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MPLS Performance Management

Ease Project Lifecycle Management and Lower MTTR with nGenius Solution

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Today's Focus

- MPLS network performance challenges
- Meeting the challenges through the Performance Lifecycle Management
- Best practices for a unified performance management solution
- Case Study Examples

Performance Management Lifecycle

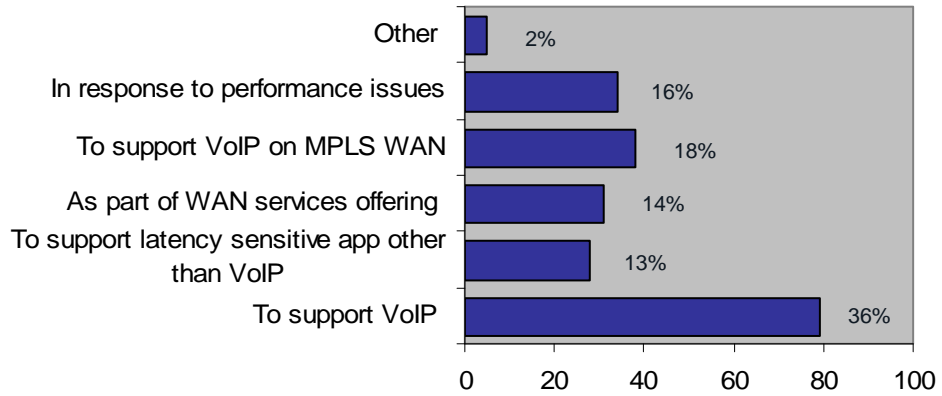Monitor   Assessment

Verify   Plan
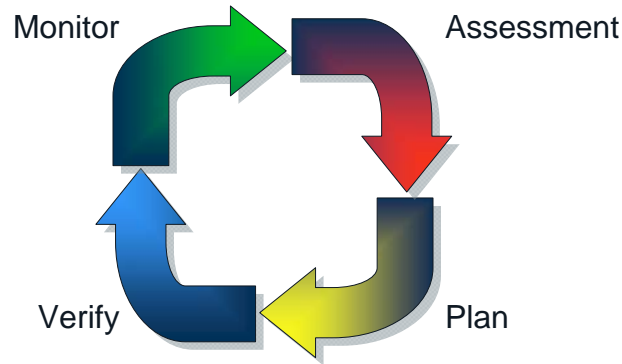
MPLS Adoption Trends

- The results of a summer 2006 survey by Ashton, Metzler Assoc & NetScout confirmed the connection between VoIP deployment and MPLS.
  - The majority (58%) of the companies that were implementing new deployments of VoIP were also implementing MPLS
  - The majority (54%) of the companies expanding their existing deployments of VoIP are also implementing MPLS

Why Implement QoS?*

Category	Percentage
Other	2%
In response to performance issues	16%
To support VoIP on MPLS WAN	18%
As part of WAN services offering	14%
To support latency sensitive app other than VoIP	13%
To support VoIP	36%

* Based on March 2007 Metzler Assoc./NetScout survey.

n=217

Converged Network Challenges

- Primary Business Concerns
  - Cost of WAN services in general – will MPLS reduce or help better manage the costs?
  - Maintaining quality delivery of voice and data services over the MPLS network

- Technical Considerations
  - Proper traffic prioritization (QoS) to ensure applications do not contend for resources with each other
  - Is there or will there be traffic on the network that has an increased sensitivity to delay, jitter and packet loss

- Deployment Issues
  - Other projects impacting the MPLS rollout may require changes to the existing network

Challenges of MPLS Technologies

London Headquarters

Core Switch — Site Router

MPLS Network

Los Angeles

Amsterdam

Tokyo
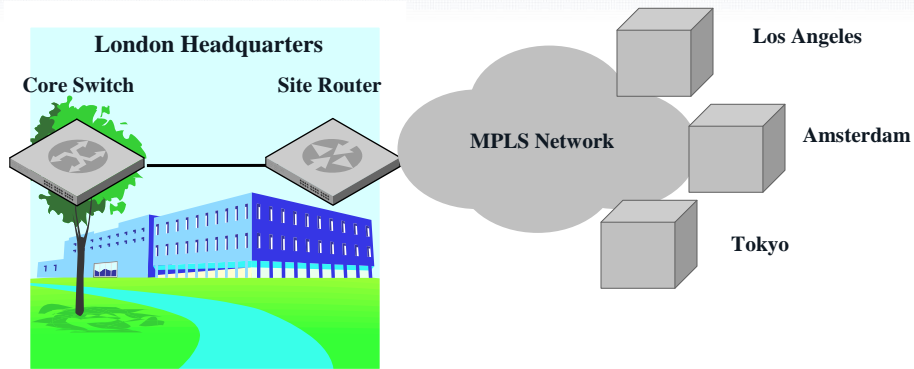
- Lack of application visibility across MPLS cloud
- Hinders your ability to manage performance

What is Needed: Lifecycle Performance Management

- High Definition Visibility
  - Real-time, infrastructure-wide, high definition
  - In-depth application behavior knowledge
- Actionable Collaboration
  - Flexible, scalable, secure web-based reporting
  - On-demand transfer of intelligence
- Accelerated Detection & Resolution
  - Advanced early warning system
  - Automated diagnostics

