PROFINET

The Industrie 4.0 Network

www.siemens.com/profinet

Industrie 4.0

Initiatives around the world focusing on “the Future of Manufacturing”

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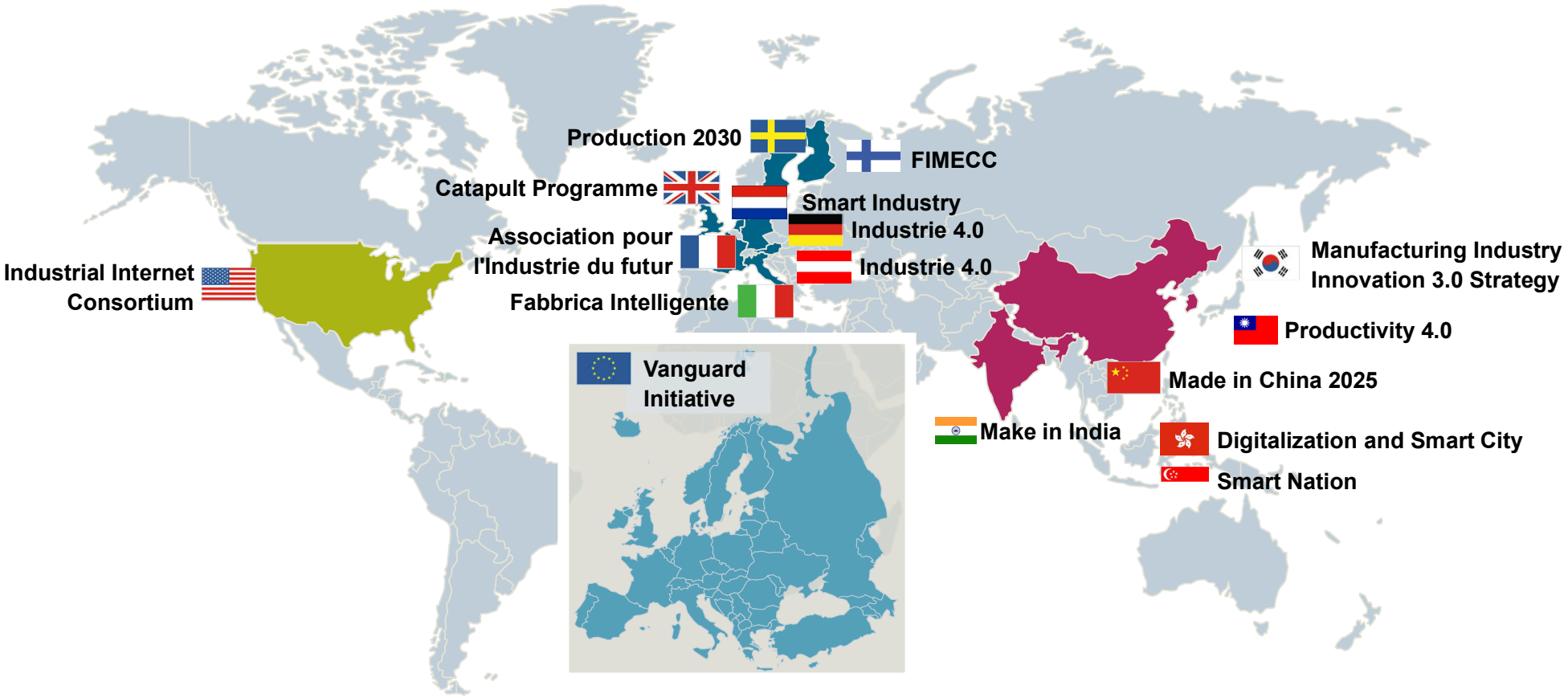

Powerful networks

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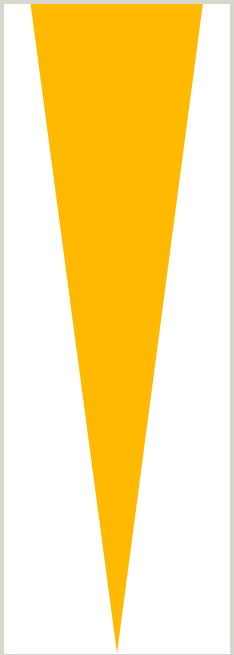
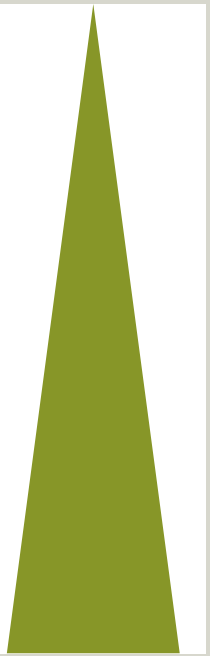
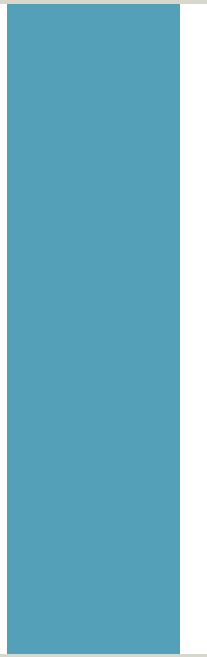
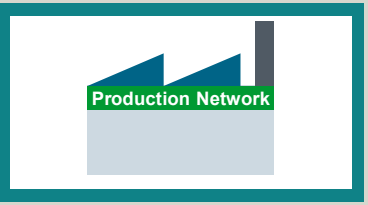
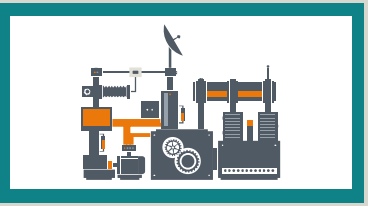
		Bandwidth	Real time	Usability	New requirements
Corporate level					Cloud
Production level					Energy /Asset management
Field level					Condition monitoring

PROFINET - One Standard that covers all requirements already!

What is PROFINET?

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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

Traditional Automation Structure

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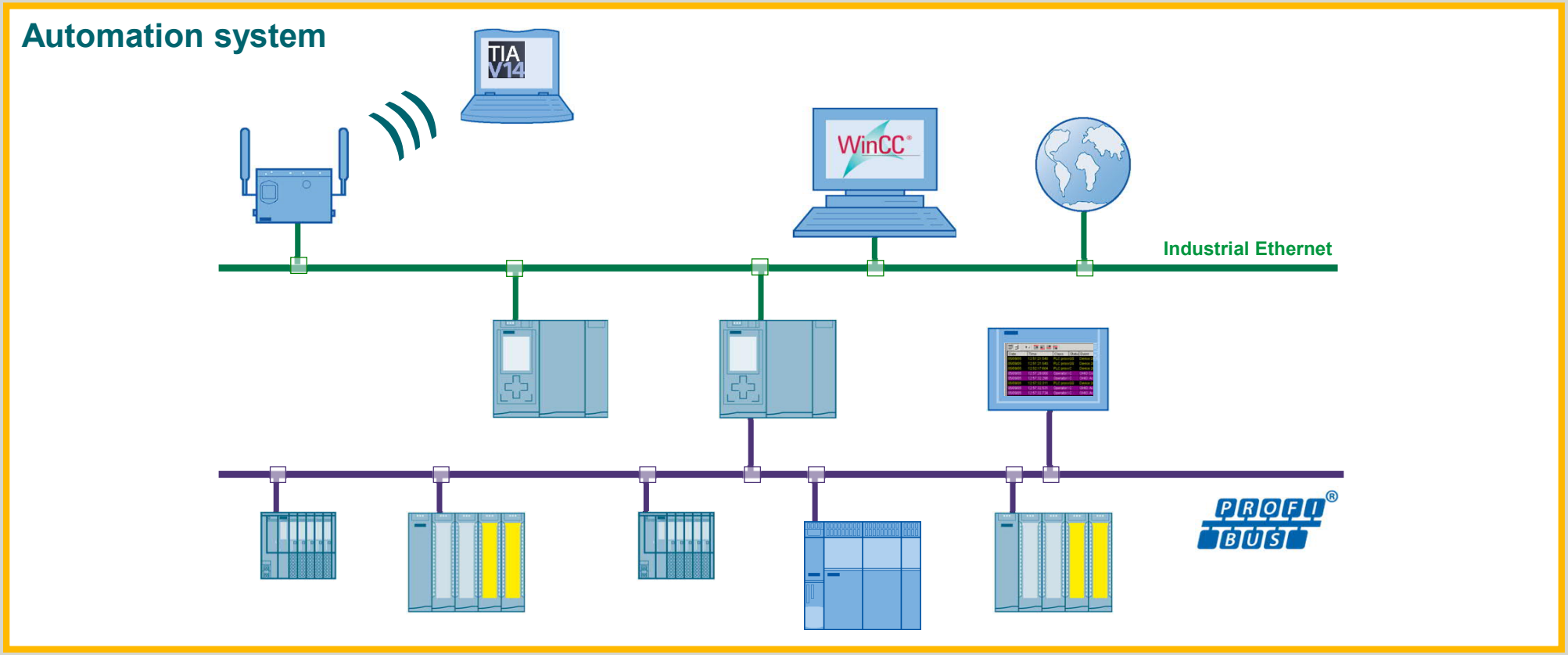

