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Unleashing the power of IoT connectivity

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Telia Company's purpose is to reinvent better, connected living, and it strives to improve business efficiency. The transition to cellular LPWA and 4G/5G technologies makes it possible to unleash the power of IoT connectivity to enhance enterprises' business performance and sustainability.

Key insights

- Telia experienced more than double the growth in the number of cellular-connected IoT devices on its networks across the Nordic and Baltic countries in 2021.
- Globally, the number of IoT devices connected by cellular LPWA technologies is expected to overtake 2G/3G connected IoT devices in 2023.
- Emerging use cases, supported by cellular LPWA IoT technologies, improve business performance and efficiency for enterprises across various industries.

At the crossroads of change

In recent years, Telia has seen a continuous rise in the number of cellular-connected IoT devices on its networks across the Nordic and Baltic countries. 2021 saw an increase of 44 percent, more than double the growth compared to 2020. The growth is primarily fueled by large-scale smart meter deployments, based on the low-power wide-area (LPWA) IoT technologies, NB-IoT and Cat-M. In addition, the adoption of embedded universal integrated circuit cards (eUICC)¹ has simplified the global deployment of connected devices by allowing remote SIM provisioning of multiple network profiles.

NB-IoT and Cat-M technologies are ideal for connecting massive volumes of low-cost, low-complexity IoT devices with long battery life and limited data throughput demand.

These technologies, which form part of the 5G standard, are the successors to 2G and 3G networks that are being replaced as the industry moves to adopt broadband and critical IoT, powered by 4G and 5G.

IoT devices migrating to modernized networks

2G and 3G networks are being phased out globally to enable the reuse of valuable radio spectrum for 4G and 5G deployments. By modernizing the networks with the latest technology and replacing old equipment, it is possible to realize new business opportunities and create significant energy savings at the same time.

About 30 percent of all cellular IoT devices are still connecting through 2G/3G networks. However, enterprises are migrating their IoT devices and services to Cat-M and NB-IoT networks, which are more energy efficient, reliable and have higher capacities. Across Europe, the sunset of 3G networks is happening before 2G (see Figure 22, page 22), but the order and the schedule varies from country to country and between service providers. Telia will decommission its 3G networks before 2G, with the 3G sunset already in motion across Telia's markets in the Nordics and Baltics.

Globally, the number of IoT devices connected via 2G and 3G has been in slow decline since 2019. The combined segment of cellular LPWA, broadband and critical IoT (4G/5G) overtook 2G/3G in terms of IoT connection numbers for the first time in 2020. LPWA IoT technologies are expected to make up about 50 percent of all cellular IoT connections in 2027 (see Figure 13, page 13).

Extending IoT connectivity reach with cellular LPWA

LPWA IoT technology supports solutions requiring low total cost, long battery life and the ability to operate in remote locations. Its energy efficiency comes from sending smaller amounts of data at defined time intervals and then quickly powering down the transmitter in between. The two different cellular LPWA IoT network technologies, NB-IoT and Cat-M – both under the 5G standard – are inherently more secure and have longer reach than previous generations. For example, Cat-M can have a reach of up to 100km and NB-IoT up to 120km from a radio base station. The extended reach and high-penetration capabilities make it possible to cost-efficiently connect sensors in cities, remote rural, coastal, and maritime areas, and even deep inside buildings or underground. In several tests throughout its development, Telia has shown that NB-IoT can connect devices placed as deep as 80m underground.²

The transformational power of enterprise digitalization

Organizations that embrace this new era of digitalization enjoy increased efficiency and cost reductions, thanks to better predictability and greater control. Digitalization also means companies are becoming software businesses, generating proprietary data. They are no longer an isolated part in a vertical market, but a data-driven, interconnected element of a wider, digital ecosystem of services.

¹ eUICC is the software that lets an embedded SIM (eSIM) accommodate multiple SIM profiles and enables it to be provisioned remotely.

² In tests conducted by Telia, together with a customer, an NB-IoT connection reached 80m into a concrete underground shelter. This was 60m deeper than a mobile phone call reached during the same test.

For example, when an agriculture machinery manufacturer equips a tractor with more than 300 IoT sensors and the ability to process more than 150,000 measurements per second, the business and its value creation changes. The tractor is now a data-generating unit, part of an ecosystem of related services such as weather forecasting, commodity pricing and crop yield predictions.

There are many more examples: A car manufacturer that harnesses IoT connectivity is no longer just selling cars, they are also enabling carpooling services and shared ownership alternatives, while gathering and handling information about the driver, roads, traveling habits and even the weather. Providers of consumer IoT services improve the health and lifestyle of consumers thanks to health monitoring, lifestyle optimization and entertainment apps.

