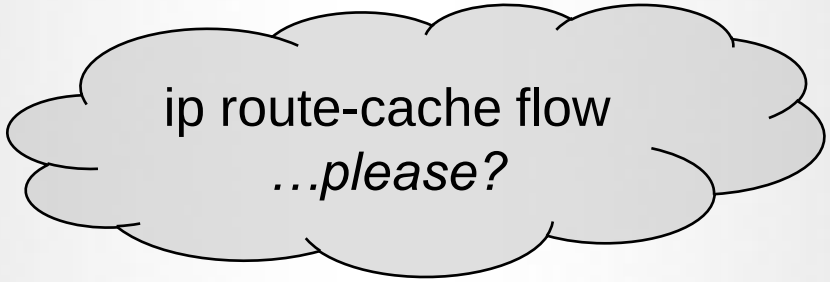
Leveraging Your Infrastructure for Performance Management



Ward Cobleigh

ward.cobleigh@flukenetworks.com

Because your network has *so much* it wants to tell you

Today's Agenda

- Fluke Networks overview
- Evolution of network management and infrastructure technologies
- Leveraging embedded technologies for performance management:
  - *Flow data*
  - *IP SLAs*
  - *Performance Routing*
- Open forum discussion

Who Is Fluke Networks?

- Began as an exploratory business unit within Fluke Corporation in 1992
  - *Fluke Corporation has 60 years as world-leader of electronic test tools*
- In 2000, growth and market conditions caused Fluke Networks to become a separate business
  - *Fluke Networks and Fluke Corporation are separate and distinct entities*
  - *Both are part of the Danaher family of companies (NYSE:DHR)*

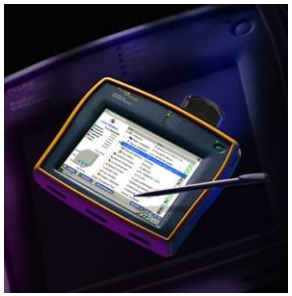
DSP-100
Fluke Networks'
First Cable Tester

Fluke Networks'
First Handheld
Network Analyzer

DANAHER

Danaher, a diversified technology leader, designs, manufactures, and markets innovative products and services with strong brand names and significant market positions over 6 strategic platforms

Test & Measurement



FLUKE

FLUKE networks

VISUAL NETWORKS

CRANNOGSOFTWARE

Tektronix
Enabling Innovation

Environmental

Hand Tools

Motion

Medical

Product ID

Fluke Networks Today

- Part of a $11B premiere global enterprise
- Continuously profitable company since its inception
- Total annual sales exceed $340M
- Over 800 associates worldwide
  - Worldwide Headquarters: Everett, WA
  - Major research & development facilities: Colorado Springs, CO; Austin, TX; Dallas, TX; Duluth, GA; Cincinnati, OH; Bridgewater, NJ; Rockville, MD; Dublin, Ireland; Bangalore, India; Shanghai, China
  - Sales Offices & Associates Worldwide: Extensive operations in Europe, Asia, Australia, South America and North America
  - Technical Assistance Centers: Everett, WA; Watford, UK; Rockville, MD

Fluke Networks' Core Customers

Enterprise Managers

Distributed and handheld
LAN and WAN
test and analysis solutions

Datacom Installers

Copper & fiber cable
certification and troubleshooting
Communication networks testing

Communication Service Providers

xDSL qualification
Process improvement
Access management and testing

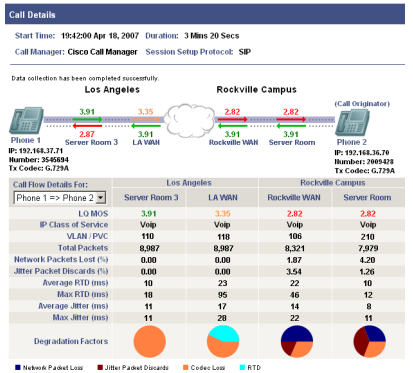
Fluke Networks Performance Management (PfM)

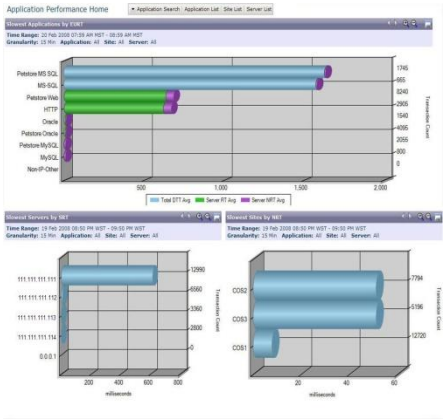
Overview

- Manage application performance and network performance in a converged voice/data network
- Broad enterprise visibility, deep analysis and detailed troubleshooting capability

Value to our customers

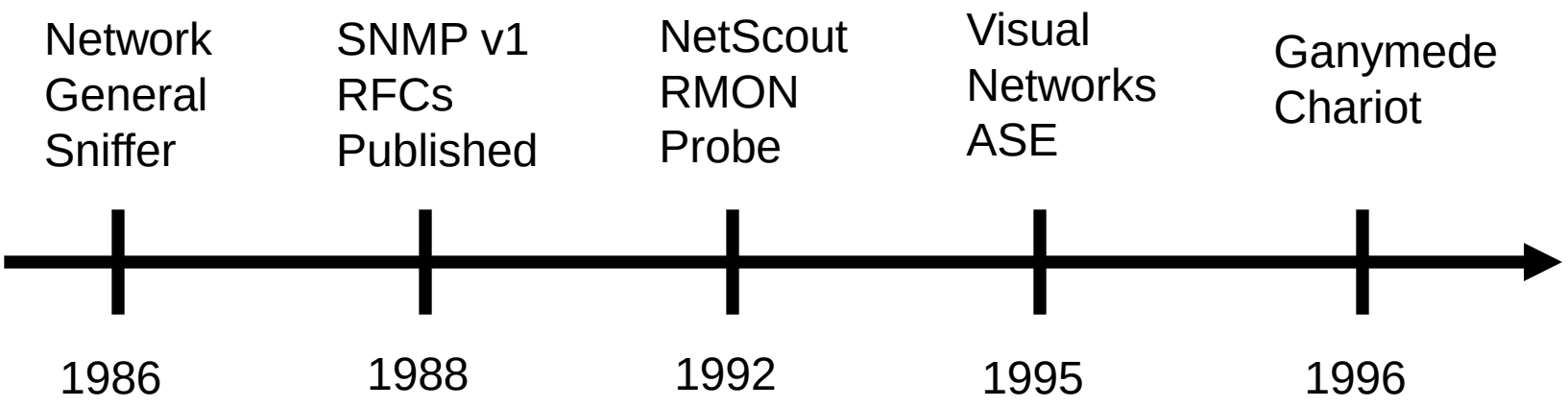
- Maximize the value of IT by delivering superior IT services
- Provide quality end user experience through:
  - *Proactive monitoring and management*
  - *Reactive troubleshooting and recovery*





