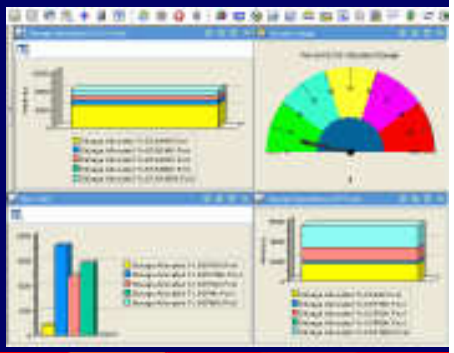
Top 10 z/OS Communication Server Problems Isolating them with OMEGAMON and NetView for z/OS



Ernie Gilman
IBM Sr. Consulting IT Specialist
Upstate NY - New England
egilman@us.ibm.com

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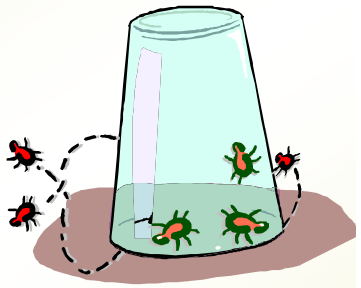
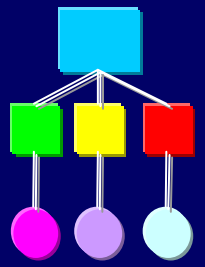
AGENDA

- Overview of IBM Tivoli Network Management

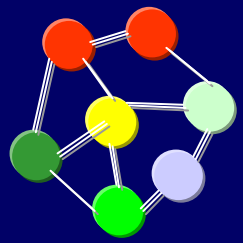


- **z/OS Communication Server Top Ten Problems**
  1. TCP/IP Stacks
  2. Denial of Service Attack
     - Intrusion Detection
  3. DVIPA
  4. OSA Express and Channel Interfaces
  5. TCP/IP Connections
  6. Applications
  7. FTP
  8. TN3270
     - Siding Window
  9. SNA over IP
     - Enterprise Extender and HPR
  10. SNA
     - CCL (Communication Controller on Linux)

Moving from SNA to TCP/IP



SNA	*TCP/IP*
▪ Generic Alerts ▪ VR Flow Control ▪ HPR ▪ SNI ▪ Intelligent agents ▪ Hierarchal (Subarea) ▪ LU2 ▪ Sessions Controlled ▪ 3745 (CCL)	▪ Traps ▪ Discards ▪ Enterprise Extender ▪ Internet ▪ MIB Polling ▪ Peer to Peer ▪ TN3270 ▪ FTP Uncontrolled ▪ OSA-Express, ▪ Denial of Service Attack



•Set up MIB Polling
•Set Thresholds
•Traces

Tivoli z/OS Network Performance and Automation Management

NetView and OMEGAMON Interfaces

NetView for z/OS

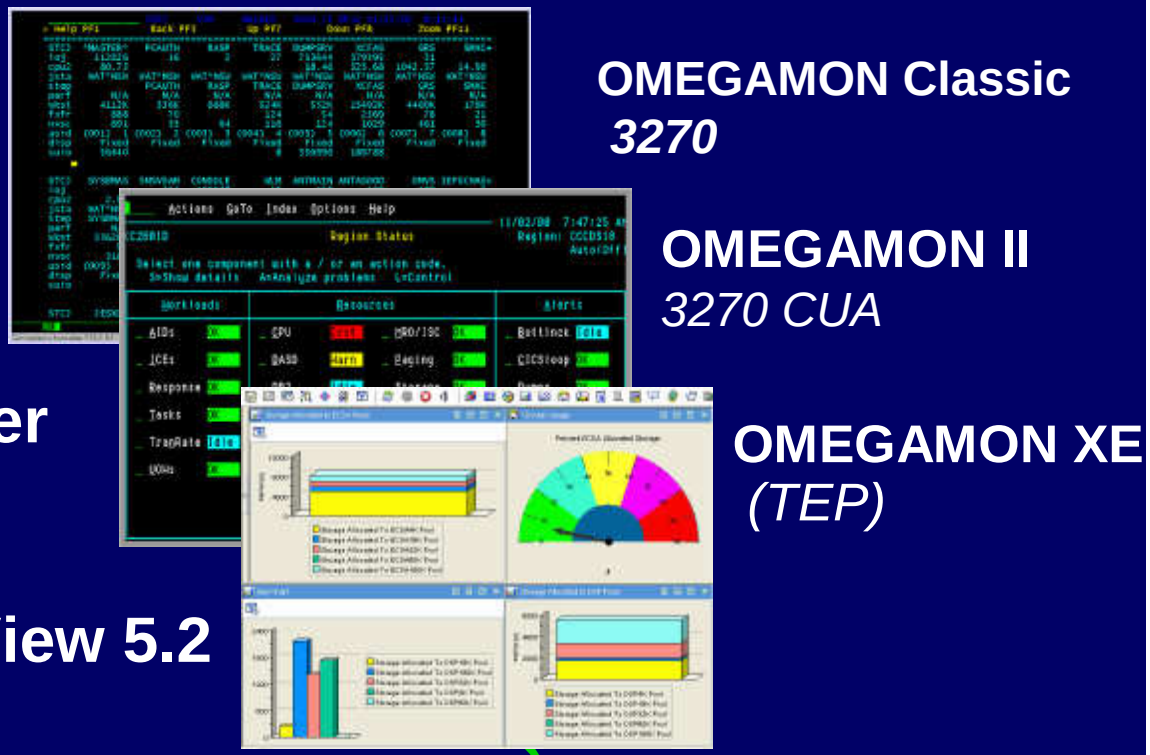
3270

NMC
Java GUI

Browser

NetView 5.2
TEP

OMEGAMON



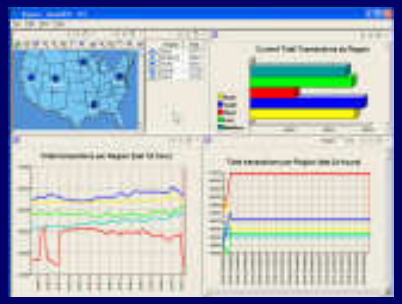
OMEGAMON Classic
3270

OMEGAMON II
3270 CUA

OMEGAMON XE
(TEP)

Operations

Performance



OMEGAMON DE

Tivoli Enterprise Portal (TEP)

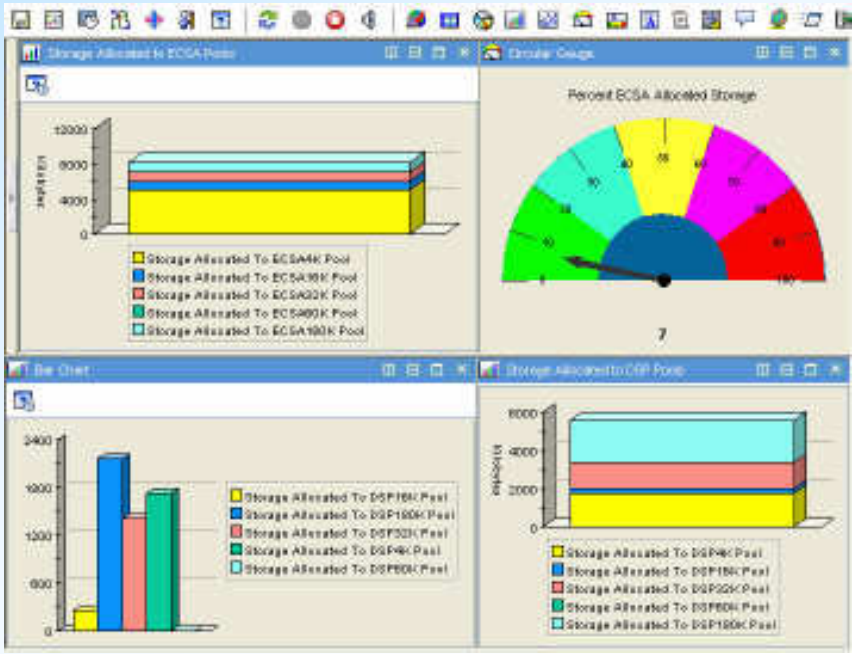
IBM Tivoli Enterprise Portal (TEP) Integration

z/OS Health check	*z/OS Management Console*
z/OS & USS	*OMEGAMON XE on z/OS*
NetView for z/OS	*IBM Tivoli NetView for z/OS V5.2*
Network	*OMEGAMON XE for Mainframe Networks*
DB2	*OMEGAMON XE for DB2 PE/PM*
CICS	*OMEGAMON XE for CICS*
IMS	*OMEGAMON XE for IMS*
Storage	*OMEGAMON XE for Storage*
WebSphere MQ	*OMEGAMON XE for Messaging*
WebSphere Appl Server	*ITCAM for WAS*
z/VM & Linux on z	*OMEGAMON XE on z/VM and Linux*
Distributed Monitoring	*IBM Tivoli Monitoring (ITM) & ITCAM*

TEP

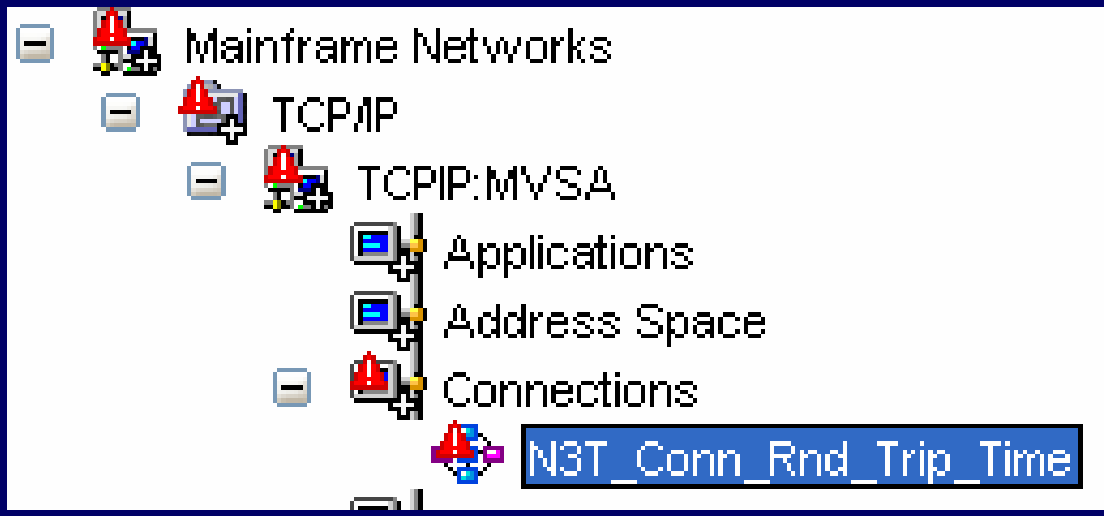
Tivoli Enterprise Portal Highlights

- **Common user interface**
  - Tivoli Enterprise Portal (TEP)
  - Manage z/OS system and distributed resources from a single user interface.
  - Displays data in graphs, charts and table formats
  - Displays real time and historical data
- **Easy to configure**
  - Filters, Sort
  - Customize workspaces and reports
  - Define thresholds and generate events
- **Out of the box Best Practices**
  - Workspaces
  - Situations - Event Notification
  - Problem Signatures and Expert Advice



Tivoli Enterprise Portal Situations and thresholds

The first time I knew there is a problem was when users start calling



Why not use out of the box situations to proactively notify you.

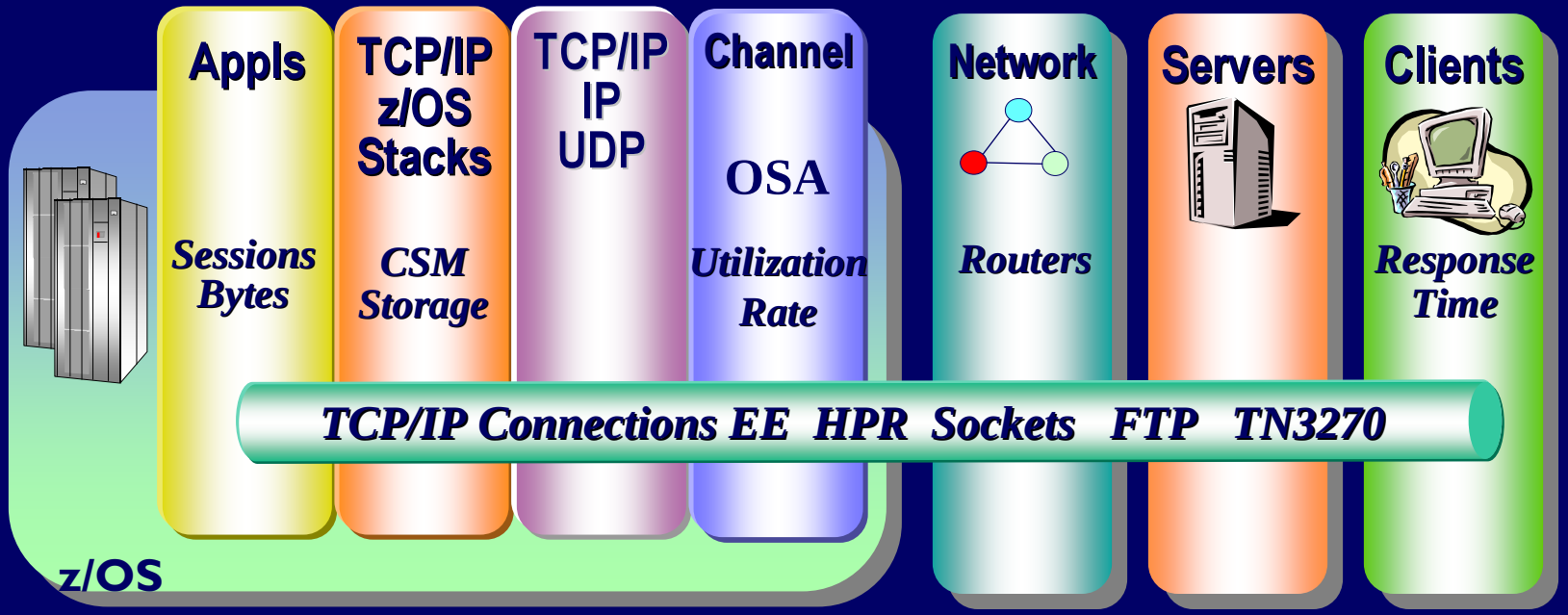
Response Time	Origin Node	System ID
15.19	TCPIP:MVSA	MVSA
5.67	TCPIP:MVSA	MVSA

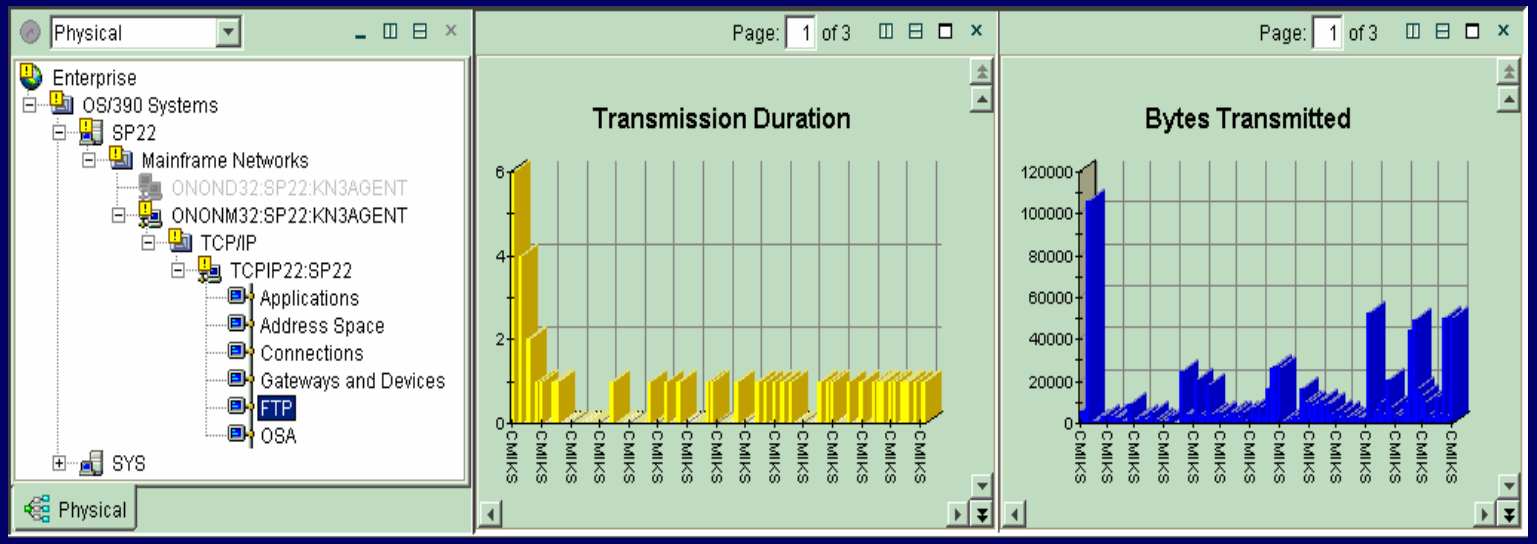
Response Time GE 5.00

With so much data, how do you know what to look at?

- Thresholds can be used to highlight attributes of potential problems

IBM z/OS Communications Management





z/OS Network Performance Data Collection Points

NetView for z/OS | ***OMEGAMON XE for Mainframe Networks***

NLDM API | Trace API | VTAM API | TCP/IP API | SNMP

z/OS Communications Server NMI API

- **Collected using the TCP/IP API:**
  - Applications, Connections, TCP/IP Memory Statistics
  - FTP Sessions and Transfers, TN3270 Server Sessions
- **Collected using the VTAM API:**
  - VTAM Summary, CSM Buffer Pools
  - Enterprise Extender (EE), High Performance Routing (HPR)
- **Collected using SNMP:**
  - TCP/IP Summary, TCP/IP Stack Layers
  - Gateways and Devices, Interfaces, OSA
- **Collected using the TRACE API:**
  - TCP/IP Packet Trace and Formatting
- **Collected using the "Session Awareness and trace" API:**
  - SNA Session Awareness and Trace

✓**Fast**
✓**Scalable**
✓**Reliable**

z/OS Communication Server Top Ten Problems

1. **TCP/IP Stacks**
2. Denial of Service Attack
   - Intrusion Detection
3. DVIPA
4. OSA Express and Channel Interfaces
5. TCP/IP Connections
6. Applications
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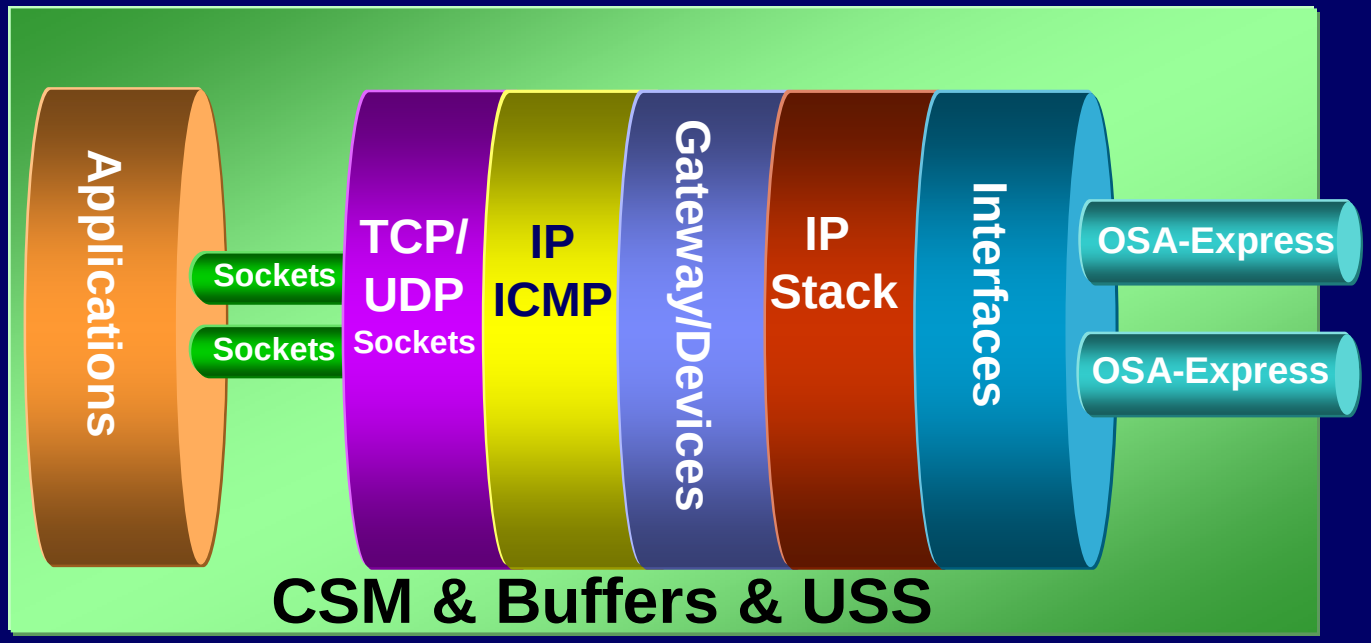
   - Enterprise Extender and HPR
10. SNA
    - CCL (Communication Controller on Linux)

TCP/IP Stack Problems



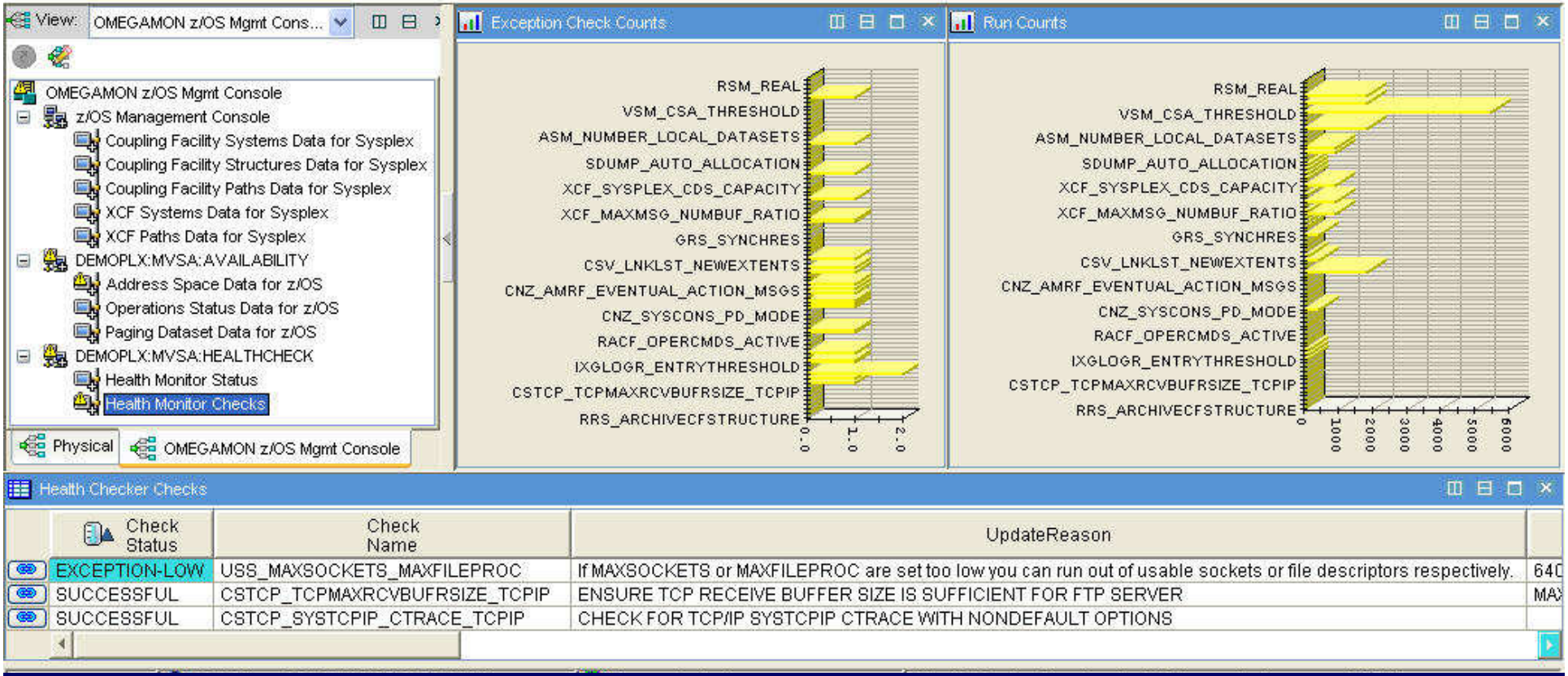
Why is TCP/IP running so slow?

