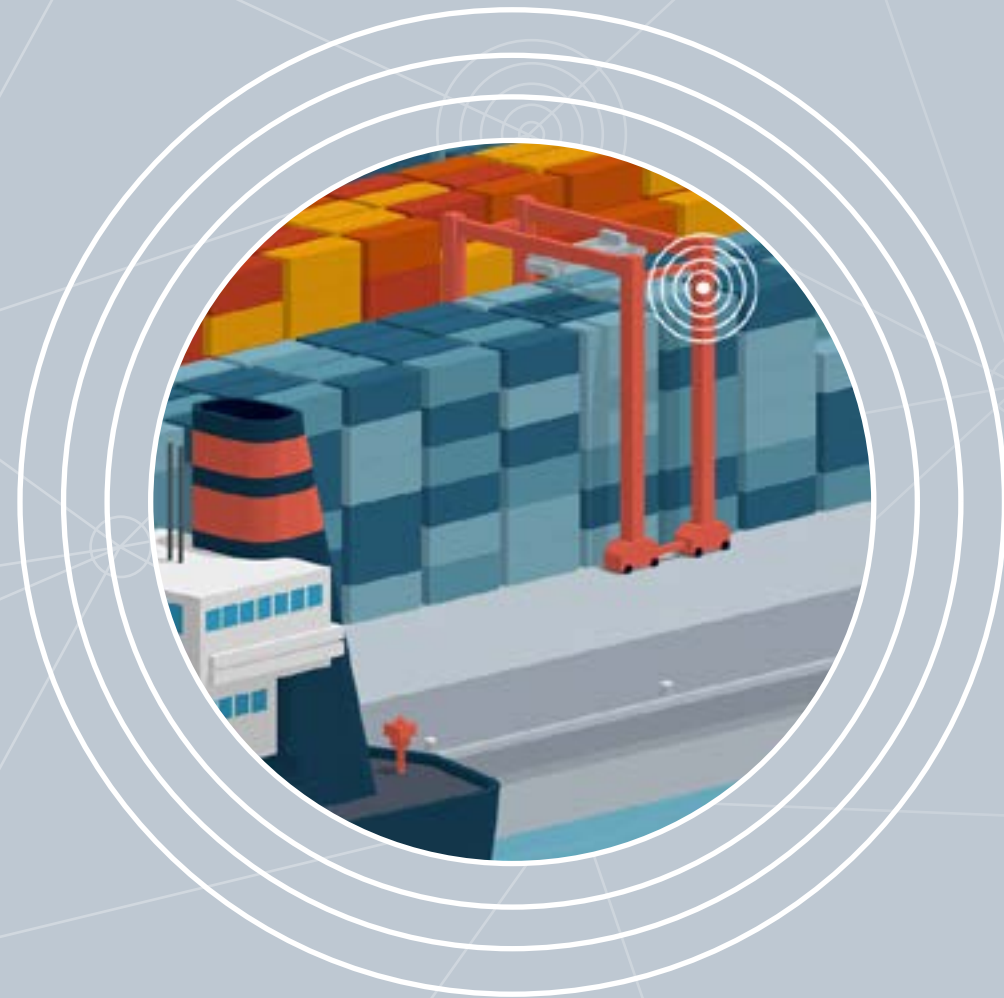




NOKIA

Discover the future of terminal operations
Nokia Industrial-grade Private Wireless for Ports

In this guide we look at how industrial-grade private wireless can help ambitious terminal operators do extraordinary things, zooming in on practical use cases for creating safer, more efficient and more productive port operations.



> Industry 4.0

Connect everyone and everything throughout your terminal

> Enhanced Operational Control

Get complete visibility of operations with a single, predictive view of your entire terminal area.

> Improved Yard Operations

Get industrial-grade wireless infrastructure for complete control of all conventional and automated operations throughout your port terminal.

