

The Siemens logo is displayed in a white rectangular box. The background of the entire page is a detailed, high-angle photograph of a Siemens industrial Ethernet switch. The switch is a rack-mountable device with a dark grey metal chassis. It features several network ports on the front panel, including RJ45 ports and fiber optic ports. The internal components, such as the printed circuit board (PCB) and various modules, are visible through a transparent section of the chassis. The image is overlaid with a digital aesthetic, including binary code (0s and 1s) and glowing yellow and blue lines that suggest data flow and network connectivity. The overall color palette is dominated by blues, greys, and yellows.

Technical  
article

# High-performance Industrial Ethernet Switch connects Automation and Office Networks

## Industrial Backbone as Interface between Production and Office

In globally operating companies, production and office networks are increasingly merging. To attain a joint network from the field level all the way to the transfer point to the World Wide Web, the requirements of both worlds must be taken into consideration when connecting the industrial backbone to the core. With high-performance Industrial Ethernet switches featuring automation and IT mechanisms, the goal of “one cable for everything” is achieved.

When it comes to networks, almost every company turns to Ethernet according to the 802.3 standard established by the Institute of Electrical and Electronics Engineers (IEEE). The advantages of Ethernet, such as it being an open standard, its global spread, high data rate and especially the connection to the Internet, speak for this communication technology.

In the private sector, Ethernet has proven the ideal medium for home networking – from simply connecting personal computers (PCs) to the Internet to increasingly complex applications with intelligent television services (smart TVs), videos from the Internet (video on demand), voice over IP (VoIP), or the mobile data exchange via smart phones and tablet PCs.

An ever faster growing, global data network and larger and larger data volumes, in both wired (up to 100 Gbit/s) and wireless networks (up to 1 Gbit/s with the WLAN standard IEEE 802.11ac) are the basis for higher mobility, a greater exchange of information, and a faster time-to-market. Internationally operating companies utilize these advantages to set themselves apart from the competition.

### Integrated Communication in a Corporate Network

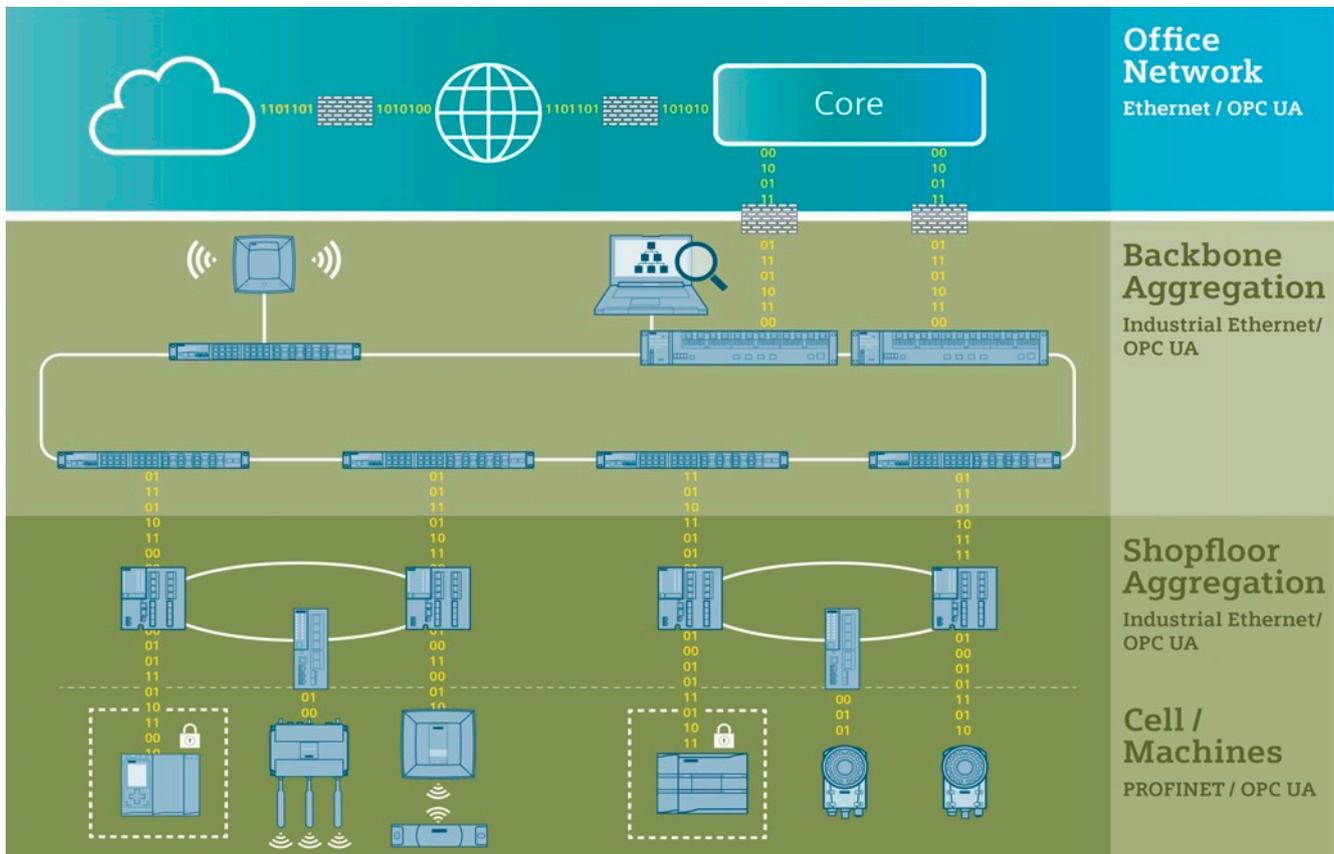
The technological progress, worldwide acceptance, and globally applicable standards in the private and office sectors have resulted in Ethernet increasingly entering the industrial sector. While just a few years ago the industrial network was usually strictly separated from the office network, the boundaries nowadays have become increasingly blurred; although significant differences can be observed in the planning and execution. In the office network, the authenticity of the data stands above everything else in order to protect the entire corporate network against unauthorized access (industrial espionage) and to not be paralyzed by hacker attacks; whereas in the production network, the integrity of the data, safety, and determinism have to be observed. The transmission of production data between the manufacturing and the industrial data processing center on-site or the company-wide data processing center, e.g., for data backup, demands high bandwidths. Big data and cloud computing are only two keywords named here. Furthermore, an integrated, vertical communication from the field level to the ERP level (enterprise resource planning) is becoming more and more important. So that the office and industrial networks function like a joint network for the user today, Ethernet switches – such as the SCALANCE XR-500 from Siemens – are employed at the connection points. As transition components, these high-performance Ethernet switches meet the requirements of an office switch as well as the special challenges of industrial devices.

