



# Kinetic Mesh Networks - Complete Connectivity for Marine Port Operations

A kinetic mesh network can be deployed and integrated flawlessly into your existing infrastructure, enabling unprecedented autonomy within the port. Ruggedised network nodes can be installed directly onto port assets such as quay cranes, camera towers, vehicles etc, meaning that these nodes move with your port operations – your assets become network nodes. InstaMesh networking software ensures that the fastest data transfer route is always selected, with nodes able to communicate peer-to-peer via multiple simultaneous connections, sharing information back and forth in a fully mobile, highly resilient web of communications. The result is that port operations keep moving and evolving with mission-critical reliability, delivering autonomous operations, improving productivity and ensuring safety.



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# CHALLENGES

We are all aware of the challenges of getting reliable and resilient wireless traffic around marine ports. These are environments that:



- Contain a lot of steel structures, like constantly moving container stacks, vehicles and cranes, that block the line of sight.
- Are often exposed to extreme weather and temperature fluctuations.
- Demand low latency communication, including video transmission and remote driving of autonomous vehicles.
- Need real-time communication between hundreds of trucks and multiple servers, including position, job order, maintenance, and status information.
- Need integration and information exchange with other machinery and safety-relevant systems, such as pinning stations, refuelling stations and cranes.
- Demand the highest network availability and redundancy so that operations in the terminal are not disrupted.
- Demand security of the network to avoid risks and dangers of unauthorised access to data, heavy machinery and autonomous operating vehicles.

# SOLUTION BENEFITS



Rajant's Kinetic Mesh® Wireless Networks overcome these challenges, and are proving to enable unprecedented benefits for marine ports around the world. Kinetic Mesh Networks are also highly cost-effective, especially when compared to 5G, and they provide:

- ✓ **No breaks in service:** The network maintains multiple connections simultaneously for continuous mobile connectivity, even at high speeds and in challenging topography like container ports.
- ✓ **Interference Free Communications:** A protocol that constantly evaluates the best frequency to direct traffic via layer 2; full redundancy to route around local interference.
- ✓ **No single point of failure:** No route or LAN controller; infrastructure failures or interference/congestion have minimal impact.
- ✓ **Highly scalable and adaptive:** Automatic Protocol Tunnelling (APT) allows for multiple ingress/egress points into the wired networks; and enables higher throughput even as the network grows.

# PORT USE CASES

Kinetic mesh networks fulfil many use cases in marine ports around the world and they include:



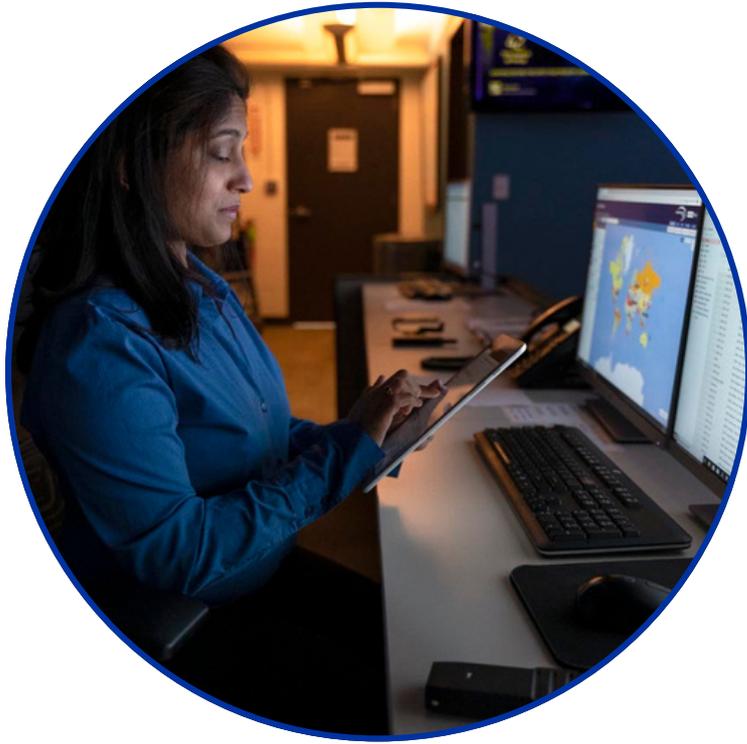
## Crane & Container Management:

- 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 Assets.
- 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:

- ▶ Tracking of Personnel.
- ▶ Anti-collision.
- ▶ Video Surveillance.
- ▶ Automatic Truck Identification.

