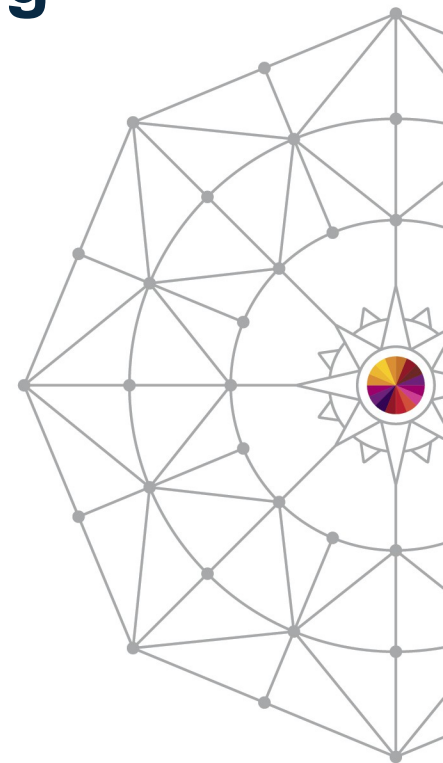


How IBM Can Identify z/OS Networking Issues without tracing

Ernie Gilman
IBM

August 6th, 2014
Session 16084



#SHAREorg



Abstract

- Running traces has become an essential tool in resolving networking issues on z.
- To reduce the need of running traces, z/OS Communication Server created the Network Management Interface (NMI) to give management tools **high-speed, low-overhead access to networking information**, needed to isolate networking issues.
- This session will provide examples of how IBM's OMEGAMON for Mainframe Networks (MFN) leverages the NMI to help networking experts **reduce the need to run traces by as much as 90%**.

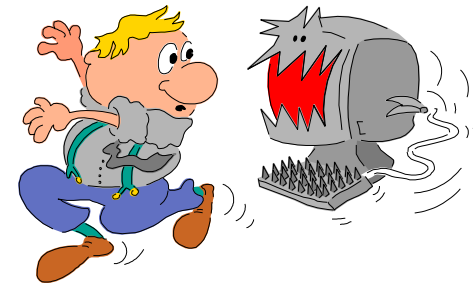
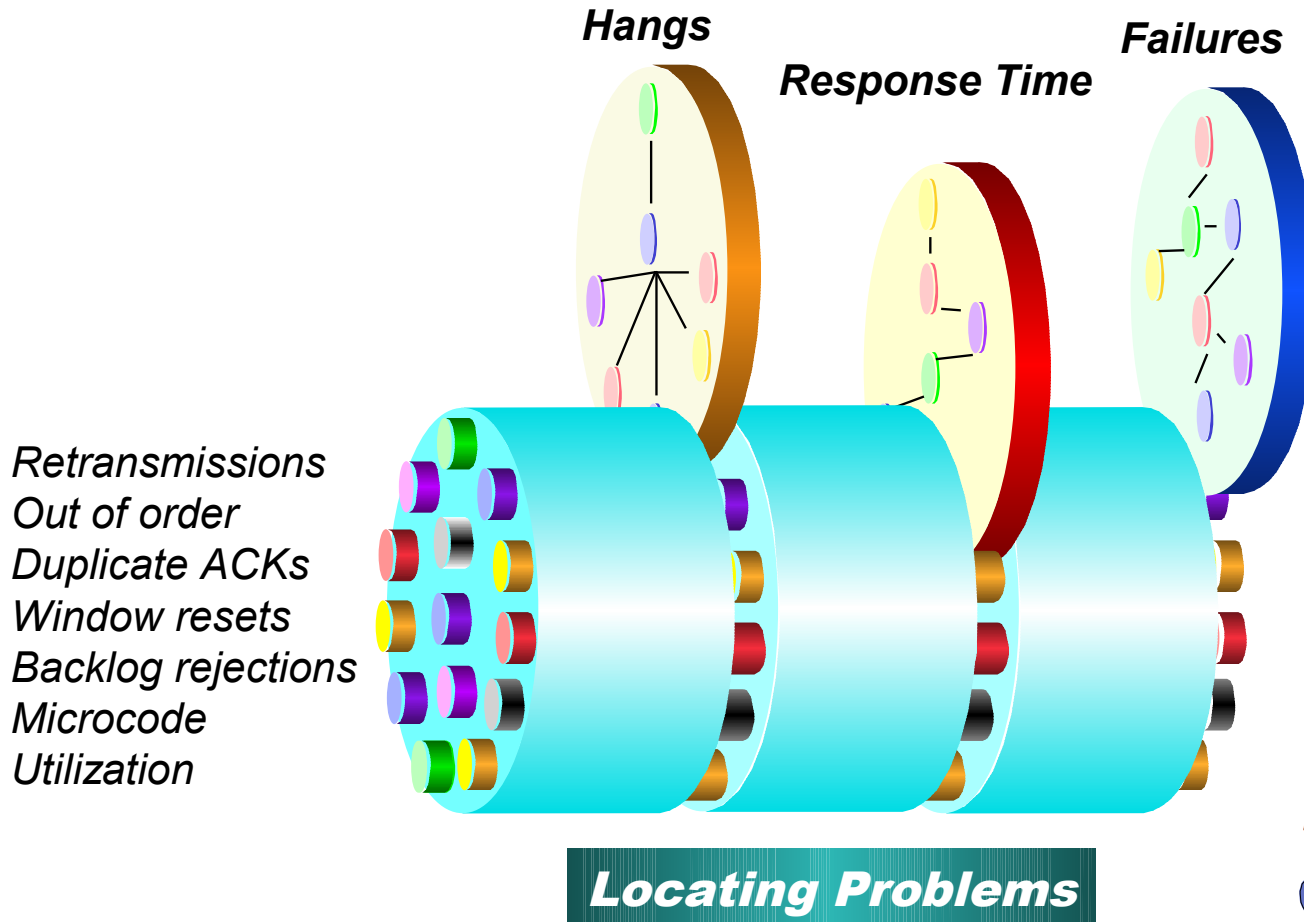


Agenda

- Overview of how OMEGAMON leverages NMI
 - New Enterprise Views in e3270ui and TEP GUI
- Enterprise Application Health
- Enterprise Connection Health
- Historical baselines
- Finding a resource
- FTP Sessions and Transfer Issues
- OSA Express
- IPSEC



