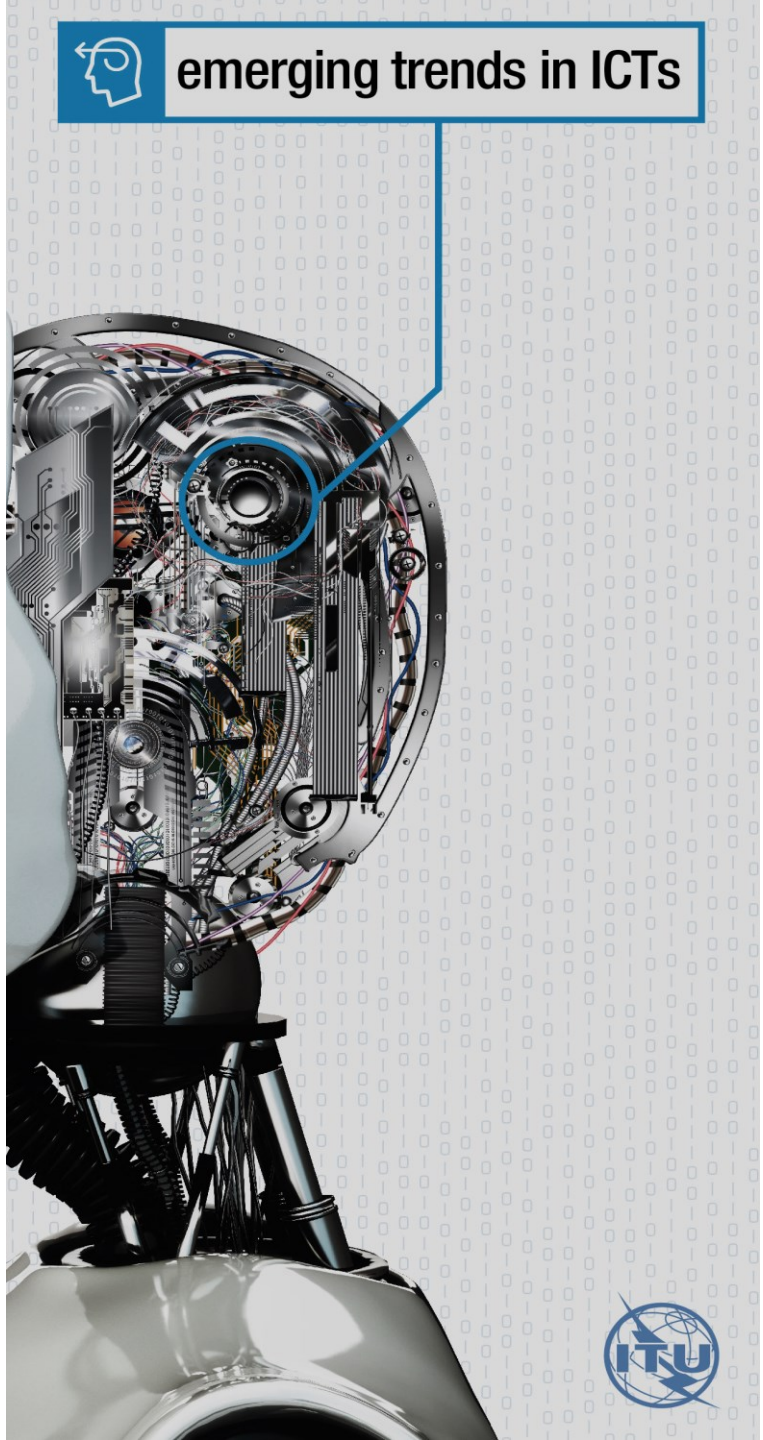


Geneva Mission Briefing Series

Emerging Trends in 5G/IMT2020

September 2016

ITU Overview

"Committed to connecting the world"

193 Member States
874 Sector Members
171 Associates
127 Academia

ITU-T

Telecommunication standardization - network and service aspects

ITU-D

Promote and assist the extension of ICTs to all the world's inhabitants - narrowing the digital divide

