

# ITU-T

TELECOMMUNICATION  
STANDARDIZATION SECTOR  
OF ITU

## E.804.1

(10/2020)

SERIES E: OVERALL NETWORK OPERATION,  
TELEPHONE SERVICE, SERVICE OPERATION AND  
HUMAN FACTORS

Quality of telecommunication services: concepts, models,  
objectives and dependability planning – Terms and  
definitions related to the quality of telecommunication  
services

---

**Application guide for Recommendation ITU-T  
E.804 on quality of service aspects for popular  
services in mobile networks**

Recommendation ITU-T E.804.1

ITU-T E-SERIES RECOMMENDATIONS

**OVERALL NETWORK OPERATION, TELEPHONE SERVICE, SERVICE OPERATION AND HUMAN FACTORS**

**INTERNATIONAL OPERATION**

|                                                        |             |
|--------------------------------------------------------|-------------|
| Definitions                                            | E.100–E.103 |
| General provisions concerning Administrations          | E.104–E.119 |
| General provisions concerning users                    | E.120–E.139 |
| Operation of international telephone services          | E.140–E.159 |
| Numbering plan of the international telephone service  | E.160–E.169 |
| International routing plan                             | E.170–E.179 |
| Tones in national signalling systems                   | E.180–E.189 |
| Numbering plan of the international telephone service  | E.190–E.199 |
| Maritime mobile service and public land mobile service | E.200–E.229 |

**OPERATIONAL PROVISIONS RELATING TO CHARGING AND ACCOUNTING IN THE INTERNATIONAL TELEPHONE SERVICE**

|                                                                |             |
|----------------------------------------------------------------|-------------|
| Charging in the international telephone service                | E.230–E.249 |
| Measuring and recording call durations for accounting purposes | E.260–E.269 |

**UTILIZATION OF THE INTERNATIONAL TELEPHONE NETWORK FOR NON-TELEPHONY APPLICATIONS**

|                 |             |
|-----------------|-------------|
| General         | E.300–E.319 |
| Phototelegraphy | E.320–E.329 |

**ISDN PROVISIONS CONCERNING USERS**

E.330–E.349

**INTERNATIONAL ROUTING PLAN**

E.350–E.399

**NETWORK MANAGEMENT**

|                                                             |             |
|-------------------------------------------------------------|-------------|
| International service statistics                            | E.400–E.404 |
| International network management                            | E.405–E.419 |
| Checking the quality of the international telephone service | E.420–E.489 |

**TRAFFIC ENGINEERING**

|                                                                                   |             |
|-----------------------------------------------------------------------------------|-------------|
| Measurement and recording of traffic                                              | E.490–E.505 |
| Forecasting of traffic                                                            | E.506–E.509 |
| Determination of the number of circuits in manual operation                       | E.510–E.519 |
| Determination of the number of circuits in automatic and semi-automatic operation | E.520–E.539 |
| Grade of service                                                                  | E.540–E.599 |
| Definitions                                                                       | E.600–E.649 |
| Traffic engineering for IP-networks                                               | E.650–E.699 |
| ISDN traffic engineering                                                          | E.700–E.749 |
| Mobile network traffic engineering                                                | E.750–E.799 |

**QUALITY OF TELECOMMUNICATION SERVICES: CONCEPTS, MODELS, OBJECTIVES AND DEPENDABILITY PLANNING**

|                                                                                             |                    |
|---------------------------------------------------------------------------------------------|--------------------|
| <b>Terms and definitions related to the quality of telecommunication services</b>           | <b>E.800–E.809</b> |
| Models for telecommunication services                                                       | E.810–E.844        |
| Objectives for quality of service and related concepts of telecommunication services        | E.845–E.859        |
| Use of quality of service objectives for planning of telecommunication networks             | E.860–E.879        |
| Field data collection and evaluation on the performance of equipment, networks and services | E.880–E.899        |
| <b>OTHER</b>                                                                                | <b>E.900–E.999</b> |

