Willkommen

Aplicaciones

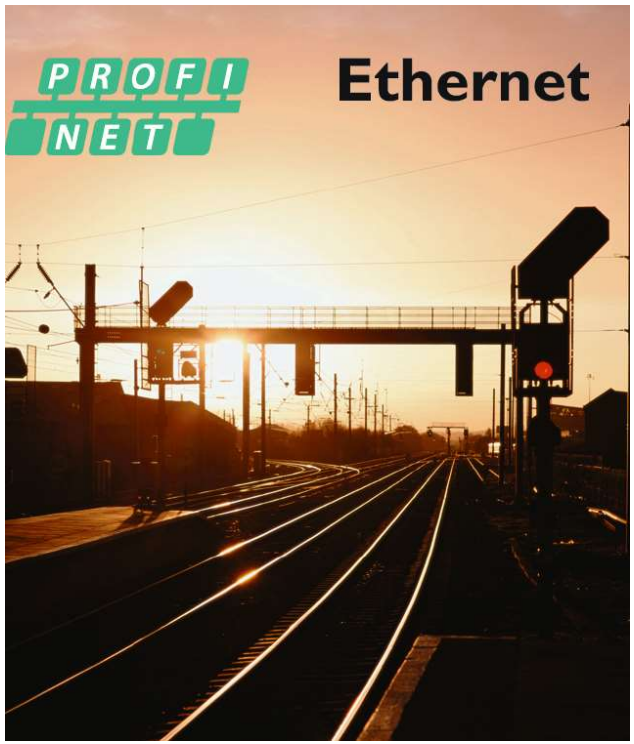
Proyectos con PROFINET

Ing. Antonio Gordillo / Marketing Infraestructura y Sistemas Automatización / 10 JUNIO 2021

PHOENIX CONTACT
INSPIRING INNOVATIONS

Agenda

- PROFINET
- Performance Diagnostic Safety Energy Management Machine Building
- Conformance Classes
- Applications
  - Factory Automation
  - Infraestructure
  - Energy
  - Process



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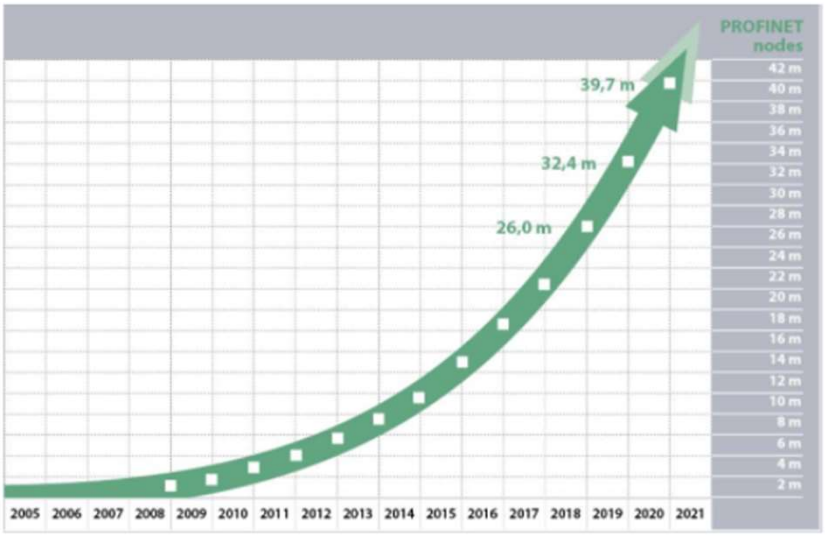
PROFINET has beaten all previous records in 2020 with a total of 7.3 million products placed on the market. The number of installed PROFINET devices rose by more than 22% in comparison to the previous year, reaching a combined total of 40 million



PROFINET is the open, cross-vendor Industrial Ethernet standard for production and process automation.

PROFINET Technology

The Easy Way to PROFINET—North America Edition

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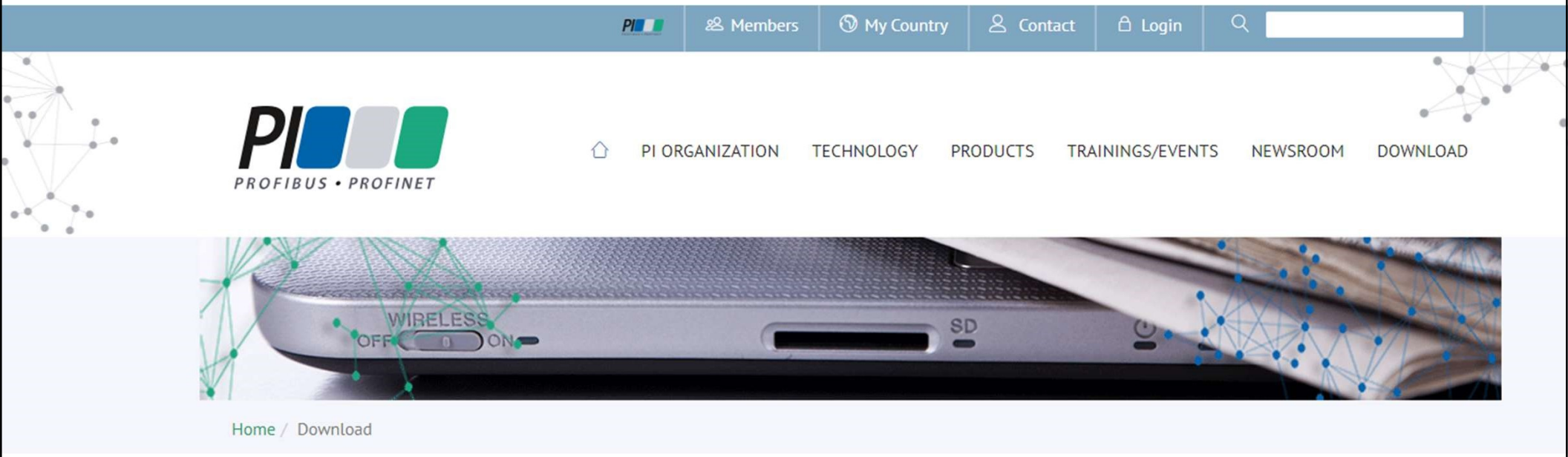
PROFINET

Organization

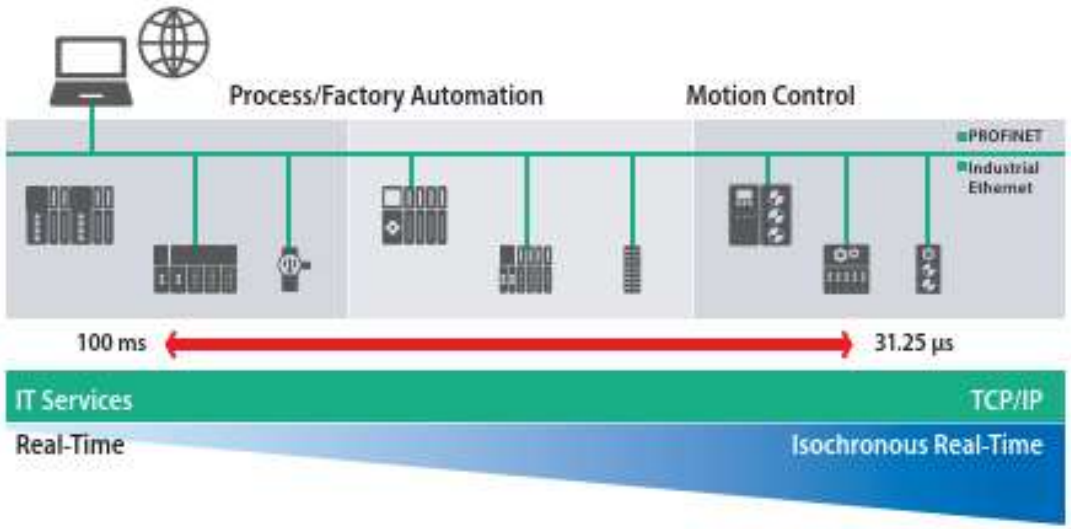


PROFINET

Performance Diagnostic Safety Energy Management Machine Building

Performance

PROFINET is designed for all branches of industrial automation engineering:



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PROFINET

Performance Diagnostic Safety Energy Management Machine Building

Performance

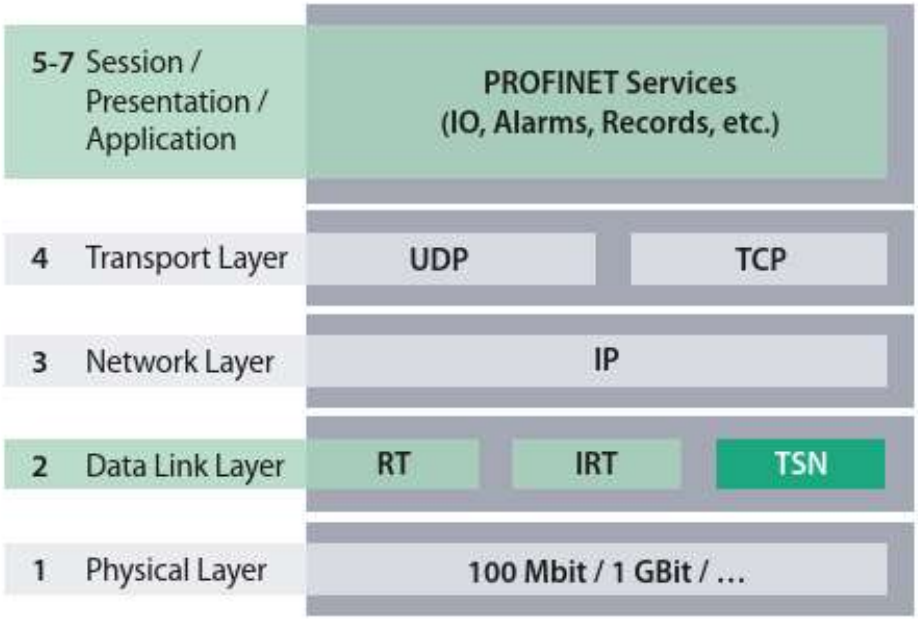
TSN integration in PROFINET
uses future-proof IEEE technology

Approach of PROFIBUS & PROFINET International (PI)

- **TSN and PROFINET**

PI is currently working on the use of TSN for PROFINET.
The advantages are:

- Use of future-proof IEEE technology, including Gbit
- Scalable integration
- Application layer remains unchanged



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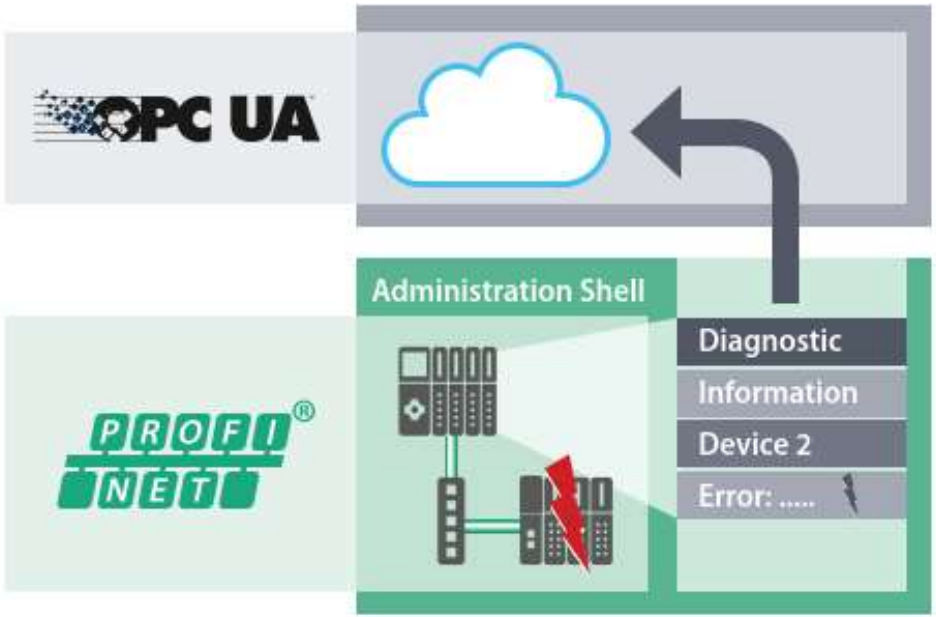
PROFINET

Performance Diagnostic Safety Energy Management Machine Building

Diagnostic



PROFINET and OPC UA
From Data to Information

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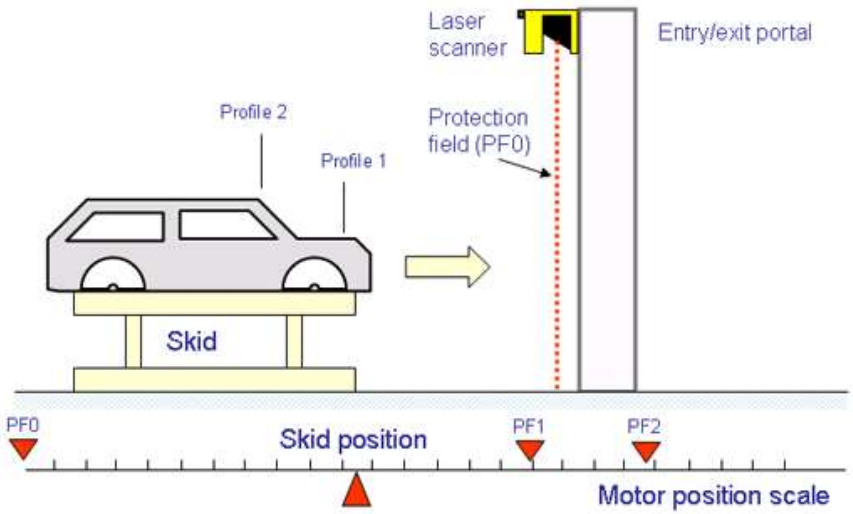
Performance Diagnostic Safety Energy Management Machine Building

Safety

Safety in Automation

Safety has become an integral part of Automation Systems.There is hardly any machine or piece of equipment anymore which does not feature some sort emergency stop or other means of safety device.



F-Device Families

- Remote I/O
- Optical sensors
- Drives
- Robots
- F-Gateways
- PA-Devices

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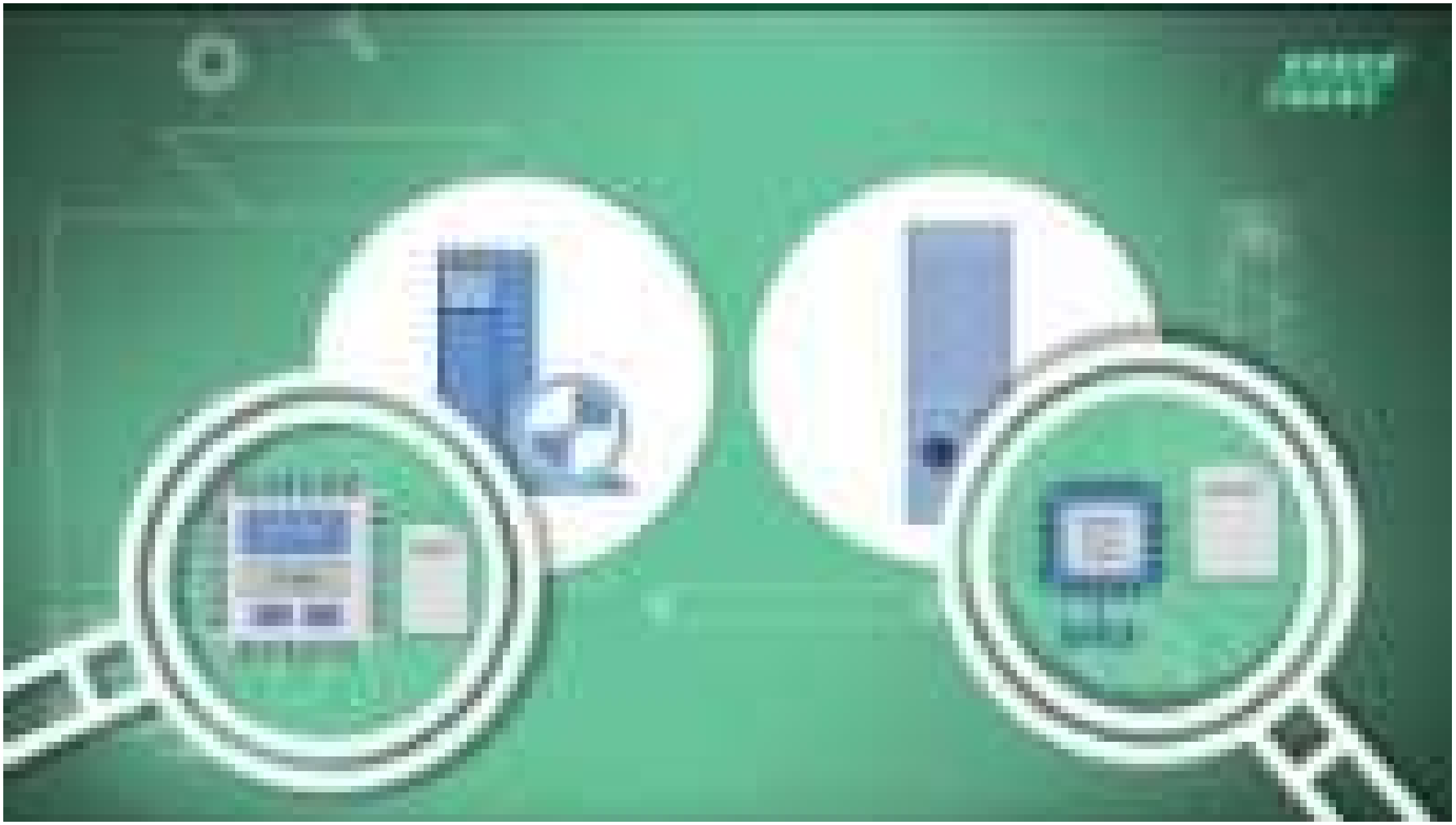

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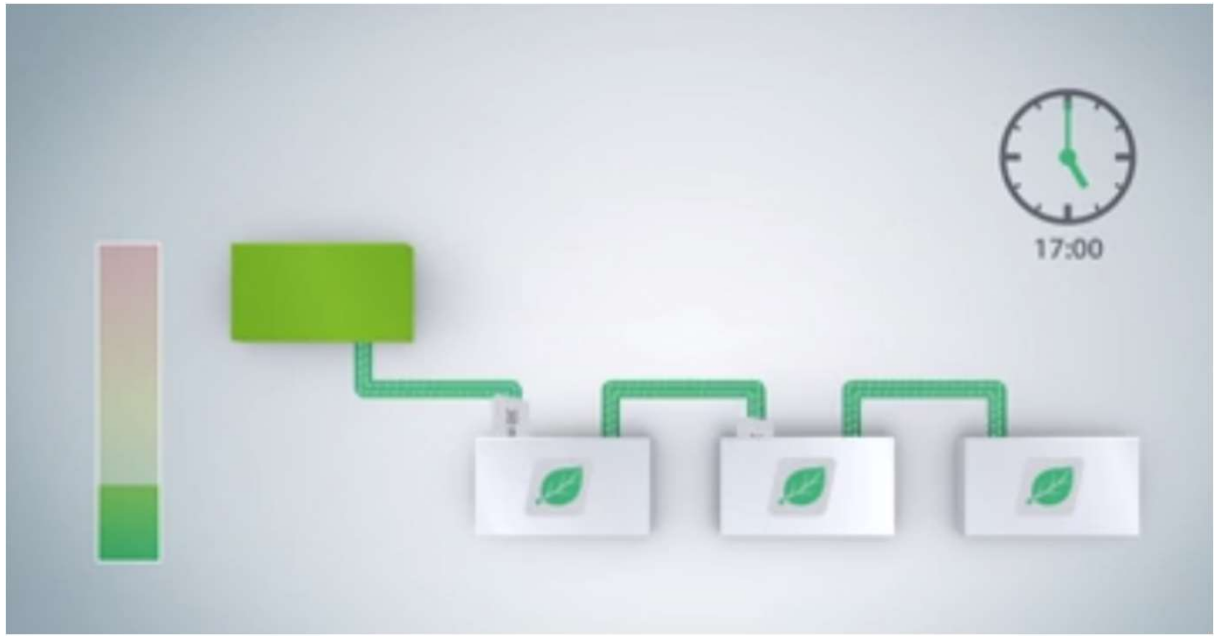
Performance Diagnostic Safety Energy Management Machine Building

Energy Management



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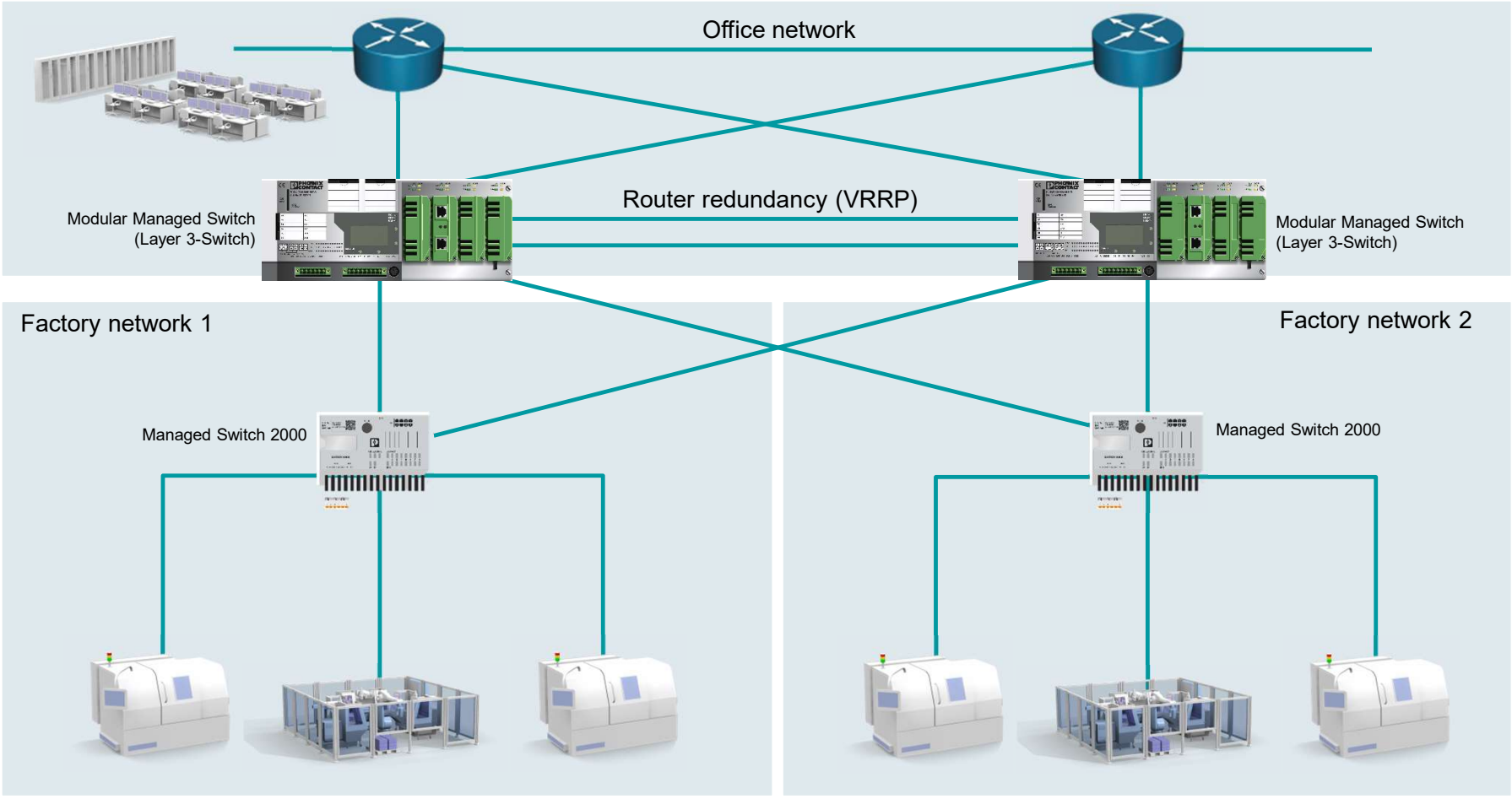
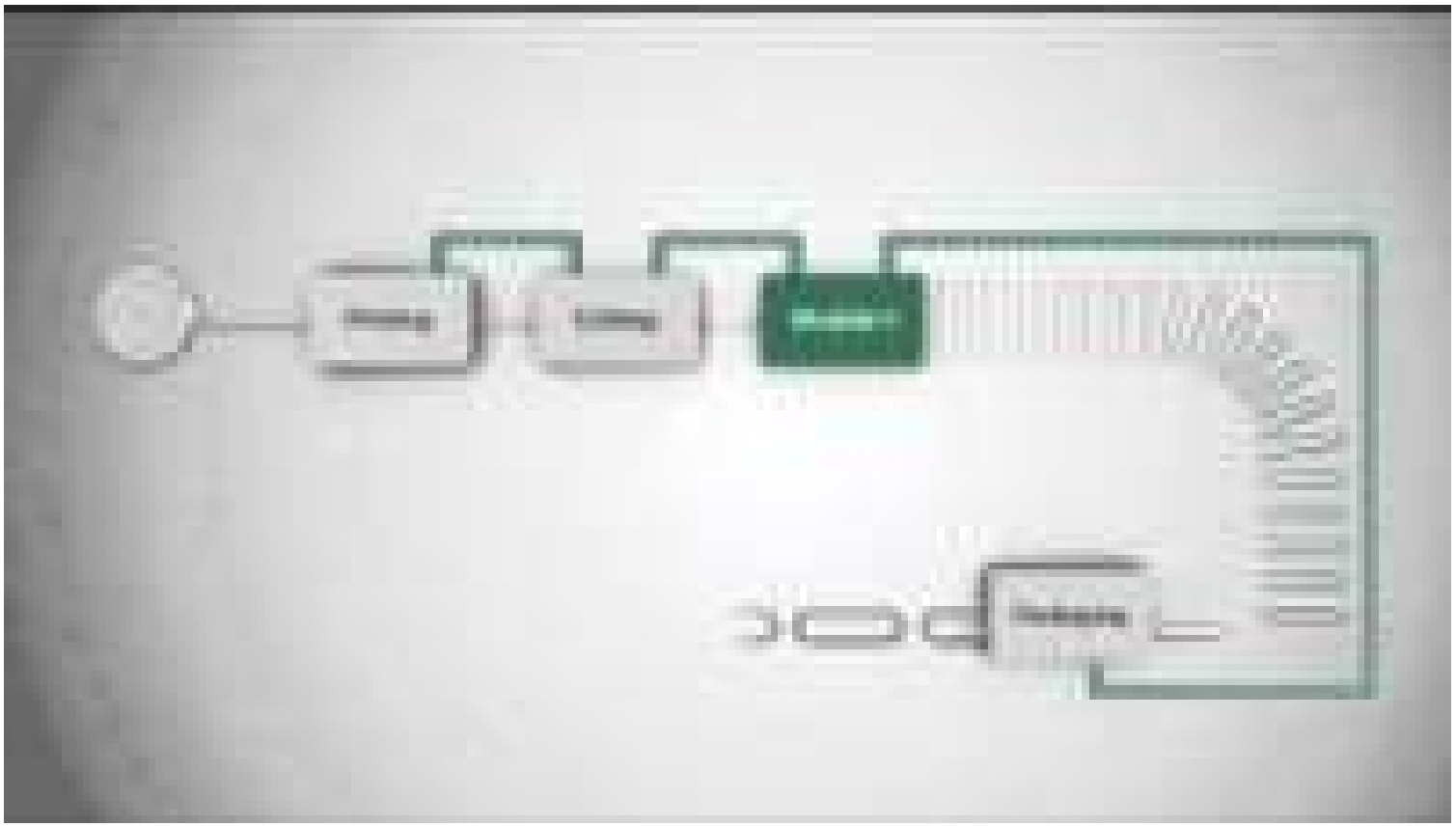


