

## **Oferta en Protocolos Ethernet de Automatización**

**Modbus/TCP**

**EtherNet/IP**

**PROFINET**

# Agenda

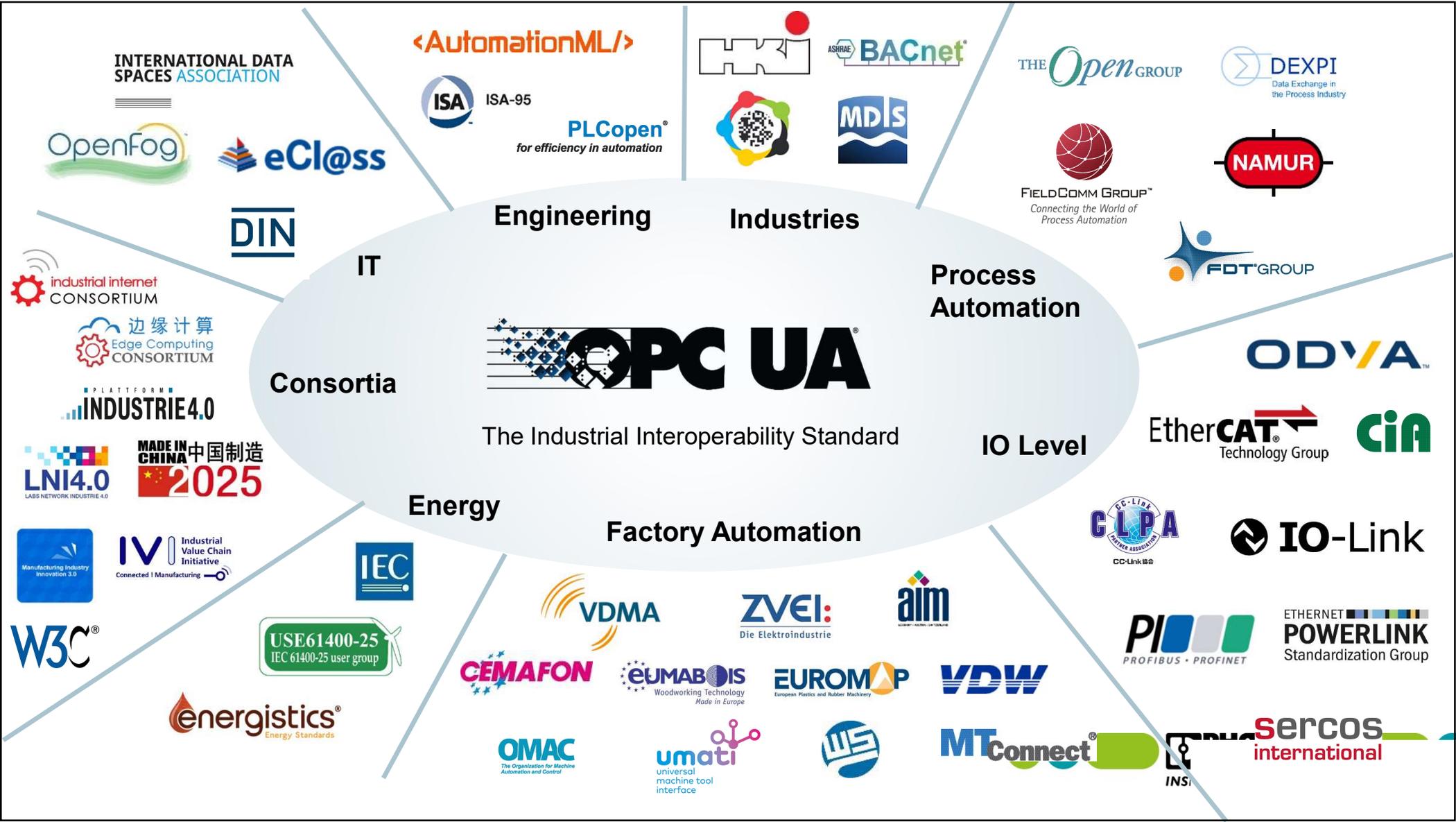
- Protocolos Ethernet Industriales
- Modbus/TCP
- EtherNet/IP
- PROFINET

# Protocolos Ethernet Industriales

Ethernet

# Protocolos Industriales

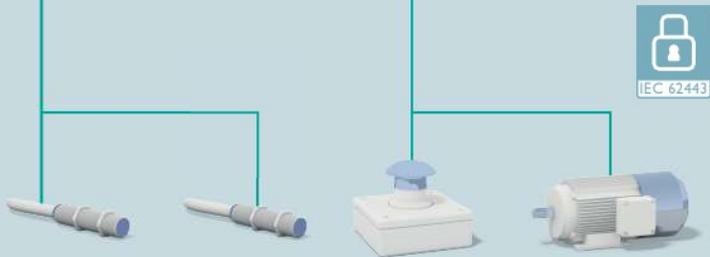
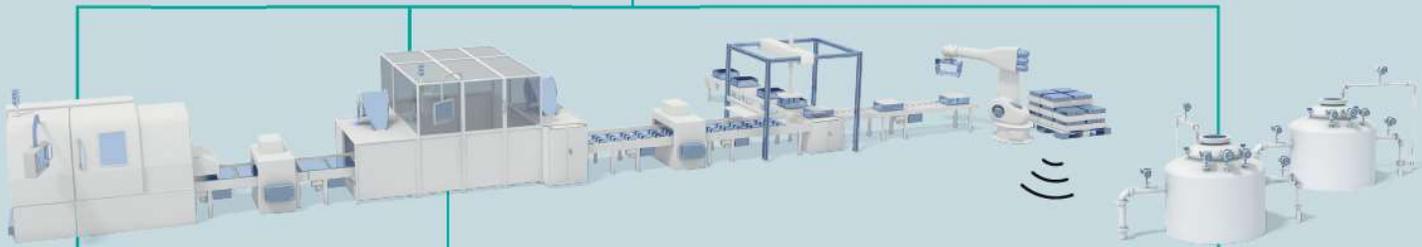


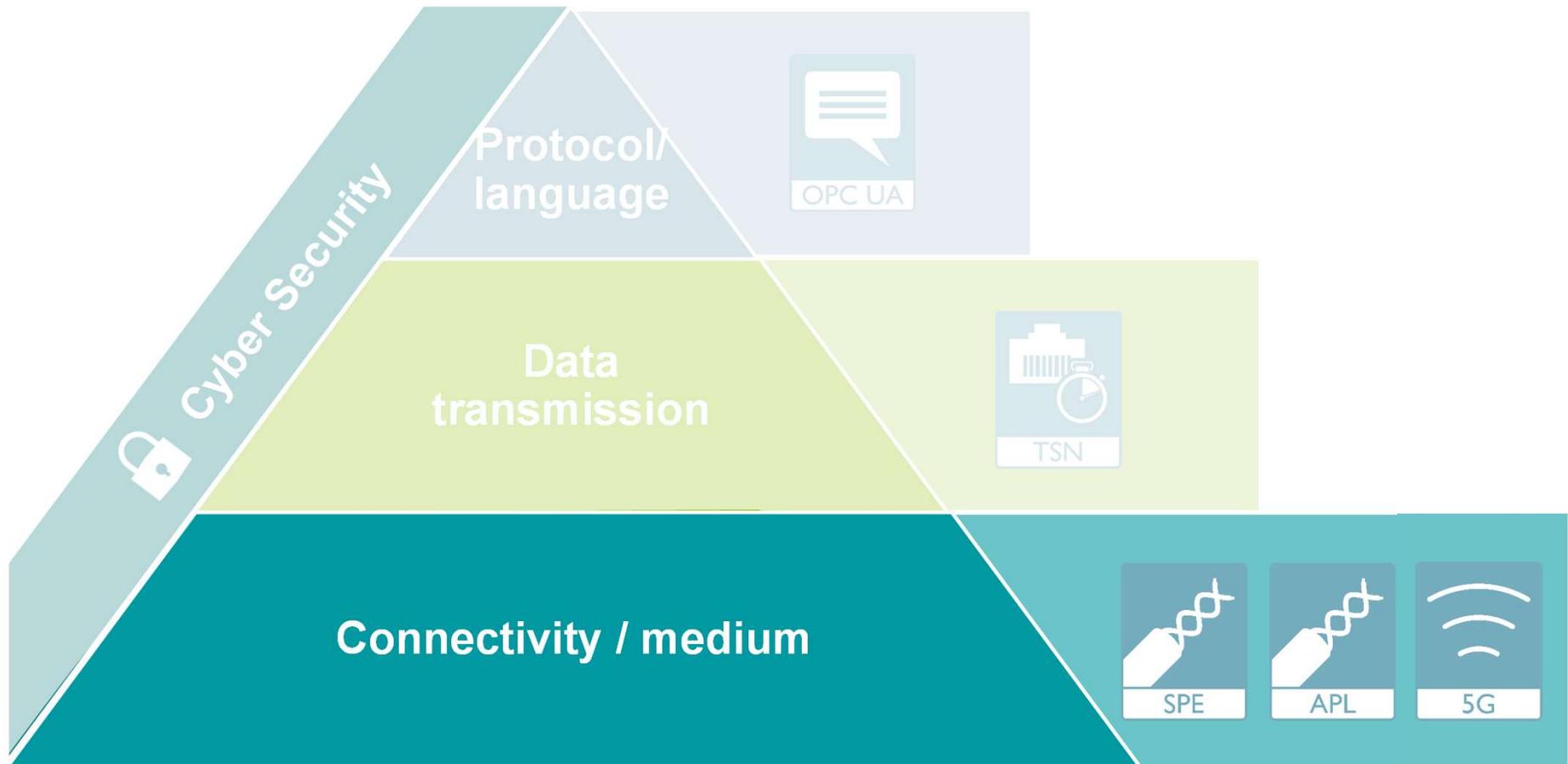


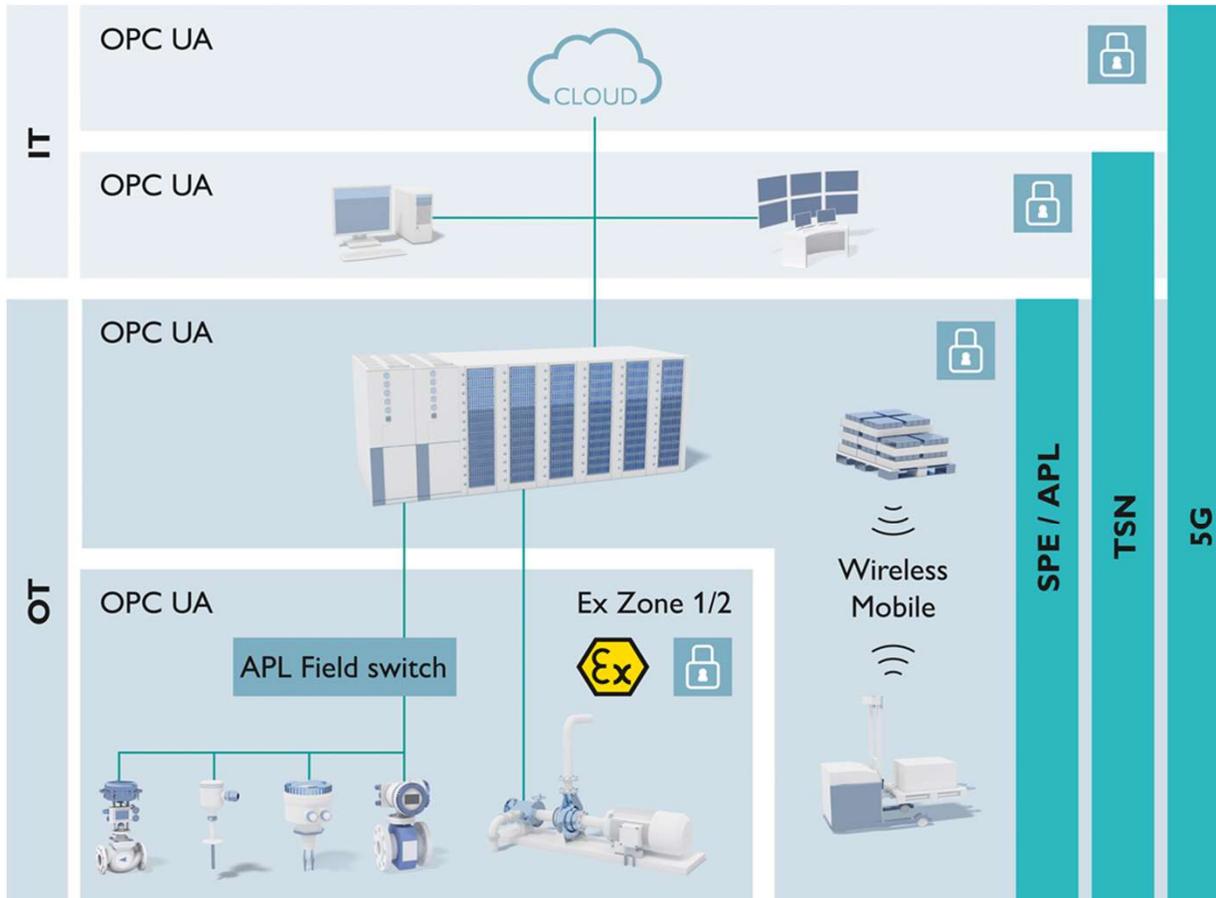
IT



OT





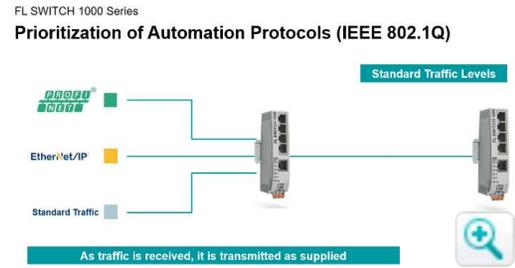


# Unmanaged Switches



Prioritization of the data traffic

- The real-time properties of PROFINET and EtherNet/IP™ automation networks are supported
- More stable networks and increased system availability

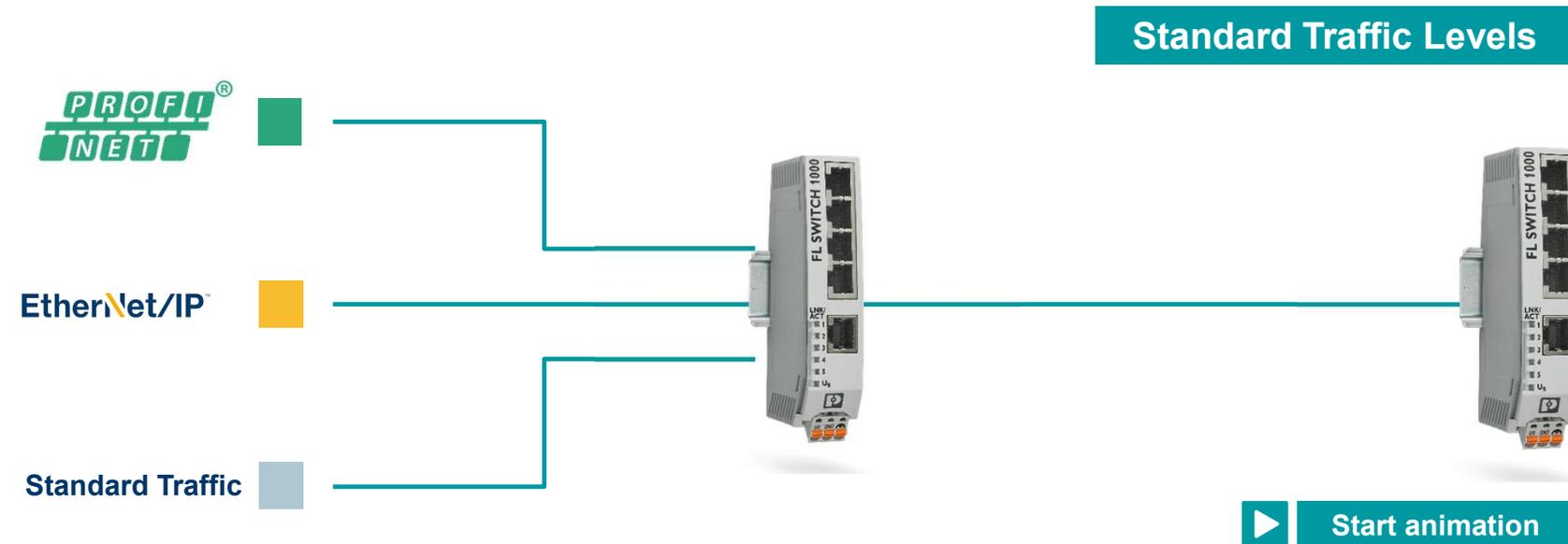


 Automation protocols



FL SWITCH 1000 Series

## Prioritization of Automation Protocols (IEEE 802.1Q)

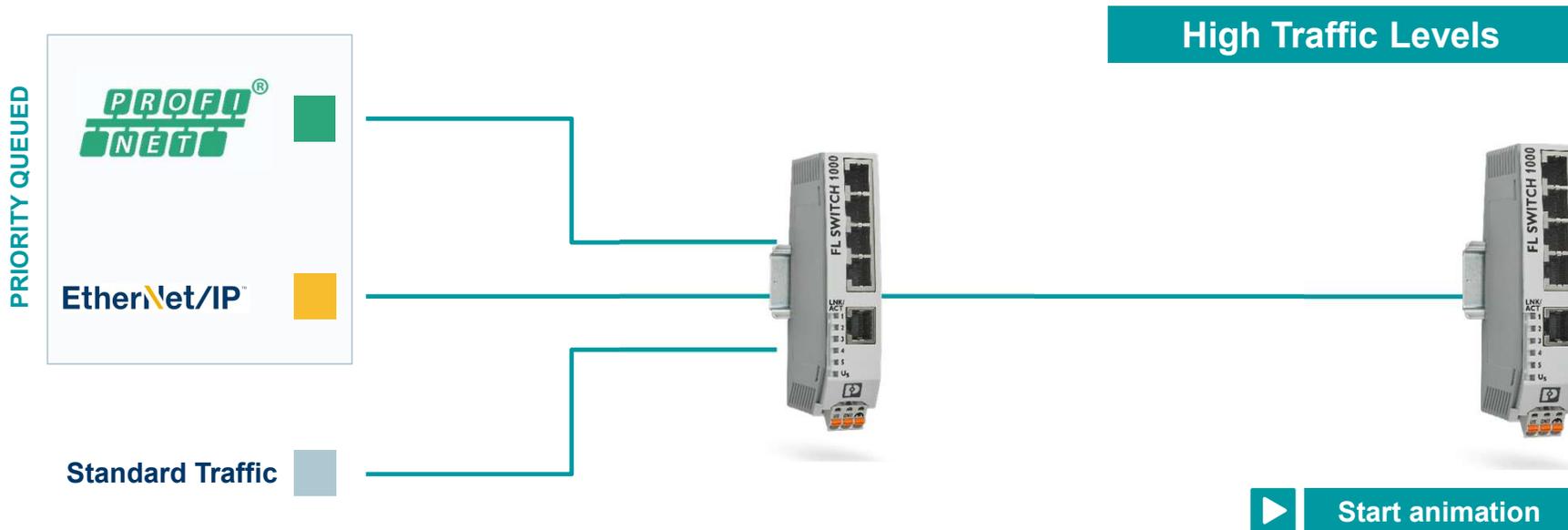


As traffic is received, it is transmitted as supplied



FL SWITCH 1000 Series

## Prioritization of Automation Protocols (IEEE 802.1Q)



As buffer fills, select traffic types take priority



# Prioritization of Traffic (IEEE 802.1Q)

## PRIORITY QUEUED



Ethernet/IP



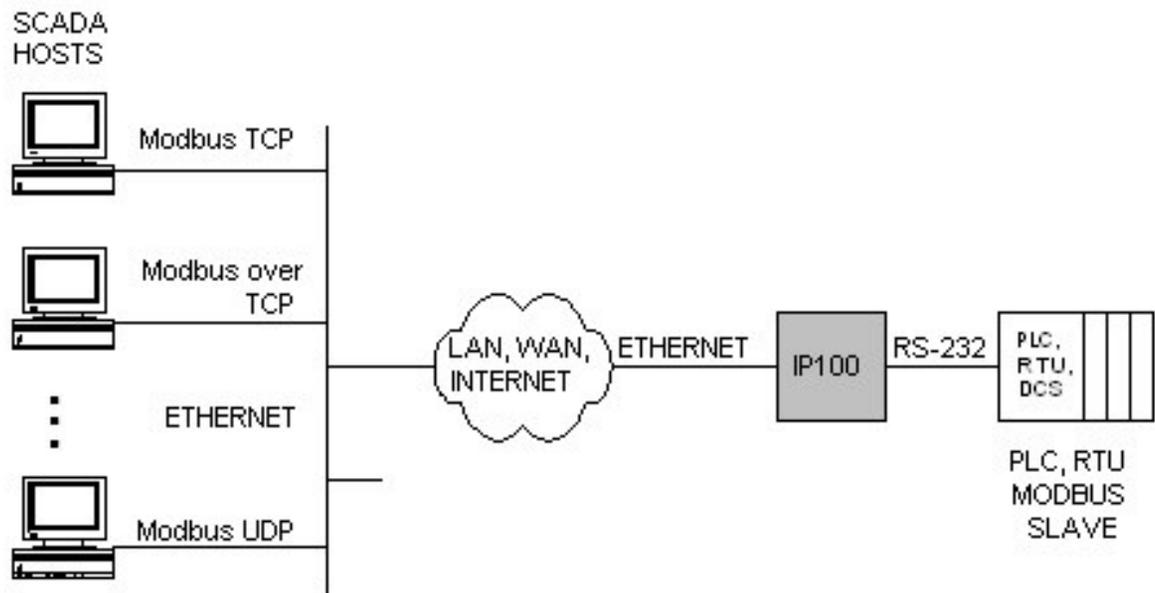
## NON-PRIORITY QUEUED

Standard Traffic

Queues assigned in accordance with standard recommendations



# Modbus TCP/IP



## Principales protocolos

[ editar ]

De serie	Ethernet	Protocolo	Red	Normas
Modbus -RTU	Modbus -TCP	TCP / IP		IEC 61158 e IEC 61784
Profibus	PROFINET IO	protocolo de tiempo real isócrono ( IRT ), protocolo en tiempo real (RT), en tiempo real sobre UDP protocolo (RTU)	Switches , router y wireless , de 100 Mbit / s hasta 1 Gbit / s	IEC 61158 y IEC 61784
DeviceNet (CIP); ControlNet (CIP)	Ethernet / IP (CIP)	TCP / IP, UDP / IP	Switches , router y wireless , de 100 Mbit / s hasta 1 Gbit / s	IEC 61158 e IEC 61784; ODVA EtherNet / IP estándar
Foundation Fieldbus H1	Foundation Fieldbus Ethernet de alta velocidad (HSE)			
CANopen	Ethernet Powerlink		Ethernet de 100 Mbits / s	IEC 61158 , EPSG (Ethernet Powerlink Grupo de Normalización)
CANopen	EtherCAT	EtherCAT, EtherCAT / UDP	Ethernet de 100 Mbits / s	IEC 61158 , IEC / PAS 62407, IEC 61784-3, ISO 15745-4
	<b>VARAN</b> V ersatile Un Andom R utomatización A cceso N RED	VARAN, TCP / IP, Seguridad	Ethernet de 100 Mbits / s	VARAN-BUS GRUPO DE USUARIOS - VVO
SERCOS I / II	SERCOS III		Ethernet de 100 Mbits / s	IEC 61491, se fusionaron en la norma IEC 61158
	FL-Net (OPCN-2)	UDP / IP	Ethernet de 10 Mbit / s	por JEMA (Asociación de Fabricantes Japoneses de la Electricidad)

# Products Modbus/TCP

- Gateways



PSR-M-GW-MODTCP-PI



GW PN/MODBUS 1E/2DB9

- IO-Link Master



IOL MA8 PN DI8

- IO-Link Master



AXL E ETH IOL8 DI4 M12 6P



AXL E ETH IOL8 DI4 M12 6M

Portfolio

## Modbus/TCP

- Measuring Devices



EEM-EM375  
EEM-EM377



EEM-MB371-24DC



EEM-MA370



EEM-MA771-24DC

Portfolio

## Modbus/TCP

- Controllers



ILC 171 ETH 2TX



AXC 1050



AXC 3050

Portfolio

## Modbus/TCP

- I/O Systems Buskoppler - Cabeceras



IL ETH BK DI8 DO4 2TX-PAC  
IL ETH BK DI8 DO4 2TX-XC-PAC



AXL F BK ETH  
AXL F BK ETH XC



AXL F BK ETH NET2

Portfolio

## Modbus/TCP

- Energy and Power Measurement



EEM-MB370



EEM-MB370-EIP



EEM-MB370-24DC



EEM-MB371



EEM-MB371-PN



EEM-MB371-24DC

Portfolio

## Modbus/TCP

- Energy and Power Measurement



EEM-MA370

EEM-MA371



EEM-MA370-R

EEM-MA371-R



EEM-MA370-24DC

EEM-MB371-24DC

Portfolio

## Modbus/TCP

- Energy and Power Measurement



EEM-MA770  
EEM-MA770-EIP  
EEM-MA770-PN  
EEM-MA770-R  
EEM-MA770-24DC



EEM-MA771  
EEM-MA771-EIP  
EEM-MA771-PN  
EEM-MA771-R  
EEM-MA771-24DC

Portfolio

## Modbus/TCP



GW MODBUS TCP/RTU 1E/1DB9  
GW MODBUS TCP/RTU 1E/2DB9  
GW MODBUS TCP/RTU 2E/2DB9  
GW MODBUS TCP/RTU 2E/4DB9

GW MODBUS TCP/ASCII 1E/1DB9  
GW MODBUS TCP/ASCII 1E/2DB9  
GW MODBUS TCP/ASCII 2E/2DB9  
GW MODBUS TCP/ASCII 2E/4DB9

Portfolio

## Automation Systems



ILC 131 ETH

ILC 151 ETH

ILC 151 ETH XC

ILC 171 ETH 2TX

ILC 191 ETH 2TX

The Modbus/TCP (UDP) communication protocol can be used via the Ethernet interfaces of the Inline controller. The Inline controller can be used as a Modbus/TCP client and/or as a Modbus/TCP server (as of firmware version 4.40 and AUTOMATIONWORX Software Suite Version 1.82 AddOn V1). For additional information, please refer to the AH EN MODBUS TCP application note.

Portfolio

## Automation Systems



AXC 1050

AXC 1050 XC

The Modbus TCP communication protocol can be used via the Ethernet interfaces of the controller. The controller can be used as a Modbus/TCP client and/or as a Modbus/TCP server (as of firmware version 3.00 and AUTOMATIONWORX Software Suite 2017 Version 1.84). For additional information, please refer to the AH EN MODBUS TCP application note

Portfolio

## Automation Systems

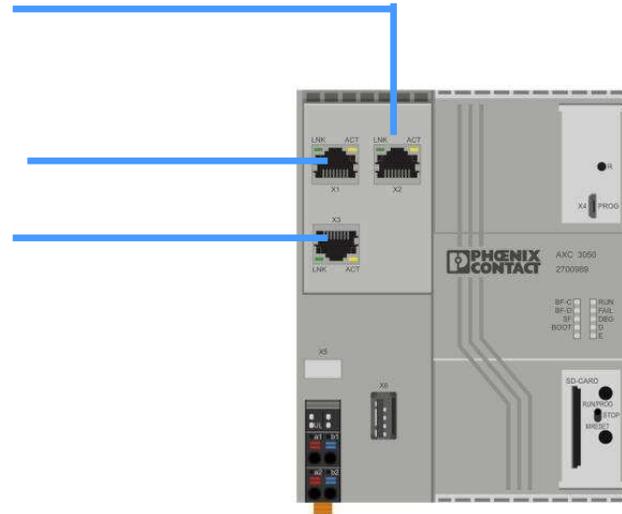


AXC 3050

1

2

3



The Modbus TCP communication protocol can be used via the Ethernet interfaces of the AXC 3050 controller. In this case, the controller can be used as a Modbus client. For additional information, please refer to the AH EN MODBUS TCP application note. The controller can also be configured as a Modbus TCP server using functional blocks

Portfolio

## Automation Systems



BTP 2043W  
BTP 2070W  
BTP 2102W



TP 3070W



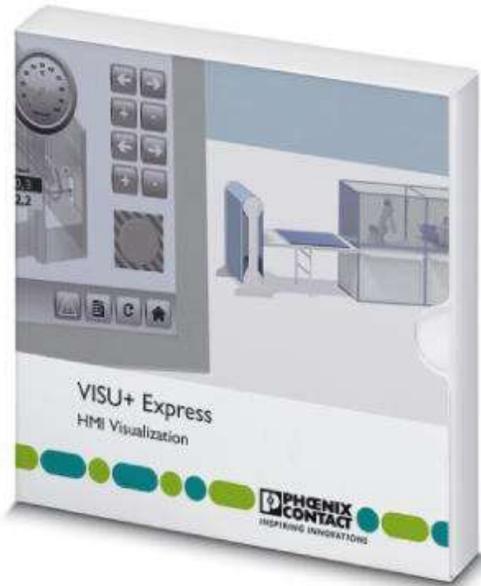
TP 3070W/P



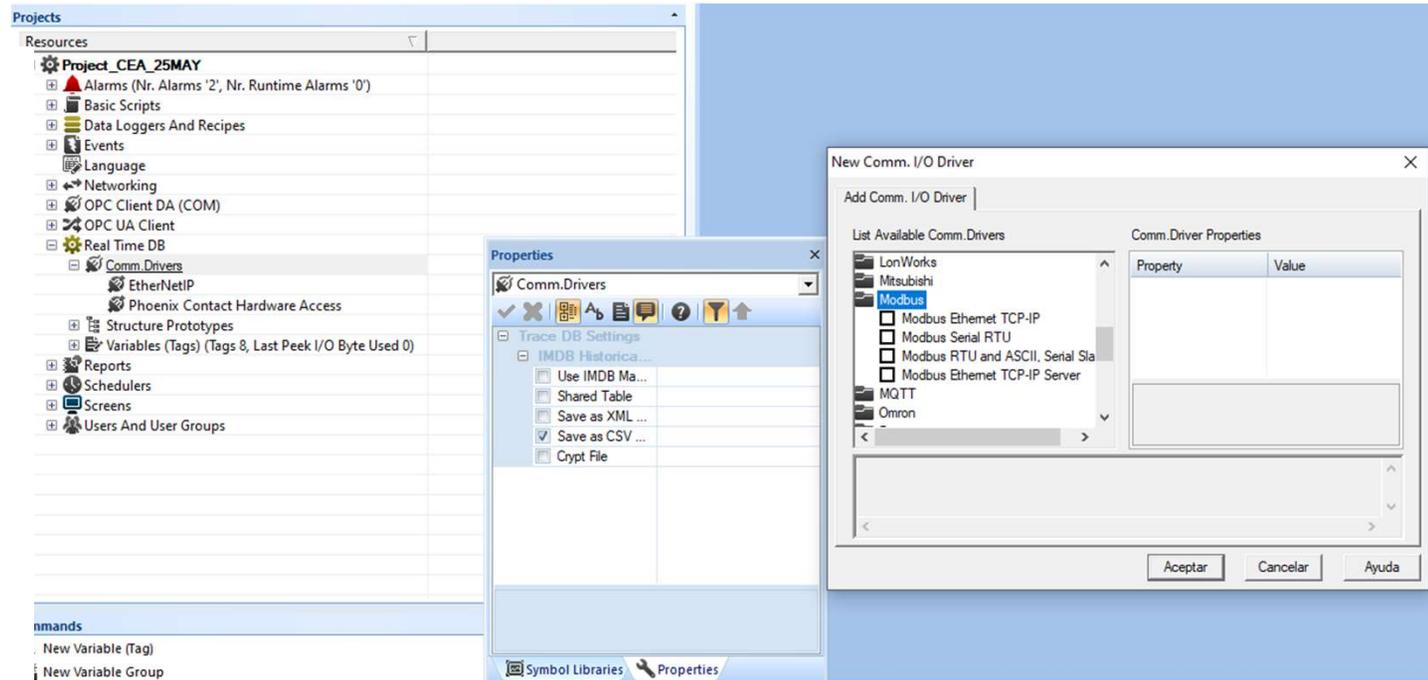
TP TP 6101-WXPS

Portfolio

# Automation Systems



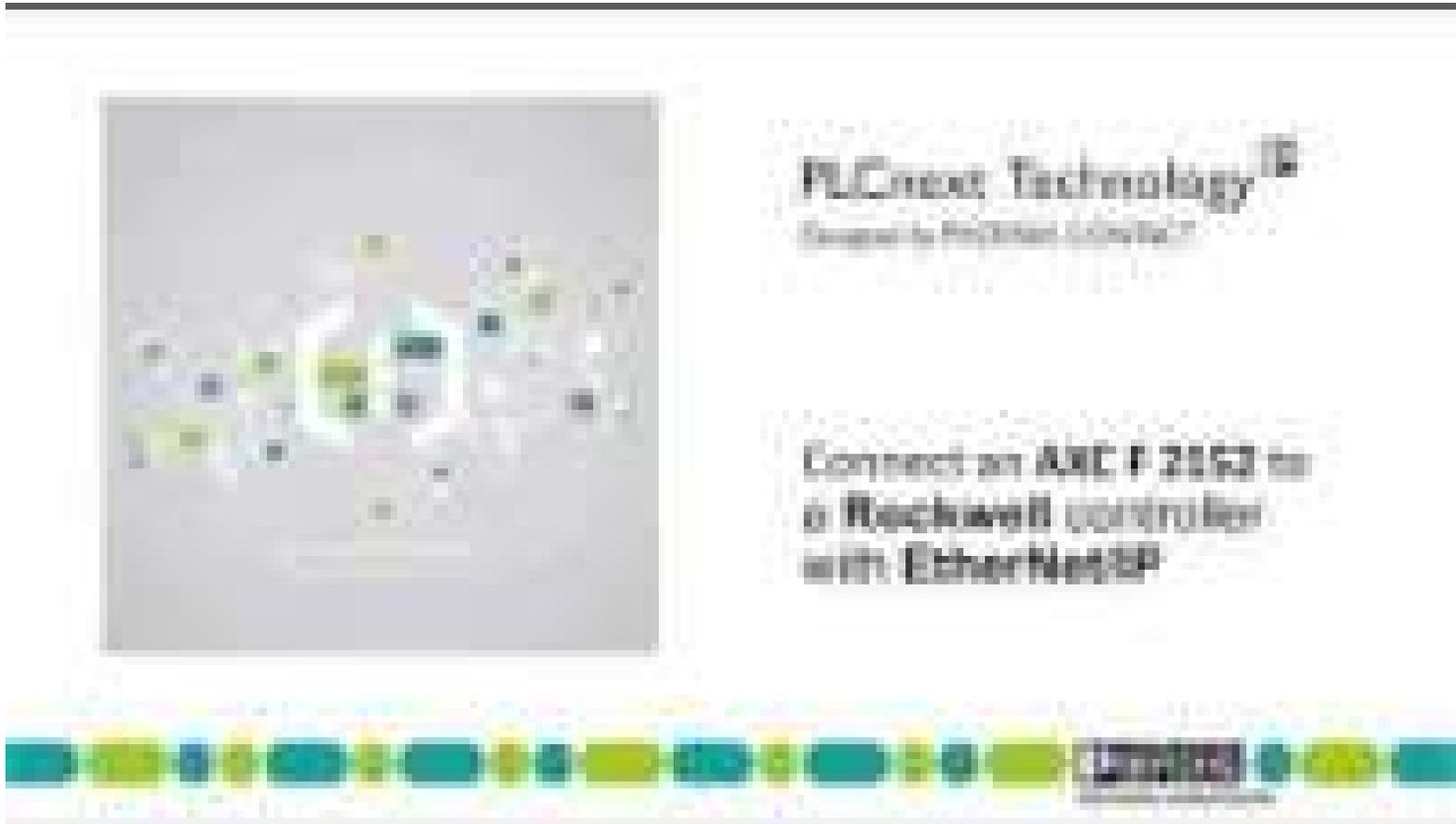
VISU+ EXPRESS



VISU+

# EtherNet/IP

<p><b>Modbus</b> <b>TCP/IP, 1999</b></p>	<p><b>Velocidad:</b> 10Mbit/s, 100 Mbits/s, 1Gbit/s; <b>Topología física:</b> generalmente estrellas basado; puede ser de bus, anillo, árbol o malla <b>topología lógica:</b> centralizado, maestro/esclavo; <b>Longitud de la red:</b> teóricamente ilimitado número de nodos y distancia, aunque realista limitada por la velocidad de actualización; <b>Método de transmisión:</b> Modbus IP utiliza estándar Ethernet <b>industrial sesgos:</b> General.<a href="http://www.rtaautomation.com/modbustcp/">http://www.rtaautomation.com/modbustcp/</a></p>
<p><b>Ethernet/IP,</b> <b>1990</b> by Rockwell Automation</p>	<p><b>Velocidad:</b> 10Mbit/s, 100 Mbits/s, 1Gbit/s; <b>Topología física:</b> generalmente estrellas; puede ser autobús, árbol o malla; <b>Topología lógica:</b> centralizado, maestro/esclavo; <b>Longitud de la red:</b> teóricamente ilimitado, sin embargo tiempos de ciclo y rendimiento de la red será un factor limitante; <b>Método de transmisión:</b> utiliza Ethernet estándar; <b>Sesgos de industria:</b> maquinaria en General, las máquinas de la industria y la producción auto. <a href="http://en.wikipedia.org/wiki/EtherNet/IP">http://en.wikipedia.org/wiki/EtherNet/IP</a></p>
<p><b>PROFINET,1989</b> (Process Field Bus), BMBF, Siemens</p>	<p><b>Velocidad:</b> 100 Mbits/s y superior; <b>Topología física:</b> generalmente estrellas; puede ser autobús, árbol o malla; <b>Topología lógica:</b> centralizada; <b>Número máximo de dispositivos:</b> 200 puntos de la entrada-salida son posibles en una red PROFINET. Una de las principales ventajas de PROFINET comparado con PROFIBUS es que puedes tener más nodos de la red. <b>Longitud de la red:</b> la longitud, velocidad y topología dependen de los componentes de la red usted elige para su red. Con componentes externos fibra óptica distancias de hasta 26km son posibles dependiendo del tipo de fibra óptica se utiliza y los proveedores. En la red eléctrica la distancia máxima entre dos dispositivos cualesquiera es 100m. <b>Método de transmisión:</b> Ethernet basado con VLAN; <b>Sesgos de la industria:</b> automotriz. <a href="http://en.wikipedia.org/wiki/PROFINET">http://en.wikipedia.org/wiki/PROFINET</a></p>



## EtherNet/IP™ | How to connect your PLCnext Control to controllers from other manufacturers using EIP

Factory network



Remote Service

Machine network



Firewall, 1:1 NAT. Router

Machine core network

EtherNet/IP DLR ring

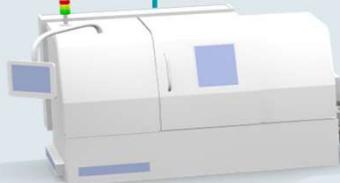
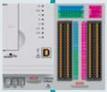


Advanced Managed Switches



EtherNet/IP

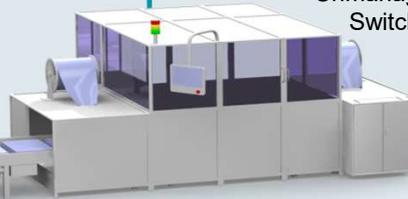
Unmanaged Switches



Switch 2000



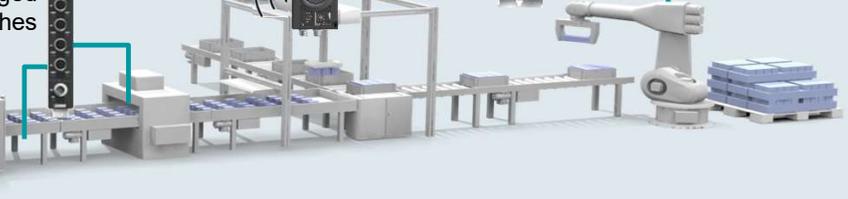
EtherNet/IP

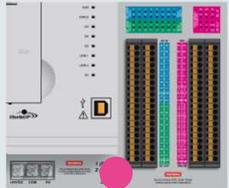


Unmanaged Switches



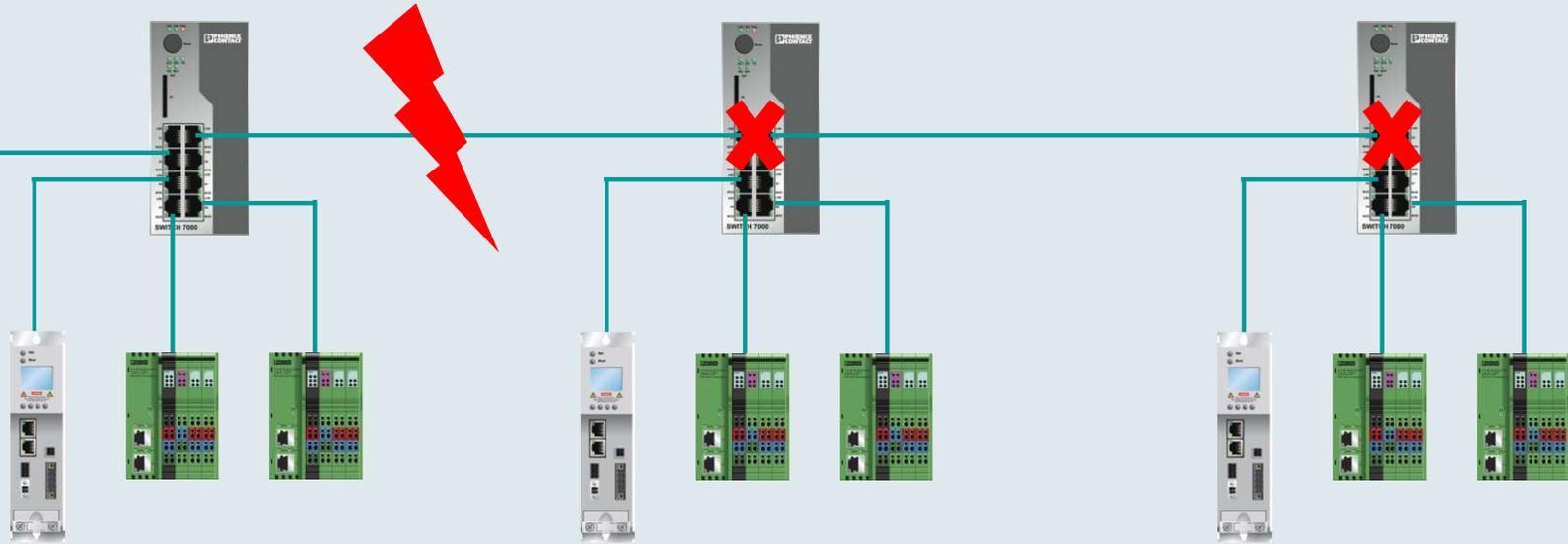
Advanced Managed Switches



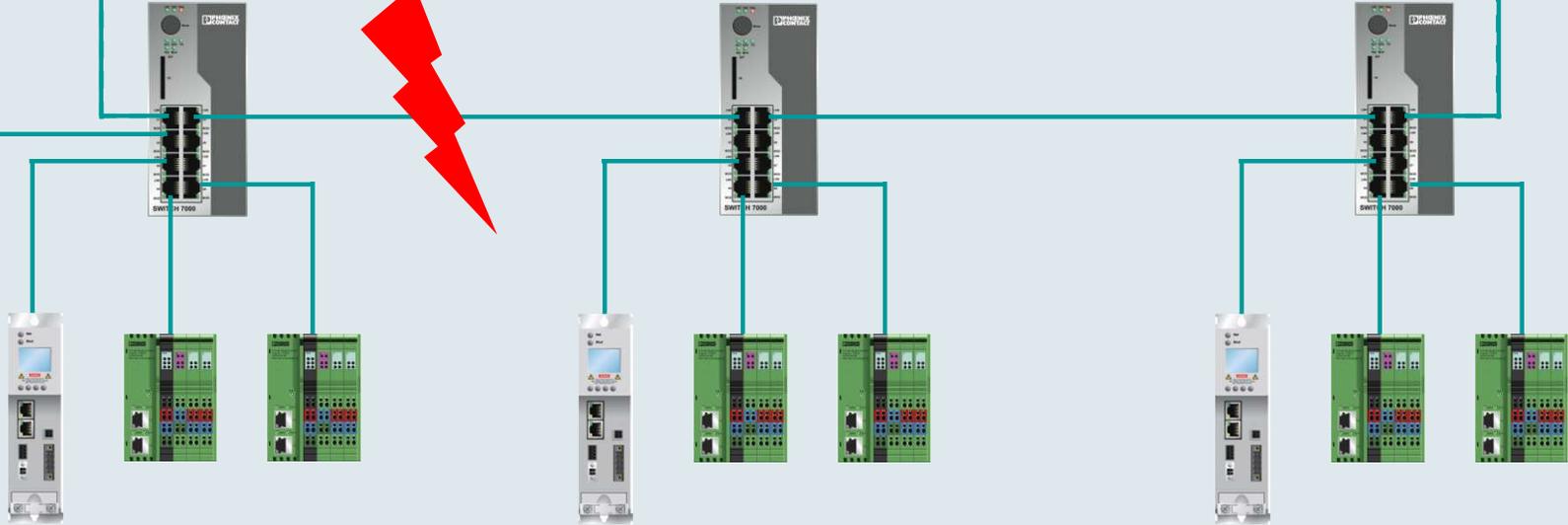
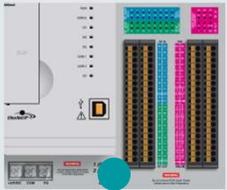


EtherNet/IP  
Controller

 Activate redundancy  
mechanism



DLR redundancy – recovery time < 3 ms



# Managed Switches 7000

EtherNet/IP™

**i** Common Industrial Protocol (CIP)

**i**

Device Level Ring (DLR) redundancy **i**

**i** IGMP snooping/querier



Faceplate visualizations **i**

Gigabit combo ports **i**

**i** Automation protocols



# Switch 7000

EtherNet/IP™

Common Industrial Protocol (CIP)



- Integration into EtherNet/IP control systems



 Automation protocols



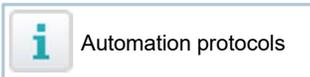


Diagnosis

EtherNet/IP™

Common Industrial Protocol  
(CIP)

Configuration



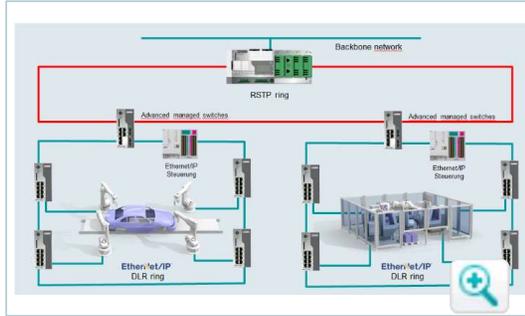
# Switch 7000

EtherNet/IP™



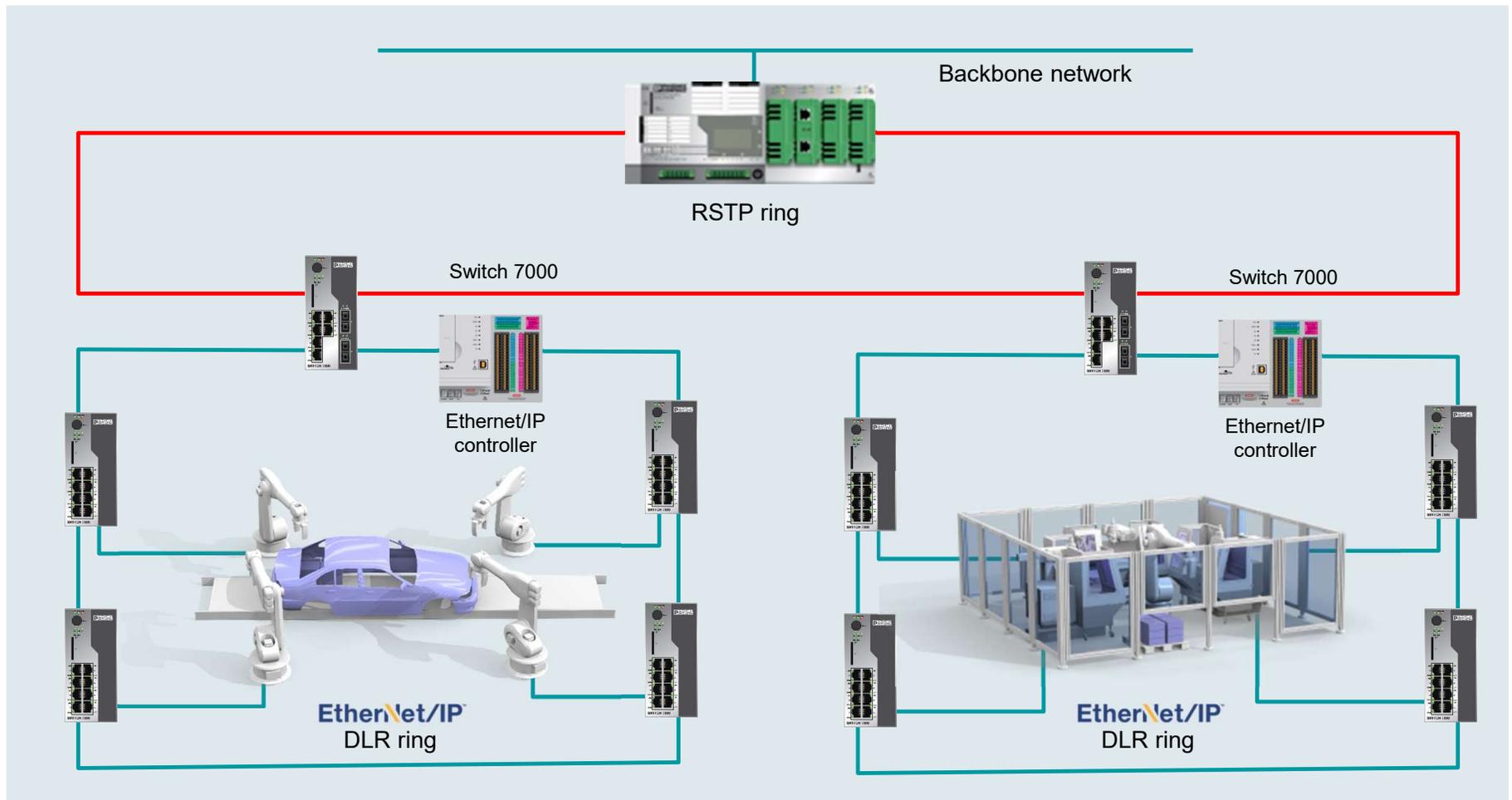
Device Level Ring (DLR) redundancy

- Multivendor redundancy mechanism for EtherNet/IP
- Recovery time < 3ms



 Automation protocols





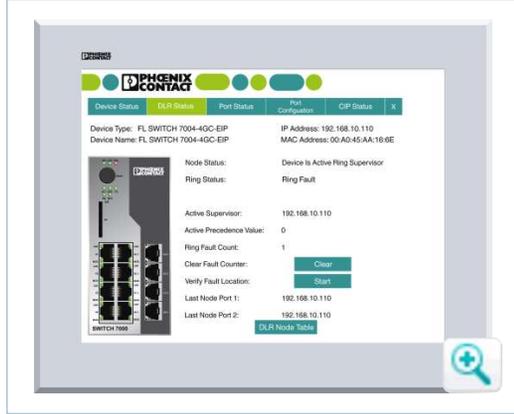
# Switch 7000

EtherNet/IP™



Faceplate visualizations

- Pre-configured visualization for Rockwell control systems
- Diagnostic information
- Port configuration



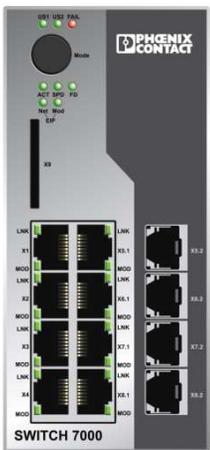
 Automation protocols





Device Status	DLR Status	Port Status	Port Configuration	CIP Status	X
---------------	------------	-------------	--------------------	------------	---

Device Type: FL SWITCH 7004-4GC-EIP  
Device Name: FL SWITCH 7004-4GC-EIP  
IP Address: 192.168.10.110  
MAC Address: 00:A0:45:AA:16:6E



Node Status: Device Is Active Ring Supervisor  
Ring Status: Ring Fault  
Active Supervisor: 192.168.10.110  
Active Precedence Value: 0  
Ring Fault Count: 1  
Clear Fault Counter:   
Verify Fault Location:   
Last Node Port 1: 192.168.10.110  
Last Node Port 2: 192.168.10.110

 Automation protocols



# Switch 7000

EtherNet/IP™



Gigabit combo ports

- Flexible choice of the transmission medium (copper or fiber) and fiber (singlemode or multimode)
- Cable length up to 80km (depending on the SFP module)



Automation protocols



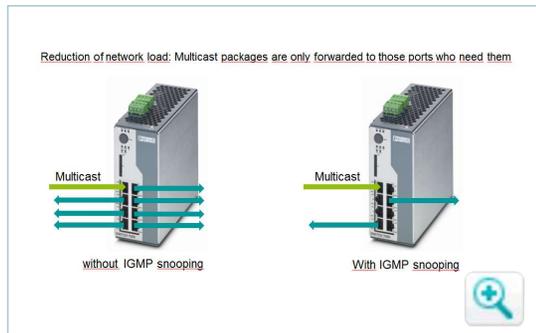
# Switch 7000

EtherNet/IP™



IGMP snooping/  
querier

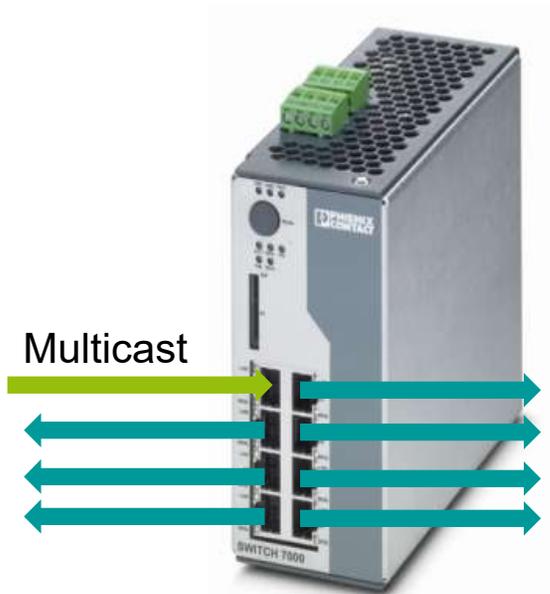
- Analysis of incoming multicast packets
- Packet forwarding only to ports, who need them
- Reduction of the network traffic



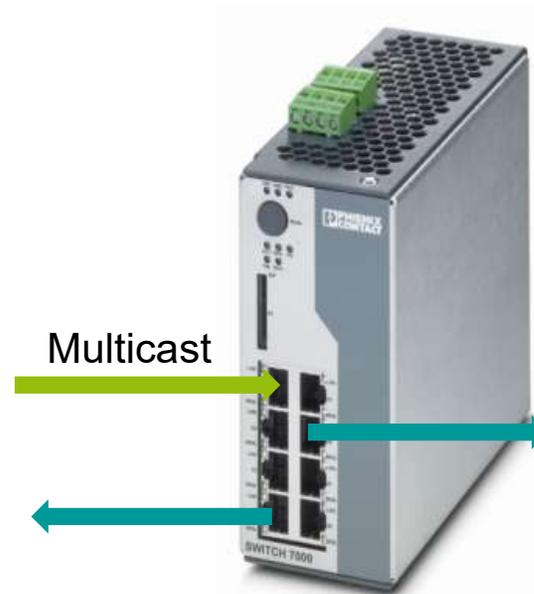
 Automation protocols



Reduction of network load: Multicast packages are only forwarded to those ports who need them



without IGMP snooping



with IGMP snooping

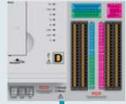
# Switch 7000



	<b>FL SWITCH 7008-EIP</b>	<b>FL SWITCH 7006/2FX-EIP</b>	<b>FL SWITCH 7005/FX- 2FXSM-EIP</b>	<b>FL SWITCH 7006-2GC-EIP</b>	<b>FL SWITCH 7004-4GC-EIP</b>	<b>FL SWITCH 7004-2TC- 2GC-EIP</b>
Ports	8x RJ45	6x RJ45 2x SC-MM	5x RJ45 1x SC-MM, 2x SC-SM	6x RJ45 2 x Gigabit combo	4x RJ45 4 x Gigabit combo	4x RJ45 2x Fast Ethernet combo 2 x Gigabit combo
Transmission speed	10/100 MBit/s	10/100 MBit/s	10/100 MBit/s	10/100/1000 MBit/s	10/100/1000 MBit/s	10/100/1000 MBit/s
Order number	2701418	2701419	2701420	2701554	2701553	2702175

 Automation protocols





EtherNet/IP<sup>™</sup>  
RSTP ring



EtherNet/IP<sup>™</sup>  
DLR ring



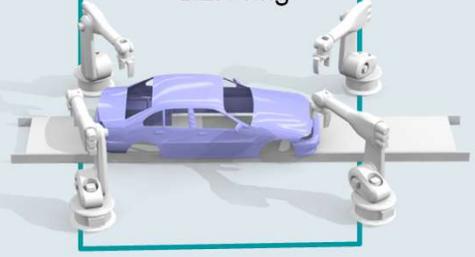
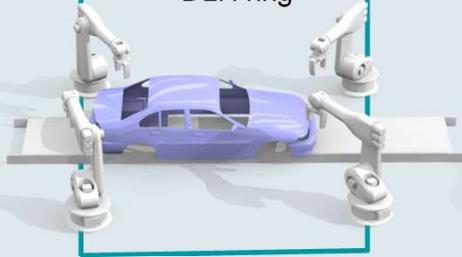
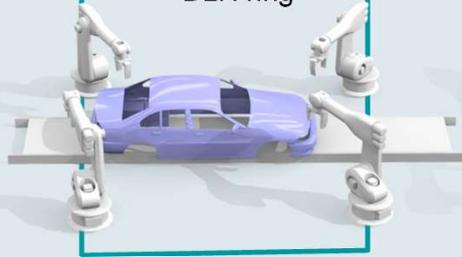
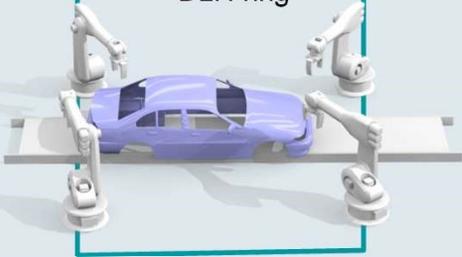
EtherNet/IP<sup>™</sup>  
DLR ring

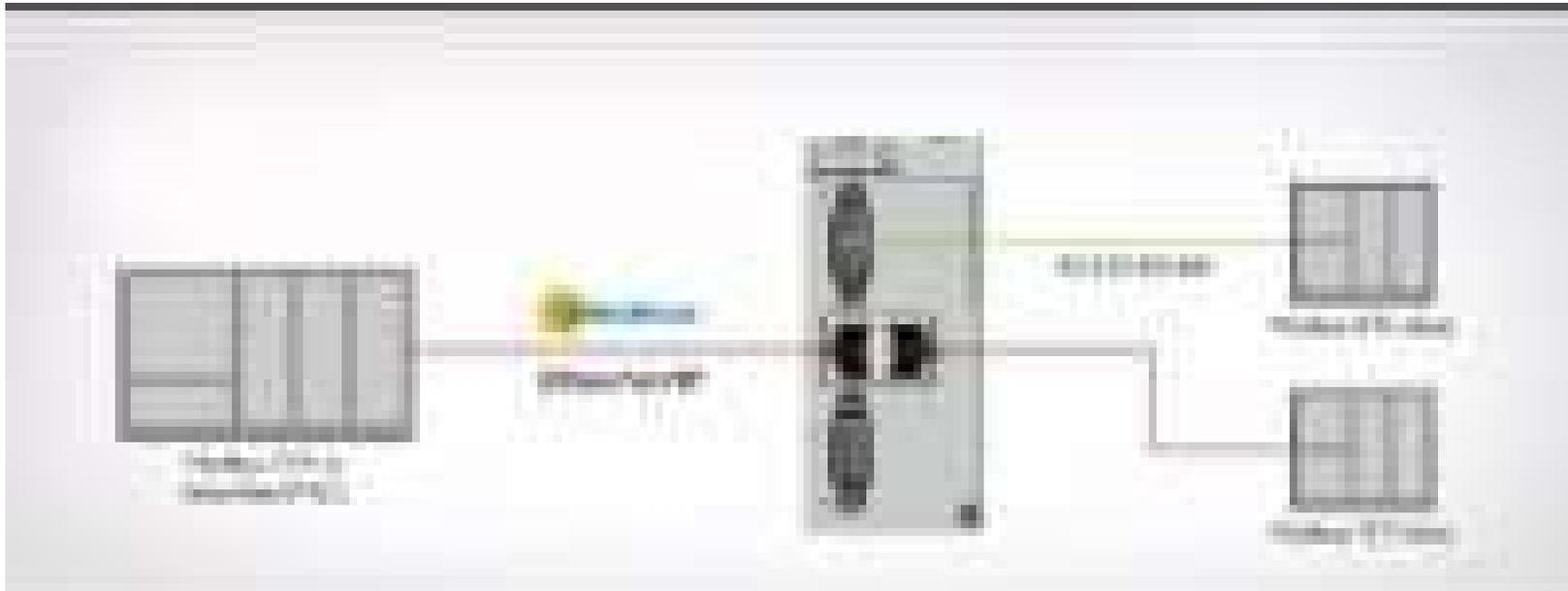


EtherNet/IP<sup>™</sup>  
DLR ring



EtherNet/IP<sup>™</sup>  
DLR ring





# Ethernet IP Gateway Configuration PHOENIX CONTACT

Configuring Phoenix Contact's EtherNet/IP Gateway

# PROFINET

Factory network



Remote Service

Firewall, 1:1 NAT. Router

Machine network

Machine core network

PROFI<sup>®</sup>  
NET MRP ring

Managed  
Switch 2000

Managed  
Switch 2000

IRT Switches

Unmanaged  
Switches

Managed  
Switch 2000

Unmanaged  
Switches

PROFI<sup>®</sup>  
NET IRT Switches



# Switches für PROFINET IRT



 Automation protocols

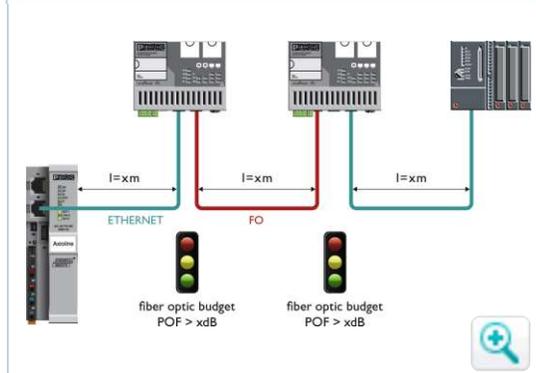


# Switches für PROFINET IRT

Diagnostics for fiber optic paths

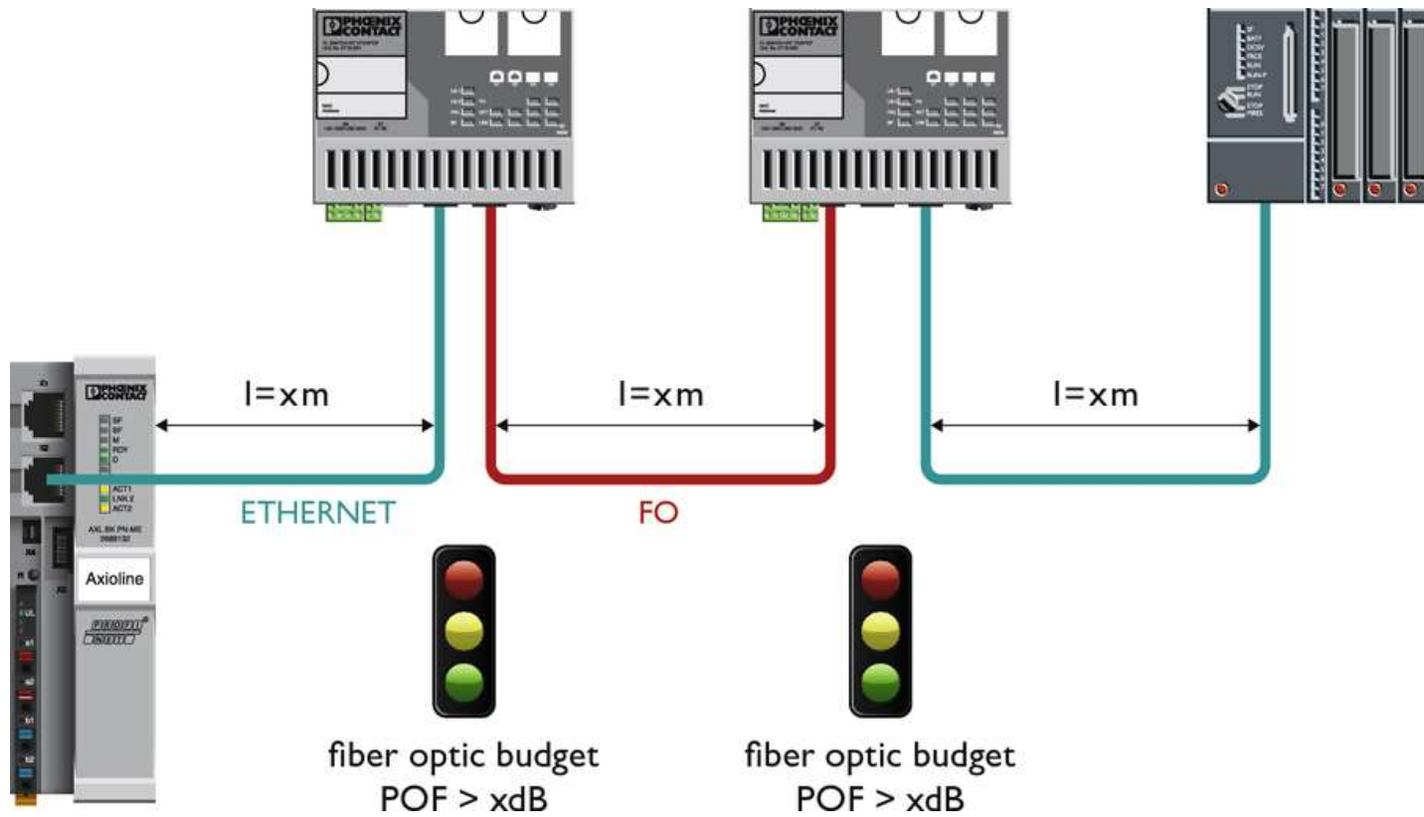


- Proactive maintenance for increased availability and less downtime
- Improved assessment of the path quality through simultaneous length measurement



 Automation protocols





 Automation protocols



# Switches für PROFINET IRT



**FL SWITCH IRT 4TX**

**FL SWITCH IRT 2TX  
2POF**

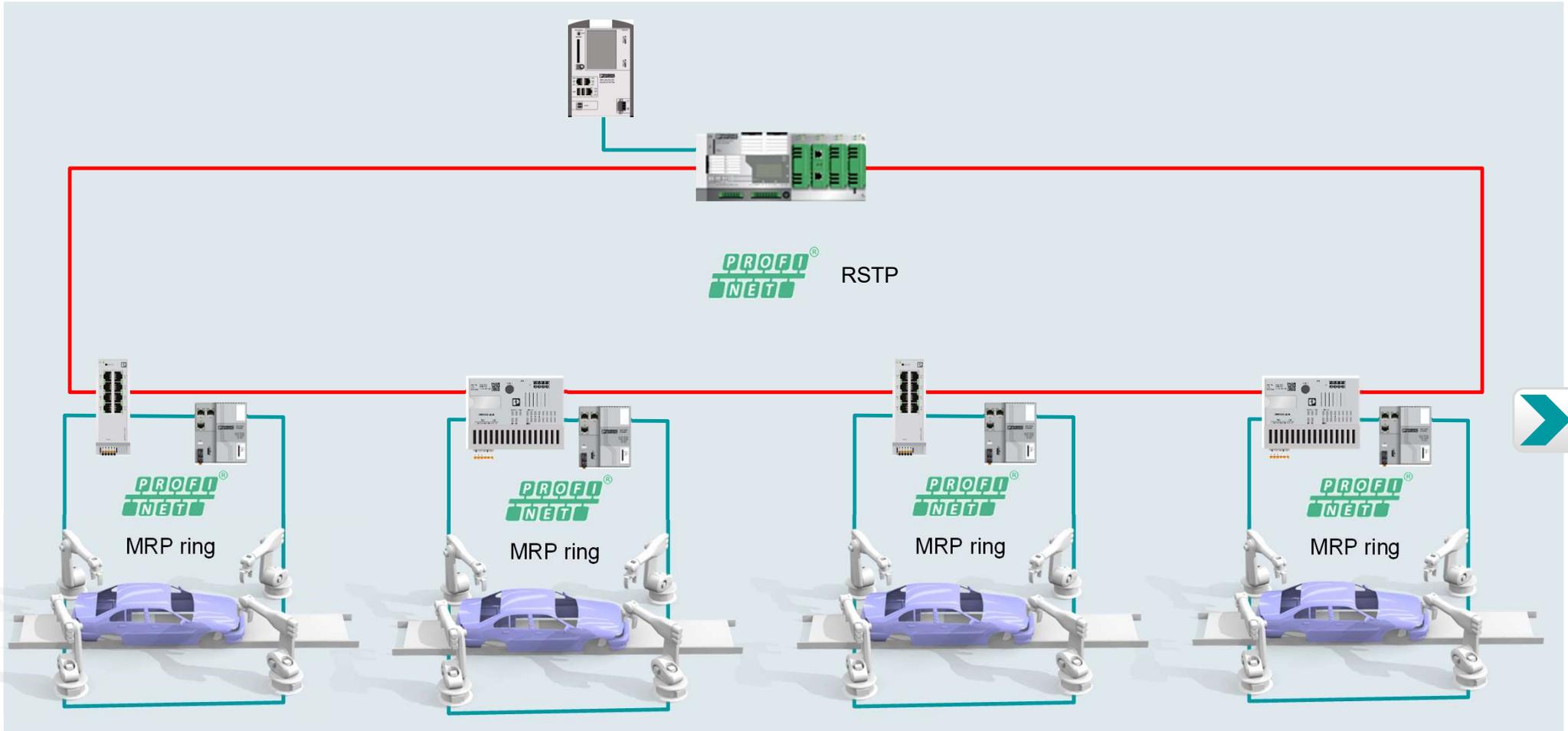
**FL SWITCH IRT TX  
3POF**

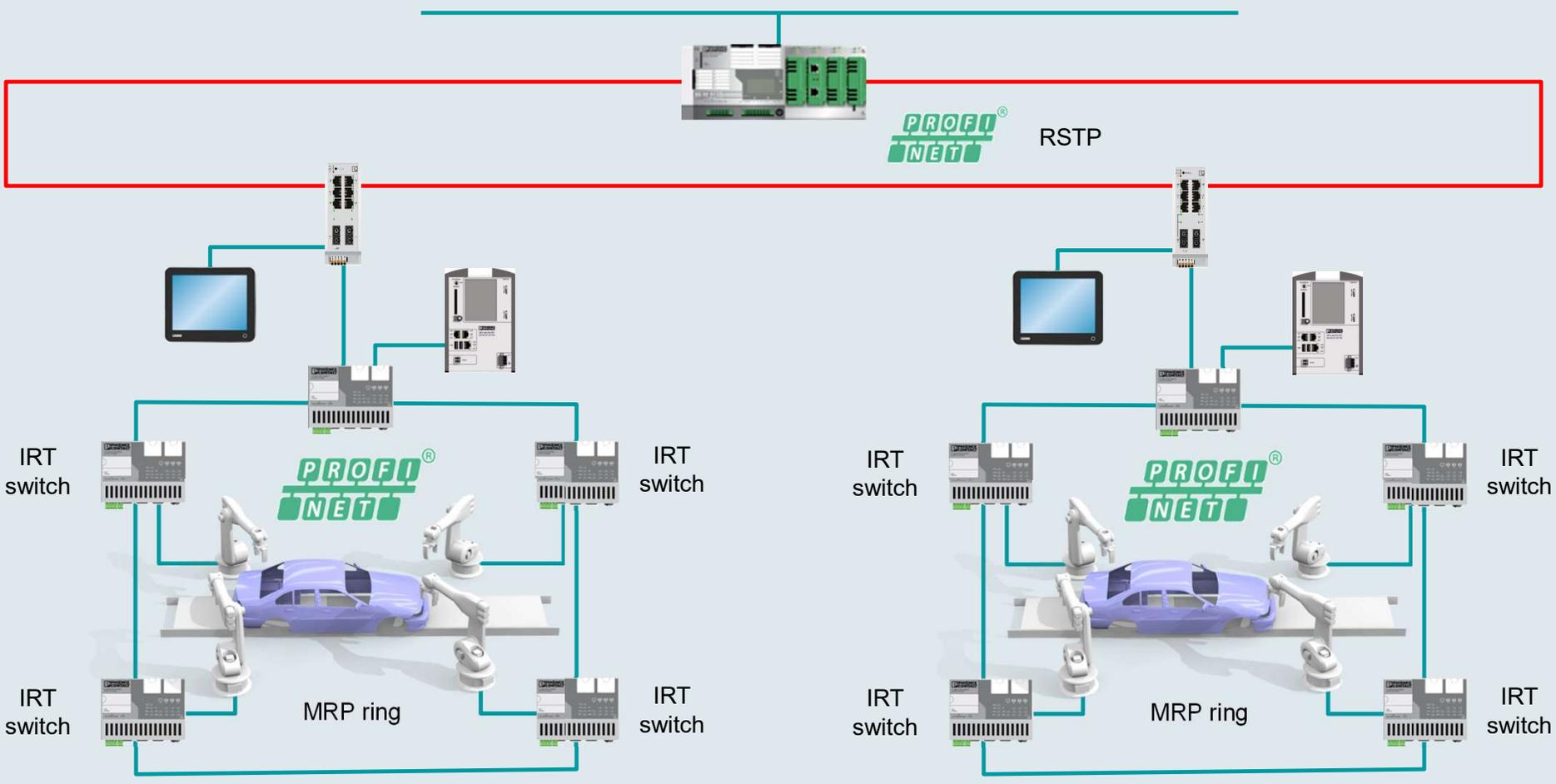
**FL SWITCH IRT IP  
TX/3POF**

Ports (Transmission speed)	4x RJ45 (10/100 Mbit/s)	2x RJ45 (10/100 Mbit/s) 2x POF SC-RJ (100 Mbit/s)	1x RJ45 (10/100 Mbit/s) 3x POF SC-RJ (100 Mbit/s)	1x RJ45 Push Pull (10/100 Mbit/s) 3x POF SC-RJ Push Pull (100 Mbit/s)
Degree of protection	IP20	IP20	IP20	IP67
Order number	2700689	2700691	2700692	2700697

 Automation protocols

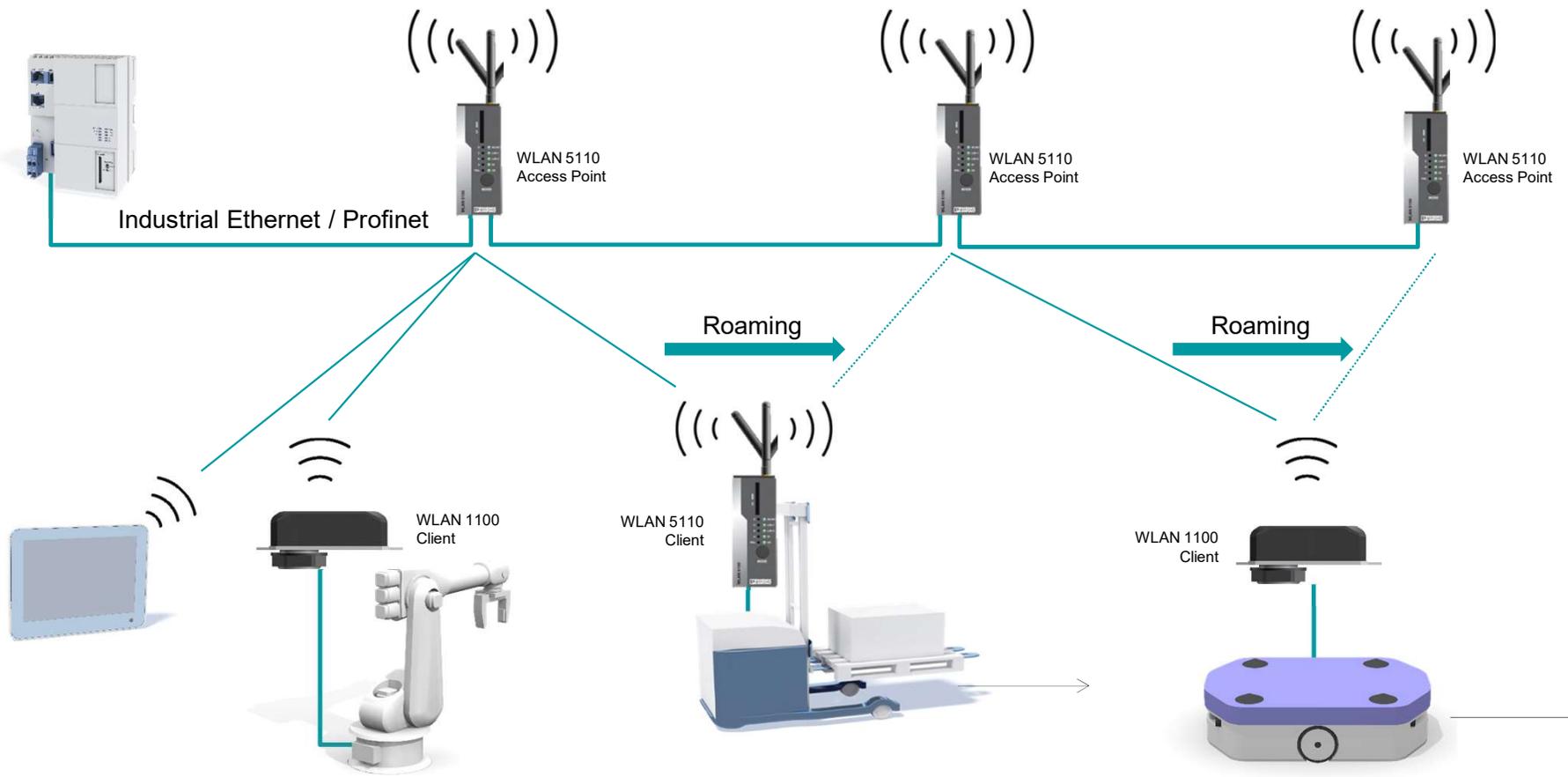


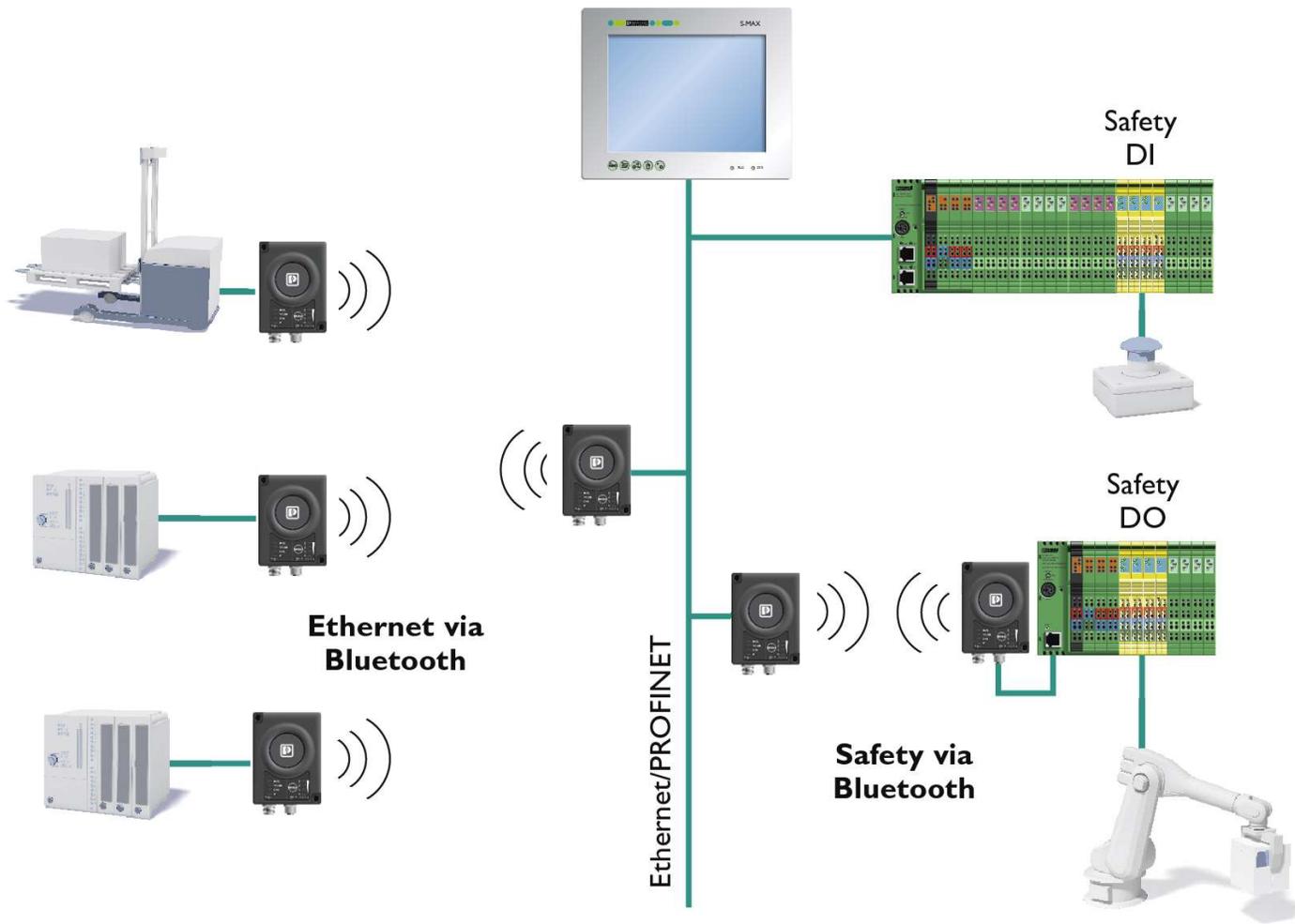




Modbus/TCP EtherNet/IP PROFINET

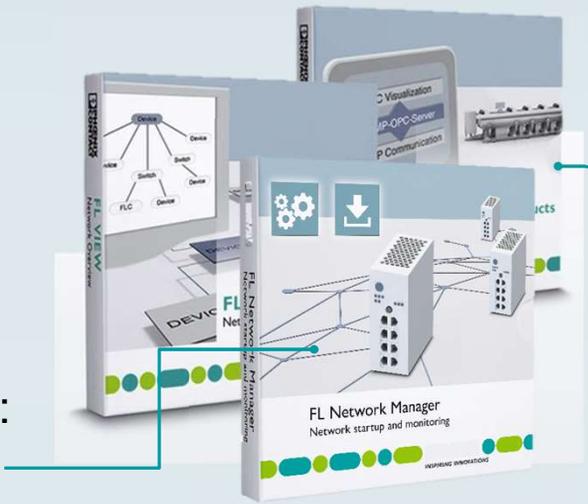
Wireless





# Software

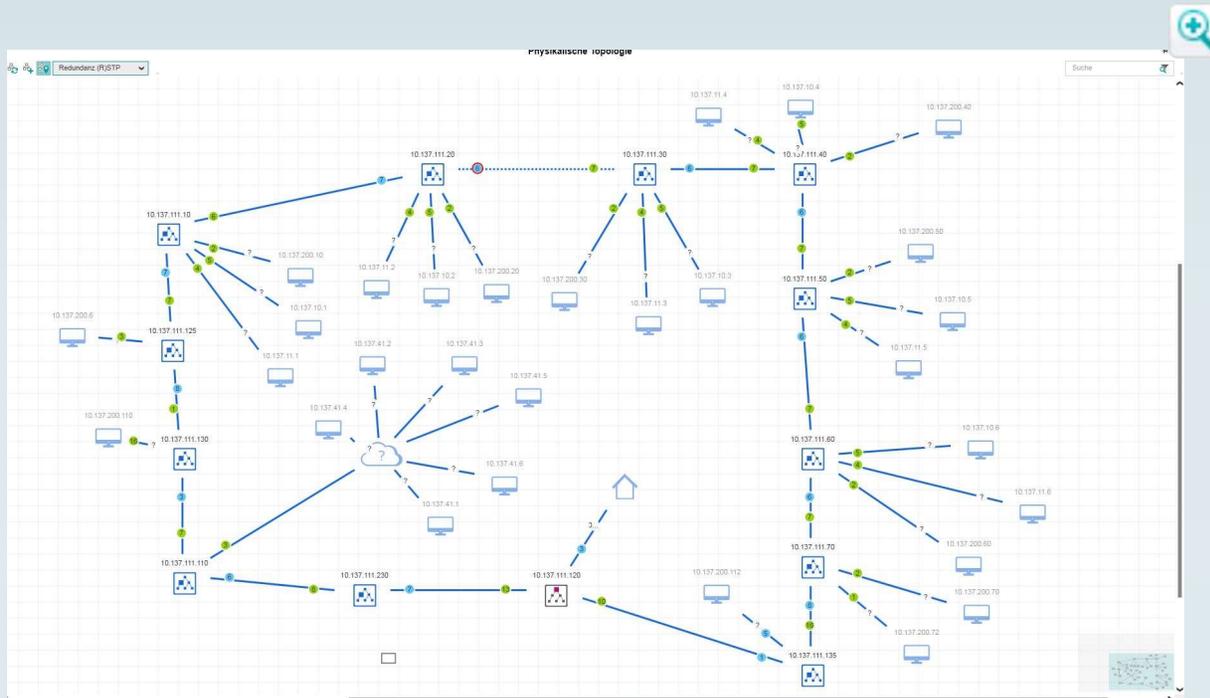
**i** FL NETWORK MANAGER:  
Network startup and  
monitoring



SNMP OPC Products: **i**  
Linking of standardized  
protocol types



# Topology Overview



## Static Network Topology

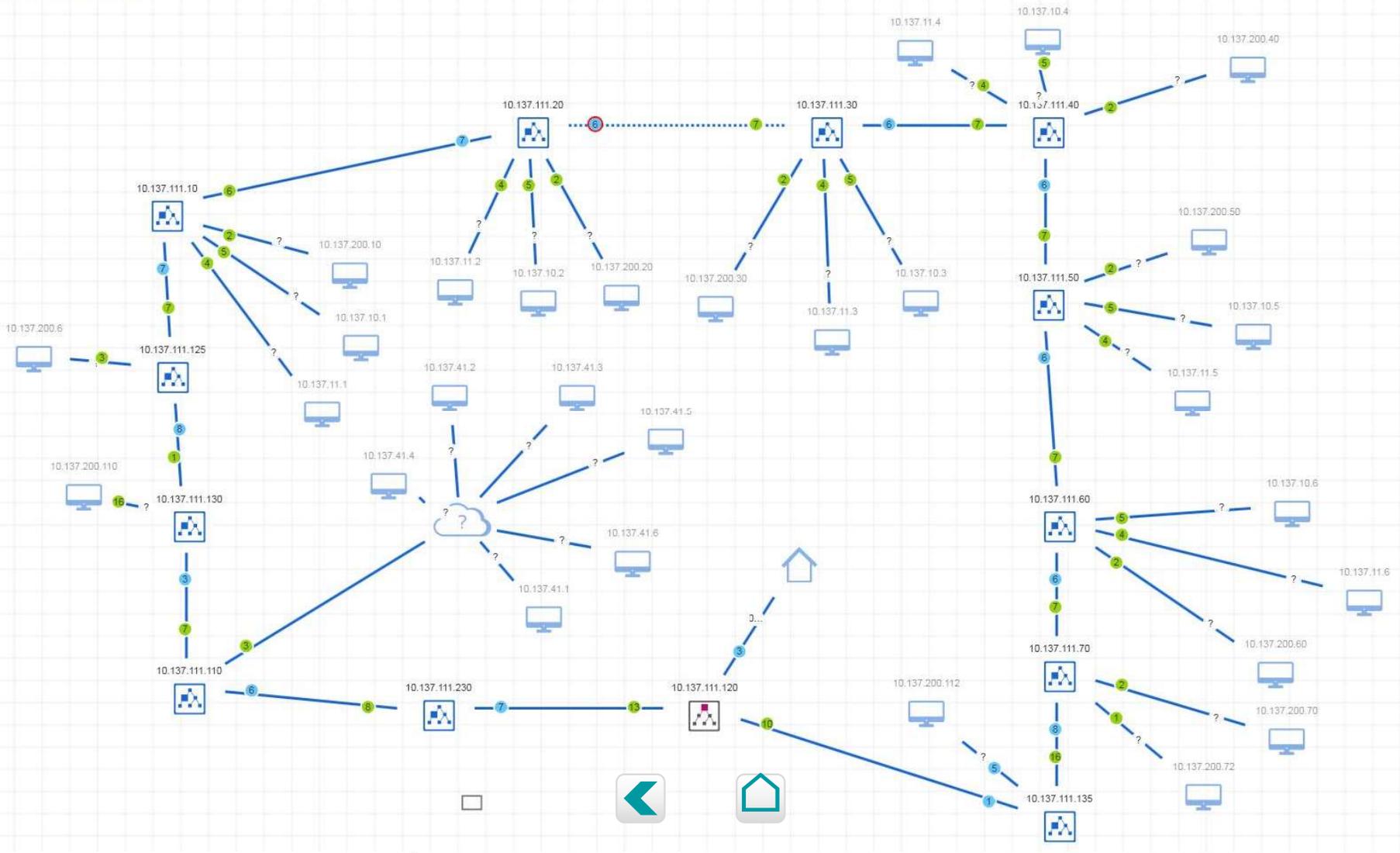
- Graphical overview
- Detection of switches and end devices
- Views for different redundancy mechanisms with graphical detail information
- Easy topology comparison between saved and online topology, thanks to different colours



Physische Topologie

Redundanz (R)STP

Suche



FL NETWORK MANAGER BASIC - FLNetMan.netm\*

File Edit Extras Window Help

PHENIX CONTACT

**PLANT**

- Project (20 of 20)
  - 192.168.200.233 : Ethernet Device
  - 192.168.200.17 : Ethernet Device
  - 192.168.200.237 : FL SWITCH MM HS
  - 192.168.200.238 : FL SWITCH MCS 11
  - 192.168.200.20 : Ethernet Device
  - 192.168.200.10 : FL SWITCH MCS 16
  - 192.168.200.205 : FL SWITCH MCS 11
  - 192.168.200.7 : FL SWITCH GHS 12G
  - 192.168.200.1 : FL SWITCH SMCS 8GT
  - 192.168.200.6 : Ethernet Device
  - 192.168.200.15 : Ethernet Device
  - 192.168.200.16 : Ethernet Device
  - 192.168.200.4 : Ethernet Device
  - 192.168.200.3 : FL SWITCH 7008-EIP
  - 192.168.200.13 : Ethernet Device
  - 192.168.200.19 : Ethernet Device
  - 192.168.200.18 : Ethernet Device
  - 192.168.200.21 : Ethernet Device
  - 192.168.200.22 : Ethernet Device
  - 192.168.200.2 : FL SWITCH MCS 16T

**Project X**

Online Devices BOOTP/DHCP...