Traditional Automation Structure

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Installation Rules

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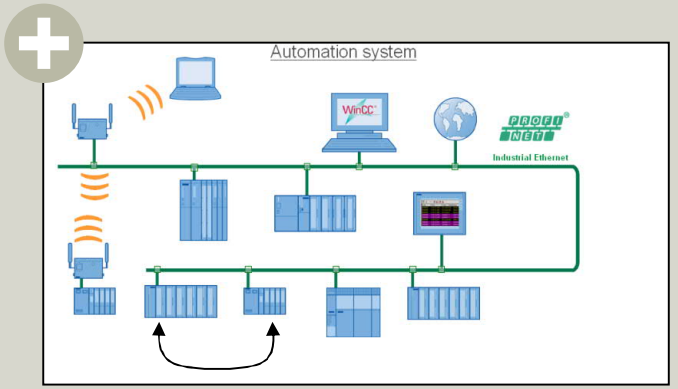
PROFIBUS®

- 32 stations on one copper segment (RS 485), Repeater counts as device!
- Terminate each Segment (first and last node!)
- Notice Shielding on the connectors and when going in cabinet
- 10cm distance between cables higher 110V if not isolate with i.e. grounded metal plate, if not possible use FO!
- On high Baudrates, no Spurlines, no Cables shorter 1m
- Segment length depends on Baudrate!!

PROFINET®

- 100 m from the switch to the end device, this is a IEEE802.3 rule!



max. 100m electrical

PROFINET – Flexible Architecture

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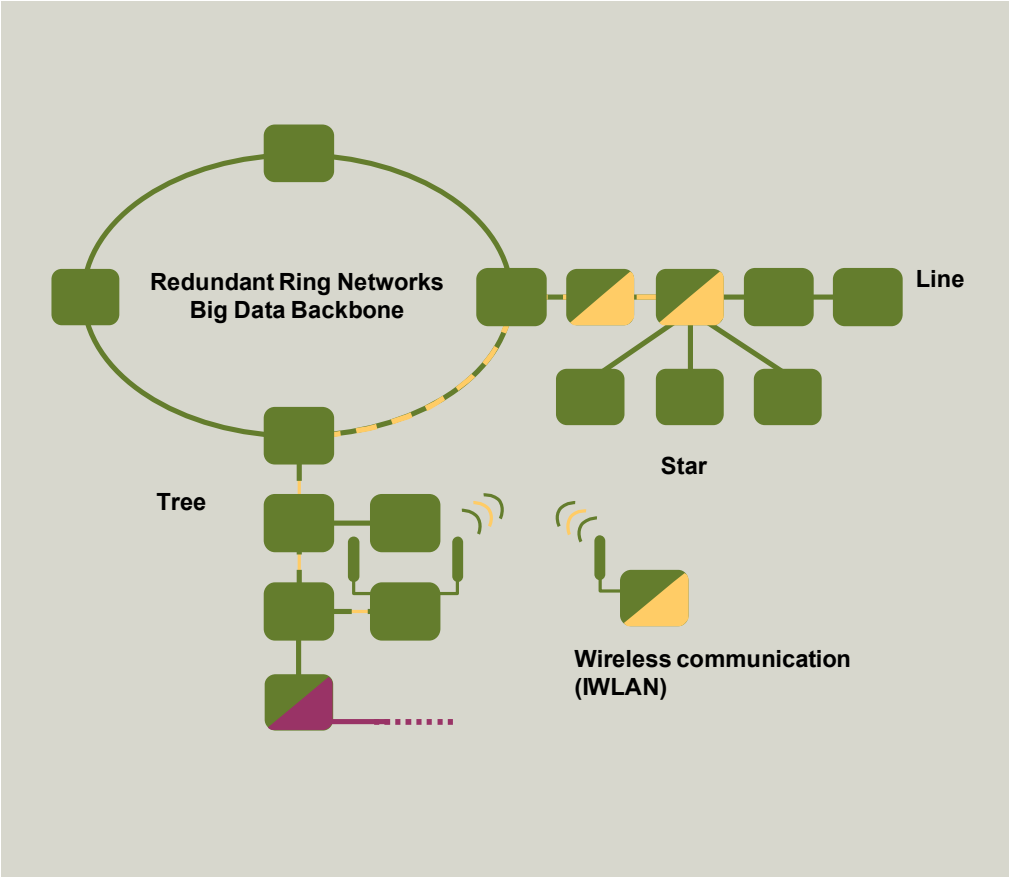
Flexibility

- Industrial Wireless LAN, even Real-Time
- Safety Integrated
- Flexible Topologies, integration of existing Fieldbus System
- Open Standards
- Web-Tools
- Easy Expendability with new standards like OPC-UA



PROFINET – Multi Protocol and Standardized Diagnostic

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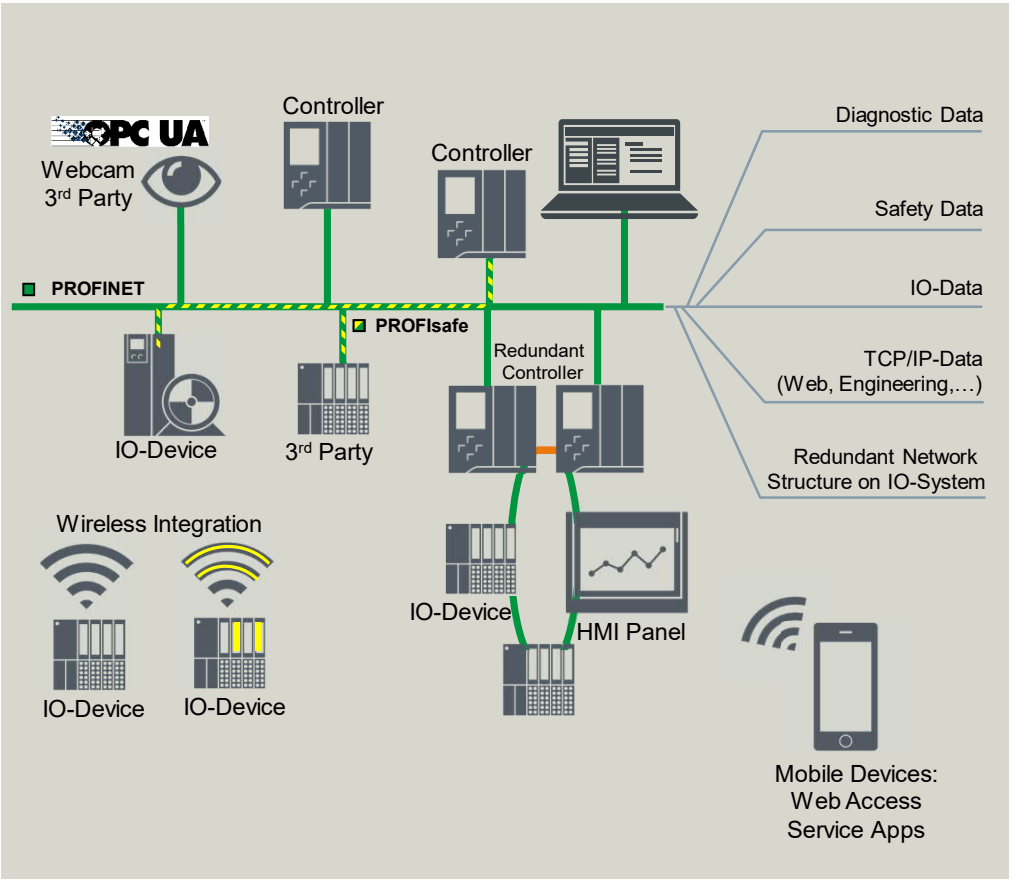
Efficient

- One cable for all purposes
- Device/network diagnosis (free tools, apps)
- Multimaster System
- Easy cabling
- Fast device replacement
- Easy implementation of 3rd Party with GSDML or new standards like OPC-UA



