



Tivoli Monitoring

Tips on Monitoring and Managing your z/VM and Linux on System z

Session 9152

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Tivoli software



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 - ▶ Kevin Yash



Agenda

- Why is it needed?
 - ▶ New work loads
 - ▶ New monitoring needs
- Brief Product Overview
 - ▶ VM Performance overview
 - ▶ A monitoring infrastructure – ITM
- System Tips
- Monitoring Scenario
- Additional Product Integration

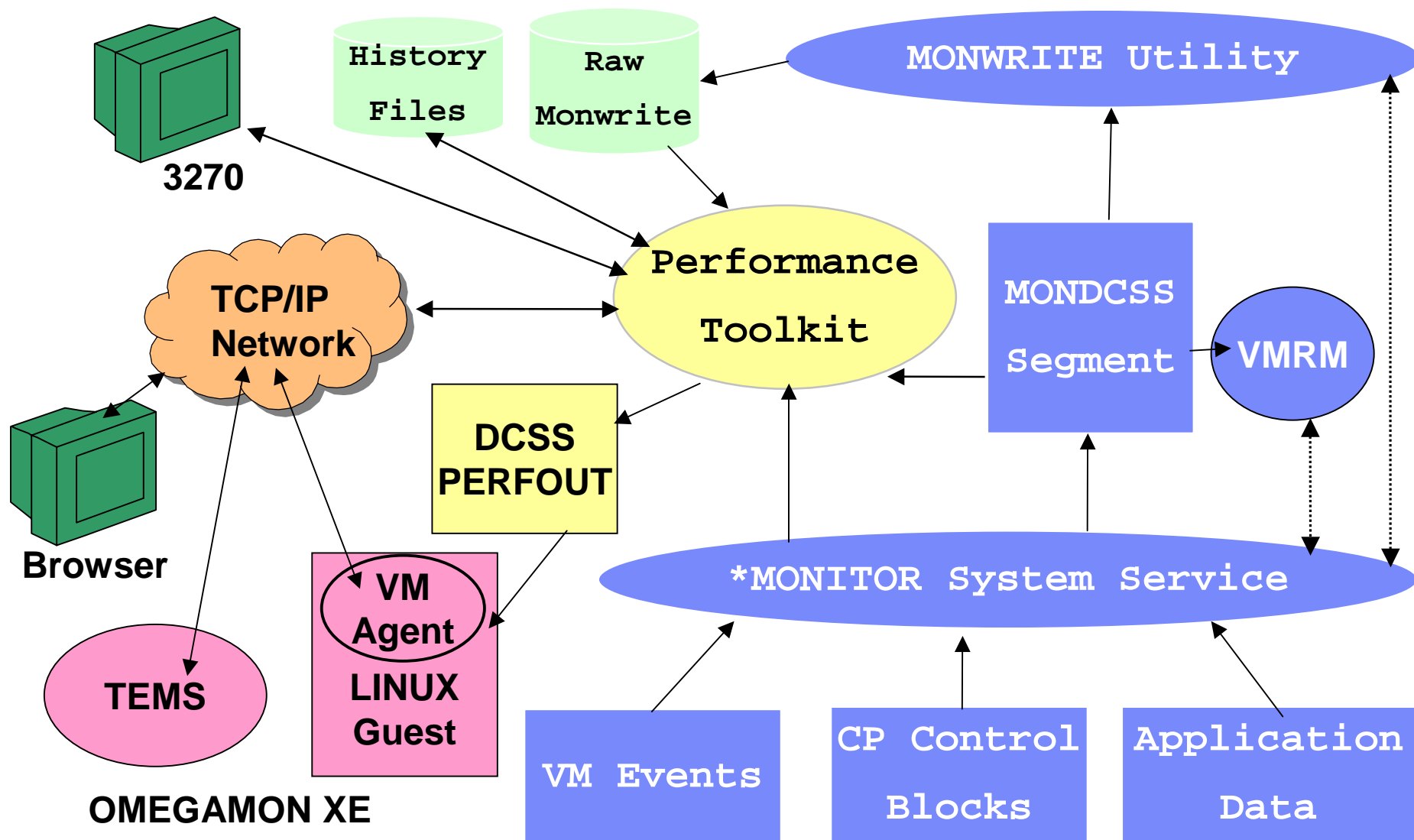


Opportunity

- New workload
 - ▶ Linux on zSeries/System z
 - ▶ WAS, DB2, Oracle, Java
- Performance
 - ▶ Real and Virtual resources
 - ▶ Monitoring needs
 - ▶ Managing needs
- Need to be able to do Systems management
 - ▶ Suite of products
 - OMEGAMON XE on z/VM and Linux
 - Operations Manager for z/VM
 - Tape Manager for z/VM
 - Backup and Restore Manager for z/VM
 - Archive Manager for z/VM



z/VM Performance Overview - 5,000 Foot View



z/VM Performance Toolkit Overview

- Full-Screen operator console (FCON)
- Real Time performance monitor capability for z/VM.
 - ▶ CPU Performance
 - ▶ Storage Utilization
 - ▶ Channel, I/O Device Performance
 - ▶ Detailed I/O Analysis
 - ▶ Detailed User Performance data
 - ▶ TCP/IP Server Performance
 - ▶ Linux Performance data
- 3270 interface, with ability to exploit GDDM graphics.
- Web server capability.
- Ability to customize screens.
- Some integration with other platform monitors (Linux).



B - GDLMV7 - [32 x 80]

FCX124

Performance Screen Selection (FL520 VM63967)

GDLMV7

General System Data

1. CPU load and trans.
2. Storage utilization
3. Reserved
4. Priv. operations
5. System counters
6. CP IUCV services
7. SPOOL file display*
8. LPAR data
9. Shared segments
- A. Shared data spaces
- B. Virt. disks in stor.
- C. Transact. statistics
- D. Monitor data
- E. Monitor settings
- F. System settings
- G. System configuration
- H. VM Resource Manager
- I. Exceptions
- K. User defined data*

I/O Data

11. Channel load
12. Control units
13. I/O device load*
14. CP owned disks*
15. Cache extend. func.*
16. DASD I/O assist
17. DASD seek distance*
18. I/O prior. queueing*
19. I/O configuration
- 1A. I/O config. changes

User Data

21. User resource usage*
22. User paging load*
23. User wait states*
24. User response time*
25. Resources/transact.*
26. User communication*
27. Multitasking users*
28. User configuration*
29. Linux systems*

History Data (by Time)

31. Graphics selection
32. History data files*
33. Benchmark displays*
34. Correlation coeff.
35. System summary*
36. Auxiliary storage
37. CP communications*
38. DASD load
39. Minidisk cache*
- 3A. Storage mgmt. data*
- 3B. Proc. load & config*
- 3C. Logical part. load
- 3D. Response time (all)*
- 3E. RSK data menu*
- 3F. Scheduler queues
- 3G. Scheduler data
- 3H. SFS/BFS logs menu*
- 3I. System log
- 3K. TCP/IP data menu*
- 3L. User communication
- 3M. User wait states

Pointers to related or more detailed performance data
can be found on displays marked with an asterisk (*).

Select performance screen with cursor and hit ENTER

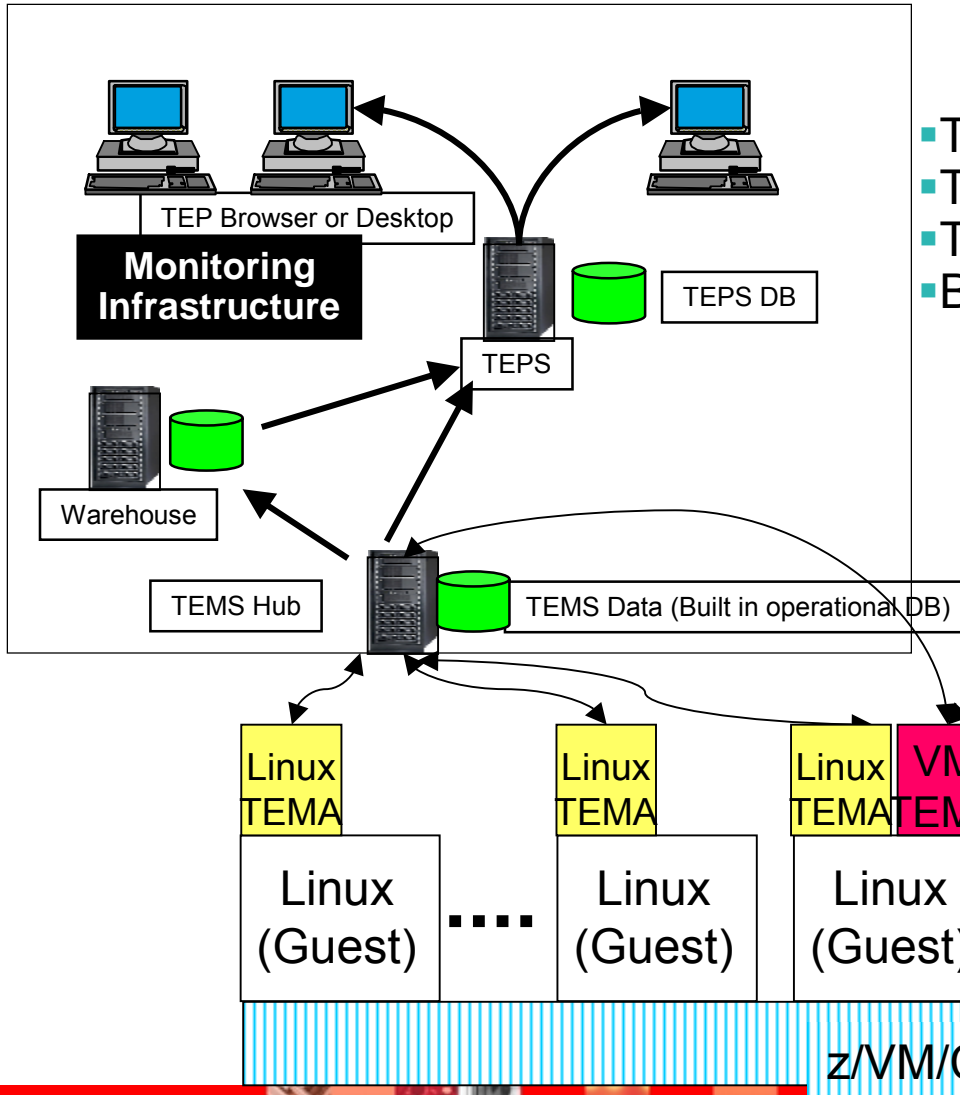
Command ===> _____

F1=Help F4=Top F5=Bot F7=Bkwd F8=Fwd F12=Return

M b

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OMEGAMON XE on z/VM and Linux agents



- There are 2 types of agents
- There is one z/VM agent per z/VM LPAR
- There is one Linux agent per Linux Guest
- Both types run on Linux

Tivoli Enterprise Portal

Improve your ability to Diagnose and Resolve Problems

Navigation Tree

Intelligent Linking

Selectable Chart Options

View Zoom

Splitter controls

UNIX Run Time

Process	Run Time
EE05MS	~4.5
EE0R	~1.5
EE0RN	~1.5
EE0MN	~1.5
EE0NS	~1.5
EE0MSS	~5.5
EE0ASR1	~1.5
EE0AGR2	~1.5

CPU Times

Process	User CPU Time	System CPU Time
EE05MS	~3.0	~0.5
EE0R	~1.0	~0.5
EE0RN	~1.0	~0.5
EE0MN	~1.0	~0.5
EE0NS	~1.0	~0.5
EE0MSS	~2.5	~0.5
EE0ASR1	~1.0	~0.5
EE0AGR2	~1.0	~0.5

OS/390 UNIX Processes for WebSphere

MVS Status	Process Status	Execution State	Process ID	Parent Process ID	Leader Session ID	Process Group	Foreground Pro
Normal	Multiple_Tasks_In_Process_+_P3rea	Running_not_in_kernel_wait	58452921	1	50482921	50482921	
Normal	Multiple_Tasks_In_Process_+_P3rea	Running_not_in_kernel_wait	33885615	1	33885615	33885615	
Normal	Multiple_Tasks_In_Process_+_P3rea	Running_not_in_kernel_wait	58452932	1	50482932	50482932	
Normal	Multiple_Tasks_In_Process_+_P3rea	Running_not_in_kernel_wait	33885672	1	33885672	33885672	
Suspended_Out	Multiple_Tasks_In_Process_+_P3rea	Running_not_in_kernel_wait	1690482	1	1690482	1690482	
Suspended_Out	Multiple_Tasks_In_Process_+_P3rea	Running_not_in_kernel_wait	33885727	1	33885727	33885727	
Normal	Multiple_Tasks_In_Process_+_P3rea	Running_not_in_kernel_wait	1690519	1	1690519	1690519	
Normal	Multiple_Tasks_In_Process_+_P3rea	Running_not_in_kernel_wait	58452988	1	50482988	50482988	

Situations

- A situation describes one or more conditions that you want to test
 - ▶ Each condition compares a user-specified value against attribute data collected from managed systems
- If all conditions are met, the situation evaluates to true and an alert indicator icon appears on the TEP to let you know that a problem exists
- When you create a situation, you can also specify automated responses to take place when the situation becomes true (Take Action)
- Each management agent comes with a set of pre-defined situations that can be set to start running as soon as the management agent is connected



Workspaces to Manage z/VM and Linux

z/VM

- **Processors**
- **SYSTEM Utilization, spinlocks**
- **Workload**
 - ▶ Linux Appldata
 - ▶ Scaled & total CPU values
- **LPAR Utilization**
- **PAGING and SPOOLING Utilization**
- **DASD**
- **Minidisk Cache**
- **Virtual Disks**
- **Channels**
- **CCW Translation**
- **REAL STORAGE Utilization**
- **NETWORK Utilization (Hiper Socket and Virtual Switch)**
- **TCPIP Utilization – Server**
- **TCPIP Utilization - Users**

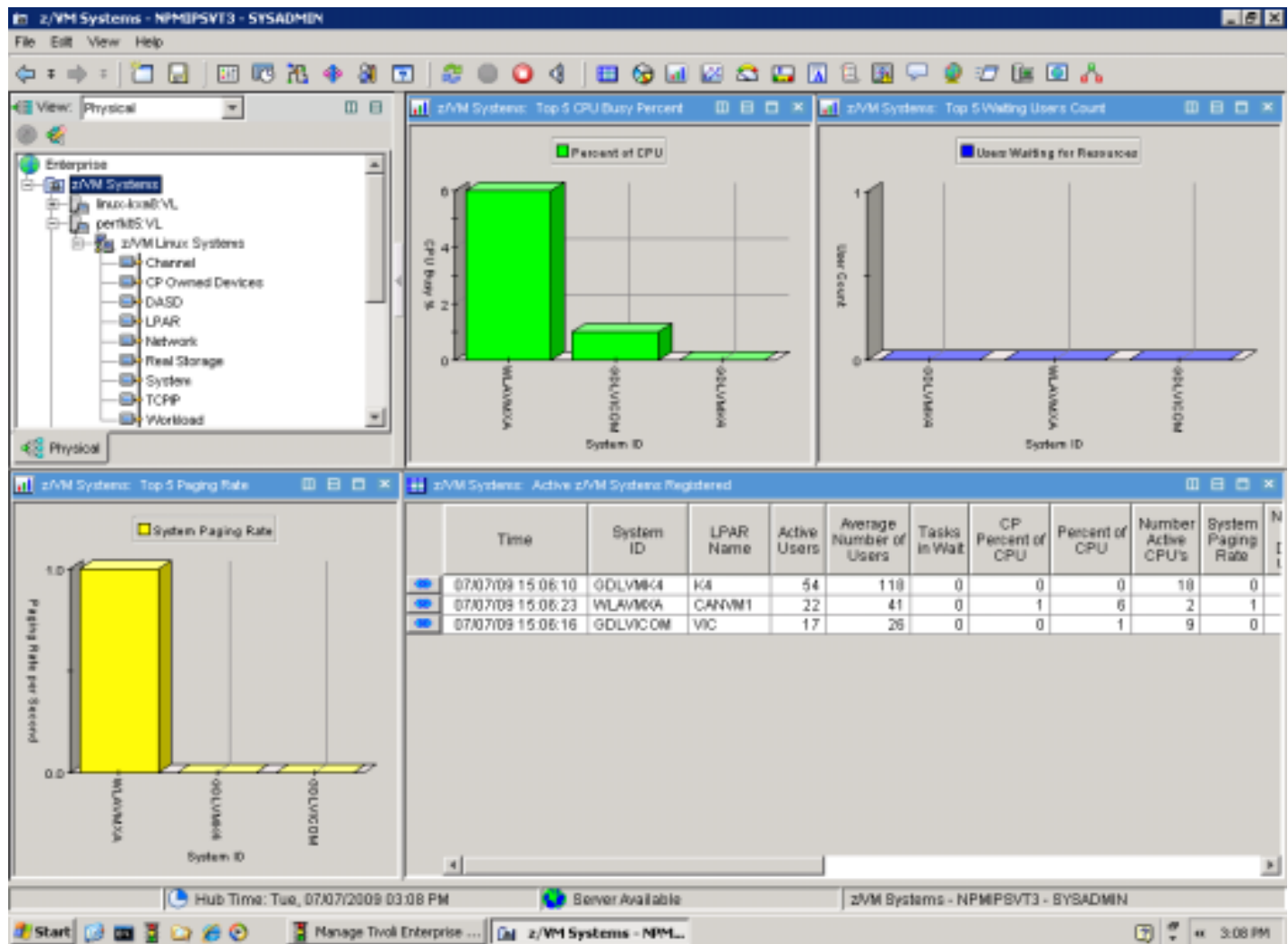
Linux

- **Linux OS**
- **System Information**
 - ▶ CPU aggregation
 - ▶ Virtual Memory Statistics
- **Process**
- **Users**
- **Disk Usage**
- **File Information**
- **Network**



Tips—Overall Health of Your System

At a quick glance you can see the %CPU usage, number of users in a wait state, and paging rates of all your z/VM systems



Tips—Overall Health of Your System

- Things to look for
 - ▶ CPU usage
 - Is any one system using more CPU than expected
 - Is any one system using less CPU than expected—you may have an underutilized processor and be wasting capacity
 - Remember, a DEDICATED processor will show 100%
 - ▶ Users waiting for resources
 - Number of users at the end of the monitoring interval who are either in:
 - Eligible list—waiting to enter the dispatch list
 - Nondispatchable
 - Waiting for paging
 - Waiting for I/O completion
 - Dispatchable
 - Waiting for a processor

Tips—Overall Health of Your System

- Things to look for
 - ▶ System paging rate
 - Number of page reads per second
 - Not a complete indicator of your paging effectiveness, but a good first glance
 - If the rate is low, and you don't have many users waiting for paging to complete (dispatch list), then you don't have a problem
 - If rate is low and you DO have many users in dispatch list, it may be an indication of a paging problem.
 - High dispatch list number could be for other reasons such as I/O contention. You need to check.
 - If the rate is high, then you may need to tune your paging subsystem.
 - High and low are relative. You need to keep historical data so you can tell when your rate has changed dramatically.

Tips—CP Owned Volumes

One place to check to see if you need to add more space on your CP-Owned volumes

The screenshot displays the 'CP Owned Devices - NPMPSVT3 - SYSADMIN' interface. It includes several monitoring panels:

- Paging and Spooling Space:** A bar chart comparing Allocation (yellow) and Available Slots (blue) across various devices.
- Top 5 Page Extent Utilization:** A bar chart showing device percent full for devices like zovapn, j04e0f, j04e0t, and j04e0b.
- Top 5 Dump Extent Utilization:** A bar chart showing device percent full for device j04e00a.
- Top 5 Spool Extent Utilization:** A bar chart showing device percent full for devices j04e00a, j04e00b, j04e00c, j04e00d, and j04e00e.
- CP Device Table (Paging and Spooling):** A table with columns for Time, System ID, LPAR Name, Device VOLSER, Device Address, PAGING SPOOLING, Allocation, Available Slots, Device Type, Device Extent, Device Percent Full, Device Start Extent, and Device Slots Used.

