1. Question: What does IMT stand for?

IMT stands for "International Mobile Telecommunications'.

The term International Mobile Telecommunications (IMT) is the generic term used by the ITU community to designate broadband mobile systems. It encompasses IMT-2000, IMT- Advanced and IMT-2020 collectively.

Through its 193 Member States, 264 Sector members, 21 Associate members and 156 Academy members, the ITU-R develops and adopts the international regulations and global standards which, through their worldwide application, enable the harmonization and implementation of broadband mobile networks (3G, 4G and now 5G) throughout the World.

2. Question: What is ITU's role in IMT?

The ITU Radiocommunication Sector (ITU-R) develops and adopts the international regulations on the use of the radiofrequency spectrum, the Radio Regulations (RR). To take into account the progress of technologies and the changes in spectrum uses, the RR are updated every four years by the ITU World Radiocommunication Conference (WRC). The RR are an international treaty that is binding on the 193 Member States of the ITU. It is the basis for the harmonization of IMT spectrum worldwide.

The ITU-R also develops and adopts the global standards for the overall requirements of IMT and for its radio interface (ITU-R Recommendations), as well as best practices in the implementation of these standards and regulations (ITU-R Reports and Handbooks).

The ITU Telecommunication Standardization Sector (ITU-T) develops and adopts global standards for the IMT core network. (ITU-T Recommendations).

These developments take place through extensive studies and discussions involving all stakeholders from governments, regulators, industry and academia, which are conducted by the ITU-R Study Groups and ITU-T Study Groups in their respective fields.

Through this work, since 1990, ITU has been leading international efforts to enable mobile broadband communications (3G, 4G and now 5G).

3. Question: What is IMT-2000, IMT-Advanced, and IMT-2020?

All mobile broadband systems (3G, 4G and soon 5G) are based on the ITU's IMT standards.

The initial set of IMT standards was approved by ITU in the year 2000 and called **IMT-2000**. The first 3G deployments commenced shortly after on this basis.

In January 2012, ITU defined the 4G wireless cellular technology, **IMT-Advanced** which has been deployed nearly worldwide.

In February 2020, the development of the standards for the 5th generation, **IMT-2020**, was concluded and meanwhile more than 200 commercial launches across the world and more than 1200 announced devices (at least 870 commercially available) can be noted.

IMT provides the global platform on which to build the next generations of mobile broadband connectivity.

4. Question: What technology is IMT-2000, IMT-Advanced, and IMT-2020?

IMT standards are not specific technologies, but rather specifications and requirements for high- speed mobile broadband service, taking into account what technology is expected to provide in the corresponding timeframe. ITU defined the process of evaluation and the subsequent selection of mobile technologies that fulfill a number of established technical parameters (peak data rate, latency, spectrum efficiency, etc.).

The requirements for IMT standards for 5G (**IMT-2020**) has been agreed in close collaboration with the mobile broadband industry and the wide range of stakeholders in the 5G community.

In this regard, **IMT-2020** systems are mobile systems that include the new capabilities of **IMT** that go beyond those of IMT-Advanced which would make **IMT-2020** more efficient, fast, flexible, and reliable when providing diverse services in the intended usage scenarios.

The procedure, the methodology and the criteria (technical, spectrum and service) to be used in evaluating the candidate **IMT-2020** radio interface technologies (RITs) or Set of RITs (SRITs) have been applied through a number of tests throughout the World, in order to simulate closely the more stringent radio operating environments. The evaluation procedure is designed in such a way that the overall performance of the candidate RITs/SRITs may be fairly and equitably assessed on a technical basis. It ensures that the overall **IMT-2020** objectives were met.