PROFINET

Machine Building

Machine Building



INSPIRING INNOVATIONS

Managed Switches 2000

Easy configuration

Redundancy

Security

Profinet and
EtherNet/IP™ support

Unmanaged
mode

DHCP server

Automation protocols

INSPIRING INNOVATIONS

PROFINET

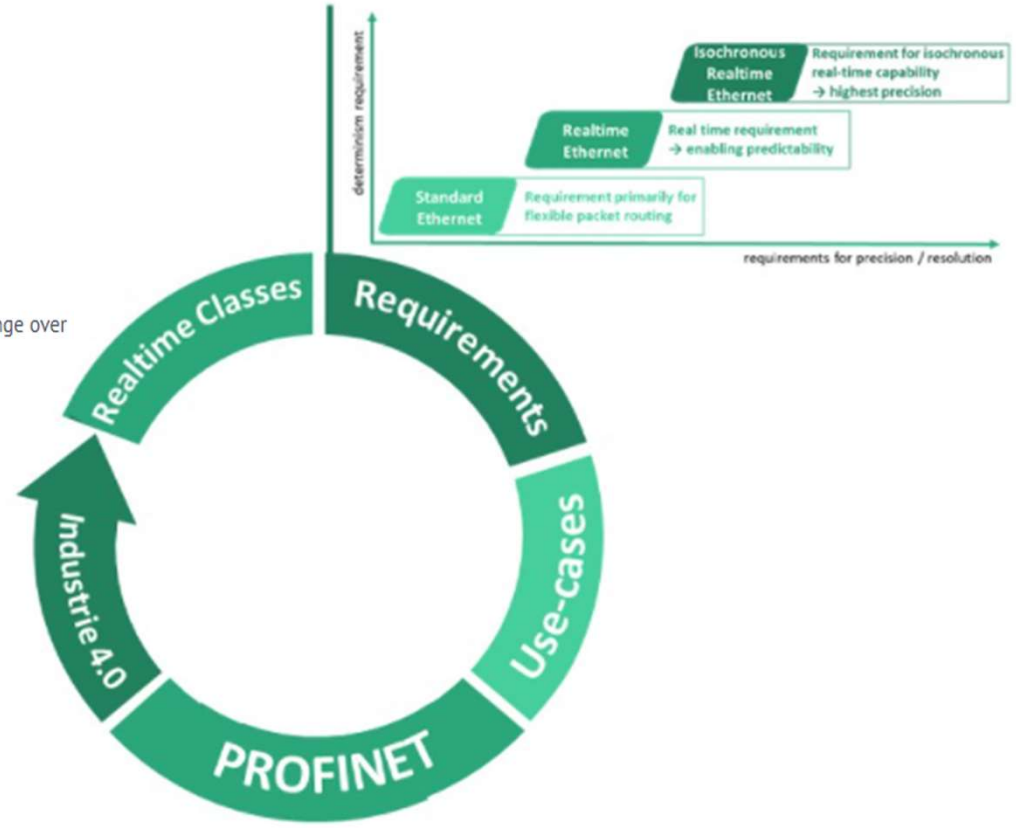
Device Classes

Realtime Use Cases

PROFINET RT and IRT

PROFINET RT and IRT services, as well as Standard Ethernet services are forming specific *use-cases*-Clusters:

These *use-cases* are clearly defined by the requirements related to real time capability they need and will not change over time.



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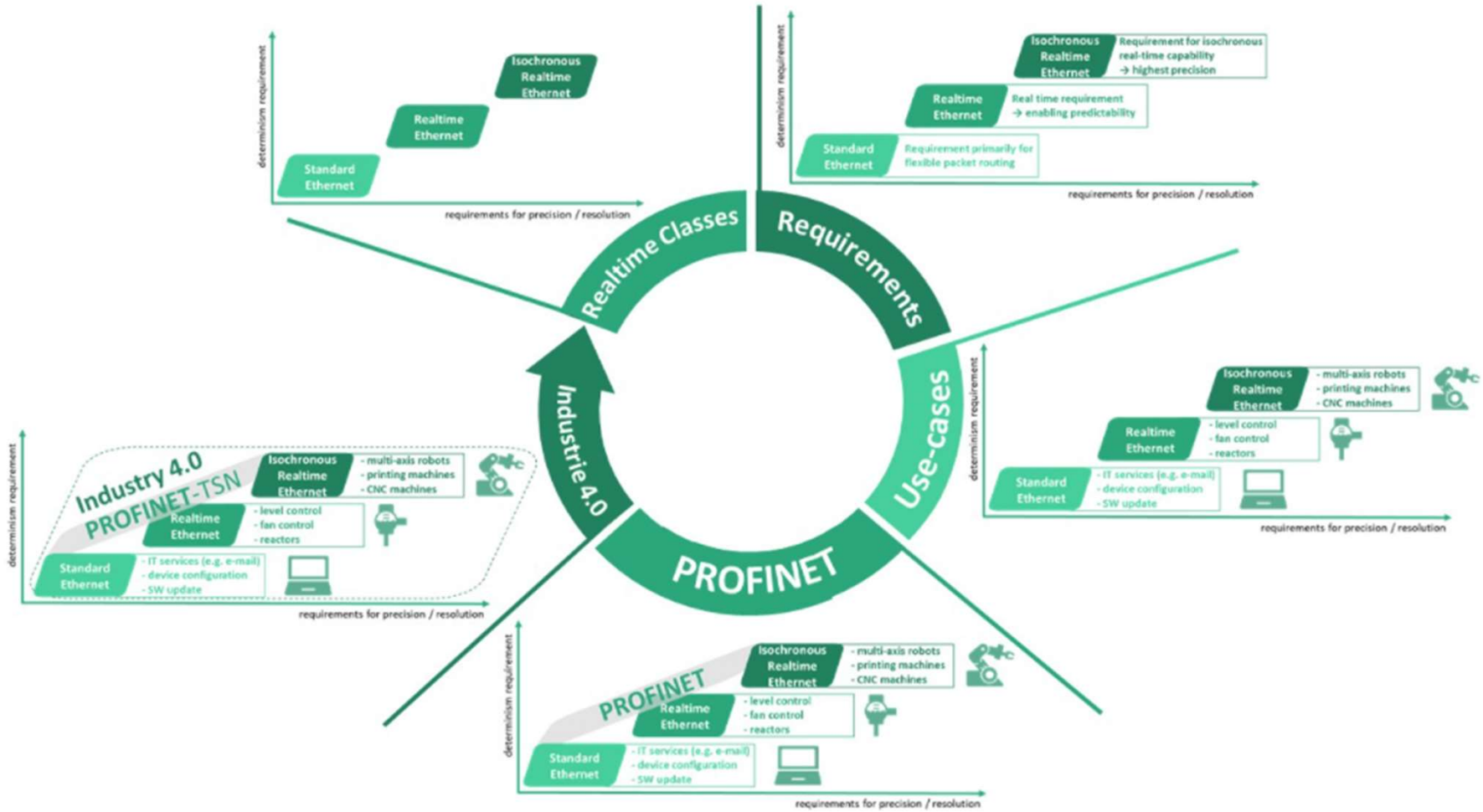

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Conformance Classes

Conformance Classes

To meet the different requirements of automation systems, three Conformance Classes that build upon one another are defined for PROFINET. Each class has a functional scope determined for the typical area of application. The device manufacturer must consider the required Conformance Class before selecting an implementation option for the PROFINET device interface, as the type of interface implementation affects the Conformance Class that can be achieved.

- CC-A
- CC-B
- CC-C

	Single Port	Multi Port
Conformance Class A	X	X
Conformance Class B	X	X
Conformance Class C		X

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Conformance Classes

You can choose from different options in order to implement the solution that best suits the details of the automation device:

- Design
- Degree of protection
- Connection method
- Application
- Integrated multi-port switch
- Real-time properties

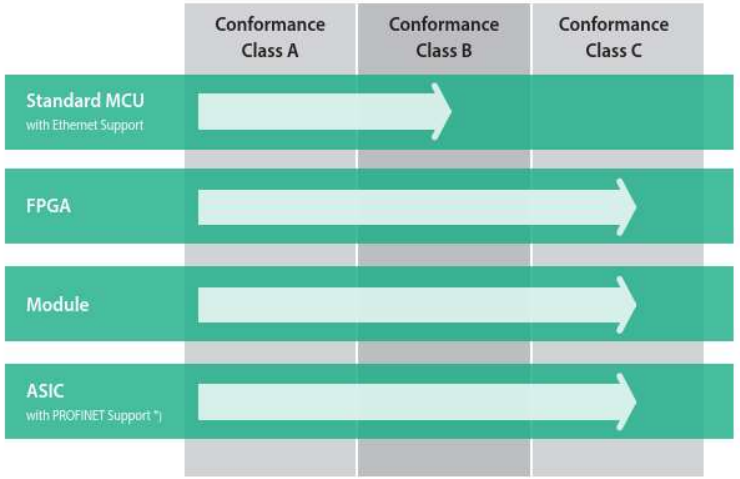
In principle, the following options are also available:

1: Standard microcontroller unit (MCU) with integrated or external standard Ethernet controller or FPGA

2: FPGA with internal or external standard or IRT-capable switch

3: Module with standard microcontroller or with microcontroller with IRT hardware support

4: ASIC with IRT hardware support and IRT-capable switch



*) CC-C only if synchronization is available

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- Factory Automation
- Infraestructure
- Energy
- Process

Applications

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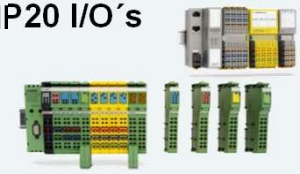
PROFINET Factory Automation

More than 60.000 products

Operator station 	**PLC** 	**IPC & HMI** 	**Security** 	**Network** 
Power supply 	**Surge protection** 	**Fuse** 	**IP20 I/O´s** 	**IP20 Safety I/O´s** 
IP67 IO´s 	**Terminal blocks** 	**Field Connector** 	**Profinet Cable** 	**Sensor actor cable** 
Energy meter 	**Current transformer** 	**Sensors** 	**Marking** 	**Service** 

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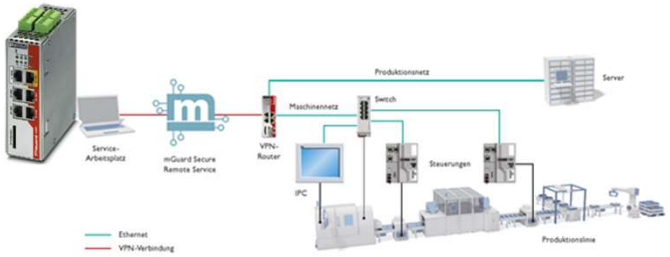
Enhanced thinking examples !

Examples



Car manufacturer

- PILOT Cell „Body Shop“
- Library & Visulization objects
- Visualization generator
- Next body shop won

Systemintegrator

- „Paint Shop“- Color sampling
- Substation with safety bridge technology for open communication

Car part supplier

- Remote control via Internet
- MGuard VPN router
- mGguard secure remote service

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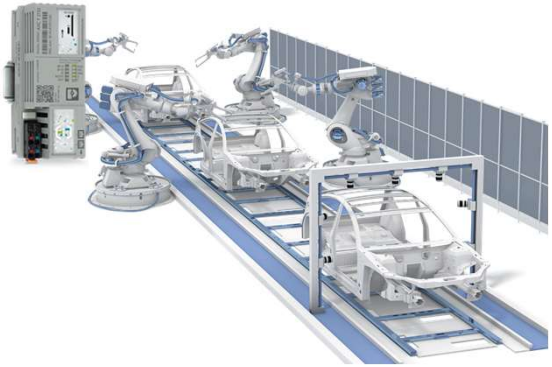
Enhanced thinking examples !

Examples

Robot manufacturer

- Discrete high level language programming in combination with IEC 61131



Car manufacturer

- Data collecting
- MS SQL data base
- Cyber Security feature of PLCnext

Hydr. stamping manufacturer

- Wireless connection to moving parts
- Easy to configure
- FL EPA 2

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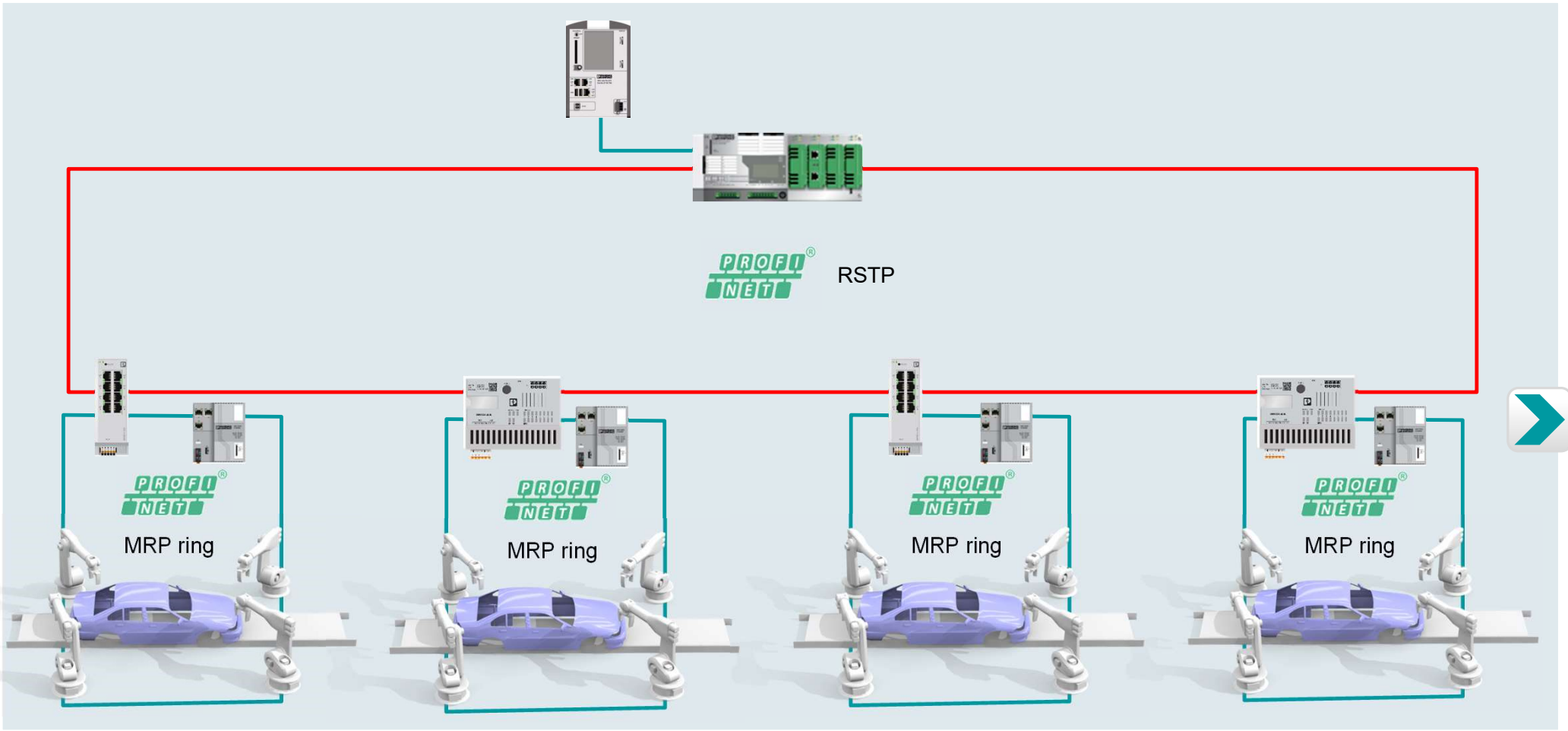
INSPIRING INNOVATIONS



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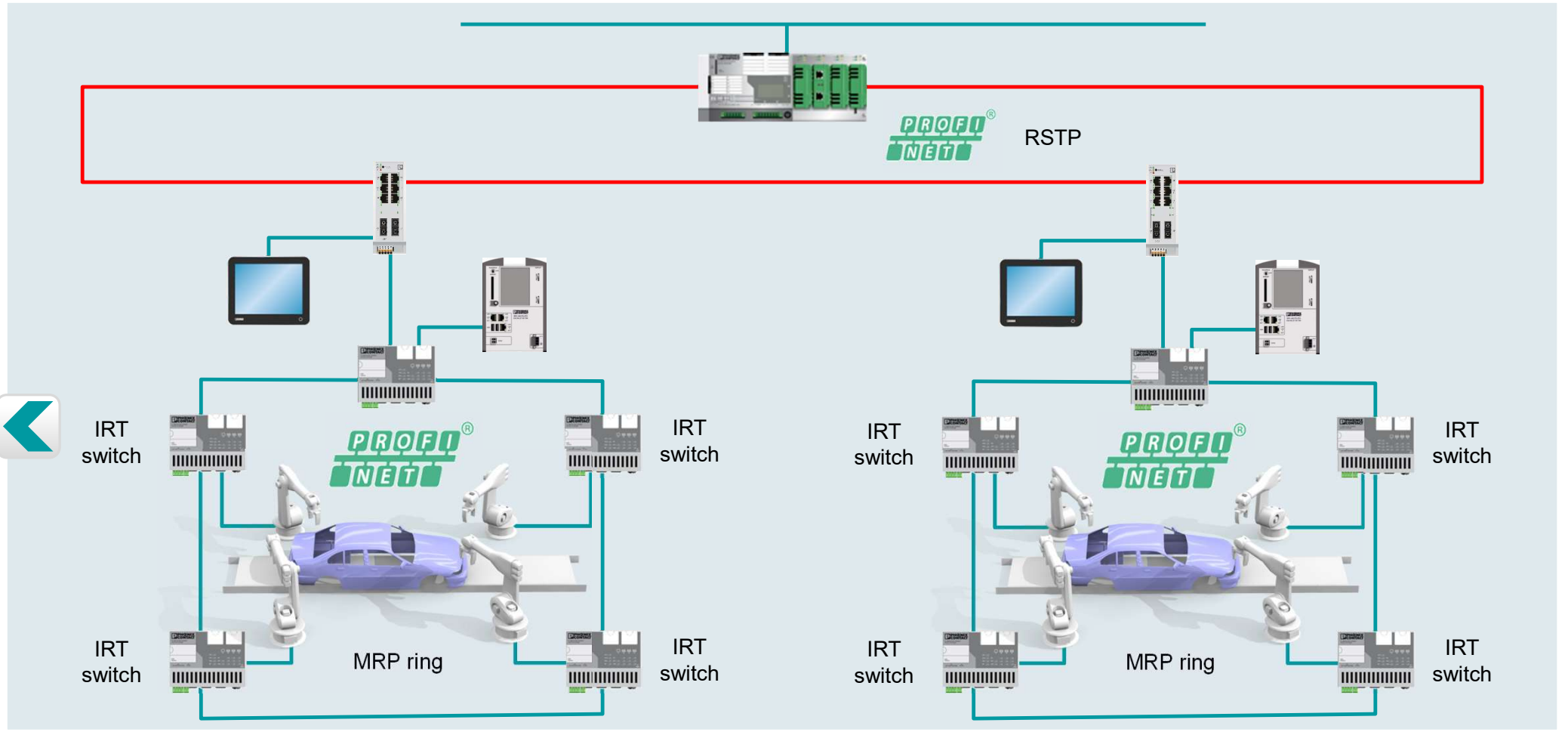
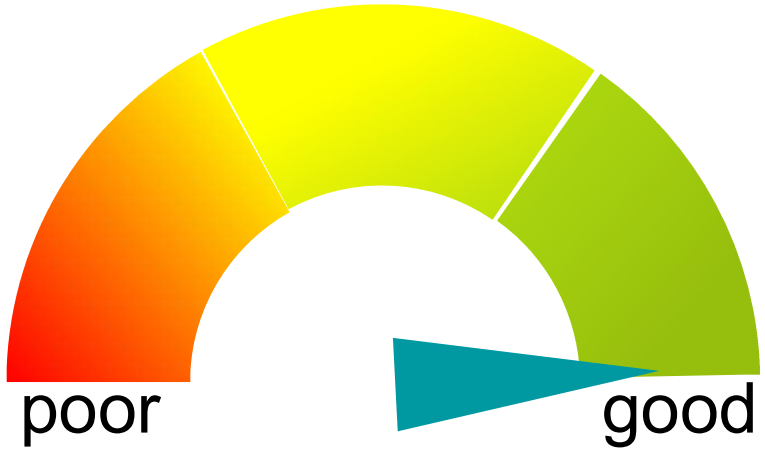

RSTP
IRT switch
IRT switch
IRT switch
IRT switch
MRP ring
IRT switch
IRT switch
IRT switch
IRT switch
MRP ring

Distribute network data intelligently

Typical problems in unmanaged networks: As the network grows, network stability declines



Network stability

215 Network devices

- High broad-and multicast-traffic in the network
- Unauthorized devices
- Network loop
- Cable and connector problems