Time	System ID	LPAR Name	Device VOLSER	Device Address	PAGING SPOOLING	Allocation	Available Slots	Device Type	Device Extent	Device Percent Full	Device Start Extent	Device Slots Used
07/07/09 15:09:09	GDLVMK4	K4	K4FBA2	0201	T-DISK	11247	1405	9336	11250	0	4	0
07/07/09 15:09:09	GDLVMK4	K4	K44EBA	4EBA	T-DISK	10016	1009620	3398	10016	44	1	793260
07/07/09 15:09:09	GDLVMK4	K4	K44E8D	4E8D	SPOOLING	10016	1189980	3398	10016	34	1	812900
07/07/09 15:09:09	GDLVMK4	K4	K44E8E	4E8E	PAGING	10016	1730880	3398	10016	4	1	72800
07/07/09 15:09:09	GDLVMK4	K4	K44E8F	4E8F	SPOOLING	5016	334080	3398	5016	83	1	568800
07/07/09 14:09:09	GDLVMK4	K4	K44E8F	4E8F	PAGING	4000	816000	1308	10016	0	4017	81600

Tips—CP Owned Volumes

- CP-Owned Volumes
 - ▶ Consist of
 - Page, Spool, Tdisk, Directory and Dump (subset of spool)
 - ▶ Considerations
 - Page
 - Are my volumes getting full—do I need to add more
 - Is my paging spread out sufficiently
 - Spool
 - Used mainly for Reader and Print files, Dumps and Named Saved Systems
 - If full, can I delete old spool files, or do I need more?
 - Good to have an automatic cleanup program, perhaps based on age of spool file (SFPURGER utility)

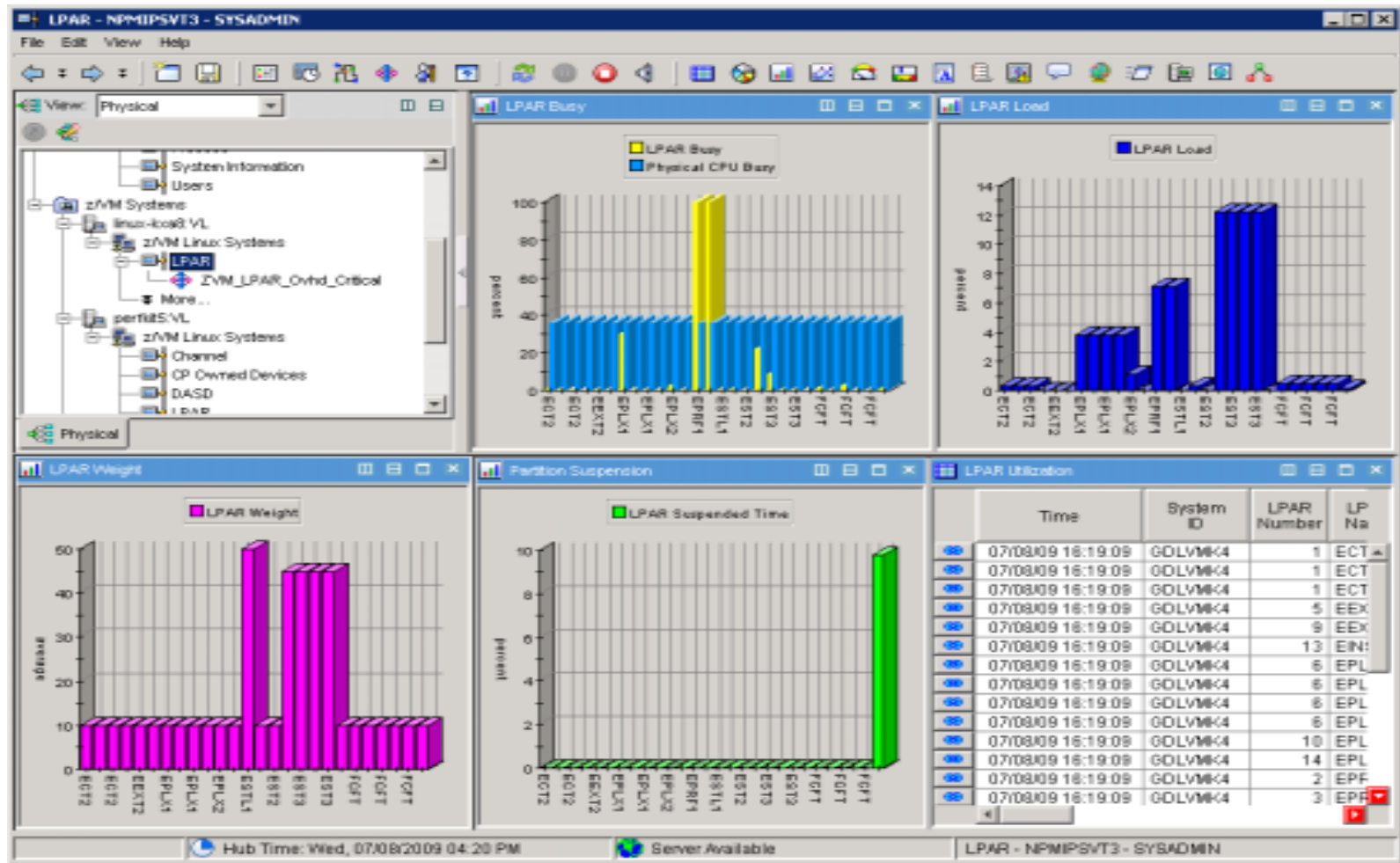
Tips—CP Owned Volumes (paging)

- General tips
 - ▶ Page space utilization should always be < 50%
 - ▶ Never put Paging and Spool space on the same volume
 - ▶ Allocate Spool and Page volumes to try and reduce I/O contention by separating them as much as possible (control unit, channel, etc)
 - ▶ Dedicated paging devices reduce contention for paging
 - ▶ Don't put highly used files on the same volume as paging and spool space, such as the CMS system disk
 - ▶ Use devices of the same size and geometry
 - ▶ Use your fastest devices for Paging
 - ▶ Multiple Paging devices allow more overlap of paging operations
 - ▶ Large contiguous free space allows for greater paging efficiency
 - ▶ Expanded storage can be used for paging



Tips—LPAR Usage

LPAR workspace allows you to look at all your LPARs across the CEC

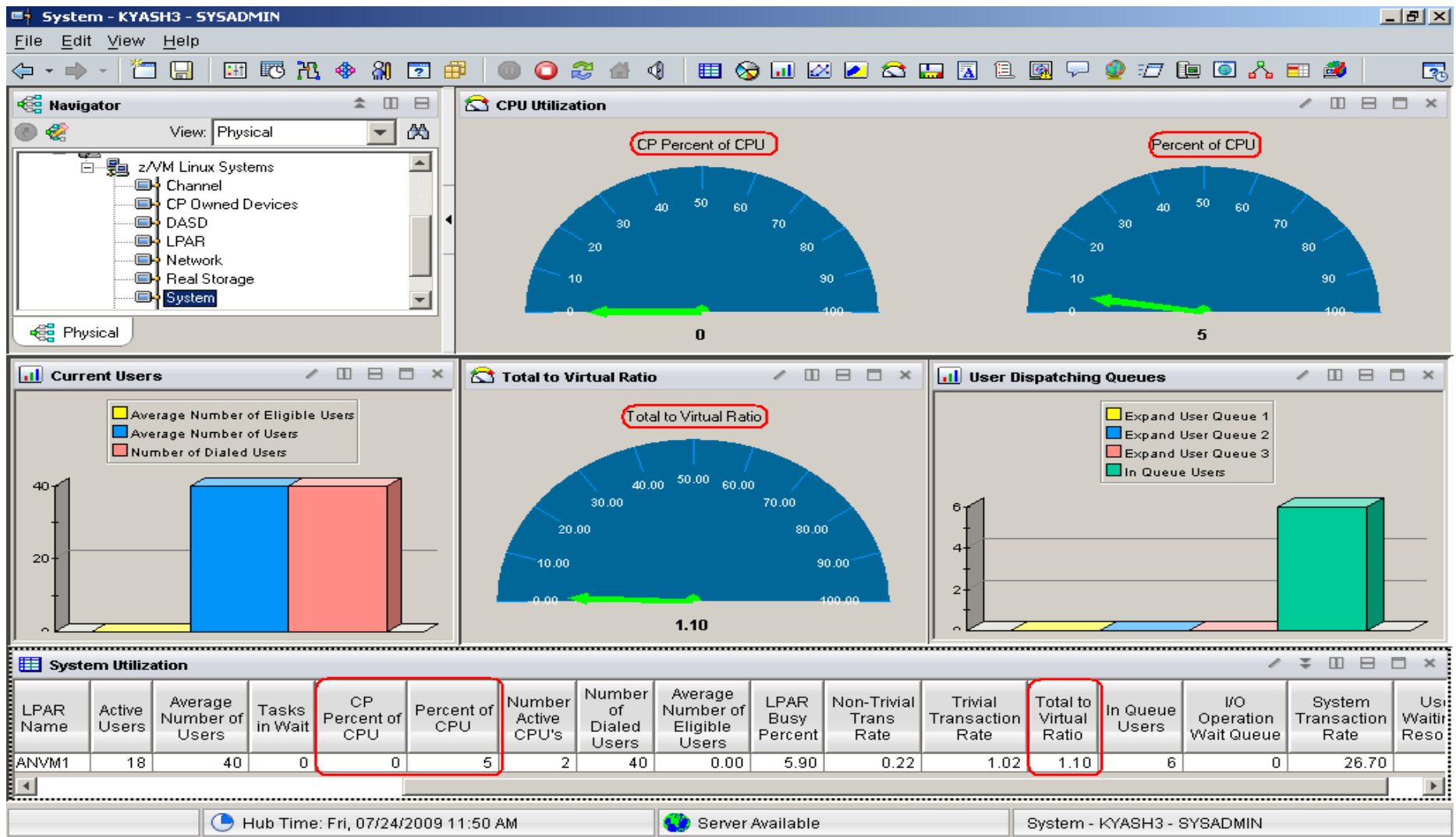


Tips—LPAR Usage

- Considerations
 - ▶ Are the LPAR weights balanced as you expected
 - ▶ Do you have an dedicated processors, and should you?
 - ▶ Do you have the right number of processors per LPAR?
 - Too few means tasks must wait for a processor
 - Multi-threaded applications can use multiple processors concurrently
 - Too many means extra overhead
 - ▶ Look at the %Busy
 - Are there some processors being underutilized?
 - Are they needed?
 - Can you shift work (virtual machines) to them
 - ▶ Look at multiple intervals, or use historical data before jumping to conclusions
 - ▶ May want to drill down to individual processors for more details



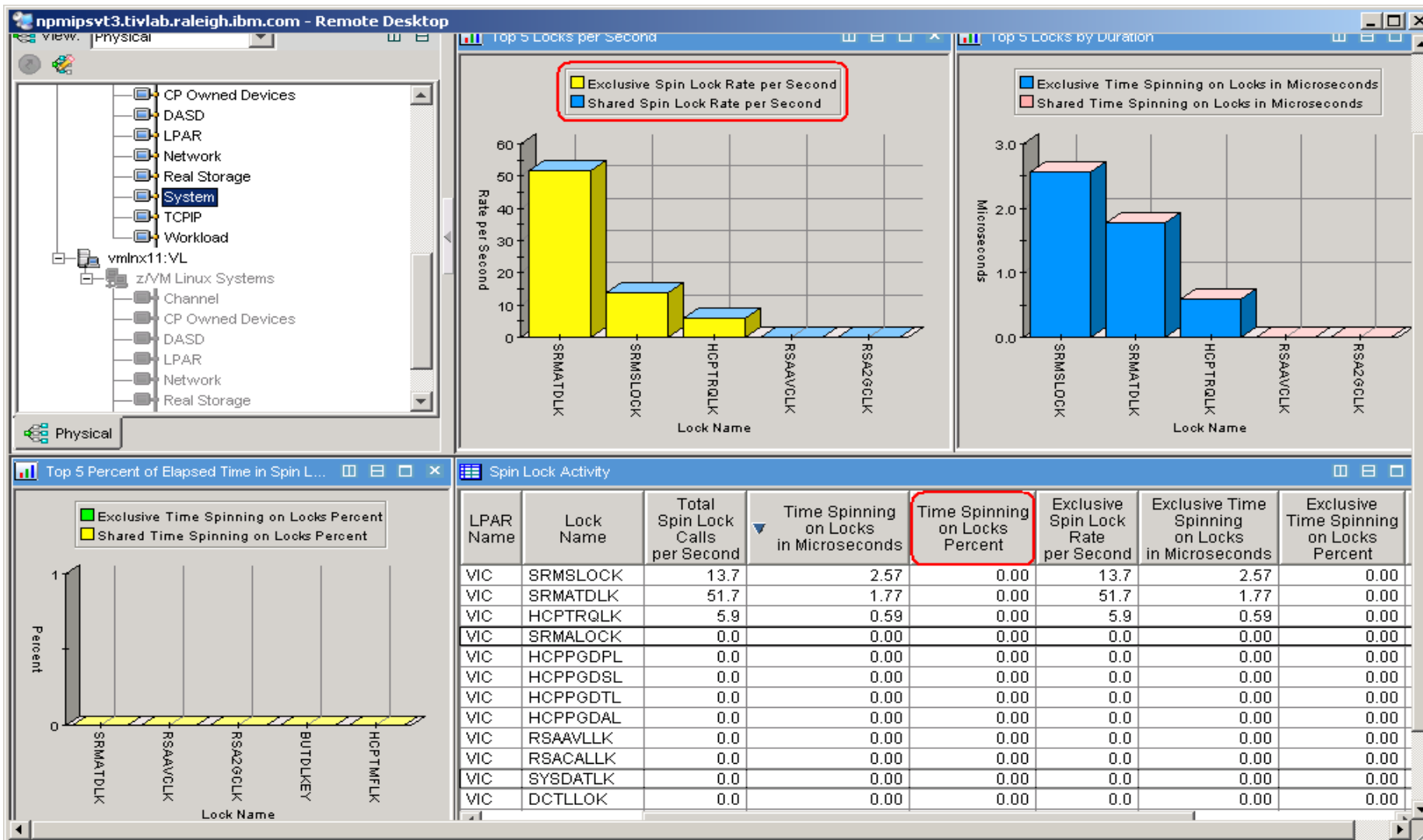
System Processor Utilization Workspace



Processor Utilization

- **Total Processor Utilization** This is the processor utilization from the VM perspective and includes CP, VM System, and Virtual CPU time.
- **System Time:** This is the processor time used by the VM control program for system functions that are not directly related to any one virtual machine. This should be less than 10% of the total.
- **CP Processor Time:** This is the processor time used by the VM control program in support of individual virtual machines.
- **Virtual Processor Time: (Emulation Time):** This is processor time consumed by the virtual machine and the applications within it.
- **Total to Virtual Ratio** The ratio of total processor time to virtual processor time is often used as an indicator of z/VM efficiency or overhead. The closer to 1.0, the better the z/VM efficiency. RoT: Should explore causes of a ratio over 1.30.

Spinlock Workspace



Spin Lock Wait

- **Time Spinning on Locks Percent:**
 - ▶ The percentage of time processors spend spinning on formal spin locks. RoT: Should be less than 10%.
 - ▶ Increases as number of logical processors increases.



VDISK Workspace

The screenshot displays the VDISK - KYASH3 - SYSADMIN interface with the following components:

- Navigator:** A tree view on the left showing the system hierarchy: Windows Systems, z/VM Systems, vmnx11-VL, z/VM Linux Systems, Channel, CP Owned Devices, DASD, LPAR, Network, Real Storage, System, TCPIP, and Workload.
- Top 5 Paging Rates per Second:** A bar chart showing paging rates for five VDISK owners: ACKERK - 0299, ANGELOM - 0700, AVATAR - 1111, BIGANG - 0700, and BRIANKT - 0700. The legend includes Pages Read from DASD per Second (yellow), Pages Stolen per Second (blue), and Pages Written to DASD per Second (red).
- Top 5 Expanded Storage Paging Rate...:** A bar chart showing expanded storage paging rates for the same five VDISK owners. The legend includes Pages to Central Storage per Second (yellow), Pages to DASD per Second (blue), and Pages from Central Storage per Second (red).
- Top 5 Pages in Use:** A bar chart showing page counts for five VDISK owners: EDLMIK14 - 06FA, EDLMIK15 - 06FA, EDLMIK23 - 06FA, EDLMIK23 - 06FA, and EDLMIK23 - 06FB. The legend includes Resident Pages (yellow), Lacked Pages (blue), Occupied Slots (green), and XSTORE Pages (red).
- Virtual Disk Activity:** A table showing activity for various VDISKs. The table has columns for Time, System ID, LPAR Name, VDISK Owner, Device Number, VDISK Size, Number of Links, Virtual I/O's per Second, Pages Stolen per Second, and Pa: fro pe ±.

Time	System ID	LPAR Name	VDISK Owner	Device Number	VDISK Size	Number of Links	Virtual I/O's per Second	Pages Stolen per Second	Pa: fro pe ±
04/06/09 23:35:51	GDLVM7	GDLVM7	ACKERK	0299	100,000	1	0.00	0.00	
04/06/09 23:35:51	GDLVM7	GDLVM7	ANGELOM	0700	7,000,000	1	0.00	0.00	
04/06/09 23:35:51	GDLVM7	GDLVM7	AVATAR	1111	4,000,000	1	0.00	0.00	
04/06/09 23:35:51	GDLVM7	GDLVM7	BIGANG	0700	7,000,000	1	0.00	0.00	
04/06/09 23:35:51	GDLVM7	GDLVM7	BRIANKT	0F00	1,440,000	1	0.00	0.00	
04/06/09 23:35:51	GDLVM7	GDLVM7	CORAKR	05FF	10,000,000	1	0.00	0.06	
04/06/09 23:35:51	GDLVM7	GDLVM7	CORAK2	05FF	20,000	1	0.00	0.00	
04/06/09 23:35:51	GDLVM7	GDLVM7	CRASTDA	0999	4,000,000	1	0.00	0.01	
04/06/09 23:35:51	GDLVM7	GDLVM7	DENISE	1111	4,000,000	1	0.00	0.00	
04/06/09 23:35:51	GDLVM7	GDLVM7	DENISE	020E	5,000,000	1	0.00	0.00	
04/06/09 23:35:51	GDLVM7	GDLVM7	DENISE2	1111	4,000,000	1	0.00	0.00	

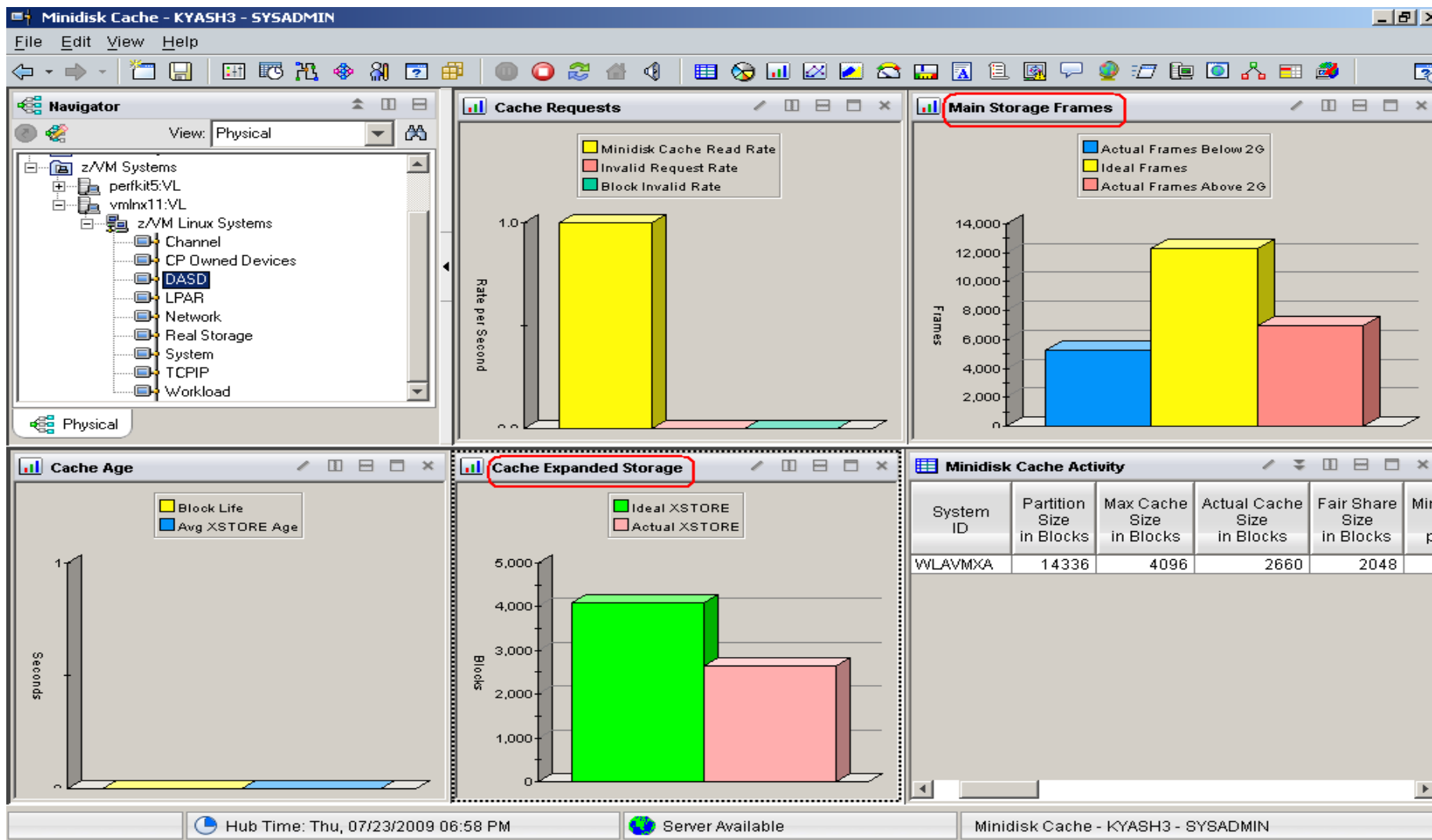
Hub Time: Mon, 04/06/2009 11:38 PM Server Available VDISK - KYASH3 - SYSADMIN

VDISK

- What is it?
 - ▶ FBA (Fixed Block Architecture disk) device emulated in-memory
 - Translation: Very fast “device”.
 - ▶ High performance paging device for Linux on z.
 - ▶ Memory is allocated by CP from the Dynamic Paging Area
 - ▶ Allocated only when referenced
 - Allocating a 10 MB device does NOT instantly consume 10 MB of pages.
 - Pages are allocated when needed.
 - ▶ Not recommended in a storage-constrained z/VM system.



OMEGAMON MDISK Cache Allocations



Minidisk Cache

- z/VM minidisk cache is a write-through cache:
 - ▶ Improves read I/O performance.
 - ▶ But it's not free.
- Not recommended for:
 - ▶ Memory constrained systems.
 - ▶ Linux swap file disks.
- Default system settings are less than optimal.
- Recommended settings:
 - ▶ Eliminate MDC in expanded storage.
 - **SET MDC XSTORE 0M 0M**
 - ▶ Limit MDC in central storage – 10% is a good starting point.
 - **SET MDC STORE 0M 256M**
 - ▶ Monitor with OMEGAMON XE and/or the Q MDC command.



DASD I/O Workspace

The screenshot displays the DASD I/O Workspace interface with the following components:

- Navigator:** Shows a tree view of z/VM Systems, including perkit5:VL, vmlnx11:VL, and z/VM Linux Systems. The DASD component is highlighted.
- Top 5 Device Busy:** A bar chart showing the percentage of busy devices. A red box highlights the legend 'Percent Busy'.
- Top 5 I/O Rate:** A bar chart showing the number of I/O operations per second for the top 5 devices.
- Top 5 Servi...:** A stacked bar chart showing connection, disconnect, and pending times. A callout box indicates '0.40 (VMCD02)'.
- Top 5 I/O...:** A bar chart showing the average queued I/O for the top 5 devices.
- DASD I/O Activity:** A table listing DASD devices and their performance metrics. A red box highlights the 'Average Service Time' column.

