RAJANT

CASE STUDY

Rajant's Kinetic Mesh® Technology Boosts Speed and Efficiency for Class I Railroad's Intermodal Railyard

Freight railyards are a dynamic environment in which all assets—cargo, people and vehicles—are constantly on the move.

For this complicated operation to run smoothly requires reliable access to real-time data, but the rugged environment of an intermodal railyard makes constant connectivity a difficult goal to achieve.

When a Class I railroad's intermodal yard decided to purchase additional heavy equipment to help increase speed and efficiency, management quickly realized their basic Wi-Fi solution was no longer robust enough. Vehicle locations, the dynamic nature of stacked containers, and trains coming in and out of the yard meant the yard needed higher availability than the Wi-Fi could offer. The railyard needed a new solution.

The Challenge

One of the railyard's goals was to improve container movement efficiency, so containers only required one to two moves, versus five to six. With this reduction, the yard would increase efficiency, lessen wear and tear on the moving vehicles, reduce lane blockages and congestion,and speed up the truck-to-stack, stack-to-truck, train-to-stack and stack-to-train times.

To meet that goal, the railroad planned to purchase two 30-ton overhead cranes and install them in the center of the yard to speed up container movement. The railyard also explored the implementation of a stack management application to track contents of the container stack and manage cranes, vehicles, containers and devices.

In addition to Wi-Fi, the intermodal yard utilized vehicle-mount computers and two-way radios to determine vehicle and personnel locations, but this was not enough to support the new stack management application. Site constraints meant access points couldn't be installed and there wasn't any logical place to put additional towers. The yard needed a different type of network.

Company Profile

- Class I intermodal railyard operation spanning approximately 118 acres
- Operating a variety of vehicles and equipment including 30 hostlers and 9 reach stackers

Solution Components

- Rajant Kinetic Mesh® private wireless network consisting of the following BreadCrumb® nodes:
  - 4 LX5s as access points
  - 2 LX5s and 2 ME4s installed on rubber-tired gantry cranes
  - 10 ME4s installed on reach stackers
  - 30 JR2s installed on hostlers and other yard vehicles

Kinetic Mesh Partner (KMP)

- Future Technologies: wireless integrator specializing in the assessment, planning, design, implementation, and support of innovative communications solutions.

Outcome and Impact

- Improved speed and efficiency and streamlined stack management
- Increased reliability with fully redundant, low latency network with no single point of failure
- Enables real-time, end-to-end view of intermodal operations for timely analysis and decision-making
- Provides railyard ability to support future applications including yard management software and stack management system

The Solution

TESSCO, one of the railroad's partners, learned of the challenge the railroad was facing, and referred the railroad to one of its own partners, Future Technologies, a wireless integrator providing turnkey installs for specialized projects. Future Technologies began to examine options for a better wireless solution to accommodate the new equipment and software.

The yard needed high availability, so that sent UDP packet streams are always received, to ensure the current method of tracking equipment and containers as well as the new stack management application can function properly. If a packet is missed, the system will not record the location of a container, and disrupt the entire process.

Knowing the railyard's specific requirements, Future Technologies recommended Rajant Corporation's Kinetic Mesh® wireless network, a type of wireless network that has been successfully deployed in other harsh environments such as ports, oil and gas, mining and military operations.

In a Kinetic Mesh network, there is no static infrastructure; each radio, or node, serves as singular infrastructure, which enables all devices and the network itself to be mobile—a critical component for a railyard, where people, devices, vehicles and equipment are constantly on the move. The network employs multiple radio frequencies and any-node-to-any-node capabilities to continuously and instantly transmit data in real time via the best available traffic path and frequency.

Because there is no central control node—and thus no single point of failure—routes are built automatically, and are evaluated for quality and performance with every received and sent packet. If a certain path becomes unavailable for any reason—due to a vehicle moving out of coverage, or an object that moves in and obstructs coverage, for example—nodes on the network use an alternate route to deliver data.

This allows the network to adapt to node location, local interference and congestion dynamically, eliminating downtime even in the most rugged conditions. All infrastructure components transmit and receive real-time information, enabling an end-to-end view of intermodal operations and allowing timely analysis and decision-making. The network can be redeployed in multiple ways simply and easily by repositioning the nodes.

> "We had to have backhaul capability and capacity injection capability at multiple sites without building a whole lot of infrastructure to support that, which isn't possible with traditional Wi-Fi solutions.
>
> **— David Rumore**
> Executive Vice President, Future Technologies

The Results

The complete installation is still ongoing, as delivery of the 30-ton cranes was delayed, but the existing network is already exceeding railyard personnel's expectations.

"Proper meshing and make-before-break are mission-critical," Purintun said. "This is the only radio that makes and maintains multiple connections to access points and other subscribers to make split-second decisions on packet flow. Additionally, the number of mobile vehicles that were outfitted with these radios will expand the network capability, not impede it, which is important because the number of access point locations had to be so few."

Applications being developed for the railyard include the stack management system and yard management software. The upgraded yard management system will be a total yard solution and is three to five years from completion. These systems will organize all movement based on location data, using the most logical routes for the highest efficiency. Some of the vehicles will have tablets inside them to enable even speedier information transfer.

After the large cranes are delivered, the rest of the network will be deployed—in plenty of time for the railyard to streamline container movement and meet its improved speed and efficiency goals before the busy holiday season.

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