5. Question: Which technologies meet the IMT criteria and specification?

The technologies that meet **IMT-2000** criteria and specifications are:

1- IMT-2000 CDMA Direct Spread
2- IMT-2000 CDMA Multi-Carrier
3- IMT-2000 CDMA TDD
4- IMT-2000 TDMA Single-Carrier
5- IMT-2000 FDMA/TDMA
6- IMT-2000 OFDMA TDD WMAN

Right now, two technologies have been found to **meet the IMT-Advanced** criteria and specifications:

1- LTE-Advanced
2- WirelessMAN-Advanced

ITU has determined that "LTE-Advanced" and "WirelessMAN-Advanced" should be accorded the official designation of IMT-Advanced. These are extensions of the LTE and WiMax technologies.

Initially, three technologies were meeting **IMT-2020** specifications – a fourth technology has been included in February 2022, after the successful evaluation by a number of evaluation groups worldwide.

1- 3GPP 5G-SRIT
2- 3GPP 5G-RIT
3- 5Gi
4- DECT 5G-SRIT

6. Question: What are the key features of IMT-2000 and IMT-Advanced systems?

Key features of **IMT-2000 and IMT-Advanced** systems:

- a high degree of commonality of functionality worldwide while retaining the flexibility to support a wide range of services and applications in a cost efficient manner;
- compatibility of services within IMT and with fixed networks;
- capability of interworking with other radio access systems;
- high quality mobile services;
- user equipment suitable for worldwide use;
- user-friendly applications, services and equipment;
- worldwide roaming capability; and,
- enhanced peak data rates to support advanced services and applications: Initially peak data rates of 100 Mbit/s for high and 1 Gbit/s for low mobility were established as targets for IMT-Advanced systems.

These features enable IMT-2000 and IMT-Advanced to address evolving user needs and the capabilities are being continuously enhanced in line with user trends and technology developments.

Key features of IMT-2020 can be found within the questions about IMT-2020. See question 17.

7. Question: What is the Vocabulary of terms for IMT?

This is available in Recommendation ITU-R M.1224.

IMT-Advanced systems, the next step in global wireless broadband communications, include new capabilities that go beyond IMT-2000, widely deployed since 2000 and referred to as 3G mobile technology.

With the completion of an intensive programme developed by ITU's Radiocommunication Sector (ITU-R)

to stimulate global development of the future IMT technologies and following a detailed evaluation against stringent technical and operational criteria, ITU has determined that "LTE-Advanced" and "WirelessMAN-Advanced" should be accorded the official designation of IMT-Advanced.

8. Question: Where can I find the full list of ITU-R Reports on IMT?

Relevant ITU-R Reports can be found here and at:
https://www.itu.int/en/ITU-R/study-groups/rsg5/rwp5d/imt-2020/Pages/default.aspx https://www.itu.int/pub/R-REP-M/en

9. Question: Where can I find the full list of ITU-R Recommendations (standards or specifications) on IMT?

Relevant ITU-R Recommendations can be found here and at:
https://www.itu.int/en/ITU-R/study-groups/rsg5/rwp5d/imt-2020/Pages/default.aspx https://www.itu.int/rec/R-REC-M/en

10. Question: What Specifications for IMT are available in ITU-R Recommendations?

Recommendation ITU-R M.1457-15 - Detailed specifications of the terrestrial radio interfaces of International Mobile Telecommunications-2000 (IMT-2000) **(*October 2020*)**

Recommendation ITU-R M.2012-4 - Detailed specifications of the terrestrial radio interfaces of International Mobile Telecommunications Advanced (IMT-Advanced) **(*November 2019*)**

Recommendation ITU-R M.1579-2 - Global circulation of IMT-2000 terrestrial terminals **(January *2015*)**

Recommendation ITU-R M.2070-1 - Generic unwanted emission characteristics of base stations using the terrestrial radio interfaces of IMT-Advanced **(*February 2017*)**

Recommendation ITU-R M.2071-1- Generic unwanted emission characteristics of mobile stations using the terrestrial radio interfaces of IMT-Advanced **(*February 2017*)**

Recommendation ITU-R M.2083 - IMT Vision - "Framework and overall objectives of the future development of IMT for 2020 and beyond ***(September 2015)***

