



NetworkPhysics



## ***Troubleshooting Application Performance Issues Across MPLS Networks***

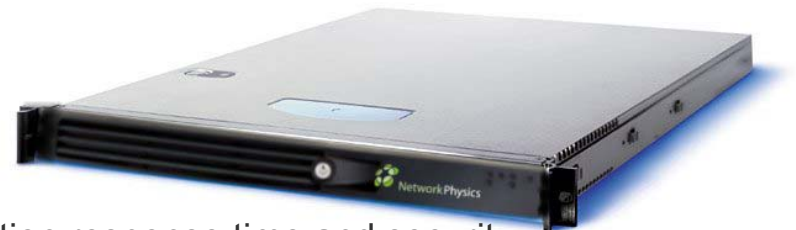
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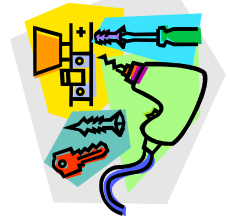
***MPLSCon 2005, New York***

- **Background**
  - Brief intro to Network Physics
  - “The network is slow”...or is it?
- **Building Blocks for Troubleshooting Application Performance**
  - Managing flows, distributed management
  - Application performance metrics
  - Troubleshooting data center, server, & app problems
- **Managing WAN & MPLS Issues**
  - BGP visibility & awareness
  - Internet & ISP management
  - Path analysis
- **Case Study Examples**
  - MPLS migration
  - Branch office performance management

- **What We Do:**
  - Enable enterprises to troubleshoot application response time issues across complex, converging networks
    - Performance, security, integrity of end-to-end application infrastructure
      - Across server, network, service provider, applications
- **Product Overview:**
  - Network application management appliances
    - **Troubleshoot** application response time problems
    - Accurately identify **problem source**: server, application, network, or provider
    - Pinpoint **infected** hosts and rogue traffic
  - NetSensory Enterprise Architecture
    - NetSensory OS: Distributed Network Application Management software
    - NP-2000: Edge intelligent appliances
    - NP-500: Branch office visibility
    - NP-Director: Global management appliance
- **Market:**
  - Network Application Management
  - Rapidly growing market for troubleshooting application response time and security issues



# “The Network’s Slow”

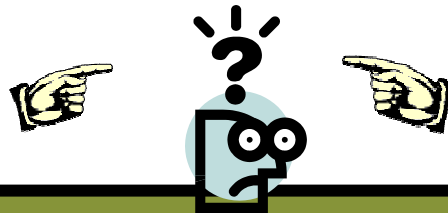
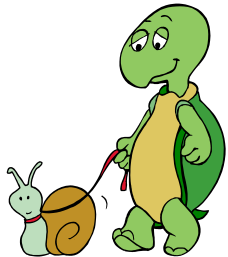


*I've instrumented my network...  
...bought all the right tools...  
...Mercury, OpenView, Concord...*



*...BUT...*

*...users are still complaining about slow response times...  
...the app and server teams are still blaming the network...  
...all my tools still say everything's OK...*



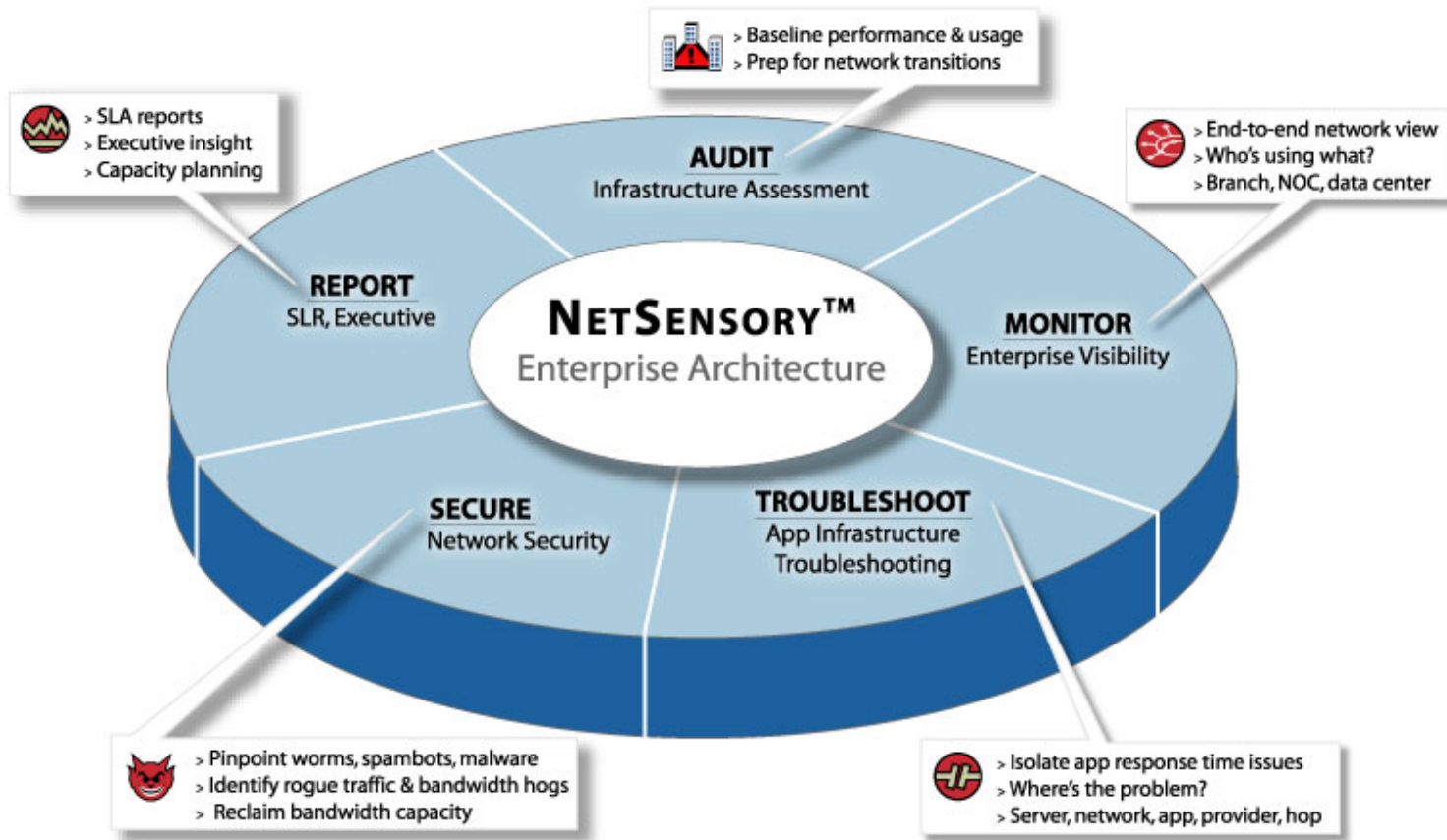
*...and no one, including me, knows for sure...  
so they blame... **THE NETWORK***

TIRED OF BEING THE  
**USUAL SUSPECT?**

Defend yourself against  
**"THE NETWORK  
IS SLOW"**



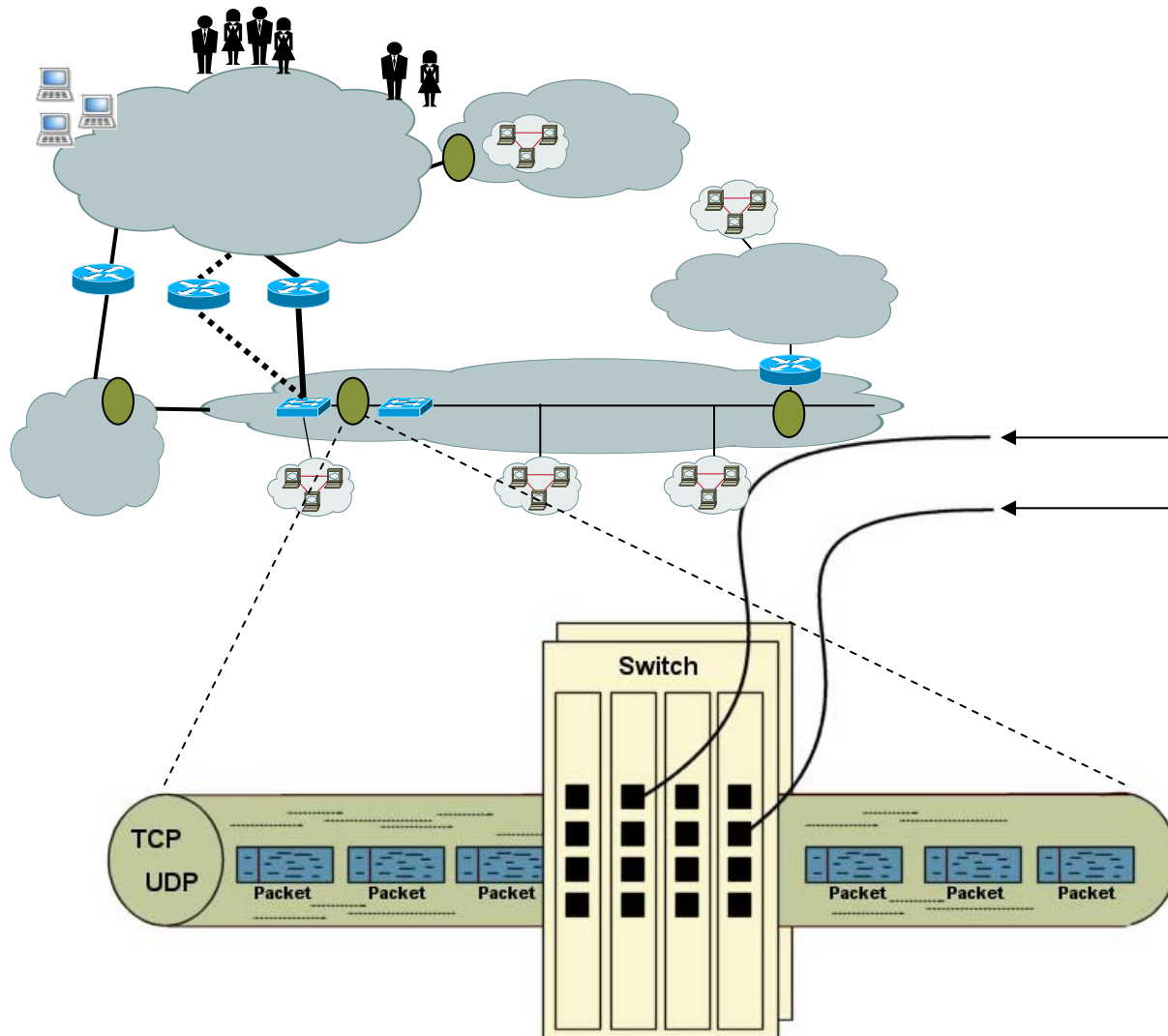
*The blueprint for application infrastructure integrity*



*It's NOT  
the Network*

# **Building Blocks for Troubleshooting Application Performance**

# Concept #1: Manage Your Flows, Not Your Devices



## Flow-Based Network Application Management

- **Flows = TCP, UDP connections**
  - End-to-end, Layer 4
  - Source, destination
  - Application or service port
- **Flow-based appliances monitor flows via switch spanning port or tap**
  - All traffic, all the time
- **Non-invasive: no agents, no SNMP, no polling, no synthetic transactions**
- **Inspect TCP, UDP flows in real-time to monitor performance, response time, utilization**
- **Deploy at major aggregation points to maximize flow visibility**



# Concept #2: Manage a Distributed Network with a Distributed Solution

## Three critical components

- 1 Distributed OS
- 2 Global Mgmt Appliance
- 3 Edge Intelligence

## Distributed OS

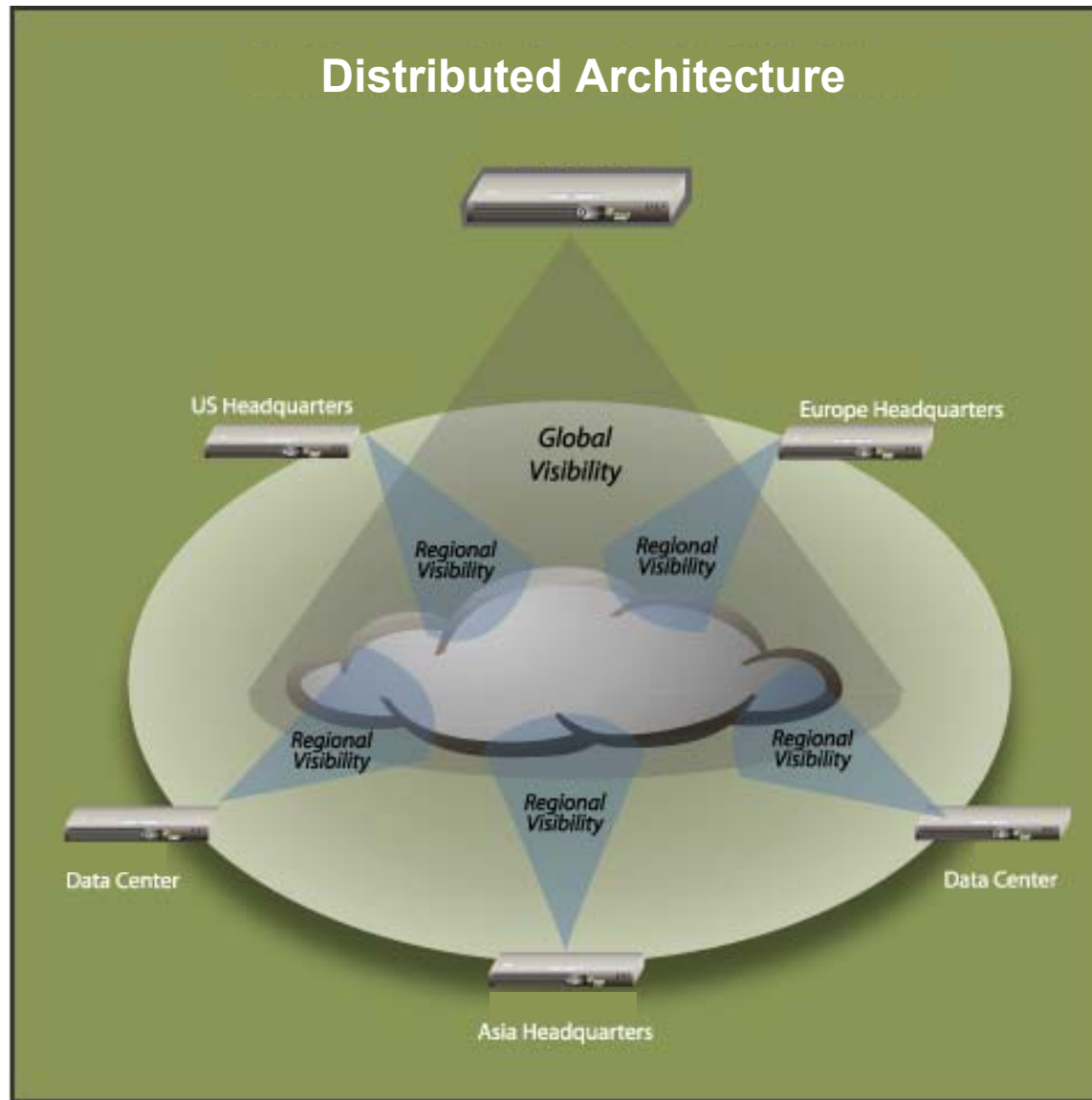
- Distributed enterprise-scale software
- Consistent across all appliances
- Coordinates global deployment

