

Let Your Mainframe do the Heavy Lifting - Strategies to Manage and Support your Communications Infrastructure

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Agenda

- The Operational Impact of VoIP and Convergence Tech.
- Identifying the Key VoIP QoS Metrics
 - VoIP service availability and reliability is mandatory
- Relationship Between Infrastructure and VoIP
 - Key infrastructure component metrics for VoIP serviceability
- Critical Capabilities to Manage the Entire Domain

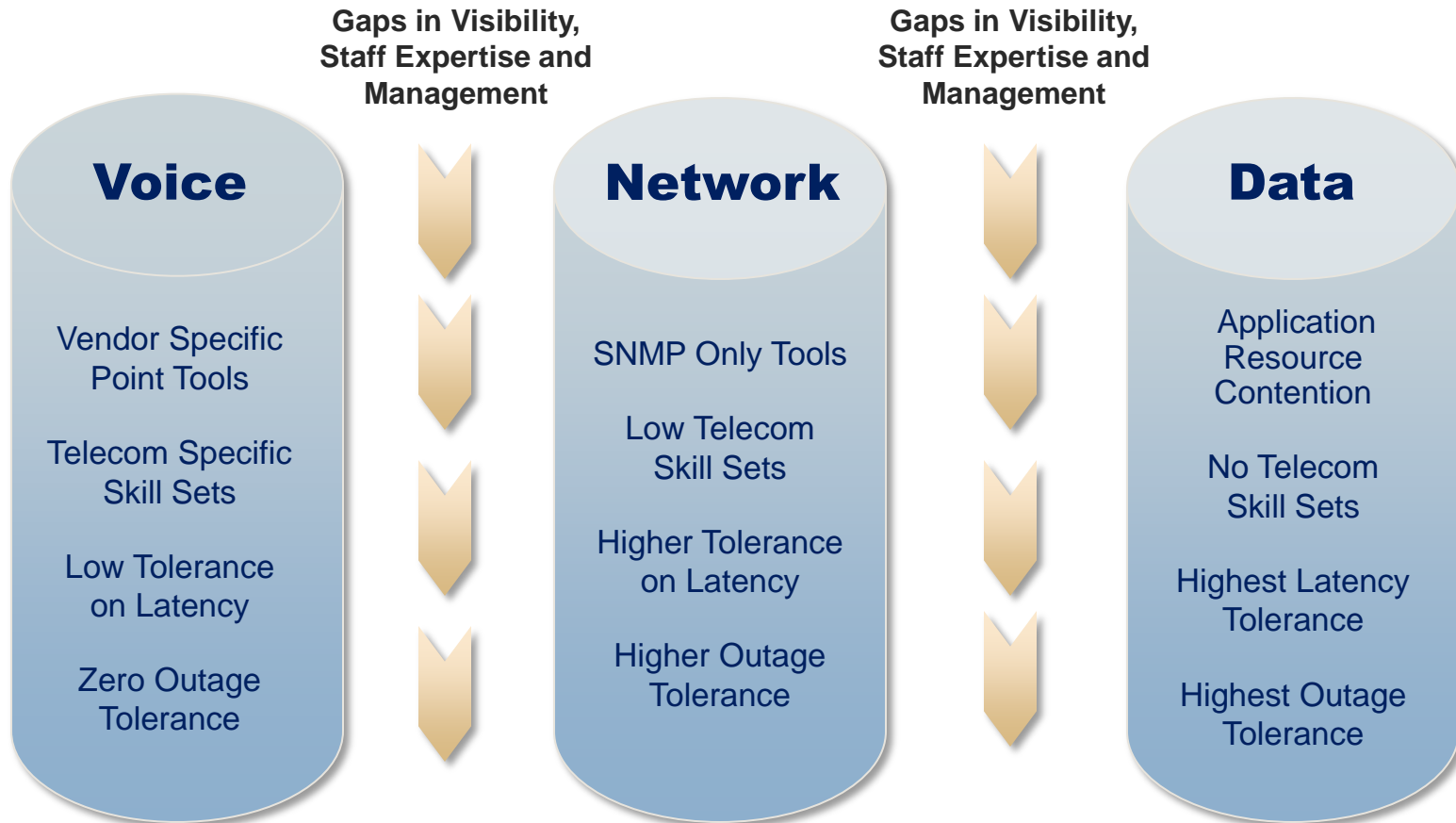
UC, VoIP and Convergence Impact

- Leverage VM on Mainframe for UC Management
- Converged Voice Network Lay Foundation for Advanced Communications
 - Collaboration, Workforce Mobility and UC
 - Creates 24x7 end user demands
- Convergence Impact on the Technology Domain
 - Multi-vendor network devices, switches and servers
 - Voice traverses the data domain
 - Network impairments affecting call quality are instantly noticed
 - Diverse protocols, metrics, KPIs

Obstacles to Convergence Success

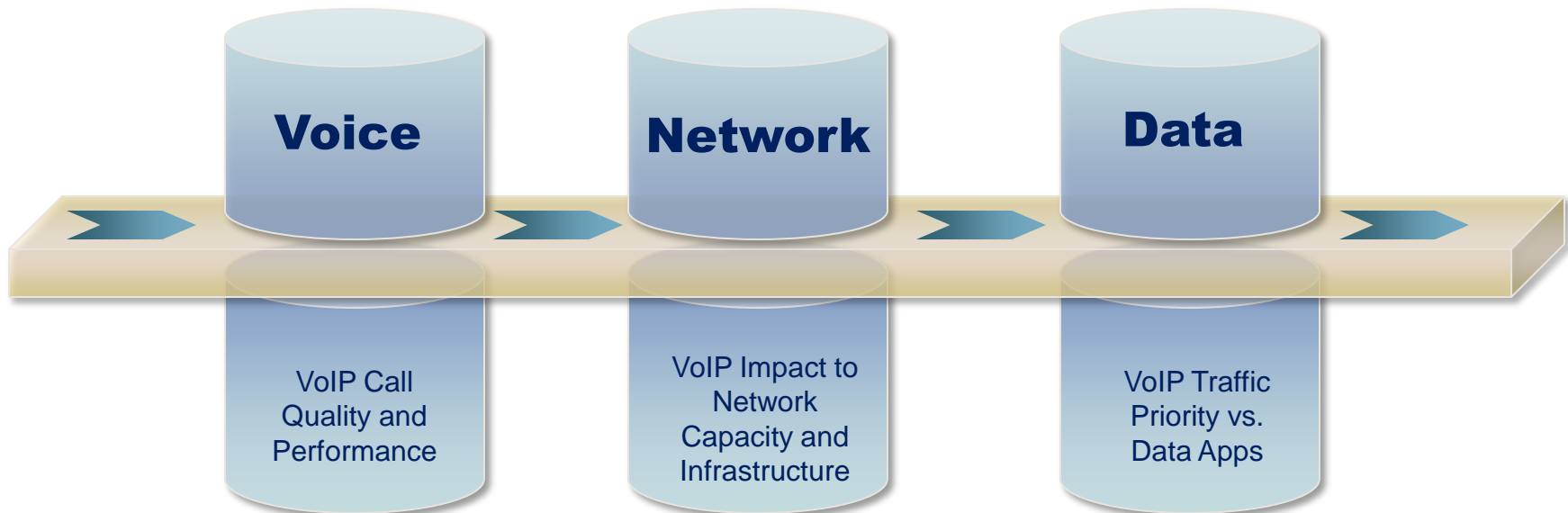
- “Management Gaps” that Endanger VoIP Services
 - Lack of visibility across VoIP, SIP, UC and Infrastructure
 - Poor end-to-end visibility
- Knowledge Barriers that Drive Up Costs
 - Existing staff are not equipped to handle support load
 - Lack of optimization as VoIP traffic grows
- Lack of New Communications Technology Adoption
 - Reduced IT staff to address end-user complaints
 - Poor user experience upon technology rollout