### Ethernet Components in Industrial Applications

Siemens, coming from the automation world, knows the requirements of industrial applications with regard to determinism, cyclical data traffic, motion control, and safety. To meet these requirements in an Ethernet-based network, Siemens entered the world of Ethernet-based communication with the SINEC H1 bus (“yellow cable”) in the mid-eighties. SINEC H1 is a communication network for the cell level using baseband transmission technology according to IEEE 802.3 with CSMA/CD access methods and with networking via triaxial bus cable (H1) and point-to-point via fiber-optic cable and star coupler (H1FO). Today, Industrial Ethernet switches of the SCALANCE X product family in various performance classes with a bandwidth up to 10 Gbit/s provide for a reliable and robust network in the automation landscape.



The modularly designed Industrial Ethernet switches SCALANCE XR-500 offer up to 52 ports – optionally mixed (electrical and optical) – and up to four 10 Gigabit ports for the connection to the core.



The SCALANCE XR-500 joins the production network with the office network and enables the structured connection of the individual shop floor networks (shop floor aggregation).

### Industrial Backbone as Interface between Production and Office Worlds

According to a study by the ARC Advisory Group from the year 2013, 30.3 percent of all machines and plants worldwide that are networked with Industrial Ethernet communicate via Profinet. Based on standard Ethernet according to IEEE 802.3, Profinet brings a number of advantages with regard to flexibility, efficiency, and performance – and thus is the ideal platform for a reliable communication between the individual components within the automation cell.

The powerful Ethernet switches of the product line SCALANCE XR-500 combine the individual automation cells into an industrial backbone and connect them to the core of the corporate network via existing firewall hardware. It is thus easier for IT administrators to monitor and verify the data flow of industrially used information at the company or production location. If there are multiple automation cells per shop floor, they are again structured into individual shop floor networks (shop floor aggregation).

From its automation experience, Siemens knows the requirements companies make on the connection between industrial backbone and office network. For instance, the response times for service calls are substantially lower in the industrial network. Outsourcing an industrial network thus becomes at least somewhat more high-risk. To realize a quick repair and restart, the components of the industrial backbone are often placed in the industrial environment, e.g., on the shop floor.

In addition to suitable software features from the automation, such as the already mentioned Profinet functionality, and IT characteristics, such as a high bandwidth, the hardware must be industrial-grade. A wide temperature range, high degree of protection, redundant voltage feed as well as rugged cables and connectors are only a few characteristics demanded of an industrial backbone. The high-performance switches of the product family SCALANCE X are designed for such applications; they possess these characteristics and are suitable components for industrial networks for another reason: Siemens maintains spare parts for its SCALANCE products for ten years.

## Switches in the Industrial Backbone

The data separation between office and industrial networks will soon be a thing of the past. When linking them, however, one should take into consideration that each area has its own special requirements calling for individual solutions. Data only relevant for the industrial network must not get into the office network.

The Industrial Ethernet switches SCALANCE XR-500 provide for a high-performance, convenient transition between production and office networks. Bandwidths up to 10 Gbit/s, key industrial approvals, and many industry-demanded hardware properties highlight the reliable and robust operation in the industrial backbone of a production site. In addition to standardized office features, which – among other things – support the administrators through the IT department, the SCALANCE XR-500 products contain automation-relevant characteristics, such as the Industrial Ethernet protocol Profinet. Over the past 20 years, Siemens has utilized its experience in automation to develop a portfolio of network components for different industries and use cases. This experience shows during the analysis, planning, and implementation of industrial networks.

### Properties of the SCALANCE XR-500

- Unlimited flexibility for network expansions and retrofitting thanks to full modularity
- Electrical or optical networking via combo-ports (SCALANCE XR524 8C/XR526 8C), even while in operation (hot-swappable)
- Reduction of warehousing costs for different device types thanks to fully modular design
- Optional retrofitting of Layer 3 functions via key plug without changing the hardware
- High availability through redundant power supply, C plug removable medium, and redundancy functions
- Models with different (AC/DC) and optionally redundant power supply
- Transmission of large amounts of data with 10 Gbit/s ports
- The modular switches SCALANCE XR528 and XR552 feature high connection density and flexibility for different transmission media

## Security information

In order to protect plants, systems, machines and networks against cyber threats, it is necessary to implement – and continuously maintain – a holistic, state-of-the-art industrial security concept. Siemens' products and solutions only form one element of such a concept. For more information about industrial security, please visit [www.siemens.com/industrialsecurity](http://www.siemens.com/industrialsecurity)

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