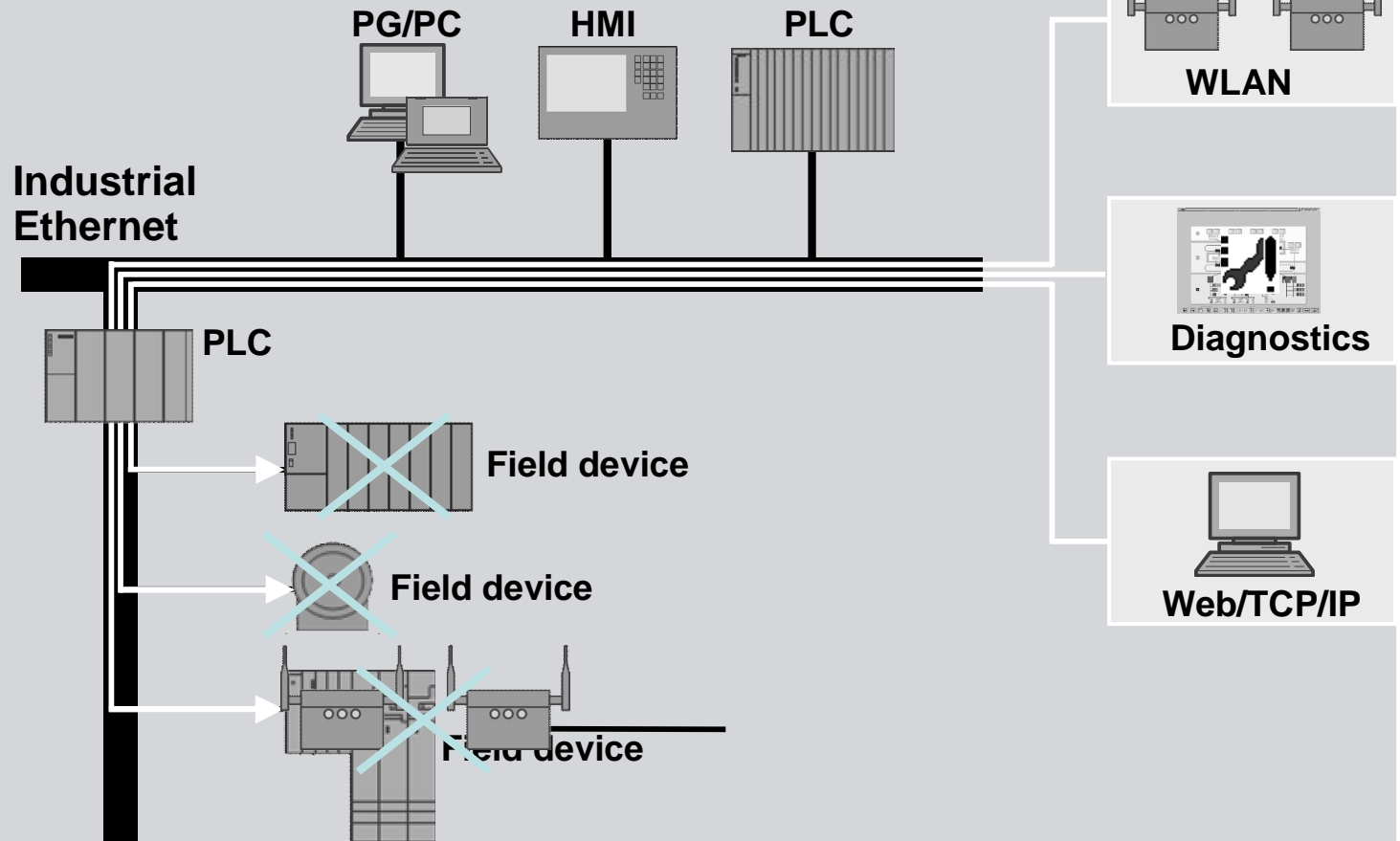
Performance

Integration

Innovations

Enhancement

Conventional automation topologies with fieldbuses
such as EtherCAT, Ethernet Powerlink, PROFIBUS, Interbus and other



PROFINET – use one bus for all your tasks!

18

Introduction

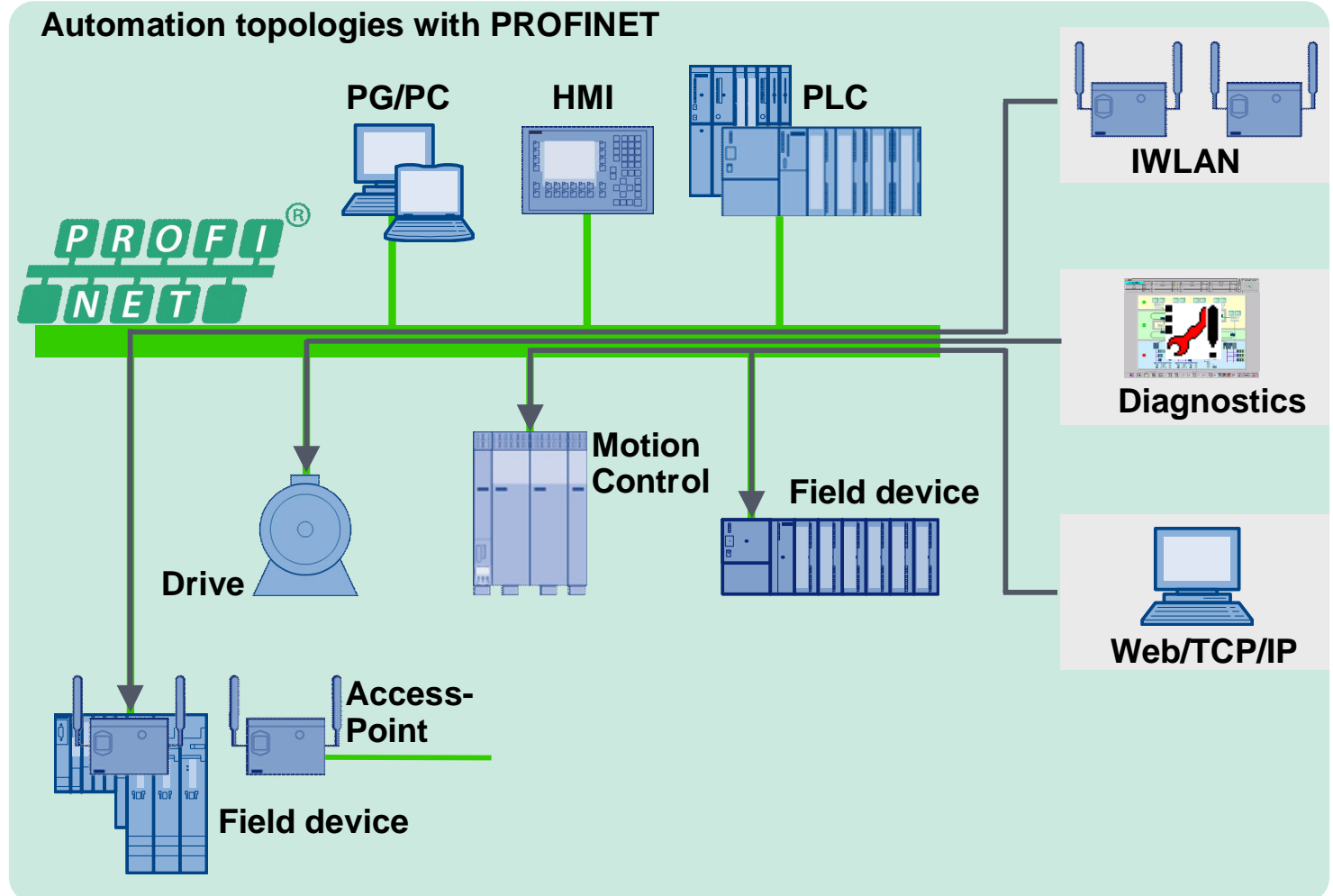
Uniform
structures

Performance

Integration

Innovations

Enhancement



Introduction

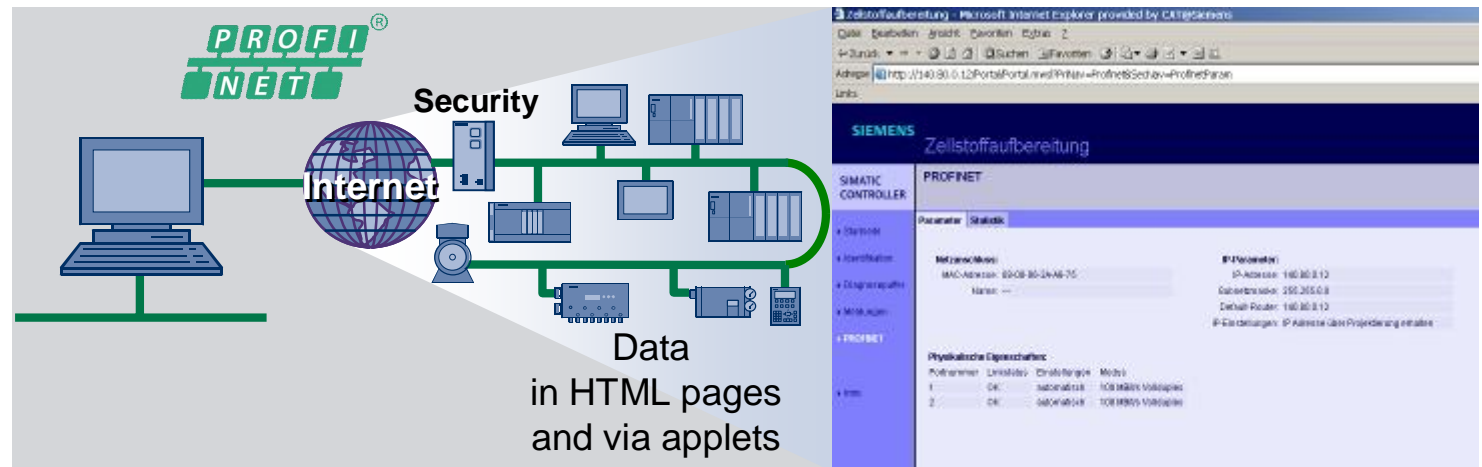
Uniform
structures

Performance

Integration

Innovations

Enhancement



Access to the automation from anywhere in the world

- Via the integrated web server in automation devices
- With a standard Internet browser
- Regardless of your engineering tool
- Easy remote diagnosis and services

Event-driven message dispatched by SMS or e-mail

PROFINET - innovative communications via TCP/IP and the Internet for automation applications, too!