**INTERNATIONAL OPERATION**

|                                                       |               |
|-------------------------------------------------------|---------------|
| Numbering plan of the international telephone service | E.1100–E.1199 |
|-------------------------------------------------------|---------------|

**NETWORK MANAGEMENT**

|                                  |               |
|----------------------------------|---------------|
| International network management | E.4100–E.4199 |
|----------------------------------|---------------|

*For further details, please refer to the list of ITU-T Recommendations.*

# Recommendation ITU-T E.804.1

## Application guide for Recommendation ITU-T E.804 on quality of service aspects for popular services in mobile networks

### Summary

Recommendation ITU-T E.804.1 provides detailed guidance on the application of quality of service (QoS) metrics defined in clause 7 of Recommendation ITU-T E.804.

### History

| Edition | Recommendation | Approval   | Study Group | Unique ID*                                                                   |
|---------|----------------|------------|-------------|------------------------------------------------------------------------------|
| 1.0     | ITU-T E.804.1  | 2020-10-14 | 12          | <a href="http://handle.itu.int/11.1002/1000/11830-en">11.1002/1000/14427</a> |

### Keywords

Guidance, metrics, mobile services, QoS, trigger points, user perception.

---

\* To access the Recommendation, type the URL <http://handle.itu.int/> in the address field of your web browser, followed by the Recommendation's unique ID. For example, <http://handle.itu.int/11.1002/1000/11830-en>.

## FOREWORD

The International Telecommunication Union (ITU) is the United Nations specialized agency in the field of telecommunications, information and communication technologies (ICTs). The ITU Telecommunication Standardization Sector (ITU-T) is a permanent organ of ITU. ITU-T is responsible for studying technical, operating and tariff questions and issuing Recommendations on them with a view to standardizing telecommunications on a worldwide basis.

The World Telecommunication Standardization Assembly (WTSA), which meets every four years, establishes the topics for study by the ITU-T study groups which, in turn, produce Recommendations on these topics.

The approval of ITU-T Recommendations is covered by the procedure laid down in WTSA Resolution 1.

In some areas of information technology which fall within ITU-T's purview, the necessary standards are prepared on a collaborative basis with ISO and IEC.

## NOTE

In this Recommendation, the expression "Administration" is used for conciseness to indicate both a telecommunication administration and a recognized operating agency.

Compliance with this Recommendation is voluntary. However, the Recommendation may contain certain mandatory provisions (to ensure, e.g., interoperability or applicability) and compliance with the Recommendation is achieved when all of these mandatory provisions are met. The words "shall" or some other obligatory language such as "must" and the negative equivalents are used to express requirements. The use of such words does not suggest that compliance with the Recommendation is required of any party.

## INTELLECTUAL PROPERTY RIGHTS

ITU draws attention to the possibility that the practice or implementation of this Recommendation may involve the use of a claimed Intellectual Property Right. ITU takes no position concerning the evidence, validity or applicability of claimed Intellectual Property Rights, whether asserted by ITU members or others outside of the Recommendation development process.

As of the date of approval of this Recommendation, ITU had not received notice of intellectual property, protected by patents, which may be required to implement this Recommendation. However, implementers are cautioned that this may not represent the latest information and are therefore strongly urged to consult the TSB patent database at <http://www.itu.int/ITU-T/ipr/>.

© ITU 2020

All rights reserved. No part of this publication may be reproduced, by any means whatsoever, without the prior written permission of ITU.