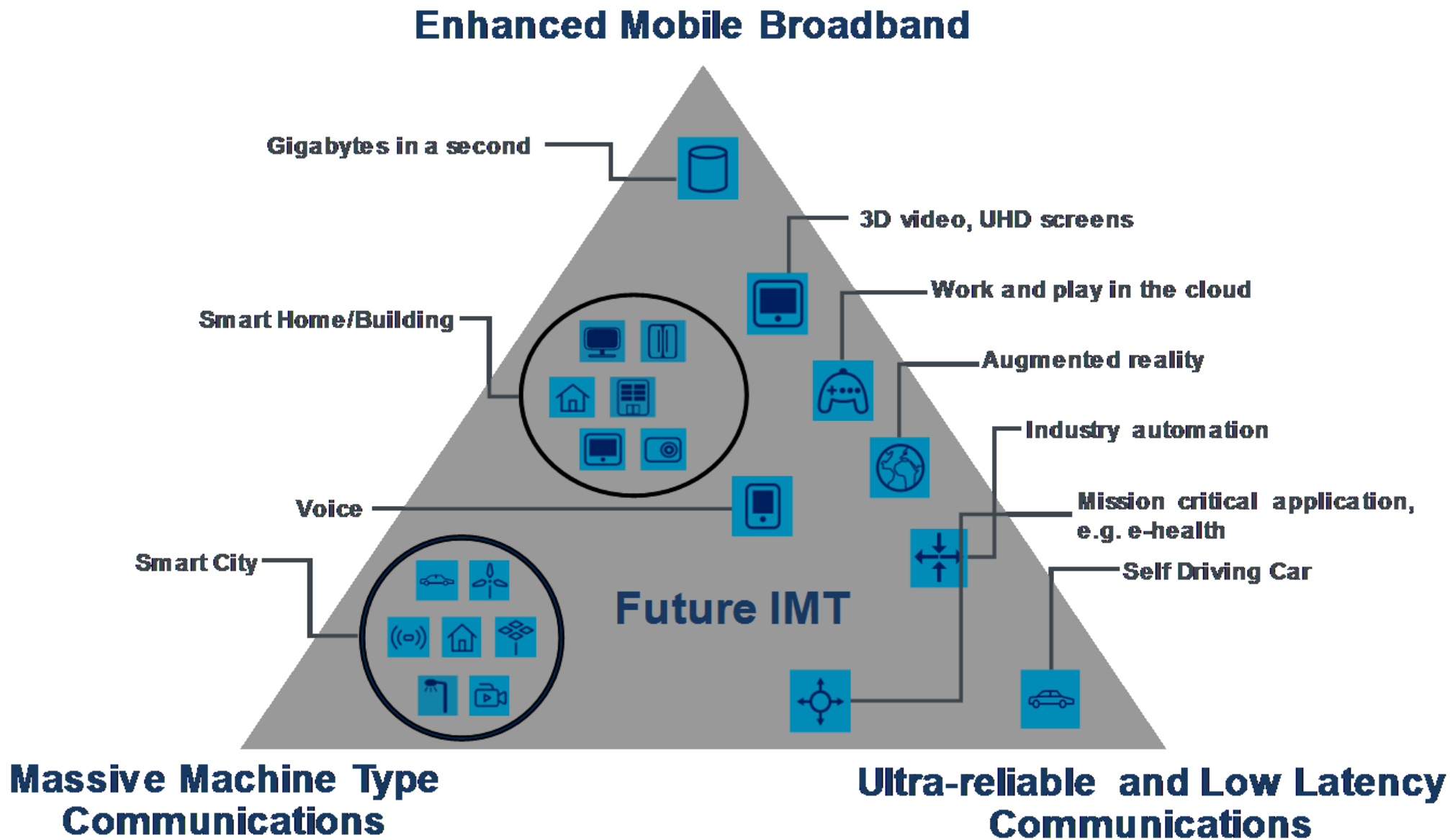
ITU-R

Global radio spectrum management and radiocommunication standardization

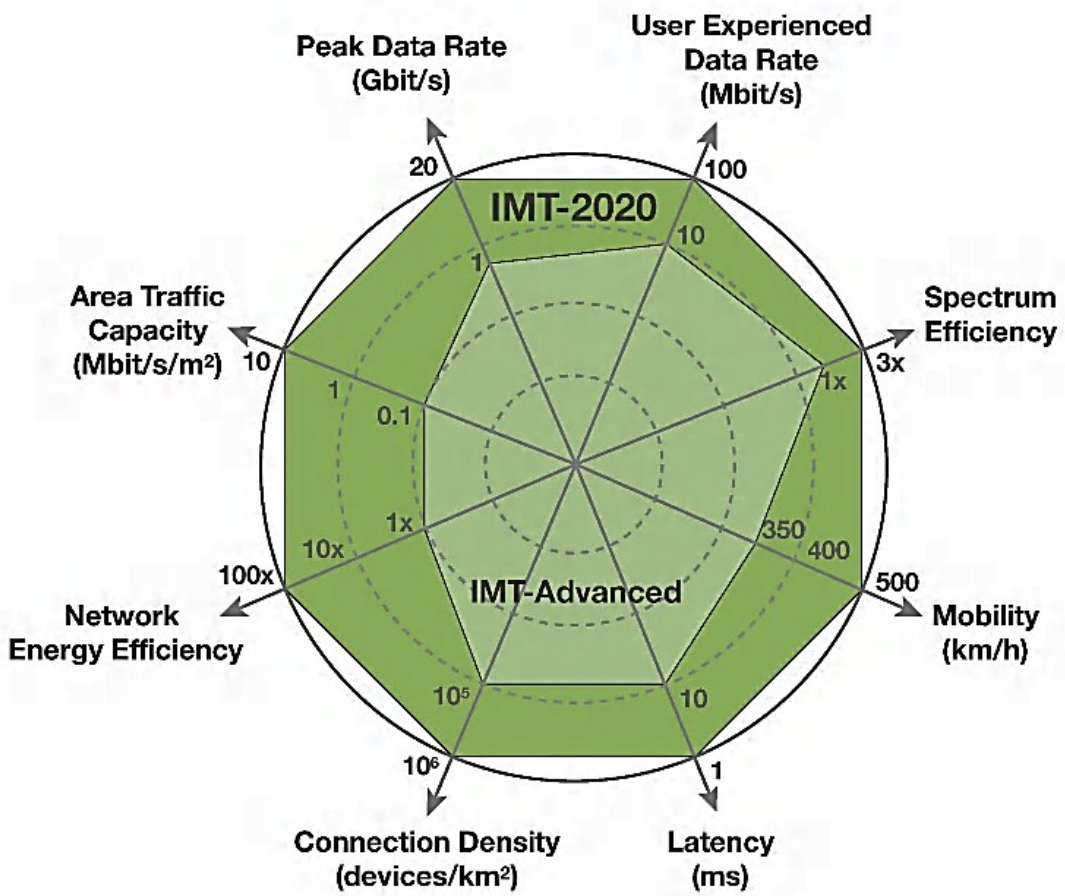
IMT-2000,, IMT-Advanced, & IMT-2020

- All of today's 3G and 4G mobile broadband systems are based on the ITU's IMT standards.
- IMT provides the global platform on which to build the next generations of mobile broadband connectivity.
- ITU established the detailed specifications for **IMT-2000** and the first 3G deployments commenced around the year 2000.
- In January 2012, ITU defined the next big leap forward with 4G wireless cellular technology – **IMT-Advanced** – and this is now being progressively deployed worldwide.
- The detailed investigation of the key elements of **IMT-2020** is already well underway, once again using the highly successful partnership ITU-R has with the mobile broadband industry and the wide range of stakeholders in the 5G community.

