BUILDING A DIGITALIZATION FOUNDATION FOR PORT 4.0

Todd Nate, Head of Private Wireless Sales, North America, Nokia

Port terminal operators are using digitalization to become more flexible and resilient so they can respond to volatile market demands, shifting transport routes, and growing vessel sizes with greater speed, agility, coordination, and collaboration. To succeed, they need digital-ready connectivity platforms that can enable and optimize advanced Port 4.0 use cases such as autonomous operations, wireless data, worker collaboration, computer vision, and environmental monitoring.

SAFETY AND PRODUCTIVITY ARE THE TOP PRIORITIES

Every terminal operator wants to ensure seamless productivity and maximum safety across the yard terminal. The key to achieving these goals is to support staff communications and collaboration through reliable and secure data and voice applications on a converged private network based on 4G LTE or 5G cellular technology.

With private wireless networks, operators can remotely connect and monitor workers using wearable sensors and connected personal protective equipment (PPE). They can also move on from


Private Mobile Radio (PMR) and equip workers with dynamic group communications and advanced push-to-talk (PTT), push-to-video (PTV), and group call capabilities. According to Nokia Bell Labs research, terminal operators that replace a patchwork of networks with industrial-grade private wireless connectivity typically reduce their total cost of ownership (TCO) by up to 27 per cent.

Terminal operators can also take advantage of private wireless connectivity to support productivity-boosting applications such as:

- condition monitoring, which can provide real-time insights into the surrounding environment or the quality of goods in containers and facilitate a transition to predictive maintenance;
- real-time asset tracking, which can help improve resource planning and scheduling and reduce inventory loss;
- computer vision and video analytics, which can simplify quality inspections, enhance site security, and identify issues and root causes;

"THE KEY TO ACHIEVING THESE GOALS IS TO SUPPORT STAFF COMMUNICATIONS AND COLLABORATION THROUGH RELIABLE AND SECURE DATA AND VOICE APPLICATIONS ON A CONVERGED PRIVATE NETWORK BASED ON 4G LTE OR 5G CELLULAR TECHNOLOGY."
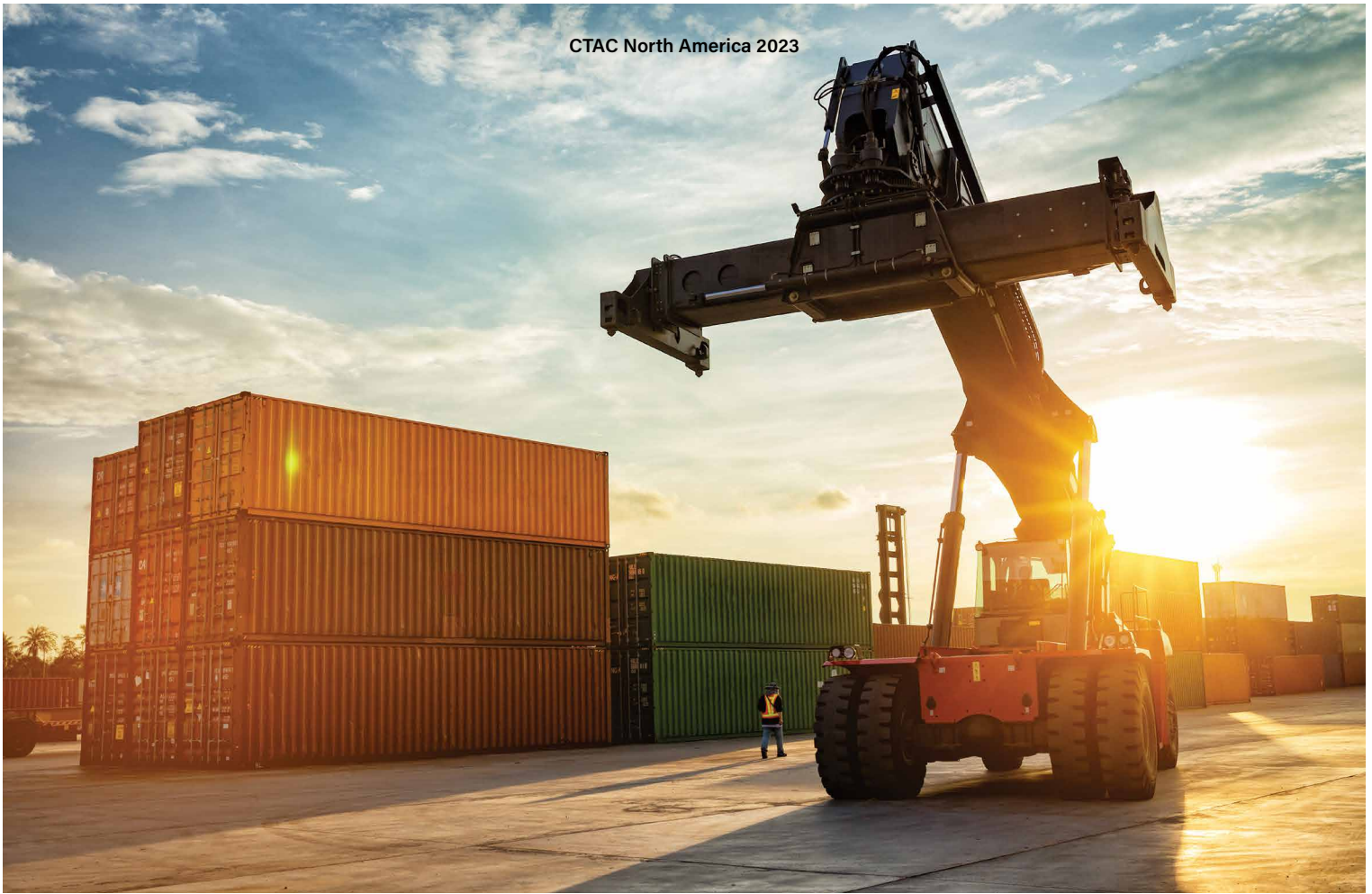
- wireless remote control, which can ease the introduction of semi-automated operations for cranes and straddle carriers;
- remote reefer monitoring, which makes it easier to keep track of the temperature and humidity levels in refrigerated containers;
- drone inspection, which provides safer and faster ways to check incoming ships and monitor terminal areas;
- remote technical support, which uses augmented reality (AR) to give workers situated in different site locations instant access to assistance from experienced technicians and trainers.

