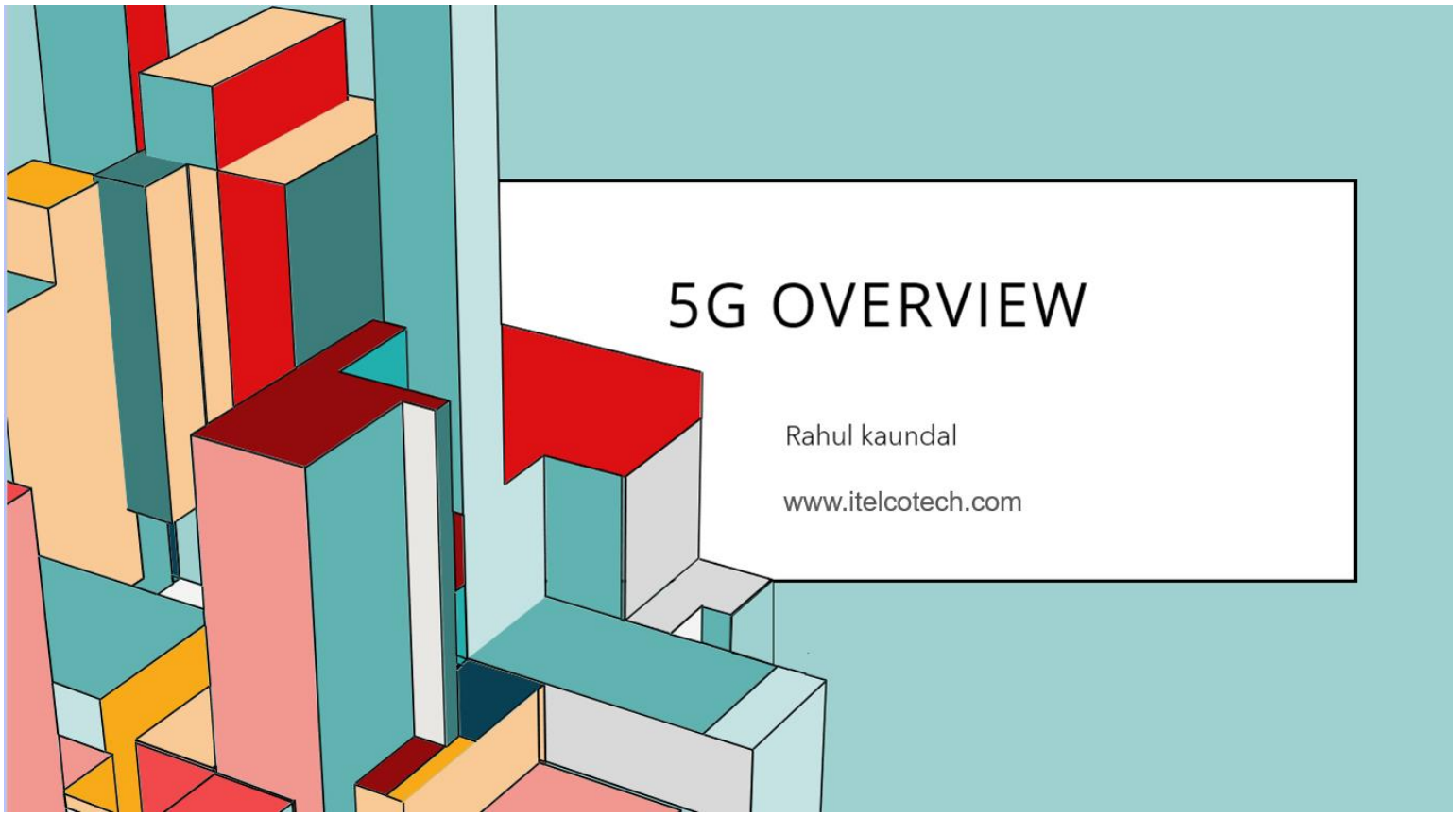
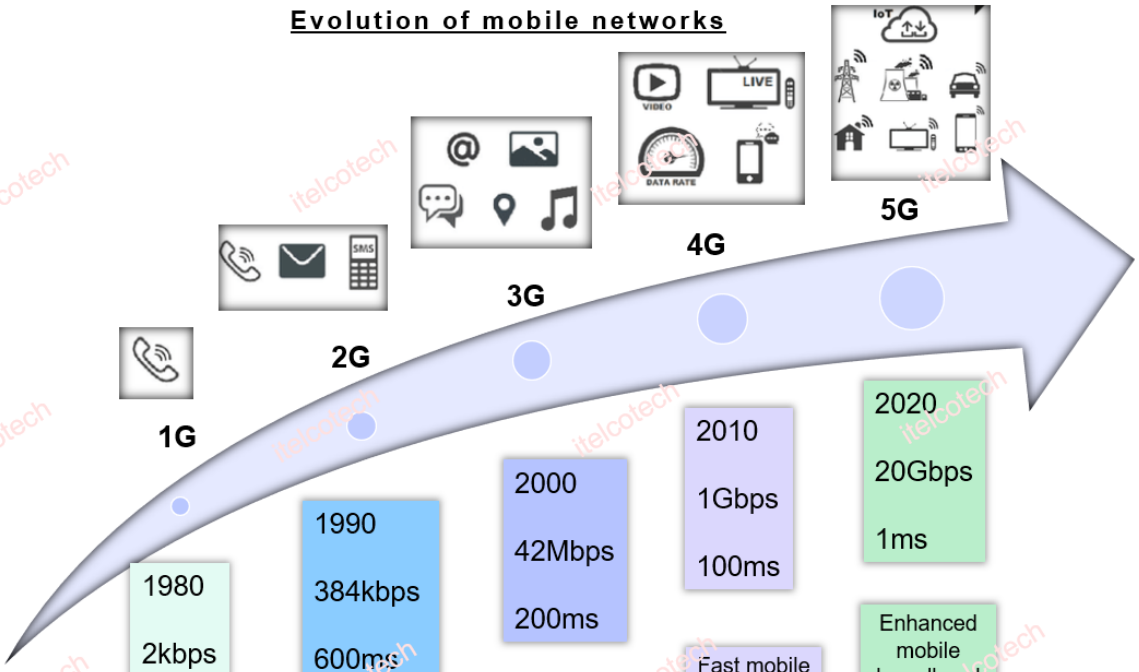