PROFINET - More values for the customers with additional functionality

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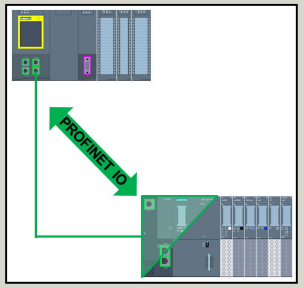
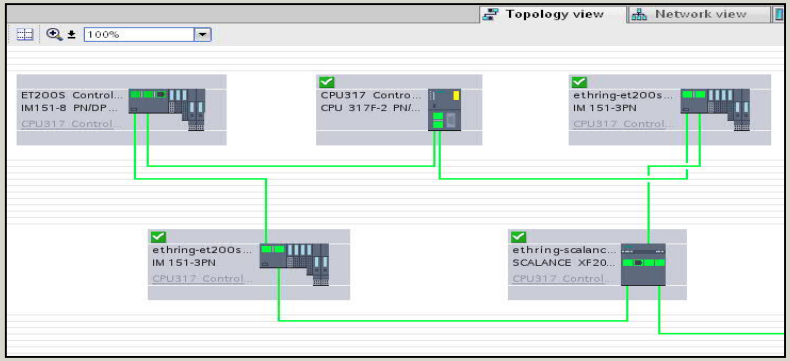
Features

- I-Device - PLC as Intelligent IO-Device
- Redundancy - MRP – Media Redundancy Protocol
- AWP – Advanced Web Programming
  User-defined Web Pages
- PROFIenergy
- Easy Expendability with new standards like OPC-UA





Increased Diagnostic – Reduce downtime, predictive maintenance

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Besides

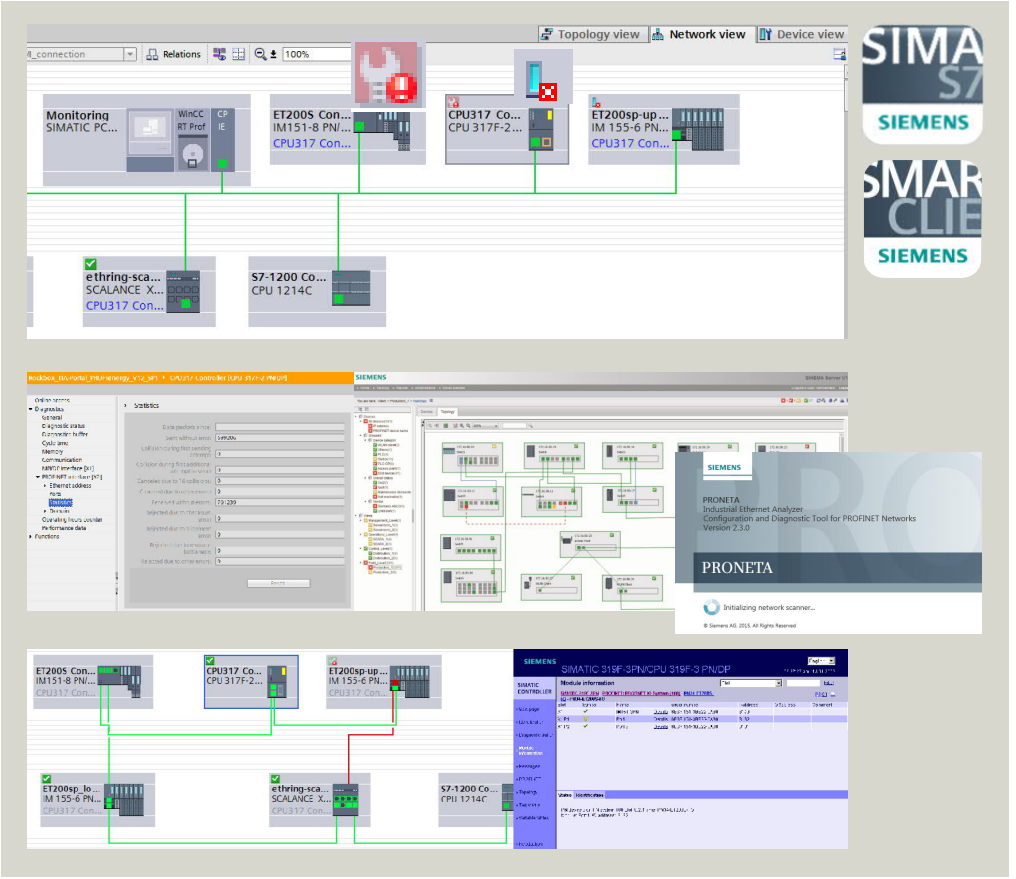
- Proven Fieldbus diagnostic, well known Diagnostic

...use of Standard-Ethernet-Diagnostic

- SNMP (Simple Network Management Protocol) integrated in the Devices
- Possibility to integrate into Network level on Plant Asset Management
- Free Diagnostic Tools like PRONETA, Smartphone Apps available

...on top we offer...

- Simple error localization with Topological View
- Web diagnostic running on the controller even with user defined WebPages!



PROFINET always requires a Device Name

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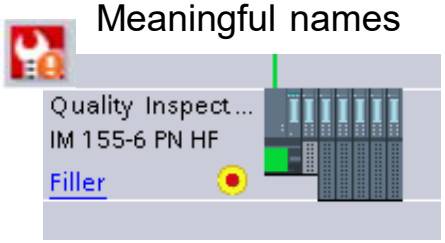
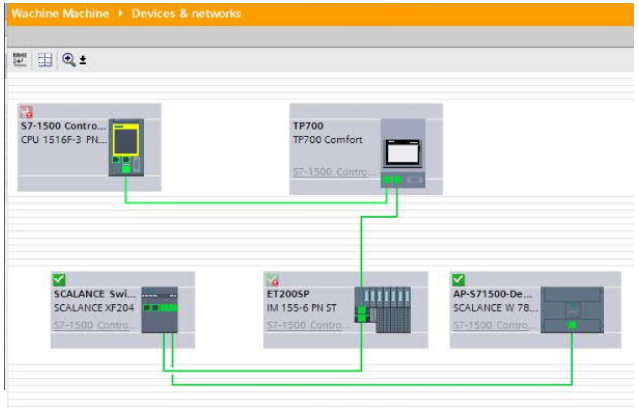
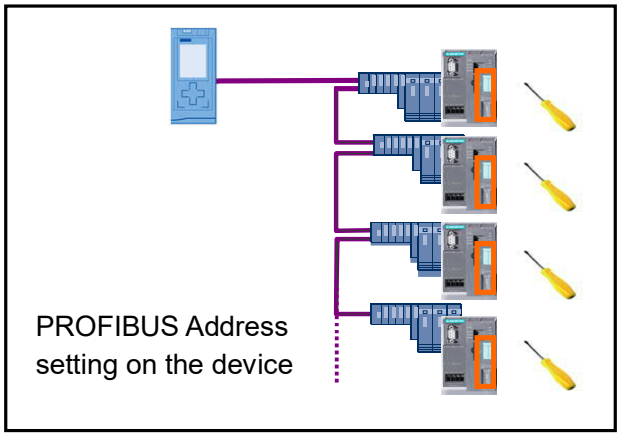
Names instead of numbers

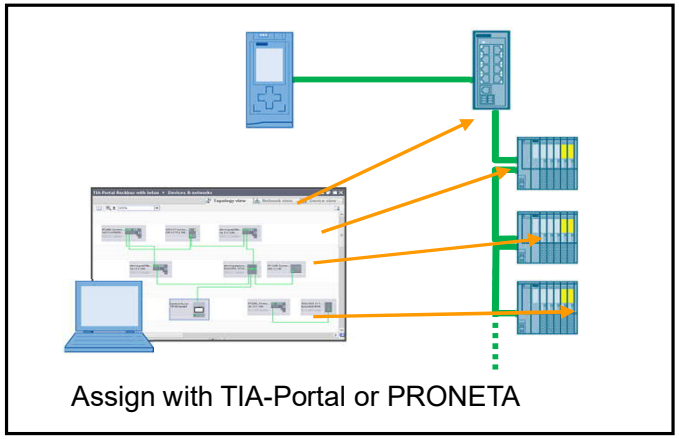
- Meaningful names for each station
- Device Name = IP Address set by engineering

