

Industrial Ethernet Communication



simatic net SCALANCE X



SIEMENS

SCALANCE – scalable performance

Totally Integrated Automation from Siemens demonstrates in a number of successful applications around the world the extent to which integrated solutions can be created today with shared tools and standardized mechanisms. This is closely connected to focused further development of industrial communication with SIMATIC NET. A pioneering milestone in this development

is SCALANCE, the new generation of active network components for establishing integrated networks.

These active network components are optimally coordinated with each other. They have been designed for harsh industrial environments and enable integrated, flexible and secure setup of a high-performance network.

SCALANCE

S Security

SCALANCE S –
for industrial security

Thanks to security mechanisms such as authentication, data encryption or access control, SCALANCE S protects networks and data within an organization against spying, manipulation and unauthorized access. SOFTNET Security Client for secure access to devices protected by SCALANCE S



W Industrial Wireless LAN

SCALANCE W –
reliable radio technology for Industrial Wireless LAN

Based on Industrial Wireless LAN, SCALANCE W supports integrated communication into areas that until now have been difficult or even impossible to access. It does this by reserving data rates or monitoring the wireless connection. SCALANCE W uses the WLAN standards compliant with IEEE 802.11a/b/g/h



X Switched Networks

SCALANCE X –
Industrial Ethernet switches from the entry level to high-performance networks

SCALANCE X offers a graded portfolio of Industrial Ethernet switches with different functions, e.g. for diagnostics via PROFINET, SNMP or the Internet, to meet different requirements such as network structure, data rate and number of ports.



Communication in industrial environments

Industrial communication differs fundamentally from the communication that is used in the office environment. In the office environment, many clients communicate with one server; there are no cross-connections between clients. This type of data transmission can cause bottlenecks and delays when communication links are being established, when too many clients access a server simultaneously.

This cannot be used for automation because cyclically executing process programs require up-to-date input data in order to issue the appropriate control commands to components.

Furthermore, applications, communications relationships and network structures must be individually adapted to the harsh industrial conditions.

An industrial network must also be able to respond flexibly and at short notice to changing market requirements and retooling must be fast and efficient. It must always be ensured, however, that the capacity of the network and therefore the plant or machines must be optimally utilized and any downtimes must be minimized. All the production and management processes must perfectly interact.

These requirements can only be satisfied when it is based on an open, company-wide communication system that permeates the entire company and extends beyond its boundaries. Island solutions are avoided in automation and information technology, so the following preconditions must apply:

- Continuous flow of information from the actuator/sensor level through to the corporate management level
- Availability of information at every location
- Fast exchange of data between the plant sections
- Easy, plant-wide configuration and efficient diagnostics
- Integrated security functions that block unauthorized access

Totally Integrated Automation

The automation components of SIMATIC NET are part of Totally Integrated Automation (TIA), an integrated range of products and systems for automation in all areas - from incoming goods, through the production process to the dispatch of goods, from the field level, through to the connection to the corporate management level. These components feature the highest possible degree of integration because they access a common data base which, in turn, saves data entry costs and ensures consistency throughout the project.

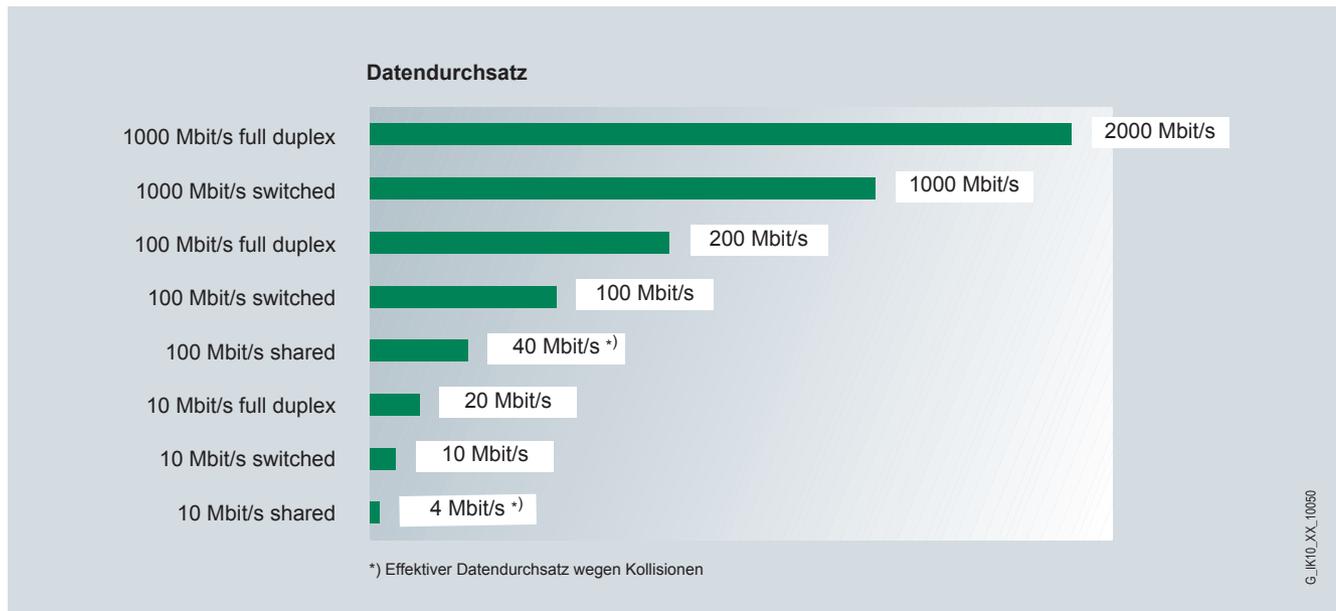
Availability and performance

The demand for high network availability for a high-performance network in the various automation applications is rising continuously. Different topologies such as line, ring or star offer wide-ranging possibilities, e.g. when implementing a production line or manufacturing cell.

Industrial Ethernet is a high-performance area and cell network designed to the IEEE 802.3 (ETHERNET) and 802.11 (Wireless LAN) standards that can be used to construct high-performance communication networks that extend over long distances. PROFINET, the open Industrial Ethernet Standard uses Industrial Ethernet and real-time communication right down to the field level. If existing IT standards are fully utilized, PROFINET even permits isochronous motion control applications to be implemented via Industrial Ethernet.



Network performance and network technologies for Industrial Ethernet



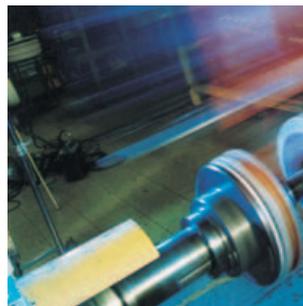
Throughput of the networks/values for 5 network stations

When combined, the current Industrial Ethernet technologies can boost performance on the network by a factor of 50 and more in comparison with the original 10 Mbit/s technology. These technologies are:

- **Fast Ethernet** with 100 Mbit/s:
Messages are transported much faster than Ethernet (10 Mbit/s) and therefore only occupy the bus for an extremely short time.
- **Gigabit Ethernet** with 1 Gbit/s:
Gigabit Ethernet is faster than Fast Ethernet by a factor of 10, the bus is occupied for only one tenth of the time.
- **Full Duplex** prevents collisions:
The data throughput increases enormously because the usual message repetitions are avoided. Data can be sent and received simultaneously between two stations. The data throughput for a full duplex connection therefore rises to 200 Mbit/s with Fast Ethernet and to 2 Gbit/s with Gigabit Ethernet. With full duplex, a greater extension of the network is possible. This means, for example, that when glass fiber-optic cables of 50/125 µm are used, distances of up to 26 km can be achieved.
- **Switching** supports parallel communication:
When a network is subdivided into several segments using a switch, this results in load separation. Data communication is possible in each individual segment independently of the other segments. This means that, throughout the network,

several messages can be in transit at the same time. The performance gain is due to the simultaneity of several message frames.

- **Autocrossover** automatically crosses the send and receive cables on Twisted Pair interfaces
- **Autosensing** describes the characteristic of network nodes (data terminals and network components) that automatically detect the transmission rate of a signal (10 Mbit/s, 100 Mbit/s or 1 Gbit/s) and support autonegotiation.
- **Autonegotiation** is a configuration protocol on Fast Ethernet. Before initiating the actual data transmission, network devices automatically negotiate a transmission mode which is supported by any device (100 Mbit/s or 10 Mbit/s, full duplex or half duplex).
- **Gigabit cabling system**
The 8-core FastConnect cabling system of SIMATIC NET supports transmission rates of up to 1 Gbit/s.



Switches – neural points in the network

Industrial Ethernet Switches are active network components that support the different network topologies:

Networks can be constructed with switches in electrical or optical line, star and ring topologies. These active network components specifically distribute data to the relevant addressees.

The SCALANCE X product group is a new generation of Industrial Ethernet switches from SIMATIC NET. It consists of different, complementary product lines that are also available for PROFINET applications which are coordinated and adapted for the respective automation task.

Switched Network

Fiber-optic conductors or twisted-pair cables are used as the transmission media between the switches. Data terminals or network segments are connected over twisted-pair cables.

The switching technology permits parallel communication, i.e. a network is divided into several segments, thereby facilitating a reduction of the load separation. Data communication is therefore possible in each individual segment independently of the other segments. In the overall network, several messages can therefore be en-route simultaneously.

The increase in performance is therefore due to the sending of several messages simultaneously.

