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Secure and reliable network solution supports increased productivity

Since 1964, the small town of Indre Arna, just 10 kilometers outside Bergen, has been the home of Toro, an Orkla Group brand familiar to many Norwegians from family dinners and birthday parties. The dry mixes for soups, sauces, cakes, and waffles are produced in a highly automated factory that has been modernized and expanded nine times over the years. The latest addition: a state-of-the-art industrial network that provides a stable, reliable, and secure communication backbone for all operations in the Indre Arna facility. The solution provides excellent availability and performance of the Operation Technology (OT) for today and for many years to come thanks to a segmented and redundant Layer 3 network from Siemens. And this while having a defined interface to the enterprise network.

Using the latest production technology has always been part of the Orkla tradition, explains Ståle Faugstad, technical lead for automation and IT for Orkla in Indre Arna: “We upgraded our operations with state-of-the-art automation systems in the mid-90s, and even today, the Indre Arna factory is very advanced in this respect. Nevertheless, several components had reached the end of their lifecycle, and Orkla could not upgrade its network security to today’s standards with the existing capabilities. With the existing systems, we couldn’t operate the factory any longer as we needed to. We needed to act,” says Faugstad.

Solution highlights

- Eliminated network-related production downtimes (before 3 or 4 days a year)
- Freeing up of resources for further improvements and extensions
- Higher plant performance thanks to advanced apps utilizing process data
- Highly available, reliable network with real-time and safety related communication
- Sophisticated but easily manageable architecture reducing OPEX significantly

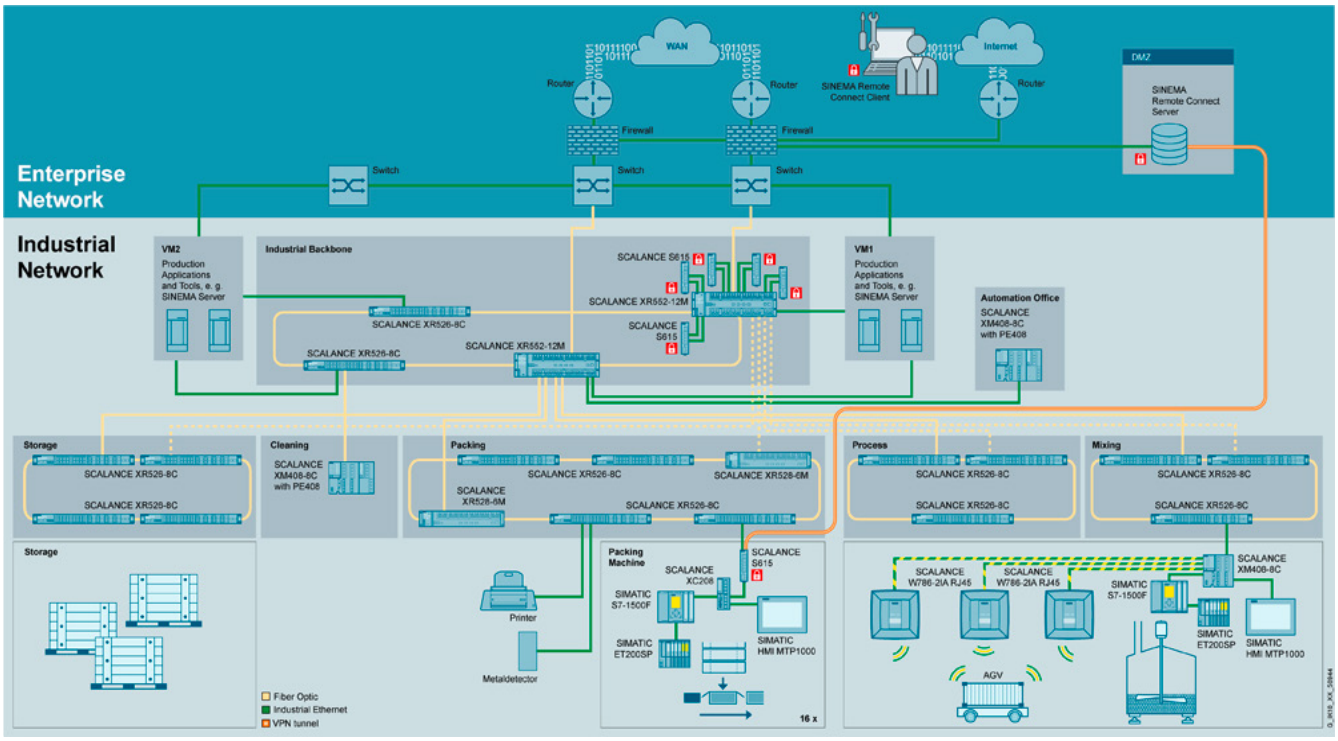
Addressing the upgrade challenge with a secure, highly available, and reliable production network