Enterprises can be transformed and their new capabilities turned into new customer values and chargeable services. Internal processes and cost control become more effective too, as every decision can be based on real-time data. Monitoring enables less repeating and reactive maintenance, and there is no longer a need for so many trips or manual efforts, leading to clear sustainability gains such as reduced CO2 and pollution from fossil-fueled vehicles. Smarter energy systems, smarter grids and better monitoring allow for a more efficient use of resources.

A truly data-driven, or rather data-native, company makes data the basis for all decision making, regardless of whether it relates to technology, business decisions or sustainability.

IoT connectivity goes underground for pest control

As cities expand and urbanization grows, there is typically an increase in common underground pests, such as rats. Poison traps have traditionally been used for pest control. However, this method allows poison to enter the food chain whereby birds, foxes and domestic pets eat the poisoned rats above ground.

A pest control company in Denmark developed a new digital trap that enables an ethical, non-toxic approach. At first, the solution utilized 2G (GSM/GPRS) for connectivity, but due to the heavy steel covers below the surface of the drains, 25 percent of the traps could never connect to the network. By migrating from legacy connectivity to NB-IoT technology, the connection success rate rose from 75 percent to 100 percent. NB-IoT technology fulfilled the performance requirements to connect the traps deep underground, enabling performance monitoring and information gathering about the number of triggered traps, maintenance needs and sewer flooding in hard-to-reach places. This gave the company a competitive advantage.

Navigating treacherous waters with IoT

Hundreds of thousands of islands making up the archipelagos of Finland and Sweden are battered by brutal storms every winter. Navigation marks are extensively deployed to support marine traffic safety, but these often break free from their anchors and float across long distances. In the past, local maritime authorities had to go out on resource-demanding and fuel-consuming runs each spring to find the marks and return them to their correct locations.



This article was written in cooperation with Telía Company, a market-leading service provider in Sweden, providing innovative services for more digitalized and sustainable societies across the Nordics and the Baltics.

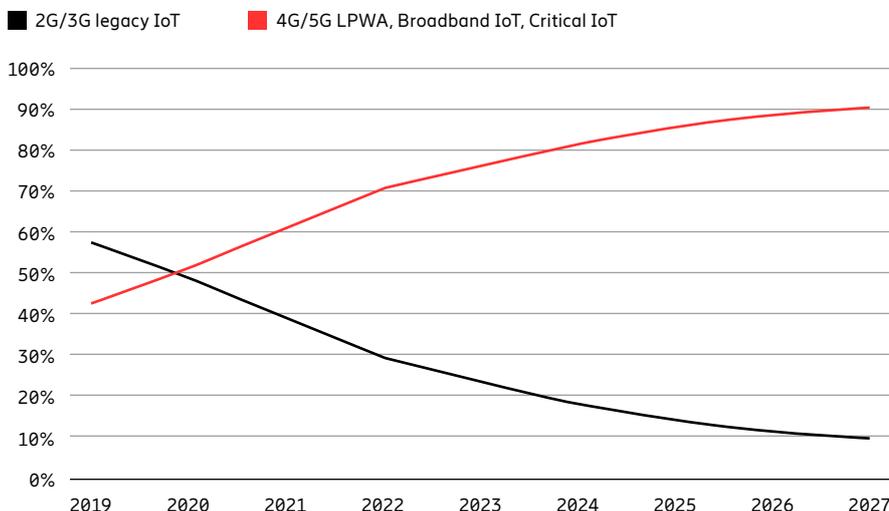
A Finland-based global provider of advanced tracking and sensor solutions took on the challenge, developing a tracker using NB-IoT and aiming to deploy them in over 20,000 navigation marks in the Finnish archipelago. NB-IoT is the ideal connectivity solution for the hard-to-reach offshore navigation marks thanks to its extensive reach and the ability to operate for up to ten years on a single battery charge. Sea routes will be digitalized by remotely tracking navigation marks, which create savings in cost and resources, reduce CO2 emissions and make the waters safer.

Remove roaming limits

Global multinational enterprises (MNEs) need to connect IoT devices across different countries and regions. For an MNE to procure local solutions from a local service provider in each market would be very challenging to implement and to operate, both technically and commercially.

Using cellular network capabilities, they can change the connectivity profile of devices through eUICC. The SIM profile is changeable over-the-air (OTA) and can be set to become a local network device to fulfill the legal requirements that exist in each market, or to have a roaming profile when allowed.

Figure 24: Percentage share of 2G/3G vs 4G/5G connections for cellular IoT



Source: Ericsson Mobility Visualizer.
 Note: NB-IoT and Cat-M access technologies are also referred to as LPWA technologies.

A Finland-based manufacturer of industrial and marine gearboxes, as well as drives for process industries, needed to set up easy-to-use and cost-effective mobile connections for some of its 200,000 gearboxes across 40 countries. In many critical segments of the process industry, optimized gearboxes that allow for uninterrupted operations and cost-effective maintenance are vital. Unplanned maintenance leads to production loss.

