



Reference

A FARSIGHTED SOLUTION:

WLAN-communication for the Augustusburg Cable Railway

170 meters above the valley of the river Zschopau (Saxony, Germany), visitors can enjoy a splendid view over the hilly countryside of Central Saxony – one of the reasons why Augustusburg describes itself as a “City with farsightedness”. Farsightedness also led the operator of the 110 year old cable railway to modernize its communication with SCALANCE IWLAN components. Now it benefits from higher reliability, better diagnosis, and higher data quality – and is optimally prepared for future challenges.

Highlights

- Reliable communication even under harsh weather conditions
- Low-maintenance thanks to easy diagnosis and troubleshooting
- Higher bandwidth facilitates additional services such as passenger information
- Better data transmission quality, e.g., for high-definition video data
- One combined network for control, audio, and video data
- Low-maintenance IWLAN solution for communication between cars, mountain station, and valley station



The cars meet each other at the passing loop in the middle of the 1.2 km long track.

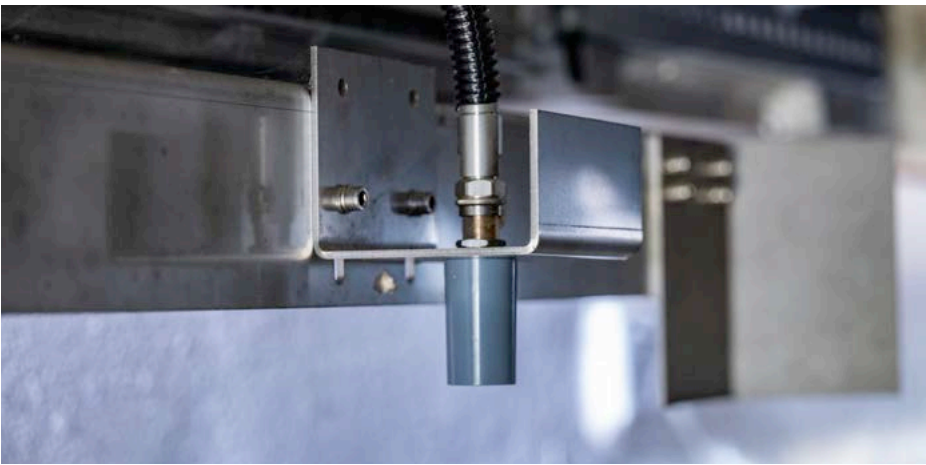
In the 16th century, Elector August of Saxony took advantage of the city's unique location and built an imposing castle here. It is visible from afar and still overshadows the town today. By the end of the 19th century, the spot served as a recreational area for visitors from the nearby Saxon industrial regions. It was them who provided the impetus for the construction of the cable railway between the Erdmannsdorf quarter, which is located in the valley, and Augustusburg. Since 1911, the railway overcomes an elevation difference of 168 meters over the course of its 1,200 meter journey. Apart from being a tourist attraction, the railway is also part of public transportation. "We therefore have to make sure that we can guarantee a reliable railway operation," explains Peter Donat, operations manager of the Augustusburg Cable Railway.

New and more stable communication for the historic railway

It is this reliability that has worried the operators in recent times. The cable railway has driverless cars and hence both the cars and the tracks need to be monitored permanently to ensure that the operations manager at the mountain station can react immediately in case of disruption. For this reason, the cable railway's two cars were connected to the control station in Augustusburg via three media: a wireless network for controlling the cars, a wired network for transmitting video data, and another wireless network for audio data to establish an audio connection with the passengers.

Especially the wireless connections had been subject to failure. Partly, this was due to the widespread area: the railway's track runs along a densely wooded valley. This meant that branches had to be removed and trees close to the radio masts had to be cut back. There is also a ski slope directly next to the track, which is sprayed with artificial snow during the winter. The moisture from the snow canons heavily impairs the radio connection. "But apparently, the operator cannot simply stop operation – after all, the cable railway is essential for transport in this town," explains André Aßmus. Two years ago, he visited Augustusburg for the first time to examine the current status of the communication solution. He is one of two managing directors of Ari-contact GmbH & Co. KG and has already partnered with Siemens in the past to equip numerous cable railway projects with automation and communication technology.

Furthermore, the Verkehrsbund Mittelsachsen GmbH, which operates the cable railway, was increasingly concerned by the maintenance and service costs. As a result, they decided to rebuild communication and control of the Augustusburg Cable Railway on a future-proof foundation and tasked Ari-contact with developing a concept.



