



## Wrap-up Session

Session Moderated by:

Jean-Yves Monfort (ITU-T SG12 Chairman)

## Session 1 : Tutorials

- s1p1 QoE measurement in the NGN-a market perspective. Dr Mike Hollier, CTO Psytechnics
  - s1p2 A taxonomy of Quality Prediction Models Recommended by ITU-T. Sebastian Möller, Alexander Raake, Deutsche Telekom Labs, Berlin.
  - s1p3 Overview on ITU-T Handbook on QoS and Network Performance. Volker Sypli, Federal Network Agency, Germany
- Session Moderator : Jean-Yves Monfort

## Highlights and proposals from Presentation 1 “QoE measurement in the NGN-a market perspective”

- Economic analysis of the evolution of the market, and consequences on QoS/QoE (differentiation, relationship between the Telcos&SP and consumers, indicators,...)
- Need to develop methods able to detect consumers dissatisfaction
- Need for appropriate accuracy
- Several parameters to be taken into account : availability, quality, price and utility

## Highlights and from Presentation 2 “A taxinomy of Quality Prediction Models Recommended by ITU-T”

- The existing models provide quality estimations/predictions, not quality measurements
- Care shall be taken, when using models, to avoid errors and miss-uses. In particular
  - What are the recommended input signals ?
  - What are the recommended/not recommended applications?
  - When the model scopes of the models are different, don't make comparisons on the results.
- During discussions : A mean consumer / different types of consumers
  - Consequences on models implementations and uses?

## Highlights from Presentation 3 “Overview on ITU-T Handbook on QoS and Network Performance”

- o The Handbook gives an overview of the of the works and results on QoS and Performance, in ITU-T, but also in other bodies.
- o A revised version is under preparation

- Several models have been developed and are currently used by the Industry, but next steps are needed :
  - to complete the tool box (by creating new models, by adapting the existing ones to face new challenges, but also by qualifying/combining existing and new indicators)
  - to better take into account the economic constraints/objectives of the operators/SPs and the consumers' experience
- More conclusions/Recommendations are available from, at least Sessions 5 and 8.

## Session 2 : Inter-domain QoS Highlights & Conclusions

End-to-end QoS over heterogeneous network  
Olivier Dugeon, France Telecom R&D

Border Crossings: Evolving Interdomain QoS in a  
Heterogeneous World/ Kathleen Nichols, Pollere LLC

Al Morton  
AT&T Labs

## Highlights from Presentation 1

### End-to-end QoS over heterogeneous network

- o IMS is not enough - AS path computation is not a service role (all AS will implement some form of QoS Control Function)
- o EuQoS uses a mix of QoS Paradigms (realistic)
- o EuQoS E2E path is pre-provisioned, using qBGP or MPLS-TE (may do some aggregation)
- o EuQoS selected the “best” subset of QoS protocols to implement the QoS functions.

## Highlights from Presentation 2

### Border Crossings: Evolving Interdomain QoS in a Heterogeneous World

- o Keep the framework general, allow domains to have different details, but within bounds to maintain interoperability
- o Be realistic about what network QoS is achievable, in terms of combined performance of several domains
- o Many approaches (& standards) on assuring E2E QoS, need to reconcile different approaches into a common framework:
  - So, Who will do it?

- There are many ways to approach the E2E and Inter-domain QoS assurance problem:
  - Learn about each one and compare their strengths and weaknesses
  - Distill the commonalities, are these the elements of an approach agreeable to all?
- Structure the goals for Inter-domain QoS:
  - Consider ~5 use cases/applications
  - Locate rejections (to aid correction/re-route)
  - 3<sup>rd</sup> party control, stop unwanted traffic
  - Need flexibility in signaling, mechanisms, etc.



- o Continuum between per-flow signaling and static QoS provisioning
  - Simple solutions may be somewhere in the middle
  - You don't always have to signal, and answers might be obvious
  - Resource managers could exchange useful info
    - Between networks
    - RM (in Home GW?) responding on behalf of user
  - What is the general information model?

