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Technical
article

Four in a Row wins!

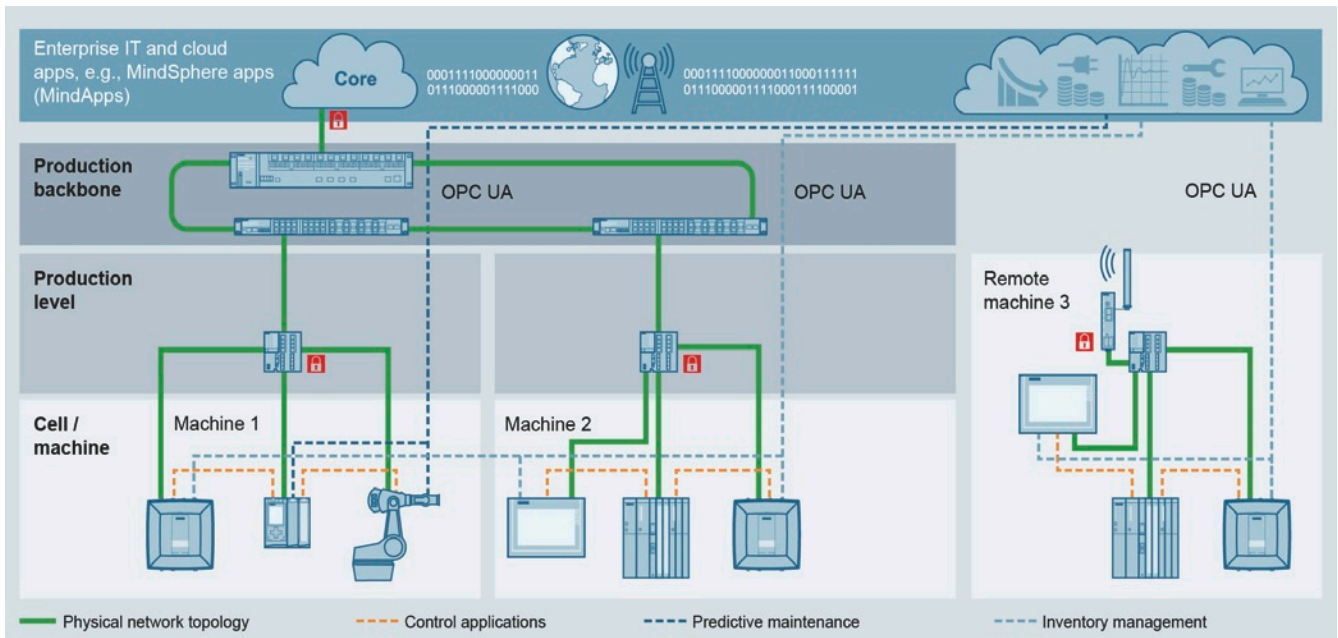
Powerful Industrial Ethernet Switches for the Field

Companies with a claim to innovation and cutting-edge technology must face the challenges of digitalization. In addition to high productivity and long runtimes of machinery and equipment, production facilities worldwide require flexibility with regard to design, commissioning and maintenance. Robust and reliable networks that transparently and securely transmit data in both the horizontal and the vertical communication are essential for a digital factory. The centerpieces of these high-performance networks are Industrial Ethernet switches that understand the language of automation and support standard IT mechanisms. In order to be applicable in all areas of discrete manufacturing and the process industry, four new variants of Industrial Ethernet switches are now available. This makes the change to digitalization easy

Industrial Communication Networks – the Basis of Digitalization

Industrial networks form the basis for an efficient production. The large amounts of data delivered by more and more intelligent devices must therefore reliably reach their destination. As the ideal communication standard in companies, Ethernet according to IEEE 802.3 has established itself. The advantages are obvious: Internet compatibility, high bandwidth and barrier-free transition between company IT and industry. This means that machinery and equipment can not only communicate horizontally, but also transmit data vertically to higher-level areas all the way to cloud-based systems. Depending on the size of the production site, these Ethernet-based networks are divided into different areas. Machinery and equipment that exchange data with each other on the cell level are securely linked to

the production network. If the production takes place across several industrial buildings, the aggregation via a high-performance industrial backbone makes sense – before the production network is connected to the higher-level company network. Through this structured segmentation of the individual areas, the reliability and speed in the network can be raised to the maximum, and it creates transparency with regard to the individual production units. Centralized management and monitoring tools provide support to keep an eye on the network status and data traffic in the production network at all times. While the network of the factory building and the backbone is very similarly structured in many companies, there are differences on the cell level.