Network Management & Infrastructure Technologies Milestones

Early Network Management Milestones



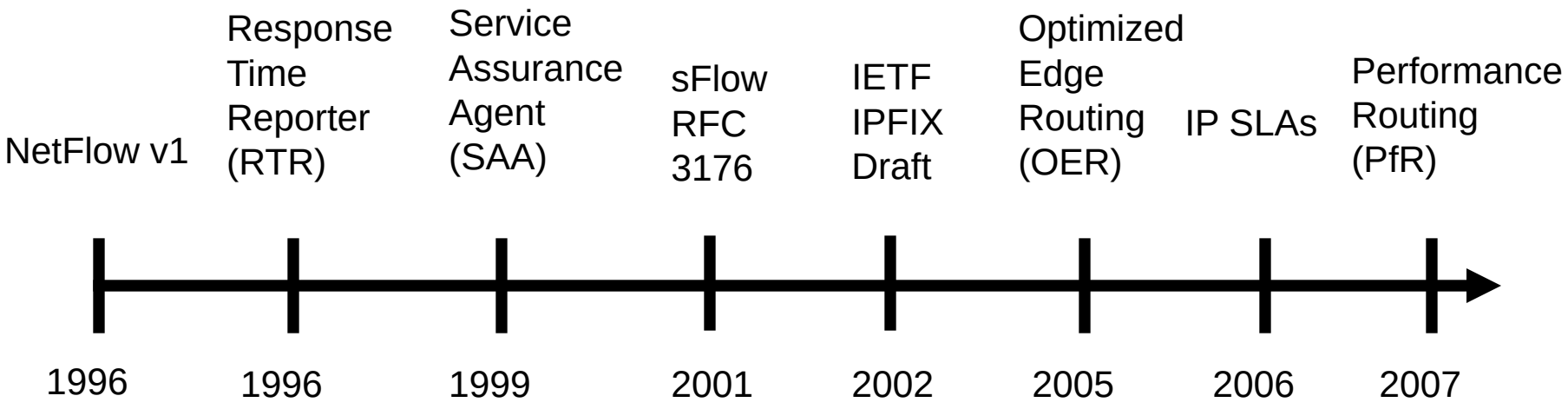
- Hardware probes
- Software agents
- Primarily focused on reactive troubleshooting

Things Were Changing…

- Evolution from shared to switched media (first Ethernet switch introduced in 1989)
- Faster speeds and feeds becoming more commonplace (Gigabit Ethernet standardized in 1998)
- Data volumes and network configurations began to challenge the “capture and analyze everything” philosophy (MPLS standardized in 2001)

- Processing power of infrastructure devices increasing
- Routers and switches could do more than just route and switch

Embedded Technologies Milestones



- Embedded functionality
- No probes or agents required
- Better suited for proactive performance management

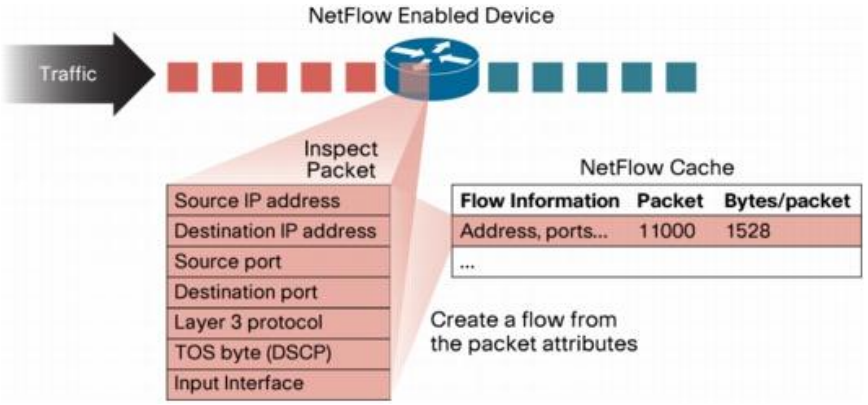
Cisco IOS NetFlow
IPFIX
Flow-based technologies

What Is NetFlow?

"YOU CAN THINK OF NETFLOW AS A FORM OF TELEMETRY PUSHED FROM ROUTERS AND LAYER 3 SWITCHES, EACH ONE ACTING AS A SENSOR."

JOHN CORNELL, CISCO IT TECHNICAL STAFF

- NetFlow is a protocol for a router or Layer 3 switch to quantify the traffic passing through it
  - *Traffic statistics are locally stored (cached)*
  - *Traffic statistics can be exported to other devices or applications for analysis and reporting*



- Applications for NetFlow: Troubleshooting, forensic traffic analysis, intrusion detection, capacity planning, usage based accounting, etc.

Flow Flavors

- Cisco IOS NetFlow v9: www.cisco.com/go/netflow
- IPFIX Working Group: http://www.ietf.org/html.charters/ipfix-charter.html
- sFlow: http://www.sflow.org/
  - *Alcatel-Lucent*
  - *Allied Telesis*
  - *Extreme Networks*
  - *Foundry Networks*
  - *H/P*
- J-Flow:

http://www.juniper.net/techpubs/software/erx/junose82/swconfig-ip-services/html/ip-jflow-stats-config.html

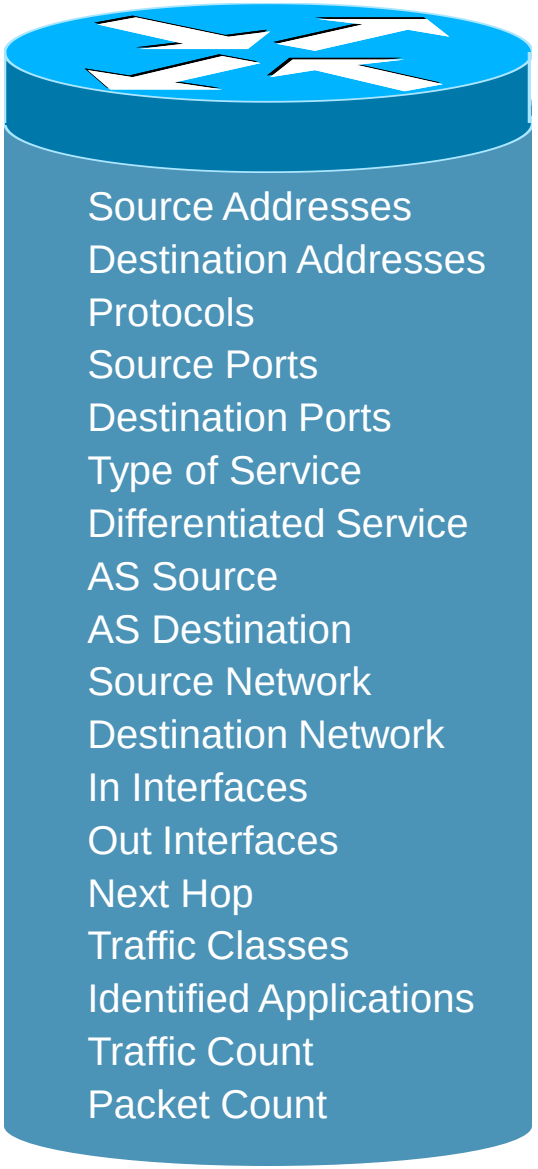
What you can learn watching network traffic

- "In advanced networks, the flow and analysis tools become a big deal."
- "Responsibility for network performance falls on the network team tools that provide deep behavioral analysis, traffic analysis and NetFlow analysis will become more critical."
- "Whether is network behavior analysis or application traffic flows, the key to understanding business issues such as end user experience lies in monitoring traffic."

George Hamilton, director of Yankee Group's enabling technologies enterprise group (3/08)

Flow Data Evolution

- Great data source, but…
  - *How do you keep the data for a meaningful amount of time at a useful level of granularity?*
  - *How can you easily manipulate this data to quickly get to what you need?*
  - *How do you present the data in a simple, intuitive manner?*



What "Top N" Doesn't Tell You

Top hosts, conversations, protocols

My servers are busy

What's really happening on my network

"Other"

How MySpace Is Hurting Your Network

Social networking sites drive up DNS traffic, bandwidth

Increasingly popular social-networking sites such as MySpace, YouTube and Facebook are accounting for such huge volumes of DNS queries and bandwidth consumption that carriers, universities and corporations are scrambling to keep pace.