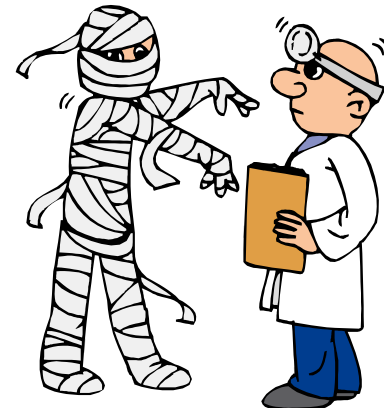
Networking problem indicators



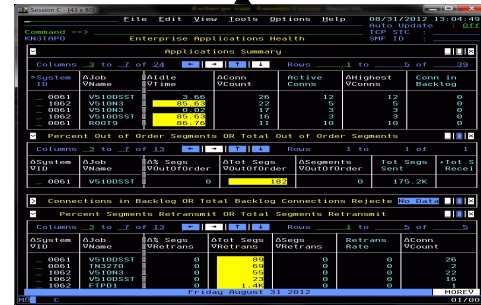
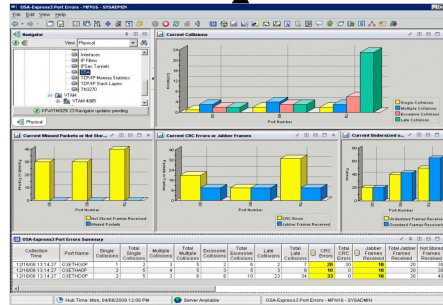
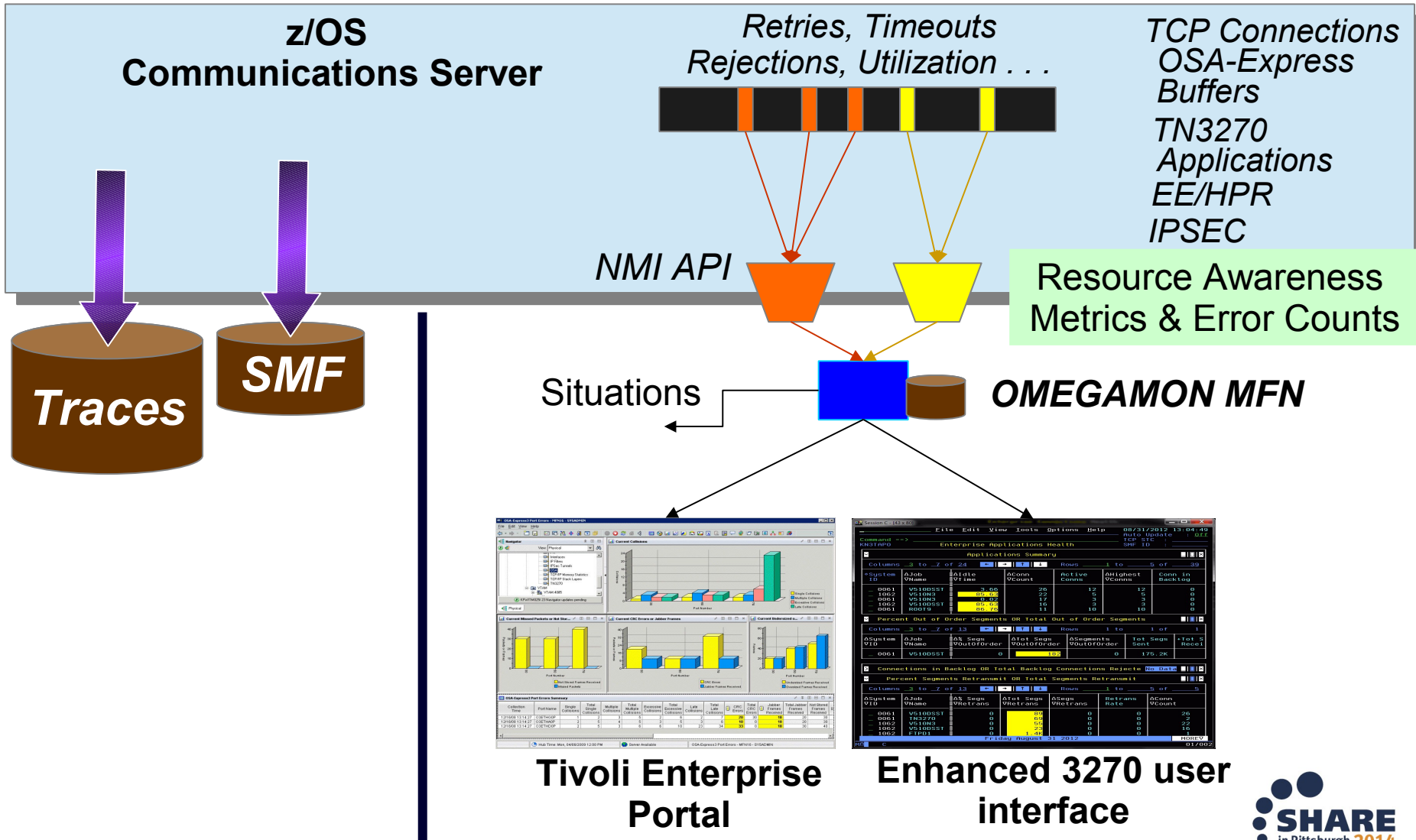
Key Points to Reducing the Need for Traces

1. Access to z/OS Communications Server data
 - ✓ High speed, Low overhead access to networking data
 - ✓ Management tools have access through the **NMI**¹ API
2. OMEGAMON for Mainframe Networks leverages **NMI**¹
 - ✓ Proactive with Alerting
 - ✓ Enterprise Networking Health Views
 - ✓ Wildcard FIND Connections, TN3270 and FTPs
 - ✓ History provides trending and eliminates recreates

NMI¹ = *Network Management Interface*



z/OS Communications Server Monitoring Overview



Enterprise Application Health



Command ==>

KN3START

Enterprise Network Health

Network Health for Applications

Columns 3 to 11 of 21



Rows

ΔSystem VID	ΔJob VName	Δ% Segs VOutOfOrder	ΔTot Segs VOutOfOrder	ΔConn in VBacklog	Backlog Rejected	ΔTot Backlog VRejected	Δ% Segs VRetrans	ΔTot Segs VRetrans
MVSA	JOB1	5	19	0	0	0	0	0
MVSB	JOB456	0	8	0	0	0	0	522
MVSC	JOBFTP	0	125	0	0	50.3K	0	377
MVSA	JOB CD	0	0	0	0	0	0	794

List applications that may be impacted by networking issues



- Out of order segments
- **Backlog connections rejected**
- Segments retransmitted
- Datagrams Discarded
- Number of connections and Idle Time



Backlog Connection Rejections

• Overview

- ✓ Connection Rejections
 - ◆ Exceeds Backlog Limit
- ✓ Need to retry logon
 - ◆ Excessive overhead
- ✓ Backlog limit too low
 - ◆ Application can override