Volume Serial Number	Device Address	Device Type	Connection Time	Percent Busy	Average Queued IO	Average Service Time	Number IO per Second	Average Disconnect Time
VM54SP	5A1A	3390	0.60	0	0.00	0.90	3	0.00
VM54RS	5AE9	3390	0.50	0	0.00	0.80	0	0.00
VMSL51	5A57	3390	0.40	0	0.00	0.70	0	0.00
VMSL54	5A5A	3390	0.30	0	0.00	0.70	0	0.00
VMSL50	5A56	3390	0.30	0	0.00	0.70	0	0.00
VM53PA	5A08	3390	0.40	0	0.00	0.70	0	0.00
VMCD02	5A04	3390	0.40	0	0.00	0.70	0	0.00
VMSL53	5A59	3390	0.30	0	0.00	0.70	0	0.00
VMCD05	5A3A	3390	0.30	0	0.00	0.60	0	0.00
VMSLHC	5A39	3390	0.30	0	0.00	0.60	0	0.00
VM54GS	5A35	3390	0.30	0	0.00	0.60	0	0.00

Direct Access Storage Devices (DASD)

- **Avg Pending Time for DASD**

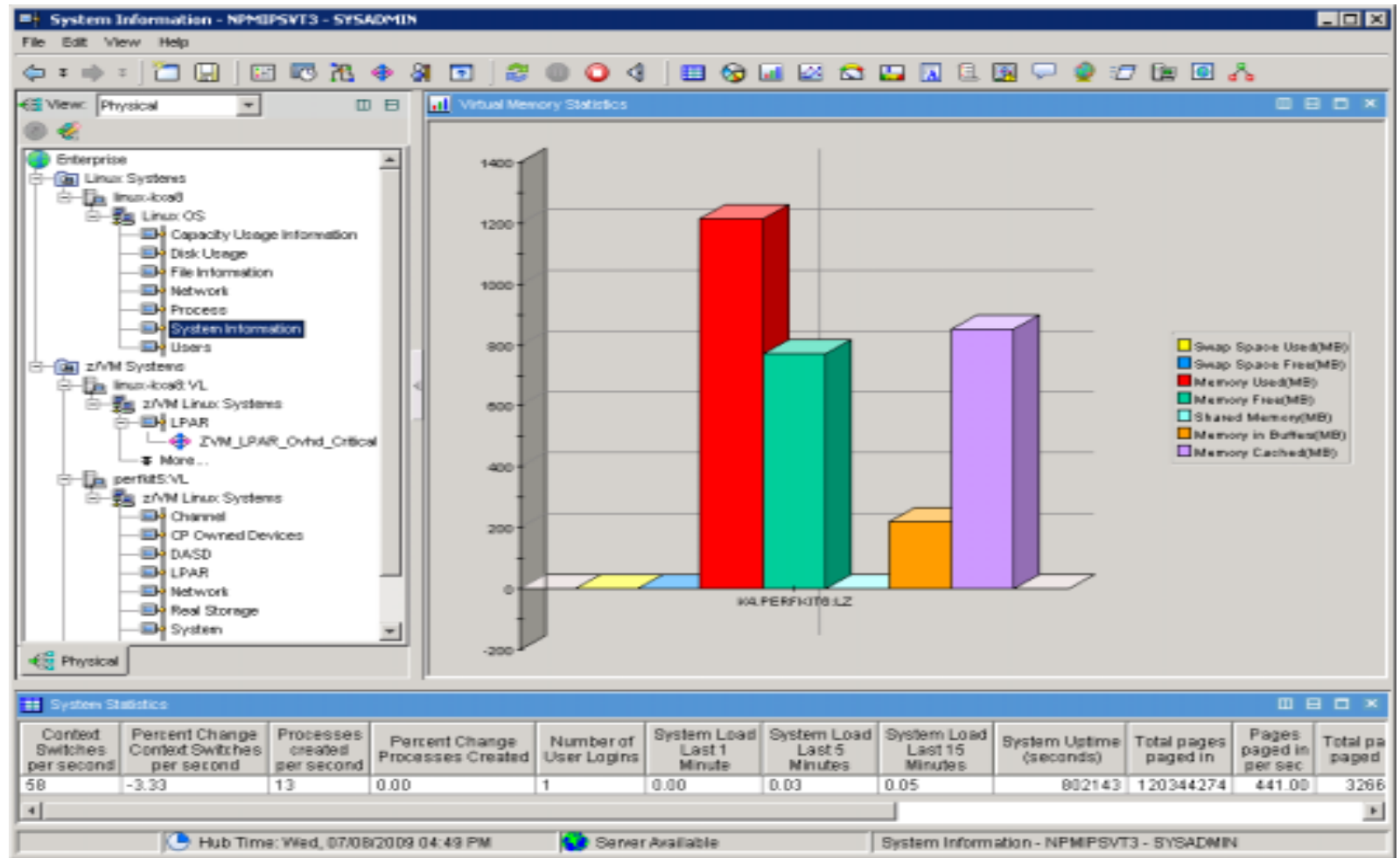
- ▶ Average pending time for real DASD I/Os. RoT: Should be less than 1 millisecond.

- Items worth keeping an eye on:

- ▶ **Number of I/O's per Second, Percent Busy**
- ▶ **Avg Service Time** Average service time for real DASD devices (sum of the pending, connect, and disconnect times).
- ▶ **DASD I/O Rate** Rate of traditional real I/Os per second to real DASD devices. Worth monitoring.

Sizing Linux Guests

Memory usage of a particular Linux virtual machine



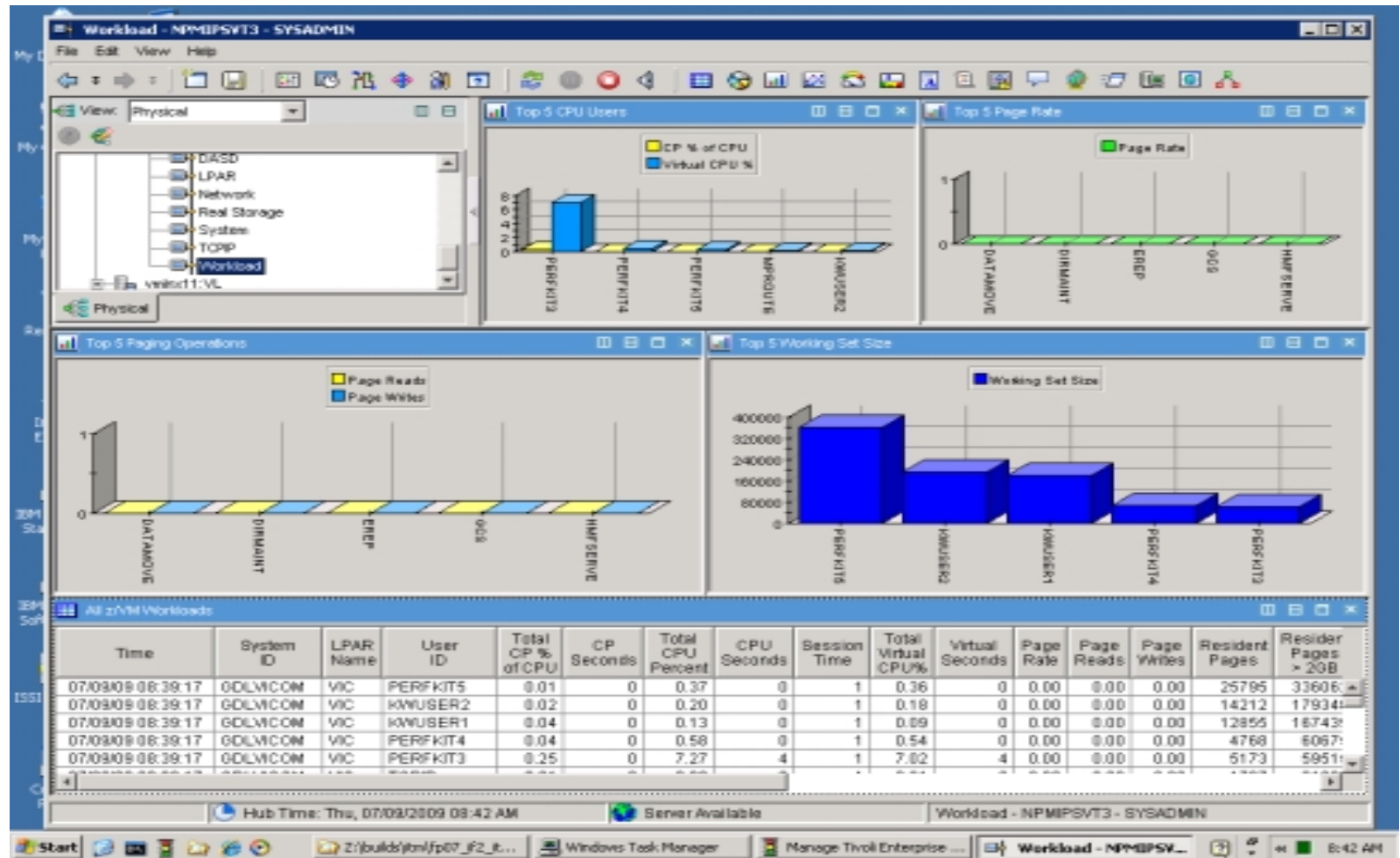
Sizing Linux Guests

- Considerations
 - ▶ Don't define more virtual processors than you have logical processors
 - ▶ More memory is not always better
 - Linux will use all available memory
 - Any space it doesn't need will be used as file buffer cache. Notice the large amount of cache used in example—indicates that guest may be sized too large
 - Larger Linux guests means that z/VM has to swap out larger virtual machines when running other guests
 - One method—use monitor to watch for swapping. Shrink guest size until it starts swapping.
 - Another method. Look at the Working Set Size for the Virtual Machine. This shows what z/VM is using for the guest. May still be too large if storage is used for cache
 - To handle some swapping, define a Vdisk. This is much faster than swapping to a real device



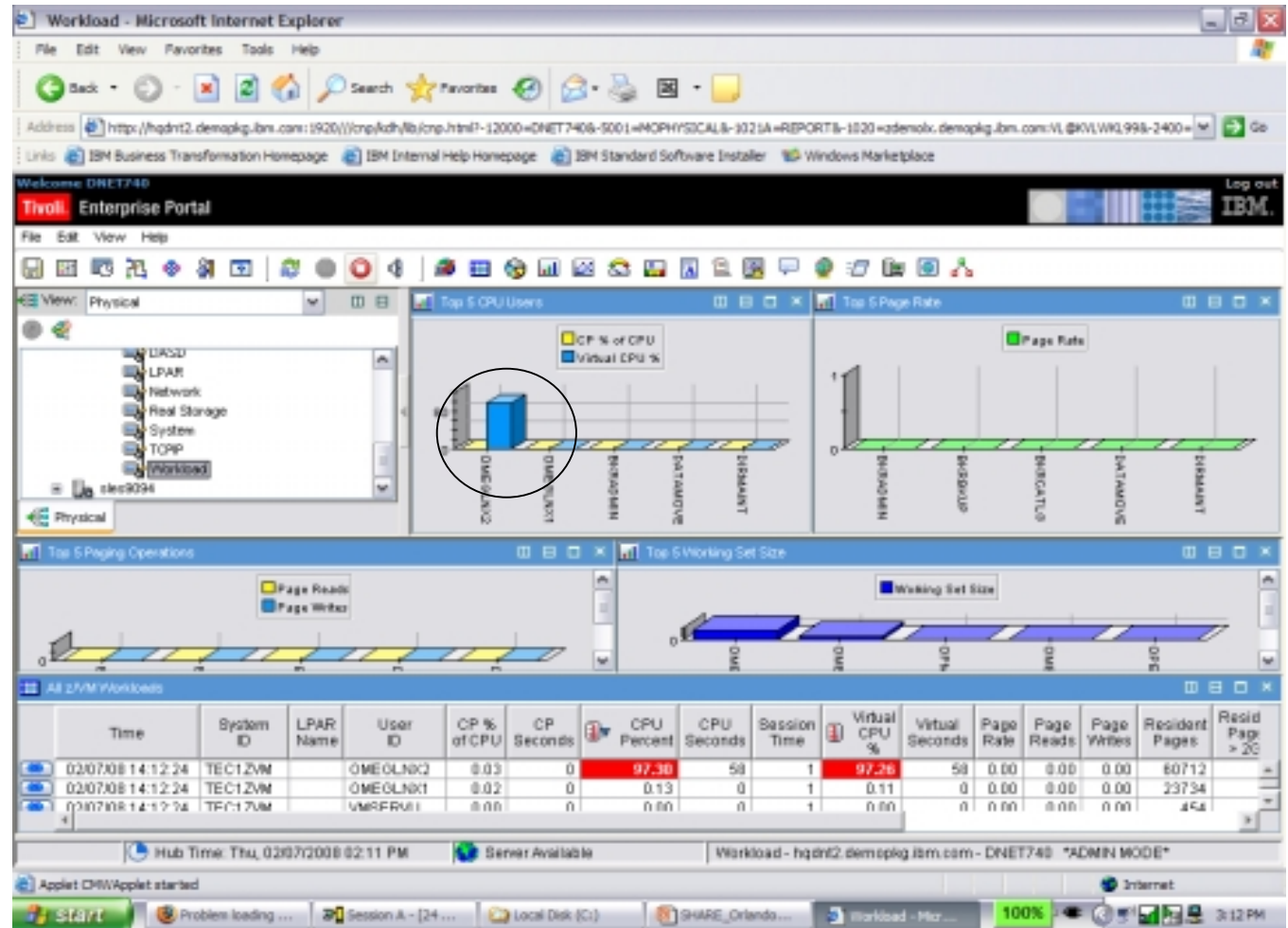
Sizing Linux Guests

Working Set Size can be found on the Workload workspace of the z/VM agent



Scenario—System Running Slowly

System is running slowly. Check Workload workspace to see if any particular user is hogging the CPU.



Scenario—System Running Slowly (cont)

Predefined Link to take You directly To the Process workspace

The screenshot shows the Tivoli Enterprise Portal interface. On the left, a tree view shows the system hierarchy with 'Workload' selected. The main area displays several performance charts: 'Top 5 CPU Users', 'Top 5 Page Rate', 'Top 5 Paging Operations', and 'Top 5 Working Set Size'. A table at the bottom lists system processes with columns for User ID, CP % of CPU, CP Seconds, CPU Percent, CPU Seconds, Session Time, Virtual CPU %, Virtual Seconds, Page Rate, Page Reads, Page Writes, Resident Pages, and Resident Pages + 206. A context menu is open over the table, with 'Process link' highlighted and circled. The status bar at the bottom shows 'Hub Time: Thu, 02/07/2008 05:10 PM' and 'Server Available'.

User ID	CP % of CPU	CP Seconds	CPU Percent	CPU Seconds	Session Time	Virtual CPU %	Virtual Seconds	Page Rate	Page Reads	Page Writes	Resident Pages	Resident Pages + 206
02/07/08 17:10:24 TEC1ZVM OMEGLN02	0.01	0	78.50	47	1	78.48	47	0.00	0.00	0.00	60726	0
02/07/08 17:10:24 TEC1ZVM OMEGLN01	0.02	0	0.12	0	1	0.09	0	0.00	0.00	0.00	23734	0
02/07/08 17:10:24 TEC1ZVM VMSERVU	0.00	0	0.00	0	1	0.00	0	0.00	0.00	0.00	454	0
02/07/08 17:10:24 TEC1ZVM TSTADMIN1	0.00	0	0.00	0	1	0.00	0	0.00	0.00	0.00	180	0

Scenario—System Running Slowly (cont)

See if there is a process which is using too much CPU

Process Command name (Unicode)	Process ID	Process Parent ID	Process State	Process System CPU (Percent)	Process User CPU (Percent)	Cumulative Process System CPU (Percent)	Cumulative Process User CPU (Percent)	Kernel Priority	Nice Value	Total Size (pages)	Residen Size (pa
stress1	11852	11851	Running	0.11	96.44	0.00	0.00	25	0	479	
ktzagent	1729	1	Sleeping	0.03	0.02	0.00	0.00	16	0	18044	
ktzagent	11447	1	Sleeping	0.04	0.01	0.00	0.00	16	0	14832	
...

Scenario—System Running Slowly (cont)

You can issue a Take Action command to stop the offending process

The screenshot displays the Tivoli Enterprise Portal interface. The main window shows a tree view of system components, with 'Process' selected. An 'Edit Action' dialog box is open, showing the configuration for a 'Kill Transaction' action. The 'Action Command' section is set to 'System Command' with the command 'kill -9 11851'. Below the dialog box, the 'Process Information Detail' table is visible, showing the following data:

Process Command name (Unicode)	Process ID	Process Parent ID	Process State	Process System CPU (Percent)	Process User CPU (Percent)	Cumulative Process System CPU (Percent)	Cumulative Process User CPU (Percent)	Kernel Priority	Nice Value	Total Size(pages)	Residen Size(pag)
stress1	11852	11851	Running	0.11	95.44	0.00	0.00	25	0	479	
ktagent	1729	1	Sleeping	0.03	0.02	0.00	0.00	16	0	18044	
ktagent	11447	1	Sleeping	0.04	0.01	0.00	0.00	16	0	14832	
...

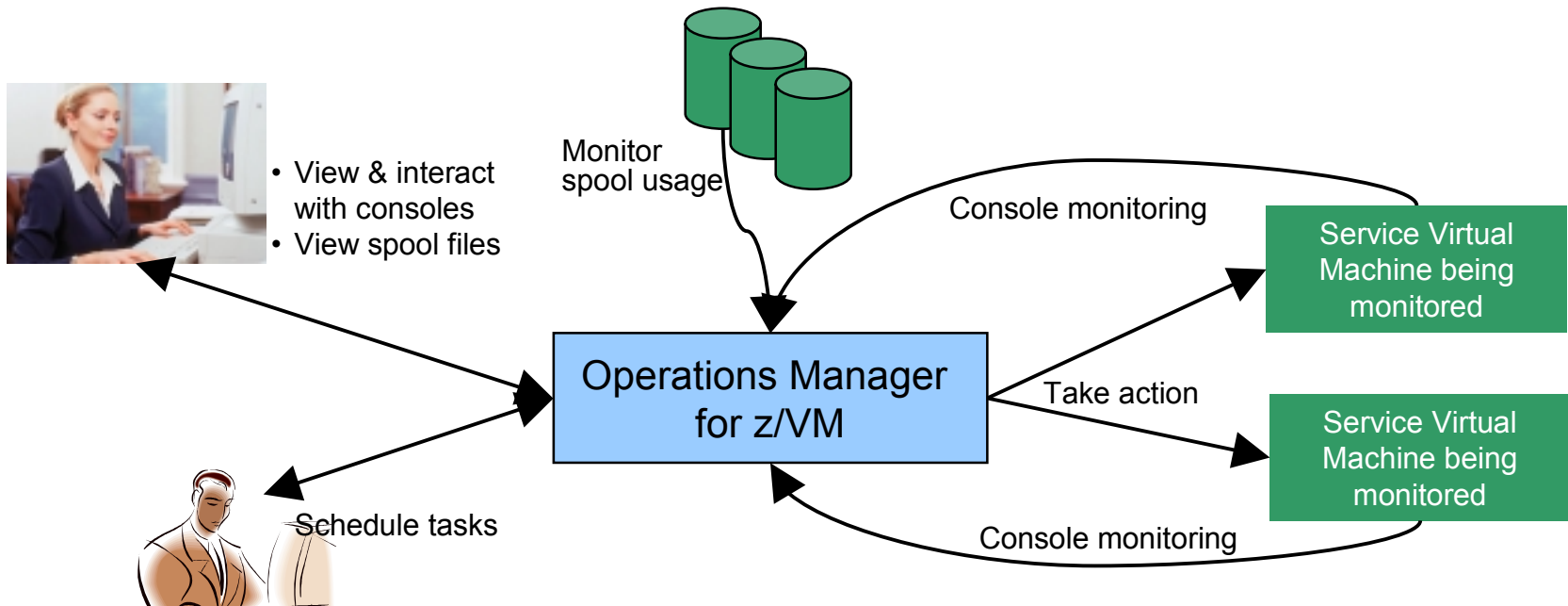
Operations Manager for z/VM

Increase productivity

- Authorized users view and interact with monitored virtual machines without logging onto them
- Multiple users view/interact with a virtual machine simultaneously

Improve system availability

- Monitor virtual machines and processes
- Take automated actions based on console messages
- Reduce problems due to operator error



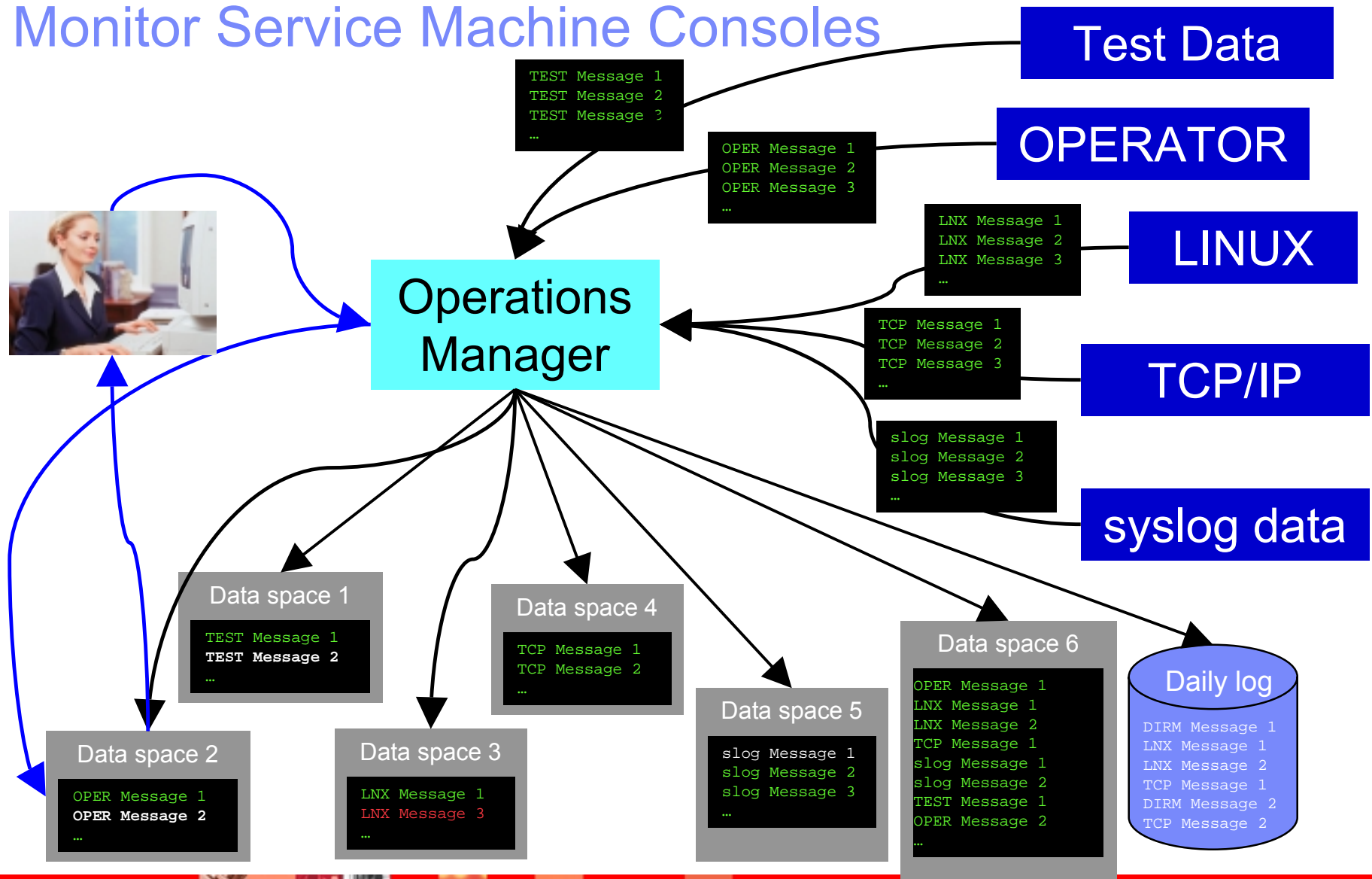
Automation

- Routine activities done more effectively with minimal operations staff
- Schedule tasks to occur on a regular basis

Integration

Fulfill take action requests from OMEGAMON XE on z/VM and Linux

Monitor Service Machine Consoles



Monitor Service Machines

- Define rules to
 - ▶ Scan console messages for text matching
 - Includes column, wildcard, and exclusion support
 - Optionally restrict to specific user ID(s)
 - ▶ Take actions based on matches
- Multiple rules can apply to one message
 - ▶ Rules processed in order of definition in the configuration file
 - ▶ FINAL option available to indicate no additional rules should be evaluated