Social-networking sites create large volumes of DNS traffic because they pull content from all over the Internet. Most of these sites use content-delivery networks to extend the geographical reach of their content so users can access it closer to home.

"A single MySpace page can have anywhere from 200 to 300 DNS lookups, while a normal news site with ads might have 10 to 15 DNS lookups," Tovar says. "It's an exponential increase.“

"They're making use of an awful lot of short TTLs [time to live values]," Oborn says. "That increases the load on the DNS servers. The same thing would happen for an enterprise customer as you see happening on a service provider network.“

The impact of social-networking sites is primarily on carrier and university networks today, but it is likely to affect more corporations as they add social-networking features to their e-commerce and intranet sites.

By Carolyn Duffy Marsan, Network World, 06/22/07

MS-SQL Slammer

NETWORKSUPERVISION

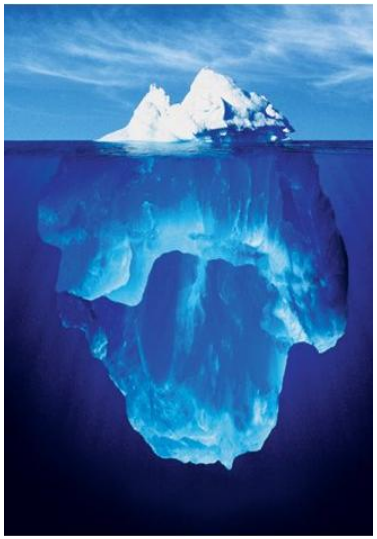
Conversations

Time Range: 14-Aug-2007, 16:56 IST - 16:57 IST
Source Address: 116.32.207.100
Dest Application: MS SQL

Results 1 to 233 of 22772

Source Address	Source App.	Dest. Address	Dest. App.	Traffic	% of Total Traffic	Packets	% of Total Packets
116.32.207.100	6000/TCP	149.153.0.0	1433/TCP (MS SQL)	5.33 bps (40 B)	<1%	0.02 /s (1)	<1%
116.32.207.100	6000/TCP	149.153.0.1	1433/TCP (MS SQL)	5.33 bps (40 B)	<1%	0.02 /s (1)	<1%
116.32.207.100	6000/TCP	149.153.0.2	1433/TCP (MS SQL)	5.33 bps (40 B)	<1%	0.02 /s (1)	<1%
116.32.207.100	6000/TCP	149.153.0.3	1433/TCP (MS SQL)	5.33 bps (40 B)	<1%	0.02 /s (1)	<1%
116.32.207.100	6000/TCP	149.153.0.4	1433/TCP (MS SQL)	5.33 bps (40 B)	<1%	0.02 /s (1)	<1%
116.32.207.100	6000/TCP	149.153.0.5	1433/TCP (MS SQL)	5.33 bps (40 B)	<1%	0.02 /s (1)	<1%
116.32.207.100	6000/TCP	149.153.0.6	1433/TCP (MS SQL)	5.33 bps (40 B)	<1%	0.02 /s (1)	<1%
116.32.207.100	6000/TCP	149.153.0.7	1433/TCP (MS SQL)	5.33 bps (40 B)	<1%	0.02 /s (1)	<1%
116.32.207.100	6000/TCP	149.153.0.8	1433/TCP (MS SQL)	5.33 bps (40 B)	<1%	0.02 /s (1)	<1%
116.32.207.100	6000/TCP	149.153.0.9	1433/TCP (MS SQL)	5.33 bps (40 B)	<1%	0.02 /s (1)	<1%
116.32.207.100	6000/TCP	149.153.0.10	1433/TCP (MS SQL)	5.33 bps (40 B)	<1%	0.02 /s (1)	<1%
116.32.207.100	6000/TCP	149.153.0.11	1433/TCP (MS SQL)	5.33 bps (40 B)	<1%	0.02 /s (1)	<1%
116.32.207.100	6000/TCP	149.153.0.12	1433/TCP (MS SQL)	5.33 bps (40 B)	<1%	0.02 /s (1)	<1%
116.32.207.100	6000/TCP	149.153.0.13	1433/TCP (MS SQL)	5.33 bps (40 B)	<1%	0.02 /s (1)	<1%
116.32.207.100	6000/TCP	149.153.0.14	1433/TCP (MS SQL)	5.33 bps (40 B)	<1%	0.02 /s (1)	<1%
116.32.207.100	6000/TCP	149.153.0.15	1433/TCP (MS SQL)	5.33 bps (40 B)	<1%	0.02 /s (1)	<1%
116.32.207.100	6000/TCP	149.153.0.16	1433/TCP (MS SQL)	5.33 bps (40 B)	<1%	0.02 /s (1)	<1%
116.32.207.100	6000/TCP	149.153.0.17	1433/TCP (MS SQL)	5.33 bps (40 B)	<1%	0.02 /s (1)	<1%
116.32.207.100	6000/TCP	149.153.0.18	1433/TCP (MS SQL)	5.33 bps (40 B)	<1%	0.02 /s (1)	<1%
116.32.207.100	6000/TCP	149.153.0.19	1433/TCP (MS SQL)	5.33 bps (40 B)	<1%	0.02 /s (1)	<1%
116.32.207.100	6000/TCP	149.153.0.20	1433/TCP (MS SQL)	5.33 bps (40 B)	<1%	0.02 /s (1)	<1%
116.32.207.100	6000/TCP	149.153.0.21	1433/TCP (MS SQL)	5.33 bps (40 B)	<1%	0.02 /s (1)	<1%
116.32.207.100	6000/TCP	149.153.0.22	1433/TCP (MS SQL)	5.33 bps (40 B)	<1%	0.02 /s (1)	<1%
116.32.207.100	6000/TCP	149.153.0.23	1433/TCP (MS SQL)	5.33 bps (40 B)	<1%	0.02 /s (1)	<1%
116.32.207.100	6000/TCP	149.153.0.24	1433/TCP (MS SQL)	5.33 bps (40 B)	<1%	0.02 /s (1)	<1%
116.32.207.100	6000/TCP	149.153.0.25	1433/TCP (MS SQL)	5.33 bps (40 B)	<1%	0.02 /s (1)	<1%
116.32.207.100	6000/TCP	149.153.0.26	1433/TCP (MS SQL)	5.33 bps (40 B)	<1%	0.02 /s (1)	<1%
116.32.207.100	6000/TCP	149.153.0.27	1433/TCP (MS SQL)	5.33 bps (40 B)	<1%	0.02 /s (1)	<1%
116.32.207.100	6000/TCP	149.153.0.28	1433/TCP (MS SQL)	5.33 bps (40 B)	<1%	0.02 /s (1)	<1%
116.32.207.100	6000/TCP	149.153.0.29	1433/TCP (MS SQL)	5.33 bps (40 B)	<1%	0.02 /s (1)	<1%
116.32.207.100	6000/TCP	149.153.0.30	1433/TCP (MS SQL)	5.33 bps (40 B)	<1%	0.02 /s (1)	<1%
116.32.207.100	6000/TCP	149.153.0.31	1433/TCP (MS SQL)	5.33 bps (40 B)	<1%	0.02 /s (1)	<1%
116.32.207.100	6000/TCP	149.153.0.32	1433/TCP (MS SQL)	5.33 bps (40 B)	<1%	0.02 /s (1)	<1%
116.32.207.100	6000/TCP	149.153.0.33	1433/TCP (MS SQL)	5.33 bps (40 B)	<1%	0.02 /s (1)	<1%
116.32.207.100	6000/TCP	149.153.0.34	1433/TCP (MS SQL)	5.33 bps (40 B)	<1%	0.02 /s (1)	<1%
116.32.207.100	6000/TCP	149.153.0.35	1433/TCP (MS SQL)	5.33 bps (40 B)	<1%	0.02 /s (1)	<1%
116.32.207.100	6000/TCP	149.153.0.36	1433/TCP (MS SQL)	5.33 bps (40 B)	<1%	0.02 /s (1)	<1%
116.32.207.100	6000/TCP	149.153.0.37	1433/TCP (MS SQL)	5.33 bps (40 B)	<1%	0.02 /s (1)	<1%
116.32.207.100	6000/TCP	149.153.0.38	1433/TCP (MS SQL)	5.33 bps (40 B)	<1%	0.02 /s (1)	<1%
116.32.207.100	6000/TCP	149.153.0.39	1433/TCP (MS SQL)	5.33 bps (40 B)	<1%	0.02 /s (1)	<1%

