

## Private LTE-based networks for terminal operators

### Use case

Nokia helps you retrofit your existing terminal to take advantage of smart port concepts by providing scalable, modular network solutions that increase operating efficiency, improve employee safety, and enhance your competitive edge. These offerings allow you to leverage the flexibility of wireless and gain the coverage, capacity, and control provided by private networks—while delivering the reliability and Quality of Service of LTE-based technologies.

Smart ports recognize the crucial role technology can play in addressing the challenges seaports are facing—which range from operational efficiency to the safety of personnel, from data security to intensified competition. In the Port 4.0 revolution, smart ports and personnel across the entire supply chain are interconnected and can work together to maximize the value of their overall ecosystem. As a result, ports that don't use this smart approach to boost productivity and efficiency risk falling behind their industry competitors.

## Challenges

Every seaport faces the following key challenges:

- **Operational efficiency.** As vessels grow in size, container traffic is nearly overwhelming. Terminals are already running 24/7, but automation offers a valuable solution by accelerating loading and unloading. In addition, container ships need to share a huge amount of data with other parties in their supply chain, in order to be more efficient and co-ordinate the entire ecosystem. The connectivity for this data transfer must be reliable, secure, and always on.
- **Worker safety.** Terminals are a hazardous workplace because there are so many moving vehicles, large and heavy containers, and limited visibility at intersections. Therefore, it is essential to know at all times where employees, machines, and freight are positioned. Robust and wireless networks offer a way to increase awareness of this large number of moving elements, so terminal operators can enhance control and improve safety.
- **Competition.** In today's competitive environment, winners will be the smartest ports, not the biggest. That's because a good physical infrastructure is no longer the sole key to success. Instead, smart systems can allow new business models and data-driven services. These systems enable everyone in the value chain to know what has happened or is happening to the cargo, so they can coordinate their actions for optimal efficiency and speed.

## How we help you

Nokia provides the end-to-end, business-critical LTE-based networks you need to meet these challenges. Our scalable, modular solutions offer a cost-effective way to retrofit your existing terminal. Each network leverages our market-leading expertise in LTE-based technologies, along with our strong partnerships with communication service providers and IT enterprise system vendors.

Nokia can:

- Provide networks in licensed, unlicensed, and shared spectra
- Ensure full coverage to every corner of the terminal
- Allow you to prioritize data traffic among applications
- Deliver robust and reliable voice communication
- Enable innovative augmented-reality applications to handle containers
- Provide low latency and uncontested throughput.

## How our approach changes the game

Our end-to-end and modular approach greatly simplifies deployment and operation of broadband communications solutions, while preserving essential business-critical qualities.

### **Complete LTE radio access networks portfolio**

Two different networking approaches are available to terminal operators. Nokia can help you use a slice of a public licensed LTE network, which is dedicated solely to your port operations, based on an agreement with the local mobile operator. In addition, we offer the following LTE-based networks that do not require a license:

- **MulteFire** radio technology leverages the unlicensed 5GHz band globally to deliver LTE-like performance with Wi-Fi simplicity.
- **Citizen Broadband Radio Service (CBRS)** radio technology leverages the US shared-access 3.5GHz band to deliver LTE services according to a three-tier priority-access model.

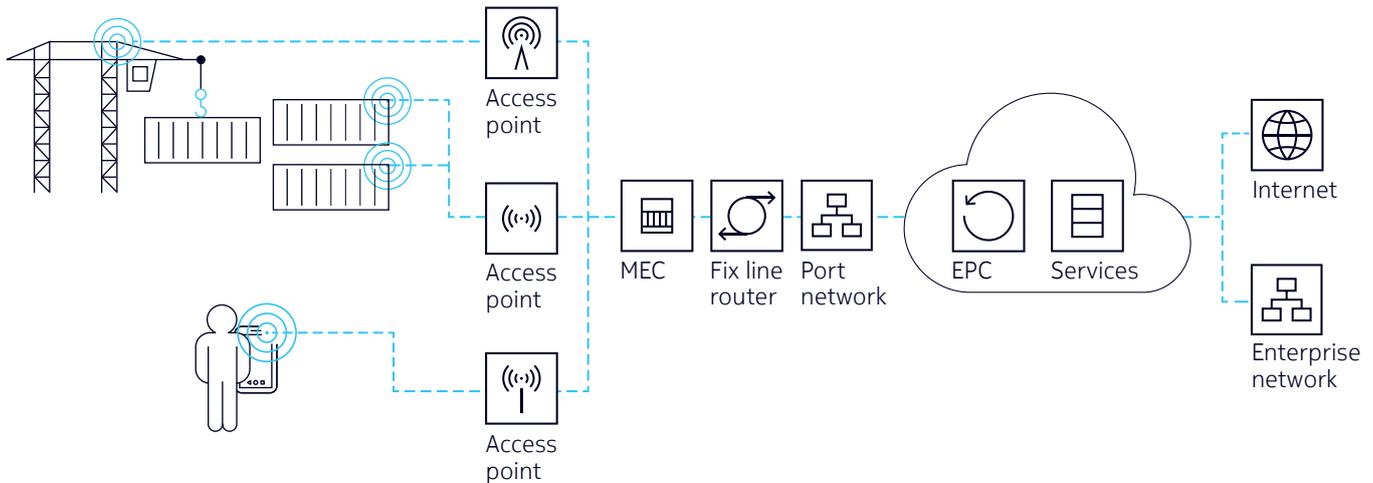
In addition to traditional base stations, we offer a family of small cells and rapidly deployable LTE systems.

