MPLS Japan 2003

Tools and techniques for smooth installation and maintenance of MPLS network

Agilent Technologies

Why the need for tools?

The trend is that the packet network will be predominantly IP/MPLS

As a result, most user services will have to be supported over MPLS networks - be it Voice or Wireless or even ATM/FR service

Clearly, MPLS network need to very well managed, as the importance of the services it carries will be very high

Solution requires two pronged approach

Technical

- Should be comprehensive

- Features need to be suitable to testing network

- Features need to be tailored to test MPLS

Logistical

- Should not be expensive to implement

- Should not be difficult to manage or operate

Centralized Testing for Network

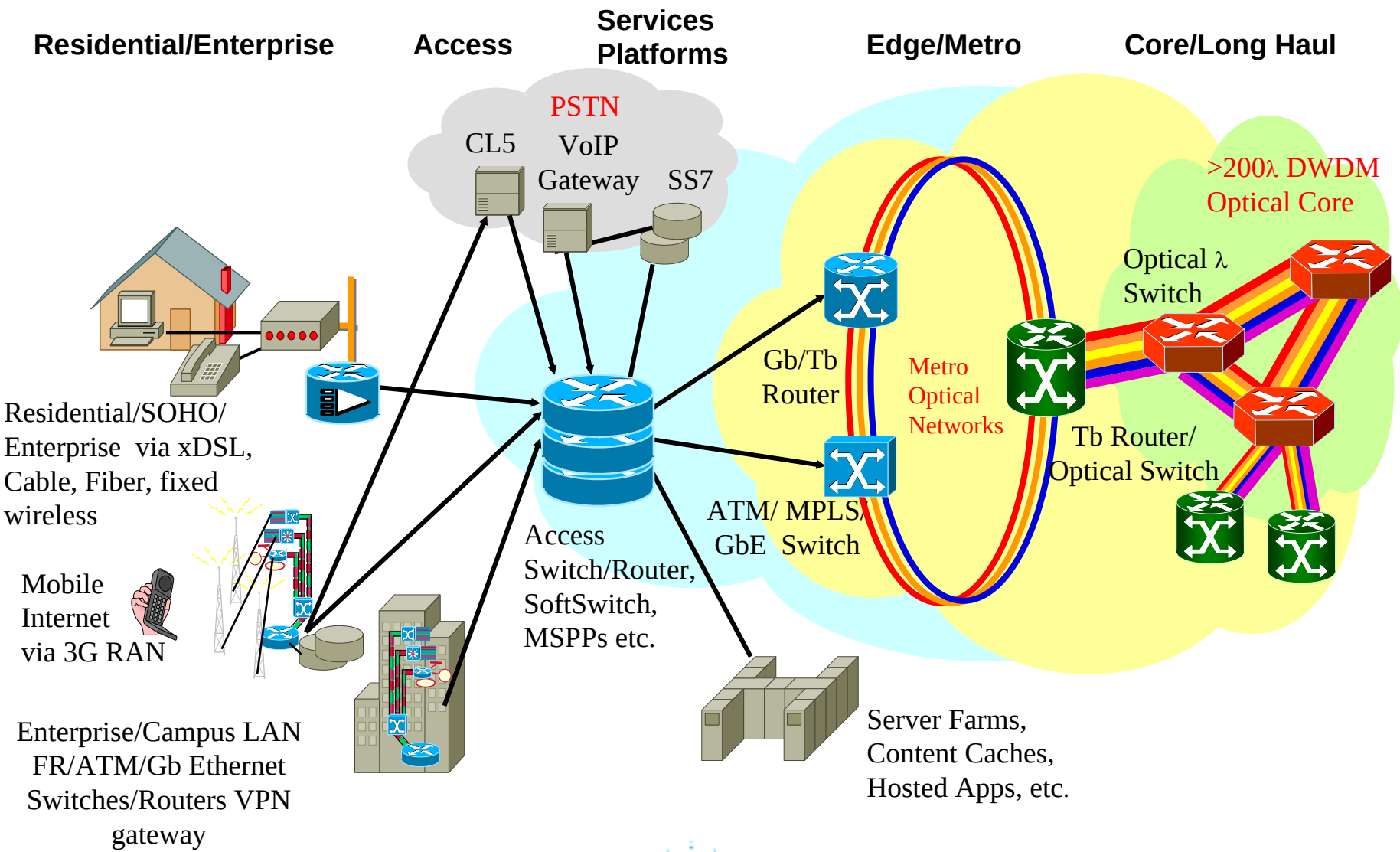
Why Centralized Troubleshooting/Management?

- A real business benefit
- Simplifies existing methods
- Reduce MTTR (Mean Time to Repair)

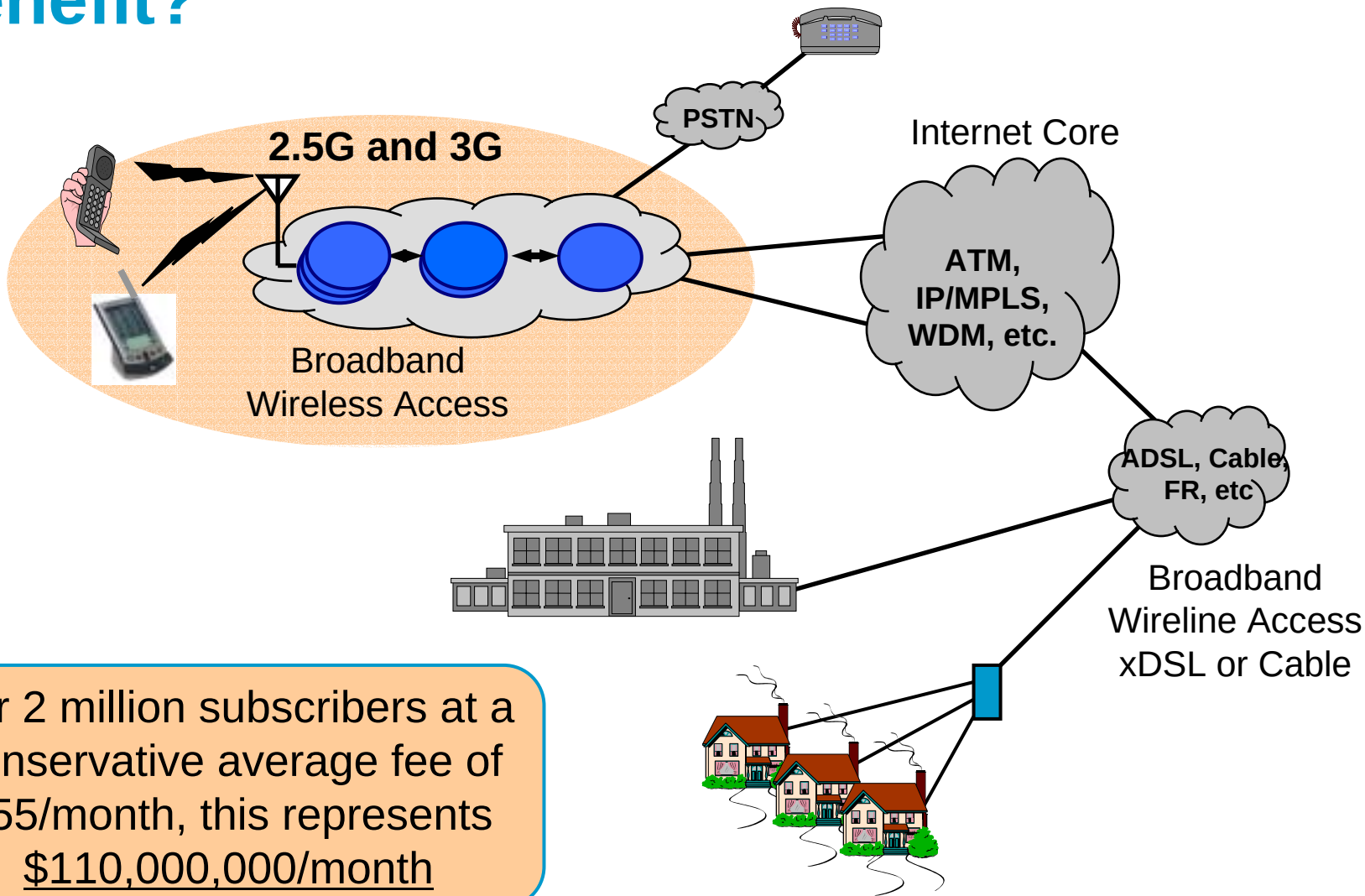
Implementing Centralized Troubleshooting