Convergence Aggravates Silos

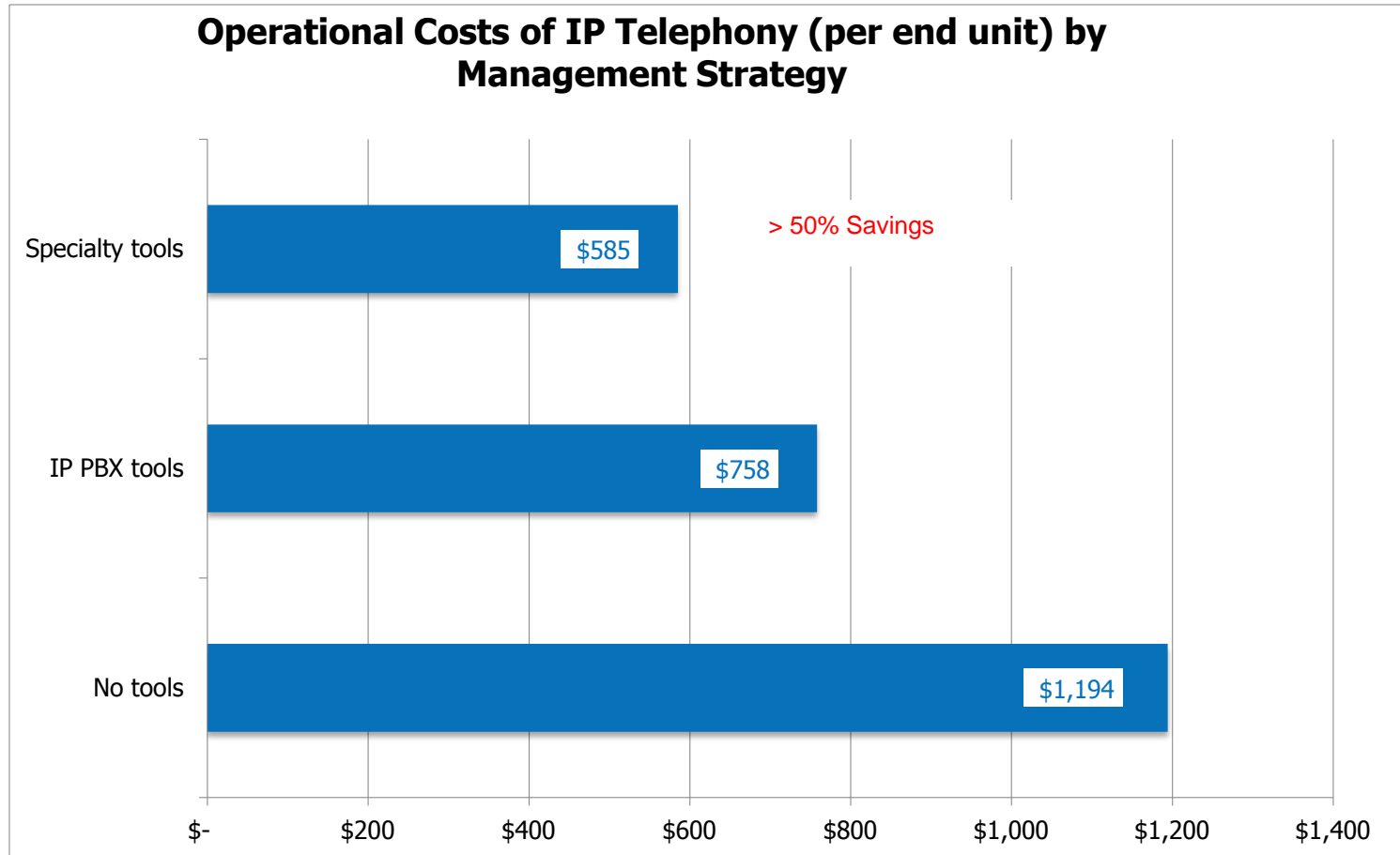


Gain Visibility Across Domains

- Unify Management Across Silos
 - Improves support effectiveness and reduces cost
 - Reduces risks and increases service levels
 - Minimizes complexity and maximizes staff resources