Security with PROFINET

20

Introduction

Uniform
structures

Performance

Integration

Innovations

Enhancement

Offers protection from

- Address errors and improper operation
- Unauthorized access
- Manipulation and espionage

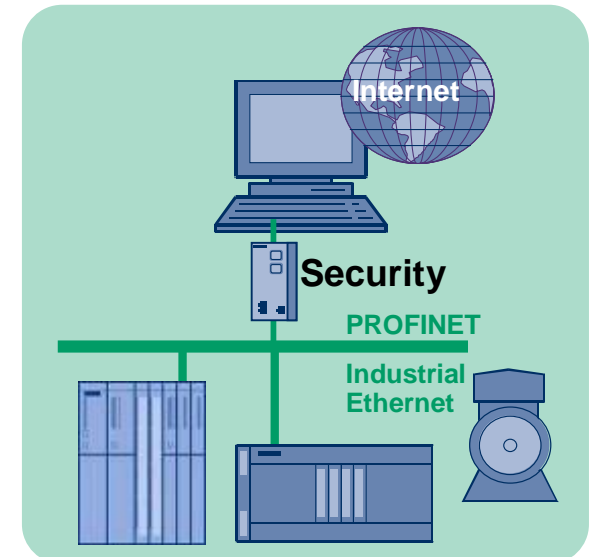
Features

- Scalability and reaction-free installation
- Only basic IT knowledge required
- Proven and certified security standards (firewall, VPN)

Enables

- Use of Ethernet at all levels of automation
- Vertical networking
- Increased use of open IT standards in automation

**Boost security and performance
in your production processes!**



PROFINET – Flexible network topologies

21

Introduction

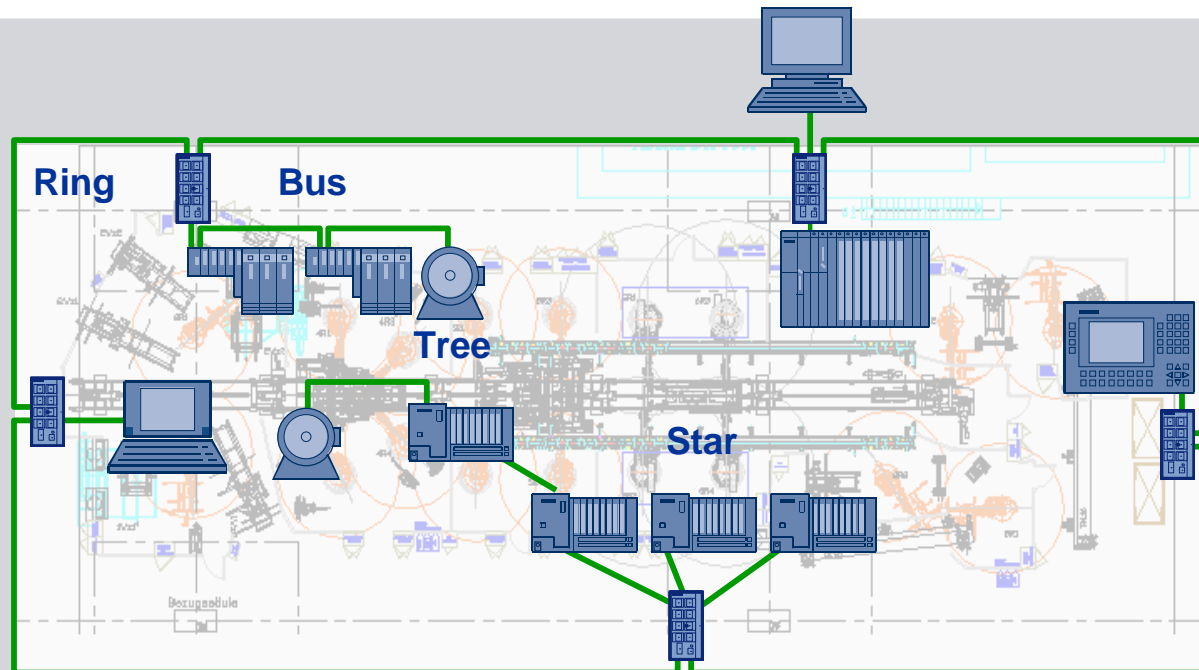
Uniform
structures

Performance

Integration

Innovations

Enhancement



Benefits and added value for our customers

- Bus structure through integration of switch ports in devices
- Tree and star topologies for tree'd configurations
- Redundant rings with reconfiguration in real time

**Cost reduction and
more flexibility**

High availability

PROFINET – use one bus for all your tasks!!

22

Introduction

Uniform
structures

Performance

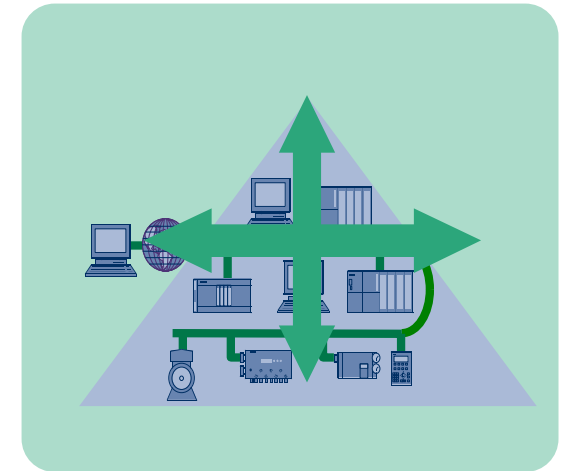
Integration

Innovations

Enhancement

Benefits and added value for customers

- Connect any automation device to any point
- All automation applications run via just one cable; Real-time and TCP/IP
- Standard and failsafe automation via one cable – or even wireless



Summary

Flexibility and cost reduction for engineering, installation and maintenance

Configuration – like PROFIBUS

23

Introduction
Uniform
structures
Performance
Integration
Innovations
Enhancement

HW Config - [Controller (Configuration) -- PNIO_Multivendor]

Station Edit Insert PLC View Options Window Help

PROFIBUS(1): DP master system (1)

ABB-AC500-PLC4.project* - ABB Configurator

File Edit View Project Tools Window Help

Devices

PC WorX

Read PROFINET

Selected PROFINET IO Controller

Name: ILC-370-pn3.quickstart.de IP Address: 192.168.0.2

Device Type: ILC 370 PN 2TX-IB Subnet Mask: 255.255.255.0

Default Gateway:

Available on Network:

Name	Type	MAC Address	IP Address	Subnet Mask
ilb-dio6	IO-Dev.: ILB PN 24 DI16 DO16-2TX	00:A0:45:04:04:34	0.0.0.0	0.0.0.0
fl-switch-mcs-16x5	IO-Dev.: FL SWITCH MCS 16TX	00:A0:45:02:9D:21	192.168.0.6	255.255.255.0
fl-sk4	IO-Dev.: FL IL 24 BK PN PAC	00:A0:45:05:2A:3F	0.0.0.0	0.0.0.0
fl-pn-bis3	IO-Dev.: FL PN/IBS	00:A0:45:05:09:34	0.0.0.0	0.0.0.0

Filter: ☐ unnamed ☐ not in Project

Flashing On Insert Refresh

4 PROFINET devices reachable on the network!

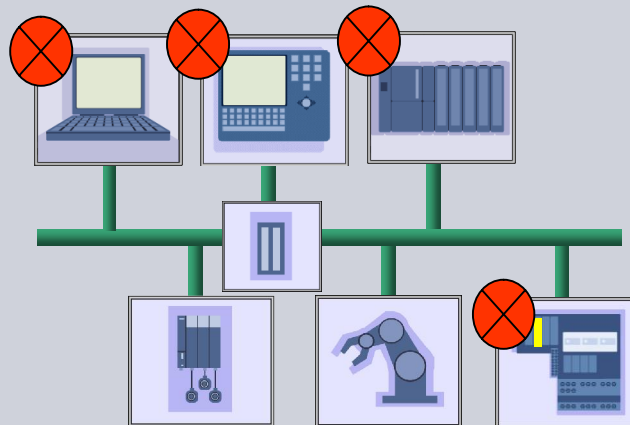
Help Close

Copy
Cut
Delete
Paste
Plug Device...
Add Device...
Update Device...
Insert Device...

PROFINET Marketing - Benefits

**PROFINET
offers ...**

**... more
continuity
(uniform
structures)**



For diagnostic

Requirements for diagnostics

25

Introduction

Uniform
structures

Performance

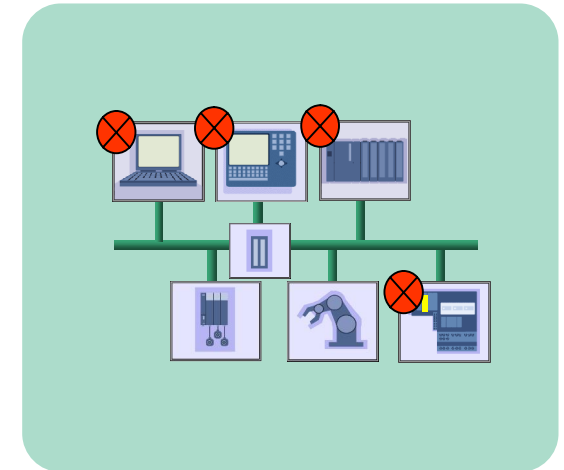
Integration

Innovations

Enhancement

You want...

- Access to your data from anywhere
- To localize faults quickly
- Fault messages in plain text and foreign languages
- Comprehensive diagnostics down to the channel, even across gateways
- To use common IT standards
- A graphical overview of the real topology
- Preventative diagnostics and maintenance



**Goal: Fast commissioning and increase in
plant availability**

Simple by integrated naming

26

Introduction

Uniform
structures

Performance

Integration

Innovations

Enhancement

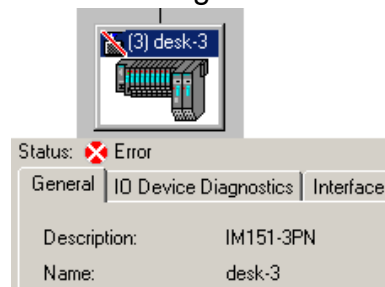
Comprehensible names of devices

- well defined names for the addressing are also used for diagnostic information, e. g. „desk-3“

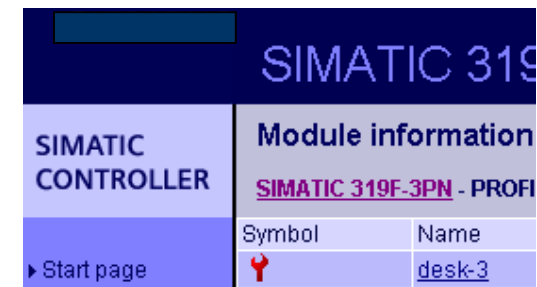
Offline-Engineering



Online-Diagnostics

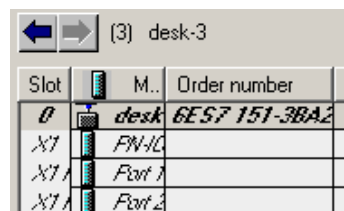


Web-View



Consequent support also of the connectors/wiring naming

Offline-Engineering

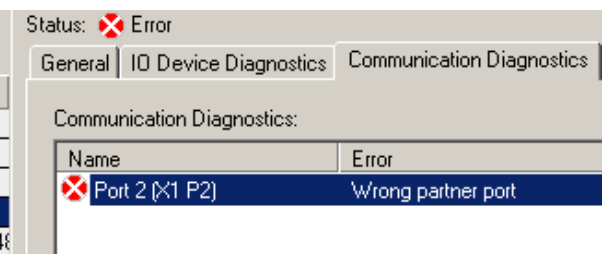


Device-Housing



X1 P2

Online-Diagnostics



Error prevention

Clear identification of the fault location

Fast repair

Topology view

27

Introduction

Uniform
structures

Performance

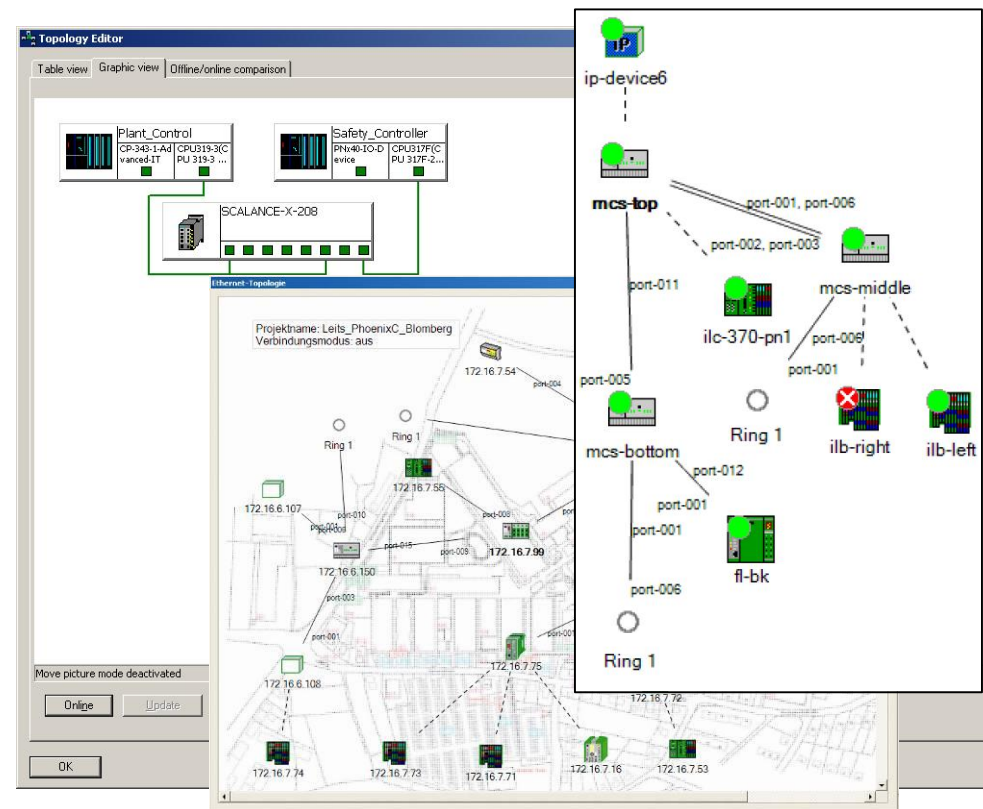
Integration

Innovations

Enhancement

Engineering view in addition to the actual plant
structure

- graphical
- tabular
- offline
- online
- integrated in
 - Engineering
 - Controller