The switching technology offers definite advantages:

- Switches can be used to construct subnets and network segments
- Data throughput and network performance are increased by structuring the data traffic
- The rules for network configuration are simple
- Network topologies with 50 switches in a ring and an overall extension of up to 150 km can be implemented without the need to take signal propagation times into account.
- Unlimited expansion of the network by connecting individual collision domains/subnets (beyond 150 km, the signal propagation times must be taken into account)
- Easy, reaction-free extension of existing networks is possible

Functionality of the Industrial Ethernet switches

- Depending on the number of available interfaces, switches are capable of temporarily and dynamically connecting several pairs of subnets or nodes simultaneously
- By filtering the data traffic on the basis of the Ethernet (MAC) address of the data terminals, local data traffic remains local and only data to stations in another subnet is forwarded by the switch
- More data terminals can be connected than in a classic Ethernet network
- Limiting error propagation to the subnet concerned

Highlights of SCALANCE X Industrial Ethernet switches

- A robust, innovative and space-saving housing design, which can very easily be integrated into a SIMATIC automation solution; free choice between a 35 mm standard DIN rail, S7-300 section rail or direct wall mounting
- The sleeve design together with the PROFINET-compliant Industrial Ethernet FastConnect RJ45 Plug 180 from SIMATIC NET offers additional tension and bending stress relief
- High Speed Redundancy permits very fast reconfiguration times (≥ 0.3 seconds) with up to 50 switches in the case of SCALANCE X-200IRT or SCALANCEX-400 in a ring



Switches for future-oriented networks

Autosensing/Autonegotiation

Autosensing describes the characteristic of network nodes (data terminals and network components) that automatically detect the transmission rate of a signal (10 Mbit/s, 100 Mbit/s or 1000 Mbit/s) and support autonegotiation.

Autonegotiation is the configuration protocol in Fast Ethernet. It enables the participating nodes to negotiate and agree the transmission rate before the first data packages are transferred:

- 10 Mbit/s, 100 Mbit/s or 1000 Mbit/s
- Full duplex or half duplex

Autonegotiation can also be deactivated if a specific transmission rate has to be set.

The advantage with autosensing lies in the problem-free interoperability of all Ethernet components. Classical Ethernet components that do not support Autosensing work problem-free with Fast Ethernet and new Gigabit Ethernet components that do support autosensing.

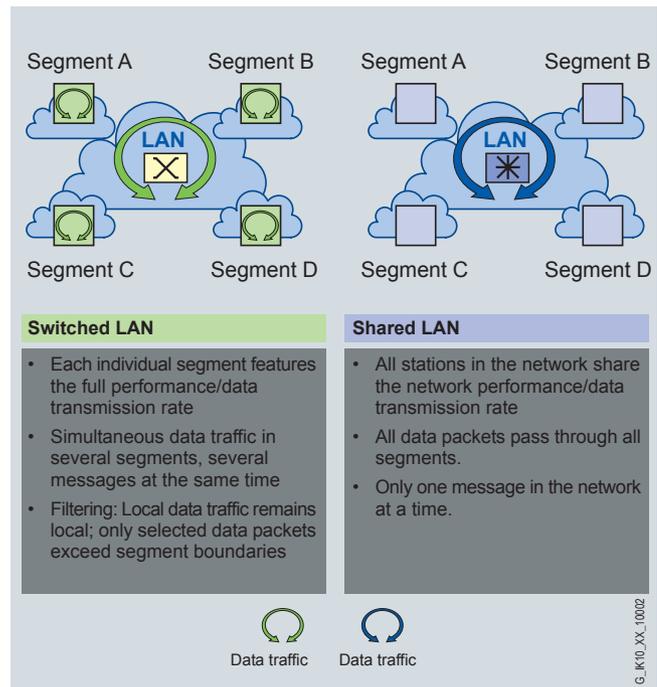
Autocrossover

The autocrossover function automatically crosses the send and receive cables on Twisted Pair interfaces. This means that crossed connecting lines (e.g. TP XP Cords) are no longer required.

High-speed redundancy – with SIMATIC NET

Extremely fast reconfiguration of the network in a ring following an error is indispensable for industrial applications, because the connected data terminals will otherwise disconnect logical communication links. This would result in a process running out of control or emergency shutdown of the plant.

In order to achieve the very fast response times required, SIMATIC NET uses the specially developed High Speed Redundancy procedure for controlling the redundancy. Reconfiguration of a network as a functional network infrastructure in a fraction of a second can therefore be assured. In an optical ring comprising 50 switches, the network will be reconfigured after an error (cable break or failure of a switch) in less than 0.3 seconds.



Increase in performance due to Switching, Full Duplex and 100 Mbit/s

The connected data terminals remain unaffected by the changes in the network and logical connections are not disconnected. Control over the process or application is assured at all times.

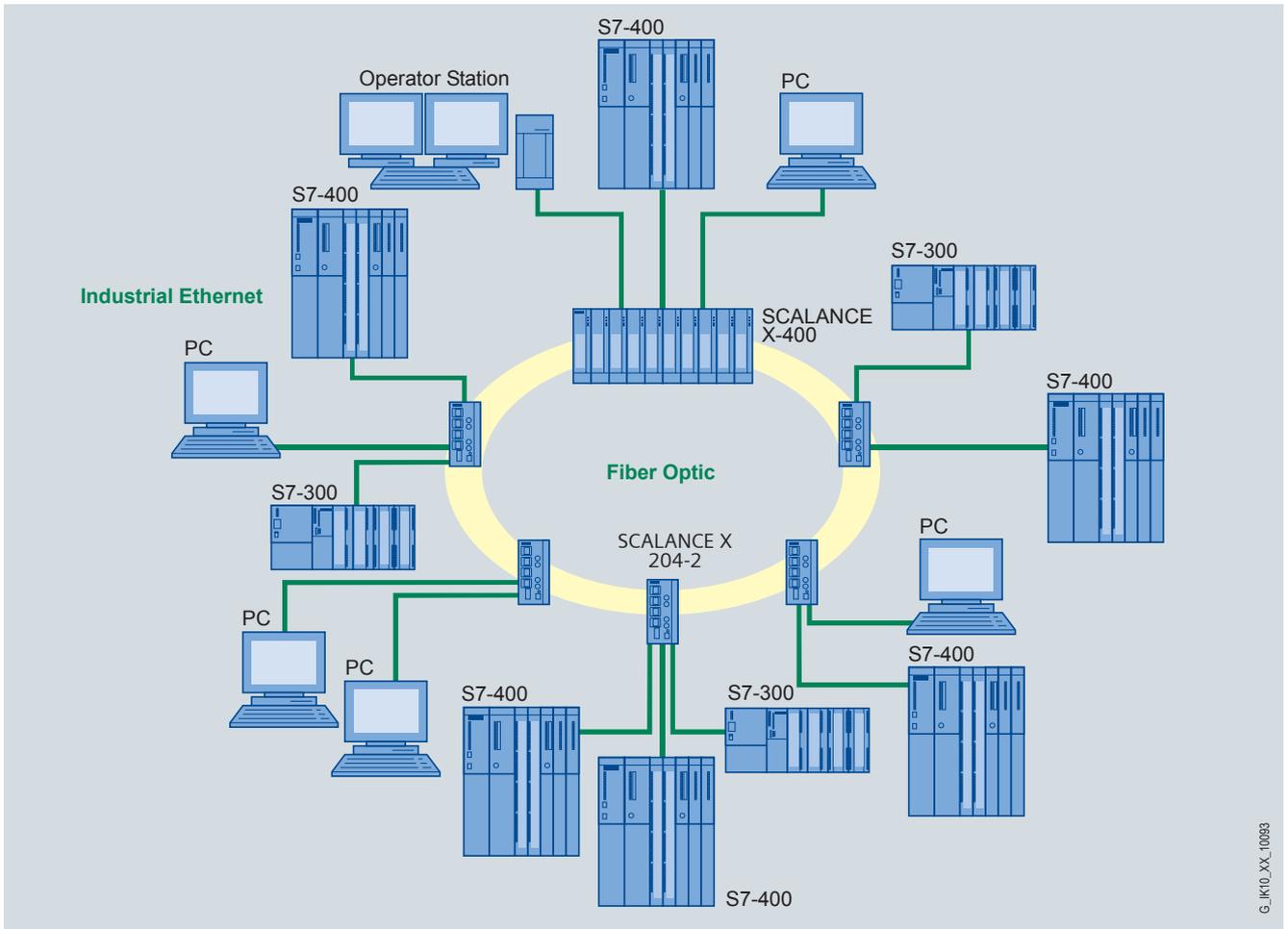
In addition to implementing high-speed media redundancy in the ring, SIMATIC NET switches also offer the functions required for high-speed redundant coupling of rings or network segments. Network segments in any topology or rings can be coupled over two switches.

Redundancy with the standard Spanning Tree algorithm

The Spanning Tree algorithm is described in the IEEE 802.1d standard; it organizes any number of meshed Ethernet structures comprising bridges and switches.

To prevent data packages circulating in the network, in the case of closed meshes different connections are switched to standby so that an open tree structure results from the meshed structure.

The bridges/switches communicate for this purpose using the Spanning Tree protocol. This protocol is extremely complex because it has to handle any type of network structure.



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Configuration with high-speed redundancy in the optical ring

The organization of network structures with the Spanning Tree protocol can take from 30 to 60 seconds. During this period, productive communication for reliable visualization or process control in the network is not possible.

In the time-optimized variant "Rapid Reconfiguration Spanning Tree" according to IEEE 802.1, the time is shortened to a few seconds for up to 10 series-connected switches. For connecting to office networks, some SIMATIC NET switches, e.g. SCALANCE X-400, support the Rapid Spanning Tree Protocol.

