



Digitalization

Industrie 4.0

Smart Production

E-Mobility

Smart Energy

Energy Efficiency

Smart Infrastructure

Smart Buildings

Renewables

Antonio Gordillo

IMA

Enero 2021

Welcome

Panorama y guía de selección de switches

Inteligentes y switches

Administrables



Webinars

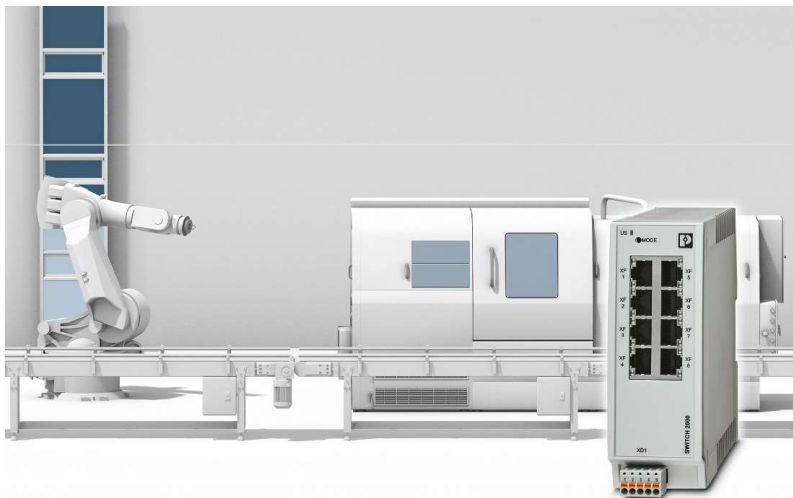
Agenda

- Panorama de Productos
 - Switches Inteligentes
 - Switches Administrables
 - Aplicaciones - Arquitecturas Ethernet
-



Webinar IMA Enero 2021

Panorama y guía de selección de switches inteligentes y switches administrables



Fecha	7 Enero 2021
Hora	9:00
Hora	
Duración	1 hora
Costo	gratuito

Conocer y saber seleccionar entre un switch inteligente de bajo costo así como un switch administrable y sus aplicaciones.

En esta sesión se brindarán las bases sobre toda nuestra oferta de la gama FL SWITCH 2000 que ha sido ya integrada en aplicaciones diversas de infraestructura de automatización en diversos campos de aplicación industrial. Conozca más a detalles la configuración, posibilidades y correcta elección de estos productos y sus recomendaciones de acuerdo a protocolos y arquitecturas de redundancia así como las características más relevantes en la configuración de los mismos y su utilización.

Network Technology

FL SWITCH 2000



A word cloud graphic centered around the product name. The words are arranged in a circular pattern, with 'Ethernet' and 'Switch2000' being the largest. Other prominent words include 'EtherNet/IP', 'Profinet', 'CC-Link', 'DHCP', 'RSTP', 'Unmanaged-Mode', 'Gigabit', 'SD-card', 'HTTPS', 'LLDP', 'Infrastructure', 'Managed', 'Traps', 'SNMPv3', 'ACD', 'RINA', 'ABS', 'MRP', 'LTS', 'SFP', 'TFTP', 'ATEX', 'DNV/GL', 'CLI', 'QoS', 'VLAN', 'Fiber-optic', 'CE', 'HTTP', 'IGMP', 'Portmirroring', 'Smart-Mode', 'FRD', 'Gas', 'UL61010', 'BootP', 'Maritime', 'Diagnostics', 'Combo-port', 'IECEx', 'Oil', 'CULUS', 'FAIL', 'BF', 'SF', 'US1', 'US2', 'MODE', 'XD1', 'XF 1', 'XF 2', 'XF 3', 'XF 4', 'XF 5', 'XF 6', 'XF 7', 'XF 8', 'XF 9', 'XF 10', 'XF 11', 'XF 12', 'XF 13', 'XF 14', 'XF 15', 'XF 16', 'XF 17', 'XF 18'.

In **PROFINET** a COTS (Commercial Off The Shelf) switch will work... but... **Unmanaged**

Feature	Description	Used in PROFINET?
Quality of Service (QoS)	Prioritize frames	recommended
Diagnostics	Handle errors	useful
Trunking	Increase bandwidth	useful
VLAN	Isolate traffic	useful
Port mirroring	Monitor traffic	useful
IGMP snooping	Reduces Multi-cast flooding	not needed

What switch to use it Unmanaged vs Managed on PROFINET

FL SWITCH 2000

Portfolio overview



FL SWITCH 20xx/21xx

Basic functionality (e.g. for machine building)



FL SWITCH 22xx/23xx

+
Fiber optic variants
+
Full PROFINET support
+
Extended redundancy, security
and management features



New

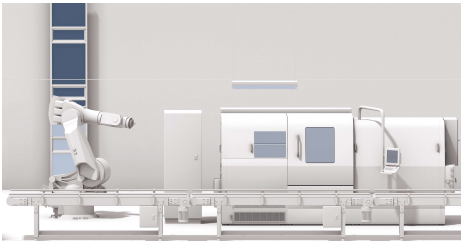
FL SWITCH 24xx/25xx

+
Flat design
+
Metal housing
+
Relay contact

Extended performance

FL SWITCH 2000

Portfolio overview



Machine building

	FL SWITCH 20xx	FL SWITCH 21xx
Transmission speed	Fast Ethernet (100 Mbit/s)	Gigabit Ethernet (1000 Mbit/s)
Operating temperature	0°C - 60°C	
Supply voltage	18-32 V DC	
Approvals	 	

FL SWITCH 2000

Portfolio overview



	FL SWITCH 22xx	FL SWITCH 23xx
Transmission speed	Fast Ethernet (100 Mbit/s)	Gigabit Ethernet (1000 Mbit/s)
Operating temperature	-40°C - 70°C	
Supply voltage	12-57 V DC, redundant	
Alarm output	Digital alarm output	
Approvals	       	



Factory Automation



Marine and offshore



Process Technology

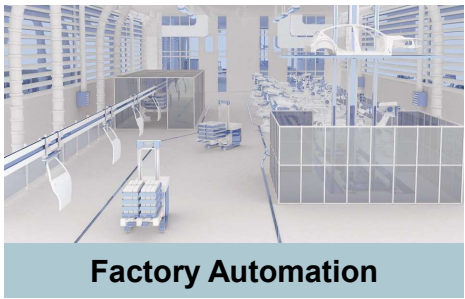
FL SWITCH 2000

Portfolio overview



	FL SWITCH 24xx	FL SWITCH 25xx
Transmission speed	Fast Ethernet (100 Mbit/s)	Gigabit Ethernet (1000 Mbit/s)
Operating temperature	-40°C - 70°C	
Supply voltage	19.2-32 V DC, redundant	
Alarm output	Alarm relais output	
Approvals		

Note: Not all maritime approvals will be available at market launch



Factory Automation



Marine and offshore



Flat cabinets

FL SWITCH 2000

Overview product family – standard models

- No specific preconfiguration

Fast Ethernet (100 MBit/s)		Gigabit Ethernet (1000 MBit/s)	
FL SWITCH 20xx series FL SWITCH 2005 (2702323) FL SWITCH 2008 (2702324)		FL SWITCH 21xx series FL SWITCH 2105 (2702665) FL SWITCH 2108 (2702666)	
FL SWITCH 22xx series FL SWITCH 2205 (2702326) FL SWITCH 2208 (2702327) FL SWITCH 2207-FX (2702328) FL SWITCH 2207-FX SM (2702329) FL SWITCH 2206-2FX (2702330) FL SWITCH 2206-2FX SM (2702331) FL SWITCH 2206-2FX ST (2702332) FL SWITCH 2206-2FX SM ST (2702333) FL SWITCH 2204-2TC-2SFX (2702334) FL SWITCH 2206-2SFX (2702969)		FL SWITCH 23xx series FL SWITCH 2308 (2702652) FL SWITCH 2304-2GC-2SFP (2702653) FL SWITCH 2306-2SFP (2702970) FL SWITCH 2316 (2702909) FL SWITCH 2314-2SFP (1006191) FL SWITCH 2312-2GC-2SFP (2702910)	
FL SWITCH 24xx series 1043412 FL SWITCH 2408 1043414 FL SWITCH 2406-2SFX 1088853 FL SWITCH 2404-2TC-2SFX		FL SWITCH 25xx series 1043484 FL SWITCH 2508 1043491 FL SWITCH 2506-2SFP 1088872 FL SWITCH 2504-2GC-2SFP	
1043416 FL SWITCH 2416 1043423 FL SWITCH 2414-2SFX 1088875 FL SWITCH 2412-2TC-2SFX		1043496 FL SWITCH 2516 1043499 FL SWITCH 2514-2SFP 1088856 FL SWITCH 2512-2GC-2SFP	

FL SWITCH 2000

Overview product family – PROFINET models

- PROFINET optimized variants
 - Gigabit and fiber optic variants
 - Additional status LEDs (BF, SF) for PN diagnosis
 - BF → Bus error, no connection with PLC
 - SF → System fault
- Preconfigured in factory default
 - DCP activated
 - LLDP activated
 - PROFINET device activated



Fast Ethernet (100 MBit/s)	Gigabit Ethernet (1000 MBit/s)
FL SWITCH 22xx series FL SWITCH 2208 PN (1044024) FL SWITCH 2206-2SFX PN (1044028) FL SWITCH 2216 PN (1044029) FL SWITCH 2214-2SFX PN (1044030)	FL SWITCH 23xx series FL SWITCH 2308 PN (1009220) FL SWITCH 2306-2SFP PN (1009222) FL SWITCH 2316 PN (1031673) FL SWITCH 2314-2SFP PN (1031683)
FL SWITCH 24xx series 1089133 FL SWITCH 2408 PN 1089126 FL SWITCH 2406-2SFX PN 1089150 FL SWITCH 2416 PN 1089139 FL SWITCH 2414-2SFX PN	FL SWITCH 25xx series 1089134 FL SWITCH 2508 PN 1089135 FL SWITCH 2506-2SFP PN 1089205 FL SWITCH 2516 PN 1089154 FL SWITCH 2514-2SFP PN

FL SWITCH 2000

Overview product family – Coated models

- Conformally coated PCBs
- Perfect for harsh environments with corrosive surrounding
- No specific preconfiguration



Fast Ethernet (100 MBit/s)

FL SWITCH 22xx series

FL SWITCH 2208C (1095627)
FL SWITCH 2206C-2FX (1095628)

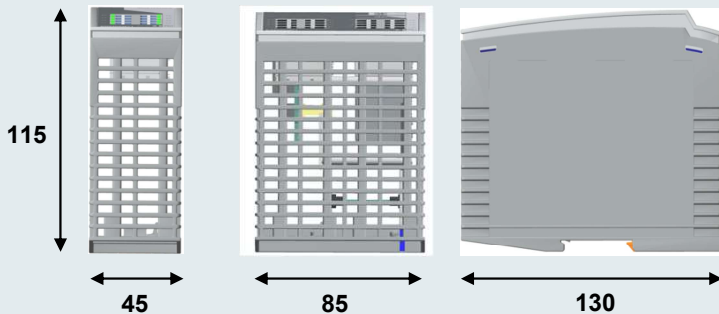
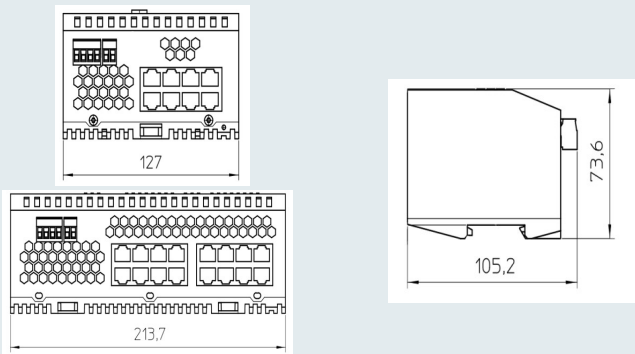
New



