NOKIA

Small-Large Industrial Campus private LTE solution

Critical wireless connectivity powering the 4th industrial revolution

To digitally connect all of your critical operations in real time so that they agilely respond to demand requires connectivity everywhere — wireless connectivity that is utterly reliable, secure and covers every inch of your operations, no matter how fast the parts are moving. You need Private LTE from Nokia.

Based on 4G cellular technology that has been used for nearly a decade in mobile networks, Private LTE is now available, affordable and as easy to install as a Wi-Fi network — but as robust and capable as Ethernet. It will make your most ambitious Industry 4.0 dreams come true.

Industrial-strength wireless

Private LTE from Nokia provides robust connectivity to power your Industry 4.0 transformation.

- Remotely control equipment and machines with HD video
- Deploy site cameras for increased site security and operational overview
- Enable the collection of environmental data from many low power sensors
- Implement remote controlled and autonomous and collaborative cranes, AGV, forklift trucks, and compute the trajectories of vehicles (cranes, AGV), machinery and personnel for optimized workflows
- Implement worker smart wearables for increase safety
- Run Push-to-talk and Push-to-video applications on LTE
- Connect machines wirelessly to allow production line re-shuffling.

Private LTE can support all mission-business critical vertical application on a single network to make your operations automatically efficient, ensure safety and security, and push you to new levels of quality and productivity.

This is the vision of digital transformation that Private LTE from Nokia makes it possible for any business to achieve.

Private LTE capabilities for industrial campuses

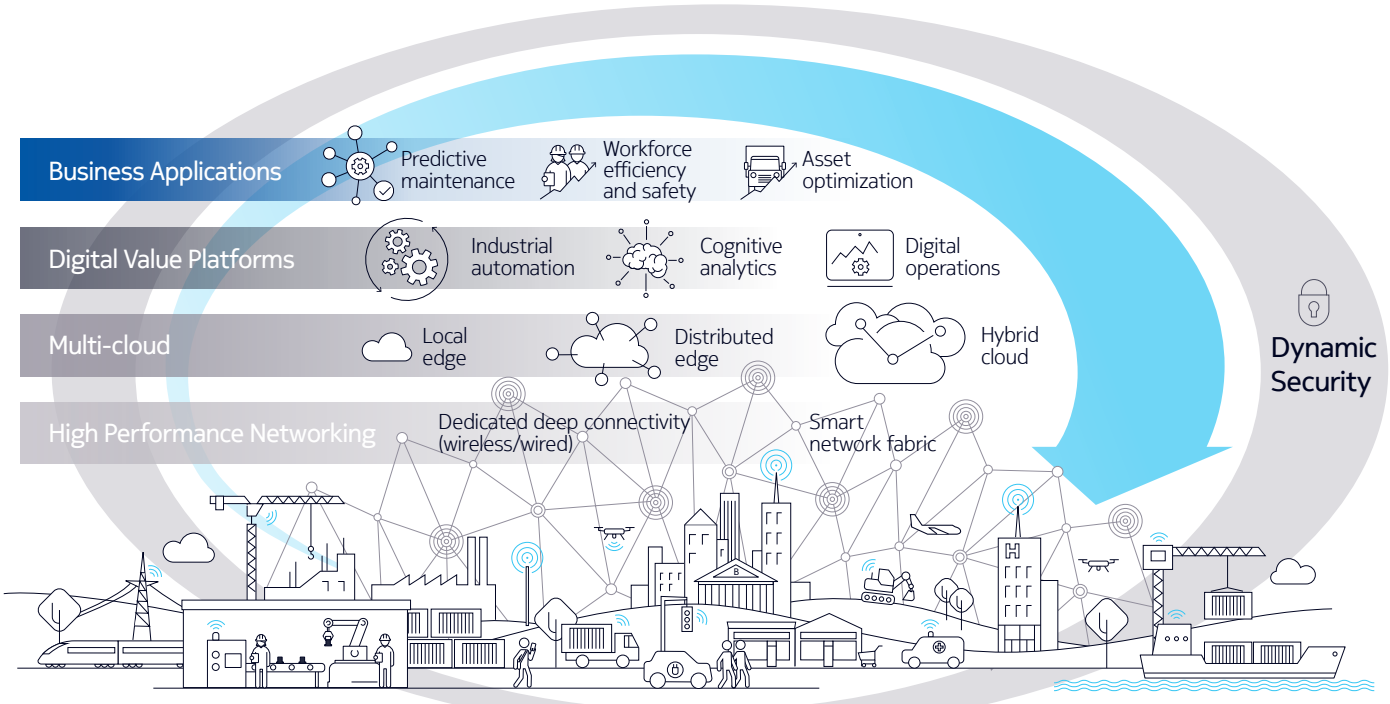
Disruptive technology, one decade old

Until very recently, LTE technology was reserved for mobile operators due to their ownership of LTE radio spectrum. But governments around the world are releasing new spectrum specially designated for private networks. Mobile operators are also willing to lease their spectrum, and LTE can operate in unlicensed/lightly licensed spectrum as well.