- Various Elements Required
- Sample Scenarios

Today's Carrier Network:



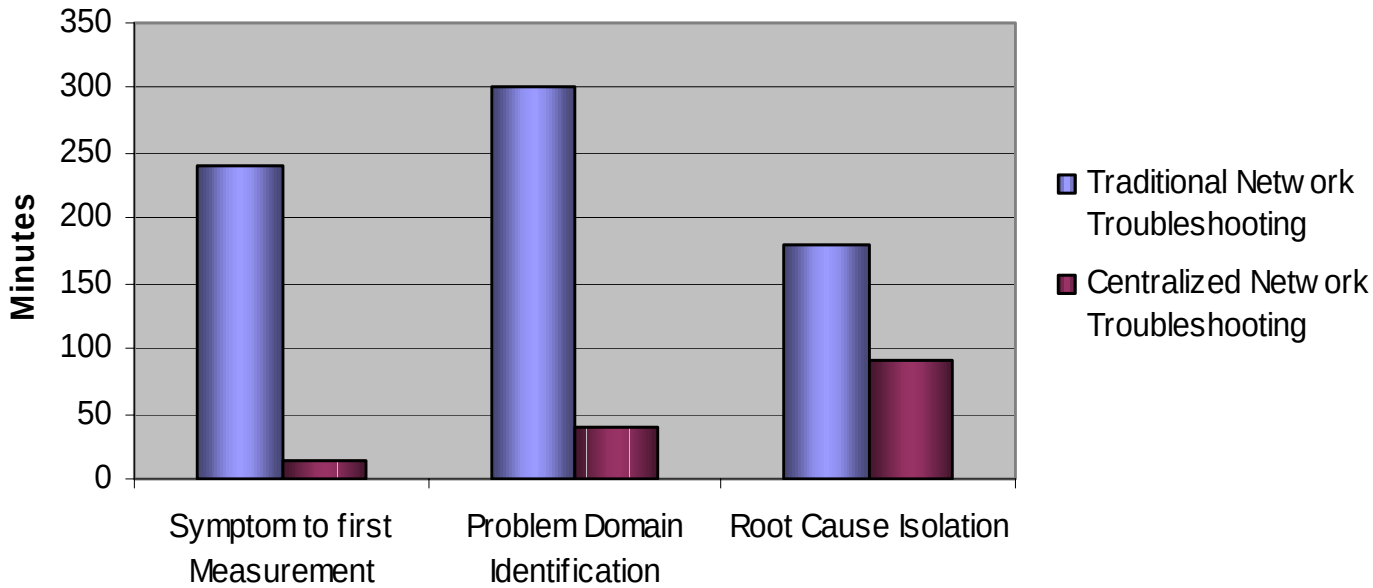
Converged Wireless Multi-services: Benefit?



For 2 million subscribers at a conservative average fee of $55/month, this represents $110,000,000/month

Extreme Productivity Improvement:

Drastically Reduce the Time it Takes to Start Solving the Problem



Source: Agilent Customer Base, 2002

Traditional Network Troubleshooting

Problem symptoms detected to first measurement: 60 – 240 minutes

Problem domain isolation: 120 – 300 minutes

Root Cause identification: 60 – 180 minutes

Meant Time to Repair (MTTR): 240 – 720 minutes

Centralized Network Troubleshooting

Problem symptoms detected to first measurement: 5 – 15 minutes

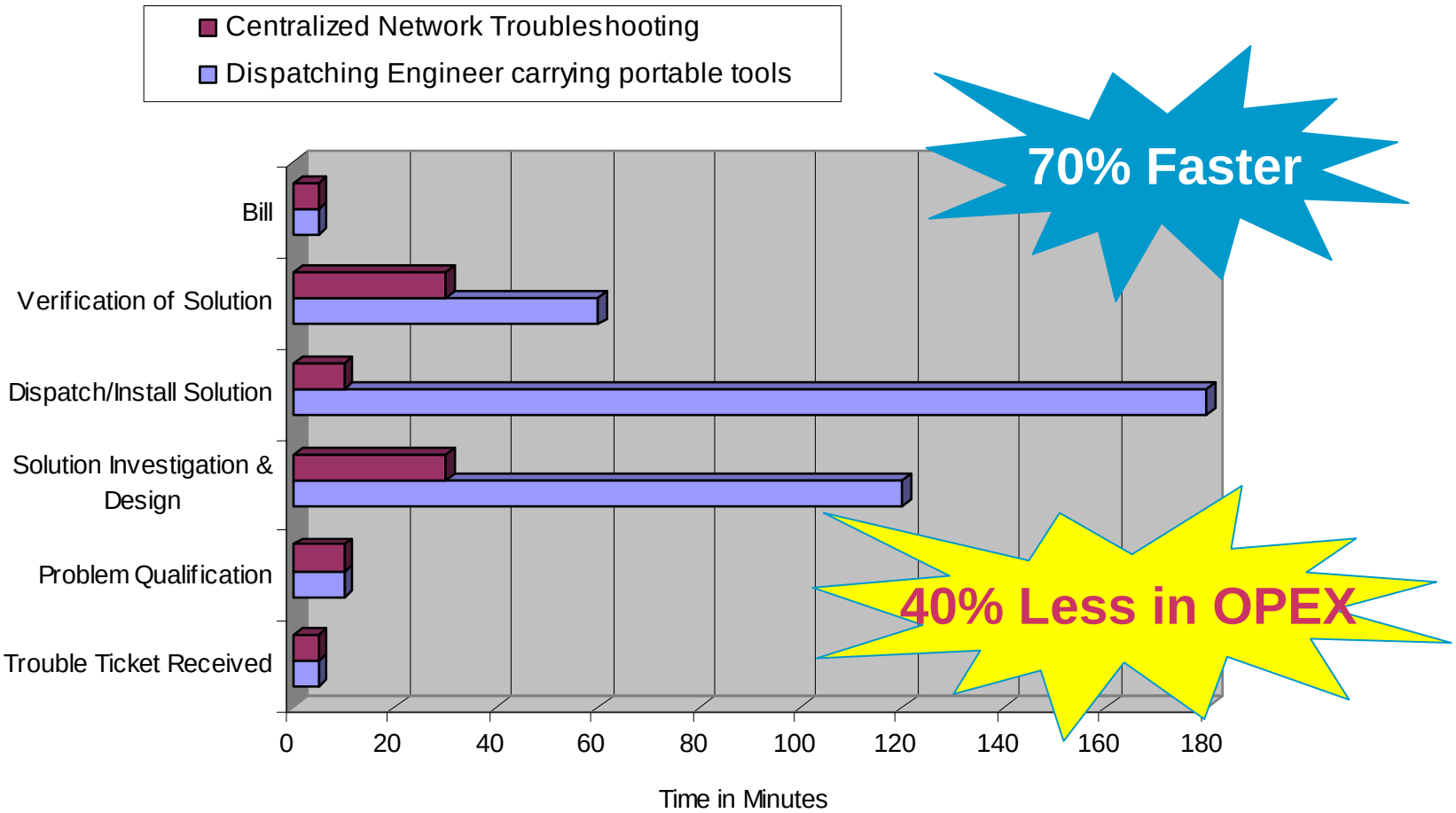
Problem domain isolation: 20 – 40 minutes