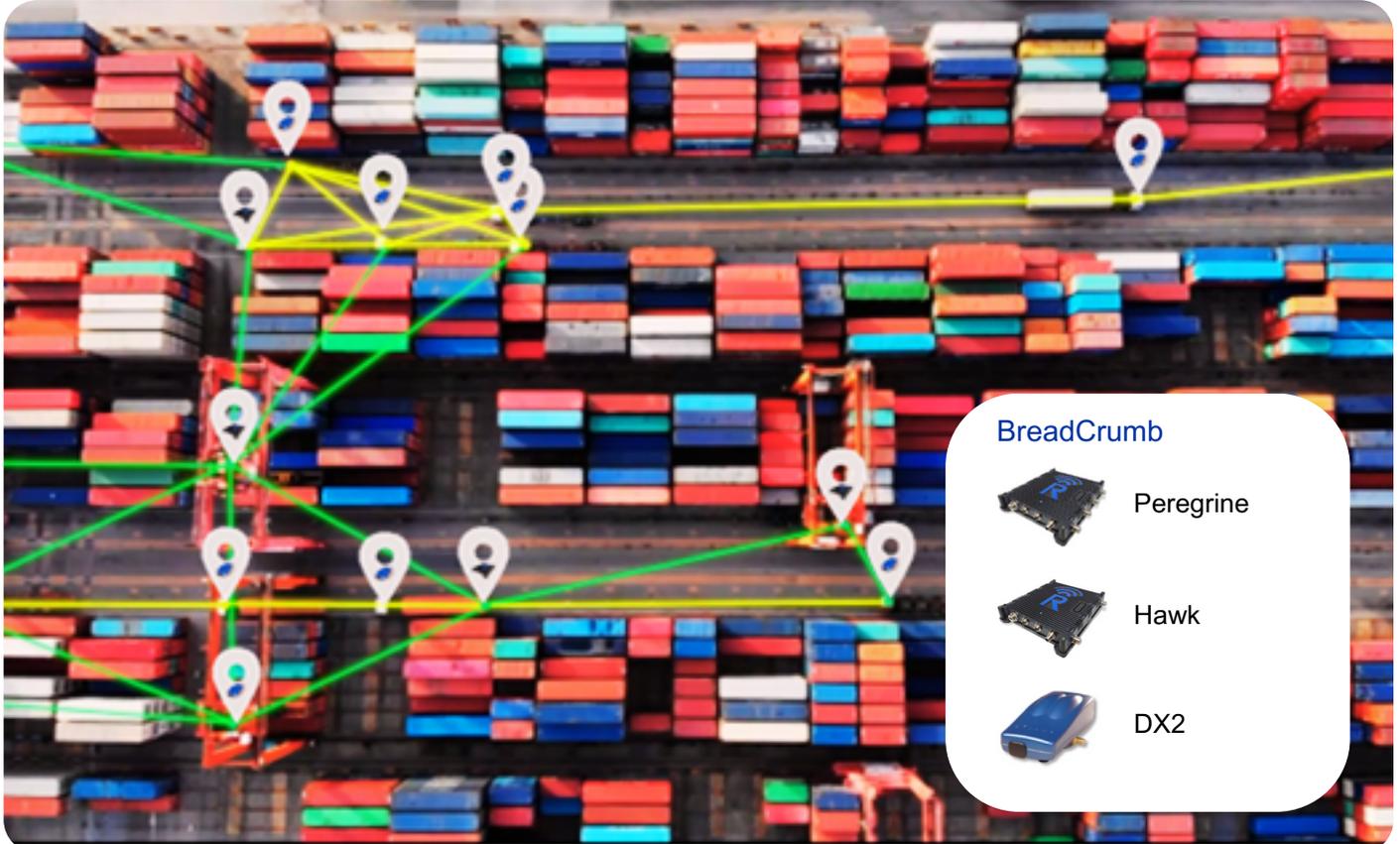
### Next-Gen Applications:

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



# SOLUTION DESCRIPTION

The high levels of availability and resilience are achieved through the kinetic mesh eliminating single points of failure as shown below.

