



ERICSSON

# This is 5G



# 5G: More than just another 'G'

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5G is here and set to change our world for the better.

Most people today have heard of 5G, but not everyone understands exactly what it is and the positive impact it could have on businesses and society. Compared to the relatively incremental shift from 3G to 4G, 5G is a game changer.

Yes, it is true that 5G represents the fifth generation of mobile networks, but it is so much more than just another 'G'. It will entirely change what we can do with mobile connectivity.

5G is an innovation platform, which will only be limited by imagination.

We predict that in 2026, 5G networks will carry more than half of the world's mobile data traffic (growing by a factor of 4.5 by the end of 2026 compared to today). Due to this there is an urgent need for more efficient network technologies, data capacity and better use of the existing spectrum.

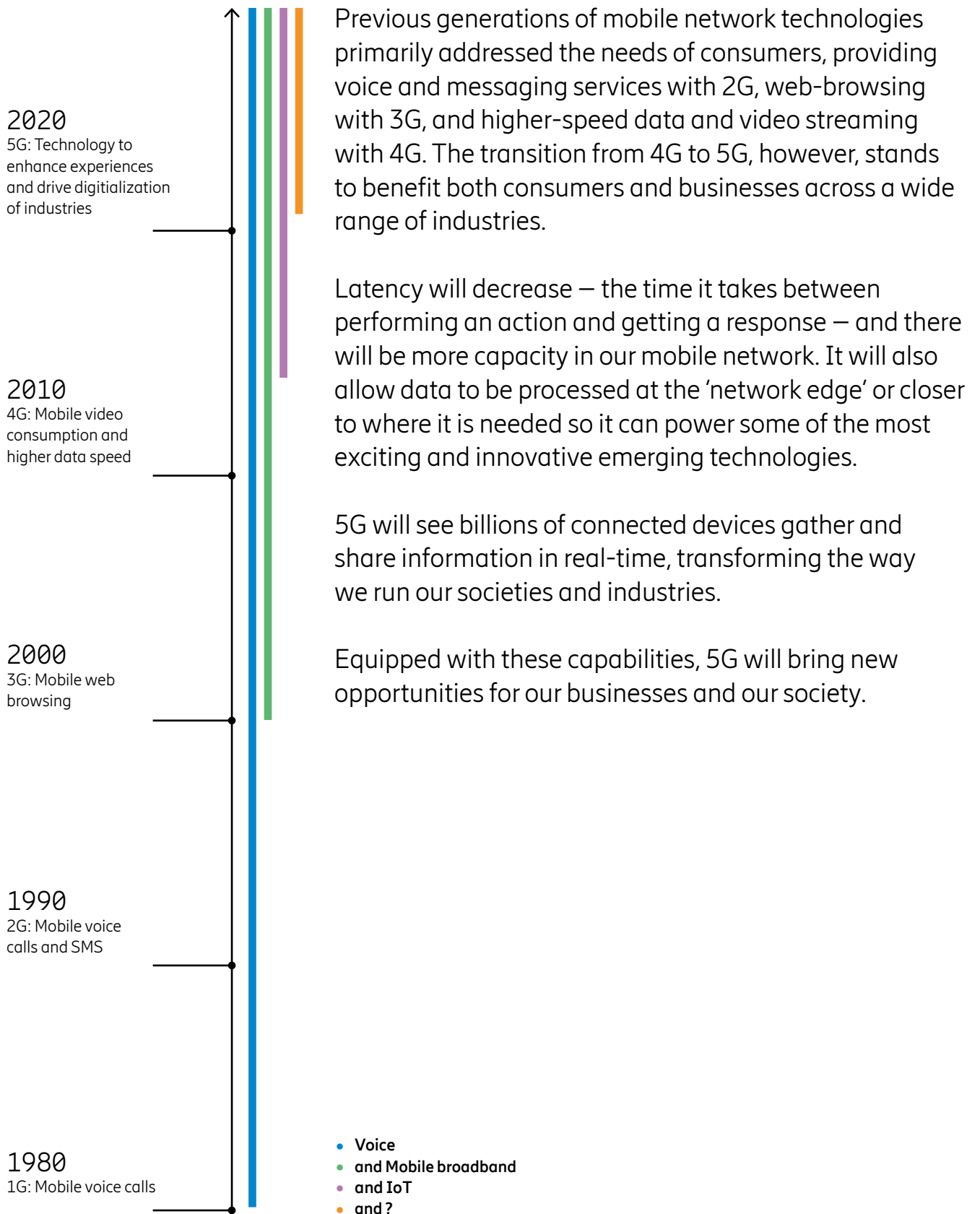
Read on to learn what 5G is and what it can help achieve.

