



THIS IS 5G

WHAT IS 5G?

Previous generations of mobile networks addressed consumers predominantly for voice and SMS in 2G, web-browsing in 3G and higher-speed data and video streaming in 4G. The transition from 4G to 5G will add exciting new capabilities and will serve both consumers and multiple industries.

The capabilities of 5G will span several dimensions, including tremendous flexibility, lower energy consumption, greater capacity, higher bandwidth, security, reliability and speed, as well as lower latency and device costs. It will bring new opportunities for people, society and businesses.

2G

VOICE
Massive mobile voice communication

3G

BROWSING
Feature phones and mobile broadband introduction

4G

VIDEO
Smartphone popularization and mobile data traffic exponentially increase

5G

MULTIPLE INDUSTRIES
Any device can provide access to the content and enable new business opportunities across industries

IN 2022, ERICSSON FORECASTS:

9B

9 BILLION MOBILE
SUBSCRIPTIONS

18B

18 BILLION CONNECTED IOT
DEVICES

530M

530 MILLION 5G
SUBSCRIPTIONS

75%

VIDEO WILL ACCOUNT FOR 75%
OF MOBILE DATA TRAFFIC

ericsson.com/mobility-report

WHAT WILL HAPPEN IN THE NEXT FIVE YEARS?

Industries will be transforming by new capabilities brought on by 5G. Examples of these capabilities include:

1. The ability to download a full-length HD movie in seconds
2. The quick reaction time (low latency) to enable remote robotics
3. The ability to spin up virtual networks on-demand with network slicing
4. Battery lifetimes beyond 10 years for remote cellular devices

REQUIREMENTS OF A 5G NETWORK

- Up to 100 times faster data rates: instant access to services and applications
- Network latency lowered by a factor of five; use cases in areas such as manufacturing, automotive, energy and utilities, healthcare
- Mobile data volumes expanded by a factor of 1,000
- 10x better battery life: remote sensors and more sustainable networks

WHY 5G

Three areas of usage and applications have been defined by the International Telecommunication Union's Radiocommunication Sector (ITU-R) as part of its program to expand and support diverse usage scenarios and applications beyond 4G:



NON-SIM
DEVICES



SMARTPHONES



HOME, ENTERPRISE, VENUES, MOBILE/WIRELESS/FIXED



4K/8K, UHD, BROADCASTING, VR/AR

ENHANCED MOBILE BROADBAND

Usage scenarios:

- Widespread connectivity is needed as the demand for mobile broadband continues to grow
- Data rates, connection density, and mobility
- Human-centric use cases: Access to multi-media content, such as 4k streaming on a mobile device or on-site live experiences



MASSIVE MACHINE-TYPE COMMUNICATIONS

Usage scenarios:

- Connectivity is required for millions of devices
- Typically transmitting a low volume of non-delay-sensitive data (low bandwidth and not latency critical)
- Devices must be low cost with extremely long battery lives



CRITICAL MACHINE-TYPE COMMUNICATIONS

Usage scenarios:

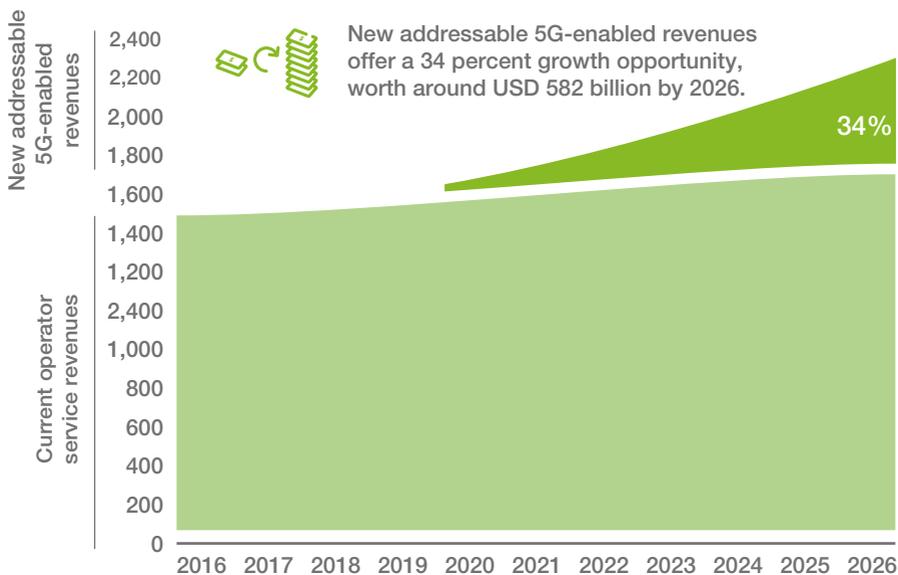
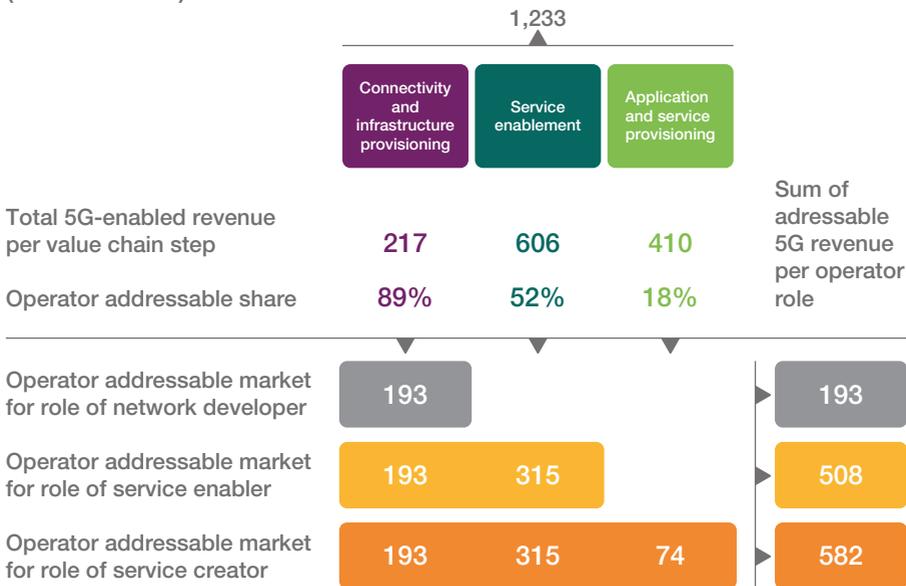
- Ultra-reliable, resilient and instantaneous connectivity
- Stringent requirements on availability, latency and throughput