22,772 Conversations in ONE MINUTE!



Less than 900KB

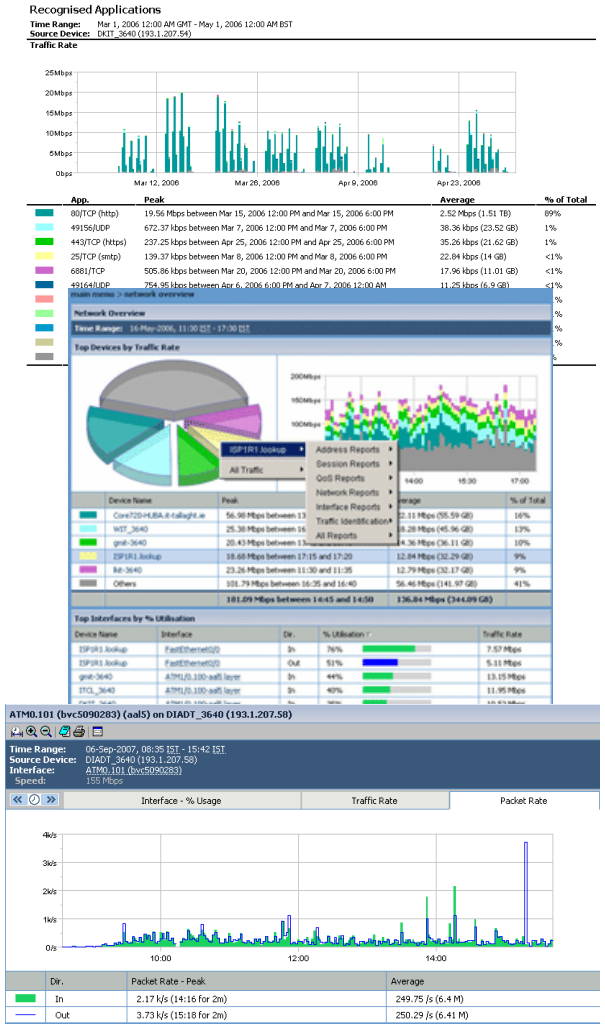
Questions To Consider

- How will we use flow data to:
  - *Solve a current problem?*
  - *Achieve an organizational goal?*
  - *Satisfy an identified need?*
- What depth, breadth, coverage is required?
- Is flow data available everywhere we need it?
- How long will we need to retain the data?
- Who will use the information?

There is no one-size-fits-all solution for flow data analysis

NetFlow Tracker

- Supports all major flow types
- All of the flows, all of the time:
  - *Not Top-N limited (Top-N-y)*
  - *Keep real time data at one minute resolution indefinitely*
- User-defined data retention and granularity
- “Sweep and swoop” from high-level summaries right down to individual flows
- 100% web-based, fully URL controllable
- Available as an appliance or software only



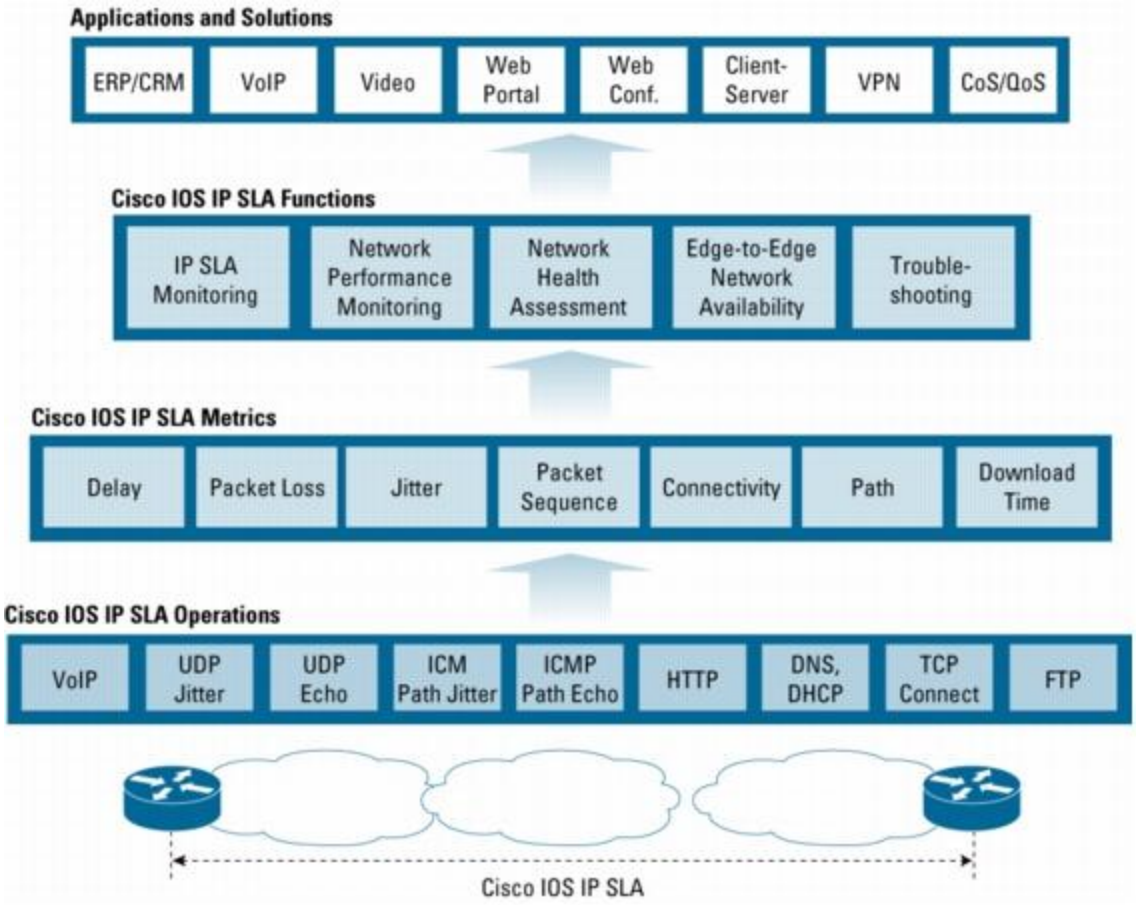
NetFlow Tracker Demo

Cisco IOS IP Service Level Agreements (IP SLAs)

What Are IP SLAs?