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

Catch some TCP/IP Stack issues early

z/OS Communication Server Health Checks:

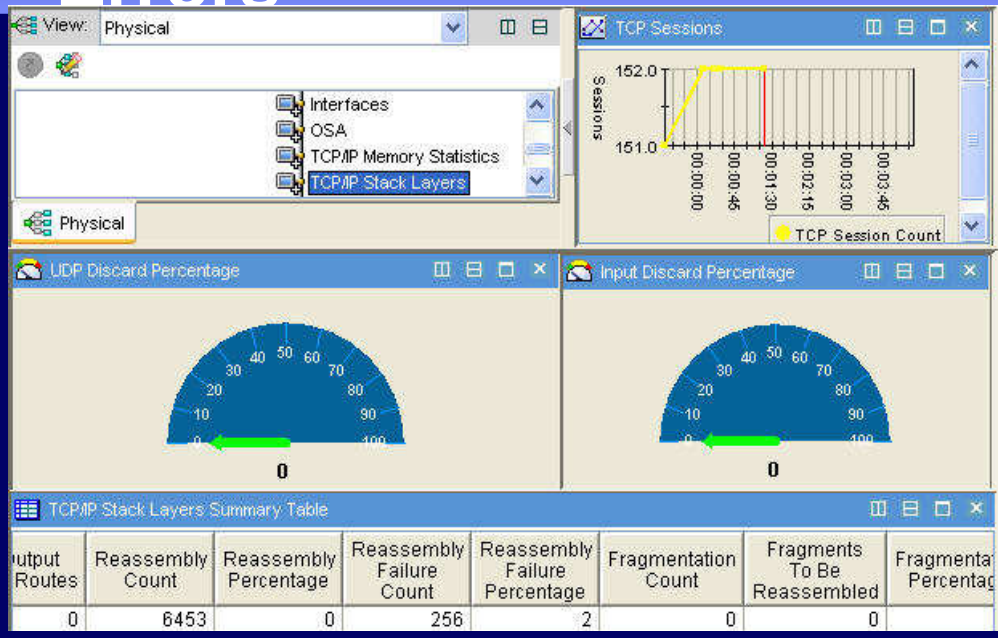
- MAXSOCKETS or MAXFILEPROC too small (z/OS 1.4+)
  - If too small you could run out of sockets or file descriptors (64K)
- TCP Max Receive Buffer Size could bee too small for FTP (z/OS 1.8+)
- TCP/IP Event Trace is running but without default options (z/OS 1.8+)



IBM z/OS OMEGAMON Management Console (Now Included with z/OS)

TCP/IP Stack Isolation – Errors

- Out of Order
  - Routing tables
- Fragmentation
  - MTU size
- Discards
- Segment Errors
  - Checksum
- Timeouts
  - Connectivity
- UDP input Errors
  - Attack
- UDP Discards
  - Wrong Sockets



Out of the box Situations for Operator awareness

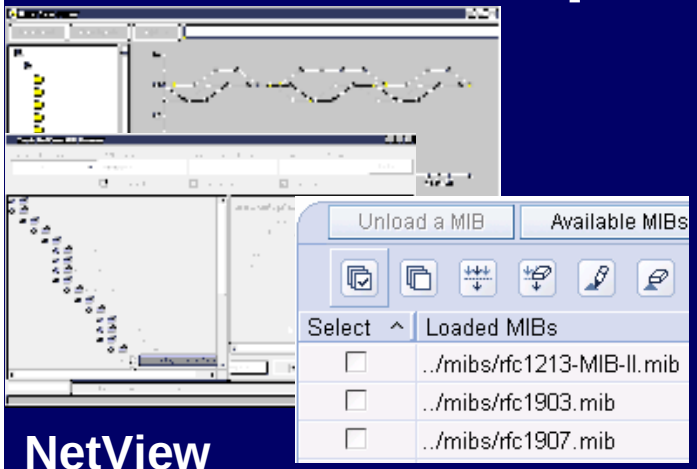
OMEGAMON XE for Mainframe Networks

Stack Situations

- Output IP Segment Discards
- % Inbound IP Segment Discards
- % Out of order Segments
- TCP/IP Connections Dropped
  - Retransmit threshold
  - No response window probes
  - No response on keep alives
  - FINWAIT2 timed out
- Segments received in error
  - ie bad Checksums

TCP window probes sent

TCP/IP Stack Operations



NetView

- Real-time Poller
- MIB Browser
- Web Interface
- NMC (Topology)
- 3270 Operations

NetView for z/OS Commands

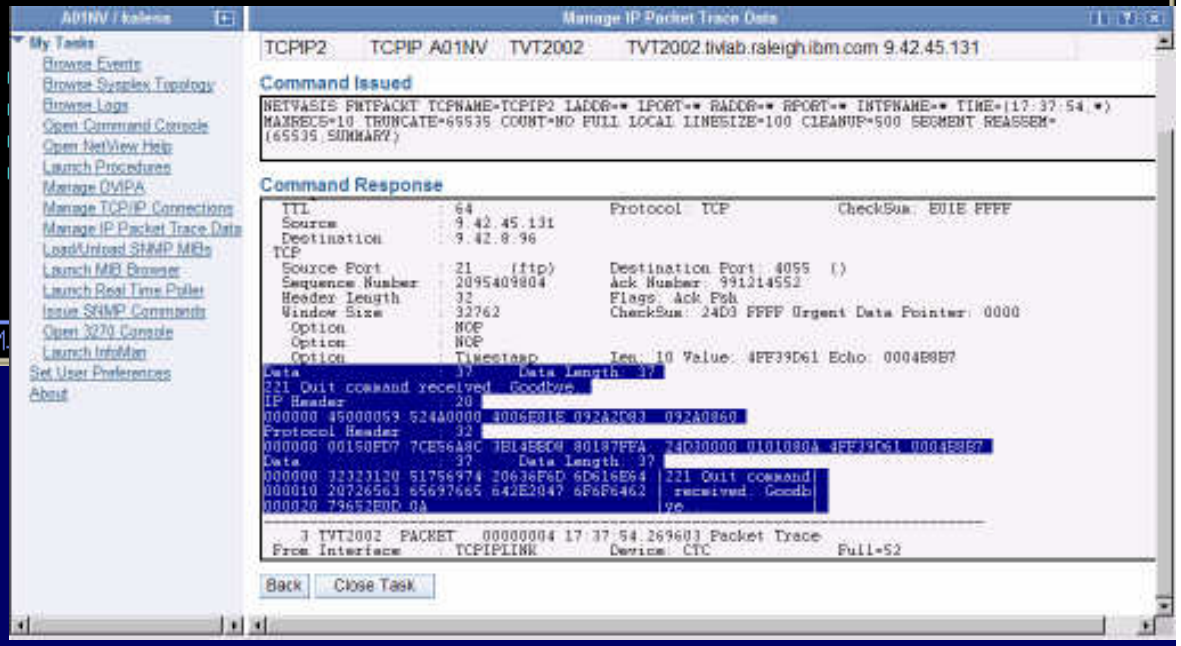
- **PING, REMOTE PING**
  - Check connectivity
- **TRACERTE**
  - Response time between hops
- **SNMP commands**
  - Interrogate SNMP devices

```
CNMKWIND OUTPUT FROM  FMTPACKT FULL TCPNAME=TCPIP2 ASCII RAD  LINE 128 OF 2392
BNH773I NUMBER OF PACKETS: 66 , MISSED BUFFERS: 0 , TCPNAME: TCPIP2
   Option          : NOP
   Option          : NOP
   Option          : Timestamp        Len: 10 Value: 0DBE77B0 Echo: 00000000

Data                : 63     Data Length: 63
220-FTPD1 IBM FTP CS V1R5 at TVT2002, 19:59:50 on 2005-02-02.

IP Header           : 20
000000 45000073 287F0000 400609E3 092A2D83  092A084D

Protocol Header     : 32
000000 00150604 285F54D4 83F69B04 80188000  6BC70000 0101080A 0DBE77B0 00000000
```

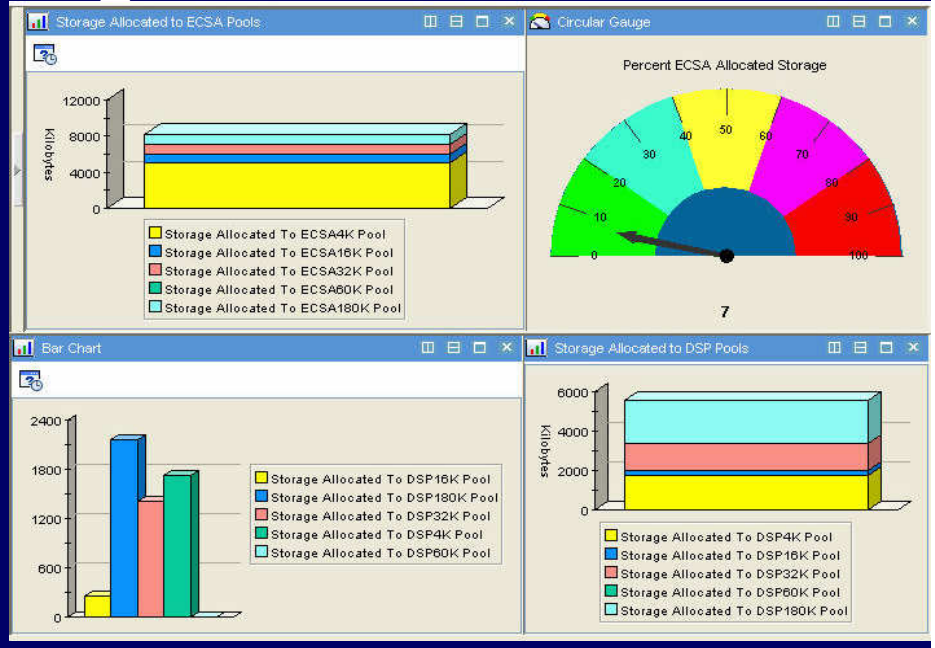


NetView Formatted TCP/IP Packet Trace

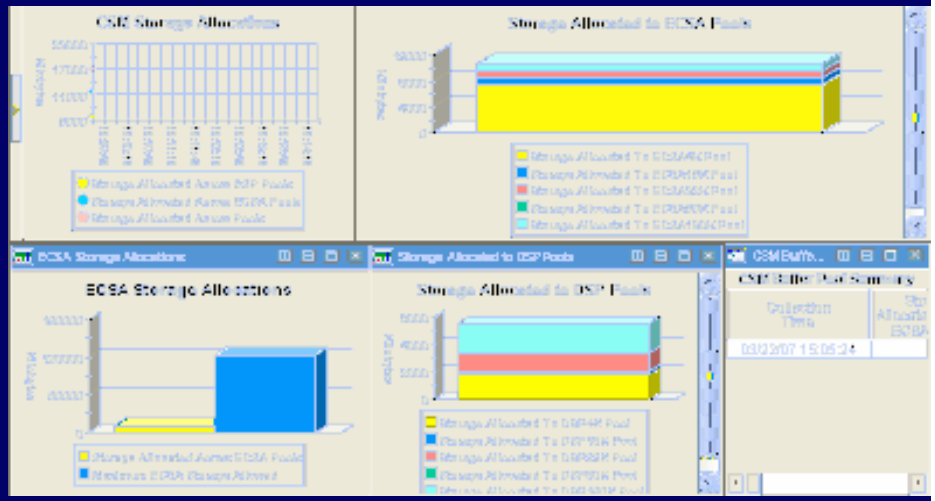
TCP/IP Stack Isolation – Storage

OMEGAMON XE for Mainframe Networks

•High storage utilization could indicate High Network congestion as requests back up



TCP/IP Storage



CSM

CSA Situations
- % VTAM CSA Below line
- % VTAM CSA
- % ECSA allocated vs. Max

TCP/IP Memory Situations
- % Private allocated vs. Max
- % ECSA allocated vs. Max

Out of the box Situations for Operator awareness

TCP/IP Stack Summary

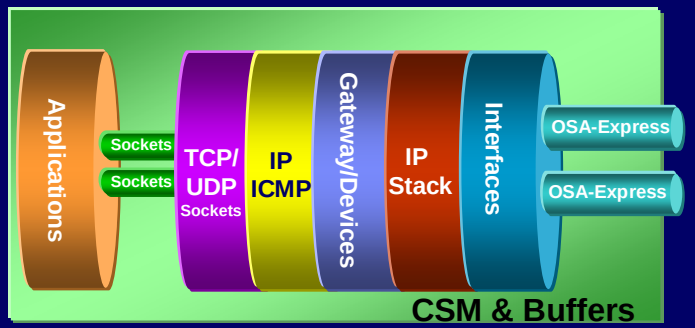
Other Recourses
- OSA-Express
- Interfaces
- Applications
- USS

OMEGAMONs

z/OS Comm Srv Health Check
- MAXSOCKETS
- MAXFILEPROC
- Max Receive Buffer Size
- TCP/IP Trace defaults

z/OS Mgmt Console

Out of the box Situations for Operator awareness



IP Operations
- Ping, Remote Ping
- TRACERTE
- SNMP
- Packet Trace

NetView for z/OS

IP Stack Performance
- Discards
- Timeouts
- Fragmentation
- Reassembly Errors
- Segment Errors

OMEGAMON MFN

Storage & Buffers
- CSA,
- ECSA

OMEGAMON MFN

z/OS Communication Server Top Ten Problems

1. TCP/IP Stacks
2. **Denial of Service Attack**
   - Intrusion Detection
3. DVIPA
4. OSA Express and Channel Interfaces
5. TCP/IP Connections
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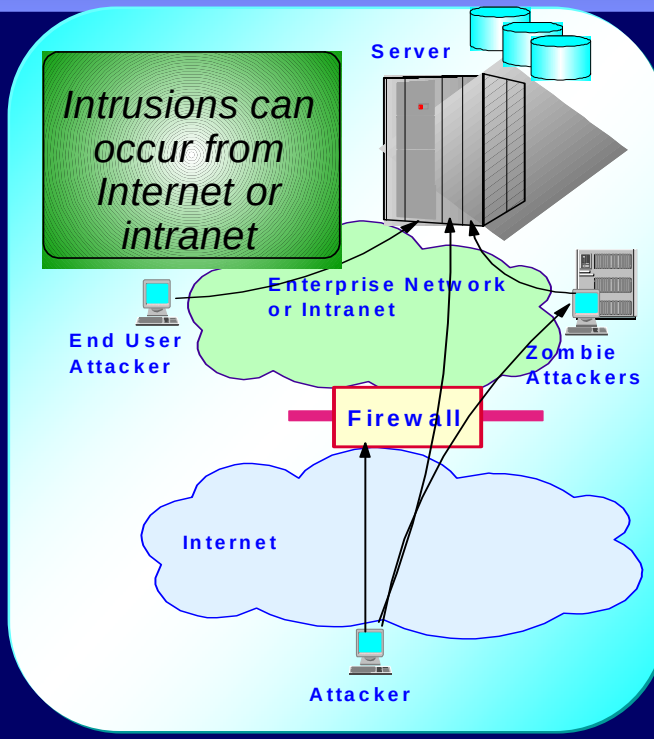
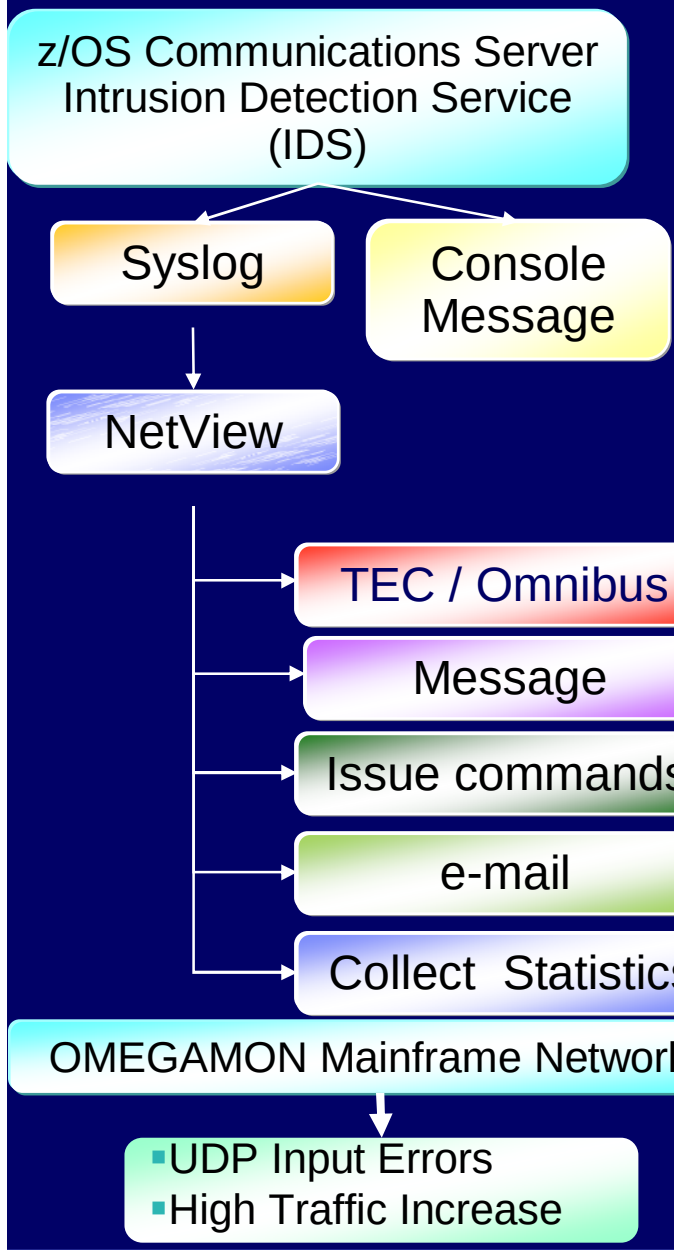
7. FTP
8. TN3270
9. SNA over IP
   - Enterprise Extender and HPR
10. SNA
    - CCL (Communication Controller on Linux)

The Intrusion Threat

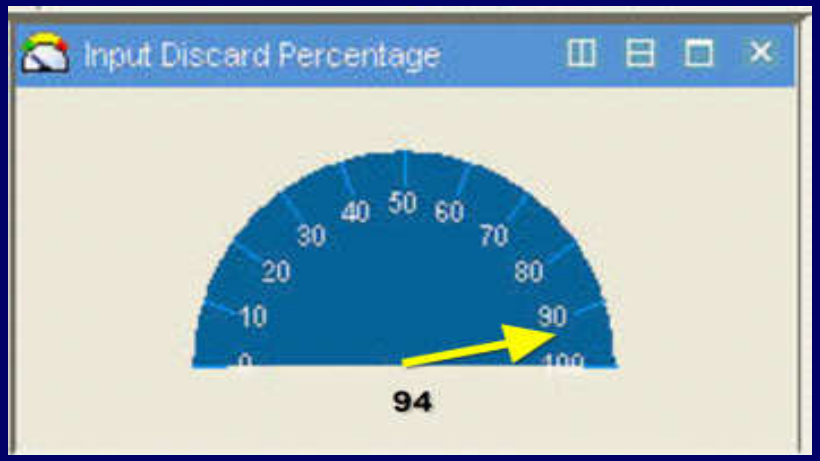
- **What is an Intrusion?**
  - Intrusions can occur from Internet or intranet
  - Information gathering (scan)
    - Network and system info, locations, ICMP, TCP, UDP
  - Eavesdropping / Impersonation / Theft
  - Denial of Service Attack
- **Attack detection**
  - Malformed packets
  - IP option restrictions
  - ICMP redirect restrictions
  - Outbound RAW socket restrictions
- **Prevention**
  - Firewall can provide some level of protection from Internet
  - Perimeter Security Strategy *alone* may not be sufficient



z/OS Communications Server Intrusion Detection Service (IDS) and NetView



- Intrusion Detection Service (IDS
  - z/OS Communications Server
- Notification
  - NetView for z/OS
    - Type of intrusion
    - IP address intruder
    - IP address of target stack
- Unusual IP Stack statistics
  - OMEGAMON XE for Mainframe Networks