Process Technology

FL SWITCH 2000

Overview technical data

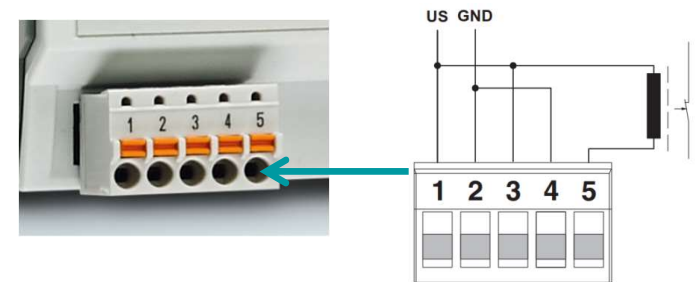
	FL SWITCH 20xx/21xx/22xx/23xx	FL SWITCH 24xx/25xx
Dimensions	 115 45 85 130	 127 213.7 73.6 105.2
Operating Temperature	0°C - 60°C (FL SWITCH 20xx/21xx) -40°C - 70°C (FL SWITCH 22xx/23xx)	-40°C - 70°C
Supply voltage	18-32 V DC, non-redundant (FL SWITCH 20xx/21xx) 12-57 V DC, redundant (FL SWITCH 22xx/23xx)	19.2-32 V DC, redundant
Alarm output	Digital alarm output (FL SWITCH 22xx/23xx)	Alarm relais contact

FL SWITCH 2000

Alarm output

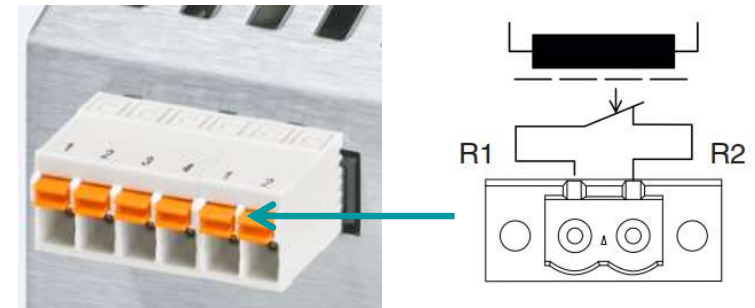
- **FL SWITCH 22xx/23xx**

- Digital alarm output (open drain output)
 - Normal mode → Output is connected to ground potential
 - Error/Alarm mode → Output is floated
 - External relays required
 - e. g. RIF-0-RPT-24DC/21 (2903370)



- **FL SWITCH 24xx/25xx**

- Alarm relais contact



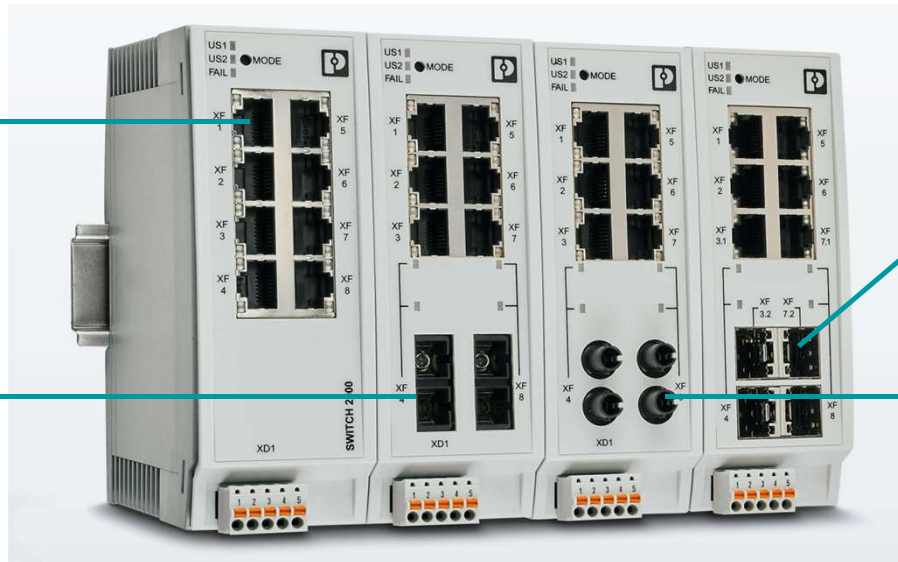
FL SWITCH 2000

Connections via copper and fiber

Copper connection
(RJ45)



Fiber connection
(SC-D)



Slot for SFP modules



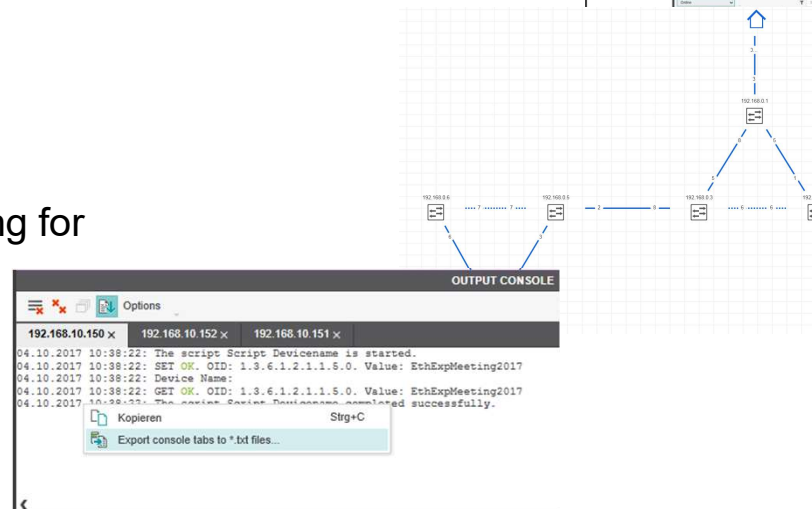
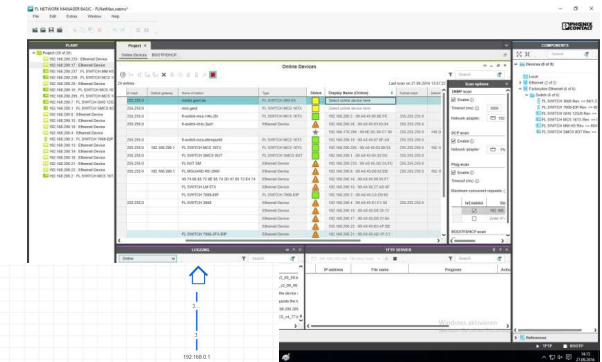
Fiber connection
(ST-D)



FL SWITCH 2000 – Feature Set

Configuration via FL NETWORK MANAGER

- With the FL NETWORK MANAGER you are able to get a quick and easy startup of your network. The software supports you with the following functions:
 - Network detection for unknown IP addresses
 - IP assignment
 - Single/Multiple device configuration
 - Multiple Firmware Update
 - Comfortable up and download handling for configuration files
 - SNMP Scripting
 - Topology detection

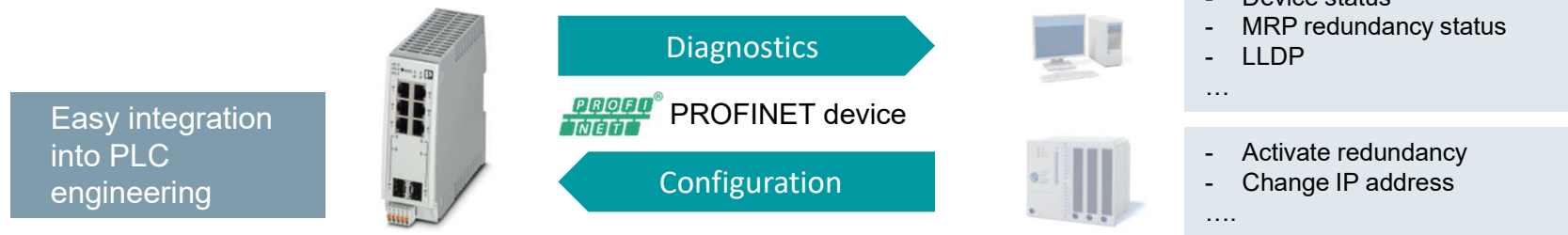


Order Number: 2702889

FL SWITCH 2000 – Feature Set

PROFINET support - Overview

- Prioritization of data packets (Quality of service)
- Topology information and neighbor detection via LLDP
- Ring redundancy via MRP as a client/manager (MRM functionality only on FL SWITCH 22xx/23xx/24xx/25xx) [Media Redundancy Manager-License on external SD-Card→ 2700270 FL SD FLASH/MRM]
- PROFINET device – Integration into PLC engineering (PC WORX, TIA Portal/Step 7)

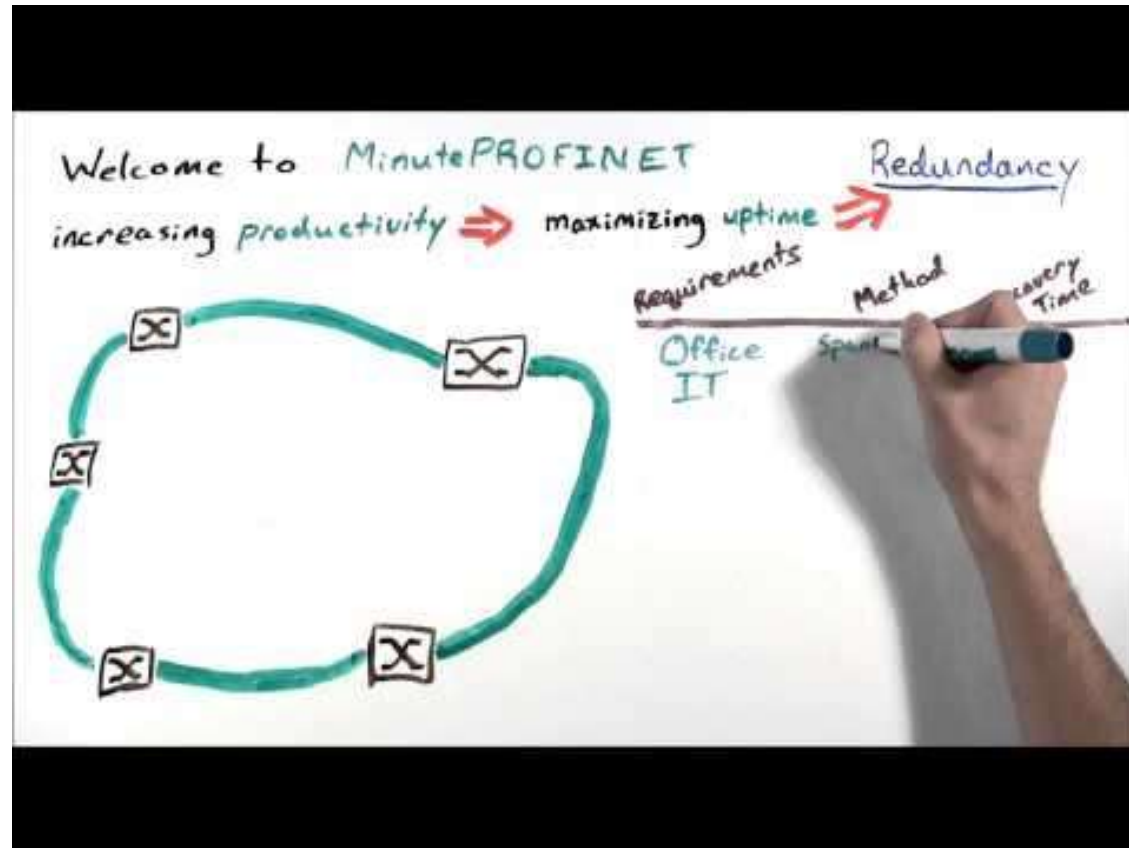


MRP

**Media
Redundancy
Protocol**

Manager (one)