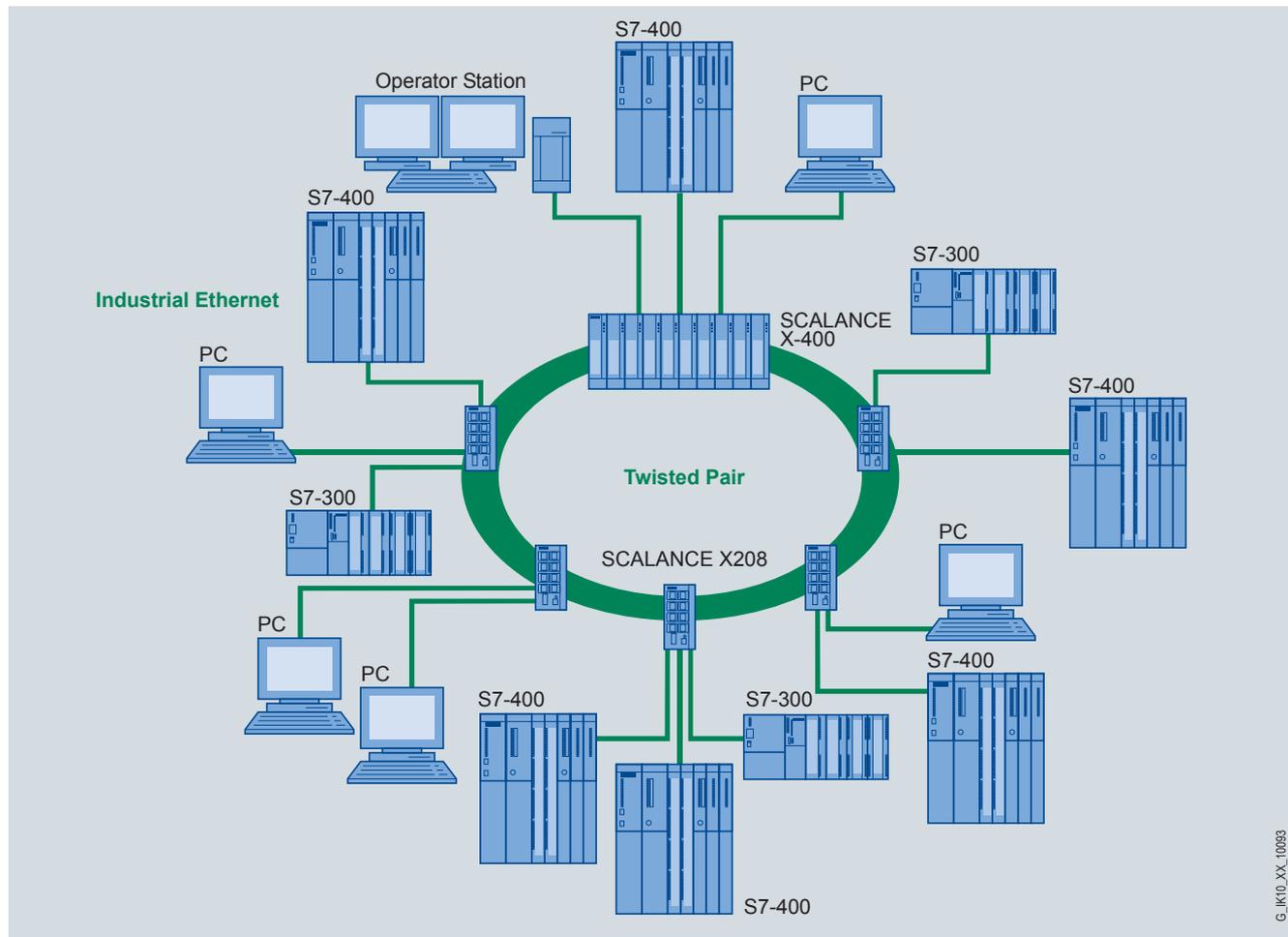
Optical cabling with POF/PCF or glass fiber-optic cable

Fiber-optic cables are always recommended as an alternative to copper cables in environments subject to strong electromagnetic interference (EMI) if reliable equipotential bonding cannot be guaranteed, if the system is in the open air, or if no EMI is desired.

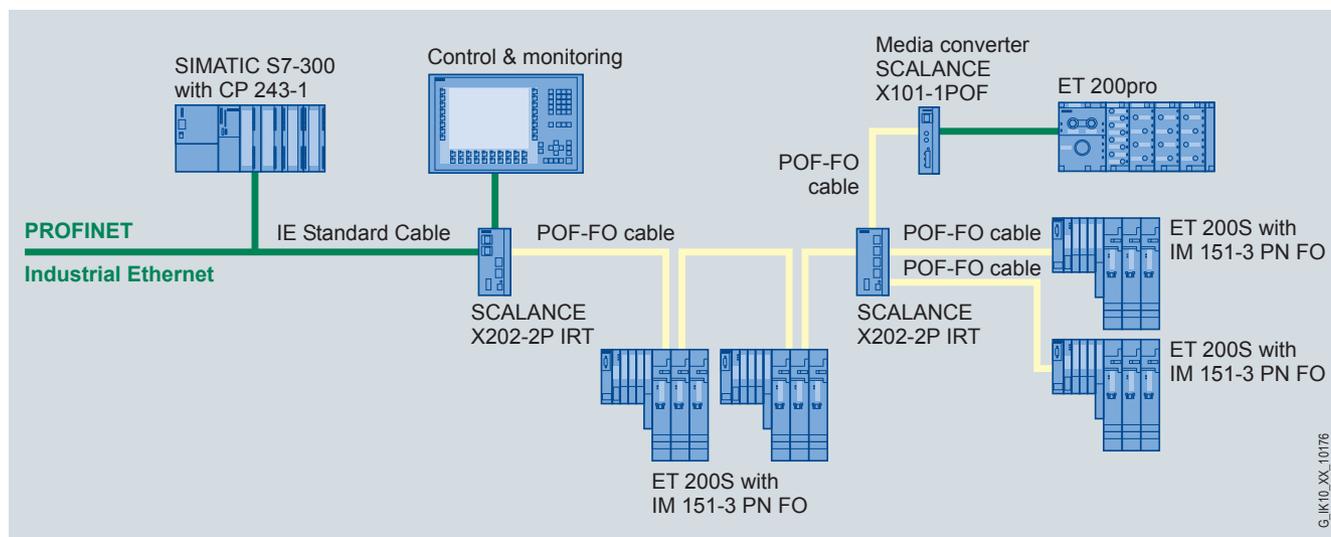
Glass fiber-optic cables are used to establish optical network topologies covering long distances, while for shorter distances, plastic fiber-optic cable made of light-conducting plastics like polymer optical fiber (POF), or plastic covered glass fibers such as polymer cladded fiber (PCF), are used. Simple fiber-optic cabling for machine-level use is implemented with the new SC RJ connection system for POF and PCF. The SC RJ connectors can be assembled particularly quickly and easily on-site. The plastic fiber-optic cables designed for this purpose can be used universally or specifically in festoon cable systems.

For optical PROFINET networking, products with POF or PCF connection are used, e.g. the Industrial Ethernet Switch SCALANCE X200-4P IRT, ET 200S distributed I/O or the SCALANCE X101-1POF media converter.

Switches for future-oriented networks



Configuration with high-speed redundancy in the electrical ring



Mixed network with SCALANCE X-200P IRT and SCALANCE X101-1POF media converter

SCALANCE X Industrial Ethernet switches



SCALANCE X is the product range of Industrial Ethernet switches from SIMATIC NET. Switches are active network components that specifically distribute data to the relevant addressees. The SCALANCE X product group comprises various coordinated product lines, tailored to the respective automation task.

SCALANCE X005 Entry Level

Unmanaged Switch with five ports and diagnostics in the device for use in machines or process cells.

SCALANCE X-100 unmanaged

Switches with electrical and/or optical ports, redundant power supply and signal contact for use in machine-level applications.

SCALANCE X-200 managed

Universally applicable, from machine-level applications to networked plant sections. Configuration and remote diagnostics are integrated in the STEP 7 engineering tool. This increases the level of plant availability. Devices with a high degree of protection permit a cabinet-free construction.

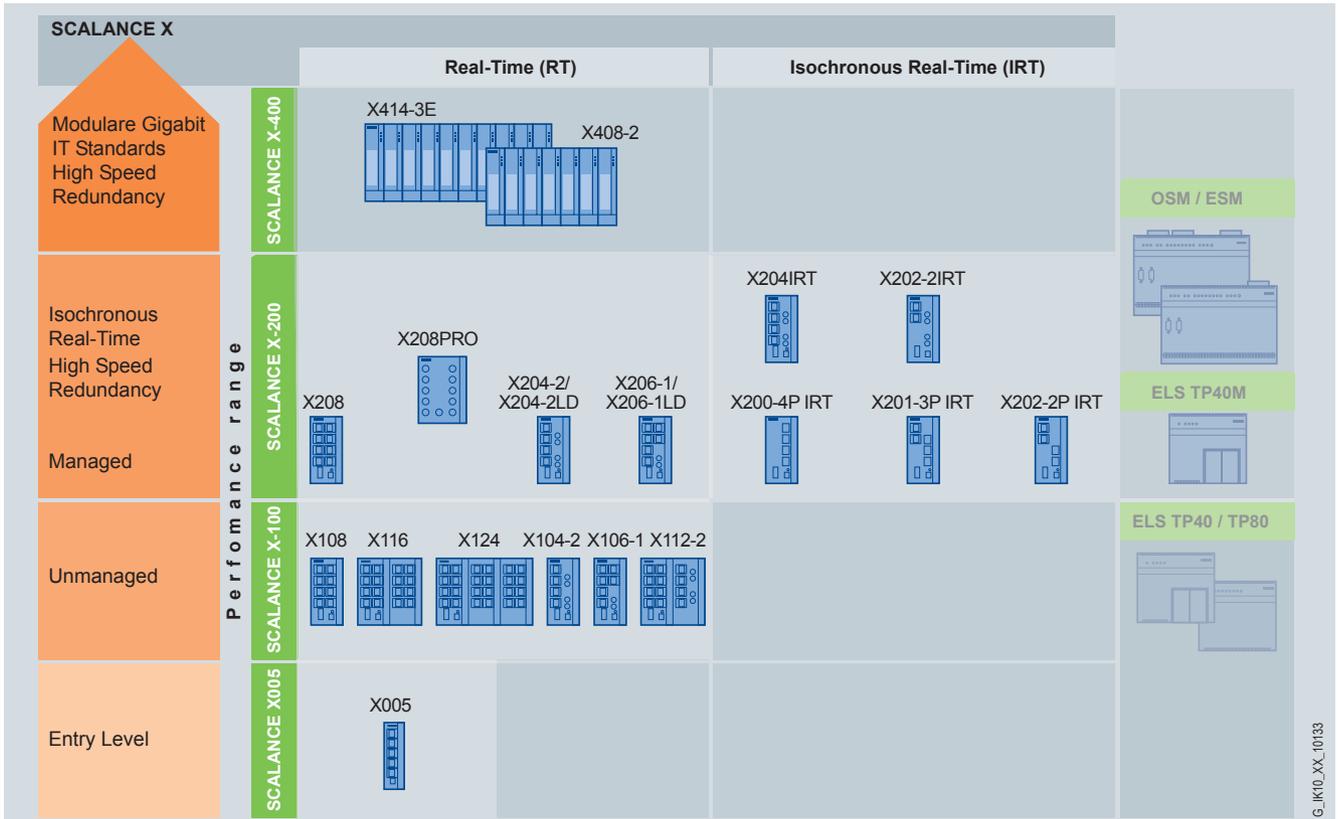
Appropriate switches (SCALANCE X-200IRT) are also available for use in plant section networks with hard real-time demands and maximum availability.