## Global Management Appliance

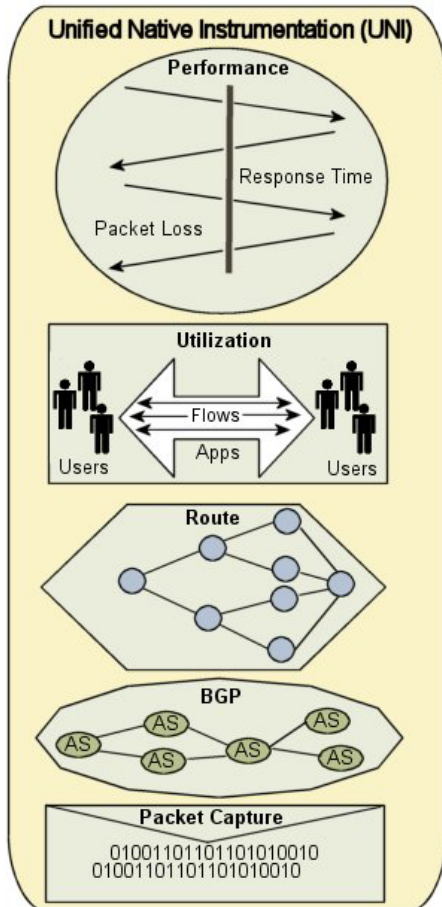
- New global aggregation appliance
- End-to-end enterprise view
  - Topology, alerts, reports
- Global troubleshooting
  - Application infrastructure issues
  - Isolating enterprise infections
- Harnesses edge intelligence

## Edge Intelligent Appliances

- Regional collection, analysis, correlation, storage
- Decentralized, not monolithic
- Federated databases
- Sense & respond locally

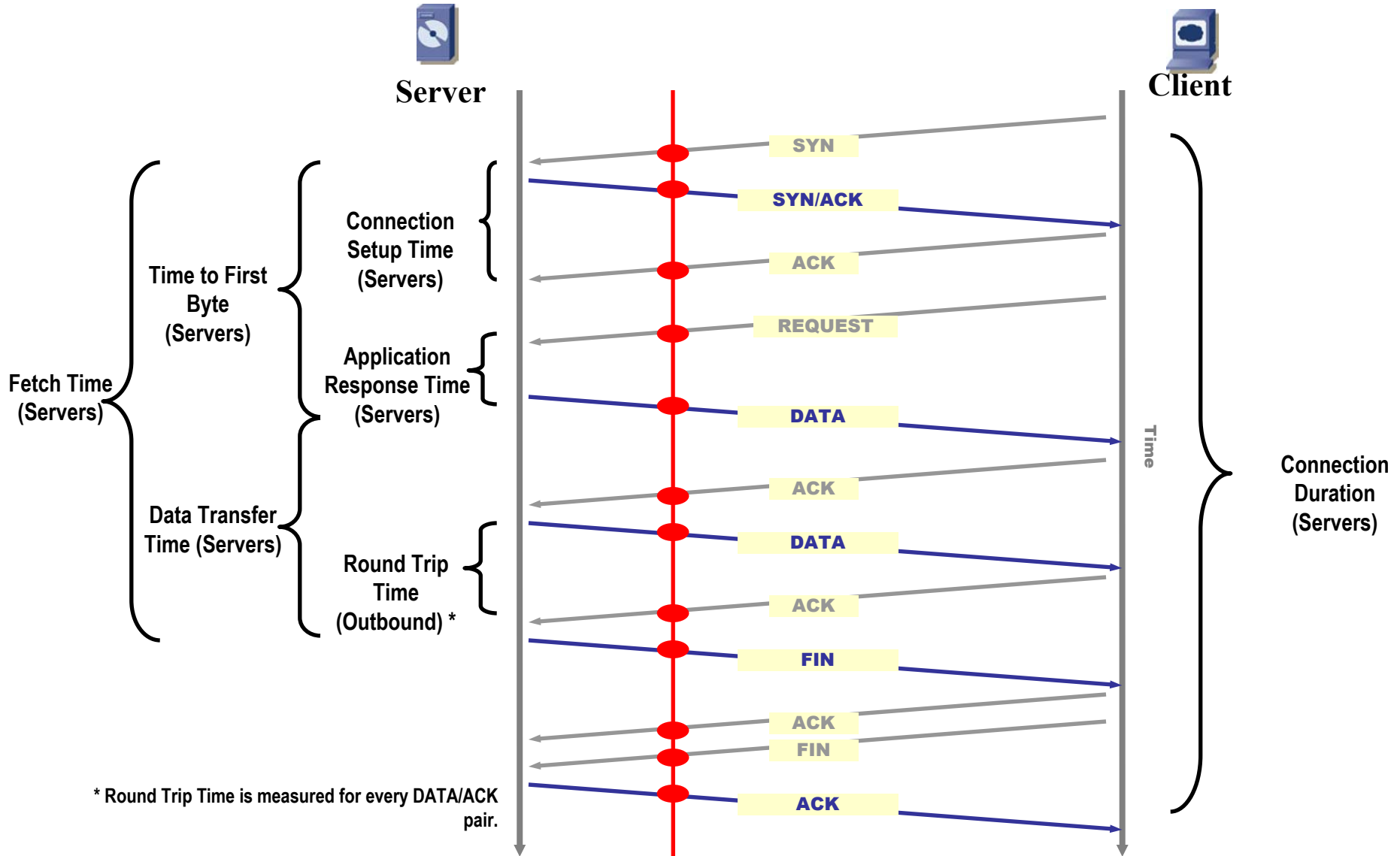


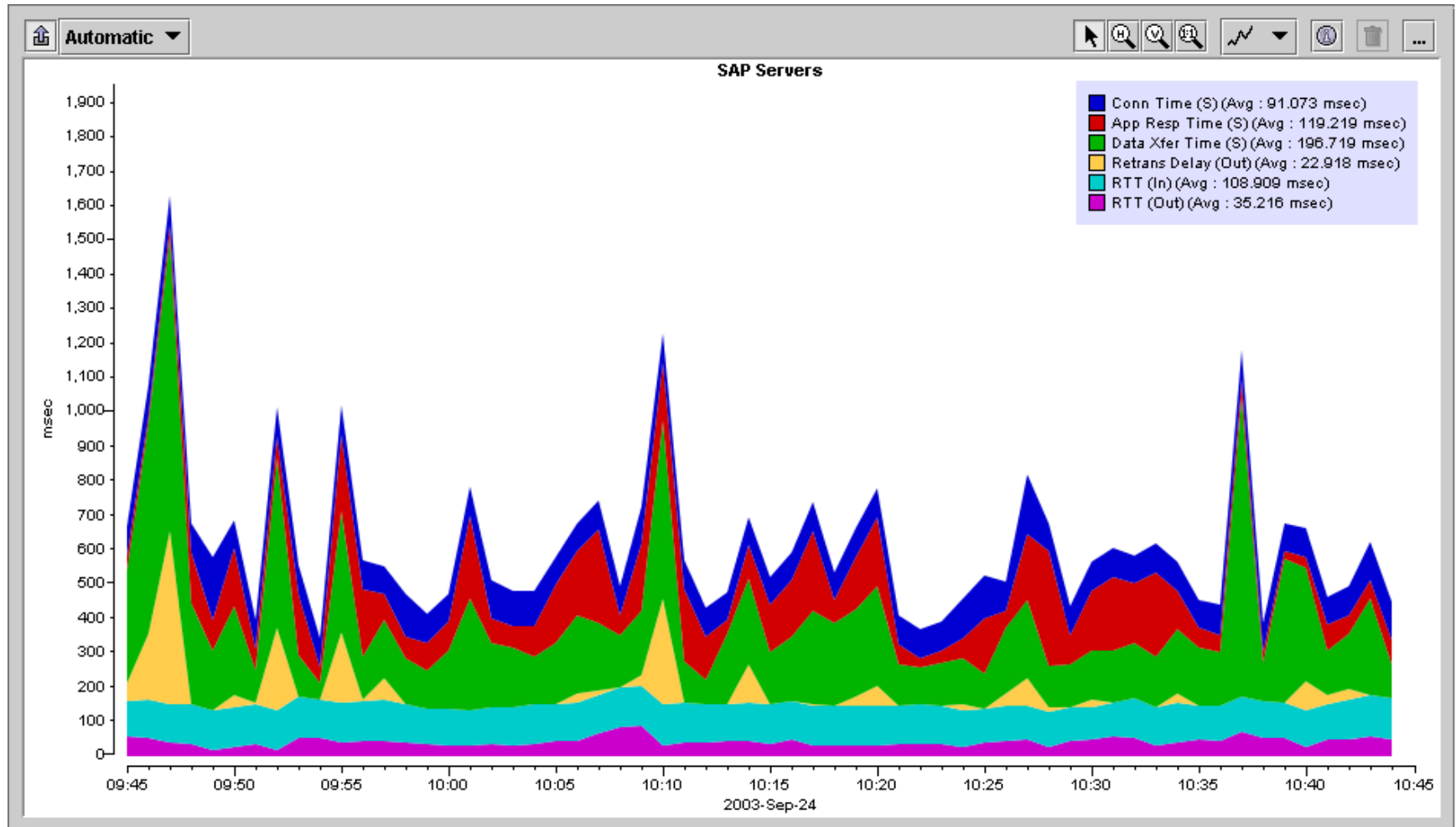
- **Depth and Breadth of Instrumentation**
  - Agentless, flow-based approach: minimal footprint, non-invasive
  - Application performance per user per app
  - Usage metrics
  - Visibility into network cloud
  - Route analytics
  - Packet
- **Business Relevance**
  - Group flows in business-centric context: sites, partners, departments, classes of users, campuses, data centers, server farms
  - Understand flows between groups
  - Enable drill downs to detailed application conversations ip-to-ip
- **Integrated Architecture**
  - Bring it all together under one integrated troubleshooting environment



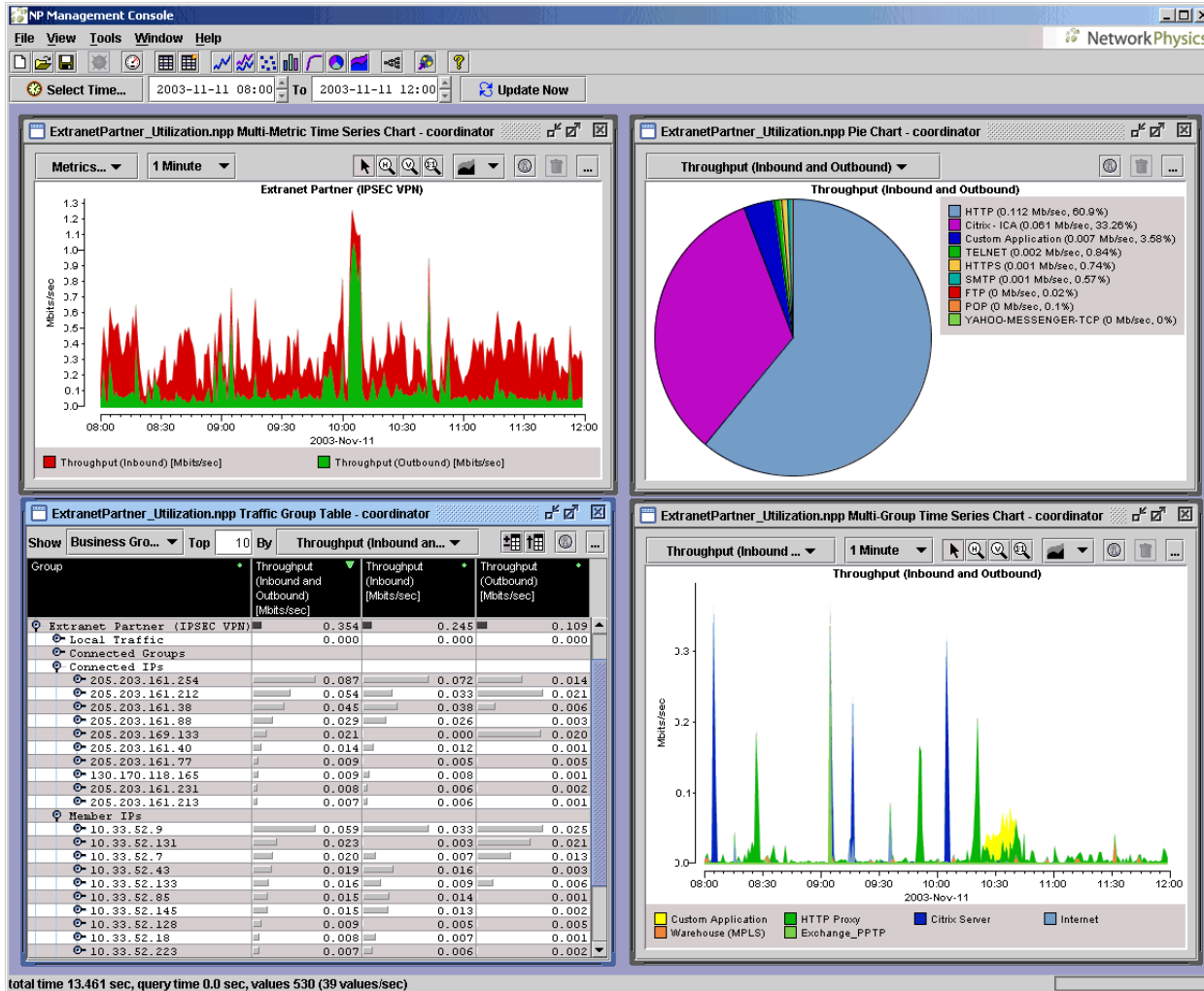
- **Track the five key measurement categories**
  - Unified measurement
  - Utilization, Performance, Traceroute, BGP, and Packet Capture
- **Cost-effective, versatile**
  - One appliance, one deployment
- **Non-invasive, no SNMP, no agents**
  - Autonomic, self-sufficient
  - Not in-line: span, tap, or mirror
  - Minimize deployment headaches & complexity
- **Real-time, one-minute granularity**
  - Best-in-class real-time measurement & analysis
- **Time To Value**
  - Ease of installation

