The future is 5G

Introduction

5G is the next-generation communications technology that will become the unifying connectivity layer for the future, and 5G will impact the connected universe and transform how we connect unlike any technology before. The following sections outline this future for 5G. If you are new to 5G and haven't heard much about it, or if you are wondering what 5G is all about and you want to prepare yourself to handle the emergence of 5G, then the 5G overview below should provide some answers on what to expect from 5G in the next few years.

What 5G is

5G is a new ecosystem, a system of systems, and an umbrella of technologies that will revolutionize the mobile industry and different industries. It will form a cornerstone for the new digital world economy, and it represents a new generation of mobile technology. Technically, 5G is a marketing term for IMT (International Mobile Telecommunication)-2020, which is defined by the International Telecommunication Union as "to provide lightning speed, omnipresent, ultra-reliable mobile communications."

Why we need 5G

4G delivered mobile broadband, but it is simply not robust enough to build a new world with an internet of things, smart cities, autonomous cars, mission-critical services and virtual reality. 5G provides the mobile connectivity combined with the speed, bandwidth, latency, and reliability required to support these new use cases.
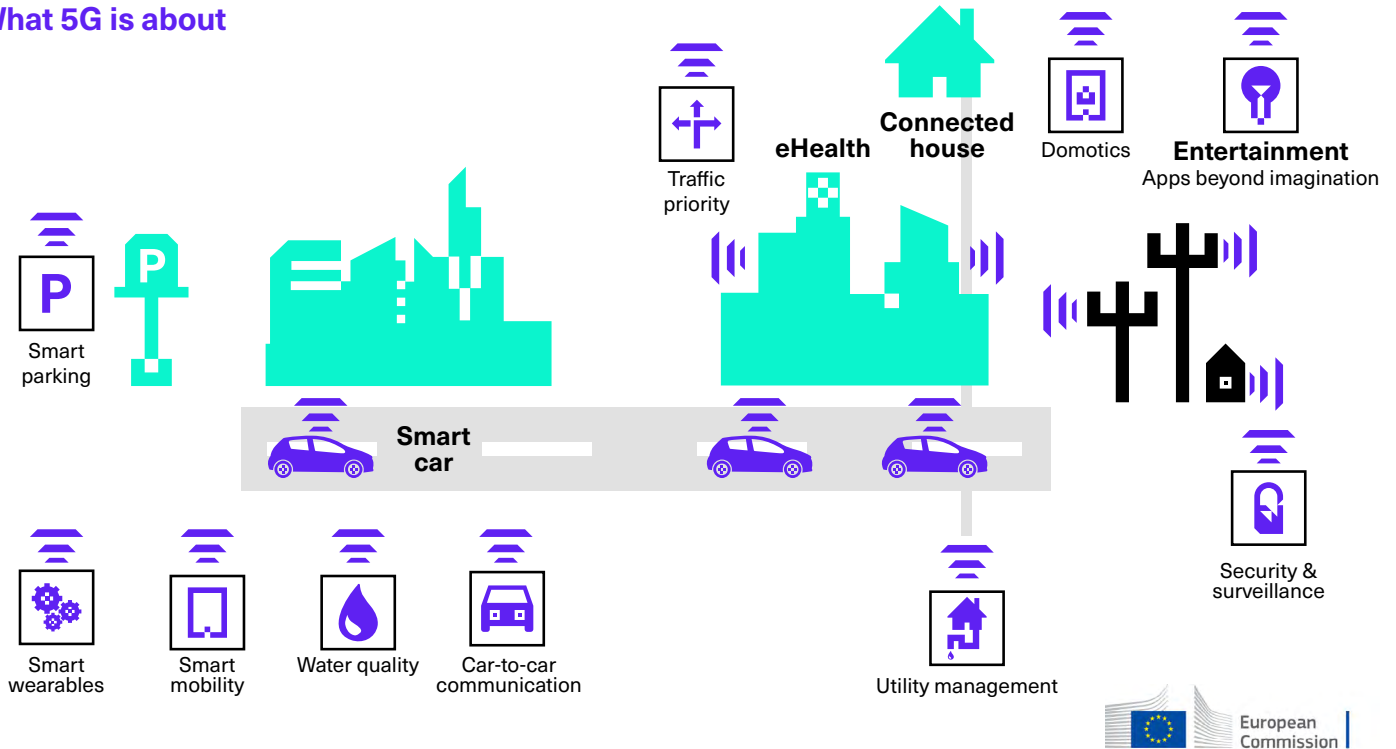
Why there is so much talk about 5G

5G promises to be the largest technology advancement in mobile for the near future. It marks a complete paradigm shift from the current status quo in many ways. 5G is more than a technology. It is an enabler as well as a catalyst for such innovations as digital lifestyles, smart cities, connected and autonomous cars, connected industries and factories, healthcare systems, smart agriculture services, media and communications services, augmented and virtual reality technologies, and mission-critical communications.