Root Cause identification: 30 – 90 minutes

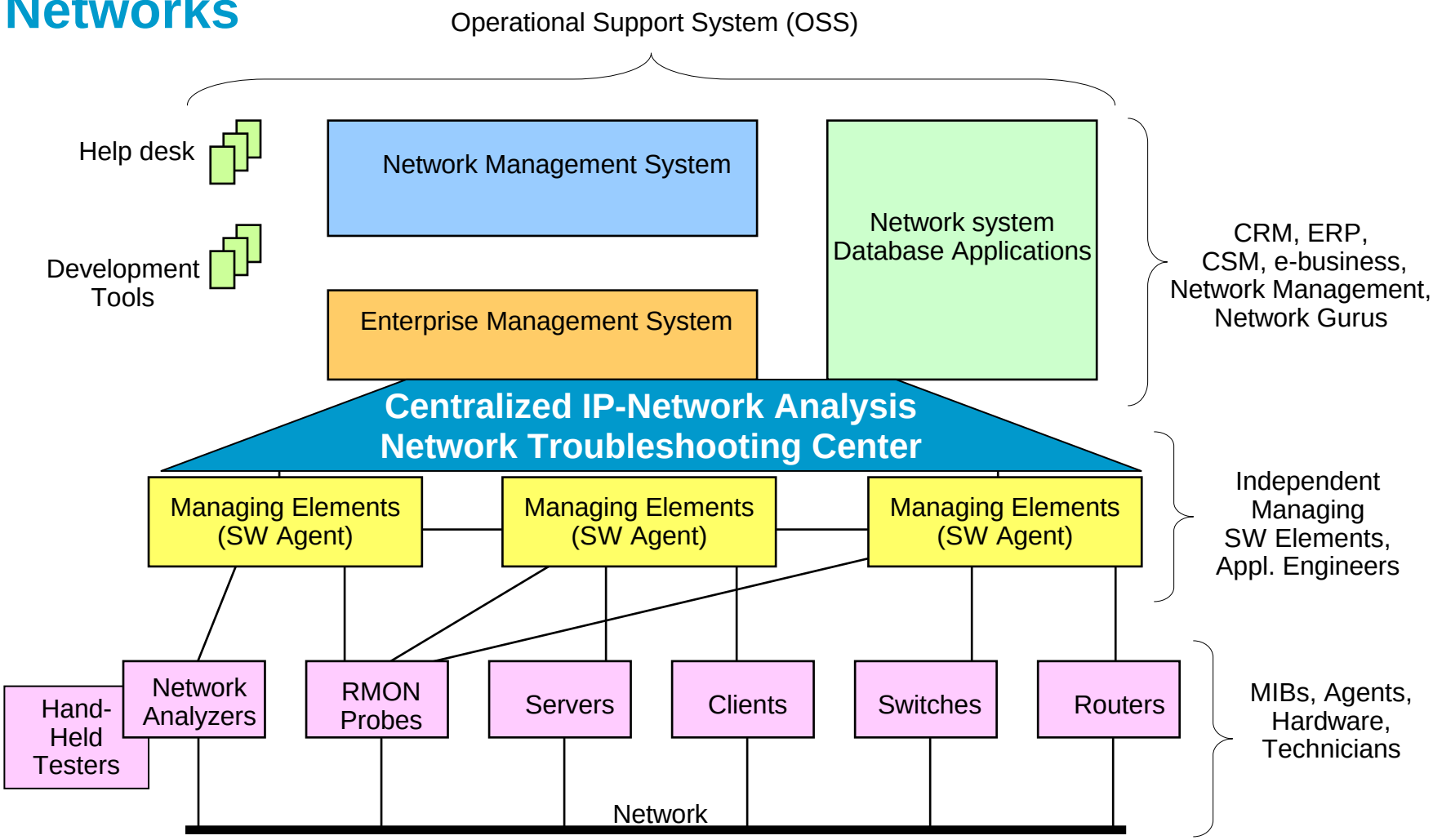
Mean Time to Repair (MTTR): 55 – 145 minutes

How Much Time?

