

IWLAN with PROFINET in Outdoor Installations: Cost Analysis

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Summary

A typical application area for wireless communication using Industrial Wireless LAN (IWLAN) with PROFINET is broad-scale outdoor use. Users benefit from more flexibility, easier expandability, lower installation costs, increased efficiency in day-to-day operation, and reduced maintenance costs.

This specialist article uses a typical application to demonstrate the advantages of a fully automated, fail-safe crane control system in the steel industry. Detailed contents:

- Project definition and automation architecture
- Cost analysis
- Conclusion

IWLAN with PROFINET in outdoor installations

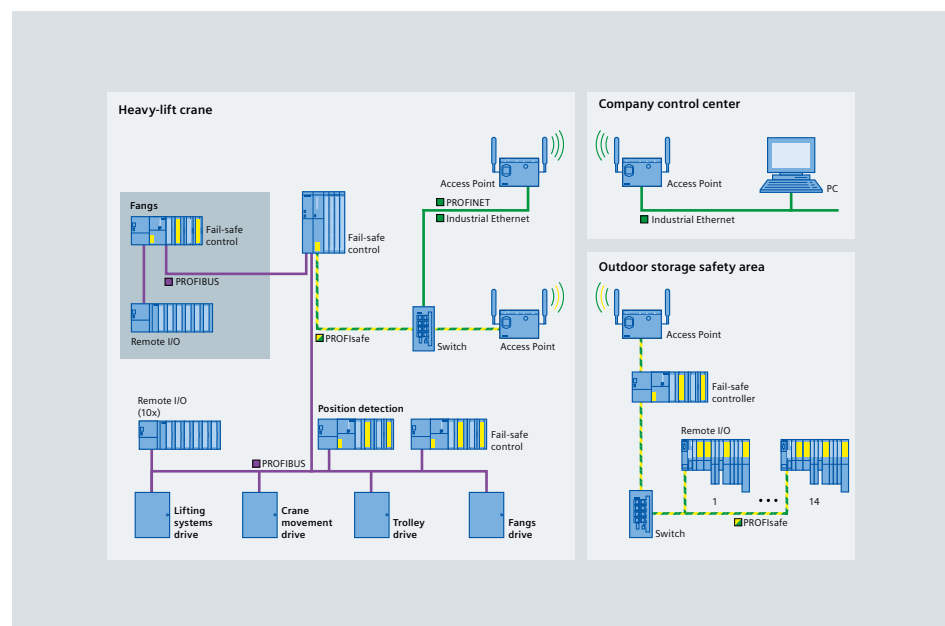
The following example compares wired and wireless solutions to highlight the benefits of wireless communication in general, and specifically of IWLAN with PROFINET, the leading Industrial Ethernet standard.

Project definition and automation architecture

In our example, a company is operating a heavy-lift crane in its cold rolling mill to handle steel coils of varying dimensions and qualities. The attached outdoor storage area is around 16,000 square meters and has room for up to 1,500 steel coils. The outdoor storage area is fully fenced for the protection of people, machines, and material, and access is provided through 14 safety gates with fail-safe surveillance. The steel coils are quickly and safely moved by the crane over a length of 450 meters and a breadth of 50 meters.

It is precisely in this type of open-air application that a wired automation solution has a number of disadvantages. Trailing cables and contact conductors are susceptible to wear and tear. Cable breaks or short circuits due to leaky connections or cables can lead to unplanned and costly system breakdowns. The systems must therefore be regularly inspected and maintained.

