# 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 globally growing phenomenon resulting in limited space for public transportation while increasing demands on reliability and flexibility Smart public transport concepts, with Transport System Bögl (TSB) in the forefront, are essential to meet the transportation challenges of metropolitan areas successfully.

With over 90 years of experience, the Max Bögl group stand out with their innovative and future-oriented technologies. A prime example of such future-oriented innovation is the Transport System Bögl (TSB). With the use of modern magnetic levitation (maglev) technology Max Bögl intend to redefine the future of mobility with smart integration of a visually appealing transport system into our urban landscapes. The Transport System Bögl is quiet, flexible and reliable while saving space and lowering emissions. From the planning phase to operation, the Max Bögl Group provides an efficient complete mobility system for local public transport.

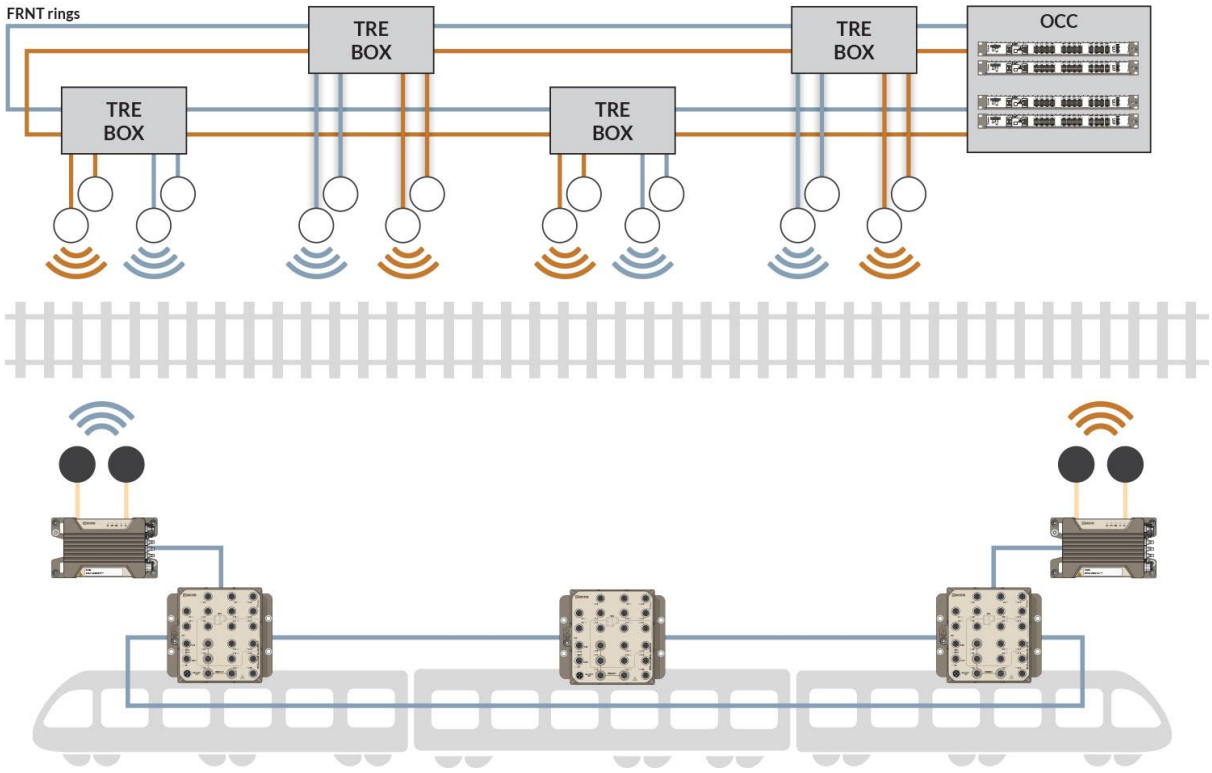
## TSB needed extremely reliable Ethernet data communication

Transport System Bögl (TSB) was developing their new magnetic levitation technology for public mass transit when they came in contact with Westermo. During discussions it became clear that extremely reliable Ethernet data communication between the control unit and train for Automatic Train Operation (ATO) and Communication based Train Control (CBTC) was essential for their project. Highly available data communication required specialized and in-purpose designed wireless technology. TSB selected Westermo as their supplier of robust and reliable Ethernet data communication based on Westermo's renowned engineering know-how and robust products with high availability and reliability.

Bernhard Immken, Head of Operation Control System and Approval at Max Bögl was involved in the very beginning of the project. Mr Immken stated the following about choosing Westermo as their supplier of industrial data communication: "Among the reasons for choosing Westermo was their prior experience with CBTC and technical knowledge regarding Wireless LAN and Ethernet networking."

## The solution provided by Westermo

The Ethernet communication solution for TSB is entirely engineered and supplied by Westermo. A highly available and redundant Ethernet network architecture was built upon Westermo's wireless and wired solutions.




*A fully redundant train to ground Ethernet application*

## Redundant Ethernet Architecture

The basis for the redundancy is a double FRNT ring (blue and red) on the trackside, which is independently guided. FRNT is Westermo's own robust and reliable protocol for resilience in switched networks. Thanks to the ring architecture, an Ethernet path is available even in case of a failure. In addition, the availability is massively increased by a second FRNT ring. The access points on the trackside are installed redundantly as well. Furthermore, there is also a FRNT ring in the train, to which two WLAN clients are connected. These WLAN clients connect to the redundant networks (shown above in red and blue). If one of the networks fails on the trackside, both clients automatically connect to the same network until the other network is available again. This double redundancy leads to an even higher 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 as well, from Wireless encryption and access authentication to end-to-end data encryption.

## Trackside radio equipment box

Westermo supported Max Bögl during commissioning on-site as well as remotely. A project highlight is the specially developed Trackside-Radio-Equipment-Box (TRE-Box). The Westermo TRE-Box is delivered to TSB fully equipped, tested and configured directly from production to the project site. Inside each box are Westermo WLAN access points, switches and Fibre terminators. FRNT sub-rings between the TRE-boxes along the tracks ensure a reliable and redundant network. With the help of Westermo's prefabricated TRE-box, commissioning and installation on-site for Transport System Bögl has become extremely easy, fast and cost-effective. Westermo's comprehensive product portfolio designed specifically for onboard as well as trackside enabled the delivery of a reliable Ethernet network solution completely built out of Westermo devices. For trackside the products used are WLAN AP RT-370, RedFox Ethernet Switches and Routers, Trackside-Radio-Equipment-Box (TRE-Box) and Antennas. The products used onboard are WLAN Client RT-320, WLAN AP RT-610 for public Wi-Fi, Viper Switches and Antennas.

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

## Secure and flexible network

A challenge with the installation was the fact that the system was completely newly developed. As a result, the requirements for a solution could not be clearly defined initially. This put demands on Westermo to provide a system that was easily adaptable and expandable. Together with Max Bögl, Westermo has created a secure and flexible network according to the main requirements and parameters for a futureproof transport system.

Once the solution was installed, the immediate results were very good. However, there were still some challenges. Most of them were mechanical adjustments such as alignment of the antennas and replacing defective antenna cables remaining from the previous system. Westermo was able to measure the performance of the train to ground link during commissioning and succeeded in detecting the faulty RF cables and antennas.

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

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