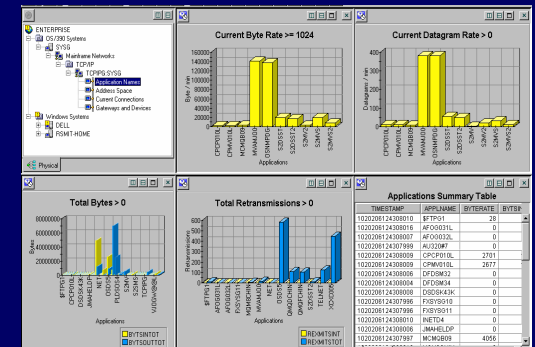


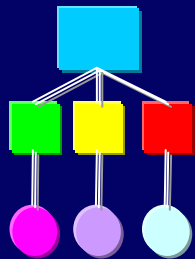


IBM zSeries Network Performance Management



Ernie Gilman
IBM Sr. Consulting IT Specialist
egilman@us.ibm.com

- Overview of IBM Tivoli zSeries network management
- IBM Tivoli NetView for z/OS Integration
with Tivoli Enterprise Portal Scenarios
- IBM Tivoli OMEGAMON for Mainframe Network
Using new CS for z/OS API

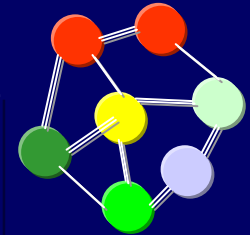


SNA

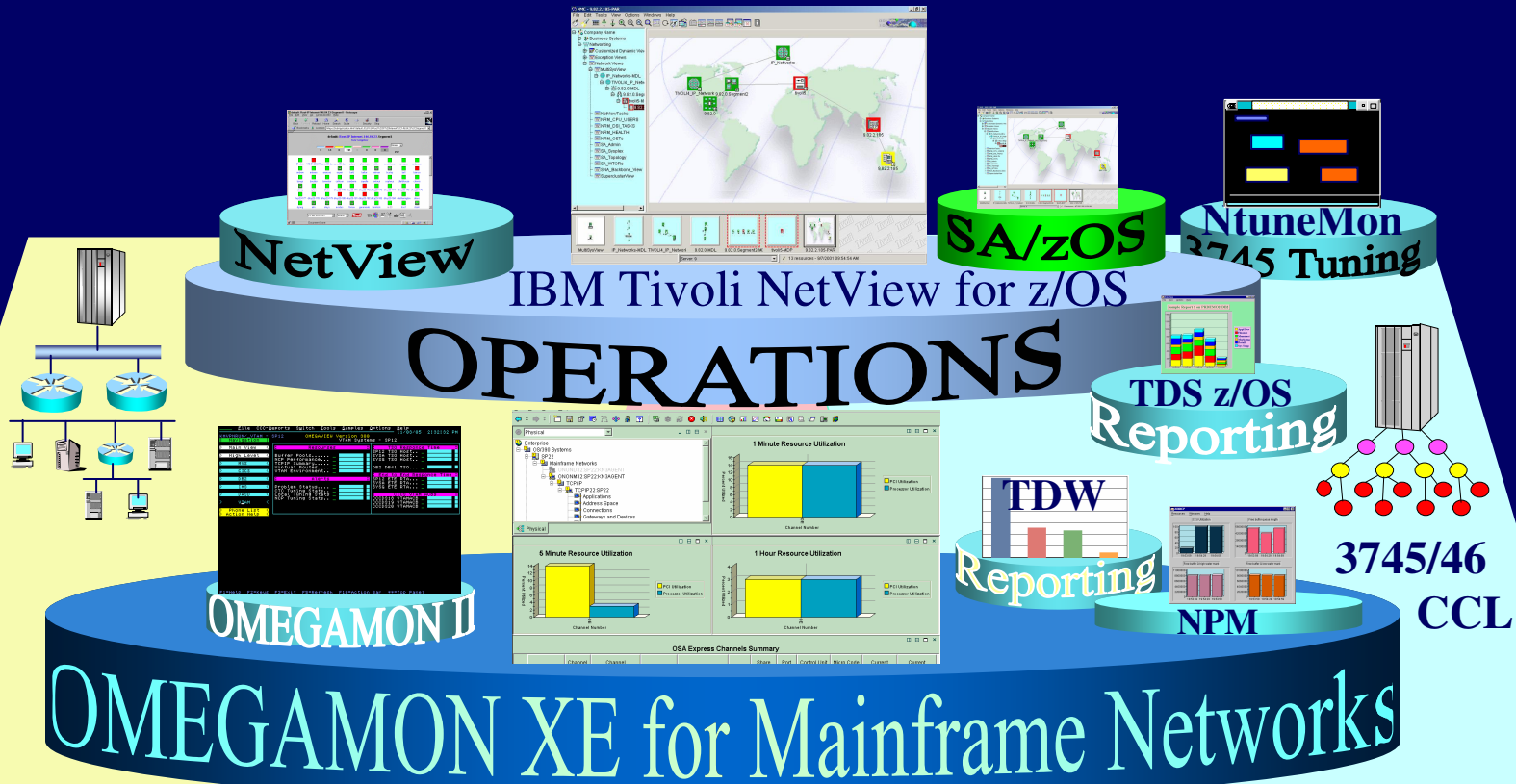
- Generic Alerts
- VR Flow Control
- HPR
- SNI
- Intelligent agents
- Hierarchal (Subarea)
- LU2
- Sessions Controlled
- 3745 (CCL)

TCP/IP

- Traps
- Discards
- Enterprise Extender
- Internet
- MIB Polling
- Peer to Peer
- TN3270
- FTP Uncontrolled
- OSA-Express, Cisco CIP
- Denial of Service Attack



- Implement Topology
- Set up MIB Polling
- Set Thresholds
- Traces

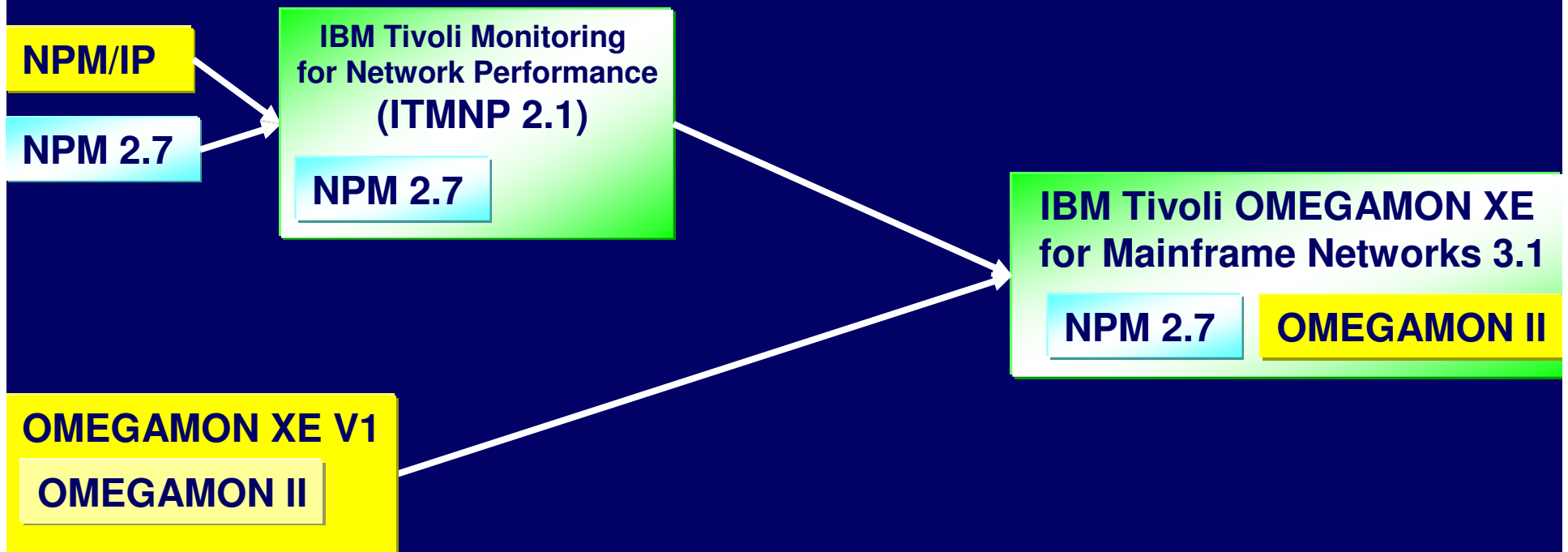


OSA-Express
FTP TCP/IP

EE **HPR**
TN3270

SNA
APPN & Subarea

IBM Network Performance Management Evolution





NetView for z/OS Integration with Tivoli Enterprise Portal Scenarios



■ Console Evolution

- Text-based 3270-type display
- Web browser 3270-type display
- Platform Independent Java 3270-type console
- Platform Independent Java Graphics console provides graphical at-a-glance views of the network's status
- Tivoli enterprise Portal

The bottom screenshot displays the following data:

Local IP Address	Local Port	Remote IP Address	Remote Port	Start Time	End Time	In (Bytes)	Out (Bytes)	Max Conn	Reestablishment	TCPIP Name	Address	TCB Address	Secret Sequence ID	Protocol	TCP LU Name	SNM Application Name
196.42.38.8	1026	127.0.0.1	1024	03/22/05 08:41:21	03/22/05 11:42:28	1095	1122	144360	0	TCPIP						
196.42.38.8	1024	127.0.0.1	1026	03/22/05 08:41:21	03/22/05 11:42:28	1095	1122	144360	0	TCPIP	TS12IBEW	00B819C0	0000F8000000	NAH		
196.42.38.123	128	128.83.2.3	1024	03/22/05 08:41:21	03/22/05 11:52:28	3224	4520	42420	0	TCPIP	CANSBEN0	00B819C0	0000F8000000	NAH		
196.42.38.110	1025	128.83.2.1	1025	03/22/05 08:41:21	03/22/05 11:52:28	2847	3453	10555	0	TCPIP	CANSBEN0	00B819C0	0000F8000000	NAH		
196.42.38.117	123	128.8.0.6	1993	03/22/05 08:41:21	03/22/05 12:07:18	3496	4095	85535	0	TCPIP	CANSBEN0	00B819C0	0000F8000000	NAH		
196.42.38.110	1025	128.8.14.7	1314	03/22/05 08:41:21	03/22/05 12:16:44	3245	2695	32768	0	TCPIP	TS12IBEW	00B819C0	0000F8000000	NAH		

■ Common user interface

- Candle Net Portal (CNP) and Tivoli Enterprise Portal (TEP)
- Manage z/OS system resources from a single user interface.
- Easy to use and Intuitive
- Displays data in graphs, charts and table format

■ Easy to configure

- Define thresholds, Filters, Sort
- Customize workspaces and reports
- Generate Events

■ Out of the box

- Situations
- Problem signatures and Expert Advice

■ Integrated

- OMEGAMON products
- NetView for z/OS
- TEC
- ITM 6.1 (TEP)
- z/OS Health Checker



Scenario 1

OSA-Express performance problems

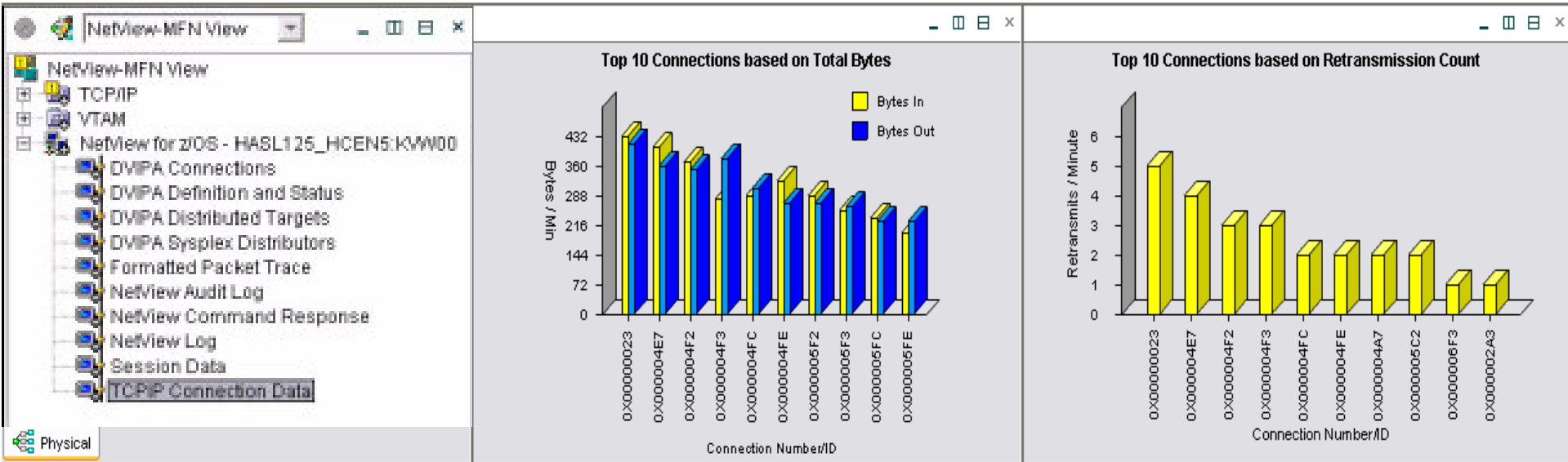
Scenario Background

- The System Programmer gets notified by the Operator that a user is having response time problems accessing a z/OS Telnet applications.

NetView TCP/IP Connection Data Workspace



File Edit View Help



TCPIP_Connection_Data

Local IP Address	Local Port	Remote IP Address	Remote Port	Start Time	End Time	Bytes In	Bytes Out	Maximum Send Window Size	Retransmission Count	TCPIP Name	Address Space Name	TCB Address	Socket Resource ID	Protocol Indicator	Telnet LU Name	SNA Application Name
196.196.196.196	196	196.196.196.196	196	2/05 11:50:28	ACTIVE***	0	0	64240	5	TCPIP	T520EENV	006918C0	00000F800000000	N/A		
				2/05 11:50:28		3224	452		0	TCPIP	T520EENV	006918D8	00000F600000000	N/A		
				2/05 11:57:42		2847	3452		0	TCPIP	SANGLIBNS	00000F10	00000F700000000	N/A		
				2/05 12:07:19		3456							00000F800000000	N/A		

2. Link to the OMEGAMON for Mainframe Networks TCP/IP Connection workspace to view performance data

1. NetView TCP/IP Connection Data workspace shows that the connection is active and has not been "bouncing" frequently.

OMEGAMON TCP/IP Connection Data Workspace

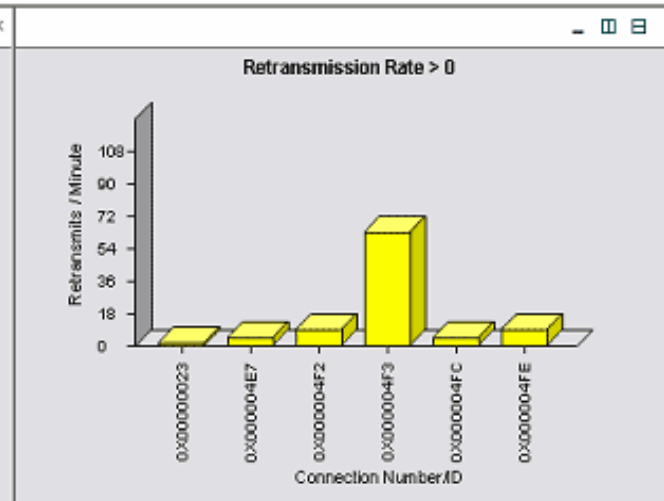
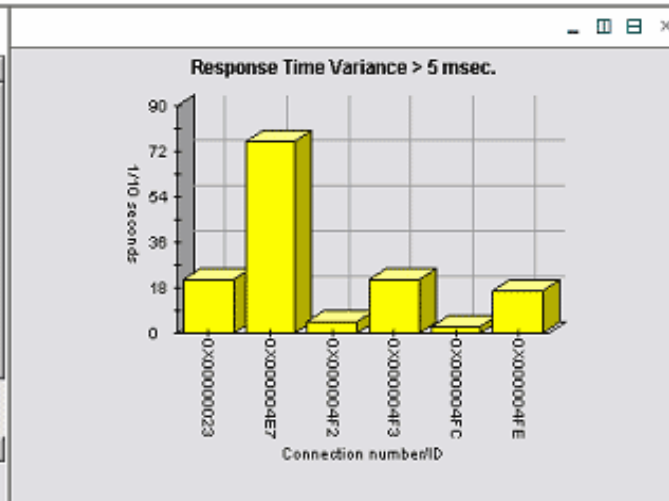


File Edit View Help

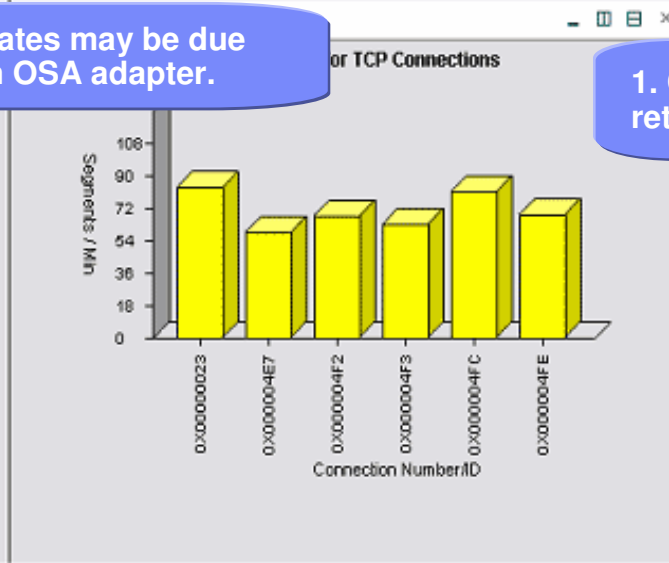
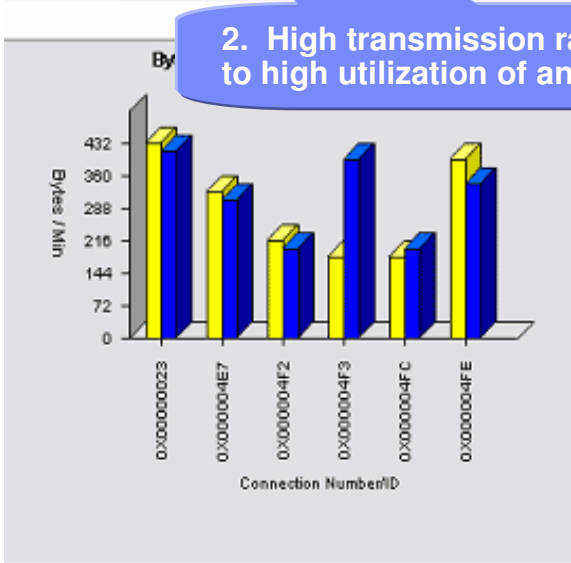


Physical

- 0053
 - Mainframe Networks
 - CAN3310:0053:KN3AGENT
 - TCP/IP
 - TCPIP:0053
 - Applications
 - Address Space
 - Connections
 - Gateways and Devices
 - FTP
 - OSA
 - TCPIP Memory Statistics
 - TCPIP Server Session Av



2. High transmission rates may be due to high utilization of an OSA adapter.



1. Connection has a high retransmission rate.

Protocol	IP Address	Port	Remote IP	Remote Port	Retransmission Rate
TCPIP	196.42.38.5	1025	1024	1024	0
TCPIP	196.42.38.6	1024	127.0.0.1	1025	0
TCPIP	196.42.38.9	23	128.53.2.3	1024	0
TCPIP	196.42.38.13	1025	128.53.2.71	1055	84
TCPIP	196.42.38.17	23	128.0.0.6	7503	0
TCPIP	196.42.38.19	1025	128.5.14.7	1314	0