The Nokia Private LTE solution completely changes what you can do compared to any other kind of wireless technology. Imagine the capabilities of Ethernet in a wireless format. And, it already has a mature system of LTE-connected industrial devices and has proven its capabilities for a decade in the most demanding networks in the world.

Future X for industries architecture

Nokia Private LTE provides a ubiquitous connectivity platform for supporting enterprise clouds, dedicated slices for specific applications, such as IoT, and the digital connectivity to consolidate every kind of data, using AI and machine learning to optimize and automate your operations.



The Nokia Small-Large Industrial Campus private LTE solution

The Nokia Small-Large Industrial Campus private LTE solution is an easy to deploy solution that can cover combined indoor and outdoor areas of industrial campuses. The LTE micro core is the heart of the system and is joined to LTE radios distributed around the campus that provide the radio coverage in and around the site.

With up to 150x LTE base transceiver stations (BTS), site coverage can scale from very small to very large sites with up to 400,000 km^2 outdoor or 20 km^2 indoor.

With private LTE networks, enterprises get a dedicated wireless network that provides its full capacity for enterprise critical machines and workers. 4G/LTE can support the majority of today's industrial applications, and the Nokia Private LTE solution will be easily upgradeable to 5G.

Access to the network and priority/ performance parameters are controlled by the enterprise. Defined machines, sensors and workers are granted access and guaranteed the right level of performance.

Wireless access points, called base transceiver stations (BTS), come in outdoor and indoor versions, with varying output power from 250mW to 20W. Each BTS can support up to 800 actively communicating users per cell.

They can be connected by either CAT cables (existing or new), PON cabling or microwave links. Nokia Flexi Zone small cells are renowned for their class leading performance, high capacity and compact all-in-one form factor, easing deployment with a single box solution that integrates all the needed elements.

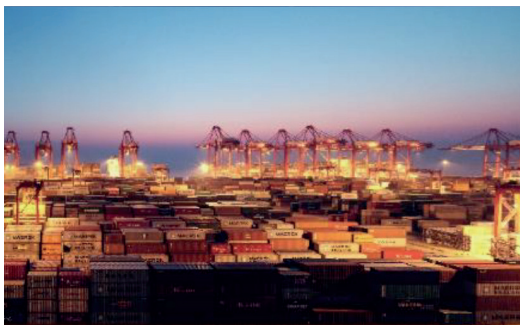
The micro core network (MCN) combines all the functions required to run a full-blown private LTE network. MCN can be run on any COTS server, including Nokia AirFrame servers. It supports up to 10,000 active users as well as Geo-redundancy for increased availability and reliability.

The Nokia Private LTE solution provides a software interface for operating and managing your system.

Various applications, from Nokia or third parties, can be added to expand the system capabilities. For example, Nokia Group communications enables Push-to-Talk (PTT) applications on the same LTE network, saving the need to run a separate PMR network for critical voice communications and also enabling Push-to-Video (PTV) applications.

Where is Nokia Private LTE being used today?

Nokia Private LTE solutions are being used by many large enterprises worldwide to support business- and mission-critical enterprise applications for everything from utilities and mining to manufacturing, airports and port operations.



Port operations

Video surveillance, video orchestration and remote operation and geo-positioning of vehicles (cranes/trucks).

Manufacturing

Enhanced collaborative automated guided vehicles (AGVs), sensors, machine connectivity and group-critical communications.

Oil extraction

Reliable coverage for IoT sensors and remote plant monitoring and operation.

Mining

Reliable wide area coverage for worker safety (smart wearables), video for operational overview, group communications and Improved mining efficiency with remote and autonomous vehicles.

LTE leadership

Nokia is a proven leader in digital transformation having spent decades building some of the planet's biggest and most advanced IP, optical and wireless networks.

Nokia's 400+ LTE mobile operator customers today serve more than three of every four LTE subscribers worldwide. In addition, Nokia has deployed over 1,000 mission-critical networks with leading enterprise organizations such as utilities, railways, smart cities, mining companies, banks and healthcare systems worldwide.

Along with its strong heritage in networking, Nokia Bell Labs, one of the world's pre-eminent research organizations, has pursued cutting edge research in cloud, machine learning and analytics, developing the software platforms to support networking solutions for the new age of industry.

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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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