## Session 3 : Interoperability testing and terminal issues

### Highlights & Conclusions

The Artificial Ear dilemma: challenges of modern handset testing

*Gunnar Rasmussen, GRAS Sound & Vibration*

Speech Quality Testing for VoIP Terminals and Gateways

*Hans Gierlich, Head Acoustics*

Terminal Standards - SDOs' Mastermind plus Regional Flavour

*Joachim Pomy, Avaya*

The TR-069 protocol and its ability to manage QoS policies on CPE

*William Lupton, 2 Wire*

Session Chair: Rodolfo Ceruti  
Telecom Italia

## Highlights from Presentation

### “The Artificial Ear dilemma: challenges of modern handset testing”

- Evolution from “simple” handset shapes to oddly shaped, miniaturized telephones
- Parallel progress of measuring devices: from the simple cavity Couplers to multiple cavity Artificial Ears and, eventually, to pinna-shaped ears mounted on the Head and Torso Simulator
- More sophisticated measurement procedures (positioning rules, application force)
- Need to further improve current Recommendations (P.57, P.58) increasing the frequency range and extending the mapping of generated sound pressure from the Artificial Mouth, particularly close to the cheek for testing short boom headsets (e.g., Bluetooth) and mobile handsets.

## Highlights from Presentation

### “Speech Quality Testing for VoIP Terminals and Gateways - Input from ETSI “Plugtest” Speech Quality Test Events ”

- Need to move from “simple” measurement set-ups to complex test beds allowing to reproduce the actual operations and interactions of VoIP Terminals and Gateways in real networks
- Availability of new test signals (Complex Source Signal) and analysis techniques (objective quality score, double talk and echo return tests, diagnostic spectral analysis, quality of background noise)
- Necessity to synthesize the (multidimensional) aspects of terminal quality and performances by suitable concise presentations, like the “pie” approach recently standardised by ITU-T (P.505)
- Opportunity to spread this knowledge by promoting new standards (e.g., P.501, P.502) and testing initiatives (like ETSI Plugtests) helping Companies to improve their products while getting acquainted with modern test methods

## Highlights from Presentation

### “Terminal Standards – SDOs’ Mastermind plus Regional Flavour – Or what?”

- Transition from a fully regulated top-down approach to the new, liberalised, market access of terminals
- Quickly decreasing impact of international transmission plans on QoS, mainly due to the expansion of VoIP networks and services (both public and private)
- Increasing potential role of Country independent QoS requirements for Terminals in a full IP/NGN Environment but:
- convergence of different SDOs work on the same topics of requirements for VoIP Terminals with a lack of global coordination on VoIP Terminal Standards
- The only possible way-out in the all-IP next network scenario: Global Coordination of Standards for NGN VoIP terminals and gateways, as already achieved for NGN networks, to achieve a unique set of QoS Requirements for VoIP Terminals

## Highlights from Presentation

### “The TR-069 protocol and its ability to manage QoS policies on the CPE”

- Customer premises equipment (CPE) have become an integral part of service platforms in NGN networks: consequent need for a management protocol to be used by service and network providers
- TR-069: protocol family developed by DSL Forum but not specific for DSL deployments: it is technology agnostic
- Main functions: dynamic service provisioning, software/firmware management, status and performance monitoring, diagnostics
- Monitoring of QoS performances not yet widely developed: standardisation is encouraged also in this field since it promotes interoperability
- Need to assure the security of sensible users' data in order to guarantee privacy (aspect particularly relevant for regulators)

# Evolution of the electroacoustic testing of modern multimedia sets

- Improvement/validation of modern Artificial Ears
- Extension of frequency bandwidth of test equipment (artificial ears and mouth, HATS) to the full-bandwidth frequency range (20-20000 Hz)
- Mapping of HATS voice generation to areas typically used by modern handsets/headsets (cheek region)
- Improve the definition of testing arrangements for testing the electroacoustic performances of multimedia entertainment terminals (e.g., music listening)

