KPI & voice quality measurement during drive tests

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Workshop
IMPLEMENTATION EXPERIENCE OF NETWORK PERFORMANCE PARAMETERS CONTROL
SYSTEMS AND GRANTING REQUIRED LEVEL OF SERVICES QUALITY ON THE OPERATOR
NETWORKS. SENSOR NETWORKS – AS OPTIMIZATION TOOL FOR VEHICULAR TRAFFIC FLOW

Moscow

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Contents

- ETSI STQ Mobile Standards

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ETSI Specialist work on Mobile QoS (1)

- ITU-T does not have detailed standards on Mobile QoS
  - Industry there relies on proprietary network counter solution because of different QoS philosophy
  - Thus hesitant to standardize KPIs in ITU-T.
- ETSI STQ and its sub-committee STQ MOBILE are considering end-to-end aspects and benchmarking for Mobile QoS
- Published a series of concise and globally recognized standards
- ETSI TR 102 493 V1.2.1 (2009-06) (STQ);Guidelines for the use of Video Quality Algorithms for Mobile Applications
- ETSI TR 102 505 V1.1.1 (2006-12) (STQ);Development of a Reference Web page

ETSI Specialist work on Mobile QoS (2)

- ETSI TR 102 506 V1.3.1 (2010-07) (STQ);Estimating Speech Quality per Call
- ETSI TR 102 529 V1.1.1 (2009-03) (STQ);SMS Testing Guidelines;Measurement Methodologies and Quality Aspects
- ETSI TR 102 581 V1.1.1 (2007-05) (STQ);A Study on the Minimum Additional Required Attenuation on the Antenna Path of the Field Test Equipment
- ETSI TR 102 607 V1.1.1 (2007-10) (STQ);TCP IP Stack Parameter Settings for Microsoft Windows XP and Microsoft Windows Vista;Comparison and Recommendations
- ETSI TR 102 678 V1.1.1 (2009-11) (STQ);QoS Parameter Measurements based on fixed Data Transfer Times
- ETSI TR 102 779 V1.1.1 (2009-03) (STQ);Multi-component KPI

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ETSI Specialist work on Mobile QoS (3)

- ETSI TR 102 807 V1.1.1 (2010-03) (STQ);Process description for the transaction view model
- ETSI TS 102 250-1 V1.2.1 (2007-03) (STQ);QoS aspects for popular services in GSM and 3G networks; Part 1: Identification of Quality of Service criteria
- ETSI TS 102 250-2 V1.7.1 (2009-10) (STQ);QoS aspects for popular services in GSM and 3G networks; Part 2: Definition of Quality of Service parameters and their computation
- ETSI TS 102 250-3 V1.5.1 (2010-08) (STQ);QoS aspects for popular services in GSM and 3G networks; Part 3: Typical procedures for Quality of Service measurement equipment
- ETSI TS 102 250-4 V1.3.1 (2009-03) (STQ);QoS aspects for popular services in GSM and 3G networks; Part 4: Requirements for Quality of Service measurement equipment

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ETSI Specialist work on Mobile QoS (4)

- ETSI TS 102 250-5 V1.6.1 (2009-06) (STQ);QoS aspects for popular services in GSM and 3G networks; Part 5: Definition of typical measurement profiles

- ETSI TS 102 250-6 V1.2.1 (2004-10) (STQ);QoS aspects for popular services in GSM and 3G networks; Part 6: Post processing and statistical methods

- ETSI TS 102 250-7 V1.1.1 (2009-10) (STQ);QoS aspects for popular services in GSM and 3G networks; Part 7: Network based Quality of Service measurements