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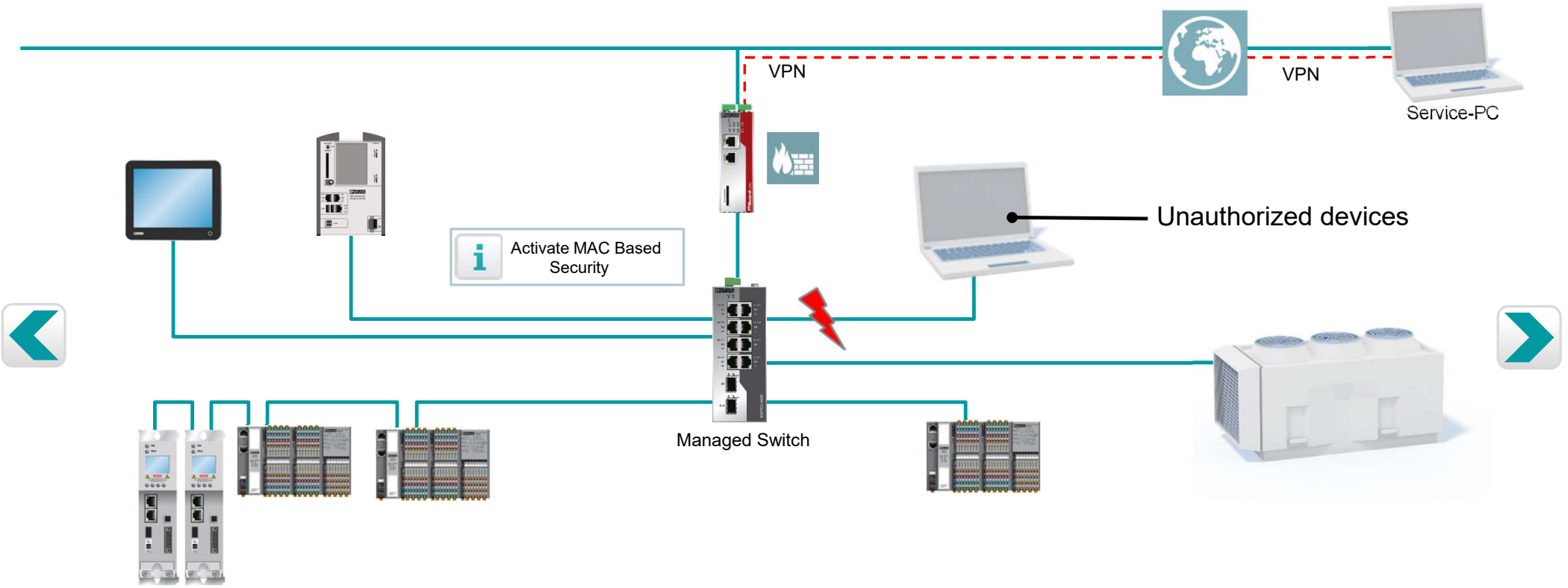
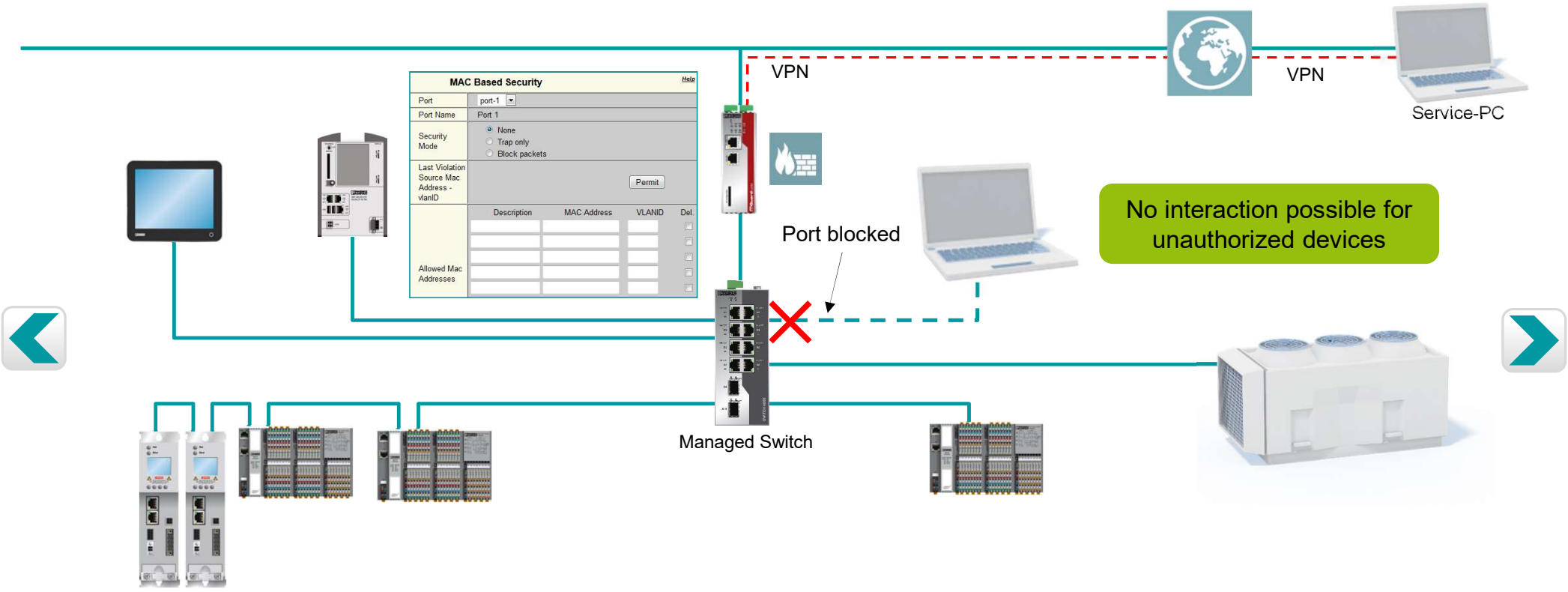
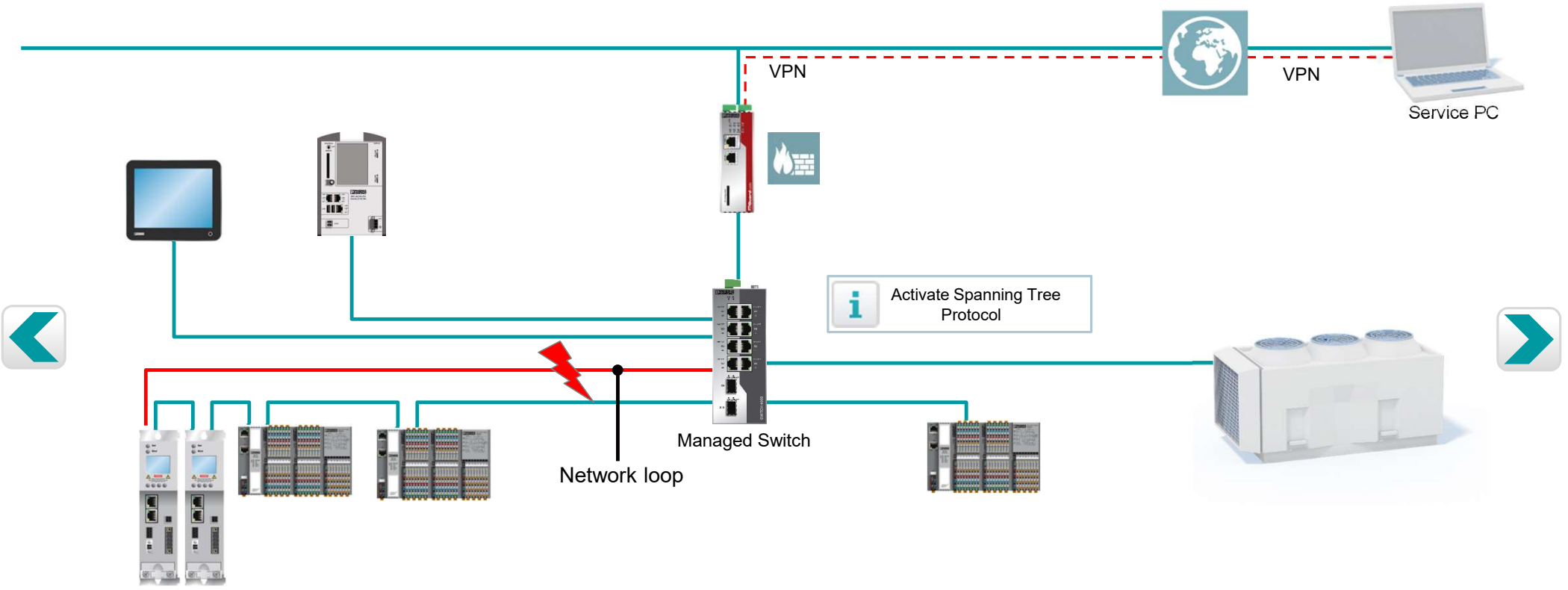
Unauthorized devices