# Application Performance Metrics





## Response Time Composition Chart



## Key Metrics

- Throughput
  - Average Inbound, Outbound, Total
  - 95% Average Total Throughput
- Average Payload
- Usage by applications & users

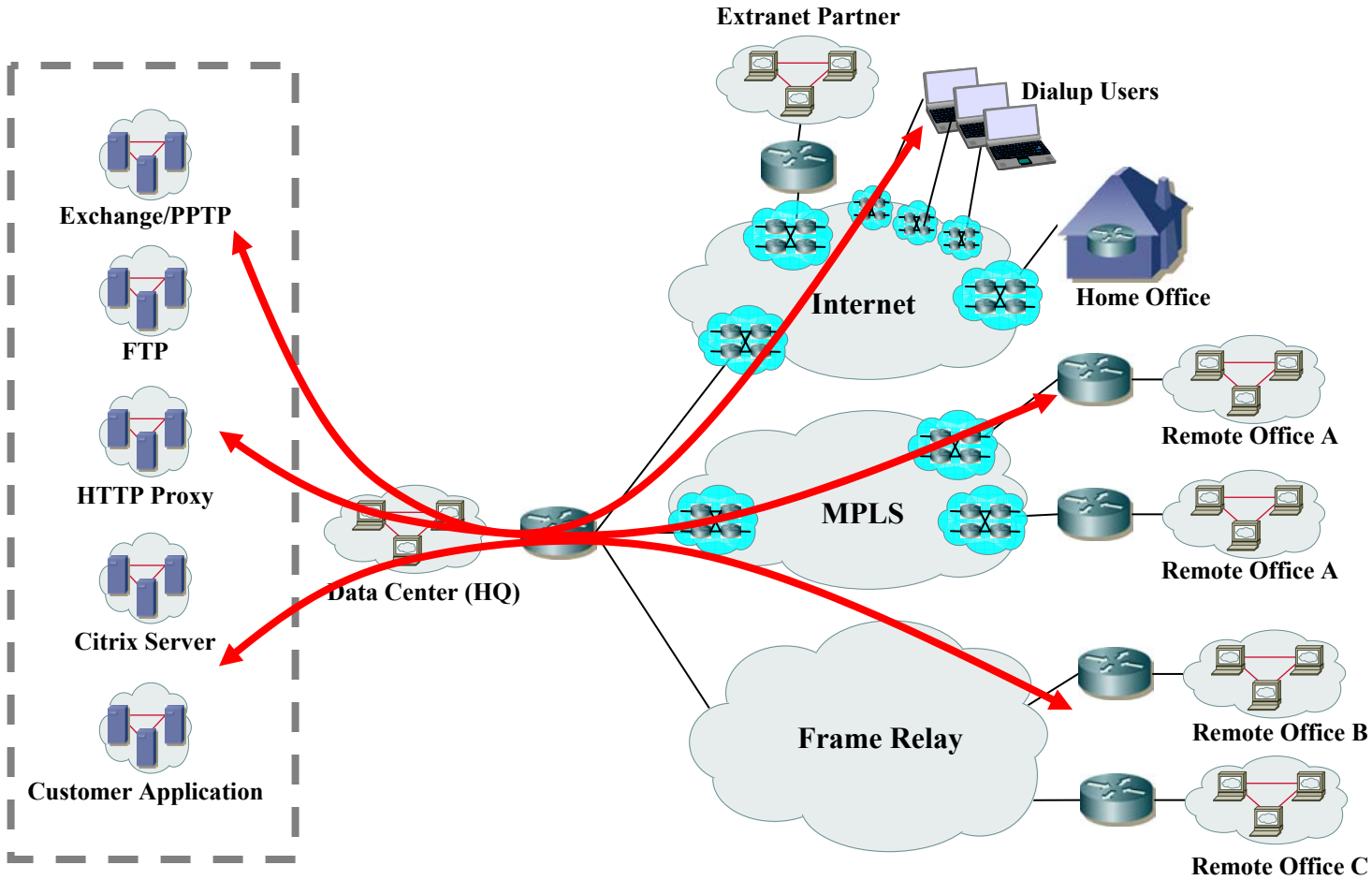
## What resources are being used?

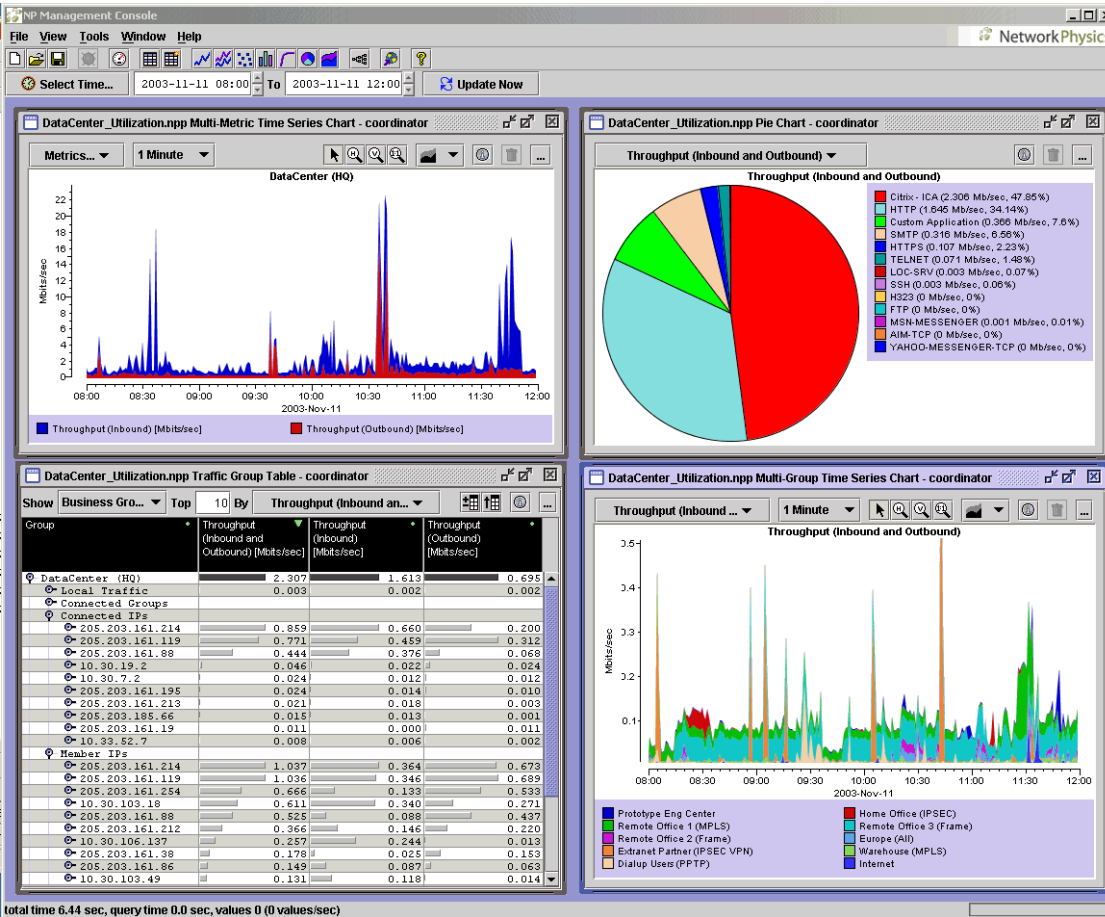
- Top applications used
- Top IP's accessed
- Top Server's used

## Who is using the resources?

- Total traffic by Remote Site
- Top users by IP
- Top users by Application

# Focusing On The Data Center



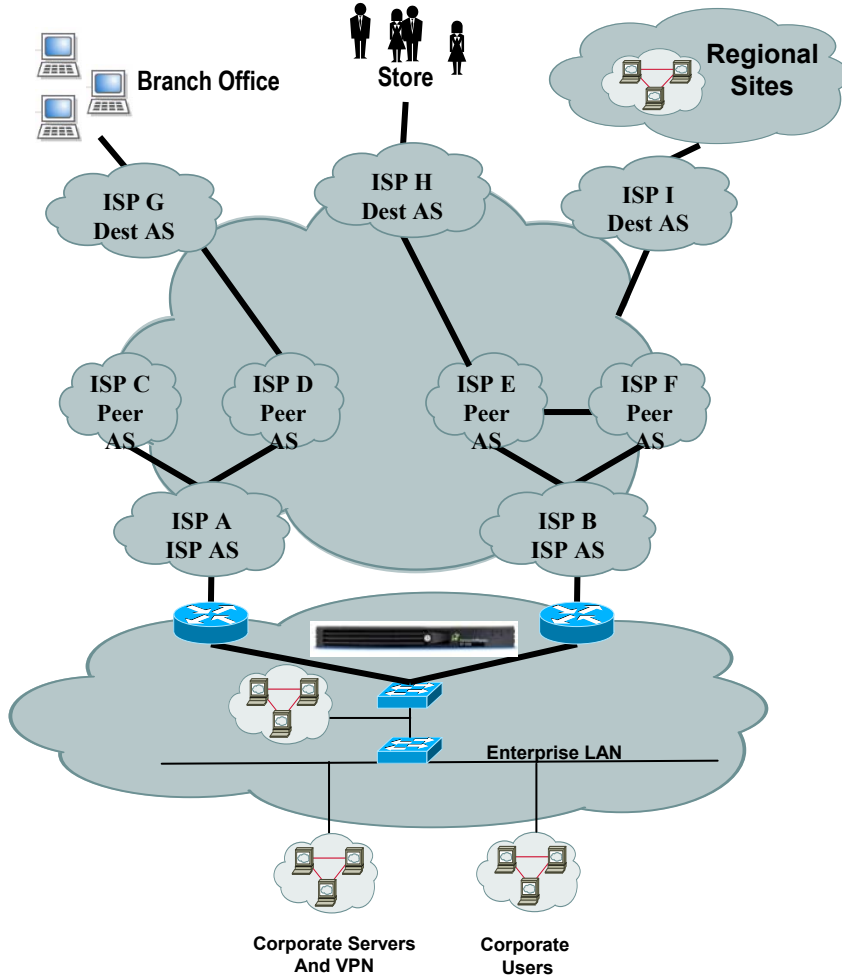


- **Overall Server Health**
  - Connection Request Per Minute
  - Failed Connections
  - Client/Server Reset Rates
  - Application Response Time
- **Baselining User Performance**
  - By Application, Remote Site, IP Address
- **Breakdown of Users Experience**
  - Application Response Time
  - Data Transfer Time
  - Round Trip Time
  - Retransmission Delay
- **Capacity Planning**
  - Throughput
    - Avg Inbound, Outbound, Total
    - 95% Average Total Throughput
    - Average Payload
- **Who's using the Servers?**
  - Top Users by Remote Site and IP's
- **Which servers are used most?**
  - Breakdown by server IP
- **Server Groups Run Multiple Applications!**
  - Throughput/Payload per application
  - Top Users by IP
  - Top servers per application