The antenna of the Clients on each of the two cars moves at a constant distance from the RCoax cable.

Low-maintenance solution with IWLAN and RCoax antennas

To increase the reliability of communication and data exchange, Ari-contact used a solution that had already proven itself in other cable railway applications. Along the entire track, high-performance IWLAN communication has been established on the basis of SCALANCE components from Siemens. For this purpose, 21 SCALANCE W770 Access Points have been installed in existing shafts along the track, which were then connected via a fiber optic ring with powerful SCALANCE XC-200 switches. The fiber optic technology connects the Access Points with each other and establishes a connection between the mountain and valley stations. In the cars themselves, the SCALANCE W730 serves as IWLAN Client for outside communication.

To transmit signals between the Client Modules in the cars and the Access Points on the track, every Access Point is equipped with RCoax radiating cables, which function as antennas and are laid along the rails. This antenna type emits radio signals through openings in the outer conductor – thus establishing the radio connection with the mobile participant. As a result, a defined radio field is built up along the entire 1.2 km railway. The small and constant gaps between the antennas of the Access Points and Clients result in a high signal quality. Furthermore, the radio field is no longer impaired by branches or other factors, which leads to a much more reliable communication than before.

For André ABmus, another particularity of the project in Augustusburg was the network's inner architecture. "Overall, we transmit three different data categories over a single network." These data categories are prioritized differently. The control data is most important – "to avoid disruptions, it is essential that safety-related data is transmitted quickly enough." The audio communication between the control station and the cars, which includes emergency calls, has the second highest priority. In third place is the data from the surveillance cameras: as the railway track runs through a densely wooded area, branches and other barriers can lead to unplanned disruptions. To make sure the dispatcher sees these in time, every car is equipped with one camera at the front and one at the back, which monitor the track. "In addition, the dispatcher receives camera footage from the car's interior to notice when a passenger has a problem, for example, a medical emergency," explains ABmus.

To ensure the secure and reliable transmission of this data, the Access Points and Client Modules along the track utilize special iFeatures of the SCALANCE systems: the added industrial feature "Industrial Point Coordination Function (iPCF)" was developed for industrial applications such as electric overhead monorails and enables real-time data transmission and fast roaming. With iPCF, the entire data flow can be assigned to one radio cell.

For this purpose, the Access Point queries all clients of a radio cell in cyclical intervals. The short polling cycle times allow the client to quickly determine, whether the connection to its Access Point still exists. iPCF thereby also enables a quick and reliable change between two radio cells with constant roaming times below 50 ms.

More possibilities with a significantly leaner architecture

The new communication solution has now been in operation for a few months and has already convinced the operator. A key reason for this is the considerably better transmission quality, especially for video data. Whereas the images used to be heavily pixelated, they now appear pin-sharp and provide the operations manager with a clearer view of the track's condition. Due to the higher bandwidth, even information for the passengers, such as on timetables or the railway's history, can be transmitted simultaneously to the safety- and operations-relevant functions. "Thanks to the IWLAN solution, the cable railway can now transmit all data over one common network where previously three networks were needed. This makes maintenance significantly easier," explains Aßmus.

Additionally, the new system is future-proof, since data is exchanged via standard IT and OT protocols, such as TCP/IP or PROFINET. This also allows communication to be easily integrated into the automation solution, thereby simplifying diagnosis and troubleshooting, as operations manager Peter Donat confirms: "The quality of the information of diagnosing is substantially higher. You can see quicker what may be the fault and identify the root problem easier than previously." Of course, the communication is also significantly more stable than it used to be: "Here we have an installation with real outdoor capabilities, rugged enough to work reliably in any wind and weather," as Aßmus is pleased to conclude. In the meantime, he and his project team at Ari-contact have equipped another project with the same communication solution and are already working on the next cable railway project: "In this next project we will also rely on the same solution. There is no reason for us to look for anything else."



High-definition video footage of the track and the car's interior are transmitted via the IWLAN network.

Security information

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The operations manager always has all current information regarding the track's condition at hand.

Tradition has future

In the meantime, Peter Donat has already cleared the next scheduled ride and makes sure that passengers arrive at their destination as safe as ever. This time, it's a kindergarten group, for whom the ride on the cable railway seems like a real adventure. With glowing eyes, the children watch how the two cars pass each other at the passing loop and pepper their teachers with questions even after leaving the car. Who knows: maybe one of these kids is going to control the cable railway's cars in twenty years – as far as communication is concerned, the Cable Railway Augustusburg is best prepared for the coming generations.