**Online Devices**

24 entries

Last scan on 27.09.2016 13:57:22

Subnet mask	Default gateway	Name of station	Type	Status	Display Name (Online)	Subnet mask	Default
255.255.0		mmhs.gerd.de	FL SWITCH MM HS	🟡	Select online device here		
255.255.0		mcs.gerd	FL SWITCH MCS 16TX	🟡	Select online device here		
255.255.0		fl-switch-mcs-14tx-2tx	FL SWITCH MCS 16TX	🟢	192.168.200.2 : 00:A0:45:05:6E:FE	255.255.255.0	
255.255.0		fl-switch-irt-tx-3pof	Ethernet Device	🟡	192.168.200.20 : 00:A0:45:03:03:04	255.255.255.0	
				🟡	192.168.178.200 : 00:0E:0C:50:C7:30	255.255.255.0	149.21
255.255.0		fl-switch-mcs-slemppunkt	FL SWITCH MCS 16TX	🟢	192.168.200.10 : 00:A0:45:07:8F:A9	255.255.255.0	
255.255.0	192.168.200.1	FL SWITCH MCS 16TX	FL SWITCH MCS 16TX	🟢	192.168.200.205 : 00:A0:45:03:89:55	255.255.255.0	192.11
255.255.0		FL SWITCH SMCS 8GT	FL SWITCH SMCS 8GT	🟢	192.168.200.1 : 00:A0:45:0A:02:D5	255.255.255.0	
255.255.0		FL NAT SM	Ethernet Device	🟡	192.168.200.233 : 00:A0:45:AD:2A:FC	255.255.255.0	
255.255.0	192.168.200.1	FL MGUARD RS 2000	Ethernet Device	🟡	192.168.200.6 : 00:A0:45:D6:62:EB	255.255.255.0	192.11
		45 74 68 65 72 6E 65 74 2D 47 65 72 E4 74	Ethernet Device	🟡	192.168.200.16 : 00:A0:45:08:55:F7		
		FL SWITCH LM 5TX	Ethernet Device	🟡	192.168.200.15 : 00:A0:45:27:AD:6F		
		FL SWITCH 7008-EIP	FL SWITCH 7008-EIP	🟢	192.168.200.3 : 00:A0:45:CA:D9:65		
255.255.0		FL SWITCH 3008	Ethernet Device	🟡	192.168.200.4 : 00:A0:45:61:C1:59	255.255.255.0	
			Ethernet Device	🟡	192.168.200.18 : 00:A0:45:D0:35:72		
			Ethernet Device	🟡	192.168.200.17 : 00:A0:45:D8:31:9A		
			Ethernet Device	🟡	192.168.200.22 : 00:A0:45:B3:AF:BE		
			Ethernet Device	🟡	192.168.200.21 : 00:A0:45:AD:1F:C1		

**COMPONENTS**

Devices (8 of 8)

- Local
- Ethernet (2 of 2)
  - Factoryline Ethernet (6 of 6)
    - Switch (6 of 6)
      - FL SWITCH 3008 Rev. >= 00/1.2
      - FL SWITCH 7008-EIP Rev. >= 00/1.2
      - FL SWITCH GHS 12G/8 Rev. >= 1.0
      - FL SWITCH MCS 16TX Rev. >= 1.0
      - FL SWITCH MM HS Rev. >= 00/1.2
      - FL SWITCH SMCS 8GT Rev. >= 1.0

**SNMP scan**

Enable

Timeout (ms): 3000

Network adapter: 192

**DCP scan**

Enable

Network adapter: FL

**Ping scan**

Enable

Timeout (ms):

Maximum concurrent requests:

IsEnabled	Sta
<input checked="" type="checkbox"/>	192.168.200.2
<input type="checkbox"/>	Enter IP

**BOOTP/DHCP scan**

**LOGGING**

Online

Time Stamp	Code	
27.09.2016 14:03:24	TFTP0012	Transfer of file 'fl_switch_7000_v2_00_00.b
27.09.2016 14:03:36	UPD0001	Firmware image fl_switch_7000_v2_00_00.
27.09.2016 14:05:07	UPD0003	Successful firmware update on the device
27.09.2016 14:06:29	TFTP0007	The device 192.168.200.205 requests the fi
27.09.2016 14:06:29	TFTP0009	TFTP request from device 192.168.200.205
27.09.2016 14:06:34	TFTP0012	Transfer of file 'FL_SWITCH_MCS_v4_77.b

**TFTP SERVER**

192.168.200.200 - FM Next Test

IP address	File name	Progress	Action

Windows aktivieren  
Wechseln Sie zu den Einstellungen

References

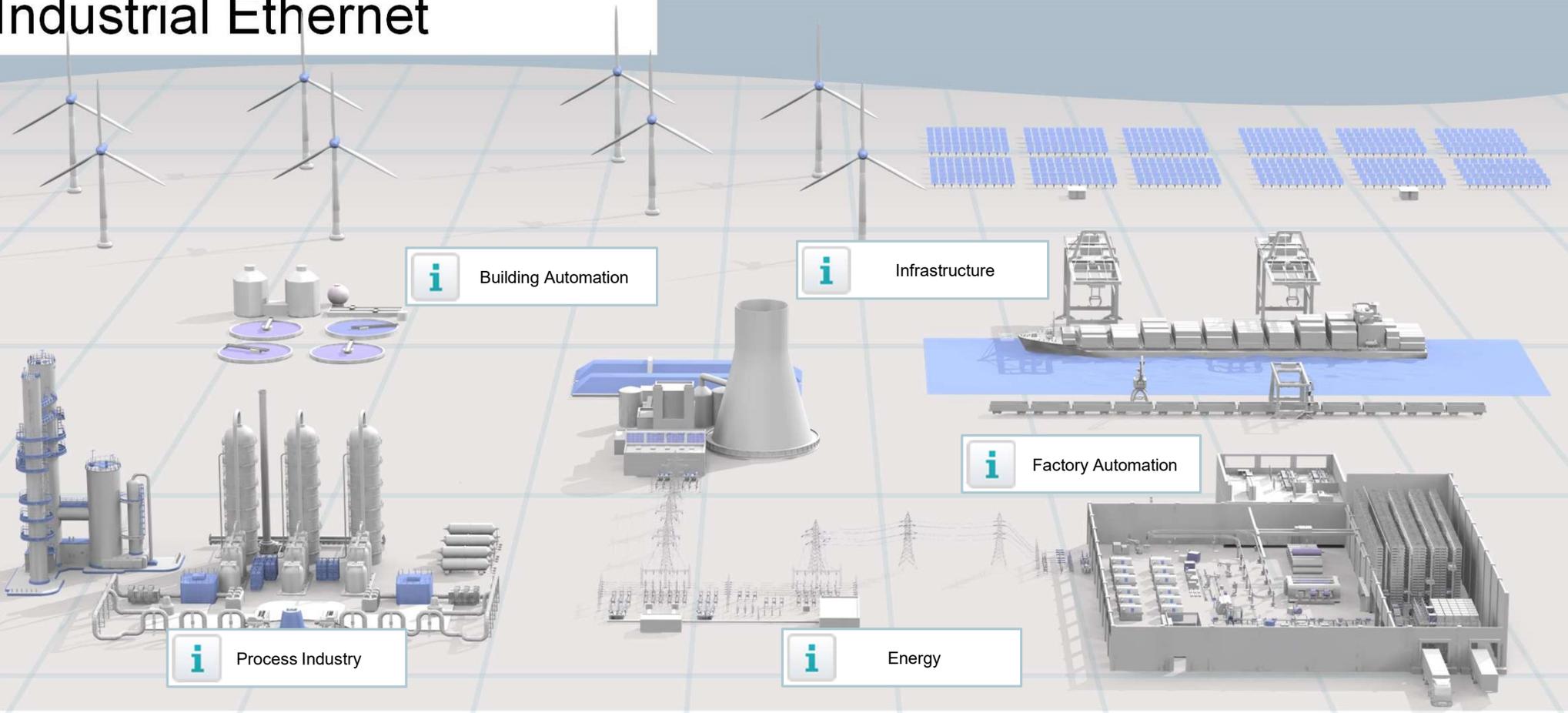
TFTP BOOTP

Web und Windows durchsuchen

14:13  
27.09.2016



# Industrial Ethernet



**i** Building Automation

**i** Infrastructure

**i** Factory Automation

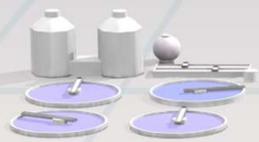
**i** Process Industry

**i** Energy

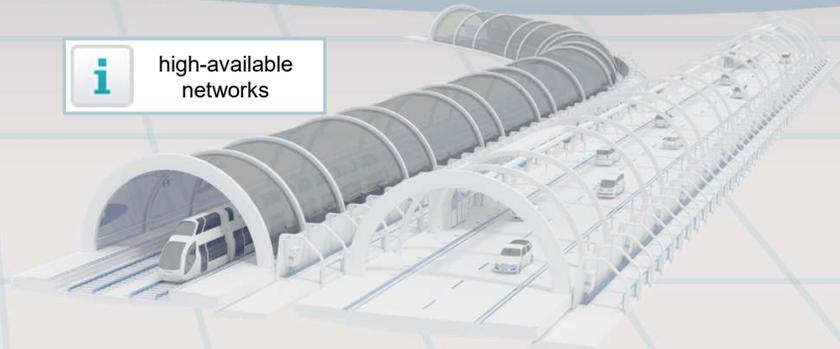
**i** Solution overview



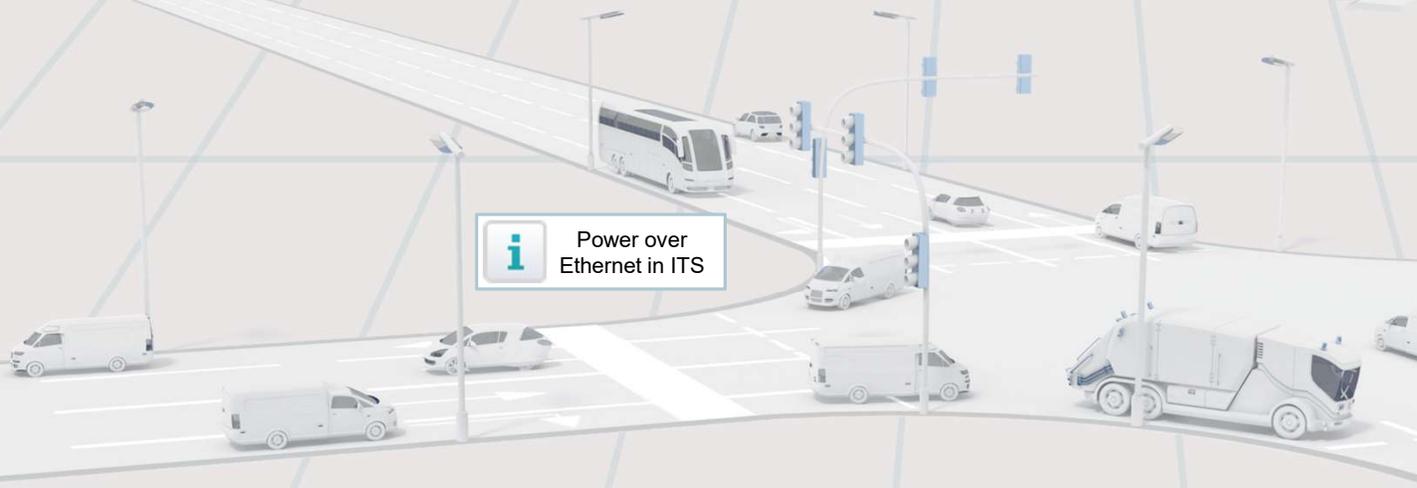
# Infrastructure



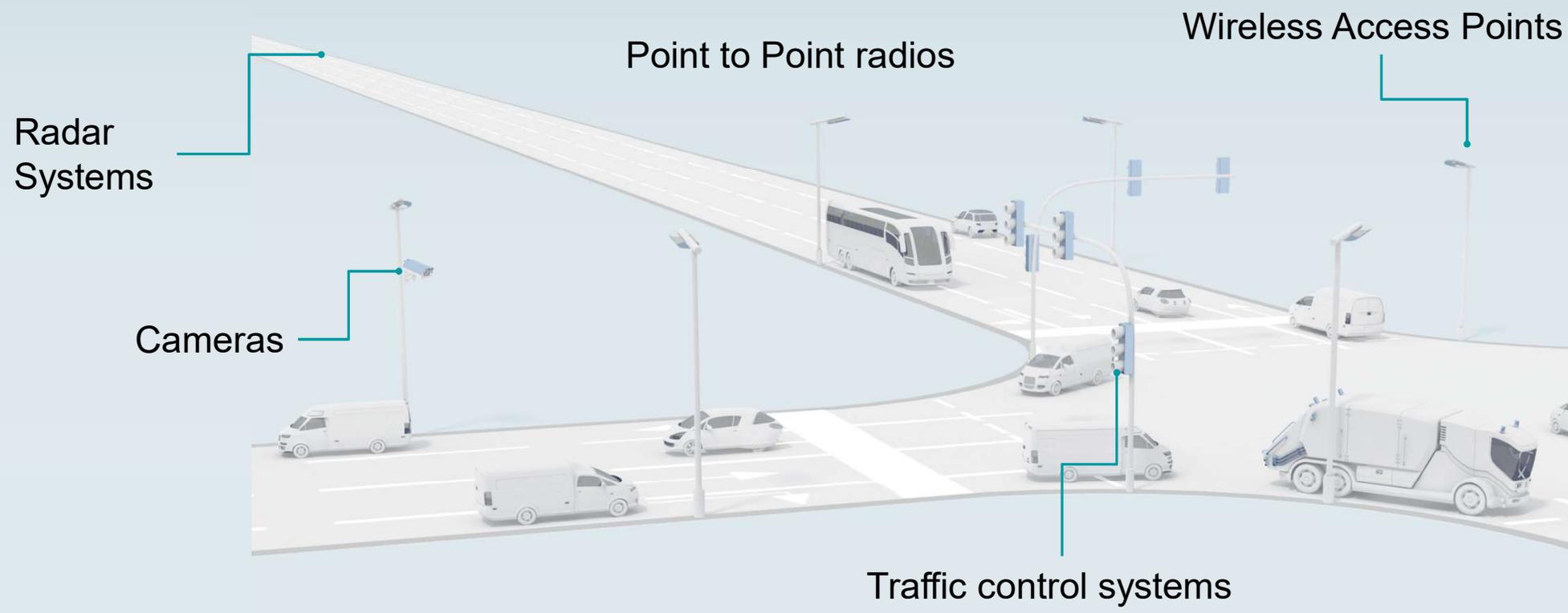
**i** high-available networks



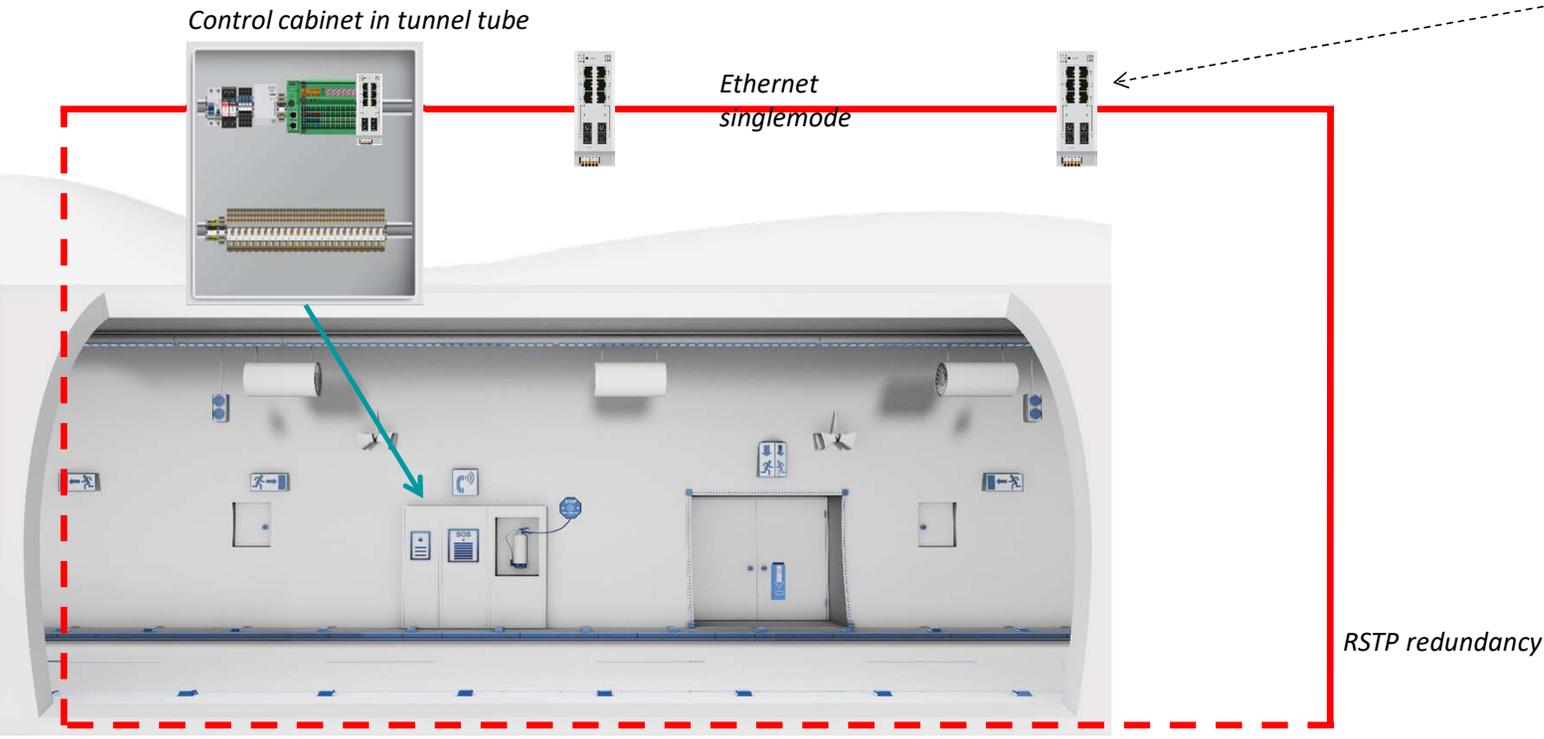
**i** Power over Ethernet in ITS



# ITS – Intelligent Transportation Systems



# High-available infrastructure networks

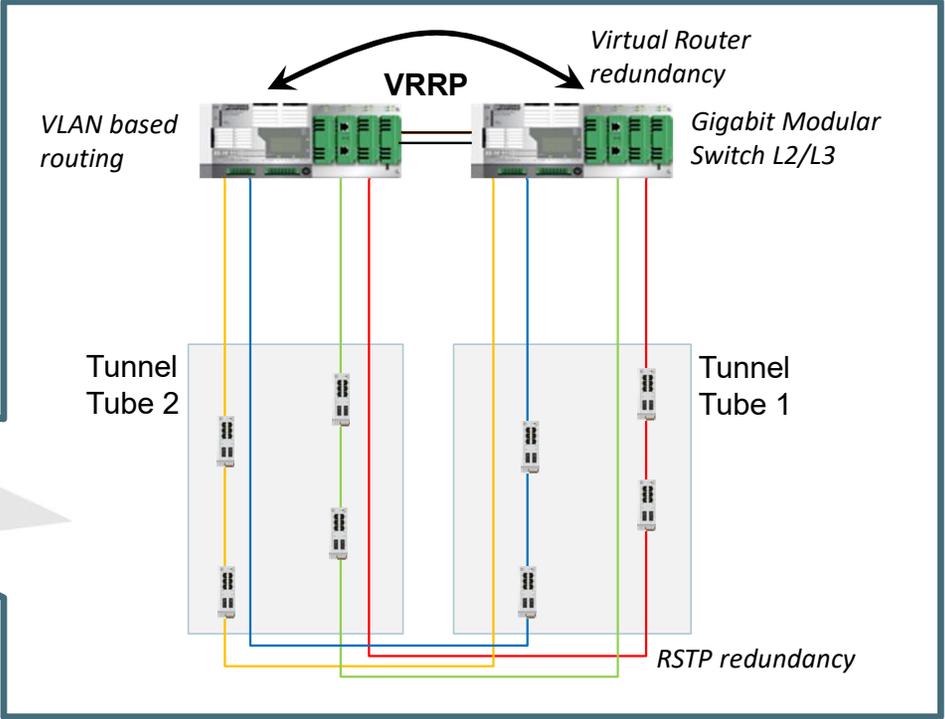
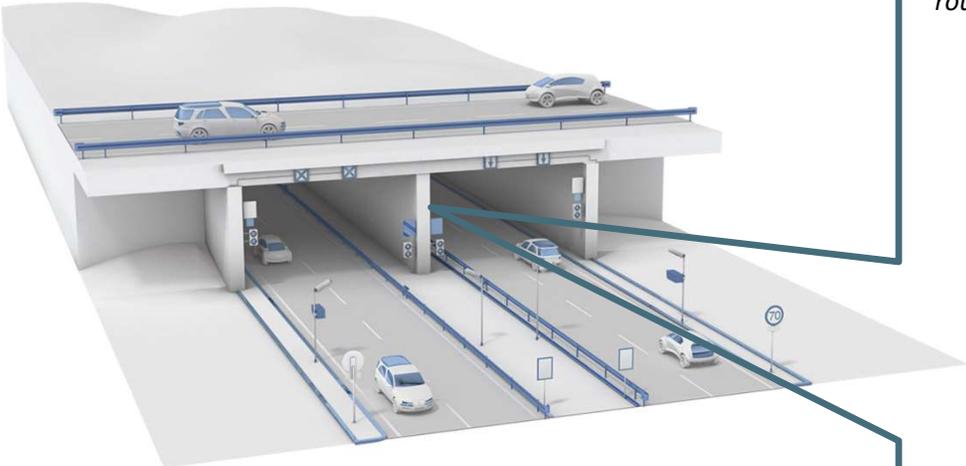


RX Power(dBm)	TX Power(dBm)
-16	-1.8
N/A	N/A

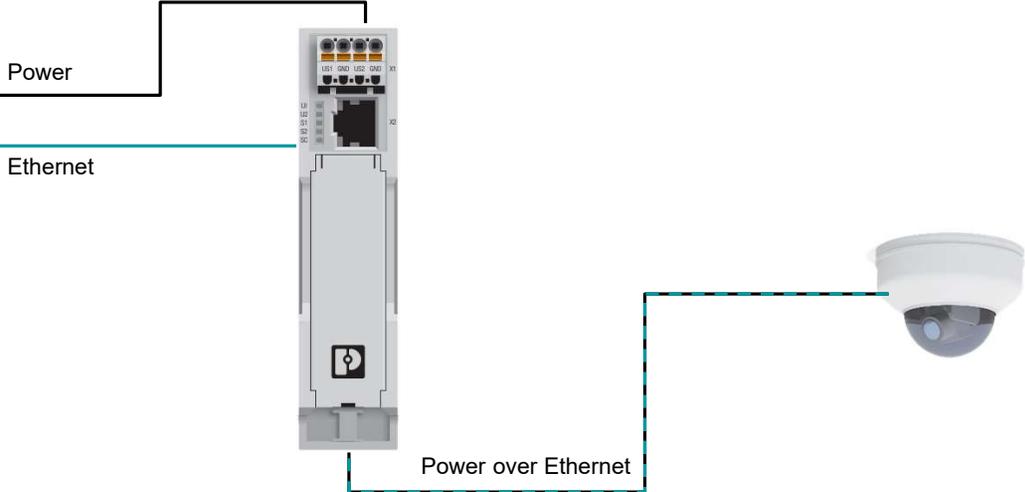
Integrated Fiber diagnostics



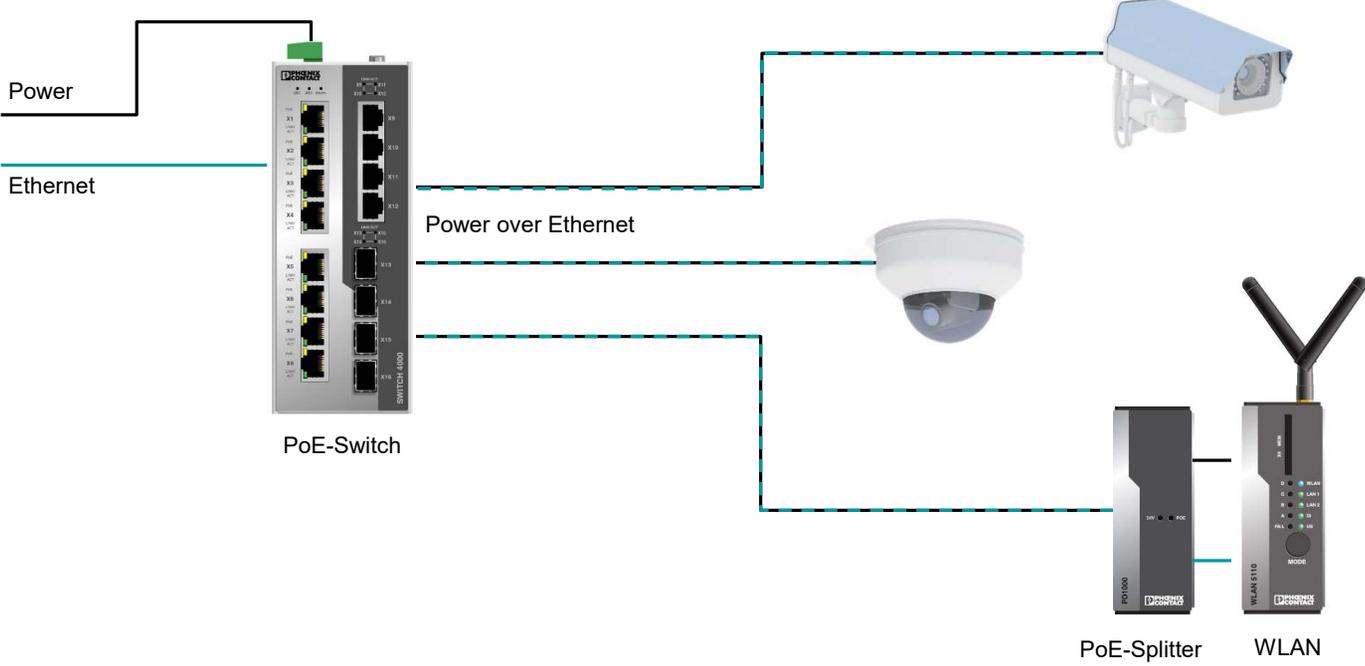
# High-available infrastructure networks



# Save installation costs with Power over Ethernet

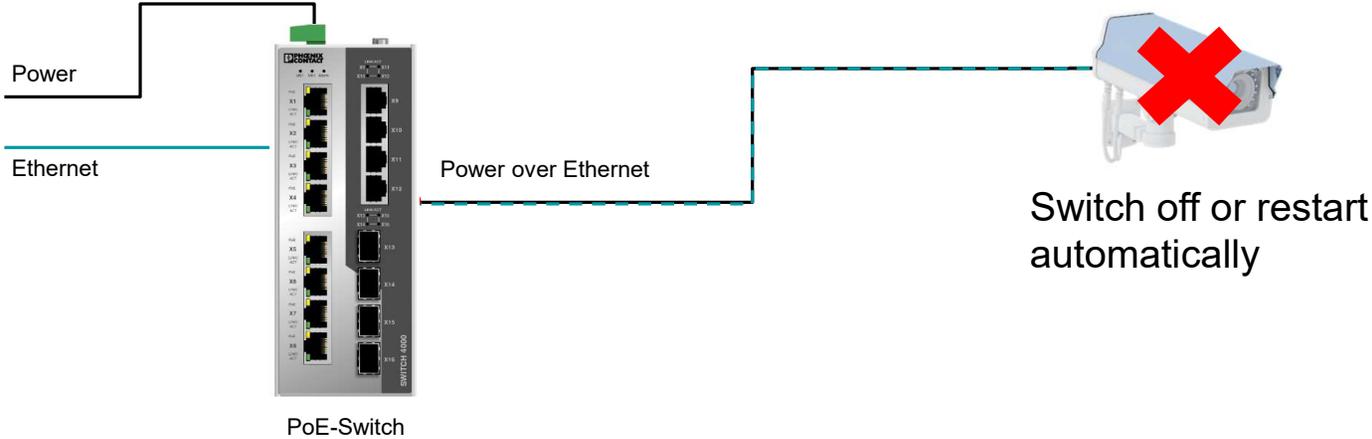


# Save installation costs with Power over Ethernet



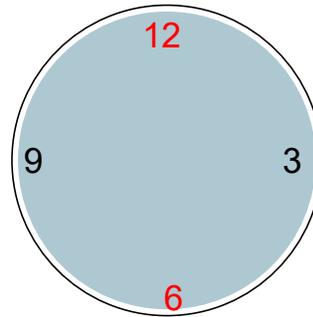
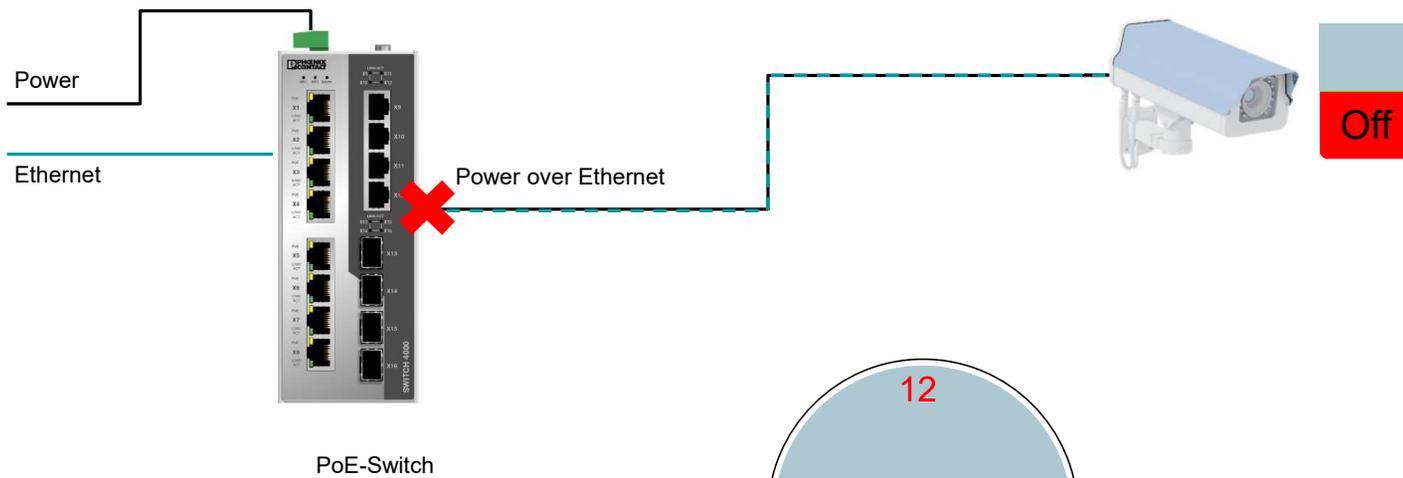
# Save installation costs with Power over Ethernet

*Watchdog function*



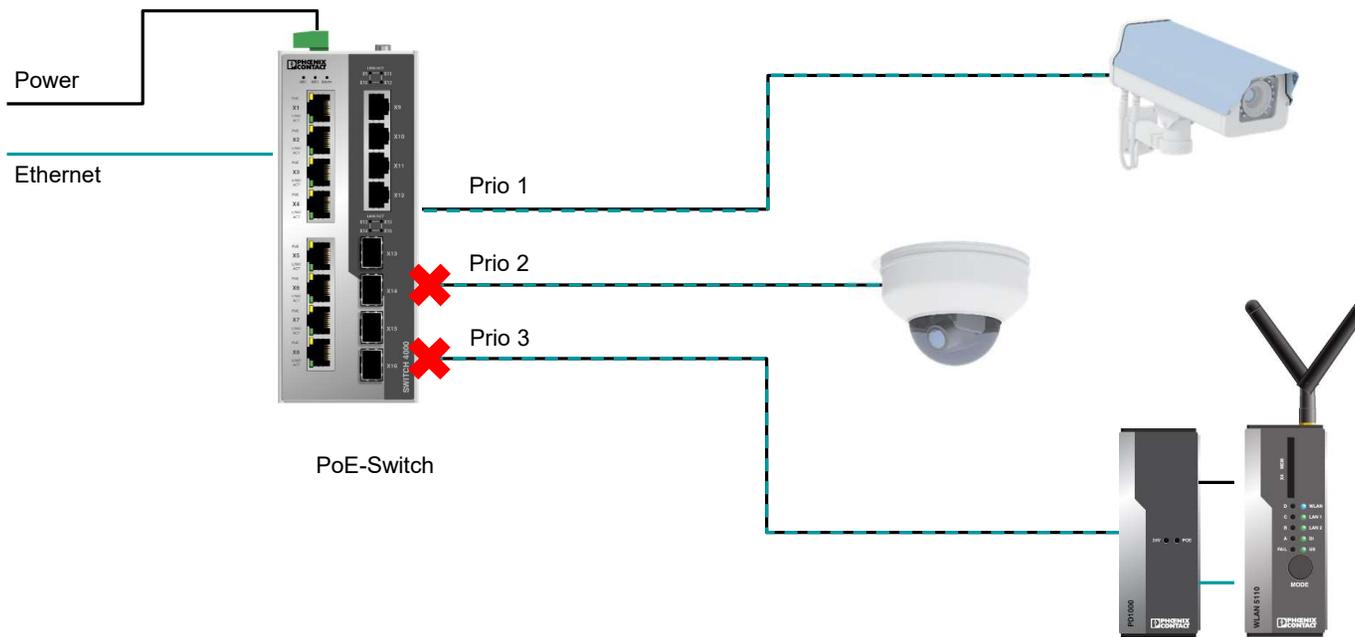
# Save installation costs with Power over Ethernet

## PoE Scheduler



# Save installation costs with Power over Ethernet

## PoE Prioritization



# Infrastructure & building automation

**i** Wireless data transfer

**i** Securing the network

**i** networking of distant buildings

**i** Reliable WLAN connections

**i** Distribute network data intelligently

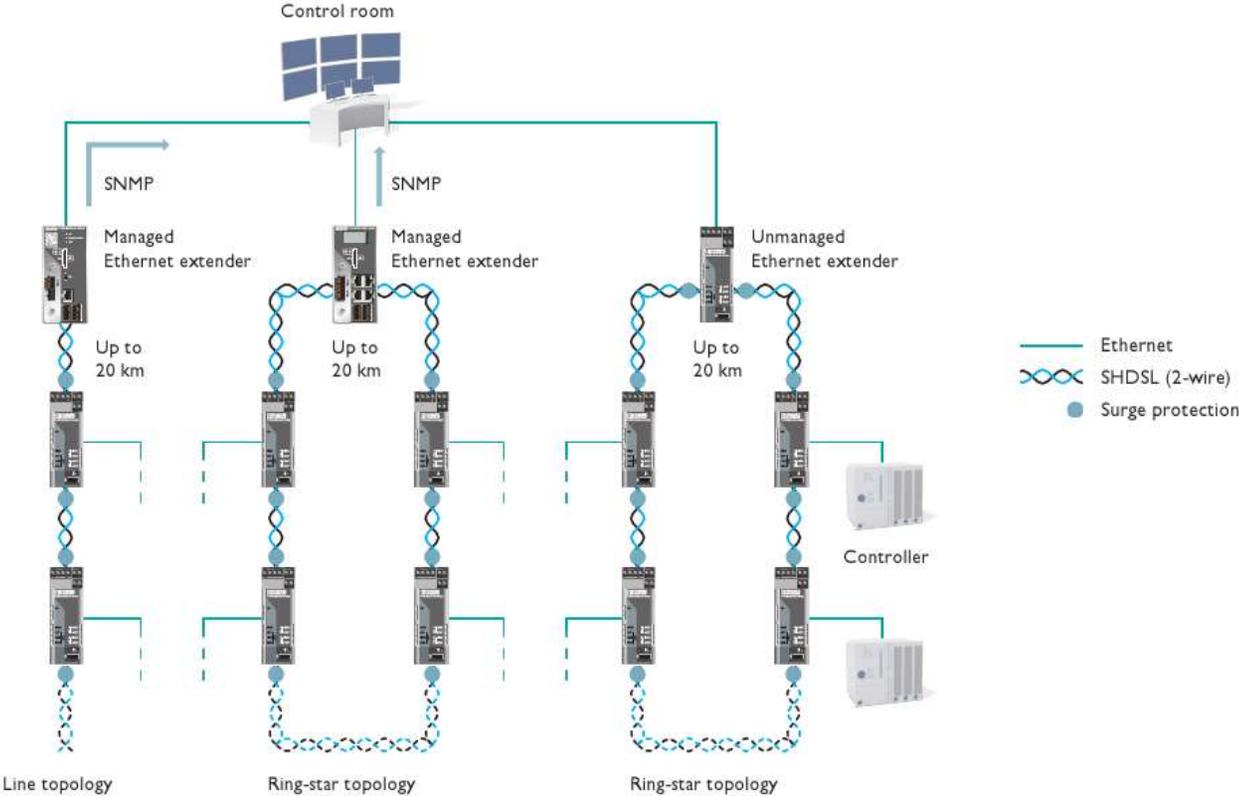
**i** Switching relays remotely

**i** Power over Ethernet

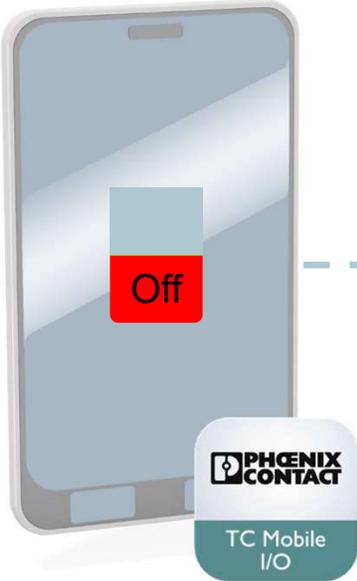
**i** high-performance networks



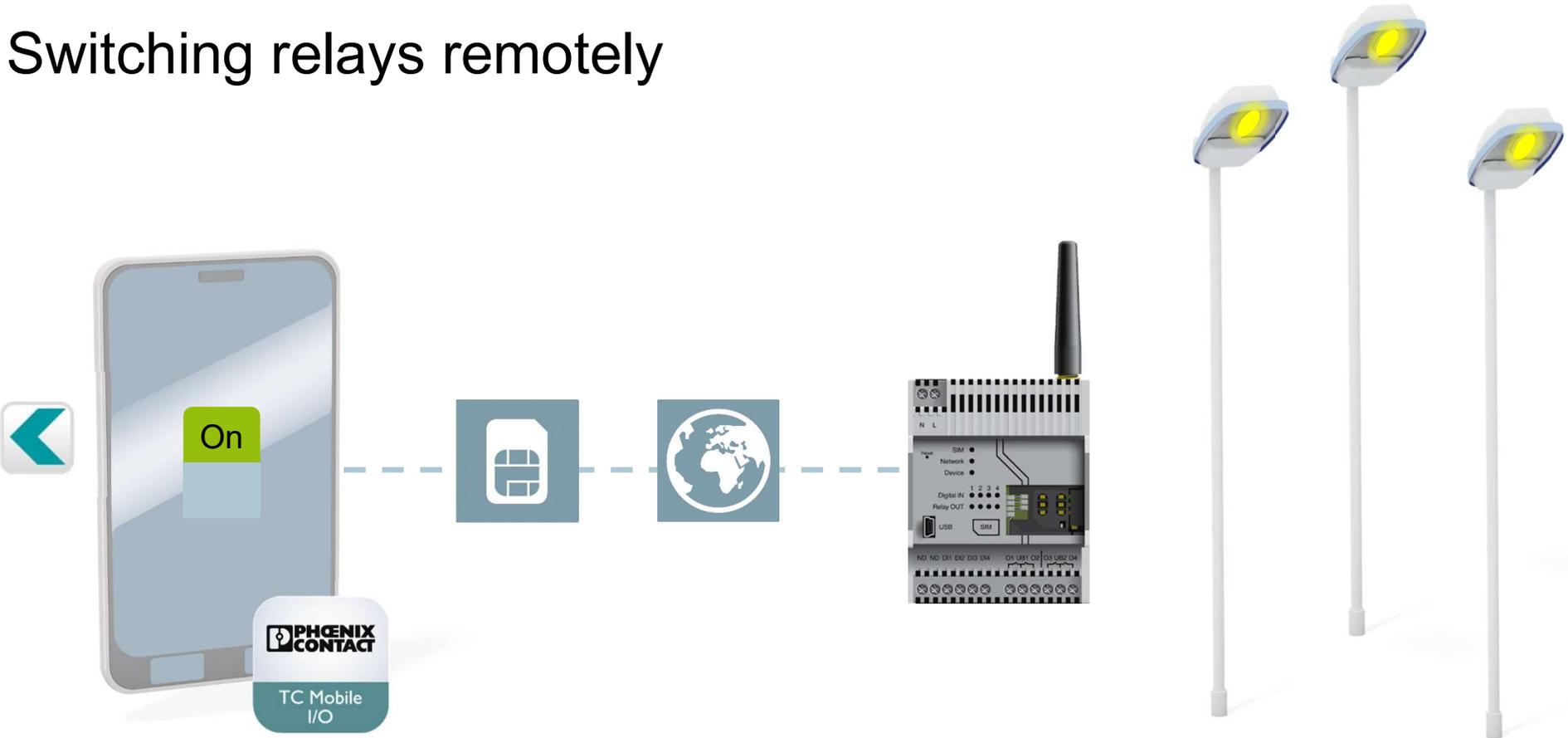
# Subsequent networking of distant buildings



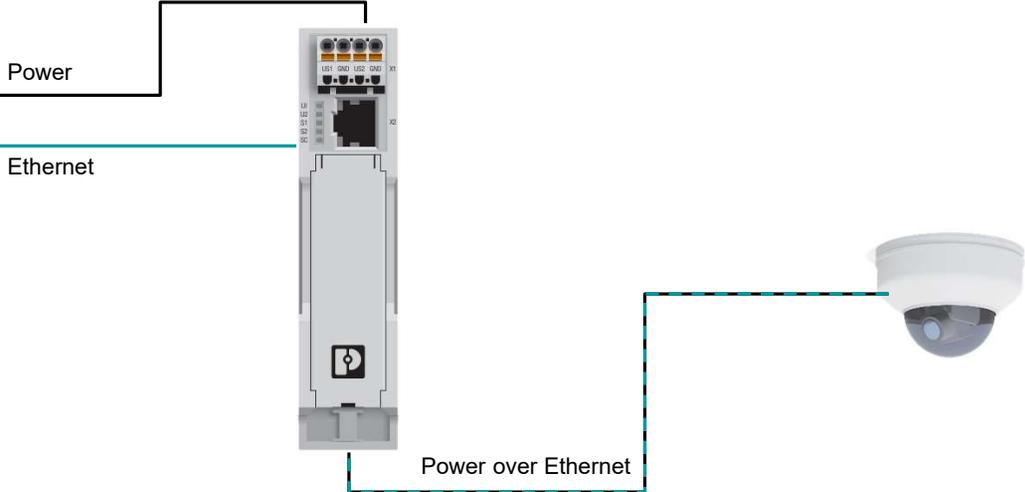
# Switching relays remotely



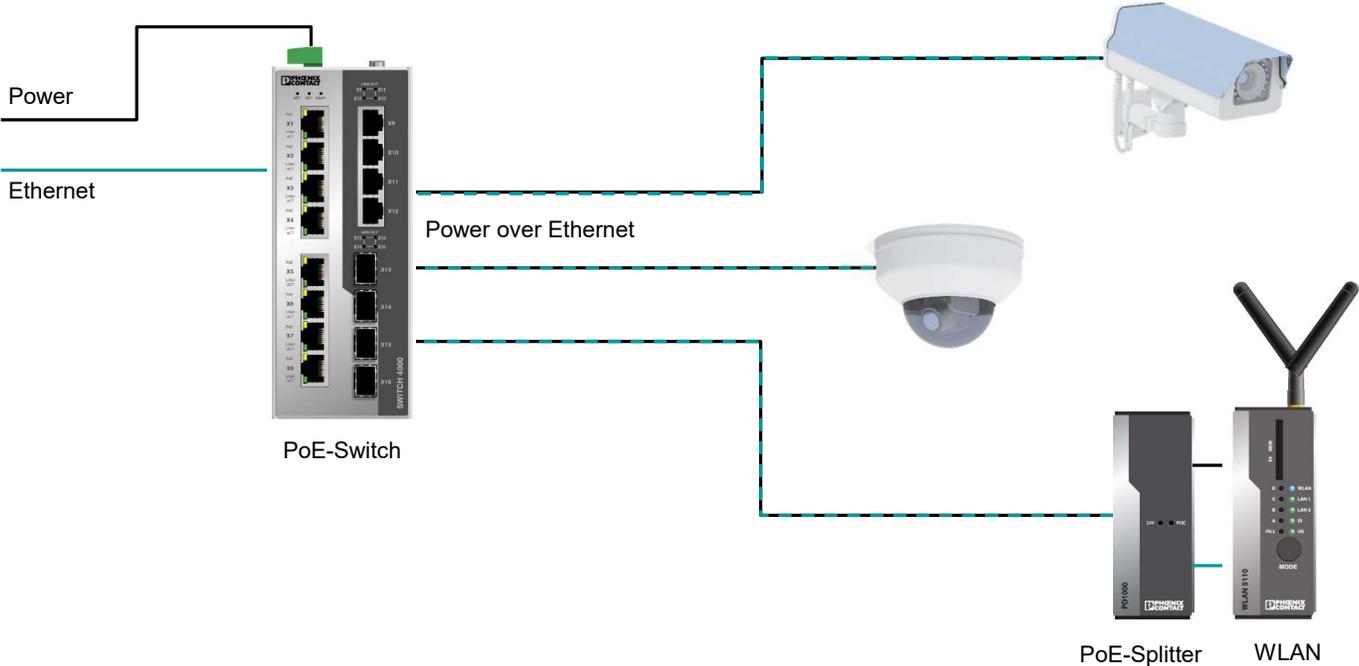
# Switching relays remotely



# Save installation costs with Power over Ethernet

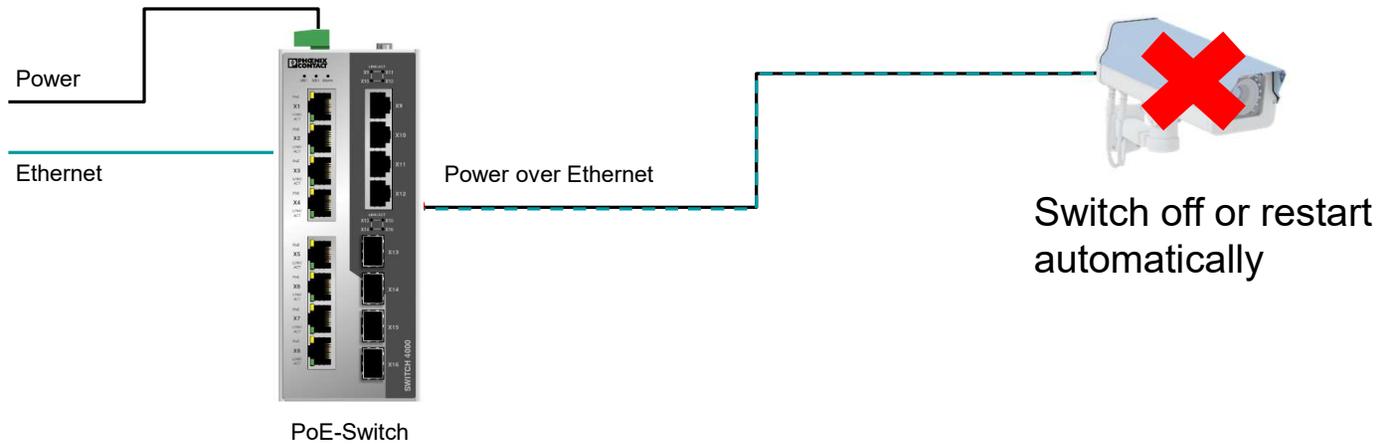


# Save installation costs with Power over Ethernet



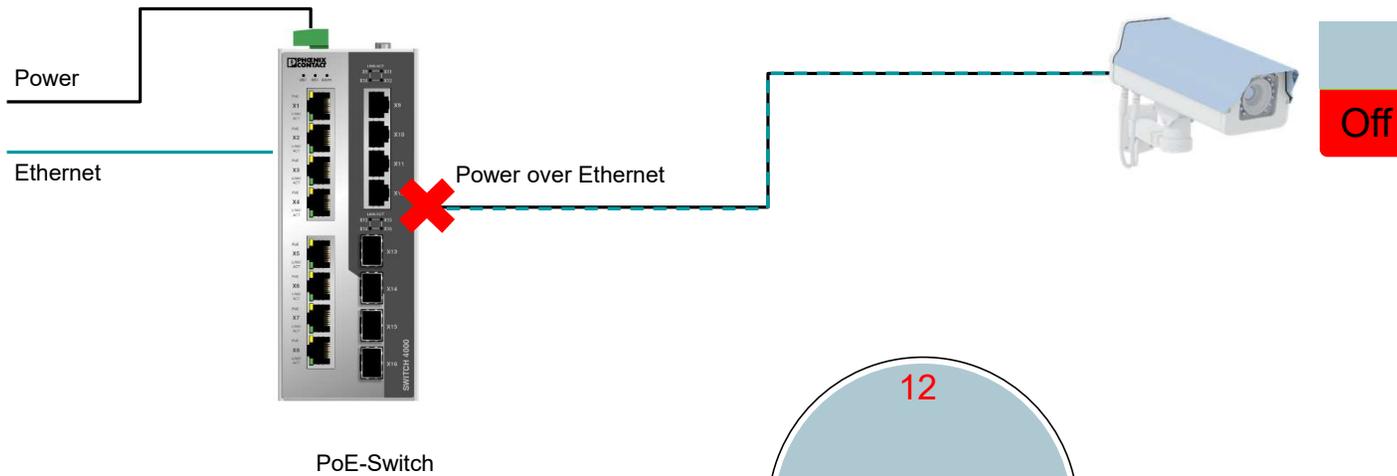
# Save installation costs with Power over Ethernet

*Watchdog function*



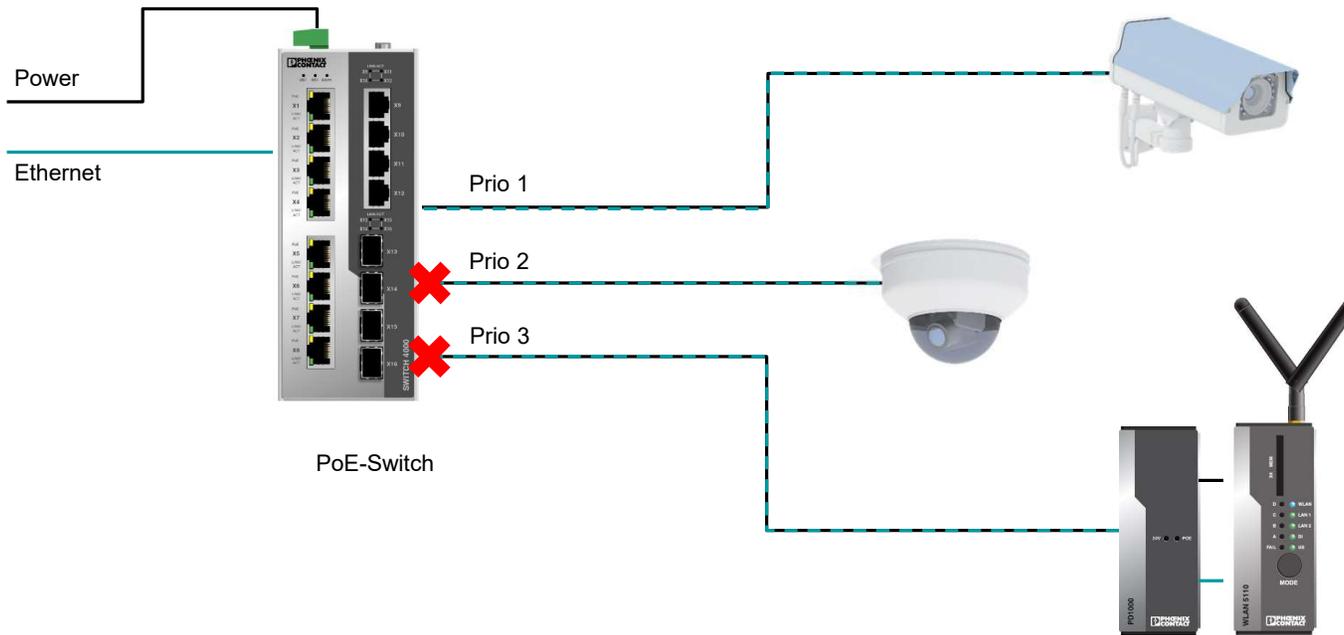
# Save installation costs with Power over Ethernet

## PoE Scheduler

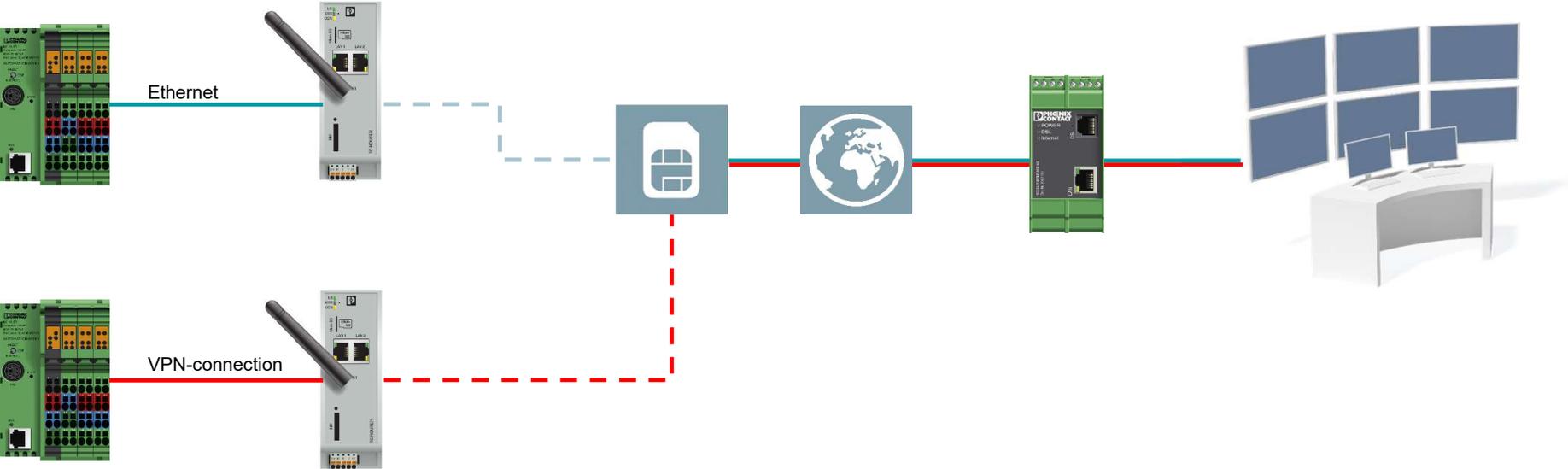


# Save installation costs with Power over Ethernet

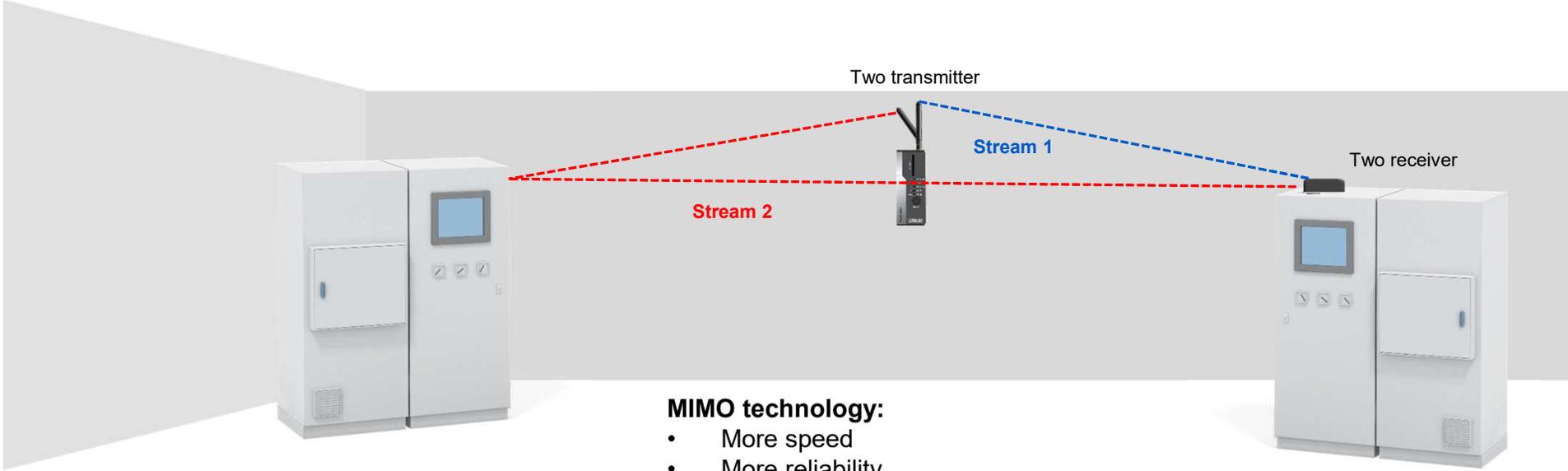
## PoE Prioritization



# Wireless data transfer from remote stations



# Establishing reliable WLAN connections

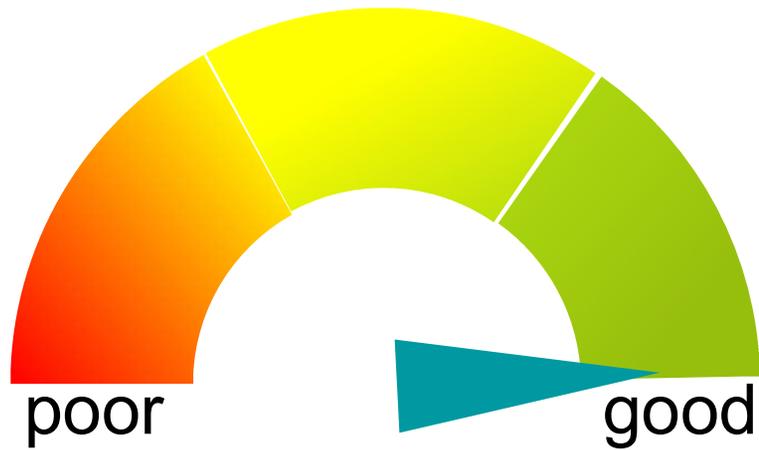


- MIMO technology:**
- More speed
  - More reliability
  - More distance
  - Better coverage



# 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

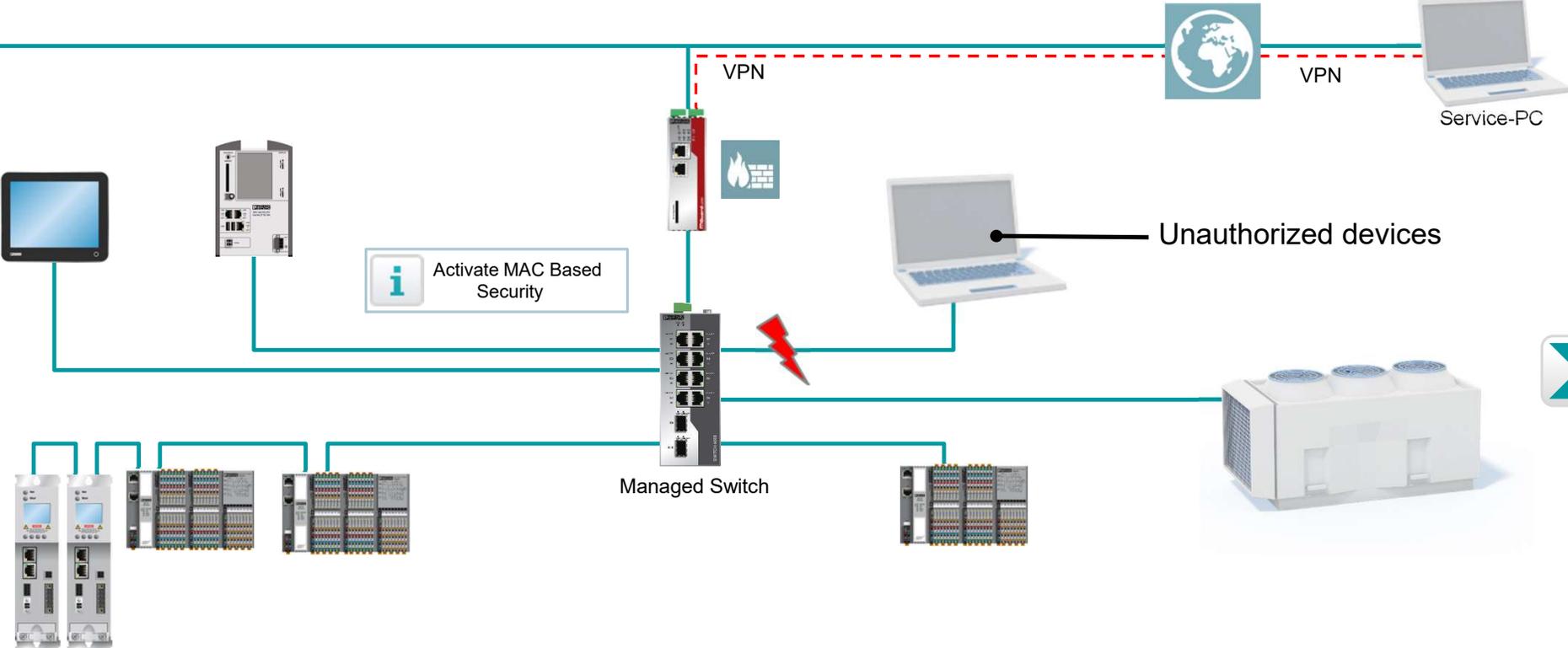
 Unauthorized devices

 Network loop

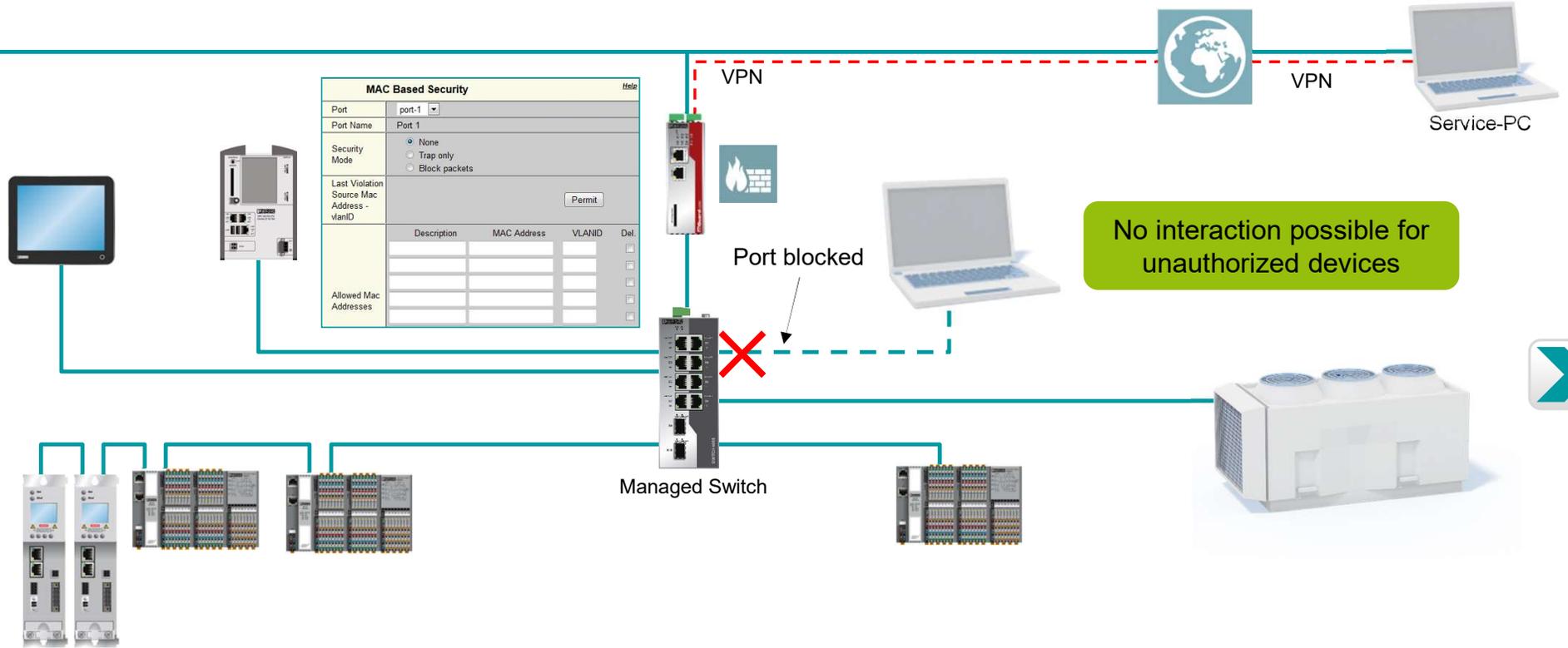
 Cable and connector problems



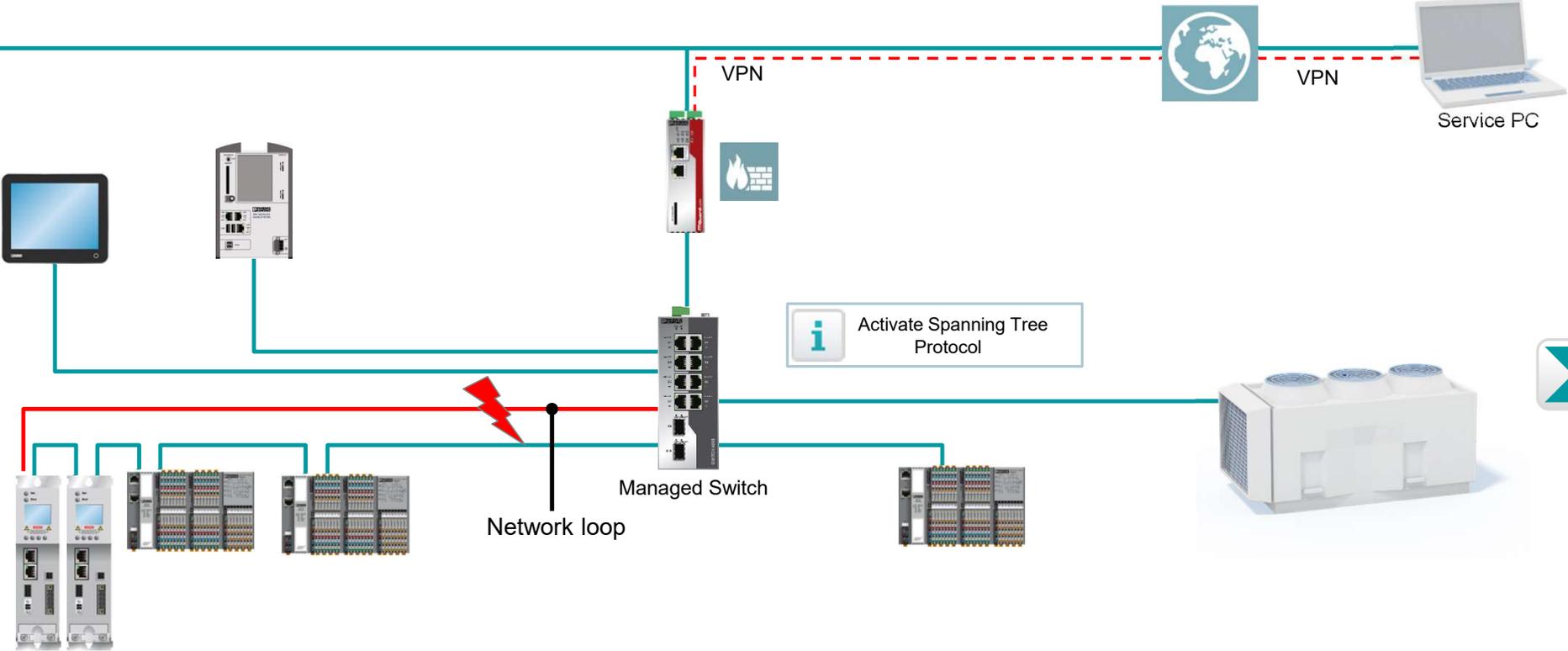
# Unauthorized devices



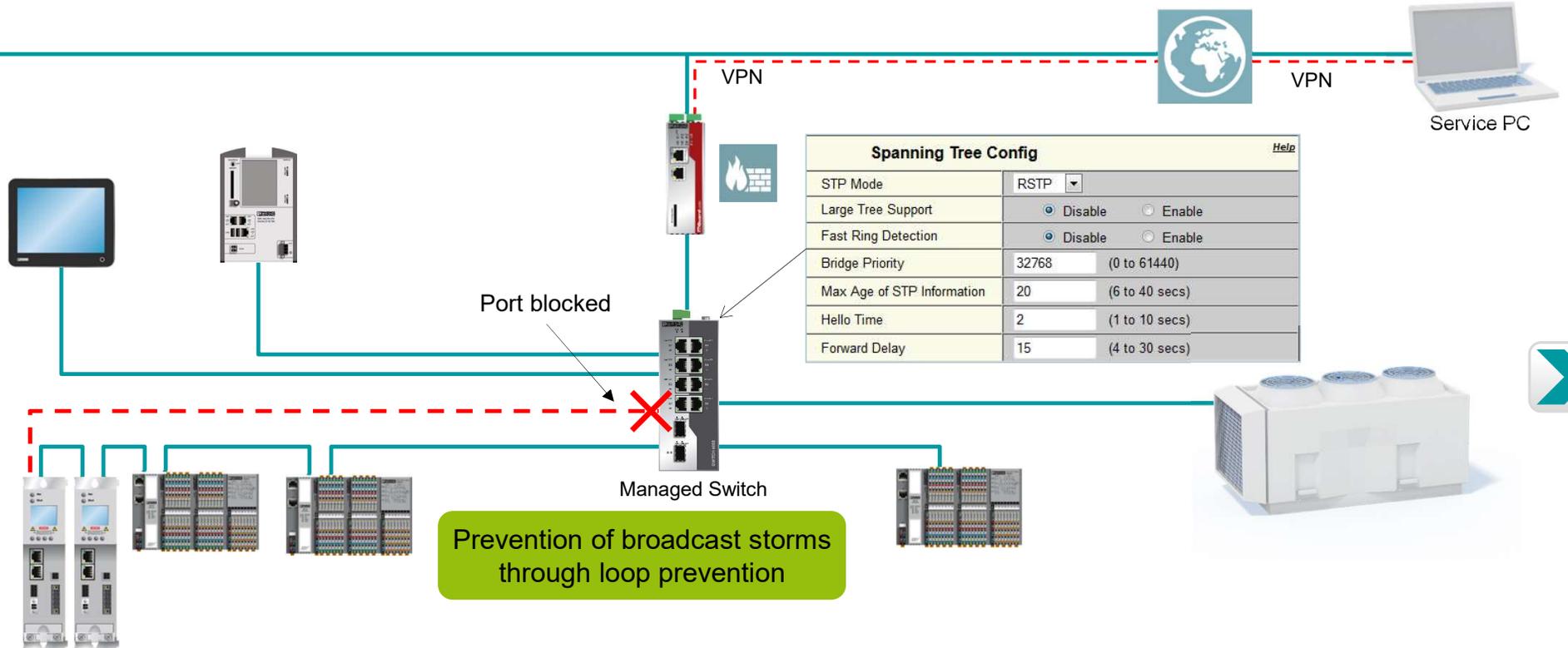
# Our Solution: MAC Based Security



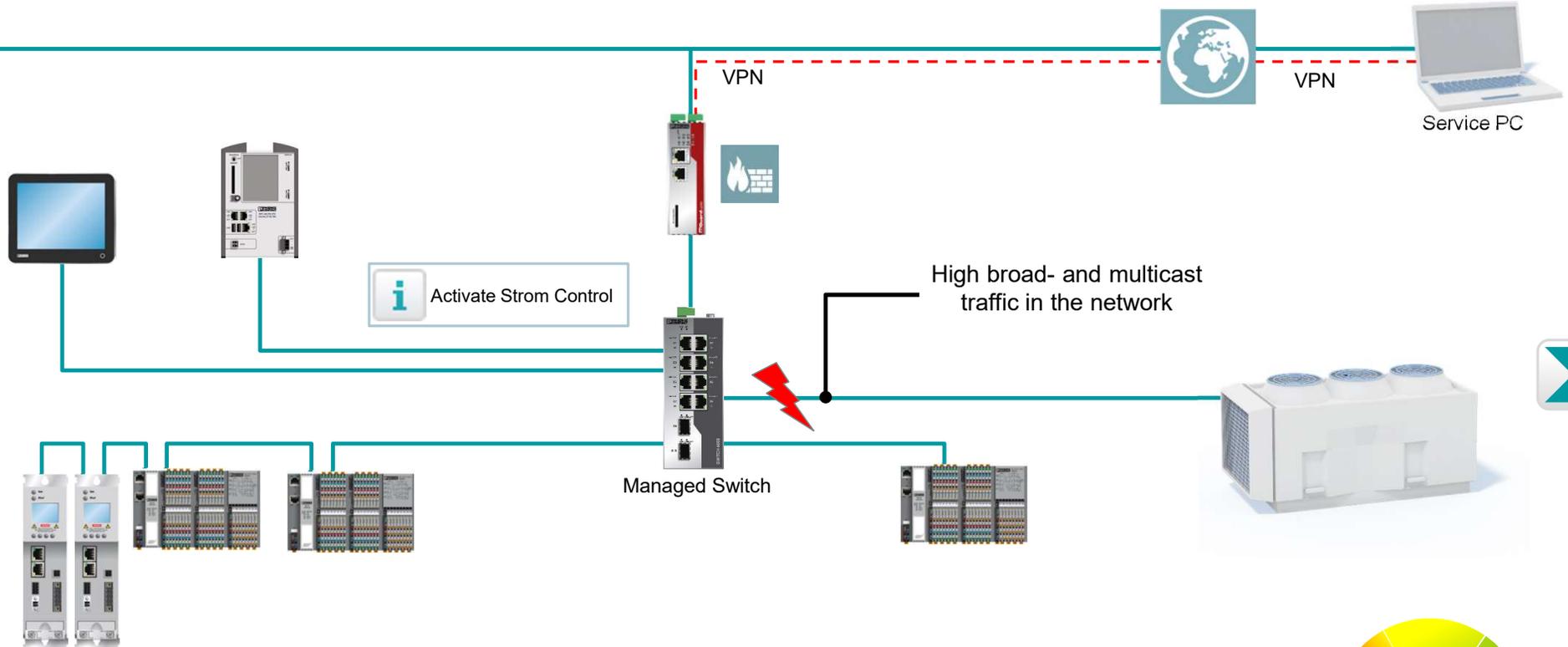
# Network Loops



# Our Solution: Spanning Tree Protocol



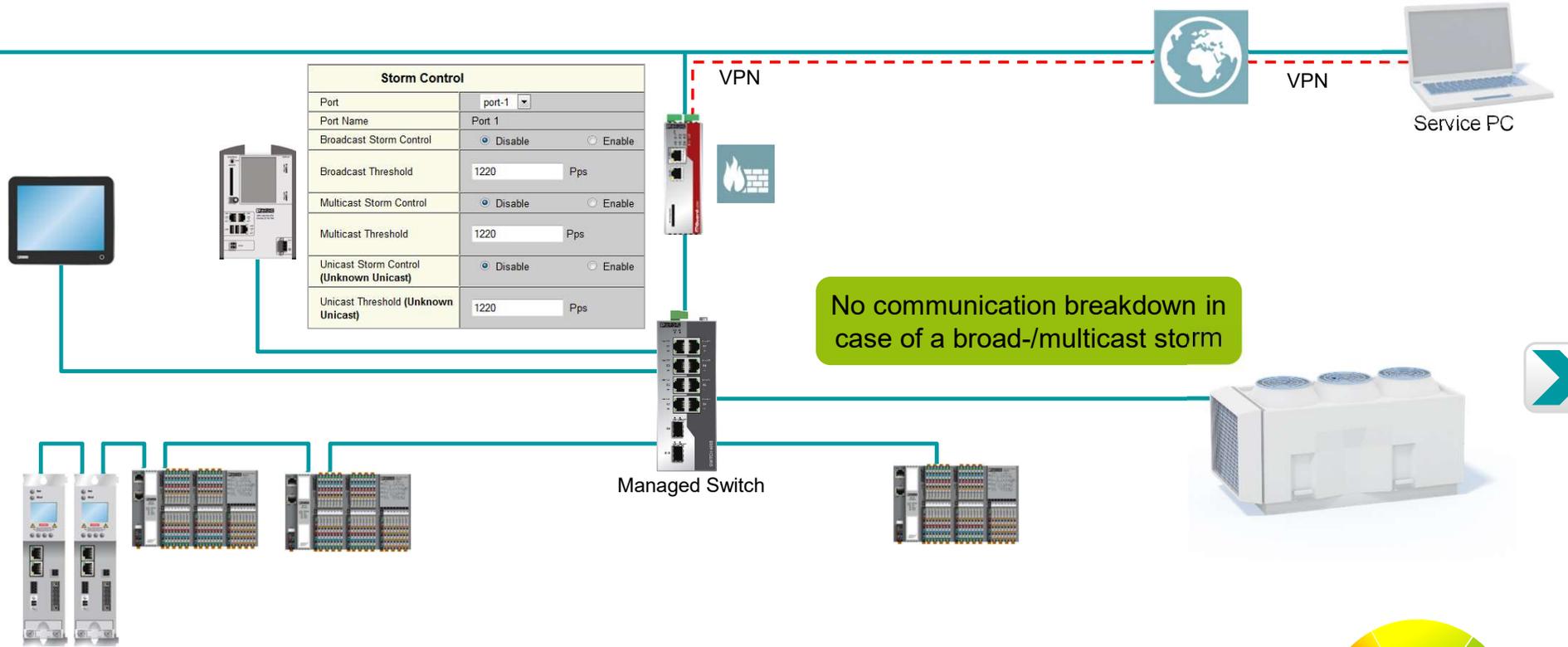
# High broad- and multicast traffic



Realtime and availability



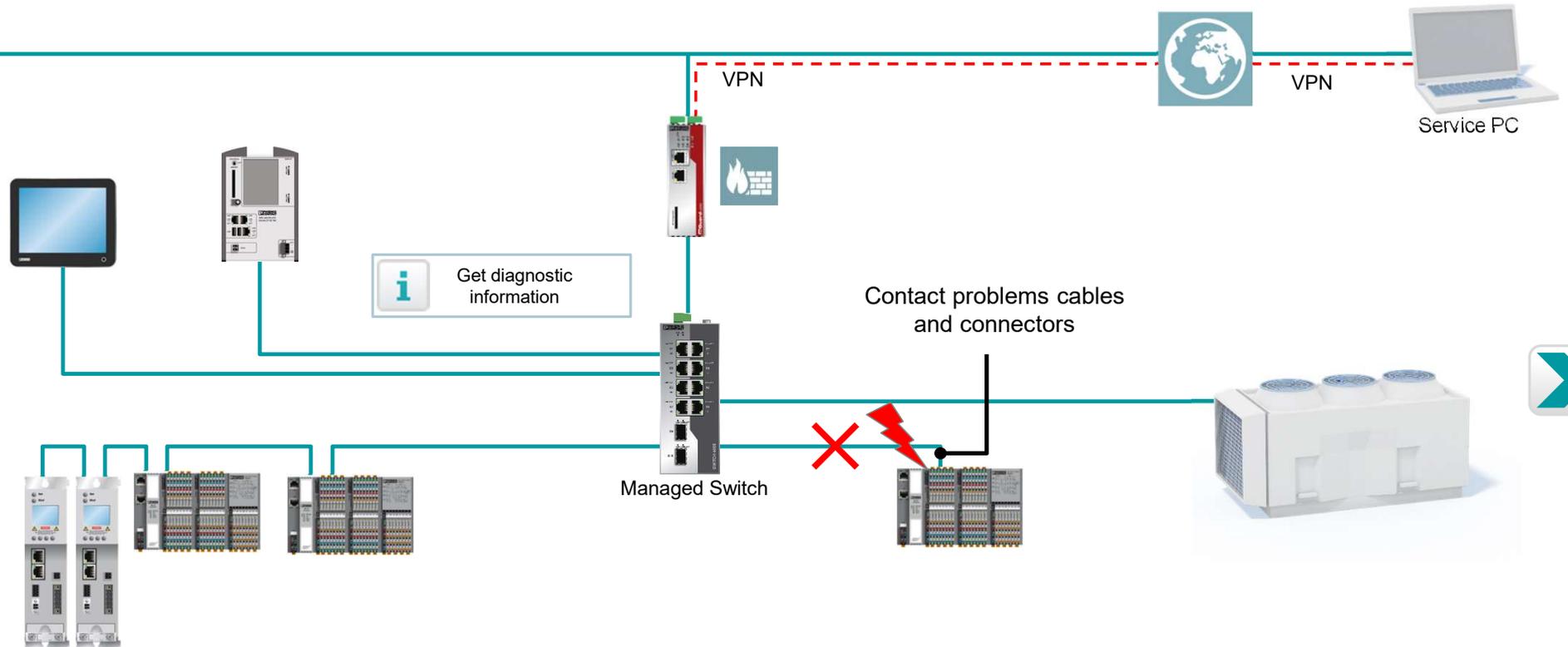
# Our solution: Storm control



Realtime and availability



# Contact problems of cables and connectors



# Our solution: Diagnostic information

Event Table	
System Up Time	22 min 50 sec
Time	Event
20 min 35 sec	LLDP recognized new neighbor at port 5
20 min 35 sec	Link up on Port: 5
20 min 19 sec	Link up on Port: 7
20 min 16 sec	LLDP recognized new neighbor at port 3
20 min 16 sec	Link up on Port: 3
20 min 13 sec	Link down on Port: 3
17 min 55 sec	Configuration has been saved.
17 min 30 sec	The configuration has been modified the first time after the last storing.
59 sec	Link up on Port: 3
55 sec	Link down on Port: 3
29 sec	Configuration has been saved.
25 sec	The configuration has been modified the first time after the last storing.
3 sec	Link up on Port: 3
3 sec	Configuration has been saved.
3 sec	Boot.
0 sec	RSTP disabled.
0 sec	Power Supply US2 lost

Port Statistics	
Port Number	3
Packets	4103
up to 64 Octets	2969
65 to 127 Octets	631
128 to 255 Octets	71
256 to 511 Octets	425
512 to 1023 Octets	1
1024 to 1518 Octets	6
Broadcast	307
Multicast	50
Octets	448306
Fragments	0
Undersized Packets	0
Oversized Packets	0
CRC Alignment Errors	1
Drop Events	0
Jabbers	0
Collisions	0
Clear counters	
You can set the statistic counters of all switch ports to zero.	
Enter password	*****
<input type="button" value="Clear"/>	
Port Configuration of port 3: General   RSTP	
<small>Note: This web page will be refreshed in 23 sec automatically (change the interval at the web page 'General Configuration / User Interfaces')</small>	