Ready | Hub Time: Not Available | Server Available | Enterprise Status - nobody.nowhere.ibm.com - SYSADMIN

NetView Formatted TCP/IP Packet Trace



Formatted Packet Trace - 9.82.38.42 - SYSADMIN

File Edit View Help



NetView-MFN View

- CSM
- EE
- HPR
- NetView for z/OS - HASL125_HCEN5:KWW0
 - DVIPA Connections
 - DVIPA Definition and Status
 - DVIPA Distributed Targets
 - DVIPA Sysplex Distributors
 - Formatted Packet Trace**
 - NetView Audit Log
 - NetView Command Response
 - NetView Log

Physical NetView-MFN View

Packet Trace Summary Table

Record Type	Packet Trace
SUM	=====
SUM	2 segmented trace records read
SUM	0 segmented trace records were lost
SUM	99 trace records read
SUM	0 records could not be validated
SUM	0 data trace records processed

Page: 1 of 4

Packet Trace Details Table

Record Type	Packet Trace
DET	
DET	DP Nr hh:mm:ss.mmmmmm lpld Seq_num Ack_num ...
DET	Data Source/Destination
DET	OU 1 15:19:34.931192 E775 80
DET	04098400 9.82.56.125-2918
DET	9.82.38.16-2850
DET	IU 2 15:19:34.944228 9D39 1024
DET	04008400 9.82.38.16-2850
DET	9.82.56.125-2918
DET	IU 4 15:19:34.945566 E776 4
DET	00000000 127.0.0.1-1770
DET	127.0.0.1-1770
DET	00000000 127.0.0.1-1770

Ready Hub Time: Wed, 11/30/2005 03:29 PM Server Available. Formatted Packet Trace - 9.82.38.42 - SYSADMIN

OMEGAMON OSA Channel Workspace



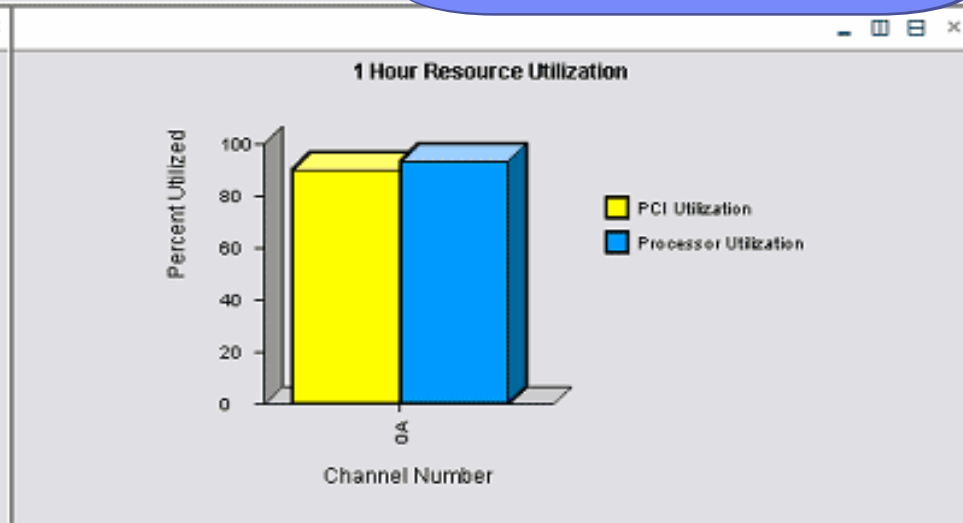
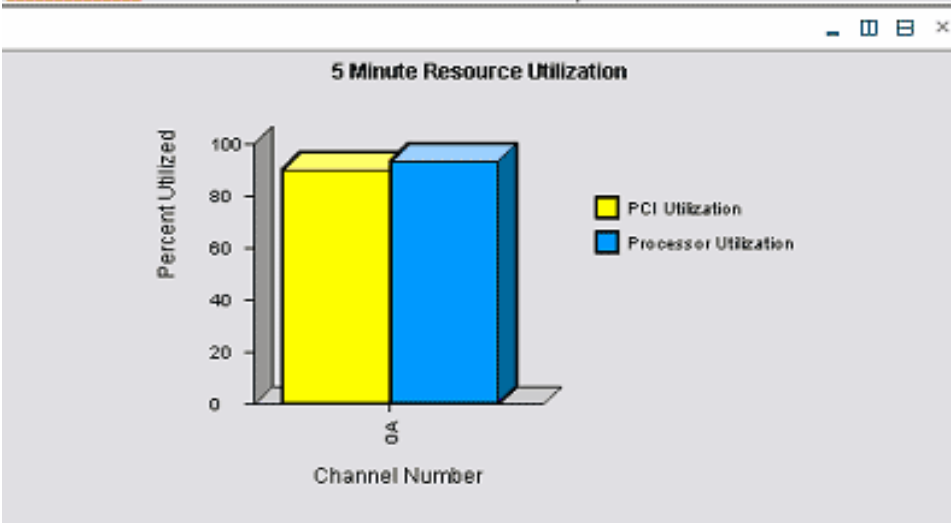
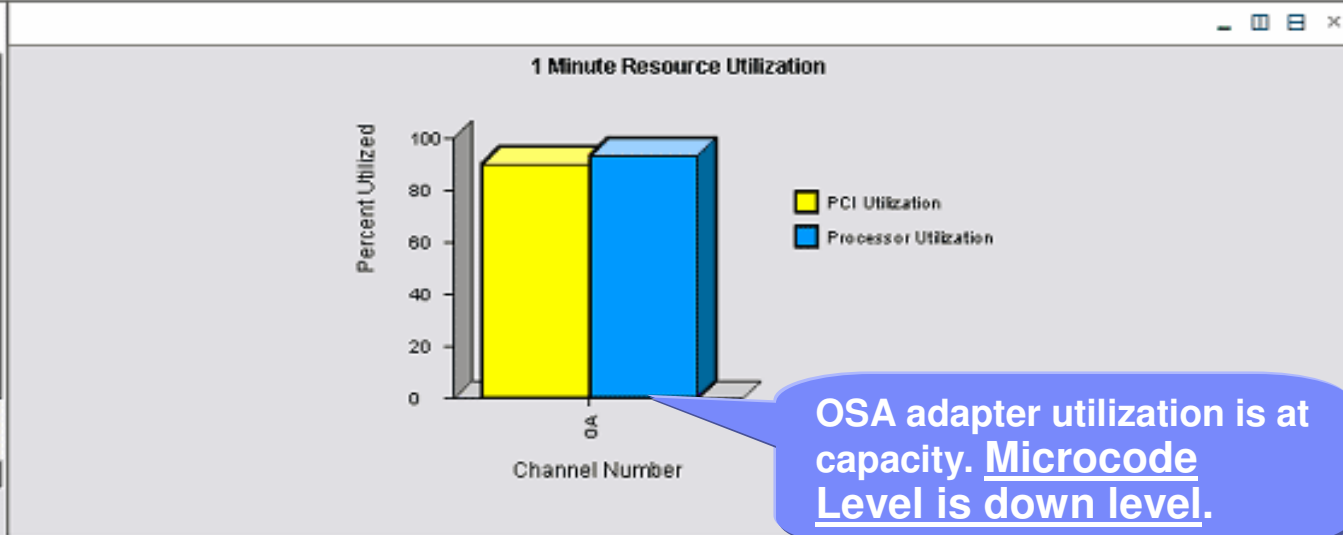
File Edit View Help



Physical

- 0053
 - Mainframe Networks
 - CAN3310:0053:KN3AGENT
 - TCP/IP
 - TCP/IP:0053
 - Applications
 - Address Space
 - Connections
 - Gateways and Devices
 - FTP
 - OSA**
 - TCP/IP Memory Statistics
 - TN3270 Server Session Av
 - TCP/IPB:0053

Physical



Ready | Hub Time: Not Available | Server Available | Enterprise Status - nobody.nowhere.ibm.com - SYSADMIN

OMEGAMON OSA Channel Workspace

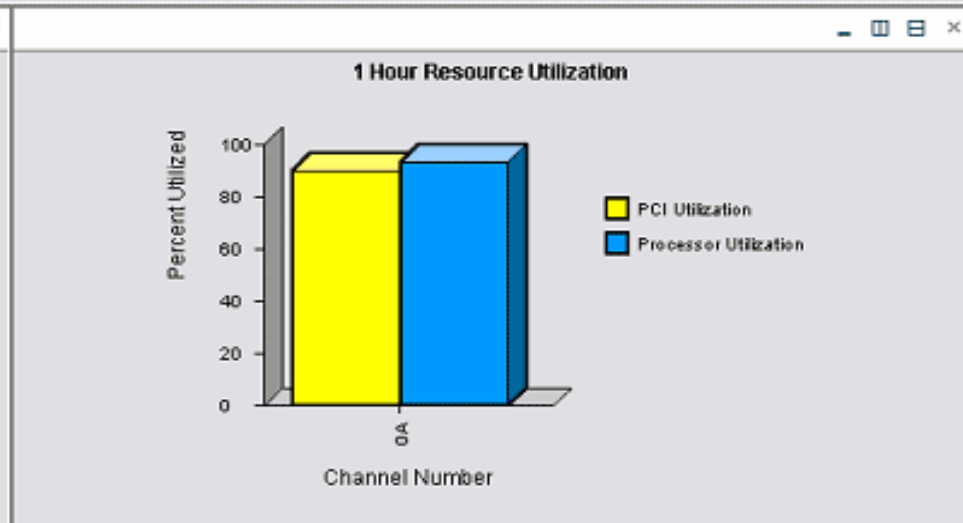
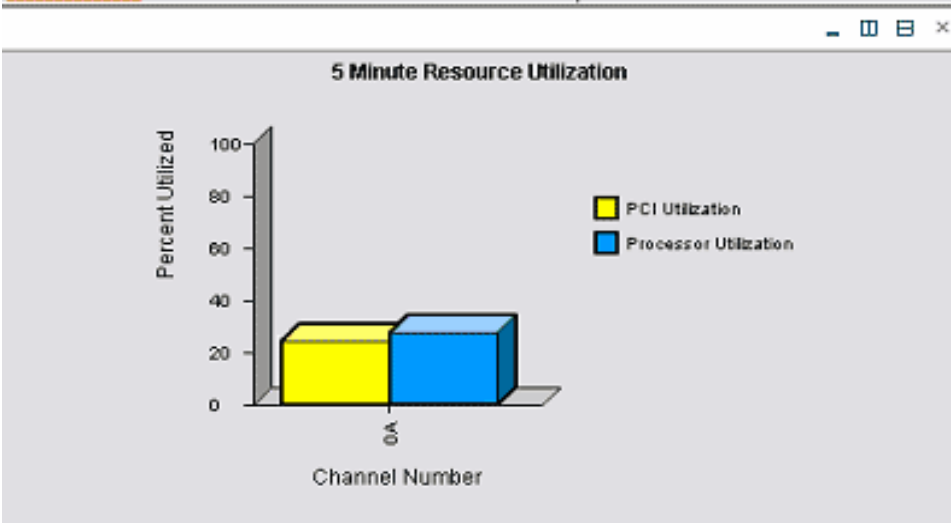
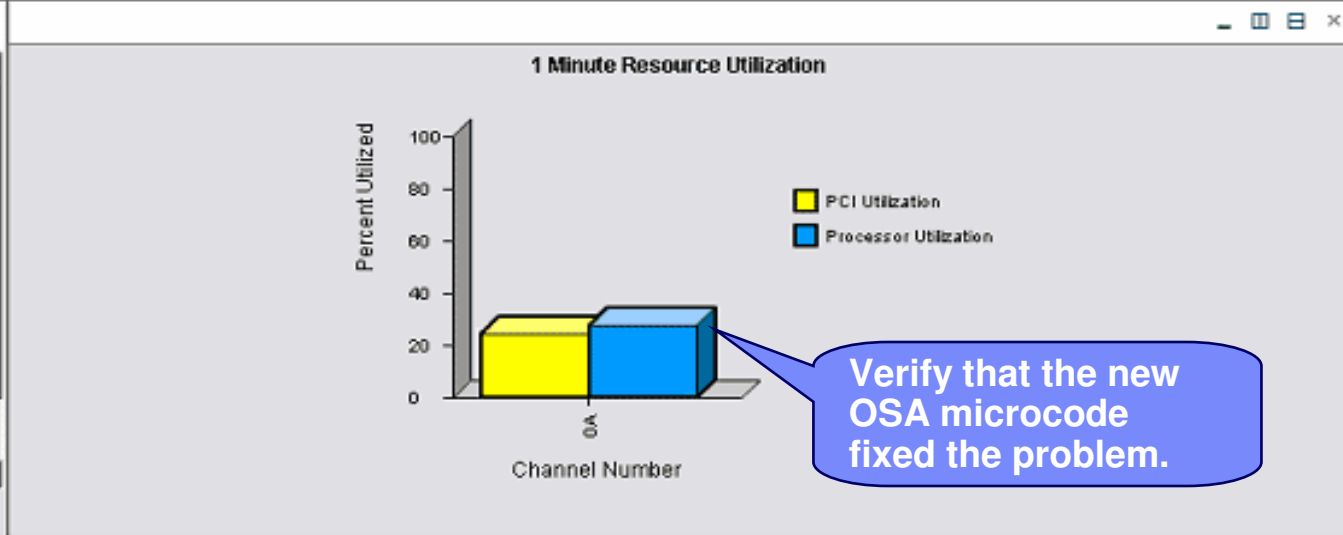


File Edit View Help



Physical

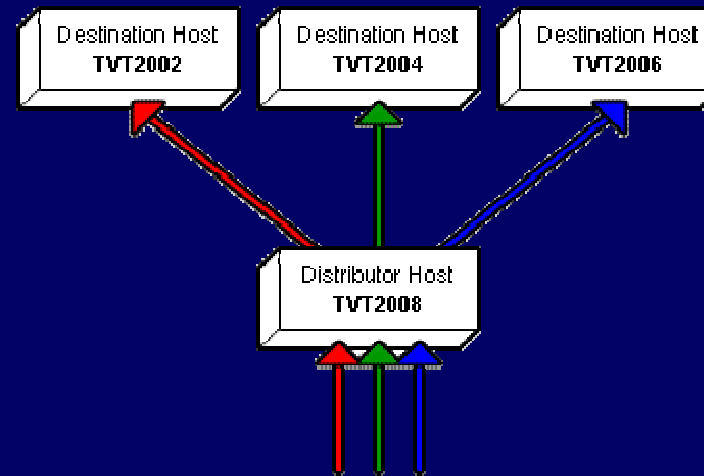
- 0053
 - Mainframe Networks
 - CAN3310:0053:KN3AGENT
 - TCP/IP
 - TCPIP:0053
 - Applications
 - Address Space
 - Connections
 - Gateways and Devices
 - FTP
 - OSA**
 - TCP/IP Memory Statistics
 - TN3270 Server Session Av
 - TCPIPB:0053



Ready Hub Time: Not Available Server Available Enterprise Status - nobody.nowhere.ibm.com - SYSADMIN

Scenario 2

DVIPA Workload by Destination Hosts



Scenario Background

- The System Programmer gets notified by the Operator that a user is having response time problems accessing a z/OS Telnet applications.
- The System Programmer views the DVIPA Distributed Targets Workspace to investigate the workload distribution of the telnet connections across the DVIPA telnet targets.

DVIPA Distributed Targets Workspace



File Edit View Help

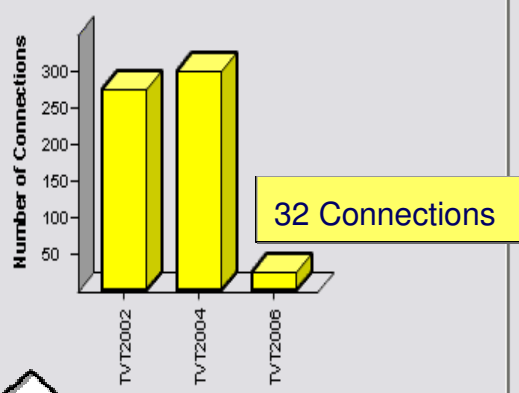
Animated



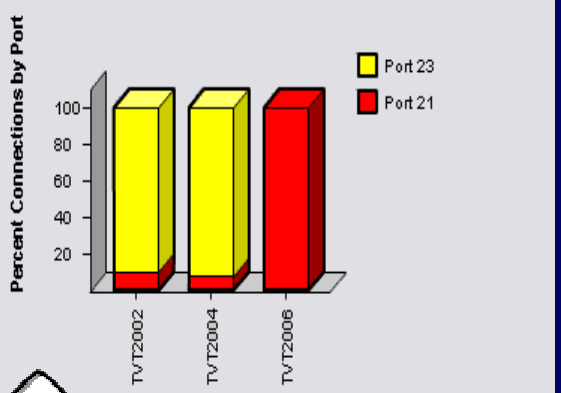
NetView-MFN View

- NetView-MFN View
 - TCP/IP
 - VTAM
 - NetView for z/OS - HASL125_HCEN5:KWV00
 - DVIPA Connections
 - DVIPA Definition and Status
 - DVIPA Distributed Targets
 - DVIPA Sysplex Distributors
 - Formatted Packet Trace
 - NetView Audit Log
 - NetView Command Response
 - NetView Log
 - Session Data

DVIPA Workload by Destination Host



Percent Workload by Port per Destination Host



He decides to check the NetView Log to see if there are any messages pertaining to TVT2006.

This chart shows that TVT2006 has a disproportionately small amount of connections. This could indicate a problem with the connections going to TVT2006 or that TVT2006 is not being utilized efficiently.

This chart shows that there are no telnet connections on TVT2006, which explains why the first chart shows so few overall connections.

DVIPA IP Address	Port	Distributor Short Host Name	Distributor TCP Name	IP Address	Destination Host	Protocol	Count
146.84.175.112	23	TVT2008	TCPIP8				
146.84.175.112	23	TVT2008	TCPIP8				
146.84.175.112	23	TVT2008	TCPIP8	193.1.1.16	TVT2006	Telnet	2
146.84.175.112	21	TVT2008	TCPIP8	193.1.1.12	TVT2002	FTPD	1
146.84.175.113	23	TVT2008	TCPIP8	193.1.1.12	TVT2002	Telnet	1
146.84.175.113	23	TVT2008	TCPIP8	193.1.1.14	TVT2004	Telnet	1
146.84.175.113	23	TVT2008	TCPIP8	193.1.1.16	TVT2006	Telnet	2
146.84.175.112	21	TVT2008	TCPIP8	193.1.1.14	TVT2004	FTPD	1
146.84.175.114	23	TVT2008	TCPIP8	193.1.1.12	TVT2002	Telnet	1

He verifies that there are telnet servers configured for TVT2006 but there are no connections.

Ready | Hub Time: Not Available | Server Available | Enterprise Status - nobody.nowhere.ibm.com - SYSADMIN

File Edit View Help

Animated



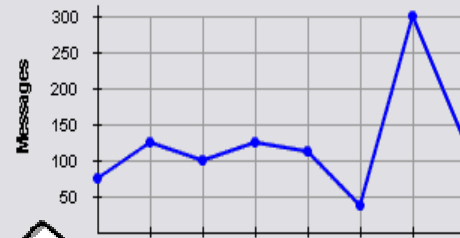
NetView-MFN View

NetView-MFN View

- TCP/IP
- VTAM
- NetView for z/OS - HASL125_HCEN5:KWW00
 - DVIPA Connections
 - DVIPA Definition and Status
 - DVIPA Distributed Targets
 - DVIPA Sysplex Distributors

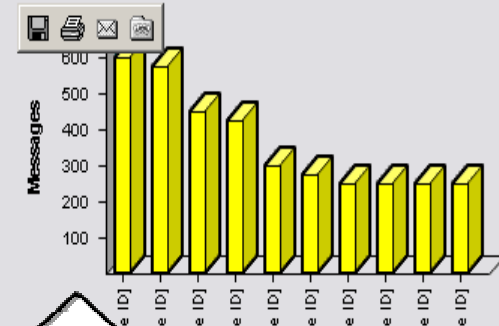
He clicks on DVIPA Distributed Targets in the navigator pane. This navigates him to the DVIPA Distributed Target pane so that he can verify that the problem has been resolved.