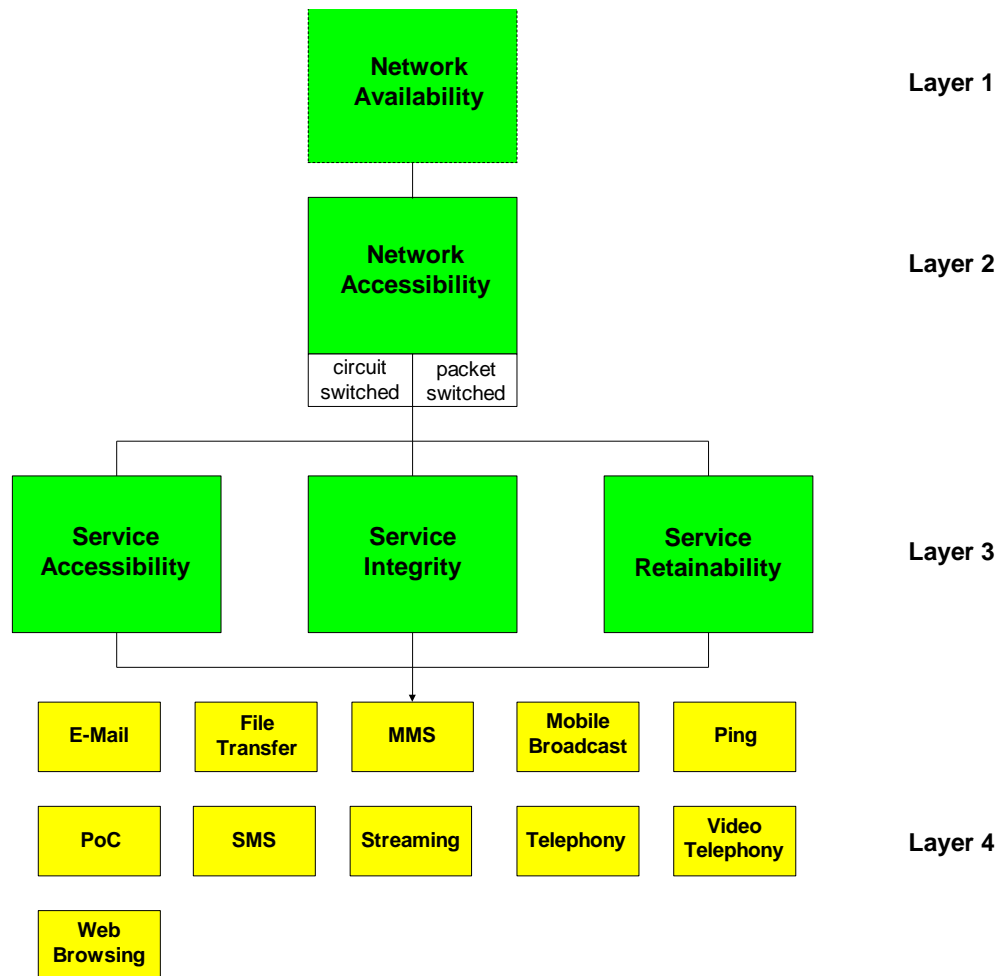- For free download see: http://pda.etsi.org/pda/queryform.asp

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QoS aspects of Mobile

Network Availability	Layer 1
Network Accessibility	Layer 2

circuit switched | packet switched

| **Service Accessibility** | **Service Integrity** | **Service Retainability** | Layer 3 |

E-Mail	File Transfer	MMS	Mobile Broadcast	Ping	
PoC	SMS	Streaming	Telephony	Video Telephony	Layer 4
Web Browsing					

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QoS Layers in Mobile

- QoS model for mobile has four layers.
- First layer is the Network Availability
  - defines QoS rather from the viewpoint of the service provider than the service user
- Second layer is the Network Access
  - from user's point of view basic requirement for all the other QoS aspects and parameters
- Third layer contains other QoS aspects
  - Service Access, Service Integrity & Service Retainability
- Different services are located in the fourth layer
  - Their outcome are the QoS parameters as perceived by the user

Layered Mobile QoS (1)

- If we follow the layered approach
  - focussing on events that can be perceived by the user
  - focussing on most relevant services in the market
    - Telephony
    - SMS
    - MMS
    - Video Telephony
    - Video Streaming
    - Web Browsing

Layered Mobile QoS (2)

- *Layer 1*

- Radio Network Unavailability [%]

- *Layer 2*

- Network Selection and Registration Failure Ratio [%]

Layered Mobile QoS (4)

- *Telephony Layer 3*
  - Telephony Service Non-Accessibility [%]
- *Telephony Layer 4*
  - Telephony Setup Time [s]
  - Telephony Cut-off Call Ratio [%]

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Layered Mobile QoS (5)

- *SMS Layer 3*
  - SMS Service Non-Accessibility [%]

- *SMS Layer 4*
  - SMS End-to-End Delivery Time [s]
  - SMS Completion Failure Ratio [%]

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Layered Mobile QoS (6)

- *MMS Layer 3*
  - MMS Send Failure Ratio [%]
- *MMS Layer 4*
  - End-to-End Delivery Time [s]
  - MMS End-to-End Failure Ratio [%]