VPN



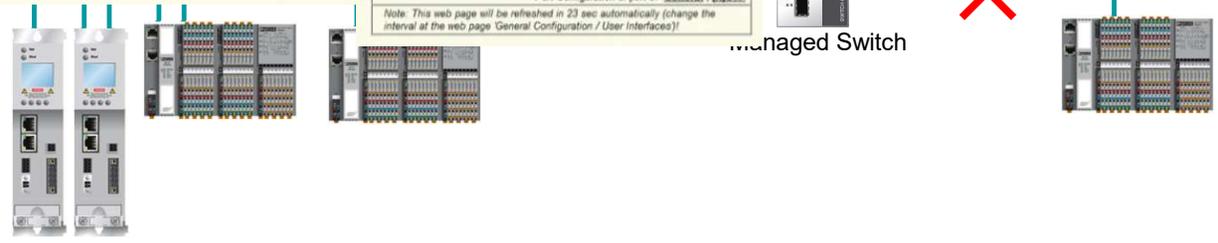
VPN

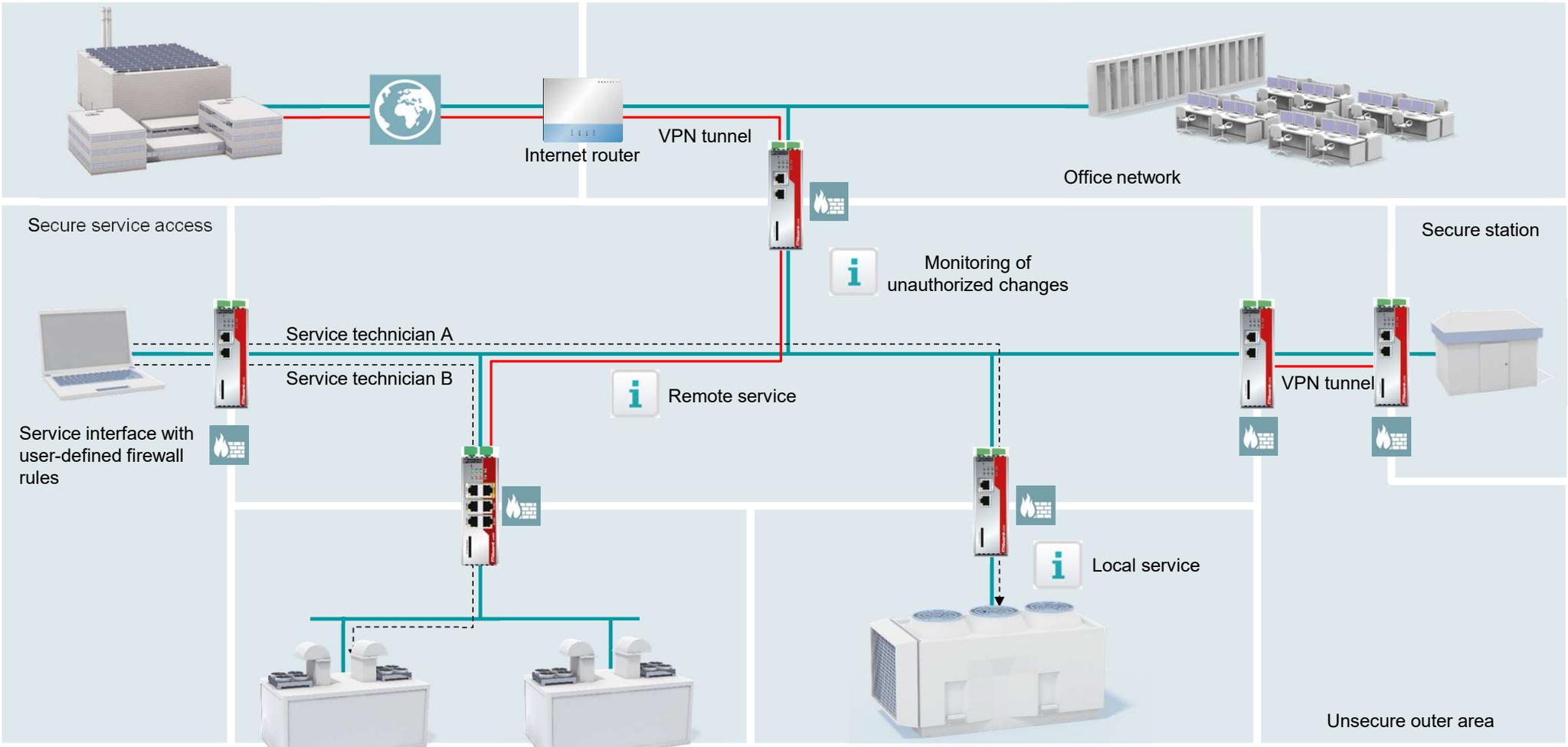


Service PC

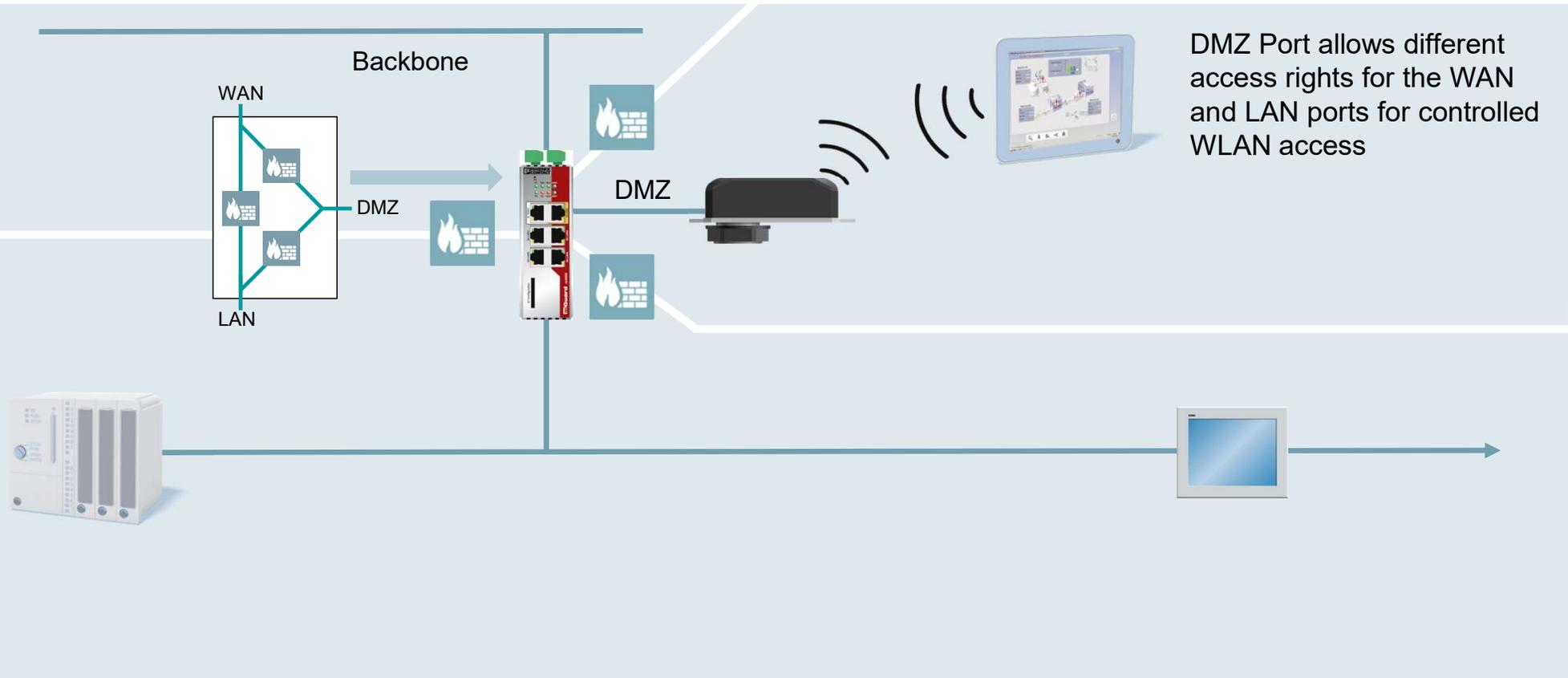
Receive diagnostic information in case of problems with cables and connectors

Managed Switch





# Secure WLAN machine network





Ethernet



## CIFS Integrity Monitoring

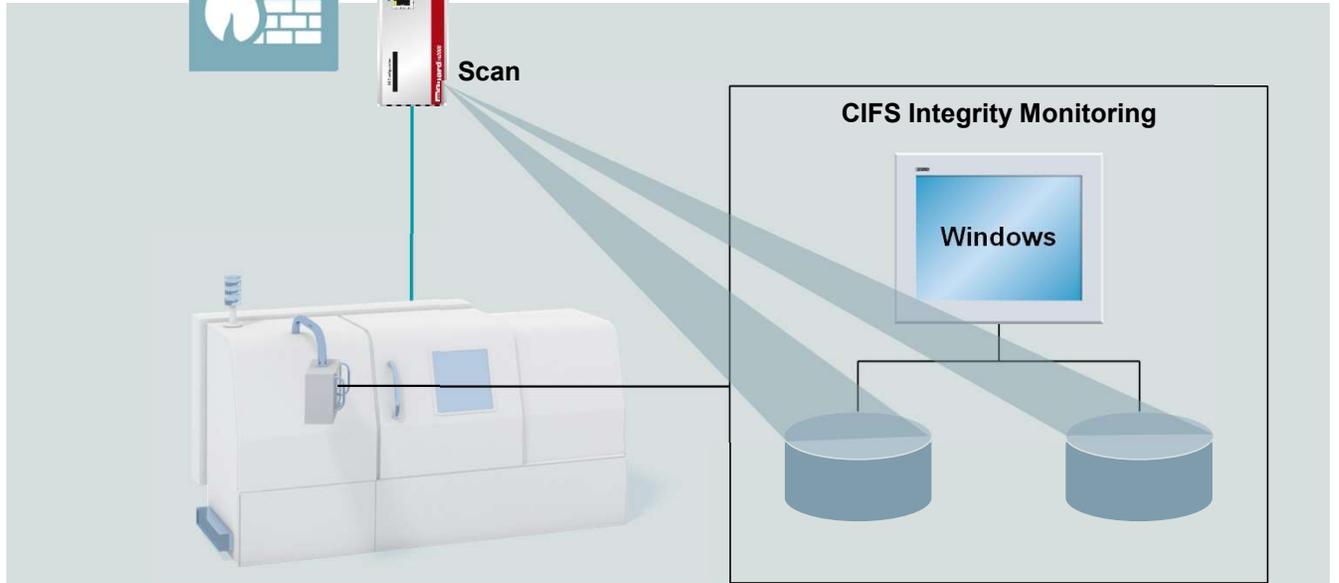
constantly monitors your file systems for unauthorized changes and alerts you if a change is detected



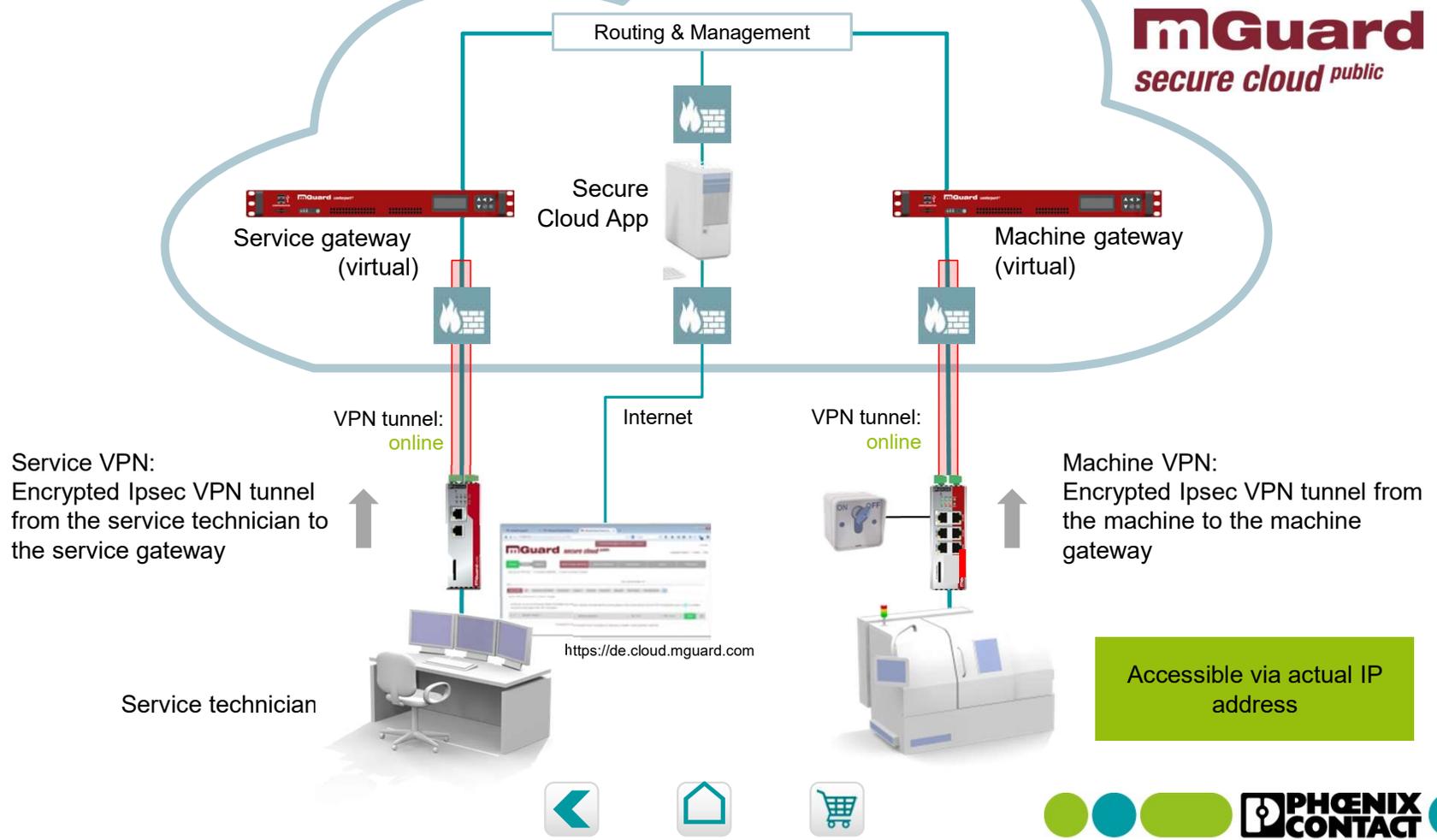
Firewall  
CIFS Integrity Monitoring



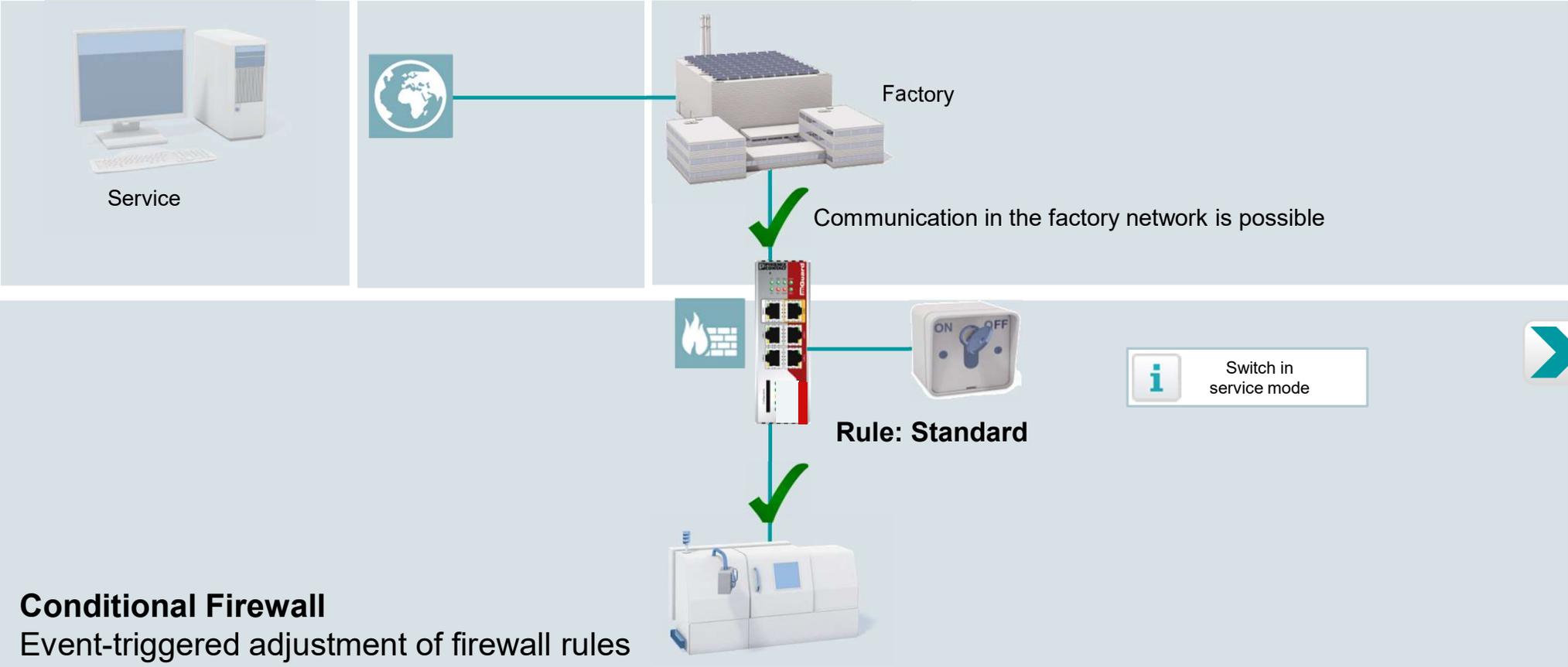
Scan



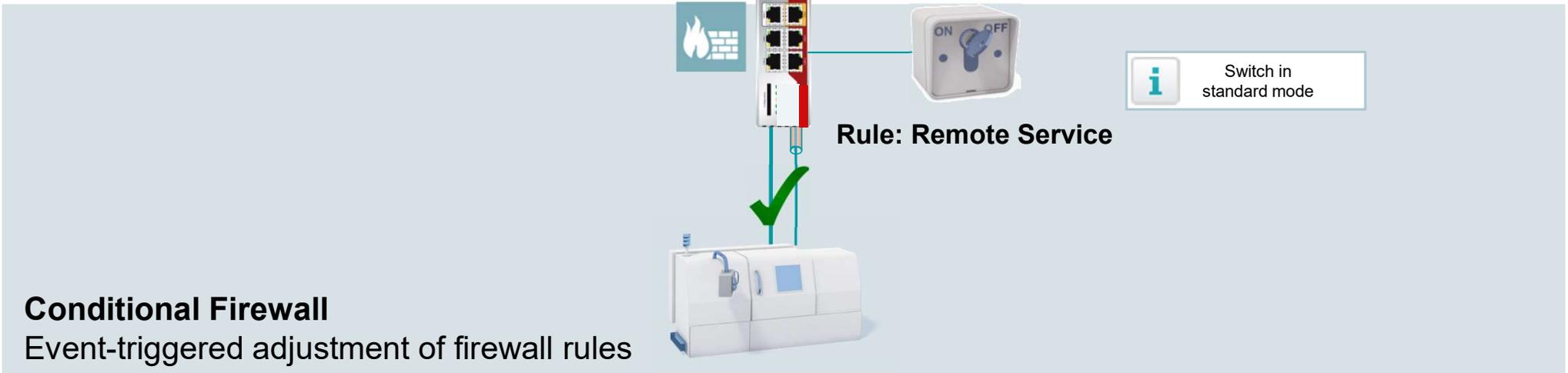
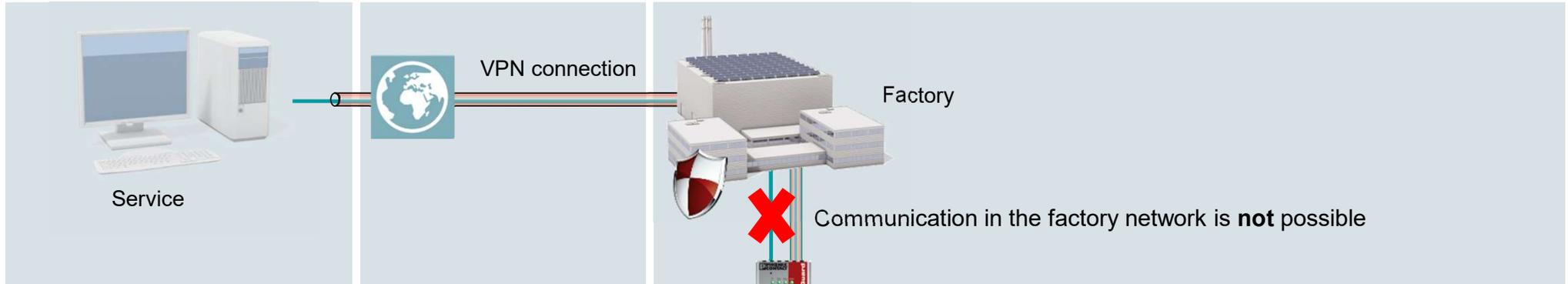
# Remote Service



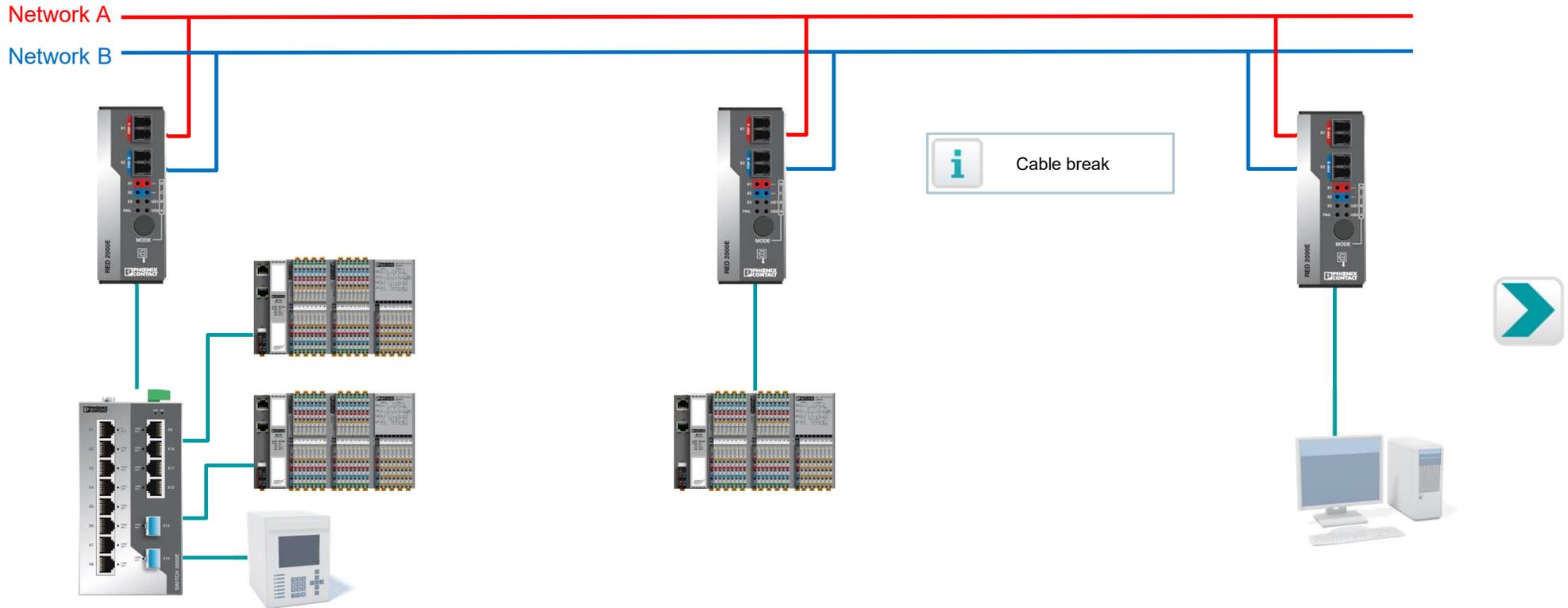
# Prevention of unauthorized access



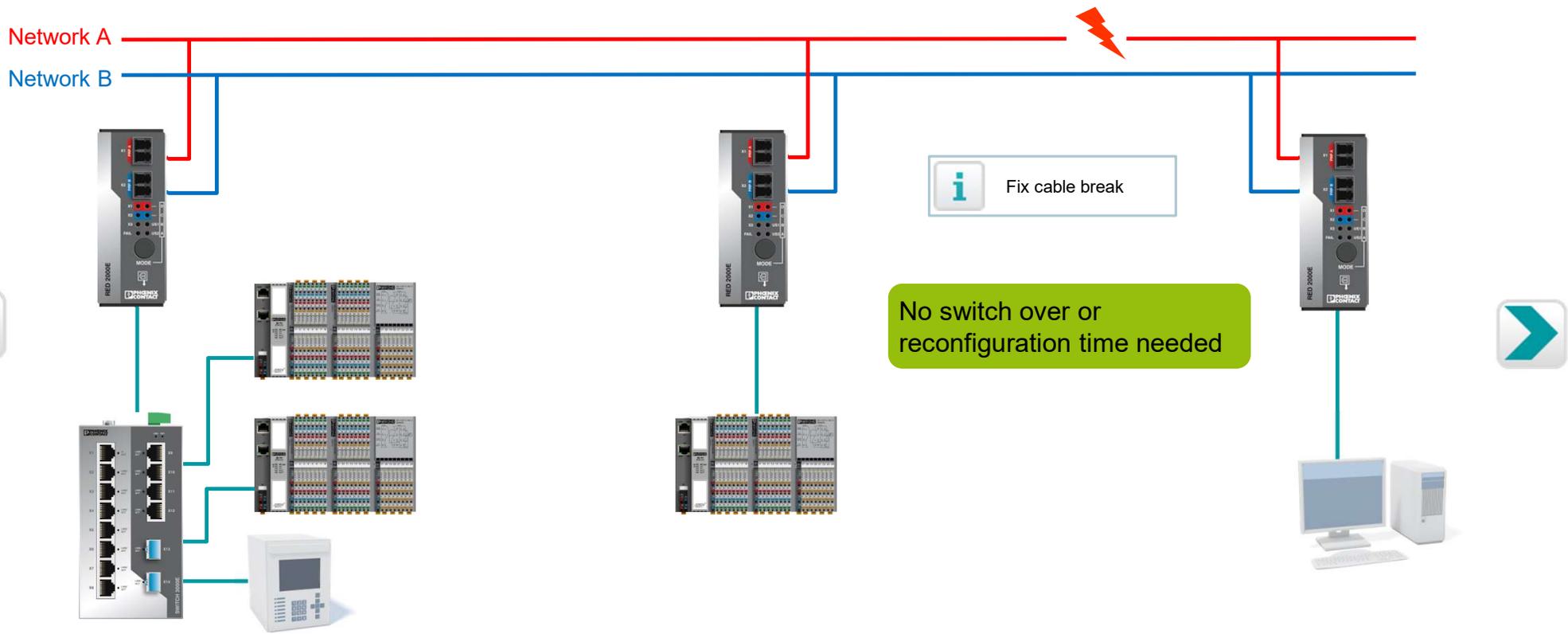
# Prevention of unauthorized access



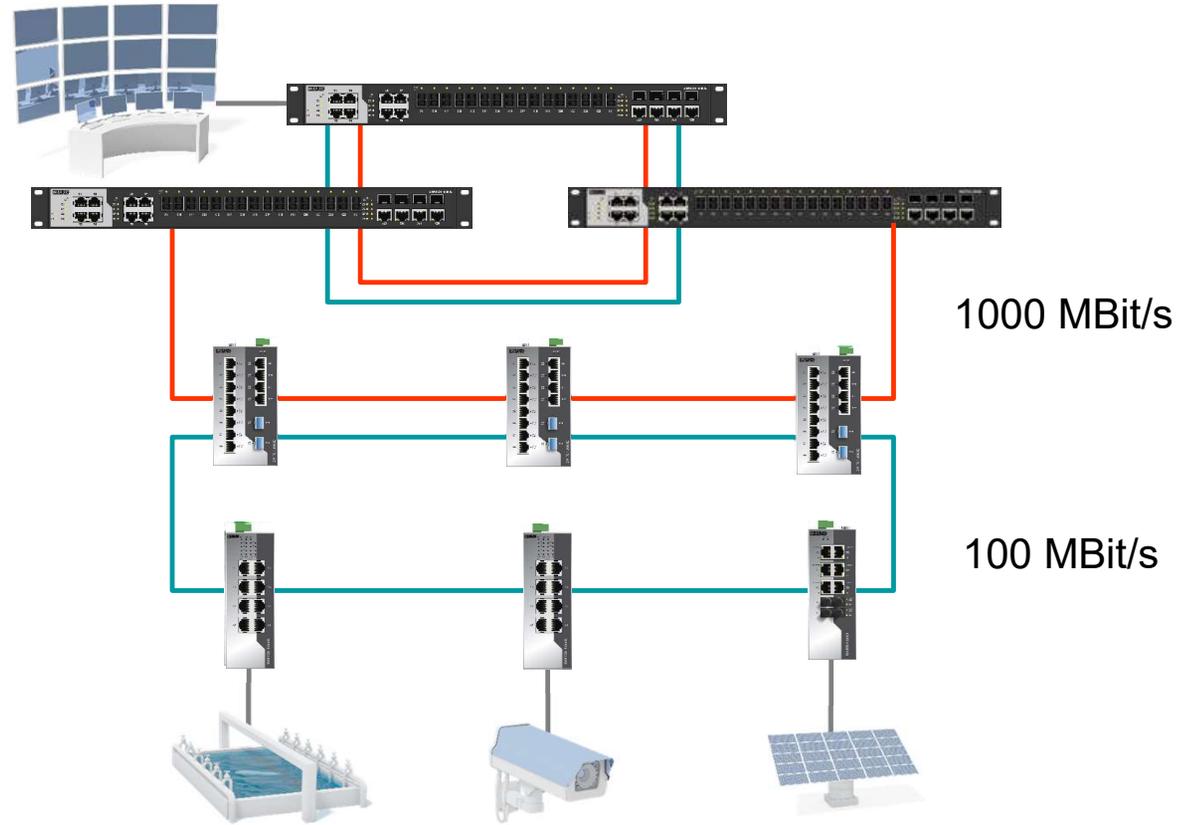
# Availability through Parallel Redundancy Protocol



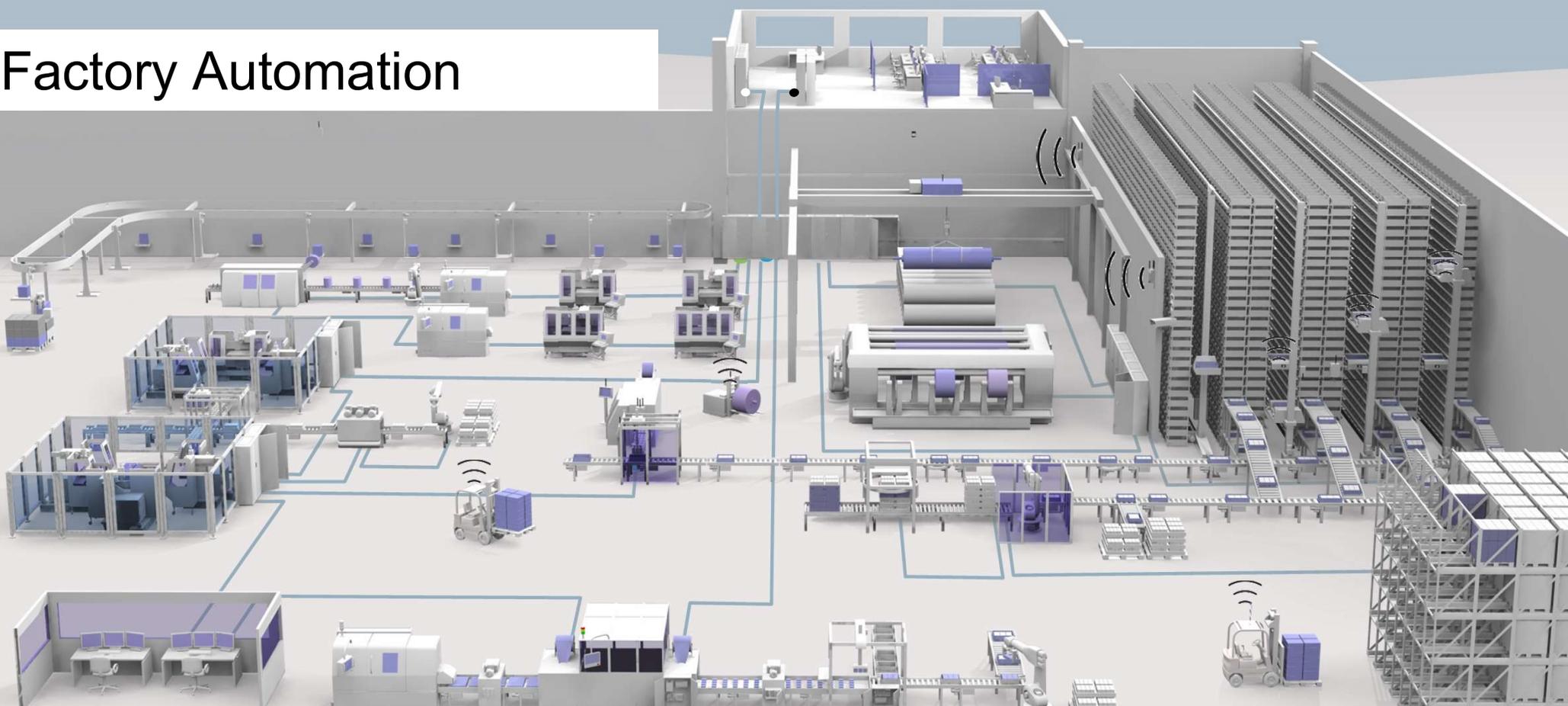
# Availability through Parallel Redundancy Protocol



# Availability through Extended Ring Redundancy



# Factory Automation



**i** Network availability

**i** Network security

**i** Production line

**i** Machine network

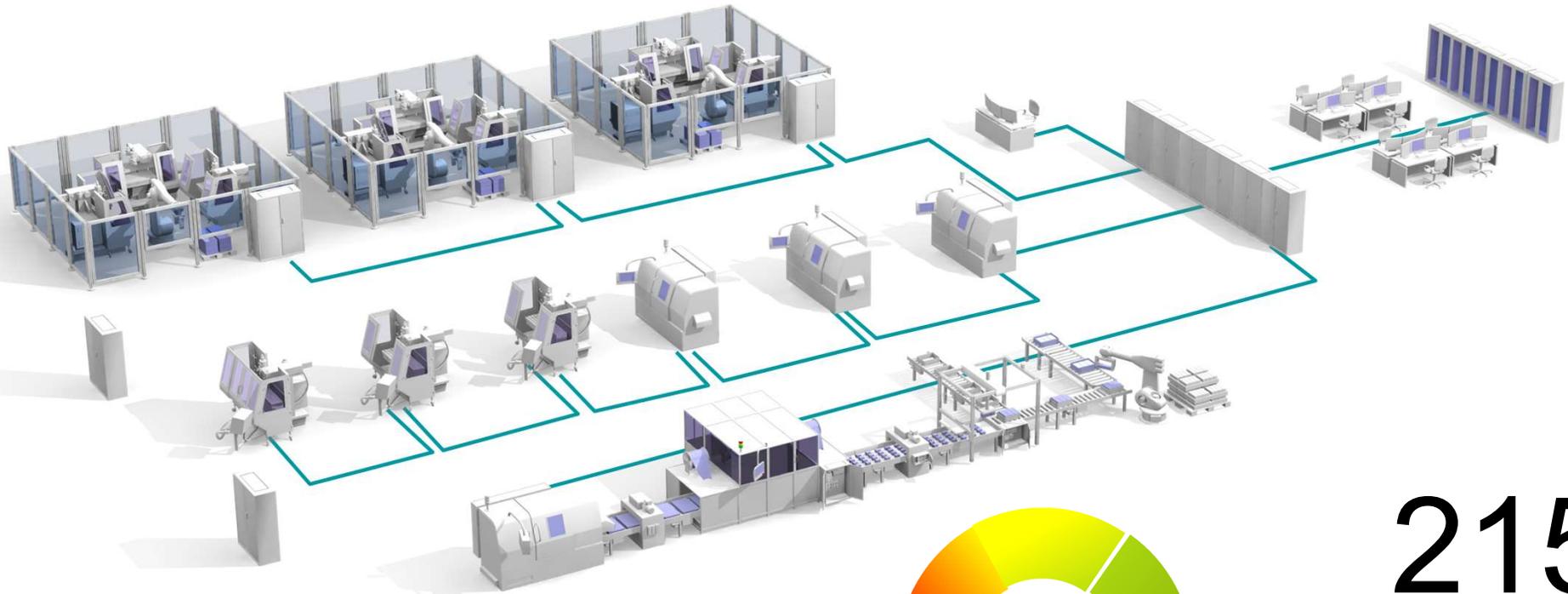
**i** Wireless for Material Handling

**i** Solution overview



# Typical problems in unmanaged networks

*As the network grows, network stability declines*



215

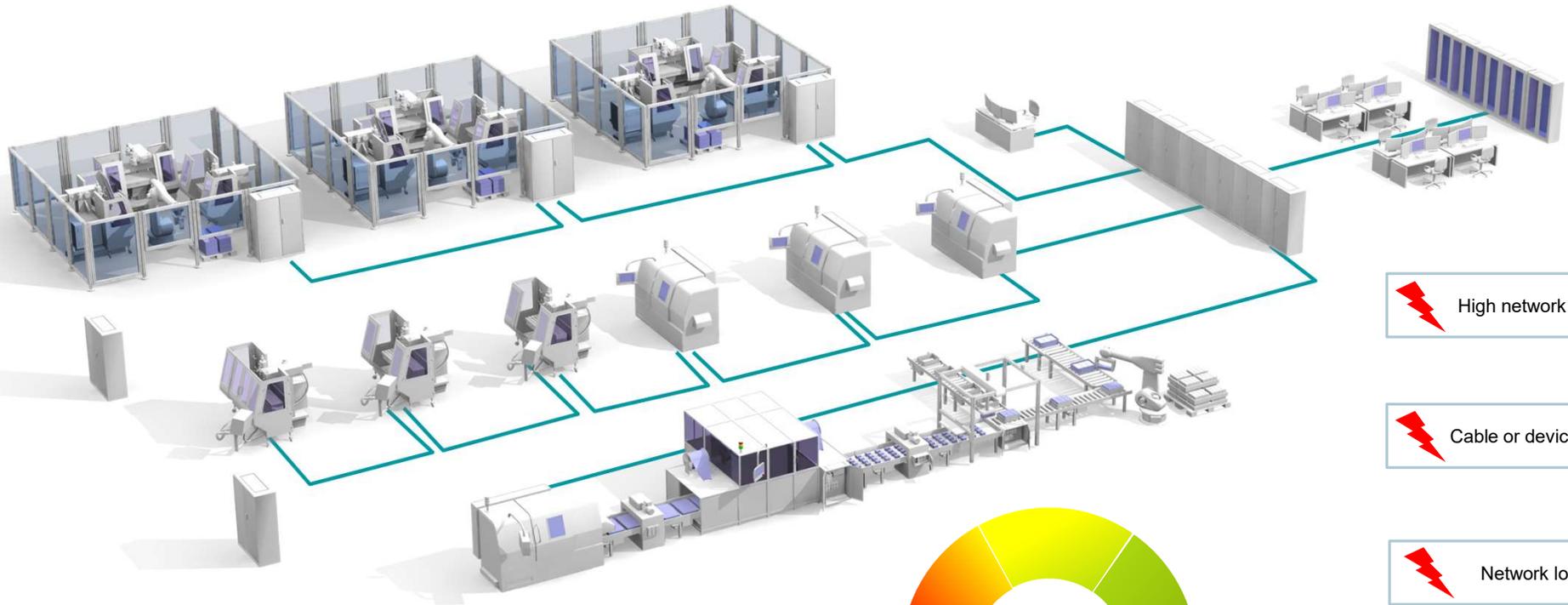
poor  good

Network devices



# Typical problems in unmanaged networks

*As the network grows, network stability declines*



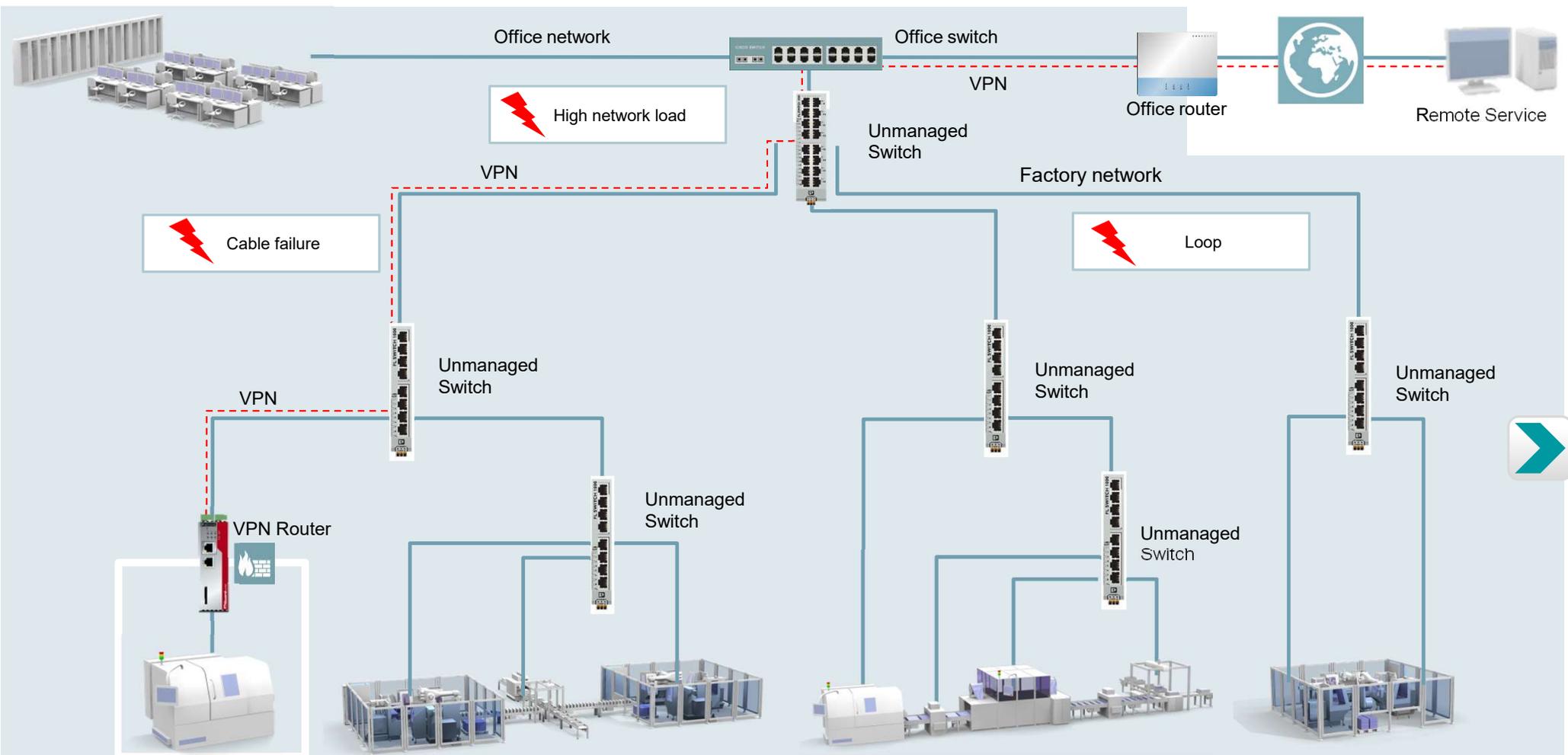
 High network load

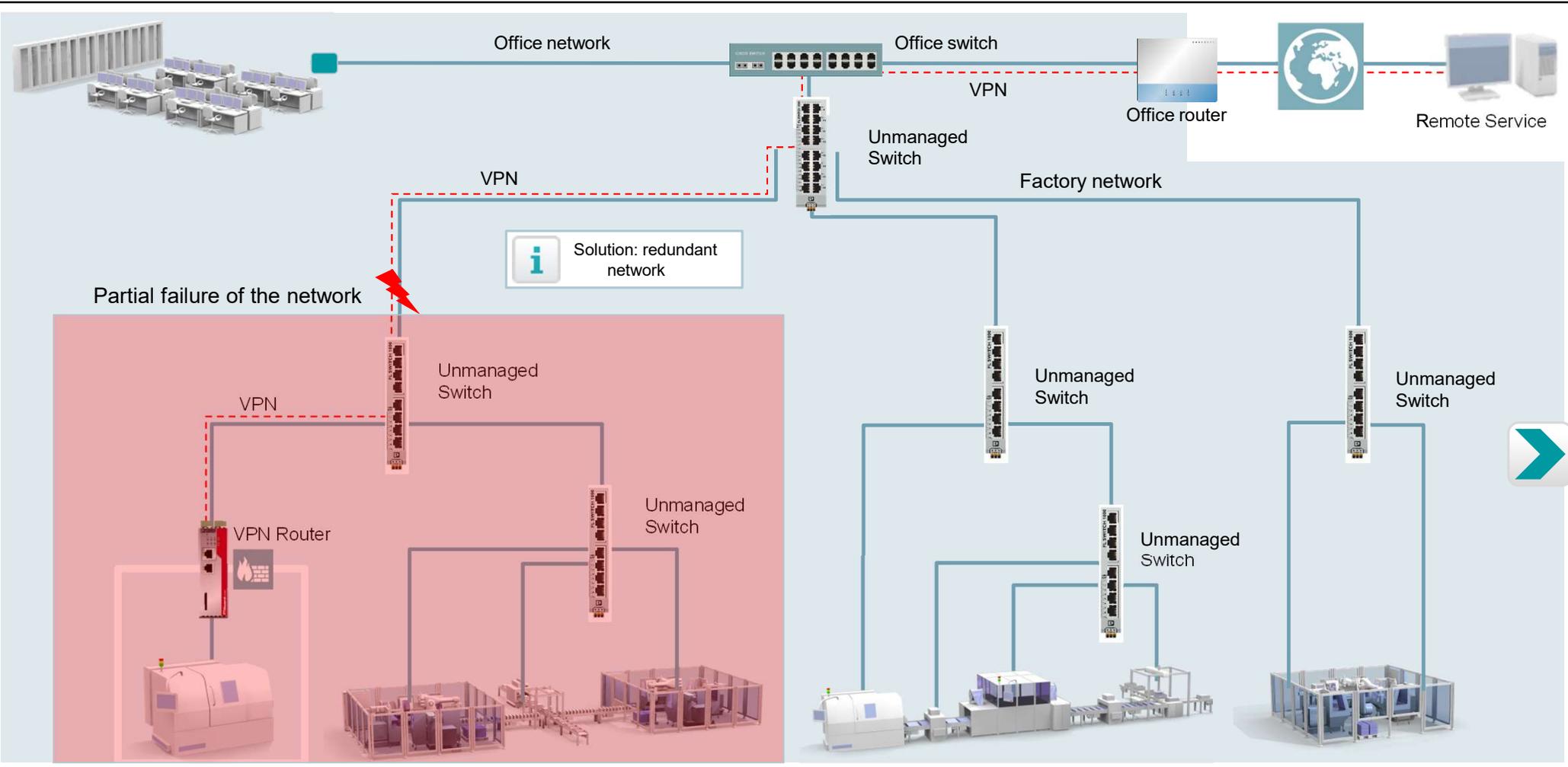
 Cable or device failure

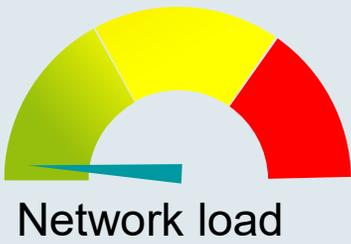
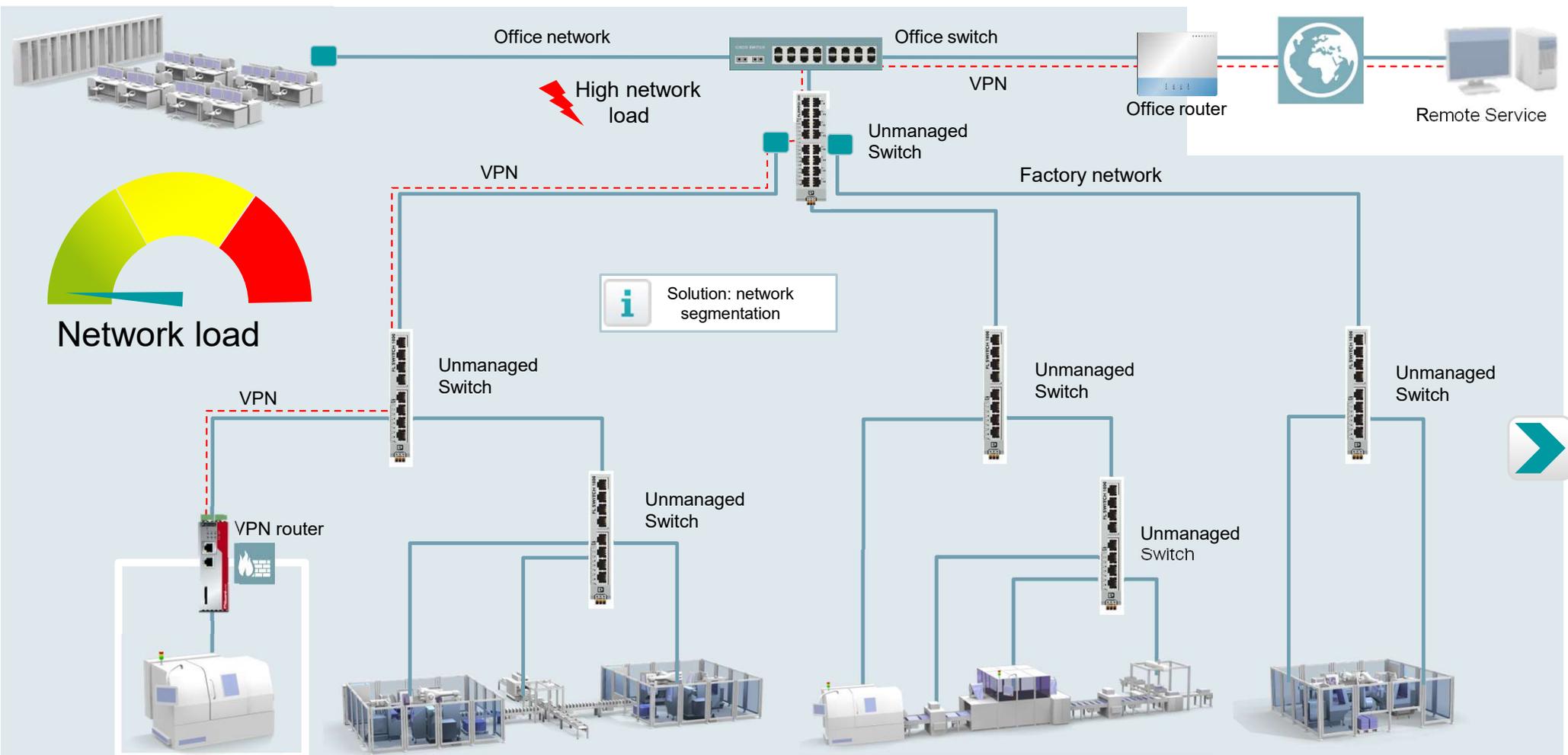
 Network loop

 2D-Topology



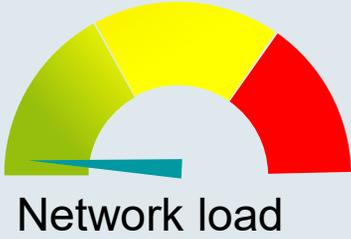
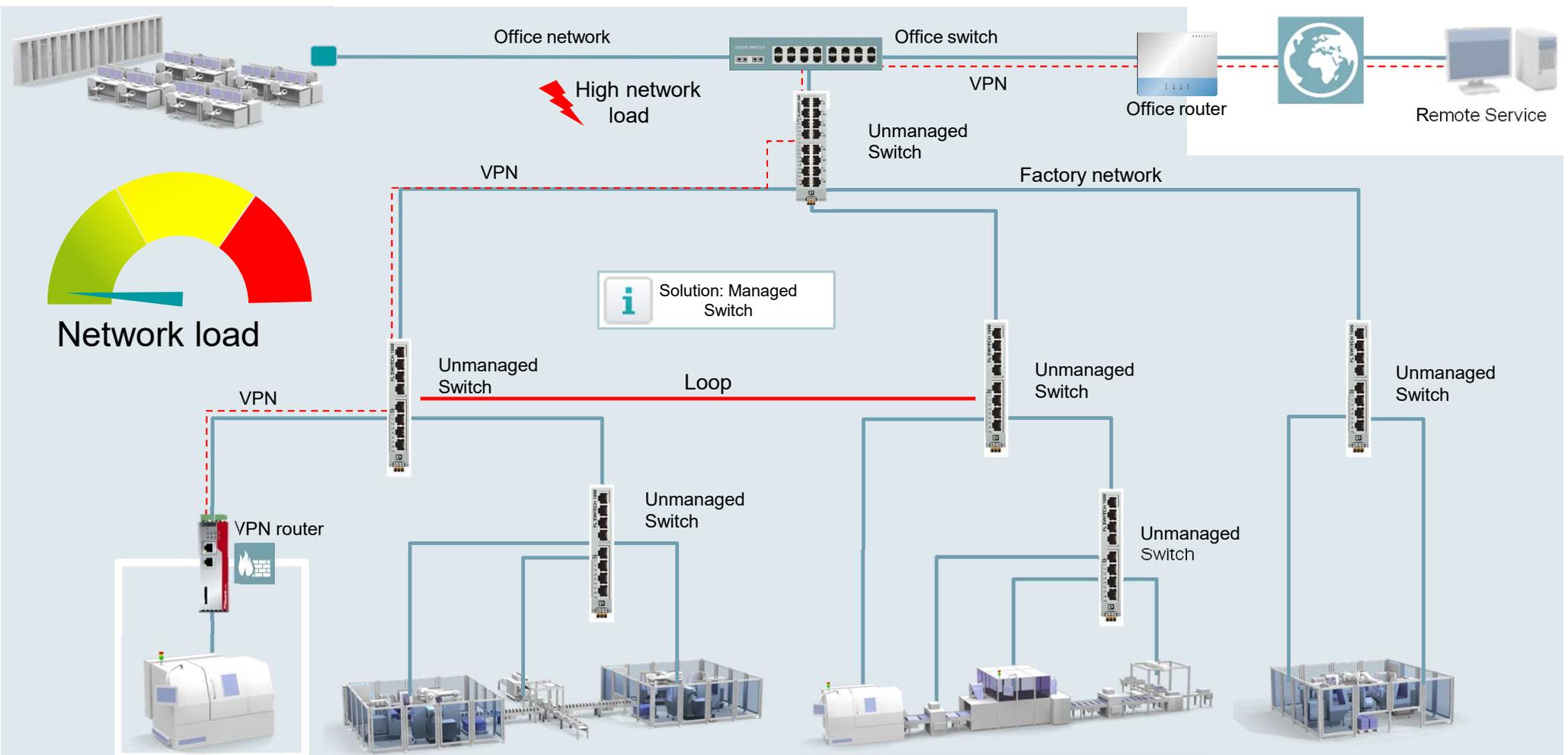






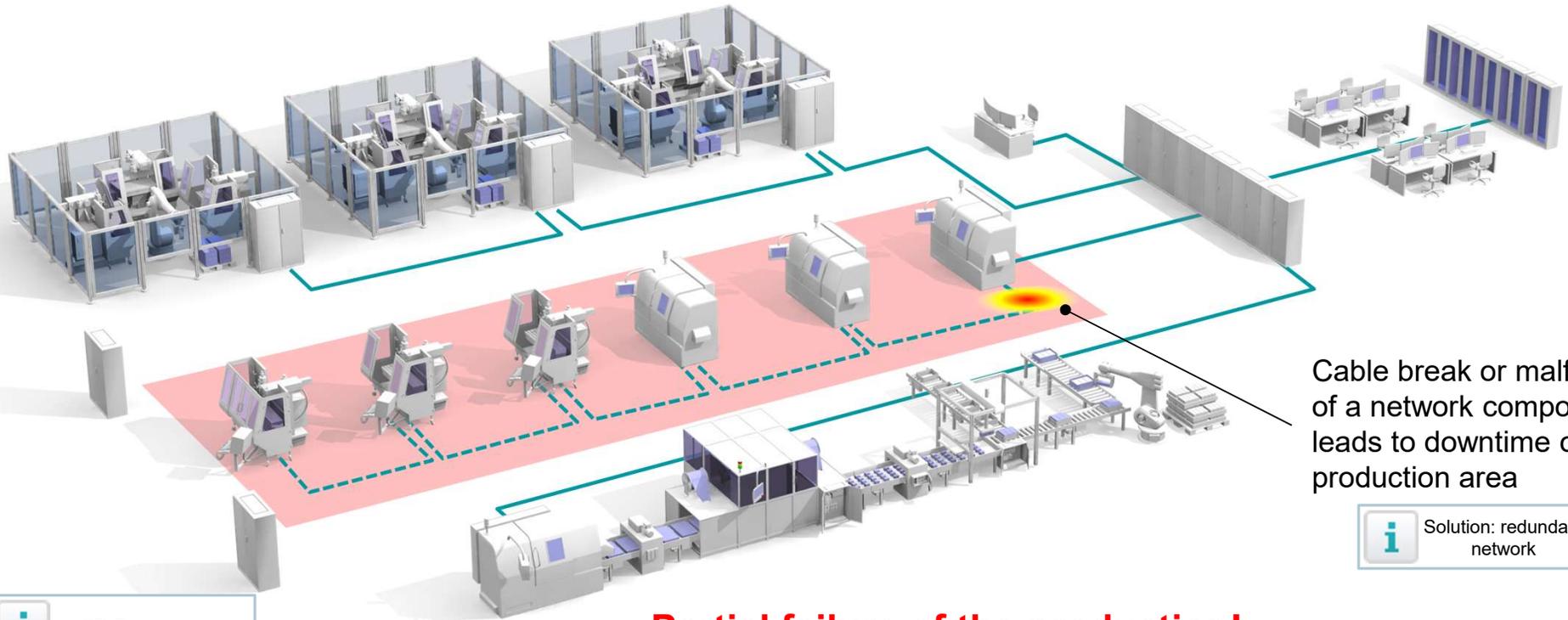
**i** Solution: network segmentation





# Typical problems in unmanaged networks

*Cable or device faults*



Cable break or malfunction of a network component leads to downtime of a production area

**i** Solution: redundant network

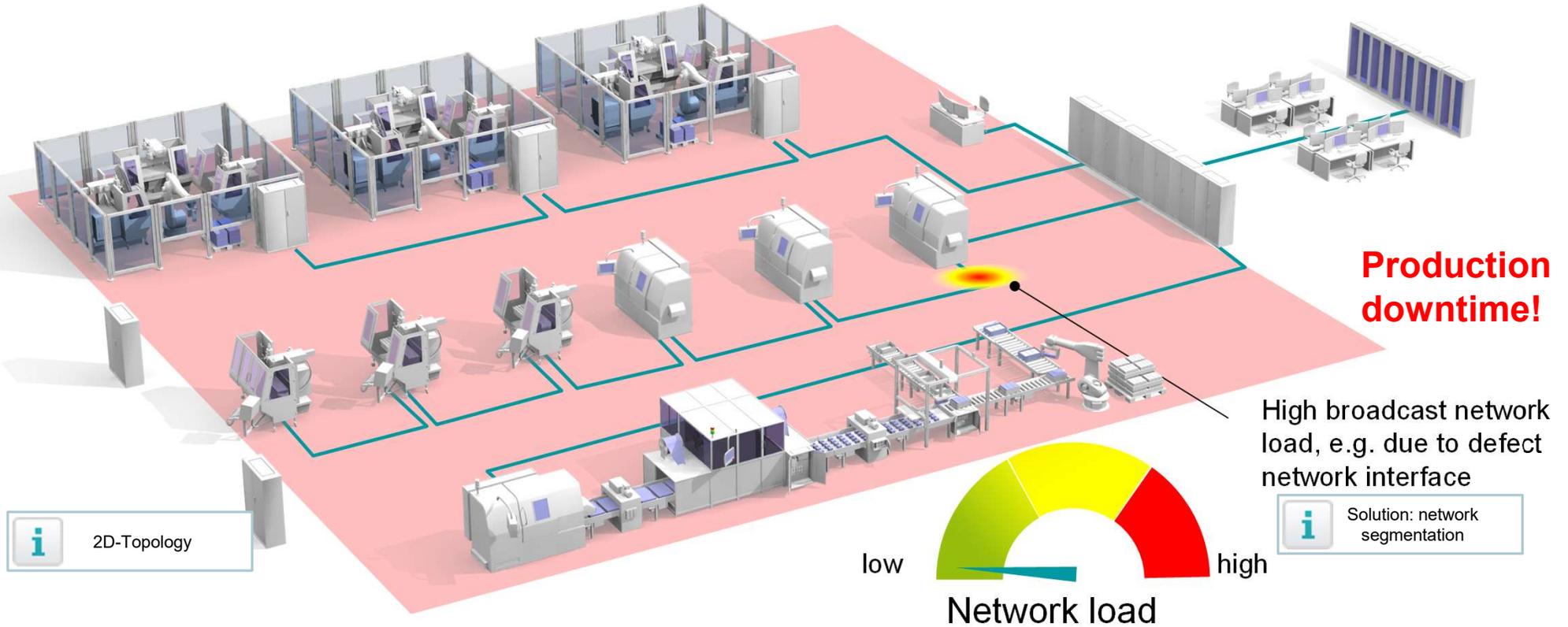
**Partial failure of the production!**

**i** 2D-Topology



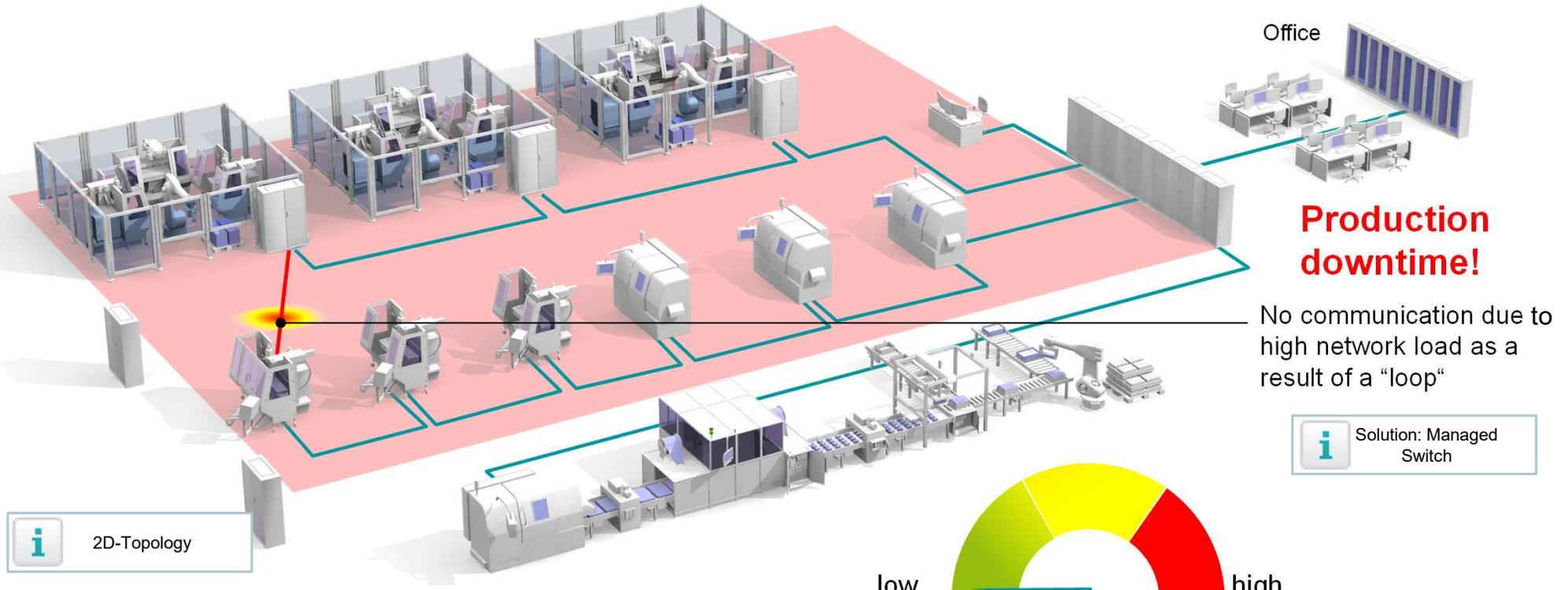
# Typical problems in unmanaged networks

*High network load*



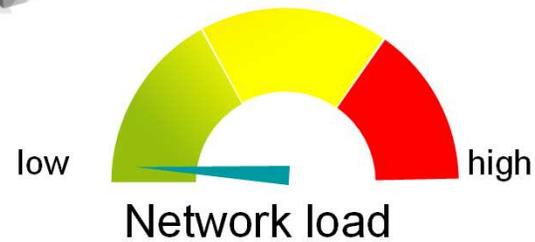
# Typical problems in unmanaged networks

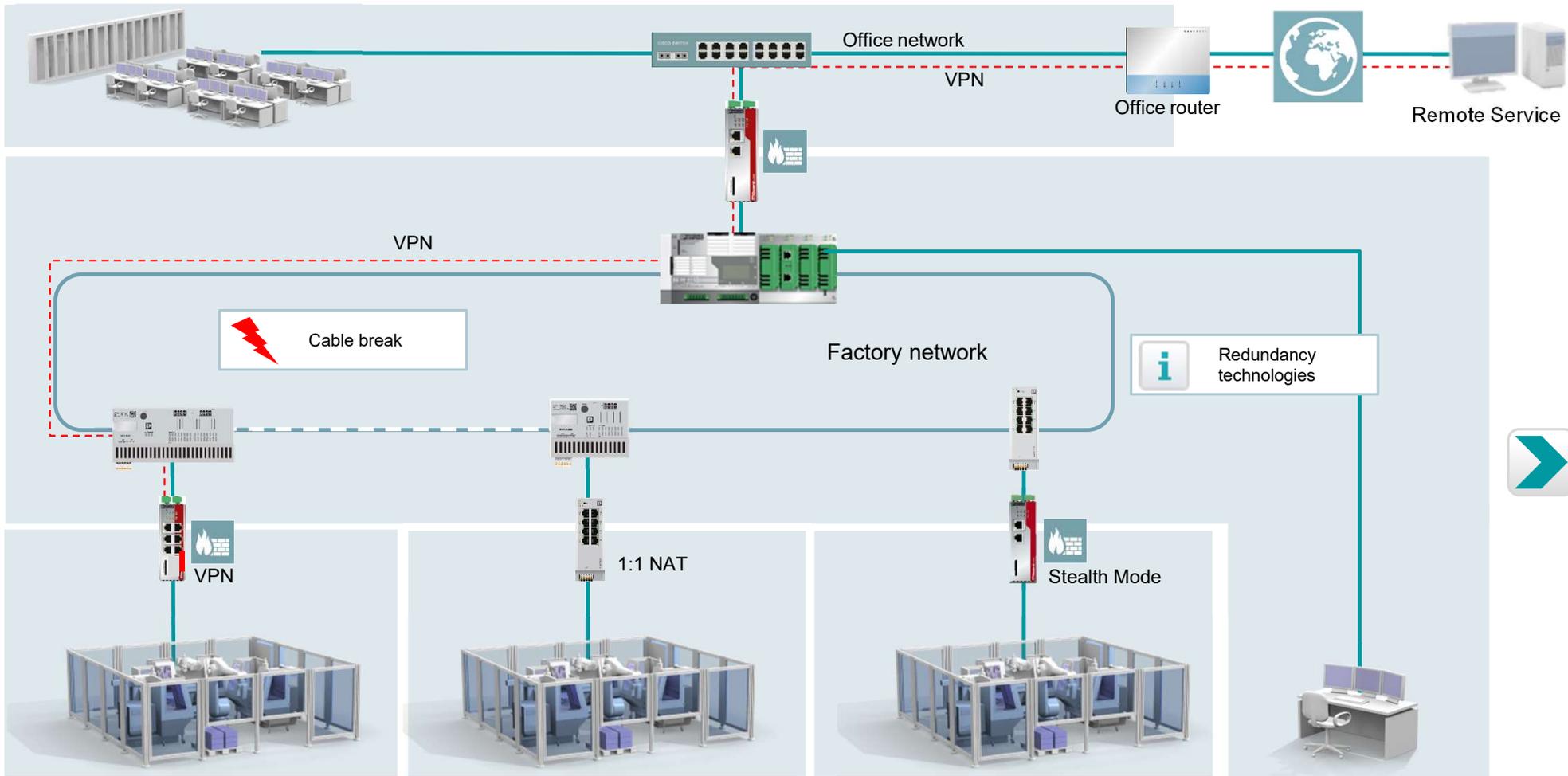
## Network loop



**i** 2D-Topology

**i** Solution: Managed Switch





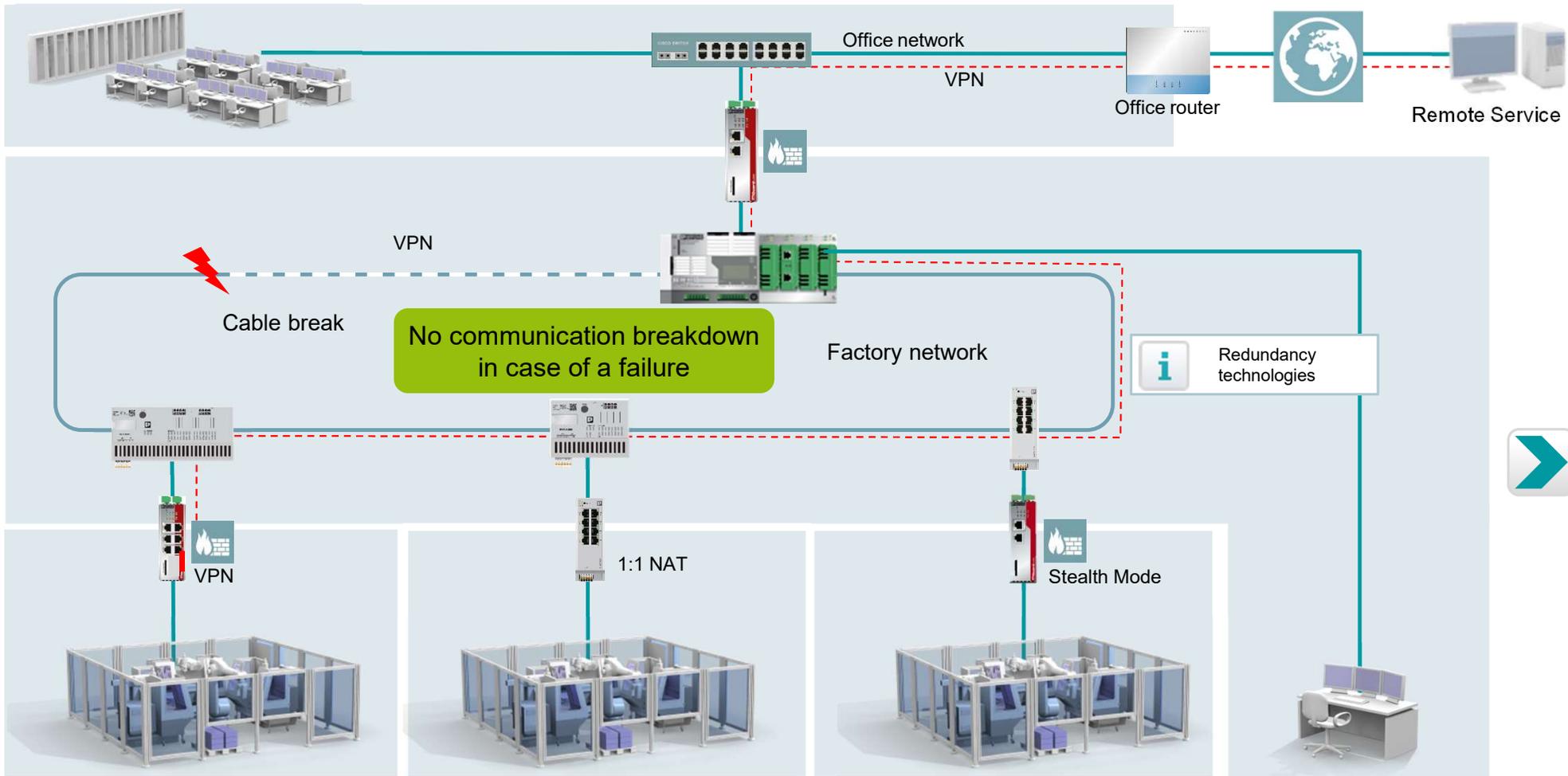
Machine network 01

Machine network 02

Machine network 03

**FL VIEW**  
Network Overview





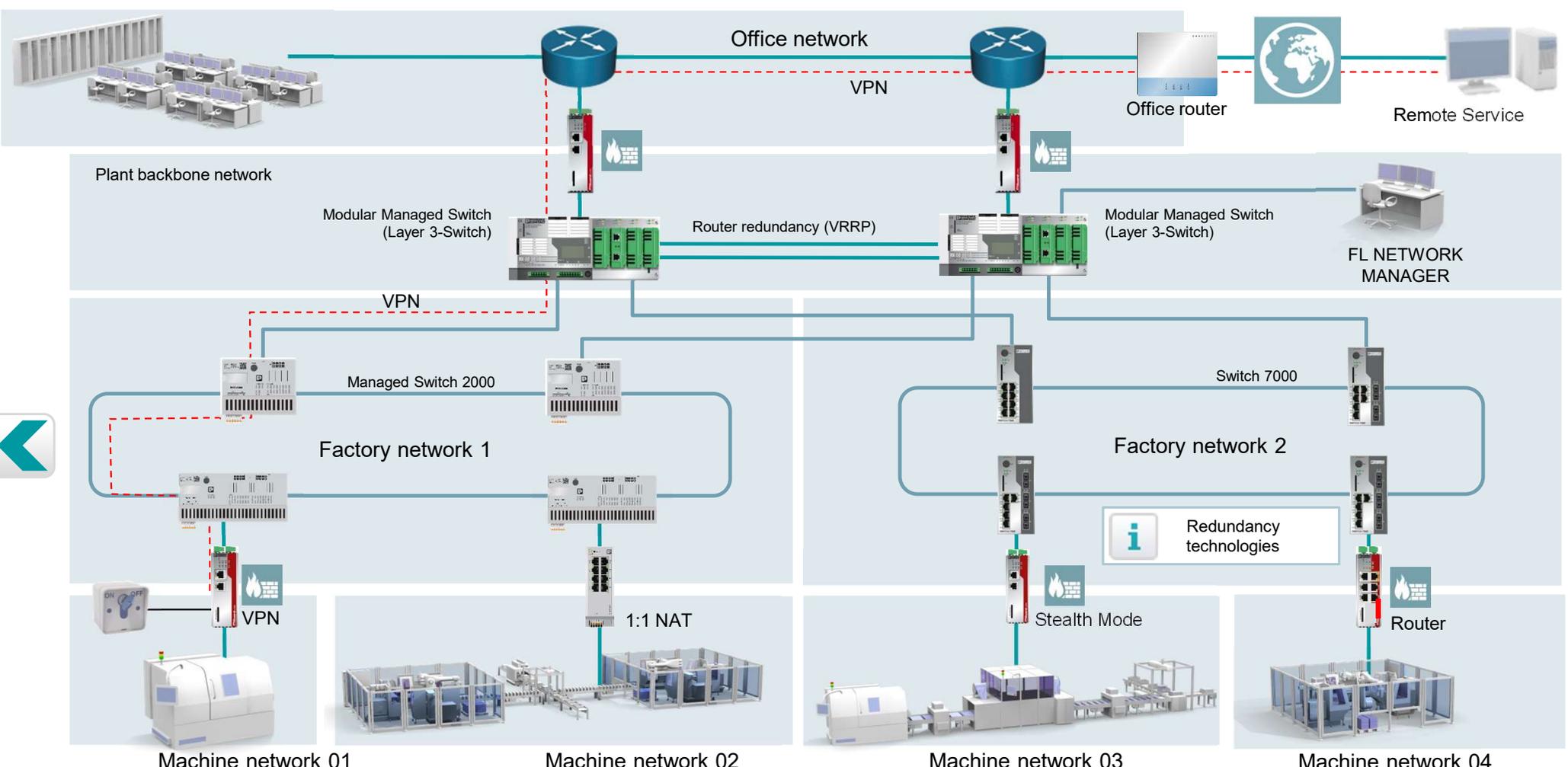
Machine network 01

Machine network 02

Machine network 03

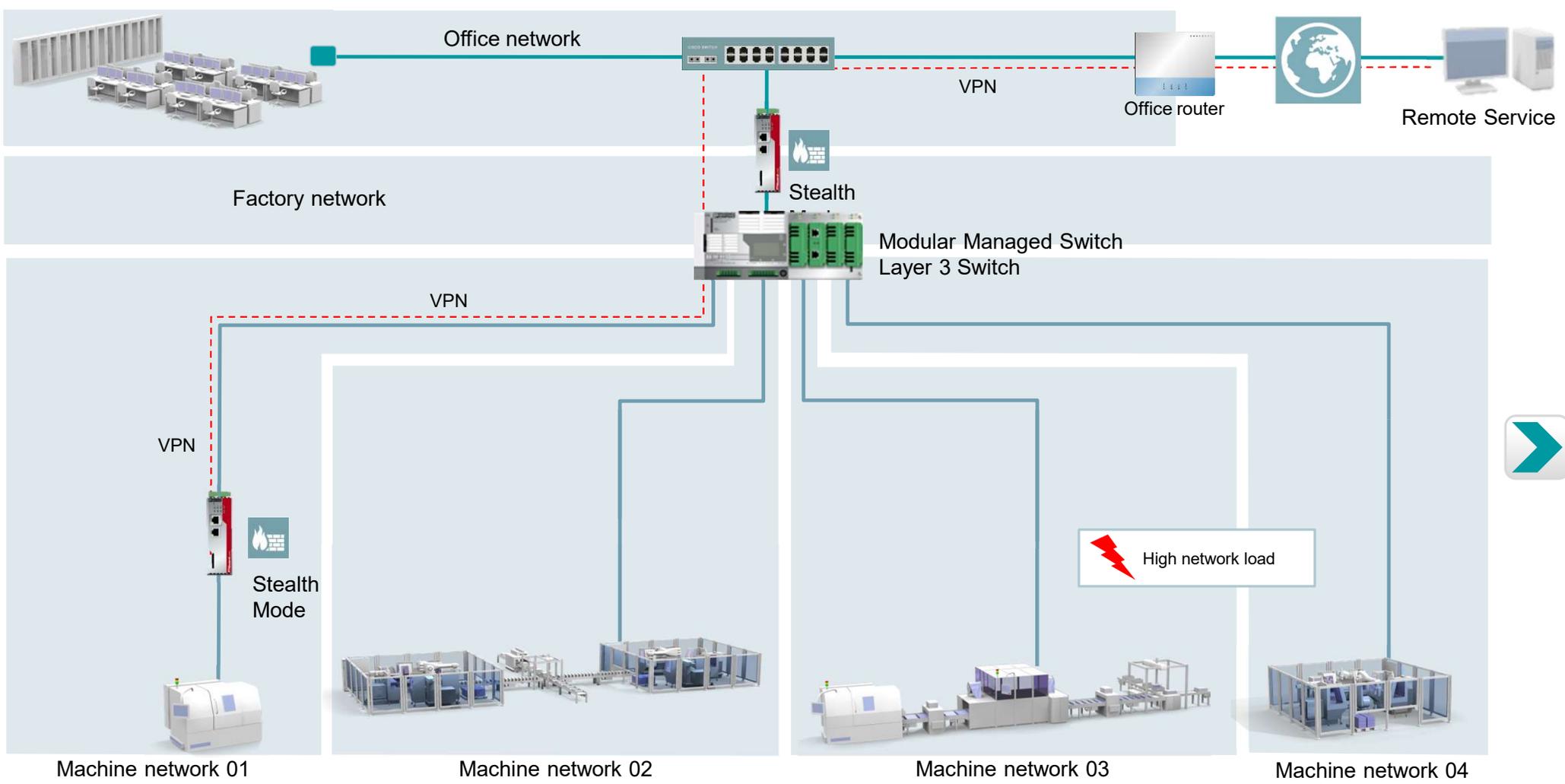
**FL VIEW**  
Network Overview

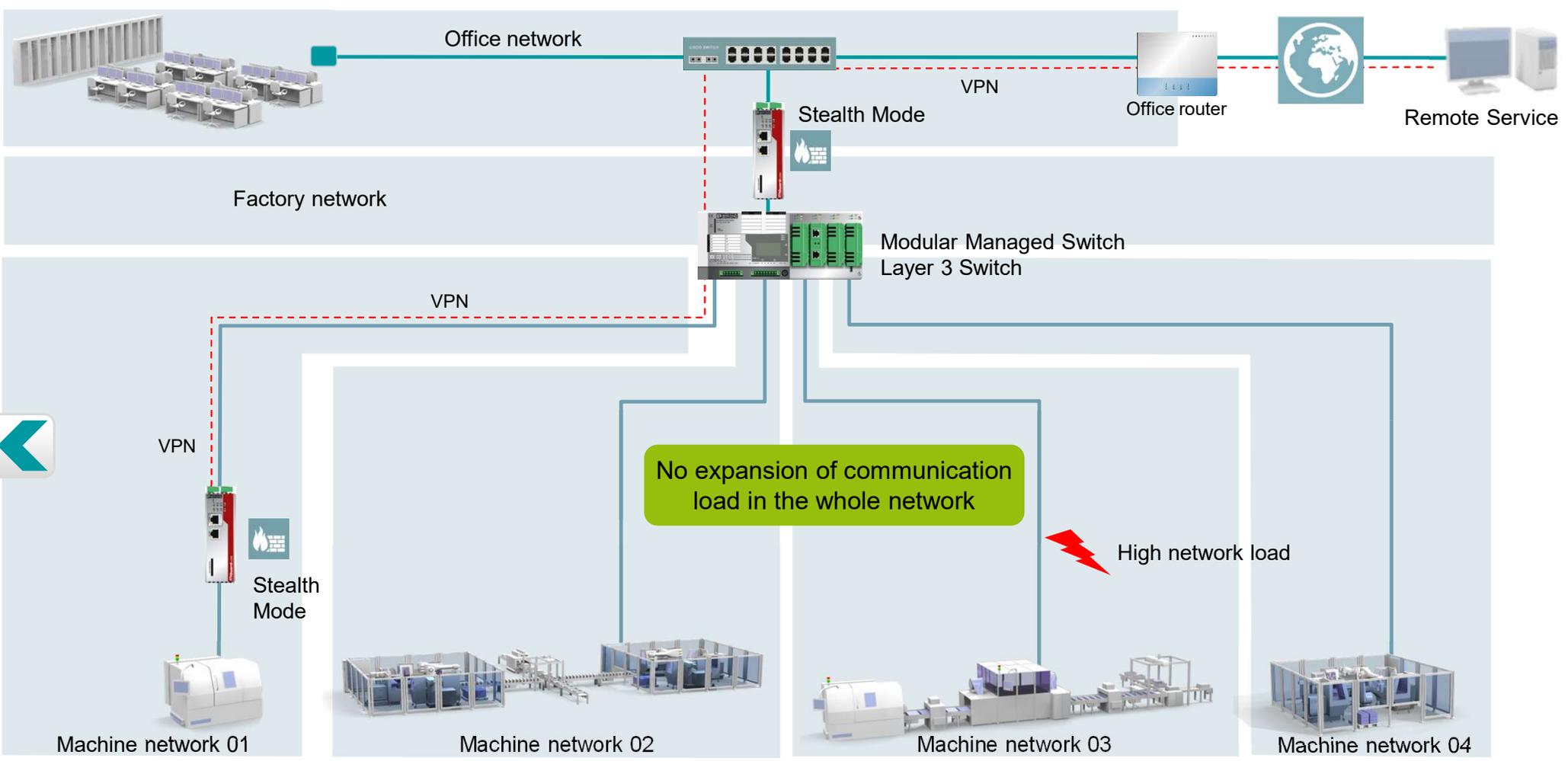


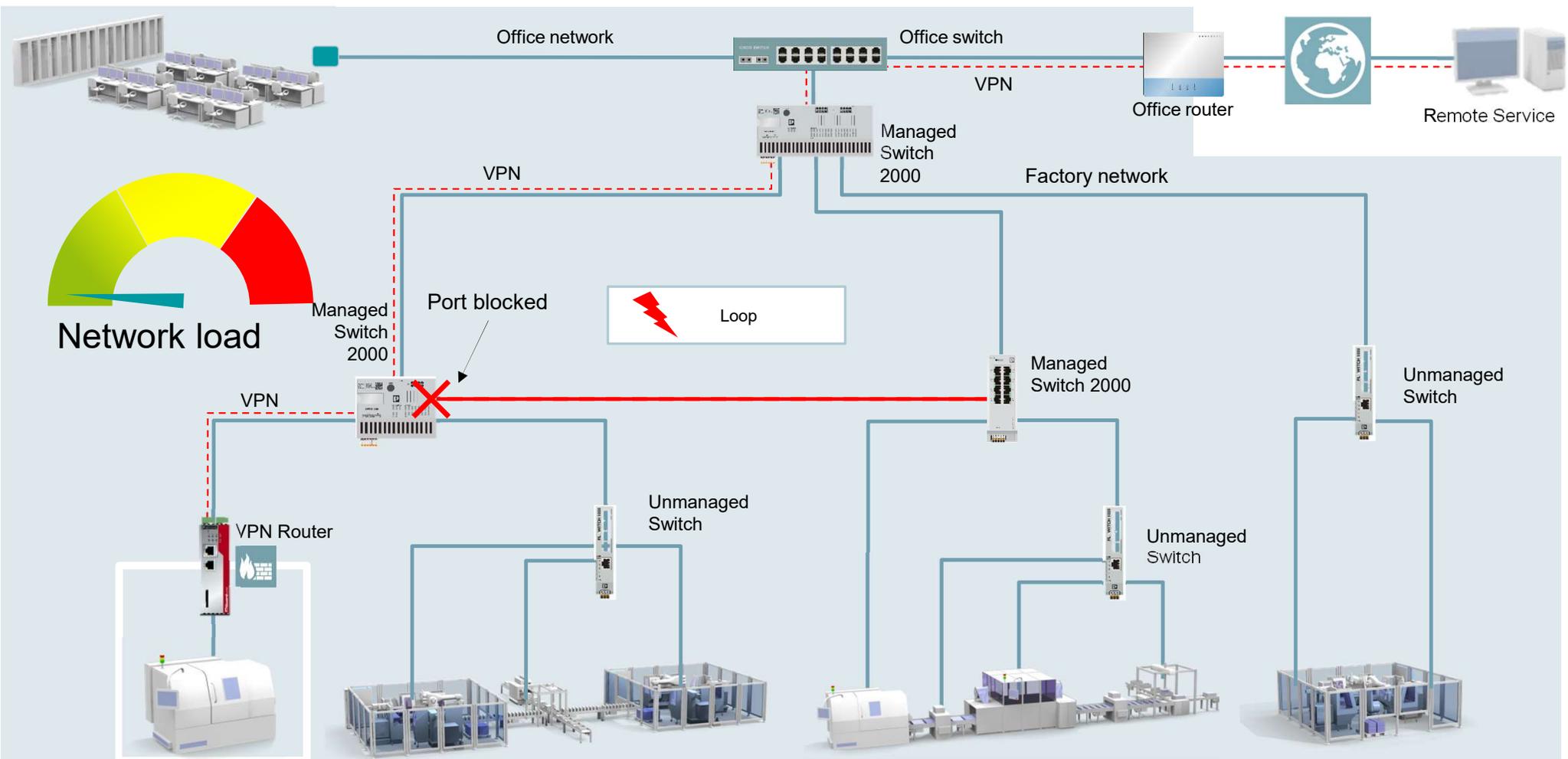


Standard	Products	Standard	Reconfiguration time	Topologies	Max. devices	Ring coupling	Applications
<b>RSTP/STP</b> Rapid Spanning Tree Protocol	Lean/Smart/Modular/Standard Managed	IEEE 802.1D-2004	Up to several seconds	Ring, meshed structures, star, tree	15 (for ring structure)	Yes	IT and automation networks
<b>RSTP</b> Fast ring detection + Large Tree Support	Lean/Smart/Switch 7000, GHS	-	100 to 500 ms	Ring, meshed structures, star, tree	57 (for ring structure)	Yes	Automation networks
<b>MRP</b> Media Redundancy Protocol	Smart Managed and Modular Managed Switch	IEC 62439-2	200 ms	Ring	50	No	PROFINET automation networks
<b>DLR</b> Device Level Ring	Switch 7000	-	3 ms	Ring	50	No	EtherNet/IP automation networks
<b>PRP</b> Parallel Redundancy Protocol	RED 2000E	IEC 62439-3	Bumpless	Double networks in line, star or tree formation	Any	-	Energy systems. Infrastructure
<b>ERR</b> Extended Ring Redundancy	Switch 3000/4000	-	15 ms	Ring	200	Yes	Infrastructure
<b>VRRP</b> Virtual Router Redundancy Protocol	RFC 3768	-	Up to several seconds	Double and multiple routers	Any	-	Connection to the company network