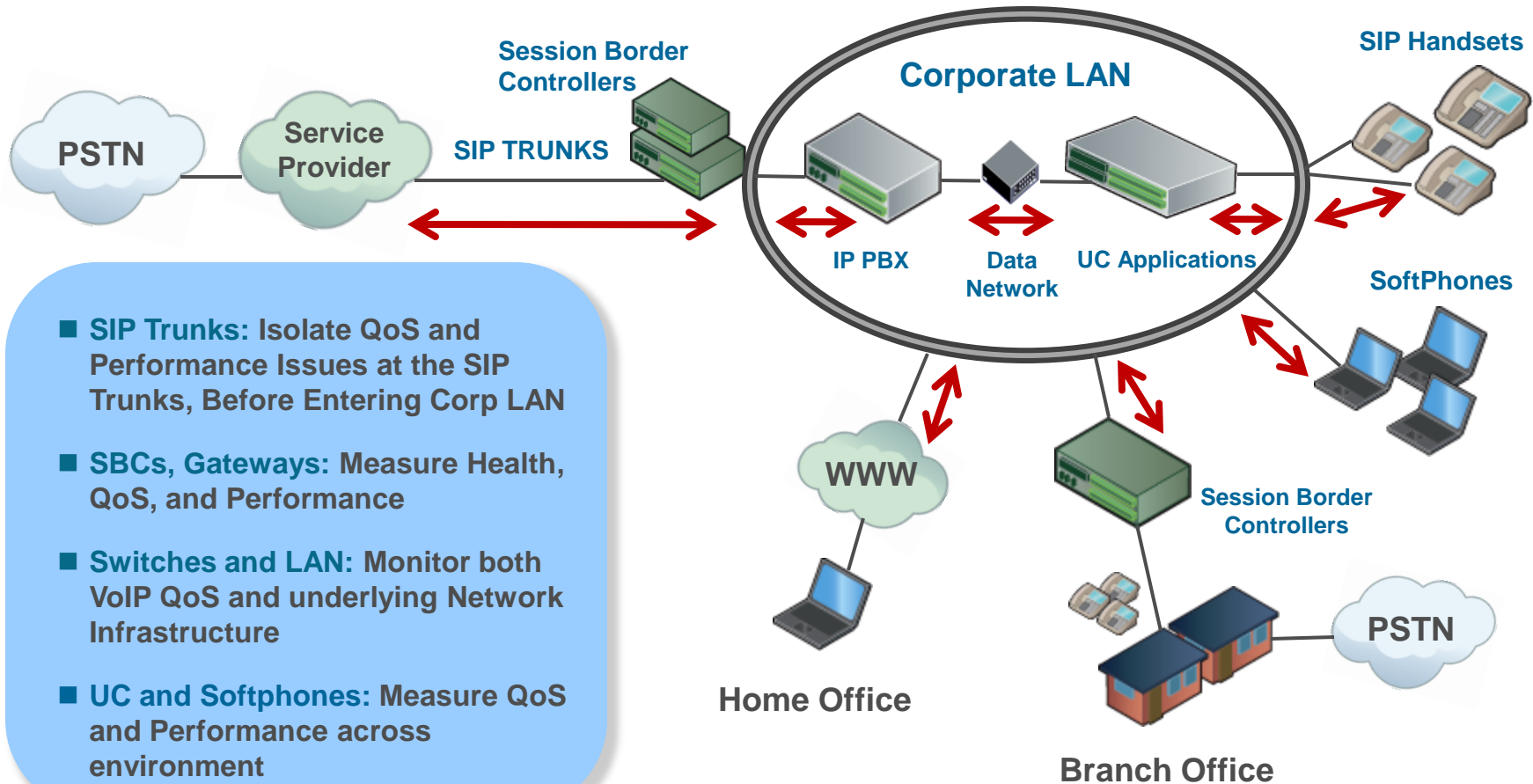


Nemertes Research Quantifies Real Cost



» Reference: Nemertes Research 2011

Visibility Required to Achieve Savings



- **SIP Trunks:** Isolate QoS and Performance Issues at the SIP Trunks, Before Entering Corp LAN
- **SBCs, Gateways:** Measure Health, QoS, and Performance
- **Switches and LAN:** Monitor both VoIP QoS and underlying Network Infrastructure
- **UC and Softphones:** Measure QoS and Performance across environment

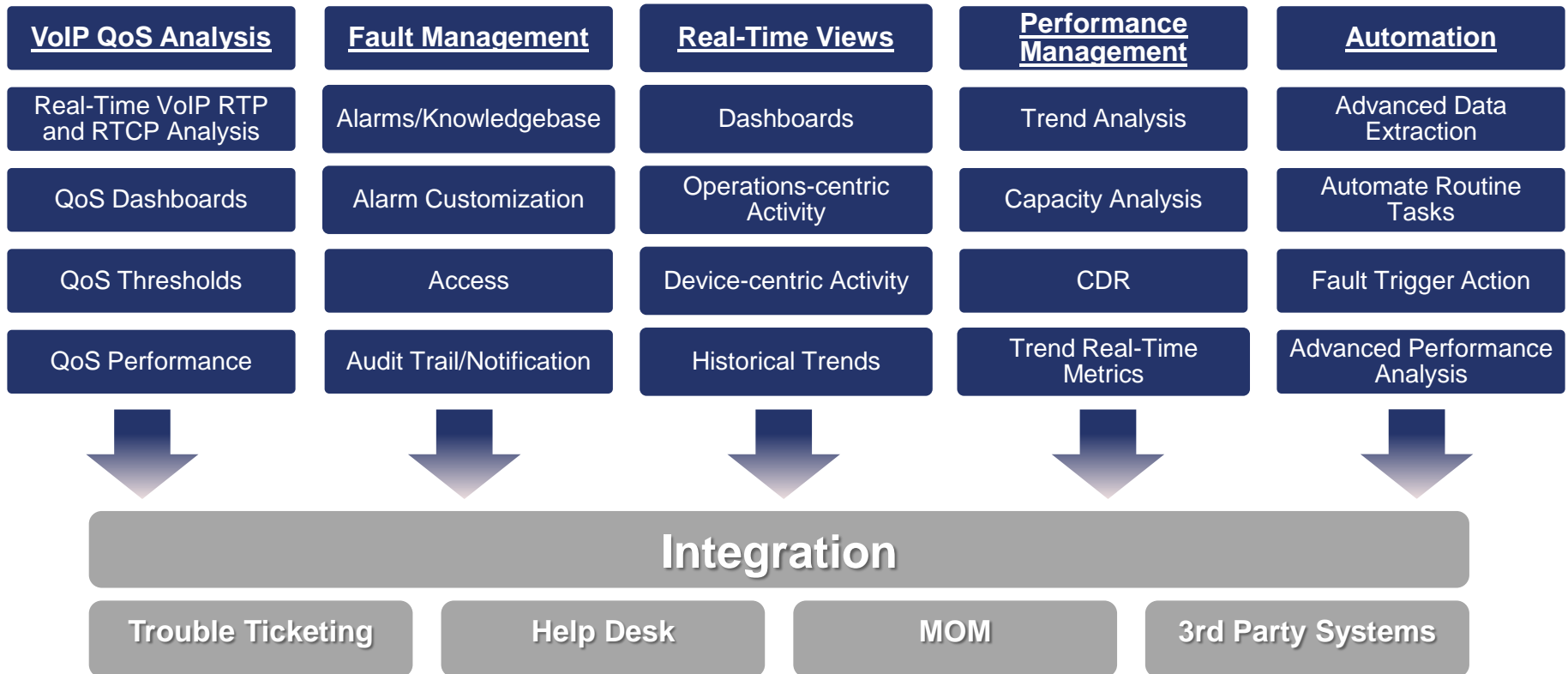
Why Metrics Matter?

VoIP QoS and Infrastructure Service Assurance

<u>Avaya Aura</u>	<u>Nortel</u>	<u>Networking Components</u>	<u>Application Servers</u>
RTCP VoIP QoS Metrics	Passive VoIP QoS Metrics	Component Availability	Component Availability
Call Detail Records	Call Detail Records	Component Reliability	Component Reliability
Component Availability	Component Availability	Component Resources	HW/SW Resources
Component Reliability	Component Reliability	Link Status, Availability and Reliability	Application Events and Processes
DSP\System Resources	System Resources	Link Bandwidth Usage and Errors	HW/SW Connectivity
Component Connectivity	Component Connectivity	Trunk Status and Usage	DB Status and Performance
License Usage	License Usage	SIP Trunk Status, Availability and Reliability	Application Specific Performance
Trunk Traffic Usage and Capacity	Trunk Traffic Usage and Capacity	Environmental	Environmental