Adjusting Resources for a Linux Guest

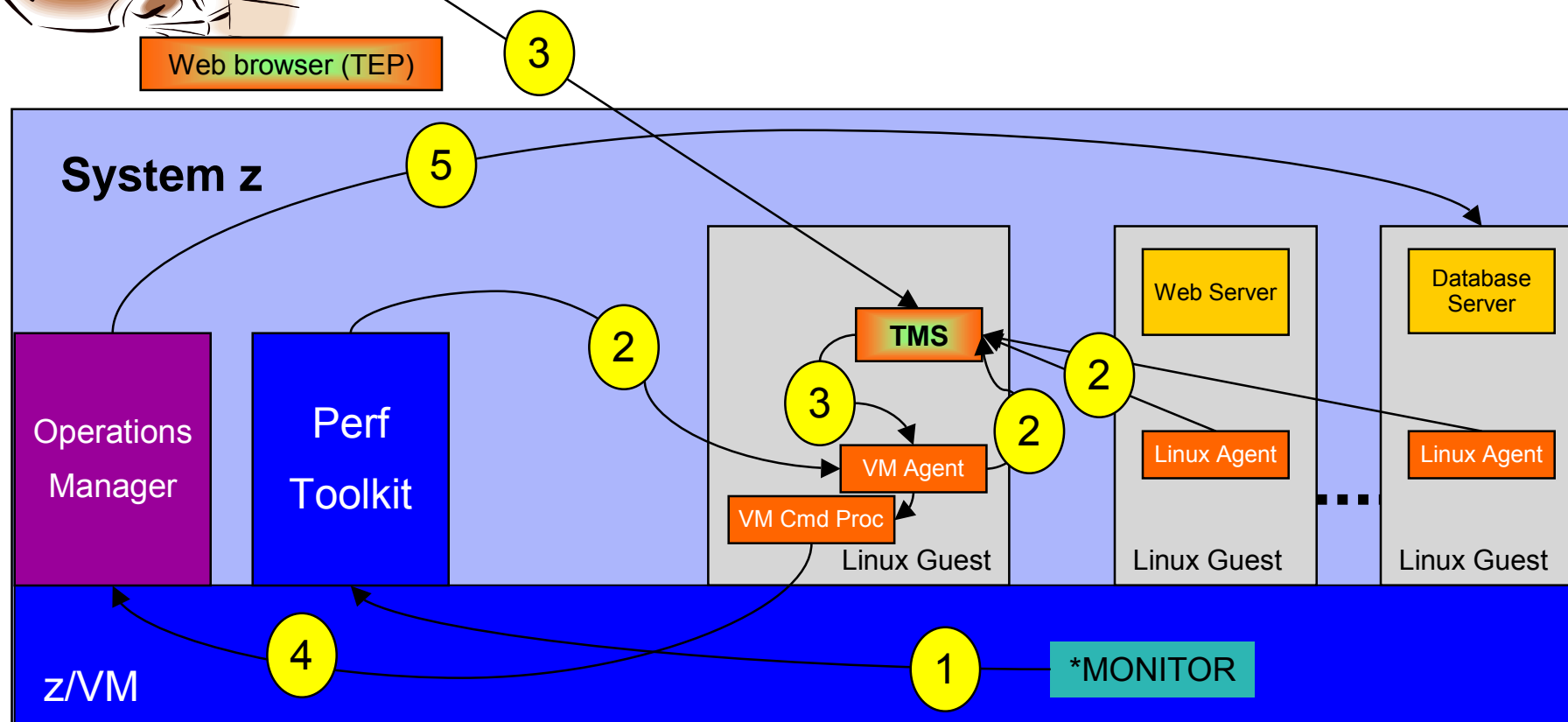
- Virtual CPU consumption is high for a Linux guest
- Detect the alert
 - ▶ Automation receives the message
- Action is triggered by a rule in Operations Manager
- Operations Manager issues CP commands to tune the guest
 - ▶ SET QUICKDSP
 - ▶ SET SHARE
- Ability to monitor the output is key



OMEGAMON XE and Operations Manager for z/VM



Process Flow



Adjusting resources for a Linux guest

The screenshot displays the Tivoli Enterprise Portal interface for monitoring a virtual machine named 'High CPU'. The interface is divided into several panels:

- Navigator:** Shows a tree view of system components, with 'High CPU' selected under 'Virtual'.
- SLPARM Process View:** A bar chart showing CPU usage for various processes. The 'Process System CPU (Percent)' is highlighted in red, and 'Process User CPU (Percent)' is highlighted in yellow.
- Event Console:** A table showing system events. One event is visible:

Severity	Status	Event	Event Name	Display Item	Total Time
Critical	Open		Demo_CPU_high		14:09:56
- Plot Chart:** A line graph showing 'Virtual CPU %' over time. The y-axis ranges from 0 to 25, and the x-axis shows dates from 08/27/08 to 09/01/08. A yellow line shows a sharp spike in CPU usage starting around 08/29/08.
- Terminal:** A text window showing system logs and commands. Key messages include:


```

08/24/2008 11:45:02 WPI - share for SLESA107 successfully changed.
08/24/2008 11:50:00 * RPO FROM OPERATOR: GUEST NEEDS CPU PRIORITY
08/24/2008 11:50:00 * RPO FROM OPERATOR: GUEST NEEDS CPU PRIORITY
08/24/2008 11:50:00 END WCPM SIGNALIST
08/24/2008 11:50:00 WCPM - changing SHARE setting for SLESA107 from 100 to 5.
08/24/2008 11:50:00 WRD SLESA107: ABSOLUTE SHARE = 5
08/24/2008 11:50:00          MAXIMUM SHARE = LIMITING ABSOLUTE 5
08/24/2008 11:50:00 WPI - share for SLESA107 successfully changed.
08/24/2008 11:58:07 * RPO FROM OPERATOR: GUEST NEEDS CPU PRIORITY
08/24/2008 11:58:07 * RPO FROM OPERATOR: GUEST NEEDS CPU PRIORITY
08/24/2008 11:58:07 END WCPM SIGNALIST
08/24/2008 11:58:07 WPI - changing SHARE setting for SLESA107 from 50 to 5.
08/24/2008 11:58:07 WRD SLESA107: ABSOLUTE SHARE = 5
08/24/2008 11:58:07          MAXIMUM SHARE = LIMITING ABSOLUTE 5
08/24/2008 11:58:07 WPI - share for SLESA107 successfully changed.
08/24/2008 11:59:52 * RPO FROM OPERATOR: GUEST NEEDS CPU PRIORITY
08/24/2008 11:59:52 * RPO FROM OPERATOR: GUEST NEEDS CPU PRIORITY
08/24/2008 11:59:52 END WCPM SIGNALIST
            
```

Operations Manager Configuration

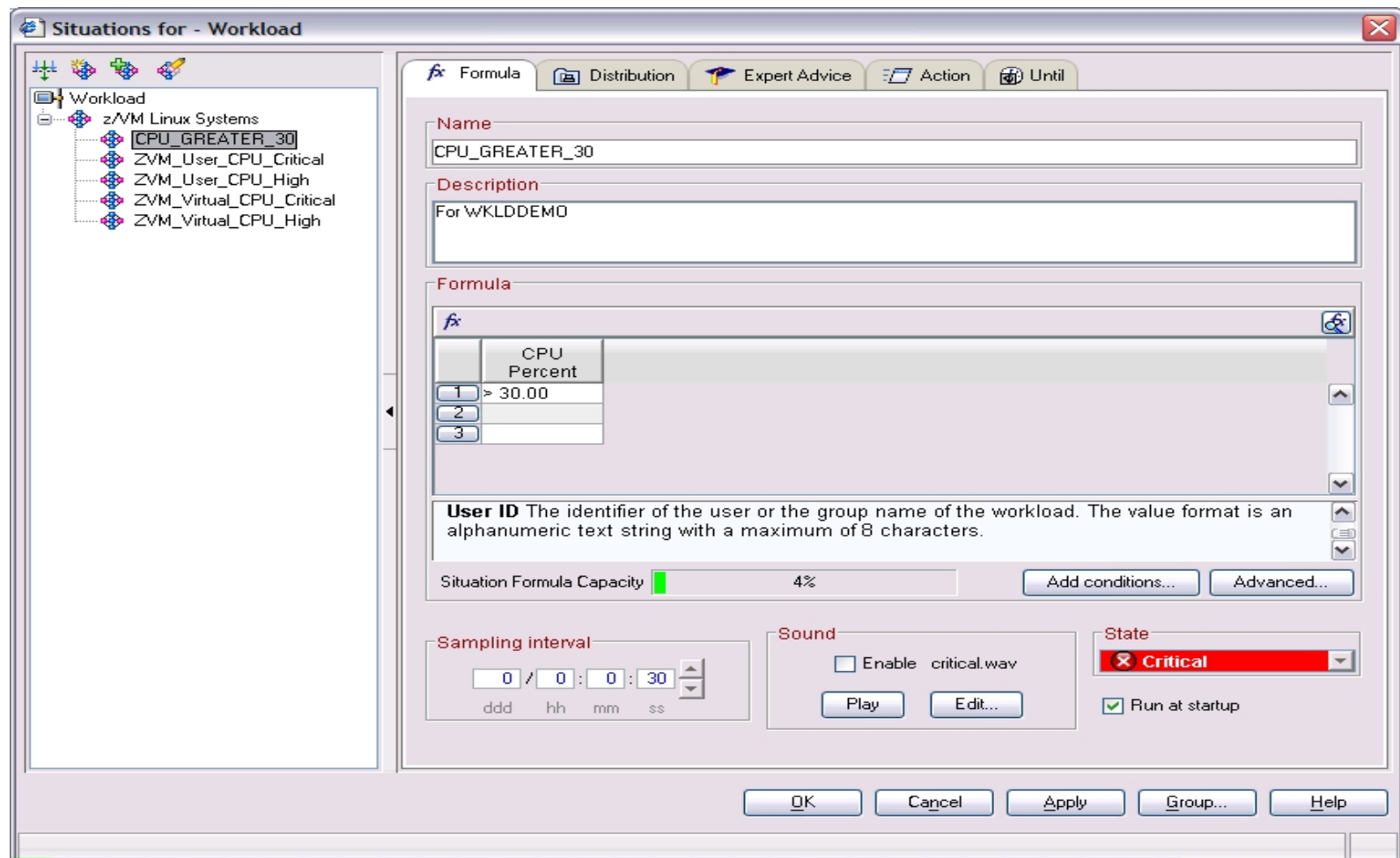
- Define a rule to look for the message from OMEGAMON:

```
DEFRULE NAME(GUSTCPU),+  
  MATCH(*GUEST NEEDS CPU PRIORITY*),+  
  ACTION(GUESTCPU),+  
  PARM(SLESA107)
```

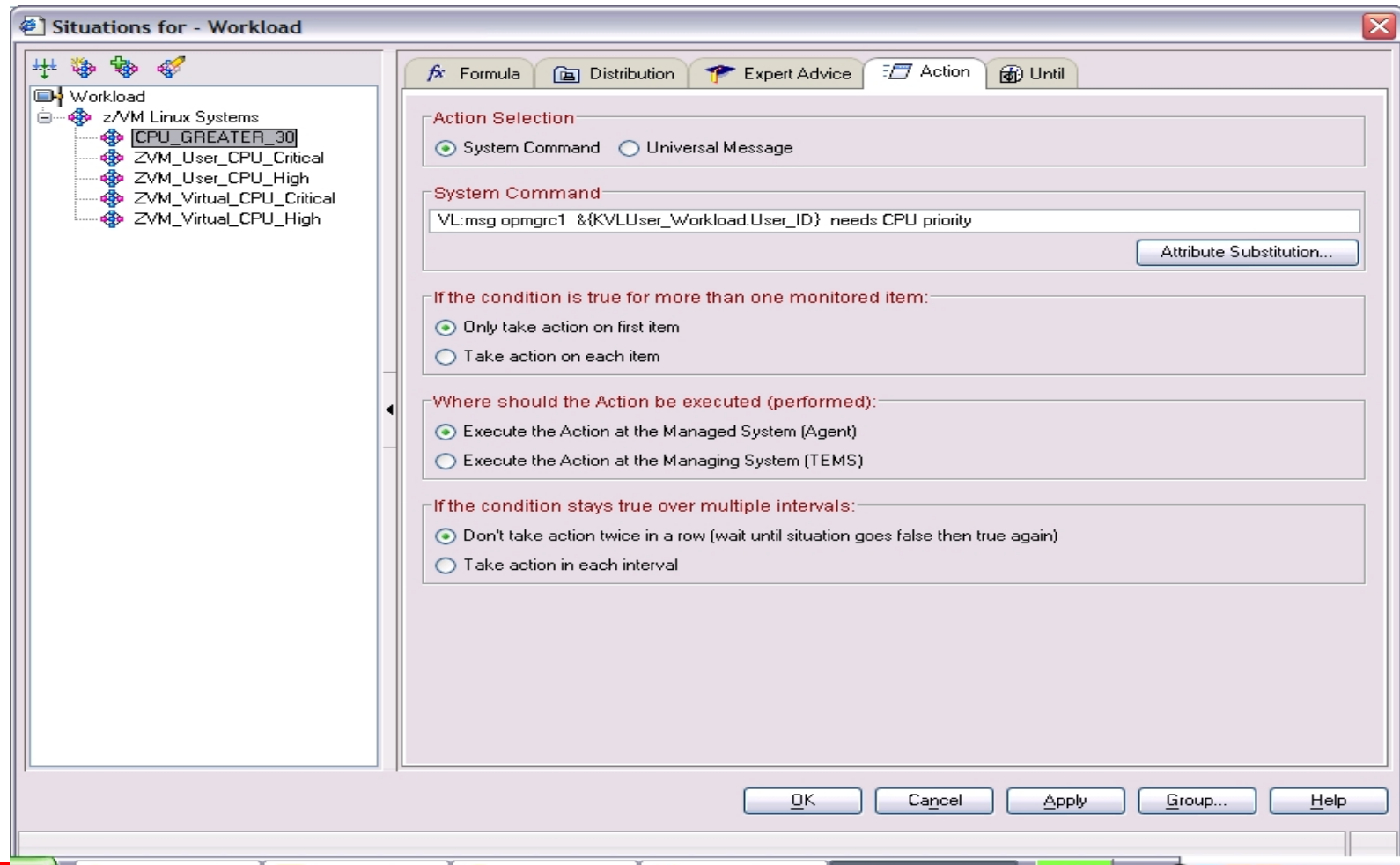
- Define actions to highlight the message and call an EXEC to adjust CPU, passing the guest name

```
DEFACTN NAME(GUESTCPU),+  
  INPUT(AHI),+  
  NEXTACTN(GUSTCPUB)  
*  
DEFACTN NAME(GUSTCPUB),+  
  COMMAND(EXEC VCPU &P),+  
  ENV(LVM),+  
  OUTPUT(LOG)
```

OMEGAMON Configuration



OMEGAMON Configuration



Additional Automation Scenarios

- ▶ Automating and scheduling the backup of a Linux guest
- ▶ Send a message or e-mail if spool usage is too high
 - Tools to find and view spool files based on size, owner, and/or date
- ▶ Automate the response to a disk full condition
- ▶ Take actions based on messages in Linux syslog data

Session 9164: Tuesday at 9:30am

Handouts available online, with screenshots



Related Sessions

- 9102 Introduction to Virtualization: z/VM Basic Concepts and Terms
- 9115 VM Performance Introduction
- 9106 VM Performance Update
- 9166 z/VM Performance Case Studies
- 9122 z/VM Tuning Revisited with Specialty Engines for z/OS
- 9164 Automation and Backup Scenarios for z/VM and Linux on System z
- 5201-5202 Explore the TEP Hands on Lab (Tuesday)



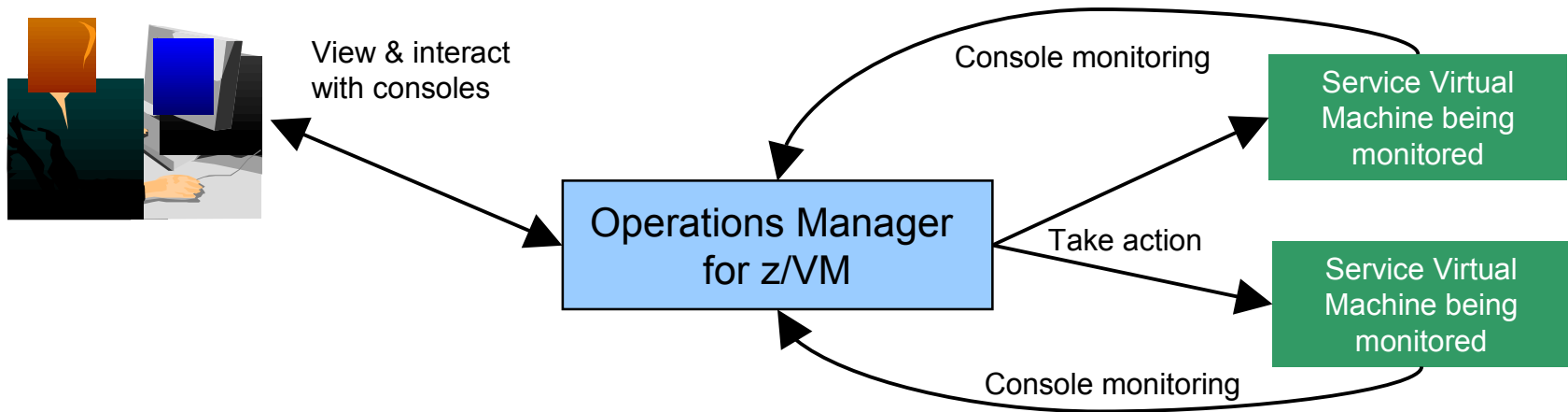
BACKUP



Operations Manager for z/VM

- Increase productivity
 - Authorized users view and interact with monitored virtual machines without logging onto them
 - Multiple users view/interact with a virtual machine simultaneously

- Improve system availability
 - Monitor virtual machines and processes
 - Take automated actions based on console messages
 - Reduce problems due to operator error



Automation

Routine activities done more effectively with minimal operations staff

Integration

Fulfill take action requests from OMEGAMON XE on z/VM and Linux

Operations Manager for z/VM and OMEGAMON XE on z/VM and Linux



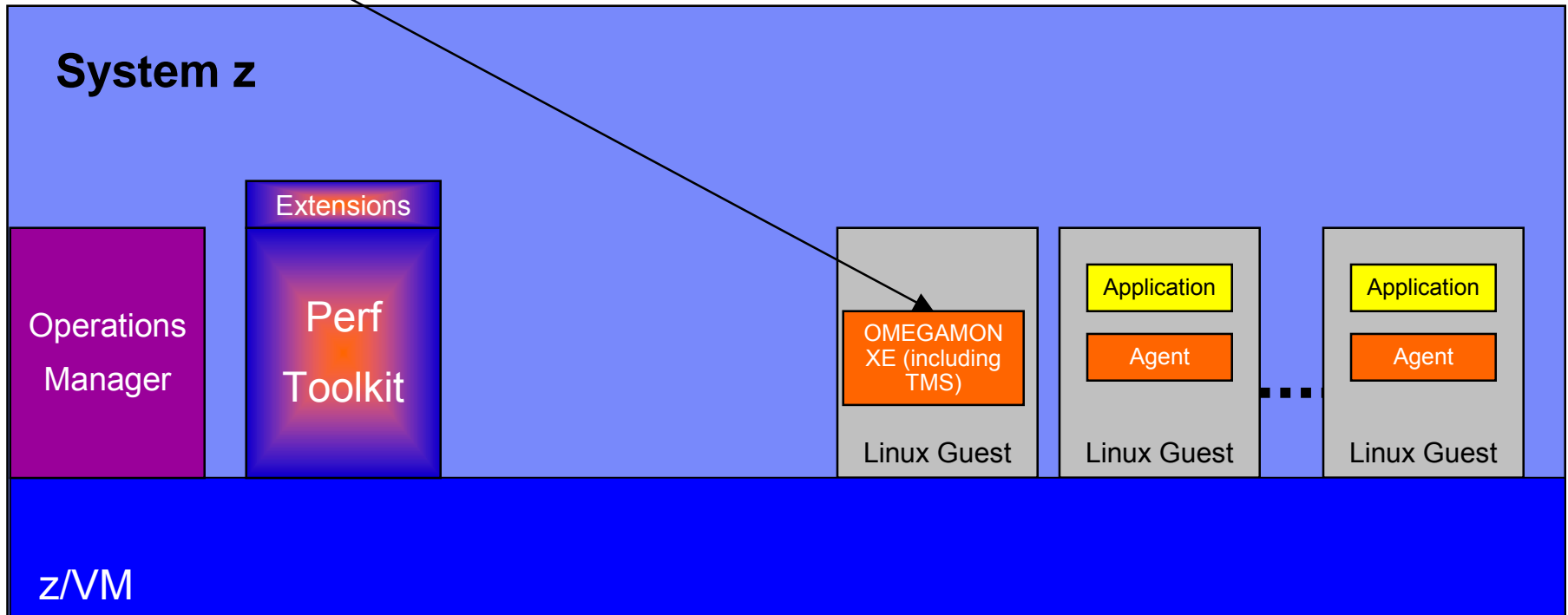
Web browser

➤ OMEGAMON XE on z/VM and Linux

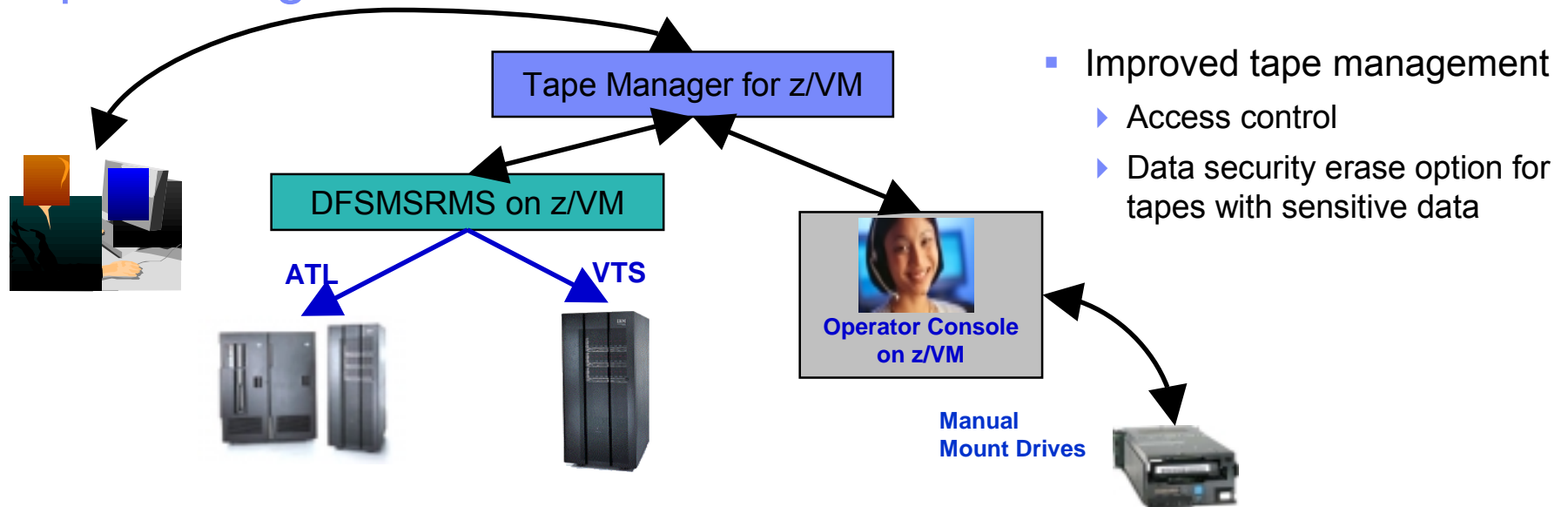
- Performance monitoring for z/VM and Linux guests
- Part of Tivoli Management Services (TMS) infrastructure