Report ITU-R M.2334-0 - Passive and active antenna systems for base stations of IMT systems **(*Nov. 2014*)**

Report ITU-R M.2375-0- Architecture and topology of IMT networks **(*July 2015*)**

Report ITU-R M.2410-0- Minimum requirements related to technical performance for IMT-2020 radio interface(s) **(*November 2017*)**

11. Question: Is there a satellite component to IMT?

A series of ITU-R Recommendations (standards) for the satellite component to IMT have been developed including integration of the terrestrial and satellite mobile communication systems, these are:

Rec. ITU-R M.818 - Satellite operation within International Mobile Telecommunications-2000 (IMT-2000)
Rec. ITU-R M.1167 - Framework for the satellite component of International Mobile Telecommunications-2000 (IMT-2000)
Rec. ITU-R M.1182 - Integration of terrestrial and satellite mobile communication systems
Rec. ITU-R M.1850 - Detailed specifications of the radio interfaces for the satellite component of International Mobile Telecommunications-2000 (IMT-2000)
Rec. ITU-R M.2014 - Global circulation of IMT-2000 satellite terminals

12. Question: Is IMT-2000, IMT-Advanced or IMT-2020 3G, 4G or 5G?

ITU does not have a definition for 3G, 4G or 5G and ITU cannot hold a position on whether or not a given technology is labelled with that term for marketing purposes.

IMT-2000, in use for over a decade since 2000, has been widely deployed and is commonly referred to as 3G.

The term “4G” remains undefined, but it is being applied by some operators to the forerunners of **IMT-Advanced** technologies — LTE, HSPA+, WiMax and to other evolved 3G technologies, which provide a substantial level of improvement in performance and capabilities with respect to the initial third generation systems.

Specifications for mobile broadband wireless technology – **IMT- Advanced** – were agreed by the ITU Radiocommunication Assembly in January 2012.

Similarly, the term '5G' remains undefined, but the service requirements and main system characteristics developed by various standardization organizations for 5G correspond to the key characteristics that ITU has specified for **IMT-2020**, as the next step in mobile broadband wireless communications.

13. Question: What was the step represented by IMT-Advanced in global mobile broadband?

Specifications for IMT-Advanced were approved by the ITU Radiocommunication Assembly in January 2012.

With the completion of an intensive programme developed by ITU's Radiocommunication Sector (ITU-R) to stimulate global development of the future IMT technologies and following a detailed evaluation against stringent technical and operational criteria, ITU has determined that "LTE-Advanced" and "WirelessMAN-Advanced" should be accorded the official designation of IMT-Advanced.

IMT-Advanced systems include new capabilities that go beyond IMT-2000, widely deployed since 2000 and referred to as 3G mobile technology. ITU has specified the standards for IMT-Advanced, a significant step in global wireless broadband communications.

IMT-Advanced provides comprehensive support for broadband wireless data and brings major improvements. These include increased spectrum efficiency to handle more users at higher data rates per radio channel; a fully packet-based architecture for reduced costs; lower latency leading to more responsive Internet and multimedia applications; improved radio resource management and control to enhance quality of service, and new capabilities for the radio interface such as wideband radio channels and multiple-input and multiple-output (MIMO) for the use of multiple antennas at both the transmitter and receiver end to improve communication performance.

14. Question: What is the step represented by IMT-2020 in global mobile broadband?

The socio-technical evolution in the last few decades has been significantly driven by the evolution of mobile communications and has contributed to the economic and social development of both developed and developing countries. Mobile communications has become closely integrated in the daily life of the whole society. It is expected that the socio-technical trends and the evolution of mobile communications systems will remain tightly coupled together and will form a foundation for society in 2020 and beyond.

It is foreseen that new demands, such as more traffic volume, many more devices with diverse service requirements, better quality of user experience (QoE) and better affordability by further reducing costs, will require an increasing number of innovative solutions.