- Formerly known as the Service Assurance Agent (SAA) or Response Time Reporter (RTR)
- Active traffic generation in a continuous, reliable, predictable manner for measuring network, application, and voice performance
- Generated traffic simulates network applications like VoIP and collects performance information in real-time.
- Routers and switches are configured to be IP SLA agents or IP SLA responders (agents initiate tests)
- Agent test results stored in Cisco RTTMON-MIB

IP SLA Operations, Metrics, Functions



Why use Cisco IP SLAs?

IP SLAs is an Embedded IP Application Service in the Network

- **Service Level Agreement (SLA)** Monitoring and validation.
- **Performance** and **Availability** validation testing of the Networks
- Additional **Trend Monitoring** to NMS
- **Network Baselines** – Prepare for New Services
- Aid **Troubleshooting & Fault** Analysis
- Performance Issue Isolation **@ or between** Any two Network Nodes
- **Change Control Impact** – Verify Performance and Health impacts.
- **Ubiquity** – IP SLAs is on nearly every Cisco platform and OS

UDP Jitter with VoIP MOS Score

- Introduced in Cisco IOS 12.3(4)T
- This enhanced UDP Jitter operation reports both Mean Opinion Score (**MOS**) and Calculated Planning Impairment Factor (**ICPIF**)
- The results estimate the users VoIP experience through the network and should be used as part of reporting in conjunction and comparison with passive measurement technologies as well.
- Supported Codecs:

  G.711 A Law (g711alaw: 64 kbps PCM compression method)

  G.711 mu Law (g711ulaw: 64 kbps PCM compression method)

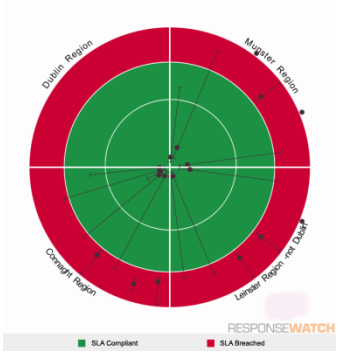
  G.729A (g729a: 8 kbps CS-ACELP compression method)

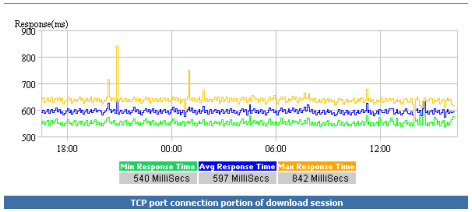
Questions To Consider

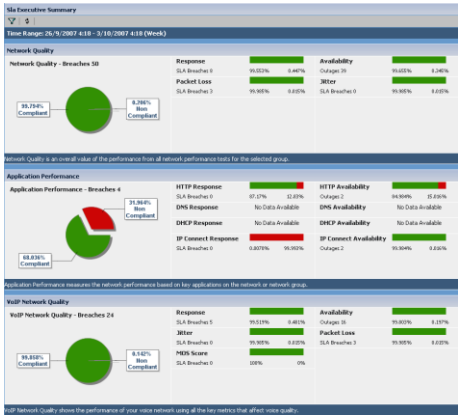
- How can we effectively utilize IP SLAs for:
  - *VoIP pre-assessment testing?*
  - *Network/Application/VoIP troubleshooting?*
  - *Monitoring server availability and responsiveness?*
- How do IP SLAs fit with our existing tool set and network management approach?
- Do we have adequate coverage?
- What additional visibility will we need?
- Who will use the information?

Fluke Networks *ResponseWatch*

- Can monitor any Cisco IP SLA test type
- Reporting presentation by response times and SLA compliance
- Internal and External SLA monitoring
- Performance visibility for business-critical applications
- Network performance monitoring
- Network operation troubleshooting
- IP service (e.g., VoIP) network health readiness or assessment
- Edge-to-edge network availability monitoring
- Alerting (Syslog output)
- 100% web enabled (no console)







ResponseWatch Demo

Reference

Cisco IP SLAs on Cisco.com:
http://www.cisco.com/go/ipsla

Cisco IOS Performance Routing

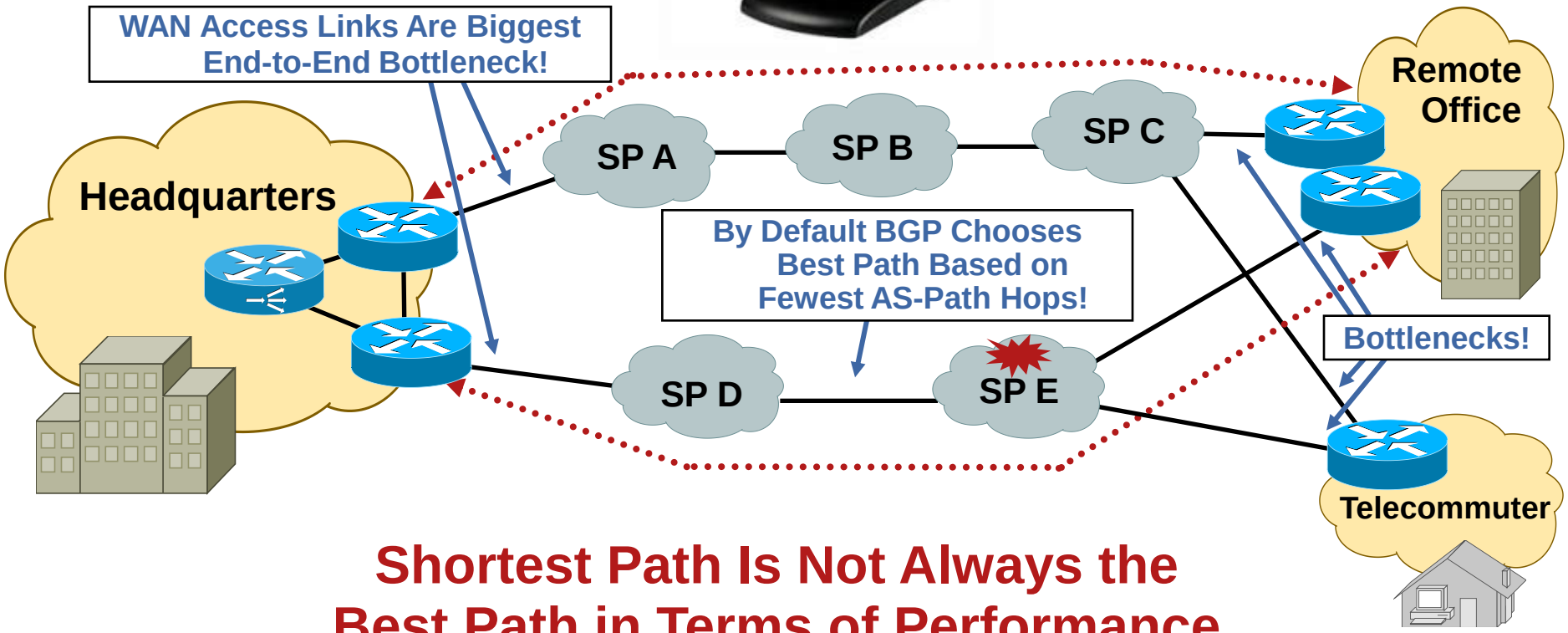
Cisco 'Empowered Branch' offerings
(9/26/07 announcement)

- Cisco 1861 Integrated Services Router (ISR)
- Cisco Catalyst® 2960 Series Switches with LAN Lite Cisco IOS® Software
- Cisco Intrusion Prevention System Advanced Integration Module (IPS AIM)