SCALANCE X-400 modular

For use in high-performance plant networks (e.g. with high-speed redundancy). Due to the modular structure, the switches can be adapted to the task in question. Due to the support of IT standards (e.g. VLAN, IGMP, RSTP), the seamless integration of automation networks into existing office networks is possible.

Routing functions on Layer 3 permit the communication between different IP subnets.

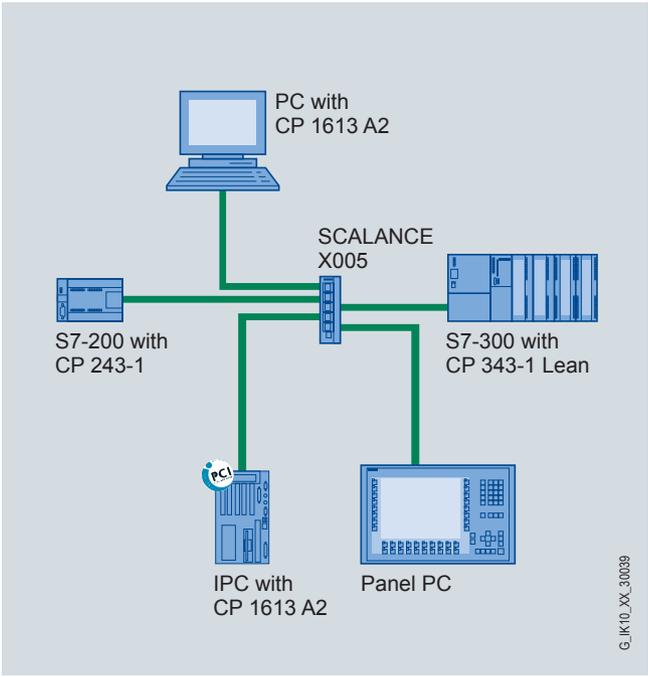
Positioning of the Industrial Ethernet switches



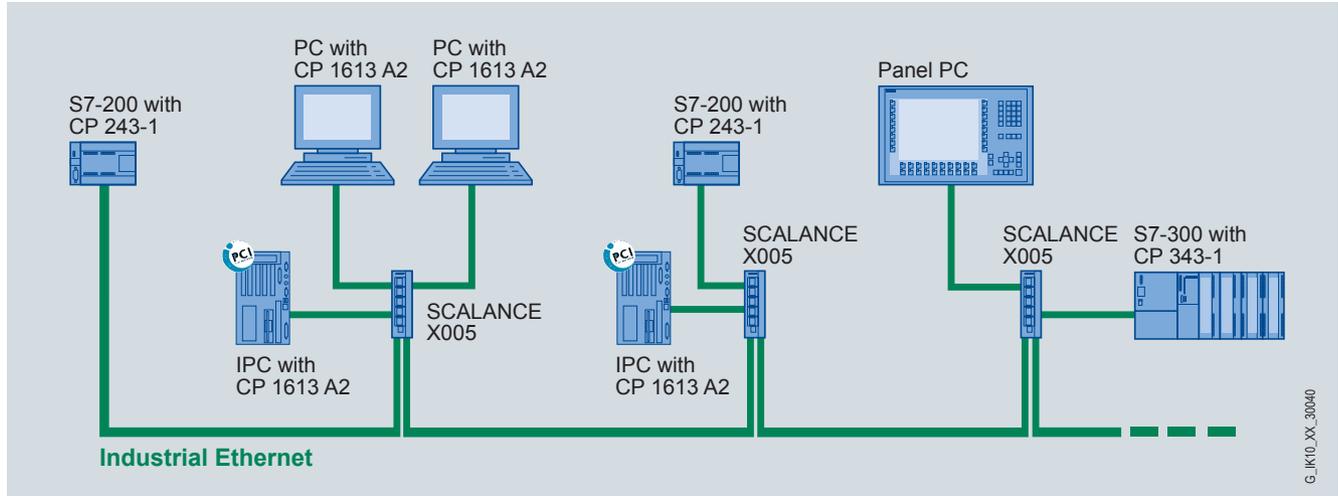
SCALANCE X005 Entry Level

The Industrial Ethernet entry level switch SCALANCE X005 is an unmanaged switch with five RJ45 ports, 10/100 Mbit/s. The product is a low-cost solution for constructing small star or line structures with switching functionality in machine or plant islands. SCALANCE X005 has a rugged metal housing (IP30) for space-saving installation in the control cabinet, on standard rails, on S7-300 rails or for direct wall mounting.

- Five electrical RJ45 ports 10/100 Mbit/s
- Diagnostics on the device by means of LEDs (power, link status, data communication)
- RJ45 sockets with sleeve for PROFINET-compliant plug-and-socket connector, IE FC RJ45 plug for additional strain relief
- Integrated autocrossover function makes the use of uncrossed connection cables possible
- Automatic detection and negotiation of the data transmission rate by means of autosensing and autonegotiation function



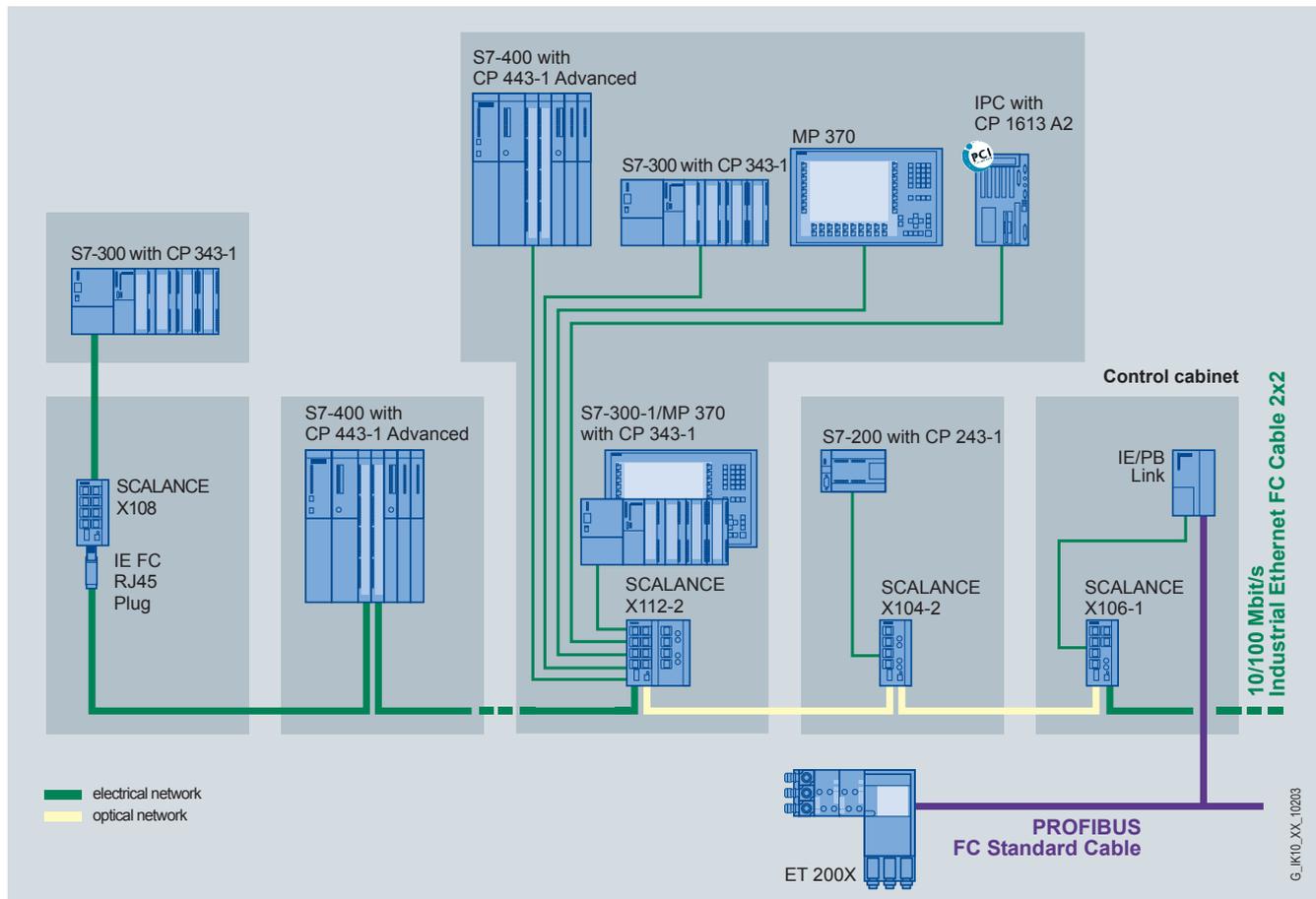
Star topology with SCALANCE X005



Line topology with SCALANCE X005

SCALANCE X Industrial Ethernet switches

SCALANCE X-100 unmanaged



Electrical and optical linear structure with SCALANCE X-100

The unmanaged switches of the SCALANCE X-100 product range with up to 24 ports are very suitable for building up linear and star structures (10/100 Mbit/s) and perfect for the on-site diagnosis in machine-related applications.

They are suitable for industry and save room in the control cabinet with their compact housing.

