AVAYA

IP Telephony

Contact Centers

Mobility

Services

WHITE
PAPER

Avaya ExpertNet™
VoIP Assessment Tool

September 2005

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Overview

This white paper is intended for IT Managers, Network Architects and System Administrators who need a better understanding of how the Avaya ExpertNet VoIP Assessment Tool (EVAT) software operates on any network and gathers information in order to determine the readiness of any network for IP telephony and video.

Avaya Engineers deploy the EVAT suite of software onto the customer network and run the assessment typically for one to two weeks. The engineers then collect the data and generate detailed analysis reports that help them determine the readiness of the network for voice and video traffic. The reports will focus on the following factors that can affect successful Voice over IP (VoIP) deployment:

- Transcoding
- WAN protocols
- Echo
- Delay
- Silence Suppression
- Jitter
- CODEC selection
- Packet loss
- Router and data-switch setup
- Packet mis-order
- Reliability
- Available bandwidth
- Scalability
- Packet prioritization
- Manageability
- Network design
- End point quality (sound card, microphone, earpiece, etc.)
- Duplex

EVAT Remote Monitoring

The Avaya ExpertNet VoIP Assessment Tool discovers the network using Simple Network Management Protocol (SNMP), injects Real-Time Transport Protocol (RTP) synthetic traffic between a set of endpoints called **babels**, measures the delay, jitter and loss on the RTP traffic generated and provides extensive Reporting and Analysis.
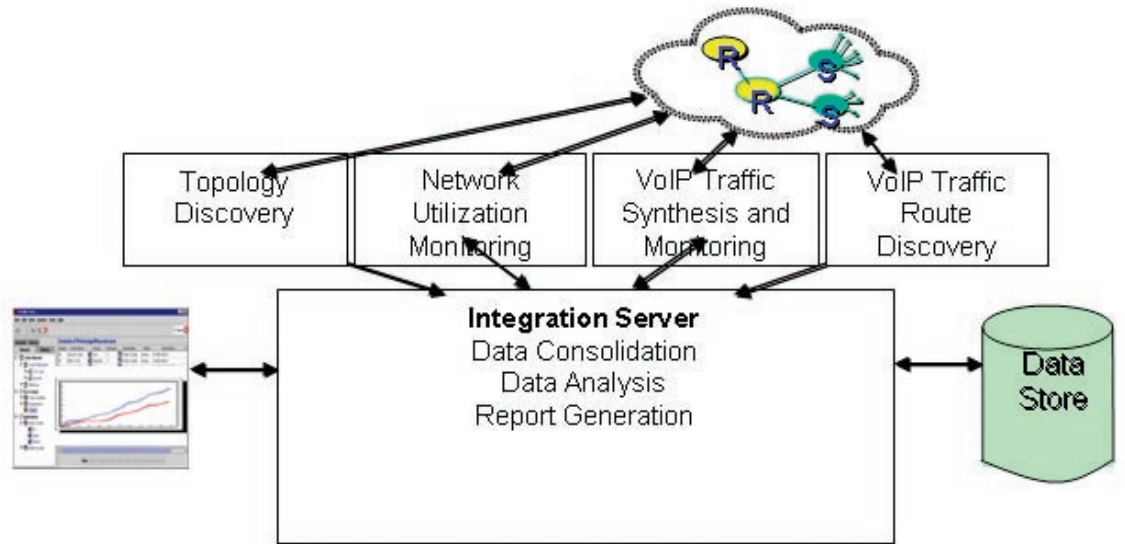

Figure 1 Network schematic of Avaya ExpertNet VoIP Assessment Tool

The Open Systems Interconnection (OSI) Model
7. Application Layer
6. Presentation Layer
5. Session Layer
4. Transport Layer
3. Network Layer
2. Data Link Layer
1. Physical Layer

EVAT provides:

- OSI Layer 2/Layer 3 Topology obtained from SNMP

- Layer 3 Topology obtained from Traceroute probes

- SNMP data collection from network devices

- Synthetic VoIP generation and measurement

- Integrated VoIP/SNMP data analysis

- Report generation

Avaya ExpertNet VoIP Assessment Tool Key Differentiators:

- Provides assessment of a live network 24 hours a day, seven days a week

- Automatically injects synthetic IP calls, and measures QoS and utilization across the network in real time

- Provides powerful analysis by integrating the call path with device utilization and end-to-end QoS statistics

- Delivers both Layer 2 and Layer 3 topology discovery, for a more complete network view

Hardware/Software requirements for EVAT

The EVAT server software sits on a full-fledged Linux Server. The tested platforms are: RedHat 7.2, RedHat 8.0 and RedHat 9.0. EVAT can be installed on a Laptop for a small-scale assessment where the networks range to a couple of subnets. It can be installed on a desktop P-III or greater (600 MHz or greater) for a large-scale assessment (where the networks range to several hundred networks).

