



Reference

Communication in sync with the train

For many travelers, vacation starts as soon as they arrive at Düsseldorf Airport – at the car park or airport railway station: at a lofty height of ten meters, they can enjoy the view over the airport while riding the SkyTrain and comfortably getting to the terminal and the gates. In the future, the cabin railway will provide even greater convenience for its riders – with a passenger information system and even more demand-based timing. The foundation for this was laid by the operator in form of a reliable network solution and state-of-the-art technologies for wireless communication.

The fully automatic train, which was developed and built by Siemens Mobility, has been running the 2.5 kilometer-long route between Düsseldorf Airport railway station and Terminal C since 2002. Up to six trains, each consisting of two coupled cabins, can be used with variable timing. “According to demand, we can transport up to 2,000 passengers per hour and direction,” explains Christian Höveler, Systems Engineer for SkyTrain at Düsseldorf Airport. “The SkyTrain is highly frequented, especially during peak times. That’s why it’s important to us that our equipment and systems work reliably so that passengers do not experience long waiting times and quickly get to the terminal, car parks, or railway station. In addition, our



Up to 2,000 passengers can be transported per hour with a total of six trains.

goal is to further optimize operations – for example, through a more flexible train operation with multiple lines, needs-based vehicle deployment, and better communication with passengers, even while moving.”

The right infrastructure is crucial

Höveler and his team can make use of a well-developed infrastructure – there is a separate track for each driving direction, and trains can be flexibly added to passenger service or taken out of service by means of several railway switches and signal control devices. The train operation itself then runs fully automated with an encapsulated control system. “Some time ago, we also installed a star-shaped Gigabit network with two fiber optic cables alongside the track – through which we can transmit information over the entire route. However, what we still lacked was a high-performance and reliable connection of the vehicles and cabins – in order to be able to capture status and diagnostic information while moving and to provide the passengers on the trains with dynamic information about stops or the progress of the journey. That’s why we decided to set up a wireless connection as well.”

When searching for the right project partner, Düsseldorf Airport had a few central requirements: the wireless communication solution had to be reliable, secure, and modularly expandable – “apart from that, we were open to many solutions

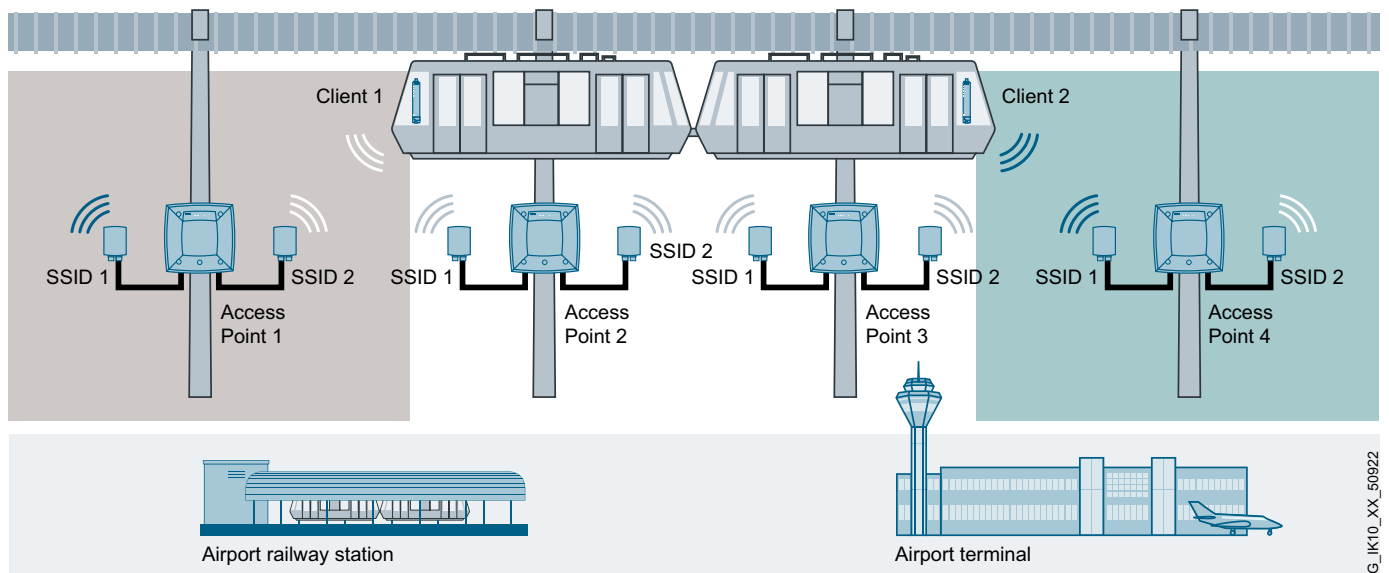
and concepts,” recalls Höveler. A central element, however, was the operational safety of the railway. Since Siemens Mobility is already responsible for the operation and maintenance of the SkyTrain at Düsseldorf Airport, and also was to assume the upkeep of the communication solution in the future, it was part of the tender that the installation work on the trains themselves always had to be performed by the Siemens team. Therefore, it was obvious for Höveler and his colleagues to request a wireless solution for connecting the trains from Siemens, among other suppliers.