AGENDA

- Evolution of mobile networks
- 5G Standards and specifications
- 3GPP Releases & Working Groups
- What is 5G
- 5G key capabilities
- 5G design goals
- 5G Use cases
- 5G contribution to global economy

Evolution of mobile networks



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5G Standard & Specification – ITU & 3GPP

- **International Telecommunication Union (ITU) is a** United Nations specialized agency who issues standards, called recommendations that define the overall concept for 5G technology including **technical, performance, and service requirements**. Its objective to achieve end-to-end compatibility of international telecommunication connections, regardless of the countries of origin and destinations.
- The **3rd Generation Partnership Project (3GPP)** unites seven telecommunications standard development organizations (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC), known as "Organizational Partners", **who produce the reports and specifications** that define 3GPP technologies.
- ITU translates 3GPP specifications into international standards (called recommendations) that dictate how 5G is being implemented
- **Aim of ITU and 3GPP is to accelerate innovation in cellular telecommunications technologies, including radio access, core network and service capabilities**, which provide a complete system description for mobile telecommunications.
- The 3GPP specifications also provide hooks for non-radio access to the core network, and for interworking with non-3GPP networks and are verified for different deployment scenarios.

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5G Standard & Specification – ITU & 3GPP

- **International Telecommunication Union (ITU)**

define the overall concept for 5G technology including **technical, performance, and service requirements**

- The **3rd Generation Partnership Project (3GPP)**

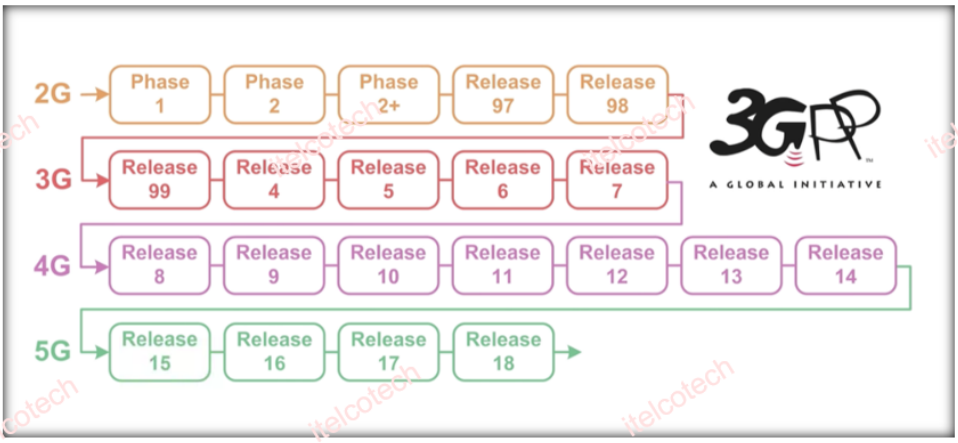
who produce the reports and specifications that define 3GPP technologies

translate

International Standards/Recommendations

3GPP Releases

- 3GPP keeps on releasing **new specifications** quite often with new features and use cases.
- 5G related specifications starts from Release 15.
- Currently 3GPP keeps on evolving 5G and published some advanced specifications in subsequent Releases 16,17 & 18.



Source – 3GPP

3GPP Technical Specifications Groups (TSGs)

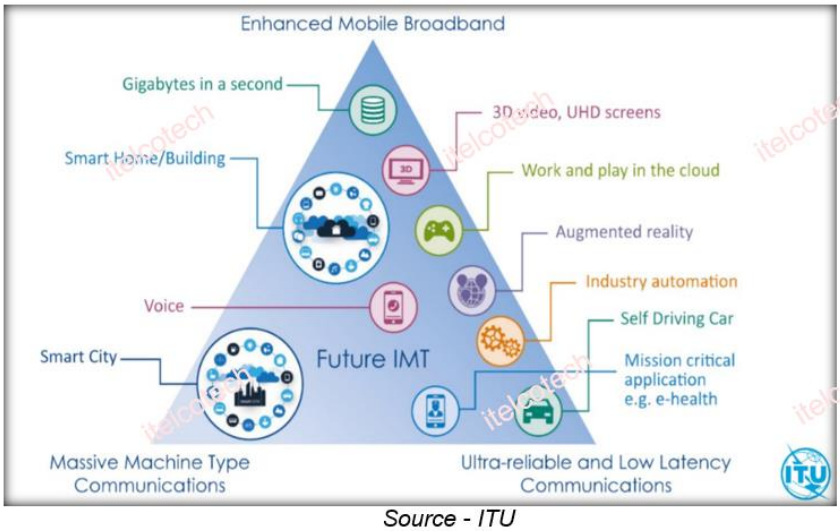
TSG CT Core Network & Terminals	TSG RAN Radio Access Network	TSG SA Service & System Aspects
CT WG1 User Equipment to Core Network protocols	**RAN WG1** Radio Layer 1 (Physical layer)	**SA WG1** Services
CT WG3 Interworking with External Networks & Policy and Charging Control	**RAN WG2** Radio layer 2 and Radio layer 3 Radio Resource Control	**SA WG2** System Architecture and Services
CT WG4 Core Network Protocols	**RAN WG3** UTRAN/E-UTRAN/NG-RAN architecture and related network interfaces	**SA WG3** Security and Privacy
CT WG6 Smart Card Application Aspects	**RAN WG4** Radio Performance and Protocol Aspects	**SA WG4** Multimedia Codecs, Systems and Services
	RAN WG5 Mobile terminal conformance testing	**SA WG5** Management, Orchestration and Charging
	RAN AH1 ITU-R Ad Hoc	**SA WG6** Application Enablement and Critical Communication Applications