 Backlog Limit	Backlog Connections Rejected	 Total Backlog Connections Rejected	Backlog Connections Rejected Time Stamp
2	0	6	08/18/11 14:54:40
10	0	0	
2	0	50.3K	08/18/11 14:11:03
10	0	7	08/20/11 10:05:35
2	0	6	08/18/11 14:35:27

ΔTot Backlog ∇Rejected	Δ% Segs ∇Retrans	ΔTot Segs ∇Retrans	ΔIdle ∇Time
0	0	0	0.00
0	0	522	0.00
50.3K	0	377	0.00
0	0	794	585.16

• Results:

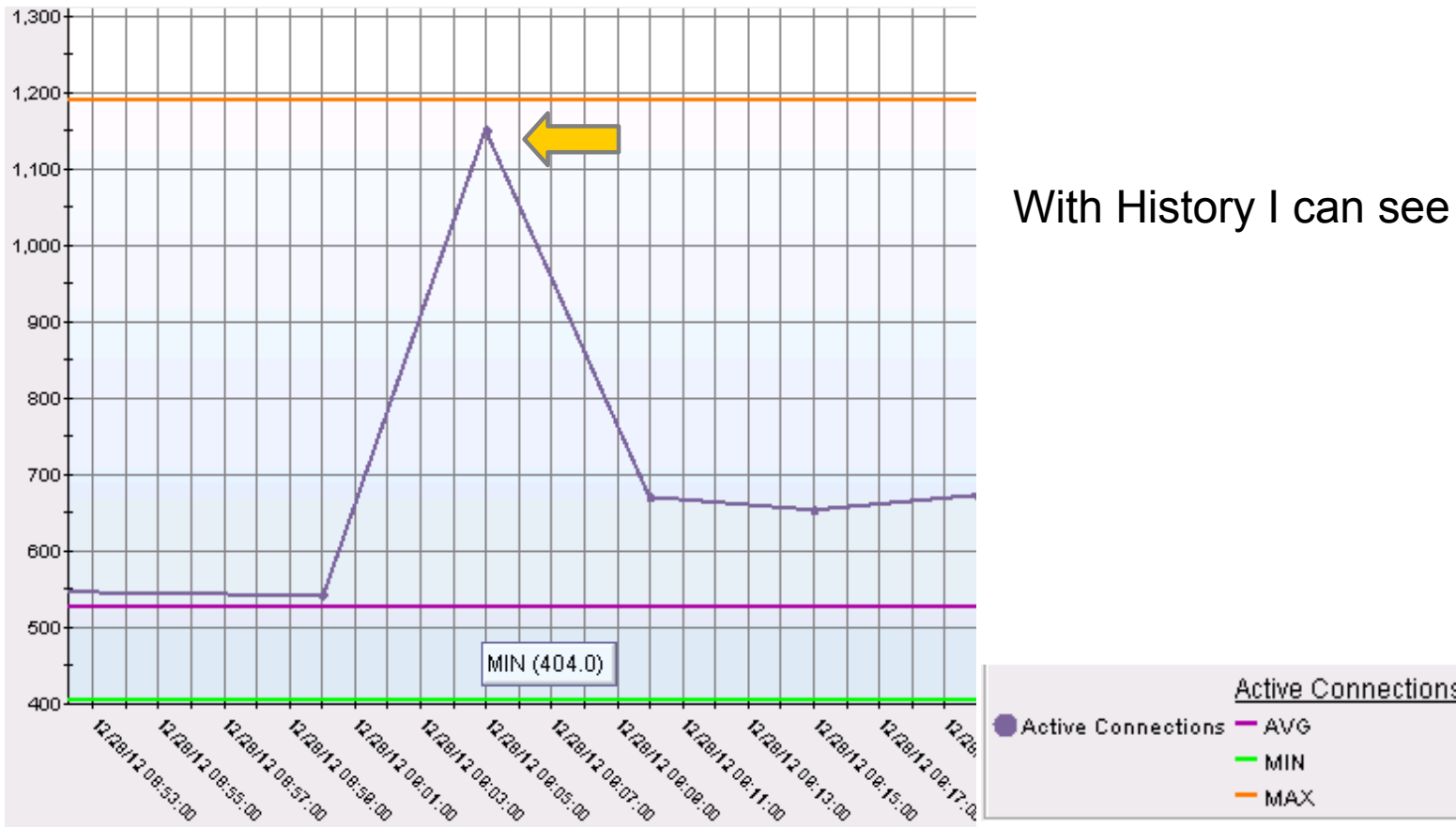
E3270ui or TEP: Network Health for Applications

- ★ Most common unknown issue
- ★ Applications will not be notified
- ★ No Message from Comm Server

Backlog Connections Rejected History example



With History I can see more details



Recording Time	Local Port	Application Name	ASID	<input checked="" type="checkbox"/> Active Connections	<input checked="" type="checkbox"/> Backlog Connections Rejected
12/28/12 09:00:00	3006	DSNJDIST	0X007A	542	0
12/28/12 09:05:00	3006	DSNJDIST	0X007A	1151	294
12/28/12 09:10:00	3006	DSNJDIST	0X007A	670	0
12/28/12 09:15:00	3006	DSNJDIST	0X007A	653	0
12/28/12 09:20:00	3006	DSNJDIST	0X007A	672	0



Enterprise Connections Health



File Edit View Tools Options Help 12/30/2012 15:10:38

Auto Update : Off
TCP STC : *
SMF ID : *

Command ==>
KN3TCPO

Enterprise Connections Health

Time Since Last Activity > 10 Minutes

Columns 4 to 8 of 16 Rows 1 to 8 of 33

ΔSystem ▽ID	ΔJob ▽Name	ΔLocal ▽Port	ΔRemote ▽IP Address	ΔLast ▽Activity	Connection State	Tot Segs Retrans	+Tot S OutOf
- MVSE	CICSAR10	3090	204.146.27.23	21d 05h	ESTABLISHED	0	0
- MVSE	IBMSMV32	9994	122.248.183.1	19d 13h	ESTABLISHED	10	0
- MVSE	IBMSMV32	9994	99.138.104.246	19d 00h	ESTABLISHED	0	0
- MVSE	IBMSMV32	9994	99.138.104.246	18d 17h	ESTABLISHED	0	0
- MVSE	IBMSMV32	9994	99.138.104.246	18d 12h	ESTABLISHED	0	0
- MVSE	CICSAOR2	8082	129.33.1.38	18d 02h	ESTABLISHED	0	0
- MVSE	CICSAOR2	8082	129.33.1.37	18d 02h	ESTABLISHED	0	0
- MVSE	CICSAOR2	8082	129.33.1.37	18d 02h	ESTABLISHED	0	0