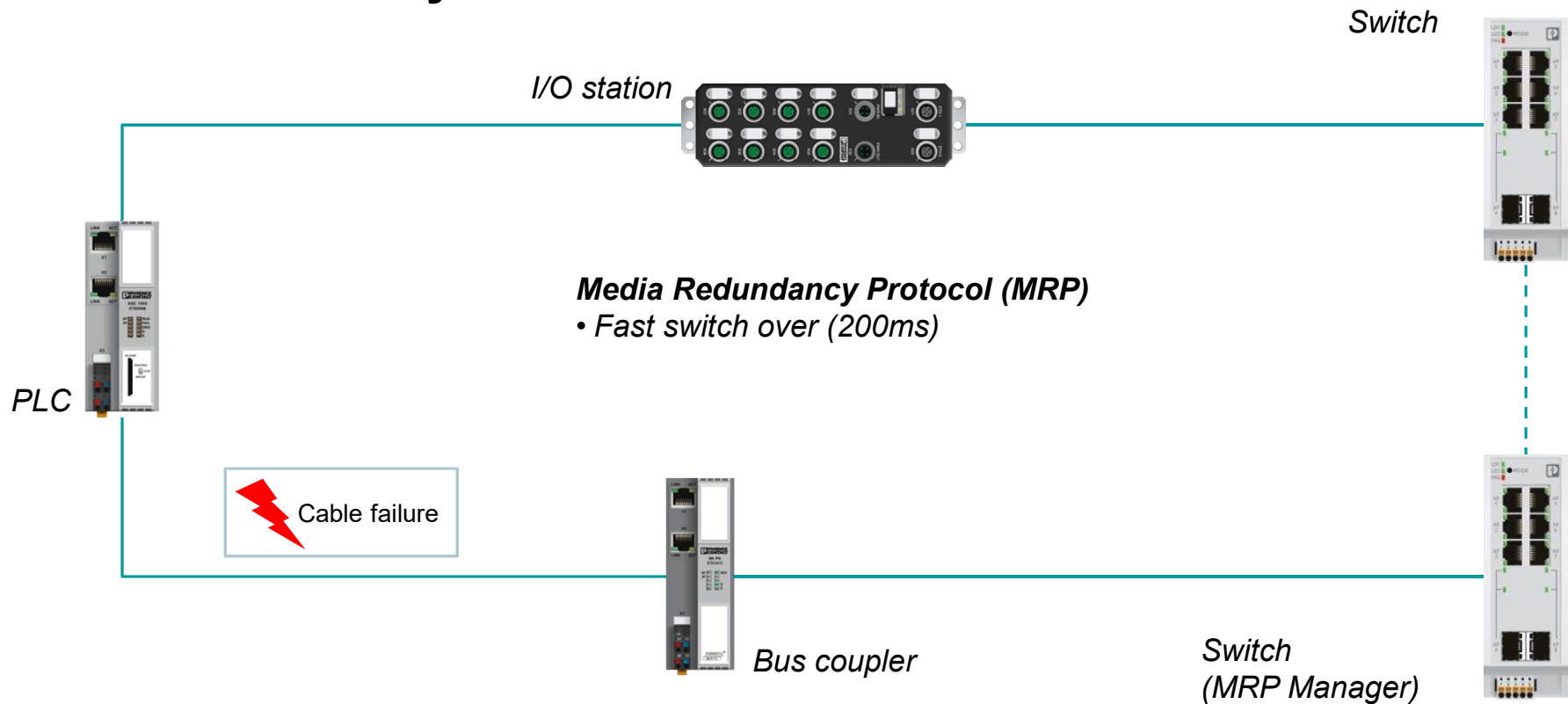
Clients (several)



Media Redundancy Protocol Media Redundancy for the Industry (with PROFINET media redundancy examples)

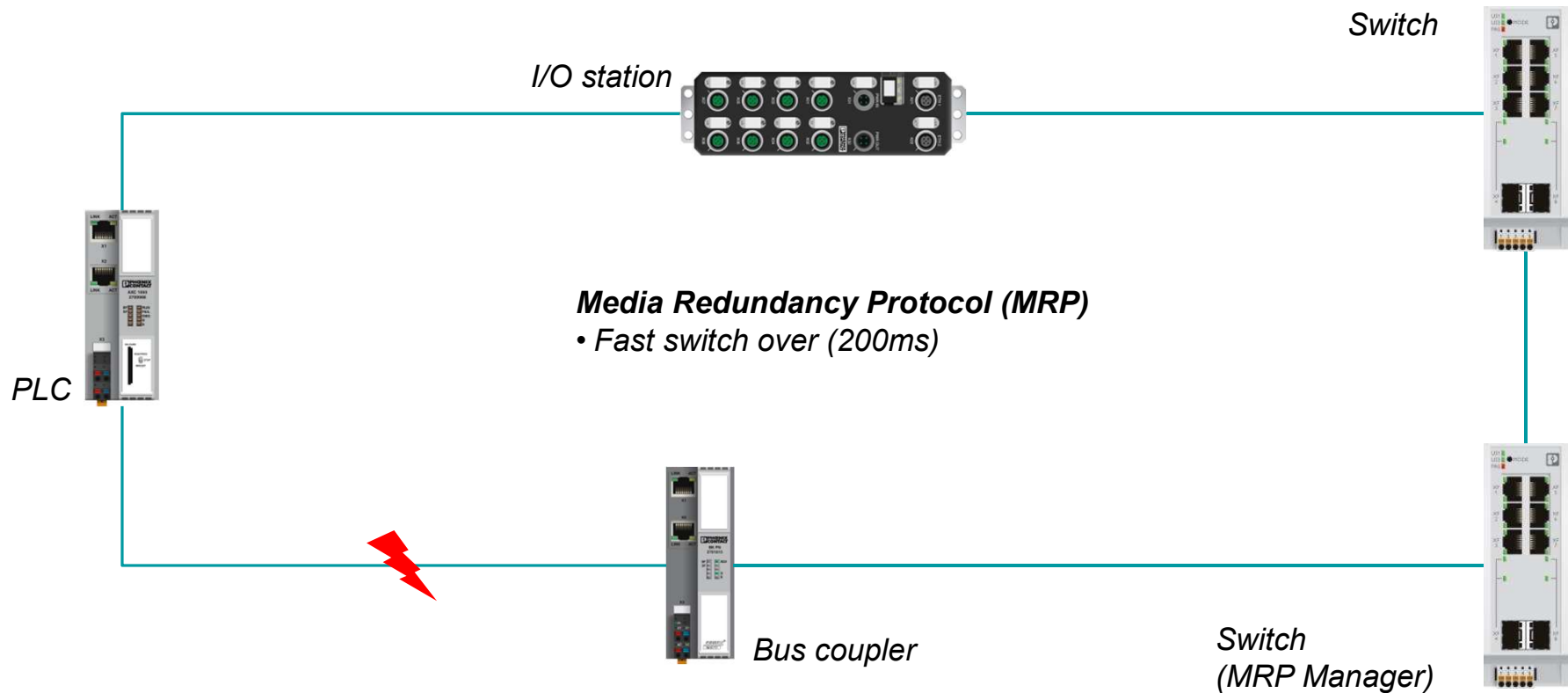
FL SWITCH 2000 – Feature Set

Media redundancy



FL SWITCH 2000 – Feature Set

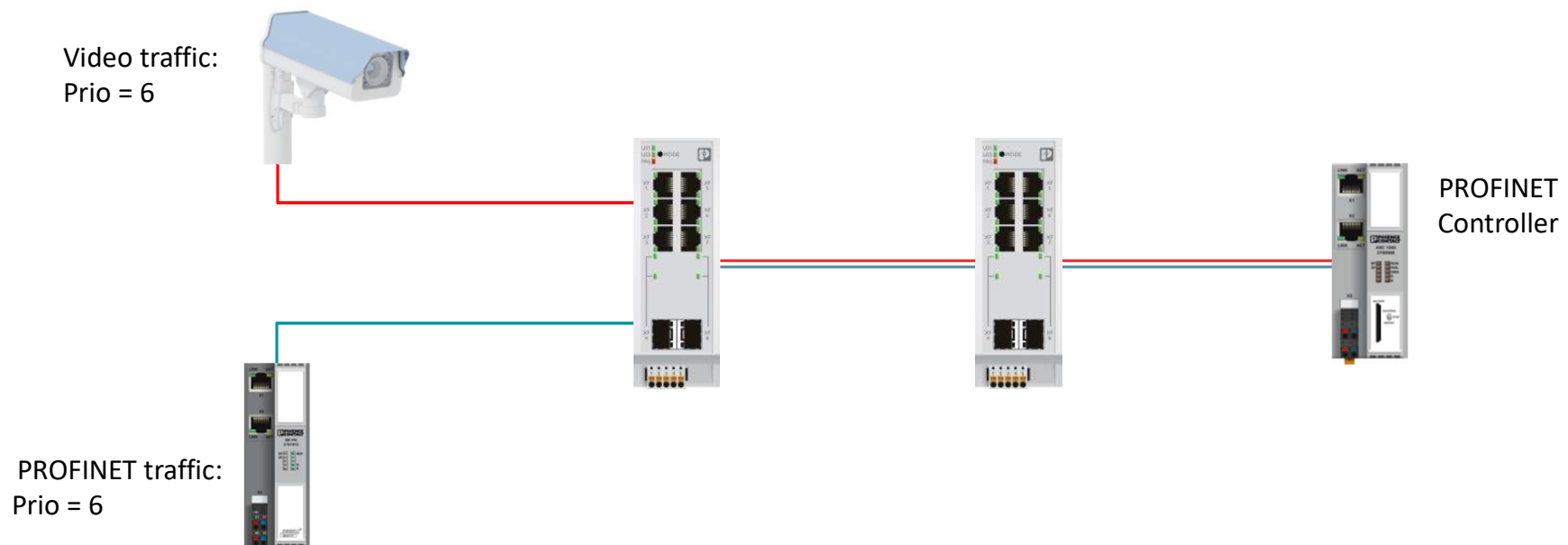
Media redundancy



FL SWITCH 2000 – Feature Set

Hardware based PROFINET prioritization

- Prioritized forwarding of PROFINET frames based on EtherType

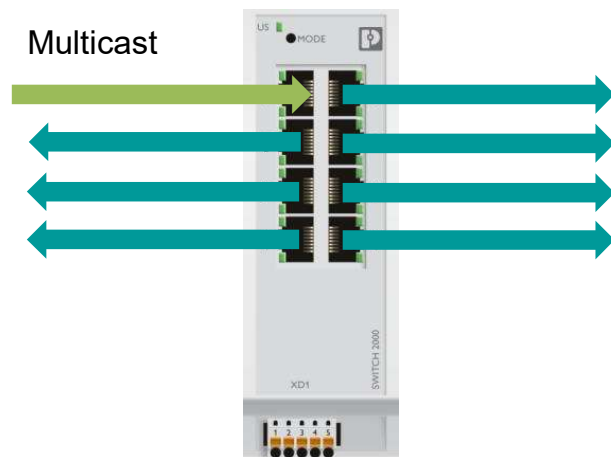


FL SWITCH 2000 – Feature Set

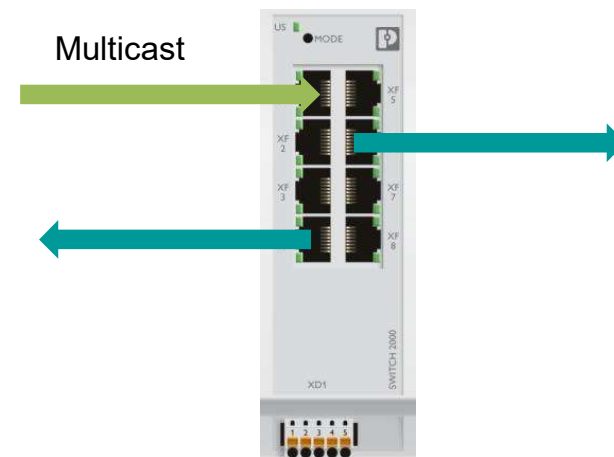
EtherNet/IP support - Overview

- Prioritization of data packets (Quality of Service via DSCP/DiffServ)
- IP-Address assignment via DHCP to connected participants
- Multicast traffic filter for EtherNet/IP (IGMP Snooping/Querier)