Clear plant overview, documentation
Fast fault location
Fast access to detailed diagnostics

Presentation of diagnostics and parameter settings

Introduction

Uniform
structures

Performance

Integration

Innovations

Enhancement

Statistics Packet Size

Port	64	65-127	128-255	256-511	512-1023	1024-1518
1	75	16606584	68	8	4	-
2	-	-	-	-	-	-
3	-	-	-	-	-	-
4	-	5518402	30	6	-	-
5	-	5512938	13	4	-	-
6	-	5518048	12	3	-	-
7	153	4887	175	49	13	-
8	3	309	35	676	-	-
All	231	33161168	333	746	17	-

Simple access
Regardless of location, even wireless
No engineering

Introduction

Uniform
structures

Performance

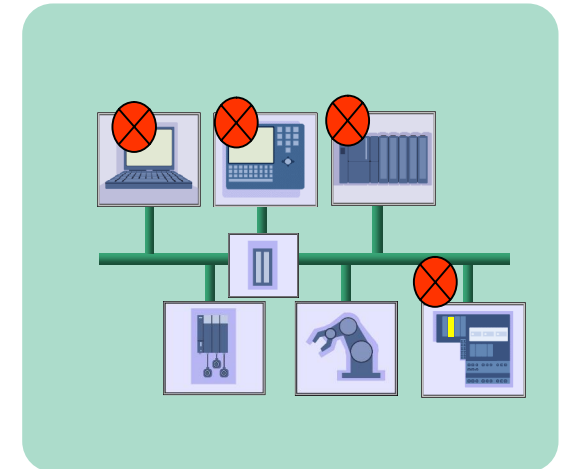
Integration

Innovations

Enhancement

Added value for our customers

- Fast engineering
- High plant availability
- Cuts costs of configuration and commissioning
- Diagnostic information worldwide
- Fast localization of faults
- Transparency in the network
- Automatic documentation
- Preventative maintenance
- Data available from anywhere

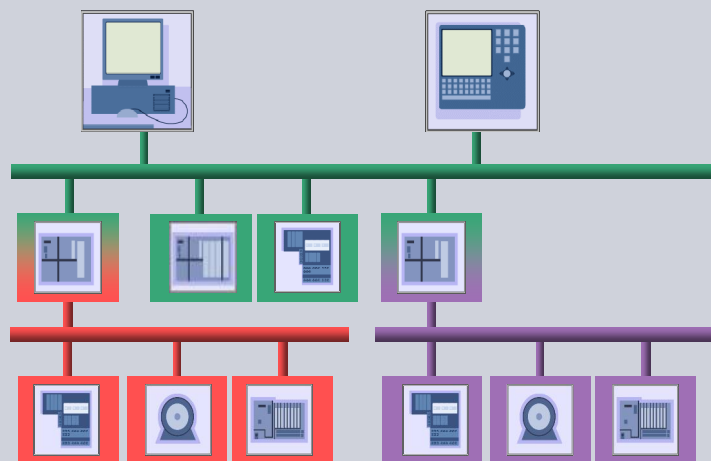


Summary

... Increase of efficiency by fast commissioning and increased plant availability

**PROFINET
offers ...**

**... seamless
integration of
existing
systems**



Such as
components,
fieldbuses and
networks

Requirements for setting up PROFINET

31

Introduction

Uniform
structures

Performance

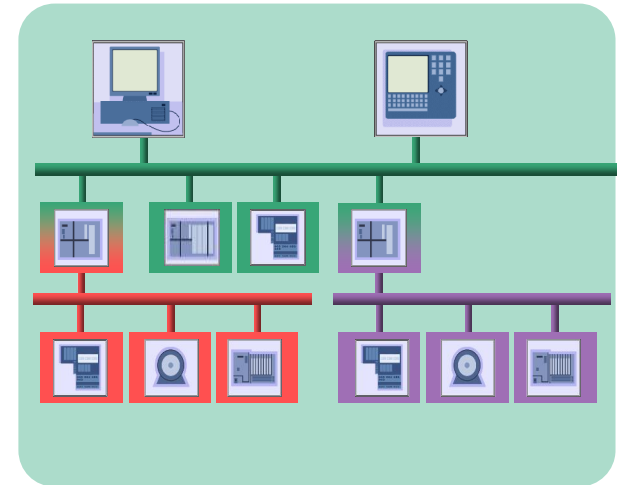
Integration

Innovations

Enhancement

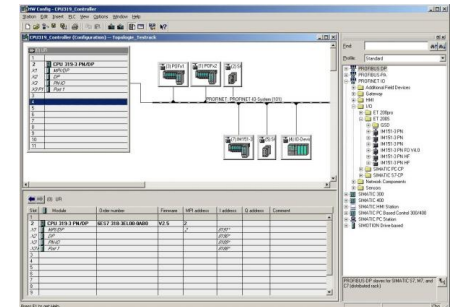
Do you want to...

- Easily integrate existing fieldbus systems?
- Integrate existing Ethernet networks?
- Continue using existing user programs?
- Continue using existing devices?



And ...

- Continue using your existing knowledge and tools without a problem?



Minimizes the time and expense of setting up your system with or migrating to PROFINET

PROFINET has the answer to your requirements

32

Introduction

Uniform
structures

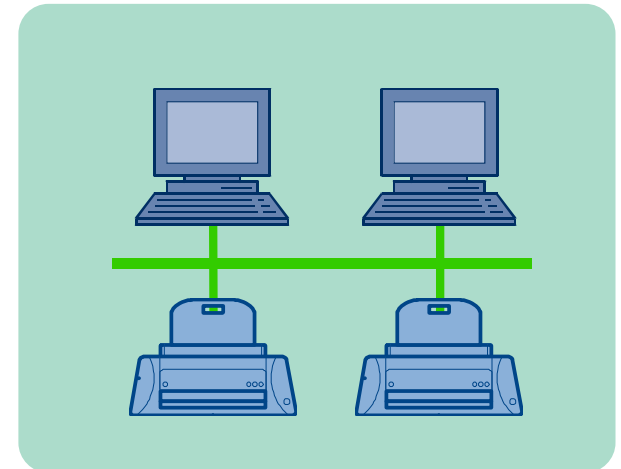
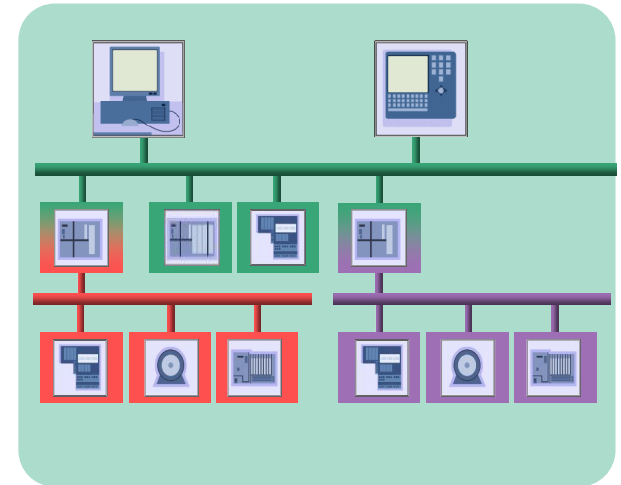
Performance

Integration

Innovations

Enhancement

- Integration of existing fieldbus systems through proxy technology
- PROFINET is standard Ethernet
- Lets you continue using your user programs
- Makes it easy to convert existing devices
- Engineering – with the same look & feel



Easy integration of existing fieldbus systems through proxy functionality

33

Introduction

Uniform structures

Performance

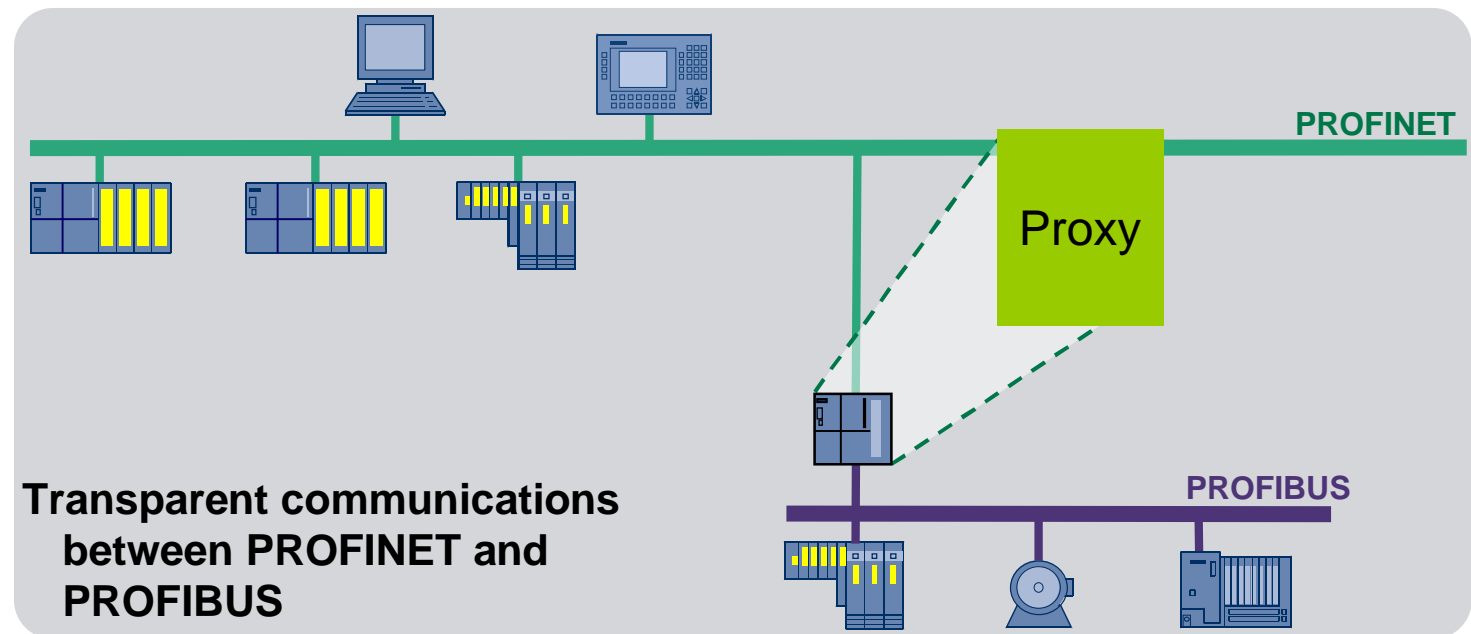
Integration

Innovations

Enhancement

Benefits and added value for our customers

- Including gateways for PROFIBUS, Interbus, AS-Interface and other fieldbuses
- Including controllers with PROFINET and PROFIBUS interface



Protects your investment

Transparent integration without programming

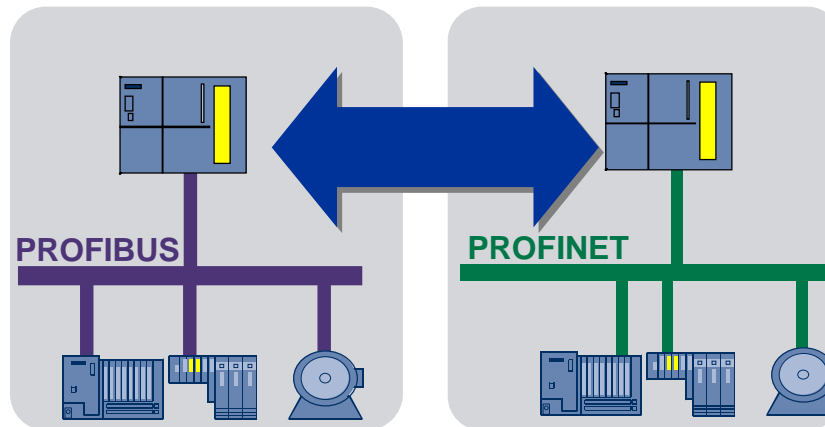
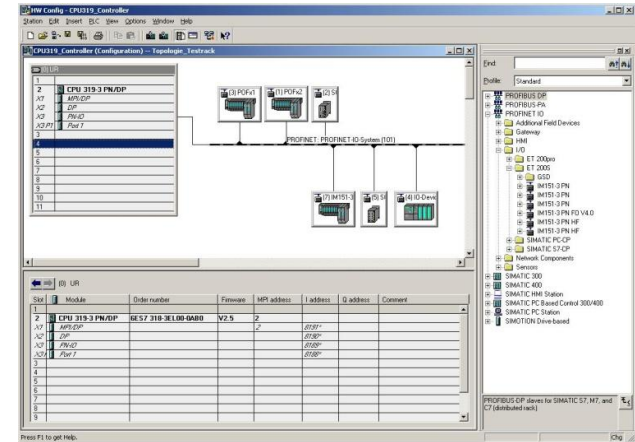
Just continue using your user program with PROFINET ...