Connection State Not Equal to Established

Columns 4 to 7 of 11 Rows 1 to 3 of 3

ΔSystem ▽ID	ΔJob ▽Name	ΔLocal ▽Port	ΔRemote ▽IP Address	ΔConnection ▽State	Connection Start Time	ΔConn ▽Duratio
- MVSE	RD4ZRSE9	57701	192.84.47.60	CLOSE WAIT	12/12/12 15:06:56	18d 0
- MVSE	RD4ZRSE2	60649	192.84.47.60	CLOSE WAIT	12/12/23 23:27:59	6d 1
- MVSE	RD4ZRSE9	41779	192.84.47.60	CLOSE WAIT	12/12/12 14:39:39	18d 0

Inbound or Outbound Bytes Buffered

Columns 4 to 7 of 11 Rows 1 to 3 of 3

ΔSystem ▽ID	ΔJob ▽Name	ΔLocal ▽Port	ΔRemote ▽IP Address	ΔIn Bytes ▽Buffered	ΔOut Bytes ▽Buffered	In Queued Data Time Stamp
- MVSE	RD4ZRSE9	57701	192.84.47.60	84	0	12/12/12 16:43:06
- MVSE	RD4ZRSE2	60649	192.84.47.60	84	0	12/12/24 00:43:07
- MVSE	RD4ZRSE9	41779	192.84.47.60	84	0	12/12/12 17:03:06

- We see three windows with potential connection issues
- Connections with no activity in longer than 10 minutes.
 - Connections not in Established state.
 - Connections with bytes being buffered in CSM storage.



TCP/IP Bytes Backing Up

• Overview

- ✓ Backup in CSM storage
 - ◆ LPAR can run out of storage
- ✓ Outbound backup
 - ◆ Endpoint slow or Network issues
- ✓ Inbound backup
 - ◆ High Application CPU

• Results

- ★ Can Prevent LPAR crash
 - ◆ Situation to drop connection

Inbound Bytes Buffered	Percent Segments Retransmitted	Total Segments Retransmitted	Duplicate ACKs
209621	2	112	96
84	0	0	1
84	0	0	1

TEP: Inbound & Outbound Bytes Buffered

ΔJob ▽Name	ΔLocal ▽Port	ΔRemote ▽IP Address	ΔIn Bytes ▽Buffered	ΔOut Bytes ▽Buffered
CDCONN	1364	9.39.68.147	4.0K	0
RD4ZRSE2	4077	9.39.68.147	84	0
ADHCDSNB	56909	9.39.68.70	60	0
ADHCDSNB	10141	9.39.68.70	60	0
ADHCDSNB	10152	9.39.68.70	60	0
AUVSTAPV	33864	9.39.68.70	60	0
BBOS002S	53094	9.39.68.147	23	0
BBOS002S	51611	9.39.68.147	23	0

e3270ui: Enterprise Connection Health

Zombie Connections

• Overview

- ✓ Connections
 - ◆ Not in established State
- ✓ Can prevent new connections
 - ◆ Exceed maximum socket limit
- ✓ No activity for days

• Results

- ★ **Prevent Major outage**
 - ◆ Drop zombie connections

Enterprise Connections Health

Connection State Not Equal to Established

Local Port	ΔConn ▽Duration	Last Activity	Local IP Address
7701	18d 00h	17d 22h	192.84.47.60
0649	6d 15h	6d 14h	192.84.47.60
1779	18d 00h	17d 22h	192.84.47.60

E3270ui or TEP:
Enterprise Connection Health

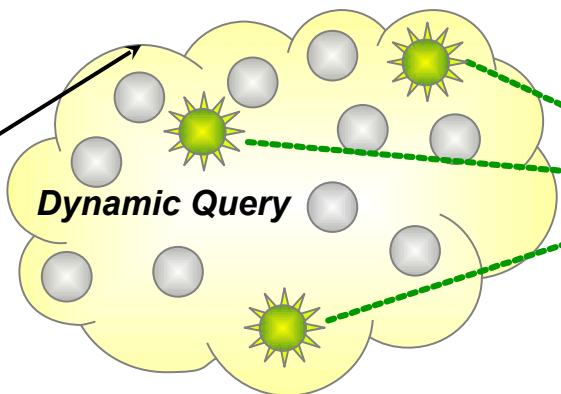
Connections in CLOSE WAIT for hours or days can eventually prevent new connections from starting. This can be caused by applications failing to cleanup connections correctly. You can drop these “zombie” connections by issuing Drop command right from here.

Finding a Connection - FAST

Enterprise Connections FIND

Enterprise (all LPARs)

System ID	*
TCPIP STC Name	*
Remote IP Address	9.82.56.*
Local IP Address	*
Local Port	*
Application Name	*
Connection State	*



Remote IP Address	Application Name	Remote Port
9.82.56.109	CXEGDSST	35234
9.82.56.100	CXEGDSST	36487
9.82.56.102	CXEGDSST	59457
9.82.56.124	TWC6	24907