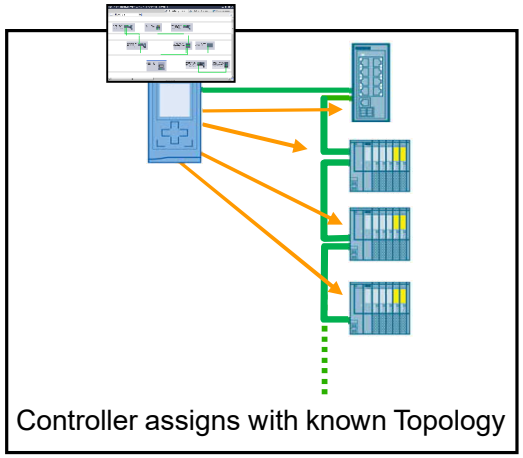
Meaningful names











TIA - Traditional

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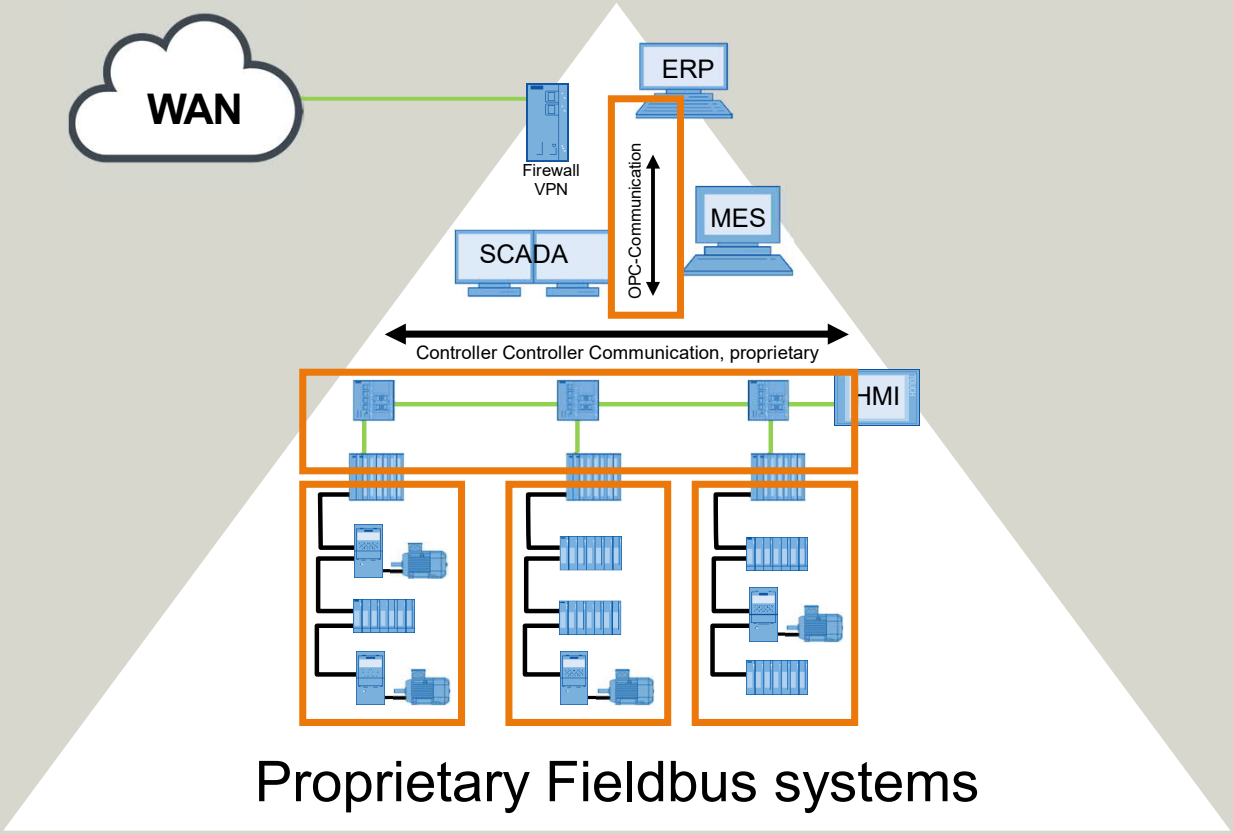

1. In case of other Ethernet based standards network separation applies.
2. Additional training and know how required (multiple networks).
3. Access to fieldbus devices always via controller (additional load and additional cost). Additional cost because of functionality at the controller level or even a hardware card for proxy function.
4. Controller – Controller communication must be programmed, not very flexible.
5. Diagnostic must be programmed, not easy to integrate into a SCADA, HMI.
6. No wireless integration on IO Device and Engineering Level
7. No direct access to the Fieldbus Level.
8. No possibility to of a clear topological view.

Welcome to the Digitalization concepts

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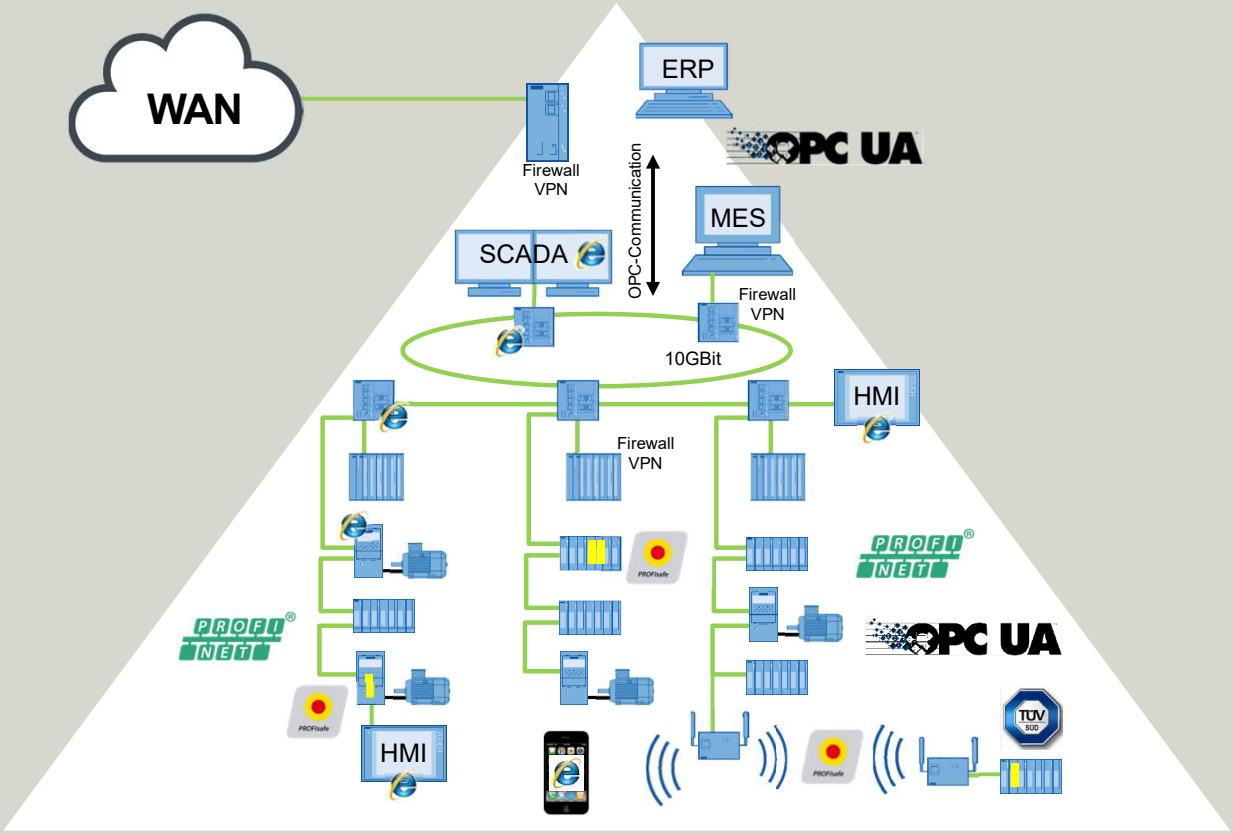

1. Web Access, flexible remote service, built in - **no** additional **cost** required
2. Safety integrated, Wireless. Now even Chinese national standard CB/T.
3. Firewall and Security in all levels of automation, engineering integrated in TIA-Portal.
4. Diagnostic and Asset Management integrated in the PROFINET standard, **free** diagnostic tools available.
5. Increased flexibility due to modular machine concepts and flexible network structures (star, ring, line)
6. Cloud Services.
7. High bandwidth allows to be a backbone for Big Data
8. Ready for Industrie 4.0 or IIOT
9. Fast Controller – Controller communication without programming (1440 Bytes within 1ms) in realtime
10. Profiles to be open like PROFIsafe, PROFIenergy, PROFIdrive
11. OPC-UA also in the field, PROFINET is multiprotocol capable.