34

Introduction
Uniform
structures
Performance
Integration
Innovations
Enhancement

Benefits and added value

- Just reconfigure your hardware...
- ... no reprogramming work necessary
- use the same exact tools with the same look & feel
- same system design for PROFIBUS and PROFINET

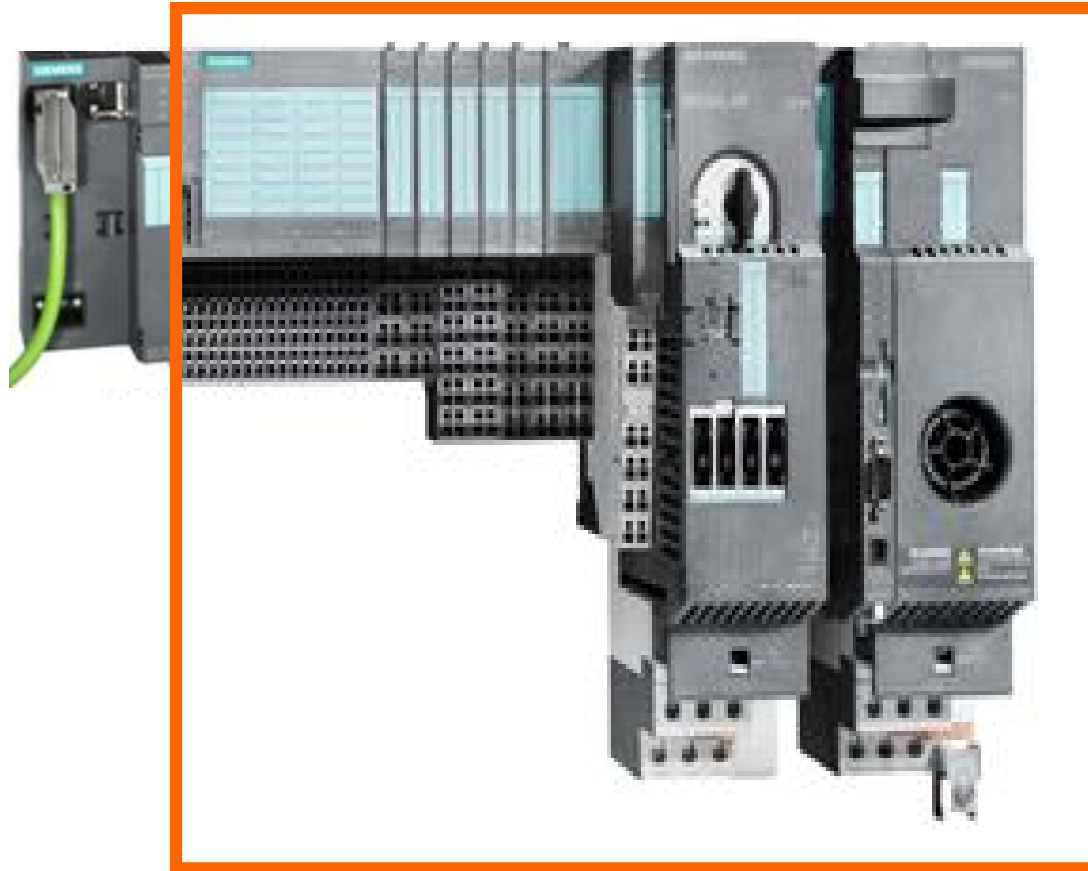


Reduce the time and expense of engineering and testing

From PROFIBUS to PROFINET

35

Introduction
Uniform
structures
Performance
Integration
Innovations
Enhancement



Keep all the IOs only the
Interface Module needs to
be changed!

Advantages to using PROFINET

36

Introduction

Uniform
structures

Performance

Integration

Innovations

Enhancement

Protects your investment

- Seamless integration of existing fieldbuses
- Easy conversion of existing devices
- No additional tools or training needed

Saves costs

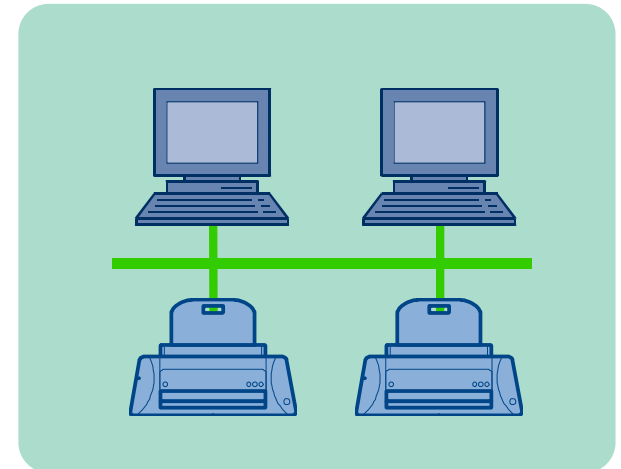
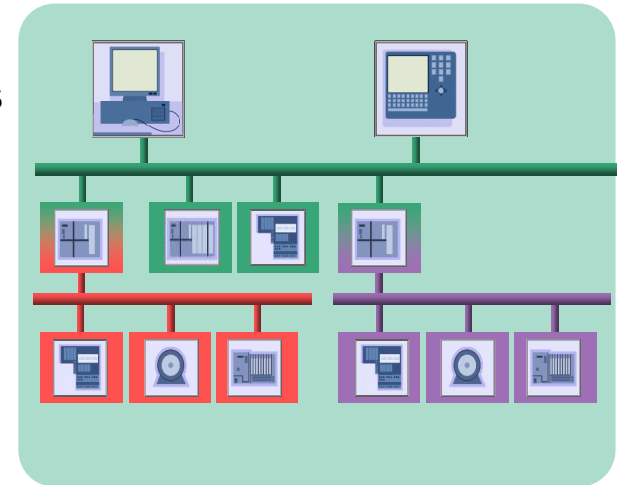
- Uses existing Ethernet networks

Uniformity

- Uniform physical network concept

Saves time

- Reduces engineering and testing time
- Cuts time needed for migration

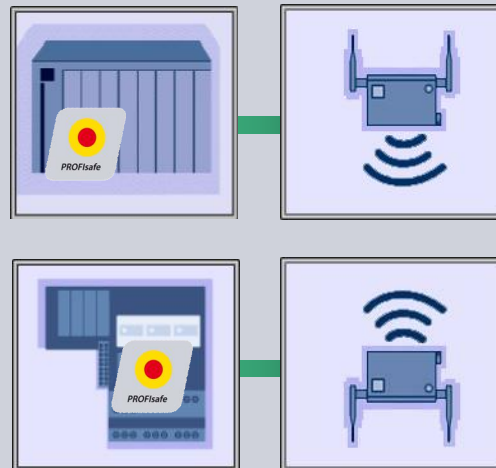


Summary

Minimizes the time and expense of setting up your system with or migrating to PROFINET.

**PROFINET
offers ...**

**... new,
innovative
applications**



With wireless
automation

Does this sound familiar?

38

Introduction

Uniform
structures

Performance

Integration

Innovations

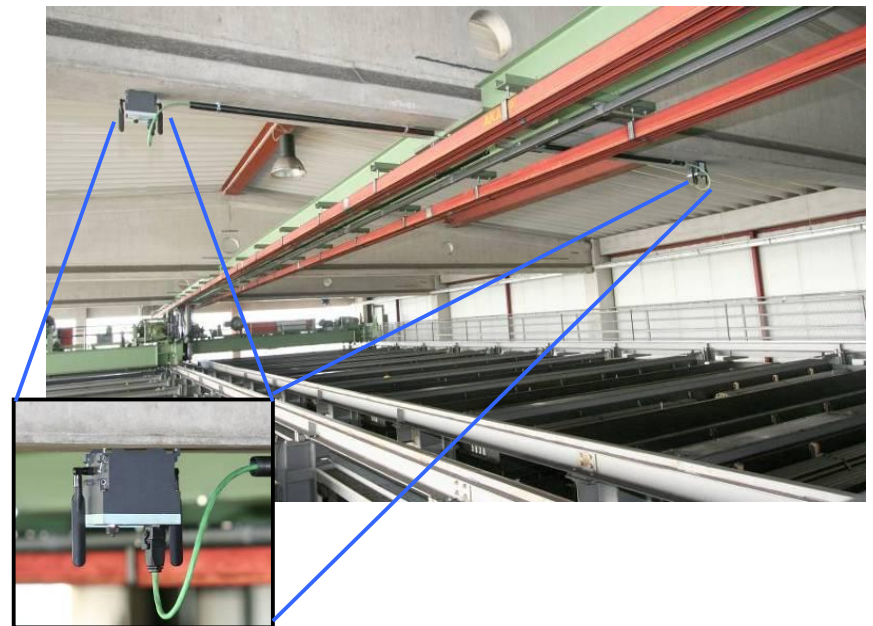
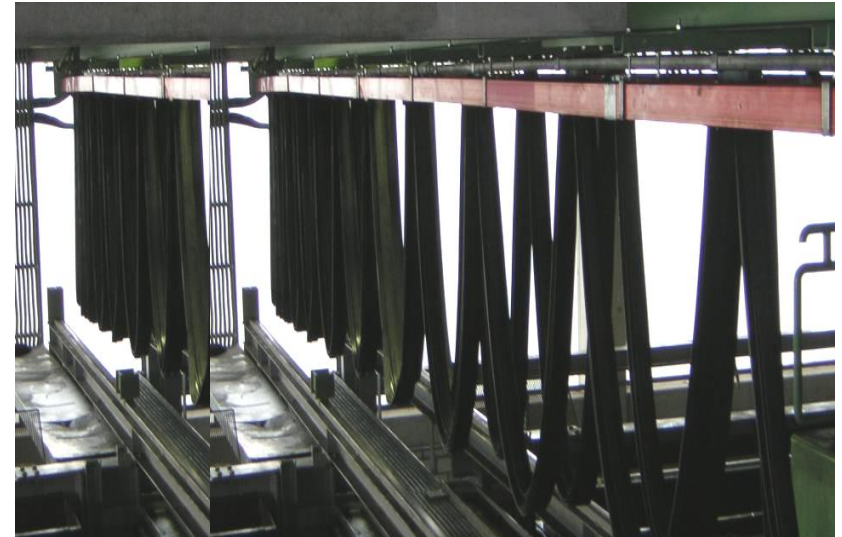
Enhancement

Your constraints...

