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Smart industrial rail guided vehicles need a reliable communications network

"The reliable and secure communication solution is the key element to maximize the utilization of available production capacities and securing the needs of our customers by providing stable internal logistics of goods. The deployed technology has definitely contributed to improve the company's operational processes."

Jaroslav Jaroš
Mondi SCP, IT Manager

Unique WiFi-based solution for mobile rail guided vehicle control in the manufacturing industry

1. REQUIREMENTS

- **replace an existing outdated communication system** of the automated finished product warehouse for a more innovative technology
- **eliminate downtime in the manufacturing process**
- **improve availability and stability** of the pallet transport system
- comply with the **highest quality and safety standards**
- **streamline and simplify difficult maintenance**

2. SOLUTION

- design a **new WiFi-based communication system solution**
- **replace ProfiBus with ProfiNet communication protocol**
- **secure and encrypted protocol**
- PRP (**Parallel Redundancy Protocol**) in a wireless environment
- **wireless Access Points** integrated into the existing wireless environment
- **Cisco industrial-grade networking components**

3. OUTCOMES

- **elimination of production losses**
- **improved communication system reliability**
- **uninterrupted passage** across the entire wireless network
- **redundant solution** in case of a component failure
- **simpler and less expensive maintenance**
- **secured and encrypted wireless communication**
- **effective system diagnostics**

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Background

What do industrial enterprises need to operate efficiently and without unnecessary downtime? Undoubtedly, many managers would say reliable machines, timely supplies of raw materials and energies, and skilled labour.

Probably, only a few would highlight a communication system used for the transportation of pallets loaded with goods from an automatic packaging line to a warehouse. However, the example of Mondi SCP - a pulp and paper producer from Ružomberok, Slovakia, shows how important role communication technologies play not only in people's lives, but also in manufacturing enterprises.

Frustrating downtimes

Today, industry is largely automated, and Mondi SCP is a case in point. Finished wrapped pallets are transported from the production plant to an automated rack warehouse by autonomous rail guided vehicles controlled by a central software system.

For several years, the rail guided vehicles communicated with the control centre via ProfiBus, with data being transferred through the Wampfler contact communication bus. However, such a system is, to a large extent, obsolete and requires relatively complex maintenance.

Moreover, if one rail guided vehicle stops, all the other rail guided vehicles stop as well, and it is often difficult to troubleshoot the problem. Since the production continues non-stop, newly packaged products begin to pile up in the packaging area.

The company management therefore decided to replace the obsolete and hard to maintain communication system with a new modern stable solution meeting the highest quality and safety standards. They entrusted the project to Soitron that has extensive experience in designing wireless networks in both industrial and office environments.

Reliably, in real time

As part of this project, Soitron presented in the Ružomberok paper mill an innovative ProfiNet-based wireless communication solution for autonomous rail guided vehicles. This new protocol with the response rate of less than 100 milliseconds, which is five times faster than the former ProfiBus platform, guarantees a real-time communication between rail guided vehicles and the central system.

The network data traffic is encrypted, i.e. well secured. However, what's more important for operational reliability and process continuity is that the system is designed redundantly. *"This means that if one access point fails, the nearby access devices take over its role. The plant is also fitted with redundant switches so that a failure of one network element does not adversely affect the network functionality,"* explains Roland Rais, a network specialist at Soitron.

Communication reliability is also ensured by industrial-grade Cisco access points and network components resistant to water, dust and dirt and fit for use in extremely low or high temperatures.

"This solution can be implemented without putting all rail guided vehicles out of operation."

Roland Rais
Soitron, System Engineer

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"Deploying the ProfiNet industry protocol in a wireless WiFi/PRP environment is a unique solution that, in terms of its scope and the type of technology used, is the first mplementation of its kind in the world."

Michal Remper
Cisco, Consultant System Engineer

New know-how for Cisco

A ProfiNet-based industrial wireless communication network in which mobile objects must communicate in real time and move between multiple access points is a globally unique new solution. After completion of the project at Mondi SCP Cisco is developing a so-called **Cisco Validated Design**, i.e. a certain type of gui-delines for designing this type of solutions. *"Information obtained during our testing and solution finalisation was sent to Cisco laboratories to help them create the validated design,"* adds R. Rais.

Naturally, even with such basic guidelines for designing the communication of mo-ving objects, the actual design and imple-mentation of such solutions is far from trivial. Purchasing high-end hardware alone is not enough. One also needs to have advanced knowledge of networking - from the most suitable positioning of devices, to choosing right type of cabling, to con-figuring and debugging communication flows, or integration into the existing corporate network.

"The design of the communication solution will never be the same, even if we used the same hardware components," explains R. Rais. However, even the choice of hardware is different for each customer. For example, in Mondi SCP, Soitron used Cisco PRP protocol (Parallel Redundancy Protocol) implemented in a wireless

environment and then finetuned it to meet the requi-rements of the customer's existing system.

No production disruption

After the viability and reliability of the new wireless communication system for the control of autonomous rail guided vehicles has been verified in the pilot phase, Mondi SCP deployed it to their production system. According to R. Rais, a similar solution can be implemented even without putting all rail guided vehicles out of operation: *"As the control system remains the same and the data can flow through both protocols, we can equip the rail guided vehicles with necessary technology one by one".*

With new technologies the industrial plants now have an opportunity to bring true intelligence to many elements of the production process, including logistic rail guided vehicles for transport of goods. Now they can perform much more than just basic tasks - thanks to their sensors, they can collect useful data about their environment and themselves. For example, they can provide an early warning if a specific component is worn out. However, for any machine or equipment in the industry to be smart, they need a reliable communications network to communicate and continuously, in real time, transmit their intelligence hidden in the data.

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"The Parallel Redundancy Protocol (PRP) over wireless allows the distribution of traffic over two parallel wireless connections to achieve the highest level of resilience, for various industrial IoT application this ensures continuous connectivity for industrial applications and minimize downtown. The solution is built based on open 802.11 standard, which allow us to interoperate with other systems."

Linyu Lu
Cisco, Technical Marketing Engineer - IoT Wireless

mondi scp

Mondi SCP, a.s.
a member of Mondi Group

Mondi SCP, a.s. in Ružomberok is one of Mondi Group's largest plants and is the biggest integrated paper and pulp producing mill in Slovakia. Daily it adds a high value to wood, our local renewable raw material coming from well-managed FSC and PEFC certified forests or from controlled sources. Its location in the centre of Europe enables the company to deliver products to its customers in the required time and quality. With almost 95 % of the production being exported, millions of people around the world are in contact with Mondi SCP products every day. Mondi SCP is one of the largest industrial entities in Slovakia and the largest private employer in the region.

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