MPLS Performance Management Lifecycle
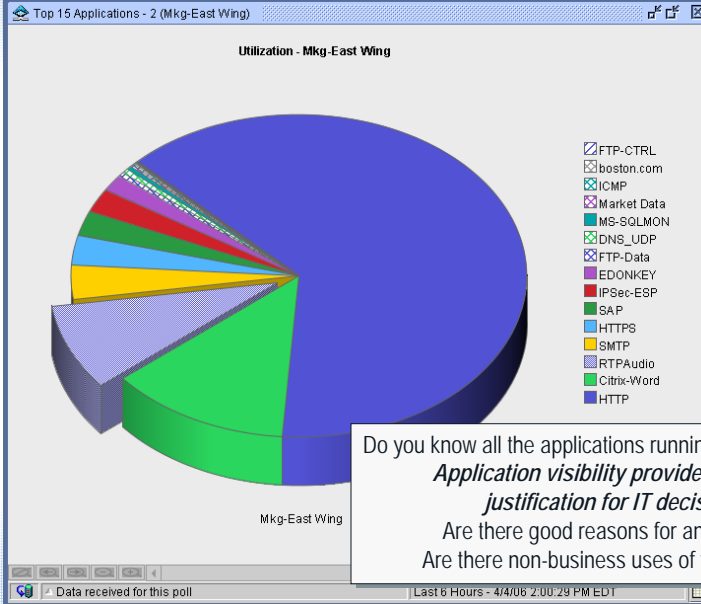*Best Practices*

- Assessment
  - What is your bandwidth requirements?
  - What applications are already on the network?
  - Is your network ready for other services, e.g. Voice?
- Planning
  - Have you made all necessary decisions to ensure an effective rollout?
  - Are you establishing a QoS policy? What applications get what QoS class?
- Impact analysis – pilot to rollout
  - Is everything running as smoothly as planned?
  - Are the QoS classes appropriate designed and configured?
- Ongoing management
  - How is your network changing and growing over time?

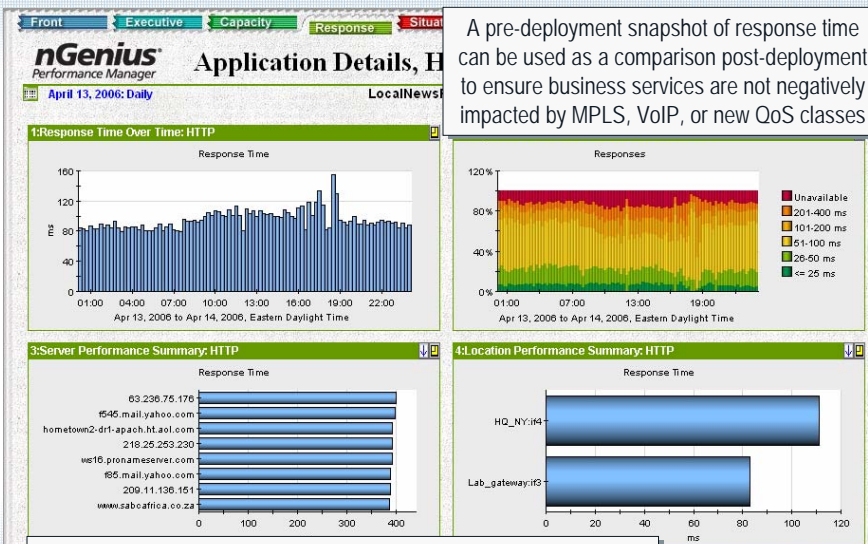**Step One: Assessment**
Is your network ready for MPLS?

- Create an inventory of *all* applications on the network
  - Needed for making capacity and usage policy decisions
  - Useful in creating QoS policies
- Evaluate bandwidth to ensure capacity
  - Trend network utilization; determine areas with incorrect capacity
  - Identify how business sites use network resources
  - Does adding voice change bandwidth requirements
- Baseline the response time of key business applications
  - May be used to establish alarms for critical business services
- Audit the network for subtle, systemic problems
  - Identify issues that may impact application performance, QoS class assignments

Understand how your business uses the network

Top 15 Applications - 2 (Mkg-East Wing)

Utilization - Mkg-East Wing

- FTP-CTRL
- boston.com
- ICMP
- Market Data
- MS-SQLMON
- DNS_UDP
- FTP-Data
- EDONKEY
- IPSec-ESP
- SAP
- HTTPS
- SMTP
- RTPAudio
- Citrix-Word
- HTTP

Mkg-East Wing

Do you know all the applications running on your network?
Application visibility provides business justification for IT decisions:
Are there good reasons for an upgrade?
Are there non-business uses of the network?

