

ITU-T Study Group 12: Performance, QoS and QoE

An overview of the global lead on
QoS/QoE standards

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Outline

- Study Group 12: Performance, QoS and QoE
 - Mandate
 - Prerequisites: Performance, QoS and QoE
 - Leadership, structure, meetings
 - Recommendations and topics under discussion

SG 12 Mandate

- Performance, QoS and QoE
- Responsible for Recommendations on performance, quality of service (QoS) and quality of experience (QoE) for
 - full spectrum of terminals, networks and services
 - ranging from speech over fixed circuit-based networks to multimedia applications over networks that are mobile and packet based
- Included are
 - operational aspects of performance, QoS and QoE
 - end-to-end quality aspects of interoperability
 - development of multimedia quality assessment methodologies, both subjective and objective.
- SG 12 is the Lead SG on
 - quality of service and quality of experience
 - driver distraction and voice aspects of car communications
- <http://itu.int/en/ITU-T/studygroups/2013-2016/12/>

Prerequisites: Performance, QoS and QoE

Basic definitions:

Recommendation ITU-T E.800

- Network Performance (NP)
 - Pre-requisite to Quality of Service (QoS)
 - Not directly visible to the user
- Quality of Service (QoS)
 - Performance of the Service offered to the User
 - Some QoS Aspects directly perceivable, some indirectly

Network Performance

- Charging Performance
- Provisioning Performance
- Administration Performance
- Availability Performance
- Transmission Performance

Quality of Service

- Service Support Performance
- Service Operability Performance
- Serveability
- Service Security Performance

QoE Definition

- ITU-T Rec. G.100 / P.10 defines
 - Quality of Experience (QoE): The overall acceptability of an application or service, as perceived subjectively by the end-user.
 - NOTE 1 – Quality of experience includes the complete end-to-end system effects (client, terminal, network, services infrastructure, etc.).
 - NOTE 2 – Overall acceptability may be influenced by user expectations and context.

Leadership, structure, meetings

SG 12 Leadership Team

- Chairman
 - Kwame Baah-Acheamfuor (National Communications Authority, Ghana)
- Vice Chairmen
 - Paul Barrett (Netscout, United States)
 - Vincent Barriac (Orange, France)
 - Gamal Amin Elsayed (National Telecommunication Corporation, Sudan)
 - Hyung-Soo Kim (KT Corporation, Republic of Korea)
 - Al Morton (AT&T, United States)
 - Qi Feng (Beijing University of Posts and Telecommunications, China)
 - José Guadalupe Rojas Ramírez (Mexico)
 - Akira Takahashi (NTT, Japan)
 - Hassan Talib (Agence Nationale de Réglementation des télécommunications, Morocco)
- ITU/TSB Staff:
 - Martin Adolph, Advisor
 - Emmanuelle Labare, Assistant

Working Parties

- **WP 1 Terminals and multimedia subjective assessment**
- CHAIR: **Lars Birger Nielsen** (Brüel & Kjaer, Denmark)
VICE CHAIR: **Gunilla Berndtsson** (Ericsson, Sweden)

Q3/12 Speech transmission characteristics of communication terminals for fixed circuit-switched, mobile and packet-switched (IP) networks

Q4/12 Hands-free communication and user interfaces in vehicles

Q5/12 Telephonometric methodologies for handset and headset terminals

Q6/12 Analysis methods using complex measurement signals including their application for speech enhancement techniques and hands-free telephony

Q7/12 Methods, tools and test plans for the subjective assessment of speech, audio and audiovisual quality interactions

Q10/12 Conferencing and telemeeting assessment

Working Parties

- **WP 2 Objective models and tools for multimedia quality**
- CHAIR: **Paul Barrett** (Netscout, United States)
VICE CHAIR: **Vincent Barriac** (Orange, France)

Q8/12

E-Model extension in wideband transmission and future telecommunication and application scenarios

Q9/12

Perceptual-based objective methods for voice, audio and visual quality measurements in telecommunication services

Q14/12

Development of parametric models and tools for multimedia quality assessment

Q15/12

Objective assessment of speech and sound transmission performance quality in networks

Q16/12

Framework for diagnostic functions and their interaction with external objective models predicting media quality

