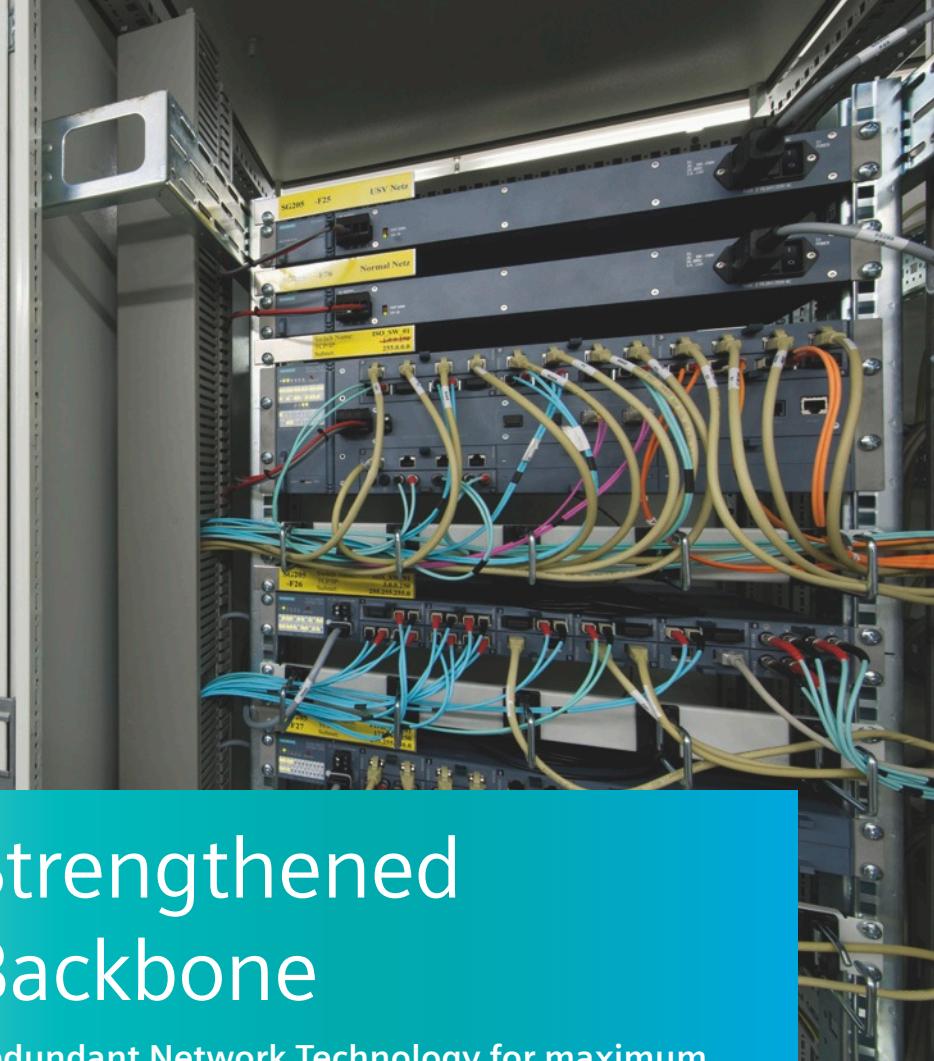





Reference



Strengthened Backbone

Redundant Network Technology for maximum Availability and Performance

As the basis for the pending virtualization of the process control level in the production of sugar substitutes, the operating company has modernized the backbone of its plant network. With 1 or 10 Gbit/s fast, redundant and modular Industrial Ethernet switches, the company significantly increased the data transmission rates, the reliability, the flexibility, and thus the performance and availability of the overall system.

In complex technical processes, the availability of the plant network is a decisive factor for the productivity and the quality of the processes as well as the end products. In segmented networks, missing process data, let alone failures in subnets, can sometimes have costly consequences. In principle, this can also happen during the industrial production of the sugar substitutes Isomalt, Palatinose™, and galenIQ™ at the plant in Offstein/Pfalz (Germany) of the Beneo-Palatinit GmbH, a company of the Beneo GmbH and Südzucker AG (see box for a brief profile).

The company has always done its utmost to minimize risks, and in the past implemented important network components, such as switches and communication channels, in a redundant manner – to the extent possible at that time.

These components stood trial again, in preparation of the planned switchover (upgrade) to the virtual version 8 of the process control system SIMATIC PCS 7 from Siemens. "With the virtualization, the circulating data amounts will continue to increase," states Walter Robelek, measurement and control technology supervisor at the plant in Offstein. "That's why we started the search for even faster and more reliable network technology. And also because the previous system with a maximum transmission speed of 100 Mbit/s already had reached its limits in some cases, which resulted in longer screen loading times."