...Downtime is Not an Option

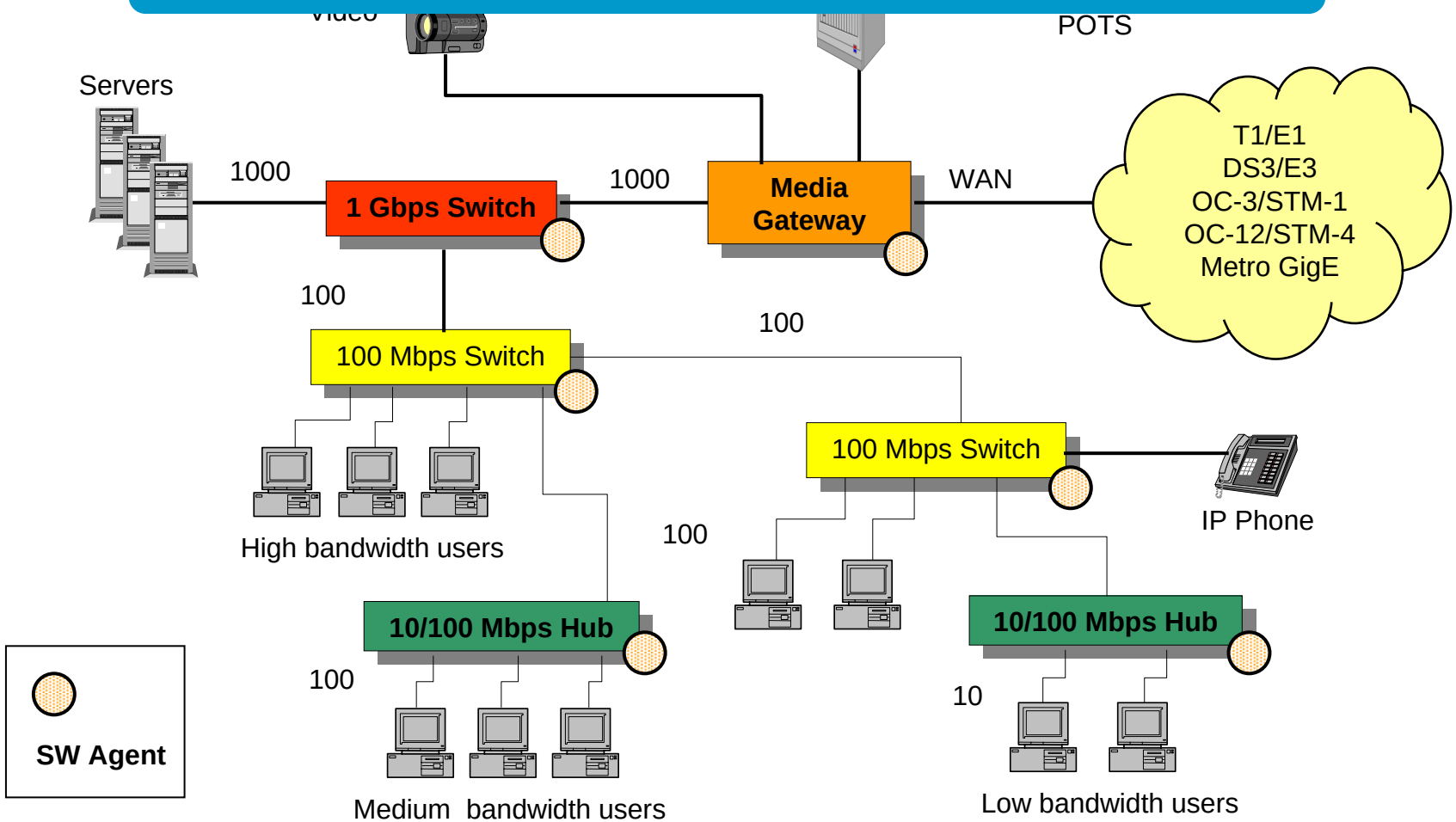


Implementing Centralized Network Troubleshooting for Managing the Various Components of Mission Critical Networks

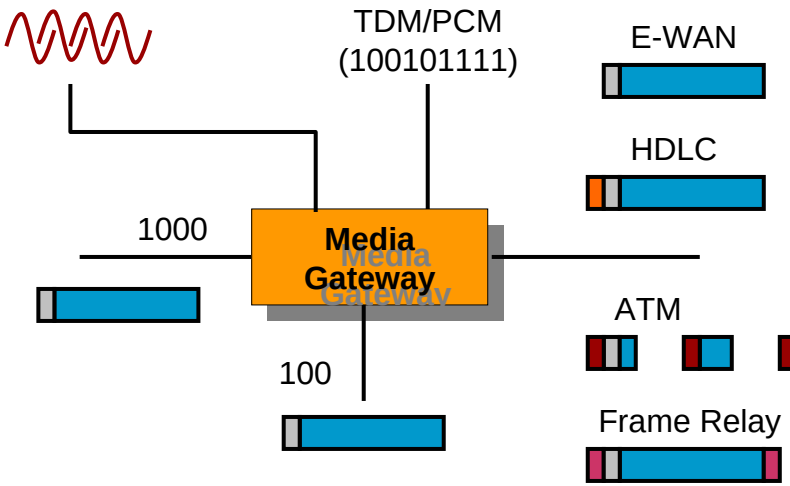


Converged Network Architecture: What if...

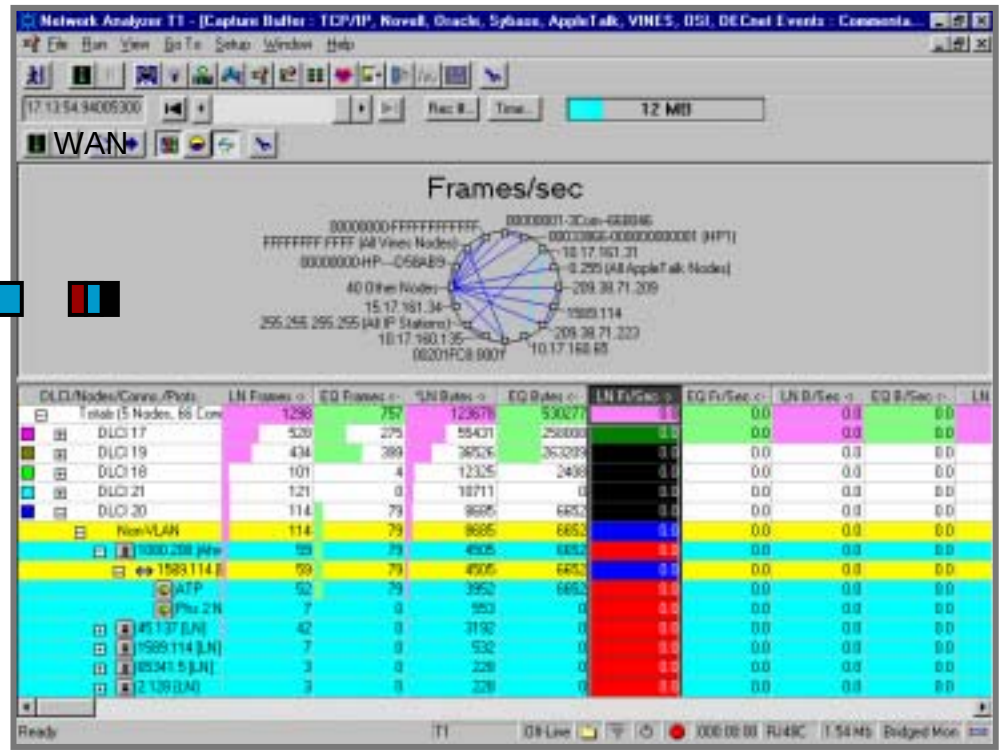
uld use the SW Agents already existing in my network elemer



And What if I Could Also do Troubleshooting?



etwork Analyzer: Traffic Statistic



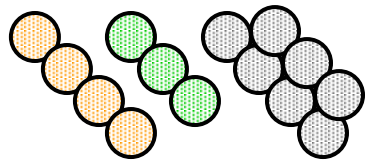
HTTP/Telnet/H.323/SIP	HTTP/Telnet/H.323/SIP
TCP/UDP	TCP/UDP
IP/MSDP/PIM/RSVP	IP/OSPF/IGRP/BGP
LLC/DSAP/SSAP/SNAP	ATM/FR/HDLC/PPP
Ethernet MAC	Optical/Wire/Wireless