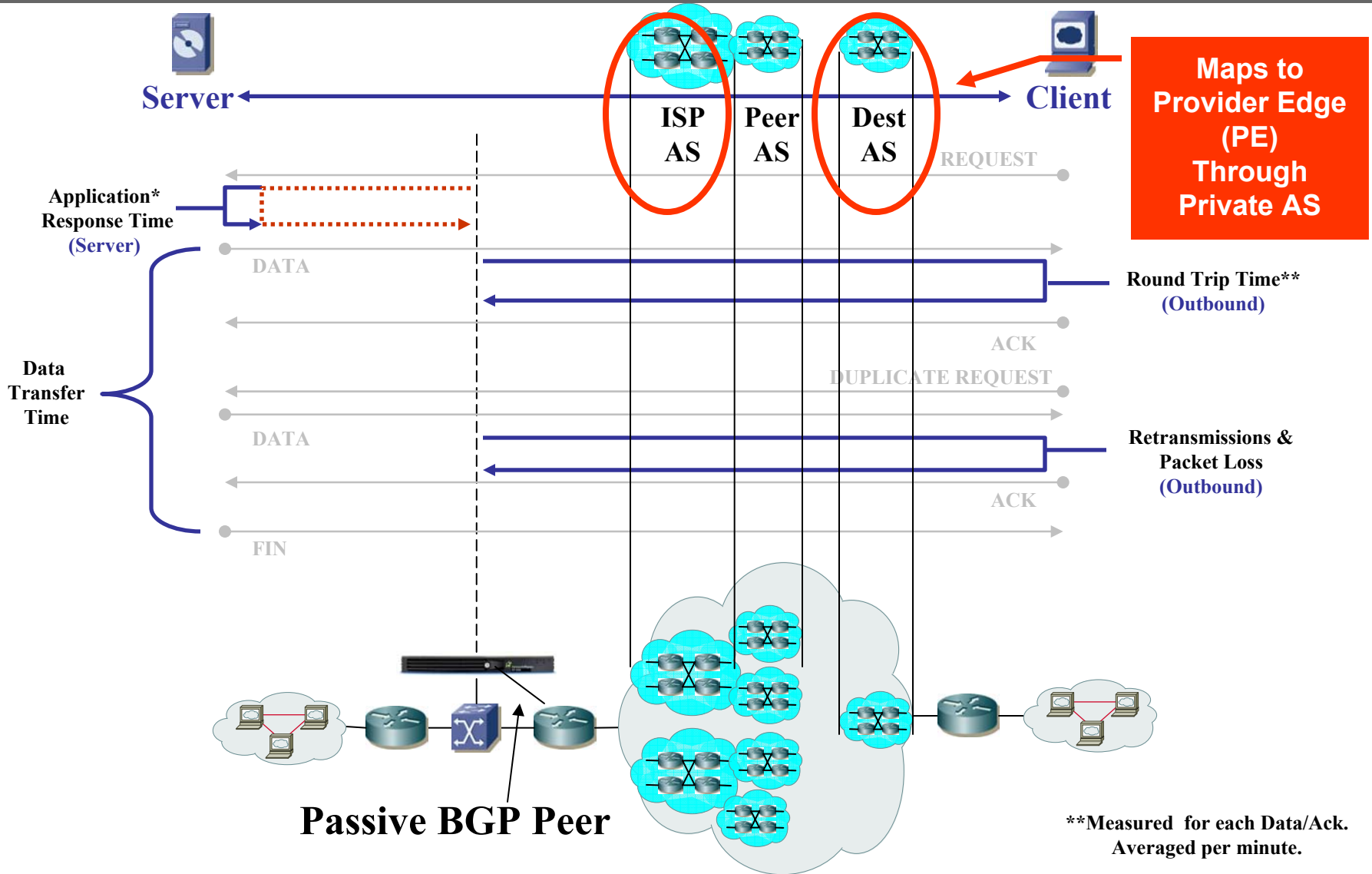
# Managing WAN & MPLS Issues

## Automatic Autonomous System Discovery (AASD)



- Query routes as a passive BGP peer
- Auto-discovers AS paths for each flow
- Aggregates flow data against each AS
  - Characterize performance of the network on a per AS basis
- Each destinations-AS equates to a remote site for instant grouping
  - Automatically discovers complex MPLS AS (Autonomous System) topologies
    - Destination AS = Branch offices (remote sites, locations)
  - Dynamically maps application performance, utilization, and security to this business topology
  - Synchronizes application performance to MPLS topology

# Insight Into The Cloud (AS Data)



Network Physics Project-1.npp Traffic Group Table - coordinator

Show **ISP AS** Top 20 By **Throughput (Inbound and Outbound)**

Group	Information	Through... (Inbound and Outbound)...	Throug... (Inbound) [Mbits/sec]	Throug... (Outbound) [Mbits/sec]	Round Trip Time (Outbound) [msec]	Packet Loss (Outbound) [%]
ISP AS 65000	ASN-HOSTCENTER	32.954	16.398	16.556	19.160	3.573
ISP AS 13979	ATT-IPFR	8.387	2.500	5.886	66.621	28.636
Peer ASes	Peer ASes					
Peer AS 65224	IANA-RSVD2	4.523	1.154	3.369	76.914	1.833
Peer AS 65201	IANA-RSVD2	1.115	0.406	0.709	39.991	2.927
Peer AS 65007	IANA-RSVD2	0.991	0.420	0.571	71.571	86.019
Peer AS 65101	IANA-RSVD2	0.955	0.332	0.623	34.983	4.937
Peer AS 65301	IANA-RSVD2	0.340	0.043	0.297	160.088	3.423
Peer AS 65003	IANA-RSVD2	0.096	0.024	0.072	63.183	0.953
Peer AS 65008	IANA-RSVD2	0.081	0.035	0.046	145.677	0.344
Peer AS 65002	IANA-RSVD2	0.069	0.015	0.054	55.803	0.341
Peer AS 65004	IANA-RSVD2	0.065	0.021	0.044	53.435	0.883
Peer AS 65005	IANA-RSVD2	0.063	0.016	0.047	53.481	1.017
Peer AS 65001	IANA-RSVD2	0.056	0.022	0.035	37.334	0.623
Peer AS 65009	IANA-RSVD2	0.019	0.006	0.014	144.550	0.040
Peer AS 13979	ATT-IPFR	0.011	0.005	0.005		
ISP AS 65006	IANA-RSVD2	0.867	0.314	0.553	39.223	66.936
ISP AS 65002	IANA-RSVD2	0.750	0.218	0.532	97.698	1.755
ISP AS 65001	IANA-RSVD2	0.686	0.167	0.519	111.290	1.390
ISP AS 65004	IANA-RSVD2	0.582	0.147	0.435	99.443	1.457
ISP AS 65005	IANA-RSVD2	0.560	0.143	0.417	116.242	1.453
ISP AS 65003	IANA-RSVD2	0.511	0.118	0.392	114.868	2.086

- Enabled by Automatic Autonomous System Discovery (AASD)
- Measure your ISP's performance and their peers
- Works across Internet and MPLS clouds
- Key metrics for all flows going through each Autonomous System
  - Throughput
    - Average Inbound, Outbound, Total
    - 95% Average Total Throughput
    - Average Payload
  - Performance
    - Packet Loss
    - Retransmissions
    - Round Trip Time
- In an MPLS environment...
  - Each Destination AS equates to each remote site for instant grouping

Network Physics Project-1.npp Traffic Group Table - coordinator

Show **Dest AS** Top 20 By **Throughput (Inbound and Outbound)**

Group	Information	Through... (Inbound and Outbound)...	Throug... (Inbound) [Mbits/sec]	Throug... (Outbound) [Mbits/sec]	Round Trip Time (Outbound) [msec]	Packet Loss (Outbound) [%]
Dest AS 65000	ASN-HOSTCENTER	45.259	26.123	19.136	83.667	0.997
Dest AS Unknown	Unknown AS	28.029	10.195	17.834	37.199	4.224
Dest AS 65224	IANA-RSVD2	4.171	3.072	1.098	20.165	2.759
Dest AS 65007	IANA-RSVD2	0.991	0.571	0.420	20.873	97.664
Dest AS 65201	IANA-RSVD2	0.869	0.534	0.335	14.151	3.205
Dest AS 65006	IANA-RSVD2	0.867	0.553	0.314	30.672	93.477
Dest AS 65002	IANA-RSVD2	0.824	0.588	0.236	23.793	3.107
Dest AS 65001	IANA-RSVD2	0.755	0.558	0.197	21.985	2.135
Dest AS 65004	IANA-RSVD2	0.662	0.484	0.178	36.553	2.204
Dest AS 3505	CTCIS	0.631	0.017	0.614	1.051	0.396
Dest AS 65005	IANA-RSVD2	0.626	0.465	0.161	47.457	3.011
Dest AS 65003	IANA-RSVD2	0.610	0.467	0.143	26.189	3.705
Dest AS 7018	ATT-INTERNET4	0.540	0.050	0.490	10.480	1.188
Dest AS 65101	IANA-RSVD2	0.502	0.335	0.168	14.470	3.827
Dest AS 1239	SPRINTLINK	0.496	0.217	0.279	117.937	0.648
Dest AS 701	ALTERNET-AS	0.363	0.040	0.323	5.408	1.209
Dest AS 12076	HOTMAIL-AS	0.209	0.087	0.122	23.736	1.092
Dest AS 3967	CW-AS3967	0.207	0.038	0.170	9.106	2.218
Dest AS 5511	RIPR-ASNBLOCK5	0.193	0.028	0.165	12.612	1.324
Dest AS 1740	CERFNET	0.187	0.044	0.143	28.226	2.033

Group	Information	95th Percentile Total Outbound Throughput (Mbits/sec)	Total Outbound Throughput (Mbits/sec)	Total Inbound Throughput (Mbits/sec)
1-AS 12182	1-AS 12182	40.249	21.091	3.062
-12.0.0.0/8	12.0.0.0/8	2.468	1.274	0.188
-66.218.64.0/19	66.218.64.0/19	0.936	0.293	0.032
-205.188.0.0/16	205.188.0.0/16	0.572	0.255	0.037
-152.163.0.0/16	152.163.0.0/16	0.333	0.239	0.031
-4.0.0.0/8	4.0.0.0/8	0.474	0.226	0.032
-67.192.0.0/10	67.192.0.0/10	0.396	0.175	0.034
-64.12.0.0/16	64.12.0.0/16	0.414	0.183	0.030
-65.192.0.0/11	65.192.0.0/11	0.411	0.141	0.021
-161.165.0.0/16	161.165.0.0/16	0.317	0.176	0.020
-208.192.0.0/10	208.192.0.0/10	0.330	0.111	0.016
-67.24.0.0/13	67.24.0.0/13	0.247	0.106	0.021
-65.128.0.0/11	65.128.0.0/11	0.231	0.096	0.019
-66.136.0.0/13	66.136.0.0/13	0.255	0.105	0.016
-65.64.0.0/13	65.64.0.0/13	0.253	0.100	0.015
-65.56.0.0/14	65.56.0.0/14	0.200	0.085	0.017
-208.0.0.0/11	208.0.0.0/11	0.252	0.090	0.013
-63.160.0.0/12	63.160.0.0/12	0.226	0.082	0.013
-216.239.46.0/24	216.239.46.0/24	0.357	0.113	0.006
-64.112.224.0/20	64.112.224.0/20	0.383	0.097	0.004
-198.26.0.0/16	198.26.0.0/16	0.256	0.083	0.011
1-AS Unknown	1-AS Unknown	1.057	0.378	0.053
1-AS 4513	1-AS 4513	0.136	0.049	0.006
-209.11.112.0/20	209.11.112.0/20	0.026	0.006	379.3E-6
-62.254.0.0/17	62.254.0.0/17	0.012	0.002	313.6E-6
-209.208.128.0/17	209.208.128.0/17	0.009	0.001	207.7E-6
-208.26.224.0/19	208.26.224.0/19	0.006	0.001	133.4E-6
-140.146.128.0/17	140.146.128.0/17	0.007	0.001	135.7E-6
-213.42.0.0/18	213.42.0.0/18	0.005	0.001	116.1E-6
-142.154.64.0/18	142.154.64.0/18	0.006	0.001	131.3E-6
-195.229.192.0/18	195.229.192.0/18	0.004	0.001	104.3E-6
-62.194.0.0/16	62.194.0.0/16	0.004	0.001	64.24E-6
-66.46.0.0/18	66.46.0.0/18	0.007	0.001	135.4E-6
-213.89.128.0/17	213.89.128.0/17	0.007	0.001	40.98E-6
-216.191.224.0/19	216.191.224.0/19	0.004	0.001	104.3E-6
-216.191.128.0/18	216.191.128.0/18	0.007	0.001	119.3E-6
-209.10.0.0/16	209.10.0.0/16	0.004	0.001	106.4E-6
-172.128.0.0/13	172.128.0.0/13	0.000	0.001	156.7E-6
-172.160.0.0/13	172.160.0.0/13	0.000	0.001	134.9E-6
-172.144.0.0/13	172.144.0.0/13	0.000	0.001	135.2E-6
-209.10.208.0/20	209.10.208.0/20	0.002	0.001	85.61E-6
-216.129.0.0/19	216.129.0.0/19	0.003	0.001	88.09E-6
-216.191.64.0/19	216.191.64.0/19	0.001	0.001	72.97E-6
1-AS 17374	1-AS 17374	0.110	0.071	0.454
-209.10.214.0/24	209.10.214.0/24	0.110	0.071	0.454
-192.168.0.0/16	192.168.0.0/16	0.000	6.108E-9	0.000
-10.0.0.0/8	10.0.0.0/8	0.000	0.000	1.257E-6

1

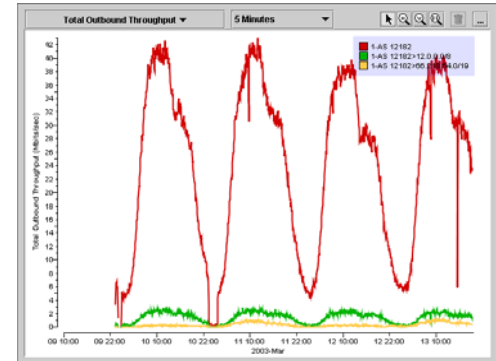
ISP traffic drills down to top CIDR blocks

2

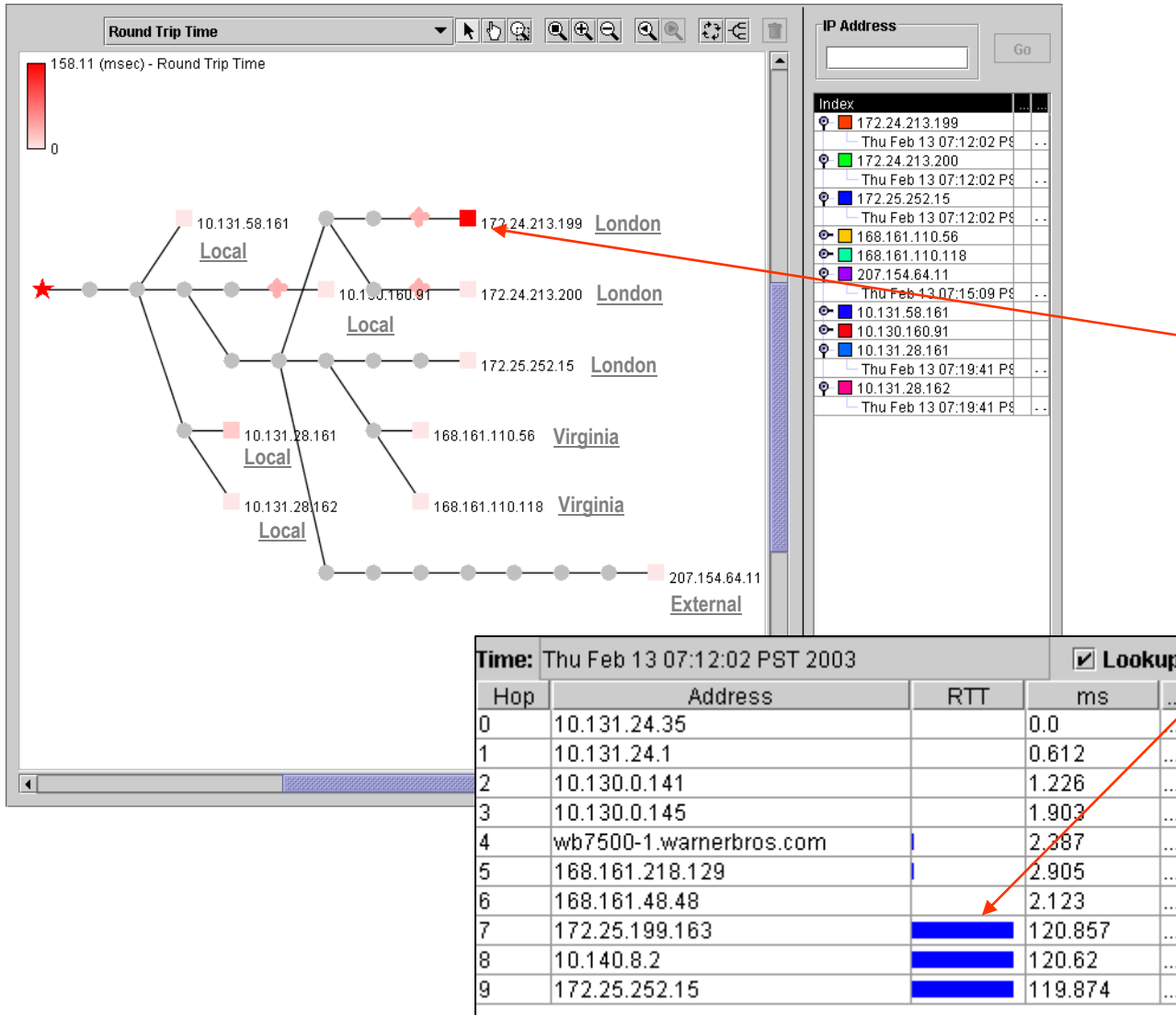
Identifies top targets to re-route during overflow conditions