Data received for this poll   Last 6 Hours - 4/4/06 2:00:29 PM EDT

Baseline response time of key business applications

Front   Executive   Capacity   Response   Situa

nGenius
Performance Manager   **Application Details, H**

April 13, 2006: Daily   LocalNews

A pre-deployment snapshot of response time can be used as a comparison post-deployment to ensure business services are not negatively impacted by MPLS, VoIP, or new QoS classes

1:Response Time Over Time: HTTP

Response Time

01:00 04:00 07:00 10:00 13:00 16:00 19:00 22:00
Apr 13, 2006 to Apr 14, 2006, Eastern Daylight Time

Responses

- Unavailable
- 201-400 ms
- 101-200 ms
- 51-100 ms
- 26-50 ms
- <= 25 ms

01:00   07:00   13:00   19:00
Apr 13, 2006 to Apr 14, 2006, Eastern Daylight Time

3:Server Performance Summary: HTTP

Response Time

63.236.75.176
f545.mail.yahoo.com
hometown2-dr1-apach.ht.aol.com
218.25.253.230
ws16.pronameserver.com
f95.mail.yahoo.com
209.11.136.151
www.sabcafrica.co.za

0   100   200   300   400

4:Location Performance Summary: HTTP

Response Time

HQ_NY:if4

Lab_gateway:if3

0   20   40   60   80   100   120
ms

Response time provides insight into the end-user experience and should be an integral part of any performance management audit

Step Two: Planning
Have you made all decisions to ensure an effective rollout?

Based on the gathered data…

- Investigate and troubleshoot subtle problems
  - Remove retired and non-business related applications and utilization
- Fine-tune capacity
  - Place orders for MPLS and bandwidth based on the needs uncovered
- Establish and implement QoS policies
  - How many classes and what applications are delivered in each
- Establish post-deployment alarm thresholds
  - Utilization and response time alerts

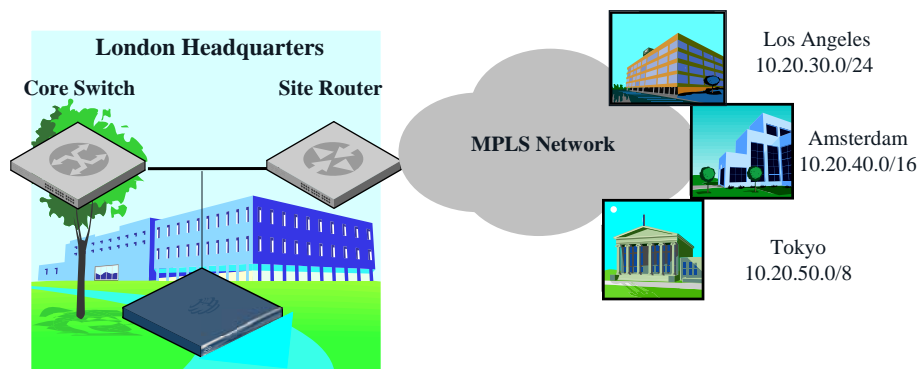## Fine-tune capacity and implement needed upgrades

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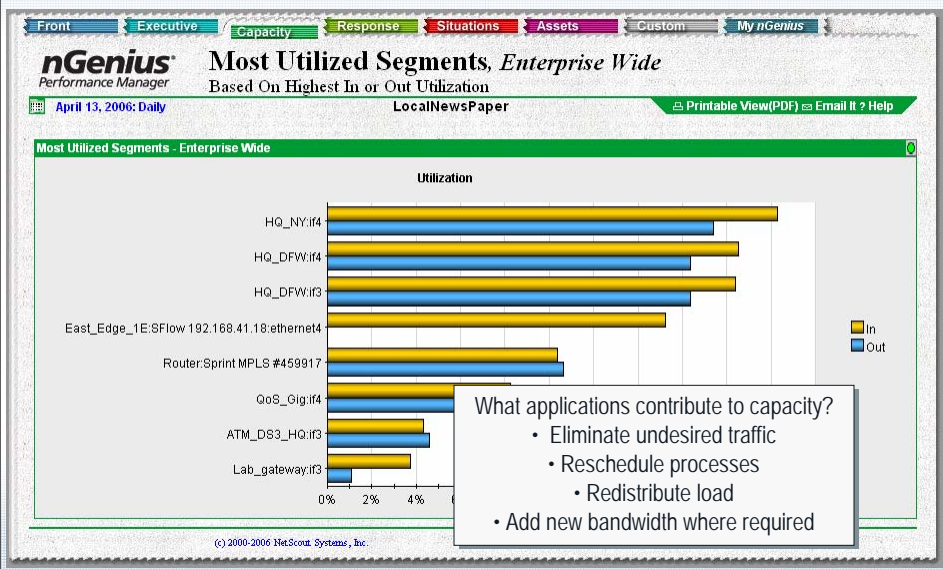
Step Three: Impact Analysis
Is everything running as smoothly as planned?

