

ITU-R

Radiocommunication Sector of ITU

Recommendation ITU-R M.2083-0 (09/2015)

IMT Vision – Framework and overall objectives of the future development of IMT for 2020 and beyond

M Series
**Mobile, radiodetermination, amateur
and related satellite services**



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SA	Space applications and meteorology
SF	Frequency sharing and coordination between fixed-satellite and fixed service systems
SM	Spectrum management
SNG	Satellite news gathering
TF	Time signals and frequency standards emissions
V	Vocabulary and related subjects

Note: This ITU-R Recommendation was approved in English under the procedure detailed in Resolution ITU-R 1.

Electronic Publication
Geneva, 2015

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RECOMMENDATION ITU-R M.2083-0

IMT Vision – Framework and overall objectives of the future development of IMT for 2020 and beyond

(2015)

Scope

This Recommendation defines the framework and overall objectives of the future development of International Mobile Telecommunications (IMT) for 2020 and beyond in light of the roles that IMT could play to better serve the needs of the networked society, for both developed and developing countries, in the future. In this Recommendation, the framework of the future development of IMT for 2020 and beyond, including a broad variety of capabilities associated with envisaged usage scenarios, is described in detail. Furthermore, this Recommendation addresses the objectives of the future development of IMT for 2020 and beyond, which includes further enhancement of existing IMT and the development of IMT-2020. It should be noted that this Recommendation is defined considering the development of IMT to date based on Recommendation ITU-R M.1645.

Keywords

IMT, IMT-2020

Abbreviations/Glossary

ICT	Information and Communication Technology
IMT	International Mobile Telecommunications
IoT	Internet of Things
M2M	Machine-to-Machine
MIMO	Multiple Input Multiple Output
QoE	Quality of Experience
QoS	Quality of Service
RAT	Radio access technology
RLAN	Radio Local Area Network

Related ITU Recommendations, Reports

Recommendation ITU-R M.1645 – Framework and overall objectives of the future development of IMT-2000 and systems beyond IMT-2000

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

Report ITU-R M.2320 – Future technology trends of terrestrial IMT systems

Report ITU-R M.2370 – IMT Traffic estimates for the years 2020 to 2030

Report ITU-R M.2376 – Technical feasibility of IMT in bands above 6 GHz

Report ITU-R M.2134 – Requirements related to technical performance for IMT-Advanced radio interface(s)

The ITU Radiocommunication Assembly,

considering

- a) that ITU has contributed to standardization and harmonized use of IMT, which has provided telecommunication services on a global scale;
- b) that technological advancement and the corresponding user needs will promote innovation and accelerate the delivery of advanced communication applications to consumers;
- c) that Question ITU-R 229/5 addresses further development of the terrestrial component of IMT and the relevant studies under this Question are in progress within ITU-R;
- d) that Recommendation ITU-R M.1645 defines the framework and overall objectives of the future development of IMT-2000 and systems beyond IMT-2000;
- e) that for global operation and economies of scale, which are key requirements for the success of mobile telecommunication systems, it is desirable to establish a harmonized timeframe for future development of IMT considering technical, operational and spectrum related aspects;
- f) that wireless communication applications are expected to expand into new market segments to facilitate the digital economy, e.g. smart grid, e-health, intelligent transport systems and traffic control, which would bring requirements beyond what can be addressed in today's IMT application areas;
- g) that rapid uptake of smartphones, tablets and innovative mobile applications created by users has resulted in a tremendous increase in the volume of mobile data traffic;
- h) that the number of devices accessing the network are expected to increase due to the emerging applications of Internet of Things (IoT);
- i) that technologies such as beamforming, massive-Multiple Input Multiple Output (MIMO) are easier to implement in higher frequencies due to short wavelength;
- j) that wide contiguous bandwidth would enhance data delivery efficiency and ease the complexity of hardware implementation;
- k) that the cell size is being reduced (e.g. the order of some tens of metres) to provide larger area traffic capacity in dense areas;
- l) that IMT interworks with other radio systems,

recognizing

- a) that some administrations had deployed IMT-Advanced systems before global deployment due to the rapid increase of data traffic;
- b) that development of new radio interfaces that support the new capabilities of IMT-2020 is expected along with the enhancement of IMT-2000 and IMT-Advanced systems,

noting

that pursuant to Article 44 of the ITU Constitution, Member States shall endeavour to apply the latest technical advances as soon as possible,

recommends

that the Annex should be used as the framework and the overall objectives for the future development of IMT for 2020 and beyond.

Annex

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1 Introduction

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.

In the future, however, 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 objective of this Recommendation is to establish the vision for IMT for 2020 and beyond, by describing potential user and application trends, growth in traffic, technological trends and spectrum implications, and by providing guidelines on the framework and the capabilities for IMT for 2020 and beyond.

2 Observation of trends

2.1 User and application trends

Mobile devices play various, continuously evolving roles in everyday life. Future IMT systems should support emerging new use cases, including applications requiring very high data rate communications, a large number of connected devices, and ultra-low latency and high reliability applications. More specific user and application trends are explained in §§ 2.1.1 to 2.1.8.