# Speech Quality Testing for VoIP Terminals and Gateways

- Further improvement of Complex Test Signals, to cover the full audio bandwidth, and of related analysis techniques for characterizing the transmission characteristics of IP multimedia terminals
- Further promotion of modern testing methodologies through interoperability and conformance testing initiatives (as Plugtests)

### Other standardisation issues

- Global Coordination of Standards for NGN VoIP terminals and gateways to achieve a unique set of QoS Requirements for VoIP Terminals (coordination already in place for NGN networks standardisation)
- Standardisation of monitoring methods of QoS performances based on the TR-069 protocol family (aimed at promoting the wider interoperability of IP multimedia services and platforms)

## Session 4 : Home Networking QoS/QoE Highlights & Conclusions

- s4p1 JCA HN Taskforce on QoS and Terminology: Jean-Yves Monfort, France Telecom, ITU-T SG12 Chair
- s4p2 Home Gateway Initiative QoS Architecture: Duncan Bees (PMC-Sierra), Deputy Chair of HGI QoS Techn. Group
- s4p3 Home Network QoS with UPnP-QoS: Michael van Hartskamp - Philips- Co Chair of the UPnP-QoS WC

Session Moderator : Jean-Yves Monfort

## Highlights from Presentation 1 “JCA HN Taskforce on QoS and Terminology”

- Presentation of Joint Coordination Activity on Home Networking, of the Terms of Reference and Objectives of the Task force on QoS & Terminology.
- List of examples of topics to be considered under the Task Force

## Highlights from Presentation 2 “Home Gateway Initiative QoS Architecture”

- o HGI has just completed the Release 1 of the Requirements.
- o Review of the objectives of HGI and interfaces considered in HGI.
- o Focus given on classification requirements and queuing requirements (and examples)...
- o Release 2 will focus on fixed-mobile convergence and new QoS Mechanisms

## Highlights from Presentation 3 “Home Network QoS with UPnP-QoS”

- o The presentation gave an overview of UPnP-QoS versions 1 and 2 and gave a more detailed information on Version 3 intended to optimize the services differentiation, based on end-to-end admission control and managed QoS.
- o Another topic concerns the user management of QoS, and the associated technical requirements.

- o After Session 4, a meeting have been organized in order to make progress in the Task force QoS & Terminology and an action plan has been defined.
  - Collaborations under progress
- o First results to be presented at the next TSAG meeting.

## Session 5 : QoE Highlights & Conclusions

Perceived quality of channel zapping - Kamal Ahmed

3GPP Packet Switch Streaming Quality of Experience - Frederic  
Gabin

Quality of Experience in Mobile TV Services - Angela Sasse & Hendrik  
Knoche

Quality and Security Usability - Luis Cardoso

Session Moderator - Paul Coverdale

## Highlights from Presentation 1

### Perceived quality of channel zapping

- o Important issue for IPTV QoE
- o Channel change delay needs to be  $<0.4s$  for acceptability

## Highlights from Presentation 2

### 3GPP Packet Switch Streaming Quality of Experience

- o Acceptance of mobile streaming services driven by Web experience
- o Buffering/re-buffering duration an important metric
- o Early users have low QoE expectations, but that will change

## Highlights from Presentation 3 Quality of Experience in Mobile TV Services

- User satisfaction a function of display size, content, and accompanying audio and text
- Experimental methodology important
- Utility curves across several types of content show that quality on small screens is always unacceptable to majority of users
  - Don't provide mobile TV to customers with small screens

## Highlights from Presentation 4 Quality and Security Usability

- o The user is a key component of any security system
- o Blaming the user will not lead to more effective security systems
- o Must be easier to use security systems than to bypass them