Working Parties

- **WP 3 Multimedia QoS and QoE**
- **CHAIR: Paul Coverdale** (Huawei Technologies, China)
VICE CHAIR: Akira Takahashi (NTT, Japan)

Q11/12

Performance interworking and traffic management for Next Generation Networks

Q12/12

Operational aspects of telecommunication network service quality

Q13/12

QoE, QoS and performance requirements and assessment methods for multimedia

Q17/12

Performance of packet-based networks and other networking technologies

Groups under SG12

- QSDG (Quality of Service Development Group)
 - Meets once a year
 - Liaison/organize workshops on SG12 issues
 - Operational aspects and regional/country experiences are actively discussed
- RG-AFR (Regional Group for Africa)
 - Established under a parent Study Group to facilitate discussions in the region.
 - Meets once a year
 - Assists the region to participate in and contribute to the parent Study Group meetings and other activities.
 - Holds a session during every SG12 meeting
 - Regional Standardization Forum often collocates

Past meetings and other activities in current Study Period

- ITU Workshop on Monitoring and Benchmarking of QoS and QoE of Multimedia services in Mobile Networks (Buenos Aires, Argentina, 24-25 July 2014)
- **SG12 meeting (Geneva, 2-11 September 2014)**
- ITU Workshop on QoS Regulatory and Operational Issues, and 31st QSDG meeting (Dubai, UAE, 2-6 November 2014)
- ITU Workshop on QoS and QoE of Multimedia Services in Emerging Networks (Istanbul, Turkey, 9-11 February 2015)
- Meeting of ITU-T SG12 Regional Group for Africa, and ITU Regional Standardization Forum (Dakar, Senegal, 23-25 March 2015)
- **SG12 meeting (Geneva, 5-14 May 2015)**
- ITU Workshop on Performance, QoS and QoE of Emerging Networks and Services, and 32nd QSDG meeting (Athens, Greece, 7-11 September 2015)
- Stakeholders Forum on QoS and Consumer Experience (Nairobi, Kenya, 23-25 November 2015)
- **SG12 meeting (Geneva, 12-21 January 2016)**
- Meeting of ITU-T SG12 Regional Group for Africa, and ITU Regional Standardization Forum (Livingstone, Zambia, 16-18 March 2016)

Upcoming meetings and other activities in current Study Period

- ITU Workshop on QoS and QoE of Multimedia applications and services, and 33rd meeting of the Quality of Service Development Group (QSDG) (**Haarlem/Amsterdam, The Netherlands, 9-13 May 2016**)
 - Open for presentations and participation
 - See <http://www.itu.int/en/ITU-T/Workshops-and-Seminars/qos/201605/> for more information
- **SG12 meeting (Geneva, 7-16 June 2016)**

Recommendations and topics under discussion

SG 12 Recommendations

- E-Series: Overall Network Operation, telephone service, telephone operation and human factors
 - E.420-E.479, E.800-E.859
- G-Series: Transmission Systems and media, digital systems and networks
 - G.100-series, except G.160-, G.180- and G.190-series, G-1000 series
- I-Series: Integrated Services Digital Network
 - I.350-series (including Y.1501/G.820/I.351), I.371, I.378, I.381
- P-Series, except P.900-series: Terminals, subjective and objective test methods
- Y-Series: Global Information infrastructure, Internet Protocol aspects and Next Generation Networks
 - Y.1220-, Y.1530-, Y.1540-, Y.1560-series

Key topics

- Communication in vehicles (Q4/12)
- Conferencing and telemeeting assessment (Q10/12)
- Mobile terminal audio interface (Q3/12)
- Multimedia quality assessment (Q13 and Q14/12)
- Objective audiovisual quality assessment (Q8 and 9/12)
- Objective voice quality assessment (Q8, 9, 15 and 16/12)
- Operational aspects of QoS (Q12/12)
- Packet based network performance (Q11 and 17/12)
- QoS for terminals (Q5 and 6/12)
- QoS for voice over LTE (Q11/12)
- Subjective audiovisual quality assessment (Q7/12)