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Layered Mobile QoS (7)

- *Video Telephony Layer 3*
  - VT Service Non-Accessibility [%]

- *Video Telephony Layer 4*
  - VT Audio/Video Setup Time [s]
  - VT Cut-off Call Ratio [%]

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Layered Mobile QoS (8)

- *Streaming Video Layer 3*
  - Streaming Service Non-Accessibility [%]
- *Layer 4:*
  - Streaming Service Access Time [s]
  - Streaming Reproduction Cut-off Ratio [%]

Layered Mobile QoS (9)

- *Web Browsing (HTTP) Layer 3*
  - HTTP Service Non-Accessibility [%]

- *Web Browsing (HTTP) Layer 4*
  - HTTP Setup Time [s]
  - HTTP Session Failure Ratio [%]
  - HTTP Data Transfer Cut-off Ratio [%]

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Layered Mobile QoS (10)

- This approach would make us end up with > 20 QoS parameter
  - All relate to user perceptional events
  - But this is just for Mobile

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- Starting point
  - ETSI Technical Committee STQ
    - Prepared 4 ES on E2E voice quality as perceived by the user for VoIP terminals
    - Those 4 ES have been approved by ETSI membership
    - Several Mobile Network Operators unhappy with voice quality of mobile phones
- Global Certification Forum
  - Entirely industry driven, non-profit making organisation responding to market requirements
  - Three membership types
    - Operators
    - Manufacturers
    - Observers

- STQ agreed and decided to adapt the 4 ES on VoIP phone quality to Mobile
  - Supporters are major mobile operators throughout Europe - key players
- Formerly Voice Quality requirements dictated by 3GPP SA
  - Manufacturers blocking quality enhancements for cost reasons
- ETSI approves mobile phone Qos as perceived by the user standards
  - As ETSI Technical Specifications
  - Approval on the spot by TB ETSI STQ

- ETSI STQ submits new standards on Mobile Phone quality as perceived by the user to the GCF
  - In reply some clarification & corrections are discussed
  - GCF will use the new ETSI TS as a basis for defining their targets
  - Better voice quality of mobile phones in the market place to be expected, soon

Telephony Measurements in the Network (1)

- Transaction definition and transaction types
  - The basic transaction for telephony testing is equivalent to a single call to a counterpart extension. It is assumed that the call partner is typically a fixed-network type extension to avoid uncertainties related to a second mobile connection.
  - Type is either Mobile Originated (MO) or Mobile Terminated (MT).
  - It is assumed that once a connection has been established, for further measurements it does not matter which side has triggered it. Therefore, the audio data flow parameter will not be logically linked to the call type.

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Telephony Measurements in the Network (2)

- Content quality
  - For content quality assessment, data is generated at the receiving end. For downlink content, data storage is therefore straightforward; quality-assessment data is simply included with other data items making up the result file. For uplink content, at some point in time results have to be integrated with the rest of the data.
  - For assessing content quality of complete transmitted speech samples, at least the following methods are possible:
  - Real-time assessment (streaming mode), where the speech quality assessment algorithm continuously outputs MOS_LQO data items.
  - "Offline" assessment, where content is first recorded in some way and later being processed.
  - Data processing must make sure that only such content quality data is used which lies inside the "connection active" time window and is in line with one of the two different content quality parameters.
- Verification of usable two-way connection
  - Only calls with a valid two-way end-to-end information connection shall be considered for content quality assessment (valid calls).
  - A non-valid call shall be treated like a dropped call, with a modifier indicating this particular cause.