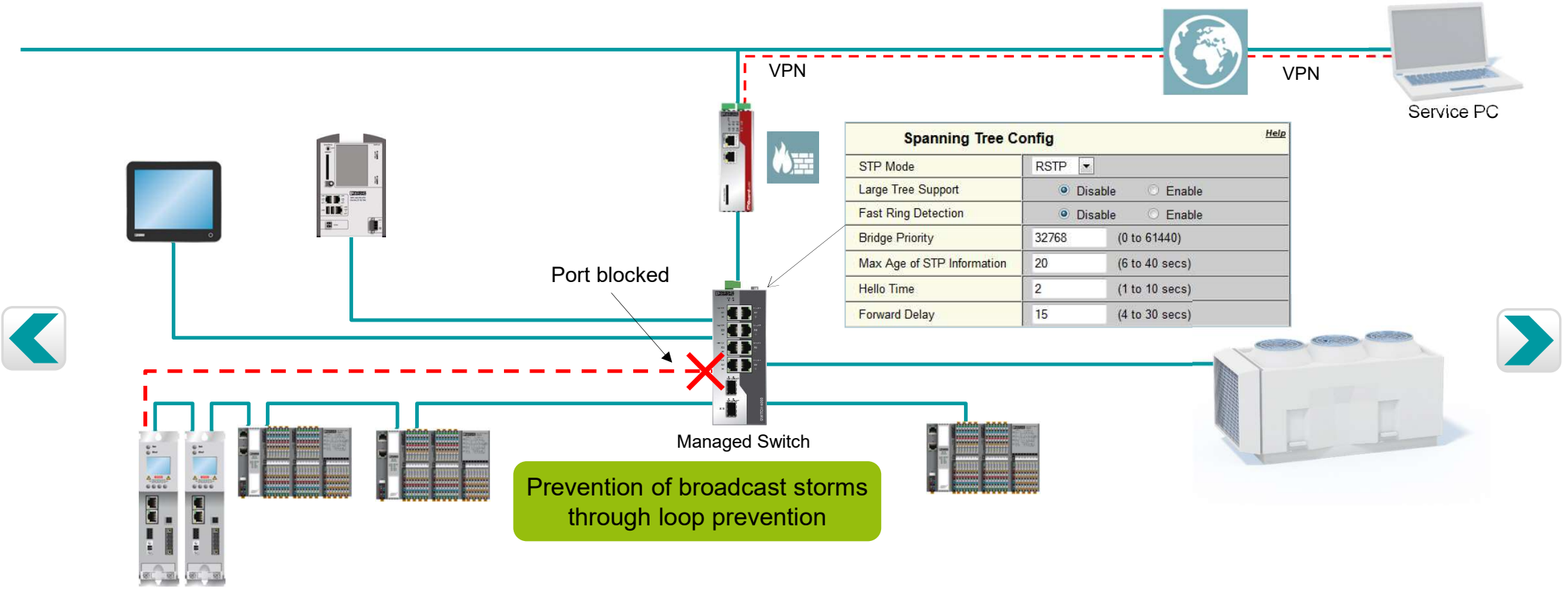
Our Solution: MAC Based Security



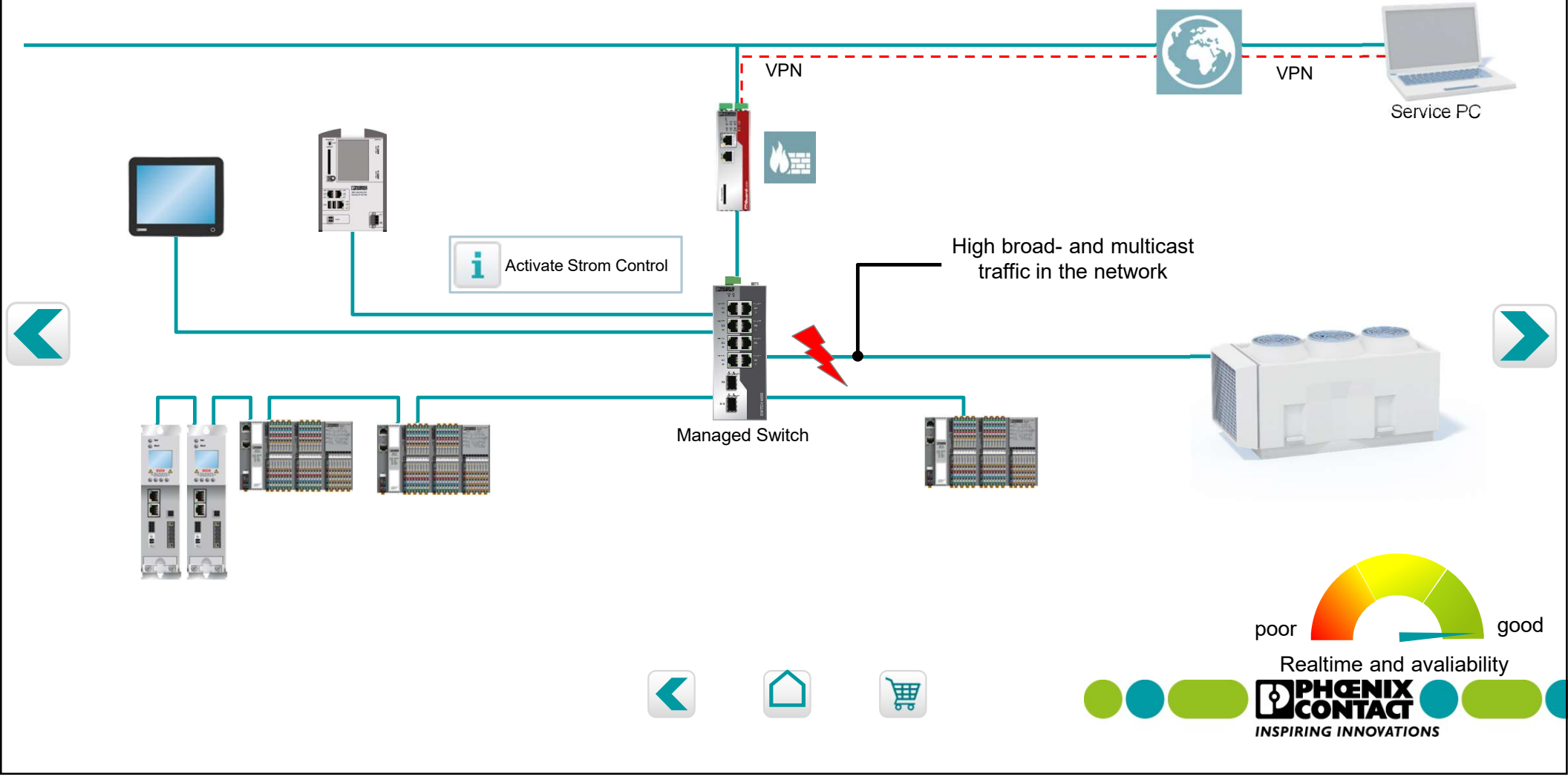
Network Loops



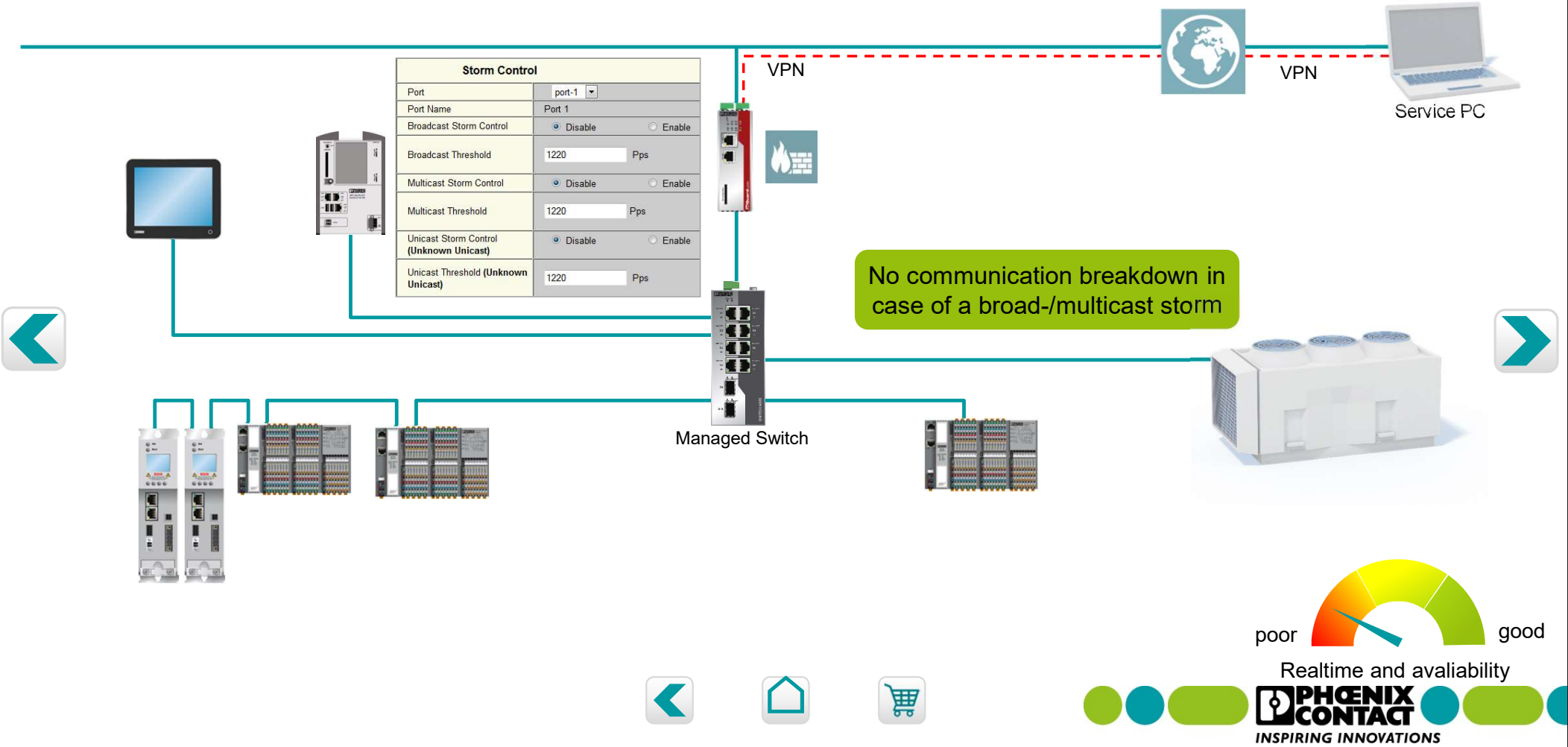
Our Solution: Spanning Tree Protocoll



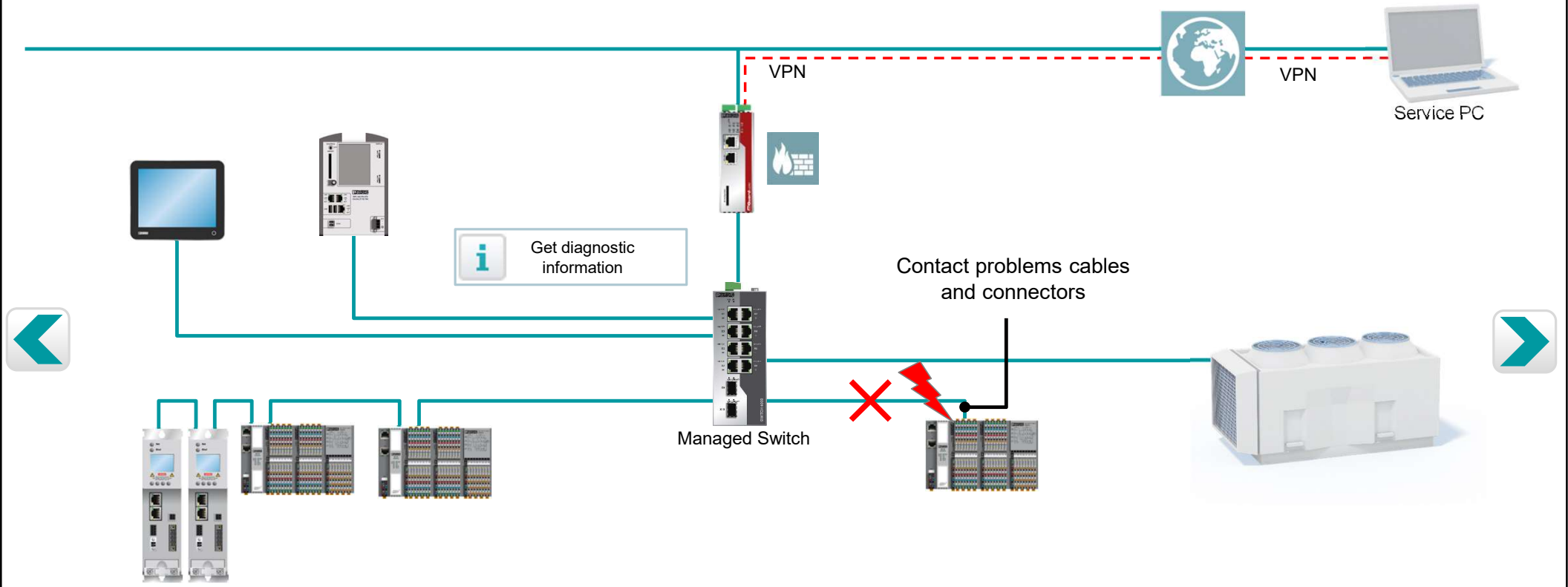
High broad- and multicast traffic



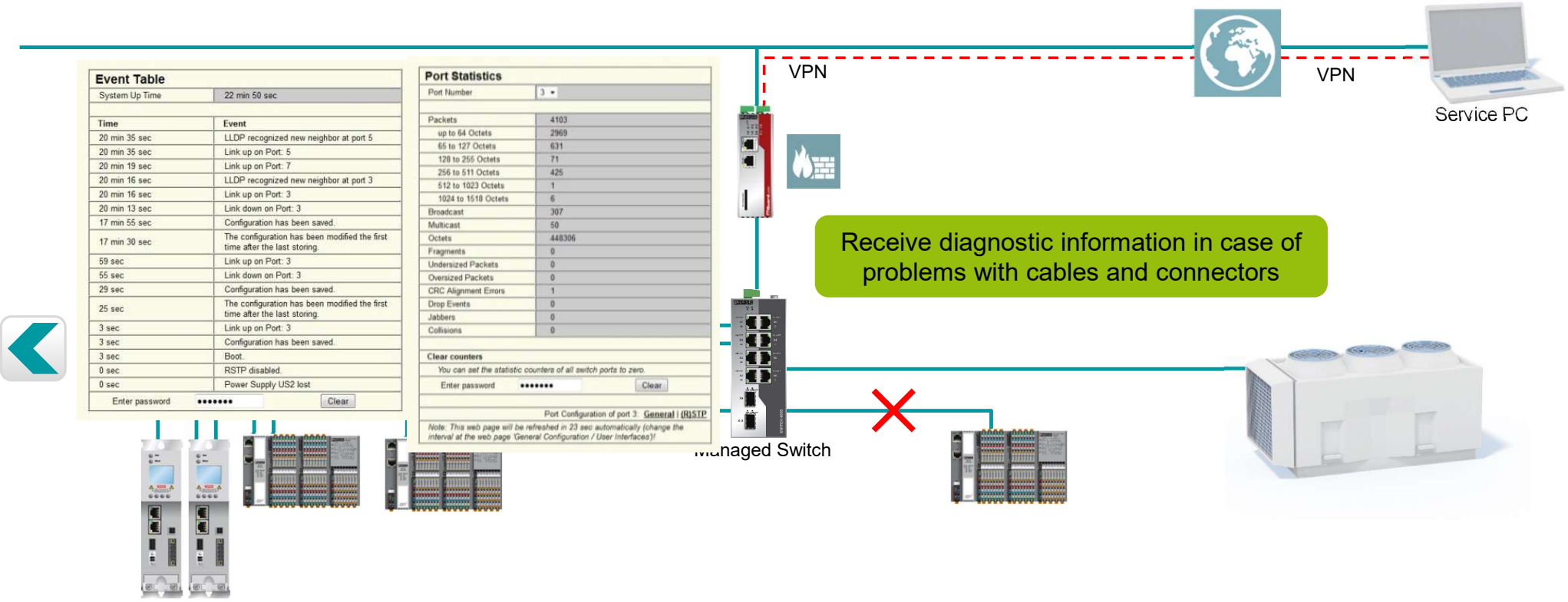
Our solution: Storm control

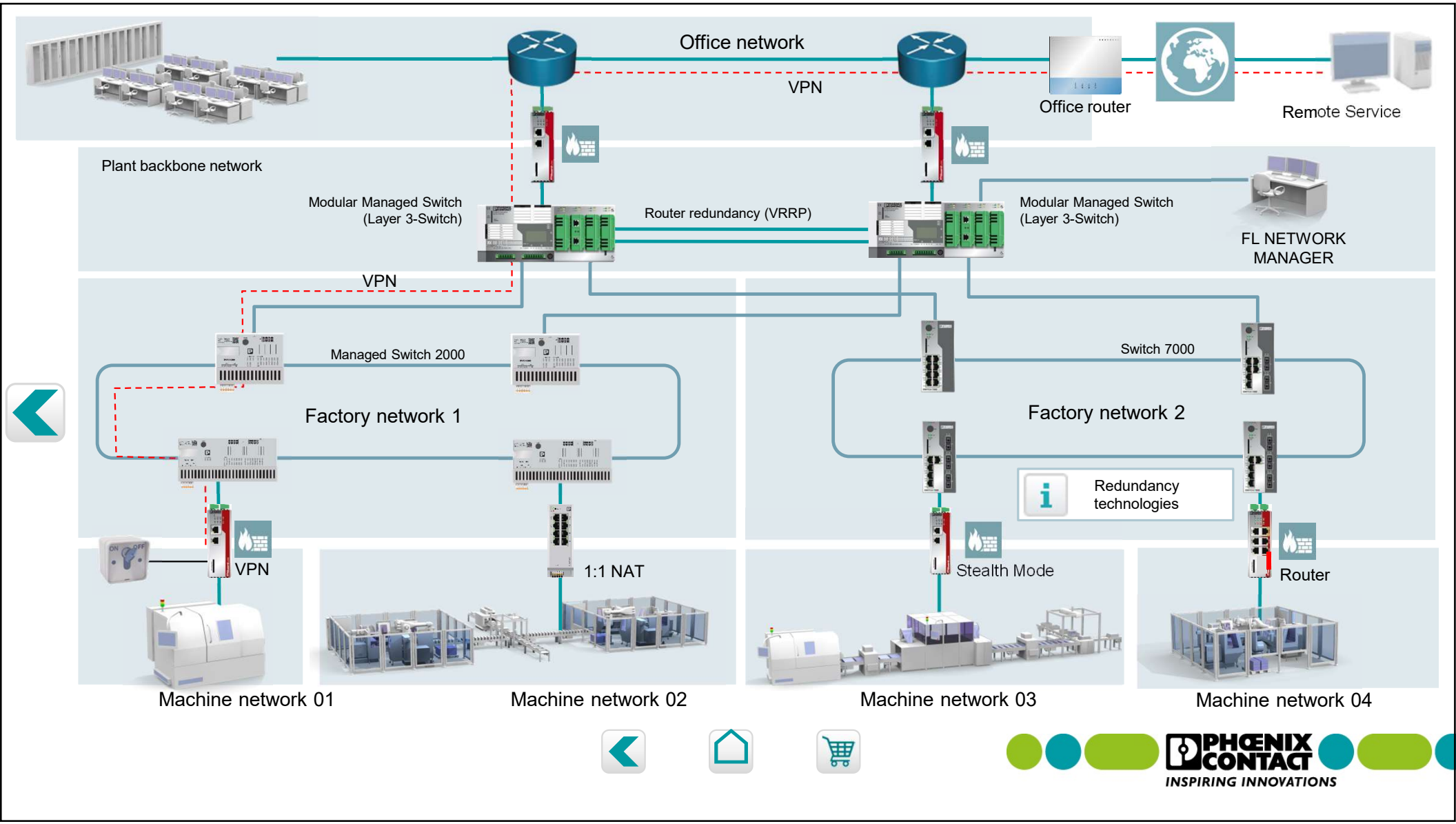


Contact problems of cables and connectors

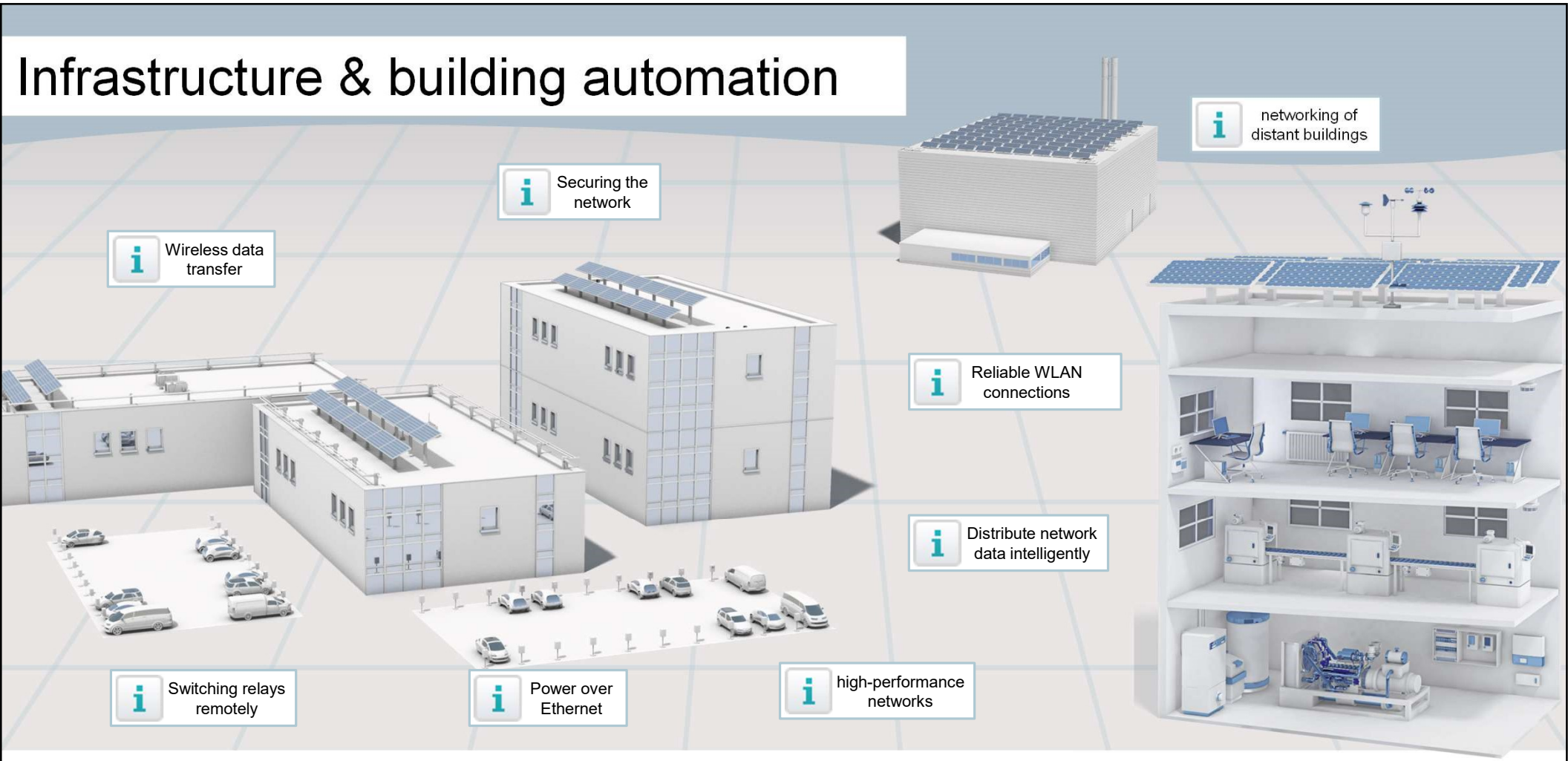


Our solution: Diagnostic information




Office network
VPN
Office router
Remote Service
Plant backbone network
Modular Managed Switch
(Layer 3-Switch)
Router redundancy (VRRP)
Modular Managed Switch
(Layer 3-Switch)
FL NETWORK
MANAGER
VPN
Managed Switch 2000
Factory network 1
Switch 7000
Factory network 2
Redundancy
technologies
VPN
1:1 NAT
Stealth Mode
Router
Machine network 01
Machine network 02
Machine network 03
Machine network 04

Infrastructure & building automation



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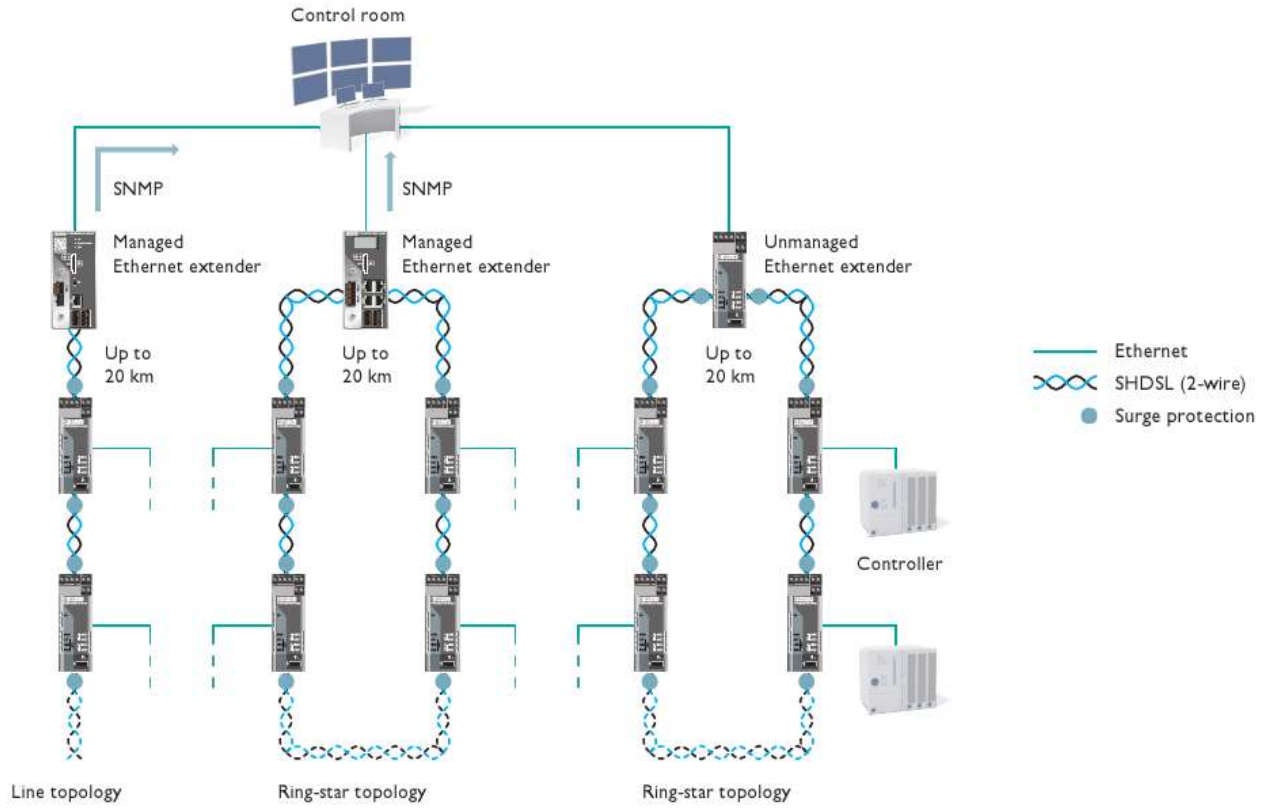
Subsequent networking of distant buildings



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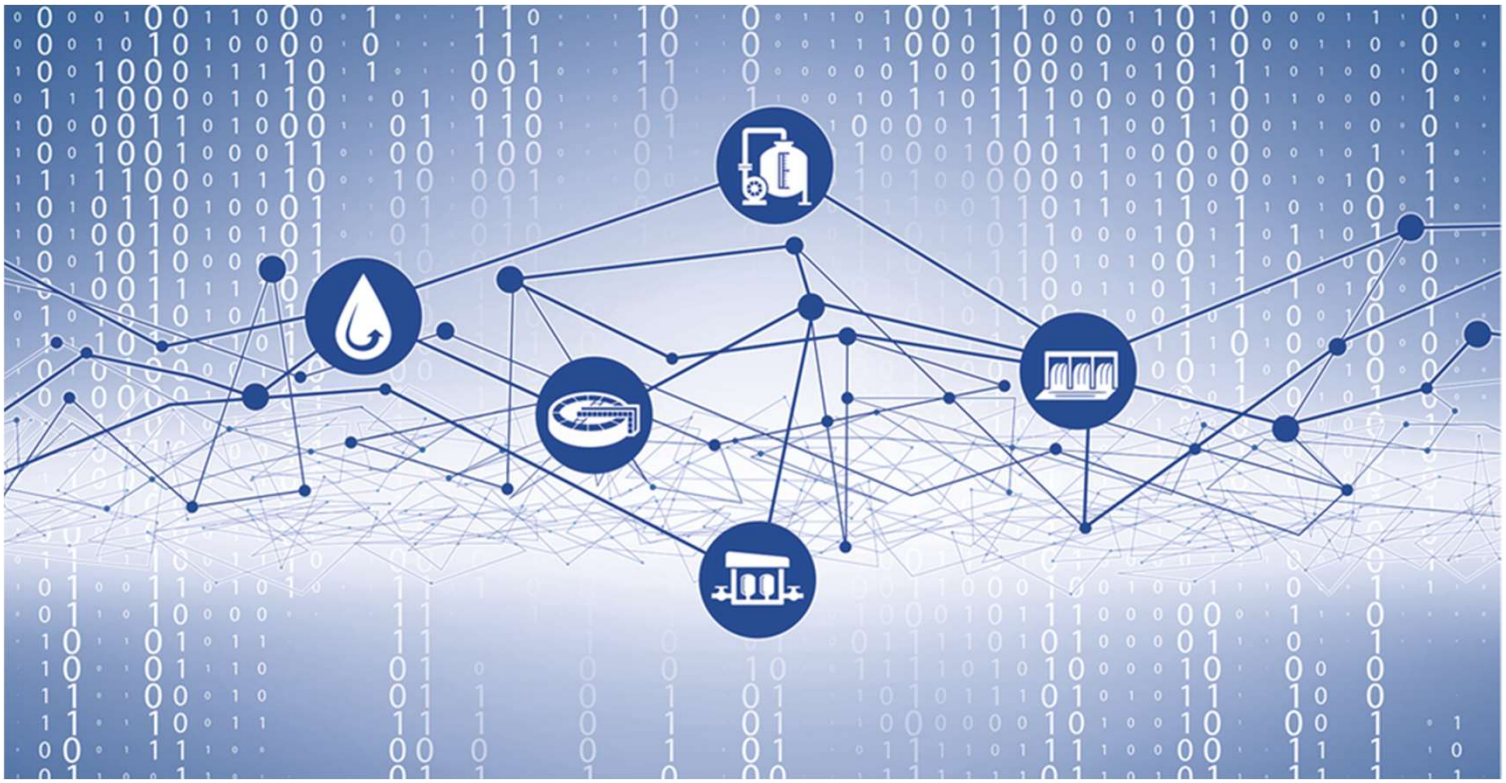
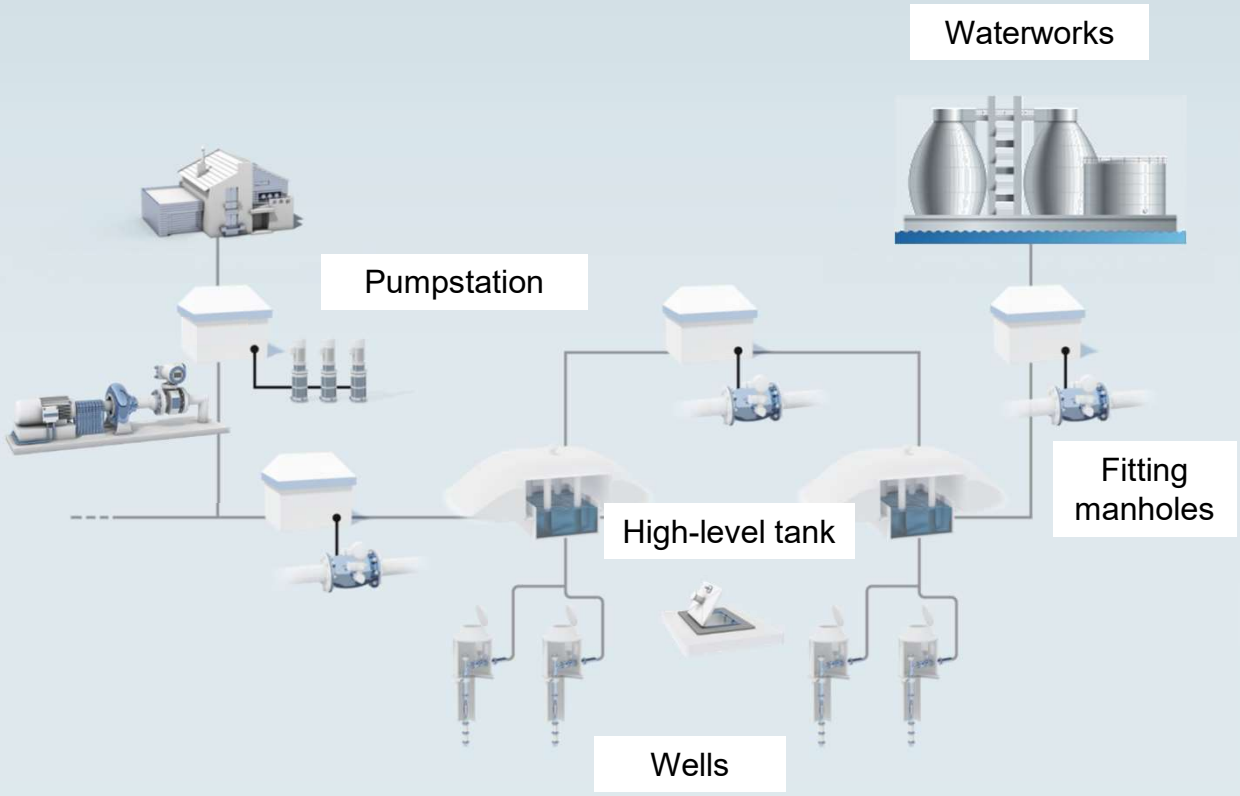
PROFINET

Infraestructure Water and Waste Water



INSPIRING INNOVATIONS

Water supply



Customer pains:

- Long distances
- „Old“ copper cable
- No cable
- Transmission of I/O signals
- Transmission of field buses

  (Profibus, Modbus, Profinet…)
- Secure data communication

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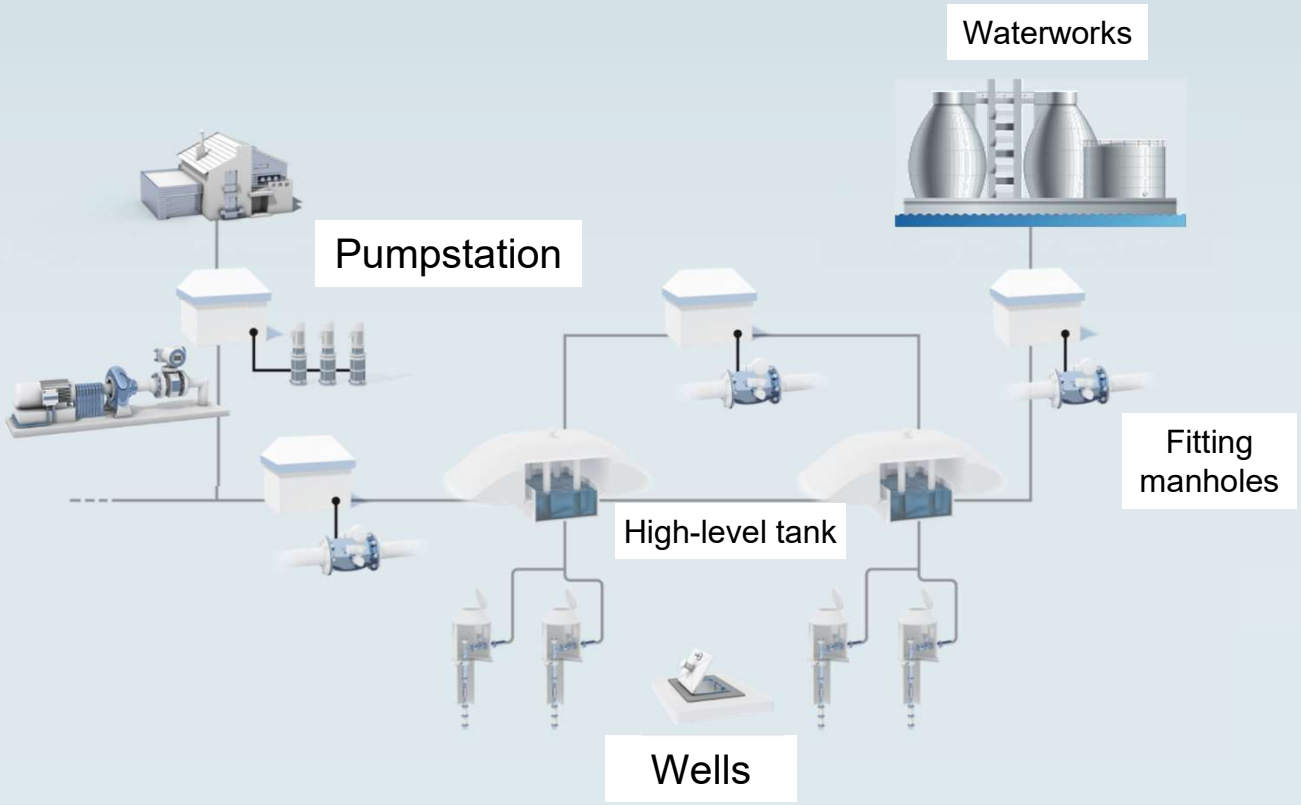
Water supply



- Pumpstation
- Wells

Wells

Ethernet Extender

Switches

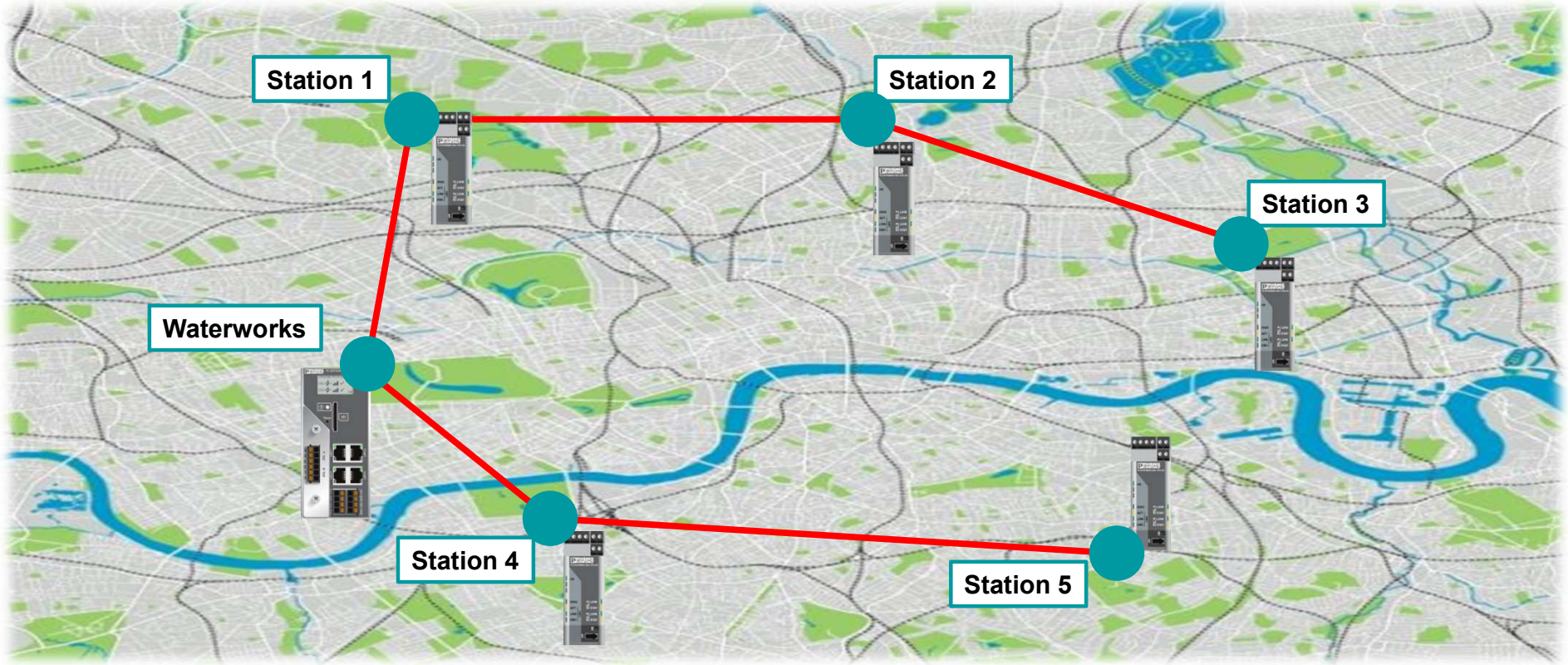
Surge protection

mGuard
Cyber security

RJ 45 cable
& connector

Water 4.0

Ethernet Infrastructure



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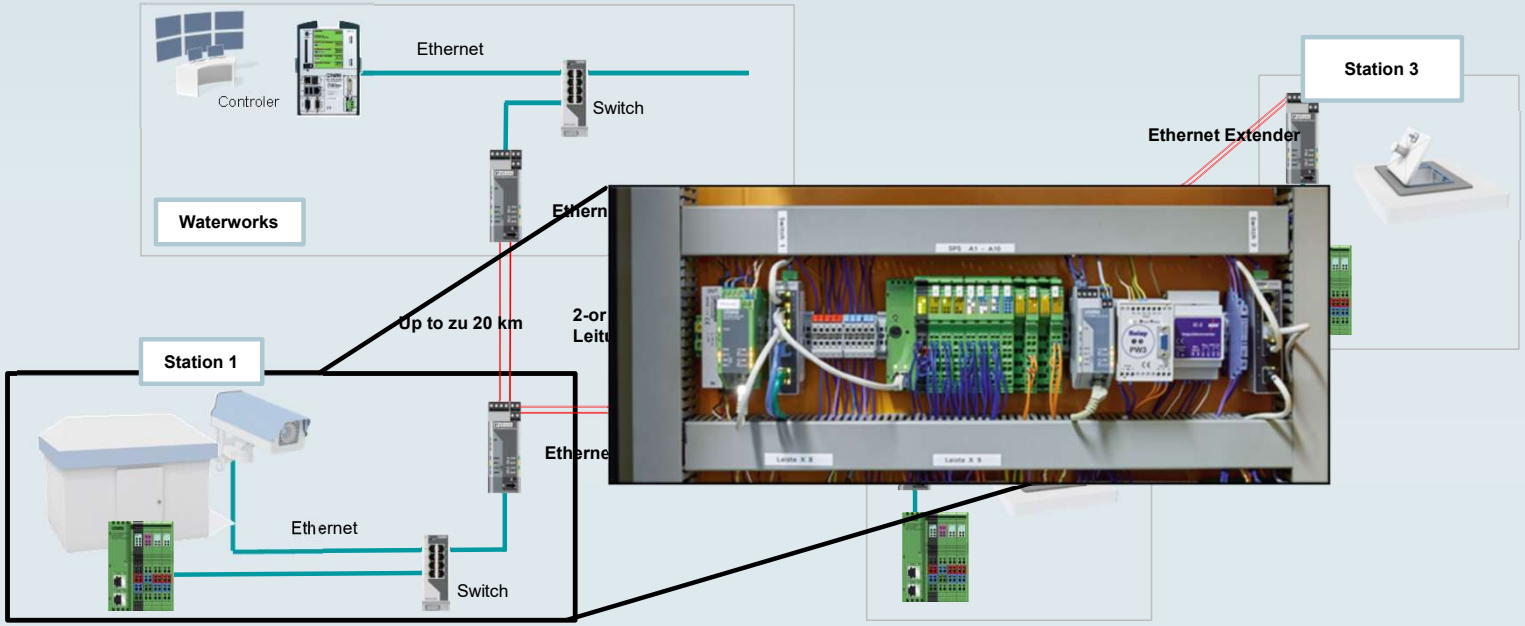
Ethernet Extender