Message Rate



He browses the log and notices there is a spike in activity around noon. This could signify that there was a problem around that time. Additionally, he could view historical data to determine if this pattern occurred over the last several days.

Top Ten Messages IDs in the NetView Log



In addition, this chart indicates that a message pertaining to the Telnet server has been issued frequently.

ID	Source	Target	Priority	Time	Direction	Message
002280	NETOP1	NTV7B	%	00:00:00	-	CNM249E DSISCMED: NO DATA FOUND ...
002281	NETOP1	NTV7B	P%	06:58:20	Q	IST526I ROUTE FAILED FROM 182 TO 254...
002282	DSIWEB	NTV7B	B	07:45:11	B	CNMENSEC NULL IPCHECK 127.0.0.1
002283	DSIWEB	NTV7B		07:45:11	I	NULL IPCHECK 127.0.0.1
002284	DSIWEB	NTV7B		07:45:11	C	securitycheck = PASSED
002285	DSIWEB	NTV7B	P%	08:27:28	B	FKXEGTPF
002286	NETOP1	NTV7B	P%	08:45:05	Q	IST526I ROUTE FAILED FROM 227 TO 2
002287	NETOP1	NTV7B	P%	08:45:05	Q	IST526I ROUTE FAILED FROM 183 TO 2

He browses the log for that timeframe. There are messages indicating that the telnet application has been looping and not accepting connections. He **recycles the Telnet servers on TVT2006**

DVIPA Distributed Targets Workspace



Animated

File Edit View Help

NetView-MFN View

NetView-MFN View

- TCP/IP
- VTAM
- NetView for z/OS - HASL125_HCEN5:KWW00
 - DVIPA Connections
 - DVIPA Definition and Status
 - DVIPA Distributed Targets
 - DVIPA Sysplex Distributors
 - Formatted Packet Trace
 - NetView Audit Log
 - NetView Command Response
 - NetView Log
 - Session Data
 - TCPIP Connection Data

Physical NetView-MFN View

DVIPA Workload by Destination Host

Destination Host	Number of Connections
TVT2002	~280
TVT2004	~300
TVT2006	~230

Percent Workload by Port per Destination Host

Destination Host	Port 23 (%)	Port 21 (%)
TVT2002	~95	~5
TVT2004	~95	~5
TVT2006	~75	~25

He can visually see that connections to TVT2006 are looking better

This chart shows that TVT2006 has Telnet connections once again.

DVIPA IP Address	Port	Distributor Short Host Name	Distri Name	Address	Host Name	Protocol	Number Servers	Connections	...	
146.84.175.112	23	TVT2008	TCPIP8	193.1.1.12	TVT2002	Telnet	2	43	2	UNKNOWN
146.84.175.112	23	TVT2008	TCPIP8	193.1.1.14	TVT2004	Telnet	1	128	1	UNKNOWN
146.84.175.112	23	TVT2008	TCPIP8	193.1.1.16	TVT2006	Telnet	2	40	2	UNKNOWN
84.175.112	21	TVT2008	TCPIP8	193.1.1.12	TVT2002	FTPD	1	55	1	UNKNOWN
			CP/IP8	193.1.1.12	TVT2002	Telnet	1	51	2	UNKNOWN
			CP/IP8	193.1.1.14	TVT2004	Telnet	1	133	1	UNKNOWN
			CP/IP8	193.1.1.16	TVT2006	Telnet	2	35	2	UNKNOWN
			CP/IP8	193.1.1.14	TVT2004	FTPD	1	90	1	UNKNOWN
			CP/IP8	193.1.1.12	TVT2002	Telnet	1	120	1	UNKNOWN

He verifies that the Telnet DVIPA target for TVT2006 has connections. He decides to navigate to the DVIPA Connections workspace to verify that traffic is flowing over these connections.

Server Available Enterprise Status - nobody.nowhere.ibm.com - SYSADMIN

DVIPA Connections Workspace



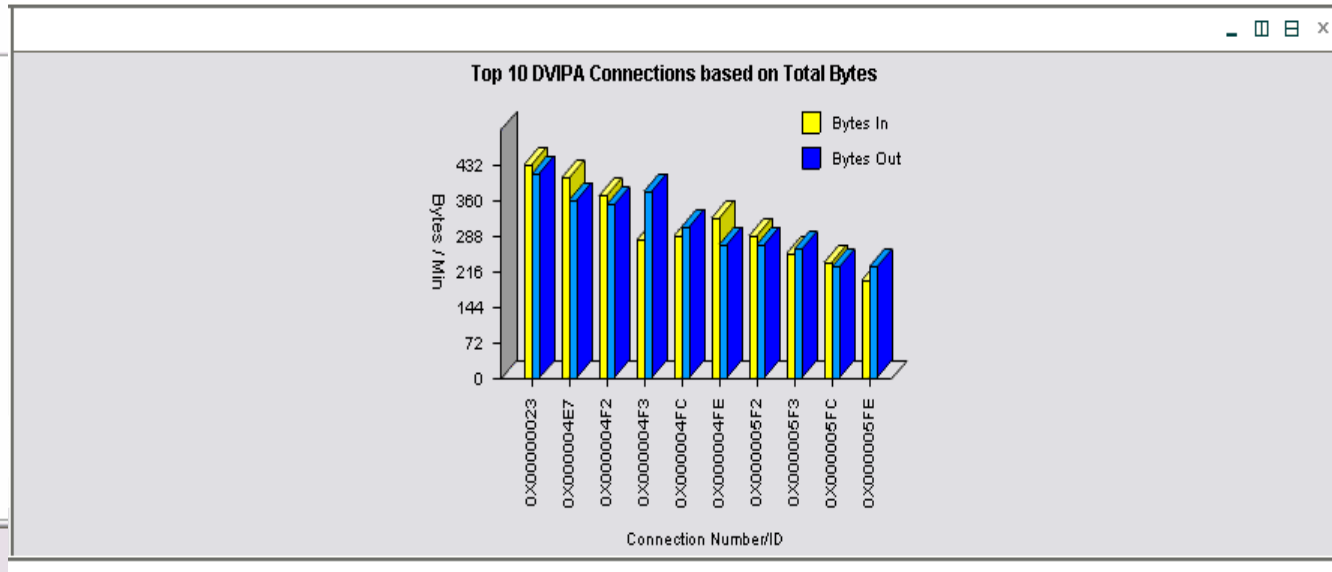
File Edit View Help



NetView-MFN View

- NetView-MFN View
 - TCP/IP
 - VTAM
 - NetView for z/OS - HASL125_HCEN5:KWW00
 - DVIPA Connections
 - DVIPA Definition and Status
 - DVIPA Distributed Targets
 - DVIPA Sysplex Distributors
 - Formatted Packet Trace
 - NetView Audit Log
 - NetView Command Response
 - NetView Log
 - Session Data
 - TCPIP Connection Data

Physical NetView-MFN View



DVIPA Connections

	Local IP Address	Local Port	Remote IP Address	Remote Port	Bytes In	Bytes Out	Server Job Name	Connection ID	LU Name	Application Name
	196.42.38.6	23	127.0.0.1	1025	1095	1123	TCPIP	14899	NTE1TS02	NTCPE103
	196.42.38.6	23	128.53.2.3	1024	3224	4520	TCPIP	14990	NTE1TS03	NTCPE214
			71	1055	2847	3453	TCPIP	14991	NTE1IMS1	NTCPE104
				7503					NTE1IMS2	NTCPE216
			7	1314					NTE1TS04	NTCPE217
			62	1025					NTE1TS05	NTCPE103

The link in the NetView DVIPA Connections table will take you to the OMEGAMON MFN TCP/IP Connection workspace.

He verifies that the Bytes In and Bytes out counters indicate traffic is flowing across the connections.

Ready

Hub Time: Not Available

Server Available

Enterprise Status - nobody.nowhere.ibm.com - SYSADMIN

TCP/IP Connection Data Workspace



Animated

File Edit View Help

NetView-MFN View

NetView-MFN View

- TCP/IP
- VTAM
- NetView for z/OS - HASL125_HCEN5:KWV00
 - DVIPA Connections
 - DVIPA Definition and Status
 - DVIPA Distributed Targets
 - DVIPA Sysplex Distributors
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 - NetView Audit Log
 - NetView Command Response
 - NetView Log
 - Session Data
 - TCPIP Connection Data

Physical NetView-MFN View

Top 10 Connections based on Total Bytes

Top 10 Connections based on Retransmission Count

The first bar chart shows the top 10 connections based on total bytes and provides an indication of the connections with the highest amount of traffic.

He can also link to the OMEGAMON MFN TCP/IP Connection Data workspace from this chart.

The second bar chart shows the top 10 connections based on retransmission counts. Retransmission counts greater than 5 often indicate a problem.

Local IP Address	Local Port	Remote IP Address	Remote Port	Start Time	...	In	Out	Send Window Size	Count	Name	...
196.42.38.5	1025	127.0.0.1	1024	03/22/05 06:41:21	***ACTIVE***	0	0			TCPIP	
196.42.38.6	1024	127.0.0.1	1025	03/22/05 06:41:21	03/22/05 11:50:28	1095	1123	64240	5	TCPIP	T520
128.52.2.2	1024	128.52.2.2	1024	03/22/05 06:41:21	03/22/05 11:50:28	3224	4520	64240	0	TCPIP	T520EENV 006918D8 00000F6000000000 N/A
128.52.2.2	1024	128.52.2.2	1024	03/22/05 06:41:21	03/22/05 11:57:42	2847	3453	65535	0	TCPIP	CANSHBN3 006BE940 00000F7000000000 N/A
128.52.2.2	1024	128.52.2.2	1024	03/22/05 06:41:21	03/22/05 12:07:19	3456	4095	65535	0	TCPIP	CANSHBN3 0069BCFE 00000F9000000000 N/A
128.52.2.2	1024	128.52.2.2	1024	03/22/05 06:41:21	03/22/05 12:18:44	3245	3985	32768	4	TCPIP	T520EENV 006845BC 00000BF800000000 N/A

available Server Available Enterprise Status - nobody.nowhere.ibm.com - SYSADMIN

The link in the NetView TCP/IP Connection Data table will take you to the OMEGAMON MFN TCP/IP Connection Data workspace.

OMEGAMON HPR WorkSpace



IBM OMEGAMON HPR WorkSpace interface showing various performance metrics and a connection summary table.

Physical (Tree View):

- TCRP
- VTAM
 - VTAM 0030
 - Address Space
 - CDE
 - IE
 - ISPF

Round Trip Variance > 5 ms (Bar Chart):

Path Switches > 0 (Bar Chart):

Packet Retransmission Rate > 0 (Bar Chart):

Byte Rate > 0 (Bar Chart):

Packet Rate > 0 (Bar Chart):

Out of Sequence Buffers > 0 (Bar Chart):

Unacknowledged Buffers > 0 (Bar Chart):

HPR Connection Summary Table

Collection Time	Local RTP PU Name	Local CP Name	Remote CP Name
07/25/05 11:58:23	CNR00885	US0BMVT.NT150MVS	US0BMVT.SUPER2
07/25/05 11:58:23	CNR00884	US0BMVT.NT150MVS	US0BMVT.SUPER2
07/25/05 11:58:23	CNR00882	US0BMVT.NT150MVS	US0BMVT.SUPER2

Link to NetView Session workspace

Ready | Hub Time: Mon, 07/25/2005 12:00 PM | Server Available | HPR Connections - >KRA20 - SYSADMIN "ADMIN MODE"

Session Data Workspace



SESSION DATA - 9.82.38.42 - SYSADMIN

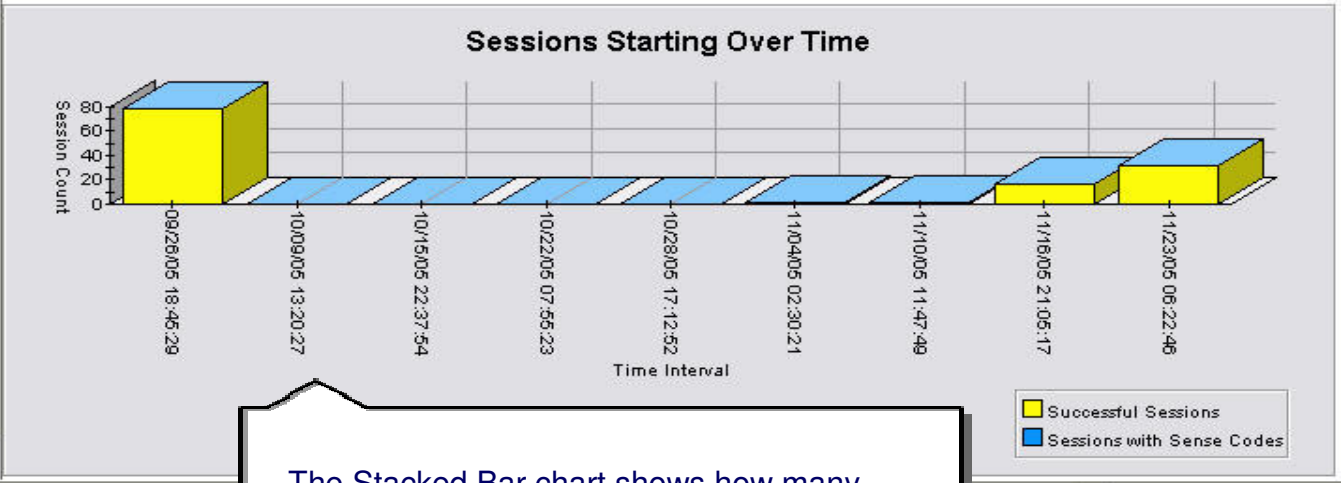
File Edit View Help



NetView-MFN View

- NetView-MFN View
 - TCP/IP
 - VTAM
 - NetView for z/OS - HASL125_HCEN5:KWW00
 - DVIPA Connections
 - DVIPA Definition and Status
 - DVIPA Distributed Targets
 - DVIPA Sysplex Distributors
 - Formatted Packet Trace
 - NetView Audit Log
 - NetView Command Response
 - NetView Log
 - Session Data**
 - TCPIP Connection Data

Physical NetView-MFN View



The Stacked Bar chart shows how many sessions terminated with abnormal sense codes against the total successful terminations over time.

Primary Name	Primary Ty	Start Time	End Time	Secondary Name	Secondary Domain	DLUS	DLUR	Se
USIBMWZV.H...	SSCP	11/29/2005 15:18:11	ACTIVE	USIBMWZV.HCEN500				
USIBMWZV.H...	SSCP	11/29/2005 15:18:11	ACTIVE	USIBMWZV.HCEN500F	LU	USIBMWZV.HSLV12.E...	HCEN5	HCEN5
USIBMWZV.H...	SSCP	11/29/2005 15:18:11	ACTIVE	USIBMWZV.HCEN500C	LU	USIBMWZV.HSLV12.E...	HCEN5	HCEN5
USIBMWZV.H...	SSCP	11/29/2005 15:18:11	ACTIVE	USIBMWZV.HCEN500D	LU	USIBMWZV.HSLV12.E...	HCEN5	HCEN5
USIBMWZV.H...	SSCP	11/29/2005 15:18:11	ACTIVE	USIBMWZV.HCEN5008	LU	USIBMWZV.HSLV12.E...	HCEN5	HCEN5
USIBMWZV.H...	SSCP	11/29/2005 15:18:11	ACTIVE	USIBMWZV.HCEN500B	LU	USIBMWZV.HSLV12.E...	HCEN5	HCEN5
USIBMWZV.H...	SSCP	11/29/2005 15:18:11	ACTIVE	USIBMWZV.HCEN5009	LU	USIBMWZV.HSLV12.E...	HCEN5	HCEN5
USIBMWZV.H...	SSCP	11/29/2005 15:18:11	ACTIVE	USIBMWZV.HCEN5007	LU	USIBMWZV.HSLV12.E...	HCEN5	HCEN5
USIBMWZV.H...	SSCP	11/29/2005 15:18:11	ACTIVE	USIBMWZV.HCEN5006	LU	USIBMWZV.HSLV12.E...	HCEN5	HCEN5
USIBMWZV.H...	SSCP	11/29/2005 15:18:11	ACTIVE	USIBMWZV.HCEN5005	LU	USIBMWZV.HSLV12.E...	HCEN5	HCEN5
USIBMWZV.H...	SSCP	11/29/2005 15:18:11	ACTIVE	USIBMWZV.HCEN5001	LU	USIBMWZV.HSLV12.E...	HCEN5	HCEN5
USIBMWZV.H...	SSCP	11/29/2005 15:18:11	ACTIVE	USIBMWZV.HCEN5003	LU	USIBMWZV.HSLV12.E...	HCEN5	HCEN5
USIBMWZV.H...	SSCP	11/29/2005 15:18:11	ACTIVE	USIBMWZV.HCEN5000	LU	USIBMWZV.HSLV12.E...	HCEN5	HCEN5
USIBMWZV.H...	SSCP	11/29/2005 15:18:11	ACTIVE	USIBMWZV.HCEN5004	LU	USIBMWZV.HSLV12.E...	HCEN5	HCEN5
USIBMWZV.H...	SSCP	11/29/2005 15:18:11	ACTIVE	USIBMWZV.HCEN5002	LU	USIBMWZV.HSLV12.E...	HCEN5	HCEN5
USIBMWZV.H...	SSCP	11/29/2005 15:18:11	ACTIVE	USIBMWZV.BNJHWMON	LU	USIBMWZV.HSLV12.E...	HCEN5	HCEN5

Ready Hub Time: Tue, 11/29/2005 08:18 PM Server Available. SESSION DATA - 9.82.38.42 - SYSADMIN

- **Enterprise Interoperability and Integration**
 - Share IP availability and performance data between NetView and OMEGAMON for Mainframe Networks
 - Service Desk Integration with leading trouble ticket providers (From NetView, open incident records, etc.)
 - Consolidate Events through Common Event Infrastructure for display and automation.
 - MSM Agent for ITM Data
- **IP Management and Automation**
 - TCP/IP packet tracing & formatting , intrusion detection, and TCP/IP connection management
 - SNMPv3 support and IPv6 capabilities
- **Enhanced Operations Support**
 - Automated Message Attribute Handling
 - Increased RODM capacity
- **Accelerate time to value**
 - Simplified style sheet migration and reporting

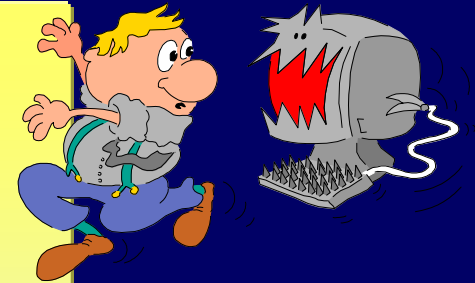
- **Interoperate with OMEGAMON, TSA, TBSM, and Trouble Ticket Products**
- **Richer TCP/IP Network Management**
- **Expanded Automation**
- **Manage growing Networks**
- **Improved Customer Time-to-Value**
- **Improved Ease of Use**