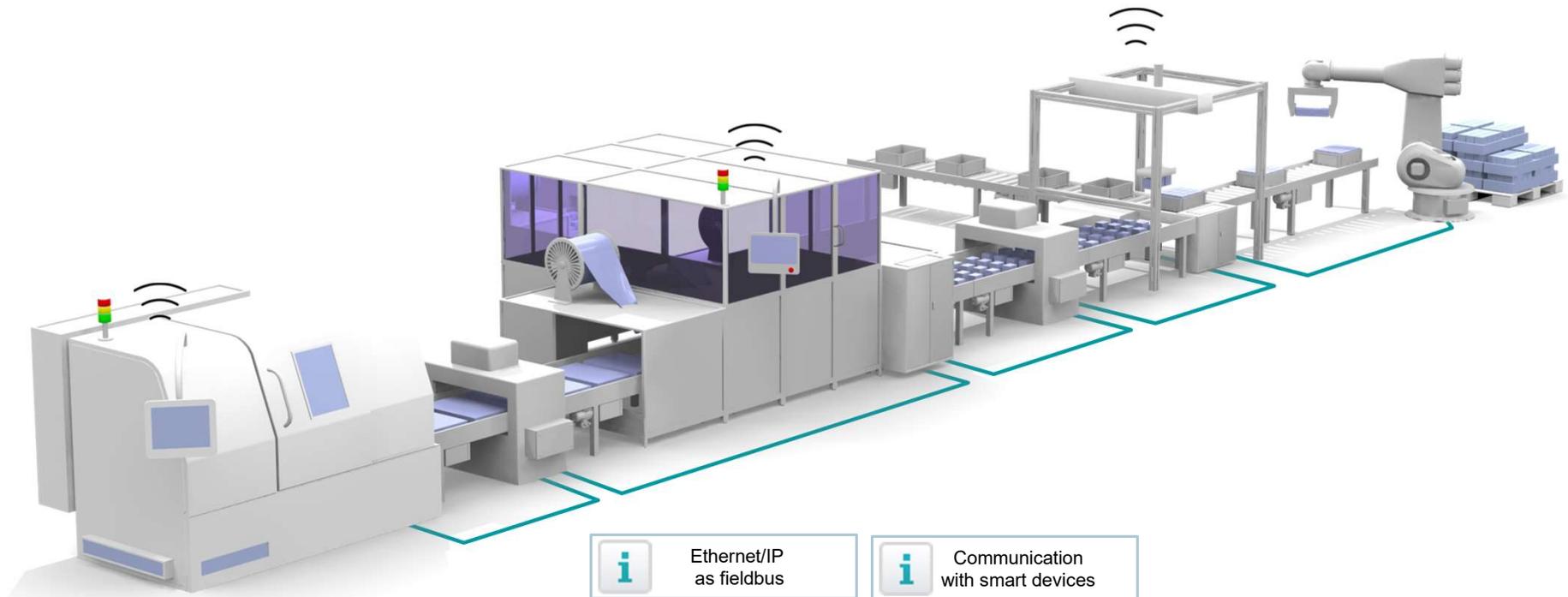








# Typical problems in machine networks



**i** Secure Remote Service

**i** Performance and availability

**i** Profinet as fieldbus

**i** Communication with moving parts

**i** Network security

**i** Integration in production network

**i** Ethernet/IP as fieldbus

**i** Communication with smart devices



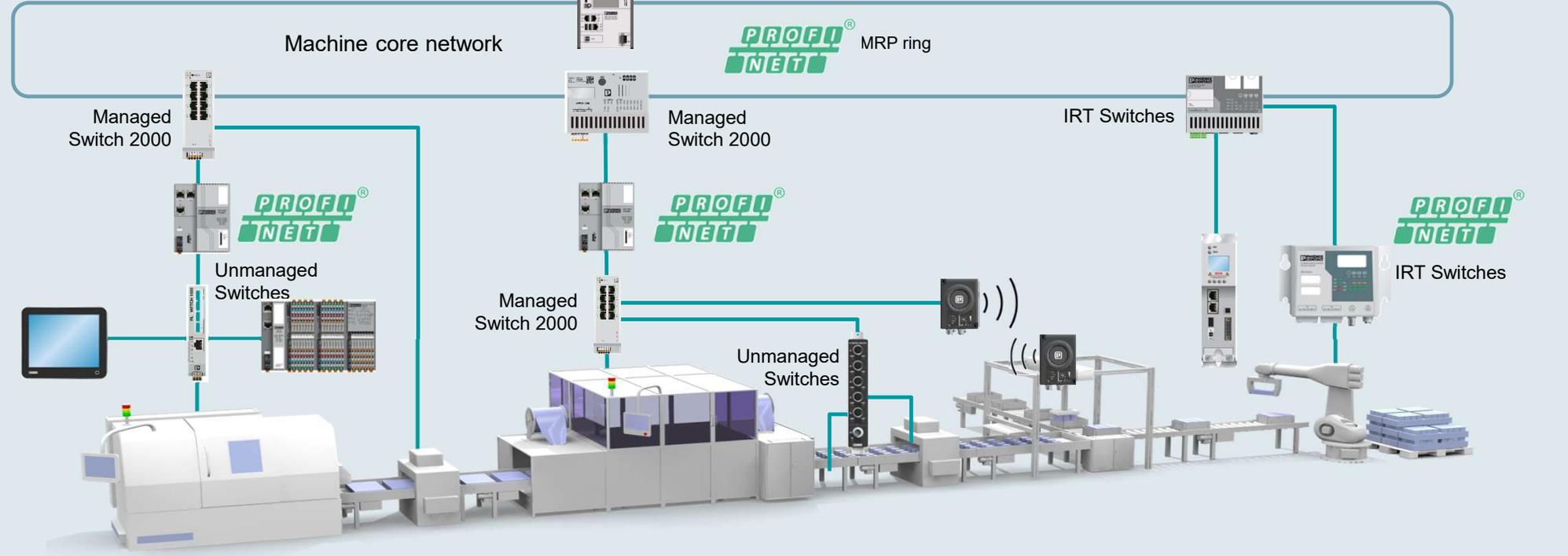
Factory network



Remote Service

Machine network

Firewall, 1:1 NAT. Router



Factory network



Remote Service

Machine network



Firewall, 1:1 NAT. Router

Machine core network

EtherNet/IP DLR ring



Advanced Managed Switches



EtherNet/IP

Unmanaged Switches



Switch 2000



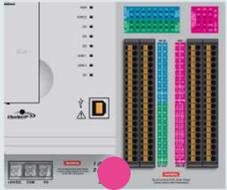
EtherNet/IP

Unmanaged Switches



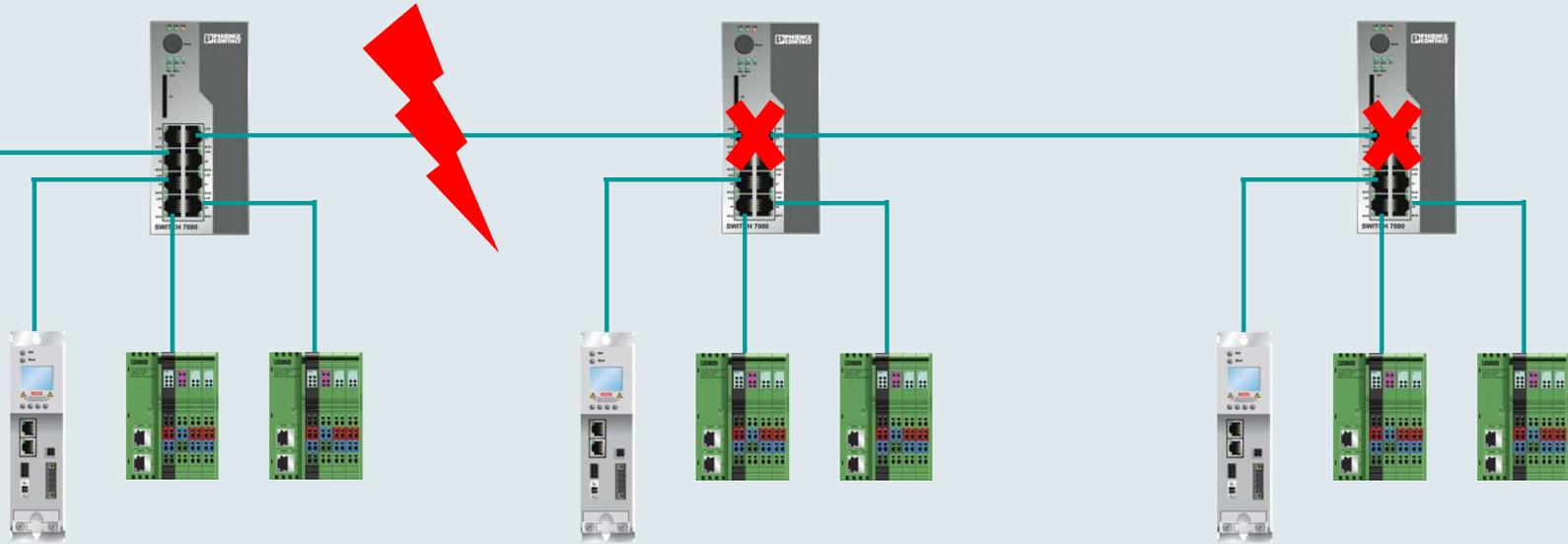
Advanced Managed Switches



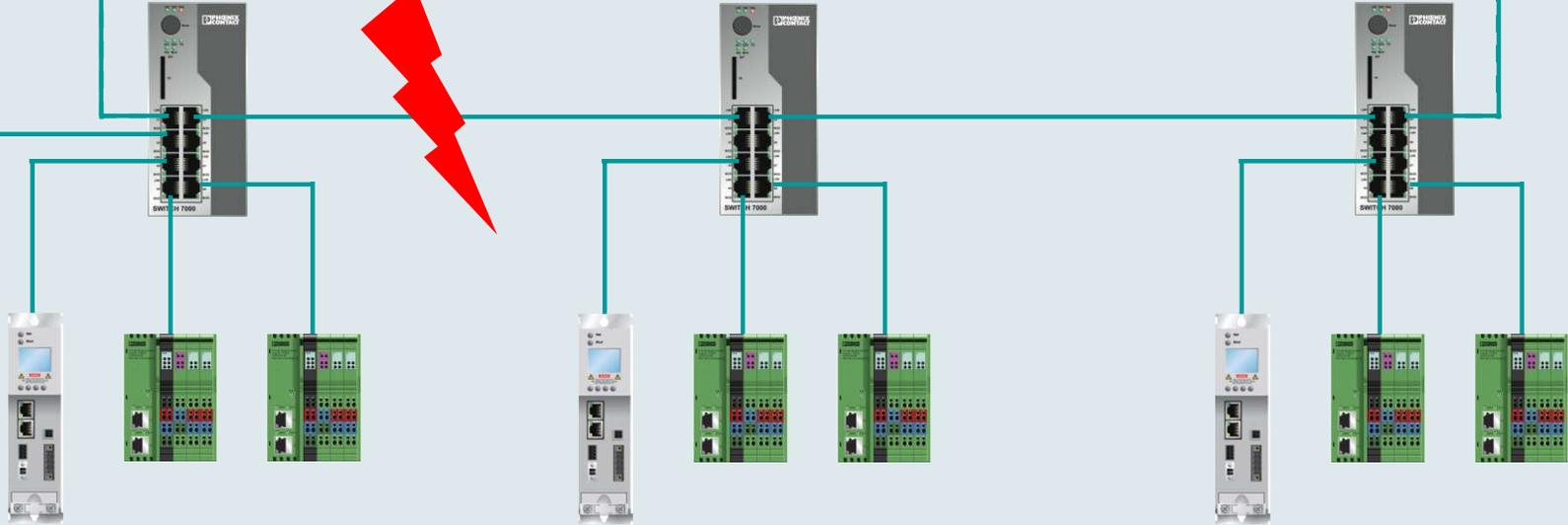
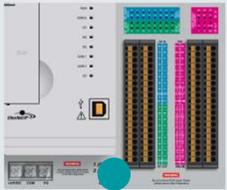


EtherNet/IP  
Controller

 Activate redundancy  
mechanism



DLR redundancy – recovery time < 3 ms





Controller

Ethernet / PROFINET



Access Point



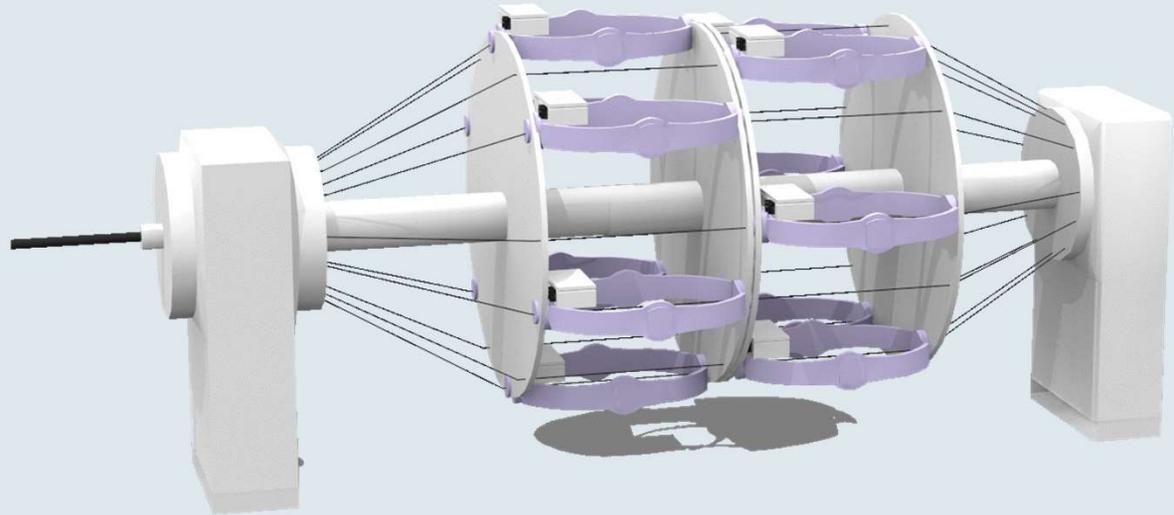
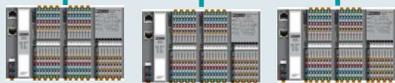
Bluetooth



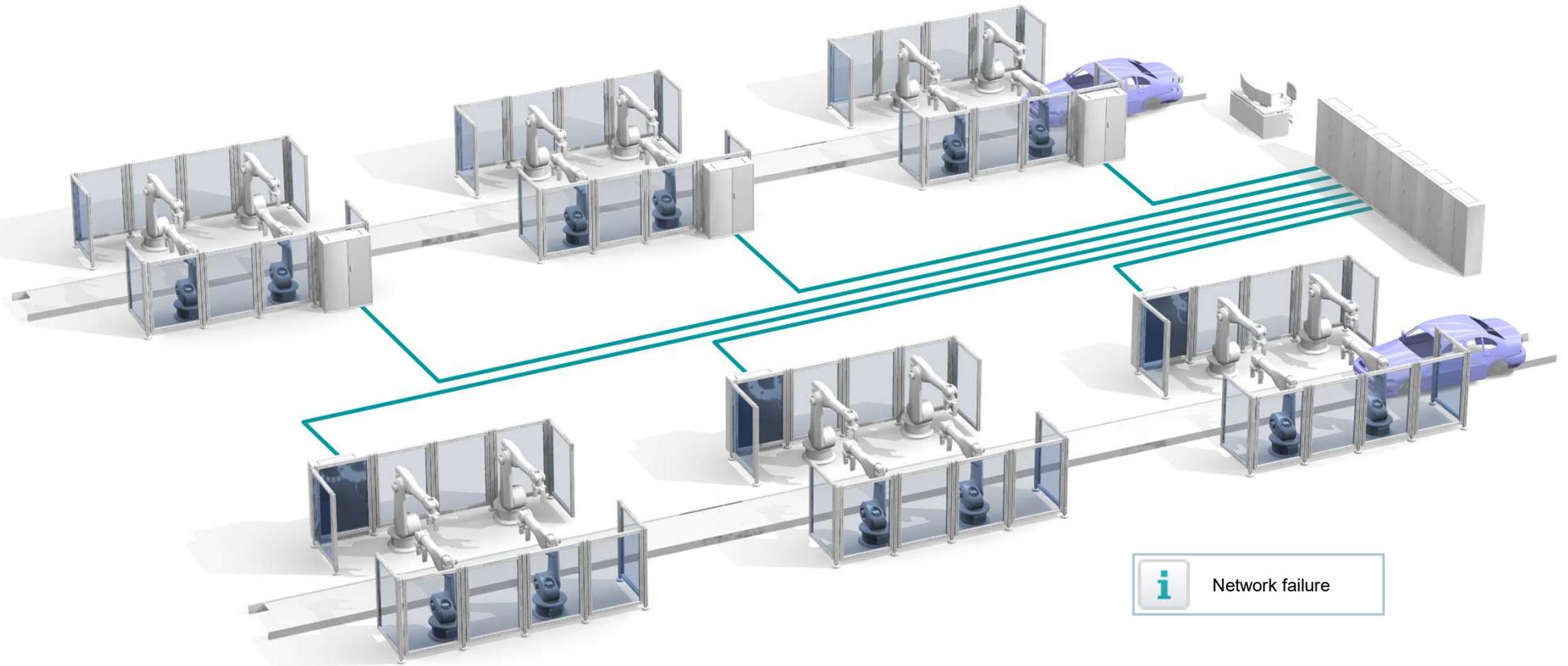
Client



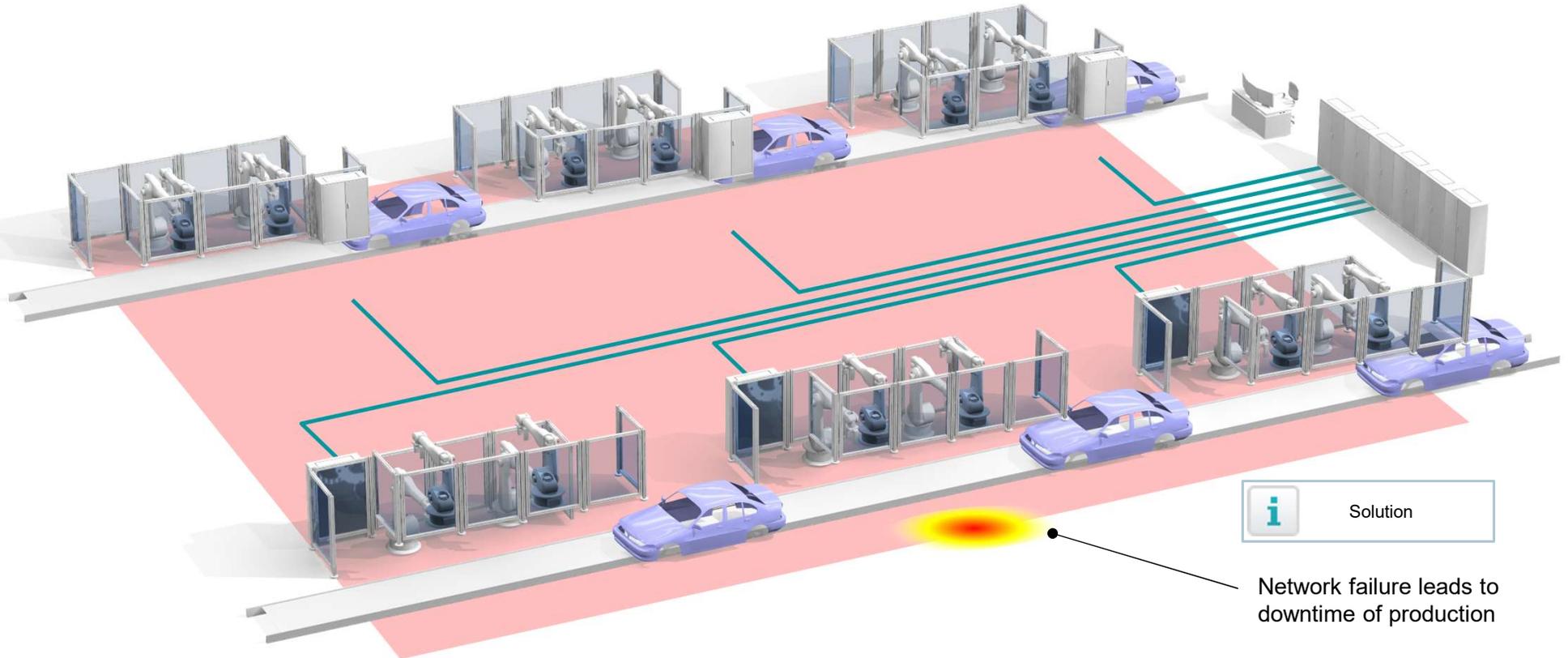
Client



# Production line



# Production line

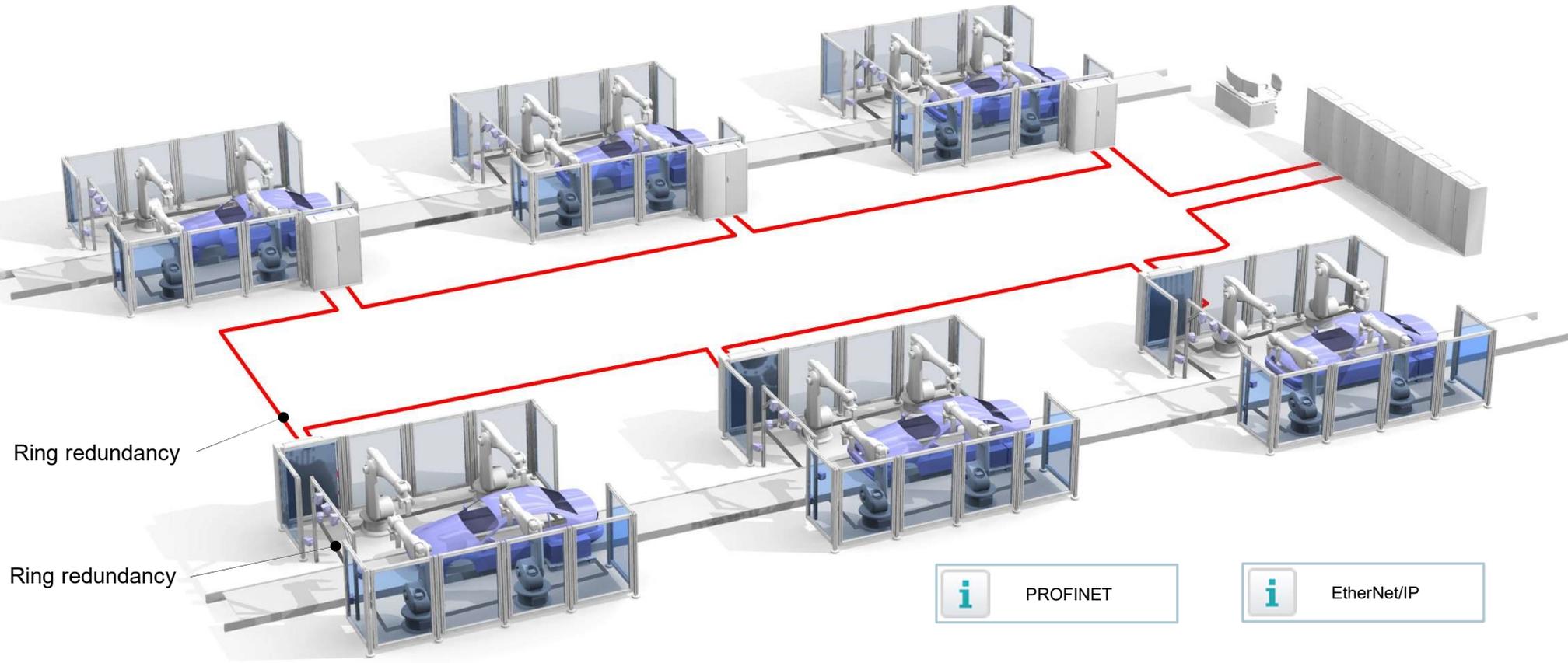


 Solution

Network failure leads to downtime of production



# Reliable production line network structure



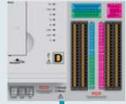
Ring redundancy

Ring redundancy

 PROFINET

 EtherNet/IP





EtherNet/IP<sup>™</sup>  
RSTP ring



EtherNet/IP<sup>™</sup>  
DLR ring



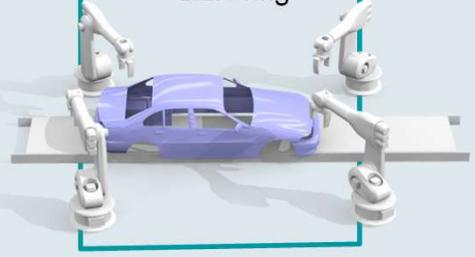
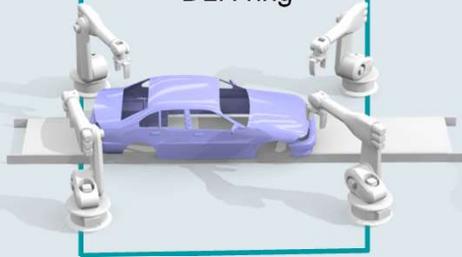
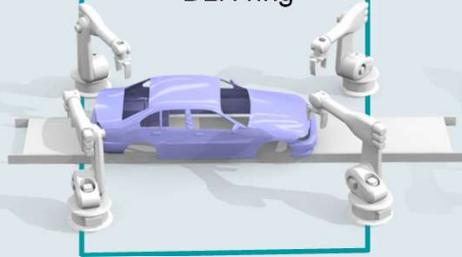
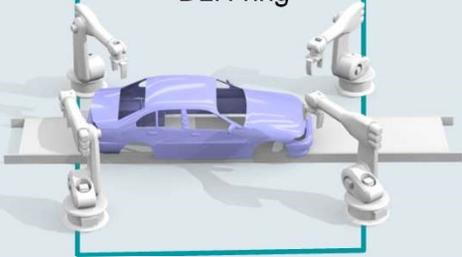
EtherNet/IP<sup>™</sup>  
DLR ring

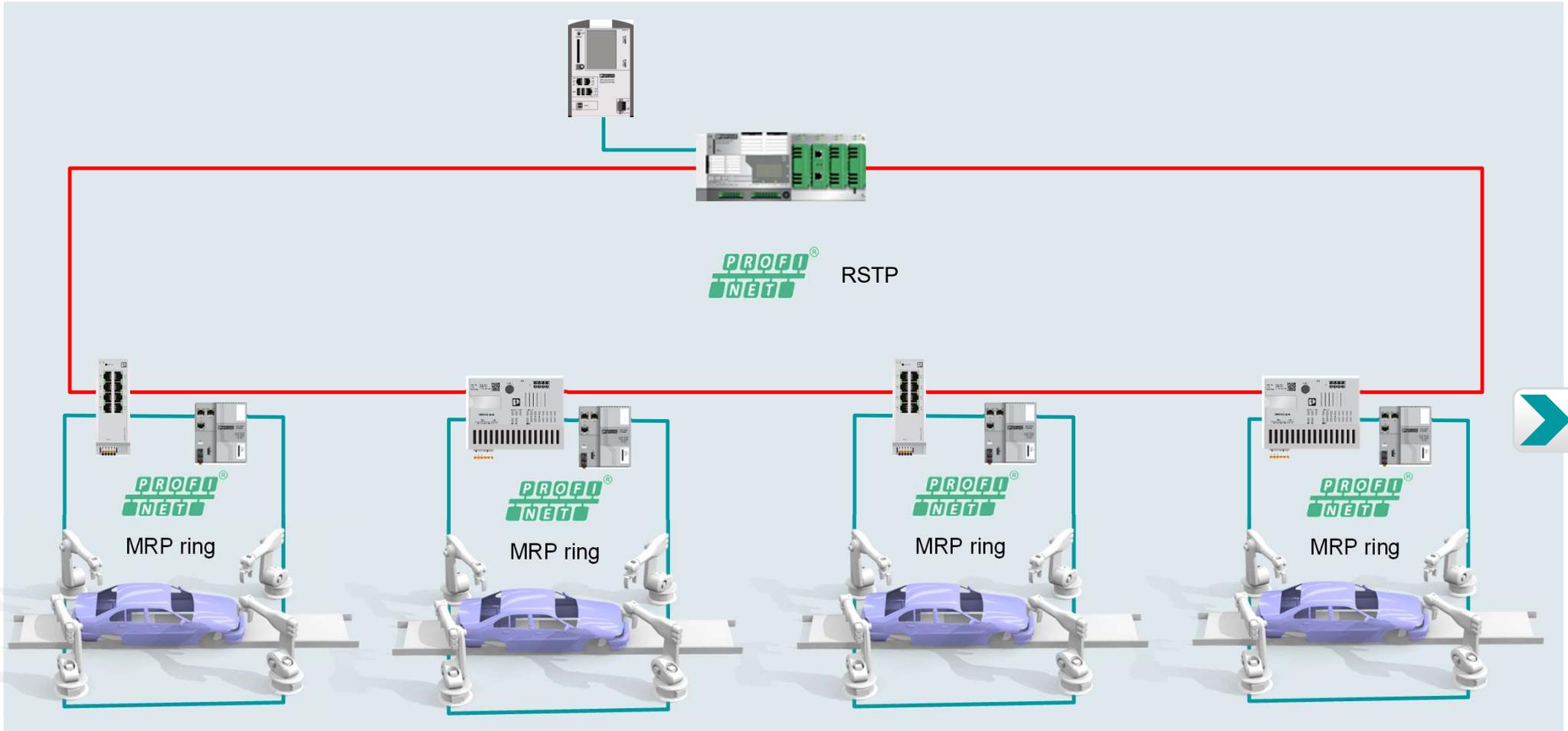


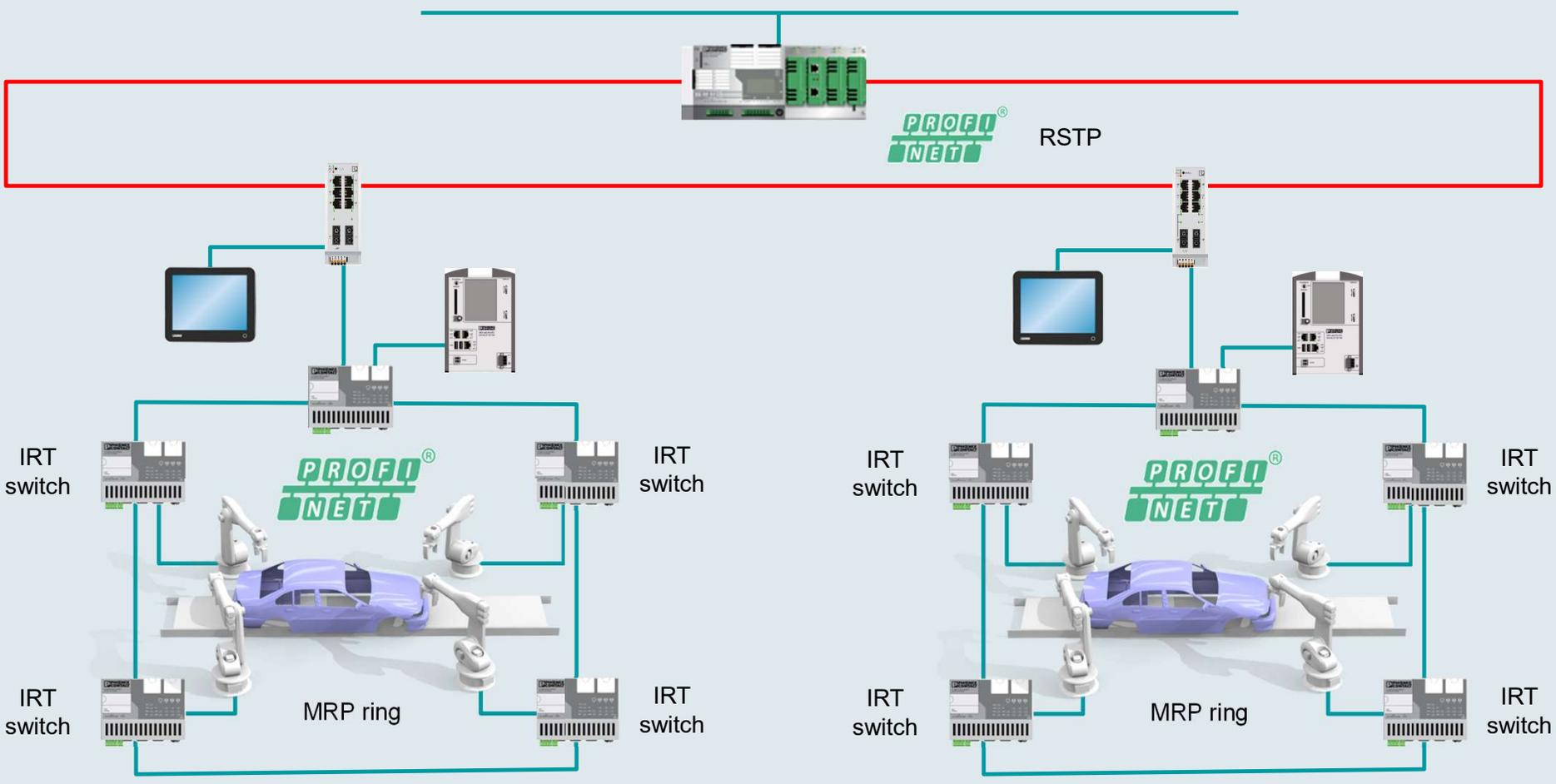
EtherNet/IP<sup>™</sup>  
DLR ring



EtherNet/IP<sup>™</sup>  
DLR ring

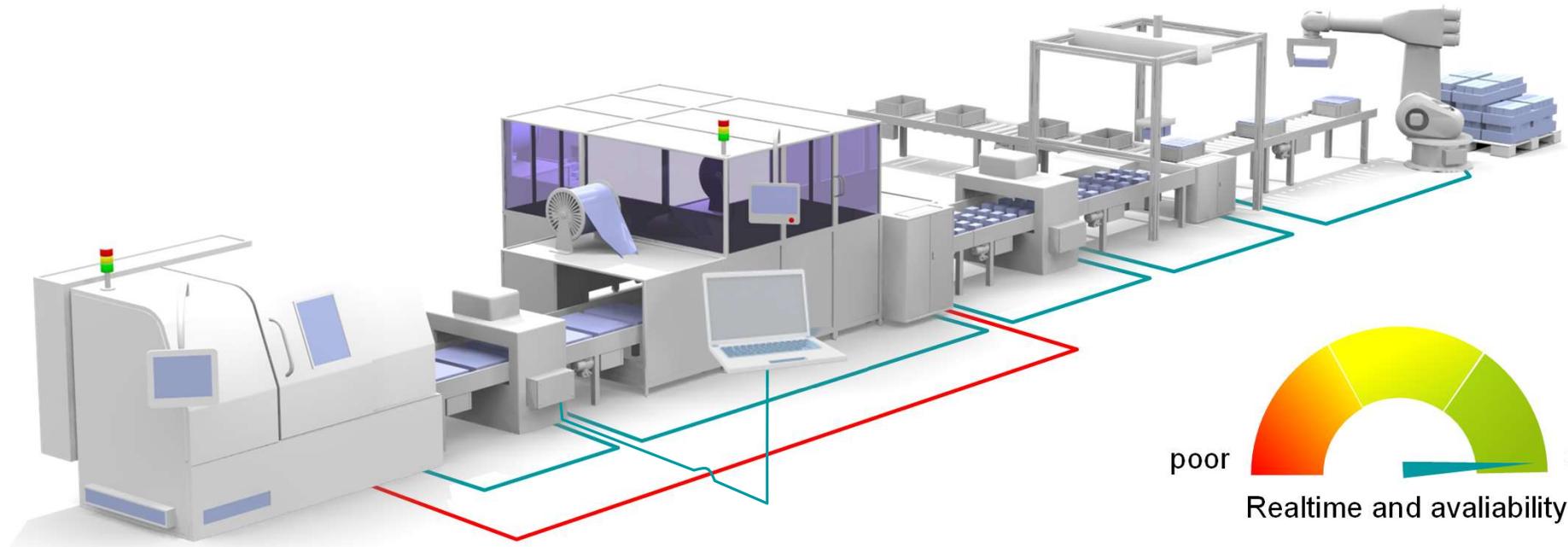






# Typical problems in unmanaged machine networks

*Performance and availability*



 High broad-and multicast-traffic in the network

 Protocol issues

 Unauthorized devices

 Network loop

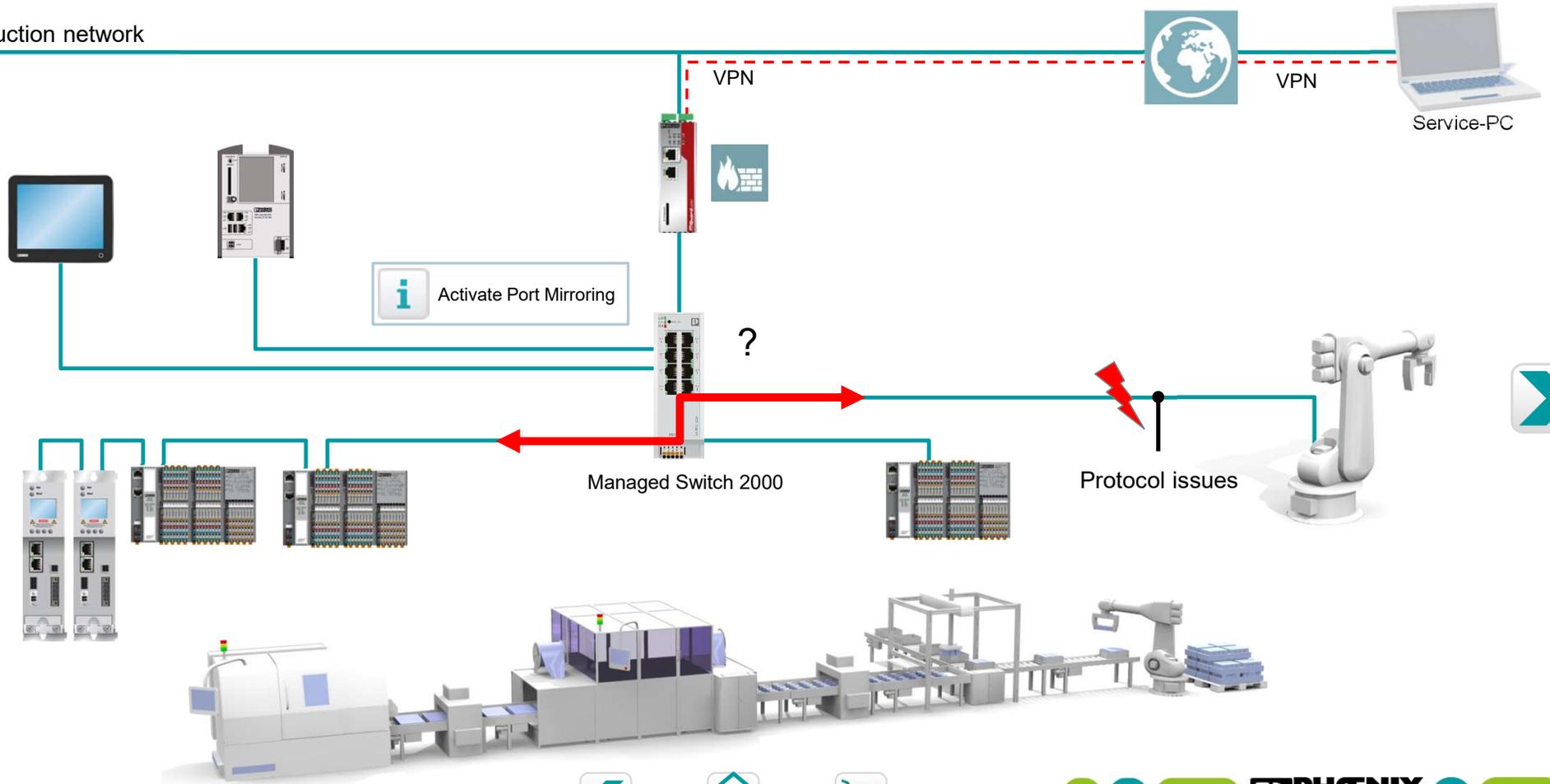
 Cable and connector problems

 Device failure



# Protocol issues

Production network





# Unauthorized devices

Production network



VPN

VPN



Service-PC



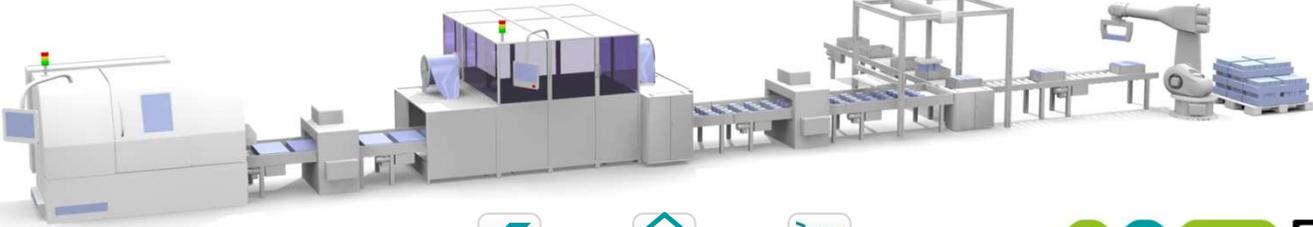
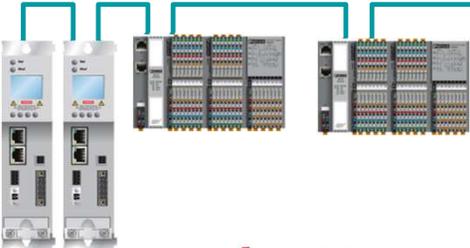
Activate MAC Based Security



Unauthorized devices



Managed Switch 2000



# Our Solution: MAC Based Security

Production network



VPN



Service-PC

MAC Based Security																			
Port	port-1																		
Port Name	Port 1																		
Security Mode	<input checked="" type="radio"/> None <input type="radio"/> Trap only <input type="radio"/> Block packets																		
Last Violation	[Permit]																		
Source Mac Address - vlanID																			
<table border="1"><thead><tr><th>Description</th><th>MAC Address</th><th>VLANID</th><th>Del</th></tr></thead><tbody><tr><td> </td><td> </td><td> </td><td> </td></tr><tr><td> </td><td> </td><td> </td><td> </td></tr><tr><td> </td><td> </td><td> </td><td> </td></tr></tbody></table>				Description	MAC Address	VLANID	Del												
Description	MAC Address	VLANID	Del																
Allowed Mac Addresses																			

VPN



Port blocked

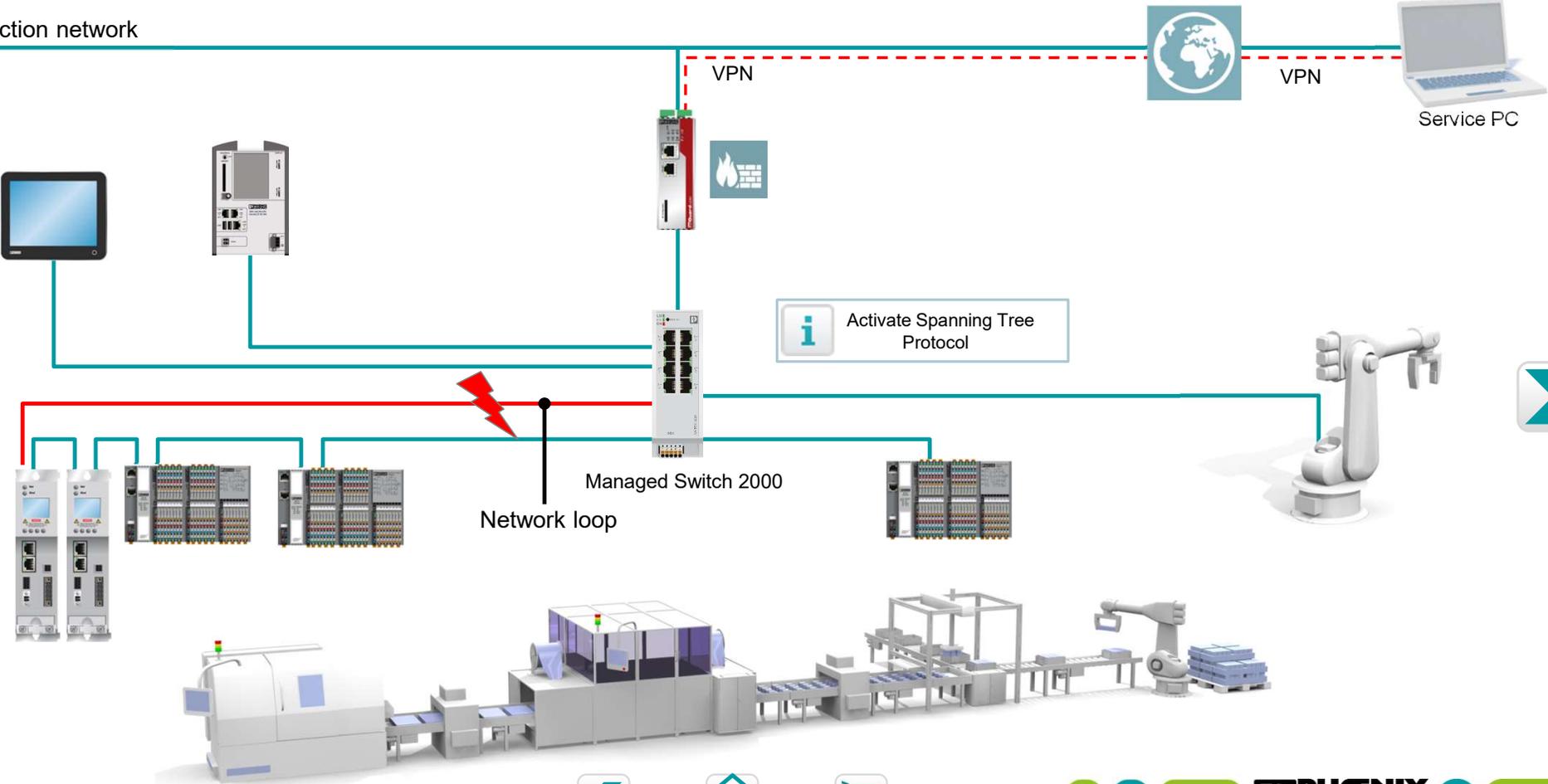
No interaction possible for unauthorized devices

Managed Switch 2000



# Network Loops

Production network



# Our Solution: Spanning Tree Protocol

Production network



VPN

VPN

Service PC

Spanning Tree Config <small>Help</small>		
STP Mode	RSTP	
Large Tree Support	<input checked="" type="radio"/> Disable <input type="radio"/> Enable	
Fast Ring Detection	<input checked="" type="radio"/> Disable <input type="radio"/> Enable	
Bridge Priority	32768	(0 to 61440)
Max Age of STP Information	20	(6 to 40 secs)
Hello Time	2	(1 to 10 secs)
Forward Delay	15	(4 to 30 secs)

Port blocked

Managed Switch 2000

Prevention of broadcast storms through loop prevention



# Profinet simple device replacement

Production network



VPN

VPN

Service PC

LLDP (Link Layer Discovery Protocol) and  
SNMP (Simple Network Management Protocol)  
support required

Managed Switch 2000

Device failure

Change device



# Profinet simple device replacement

Production network



VPN

VPN

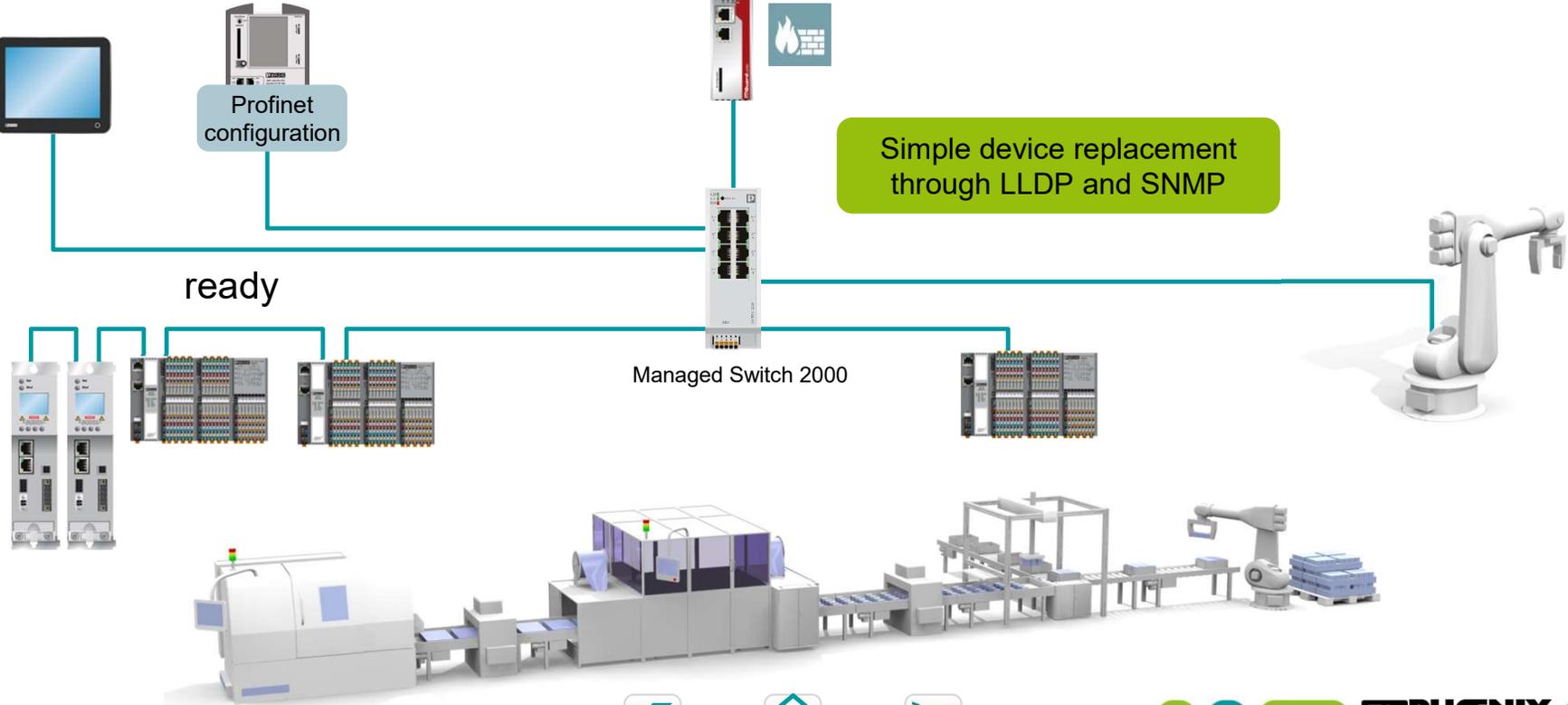
Service PC

Profinet configuration

Simple device replacement through LLDP and SNMP

ready

Managed Switch 2000



# High broad- and multicast traffic

Production network



VPN

VPN



Service PC



 Activate Storm Control



High broad- and multicast traffic in the network

Managed Switch 2000



Realtime and availability



# Our solution: Storm control

Production network



VPN



Service PC

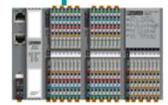
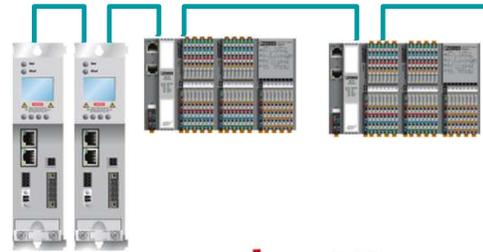
Storm Control	
Port	port-1
Port Name	Port 1
Broadcast Storm Control	<input checked="" type="radio"/> Disable <input type="radio"/> Enable
Broadcast Threshold	1220 Pps
Multicast Storm Control	<input checked="" type="radio"/> Disable <input type="radio"/> Enable
Multicast Threshold	1220 Pps
Unicast Storm Control (Unknown Unicast)	<input checked="" type="radio"/> Disable <input type="radio"/> Enable
Unicast Threshold (Unknown Unicast)	1220 Pps

VPN



No communication breakdown in case of a broad-/multicast storm

Managed Switch 2000



Realtime and availability



# Contact problems of cables and connectors

Production network



VPN

VPN



Service PC

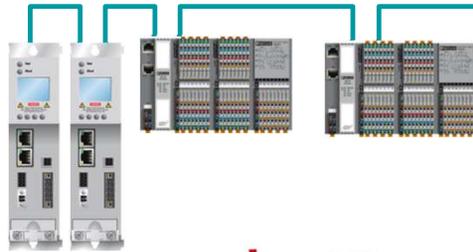
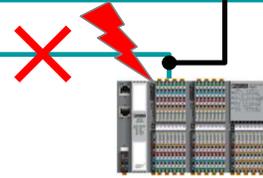


Get diagnostic information



Contact problems cables and connectors

Managed Switch 2000



# Our solution: Diagnostic information

Production network

Event Table	
System Up Time	22 min 50 sec
Time	Event
20 min 35 sec	LLDP recognized new neighbor at port 5
20 min 35 sec	Link up on Port: 5
20 min 19 sec	Link up on Port: 7
20 min 16 sec	LLDP recognized new neighbor at port 3
20 min 16 sec	Link up on Port: 3
20 min 13 sec	Link down on Port: 3
17 min 55 sec	Configuration has been saved.
17 min 30 sec	The configuration has been modified the first time after the last storing.
59 sec	Link up on Port: 3
55 sec	Link down on Port: 3
29 sec	Configuration has been saved.
25 sec	The configuration has been modified the first time after the last storing.
3 sec	Link up on Port: 3
3 sec	Configuration has been saved.
3 sec	Boot.
0 sec	RSTP disabled.
0 sec	Power Supply US2 lost

Port Statistics	
Port Number	3
Packets	4103
up to 64 Octets	2969
65 to 127 Octets	631
128 to 255 Octets	71
256 to 511 Octets	425
512 to 1023 Octets	1
1024 to 1518 Octets	6
Broadcast	307
Multicast	50
Octets	448306
Fragments	0
Undersized Packets	0
Oversized Packets	0
CRC Alignment Errors	1
Drop Events	0
Jabbers	0
Collisions	0

Clear counters  
You can set the statistic counters of all switch ports to zero.  
Enter password \*\*\*\*\* Clear

Port Configuration of port 3: General I (RSTP)  
Enter password \*\*\*\*\* Clear

Note: This web page will be refreshed in 23 sec automatically (change the interval at the web page 'General Configuration / User Interfaces')

VPN



VPN



Service PC

Receive diagnostic information in case of problems with cables and connectors

Managed Switch 2000





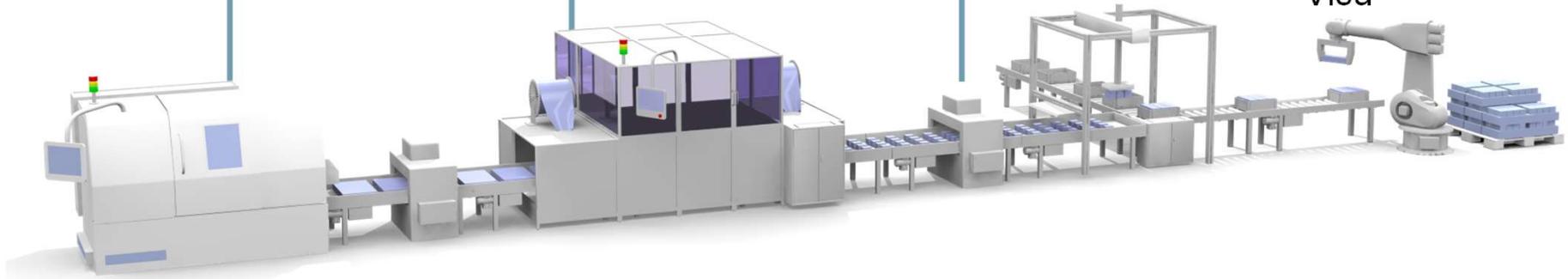
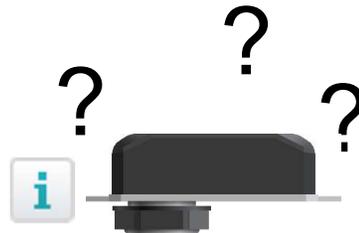
Unlimited service access into machine network

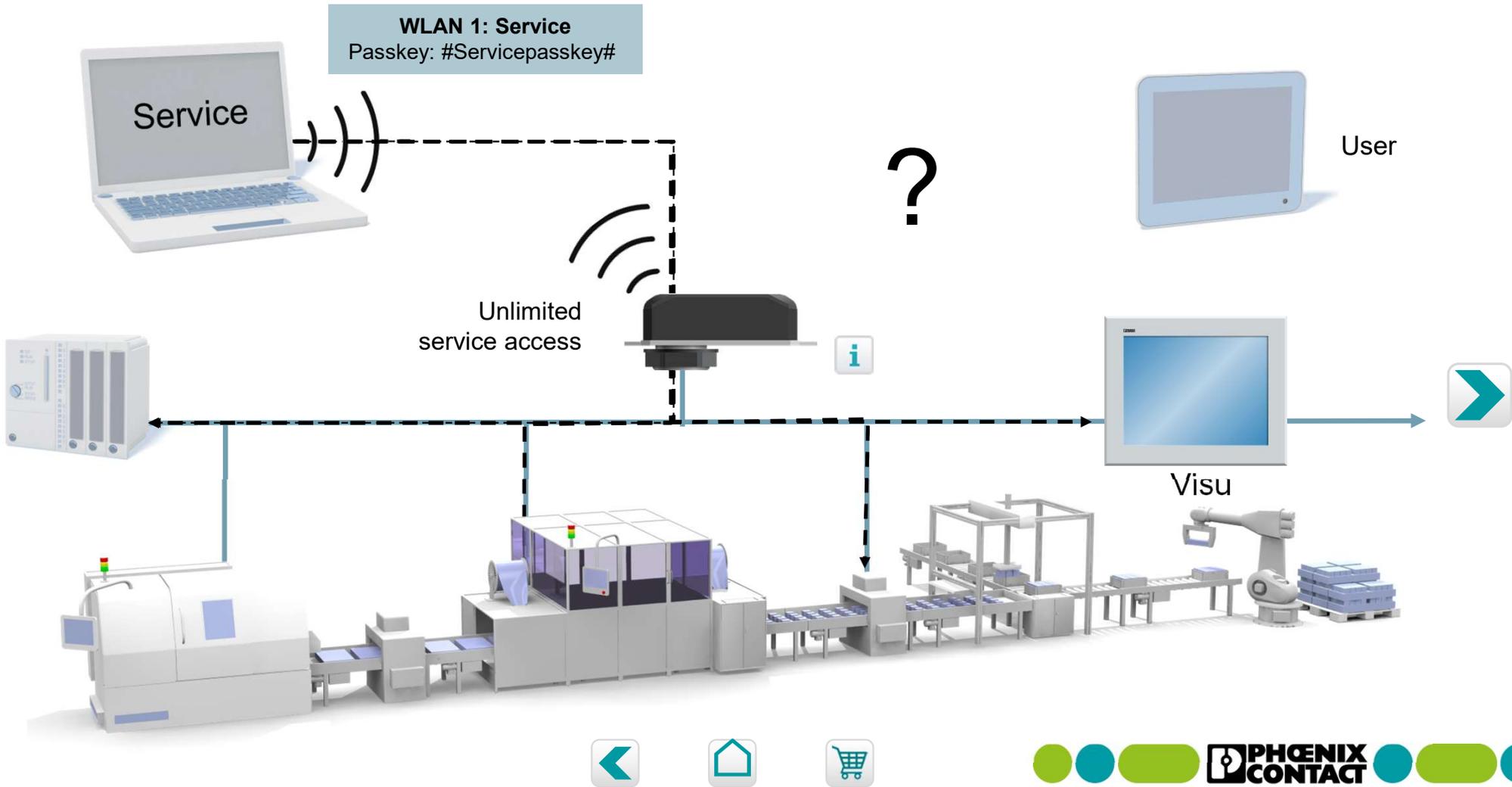
- Access on all devices

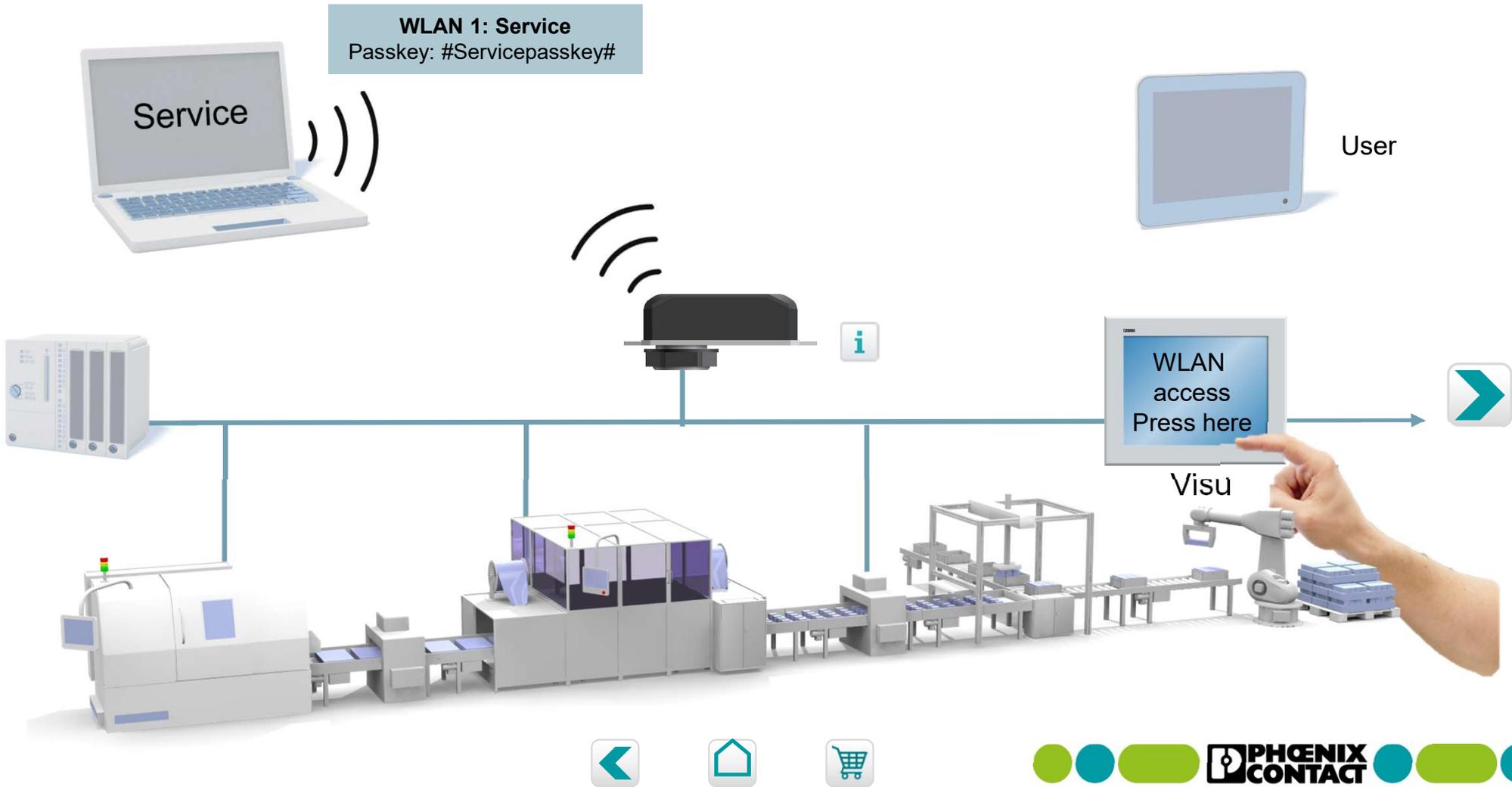


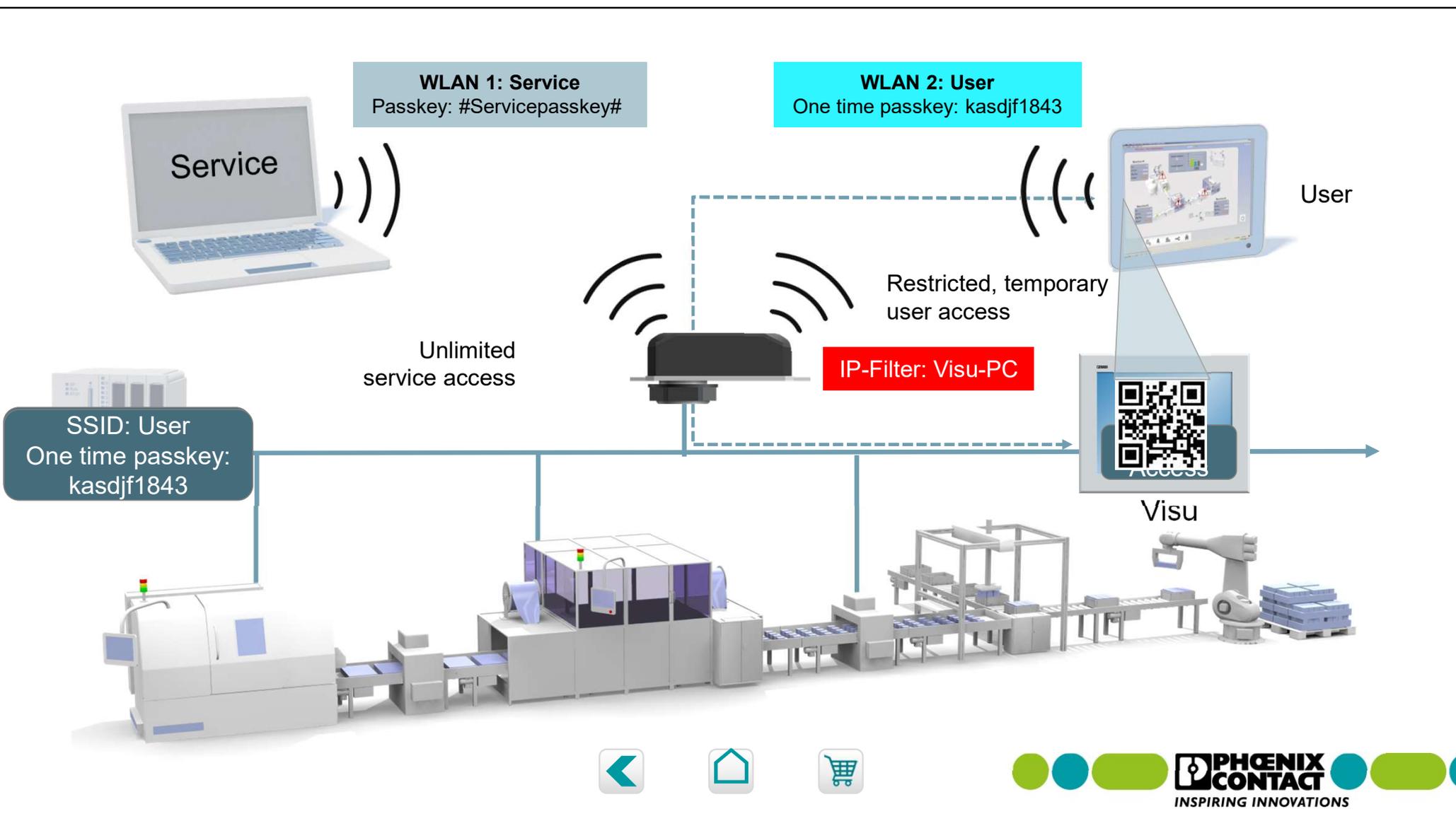
Restricted, temporary user access into machine network

- Access only on authorized devices, e.g. visualization
- Simple use of one-time passkeys for the WLAN

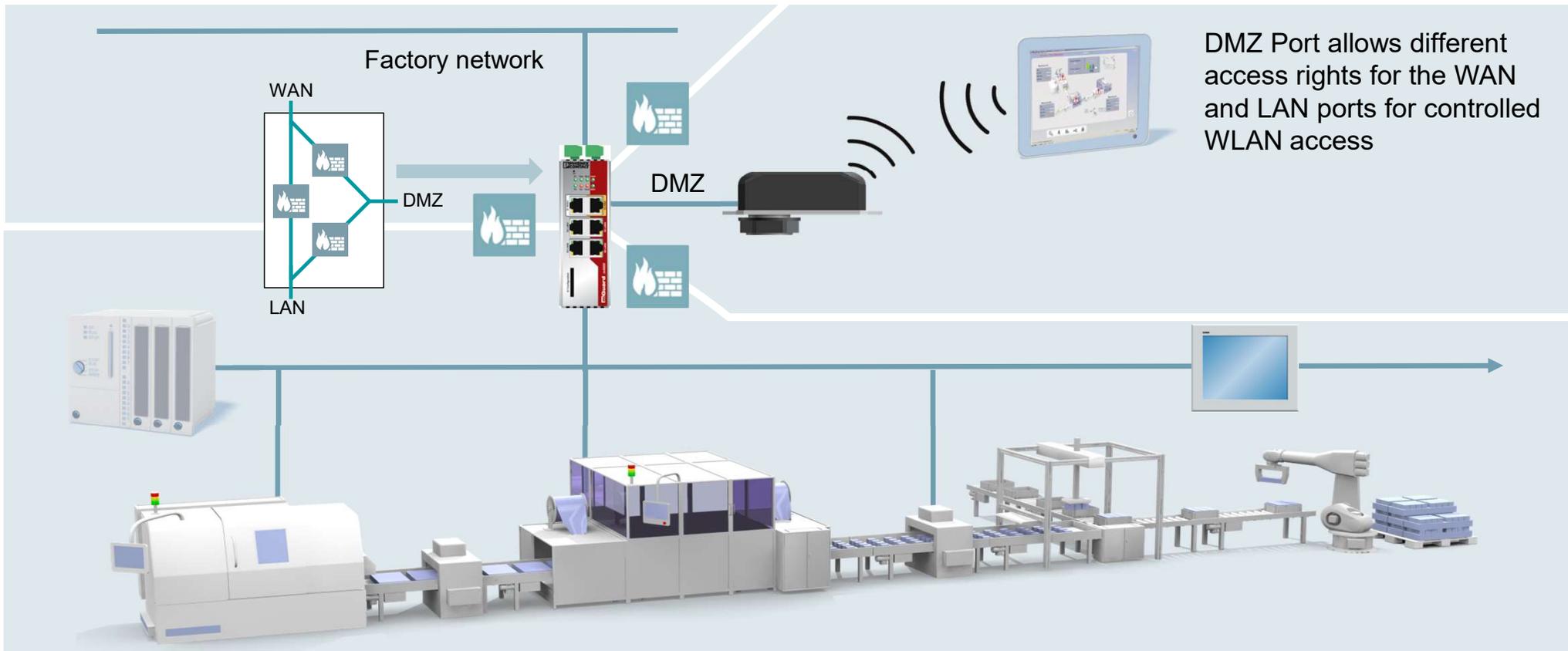








# Secure WLAN machine network



# Integration in production network

## 1:1NAT

Integrate your machine networks and solve IP address conflicts



Factory network  
(192.168.0.0/16)

LAN 1

LAN 1

LAN 1



LAN 2

LAN 2

LAN 3



Machine network (172.16.0.0/24)



Machine network (172.16.0.0/24)



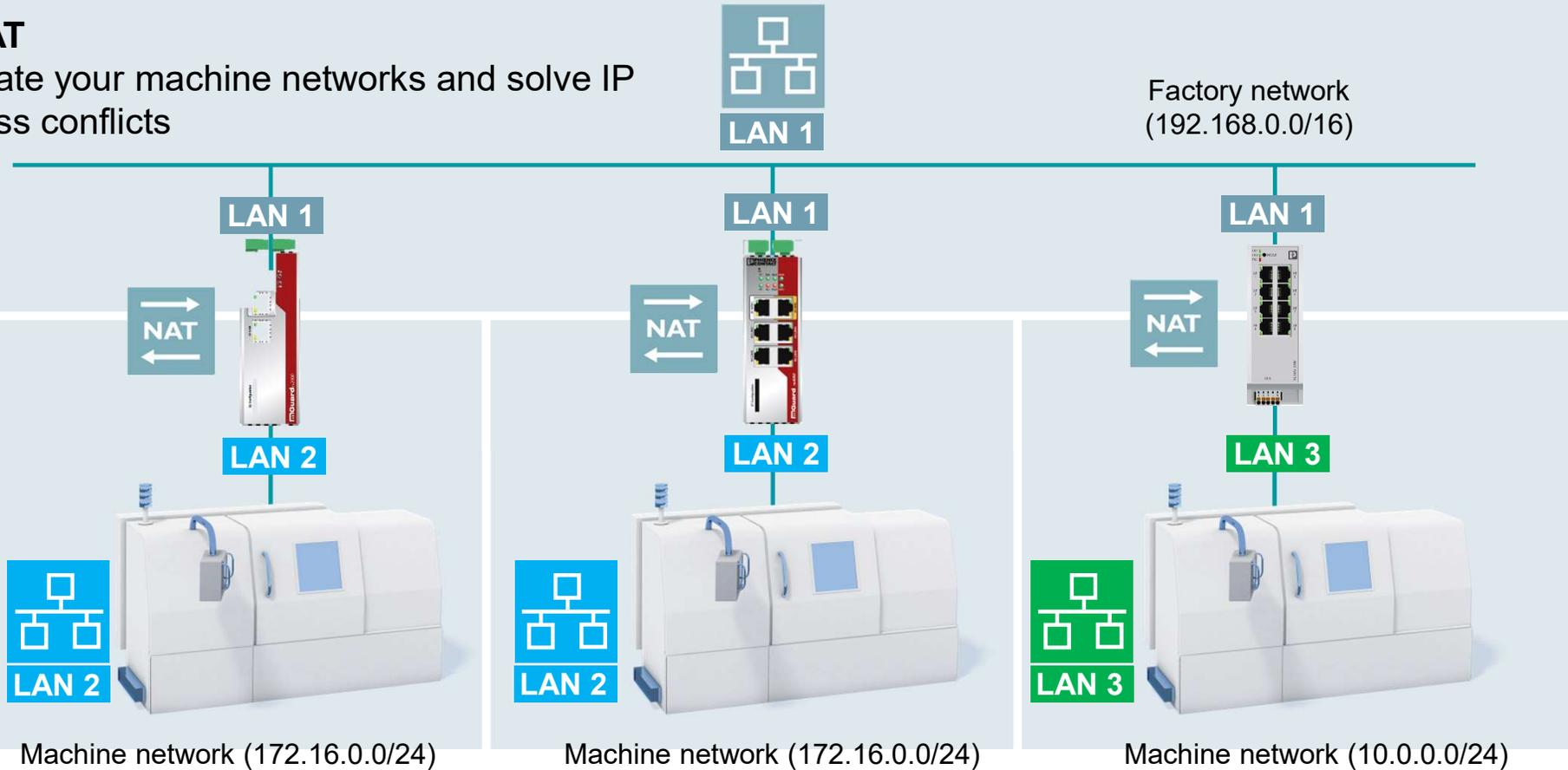
Machine network (10.0.0.0/24)



# Integration in production network

## 1:1NAT

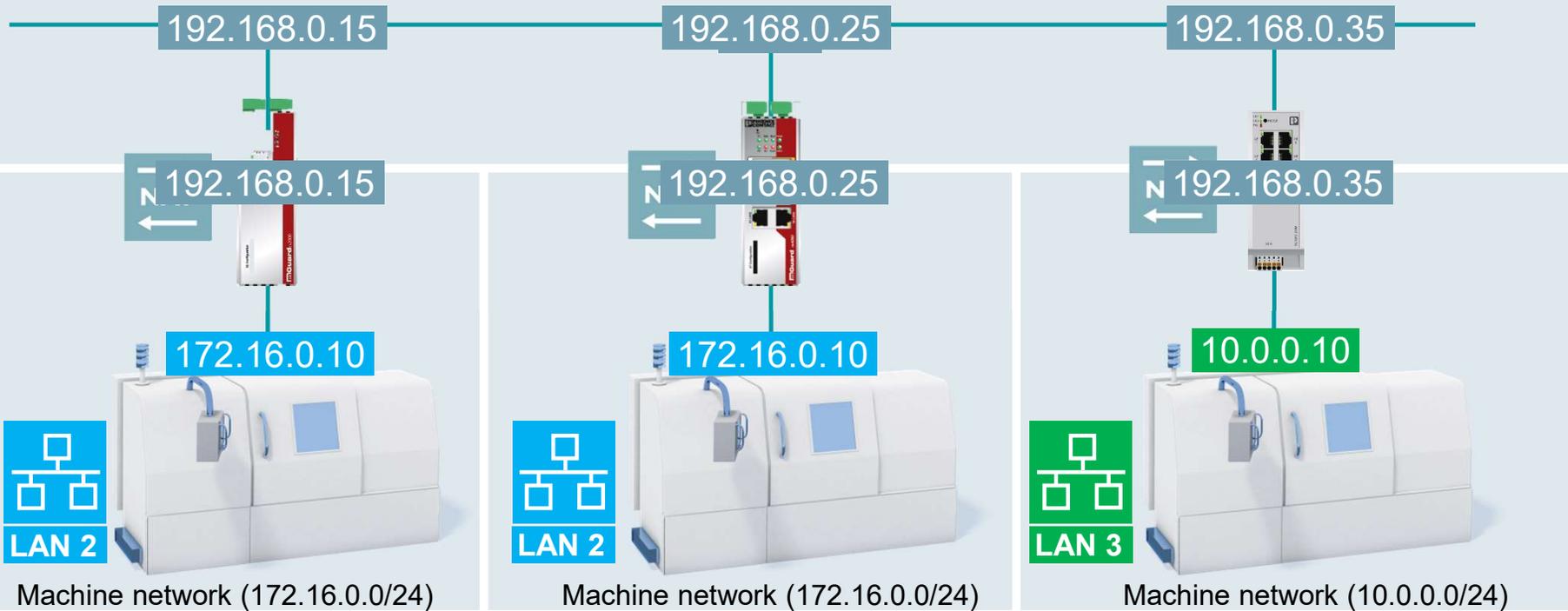
Integrate your machine networks and solve IP address conflicts



# Integration in production network

## 1:1NAT

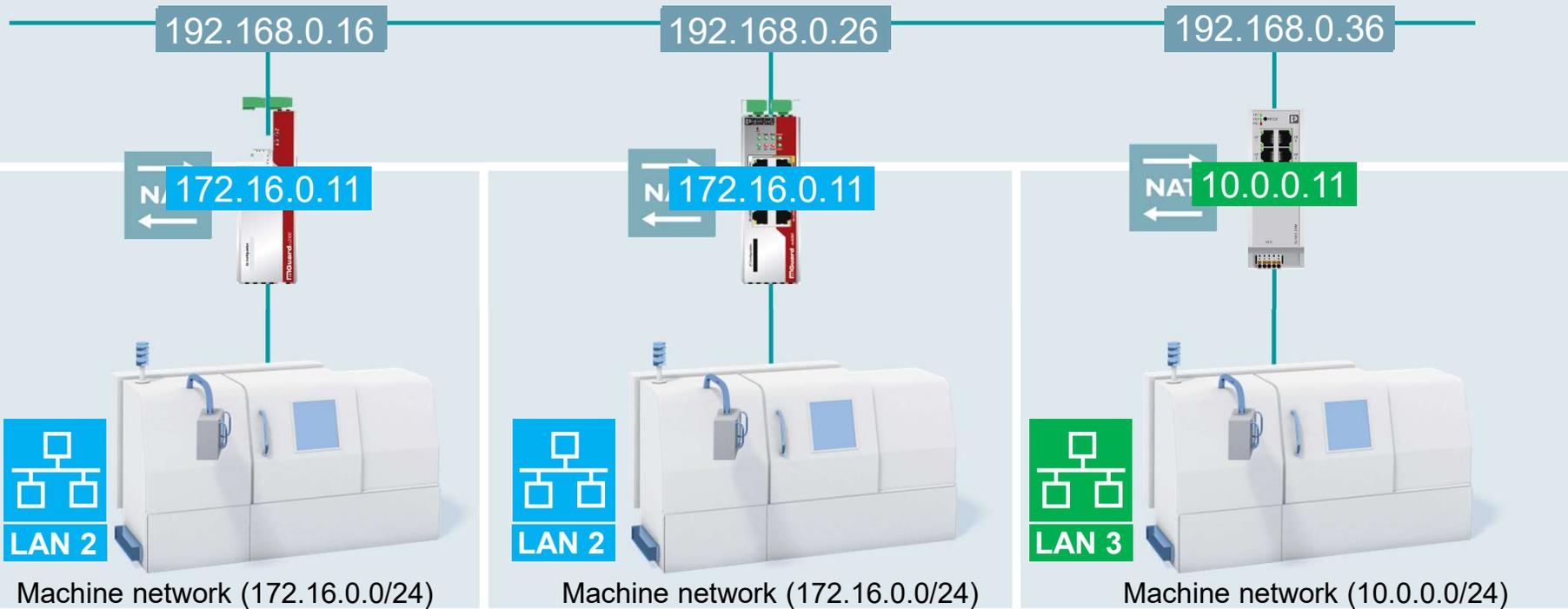
Integrate your machine networks and solve IP address conflicts



# Integration in production network

## 1:1NAT

Integrate your machine networks and solve IP address conflicts



# Remote Service



VPN

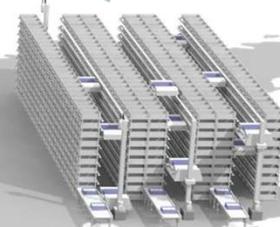
VPN

VPN

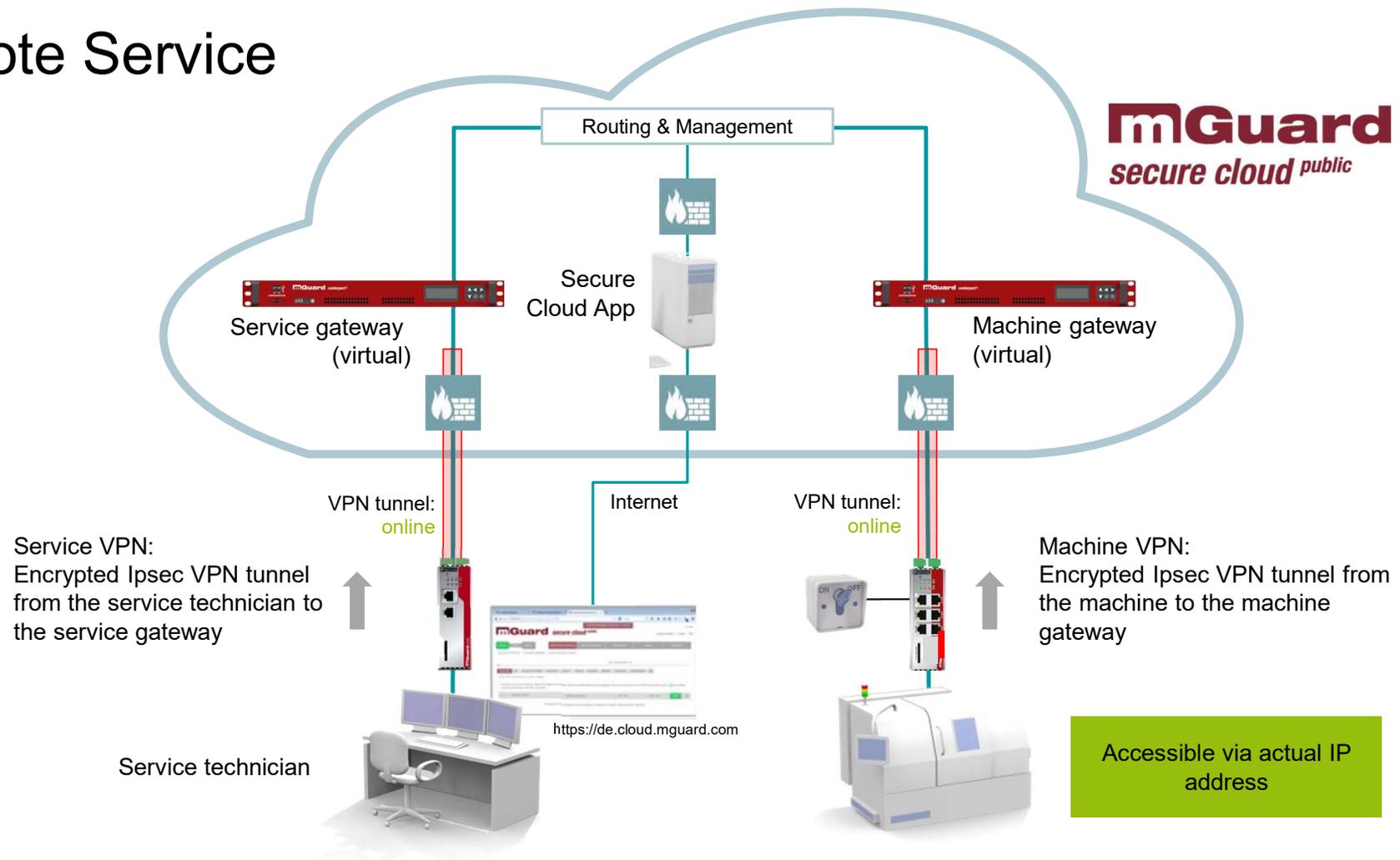
https

VPN

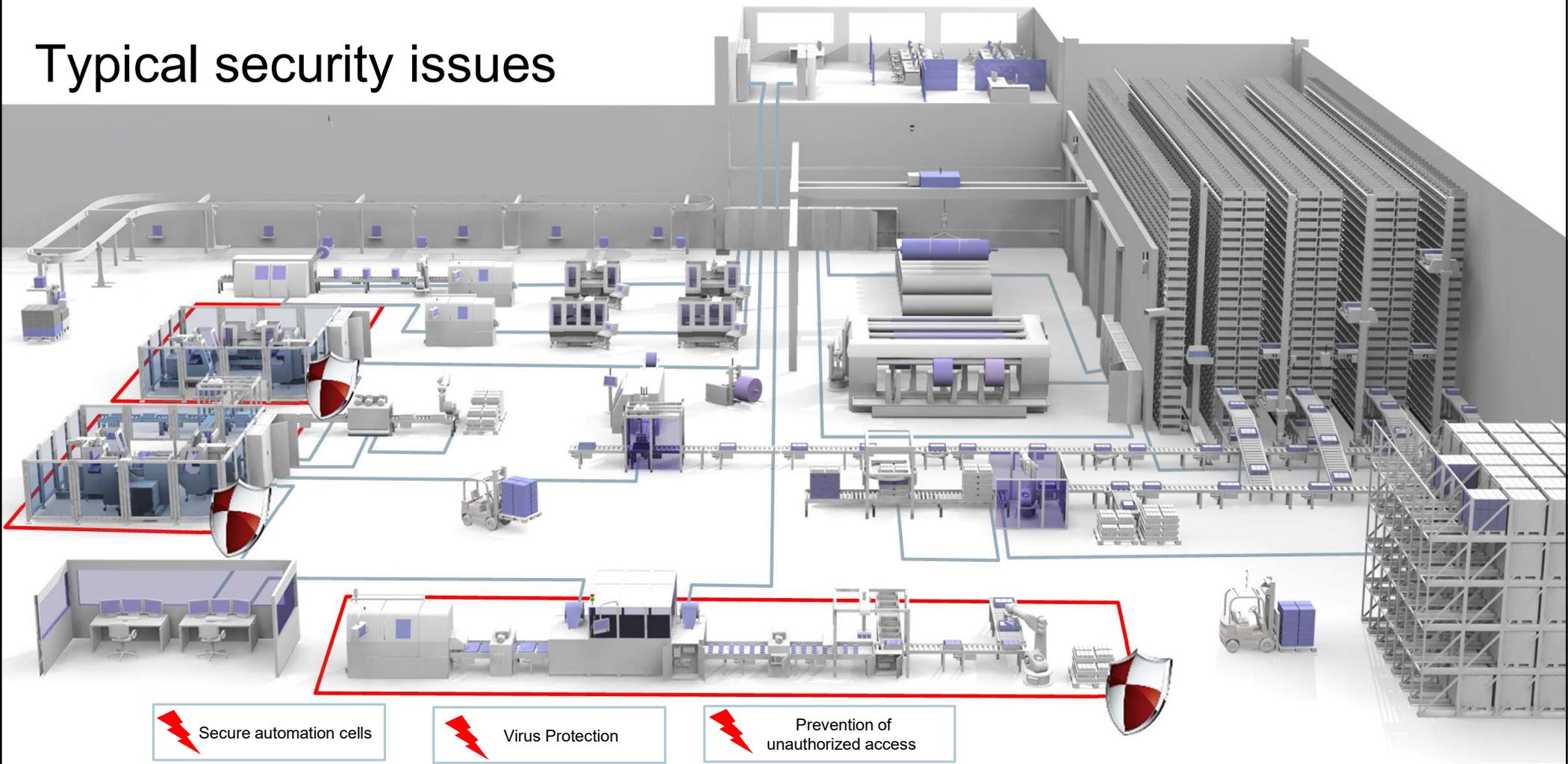
VPN

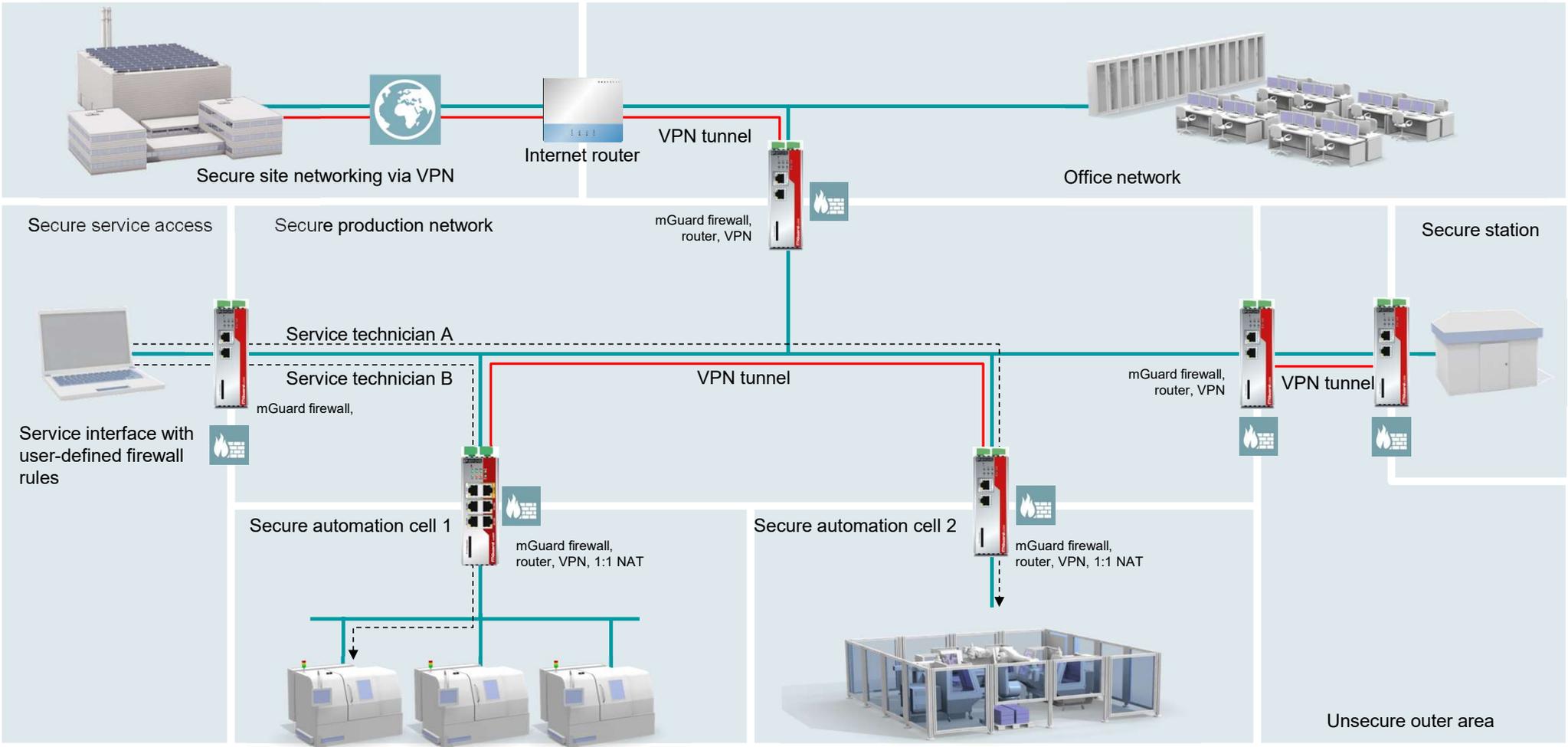


# Remote Service



# Typical security issues







Ethernet



## CIFS Integrity Monitoring

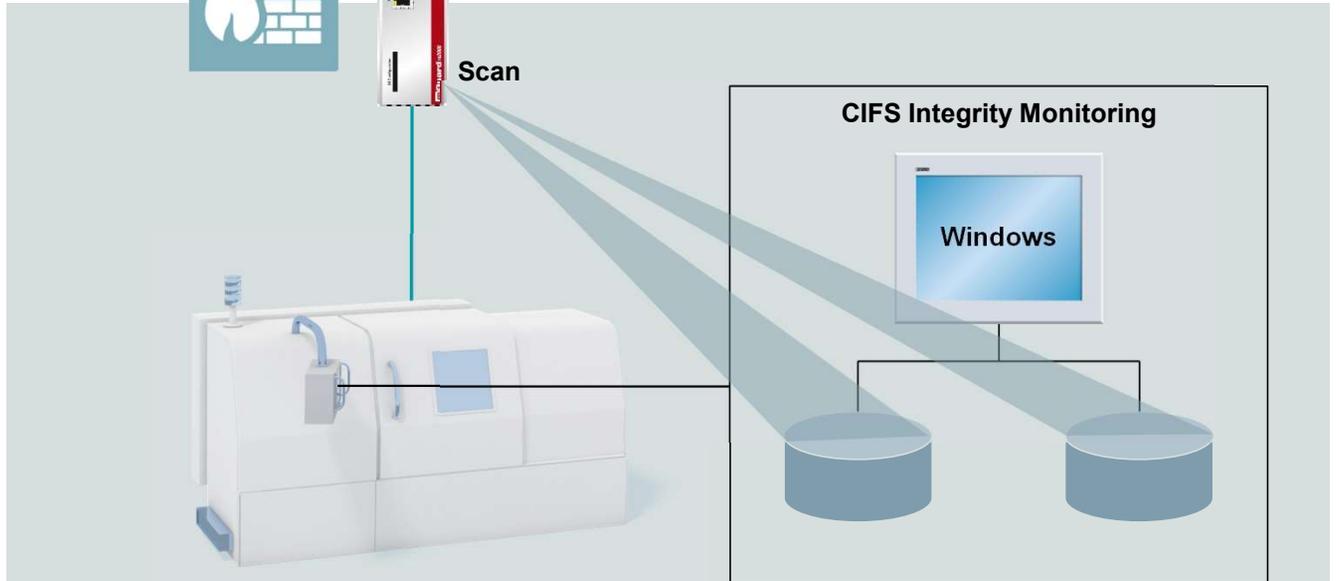
constantly monitors your file systems for unauthorized changes and alerts you if a change is detected