> Case Studies

Nokia Industrial-grade Private Wireless in Action

Make Industry 4.0 a reality

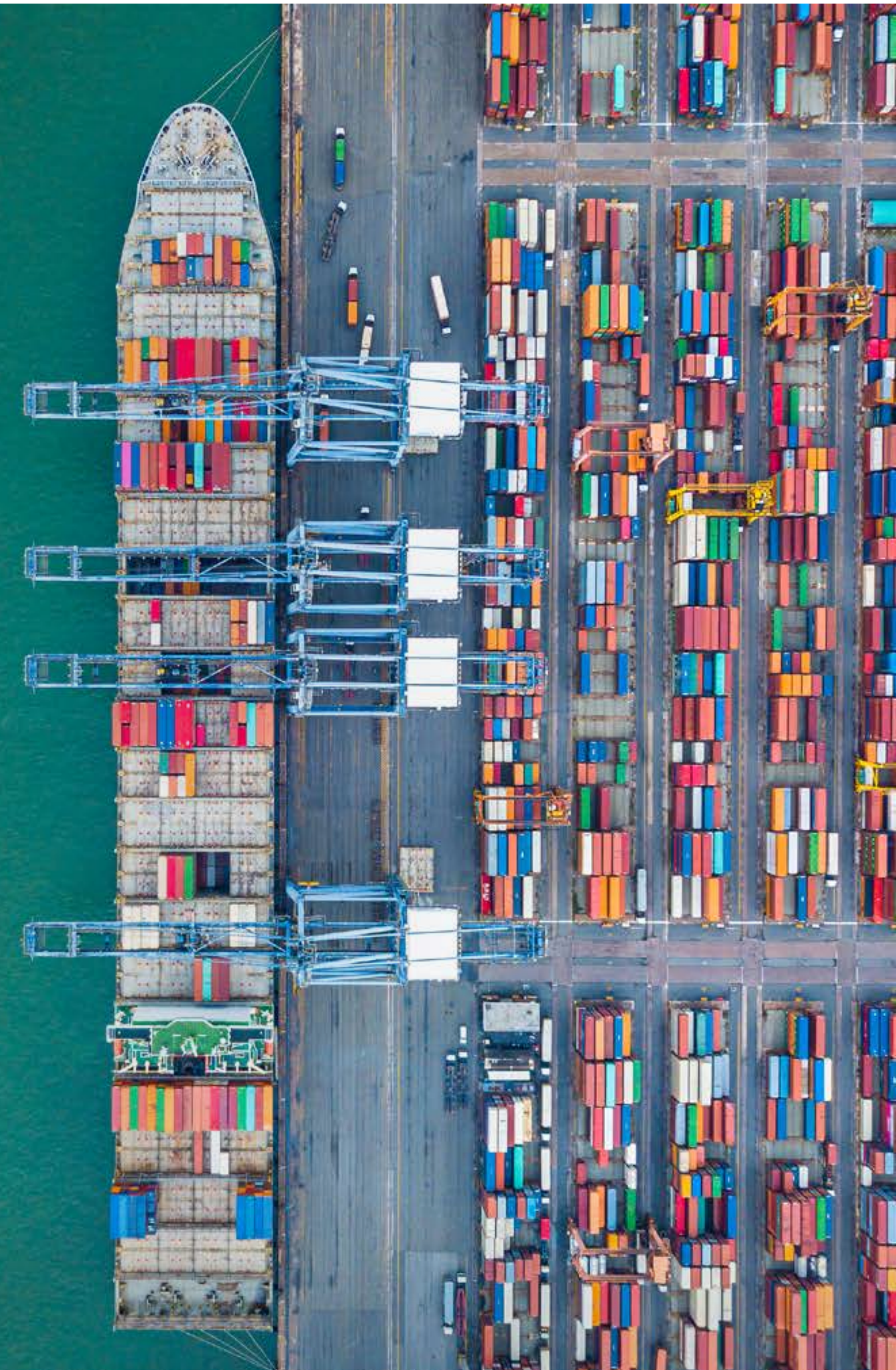
The fourth industrial revolution is well underway – but how are port terminal operators able to turn the possibilities of Industry 4.0 into operational realities?

