EMBRACING THE RIGHT TECHNOLOGY FOR PORT OPERATIONAL PROSPERITY

Sagar Chandra, VP of Business Development - Latin America, Rajant Corporation

Many of the world's major ports have been in operation for decades. They are now faced with the challenge of aging, mobile-limited network infrastructure in an environment more dynamic and demanding than ever before. Emerging technologies, such as 5G, bring next-generation connectivity capabilities and offer promises to revolutionize port operations. However, this new paradigm of hyper-interconnectivity between mission-critical operational assets carries with it many risks. For port operators to usher in a connected 'Port of Things' to meet demands, they will need a wireless solution designed to cater to its unique requirements.

Ensuring higher bandwidth and decreased latency, technology plays a fundamental part in enabling the Industrial Internet of Things (IIoT), a market set to reach $1,083 billion by 2025 and offers enhanced productivity and safety benefits for critical industries.

EMBRACING 5G AND M2M TECHNOLOGY IN PORTS

The explosion of IIoT devices, autonomous equipment and robotics platforms offer further opportunities for port terminals to achieve transformative productivity and efficiency gains. However, to take advantage of such applications, they must rapidly modernize their largely wired networks.

For many sectors, having wireless connectivity capabilities that offer greater

flexibility and automation is of paramount importance. More importantly, M2M (machine-to-machine) connectivity is an enabler for other technologies, such as artificial intelligence (AI), augmented reality, and robotics. With the capacity to streamline processes, identify potential problems across the port, and the ability to monitor staff and equipment effectively, exponential technologies need to fill 5G connectivity gaps with solutions that will help operators become more productive than ever before.

The challenging environments of ports means that 5G cannot overcome potential signal blockage and signal interference from containers, ships, and neighbouring ports. In ports, assets are constantly in motion. The level of interdependence between devices, valves, pumps, motors and people, control systems, and AI – will require permanent real-time, not intermittent, vigilance. The increased interdependency between connected devices powered by 5G means compounds exposure to risks and therefore requires constant monitoring and upkeep. In comparison, M2M functionality ensures that as the fleet is in continuous motion, there is a higher level of connectivity with devices and infrastructure in an environment where the only constant is change.

CONTINUOUS CONNECTIVITY REQUIRED

Ports are busy environments with container ships, vehicles, and staff constantly on the move throughout the day. If operators deploy Wi-Fi, it brings the benefit of high-speeds and the capacity to support an increasing concentration of mobile devices. However, this land technology is most suited to indoor environments where the clients are mostly stationary. As multiple access points are added to keep sprawling outdoor operations covered, this makes the network difficult to design for optimum performance. With Wi-Fi deployments, operators aren't able to work around interference, which means coverage drops are common.

Furthermore, a Long-Term Evolution (LTE) network for an ever-moving environment with obstructions is not practical as LTE relies on fixed infrastructure. Many operators may opt for LTE as 4G towers can disperse signals over infrastructure obstructions for wide area coverage. However, an autonomous container truck, for example, will not be able to move across the site as the RF signal cannot move through common industrial obstructions. If a blockage causes coverage to break, even momentarily, it could cause the truck to grind to a halt. Therefore, it requires continuous connectivity to run.

Installing an additional tower can be a time-consuming, complex, and costly feat for operators, as the respective technologies have unique challenges. For LTE, this means data rates will begin to degrade the further mobile equipment moves from the tower. As 5G takes advantage of higher frequencies to deliver data rates faster than 4G, the frequencies will have a shorter range and require a line of sight. This means more towers are needed, causing deployment and maintenance costs to rise rapidly.

THE SHORTCOMINGS OF CARRIER-BASED AND PRIVATE LTE

Carrier-based LTE is the most commonly used, with users buying subscriber modules from a carrier for industrial clients. If operators wish to cover a vast area and have small, static LTE modems and devices that can collect sensor data, carrier-based LTE can prove an option for industrial businesses. As an alternative to deploying a full network, this is the ideal choice for a customer looking to connect minimal devices inexpensively whilst fulfilling the broad coverage.

