H.323 Beacon:

An H.323 Application Related End-to-End Performance Troubleshooting Tool

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What is H.323?
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An umbrella standard that defines how real-time multimedia communications such as Videoconferencing can be supported on packet switched networks (Internet)

- Codecs: H.261, H.263, G.711, G.723.1
- Signaling: H.225, H.245
- Transport Mechanisms: TCP, UDP, RTP and RTCP
- Data collaboration: T.120
H.323 Protocol Stack
Three ways to Videoconference over the Internet…
Three ways to Videoconference over the Internet …

1. Point-to-Point
Three ways to Videoconference over the Internet …

2. Multi-Point Star Topology
Three ways to Videoconference over the Internet …

3. Multi-Point Multi-Star Topology
Scenario I: A Researcher and an Industry professional want to Videoconference
Case 1: Researcher is unable to make a call!
There was a mis-configured firewall blocking necessary ports...
Case2: Industry professional is unable to make a call!
His LAN’s Internet connectivity was non-functional at that time...
Case 3: They connected, but of them experienced bad audio & video!
There was congestion at one of the intermediate routers along the path...
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The performance problem can be anywhere in the E2E Path!!!
Good News! ISPs are instrumenting their networks...
Scenario II: In a Multi-point setting...
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Topics of Discussion

- H.323 Beacon Overview
- Why not use the other existing tools?
- Tool Features
- Two Case-studies
- Conclusion
H.323 Beacon Overview

- An application-specific measurement tool
  - To monitor and qualify the performance of an H.323 Videoconferencing sessions at the host and in the network (end-to-end)

- Useful to an end-user/conference operator/network engineer

- Uses OpenH323 and J323Engine libraries

- Easy to install and use!

- Open source
Comparison with other existing tools...

- H.323 protocol has many idiosyncrasies
- ICMP and UDP based tools fail to capture the performance issues faced by actual voice and video traffic at the host and in the network
  - ping, traceroute, Iperf, pathrate, …
- Commercial tools are VERY expensive!
  - NetIQ Chariot, Spirent Smartbits, Telchemy VQMon,…
Initial call setup failures and haphazard disconnections...

Test Status

- In-Session, Normal Close, Exception Close

Exception Close Alarms

- “Possible Firewall/NAT presence obstruction”
- “No Internet connectivity”
- “Incompatible codec being used”
- “Insufficient bandwidth”
- “Remote H.323 Beacon Server not online”
Initial call setup failures and haphazard disconnections...
Network Health Status...

- Delay, Jitter and Loss data
- Real-time, offline raw data and test session summary
Network Health Plots...

- Watermarks for “Good”, “Acceptable” and “Poor” grade of quality as experienced by end-user
- Delay: (0-150)ms, (150-300)ms, > 300ms
- Jitter: (0-20)ms, (20-50)ms, > 50ms
- Loss: (0-0.5)%, (0.5-1.5)%, >1.5%
  - Levels obtained from our *PAM 2004* paper

![Network Health Plots Diagram](image)
Audio and Video Quality Assessments

- Audio and video loopback feature
- E-Model-based objective MOS ranking
- Slider-based subjective MOS ranking
Customization of tests...

- Test results data folder, TCP/UDP/RTP port settings, H.225 and H.245 parameters, preferred codec, watermarks for delay, jitter, loss, ...
Use-case I

Problem report

- Intermittent frame freezing
- Lot of pixilation
- No significant audio problems
- Sudden disconnections

Effect of a mis-configure firewall on a video stream
Use-case I (contd.)

**MCU Software**
- ~15 fps for 384Kbps call and ~0.6% packet loss
- ~30 fps for 128Kbps call and ~0% packet loss

**H.323 Beacon**
- Sluggish call-setup
- Delayed packet-events
- Initial jitter variations in poor range

Increasing the rate-limit and firewall reconfiguration solved the problem!
Use-case II

- **Problem report**
  - Poor audio and video reception at the site of user
  - Problem only in the streams from Campus A to Campus B

- **MCU Software**
  - Packet loss (~1%)
  - Packet re-ordering

- **H.323 Beacon**
  - Jitter values consistently in poor range
  - Traceroute and Reverse-Traceroute showed an asymmetric route

- **E-Model results**
  - Campus A to Campus B: 3.78
  - Campus B to Campus A: 4.37
Problem was solved by contacting the neighboring ISP who was suspected to be experiencing problems!
Future Work

- Porting the software to Linux
- Fixing bugs of past releases
- Server-to-Server module to support routine monitoring in ISP backbones
- Video and E-Model integration into C++ client
Questions?

http://www.itecohio.org/beacon