RAJANT

The Network Powering Reliable, Resilient, **Extended-Range Railway Communications**

Railway and trainyard operations increasingly leverage autonomous technologies to improve transport speed, enhance tracking and control, and increase safety.

Unfortunately, traditional wireless networks like Wi-Fi, Point-to-Multipoint, and LTE cannot support these applications because they operate from fixed infrastructure and must break connectivity for handoffs. And even momentary drops of coverage can compromise an agency's visibility into their trains' locations or the functioning of autonomous railyard equipment.

Rajant's Kinetic Mesh® wireless network enables fully mobile, mission-critical communications for **platform-to-platform, train-to-platform, and train-to-train communication, enabling CBTC and access to on-board CCTV** to improve safety and increase ridership.

If It's Moving, It's Rajant: **Coverage that Keeps Up with Rail's Speed & Mobility Demands**

Rajant's BreadCrumb® network nodes are fully mobile and can hold multiple connections simultaneously over multiple frequencies, creating a Kinetic Mesh® network that enables high throughput communications throughout tunnels and across rail lines.

Deployed on wayside points and on the train itself, they work peer-to-peer to form an adaptable, resilient mesh between both fixed and in-motion rail assets, creating hundreds of potential paths over which to direct traffic.

Rajant's InstaMesh® networking protocol provides for the continuous and instantaneous routing of data, voice, and video communications over these connections by selecting, in real-time, the best pathway between any two points on the network, even when those points are in motion. If a path becomes unavailable or blocked, InstaMesh will dynamically route communications via the next-available path.

Rajant's network is the only wireless solution that enables true machine-to-machine (M2M) and vehicle-to-vehicle (V2V) communications, which delivers the highest reliability and best performance for autonomous solutions. The network's fault-tolerant nature ensures that even autonomous machines run at all times without fail.

Robust Fault Tolerance in Challenging RF Environments

BreadCrumbs can similarly be deployed on railyard equipment and vehicles and are ideal for these difficult-to-network environments, which must deal with signal blockage caused by large and moving metal container stacks and cranes. Multiple network data paths and frequency options provide redundancy and enable the network to mitigate the effects of interference to maintain high availability.

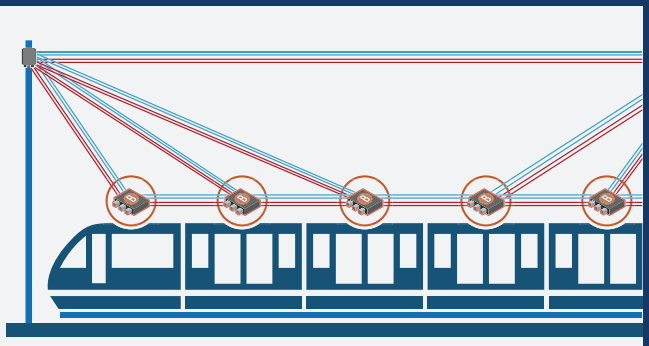
Self-optimizing Network Managed with Minimal Technical Resources

Rajant Kinetic Mesh offers the additional benefit of the low cost of ownership because it can be maintained without dedicated IT resources. After initial configuration, new BreadCrumbs added to the network automatically begin communicating with their neighboring nodes, autonomously and without outside intervention. This also makes the mesh easily scalable to hundreds of high-bandwidth nodes.

Powering Real-Time Rail Applications

Communications & Control on the Move

With Rajant's network, **updates on the location, status, and performance of trains, freight, and associated rail equipment can be sent and received in real-time,** allowing for an accurate end-to-end view of intermodal operations and enabling timely analysis and decision making.