Structure of a typical production network

PROFINET – the Industrial Ethernet Standard for discrete Manufacturing and the Process Industry

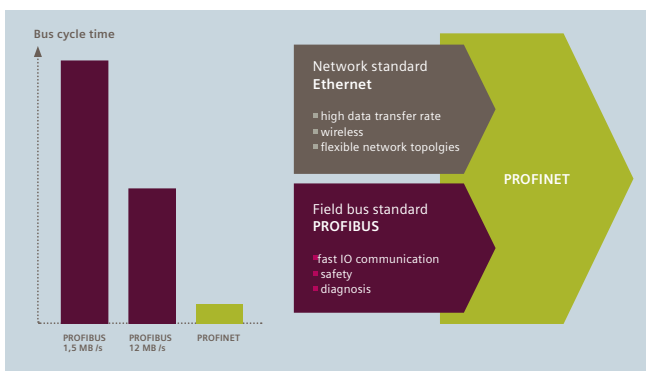
Even if it seems today as if nothing other than Ethernet has ever existed, this was not always so. In fact, office and industrial communications first developed separately. Only the globalization and the desire to access globally distributed machinery and equipment via the Internet gave rise to a common communication standard. At first, however, fieldbus systems such as Profibus established themselves in industry. Requirements such as determinism, functional safety and diagnostics needed to be ensured in the production. To meet these requirements with a single communication standard for both company IT and industry, the Ethernet standard was not enough. An Ethernet standard adapted to industry had to be created – thus PROFINET was born! PROFINET is the open, vendor-independent Industrial Ethernet standard for all areas of application in industrial automation and combines the advantages of the Ethernet standard – such as high data rate, mobility thanks to wireless technologies and flexible use of different topologies – with the advantages of Profibus just mentioned.

PROFINET is suitable in discrete manufacturing for fast production processes – such as found in machine construction and logistics. On the other hand, PROFINET is also the ideal communication standard in the process industry, since the robust protocol can be used under the harshest environmental conditions, e.g., as prevalent in the oil & gas and chemical industries. However, a robust communication protocol is not everything, because without the right infrastructure, the PROFINET data do not reach their destination.

Four Switch Variants for all Field Level Areas

Depending on the application, machinery and equipment are located in factory buildings, outdoors, are exposed to harsh and extended environmental conditions, or operate in explosive environments. No matter where – the communication of the devices among each other and with other areas of the network must always be reliable, robust and secured. This is ensured by network components that possess the right characteristics for every application.

With the four new variants of Industrial Ethernet switches from the SCALANCE X-200 product line, exactly the network components are available, which are needed for the implementation of all requirements on the field level. For instance, with the components of SCALANCE XB-200, small machinery and equipment networks can be designed cost-optimized. In addition to functionalities such as the setup of redundant network structures with the MRP protocol (media redundancy protocol), the switches can be integrated into the comprehensive engineering system – the TIA Portal – via the end-to-end system diagnostics with PROFINET. The possibility of fiber monitoring, i.e., the monitoring of optical fiber connections, allows for preventive maintenance and avoids unnecessary downtime. These and other functionalities are supported by the SCALANCE XC-200 products, which succeed the well-known SCALANCE X-200 devices used up to now. With a



PROFINET combines the advantages of the Ethernet standard and Profibus



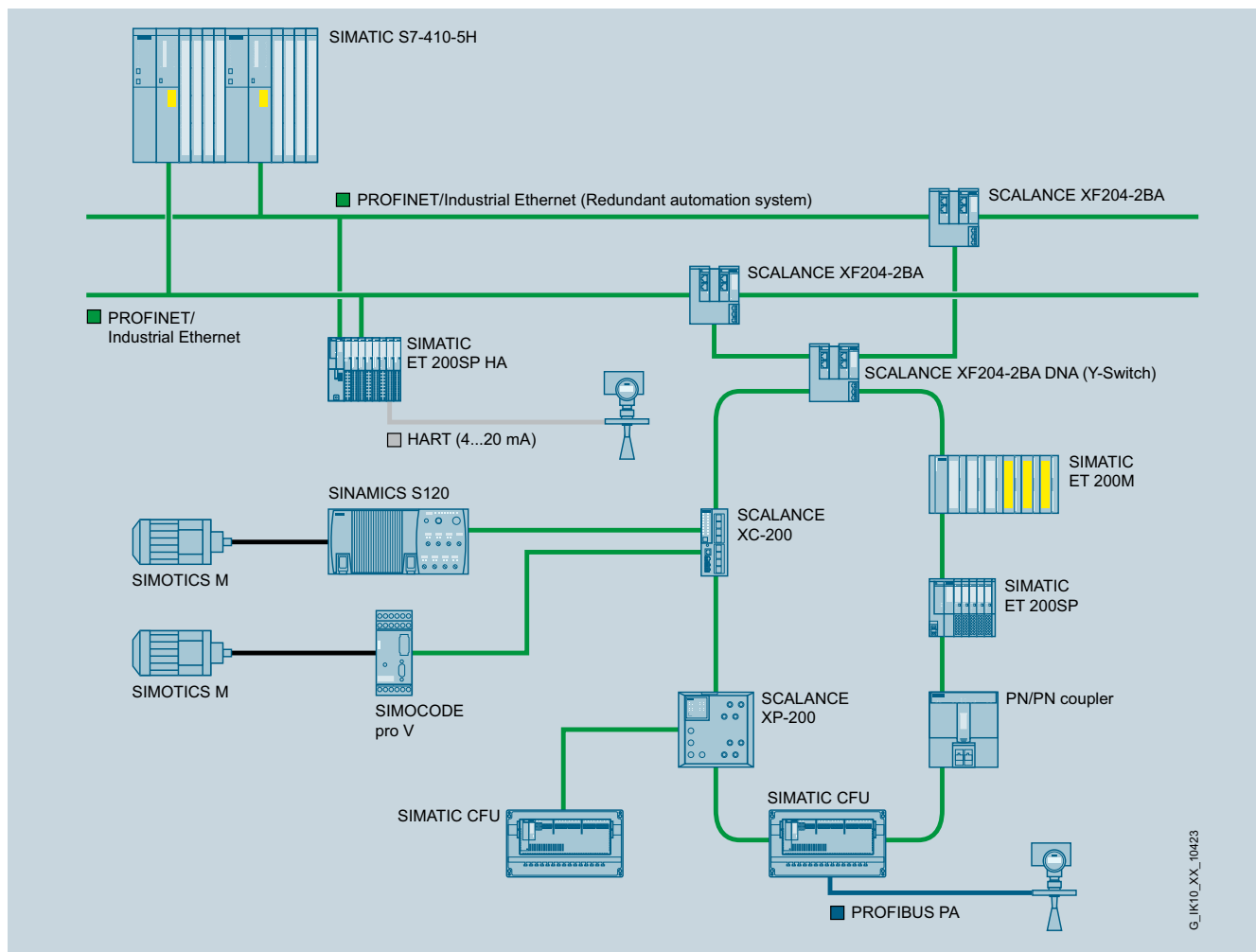
X-200 Industrial Ethernet switches for the field level