The communication systems of the classic automation pyramid doesn‘t reach the actuator and sensor level

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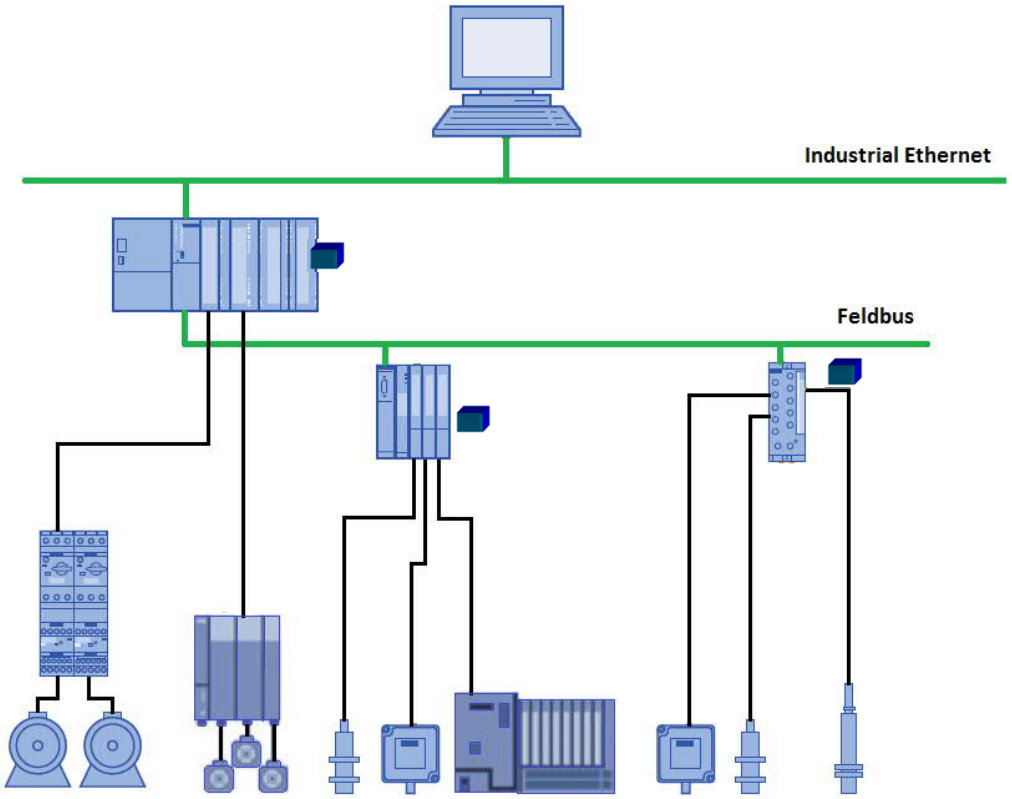

The communication systems reaches only the IO-level and complex field devices

The simplest communications interface that takes you right down to the actuator/sensor level (field level)

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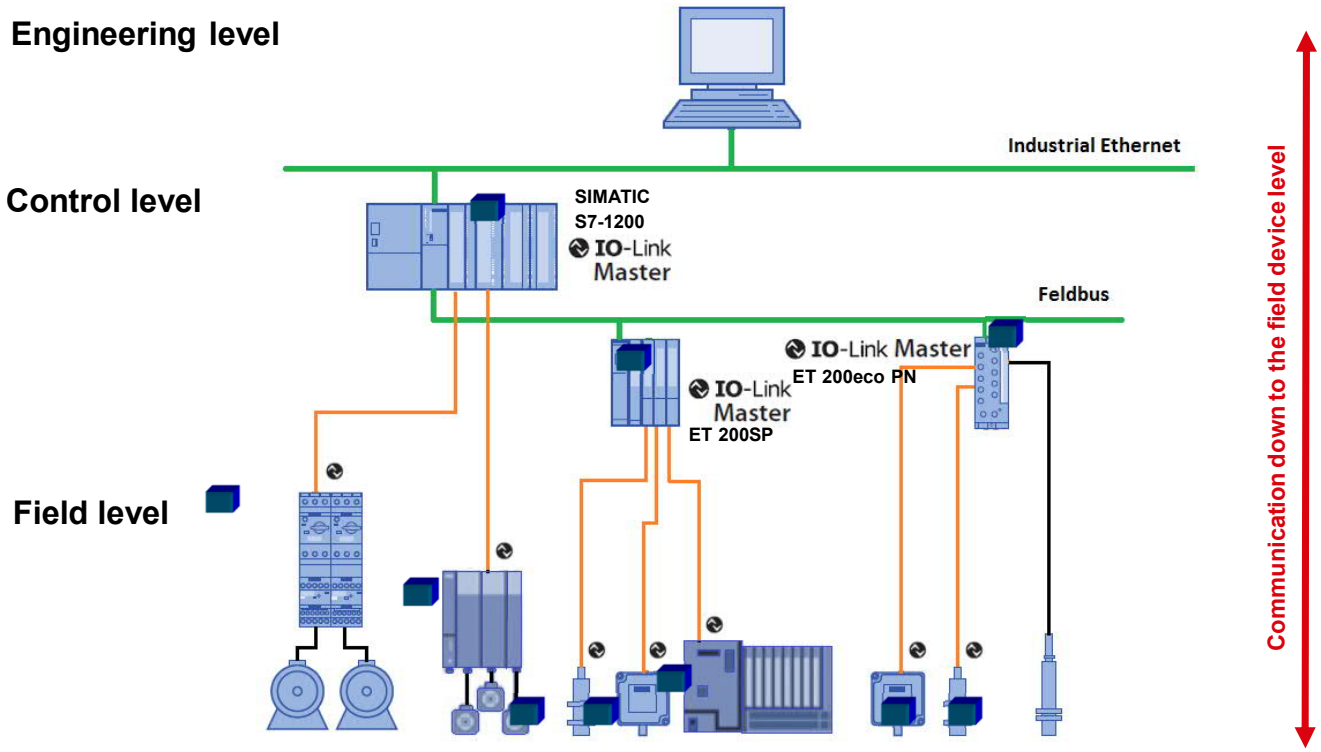
IO-Link closes the communication gap in the automation system



… intelligent sensors and actuators are accessible to communication

… bi-directional transfer of cyclic and acyclic data

IO-Link

IO-Link Association:
Rapid growth of members in the last 2 years

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More than 230 companies from the automation & communications industry

- Positioned as an organization within the PNO (PROFIBUS user organization)
- Specialists come together (IO-Link company community)
- Competent manufacturers and technology providers from around the world
- Trade faires and conventions
- Independent of field bus
- IO-Link is a standard (IEC 61131-9)

Significant Growth of in installed IO-Link units

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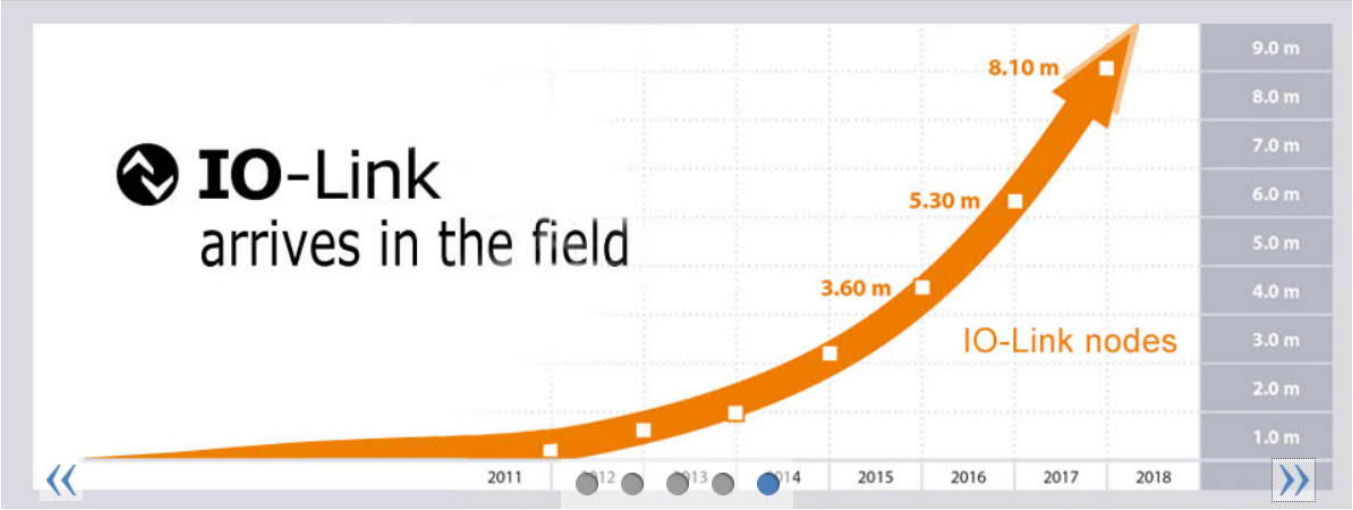

More than 7000 IO-Link products available

- Master modules for > 15 fieldbus systems
- Central masters
- Wide variety of sensors for
  > 35 sensor technologies
- actuator technologies

The competence matrix shows, which technologies, products and services each company provides for.