Source – 3GPP

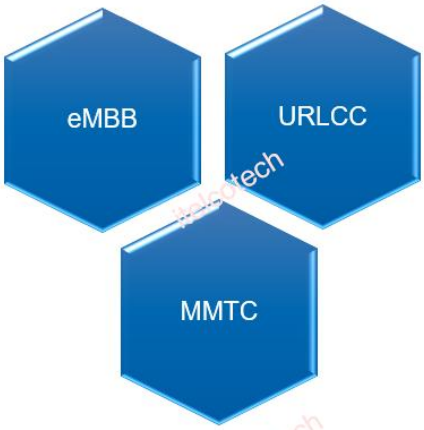
What is 5G

5G, known as fifth generation, is a technology focused on **providing better wireless connectivity** in telecom domain by enabling -

- **Enhanced broadband (eMBB)**
- **Massive machine to machine communication (MMTC)**
- **Ultra reliable low latency communication (URLLC)**



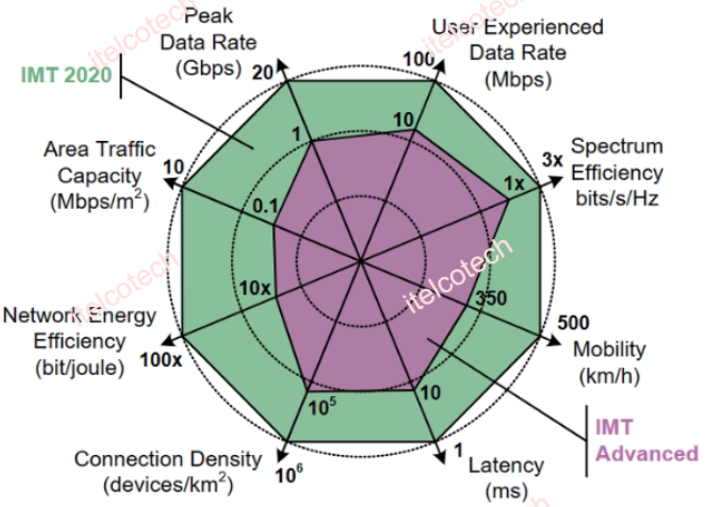
Source - ITU



5G Key Capabilities

Key capabilities defined by the International Telecommunication Union (**ITU-R**) are -

- **Peak data rate**– 20 Gbps DL
- **User data rate** –100 Mbps
- **Latency** – 1 ms
- **Spectrum efficiency** – 3X than 4G
- **Mobility**– 500 Km/hr.
- **Connection density** – 1 Million devices/sq. km
- **Network energy efficiency** – 100X than 4G
- **Area traffic capacity** – 10 Mbps/sq. km