EVAT call placement software, or babel, sits on a Single Board Computer (SBC). The babel software is supported on SBCs made by Axis and Intrinsyc. The SBC runs Linux as an Operating System and has no Hard Drive storage space.

EVAT supports three versions of the Axis:

- Single Port Axis 82 model

- Dual Port Axis 83 model

- Dual Port Axis 83+ model

Figure 2 Single Board Computer from Axis (Single Port Model)

The SBCs are configured to get a DHCP address. They can also be assigned static addresses.

Figure 3 Single Board Computer from Axis (Large Dual Port Models)

EVAT supports the Intrinsyc SBC:

• CerfCube 405 EP

Avaya ExpertNet VoIP Assessment Tool Operation

The EVAT server sweeps all of the subnets that are to be assessed for IP telephony readiness, discovers managed devices (routers, switches, hosts, phones, printers) and builds a topology at Layer3 and at Layer2. A set of babels (The SBCs running the babel software) are distributed and placed strategically at each end of the network. The EVAT server contacts each of the babels and schedules a call pattern between them so that a proper assessment of the network can be done with minimum load.

Red lines
indicate RTP
Synthetic traffic
between Babels

ExpertNet Server

EVAT Server:

- Receives results of RTP
  synthetic traffic between
  Babels

- Receives SNMP data
  from routers and
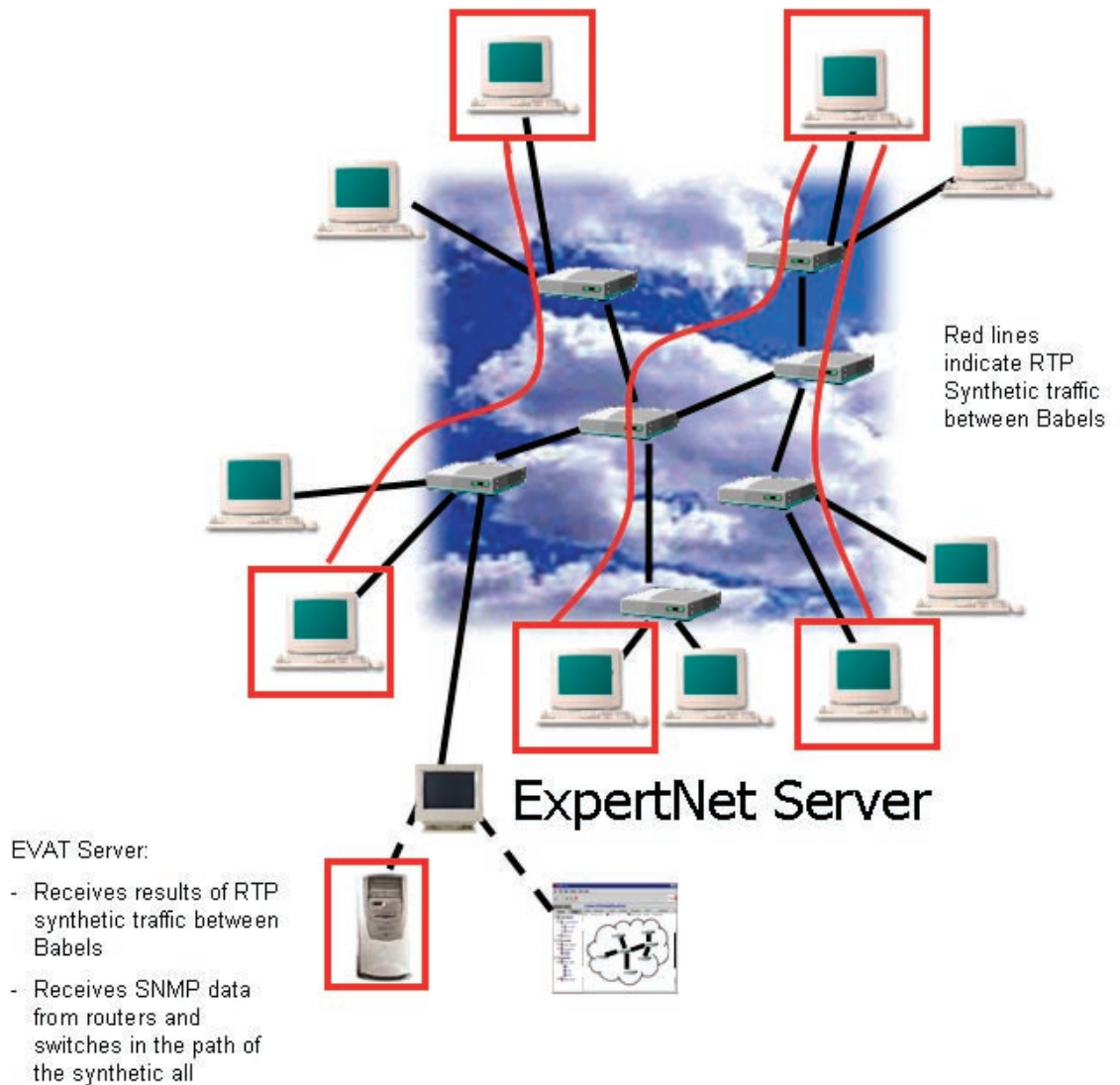 switches in the path of
  the synthetic all