The technologies – industrial IoT, AI, machine learning and more – are available to help you sharpen your competitive edge, bringing automation-powered efficiency, turn-on-a-dime agility, and increased safety, security and compliance.

With container traffic expected to double by 2050, there's no better time to start embracing this opportunity. But doing so hinges on one thing: connectivity.

The trouble is, the wireless networks that most ports rely on simply weren't built for business-critical industrial use cases or modern terminal operations. They were designed for tasks like web browsing and email communications, and they're characterized by unpredictable performance, patchy coverage and poor security.

To make Industry 4.0 work for your organization, you need industrial-grade, pervasive wireless connectivity. With a private LTE or 5G network, you can deliver real competitive advantage right now using your existing ecosystem of machines, sensors and systems.



Nokia Industrial-grade Private Wireless is here

The LTE networks that were once only available to mobile network operators are now within reach for ports.

Governments around the world have been designating spectrum for industry, and Nokia has been pioneering small cell technology ideal for private industrial networks that are easy to operate without needing specialized mobile wireless expertise. That means you can deploy a private wireless network with LTE or 5G capabilities that's ready to meet your needs.

You can meet critical operational connectivity requirements with a dedicated LTE or 5G network built to handle the demands of digital port applications, offering you:

- **Intrinsic security**
to ensure truly safe and reliable connection
- **Mission-critical reliability**
for near-continuous operations
- **Deep, wide coverage**
to connect everyone and everything
- **Predictable performance**
for industrial automation and real-time asset coordination
- **High capacity**
to easily handle the rapid growth of devices, sensors and data
- **Greater operational control and flexibility**
to enhance safety and respond quickly to changing business needs
- **Effortless mobility**
built on trusted 3GPP mobile standards for reliable coverage and support for a large number of devices



Nokia Industrial-grade Private Wireless for Ports

Connect everyone and everything
throughout your terminal

With dynamically changing volumes of container traffic – that grow relentlessly each year – staying on top in the competitive container port industry means constantly striving for new levels of operational excellence.

The pressure is on to boost efficiency throughout terminal operations, whether by optimizing manned operations, increasing automation, or even rolling out smart port concepts like workflow optimization across stakeholders and their berth, yard, rail and road traffic. And all of this needs to be done in extremely hazardous environments, where worker safety is a key priority.

Today's Wi-Fi networks aren't up to the task.
It's time for industrial-grade private wireless.



