Service Level Agreements for VoIP

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Burton Group Catalyst 2005
Agenda

• VoIP SLAs
  – What’s typical
  – Why typical isn’t ok
• Approaches to SLA measurement
• What to measure
• The “trust” problem
• Final thoughts
What is an SLA?

- Agreed set of performance parameters that:
  - Are measurable
  - Can be easily related to application performance

- In theory - if the SLA is met then the customer is happy

- How well does this work for Voice over IP?
Service Provider Perspective

• Contractual SLA
  - Keep SLA as general as possible
  - Easily measured metrics
  - Measure at service demarcation point
  - SLA monitoring

• But......
  - Want customer to have good experience overall but minimize level of contractual commitment to this
Customer Perspective

• Voice is a mission critical application

• SLA should report all issues that affect service quality (i.e. don’t want service provider to claim they meet SLA when service unsatisfactory)

• Need service provider to “make it work”

• SLA helps to focus service provider on delivering agreed quality levels

• Highly reliable voice service more important than refunds
Actual (typical?) VoIP SLA

- Jitter < 20ms
- Loss < 0.1%
- Latency < 100ms
- Availability 99.9%

What does this mean in practice?
Jitter

Average jitter level (PPDV) = 4.5mS
Packet Loss - also time varying

Average packet loss rate = 2.1%
Leads To Time Varying Call Quality

Degraded Service Quality (DSQ) Event = MOS less than X for more than N mS
Delay

![Graph showing MOS Score vs. Round trip delay (milliseconds) with curves for 55dB and 35dB Echo Return Loss.]

1. **Delay**
2. **MOS Score**
3. **Round trip delay (milliseconds)**
4. **Echo problems**
5. **Conversational problems**

- **55dB Echo Return Loss**
- **35dB Echo Return Loss**

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Why does echo make a difference?

Round trip delay - typically 50mS+

Additional delay introduced by VoIP makes existing echo problems more obvious
Customer expectations of service quality

• **Listening quality**
  – Clarity, no distracting noise/ pops/ distortion

• **Conversational quality**
  – No noticeable delay or echo

• **Availability**
  – Always available, does not drop calls

• **Signaling quality**
  – Low call setup delay, features work
A Better VoIP SLA?

99.9% of calls/ intervals have MOS-LQ > 3.9
MOS-CQ > 3.8

Degraded Service Quality Events < 0.1/ hour
[DSQ = ....]

Latency < 100mS

Availability 99.9%

Based on either reference or actual endpoint

Transient quality problems

Also reflected in MOS-CQ

Availability of media AND Signaling path
Enterprise Scenario
Measuring at ISP Demarcation - active test

Test call

Active Test Functions
Active test for IP Service SLA

- Uses VoIP calls, to ensure packets are treated identically to “real” VoIP calls
- Use a Reference endpoint - I.e. a fixed configuration, known, virtual IP endpoint
- Test:
  - Peak times - to understand quality under load conditions
  - Off-peak times - to detect problems before they impact users
Measuring at user desktop - passive test

RTCP XR

SIP QoS Report

Embedded Monitoring Function
Passive test for IP SLA

- Most effective for end-to-end measurement
- Embedded quality monitoring function in IP endpoint
- Can measure service quality, signaling reliability
- Collect data via RTCP XR or SIP QoS reports
Service Level Metrics - “mine” or “yours”

• Common problem with SLAs
  – Service provider measures SLA and reports that they meet SLA
  – Customer uses different tools and finds that service provider “does not” meet SLA

• Who is right?
Overcoming the “somebody else’s problem” problem

• Need
  – Common measurement methodology
  – Ability to make the same measurements at the same time in the same way

• Otherwise
  – Results will differ and fingers will point

• Solution?
  – A common (trusted) measurement methodology
  – A shared (trusted) measurement function that is accessible to both service provider and customer
A “Trusted” SLA Monitoring Function

Enterprise

Service Provider

Active test agent
Summary Stats
Non-intrusive monitoring
Summary Stats

Edge router
SLA Monitoring Function

- Ideally - locate in edge router on customer premise
- Measurement data available to both service provider and customer
- Provides both
  - Non-intrusive per-call monitoring of live traffic
  - Active test agent for scheduled testing and troubleshooting
- Measures SLA in terms of
  - Estimated call quality level (MOS, R)
  - DSQ (Degraded Service Quality) events
  - Loss, jitter, discard, delay........
VoIP SLA Management

- VoIP SLAs
  - What’s typical
  - Why typical isn’t ok
- Approaches to SLA measurement
- What to measure
- The “trust” problem
- Final thoughts?
  - VoIP does not have such distinct service boundaries as traditional telephony - some form of shared data model is an essential addition to an SLA for collaborative troubleshooting across network boundaries.