The scope of IMT-2020 (5G) is much broader than the previous generations of mobile broadband communication systems. It comprises not just an enhancement to the traditional mobile broadband scenarios, but extending the application of this technology to use cases involving ultra-reliable and low latency communications, and massive machine-type communications, as described in the IMT Vision included in Recommendation ITU-R M.2083, which contains overall objectives of the future development of IMT for 2020 and beyond.

15.Question: What is the international and national role in the standardization of IMT?

In terms of spectrum, the ITU Radio Regulations (RR) establishes the allocation of specific frequency bands for each radio service (41 services in total), including the mobile terrestrial service (the service involved, in this case).

At the national or regional level, such allocated bands are then further allocated or assigned for specific types of system or applications using specific channel arrangements. These channel arrangements may differ from region to region or from country to country, resulting in a large diversity of such “bands”.

As the channelling arrangements do not necessarily use the whole allocated spectrum, and sometimes channelling plans might overlap each other, the sum of bandwidths of the various bands does not match with the total bandwidth of allocated spectrum.

While spectrum allocations are defined on RR, which has the power of international treaty, the various channeling options and their resulting “bands” are considered mainly by the ITU-R Study Groups, (in this case ITU-R Study Group 5), and the results are issued as ITU Recommendations.

Such Recommendations or standards are not compulsory, however as they are developed with the participation of all sectors of the industry and approved by ITU Member States, they play a key role in determining which channel arrangements are adopted in a given region or country. ITU strives to achieve worldwide harmonization of these channel arrangements, to the universal benefit of industry and users, but in some cases this goal is not able to be fully achieved.

There are specific ITU-R Recommendations which describe the detailed technical specifications for the IMT terrestrial radio interfaces, including IMT-2000, IMT-Advanced and IMT-2020; they specify which technologies fully meet the technical criteria for the respective IMT radio interfaces. See here - https://www.itu.int/rec/R-REC-M/en.

16. Question: What are the spectrum bands identified for IMTsystems?

Successive World Radiocommunication Conferences (WRCs) have identified specific frequency bands for the deployment of IMT systems in general (which includes IMT-2000, IMT- Advanced and IMT-2020). This identification does not preclude the use of this band by any application of the services to which it is allocated and does not establish priority in the Radio Regulations. In effect, it is up to each country to determine which bands will be made available for IMT in each country/region depending on national/regional requirements.

The Radio Regulations (RR) identify the following frequency bands that might be used by IMT systems (see table below):

Frequency Bands identified for IMT (MHz)	Footnotes identifying the band for IMT in the Radio Regulations			**Available Bandwidth (MHz)**
	Region 1	Region 2	Region 3	
450-470	5.286AA			20
470-698	-	5.295, 5.308A	5.296A	228
694/698-960	5.317A	5.317A	5.313A, 5.317A	262
1 427-1 518	5.341A, 5.346	5.341B	5.341C, 5.346A	91
1 710-2 025	5.384A, 5.388			315
2 110-2 200	5.388			90
2 300-2 400	5.384A			100
2 500-2 690	5.384A			190
3 300-3 400	5.429B	5.429D	5.429F	100
3 400-3 600	5.430A	5.431B	5.432A, 5.432B, 5.433A	200

3 600-3 700	-	5.434	-	100
4 800-4 990	-	5.441A	5.441B	190
24 250-27 500*	5.532AB			3250
37 000-43 500*	5.550B			6500
45 500-47 000*	5.553A			1500
47 200-48 200*	5.553B			1000
66 000-71 000*	5.559AA			5000

Reference Document: Report ITU-R M.2411, Recommendation ITU-R M.1036 and RR edition 2020

* *this band is identified for IMT from 01.01.2021*

Many of these frequency bands are currently used for 3G and 4G or have been earmarked for 5G. WRC-19 identified five additional frequency bands for IMT between 24.25 and 71 GHz. Totally 17.25 GHz bandwidth spectrum: 14.75 GHz worldwide (24.25-27.5 GHz, 37-43.5 GHz, 66-71 GHz) and 2.5 GHz on regional and country basis (45.5-47 GHz, 47.2-48.2 GHz). See also Question 19.