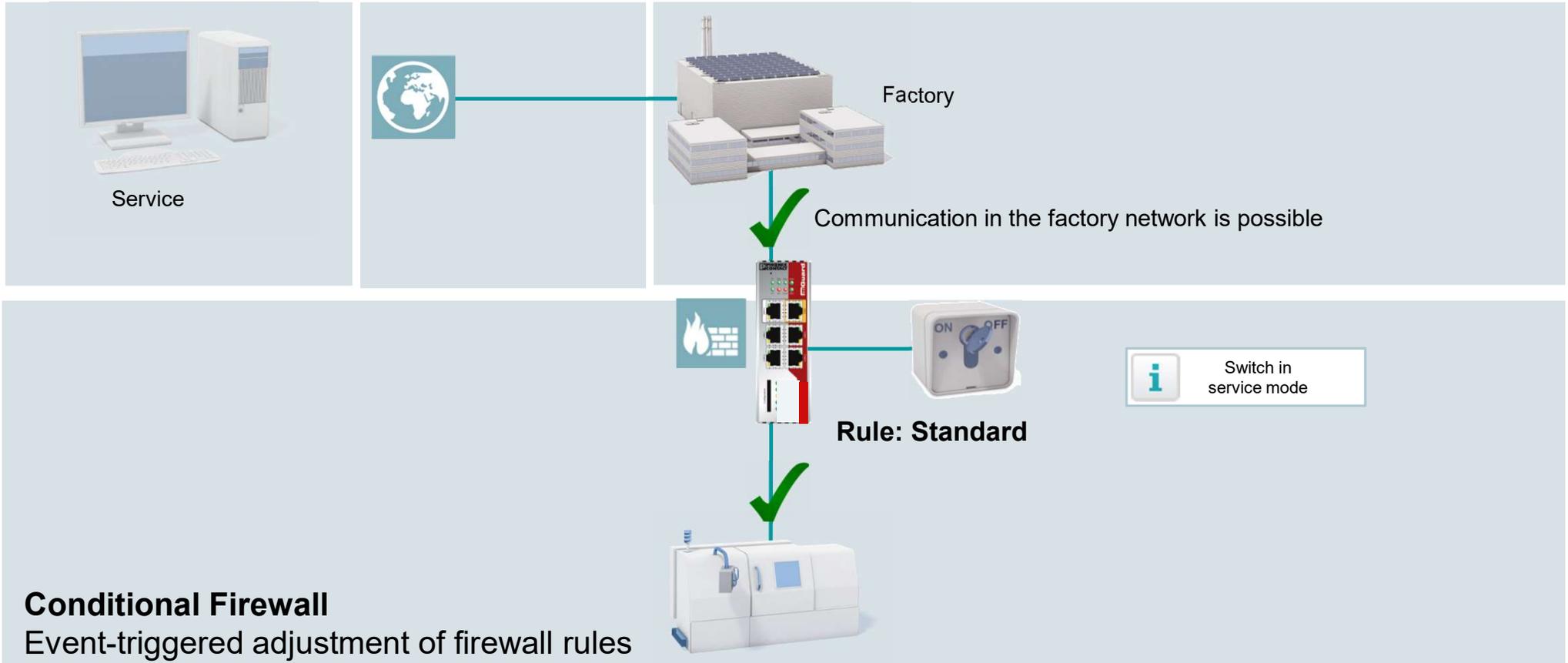
Firewall  
CIFS Integrity Monitoring



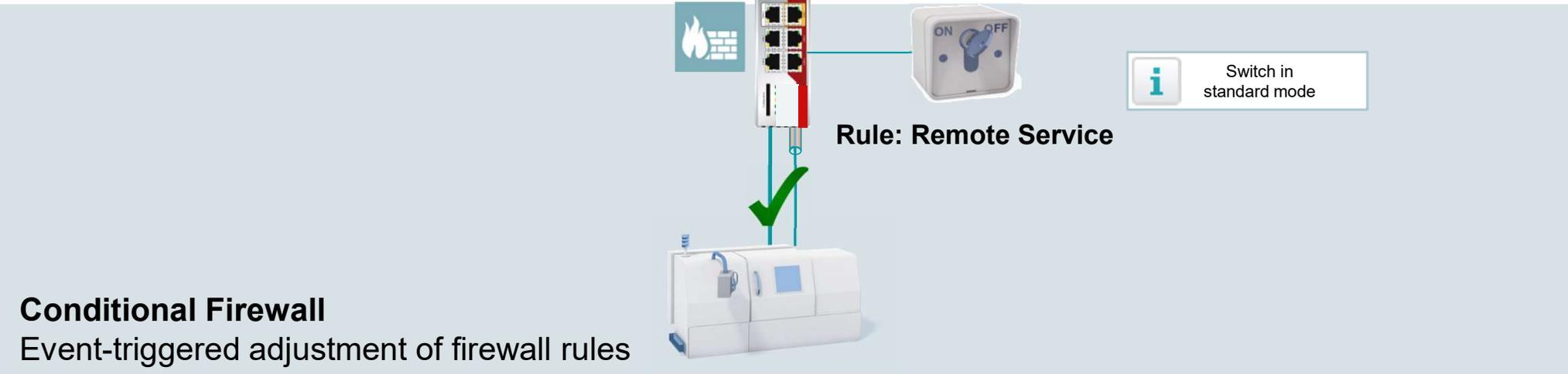
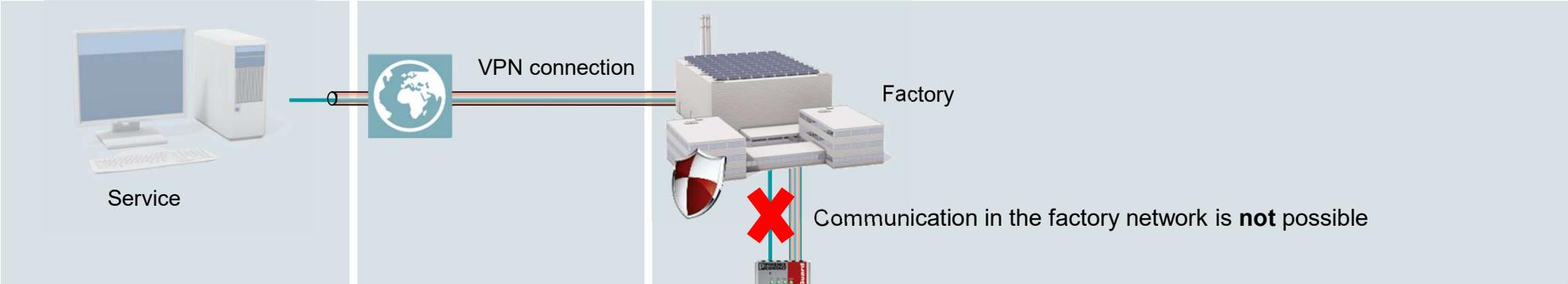
Scan



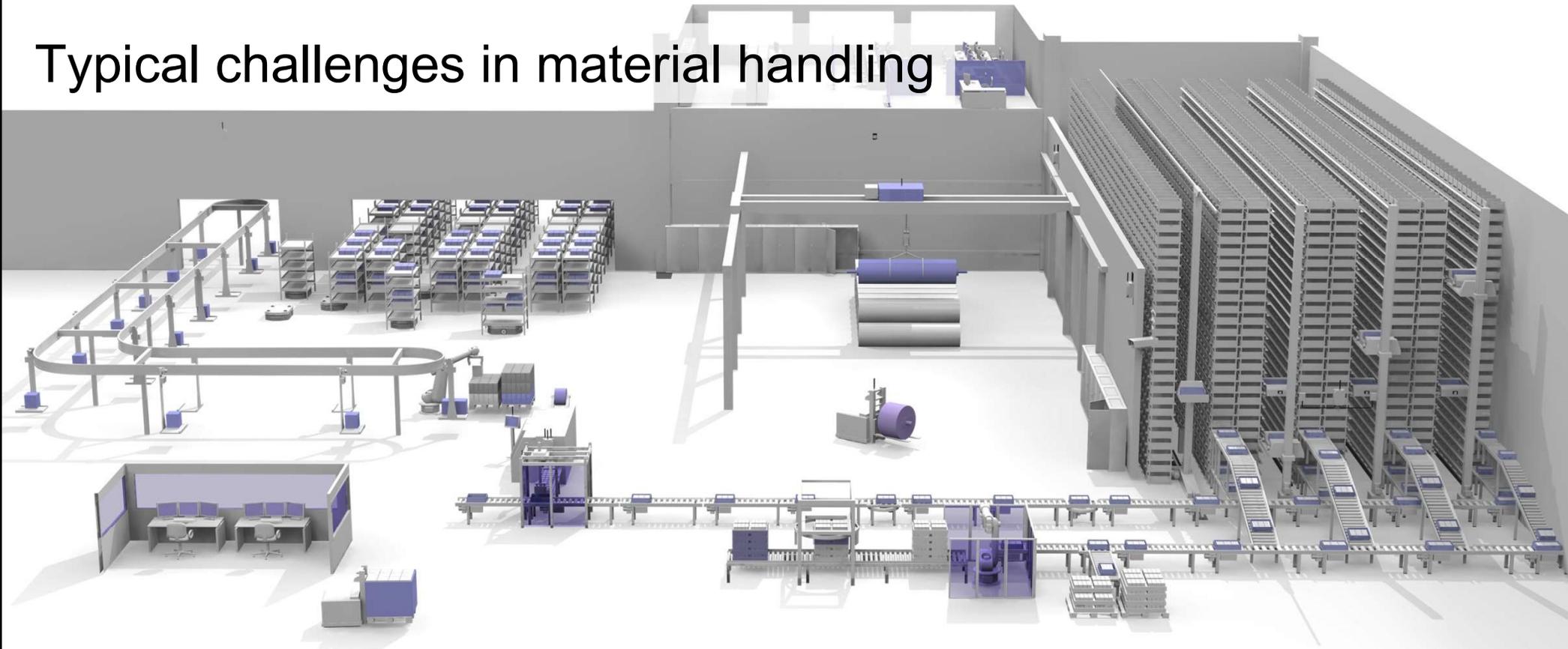
# Prevention of unauthorized access



# Prevention of unauthorized access



# Typical challenges in material handling



Automated guided vehicle



Typical WLAN network structure



Electric monorail conveyor



Moving parts

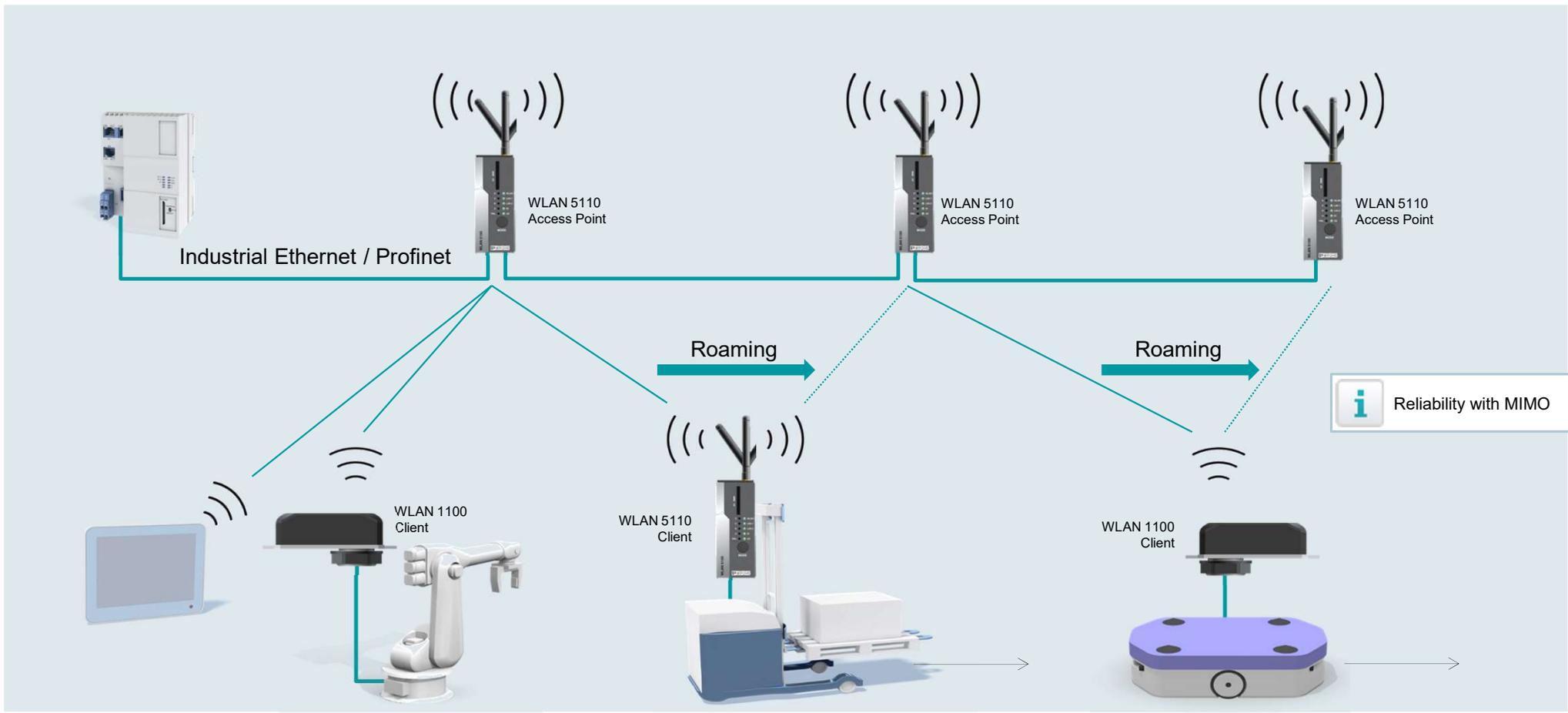


Automatic shuttle warehouse

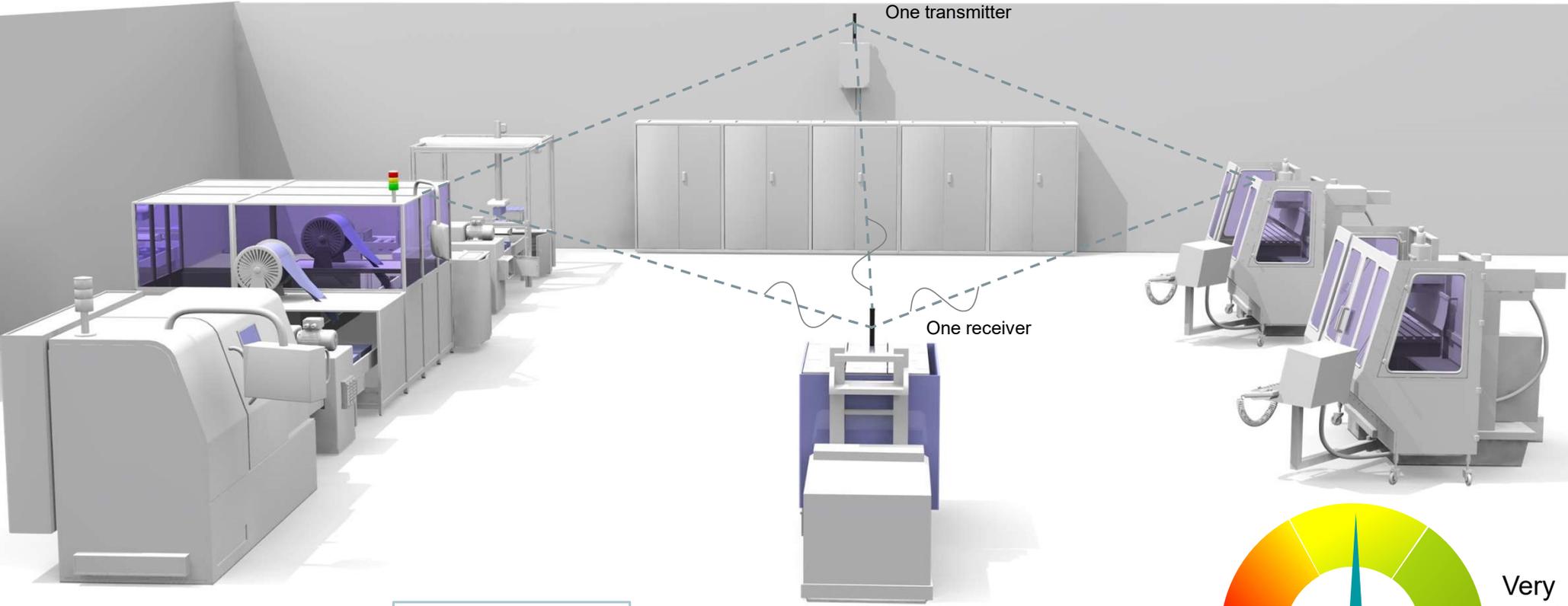


Wireless for cranes





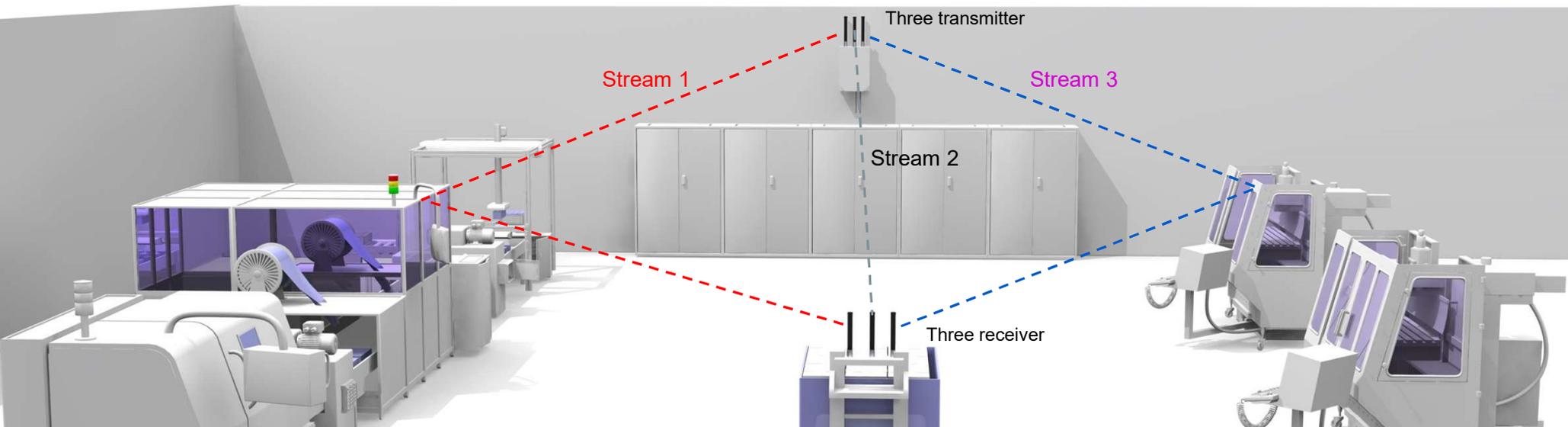
# Standard antenna technology



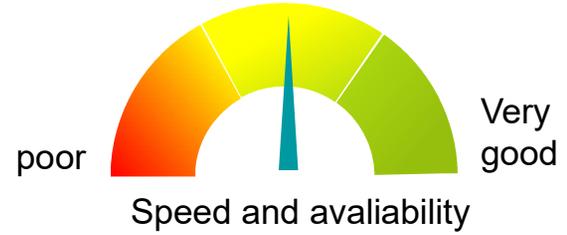
 With MIMO



# MIMO antenna technology



- With MIMO**
- More speed
  - More reliability
  - More distance
  - Better coverage





Industrial Ethernet / Profinet



WLAN 5110  
Access Point

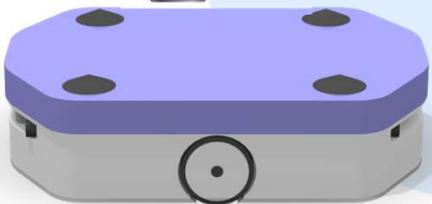


WLAN 5110  
Access Point



WLAN 5110  
Access Point

Client

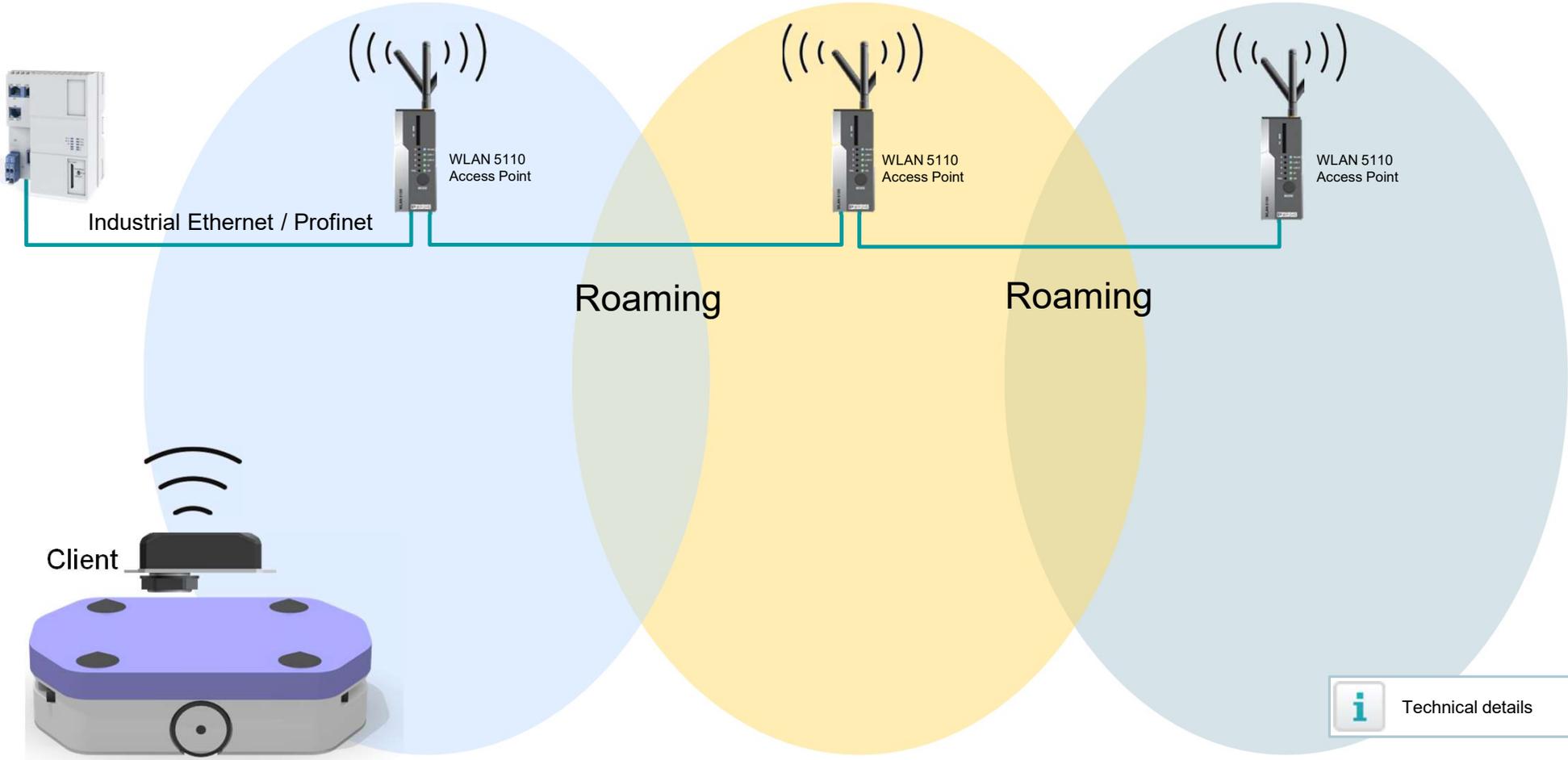


Start moving



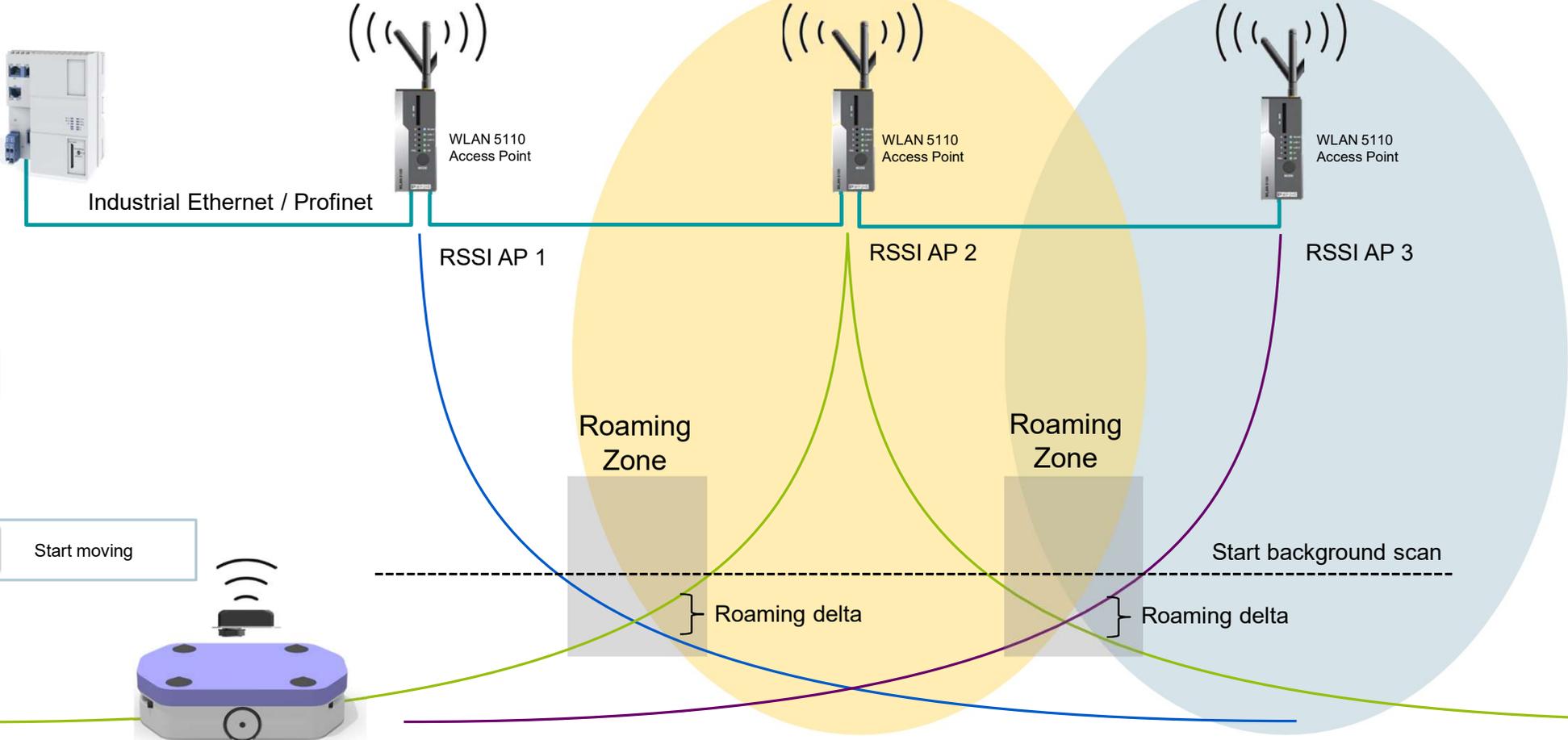
**PHOENIX  
CONTACT**  
INSPIRING INNOVATIONS



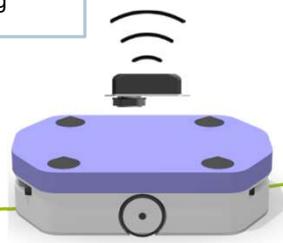


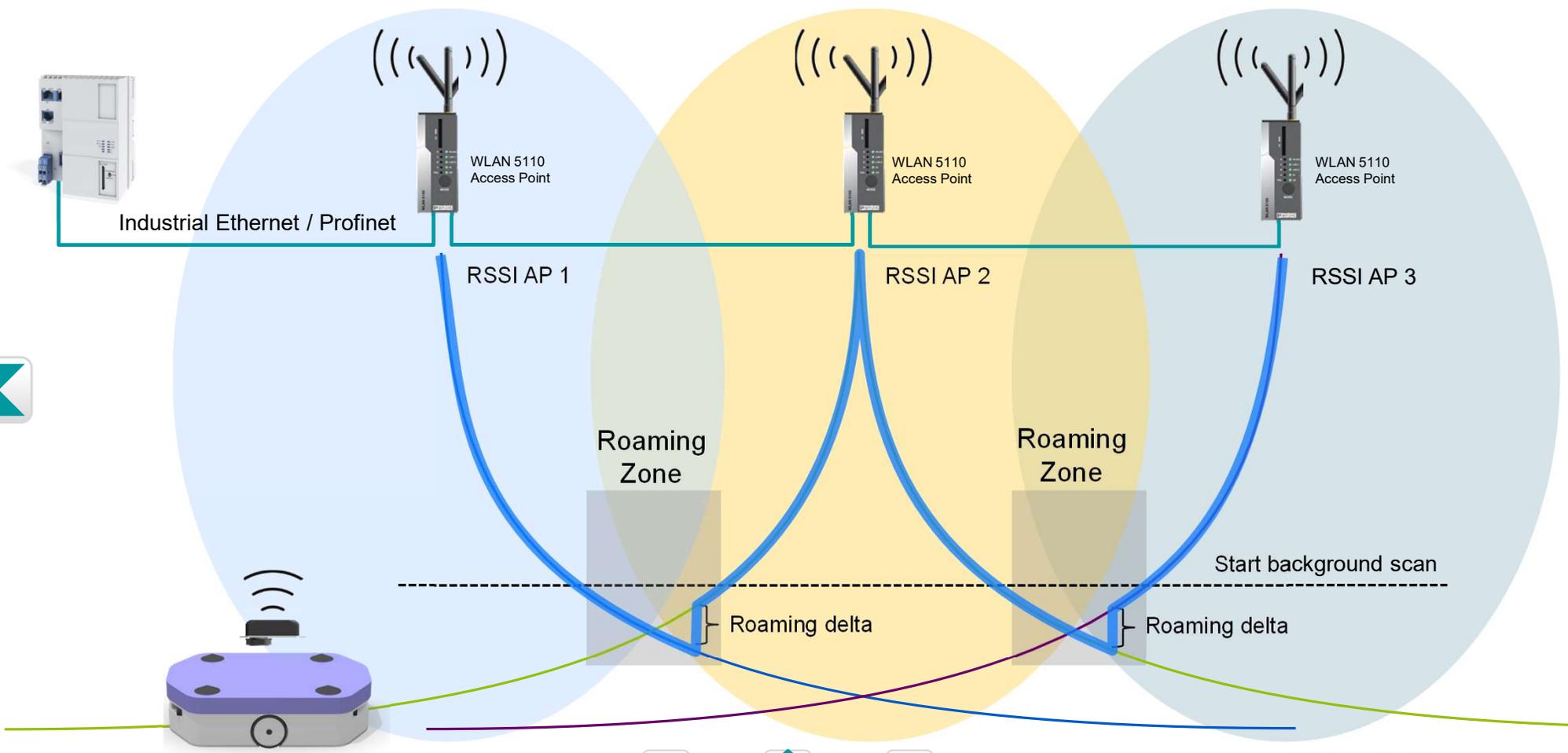
 Technical details

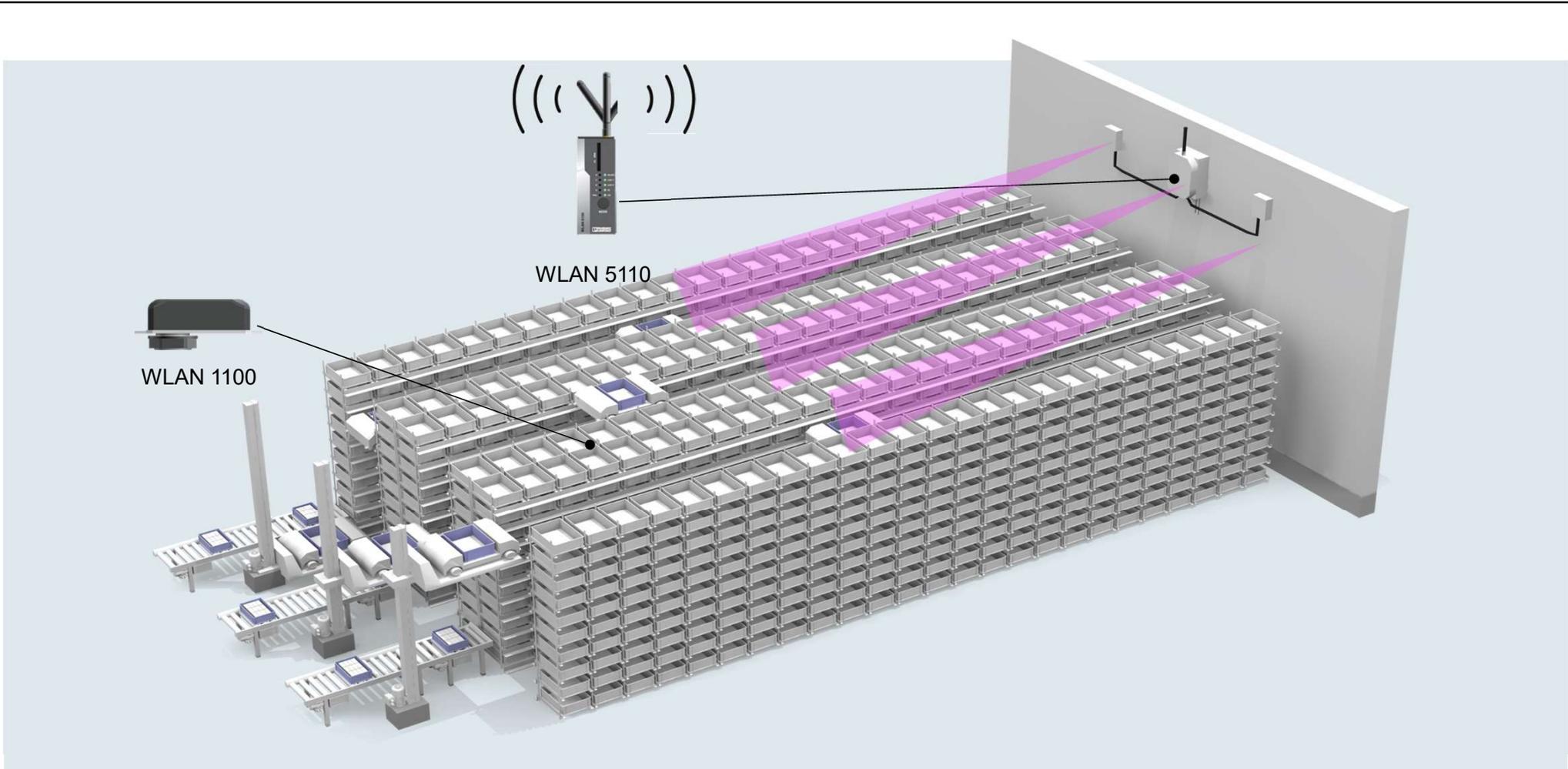




**i** Start moving







WLAN 5110



WLAN 1100



**PHOENIX CONTACT**

INSPIRING INNOVATIONS



Access Point



Controller

Ethernet

PROFINET

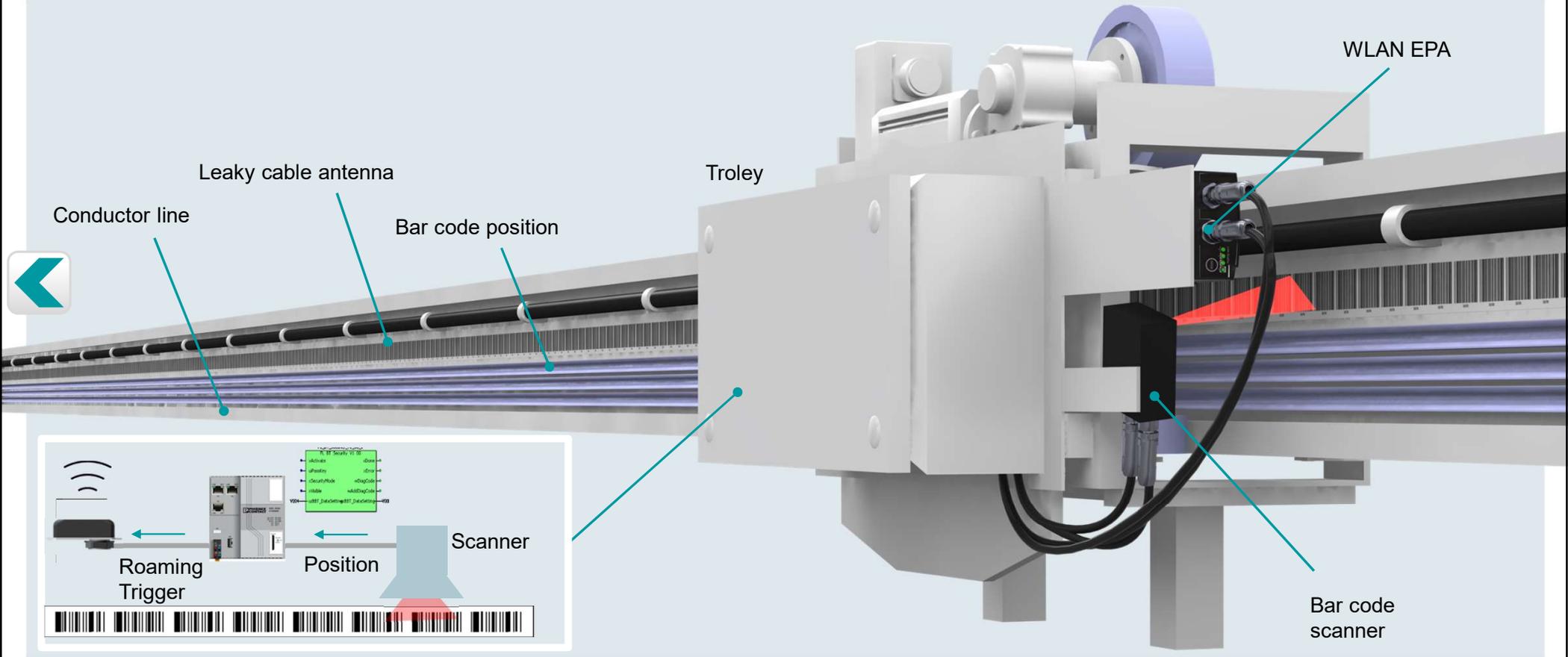
Wireless LAN

Leaky cable antenna



**PHOENIX CONTACT**  
INSPIRING INNOVATIONS

# Controlled roaming depending on position





Controller

Ethernet / PROFINET



Access Point

Bluetooth



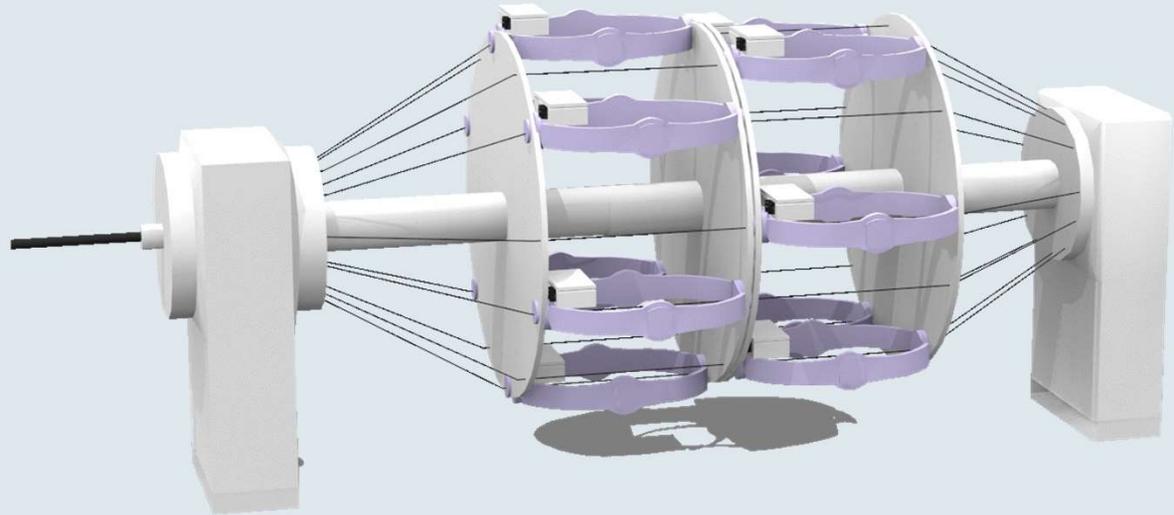
Client



Client



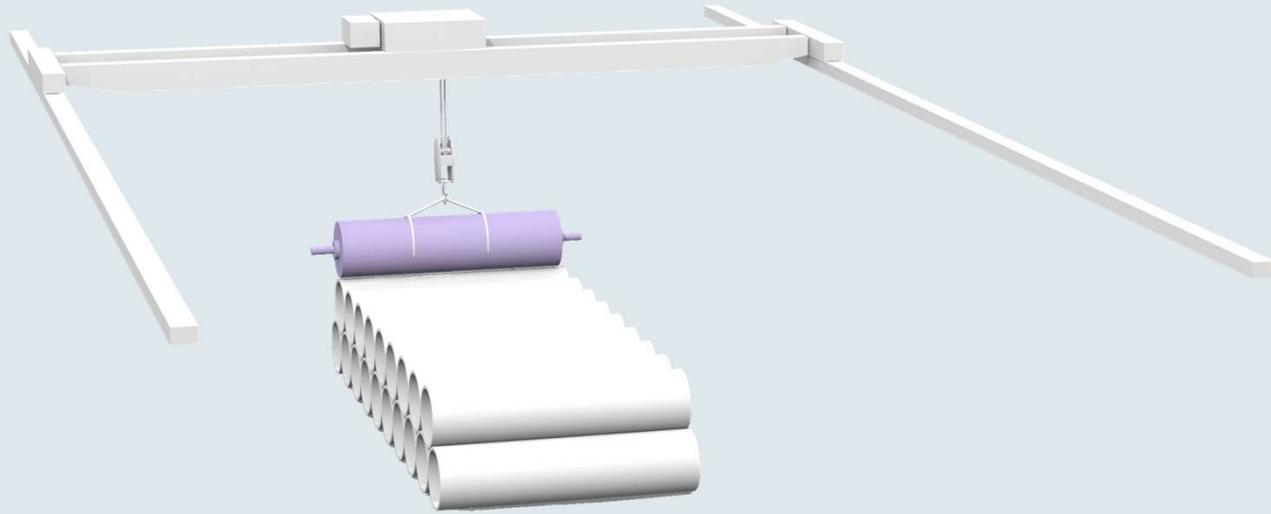
Client





Controller

Ethernet / PROFINET



Client



Bluetooth

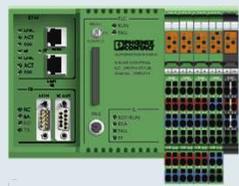


Client



PROFIsafe / SafetyBridge





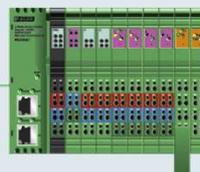
Controller



Bluetooth Access Point



Scraper bridge



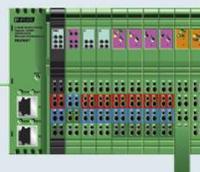
Bus coupler



Motor starter



Drive motor



Bus coupler



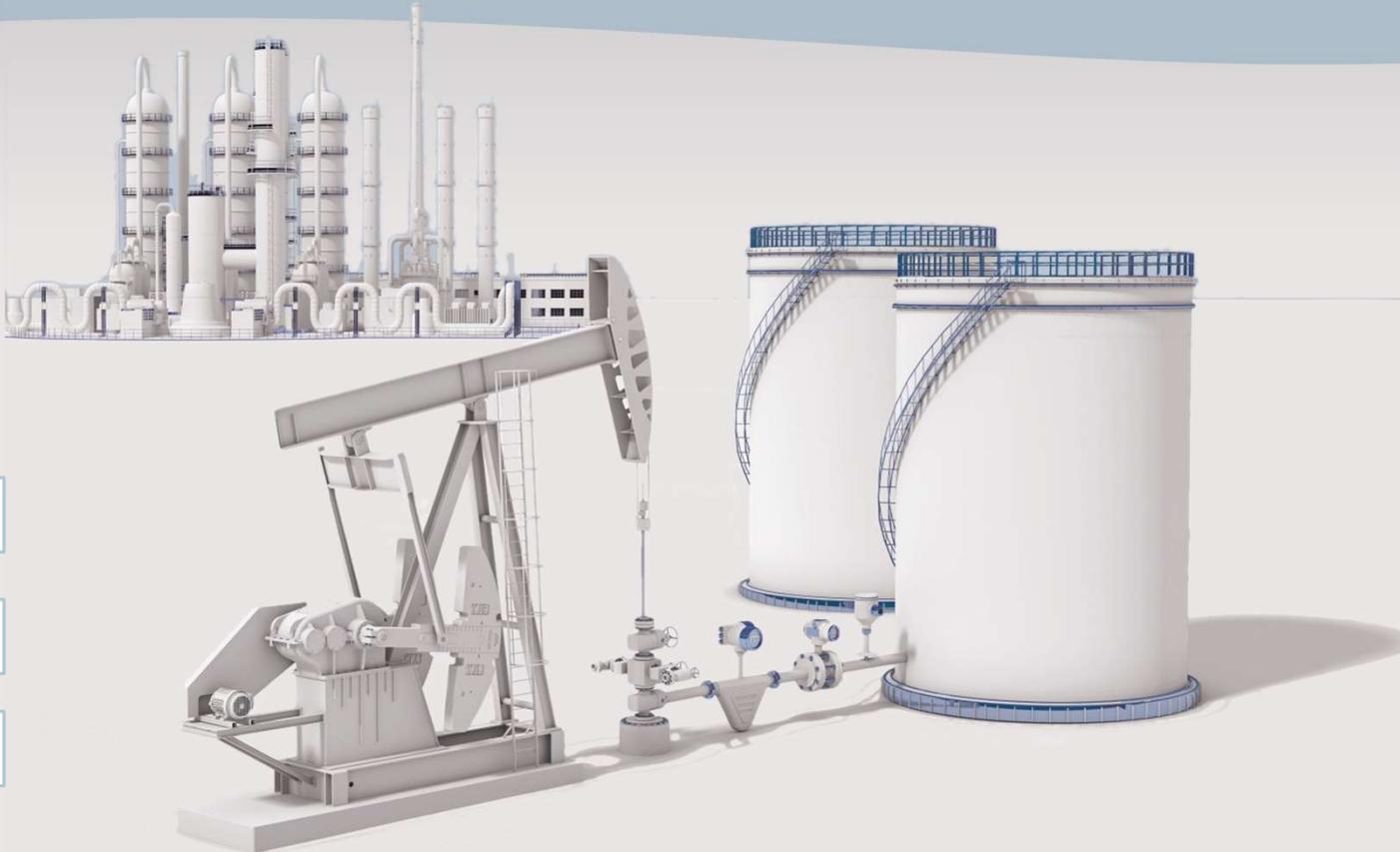
Motor starter



Drive motor



# Process Industry



**i** Network security

**i** Remote communication

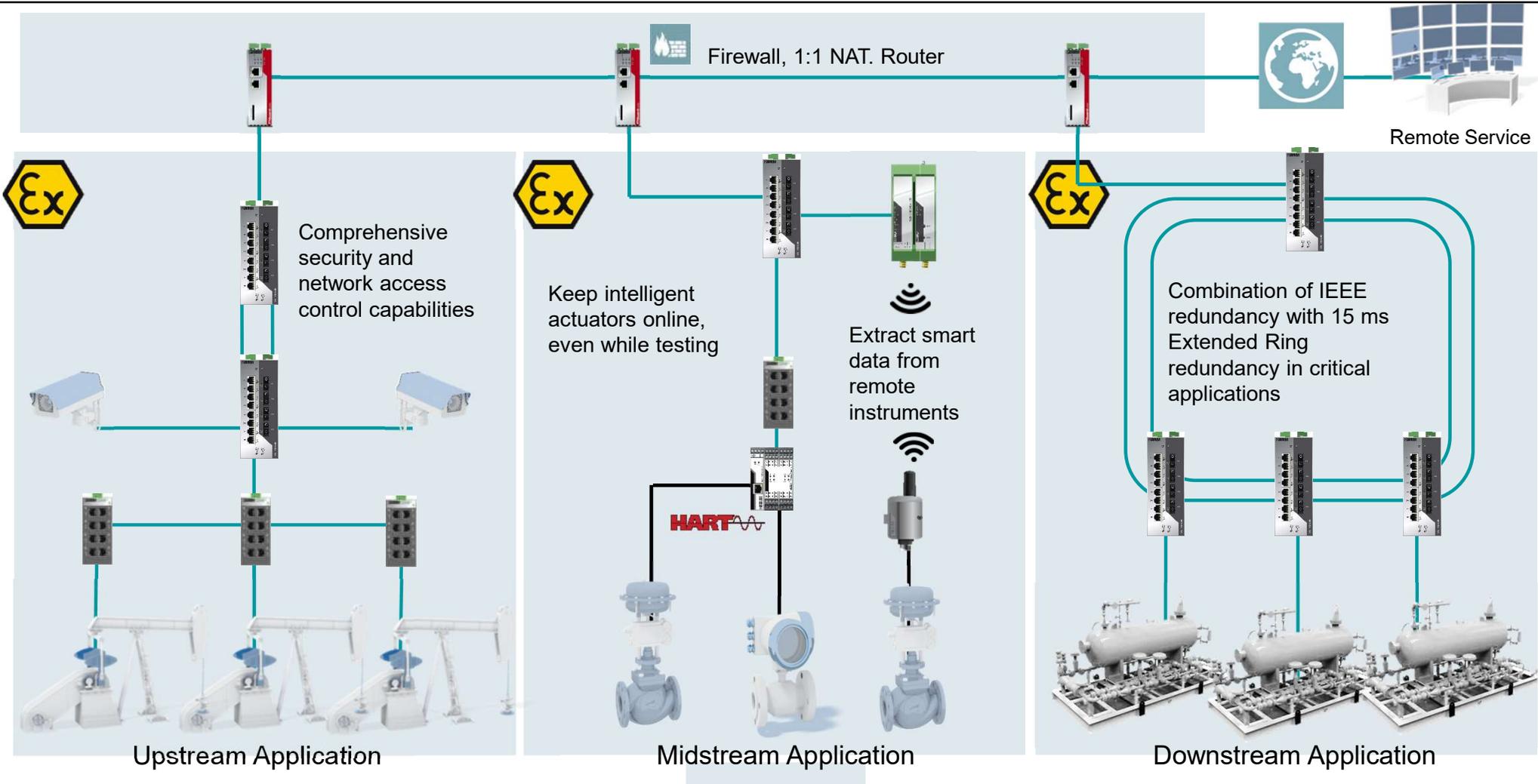
**i** Typical network structure

**i** Availability

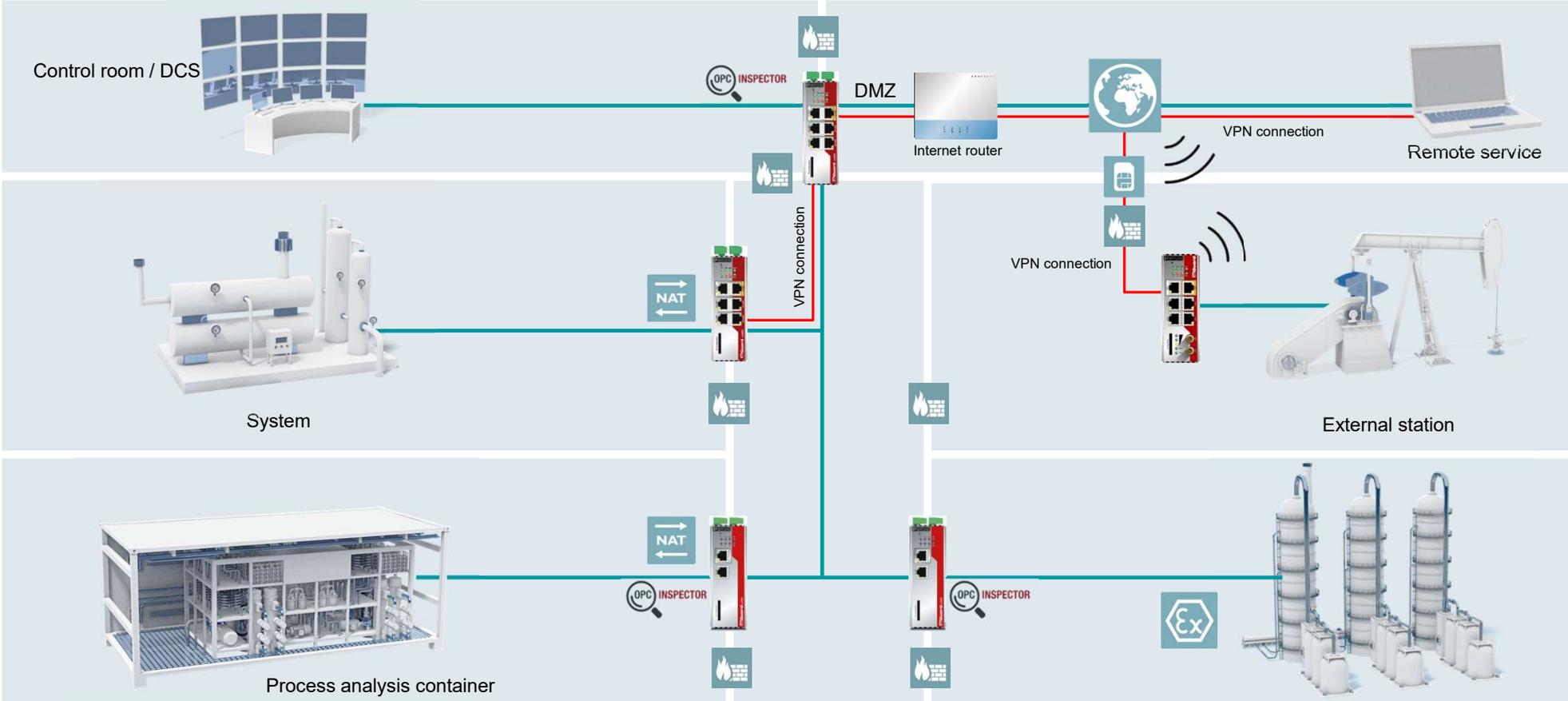
**i** Secure OPC connection

**i** Station integration





# Secure network structure



# Availability



 Cable or firewall failure



# Availability



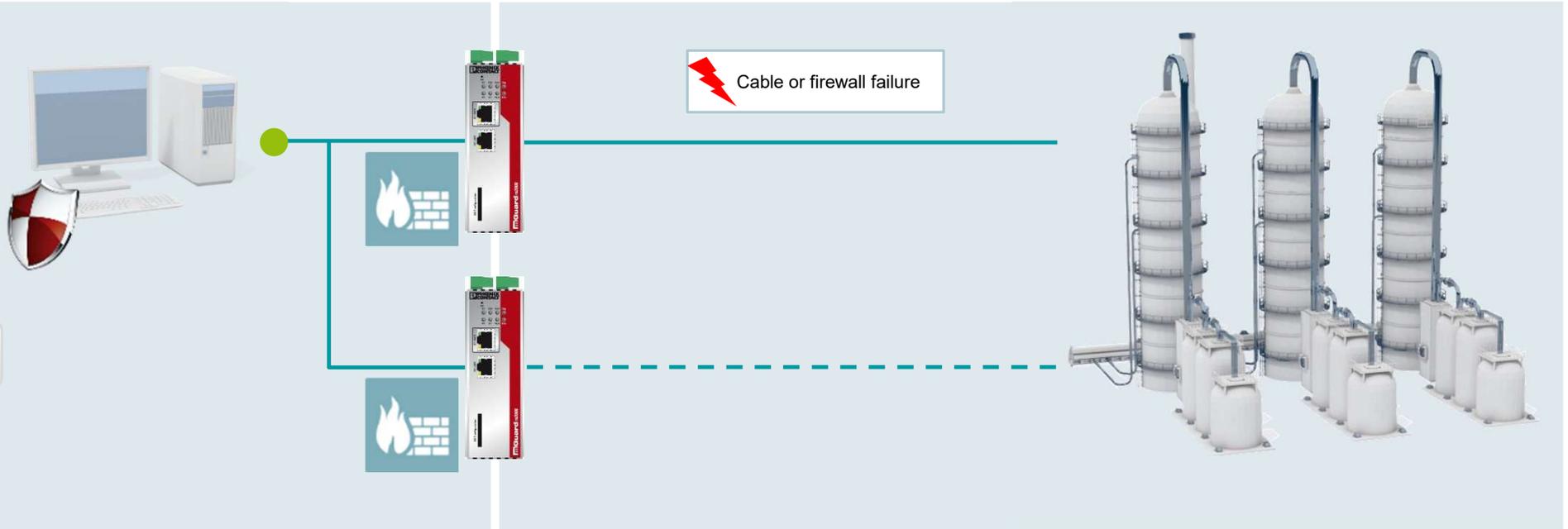
Cable break or failure of the firewall



Solution



# Availability

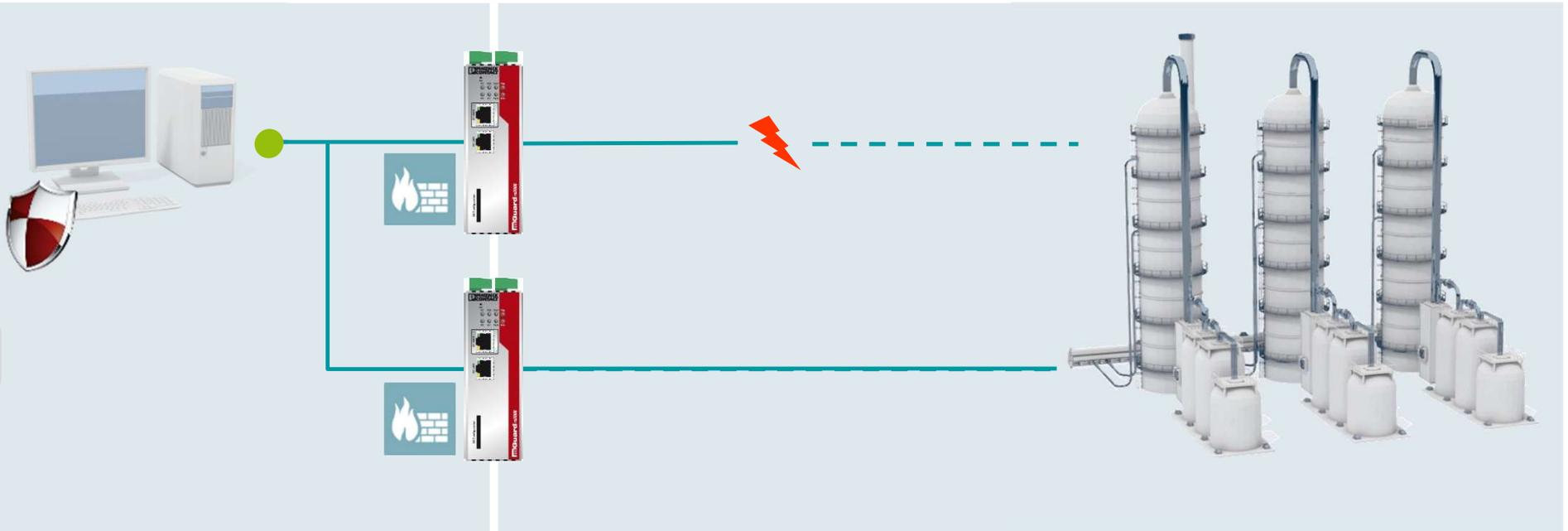


## Redundant firewall

for increased security and availability: Use an additional FL MGuard as a redundant firewall without having to configure a second default gateway.



# Availability

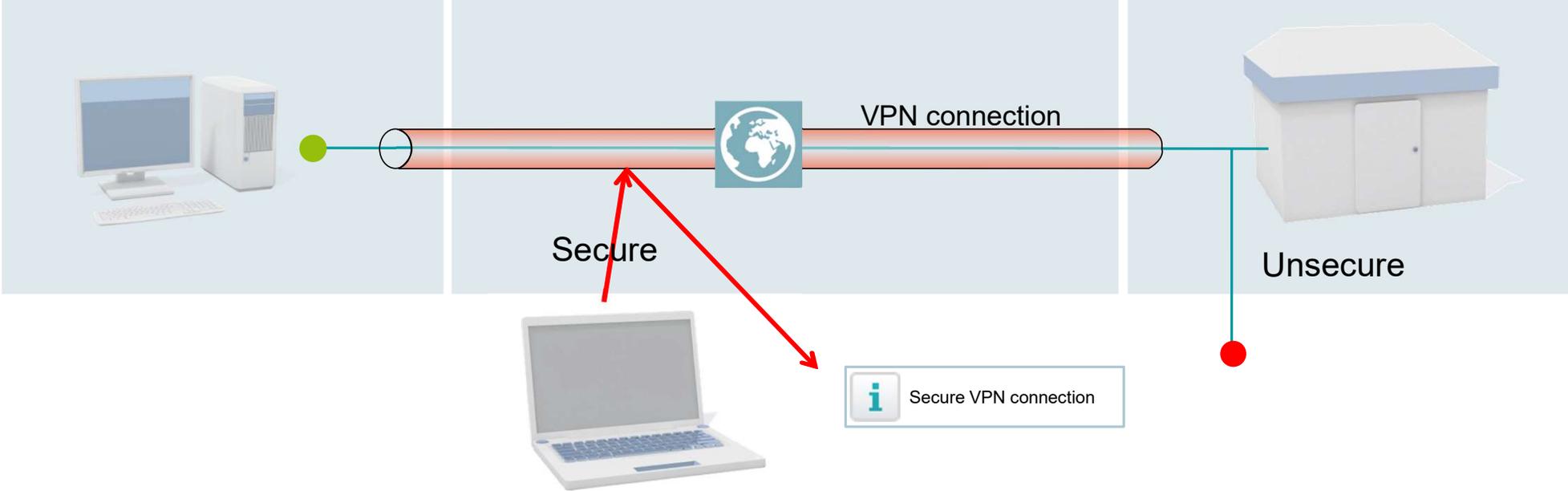


## Redundant firewall

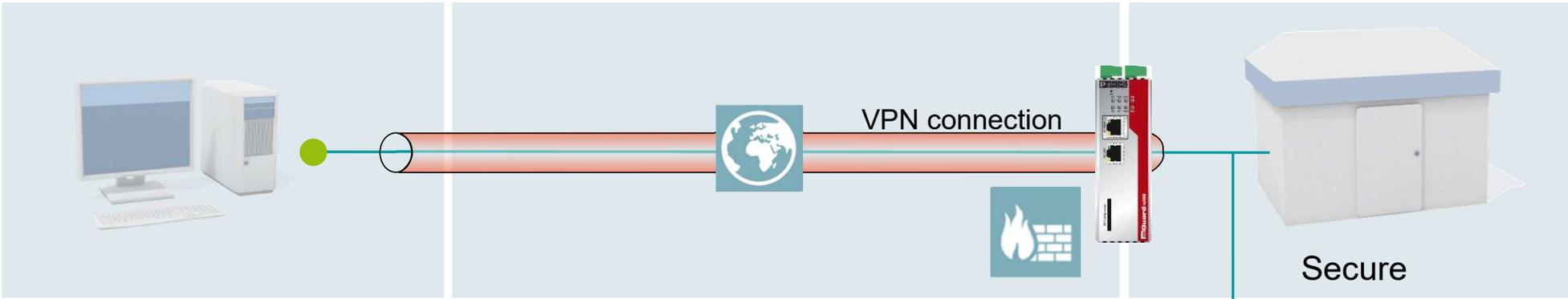
for increased security and availability: Use an additional FL MGUARD as a redundant firewall without having to configure a second default gateway.



# Secure remote communication



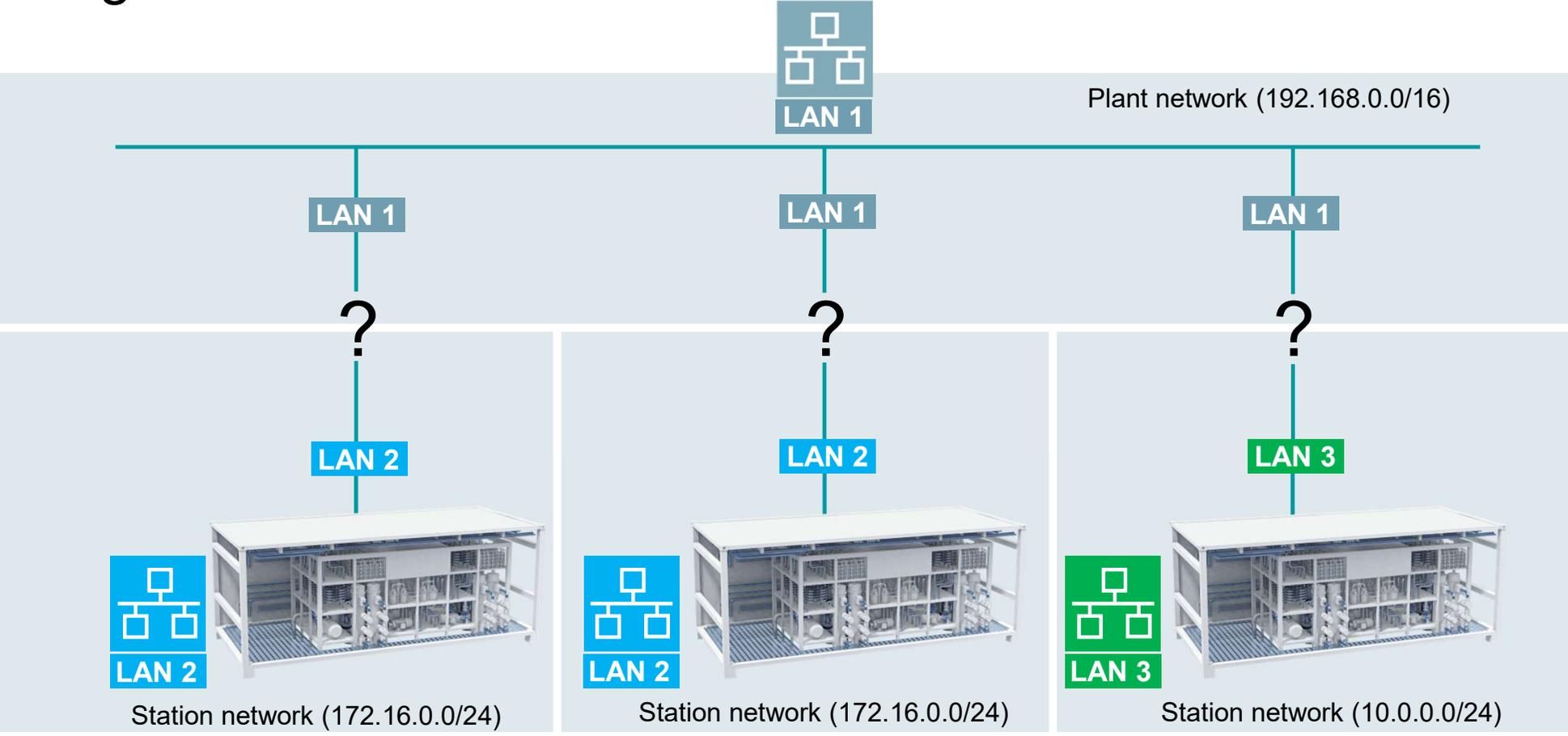
# mGuard firewall secures VPN connections



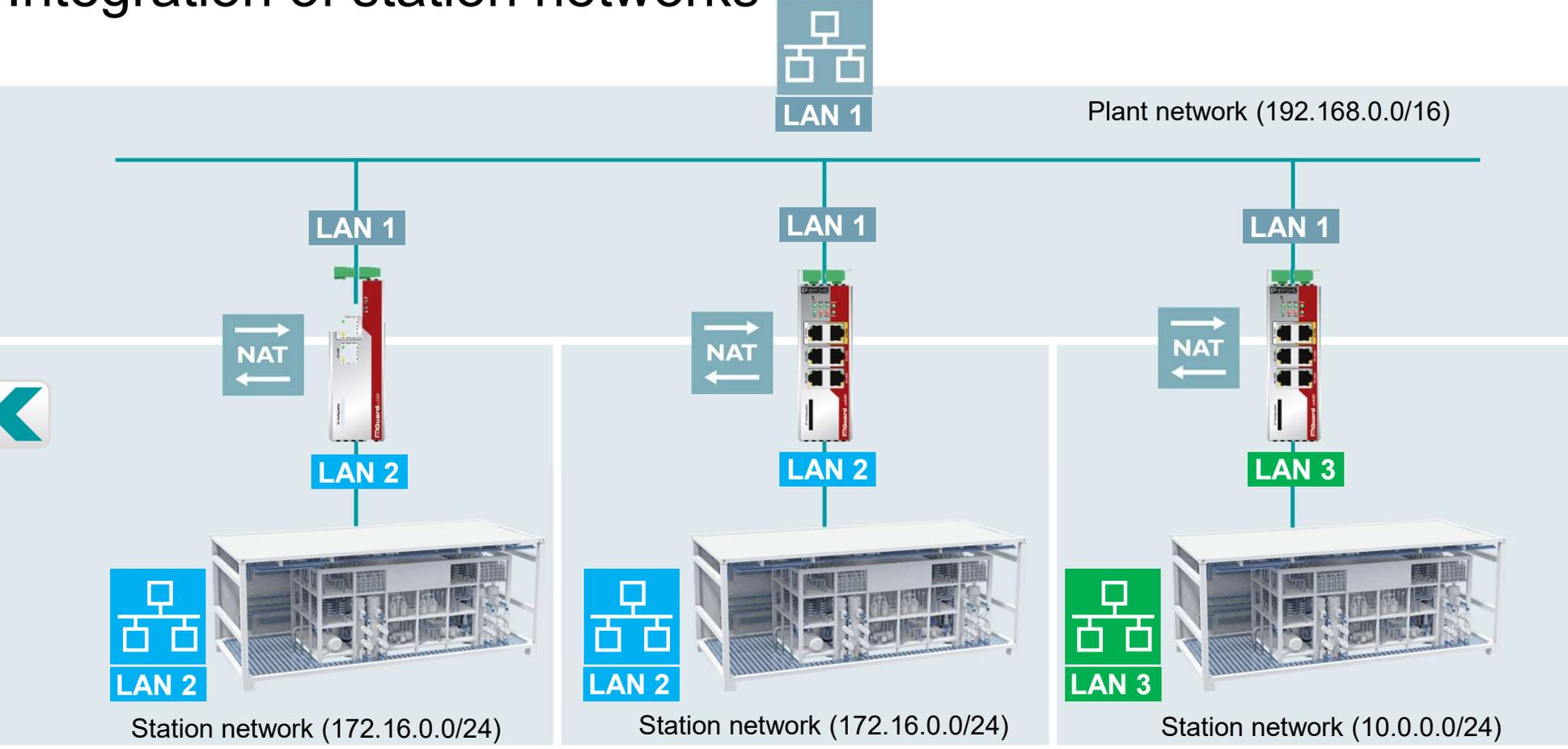
**mGuard firewall secures VPN connections**  
protects both communicating parties if one of them is attacked



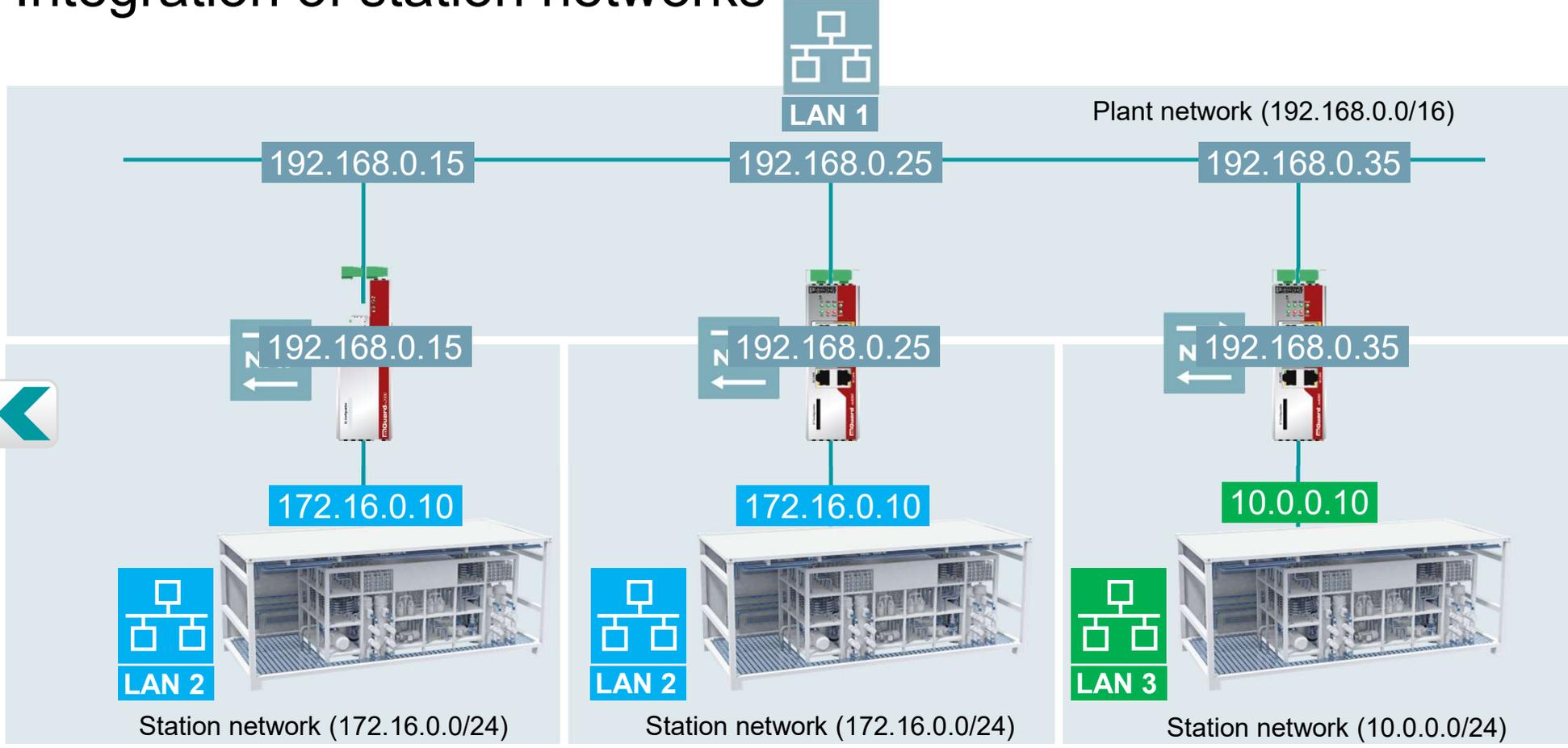
# Integration of station networks



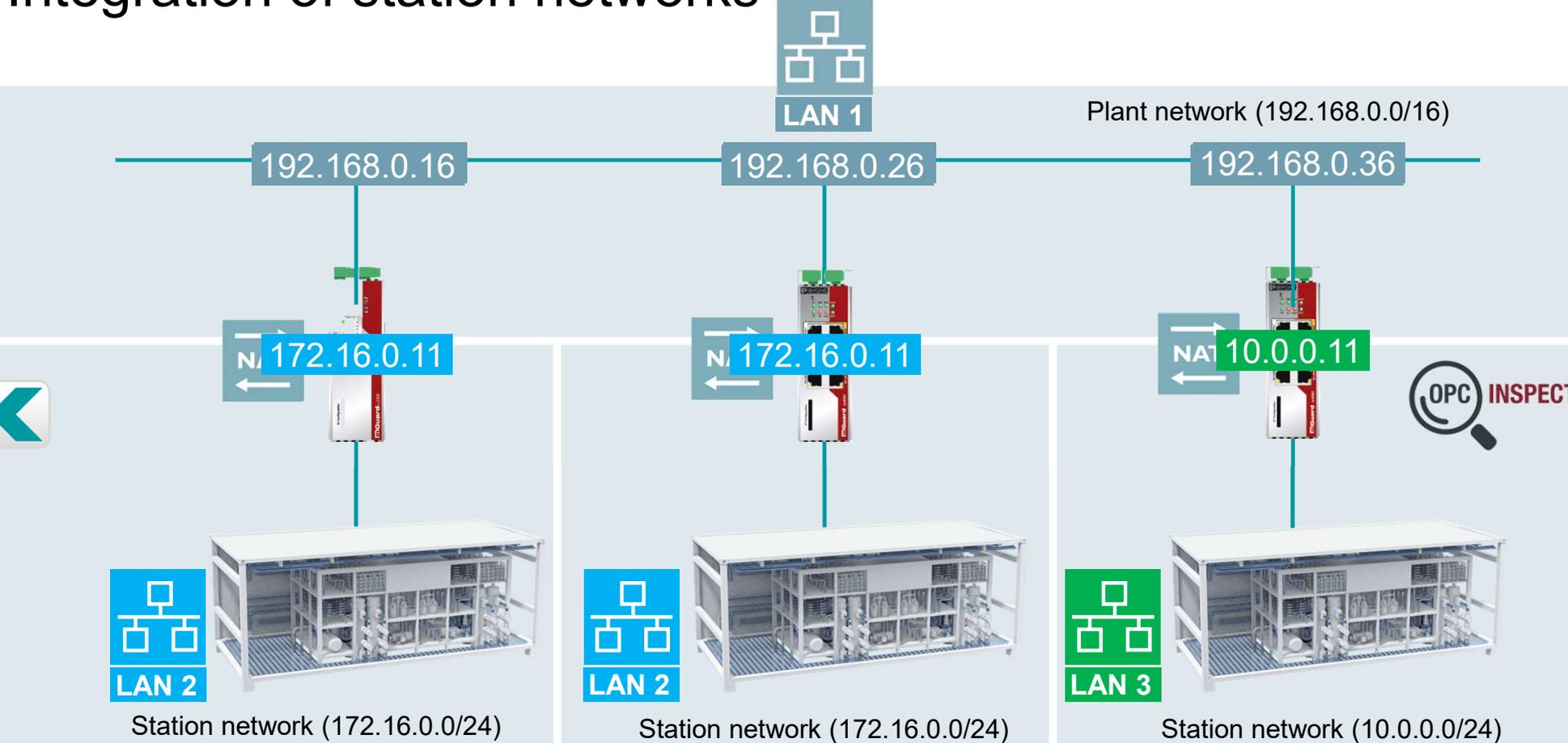
# Integration of station networks



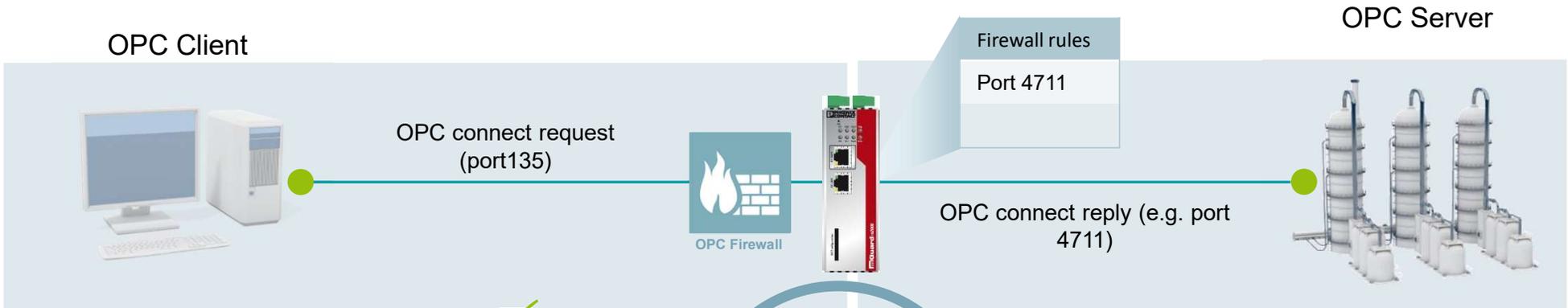
# Integration of station networks



# Integration of station networks



# Secure OPC connection



Authorized connection, valid OPC request

Header OPC Port 4711

Valid OPC response use port 4711 for OPC traffic



**OPC INSPECTOR**

## OPC Inspector with Deep Packet Inspection

- analyzes the OPC frame and automatically adjusts the used ports
- Intelligent Deep Packet Inspection allows masquerading and 1:1 NAT for OPC (OLE for Process Control)