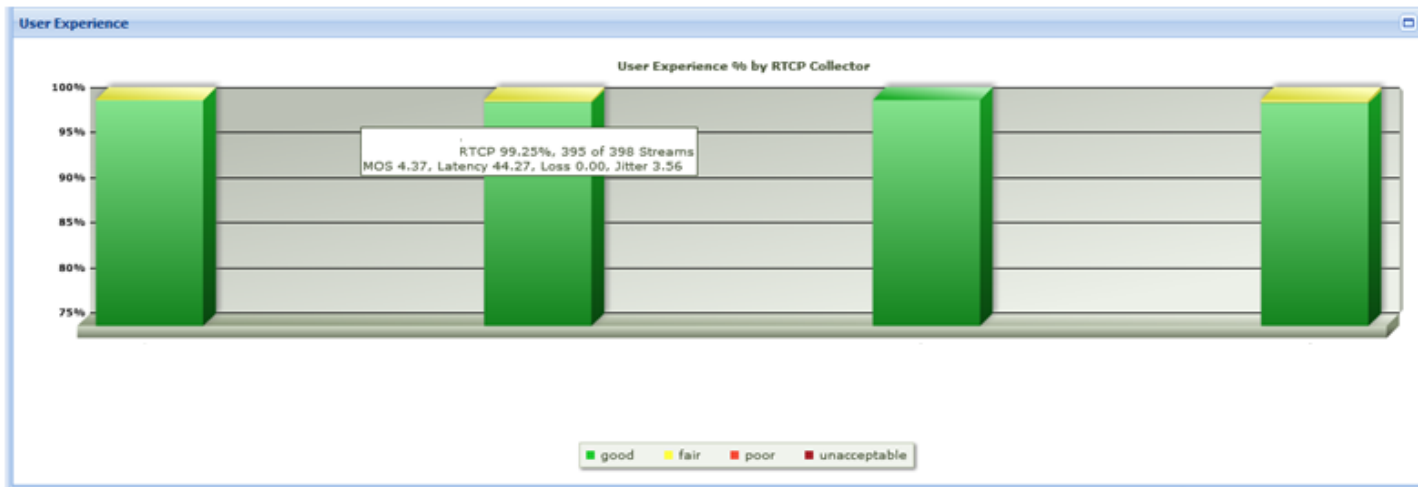
Unified VoIP Services Management View

Virtualize the SIP, UC, VoIP and Infrastructure Service Assurance



VoIP QoS – How Do You Quantify?

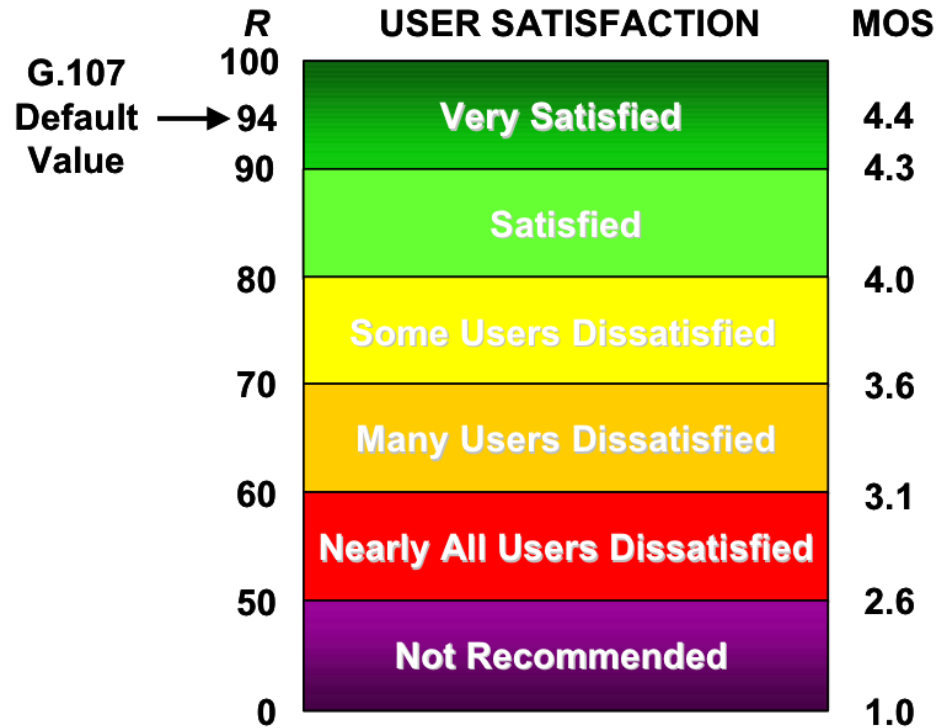
- Quantify VoIP QoS Traffic by Real-Time Mean Opinion Score (MOS) Metrics



- Derived from ITU-T G.107 E-model R-factor value
- Consumer prediction by MOS Scale between 1 and 5
- Best achievable MOS value is dependent on Codec

VoIP QoS – Expanded MOS Definition

- R-factor values to MOS scaling showing user opinions



» Reference: tiaonline

VoIP QoS – Impairments Affecting MOS

Packet Loss (%)

- » Percentage of packets identified as lost and can include late/discarded packets
- » Highest acceptable rate is 1%...however it is dependent on codec

Latency (msec)

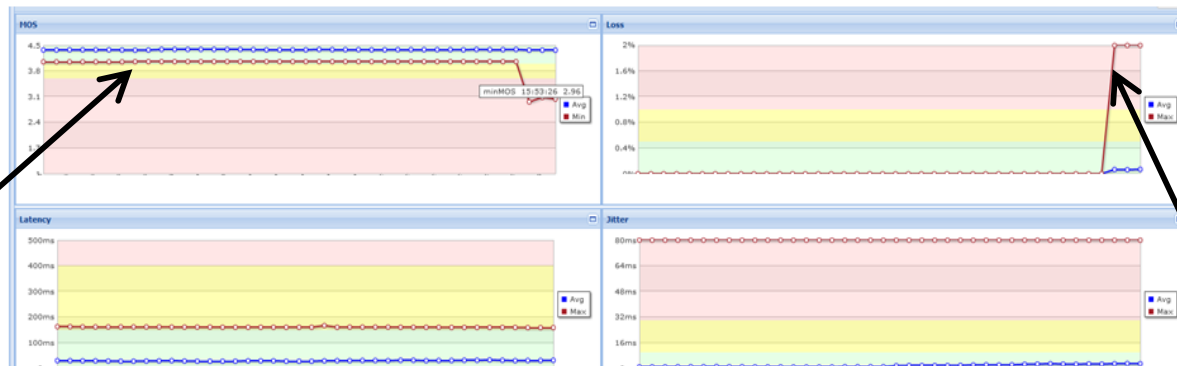
- » length of time for a packet to traverse the network including codec and buffer delay
- » ITU-T G.114 recommends maximum of 150 msec latency

Jitter (msec)

- » Measure variation of the packet inter-arrival time
- » Should be less than 40msec...mitigated by Jitter Buffers

Codec

- » G.711 → Bit Rate = 64 kbps → Best Achievable MOS = 4.3
- » G.729 → Bit Rate = 8 kbps → Best Achievable MOS = 4.0



Impact of impairments are almost instantly perceived by the end-user

MOS Values are dependent on Packet Loss, Latency, Jitter and Codec

VoIP QoS – Why Metrics Matter?

