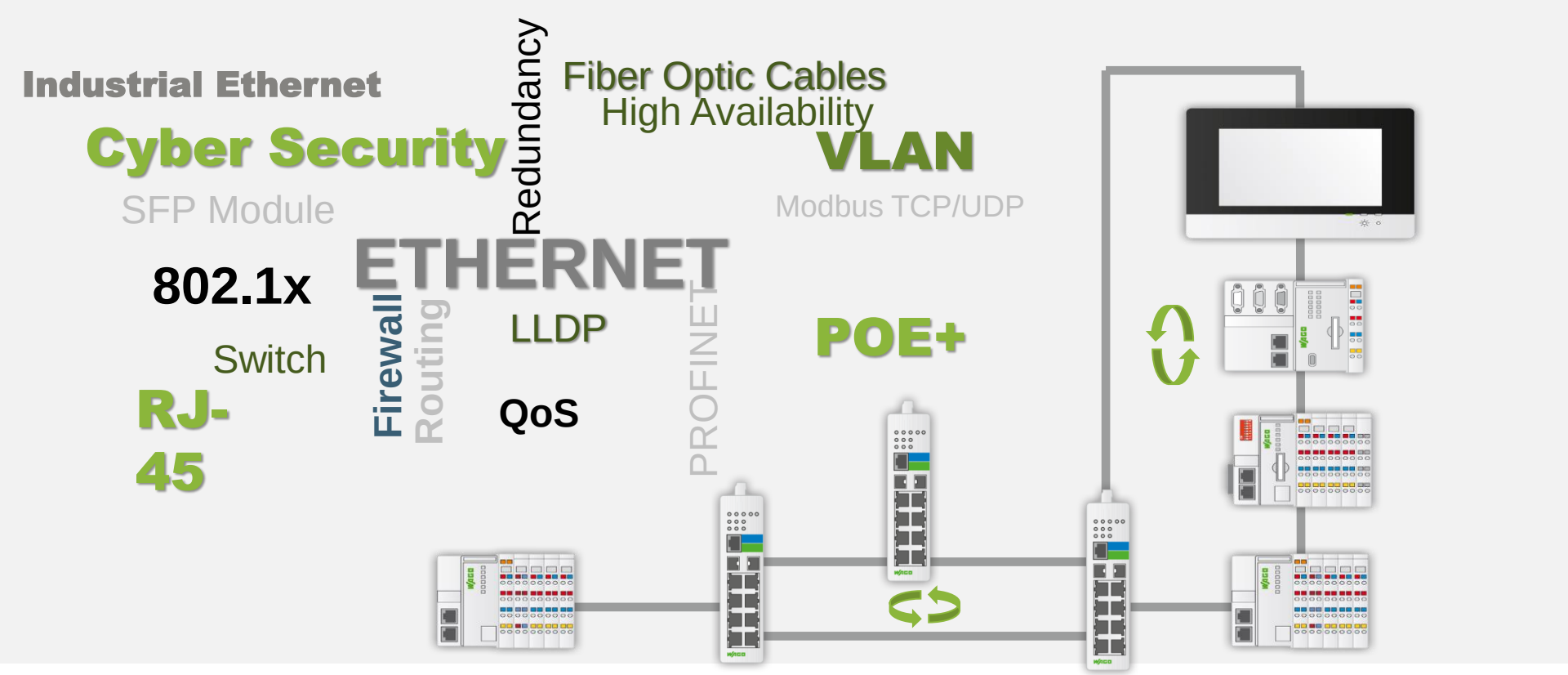


INDUSTRIAL SWITCHES

Ingo Suleck, Produktmanagement Automation

INDUSTRIAL SWITCHES

WAGO Range of Products

Industrial Switches (ECO)

- Versions with 5 to 8 ports
- Fast Ethernet and gigabit
- Easy carrier rail mounting
- Useable without configuration
- …

Industrial Switches

- Redundant power supply
- Alarm relay for diagnosis
- Connection of fiber optic cables (SFP-Slots)
- Up to 16 cooper ports
- **…**

Industrial Managed Switches

- Administration/diagnostics
- Redundancy solution
- Network security
- Performance and Traffic Control
- …

PROFINET Managed Switch

- PROFINET CC-B certified
- Configuration via GSD-file
- Media redundancy manager
- Potential-free connection via SFP modules
- …

INDUSTRIAL SWITCHES ECO

Reference list





	852-111	**852-1111**	**852-112**	**852-1112**	**852-1411 / 852-1417**
Ports	5x10/100Base-TX	5x10/100/**1000**Base-T	8 x 10/100Base-TX	8x10/100/**1000**Base-T	5x10/100/**1000** Base-T
Dimensions (mm)	23.4 x 109.2 x 73.8	23.4 x 109.2 x 73.8	109.2 x 73.8 x 23.4	46 x 116 x 99.6	46 x 116 x 99.6
Ambient temperature	**–40 … +70 °C**	**–40 … +70 °C**	**–40 … +70 °C**	0 … +60 °C	-40 … +70 °C
Approvals	UL, DNV GL [1]	UL [2], DNV GL [1]	UL	UL[2]	UL[2] ; IEC61850-3 [2]
PROFINET	-	**CC-A**	-	**CC-A**	**CC-A**
Feature					4*PoE+ and 2 SFP-Slot

The benefits of the ECO program:

- Mounting on din rail
- Immediately usable without configuration
- Industrial rubustness

[1] with 852-9101 [2] pending

INDUSTRIAL SWITCHES

Reference list

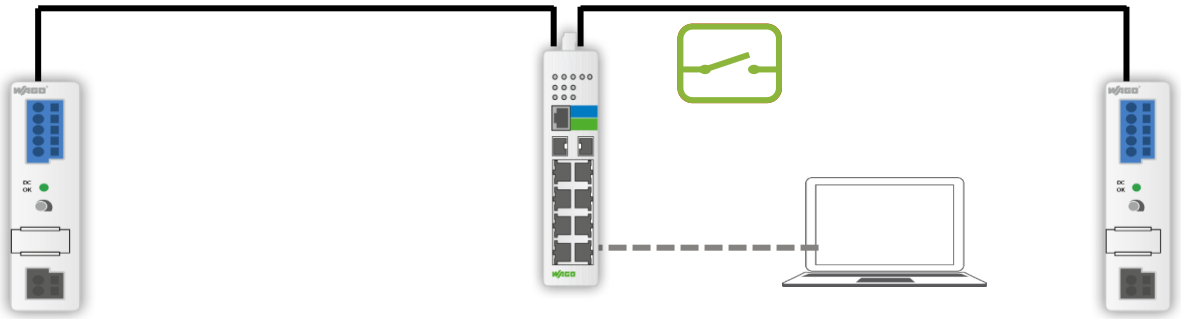
	852-101	**852-102**	**852-103**/040-000	**852-1102**	**852-1106**
Copper ports	5 x 10/100	8 x 10/100	8 x 10/100	8 x 10/100/**1000**	16 x 10/100/**1000**
FO ports	-	-	2 x SFP 100	-	-
Redundant power supply	✓	✓	✓	✓	✓
Alarm contact	✓	✓	✓	✓	✓
Dimensions (mm)	50 x 105 x 120	50 x 162 x 120	50 x 162 x 120	50 x 105 x 120	50 x 120 x 162
Ambient temperature	−40 … +70 °C	−40 … +70 °C	−40 … +70 °C	−40 … +70 °C	−40 … +70 °C
Approvals	UL	UL	UL	UL [1]	UL [1]
PROFINET	-	-	-	**CC-A**	**CC-A**

[1] pending

INDUSTRIAL SWITCHES

Redundant power supply and alarm contact

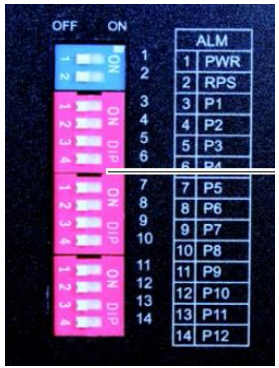
Primary power supply **PWR**



Secondary power supply **RPS**

Alarm Contact

- Primary power supply monitoring
- Secondary power supply monitoring
- Monitoring of ETHERNET ports (Link down)



INDUSTRIAL SWITCHES

Industrial Switch; 16 Ports 1000Base-T

Common Features

- 16 x 1GBit/s RJ45 ports
- Redundant power supply 12 … 60V DC
- Alarm relay, configurable via DIP switch
- Energy Efficient Ethernet(IEEE 802.1az)
- Paket prioritization based on IEEE802.1p
- Extended temperature range -40°C … +70°C

Advantages

- High port density
- High data throughput and power adaption to the true traffic
- Support PROFINET Conformance Class A (IEEE 802.1p)

Item-Nr. : 852-1106

INDUSTRIAL SWITCHES

Industrial Switch; 16 Ports 1000Base-T

Common Features

- 8 x 1GBit/s RJ45 ports
- Redundant power supply 9 … 57 V DC
- Alarm relay, configurable via DIP switch
- Energy Efficient Ethernet(IEEE 802.1az)
- Paket prioritization based on IEEE802.1p
- Extended temperature range -40°C … +70°C

Advantages

- High port density
- High data throughput and power adaption to the true traffic
- Support PROFINET Conformance Class A (IEEE 802.1p)

Item-Nr. : 852-1102

INDUSTRIAL MANAGED SWITCHES

View

				NEW	NEW
					
	852-303	**852-1305**	**852-1505**	**852-1305/000-001**	**852-1505/000-001**
Copper ports	8 x 10/100	8 x 10/100/1000	8 x 10/100/1000	8 x 10/100/1000	8 x 10/100/1000
FO ports	2 x SFP 100/1000	4 x SFP 1000	4 x SFP 1000	4 x SFP 1000	4 x SFP 1000
Redundant power supply	✓	✓	✓	✓	✓
Alarm contact	✓	✓	✓	✓	✓
Dimensions (mm)	50 x 120 x 162	50 x 120 x 162	50 x 120 x 162	50 x 120 x 162	50 x 120 x 162
Ambient temperature	−40 … +70 °C	−40 … +70 °C	−40 … +70 °C	−40 … +70 °C	−40 … +70 °C
Approvals	UL[1], DNV GL	UL[1], DNV GL		UL[1] , IEC61850-3	UL[1] , IEC61850-3
PROFINET	**CC-A**	**CC-A**	**CC-A**	**CC-A**	**CC-A**
PoE+ / USB			8xPoE+	USB-Host	8xPoE+, USB-Host