Want to integrate more?
No Problem with PROFINET Gateways

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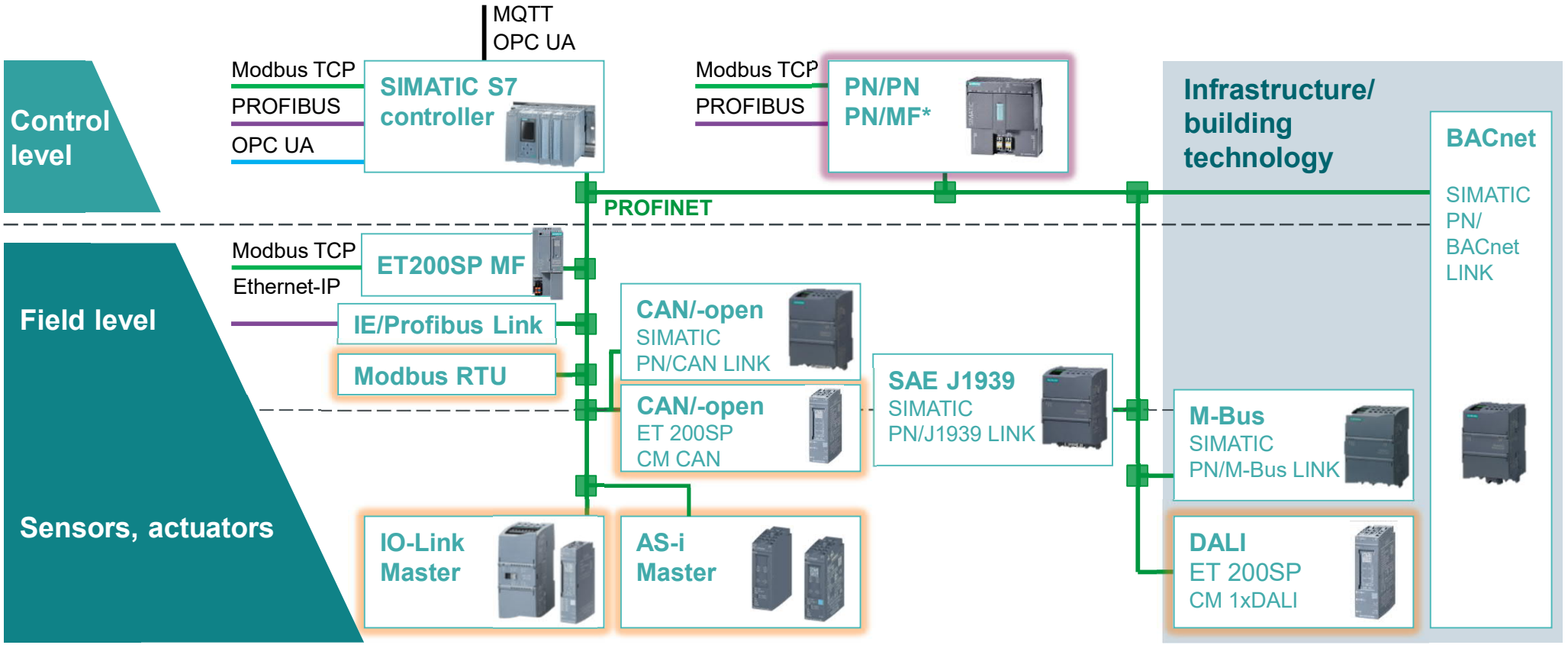

*) MF: Multifunctionbus

Legend: Link Modules Coupler

R/H PROFINET Network configuration – Connectivity ET200 Stations

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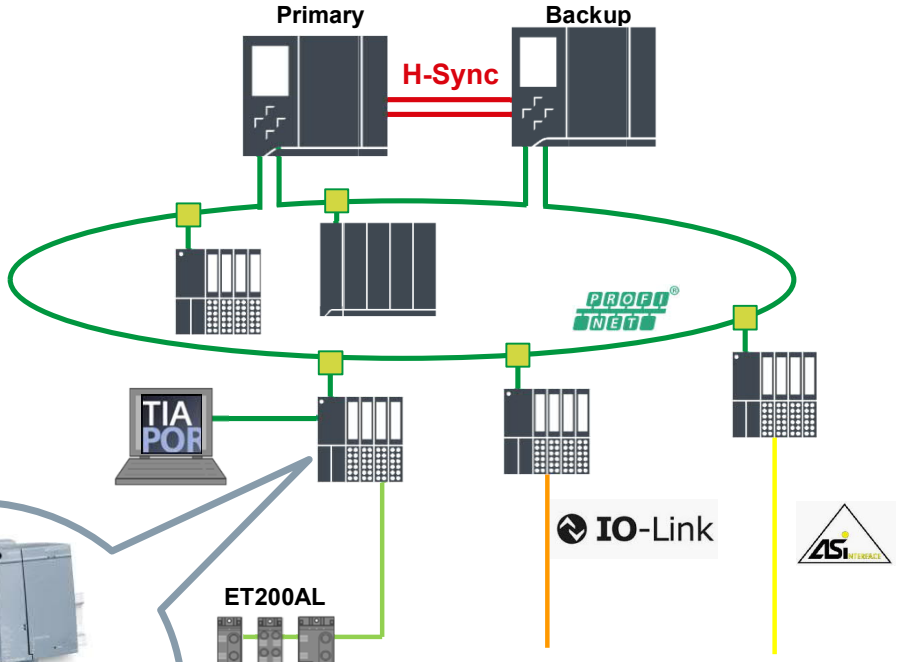
Connectivity ET 200SP

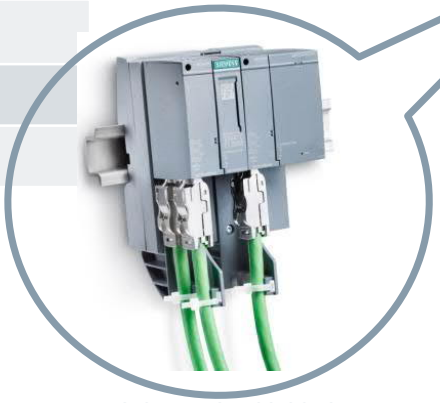
Module func.	PtP Connections	Bus systems
3 Port IM Module	IO-Link Master	AS-I Master
Motorstarter	PtP / Modbus RTU	• DALI • CAN • DMX512
ET200AL System	HART	

Connectivity ET 200MP

IO-Link Master
PtP / Modbus RTU
Configuration with active backplane possible
64 Channels are now availabel

New





6ES7 155-6AU30-0CN0

SIMATIC ET 200eco PN
The next generation of rugged I/O in IP65/67

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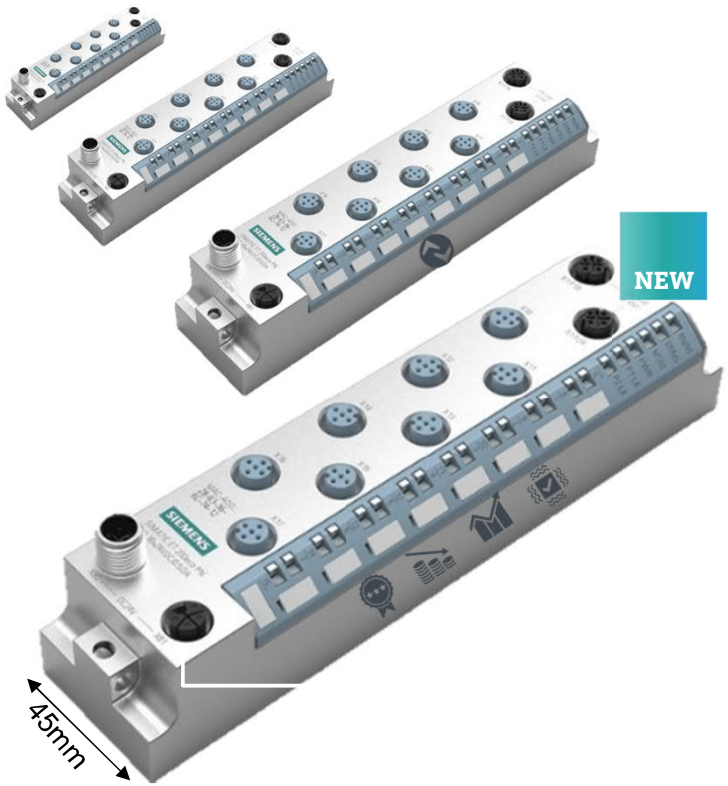