- Average Values Can Hide Spikes in VoIP QoS Impairments

Avg MOS = 3.6 (Fair Call)
 Min MOS = 2.9 (Unacceptable)



Avg PL = 0.3% (Acceptable)
 Max PL = 2% (Unacceptable)

- “Bursty” Impairments can be seen by:
 - Minimum MOS Values
 - Maximum Packet Loss %
 - Maximum Latency
 - Maximum Jitter
 - Jitter Buffer Delay, Underrun, Overrun
- Packet Settings for the VoIP call...RSVP, DiffServ, CoS

VoIP QoS – Path Statistics

- Identify the Path of VoIP Conversations to Troubleshoot

Call Paths: Call Controller 192.168.200.1

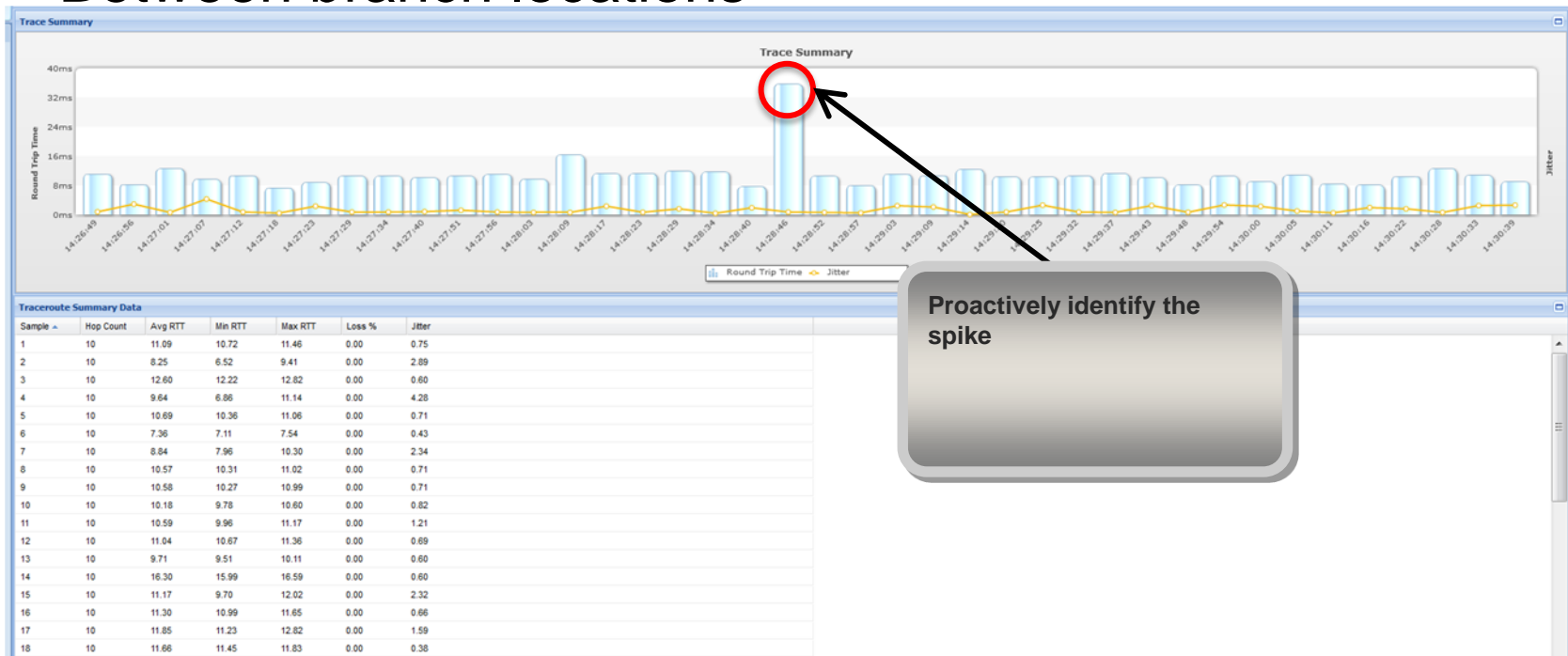
gwp@192.168.1.100 -> gwp@192.168.1.200 gwp@192.168.1.200 -> gwp@192.168.1.100

Set ▾	Order	Hop	RTT
59	0	192.168.201.2	2
59	1	192.168.201.3	1
58	0	192.168.201.2	2
58	1	192.168.201.3	1
57	0	192.168.201.2	2
57	1	192.168.201.3	2
56	0	192.168.201.2	2
56	1	192.168.201.3	3
55	0	192.168.201.2	2

- Hop IP Address
- Hop Round Trip Time (RTT) msec

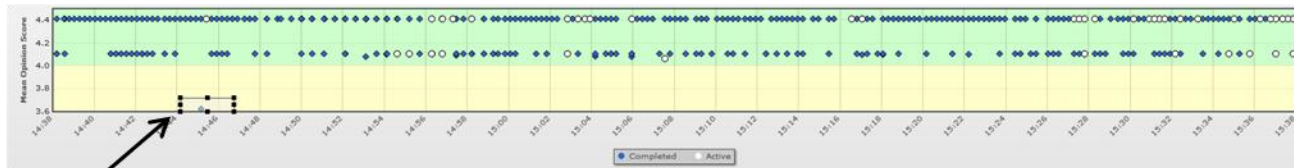
VoIP QoS – Baseline Your SIP Routes

- Proactively sample possible paths on SIP trunks
- Either test RTP or tag packets
- Between branch locations



VoIP QoS – Identify Call Record Results

- Troubleshooting VoIP QoS Issues Requires Access to:
 - VoIP QoS Call Endpoint Details



