Pioneering the fundamental technologies of 5G

Nokia Bell Labs invented many of the fundamental technologies that are being used to develop 5G standards.

We played a key role in driving the first set of globally interoperable 5G standards to completion with 3GPP Release 15. We continue to realize our holistic 5G vision within Releases 16 and 17, including network features that will enable true industrial automation.

Enabling Release 15 initial deployments

LDPC channel coding

Our crucial inventions made low-density parity check (LDPC) coding reliable and practical for real-world communications. LDPC is an essential component for efficient and reliable transmission of feasible multi-gigabit-per-second handsets and gNBs.

5G radio stack design

Nokia Bell Labs researchers invented 5G numerology for simplified LTE + 5G implementation. Together with MAC layer solutions for efficient high-rate handset protocols, this invention provides the basis for new 5G radio designs and quick rollouts.

Massive MIMO

We pioneered MIMO in 1995 and extended the concept with multi-user MIMO and massive MIMO through to its adoption in 5G standards. Massive MIMO is essential for initial 5G Release 15 deployments.

Common data layer and stateless net functions

Our researchers created the common data layer that supports 5G stateless network functions. This data layer is a key enabler for unlimited scalability and resilience in the core. It is also an open ecosystem for data exposure and analytics.

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Mobile edge computing

We led the development of mobile edge computing (MEC) within ETSI and introduced MEC to 5G. This created a key architecture paradigm shift that enabled end-to-end low-latency services and private networks for new verticals.

Access-agnostic core

We are among the leading contributors to the design and definition of an access-agnostic 5G core, providing a universal network solution that serves different radio and fixed access technologies. We also championed 5G AKA authentication, an essential ingredient for efficient and secure 5G networks.

mmWave

Nokia Bell Labs is a technology pioneer and industry leader in mmWave for high-capacity wireless access. We have invented essential enablers for cost-effective mmWave deployment.

Inventions for Release 16

5G unlicensed spectrum

We championed enhancements that enabled 5G New Radio (NR) in unlicensed spectrum bands. These enhancements increased capacity for service providers and private networks and enabled the operation of standalone networks.

Private networks

We expanded the capabilities of the private network core for users in enterprise, industrial and other non-public segments.

Industrial IoT

Our innovations for time-critical operations over the 5G network are vital for manufacturing automation and many other industrial use cases.

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Release 17 enablers

NR-Light

We proposed NR-Light to support massive IoT with medium-rate sensors, such as video cameras.

Enhanced industrial IoT

We are leading the evolution of wide-area time-synchronous communications beyond IEEE's industrial Ethernet solutions by providing native 5G support.

Automation for diverse networks

Inspired by our end-to-end Future X network vision, we continue to drive work in network slicing enhancement, network automation and edge computing.

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