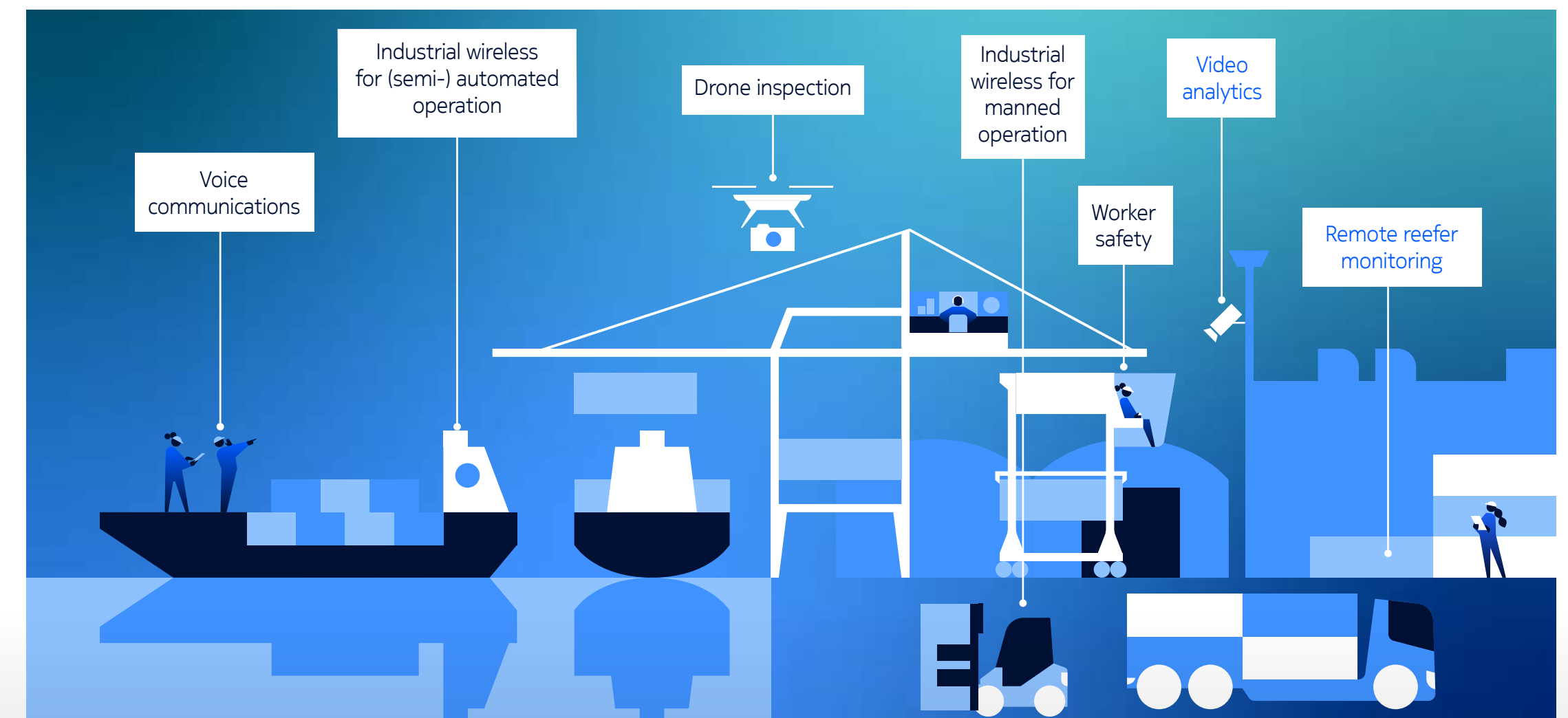
See, understand and control your entire terminal

Nokia Industrial-grade Private Wireless delivers resilient, secure connectivity for critical communications and operational applications on a dedicated network – with coverage that reaches every corner of the terminal.

A reliable, high-performance network provides a seamless connection between the terminal operating system (TOS) and drivers and equipment anywhere in the container yard, helping increase moves per hour. Real-time situational awareness and greater visibility of a large number of moving elements help enhance safety across the terminal. And because there's far less infrastructure to buy, install and maintain compared to existing wireless networks, it's easy and cost-effective to retrofit an LTE network today that's ready for 5G tomorrow.

Use cases

- **Industrial wireless for manned operations:** Highly available and reliable connectivity – even between container stacks – to increase TOS efficiency and container yard productivity
- **Voice communications:** Advanced communications capabilities on a secure converged network
- **Video analytics:** Allowing real-time responses to terminal challenges
- **Remote reefer monitoring:** maintaining optimum conditions of goods
- **Industrial wireless for (semi-) automated operations:** Predictable, low-latency connectivity for smart port applications, such as crane remote control or automated container handling equipment
- **Worker safety:** Real-time workforce safety and fatigue monitoring
- **Drone inspection:** High-value asset monitoring and increased situational awareness



Enhanced operational control

Get complete visibility of operations with a single, predictive view of your entire terminal area.

Connect personnel through reliable, secure voice applications on a single converged network – and keep them protected with remote safety monitoring from wearable sensors and connected personal protective equipment (PPE). Use robust mobile broadband to pass data between systems, container handling equipment and employees. And get broader container terminal coverage from a minimized infrastructure for more efficient connectivity and monitoring of all assets.

- Real-time information from sensors and other devices
- Low-latency data connectivity to systems, container handling equipment, and staff
- Reliable voice connectivity to personnel
- Minimized infrastructure for full terminal coverage



Voice communications

Use a single, converged wireless system for all your communication needs – including data and voice – to connect everyone in the terminal. Communications are key for terminal operations, but Private Mobile Radio (PMR) is limited in functionality. With a private wireless network, you can use LTE/5G-based dynamic group communications and advanced push-to-talk (PTT), push-to-video (PTV) and group call capabilities.