EtherNet/IP™



Without IGMP snooping

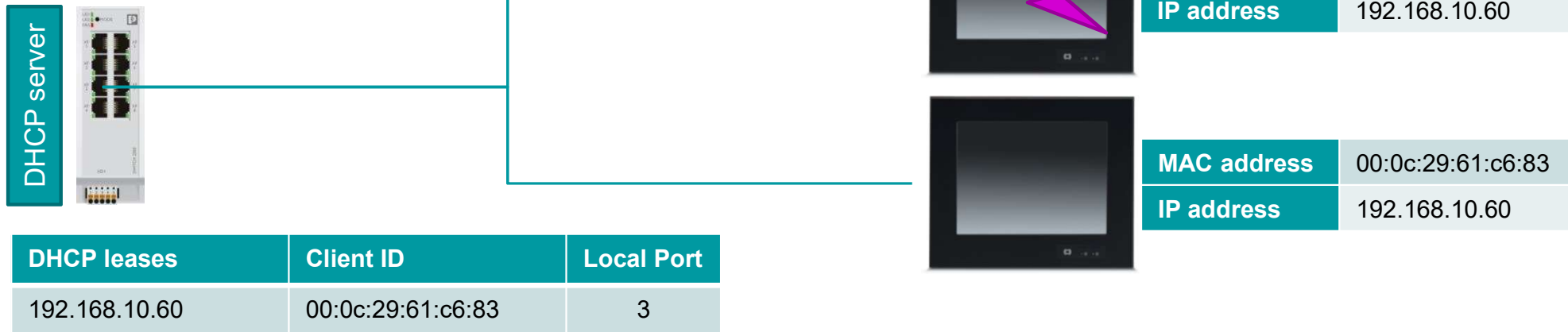


With IGMP snooping

FL SWITCH 2000 – Feature Set

IP address assignment – DHCP server

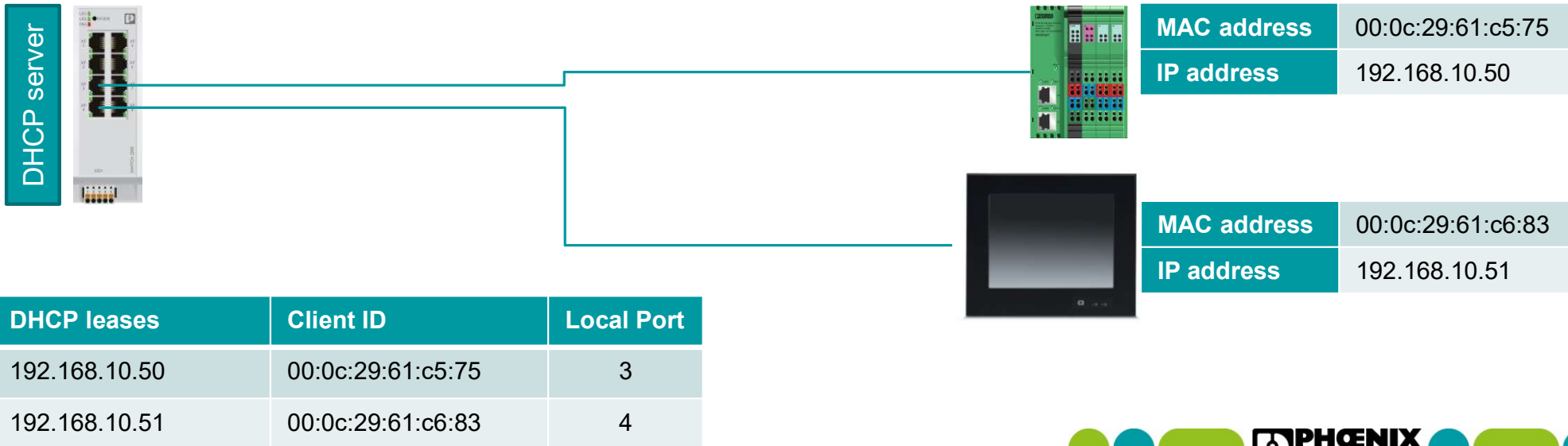
- **Port-based** → IP address assignment to single ports
 - Easy start of connected devices
 - Easy replacement of connected devices



FL SWITCH 2000 – Feature Set

IP address assignment – DHCP server

- **Pool-based** → IP address assignment **on all ports**
 - Available on FL SWITCH 2200/2300 series





FL SWITCH 2000

MAC-based port security



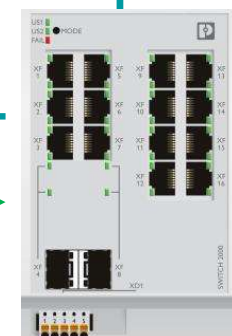
SNMP server



Service Laptop 1
MAC Address: 00:A0:45:6C:D2:06

Allowed MAC Addresses (list per port)

Description	MAC Address	VLAN ID
Service Laptop 1	00:A0:45:6C:D2:06	1
Service Laptop 2	00:A0:45:6C:D2:10	1
...	...	...



Switch



Security

FL SWITCH 2000

MAC-based port security



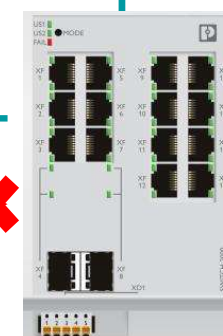
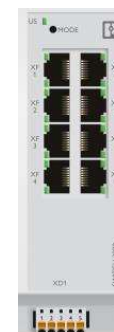
SNMP server



Unauthorized device
MAC Address: 12:34:56:78:90:12

Allowed MAC Addresses (list per port)

Description	MAC Address	VLAN ID
Service Laptop 1	00:A0:45:6C:D2:06	1
Service Laptop 2	00:A0:45:6C:D2:10	1
...	...	...



Switch

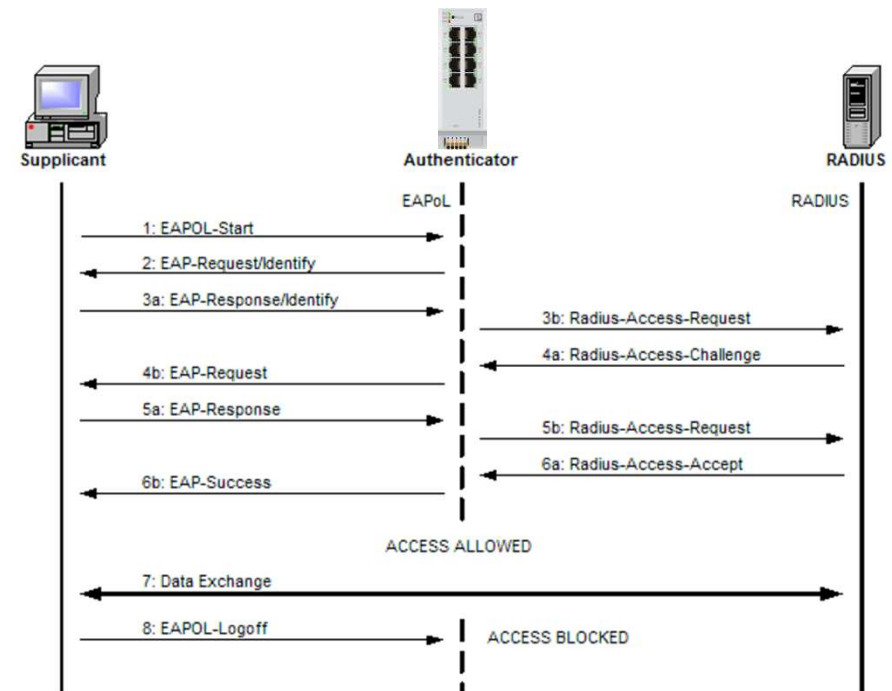
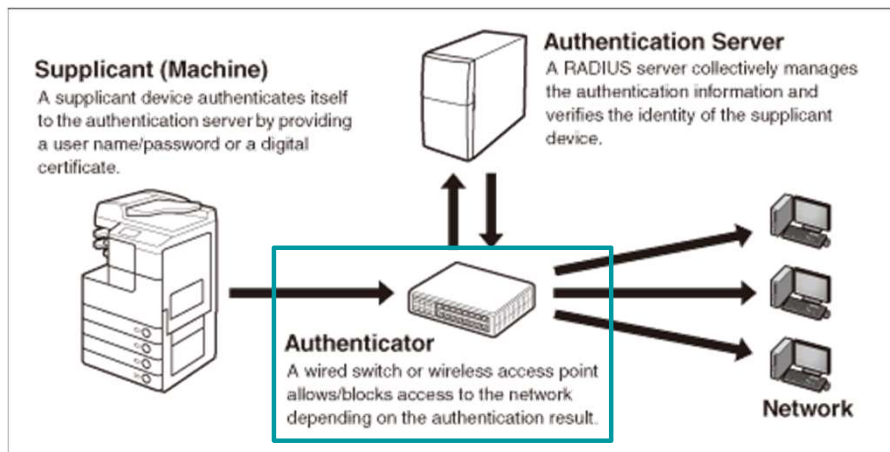


Security

FL SWITCH 2000

RADIUS Authentication (802.1x)

The switches can act as authenticator and provide/block access of supplicants to a network



FL SWITCH 2000

RADIUS Authentication (802.1x)



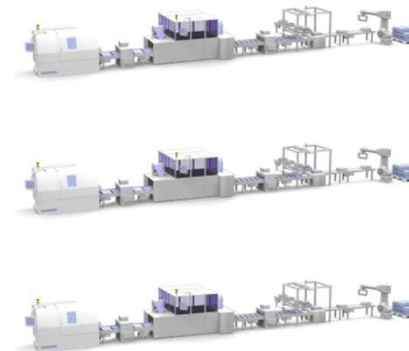
Security



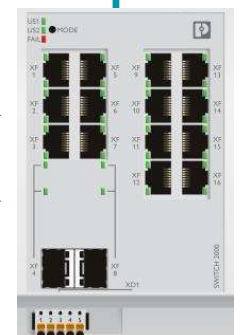
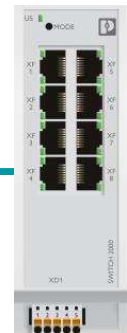
*Authentication
Server*



Client (Supplicant)



Network



*Switch
(Authenticator)*

Radius-Access-Request/Response

Identification



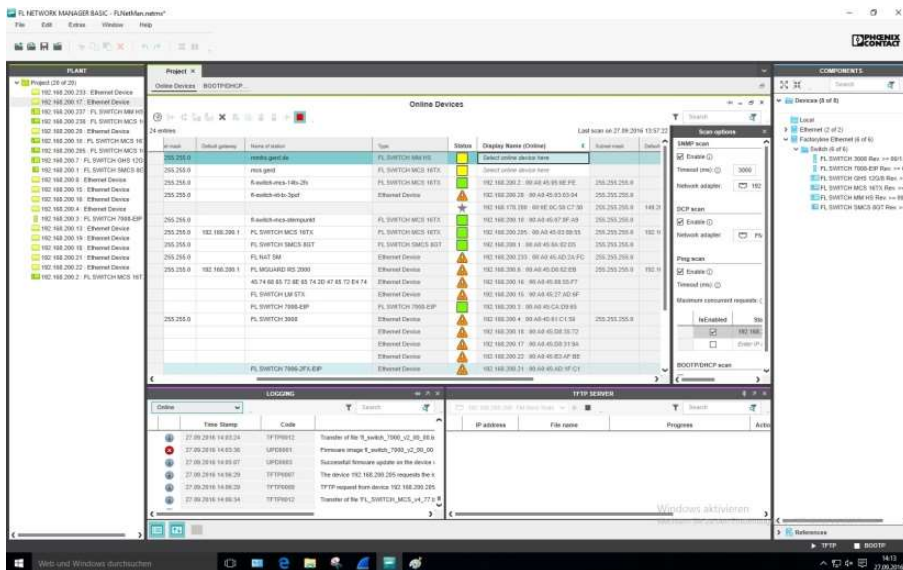
FL Network Manager- Your easy way for network configuration

FL Network Manager

How can the Network Manager help you?

With the FL NETWORK MANAGER you are able to get a quick and easy startup of your network.

Therefore the software supports you with a lot of helpful functions!