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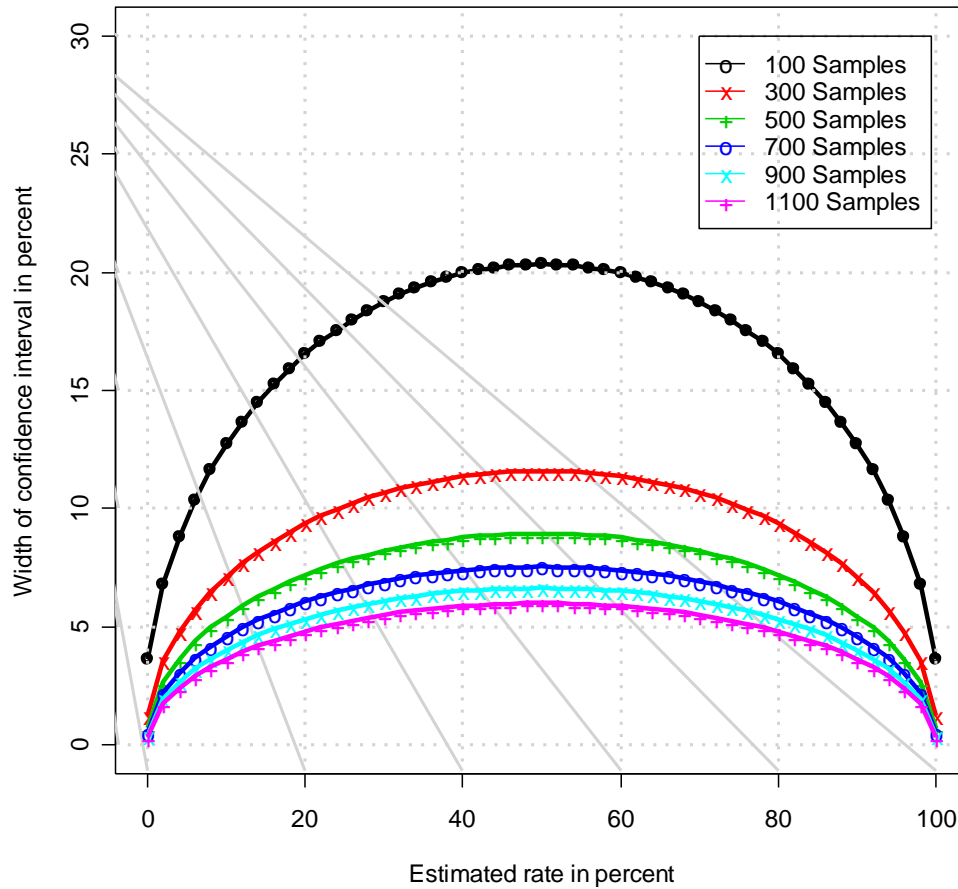
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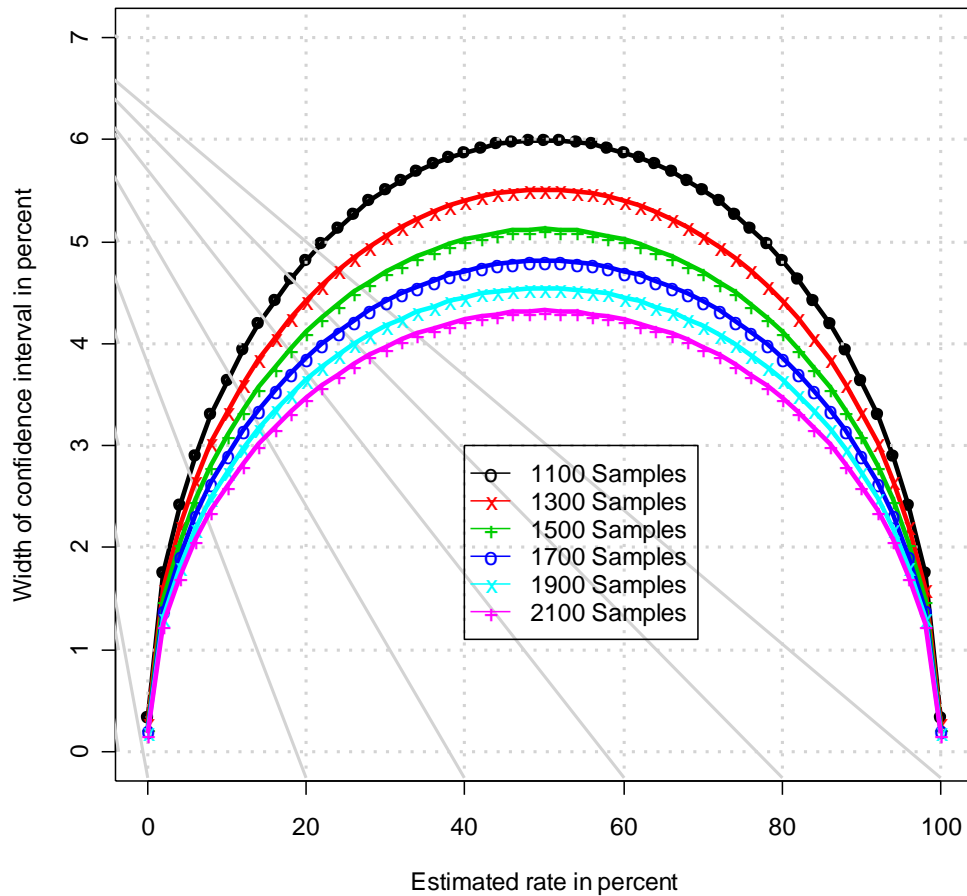
- Statistics – Presentation of Results

