QoS SIG Presentation

QoE Measurements In A SeON Framework

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QoE Metrics

- QoE => Perceived Quality of Service
- Network Metrics
  - Bit rate, delay, jitter, packet loss rate
  - Power consumption
- Application Metrics
  - Call setup delay
  - Failed calls, dropped calls, retransmission
  - MOS (Mean Opinion Score)
- Several standards groups …
  - ITU-T SG12
  - ITU X.902 (IP Telephony)
  - IETF – IPPM, DIFFSERV
  - 3GPP – 3GPP TS 32.409 (IMS performance)
What is Frequency of Measurement?

- Duration of Flow?
- Minutes?
- Seconds?
- Sub-seconds?
- Per-packet?
Require Multi-timescale Measurements
In a SeON framework such timescale shall be specifiable & negotiable.

Details to be investigated by working group.
QoE Metrics

What To Measure?

Which Layer?

Which Application?

Which User?

Hop-by-hop or End-to-end?

Etc?
QoS is needed at multiple layers
QoE Metrics

IP Layer

UDP Layer
QoE Metrics

All Traffic Except Facebook

Facebook Only
Require Multi-Layer Measurements
Require DPI for Application Classification
In A SeON Framework Such Layer Shall Be Specifiable & Negotiable

Details To Be Investigated By Working Group
Experiencing QoS due to mobility in Campus net

Administrative Domain B

Authorization Agent

Registration Agent

Authentication Agent

Configuration Agent

Signaling Proxy

128.59.10.7

N1- Network 1 (802.11)

N2- Network 2 (CDMA/GPRS)

128.59.9.6

18 Seconds media interruption

h/o delay 18 s

128.59.11.8

900 ms media interruption

h/o delay 900 ms

128.59.10.7

4 Seconds media interruption

h/o delay 4 s

207.3.232.10

Layer 2 PoA

B

N1

Backbone

N2

128.59.11.8

Layer 2 PoA

D

128.59.11.8

Layer 3 PoA

A

L3 PoA

N2

Layer 2 PoA

C

N1

Mobile Host

Layer 2 PoA

A

207.3.232.10

Layer 3 PoA

N2

Authorization Agent

Registration Agent

Authentication Agent

Configuration Agent

Signaling Proxy

Administrative Domain A

Layer 3 PoA

N2

Layer 3 PoA

N1
Where is the delay during handover process?
What If Devices Are Virtual?

Important to Specify Measurement Boundaries And Type of Measurements For Abstraction From Implementation
Require Measurements Between Elements
In A SeON Framework Such (Logical) Measurements Shall Be Specifiable & Negotiable

Details To Be Investigated By Working Group
Cross-layer feedback helps to achieve QoE

<table>
<thead>
<tr>
<th>User Needs, Requirement</th>
<th>Audio, Video, Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAP</td>
<td>Codecs (H.261)</td>
</tr>
<tr>
<td>SIP</td>
<td></td>
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<tr>
<td>H.323</td>
<td></td>
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<tr>
<td>SDP</td>
<td></td>
</tr>
</tbody>
</table>

- **TCP**: Retransmission, RTCP Feedback
- **SIP**: User
- **H.323**: Codecs (H.261)
- **SDP**: User
- **RTP**: User Needs, Requirement
- **RTCP**: Re-negotiate Bw, codec

- **UDP**: User Needs, Requirement
- **SCTP**: TX power, Modulation BER
- **SAP**: User Needs, Requirement
- **SDP**: User Needs, Requirement
- **TCP**: User Needs, Requirement
- **RTP**: User Needs, Requirement

<table>
<thead>
<tr>
<th>Networking Protocols</th>
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<tbody>
<tr>
<td>MIP</td>
</tr>
<tr>
<td>MIPv6</td>
</tr>
<tr>
<td>ICMP</td>
</tr>
<tr>
<td>IGMP</td>
</tr>
<tr>
<td>CIP</td>
</tr>
<tr>
<td>RIP</td>
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<tr>
<td>OSPF</td>
</tr>
</tbody>
</table>

- **AAL3/4**: User Needs, Requirement
- **CSMA/CA**: User Needs, Requirement
- **CSMA/CD**: User Needs, Requirement
- **PPP**: User Needs, Requirement

- **SONET**: TX power, Modulation BER
- **802.11**: TX power, Modulation BER
- **802.3**: TX power, Modulation BER
- **CDMA/GPRS/LTE**: TX power, Modulation BER
QoE Metrics

Per flow Measurements (IntServ)

Aggregation Across Domains

Per flow guarantees

End-to-end

Scalability can be difficult? Should we investigate?

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Define several use case scenarios for communication in rural India
- Focus QoS metrics for a specific set of applications

Survey available techniques and framework being discussed in different SDOs

Map the appropriate techniques and protocols to those use case scenarios

Draft Best Current Practices for QoS Requirement for Rural India
Still Needs Investigation