- Analyze remote site performance over MPLS
  - Are all applications and site communications operating as required
- Determine whether bandwidth utilization estimates meet with actuals
- Confirm QoS configuration and success
  - Are all applications in the proper delivery class?
- Confirm configuration and quality of key applications
  - E.g. is PACS, FIX Protocol, or VoIP being delivered as designed?
- Re-evaluate response time of critical applications
  - Are key applications being delivered within previous response time levels? Have there been negative or positive impacts using QoS? Adding VoIP?
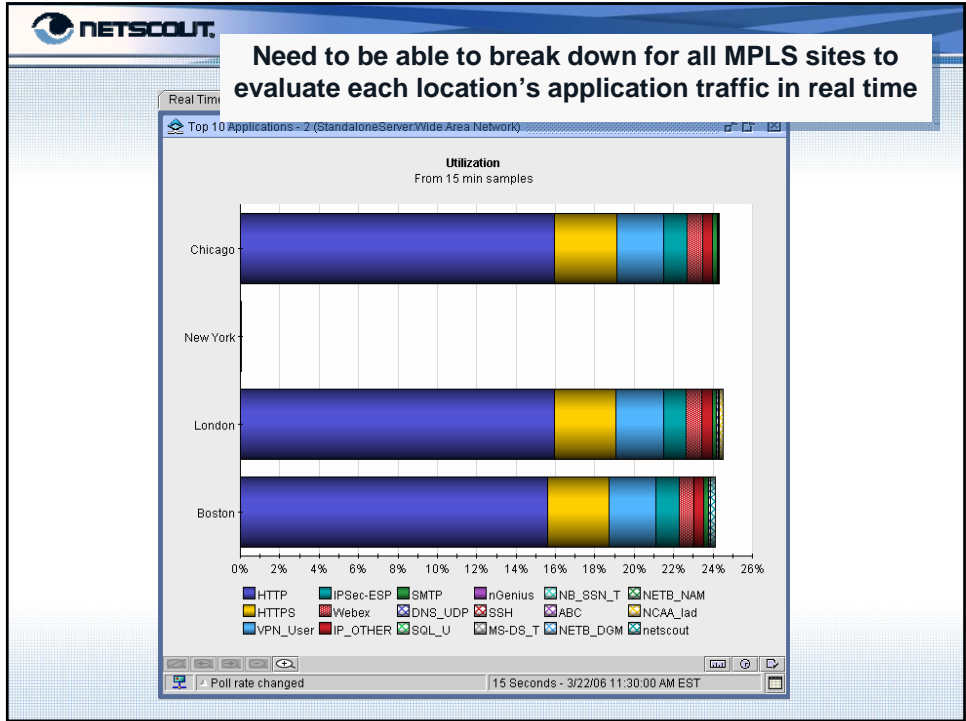

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Visibility into remote site traffic

London Headquarters

Core Switch **Site Router**

MPLS Network

Los Angeles
10.20.30.0/24

Amsterdam
10.20.40.0/16

Tokyo
10.20.50.0/8

Gain visibility on LAN side of WAN router…

…to view remote site traffic!

Customer Story – Lifecycle Management

- Home Improvement Retailer with hundreds of stores in North America
- Visibility Pain Point:
  - Frame Relay WAN migrating to MPLS.
  - Implemented site monitoring with *nGenius* LAN Probes well before cutover began.
  - Visibility throughout the lifecycle of the project

"Measure twice, cut once."

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Monitoring Applications in QoS Deployments

- MPLS based Class of Service offerings and VoIP initiatives are drivers to implement QoS policies
- Rely on Standards e.g. Differentiated Services Code Points (DSCP) in packet headers –
  - As defined in RFC 2474 and 2475
  - View each code point as a Virtual Circuit
- Identify and view applications within each classification
- Identify virtual circuits and all the QoS classes within them
  - E.g. Sites or VLANs
- Simultaneously view segments with virtual circuits plus associated QoS classes

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High-Definition Visibility:
Deep Packet Inspection: QOS

