



Importance of 5G (IMT-2020) for High-Speed & High Quality Broadband Development

Global trends in broadband deployment and broadband access technologies development

ITU workshop on policies and regulatory methods for broadband deployment and broadband access technologies
Geneva, 17 September 2018

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Agenda

- Digital Transformation and Economy
- High-Speed, High-Quality Broadband: 5G (IMT-2020)
- 5G Plans
- Recommendations

KEY SUCCESS FACTORS FOR DIGITAL TRANSFORMATION

- Political support and coordination between different Ministries
- National and regional plans including financing mechanisms
- High-speed, High-quality Broadband network and services
- Demand creation programs
- Digital skills

5G IS A CRITICAL ELEMENT OF THE NEW DATA ECONOMY

Connecting billions of devices will generate a massive wave of data. 5G has the scale and scope to enable new **insights**, drive business **efficiencies**, and create data **monetization**.

Autonomous Driving

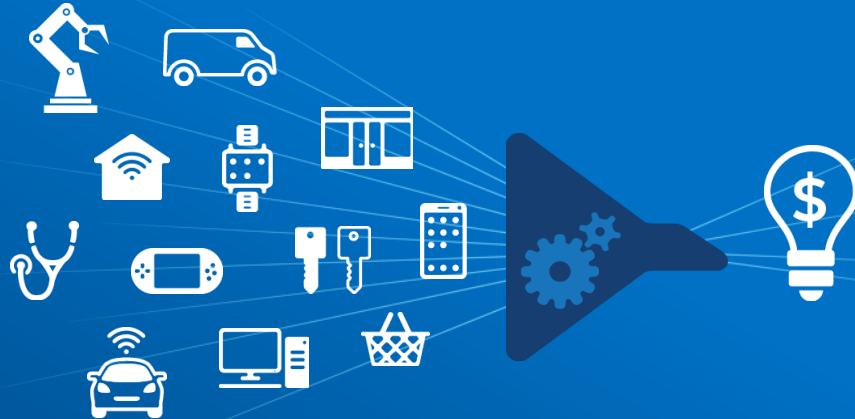
1 GB/second

Smart Hospital

4000 GB/day

Connected Factory

1 million GB/day



How 5G will contribute to the economy?

- According to IHS report In 2035, 5G will enable \$12.3 trillion of global economic output. That is nearly equivalent to US consumer spending in 2016 and more than the combined spending by consumers in China, Japan, Germany, the United Kingdom and France in 2016 <https://www.ihs.com/Info/0117/5g-technology-global-economy.html>
- According to European Union; 5G could bring about EUR 113 billion per annum in benefits in four industries (automotive, healthcare, transport and utilities), with benefits widely spread over business, consumers and wider society.

ITU WTDC 2017: HIGH-SPEED, HIGH-QUALITY BROADBAND (5G/IMT-2020)

ITU WTDC 2017 Resolution 43 (Assistance in implementing IMT and future networks)

- the need for assistance to developing countries to provide *high-speed and high-quality* mobile broadband in those countries, insofar as developed and developing countries are using the same mobile broadband technologies but there are very important differences between the mobile data speeds and service qualities;
- the very important role of IMT and future networks in broadband services and the crucial role of IMT-2020 for new services;
- that IMT-2020 will provide many very important benefits to developing countries (such as smart transportation systems to prevent traffic accidents, remote surgery with e-health, augmented/virtual reality-based e-learning, smart energy, smart water management, smart agriculture, new innovative applications for persons with disabilities and persons with specific needs, etc.), and successful planning and deployment of IMT-2020 is very important;
- that ITU has successfully focused on the promotion of IMT during the last 16 years, coverage of these networks having reached 84 percent of the world's population in 2016, and that it is important for ITU-D to include IMT-2020 in the next four-year period, the other two Sectors, ITU-R and ITU-T, having already prioritized IMT-2020;
- to take into account the importance of transition to IMT-2020;
- to take into account the challenges to enhancing mobile-broadband services, including the need for greater data speeds, service quality and affordability in developing countries,

ITU WTDC 2017: HIGH-SPEED, HIGH-QUALITY BROADBAND (5G/IMT-2020)

ITU WTDC 2017 Buenos Aires Declaration

that innovation is essential in enabling infrastructure deployment and boosting the penetration of ***high-capacity, high-quality telecommunication/ICT infrastructure and services***, especially for rural and remote areas.