OMEGAMON XE for Mainframe Networks IP Stack Layers Workspace

z/OS Communication Server Top Ten Problems

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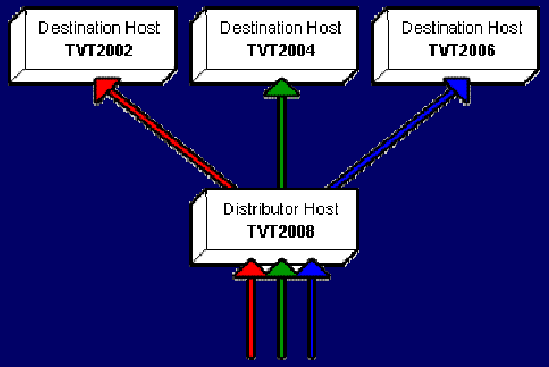
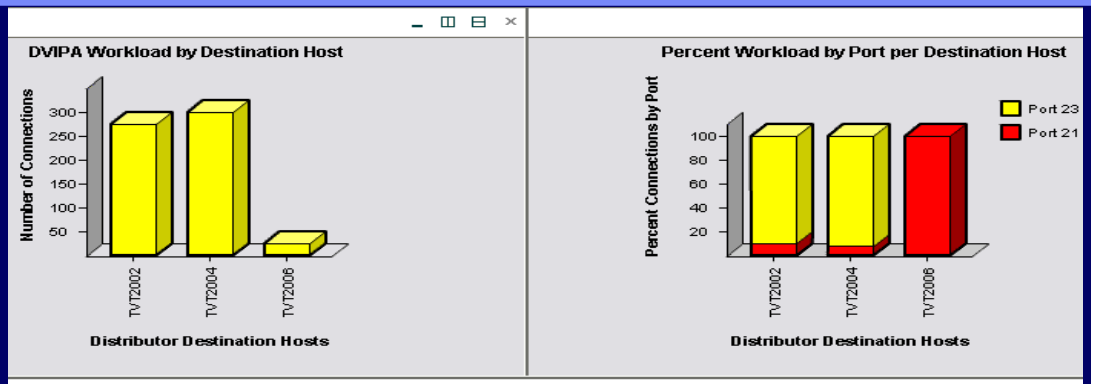
DVIPA Problems



DVIPA workload distribution could cause performance problems.
DVIPA can be monitored with NetView for z/OS

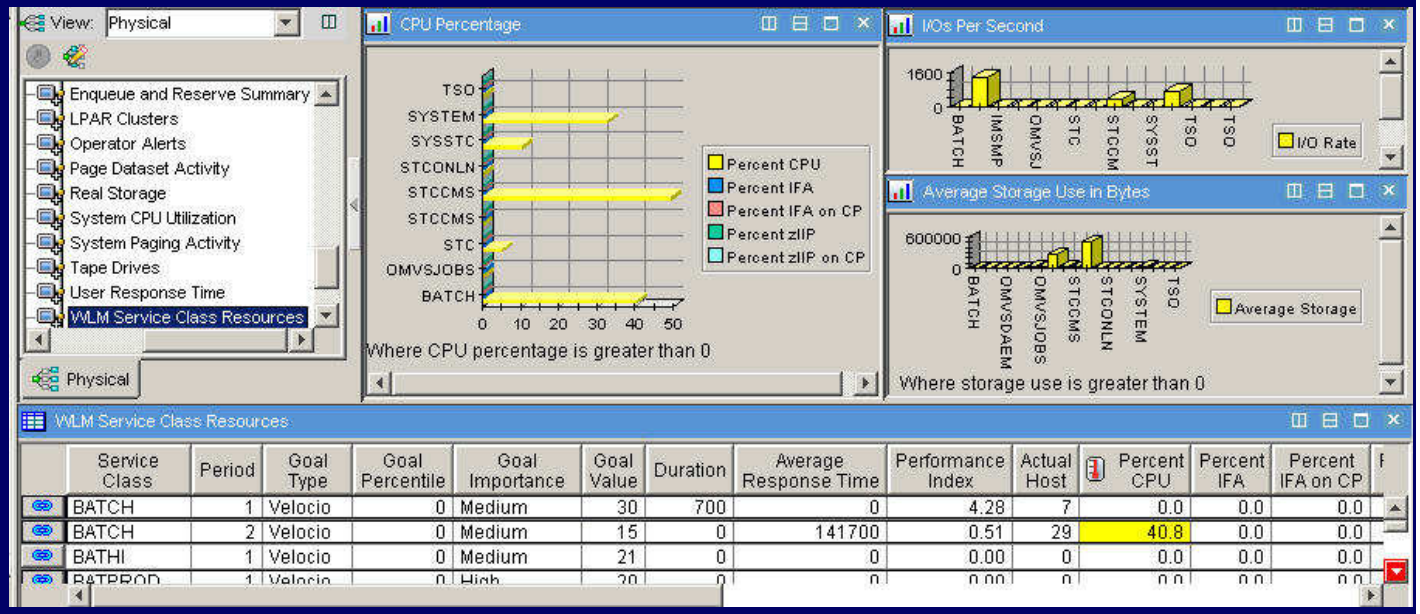


DVIPA_Distributed_Targets

arget XCF IP ddress	Destination Short Host Name	Target Job Name	Number of Servers	Number of Connections	WLM Weight	Server J
93.1.1.12	TVT2002	Telnet	2	43	2	UNKNO
93.1.1.14	TVT2004	Telnet	1	128	1	UNKNO
93.1.1.16	TVT2006	Telnet	2	0	2	UNKNO

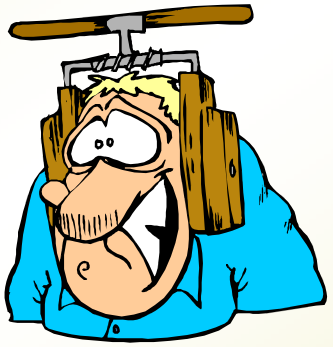
NetView for z/OS DVIPA Distributed Targets Workspace

One of the factors impacting DVIPA is WLM.
Monitor WLM & XCF with OMEGAMON XE on z/OS



OMEGAMON XE on z/OS WLM Service Class Resources Workspace

z/OS Communication Server Top Ten Problems



1. TCP/IP Stacks
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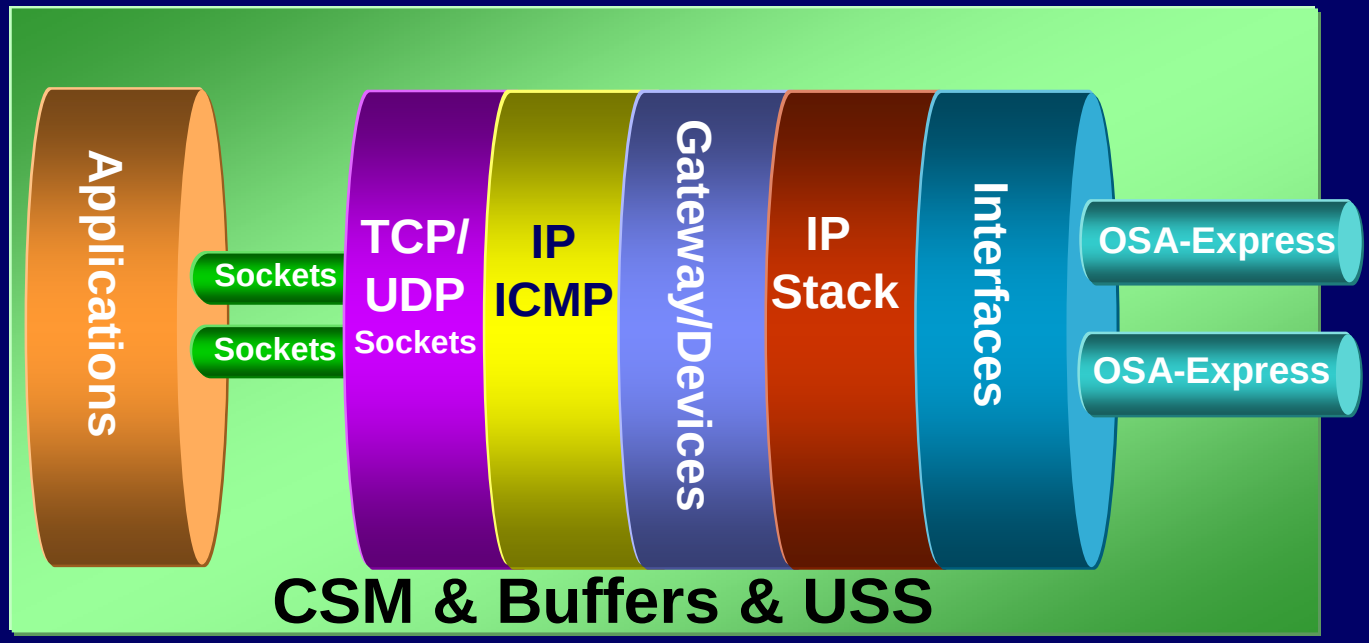
OSA-Express, Interfaces, Devices and Gateways

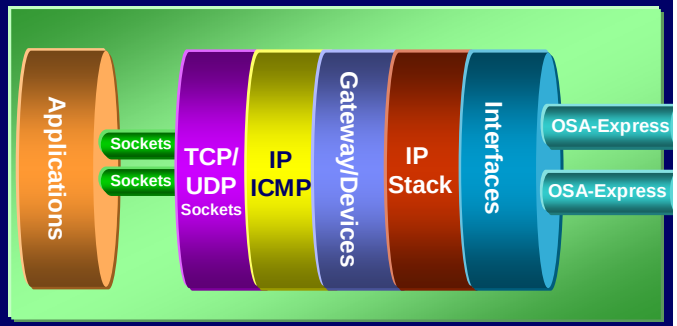


What is the performance of my channels?

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

Interfaces, Devices and Gateways

Interfaces
- Packet Errors
- Bandwidth Utilization
- MTU Size
  - Can cause performance issues
  - Default to 576 except OSA-Express defaults 1492



Interfaces Summary Table

Interface Name	Description	Interface Type	Current State	MTU Size	Transmit Packet Rate	Receive Packet Rate
TCPIPLINK	IP Assist QDIO Ethernet	ethernetCsmacd	Up	1492	4312	74909
LOOPBACK	Loopback	softwareLoopback	Up	65535	890	890
LOOPBACK	Loopback Device	propVirtual	Up	0	890	890
OSA1	Multipath Channel IP Assist Device	propVirtual	Up	0	4312	74909
EZAXCFSA	Multipath Channel Point-to-Point	mpc	Down	55296	0	0
EZAXCF12	Multipath Channel Point-to-Point	mpc	Down	55296	0	0
EZAXCF11	Multipath Channel Point-to-Point	mpc	Down	55296	0	0
EZAXCF13	Multipath Channel Point-to-Point	mpc	Down	55296	0	0

Interface Situations
- %Receive Capacity
- Bandwidth Utilization
- %Transmit Capacity
- %Packets received in Error
- %Packets sent in Error
- %Total packets in Error
- %Packets Discarded

Out of the box Situations for Operator awareness

Gateway
- Attached Router IP Address
- Gateway Link Status

Devices
- Queue size
- Device Status

Gateways

Network Address	First Hop	Link Name	Link Status
127.0.0.1	<direct>	LOOPBACK	READY
9.39.66.0	9.39.64.1	OSA2	READY
9.39.65.0	9.39.64.1	OSA2	READY
9.39.64.0	<direct>	OSA2	READY

Devices

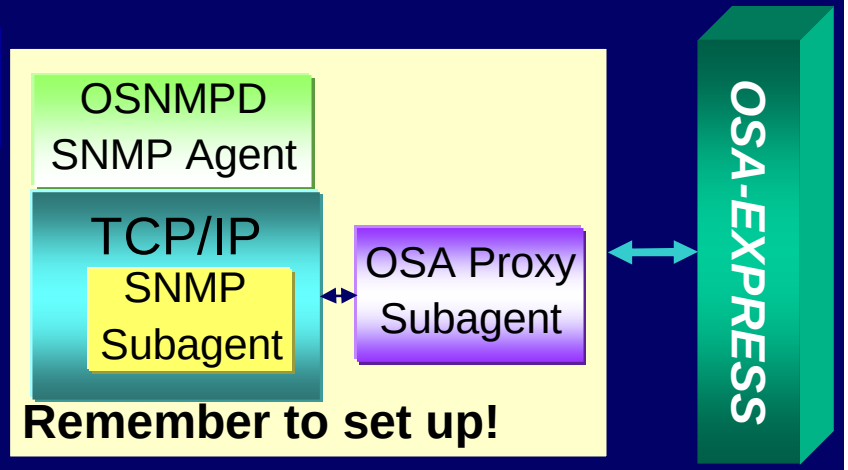
Device Name	Device Type	Device Status	Queue Size	Device Address
IUTSAMEH	MPCPTP	up	0	0000
LOOPBACK	LOOPBACK	up	0	0000
OSAF6D0	LCS	up	0	F6D0
VDEV1	VIPA	up	0	0000

Device Situations
- Device Active
  - Initialization not complete
- Device Inactive
  - If Autostart=YES

Management of OSA-EXPRESS

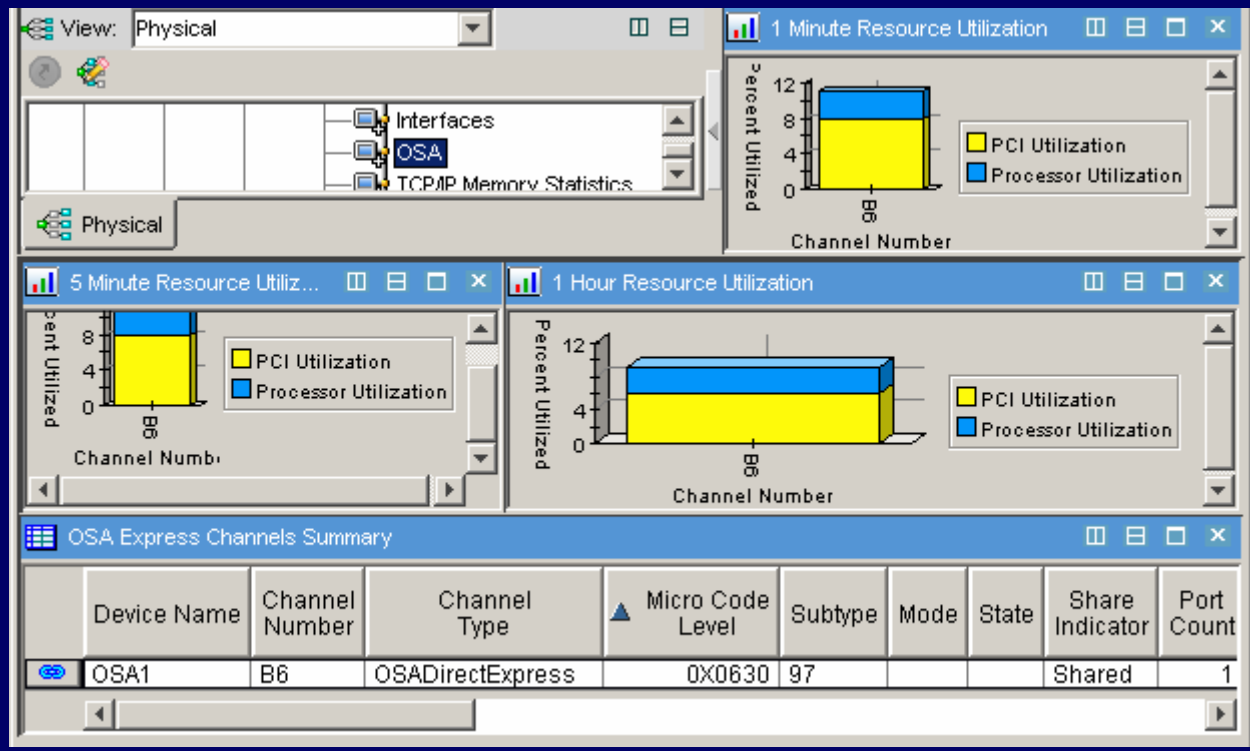
- **Online Status**
- **Configuration**
  - Mac address
  - Channel ID
  - Port Name
  - Adapter capacity
- **Microcode Level**
  - Performance enhancement
- **Utilization**
- **Transmission Rates**
- **Unknown IP Frames**
- **By LPARS**
- **By Ports**

Why is my OSA adapter so slow?



OSA Situations
- PCI Bus Utilization
- Processor Utilization
- Combined Utilization

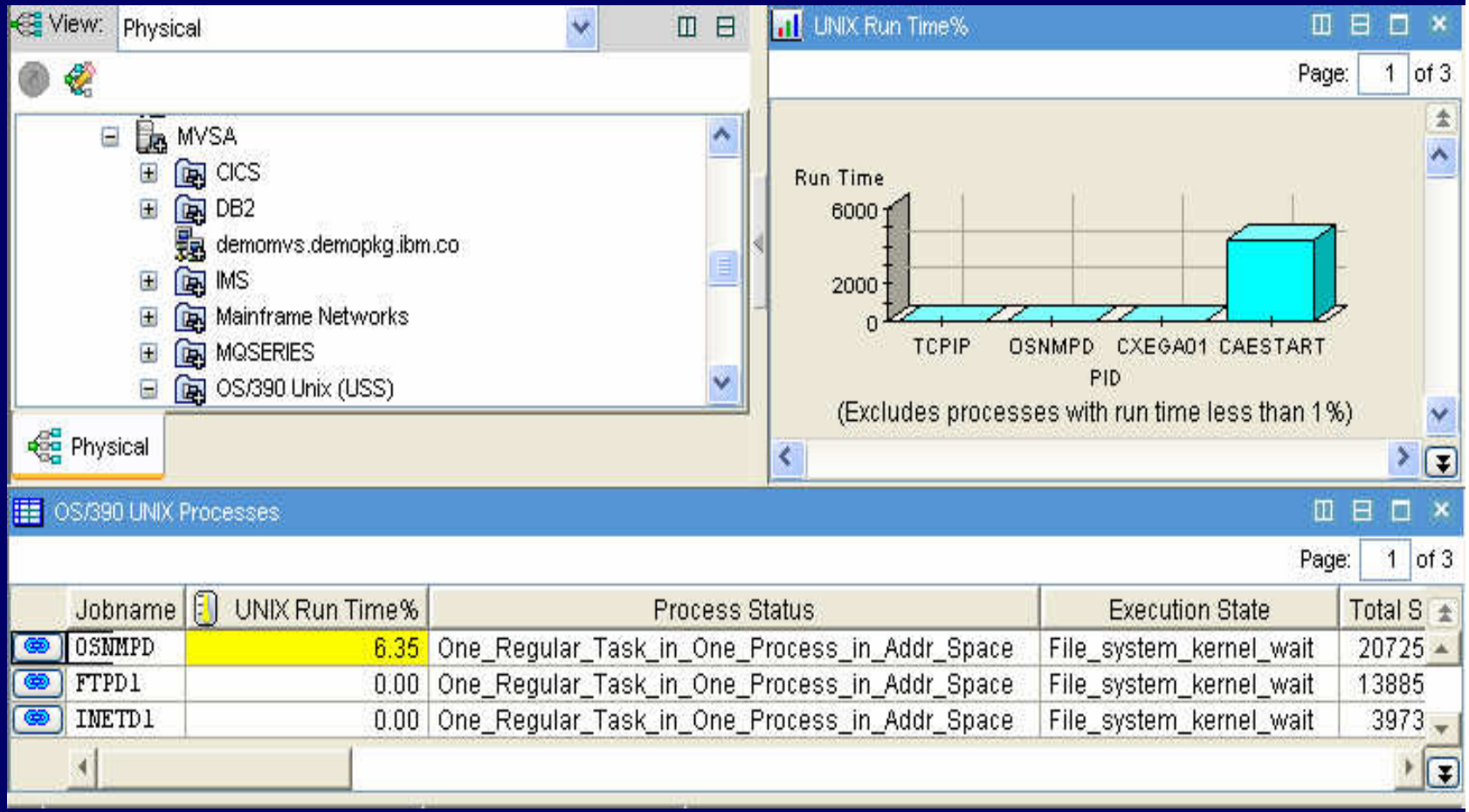
Out of the box Situations for Operator awareness



UNIX System Services (USS)

Is key process down?