Point-to-Point and Line network structure



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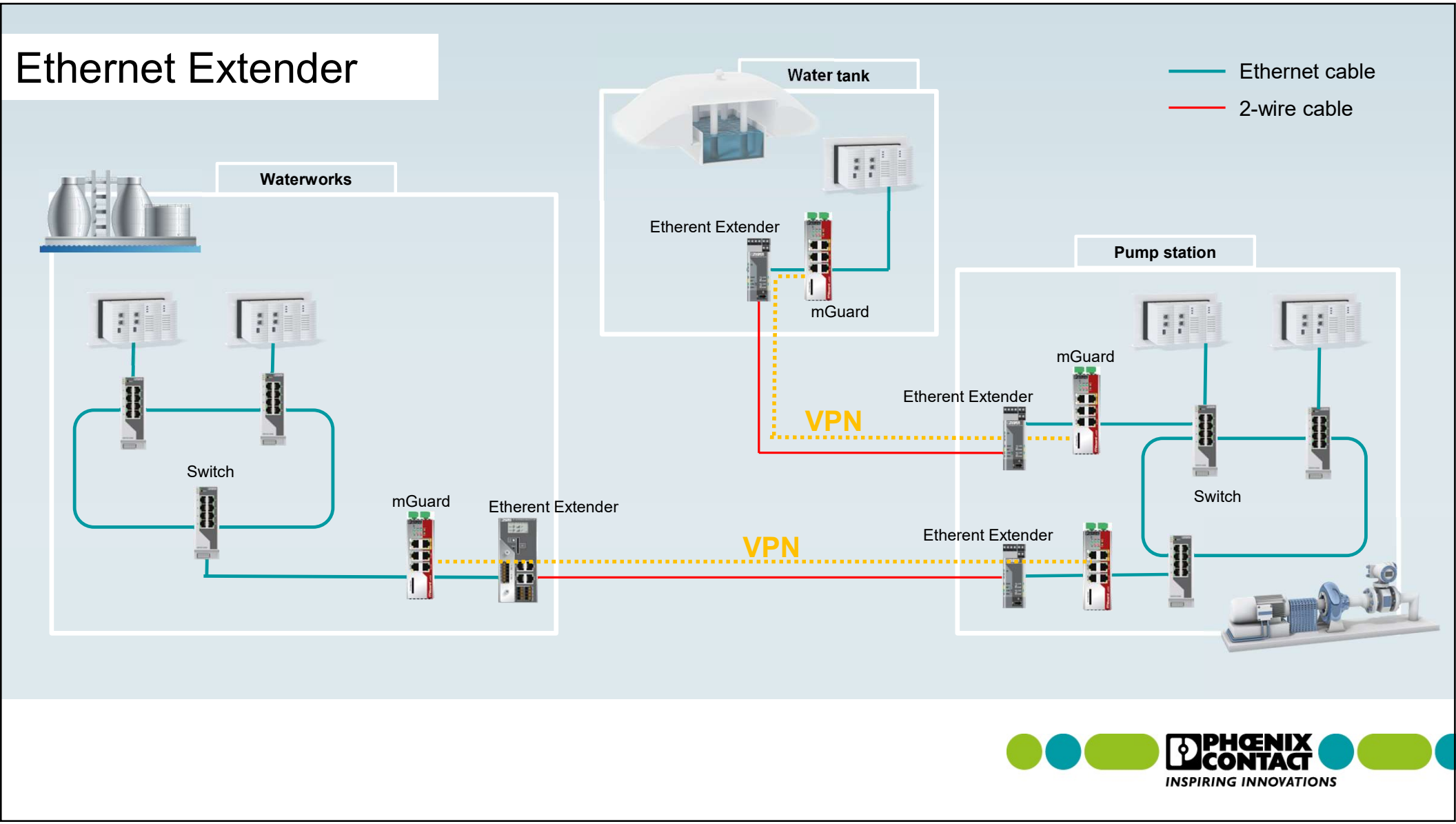
Ethernet Extender



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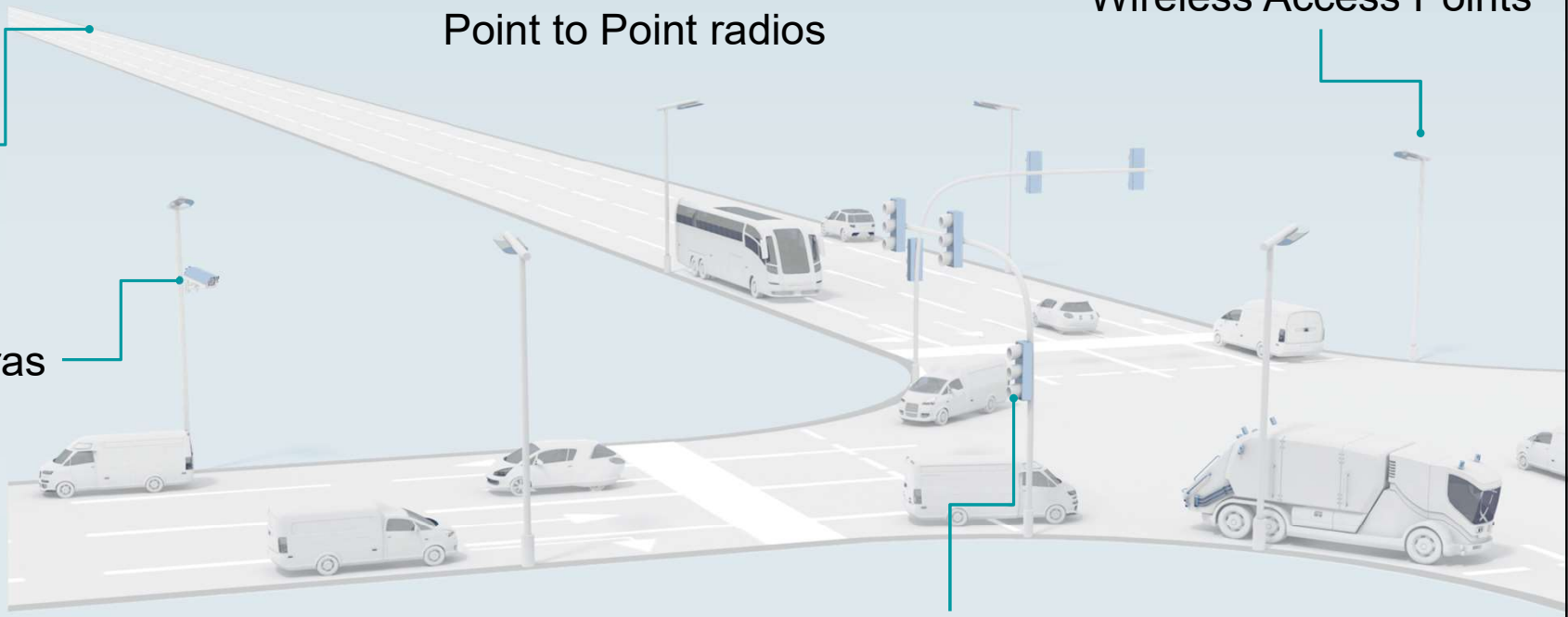
ITS – Intelligent Transportation Systems



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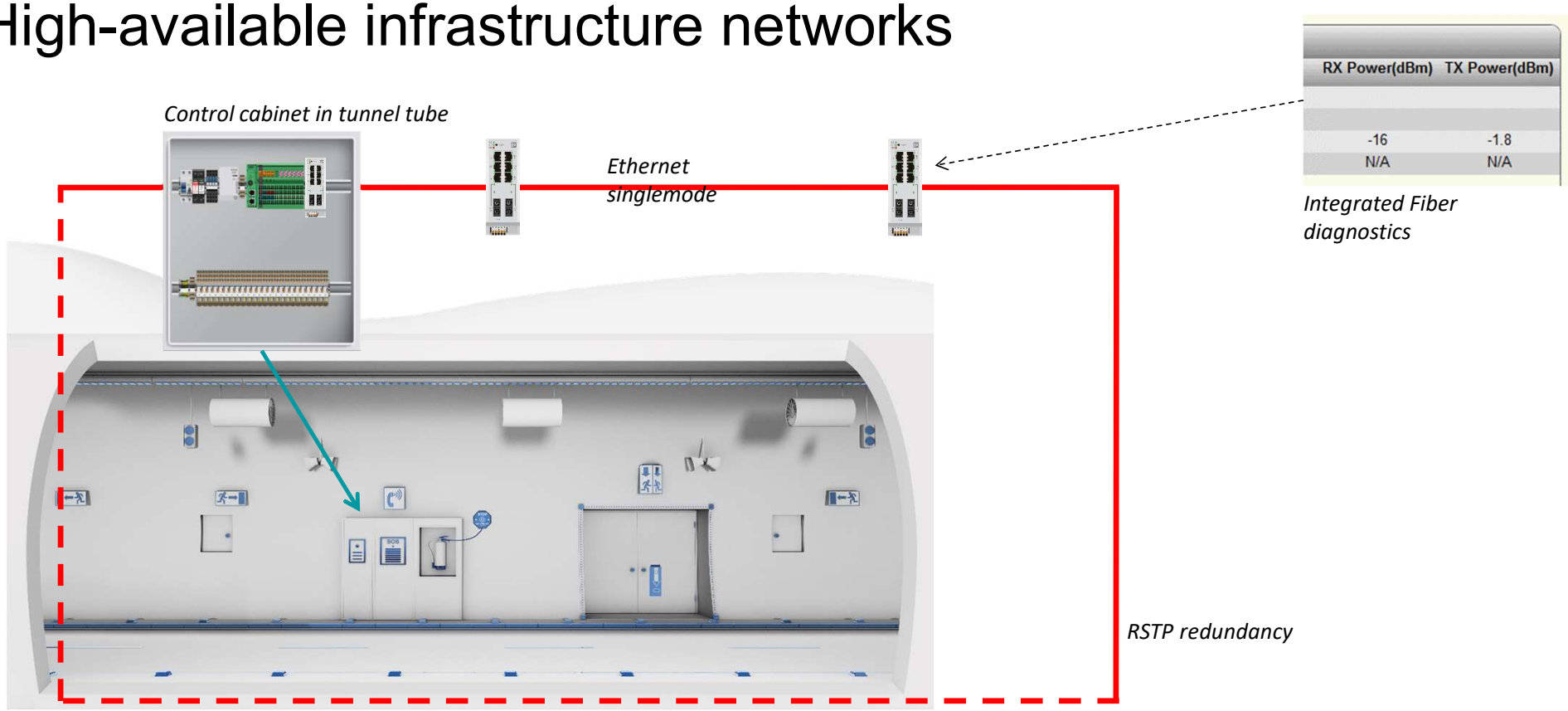
High-available infrastructure networks



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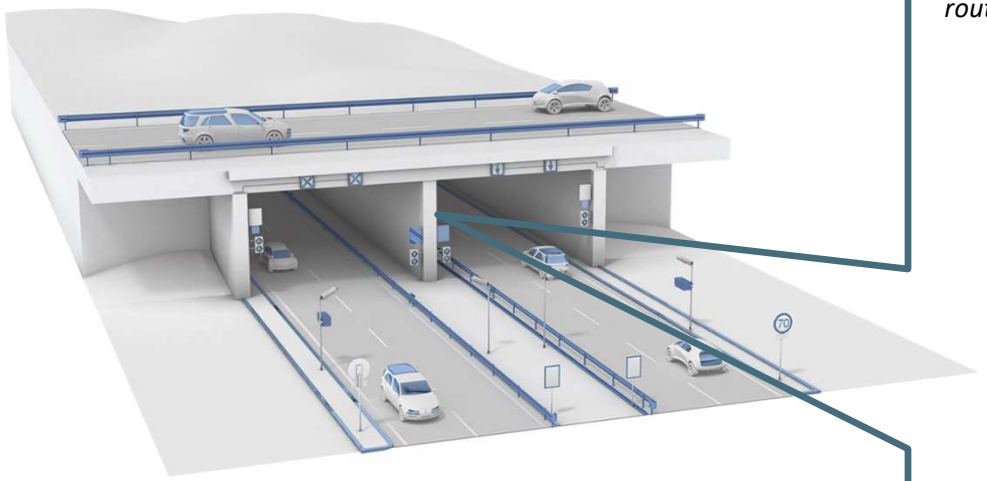
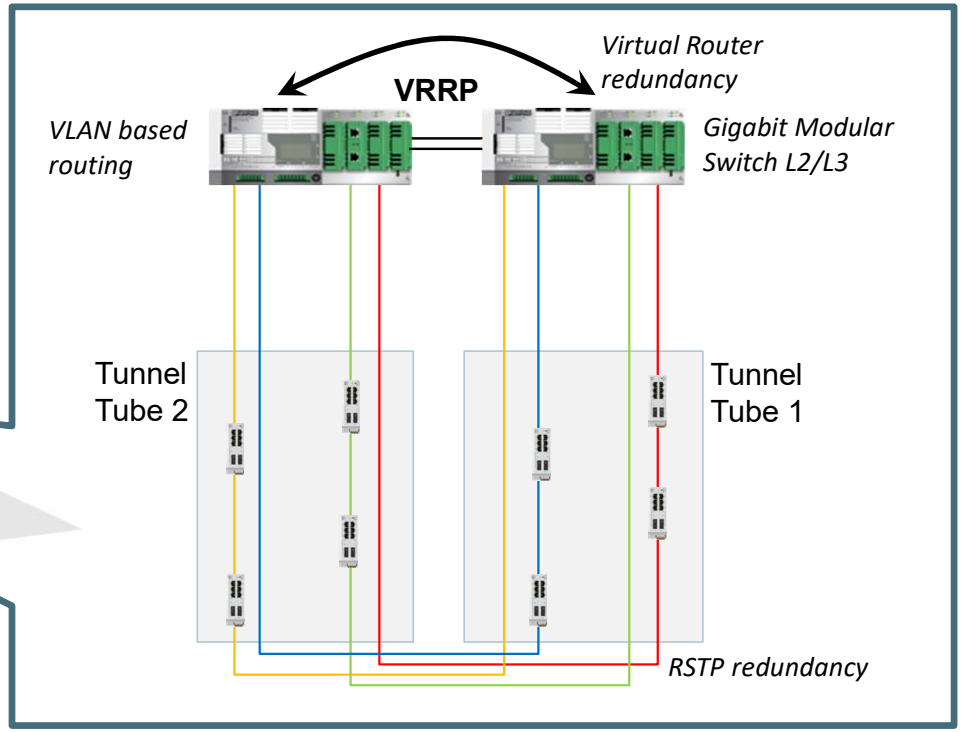
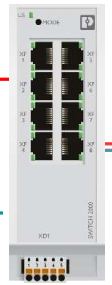
High-available infrastructure networks

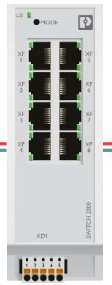




INSPIRING INNOVATIONS

Video traffic:
Prio = 6





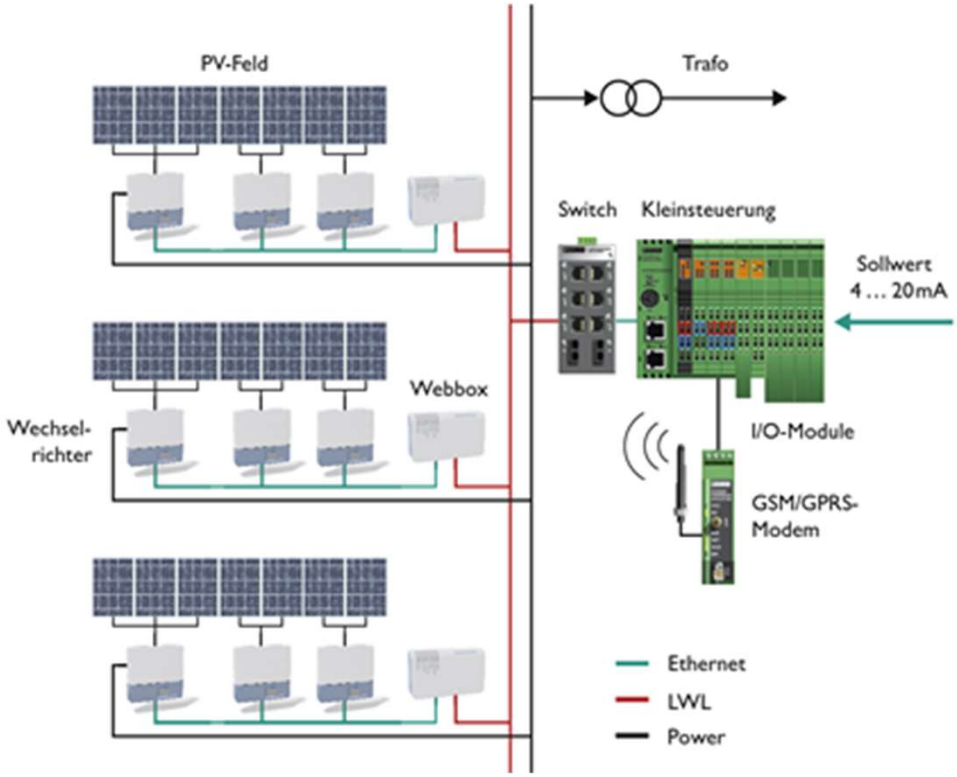
PROFINET
Controller

PROFINET traffic:
Prio = 6

Prioritized forwarding of PROFINET frames

PROFINET

Energy (Solar & Wind)



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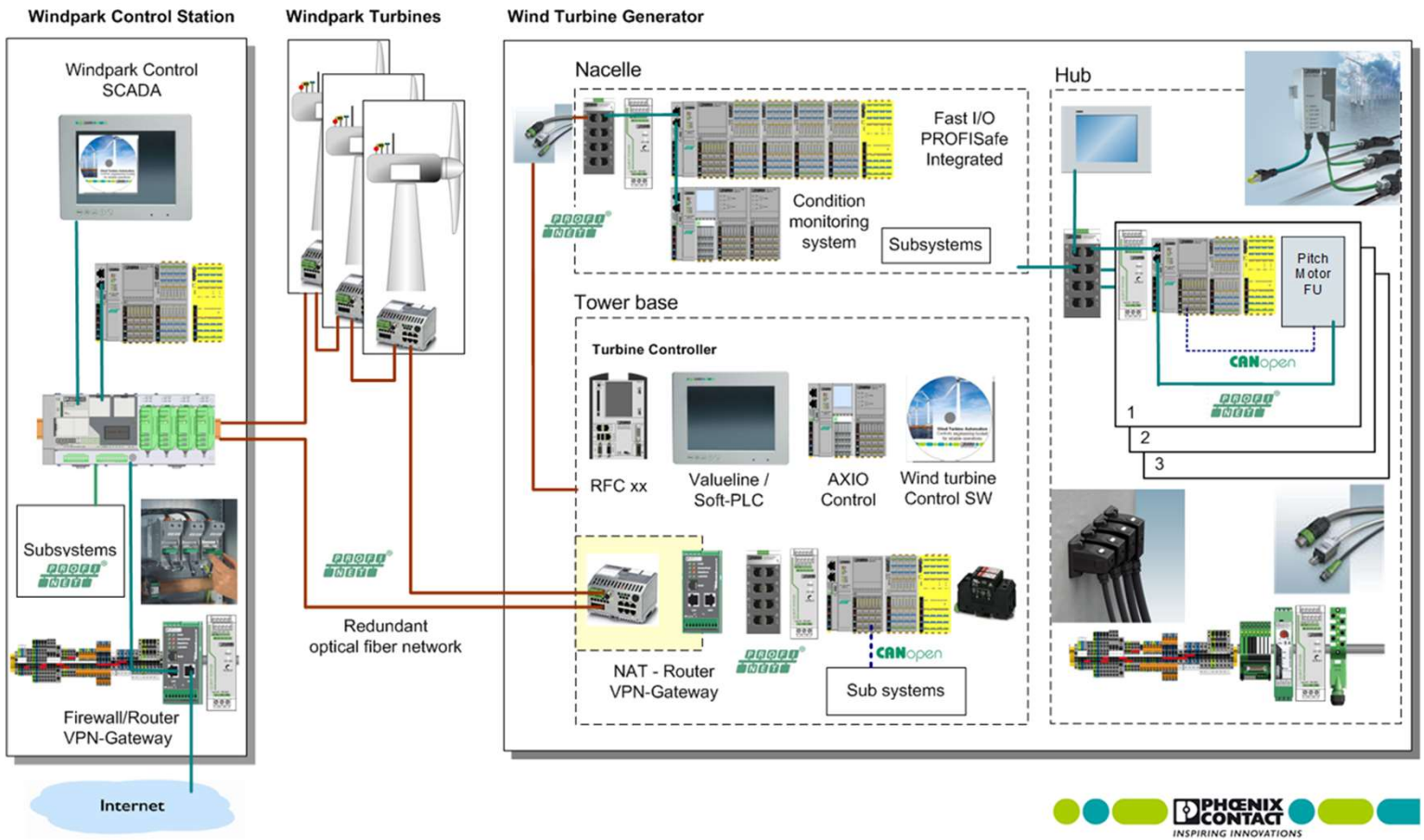
PROFINET