data rate of up to 1 Gbit/s, a high-performance connection to the production network is made possible. In addition, stand-by connections increase the redundancy in the network even in the event of a hardware failure. Approvals, e.g., for Ex Zone 2 and railway standards for the use along rail-guided routes, expand the possible applications of these Industrial Ethernet switches. The EN 50155 rail standard and the EN 45545 fire protection standard for the use in trains are supported by the devices of the SCALANCE XP-200 series, which furthermore come with an IP65 protection rating. These

variants are thus ideal for a cabinet-free design. Besides electrical interfaces with M12 connection technology and speeds up to 1 Gbit/s, these switches can power up to eight Power-over-Ethernet-capable devices such as WLAN access points and optical readers. This reduces the wiring effort, as only one line is necessary for data and power. For the fastest production processes requiring maximum accuracy, the SCALANCE XF204-2BA IRT switch in the design of the SIMATIC ET 200SP is available. Fitting this remote I/O in the control cabinet, the switch variant enables the transmission of isochronous data packets via PROFINET with IRT real-time capability – without interruption in case of a communication connection failure thanks to the bumpless MRPD redundancy mechanism (media redundancy with planned duplication).

Y-Switch – for the Connection of S2 Devices to highly available Systems

In addition to the SCALANCE XF204-2BA IRT switch, there are two other representatives from this product line, which are particularly suitable for the process industry. With hardware properties such as coated circuit boards (conformal coating) and NAMUR NE 21 compliance, the SCALANCE XF204-2BA and SCALANCE XF204-2BA DNA switches can also be used under climatically harsh conditions. In doing so, the SCALANCE XF204-2BA DNA occupies a special position:



Y-switch integrates S2 devices into a redundant R1 system

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It comes equipped with the so-called Y-switch functionality, which allows S2 devices to be integrated into a highly available R1 system. S2 device describes a compact PROFINET device such as the new SIMATIC CFU, which can be operated on a highly available system such as the SIMATIC S7-400H. The R1 system is the redundant execution of the communication interface of a PROFINET device, as can be found, e.g., in the new SIMATIC ET 200SP HA remote I/O. The Y-switch also allows the S2 devices to be first redundantly transferred into a ring before being integrated into the R1 system. Digitalization is thus achieved in process automation – also thanks to the flexible use of interface options. Through various bus adapters, which in addition to the SIMATIC ET 200SP can also be used with all SCALANCE XF204-2BA devices, several combination possibilities are available. Besides bus adapters with copper connection technology (RJ45), there are optical connections (glass or plastic optical fiber) and the combination of both.

Industrial Communication – the Key Element in the digital Company

The requirements for industrial networks are steadily rising. In the future, too, companies must be able to conveniently manage ever-increasing amounts of data and a growing number of intelligent participants. By utilizing proven standards such as PROFINET and OPC UA, the digitalization is taken into account. By means of powerful network components, an end-to-end, open and secured communication from the field level to the cloud is realized in just one network. Worldwide available know-how from manufacturers and partners as well as trained and certified service personnel ensure the smooth operation of ground-breaking networks, and thus provide investment protection from the planning to the commissioning to the ongoing operation. Industrial communication is therefore the key element in modern companies. The four new Industrial Ethernet switch variants from the SCALANCE X-200 product line provide support for this.

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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