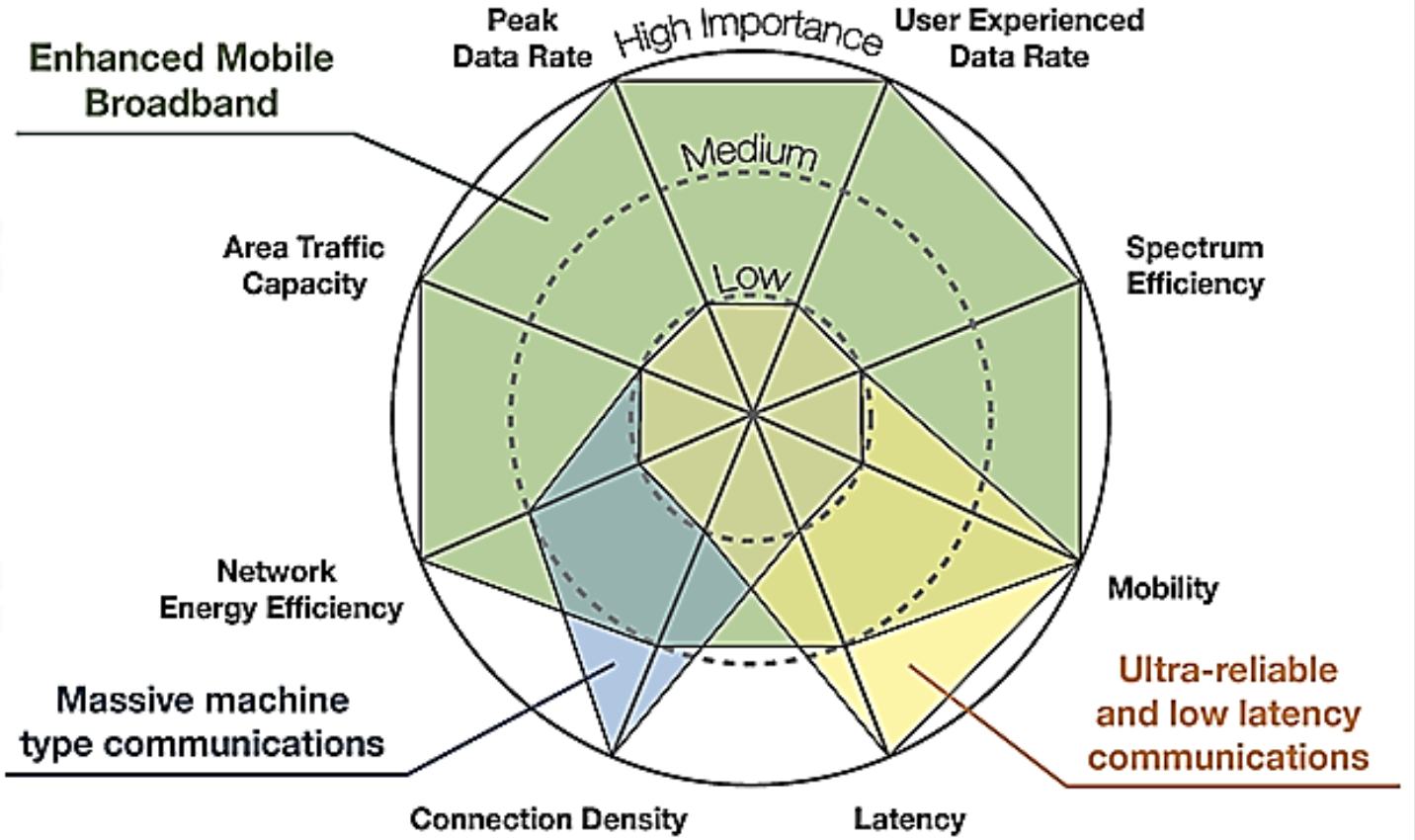
5G Usage scenarios



5G Capability Perspectives from the ITU-R IMT-2020 Vision Recommendation



Enhancement of key capabilities from IMT-Advanced to IMT-2020



The importance of key capabilities in different usage scenarios

The values in the figures above are targets for research and investigation for IMT-2020 and may be revised in the light of future studies. Further information is available in the IMT-2020 Vision Recommendation (Recommendation ITU-R M.2083)

IMT-2020 Standardization Process – Where we are and what is ahead

- Development Plan
- Market/Services View
- Technology/ Research Kick Off
- Vision & Framework
- Name IMT-2020
- < 6 GHz Spectrum View
- > 6 GHz Technical View
- Process Optimization

2012-2015

- Spectrum/Band Arrangements (post WRC-15)
- Technical Performance Requirements
- Evaluation Criteria
- Invitation for Proposals
- Sharing Study Parameters (IMT-WRC-19)
- Sharing Studies (WRC-19)

2016-2017

Setting the stage for the future: vision, spectrum, and technology views

- Proposals
- Evaluation
- Consensus Building
- CPM Report (IMT-WRC-19)
- Sharing Study Reports (WRC-19)