[1] pending

INDUSTRIAL MANAGED SWITCHES

852-1305

** Small Form-factor Pluggable –* Interface for fiber optic cables

Administration and Diagnostics

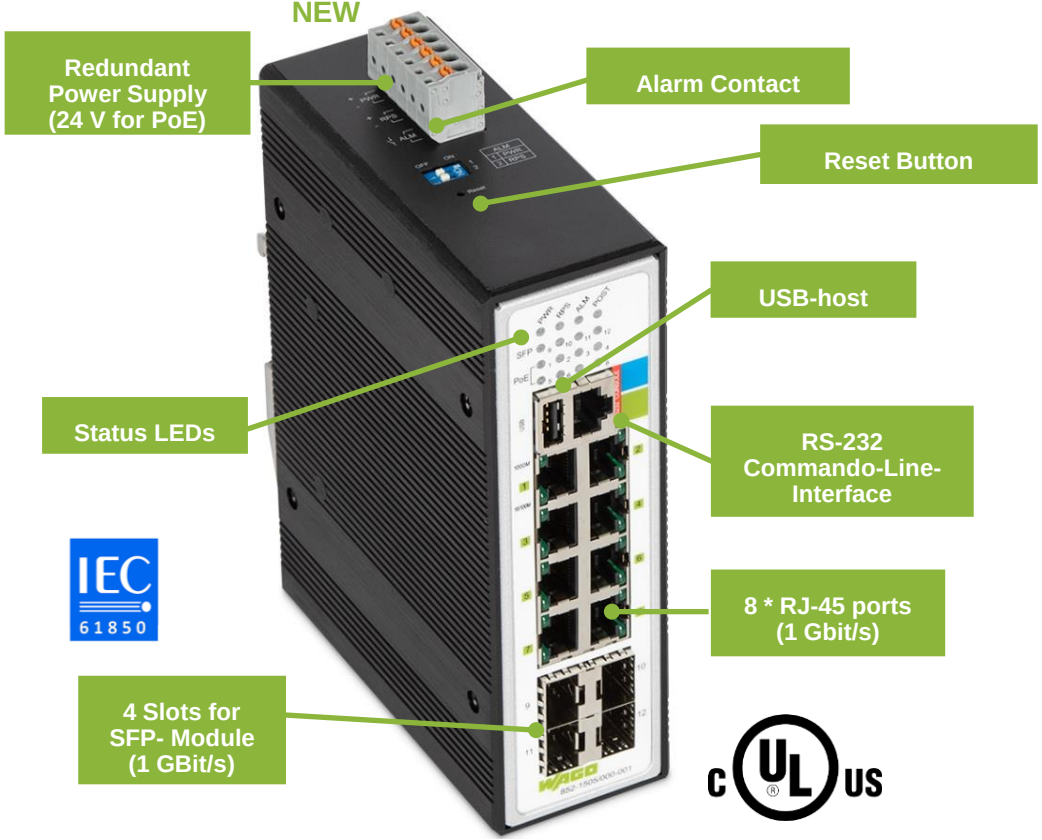
- Web-based management,
- Secure Webserver, SNMP
- Modbus/TCP device diagnosis
- Mirror port, LLDP, notifications by e-mail
- RMON, SFP modules with DDM

Management Function (cf. next side)

- Security, Availability, …

INDUSTRIAL MANAGED SWITCHES

NEW



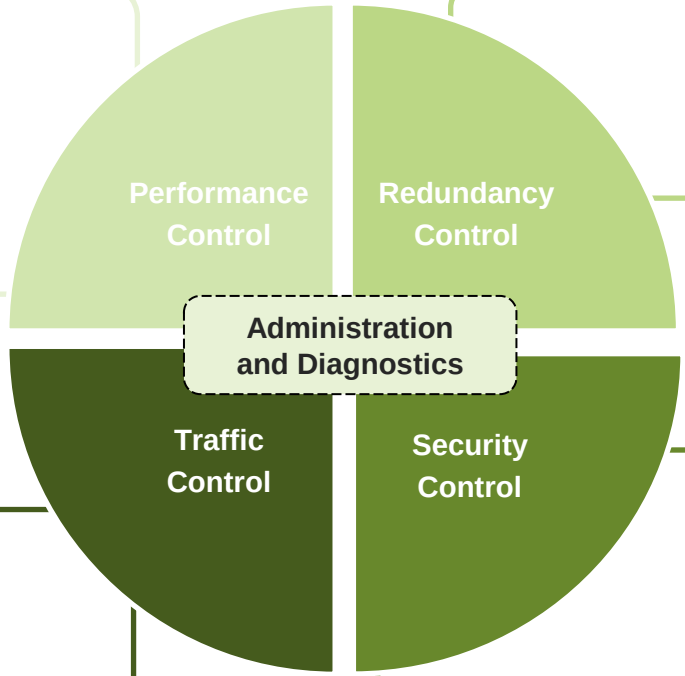
- **Complies with IEC-61850-3 energy standard:** Optimized for the energy industry
- **Firmware update possible via USB stick:** comfortable and easy handling
- **Power-over-Ethernet (PoE) version:** simple wiring, saves time, space and money
- **Flexible configuration with WBM or CLI:** all managed-Features available
- **Potential-free connection via SFP modules** Cable lengths of over 10.000 meters possible

Availability: June / 2019

INDUSTRIAL MANAGED SWITCHES

Features for one Application

Management Function Overview



- Strom Control
- Bandwidth Limit
- Auto-Provisioning
- Link Aggregation
- …

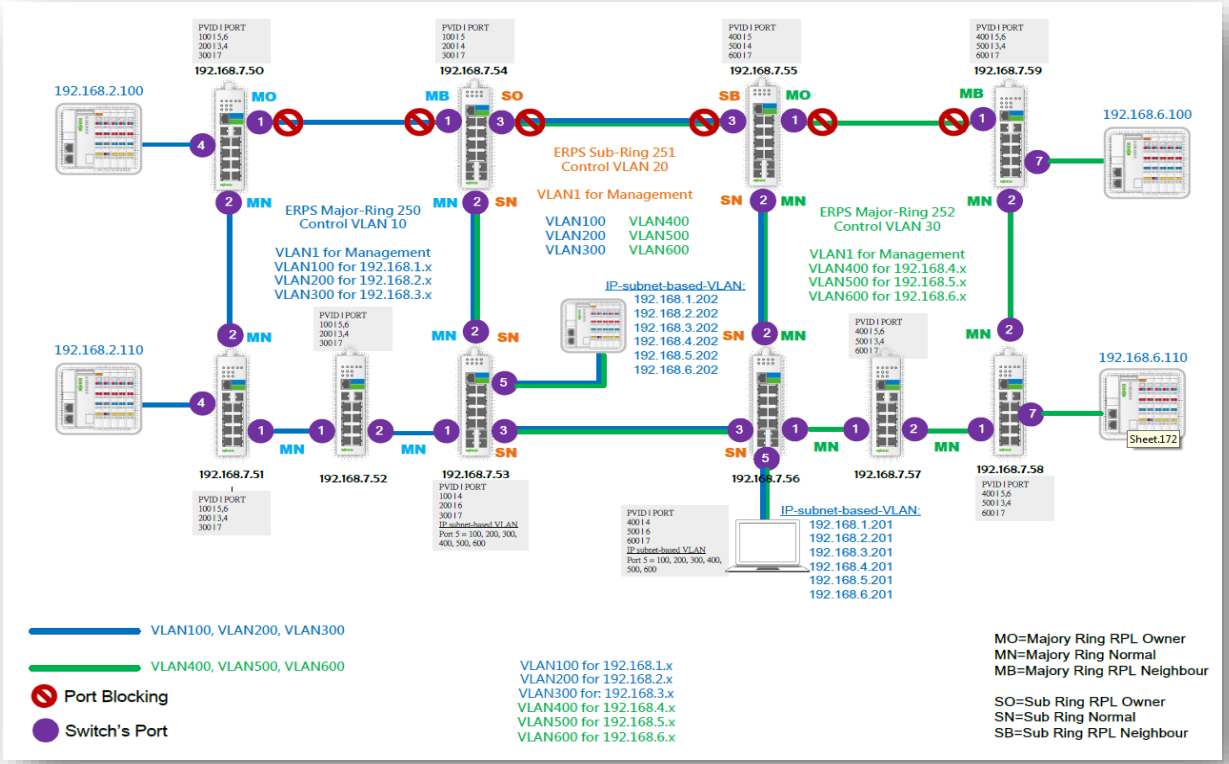
- ERPS
- Dual Homing
- Xpress/Jet- Ring
- Dual Ring
- …

- VLAN
- IGMP Snooping
- Static Route
- IP Based VLAN
- …

- Access Control List
- DHCP Snooping
- Port Security
- Service Control
- Authentication 802.1x
- …