- Automatically restart with Reflex automation
- OSNMPD
- FTPD
- Inetd



USS Management now part of OMEGAMON XE on /OS

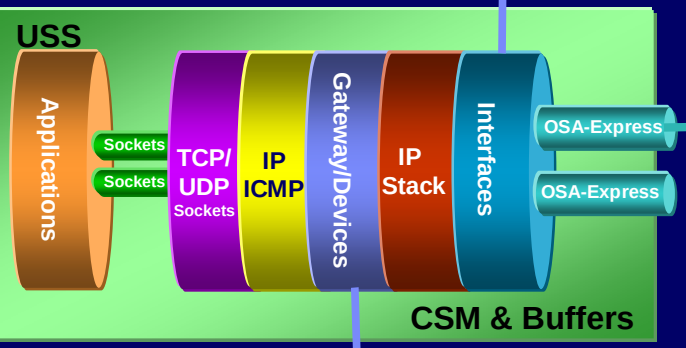
OSA-Express & Interfaces Stack Summary

Interfaces
- Packet Errors
- Bandwidth Utilization
- MTU Size

OMEGAMON MFN
NetView for z/OS

Unix System Services
- OSNMPD, inetd running?
- USS Resources

OMEGAMON z/OS



OSA-Express
- Offline status
- Configuration
- Microcode Level
- Utilization
- Traffic

OMEGAMON MFN

Gateway & Devices
- Packet Size
- IP Address
- Queue size

OMEGAMON MFN

Out of the box Situations for Operator awareness

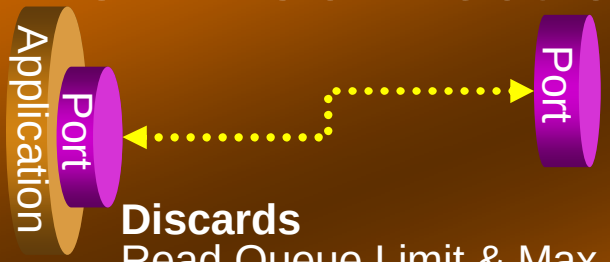
z/OS Communication Server Top Ten Problems

1. TCP/IP Stacks
2. Denial of Service Attack
   - Intrusion Detection
3. DVIPA
4. OSA Express and Channel Interfaces
5. **TCP/IP Connections**
6. Applications
7. FTP
8. TN3270
9. SNA over IP
   - Enterprise Extender and HPR
10. SNA
    - CCL (Communication Controller on Linux)

TCP/IP & UDP Connections

- Routing Problems
- Network Congestion
- High CPU
- Low buffers or Storage
- Erratic response time
- Wrong Socket port

UDP Connections

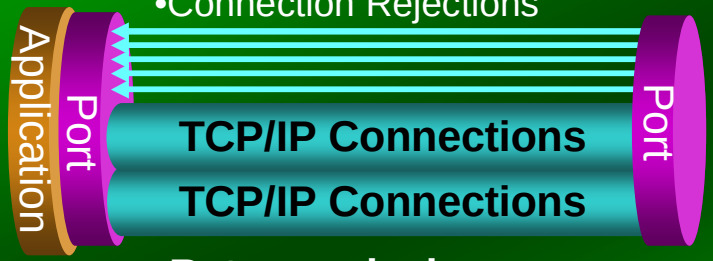


No recovery

Discards
Read Queue Limit & Max

TCP/IP Connections

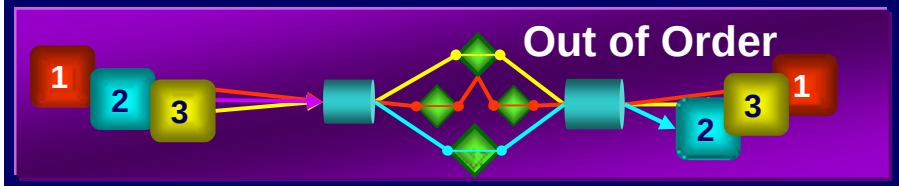
- Connection Backlog & Limit
- Connection Rejections



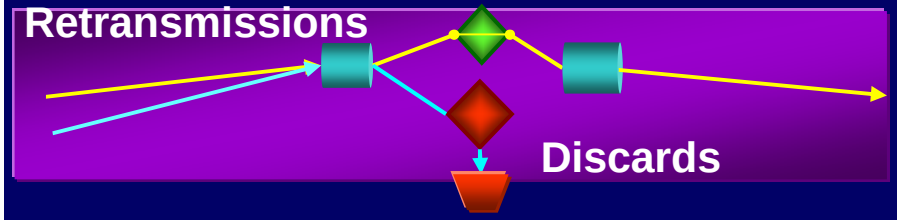
TCP/IP performs recovery

Retransmissions
Out of Order
Response time Variance

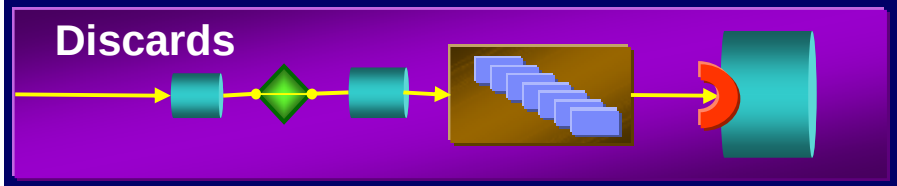
TCP/IP Connection warnings



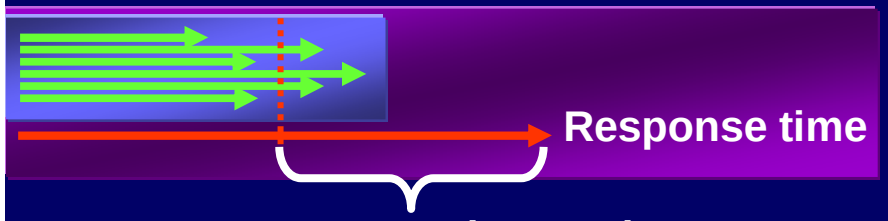
Routing or Congestion Problems



Network Congestion

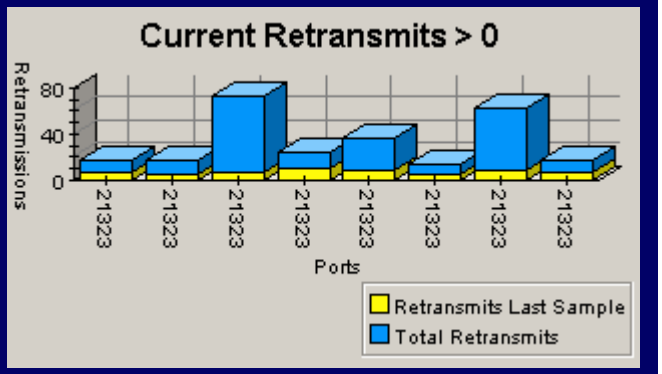


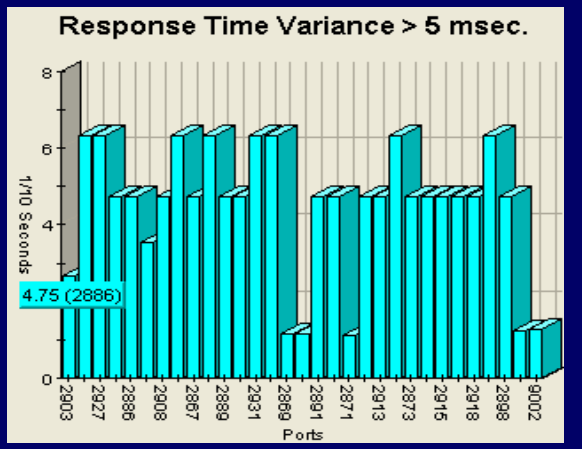
- High CPU
- Low Storage
- Low Buffers



Erratic response time

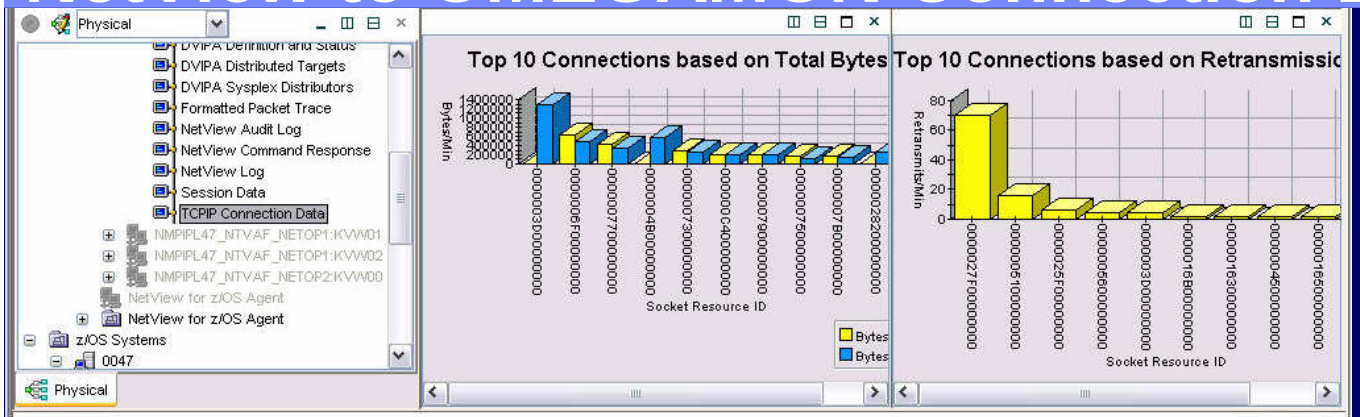
- Influx of connections
- Backlog Limit too low

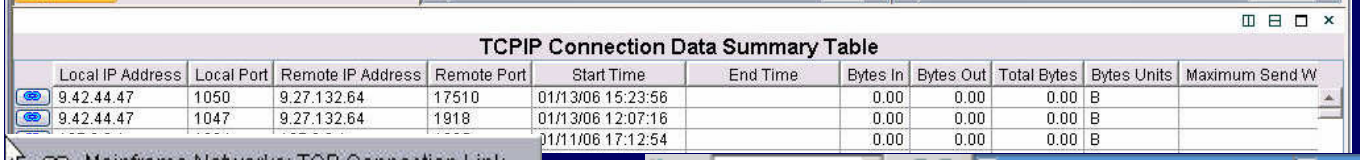




OMEGAMON XE for Mainframe Networks

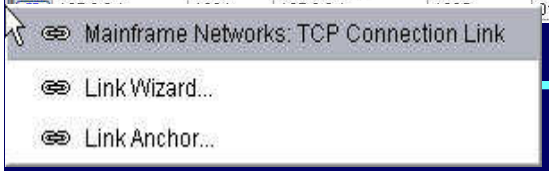
NetView to OMEGAMON Connection Link

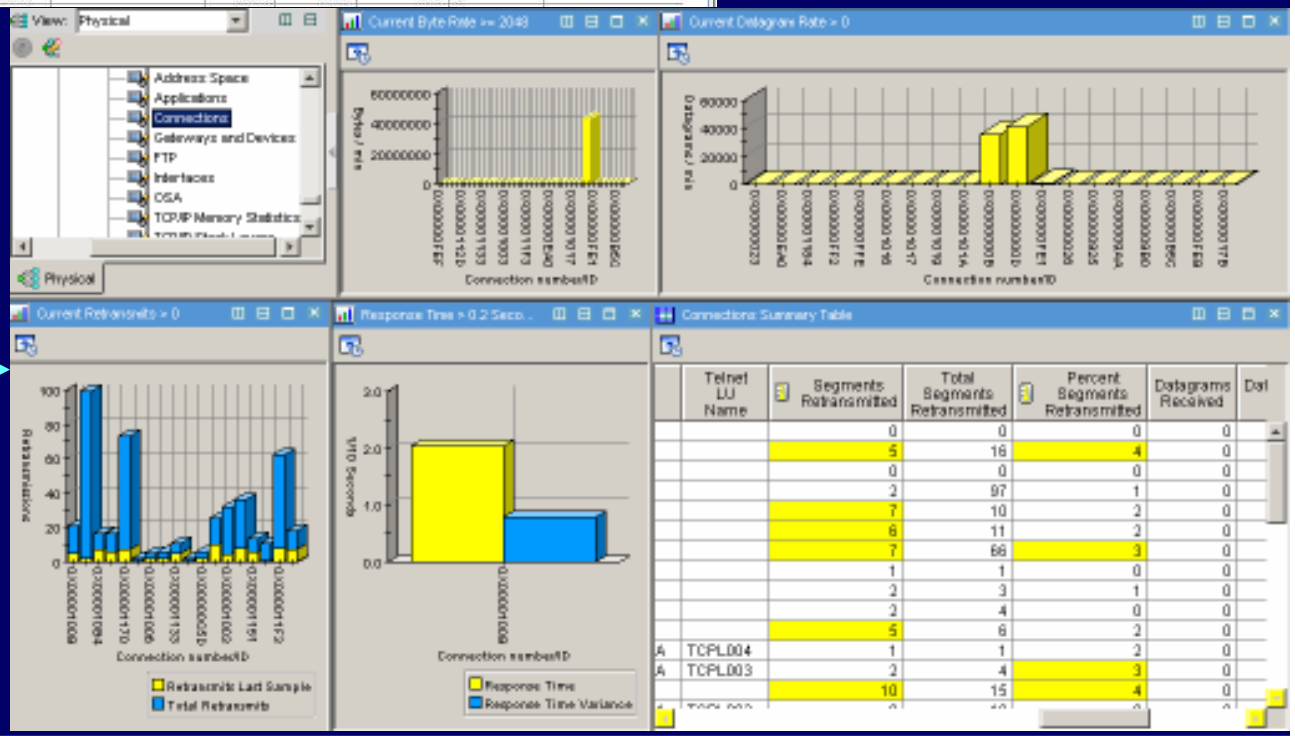




NetView for z/OS Connections Workspace

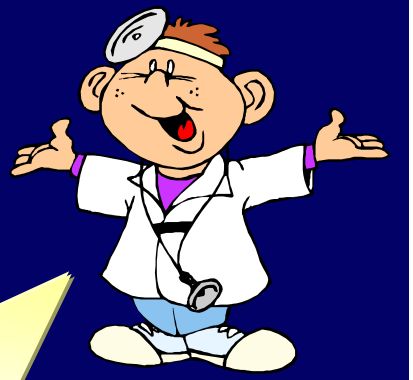
Will also show inactive connections





OMEGAMON XE for Mainframe Networks Connections Workspace

Example of Isolating connection performance problems



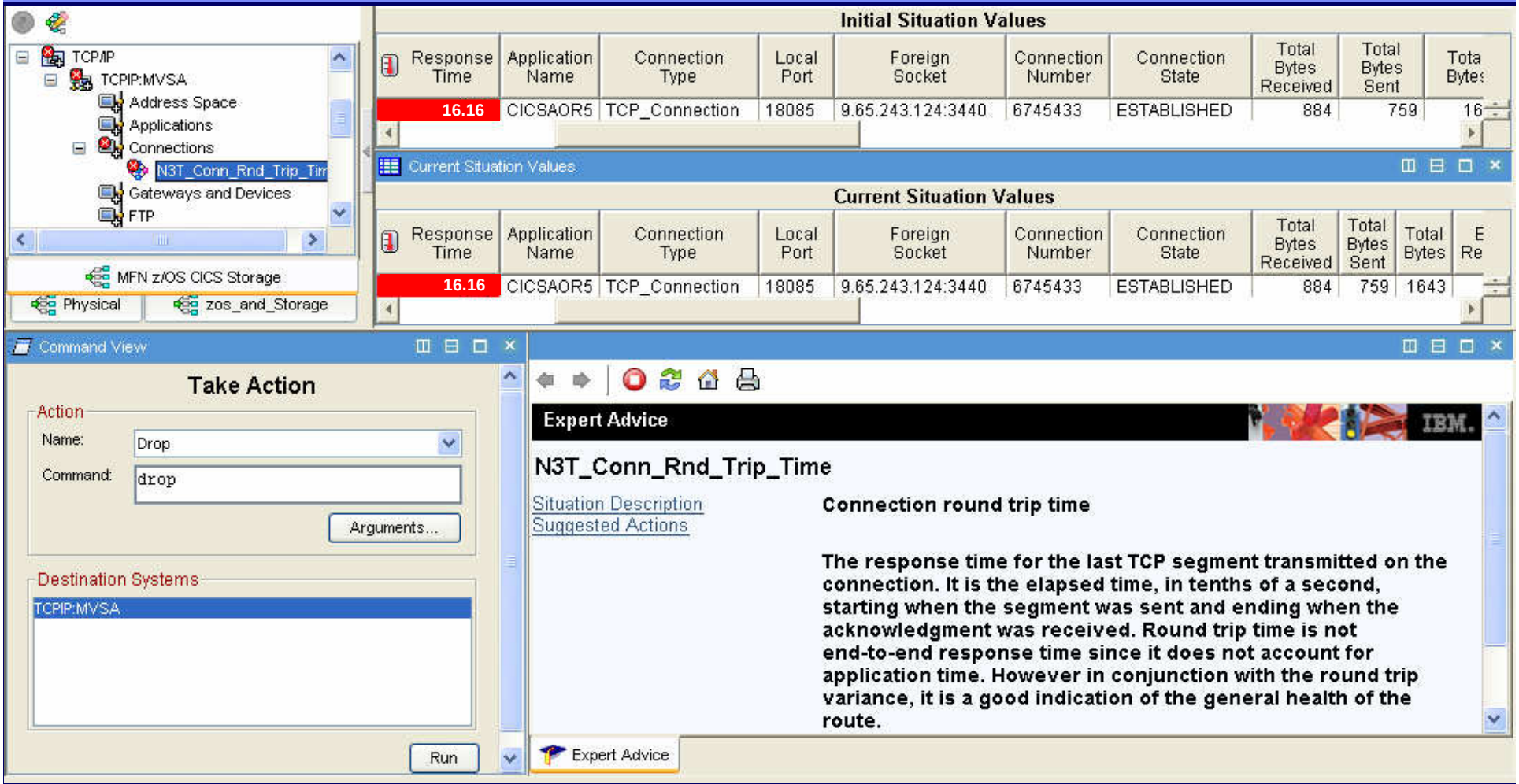
Why is my performance so bad?

Yes, I see Round Trip is High
So is the Round Trip Variance

This is a result of a high number of retransmissions.

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

Proactive with Situation Notification



- **Initial Situation Values:** Captures attributes at time situation triggers
- **Current Situation Values:** Compare current attributes with initial attributes
- **Expert Advice:** Provides best practices on situation
- **Take Action:** Issue commands from TEP
- **Reflex Automation:** Automatically issue commands when situation triggers

TCP/IP & UDP Connections

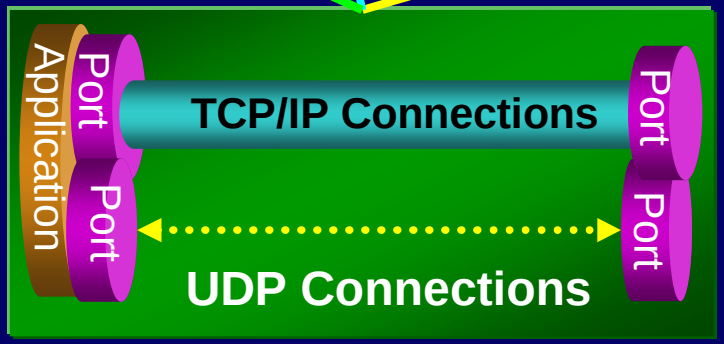
Other Resources
- IP Stacks, USS
- Memory, Buffers CPU
- OSA-Express, Interfaces
- Applications

OMEGAMONs

UDP Connections
- High number of Discards
- Queued and Queue Limit
- Traffic rates

OMEGAMON MFN

TCP/IP Connections
- Response Times
- Retransmissions
- Out of Order
- Response times
- Connection Backlogs
- Connection rejections
- Discards
- Wrong port
- **OMEGAMON MFN**
- **NetView for z/OS**



TCP/IP Connection Situations
- Connections being rejected
- Connection byte rate
- Connections in backlog queue
- Retransmissions
- Datagram Rate
- % Datagrams discarded
- % Segments out of order
- % Segments retransmitted
- Round Trip Time
- Round Trip Variance
- Connection Count

z/OS Communication Server Top Ten Problems

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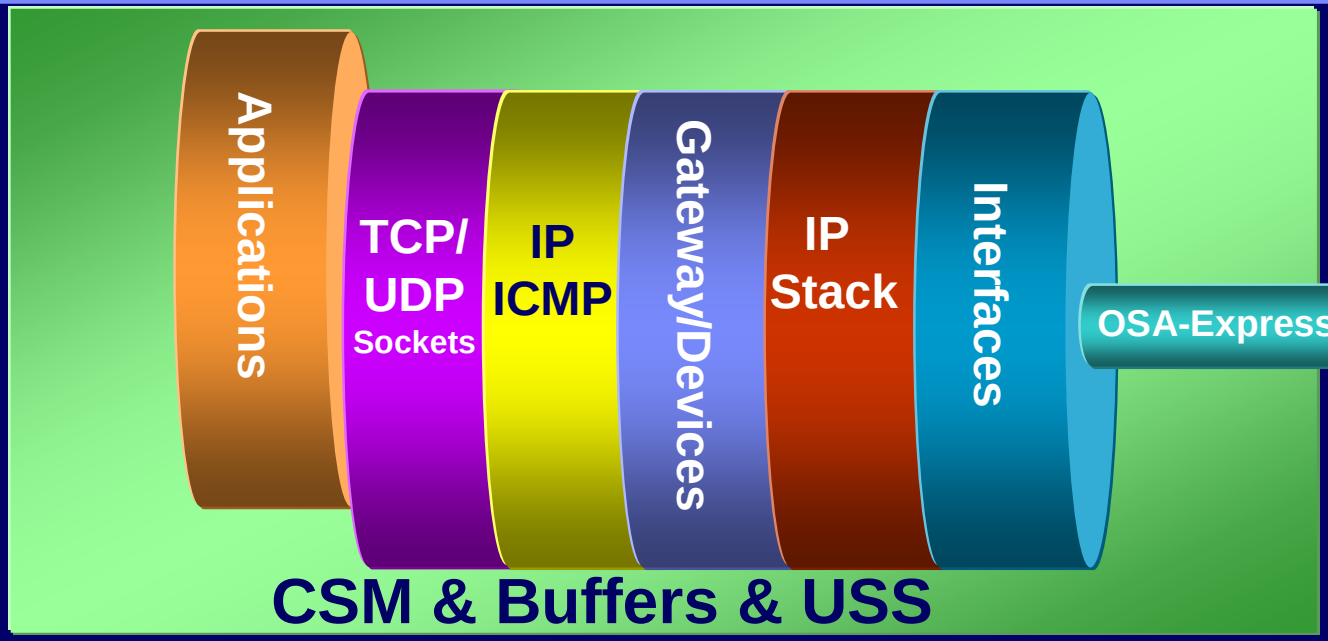
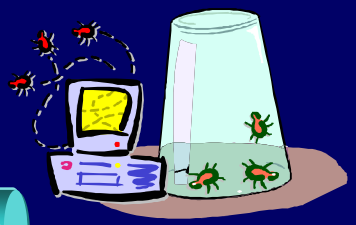
    - CCL (Communication Controller on Linux)