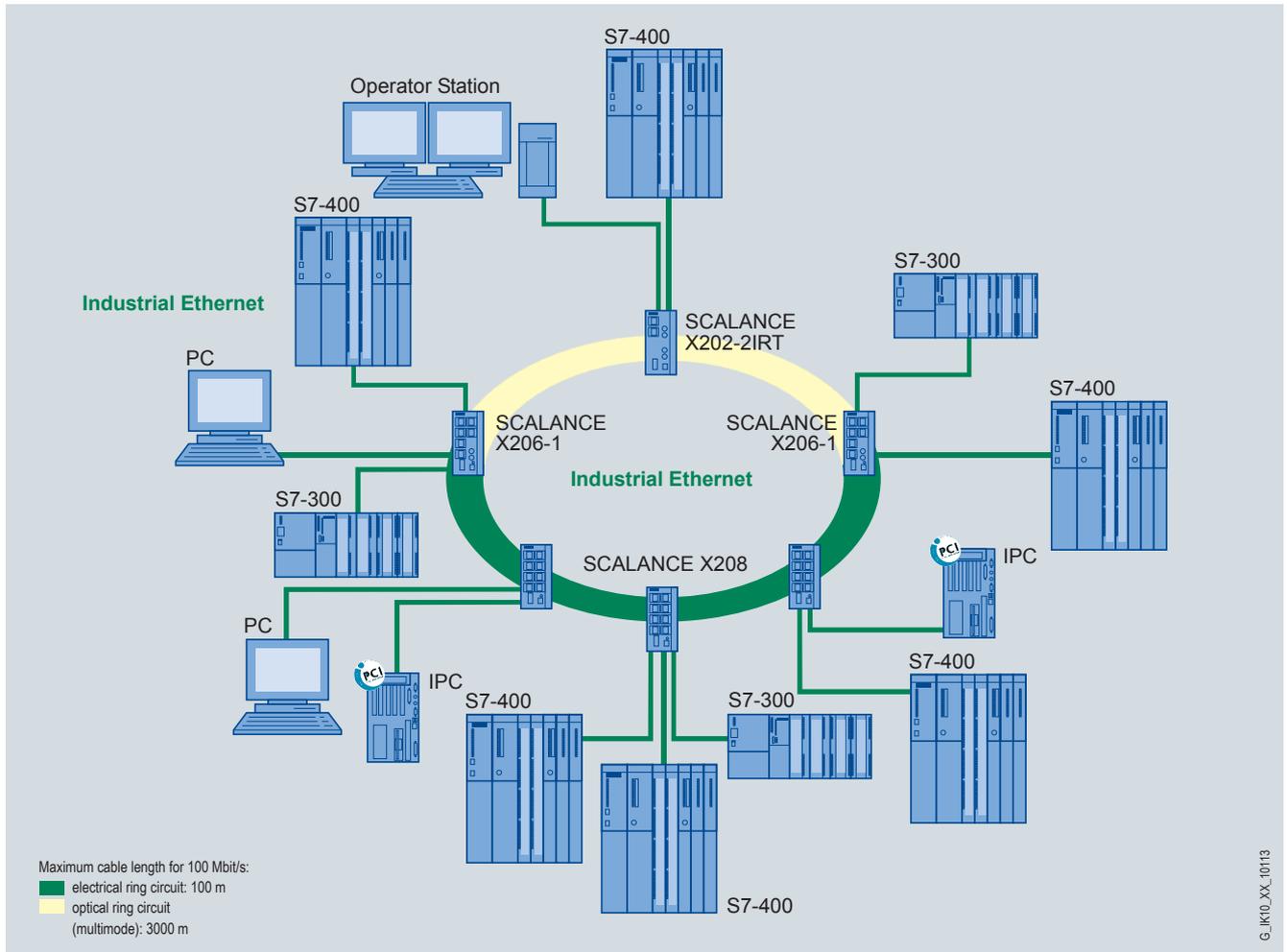
The SCALANCE X-100 switches are available as electrical and electrical/optical variants, which can be mixed in a network and therefore realize changeovers between electrical and optical stretches.

- SCALANCE X108 with eight electrical ports
- SCALANCE X116 with 16 electrical ports
- SCALANCE X124 with 24 electrical ports
- SCALANCE X104-2 with four electrical and two optical ports (BFOC)

- SCALANCE X106-1 with six electrical and one optical port (BFOC)
- SCALANCE X112-2 with 12 electrical and two optical ports (BFOC)

- Diagnostics on the device by means of LEDs (power, link status, data communication) and signal contact (signal mask can be set on site using buttons)
- Redundant power supply
- RJ45 sockets with sleeve for PROFINET-compliant plug-and-socket connector, IE FC RJ45 plug for additional strain relief
- Integrated autocrossover function makes the use of uncrossed connection cables possible
- Automatic detection and negotiation of the data transmission rate by means of autosensing and autonegotiation function

SCALANCE X-200 managed



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High speed redundancy in the ring with electrical and optical paths

The managed switches of the SCALANCE X-200 product range are very well suited for the setup of linear, star, and ring structures (10/100 Mbit/s).

They save room in the control cabinet thanks to their compact housing, and make it easy to expand the network thanks to their design.

The SCALANCE X-200 switches allow high network availability, since they make ring redundancy possible in combination with SCALANCE X-400/X-200IRT or OSM/ESM as redundancy manager.

With the C-PLUG swap medium, devices can be exchanged without a programming device; the configuration or application data are secured on the C-PLUG and can be implemented in another SCALANCE X-200 switch without special know-how.

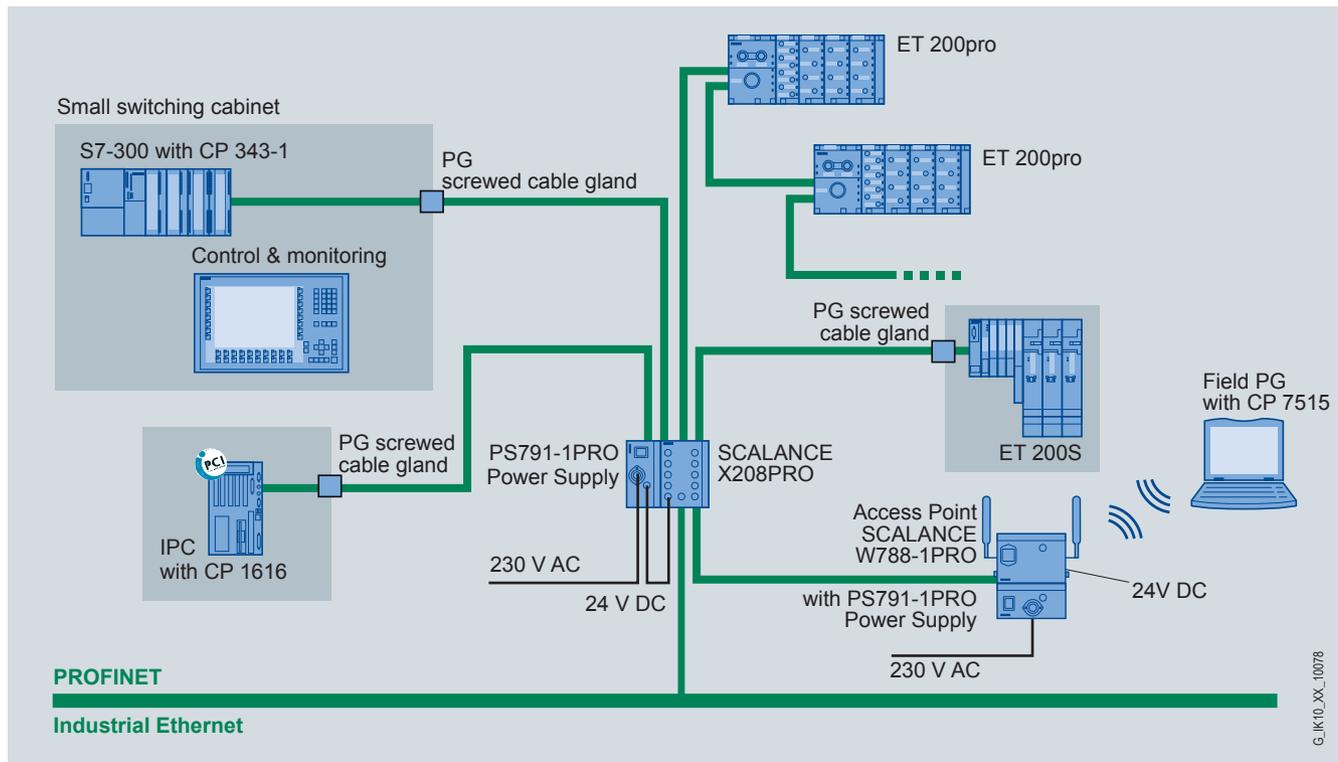
Based on PROFINET, it is easy to integrate the switches of the SCALANCE X-200 product range into the process and system diagnosis.

The SCALANCE X-200 switches are available as electrical and electrical/optical variants, which can be mixed in a network and therefore realize changeovers between electrical and optical paths.

- SCALANCE X208 with eight electrical ports
- SCALANCE X206-1/X206-1LD with six electrical and one optical port (BFOC)
- SCALANCE X204-2/X204-2LD with four electrical and two optical ports (BFOC)
- SCALANCE X208PRO with eight electrical ports; version in protection degree IP65 which enables the setup of a star-shaped network structure outside the control cabinet and can be operated via 24 V DC or if required via power supply PS791-1PRO with 230 V AC.

SCALANCE X Industrial Ethernet switches

SCALANCE X-200 managed



Star network topology with SCALANCE X208PRO outside the control cabinet and 230 V AC power supply

SCALANCE X-200IRT managed

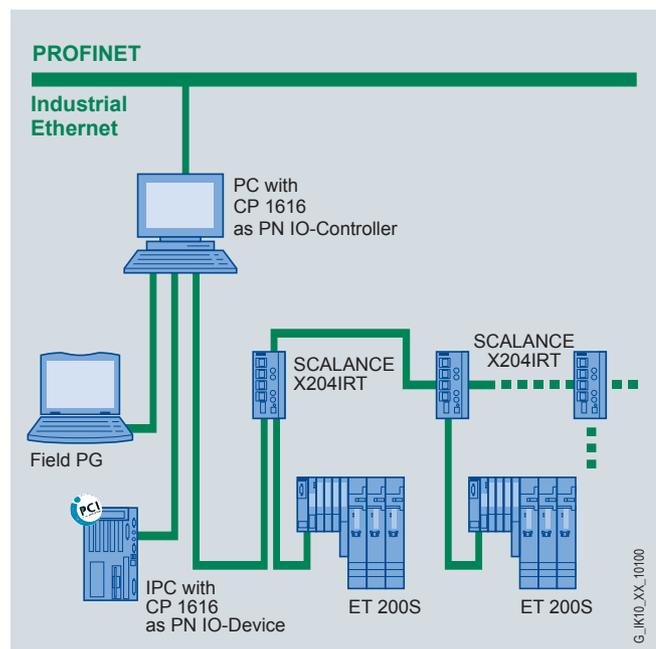
With the versions SCALANCE X-200IRT, real time and isochronous real time networks can be set up. As a result, a network is available for heavy real-time and standard data transmission (TCP/IP), preventing the need for a double infrastructure.