## Table of Contents

|   |                                                                                                            | Page |
|---|------------------------------------------------------------------------------------------------------------|------|
| 1 | Scope .....                                                                                                | 1    |
| 2 | References.....                                                                                            | 1    |
| 3 | Definitions .....                                                                                          | 2    |
|   | 3.1 Terms defined elsewhere .....                                                                          | 2    |
|   | 3.2 Terms defined in this Recommendation.....                                                              | 2    |
| 4 | Abbreviations and acronyms .....                                                                           | 3    |
| 5 | Conventions .....                                                                                          | 4    |
| 6 | Service independent QoS parameters .....                                                                   | 4    |
|   | 6.1 Radio network unavailability .....                                                                     | 4    |
|   | 6.2 Other parameters .....                                                                                 | 4    |
| 7 | QoS parameters for direct services .....                                                                   | 5    |
|   | 7.1 Audio-visual streaming .....                                                                           | 5    |
|   | 7.2 Telephony .....                                                                                        | 8    |
|   | 7.3 HTTP-based data services .....                                                                         | 10   |
|   | 7.4 Other direct services with lower usage and less priority for QoS supervision.....                      | 12   |
| 8 | Store and forward services .....                                                                           | 12   |
|   | 8.1 Generic parameters .....                                                                               | 12   |
|   | 8.2 SMS .....                                                                                              | 14   |
|   | 8.3 Other store-and-forward services with lower usage and less priority for QoS supervision.....           | 14   |
| 9 | Summary .....                                                                                              | 14   |
|   | Appendix I – Experience of a multinational operator.....                                                   | 18   |
|   | Appendix II – Example of a recent work on best practices, as proposed by ETSI.....                         | 20   |
|   | Appendix III – Alternative approach for performance measurement of HTTP-based data transfer services ..... | 22   |
|   | Bibliography.....                                                                                          | 23   |

## Introduction

The list of services presented in clause 7 of [ITU-T E.804], and the associated list of metrics defined, is rather large and include:

- 11 service independent QoS parameters (clause 7.2)
- 14 direct services, with a total of 175 QoS parameters (clause 7.3)
- 3 store-and-forward services, with a total of 70 QoS parameters (clause 7.4)

When readers and potential users (mostly service providers and national regulation authorities, for monitoring purposes) consider this material, and before considering the provision in the following clauses of [ITU-T E.804], the first principal question arising is how to practically use it.

The solution to this question can be divided into two separate threads:

- 1) The prioritization of services and metrics<sup>1</sup>. Indeed, the supervision of a network cannot be based on a too large number of criteria. A subset of relevant services and metrics must be identified. To do so, recent evolutions in the usage of mobile applications, as well as new philosophies for monitoring, which are not yet incorporated in the current version of [ITU-T E.804], must also be taken into account.
- 2) The application of the selected metrics. Even if [ITU-T E.804] provides trigger points as well as instantiation across various access technologies or guidance for the usage of measurement tools, in some cases the elements provided need to be completed to achieve an applicable measurement procedure.

This Recommendation answers both parts of the question, taking into account the relevance of the service or metric for end-users. To do so, the information below is provided in the following clauses of this Recommendation:

- In clause 6, service independent QoS parameters from clause 7.2 of [ITU-T E.804] are reviewed, a subset of meaningful key performance indicators (KPIs) is proposed, and when needed detailed information provided to better apply them practically.
- In clauses 7 and 8, services and applications from clauses 7.3 and 7.4 of [ITU-T E.804] respectively are reviewed and a subset of services is proposed; then for each selected service, corresponding parameters are reviewed, a subset of meaningful QoS parameters is proposed, and when needed detailed information provided to better apply them practically.

The proposal made in this Recommendation for services is based on assumptions mostly related to an average business model of a mobile operator. This selection may differ from the appropriate one (potentially operator-specific) at local level. On the other hand, commercial considerations may suggest a set of services which cover the largest possible ground, in the sense that a particular service may not be the most popular service but its KPI could be good proxies for a large set of actual use cases. In that perspective, [ETSI TR 103 559] contains an agreed collection of test scenarios that can be considered relevant. A more generic recommendation can also be found in [ITU-T E.830].