APPLICATION FOR MANAGED SWITCH

WAGO Range of Applications



COMBINATION OF MANAGEMENT FUNCTION

ERPS
Storm Control
VLAN
IP Based VLAN
SNMP

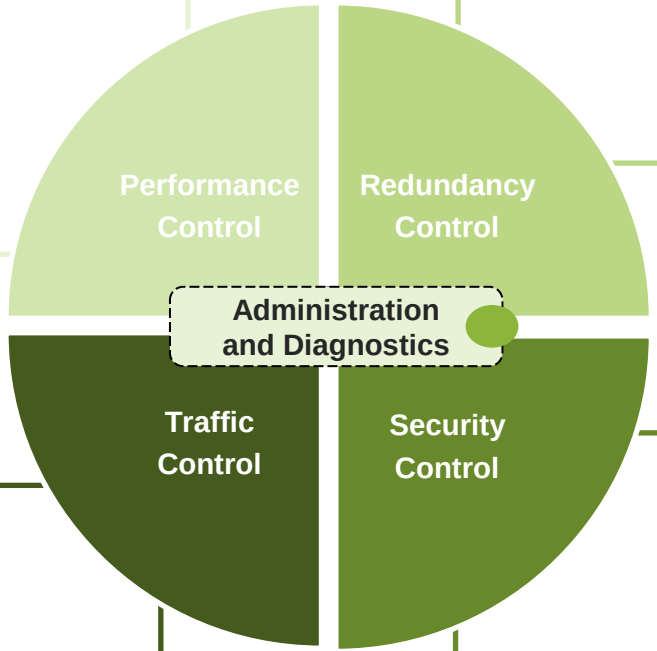
Exampe of the Application

APPLICATION FOR MANAGED SWITCH

Management Function Overview

- Strom Control
- Bandwidth Limit
- Auto-Provisioning
- Link Aggregation
- …

- ERPS
- Dual Homing
- Xpress/Jet- Ring
- Dual Ring
- …

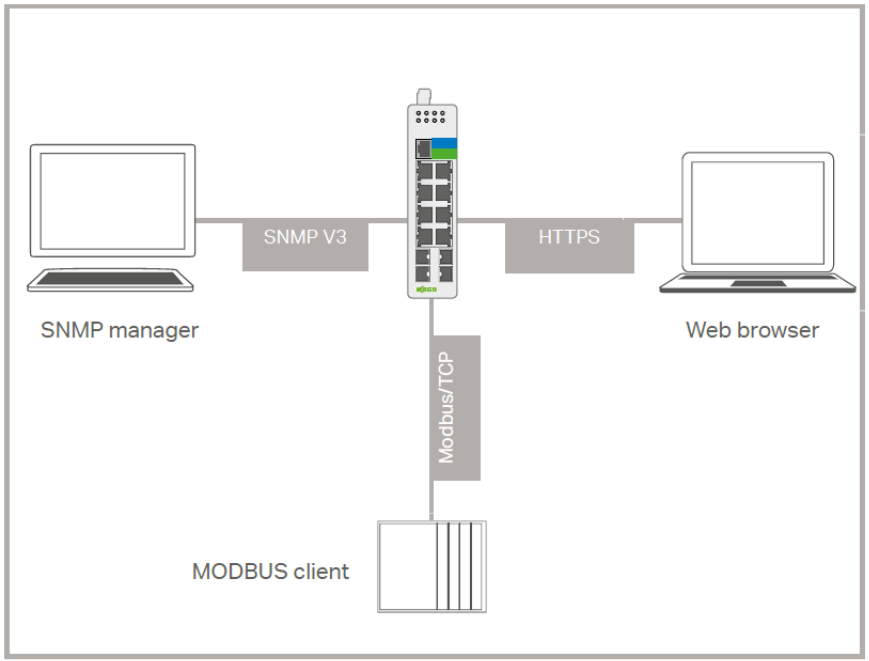


- VLAN
- IGMP Snooping
- Static Route
- IP Based VLAN
- …

- Access Control List
- DHCP Snooping
- Port Security
- Service Control
- Authentication 802.1x
- …

INDUSTRIAL MANAGED SWITCHES

Diagnostic and configuration



Configuration and Diagnostics

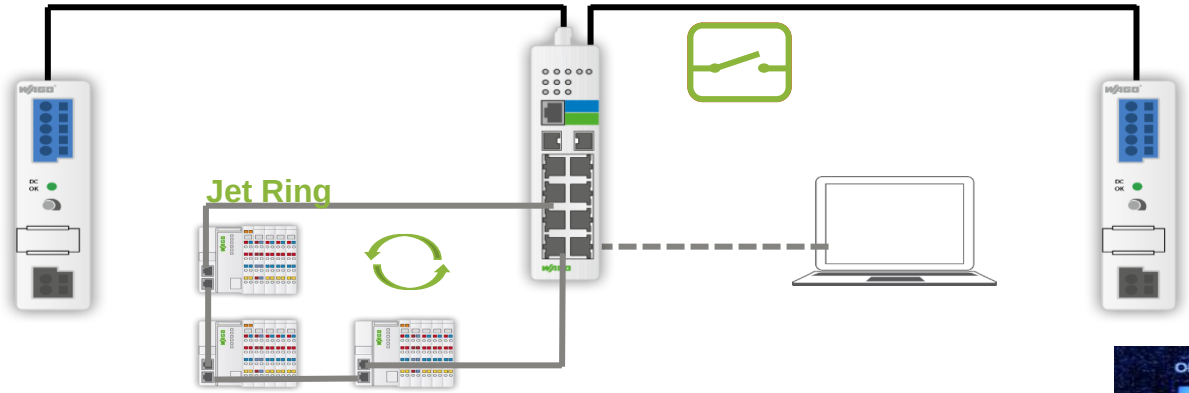
Several Options

- Configuration via Web-Based Management
- Configuration via command line (SSH, Telnet, RS-232)
- Network management via SNMP v1, v2, v3
- Support of MIB standards
  (*Management Information Base*)
- Diagnostics via Modbus TCP
  Numerous information available for
  easy diagnostics via MODBUS

INDUSTRIAL SWITCHES

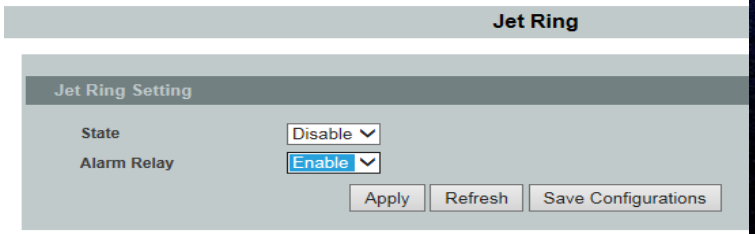
DIAGNOSTICS

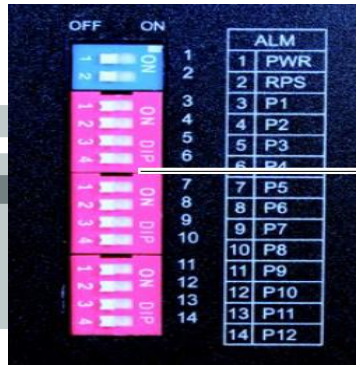
Redundant power supply and alarm contact



Alarm Contact

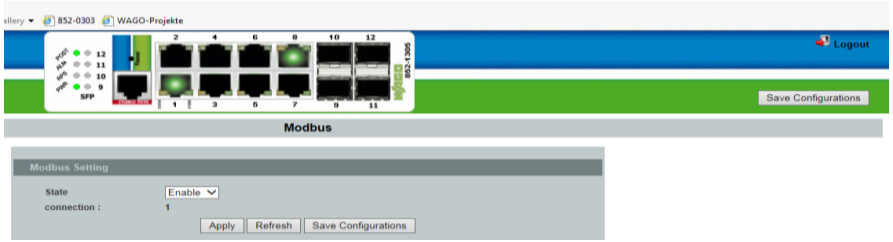
- Primary power supply monitoring
- Secondary power supply monitoring
- Monitoring of ETHERNET ports
- Fault in Jet-Ring / ERPS-Ring





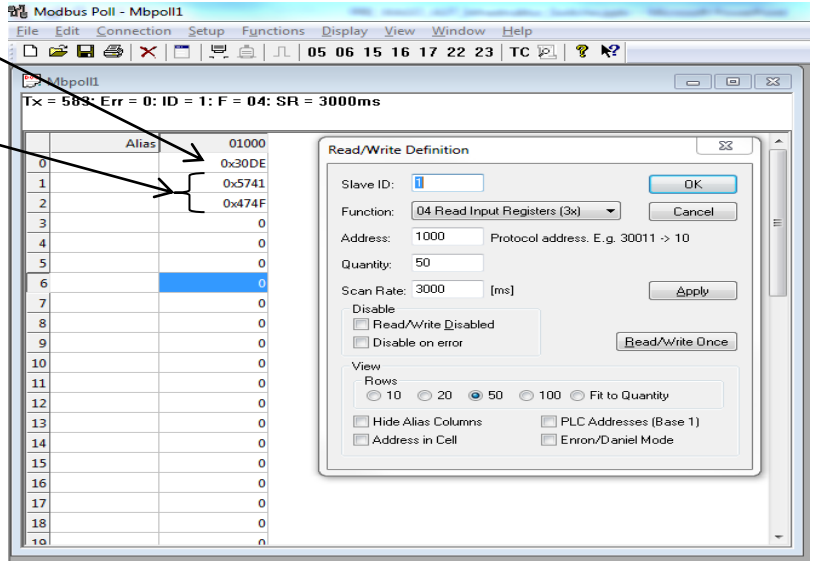
INDUSTRIAL MANAGED SWITCHES

Diagnostics by Modbus



Vendor-ID: 0x30DE

0x57 = ‘W‘
0x41 = ‘A‘
0x47 = ‘G‘
0x4F = ‘O‘



Port 2: other Switch

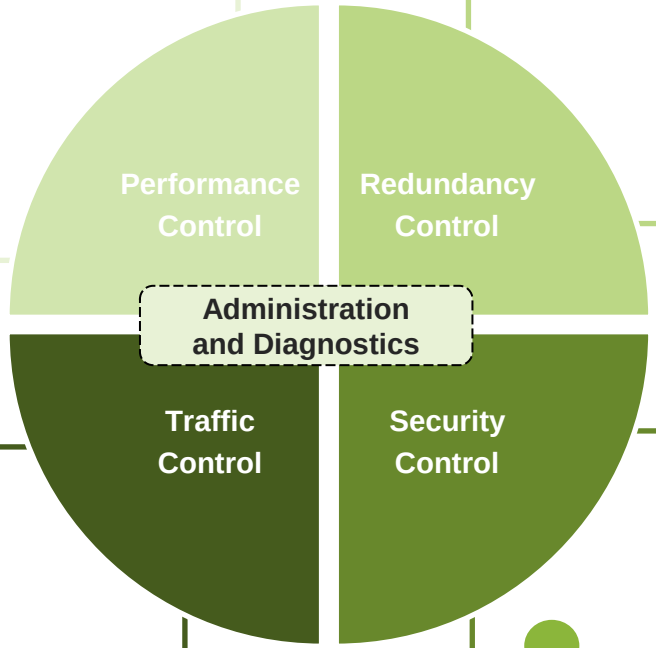
Port 8: PC

INDUSTRIAL MANAGED SWITCHES

Management Function Overview

- Strom Control
- Bandwidth Limit
- Auto-Provisioning
- Link Aggregation
- …

- ERPS
- Dual Homing
- Xpress/Jet- Ring
- Dual Ring
- …



- VLAN
- IGMP Snooping
- Static Route
- IP Based VLAN
- …

- Access Control List
- DHCP Snooping
- Port Security
- Service Control
- Authentication 802.1x
- …

INDUSTRIAL MANAGED SWITCHES

Access Control List

SECURITY CONTROL

Operating PC

Client web https (port 443)

192.168.1.100

Third Party Control

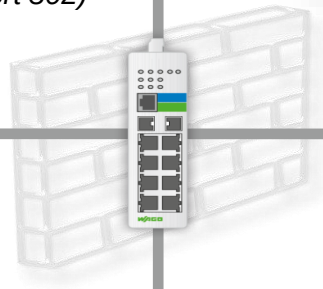
Client Modbus/TCP (port 502)

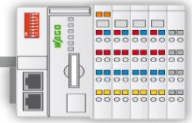
192.168.1.200

Maintenance PC

Full access

192.168.1.250





Programmable Controller

Resource to protect (example)

192.168.1.1

Nom du profil	1	**Action**	Autoriser
IP source	192.168.1.100	**Masque IP source**	255.255.255.255
IP destination	192.168.1.1	**Masque IP destination**	255.255.255.255
Port source	Any	**Port destination**	443

Nom du profil	2	**Action**	Autoriser
IP source	192.168.1.200	**Masque IP source**	255.255.255.255
IP destination	192.168.1.1	**Masque IP destination**	255.255.255.255
Port source	Any	**Port destination**	502

