

RECOMMENDATION ITU-R M.1079-2

Performance and quality of service requirements for International Mobile Telecommunications-2000 (IMT-2000) access networks

(Question ITU-R 229/8)

(1994-2000-2003)

Summary

This Recommendation defines the speech/data quality and performance requirements for IMT-2000 access networks taking into consideration the end-to-end requirements. It also defines the connection/session performance, concerning issues such as call set-up time, delay characteristics and handover probability, to be achieved in the IMT-2000 access network that the user will expect in a network of comparable performance to the fixed network.

1 Introduction

IMT-2000 are third generation mobile systems which provide access to a wide range of telecommunication services, supported by the fixed telecommunication networks (e.g. public switched telephone network (PSTN)/ISDN/Internet Protocol (IP)), and to other services that are specific to mobile users.

Key features of IMT-2000 are:

- high degree of commonality of design worldwide;
- compatibility of services within IMT-2000 and with the fixed networks;
- high quality;
- small terminal suitable for worldwide use;
- worldwide roaming capability;
- capability for multimedia applications, and a wide range of services and terminals.

The capabilities of IMT-2000 systems are being continuously enhanced in line with market and technology trends.

This Recommendation on performance and QoS requirements defines the requirements for speech quality, data quality, connection/session performance and the radio interface performance to be achieved in IMT-2000.

Annex 1 contains information on planning tools to address end-to-end voice transmission quality.

2 Scope

This Recommendation defines the speech/data quality and performance requirements for IMT-2000 access networks, taking into consideration the end-to-end requirements.

This Recommendation lists the basic Recommendations essential for:

- achieving speech quality comparable to the fixed network by specifying natural speech, free, for example from excessive delay and echoes, that will enable users to converse easily using the IMT-2000 network, taking account of the full range of impairments like transcoding and environmental noise that are to be expected; and
- acceptable data quality and performance requirements.

This Recommendation also defines the connection/session performance, concerning issues like call set-up time, delay characteristics and handover probability, to be achieved in the IMT-2000 access network that the user will expect in a network of comparable performance to the fixed network. The scope of the Recommendation includes both the terrestrial and the satellite radio interfaces, as defined in Recommendation ITU-R M.1457.

3 Structure of the Recommendation

This Recommendation contains recommendations dealing with speech/data quality, connection/session performance, data, the requirements for other services and the radio performance requirements. In particular, QoS requirements are given in this Recommendation to meet end-to-end quality for services in wireless mobile networks.

4 Related documents

The following are the applicable related documents:

Recommendation ITU-R M.816:	Framework for services supported on International Mobile Telecommunications-2000 (IMT-2000)
Recommendation ITU-R M.818:	Satellite operation within International Mobile Telecommunications-2000 (IMT-2000)
Recommendation ITU-R M.819:	International Mobile Telecommunications-2000 (IMT-2000) for developing countries
Recommendation ITU-R M.1034:	Requirements for the radio interface(s) for International Mobile Telecommunications-2000 (IMT-2000)
Recommendation ITU-R M.1224:	Vocabulary of terms for International Mobile Telecommunications-2000 (IMT-2000)
Recommendation ITU-R M.1225:	Guidelines for evaluation of radio transmission technologies for IMT-2000
Recommendation ITU-R M.1311:	Framework for modularity and radio commonality within IMT-2000

Recommendation ITU-R M.1457:	Detailed specifications of the radio interfaces of International Mobile Telecommunications-2000 (IMT-2000)
ITU-T Recommendation E.770:	Land mobile and fixed network interconnection traffic grade of service concept
ITU-T Recommendation E.771:	Network grade of service parameters and target values for circuit-switched land mobile services
ITU-T Recommendation E.800:	Terms and definitions related to quality of service and network performance including dependability
ITU-T Recommendation F.116:	Service features and operational provisions in IMT-2000
ITU-T Recommendation G.107:	The E-model, a computational model for use in transmission planning
ITU-T Recommendation G.114:	One-way transmission time
ITU-T Recommendation G.131:	Control of talker echo
ITU-T Recommendation G.173:	Transmission planning aspects of the speech service in digital public land mobile networks
ITU-T Recommendation G.174:	Transmission performance objectives for terrestrial digital wireless systems using portable terminals to access the PSTN
ITU-T Recommendation G.726:	40, 32, 24, 16 kbit/s adaptive differential pulse code modulation (ADPCM)
ITU-T Recommendation G.728:	Coding of speech at 16 kbit/s using low-delay code excited linear prediction
ITU-T Recommendation G.729:	Coding of speech at 8 kbit/s using conjugate-structure algebraic-code-excited linear-prediction (CS-ACELP)
ITU-T Recommendation G.1010:	End-user multimedia QoS categories
ITU-T Recommendation P.79:	Calculation of loudness ratings for telephone sets
ITU-T Recommendation P.313:	Transmission characteristics for cordless and mobile digital terminals
ITU-T Recommendation P.800:	Methods for subjective determination of transmission quality
ITU-T Recommendation P.830:	Subjective performance assessment of telephone-band and wideband digital codecs
ITU-T Recommendation P.831:	Subjective performance evaluation of network echo cancellers

