VoIP Performance Management

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Outline

- Fault/Performance Management vs Test & Measurement
- Endpoint reporting models and distributed management
- State of deployment?
- Making the data more usable and useful
Test, Measurement and Management

- Traditionally
  - Distinction between “test and measurement”, “fault/performance management”, “service assurance”.....
  - Focus on probes and analyzers for data collection/analysis

- Problem
  - With IP end-to-end transport for impairment sensitive traffic (voice/video), need to get feedback from IP endpoints and detect transient problems

- Solution
  - Common monitoring/measurement technology deployed through most test equipment vendors and many network and customer premise equipment vendor
  - Advanced agent technology in network/customer premise equipment enables a management reporting application to drill down to analyzer-like detail
  - Less distinction between Fault/Performance Management and network/ in-service
Active and Passive Agents distributed in network equipment, CPE, dedicated probes, downloadable agents.......

Management Middleware

Agent Management Framework

Web services
APIs

NMS/OSS
Customer Service
Dashboard

Direct SQL queries
SQL database

Distributed VoIP Performance Management
Embedded VoIP performance agent

- SIP RTCP Summary Reports
- RTCP XR
- RTP
- IP stack
- IP Phone
- Voice Codec
- Embedded Agent
- Reporting
RTCP XR and SIP RTCP Summary Reports

End of call report

RTCP XR exchanged every 5-15 seconds during call

QoE

Embedded Agent

Embedded Agent
## RTCP XR Reports

<table>
<thead>
<tr>
<th>Loss Rate</th>
<th>Discard Rate</th>
<th>Burst Density</th>
<th>Gap Density</th>
</tr>
</thead>
<tbody>
<tr>
<td>Burst Duration (mS)</td>
<td></td>
<td>Gap Duration (mS)</td>
<td></td>
</tr>
<tr>
<td>Round Trip Delay (mS)</td>
<td></td>
<td>End System Delay (mS)</td>
<td></td>
</tr>
<tr>
<td>Signal level</td>
<td>RERL</td>
<td>Noise Level</td>
<td>Gmin</td>
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<tr>
<td>R Factor</td>
<td>Ext R</td>
<td>MOS-LQ</td>
<td>MOS-CQ</td>
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<tr>
<td>Rx Config</td>
<td>-</td>
<td>Jitter Buffer Nominal</td>
<td></td>
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<tr>
<td>Jitter Buffer Max</td>
<td></td>
<td>Jitter Buffer Abs Max</td>
<td></td>
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</tbody>
</table>
Challenges - SBC’s and Transcoding Gateways

- Pass RTP through
  - i.e. Just a firewall

- Logically terminate and recreate RTP stream
  - No impact on quality

- Transcode voice packets
  - No impact on IP impairments, may affect payload

- Terminate voice stream and recreate
  - IP impairments masked or converted to payload degradation

- Voice Quality Enhancement
  - IP impairments repaired, echo and noise reduction
End to End Performance Reporting Protocols

RTCP XR (RFC3611) – End-to-end orientation

RTCP HR – End-to-end orientation
New RTCP HR/ RTCP XR Video Metrics structure

- Common identifier block - can have multiple
- Broadly applicable Metrics blocks
Status of related standards

• Reporting protocols
  – RFC3611 - RTCP XR
    • Widely deployed
  – RTCP HR
    • Being reworked into a series of generic XR metrics blocks, potential completion mid-2009
  – SIP RTCP Summary Report draft
    • In IESG

• MOS estimation
  – ITU-T P.564 - listening quality / IP based
  – ITU-T P.CQO - conversational quality (prob 2009-2010)
Distributed VoIP Performance Management - deployment?

Over 150 Equipment Manufacturers Supporting Distributed Model
Over 200 million endpoints deployed
Metrics and protocols are < half the solution

- **Raw data**
  - “The signal level was -7dBm0 for the call from 192.168.1.220:400 to 192.168.1.240:3200”

- **User requirements?**
  - What the heck is a dBm0?
  - Don’t just provide a number – explain how bad it is, what it should be and what could cause it to be “off”
  - Just tell me what is wrong (I’ve plenty of other things to do)
  - I have 500k calls per day – how can I easily recognize problems that are similar (i.e. troubleshoot calls in groups rather than individually)
Example VoIP Performance Management System
Example VoIP Performance Management System

Expert analysis
What problems?

Problem description
Problem
Symptoms
Resolution

Metrics are “self-describing”
Summary

- Widely deployed agents embedded in IP phones, gateways, routers.....
- Protocols and agents in use today, new standards continue to emerge from ITU and IETF
- Over 150 equipment vendors supporting model and over 200 million endpoints deployed
- Need to make the reported data intuitive and useful