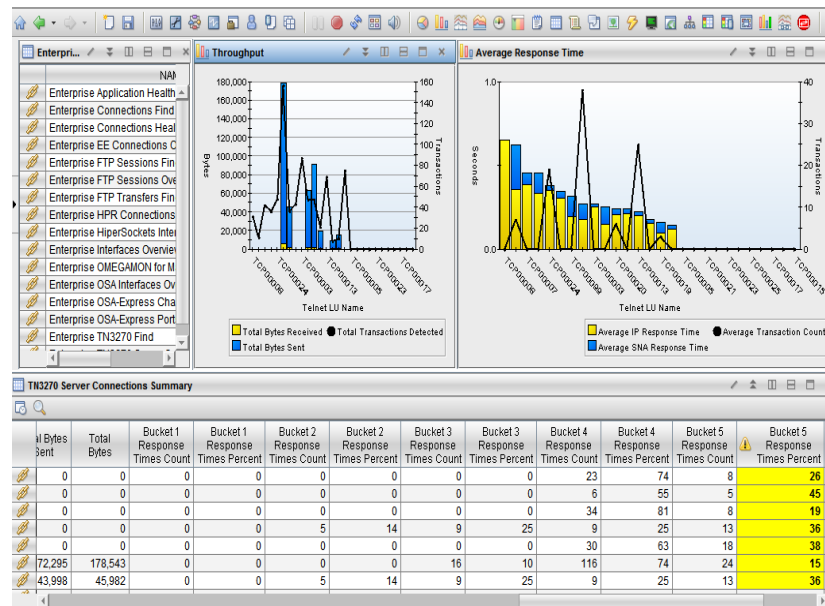
Enterprise FINDS

- ★ Connections
- ★ TN3270
- ★ FTP Sessions
- ★ FTP Transfers

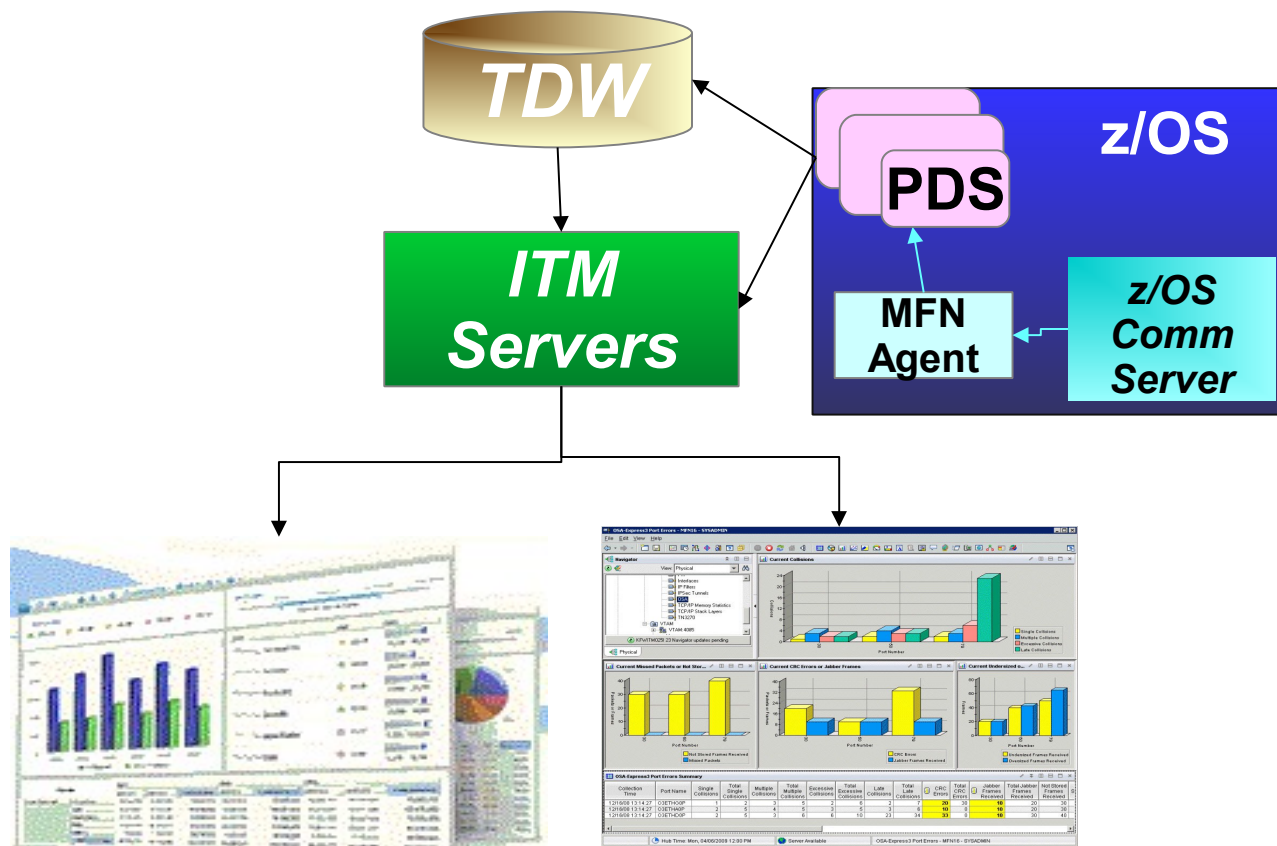
FIND By - Examples:

- Wild Card '*'
- IP Addresses
- Ports
- Applications
- Connection States
- TN3270 LOGMODES
- TELNET Names
- FTP DSN
- USERIDS

Diagnose



OMEGAMON MFN History Overview



TCR

TEP

- ◆ **PDS:** Persistent Data Store – 24 Hours Short Term History
- ◆ **TDW:** Tivoli Data Warehouse – Long Term History
- ◆ **TEP:** Tivoli Enterprise Portal GUI
- ◆ **TCR:** Tivoli Common Reporter