Figure 1:
Typical automation architecture with IWLAN and PROFINET



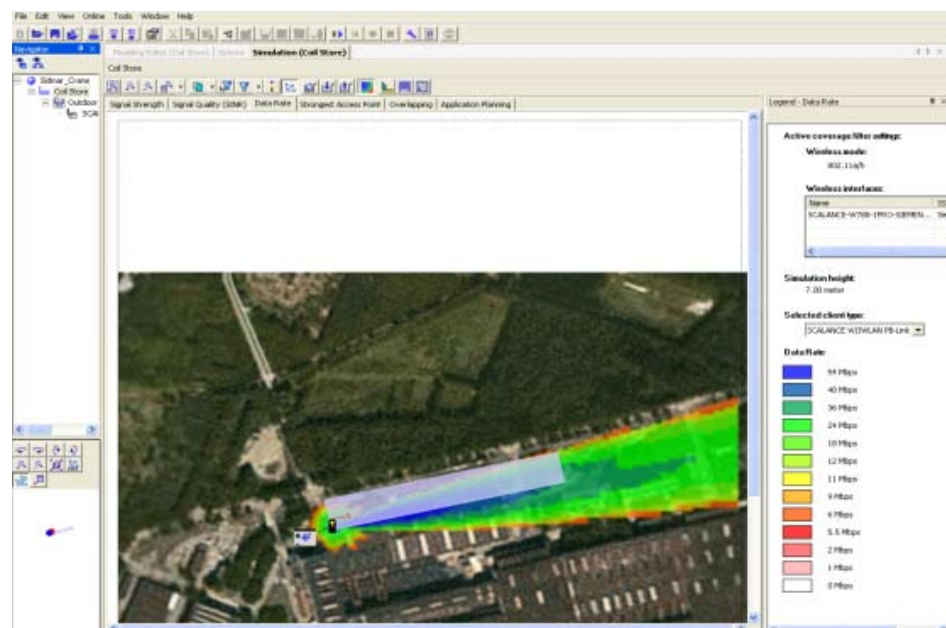
Connecting the systems wirelessly eliminates these disadvantages. A typical architecture for this application is illustrated in Figure 1. The crane is connected to the I WLAN network using a SCALANCE Industrial Ethernet Switch. All the crane movements are controlled via a high-performance SIMATIC S7-400 controller that communicates with the subordinate systems via PROFIBUS. The safety systems are also connected to PROFINET via I WLAN.

In order to ensure that the systems operate smoothly, there must be guaranteed radio coverage in the crane's area of operation. Radio field planning is quick and easy to carry out with the help of the SINEMA E tool (Figure 2). This tool is perfectly matched to the SCALANCE network components but can also be used for the construction of a radio field with components from other manufacturers.

Figure 2:

Radio field planning with SINEMA E: In addition to the floor-plan drawings, satellite or aerial photographs can also be used as a basis for radio field planning.

SINEMA E ensures that optimal coverage of the work area of the wirelessly connected systems can be quickly and easily planned. Interested users can request the SINEMA E demo CD from the regional Siemens partner.



The benefits at a glance

The IWLAN solution with PROFINET offers a wide range of advantages for crane control:

- Higher performance thanks to a higher data transfer rate

- Greater flexibility and system availability

- Clear cost savings, both in installation and in operation

- Increased safety in operation

- Safety applications possible via a single medium with PROFINET, including wireless

- Integration with Ethernet: easy connection to the control and company management levels

- Future-safe solution

- Speedy installation and commissioning thanks to reliable hardware components for wireless communication

- Good support thanks to widely used technology

Cost analysis

With the suggested configuration, the savings opportunities are already considerable at the initial investment stage, as demonstrated by the sample calculation in Table 1. The initial installation costs alone come to less than 20 percent of the costs that would be incurred for a conventional wired network.

What's more, in addition to significantly reduced installation costs, users also benefit from minimal service and maintenance costs, as there is no need for components that are susceptible to wear and tear, such as contact conductors and trailing cables.

Table 1:

Total cost of ownership comparison for a crane with directional antennas

Investment costs for a conventional wired solution	
Material and installation costs approx.	15.550 €
Annual servicing costs approx.	930 €
Total costs approx.	16.480 €

Investment costs for an IWLAN solution with PROFINET	
Material and installation costs approx.	3.185 €
Annual servicing costs approx.	n/a
Total costs approx.	3.185 €

Savings potential	
In first year approx.	13.295 €
In subsequent years approx.	930 €
Savings after 3 years approx.	15.155 €



Conclusion

In addition to the maintenance cost savings, there are also advantages for the system's operation. For instance, the risk of unplanned breakdowns – for example, through faults caused by cable breaks – is considerably reduced. These advantages are also significant but cannot generally be quantified. In the overall survey of a specific installation, these factors must also be taken into consideration, however, meaning that the effective cost savings of a wireless solution are actually even higher.

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