Applications

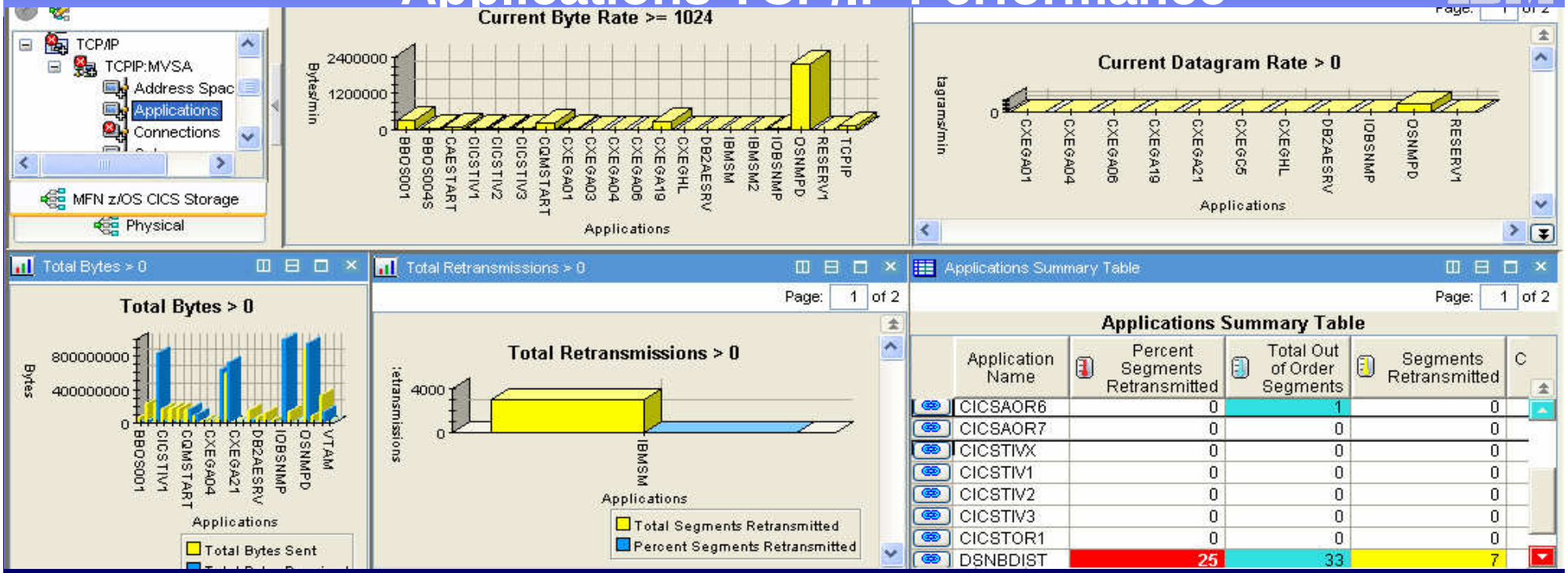




What is wrong with my applications?

- Connections
  - State, Rate, Backlog, Rejections
- Last activity time
- Response Times
- Retransmissions
- Transmit / Receive Rates
- Out of order segments
- CICS, IMS, WAS, z/OS

Applications TCP/IP Performance

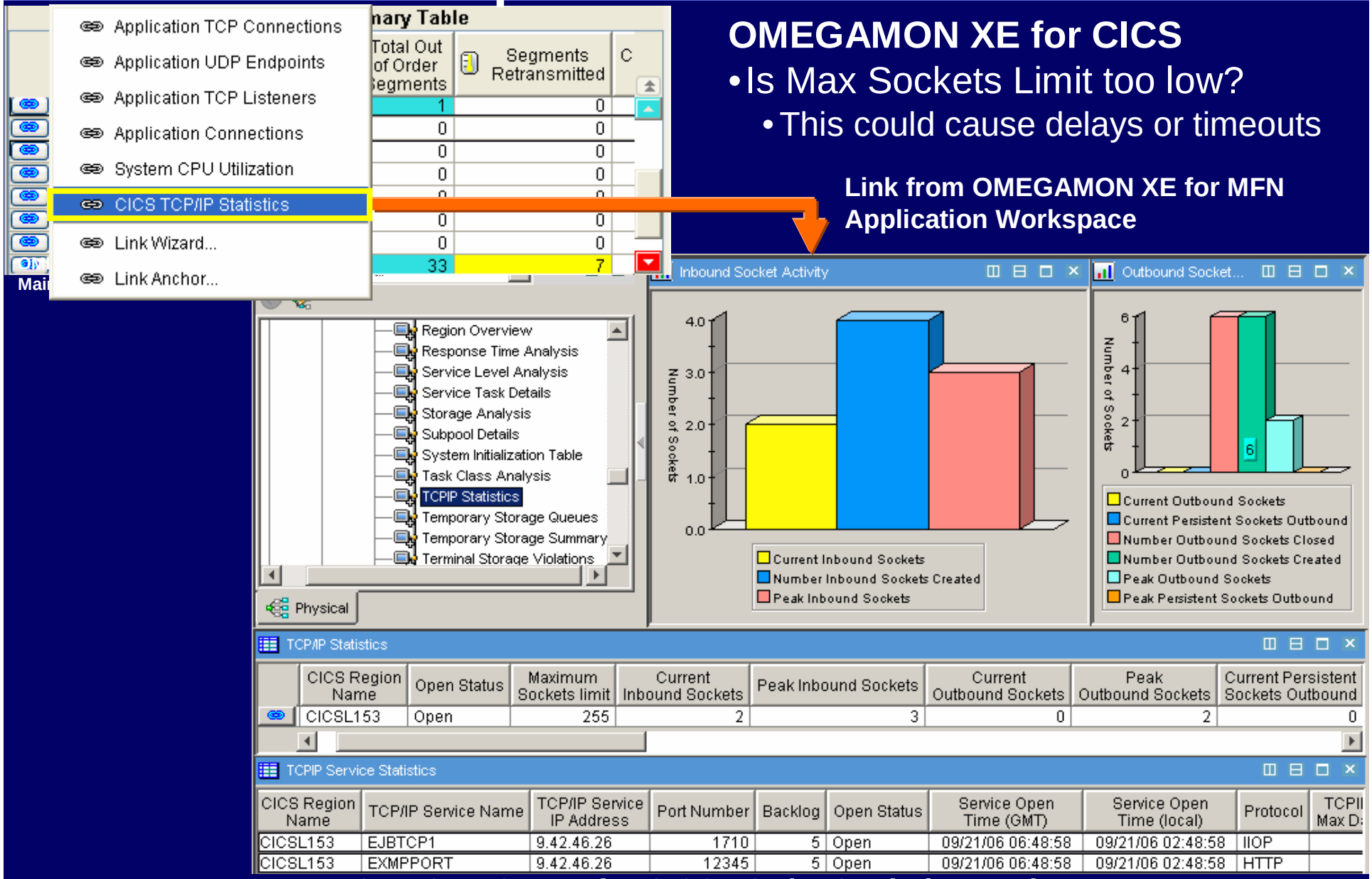


Out of the box Situations for Operator awareness

TCP/IP Application Situations

- Connections being rejected because backlog limit reached
- Connections in backlog queue
- Application throughput rate
- Datagram rate & FTP byte rate
- Applications not accepting connections
- % Datagrams discarded to application
- % Segments out of order for application
- % Segments retransmitted for application
- Retransmissions to application

Could it be a CICS problem?



OMEGAMON XE for CICS

- Is Max Sockets Limit too low?
  - This could cause delays or timeouts

Link from OMEGAMON XE for MFN Application Workspace

CICS Region Name	Open Status	Maximum Sockets limit	Current Inbound Sockets	Peak Inbound Sockets	Current Outbound Sockets	Peak Outbound Sockets	Current Persistent Sockets Outbound
CICSL153	Open	255	2	3	0	2	0

CICS Region Name	TCP/IP Service Name	TCP/IP Service IP Address	Port Number	Backlog	Open Status	Service Open Time (GMT)	Service Open Time (local)	Protocol	TCPII Max D:
CICSL153	EJBTCP1	9.42.46.26	1710	5	Open	09/21/06 06:48:58	09/21/06 02:48:58	IIOP	
CICSL153	EXMPPORT	9.42.46.26	12345	5	Open	09/21/06 06:48:58	09/21/06 02:48:58	HTTP	

OMEGAMON XE for CICS TCP/IP Statistics workspace

Could it be a z/OS Utilization Problem?

Applications Summary Table

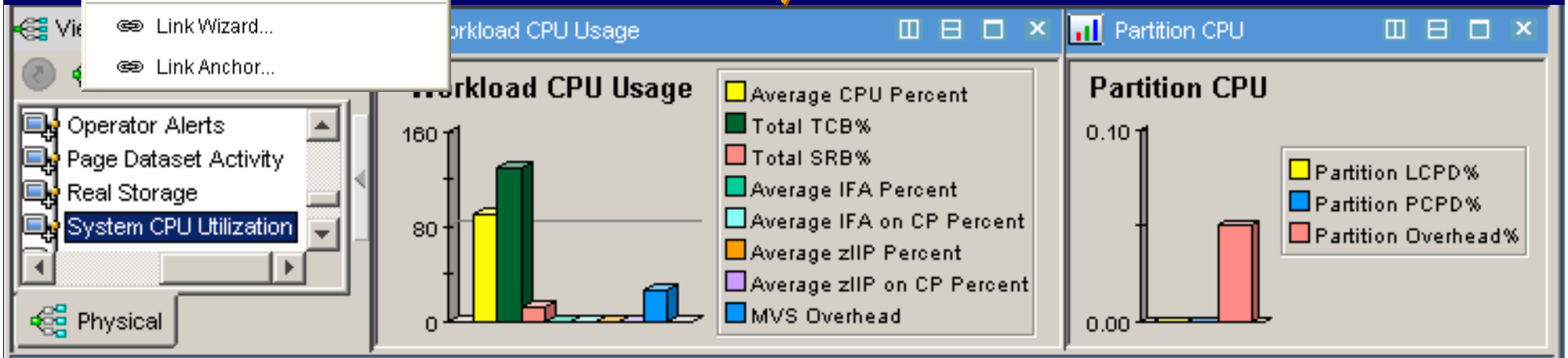
Application Name	Percent Segments Retransmitted	Total Out of Order Segments	Segments Retransmitted	C
CICSAOR6	0	1	0	
CICSAOR7	0	0	0	
CICSTIVX	0	0	0	
C		0	0	
C		0	0	
C		0	0	
C		0	0	
D		33	7	

- Application TCP Connections
- Application UDP Endpoints
- Application TCP Listeners
- Application Connections
- System CPU Utilization
- CICS TCP/IP Statistics
- Link Wizard...
- Link Anchor...

OMEGAMON XE for z/OS

- What is CPU Utilization?
- Are there storage problems?

Link from OMEGAMON XE for Mainframe Networks Application workspace



System CPU Utilization

Average CPU Percent	RMF MVS CPU Percent	RMF LPAR CPU Percent	Total TCB%	Total SRB%	WLM Mode	Average IFA Percent	Average IFA on CP Percent	Average zIIP Percent	Average zIIP on CP Percent	MVS Overhead
91	87.1	79.7	129	12	Goal	0	0	0	0	27

OMEGAMON XE on z/OS System CPU Utilization workspace

TCP/IP Applications Summary

CICS Management
- Maximum Sockets
- Bottleneck Analysis
- Connection Analysis
- Region Status

OMEGAMON XE CICS

z/OS and USS Management
- CPU Utilization
- Storage
- USS Processes

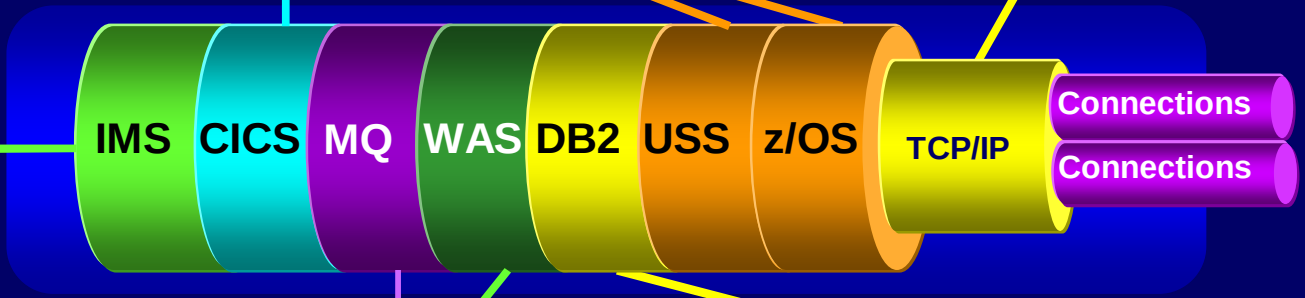
OMEGAMON XE on z/OS

TCP/IP Connections
- Response Times
- % Retransmitted
- Discards

- **OMEGAMON MFN**
- **NetView for z/OS**

IMS Management
- OTMA
- Queues
- IMS Connect

OMEGAMON XE for IMS



WebSphere MQ Management
- Channels
- Queues
- Response Time

OMEGAMON XE for Messaging on z/OS

WebSphere Management
- Resource Utilization
- Request Analysis
- JDBC Contention

ITCAM for WAS

DB2 Management
- Locking Conflicts
- Thread Analysis
- DB2 Connect

OMEGAMON XE for DB2 PE/PM

z/OS Communication Server Top Ten Problems

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4. OSA Express and Channel Interfaces
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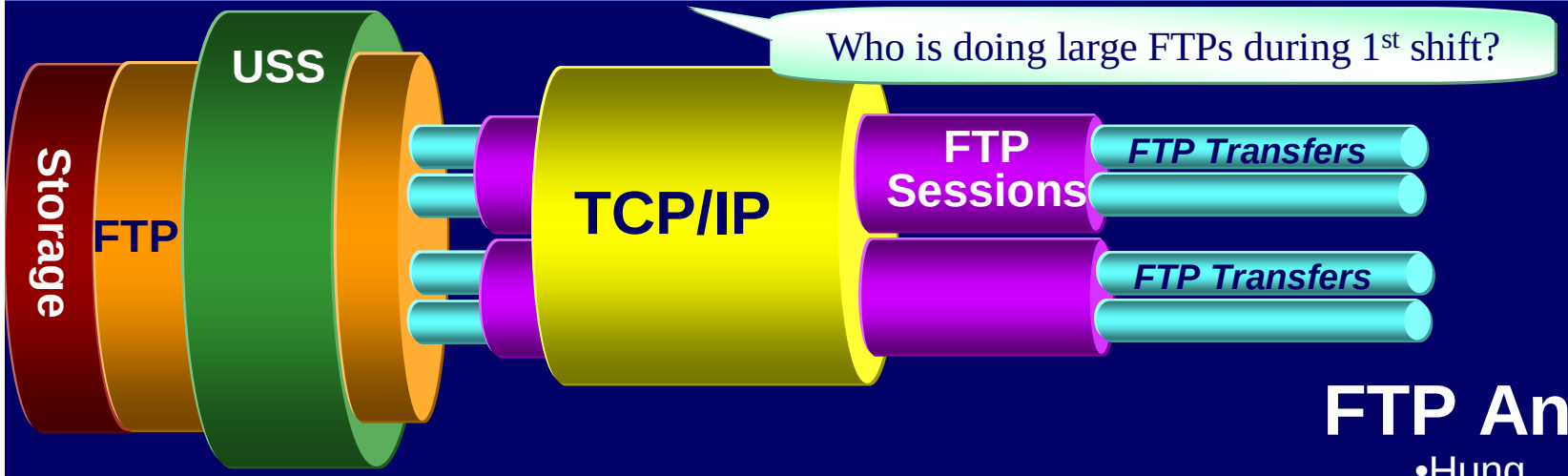
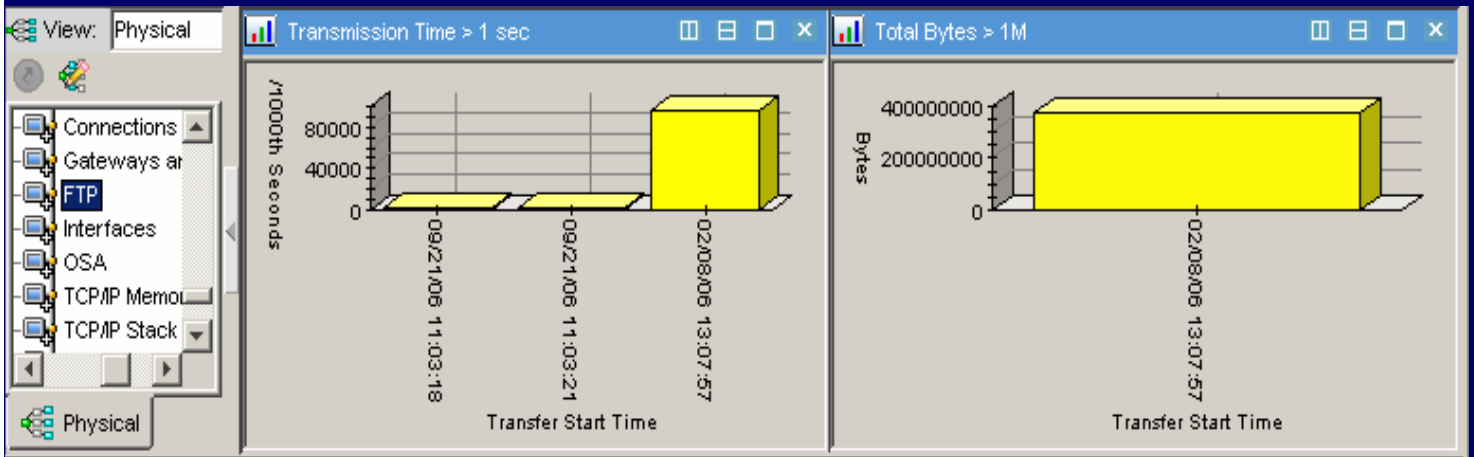
    - CCL (Communication Controller on Linux)

FTP Problems



FTP Analysis

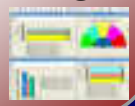
- Hung
- Too Large
- Login Failure reasons
- Failures codes
- Last command
- Datasets names



FTP Summary

Storage & Datasets
- Storage Device problems

OMEGAMON XE Storage



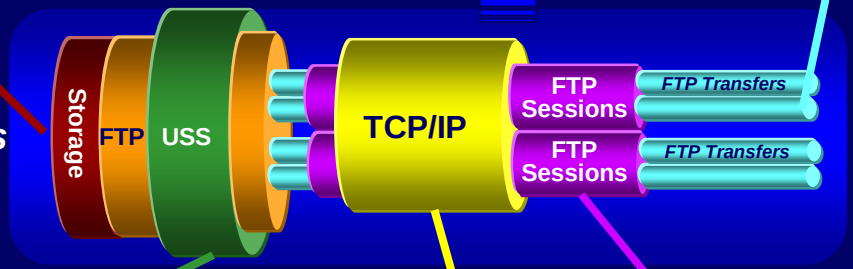
Other Resources
- IP Stacks, USS
- Memory, Buffers
- OSA-Express
- Interfaces

OMEGAMONs

FTP Transfers
- Last Command
- Last Reply
- Duration, Hangs
- Too Large
- Dataset

OMEGAMON MFN

Out of the box Situations for Operator awareness



FTP Situations
- Invalid Sequences
- Network Errors
- Server Errors
- System Resource Error
- File system error
- FTP byte rate

Unix System Services
- Is FTPD running?
- USS Resources

OMEGAMON z/OS

TCP/IP Connections
- Response Times
- % Retransmitted
- Discards

- **OMEGAMON MFN**
- **NetView for z/OS**

FTP Sessions
- Logon Failures
- Session end reasons

OMEGAMON MFN

z/OS Communication Server Top Ten Problems

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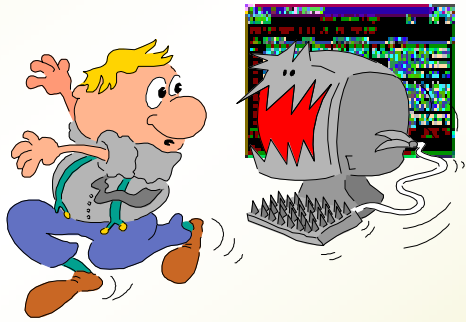
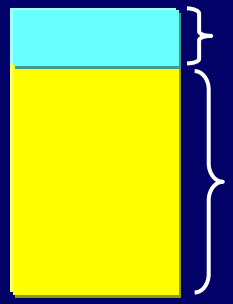


TN3270 Problem Analysis



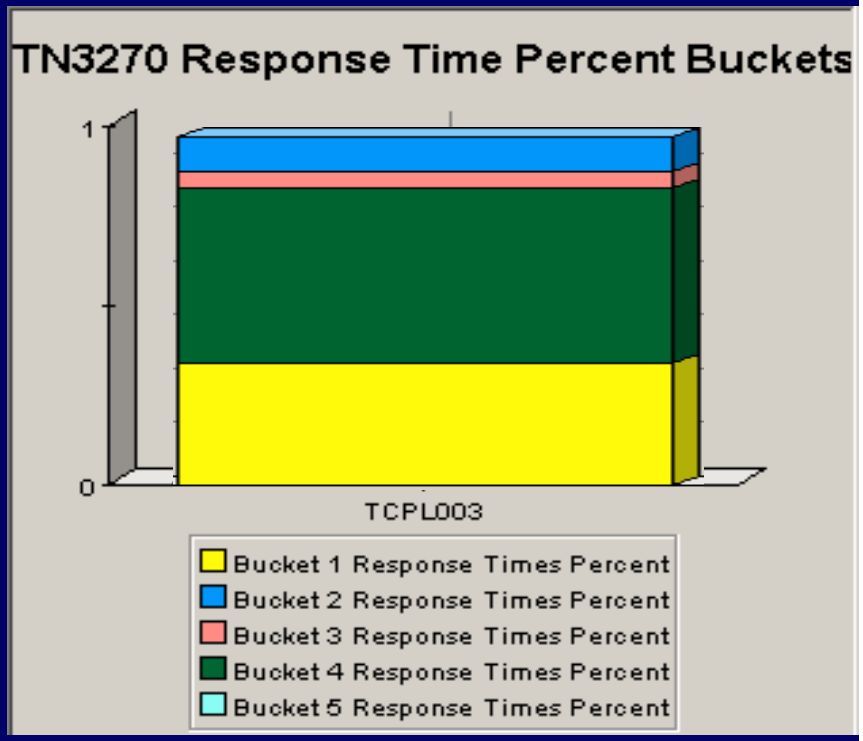
High average SNA response time Investigate:
- High application workload spike
- or z/OS system resource constraints.

