



HIRSCHMANN

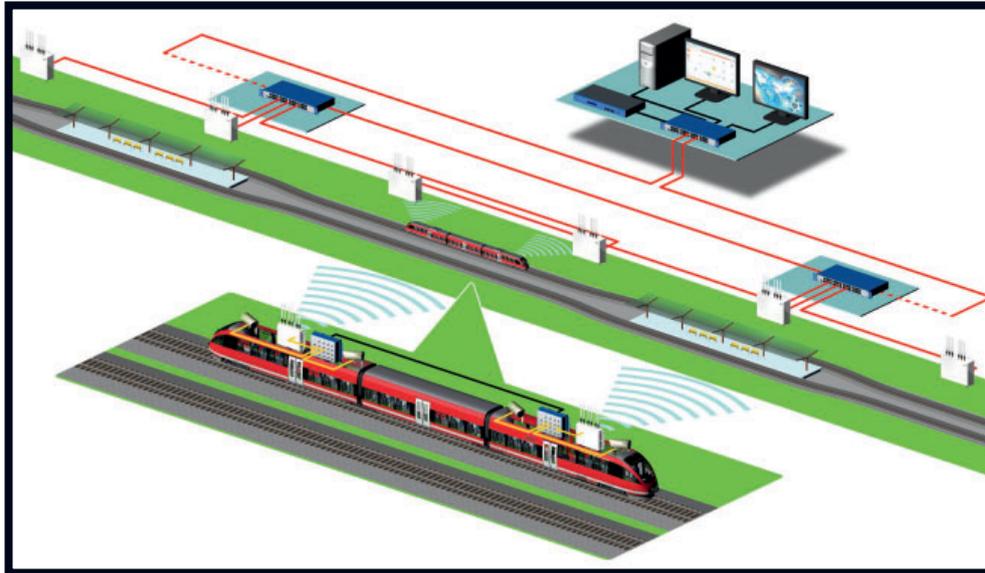
A **BELDEN** BRAND

Seamless Wireless LAN Communication for Layer 3 CBTC Networks

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A revolutionary solution for Communications Based Train Control (CBTC) applications

Hirschmann delivers a robust wireless train-to-ground communication solution for high speed rail applications, offering seamless roaming (0ms handover time) and zero packet loss over any Layer 3 IP network.



Communications Based Train Control (CBTC) makes use of the telecommunications between the train and track equipment for the real time traffic management and infrastructure control.

CBTC uses continuous, bidirectional data communications between the train and the control room to:

- provide exact train positioning information
- maximize capacity and minimize headways
- manage railway traffic and speed in a more efficient and safe way

Poor train-to-ground communication performance, or a loss of communication could result in:

- temporarily reducing the speed of the train
- bringing the train to a complete stop
- operating in a degraded mode until communications are re-established

This is the reason why CBTC networks require an extremely high level of availability and low latency.