- *Cisco IOS Performance Routing (PfR) and High-End Cisco Wide Area Application Services (WAAS) Network Module. Accelerates business-critical applications and minimizes WAN bandwidth expenses with application-aware routing and WAN traffic optimization*

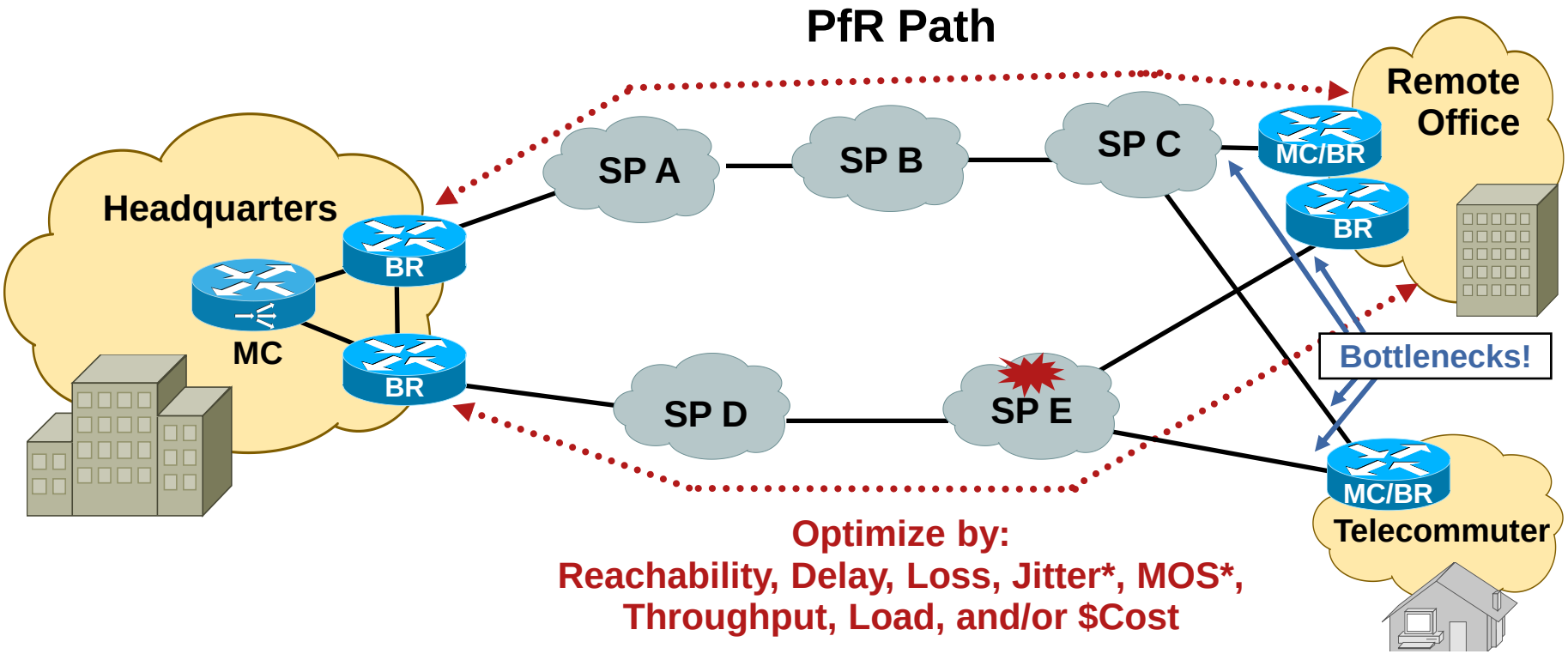
- Wireless LAN Controller support for IEEE 802.11n
- Cisco Unified Messaging Gateway

Best Path Selection, Two or More Paths



Shortest Path Is Not Always the Best Path in Terms of Performance

PfR Best Path



PfR Components

- BR—Border Router
- MC—Master Controller (decision maker)

Selecting “Best” Traffic-Class Path

Link	Utilization	Delay (ms) Priority 1	Jitter (ms) Priority 2
Serial1	89%	100	30
Serial2	50%	113	30
Serial3	60%	119	32
Serial4	40%	150	20

Cisco PfR and Cisco WAAS Integration Adaptive WAN-Optimized Network

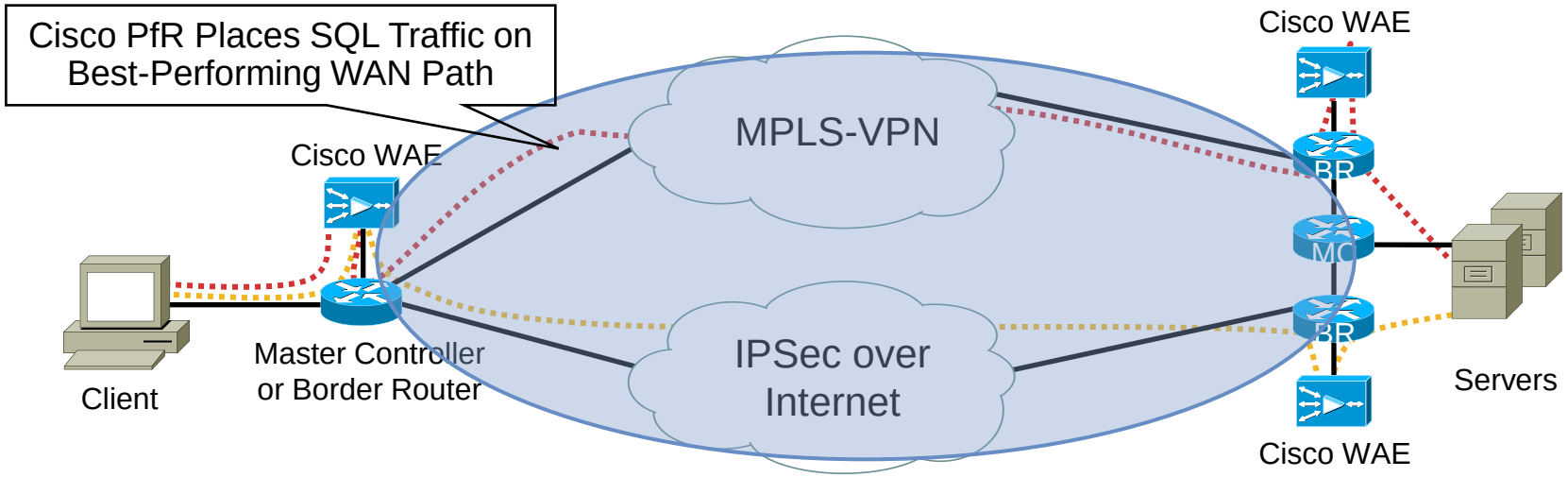
- Cisco® Wide Area Application Services (WAAS) optimizes the TCP session

  Reduction in latency and data on the wire

- Cisco PfR monitors and optimizes WAN path selection

  Not all WAN paths are equal: latency, loss, throughput, etc.

- Cisco WAAS network transparency allows individualized session placement by Cisco PfR over best WAN path



Questions To Consider

- Are we making optimal use of all available bandwidth and paths?
- Would it be advantageous to route around network congestion or service provider performance problems?
- Are there business-critical applications that should receive priority treatment?
- Do we know how the network is performing under normal circumstances?
- Will leveraging PfR, NetFlow, and IP SLAs help IT deliver better service to the business and to our customers?

Fluke Networks *PfR Manager*

CISCO Compatible

What is Fluke Networks *PfR Manager*?