Full application-level visibility into the traffic to and from a remote "site" and for associated QoS levels
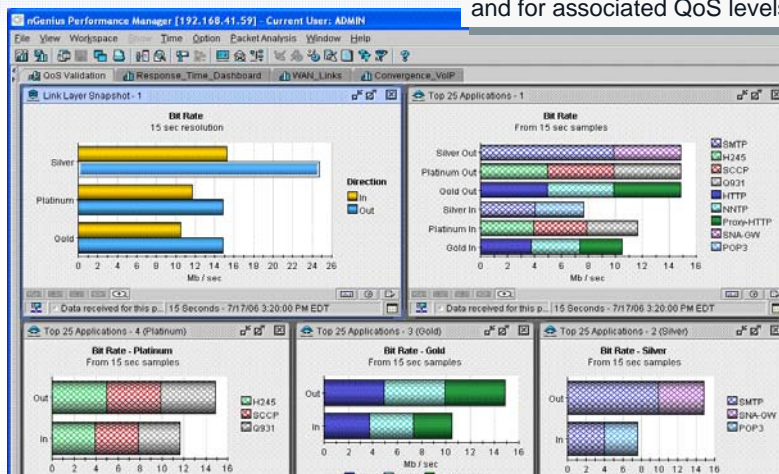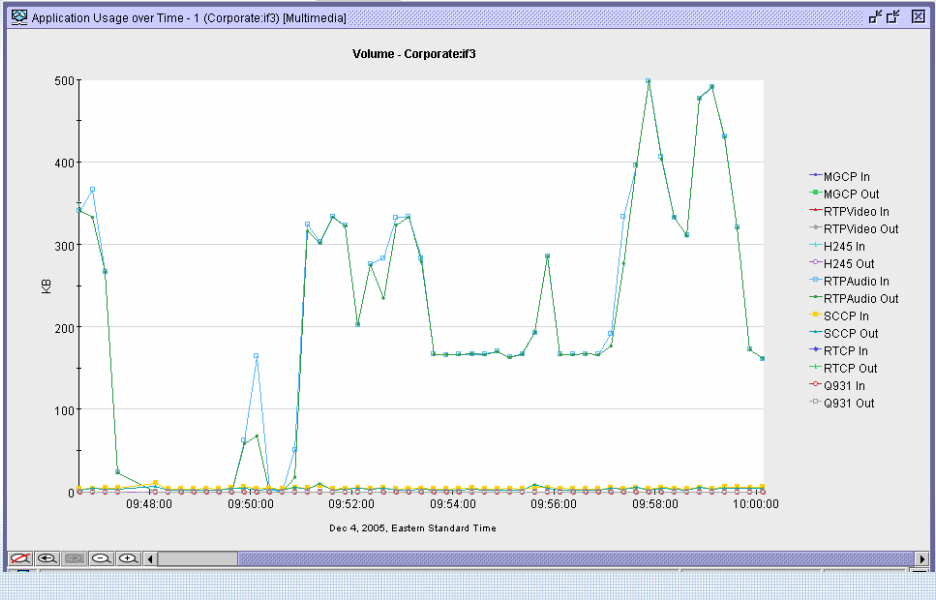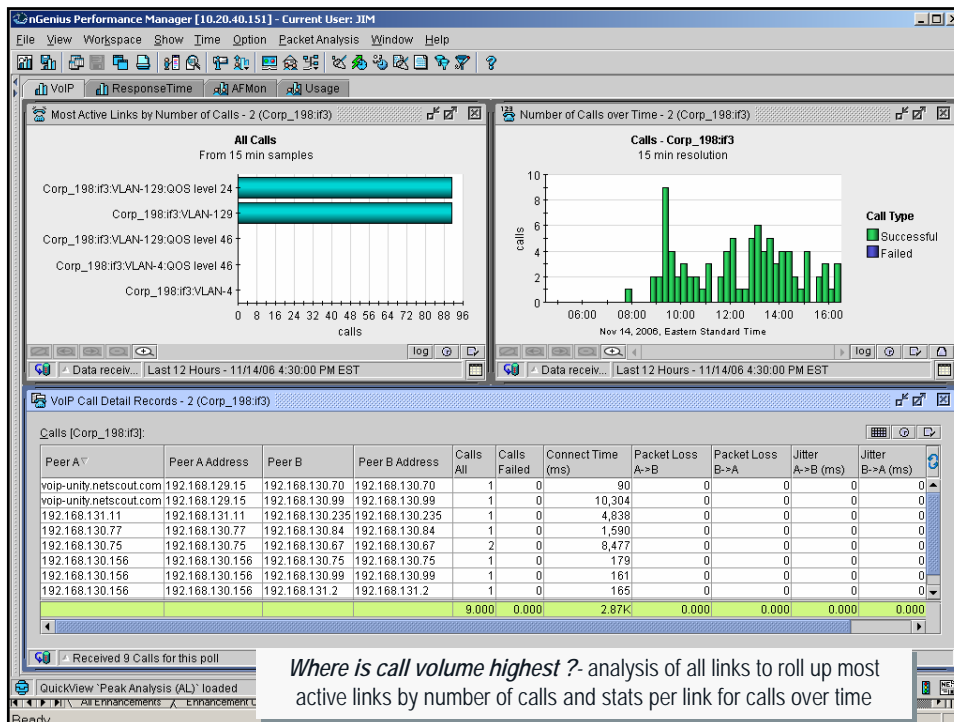

Applications that have been assigned a wrong DSCP will be quickly identified with these types of views and will make pinpointing the misconfigured device much easier

Monitoring VoIP

- Monitor utilization for each VoIP-supported protocol
  - RTP, RTCP, H.323, SIP, MGCP, SCCP (Skinny)
- Configuration information
  - DSCP, Codec, Dialing Plan
- Phone specific information per network segment
  - Active phone users, senders and receivers, number of valid and incomplete calls, total talk time, average call duration
- Data should be logged to provide historical information & provides
  - Top-level summaries
  - As well as detailed drill down information
- Quality indicators
  - Jitter, packet loss, call set-up time

VoIP Quality ▶	VoIP Link Summary
Top N Links	Most Active Links by Number of Calls
Alarm ▶	Worst Links by Number of Unsuccessful Calls
	Worst Links by Lowest MOS
QuickViews ▶	Worst Links by Highest Jitter
	Worst Links by Packet Loss
	Jitter over Time
	MOS over Time
	Packet Loss over Time
	Number of Calls over Time
	VoIP Call Detail Records
	Phone Users

Does actual volume meet with estimates

Application Usage over Time - 1 (Corporate:if3) [Multimedia]

Volume - Corporate:if3

Legend: MGCP In, MGCP Out, RTPVideo In, RTPVideo Out, H245 In, H245 Out, RTPAudio In, RTPAudio Out, SCCP In, SCCP Out, RTCP In, RTCP Out, Q931 In, Q931 Out