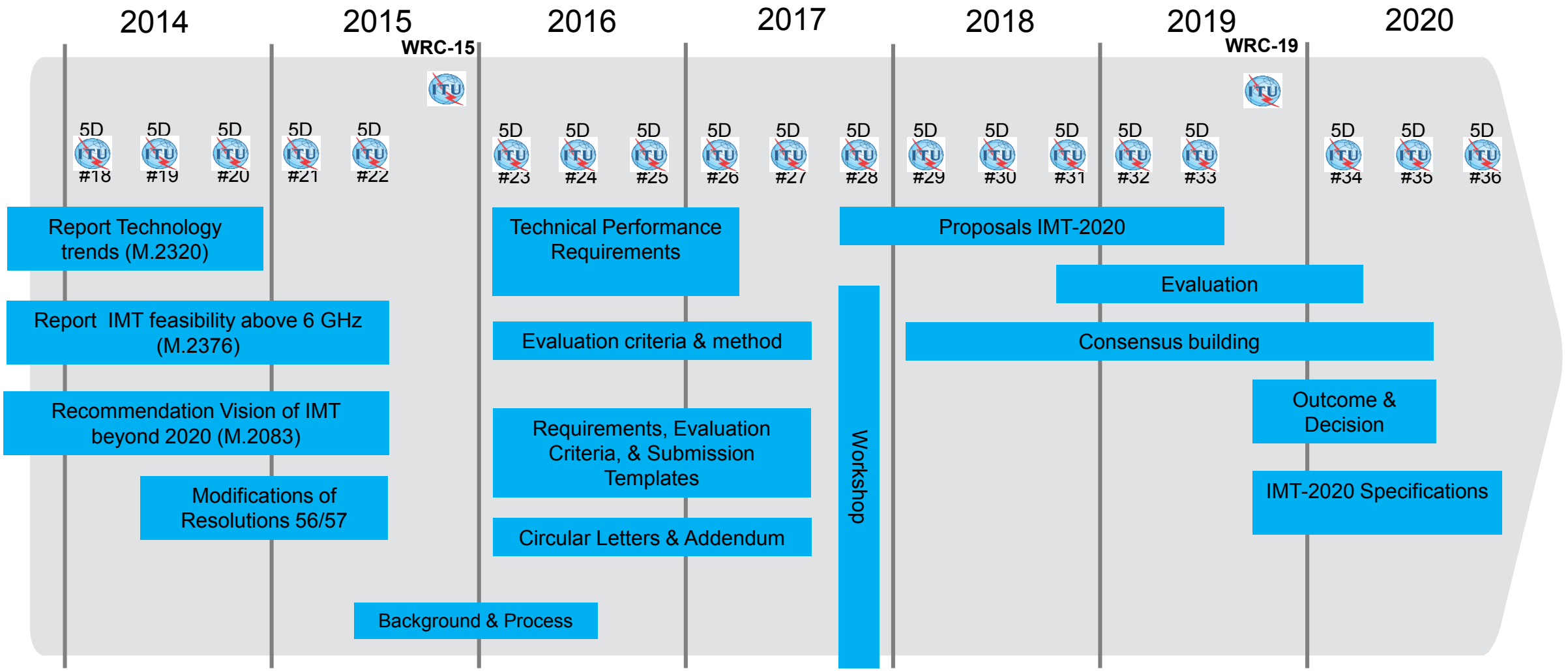
2018-2019

- Spectrum/Band Arrangements (WRC-19 related)
- Decision & Radio Framework
- Detailed IMT-2020 Radio Interface Specifications
- Future Enhancement/ Update Plan & Process

2019-2020

Defining the technologies

Detailed timeline & process for IMT-2020 in ITU-R

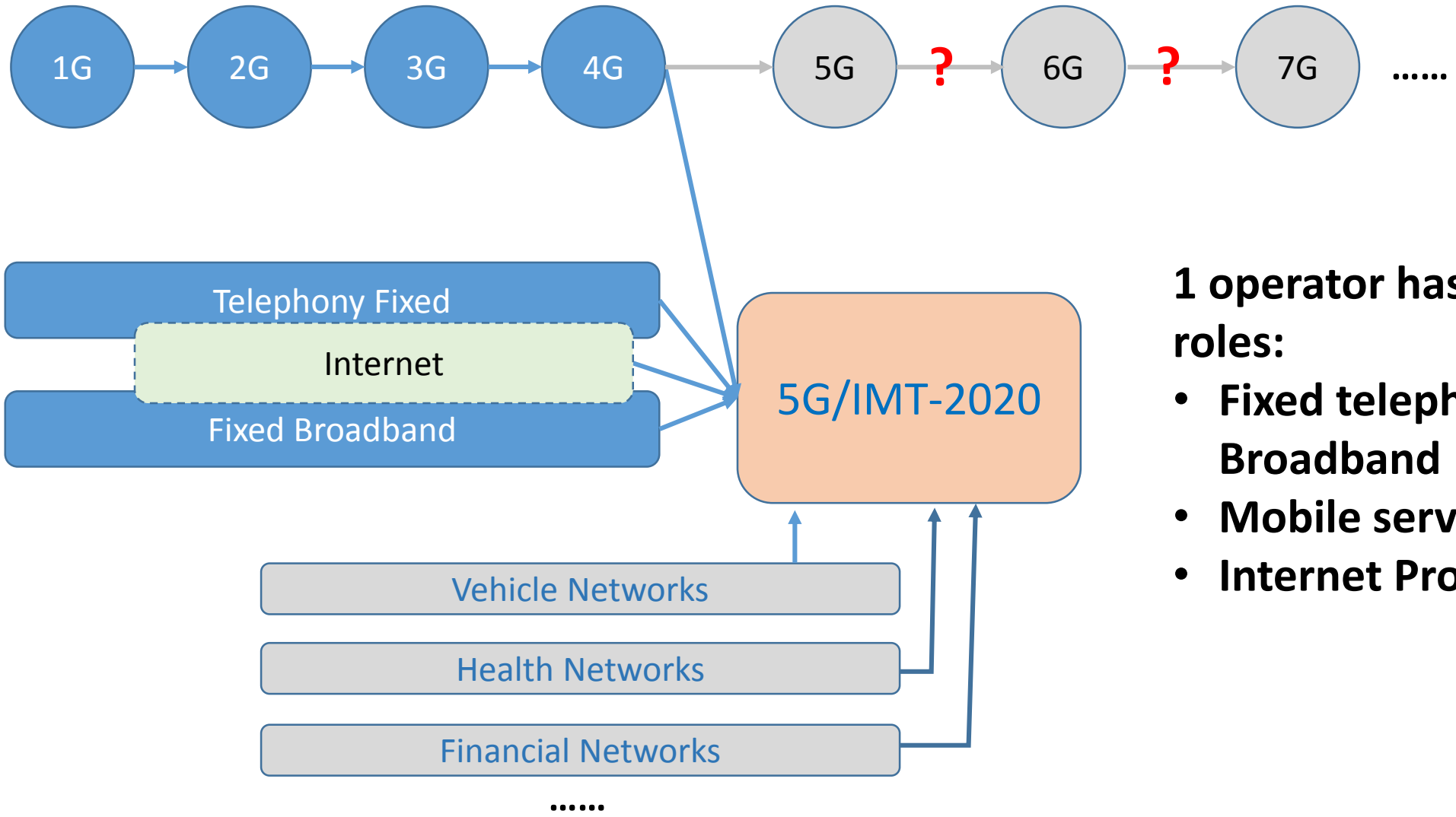


Note: While not expected to change, details may be adjusted if warranted.