Initial IP assignment

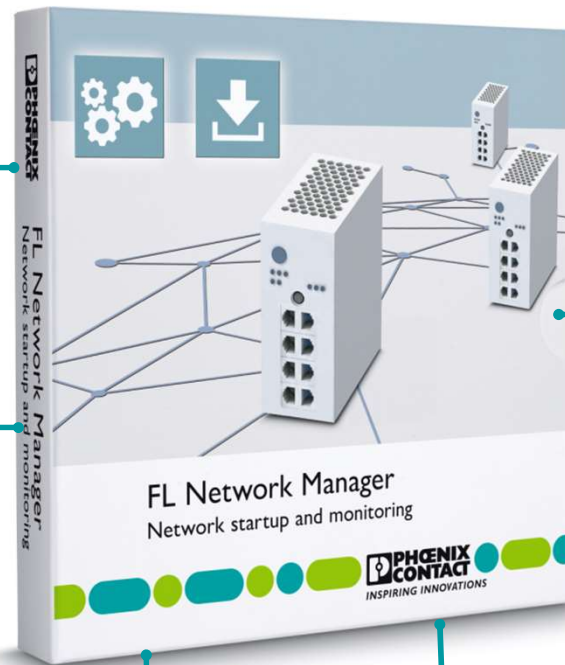
Via BootP, DHCP, DCP

Multi Device Configuration

Quick configuration of same parameters for different devices in parallel

SNMP based Scripting

SNMP configuration and information independent of device vendor



Multi Device Firmware Update

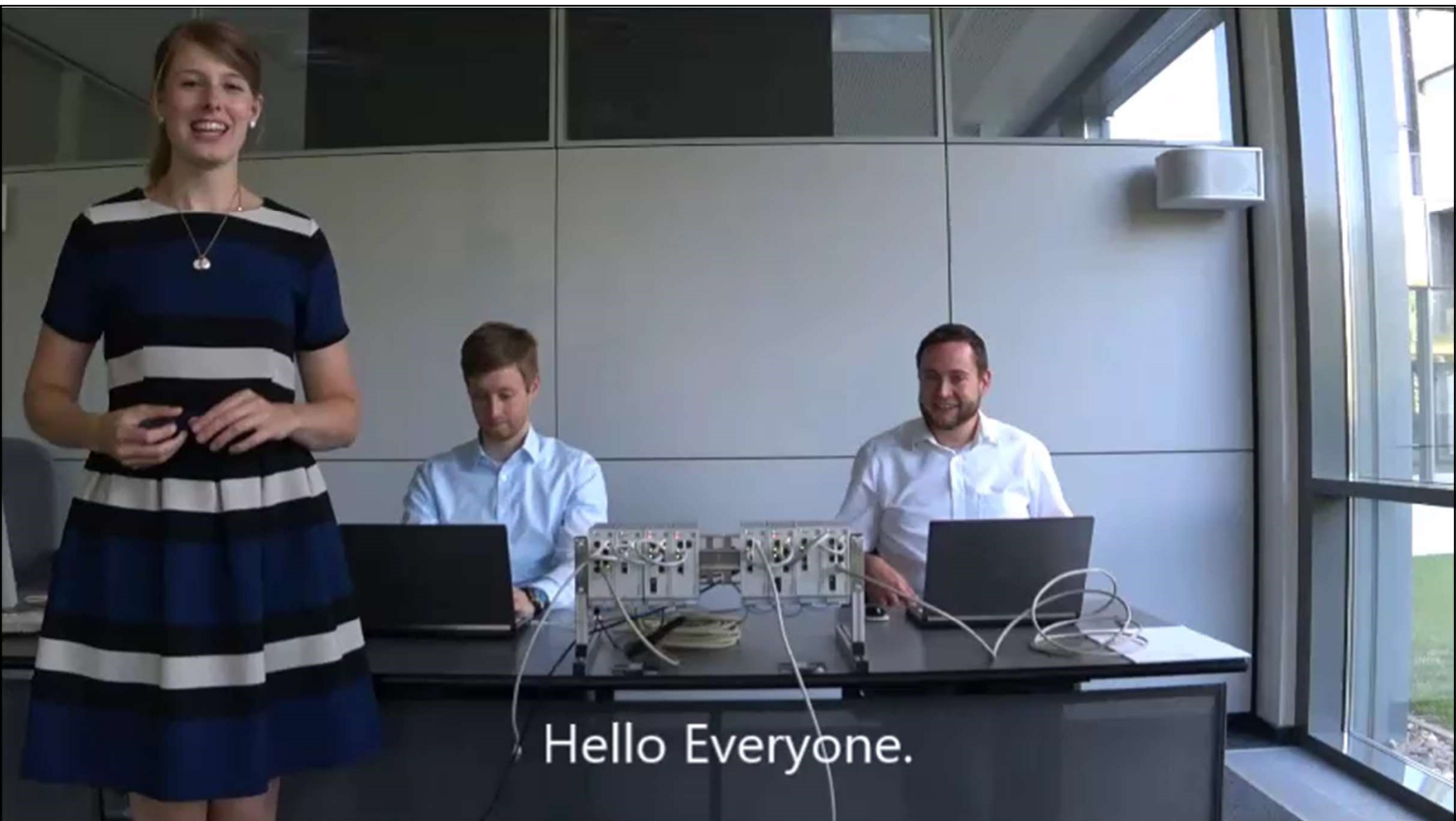
Easy Firmware update for many devices in parallel, thanks to the integrated TFTP server

Configuration File Handling

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

Topology overview

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



Hello Everyone.

FL Network Manager

Use case 1: Network start up

■ Issues

- No IP addresses on the devices
- Switches often decentral placed
- Unknown firmware status of devices

Solution

- ➔ Easy initial IP assignment via BootP, DHCP,...
- ➔ The network can be configured from a central position
- ➔ Thanks to the multi device configuration function, parameter can be cloned on all needed switches

The screenshot shows the 'BOOTP/DHCP-Server' configuration window. It includes a checkbox to activate the server, a dropdown for the network adapter (selected as '192.168.10.11 Ethernet 2'), input fields for subnet mask (255.255.255.0), standard gateway, start IP address (192.168.10.100), end IP address (192.168.10.120), and lease duration (01:00:00).

BOOTP/DHCP-Server	
☒	BOOTP/DHCP-Server aktivieren
Netzwerkadapter:	192.168.10.11 Ethernet 2
Subnetzmaske:	255 . 255 . 255 . 0
Standard-Gateway:	
Betriebsmodus:	BOOTP/DHCP
Start-IP-Adresse:	192 . 168 . 10 . 100
End-IP-Adresse:	192 . 168 . 10 . 120
Lease-Dauer:	01 : 00 : 00

FL Network Manager

Use case 2: Maintenance firmware update

Issues:

- Exact IP addresses of devices are not clear
- Unknown firmware state of the switches
- Order of devices for update

Solution

With the IP range scan, it is enough to know the address range

Firmware status are listed for all scanned devices

The Network Manager can make a multi device firmware update

Firmware Update



Update firmware on the selected device(s)
Select the TFTP server and the firmware file for each device type.

- ☒ Local TFTP server
☐ Remote TFTP server

IP address: 192 . 168 . 200 . 200

Type	File Name
FL SWITCH MCS 16TX	
FL SWITCH 7008-EIP	EUPL-EN.pdf
	FL_NAT_SMN_v3_25.bin
	FL_SWITCH_3000_4000_v1_22.bin
	FL_SWITCH_3000_4000_v1_30.bin
	fl_switch_7000_v1_21.bin
	fl_switch_7000_v2_00_00.bin
	FL_SWITCH_GHS_02_62_00.stk
	FL_SWITCH_GHS_03_00_00.stk
	fl_switch_int_v2_00.bin
	fl_switch_int_v2_01.bin
	FL_SWITCH_LM_3_49.bin
	FL SWITCH MCS v4_77.bin

FL Network Manager

Use case 3: Redundancy diagnostic

■ Issues

- Where to start the analysis
- How does the redundancy configuration looks like
- Identify single port states for redundancy mechanism

Solution

- The network topology is a good starting point to see, how the ring was built
- With the Multi Device configuration one parameter can be displayed for all devices
- With the detail view for redundancy



FL Network Manager

Use case 4: Integration of third party devices

■ Issues

- No device description files available
- Unknown SNMP structure of third-party devices
- Nearly no diagnostic data in Network Manager

Solution

- ➔ With SNMP scripting, it is possible to configure devices without description
- ➔ The SNMP structure can be found in the MIB file of the device
- ➔ A diagnostic script can be created and used for detail device diagnostic

Skriptcode

```
/* This script reads the Portspeed and Duplex Mode for each port
The maximum port number can be changed with the definition for
|'portNumberMax'
*/

//variable declaration
VAR
  duplexModeOid : OID := '1.3.6.1.4.1.4346.11.11.4.2.2.1.4';
  duplexMode : INTEGER32 := -1;

  portSpeedOid : OID := '1.3.6.1.4.1.4346.11.11.4.2.2.1.3';
  portSpeed : GAUGE32 := GAUGE32#0;

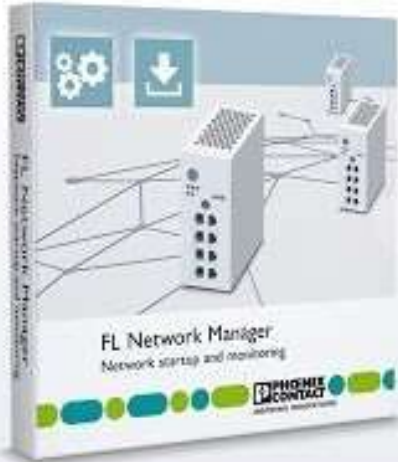
  portNumber : INTEGER32;
  portNumberMax : INTEGER32 := 48;
END_VAR

WRITECONSOLE('=====');
WRITECONSOLE('Read port informations');
WRITECONSOLE('=====');

portNumber := 1;
duplexMode := GET(duplexModeOid + portNumber, TYPE_REF INTEGER32);
portSpeed := GET(portSpeedOid + portNumber, TYPE_REF GAUGE32);

while (duplexMode >= 0 & portNumber < portNumberMax) do
  WRITECONSOLE('=====');
```





FL Network Manager

SNMP scripting
Read out and set
parameters easily via SNMP



FL Network Manager – SNMP scripting



FL SWITCH 2000 – Firmware 2.80

New features

new



More data throughput and redundancy

- Link Aggregation/LACP

Supported only by:

- FL SWITCH 22xx/23xx
- FL SWITCH 24xx/25xx
- FL NAT 22xx/23xx



More diagnostics

- CRC-Surveillance
- Syslog
- Snapshot tool



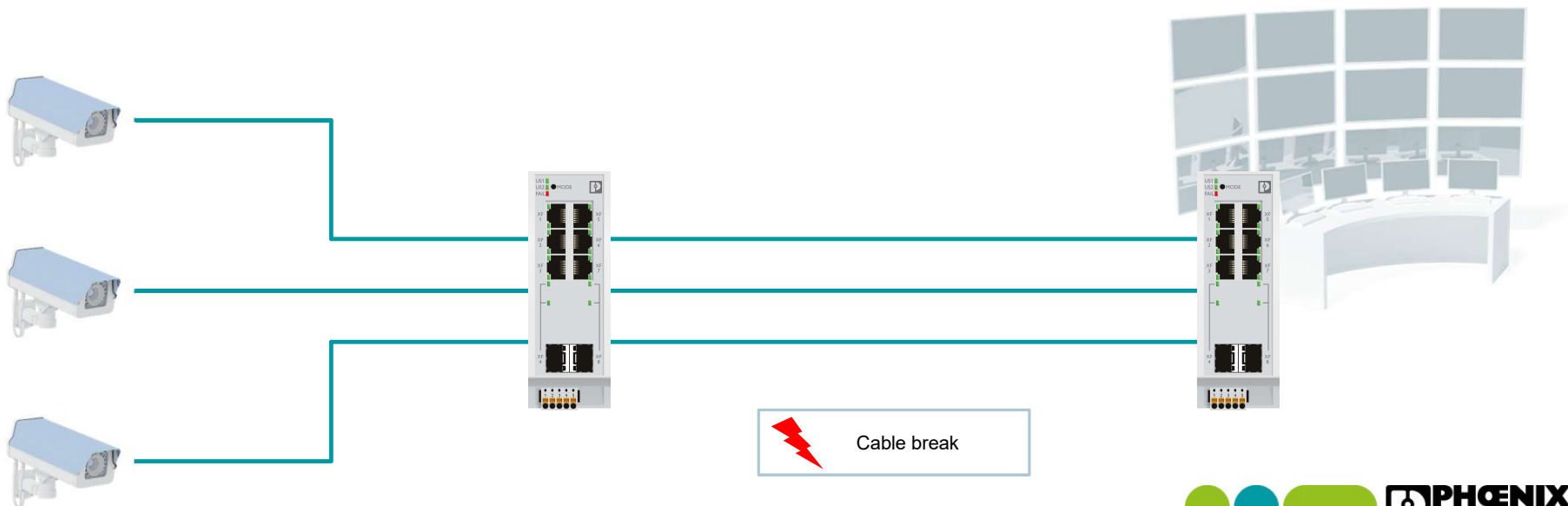
More security

- Deactivation of Smart Mode button
- Configurable login expire time
- Individual SNMPv3 password