- Expensive slip rings or slip conductors
- Low flexibility & limited space
- High maintenance costs

Your needs...

- An easy networking solution even for hard-to-reach places
- More space & greater flexibility
- Less maintenance costs



Introduction

Uniform
structures

Performance

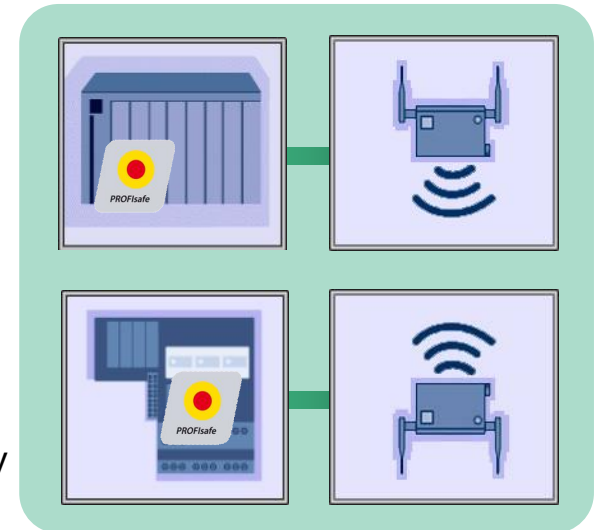
Integration

Innovations

Enhancement

PROFINET based on standard Ethernet

- Wireless communications in compliance with IEEE standard possible
- Industrial WLAN (IEEE 802.11)
 - cyclic and acyclic data transmission
 - Supervision of wireless connection
 - Redundant wireless operation over 2 separate wave bands for raised availability
 - PROFI-safe over WLAN
- Bluetooth (IEEE 802.15.2)
 - Coexistence with WLAN
- Fast commissioning
- Easy diagnostics



Using established standards for innovative applications

**PROFINET
offers ...**

**... new,
innovative
applications**



PROFIsafe

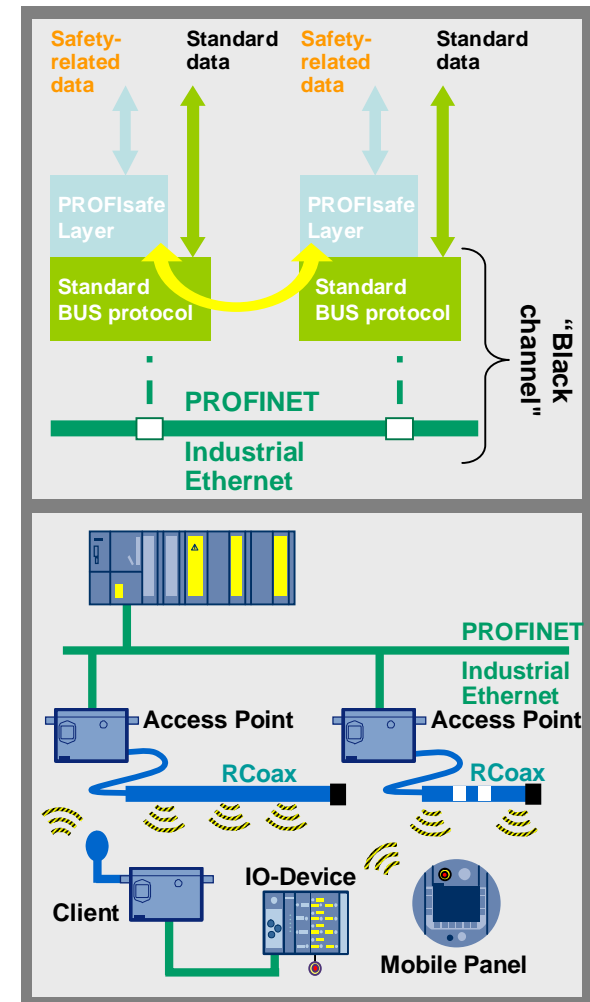
With integrated
safety

Use of the PROFI-safe profile

- Tested and accepted with PROFINET
- Standard and failsafe communications over the same transmission path
- Can be used for stationary and mobile
Emergency Stop function
- Allows the use of extended safety functions by use of dedicated PROFI-safe devices

Even wireless...

**Failsafe and available,
just like hard-wired!**



Safety solutions conforming of standards

42

Agenda



Uniform
structures

Performance

Integration

Innovations

Enhancement

- Using PROFIsafe and PROFINET can satisfy all requirements when it comes to ensuring complete safety for humans, equipment, and the environment.
- First communications standard developed in accordance with safety standard IEC 61508
- Developed to IEC 61784-3-3, PROFIsafe is the international standard
- PROFIsafe handles potential faults (e.g. invalid addresses, delays, data loss) by means of
 - Serial numbering
 - Time monitoring
 - Authenticity monitoring
 - Additional CRC backup
- Evaluated by  BGIA and 
- Drive technology also fits in seamlessly here with the integrated safety functions according to IEC 61800-5-2.



The competition

43

Introduction

Uniform
structures

Performance

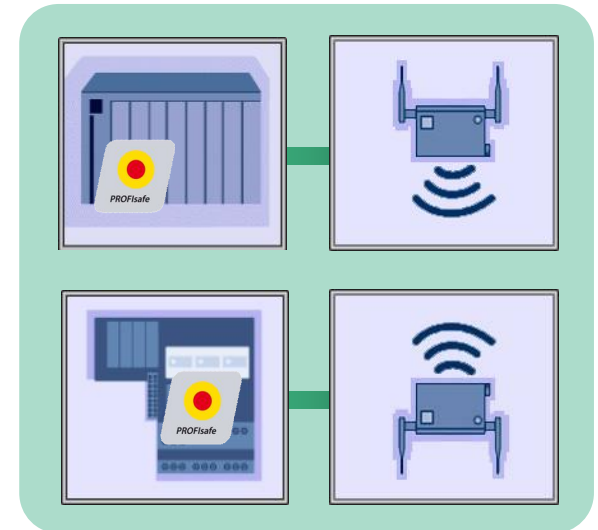
Integration

Innovations

Enhancement

Only with PROFINET...

- Wireless available
- Benchmark for the safety communication in the IEC standards
- Established as open standard
- 10 years experience
- More as 100 000 plants in many branches:
 - Factory
 - Process
 - Train
 - Cable car
 - Fun rides
 - Nuclear
 -



PROFIsafe, the proven and established market leader

Standardized safety technology

44

Introduction

Uniform
structures

Performance

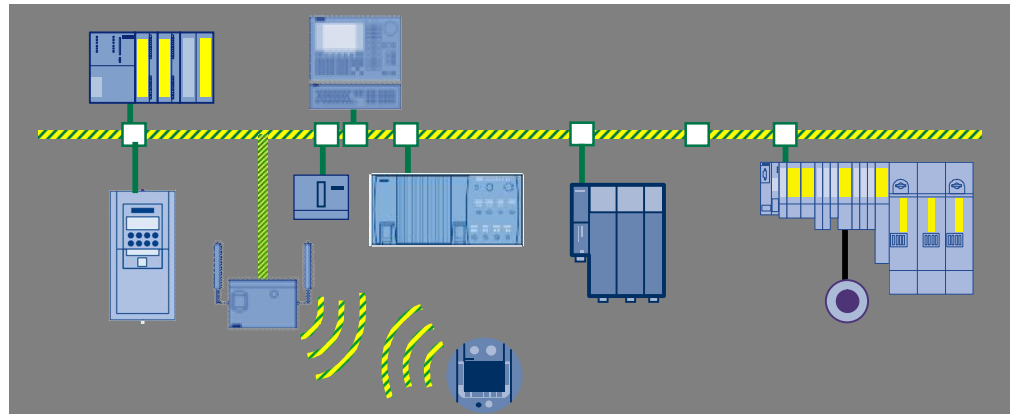
Integration

Innovations

Enhancement

Safety for humans and machines

- Safety and standard data over one connection, within one station
- PROFIsafe via PROFIBUS and PROFINET



Summary

Save space, time and money with PROFIsafe

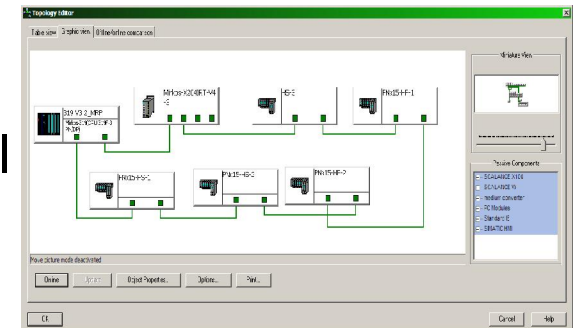
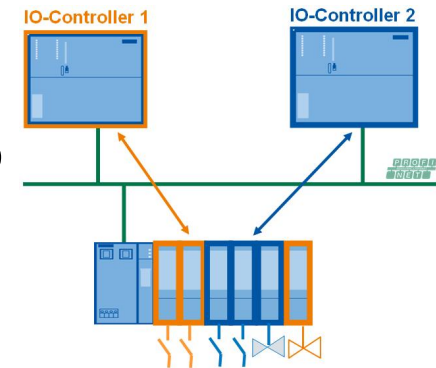


PROFINET can do more...

Introduction
Uniform
structures
Performance
Integration
Innovations
Enhancement

New Functions of PROFINET

- Shared-Device
 - Access from multiple IO-Controllers to one IO-Device
- I-Device (Intelligent Device)
 - Controller as Intelligent IO-Device
- Redundancy
 - MRP – Media Redundancy Protocol
- Web on Controller
 - Userdefined Web Pages
- IRT and Clocksynchronisation



MRP – Media Redundancy Protocol

47

Introduction
Uniform
structures
Performance
Integration
Innovations
Enhancement

- IEC 61158-5-10
- Edition 1.0 2007-12

**INTERNATIONAL
Standard**

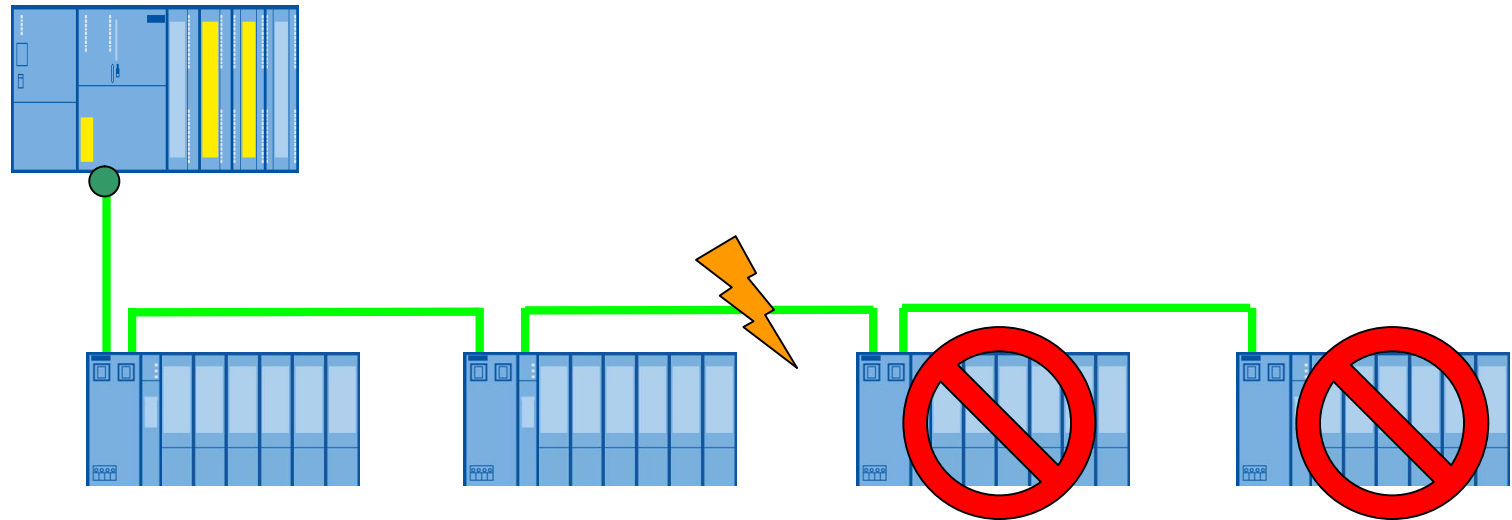


- Based on ring topology.
- Max. number (50) of ring nodes
 - PN IO controller
 - PN IO devices
 - Network infrastructure components (switches)
- Configuration and Diagnostic in Engineering
- Reconfiguration time 200ms