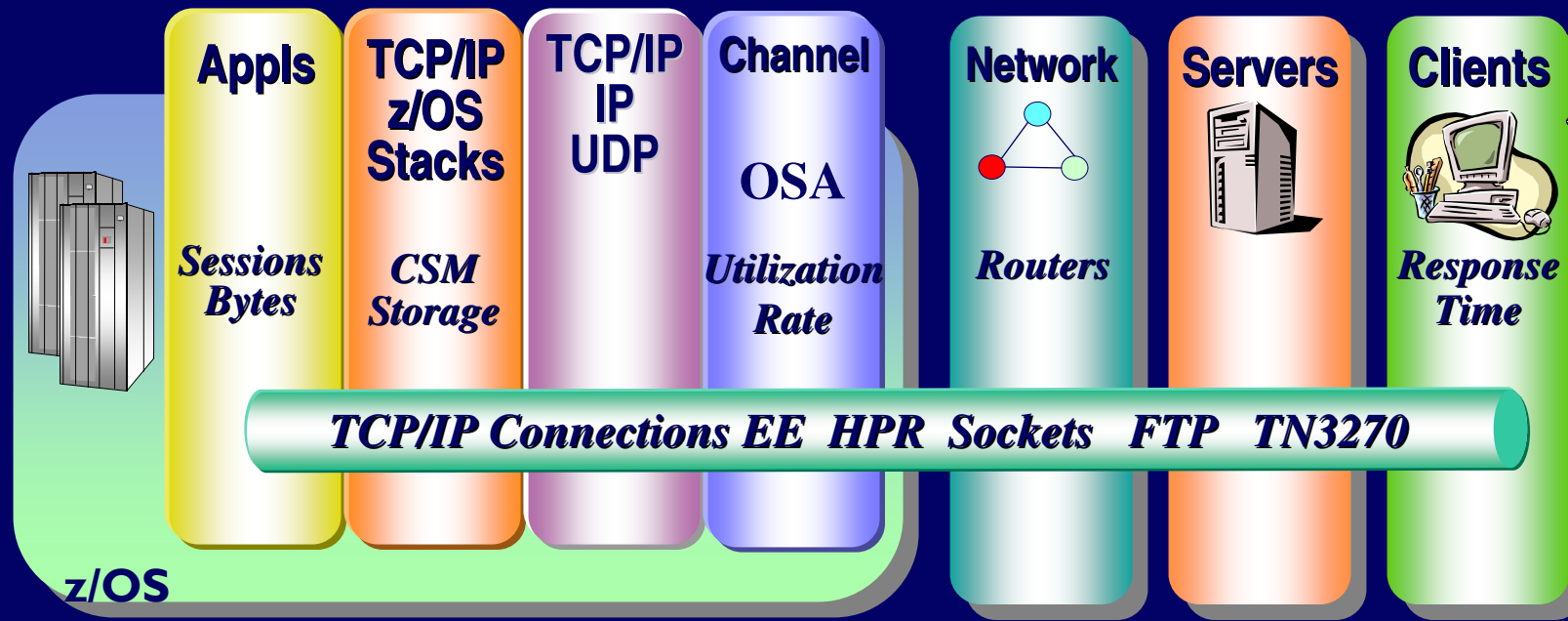
OMEGAMON XE for Mainframe Networks 3.1



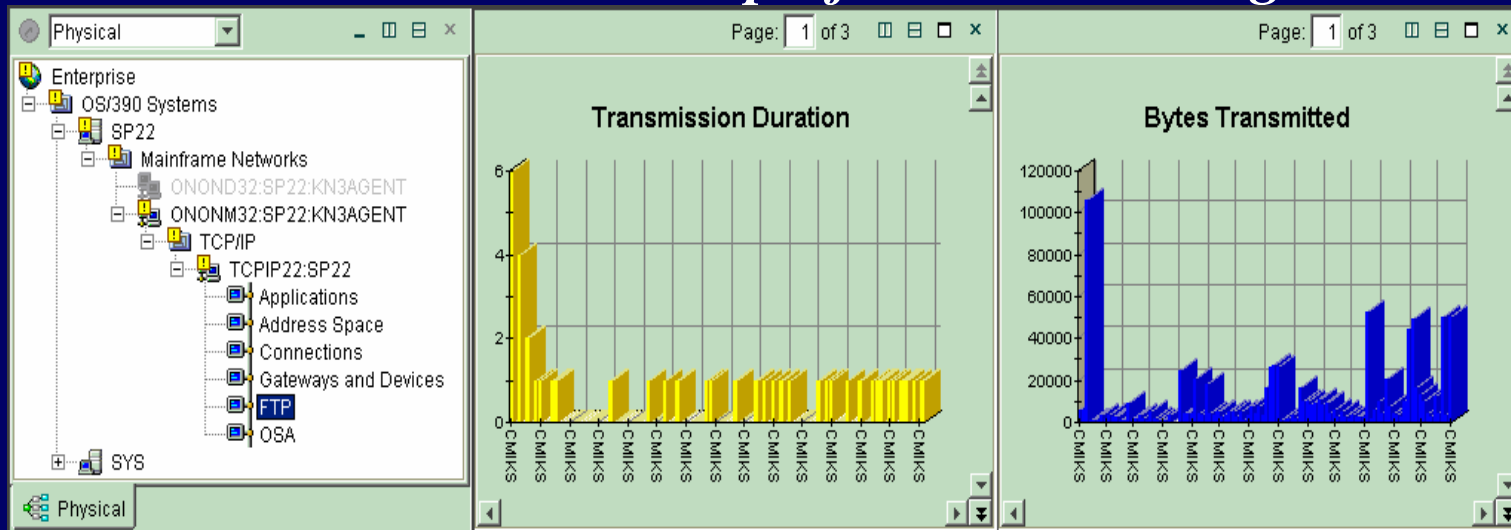
- IBM TCP/IP z/OS (Communications Server)
- FTP problems, failures, timeouts, hangs
- Unauthorized users doing large FTPs
- TCP/IP just slows down or hangs.
- Long problem resolution times for network problems
- Managing multiple z/OS IP stacks at once
- How to manage SNA over IP
 - (EE, HPR, TN3270)
- Channel problems – OSA Express
- TCP/IP tools do not understand the mainframe



IBM Network Performance Management



z/OS Oriented TCP/IP end to end performance management



- ✓ Fast
- ✓ Scalable
- ✓ Reliable

z/OS

IBM Tivoli OMEGAMON XE for Mainframe Networks

CS z/OS

VTAM API

TCP/IP API

SNMP

■ Collected using the z/OS Communications Server TCP/IP API:

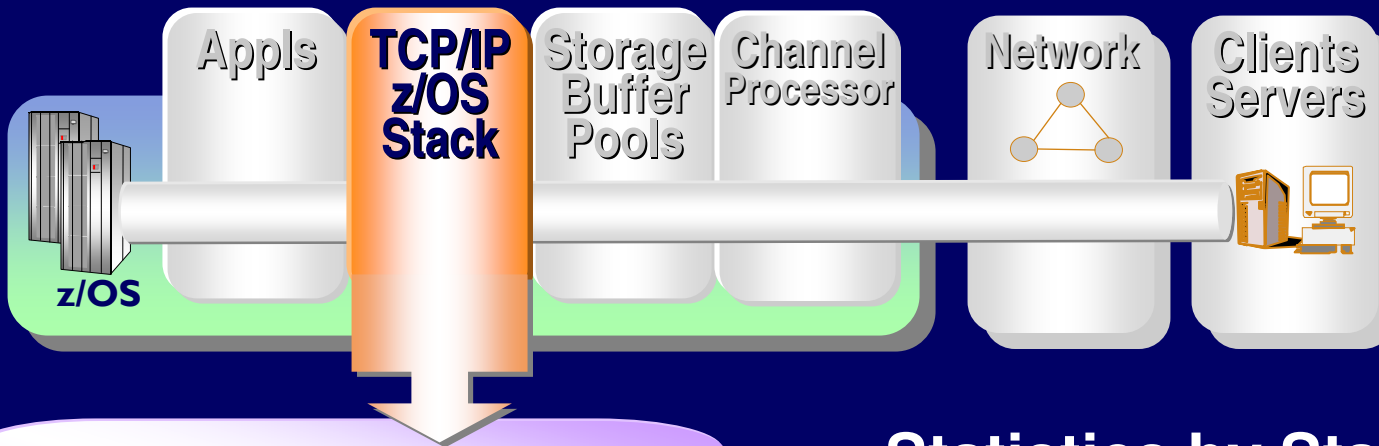
- Applications
- Connections including TCP Connections, TCP Listeners and UDP End Points
- FTP Sessions and Transfers
- TN3270 Server Sessions
- TCP/IP Memory Statistics

■ Collected using the z/OS Communications Server VTAM API:

- VTAM Summary
- CSM Buffer Pools
- Enterprise Extender connections (EE)
- High Performance Routing connections (HPR)

■ Collected using SNMP:

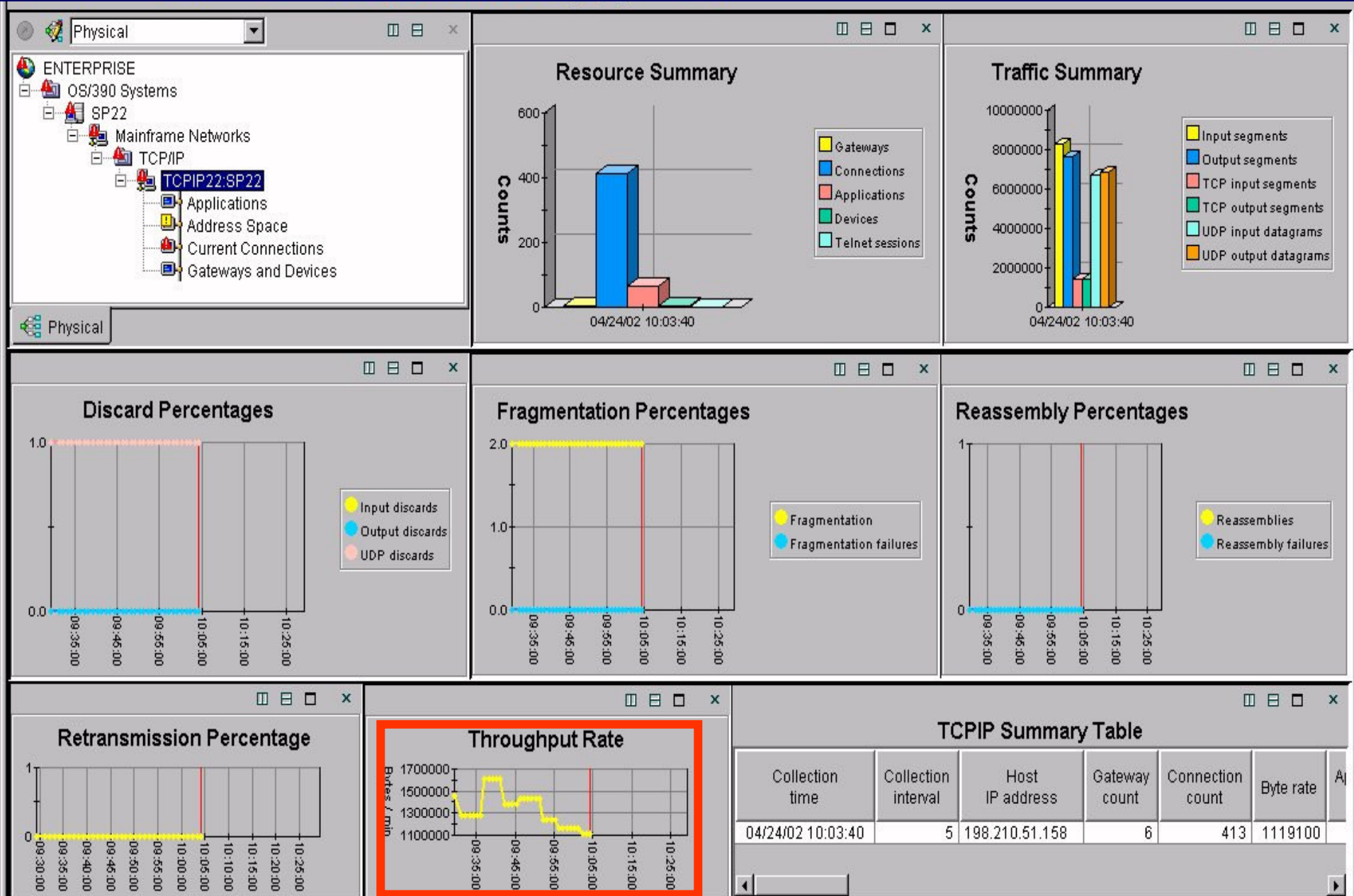
- TCP/IP Summary
- TCP/IP Stack Layers
- Gateways and Devices
- Interfaces
- OSA



Why is my TCP/IP stack running so slow?

- **Statistics by Stack**
- **Receive and Transmit rates**
- **Segment Errors**
- **Out of order errors**

Detect Intermittent Problems



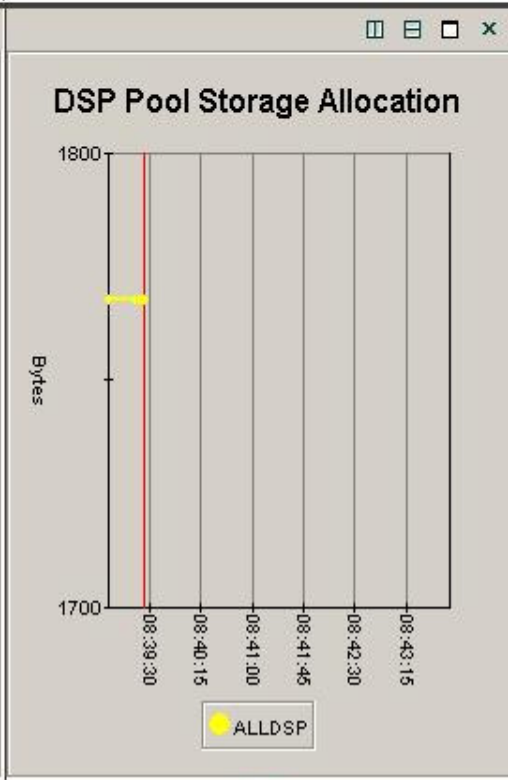
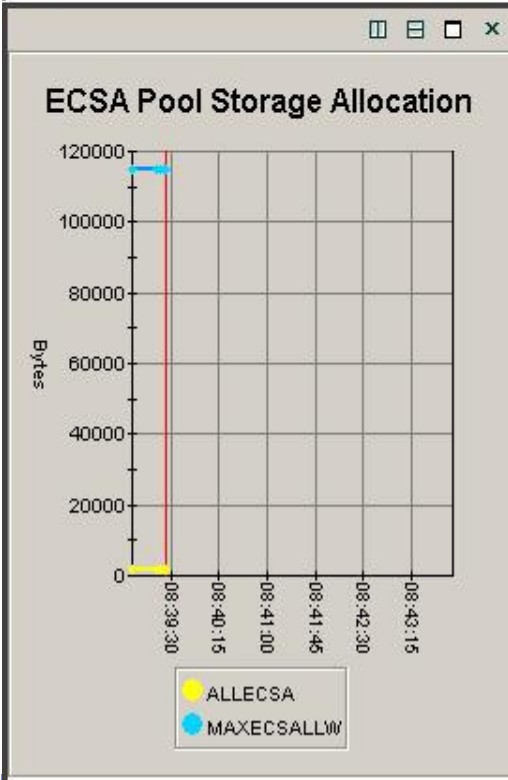
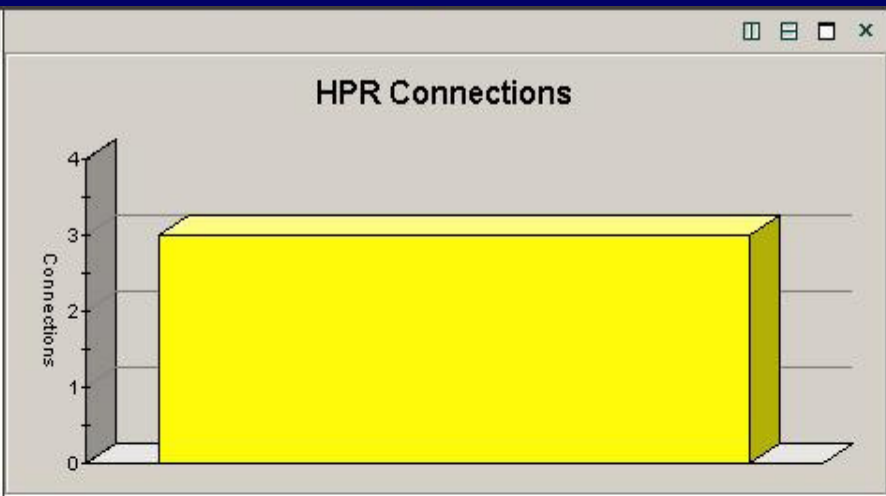
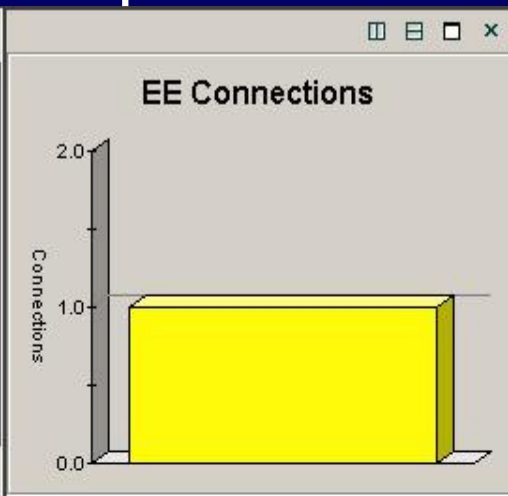
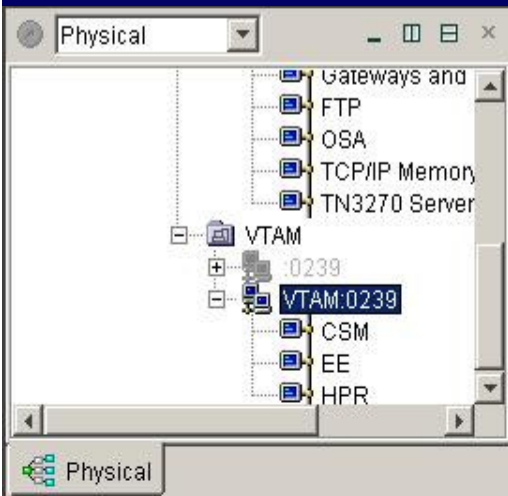
Erratic Response Time Highlighted