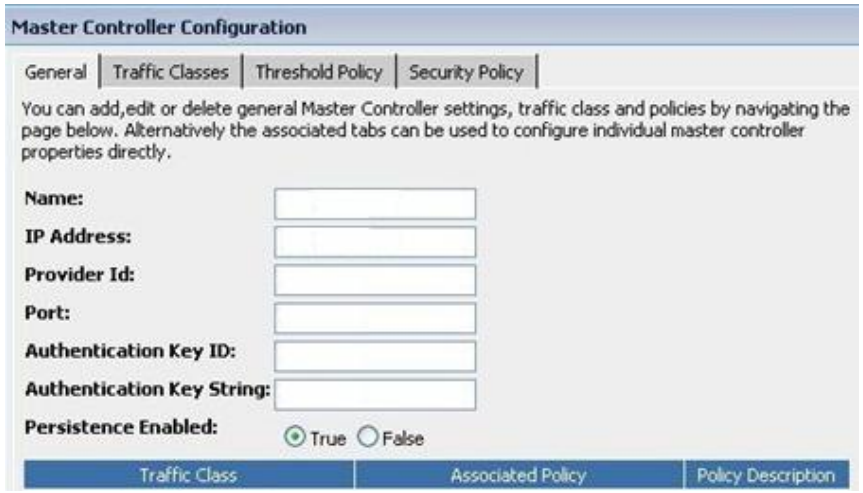
- Developed in partnership with Cisco over an 18-month period
- Browser-based Windows application
- Complete, intuitive graphical user interface for:
  - *PfR Traffic Class and Policy configuration*
  - *Real-time analysis, status updates, troubleshooting*
  - *Historical reporting*
- The only PfR management system available today

Fluke Networks *PfR Manager—Why?*

- *PfR Manager* provides a graphical user interface for:
  - *PfR Traffic Class and Policy configuration*
  - *Real-time analysis, status updates, troubleshooting*
  - *Historical reporting*
- *PfR Manager* reduces learning curve, time, and costs associated with PfR testing, configuration, implementation, and administration
- *PfR Manager* helps you understand and demonstrate the impact of change—what value is PfR providing?

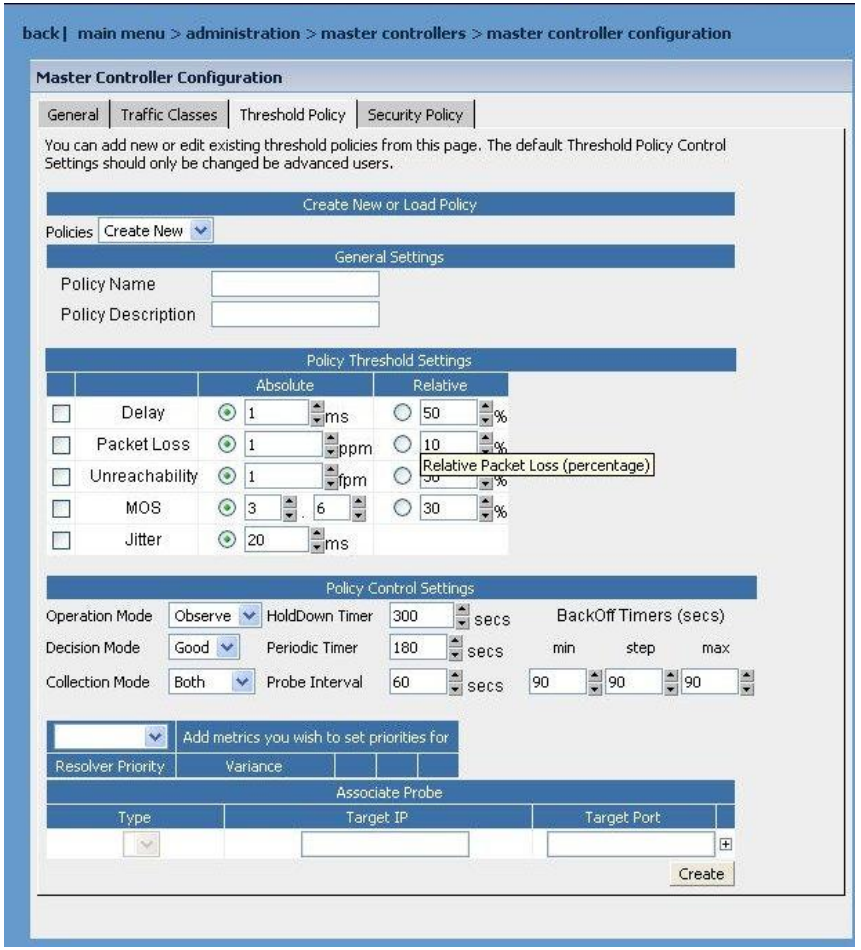
How *PfR Manager* Works

- *PfR Manager* communicates directly with the Master Controllers via secure API link
- *PfR Manager* sends Traffic Class and Policy configuration data to the Master Controllers
- PfR Manager receives:
  - *Performance statistics*
  - *Status of classes and exits*
  - *Events*
- Web-based interface, URL-accessible reporting
- Role-based security

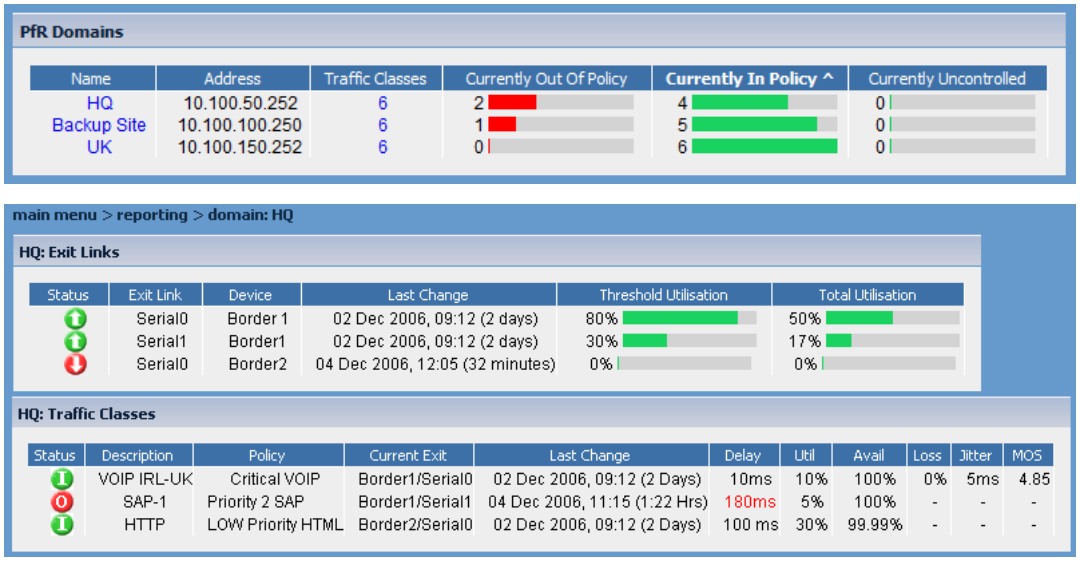


Configuring PfR with *PfR Manager*

- Define Traffic Classes
  - *Addresses, ports, protocols, DSCP values*
- Configure policy thresholds
- Choose modes of operation
  - *Observe or Control*
  - *Good or Best*
  - *Passive or Active*
- Create security policies