Wind



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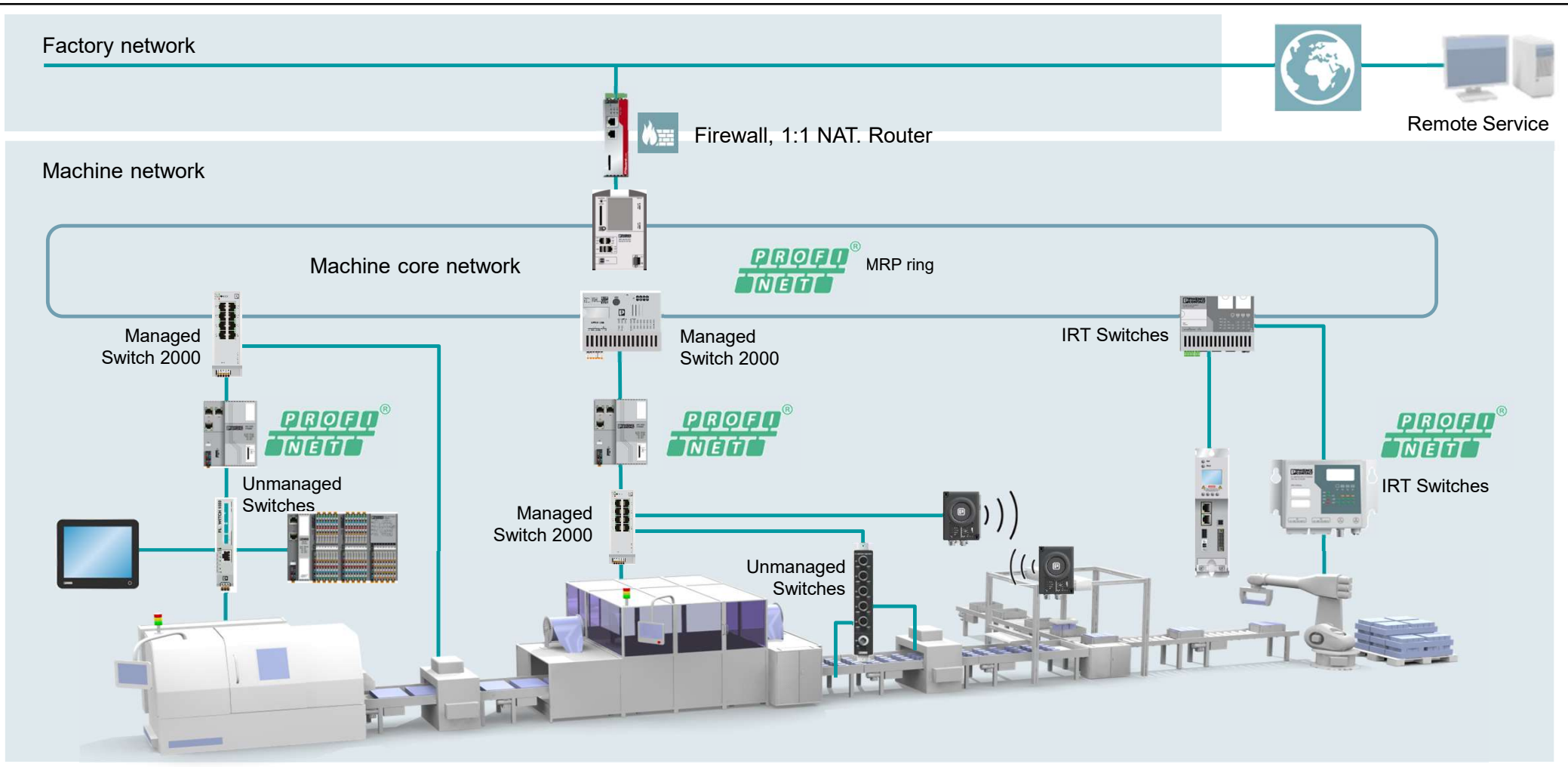
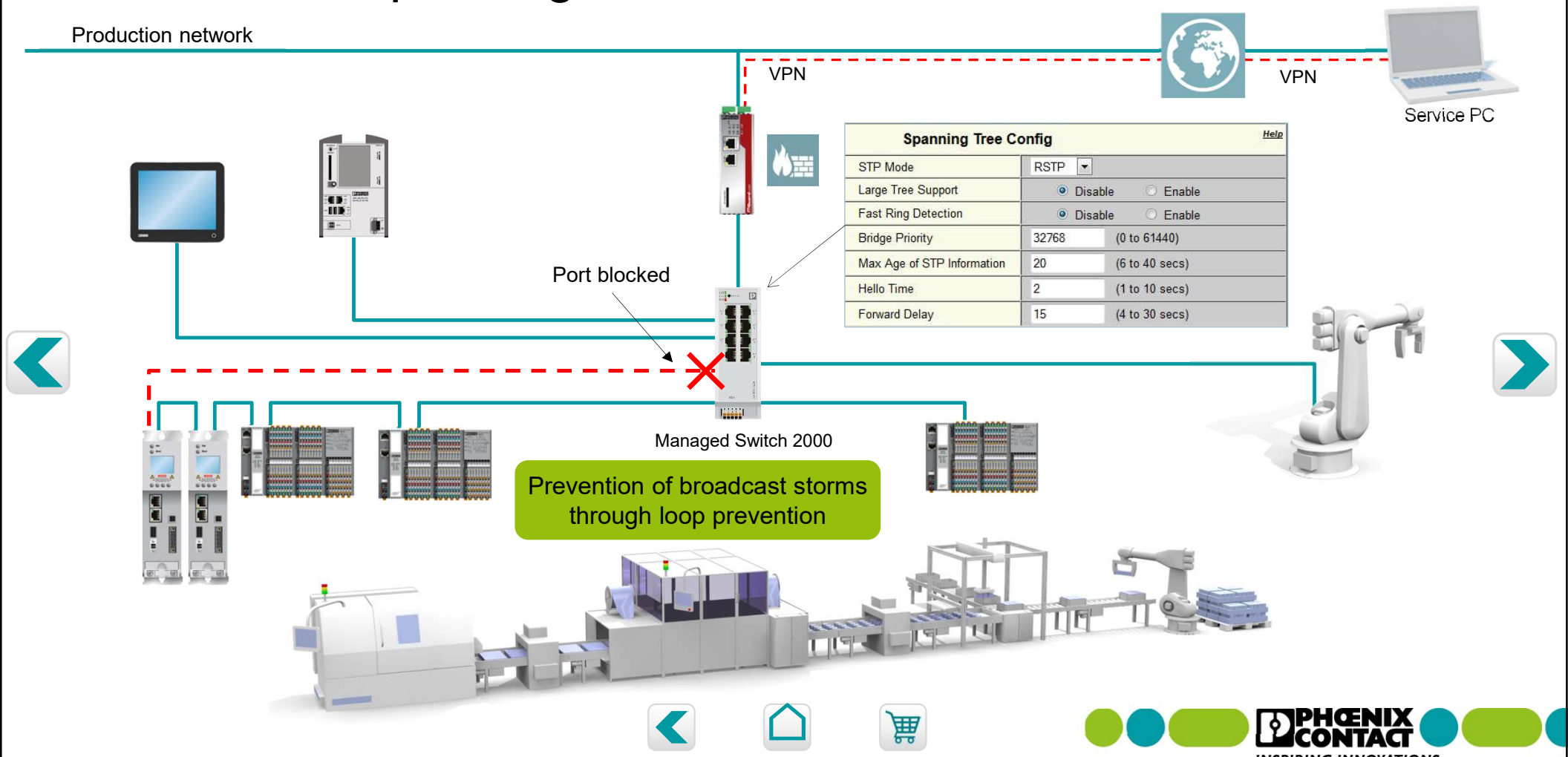
INSPIRING INNOVATIONS

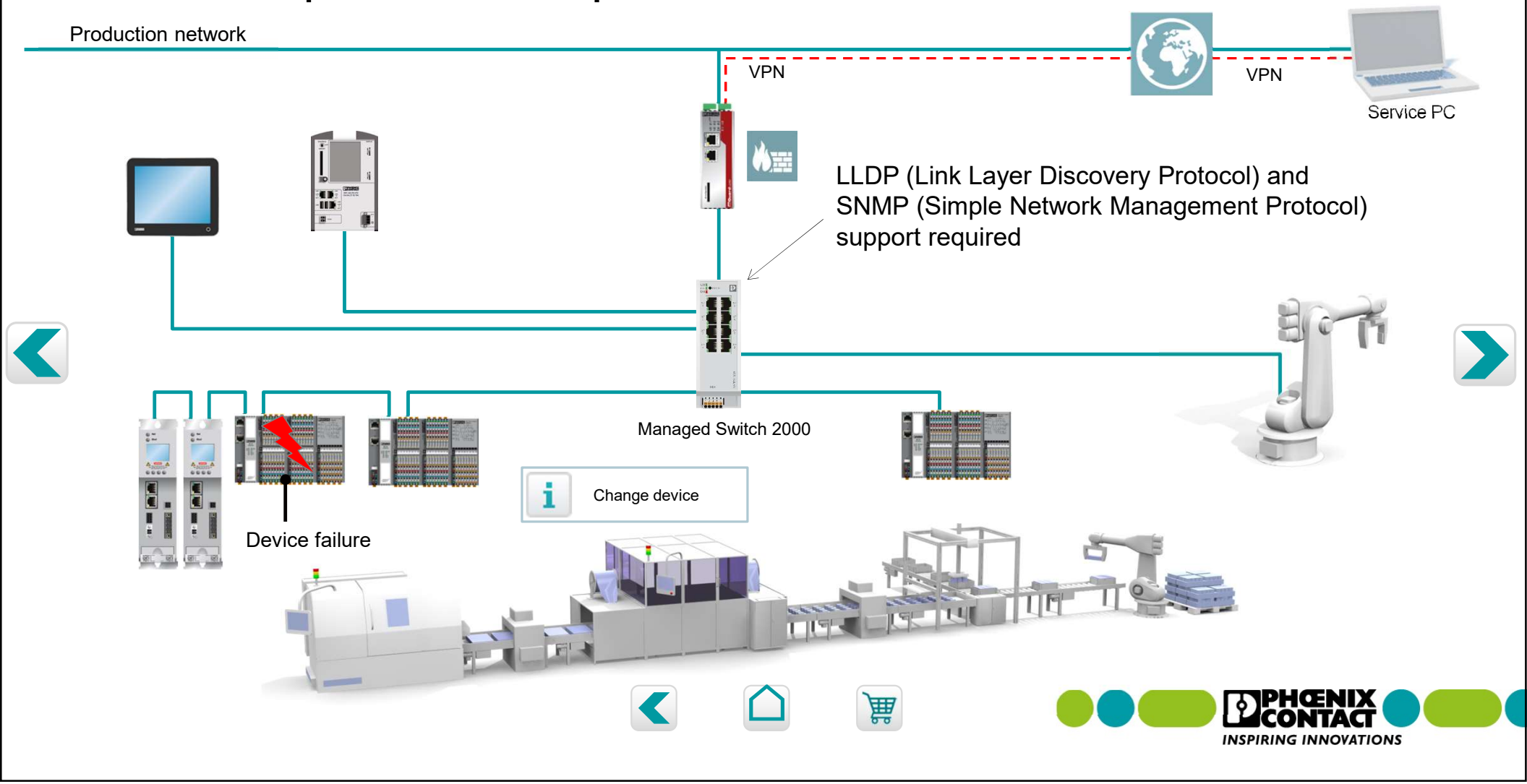

Factory network
Remote Service
Firewall, 1:1 NAT. Router
Machine network
Machine core network
MRP ring
Managed Switch 2000
Managed Switch 2000
IRT Switches
Unmanaged Switches
Managed Switch 2000
Unmanaged Switches
IRT Switches