Connections Summary Table

Application Name	Local Port	Foreign Socket	Byte Rate	Bytes In Last Sample	Bytes Out Last Sample	Datagram Rate	Datagrams In Last Sample	Datagrams Out Last Sample	Total Retransmits	Round Trip Time	R \
VFCTH@@L	21326	198.210.51.158..2500	2414	9784	2288	0	0	0	0	1.10	
PLDSOS6	26060	**	125	416	208	1	2	2	0	0.00	
PLDSOS6	6199	**	10	24	24	1	2	2	0	0.00	
PLDSOS6	6200	**	62	104	208	0	1	1	0	0.00	
PLDSOS6	6203	**	62	104	208	0	1	1	0	0.00	
VFCTH@@L	21326	198.210.51.146..1030	306	1330	200	0	0	0	1	0.17	
EDMQ030	7381	**	216	540	540	18	45	45	0	0.00	
EDMQ030	7386	**	9160	41752	4048	18	45	45	0	0.00	
EDMQ040	7396	**	2210	888	10164	4	10	10	0	0.00	
EDMQ040	7399	**	2726	1152	12476	5	13	13	0	0.00	
EDMQ040	7428	**	2210	888	10164	4	10	10	0	0.00	
EDMQ030	7576	**	41	96	108	0	1	1	0	0.00	
VCCTW@@L	1044	198.210.51.174..21323	101356	31860	474922	0	0	0	183	0.24	
CSC2SP22	1153	**	29	72	72	2	6	6	0	0.00	
CSC2SP22	1169	**	266	720	612	2	6	6	0	0.00	
CSC2SP22	1173	**	136	188	490	1	2	2	0	0.00	
PLDSOS6	9621	**	341	0	1704	4	0	18	0	0.00	
PLDSOS6	9622	**	341	0	1704	4	0	18	0	0.00	
PLDSOS6	9788	**	341	0	1704	4	0	18	0	0.00	
PLDSOS6	9789	**	341	0	1704	4	0	18	0	0.00	
CSC2SP22	9975	**	190	184	764	1	2	2	0	0.00	
VAN3@@@L	10082	**	28800	130297	13703	79	198	198	0	0.00	
MCMQB07	10123	**	9571	836	47020	12	9	49	0	0.00	
BBOWEB40	3555	198.210.51.158..47275	298	308	1184	0	0	0	0	2.13	
MCMQB07	47275	198.210.51.158..3555	298	1184	308	0	0	0	0	2.44	
VFN3H@@L	1196	**	28843	130301	13914	79	198	198	0	0.00	
CSC2SP22	1200	**	190	184	764	1	2	2	0	0.00	
VFONH@@L	1203	**	144308	651995	69544	396	990	990	0	0.00	

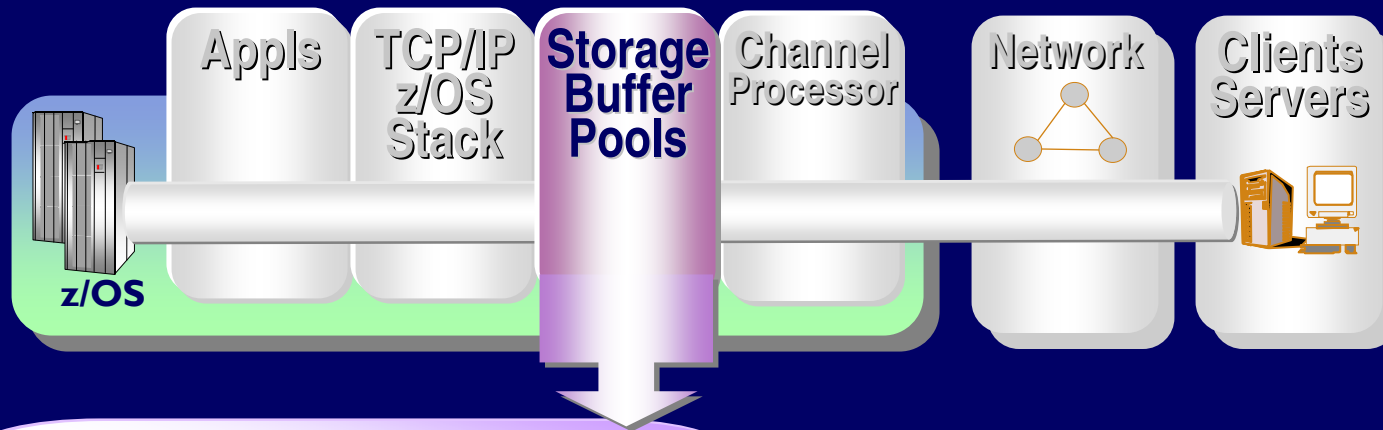
New VTAM Workspace



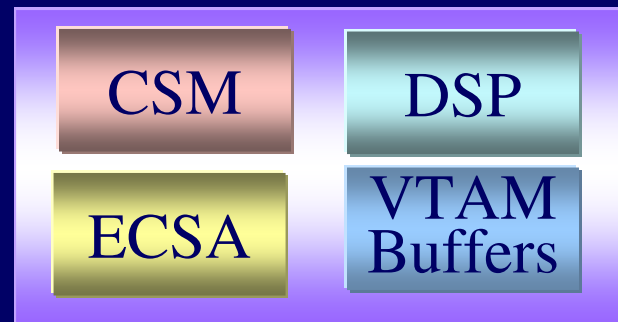
Table

TIMESTAMP	EECONNCT	HPRCONNCT	ALLECSA	MAXECSALLW
1041206083824000	1	3	1959	1148

Storage and Buffer Pools



Is TCP/IP data backing up into my z/OS?



VTAM Storage



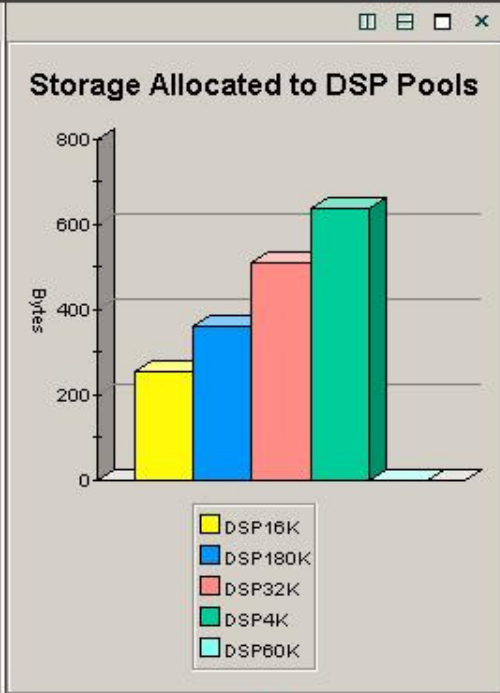
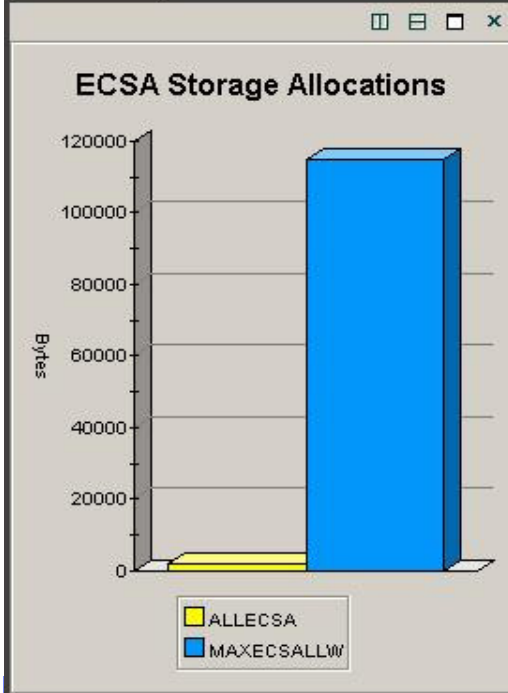
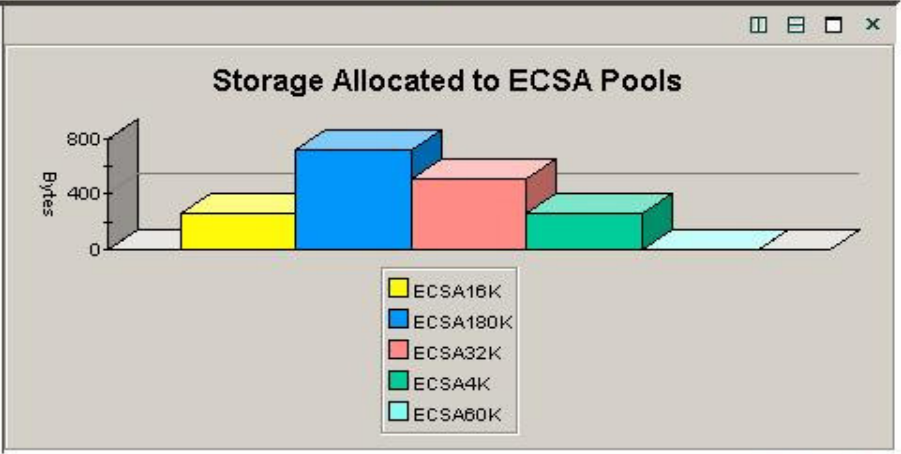
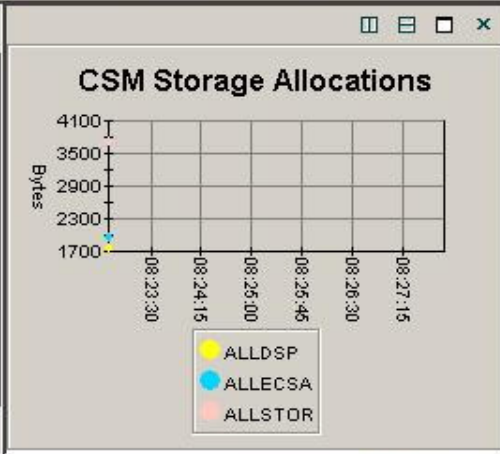
CSM Buffer Pools - kratz - SYSADMIN *ADMIN MODE*

File Edit View Help



Physical

- Gateways and
- FTP
- OSA
- TCP/IP Memory
- TN3270 Server
- VTAM
 - :0239
 - VTAM:0239
 - CSM
 - EE
 - HPR



CSM Buffer Pool Summary

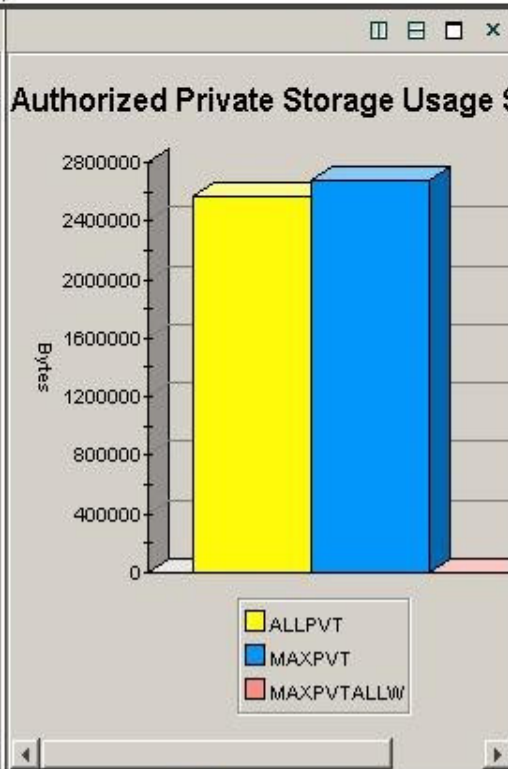
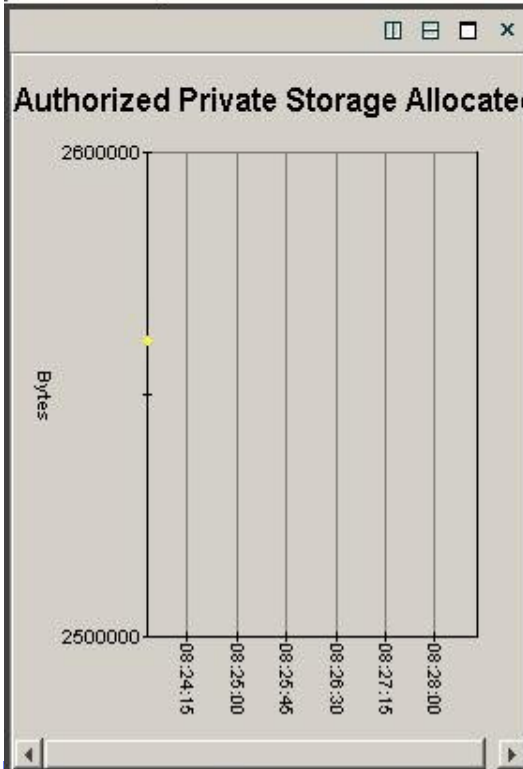
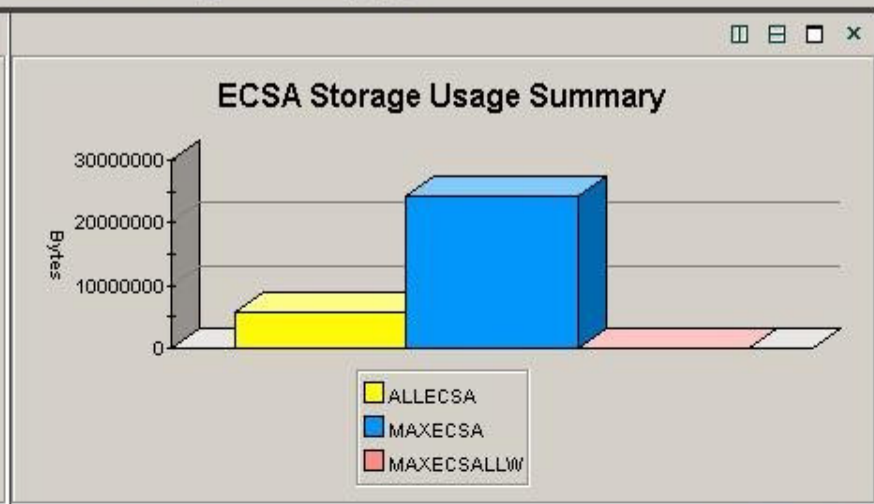
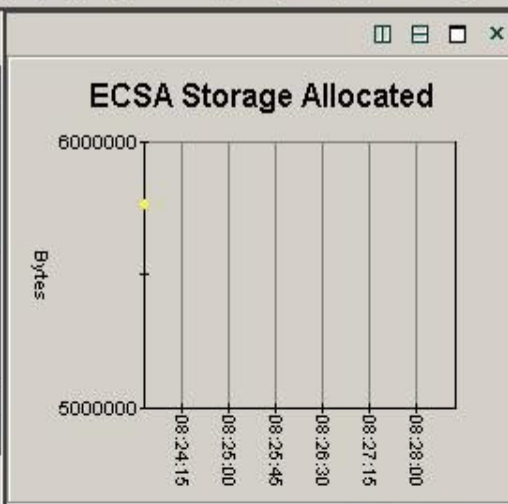
TIMESTAMP	ALLECSA	MAXECSALLW	PCTECSA	ALLDSP	ALLSTOR
1041206082224000	1959	114894	1	1768	37

TCP/IP Memory



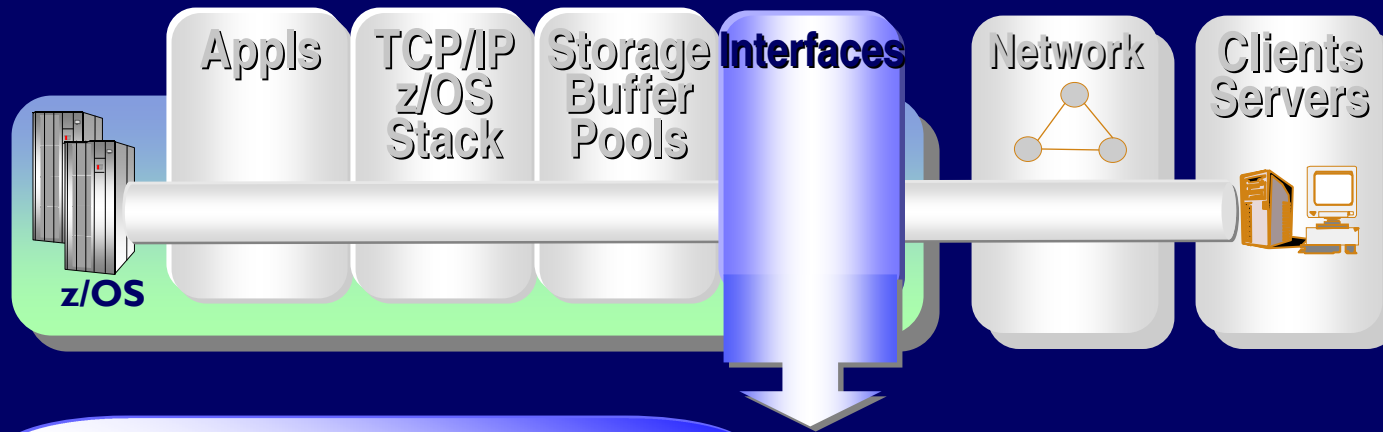
Physical

- Gateways and U...
- FTP
- OSA
- TCP/IP Memory
- TN3270 Server S...
- VTAM
 - :0239
 - VTAM:0239
 - CSM
 - EE
 - HPR



TCP/IP Memory Statistics Summary

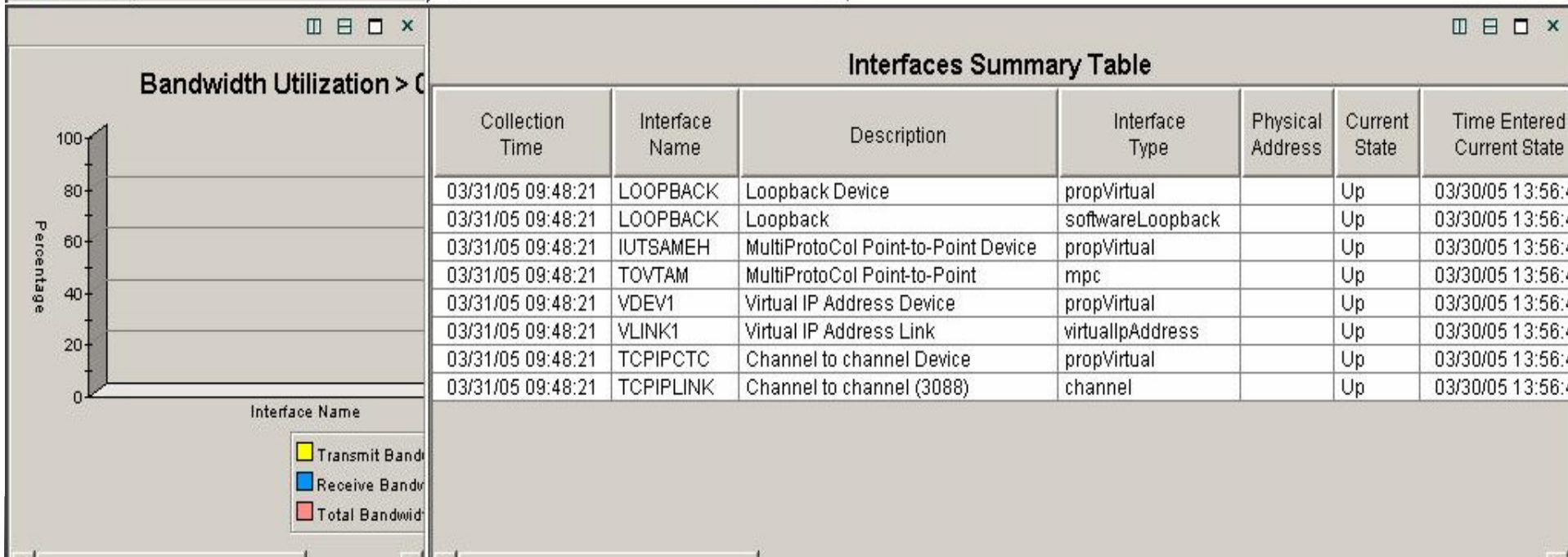
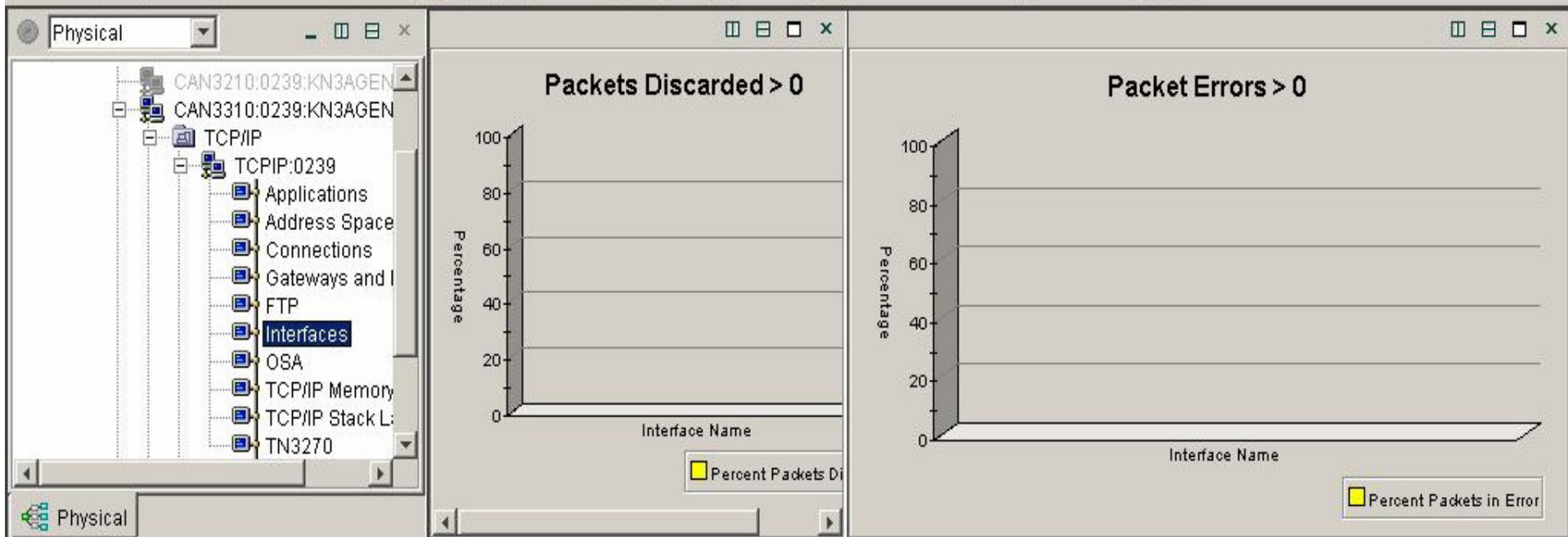
PCTECSA	ALLECSA	ALLPVT	TIMESTAMP	IPADDRESS	MAXEC...
0	5764016	2561024	1041206082224000	192.168.1.142	243246