- Understanding customer expectations for QoE is a key factor in introducing new services
- Good perceived QoE requires exceeding customer expectations
- Customer expectations are influenced by cost/charging, and available alternatives
- Need more fundamental data from subjective tests in order to define QoE requirements for new services

- o With communication and media consumption, the best QoS is the one you don't notice
- o Customers want to focus on communication (e.g. in a video conference) or the experience of consumption (e.g. watching a music clip); any noticeable degradation is a distraction (= violation of expectations)

- MOS may not be sufficient for predicting perceived QoS, especially in upper range
- Need to collect a richer set of empirical data (including qualitative comments, and usage data & user reports from longer-term usage (e.g. in “living labs”))
- Utility curves (based on binary acceptability ratings) are helpful to service providers

## Session 6 : New Services Highlights & Conclusions

IPTV QoE requirements

Accessibility considerations for QoE

Recent developments in QoE aspects of video  
conferencing services

New media coding developments in ITU-T

Moderator: Paul Barrett, Psytechnics

## Highlights from Presentation 1

“IPTV QoE requirements: IP transport and ADSL access technical challenges”, Riccardo Fiandra (Fastweb)

- o Need a complete end-to-end view of performance of a system from the perspective of the *user* to ensure service success
- o The IP packet loss is by far the most important network transport parameter to affect IPTV service quality
- o Error recovery offers possibility to extend reach of ADSL/ADSL2+ and meet QoE target

## Highlights from Presentation 2 “Accessibility considerations for QoE”, Andrea Saks (Independent Accessibility Consultant)

- o The key to accessibility is to provide more media alternatives
- o Video performance requirements for sign language and lip reading must be respected
- o Real-time text for fluent interactions
- o Wider audio bandwidths will give hard-of-hearing users a chance
- o ITU Accessibility checklist will help to ensure accessibility for all

## Highlights from Presentation 3

### “Recent developments in QoE aspects of video conferencing services”, Patrick Luthi (Tandberg)

- o Recent ITU standards have significantly enhanced videoconferencing QoE
- o H.264 delivers significant video coding gain;
- o G.722.1 Annex C super-wideband coding delivers improved audio intelligibility and transparency
- o H.460.18 &19 NAT/firewall traversal recommendations finally solve the NAT firewall traversal problem and open up enterprise-to-enterprise video communication
- o Call set-up acceleration will enhance QoE
- o Dual video channels - best feature of the decade!

## Highlights from Presentation 4 “New media coding developments in ITU-T”, Claude Lamblin (France Telecom)

- o Media coding trends: universal access, interoperability, flexible enhancement
- o Media coding objective: quality/bit-rate trade-off
- o Embedded coding schemes provide greatly improved flexibility in this trade-off
- o ITU is standardising embedded audio codecs, e.g. G.729EV (G.729.1)
- o Embedded (scalable) version of H.264 is planned

- QoE is a key consideration in the development and deployment of new services
- People are strongly encouraged to consider accessibility when setting standards, and to read the Accessibility Check list:  
<http://www.itu.int/ITU-T/studygroups/com16/accessibility/index.html>
- Low delay and low complexity are key requirements for future video coding standards
- Wider audio bandwidth brings a genuine benefit to many new applications

## Session 7 : NGN-related QoS and the Accumulation of Network Impairments

### Highlights & Conclusions

- Resource & Admission Control for NGN (H. Lu, Lucent)
- Ranged Allocation Method (L. Zheng, Huawei)
- E2E QoS using Managed Impair. Accum. (A. Morton, AT&T)

Chuck Dvorak, session chair  
AT&T Labs

- The IP transport performance needs for user applications are generally well understood, and Y.1541 provides the network IP QoS classes that can support most of these quite well.
- This session gave an overview of NGN QoS architecture activities and issues, and presented some specific approaches being considered for managing the performance of the end-to-end IP network so that Y.1541 QoS classes can be supported.
- Two approaches described for realizing e2e QoS a la Y.1541 were Ranged Allocation and Impairment Accumulation. These and all other methods have pros and cons. (See recently consented Rec. Y.1542.)
- The Resource and Admission Control Function architecture augments native transport QoS support, and enables dynamic application-driven resource management by taking into account resource availability.