PfR Manager—Status Reporting and Navigation



PfR Domains

Name	Address	Traffic Classes	Currently Out Of Policy	Currently In Policy ^	Currently Uncontrolled
HQ	10.100.50.252	6	2	4	0
Backup Site	10.100.100.250	6	1	5	0
UK	10.100.150.252	6	0	6	0

main menu > reporting > domain: HQ

HQ: Exit Links

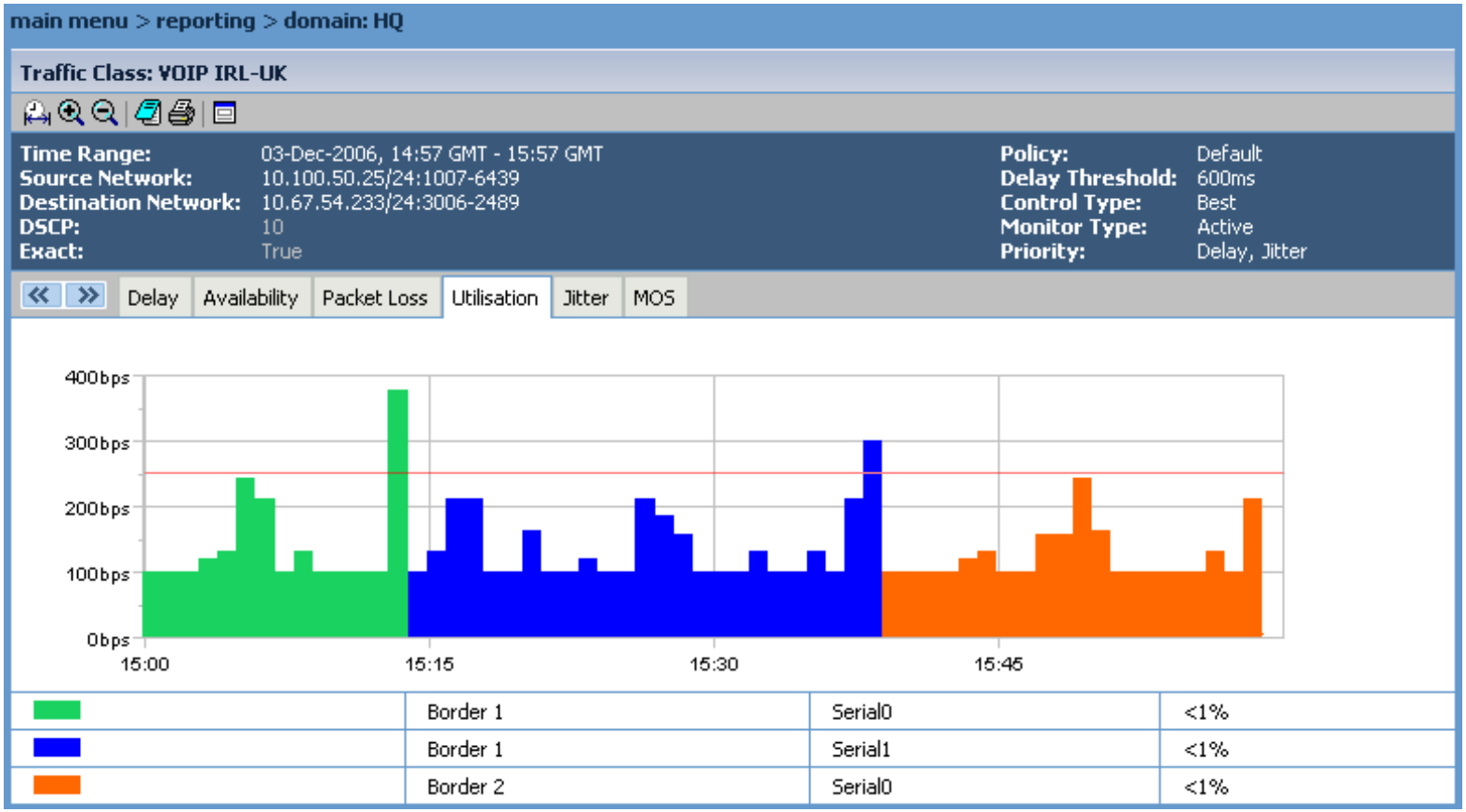
Status	Exit Link	Device	Last Change	Threshold Utilisation	Total Utilisation
↑	Serial0	Border 1	02 Dec 2006, 09:12 (2 days)	80%	50%
↑	Serial1	Border1	02 Dec 2006, 09:12 (2 days)	30%	17%
↓	Serial0	Border2	04 Dec 2006, 12:05 (32 minutes)	0%	0%

HQ: Traffic Classes

Status	Description	Policy	Current Exit	Last Change	Delay	Util	Avail	Loss	Jitter	MOS
1	VOIP IRL-UK	Critical VOIP	Border1/Serial0	02 Dec 2006, 09:12 (2 Days)	10ms	10%	100%	0%	5ms	4.85
0	SAP-1	Priority 2 SAP	Border1/Serial1	04 Dec 2006, 11:15 (1:22 Hrs)	180ms	5%	100%	-	-	-
1	HTTP	LOW Priority HTML	Border2/Serial0	02 Dec 2006, 09:12 (2 Days)	100 ms	30%	99.99%	-	-	-

- Aggregated view of vital statistics—single view of PfR Domains
- Traffic Class and Exit Link listing with current status
- At-a-glance status and performance data
- Problems on the network are immediately evident

History of Traffic Class Performance



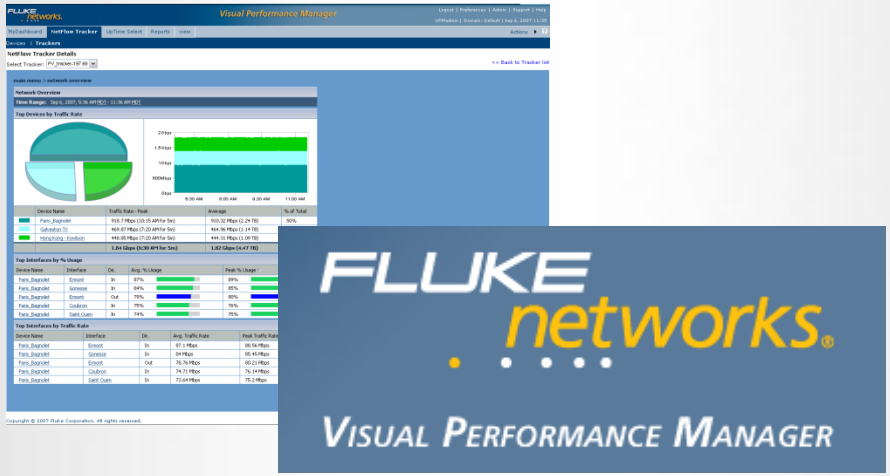
Reference

Cisco PfR on Cisco.com:
http://www.cisco.com/go/pfr/

Leveraging Embedded Technologies for Performance Management

- Unleash the full power of your infrastructure by utilizing embedded capabilities and data sources
  - *Flow data*
  - *IP SLAs*
  - *Performance Routing*
- Numerous applications: Troubleshooting, forensic analysis, capacity planning, VoIP pre-assessment testing, SLA management, proactive performance management
- Not a panacea; complements existing tools and technologies
- What problem are you trying to solve?

Bringing It All Together



Visual Performance Manager provides an integrated view of critical network data to deliver an unrivaled depth and breadth of information so that enterprises can more effectively manage end-to-end quality of experience

Thank You!

ward.cobleigh@flukenetworks.com

www.flukenetworks.com/cisco