Feature / Function

6 new ET 200eco PN modules:

- DI 8X24VDC
- DI 16X24VDC
- DQ 8X24VDC/0,5A
- DQ 8X24VDC/2A
- DIQ 16X24VDC/0,5A/2A
- CM 8x IO-Link + DI 4x24VDC

New features:

- S2-Redundancy
- Shared Device
  (Distribution of the outputs of a module to several controllers)
- MSI / MSO
  (Read access to inputs/outputs from up to 4 controllers)
- Clock sync. up to the channel
- High supply current up to 12A
- Single / Double assignment of channels via parameterization

Benefit

- **Easier mounting & handling** due to the possibility of mounting the modules directly on the machine outside the control cabinet
- **Less planning effort** due to standardization of the module width
- **Cost savings in warehousing** by combining the module portfolio
- **Greater machine/plant transparency** through MSI/MSO and detailed diagnostics
- **More flexibility** through the parameterizable channel assignment of the ports
- **Higher machine availability** due to the possibility to operate the modules also in ring structures

SIMATIC ET 200SP for lighting control
Simple integration of lighting controls into automation system

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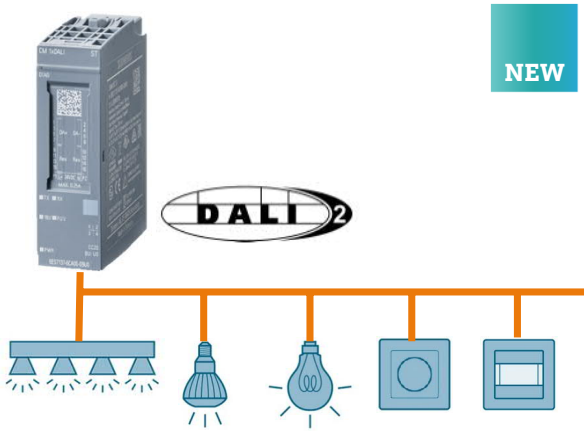

Feature / Function	Benefit
Upgrade CM PtP for DMX 512 Use of the ET 200SP CM PtP as master module for lighting control with DMX 512 (**D**igital **M**ultiple**X 512)** • Typical applications: Stage and show lighting, large light shows, …	**Simple and cost-effective integration** of lighting controls into automation: ▪ **Saves space in the control cabinet** thanks to the small footprint of the ET 200SP ▪ **Time savings in engineering** due to simple parameterization and programming in the TIA Portal ▪ **Saves space and costs** for additional control units ▪ **Scalability of the quantity structure** due to the possibility of inserting several modules per station
CM 1 x DALI (**D**igital **A**ddressable **L**ighting **I**nterface) ET 200SP DALI Multi-Master module for connecting one DALI bus (per module) with up to 64 luminaires and 63 sensors • Control of the connected devices via function blocks • Integrated power supply up to 160 mA • Typical applications: tunnels, hall lighting, shipbuilding, etc.	

SIMATIC ET 200SP

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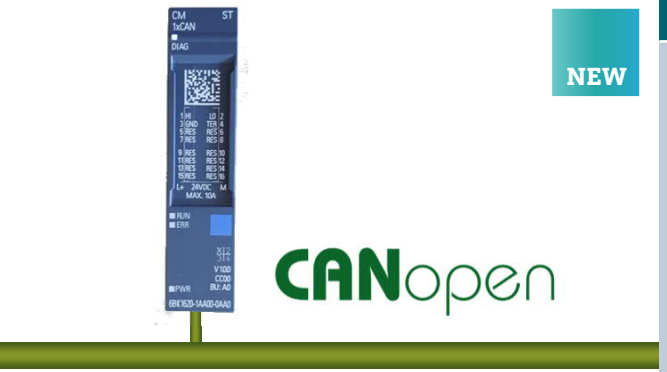

NEW

Feature / Function

CM 1 x CAN

ET 200SP module for integrating CAN/CANopen* nodes into the automation solution in confined spaces (e.g. for AGV-systems, eCar charging stations, …)

*Implementation acc. to specification "CiA 301"

Benefit

- **Compact and cost-effective solution** for the connection of CAN / CANopen devices
- **Time savings in engineering** thanks to simple parameterization possibility in the TIA Portal
- **Saves space in the control cabinet** thanks to the small footprint of the ET 200SP

SIMATIC S7-1500 / ET 200MP – New products
New products & features for better availability and minimum footprint

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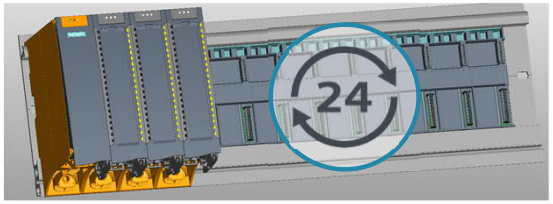
NEW

Feature / Function	Benefit
New modules with high channel density **64-channel digital modules:** • DI 64x24VDC BA (p-/m-reading) • DQ 64x24VDC/0.3A BA • DQ 64x24VDC/0.3A SNK BA (m-switching) • DI 32x24VDC/DQ 32x24VDC/0.3A SNK BA **16-channel analog modules:** • AI 16xU BA • AI 16xI BA	▪ **Optimized price-performance solution** for price-sensitive applications ▪ **Minimum footprint** due to highest possible channel density ▪ **Time saving** for mounting through the tool-free assembly of shielding and use of TOP Connect

NEW



Active backplane bus / Hot Swapping By using the active backplane bus for the ET 200MP, hot swapping (module exchange at RUN of the PLC) is possible even with multiple modules. Up to **12** modules of S7-1500 / ET 200MP can be configured per station.	**Highest machine / system availability,** since in the event of failure and replacement of one or more modules, the PLC and unaffected modules remain in operation.

SIMATIC ET 200 MultiFieldbus Interfaces for ET 200MP, ET 200SP, ET 200eco PN, Coupler

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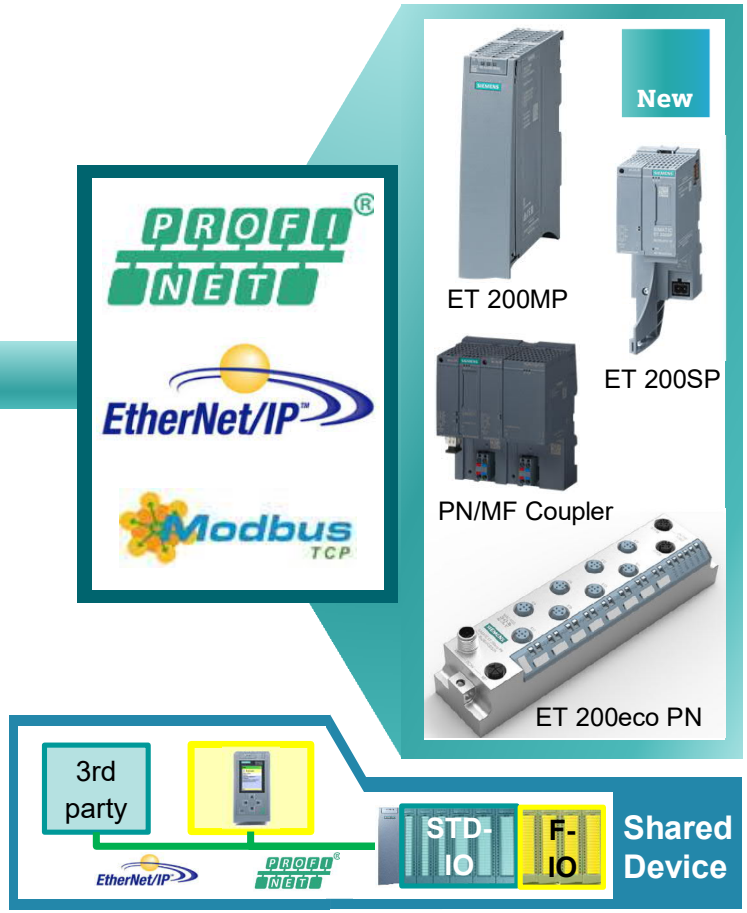

Feature / Function

Products

- ET 200MP IM: IM155-5**MF** ST
- ET 200SP IM: IM156-6**MF** HF
- ET 200eco PN “Next generation”*
- **PN/MF** Coupler