Average Total Response Time	Average IP Response Time	Average SNA Response Time	Average Transaction Count	Response Time Collection Time
129	96	33	6	04/08/06 14:37:28

Sliding Window

LOGMODE
- Can cause logon failures
- Wrong screen sizes

Response times
- Average by IP & SNA time
- Standard Variation by IP & SNA time
- Sliding Window (Buckets)



NetView NLDM Trace (Session Monitor)

```
NLDM.PIUT SESSION TRACE DATA PAGE 1
----------- PRIMARY --------------+---------- SECONDARY --------------+- DOM -
NAME ECHOA99 SA 00000063 EL 009D  | NAME ECHOA09 SA 00000009 EL 00E1  | CNM99
----------------------------------+-----------------------------------+-------
SEL#  TIME    SEQ# DIR TYPE   ******** REQ/RESP HEADER ******** RULEN SENS N
( 1) 09:30:47 00B6 P-S DATA   ....OC.DR.......BBEB.............    66      T
( 2) 09:30:47 00B6 S-P (+)RSP ....OC.DR.........................     0
( 3) 09:30:47 00B6 S-P DATA   ....OC.DR.......BBEB.............    66      T
( 4) 09:30:47 00B6 P-S (+)RSP ....OC.DR.........................     0
( 5) 09:30:47 00B7 P-S DATA   ....OC.DR.......BBEB.............    66      T
( 6) 09:30:47 00B7 S-P (+)RSP ....OC.DR.........................     0
( 7) 09:30:47 00B7 S-P DATA   ....OC.DR.......BBEB.............    66      T

END OF DATA ENTER SEL# OR COMMAND CMD==>
```

Since TN3270 appears as a SNA resource to VTAM NetView SNA tools Like NLDM Trace will work.

TN3270 Summary

Application Performance
- CPU, Storage
- Response times

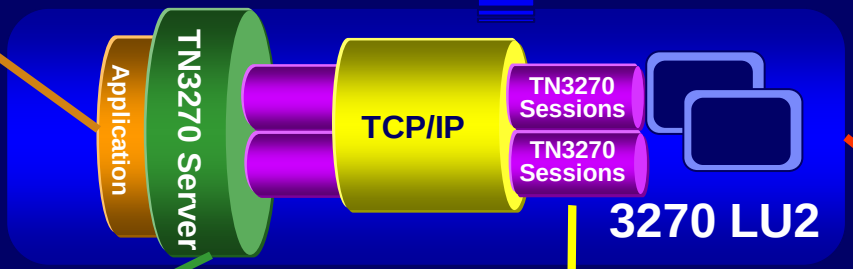
OMEGAMON CICS, IMS, WAS, DB2, Messaging, z/OS

Other Resources
- IP Stacks, USS
- Daemons running?
- Memory, Buffers
- OSA-Express
- Interfaces

OMEGAMONs

TN3270 Situations
- Avg SNA Response Time
- Avg Response Time
- Bucket-5 Response time

Out of the box Situations for Operator awareness

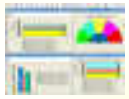


TN3270 Server

- SNA & IP Response times
- Logmode: Logon failure

OMEGAMON MFN

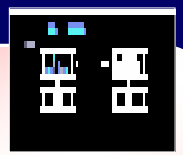
TCP/IP Connections



- Response Times
- % Retransmitted
- Discards

- **OMEGAMON MFN**
- **NetView for z/OS**

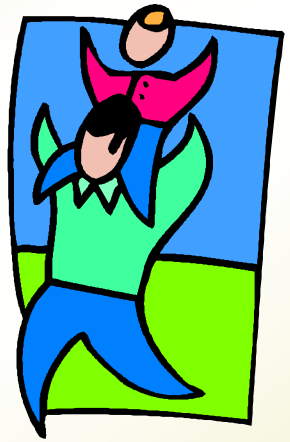
SNA Sessions



- NLDM
- Session Awareness
- Traces

NetView for z/OS

z/OS Communication Server Top Ten Problems



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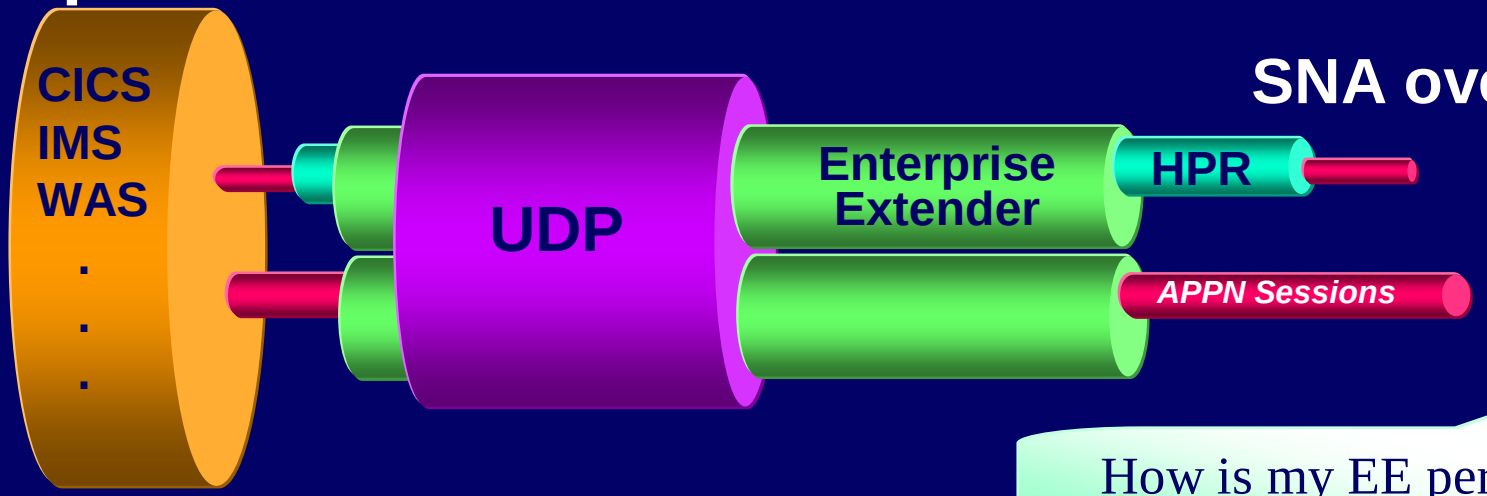
Enterprise Extender and HPR

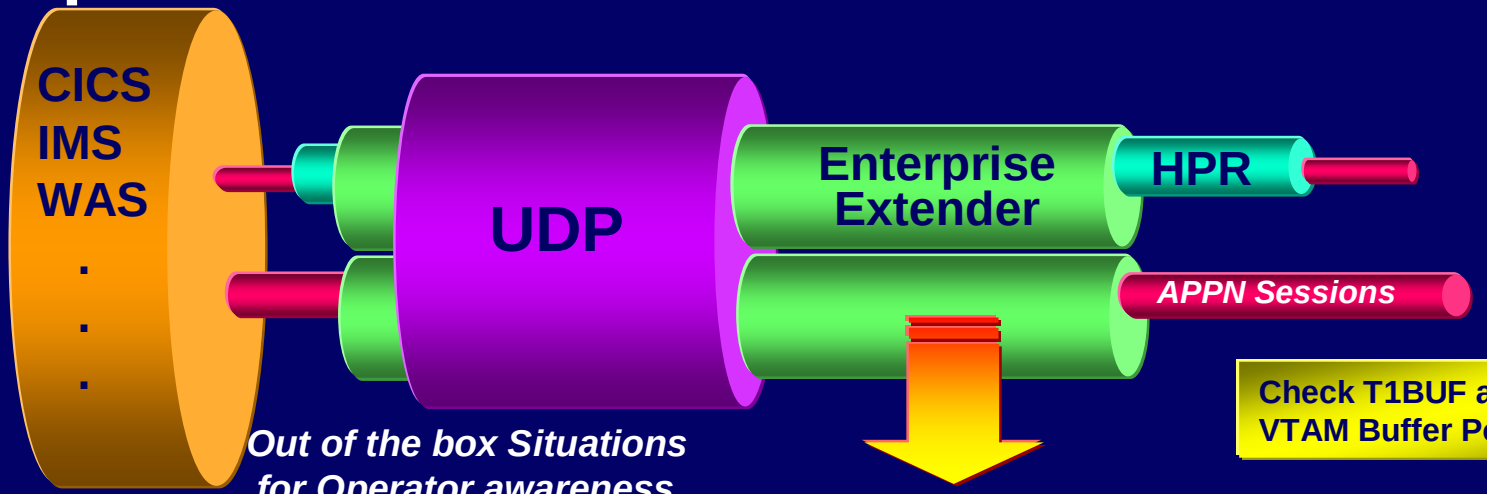


- EE flows over UDP
- EE performs retransmissions since UDP will not
- HPR can flow over EE
- HPR endpoints are responsible for error recovery and Flow Control
- MTU being too small can cause fragmentation or retransmissions

Network Priority Mappings

UDP Ports	SNA		Path Switch Timeout
12000	LL2 (LIVTIME 10 Seconds)		
12001	Network		1 Minute
12002	High	*TP(2)*	2 Minutes
12003	Medium	*TP(1)*	3 Minutes
12004	Low	*TP(0)*	8 Minutes
Type of Service (TOS)	**Class of Service (COS) (LOGMODE)**		

Enterprise Extender

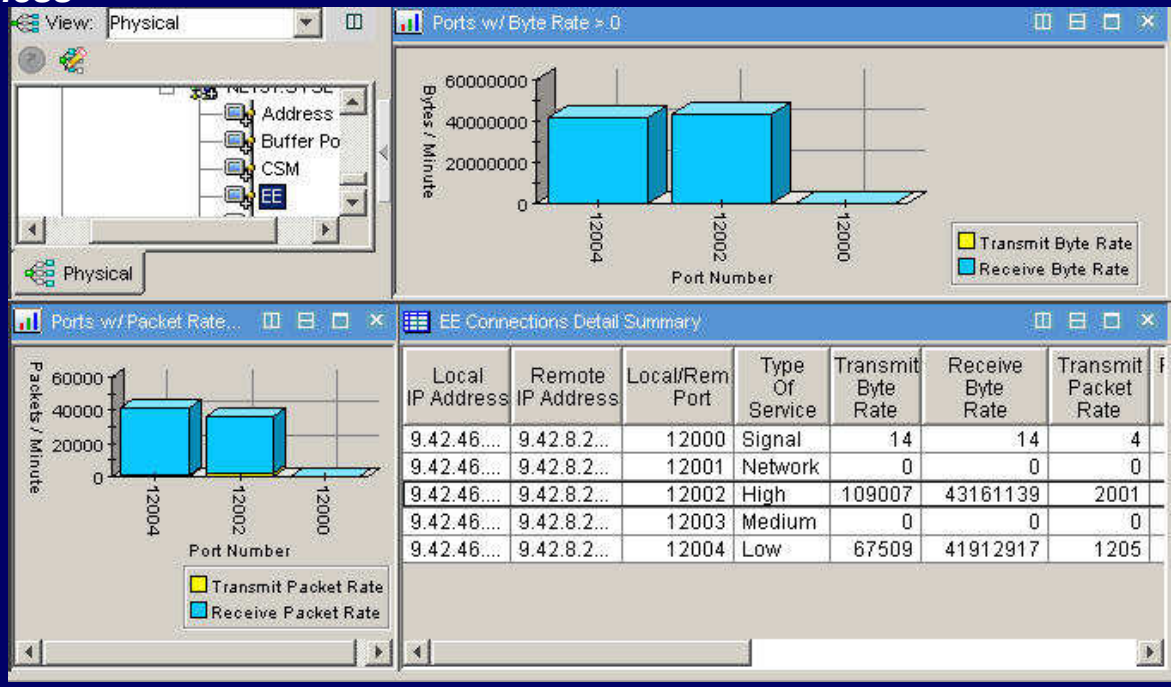


EE Situations
- % Retransmissions

- **High Throughput Rates**
- **High Retransmission Rates**
- **Wrong Type of Service (TOS)**
  - Too much at high priority

UDP Port to SNA Mapping

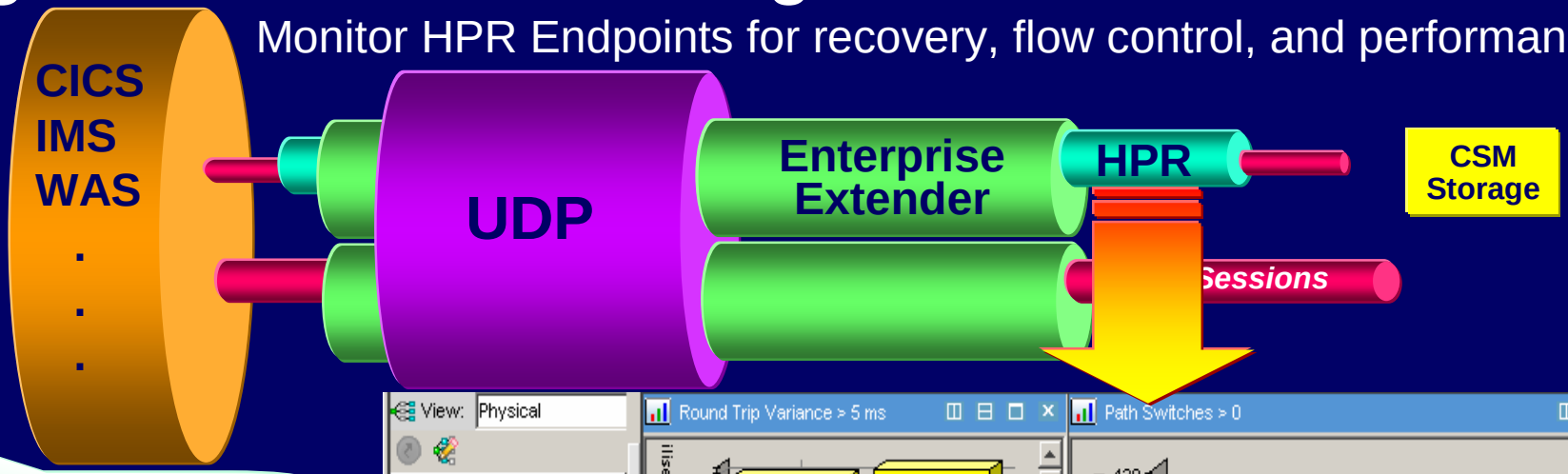
12000	LL2
12001	Network
12002	High
12003	Medium
12004	Low



OMEGAMON MFN EE Connection Details Workspace

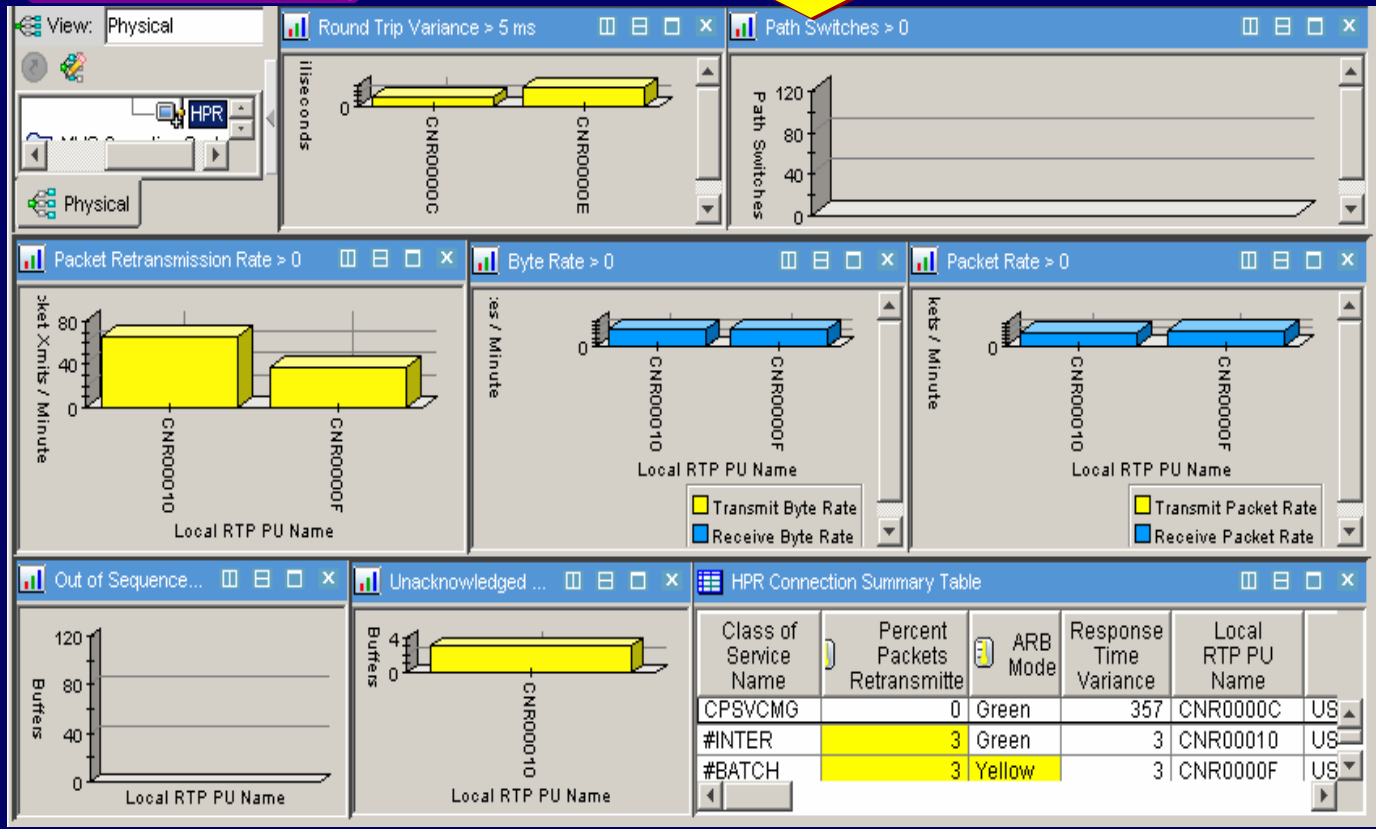
High Performance Routing

Monitor HPR Endpoints for recovery, flow control, and performance



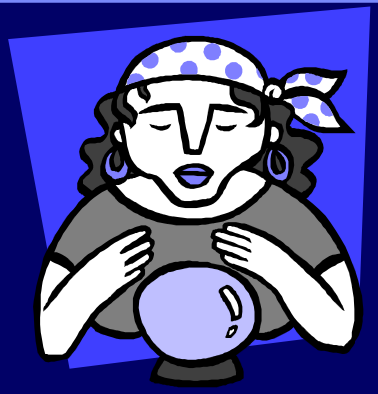
Is my HPR so Slow?

- Retransmissions
- Path Switches
- ABR Mode
  - Adaptive Rate Based Flow control
    - Red
    - Yellow
    - Green
- Out of Sequence
- Response Time Variance
- Class of Service
- Throughput
- Watch for CSM increase
  - Backup of un-ack buffers
- Look at UDP workspace
  - Ports 12000-12004



OMEGAMON XE for MFN HPR Connections Workspace

HPR Situation Expert Advice Example



Out of the box Situations for Operator awareness

HPR Situations Out of the Box
- HPR Throughput
- Path Switches
- Out of Sequence

N3V_HPR_Conn_Path_Switch

HPR RTP connection with path switch due to error

Situation Description

A number of path switches have one or more of the following path switch triggers:

- TGINOP: The link of the first (or only) hop of the HPR RTP pipe is not functioning and triggers a path switch.
- SRT (Short Request Timer) Retries: The end point has repeatedly not responded within the specified time interval to timing-sensitive packets sent to it. Therefore, the existing path is assumed to be unusable and triggers a path switch.
- No NCB (Network Control Block): The DLC associated with the HPR RTP connection can no longer be accessed. The first hop of the RTP pipe is therefore no longer usable and triggers a path switch.
- Modify RTP Command
- Auto Path Switch
- Partner Initiated

Note: By default, this situation only tests for No NCB.

This situation is probably triggered by losing connectivity to the remote endpoint or constrained CPU in the remote z/OS Communications server address space.