These applications, connected to the terminal operating system (TOS) through a dedicated wireless network, can guarantee service-level agreements (SLAs) and handle data traffic that supports a range of protocols, including PROFINET or PROFISAFE. They can also increase yard productivity by up to 28 per cent and minimize accidents or injuries by reducing emergency stops by up to 90 per cent.

"MANY PORT TERMINAL OPERATORS HAVE STARTED TO IMPLEMENT INDUSTRIAL-GRADE PRIVATE WIRELESS NETWORKS AND EDGE COMPUTING TO ADDRESS THEIR NEED FOR RELIABLE, LOW-LATENCY, HIGH-BANDWIDTH COMMUNICATIONS."

### HOW WELL ARE PORT TERMINALS POSITIONED FOR INDUSTRY 4.0 SUCCESS?

To better understand the current competitive landscape and digital transformation status of the maritime industry, Nokia partnered with ABI Research to survey port operators in five key markets. We also surveyed industrial enterprises across six other industries.

Together, we studied their barriers to adoption, and the degree of alignment between their Information Technology (IT) infrastructure investments and Operational Technology (OT) use cases underpinned by digital technologies. We aimed to create a maturity index that would help port operators understand how well they are positioned for Industry 4.0 success.

According to our analysis, ports scored 60.9 out of 100 on IT maturity, which covers technology deployments with industrial Wi-Fi, private LTE/5G, edge computing, cloud, ruggedized devices, and management systems. Ports scored 67.3 out of 100 on OT use

Industry 4.0 Matrix Index by Vertical

Source: ABI Research
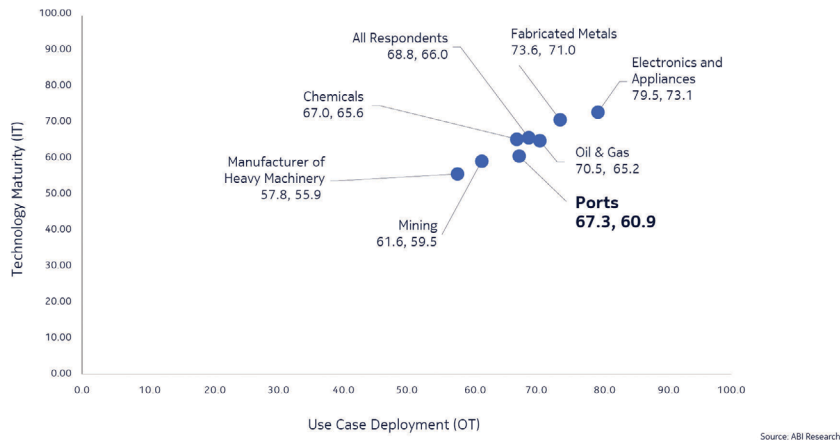
case deployments, which cover asset performance improvement, operation optimization, worker collaboration, and data analytics. When these two scores are close, there is greater alignment between the IT and OT teams, which will help ports prepare for more challenging demands and achieve their Industry 4.0 goals.

In the OT environment, our survey studied the most common use cases, including equipment and asset performance improvement, operation optimization, data analytics, and work delivery. Port operators generally lag behind enterprises in other verticals in connecting and digitalizing existing assets and operations. They have also been slower to deploy use cases such as autonomous vehicles and Digital Twins, and need to take greater advantage of their IT infrastructure while prioritizing workforce operations and safety. The top OT use cases for port operators are data analytics-driven root cause identification and video-based quality inspection.