3

95 percentile grouping for traffic engineering and easier cost management

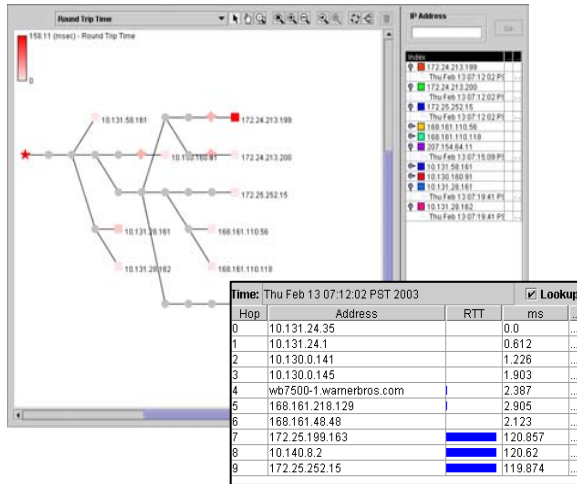


# Path Analysis Inside the Cloud

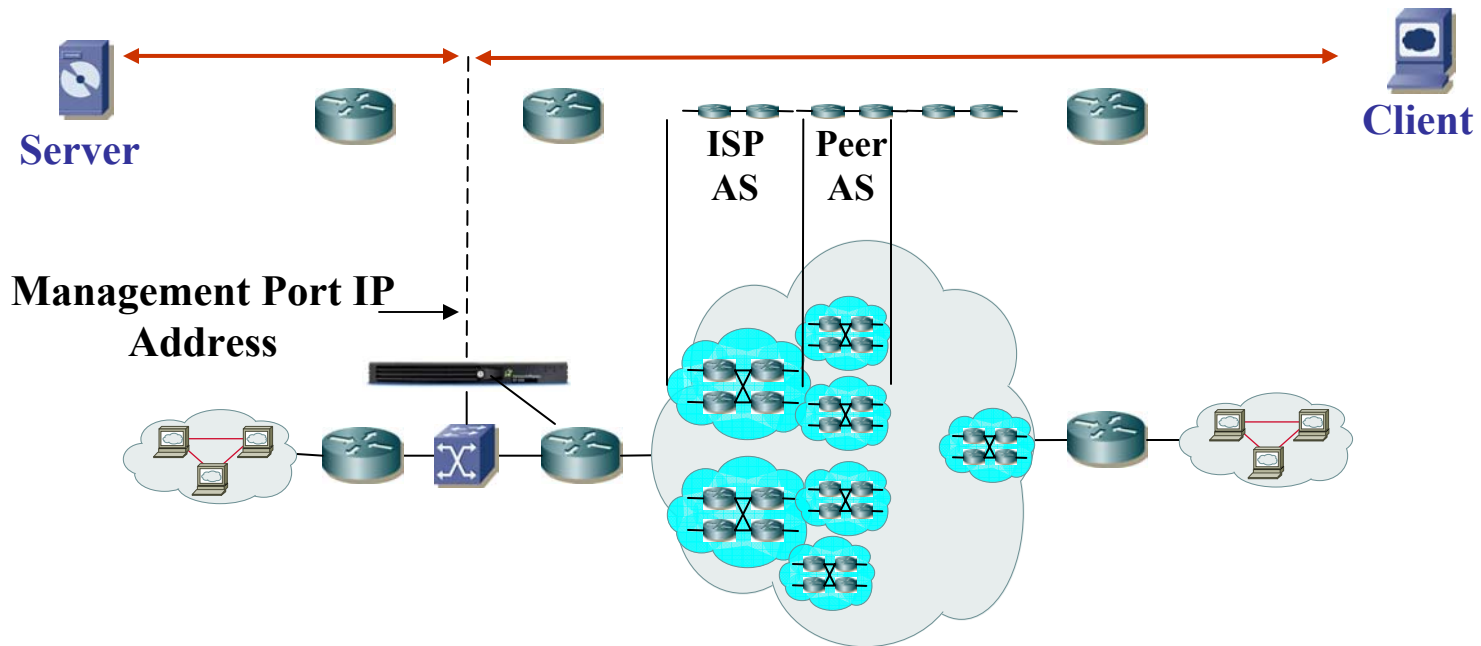


- Graphical network route analysis pinpoints hidden bottlenecks
- Identifies destinations with critical performance issues
- Measures hop-by-hop delay metrics to localize network latency problems

# Insight Into The Cloud (Traceroute)



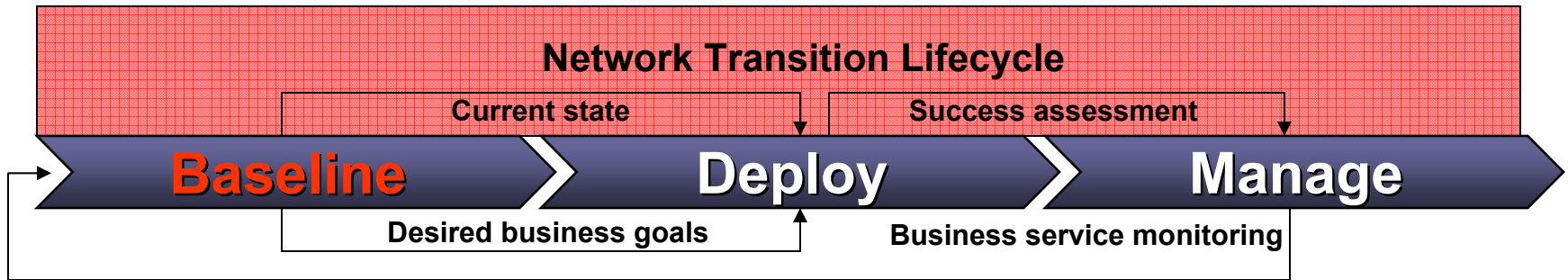
- Automatic TR based on anomalies
- Hop by hop metrics
- Auto-generated topology
  - Historical
  - Multiple traces
- **ISP Metrics**
  - ISP RTT
  - Trans ISP RTT



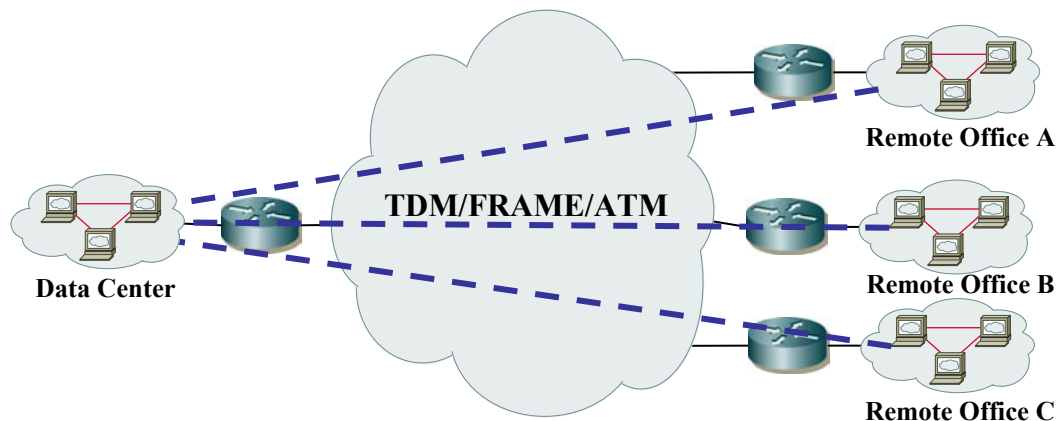
# MPLS Migration Case Studies



# MPLS Migration: Baseline Existing WAN

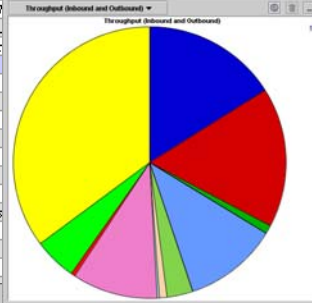


- **Baseline all users.** Identify each client IP or subnet currently accessing the network
- **Understand who is using the network** and how much they are using.
- **Obtain performance and utilization information** for each remote site and internal resources
- **Qualify and classify end-users** by time, usage, activity, and behavior
- **Classify traffic** based on users, groups, VPNs, servers utilized, network paths



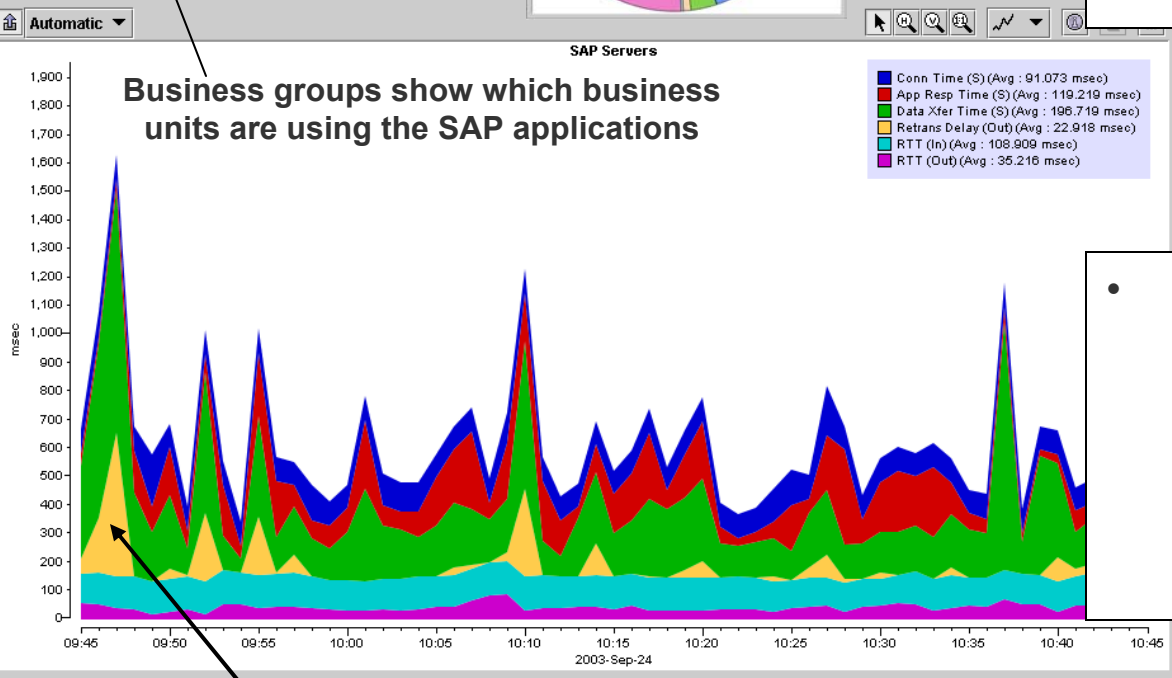
# Auditing Application Performance

Group	Information	Throughput (Inbound and Outbound) [Mbits/sec]	Throughput (Inbound) [Mbits/sec]	Throughput (Outbound) [Mbits/sec]
WB Internal networks	WB Internal networks	60.741	51.567	9.173
Internet	Outside Addresses	57.292	7.545	49.746
SAP Servers	SAP Subnet V		0.876	11.993
Local Traffic	Local Traffic		0.000	0.000
Connected Groups	Connected Gr		0.876	11.992
WB Internal networks	WB Internal		0.764	11.353
SF Center	SF Center		0.021	0.015
B137	B137		0.011	0.007
SF Left 2	SF Left 2		0.002	0.004
B154	B154		0.001	0.005
CVC	CVC		0.001	0.004
B140	B140		0.003	0.001
AD Burbank	AD Burbank		0.001	0.003
Sherman Oaks Feature Animation	Sherman Oaks		0.000	0.002
SF Right	SF Right		0.000	0.001
Other Group	Other Group		0.000	0.000
B4	B4		0.000	0.000



## Business Problem

- **Application Performance**
  - Inability to account for SAP usage and network effectiveness in delivering SAP to the internal business units.