➤ Operations Manager for z/VM

- Monitor consoles of z/VM service machines and guest user IDs
- Take actions based on console messages
 - Respond to “take action” requests from OMEGAMON
- Schedule routine tasks



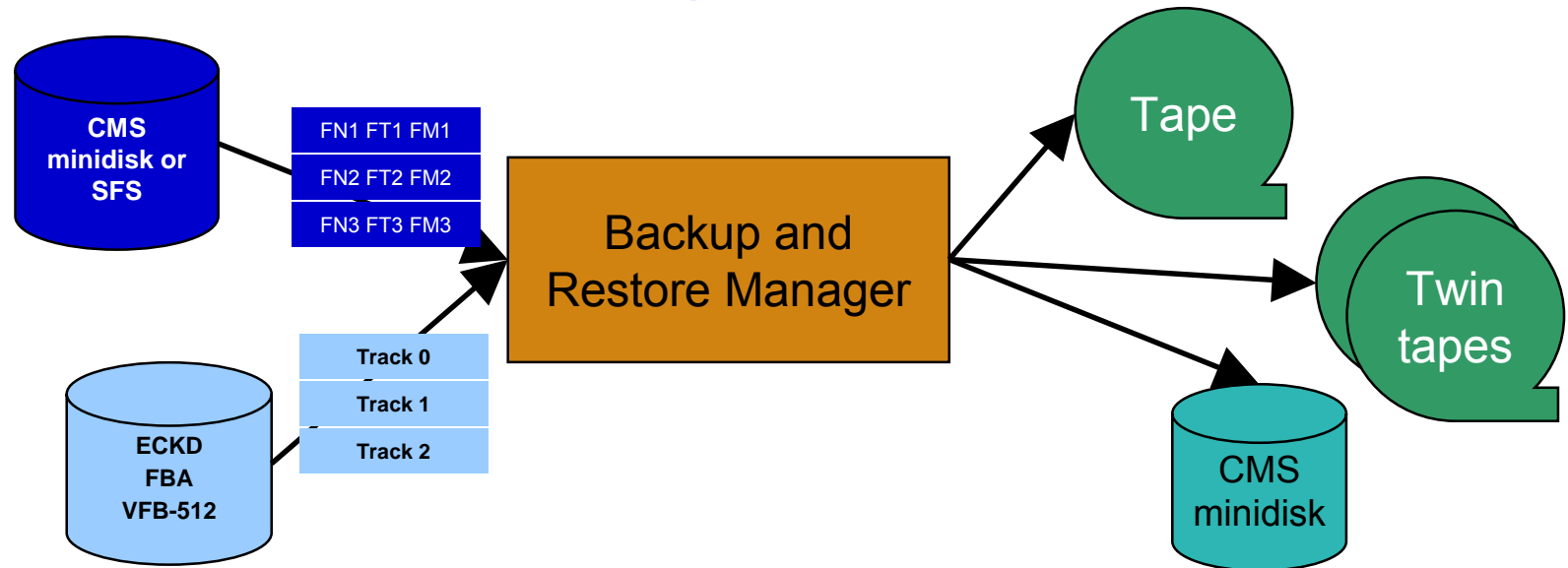
Tape Manager for z/VM



- Improved tape management
 - ▶ Access control
 - ▶ Data security erase option for tapes with sensitive data

- Effective management of tapes in ATL or VTS
 - ▶ Granular access control
 - ▶ Expiration processing
 - ▶ Notification for low threshold for tape resources
- Improved accuracy of manual tape processing
 - ▶ Automated interface to Operator for manual mounts
 - ▶ Verification of mount before given to requesting user
 - Internal tape label (verified again when user detaches the tape)
 - Read/Write verification
- Share tape devices with z/OS or other systems
- Integrated management of z/OS and z/VM tapes
 - ▶ Optionally use DFSMSrmm on z/OS as the tape catalog for z/VM and z/OS tapes
 - ▶ Tapes, access control, and retention managed by the existing RMM catalog
 - ▶ Accessible via Tape Manager on z/VM

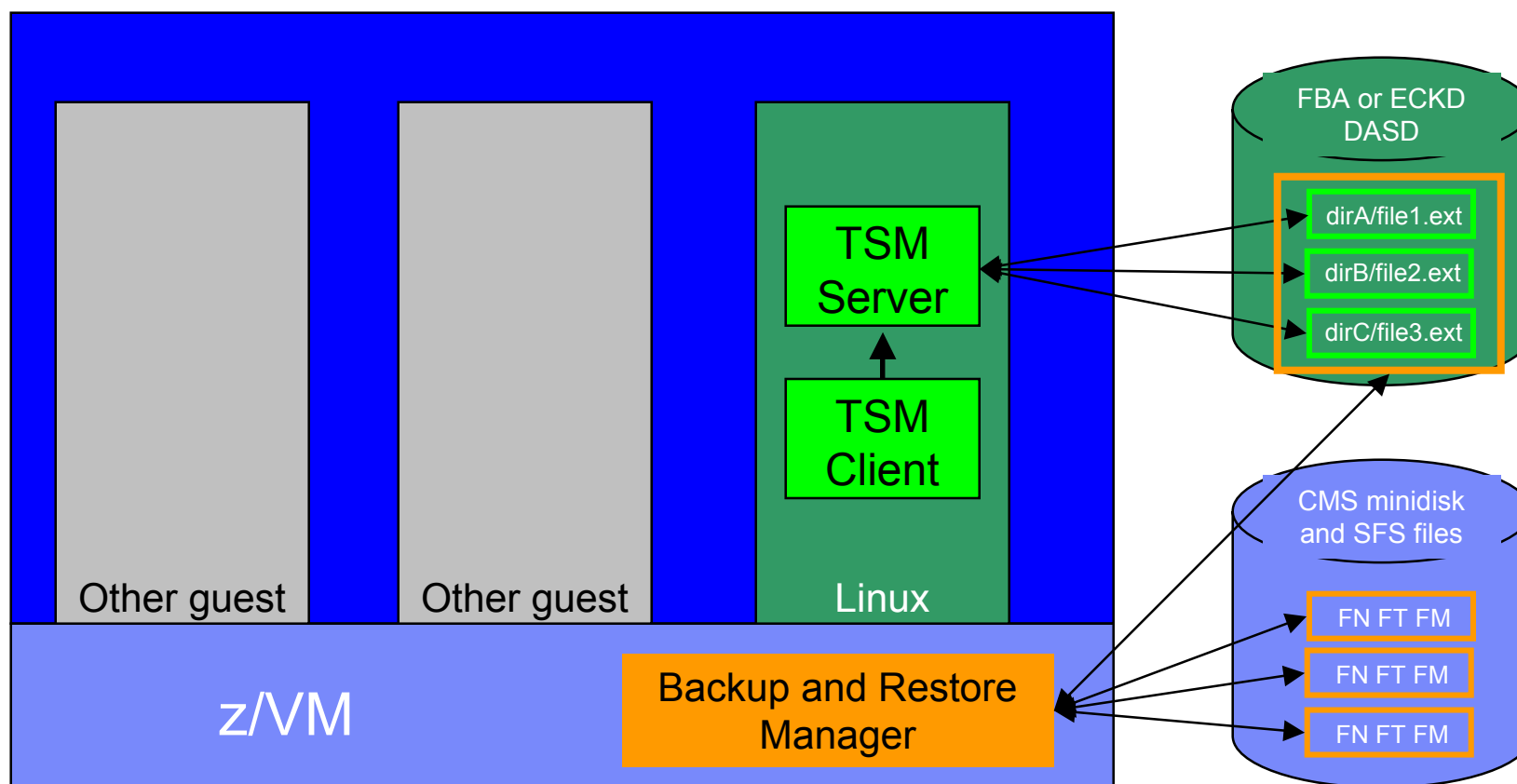
Backup and Restore Manager for z/VM



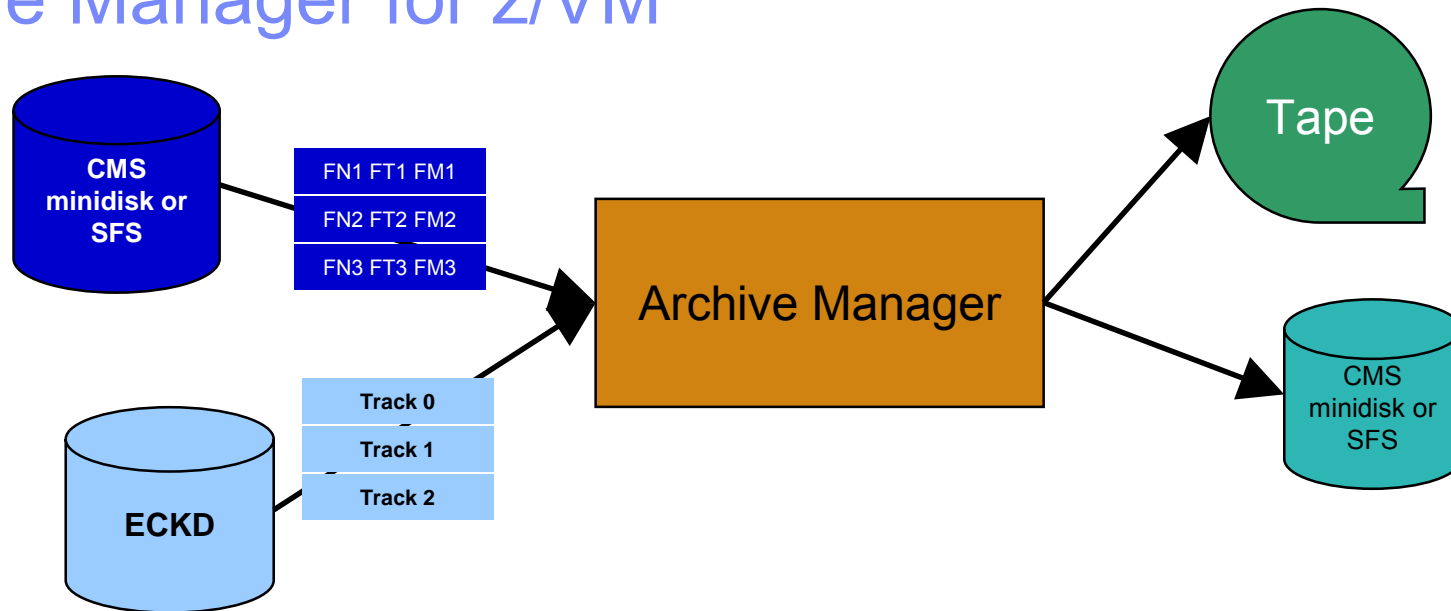
- **System backups available for Disaster Recovery**
- **Guest backups available for restoring to a previous state/level**
- **Backups of user data available for**
 - ▶ Restoring to a previous state/level
 - ▶ Replacing files accidentally erased
- **Flexible selection of data to back up**
 - ▶ Include/exclude minidisks, directories, DASD extents
 - ▶ Review of backup job before submission
- **Reduced backup window with concurrent processing**
 - ▶ Multiple worker service machines sharing the job
- **Users restore their own data**
 - ▶ No administrator interaction required
- **Management of backup data**
 - ▶ Retention set as part of the backup job
 - ▶ Automatic aging and pruning of the backup catalog
 - ▶ View/query the list of expired backups
- **Integration with Tape Manager for z/VM**

Backup and Restore Manager and Linux Guests

Using Backup and Restore Manager with Tivoli Store Manager



Archive Manager for z/VM



- Improve end user satisfaction and productivity
 - ▶ Users manage their own disk space
 - ▶ Move infrequently used files to tape or other disk
 - ▶ Archive and recall functions are controlled by the user
 - No administrator intervention required
 - ▶ Archived data staged to DASD, then tape if applicable
 - Users don't wait for a tape mount for archive request to complete
- Reduce DASD space requirements
 - ▶ Archive older files to less expensive storage media
 - ▶ Continue to provide users access to the archived data/files
- Control location, retention, and access to archived data
- Integration with Tape Manager for z/VM

For More Information

- Product Web sites
 - ▶ <http://www.ibm.com/software/stormgmt/zvm/>
 - Publications
 - Pre-requisites
 - Announcements
 - Support
- e-mail: Tracy Dean, tld1@us.ibm.com



The following pages contain screenshots and a list of all the data available via the OMEAGMON on z/VM and Linux and the Linux OS agents



z/VM Linux Default Workspace

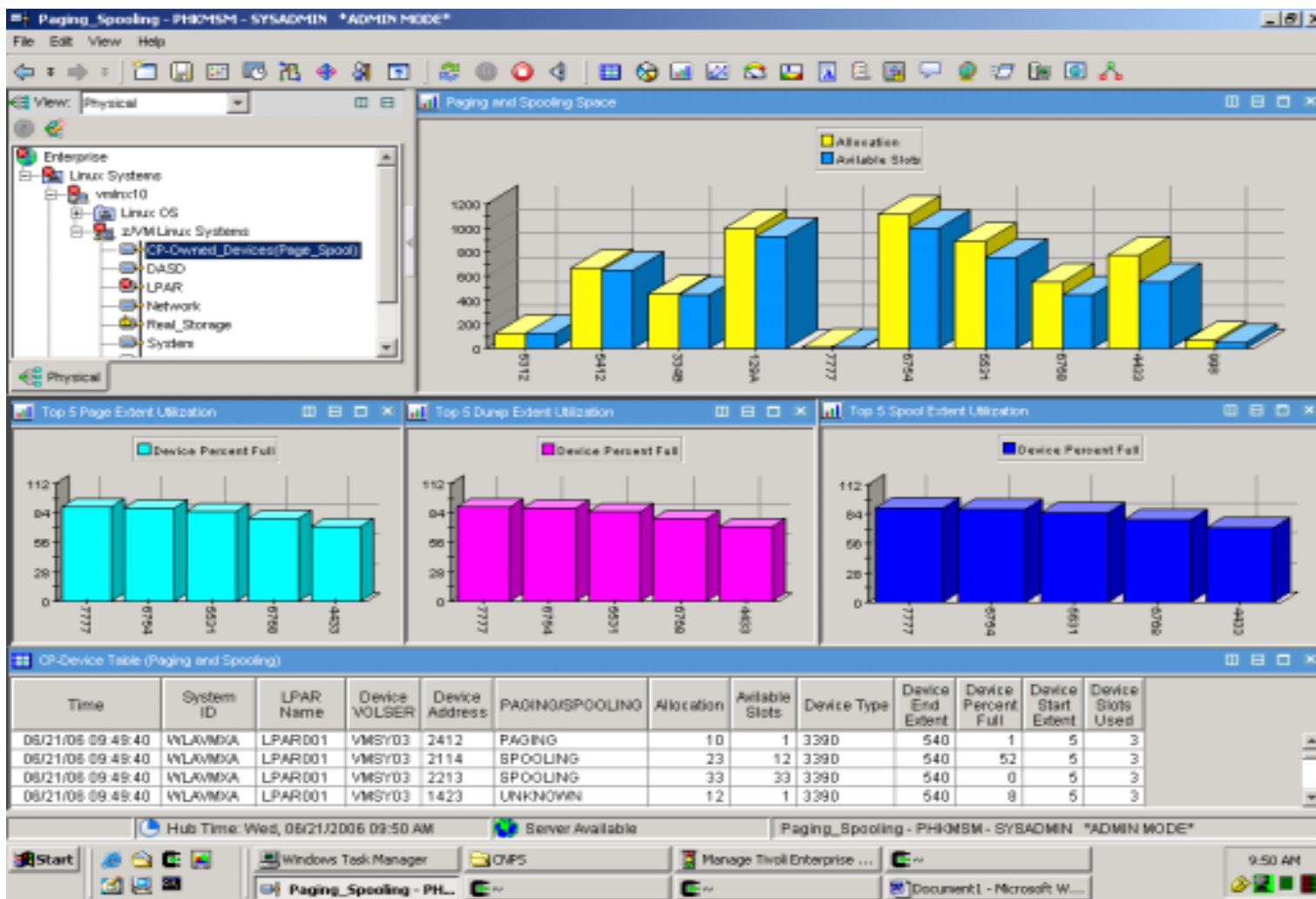
The screenshot displays the z/VM Linux Systems management console with several monitoring windows open:

- z/VM PTK Collector Status:** A table listing active collectors and their status.
- Situation Event Console:** A table showing system events and situations.
- DASD Activity:** A horizontal bar chart showing the percentage of busy DASD units over time.
- z/VM User CPU Utilization:** A horizontal bar chart comparing CPU usage for PERMIT and VMUSER.
- z/VM User Working Set and Storage:** A horizontal bar chart showing memory usage for PERMIT and VMUSER.

Time	Collector Name	Status
06/21/06 09:49:40	Performance Toolkit Collector	ACTIV
06/21/06 09:49:40	LPAR	ACTIV
06/21/06 09:49:40	System	ACTIV
06/21/06 09:49:40	Storage	ACTIV
06/21/06 09:49:40	CP Owned	ACTIV
06/21/06 09:49:40	DASD	ACTIV
06/21/06 09:49:40	Workload	ACTIV
06/21/06 09:49:40	Hipersocket	ACTIV
06/21/06 09:49:40	Virtual Switch	ACTIV
06/21/06 09:49:40	TCP/IP	ACTIV
06/21/06 09:49:40	TCP/IP User	ACTIV
06/21/06 09:49:40	Linux Application	ACTIV

Status	Situation Name	Display Item	Source
Open	ZVM_Avail_Near2G_Low		vmfrc10.tivlab.raleigh
Open	ZVM_LPAR_Busy_Critical		vmfrc10.tivlab.raleigh

PAGING and SPOOLING Utilization



PAGING and SPOOLING Utilization

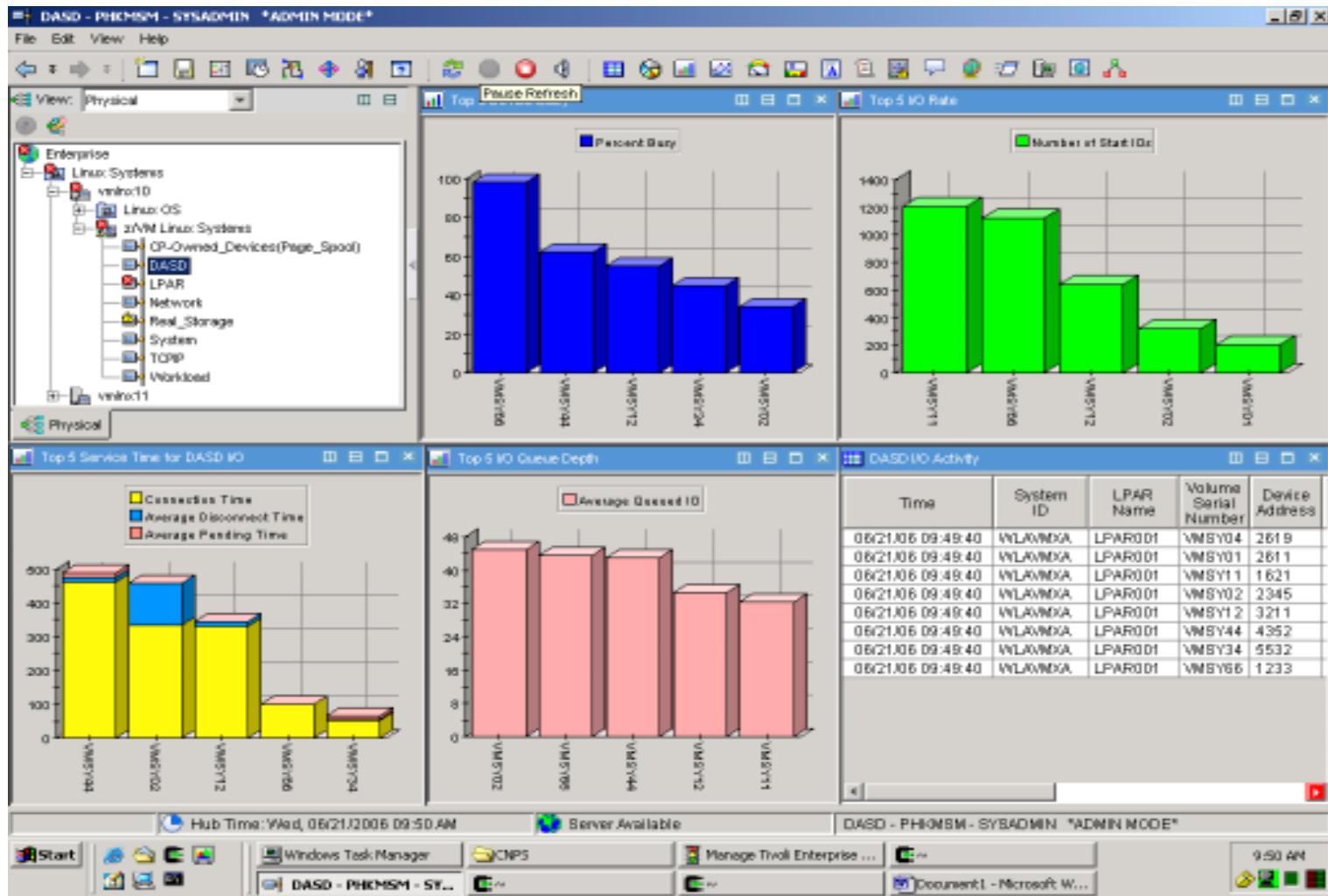
- **Paging_Spooling Workspace**
 - ▶ This workspace displays data on the paging and spooling devices for the whole z/VM system.