Dec 4, 2005, Eastern Standard Time

Where is call volume highest ?- analysis of all links to roll up most active links by number of calls and stats per link for calls over time
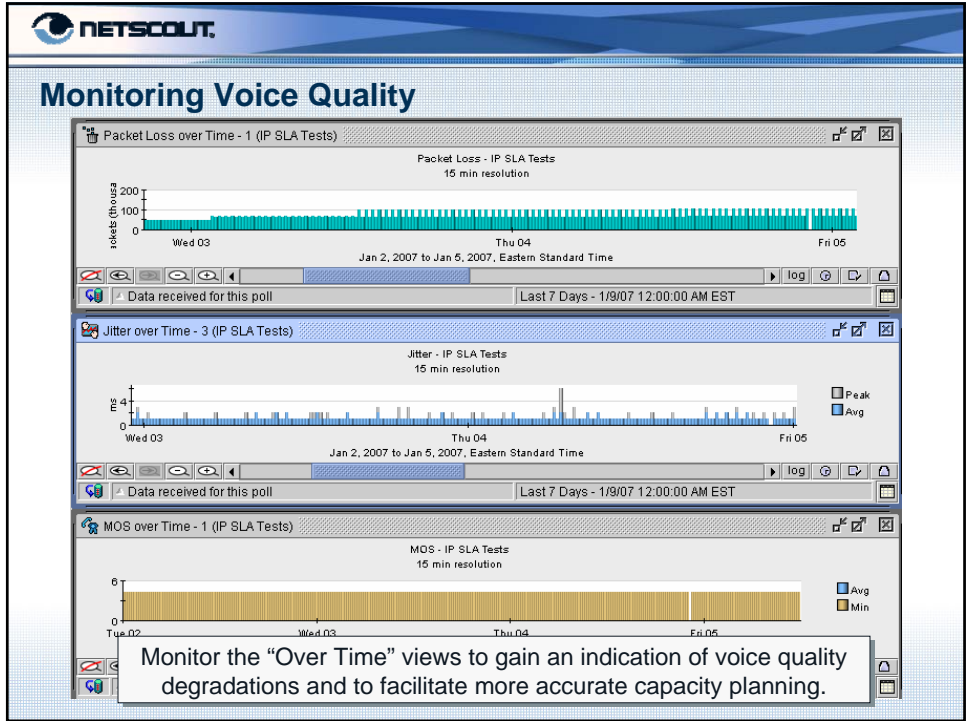
In Cisco Networks Use IP SLA Tests

IP/SLA ICMP echo	A round trip time measuring how long it takes the target device to respond to an ICMP echo.
IP/SLA DNS	Difference in time between when the client sends a DNS request and when it receives a reply.
IP/SLA TCP Socket Connect	Difference in time between when the client sends the initial SYN and when the client sends the final ACK in the connect sequence.
IP/SLA UDP jitter (VOIP)	Measures round trip delay, average jitter, MOS and packet loss.
IP/SLA DHCP	Measures the round trip time taken to discover a DHCP Server and obtain a lease from it.
IP/SLA Web Page Retrieval	Measures the amount of time it takes to retrieve the specified Web page.

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Monitoring Voice Quality

Packet Loss over Time - 1 (IP SLA Tests)

Packet Loss - IP SLA Tests
15 min resolution

Wed 03   Thu 04   Fri 05
Jan 2, 2007 to Jan 5, 2007, Eastern Standard Time

Data received for this poll   Last 7 Days - 1/9/07 12:00:00 AM EST

Jitter over Time - 3 (IP SLA Tests)

Jitter - IP SLA Tests
15 min resolution

☐ Peak
☐ Avg

Wed 03   Thu 04   Fri 05
Jan 2, 2007 to Jan 5, 2007, Eastern Standard Time

Data received for this poll   Last 7 Days - 1/9/07 12:00:00 AM EST

MOS over Time - 1 (IP SLA Tests)

MOS - IP SLA Tests
15 min resolution

☐ Avg
☐ Min

Tue 02   Wed 03   Thu 04   Fri 05

Monitor the "Over Time" views to gain an indication of voice quality degradations and to facilitate more accurate capacity planning.

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Case Study
Mis-configured QoS causes problems at hospital

- 500 bed hospital in the Western U.S.
- VoIP pain point:
  - Deployed Avaya VoIP solution hospital wide.
  - Whole wings of the hospital would intermittently deregister and lose telephone service. They were unable to identify to problem using the vendor-supplied management console.

The nGenius Solution was brought into the situation and they were immediately able to the problem a mis-configured QoS setting. Simply changing the QoS levels so they were the same on inbound and outbound eliminated all problems.
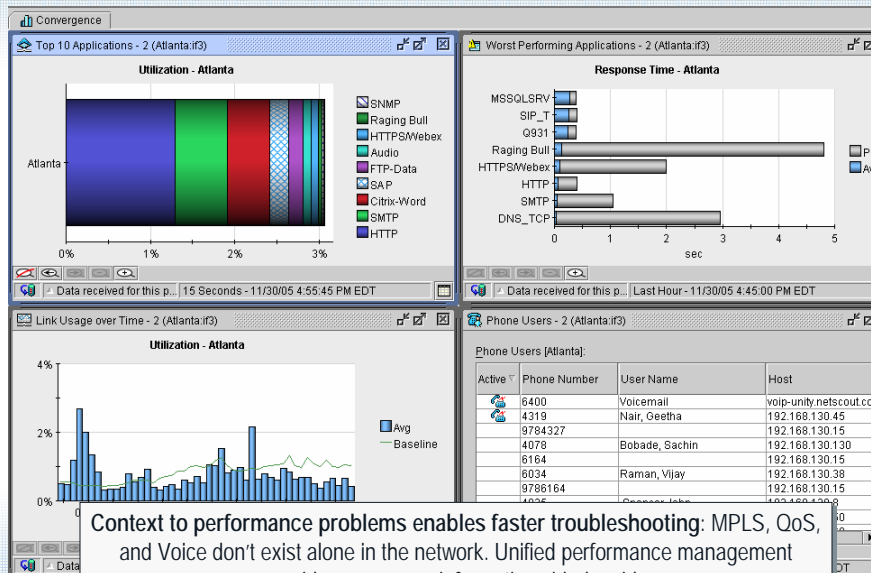
Most Recent Conversations - 1 (VoIP_IT_CM1:if3) [4224]