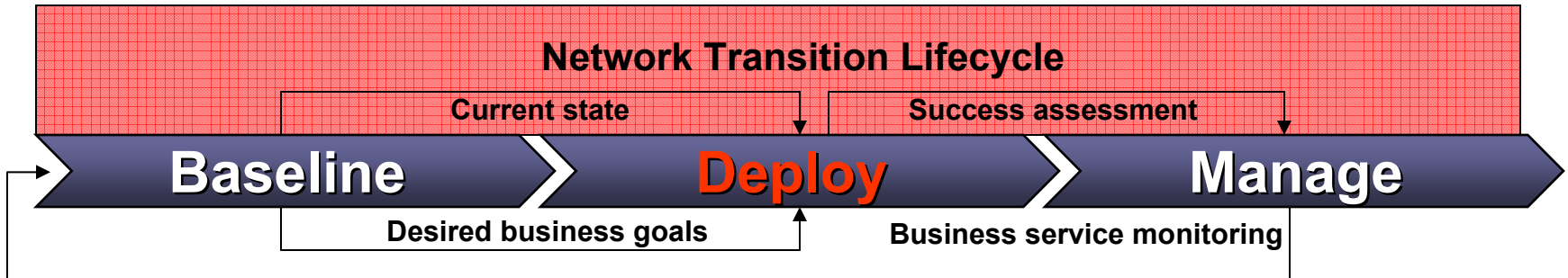
## Network Drilldown

- **Performance**
  - Application and Business specific response time charts measure the users experience and isolate where the delay is in the network (Client, Network, Server)

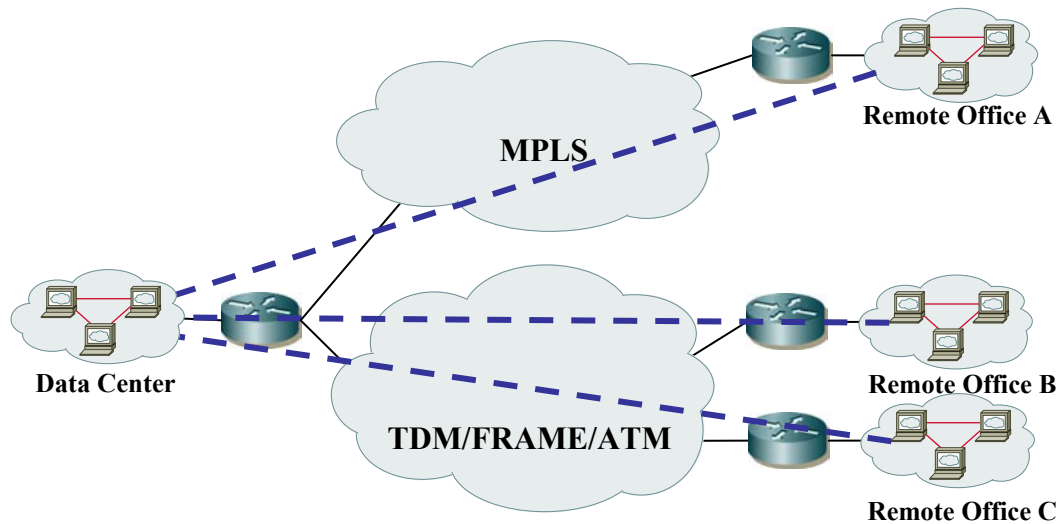
Business groups show which business units are using the SAP applications

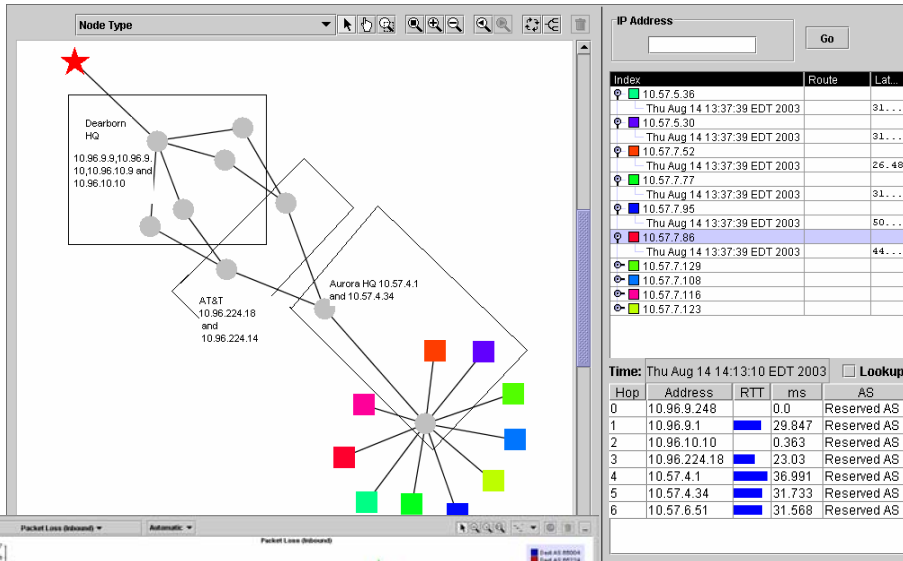
Occasional Packet Loss on the network is causing slower response time by the SAP servers.

# MPLS Migration: Deploy and Validate

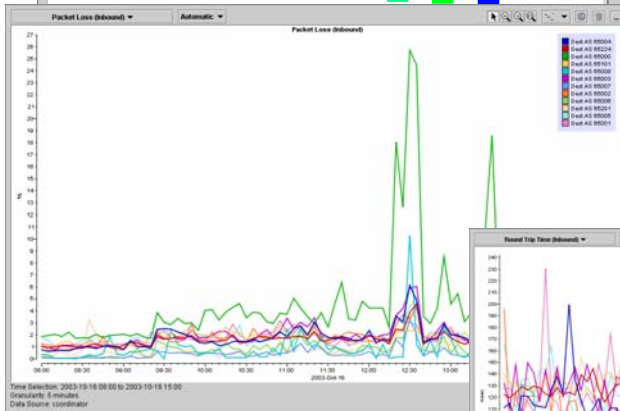


- **Maintain visibility** of your network during changes.
- Get **early warning** at on-set of problems.
- **Quickly identify** poorly provisioned areas.
- Monitor network status **dynamically** without employing new resources, hardware or software.
- Get immediate results and reports while changes are taking place. NP appliance will **auto-adapt** to new conditions.
- **Quantify changes** in network utilization and performance **against baseline**

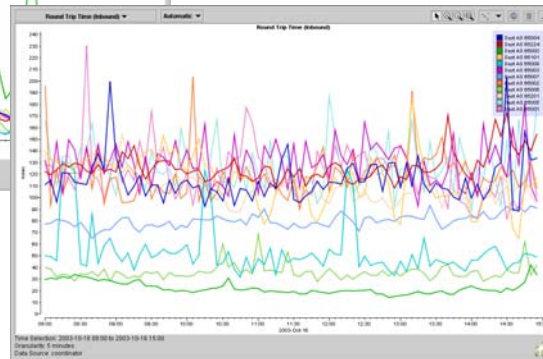




**Traceroute topology (real-time and historical)**



**Average packet loss and round trip time for each remote AS**



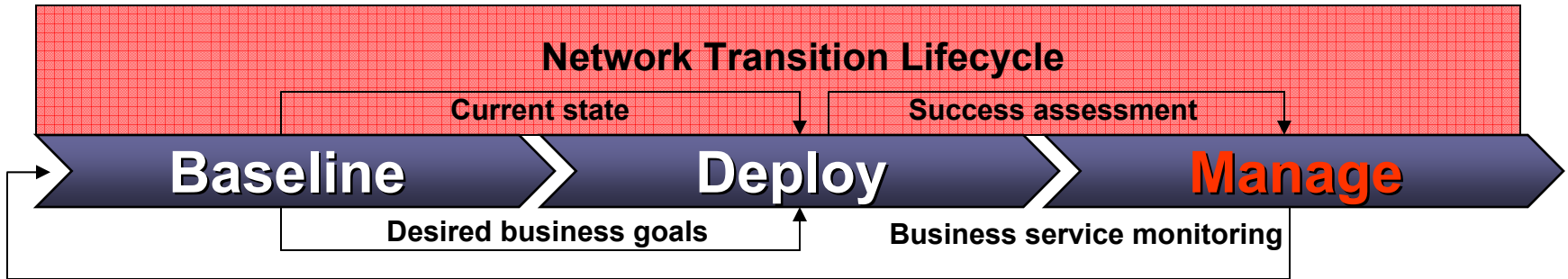
## Business Problem

- **Frame-to-MPLS Migration**
  - Providing “frame relay” visibility in MPLS world
  - Hub & spoke topologies
    - ❖ Eliminating need for spoke instrumentation
    - ❖ “Spoke visibility” with “hub deployment”

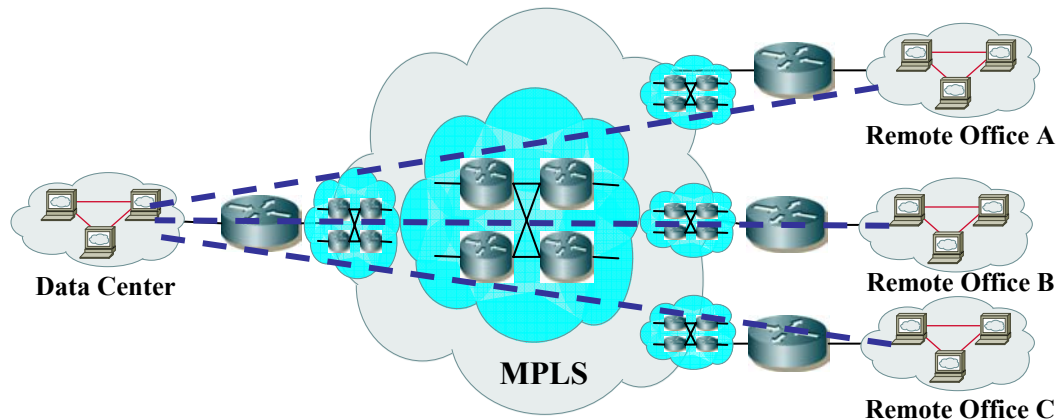
## Network Drilldown

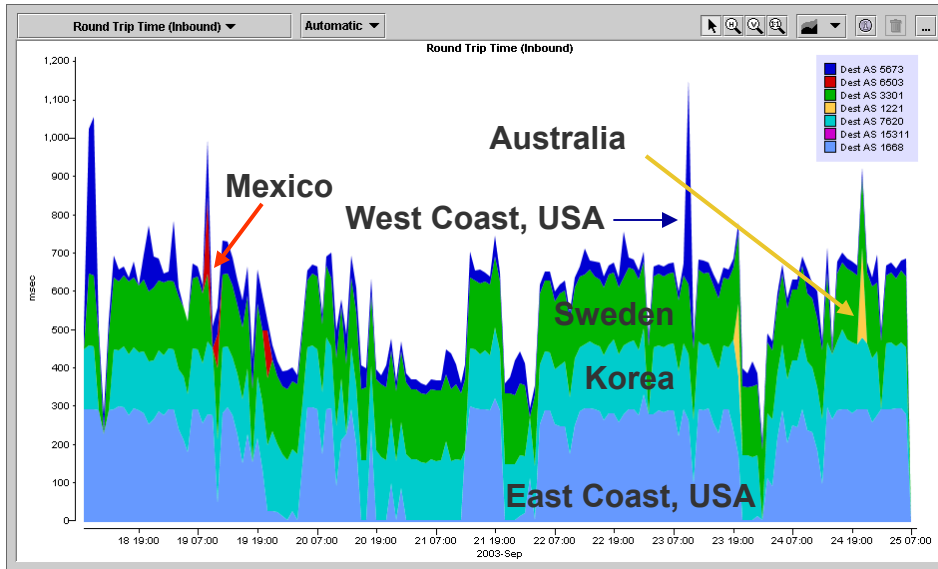
- **Branch office performance**
  - Traceroute topology shows you response time through the cloud
  - BGP AS groups map to branch offices
  - Centralized deployment (HQ) provides branch visibility

# MPLS Migration: Ongoing Management

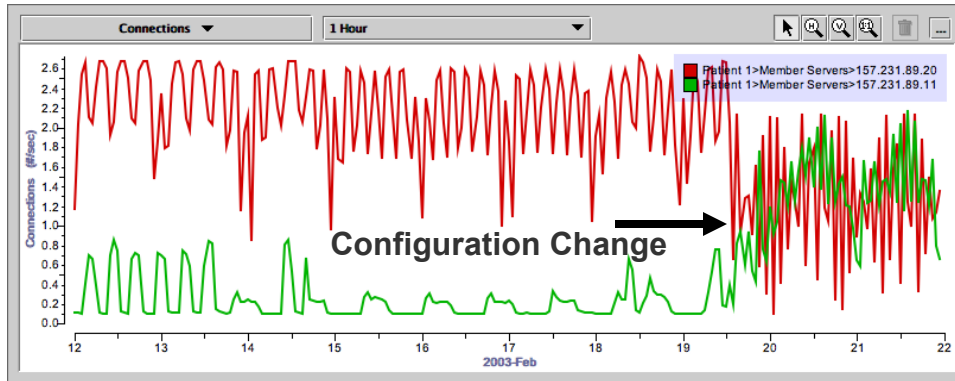


- Immediate availability of **historical data** for comparison and on-demand reporting.
- **Support for trending analysis** for each user (IP address), business entity, location, offices, etc.
- A solution that **can validate the effectiveness** of the changes and support it with detailed data.
- An **adaptable solution** that mirrors your network everyday, every minute, in real-time.
- Forensic solution that **leverages real-traffic information**: no synthetic transactions, no sampling.





Comparing round trip times around the world as a way of measuring the customer experience



A poorly configured Load Balancer (LB) causing inefficient use of server resources. A change in LB configuration optimizes resources.