Figure 4 Diagram of Avaya ExpertNet VoIP Assessment Tool operation

Synthetic RTP calls are started between the babels and measurements (like one-way delay, jitter, loss, loss burst) for every call are calculated and sent back to the EVAT server for storage. As the calls are being placed, specific network elements, such as routers and switches, that lie in the call path between the babels are polled using SNMP. Information gathered includes interface utilization and error at Layer2 and Layer3. The data collection duration typically runs from one to two weeks including nights and weekends. The calls are then stopped, SNMP monitoring halted and analysis reports run.

Communication between the babels

The babels place RTP calls that simulate VoIP calls between themselves in a pre-configured pattern. The calling pattern can be configured for minimum network load or for maximum network load. There are various parameters of the synthetic calls that can be configured, including the length of the call, the TOS/DSCP information to be used, the payload lengths, and the frequency of data aggregation. RTP calls use a pseudo-random UDP port in the range of 2048-3028. This range is configurable. The babels can also place special calls between themselves that collect traceroute information. Traceroute is a utility that traces a packet from a source computer to a destination computer, showing how many hops the packet

requires to reach the host and how long each hop takes. This can be run less frequently than the synthetic RTP calls. Special calls use traceroute over User Datagram Protocol (UDP), Internet Control Message Protocol (ICMP) and enable the IP Record Route mechanism to collect topology information.

EVAT SNMP Monitoring

The EVAT server can also use SNMP data to provide a better analysis. SNMP monitoring is not required, but desired. The EVAT server can be configured to poll for SNMP data from routers and switches that lie in the path of synthetic calls. This information is polled when synthetic calls are being placed. The data that is fetched can be classified into two categories

• Device level Management Information Bases (MIBs) that gather packet level counters for traffic and errors

• Interface level MIBs that gather octet level traffic and errors

Security Around EVAT

EVAT server software sits on full-fledged Linux server. It is recommended that the Linux server be patched for security with up-to-date software from the Linux vendor and all recommended precautions to secure a Linux server be taken. Access to EVAT is also password protected.

Usually the main concern with the babels is whether they can be used in a Denial of Service attack against the customer's network. Babels are very slow CPU-wise, have limited amounts of memory, use read-only file systems, and have a non-Intel®-based architecture—making them less likely to be the focus of any virus attack. They are also password protected. The Axis box runs telnet, but it can be disabled.

EVAT Analysis and Reports

EVAT offers an extensive analysis and reporting mechanism, which uses collected call measurements, SNMP data and topology information.

Historical Network Visualization with QoS

Basic network visualization with QoS shows the health of the network by coloring every device either green or red, with red indicating a bad call ratio. A call ratio for a device is the ratio of calls that passed through a particular device that exceeded an acceptable set threshold for delay, jitter, loss or MOS (Mean Opinion Score) to the total number of calls that passed through that device.