Endpoints of this Bad Call

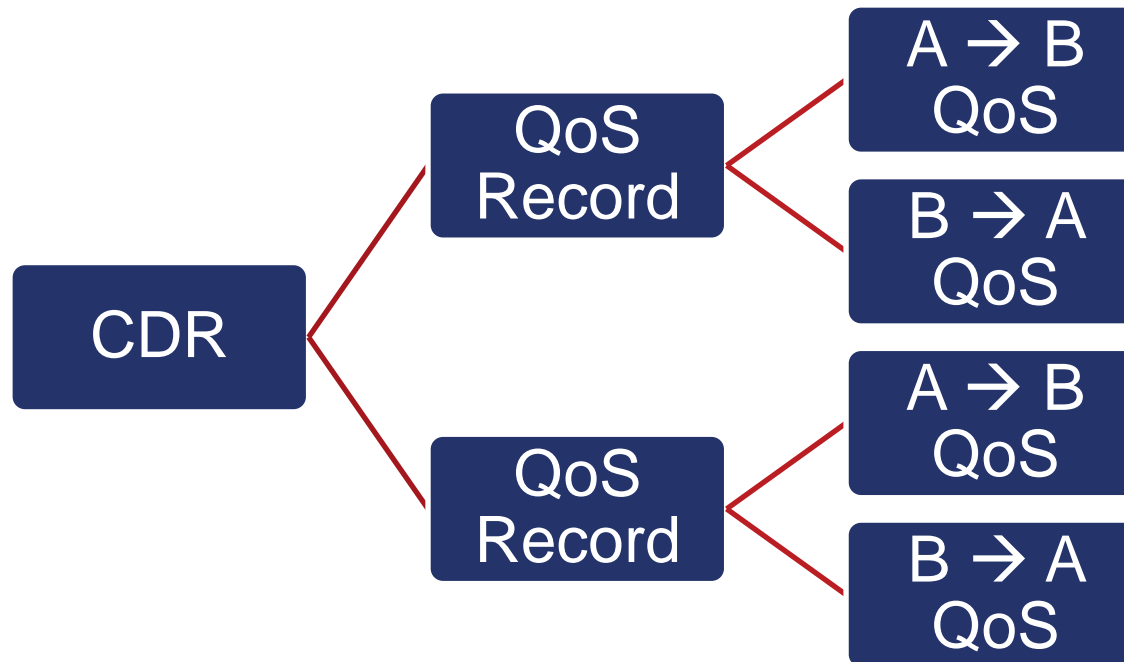
All Call Voice Quality													
Date/Time	Endpoint1	Endpoint2	Duration	Codec	Avg MOS1	Avg MOS2	Avg Latency1 (ms)	Avg Latency2 (ms)	Avg Jitter1 (ms)	Extension2	Avg Jitter2 (ms)	Avg Pkt Loss1 (%)	Avg Pkt Loss2 (%)
10/1/2010 9:11:24	gws@33.123.0.0	6780@192.168.1.1	1	G.729a	4.10	4.08	119.00	45.34	4.00		0.00	0.00	0.00
10/1/2010 9:11:24	12345@192.168.1.1	54321@192.168.1.1	59027	G.711u	4.41	2.93	20.73	34.17	0.00		0.00	0.00	4.96

- Associated Call Detail Records for ANI, Trunk, Node, etc...

All Call Detail Records												
Date/Time	Call Type	Calling Number	Dialed Number	In Trunk	In TAC	Out Trunk	Out TAC	Duration	Condition Code	FRL	Feature Flag	Node Number
4/5/2011 22:08:12	Outbound	11081	0116596507831			93	1007	00:09:48	7	2	4	1
4/5/2011 22:08:12	Inbound	7605366160	2343	1	1008			00:09:48	9	1	0	1

VoIP QoS – CDR vs QoS Record

- Understanding Call Flow is helpful when Troubleshooting

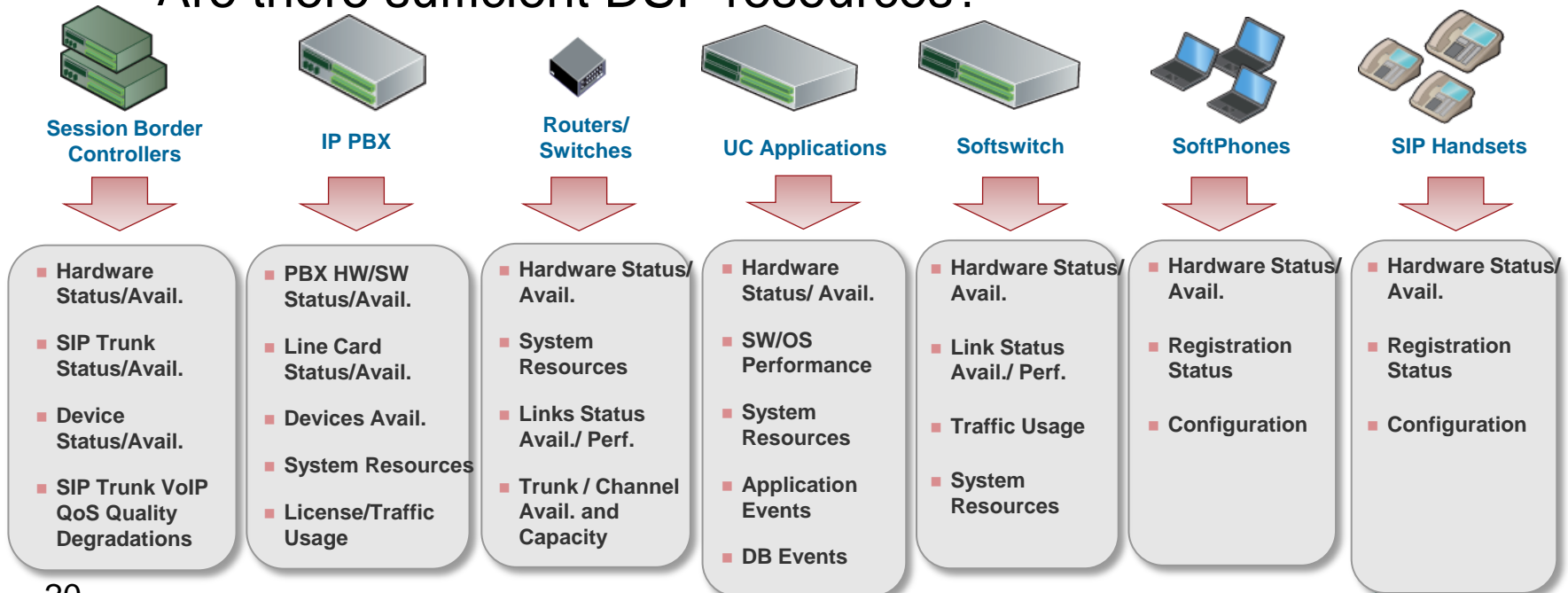


VoIP QoS – Overview of Visibility

- Dashboards
 - Show deviations to normal trends
 - Provide a “state of the union” overview of the network
- Live Statistics
 - Real-time statistics for active calls
- VoIP QoS Records
 - Trace end-points, path and raw metrics for each call
 - Baseline QoS performance
- Call Detail Records
 - Identify ingress/egress locations for trouble calls

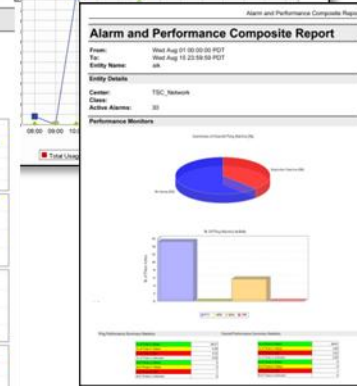
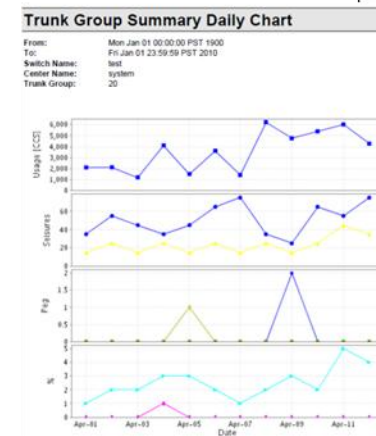
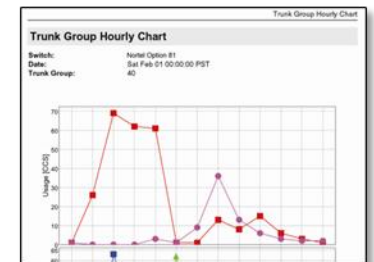
But What About the Infrastructure

- VoIP QoS is Dependent on the Physical Network
 - A “Channel” failure will cause calls to fail but “alarm”?
 - Are system resources affecting VoIP packet loss?
 - Are there sufficient DSP resources?