**Nokia Multi-access Edge Computing (MEC)** is a virtualized platform, running on COTS IT servers, which ensures that low-latency IoT applications perform smoothly. In addition, it reduces unnecessary traffic to the central cloud, keeping traffic within the enterprise premises. MEC can host the following applications and functions:

- The Local Break Out (LBO) function allows operators to dedicate a slice of a public LTE networks to the port and allows the port to keep data local.
- Evolved Packed Core functions make the private network fully self-contained, when all EPC functions are distributed—or partially autonomous, when only the functions required for connecting the centralized EPC to the enterprise system are hosted on MEC.
- Third parties' Industrial IoT software, such as Amazon Web Services GreenGrass, can also be hosted to provide additional capabilities.

**Nokia Managed services** are available for terminal operators that choose to build their own private LTE-based network, rather than using services from a local mobile operator. Such services eliminate the need for IT departments to build up LTE competences, minimize upfront capital expenditures, and help guarantee that appropriate Service Level Agreements are satisfied.

## Network architecture for a container terminal campus



## Why our approach is different?

- **A trusted partner:** Nokia has 330+ references in LTE and is a founding member of the MulteFire and CBRS Alliances.
- **The secure choice:** working at the forefront of 3GPP standardization for business-critical capabilities, we offer best-in-class networks resiliency through a high-availability architecture, design expertise, and security communications.
- **End-to-end portfolio:** Nokia is a one-stop resource for your enterprise communication networks – ranging from public-private hybrid cloud to IP/MPLS and wireless networks.

## How you benefit

Nokia helps you succeed on your path to Port 4.0 with the following crucial advantages:

- Robust and mobile broadband coverage in port environments, including:
  - Data connectivity to cranes, vehicles, and staff
  - Broadband ship-to-shore connectivity
  - IoT connectivity for sensors and smart devices
- Business-critical network resiliency with LTE networks that provide a high level of reliability and security for services, such as:
  - Voice connectivity to personnel
  - Group communication (push to talk and push to video)
- Flexible and modular approach to deployment that enables OPEX- or CAPEX-based business model



## Let us help you

Nokia is committed to helping terminal operators leverage the latest wireless technologies to unleash the full potential of digital transformation and Port 4.0 concepts. Through our end-to-end COTS solutions and services, we deliver business-critical, secure, broadband IP communications solutions that provide your terminal with the essential building blocks of the industrial internet of things.

For more information about Nokia solutions for terminal operators, visit <https://networks.nokia.com/transportation>

### About Nokia

We create the technology to connect the world. Powered by the research and innovation of Nokia Bell Labs, we serve communications service providers, governments, large enterprises and consumers, with the industry's most complete, end-to-end portfolio of products, services and licensing.

From the enabling infrastructure for 5G and the Internet of Things, to emerging applications in virtual reality and digital health, we are shaping the future of technology to transform the human experience.

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**Europe and Asia Pacific:** +44 203 582 5650 (M-F 08:00 – 16:00 GMT)

**United States and Canada:** +1 866 231 0264 (M-F 08:00 – 17:00 EST)

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Nokia Oyj  
Karaportti 3  
FI-02610 Espoo  
Finland  
Tel. +358 (0) 10 44 88 000

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