- **CP-Device Table**
 - ▶ All attributes are collected for the current reporting interval

- **Description**
 - ▶ TOD clock at start of interval (Approximately 1 second accuracy).
 - ▶ SYSID of z/VM System.
 - ▶ Assigned logical partition number.
 - ▶ Real address of CP-owned DASD.
 - ▶ Number of cylinders or blocks allocated for the CP-owned extent.
 - ▶ Number of slots available on the CP-Owned device at the time the sample was taken.
 - ▶ Type of DASD (for example: 3370 or 3380).
 - ▶ Primary Purpose of this device.
 - ▶ End extent allocated on CP-owned device. (cylinder or block number)
 - ▶ Percentage of space on the CP-Owned volume in use at the time the sample was taken.
 - ▶ Starting cylinder or block number for the CP-Owned device extent.
 - ▶ Number of used slots on the CP-Owned device at the time the sample was taken.
 - ▶ Volume serial number of CP-owned DASD.

- **Policies provide advanced automation processes**
- **Historical data option to show previous information**

DASD



DASD

- **DASD Workspace**
 - ▶ The DASD workspace provides several views that show the busiest I/O devices on the overall z/VM system.

- **DASD I/O Activity Table (IO TABLE)**
 - ▶ All attributes are collected for the current reporting interval

- **Description**
 - ▶ TOD clock at start of interval (Approximately 1 second accuracy)
 - ▶ SYSID of z/VM System.
 - ▶ Assigned logical partition number.
 - ▶ Real address of device.
 - ▶ Type of device (for example: 3370 or 3380).
 - ▶ Average time this device was in CONNECT state during the interval.
 - ▶ Percentage of time the device was found busy.
 - ▶ Average number of I/Os queued on the device.
 - ▶ Number of I/Os started on this device.
 - ▶ I/Os per second to this device (I/O rate).
 - ▶ Average time this device was in DISCONNECT state during the reporting interval.
 - ▶ Average time this device was in PENDING state during the reporting interval.
 - ▶ Average service time for this device in milliseconds.
 - ▶ Volume serial number if DASD device.

LPAR Utilization

The screenshot displays the LPAR management interface with the following components:

- View: Physical** (Left Panel): A tree view showing the system hierarchy: Enterprise > z/VM Systems > vmrx11:VL > z/VM Linux Systems > LPAR.
- LPAR Busy** (Top Middle Chart): A bar chart comparing LPAR Busy (yellow) and Physical CPU Busy (blue) for five LPARs: CANSYSA, CANVM1, RALHCD, TIVVMT01, and TIVVM8. CANSYSA shows the highest busy percentage at approximately 95%.
- LPAR Load** (Top Right Chart): A bar chart showing LPAR Load (blue) for the same five LPARs. CANSYSA has the highest load at approximately 33%.
- LPAR Weight** (Bottom Left Chart): A bar chart showing LPAR Weight (magenta) for the five LPARs. CANVM1 has the highest weight at approximately 115%.
- Partition Suspension** (Bottom Middle Chart): A bar chart showing LPAR Suspended Time (green) in percent for the five LPARs. CANVM1 has the highest suspended time at approximately 1.5%.
- LPAR Utilization** (Bottom Right Table): A table listing recent utilization events.

Time	System ID	LPAR Number	LPAR Name
08/07/08 17:36:55	WLAVMKA	1	CANSYSA
08/07/08 17:36:55	WLAVMKA	2	CANVM1
08/07/08 17:36:55	WLAVMKA	5	RALHCD
08/07/08 17:36:55	WLAVMKA	3	TIVVMT01
08/07/08 17:36:55	WLAVMKA	4	TIVVM8

System Status: Hub Time: Thu, 08/07/2008 05:40 PM | Server Available | LPAR - bmaddox3.raleigh.ibm.com - SYSADMIN

Processor Utilization

Processor - bmaddox3.raleigh.ibm.com - SYSADMIN

File Edit View Help

View: Physical

- Enterprise
 - Linux Systems
 - z/VM Systems
 - vmx011:VL
 - z/VM Linux Systems
 - Channel
 - CP-Owned Devices
 - DASD
 - LPAR**
 - Network
 - Real Storage
 - System
 - TCPP
 - Worldwid

Physical

LPAR Weight

LPAR Name	Weight (approx)
CANSYSA	105
CANVM1	115
BALHCD	5
TIVVM01	10
TIVVM0B	105

LPAR Load

Category	Value (approx)
LPAR Lead	2.5%
z/VM CPU Lead	12.5%
Logical CPU Lead	12.5%

LPAR Processor Busy

LPAR Name & Processor Number	LPAR Busy (approx)	LPAR Overhead Percent (approx)
CANVM1 - 0	3.5%	3.5%
CANVM1 - 1	9.5%	9.5%

LPAR Processor Utilization

System ID	LPAR Number	LPAR Name	LPAR Partition ID	LPAR CPU	LPAR Capped	LPAR Weight	LPAR Wait	LPAR Load	LPAR Status	Processor Type	Processor Number	LI Stat T
WLAVM0A	2	CANVM1	01	2	NO	114.00	NO	2.10	ACTIVE*	CP	0	
WLAVM0A	2	CANVM1	01	2	NO	114.00	NO	2.10	ACTIVE*	CP	1	

Hub Time: Thu, 08/07/2008 05:40 PM Server Available Processor - bmaddox3.raleigh.ibm.com - SYSADMIN

start Local Dis... Session ... Manage ... Proces... Phillis a... Window... Microsof... 100% 5:36 PM

LPAR Utilization

- LPAR Utilization Workspace
 - ▶ The LPAR Utilization Workspace provides information about the overall utilization of the system complex. The LPAR Workspace is connected to the LPAR entry on the Navigator.

- **LPAR Utilization table (Data is taken from the IRA LPAR Table)**
 - ▶ All attributes are collected for the current reporting interval

- **Description**
 - ▶ TOD clock at start of interval (Approximately 1 second accuracy).
 - ▶ SYSID of z/VM System.
 - ▶ Assigned logical partition number.
 - ▶ Assigned name of the logical partition.
 - ▶ Utilization of the system based on the number of logical processors available.
 - ▶ Computed as: $(\text{Dispatch time} / \text{Elapsed time}) * \text{Number of LPs}$ Total amount of time that all of the logical processors for this LPAR were busy during the reporting interval.
 - ▶ Number of logical processors assigned to this LPAR.
 - ▶ Average percentage of elapsed time that logical processors were 'suspended', i.e. could not give service to the guest system due to LPAR management time and contention for real processors, where the 'suspended' time is calculated as the difference between elapsed time and the sum of processor busy time and voluntary wait time for the same processor as seen by the VM system that is active in the partition.
 - ▶ Amount of logical CPU busy which was due to LP dispatching overhead.

LPAR Utilization (cont)

- ▶ Average percentage of elapsed time that the logical processors spent for LPAR management. This information is available only on systems with the LPAR management time facility.
- ▶ Status of the logical partition during the reporting interval. Can be ACTIVE or INACTIVE. The partition that was used to collect the LPAR data will have an asterisk (*) appended (for example, 'ACTIVE*').
- ▶ Status of the WAIT bit for the logical processors within this LPAR. If any LP has the WAIT bit ON, this field will contain 'YES'.
- ▶ Average weight of all logical processors defined for this LPAR. The weight values for dedicated processors will be 1000.
- ▶ Utilization of the system based on the number of physical processors available
- ▶ The CPU type of the logical processors defined for the partition. Possible values are:
 - CP
 - ICF
 - IFL
 - ZIIP
 - ZAAP
 - Special
 - Unknown.

NETWORK Utilization (Hipersocket)

The screenshot displays the Tivoli Network Manager interface for a system named 'bmaddox3.raleigh.ibm.com'. The interface is divided into several panes:

- Left Pane:** A tree view showing the system hierarchy: Enterprise > Linux Systems > z/VM Systems > vmrx11:VL > z/VM Linux Systems > Network.
- Top 5 HiperSockets Message Rate per Second:** A line graph showing message rates for different channel paths. The legend includes 'Transferred Total Messages' (blue) and 'Transferred LPAR Messages' (green).
- Top 5 HiperSockets Message Failure Rate per Second:** A line graph showing failure rates for different channel paths. The legend includes 'Failed LPAR No Buffer' (yellow), 'Failed LPAR Other' (blue), and 'Failed Total No Buffer' (red).
- Top 5 Virtual Switch Devices Receive ...:** A 3D bar chart showing receive and transmit rates for different real device addresses. The legend includes 'Receive Packets Rate per Second' (yellow), 'Receive Packets Discarded Rate per Second' (blue), 'Transmit Packets Rate per Second' (red), and 'Transmit Packets Discarded Rate per Second' (green).
- HiperSockets Activity Table:** A table with columns: Time, System ID, LPAR Name, Channel Path, Sharing Indicator, Transferred Total Messages, Transferred Total Data Units, Failed Total No Buffer, Transferred LPAR Messages, Transferred LPAR Data Units, Failed LPAR No Buffer, and Failed LPAR Other. A text box below the table reads: "The hexadecimal identifier for the channel path."
- Virtual Switch Activity Table:** A table with columns: Time, System ID, LPAR Name, Real Device Address, User ID, VSWITCH Timeout, Transmit Bytes, Transmit Packets Rate per Second, and Transmit Packets Discarded Rate per Second. The data row shows: 08/07/08 17:39:54, WLAVMXA, CANVM1, 2E66, WLACTL1, 300, 1,354.00, 2.00, 0.0.

The Windows taskbar at the bottom shows the system time as Thu, 08/07/2008 05:43 PM, server status as 'Server Available', and the taskbar includes icons for 'start', 'Local Dis...', 'Session ...', 'Manage ...', 'Network...', 'Philies a...', 'Window...', 'Microsof...', '100%', and the system clock at 5:39 PM.

NETWORK Utilization (Hipersockets)

▪ NETWORK Workspace

- ▶ This workspace displays data about the utilization of the hipersocket and virtual switch devices on the z/VM system

▪ Hipersocket Utilization (HIPERSOCKET TABLE)

- ▶ All attributes are collected for the current reporting interval

▪ Description

- ▶ TOD clock at start of interval (Approximately 1 second accuracy).
- ▶ SYSID of z/VM System.
- ▶ Assigned logical partition number.
- ▶ Hex channel path identifier.
- ▶ Sharing indicator for the channel YES - shared with other LPARs, NO - Dedicated channel.
- ▶ Number of messages sent per second for the whole system.
- ▶ Number of data units sent per second for the whole system.
- ▶ Number of sends per second that failed due to no receiver buffer for the whole system.
- ▶ Number of messages sent per second for this partition.
- ▶ Number of data units sent per second for this partition.
- ▶ Number of sends per second that failed due to no receiver buffer for this partition.
- ▶ Number of sends per second that failed due to other problems for this partition.

NETWORK Utilization (Virtual Switch)

The screenshot displays the VSWITCH management console with several performance graphs and a data table. The graphs show the following data:

- Top 5 Lock Requests Rate per Second:** A single yellow bar representing a rate of 1.00 (2E65) for Real Device Address 2E00.
- Top 5 Lock Defers Rate per Second:** Three bars representing LAN Lock Defers per Second (green), Send Lock Defers per Second (yellow), and Receive Lock Defers per Second (blue) for Real Device Address 2E00.
- Top 5 Transmit Packets Rate per Second:** A single green bar representing a rate of 2.0 for Real Device Address 2E00.
- Top 5 Receive Packets Rate per Second:** A single yellow bar representing a rate of 1.0 for Real Device Address 2E00.
- Top 5 Signals Issued Rate per Second:** Three bars representing Write Signals per Second (yellow), Read Signals per Second (blue), and Sync Signals per Second (red) for Real Device Address 2E00.

The Virtual Switch Activity table is as follows:

Time	System ID	LPAR Name	Real Device Address	User ID	VSWITCH Timeout	Transmit Bytes	Transmit Packets Rate per Second	Transmit Packets Discarded Rate per Second	Receive Bytes	Receive Packets Rate per Second	Receive Packets Discarded Rate per Second	QSV

NETWORK Utilization (Virtual Switch)

- **NETWORK Workspace**
 - ▶ This workspace displays data about the utilization of the hipersocket and virtual switch devices on the z/VM system

- **Virtual Switch Utilization Table (VIRT SWITCH TABLE)**
 - ▶ All attributes are collected for the current reporting interval

- **Description**
 - ▶ TOD clock at start of interval (Approximately 1 second accuracy).
 - ▶ SYSID of z/VM System.
 - ▶ Assigned logical partition number.
 - ▶ Real Device Address.
 - ▶ User id of the virtual machine the device is currently attached to.
 - ▶ Timeout value for the virtual switch in seconds.
 - ▶ Number of bytes transmitted per second.
 - ▶ Number of packets transmitted per second.
 - ▶ Number of outbound packets discarded per second.
 - ▶ Number of bytes received per second.
 - ▶ Number of packets received per second.
 - ▶ Number of inbound packets discarded per second.
 - ▶ Queue storage value (Values 1 - 8).

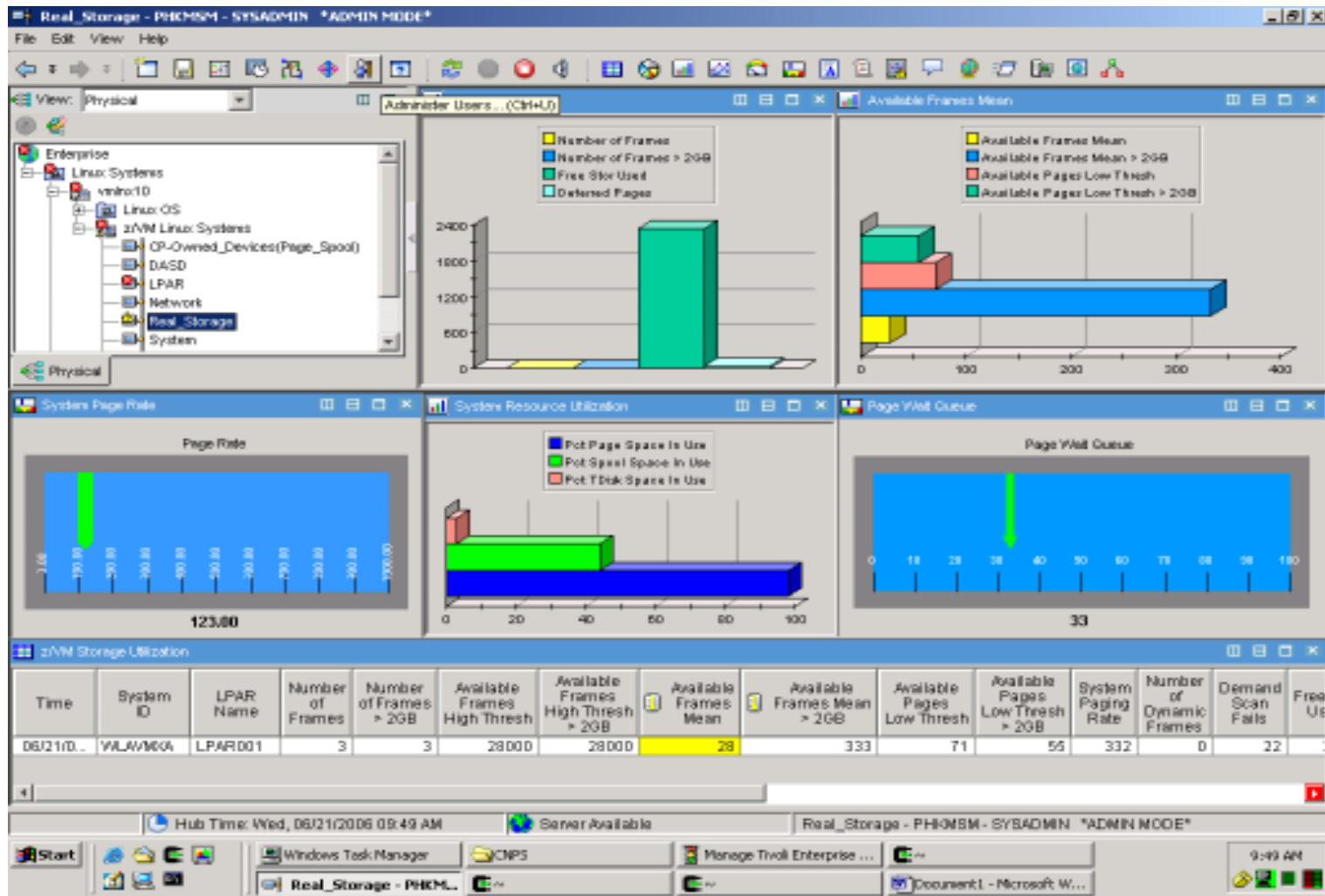
Virtual Switch (cont)

- ▶ The name of the link aggregation port group in use for this virtual switch
- ▶ The number of input buffers processed per second
- ▶ The number of input queue overflows per second
- ▶ The number of interrupts, such as Peripheral Component Interconnect (PCI) interrupts, that resulted in input queue processing, per second.
- ▶ The number of interrupts, such as Peripheral Component Interconnect (PCI) interrupts, that resulted in input queue processing, per second
- ▶ The LAN Management IP address
- ▶ The number of times per second that the CP monitor waited for the network lock
- ▶ The load balancing interval
- ▶ The number of lock requests made for the network lock, per second
- ▶ The LAN Management Media Access Control (MAC) address
- ▶ The Open Systems Adapter (OSA) device microcode level
- ▶ The number of output buffers processed per second

Virtual Switch (cont)

- ▶ The number of output queue overflows per second
- ▶ The number of read signals issued per second
- ▶ The number of times per second that CP monitor waited for any lock when receiving data on this VSWITCH port
- ▶ The number of times per second that CP monitor waited for any lock when sending data from this VSWITCH port
- ▶ The session layer, either 2 or 3 of the Open Systems Interconnection (OSI) seven-layer model
- ▶ The number of sync signals issued per second
- ▶ The number of Link Aggregation Control Protocol (LACP) Packet Data Units (PDUs) received on this port
- ▶ The number of LACP PDUs sent on this port
- ▶ The number of marker PDUs received
- ▶ The number of marker PDUs sent to this port in response to receiving a marker PDU from the partner port
- ▶ The number of marker PDUs sent to this port
- ▶ The total number of times the virtual switch timed out while waiting for a marker response PDU for a marker request sent by CP monitor to a partner port
- ▶ The number of write signals issued per second

REAL STORAGE Utilization



REAL STORAGE Utilization

▪ REALSTORAGE Workspace

- ▶ The Real Storage Utilization workspace provides several views for the overall Storage and Paging activity for the z/VM system. Additionally, the Linux Group Paging Activity view displays z/VM paging activity specific to the Linux guests.

▪ z/VM Storage Utilization (SYSTEM TABLE storage attributes only)

- ▶ This Table reflects only the portion of the System table that contains storage related attributes.
- ▶ All attributes are collected for the current reporting interval

▪ Description

- ▶ TOD clock at start of interval (Approximately 1 second accuracy).
- ▶ SYSID of z/VM System.
- ▶ Assigned logical partition number.
- ▶ Number of frames currently on the available list.
- ▶ High threshold for the available list replenishment subsystem.
- ▶ Average number of page frames on the available list.
- ▶ Low threshold for the available list replenishment subsystem.
- ▶ System-wide I/O paging rate. Related statistics appear elsewhere by DASD volume.
- ▶ Number of frames allocated to the dynamic paging area.
- ▶ Number of times the demand scan was invoked and could not replenish the available list to its threshold.
- ▶ Number of frames used by free-storage management.
- ▶ Number of deferred pages waiting for a frame.
- ▶ Total number of free-storage requests during the reporting interval.
- ▶ Total number of free-storage releases during the reporting interval.
- ▶ Number of pages per second being read in by the system.
- ▶ System resource weight for paging. Used by the scheduler to decide how much of a bottleneck the paging resources are.
- ▶ Average system-wide percent of paging space in use. Related statistics appear elsewhere by DASD volume.
- ▶ Percent of SPOOL space in use for the entire system.
- ▶ Percent of temporary disk space in use for the entire system.
- ▶ Average number of page faults per second for single-page reads during the reporting interval.
- ▶ Percentage of real storage available to the Dynamic Paging Area.
- ▶ Average number of users in queue waiting to be dispatched.
- ▶ Percent of all virtual machines in a page wait state.

REAL STORAGE Utilization (cont.)

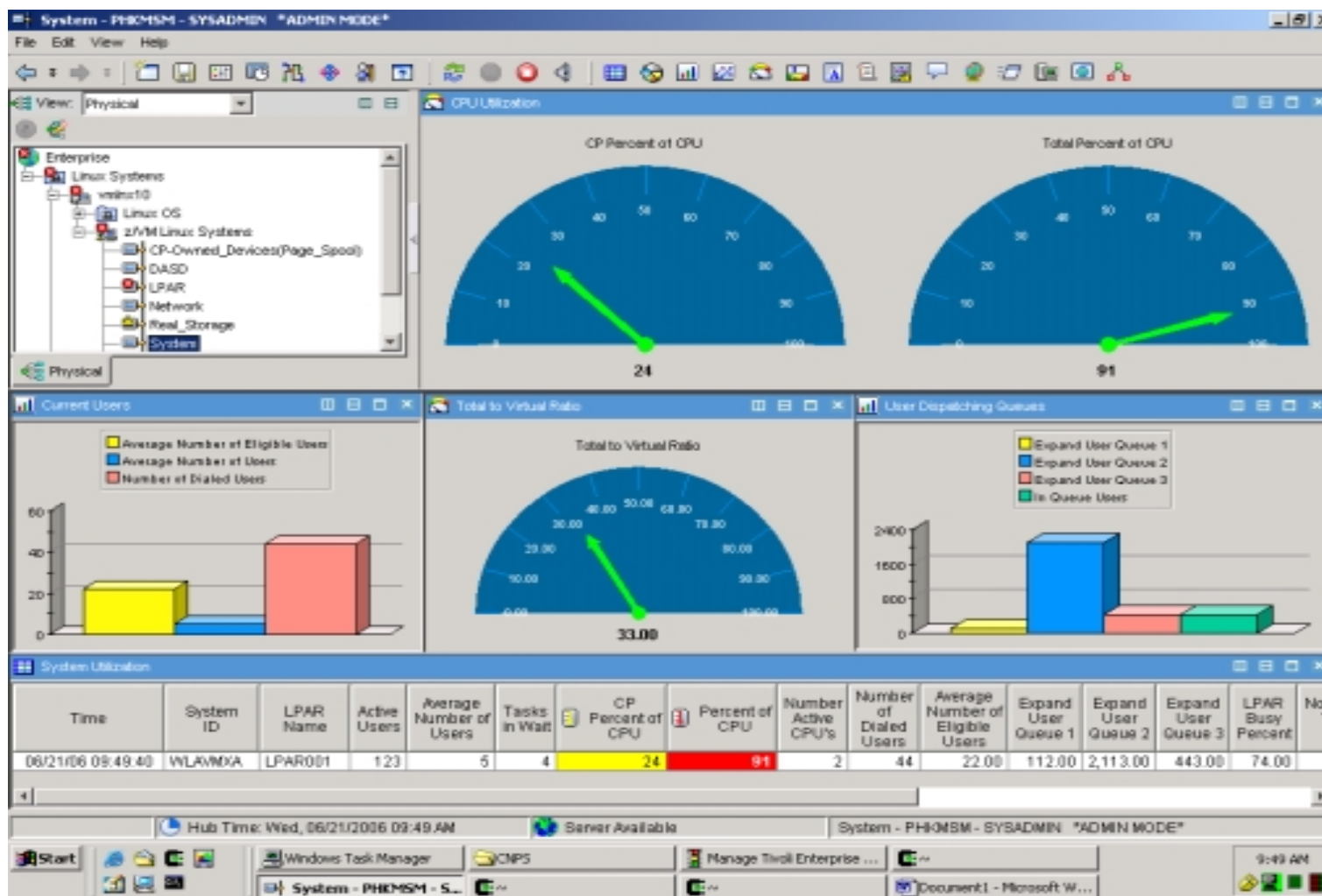
- **REALSTORAGE Workspace (cont)**
- The Real Storage Utilization workspace provides several views for the overall Storage and Paging activity for the z/VM system. Additionally, the Linux Group Paging Activity view displays z/VM paging activity specific to the Linux guests.

