RAJANT

Trailblazing Network Technology for
Connected Port Mobility & Autonomy

Rajant's Kinetic Mesh is the leading network technology for ports and harbors taking steps towards autonomy in their daily operations, **providing for ubiquitous, port-wide mobility and unmatched network resiliency** — both of which are needed to enable reliable, efficient autonomous processes.

Port operations are becoming safer and more streamlined as the shift is made towards unmanned operations; but autonomy requires constant connectivity and this level of coverage is often difficult to maintain in dynamic port settings. Large metal containers and equipment block RF signals, causing drops in communications that, even if momentary, will inhibit the proper functioning of autonomous systems and other critical real-time port applications like those used for fleet management and asset tracking.

This issue is exacerbated by the fact that containers and equipment are constantly moving throughout the port, and designing a traditional network like Wi-Fi or LTE around such obstructions is simply not practical because they rely so heavily on fixed infrastructure. In fact, to enable mobility, these architectures use mobile clients that "roam" between fixed access points, disconnecting from one access point before connecting to the next and therefore causing frequent breaks in connectivity. What's more, roaming is handled by a core controller which represents a critical point of failure. If the controller goes down, so do all the autonomous systems and applications powering port productivity.

If It's Moving, It's Rajant:
Agile Connectivity that Paves the Way for Current and Future Autonomy

As the only wireless solution that does not rely on controllers or special infrastructure hardware, Rajant Kinetic Mesh networks are the choice among leading ports worldwide to fully and reliably integrate IIoT applications and autonomy into their daily operations.

The unique nature of our Kinetic Mesh architecture provides built-in redundancy needed to enable seamless mobility and ensure the uptime of mission-critical applications.

All network nodes can be mobile and create a mesh between fixed and moving port assets.

Rajant's lightweight, ruggedized network nodes, known as BreadCrumbs®, work peer-to-peer to from a multi-radio Kinetic Mesh network. These nodes can be deployed on fixed or moving equipment such as quay cranes, gantry cranes, reach stackers, and terminal tractors, and hold multiple connections simultaneously over multiple frequencies to create hundreds of potential paths over which to direct traffic. There is no controller node and therefore no single point of failure.

Rajant's patented InstaMesh® networking protocol intelligently directs traffic over these connections.

Every BreadCrumb is infused with the intelligence of InstaMesh, which works autonomously and in real-time to select the fastest path or paths for delivery in the moment. If a connection becomes unavailable or blocked, for example by a tractor moving through its path, InstaMesh will dynamically route communications via the next-best available path to maintain reliable, low latency performance. With multiple mesh routes to choose from, switching routes is seamless and makes true mobility possible – no connections need to be broken for new ones to be made, so mobile assets remain continually connected as they move throughout the port.

The simplicity of Kinetic Mesh streamlines set up and greatly reduces infrastructure dependence.

With no controller appliance, controlling software, or central controller core, any BreadCrumb in Rajant's network can perform any function. That means there is no need for dedicated basestation or infrastructure hardware, significantly reducing costs and complexity compared to infrastructure-dependent LTE or Wi-Fi networks. It also makes setup extremely simple, functioning as a "plug and play" Ethernet network. After initial configuration, Kinetic Mesh runs in a self-optimizing fashion with minimal need for intervention or technical resources to support ongoing management; it is an autonomous network designed to support autonomous processes.

Kinetic Mesh protects infrastructure investments by enhancing existing Wi-Fi networks.

The unique nature of Rajant's Kinetic Mesh also allows for seamless integration with devices that traditionally rely on Wi-Fi, as Wi-Fi connectivity, Wi-Fi comparability, or AP modes can selectively be enabled on individual BreadCrumbs. This is crucial in port settings, where Wi-Fi reliability and speeds often fall short but reworking the entire network infrastructure is expensive and rarely feasible.

What Can You Run on a Rajant Network?

Because BreadCrumb nodes are able to receive and transmit data simultaneously, more data can be moved faster, enabling the network to accommodate multiple applications at the same time. InstaMesh sends packages over Layer 2, which creates significant latency savings when aggregating across an entire network running multiple applications, and still seamlessly integrates into Layer 3 networks.

As a result, Rajant's Kinetic Mesh upholds the performance required to deliver real-time data from numerous transportation applications simultaneously and to support the next generation of autonomous machinery – enhancing ROI.