Historical Baselines – on Demand

Show data for last

weekdays

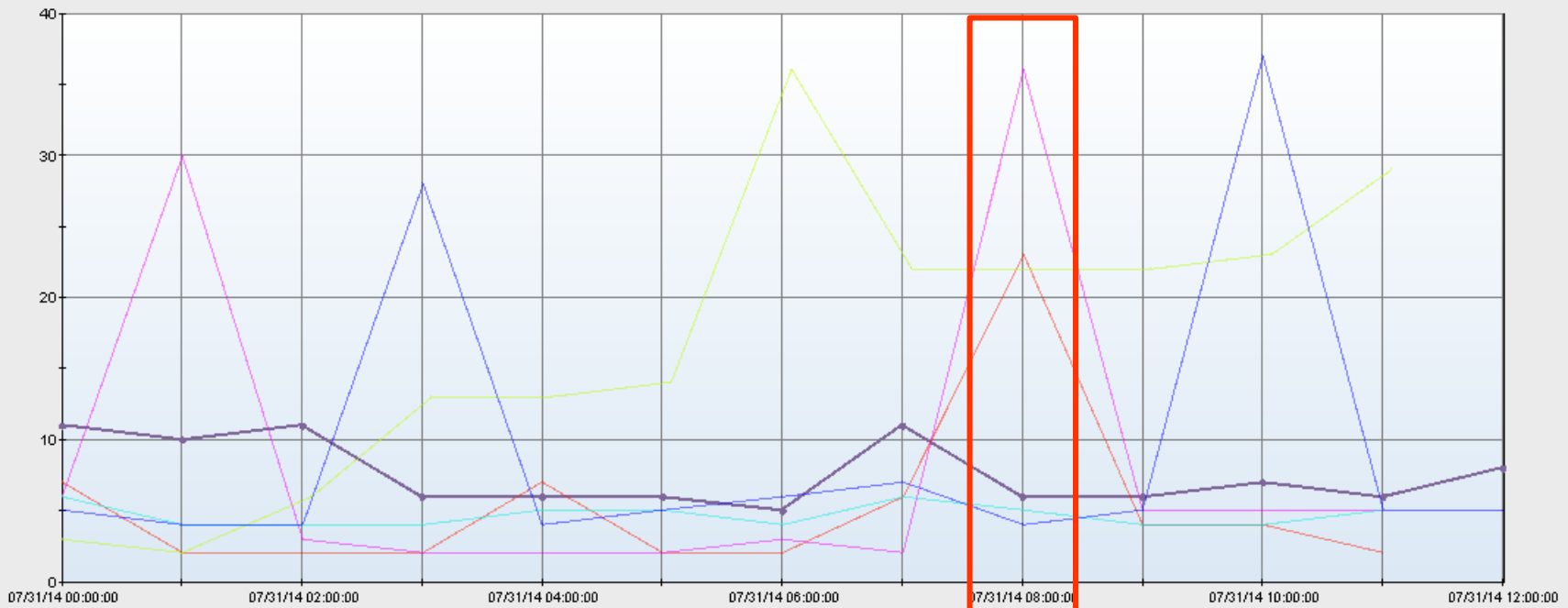
calendar days

- History Overlay for same time each day
- See weekly trends
- Create on-demand

Last

Hours

TCP Segment Retransmission Rate - last 5 days



Thu_07/24

Fri_07/25

Mon_07/28

Tue_07/29

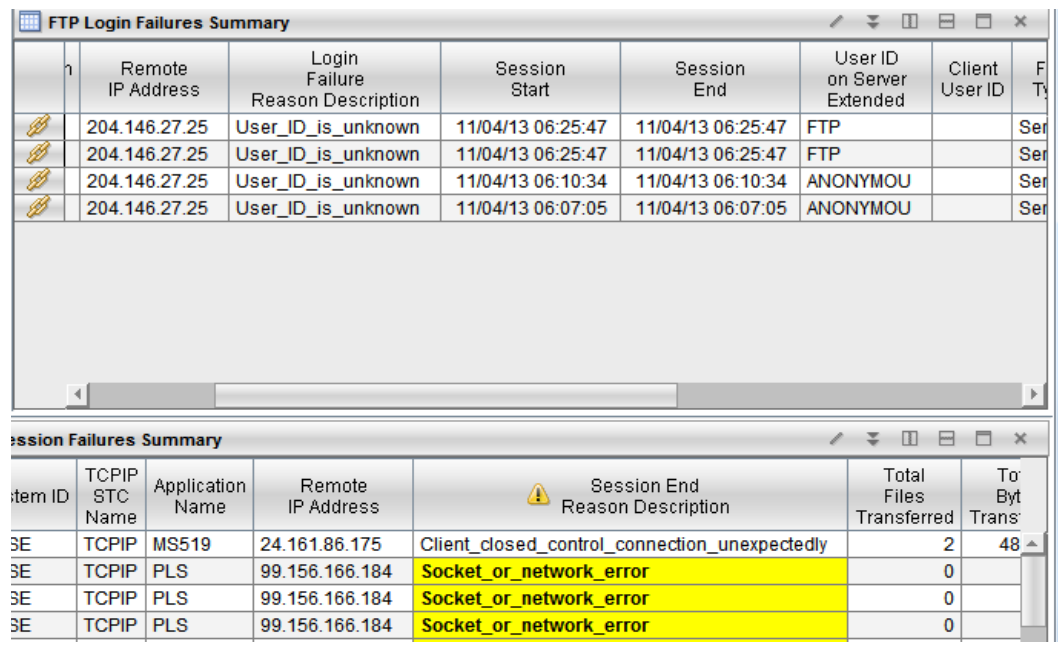
Wed_07/30

● TCP Segment Retransmission Rate ● TCP Segment Retransmission Rate ● TCP Segment Retransmission Rate ● TCP Segment Retransmission Rate ● TCP Segment Retransmission Rate ● TCP Segment Retransmission Rate

FTP Monitoring

• Overview

- ✓ FTP Sessions
 - ◆ Session Errors
 - ◆ Drill down to TCP/IP
- ✓ FTP Transfers
 - ◆ Monitor performance
- ✓ Enterprise FINDS
 - ◆ IP Address,
 - ◆ USERID, DSN



FTP Login Failures Summary

	Remote IP Address	Login Failure Reason Description	Session Start	Session End	User ID on Server Extended	Client User ID	F T
	204.146.27.25	User_ID_is_unknown	11/04/13 06:25:47	11/04/13 06:25:47	FTP		Ser
	204.146.27.25	User_ID_is_unknown	11/04/13 06:25:47	11/04/13 06:25:47	FTP		Ser
	204.146.27.25	User_ID_is_unknown	11/04/13 06:10:34	11/04/13 06:10:34	ANONYMOU		Ser
	204.146.27.25	User_ID_is_unknown	11/04/13 06:07:05	11/04/13 06:07:05	ANONYMOU		Ser

Session Failures Summary

Item ID	TCP/IP STC Name	Application Name	Remote IP Address	Session End Reason Description	Total Files Transferred	Total Bytes Transferred
SE	TCPIP	MS519	24.161.86.175	Client_closed_control_connection_unexpectedly	2	48
SE	TCPIP	PLS	99.156.166.184	Socket_or_network_error	0	
SE	TCPIP	PLS	99.156.166.184	Socket_or_network_error	0	
SE	TCPIP	PLS	99.156.166.184	Socket_or_network_error	0	

• Results

- ★ Access History immediately
- ★ No need to wait for Report

Available in TEP and e3270ui


e3270ui: Not available in V5.1

OSA-Express and Hypersockets

• Overview

- ✓ Utilization, Discards,
- ✓ Microcode, MTU Size
- ✓ **Outbound Queue Priorities**
- ✓ **View non-z/OS OSAs (snmp)**
- ✓ **Alert if OSA is down**

TEP: OSA and Hypersockets



The screenshot displays the 'Enterprise OSA Interfaces Overview' tool with several data tables. Red boxes highlight specific areas of interest:

- OSA Interface Statistics:** A table with columns for System ID, Interface Name, Bandwidth Util, Bytes Recv or Xmitd, % Packets Vin Error, % In Pkts in Error, % Out Pkts in Error, and % Pac Disca. The 'OSAGL' interface shows 50.3K Bytes Recv and 0% In Pkts in Error.
- OSA Interface Status:** A table with columns for System VID, Interface Name, Interface Status, Actual VMTU, Device or Datapath, Duplicate Addr Count, Actual Perf Type, and MTU. The 'OSAGL' interface is shown as 'Active' with a 'Duplicate Addr Count' of 0.
- OSA Interface Write Queue Statistics:** A table with columns for System VID, Interface Name, Queue VPriority, Max Staging VQueue Depth, Used VSBALs, Max Active VSBALs, Avg Active VSBALs, and SBALE VPer S. The 'OSAGL' interface has a 'Queue VPriority' of 3.
- OSA Interface Read Queue Statistics:** A table with columns for System VID, Interface Name, Queue ID, Reads VExhausted, Read VDeferrals, Tot Read VDeferrals, Used VSBALs, and % Packets Acceleral. The 'OSAGL' interface has a 'Queue ID' of 1 and 'Used VSBALs' of 4.4M.