## What action is needed?

### SESSION 7

There were far too many questions asked, and issues raised to be able to address here. Most had to do with the details of the QoS approaches and Resource Management mechanisms that were presented.

Clearly, it would be beneficial to have an open, detailed discussion on all these issues--in particular on the specifics of each method, to identify what they have in common, where they differ, and what standards are needed for the common parts and the differing parts. It is proposed that, as a follow up to this workshop, SG12 schedule an ad hoc discussion on this at its next meeting.

## Session 8 : Quality prediction

**Objectives:** Examine the state of the art on existing methodologies and tools available for the prediction and/or measurement of the quality of audio and video delivered over digital networks.

**Moderator:** Arthur Webster  
NTIA/ITS

## Session 8 : Quality prediction

Recent Developments In Objective Voice And Video  
Quality Models / Quan Huynh-Thu, Psytechnics  
Standardization Activities For Multimedia Opinion Model:  
G.OMV / Akira Takahashi , NTT  
Quality Assurance for IPTV / David Hands , BT  
End to End QoS and Triple Play / Bruce Adams , Telchemy

Moderator: Arthur Webster  
NTIA/ITS

## Highlights from Presentation 1 “Recent developments in objective voice and video quality models”

- Adequate balance between price/quality is crucial for success of emerging multimedia services
- End to end quality assessment/monitoring is essential to ensure sufficient quality
- Evaluation of end-user perceived quality is vital
- ITU standards for perceptual quality assessment of voice and video exist
- Evaluation of new perceptual models for multimedia is on-going

## Highlights from Presentation 2 “Standardization activities for multimedia opinion model: G.OMV”

- o Quality measurement methods needed for:
  - Quality planning
  - Monitoring and SLA enforcement
  - Determining Quality Budgets
  - Benchmarking
  
- o Need an “E Model for Multimedia”
  
- o G.OMV, under progress, promises to answer many of the monitoring needs of industry

## Highlights from Presentation 3 “Quality Assurance for IPTV”

- Perceptually-relevant measurement methods for Quality Assurance are required
- Methods specific for media preparation stage are needed
  - to check that quality is fit-for-purpose before it is transmitted
- Industry requirements for Quality Assurance method:
  - fast, computationally light, accurate
- Hybrid bit-stream / pixel based measurement system is shown to provide fast, accurate QA of IPTV content

## Highlights from Presentation 4 “End to End QoS and Triple Play”

- o VoIP and IPTV
  - Can have performance problems
- o Monitoring needed for Video and Audio
  - End to End
  - At each stage of transmission chain
- o Embedded in equipment
  - Access nodes and Gateways
  - Monitor and report in real-time
- o Methods are available now
  - Some standardized
  - Some proprietary
- o Need to complete standardization of measurement methods for Monitoring of audio and video in real-time

- End to end quality monitoring is essential to ensure QoS/QoE and to achieve sufficient Average Revenue per User (ARPU) in VoIP, IPTV, and other media services
- Perceptually-relevant Quality Assurance of pre-transmission content has been neglected
- Measurement of Perceptual Quality
  - Needs to be fast, computationally light, and accurate for monitoring to be most practical
  - Hybrid approach appears ideally suited to meet industry QA needs and its performance is very good

- We need to complete the validation and standardization of multiple measurement methods for various applications
  - Telecommunications applications
  - Measurement applications
- Cooperative work is underway in SG12, SG9, JRG-MMQA, WP6Q, and VQEG to develop, validate, and standardize quality measurement methods for audio, video, and multimedia
- This work needs to be accelerated

## Session 9: Regulatory aspects of QoE/QoS in NGNs Highlights & Conclusions

The session addressed the role of regulatory bodies and their importance in QoS issues.

