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

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)
- **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)
- **SG12 meeting (Geneva, 12-21 January 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
- **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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1956 2016
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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

<table>
<thead>
<tr>
<th>Error tolerant</th>
<th>Conversational voice and video</th>
<th>Voice/video messaging</th>
<th>Streaming audio and video</th>
<th>Fax</th>
</tr>
</thead>
<tbody>
<tr>
<td>Error intolerant</td>
<td>Command/control (e.g. Telnet, interactive games)</td>
<td>Transactions (e.g. E-commerce, WWW browsing, Email access)</td>
<td>Messaging, Downloads (e.g. FTP, still image)</td>
<td>Background (e.g. Usenet)</td>
</tr>
</tbody>
</table>

- **Interactive** (delay <<1 s)
- **Responsive** (delay ~2 s)
- **Timely** (delay ~10 s)
- **Non-critical** (delay >>10 s)