However, for operators dependent on real-time events in IIoT environments, carrier-based LTE leaves critical communications to someone else. Operators will also face a reduction in control and visibility, as the public cellular tower will carry other non-critical data, using up resources that are meant for an operator's IIoT, affecting the overall productivity. As many interests tug on the single network resource, it means potential priority clashes arise as resources may be

RAJANT CAN HOLD THE ANSWER

The only wireless network to enable M2M connections is Rajant Corporation Kinetic Mesh®, with BreadCrumb® wireless nodes and InstaMesh® networking protocol software. It is an ideal solution for any port operators looking to extend the range of LTE and enable fully mobile coverage without the infrastructure. Rajant's multi-transceiver redundancy eliminates any single point of failure for mission-critical reliability to enhance LTE as well as Wi-Fi.

InstaMesh intelligently orchestrates traffic over the industrial connections. If faced with a signal blockage, it redirects traffic over the next available path, which allows the network to self-optimize and ensures continuous data flow. Compared to LTE, which has an active, designated point of communication, Rajant's network has multiple active, persistent connections. Compared to an increase of latency involved with an LTE handoff, Rajant offers enhanced flexibility, ease of deployment, lower cost, and is not reliant on a centralized and fixed architecture, which could go down at any time.

The nodes can be fixed or mobile, functioning peer-to-peer. They can be deployed easily and rapidly anywhere, on any asset, to extend or enhance operational coverage in port-wide IIoT environments. With the capacity to expand and create networks where they did not exist before, Kinetic Mesh expansion does not cripple connectivity. Rather, Kinetic Mesh strengthens as it grows with low-latency, high-throughput, and secure military-grade encryption options for a variety of data, voice, video, and autonomous applications. Offering a full spectrum of sizes, Rajant supports all types of drone autonomy and drone swarms for applications like mapping over vast areas in real-time.

allocated to one tower over the other if two were to go down.

Whereas, with private LTE networks, the customer owns and administers this by using unlicensed frequencies or renting a licensed frequency from a cellular carrier or buying from a regulatory agency. Compared to carrier-based LTE, operators can hold onto the network and own the maintenance to control the coverage. Private LTE provides the ability to decide how to utilize the bandwidth as it can be split to 50% uplink and 50% downlink. It can also be deployed across different premises and takes advantage of strong receiver sensitivity as it can go 40x stronger than Wi-Fi receiver sensitivity. Whether it is licensed or unlicensed, unfortunately, the infrastructure can be cost-prohibitive. The availability of licensed bands can be difficult to source, and if deployed into an unlicensed band, where it's not expecting to deal with residual noise, the advantages are lost.

In addition, configuring Private LTE networks is not easy without the advanced technical networking qualifications, and whilst it may show real savings when first deployed, costs may rise significantly for licensing and features in the future. Operators want a solution they can deploy, maintain, and support for many years, but with rapidly evolving technology always changing, this can prove a formidable challenge. Private LTE uses the same network architecture as the first cellular networks deployed, which holds fundamental weaknesses.

For high bandwidth applications, such as autonomous vehicles using video, it means operators may have a very constrained throughput. LTE speeds are dedicated to downstream access, which means LTE lacks the upstream speed needed by industrial operations to run multiple mission-critical applications such as CCTV and real-time machine guidance. Neither carrier-based or private LTE may be the sensible choice in expansive and ever-moving port environments.

FILLING THE COVERAGE GAP

As carrier-based or private LTE drains the capacity of the single network resource, it can mean the budget on network capacity rollout can be defeated. Turning to a solution that allows you to build on what you have, offers the best of all worlds and fills the gap with pervasive, mission-critical coverage, and added M2M communications to work around dense obstructions is the only option for Industrial IoT networking.

ABOUT THE AUTHOR

Sagar Chandra is Vice President of Business Development – Latin America for Rajant working to improve communications and real-time data access for various port projects in Central America and South America. Mr. Chandra possesses more than 16 years of experience in providing Fleet Management and Mine Management Systems to global mining customers. He has extensive experience working with large mining companies in North and South America, including BHP Billiton, Rio Tinto, Barrick, Imperial Oil, Cliffs Natural Resources, Codelco, Vale and others. He joined Rajant after serving as Services Director, Americas for Geovia. Prior, he was with Modular Mining Systems, holding a variety of titles, including GM, North America.

ABOUT THE ORGANIZATION

Rajant Corporation is the exclusive provider of private wireless networks powered by the patented Kinetic Mesh network, BreadCrumb wireless nodes, and InstaMesh networking software. With Rajant, customers can rapidly deploy a highly adaptable and scalable network that leverages the power of real-time data to deliver on-demand, mission-critical business intelligence. Rajant is headquartered in Malvern, Pennsylvania, with additional facilities and offices in Arizona, Kentucky, and Alabama.