ITU-T Recommendation P.862:	Perceptual evaluation of speech quality (PESQ): An objective method for end-to-end speech quality assessment of narrow-band telephone networks and speech codecs
ITU-T Recommendation Q.1701:	Framework of IMT-2000 networks
ITU-T Recommendation Q.1711:	Network functional model for IMT-2000
ITU-T Recommendation Y.1540:	Internet protocol data communication service – IP packet transfer and availability performance parameters
ITU-T Recommendation Y.1541:	Network performance objectives for IP-based services

5 Abbreviations and acronyms (see Note 1)

ADPCM	adaptive differential pulse code modulation
BER	bit error ratio
CN	core network
CRC	cyclic redundancy code
DCME	digital circuit multiplex equipment
FTP	file transfer protocol
GoB	good or better
GoS	grade of service
IP	Internet protocol
ISP	Internet service provider
MOS	mean opinion score
MT	mobile terminal
PDP	packet data protocol
PDU	protocol data unit
PLR	packet loss ratio
PoW	poor or worst
QoS	quality of service
RAN	radio access network
RANI	radio access network interface

RLP	radio link protocol
RRM	radio resource management
SDU	service data unit
SMS	short message service
VoIP	voice over IP

NOTE 1 – Additional abbreviations are provided in Recommendation ITU-R M.1224.

6 Definitions

6.1 QoS

The collective effect of service performances which determine the degree of satisfaction of a user of a service. It is characterized by the combined aspects of performance factors applicable to all services, such as:

- service operability performance
- service accessibility performance
- service retainability performance
- service integrity performance
- other factors specific to each service.

6.2 Speech quality

The speech quality expresses the degree of customer satisfaction with conversational speech transmission. Speech quality depends on the quality of the whole speech path from the talker at one end of the connection to the listener at the other, and can be categorized into two types of quality: quality which is mainly dependent on handset acoustics and quality which is mainly dependent on the transmission medium. Telecommunications services where special attention needs to be paid to speech quality, such as audio teleconferencing and voice mail, should also be considered.

6.3 Connection performance

Connection performance is expressed in ITU-T Recommendation E.770 as Grade of Service (GoS). GoS parameters consist of the signalling delay for call set-up and call release, and the probability of end-to-end blocking, as well as the probability of unsuccessful handover, etc.

6.4 Service retainability performance

Service retainability performance is defined in ITU-T Recommendation E.800 as the probability that a service, once obtained, will continue to be provided for a communication under given conditions, for example conditions of fading, shadowing and co-channel interference.

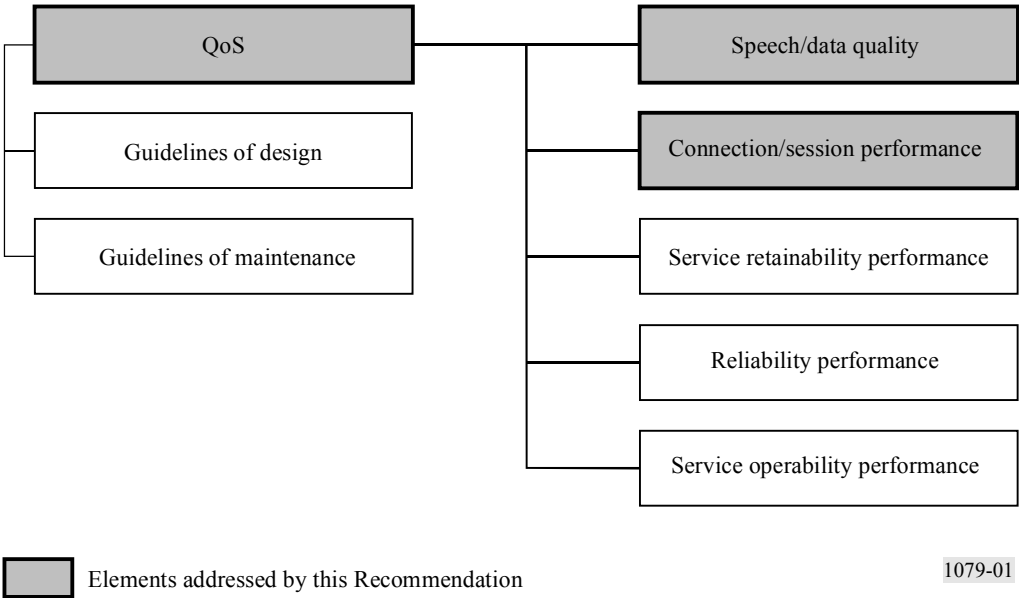
6.5 Reliability performance

Reliability performance is defined in ITU-T Recommendation E.800 as the probability that an item can perform a required function under stated conditions for a given time interval. Faults in the telephone network can be classified as two types. One type is where the user encounters a small scale fault in the network segment other than the user’s own segment, in which case service can be re-established if the user calls again at once. The other type is where the fault occurs in the user’s segment or a large-scale fault occurs in the network segment, in which case, no service can be provided even if the user calls many times. A measure of reliability performance of the user’s segment is the failure rate, and a measure of the network segment is unavailability.

6.6 Guidelines of design

To realize telecommunication services which achieve the criteria specified in quality of service, guidelines for the design of the network are needed. The quality of systems which are designed in accordance with these guidelines will be expected to meet the recommendations made below (see Fig. 1).

FIGURE 1
An example of the functional structure of quality for telecommunication service



6.7 Guidelines of management

Guidelines to maintain and operate the facilities are needed. These guidelines are the basis on which a service provider or a network operator maintains the service, judges the quality in order to improve the service, and takes remedial action.