The high-speed redundancy function enables very fast response times in the range of sub-seconds (≥ 0.3 seconds) for 50 switches.

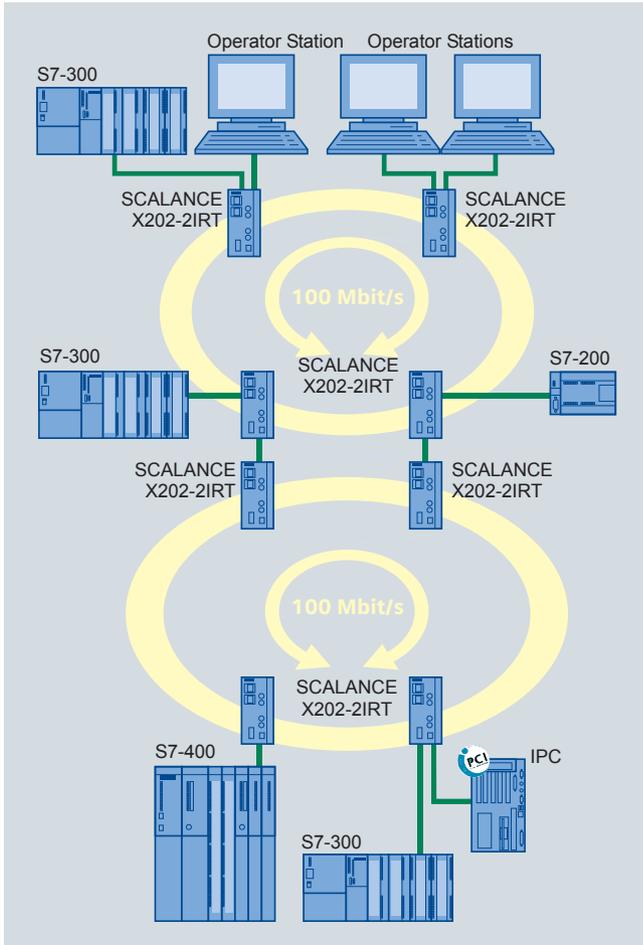
Redundant ring structures can be set up and two sub-networks, e.g. rings, can be connected redundantly via the SCALANCE X-200IRT switches.

The SCALANCE X-200IRT switches are available as electrical and electrical/optical versions:

- SCALANCE X204IRT with four electrical ports
- SCALANCE X201-3P IRT with one electrical and three optical ports (POF/PCF)
- SCALANCE X200-4P IRT with four optical ports (POF/PCF)
- SCALANCE X202-2IRT/X202-2P IRT with two electrical and two optical ports (BFOC or POF/PCF)

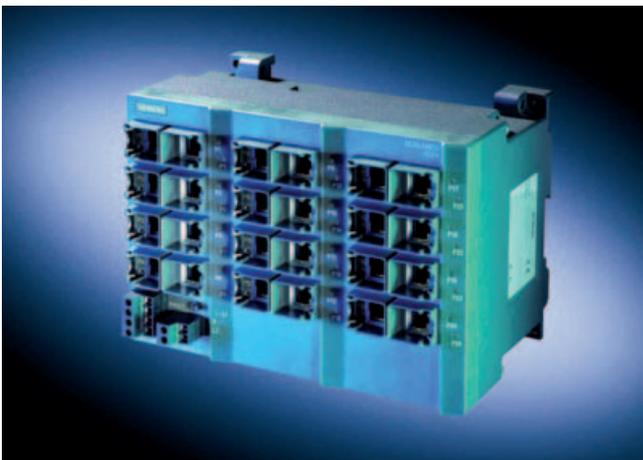


Configuration example for SCALANCE X204IRT



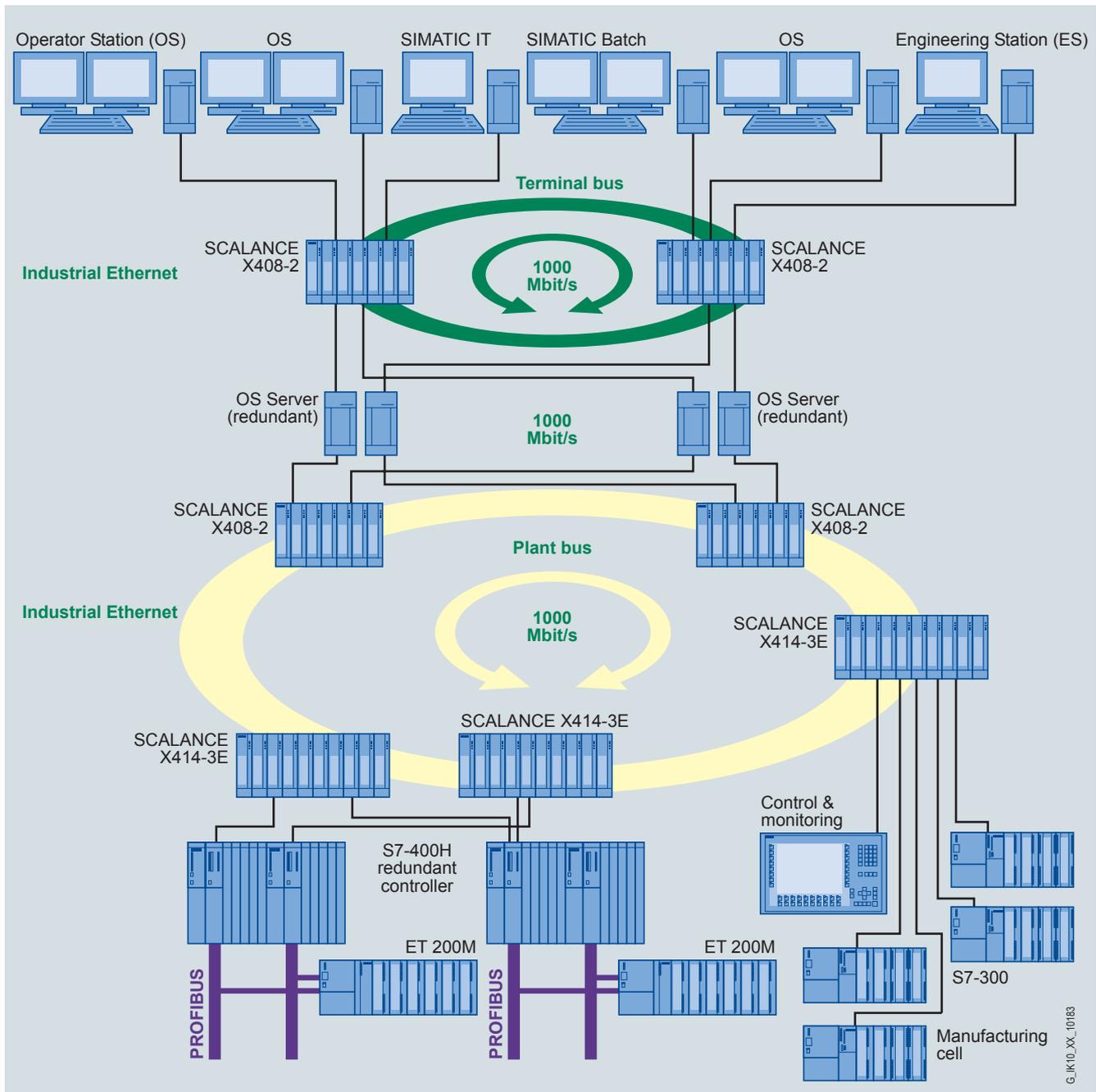
Redundant coupling of two subnets with SCALANCE X-200IRT

- Diagnostics on the device by means of LEDs (power, link status, data communication) and signal contact (signal mask can be set on site using buttons)
- Redundant power supply
- RJ45 sockets with sleeve for PROFINET-compliant plug-and-socket connector, IE FC RJ45 plug for additional strain relief
- Integrated autocrossover function makes the use of uncrossed connection cables possible
- Automatic detection and negotiation of the data transmission rate by means of autosensing and autonegotiation function
- Remote diagnosis is performed by means of floating signal contact, SNMP, Web browser and PROFINET IO diagnostics
- Integrated configuration and diagnostics in STEP 7
- Integration of the switches in existing network management infrastructure by means of SNMP access
- Automatic e-mail sending function
- C-PLUG swap medium for rapid replacement of devices



SCALANCE X Industrial Ethernet switches

SCALANCE X-400 modular



Use of the SCALANCE X-400 switches in a process control system, e.g. PCS7

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The modular switches of the SCALANCE X-400 product range are Industrial Ethernet switches for setting up linear, star, and ring structures (10/100/1000 Mbit/s) for high-performance networks.

They allow flexible setup of optical or electrical networks, which can be adapted in their topology, port number, and port type to the respective network structures. Furthermore, they enable high network availability, since, for example, they enable ring redundancy in combination with a redundancy manager function, have redundant power supply or allow to exchange and extend media modules during operation.

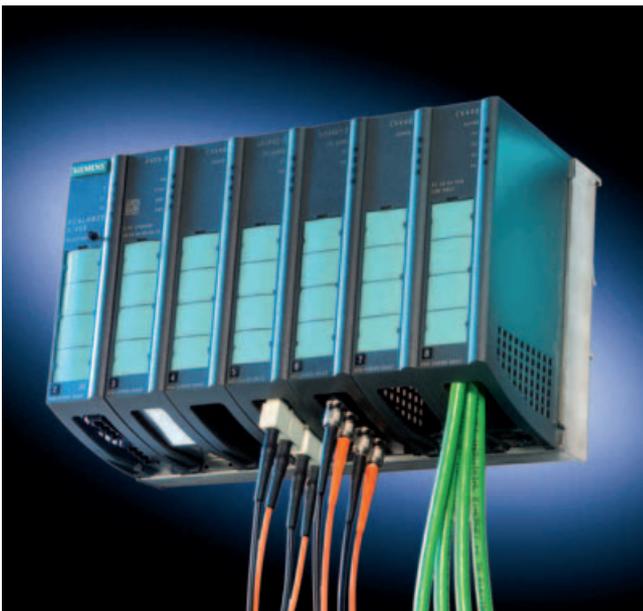
With the C-PLUG swap medium, devices can be exchanged without programming device; the configuration or application data are secured on the C-PLUG and can be implemented in another SCALANCE X-400 switch without special know-how.