Unbroken communication for a tightly synced system

The concept that Siemens proposed for the SkyTrain quickly convinced the persons responsible. It is based on high-performance network components that were developed for demanding applications in industry and logistics. This means Düsseldorf Airport can ensure that the trains always have a connection to the network even while they are moving – through, among other things, IWLAN components without any latency during the roaming process. The SCALANCE W Client Modules and Access Points utilize the industrial Parallel Redundancy Protocol (iPRP). iPRP is based on PRP redundancy technology known from wired networks. In short, data packets are duplicated and transmitted on two independent infrastructures,

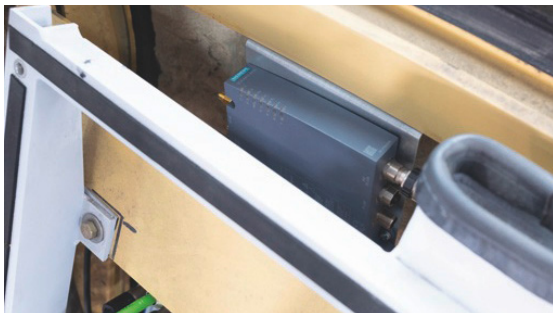


Quite recently, the wireless network solution has made it possible to also exchange information with the trains while they are moving.



i.e., two radio connections in wireless networks are used in parallel. Two IWLAN clients simultaneously transmit the data to two Access Points. The two Access Points provide two SSIDs and the clients are configured to only connect to one of the two SSIDs. Additionally, iPRP ensures that the clients never connect to the same Access Point. If a client leaves the range of its Access Point, the communication continues over the second connection. Meanwhile, the first client is already establishing the connection to the next Access Point. Only then does the roaming process start on the second client. This guarantees that both clients of a vehicle are never simultaneously searching for alternative Access Points and that always at least one connection is stable. iPRP thus enables a reliable communication between the trains and the stationary network, even if the roaming process is delayed or interference occurs.

This special additional function meant for industrial applications immediately convinced Höveler: "In this way, we can always get current information into the trains – practically instantaneously. Other solutions, such as UMTS, sometimes exhibited latencies of up to 20 seconds during roaming tests." Besides iPRP, the Siemens concept also included other industry-specific functions for the railway operation. With the help of the layer 3 switches, the stationary and mobile systems are segmented in the network. "Thanks to the targeted addressing, we can even extract a little more performance from the communication," explains Höveler. The SCALANCE components were also persuasive when it came to compactness, maintenance, and robustness – "from the form factor of the Client Modules in the vehicles, which we were able to install behind the existing cabin paneling, to the installation on the top-hat rail, to the



In the cabins, the compact design of the SCALANCE W Client Modules paid dividends: they could simply be installed behind the cabin paneling.

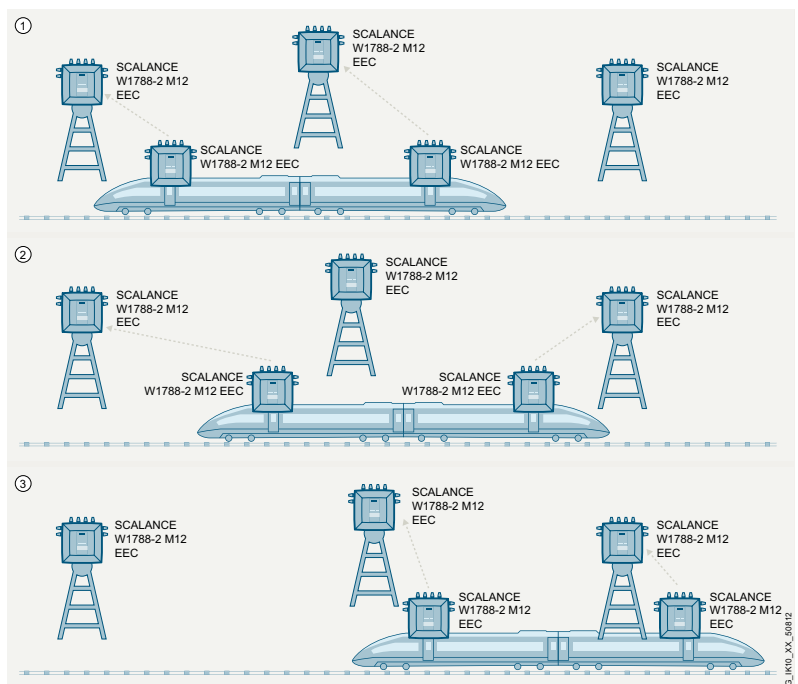


The SCALANCE W786 Access Points are installed on the supports of the railway and communicate via two antennas on outriggers with the trains on the two tracks.