- **Linux Storage Utilization (WORKLOAD TABLE storage attributes only)**
- This Table reflects only the portion of the Workload table that contains storage related attributes used by the Real Storage Workspace.
- All attributes are collected for the current reporting interval

- **Description**
- TOD clock at start of interval (Approximately 1 second accuracy).
- SYSID of z/VM System.
- Assigned logical partition number.
- Userid or group name.
- Rate of page-ins and page-outs for this workload (in pages/sec.).

- **Linkage and Secondary Workspaces:**
- A link exists from the Linux Storage Utilization Table. Each row in the table is keyed to a Linux Guest. Selecting the link for a specific row will take the user to the Linux Storage Utilization Workspace for the selected Linux Guest.
- There are no Secondary Workspaces for the System Workspace

SYSTEM Utilization



SYSTEM Utilization

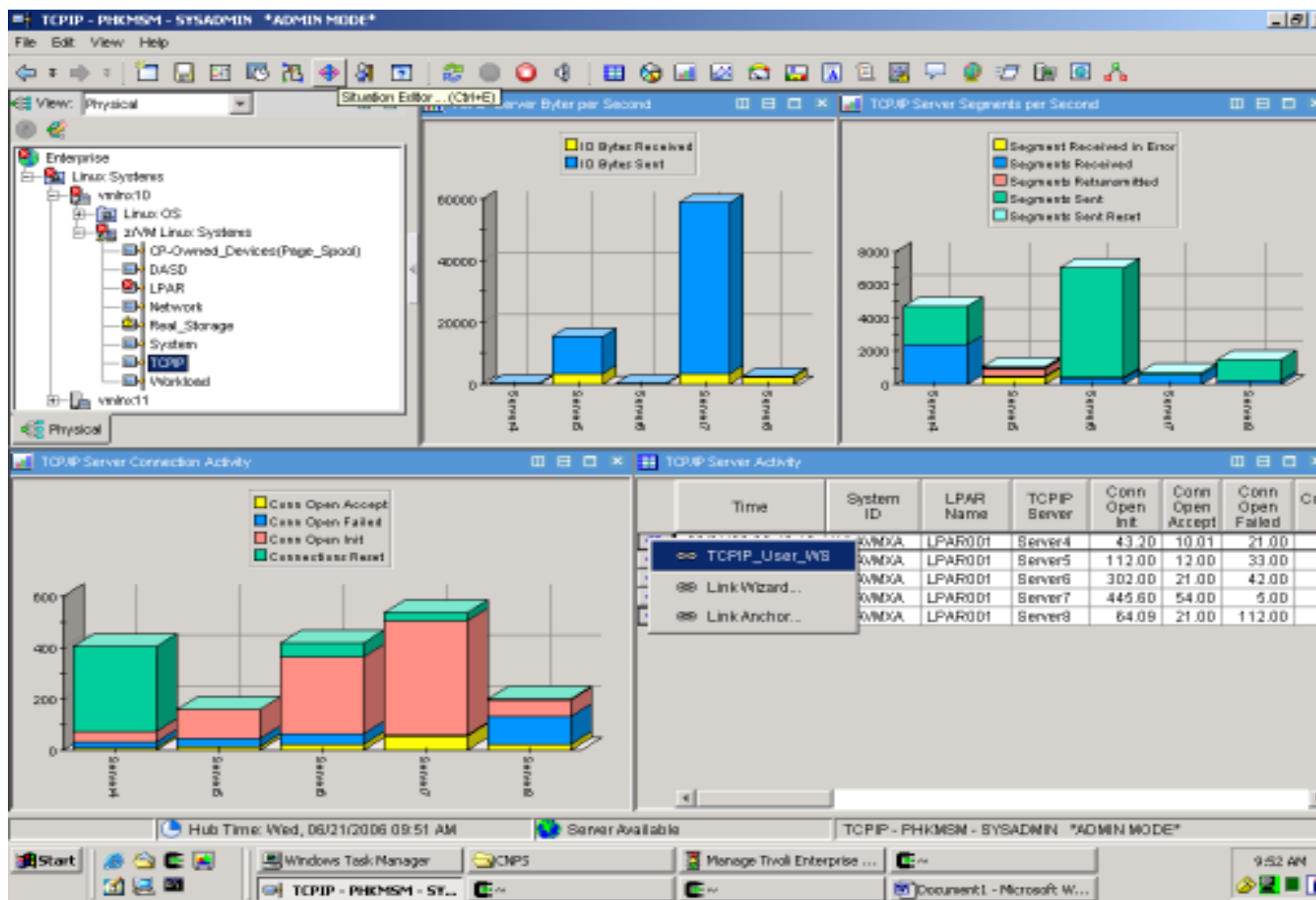
- **The SYSTEM Workspace**
 - ▶ The System Utilization workspaces provide a view into the CPU utilization for the VM LPAR. The System Workspace is connected to the SYSTEM entry on the Navigator.

- All attributes are collected for the current reporting interval

- **Description**
 - ▶ TOD clock at start of interval (Approximately 1 second accuracy).
 - ▶ SYSID of z/VM System.
 - ▶ Assigned logical partition number.
 - ▶ Number of users who had any activity since the last sampling interval.
 - ▶ Average number of users logged on.
 - ▶ Number of tasks that cannot be executed because they are waiting for a frame.
 - ▶ Percentage of CPU utilized by CP.
 - ▶ Total CPU utilization (CP and virtual combined). If you are running multiple processors, this value is the sum of CPU utilization for all processors and can be greater than 100%.
 - ▶ Number of active processors.
 - ▶ Number of users who are dialed to VM.
 - ▶ Average number of users waiting in the eligible list.
 - ▶ Number of short running (interactive) users in the eligible list for the E1 queue.
 - ▶ Number of medium-running users in the eligible list for the E2 queue.
 - ▶ Number of long-running users in the eligible list for the E3 queue.
 - ▶ Total number of trivial transactions processed during the reporting interval.
 - ▶ Ratio of total CPU time to virtual CPU time.
 - ▶ Average number of users in queue waiting to be dispatched.
 - ▶ Percent of all virtual machines in an I/O wait state.

- **Linkage and Secondary Workspaces:**
 - ▶ A link is established on the table to the System_Terminal Workspace. This is a direct link to the workspace and does not require any DWL connections.
 - ▶ There are no Secondary Workspaces for the System Workspace

TCPIP Utilization - Server



TCPIP Utilization - Server

- **TCPIP Workspace**
 - ▶ This Workspace displays data about the TCPIP Servers running on the z/VM system.

- **TCPIP Server Activity (TCPIP Table)**
 - ▶ All attributes are collected for the current reporting interval

- **Description**
 - ▶ TOD clock at start of interval (Approximately 1 second accuracy).
 - ▶ SYSID of z/VM System.
 - ▶ Assigned logical partition number.
 - ▶ Name of the TCP/IP Server.
 - ▶ Rate per second at which TCP connection open requests were initiated.
 - ▶ Rate per second at which TCP connection open requests were accepted.
 - ▶ Rate per second for TCP connection open failures.
 - ▶ Reset rate per second for TCP Connections.
 - ▶ Read requests per second.
 - ▶ Write requests per second.
 - ▶ Number of bytes received per second.
 - ▶ Number of bytes sent.
 - ▶ TCP segments received rate per second.
 - ▶ TCP segments transmit rate per second.
 - ▶ Rate at which TCP segments were retransmitted, per second.
 - ▶ Rate at which TCP segments were received that had errors, per second.
 - ▶ Rate at which TCP segments were transmitted that included a reset, in seconds.
 - ▶ ARP requests received rate per second.
 - ▶ Rate at which ARP replies were transmitted, per seconds.
 - ▶ Rate at which ARP requests were transmitted, per second.

TCPIP Utilization – Server (cont)

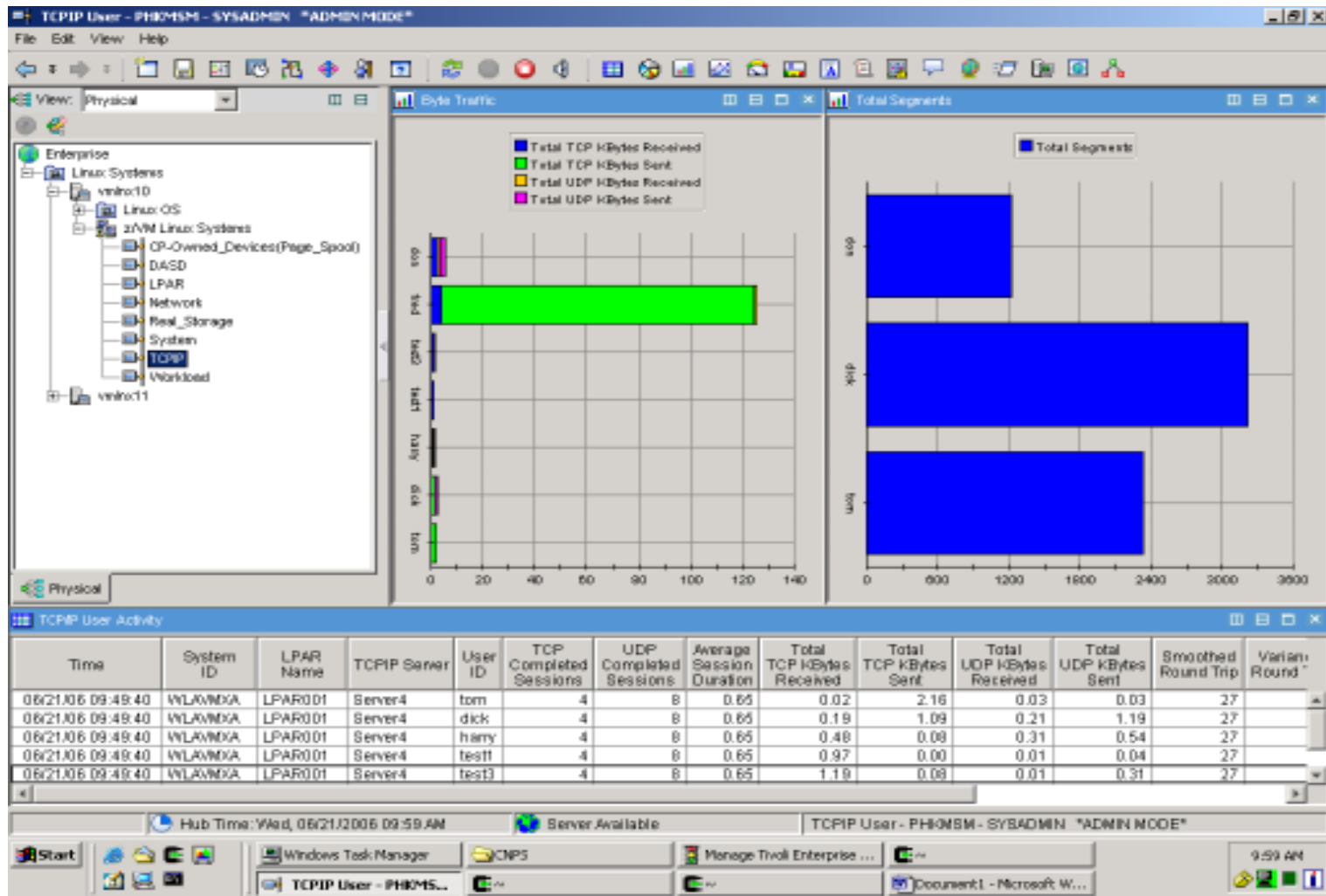
- **TCPIP Workspace (cont)**
 - ▶ This Workspace displays data about the TCPIP Servers running on the z/VM system.

- **TCPIP Server Activity (TCPIP Table) (cont)**
 - ▶ All attributes are collected for the current reporting interval

- **Description (cont)**
 - ▶ Activity control block pool level.
 - ▶ Client control block pool level.
 - ▶ Regular envelope pool level.
 - ▶ Large envelope pool level.
 - ▶ Raw IP Control Block Pool level.
 - ▶ Socket control block pool level.
 - ▶ BSD-type socket control block pool level.
 - ▶ TCP control block pool level.
 - ▶ UDP control block pool level.
 - ▶ Regular data buffer pool level.
 - ▶ Small data buffer pool level.
 - ▶ Tiny data buffer pool level.
 - ▶ Segment acknowledgement control block pool level.
 - ▶ Fixed page storage pool level.

- **Linkage and Secondary Workspaces:**
 - ▶ A link exists from the TCPIP Server Activity Table. Each row in the table is keyed to a TCP/IP Server. Selecting the link for a specific row will take the user to the TCPIP User Workspace for the selected Server.
 - ▶ There are no Secondary Workspaces for the System Workspace

TCPIP Utilization - Users



TCPIP Utilization - Users

- **TCPIP User Workspace**
 - ▶ This workspace displays data about the main users of the TCPIP function for the server selected on the previous workspace.

- **TCPIP User Activity (TCPIP USER)**
 - ▶ All attributes are collected for the current reporting interval

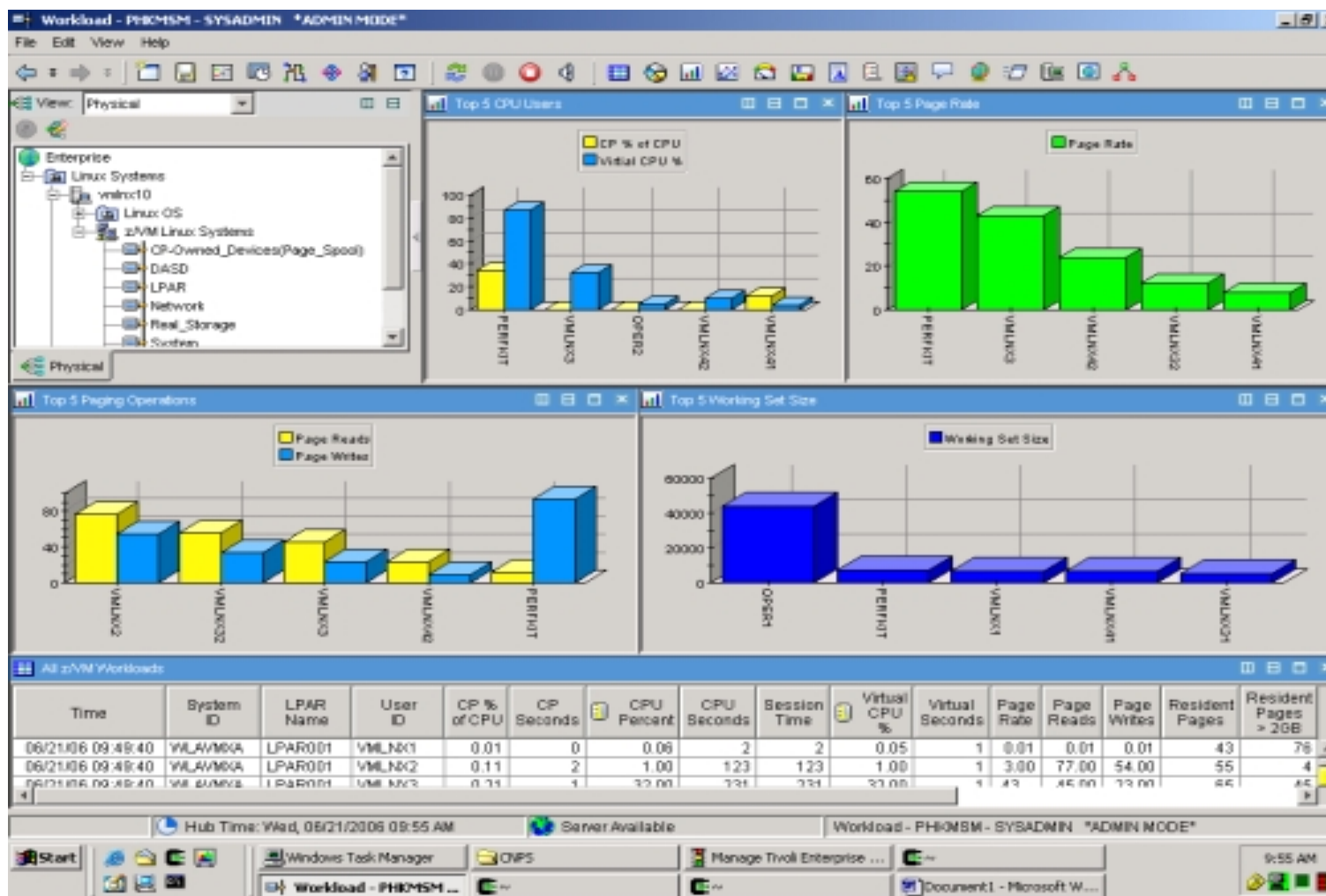
- **Description**
 - ▶ TOD clock at start of interval (Approximately 1 second accuracy).
 - ▶ SYSID of z/VM System.
 - ▶ Assigned logical partition number.
 - ▶ Name of the TCP/IP server that the user is connected to.
 - ▶ Userid of the virtual machine that handled the local side of the conn.
 - ▶ Number of completed TCP sessions.
 - ▶ Number of completed UDP sessions.
 - ▶ Average elapsed time from open to close for sessions.
 - ▶ Number of bytes received during TCP sessions.
 - ▶ Number of bytes sent during TCP sessions.
 - ▶ Number of bytes received during UDP sessions.
 - ▶ Number of bytes sent during UDP sessions.
 - ▶ Smoothed round trip time, in seconds.
 - ▶ Round trip variance time, in seconds.
 - ▶ Total number of segments.
 - ▶ Maximum number of unacknowledged segments.
 - ▶ Maximum input buffer queue size.
 - ▶ Maximum output buffer queue size.

- **Linkage and Secondary Workspaces:**
 - ▶ Link from the TCPIP User Activity Table to the Linux Network Workspace for the selected Linux Guest system. (Each row in the table will be for a specific guest system). This function requires DWL to be implemented.
 - ▶ There are no Secondary Workspaces for the System Workspace

System Terminal Workspace

The screenshot displays the System Terminal Workspace interface. At the top, a window titled "System_Terminal - PHKOCH - SYSADMIN" contains a terminal window and a tree view. The tree view on the left shows a hierarchy under "Enterprise" including "Linux Systems", "Windows Systems", and "PHKOCH". Under "PHKOCH", there are several sub-items like "Universal Agent", "Universal Data Provider", and "SYSTEM". The terminal window on the right shows a boot sequence for a VM named "bvm2", displaying memory usage statistics and a prompt for "USERID". Below the terminal is a "Take Action" panel with a dropdown for "Action Name" (set to "<Select Action>"), a text field for "Command", and a list box for "Destination System(s)". The status bar at the bottom indicates "Ready", "Hub Time: Wed, 08/24/2005 11:05 AM", "Server Available", and "System_Terminal - PHKOCH - SYSADMIN".

WORKLOAD (z/VM User ID) Activity



WORKLOAD (z/VM User ID) Activity

- **Workload Workspace**
 - ▶ This workspace displays the system usage (by userid/workload) for all users on the z/VM system.

- **All z/VM Workloads (Workload Table)**

- **Description**
 - ▶ TOD clock at start of interval (Approximately 1 second accuracy).
 - ▶ SYSID of z/VM System.
 - ▶ Assigned logical partition number.
 - ▶ Userid or group name.
 - ▶ Number of Virtual CPUs (VCPUs)
 - ▶ Percent of total CPU used by the system to manage this workload.
 - ▶ Percent of total CPU used by the system to manage this workload scaled by number of VCPUs
 - ▶ Total CP seconds used by this workload (to nearest second).
 - ▶ Percent of total CPU used by the system to manage this workload.
 - ▶ Percent of total CPU used by the system to manage this workload. scaled by number of VCPUs
 - ▶ Total CPU seconds used by this workload (to nearest second).
 - ▶ Total time this workload was logged on (to nearest second), or aggregation of group.
 - ▶ Percent of virtual CPU utilization for the workload specified.
 - ▶ Percent of virtual CPU utilization for the workload specified scaled by number of VCPUs
 - ▶ Total virtual CPU seconds used by this workload (to nearest second).

WORKLOAD (z/VM User ID) Activity (cont)

■ Description

- ▶ The rate of page-ins and page-outs for this workload (in pages/sec.).
- ▶ Number of page reads over the specified period of time.
- ▶ Number of page writes over the specified period of time.
- ▶ The current number of pages physically in main storage for this workload.
- ▶ Average storage size for this workload.
- ▶ The number of megabytes of expanded storage attached to this workload.
- ▶ The number of expanded pages moved for this workload.
- ▶ The number of expanded storage blocks allocated to this workload by CP for paging.
- ▶ A user's projected working set size. This value is calculated each time a user drops from queue, and is based on the number of pages referenced during the last stay in queue.
- ▶ Name of the group that this workload belongs to [Primarily used to determine which VMs are Linux guest hosts.]

■ Linkage and Secondary Workspaces:

- ▶ No Links from this Workspace
- ▶ Secondary Workspaces from the WORKLOAD Navigator is the Linux Workload Workspace
 - Right Mouse click on WORKLOAD Navigator to go to Linux Workload workspace.

Linux Workload Workspace

The screenshot displays the Linux Workload Workspace interface. On the left, a tree view shows the system hierarchy. The main area contains several charts: 'Top 5 CPU Linux Guest Systems' (bar chart of CPU % and Virtual CPU %), 'Top 5 Linux Guest Systems Page Rate' (bar chart of Page Rate), 'Top 5 Linux Guest System Working Set Size' (bar chart of Working Set Size), and 'Top 5 Linux Guest System' (bar chart of CPU % and Virtual CPU %). A context menu is open over the 'Top 5 Linux Guest System' chart, showing options like 'Workspace', 'Take Action...', 'Launch...', and 'Properties...'. At the bottom, a table lists system performance metrics.