2.1.1 Supporting very low latency and high reliability human-centric communication

People expect the experience of instantaneous connectivity wherein applications need to exhibit “flash” behaviour without waiting times: a single click and the response is perceived as instantaneous. Flash behaviour will be a key factor for the success of cloud services and virtual reality and augmented reality applications. The low latency and high reliability communication that supports such behaviour thus becomes an enabler for the future development of new applications, e.g. in health, safety, office, entertainment, and other sectors.

2.1.2 Supporting very low latency and high reliability machine-centric communication

The reliability and latency in today’s communication systems have been designed with the human user in mind. For future wireless systems, the design of new applications is envisaged based on machine-to-machine (M2M) communication with real-time constraints. Driverless cars, enhanced mobile cloud services, real-time traffic control optimization, emergency and disaster response, smart grid, e-health or efficient industrial communications are examples of where low latency and high reliability can improve quality of life.

2.1.3 Supporting high user density

Users will expect a satisfactory end-user experience in the presence of a large number of concurrent users, for example in a crowd with a high traffic density per unit area and a large number of handsets and machines/devices per unit area. Examples are audio-visual content to be provided concurrently across an entire cell or infotainment applications in shopping malls, stadiums, open air festivals, or other public events that attract a lot of people. This includes users who use their phone while in unexpected traffic jams, or when travelling in public transportation systems, as well as professionals working in organisations such as police, fire brigades, and ambulances to exploit the public communication networks in crowded environments and machine-centric devices.

2.1.4 Maintaining high quality at high mobility

A connected society in the years beyond 2020 will need to accommodate a similar user experience for end-users on the move and when they are static e.g. at home or in the office. To offer the “best experience” to highly mobile users and communicating machine devices, robust and reliable connectivity solutions are needed as well as the ability to efficiently maintain service quality with mobility.

Maintaining high quality at high mobility will enable successful deployment of applications on user equipment located within a moving platform such as cars or high-speed trains which are being deployed in several countries. Connectivity on mobile platforms may be provided via IMT, Radio Local Area Network (RLAN) or another network on that platform using suitable backhaul.

2.1.5 Enhanced multimedia services

It is likely that demand for mobile high-definition multimedia will increase in many areas beyond entertainment, such as medical treatment, safety, and security.

User devices will get enhanced media consumption capabilities, such as Ultra-High Definition display, multi-view High Definition display, mobile 3D projections, immersive video conferencing, and augmented reality and mixed reality display and interface. This will all lead to a demand for significantly higher data rates. Media delivery will be both to individuals and to groups of users.

2.1.6 Internet of Things

In the future, every object that can benefit from being connected will be connected through wired or wireless internet technologies. Therefore, the number of connected devices will grow rapidly and is expected to exceed the number of human user devices in the future.

These connected “things” can be smart phones, sensors, actuators, cameras, vehicles, etc., ranging from low-complexity devices to highly complex and advanced devices. A significant number of connected devices are expected to use IMT systems.

As a result, the connected entities are bound to have varying levels of energy consumption, transmission power, latency requirements, cost, and many other indices critical for stable connection.

In addition, as more and more things get connected, various services that utilize the connection capabilities of things will appear. Smart energy distribution grid system, agriculture, healthcare, vehicle-to-vehicle and vehicle-to-road infrastructure communication are generally viewed as potential fields for further growth of the Internet of Things (IoT).

2.1.7 Convergence of applications

New applications are increasingly being delivered over IMT, including e-Government, public protection and disaster relief communication, education, linear¹ and on-demand audio-visual content, and e-health. This convergence of applications must take account of the requirements associated with these applications.

2.1.8 Ultra-accurate positioning applications

As the accuracy of positioning gets better, location-based service applications that provide improved emergency rescue services, as well as precise ground based navigation service for unmanned vehicles or drones may expand extensively.

2.2 Growth in IMT traffic

There are many drivers influencing the growth of future IMT traffic demand, especially the adoption of devices with enhanced capabilities that require increased bit rates and bandwidth usage. Similar drivers increased traffic in the transition from IMT-2000 to IMT-Advanced.

The main drivers behind the anticipated traffic growth include increased video usage, device proliferation and application uptake. These are expected to evolve over time, and this evolution will differ between countries due to social and economic differences. These drivers and other trends which impact traffic growth are detailed in Report ITU-R M.2370. The Report contains global IMT traffic estimates beyond 2020 from several sources. These estimates anticipate that global IMT traffic will grow in the range of 10-100 times from 2020 to 2030.

¹ A linear audio-visual service refers to the “traditional” way of offering radio or TV services. Listeners and viewers “tune in” to the content organised as a scheduled sequence that may consist of e.g. news, shows, drama or movies on TV or various types of audio content on radio. These sequences of programmes are set up by content providers and cannot be changed by a listener or a viewer. Linear services are not confined to a particular distribution technology. For example, a live stream on the Internet is to be considered as a linear service as well.