Regional Initiatives

AFR2 (Africa): Promotion of emerging broadband technologies

Objective: To promote emerging technologies to assist the Africa region in securing the full benefits of ***high-speed, high-quality broadband***.

EUR1 (Europe): Broadband infrastructure, broadcasting and spectrum management

Objective: To facilitate ***high-speed connectivity*** with resilient and synergistic infrastructure development, deployment and sharing, whilst ensuring a trusted and quality user experience.

QUESTION 1/1: HIGH-SPEED, HIGH-QUALITY BROADBAND

Statement of the situation or problem:

- To benefit from new technologies and services, developing countries need high-speed, high-quality broadband connectivity, not just low speed broadband.
- Examples of experiences and policies facilitating the transition from narrowband to high-speed, high-quality broadband networks.

Question or issue for study

- Policies and regulations that promote increased high-speed, high-quality broadband network connectivity in developing countries.
- Methods to implement affordable and sustainable broadband networks, including the transition from narrowband to high-speed, high-quality networks and interconnection and interoperability features

Expected output

- Guidelines for making the transition from narrowband to high-speed, high-quality broadband networks (including transition to IMT-2020 networks), taking into account interconnection and interoperability features.

THE INCOMING FLOOD OF DATA

The rise of connected things and media by 2020

- **212B** sensors
- **50B** devices
- **47%** connections will be machine to machine

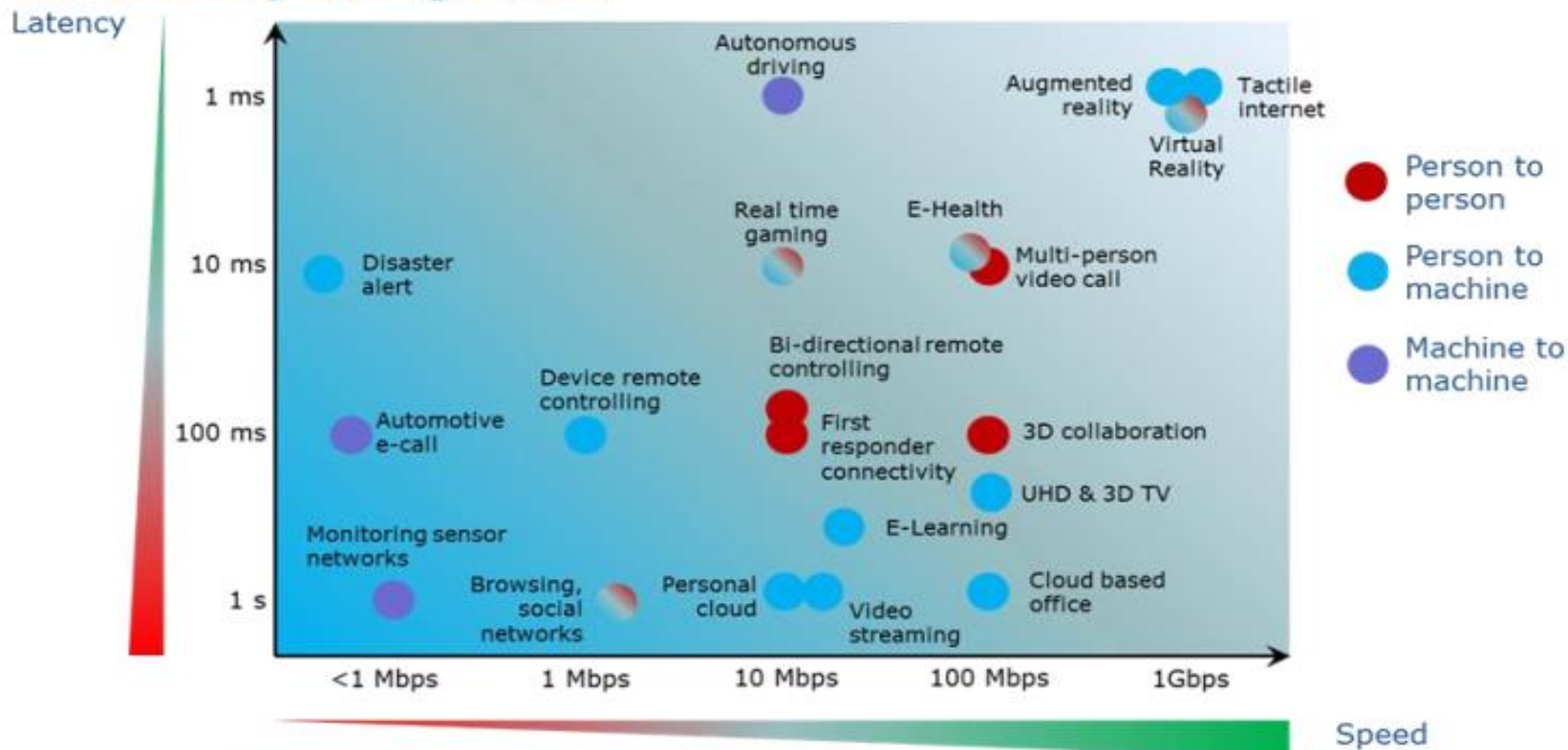
Generating tremendous amounts of data every day in 2020