## Business Problem







- **Customer Experience**
  - Inability to measure customer satisfaction in a non intrusive manner.
  - No MPLS visibility & troubleshooting tools

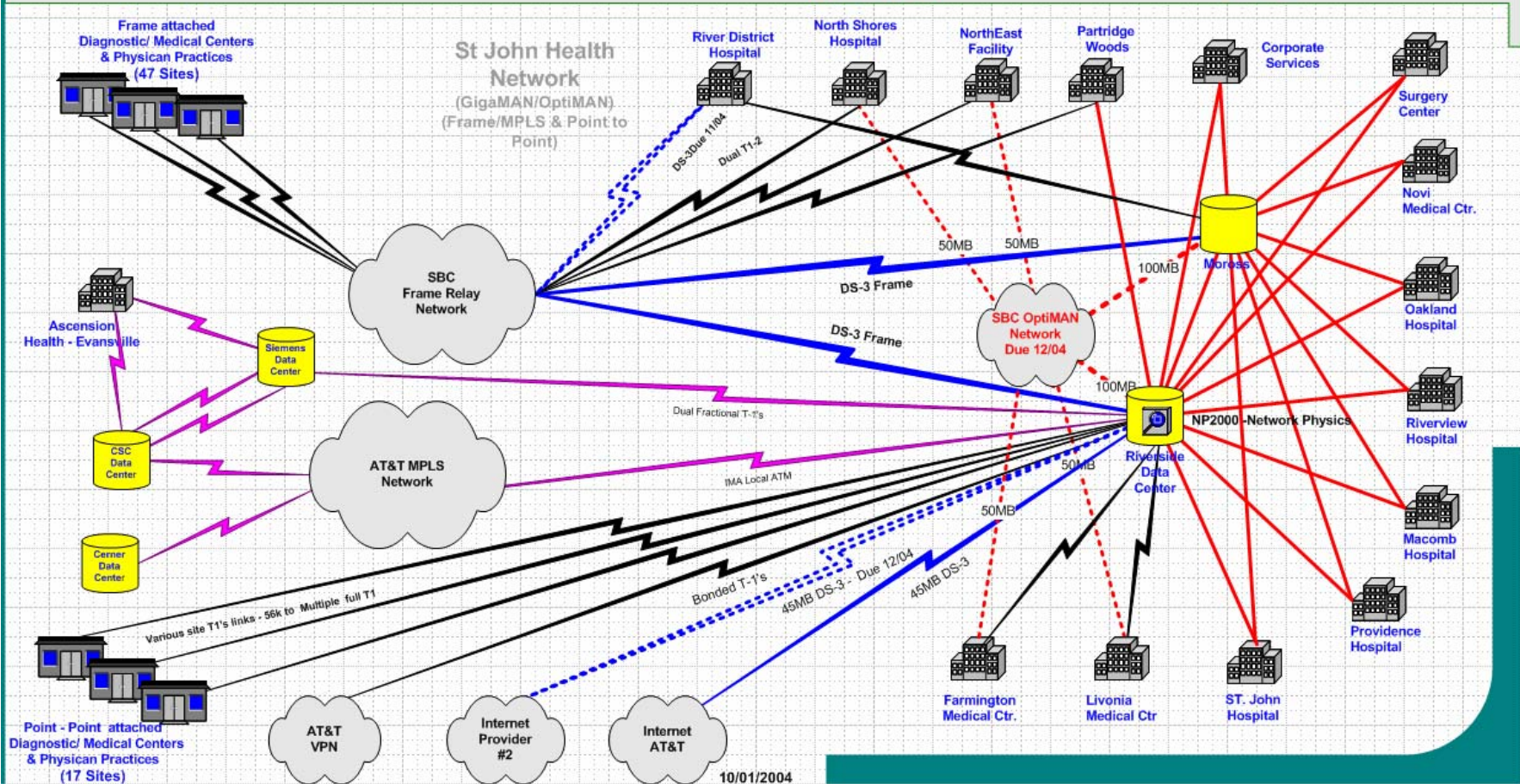
## Network Drilldown

- **Performance and Fault Monitoring**
  - NOC monitors real-time connection rates to determine the load, and effectiveness, of the web server farm



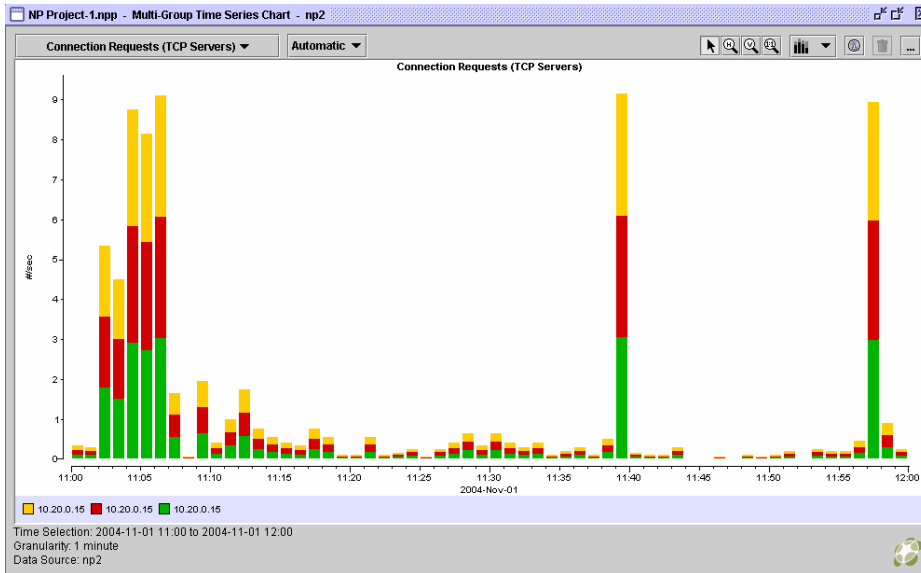
## St John Health Network FY05 Plan

-  Planned DS-3
-  Existing OptiMAN Ethernet Circuit
-  Planned OptiMAN Ethernet Circuit
-  Existing Circuit Solid (blue or Black)
-  Existing GB Ethernet Circuit
-  CSC/Ascension Circuit

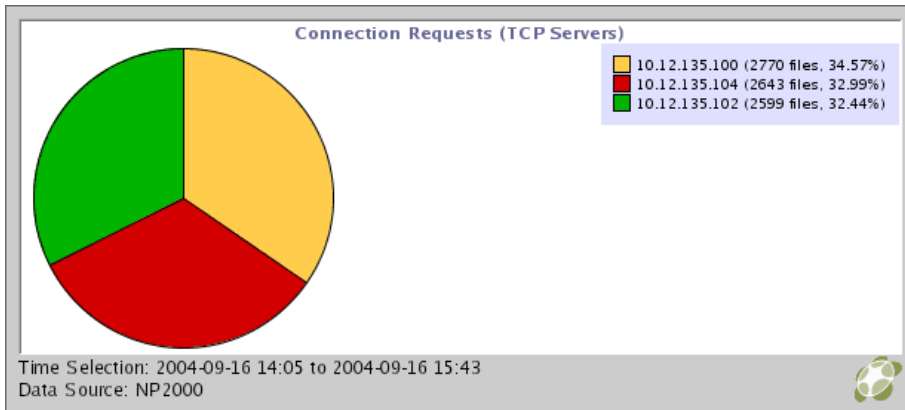


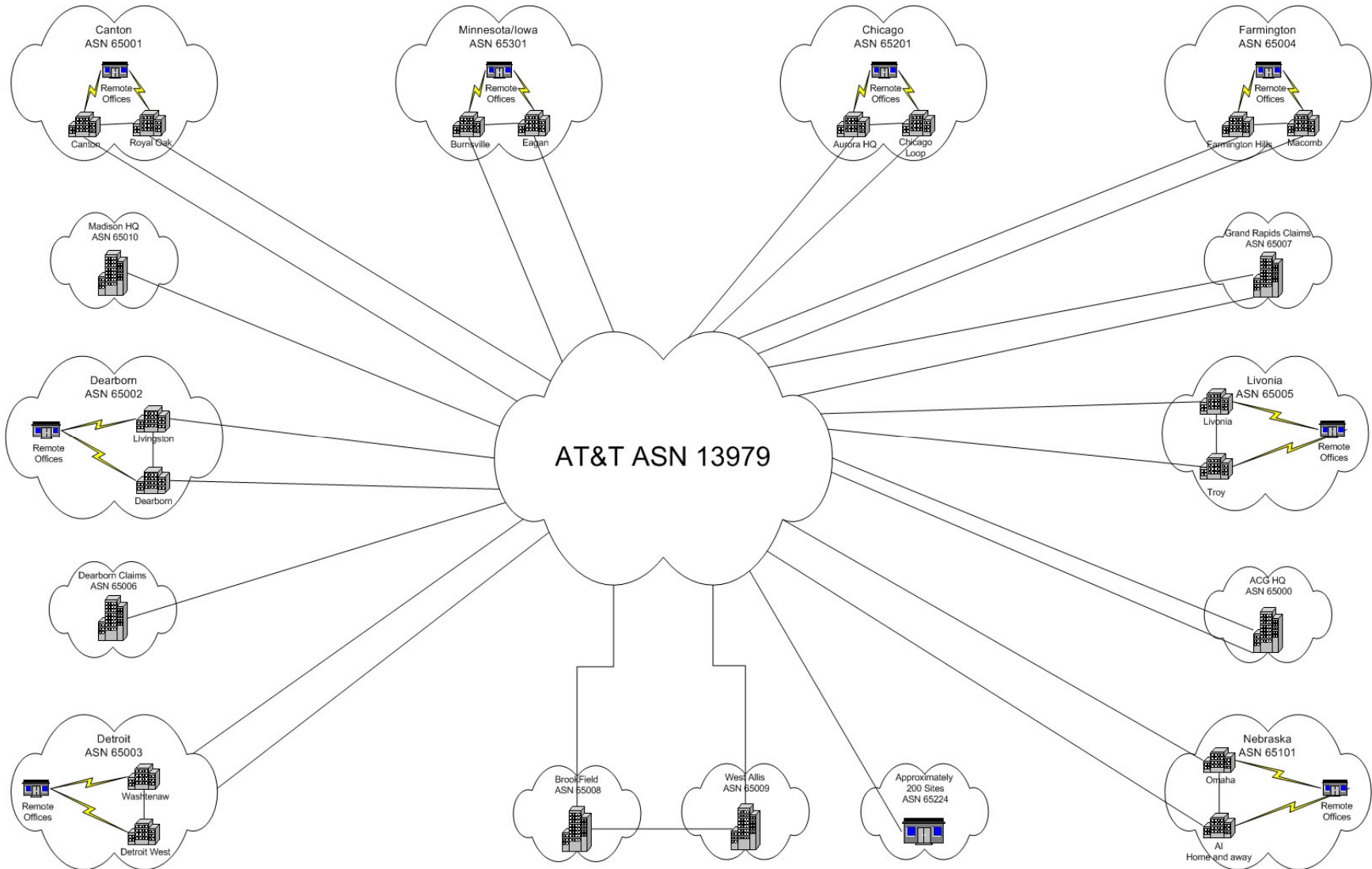
- **Manage user experience and server health for Patient Management and Pharmacy Systems**
  - PeopleSoft (Financials, HR)
  - SMS InVision System (Health Information System - Mainframe - outsourced)
- **Identify unknown worm infected hosts**
  - FDA managed hosts. No access by internal IT organization
- **Discovery of unexpected communications between servers**
- **Understand peak and sustained data bandwidth for 7 systems that have mission critical status and Data Recovery (DR) requirements**
  - Monitoring to ensure DR bandwidth will support all 7 systems in a DR event.
- **ASP Management**
  - BlueCross, TechRx, Recruitsoft
  - ASP's claim the problem is always the Internet!
  - Manage traffic volumes and understand impact on Internet Connection
- **Manage new application rollouts**
  - PeopleSoft Upgrade
  - Validate impact on network and application response time
  - Proactive involvement eliminates network blame for problems during rollout
- **Troubleshoot WAN routing changes**
  - Isolated routing problems associated with changes in MPLS environment
- **Network change management**
  - Reallocation of IP addresses
    - Isolate traffic to IP addresses that no longer exist on the network
    - "Finding people left behind"
- **Insight into application performance on systems not managed by ITS**





- **Goals**
  - Maximize Application Performance
  - Validate tiered application design and load balancing effectiveness
- **Server Capacity**
  - Real-Time and Historical tracking of connections to PeopleSoft servers
- **Load Balancing**
  - Stack charts and Pie charts enable clear visibility into load on a per server basis





