

Technical
article

Fast on the Network

Unmanaged Industrial Ethernet Switches for the quick and easy Network Setup

With the growth of Ethernet-based networks in industry, the need for Industrial Ethernet switches as an interface multiplier increases according to a 2015 study by IHS Technology – Industrial Ethernet Infrastructure Components. The principal market driver here is the necessity for greater efficiency in the production – thus improving the competitiveness. In this context, a rapid and cost-effective commissioning of the devices is of crucial importance. With the unmanaged Industrial Ethernet switches, industrial communication networks in electrical and optical line and star structures are made possible using the plug & play principle.

The globalization of the economy and the related technical progress lead to the worldwide use of Ethernet as the standard for the communication. Requirements such as increasing the efficiency and flexibility through simple and cost-effective automation solutions are important factors in automation technology, which must be taken into account during the product development. Innovative products that quickly, easily and cost-effectively meet customer requirements despite the increased complexity of the plants and networks are now demanded more and more. Especially in the production and process automation, the data of the individual industrial communication networks must be exchanged in a clear and structured manner. Via local networks (LAN – local area network), the data from the networks can be transmitted in packets using the standard

Ethernet IEEE 802.3 (Institute of Electrical and Electronics Engineers). Since the 1990s, this standard has established itself in automation and network technology worldwide and been continuously developed further. While the original Ethernet interconnected several networks via a bus topology with only one participant being able to send, the procedure employed today utilizes CSMA/CD. Carrier sense multiple access with collision detection (CSMA/CD) regulates the data transmission by the network participants and prevents a data collision. Through the years, Ethernet has adapted to the changing requirements and covered new fields of application.

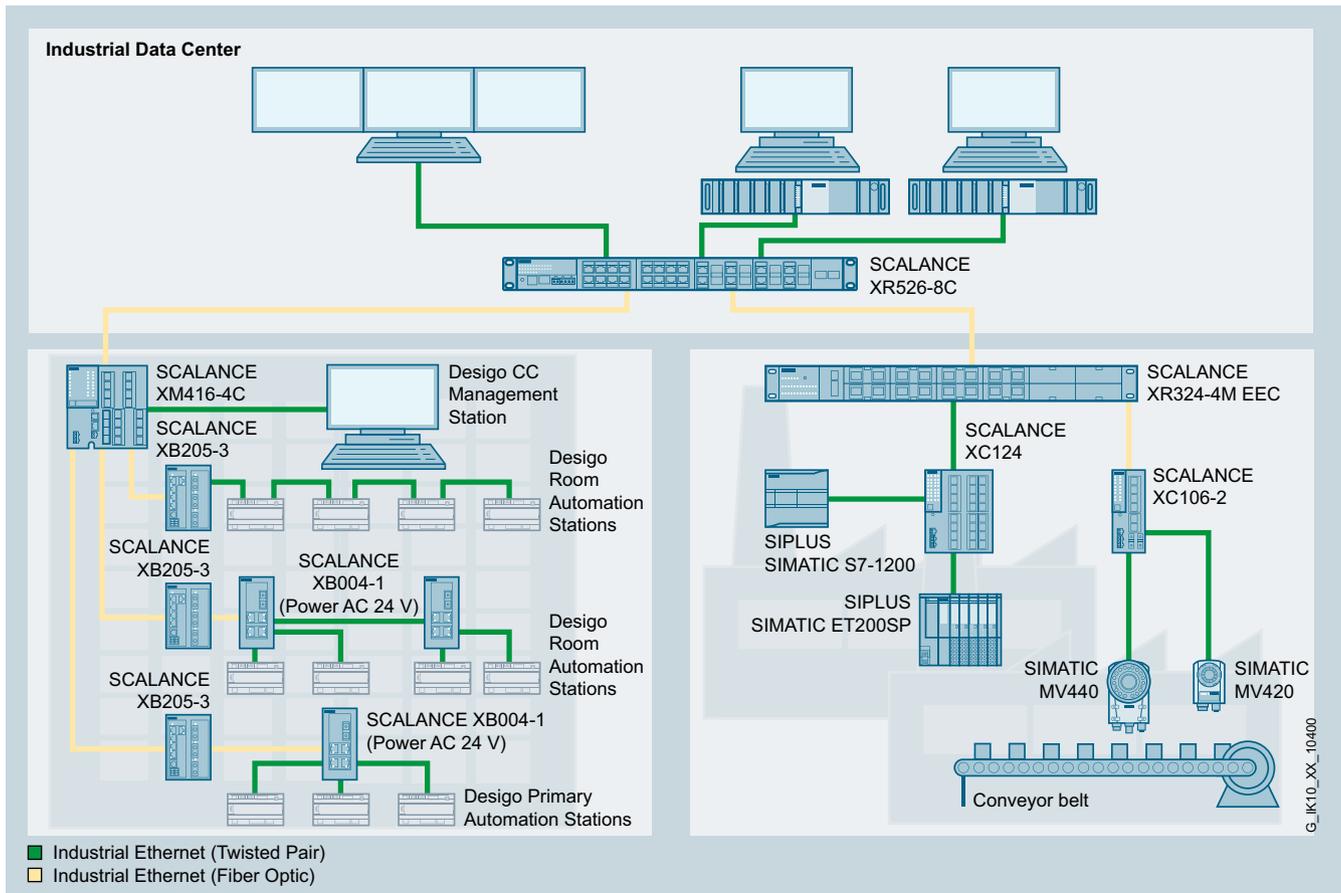
Examples of this include Ethernet in industrial and automation environments, as the basis for building automation and, last but not least, Ethernet with a higher data transmission rate of 10 gigabits over copper cabling systems for a plant performance increase. Production and process applications can be implemented more efficiently and flexibly via Industrial Ethernet and the use of standard IT applications. Commercial IT is therefore the foundation for industrial applications. Siemens, the world market leader in automation technology, knows the above requirements of the globalization of companies with regard to the industrial network since 1985. Sinec H1 was the first Industrial Ethernet network.