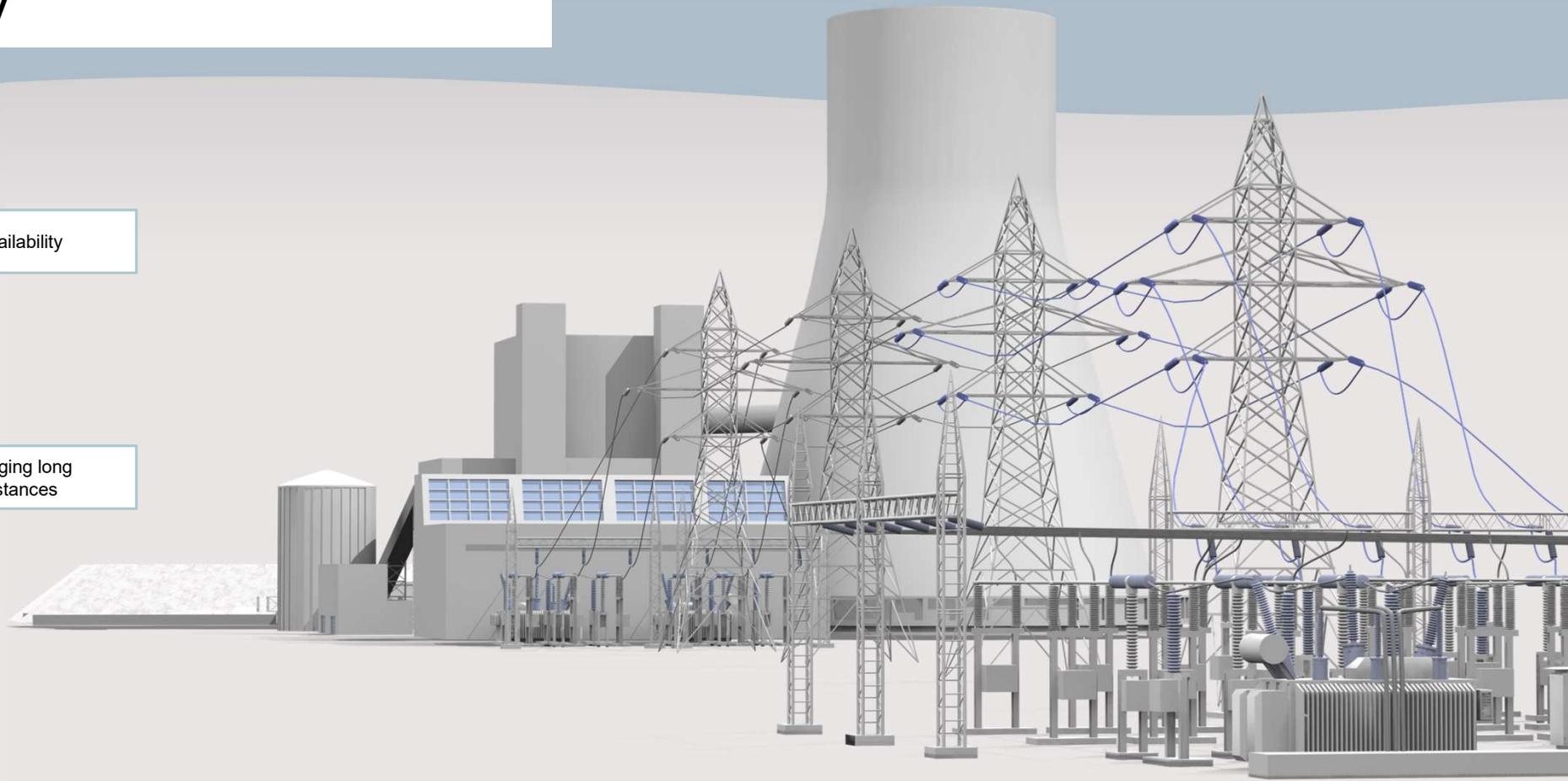
# Energy



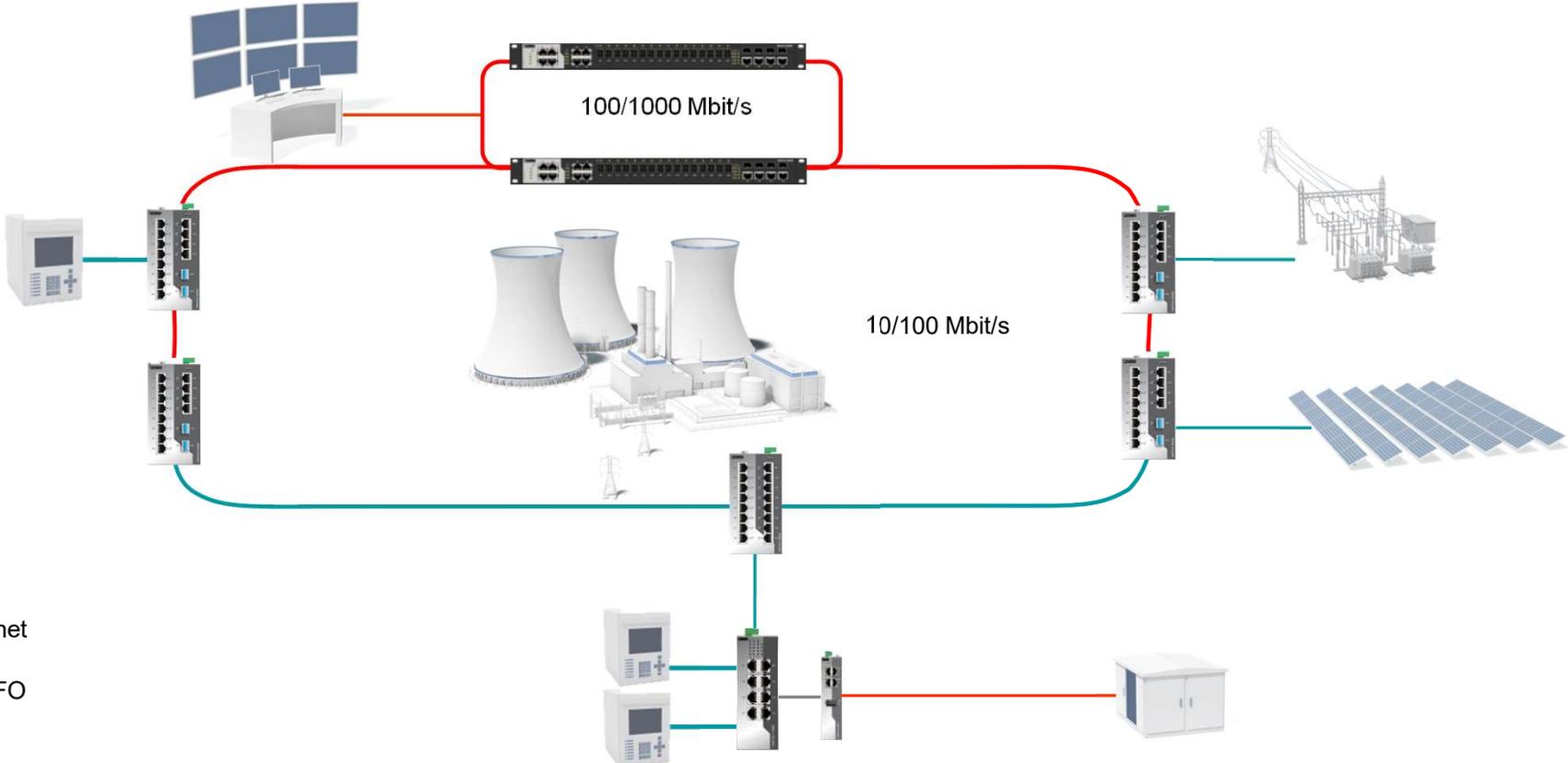
Availability



Bridging long distances



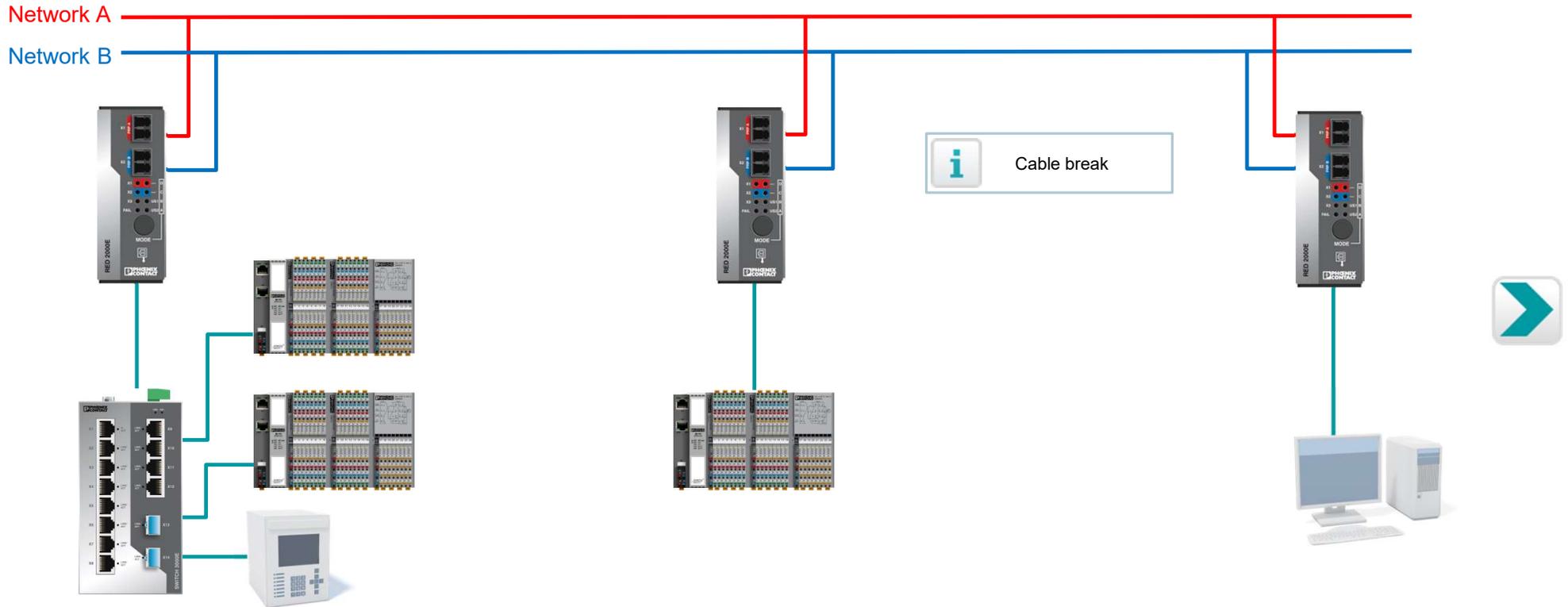
# Bridging long distances



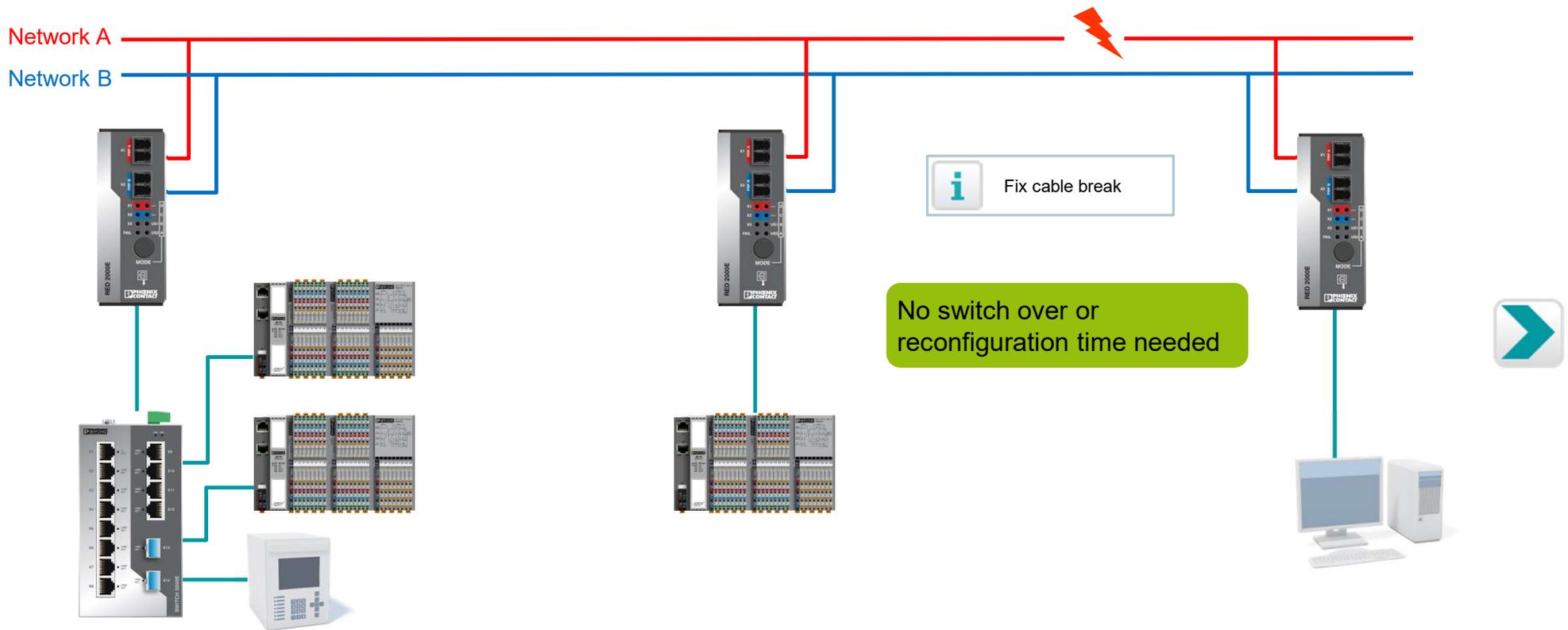
— Ethernet  
— LWL/FO



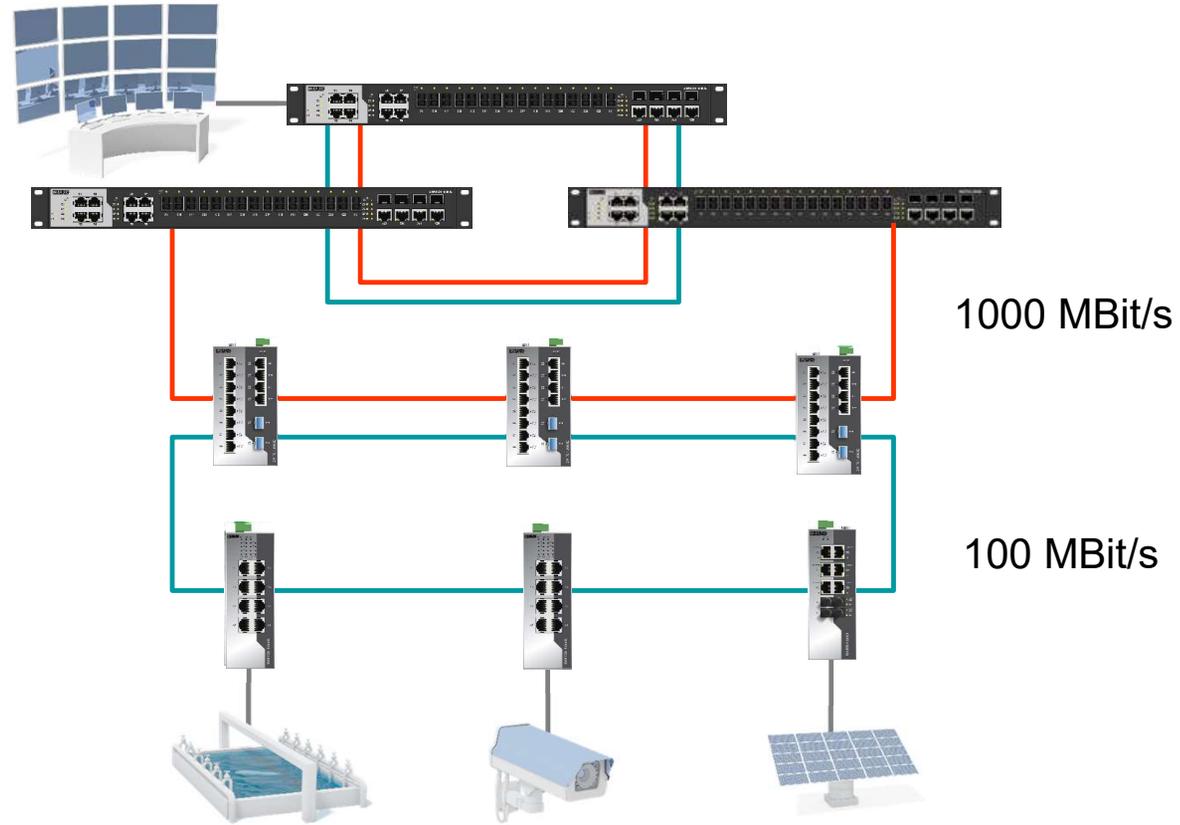
# Availability through Parallel Redundancy Protocol

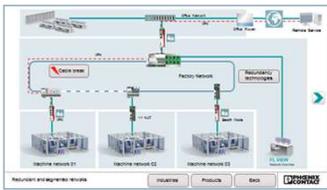


# Availability through Parallel Redundancy Protocol

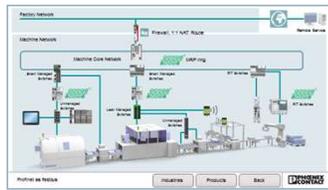


# Availability through Extended Ring Redundancy





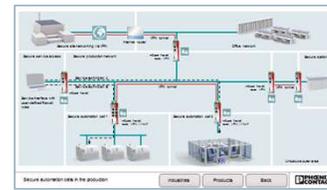
Redundancy



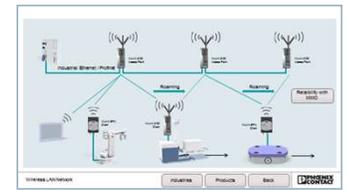
Profinet network



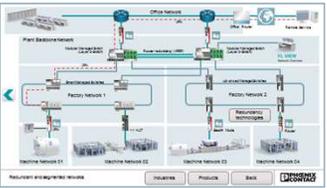
Ethernet/IP network



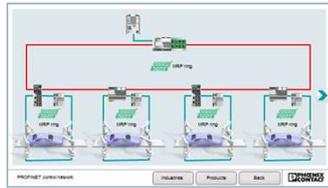
Secure network



WLAN network



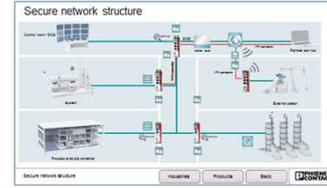
Factory network



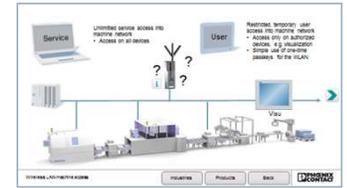
Profinet ring



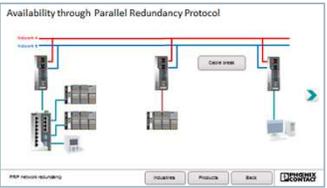
EtherNet/IP ring



Secure process network



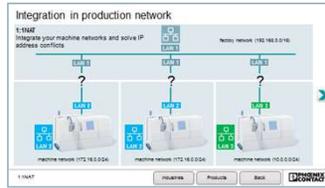
WLAN Access for machine



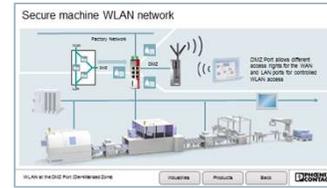
PRP redundancy

IP Address	MAC Address	Priority	Group	State	Role	Active
192.168.1.1	08:00:27:00:00:01	1	1	UP	Master	Yes
192.168.1.2	08:00:27:00:00:02	2	1	UP	Backup	No
192.168.1.3	08:00:27:00:00:03	3	2	UP	Master	Yes
192.168.1.4	08:00:27:00:00:04	4	2	UP	Backup	No

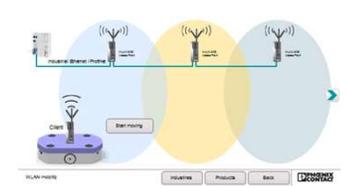
Redundancy overview



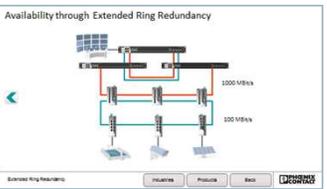
1:1 NAT



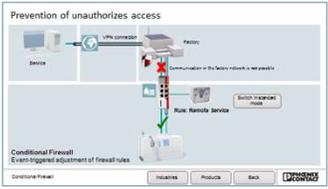
DMZ Port



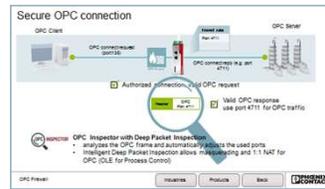
WLAN roaming



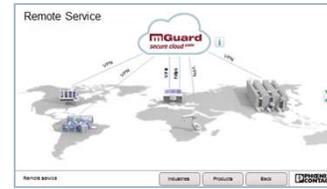
Infrastructure network



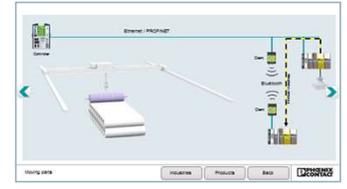
Conditional Firewall



OPC Firewall



Remote service



Safety over Bluetooth



# Our product portfolio



Managed Switches



Cyber Security



Power over Ethernet



Serial Device Server, Gateways



Unmanaged Switches



Remote communication



Network installation



Timeserver



Wireless Ethernet



Media conversion



Software



Video surveillance



# Our product portfolio



Managed Switches



Cyber Security



Power over Ethernet



Unmanaged Switches



Remote communication



Network installation



Wireless Ethernet



Media conversion



Software

-  Switch 2000
-  Switch 3000/4000
-  Switch 7000
-  Profinet IRT
-  Modular Managed
-  NAT-Switches



 Automation protocols



# Our product portfolio

 <p>Managed Switches</p>	 <p>Cyber Security</p>	 <p>Power over Ethernet</p>
 <p>Unmanaged Switches</p>	 <p>Remote communication</p>	 <p>Network installation</p>
 <p>Wireless Ethernet</p>	 <p>Media conversion</p>	 <p>Software</p>

-  Mounting rail devices and PCI cards
-  mGuard 1100
-  Other designs
-  Extended functionalities
-  Central management software

 Automation protocols



# Our product portfolio

 <p>Managed Switches</p>	 <p>Cyber Security</p>	 <p>Power over Ethernet</p>
 <p>Unmanaged Switches</p>	 <p>Remote communication</p>	 <p>Network installation</p>
 <p>Wireless Ethernet</p>	 <p>Media conversion</p>	 <p>Software</p>

-  PoE Injectors
-  PoE Switches
-  PoE Splitters

 Automation protocols



# Our product portfolio

 <p>Managed Switches</p>	 <p>Cyber Security</p>	 <p>Power over Ethernet</p>
 <p>Unmanaged Switches</p>	 <p>Remote communication</p>	 <p>Network installation</p>
 <p>Wireless Ethernet</p>	 <p>Media conversion</p>	 <p>Software</p>

-  Switch 1000
-  Switch SFNT
-  Switch 1800 & 1900
-  Switch 1605

 Automation protocols



# Our product portfolio

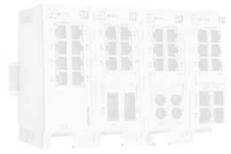
 <p>Managed Switches</p>	 <p>Cyber Security</p>	 <p>Power over Ethernet</p>
 <p>Unmanaged Switches</p>	 <p>Remote communication</p>	 <p>Network installation</p>
 <p>Wireless Ethernet</p>	 <p>Media conversion</p>	 <p>Software</p>

-  Secure remote control
-  Remote control via cloud
-  Remote access via internet and mobile phone network
-  Extension of complex IP networks

 Automation protocols



# Our product portfolio

 <p>Managed Switches</p>	 <p>Cyber Security</p>	 <p>Power over Ethernet</p>
 <p>Unmanaged Switches</p>	 <p>Remote communication</p>	 <p>Network installation</p>
 <p>Wireless Ethernet</p>	 <p>Media conversion</p>	 <p>Software</p>

-  Copper-based network installation
-  Fiber optic-based network installation
-  Patch panels
-  PRP-redundancy modules
-  SFP modules
-  Memory media

 Automation protocols



# Our product portfolio

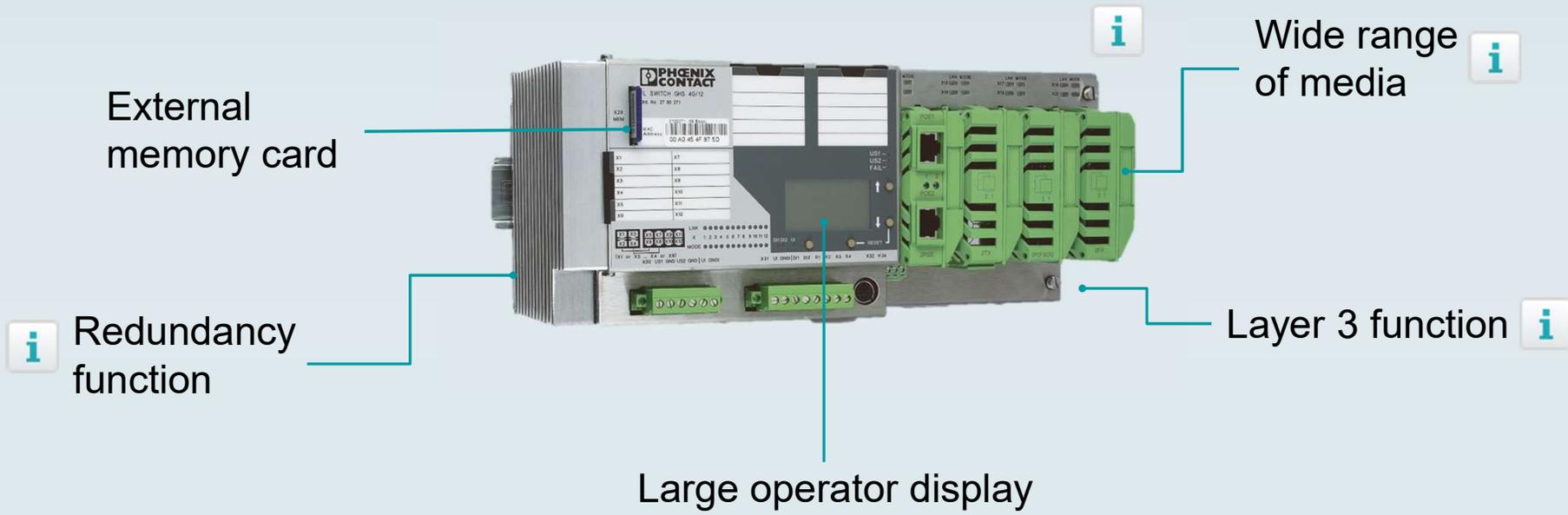
 <p>Managed Switches</p>	 <p>Cyber Security</p>	 <p>Power over Ethernet</p>
 <p>Unmanaged Switches</p>	 <p>Remote communication</p>	 <p>Network installation</p>
 <p>Wireless Ethernet</p>	 <p>Media conversion</p>	 <p>Software</p>

-  FL EPA
-  FL BLE 1300
-  FL WLAN 1100/2100
-  FL WLAN 5110
-  FL WLAN 1010/2010

 Automation protocols



# Modular Managed Switches



 Automation protocols



# Modular Managed Switches



Wide range of media

- Up to 12 integrated Gigabit ports
- 4 SFP Gigabit slots
- Different fiber optic connections (SC, ST, POF)
- Power over Ethernet



 Automation protocols



# Modular Managed Switches



Redundancy  
function

- Meshed structures with RSTP
- Media Redundancy protokoll (MRP) according to IEC 62439
- Large Tree Support
- Fast Ring Detection
- Router redundancy with VRRP

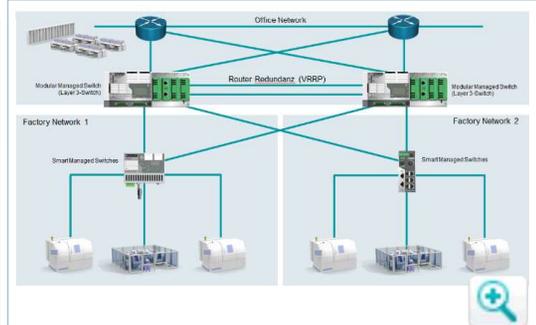


# Modular Managed Switches



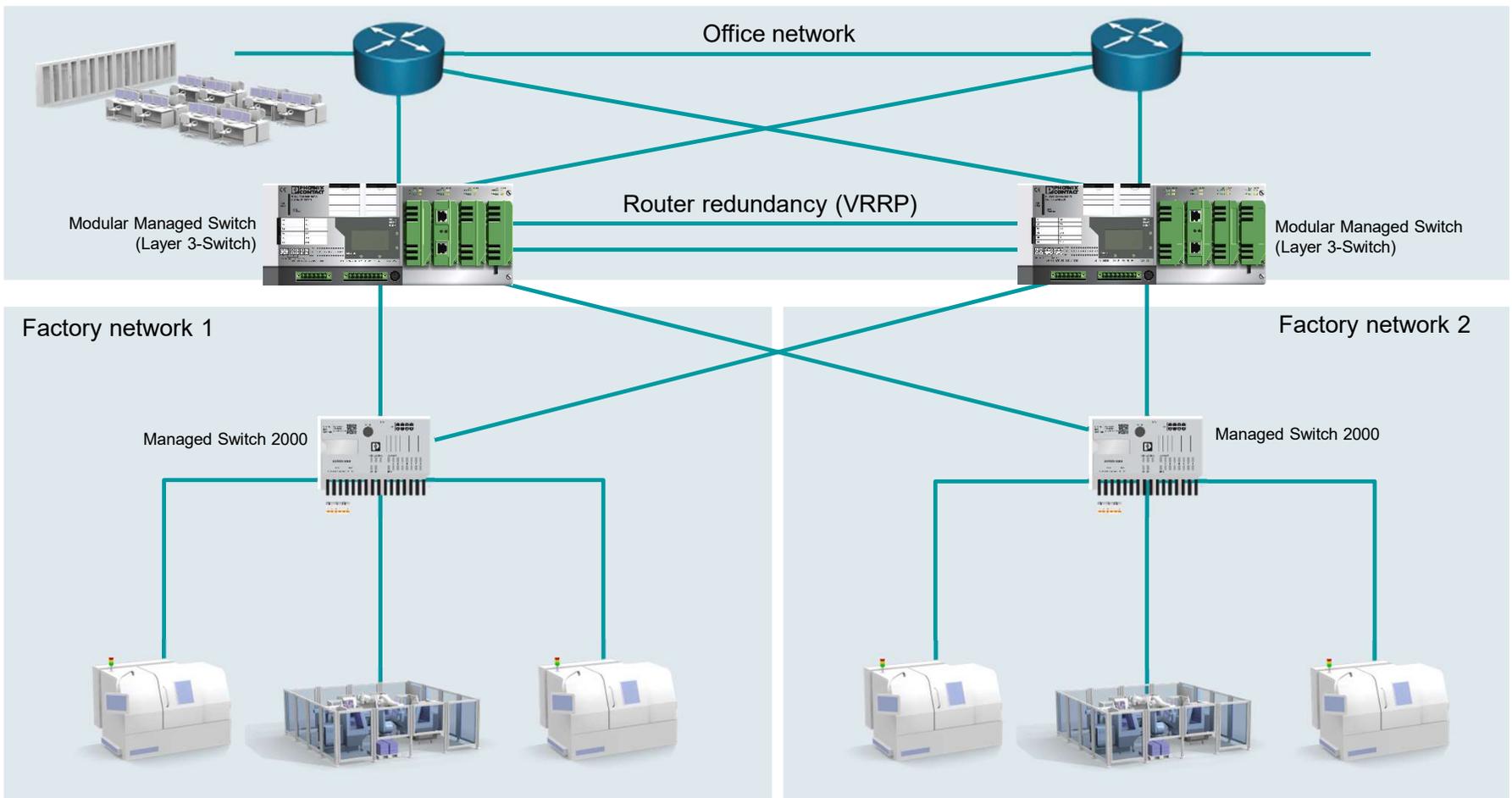
Layer 3 function

- Port-specific routing up to 28 times
- Static and dynamic routing
- Routing VLANs
- Run Several routers via VRRP



 Automation protocols





# Modular Managed Switches



	<b>FL SWITCH GHS 4G/12</b>	<b>FL SWITCH GHS 12G/8</b>	<b>FL SWITCH GHS 4G/12-L3</b>	<b>FL SWITCH GHS 12G/8-L3</b>	<b>FL FXT</b>
Ports	4x Combo ports 4x RJ45 ports Expandable up to 24 Ports	4x SFP Gigabit slots 8x RJ45 Gigabit ports Expandable up to 28 Ports	4x Combo ports 4xRJ45 ports Expandable up to 24 Ports	4x SFP Gigabit slots 8x RJ45 Gigabit ports Expandable up to 28 Ports	Extension module for up to 8 Ethernet ports
Layer 3 fuction	No	No	Yes	Yes	-
Order number	2700271	2989200	2700787	2700786	2989307



 Automation protocols



# Media modules



	<b>FL IF 2TX VS-RJ-D</b>	<b>FL IF 2TX VS-RJ-F</b>	<b>FL IF 2PSE-F</b>	<b>FL IF 2FX SC-D</b>	<b>FL IF 2FX SC-F</b>	<b>FL IF 2FX SM SC-D</b>	<b>FL IF 2FX ST-D</b>	<b>FL IF 2POF SCRJ-D</b>
--	------------------------------	------------------------------	-------------------------	---------------------------	---------------------------	------------------------------	---------------------------	------------------------------



Ports	RJ45, connection direction downward	RJ45, connection direction forward	PoE- RJ45, connection direction forward	SC, connection direction downward	SC, connection direction forward	SC, connection direction downward	ST, connection direction downward	SC-RJ, connection direction downward
Fiber type	-	-	-	Multimode fiber optics (1300 nm)	Multimode fiber optics (1300 nm)	Singlemode fiber optics (1300 nm)	Multimode fiber optics (1300 nm)	POF/PCF fiber (650 nm)
Order number	2832357	2832344	2832904	2832425	2832412	2832205	2884033	2891084

Automation protocols



# Managed Switches 7000

EtherNet/IP™

**i** Common Industrial Protocol (CIP)

**i**

Device Level Ring (DLR) redundancy **i**

**i** IGMP snooping/querier



Faceplate visualizations **i**

Gigabit combo ports **i**

**i** Automation protocols



# Switch 7000

EtherNet/IP™

Common Industrial Protocol (CIP)



- Integration into EtherNet/IP control systems



 Automation protocols





Diagnosis

EtherNet/IP™

Common Industrial Protocol  
(CIP)

Configuration



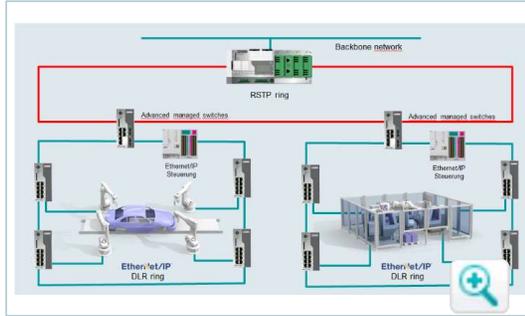
# Switch 7000

EtherNet/IP™



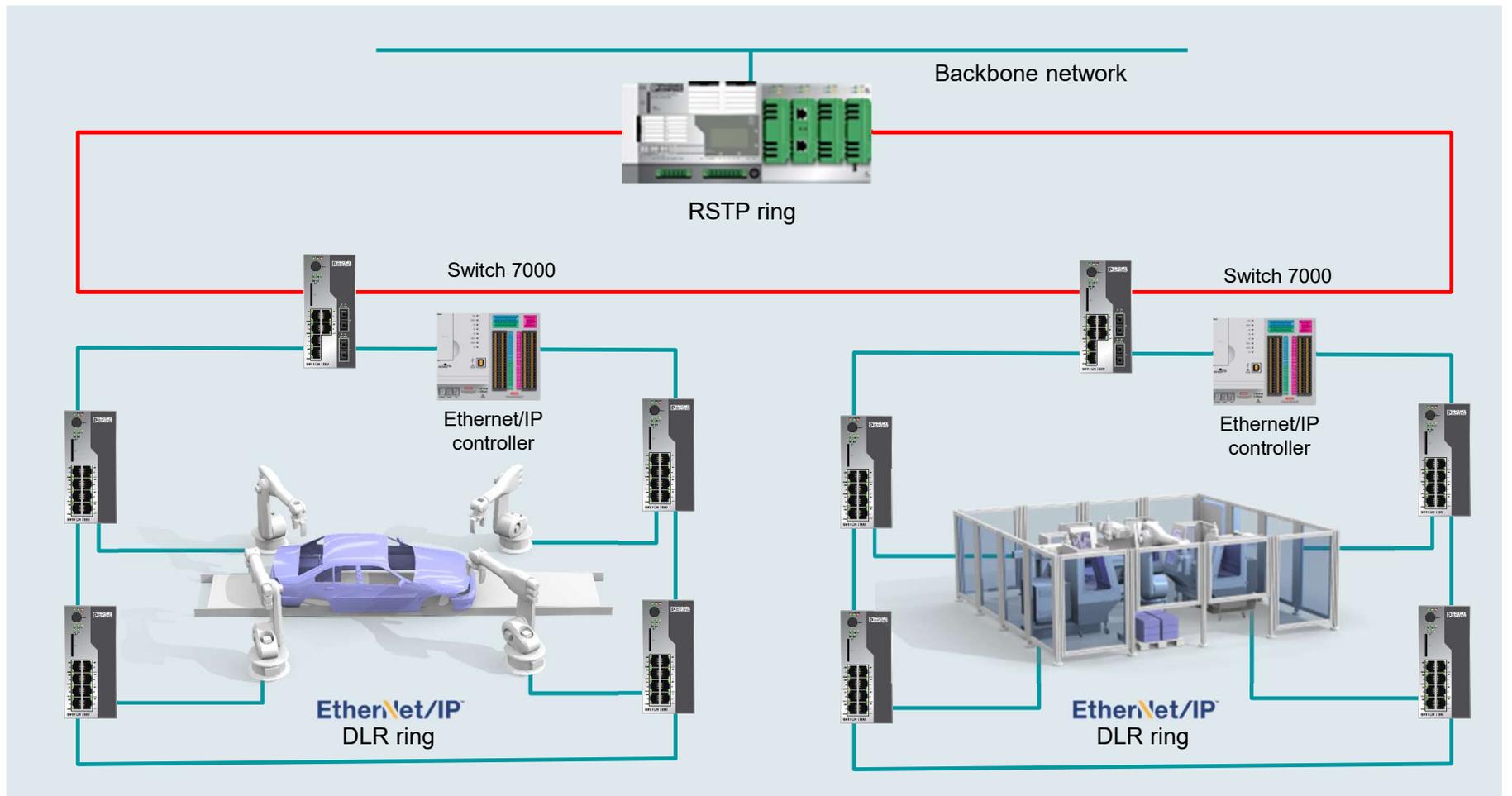
Device Level Ring (DLR) redundancy

- Multivendor redundancy mechanism for EtherNet/IP
- Recovery time < 3ms



 Automation protocols





# Switch 7000

EtherNet/IP™



Faceplate visualizations

- Pre-configured visualization for Rockwell control systems
- Diagnostic information
- Port configuration



 Automation protocols

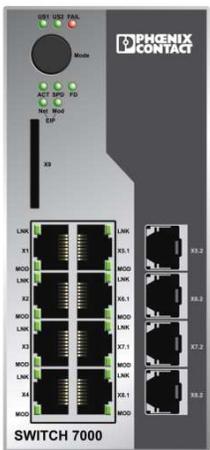




Device Status	DLR Status	Port Status	Port Configuration	CIP Status	X
---------------	------------	-------------	--------------------	------------	---

Device Type: FL SWITCH 7004-4GC-EIP  
Device Name: FL SWITCH 7004-4GC-EIP

IP Address: 192.168.10.110  
MAC Address: 00:A0:45:AA:16:6E



Node Status: Device Is Active Ring Supervisor  
Ring Status: Ring Fault  
Active Supervisor: 192.168.10.110  
Active Precedence Value: 0  
Ring Fault Count: 1  
Clear Fault Counter: [Clear](#)  
Verify Fault Location: [Start](#)  
Last Node Port 1: 192.168.10.110  
Last Node Port 2: 192.168.10.110

[DLR Node Table](#)

Automation protocols



# Switch 7000

EtherNet/IP™



Gigabit combo ports

- Flexible choice of the transmission medium (copper or fiber) and fiber (singlemode or multimode)
- Cable length up to 80km (depending on the SFP module)



Automation protocols



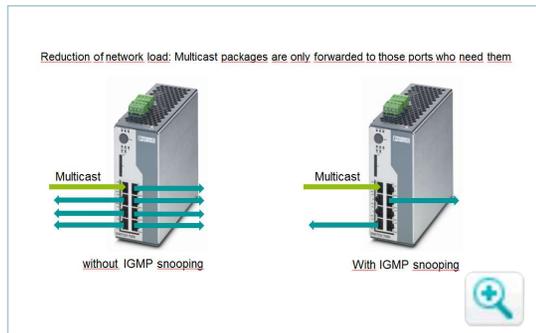
# Switch 7000

EtherNet/IP™



IGMP snooping/  
querier

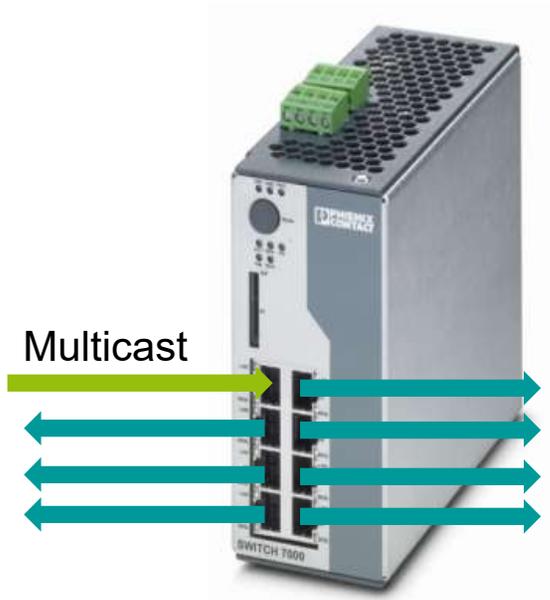
- Analysis of incoming multicast packets
- Packet forwarding only to ports, who need them
- Reduction of the network traffic



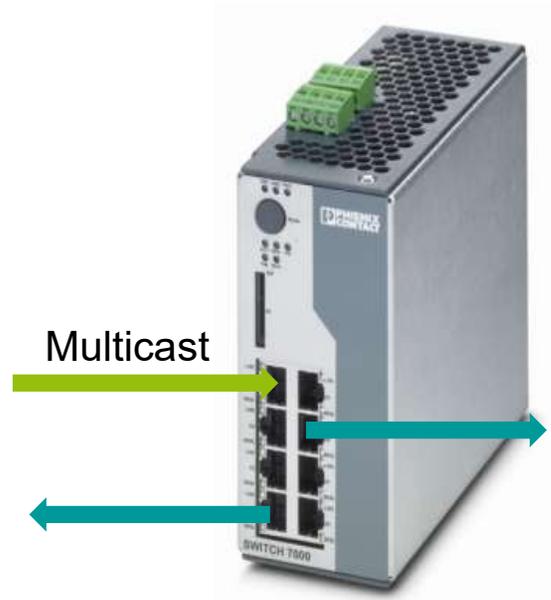
Automation protocols



Reduction of network load: Multicast packages are only forwarded to those ports who need them



without IGMP snooping



with IGMP snooping

# Switch 7000



	<b>FL SWITCH 7008-EIP</b>	<b>FL SWITCH 7006/2FX-EIP</b>	<b>FL SWITCH 7005/FX- 2FXSM-EIP</b>	<b>FL SWITCH 7006-2GC-EIP</b>	<b>FL SWITCH 7004-4GC-EIP</b>	<b>FL SWITCH 7004-2TC- 2GC-EIP</b>
Ports	8x RJ45	6x RJ45 2x SC-MM	5x RJ45 1x SC-MM, 2x SC-SM	6x RJ45 2 x Gigabit combo	4x RJ45 4 x Gigabit combo	4x RJ45 2x Fast Ethernet combo 2 x Gigabit combo
Transmission speed	10/100 MBit/s	10/100 MBit/s	10/100 MBit/s	10/100/1000 MBit/s	10/100/1000 MBit/s	10/100/1000 MBit/s
Order number	2701418	2701419	2701420	2701554	2701553	2702175

 Automation protocols



# Managed Switches 2000

**i** Easy configuration →

**i** Redundancy

Security **i**

Profinet and EtherNet/IP™ support **i**

**i** Unmanaged mode **i**

DHCP server **i**

**i** Automation protocols



# Managed Switches 2000

Easy configuration



- Several options for easy configuration

<b>SD card</b> Easy replication of configuration	<b>Smart mode button</b> Configuration on the device
<b>Web based management</b> Configuration from the browser	<b>CLI and SNMP</b> Configuration from the PLC
<b>PROFINET device</b> Configuration from PC WOPX or TIA Portal	<b>Management software</b> Configuration via FL-NETWORK-MANAGER



 Automation protocols



## SD card



Easy replication of configuration



## Smart mode button

Configuration on the device



## Web based management

Configuration from the browser



## CLI and SNMP

Configuration from the PLC



## PROFINET device

Configuration from PLCnext Engineer  
or TIA Portal



## Management software

Configuration via FL NETWORK MANAGER



Automation protocols

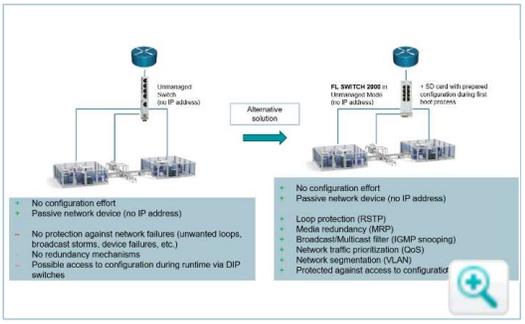


# Managed Switches 2000



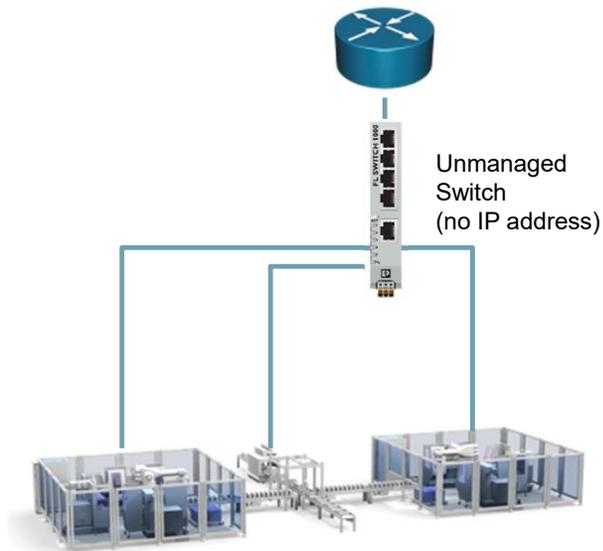
Unmanaged mode

- Operation like unmanaged switch
- No IP configuration
- Enabled management features



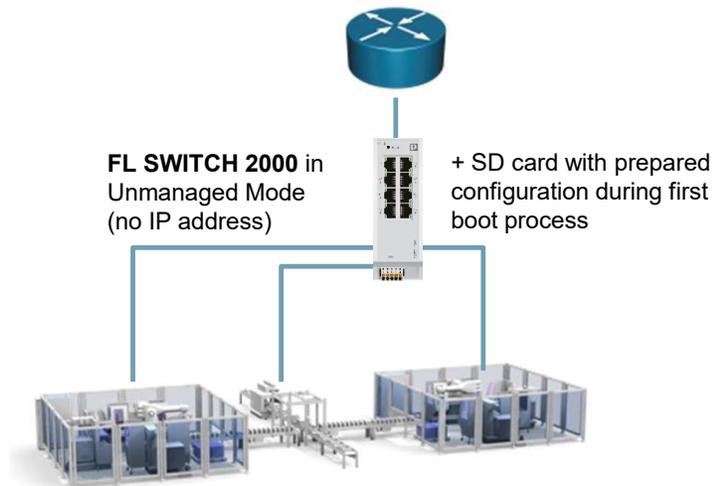
Automation protocols





- + No configuration effort
- + Passive network device (no IP address)
- No protection against network failures (unwanted loops, broadcast storms, device failures, etc.)
- No redundancy mechanisms
- Possible access to configuration during runtime via DIP switches

Alternative solution



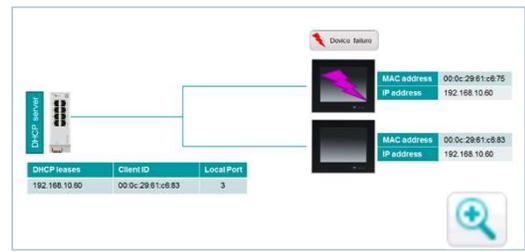
- + No configuration effort
- + Passive network device (no IP address)
- + Loop protection (RSTP)
- + Media redundancy (MRP)
- + Broadcast/Multicast filter (IGMP snooping)
- + Network traffic prioritization (QoS)
- + Network segmentation (VLAN)
- + Protected against access to configuration during runtime

# Managed Switches 2000

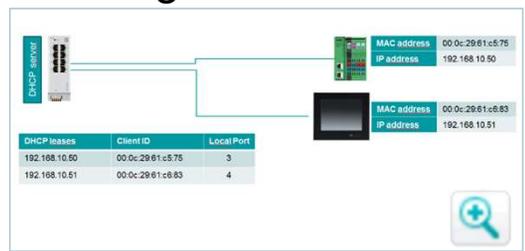


DHCP server

- Device replacement without IP reconfiguration of the network



- Easy IP address assignment\*



\*Only for models 22xx and 23xx

Automation protocols



DHCP server



 Device failure



MAC address	00:0c:29:61:c6:75
IP address	192.168.10.60

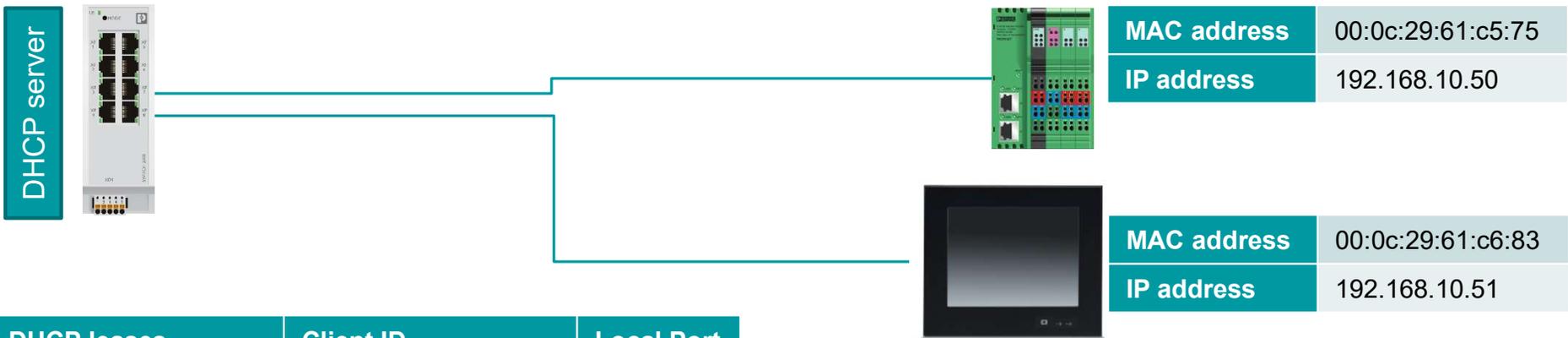


MAC address	00:0c:29:61:c6:83
IP address	192.168.10.60

DHCP leases	Client ID	Local Port
192.168.10.60	00:0c:29:61:c6:83	3

 Automation protocols





DHCP leases	Client ID	Local Port
192.168.10.50	00:0c:29:61:c5:75	3
192.168.10.51	00:0c:29:61:c6:83	4

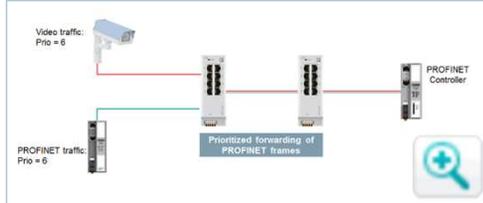
# Managed Switches 2000



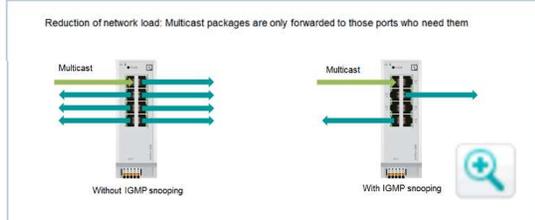
Profinet and EtherNet/IP™ support



- PROFINET device
- Link Layer Discovery Protocol (LLDP)
- MRP redundancy
- PROFINET prioritization



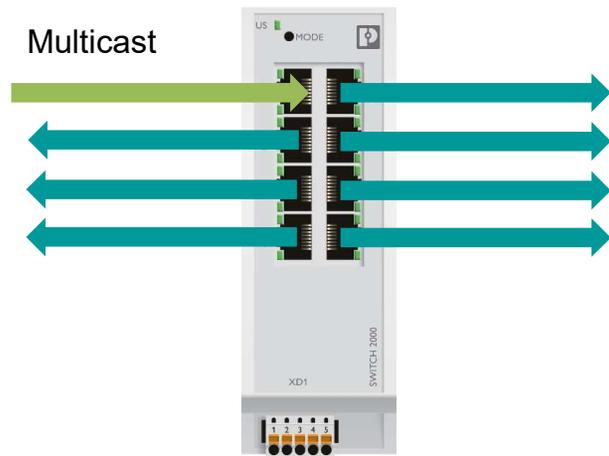
- Extended multicast filtering (IGMP snooping/querier)



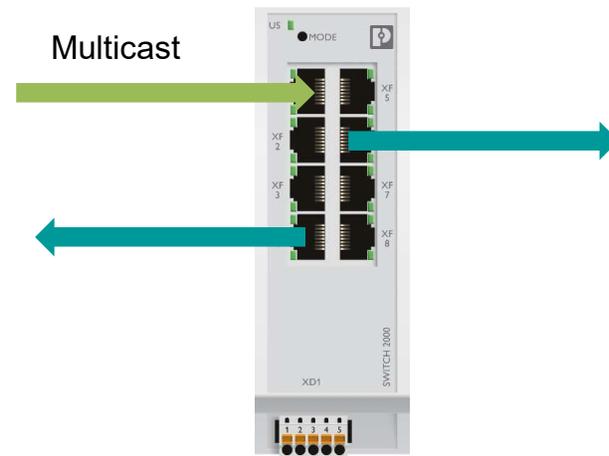
Automation protocols



Reduction of network load: Multicast packages are only forwarded to those ports who need them



Without IGMP snooping

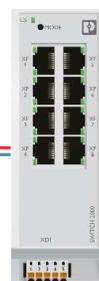


With IGMP snooping

Video traffic:  
Prio = 6



PROFINET traffic:  
Prio = 6



PROFINET  
Controller

Prioritized forwarding of  
PROFINET frames

# Managed Switches 2000



Redundancy

- Media Redundancy Protocol (MRP)
  - Client
  - Manager (optional)\*
- Rapid Spanning Tree Protocol (RSTP)
- RSTP Extensions\*
  - Fast Ring Detection
  - Large Tree Support

\*Only for models 22xx and 23xx

 Automation protocols



# Managed Switches 2000



Security

- Secure Interfaces
  - HTTPS
  - SSH
- MAC-based port security\*
- RADIUS authentication (IEEE 802.1x)\*

\*Only for models 22xx and 23xx



Automation protocols



# Managed Switches 2000

**FL SWITCH 20xx/21xx/22xx/23xx**  
*Variants in narrow design*



**FL SWITCH 24xx/25xx**  
*Variants in flat design*



**FL SWITCH 26xx/27xx**  
*Variants for field applications*



 Automation protocols



# Managed Switches 2000



	FL SWITCH 2005	FL SWITCH 2008	FL SWITCH 2016	FL SWITCH 2105	FL SWITCH 2108	FL SWITCH 2116
Ports	5 x RJ45	8 x RJ45	16 x RJ45	5 x RJ45	8 x RJ45	16 x RJ45
Transmission speed	10/100 MBit/s	10/100 MBit/s	10/100 MBit/s	10/100/1000 MBit/s	10/100/1000 MBit/s	10/100/1000 MBit/s
Operating temperature	0 °C...60 °C	0 °C...60 °C	0 °C...60 °C	0 °C...60 °C	0 °C...60 °C	0 °C...60 °C
Presetting	-	-	-	-	-	-
Order number	2702323	2702324	2702903	2702665	2702666	2702908



 Automation protocols



# Managed Switches 2000



	FL SWITCH 2205	FL SWITCH 2208	FL SWITCH 2208 PN	FL SWITCH 2207-FX	FL SWITCH 2207-FX SM
Ports	5 x RJ45	8 x RJ45	8 x RJ45	7 x RJ45 1 x SC-MM	7 x RJ45 1 x SC-SM
Transmission speed	10/100 MBit/s	10/100 MBit/s	10/100 MBit/s	10/100 MBit/s	10/100 MBit/s
Operating temperature	-40 °C...70 °C	-40 °C...70 °C	-40 °C...70 °C	-40 °C...70 °C	-40 °C...70 °C
Presetting	-	-	PROFINET	-	-
Order number	2702326	2702327	1044024	2702328	2702329

Automation protocols



# Managed Switches 2000



	FL SWITCH 2206-2FX	FL SWITCH 2206-2FX SM	FL SWITCH 2206-2FX ST	FL SWITCH 2206-2FX SM ST
Ports	6 x RJ45 2 x SC-MM	6 x RJ45 2 x SC-SM	6 x RJ45 2 x ST-MM	6 x RJ45 2 x ST-SM
Transmission speed	10/100 MBit/s	10/100 MBit/s	10/100 MBit/s	10/100 MBit/s
Operating temperature	-40 °C...70 °C	-40 °C...70 °C	-40 °C...70 °C	-40 °C...70 °C
Presetting	-	-	-	-
Order number	2702330	2702331	2702332	2702333

Automation protocols



# Managed Switches 2000



	<b>FL SWITCH 2206-2SFX</b>	<b>FL SWITCH 2206-2SFX PN</b>	<b>FL SWITCH 2204-2TC- 2SFX</b>	<b>FL SWITCH 2216</b>	<b>FL SWITCH 2216 PN</b>
Ports	6 x RJ45 2 x SFX	6 x RJ45 2 x SFX	4 x RJ45 2 x Fast Ethernet combo 2 x SFX	16 x RJ45	16 x RJ45
Transmission speed	10/100 MBit/s	10/100 MBit/s	10/100 MBit/s	10/100 MBit/s	10/100 MBit/s
Operating temperature	-40 °C...70 °C	-40 °C...70 °C	-40 °C...70 °C	-40 °C...70 °C	-40 °C...70 °C
Presetting	-	PROFINET	-	-	PROFINET
Order number	2702969	1044028	2702334	2702904	1044029

Automation protocols



# Managed Switches 2000



	FL SWITCH 2214-2FX	FL SWITCH 2214-2SFX	FL SWITCH 2214-2SFX PN	FL SWITCH 2214-2FX SM	FL SWITCH 2212-2TC-2SFX
Ports	14 x RJ45 2 x SC MM	14 x RJ45 2 x SFX	14 x RJ45 2 x SFX	14 x RJ45 2 x SC SM	12 x RJ45 2 x SFX 2 x Fast Ethernet combo
Transmission speed	10/100 MBit/s	10/100 MBit/s	10/100 MBit/s	10/100 MBit/s	10/100 MBit/s
Operating temperature	-40 °C...70 °C	-40 °C...70 °C	-40 °C...70 °C	-40 °C...70 °C	-40 °C...70 °C
Presetting	-	-	PROFINET	-	-
Order number	2702905	1006188	1044030	2702906	2702907

Automation protocols



# Managed Switches 2000



	FL SWITCH 2308	FL SWITCH 2308 PN	FL SWITCH 2304-2GC-2SFP	FL SWITCH 2306-2SFP	FL SWITCH 2306-2SFP PN
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Ports	8 x RJ45	8 x RJ45	4 x RJ45 2 x Gigabit combo 2 x SFP	6 x RJ45 2 x SFP	6 x RJ45 2 x SFP
Transmission speed	10/100/1000 MBit/s	10/100/1000 MBit/s	10/100/1000 MBit/s	10/100/1000 MBit/s	10/100/1000 MBit/s
Operating temperature	-40 °C...70 °C	-40 °C...70 °C	-40 °C...70 °C	-40 °C...70 °C	-40 °C...70 °C
Presetting	-	PROFINET	-	-	PROFINET
Order number	2702652	1009220	2702653	2702970	1009222

Automation protocols



# Managed Switches 2000



	FL SWITCH 2316	FL SWITCH 2316 PN	FL SWITCH 2314-2SFP	FL SWITCH 2314-2SFP PN	FL SWITCH 2312-2GC-2SFP
Ports	16 x RJ45	16 x RJ45	14 x RJ45 2 x SFP	14 x RJ45 2 x SFP	12 x RJ45 2 x Gigabit combo 2 x SFP
Transmission speed	10/100/1000 MBit/s	10/100/1000 MBit/s	10/100/1000 MBit/s	10/100/1000 MBit/s	10/100/1000 MBit/s
Operating temperature	-40 °C...70 °C	-40 °C...70 °C	-40 °C...70 °C	-40 °C...70 °C	-40 °C...70 °C
Presetting	-	PROFINET	-	PROFINET	-
Order number	2702909	1031673	1006191	1031683	2702910

Automation protocols



# Managed Switches 2000



	FL SWITCH 2408	FL SWITCH 2406-2SFX	FL SWITCH 2404-2TC-2SFX	FL SWITCH 2408 PN	FL SWITCH 2406-2SFX PN
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Ports	8 x RJ45	6 x RJ45 2 x SFX	4 x RJ45 2 x Fast Ethernet Combo 2 x SFX	8 x RJ45	6 x RJ45 2 x SFX
Transmission speed	10/100 MBit/s	10/100 MBit/s	10/100 MBit/s	10/100 MBit/s	10/100 MBit/s
Operating temperature	-40°C – 70°C	-40°C – 70°C	-40°C – 70°C	-40°C – 70°C	-40°C – 70°C
Presetting	-	-	-	Profinet	Profinet
Order number	1043412	1043414	1088853	1089133	1089126



 Automation protocols



# Managed Switches 2000



	FL SWITCH 2208C	FL SWITCH 2206C-2FX
Ports	8 x RJ45	6 x RJ45 2 x SC-MM
Transmission speed	10/100 MBit/s	10/100 MBit/s
Special feature	Conformal Coating	Conformal Coating
Operating temperature	-40 °C...70 °C	-40 °C...70 °C
Presetting	-	-
Order number	?	?



Automation protocols



# Managed Switches 2000



	FL SWITCH 2416	FL SWITCH 2414-2SFX	FL SWITCH 2412-2TC-2SFX	FL SWITCH 2416 PN	FL SWITCH 2414-2SFX PN
Ports	16 x RJ45	14 x RJ45 2 x SFX	12 x RJ45 2 x Fast Ethernet Combo 2 x SFX	16 x RJ45	14 x RJ45 2 x SFX
Transmission speed	10/100 MBit/s	10/100 MBit/s	10/100 MBit/s	10/100 MBit/s	10/100 MBit/s
Operating temperature	-40°C – 70°C	-40°C – 70°C	-40°C – 70°C	-40°C – 70°C	-40°C – 70°C
Presetting	-	-	-	Profinet	Profinet
Order number	1043416	1043423	1088875	1089150	1089139

 Automation protocols



# Managed Switches 2000



	<b>FL SWITCH 2508</b>	<b>FL SWITCH 2506-2SFP</b>	<b>FL SWITCH 2504-2GC-2SFP</b>	<b>FL SWITCH 2508 PN</b>	<b>FL SWITCH 2506-2SFP PN</b>
--	-----------------------	----------------------------	--------------------------------	--------------------------	-------------------------------

Ports	8 x RJ45	6 x RJ45 2 x SFP	4 x RJ45 2 x Gigabit Combo 2 x SFP	8 x RJ45	6 x RJ45 2 x SFP
Transmission speed	10/100/1000 MBit/s	10/100/1000 MBit/s	10/100/1000 MBit/s	10/100/1000 MBit/s	10/100/1000 MBit/s
Operating temperature	-40°C – 70°C	-40°C – 70°C	-40°C – 70°C	-40°C – 70°C	-40°C – 70°C
Presetting	-	-	-	Profinet	Profinet
Order number	1043484	1043491	1088872	1089134	1089135

 Automation protocols



# Managed Switches 2000



	FL SWITCH 2516	FL SWITCH 2514-2SFP	FL SWITCH 2512-2GC-2SFP	FL SWITCH 2516 PN	FL SWITCH 2514-2SFP PN
Ports	16 x RJ45	14 x RJ45 2 x SFP	12 x RJ45 2 x Gigabit Combo 2 x SFP	16 x RJ45	14 x RJ45 2 x SFP
Transmission speed	10/100/1000 MBit/s	10/100/1000 MBit/s	10/100/1000 MBit/s	10/100/1000 MBit/s	10/100/1000 MBit/s
Operating temperature	-40°C – 70°C	-40°C – 70°C	-40°C – 70°C	-40°C – 70°C	-40°C – 70°C
Presetting	-	-	-	Profinet	Profinet
Order number	1043496	1043499	1088856	1089205	1089154



 Automation protocols



# Managed Switches 2000



**FL SWITCH 2608**    **FL SWITCH 2608 PN**    **FL SWITCH 2708**    **FL SWITCH 2708 PN**



Ports	8 x M12			
Transmission speed	10/100 MBit/s	10/100 MBit/s	10/100/1000 MBit/s	10/1000 MBit/s
Operating temperature	-40°C – 70°C	-40°C – 70°C	-40°C – 70°C	-40°C – 70°C
Presetting	-	PROFINET preset and certified, status LEDs	-	PROFINET preset and certified, status LEDs
Order number	1106500	1106616	1106615	1106610

Automation protocols



# Switch 3000/4000

Easy configuration and diagnostics

 Comprehensive security functions



Variants for IEC 61850 

 Fast redundancy mechanisms for large networks 

Wide temperature range

 Automation protocols



# Switch 3000/4000



Fast redundancy mechanisms for large networks

- Combination of IEEE functions and extended ring redundancy
- Switch-over times of 15 ms with several hundred switches in the ring
- Coupling of multiple rings



Automation protocols



# Switch 3000/4000



Variants for  
IEC 61850

- Particularly high immunity to electromagnetic and electrostatic interference
- Extended temperature range
- Extreme shock and vibration resistance
- Redundant, replaceable power supply and special operating voltages (optional)



Automation protocols



# Switch 3000/4000

Comprehensive security functions



- Secure interfaces
- SNMPv3
- HTTPS
- MAC-based port security
- RADIUS Authentication (802.1x)



Automation protocols



# Switch 3000/4000



	FL SWITCH 3005	FL SWITCH 3005T	FL SWITCH 3008	FL SWITCH 3008T	FL SWITCH 3016	FL SWITCH 3016T	FL SWITCH 3016E
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Ports (Transmission speed)	5x RJ45 (10/100 Mbit/s)	5x RJ45 (10/100 Mbit/s)	8x RJ45 (10/100 Mbit/s)	8x RJ45 (10/100 Mbit/s)	16x RJ45 (10/100 Mbit/s)	16x RJ45 (10/100 Mbit/s)	16x RJ45 (10/100 Mbit/s)
Temperature range	-10 °C ... +60 °C	-40 °C ... +75 °C	-10 °C ... +60 °C	-40 °C ... +75 °C	-10 °C ... +60 °C	-40 °C ... +75 °C	-40 °C ... +75 °C
IEC61850-3/ IEEE1613	No	No	No	No	No	No	Yes
Special features	-	-	-	ATEX approval	-	-	-
Order number	2891030	2891032	2891031	2891035	2891058	2891059	2891066



 Automation protocols



# Switch 3000/4000



	FL SWITCH 3004T-FX	FL SWITCH 3004T-FX ST	FL SWITCH 3006T-2FX	FL SWITCH 3006T-2FX ST	FL SWITCH 3006T-2FX SM
Ports (Transmission speed)	4x RJ45 (10/100 Mbit/s) 1x FX-SC- Multimode	4x RJ45 (10/100 Mbit/s) 1x FX-ST- Multimode	6x RJ45 (10/100 Mbit/s) 2x FX-SC- Multimode	6x RJ45 (10/100 Mbit/s) 2x FX-ST- Multimode	6x RJ45 (10/100 Mbit/s) 2x FX-SC- Singlemode
Temperature range	-40 °C ... +75 °C	-40 °C ... +70 °C			
IEC61850-3/ IEEE1613	No	No	No	No	No
Special features	-	-	ATEX approval	-	-
Order number	2891033	2891034	2891036	2891037	2891060



Automation protocols



# Switch 3000/4000



	FL SWITCH 3012E-2SFX	FL SWITCH 3012E-2SFX	FL SWITCH 3012E-2FX	FL SWITCH 3012E-2FX SM
Ports (Transmission speed)	12x RJ45 (10/100 Mbit/s) 2x SFP slots (100MBit/s)	12x RJ45 (10/100 Mbit/s) 2x SFP (100 Mbit/s)	12x RJ45 (10/100 Mbit/s) 2x MM FX-SC (100 Mbit/s)	12x RJ45 (10/100 Mbit/s) 2x SM FX-SC (100 Mbit/s)
Temperature range	-40 °C ... +70 °C	-40 °C ... 70 °C	-40 °C ... 70 °C	-40 °C ... 70 °C
IEC61850-3/ IEEE1613	Yes	Yes	Yes	Yes
Special features	-	-	-	-
Order number	2891067	2891067	2891120	2891119

 Automation protocols



# Switch 3000/4000



	<b>FL SWITCH 4008T-2SFP -</b>	<b>FL SWITCH 4008T-2GT-3FX SM</b>	<b>FL SWITCH 4008T-2GT-4FX SM</b>	<b>FL SWITCH 4012T-2GT-2FX</b>	<b>FL SWITCH 4012T-2GT-2FX ST</b>
Ports (Transmission speed)	8x RJ45 (10/100 Mbit/s) 2x SFP slots (1000 Mbit/s)	10x RJ45 (8x 10/100 Mbit/s und 2x 10/100/1000 MBit/s) 3x FX-SC-D (100 Mbit/s)	10x RJ45 (8x 10/100 Mbit/s und 2x 10/100/1000 MBit/s) 4x FX-SC-D (100 Mbit/s)	14x RJ45 (12x 10/100 Mbit/s und 2x 10/100/1000 MBit/s) 2x FX-SC-D (100 Mbit/s)	14x RJ45 (12x 10/100 Mbit/s und 2x 10/100/ 1000 MBit/s) 2x FX-ST (100 Mbit/s)
Temperature range	-40 °C ... +75 °C	-40 °C ... +75 °C	-40 °C ... +75 °C	-40 °C ... +75 °C	-40 °C ... +75 °C
IEC61850-3/ IEEE1613	No	No	No	No	No
Special features	ATEX approval				
Order number	2891062	2891160	2891061	2891063	2891161

Automation protocols



# Switch 3000/4000



**FL SWITCH  
4808E-16FX LC-  
4GC**

**FL SWITCH  
4808E-16FX SM-  
4GC**

**FL SWITCH  
4808E-16FX-4GC**

**FL SWITCH  
4808E-16FX SM  
LC-4GC**

**FL SWITCH  
4824E-4GC**

Ports  
(Transmission  
speed)

8x RJ45  
(10/100 Mbit/s)  
16x LC-MM  
(100 Mbit/s)  
4x Gigabit combo  
(1000MBit/s)

8x RJ45  
(10/100 Mbit/s)  
16x SC-D SM  
(100 Mbit/s)  
4x Gigabit combo  
(1000MBit/s)

8x RJ45  
(10/100 Mbit/s)  
16x SC-D MM  
(100 Mbit/s)  
4x Gigabit combo  
(1000MBit/s)

8x RJ45  
(10/100 Mbit/s)  
16x LC-SM  
(100 Mbit/s)  
4x Gigabit combo  
(1000MBit/s)

24x RJ45  
(10/100 Mbit/s)  
4x Gigabit combo  
(1000MBit/s)

Temperature  
range

-40 °C ...  
+70 °C

IEC61850-3/  
IEEE1613

Yes

Yes

Yes

Yes

Yes

Special features

Order number

2891073

2891080

2891079

2891074

2891072

Automation protocols



# Switch 3000/4000



	<b>FL SWITCH 4808E-16FX ST- 4GC</b>	<b>FL SWITCH 4808E-16FX SM ST-4GC</b>	<b>FL SWITCH 4800E-24FX-4GC</b>	<b>FL SWITCH 4800E-24FX SM- 4GC</b>
--	---------------------------------------------	-----------------------------------------------	-------------------------------------	---------------------------------------------



Ports (Transmission speed)	8x RJ45 (10/100 Mbit/s) 16x ST-MM (100 Mbit/s) 4x Gigabit combo (1000MBit/s)	8x RJ45 (10/100 Mbit/s) 16x ST SM (100 Mbit/s) 4x Gigabit combo (1000MBit/s)	24x SC MM (100 Mbit/s) 4x Gigabit combo (1000MBit/s)	24x SC SM (100 Mbit/s) 4x Gigabit combo (1000MBit/s)
Temperature range	-40 °C ... +70 °C	-40 °C ... +70 °C	-40 °C ... +70 °C	-40 °C ... +70 °C
IEC61850-3/ IEEE1613	Yes	Yes	Yes	Yes
Special features				
Order number	2891085	2891086	2891102	2891104

 Automation protocols



# Switches für PROFINET IRT



 Automation protocols

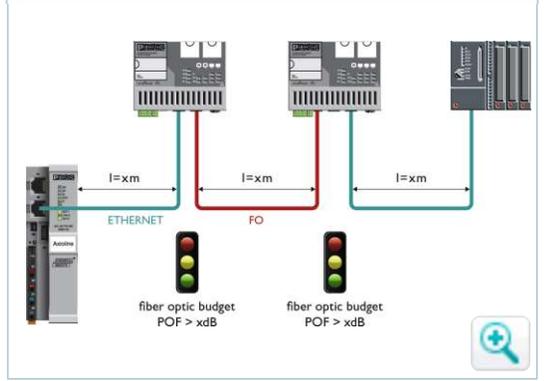


# Switches für PROFINET IRT

Diagnostics for fiber optic paths

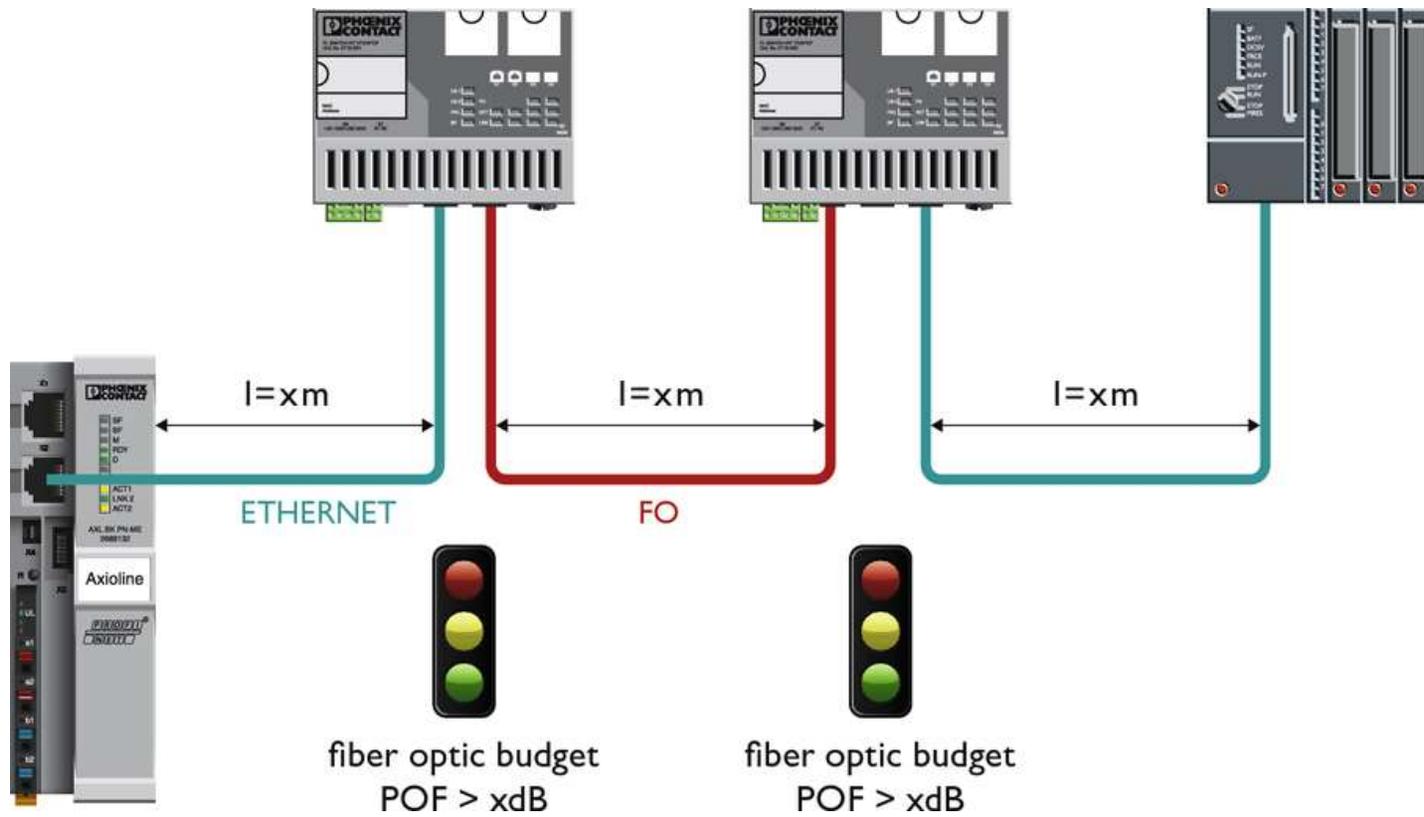


- Proactive maintenance for increased availability and less downtime
- Improved assessment of the path quality through simultaneous length measurement



 Automation protocols





 Automation protocols



# Switches für PROFINET IRT



**FL SWITCH IRT 4TX**

**FL SWITCH IRT 2TX  
2POF**

**FL SWITCH IRT TX  
3POF**

**FL SWITCH IRT IP  
TX/3POF**

Ports (Transmission speed)	4x RJ45 (10/100 Mbit/s)	2x RJ45 (10/100 Mbit/s) 2x POF SC-RJ (100 Mbit/s)	1x RJ45 (10/100 Mbit/s) 3x POF SC-RJ (100 Mbit/s)	1x RJ45 Push Pull (10/100 Mbit/s) 3x POF SC-RJ Push Pull (100 Mbit/s)
Degree of protection	IP20	IP20	IP20	IP67
Order number	2700689	2700691	2700692	2700697

 Automation protocols



# NAT Switch

 IP-Masquerading

Flexible WAN/LAN  
port configuration

L3-Routing and  
L2-Switching



1:1 NAT 

 Cost-effective integration  
into higher-level networks

Virtual NAT 

Port Forwarding 

 Automation protocols



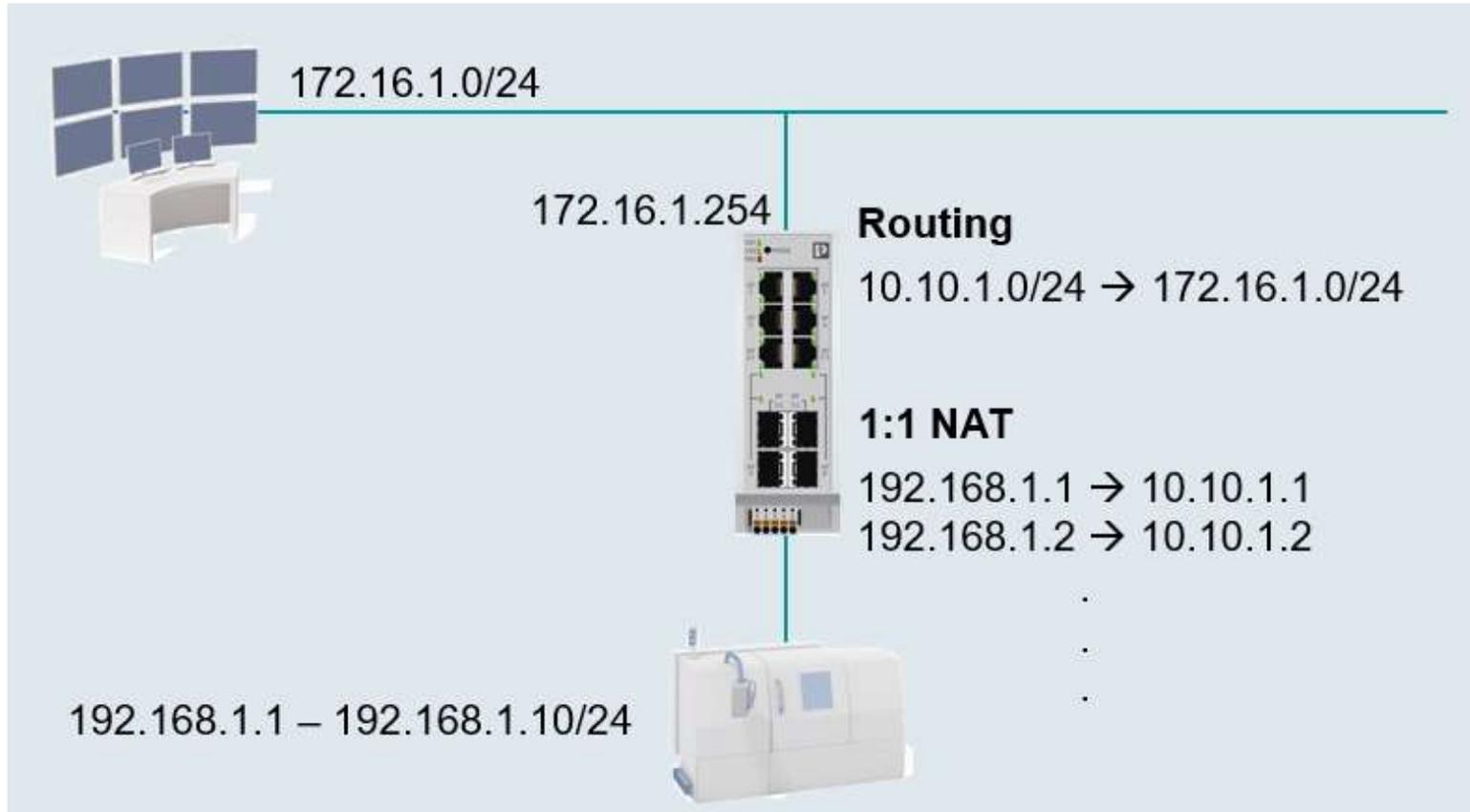
# NAT Switch



Virtual NAT

- Integration of machines with the same IP address into higher-level networks
- Thanks to a virtual intermediate level, only one IP address is needed in the higher-level network





 Automation protocols

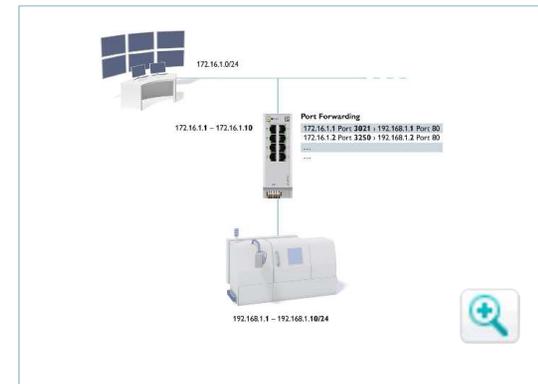


# NAT Switch



Port Forwarding

- Makes services of LAN devices reachable from WAN network



Automation protocols





172.16.1.0/24

172.16.1.254

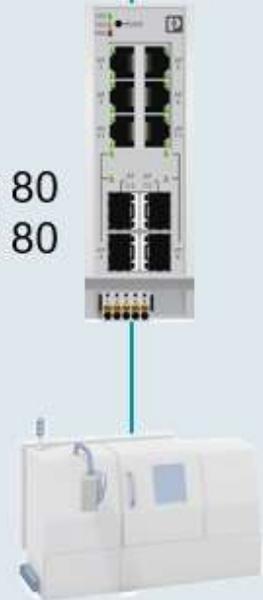
### Port Forwarding

172.16.1.254 Port 3021 → 192.168.1.1 Port 80

172.16.1.254 Port 4201 → 192.168.1.2 Port 80

·  
·  
·

192.168.1.1 – 192.168.1.10/24

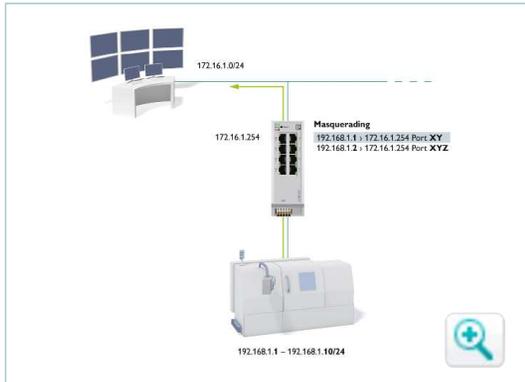


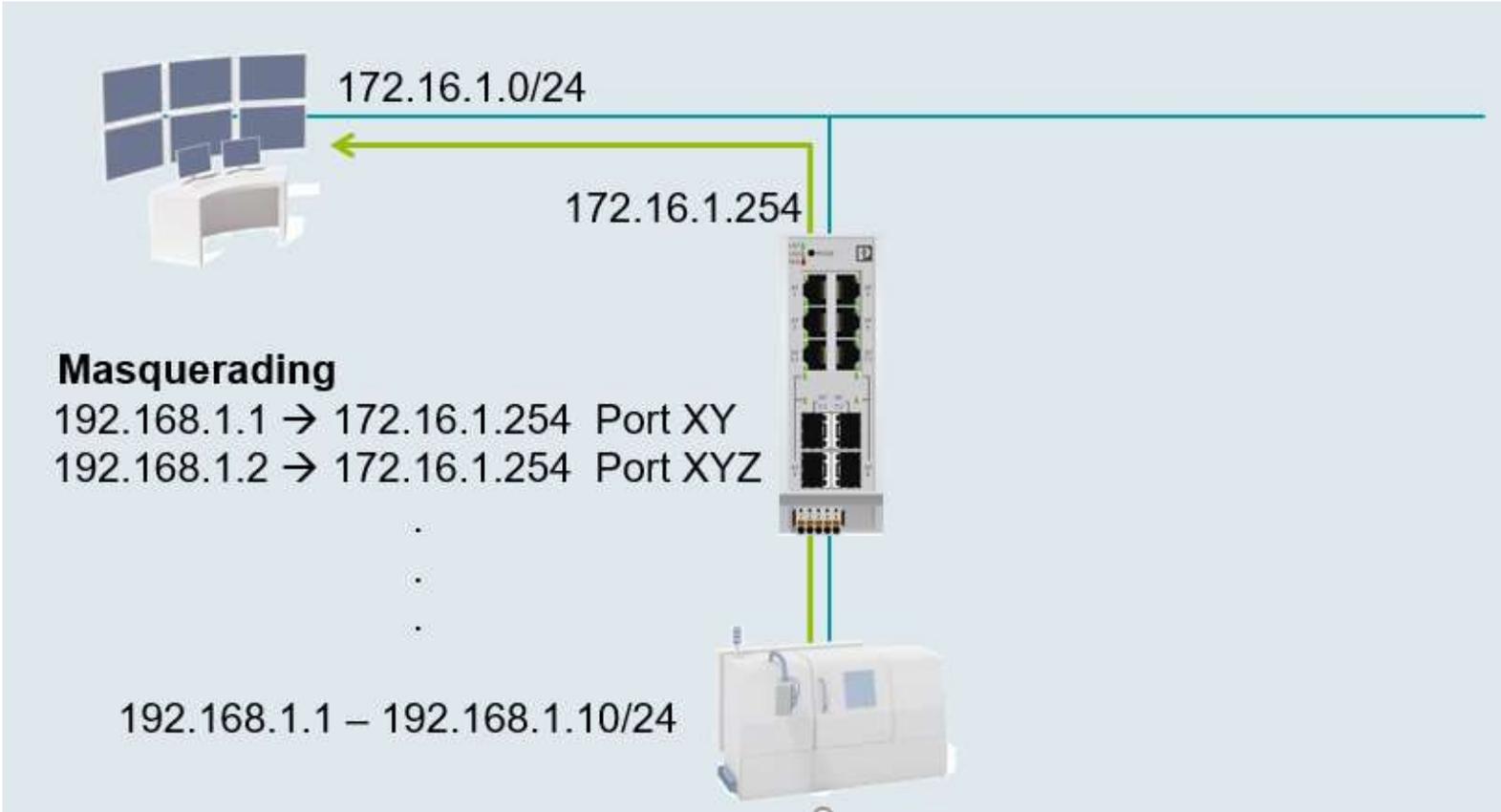
# NAT Switch

IP Masquerading



- NAT device works as a representative for LAN devices
- Differentiation of LAN members via different TCP/UDP ports