temperature resistance. Last but not least, the proposal from Siemens was also compelling in terms of value for money,” summarizes Höveler. As part of the project, Siemens supported Düsseldorf Airport in the planning and installation of the network solution. “What personally really impressed me was how the know-how carriers at Siemens exchanged ideas with each other. We really had experts on the team,” states Höveler. “It was an exciting challenge for us to integrate the wireless communication system into SkyTrain’s existing network – all that in a demanding airport environment. The key to success was the close collaboration with Mr. Höveler, our colleagues from Siemens Digital Industries regarding the network components, and the on-site Siemens Mobility Service team responsible for the installation,” explains Uwe Weinfurter, Project Manager at Siemens Mobility Products & Radio Solutions.

Well-thought-out details support maintenance and modernization

In total, 30 SCALANCE W786 Access Points with corresponding antennas were installed along the route. Per train, two SCALANCE XP208PoE EEC switches and two SCALANCE X204RNA EEC switches are installed to provide network redundancy. The wireless connection to the SCALANCE W786 Access Points along the route and between the two train cabins is handled by four SCALANCE W774-1 M12 EEC, which operate as Access Points in client mode. As EEC variant, they are ideally suited for the requirements in traffic and transportation thanks to conformal coating. The system not only works very reliably but can also be easily and flexibly adapted to new tasks, says Höveler: “For our passenger information system, we had to look at and change some settings in the configuration of the IWLAN components. For this purpose, a very user-friendly web interface is provided for the SCALANCE W components, which makes working with the system exceptionally easy. Another feature we really like is the C-Plug removable medium on which the component’s configuration data is mirrored. If we exchange a device, we just have to reinsert the C-Plug into the new device – and the communication is up and running again. Simply great!”



With iPRP, redundancy technology can be used in wireless networks for the parallel utilization of two radio links; here an example of how it works.

With SCALANCE components, Düsseldorf Airport can also plan for the future. Siemens guarantees ten years of spare parts availability. Thanks to the broad, end-to-end portfolio, individual components can easily be replaced by new devices, for instance, if more ports are needed. This allows Düsseldorf Airport to easily expand the SkyTrain network at any time. For Christian Höveler, the investment has already paid off: “Thanks to the new communication solution, we can read out a variety of information from the train operation and thereby optimize it – including temperatures and diagnostic and operating data. Our new passenger information system can also be implemented on this basis, and with Siemens we have a point of contact that expertly accompanies us.” The new communication solution keeps the SkyTrain in sync even better – “ultimately, we can achieve even more capacity for our passengers.”

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 more information about industrial security, please visit [siemens.com/industrialsecurity](https://www.siemens.com/industrialsecurity)

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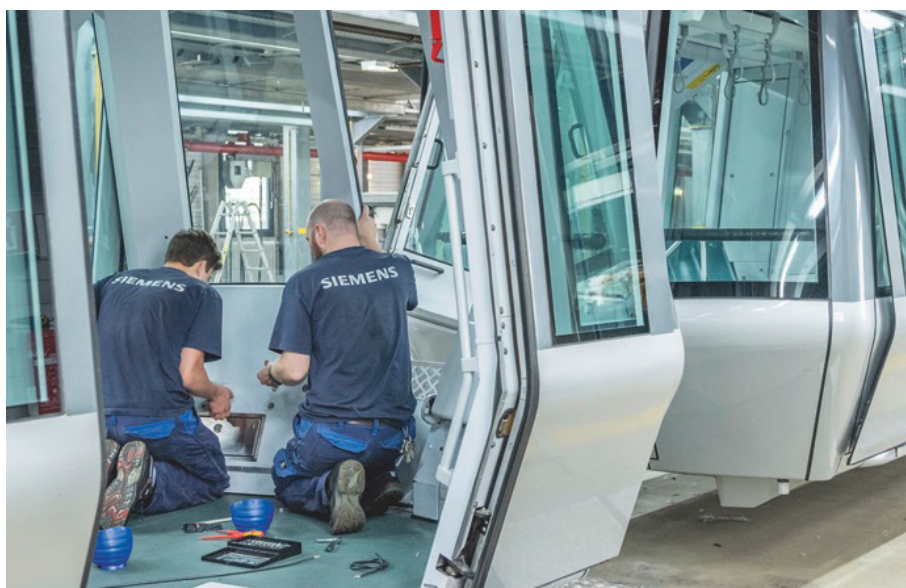
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“Via the IWLAN network, we are able to read out a variety of information from the trains even while they are moving and thereby optimize the train operation. Our new passenger information system can also be implemented on this basis.” Christian Höveler, SkyTrain Systems Engineer, Düsseldorf Airport



The solution was planned and implemented by a Siemens team that will also maintain and expand the system as part of the maintenance contract for the entire SkyTrain.