Today's products of the SCALANCE X family are ideal components for industrial networks and optimized for the most diverse applications. The portfolio is divided into managed and unmanaged switches. Managed Layer 2- and Layer 3-capable switches are characterized by their high levels of functionality and comprehensive diagnostic capabilities. This allows larger networks with many participants to be set up and monitored. Unmanaged switches are components that do not provide options for the administration by means of standard tools, e.g., network management. They are, for example, suitable for the machine-level networking of plants. The small switches are employed for the simple and cost-effective connection of Industrial Ethernet components in production halls on the field level.

Cost-effective entry-level Solution with easy Handling

A switch is a component for the distribution of data. In doing so, the data packets are not sent to all ports, but only to the one to which the addressed terminal device is connected. The communication takes place on the second layer of the OSI layer model (open system interconnection) and only needs the MAC addresses (media access control) of the participants. In small or medium-sized machines, only a few Ethernet devices are normally used. In order to network these few components in a closed network, unmanaged switches are typically utilized. For the data communication of this layer, no further functionalities and diagnostic capabilities are necessary. The unmanaged switches can be integrated into an industrial network without a preliminary configuration. The Ethernet components can be put into operation more quickly and easily, and are thus more cost-effective than managed switches.

With the SCALANCE XB-000 product family, the components exactly fulfill these requirements. The small and compact form factor requires little space in the control cabinet and thus represents an economical variant for a network expansion. For the transmission at higher data rates and the connection of multiple devices, data transmission rates of up to 1000 Mbit/s and distances of up to 26 km can be realized with fiber optic cables. Consequently, far-away machine and plant components can be easily and inexpensively networked with each other and automated. Unmanaged switches are not only used for near-industrial applications but also for the building automation. In public buildings, such as schools, supermarkets, airports and underground garages, the building automation and control networks (BACnet) protocol has established itself as the communication standard. As a company-neutral standard, Ethernet-based devices for the data communication can also be used with building automation components over BACnet/IP. The SCALANCE XB-000 product family features a supply voltage of 24 V AC (alternating current) customary in building automation.



The robust SCALANCE XC-100 unmanaged Industrial Ethernet switches with electrical and/or optical port variants enable a cost-optimized machine-level networking – even when subjected to extreme temperature fluctuations.

Industrial-grade Ethernet Components

Besides the compact and small form factor, a robust network for extreme ambient conditions also is an important factor. For instance, switches are used in the food production in refrigerated warehouses and freezers. For that, Ethernet components must be able to withstand temperatures below freezing. The switches must function not only in temperature-critical environments but also in potentially explosive atmospheres, e.g., caused by gases, vapors or mists. Special regulations must be adhered to, which are governed by the ATEX (Atmospheres Explosibles) / IECEx approval. Especially suitable for these requirements are the SCALANCE XC-100 unmanaged Industrial Ethernet switches.

Other required criteria include a redundant supply of power to ensure reliability, industrial-grade RJ45 retaining collars and a signal contact for rapid diagnostics. The industrial-suited SCALANCE XC-100 product family also possesses an approval for motor vehicles – so that it can be used for road transportation.

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 <http://www.siemens.com/industrialsecurity>

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Two in One – Power over Ethernet

With the continued development of Ethernet, not only technical possibilities arise. The use of Ethernet-based components can solve problems beyond the traditional LAN application. With the introduction of voice over IP (VoIP), voice communication can now also run over LAN – the corresponding terminal devices, however, must be supplied with operating voltage. But also wireless access points – typically installed in hard to reach places, or web cameras – installed in a production hall or train station, must be supplied with voltage. For the cost-effective supply of power to terminal devices on the LAN, the Ethernet standard was extended by IEEE 802.3af for the remote supply of power. Employing the switches, the supply of power can be realized with up to 48 V and 12.95 W. PoE supports 10Base-T, 100Base-T and also 1000Base-T Gigabit Ethernet. The SCALANCE X108PoE unmanaged Industrial Ethernet switch (with two PoE ports and six RJ45 ports) from Siemens transmits data and power over one cable. This reduces the wiring effort and results in cost savings.

Conclusion and Outlook

The steady technological progress and changed requirements in the industry lead to an increase in the use of Ethernet-based components. Especially in the area of industrial and automation technology, attention is paid to high-performance and cost-effective components on the field level. Globalization results in an increase of global competition among producing companies for products with high quality. The associated increase of data in the production must be reliably documented accordingly and transmitted more quickly. Not only high data transmission rates but also Power over Ethernet will play important roles in the future – in order to realize cost-effective solutions.

With its many years of experience in the field of automation technology, Siemens offers a wide range of network components that feature Gigabit and Power over Ethernet.

SCALANCE XC-100 – Highlights

- Industrial-grade thanks to robust retaining collar and enclosure concept for RJ45 ports
- Wiring without patch panel (IE FC RJ45 180) – suitable for FastConnect use
- Quick fault detection thanks to clear diagnostic LEDs
- Reliable operation, even in the event of a power supply failure
- Use in PROFINET-relevant applications