# NAT Switch



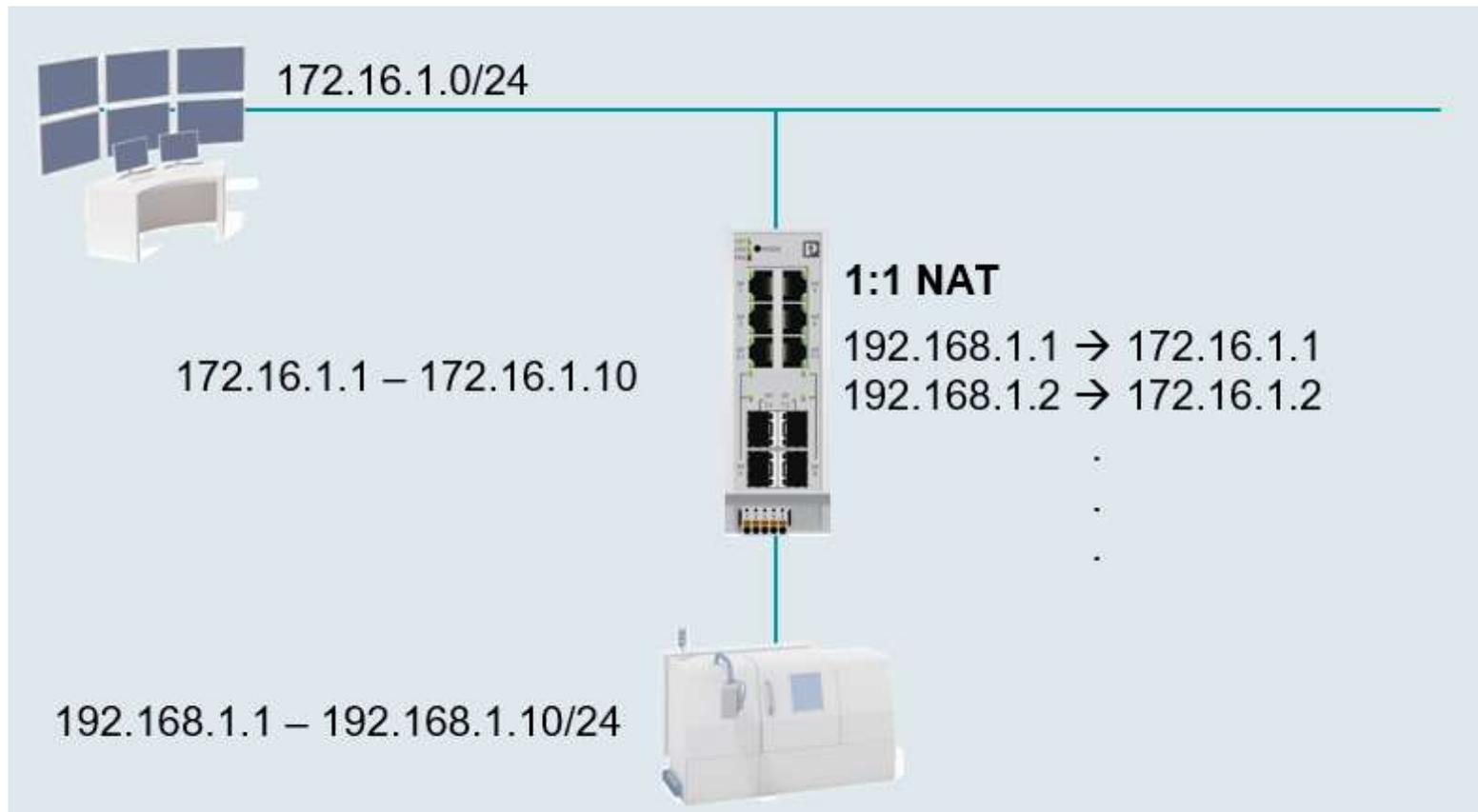
1:1 NAT

- Parallel operation of identical machines in one network
- Save configuration time



 Automation protocols





# NAT Switch



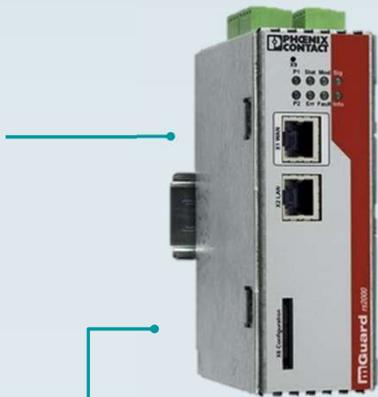
	FL NAT 2008	FL NAT 2208	FL NAT 2304-2GC-2SFP
Ports	8 x RJ45	8 x RJ45	4 x RJ45 2 x Gigabit combo 2 x SFP
Transmission speed	10/100 MBit/s	10/100 MBit/s	10/100/1000 MBit/s
Operating temperature	0 °C...60 °C	-40 °C...70 °C	-40 °C...70 °C
Feature set	Basic	Extended	Extended
Order number	2702881	2702882	2702981

 Automation protocols



# Mounting rail devices and PCI cards

Optimized designs for different industrial applications 



Firewall and VPN 

Functions especially tailored to industrial applications 

Quick and easy configuration 



# Mounting rail devices and PCI cards

Optimized designs  
for different  
industrial  
applications



■ Slim



■ Flat



■ PCI(E)



# Mounting rail devices and PCI cards

Quick and easy configuration



- Web interface
- Optional configuration memory on SD card



# Mounting rail devices and PCI cards



Functions especially tailored to industrial applications

- Conditional firewall
- User firewall
- DPI (OPC Inspector)
- Firewall and VPN redundancy
- Switchable via I/Os



# mGuard 1100



Easy Protect Mode

Cost-effective security routers

Firewall Assistant



Network Address Translation (NAT) to efficiently adapt IP addresses



Test Mode: a straightforward test of the created firewall rules without limiting system availability

Automation protocols



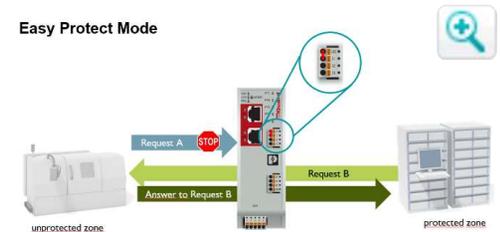
# mGuard 1100

Easy Protect Mode



- Access is generally only permitted in one direction
- Network cells can be easily protected without having to assign an IP address or configure the device

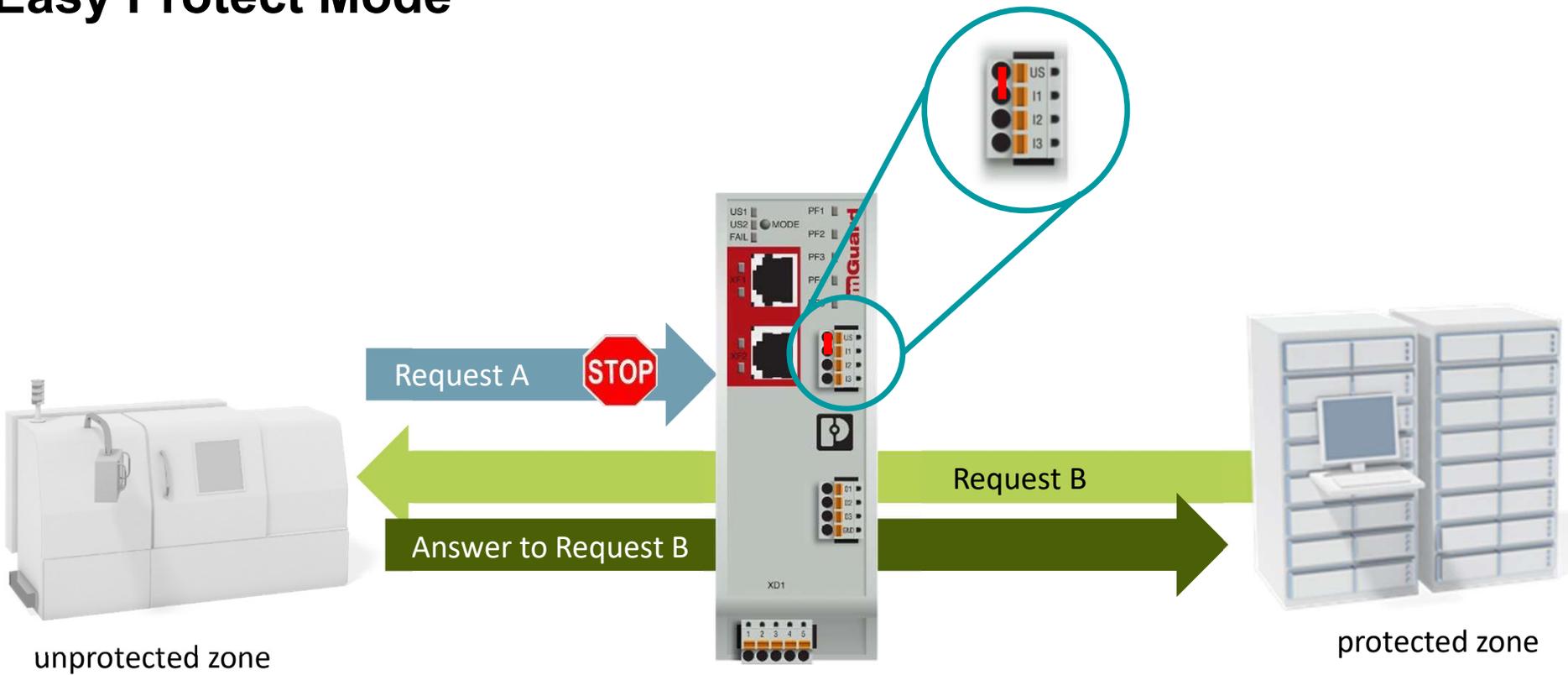
Easy Protect Mode



Automation protocols



# Easy Protect Mode



 Automation protocols

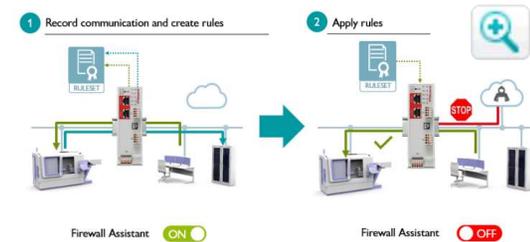


# mGuard 1100



Firewall Assistant

- Record communication and create rules
- As soon as the Firewall Assistant is switched off, the rule set is active

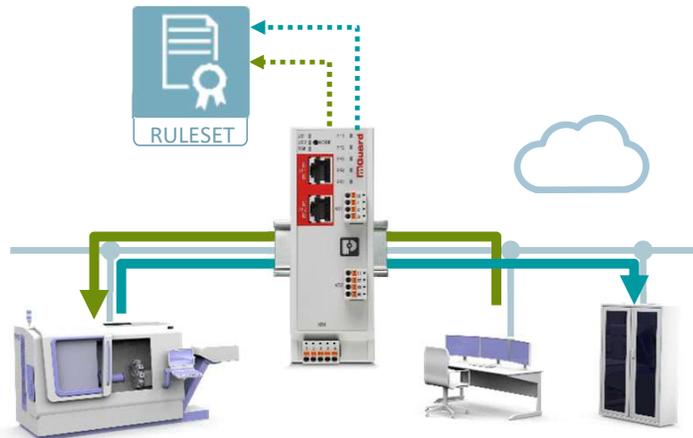


Automation protocols



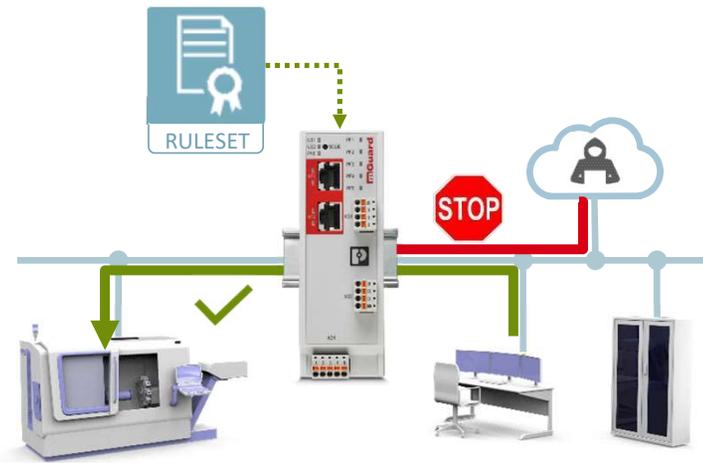
# Firewall Assistant: helps you create firewall rules

1 Record communication and create rules



Firewall Assistant  ON

2 Apply rules



Firewall Assistant  OFF

 Automation protocols



# mGuard 1100



Network Address Translation (NAT) to efficiently adapt IP addresses

- Secure machine integration with NAT without having to change the IP address



Automation protocols



# Mounting rail devices and PCI cards



	<b>FL MGuard 1102</b>	<b>FL MGuard RS2000 TX/TX-B</b>	<b>FL MGuard RS2000 TX/TX VPN</b>	<b>FL MGuard RS2005 TX VPN</b>	<b>TC MGuard RS2000 3G VPN</b>
VPN tunnel optionally expandable	-	-	2	2	2
Firewall	Firewall Assistent	2-Click-Firewall	2-Click-Firewall	2-Click-Firewall	2-Click-Firewall
Integrated switch	-	-	-	5-Port unmanaged	4-Port unmanaged
Special features	-	-	-	-	Mobilfunk
Extended functionalities	No	No	No	No	No
Order number	1153079	2702139	2700642	2701875	2903441



# Mounting rail devices and PCI cards



	FL MGUARD RS4000 TX/TX	FL MGUARD RS4000 TX/TX VPN	FL MGUARD RS4000 TX/TX VPN-M	FL MGUARD RS4000 TX/TX-P	FL MGUARD RS4004 TX/DTX	FL MGUARD RS4004 TX/DTX VPN	TC MGUARD RS4000 3G VPN
--	------------------------	----------------------------	------------------------------	--------------------------	-------------------------	-----------------------------	-------------------------



VPN tunnel optionally expandable	- up to 250	10 up to 250	10 up to 250	10 up to 250	- up to 250	10 up to 250	10 up to 250
Firewall	Multifunction firewall	Multifunction firewall	Multifunction firewall	Multifunction firewall	Multifunction firewall	Multifunction firewall	Multifunction firewall
Integrated switch	-	-	-	-	4-Port managed	4-Port managed	4-Port managed
Special features	-	-	Maritime approvals	ATEX, IECex approvals	DMZ-Port	DMZ-Port	WAN, mobile phone network
Extended functionalities	Optional						
Order number	2700634	2200515	2702465	2702259	2701876	2701877	2903440



# Mounting rail devices and PCI cards



	<b>TC MGuard RS4000 4G VPN</b>	<b>FL MGuard GT/GT</b>	<b>FL MGuard GT/GT VPN</b>	<b>FL MGuard PCI4000 VPN</b>	<b>FL MGuard PCIE4000 VPN</b>
--	------------------------------------	----------------------------	--------------------------------	----------------------------------	---------------------------------------

VPN tunnel optionally expandable	10 up to 250	- up to 250	10 up to 250	10 up to 250	10 up to 250
Firewall	Multifunction firewall	Multifunction firewall	Multifunction firewall	Multifunction firewall	Multifunction firewall
Integrated switch	4-Port managed	-	-	-	-
Special features	WAN, mobile phone network	Gigabit, SFP, maritime Zulassung	Gigabit, SFP, maritime Zulassung	PCI-Format	PCIE-Format
Extended functionalities	Optional	Optional	Optional	Optional	Optional
Order number	2903586	2700197	2700198	2701275	2701278



# Other Designs

 Optimized designs for different industrial applications



 Firewall and VPN

Functions especially tailored to industrial applications 

Quick and easy configuration 



# Other Designs

Optimized designs for different industrial applications



- Portable use



- Desktop applications



- Installation in a 19" rack



# Other Designs



Quick and easy  
configuration

- Web interface
- Optional configuration memory on SD card



# Other Designs



Functions especially tailored to industrial applications

- Conditional firewall
- User firewall
- DPI (OPC Inspector)
- Firewall and VPN redundancy



# Other Designs



	<b>FL MGuard SMART2</b>	<b>FL MGuard SMART2 VPN</b>	<b>FL MGuard DELTA TX/TX</b>	<b>FL MGuard DELTA TX/TX VPN</b>	<b>FL MGuard CENTERPORT</b>
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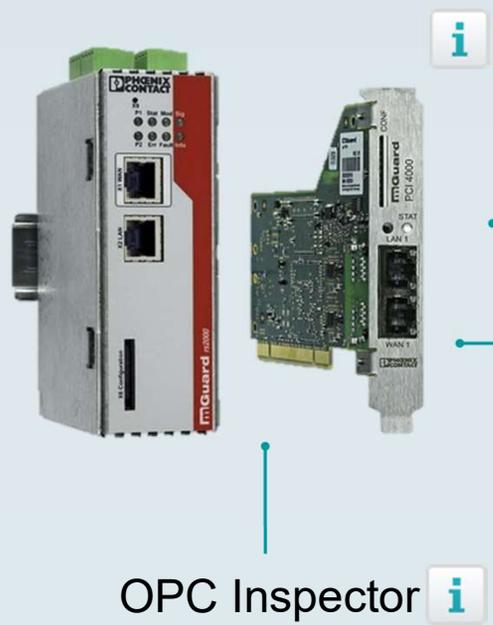
Application area	Mobile	Mobile	Desktop	Desktop	19" rack
VPN-Tunnel optionally expandable	- up to 250	10 up to 250	- up to 250	10 up to 250	- up to 3000
Firewall	Multifunction firewall	Multifunction firewall	Multifunction firewall	Multifunction firewall	Multifunction firewall
Special features	USB	USB	230 V	230 V	High performance
Extended functionalities	Optional	Optional	Optional	Optional	Optional
Order number	2700640	2700639	2700967	2700968	2702547



# Extended functionalities

 VPN extensions

 CIFS Integrity Monitoring



 Licence for Lifetime updates

Redundancy functions 

OPC Inspector 



# Extended functionalities



Licence for Lifetime updates

- Lifetime licence for actualization of the software
- Ideal protection for your network



# Extended functionalities



Redundancy functions

- Higher availability
- For Firewall or for Firewall & VPN

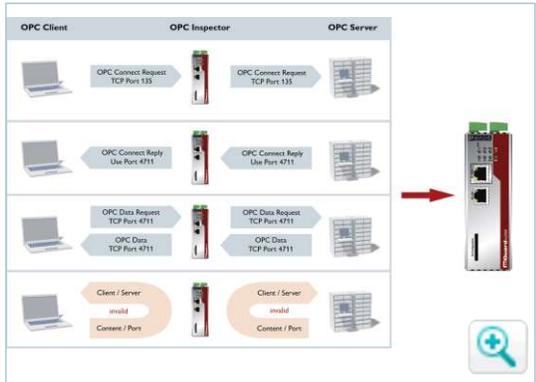


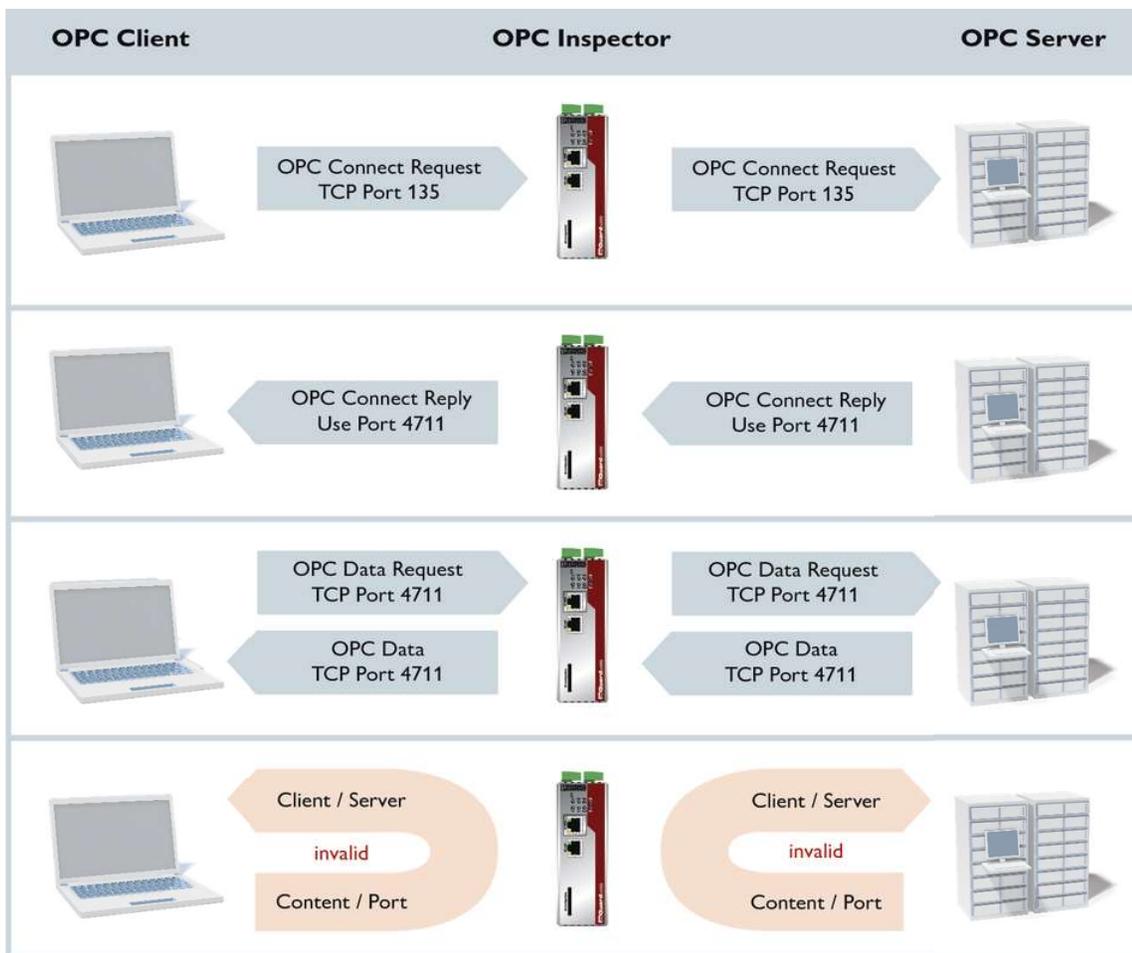
# Extended functionalities



OPC Inspector

- Deep Package Inspection for OPC Classic
- Stateful Inspection Firewall for OPC Classic



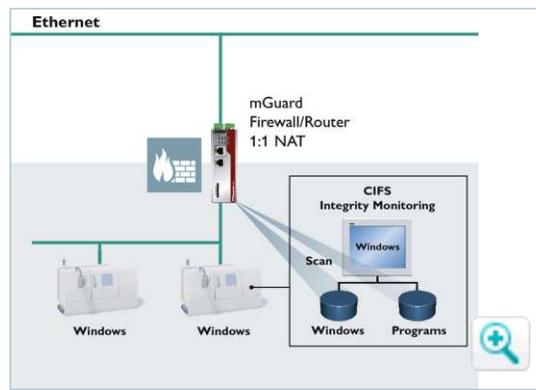


# Extended functionalities

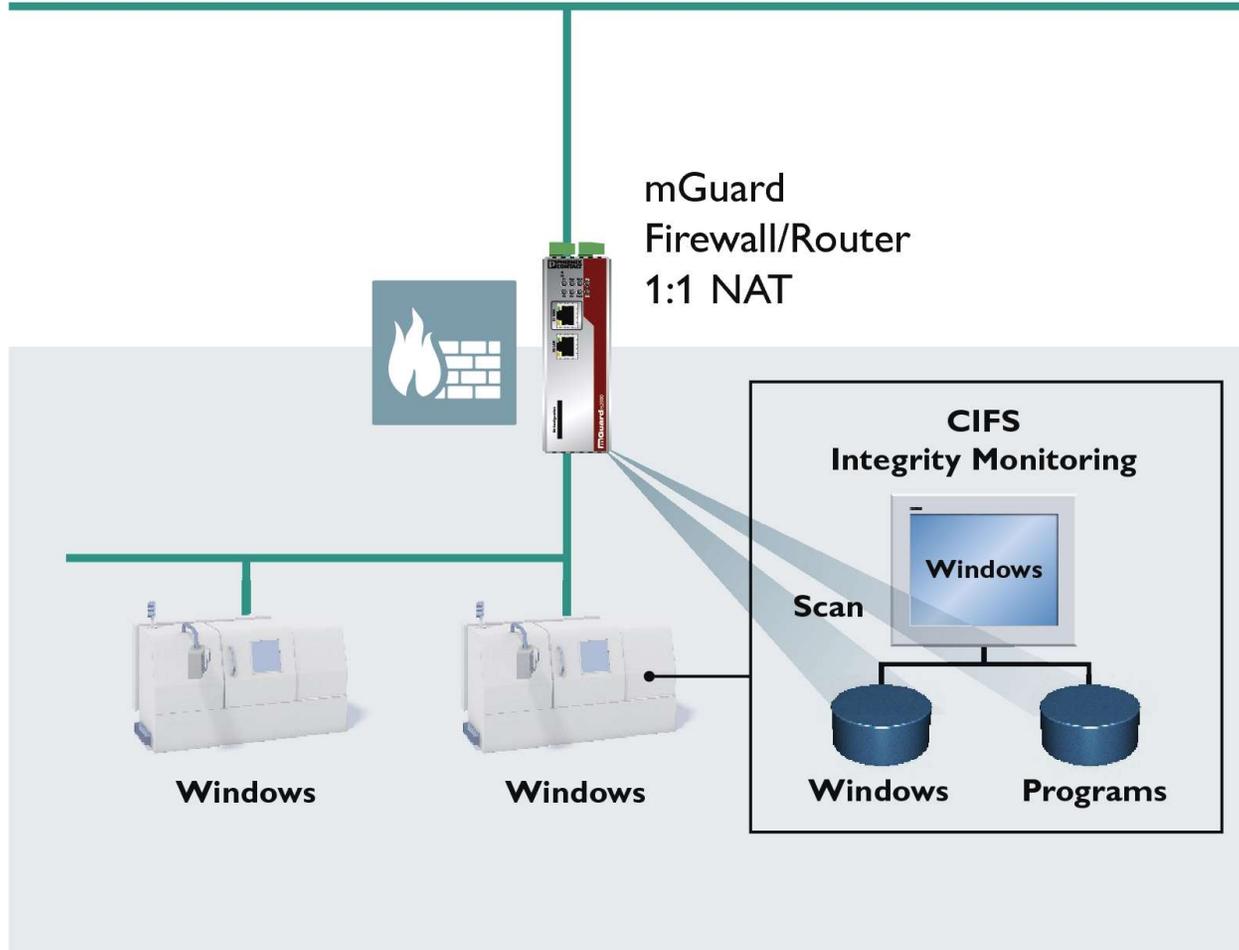
CIFS Integrity Monitoring



- Ideal for non patchable systems
- Detection of system changes



# Ethernet



# Extended functionalities

VPN extensions



- For all mGuard security appliances
- Extension in steps of 10, 100 und 250 simultaneous connections



# Extended functionalities

	<b>FL MGuard LIC LIFETIME FW</b>	<b>FL MGuard LIC FW RD</b>	<b>FL MGuard FW/VPN RD</b>	<b>FL MGuard LIC OPC INSP</b>	<b>FL MGuard LIC CIM</b>
Function	Lifetime software update	Firewall/router redundancy function	Firewall/router and VPN redundancy function	OPC-Inspector function	CIFS Integrity Monitoring (CIM)
Order number	2700184	2701356	2702193	2702191	2701083

	<b>FL MGuard LIC VPN-10</b>	<b>FL MGuard LIC VPN-100</b>	<b>FL MGuard LIC VPN-250</b>
Function	up to 10 additional VPN online connections	Up to 100 additional VPN online connections	Up to 250 additional VPN online connections
Order number	2700194	2702546	2700193



# Central device management software

 Free start-up support

Flexibly  upgradeable



 Efficient device management 



# Central device management software



Efficient  
device  
management

- Central creation and administration of all mGuard settings
- Selective or overall transmission on all remote mGuards
- Roll-out of firmware upgrades and licence extensions



# Central device management software

Free start-up support



- For an easy start-up of the software, a remote support with a Phoenix Contact employee is included



# Central device management software



Flexibly  
upgradeable

- Scalable up to several thousand devices



# Central device management software



## FL MGUARD DM UNLIMITED

Function	Central device management software for any number of MGUARDs
Order number	2981974



# Power over Ethernet Injectors

Surge protection and shield current monitoring on the field cable side



Different performance standards and electrical isolation



Multiple connection technologies and covered wiring space



Tool-free shield connection



# Power over Ethernet Injectors



Different performance standards and electrical isolation

- IEEE 802.3 at
- IEEE 802.3 af up to 30 watts
- IEEE 802.3 bt Up to 60 watts will be supported
- supply voltage and Power over Ethernet port are electrically isolated in certain versions



# Power over Ethernet Injectors

Surge protection and shield current monitoring on the field cable side



- integrated surge protection protects devices and application against sudden high voltages in the data cables
- An LED indicates differences in potential or other shield currents caused by the effects of EMC



# Power over Ethernet Injectors



Multiple connection technologies and covered wiring space

- IDC, Push-in, screw, and RJ45 connections.
- Covered cable wiring space

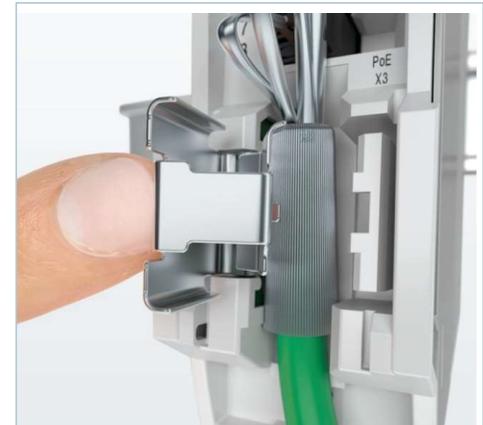


# Power over Ethernet Injectors



Tool-free shield  
connection

- Quick and easy connection of the cable shielding without tools
- strain relief is assured
- Simply lay the cable in the shaft provided and close the shroud



# Power over Ethernet Injectors



	INJ 1000 INJ 1010	INJ 1000-T INJ 1010-T	INJ 1100-T INJ 1110-T	INJ 2102-T INJ 2112-T	INJ 2103-T INJ 2113-T	INJ 2101-T INJ 2111-T	FL PSE 2TX
Connection technology	RJ45 / RJ45	RJ45 / RJ45	RJ45 / RJ45	RJ45 / IDC	RJ45 / Push-In	RJ45 / Screw	2 x RJ45/RJ45
Temperatur range	0°C ... +60°C	-40 °C ... +75 °C					0°C ... +55°C
Galvanic isolation	No			Yes			
Overtoltage protection, shield current diagnosis	No			Yes			No
Order number PoE af*/at, 15*/30W	2703005	2703006	2703009	2703012	1004065	2703011	*2891013
Order number PoE bt, 60W	2703007	2703008	2703010	2703014	1004066	2703013	-



# Power over Ethernet Switches



Reduced cabling efforts



Installation in field



Managed features



Applicable across manufacturers: conform to IEEE 802.3



Installation in control cabinet

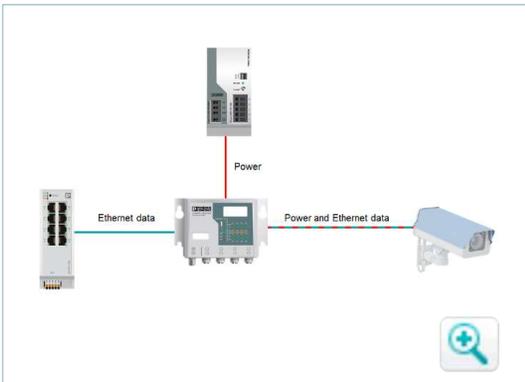


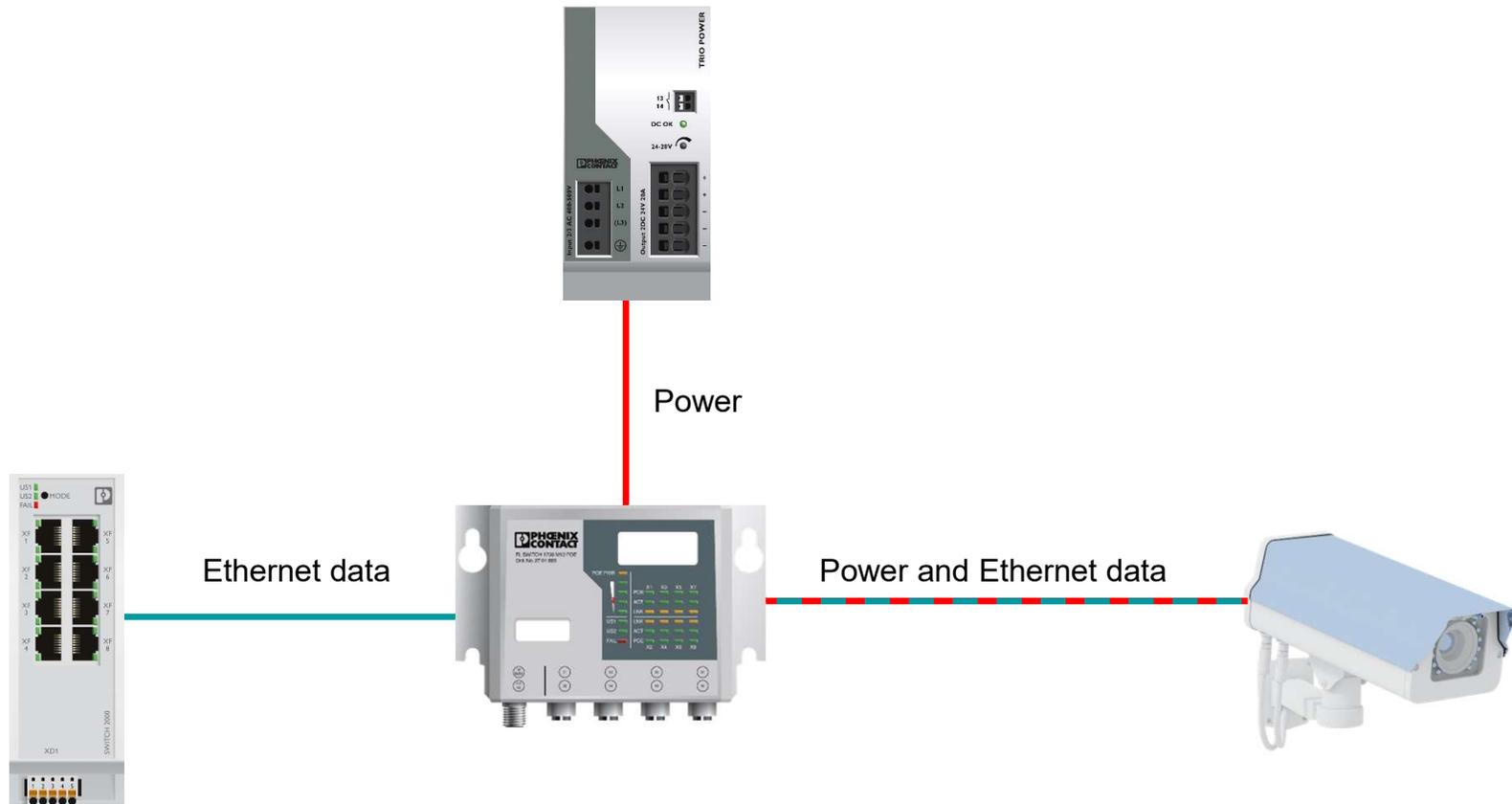
# Power over Ethernet Switches

Reduced cabling efforts



- Installation of cameras, IP phones or WLAN access points with only one cable
- Saving of power supply and related installation costs





# Power over Ethernet Switches



Installation  
in field

- Gigabit und Jumboframe support
- IEEE 802.3at (30W)
- Typically used in industrial image processing

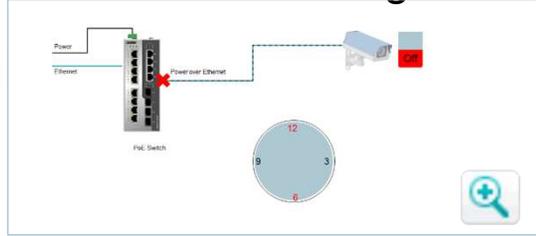


# Power over Ethernet Switches

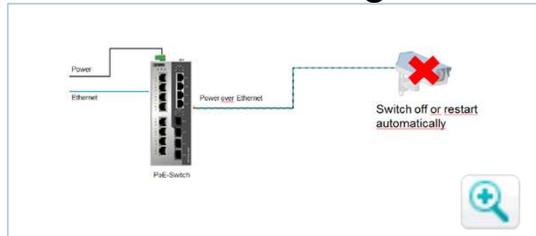


Managed features

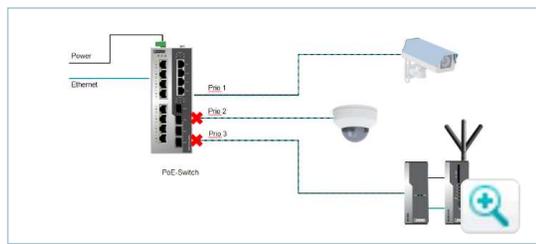
## PoE Scheduling

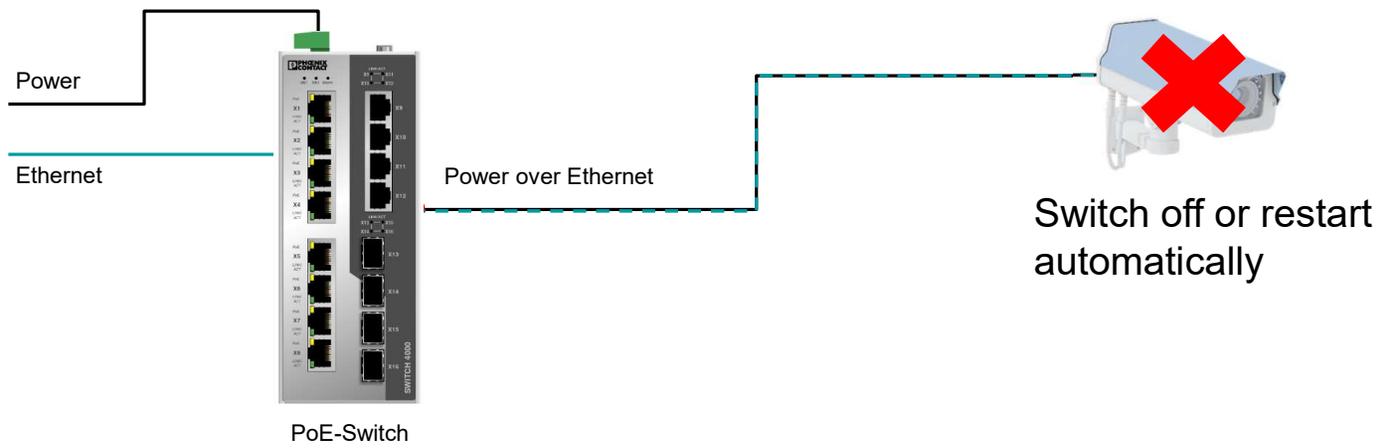


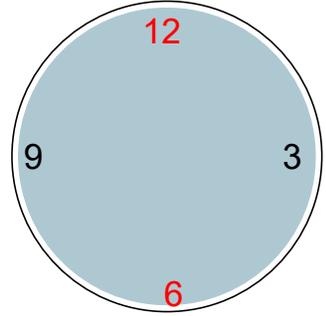
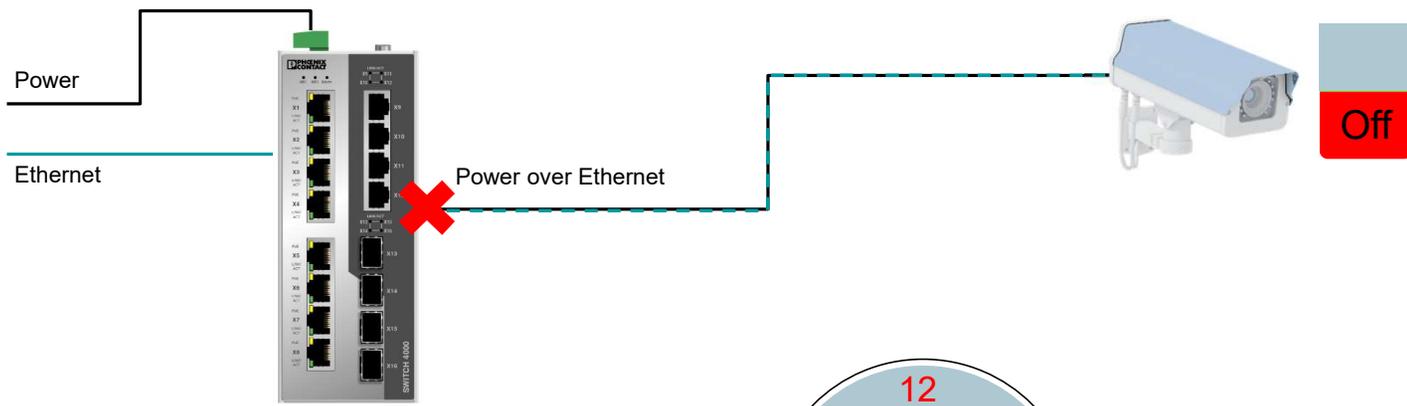
## PoE Watchdog

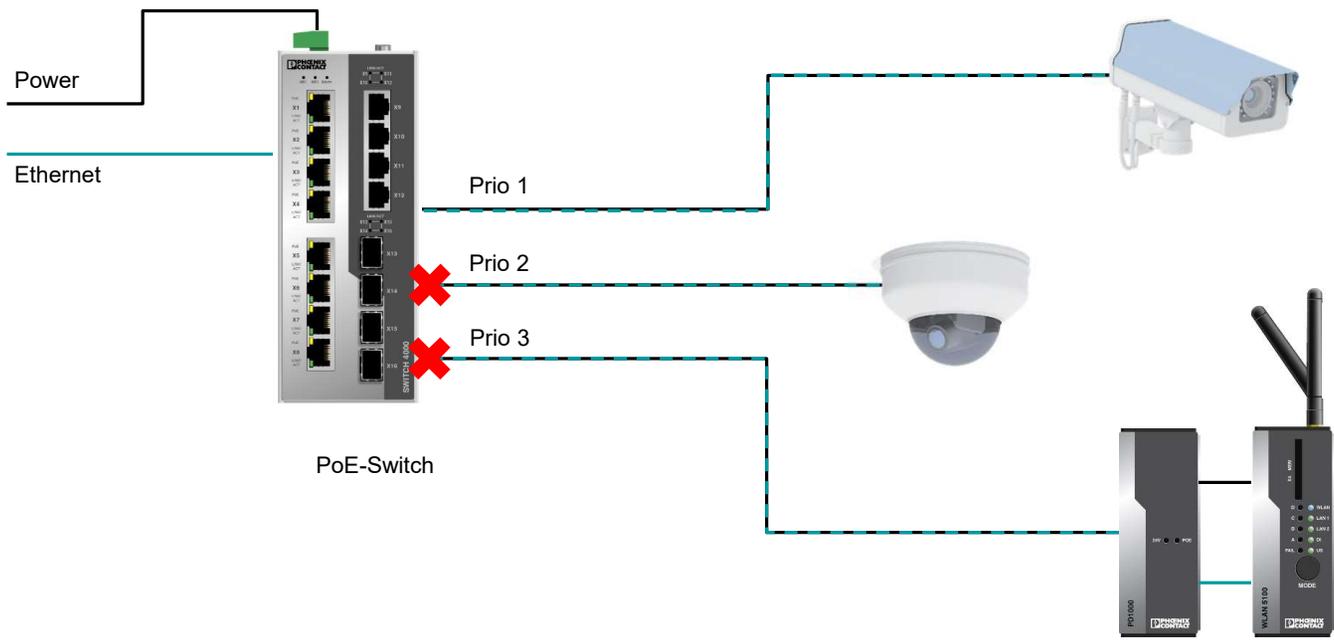


## PoE Prioritization









# Power over Ethernet Switches



Installation in  
control  
cabinet

- Easy integrable in control cabinet
- 24 V DC supply
- IEEE 802.3 af/at/bt (15 W/ 30 W/ 60 W)
- Endspan and Midspan



# Power over Ethernet Switches



**FL SWITCH  
1001T-4POE**

**FL SWITCH  
1708 M12 POE**

**FL SWITCH  
1000T-2POE-  
2SFP**

**FL SWITCH  
1001T-4POE-  
GT-SFP**

**FL SWITCH  
1001T-4POE-GT**

**FL SWITCH  
1000T-8POE-GT-  
2SFP**

Function	Unmanaged Switch					
Ports	4x RJ45 1x RJ45	8x M12	2 x RJ45 2 x SFP	4 x RJ45 1 x RJ45 1 x SFP	4 x RJ45 1 x RJ45	8 x RJ45 2 x SFP
Transmission speed	10/100 Mbit/s	10/100/1000 Mbit/s				
Power budget	30 W per port, max. 120 W	30 W per port, max. 200 W	30 W per port max. 60 W	30 W per port max. 120 W		
PoE-Standard	IEEE 802.3 af/at (PoE+)					
Order nr.	2891064	2701883	1026765	1026932	1026937	1026929



# Power over Ethernet Switches



	FL SWITCH 4000T-4POE-SFP	FL SWITCH 4000T-8POE- 2SFP	FL SWITCH 4004T-8POE- 4SFP	FL IF 2PSE-F
--	-----------------------------	----------------------------------	----------------------------------	--------------

Function	Managed Switch			Media module for Modular Managed Switch
Ports	4 x RJ45 1 x SFP	8 x RJ45 2 x SFP	8 x RJ45 4 x RJ45, 4 x SFP	2 x RJ45
Transmission Speed	10 /100 / MBit/s (RJ45) 1000 MBit/s (SFP)		10/100/1000 MBit/s	10/100 Mbit/s
Power budget	60 W per port, max. 180 W		60 W per port, max. 240 W	15 W
Standard	IEEE 802.3 af/at (PoE+), prepared for PoE bt (PoE ++)			IEEE 802.3af (PoE)
Order number	1026924	1026923	1026922	2832904



# Power over Ethernet Splitter

Robust metal housing  
and extended  
temperature range

Output power  
up to 21 W

24 V DC output voltage  
suitable for the control  
cabinet



Gigabit transmission

Compliant with  
IEEE 802.3af/at



# Power over Ethernet Splitter



## FL PD 1001 T GT

Function	PoE splitter
Ports	1x RJ45 PoE (output) 1x RJ45 (data input)
Transmission speed	10/100/1000 Mbit/s
Power budget	30 W
PoE-Standard	IEEE 802.3 af/at (PoE+)
Order number	2891042



# Unmanaged Switches 1000

 Slim design

High data rates



Status LEDs

 Flexible installation

 Prioritization of the data traffic

 Automation protocols



# Unmanaged Switches

Slim design



- particularly narrow at 2.25 cm (5 & 8 ports) and 4 cm (16 ports)
- can also be used in applications where space is limited

Ultra slim



 Automation protocols





## Unmanaged Switches

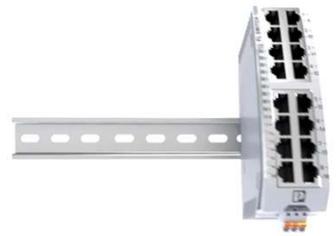


# Unmanaged Switches



Flexible installation

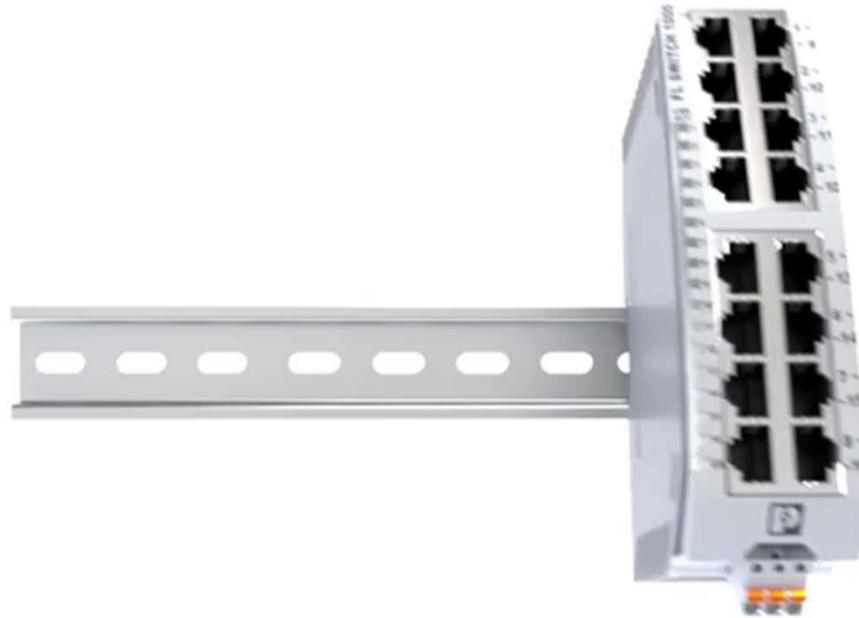
- Can be mounted flat on the mounting rail using mounting accessories
- The outgoing direction of the connections can be selected as required.



Flexible mounting options

 Automation protocols

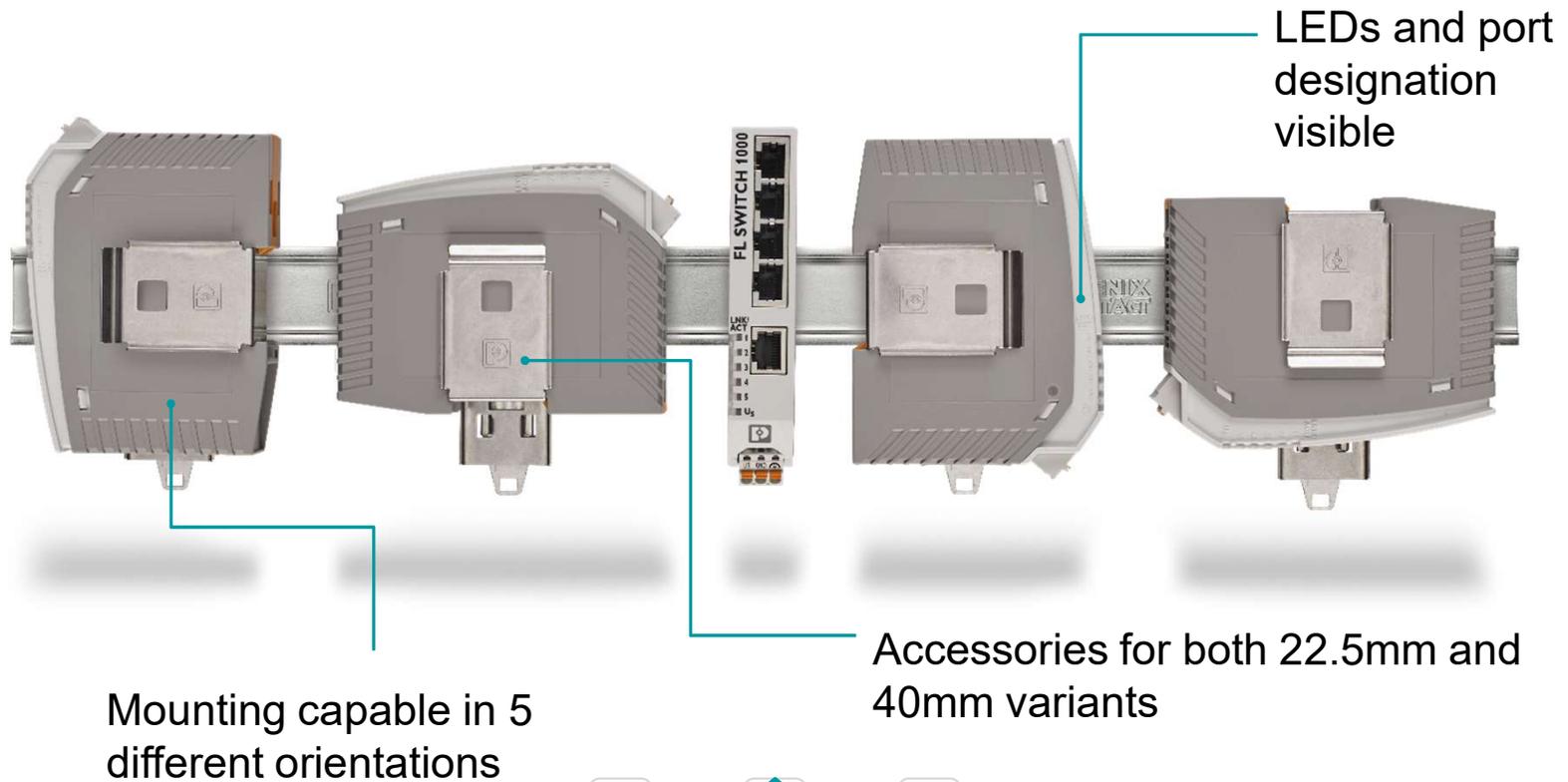




Flexible mounting options



# Unmanaged Switches - Product Mounting

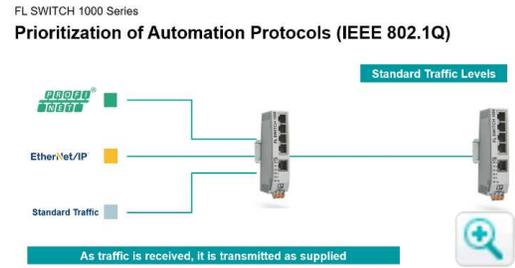


# Unmanaged Switches



Prioritization of the data traffic

- The real-time properties of PROFINET and EtherNet/IP™ automation networks are supported
- More stable networks and increased system availability

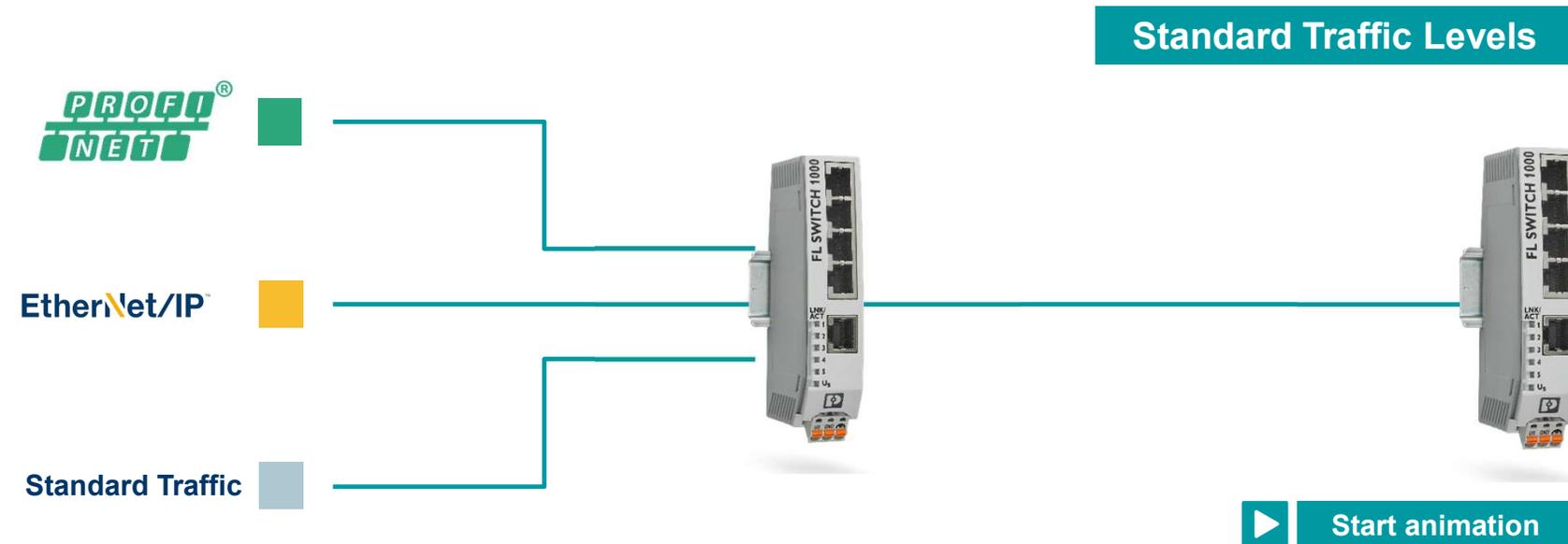


 Automation protocols



FL SWITCH 1000 Series

## Prioritization of Automation Protocols (IEEE 802.1Q)

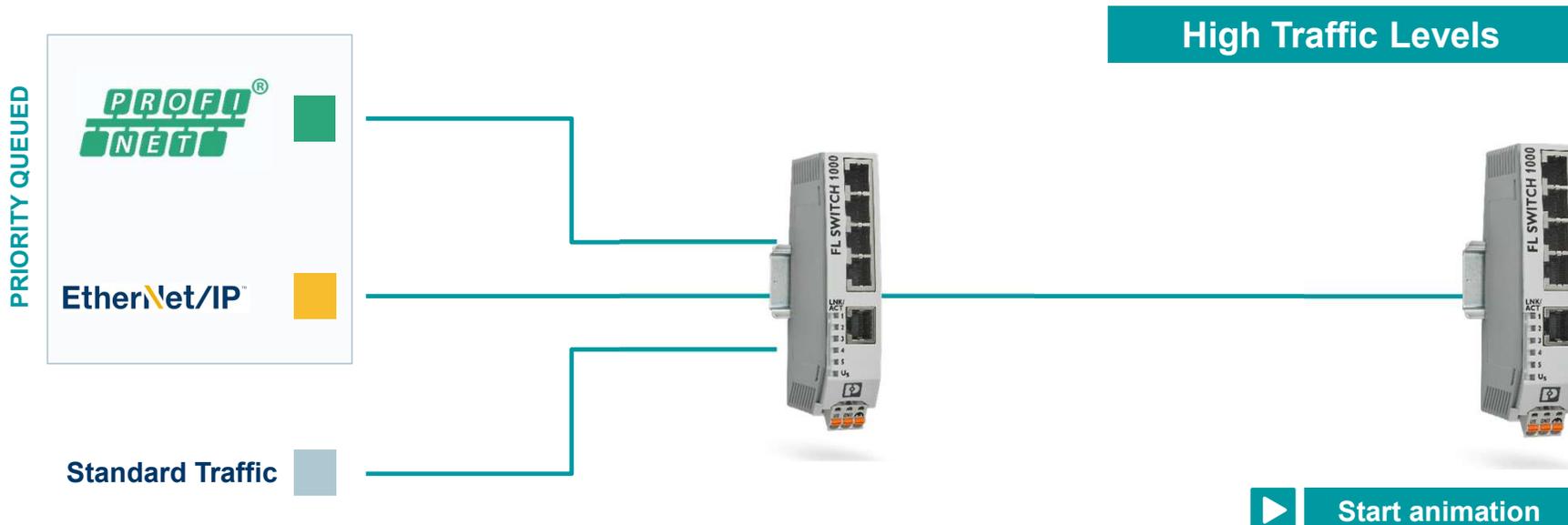


As traffic is received, it is transmitted as supplied



FL SWITCH 1000 Series

## Prioritization of Automation Protocols (IEEE 802.1Q)



As buffer fills, select traffic types take priority



# Prioritization of Traffic (IEEE 802.1Q)

## PRIORITY QUEUED



Ethernet/IP



## NON-PRIORITY QUEUED

Standard Traffic

Queues assigned in accordance with standard recommendations



# FL SWITCH 1000



	FL SWITCH 1005N	FL SWITCH 1008N	FL SWITCH 1016N	FL SWITCH 1105N	FL SWITCH 1108N
--	-----------------	-----------------	-----------------	-----------------	-----------------

Application area	Basic	Basic	Basic	Basic	Basic
Design	Slim	Slim	Slim	Slim	Slim
Copper Ports	5x RJ45 (10/100 Mbit/s)	8x RJ45 (10/100 Mbit/s)	16x RJ45 (10/100 Mbit/s)	5x RJ45 (10/100/1000 Mbit/s)	8x RJ45 (10/100/1000 Mbit/s)
Fiber optic Ports	-	-	-	-	-
Quality of Service	No	No	No	No	No
Temperature range	-10 °C ... 60 °C	-10 °C ... 60 °C	-10 °C ... 60 °C	-10 °C ... 60 °C	-10 °C ... 60 °C
Special features	-	-	-	-	-
Order number	1085039	1085256	1085255	1085254	1085243



Automation protocols



# FL SWITCH 1000



	<b>FL SWITCH 1004N-FX</b>	<b>FL SWITCH 1004N-FX ST</b>	<b>FL SWITCH 1004N-FX SM</b>	<b>FL SWITCH 1004N-SFX</b>	<b>FL SWITCH 1005N-2SFX</b>
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Application area	Basic	Basic	Basic	Basic	Basic
Design	Slim	Slim	Slim	Slim	Slim
Copper Ports	4x RJ45 (10/100 Mbit/s)	4x RJ45 (10/100 Mbit/s)	4x RJ45 (10/100 Mbit/s)	4x RJ45 (10/100 Mbit/s)	5x RJ45 (10/100 Mbit/s)
Fiber optic Ports	1x FX	1x FX ST	1x FX SM	1x FX	2x SFX
Quality of Service	No	No	No	No	No
Temperature range	-10 °C ... 60 °C				
Special features	-	-	-	-	-
Order number	1084159	1085179	1085214	1084159	1085176



Automation protocols



# FL SWITCH 1000



	FL SWITCH 1104N-SFP	FL SWITCH 1105N-2SFP
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Application area	Basic	Basic
Design	Slim	Slim
Copper Ports	4x RJ45 (10/100/1000 Mbit/s)	5x RJ45 (10/100/1000 Mbit/s)
Fiber optic Ports	1x SFP	2x SFP
Quality of Service	No	No
Temperature range	-10 °C ... 60 °C	-10 °C ... 60 °C
Special features	-	-
Order number	1085173	1085171



 Automation protocols



# FL SWITCH 1000



**FL SWITCH  
1001T-POE**

**FL SWITCH  
1008E**

Application area	Harsh environmenr	Harsh environment
Design	Slim	Slim
Ports	4x PoE+ 1x RJ45 (10/100 Mbit/s)	8x RJ45 (10/100 Mbit/s)
Quality of Service	No	No
Temperature range	-40°C ... 75°C	-40°C ... 75°C
Special features	PoE IEEE802.3at	IEC61850-3 IEEE 1613
Order number	2891064	2891065



 Automation protocols



# FL SWITCHES 1000 equipment



	<b>FL PANEL ADAPTER 22.5</b>	<b>FL PANEL ADAPTER 40</b>	<b>FL DIN-RAIL ADAPTER 22.5</b>	<b>FL DIN-RAIL ADAPTER 40</b>
Assembly	Wall mounting	Wall mounting	Rail mounting	Rail mounting
Width	22,5 mm	40 mm	22,5 mm	40 mm
Order number	1085488	1085486	1085485	1085484



 Automation protocols



# SFNB-Switches



	<b>FL SWITCH SFNB 5TX</b>	<b>FL SWITCH SFNB 8TX</b>	<b>FL SWITCH SFNB 4TX/FX</b>	<b>FL SWITCH SFNB 4TX/FX ST</b>	<b>FL SWITCH SFNB 4TX/FX SM20</b>
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Application area	Basic	Basic	Basic	Basic	Basic
Design	Slim	Slim	Slim	Slim	Slim
Ports	5x TP-RJ45 (10/100 Mbit/s)	8x TP-RJ45 (10/100 Mbit/s)	4x TP-RJ45 (10/100 Mbit/s) 1x SC-D MM (100 Mbit/s)	4x TP-RJ45 (10/100 Mbit/s) 1x ST-D MM (100 Mbit/s)	4x TP-RJ45 (10/100 Mbit/s) 1x SC-D SM (100 Mbit/s)
Quality of Service	No	No	No	No	No
Temperature range	-10 °C ... 60 °C	-10 °C ... 60 °C	-10 °C ... 60 °C	-10 °C ... 60 °C	-10 °C ... 60 °C
Special features	-	-	-	-	-
Order number	2891001	2891002	2891027	2891028	2891029



Automation protocols



# SFNB-Switches



	<b>FL SWITCH SFNB 5TX-PNE</b>	<b>FL SWITCH SFNB 8TX-PNE</b>
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Application area	Basic	Basic
Design	Slim	Slim
Ports	5x TP-RJ45 (10/100 Mbit/s)	8x TP-RJ45 (10/100 Mbit/s)
Quality of Service	Yes	Yes
Temperature range	-10 °C ... 60 °C	-10 °C ... 60 °C
Special features	PROFINET & EtherNet/IP prioritization, PTCP filtering	PROFINET & EtherNet/IP prioritization, PTCP filtering
Order number	1071801	1071800



 Automation protocols



# SF-Switches



	FL SWITCH SF 8TX	FL SWITCH SF 16TX	FL SWITCH SF 7TX/FX	FL SWITCH SF 7TX/FX ST	FL SWITCH SF 15TX/FX
Application area	Standard	Standard	Standard	Standard	Standard
Design	Flat	Flat	Flat	Flat	Flat
Ports	8x TP-RJ45 (10/100 Mbit/s)	16x TP-RJ45 (10/100 Mbit/s)	7x TP-RJ45 (10/100 Mbit/s) 1x SC-D MM (100 Mbit/s)	7x TP-RJ45 (10/100 Mbit/s) 1x ST-D MM (100 Mbit/s)	15x TP-RJ45 (10/100 Mbit/s) 1x SC-D MM (100 Mbit/s)
Quality of Service	No	No	No	No	No
Temperature range	0°C ... 55°C	0°C ... 55°C	0°C ... 55°C	0°C ... 55°C	0°C ... 55°C
Special features	-	-	-	-	-
Order number	2832771	2832849	2832726	2832577	2832661

 Automation protocols



# SF-Switches



	FL SWITCH SF 6TX/2FX	FL SWITCH SF 6TX/2FX ST	FL SWITCH SF 14TX/2FX	FL SWITCH SF 4TX/3FX ST
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Application area	Standard	Standard	Standard	Standard
Design	Flat	Flat	Flat	Flat
Ports	7x TP-RJ45 (10/100 Mbit/s) 2x SC-D MM (100 Mbit/s)	7x TP-RJ45 (10/100 Mbit/s) 2x ST-D MM (100 Mbit/s)	14x TP-RJ45 (10/100 Mbit/s) 2x SC-D MM (100 Mbit/s)	4x TP-RJ45 (10/100 Mbit/s) 3x ST-D MM (100 Mbit/s)
Quality of Service	No	No	No	No
Temperature range	0°C ... 55°C	0°C ... 55°C	0°C ... 55°C	0°C ... 55°C
Special features	-	-	-	-
Order number	2832933	2832674	2832593	2832603

 Automation protocols



# SFN-Switches



	<b>FL SWITCH SFN 5TX</b>	<b>FL SWITCH SFN 5TX-PN</b>	<b>FL SWITCH SFN 5TX-24VAC</b>	<b>FL SWITCH SFN 8TX</b>	<b>FL SWITCH SFN 8TX-PN</b>
Application area	Standard	Standard	Standard	Standard	Standard
Design	Slim	Slim	Slim	Slim	Slim
Ports	5x TP-RJ45 (10/100 Mbit/s)	5x TP-RJ45 (10/100 Mbit/s)	5x TP-RJ45 (10/100 Mbit/s)	8x TP-RJ45 (10/100 Mbit/s)	8x TP-RJ45 (10/100 Mbit/s)
Quality of Service	Yes	Yes	Yes	Yes	Yes
Temperature range	0°C ... 60 °C /	0°C ... 60 °C	0°C ... 60 °C	0°C ... 60 °C	0°C ... 60 °C
Special features	-	Optimized for PROFINET	24 V AC/DC supply voltage	-	Optimized for PROFINET
Order number	2891152	2891151	2891021	2891929	2891018



 Automation protocols



# SFN-Switches



	<b>FL SWITCH SFN 8TX-24VAC</b>	<b>FL SWITCH SFN 16TX</b>	<b>FL SWITCH SFN 4TX/FX</b>	<b>FL SWITCH SFN 4TX/FX ST</b>	<b>FL SWITCH SFN 7TX/FX</b>
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Application area	Standard	Standard	Standard	Standard	Standard
Design	Slim	Slim	Slim	Slim	Slim
Ports	8x TP-RJ45 (10/100 Mbit/s)	16x TP-RJ45 (10/100 Mbit/s)	4x TP-RJ45 (10/100 Mbit/s) 1x SC-D MM (100 Mbit/s)	4x TP-RJ45 (10/100 Mbit/s) 1x ST-D MM (100 Mbit/s)	7x TP-RJ45 (10/100 Mbit/s) 1x SC-D MM (100 Mbit/s)
Quality of Service	Yes	No	Yes	Yes	Yes
Temperature range	0°C ... 60 °C	0°C ... 60 °C	0°C ... 60 °C/	0°C ... 60 °C	0°C ... 60 °C
Special features	24 V AC/DC supply voltage	-	-	-	-
Order number	2891020	2891933	2891851	2891453	2891097

 Automation protocols



# SFN-Switches



	<b>FL SWITCH SFN 7TX/FX-NF</b>	<b>FL SWITCH SFN 7TX/FX ST</b>	<b>FL SWITCH SFN 15TX/FX</b>	<b>FL SWITCH SFN 6TX/2FX</b>	<b>FL SWITCH SFN 6TX/2FX-NF</b>
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Application area	Standard	Standard	Standard	Standard	Standard
Design	Slim	Slim	Slim	Slim	Slim
Ports	7x TP-RJ45 (10/100 Mbit/s) 1x SC-D MM (100 Mbit/s)	7x TP-RJ45 (10/100 Mbit/s) 1x ST-D MM (100 Mbit/s)	15x TP-RJ45 (10/100 Mbit/s) 1x SC-D MM (100 Mbit/s)	6x TP-RJ45 (10/100 Mbit/s) 2x SC-D MM (100 Mbit/s)	6x TP-RJ45 (10/100 Mbit/s) 2x SC-D MM (100 Mbit/s)
Quality of Service	Yes	Yes	No	Yes	Yes
Temperature range	0°C ... 60 °C	0°C ... 60 °C	0°C ... 60 °C	0°C ... 60 °C	0°C ... 60 °C
Special features	flow control disabled	-	-	-	flow control disabled
Order number	2891023	2891110	2891934	2891314	2891024

Automation protocols



# SFN-Switches



	<b>FL SWITCH SFN 6TX/2FX ST</b>	<b>FL SWITCH SFN 14TX/ 2FX ST</b>
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Application area	Standard	Standard
Design	Slim	Slim
Ports	6x TP-RJ45 (10/100 Mbit/s) 2x ST-D MM (100 Mbit/s)	14x TP-RJ45 (10/100 Mbit/s) 2x SC-D MM (100 Mbit/s)
Quality of Service	Yes	No
Temperature range	0°C ... 60 °C	0°C ... 60 °C
Special features	-	-
Order number	2891411	2891935



 Automation protocols



# SFN-Gigabit-Switches



	FL SWITCH SFN 5GT	FL SWITCH SFN 8GT	FL SWITCH SFN 7GT/SX	FL SWITCH SFN 6GT/2SX	FL SWITCH SFN 6GT/2LX	FL SWITCH SFN 6GT/2LX-20
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Application area	Gigabit	Gigabit	Gigabit	Gigabit	Gigabit	Gigabit
Design	Slim	Slim	Slim	Slim	Slim	Slim
Ports	5x RJ45 (10/100/1000 Mbit/s)	8x RJ45 (10/100/1000 Mbit/s)	7x RJ45 1x SC-D MM (10/100/1000 Mbit/s)	7x RJ45 2x SC-D MM (10/100/1000 Mbit/s)	6x RJ45 2x SC-D SM, 10 km (10/100/1000 Mbit/s)	6x RJ45 2x SC-D SM, 20 km (10/100/1000 Mbit/s)
Quality of Service	Yes	Yes	Yes	Yes	Yes	Yes
Temperature range	-25 °C ... 75 °C	-25 °C ... 75 °C	-25 °C ... 75 °C	-25 °C ... 75 °C	-25 °C ... 75 °C	-25 °C ... 75 °C
Special features	-	-	-	-	-	-
Order number	2891444	2891673	2891518	2891398	2891987	2891563

Automation protocols



# SFNT-Switches



Optimized for the process industry



Protective coating for particularly harsh environments



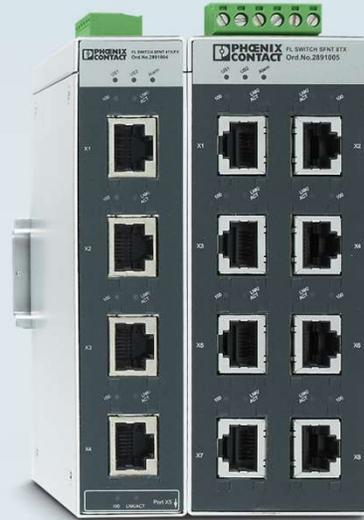
Simple diagnosis of errors

Automation protocols



# SFNT-Switches

Flexible installation



- wide temperature range from
- -40 °C to +75 °C  
Industry specific approvals ATEX, IECEx and UL Class 1 Div 2

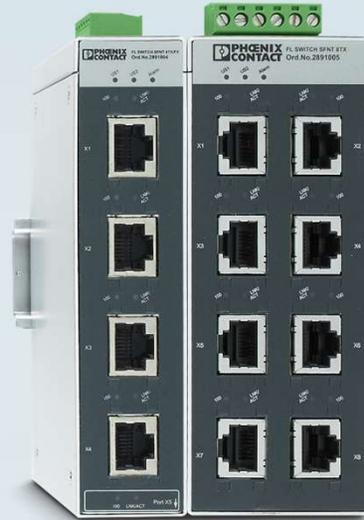


Automation protocols



# SFNT-Switches

Protective coating  
for particularly harsh  
environments



- Provides special protection against environmental failures and damage caused by external influences such as high humidity, dust or chemicals



Automation protocols



# SFNT-Switches



	FL SWITCH SFNT 5TX	FL SWITCH SFNT 5TX-C	FL SWITCH SFNT 8TX	FL SWITCH SFNT 8TX-C	FL SWITCH SFNT 16TX
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Application area	Harsh environment				
Design	Slim	Slim	Slim	Slim	Slim
Ports	5x TP-RJ45 (10/100 Mbit/s)	5x TP-RJ45 (10/100 Mbit/s)	8x TP-RJ45 (10/100 Mbit/s)	8x TP-RJ45 (10/100 Mbit/s)	16x TP-RJ45 (10/100 Mbit/s)
Quality of Service	Yes	Yes	Yes	Yes	No
Temperature range	-40°C ... 75°C				
Special features	ATEX approval	Conformal coating	ATEX approval	Conformal coating	ATEX approval
Order number	2891003	2891043	2891005	2891045	2891952



Automation protocols



# SFNT-Switches



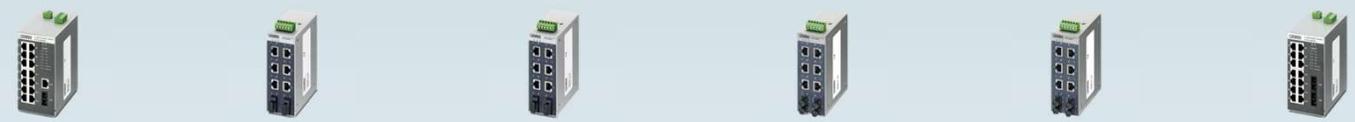
	<b>FL SWITCH SFNT 4TX/ FX</b>	<b>FL SWITCH SFNT 4TX/ FX- C</b>	<b>FL SWITCH SFNT 7TX/ FX</b>	<b>FL SWITCH SFNT 7TX/ FX- C</b>	<b>FL SWITCH SFNT 7TX/ FX ST</b>	<b>FL SWITCH SFNT 7TX/ FX ST-C</b>
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Application area	Harsh environment					
Design	Slim	Slim	Slim	Slim	Slim	Slim
Ports	4x TP-RJ45 (10/100 Mbit/s) 1x SC-D MM (100 Mbit/s)	4x TP-RJ45 (10/100 Mbit/s) 1x SC-D MM (100 Mbit/s)	7x TP-RJ45 (10/100 Mbit/s) 1x SC-D MM (100 Mbit/s)	7x TP-RJ45 (10/100 Mbit/s) 1x SC-D MM (100 Mbit/s)	7x TP-RJ45 (10/100 Mbit/s) 1x ST-D MM (100 Mbit/s)	7x TP-RJ45 (10/100 Mbit/s) 1x ST-D MM (100 Mbit/s)
Quality of Service	Yes	Yes	Yes	Yes	Yes	Yes
Temperature range	-40°C ... 75°C					
Special features	ATEX approval	Conformal coating	ATEX approval	Conformal coating	-	Conformal coating
Order number	2891004	2891044	2891006	2891046	2891007	2891047

 Automation protocols



# SFNT-Switches



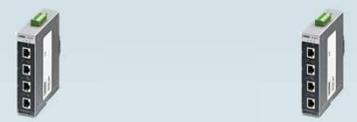
	<b>FL SWITCH SFNT 15TX/FX</b>	<b>FL SWITCH SFNT 6TX/ 2FX</b>	<b>FL SWITCH SFNT 6TX/2FX-C</b>	<b>FL SWITCH SFNT 6TX/ 2FX ST</b>	<b>FL SWITCH SFNT 6TX/2FX ST-C</b>	<b>FL SWITCH SFNT 14TX/2FX</b>
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Application area	Harsh environment	Harsh environment	Harsh environment	Harsh environment	Harsh environment	Harsh environment
Design	Slim	Slim	Slim	Slim	Slim	Slim
Ports	15x TP-RJ45 (10/100 Mbit/s) 1x SC-D MM (100 Mbit/s)	6x TP-RJ45 (10/100 Mbit/s) 2x SC-D MM (100 Mbit/s)	6x TP-RJ45 (10/100 Mbit/s) 2x SC-D MM (100 Mbit/s)	6x TP-RJ45 (10/100 Mbit/s) 2x ST-D MM (100 Mbit/s)	6x TP-RJ45 (10/100 Mbit/s) 2x ST-D MM (100 Mbit/s)	14x TP-RJ45 (10/100 Mbit/s) 2x SC-D MM (100 Mbit/s)
Quality of Service	No	Yes	Yes	Yes	Yes	No
Temperature range	-40°C ... 75°C	-40°C ... 75°C	-40°C ... 75°C	-40°C ... 75°C	-40°C ... 75°C	-40°C ... 75°C
Special features	-	-	Conformal coating	-	Conformal coating	-
Order number	2891953	2891025	2891048	2891026	2891049	2891954

 Automation protocols



# SFNT-Gigabit-Switches



	FL SWITCH SFNT 5GT	FL SWITCH SFNT 5GT-C
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Application area	Harsh environment	Harsh environment
Design	Slim	Slim
Ports	5x TP-RJ45 (10/100/1000 Mbit/s)	5x TP-RJ45 (10/100/1000 Mbit/s)
Quality of Service	Yes	Yes
Temperature range	-40°C ... 75°C	-40°C ... 75°C
Special features	-	Conformal coating
Order number	2891390	2891391



 Automation protocols



# Switch 1800 and 1900

Simple LED diagnosis



Power supply adapted to the mounting location



High port density

Automation protocols



# Switch 1800 and 1900



Power supply adapted to the mounting location

- Operated with alternating current (100 V AC ... 240 V AC) for use in 19" cabinets



# Switch 1605

Flexible choice of mounting location



Protection class IP67

Trouble-free use in automation networks

Power supply also possible as line topology

 Automation protocols



# Switch 1605



Trouble-free use in automation networks

- Guarantees real-time capability, e.g. of time-sensitive process data, even with high data loads
- Support of automation protocols such as PROFINET



Automation protocols



# Switch 1605



Protection class  
IP67

- IP67 protection rating makes the unmanaged switch resistant to external influences such as moisture or dust



Automation protocols



# Further variants



**FL SWITCH 1824**      **FL SWITCH 1924**      **FL SWITCH 1605 M12**



Application area	Standard	Gigabit	Field
Design	19"	19"	Wall mounting
Ports	24x TP-RJ45 (10/100 Mbit/s)	24x RJ45 (10/100/1000 Mbit/s)	5x M12 (10/100 Mbit/s)
Quality of Service	Yes	Yes	Yes
Temperature range	0°C ... 55°C	-25 °C ... 75 °C	-40°C ... 70°C
Special features	-	-	Degree of protection IP67
Order number	2891041	2891057	2700200

 Automation protocols



# Secure remote maintenance

Integrated Firewall

No modification of the machines and plant, no software needed



Scalable

Encrypted communication with the machine or plant

Optimized designs for different industrial applications

 Automation protocols



# Secure remote maintenance



Encrypted communication with the machine or plant

- VPN connection
- Ipsec protocol
- Encryption according to Advanced Encryption Standard (AES)



Automation protocols



# Secure remote maintenance



Optimized designs for different industrial applications

■ Slim



■ Flat



■ PCI(E)



# Secure remote maintenance



Scalable

- From one temporary VPN tunnel up to several thousand simultaneous VPN connections
- From a simple VPN router up to a professional security appliance with intelligent diagnose, alert and firewall functions



Automation protocols



# Secure remote maintenance



	<b>FL MGuard RS2000 TX/TX VPN</b>	<b>FL MGuard RS2005 TX VPN</b>	<b>TC MGuard RS2000 3G VPN</b>	<b>FL MGuard RS4000 TX/TX VPN</b>	<b>FL MGuard RS4000 TX/TX- P</b>
VPN tunnel optionally expandable	2 No	2 No	2 No	10 up to 250	10 up to 250
Firewall	2-Click-Firewall	2-Click-Firewall	2-Click-Firewall	Multifunction firewall	Multifunction firewall
Integrated switch		5-Port unmanaged	4-Port unmanaged	-	-
Special features	-	-	Mobilfunk	-	ATEX, IECex approvals
Extended functionalities	No	No	No	Optional	Optional
Order number	2700642	2701875	2903441	2200515	2702259



 Automation protocols



# Secure remote maintenance



	<b>FL MGuard RS4004 TX/ DTX VPN</b>	<b>TC MGuard RS4000 3G VPN</b>	<b>FL MGuard GT/GT VPN</b>	<b>FL MGuard PCI4000 VPN</b>	<b>FL MGuard PCIE4000 VPN</b>
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VPN tunnel optionally expandable	10 up to 250	10 up to 250	10 up to 250	10 up to 250	10 up to 250
Firewall	Multifunction firewall	Multifunction firewall	Multifunction firewall	Multifunction firewall	Multifunction firewall
Integrated switch	4-Port managed	4-Port managed	-	-	-
Special features	DMZ-Port	WAN, mobile phone network	Gigabit, SFP, maritime approval	PCI format	PCIE format
Extended functionalities	Optional	Optional	Optional	Optional	Optional
Order number	2701877	2903440	2700198	2701275	2701278

 Automation protocols



# Remote access via internet and mobile phone network



highly flexible site networking

Robust hardware for harsh industrial environments

Universal data links – worldwide and control-independent

Long range and high data throughput

Alarm via e-mail or SMS



## Remote access via internet and mobile phone network



Long range and high data throughput

- Mobile highspeed data links up to 150 Mbit/s via 4G LTE networks
- Mobile data links up to 21 Mbit/s via 3G networks
- Industrial ADSL broadband connections according to Annex A, B and J with up to 25 Mbit/s



# TC Router



	TC ROUTER 3002T-4G	TC ROUTER 3002T-3G	TC ROUTER 2002T-4G	TC ROUTER 2002T-3G	TC ANT MOBILE WALL 5M
Function	Industrial 4G router European version	Industrial 3G router European version	Industrial 4G router European version	Industrial 3G router European version	Multiband mobile phone antenna with mounting bracket for outdoor installation,  5m antenna cable (SMA)
Mobile radio Interface	4G	3G	4G	3G	
Transmission speed	150 Mbit/s LTE Downlink	21 Mbit/s HSPA Downlink	150 Mbit/s LTE Downlink	21 Mbit/s HSPA Downlink	
Switching inputs and outputs	2 digital Inputs, 1 digital output	2 digital Inputs, 1 digital output	2 digital Inputs, 1 digital output	2 digital Inputs, 1 digital output	
General	Firewall, NAT, <b>IPsec, OpenVPN</b> SMS and e-mail transmission	Firewall, NAT, <b>IPsec, OpenVPN</b> SMS and e-mail transmission	Firewall, NAT SMS and e-mail transmission	Firewall, NAT SMS and e-mail transmission	
Order number	2702528	2702529	2702530	2702531	



# TC Router



verizon



AT&T



	TC ROUTER 3002T-4G VZN	TC ROUTER 3002T-4G ATT	TC ANT MOBILE WALL 5M
Function	Industrial 4G router <b>USA</b> For communication in <b>Verizon</b> Wireless mobile network	Industrial 4G router <b>USA</b> For communication in <b>AT&amp;T</b> Wireless mobile network	Multiband mobile phone antenna with mounting bracket for outdoor installation,  5m antenna cable (SMA)
Mobile radio Interface	4G	4G	
Transmission speed	150 Mbit/s LTE Downlink	150 Mbit/s LTE Downlink	
Switching inputs and outputs	2 digital Inputs, 1 digital output	2 digital Inputs, 1 digital output	
General	Firewall, NAT, <b>IPsec, OpenVPN</b> SMS and e-mail transmission	Firewall, NAT, <b>IPsec, OpenVPN</b> SMS and e-mail transmission	
Order number	2702532	2702533	2702273



# Extension of complex IT networks

Status and diagnostics display

Remote diagnostics of all devices and paths



Replaceable surge protection

Economical Ethernet communication

Managed and unmanaged extenders in one network



# Extension of complex IT networks



Economical  
Ethernet  
communication

- Distances up to 20 kilometers
- Using existing two-wire cables
- Expanding the system during operation



# Extension of complex IT networks



Managed and unmanaged extenders in one network

- Easy installation via Plug-and-Play
- Automatic topology and data rate recognition
- Diagnostics of all devices and paths via IP







- Multi-stage signaling and remote signaling of the protective devices via SNMP, e.g.
- Performance limit reached, replacement recommended
- Overloaded, replacement required



# Extension of complex IT networks



Remote diagnostics of all devices and paths

- Automatic alarming via SNMP
- Point-to-point, line and ring topologies
- Data rates up to 30 Mbit/s



# Extension of complex IT networks



	<b>TC EXTENDER 2001 ETH-2S</b>	<b>TC EXTENDER 4001 ETH-1S</b>	<b>TC EXTENDER 6004 ETH-2S</b>
--	--------------------------------	--------------------------------	--------------------------------

Function	Unmanaged Ethernet-Extender	Managed Ethernet-Extender	Managed Ethernet-Extender
Topologies	Ring, line, point-to-point	Point-to-point	Ring, line, point-to-point
Replaceable surge protection	No	Yes	Yes
Diagnostic indicators	LEDs	LEDs	Display
Ports	2x SHDSL, 1x Ethernet	1x SHDSL, 1x Ethernet	2x SHDSL, 4x Ethernet
Order number	2702409	2702253	2702255