Nom du profil	3	**Action**	Autoriser
IP source	192.168.1.250	**Masque IP source**	255.255.255.255
IP destination	Any	**Masque IP destination**	Aucun
Port source	Any	**Port destination**	Any

The benefits of WAGO:

- ACL for ISO layer 2 / 3 / 4
- Protection against access to the switch and network devices

INDUSTRIAL MANAGED SWITCHES

Access Control List

SECURITY CONTROL

ISO layer 2 – MAC

ISO layer 3 – IP, DHCP, …

ISO layer 4 – TCP, UDP, …

Access Control List Settings

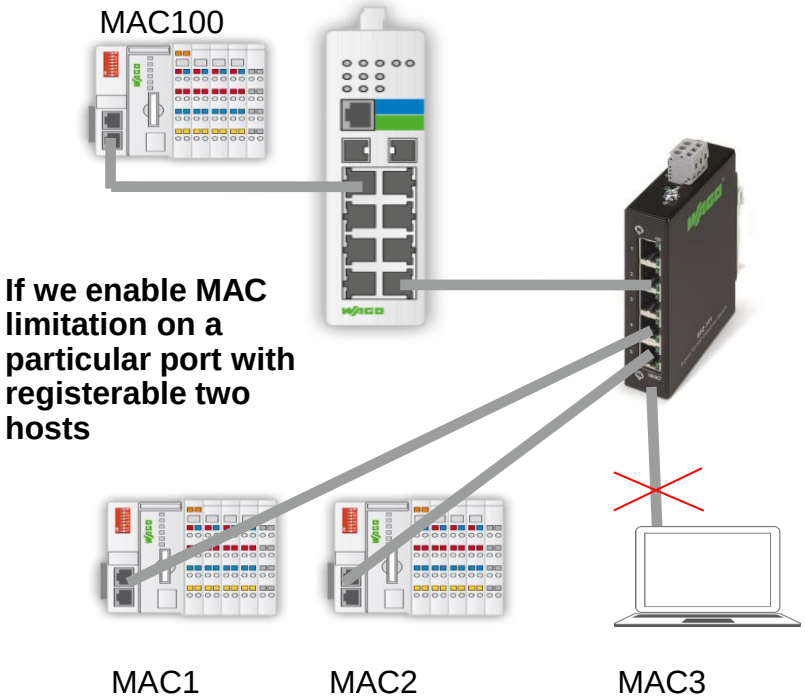
IP Type	IPv4			
Profile Name	3		Action	Disable
ETHERNET Type	Any		VLAN	Any
Source MAC	Any		Mask of Source MAC	
Destination MAC	Any		Mask of Destination MAC	
DSCP	Any	0		
Source IP	Any		Mask of Source IP	
Destination IP	Any		Mask of Destination IP	
IP Protocol	Any			
Source Application	Any			
Destination Application	Any			
Source Interface	Any	--		

Apply | Refresh | Save Configurations

INDUSTRIAL MANAGED SWITCHES

Port Security

SECURITY CONTROL



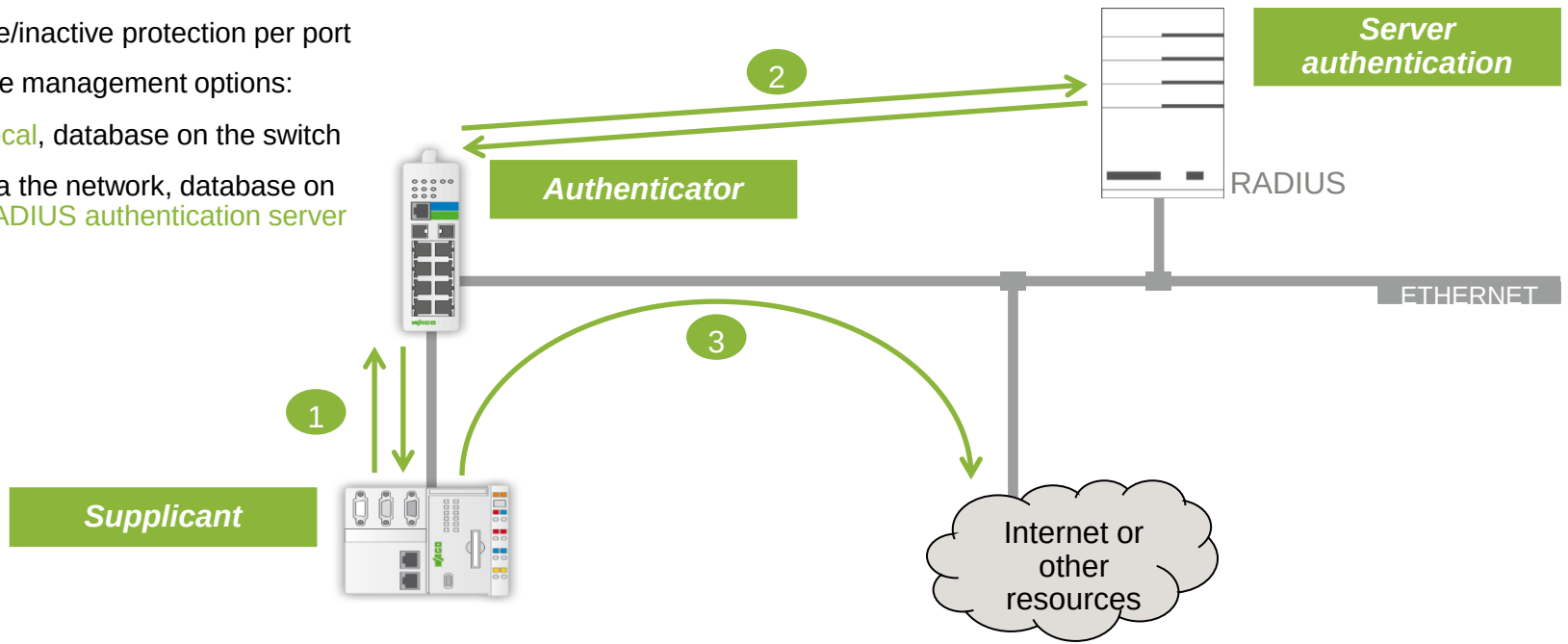
- Per port configuration
- Support registered MAC addresses by dynamic learning
- This learning process will be conducted by aging time (default 5 minutes)
- When the limit is exceeded, incoming packets with new MAC addresses are dropped
- Decide how many devices to be allowed on specific port
- If MAC limit is 0, only allow pre-defined MAC addresses (Static MAC, whitelist) can get data transmission

INDUSTRIAL MANAGED SWITCHES

Authentication 802.1X

SECURITY CONTROL

- Profile *Authenticator*
- Active/inactive protection per port
- Profile management options:
  - Local, database on the switch
  - Via the network, database on RADIUS authentication server



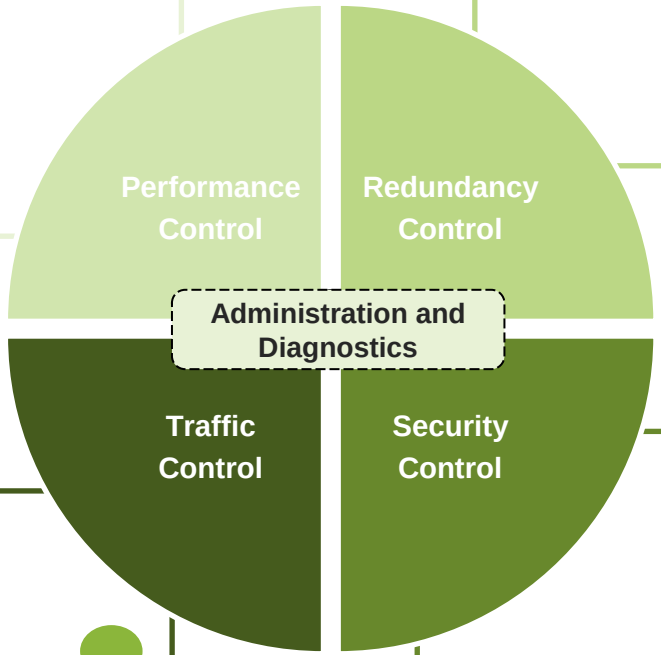
Support for authentication 802.1x requires installation of a external package on the PFC controller (FW06).

INDUSTRIAL MANAGED SWITCHES

Management Function Overview

- Strom Control
- Bandwidth Limit
- Auto-Provisioning
- Link Aggregation
- …

- ERPS
- Dual Homing
- Xpress/Jet- Ring
- Dual Ring
- …



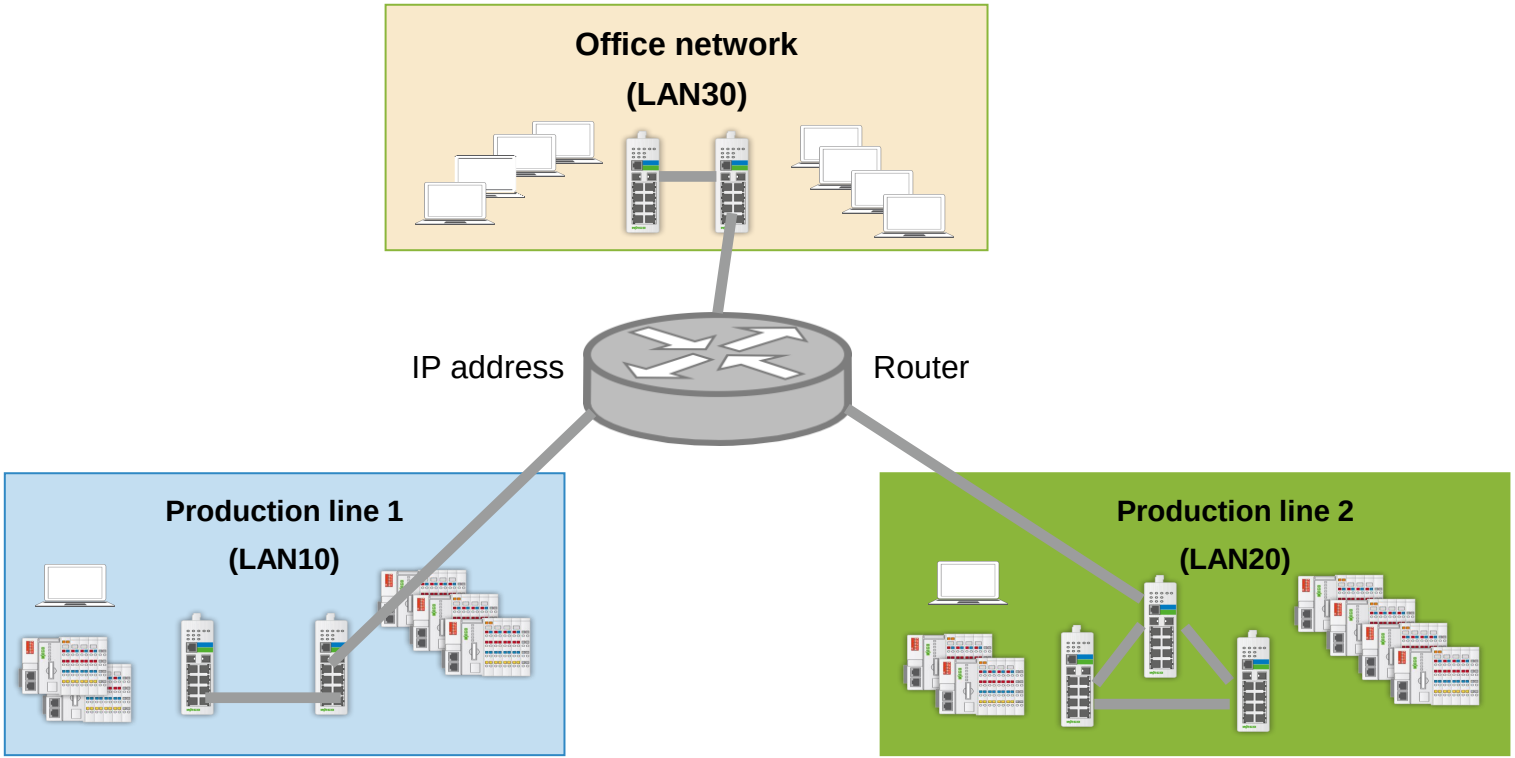
- VLAN
- IGMP Snooping
- Static Route
- IP Based VLAN
- …