17. Question: Where are the 'key technical performance parameters for IMT-2020 (5G)'?

Report ITU-R M.2410 - *"Minimum requirements related to technical performance for IMT-2020 radio interface(s)"* describes key requirements related to the minimum technical performance of IMT-2020 candidate radio interface technologies. It also provides the necessary background information about the individual requirements and the justification for the items and values chosen. Provision of such background information is needed for a broader understanding of the requirements:

- **Peak data rate:** Maximum achievable data rate under ideal conditions per user/device (in Gbit/s). Downlink peak data rate of 20 Gbit/s, Uplink peak data rate of 10 Gbit/s
- **User experienced data rate:** Achievable data rate that is available ubiquitously across the coverage area to a mobile user/device (in Mbit/s or Gbit/s). Downlink user experienced data rate of 100 Mbit/s, Uplink user experienced data rate of 50 Mbit/s
- **Latency:** The contribution by the radio network to the time from when the source sends a packet to when the destination receives it (in ms). 4 ms for eMBB and 1 ms for uRLLC
- **Mobility:** Maximum speed at which a defined QoS and seamless transfer between radio nodes which may belong to different layers and/or radio access technologies (multi-layer/-RAT) can be achieved (in km/h). Stationary: 0 km/h, Pedestrian: 0 km/h to 10 km/h, Vehicular: 10 km/h to 120 km/h, High speed vehicular: 120 km/h to 500 km/h
- **Connection density:** Total number of connected and/or accessible devices per unit area (per km^2). 1 million devices per km^2

- **Spectrum efficiency:** Average data throughput per unit of spectrum resource and per cell (bit/s/Hz). Downlink peak spectral efficiency of 30 bit/s/Hz, Uplink peak spectral efficiency of 15 bit/s/Hz
- **Area traffic capacity:** Total traffic throughput served per geographic area (in Mbit/s/m^2). 10 Mbit/s/m^2
- Other parameters: **Energy efficiency, reliability, control plane latency, mobility interruption time,** etc. with their applicable scenarios are provided in **Report ITU-R M.2410.**

See also: ITU Press Release of 26 November 2020.

18. Question: Where can I find further information from ITU regarding IMT-2020?

The ***"ITU towards 'IMT for 2020 and beyond"*** webpage is updated regularly with information about this futuristic mobile 5G technology e.g. the list of ITU-R Recommendations, Reports and Resolutions on IMT and the Working Party 5D activities in this area: The webpage is available here.

19. Question: What frequency bands are currently under study for the implementation of IMT?

The following bands will be studied with a view to an IMT identification:

- 3 600-3 800 MHz and 3 300-3 400 MHz (Region 2);
- 3 300-3 400 MHz (Region 1);
- 7 025-7 125 MHz (globally);
- 6 425-7 025 MHz (Region 1);
- 10.0-10.5 GHz (Region 2).

The results of the studies will be submitted for decision to the next World Radiocommunication Conference (WRC-23).

20. Question: What are some usage scenarios of IMT for 2020 and beyond?

Three main usage scenarios for IMT-2020 have been identified in **Recommendation ITU-R M.2083**, ***"IMT Vision – Framework and overall objectives of the future development of IMT for 2020 and beyond,"*** which are enhanced mobile broadband, ultra-reliable and low latency communications, and massive machine-type communications. Additional use cases are expected to emerge, which are currently not foreseen. For future IMT, flexibility will be necessary to adapt to new use cases that come with a widely varying range of requirements.

IMT-2020 will encompass a large number of different features. Depending on the circumstances and the different needs in different countries, future IMT systems should be designed in a highly modular manner so that not all features have to be implemented in all networks.

This following figure illustrates some examples of envisioned usage scenarios for IMT-2020.