Source - ITU

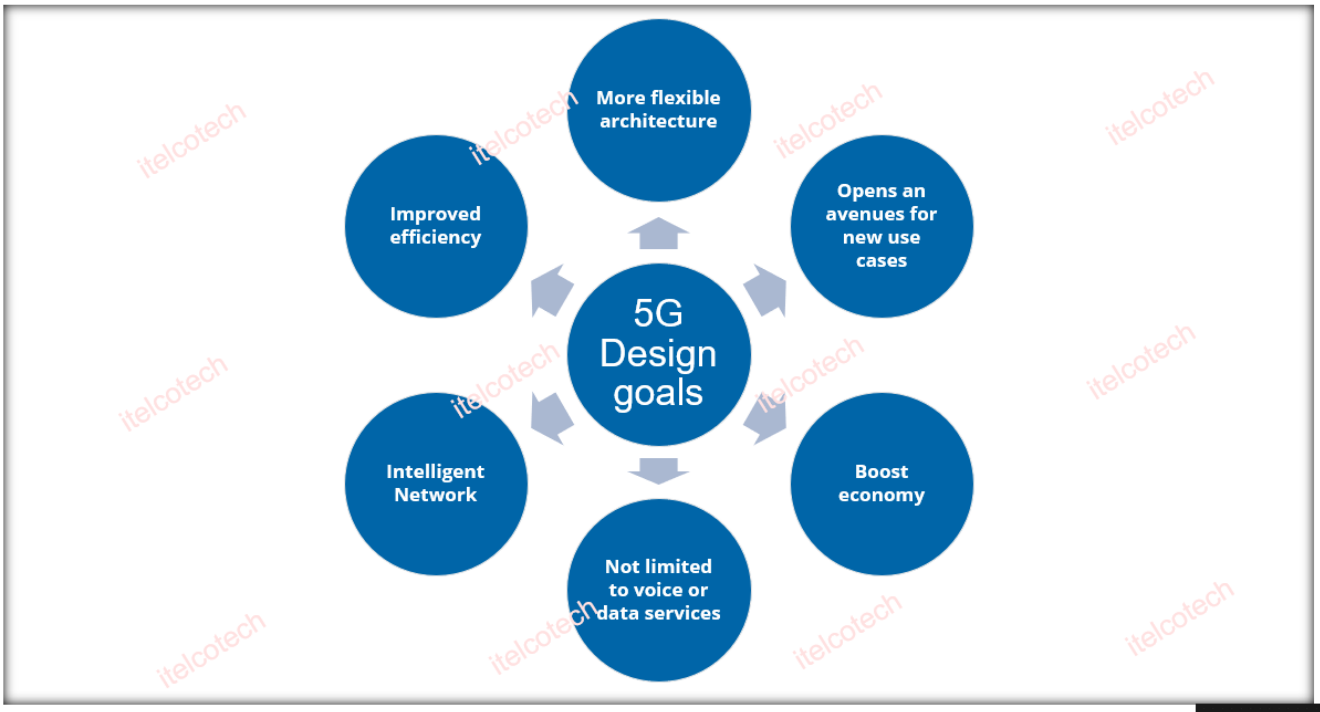
The term International Mobile Telecommunications (IMT) is the generic term used by the ITU community to designate broadband mobile system

IMT Advanced – 4G ***IMT 2020 – 5G***

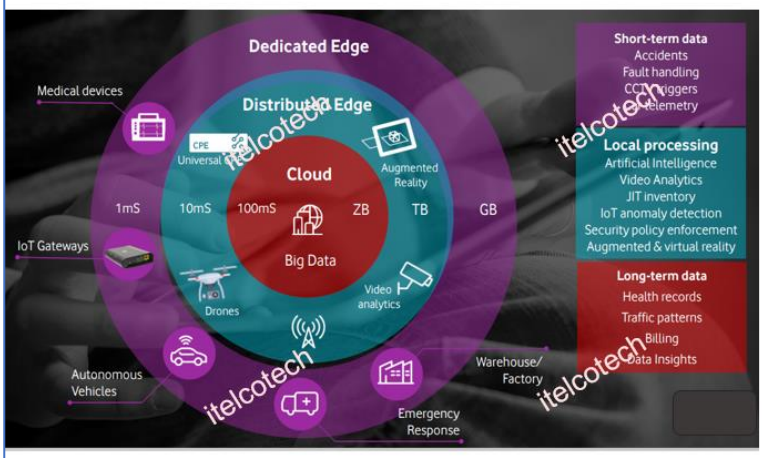
5G design goals

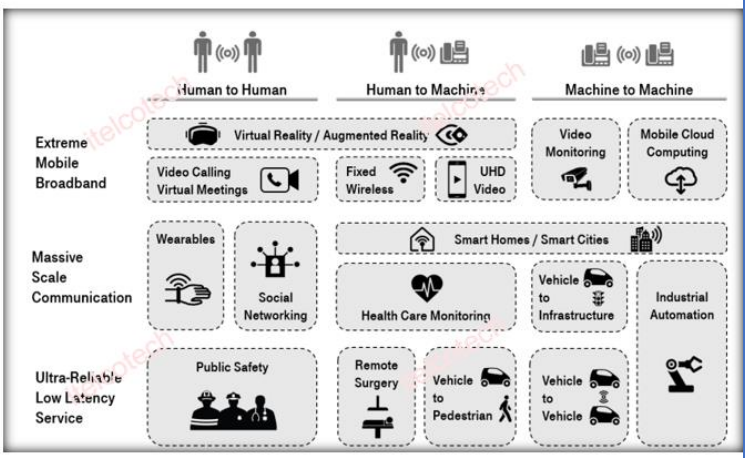
- 5G is **not limited to voice or data services**, what typically is provided by legacy networks.
- 5G **opens an avenues for new use cases** in multiple industries and plays an important role to revolutionize Industry, also known as **Industry 4.0**. This includes industries such as Healthcare, Retail, Agriculture, Media, Manufacturing, Automobiles & Logistics etc.
- 5G is **more flexible** in its architecture and can run multiple network virtually on same infrastructure, which is also known as **Network Slicing.**
- **Improved efficiency** in terms of spectrum and ecosystem.
- **Intelligent Network**: 5G improves performance by introduce intelligence using **AI/ML (Artificial Intelligence/Machine Learning).**
- 5G will help to **make cities smart and to boost economy**.