- Access Control List
- DHCP Snooping
- Port Security
- Service Control
- Authentication 802.1x
- …

INDUSTRIAL MANAGED SWITCHES

VLAN based upon IEEE802.1Q

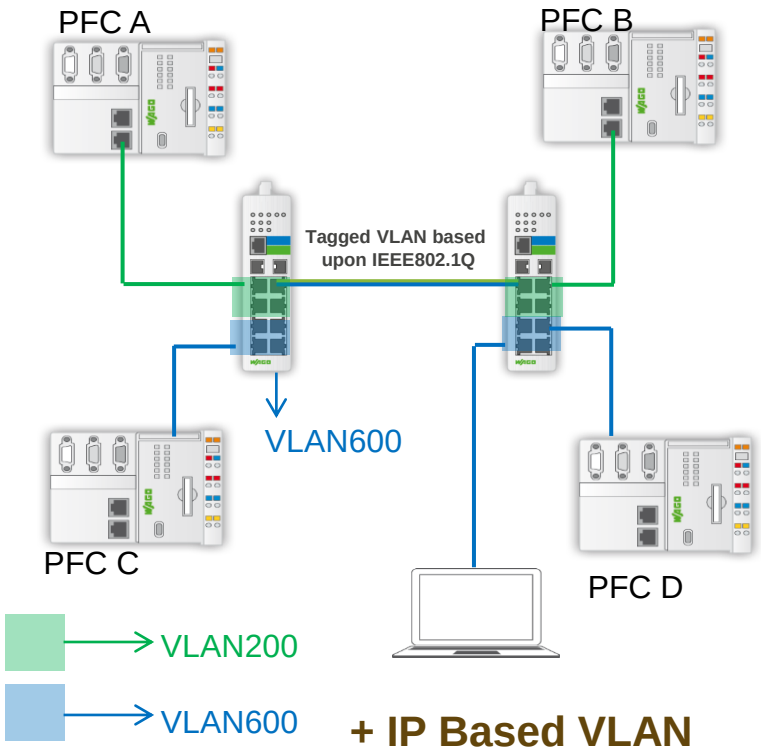
TRAFFIC CONTROL



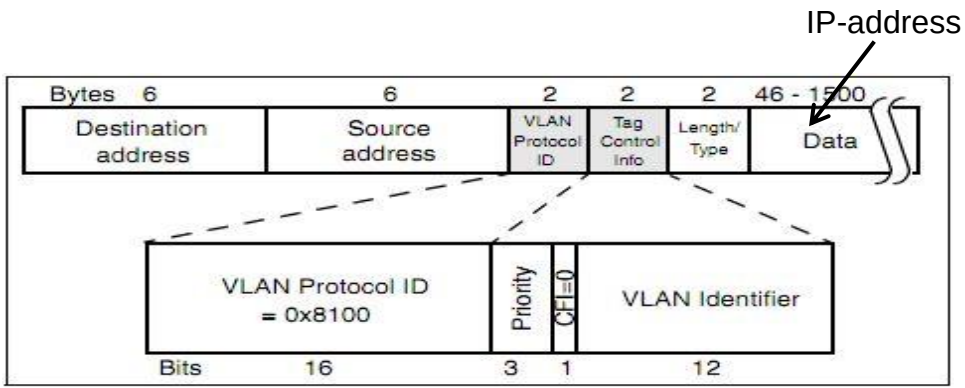
INDUSTRIAL MANAGED SWITCHES

VLAN based upon IEEE802.1Q

TRAFFIC CONTROL



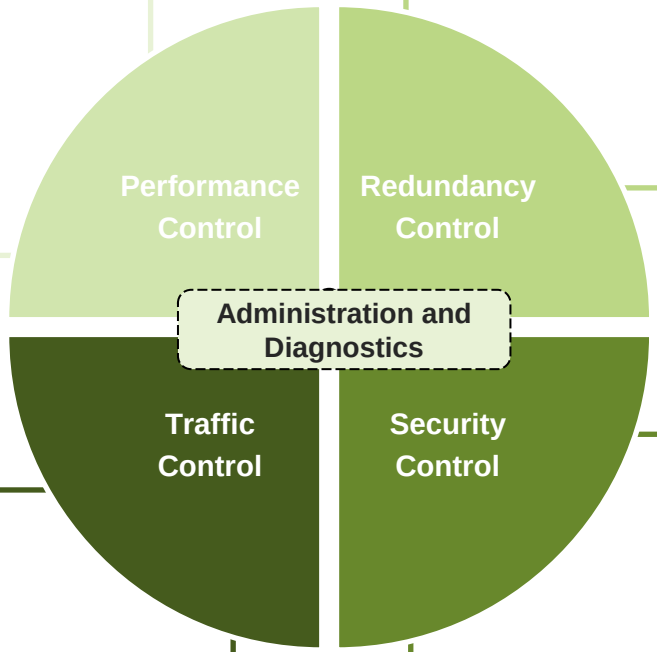
- **IEEE 802.1Q**:
  A group of devices on different physical LAN segments which can communicate with each other as if they were all on the same physical LAN segment.
- A tagged VLAN uses an explicit tag (VLAN ID) in the frame header to identify the VLAN membership if across bridges.
- It is not possible to communicate from VLAN200 to VLAN 600



INDUSTRIAL MANAGED SWITCHES

Management Function Overview

- Strom Control
- Bandwidth Limit
- Auto-Provisioning
- Link Aggregation
- …



- ERPS
- Dual Homing
- Xpress/Jet- Ring
- Dual Ring
- …

- VLAN
- IGMP Snooping
- Static Route
- IP Based VLAN
- …

- Access Control List
- DHCP Snooping
- Port Security
- Service Control
- Authentication 802.1x
- …

INDUSTRIAL MANAGED SWITCHES

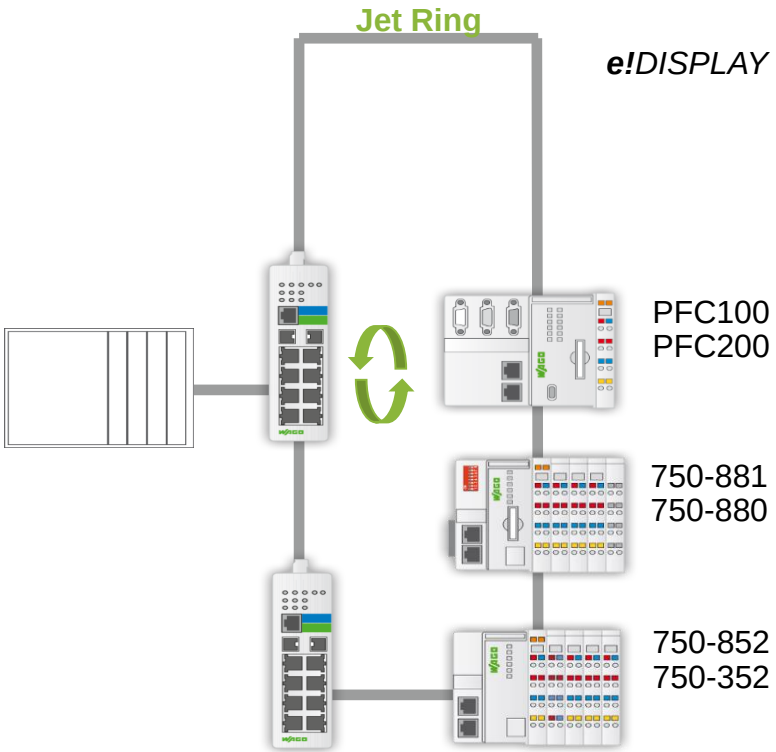
Jet Ring – Redundancy with single and open ring

Description

- Topology in proprietary ring
- Switching time < 400 ms
- Very easy configuration
- Operates on copper or fiber optic ports
- Alarm Relais (Jet Ring open)

Integration in the Jet Ring

- Industrial managed switch with Jet Ring configuration
- max. 20 Devices with integrated switch and Fast Aging configuration
  - ETHERNET Fieldbus Coupler, 750-352
  - ETHERNET Controller, 750-88X
  - PFC100/PFC200 Controller



