Westermo helps Max Bögl redefine urban transport

Highly reliable Ethernet data communication networks essential to innovative smart transport system based on magnetic levitation technology

Credits: Firmengruppe Max Bögl.

Urbanization is a growing phenomenon around the world, resulting in limited available space for public transportation. This places increasing demands on the implementation of smart public transport concepts that offer the reliability and flexibility to meet the transportation challenges of metropolitan areas.

The Max Bögl Group, one of the largest construction, technology and service companies in Germany, is addressing this challenge with its innovative and future-orientated Transport System Bögl (TSB). Based on modern magnetic levitation technology, the TSB is ideally suited for the needs of future urban transport, providing a very quiet, flexible and reliable solution, while also saving space and lowering emissions. By enabling the integration of a visually appealing and environmentally friendly public transport system into urban landscapes, Max Bögl Group intends to redefine the future of mobility.

Reliable data communication

When developing their magnetic levitation technology for public mass transit, Max Bögl knew that extremely reliable data communications were essential for connecting the control unit and train and supporting the automatic train operation (ATO) and communication based train control (CBTC) systems. Exceptionally high levels of network availability required specialized wireless technology designed specifically for transportation applications. Westermo was selected by Max Bögl to provide the data communication network technology. Fundamental to this decision was Westermo's extensive experience with data networks for transport systems and its robust range of data communications products that could provide the necessary levels of reliability and network availability.

"Among the reasons for choosing Westermo was their experience with CBTC and technical knowledge regarding wireless LAN and Ethernet networks," explained Bernhard Immken, head of operation control system and approval at Max Bögl.

TSB on test track in Sengenthal, Germany. Credits: Firmengruppe Max Bögl

Westermo solution

Westermo has designed and provided the data communication network for the TSB and implemented it at Max Bögl's test tracks in Sengenthal, Germany and Chengdu, China. The solution is a redundant ring Ethernet network architecture, constructed from Westermo wireless and wired technologies for maximum reliability and availability.
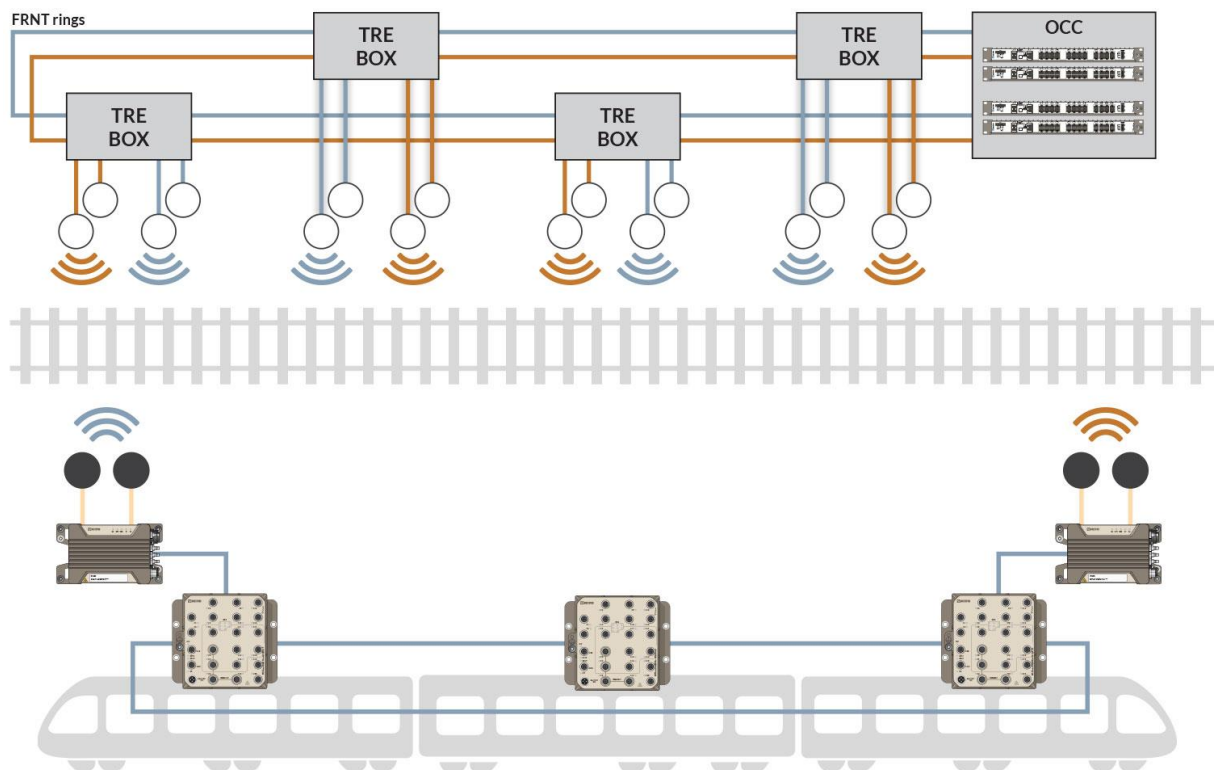
A fully redundant train to ground Ethernet application

Redundant Ethernet architecture

Network redundancy is provided by a double FRNT (Fast Recovery Network Topology) ring installed on the trackside. FRNT is Westermo's own protocol for creating resilience in Ethernet networks. The ring architecture ensures that a path for data transfer is available even if there is a device or network link failure. By adopting a second FRNT ring, this increases network availability even more.

Network reliability is further enhanced by the installation of redundant Westermo wireless access points on the trackside. In addition, the trains also incorporate a FRNT ring network, to which two Westermo wireless clients are connected. The wireless clients then connect to the redundant trackside networks (shown above in orange and blue). Should one of the trackside networks fail, both wireless clients automatically connect to the other network until the failed network is available again. This double redundancy leads to an even higher network availability.

The wireless train to ground communication solution implements Quality of Services (QoS) features which allow multiple priority queues over the air simultaneously. Therefore, high priority CBTC, CCTV and value-added service data can share the same physical radio link. Multiple levels of security are implemented including wireless encryption, access authentication and end-to-end data encryption.

Trackside radio equipment box

Westermo's comprehensive product portfolio designed specifically for onboard and trackside applications enabled the entire Ethernet network to be built using Westermo devices.

A key part of the network solution was a specially developed trackside radio equipment box (TRE-Box) containing the WLAN access points, RedFox Ethernet switches and fibre terminators. The Westermo TRE-boxes form the basis of the redundant ring network, with FRNT subrings connecting each TRE-box. The prefabricated TRE-Boxes are fully equipped, tested and configured, helping to simplify commissioning and reducing time and cost for installation.

Westermo's specially developed Trackside-Radio-Equipment-Box (TRE-box)

Secure and flexible network

Because the system was in development and still to be fully defined, it was important that Westermo could provide a secure and flexible system that was both easily adaptable and expandable. Once installed, the network performed very well, only requiring some mechanical adjustments, such as alignment of the antennas and replacing defective antenna cables that had support a previous system. Westermo provided both onsite and remote support during commissioning and was able to measure the performance of the train to ground link and detect the faulty RF cables and antennas.

Christian Bardos, Manager Operation Control System at Max Bögl, was involved at each stage of the project, from initial discussions, to commissioning, through to project completion: "We are very happy with our successful collaboration with Westermo and feel confident we made the right choice when choosing their extremely robust and reliable WLAN devices and Ethernet switches for our current and future projects."