- Internet users **1.5 GB** per day
- Self-driving cars **4,000 GB** per day
- Connected planes **20,000 GB** per day
- Connected factory **1 Million GB** per day
- Smart Hospitals **3,000 GB** per day

Source: Amalgamation of analyst data and Intel analysis.
And VNI Global Traffic Forecast. VNI stands for Visual Networking Index.



Need for speed and latency for use of applications and services by a single user



Source: Commission analysis based on GSMA and EIB

LOW LATENCY AND MISSION CRITICAL APPLICATIONS

- **Factory Automation:** Applications such as machine tools operation may allow latency as low as 0.25 ms.
- **Intelligent Transport Systems (ITS):** ITS requires a latency of 1-10 ms.
- **Robotics and Telepresence:** Touching an object by a palm may require latency down to 1 ms.
- **Virtual Reality:** Hi-resolution 360° VR requires a latency of 1 ms.
- **Health Care:** Tele-diagnosis, tele-surgery and tele-rehabilitation may require latency on the order of 1 ms.
- **Smart Grid:** Dynamic activation and deactivation in smart grid requires latency on the order of 1 ms.
- **Education and Culture:** Tactile Internet enabled multi modal human-machine interface may require latency as low as 5 ms.
- **Precision Agriculture:** Real time Connectivity with agriculture machines and drones requires less than 1 sec.
- **Emergency, Disasters and Public Safety:** 5G will also play an important role for mission critical applications such as early warning systems (Earthquake and Tsunami etc.) with high accuracy, low latency and other features.
- **Disabled People:** New innovative applications will require low latency real time communication.
- **Speech-to-Speech Translation:** Real-time speech-to-speech translation will require very low latency.

An aerial, high-angle photograph of a complex multi-level highway interchange. The roads are grey and feature yellow lane markings. Several cars and a large orange tanker truck are visible on the various levels of the interchange. The background shows some greenery and buildings. The overall scene is a dense network of roads, symbolizing a complex network.

**A NEW GENERATION OF
NETWORK IS NEEDED**




WHAT IS 5G?

- Next generation of wireless networks
- Provides higher speeds, greater capacity, and lower latency
- Transforms infrastructure to be virtualized and software-defined
- Distributes intelligence throughout the network

2G

Cellular Comms.