ol Optimized for IP over Any Topolo

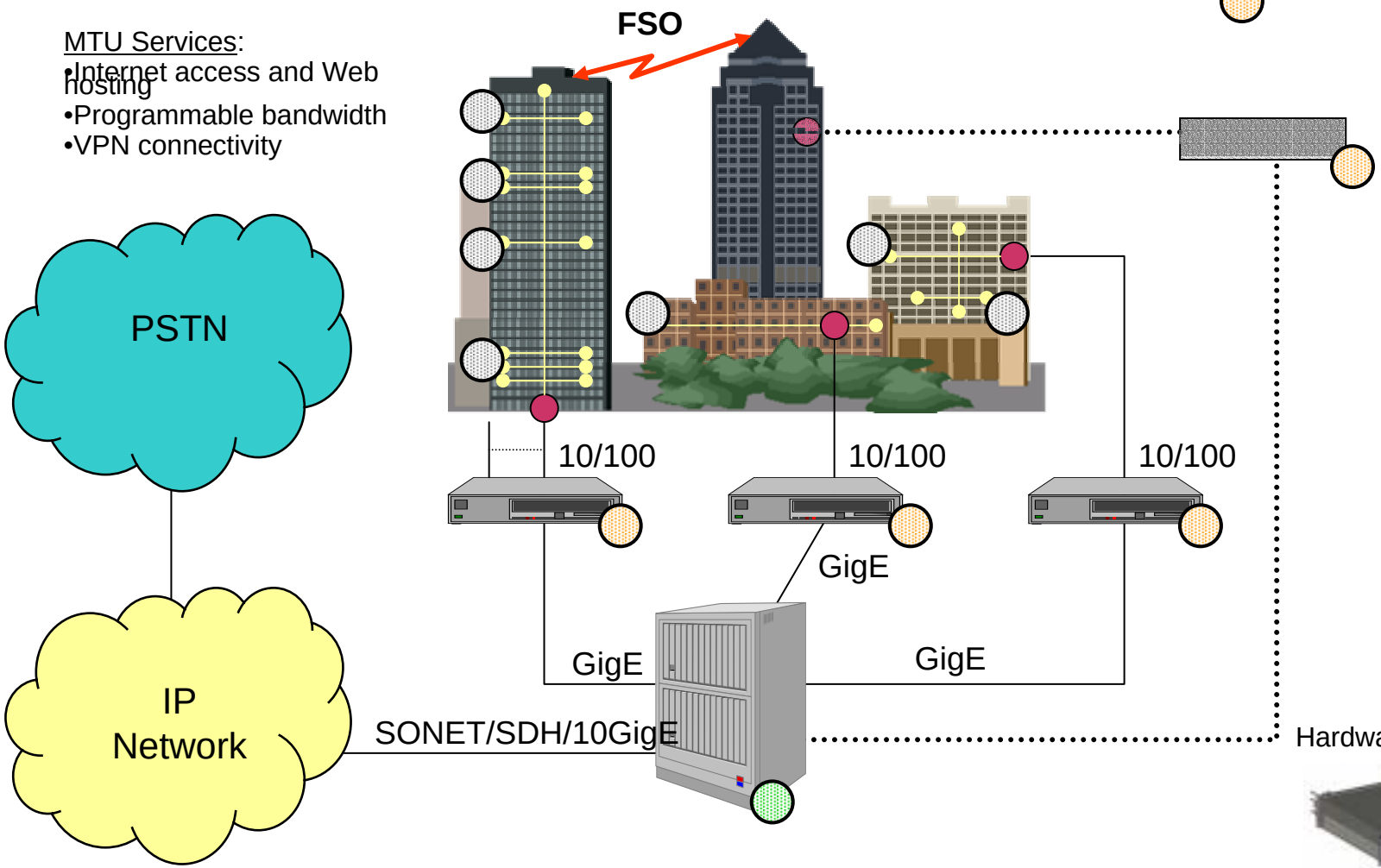
Metro Multi-Tenant Units

Centralized Network Analysis

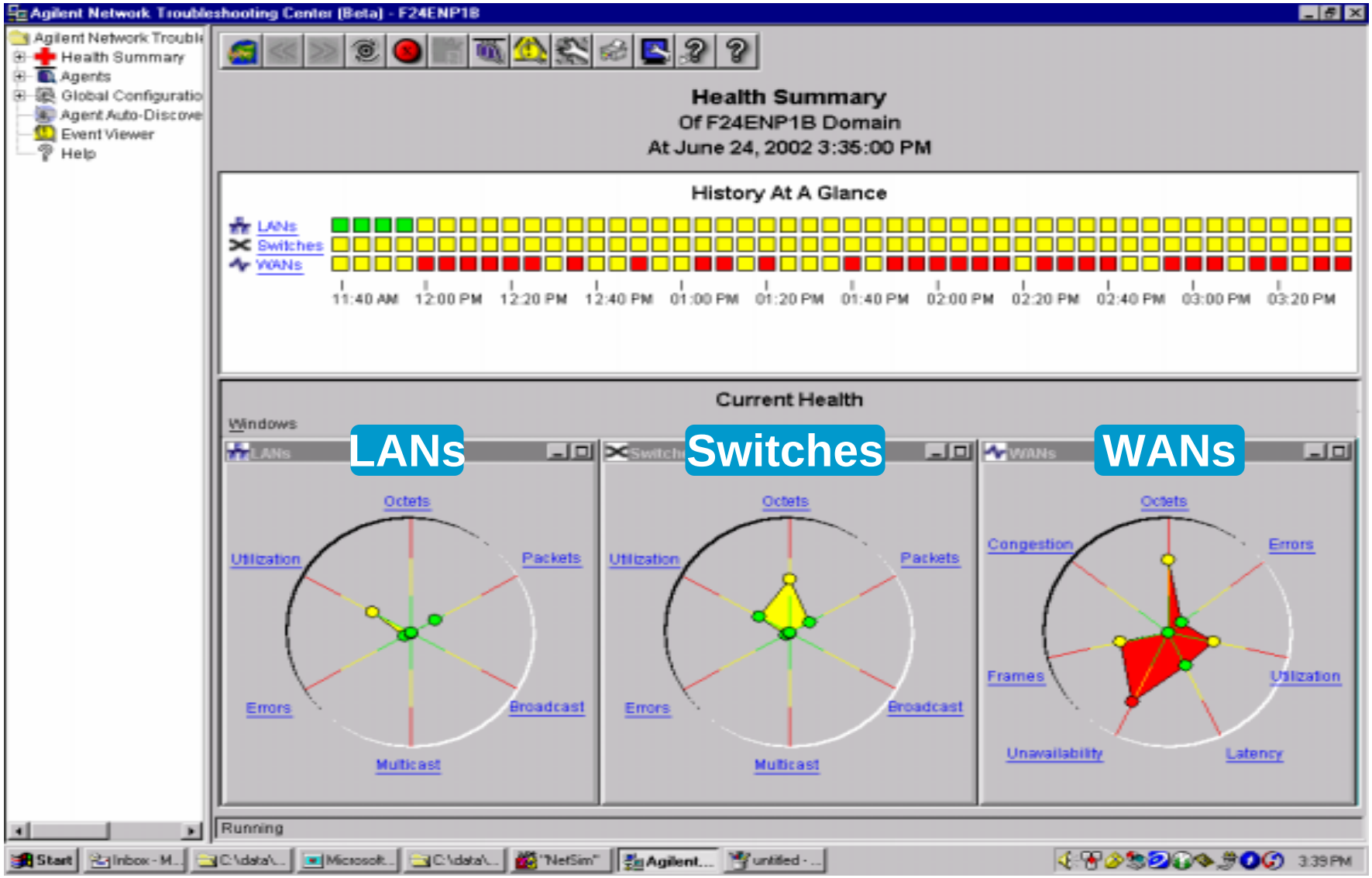
Aggregated Traffic Stats



MTU Services:
- Internet access and Web hosting
- Programmable bandwidth
- VPN connectivity



Aggregated Status from Mission Critical Areas



Why is MPLS a “special” problem?