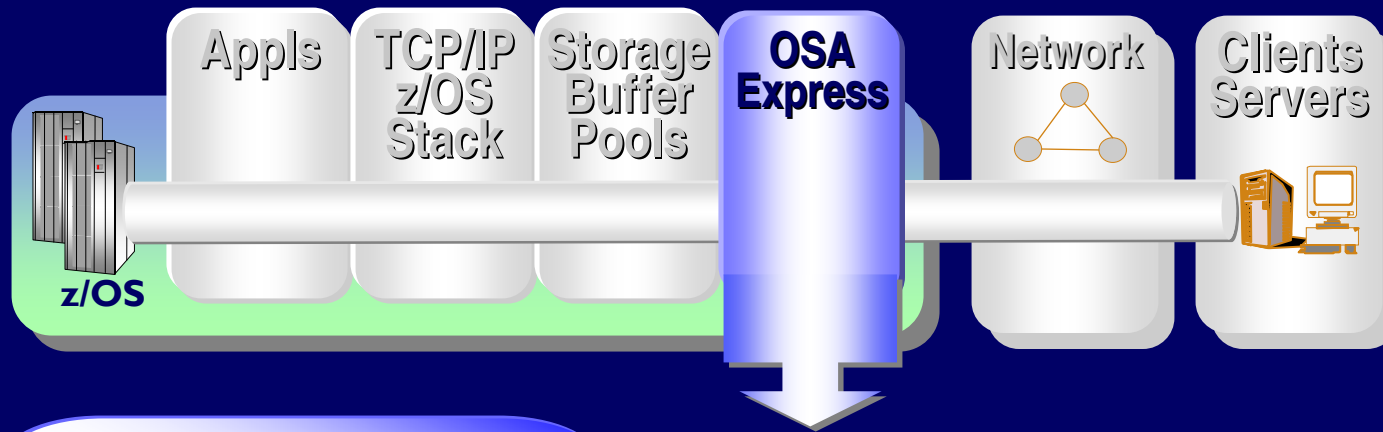


What is the performance of my channels?

- Current Status
- MTU
- Transmission Rates
- Bandwidth utilization
- Error Rates

Interfaces





What is my OSA Express adapter utilization

- Utilization
- Transmission Rates
- Mac address
- Channel ID
- Port Name
- Adapter capacity

OSA Express Performance



Physical

- Enterprise
 - OS/390 Systems
 - SP22
 - Mainframe Networks
 - ONOND32:SP22:KN3AGENT
 - ONONM32:SP22:KN3AGENT
 - TCP/IP
 - TCPIP22:SP22
 - Applications
 - Address Space
 - Connections
 - Gateways and Devices

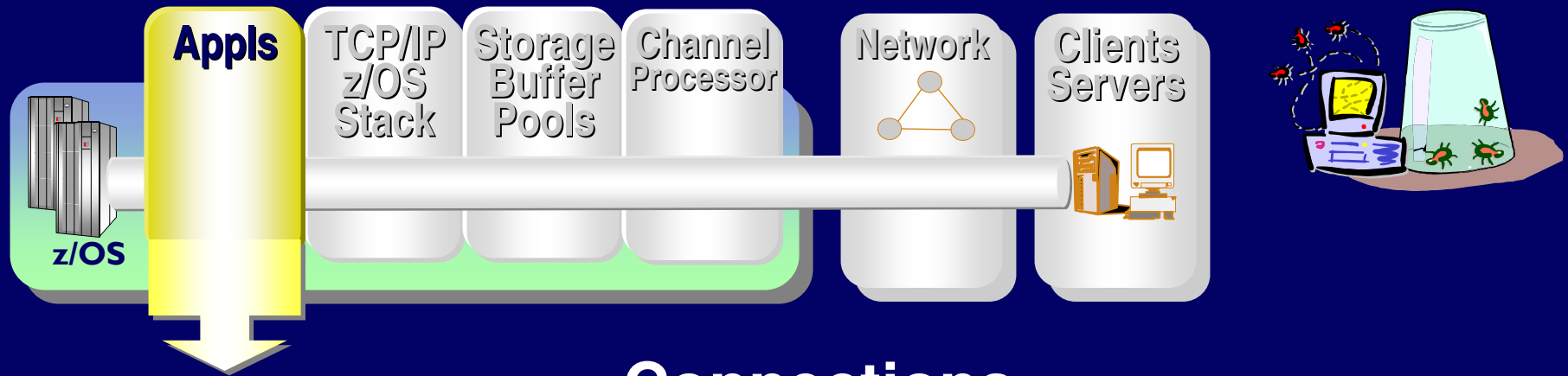
1 Minute Resource Utilization

5 Minute Resource Utilization

1 Hour Resource Utilization

OSA Express Channels Summary

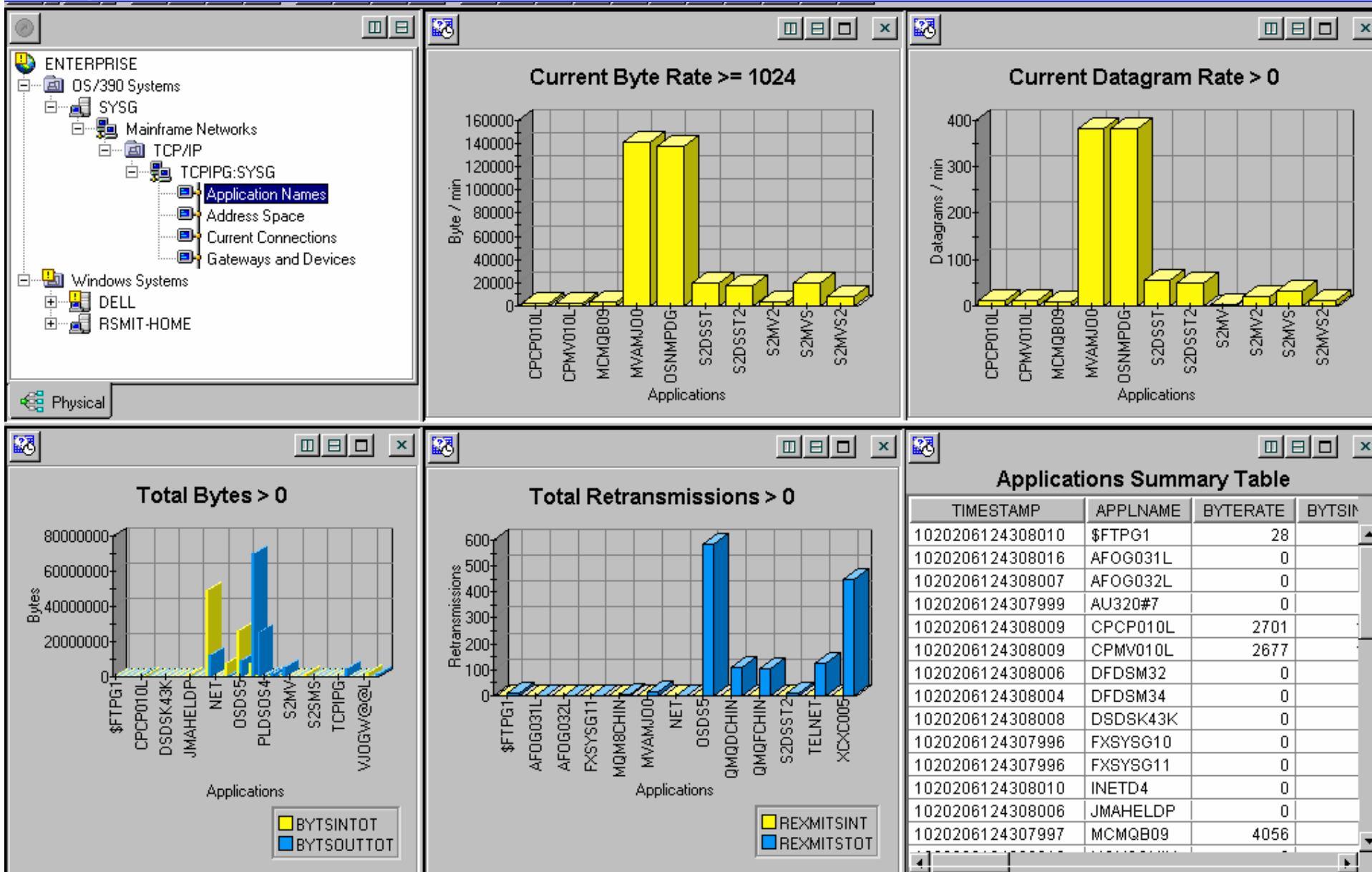
Device Name	Channel Number	Channel Type	Subtype	Mode	State	Share Indicator	Port Count	Control Unit Number	Micro Code Level	Current LPAR Name	Current LPAR Number
OSAED	0E	OSADirectExpress	FastEthernet	NothingConfigured	Online	Shared	1	00A	0329	SP22	1077952576



What is wrong with my applications?

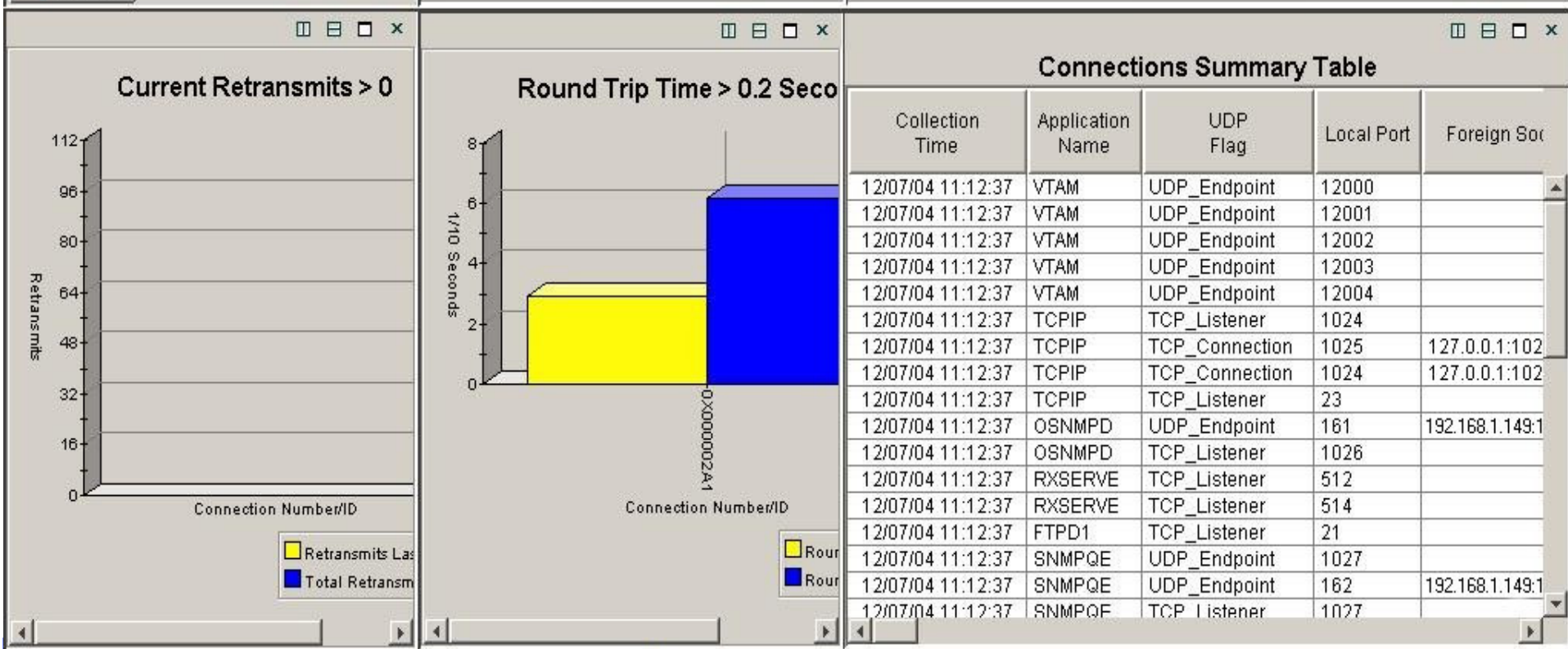
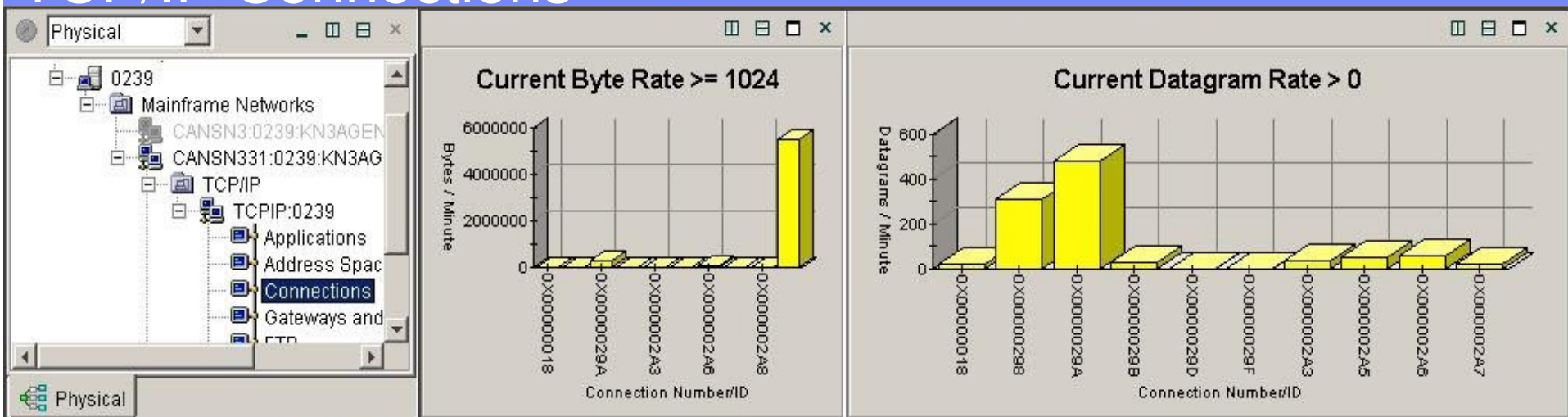
- **Connections**
 - State, Rate, Backlog, Rejections
- **Last activity time**
- **Window Sizes**
- **Response Times**
- **Retransmissions**
- **Transmit / Receive Rates**
- **Out of order segments**

Applications TCP/IP Performance



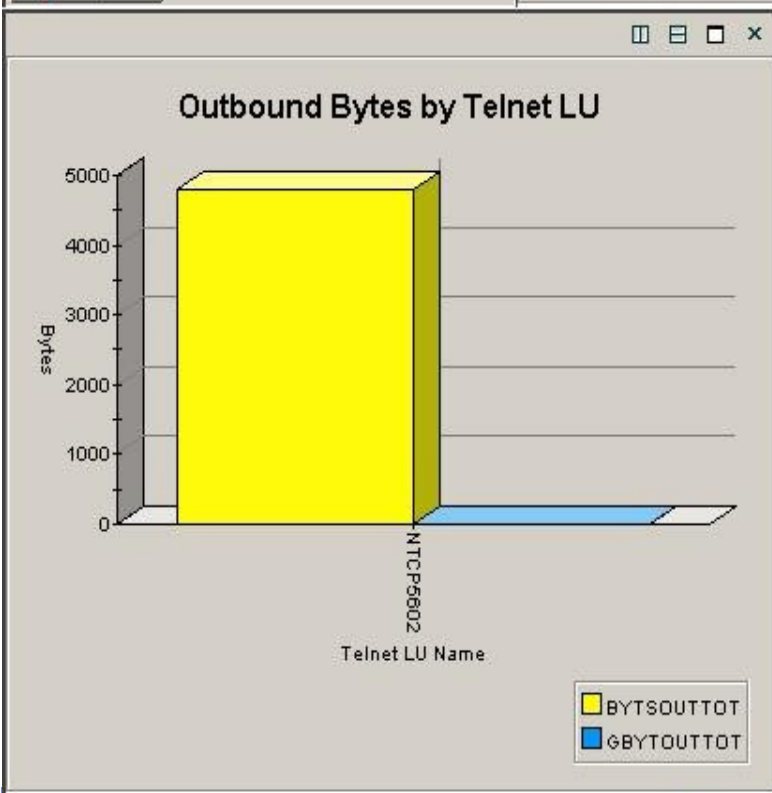
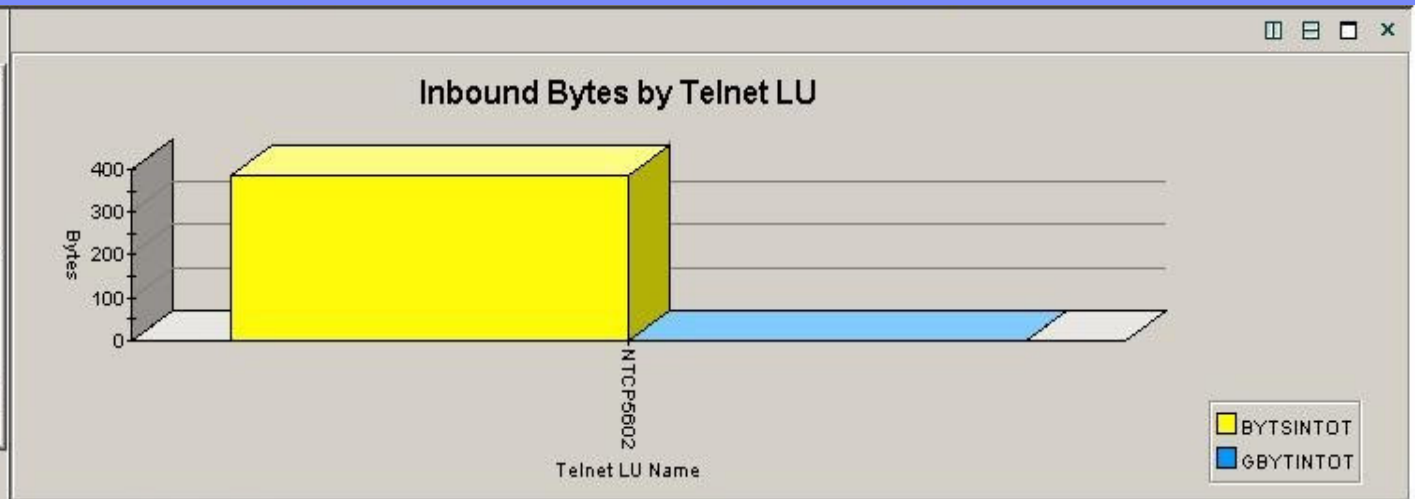
Ready Server Available Applications - dell:14000 - SYSADMIN