3G

Data and the 'app' revolution



4G

Faster data rates



5G

Reactive, smart, and connected devices



5G BRINGS NEW OPPORTUNITIES



Drones



Healthcare



Emergency Services



Autonomous Driving



Smart Cities



Smart Agriculture



Manufacturing



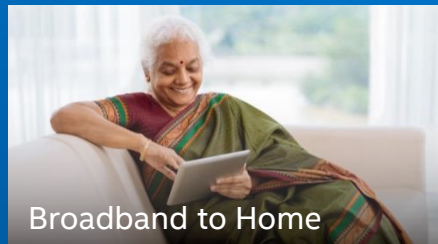
Supply Chain/
Logistics



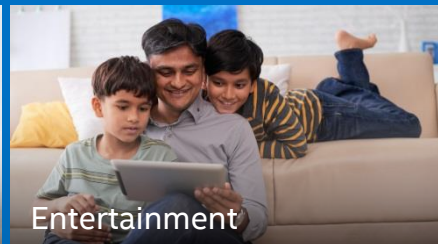
Virtual and
Merged Reality



Mobile Office



Broadband to Home

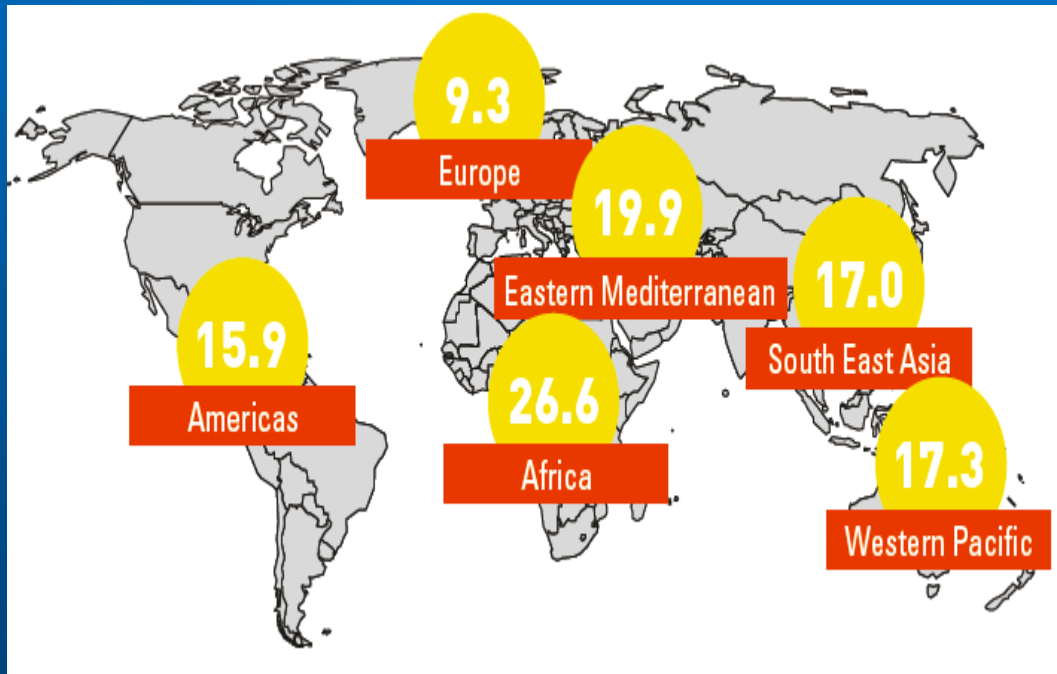


Entertainment

5G Vertical Industry

Vertical industry	Example use cases and applications	Partners
Healthcare	Connected Care, Precision Medicine, Imaging and Diagnostics, Genomics/Big Data, Remote Surgery	Medical Device Manufacturers, Insurers (public or private), Researchers, Ministries of Health
Automotive	Engine alert and automatic maintenance scheduling, autonomous driving, collision avoidance, V2V	OEM's, Researchers, Ministries of Transportation
Public Safety	Enhanced Incident/disaster alert and response, real time traffic management	Venues (i.e. stadiums, etc.), municipalities and governments, infrastructure vendors, operators, OEMs, etc.
Sustainability/ Environmental	Adaptive air sensors, water management systems, energy	Researchers, Government Parks services, Agriculture
Education	wireless real-time interactions, virtual and augmented reality interactions without visual delay	School Districts, OEM's, Ministries of Education, Regulators, Researchers
Smart City	Remote monitoring of roads and city infrastructure, smart meters/parking	Service Providers, Universities, Local Municipalities, Federal Policy Makers, Utilities, etc.
Public Transportation	Flexible/adaptive bus/fleet management, Allowing more efficient routes	Transit Systems, Operators, Municipal Governments, Researchers, etc.
Wearables	Fully connected devices (no need for a smartphone tether), tagged devices to assist with inventory management	OEM's
Smart Homes	Remote security monitoring and controls (i.e. locks, hi res camera surveillance, etc.)	Infrastructure Vendors, Heating and Cooling Systems, Cable Companies, etc.
Smart Grid	Smart 'end to end' power distribution networks with predictive analytics	See Smart City
Industrial	Sensors with wireless connectivity for crop fields can help optimize growing and minimize use of water and fertilizers through more targeted application.	Farmers/Agriculture, Ministries of Agriculture, etc.