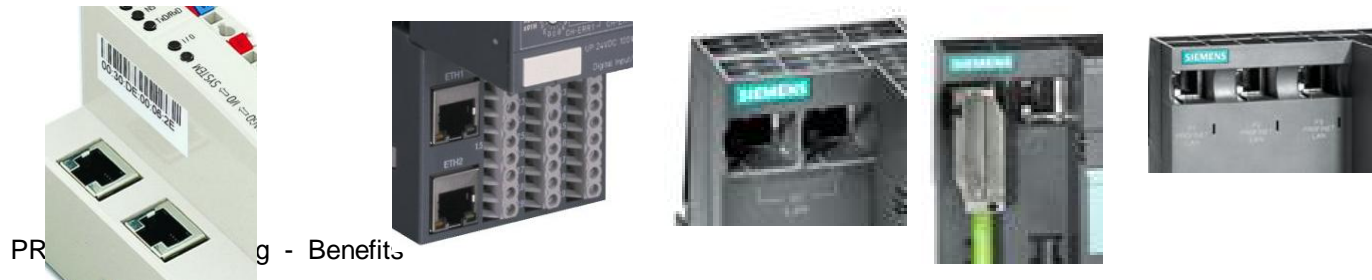
Today's configuration possibility

48

Introduction
Uniform
structures
Performance
Integration
Innovations
Enhancement



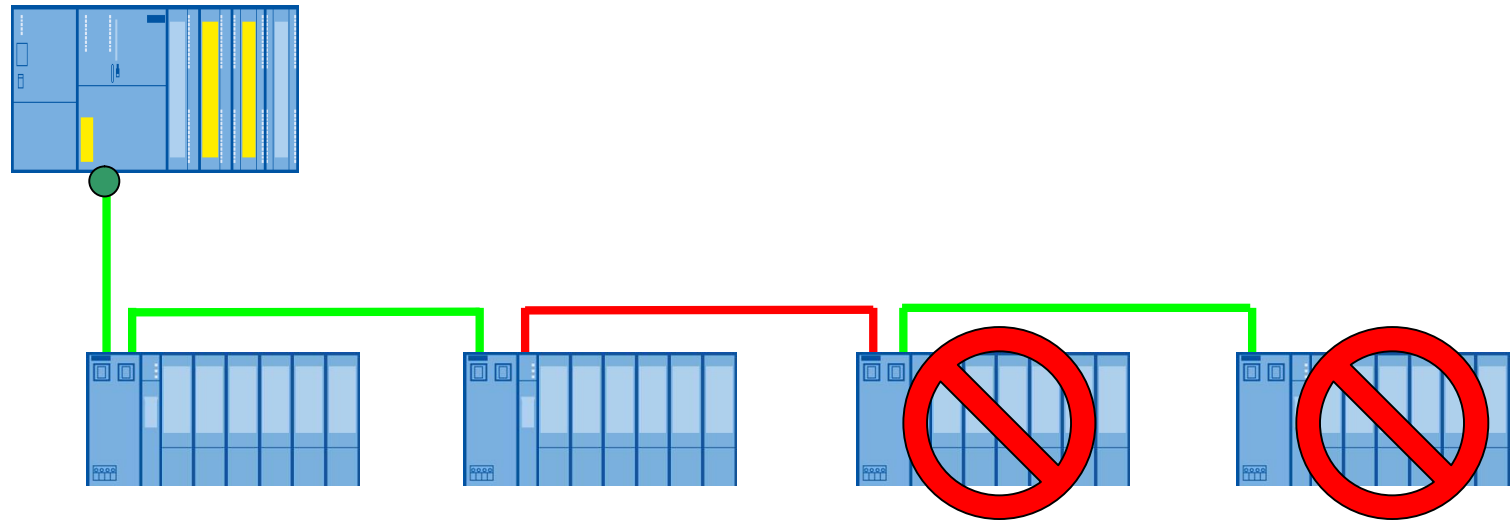
Most of PROFINET Devices are equipped with a built in Switch on Board! Line Structure is possible!



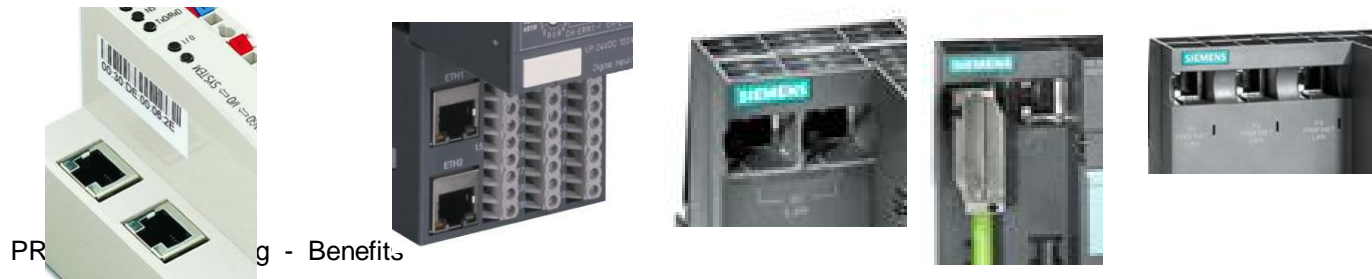
Today's configuration possibility

49

Introduction
Uniform
structures
Performance
Integration
Innovations
Enhancement



Most of PROFINET Devices are equipped with a built in Switch on Board! Line Structure is possible!

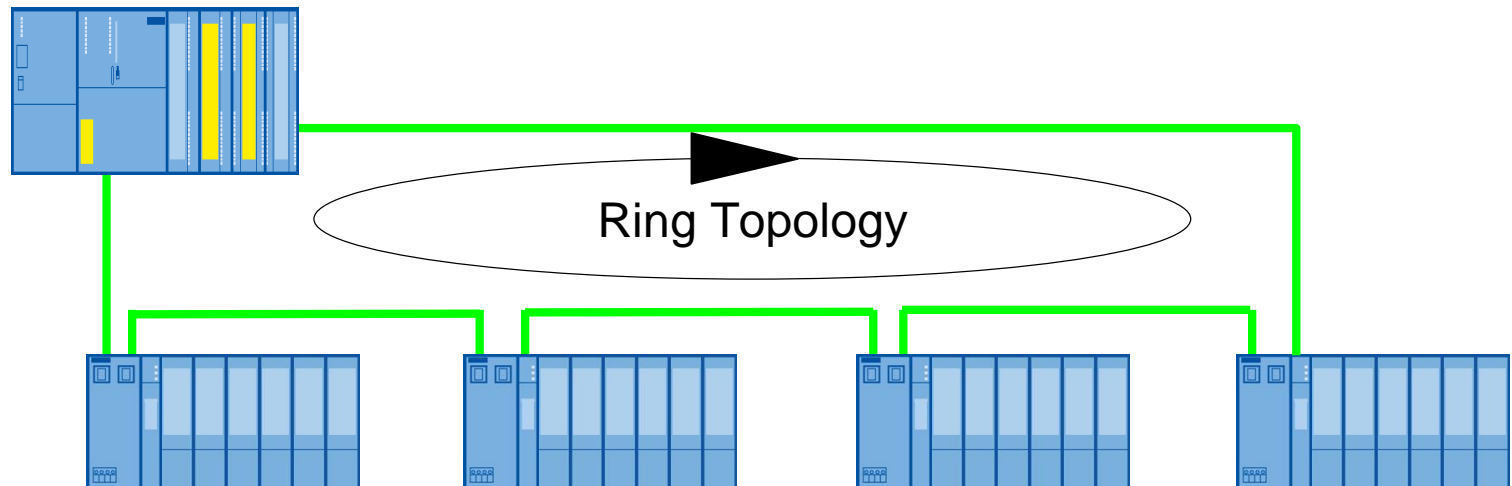


PROFINET - Benefits

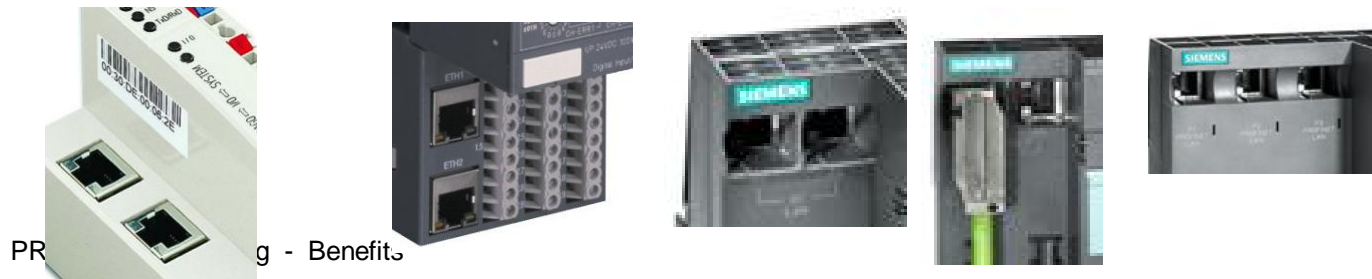
Now MRP comes in....

50

Introduction
Uniform
structures
Performance
Integration
Innovations
Enhancement



No switches needed, the function is implemented into the PROFINET Products!

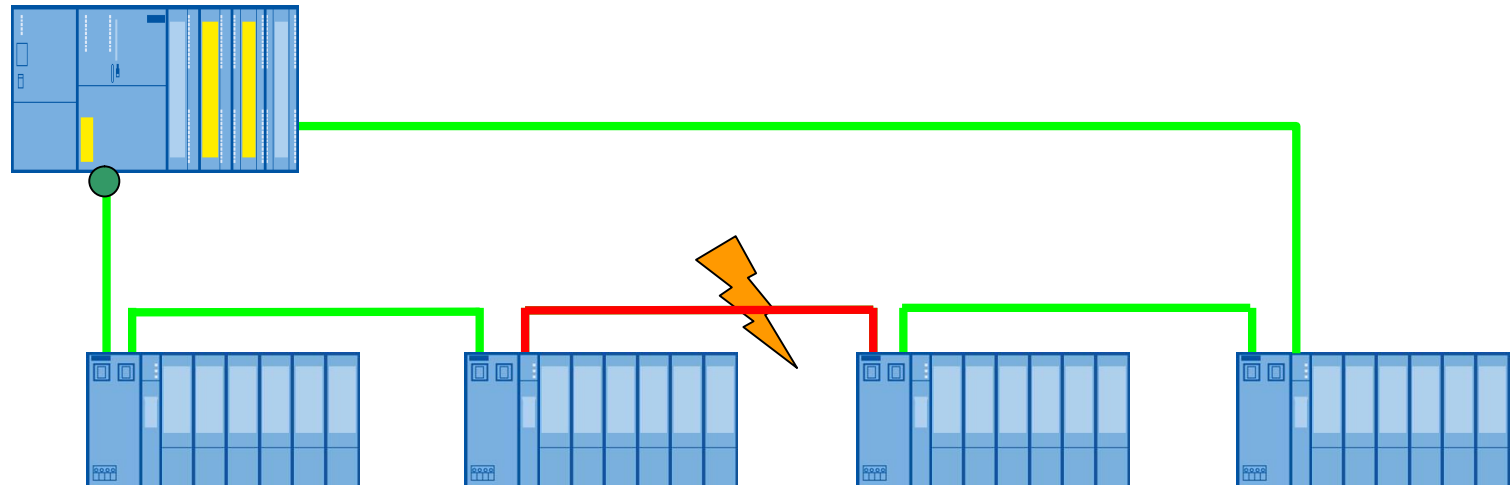


PROFINET - Benefits

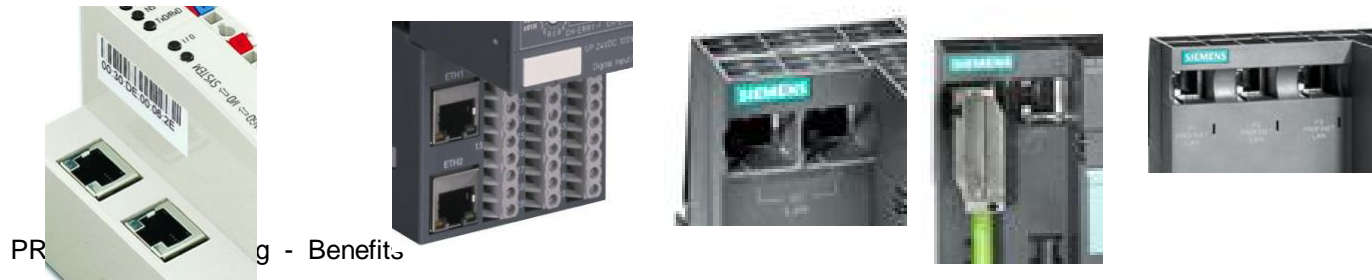
Now MRP comes in....