To determine this, the following metrics in the HPR connections table are used:

- Path switches
- Path switch trigger

This situation occurs when the path switches value is greater than zero for 3 consecutive intervals and the path switch trigger value is one of the following in the third interval:

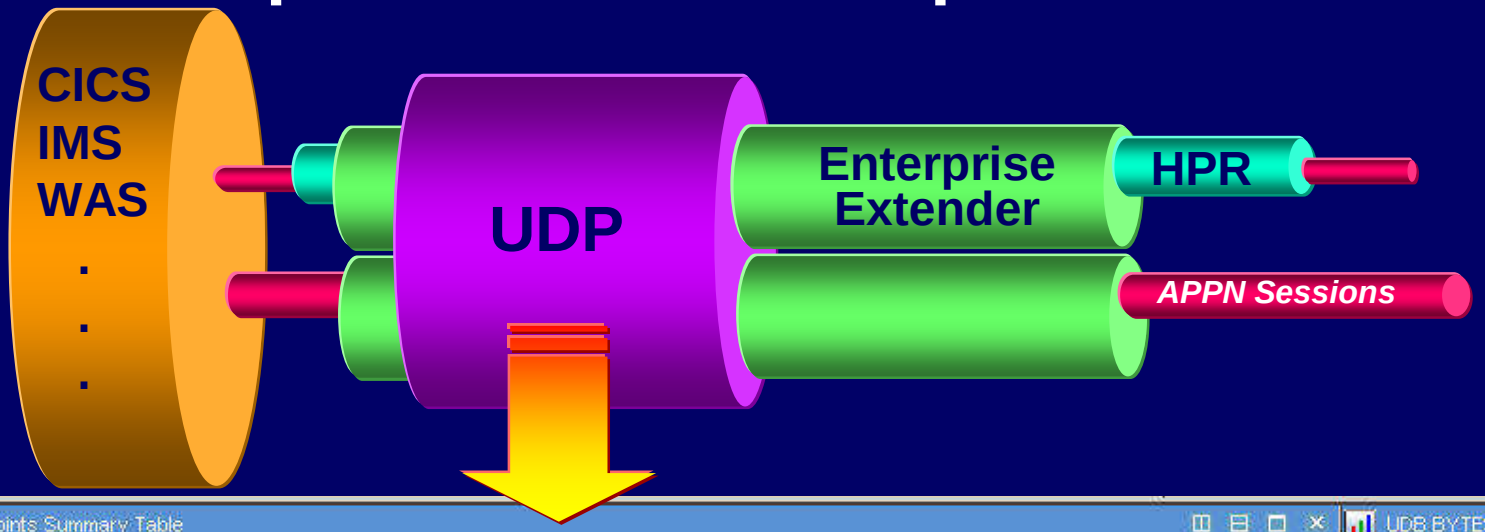
- TGINOP
- SRT retries
- No NCB

Suggested Actions

This is probably because of lost connectivity to the remote endpoint or constrained CPU in remote VTAM address space. To resolve this problem, use the following procedures:

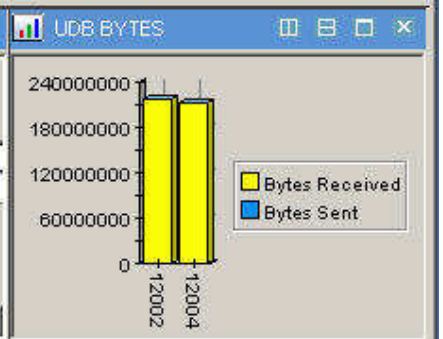
- Issue a trace route command to determine the most probable routing path.
- Determine if this path is using a secondary or backup routing path. If it is, identify and fix the problem with the primary path.
- Query the routing interfaces on the routing path to determine the number of packets dropped.
- Identify the routers along the routing path with the highest numbers of packets dropped.
- Validate the router configuration parameters.
- Check the OSA adapter metrics to determine if adapter constraints (such as excessive processor utilization or discards at the receive side) exist.
- Confirm that the CPU utilization is high for the remote system (that is, the receive side) Communications Server for z/OS address space.
- Redistribute the Communications Server for z/OS workload on the remote system (receive side) of the HPR RTP connection.

UDP problems could impact EE



UDP Endpoints Summary Table

Local Port	Datagrams Queued	Datagrams Discarded	Percent Datagrams Discarded	Queued Datagram Bytes	Send Datagram Size Limit	Receive Datagram Size Limit	Receive Queue Limit (Bytes)	Receive Queue Limit (Datagrams)	Datagrams Received	Datagrams Sent
12002	0	12	0	0	65535	65535	2949120	2000	169540	10003
12004	0	0	0	0	65535	65535	2949120	2000	200475	6032



Part of OMEGAMON MFN Connections UDP Endpoints Workspace

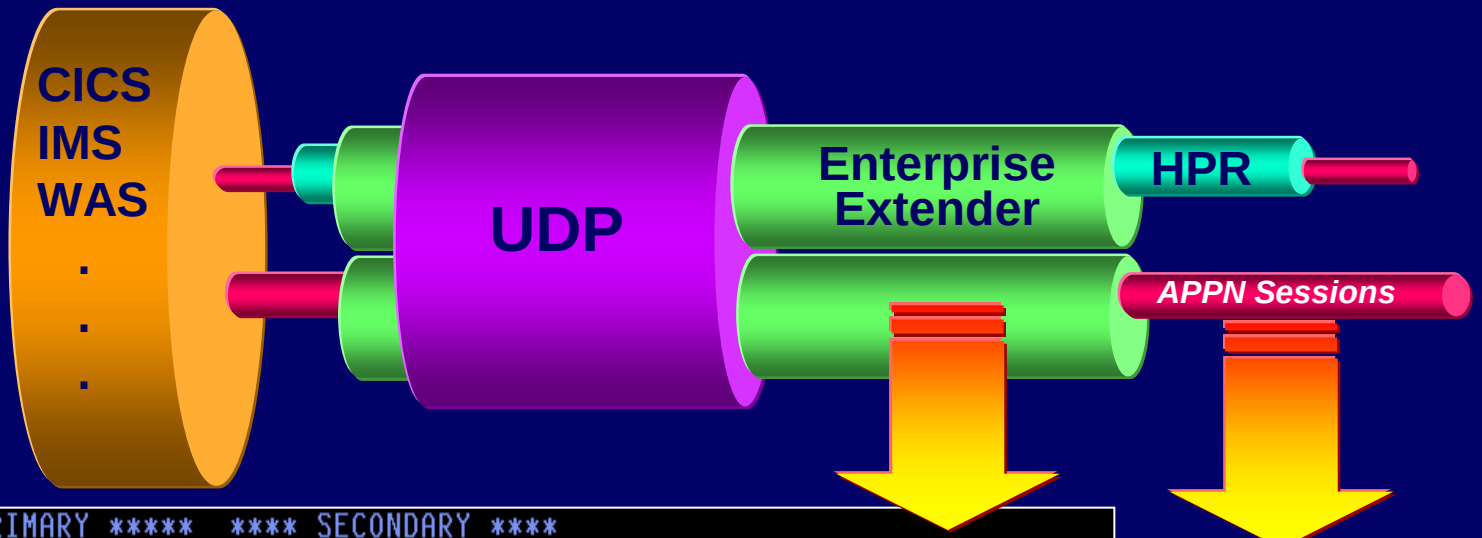
- **No Error recovery**
  - Done by endpoints, if any
- **High number of Discards**
- **Queued and Queue Limit**
- **Endpoints responsible for**
- **High Datagram and byte traffic**
  - at wrong priority

Out of the box Situations for Operator awareness

Port to SNA Map
12000 - LL2
12001 - Network
12002 - High
12003 - Medium
12004 - Low

UDP Connection Situations
- % Datagrams Discarded
- Datagram Rate
- Byte Rate

List APPN Sessions that Transverse over EE




```
***** PRIMARY *****   **** SECONDARY ****
  NAME    TYPE  DOM      NAME    TYPE  DOM      START TIME        END TIME
SEPACECP  ILU    C-C    NTVD2     LU    NTVD2  01/31 15:25:19   *** ACTIVE ***
NTVD2     LU    NTVD2  SEPACECP  ILU    C-C   01/31 15:25:19   *** ACTIVE ***
NTD2MVS   LU    NTVD2  SEPACECP  ILU    C-C   01/31 15:24:11   *** ACTIVE ***
SEPACECP  ILU    C-C    NTD2MVS   LU    NTVD2  01/31 15:24:11   *** ACTIVE ***
```

NetView for z/OS
NLDM (Session Monitor)

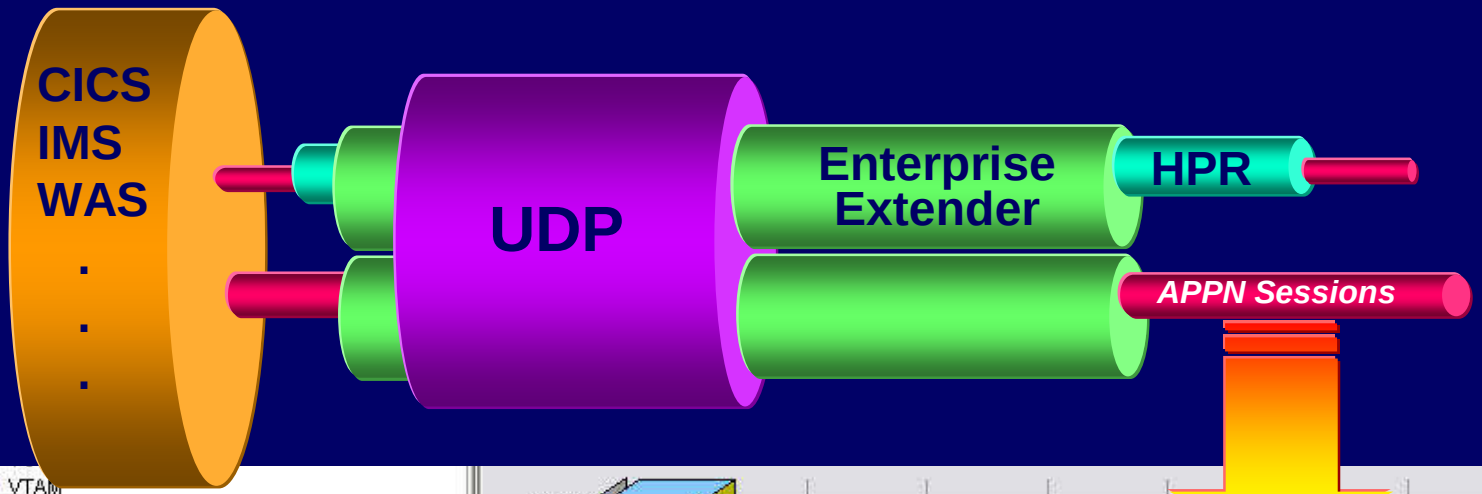
*NLDM SESS name * ACTREF*

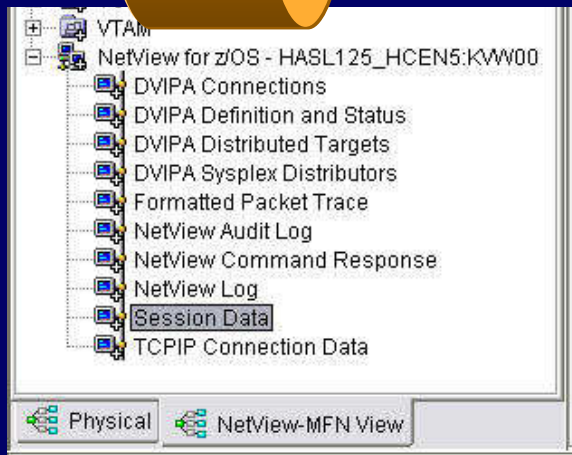
```
NLDM.CON                    SESSION CONFIGURATION DATA                    PAGE    1
------------- PRIMARY ---------------+------------- SECONDARY -------------
NAME SEPACECP  SA 00D2  EL 00000042   |   NAME NTVD2     SA 00D2  EL 0000002A
--------------------------------------+---------------------------------------
DOMAIN NTVD2  C-C  PCID USIBMNT.SEPACECP.E747BC617FFEA45E        DOMAIN NTVD2
              +-------------+                      +-------------+
CNR00004      |     ALS     | ---          --- |   CP/SSCP   | NTD2MVS
              | LOCAL DATA  |  APPN TP 03      | SUBAREA PU  | NTD2VTAM(0000)
              +------+------+                  +------+------+
                     |                                |
              +------+------+                  +------+------+
SEPACECP(0042)|     ILU     |                  |     LU      | NTVD2   (002A)
              +-------------+                  +-------------+
                                APPNCOS SNASVCMG
                                SUBACOS N/A
                                LOGMODE SNASVCMG
                                PADJ CP SEPACECP
                                SADJ CP N/A
```

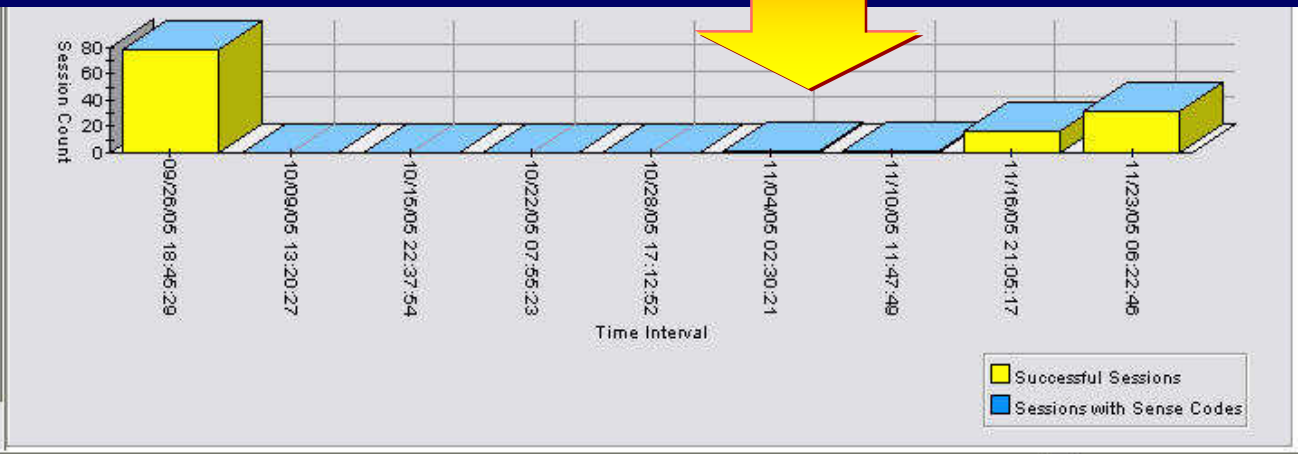
- See sessions that transverse EE connections
- Are sessions going over correct EE?

Added with APAR OA16305

View SNA session in TEP







Page: 1 of 2

Session Data Summary Table

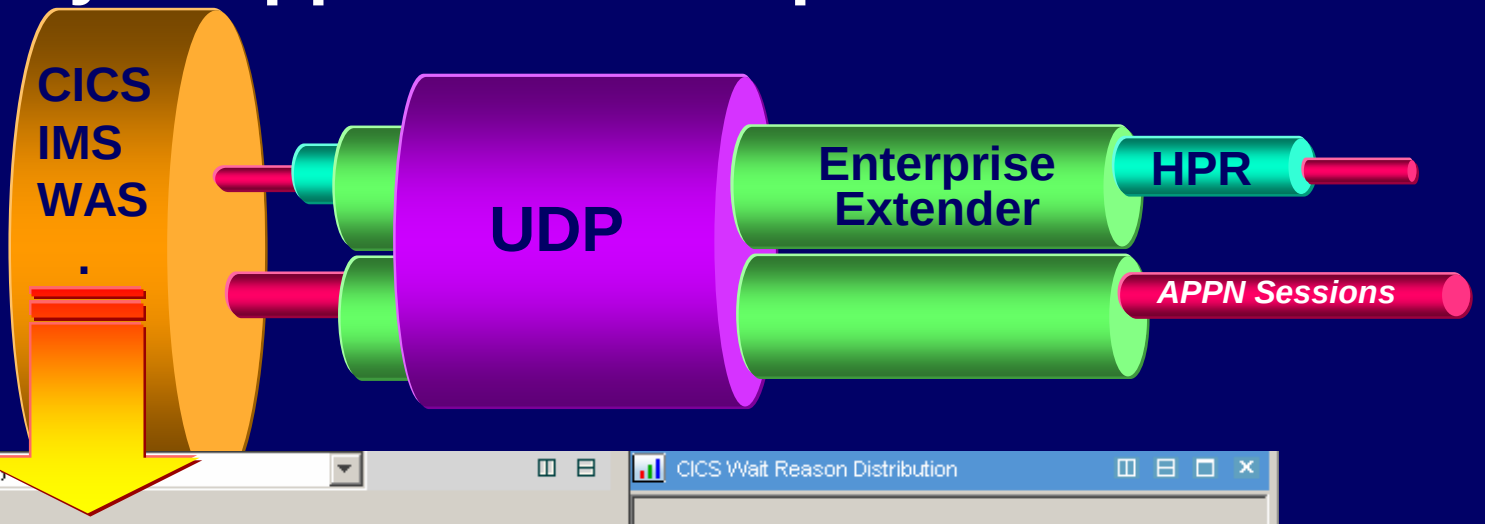
Primary Name	mary Ty	Start Time	End Time	Secondary Name	ondary	PCID	Sense Code	mary Dom	Secondary Domain	DLUS DLUR	Se
USIBMWZV.H...	SSCP	11/29/2005 15:18:11	ACTIVE	USIBMWZV.HCEN500E	LU	USIBMWZV.HSLV12.E...		HCEN5	HCEN5		
USIBMWZV.H...	SSCP	11/29/2005 15:18:11	ACTIVE	USIBMWZV.HCEN500F	LU	USIBMWZV.HSLV12.E...		HCEN5	HCEN5		
USIBMWZV.H...	SSCP	11/29/2005 15:18:11	ACTIVE	USIBMWZV.HCEN500C	LU	USIBMWZV.HSLV12.E...		HCEN5	HCEN5		

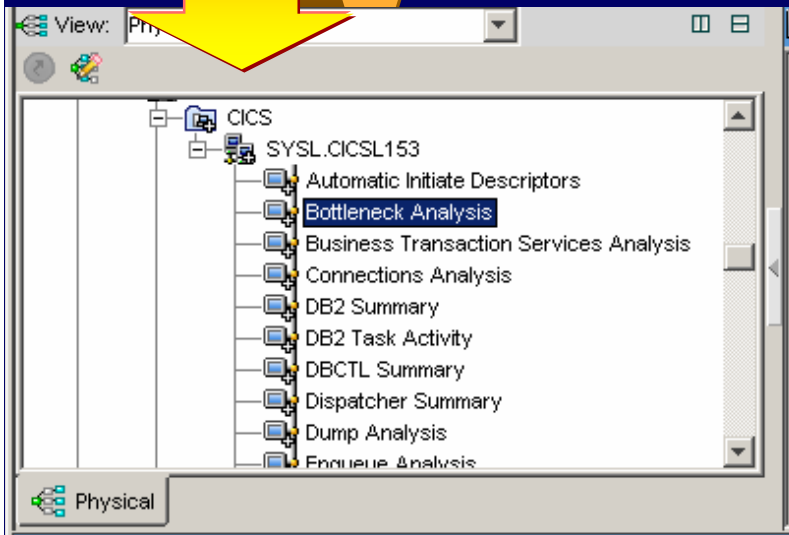
- View SNA sessions in TEP
- Session failing with sense codes

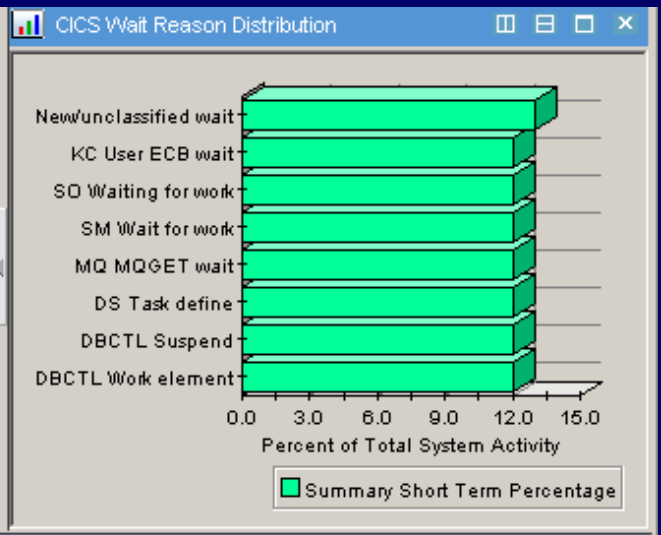
NetView for z/OS
Session Data Workspace

Added with APAR OA16305

Analyze Application end points







Bottleneck Analysis

Resource Type	Resource Name	Issuing Module	Wait Type	Dispatcher Call	Wait Reason Description	Task Type	Summary Term Perce
SODOMAIN	SO_NOWOR	DFHSOL	Socket	SUSPEND	SO Waiting for work	System	
USERWAIT	*TOTAL*	DFHEIQSK	TaskCntl	WAITMVS	KC User ECB wait	User	
USERWAIT	CDB2TIME	DFHEIQSK	Database	WAITMVS	KC User ECB wait	User	
UNKNOWN	*TOTAL*	MULTIPLE	Unknown	MULTIPLE	New/unclassified wait	Both	
UNKNOWN	JM000	MULTIPLE	Unknown	MULTIPLE	New/unclassified wait	Both	

View Application Performance with OMEGAMON XE:

- On z/OS
- For CICS
- For IMS
- For Messaging
- ITCAM for WAS
- For DB2

OMEGAMON XE for CICS bottleneck Analysis Workspace

Summary of Enterprise Extender and HPR

Application Performance
- CPU, Storage
- Response times

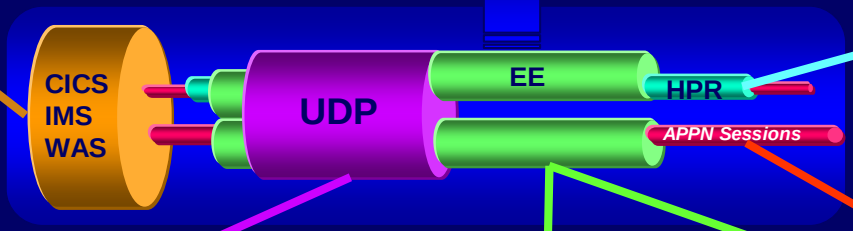
OMEGAMON CICS, IMS, WAS, DB2, Messaging, z/OS

Other Resources
- IP Stacks, USS
- Memory, Buffers
- OSA-Express
- Interfaces (MTU size)
- CSM Storage
  - Unacknowledged buffers

OMEGAMON MFN

HPR Performance
- Endpoint Recovery
- Out of Sequence
- Retransmissions
- Path Switches
- ABR Mode (flow control)
- Throughput
- Response Time Variance
- Class of Service

OMEGAMON MFN



Out of the box Situations for Operator awareness

UDP Performance
- High number of Discards
- Queued and Queue Limit
- High Datagram and byte traffic at wrong priority

OMEGAMON MFN

- **EE Performance**
- High Throughput Rates
- High Retransmission Rates
- Wrong Type of Service (TOS)
  - Too much at high priority
  - **T1BUF** and **T2BUF** Buffers

OMEGAMON MFN

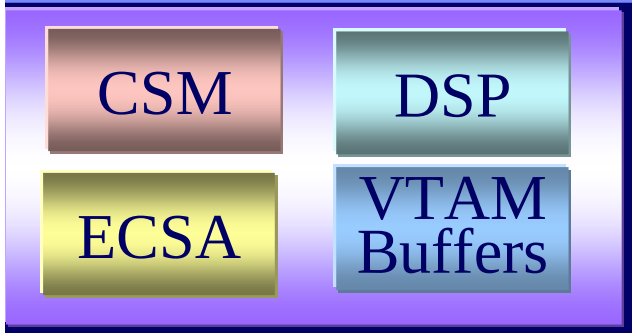
- **EE Sessions**
- See sessions that transverse EE connections
- Are sessions going over correct EE?