Detailed information is provided on metrics only in case of incompleteness of the definition and trigger points in [ITU-T E.804]. Otherwise, users will refer to information already present in [ITU-T E.804]. A summary of all recommended services and metrics and the respective placeholders for relevant information is provided in clause 9.

---

<sup>1</sup> Since the adoption of ITU-T E.804 (in 2014), the usage of vocabulary around mobile services has slightly evolved. The term "service" itself in ITU-T E.804 corresponds to what end users experience, while nowadays it is often understood with a meaning restricted to the access to network interface, and replaced by the term "application" taken from the vocabulary of Google and Apple. The usage of mobile services or applications has also become less monolithic than before, what could result in some difficulty to apply the categories (both in terms of services and parameters) defined in ITU-T E.804. In the current version of this Recommendation however, most of the vocabulary and assumptions of ITU-T E.804 are kept.

The material provided in this Recommendation is a complement to [ITU-T E.804]. It does not replace the provision contained in clause 6 and clauses 8 to 12 of [ITU-T E.804].

The lists of services and metrics in this Recommendation, and associated information, can be expanded in the future based on new contributions.



## Recommendation ITU-T E.804.1

### Application guide for Recommendation ITU-T E.804 on quality of service aspects for popular services in mobile networks

#### 1 Scope

This Recommendation provides detailed guidance on the application of QoS metrics defined in clause 7 of [ITU-T E.804] on the definition of quality of service parameters and their computation.

#### 2 References

The following ITU-T Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published. The reference to a document within this Recommendation does not give it, as a stand-alone document, the status of a Recommendation.

- [ITU-T E.804] Recommendation ITU-T E.804 (2014), *Quality of service aspects for popular services in mobile networks*.
- [ITU-T E.807] Recommendation ITU-T E.807 (2014), *Definitions, associated measurement methods and guidance targets of user-centric parameters for call handling in cellular mobile voice service*.
- [ITU-T E.830] Recommendation ITU-T E.830 (1992), *Models for the specification, evaluation and allocation of serviceability and service integrity*.
- [ITU-T G.1028] Recommendation ITU-T G.1028 (2019), *End-to-end quality of service for voice over 4G mobile networks*.
- [ITU-T G.1028.1] Recommendation ITU-T G.1028.1 (2019), *End-to-end quality of service for video telephony over 4G mobile networks*.
- [ITU-T G.1028.2] Recommendation ITU-T G.1028.2 (2019), *Assessment of the LTE circuit switched fall back – Impact on voice quality of service*.
- [ITU-T J.343] Recommendation ITU-T J.343 (2014), *Hybrid perceptual bitstream models for objective video quality measurements*.
- [ITU-T P.501] Recommendation ITU-T P.501 (2020), *Test signals for use in telephony and other speech-based applications*.
- [ITU-T P.862] Recommendation ITU-T P.862 (2001), *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 P.862.1] Recommendation ITU-T P.862.1 (2003), *Mapping function for transforming P.862 raw result scores to MOS-LQO*.
- [ITU-T P.862.2] Recommendation ITU-T P.862.2 (2007), *Wideband extension to Recommendation P.862 for the assessment of wideband telephone networks and speech codecs*.
- [ITU-T P.862.3] Recommendation ITU-T P.862.3 (2007), *Application guide for objective quality measurement based on Recommendations P.862, P.862.1 and P.862.2*.