INDUSTRIAL MANAGED SWITCHES

Xpress-Ring / Dual Ring – The performance and flexible solution

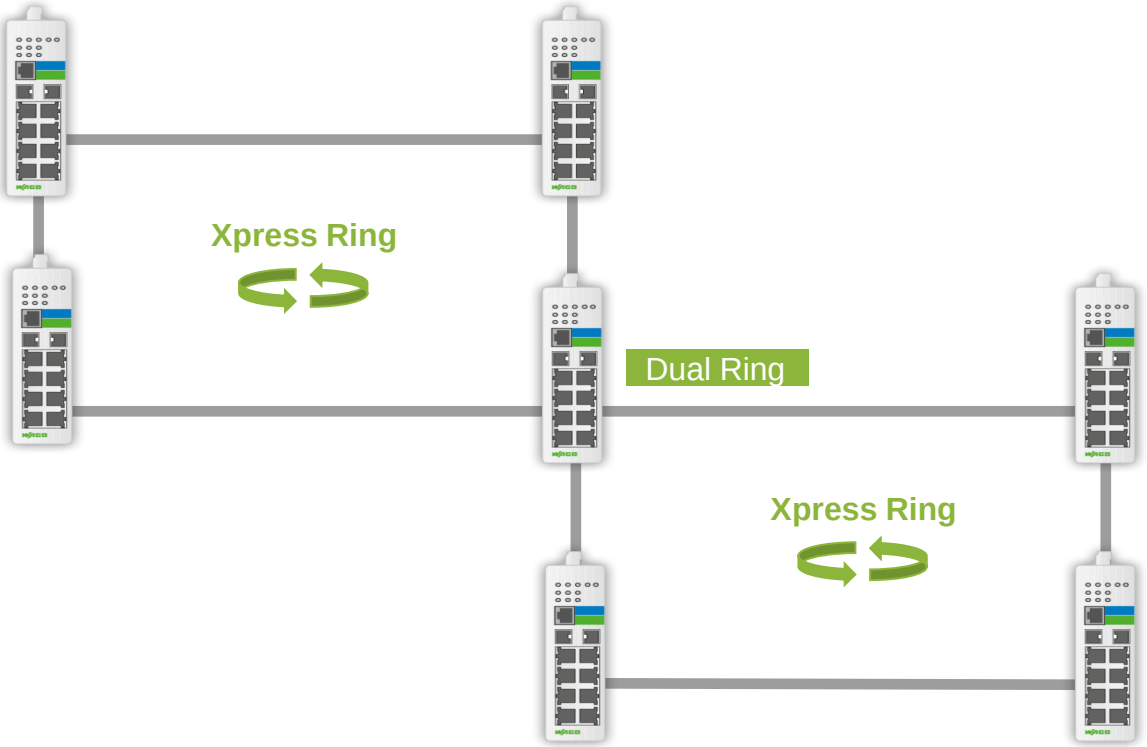
REDUNDANCY CONTROL

Description

- Topology in proprietary ring
- Improvement time <20 ms
- Easy configuration
- Operates on copper or fiber optic ports

Integration in the Xpress Ring

- Industrial managed switches with Xpress Ring configuration



* Up to 250 switches in one ring were tested.

INDUSTRIAL MANAGED SWITCHES

Dual Ring – The performance and flexible solution

REDUNDANCY CONTROL

Description

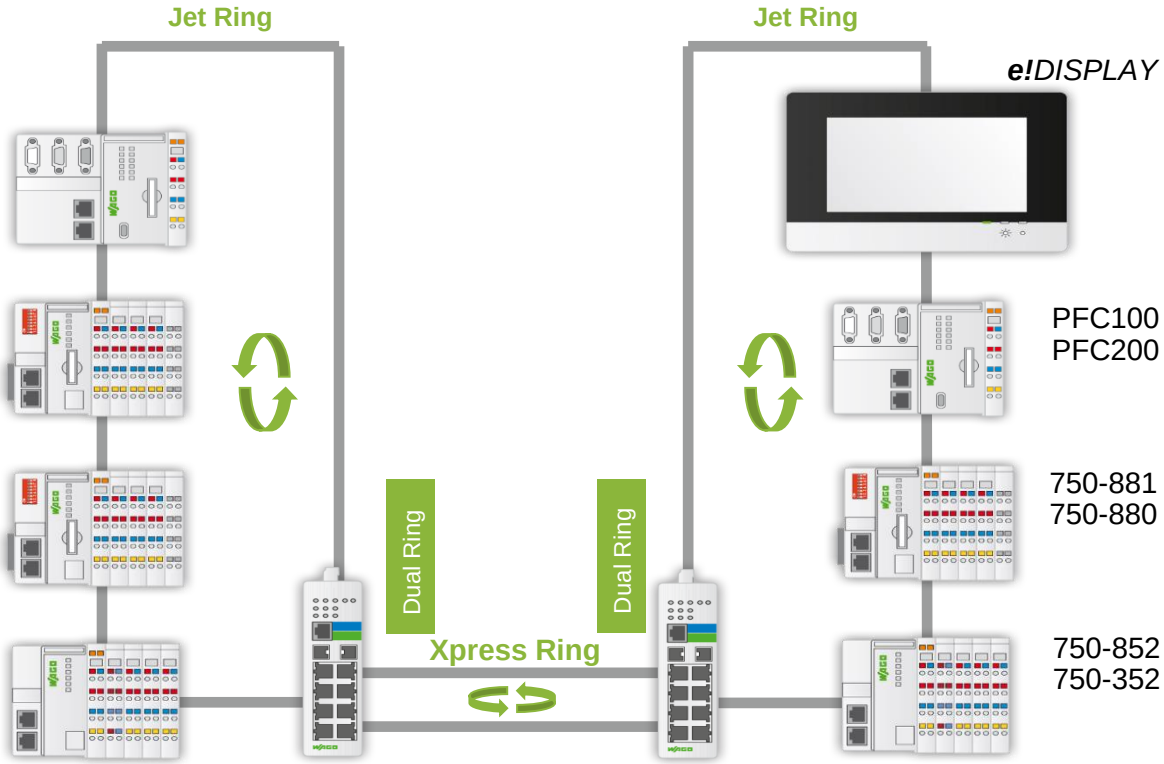
- Combination of 2 rings per switch
  - 2 x Xpress Ring
  - 1 x Xpress Ring + 1 x Jet Ring
- Easy configuration

Integration in the Xpress Ring

- Industrial managed switches with Xpress Ring configuration

Integration in the Jet Ring

- Industrial managed switch with Jet Ring configuration
- Max. 20 Devices with integrated switch and Fast Aging configuration
  - ETHERNET Fieldbus Coupler, 750-352
  - ETHERNET Controller, 32 bits
  - PFC100/PFC200 Controller
  - ***e!DISPLAY***



INDUSTRIAL MANAGED SWITCHES

ERPS V2 – The fast and open solution
Ethernet Ring Protection Switching

Description

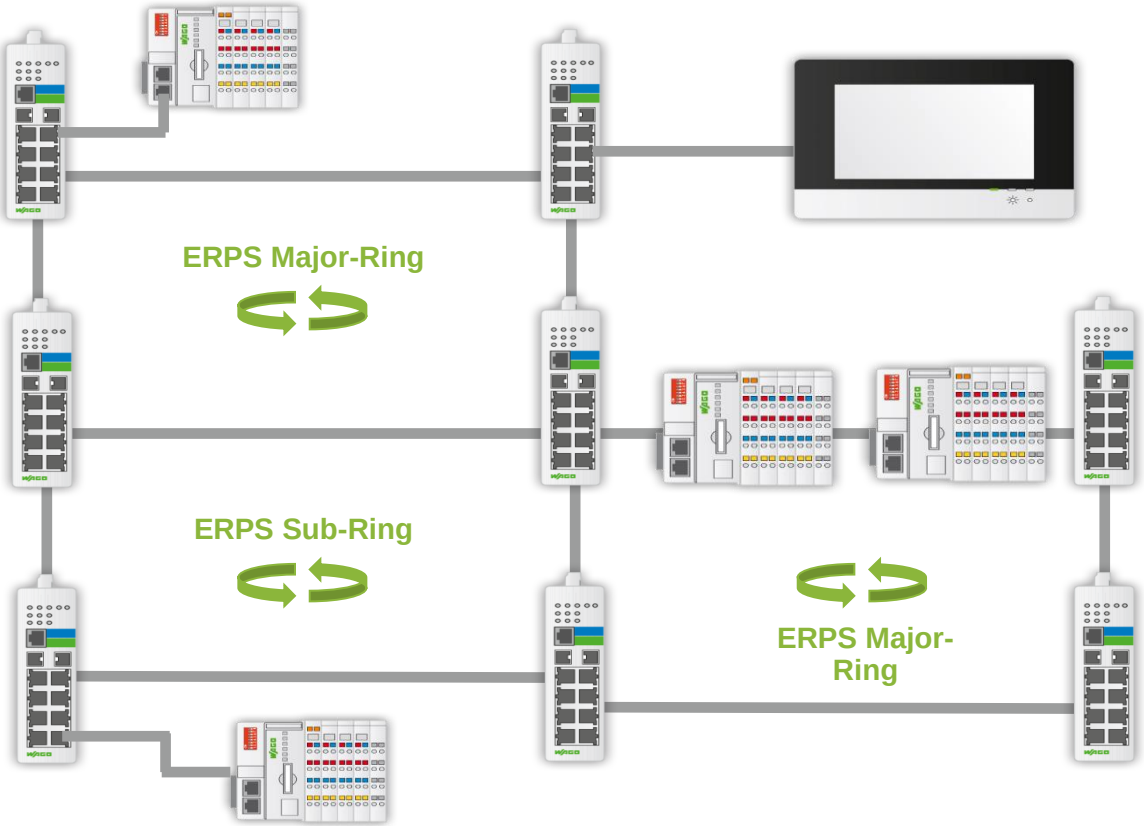
- Standardized and open technology
- Switching time < 50 ms
- Nested topologies with up to 6 rings per switch
- Elimination of SPOF (Single Point of Failure)

Integration in the ERPS Ring

- Industrial managed switches in ERPS V2 mode

Integration in the ERPS Ring in Enhancement Mode

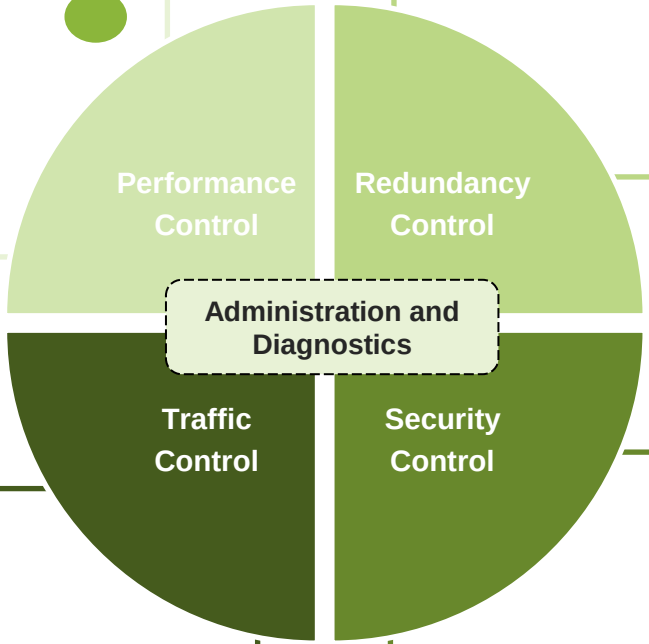
- Devices with integrated switch and Fast Aging configuration
  - ETHERNET Fieldbus Coupler, 750-352
  - ETHERNET Controller, 750-88X
  - PFC100/PFC200 Controller