Our Solution: Spanning Tree Protocoll

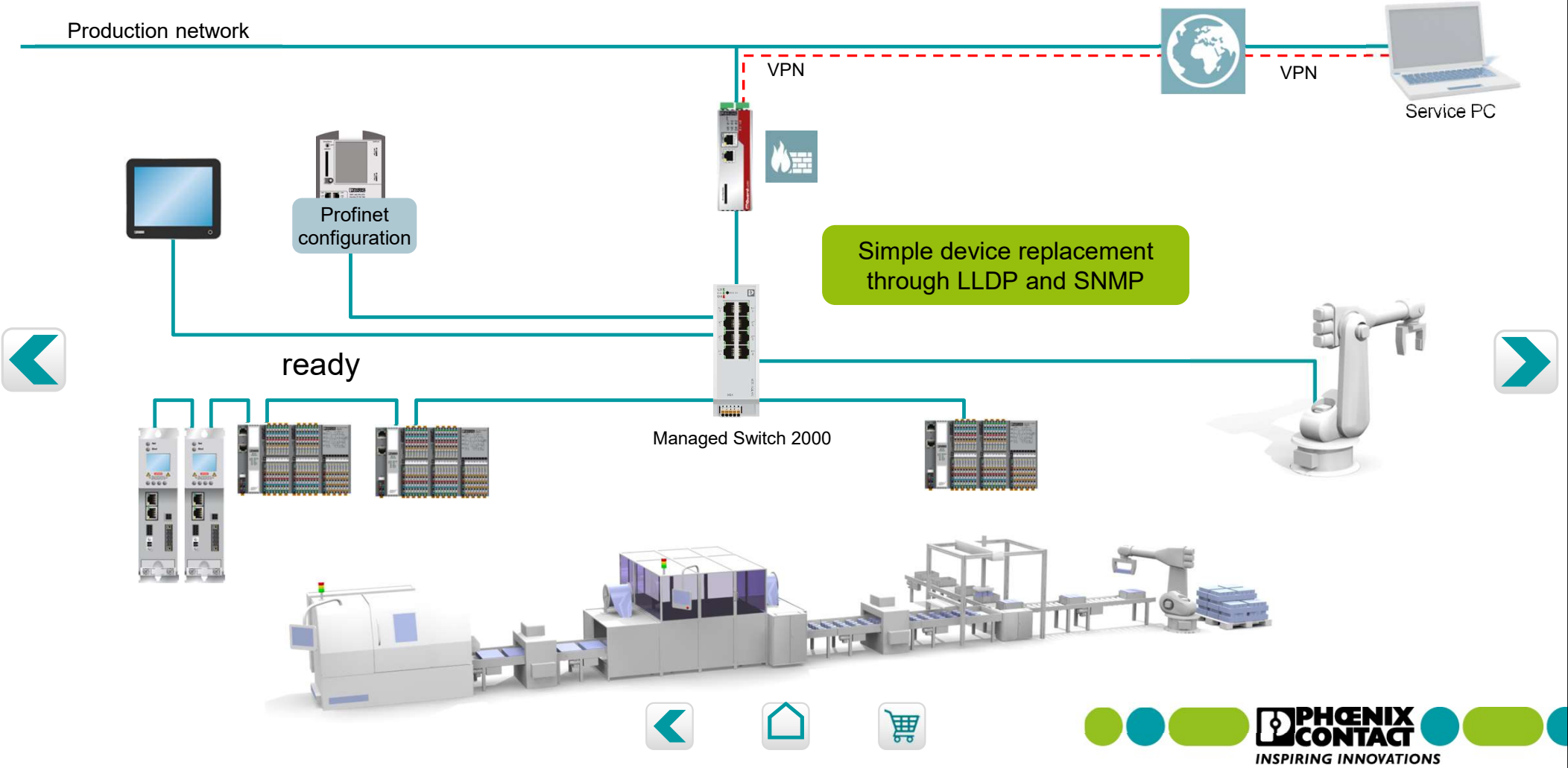


PHOENIX CONTACT
INSPIRING INNOVATIONS

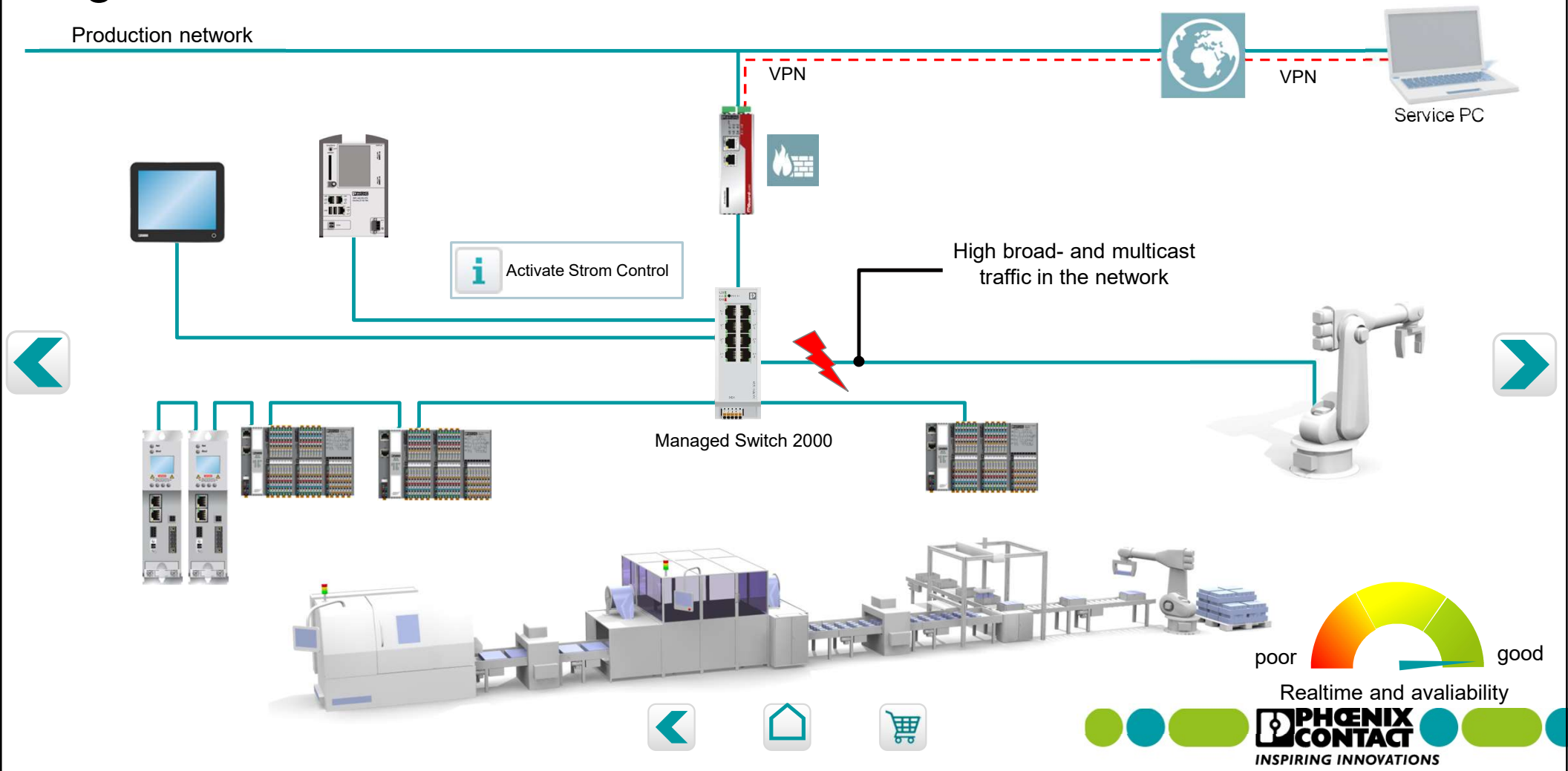
Profinet simple device replacement



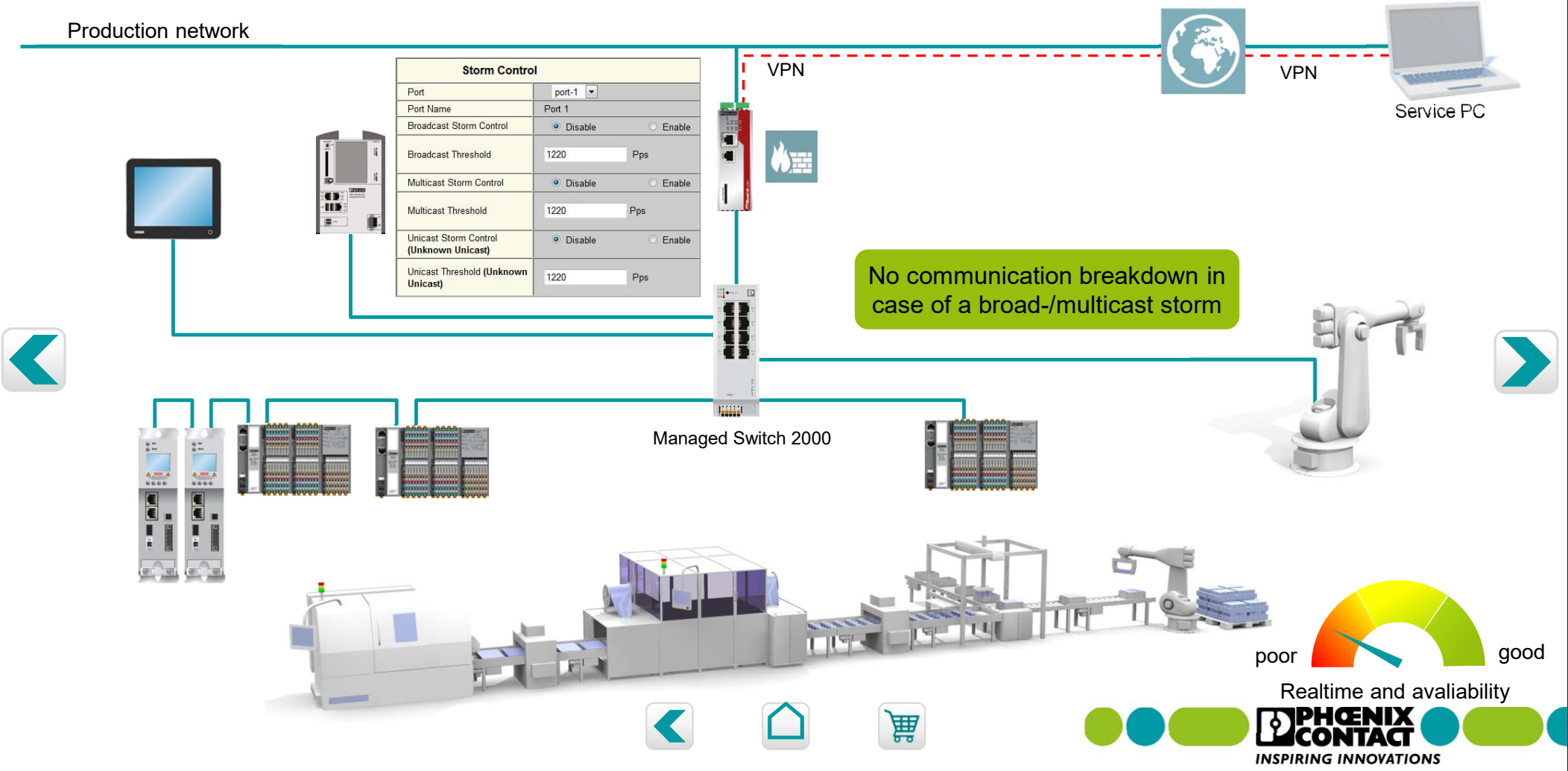
Profinet simple device replacement



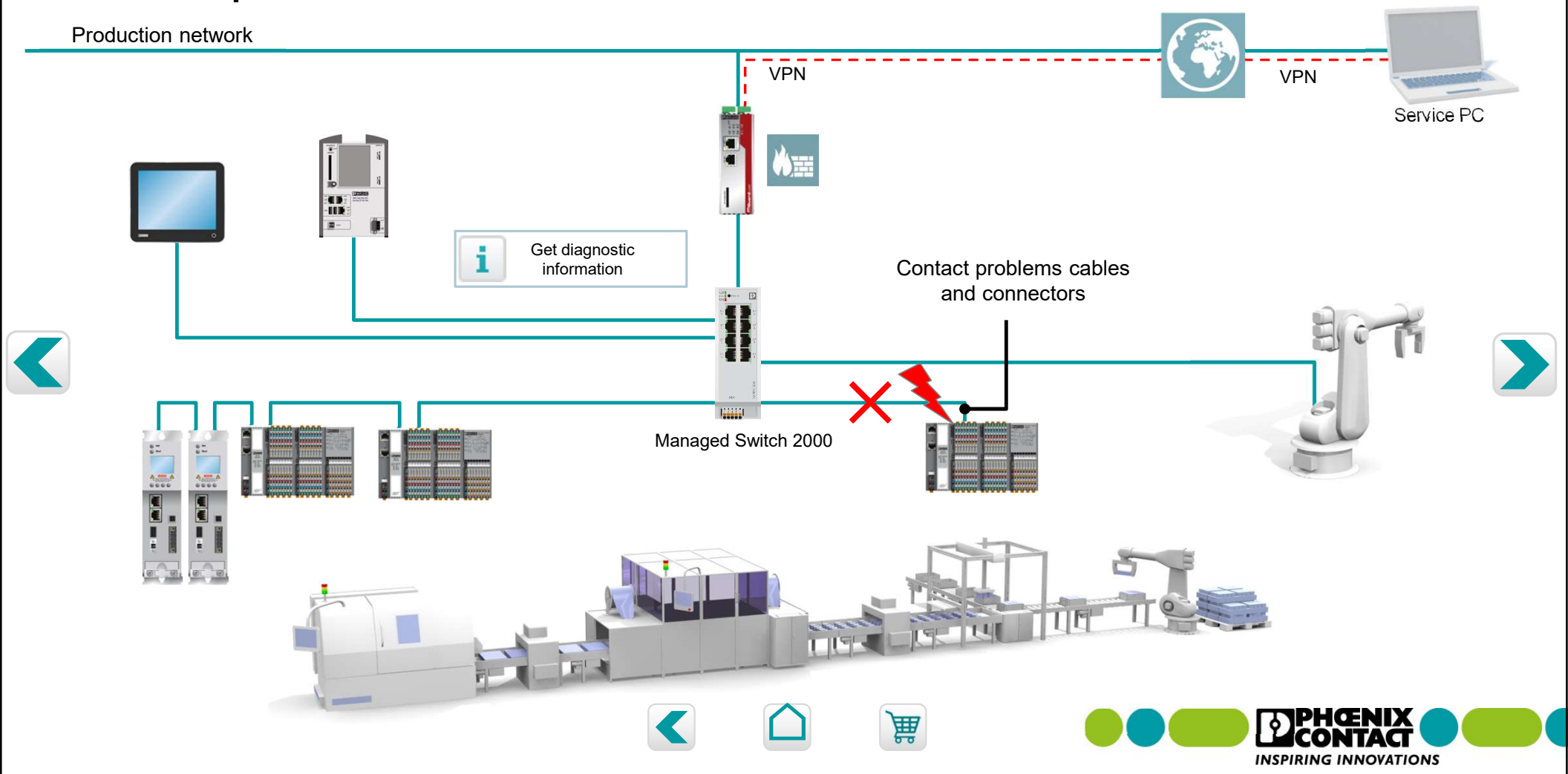
High broad- and multicast traffic



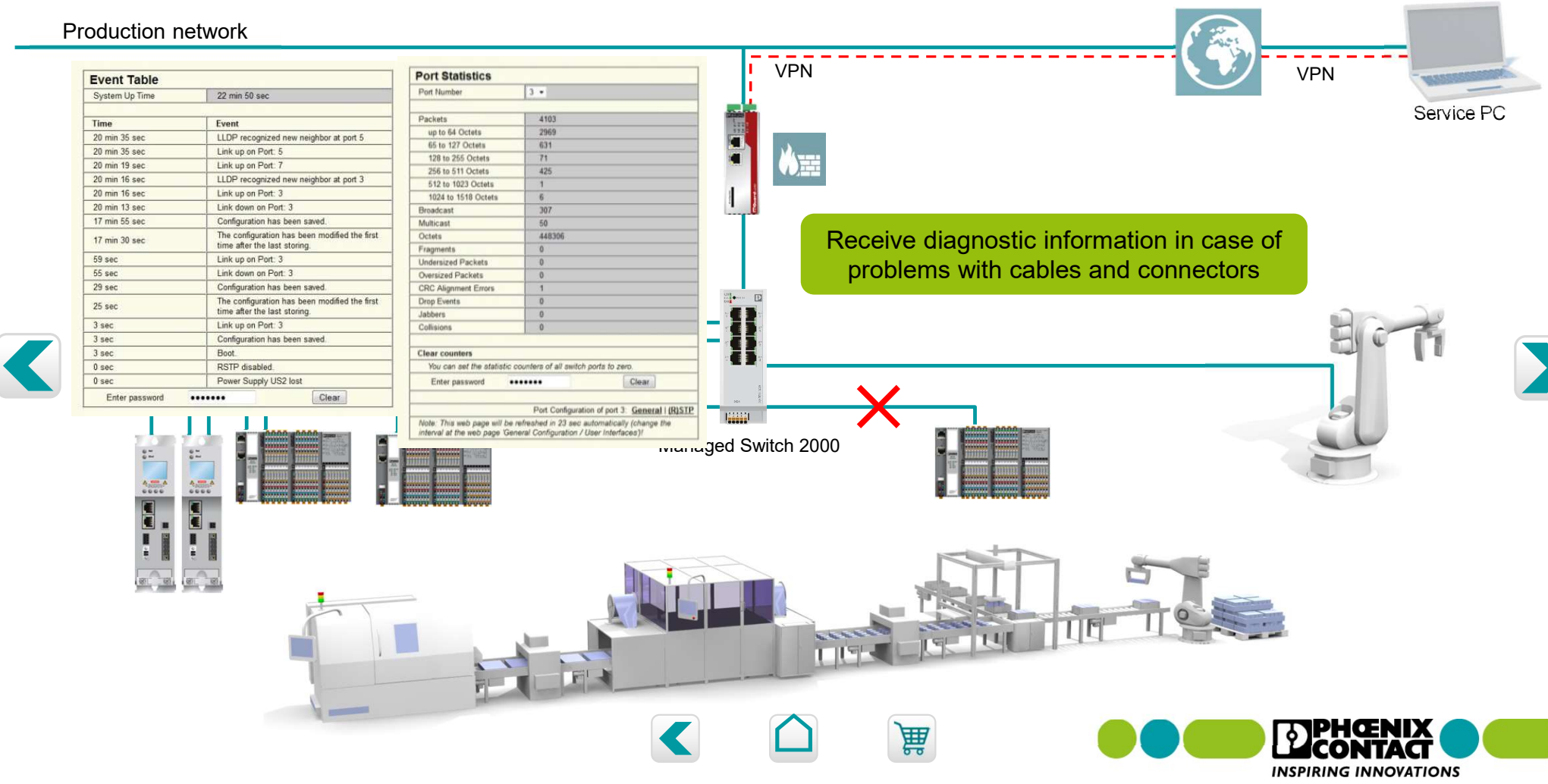
Our solution: Storm control



Contact problems of cables and connectors



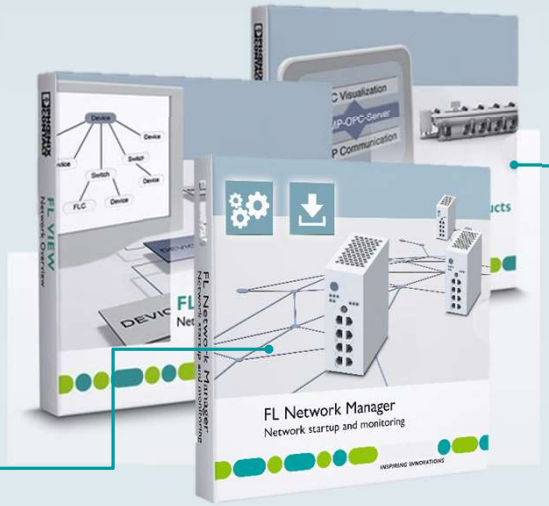
Our solution: Diagnostic information



PHOENIX CONTACT
INSPIRING INNOVATIONS

Software

SNMP OPC Products:
Linking of standardized protocol types



FL NETWORK MANAGER:
Network startup and monitoring

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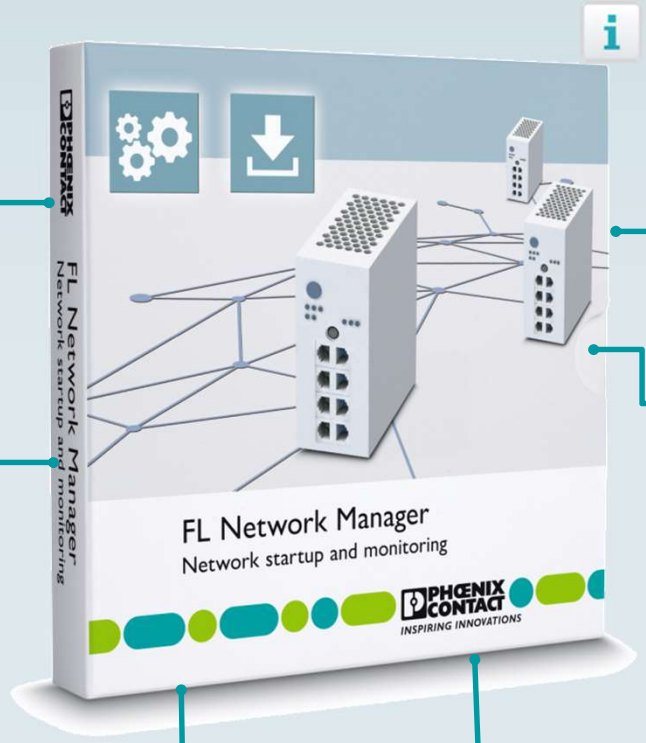
INSPIRING INNOVATIONS

Initial IP assignment

Via BootP, DHCP, DCP



Multi Device Firmware Update

Easy Firmware update for many devices in parallel, thanks to the integrated TFTP server

Configuration File Handling

Simple up- and download of configuration files for back up and reconfiguration

Multi Device Configuration

Quick configuration of same parameters for different devices in parallel

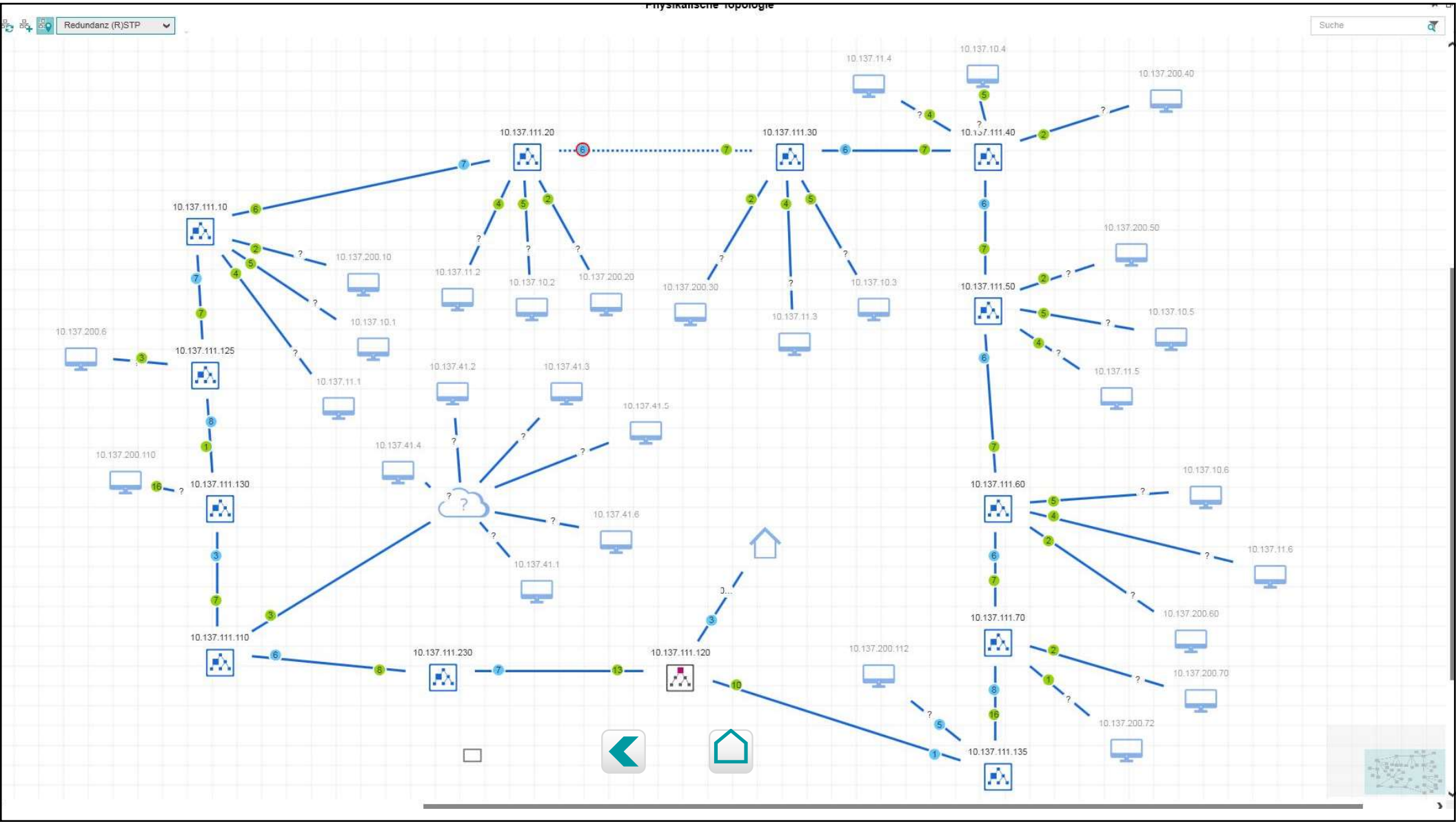
SNMP based Scripting

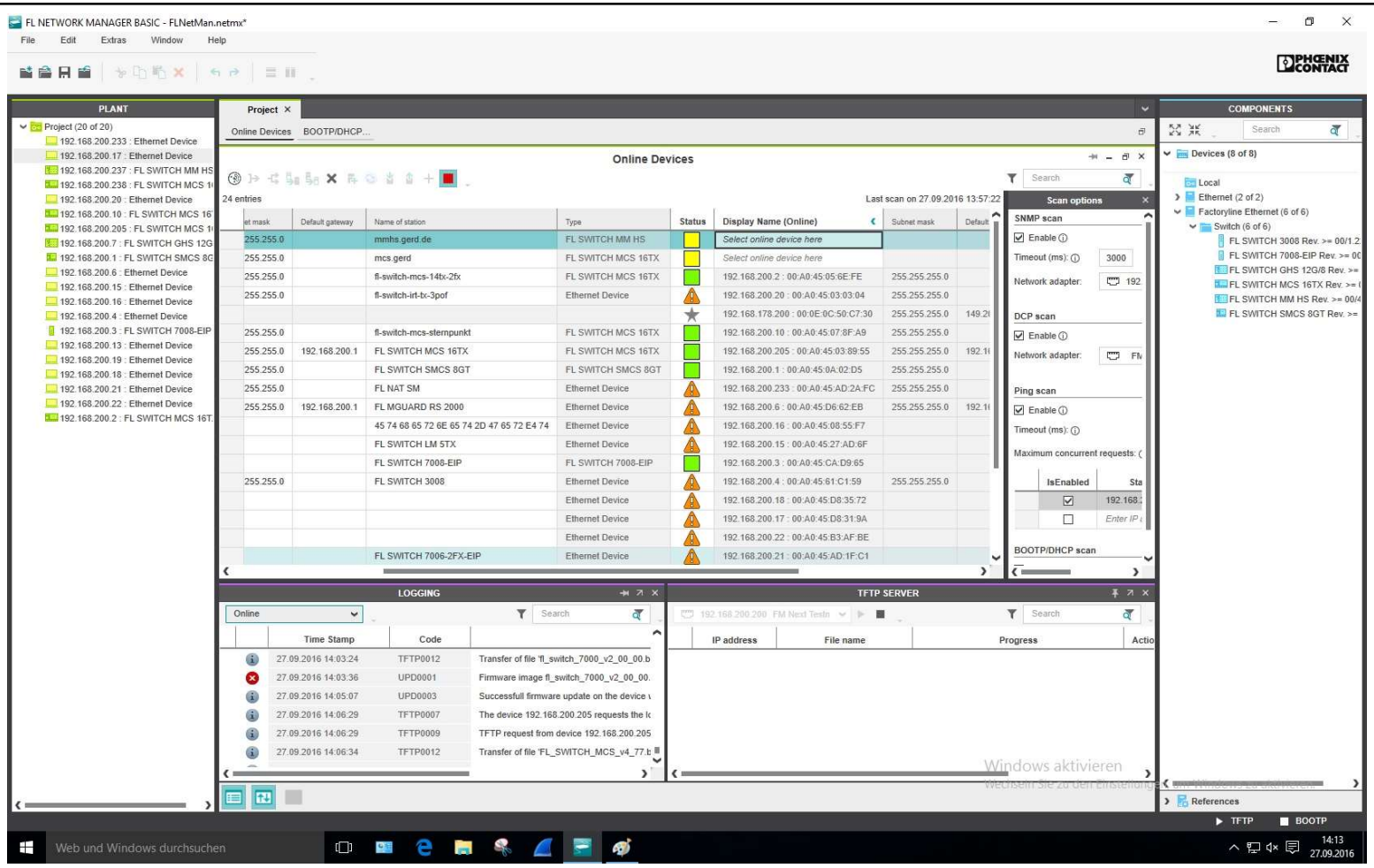
SNMP configuration and information independend of device vendor

Topology overview

Static topology overview with focus on redundancy systems (RSTP, MRP,…)

PHOENIX CONTACT
INSPIRING INNOVATIONS

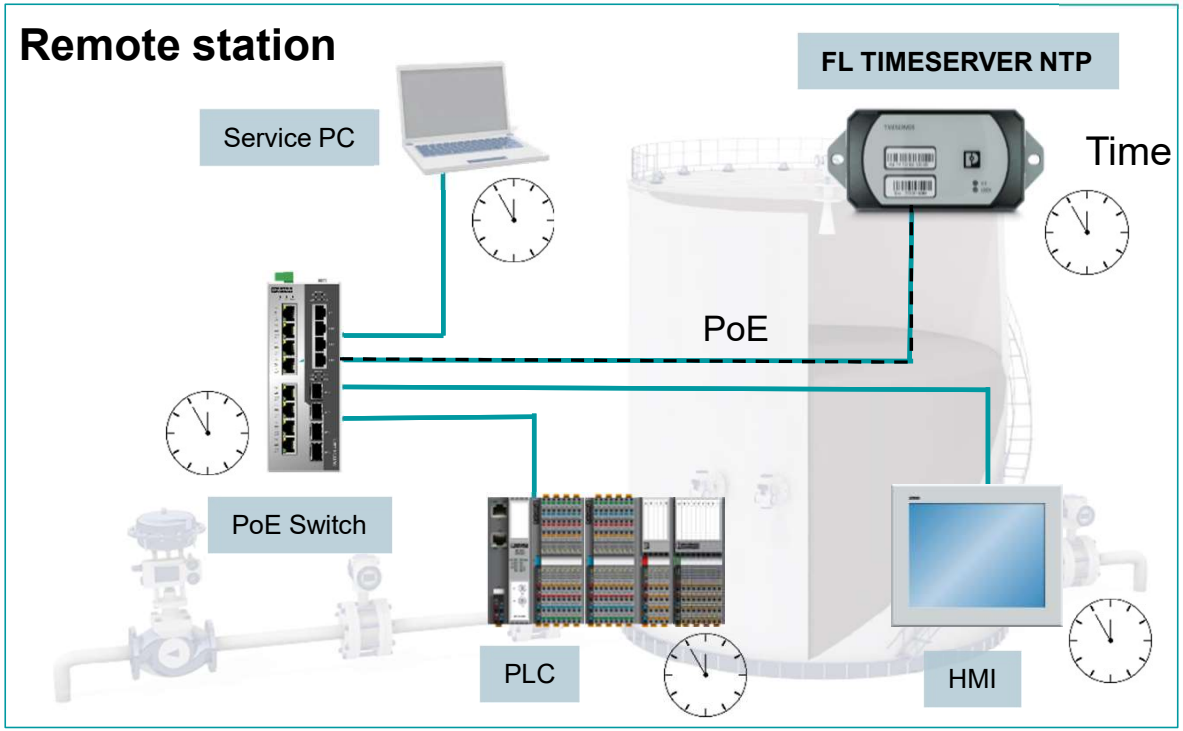

Physikalische Topologie
Redundanz (R)STP
Suche
10.137.111.20
10.137.111.30
10.137.111.40
10.137.111.10
10.137.111.125
10.137.111.130
10.137.111.110
10.137.111.230
10.137.111.120
10.137.111.50
10.137.111.60
10.137.111.70
10.137.111.135
10.137.11.4
10.137.10.4
10.137.200.40
10.137.200.10
10.137.11.2
10.137.10.2
10.137.200.20
10.137.200.30
10.137.11.3
10.137.10.3
10.137.200.50
10.137.10.1
10.137.200.6
10.137.11.1
10.137.10.5
10.137.11.5
10.137.41.2
10.137.41.3
10.137.41.5
10.137.41.4
10.137.200.110
10.137.41.6
10.137.41.1
10.137.10.6
10.137.11.6
10.137.200.60
10.137.200.112
10.137.200.70
10.137.200.72



PROFINET

Process

GPS, Galileo and GLONASS

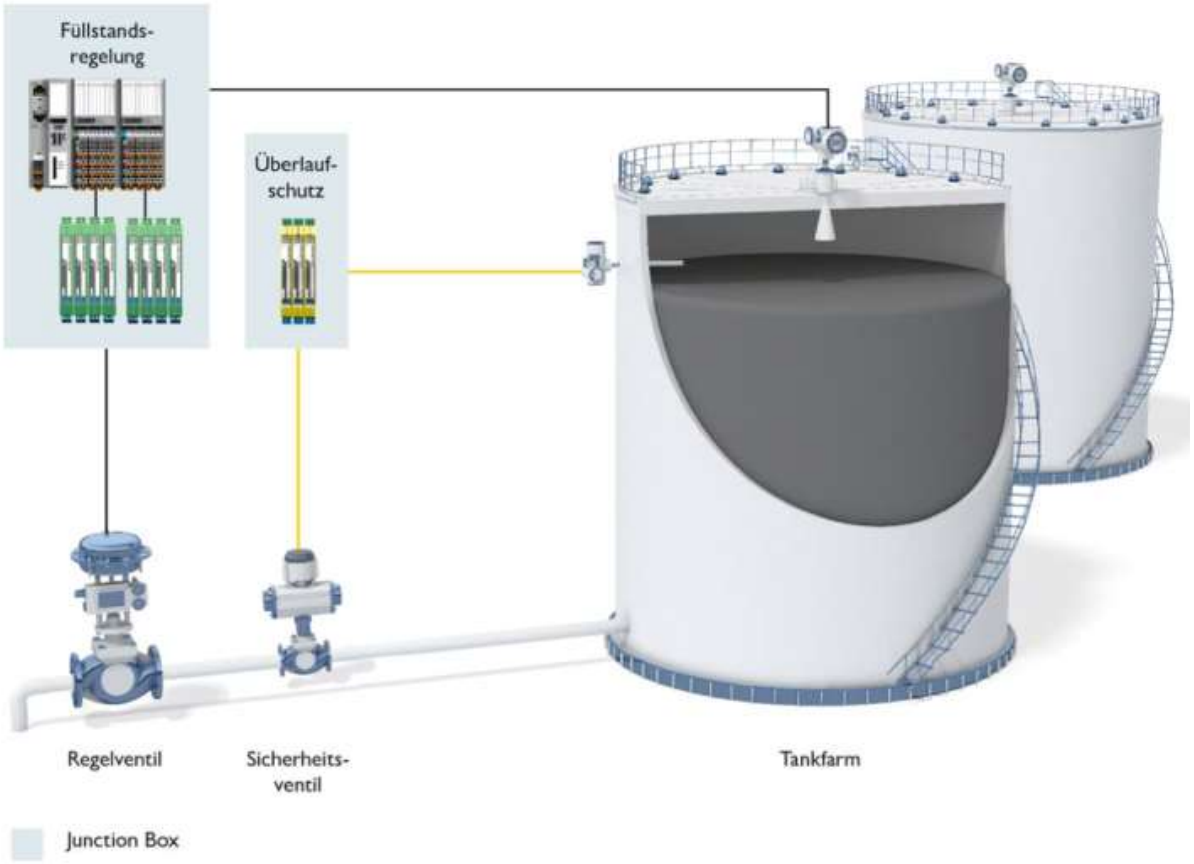




PHOENIX CONTACT
INSPIRING INNOVATIONS

PROFINET

Process



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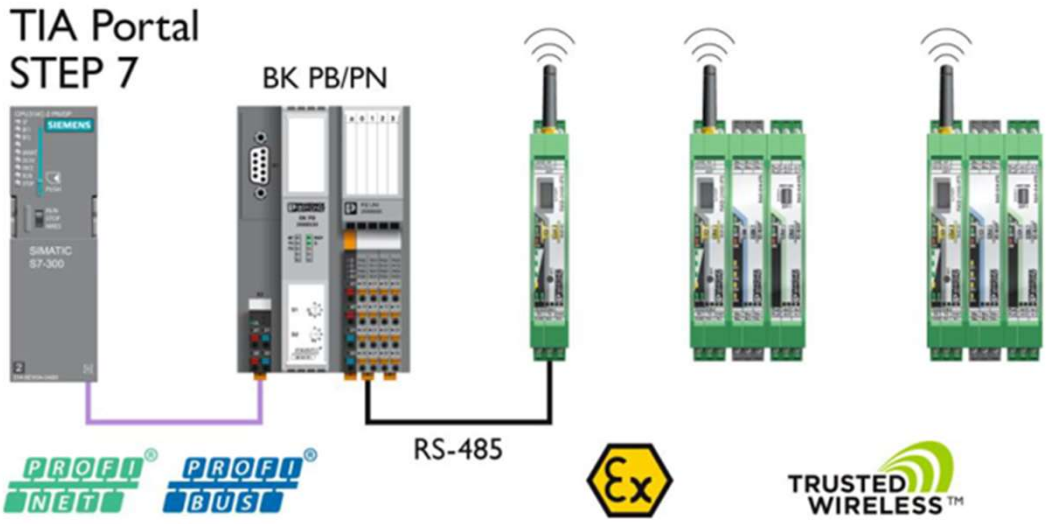
PROFINET

Process

- Wireless



Unterstützte Hardware und Software

- Siemens: S7-3xx, S7-12xx, S7-15xx Steuerungen, STEP 7, TIA Portal
- Phoenix Contact: Inline- + Axioline Steuerungen, PCWORX