New spectrum: Bands under study for WRC-19

Existing mobile allocation	No global mobile allocation
24.25 GHz – 27.5 GHz	31.8 – 33.4 GHz
37 – 40.5 GHz	40.5 – 42.5 GHz
42.5 – 43.5 GHz	
45.5 – 47 GHz	47 – 47.2 GHz
47.2 – 50.2 GHz	
50.4 – 52.6 GHz	
66 – 76 GHz	
81 – 86 GHz	

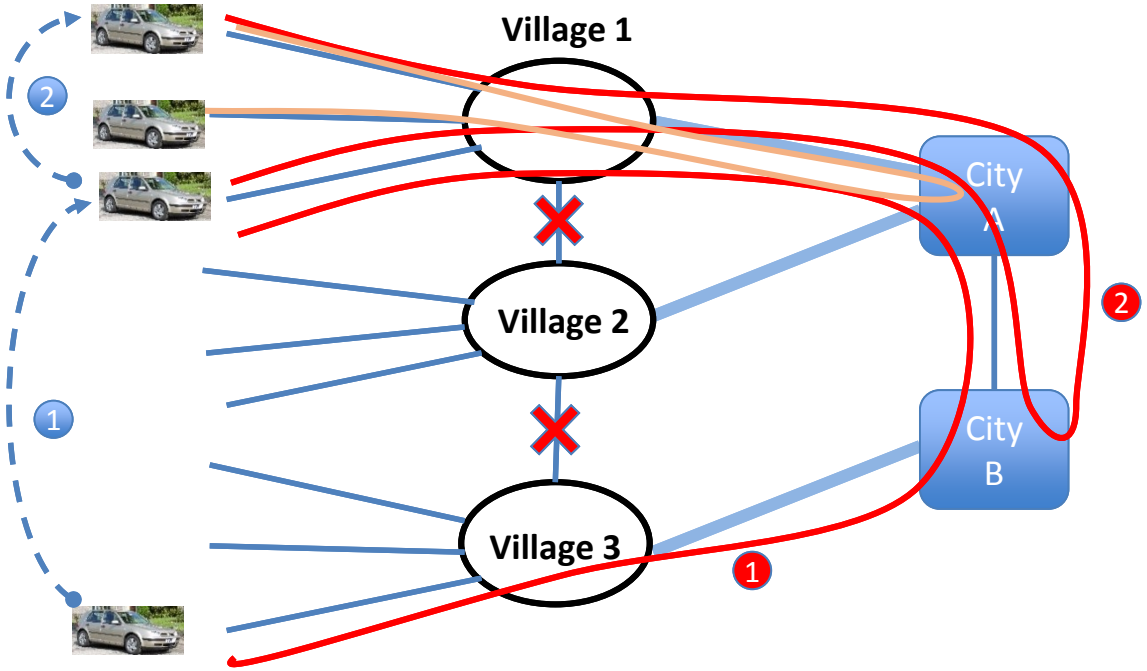
IMT-2020 / 5G: Continuation or Evolution?

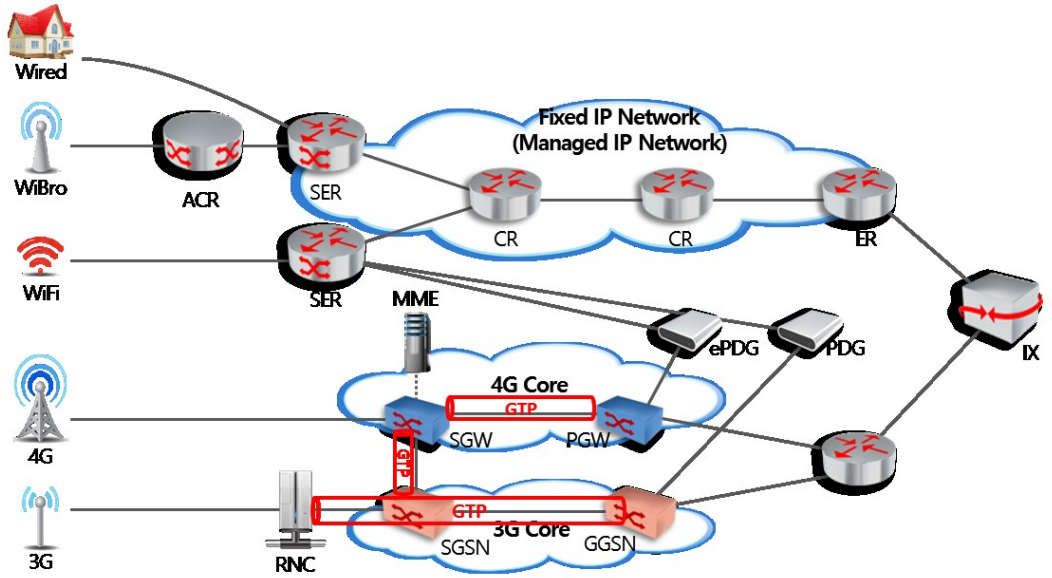


1 operator has three provider roles:

- **Fixed telephony and Broadband**
- **Mobile service provider**
- **Internet Provider**