INDUSTRIAL MANAGED SWITCHES

Management Function Overview

- Strom Control
- Bandwidth Limit
- Auto-Provisioning
- Link Aggregation
- …



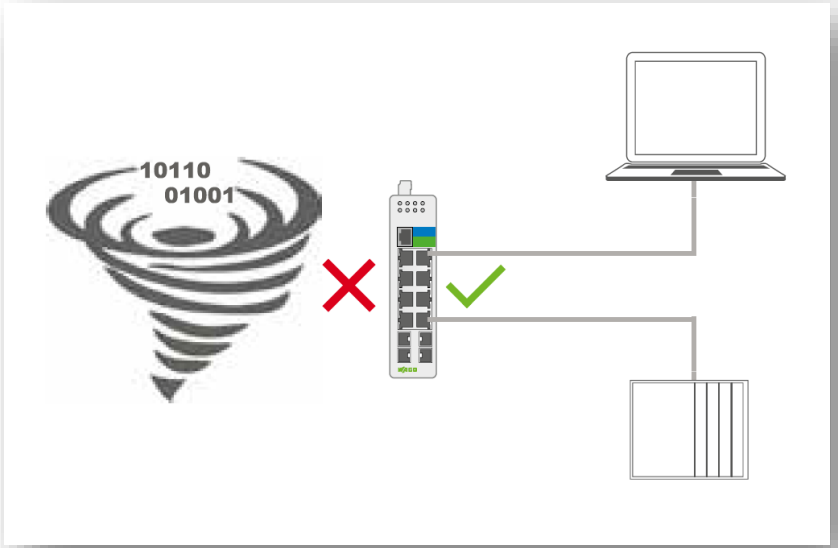
- ERPS
- Dual Homing
- Xpress/Jet- Ring
- Dual Ring
- …

- VLAN
- IGMP Snooping
- Static Route
- IP Based VLAN
- …

- Access Control List
- DHCP Snooping
- Port Security
- Service Control
- Authentication 802.1x
- …

INDUSTRIAL MANAGED SWITCHES

Storm Control and Bandwidth Limitation



Storm Control | Bandwidth Limitation

Storm Control Settings

Rate Limit Mode: pps

Port	Rate	Type
From: 5 To: 5	0 (units)	Mcast(Multicast)

Disable:0. One unit is about 652 pps

Apply | Refresh | Save Configurations

Storm Control State

Port	Rate(units)	Multicast	Broadcast	DLF	Port	Rate(units)	Multicast	Broadcast	DLF
1	1	Disable	Enable	Enable	2	1	Disable	Enable	Enable
3	1	Disable	Enable	Enable	4	1	Disable	Enable	Enable
5	1	Disable	Enable	Enable	6	1	Disable	Enable	Enable
7	1	Disable	Enable	Enable	8	1	Disable	Enable	Enable
9	1	Disable	Enable	Enable	10	1	Disable	Enable	Enable
11	1	Disable	Enable	Enable	12	1	Disable	Enable	Enable

Storm Control | **Bandwidth Limitation**

Bandwidth Limitation Settings

Port	Ingress	Egress
From: 1 To: 1	0 (Mbs)	0 (Mbs)

(Disable: 0)

Apply | Refresh | Save Configurations

Bandwidth Limitation State

Port	Ingress (Mbs)	Egress (Mbs)	Port	Ingress (Mbs)	Egress (Mbs)
1	0	0	2	0	0
3	0	0	4	0	0
5	0	0	6	0	0
7	0	0	8	0	0
9	0	0	10	0	0
11	0	0	12	0	0

PROFINET MANAGED SWITCH

Industrial Managed Switch, Profinet CC-B

852-1605 852-603 852-602

- **PROFINET CC-B certified:**
  Application in industrial automation
- **Configuration via GSD-file:**
  using of PROFINET-Configurator
- **Media redundancy protocol:**
  freely configurable as client or manager
- **PROFINET diagnostics from the application:**
  Cyclically readable diagnostic information
- **Flexible configuration of port mirroring:**
  via GSDML or Web-Based-Management
- **Potential-free connection via SFP modules:**
  Cable lengths of over 10.000 meters possible

Availability: August / 2019

PROFINET MANAGED SWITCH

Industrial Managed Switch, Profinet CC-B

Features

- 8 x RJ45-Ports with10/100/1000 Mbit/s (852-1605) or 10/100 Mbit/s (852-602, 852-603)
- 4 x SFP Slots for SFP-Module and 1000 Mbit/s (e.g. SFP-Module for fiber optic)
- Industrial-Managed-Switch with PROFINET CC-B certificate
- Cyclic (RTC) and acyclic data-transfer (RTA)
- Neighborhood detection and device replacement mechanisms (LLDP, DCP)
- Network diagnostics via SNMP. Private MIB available.
- Media redundancy protocol (MRP) as a Manager or Client
- Alarm relay for indication of cable break or power failure

Advantages

- Configuration of port mirroring via the device description file. Mirror of more than 1 port possible.
- Redundant power supply with an input voltage range of 12-60 VDC
- Extended temperature range from -40°C to 70°C

852-1605 852-603 852-602

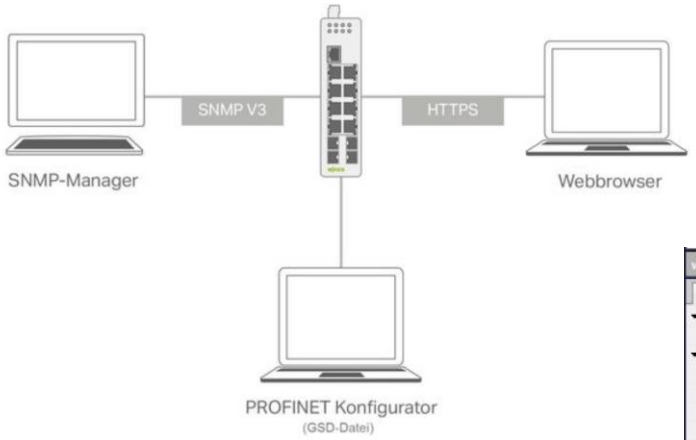
Benefits

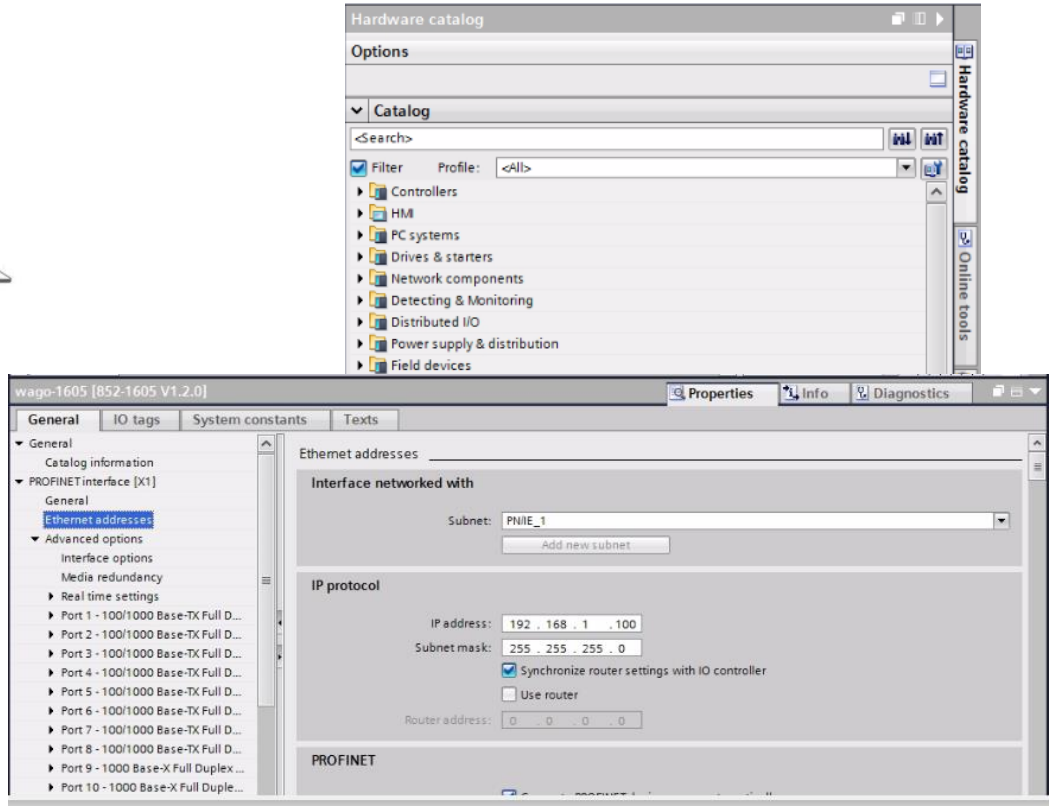
- Configuration via GSDML file (e.g. Profinet configurator from TIA) makes statup easy
- Redundancy functions (media redundancy protocol) ensure high availability in the customer application
- Fibre optic modules ensure potential-free connection to superior networks