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**If you would like to learn about any technical terms in more detail, please consult the glossary on page 19**

## 01

## What is 5G?



# What makes 5G different?

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## 5G Capabilities

Wide-range of other sectors will experience dramatic transformation, underpinned by entirely new 5G-enabled mobile capabilities. Examples include:

1. The ability to start streaming large volumes of HD audio & visual content in no time
2. Lag free networks with very high reliability and availability, enabling remote operations and robotics for even the most critical applications
3. The ability to create multiple virtual networks on-demand, each with its own performance and security specifications – called ‘network slicing’
4. A shift to more cloud based services which will improve access to resources via edge computing, making data processing and storage more efficient







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## 5G Key Features

1. Fast  
Up to 100 times faster data rates (10Gbps): instant access to services and applications
2. Available  
Users will experience less network downtime due to the combined use of high, mid-, and low frequencies
3. Secure  
The most secure mobile network ever, with security built-in as part of the standardisation process to ensure higher reliability and availability
4. Reliable  
Network latency (the time it takes for data to travel between two points) lowered by a factor of five; making it crucial to manufacturing, automotive, energy and utilities, healthcare
5. Capable  
The ability to handle connections and mobile data volumes will be expanded by a factor of 1,000

# By the numbers

## 5G Specifications

	 Speed Peak rate down/up	 Low Latency	 Availability Reliability Security*	 Mobility	 Position accuracy	 Device density
4G	1/0.2 Gbps	10ms	99.99X%	220mph	150ft	250 per mi <sup>2</sup>
5G	20/10 Gbps	1ms	99.999%	310mph	3ft	2.5 Mn/mi <sup>2</sup>



By 2026, Ericsson forecasts:

# 8.8Bn

Worldwide mobil subscriptions. More than the current global population of 7.8 billion

# 3.5Bn

5G subscriptions

# 27Bn

IoT connections, up 13% from just the start of 2020

# 60%

5G coverage for the global population

# 77%

of all mobile data traffic will be video



# 02

# How does it work?

Whereas 2G, 3G and 4G were primarily radio focused, 5G represents an entire system with radio, a telecom core, and operation systems all transformed to support new requirements. This process will involve new radio technologies, a virtualized cloud-based core, and end-to-end management to facilitate automation and new concepts like network slicing.

## Technologies at the heart of 5G

Mobile networks use radio waves to communicate, radio waves have different frequencies and 5G uses three different ranges of radio frequency – low, mid and high.

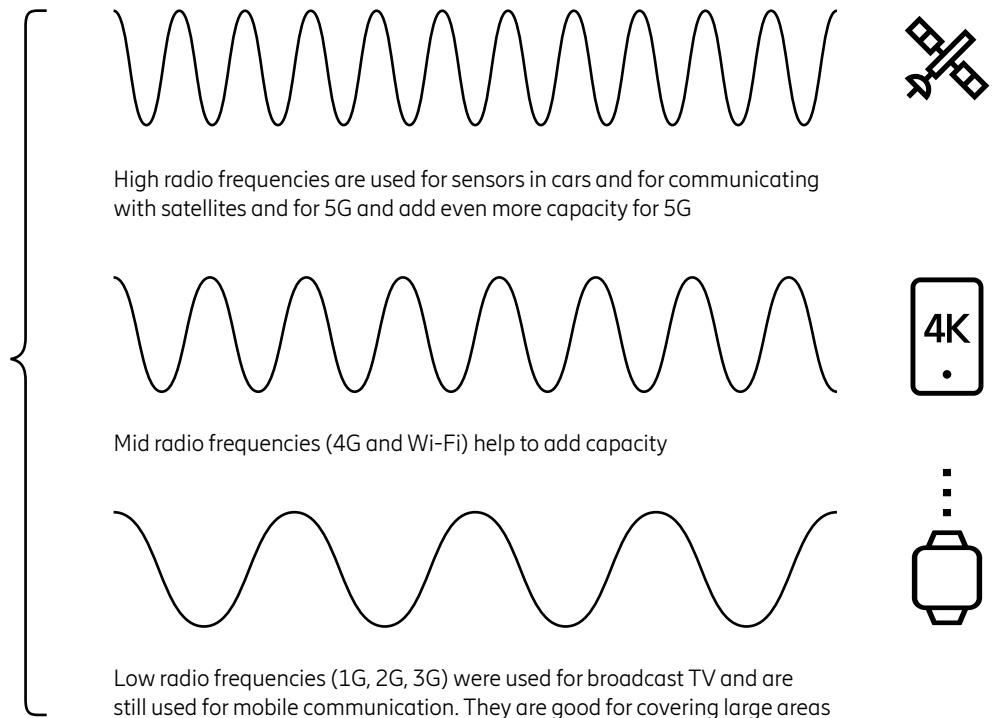
### 5G is then deployed to devices and applications through:

**The 5G core** which is like the brain of the network, where all data is routed to in order to get the information to the desired destination.