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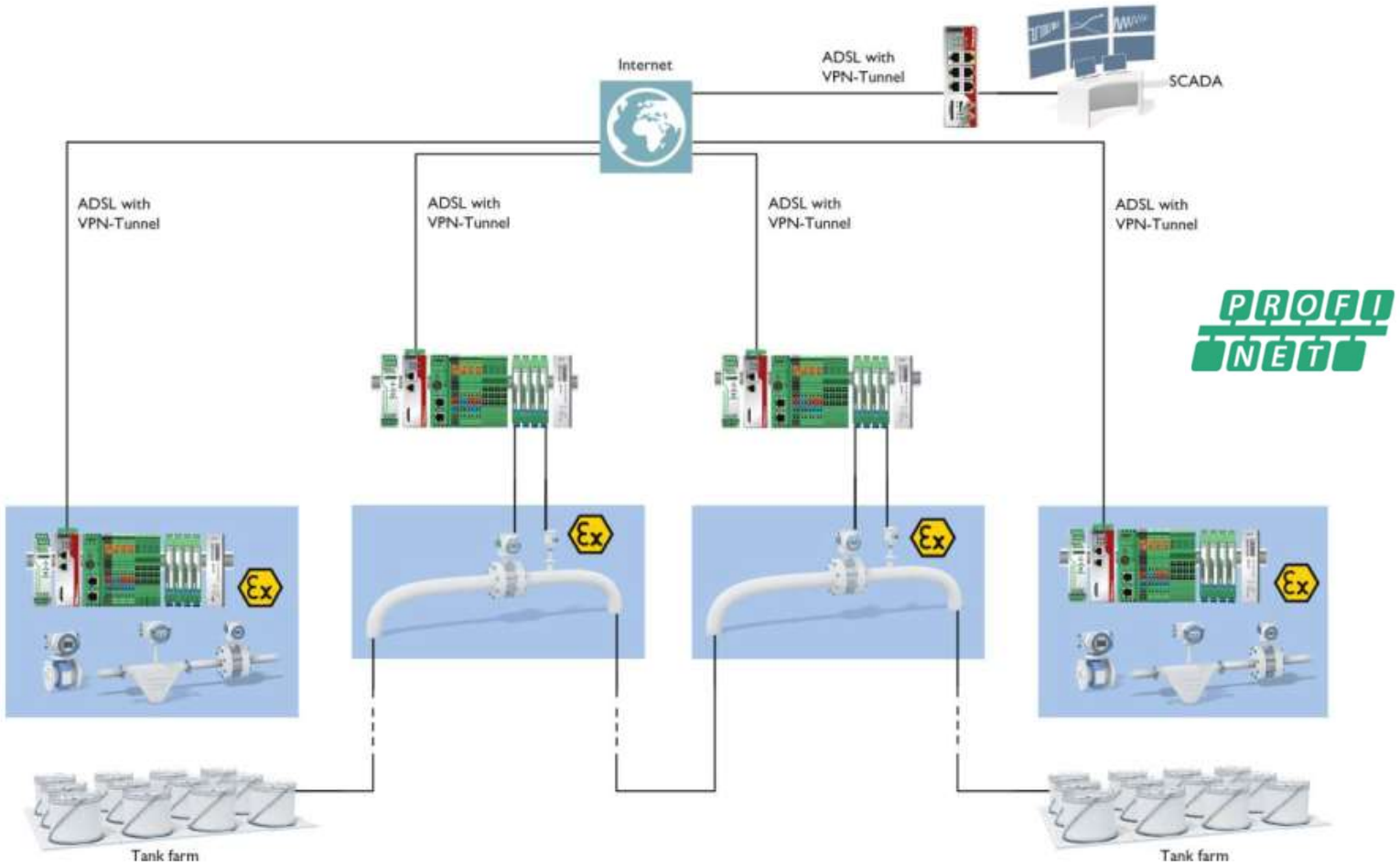
Process



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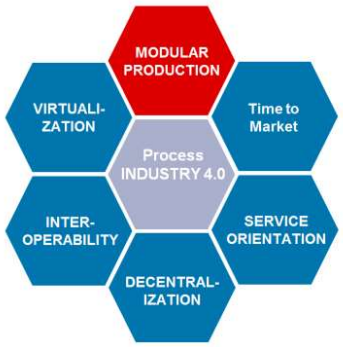
PROFINET

Process

Modular Type Package



Modular Automation

MTP

Motivation of the market segments

Pharma

Fine-chemicals

Energy, Oil & Gas

Food

Source: ZVEI/Namur/ProcessNet

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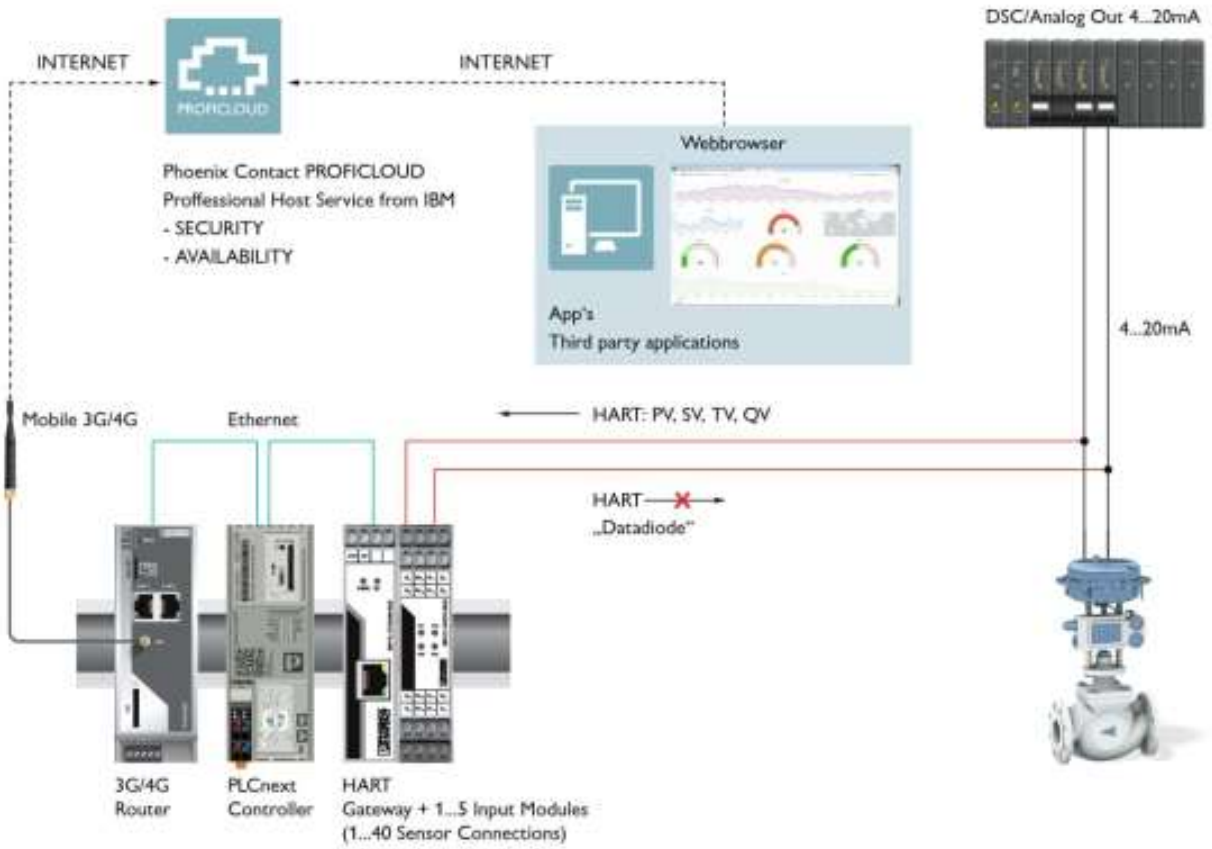

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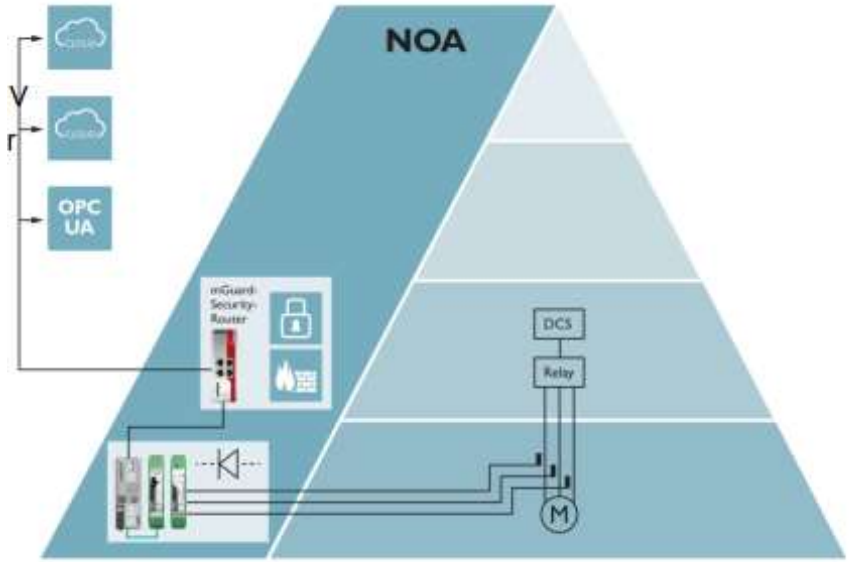
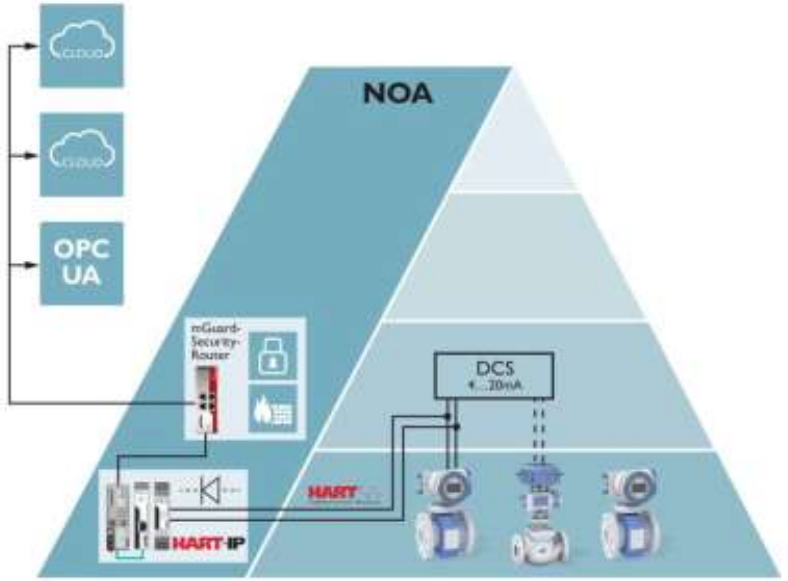
PROFINET

Process





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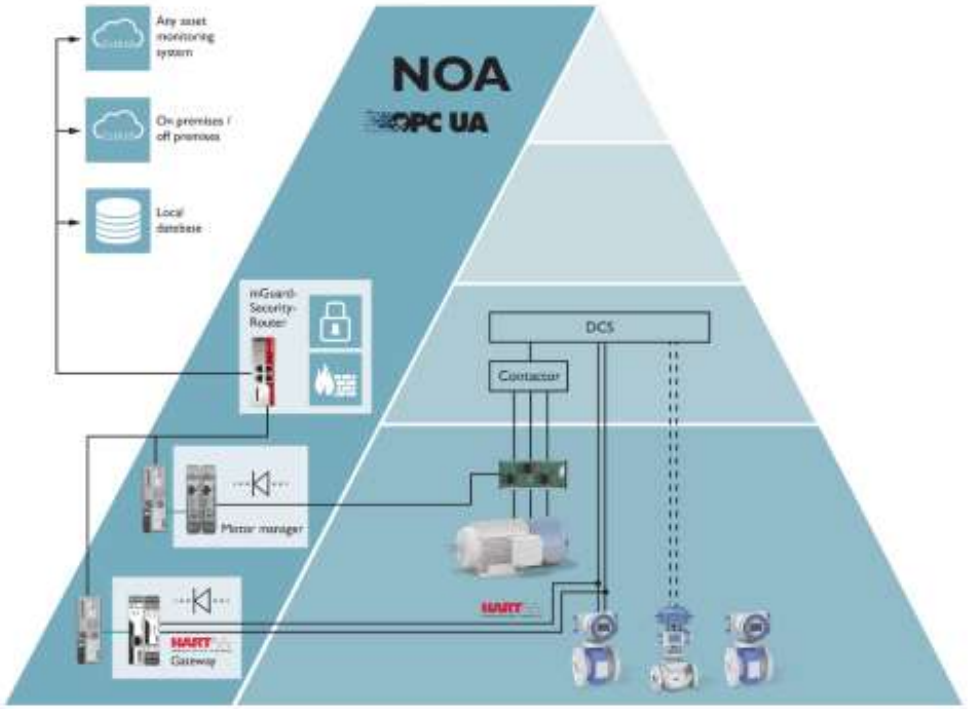
PROFINET

Process



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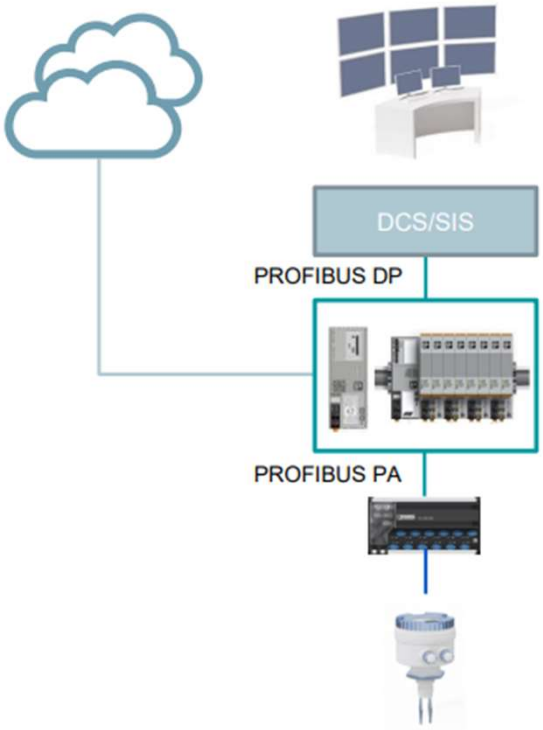

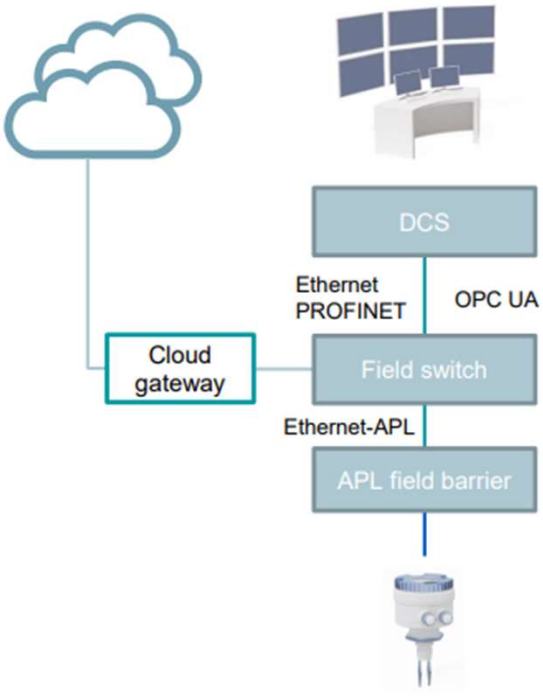

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Ethernet to the Field Within Process Plants

Standards Development Organizations

Member Companies

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ethernet-apl™
advanced physical layer

Technology, that enables
Ethernet communication
over 2 wires instead of 4 or 8
with **intrinsic safety** into the
hazardous environment

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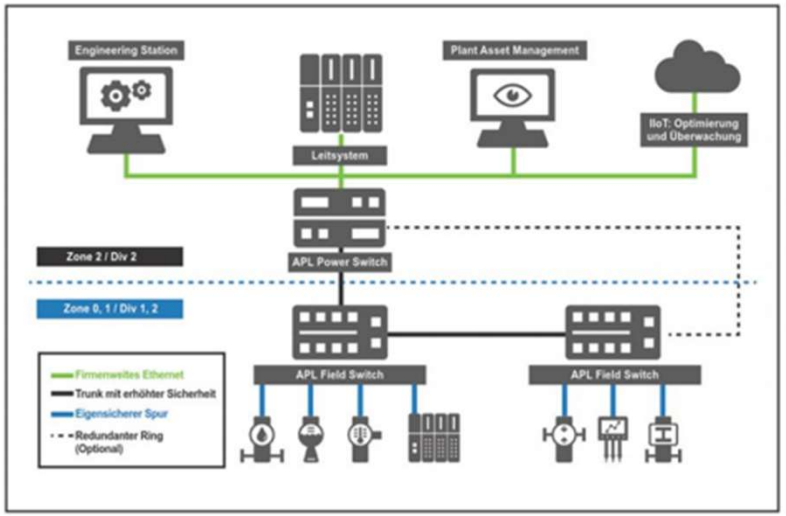
Ethernet-APL (Advanced Physical Layer)

- Single Pair Ethernet (SPE) / 2-wire
- Trunk
  - Installation in Ex zone (Ex eb) (zone 1, class 1 div 1...)
  - Cable length <= 1000 m @ 10 Mbps full duplex
  - Ex i intrinsic safety – 60 W (<= 50 field devices @ 500 mW)
- Track
  - Installation in Ex zone Ex d / Ex ia (zone 0, class 1 div 1...)
  - Cable length: <= 200 m @ 10 Mbps
  - Intrinsic safety: Redundant or non-redundant communication
  - Power mode
- Cables
  - 2-wire, shielded (IEC 61158 type A fieldbus cable)



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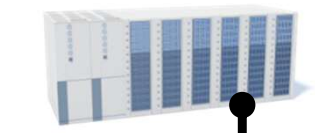
A review of the 4-20 mA loop, Fieldbus, and APL

What can process plants do in future?



Controller

200 meter

4 - 20 mA

Field Device

One single signal

Trunk
1000 meters

31,25 kbit/s

PROFIBUS®

Spur
120 meters

12 Devices

Trunk
1000 meters

10 Mbit/s

ethernet-apl™
advanced physical layer

Spur
200 meters

24 Devices

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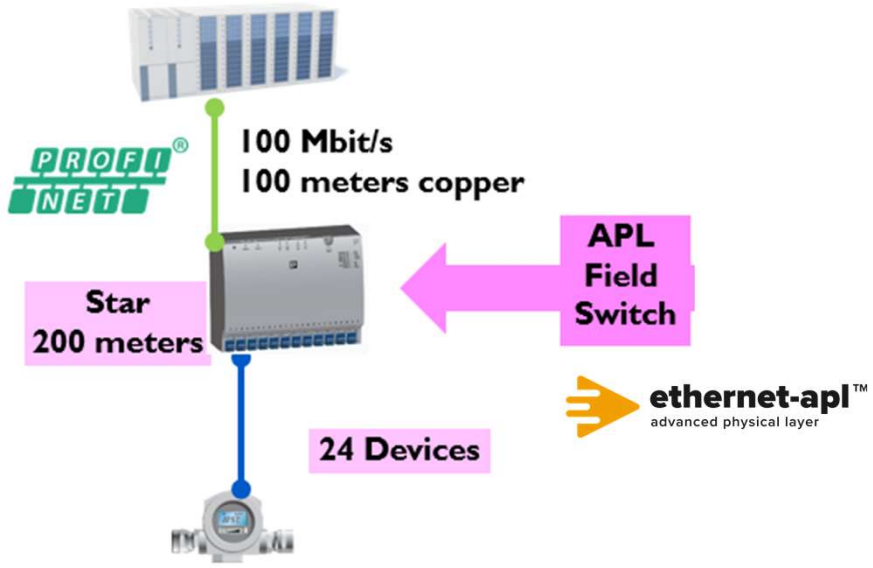
PROFINET

PROCESS



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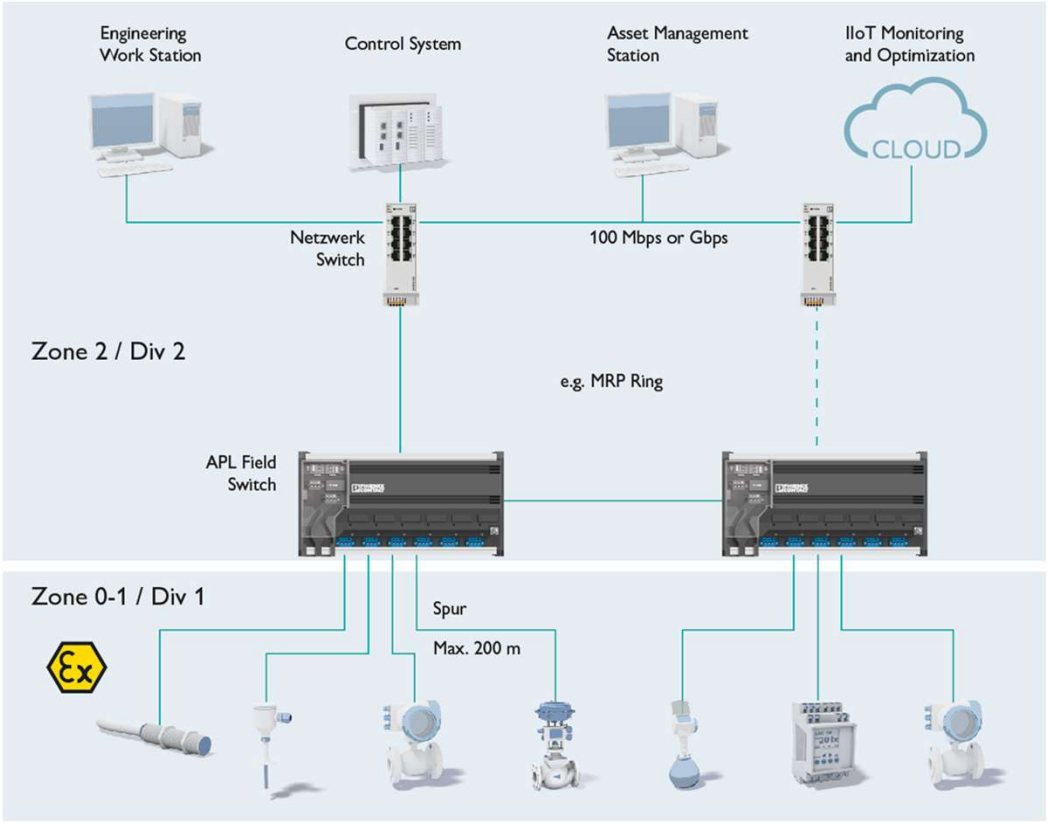
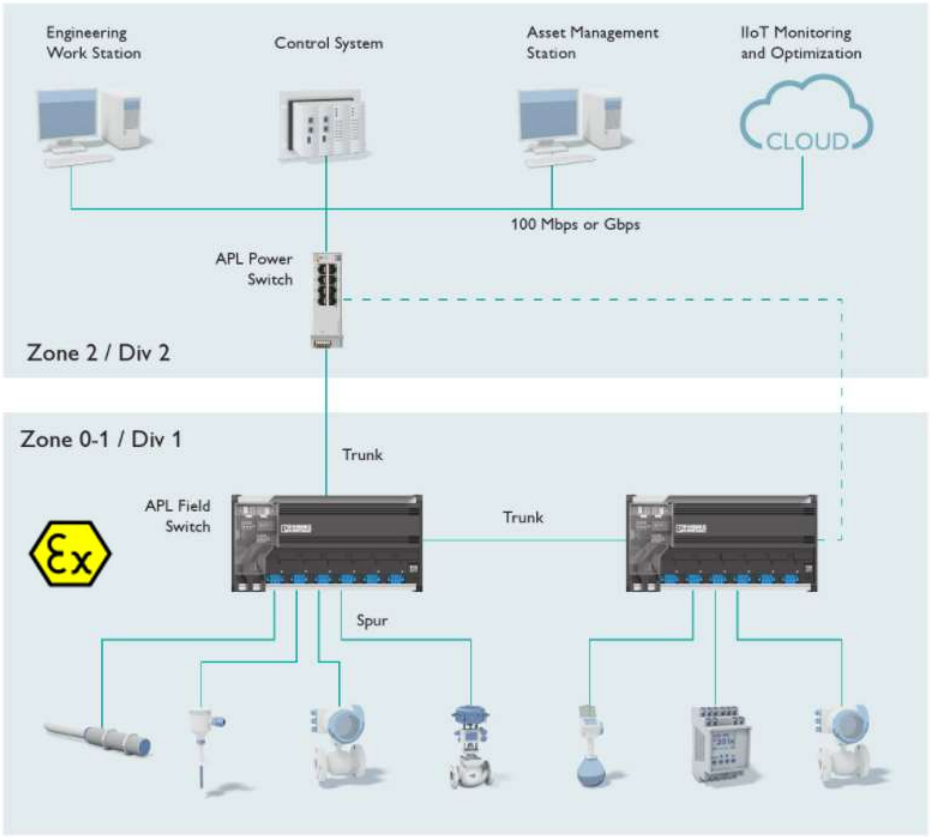
APL in Process Automation





Short or Compact Installation
Star Installation

Long Reach
Trunk and Spur

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