51

Introduction
Uniform
structures
Performance
Integration
Innovations
Enhancement



Most of PROFINET Devices are equipped with a built in Switch on Board! Line Structure is possible!

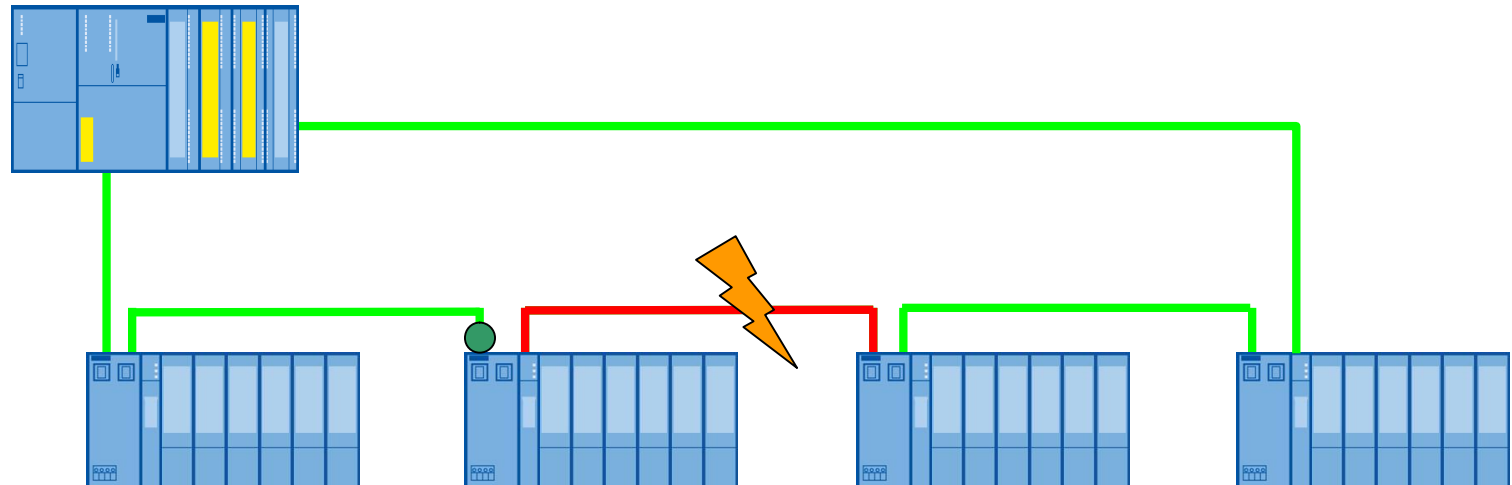


PROFINET - Benefits

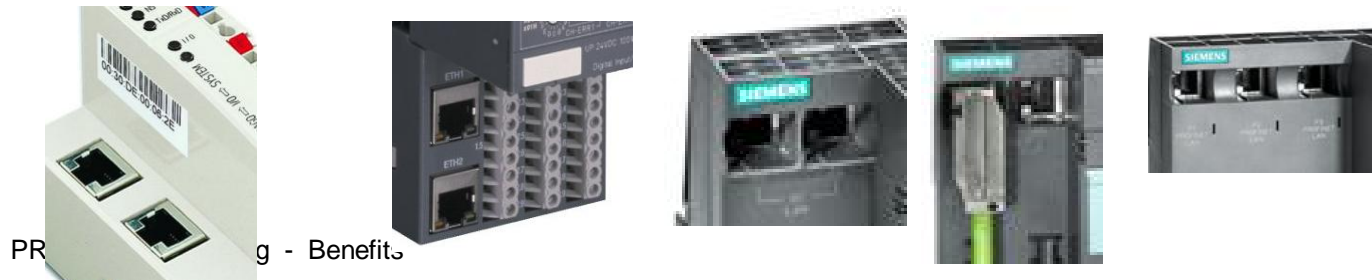
Now MRP comes in....

52

Introduction
Uniform
structures
Performance
Integration
Innovations
Enhancement



Most of PROFINET Devices are equipped with a built in Switch on Board! Line Structure is possible!

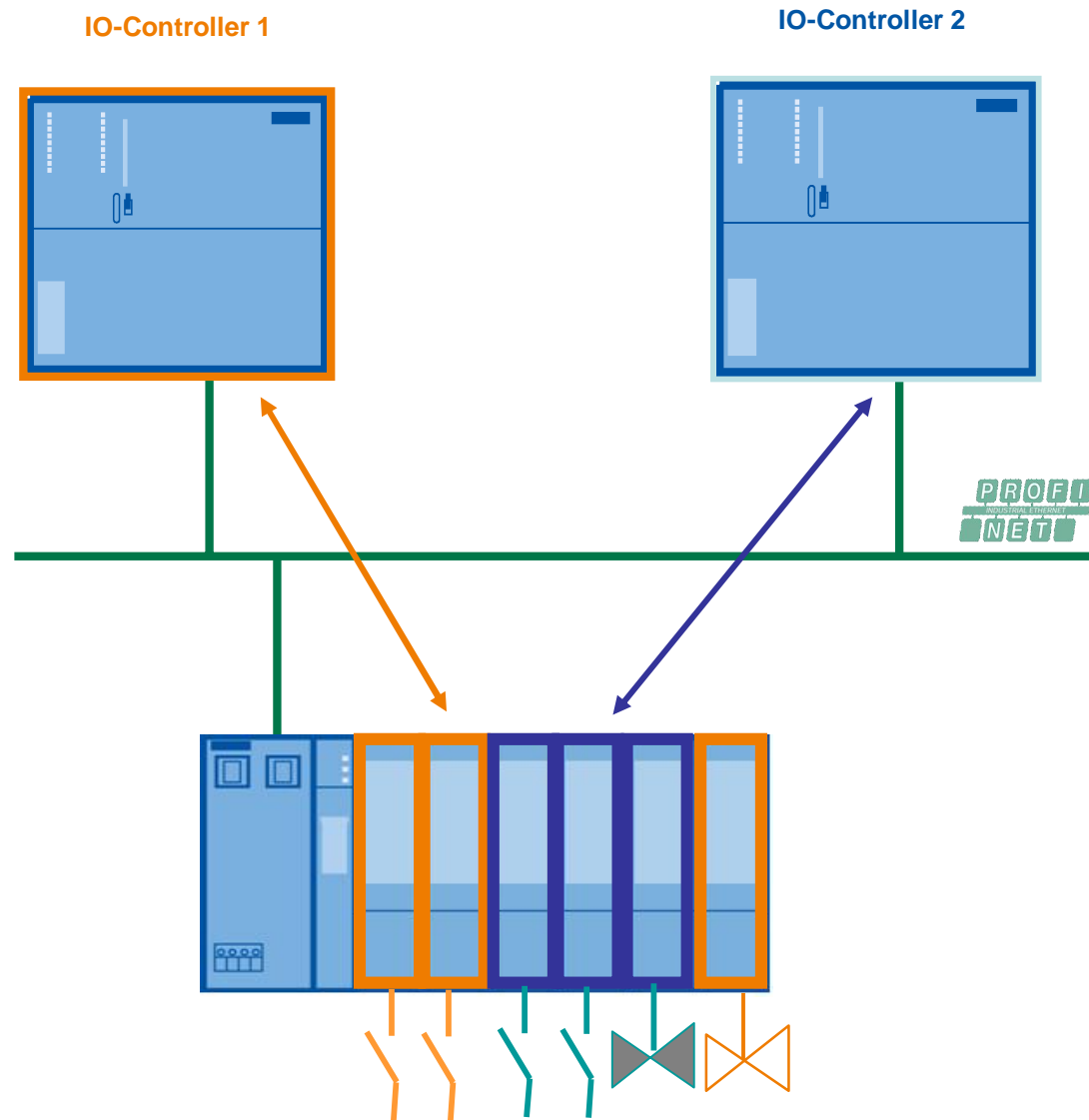


PROFINET - Benefits

Shared Device

53

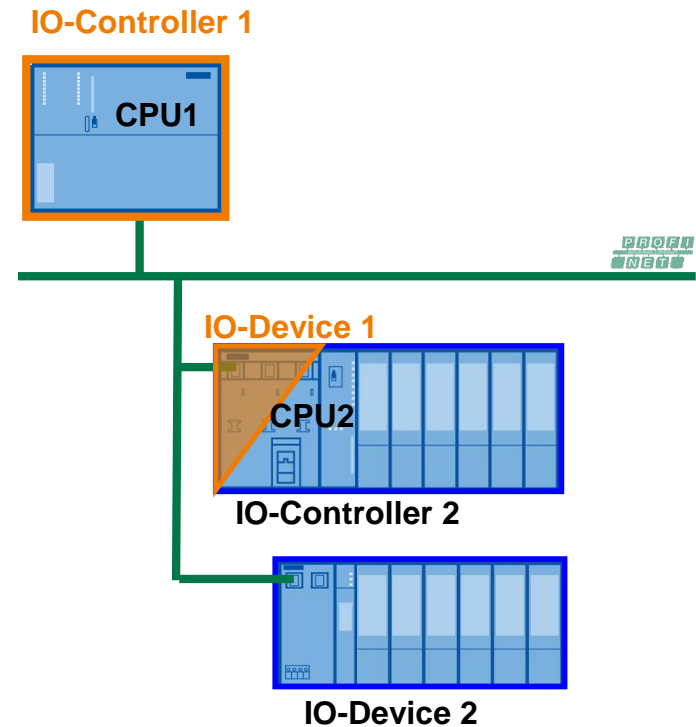
Introduction
Uniform
structures
Performance
Integration
Innovations
Enhancement



PROFINET Marketing - Benefits

Introduction
Uniform
structures
Performance
Integration
Innovations
Enhancement

- IO-Controller and additionally function as IO-Device
- Parallel operation of IO-Controller and IO-Device (I-Device)



I-Device

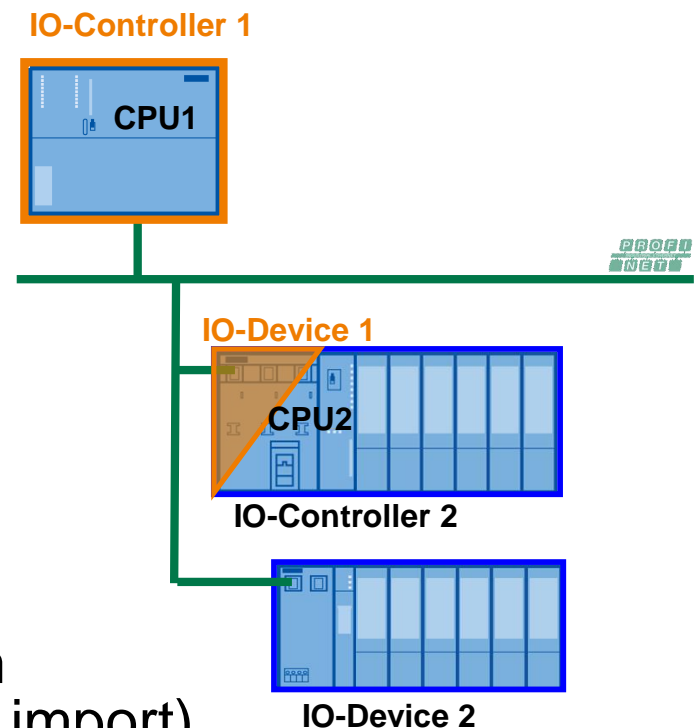
- Simple and known IO-Connections of CPUs
- Connection of CPUs in different Projects
- Connection to third party controller possible
- No PNP-Coupler necessary