This included subjects such as: how their decisions on interworking between different networks (e.g. mobile and fixed) can impact the QoS; how they assess the quality provided for telecommunications users; how they can monitor and assure the QoS delivered by the service providers; how they face the future of NGN, as well as what is the role of the regulatory bodies in a liberalized market.



# International Telecommunication Union

ITU-T

## Session 9: Regulatory aspects of QoE/QoS in NGNs Highlights & Conclusions

To regulate or not to regulate?

Béla Házkötö - National Communications Authority, Hungary

Role of Regulatory Bodies and Their Importance in QoS issues

Christine Mugimba - Uganda Communications Commission

Future Networks & Services, Standards & Regulation, private and public domains, general aspects

Nuno Encarnação - Federal Office for Communications, Switzerland

Regulatory aspects for Quality of public communication services in Republic of Macedonia

Slavica Nasteska - Agency Electronic Communications of Rep of Macedonia

Regulatory aspects of QoS with regard to IP and NGN

Volker Sypli - Federal Network Agency, Germany

**Luis Sousa Cardoso**

**QSDG Chairman**

## Highlights from Presentation 1

### “To regulate or not to regulate?”

- o Increasing the role of Regulators in the QoS regulation does not serve for interest of market. If the market exists, than the competition provides for the quality.
- o Only, in the case of monopolium justified to increase the control of Regulation on the QoS of telecommunication services

## Highlights from Presentation 2 “Role of Regulatory Bodies and Their Importance in QoS issues”

- o Assessing, monitoring and ensuring QoS requires and can be facilitated by:
  - Appropriate laws, Regulations, guidelines
  - Appropriate analytical tools
  - Outsourcing testing, type approvals, auditing
  - Collaboration with and learning from others
  - Stakeholder involvement, participation and awareness
  - Timely reviews and enforcement

## Highlights from Presentation 3 “Future Networks & Services, Standards & Regulation, private and public domains, general aspects”

- Legal provisions will have to apply
  - Independent of technologies & architectures
- Perceived main trends impacting evolution are
  - Private (home & business) domain has an attractive growth
    - Some risk to dilute the borderline private - public domains
  - Solution 1: No split (no interconnect) Net. Op. - Serv. Prov.
    - NGN (ETSI-TISPAN/ ITU-T SG13) IPCablecom2 (ITU-T SG9)
  - Solution 2: A split (interconnect) Net. Op. - Serv. Prov.
    - NGI, Internet based on IPv4, enhanced to IPv6
  - The 2 solutions may co-exist and converge later
- To apply regulation to Future Networks authorities need to
  - identify relevant entities & essential interfaces among them
  - Reassess, simplify, clarify essential regulatory objectives
  - Assign requirements to entities

## Highlights from Presentation 4 “Regulatory aspects for Quality of public communication services in Republic of Macedonia”

- o The subscriber shall have the right to obtain uninterrupted, efficient and on time provision of all public communication services which may be utilised to his terminal equipment compatible with the technological development of the operator /service provider capacities
- o The operator/service provider shall provide qualitative and uninterrupted service utilization

### “Regulatory aspects of QoS with regard to IP and NGN”

- To IP and NGN “New” Regulatory concept is needed:
  - Technological neutrality
  - QoS needs have to be reflected in access interconnection regulations
  - Non-discriminatory access to infrastructure and services of competitors
  - Maintenance of traditional services whilst not hampering development of new infrastructures and services
- Regulatory objectives are in principle the same, but QoS aspects - as a new factor - have to be incorporated into the regulatory framework

- o *NRAs should be empowered to require specific security information and to impose binding instructions on providers*
- o *Security breaches by network operators and Internet service providers should be notified to both the NRAs and consumers*

- o *"Regulators ... must not stand in the way of consolidation"*
- o *Regulators to be clear where strictly necessary...  
... otherwise 'hands off'*