Worker safety

Improve the safety of your workers with connected technologies that enable real-time monitoring and observation. Use wearable devices to observe employee health and fatigue, access safety dashboards for real-time risk mitigation, and enable automated alarms in case of accidents or danger. Improve risk management and reduce accident rates, with the ability to monitor workforce safety from anywhere.

Drone inspections

Simplify asset inspection and respond faster to emergency situations with a network-based drone system that provides a bird's-eye view of whatever's important. Use drones and mountable equipment to gain real-time insights into everything that's happening in your port. Perform aerial inspections of equipment, monitor dangerous goods, provide vital insights into emergency situations, and improve situational awareness for better decision-making and resource planning.

Improved yard operations

Get industrial-grade wireless infrastructure for complete control of all manned and remote operations throughout your (semi-) automated port.

Stay in constant touch with the condition of cargo in reefer containers remotely, with instant alarms from IoT sensors monitoring temperature, airflow, humidity and light. Use real-time insights from multiple CCTV and drone video feeds to make better-informed decisions about resource planning and emergency situations. And rely on a resilient, highly available wireless network that can support all your terminal operations – all day, every day – helping increase container throughput.

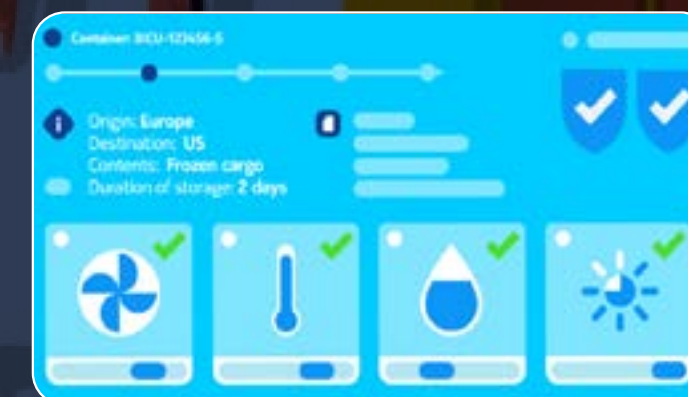
- IOT sensors to monitor temperature, airflow, humidity and light
- Reduce operational costs and risk of cargo loss
- Instant alarm data for rapid response and repair
- Lower costs for container monitoring services
- Increase container terminal throughput

Manned operations

Increase moves-per-hour by overcoming the limitations of today's wireless systems, and seamlessly connect your container handling equipment to your TOS. With a dedicated wireless network, you can eliminate security concerns and any risk of network interference, reduce radio equipment in the field, increase container yard productivity, and ensure future-readiness for your port operations.

Semi-automated operations

Enable next-generation operations with a reliable wireless system that meets the demanding transmission requirements of terminal automation. Guarantee SLAs, support PROFINET protocols for remote control, and maintain visual connectivity with your automated machinery – all through a highly available and predictable wireless infrastructure.



Nokia Industrial-grade Private Wireless in Action

Steveco achieves clarity through improved communications

The Steveco terminal in the Port of HaminaKotka is using a dedicated LTE network alongside the Nokia Digital Automation Cloud to embrace IoT, digitalize terminal processes, and provide mobile access to vital applications.

With its new communications infrastructure, the terminal operator has been able to:

- **Improve situational awareness** – from container handling to warehouse logistics and security
- **Gain vital visibility** with real-time video footage and analytics transmitted through wirelessly connected cameras
- **Provide business-critical connectivity** for terminal trucks, sensors and workers

“Cargo handling needs to become even more efficient and agile. For that we need to embrace IoT and digitalization. We must connect sensors, automatically locate the assets, and enhance the workers’ capabilities with augmented reality.”

Niko Arola, Terminal Manager, Steveco

“A port is never static, this is where private LTE really shines, with great coverage, a lot of capacity, and support for mobile broadband.”