Advantage of I-Device

55

Introduction
Uniform
structures
Performance
Integration
Innovations
Enhancement

- Controller and Device function at the same time
- Preprocessor in the I-Device
- Distribute intelligence
- Fast Controller-Controller communication (~1ms with 1440Bytes)
- Easy to use PROFINET Communication between PROFINET-Controller from different Vendors (GSDML import)



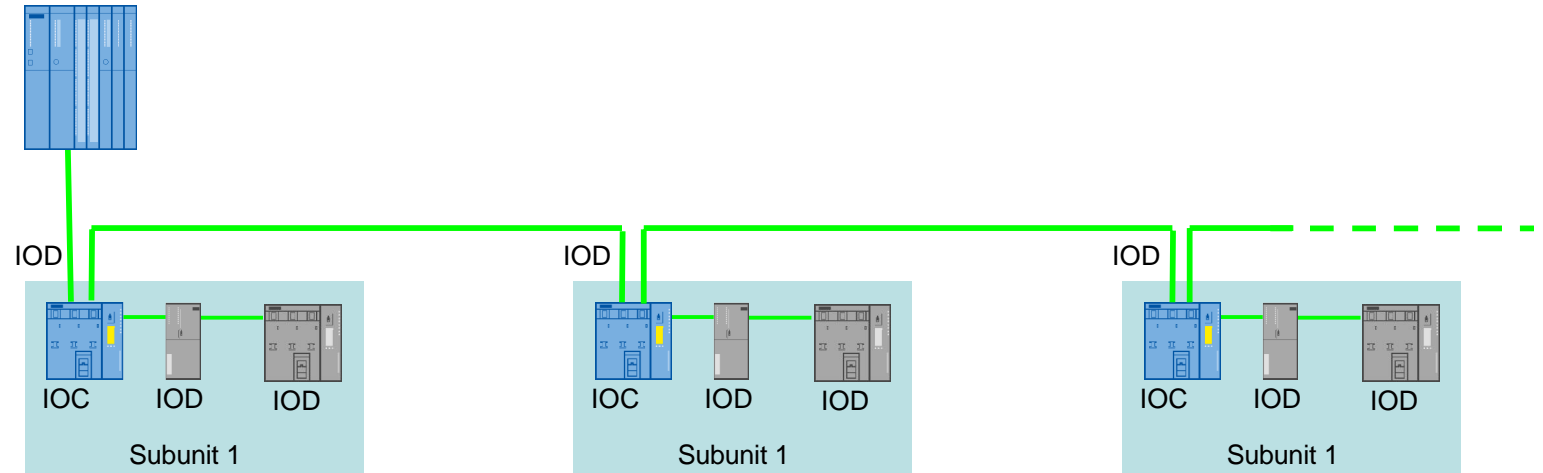
Example: Distributed Intelligence

56

Introduction
Uniform
structures
Performance
Integration
Innovations
Enhancement

- Distributed an local control of the process
 - Spread automation tasks into different levels
- Coordination of Head station in this example S7-400
 - Preprocessor in the Subunits

S7-400 as
Head station
IO-Controller



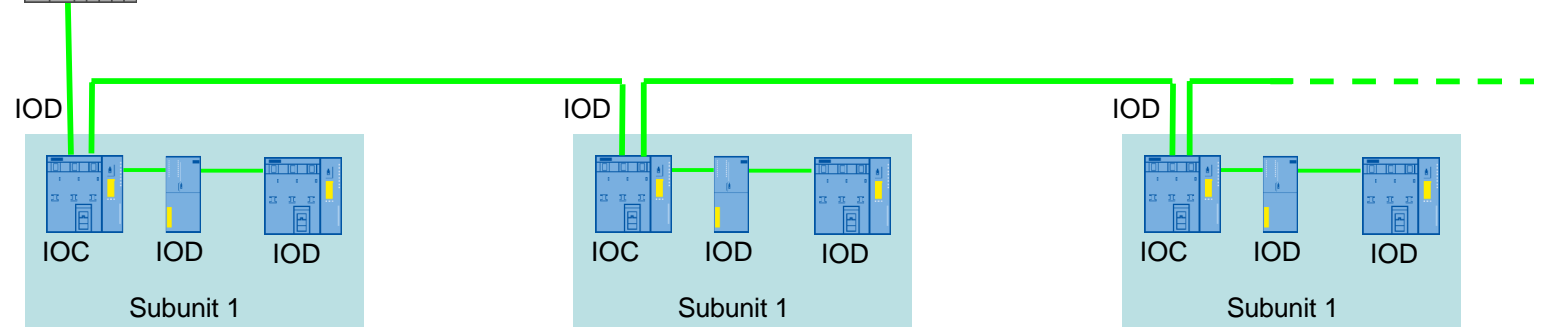
IOD = IO-Device
IOC = IO-Controller
PROFINET Marketing - Benefits

Example: Distributed Intelligence

57

Introduction
Uniform
structures
Performance
Integration
Innovations
Enhancement

S7-400 as
Head station
IO-Controller

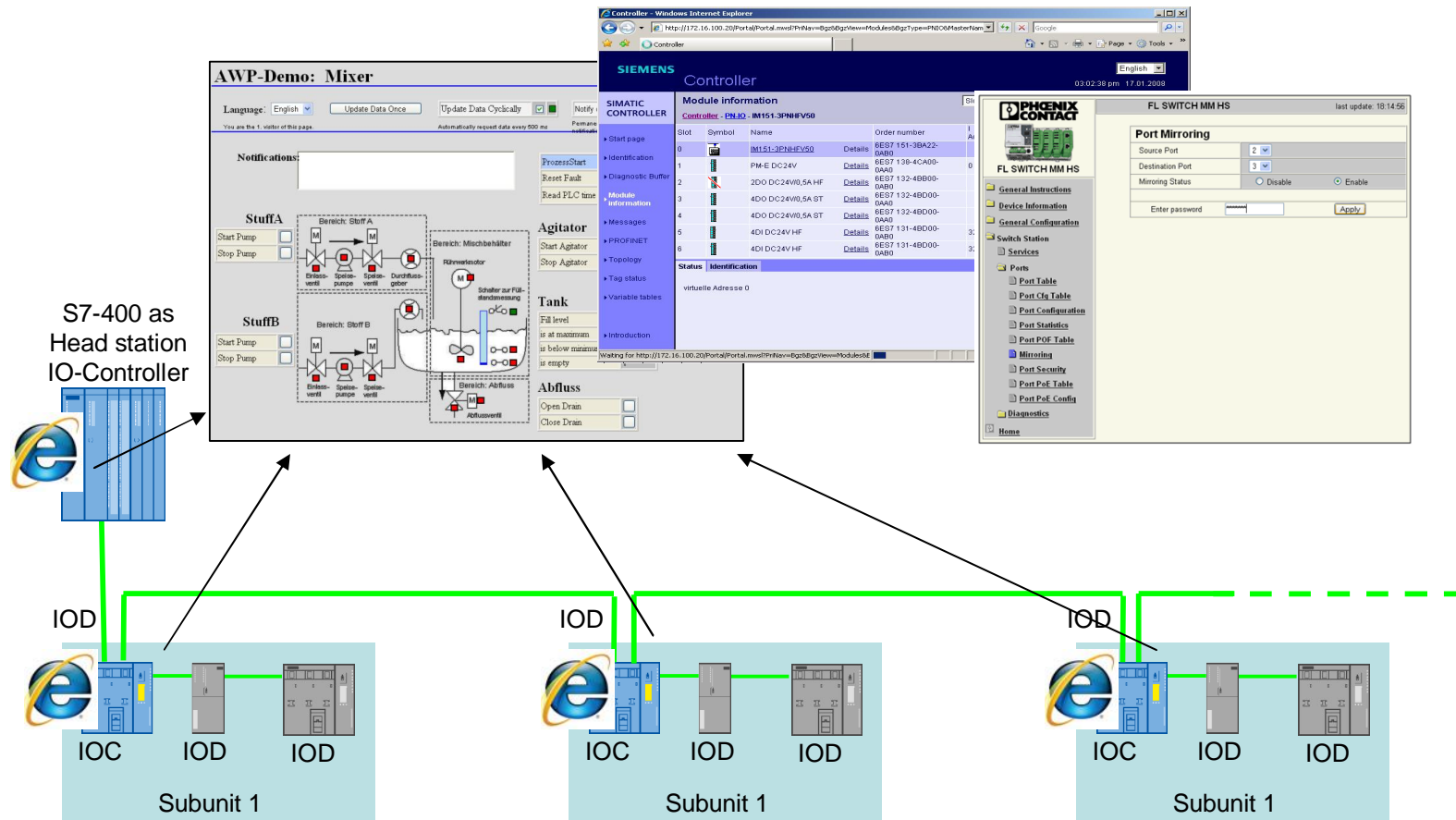


- Every unit can be controlled locally without Head station (example manual mode)

IOD = IO-Device
IOC = IO-Controller
PROFINET Marketing - Benefits

Webdiagnostics and Unser defined WebPages to access Process value

Introduction
Uniform
structures
Performance
Integration
Innovations
Enhancement



Introduction

Uniform
structures

Performance

Integration

Innovations

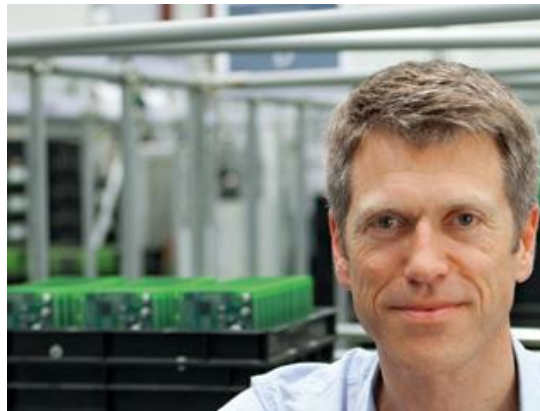
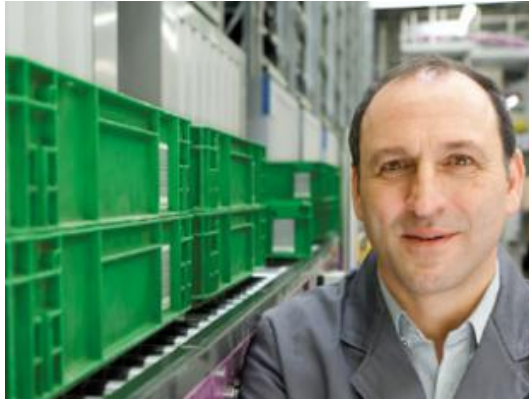
Enhancement

- Unlimited number of devices
- Multimaster
- High network flexibility
- Wireless technology
- No network installation rules except 100m Ethernet (Standard IEEE Regulation)
- High Data quantity, 1440 Bytes In/Out
- Redundancy, I-Device, Shared Device
- Isochronous mode together with IT traffic
- Standard switches with standard cables
- Fieldbus integration with Proxy technology even wireless
- Same look&feel to configure PROFIBUS compared to PROFINET
- Webdiagnostics
- PROFIenergy
- Safety Data on the same network and integrated

Customer Interviews

60

Introduction
Uniform
structures
Performance
Integration
Innovations
Enhancement



Thank you for your attention!

61

PROFIBUS/PROFINET Association South East Asia

Bernd Lieberth (President)

1, Scotts road, #21-07, Shaw Centre

Singapore-228208

E-Mail: southeastasia@profibus.com