FL SWITCH 2000 – Firmware 2.80

Link Aggregation Control Protocol (LACP) – IEEE802.1X

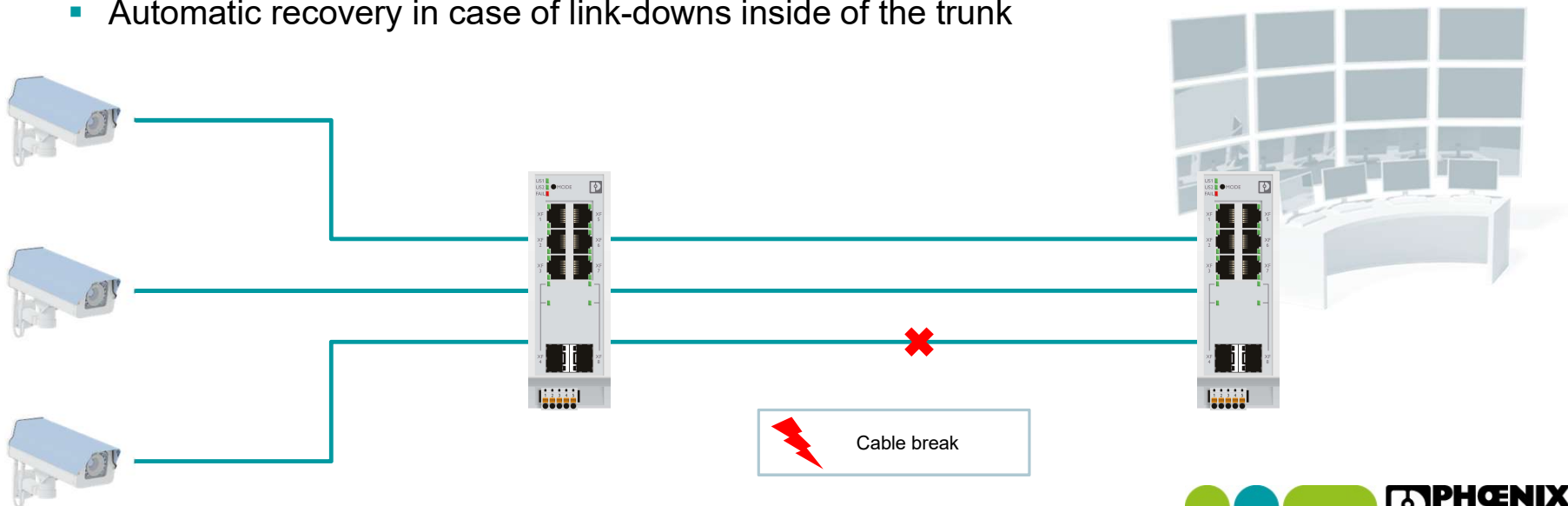
- Advantages of LACP:
 - Higher data throughput thanks to multiple network connections (trunks)



FL SWITCH 2000 – Firmware 2.80

Link Aggregation Control Protocol (LACP) – IEEE802.1X

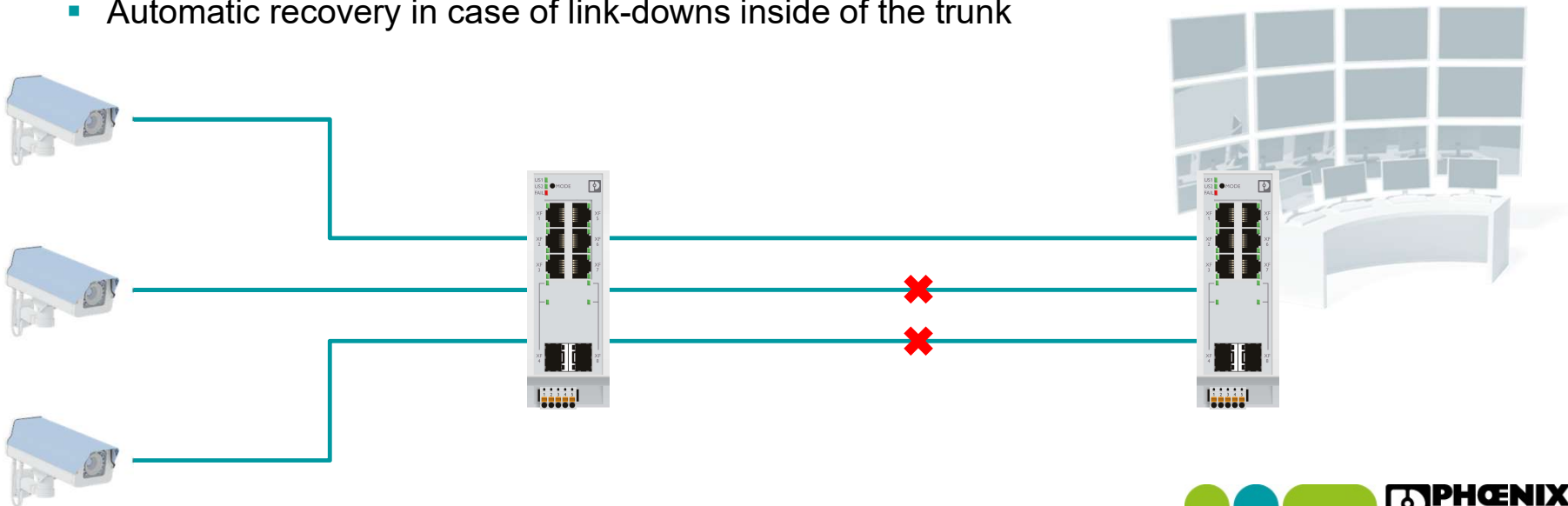
- Advantages of LACP:
 - Higher data throughput thanks to multiple network connections (trunks)
 - Higher availability thanks to redundancy mechanism within trunks
 - Automatic recovery in case of link-downs inside of the trunk



FL SWITCH 2000 – Firmware 2.80

Link Aggregation Control Protocol (LACP) – IEEE802.1X

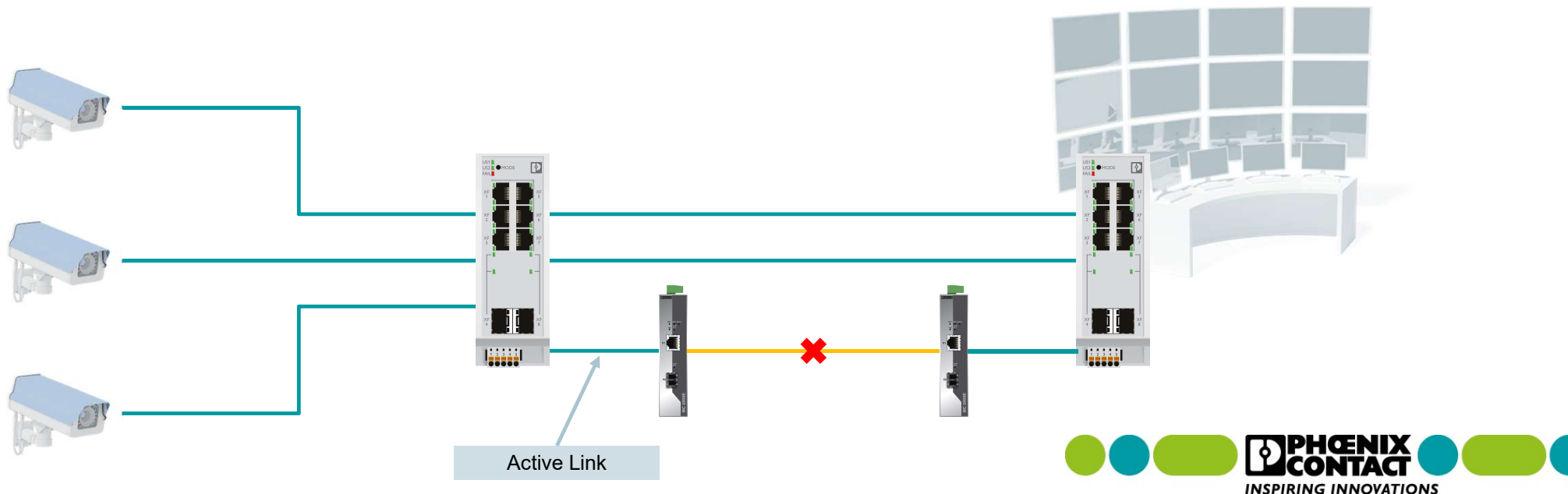
- Advantages of LACP:
 - Higher data throughput thanks to multiple network connections (trunks)
 - Higher availability thanks to redundancy mechanism within trunks
 - Automatic recovery in case of link-downs inside of the trunk



FL SWITCH 2000 – Firmware 2.80

Link Aggregation Control Protocol (LACP) – IEEE802.1X

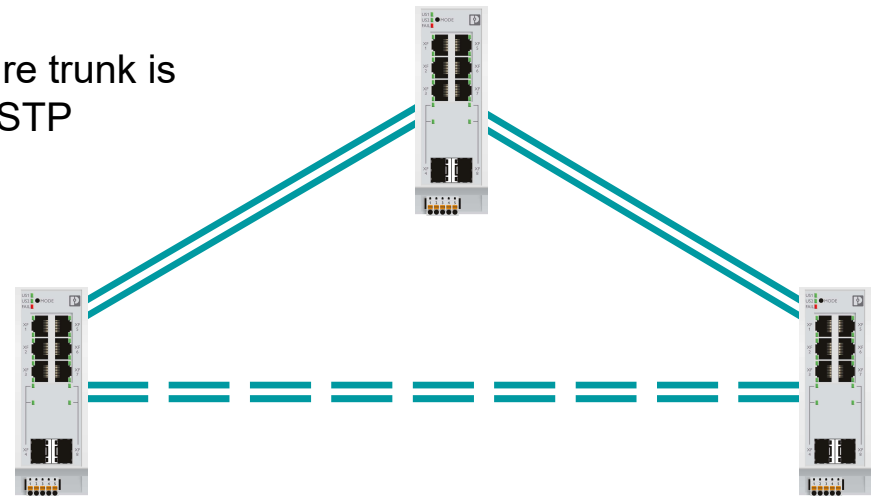
- Detection of link-downs, even if point-to-point connection goes over a media converter and link-status on the switch stays active
- Confirmation of LAG configuration between two devices → Prevention of errors due to incorrect configuration or cabling