At first, a pure IT solution seemed to be insufficient. "We cannot have a failure in the network because then we lose production." So the solution had to have robust, stable, industrial-grade components, "and we needed to have the ability to service the network ourselves locally to make sure we would have the shortest possible response times should something go wrong", emphasizes Faugstad. In an IT environment with a standard service provision, you would typically have just one virtual local area network (VLAN). The problem with this is that any issue can then quickly spread through the entire factory, continues Faugstad: "It´s obvious that a physically separated OT network became necessary. At the same time, need for real-time communication occurred with all the associated requirements. Finally, planning and building a new OT network is a challenging task, so a reliable partner with expertise for consultancy had to be integral part of all activities. We have gone through several re-automation phases recently, where we upgraded our installed systems to improve performance but also to make sure that we can service the components for the long term." Among the components recently upgraded were the programmable logic controllers (PLCs) on the various machines for mixing and packaging, where Orkla introduced SIMATIC S7-1500 PLCs. The facility also uses many other Siemens systems, including SITOP power supplies and SIMATIC HMI systems. However, the automation and IT systems were proving increasingly hard to maintain in recent years and Orkla was experiencing network stability issues.

Faugstad and his team carefully evaluated the various options and finally proposed implementing a new, dedicated industrial network for the OT level. "The challenge was clear," he says. "But what was not so obvious was which solution would fit our requirements – a new fieldbus at the automation level or a dedicated OT network? We went to trade shows and contacted various vendors as well as our own IT department, and in the end, we decided that the OT solution made the most sense for us. We already had TCP/IP (Transmission Control Protocol/Internet Protocol) communication for several processes such as printing and connecting to the enterprise resource planning (ERP) level, and by upgrading our network we could have both communication between our production departments and between the management and production floors." Faugstad and his team opted for an industrial network solution from Siemens – and they have not regretted this decision, he says. The new network provides the uptime, reliability, security, and serviceability that the production communication requires.

At first, the IT department had some concerns regarding the type and structure of the OT systems, Faugstad remembers, "but we were able to demonstrate that what we needed from the network was not achievable with an IT solution alone but required production and automation expertise as part of the application." One key differentiator between OT and IT is uptime without any failures, as Faugstad said. The new OT network consists of a redundant backbone implemented as a fiber-optic Industrial Ethernet ring that links the individual VLANs. SCALANCE X Layer 3 switches handle the traffic within the backbone. "This way, we can route the traffic in the OT network, which makes the backbone very fast and stable," explains Faugstad. Connected to this backbone are the virtual data servers: "We have a total of 18 servers in a virtual environment that are part of the Orkla domain managed by our IT department. But we perform all day-to-day service locally ourselves. That way, we really have the best of both worlds."

Inside the system: two of the high-performance SCALANCE XR-500 switches that form the new network backbone at the Indre Arna facility.



Network architecture

Linked to the backbone are more than 40 VLANs for the production floor. All VLANs are also equipped with SCALANCE X switches and protected by SCALANCE S Industrial Security Appliances. The highly segmented network architecture is another aspect that differentiates an OT network from an IT network, says Faugstad: “By isolating units in their own VLANs, we can limit the effect to just one cell – if anything goes wrong, the communication with parts of the mixing unit, the packaging department, or the utilities might have some issues, but not the entire production process.”

Some parts of the OT network require real-time communication, says Faugstad: “We have many Automated Guided Vehicles (AGVs) on the production floor, for example, in the weighing and dispensing area. Some of these have their own scales, and they need to communicate their weight readings back to the PLC for confirmation in real time – and do so every time, as the weighing of products and ingredients is critical for product quality.” In this part of the facility, the wired network is extended by a wireless solution with SCALANCE W, “which we have had absolutely no issues with,” says Faugstad. “It works reliably in an industrial environment, and it has done so from day one. A very good solution.”

In the weighing and dispensing area, AGVs can communicate weight readings back to the PLC in real time via a wireless network that is also part of the SCALANCE W solution.