Use cases: Wireless control of industrial manufacturing and production processes, remote medical surgery, distribution and automation on a smart grid, and transportation safety.

WHAT WILL 5G MEAN FOR OPERATORS?

The introduction of 5G will enable new services, new ecosystems and new revenue streams. By addressing industry digitalization with 5G, operators can benefit from a USD 582 billion market opportunity globally in 2026, based on Ericsson's 5G business potential report, representing potential of additional 34 percent growth in revenues. Operators will find the greatest opportunities in the manufacturing and energy/utilities sectors. Capturing this market potential requires investment in technology, as well as business development, go-to-market models, and organizational adaptation.

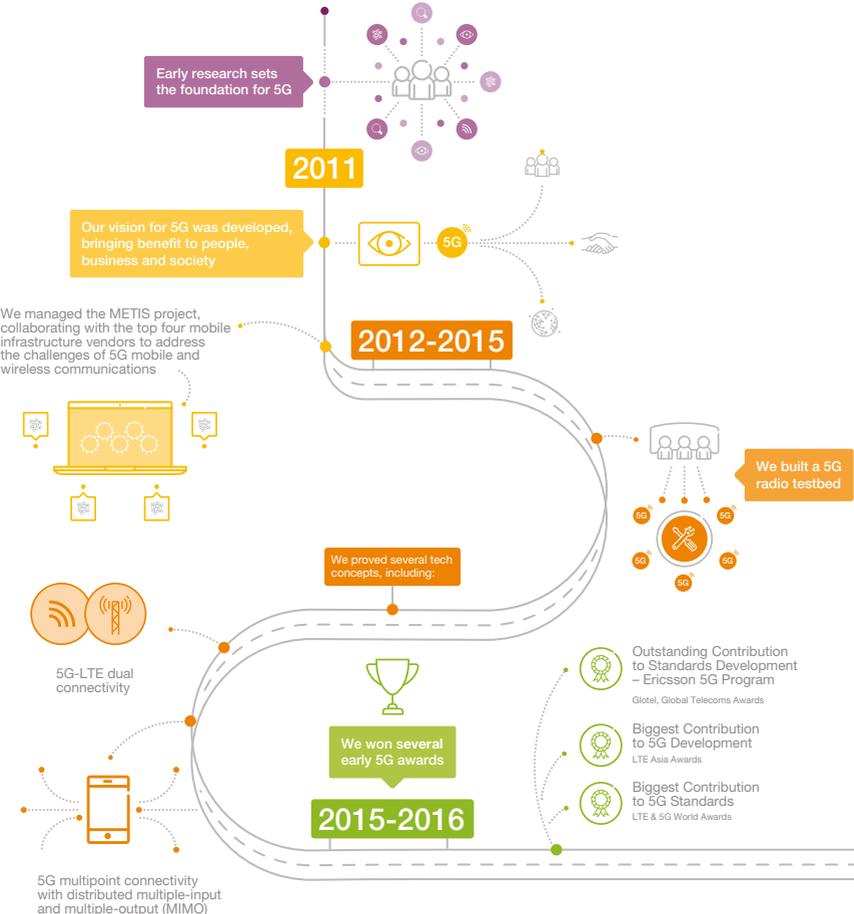
OPERATOR ADRESSABLE 5G MARKET IN EIGHT INDUSTRIES (USD BILLION)



Source: Ericsson, The 5G business potential - Industry digitalization and the untapped opportunities for operators

WHEN WILL 5G BE AVAILABLE?

Ericsson and partners have been working with 5G technology for several years in the labs, and this year we are starting to take these technologies into smaller field trials. The 5G standardization has been accelerated and is planned to be finalized by mid 2018. First commercial 5G networks and devices based on the 3GPP standards are expected in 2019, with major network deployments from 2020. Ericsson estimates the number of subscriptions reaching around a half billion by the end of 2022.