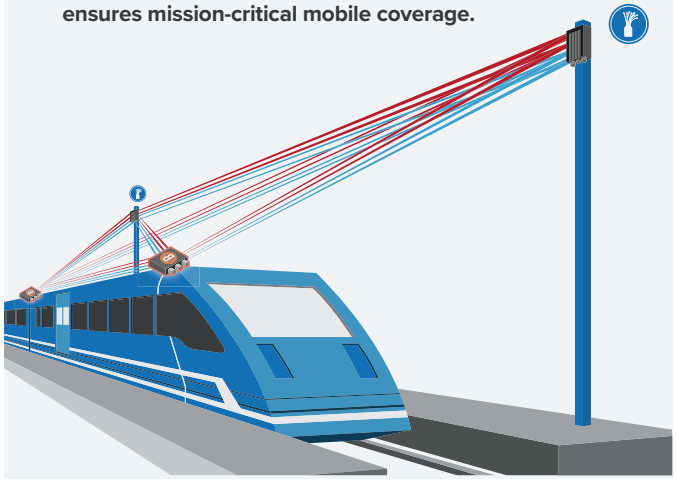


Multi-radio, Multi-frequency Redundancy Ensures Mission-critical Reliability

BreadCrumbs work peer-to-peer to **enable intra-car connectivity while simultaneously connecting to the trackside** to further increase capacity.

Kinetic Mesh is Always Connected

The redundancy of multiple simultaneous connections **ensures mission-critical mobile coverage.**



5 GHz Traffic 2.4/4.9/3.65 GHz Traffic

Enhancing Connectivity & Reliable Communications in Underground Tunneling

Extended Range Without Line-of-Sight Using Rajant RCP-2450 Antenna

By combining Kinetic Mesh with a purpose-built underground antenna array, Rajant extends mission-critical connectivity up to one kilometer underground per BreadCrumb node, making the Peregrine/RCP-2450 combination easily scalable to vast deployments.

The built-in redundancy increases transceiver capacity to ensure low latency, enabling BreadCrumbs to be cascaded together by as many as 10+ hops without throughput degradation. By placing BreadCrumb/RCP-2450 systems at interval locations throughout tunnel construction sites, additional redundancy is gained, guaranteeing application performance in even the hardest-to-network tunnel areas.

Making Railyards Smarter and More Efficient

In the intermodal yard, Rajant provides the resilient, high-bandwidth links that enable intelligent applications used to improve freight and container movement efficiency, increase worker safety, and optimize stack management. These could include:

Smart Cranes

Gantry cranes equipped with position detection systems running on Rajant's network can be used to **track the position of equipment in real time around the yard** to streamline stacking processes and decrease truck dwell time.

Smart Container Management

Optical recognition software running on cameras attached to cranes can **auto-scan and identify containers in their stack, and easily locate the proper ones to be dispatched.** This not only saves time, but keeps drivers out of hazardous areas as they do not need to track down containers manually.

IDEAL TECHNOLOGY FOR RAILWAY NETWORKS

The Peregrine is a quad transceiver BreadCrumb platform that supports a maximum combined data rate of 2.3 Gbps. It offers multiple MIMO radio interfaces, high throughput, and enhanced security performance with up to 256-QAM and 80 MHz channels.

Rajant's RCP-2450 wide-band, circular polarized antenna system pairs with the Peregrine BreadCrumb to provide bi-directional coverage with dual frequency ***2.4 and 4.9-5.85 GHz*** *connections to assist in propagating signals around tunnel bends and to and from moving machinery.*

As a combined solution, the Rajant solution increases transceiver capacity to ensure low latency and **enables BreadCrumbs to be cascaded together by as many as 10 hops or more without throughput degradation.**

RAJANT + Wabtec CORPORATION

Delivering Best-in-Class Technologies to Rail, Together

Through our strategic partnership with Wabtec, leading supplier of value-added, technology-based products and services for freight rail, passenger transit, **we are at the forefront of advancing transportation systems through continuous mobile connectivity.**

Our connectivity solutions for real-time data are a perfect complement to Wabtec's comprehensive portfolio of products and services, and together we are bringing new capabilities to support the continued digitalization of modern rail operations.

Ready to Accelerate Your Rail Operations? Make Your Move to Rajant.

Gain a network with the agility and adaptability you need to take full advantage of next-generation applications for improving safety and security, increasing operational efficiency, and implementing autonomy.

With over 50,000 BreadCrumbs operating in the field today, Rajant's networks are powering mission-critical, fully mobile communications for military, government, and industrial operations around the world – including mass transit systems and railyards with proven reliability and performance.

Interested in learning how Rajant can connect your rail system to new value?

We'll show you the opportunities that a robust mobility component can bring to your network. Visit **rajant.com/rail** to get started.

Tel: 484.595.0233 | **www.rajant.com**

20+ Years OF GAME-CHANGING WIRELESS

RAJANT

*If it's **moving**, it's Rajant.*
*Industrial Wireless Networks **Unleashed.***