Details | Setup Details | Quality | Data Volume

Conversations: [192.168.99.21:3]

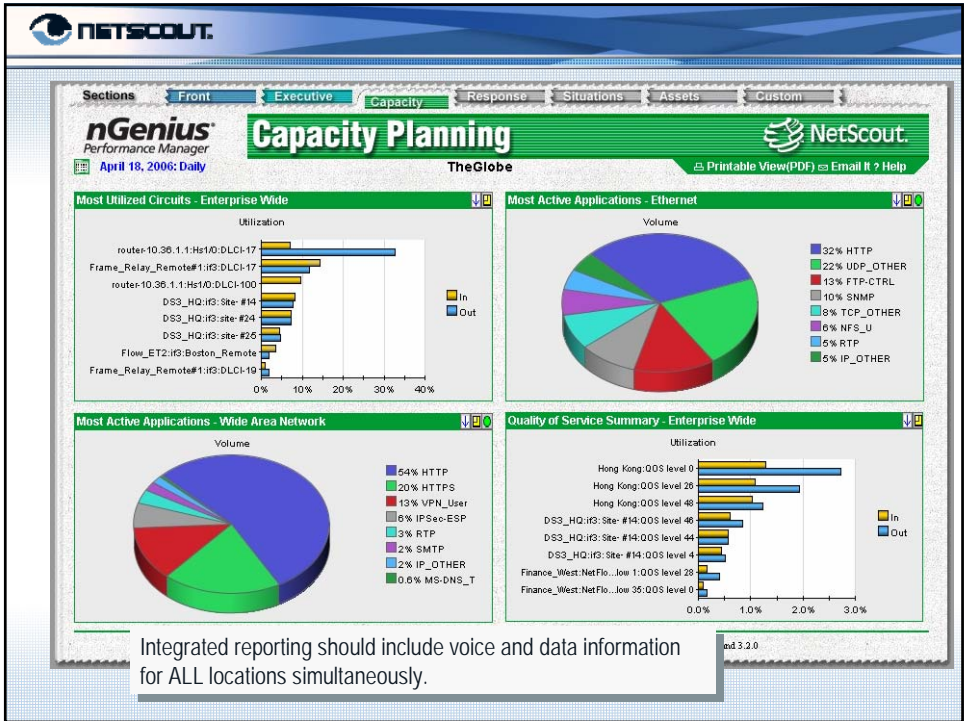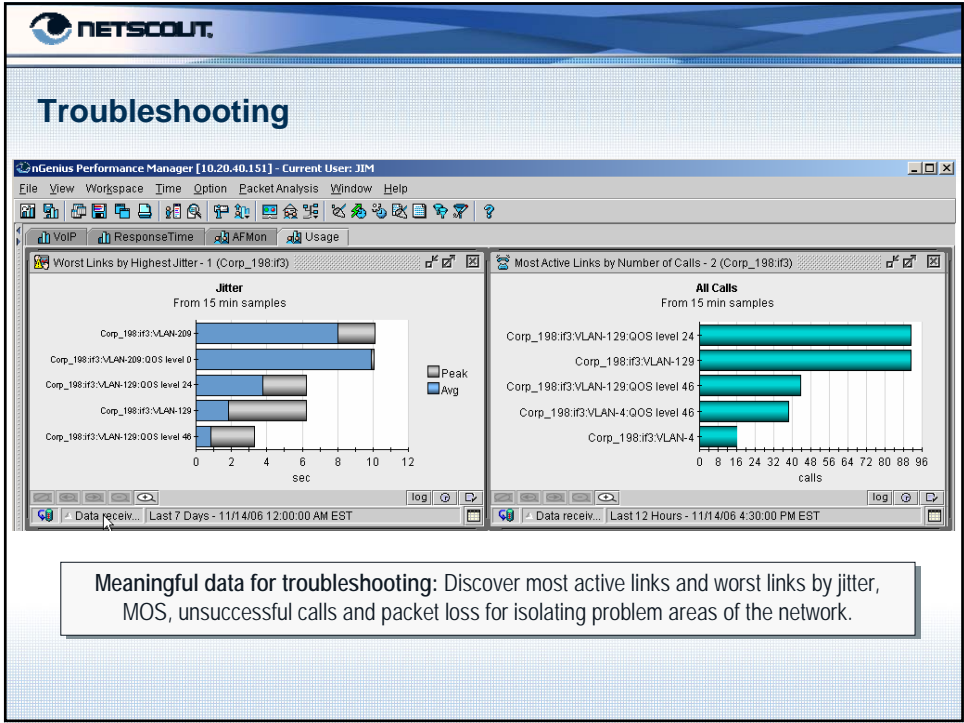| Active	Phone Number Sender	Phone Number Receiver	Packet Loss Out (%)	Packet Loss In (%)	Jitter Out	Jitter In	DSCP Out	DSCP In	IP Ad Send
	4224	6400	1.74	0.00	1,764	158	46	44	192.1
	4224	4371	0.00	0.00	0	0	46	40	192.1
	192.168.130.3	4224	0.00	0.00	0	0	40	46	192.1

Step Four: Ongoing Management
How is your network changing and growing over time?