TOMORROW

We will see 5G in action

There will be even more use cases and applications deployed, such as VR/AR gaming, remote-controlled robots and fixed wireless access, ready for 5G subscription uptake in 2019.



First commercial 5G networks and devices based on the 3GPP standards are expected in 2019



The 5G standardization planned to be finalized by mid 2018.

Our partnerships are growing

TODAY



First vehicular connectivity services (with BMW Korea and SK Telecom)

By mid-2017, we had already signed 33 5G MoU (Memorandum of Understanding) with operators, including Vodafone, Telefonía and China Mobile, to help define industry standards, drive innovation and launch equipment demonstrations.



25 Gbps downlink throughput (with NTT DOCOMO and Korea Telecom)



Test peak rates of 15 Gbps per user, and a latency below 3 milliseconds (with Telia)

Use cases delivered:

20 Gbps with two connected mobile devices outdoors (with DOCOMO)

5G advances

2016



Tactile robotic surgery at King's College London

TECHNOLOGIES AT THE HEART OF 5G

Whereas 2G, 3G and 4G were primarily radio focused, 5G will represent an entire system with radio, a telecom core, and OSS all transformed to support new requirements. This process will involve new radio technologies, a virtualized cloud-based core, and end-to-end management and orchestration to facilitate automation and new concepts like network slicing. The system will not be standardized – instead many technology areas and interfaces will be standardized in different environments.

Artificial Intelligence (AI) is the ability of machines to learn processes.

Automation makes all configurations of services and network connections, which are mainly manual today, automated. This reduces time to market for new services and improves the quality with less risk of error.

Baseband provides switching, traffic management, timing, baseband processing, and interfaces towards the radio units.

Beam tracking is used to follow the position and movements of a given device. 5G Radio points one or more beams in the best direction for that device in real-time, to ensure consistently reliable connections.

Cloudification is the conversion and/or migration of data and application programs to make better use of cloud computing.

Cross-domain orchestration manages provision, end-to-end services and connectivity across 5G system domains like radio, transport and core.

Edge computing is the technology to move the execution applications closer to the users. This will enable latency sensitive applications e.g AR/VR or mission critical use cases. This is done by having cloud platforms distributed further out in the radio network.

Dynamic Time-Division Duplexing (TDD) enables adjustments of uplink and downlink resources flexibly according to the instantaneous traffic load.

eCPRI interface is an evolved front-haul standard agreed by industry leaders, which makes it possible to move the beamforming processing from the baseband to the radio. This simplifies Massive MIMO deployment and offers the flexibility needed in real-life site environments.

Federated network slicing is designed to enable the provision of network slices globally, making sure that customers do not need individual agreements with different operators for a global service experience.

Gigabit LTE offers LTE-based download speeds of up to one gigabit per second.

Massive Multiple-Input and Multiple-Output (MIMO) is the combination of MIMO and beamforming with large number of antenna elements – to improve both throughput and energy efficiency.

Multi-User MIMO uses techniques to transmit data to several user terminals using the same time and frequency resources, thus increasing the efficiency of the system's radio spectrum.

Network Function Virtualization (NFV) enables the on-demand instantiation of functions in a format easier to load-balance, scale up/down, and allow for the movement of functions dynamically across distributed hardware resources in the network.

Network slicing enables mobile network operators to provide dedicated virtual networks with functionality specific to the service or customer over a common network.

Network slice management automates the setup of service connections to secure service quality, save costs and gain fast time to service.

Radio Access Network (RAN) connects individual devices to other parts of a

network through radio connections.

Software-Defined Networking (SDN) centrally configures and manages physical and virtual network devices in datacenters, such as routers, switches, and gateways.

Virtual Network Functions (VNF) describes telecom core functions like packet core, IP Multimedia Subsystem and Subscriber data management when implemented as software on cloud-based hardware platforms. The software will be optimized for the cloud environment. This evolution has started and will be applicable also for LTE networks.

Virtualization combines hardware and software network resources and functionality into a single, software-based administrative entity – a virtual network.

5G New Radio (NR) is the radio access interface that will become the foundation for the next generation of mobile networks.

5G policy and user data for Network Slices ensure users get the right service quality with data integrity.

5G transformation services ensure the migration of the network and operation from legacy to 5G core, virtualized and based on an automated operational model.

- 5G core network technologies
- 5G radio network technologies

TECHNICAL EXPECTATIONS OF 5G



Peak Data
Rate

1-20 Gbps



Area Traffic
Capacity

0.1-10
Mbps/m²



User
Experienced
Data Rate

10-100 Mbps



Availability

99.999%
(of time)

Spectral
Efficiency

x 1 - x 3



Battery
Life

10 years*



Mobility

300-350 km/h



Reliability

99.999%
(of packets)



Latency

1-10 ms

Position
Accuracy

10m - < 1m



Connection
Density

10k-1m
devices/km²



Security



Network
Energy
Efficiency

x 1 - x 100

Strong subscriber authentication,
user privacy and network
security

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