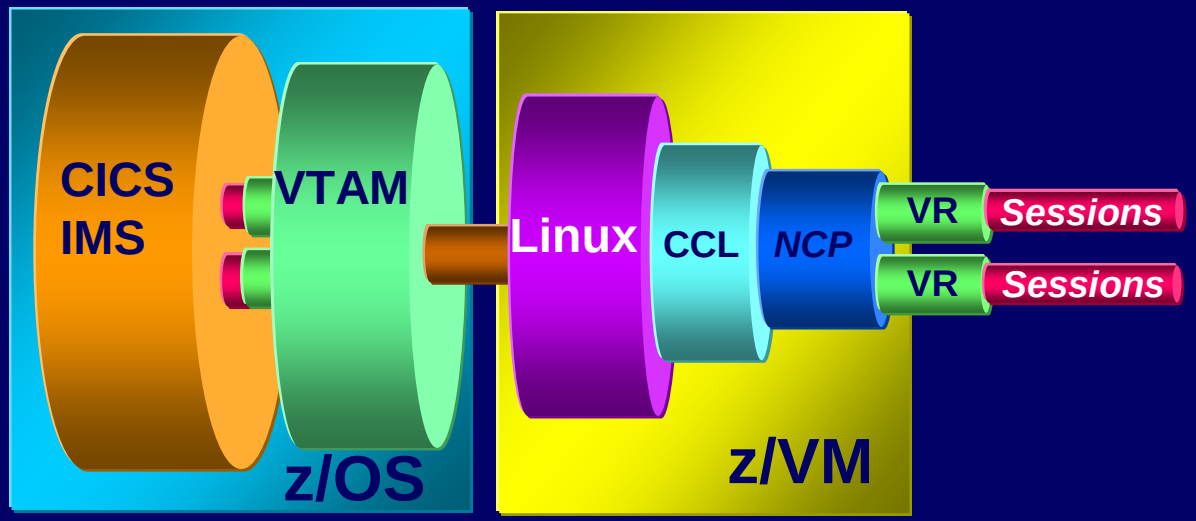
NetView for zOS
3270 & TEP Views

z/OS Communication Server Top Ten Problems

1. TCP/IP Stacks
2. Denial of Service Attack
   - Intrusion Detection
3. DVIPA
4. OSA Express and Channel Interfaces
5. TCP/IP Connections
6. Applications
7. FTP
8. TN3270
9. SNA over IP
   - Enterprise Extender and HPR
10. **SNA**
    - **CCL (Communication Controller on Linux)**

SNA & CCL- NCP Overview

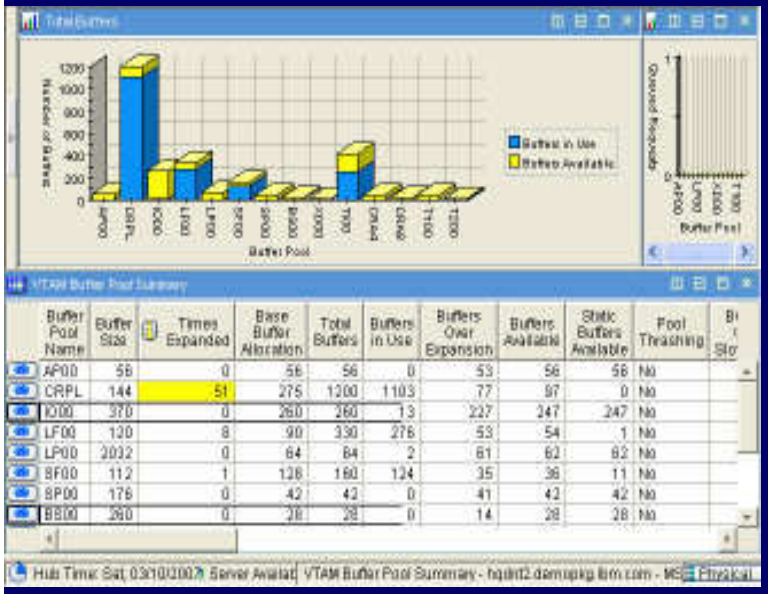




Is SNA data backing up?

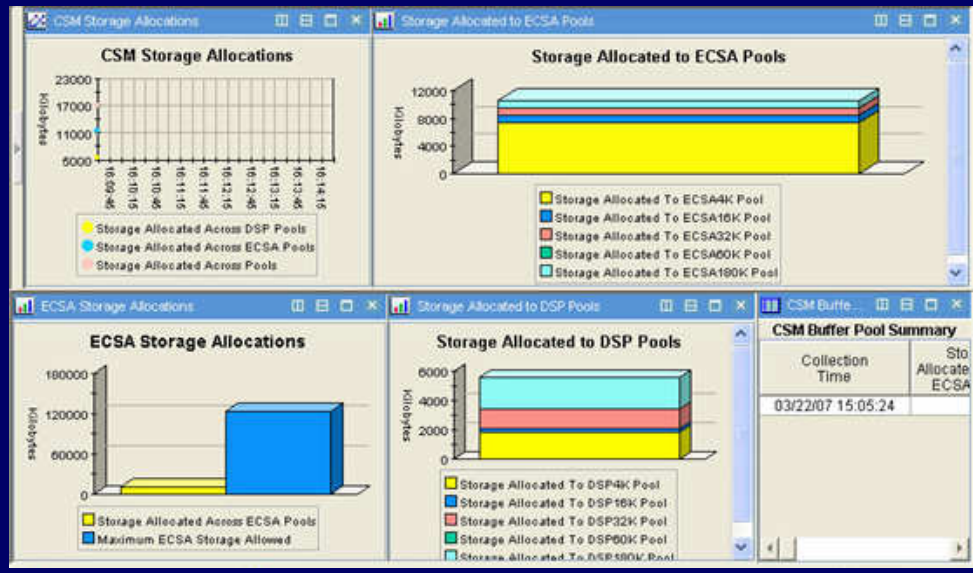
- z/VM & Linux
  - Memory and CPU Utilization
- Communications Controller on Linux (CCL)
- NCP
  - Buffers CPU Utilization
- VTAM
  - Memory and CPU Utilization
- SNA Sessions
  - Logmodes
  - Traffic Rates
  - Return codes
- VRs
  - Blocked Routes
  - Window Sizes

VTAM Buffer Pools



Buffer Pool Name	Buffer Size	Times Expanded	Base Buffer Allocation	Total Buffers	Buffers in Use	Buffers Over Expansion	Buffers Available	Static Buffers Available	Pool Thrashing
APOO	56	0	56	56	0	53	56	56	No
CRPL	144	51	275	1200	1103	77	97	0	No
IOOO	370	0	260	260	13	227	247	247	No
LFOO	120	8	90	330	276	53	54	1	No
LPOO	2032	0	64	64	2	61	62	62	No
SFOO	112	1	128	160	124	35	36	11	No
SPOO	176	0	42	42	0	41	42	42	No
SSOO	260	0	28	28	0	14	28	28	No

VTAM Buffers
- Avoid for Thrashing



CSM Storage

Buffer Situations
- Expansion Threshold
- IOBUF Expansion 90%
- Queued Buffer Requests

Out of the box Situations for Operator awareness

OMEGAMON XE for Mainframe Networks

Usage by User Category

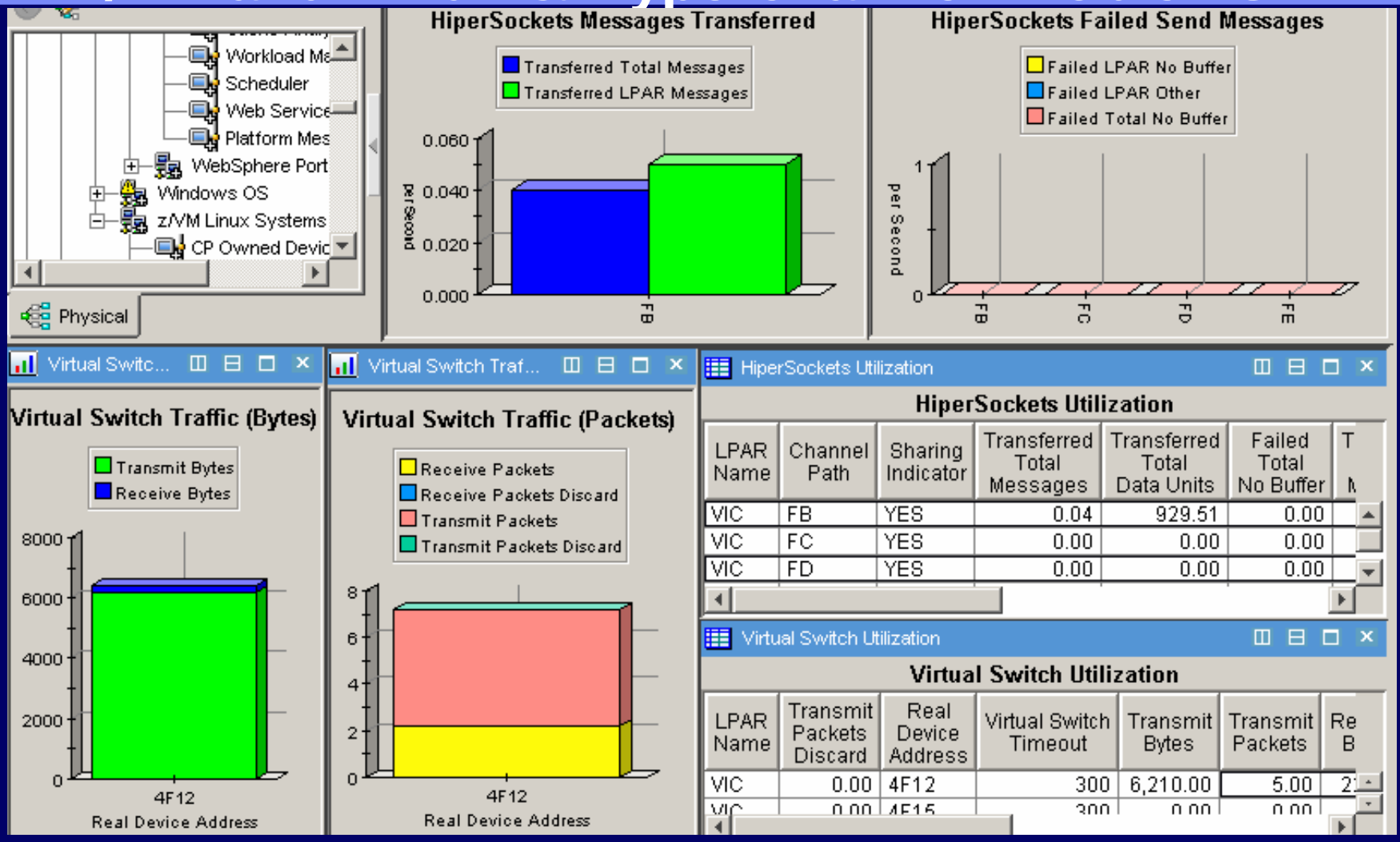
Collection Time	Description	Percent
09/21/06 11:31:57	Unallocated buffers	97
09/21/06 11:31:57	Read channel programs	0
09/21/06 11:31:57	Misc	1
09/21/06 11:31:57	TSCBs	2

Usage by User Category 2

Description	Percent	Bu
SSCP traffic	0	IOOO
Virtual route pacing response traffic	0	IOOO
APPL (PLU) to same subarea resource	100	IOOO
APPL (PLU) to different sa resource	0	IOOO
APPL (SLU) to different sa resource	0	IOOO
Local SNA to different subarea APPL	0	IOOO
Local non-SNA to different sa APPL	0	IOOO
Intermediate routing node traffic	0	IOOO

Buffers usage by Category Application or Address Space

z/VM and Linux & Hyperchannel Problems



OMEGAMON XE on z/VM and Linux Network Workspace

- **Monitor z/VM and Linux together**
- **CPU, Storage, Resources**
- **Hyperchannel**
- **See if performance issues due to Linux or z/VM**

SNA CCL-NCP Summary

Application Performance
- CPU, Storage
- Response times

OMEGAMON CICS, IMS, WAS, DB2, Messaging, z/OS

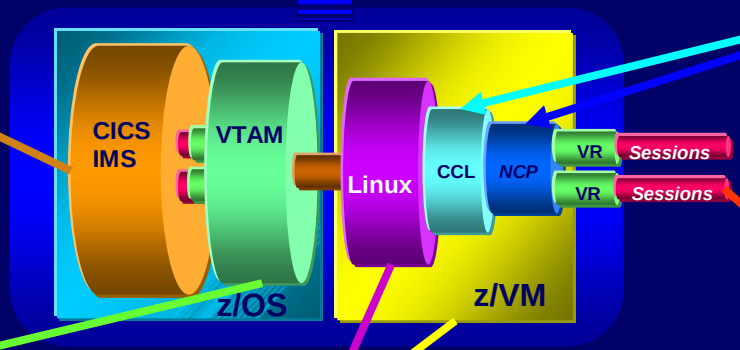
Other Resources
- IP Stacks, USS
- Hyper Channels
- Memory, Buffers
- OSA-Express
- Interfaces

OMEGAMONs

NCP CCL Performance
- Tuning, VRs
- CPU
- Buffers & Memory

OMEGAMON for MFN
- (NPM), (OMEGAMON II)

NetView for z/OS
NTuneMon, MOSS Console



VTAM Performance
- CPU Utilization
- Memory ECSA, CSM
- Buffers

OMEGAMON MFN

- **z/VM & Linux**
- CPU Utilization
- Memory
- Tasks
- Hyperchannel
- Network

OMEGAMON on z/VM & Linux

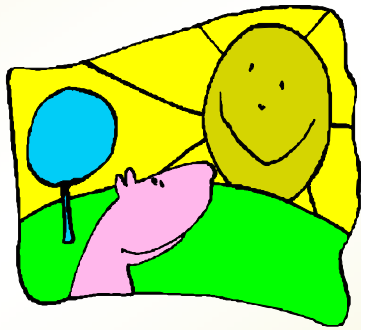
SNA Sessions
- Session Awareness
- VRs
- Traces

NetView for zOS
3270 & TEP Views

Summary

Solution	Managed as part of Communication Server Top 10 List
IBM Tivoli OMEGAMON XE for Mainframe Networks	Performance on TCP/IP Connections, UDP, FTP, OSA-Express, Interfaces, TN3270, EE, HPR Performance, Buffers, Storage
IBM Tivoli NetView for z/OS	Operations on TCP/IP Connections (active and inactive), TN3270, SNA Sessions, Interfaces, DVIPA, Intrusion Detection, IP and SNA Trace
IBM Tivoli OMEGAMON XE on z/OS	USS, WLM, XCF, CPU, Memory
z/OS OMEGAMON Management Console	Health Checks on z/OS Communications Server
IBM Tivoli OMEGAMON XE on z/VM and Linux	Hyper Channels, z/VM and Linux resources
IBM Tivoli OMEGAMON XE for Storage	Storage performance issues
IBM Tivoli OMEGAMON XE for CICS	Max Sockets, Bottleneck Analysis, Connection Analysis
IBM Tivoli OMEGAMON XE for IMS	IMS Resources, OTMA, Queues, IMS Connect
IBM Tivoli OMEGAMON XE for DB2 PE/PM	DB2 Resources, Locking Conflicts, Thread Analysis, DB2 Connect
IBM Tivoli OMEGAMON XE for Messaging	WebSphere MQ Resources, Channels, Queues, Response Time
IBM Tivoli Composite Application for WAS	WAS, Resource Utilization, Request Analysis, JDBC Contention

Summary



- **z/OS Communication Server Top Ten Problems:**
  - ✓ 1.TCP/IP Stacks
  - ✓ 2.Denial of Service Attack
    - Intrusion Detection
  - ✓ 3.DVIPA
  - ✓ 4.OSA Express and Channel Interfaces
  - ✓ 5.TCP/IP Connections
  - ✓ 6.Applications
  - ✓ 7.FTP
  - ✓ 8.TN3270
  - ✓ 9.SNA over IP
    - Enterprise Extender and HPR
  - ✓ 10.SNA
- Leveraging OMEGAMON and NetView will reduce problem isolation time
  - Out of the box best practices
    - Workspaces
    - Situations provides proactive notification
  - Common intuitive interface (TEP)
    - Isolate to all end-to-end resources

Where to go for more information

Product overviews, Manuals, Demos, and Support

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

Red Books: http://www.redbooks.ibm.com/

- **Introduction to the New Mainframe: Networking *SG24-6772***
- **OSA-Express Implementation Guide** *SG24-5948*
- **EE Implementation Guide:** *SG24-7359*
- **Customizing and Using IBM OMEGAMON z/OS Management Console** *REDP-4166*
- **IBM Tivoli OMEGAMON XE Deep Dive on z/OS** *SG24-7155*
- **Communications Server for z/OS TCP/IP Implementation policy based Network Security** *SG24-7342*

System z teleconferences:

- **Managing mainframe networks with NetView and OMEGAMON**
  http://www-306.ibm.com/software/os/zseries/webcast/16may/
- **OMEGAMON XE for CICS V4.1 Technical Update**
  http://www-306.ibm.com/software/os/zseries/telecon/13dec/
- **Managing Linux and z/VM Performance and Availability Using OMEGAMON**
  http://www-306.ibm.com/software/os/zseries/telecon/7dec/
- **OMEGAMON XE alert management considerations and best practices**
  http://www-306.ibm.com/software/os/zseries/telecon/13jun/
- **Tivoli Enterprise Portal – Dashboard to IT Service Management**
  http://www-306.ibm.com/software/os/zseries/telecon/23feb
- Live ITM 6.1 DEMO with OMEGAMON 4.1 Simulation. Order (SK4T-0622--03)

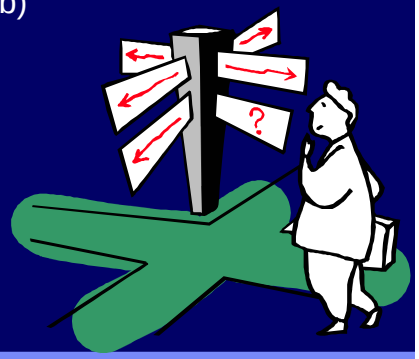
Tivoli Technical Exchange Recorded Telecasts (Select Previous Webcast Tab)

http://www-306.ibm.com/software/sysmgmt/products/support/supp_tech_exch.html

- **NetView for z/OS V5 Ease of Use**
- **Introduction to NetView for z/OS and Web Seminar Series**

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



IBM Networking Acronyms

- **APPN** Advanced Peer to Peer Networking
- **CS z/OS** Communications Server for z/OS
- **CCL** Communications Controller on Linux on z/OS
- **CTC** Channel to Channel
- **CSM** Communications Storage Manager
- **EE** Enterprise Extender
- **ESCON** Enterprise System Connection
- **FICON** Fiber Connection
- **FTP** File Transfer Protocol
- **HPR** High Performance Routing
- **ITM** IBM Tivoli Monitoring
- **ITCAM** IBM Tivoli for Composite Applications Management
- **ITMNP** IBM Tivoli Monitoring for Network Performance
- **MFN** *OMEGAMON for* Mainframe Networks
- **NPM** Network Performance Monitor (part of OMEGAMON MFN)
- **NLDM** Network Logical Data Manager "session manager" (part of NetView)
- **NPDA** Network Problem Determination Application (part of NetView)
- **LU** Logical Unit
- **PU** Physical Unit
- **NCP** Network Control Program
- **RTP** Response Time Monitor
- **SA z/OS** System Automation for z/OS
- **SLR** Service Level Reporter (TDS for z/OS)
- **SNA** System Network Architecture
- **SNI** SNA Network Interconnection
- **SNMP** Simple Network Management Protocol
- **TCP/IP** Transmission Control Protocol/Internet Protocol
- **TDS z/OS** Tivoli Decision Support for z/OS
- **TDW** Tivoli Data Warehouse
- **TEC** Tivoli Enterprise Console
- **UDP** User Datagram Protocol
- **USS** UNIX System Services
- **VTAM** Virtual Telecommunications Access Method
- **WAS** WebSphere Application Server

Thank You