They found what they were looking for in the SIMATIC NET spectrum from Siemens, whose managed Industrial Ethernet switches of the series SCALANCE X-500 and X-300 are tailor-made with respect to performance and functionality to perform the upcoming tasks. With them, it was also relatively easy to fulfill the requirements concerning redundancy, even at the much faster transmission speed of 1 or 10 Gbit/s. The existing basic structures and many network components in the plant sections could be largely retained. For instance, no complete rewiring was necessary, which would have caused a longer stoppage. For the close-range communication, the existing copper cables, for the "longer" distances (here up to 400 m), the available fiber optic connections were utilized.

High-performance, redundant Backbone with IT Connection

The network of the Beneo-Palatinit plant currently connects four process sections with over 50 SIMATIC PCS 7 operator stations in the central control center (altogether approximately 400 network participants) and – safeguarded via a firewall – the management information system (MIS), which is tied to the site's IT network. The MIS is a Siemens-developed sugar industry solution for the archiving, preparation, and visualization of process data. The PCS 7 servers – running on rugged SIMATIC industrial PCs throughout – and the core components of the plant network are set up redundantly and partly installed in physically separate electrical rooms.



Image 1: Redundant 10-gigabit backbone for an efficient, soon-to-be virtual process control: One of two rack-mountable Industrial Ethernet switches/routers SCALANCE XR552-12M from Siemens.

Two Industrial Ethernet switches of the type SCALANCE XR552-12M (Image 1) now function as the backbone and link. The 19-inch rack-mount devices are fully modular in design and provide maximum freedom for the network configuration with twelve slots for different electrical and optical 4-port media modules as well as four slots for transceivers of the type SFP (small form-factor pluggable) or SFP+ (Image 1). As a result, even heterogeneous ("grown") subsystems can be easily brought together and the load management be optimized.

Crucial for the decision made by the operator at this central location in the network were the routing functions of the Scalance X-500 on layer 3, which enable communication between various IP subnets (plant sections) with a transmission speed of 10 Gbit/s. Furthermore, the virtual router redundancy protocol (VRRP) combines both switches into a logical group, which presents itself in the network as a logical device, and in the case of a failure, internally handles the called for redundancy. The layer 3 functions can be easily retrofitted via the removable medium Key-Plug without changing the hardware – so that the network technology can grow with regard to dimensions or requirements.