Jouko Tuppurainen, VP Sales, Ukkoverkot

Nokia Industrial-grade Private Wireless in Action

Kalmar builds a roadmap to 5G with Nokia Private Wireless

Following a joint research project on wireless vehicles (5G WIVE), Kalmar and Nokia have signed a two-year co-operation agreement.

The 5G WIVE project is continued in the '5G Vertical Integrated Industry for Massive Automation' (5G VIIMA) research project, which represents one of the world's first 5G applications for terminal automation.

As part of the co-operation agreement, Nokia built a 5G-ready test network reflecting an actual terminal environment for research and development purposes, with a focus on developing increasingly intelligent container handling solutions.

This private LTE network – deployed in partnership with Ukkoverkot at Kalmar's Finnish test yard, and complemented by the Nokia Digital Automation Cloud – will enable Kalmar to:

- **Drive innovation** easily testing new technologies, concepts and products
- **Automate container handling equipment** with reliable, low-latency connectivity
- **Enable remote management** with remote control of equipment and real-time video streaming
- **Test machine-to-machine communications** against previous wireless technologies

[To learn more, read the press release](#)

“Thanks to the trial with Nokia, we were able to build a technology road map to 5G, to see how to proceed towards it and when to take certain steps.”

Pekka Yli-Paunu, Director of Automation Research at Kalmar



From now to next with Nokia Industrial-grade Private Wireless

To compete today, you need to transform your operations now. But it's difficult to get the most out of the Industry 4.0 technologies that will support your transformation when you're relying on existing wireless networks that just aren't up to the task.

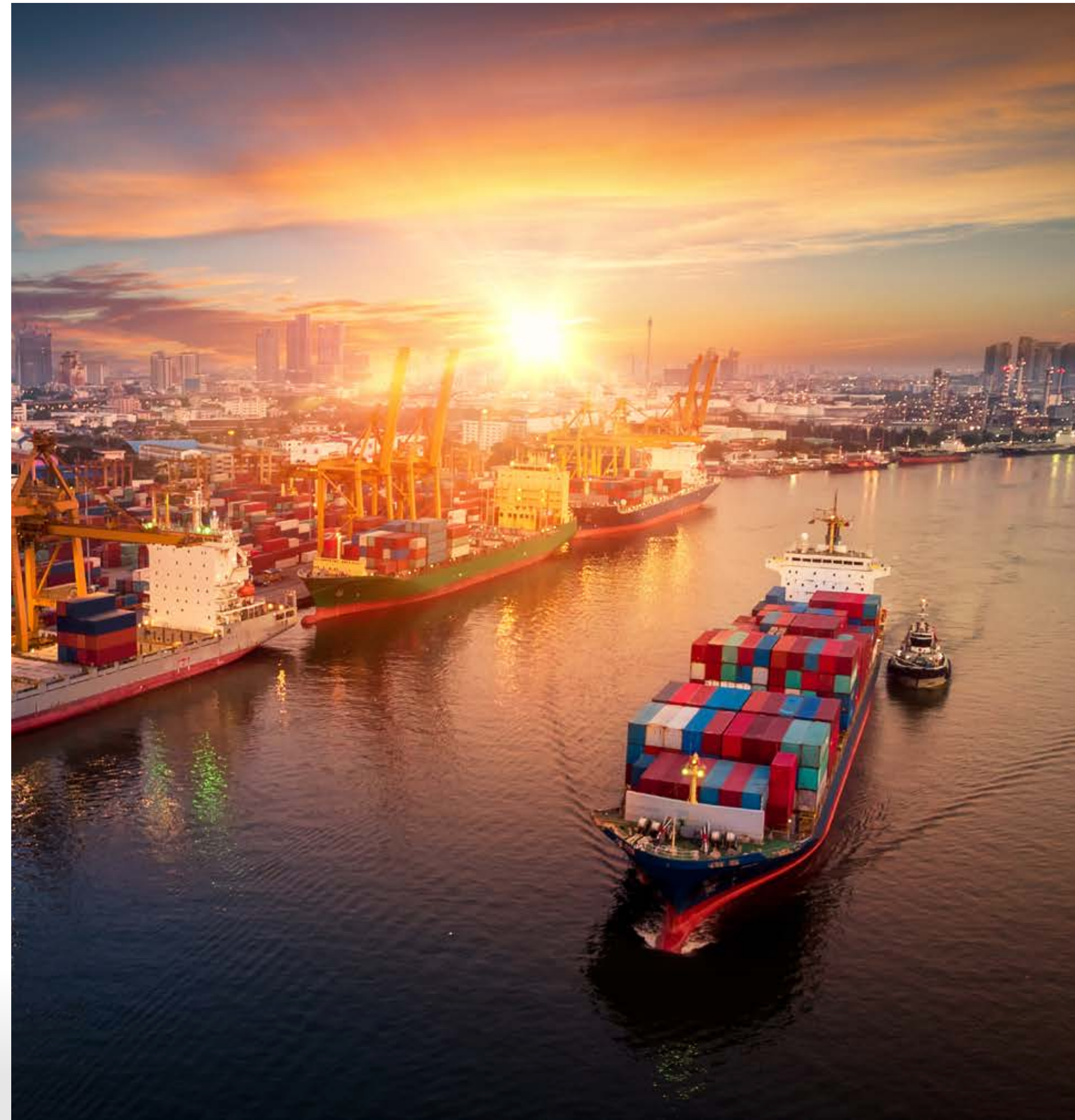
You need industrial-grade private wireless: a dedicated LTE or 5G network that offers the predictable performance, massive coverage and capacity, and built-in security and mobility.