What the key drivers for 5G are

- Mass connectivity being driven by M2M and IoT proliferation
- Low-latency applications, such as those used for augmented and virtual reality
- Precision manufacturing and control-type services
- Reliable communications for critical infrastructure, such as smart grids and similar systems
- Ultra-dense hotbeds that require super-high capacity
- Digital economy, digital connectivity, and industry requirements that place huge demands on data speed, network coverage, bandwidth, and availability
- Smart cities that require enhanced performance characteristics
- Need for significant reduction in cost per gigabyte to sustain network economics

What 5G is about

Smart parking

Traffic priority

eHealth

Connected house

Domotics

Entertainment
Apps beyond imagination

Smart car

Smart wearables

Smart mobility

Water quality

Car-to-car communication

Utility management

Security & surveillance

European Commission

What 5G will bring

The framework of technologies and capabilities that constitute 5G will deliver several key capabilities, such as high speed, high capacity, total reliability, ubiquitous availability, better quality, low latency, and highly responsive connectivity and continuity, which are all critical for emerging services and use cases. Primarily, the services are segmented into three main categories: enhanced mobile broadband (eMBB), massive machine-type communications (mMTC), and ultra-reliable and low-latency communications (uRLLC).

Enhanced Mobile broadband **eMBB**	Massive Machine type communications **mMTC**	Ultra-reliable and low latency communications **uRLLS**
Improved consumer experience More connected devices Faster connection speeds Virtual and augmented reality	e-health, transport & logistics Environmental monitoring Smart energy networks Smart agriculture, smart retail	Vehicle-to-everything communication Drone delivery Autonomous monitoring Smart manufacturing

Key benefits of 5G

- 1-to-10-gigabyte-per-second (Gbps) connections to end points in the field
- Less-than-1-millisecond end-to-end round trip delay (latency)
- 1,000 times the bandwidth per unit area
- 10 to 100 times the number of connected devices
- (Perception of) 99.999 percent availability
- (Perception of) 100 percent coverage
- 90 percent reduction in network energy usage
- Up to 10-year battery life for low-power, machine-type devices

Key elements of the 5G network

5G networks will appear in two main forms: Non-Standalone and Standalone. In the Non-Standalone mode, 5G New Radio capabilities will be introduced to work alongside the 4G-LTE network and use the network as a central part, or, in other words, use the network to communicate with the outside world. In the Standalone mode, new 5G networks consisting of the new 5G Radio Access Network and new 5G Core Network will be deployed completely separate from existing 4G networks.

Relationship between 5G and IoT

If 5G is a set of technologies, then consider IoT as a set of services and use cases that will leverage 5G. In this way, 5G will have a dramatic impact on IoT in the following ways:

- 5G will become the unifying technology fabric, enabling connectivity for IoT devices
- 5G will deliver the capabilities required for many advanced use cases for IoT, especially in the ultra-reliable low latency communications and massive IoT categories because of 5G's characteristics, such as mass connectivity, low latency, data rate, reliability, mobility, responsive connectivity, coverage density, low power, and low cost
- 5G will make IoT more secure through enhanced mechanisms
- 5G will not just enable new use cases and services for IoT, but it will expedite the mass adoption and rollout of IoT services
- 5G will mitigate the heterogeneousness and fragmentation of connectivity landscape that is hampering the IoT vision
- 5G will serve as a truly ubiquitous, reliable, scalable and cost-efficient connectivity technology that will be the key driver for global IoT

Which industry sectors will benefit from 5G

Most industries and market sectors are expected to leverage and be impacted by 5G, which will result in trillions of dollars of global economic activity in areas such as information and communications, public services, transportation, automotive services, manufacturing, agriculture, forestry and fishing, hospitality, utilities, construction, financial services and insurance, healthcare, education, mining, and arts and entertainment.

When we can expect 5G to become available

We will see the early iterations of 5G this year, followed by large-scale, end-to-end deployments of 5G-based mobile networks in 2020. There is already significant market activity around the world for 5G. With the 5G standardization activities fast-tracked and the first set of 5G standards available now, this is going to usher in a race for 5G commercial announcements and launches globally, building upon the 5G trials ongoing in many countries

What the challenges for 5G are

With 5G poised to be embraced by most industries, a vast number of new stakeholders and entities from the non-telecom world will join the new ecosystem. With a new set of players, cross-industry collaboration and integration will be critical to 5G's success. In this way, for 5G to become a truly global standard and unifying framework, ubiquitous interoperability and global roaming will be essential to avoid fragmentation of the spectrum and to deliver real economies of scale. As 5G adoption expands beyond the realm of communication services, new business models will need to be considered.

Who is defining 5G

The International Telecommunication Union has defined the requirements for the new technologies to be qualified as 5G. Global bodies, such as the 3rd Generation Partnership Project, or 3GPP – which is defining the main 5G standards – and 5GPPP, ONF, IETF, NGMN and GSMA are steering the development of 5G standards. In addition, there are regional bodies, such as the 5G Forum (Korea), 5G Mobile Communications Promotion Forum (Japan), IMT-2020 Promotion Group (China), 5G Infrastructure Association (Europe), and 5G Americas. These groups will make significant contributions to advancing 5G definitions by specifying market requirements. Academic Institutions in several countries are also providing validations of technologies and capabilities.

About the author

As Senior Strategy Director and Head of Industry Standards at Syniverse, Pradeep Bhardwaj serves as a senior technology adviser overseeing strategic initiatives to advance the adoption of leading-edge technologies and standards, such as 5G, the internet of things, mobile edge computing, LTE and VoLTE. He joined Syniverse in 2005 and has built a career that encompasses over 26 years of experience with mobile operators and telecommunication companies in the areas of GSM, fixed-line, international, wholesale, international roaming, messaging, signaling, satellite, data, and IP communications. Pradeep's emphasis is on technology strategy, industry standards, systems engineering and architecture. He has previously served as chairman of the GSMA Hubbing Provider Interworking Group from its inception to its end.

More information

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