TCP/IP Connections



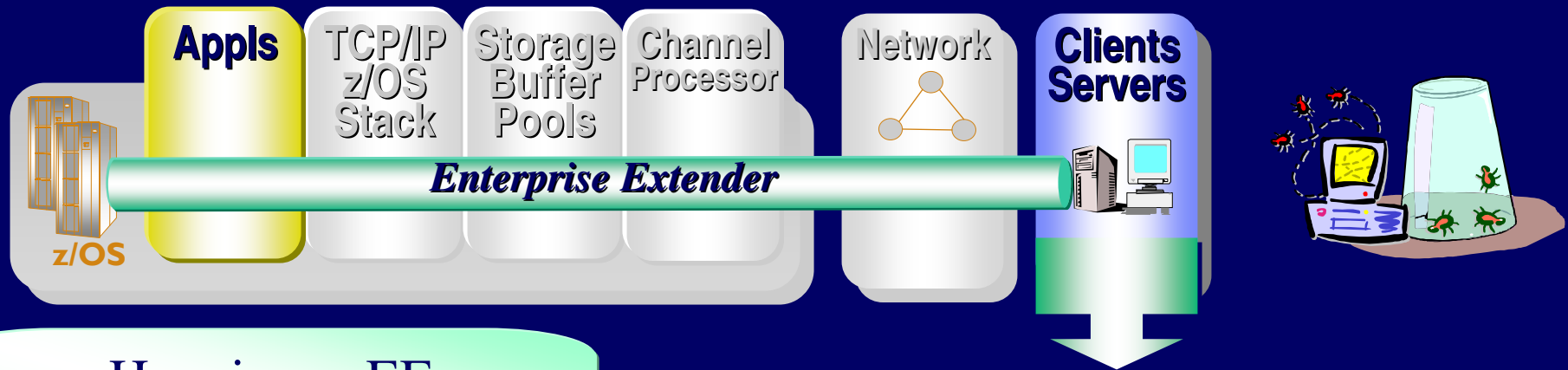
Physical

- Gateways and
- FTP
- OSA
- TCP/IP Memory
- TN3270 Server
- VTAM
 - :0239
 - VTAM:0239
 - CSM
 - EE
 - HPR



TN3270 Server Session Summary

TIMESTAMP	LUNAME	SNALUNAME	REMOTEIP	LOCALIP	REMPORT	LOCALPORT
1041206082436000	NTCP5602	NT56TSO2	192.168.0.121	192.168.1.149	0	
1041206082501000	NTCP5602	NT56TSO2	192.168.0.121	192.168.1.149	1112	



How is my EE performing?

- **EE Analysis**
 - **Throughput Rates**
 - **Retransmission Rates**
 - **RTP Pipes**
 - **Sessions**
 - **Drill down to Port Details**
 - **Type of Service (TOS)**

Enterprise Extender



Physical

- Gateways and
- FTP
- OSA
- TCP/IP Memory
- TN3270 Server
- VTAM
 - :0239
 - VTAM:0239
 - CSM
 - EE
 - HPR

Packet Retransmission Rate > 0

EE Connections w/ Byte Rate > 0

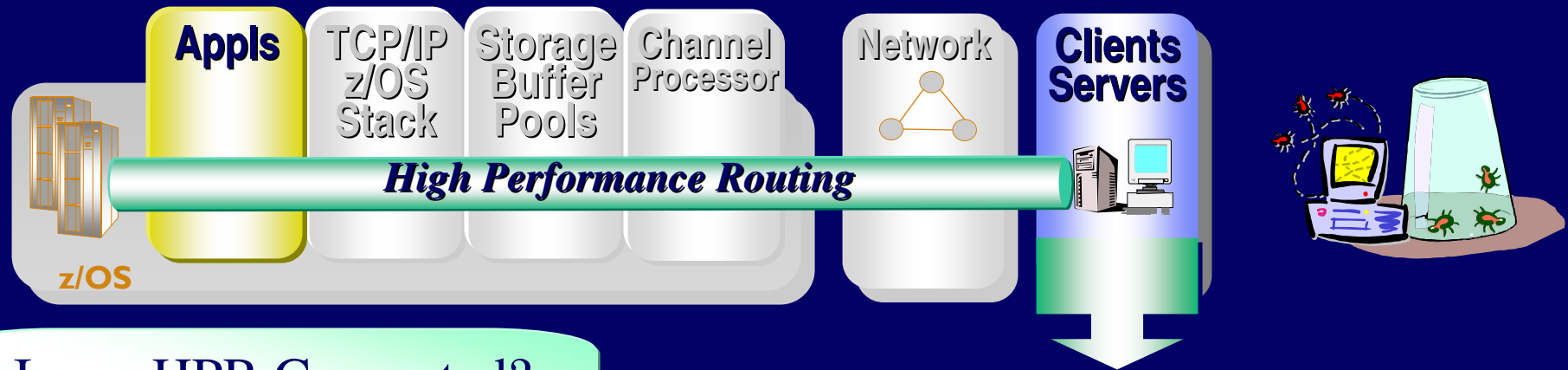
RTP Pipes > 10 or Sessions > 1000

EE Connections w/ Packet R

EE Connections Summary Table

	TIMESTAMP	LOCALIP	REMOTEIP	RTPPIPES	SESSION
	1041206083624000	192.168.1.71	192.168.0.71	4	

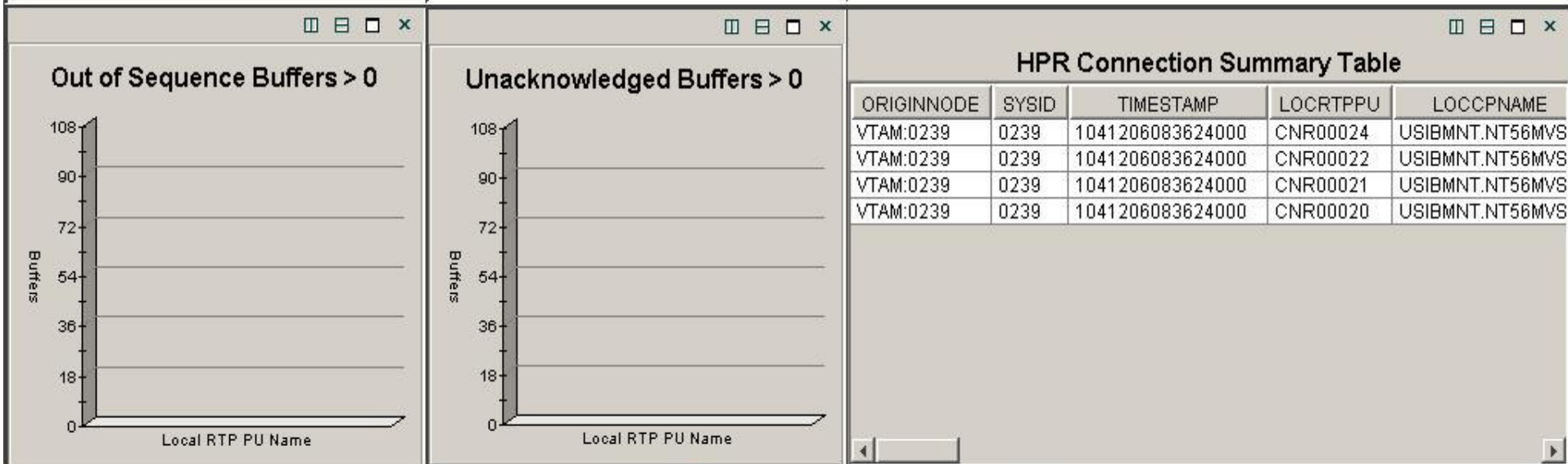
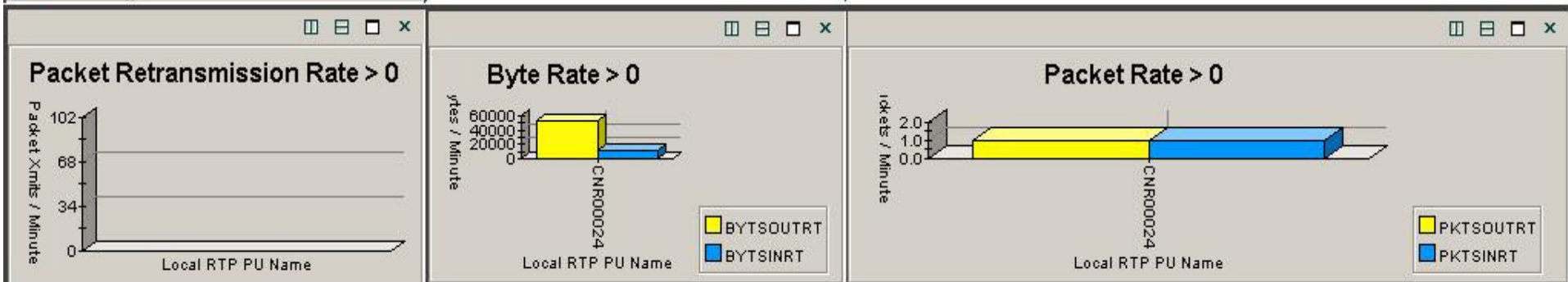
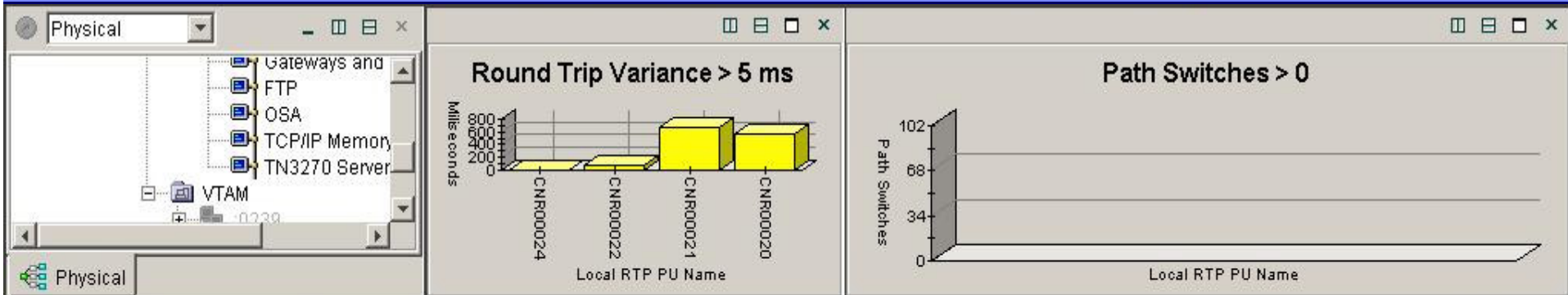
High Performance Routing (HPR) Analysis

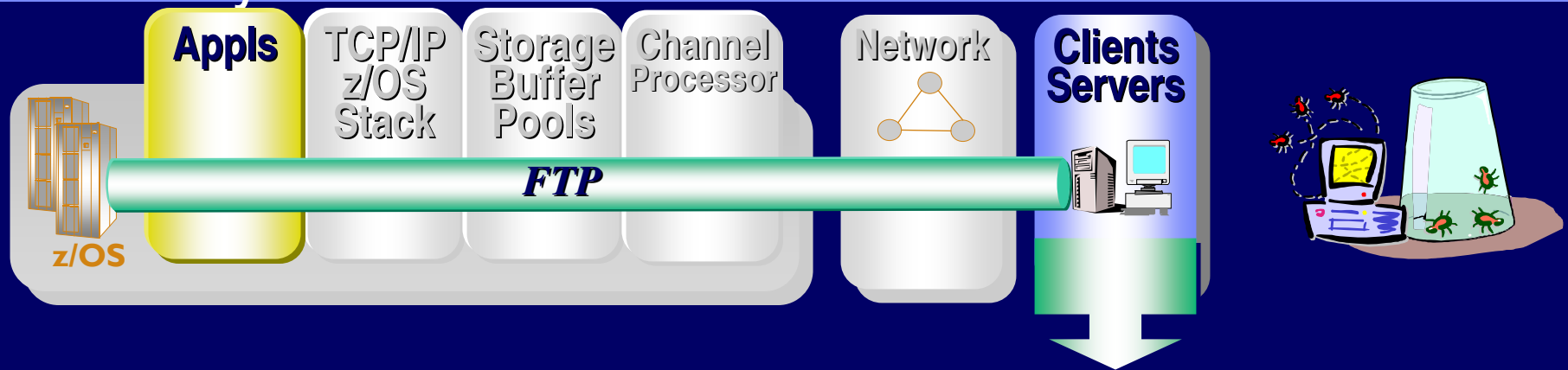


Is my HPR Congested?

- **HPR Analysis**
 - Throughput Rates
 - Retransmission Rates
 - RTP Pipe congestion
 - Round trip time
 - Sessions, CPnames
 - Drill down to link Details
 - Class of Service

HPR Performance





Who is doing large FTPs during 1st shift?

- **FTP Analysis**
 - **Datasets names**
 - **By Bytes**
 - **By failures**
 - **Last command**
 - **Login Failure reason**
 - **Transmission Mode**
 - **By Application**

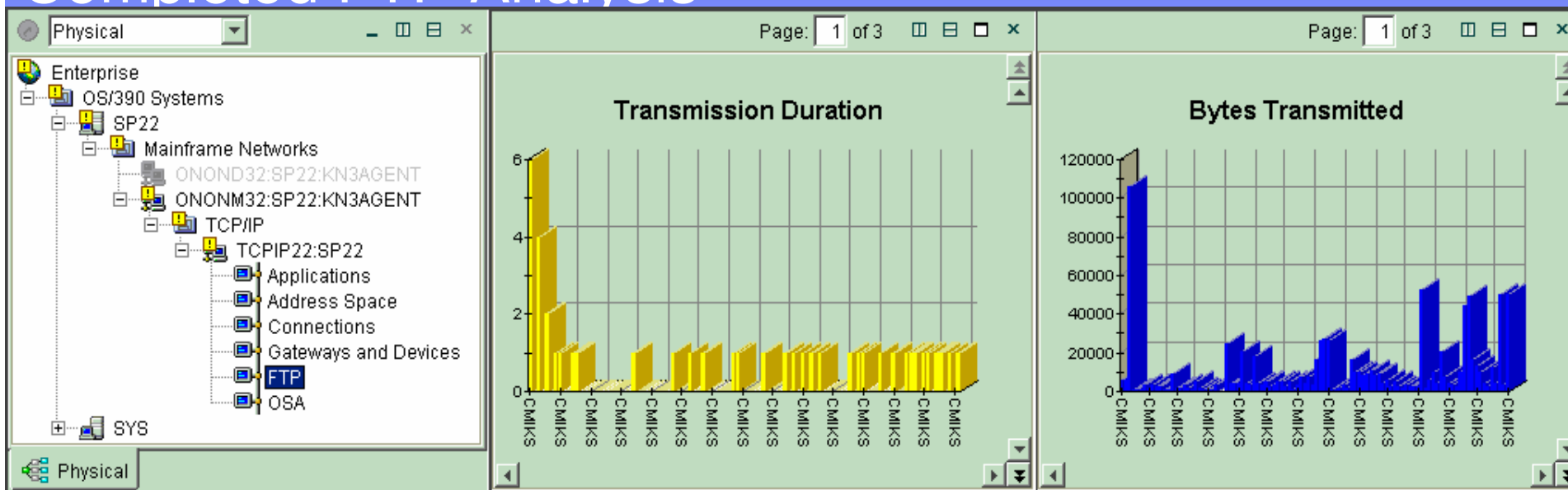
Why is my FTP performance so bad?



My Retransmissions are high!

Total Retransmits	Round Trip Time	Round Trip Variance	Telnet Appl Name	Telnet LU Name	Idle Time	Connection Number
63	16.16	11.82		TCP00041	14545	35221
18	8.44	2.45			91492	6087
16	7.09	3.19			91483	6083
0	3.26	1.12	CICSACB2	TCP00012	2203	42053

Completed FTP Analysis



Completed FTP Transmissions

File Transmission Start	File Transmission End	File Transmission Duration	Total Bytes Transmitted	UserID	File Name	Role	Command	Local IP Address	Remote IP Address
12/18/03 11:06:28	12/18/03 11:06:28	6	5920	CMIKS	CMIKS.EX.TABLES(\$ISPCMDS)	Server	RETRIEVE	198.210.51.158	172.31.12.32
12/18/03 11:06:30	12/18/03 11:06:30	0	5920	CMIKS	CMIKS.EX.TABLES(ISPCMDS)	Server	RETRIEVE	198.210.51.158	172.31.12.32
12/18/03 11:06:31	12/18/03 11:06:31	4	106320	CMIKS	CMIKS.EX.TABLES(SPELL01)	Server	RETRIEVE	198.210.51.158	172.31.12.32
12/18/03 11:06:34	12/18/03 11:06:34	0	480	CMIKS	CMIKS.EX.TABLES(TDCH15)	Server	RETRIEVE	198.210.51.158	172.31.12.32
12/18/03 11:06:34	12/18/03 11:06:35	2	480	CMIKS	CMIKS.EX.TABLES(TDCH15A)	Server	RETRIEVE	198.210.51.158	172.31.12.32
12/18/03 11:06:35	12/18/03 11:06:35	0	480	CMIKS	CMIKS.EX.TABLES(TDCL32A)	Server	RETRIEVE	198.210.51.158	172.31.12.32
12/18/03 11:06:36	12/18/03 11:06:36	1	3360	CMIKS	CMIKS.EX.TABLES(TDCL32T)	Server	RETRIEVE	198.210.51.158	172.31.12.32
12/18/03 11:06:41	12/18/03 11:06:41	1	1476	CMIKS	CMIKS.EX.CLIST(\$MSGGS)	Server	RETRIEVE	198.210.51.158	172.31.12.32
12/18/03 11:06:41	12/18/03 11:06:41	0	3608	CMIKS	CMIKS.EX.CLIST(\$ASMJCLS)	Server	RETRIEVE	198.210.51.158	172.31.12.32
12/18/03 11:06:43	12/18/03 11:06:43	0	2132	CMIKS	CMIKS.EX.CLIST(\$ASMONLY)	Server	RETRIEVE	198.210.51.158	172.31.12.32
12/18/03 11:06:44	12/18/03 11:06:44	1	2870	CMIKS	CMIKS.EX.CLIST(\$BOOKM)	Server	RETRIEVE	198.210.51.158	172.31.12.32
12/18/03 11:06:45	12/18/03 11:06:45	1	1020	CMIKS	CMIKS.EX.CLIST(#MRSETUP)	Server	RETRIEVE	198.210.51.158	172.31.12.32
12/18/03 11:06:46	12/18/03 11:06:46	0	814	CMIKS	CMIKS.EX.CLIST(@DBCS)	Server	RETRIEVE	198.210.51.158	172.31.12.32
12/18/03 11:06:47	12/18/03 11:06:47	0	9389	CMIKS	CMIKS.EX.CLIST(@SYSINFO)	Server	RETRIEVE	198.210.51.158	172.31.12.32

Situations and Thresholds



Current Situation Values

Response Time	Origin Node	System ID	Host Name	TCPIP STC Name	Collection Time	Application Name	Connection Type	Local Port	Foreign Socket	Connection Number
15.19	TCPIP:MVSA	MVSA	DEMOMVS	TCPIP	08/18/05 11:17:12	TCPIP	T	23	9.65.80.29:3064	489003

OMEGAMON XE for Mainframe Networks provides:
67 Situations out-of-the-box.
16 of these situations are auto-started

Connections Summary

Application Name	Connection Type	Local Port	Foreign Socket	Hex Connection Number	Byte Rate	Resource
DSNDDIST	T	4466	9.19.47.125:1849	0X0006F4C8	5488263	
OSNMPD	U	161	9.39.64.151:63776	0X0000001F	2400522	
CXEGA19	U	1968	9.39.64.151:161	0X00000688	154449	

You can click on a column (attribute) and sort by High or low values

Out-of-the-box Threshold values are provided for most metrics (attributes). When the threshold is exceeded, the column that displays the metric gets an icon AND the resource is highlighted as Warning (Yellow) or Critical (Red).