No unique source/destination pair in header as in IP packets

No unique VPI/VCI identifier like in ATM packets

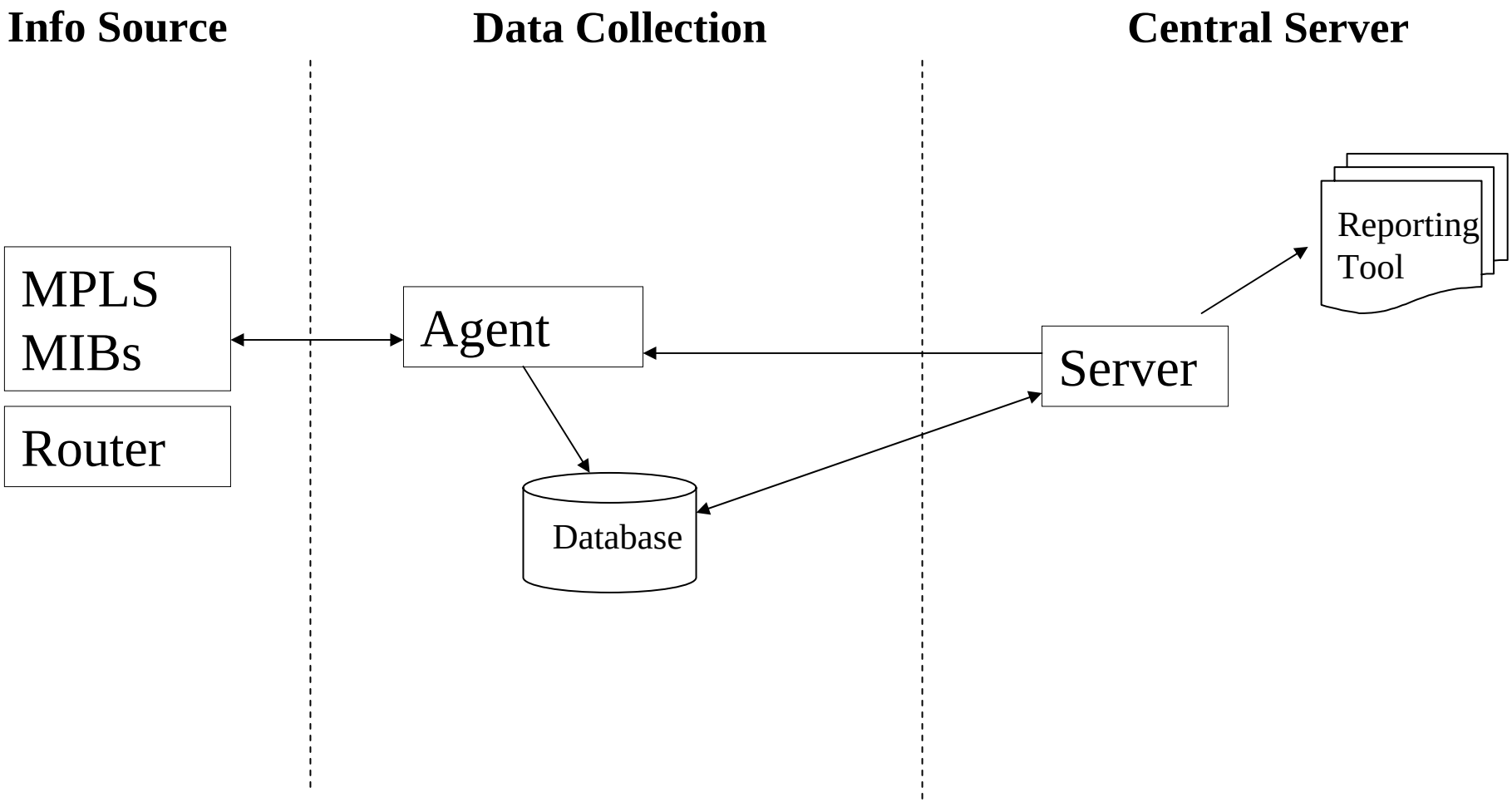
Header for a “circuit” changes on traversing a node, hence changes over every physical link - making it difficult to track

Only unique identifier is LSP ID or LSP “name” which is network specific

The LSP ID is not carried in data packets, hence need to look at MIBs

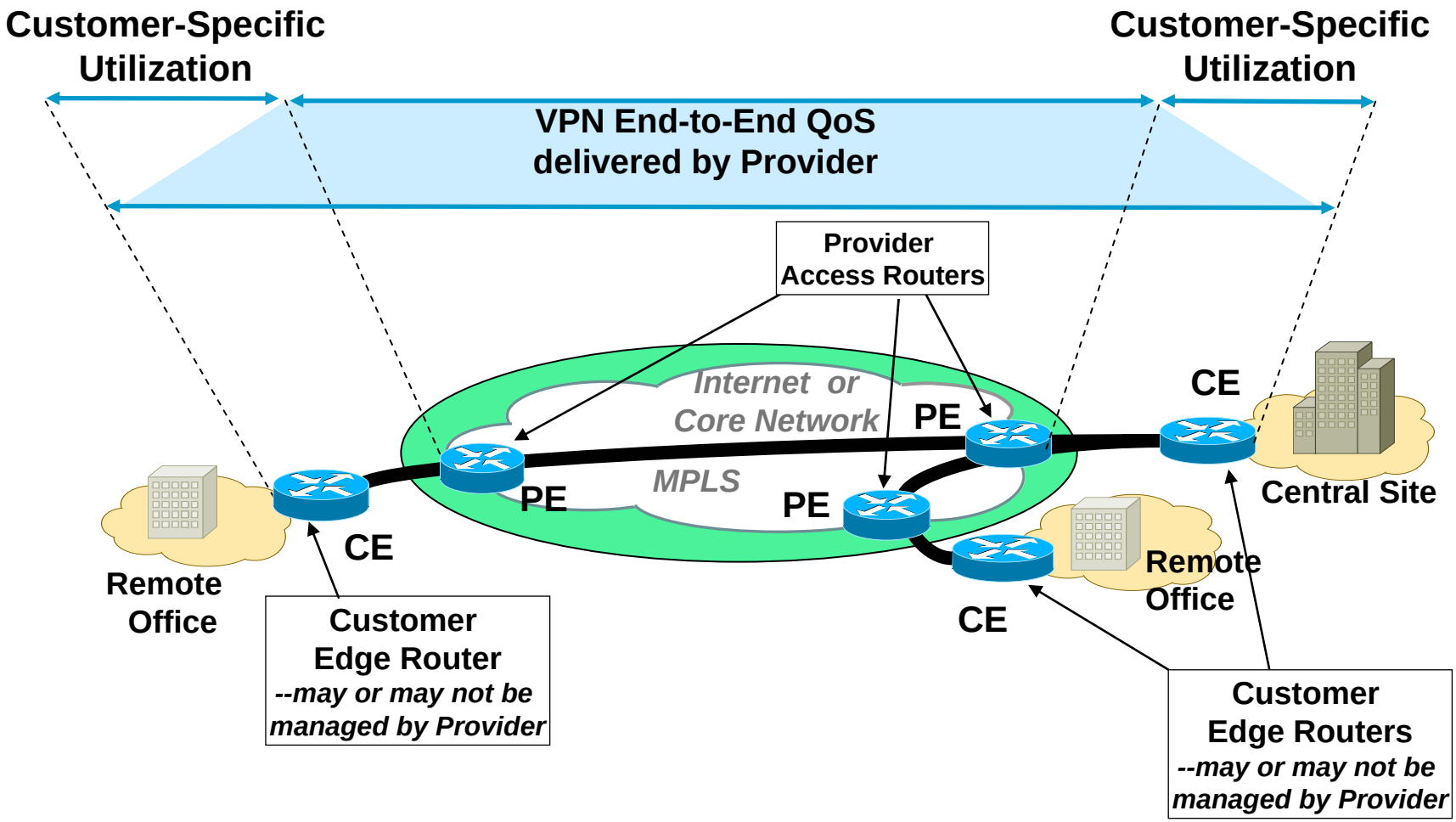
Above applies for MPLS VPNs in the same way (though inner label remains intact it is not intended to be looked at, as it may not flow over a predetermined physical path)

Looking into the MIB is a requirement



End-to-End QoS for a VPN Environment

Customer Service View and Characterization



VPN Product Requirements

Service Management based on Class-of-Service for converged networks

- CoS monitoring for Data (best effort, business, priority), Voice, Video
- End-to-end monitoring of service health, per VPN with SAA active tests
- Correlate performance events with Service and Customer impact

QoS Reporting per VPN, per application by CoS

- Latency, Jitter, Packet Loss
- Availability
- In/Out traffic policy including drops
- Actual traffic (bandwidth, e-2-e flow delivery ratios, via PerfE passive monitoring)**??**

Monitor and report on VPN Device Health

- Configurable device availability and performance data reports via PerfE MIB collector
- Management platform health monitoring (PerfE, VPNSC, QoS Manager)

SLA management and Reporting by CoS

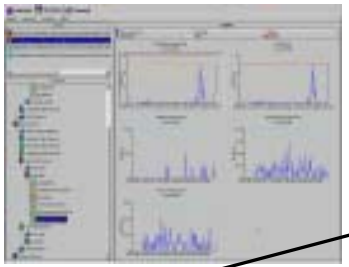
- Active SLA management per VPN, customer
- Real-time SLA alerting and reporting
- Historical SLA reporting per customer, service

Performance alerting and analysis

- Configurable alerting thresholds
- Performance metric Baselines and trend reports
- Configurable Notification and Action services

MPLS/VPN Management Solution

with optional Managed CE



QoS Manager Server

VPN Inventory Data

VPN Database

QoS Tests*

QoS Tests

MIB Agent

Data Collectors

CE Data:
- Utilization
- Error Rates
- Router Health
- Latency
- Packet Loss
- Jitter
- DNS
- LDAP
- etc.