IMT-2020:
Overcome 3G and 4G problems

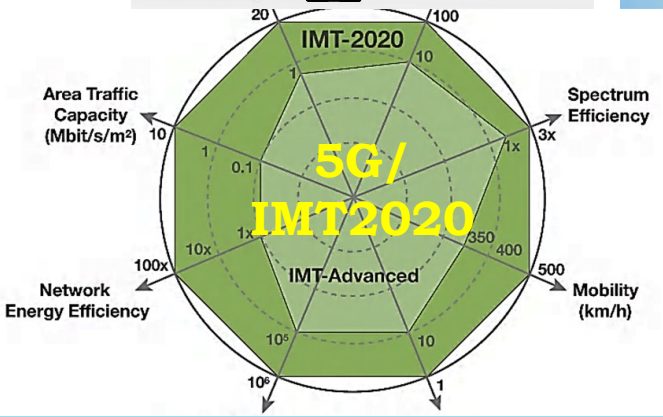


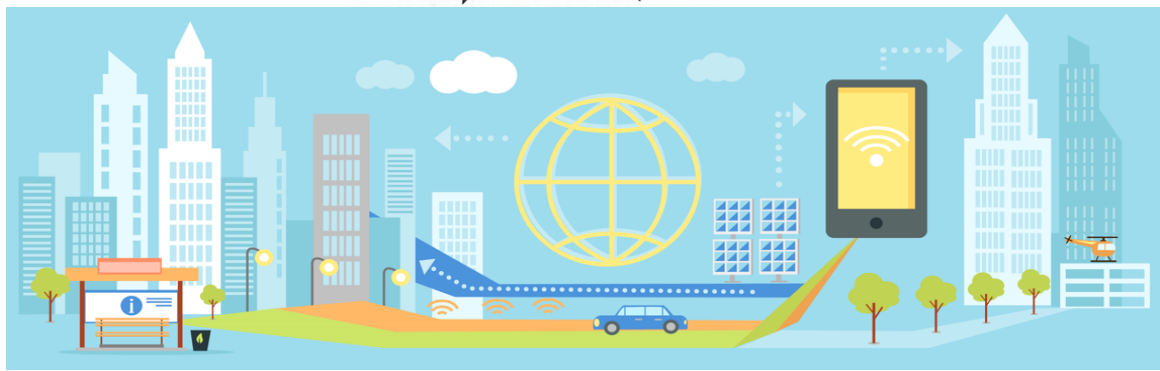


More Efficient and Effective through smart Fixed Network
Better harmonization by Fixed-Mobile Hybrid Networks

IMT-2020/5G enhances Social Infrastructure

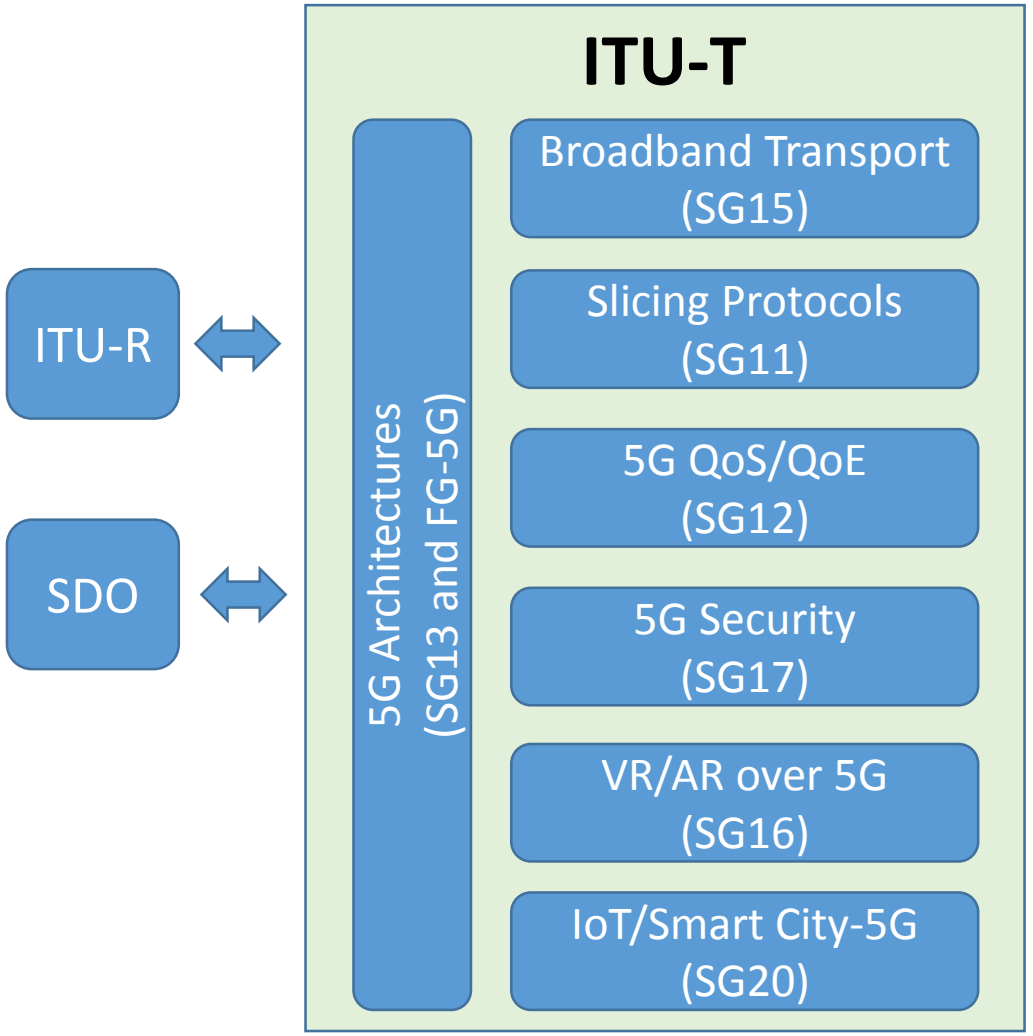
- Integrated platform for Mobile and Fixed Telephony, Broadband and Internet
- Connected Cars, Intelligent Traffic Systems, Automatic Driving/Drone
- Smart Sustainable City / Village / Community / Islands with IoT
- e/m-health, e/m-education and e-farming with Virtual Reality and Augmented Reality
- Waste/water management, early warning and disaster relief





IMT-2020 = Collaborative Effort Mobile (ITU-R/3GPP) and Fixed (ITU-T)

- Synchronize with ITU-R and collaboration with other SDOs (3GPP) on Mobile aspects
- Develop architectures and non-radio technology in ITU-T SG13, SG11 and FG-5G
- Strengthen use of Broadband transport capabilities (G.fast and Optics) in ITU-T SG15
- Identify QoS/QoE requirements in ITU-T SG12 and Security capability in ITU-T SG17
- VR/AR over 5G in ITU-T SG16 and use of IoT and Smart City in ITU-T SG20



IMT-2020 = Collaborative Effort of Open Source and Standards

- ITU-NGMN workshop on "Open Source and Standards in 5G" (25 May, 2016)
  - Open source components will complement the development of standards in 5G
  - Open source and standards are converging and both can benefit in 5G from each other
- Workshop & Demo Day at ITU: 7 December 2016