Installed sensors measure data such as oil quality, relative humidity, temperature, gearbox vibrations, pressure, and cleanliness of the equipment. Pre-installed IoT devices transmitted the relevant information to different stakeholders, such as the process

control system, the operations and maintenance personnel and the equipment manufacturer. Through eUICC SIM cards, health monitoring the equipment and anticipating subscription costs became transparent and easier to manage.

Transforming tomorrow with IoT

4G and 5G networks will continue to evolve, further enhancing IoT connectivity capabilities with higher data speeds, lower latency, improved security, and extreme reliability. Supported by 4G networks, businesses can achieve better efficiencies and performance with cellular IoT technologies, and Telia's 5G network presently supports use cases such as

remotely controlled high-lift wheel loaders, autonomous field robots for mechanical weed control and automated port operations.

Service providers are uniquely positioned to support the digital transformation of a wide range of industries with evolving cellular IoT technologies, as they enable industries to become truly data driven, efficient and sustainable to further contribute to a better society. As 5G and IoT transform connectivity and unlock new intelligence, the possibilities are only limited to what enterprises and service providers can imagine.

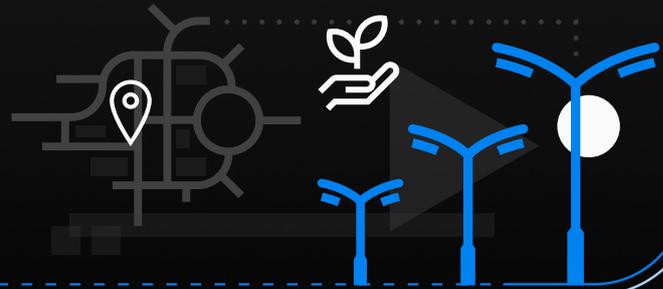
Telia's enterprise IoT use cases making a positive sustainability impact

Industry: Smart utilities

Solution: Connected lighting

Description: Migration of 2G-based IoT to cellular LPWA IoT. This enables low-cost measuring and control units to be built into equipment, addressing the growing demand for advanced lighting solutions.

Value created: Economically viable connectivity can be built into low-cost equipment. More sophisticated coordination of lighting across wide areas, countering energy shortages and improving energy efficiency. Cost-efficient managed solution provided by Telia.

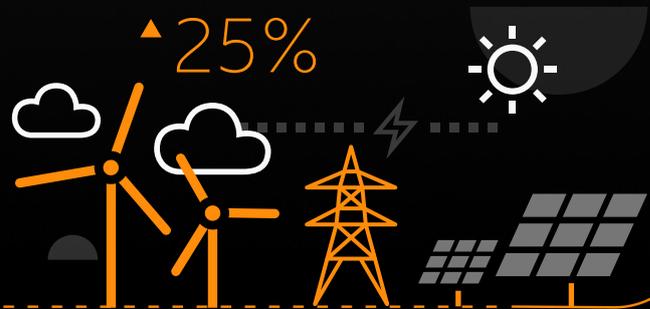


Industry segment: Smart utilities

Solution: Connected powerlines

Description: IoT connectivity provides grid owners with real-time visibility of the capacity of different parts of the grid. This enables extra energy from wind and solar to be prioritized ahead of traditional power sources such as fossil fuels.

Value created: Grid line capacity increased by up to 25 percent.

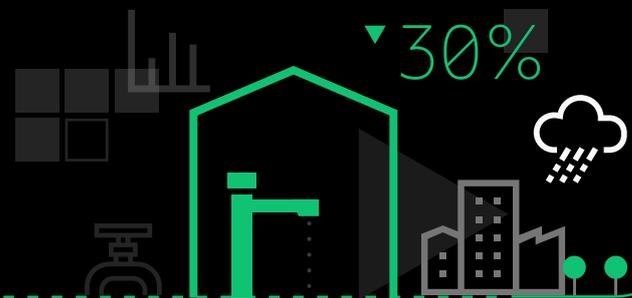


Industry: Smart utilities

Solution: Connected water taps

Description: Digitalization of water taps in public environments, such as hospitals and swimming pools, to collect data and optimize water and energy consumption. This makes the maintenance and construction planning of buildings more efficient.

Value created: Water consumption in public buildings reduced by 30 percent.



Industry: Smart public transport

Solution: Connected buses

Description: IoT technology provides a clear overview of vehicle location, direction and status.

Value created: Fuel consumption reduced by up to 15 percent with improved driver and passenger safety.



About Ericsson

Ericsson enables communications service providers to capture the full value of connectivity. The company's portfolio spans the business areas Networks, Cloud Software and Services, Enterprise Wireless Solutions, and Technologies and New Businesses. It is designed to help our customers go digital, increase efficiency and find new revenue streams. Ericsson's innovation investments have delivered the benefits of mobility and mobile broadband to billions of people globally. Ericsson stock is listed on Nasdaq Stockholm and on Nasdaq New York.

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