Historical Network Visualization with Blame Expert

EVAT also provides a sophisticated mathematical analysis, Blame Expert, which takes the end-to-end measurements of delay, jitter, loss and Mean Opinion Score (MOS) and attributes parts of them to different network segments along the path of the call. These segments, called pipes, are colored based on their contribution to the end-to-end measurement. Exonerated pipes (pipes that were not to blame) are colored green and problem pipes (pipes that contributed to the end-to-end measurements exceeding the acceptable threshold) are colored red.
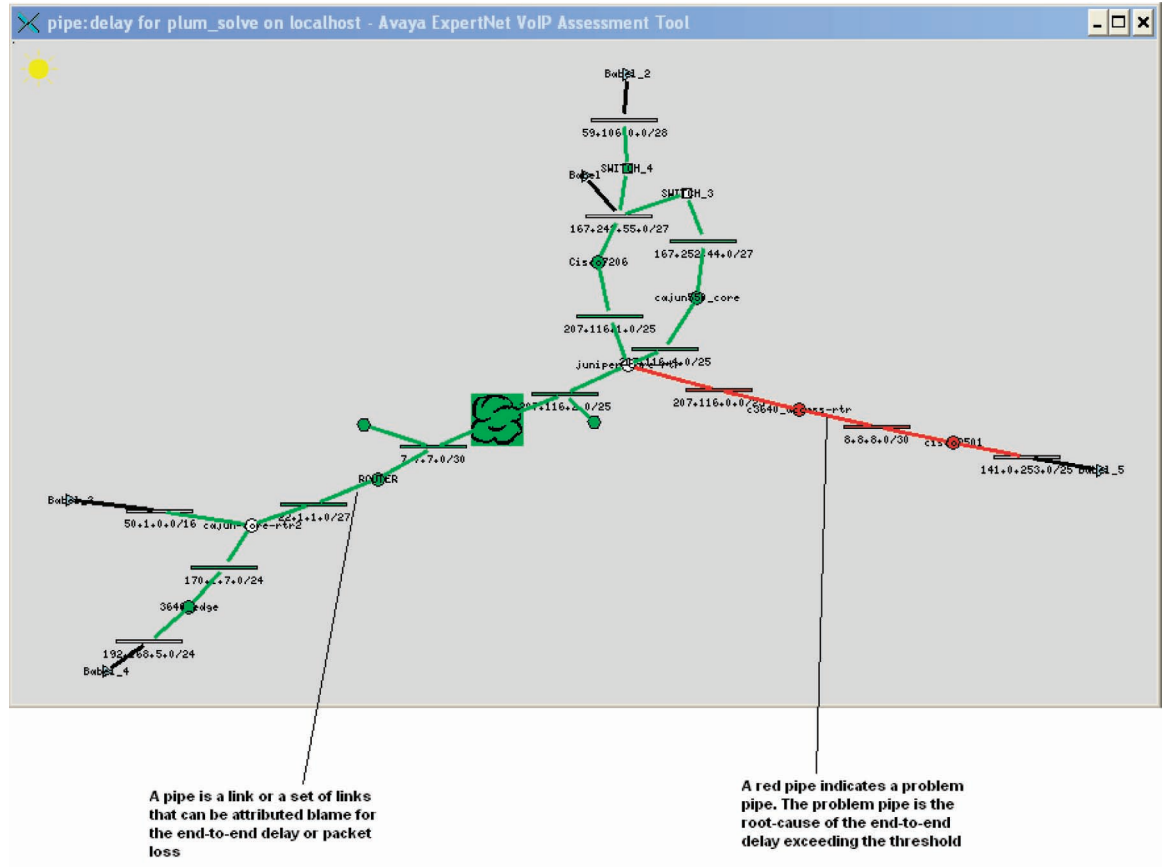
Figure 5 Screen Shot of Historical Network Visualization with Blame Expert