e3270ui: Enterprise OSA Interfaces

IPSEC

• Overview

✓ Network layer Security

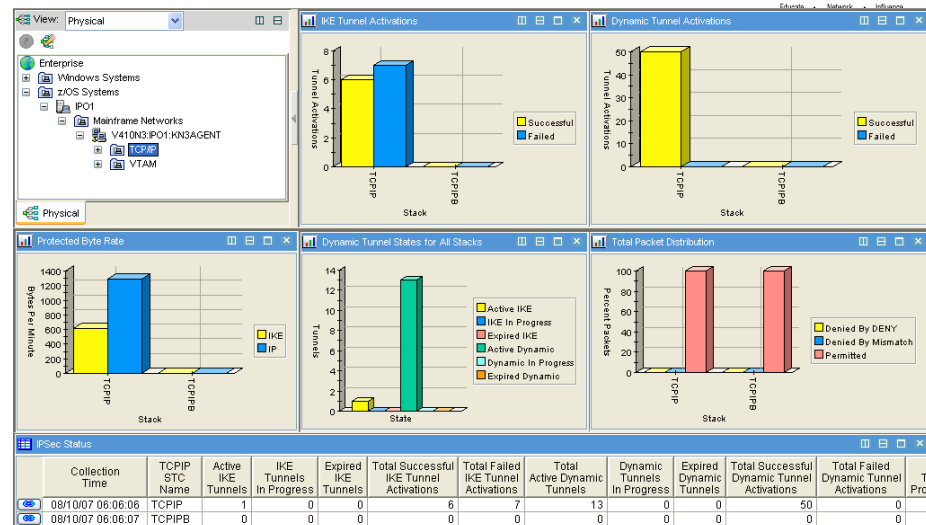
- ◆ Driven by filters
- ◆ Difficult to debug

✓ Tunnel Details

- ◆ High Retransmissions
- ◆ Out of Sequence

✓ Filter Statistics

- ◆ HPR Maps to UDP



TEP: IPSEC

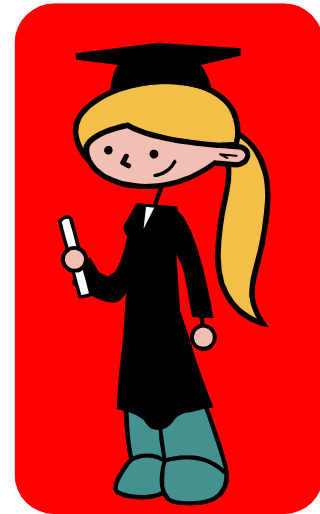
• Results

- Diagnose IPSEC filters
- **Unique to MFN**



Summary

- ✓ z/OS Comm Server NMI provides alternatives to tracing
 - ✓ High speed, low overhead access to networking data
- ✓ OMEGAMON for MFN Takes advantage of this interface
 - ✓ Enterprise health of Applications and Connections
 - ✓ History eliminates recreates
 - ✓ Flexible ways to FIND resources, really fast
 - ✓ FTP Sessions and Transfer Issues
 - ✓ OSA Express
 - ✓ IPSEC



OMEGAMON SHARE Sessions



15621: **What's New with OMEGAMON V5 Family**

Monday, 11:15 AM - 12:15 PM Room 311

15625: Learn the Latest Problem Solving Solutions for z/OS and Storage Subsystems with OMEGAMON

Tuesday 11:15 AM - 12:30 PM Room 311

15624: Learn the Latest Problem Solving Solutions for CICS and MQ with OMEGAMON

Tuesday 03:00 PM - 04:00 PM Room 311

15548: OMEGAMON XE for Storage - VSAM RLS and z/OS copy Services Monitoring

Tuesday 04:15 PM - 05:15 PM Room 317

15615: OMEGAMON V5 Enhanced 3270 Hands-on Lab

Wednesday 04:15 PM - 05:30 PM Room 301

15618: OMEGAMON Advanced Topics: User Interface Customization and the Tivoli Enterprise Portal - Hands-on Lab