PE Interface Data:
- Utilization
- Error Rates
- Router Health

Full Mesh PE↔PE:
- Latency
- Packet Loss
- Jitter
- Core I/F Utilization & Rates

Service Tests:
- DNS
- LDAP
- RADIUS
- etc.

DNS, RADIUS, LDAP, etc

MPLS Core

CE

PE

PE

CE

Downstream PE→CE:
- Latency
- Packet Loss
- Jitter

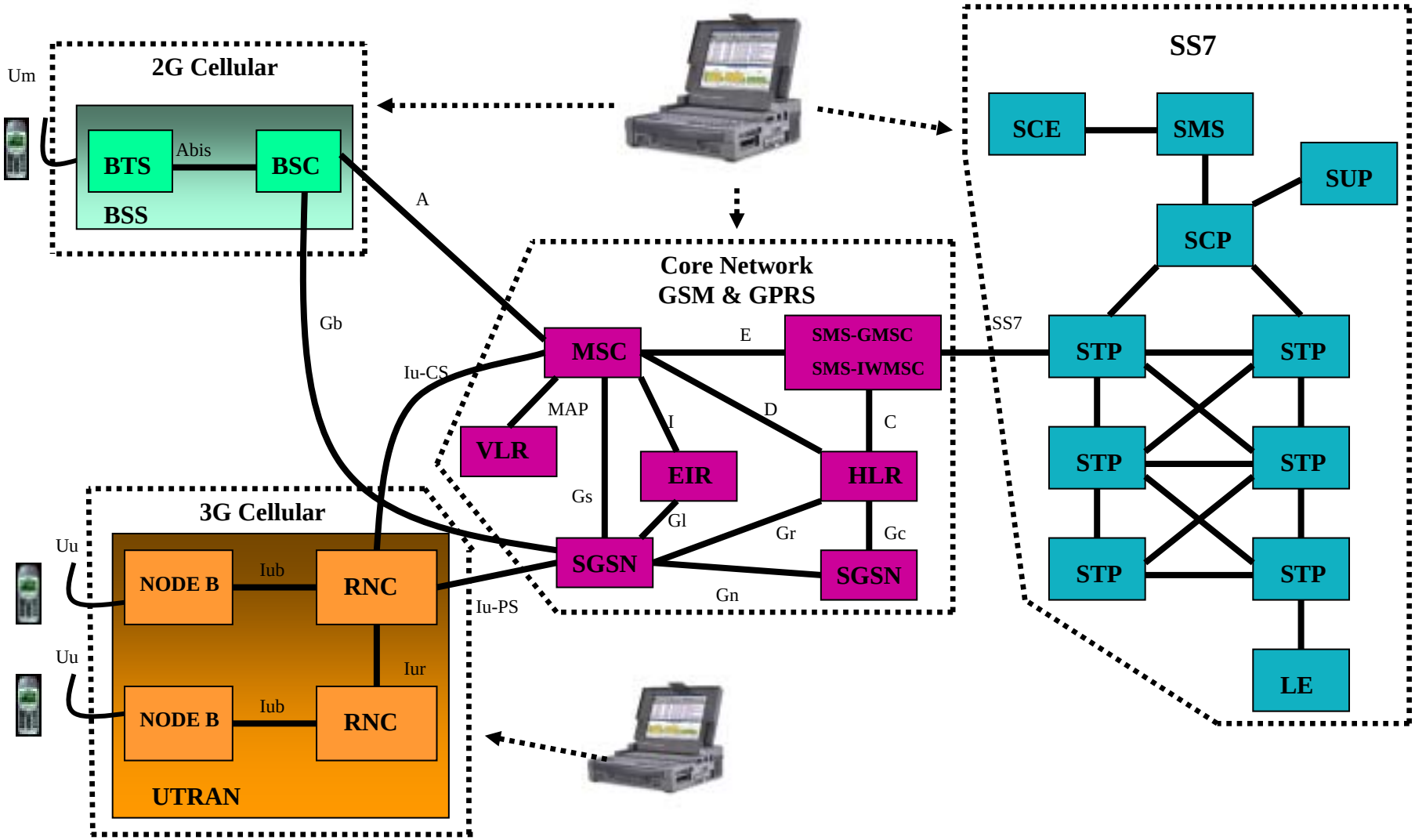
* For Managed CE Services

Active Test

Testing Services at the same time..

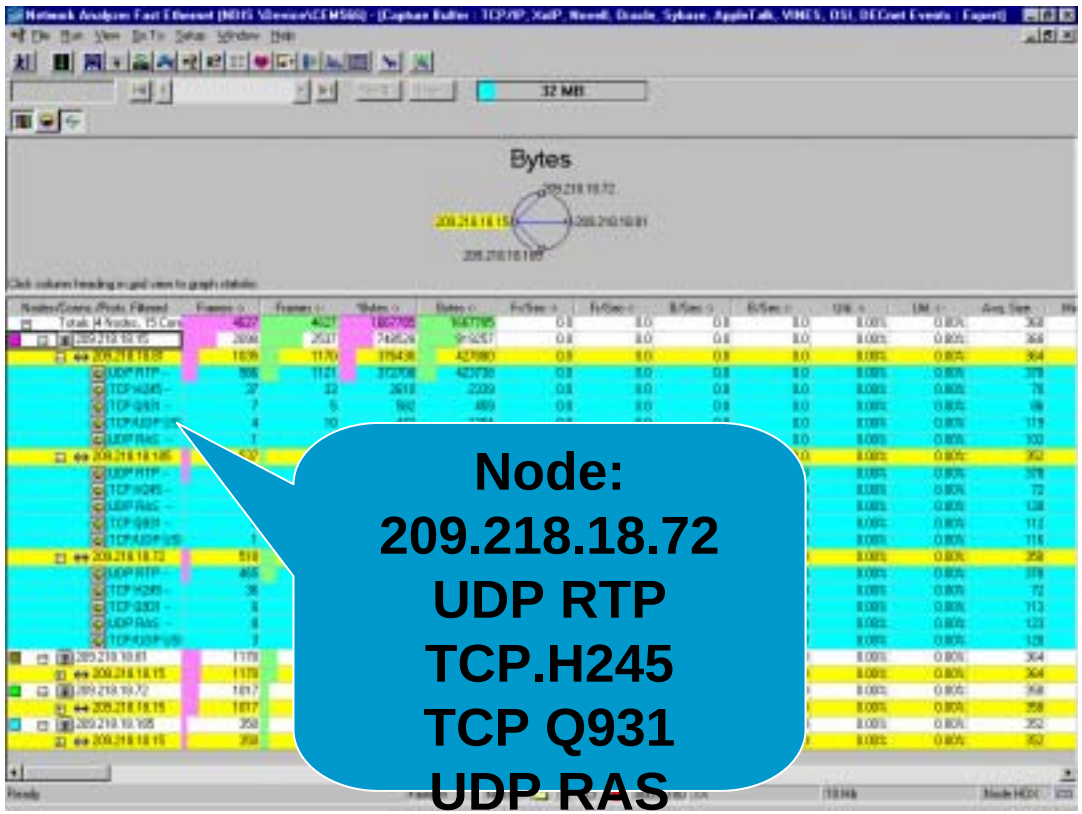
- **Wireless Signaling**
- **Voice and VoIP Signaling**