Crane & Container Management

- Vehicle Mount Terminal (VMT) Communications
- Remote Crane Control – Rubber-Tired Gantry Cranes, Rail-Mounted Gantry Cranes, Straddle Carriers, Ship-to-Shore Cranes, etc.
- Equipment Health Monitoring
- Predictive Maintenance
- RFID Tracking of Containers
- Automated Container Code Recognition (OCR)
- Container Terminal Automation

Fleet Management

- Trailer Positioning
- Telemetry from Onboard Sensors
- Real-Time Location Tracking
- Traffic Management
- Autonomous Container Trucks

Safety & Security

- RFID Tracking of Personnel
- Anti-collision
- Video Surveillance
- Automatic Truck Identification

Next-Gen Applications

- Machine-to-Machine (M2M) Communications
- Machine-to-Everything (M2X) Communications
- Autonomous Cranes
- Autonomous Drones for Port Surveillance

Autonomy is the Future, Rajant Enables it Today

Network communications are a critical component to enabling autonomous port operations – without continuous connectivity, these systems cannot run, but interference plays a big role in coverage breaks. Rajant Kinetic Mesh is uniquely able to meet this 'never-break' mandate by holding multiple connections over multiple frequencies at the same time. If a path becomes blocked, other available options are used unless and until the path opens again, ensuring the mission-critical reliability that autonomy demands.

M2M and M2X Communications: The Rajant Difference

How does Rajant provide the pervasive coverage required to mitigate interference issues? By allowing machines and vehicles to connect directly with each other on the move. In fact, it is the only wireless solution available to support M2M and M2X communications. With BreadCrumbs onboard, these assets can take mobility connectivity with them wherever they travel, and mesh together to maintain coverage between container stacks.

Servicing Norfolk Southern

Norfolk Southern is leveraging Rajant Kinetic Mesh to improve mobility and efficiency across its railyard, particularly when it comes to container movement processes. The network runs multiple applications to enable streamlined identification, sourcing, and transport of containers in the stacks, from position detection systems to OCR systems to automatically scan containers, to rubber-tire gantry crane automation to autonomously locate and move selected containers onto trucks. **In addition to reducing truck dwell time, these applications are improving safety by eliminating manual searches and the need for port personnel and drivers to be in hazardous areas.**
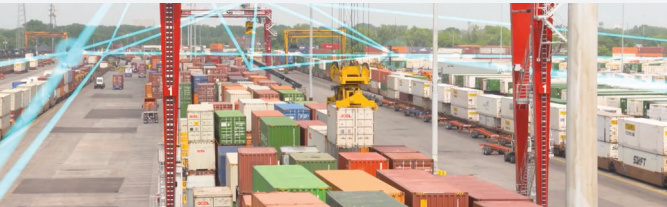
An Intelligent Network to Power Smart Port Applications

InstaMesh is constantly scanning the network to determine the fastest route or routes from source to destination, self-optimizing to guarantee application performance. With Rajant, your network becomes a strategic asset by rapidly providing the port-wide access, reach, and mobility needed to support next-generation solutions for smart cranes, autonomous container trucks, and smart container management.

Servicing DP World Antwerp

DP World Antwerp is utilizing Rajant technology to support complete digital transformation of its terminal, which handles more than two million containers per year. Kinetic Mesh provides the wireless backbone to connect DP World's operations in an anytime, anywhere mode, and has enabled them to test and implement a number of next-gen applications including remote machine health monitoring to enable predictive maintenance, and support for container terminal automation to increase efficiencies while lowering environmental impact.

Innovative Partners and Technologies Connecting Ports Across the Globe

RAJANT + EXTRONICS

In ever-changing port environments, personnel and asset tracking is critical to maintain both safety and security. That is why Rajant has partnered with Extronics to support its AeroScout Wi-Fi-based active RFID tags, which **enable the network to accurately track the location and condition of people, containers, and other valuable equipment in real time through the port.**

RAJANT + DGWORLD

Rajant's partnership with DG World, an international provider of autonomous container terminal trucks, puts our joint team at the head of connected port development. **Rajant's Kinetic Mesh technology offers the high bandwidth, low latency, and proven reliability** required to support DG World's sophisticated autonomous systems, which are having transformative impact on ports worldwide.

Rajant Private Wireless Networks: Moving Ports into the Future

There is a reason why the world's leading ports choose Rajant: because the reliability and efficiency of their autonomous processes are only possible because of Kinetic Mesh technology. For any port to fully capitalize on the promises of autonomy and other real-time applications, they must ensure their network can fully support continuous connectivity and high throughput performance everywhere throughout the port, even between the stacks — and our network has proven this capability in even the most dynamic port environments time and again.

Interested in learning how Rajant can connect your port equipment?

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

Made in USA

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