**5G networking technologies** which uses radio frequencies and advanced implementations of antennas to provide wireless connectivity to the devices.

# 5G

The radio waves used in 5G are nothing new, but what is new is how cleverly 5G uses all three to enable better ways of communicating



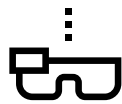




## 03

# What are the applications of 5G?

So we now know what it is and how it works, but what can 5G actually do? Taking those benefits of capacity, security, speed, availability and reliability –there are six key use cases for 5G.



## 1. Enhanced Mobile Broadband:

Mobile broadband is the first real use case for 5G, addressing traffic growth demands while also providing the higher quality of experience that consumers increasingly expect.

This will allow for:

- Delivering sensory experiences, like touch, through devices
- Greater realism in VR, AR and XR with lighter devices – untethered to laptops or desktops
- Stable and reliable connectivity in crowded spaces
- New angles and interactions for live, and remote, event spectators



## 2. Fixed Wireless Access:

5G fixed wireless access effectively eliminates the need for costly deployment of deep-fibre fixed access infrastructure, while offering peak rates that few fixed technologies are able to match.

This will allow for:

- High-speed, high-capacity broadband coverage to low income and rural areas, which are often left underserved
- Greater support for remote working practices, such as seamless high-quality virtual conferencing at home to boost team productivity
- Remote healthcare expertise with specialists smoothly consulting/diagnosing patients elsewhere
- More engaging methods of digital teaching and learning through immersive content



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### 3. Massive Internet of Things (IoT):

Massive IoT, as the name suggests, is less about speed and more about scale. It refers to applications requiring connectivity over large areas involving a huge volume of connections and devices. Typically, connections are transmitting low volume, non-critical data.

This will allow for:

- Logistic networks autonomously routing goods based on real-world conditions
- Full traceability down to the individual item at warehouses and ports
- Increased use of IoT in agriculture to efficiently grow crops



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### 4. Broadband Internet of Things (IoT):

Broadband IoT takes things up a level from Massive IoT. It adopts the capabilities of mobile broadband connectivity, providing much higher data rates and lower latencies than Massive IoT. It does this, while using machine functionalities for coverage extension and extended device battery life.

This will allow for:

- The use of drones for everyday activities such as the delivery of retail goods or medical supplies
- Tracking of traffic patterns in relation to an organisations delivery schedules
- Smarter electricity grids for greatly reduced carbon emissions



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### 5. Critical Internet of Things (IoT):

Critical IoT enables more reliable services for a wide range of time-critical tasks across most industry verticals. These applications will have set data delivery requirements regarding reliability, resilience and instantaneous connectivity e.g. data transfer within 50 milliseconds with 99.9 percent likelihood of delivery.

This will allow for:

- Wireless control of industrial manufacturing and production processes
- Remote medical surgery
- More connected vehicles sharing data to prevent road collisions
- Faster deployment of emergency services to accidents



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### 5. Industrial Automation Internet of Things (IoT):

Industrial Automation IoT will enable advanced industrial automation applications with extremely demanding connectivity requirements. In some industrial deployments, wired networks may migrate to wireless connectivity in such a manner that different parts of an industrial system may switch to wireless connectivity gradually over time.