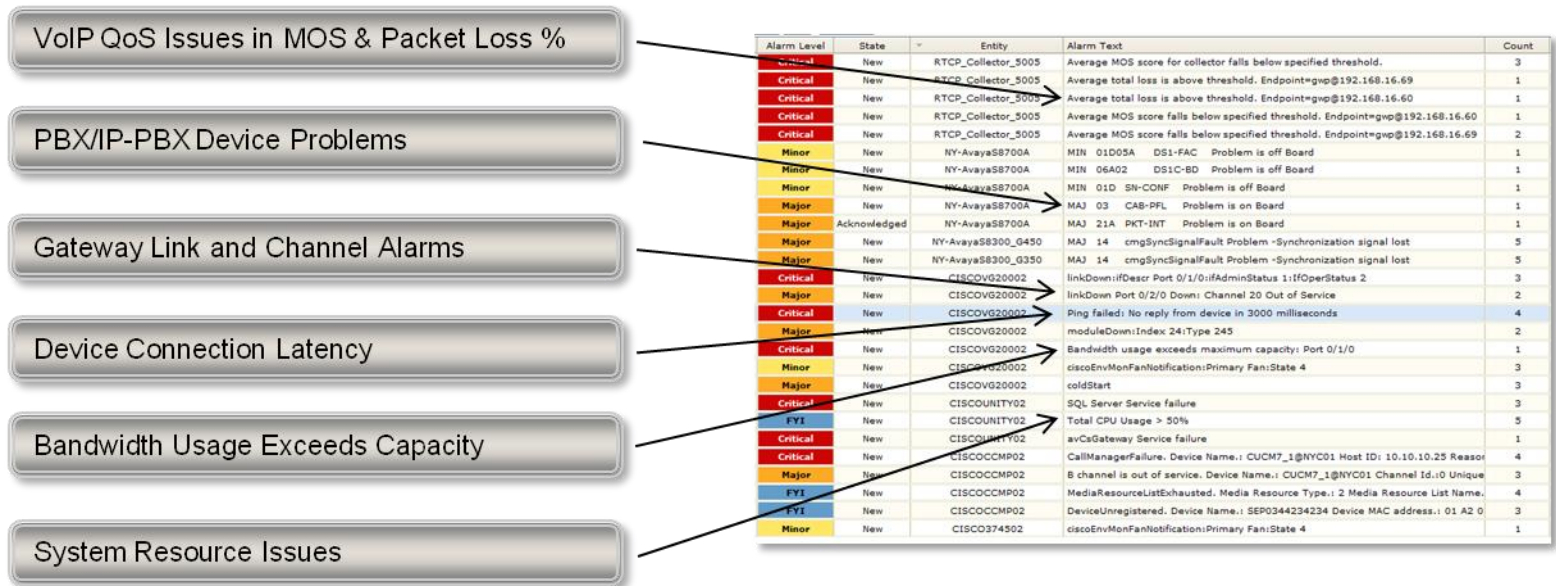
Key UC Infrastructure Statistics

- Monitor Health of Infrastructure Components
 - SNMP Alarms
 - Component and Trunk Availability
 - CM SAT Automation
- Monitoring Performance of Infrastructure
 - Trunk Group Busy Hour/Usage
 - Trunk Group Capacity Planning
 - Call Rates and Activity
 - DSP Resource and Activity
 - DSP Resource Usage
 - Attendant Statistics
 - VoIP QoS Statistics



“Single Pane of Glass” – Effective Fault Mgmt.

- A 360 Degree View is Required
 - Consolidate VoIP QoS and Infrastructure Issues to a Single Screen for Operations

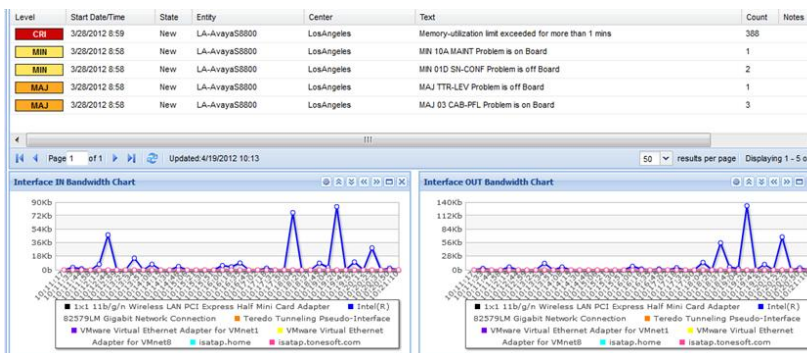


Alarm Level	State	Entity	Alarm Text	Count
Critical	New	RTCP_Collector_5005	Average MOS score for collector falls below specified threshold.	3
Critical	New	RTCP_Collector_5005	Average total loss is above threshold. Endpoint=gwp@192.168.16.69	1
Critical	New	RTCP_Collector_5005	Average total loss is above threshold. Endpoint=gwp@192.168.16.60	1
Critical	New	RTCP_Collector_5005	Average MOS score falls below specified threshold. Endpoint=gwp@192.168.16.60	1
Critical	New	RTCP_Collector_5005	Average MOS score falls below specified threshold. Endpoint=gwp@192.168.16.69	2
Minor	New	NY-AvayaS8700A	MIN 01D05A DS1-FAC Problem is off Board	1
Minor	New	NY-AvayaS8700A	MIN 06A02 DS1C-BD Problem is off Board	1
Minor	New	NY-AvayaS8700A	MIN 01D SN-CONF Problem is off Board	1
Major	New	NY-AvayaS8700A	MAJ 03 CAB-PFL Problem is on Board	1
Major	Acknowledged	NY-AvayaS8700A	MAJ 21A PKT-INT Problem is on Board	1
Major	New	NY-AvayaS8300_0450	MAJ 14 cmgSyncSignalFault Problem -Synchronization signal lost	5
Major	New	NY-AvayaS8300_0350	MAJ 14 cmgSyncSignalFault Problem -Synchronization signal lost	5
Critical	New	CISCOVG20002	linkDown::fDescr Port 0/1/0::AdminStatus 1::fOperStatus 2	3
Major	New	CISCOVG20002	linkDown::fDescr Port 0/2/0 Down: Channel 20 Out of Service	2
Critical	New	CISCOVG20002	Ping failed: No reply from device in 3000 milliseconds	4
Major	New	CISCOVG20002	moduleDown::Index 24::Type 245	2
Critical	New	CISCOVG20002	Bandwidth usage exceeds maximum capacity: Port 0/1/0	1
Minor	New	CISCOVG20002	ciscoEnvMonFanNotification:Primary Fan::State 4	3
Major	New	CISCOVG20002	coldStart	3
Critical	New	CISCOUNITY02	SQL Server Service failure	3
FYI	New	CISCOUNITY02	Total CPU Usage > 50%	5
Critical	New	CISCOUNITY02	avCaGateway Service failure	1
Critical	New	CISCOCCMP02	CallManagerFailure. Device Name.: CUCM7_1@NYC01 Host ID: 10.10.10.25 Reason	4
Major	New	CISCOCCMP02	B channel is out of service. Device Name.: CUCM7_1@NYC01 Channel Id.:0 Unique	3
FYI	New	CISCOCCMP02	MediaResourceListExhausted. Media Resource Type.: 2 Media Resource List Name.	4
FYI	New	CISCOCCMP02	DeviceUnregistered. Device Name.: SEP0344234234 Device MAC address.: 01 A2 0	3
Minor	New	CISCO374502	ciscoEnvMonFanNotification:Primary Fan::State 4	1