SCALANCE X-400 switches have a modular structure, in which media modules and/or extender modules can be connected to the switch as required. These expansions make as many as eight electrical and eight optical ports additionally available.

Gigabit connections can be established between SCALANCE X-400 switches; the twisted-pair users can be directly connected to the basic device. Optical connections are available thanks to media modules.

The SCALANCE X-400 switches are ideally suited, for example, to process control systems such as PCS7.

The following network topologies and combinations of topologies are possible:



- Fast Ethernet and Gigabit Ethernet rings with fast media redundancy; to protect against failure of a transmission link or a switch, as many as 50 SCALANCE X-400 switches cascaded in line can be connected into a ring with a total length of up to 150 km with multi-mode or 1,300 km with single mode. On the failure of a transmission link or a SCALANCE X-400 switch in the ring, the transmission path is reconfigured within 0.3 seconds.
- SCALANCE X-400 supports redundant connection of the ring structure to the corporate network with a rapid spanning tree at the same time.
- Star topology with SCALANCE X-400 switches: Each SCALANCE X-400 switch represents a star point which can interconnect as many as 26 nodes or subnets electrically or optically.
- Problem-free connection of existing twisted-pair data terminals or existing network segments up to 10/100/1000 Mbps

SCALANCE X-400 modular is available in the following versions:

- SCALANCE X408-2: choice of four electrical or optical (SC) Gigabit ports and four electrical Fast Ethernet ports
- SCALANCE X414-3: choice of two electrical or optical (SC) Gigabit ports, twelve electrical Fast Ethernet ports and up to four optical Fast Ethernet ports (BFOC). It can be extended with extender modules with either eight electrical or eight optical (BFOC) Fast Ethernet ports.

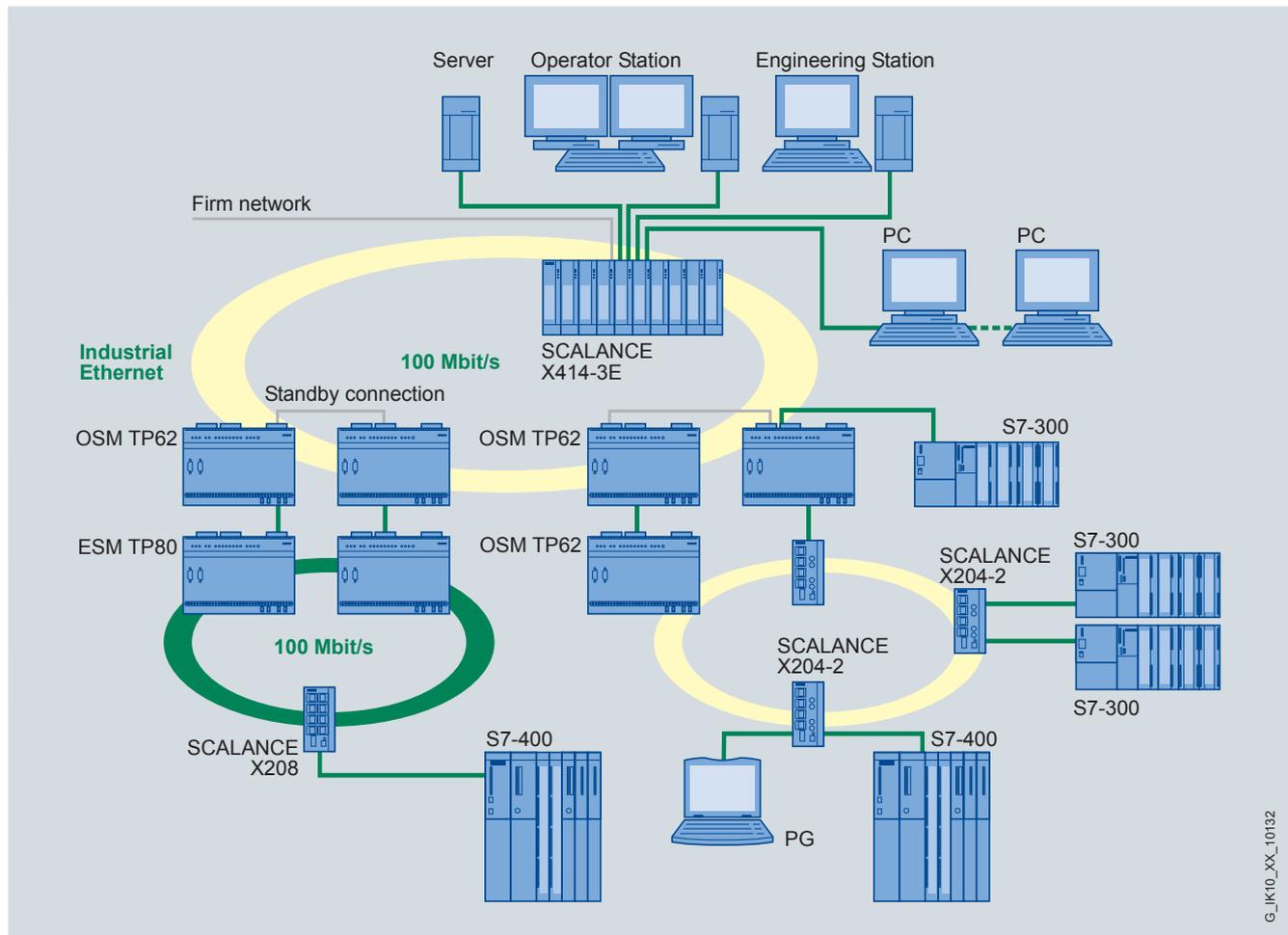
Configurations for integrating existing networks

Existing network configurations that were constructed, for example, using Industrial Ethernet Switches ELS (Electrical Lean Switch), OSM (Optical Switch Module) and ESM (Electrical Switch Module) can be expanded with SCALANCE X components problem-free.

Existing 100 Mbit/s data terminals or subnets with Fast Ethernet up to 100 Mbit/s can be easily integrated into new network structures.

SCALANCE X Industrial Ethernet switches

SCALANCE X-400 modular



Optical and electrical ring with SCALANCE X and OSM (Optical Switch Module) redundantly linked

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- Diagnostics on the device by means of LEDs (power, link status, data communication) and signal contact (signal mask can be set on site using buttons)
- Redundant power supply
- RJ45 sockets with sleeve for PROFINET-compliant plug-and-socket connector, IE FC RJ45 plug for additional strain relief
- Integrated autocrossover function makes the use of uncrossed connection cables possible
- Automatic detection and negotiation of the data transmission rate by means of autosensing and autonegotiation function
- Remote diagnosis is performed by means of floating signal contact, SNMP, Web browser and PROFINET IO diagnostics (for SCALANCE X408-2)

- Integrated configuration and diagnostics in STEP 7 with SCALANCE X408-2
- Integration of the switches in existing network management infrastructure by means of SNMP access
- Automatic e-mail sending function
- C-PLUG swap medium for rapid replacement of devices
- Multicast and Broadcast limitation
- Support of VLAN permits integration into Enterprise Security Policies
- IGMP Snooping supports Multicast filtering and limiting
- Investment protection due to compatibility of SCALANCE X with OSM, ESM and ELS
- Layer 3 (IP routing)

Diagnostics and network management with SCALANCE X

The Industrial Ethernet switches SCALANCE X005, X-100, X-200, X-200IRT, X-200P IRT, X-400, OSM and ESM have the following diagnostic functions:

- LED displays;
LEDs display information locally about power, port status and data traffic.
- Fault signal contact;
Floating signal contact easily set via a SET button supports signaling of link traffic. This enables, for example, the module to be monitored via an input module from a controller
- Signal mask;
the signal mask is set to the current status (setpoint) by pushbutton operation.
The signal mask defines which ports and which power supplies are to be monitored. The signal contact only reports an error when a monitored port or a monitored feeder fails (deviation of setpoint/actual status).
- PROFINET diagnostics;
PROFINET diagnostic alarms from SCALANCE X-200 and SCALANCE X-400 (with SCALANCE X408-2) can be displayed with the appropriate SIMATIC Engineering Tools and also processed in the controller.
By means of complete integration into the SIMATIC concept for system error messages, the engineering overhead for PLC and HMI is reduced.
- Web-based management;
The integral Web server enables configuration and diagnosis settings to be made using a standard browser. Statistical information can also be read out over the Web server.

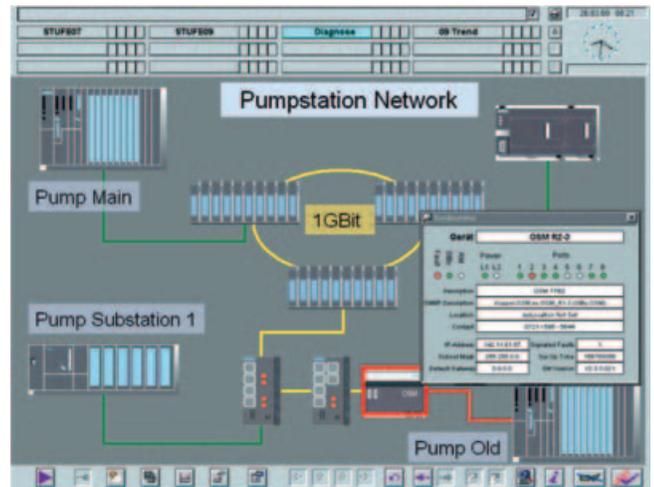
- Standard diagnostics over SNMP (Simple Network Management Protocol);
The SCALANCE X-200 and SCALANCE X-400 switches can be monitored with SNMP on a central network management system such as SNMP OPC Server.
In the event of a fault in the device, error messages (SNMP traps) can be sent to a network system or as e-mail to a specified network manager.
- VLANs (Virtual LANs)
- IGMP Snooping/Querier
- RSTP (Rapid Spanning Tree)
- Multicast/Broadcast limitation
- Layer 3 (IP routing)

Commissioning and diagnostics for SCALANCE X-400

Adjustment options on the device itself:

- Redundancy manager RM;
when setting up a ring, a SCALANCE X-400 switch in the ring is switched into the RM mode. The non-ring ports of the RM can be used as required for the connection of data terminals and networks.