Selected recent new work items

- G.IMT2020: QoS Framework for IMT 2020 (Q2/12)
- G.OM_HEVC: Opinion model for network planning of High Efficiency Video Coding (HEVC) media streaming quality (Q13/12)
- G.VidMOS: Guidelines for [selecting/choosing] models for assessing video quality (Q13/12)
- G.OMG: Opinion model for gaming applications (Q13/12)
- E.QMME: Quality measurement strategy in Major Events (e.g., Olympics, Football World Cup)

Ongoing active work items (1)

- P.381 Revision: Technical requirements and test methods for the universal wired headset or headphone interface of digital mobile terminals (Q3/12)
- P.MMIC: Technical requirements and test methods for multi-microphone wired headset or headphone interfaces of digital wireless terminals (Q3/12)
- P.carSFS: Super-WideBand (SWB) and FullBand (FB) stereo hands-free communication in motor vehicles (Q4/12)
- P.UIA: User interface requirements for automotive applications (Q4/12)
- P.TBN: Setups and testing techniques for terminal performance measurements with background noise (Q5/12)
- P.CROWD: Crowdsourcing (Q7/12)
- P.DTM: Effect of delays on the telemeeting quality (Q10/12)
- P.SAM: Spatial audio meetings quality evaluation (Q10/12)

Ongoing active work items (2)

- P.ONRA: Perceptual objective noise reduction (Q9/12)
- P.SPELQ: No-reference models for quality prediction (Q9/12)
- P.NATS: Parametric non-intrusive assessment of TCP-based multimedia streaming quality, considering adaptive streaming (Q14/12)
- P.INQX: Integral index of quality for general service monitoring (per user-session); KQI definitions (Q14/12)
- P.CQO: Conversational model (Q15/12)
- P.TCA: Technical cause analysis (Q16/12)
- G.MFWT: Measurement framework for web-site traffic characteristics (Q13/12)
- G.102y: Buffer Models for Media Streams on TCP Transport (Q17/12)

Recently completed work items

- P.807 (ex. P.INTELL): Subjective Test Methodology for Assessing Speech Intelligibility (Q7/12)
- P.1140 (ex. P.emergency): Speech Quality Requirements for Emergency Calls (Q4/12)
- P.1312: Method for the measurement of the communication effectiveness of multiparty telemeetings using task performance (Q10/12)
- G.1028 (ex. G.VoLTE): End-to-end Qos for voice over 4G mobile networks (Q11/12)



Summary

- Global lead for QoS and QoE standards
- Strong European footprint in its leadership and participation (industry and governments)
- Quick to respond to emerging demands and priorities (e.g., VoLTE, eCall, video QoS/QoE, 5G)

Thank you





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MOS = Mean Opinion Score

- The mean of opinion scores, i.e., of the values on a predefined scale that subjects assign to their opinion of the performance of the telephone transmission system used either for conversation or for listening to spoken material
- True MOS values can only be derived from subjective tests
- Usefulness of MOS values outside the original subjective test depends on statistical exercises:
 - Selection of subjects
 - Compilation of speech samples
 - Normalization of results
 - Language Dependency

Subjective Tests

- Require large group of people
- Very costly and time-consuming
- Cannot be done in real-time
- But it is the Reference for the other methods:
 - Objective models
 - Estimation models

Objective Models

- Reproducing human perception as accurate as possible
- Real-time Recording or Monitoring of Waveform Signals
- Use of an algorithm to predict the results of a subjective test
- Faster and cheaper but correlation with subjective test may vary
- Current Models include P.862 (PESQ), P.563 and the new P.863 “POLQA”
- Obsolete Models include P.861 (PSQM, for Codec Validation only) and a variety of vendors' proprietary Models

Rec. G.1010 – Model for user-centric QoS categories

Error tolerant	Conversational voice and video	Voice/video messaging	Streaming audio and video	Fax
Error intolerant	Command/control (e.g. Telnet, interactive games)	Transactions (e.g. E-commerce, WWW browsing, Email access)	Messaging, Downloads (e.g. FTP, still image)	Background (e.g. Usenet)
	Interactive (delay $\ll 1$ s)	Responsive (delay ~ 2 s)	Timely (delay ~ 10 s)	Non-critical (delay $\gg 10$ s)

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