This will allow for:

- Much more secure networks for the likes of autonomous driving
- Providing safer working environments in mines through cellular connectivity
- Digital twins that can alert faults in real machinery ahead of time and allow for predictive maintenance



## 04

# What are the benefits of 5G?

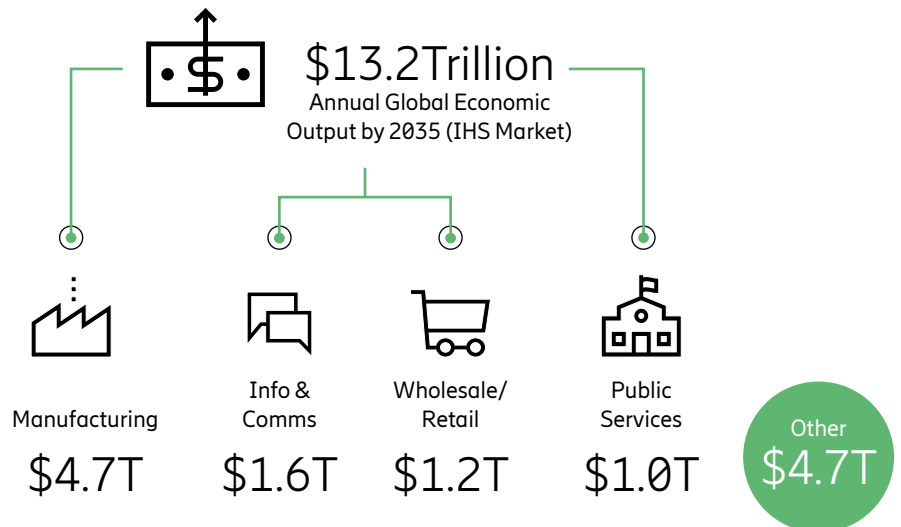
## Economic Benefits

5G has the potential to be the cornerstone of the economic recovery boosting enterprise, as well as opening up huge opportunities in healthcare, utilities, culture and more.

Further ahead, 5G technologies are expected to contribute \$13.2 trillion to the global economy by 2035, according to industry analysts IHS Markit. The automotive, healthcare, logistics and manufacturing sectors are among the sectors projected to benefit the most.

Countries that were late in adopting 4G largely missed the economic opportunities that came with it. While the development of 5G has generated lengthy discussion, the capabilities of the technology are real and 5G is here and ready to be deployed.

Figure 1: 5G will enable \$13.2 trillion in global sales activity in 2035



Source: Based on IHS Markit, The 5G Economy: How 5G will contribute to the global economy, 2019

## Societal Benefits

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**Digital technologies such as 5G and IoT are predicted to reduce global emissions by up to 15% by 2030 which will be critical in combatting climate change.**

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5G is by far the most energy efficient of all the generations. It will be an enormous contributor to breaking the energy curve. By reducing network energy use, we can also help to reduce what is often business's biggest operating cost. The shift to 5G brings an opportunity for companies to efficiently address the overall energy cost of the existing network by modernizing and replace old equipment. The latest radio equipment also opens up for a more energy efficient way to aggregate standards and utilize power down modes in a more strategic way.