# Industrial Bluetooth – FL EPA 2



Interference-free parallel operation with WLAN networks

Integrated special antennas for reliable wireless connections

Optimized for operation in PROFINET networks



Various application areas



Quick and easy startup

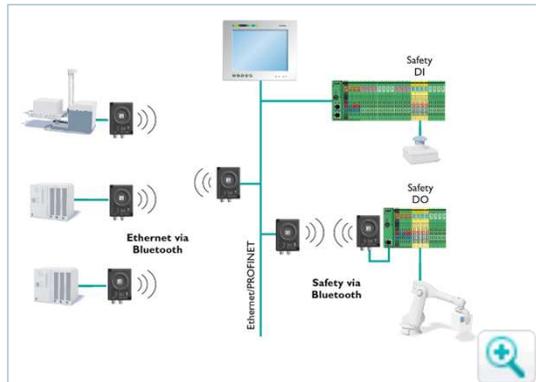


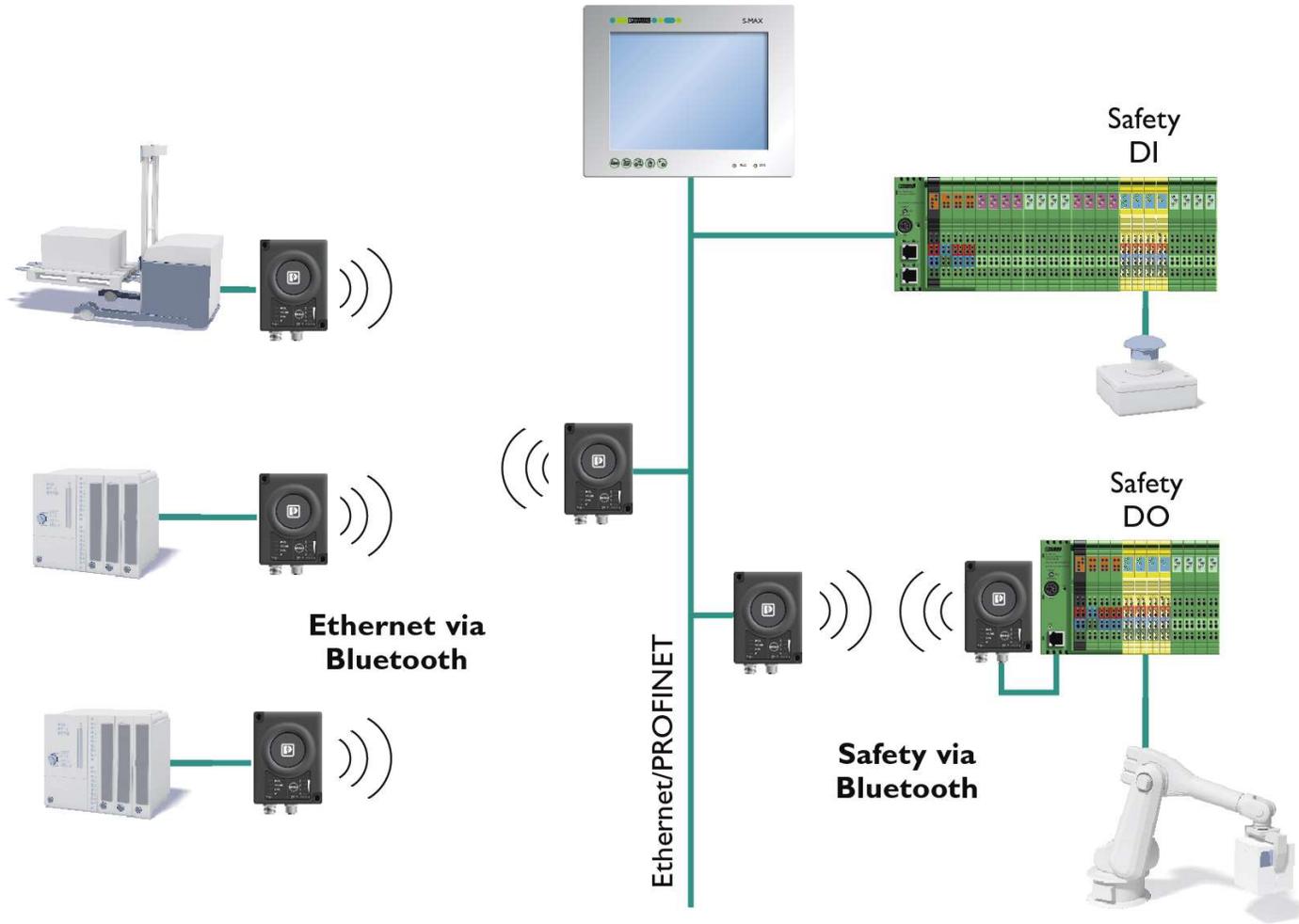
# Industrial Bluetooth – FL EPA 2



Various application areas

- Point-to-point connection (Cranes, traveling bridge collectors, robots)
- Multipoint connection (I/O components, scanners, PCs)





# Industrial Bluetooth – FL EPA 2

Interference-free parallel operation with WLAN networks



- Adaptive frequency hopping (AFH)
- Low emission mode (LEM)
- Black channel list (BCL)



# Industrial Bluetooth – FL EPA 2



	FL EPA 2 (BT Mode)	FL EPA 2 RSMA (BT Mode)	FL BT EPA 2
Function	Bluetooth Ethernet Client Adapter	Bluetooth Access Point	Bluetooth Ethernet Client Adapter
Antenna	Internal panel antenna	Omnidirectional antenna supplied as standard	Internal panel antenna
Frequency band	2,4 GHz	2,4 GHz	2,4 GHz
Connection type	M12 connection	M12 connection	M12 connection
Degree of protection	IP65	IP65	IP65
Temperature range	-40 °C ... 65 °C	-40 °C ... 65 °C	-40 °C ... 65 °C
Order number	1005955	1005957	1005869



# Industrial Bluetooth – FL BLE 1300

Protection class  
IP65

Bluetooth  
LowEnergy



Up to 8 sensors via TCP

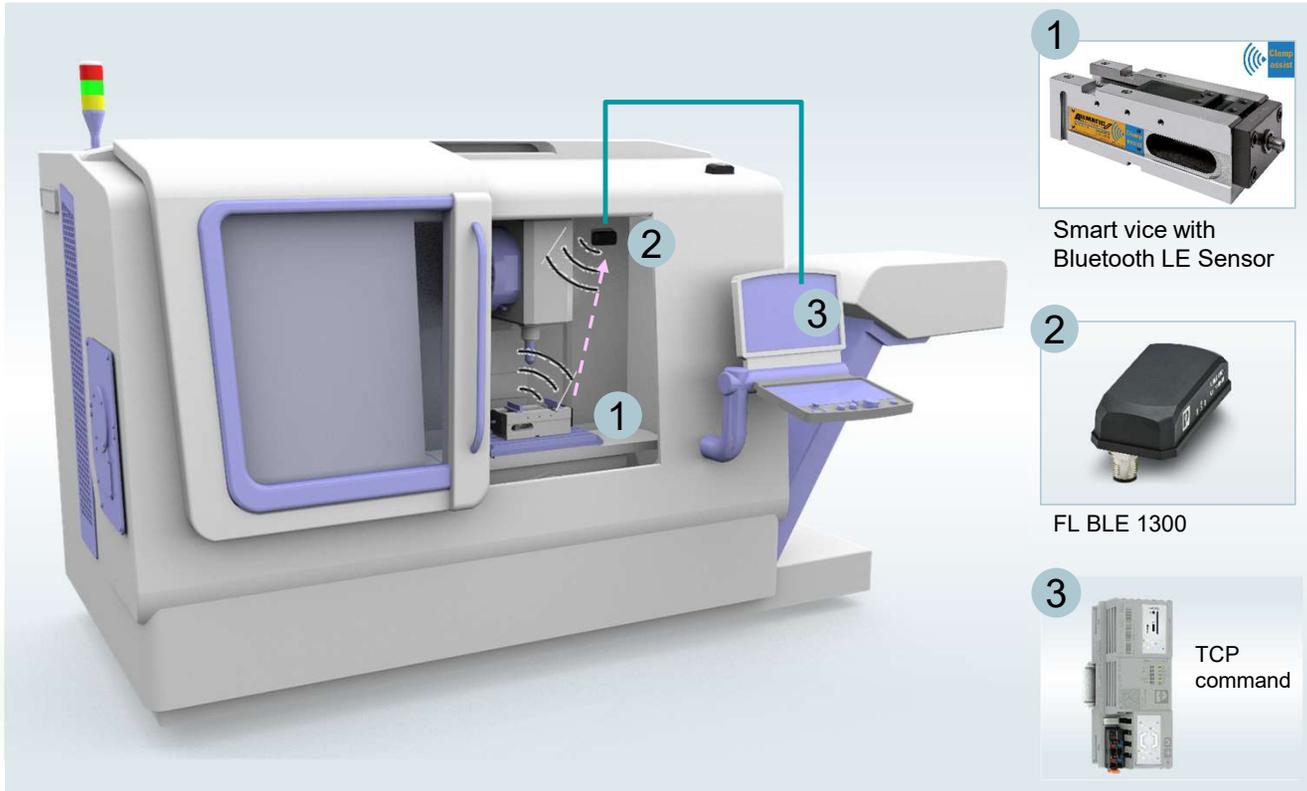


GATT



Status LEDs





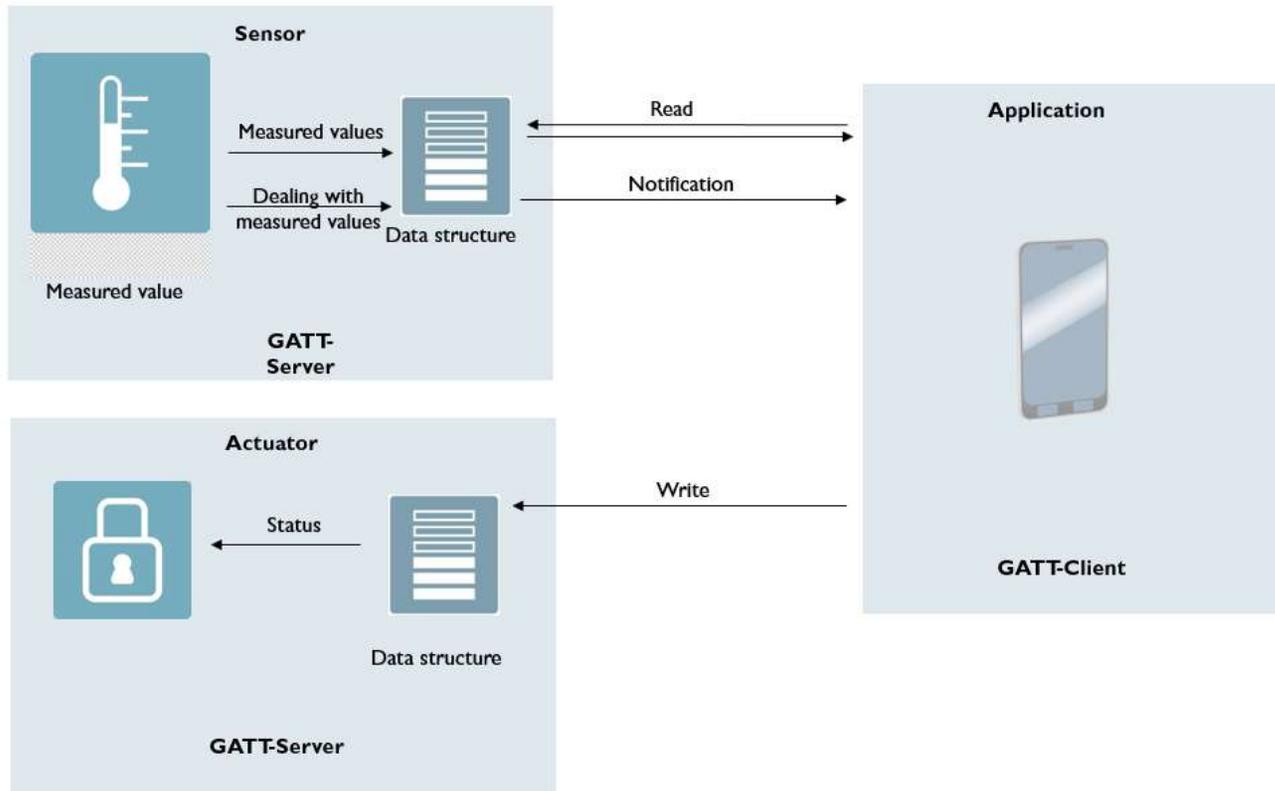
Smart vice with Bluetooth LE Sensor



FL BLE 1300



TCP command



# Industrial Bluetooth – FL BLE 1300



## FL BLE 1300

Function	Bluetooth LE 5.0 wireless module
Antenna	Internal antenna
Frequency band	2,4 GHz
Degree of protection	IP65
Temperature range	-40 °C ... 65 °C
Order number	1118418



# Industrial WLAN 1100 & 2100

Integrated antennas and wireless module in one single device

Reliable communication thanks to MIMO technology

Easy to mount

All-in-one-solution



Video

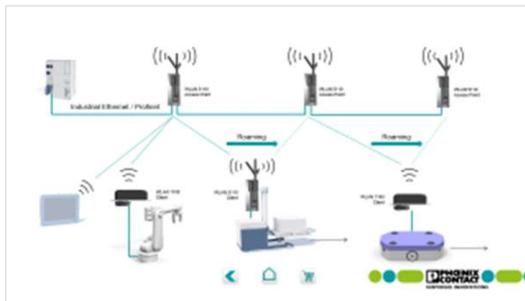


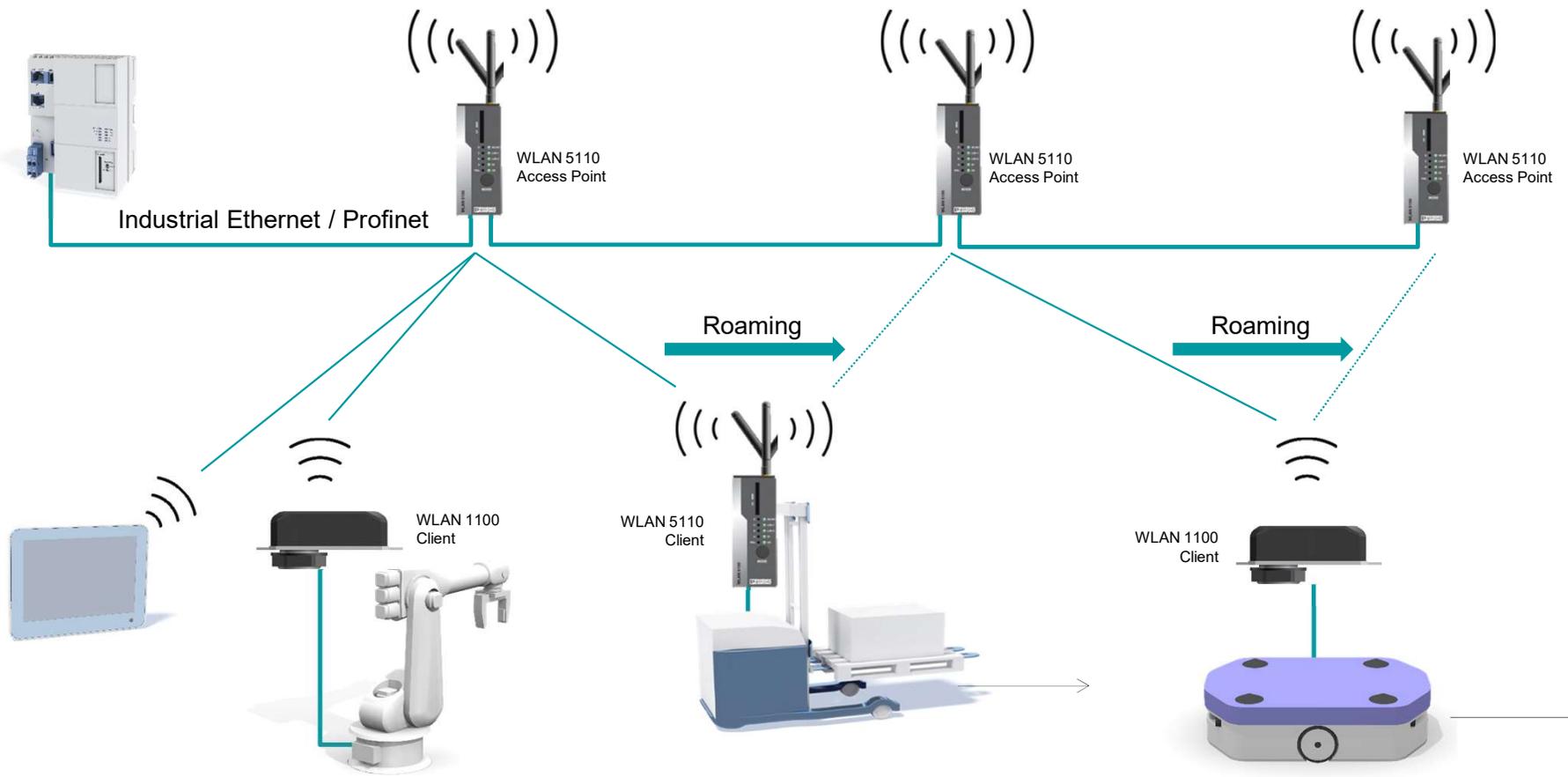
# Industrial WLAN 1100 & 2100

Reliable communication thanks to MIMO technology



- Interruption-free roaming



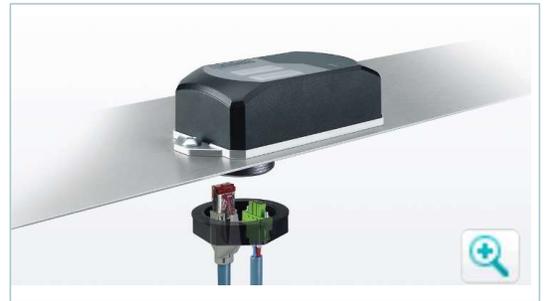


# Industrial WLAN 1100 & 2100

All-in-one-  
solution

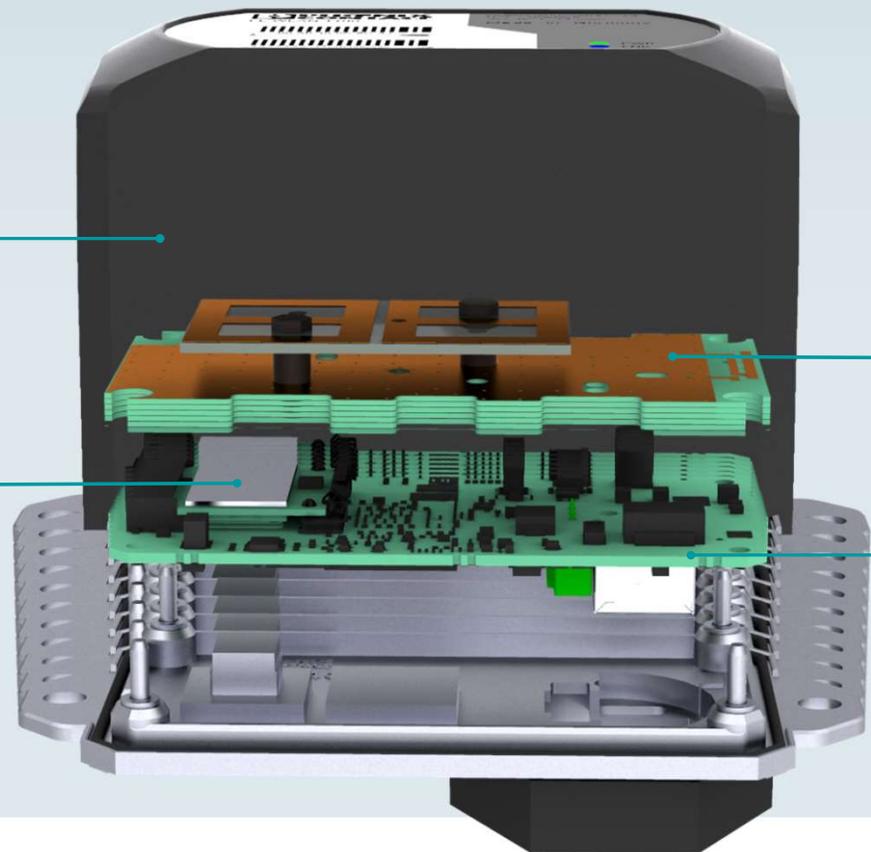


- Integrated antennas and wireless module in one single device
- Single-hole mounting directly on machines, mobile vehicles or control cabinets
- Shockproof according to IK08



# Industrial WLAN

**Extremely robust housing**, shockproof in accordance with IK08, 7 Joule at -50°C  
Protection Class IP 54  
**Powerful WLAN Board**  
802.11a/b/g/n  
Dual band, 2,4 & 5 GHz



**Special antennas**  
For fast and reliable communication

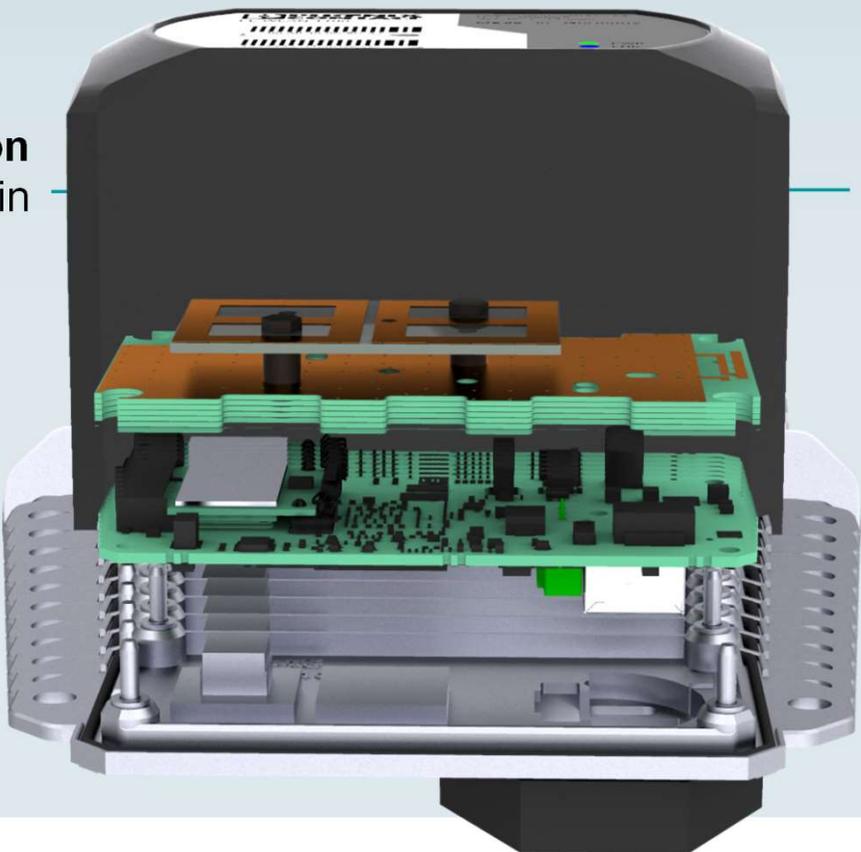
**Powerful Access Point**  
Linux operating system



# Industrial WLAN

**Power connection**  
Push-in

**Ethernet connection**  
Standard RJ45



# Industrial WLAN

**M32 inside thread**  
For optional IP67-connection  
adapter  
(if not mounted on cabinet)

**M40 external thread**  
for mounting



**Seal**  
up to IP67



# Industrial WLAN

**Fast and easy connection**  
thanks to single-hole  
mounting



# Industrial WLAN

Fast and easy connection  
thanks to single-hole  
mounting

Quick fastening



# Industrial WLAN



# Industrial WLAN



# Industrial WLAN 5010

Compact design – also suitable for control boxes in the field

Secure and compatible



External antenna connections for the flexible use of antennas

Powerful WLAN IEEE 802.11n module for more range

Cluster Management



Video



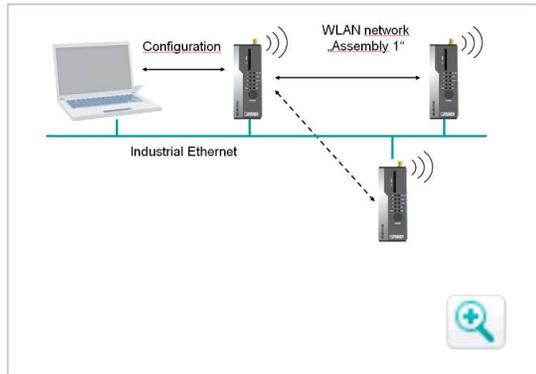
# Industrial WLAN 5100

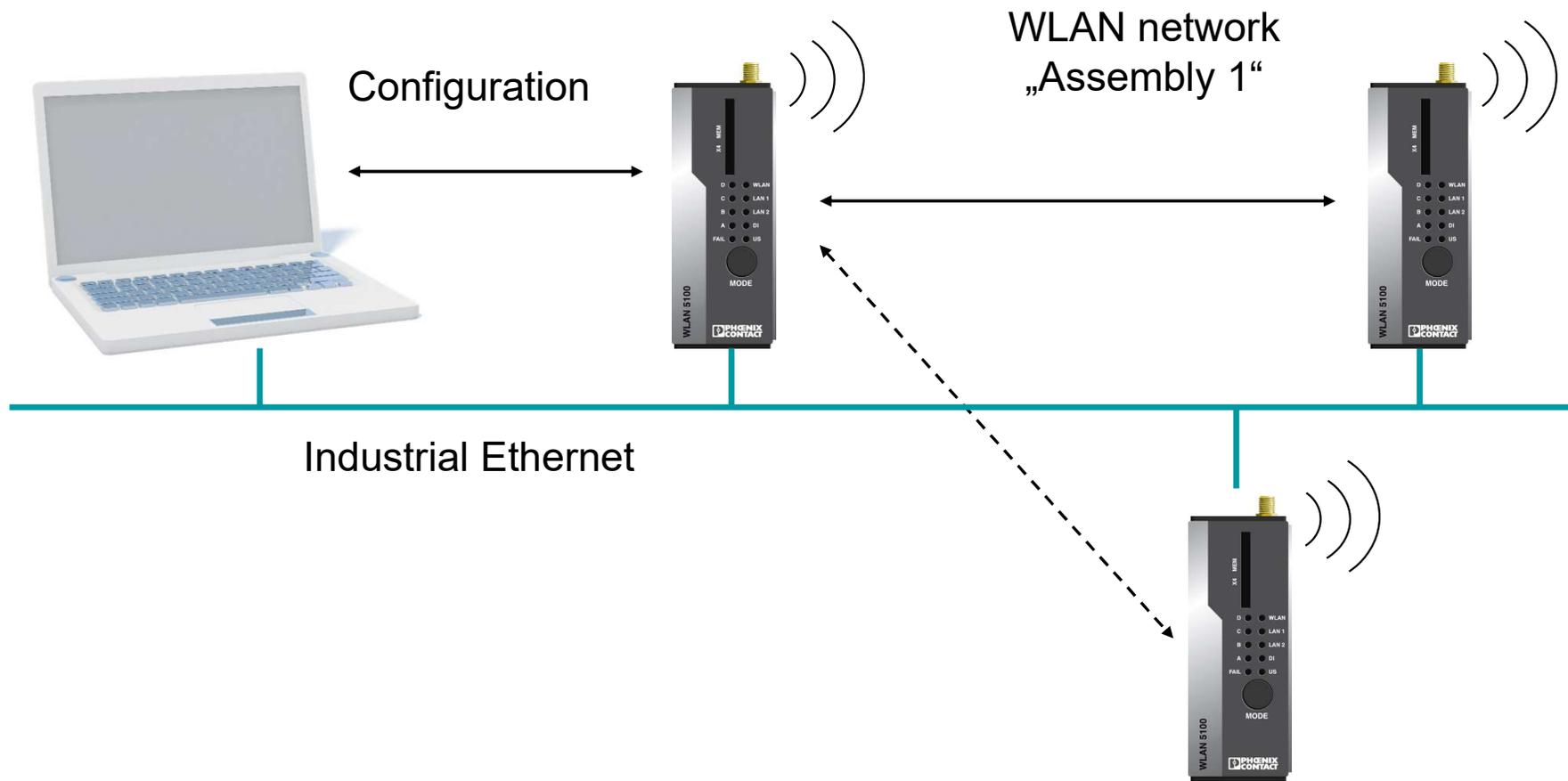


Compatible with standards IEEE 802.11 a/b/g/n

Quick and easy startup

- Cluster Management





# Industrial WLAN 1010 & 2010



Easy control through the SPS



Temp 0°...60°C



Compact and flexible mounting



High security through two virtual access points and IP filters

Connection for external antennas



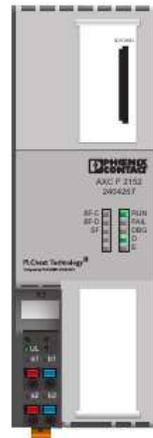
# Industrial WLAN 1010/2010

Easy control through the SPS



- Can be easily configured by a PC or PLC via a REST-API or controlled during runtime





Controller

http CLI command  
Configuration & controlling



WLAN 1010



# Industrial WLAN



	<b>FL WLAN 1100 (Europe)</b>	<b>FL WLAN 1101 (USA, Canada)</b>	<b>FL WLAN 2100 (Europe)</b>	<b>FL WLAN 2101 (USA, Canada)</b>
Function	Wireless access point and client		Wireless access point and client	
Antenna	2 x integrated Antennas with MIMO technology		2 x integrated Antennas with MIMO technology	
Wireless standard	IEEE 802.11 a/b/g/n		IEEE 802.11 a/b/g/n	
Frequency band	2,4 and 5 GHz		2,4 and 5 GHz	
Connection type	RJ45		RJ45	
Degree of protection	IP54 above, IP20 below		IP66/68 above, IP20 below	
Temperature range	0 °C ... 60 °C		-40 °C ... 60 °C	
Order number	2702534	2702538	2702535	2702540



# Industrial WLAN

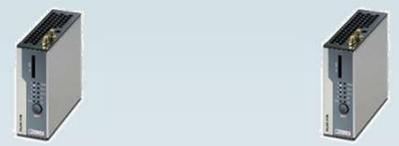


	<b>FL WLAN 1010 (Europe)</b>	<b>FL WLAN 1011 (USA, Canada)</b>	<b>FL WLAN 2010 (Europe)</b>	<b>FL WLAN 2011 (USA, Canada)</b>
--	----------------------------------	---------------------------------------	----------------------------------	---------------------------------------

Function	Wireless access point and client		Wireless access point and client	
Operating modes	Access Point, Client, 2 virtual Access Points		Access Point, Client, 2 virtual Access Points, Mesh	
Wireless standard	IEEE 802.11 a/b/g/n		IEEE 802.11 a/b/g/n	
Frequency band	2,4 and 5 GHz		2,4 and 5 GHz	
Max. Number of WLAN clients	10 Clients		60 Clients	
Degree of protection	IP20		IP20	
Temperature range	0 °C ... 60 °C		-40 °C ... 60 °C	
Order number	2702899	2702900	1119246	1119248



# Industrial WLAN



	<b>FL WLAN 5110 (Europe)</b>	<b>FL WLAN 5111 (USA, Canada)</b>
--	----------------------------------	---------------------------------------

Function	Wireless access point and client	
Antenna	2 x external Antennas (not included in scope of supply) with MIMO technology	
Wireless standard	IEEE 802.11 a/b/g/n	
Frequency band	2,4 and 5 GHz	
Connection type	RJ45	
Degree of protection	IP20	
Temperature range	-40 °C ... 60 °C	
Order number	1043193	1043201



# Industrial Bluetooth



	FL EPA 2 (WLAN Mode)	FL EPA 2 RSMA (WLAN Mode)
--	----------------------	---------------------------

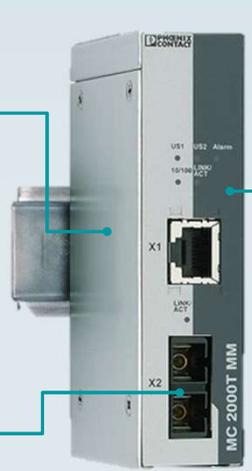
Function	Bluetooth Ethernet Client Adapter	Bluetooth Access Point
Antenna	Internal antenna	Omnidirectional antenna supplied as standard
Frequency band	2,4 and 5 GHz	2,4 and 5 GHz
Connection type	M12 connection	M12 connection
Degree of protection	IP65	IP65
Temperature range	-40 °C ... 65 °C	-40 °C ... 65 °C
Order number	1005955	1005957



# Media conversion

Maximum interference immunity,

FOT: Maximum transmission distances with an extremely high data rate



Link-fault-pass-through function: constant connection monitoring

approved for zone 2



# Media conversion



	FL MC 1000 SC	FL MC 1000 ST	FL MC 2000T SC	FL MC 2000T ST	FL MC 2000T SM20 SC	FL MC 2000T SM40 SC
Transmission	Multimode fiberglass				Singlemode fiberglass	
Connection method	SC duplex	B-FOC (ST*)	SC duplex	B-FOC (ST*)	SC duplex	
Temperature range	0°C...+60°C			-40°C...+75°C		
Range	Up to 9.6 km				Up to 20 km	Up to 40 km
Light wavelength	1310 nm					
Special features	Auto negotiation and MDI (x)		Store-and-forward or pass through mode can be selected via DIP switch with a short latency time of 835 ns. They can therefore be used for realtime Ethernet protocols			
Order number	2891320	2891321	2891315	2891316	2891317	2891318



# Media conversion



	<b>FL MC EF 1300 MM SC</b>	<b>FL MC EF 1300 MM ST</b>	<b>FL MC EF 1300 SM SC</b>	<b>FL MC 2000E</b>	<b>FL MC 2000E SM40 LC</b>
Transmission	Multimode fiberglass		Singlemode fiberglass	Multimode fiberglass	Singlemode fiberglass
Connection method	SC duplex	B-FOC (ST*)	SC duplex	LC duplex	
Temperature range	-40°C...+65°C			-40°C...+75°C	
Range	Up to 10 km		Up to 36 km	Up to 9.6 km	Up to 40 km
Light wavelength	1310 nm				
Special features	LFPT and FEF diagnostic functions, auto negotiation and auto MDI (x), backplane bus for redundant or alternative power supply			Accordance to IEC 61850/IEEE1613 4 kV insulation voltage, high EMC protection	
Order number	2902853	2902854	2902856	2891056	2891156



# Media conversion

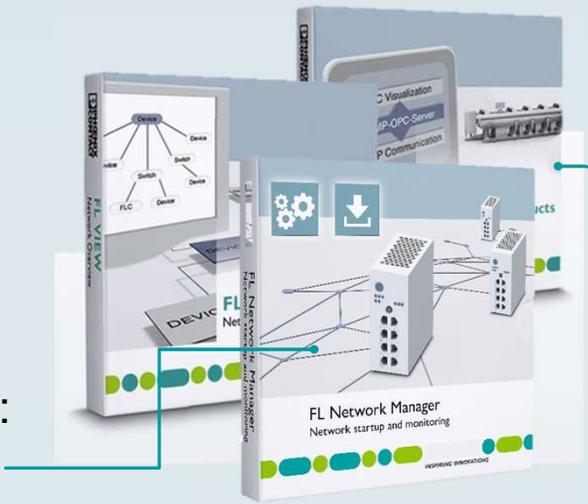


	FL MC EF WDM-SET SC	FL MC EF WDM-A SC	FL MC EF WDM-B SC	FL MC ETH/FO 660 T	FL MC EF 660 SCRJ
Transmission	Multimode and single mode fiberglass			Polymer fiber PCF	
Connection method	SC simplex			SC-RJ	
Temperature range	-40°C...+65°C			-20 °C ... 55 °C	
Range	Up to 38 km			Up to 100 m	
Light wavelength	1310/1550 nm			660 nm	
Special features	Converters A and B	Converter A	Converter B	T-coupler with two FO connections and two RJ45 sockets	Single-port media converter
Order number	2902660	2902658	2902659	2313164	2702944



# Software

**i** FL NETWORK MANAGER:  
Network startup and  
monitoring

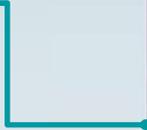


SNMP OPC Products: **i**  
Linking of standardized  
protocol types



## 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 independent of device vendor



## Topology overview

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



# Initial IP assignment

The image displays three screenshots from a network management interface:

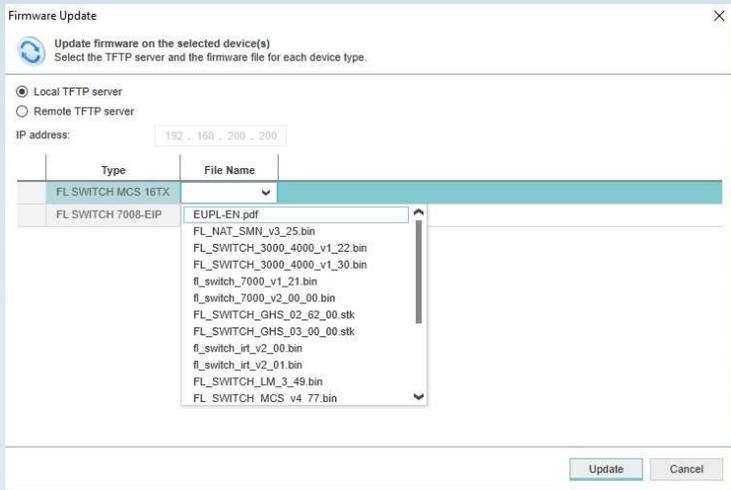
- BOOTP/DHCP SERVER:** Shows a table with columns: MAC address, IP address, Protocol, Status, Reserved, Lease expires. One entry is visible: MAC address 00:A0:45:0B:7E:6D, IP address 192.168.0.1, Protocol BOOTP, Status IP assigned, Reserved checked.
- BOOTP/DHCP Reservations:** Shows a table with columns: MAC address, IP address, Subnet mask, Default gateway. One entry is visible: MAC address 00:A0:45:0B:7E:6D, IP address 192.168.0.1, Subnet mask 255.255.255.0.
- LOGGING:** Shows a table with columns: Time Stamp, Code, Description. It lists several BOOTP/DHCP events with timestamps and descriptions of requests and replies.

## Initial IP assignment via BootP/DHCP/DCP

- All needed server integrated
- IP address, subnet mask and gateway
- Detailed status information
- Detailed logging



# Multiple Firmware Update



	Time Stamp	Code	Description
Online			
ⓘ	27.09.2016 14:05:07	UPD0003	Successfull firmware update on the device with ip-address 192.168.200.205. Old version: 4.77. New version 4.90.
ⓘ	27.09.2016 14:06:29	TFTP0007	The device 192.168.200.205 requests the local TFTP server to write the file 'C:\Users\Public\Documents\FL NETWO...
ⓘ	27.09.2016 14:06:29	TFTP0009	TFTP request from device 192.168.200.205 accepted. TFTP server started to write the file to the device...
ⓘ	27.09.2016 14:06:34	TFTP0012	Transfer of file 'FL_SWITCH_MCS_v4_77.bin' completed.
ⓘ	27.09.2016 14:08:27	UPD0003	Successfull firmware update on the device with ip-address 192.168.200.205. Old version: 4.90. New version 4.77.

Easy update for different Switches at the same time

- Needed server integrated
- No need to think about topology
- Roll picker to choose the right firmware
- One click to start all updates
- Progress bar for firmware transmission



# Configuration file handling

Read Configuration

Read configuration from the selected device(s)  
Select the TFTP server and start reading the configuration files.

Local TFTP server  
 Remote TFTP server

IP address: 192.168.0.111

Read Cancel

Write Configuration

Write configuration to the selected device(s)  
Select the TFTP server and the configuration file for each device.

Local TFTP server  
 Remote TFTP server

IP address: 192.168.1.111

Type	File name
192.168.1.9 (FL SWITCH 2005)	
192.168.1.7 (FL SWITCH 2206-2FX-ST)	192.168.1_3_08-15_102922.fcg
192.168.1.6 (FL SWITCH 2207-FX SM)	192.168.1_4_08-15_102922.fcg
192.168.1.3 (FL SWITCH 2005)	192.168.1_6_08-15_102922.fcg
	192.168.4_3_09-19_092213.fcg
	192.168.4_4_09-19_092213.fcg
	192.168.10.150_01-11_135256.fcg
	192.168.10.150_06-20_105721.fcg
	192.168.10.151_01-11_135256.fcg
	192.168.10.151_06-20_105721.fcg
	192.168.10.152_06-20_105721.fcg
	FL_SWITCH_2000_v2_01_withBL110.bin
	FL_SWITCH_GHS_03_30_00.stk

Write Cancel

Comfortable mechanism for up and download of configuration files

- Back up the configuration
- Timestamping
- The up or download will be executed with a few clicks



# MDC for easy network start up

(Rapid) Spanning Tree	Fast Ring Detection	Large Tree Support	Status
activated			
activated			
activated			

Category
Default
Alarm Contacts
Network Redundancy
SNMP trap settings

Systemname	Typ	Status	Anzeigename
EthExpMeeting2017	EL SWITCH 2005		102.168.10.15
EthExpMeeting2017			
EthExpMeeting2017			

Subnetzmaske	Standard-Gateway	Systemname	Typ
255.255.255.0			
255.255.255.0	A 255.0.0.0		
255.255.255.0	B 255.255.0.0		
	C 255.255.255.0		

## Multi Device Configuration (MDC)

- Clearly arranged parameter categories
- Set of single parameters (e.g.. RSTP activation) for several devices at the same time
- Suffix and Prefix for easy naming
- Consecutive numbering for IP-parameter



# SNMP based Scripting for SNMP devices

## Extensive functions

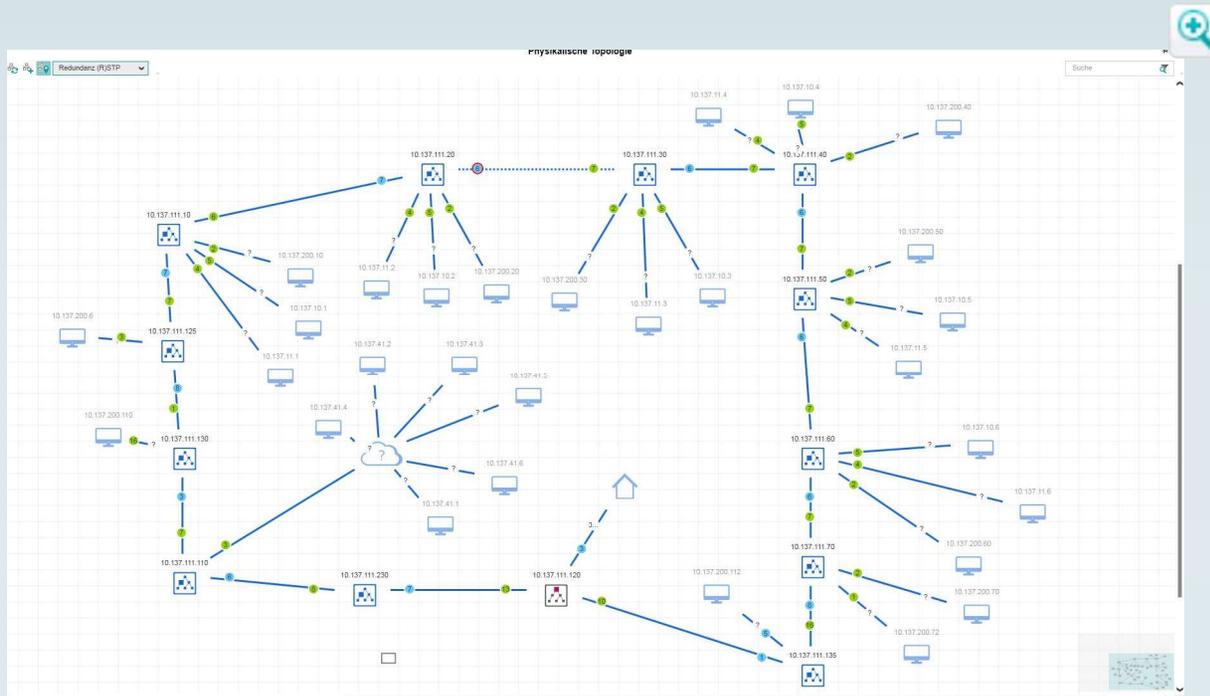
- Configuration and diagnostic for every SNMP device
- SET and GET command
- Loops and branches
- Call script in script command
- Command for structuring the output

```
Projekt Script Devicename x
Script code
Script code
1 |
2 // writes the value systemname (administratively-assigned name) for the device
3 SET('1.3.6.1.2.1.1.5.0',OctetString, 'EthExpMeeting2017');
4
5 // writes a simple text into the output window
6 WRITECONSOLE('Device Name:');
7
8 // reads the value systemname (administratively-assigned name) for the device
9 GET('1.3.6.1.2.1.1.5.0',OctetString);
```

```
OUTPUT CONSOLE
Options
192.168.10.150 x 192.168.10.152 x 192.168.10.151 x
04.10.2017 10:38:22: The script Script Devicename is started.
04.10.2017 10:38:22: SET OK. OID: 1.3.6.1.2.1.1.5.0. Value: EthExpMeeting2017
04.10.2017 10:38:22: Device Name:
04.10.2017 10:38:22: GET OK. OID: 1.3.6.1.2.1.1.5.0. Value: EthExpMeeting2017
04.10.2017 10:38:22: The script Script Devicename completed successfully.
```



# Topology Overview



## Static Network Topology

- Graphical overview
- Detection of switches and end devices
- Views for different redundancy mechanisms with graphical detail information
- Easy topology comparison between saved and online topology, thanks to different colours





FL NETWORK MANAGER BASIC - FLNetMan.netm3x

File Edit Extras Window Help

PHENIX CONTACT

**PLANT**

- Project (20 of 20)
  - 192.168.200.233 : Ethernet Device
  - 192.168.200.17 : Ethernet Device
  - 192.168.200.237 : FL SWITCH MM HS
  - 192.168.200.238 : FL SWITCH MCS 11
  - 192.168.200.20 : Ethernet Device
  - 192.168.200.10 : FL SWITCH MCS 16
  - 192.168.200.205 : FL SWITCH MCS 11
  - 192.168.200.7 : FL SWITCH GHS 12G
  - 192.168.200.1 : FL SWITCH SMCS 8GT
  - 192.168.200.6 : Ethernet Device
  - 192.168.200.15 : Ethernet Device
  - 192.168.200.16 : Ethernet Device
  - 192.168.200.4 : Ethernet Device
  - 192.168.200.3 : FL SWITCH 7008-EIP
  - 192.168.200.13 : Ethernet Device
  - 192.168.200.19 : Ethernet Device
  - 192.168.200.18 : Ethernet Device
  - 192.168.200.21 : Ethernet Device
  - 192.168.200.22 : Ethernet Device
  - 192.168.200.2 : FL SWITCH MCS 16T

**Project X**

Online Devices BOOTP/DHCP...

**Online Devices**

Last scan on 27.09.2016 13:57:22

Subnet mask	Default gateway	Name of station	Type	Status	Display Name (Online)	Subnet mask	Default
255.255.0		mmhs.gerd.de	FL SWITCH MM HS	🟡	Select online device here		
255.255.0		mcs.gerd	FL SWITCH MCS 16TX	🟡	Select online device here		
255.255.0		fl-switch-mcs-14tx-2tx	FL SWITCH MCS 16TX	🟢	192.168.200.2 : 00:A0:45:05:6E:FE	255.255.255.0	
255.255.0		fl-switch-irt-tx-3pof	Ethernet Device	🟡	192.168.200.20 : 00:A0:45:03:03:04	255.255.255.0	
				🟡	192.168.178.200 : 00:0E:0C:50:C7:30	255.255.255.0	149.21
255.255.0		fl-switch-mcs-slemppunkt	FL SWITCH MCS 16TX	🟢	192.168.200.10 : 00:A0:45:07:8F:A9	255.255.255.0	
255.255.0	192.168.200.1	FL SWITCH MCS 16TX	FL SWITCH MCS 16TX	🟢	192.168.200.205 : 00:A0:45:03:89:55	255.255.255.0	192.11
255.255.0		FL SWITCH SMCS 8GT	FL SWITCH SMCS 8GT	🟢	192.168.200.1 : 00:A0:45:0A:02:D5	255.255.255.0	
255.255.0		FL NAT SM	Ethernet Device	🟡	192.168.200.233 : 00:A0:45:AD:2A:FC	255.255.255.0	
255.255.0	192.168.200.1	FL MGUARD RS 2000	Ethernet Device	🟡	192.168.200.6 : 00:A0:45:D6:62:EB	255.255.255.0	192.11
		45 74 68 65 72 6E 65 74 2D 47 65 72 E4 74	Ethernet Device	🟡	192.168.200.16 : 00:A0:45:08:55:F7		
		FL SWITCH LM 5TX	Ethernet Device	🟡	192.168.200.15 : 00:A0:45:27:AD:6F		
		FL SWITCH 7008-EIP	FL SWITCH 7008-EIP	🟢	192.168.200.3 : 00:A0:45:CA:D9:65		
255.255.0		FL SWITCH 3008	Ethernet Device	🟡	192.168.200.4 : 00:A0:45:61:C1:59	255.255.255.0	
			Ethernet Device	🟡	192.168.200.18 : 00:A0:45:D0:35:72		
			Ethernet Device	🟡	192.168.200.17 : 00:A0:45:D8:31:9A		
			Ethernet Device	🟡	192.168.200.22 : 00:A0:45:B3:AF:BE		
			Ethernet Device	🟡	192.168.200.21 : 00:A0:45:AD:1F:C1		

**COMPONENTS**

Devices (8 of 8)

- Local
- Ethernet (2 of 2)
  - Factoryline Ethernet (6 of 6)
    - FL SWITCH 3008 Rev. >= 00/1.2
    - FL SWITCH 7008-EIP Rev. >= 00/1.2
    - FL SWITCH GHS 12G/8 Rev. >= 1
    - FL SWITCH MCS 16TX Rev. >= 1
    - FL SWITCH MM HS Rev. >= 00/4
    - FL SWITCH SMCS 8GT Rev. >= 1

**LOGGING**

Time Stamp	Code	Message
27.09.2016 14:03:24	TFTP0012	Transfer of file 'fl_switch_7000_v2_00_00.b'
27.09.2016 14:03:36	UPD0001	Firmware image fl_switch_7000_v2_00_00.
27.09.2016 14:05:07	UPD0003	Successful firmware update on the device
27.09.2016 14:06:29	TFTP0007	The device 192.168.200.205 requests the file
27.09.2016 14:06:29	TFTP0009	TFTP request from device 192.168.200.205
27.09.2016 14:06:34	TFTP0012	Transfer of file 'FL_SWITCH_MCS_v4_77.b'

**TFTP SERVER**

IP address	File name	Progress	Action
192.168.200.200	FM Next Testin		

**Scan options**

SNMP scan

Enable

Timeout (ms): 3000

Network adapter: 192

DCP scan

Enable

Network adapter: FL

Ping scan

Enable

Timeout (ms):

Maximum concurrent requests:

IsEnabled Sta

192.168.200.2

Enter IP

BOOTP/DHCP scan

Windows aktivieren  
Wechseln Sie zu den Einstellungen

References

TFTP BOOTP

14:13  
27.09.2016



# Software



Linking of  
standardized protocol  
types

- Easy converting of SNMP in OPC
- Converting of SNMP variables and alarms
- Easy start-up thanks to preconfigured profiles





SNMP-OPC-Server



# Software



## FL Network Manager Basic

Function	Configuration and monitoring of network components
Language	English
Base	SNMP
Order number	2702889



# Software



## FL SNMP OPC SERVER V3 -

## FL SNMP OPC SERVER V3 LIC 100

Function	Monitoring and configuration of SNMP-capable equipment in HMI and SCADA systems	Extension license for 100 devices for the SNMP OPC server
Language	German and English	-
Base	Conversion of SNMP in OPC	-
Order number	2701139	2701138



# Device server

Connects devices with an RS-232, RS-422 or RS-485 serial interface to a LAN

User authentication to prevent unauthorized access

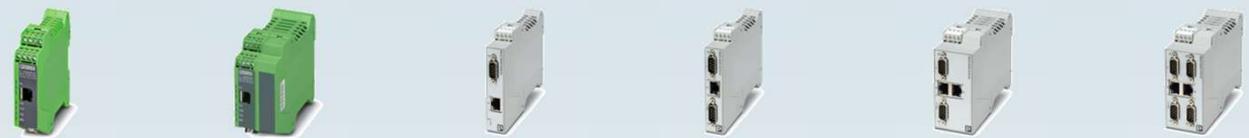


Simple configuration and built-in diagnostics

256-bit AES encryption for secure transfer of sensitive data



# Serial Device Server



	FL COMSERVER BASIC	FL COMSERVER BASIC-T	GW DEVICE SERVER 1E/1DB9	GW DEVICE SERVER 1E/2DB9	GW DEVICE SERVER 2E/2DB9	GW DEVICE SERVER 2E/4DB9
Protocol	Protocol transparent					
Ethernet interface	1x RJ45		1x RJ45		2x RJ45	
Serial interface (RS-232/422/485)	1x D-SUB 9		1x D-SUB 9	2x D-SUB 9		4x D-SUB 9
Special features	ATEX, UL (Class I, Division 2)		ATEX, IECEx, UL (Class I, Division 2)			
Order number	2313478	2904681	2702758	2702760	2702761	2702763



# Gateways



	FL COMSERVER UNI	FL COMSERVER UNI-T	GW MODBUS TCP/RTU 1E/1DB9	GW MODBUS TCP/RTU 1E/2DB9	GW MODBUS TCP/RTU 2E/2DB9	GW MODBUS TCP/RTU 2E/4DB9	GW MODBUS TCP/ASCII 1E/1DB9	GW MODBUS TCP/ASCII 1E/2DB9	GW MODBUS TCP/ASCII 2E/2DB9	GW MODBUS TCP/ASCII 2E/4DB9
Protocol	Modbus/RTU to Modbus/TCP						RAW, ASCII to Modbus/TCP			
Ethernet interface	1x RJ45		1x RJ45		2x RJ45		1x RJ45		2x RJ45	
Serial interface (RS-232/422/485)	1x D-SUB 9		1x D-SUB 9	2x D-SUB 9		4x D-SUB 9	1x D-SUB 9	1x D-SUB 9		4x D-SUB 9
Special features	ATEX, UL (Class I, Division 2)		ATEX, IECEx, UL (Class I, Division 2)							
Order number	2313452	2904817	2702764	2702765	2702766	2702767	2702768	2702769	2702770	2702771



# Gateways



	GW PN/ASCII 1E/1DB9	GW PN/ASCII 1E/2DB9	GW PN/ASCII 2E/2DB9	GW PN/ASCII 2E/4DB9	GW EIP/ASCII 1E/1DB9	GW EIP/ASCII 1E/2DB9	GW EIP/ASCII 2E/2DB9	GW EIP/ASCII 2E/4DB9
--	------------------------	------------------------	------------------------	------------------------	-------------------------	-------------------------	-------------------------	-------------------------

Protocol	RAW, ASCII to PROFINET				RAW, ASCII to EtherNet/IP			
Ethernet interface	1x RJ45		2x RJ45		1x RJ45		2x RJ45	
Serial interface (RS-232/422/485)	1x D-SUB 9	2x D-SUB 9	2x D-SUB 9	4x D-SUB 9	1x D-SUB 9	2x D-SUB 9	2x D-SUB 9	4x D-SUB 9
Special features	ATEX, IECEx, UL (Class I, Division 2)							
Order number	1021080	1021058	1021056	1020882	2702772	2702773	2702774	2702776



# Gateways

EtherNet/IP 



	GW PN/ASCII 1E/1DB9	GW PN/ASCII 1E/2DB9	GW PN/ASCII 2E/2DB9	GW PN/ASCII 2E/4DB9
Protocol	<b>Modbus to Ethernet/IP</b>			
Ethernet interface	1x RJ45		2x RJ45	
Serial interface (RS-232/422/485)	1x D-SUB 9	2x D-SUB 9	2x D-SUB 9	4x D-SUB 9
Special features	ATEX, IECEx, UL (Class I, Division 2)			
Order no.	1062540	1062423	1062380	1062388



# TIMESERVER NTP

**i** Receives accurate geo-location information

**i**

Supports Power over Ethernet for one cable operation

**i** Time synchronisation



IP67/68 outdoor housing with integrated antenna



# TIMESERVER NTP

Receives accurate geo-  
location information



- GNSS receiver for GPS, Galileo and GLONASS
- NTP time server for Ethernet networks
- Precise position determination via web-based management, SNMP, NMEA or JSON streaming

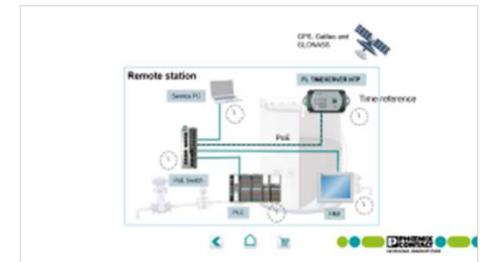


# TIMESERVER NTP



Time synchronisation

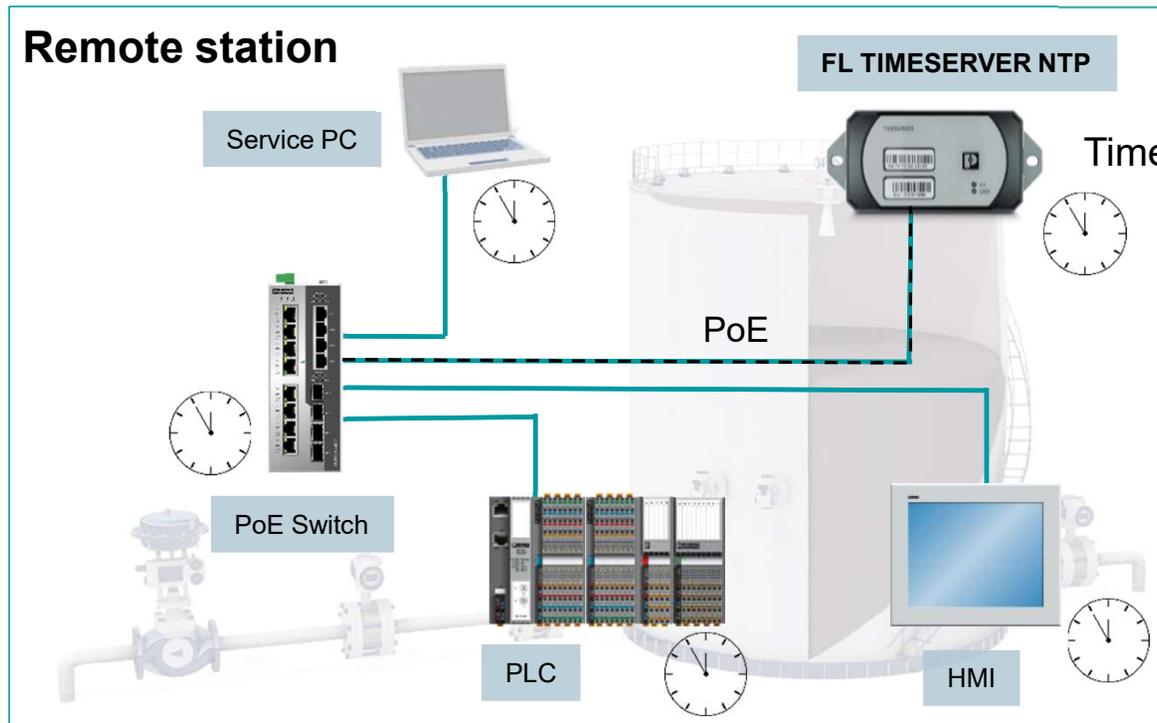
- Accurate time synchronization of Ethernet devices in a network via NTP protocol
- No Internet access necessary for more security



GPS, Galileo and  
GLONASS



## Remote station



# TIMESERVER NTP



## TIMESERVER NTP

Type	FL TIMESERVER NTP
Temperature range	-40°C...+70°C
Order number	1107132
Description	NTP timeserver with GNSS receiver



# Smart Camera Box



 Automation protocols



# Smart Camera Box

Enhanced PoE functionalities



- **Full control and monitoring** through PoE management functionalities
- **Automatic restart** of malfunctioning cameras
- Prevent overload through **power budget information**
- **Alarm message** when temperature or power budget is exceeded



Automation protocols



# Smart Camera Box

Integrated fiber optic splice cassette



- No additional splice box needed
- Secure connection of all fiber optic cables
- Enhanced cable routing inside the box

Smart Camera Box  
Installation - Splice Box



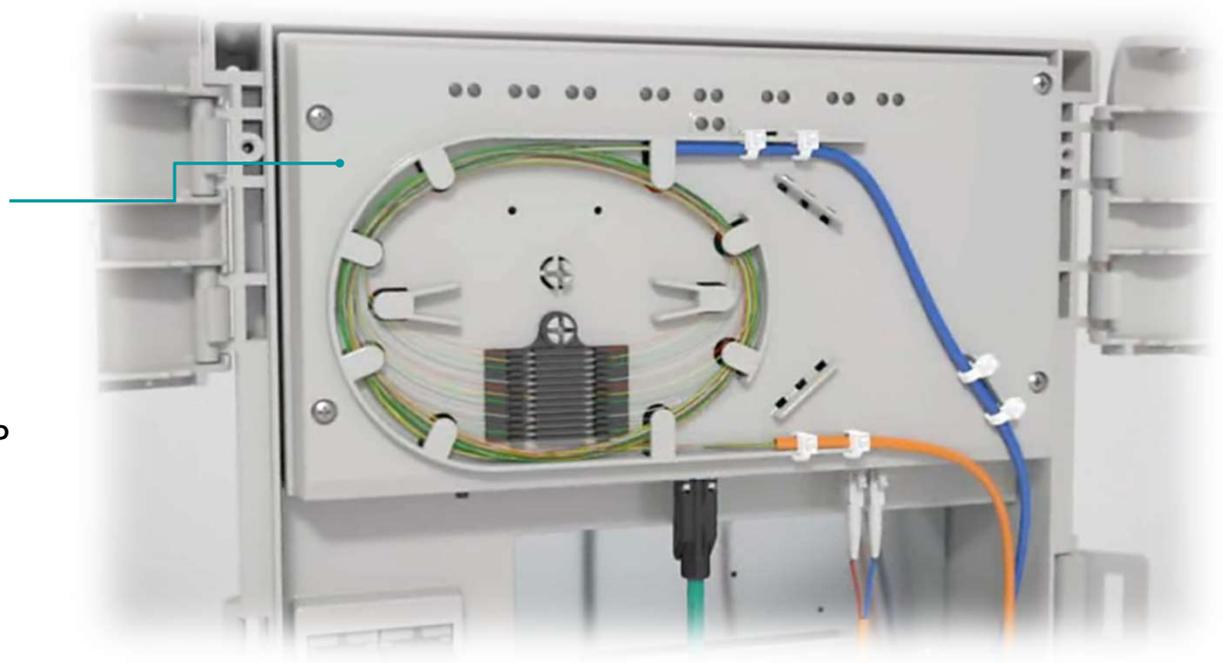
- Integrated FO splice cassette
  - No additional splice box required
  - Secure connection of all fiber optic cables
  - Improved cable routing within the box
  - Ideal for direct fiber optic connection to GPP modules and connecting field cables on-site



# Smart Camera Box Installation - Splice Box

## Integrated FO splice cassette

- No additional splice box required
- Secure connection of all fibre optic cables
- Improved cable routing within the box
- Ideal for direct fiber optic connection to SFP modules and connecting field cables crosswise.



# Smart Camera Box

Management functionality:  
Network management  
PoE management



- **Reliable networks**  
Redundancy with RSTP
- **Power over Ethernet:**  
Flexible power management on all ports
- **Flexible configuration options:**  
Web interface in responsive design, FL NETWORK MANAGER support, SNMP, CLI



# Smart Camera Box

Sabotage alarm



- **Integrated sensor** detects whether the door is open or closed
- **Alarm message** via Ethernet as soon as the door gets opened
- No additional equipment needed

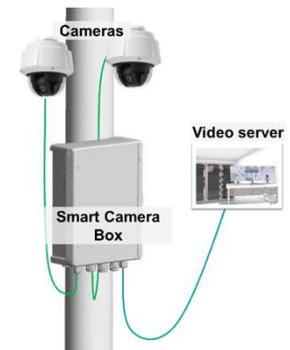


# Smart Camera Box

All-in-one device



- **All-in-one device** replaces modular control cabinet and saves time during planning and installation
- Connects installed cameras with the local network to transmit camera images to the video server



# Smart Camera Box



	<b>SCX 4POE 2LX</b>	<b>SCX 2POE 2LX</b>	<b>SCX 4POE 2T</b>	<b>SCX 2POE 2T</b>
Uplink ports	2x fibre optic cable	2x fibre optic cable	2x Ethernet copper	2x Ethernet copper
PoE ports	4	2	4	2
Order number	1102626	1108543	1108542	1108544



# Modular Ethernet HART multiplexer

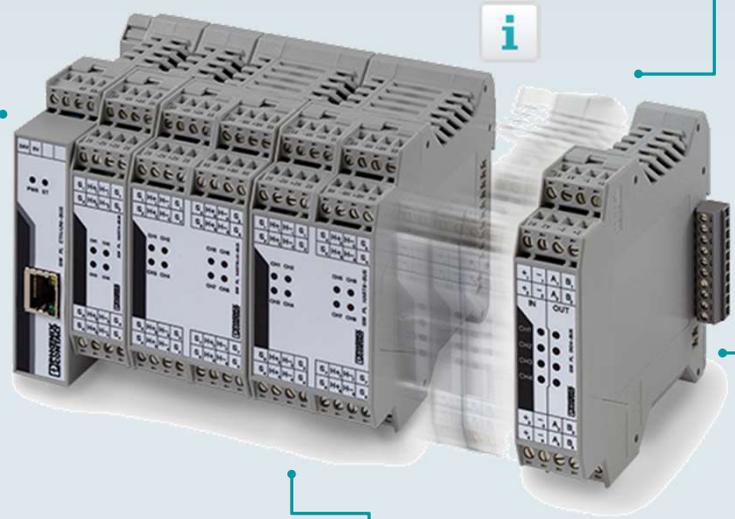
Transmit critical HART process data over Ethernet

Environmental 

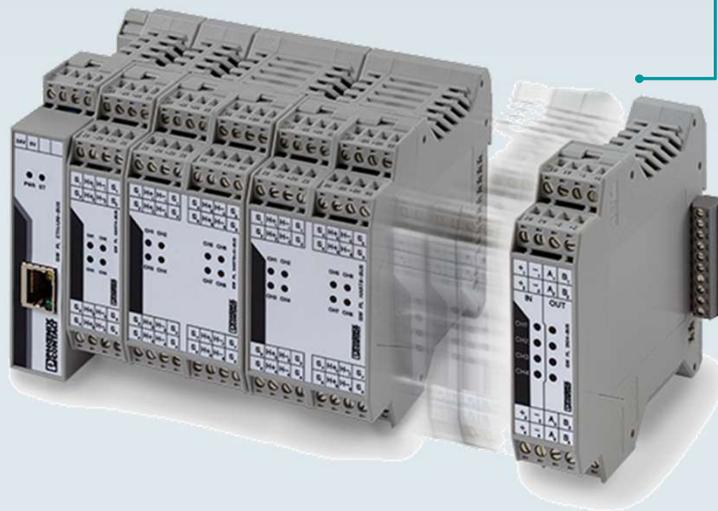
1 HART master per channel ensures maximum update rate

Connect expansion  modules

Access process data via 



# Modular Ethernet HART multiplexer

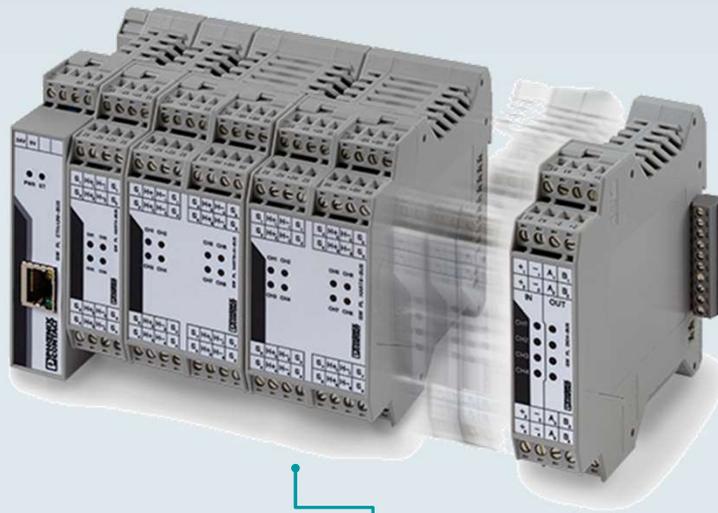


Environmental

- -40...+70°C
- ATEX, IECEx, UL Zone 2



# Modular Ethernet HART multiplexer

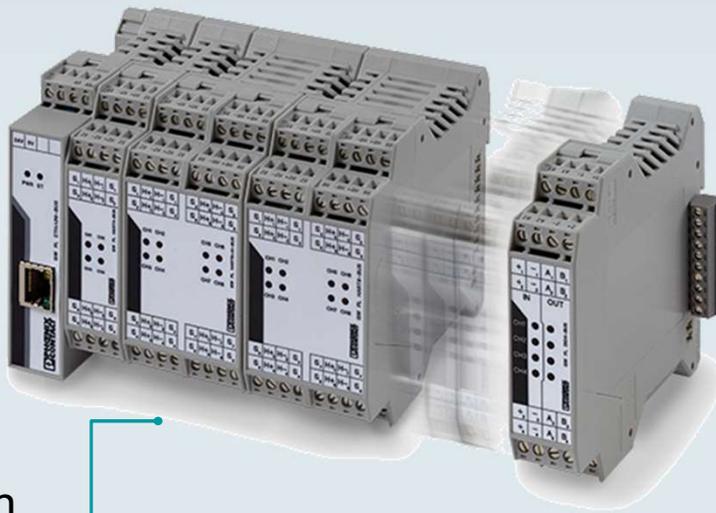


Access process data via

- Modbus TCP
- HART/IP
- Profinet
- FDT/DTM configure with a web browser



# Modular Ethernet HART multiplexer



Connect expansion  
modules

- 4 channel HART
- 8 channel HART
- 8 channel HART with loop supply
- 4 channel digital in/  
4channel digital out



# Modular Ethernet HART multiplexer



	Modular gateway Ethernet head station		Expansion modules			
Type	GW PL ETH/BASIC- BUS	GW PL ETH/UNI- BUS	GW PL HART8- BUS	GW PL HART4- BUS	GW PL HART8+AI-BUS	GW PL DIO4- BUS
Order number	2702321	2702233	2702235	2702234	2702236	2702237
Description	Head station with Modbus TCP, HART IP, FDT/DTM	Head station with Profinet, Modbus TCP, HART IP, FDT/DTM	8 channel HART module	4 channel HART module	8 channel HART module with analog loop supply	4 channel digital I/O



# Remote control via Cloud

Cost-effective entry into cloud-based remote maintenance

Simple startup due to configuration assistants in the mGuard secure remote service



Intuitive operation of web interface

Flexible communication with the cloud via operator or 4G LTE networks



# Remote control via Cloud



	TC CLOUD CLIENT 1002-4G	TC CLOUD CLIENT 1002-TX/TX	TC CLOUD CLIENT 1002-4G VZW	TC CLOUD CLIENT 1002-4G ATT
Transmission medium	4G LTE	Operator's network	4G LTE Verizon, US	4G LTE AT&T, US
Description	Industrial VPN gateway for mGuard Secure remote service, Cloud communication via 4G LTE, European version	Industrial VPN gateway for mGuard Secure remote service, cloud communication via operator network,	Industrial VPN gateway for mGuard Secure remote service, cloud communication via 4G LTE, Verizon (US)	Industrial VPN gateway for mGuard Secure remote service, cloud communication via 4G LTE, AT&T (US)
Special features	<b>Device configuration in mGuard secure remote service, simplified Web-Interface</b>			
Firewall	No	No	No	No
VPN Tunnel	1 VPN tunnel to the mGuard Secure remote service			
Order number	2702886	2702885	2702887	2702888

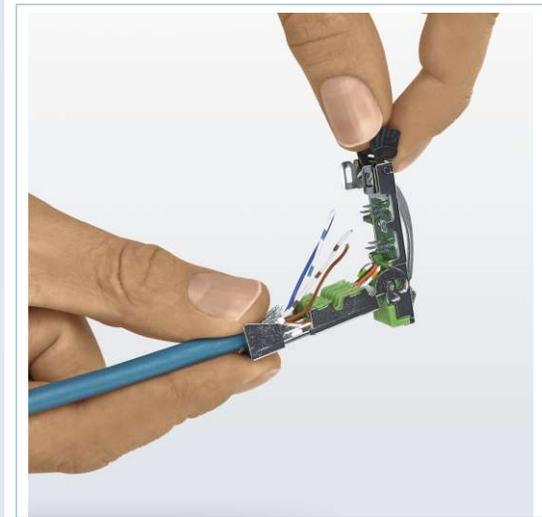


# Copper-based network installation



# Copper-based network installation

- No special tools needed
- IDC and pierce fast connection



# Copper-based network installation



Wide range of  
plugs

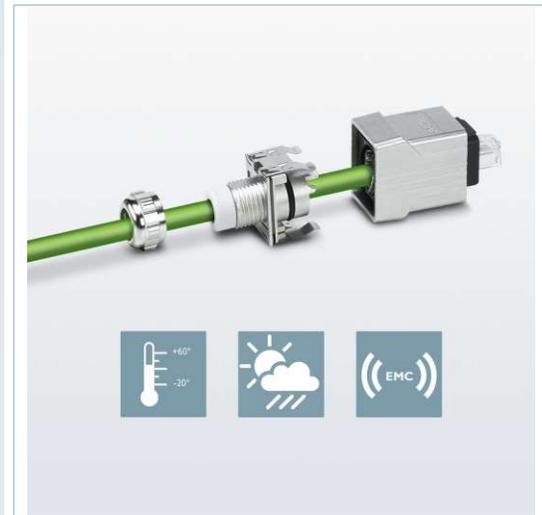
- From RJ45 to M12



# Copper-based network installation

- 360° EMC shielding
- High level of resistance to EMI and ESD

360° shielding  
concepts



# Copper-based network installation

Fast data transmission



- Data rates up to 10 Gbps
- Components that meet the CAT6<sub>A</sub> standard



# Fiber optic-based network installation

High data rates  
up to 40 Gbps

Integrated locking  
prevents accidental  
disconnection



Wide choice of  
versions 

Fast assembly in  
the field 

Solutions from IP20 to  
IP67



# Fiber optic-based network installation



Wide choice of versions

Connection types:

- SC-RJ
- LC
- SC
- FSMA
- ST

Fiber types:

- POF
- PCF
- GOF

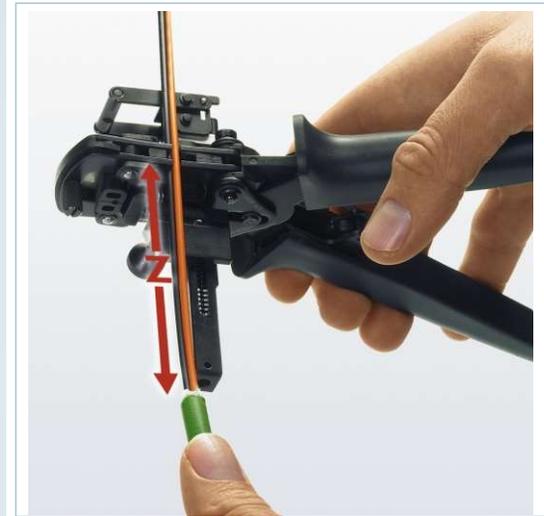


# Fiber optic-based network installation

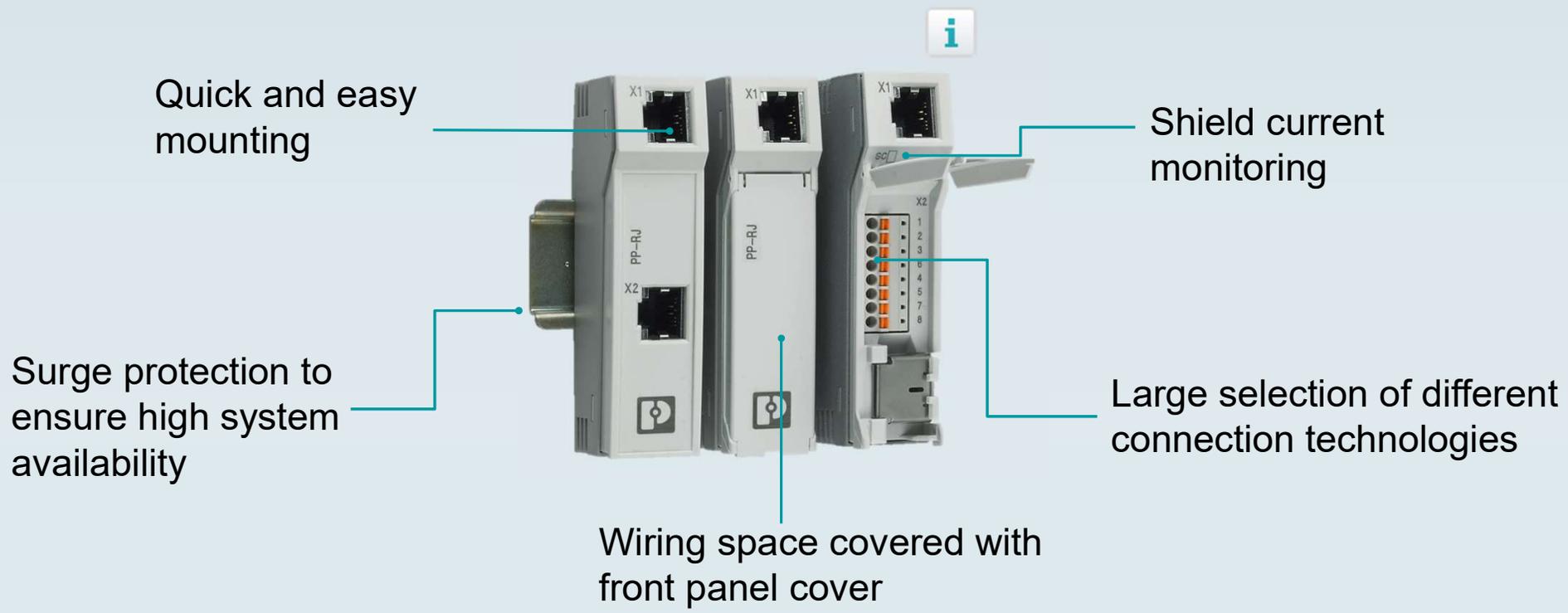


Fast assembly in the field

- Professional tools



# Patch panels



# Patch panels



	PP-RJ-RJ(-F)	PP-RJ-SC(-F)	PP-RJ-SCC(-F)	PP-RJ-IDC(-F)
Connection type	RJ45/RJ45	RJ45/Screw	RJ45/Push-In	RJ45/IDC
Description	8-pole, 10/100/1000 MBit/s			
Shielding	Directly on the DIN-rail			
Shield connection	Via RJ45 socket	Tool-free via shield current contact		
Order number	2703015	2703016	2703018	2703019
With Surge protection and Shield current diagnosis	2703020	2703021	2703022	2703023



# Patch panels



	<b>FL CAT5 TERMINAL BOX</b>	<b>FL-PP-RJ45-SC</b>	<b>FL-PP-RJ45-SCC</b>	<b>FL-PP-RJ45-LSA</b>
Connection type	RJ45/Screw	RJ45/Screw	spring-cage connection	LSA-connection
Description	4-pole, 10/100 MBit/s	8-pole, 10/100/1000 MBit/s		
Shielding	Directly on the DIN-rail	directly on the DIN rail or optionally via RC combination		
Shield connection	Bracket clamp with screws			
Order number	2744610	2901643	2901642	2901645



# Patch panels



	FL-PP-RJ45/RJ45	FL-PP-RJ45/RJ45-B	FL-PP-RJ45-SCC/SC041	FL-PP-RJ45-SCC/SC045
Connection type	RJ45/Screw	RJ45/Screw	spring-cage connection	LSA-connection
Description	8-pole, 10/100/1000 MBit/s	Extended temperature range -40 °C ... 85 °C, narrow width	Cable sharing module with cable outlet to the front	Cable sharing module with cable outlet upwards
Shielding	Directly on the DIN rail or optionally via RC combination	Continuous shield	Directly on the DIN rail or optionally via RC combination	
Shield connection	Via RJ45 port		Bracket clamp with screws	
Order number	2901646	2904933	2903532	2904577



# PRP redundancy modules

Easy setup of high-availability network infrastructure without configuration

No switching times for uninterrupted operation in the event of an error

No loss of packets in the event of network failure



Integration of non-PRP-capable devices in parallel networks for maximum availability



according to IEC 61850-3 and IEEE 1613

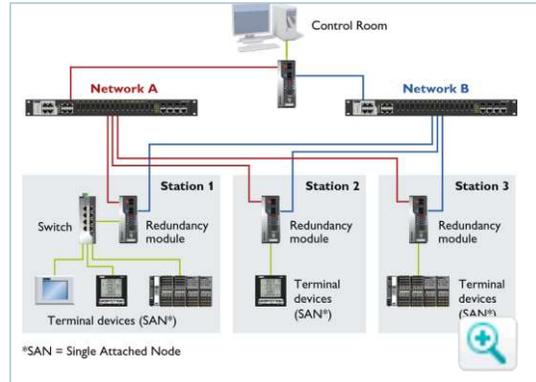


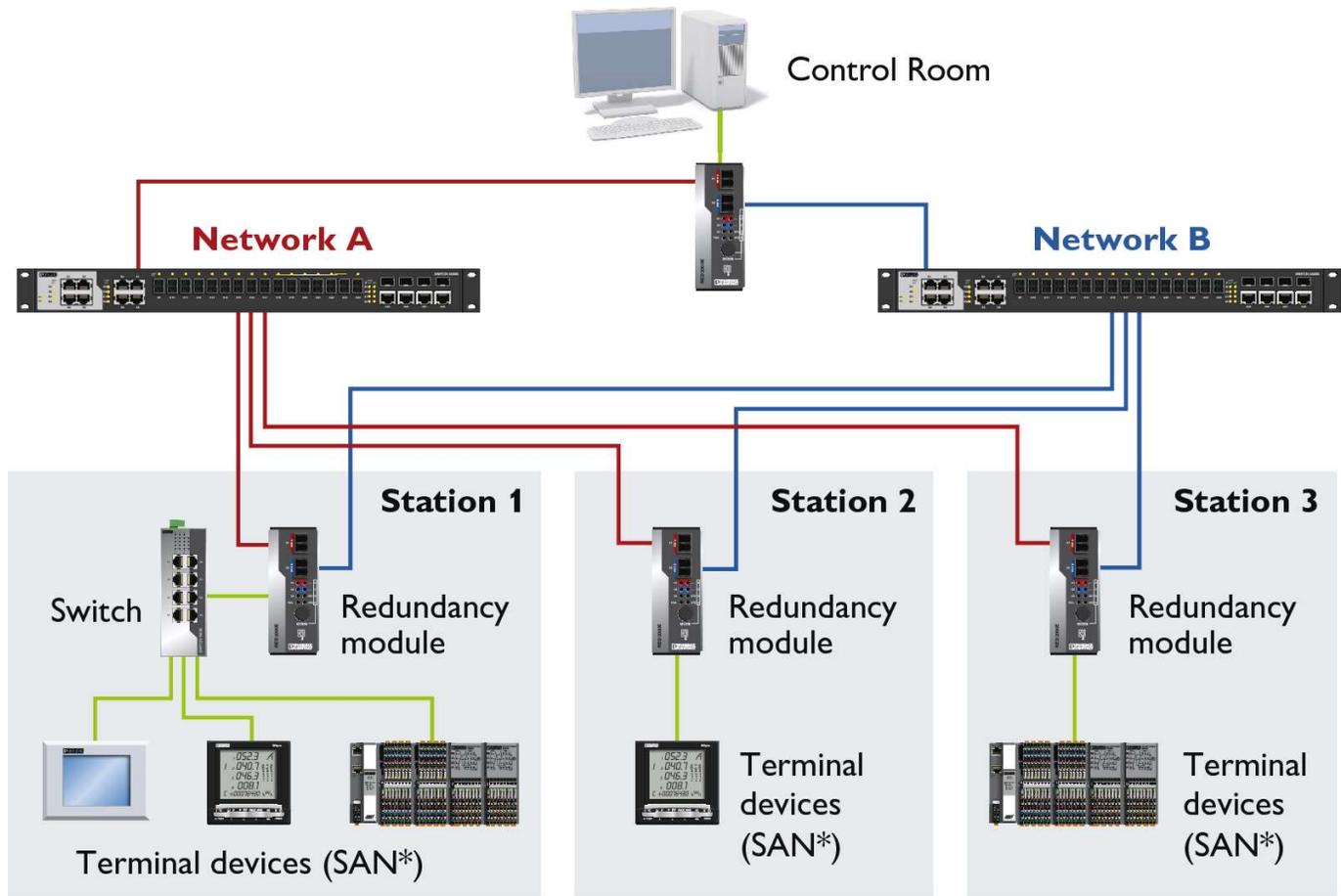
# PRP redundancy modules



Integration of non-PRP-capable devices in parallel networks for maximum availability

- Parallel Network Redundancy Protocol (PRP)
- Standardized according to IEC62439-3
- No switch-over time





\*SAN = Single Attached Node



# PRP redundancy modules



**FL RED 2003E  
PRP**

**FL RED 2001E  
PRP 2LC**

	<b>FL RED 2003E PRP</b>	<b>FL RED 2001E PRP 2LC</b>
Function	Redundancy module	Redundancy module
Design	Slim	Slim
Ports (Transmission speed)	3x RJ45 (10/100 Mbit/s)	1x RJ45 (10/100 Mbit/s) 2x LC MM (100 Mbit/s)
Special features	-	-
Temperature range	-40 °C ... 70 °C	-40 °C ... 70 °C
Order number	2701863	2701864



# SFP modules

Rapid data transfer



Versatile in use

Optimal port usage on the switch



High transmission distances



# SFP modules



	FL SFP SX	FL SFP FX	FL SFP LX10-B	FL SFP LX	FL SFP FX SM
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Function	SFP module	SFP module	SFP module	SFP module	SFP module
Connection type (Transmission speed)	LC Multimode (1000 Mbit/s)	LC Multimode (100 Mbit/s)	LC Singlemode (1000 Mbit/s)	LC Singlemode (1000 Mbit/s)	LC Singlemode (100 Mbit/s)
Max. transmission length	1 km	2 km	10 km	30 km	40 km
Wavelength	850 nm	1310 nm	1310 nm	1310 nm	1300 nm
Temperature range	-40 °C ... 75 °C	-40 °C ... 85 °C	0 °C ... 60 °C	-40 °C ... 85 °C	-40 °C ... 85 °C
Order number	2891754	2891081	1025401	2891767	2891082



# SFP modules



	FL SFP LH	FL SFP SX2	FL SFP WDM10-A	FL SFP FE WDM20-A	FL SFP WDM10-B
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Function	SFP module	SFP module	SFP module	SFP module	SFP module
Connection type (Transmission speed)	LC Singlemode (1000 Mbit/s)	LC Multimode (1000 Mbit/s)	LC Singlemode (1000 Mbit/s)	LC Singlemode (100 Mbit/s)	LC SM (1000 Mbit/s)
Max. transmission length	80 km	2 km	10 km	20 km	10 km
Wavelength	1550 nm	1310 nm	1310/1550 nm	1310/1550 nm	1550/1310 nm
Temperature range	-40 °C ... 85 °C	-40 °C ... 75 °C	-40 °C ... 75 °C	-40 °C ... 75 °C	-40 °C ... 75 °C
Order number	2989912	2702397	2702440	2702437	2702441



# SFP modules



	<b>FL SFP FE WDM20-B</b>	<b>FL SFP WDM10-SET</b>	<b>FL SFP FE WDM20-SET</b>	<b>FL SFP GT</b>
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Function	SFP module	SFP module	SFP module	SFP module
Connection type (Transmission speed)	LC SM (100 Mbit/s)	LC Singlemode (1000 Mbit/s)	LC Singlemode (100 Mbit/s)	RJ45 (1000 Mbit/s)
Max. transmission length	20 km	10 km	20 km	100 m
Wavelength	1550/1310 nm	1310/1550 nm	1310/1550 nm	-
Temperature range	-40 °C ... 75 °C	-40 °C ... 75 °C	-40 °C ... 75 °C	-40 °C ... 85 °C
Order number	2702438	2702442	2702439	2989420



# Memory media



	<b>FL MEM PLUG</b>	<b>FL MEM PLUG/MRM</b>	<b>SD FLASH 512MB</b>	<b>SD FLASH 2GB</b>	<b>FL SD FLASH/MRM</b>	<b>FL SD FLASH/L3/MRM</b>
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Function	Exchangeable Configuration memory	Configuration memory	Program and configuration memory			
Special features	-	MRM functionality	-	-	MRM functionality	MRM and Layer 3 functionality
Order number	2891259	2891275	2988146	2988162	2700270	2700607



# Switches for PROFINET and EtherNet/IP

	Unmanaged Switches		Managed Switches						
	Switch 1000/1100	Switch SFNT	Switch 2000	Switch 3000	Switch 4000/4800	Switch IRT	Switch 7000	NAT 2000	Modular Switch GHS
<b>PROFINET</b>									
<b>Class A</b> Quality of Service, PTCP filter	(•)	(•)	•	•	•	•	•	•	•
<b>Class B</b> Quality of Service, LLDP topology detection, Profinet device, redundancy (MRP), DCP	-	-	(•) (only 22xx-27xx variants)	-	-	•	-	(•) (only 22xx-23xx variants)	•
<b>Class C</b> Quality of Service, LLDP topology detection, Profinet device, redundancy (MRP), DCP, IRT (ERTEC) technology for prioritized Profinet data transmission, diagnostics for fiber optic paths	-	-	-	-	-	•	-	-	-
<b>EtherNet/IP</b>									
<b>Basic</b> IGMP snooping, IGMP querier, Multicast source detection	-	-	•	•	•	-	•	•	•
<b>Basic plus</b> IGMP snooping, IGMP querier, Multicast source detection, DLR, CIP	-	-	-	-	-	-	•	-	-

- not available, • available, (•) available in selected models