Network monitoring of a pumping station with SNMP OPC server



Module type	Possibilities of diagnostics with switches										
	LED	Error signal contact	Signal screen form	PROFINET diagnosis	Web-based management	Diagnosis via SNMP	VLAN	IGMP-Snooping/-Querier	RSTP	Multicast-/Broadcast-limitation	Layer 3 (IP-Routing)
SCALANCE X414-3E/X408-2	■	■	■	■ ¹⁾	■	■	■	■	■	■	■ ²⁾
SCALANCE X-200/X-200IRT/X-200P IRT	■	■	■	■	■	■					
SCALANCE X-100	■	■	■								
SCALANCE X005	■										
OSM	■	■	■		■	■					
ESM	■	■	■		■	■					

¹⁾ with SCALANCE X408-2 ²⁾ with SCALANCE X414-3E

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SCALANCE X Industrial Ethernet media converters

SCALANCE X-100 media converter

SCALANCE X-100 unmanaged media converter

Media converter for converting electrical signals to optical signals and for connecting existing networks, e.g. AUI networks. The SCALANCE X101-1POF media converter is ideally suited to the integration of devices with POF interfaces into existing network structures.

The unmanaged Industrial Ethernet media converters of the SCALANCE X-100 product line are ideally suited to the conversion of different transmission media in Industrial Ethernet networks with 10/100 Mbit/s in line, star and ring topologies. They are suitable for industry and save room in the control cabinet with their compact housing.

SCALANCE X-100 media converters are available, depending on the device port types as electrical or optical devices and are used to connect existing 10 Mbit/s fiber-optic networks or existing 10Base5 networks (e.g. SINEC H1):

- SCALANCE X101-1 with one electrical 10/100 Mbit/s RJ45 port and one 100 Mbit/s multimode interface (BFOC connections)
- SCALANCE X101-1LD with one electrical 10/100 Mbit/s RJ45 port and one 100 Mbit/s singlemode interface (BFOC connection system)
- SCALANCE X101-1POF with one 100 Mbit/s plastic optical fiber (POF) interface (SC RJ connections)
- SCALANCE X101-1AUI with one 10 Mbit/s AUI interface (Sub-D connections)
- SCALANCE X101-1FL with one 10 Mbit/s multimode interface (BFOC connections)



- Diagnostics on the device by means of LEDs (power, link status, data communication) and signal contact (signal mask can be set on site using buttons)
- RJ45 sockets with sleeve for PROFINET-compliant plug-and-socket connector, IE FC RJ45 plug for additional strain relief
- Redundant power supply

Module type	Type and number of ports						Features						
	Twisted Pair		Fiber Optic				Compact housing	LED diagnosis	SIMATIC environment	2 x 24 V DC	Signal contact	Local display (SET button)	Ring redundancy without RM
			Fast Ethernet		10 Mbit/s								
	10 / 100 Mbit/s		100 Mbit/s		AUI	Multimode BFOC							
RJ45	POF / PCF	Multimode BFOC	Singlemode BFOC										
SCALANCE X101-1	1		1				■	■	■	■	■	■	■
SCALANCE X101-1LD	1			1			■	■	■	■	■	■	■
SCALANCE X101-1POF	1	1					■	■	■	■	■	■	■
SCALANCE X101-1AUI	1				1		■	■	■	■	■	■	■
SCALANCE X101-1FL	1					1	■	■	■	■	■	■	■
OMC TP11	1		1				■	■	■	■	■	■	■
OMC TP11LD	1			1			■	■	■	■	■	■	■

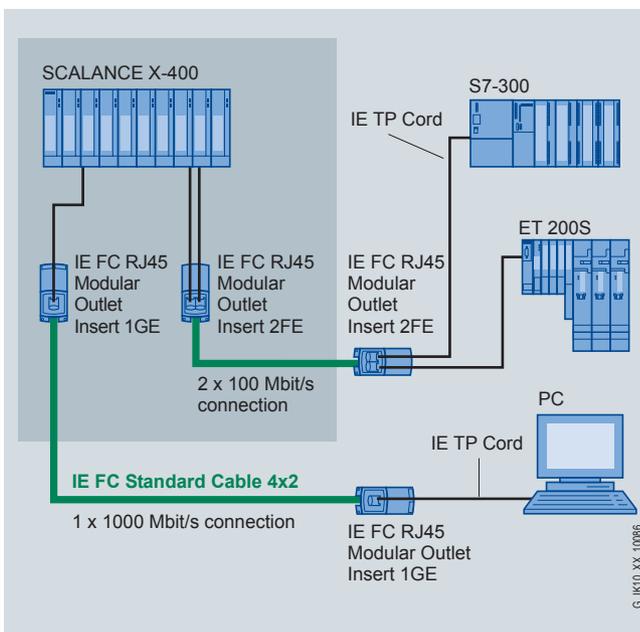
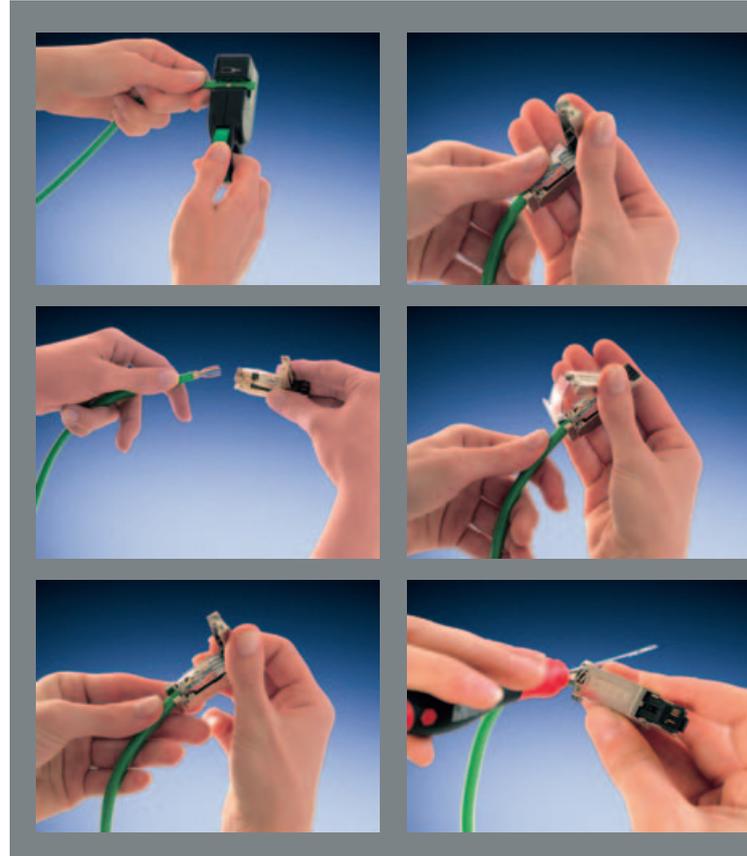
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Networking with FastConnect

The FastConnect system

The rapid connection system FastConnect (FC) for Industrial Ethernet enables industry-compatible network structures to be built up within a short time using carefully matched components. It comprises:

- Industrial Ethernet FastConnect cables specially designed for fast connection (UL and CAT5e certified) as FC TP Standard, FC TP Flexible, FC TP Trailing and FC TP Marine Cable
- User-friendly stripping technology with the **FastConnect stripping tool**, enabling the outer sheath and braided shield to be removed accurately in a single operation
- Cables prepared in this way are connected to the **FastConnect products** by means of the insulation displacement method
- IE FC RJ45 Plug 180, IE FC RJ45 Plug145 and IE FCRJ45 Plug 90 are insensitive to interference due to the rugged metal housing and are the ideal solution for installing RJ45 connectors especially at the field level (PROFINET compatible)
- Industrial Ethernet FC Modular Outlet also for Gigabit cabling



System configuration with IE FC RJ45 Modular Outlet (100/1000 Mbit/s)

Advantages of the FastConnect system

- Comprehensive product range for flexible wiring in industry in accordance with the innovative Industrial Ethernet standard PROFINET
- Faster connection of data terminals thanks to safe stripping of the outer sheath and braided shield in one step
- Easy connection method (insulation-piercing contacts) for 4-core (Cat5) and 8-core (Cat6) Industrial Ethernet FC Twisted Pair installation cables
- Easy assembly of both cable types with the preadjusted FC stripping tool
- Reliable shield contact and strain relief thanks to bolt-on cover
- Excellent EMC shielding and conduction (metal casing); mistakes are prevented thanks to color coding and the transparent terminal cover
- RJ45 cabling technology is used as the permanent standard

Industrial Ethernet switches and media converter

Rugged, flexible, high availability



Advantages at a glance

- Rugged design for industry
- Low-cost versions
- Protection of investments: Existing networks can be expanded with new products
- Corporate requirements, such as VLAN-based security policy, from the enterprise level can be satisfied
- Broad-based use in small or large networks even outside the control cabinet
- Standardized Ethernet technology can be used, reduction of training and familiarization costs
- One network for hard real time and standard TCP/IP, savings in duplicated infrastructure, high network and machine availability

- Reduction of downtimes due to saving of engineering and configuration data
- Quick, easy and reliable cabling and the option of self-assembly
- On-site or remote parameterization and diagnostics
- Support from SIMATIC Engineering Tools
- Embedding in the SIMATIC error message concept (system fault signaling, SMF) and PROFINET
- Networking without the need for additional gateways



Further information is available on the Internet

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Arrange a personal discussion with your nearest contact at:

<http://www.siemens.com/automation/partner>

In the A&D Mall you can place orders electronically via the Internet:

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In various SIMATIC NET components (e.g. SCALANCE, OSM/ESM, CPs with IT functions), extensive parameterizing and diagnostics functions (e.g. Web server, network management) are made available via open protocols and interfaces.

These open interfaces provide access to those components and could also be used for illicit activities.

When using the above-mentioned functions and these open interfaces and protocols (such as SNMP, HTTP and Telnet), suitable security measures must be implemented that block unauthorized access to the components or the network especially from the WAN/Internet.

For this purpose, automation networks must be isolated from the remaining corporate network using appropriate firewall systems such as SCALANCE S.

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