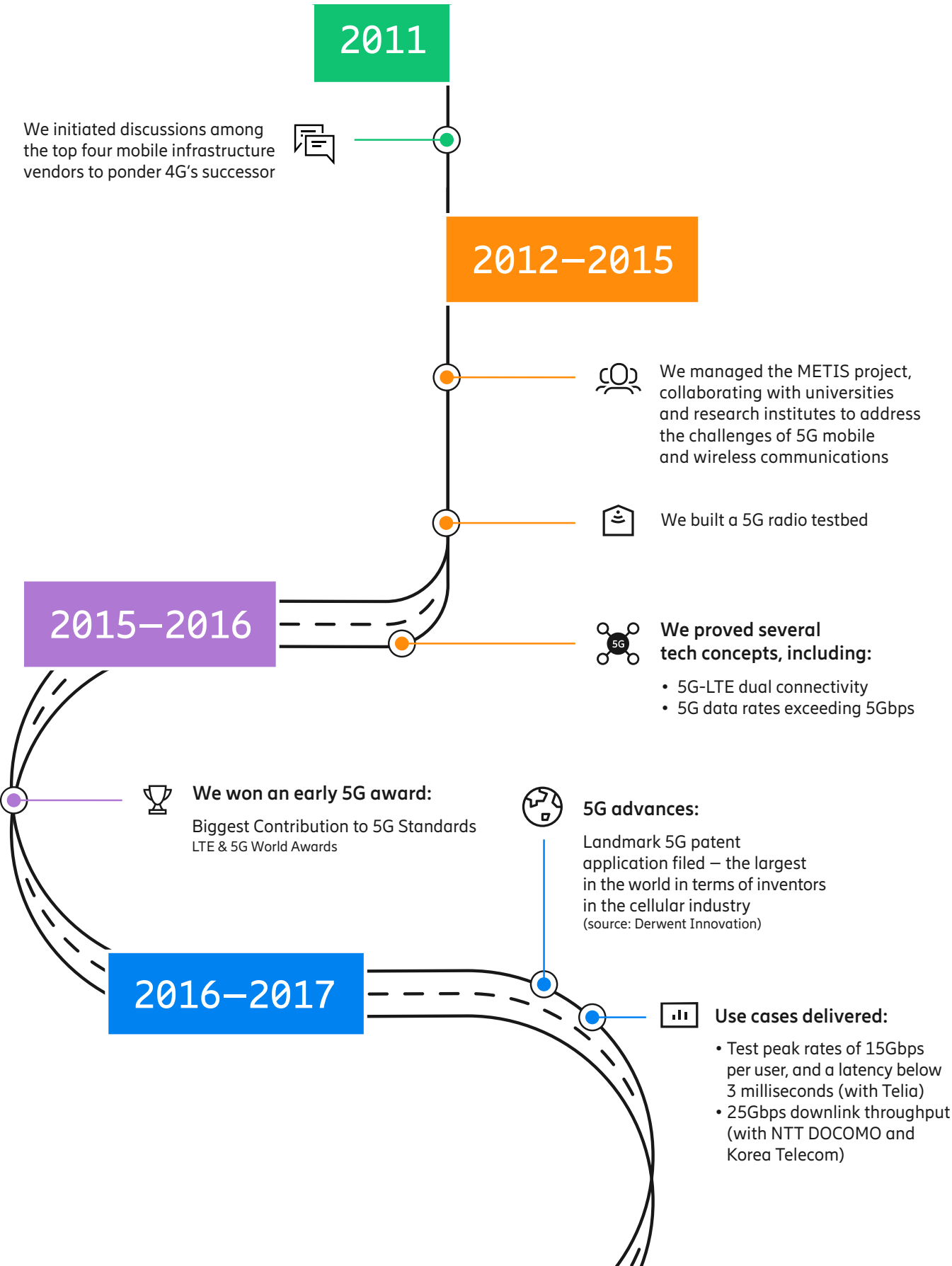
Billions of sensors in factories, cities, on farms and in our homes, provide us with the foundational elements to innovate and drive the required de-carbonization. This, enabled by 5G, will ultimately support a sustainable future for everyone.


Source: 'Exploring the effect of ICT solutions on GHG emissions in 2030', Atlantic Press 2015 <https://www.atlantis-press.com/proceedings/ict4s-env-15/25836149>





# Ericsson: Blazing the 5G Trail

From 2011 to 2021 – and beyond





 Record-breaking 5G field trial, reaching 3.6Gbps at 170kph (with SK Telecom and BMW)


 We performed the world's first federated end-to-end network slicing live demo, providing end-to-end network service between Korea and Germany (with SK Telecom and Deutsche Telekom)


 Multiple 5G New Radio (NR) trials

 First public 5G live network use cases deployed in Europe (with Telia)


 5G network tested at the Indianapolis Motor Speedway (with Verizon)


 Ericsson and Qualcomm, in collaboration with leading communications service providers, showcased 5G NR Non-Standalone (NSA) multi-vendor interoperability, as the standard was approved

 First end-to-end multi-vendor 5G commercial network data call over licensed 3.5GHz spectrum (with Telstra and Intel)


 First 5G deals signed (with Vodafone UK, Swisscom and Verizon)


**2018**


 First to successfully perform interoperability tests with third-party device chipsets in low, mid and high bands


 Connected a smartphone prototype to a live 5G network (with Swisscom and Qualcomm)


**2019–present**

 The first 5G call on 600MHz (with T-Mobile US and Intel)

 Ericsson 5G went live in South Korea with SK Telecom

 Ericsson and MediaTek completed a 5GC and NR Standalone (SA) call on a 2.6GHz band and the industry's first successful Voice over New Radio (VoNR) interoperability test

 First with live networks in low, mid and high bands

 Over 5 million 5G-ready (hardware) radios shipped to our customers since 2015



Leading 5G standardization, with the most contributions for 4G and 5G; counting declarations to ETSI and applying an essentiality filter resulted in Ericsson being on top of the 5G patent race



First 5GC and NR SA commercial network enabled



First commercial cloud native container-based Evolved Packet Core for 4G (with Verizon) and for 5G (with Telstra)



### Ericsson Spectrum Sharing milestones:

- Ericsson Spectrum Sharing (ESS) won Overall Mobile Technology and Best Mobile Technology Breakthrough at the 2020 Global Mobile Awards
- First transglobal 5G data call (with OPPO, Qualcomm Technologies, Swisscom and Telstra)
- ESS is live in four networks