- [ITU-T P.863] Recommendation ITU-T P.863 (2018), *Perceptual objective listening quality prediction*.
- [ITU-T P.863.1] Recommendation ITU-T P.863.1 (2019), *Application guide for Recommendation ITU-T P.863*.
- [ITU-T P.1201.1] Recommendation ITU-T P.1201.1 (2012), *Parametric non-intrusive assessment of audio-visual media streaming quality – Lower resolution application area*.
- [ITU-T P.1202.1] Recommendation ITU-T P.1202.1 (2012), *Parametric non-intrusive bitstream assessment of video media streaming quality – Lower resolution application area*.
- [ITU-T P.1203.1] Recommendation ITU-T P.1203.1 (2019), *Parametric bitstream-based quality assessment of progressive download and adaptive audio-visual streaming services over reliable transport – Video quality estimation module*.
- [ITU-T P.1203.2] Recommendation ITU-T P.1203.2 (2017), *Parametric bitstream-based quality assessment of progressive download and adaptive audio-visual streaming services over reliable transport – Audio quality estimation module*.
- [ITU-T P.1203.3] Recommendation ITU-T P.1203.3 (2019), *Parametric bitstream-based quality assessment of progressive download and adaptive audio-visual streaming services over reliable transport – Quality integration module*.
- [ITU-T P.1204.3] Recommendation ITU-T P.1204.3 (2020), *Video quality assessment of streaming services over reliable transport for resolutions up to 4K with access to full bitstream information*.
- [ITU-T P.1204.4] Recommendation ITU-T P.1204.4 (2020), *Video quality assessment of streaming services over reliable transport for resolutions up to 4K with access to full and reduced reference pixel information*.
- [ITU-T P.1204.5] Recommendation ITU-T P.1204.5 (2020), *Video quality assessment of streaming services over reliable transport for resolutions up to 4K with access to transport and received pixel information*.
- [ETSI TR 101 578] ETSI TR 101 578 V1.3.1 (2018), *Speech and multimedia Transmission Quality (STQ); QoS aspects of TCP-based video services like YouTube™*.
- [ETSI TR 103 138] ETSI TR 103 138 V1.5.1 (2018), *Speech and multimedia Transmission Quality (STQ); Speech samples and their use for QoS testing*.
- [ETSI TR 103 559] ETSI TR 103 559 V1.1.1 (2019), *Speech and multimedia Transmission Quality (STQ); Best practices for robust network QoS benchmark testing and scoring*.

### 3 Definitions

#### 3.1 Terms defined elsewhere

This Recommendation uses the terms defined in [ITU-T E.804].

#### 3.2 Terms defined in this Recommendation

None.

## 4 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

|         |                                                      |
|---------|------------------------------------------------------|
| 2G      | Second generation of mobile networks                 |
| 3G      | Third generation of mobile networks                  |
| 4G      | Fourth generation of mobile networks                 |
| CLIP    | Calling Line Identification Presentation             |
| CSFB    | Circuit Switched Fall Back                           |
| DNS     | Domain Name System                                   |
| FB      | Full Band (telephony)                                |
| HD      | High Definition (for voice)                          |
| HTTP    | Hypertext Transfer Protocol                          |
| IMS     | IP multimedia system                                 |
| KPI     | Key Performance Indicator                            |
| MMS     | Multimedia Messaging Service                         |
| MOS     | Mean Opinion Score                                   |
| MOS-LQO | MOS – Voice Listening Quality (Objective assessment) |
| MTSI    | Multimedia Telephony Service for IMS                 |
| NB      | Narrow Band (telephony)                              |
| PDP     | Packet Data Protocol                                 |
| QoS     | Quality of Service                                   |
| QoE     | Quality of Experience                                |
| RF      | Radio Frequency                                      |
| RSCP    | Received Signal Code Power                           |
| RCS     | Rich Communication Service                           |
| RSRP    | Reference Signal Received Power                      |
| RSRQ    | Reference Signal Received Quality                    |
| RTP     | Real time Transport Protocol                         |
| RTSP    | Real Time Streaming Protocol                         |
| SMS     | Short Messages Services                              |
| SWB     | Super Wide Band (telephony)                          |
| TCP     | Transmission Control Protocol                        |
| UDP     | User Datagram Protocol                               |
| UMTS    | Universal Mobile Telecommunications System           |
| VoLTE   | Voice over Long Term Evolution of mobile networks    |
| WAP     | Wireless Application Protocol                        |
| WB      | Wide Band (telephony)                                |
| WLAN    | Wireless Local Access Network                        |