# Map Branch Offices to Private ASN

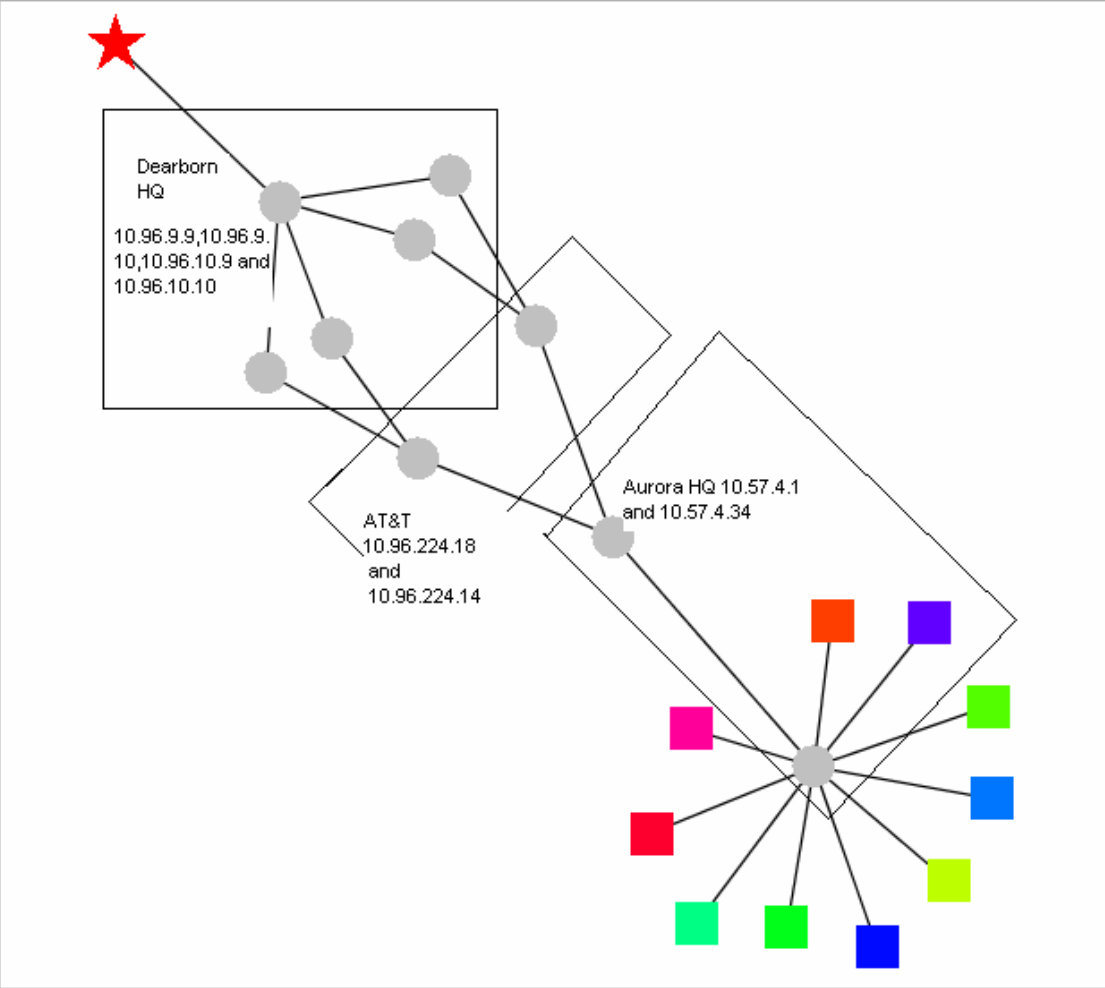
Group	Information	Throughput (Inbound and Outbound) [Mbits/sec]	Throughput (Inbound) [Mbits/sec]	Throughput (Outbound) [Mbits/sec]	Connection Requests (TCP Clients) [#]	Connection Requests (TCP Servers) [#]	Time to First Byte (TCP Clients) [msec]	Time to First Byte (TCP Servers) [msec]	Round Trip Time (Inbound) [msec]	Round Trip Time (Outbound) [msec]
Dest AS 65224	PRIVATE-ASN	4.495	3.292	1.203	28868	2468	120.942	220.442	126.175	19.490
Dest AS 65201	PRIVATE-ASN	1.135	0.741	0.395	56179	16368	83.784	88.845	110.520	13.990
Dest AS 65101	PRIVATE-ASN	0.642	0.447	0.195	49935	2022	282.875	260.756	116.395	14.970
Dest AS 65008	PRIVATE-ASN	0.225	0.154	0.070	7918	724	120.822	243.102	77.420	128.353
10.33.97.86	10.33.97.86	0.000	0.000	0.000	126	0	51.856		46.597	
10.33.97.81	10.33.97.81	0.001	0.001	0.000	156	0	67.858		67.006	
10.33.97.78	10.33.97.78	0.000	0.000	0.000	1	0	26.034		32.303	
10.33.97.73	10.33.97.73	0.000	0.000	0.000	97	0	467.510		159.569	
10.33.97.71	10.33.97.71	0.002	0.001	0.001	1211	0	41.741		36.801	1.747
10.33.97.70	10.33.97.70	0.001	0.001	0.000	18	2	86.064	72.855	61.394	8.337
10.33.97.62	10.33.97.62	0.005	0.004	0.001	736	0	124.388		50.853	0.202
10.33.97.60	10.33.97.60	0.003	0.000	0.002	22	18	41.400	1839.388	26.083	9.704
10.33.97.57	wibrccxp22d.aaa-ac...	0.001	0.000	0.000	18	0	224.553		35.264	
10.33.97.54	10.33.97.54	0.001	0.001	0.000	82	0	90.416		57.365	
10.33.97.53	wi3130011.aaa-acg.net	0.001	0.001	0.000	423	0	121.906		47.778	32.673
10.33.97.51	10.33.97.51	0.004	0.003	0.001	257	0	136.437		52.542	
10.33.97.18	wcad.aaa-acg.net	0.035	0.013	0.022	1031	154	1091.752	434.427	30.141	194.618
10.33.97.16	wibrfdscndc001.aaa...	0.150	0.114	0.035	379	320	132.668	101.736	100.149	1.765
Dest AS 65007	PRIVATE-ASN	0.983	0.554	0.429	78695	942	55.079	37234.345	79.402	24.332
Dest AS 65006	PRIVATE-ASN	0.691	0.432	0.259	10550	575	36.538	63696.606	36.011	36.657
Dest AS 65005	PRIVATE-ASN	0.623	0.468	0.155	10406	6322	85.549	185.320	125.740	46.866
Dest AS 65004	PRIVATE-ASN	0.833	0.626	0.208	80713	4090	82.293	229.071	115.113	31.808
Dest AS 65003	PRIVATE-ASN	0.540	0.403	0.137	85174	8200	79.742	173.290	128.567	36.458
Dest AS 65002	PRIVATE-ASN	0.993	0.566	0.427	11678	3869	77.570	195.811	119.404	15.895
Dest AS 65001	PRIVATE-ASN	0.717	0.521	0.196	11244	4420	71.626	184.741	120.307	19.799
Dest AS 65000	PRIVATE-ASN	35.240	19.607	15.633	81781	459261	441.263	370.338	21.162	93.195
Dest AS 12076	HOTMAIL-AS	0.171	0.057	0.114	0	44633		354.971		22.910
Dest AS 7018	ATT-INTERNET4	0.298	0.049	0.249	0	63878		341.222		17.081
Dest AS 3967	CW-AS3967	0.225	0.038	0.187	0	64692		318.647		9.600
Dest AS 3505	CTCIS	0.247	0.007	0.240	0	90		330.393		0.982
Dest AS 1740	CERFNET	0.173	0.041	0.132	0	37947		522.474	91.849	38.672
Dest AS 1239	SPRINTLINK	0.438	0.151	0.287	13709	60337	1843.501	840.335	146.498	106.308
Dest AS 701	ALTERNET-AS	0.270	0.034	0.236	5	38161		356.165	46.872	8.691
Dest AS Unknown	Unknown AS	25.929	10.211	15.718	13948	1610633	429.900	232.135	12.837	43.010

**Deep Performance Analysis per Branch Office**

Time Selection: 2003-10-16 08:00 to 2003-10-16 15:00  
 Data Source: coordinator

# Branch Office Topology Views

**Node Type** [Dropdown] [Icons]



**Dearborn HQ**  
10.96.9.9, 10.96.9.10, 10.96.10.9 and 10.96.10.10

**AT&T**  
10.96.224.18 and 10.96.224.14

**Aurora HQ** 10.57.4.1 and 10.57.4.34

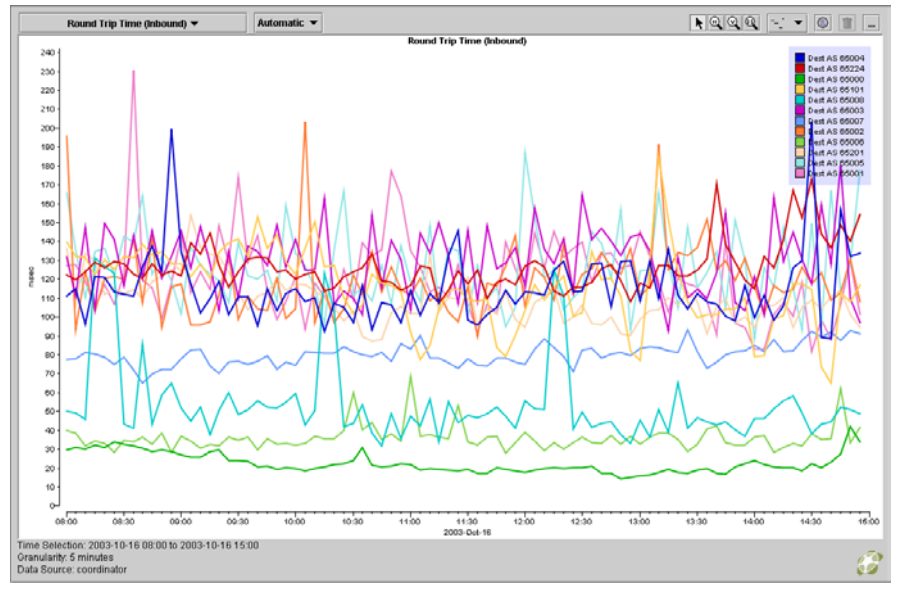
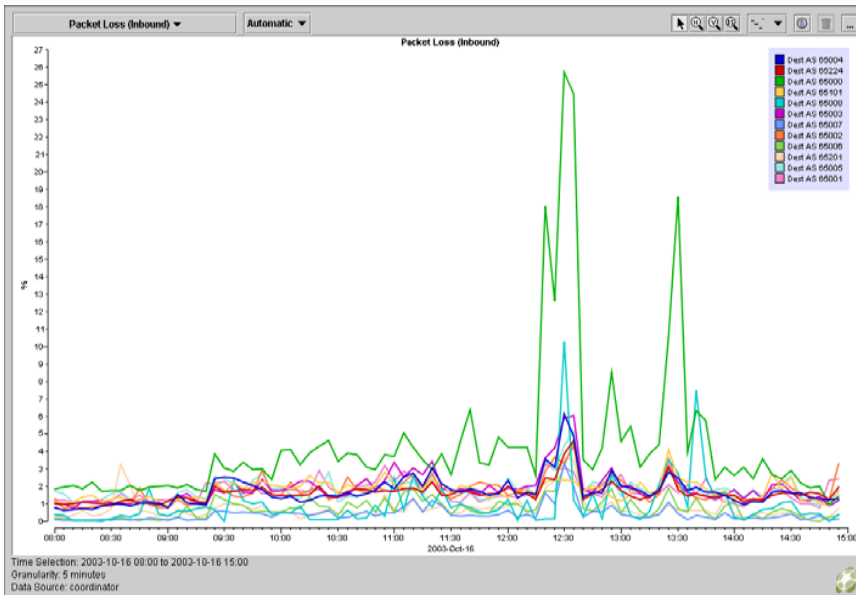
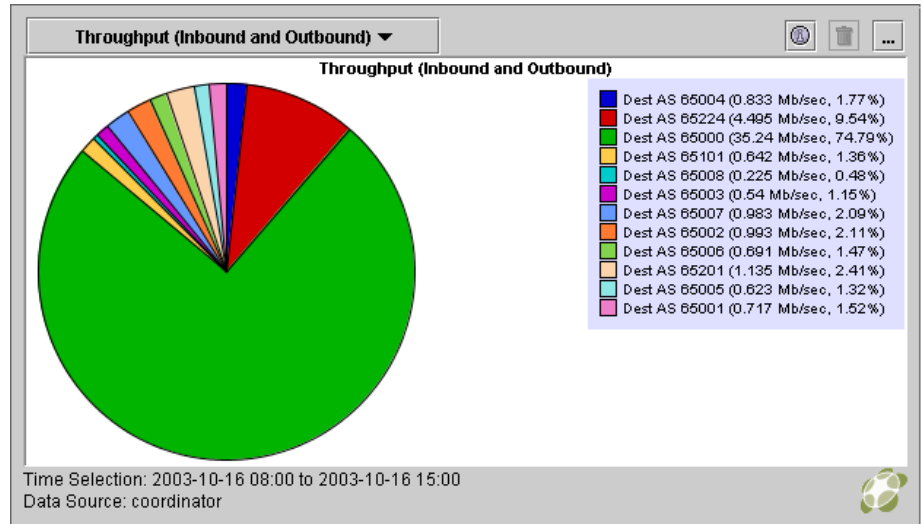
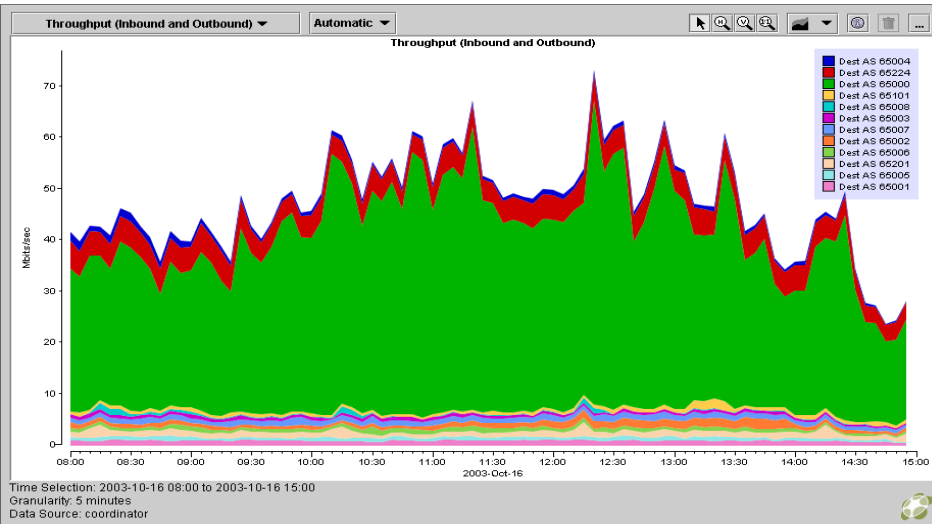
**IP Address** [Input] [Go]

Index	Route	Lat...
10.57.5.36	Thu Aug 14 13:37:39 EDT 2003	31...
10.57.5.30	Thu Aug 14 13:37:39 EDT 2003	31...
10.57.7.52	Thu Aug 14 13:37:39 EDT 2003	26.48
10.57.7.77	Thu Aug 14 13:37:39 EDT 2003	31...
10.57.7.95	Thu Aug 14 13:37:39 EDT 2003	50...
10.57.7.86	Thu Aug 14 13:37:39 EDT 2003	44...
10.57.7.129		
10.57.7.108		
10.57.7.116		
10.57.7.123		

**Time:** Thu Aug 14 14:13:10 EDT 2003  **Lookup**

Hop	Address	RTT	ms	AS
0	10.96.9.248		0.0	Reserved AS
1	10.96.9.1	<div style="width: 20px; height: 10px; background-color: blue;"></div>	29.847	Reserved AS
2	10.96.10.10		0.363	Reserved AS
3	10.96.224.18	<div style="width: 20px; height: 10px; background-color: blue;"></div>	23.03	Reserved AS
4	10.57.4.1	<div style="width: 20px; height: 10px; background-color: blue;"></div>	36.991	Reserved AS
5	10.57.4.34	<div style="width: 20px; height: 10px; background-color: blue;"></div>	31.733	Reserved AS
6	10.57.6.51	<div style="width: 20px; height: 10px; background-color: blue;"></div>	31.568	Reserved AS

# Track Branch Office Performance



# Thank You

**Questions Welcome  
Drop by our Booth!**

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[www.networkphysics.com](http://www.networkphysics.com)