EVAT Summary Reports

A Summary Report displays a range of values within a given data set irrespective of time. It provides a minimum, maximum and median for the desired classification. The X-Axis represents the value while the Y-Axis represents a series of classifications within the dataset.
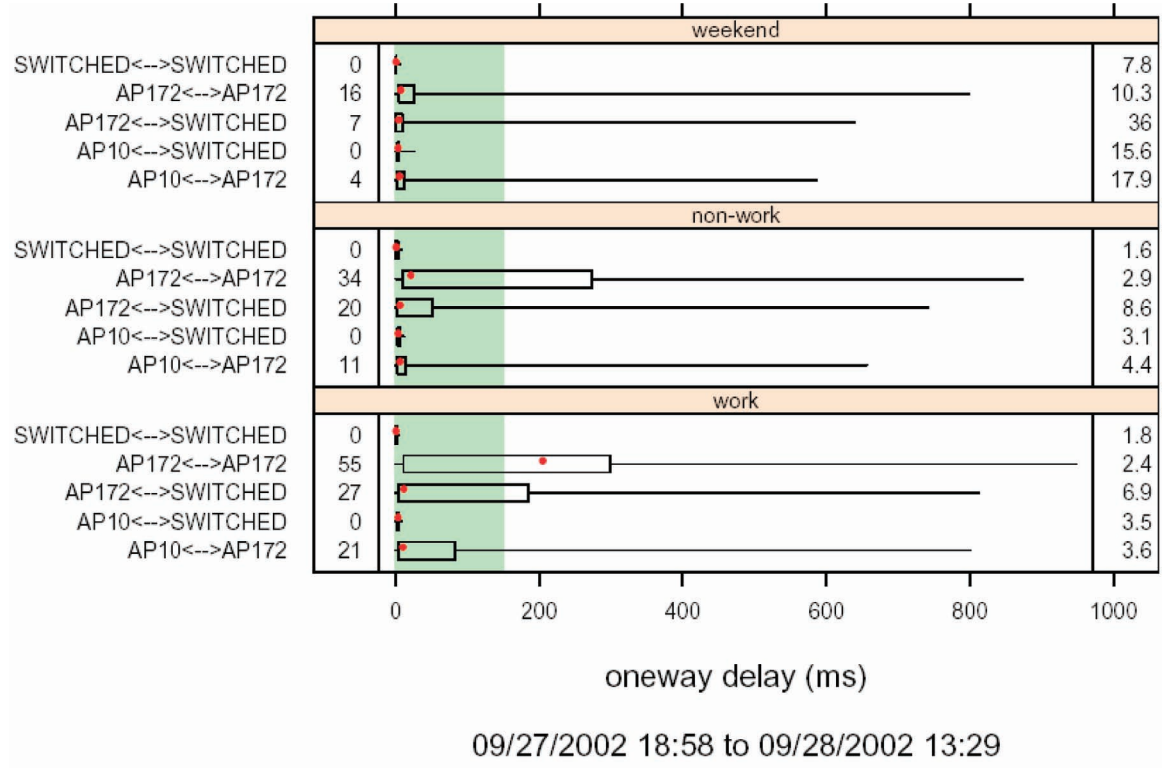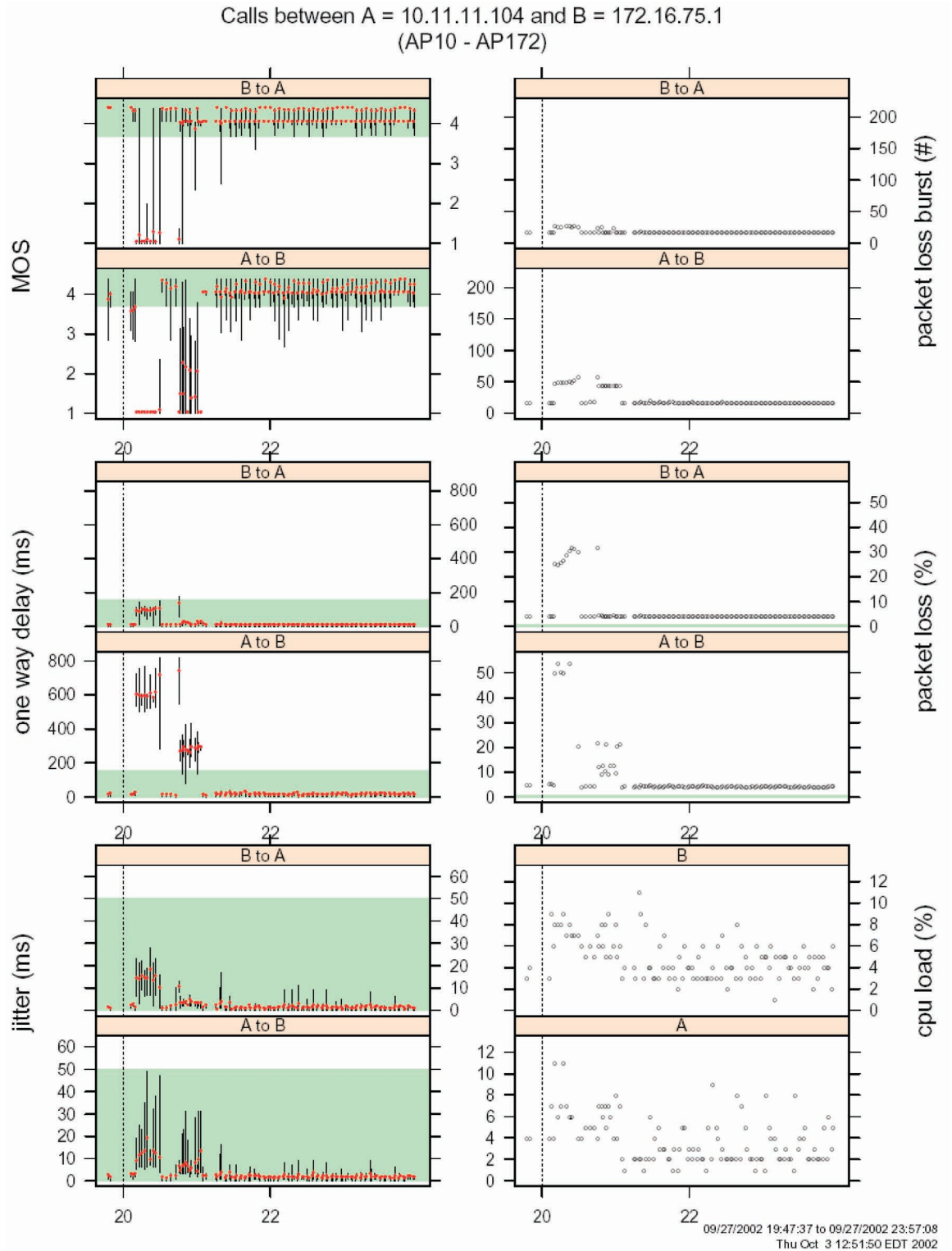
Figure 6 Summary Real-time Transport Protocol: Endpoint Group – All