Use Model for Mobile and 2.5G and 3G Networks



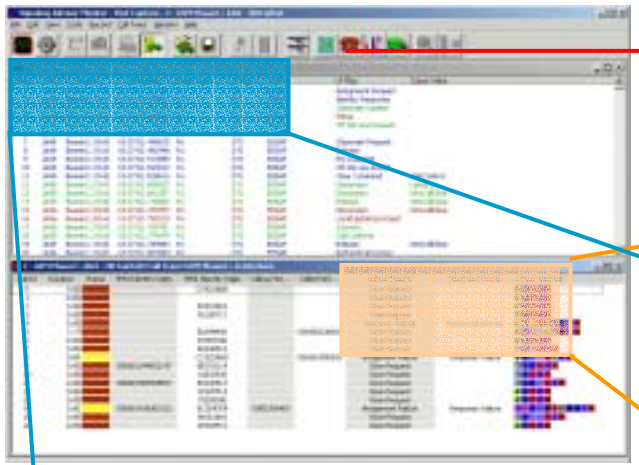
Testing & Troubleshooting VoIP Signaling

Need to Drill-Down to any Connection



- **Measure Bandwidth used for each Node, Connection & Protocol**
- **Measure the impact of data on the Performance of VoIP**
- **Measure the BW used by Voice and correlate to Voice Quality**

Find Signalling Problems quickly



: Click on “call trace” to sta

Configure & trace calls graphical

Clear Request		
Handover Failure	Normal call clearing	
Clear Request		
Clear Request		
Clear Request		
Assigmnent Failure	Temporary failure	
Clear Request		

2 - GSM Phase2+ AInt - HO Fail.tol:1 Traffic Overview (Grouped)

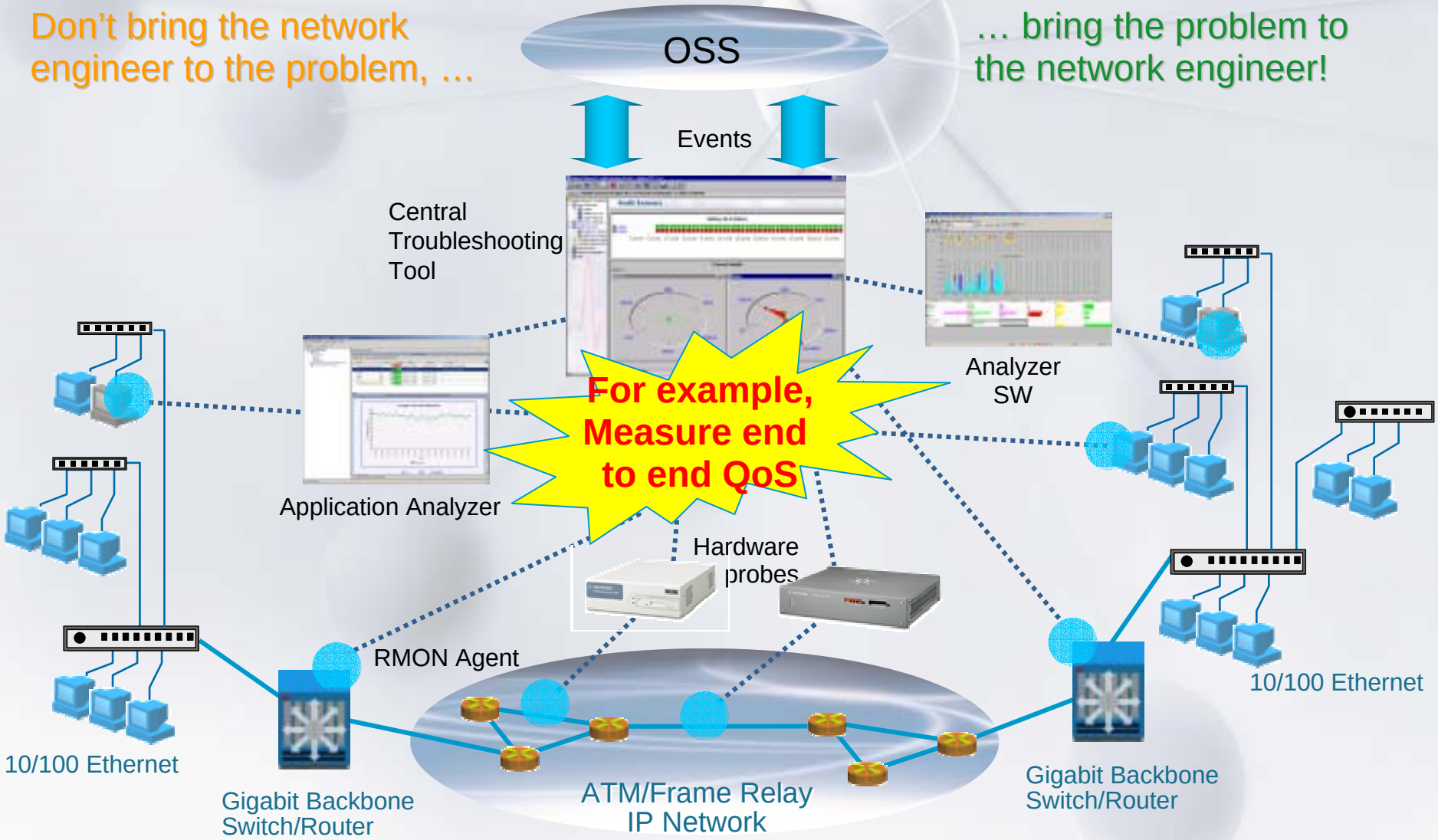
Num.	Link	Bearer	Timestamp	Event Type	L4 Msg	L5 Prot
1518	Link6	Bearer2.3 RxB	18:37:28.843841	Rx	DT1	BSSAP
1555	Link5	Bearer2.2 RxB	18:37:29.511913	Rx	DT1	BSSAP
1641	Link6	Bearer2.3 RxB	18:37:31.117088	Rx	DT1	BSSAP
1742	Link5	Bearer2.2 RxB	18:37:32.734283	Rx	DT1	BSSAP
1772	Link6	Bearer2.3 RxB	18:37:33.112834	Rx	DT1	BSSAP
1775	Link5	Bearer2.2 RxB	18:37:33.144657	Rx	DT1	BSSAP
1777	Link5	Bea				

3: See all the signaling messages for each call

Centralized Troubleshooting Summary

Don't bring the network engineer to the problem, …

… bring the problem to the network engineer!



References

- **Calculating ROI for Centralized IP Network Analysis Systems in Large Enterprise Networks**
  A White Paper by Leo De Rosa, Agilent Technologies
- **Network Troubleshooting (book), by Othmar Kyas**
  An Agilent Technologies Publication

Questions & Answers

Agilent Technologies