Ericsson, Mercedes-Benz and Telefónica Deutschland established the world's first 5G network for automotive production



Established a fully automated 5G smart factory in the US and modernized production in our China and Estonia factories



First with commercial live networks in the US, South Korea, Europe, Australia and the Middle East



100 commercial 5G agreements or contracts with unique service providers, of which more than 50 are live networks

## Beyond



### We will see 5G take off as a platform for innovation:

- 5G will serve consumers and businesses and take IoT to the next level, with enhanced mobility, flexibility, reliability and security
- We predict 2.8 billion global 5G subscriptions and expect 5G to account for 45 percent of global mobile data traffic by the end of 2025

Ericsson is at the forefront of the 5G, IoT, edge computing and cloud network infrastructure era – the first company to bring 5G to Five continents.

Around the world, we work with businesses, governments, academic institutions and the wider telecommunications industry to develop breakthrough 5G use cases that will change our world. In doing so, we've created everything from a 5G connected ambulance to the world's first 5G factory.

Ericsson Radio System allows operators to launch the new technology and grow 5G coverage fast – no matter the scale and complexity – and Ericsson Spectrum Sharing allows for accelerated 5G rollouts using existing hardware.

By making technology easy to use, adopt and scale, we aim to drive society forward and unlock new opportunities. Ericsson has a leading 5G patent portfolio and plays a pivotal role in global standardization.

Stay up to date on 5G by following us on.  
[www.ericsson.com/en/5g](http://www.ericsson.com/en/5g)

## Technology terms to know

**Advanced Antenna System** enables state-of-the-art beamforming and beam tracking that are powerful tools for improving end-user experience, capacity and coverage.

**Artificial Intelligence (AI)** is the ability of machines to learn processes and perform tasks typically requiring human input.

**Automation** sees services and network connections, which are mainly manual today, automated. This reduces time to market for new services and improves their quality by reducing the risk of human error.

**Beam tracking** is used to follow the position and movements of a given device. 5G radio points a beam in the best direction for a device to ensure consistently reliable connections.

**Capillary network** is a local network that uses short-range radio-access technologies to provide local connectivity to things and devices.

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

**Cloud RAN** is a centralised, cloud computing -based architecture for radio access networks.

**Cross-domain orchestration** manages connectivity across 5G system domains like radio, transport and core.

**Digital twins** are a digital replica of a living or non-living physical entity.

**Edge computing** moves applications closer to the users for improved performance. This helps when it is important to reduce lag time, such as AR/VR, or mission critical use cases. This is achieved when distributed cloud platforms are located further out in the radio network.

**Extended reality (XR)** is an umbrella term encompassing augmented, virtual and mixed reality technologies.

**Gbps** or gigabits per second is a measurement for how quickly data can be transferred.

**Gigabit LTE** offers LTE-based download peak speeds higher than one gigabit per second.

**Internet of things (IoT)** is the connection of physical devices, vehicles, and appliances to exchange and store data..

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

**Radio Access Network (RAN)** connects individual devices to other parts of a network through radio connections, while at the same time always relating back to the core.

**RAN Compute** is the RAN processing platform of the future that supports a greater deployment flexibility required for the growing diversity of 5G use cases.

**Spectrum Sharing** is software that dynamically shares spectrum between 4G and 5G carriers based on traffic demand, intended for quick introduction of 5G within 4G carriers on existing infrastructure.

**Virtual Network Functions (VNF)** are responsible for handling specific network functions that run in one or more virtual machines on top of the hardware networking infrastructure, which can include routers, switches, servers, cloud computing systems and more.

**Virtualization** is the process of taking physical computing objects, such as servers and network gear, and turning them into software-based alternatives.

**Virtual Reality (VR)** is a simulated experience generated through a computer.

**Wi-Fi** allow devices such as computers (laptops and desktops), mobile devices (smart phones and wearables), and other equipment (printers and video cameras) to interface with the internet.

**5G New Radio (NR)** is the new radio frequency portion that will become the foundation for the next generation of mobile networks

Ericsson enables communications service providers to capture the full value of connectivity. The company's portfolio spans Networks, Digital Services, Managed Services, and Emerging Business and is designed to help our customers go digital, increase efficiency and find new revenue streams. Ericsson's investments in innovation have delivered the benefits of telephony and mobile broadband to billions of people around the world. The Ericsson stock is listed on Nasdaq Stockholm and on Nasdaq New York.