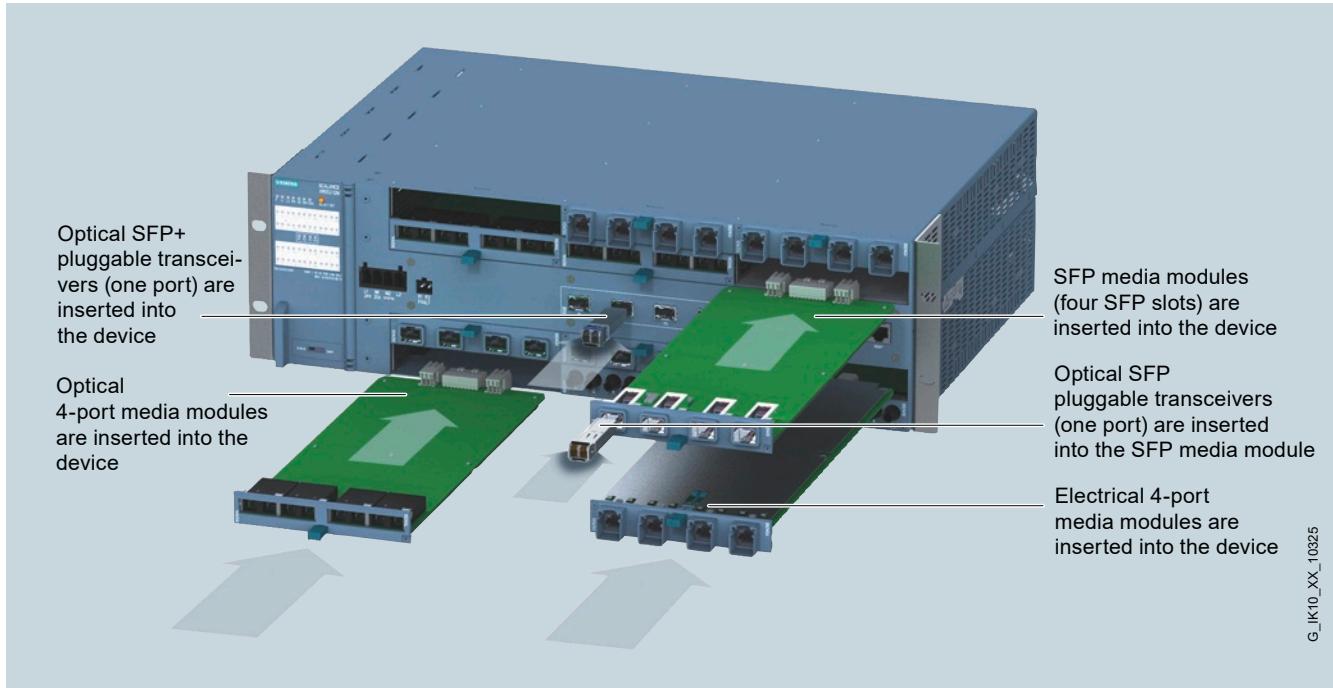


Image 2: Thanks to its modular design, the SCALANCE XR552-12M can be individually adapted to different tasks using common electrical and optical 4-port media modules.

Increased Performance and Availability in Subnets

In order to manage the increasing data flows from, to, and within the plant sections, in a quick and for the most part failsafe manner, the Beneo-Palatinit GmbH also replaced the existing switches in the subordinate subnets with current SCALANCE devices, and further expanded the redundancy possibilities. Predestined for tasks of this layer are the Industrial Ethernet switches SCALANCE X-300, which are deployed in their compact standard form factor (X308-2 inside the plants) as well as in the form of rack-mounted switches (XR324-12M in the electrical rooms). The latter are likewise fully modular and adaptable to the respective task by means of 2-port media modules (electrical and optical).

"The thus possible layer 2 redundancy represents an important advantage, which in the case of a component failure in an underlying subnet/segment does not impair any of the other ones. In the past, this could happen in the worst case," says Thorsten Kullmann, also a measurement and control technology supervisor at the Offstein plant. In the case of an error (at up to 100 switches), the new technology switches over in less than 300 ms without affecting other segments.

As an alternative to this redundancy mechanism utilizing the high-speed redundancy protocol (HRP), the media redundancy protocol (MRP) can be used, which has established itself in Profinet applications.

The in itself redundant ring structures are now also redundantly connected to the central backbone, thus covering even more possible failures. With the previous technology, the redundant rings were just connected to the top.

As long as no access to the external MIS, and thus no routing using layer 3, is required, the subordinate segments can continue to work independently, even if the entire backbone fails. If necessary, the processes can also be brought to a controlled stop.

The operator designed the system with the support of network specialists from the supplier Siemens, and readied it as much as possible for the replacement. The actual commissioning was completed within one day during a planned maintenance interval, with a subsequent optimization of the installation.

Reliability above all

The operator also took no risk when it comes to the 24 V power supply, and relies on the redundant feeding of the backbone switches by means of two separate power supply units. Additional reliability while in operation is provided by replaceable fans in the SCALANCE XR-500 units and the so-called C-Plug (configuration plug), a removable medium that saves all configuration parameters for a quick transfer to a replacement device. All media modules are also hot-swappable, i.e., they can be plugged in and removed while in operation without having to interrupt the entire process.

The network management takes place via SINEMA Server, a tool specifically developed for more complex industrial network applications. It ensures the necessary transparency and efficiency through automatic topology recognition, continuous network monitoring, and extensive functions for diagnostics and reporting.

Prepared for a Virtual Future

The modified plant network has been reliably executing the tasks assigned since April 2013. "With the high-performance and considerably more redundant Scalance switches, we are optimally prepared for the pending generation and system change at the process control level," summarizes Walter Robelek. "The fully modular approach also gives us every freedom for future system expansions with respect to media selection and transmission speed. Even if not a single Siemens network component has failed in recent years, the extended redundancy options are ensuring maximum availability at all levels."

Sweet Innovations for the Global Market

The Beneo-Palatinit GmbH, founded in 1979 and headquartered in Mannheim, Germany, is one of three companies of the functional food group Beneo, and part of the Südzucker AG, Europe's largest sugar producer. Beneo employs approximately 200 people in Mannheim and Offstein/Pfalz. The company has a global presence with subsidiaries in Spain, Brazil, the United States, and Singapore, as well as an international distribution network.

The product portfolio is comprised of functional ingredients made from natural sources. In Offstein, Beneo produces the internationally approved products Isomalt, Palatinose™, and galenIQ™ from pure beet sugar. These products are characterized by their tooth-friendliness, a low glycemic index affecting the blood sugar level, and a mild, sugar-like sweetness.

The sugar substitute Isomalt only has half as many calories as sugar. With custom-made variants, the Isomalt family is available for a broad range of applications – for sugar-free hard caramels, it is the most used raw material internationally, according to the producer.

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

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