In the IT environment, port operators have been rolling out industrial and mesh Wi-Fi and supporting their workforces with

mobile devices. They scored 9 out of 10 in both areas, in line with enterprises in other verticals. Concerning private wireless, port operators scored 7 out of 10 for private 4G/LTE and 3 out of 10 for private 5G. In both cases, they are two points behind other verticals and need to catch up.

We've developed an Industry 4.0 maturity assessment tool that will help you determine how your IT and OT implementation compares with that of other port operators. If you'd like to understand your port's readiness, scan the QR code and try the assessment tool.

AN INTEGRATED PLATFORM TO SUPPORT EXISTING INFRASTRUCTURE

Many port terminal operators have started to implement industrial-grade private wireless networks and edge computing to address their need for reliable, low-latency, high-bandwidth communications. They want solutions that will enable them to fully realize the potential of Industry 4.0 technologies and use cases such as remote-controlled cranes and straddle carriers, camera vision

technologies, and autonomous drones to transform terminals through automation, robotics, and data analytics applications.

Wi-Fi is not optimized for mission-critical applications, but it can complement a private wireless network and help accelerate the digitalization of port terminals. By integrating private wireless with Wi-Fi or aggregating them to support multipath connectivity, port terminals can deploy more advanced use cases that require optimized throughput in difficult radio conditions.

One of our port terminal customers told us that the regular disconnections and packet loss that they experienced over Wi-Fi, which created downtime and impacted productivity, are now a thing of the past. With reliability no longer a concern, they've moved from firefighting mode to focusing on the strategic use cases that will further enhance operations for their customers as well as their IT and OT teams working at the port.

THREE RECOMMENDATIONS FOR PORT TERMINALS STRIVING FOR INDUSTRY 4.0

1. Reconsider the role of Wi-Fi in terminal operations

While industrial Wi-Fi helps port operators connect yard assets and provide basic connectivity for non-critical communications, it has fundamental coverage, latency, security, and reliability limitations that hinder digital transformation. Private wireless is the right choice when it comes to automating cranes and vehicles such as straddle carriers, Ship-To-Shore (STS) cranes, Rubber-Tired Gantry (RTG) cranes, and Automatic Stacking Cranes (ASCs). To take advantage of enhanced capabilities such as low latency and real-time analytics, port operators should consider adopting edge computing and streamlining application connectivity. Existing Wi-Fi can be integrated and aggregated with private wireless to increase

"THE KEY TO ACHIEVING THESE GOALS IS TO SUPPORT STAFF COMMUNICATIONS AND COLLABORATION THROUGH RELIABLE AND SECURE DATA AND VOICE APPLICATIONS ON A CONVERGED PRIVATE NETWORK BASED ON 4G LTE OR 5G CELLULAR TECHNOLOGY."

capacity and throughput for more advanced Port 4.0 use cases.

Husky Terminal at the US Port of Tacoma saw zero packet loss in its recently launched private 4.9G/LTE network, unlike the Wi-Fi network it had previously relied on, which had sporadically dropped connectivity or failed to provide smooth handoffs between access points. This resulted in more than 83 per cent fewer IT support requests, with none of these caused by network-related issues.

2. Explore Digital Twins
Some industrial enterprises have already adopted Digital Twins to simulate key processes and collect real-time insights. Network Digital Twins enable port terminals to monitor their network operations in real time and predict maintenance

needs and potential downtime in advance. Taking things a step further, a Digital Twin is the ideal solution for fully automating yards and processes, ensuring worker safety, and opening a path to the industrial metaverse.

3. Use private wireless to improve ESG performance
A private wireless network reduces energy consumption by up to 84 per cent compared to industrial Wi-Fi because it requires far fewer access points to cover a given industrial site. Streamlining ship-to-shore communications using private wireless, radio, satellite, and microwave technologies reduces idle time for ship anchorage, which mitigates impacts on air and water quality in surrounding environments.

ABOUT THE AUTHOR:
Responsible for the vision, strategy, and execution of Private Wireless Sales in North America, Todd has 25 years of OT experience leading industrials to step-change their operational productivity/efficiency, business model flexibility, and financial position using leading-edge technology. Todd's experiences in creating, motivating, and leading teams that translate complex business drivers into successful technology transformations has given him a unique insight into the trends and dependencies of successful digital transformations. Todd earned his Bachelor of Science in Business at Indiana University and his MBA from Ball State University.

ABOUT THE COMPANY:
At Nokia, we create technology that helps the world act together.

As a B2B technology innovation leader, we are pioneering networks that sense, think, and act by leveraging our work across mobile, fixed, and cloud networks. In addition, we create value with intellectual property and long-term research, led by the award-winning Nokia Bell Labs.

Service providers, enterprises and partners worldwide trust Nokia to deliver secure, reliable, and sustainable networks today – and work with us to create the digital services and applications of the future.