Go Allwhere with Nokia Industrial-grade Private Wireless

We deliver networks that solve unique, industrial-scale challenges, giving you:

- **Remote management of resources:**
Connect every site, device asset and person for greater visibility and control
- **Reliability:**
Support efficient, round-the-clock operations and enhance worker safety
- **Security:**
Gain peace of mind with an intrinsically secure, private network
- **Capacity:**
Handle multiple HD video streams and thousands of sensor feeds
- **Performance:**
Enable extreme automation, real-time coordination, and automated operations
- **Agility:**
Make rapid operational adjustments to meet changing demands
- **Choice:**
Deploy on-premises or in the cloud, owned or as-a-service



Why Nokia?

They might not know it, but more than a billion cellphone users worldwide rely on Nokia networking technology and expertise every day. And they're not the only ones.

With more than 1,300 mission-critical networks and more than 480 private wireless deployments around the world, our industrial customers trust us because we have:

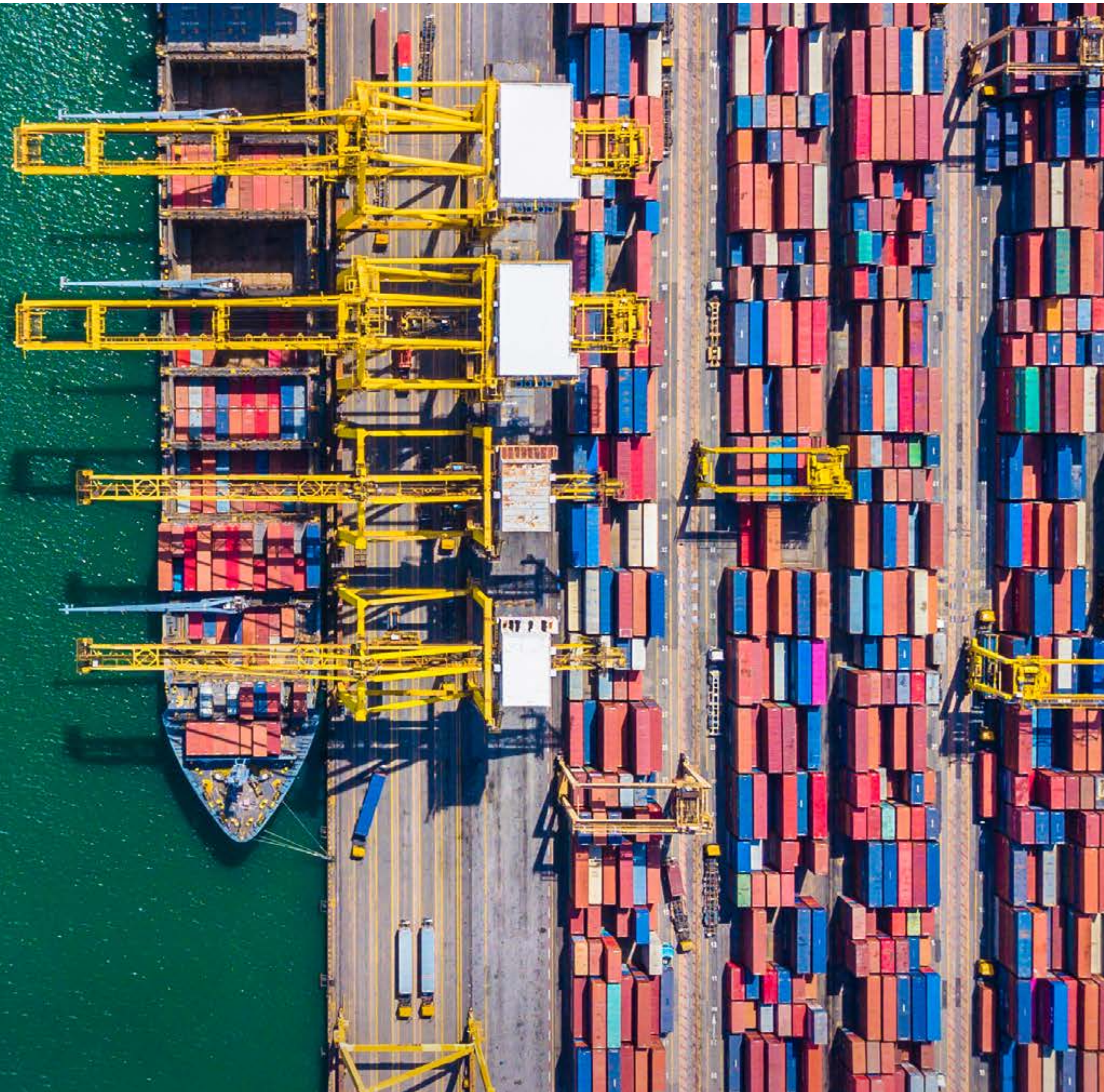
- 25+ years of industry experience and a global track record of reference projects
- Partnerships with leading terminal automation players
- Comprehensive, industry-leading 4G and 5G wireless technologies, including small cells, cloud packet core, IP and optical transport, with common management and orchestration
- A first of its kind plug-and-play solution for cellular-based industrial wireless
- End-to-end portfolio including devices, connectivity and analytics
- Top analyst approval as a vendor of choice for small cell connectivity
- Expertise in all critical communications and ultra-broadband technologies
- A full range of services available in 140+ countries

Let's get started

To learn more about what you could achieve now with Nokia Industrial-grade Private Wireless – and where it could take you next – get in touch with one of our experts:

Nokia Industrial-grade Private Wireless gives you a dedicated, industrial-grade network that solves the unique connectivity challenges your port faces now – and the ones it will face next. Want to learn what reliable, secure, high-performance wireless connectivity could do for your port? Get in touch with one of our experts today:

<https://www.dac.nokia.com/industry/port-terminal-operations/>





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About Nokia

Nokia is a global leader in the technologies that connect people and things. Powered by the innovation of Nokia Bell Labs and Nokia Technologies, the company is at the forefront of creating and licensing the technologies that are increasingly at the heart of our connected lives.

With state-of-the-art software, hardware and services for any type of network, Nokia is uniquely positioned to help communication service providers, governments, and large enterprises deliver on the promise of 5G, the Cloud and the Internet of Things. <http://nokia.com>

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