Availability: August / 2019

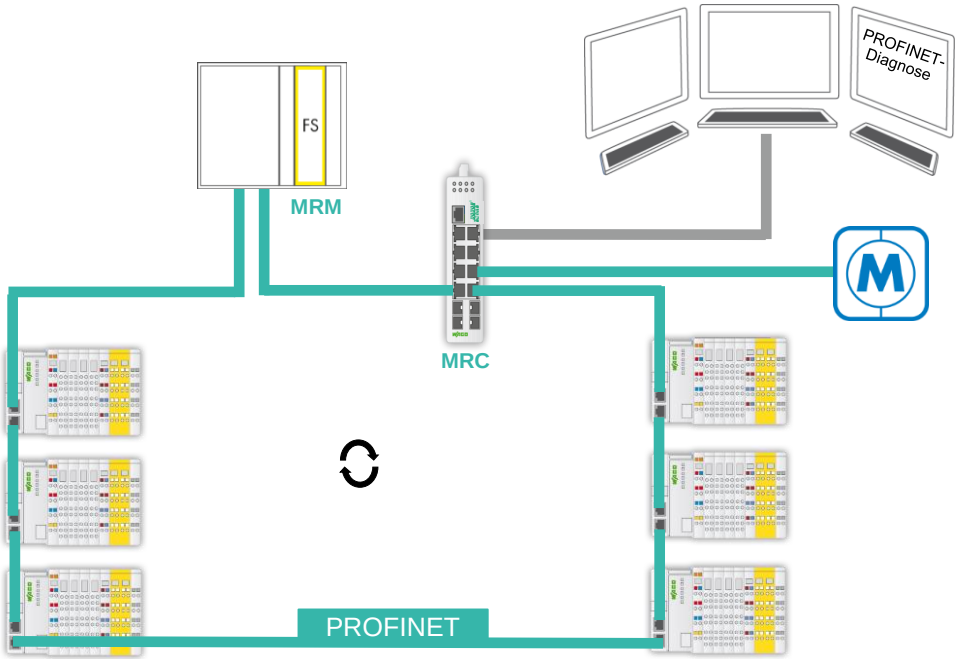
PROFINET MANAGED SWITCH

Configuration





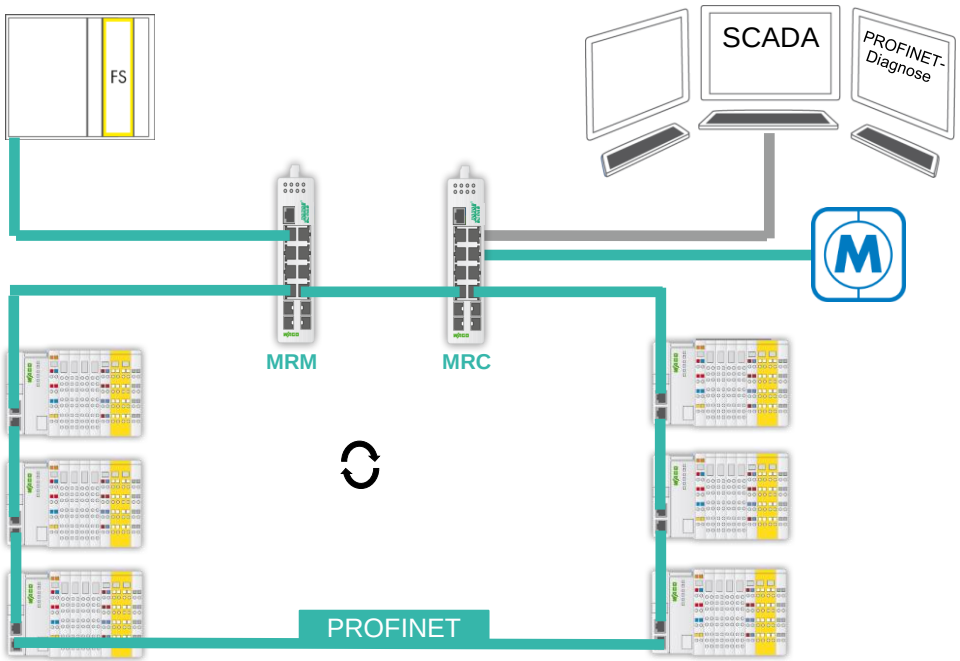
MEDIA REDUNDANCY PROTOCOL



Media redundancy protocol

- Media-redundancy-Client (MRC)
- Switch over < 200 ms
- Easy configuration with GSD-File

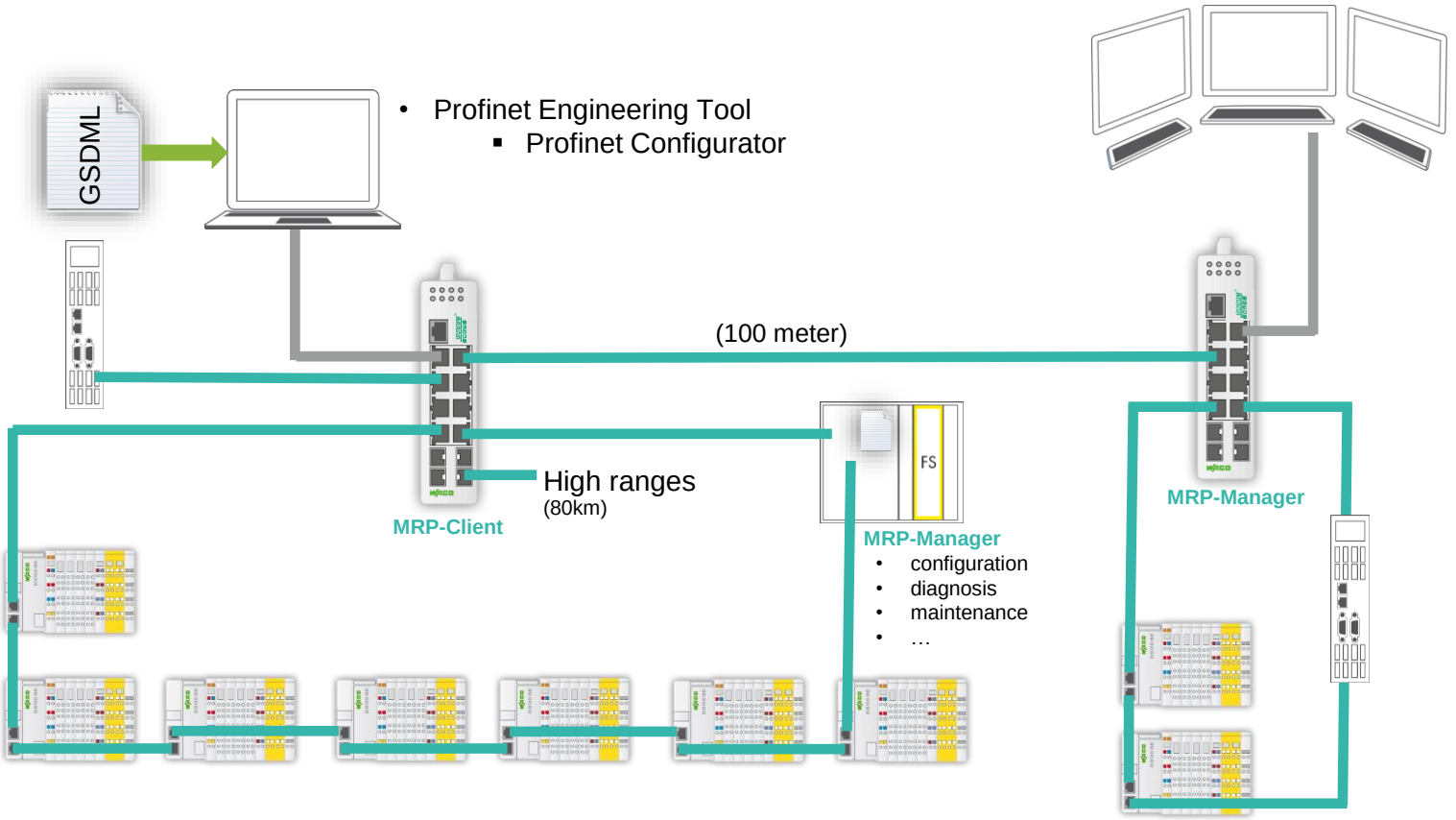
MEDIA REDUNDANCY PROTOCOL



Media redundancy protocol

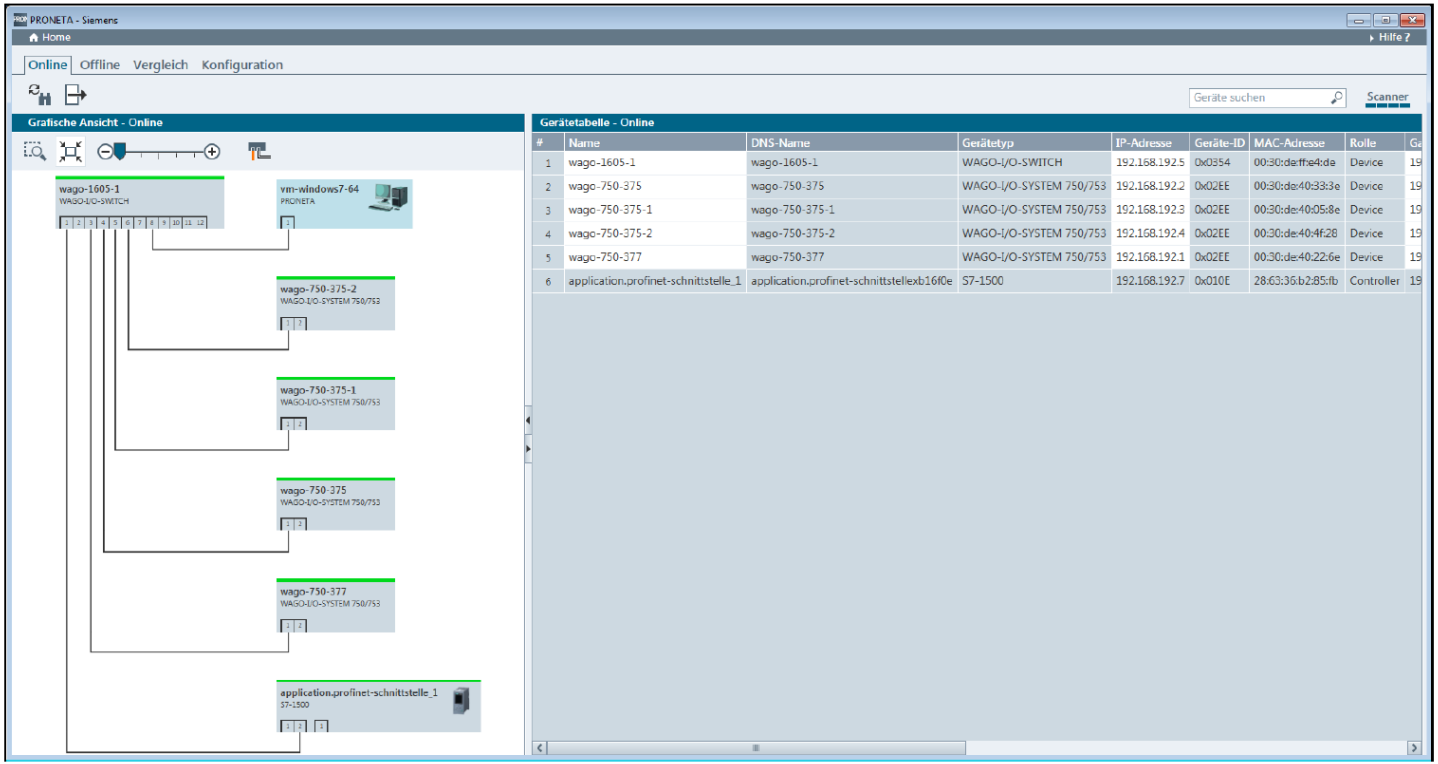
- Media-redundancy-Manager (MRM)
- Media-redundancy-Client (MRC)
- Switch over < 200 ms
- Easy configuration with GSD-File

PROFINET MANAGED SWITCH



PROFINET MANAGED SWITCH

Network scan with PRONETA



PROFINET MANAGED SWITCH

Acyclical diagnostic with TIA-Portal