FL SWITCH 2000 – Firmware 2.80

Link Aggregation Control Protocol (LACP) – IEEE802.1X

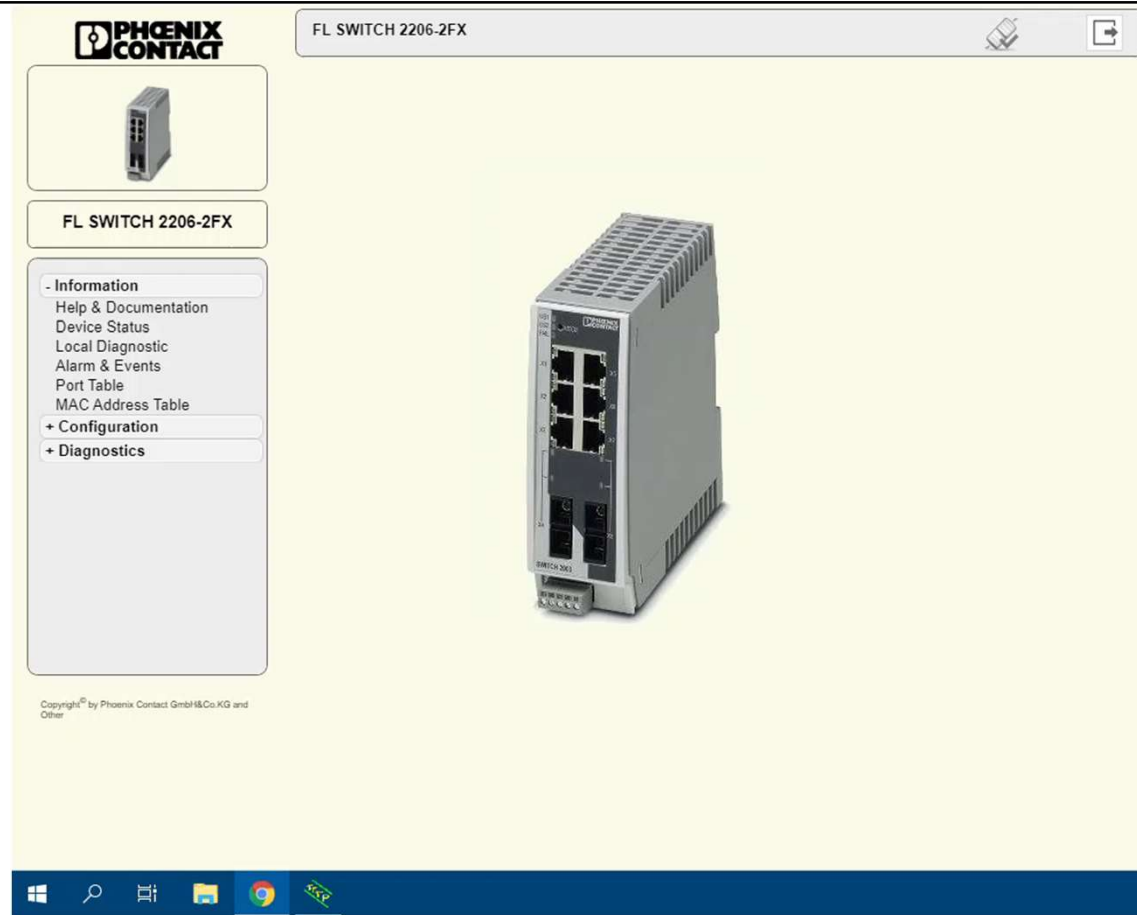
- Combination of RSTP and LACP
 - LACP Trunks are handled as one logical port → entire trunk is being set to state blocked/forwarding/alternate by RSTP
- Flexibility of device configuration
 - Maximum of 6 trunks can be configured
 - Maximum of 4 ports per trunk can be configured
- Configuration via Web-based management, FL Network Manager and SNMP



FL SWITCH 2000 – Firmware 2.80

Syslog

- Transmission of event messages to one or two Syslog servers
- Message groups for specific topics (e.g. Diagnosis, Security)



FL SWITCH 2000 – Firmware 2.80

Snapshot tool

- Snapshot of the entire device system
- Customers can download one file with all information and provide it to technical support
- Service technicians can download device information, e. g. via remote access





April 2020

FL SWITCH 2000 – Firmware 2.90

New features



Improved management

- Role-based user management



Improved prioritization

- DiffServ/DSCP for EtherNet/IP traffic prioritization



Improved IP address commissioning

- Dynamic initial IP via Zeroconf



More diagnostics

- Extended event log and SNMP trap options



Improved security

- Deactivation of SD slot
- Configurable maximum of login attempts
- Access restriction to all websites

Note: Firmware 2.90 will **ONLY** be rolled out to FL NAT 2xxx. All FL SWITCH 2xxx have to be updated manually