Wednesday 05:45 PM - 06:45 PM Room 301

16083: Innovations in Network Management with NetView for z/OS

Wednesday 3:00 PM - 04:00 PM Room 311



How IBM Can Identify z/OS Networking Issues without tracing

Ernie Gilman
IBM

August 6th, 2014
Session 16084



Thank
You



Complete your session evaluations online at www.SHARE.org/Pittsburgh-Eval

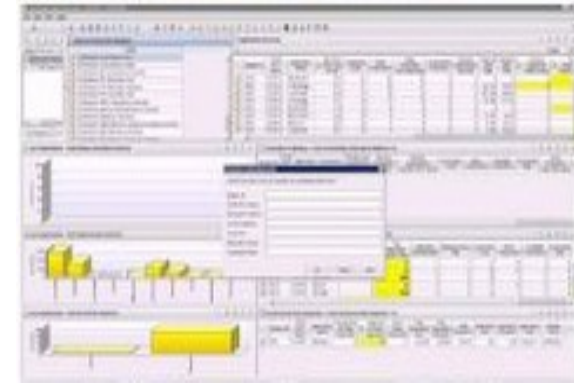


Reference

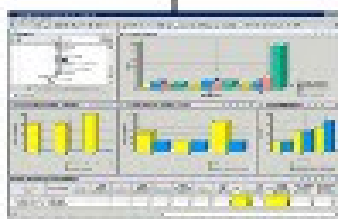
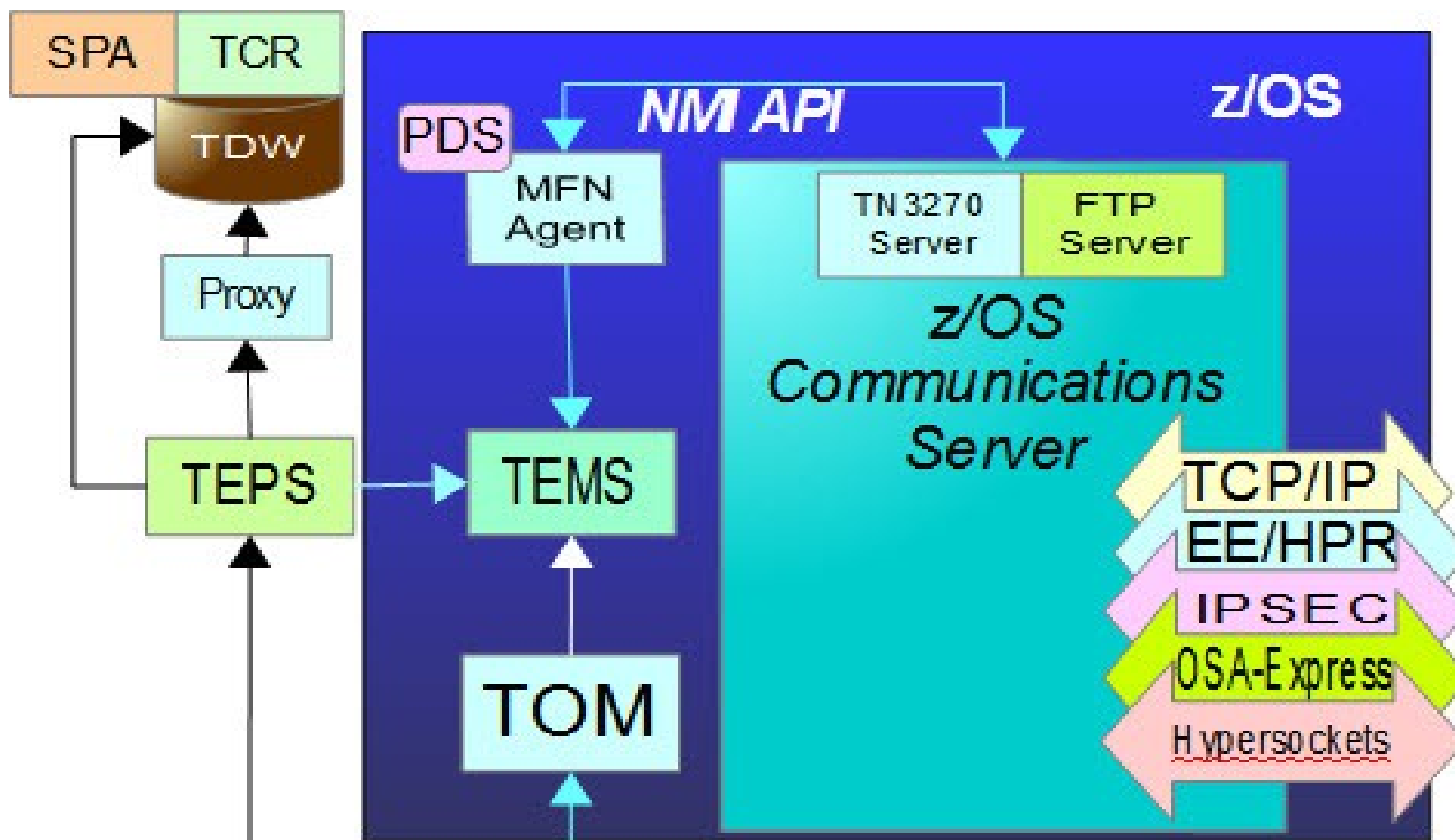
YouTube videos of problem solving scenarios:

http://www.youtube.com/playlist?list=PLiD3_RDV00Jcpl2GCf2mPqprba2KZCsP

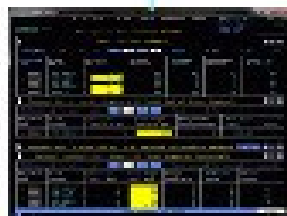
- What's New with OMEGAMON XE for Mainframe Networks?
- Diagnosing Slow Response Times to a Business Partner's Applications
- Troubleshooting Applications with Poor FTP Performance
- Troubleshooting Backlogged Connections with TEP
- Diagnosing Connection Problems using a FIND Workspace
- Spotting Trends in an Abnormal Connection Count
- Backlog Connection Count Exceeds a Defined Threshold
- Balancing Workloads Between OSA Adapters
- Troubleshooting Problems with TN3270 Connectivity
- Determining Stack Health Using Throughput
- Running a NetView z/OS IP Packet Trace from OMEGAMON Mainframe Networks
- Understanding Spikes in CSM Storage Usage



OMEGAMON MFN to z/OS Communication Server Architecture



TEP



e3270ui

TEPS: Tivoli Enterprise Portal Server
 TEP: Tivoli Enterprise Portal GUI
 TEMS: Tivoli Enterprise Management Server
 TOM: Tivoli OMEGAMON Manager
 TDW: Tivoli Data Warehouse
 PDS: Persistent Data Store
 NMI: Network Management Interface API
 SPA: Symmetrization and Pruning agent
 Proxy: Tivoli Proxy Agent for TDW
 TCR: Tivoli Comm on Reporter

Technotes

OMEGAMON XE for Mainframe Network v5.1.1 GA technote:
<https://ibm.biz/BdxknT>

High Availability z/OS Hub TEMS support Technote
<http://www-01.ibm.com/support/docview.wss?uid=swg21326770>

Troubleshooting no data conditions on the OMEGAMON Enhanced 3270 User Interface
<http://www-01.ibm.com/support/docview.wss?uid=swg21610269>

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Technotes

OMEGAMON XE for Mainframe Network v5.1.1 GA technote:
<https://ibm.biz/BdxknT>

High Availability z/OS Hub TEMS support Technote
<http://www-01.ibm.com/support/docview.wss?uid=swg21326770>

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Community, Forum, Wiki

OMEGAMON XE for Mainframe Networks Community/Forum Support Site:

<http://www-01.ibm.com/software/sysmgmt/products/support/R118663G41228S30-commur>

Tivoli System z Monitoring and Application Management:

<https://www.ibm.com/developerworks/mydeveloperworks/wikis/home?lang=en#/wiki/Tivoli%20System%20z%20Monitoring%20and%20Application%20Management>

OMEGAMON XE for Mainframe Networks Wiki:

<https://www.ibm.com/developerworks/mydeveloperworks/wikis/home?lang=en#/wiki/Tivoli%20System%20z%20Monitoring%20and%20Application%20Management>

Service Management Connect:

<https://www.ibm.com/developerworks/servicemanagement/>

Product Documentation

Document library: <https://ibm.biz/Bdxknw>
Common books: <https://ibm.biz/BdxknU>

IBM Tivoli OMEGAMON XE for Mainframe Networks:
Planning and Configuration Guide, **SC27-4447**
Enhanced 3270 User Interface Guide, **SC27-4450**
Tivoli Enterprise Portal User's Guide, **SC27-4446**
Troubleshooting Guide, **SC27-4448**
Parameter Reference, **SC27-4449**

IBM Tivoli OMEGAMON XE and Tivoli Management Services on z/OS:
Common Planning and Configuration Guide: **SC23-9734**

IBM Tivoli OMEGAMON XE and Tivoli Management Services: Enhanced
3270 User Interface Guide: **SC22-5426**