EVAT Time Series Reports

A Time Series Report displays a range of values within a given data set respective of time. The X-Axis represents time while the Y-Axis represents the value as indicated by scale.

Figure 7 Time Series Real-time Transport Protocol: Endpoint to Endpoint

Avaya ExpertNet VoIP Assessment Tool and Avaya ExpertNet Lite Assessment Tool (ELAT)

There are two suites of tools that support the IP Network Readiness Assessment, the EVAT, which has been discussed thus far, and the ELAT. The basic difference in the way these two tools operate is that the end-to-end network performance can be measured directly in EVAT, while in ELAT; performance is inferred from the characteristics to and from a single point.

FAQs

Does EVAT call placement and data collection itself cause network disruptions?

EVAT discovery, call placement, and SNMP polling can all be configured to operate on a network without causing any disruptions to ongoing day-to-day operations.

Does EVAT collect any data from the customer's network?

No, EVAT does not collect any customer data. EVAT collects measurements for calls placed by EVAT to itself (babel to babel) and collects utilization and errors on network devices that are affected by these calls.

Does EVAT know or listen to any actual IP telephony calls on the network?

No, EVAT does not have the capability to find or listen to actual IP telephony calls placed on the Customer's network.

Does EVAT fetch any other information from the network?

EVAT does not gather any other information from the network, other than the results of the calls between babels and the SNMP monitoring for traffic and error counters. The traffic usage and errors give a byte/packet level detail as to how many bytes/packets passed through this interface, and how many were dropped.

Glossary

DHCP	Dynamic Host Configuration Protocol
DSCP	Differentiated Services Code Point
ELAT	Avaya ExpertNet Lite Assessment Tool
EVAT	Avaya ExpertNet VoIP Assessment Tool
ICMP	Internet Control Message Protocol
IP	Internet Protocol
MIBs	Management Information Bases
MOS	Mean Opinion Score
QoS	Quality of Service
RTP	Real-Time Transport Protocol
SBC	Single Board Computer
SNMP	Simple Network Management Protocol
TCP	Transmission Control Protocol
TOS	Type of Service
UDP	User Datagram Protocol
VoIP	Voice over Internet Protocol

For more information about the Avaya ExpertNet™ Lite Assessment Tool (ELAT) and other Avaya Global Services solutions, contact your Avaya Client Executive or Authorized Avaya BusinessPartner, or visit us at www.avaya.com

About Avaya

Avaya enables businesses to achieve superior results by designing, building and managing their communications infrastructure and solutions. For over one million businesses worldwide, including more than 90 percent of the FORTUNE 500®, Avaya's embedded solutions help businesses enhance value, improve productivity and create competitive advantage by allowing people to be more productive and create more intelligent processes that satisfy customers.

For businesses large and small, Avaya is a world leader in secure, reliable IP telephony systems, communications applications and full life-cycle services. Driving the convergence of embedded voice and data communications with business applications, Avaya is distinguished by its combination of comprehensive, world-class products and services. Avaya helps customers across the globe leverage existing and new networks to achieve superior business results.

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