- Converged networks need unified performance management
  - Managing the network in pieces can be time consuming
  - Unified product provides a lower TCO!
- Continuation of the tasks you performed in assessment and post-deployment impact phases
  - Troubleshooting - requiring real-time information
  - Planning and traffic engineering - requiring longer-term historical information
- Communication to key constituents
 - Easy to create, customizable reports

Converged networks need unified management

Context to performance problems enables faster troubleshooting: MPLS, QoS, and Voice don't exist alone in the network. Unified performance management provides necessary information side-by-side

Troubleshooting

Meaningful data for troubleshooting: Discover most active links and worst links by jitter, MOS, unsuccessful calls and packet loss for isolating problem areas of the network.

Integrated reporting should include voice and data information for ALL locations simultaneously.
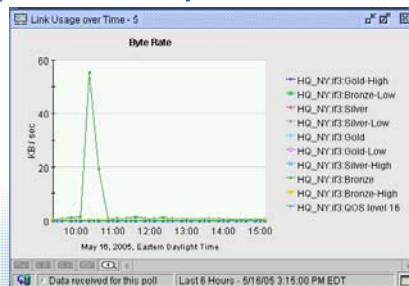
Customer Story – Lifecycle Management

- Medical instrumentation manufacturer
- Visibility Pain Point:
  - PPP WAN migrating to MPLS.
  - VoIP can't impede product/ process document maps (PDM) application for manufacturing process
  - Implemented site monitoring with *nGenius* LAN Probes for management today and for bandwidth requirements and monitoring during migration to MPLS.
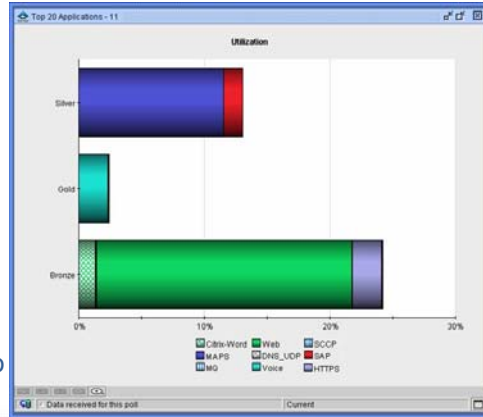
VoIP Rollout
Advance Planning Essential

- Large financial institution with 150+ branches
- VoIP pain point:
  - How to maintain quality delivery of business-critical applications during VoIP rollout
  - QoS implemented simultaneously to prioritize delivery

The nGenius Solution was used for advanced planning and for confirming QoS classifications during a VoIP rollout to ensure that business remained as usual. The company audited the existing network to forecast where adjustments were required to accommodate the new voice traffic.
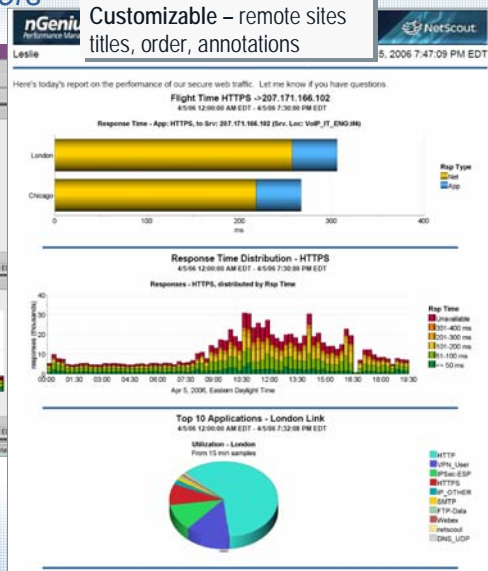
Actionable Collaboration
Sharing results with stakeholders

Customizable – remote sites titles, order, annotations

Collaboration with peers, mgmt, line of business and customers requires actionable information e.g. email, pdfs.

Effective Lifecycle Management
Performance management for MPLS/VoIP/QoS networks

- Unified information to lower TCO and optimize IT staff productivity
  – Richest source of performance data from a broad selection of sources
  – Multi-purpose application, supporting many performance management tasks
- A business perspective of converged, global networks
  – Justify upgrades, policy decisions, and intelligent budgeting with total application-level information
  – Identify and eliminate policy violations, recreational use, and rogue applications
- Improved delivery of networked applications and services
  – Unified view of all applications – voice and data – in context to their environment to help you quickly troubleshoot problems that involve interaction of multiple applications
  – Cost-containing, business relevant traffic engineering

Superior Company

- Technology leader with a clear vision
- The most experienced team in the industry
  - Founded in 1984
  - Over 360 employees
- Growing, profitable
  - $100M revenue run rate
  - $95M in cash, no debt
- World-wide distribution and support

Thank You

Questions?