Road Traffic Deaths per 100.000 Population (WHO-2015)



Information from 180 countries; 1.25 million road traffic deaths occur every year in the world.

The highest road traffic fatality rates in low-income countries.

5G Plans

- **European Union: 5G Action Plan:** http://ec.europa.eu/newsroom/dae/document.cfm?doc_id=17131
 - i) Member States to develop, by end 2017, national 5G deployment roadmaps as part of the national broadband plans
 - ii) Every Member State will identify at least one major city to be "5Genabled" by the end of 2020 and that all urban areas and major terrestrial transport paths have uninterrupted 5G coverage by 2025.
- **India: High Level Forum for 5G India 2020** (<http://www.dot.gov.in/5g-india-2020>)
- **USA: Broadband Deployment Advisory Committee** to accelerate the deployment of high speed broadband (including 5G)
- **Germany: 5G-Strategy**
(<https://www.bmvi.de/SharedDocs/DE/Publikationen/DG/098-dobrindt-5g-strategie.html?nn=12830>)
- **Turkey: 5GTR Forum**
- **UAE: National 5G Committee**
- **UK: 5G Strategy:**
(https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/597421/07.03.17_5G_strategy_-_for_publication.pdf)
- **South Korea: Creative 5G Mobile Strategy and 5GForum** (<https://www.5gforum.org>)
- **Japan: 5G Development Roadmap toward 2020** (<http://5gmf.jp/en>)

Spectrum Needs of 5G

Success requires sufficient spectrum in a variety of bands with economies of scale

5G applications drive technical requirements, including type and amount of spectrum

< 1 GHz – for wide area applications, e.g. sensor networks, etc.

< 6 GHz – for coverage/capacity trade-off, e.g. massive MIMO, outdoor-to-indoor

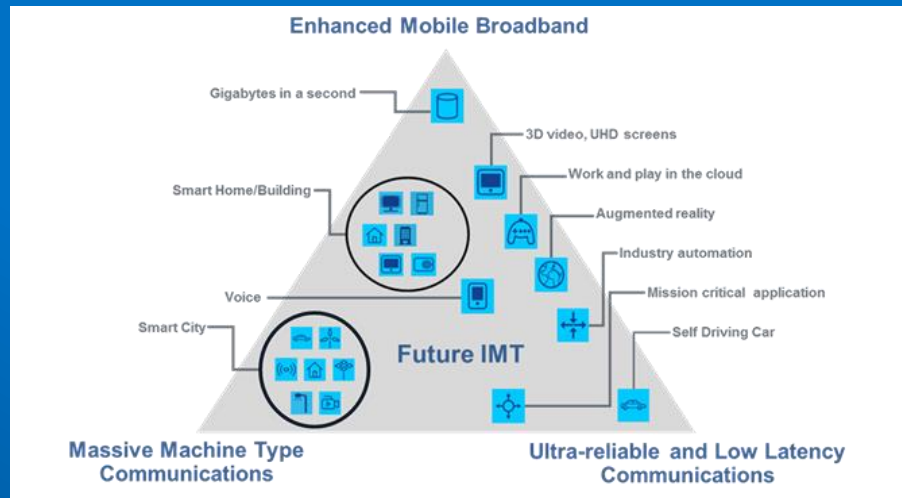
Higher MM Wave – for apps needing ultra-wide channels, e.g. 4k/8k video, VR, etc.

Continuous flow of sufficient, adequate, new spectrum is key to:

Expansion of wireless market to 5G and beyond

Building a strong and healthy eco-system

IMT for 2020 and Beyond



Recommendations

- Develop Regional and National 5G Plans and vertical applications (including financing mechanisms)
- Get political support (Presidents, Prime Ministers etc.)
- Allocate sufficient low-band, mid-band and high-band spectrum for 5G.
- Launch a 5G network at least in one major city by 2020.
- Adopt policies/regulations to accelerate the 5G (such as small cells, backhauls for 5G, removing barriers).