Hirschmann wireless train-to-ground communication solution

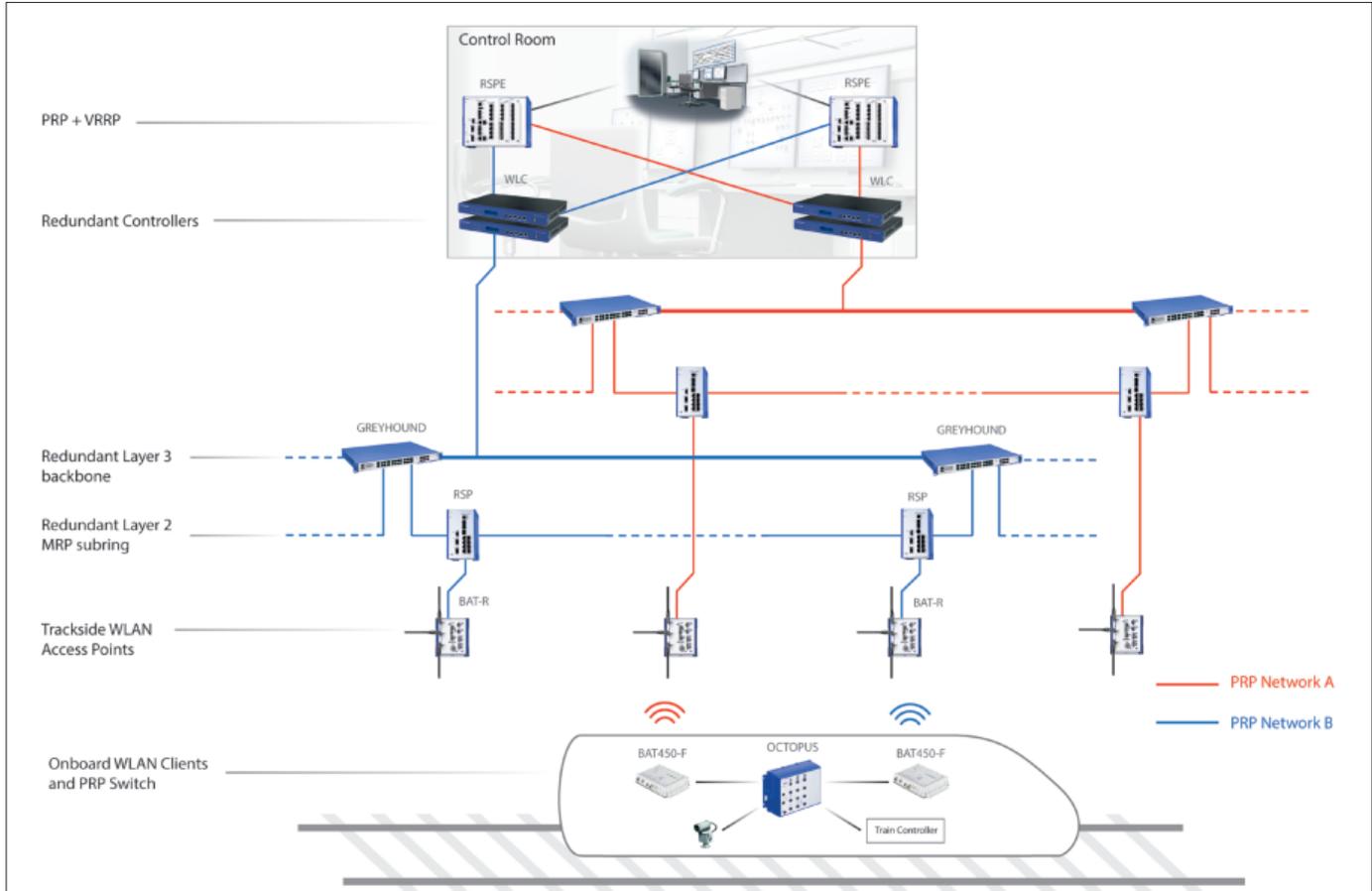
Hirschmann delivers a solution that achieves train-to-ground communication without suffering from any packet loss or roaming times that are inherent in existing WLAN technologies.

The solution employs:

- The Parallel Redundancy Protocol (PRP), which duplicates data streams over the wireless network to ensure seamless connectivity even when one radio is "roaming" across cells.
- CAPWAP tunnelling, which extends the WLAN architecture over any Layer 3 IP backbone, ensuring uninterrupted connectivity even when the train travels between different IP networks.

**Be certain.
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Hirschmann's Solution



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CBTC Network Requirements	Hirschmann's Solution
Fast Roaming Roaming handover time of <50 ms is essential to provide uninterrupted train-to-ground communication	Seamless Layer 3 Roaming with 0ms Handover Time <ul style="list-style-type: none"> - The PRP enabled OCTOPUS switch supplies duplicate redundant streams to two BAT450-F WLAN Clients providing seamless handover - The trackside BAT-R and the Wireless Controllers enables Fast Roaming over Layer3 IP network via CAPWAP tunnelling - A pair of PRP enabled RSPs restore the original duplicate data streams and provides the information to CBTC nodes
Error Tolerance Loss of the data being transmitted will result in system errors, so a packet loss of less than 0.1% is required	Zero Packet Loss <ul style="list-style-type: none"> - Duplicate streams via PRP ensures no data is lost even when one radio "roams" across WLAN cells - BAT450-F Clients operating in different wireless channels/frequencies provide the best immunity against interference - Redundant Backbone networks WLC redundancy provide extremely robust and highly available network designs
Network Latency Maximum latency from end to end must be less than 5 ms	Network Latency under 5 ms <ul style="list-style-type: none"> - PRP always forwards the fastest packet among the duplicate streams
Sufficient Throughput A throughput of at least 4 Mbit/s is required	802.11n WLAN Technology with 3x3 MIMO <ul style="list-style-type: none"> - Provides high throughput rates and allows for future scalability
Security Network protection against malicious behavior, cyber security vulnerabilities and attacks	Best In Class Security Features <ul style="list-style-type: none"> - RADIUS authentication with integrated RADIUS Server functionality - Wireless Intrusion Detection - Encrypted Backbone Data - Protected Management Frames (PMF)

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