Impact of Infrastructure – Why Metrics Matter

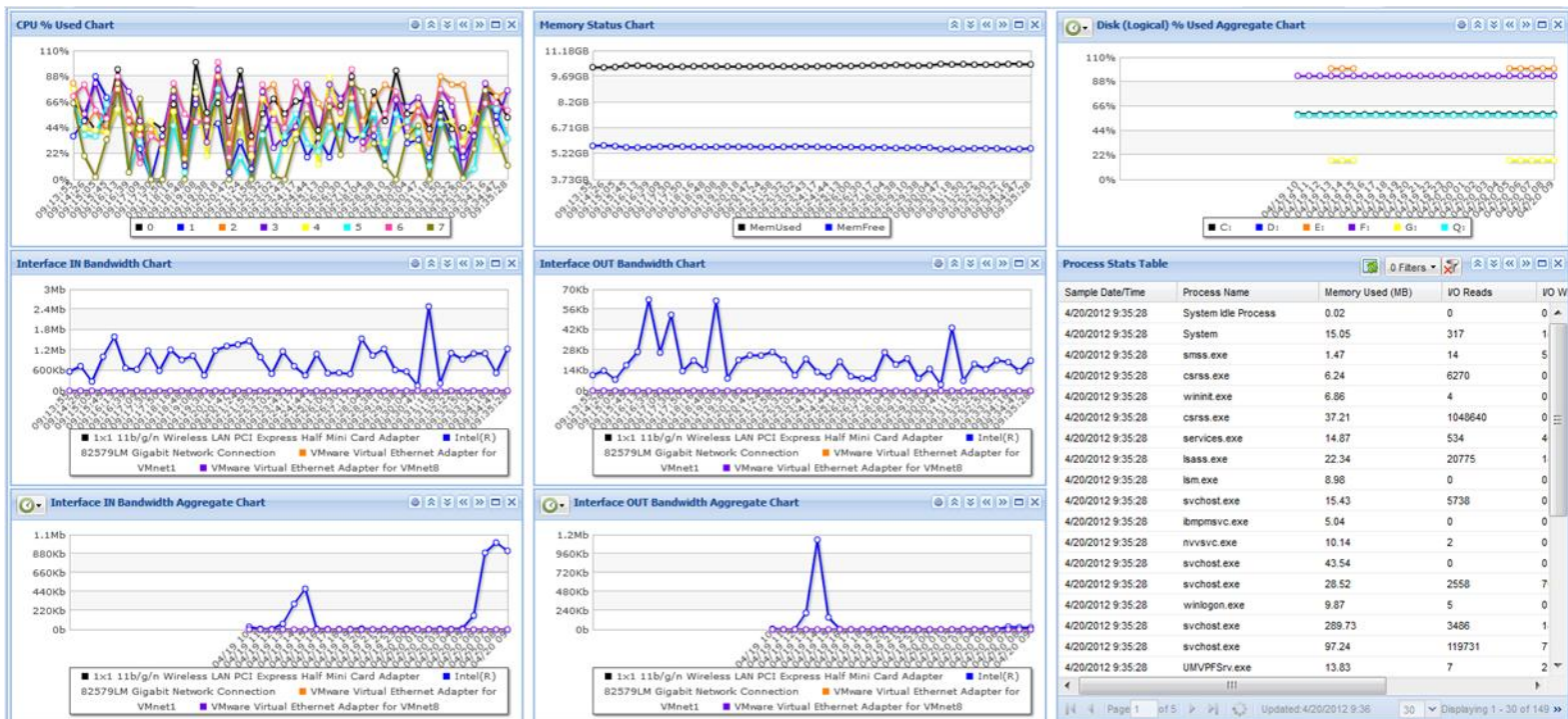
- Router with High Processor Usage May Create Excessively High Packet Loss
 - Monitor and alarm on deviations of call patterns for impairments
 - Monitor and alarm on processor/interface usage on routers
 - Isolate troubleshooting to the devices on the call path

Level	Start Date/Time	State	Entity	Center	Text	Count
FYI	3/28/2012 9:00	New	LA-AvayaS8800-RTCP	LosAngeles	Average MOS score falls below specified threshold. Endpoint=gwp@192.168.16.64	656
Alarm History						
Date/Time	User	Elapsed Time	Message			
3/28/2012	system	19 days 22 hours 8 mins	User 'system' changed alarm level 'MIN' to 'FYI'			
3/28/2012	system	19 days 22 hours 8 mins	(Evaluated Value)[3.86] less than (Target Value)[3.9]			



Impact of Infrastructure – Why Metrics Matter

- Server based communications application may not have sufficient resources to perform core functions
 - Monitor and alarm on deviations of system resources



Total Visibility for VoIP Assurance

- Objective is Proactive Management
 - Fault management for Infrastructure and VoIP QoS based on pre-defined thresholds
 - Trends and analysis to identify pattern deviations
 - Automation to identify and address advanced events
- Reactive Management must also be addressed
 - Access to actionable data for VoIP QoS faults
 - Consolidation of various data views...CDR, QoS, resources, bandwidth
 - Ability to adjust fault conditions to strive for proactive management

Summary

- Metrics do Matter
- Nemertes Best Summarized Recommendations
 - “UC management can’t be an afterthought”
 - “Plan for the long term – don’t buy unitaskers and stop-gaps”
 - Measure performance before, during and after transitions and deployment
- Manage Faults, SLAs, Events, Metrics, KPIs
- Insist on Deep QoS RTP and RTCP Visibility
- Include Trend Reporting for Capacity and Quality
- Automate Recurring Events and Integrate to OSS

About Tone Software Corporation

- Proven Track Record
 - Privately Held, Established 1974
 - Profitable & growing
- Proven Technology, Customer-focused
 - Global “World-Class” client base
 - Partner and Customer Relationships are Key to Success
 - Clients include MSPs, Integrators and Large Enterprises
- Support and Service
 - Technical Support/NOC/Professional Services



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