Confidence Intervalls for Different Sample Sizes (1)

- The following examples show the effect of different sample sizes in a measurement campaign. It is also based on the Pearson-Clopper formulas for the calculation of confidence intervals. Therefore, the examples are valid in a generic way and even for small sample sizes. For higher sample numbers, the calculation of confidence intervals based on the approximation of a normal distribution can be applied.
  - Three different graphs are depicted: Sample sizes in the range:
  - between 100 and 1 100 samples;
  - between 1 100 and 2 100 samples; and
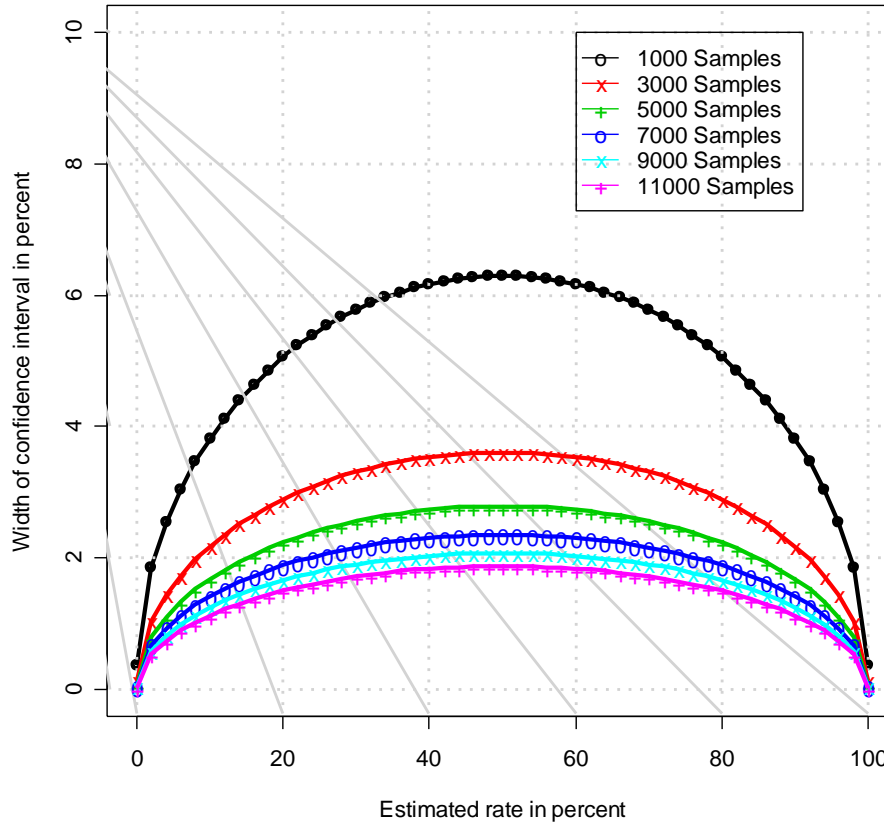 - between 1 000 and 11 000 samples.

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Confidence Intervalls for Different Sample Sizes (2)

Confidence Intervalls for Different Sample Sizes (3)

Confidence Intervalls for Different Sample Sizes (4)

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Reporting of results

- ETSI TS 102 250-6 describes which pieces of information should be given to the reader when generating a test report
  - When quantile values are used, it should be kept in mind that the computation of quantiles separates a low percentage of outlier data from the remaining data. This means:
    - If lower values represent a better outcome from the customer's perspective, a small percentage containing the highest values could be separated by calculating a 95 %-quantile or a 90 %-quantile. This is the case for example for duration values.
    - If higher values represent a better outcome from the customer's perspective, a small percentage containing the lowest values could be separated by calculating a 5 %-quantile or a 10 %-quantile. This is the case for example for throughput values.
    - Related to content quality, the appropriate quantile computation orientates itself on the scale of the determined test results. In practice, some algorithms define a value of 0 on a scale from 0 to 5 as the best quality whereas others define the value of 5 as the highest possible quality. The table below gives some hints how to use the quantile computation in these cases.

Any Questions

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