5G design goals

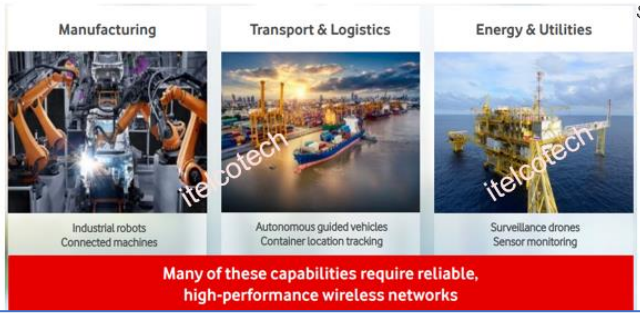


5G Use Cases



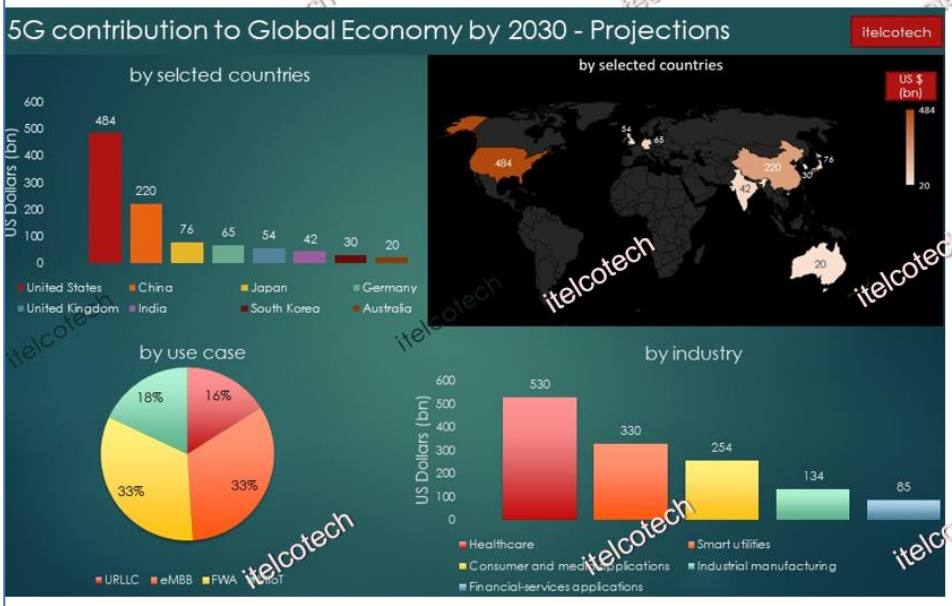


Source – 5G Americas



5G Contribution to Global Economy

5G is expected to boost the global economy by adding **US $ 1.3tn to GDP by 2030**



5G contribution to GDP by **Industry** –

- **Healthcare (40%)** – Integrate end to end digital healthcare system
- **Smart utilities (25%)** – Smart, sustainable, and agile utilities industry
- **Consumer and media applications (19%)** – 5G enhances user experience and content in gaming, entertainment, music and over-the-top (OTT) videos
- **Industrial manufacturing (10%)** - Enables efficient production facilities, preventive maintenance, and robust supply chain: Industry 4.0 revolution
- **Financial-services applications (6%)** – Enables use of digital channels, AI powered applications to improve experience and reduce loss due to frauds

Reference – Statista, GSMA & PwC