Combining expertise and services to get the best solution

Faugstad and his team developed the application for the AGVs themselves with support from Siemens. “That way, we could implement exactly what we needed and integrate it with the automation level,” explains Faugstad. “This is also why we chose Siemens as a partner: they have both automation and network expertise, so you can discuss the entire application with them. For example, we had some issues with communication across VLANs, and we got the Siemens support team involved. They identified the cause and came up with a solution within just a few hours because they know how PLC-to-PLC communication works, they know the protocols, and they know how to integrate this with the OT network.”

Siemens took a consultative approach for the planning, design, and implementation phases of the industrial network through the company’s Professional Services team, helping Orkla to choose the best network architecture and system solution, and the team will also service the OT network. The result is a stable, reliable, and secure solution for data acquisition, order handling, and equipment service, says Faugstad. “Our colleagues in the automation team have their own VLAN for remote servicing of the PLCs and automation systems, and they can fix the majority of issues via the network from their central office,” he explains. “We can provide partners and vendors with secure VPN access to machines or equipment units, and we can manage this access through the management software for VPN and remote connections. We are using SINEMA Remote Connect for this. We also use the SINEMA Server network monitoring software to identify issues in the network and fix them ourselves. It’s very convenient – so convenient that Orkla considers this solution as a model for other sites as well.”

Looking into the future at the further expansions

But the Siemens solution not only provides stable communication for current operations; having a robust and reliable network has made day-to-day work for him and his team much easier, Faugstad explains: “As we are no longer busy addressing network issues, we have the resources for upgrading and expanding the solution – actually improving things and not just keeping them running.” Current projects include an in-depth security assessment of the VLANs along with ongoing expansions of the systems and putting production data to use in new applications. “We are already calculating performance indicators such as overall equipment efficiency (OEE) from the production data we acquire over the OT network,” he says. “Now we are discussing measuring OEE based on operator inputs and linking the HMI systems with the calculations on the management level. This is also why we needed a new network – to be able to service and upgrade our network for at least another 10 years” as Faugstad says “and expand the functionality for new data applications.”

Using the SINEMA Server network monitoring software, the staff at the Indre Arna facility can identify issues in the network and resolve them directly by themselves.

Network solution with zero downtime

Thanks to the upgrade, Orkla now benefits from a solution that is secure, offers maximum uptime, and is easy to maintain with local resources. The benefits of the new OT network are visible today at the facility in Indre Arna, says Faugstad: "By moving to the new network and the robust solution from Siemens, we have reduced production downtimes due to network issues from maybe three or four days a year to zero. And because we use industry-grade components from Siemens, we will be able to enjoy this reliability for a long time," explains Faugstad.

"By moving to the new network, we have reduced production downtimes due to network issues from maybe three or four days a year to zero."

Ståle Faugstad, Technical Lead for Automation and IT, Orkla, Indre Arna

A Taste Pioneer for more than 70 Years

Toro was founded in 1946 and initially operated from a factory on Bergen's Nøstegaten Street. The first products were beef stock cubes, which gave the young company its name: "Toro" is the Spanish word for ox or bull. But Toro did not stop there and continued to expand its offerings. One milestone was in 1964 when Toro launched Bergensk Fiskesuppe (Bergen fish soup), the world's first instant fish soup. Legend has it that the demand for this new product was so high that packaging ran out just a short time after launch and new supplies had to be flown in from Switzerland by airplane; apparently, there were long lines of cars outside the Toro factory waiting for production of the popular fish soup to resume. Whether this particular anecdote is true or not, the success of the new products was undeniable; the Bergen facility soon proved to be too small for the company's rapid growth, and Toro moved its operations to Indre Arna. Since then, over the course of more than 50 years, the plant has been expanded nine times to keep up with the growing product family, which now includes not only dry soup mixes and casserole products but also cake and waffle mixes. Today, the Toro brand and its production facilities are part of Orkla Foods Norge, and Toro continues to live out its tradition of constantly innovating, expanding into new areas, and introducing new products.

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 constitute one element of such a concept. For additional information on industrial security measures that may be implemented, please visit
https://www.siemens.com/industrialsecurity

Published by
Siemens AG

Digital Industries
Process Automation
Östliche Rheinbrückenstr. 50
76187 Karlsruhe, Germany

PDF
Reference
DI PA-19/20-45
PDF 0820 5 En
Produced in Germany

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