VTAM Situations



- VTAM
 - N3V_CPU_Pct_Critical
 - N3V_CPU_Pct_VWarning
 - N3V_CSA_Pct_Below_16MB
 - N3V_EE_Pct_Packets_Rexmit
 - N3V_HPR_Conn_OOS_Buffers
 - N3V_HPR_Conn_Path_Switch
 - N3V_HPR_Throughput
 - N3V_Paging_Rate
 - N3V_Pct_ECDSA_Allocated_Stg
 - N3V_Total_CSA_Pct
 - NonPrimeShift
 - PrimeShift
 - QOMEGAMON_ONLINE
 - Weekday
 - Weekend

Situation Editor

Condition Distribution **Expert Advice** Action Until

Description
HPR RTP Connection with high number of out-of-sequence buffers

Condition

	Out of Sequence Buffers
1	GE 100
2	
3	

Click inside a cell of the table editor above to see a description of the attribute for that column and to compose the expression.
Add an attribute to the condition by clicking Add Attributes and selecting the attributes you want to include.

Sampling interval
0 / 0 : 15 : 0
dd hh mm ss

Run at startup

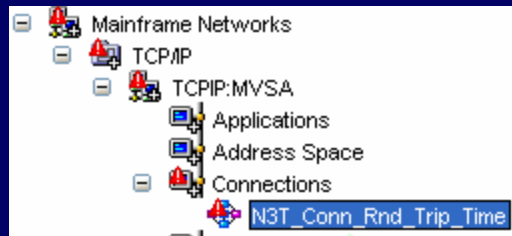
Apply Cancel Help

Point n' click to change threshold conditions. If those conditions are met, an Event is created

Condition Distribution **Expert Advice** Action Until

Text or Advice Location

A high number of out-of-sequence buffers indicates high CPU utilization of the remote z/OS Communications Server address space. This is probably due to network congestion or constrained CPU in the remote z/OS Communications Server address space. To solve, validate the router configuration parameters, confirm that CPU utilization is high for the remote system z/OS Communications Server address space, and redistribute the z/OS Communications Server workload on the HPR RTP connected remote system.

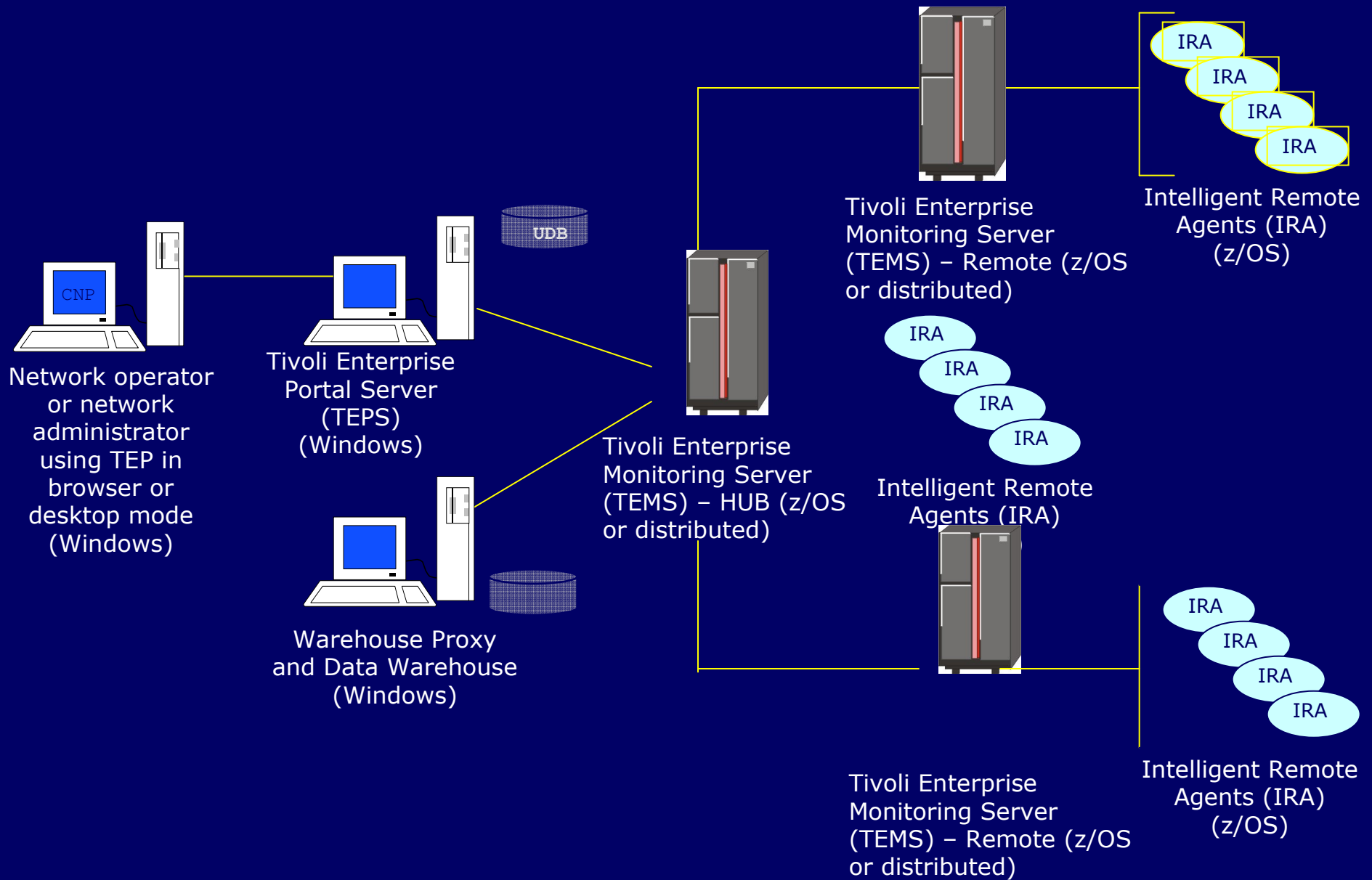


OMEGAMON 101:
 You can monitor Events
 (which are triggered by
 Situations meeting target
 conditions) from the
 Navigation Tree or the
 Event Console

Response Time	Origin Node	System ID
15.19	TCPIP:MVSA	MVSA
5.67	TCPIP:MVSA	MVSA
Response Time GE 5.00		

- [-] TCP/IP
 - N3T_Appl_Backlog_Conns_Rejected
 - N3T_Appl_Byte_Rate
 - N3T_Appl_Connections_in_Backlog
 - N3T_Appl_Datagram_Rate
 - N3T_Appl_FTPD1_Rate
 - N3T_Appl_Not_Accepting_Conn
 - N3T_Appl_Pct_Datagrams_Discd
 - N3T_Appl_Pct_OO_Segments
 - N3T_Appl_Pct_Segs_Rexmit
 - N3T_Appl_Reject_Conn
 - N3T_Appl_Reject_Conn_Resource
 - N3T_Appl_Reject_Conn_WorkSpike
 - N3T_Appl_Retransmission_Count
 - N3T_Conn_Backlog_Conns_Rejected
 - N3T_Conn_Byte_Rate
 - N3T_Conn_Connections_in_Backlog
 - N3T_Conn_Current_Retransmits
 - N3T_Conn_Datagram_Rate
 - N3T_Conn_Pct_Datagrams_Discd
 - N3T_Conn_Pct_OO_Segments
 - N3T_Conn_Pct_Segs_Rexmit
 - N3T_Conn_Rnd_Trip_Time
 - N3T_Conn_Rnd_Trip_Variance
 - N3T_Connection_Count
 - N3T_CPU_Pct_Critical
 - N3T_CPU_Pct_Warning
 - N3T_CSA_Pct_Below_16MB
 - N3T_Device_Status_Active
 - N3T_Device_Status_Inactive
 - N3T_Fragmentation_Failure_Pct
 - N3T_Fragmentation_Pct
 - N3T_IF_Rcv_Util
 - N3T_IF_Util
 - N3T_IF_Xmt_Util
 - N3T_Input_Discard_Pct
 - N3T_IP_Out_Disc
 - N3T_OSA_Chan_PCI_Busy_Pct_5Min
 - N3T_OSA_Chan_Pro_Util_Pct_5Min
 - N3T_OSA_Utilization
 - N3T_Output_Discard_Pct
 - N3T_Paging_Rate
 - N3T_Pct_Auth_Pvt_Allocated_Stg
 - N3T_Pct_ECDSA_Allocated_Stg
 - N3T_Pct_IF_Err
 - N3T_Pct_IF_In_Err
 - N3T_Pct_IF_Out_Err
 - N3T_Pct_IF_Pkt_Disc
 - N3T_Pct_IP_In_Disc
 - N3T_Pct_TCP_OO_Segs
 - N3T_Reassembly_Failure_Pct
 - N3T_Reassembly_Pct
 - N3T_Retransmission_Pct
 - N3T_TCP_Conn_Drop
 - N3T_TCP_In_Errs
 - N3T_TCP_Probes
 - N3T_Telnet_Pool_Usage_Critical
 - N3T_Telnet_Pool_Usage_Warning
 - N3T_Throughput_Rate
 - N3T_Total_CSA_Pct
 - N3T_UDP_Discard_Pct
 - NonPrimeShift
 - PrimeShift
 - GOMEGAMON_ONLINE
 - Weekday
 - Weekend

OMEGAMON XE Environment



As part of the ITM 6.1 effort, the Candle platform components have been renamed as follows:

Candle Name

Tivoli Name

OMEGAMON Platform

Tivoli Monitoring Services

CandleNet Portal (CNP)

Tivoli Enterprise Portal (TEP)

CandleNet Portal Server (CNPS)

Tivoli Enterprise Portal Server (TEPS)

Candle Management Server (CMS)

Tivoli Enterprise Monitoring Server (TEMS)

- **Candle Management Server**
 - z/OS, Windows (2000, XP Pro, 2003 Server), AIX, HP, Solaris
- **CandleNet Portal Server**
 - Recommended hardware –
 - Intel P4 server capable of running Windows 2003, XP Pro or 2003 Server and DB2 UDB 8.1
 - Windows 2000, XP Pro, 2003 Server
 - DB2 8.1 (recommended) **OR** Microsoft SQL Server version 7.0 or 2000 **OR** MSDE
 - Java 1.3.1_04 or higher
- **CandleNet Portal**
 - Recommended hardware –
 - Intel system capable of running Windows XP Pro or Windows 2000
 - Windows XP Professional Edition w/SP 1 (or higher) or Windows 2000 w/SP 3 (or higher)
 - **CNP Desktop Client**
 - requires Sun Java v1.3.1_04 thru v.1.4.2_07
 - (excluding the 1.4.0 and 1.4.1 versions)
 - **CNP Browser Client** requires Internet Explorer 6 (or higher)
 - with Java Plug-in (same Java release levels as above)
- **Warehouse Proxy and Candle Data Warehouse**
 - Recommended hardware –
 - Intel P4 server capable of running Windows 2003, XP Pro or 2003 Server and Microsoft SQL Server version 7.0 or 2000
 - Windows 2000, XP Pro, 2003 Server
 - Microsoft SQL Server version 7.0 or Microsoft SQL Server 2000 (with fix pack 3)

- OMEGAMON XE for Mainframe Networks IRA
 - z/OS 1.4 (or higher).
 - maintenance on z/OS 1.4 and z/OS 1.5.
- OSA-Express adapters
 - Either OSA/SF or SNMP direct
 - Must be configured and running in order to collect OSA statistics.
 - The OSA-Express support has been modified to support the latest version of the OSA-Express MIB. To support this MIB, the Licensed Internal Code (LIC) levels of the OSA-Express adapters must meet the following criteria:
 - OSA module on a z900 or z800 system
 - LIC version of 3.33 or higher installed
 - OSA module on a z990 processor
 - all LIC levels are supported.

Required maintenance on z/OS 1.4:

<u>APAR Number</u>	<u>Description</u>
OA04394	(VTAM) EE/HPR/CSM data collection
PQ77244	(TCP/IP) TCP/IP stack enable network management interface APIs
PQ77633	FTP client server records have invalid return code (see UQ80465)
PQ77837	(TCP/IP) FTP enable network management interface APIs
PQ77838	(TCP/IP) Config, Netstat, SNMP
PQ77840	TCP/IP) IPCS enable network management interface APIs
PQ79583	(TCP/IP) CPU missing from TCP/IP trace
PQ78753	(TCP/IP) Correct FTP port & IP field information in SMF records
PQ74292	SNMP getnext request error
PQ81716	Telnet error in the date field for logon and logoff times
PQ83920	Shareport not distributing connections evenly
PQ84072	NETSTAT socket option displays incorrect information
PQ92481	SNA collection exception CEE0374C Condition=CEE3204S
II13699	Informational APAR on CD/390 API new function

Required maintenance on z/OS 1.5:

<u>APAR Number</u>	<u>Description</u>
PQ78753	Correct FTP port and IP field information in SMF records
PQ81716	Telnet error in the date field for logon and logoff times

Where to go for more information



Product overviews, Manuals, Demos, and Support

<http://www.ibm.com/software/tivoli/sw-atoz/index.html>

Tivoli. software



White Paper

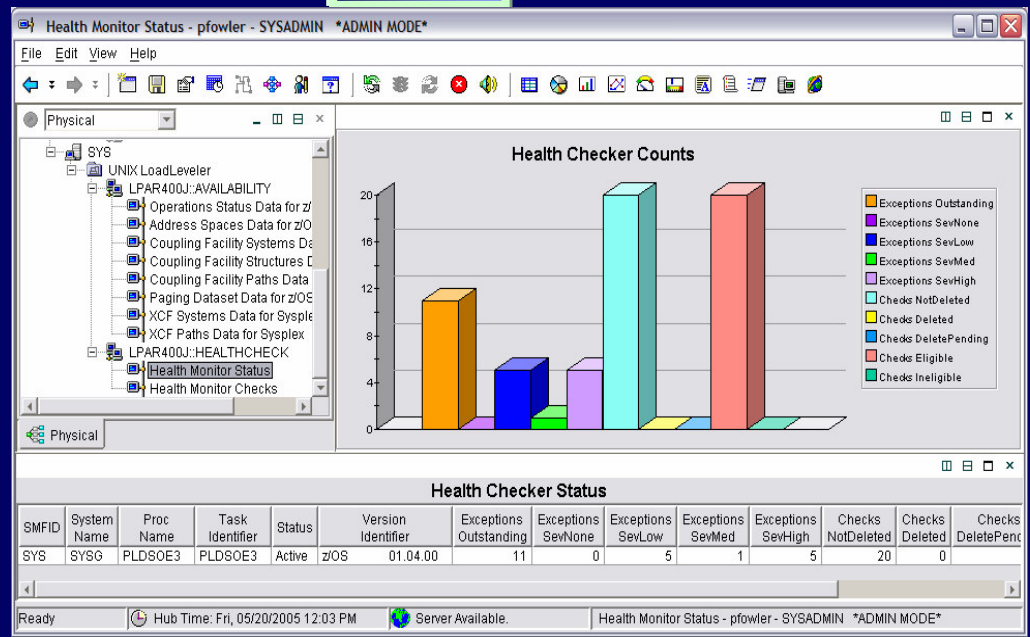
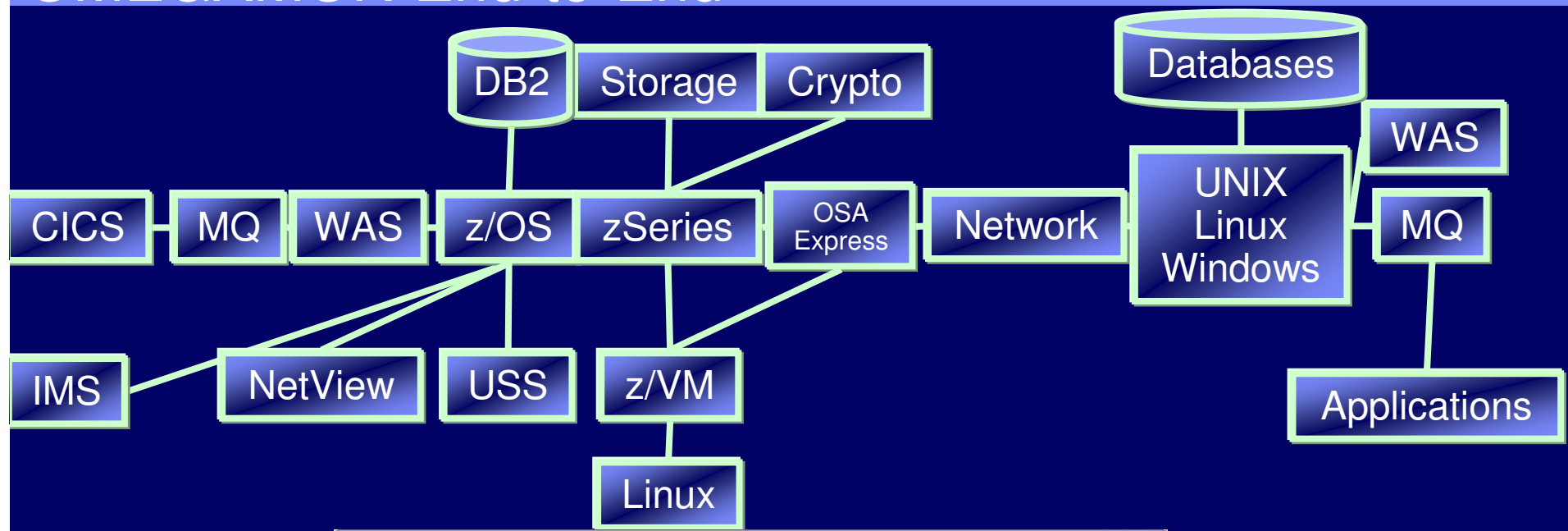
NetView for z/OS V5.2: Integrated enterprise management with OMEGAMON

http://www-306.ibm.com/software/tivoli/features/ccr2/ccr2-2005-11/product_updatesII.html

Red Book OSA-Express Implementation Guide

<http://publib-b.boulder.ibm.com/abstracts/sg245948.html?Open>

OMEGAMON End-to-End





Thank You



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