Registration for FG IMT-2020 Workshop and Demo Day at http://itu.int/en/ITU-T/Workshops-and-Seminars/201612/

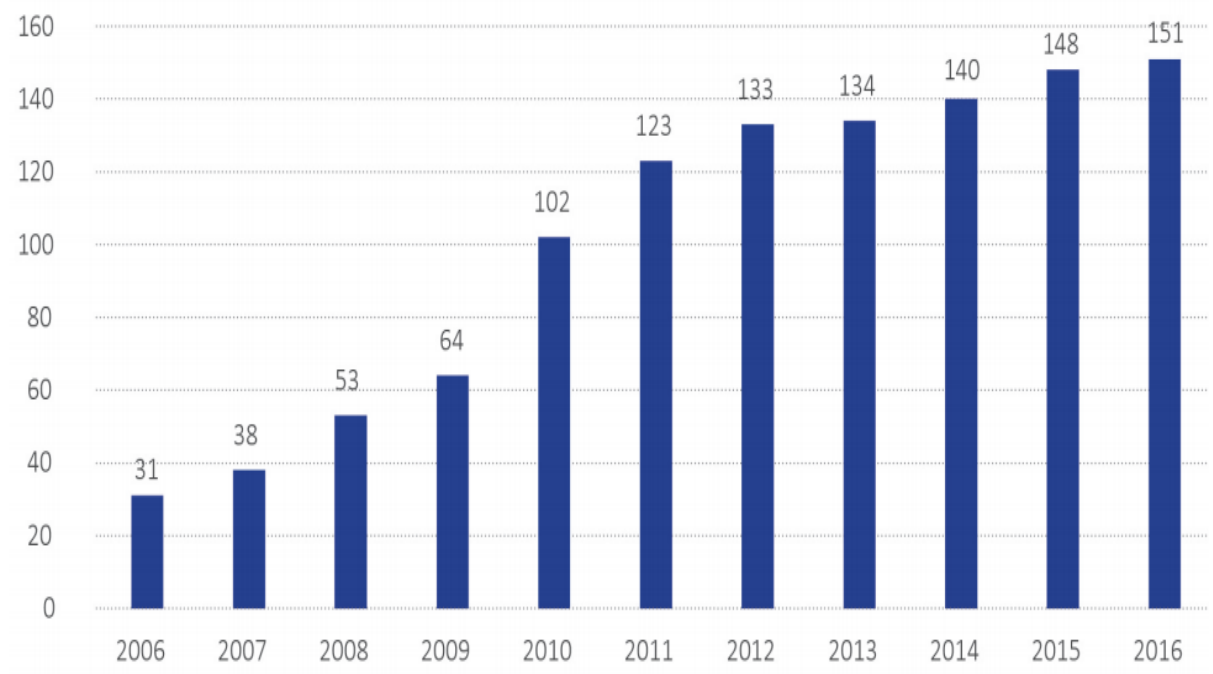
What can 5G do for developing countries

Broadband = socio-economic development

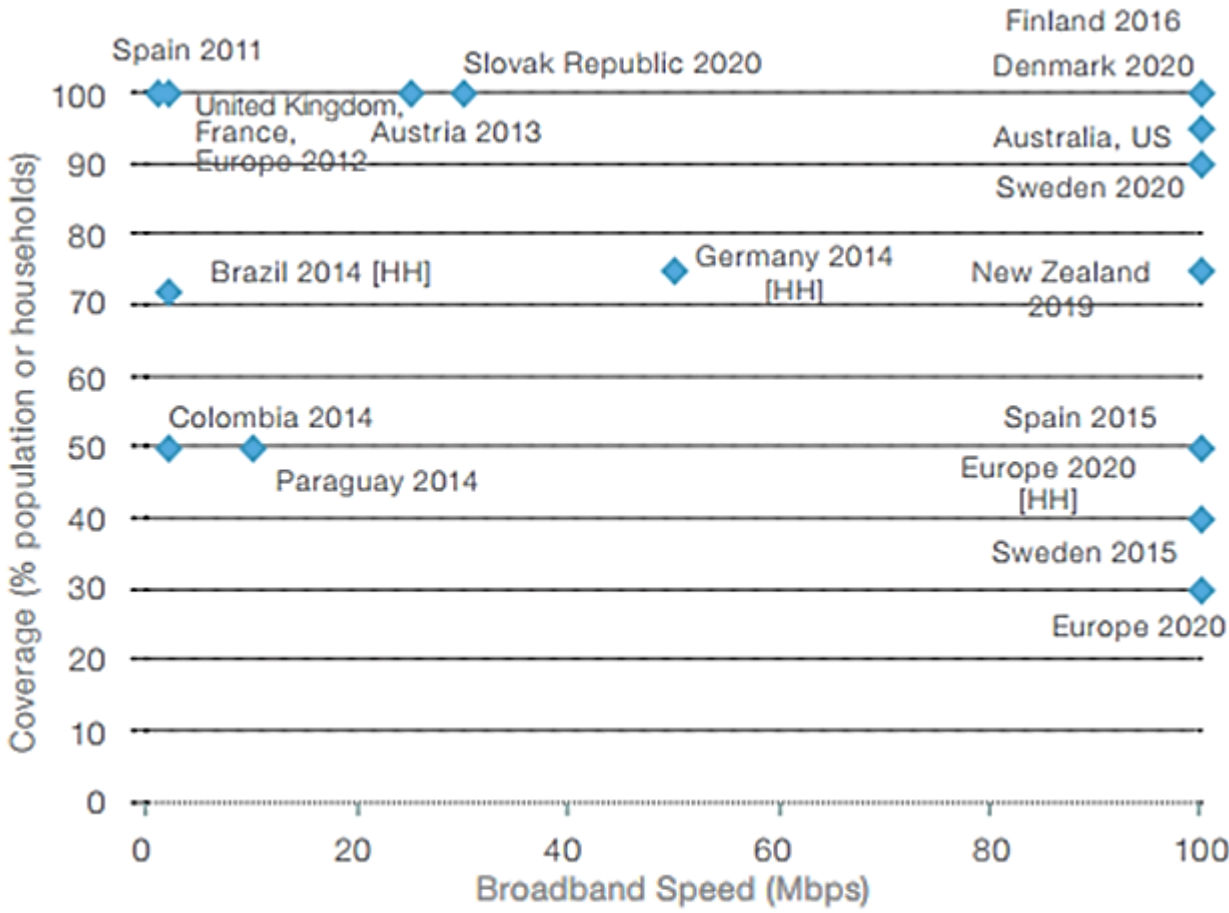
- Directly increasing GDP
- Greater economic growth or % gain in GDP
- Reducing transaction costs
- Better, faster, more informed decision-making
- Boosting labour productivity
- Resulting in a net gain in jobs