Technology Made Easy PROFINET



Maritime & Offshore



Oil & Gas



Machine & Factory automation

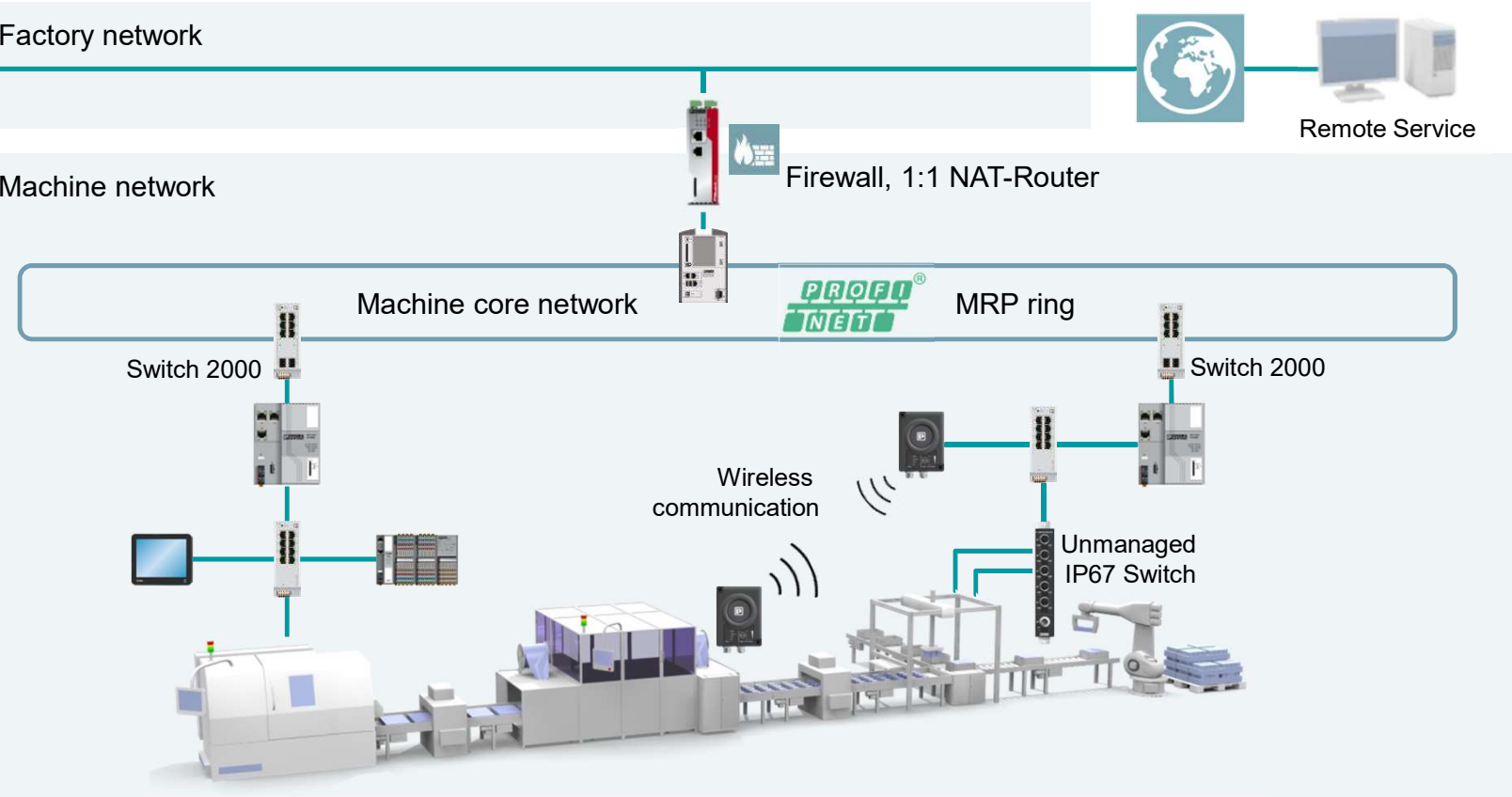
- Support of automation protocols



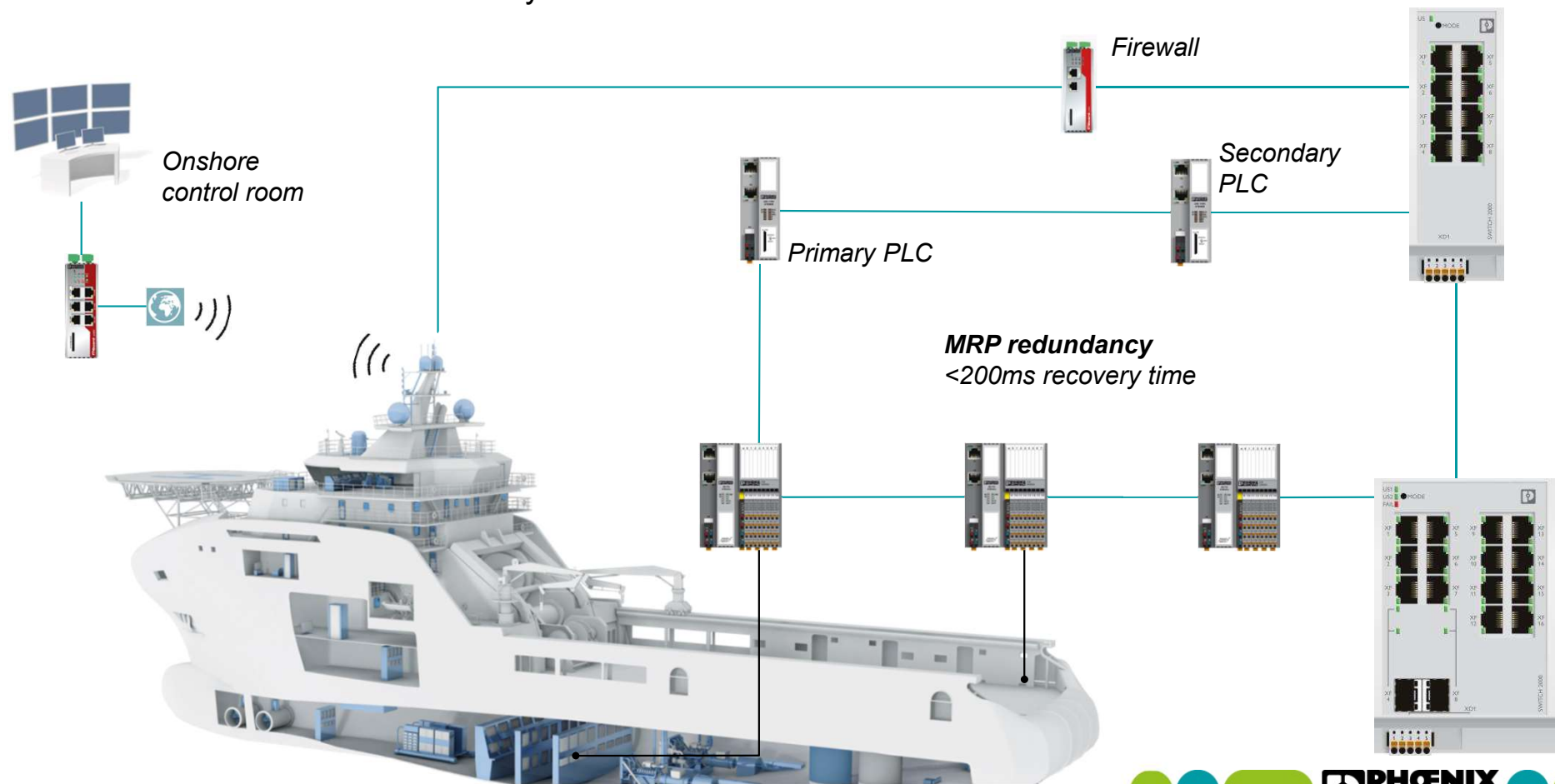
Infrastructure & Wind

- Fiber optic variants
- Suitable for harsh environments

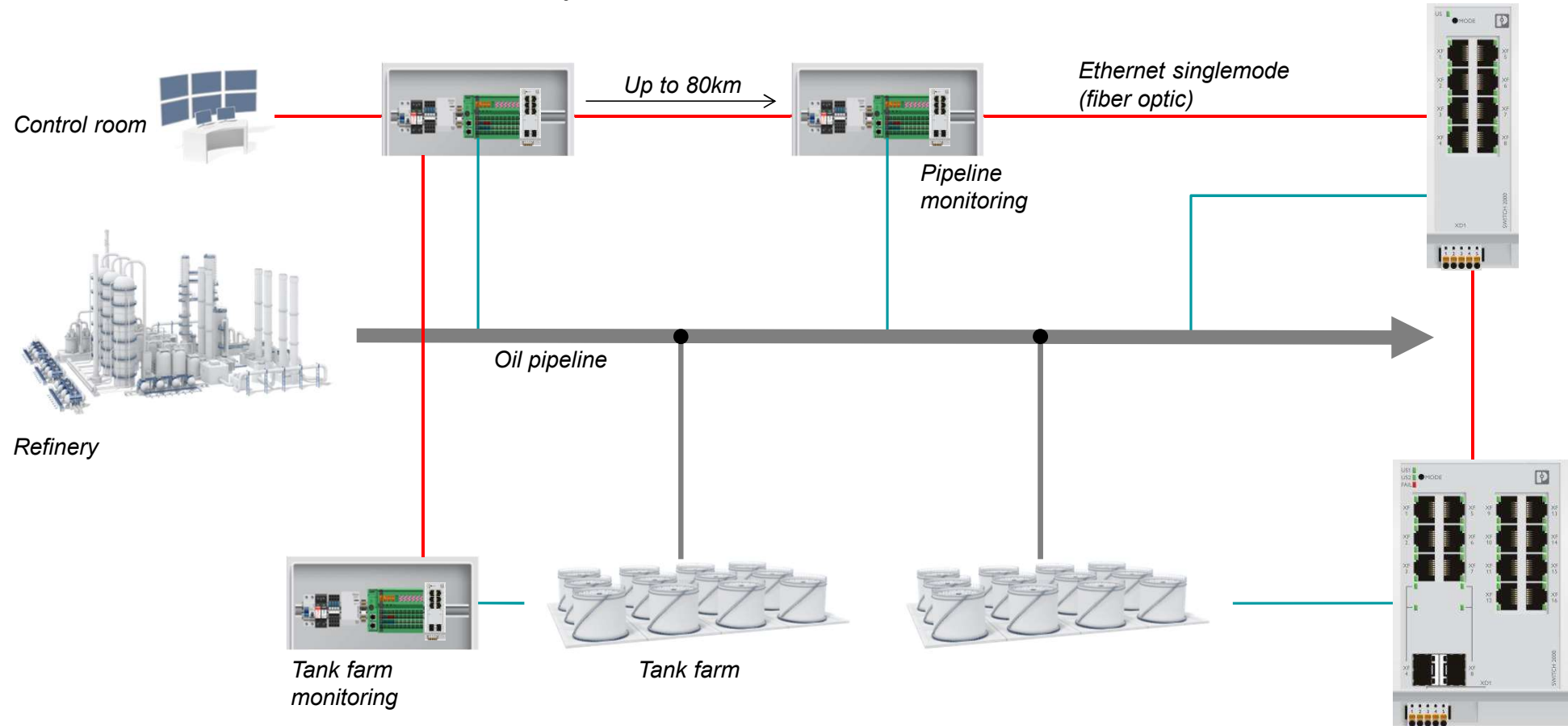
FL SWITCH 2000 – Factory Automation



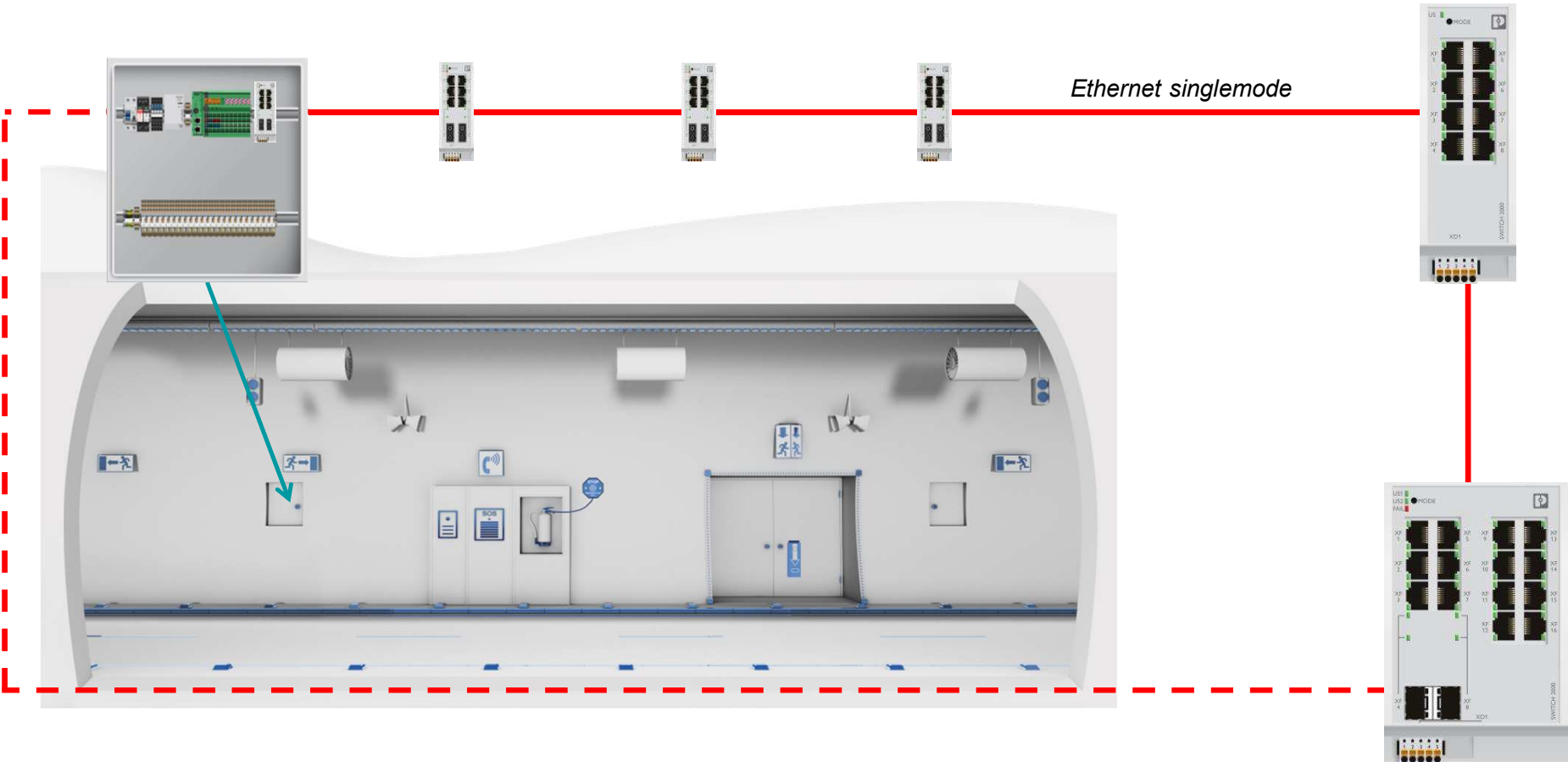
FL SWITCH 2000 – Maritime Industry



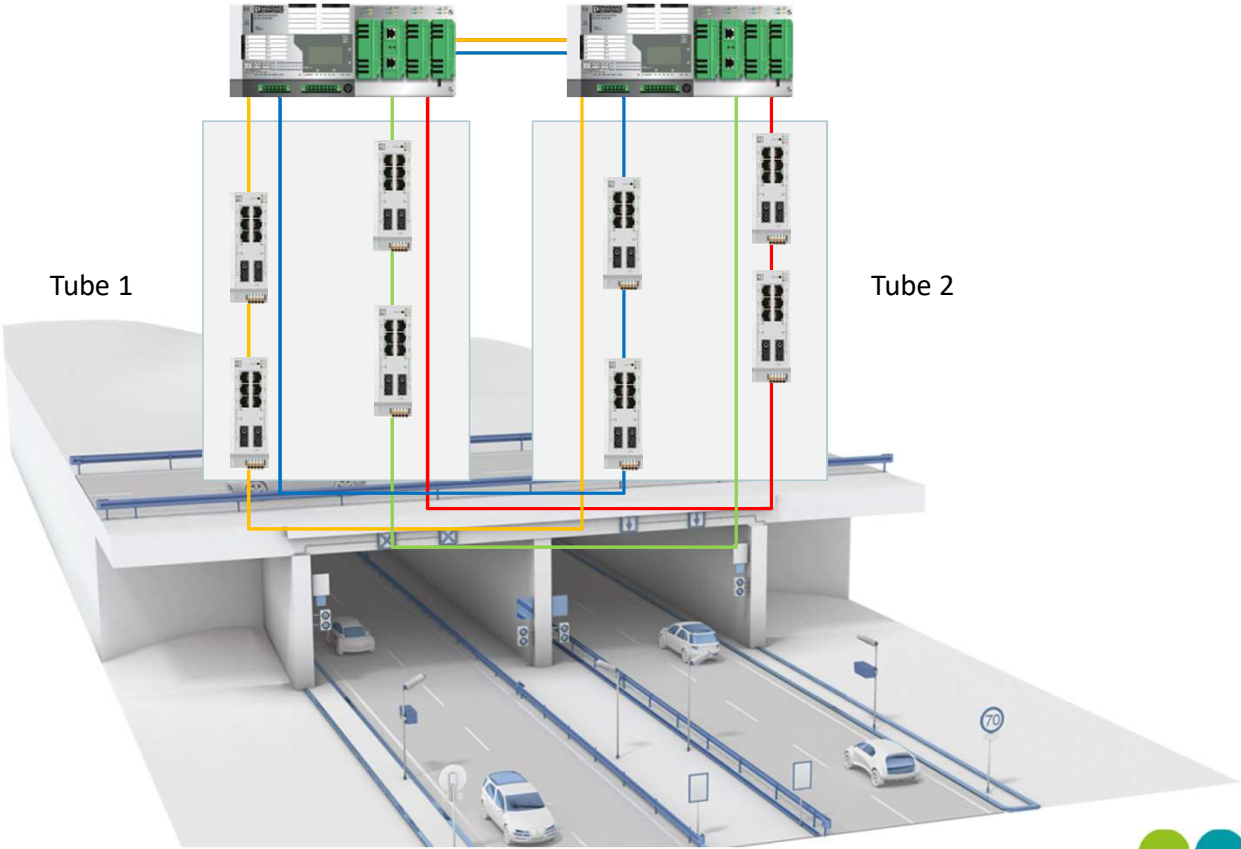
FL SWITCH 2000 – Process Industry



FL SWITCH 2000 – Infrastructure



FL SWITCH 2000 – Infrastructure



FL SWITCH 2000 – Wind Industry

WDM-Technology



Wavelength-division multiplexing (WDM):

- Full duplex communication via one fiber

Available products:

- WDM SFP modules for managed switches
- Media converters

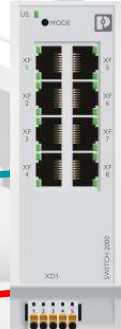
TX (1310 nm)

RX (1310 nm)

RX (1550 nm)

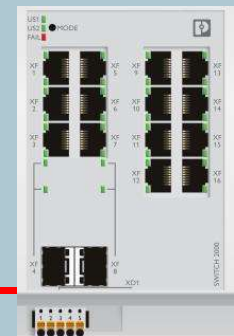
TX (1550 nm)

Nacelle switch



Wind park

Bottom box
switch
(connection to
wind park)



Webinar IMA 2020

Mayor información



Phoenix Contact, S.A. de C.V.
Lago Alberto 319 Piso 9,
Locales 902 y 903-A.
Col. Granada Del. Miguel Hidalgo,
Ciudad de México. 11520
Tel.: +52 55 1101 1380 Ext. 393
Cel.: +52 55 3233 6518
agordillo@phoenixcontact.com.mx
www.phoenixcontact.com.mx

Ing. Antonio Gordillo
Infrastructure and Systems Automation
Product Marketing Manager

www.phoenixcontact.com.mx

ventas@phoenixcontact.com.mx

55 1101 1380

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