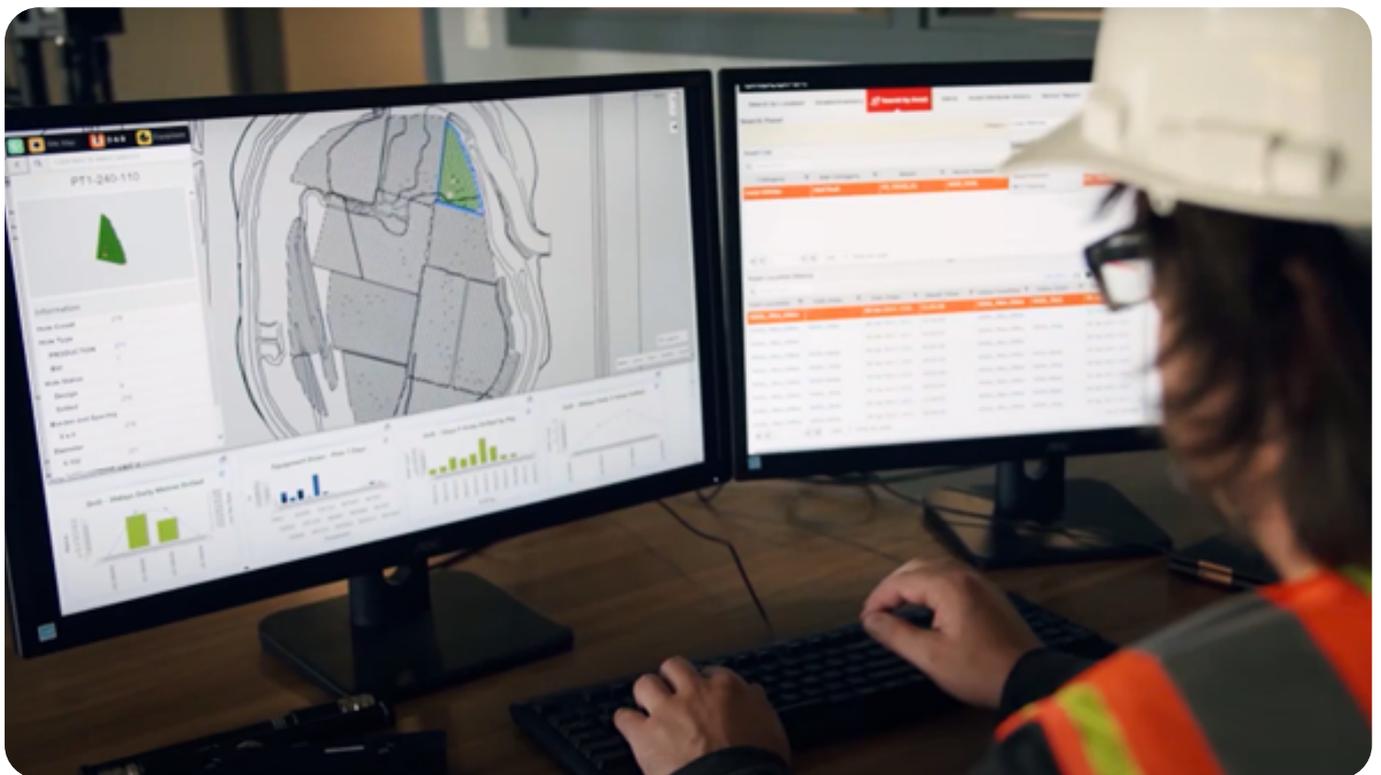


Kinetic Mesh Wireless Networks deliver this superior level of performance by using a combination of BreadCrumb® wireless network nodes and InstaMesh® networking software. Rajant Kinetic Mesh® networks employ any-node to any-node capabilities to continuously and instantaneously route data via the best available traffic path and frequency—for any number of nodes, all with extremely low overhead. Examples of Breadcrumbs include:

- **Peregrine** high performance industrial-grade BreadCrumb platform offers quad MIMO transceivers, up to 2.3Gbps aggregated data rate, higher throughput, and enhanced security performance.
- **Hawk** offers dual MIMO transceivers, up to 1.7Gbps aggregated data rate, higher throughput, and enhanced security performance.
- **DX2** is designed for private wireless networks on lightweight autonomous vehicles and integrates seamlessly with all Rajant BreadCrumb models to form a complete solution.

Breadcrumbs are high-functionality, easy-to-install wireless nodes that form the Kinetic Mesh® industrial wireless infrastructure. They work in concert with InstaMesh® to enable voice, video and data communications that operate over a common mesh infrastructure. Hundreds can be quickly linked, self-configuring as part of a fully mobile, high bandwidth industrial Wi-Fi network. They can communicate with any Wi-Fi or Ethernet-connected device to deliver low-latency, high-throughput data, voice and video applications across the meshed, self-healing network.

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# IMPROVE PORTS PRODUCTIVITY

By delivering this comprehensive, highly resilient coverage, our marine port customers can improve business performance and safety through:

- ✓ **Edge Communications:** Transmitting real-time data, voice and video at the network edge.
- ✓ **Mobile Vehicle Connectivity:** Maintaining communications with and control of diverse roaming assets.
- ✓ **Autonomous Networking:** Communicating with and remotely controlling equipment and autonomous vehicles.
- ✓ **Asset Management:** Real-time connectivity for telemetry/telematics, cargo, container and equipment tracking, plus the condition monitoring of equipment.
- ✓ **Wi-Fi Access:** Giving employees access to ship manifests, such as the loading and unloading status.
- ✓ **Wi-Fi Asset Tracking:** Using low-power Wi-Fi asset tags to locate containers, equipment and people instantaneously.
- ✓ **Rapidly and Cost-Effectively Scaling Wireless Coverage:** Supporting port expansions plus, next-gen M2M apps, robotics, and autonomous assets



With kinetic mesh networks, all the network elements move, as does the marine port environment, to form and reform connections that deliver the fastest route for data transfer and it does this instantly and autonomously. The result is that operations keep moving and evolving with mission-critical reliability while improving productivity and safety. Your assets become the network.

# CONTACT US

To understand how Kinetic Mesh Networks deliver a highly cost-effective means to help you improve productivity and safety

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