Functions

- Support for PROFINET, EtherNET/IP and Modbus TCP
- Simultaneous communication with all protocols to modules of a station via the same cable
  (e.g. Standard I/O via EIP, F-IO via PROFIsafe, Energy Metering via MTCP)
- Engineering via MFCT (MultiFieldbus Configuration Tool)
- Support of **Shared Device in MultiFieldbus configurations**
  (Allocation of a station to several controllers)

Benefit

- **Savings in costs and planning effort when designing machines/plants,** since the same IO configuration can be used independently of the overarching controller
- **High flexibility** due to the possibility of access to the ET 200 station / modules from several controllers via shared device

PN/MF Coupler:

- Easy to configure deterministic data exchange, even across network boundaries, between SIMATIC and 3rd party controllers
- Simple integration of SIMATIC controls into existing machines / plants

Engineering – TIA Portal as central Engineering Tool

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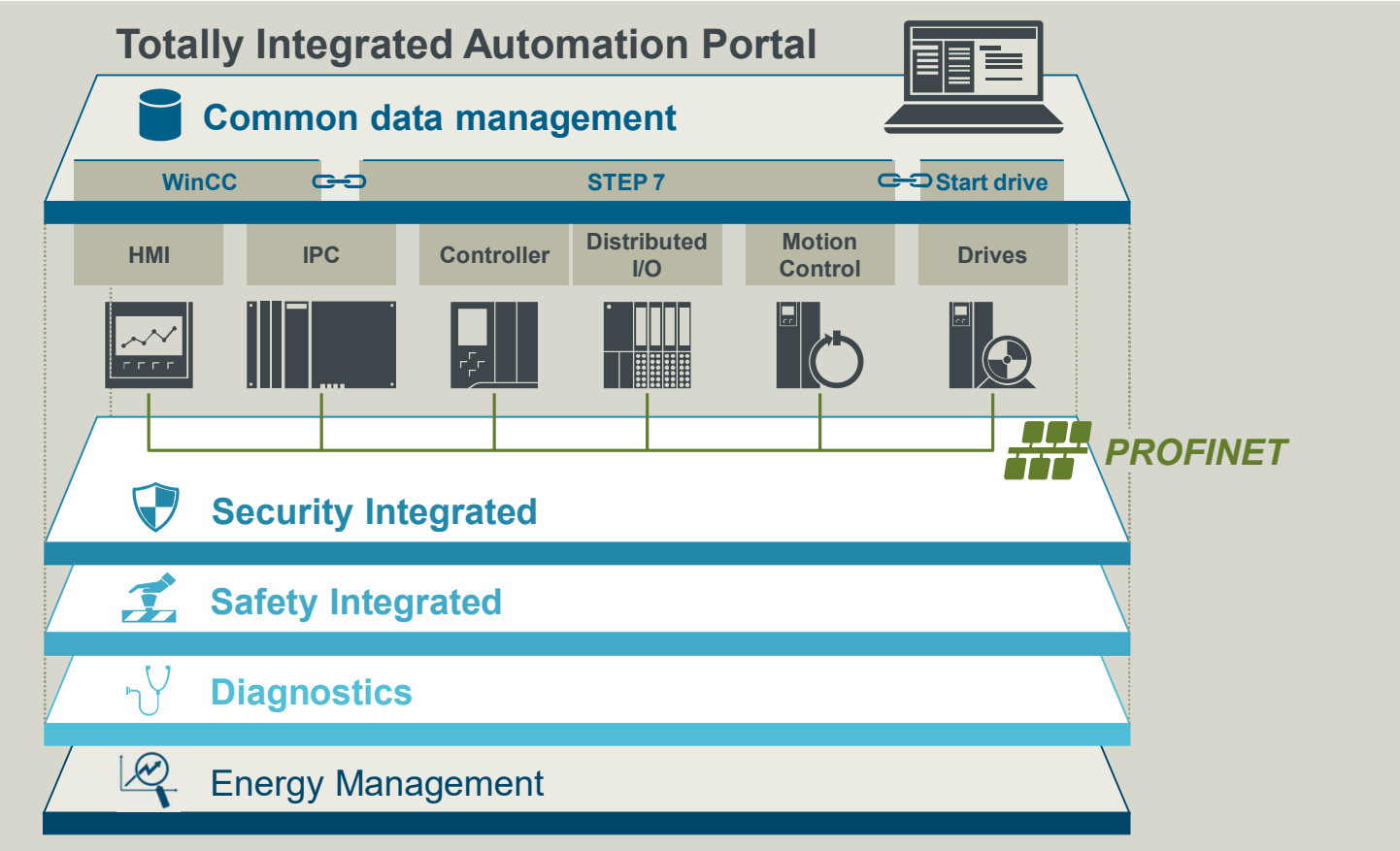
- Common data management
- Uniform and integrated operating concept
- Common, central services



Additional SIMATIC tools –
Overview of existing tools for automation tasks

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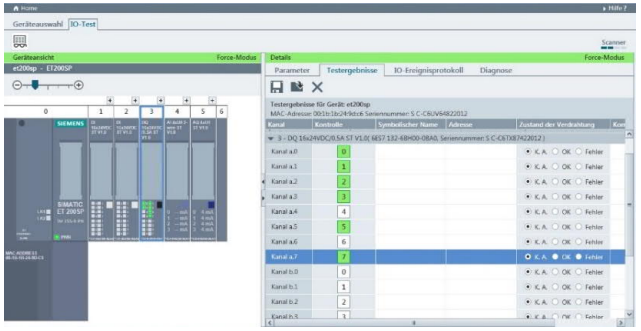
PRONETA

Free Download



Configuration of the PROFINET devices

- Adjust IP address and device name
- manual / automatic / mass operations

Offline / Online Comparison

- Reference from STEP7 project or PRONETA snapshot
- Incl. check of the ET 200 module configuration

Show details of all modules

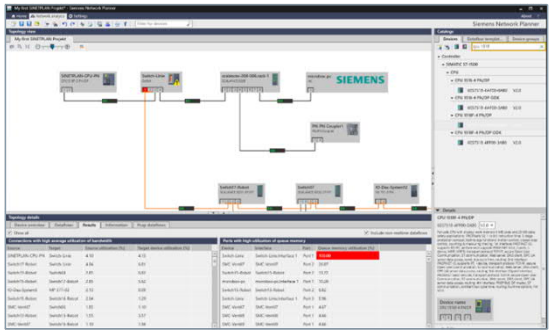
- Read and compare module configuration

IO test

- Automatically logging of IO signal changes
- Display device-specific diagnostics
- Create and export IO Check protocol

SINETPLAN

Download Trial



Simulation of the network load depending on topology and network nodes

- Report function with detailed results
- Validation of the PROFINET planning guideline
- Online scan function

Seemsless integration via API and Standards

- Import of the configuration with AutomationML
- Import of STEP7 & TIA Portal projects

Port-by-port simulation

PROFINET is 100% Ethernet
PROFINET is the Industrie 4.0 Backbone

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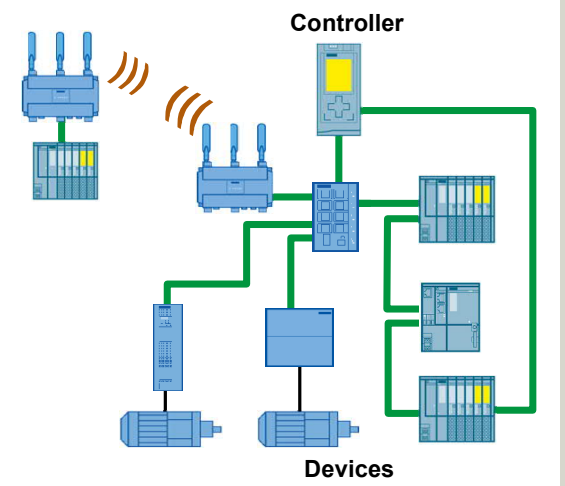
PROFINET is Ethernet

- PROFINET is the open Industrial Ethernet standard from PROFIBUS & PROFINET International (PI), Vendor neutral
- PROFINET is based on Industrial Ethernet and utilizes TCP/IP and IT-Standards even redundant (MRP), secure and Wireless real-time integration
- PROFINET is Real-Time Ethernet with cycle times as fast as 31.25µs
- PROFINET allows seamless integration of fieldbus systems, Investment protection
- PROFINET – The Industrie 4.0 Network
  - OPC UA
  - Big Data
  - Plant Transparency with integrated Diagnostic and Energy Profile



One Standard for all application

Safety Application, even Wireless
→ The answer PROFIsafe

Energy management for Plant Transparency
→ The answer PROFIenergy

Drive Applications
→ The answer PROFIdrive

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PROFINET completely for all Applications - Factory and Process Automation, Drives and Safety

Thanks for listening

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