Strategies for the deployment of Broadband "National Broadband Plans"

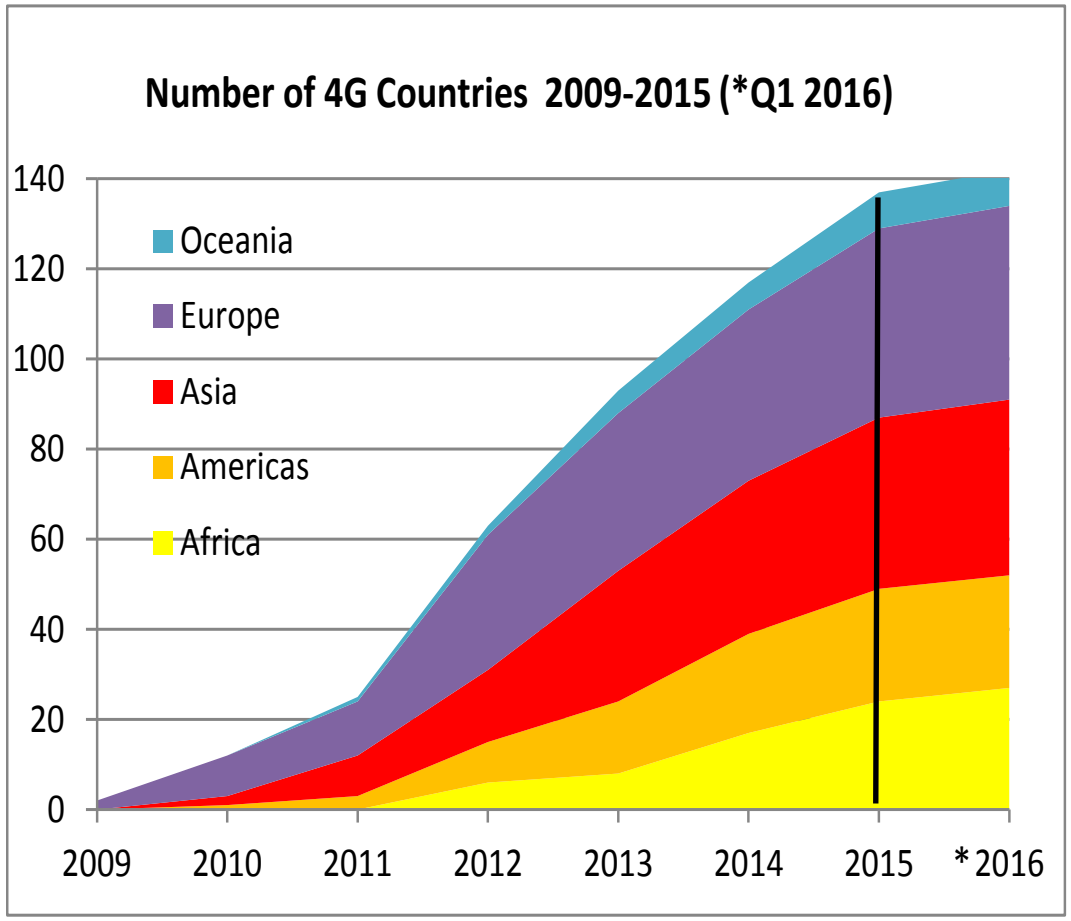
Number of countries with National Broadband Plans, 2006-2016



Source: ITU



Introduction of new ICT Technologies
Experiences with the adoption of 4G Roll-outs at the Global level



	Region	No countries	Total # Countries	% region	No. Net-works	%Total 4G NWs	Average No. networks/ country
1	Africa	27	52	52	68	9.8%	2.5
2	Americas	25	37	67.6	129	18.6%	5.2
3	Asia	39	45	79.6	188	27.1%	4.8
4	Europe	43	49	95.6	276	39.8%	6.4
5	Oceania	8	15	53.3	32	4.6%	4.0
	Total	**142**	**198**		**693**		

4G roll-outs by region (Source: ITU)

5G in the developing world

- It will undoubtedly happen, and quite rapidly once it starts.
- 5G issue part is of a much bigger issue – connecting the unconnected, and bridging the digital divide.
- Coverage versus speed trade-off reflects a larger debate about social objectives versus ‘cherry-picking’ profitable areas.
- Need a credible, viable commercial business case going forward for 5G deployments to happen in most optimal way.

Broadband Wireless Access for connecting the unconnected

- ITU-BDT is responsible for projects on implementing broadband wireless networks.

- **WTDC Resolution 43 (Rev. Dubai, 2014) – Assistance for implementing IMT**
- Aiming at addressing the issues of developing countries, **WTDC Resolution 2 (Rev. Dubai, 2014) established within the Study Group 1 the Question 2/1-Broadband access technologies**.

- In this context, capacity building activities and guidelines on IMT and related wireless and wireline technologies to Membership are being developed to assist the spread of broadband access and the achievement of the SDGs

Summary

- The scope of IMT-2020 is much broader than previous generations of mobile broadband communication systems.

- Use cases foreseen include enhancement of the traditional mobile broadband scenarios as well as ultra-reliable and low latency communications and massive machine-type communications.

- The ITU's work in developing the specifications for IMT-2020, in close collaboration with the whole gamut of 5G stakeholders, is now well underway, along with the associated spectrum management and spectrum identification aspects.

- IMT-2020 will be a cornerstone for all of the activities related to attaining the goals in the 2030 Agenda for Sustainable Development.