Worldload Group	Time	System ID	LPAR Name	User ID	CP % of CPU	CP Seconds	CPU Percent	CPU Seconds	Session Time	Virtual CPU %	Virtual Seconds	Page Rate	Page Reads	Page Writes	Res Pa
Linux	06/21/06 09:49:40	WLAVMXA	LPAR001	VMLNX1	0.01	0	0.06	2	2	0.05	1	0.01	0.01		
Linux	06/21/06 09:49:40	WLAVMXA	LPAR001	VMLNX2	0.11	2	1.00	123	123	1.00	1	3.00	77.00	54.00	
Linux	06/21/06 09:49:40	WLAVMXA	LPAR001	VMLNX3	0.11	1	12.00	211	211	21.00	1	42	46.00	23.00	

Linux Workload Workspace

- **Linux Workload Workspace**

- ▶ This workspace displays the same information as the Workload Workspace, but only for the guest systems which have the GROUP set to Linux.

- **Linux Workloads (Workload Table)**

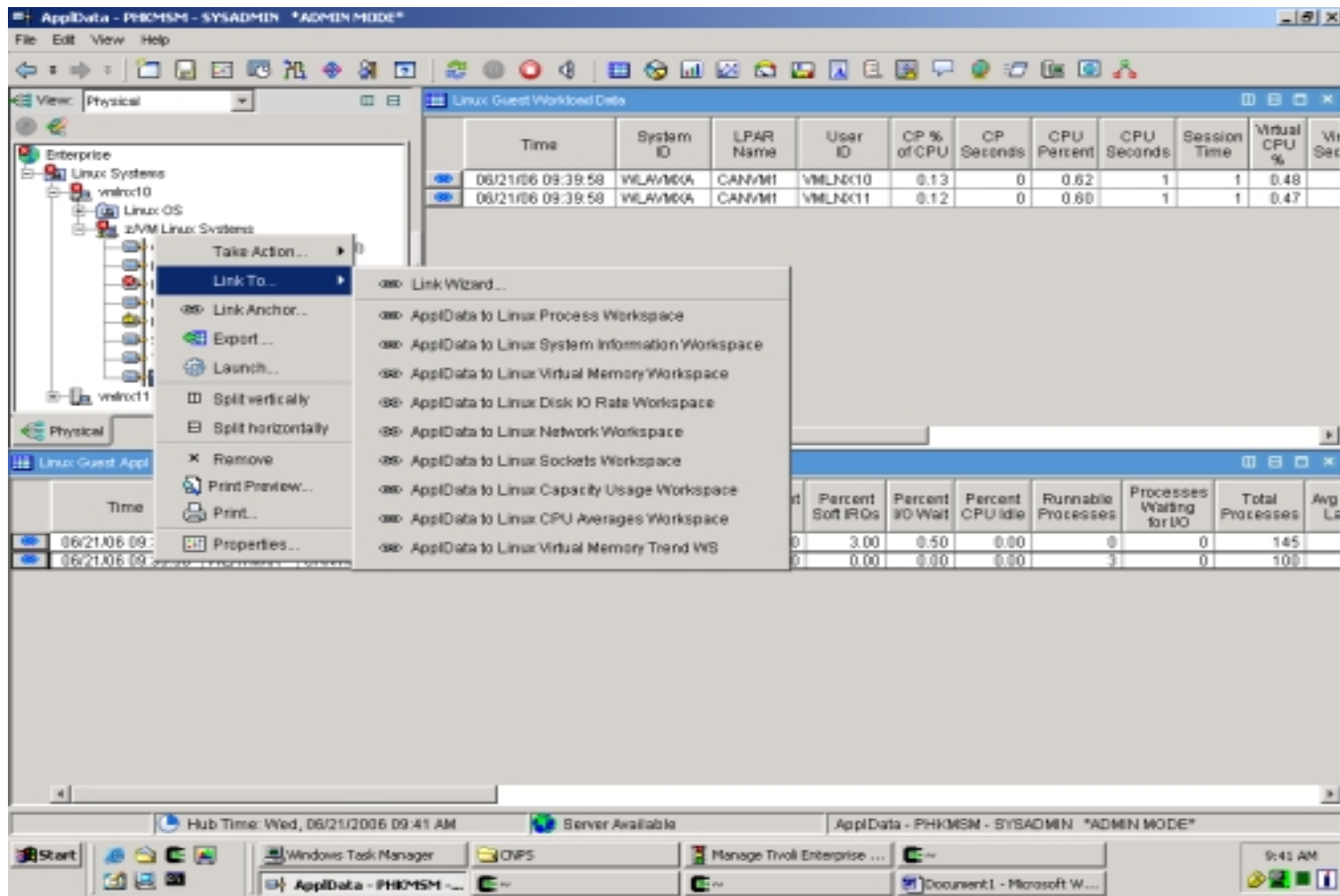
- **Description**

- ▶ TOD clock at start of interval (Approximately 1 second accuracy).
- ▶ SYSID of z/VM System.
- ▶ Assigned logical partition number.
- ▶ Userid or group name.
- ▶ Percent of total CPU used by the system to manage this workload.
- ▶ Total CP seconds used by this workload (to nearest second).
- ▶ Percent of total CPU used by the system to manage this workload.
- ▶ Total CPU seconds used by this workload (to nearest second).
- ▶ Total time this workload was logged on (to nearest second), or aggregation of group.
- ▶ Percent of virtual CPU utilization for the workload specified.
- ▶ Total virtual CPU seconds used by this workload (to nearest second).
- ▶ The rate of page-ins and page-outs for this workload (in pages/sec.).
- ▶ Number of page reads over the specified period of time.
- ▶ Number of page writes over the specified period of time.
- ▶ The current number of pages physically in main storage for this workload.
- ▶ Average storage size for this workload.
- ▶ The number of megabytes of expanded storage attached to this workload.
- ▶ The number of expanded pages moved for this workload.
- ▶ The number of expanded storage blocks allocated to this workload by CP for paging.
- ▶ A user's projected working set size. This value is calculated each time a user drops from queue, and is based on the number of pages referenced during the last stay in queue.
- ▶ Name of the group that this workload belongs to [Primarily used to determine which VMs are Linux guest hosts.]

- **Linkage and Secondary Workspaces:**

- ▶ Link from the Linux Workloads table to the OMEGAMON XE for Linux System Information Workspace for the selected Linux Guest system (by row).
- ▶ There are no Secondary Workspaces for the Workloads Workspace

AppData Workspace



AppData Workspace

- **AppData Workspace**

- ▶ This workspace displays information about Linux(R) workload activity and storage utilization

- **Description**

- ▶ The name that uniquely identifies the active z/VM system.
- ▶ The name assigned to the logical partition.
- ▶ The user identification or group name of the Linux guest.
- ▶ The number of virtual central processing units (CPUs) defined for the Linux guest system.
- ▶ The percent of total CPU used by this Linux virtual machine.
- ▶ The percent of CPU used by this Linux virtual machine, running in user mode.
- ▶ The percent of CPU used by this Linux virtual machine, running in kernel mode.
- ▶ The percent of CPU used by the Linux virtual machine, running in 'nice' mode (with modified priority).
- ▶ The percent of interrupts (IRQs).
- ▶ The percent of soft interrupts (IRQs).
- ▶ The percent of time spent by the virtual machine in an I/O wait state
- ▶ The percent of time spent by the virtual machine in a CPU idle state.
- ▶ The number of runnable processes at sampling time.
- ▶ The number of processes waiting for I/O.
- ▶ The total number of processes at sampling time.
- ▶ The average number of processes found running during the last minute.
- ▶ The average number of processes found running during the last five minutes.
- ▶ The average number of processes found running during the last fifteen minutes.
- ▶ The total size of the main memory, in megabytes
- ▶ The percent of main memory used.
- ▶ The percent of main memory used.
- ▶ The total size of the high memory, in megabytes.
- ▶ The percent of high memory used.

AppData Workspace (cont)

■ Description

The size of the memory that is usable by more than one process, in megabytes.

- ▶ The size of the memory that is reserved for buffers and for free cache, in megabytes.
- ▶ The size of the memory that is used for buffers, in megabytes.
- ▶ The total amount of swap space, both used and available, in megabytes.
- ▶ The percent of swap space used.
- ▶ The number of pages swapped in, at the rate of 4-kilobyte pages per second.
- ▶ The number of pages swapped out, at the rate of 4-kilobyte pages per second.
- ▶ The rate of page allocations (the number of pages obtained from the available list), in 4 kilobyte pages per second.
- ▶ The rate per second of major page faults for the process.
- ▶ The rate per second of minor page faults for the process.
- ▶ The block I/O data read rate, in kilobytes per second.
- ▶ The block I/O data write rate, in kilobytes per second.
- ▶ The number of networking interfaces defined.
- ▶ The rate per second of packets received.
- ▶ The rate per second of packets transmitted.
- ▶ The rate per second of bytes received.
- ▶ The rate per second of bytes received.
- ▶ The number of bad packets received, per second.
- ▶ The rate per second of packet transmit problems.
- ▶ The rate per second, of no space found in Linux buffers.
- ▶ The rate per second, of no space available in Linux.
- ▶ The rate per second of collisions while transmitting.



AppData Workspace (cont)

Linkage:

- ▶ Link from AppData to Linux Process
- ▶ Link from AppData to Linux System Information Workspace
- ▶ Link from AppData to Linux Virtual Memory Workspace
- ▶ Link from AppData to Linux Disk IO Rate Workspace
- ▶ Link from AppData to Linux Network Workspace
- ▶ Link from AppData to Linux Sockets Workspace
- ▶ Link from AppData to Linux Capacity Usage Workspace
- ▶ Link from AppData to Linux CPU Averages Workspace
- ▶ Link from AppData to Linux Virtual Memory Trend Workspace



Channel Workspace

The screenshot displays the Tivoli Channel Workspace interface within a Microsoft Internet Explorer browser window. The interface includes a navigation pane on the left, several monitoring charts, and data tables at the bottom.

Navigator: Shows a tree view of system components including Linux Systems, z/VM Systems, and z/VM Linux Systems.

Top 5 z/VM Channel Busy: A bar chart comparing Interval Busy Conditions Percent (yellow) and Average Busy Conditions Percent (blue) across CHPIDs 2C, 3C, 91, 92, and 93.

Top 5 LPAR Channel Busy - Owning Part...: A bar chart showing busy conditions for CHPIDs 0, 13, 14, and 29.

Top 5 LPAR Channels by Info...: A legend for channel busy distribution ranges (11-20% to 91-100%) and a small bar chart.

z/VM Channel Busy Table:

Time	System ID	CHPID	Model Group
02/14/08 17:32:33	WLAVMKA	2C	ESCON
02/14/08 17:32:33	WLAVMKA	3C	ESCON
02/14/08 17:32:33	WLAVMKA	91	FICON
02/14/08 17:32:33	WLAVMKA	92	FICON
02/14/08 17:32:33	WLAVMKA	93	FICON
02/14/08 17:32:33	WLAVMKA	95	FICON
02/14/08 17:32:33	WLAVMKA	E8	OSD
02/14/08 17:32:33	WLAVMKA	EA	OSD
02/14/08 17:32:33	WLAVMKA	EB	OSD
02/14/08 17:32:33	WLAVMKA	94	FICON

LPAR Channel Busy - Owning Partition Table:

Time	System ID	CHPID	Model Group	Group
02/14/08 17:32:33	WLAVMKA	10	ESCON	00
02/14/08 17:32:33	WLAVMKA	12	ESCON	00
02/14/08 17:32:33	WLAVMKA	13	ESCON	00
02/14/08 17:32:33	WLAVMKA	14	ESCON	00
02/14/08 17:32:33	WLAVMKA	15	ESCON	00
02/14/08 17:32:33	WLAVMKA	20	ESCON	00
02/14/08 17:32:33	WLAVMKA	22	ESCON	00
02/14/08 17:32:33	WLAVMKA	23	ESCON	00
02/14/08 17:32:33	WLAVMKA	28	ESCON	00
02/14/08 17:32:33	WLAVMKA	29	ESCON	00

System status: Hub Time: Thu, 02/14/2008 05:37 PM, Server Available, Channel - bmaddox3.raleigh.ibm.com - SYSADMIN

Channel Workspace

- **Channel Workspace**

- ▶ This workspace displays channel load data for all active channel paths

- **Description**

- ▶ The name assigned to the logical partition
- ▶ Description of the channel model group
- ▶ The average percentage of 'busy' conditions found
- ▶ CHPID value assigned to each installed channel path of the system
- ▶ The channel load distribution for each of the active channels
- ▶ The hexadecimal channel model group qualifier
- ▶ The percentage of 'busy' conditions found for the last interval



FICON Channel Workspace

http://bmaddox3.raleigh.ibm.com:1920 - FICON Channels - Microsoft Internet Explorer

Tivoli Enterprise Portal - Welcome SYSADMIN

File Edit View Help

Navigator View: Physical

- Linux Systems
- z/VM Systems
 - vmna11.VL
 - z/VM Linux Systems
 - Channel
 - CP Owned Devices
 - DASD
 - LPAR
 - Network
 - Real Storage
 - System
 - TCPIP
 - Workload

Physical

FICON Channel Utilization - System

Legend: Bus Cycles Percent (Yellow), Work Units Percent (Blue), Data Write Percent (Red), Data Read Percent (Green)

FICON Channel Utilization - Owning P...

Legend: Owning LPAR Work Units Percent (Yellow), Owning LPAR Data Write Percent (Blue), Owning LPAR Data Read Percent (Red)

FICON Channel Utilization - Tr...

Legend: System Writes per Second (Yellow), System Reads per Second (Blue)

Time	System ID	CHPID	Channel Shared Indicator	Bus Cycles Percent	Work Units Percent	Data Write Percent	Data Read Percent	Owning LPAR Work Units Percent	Ow D
02/14/08 17:49:34	WLAVMXA	90	Yes	0.00	0.01	0.00	0.00	0.00	
02/14/08 17:49:34	WLAVMXA	91	Yes	0.00	0.03	0.00	0.00	0.00	
02/14/08 17:49:34	WLAVMXA	92	Yes	0.00	0.01	0.00	0.00	0.00	
02/14/08 17:49:34	WLAVMXA	93	Yes	0.00	0.03	0.00	0.00	0.00	
02/14/08 17:49:34	WLAVMXA	94	Yes	0.00	0.00	0.00	0.00	0.00	
02/14/08 17:49:34	WLAVMXA	95	Yes	0.00	0.01	0.00	0.00	0.00	
02/14/08 17:49:34	WLAVMXA	96	Yes	0.00	0.01	0.00	0.00	0.00	
02/14/08 17:49:34	WLAVMXA	E0	Yes	0.00	0.00	0.00	0.00	0.00	
02/14/08 17:49:34	WLAVMXA	E1	Yes	0.00	0.00	0.00	0.00	0.00	
02/14/08 17:49:34	WLAVMXA	E4	Yes	0.00	0.00	0.00	0.00	0.00	

FICON Channel Utilization

Hub Time: Thu, 02/14/2008 05:52 PM Server Available FICON Channels - bmaddox3.raleigh.ibm.com - SYSADMIN

start Session A - [24 x ... Local Disk (C:) Microsoft PowerP... http://bmaddox3... Help -- Mozilla Fr... 100% 5:49 PM

FICON Channel Workspace

- **FICON Channel Workspace**

- ▶ This workspace displays FICON channel load data.

- **Description**

- ▶ The name assigned to the logical partition
- ▶ The bus cycles utilization for the whole system
- ▶ CHPID value assigned to each installed channel path of the system
- ▶ The channel shared indicator
- ▶ The data units read utilization for the whole system
- ▶ The data units write utilization for the whole system
- ▶ The work units utilization for the entire system
- ▶ The data units read utilization for the owning logical partition
- ▶ The data units write utilization for the owning logical partition
- ▶ The work units utilization for the owning logical partition
- ▶ The total number of bytes read per second for the entire system
- ▶ The total number of bytes written per second for the entire system

Minidisk Cache Workspace

http://bmaddox3.raleigh.ibm.com:1920 - Minidisk Cache - Microsoft Internet Explorer

Tivoli Enterprise Portal - Welcome SYSADMIN

File Edit View Help

File Edit View Help

Navigator View: Physical

- Linux Systems
- z/VM Systems
 - vmha11:VL
 - z/VM Linux Systems
 - Channel
 - CP Owned Devices
 - DASD
 - LPAR
 - Network
 - Real Storage
 - System
 - TCP/IP
 - Workload

Physical

Cache Requests

- Minidisk Cache Read Rate
- Invalid Request Rate
- Block Invalid Rate

Main Storage Frames

- Actual Frames Below 20
- Ideal Frames
- Actual Frames Above 20

Cache Age

- Block Life
- Avg XSTORE Age

Cache Expanded Storage

- Ideal XSTORE
- Actual XSTORE

Minidisk Cache Activity

Time	System ID	Partition Size in Blocks	Max Cache Size in Blocks	Actual Cache Size in Blocks
02/14/08 18:00:34	WLAVMKA	16384	4096	

Hub Time: Thu, 02/14/2008 06:05 PM

Server Available

Minidisk Cache - bmaddox3.raleigh.ibm.com - SYSADMIN

start Session A - [24 x ...] Local Disk (C:) Microsoft PowerP... http://bmaddox3... Help -- Mozilla Fr... 100% 6:01 PM

Minidisk Cache Workspace

- **Minidisk Cache Workspace**

- ▶ This workspace displays minidisk cache storage data.

- **Description**

- ▶ The number of expanded storage blocks used for minidisk caching
- ▶ The actual number of main storage page frames used for the minidisk cache below the 2 GB line
- ▶ The actual number of main storage page frames used for the minidisk cache above the 2 GB line
- ▶ The actual number of expanded storage blocks used for the minidisk cache
- ▶ The average age of paging XSTORE blocks
- ▶ The bias for minidisk cache usage of real storage
- ▶ The number of blocks per second that were invalidated following an invalidation request
- ▶ The estimated average age in seconds of a minidisk cache block
- ▶ The done rate for successfully translated channel command words
- ▶ The number of CCWs that were found to be not eligible for translation
- ▶ The rate per second that blocks could not be moved into the minidisk cache because their user's fair share limit was exceeded
- ▶ The fair share limit for the minidisk cache
- ▶ The percentage of requests that were full hits
- ▶ The ideal number of main storage page frames in the minidisk cache



Minidisk Cache Workspace (cont)

- ▶ The ideal number of expanded storage blocks in the minidisk cache
- ▶ The insertions per second into the in-transit waiting queue
- ▶ The number of requests per second to invalidate minidisk cache blocks, due to an I/O to a virtual device via a non-cacheable I/O interface
- ▶ The MDC bias for main storage
- ▶ The bias for minidisk cache use of expanded storage
- ▶ The maximum number of expanded storage blocks that can be used for minidisk caching
- ▶ The maximum number of main storage page frames to be used for the minidisk cache
- ▶ The maximum number of expanded storage blocks to be used for the minidisk cache
- ▶ The number of read requests to the minidisk cache, per second, where all the requested blocks were found in the cache
- ▶ The minimum number of main storage page frames to be used for the minidisk cache
- ▶ The minimum number of expanded storage blocks to be used for the minidisk cache
- ▶ The aborted translation attempts per second for network devices

CCW Translation Workspace

http://bmaddox3.raleigh.ibm.com:1920 - CCW Translations - Microsoft Internet Explorer

Tivoli Enterprise Portal - Welcome SYSADMIN

File Edit View Help

Navigator

- Linux Systems
- z/VM Systems
 - vmha11:VL
 - z/VM Linux Systems
 - Channel
 - CP Owned Devices
 - DASD**
 - LPAR
 - Network
 - Real Storage
 - System
 - TCPIP
 - Workload

Physical

DASD CCW Translations

BASD and Network CCW Translations

Time	System ID	Total CCWs per Second	CCWs Translated per Second	Translations Aborted per Second	CCWs Not Eligible per Second	Total Network CCWs Translated per Second	Network CCWs Translated per Second	Network CCWs Aborted per Second	Network CCWs Not Eligible per Second	LPAR Name
02/14/08 18:17:33	W1LAVMKA	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	CANVM1

Hub Time: Thu, 02/14/2008 06:21 PM

Server Available

CCW Translations - bmaddox3.raleigh.ibm.com - SYSADMIN

start | Session A - [24 x ...] | Local Disk (C:) | Microsoft PowerP... | http://bmaddox3... | Help -- Mozilla Fr... | 100% | 6:17 PM

CCW Translation Workspace

- ▶ The done rate for networks
- ▶ The number of CCWs that were found to be not eligible for translation
- ▶ The number of main storage pages deleted from cache per second
- ▶ The rate at which minidisk cache blocks are moved, per second, from expanded storage to central storage
- ▶ The rate at which minidisk cache blocks are moved per second from central storage to expanded storage
- ▶ The size of the CP partition in expanded storage
- ▶ The rate at which the steal function was invoked to steal expanded storage pages from the minidisk cache
- ▶ The total number of CCWs handled per second for DASD
- ▶ The total number of CCWs handled per second for networks
- ▶ The aborted translation attempts per second for DASD
- ▶ The number of XSTORE pages deleted from cache
- ▶ The number of times the steal function was invoked to steal expanded storage pages from cache

DASD Cache Workspace

The screenshot displays the DASD Cache Workspace application with the following components:

- Left Panel:** A tree view showing the system hierarchy: Enterprise > Linux Systems > z/VM Systems > vmrx11:VL > z/VM Linux Systems > DASD.
- Top 5 Cache Rate per Second (Components):** A bar chart showing Nonsequential Read Rate per Second (yellow), Sequential Read Rate per Second (blue), and Fast Write Rate per Second (red) for VMSERS, S30PRD, VMSLBA, and VMSLDB.
- Top 5 Percent Total Cache IO for Staging/Destaging:** A bar chart showing Nonsequential DASD to Cache Transfers Percent (blue), Sequential DASD to Cache Transfers Percent (green), and Cache to DASD Transfers Percent (yellow) for S30PRD, VMSLBA, VMSLDB, and VMSLCA.
- Top 5 Highest IO Rate per Second:** A stacked bar chart showing Normal IO Rate per Second (yellow), Sequential IO Rate per Second (blue), and Fast Write IO Rate per Second (red) for VMSERS, VMSLDB, VMSLCA, VMSLBA, and VMSLCA.
- Top 5 Cache Rate per Second:** A stacked bar chart showing Total Subchannel Measurement Block Rate per Second (green) and Total Cache Rate per Second (blue) for VMSERS, VMSLDB, VMSLCA, VMSLBA, and VMSLCA.
- DASD Cache Activity Table:** A table listing activity with columns for Time, System ID, LPAR Name, and Storage Director ID.

Time	System ID	LPAR Name	Storage Director ID
08/07/08 17:41:55	WLAVMKA	CANVM1	32
08/07/08 17:41:55	WLAVMKA	CANVM1	32
08/07/08 17:41:55	WLAVMKA	CANVM1	32
08/07/08 17:41:55	WLAVMKA	CANVM1	32
08/07/08 17:41:55	WLAVMKA	CANVM1	32
08/07/08 17:41:55	WLAVMKA	CANVM1	32
08/07/08 17:41:55	WLAVMKA	CANVM1	32
08/07/08 17:41:55	WLAVMKA	CANVM1	32
08/07/08 17:41:55	WLAVMKA	CANVM1	34
08/07/08 17:41:55	WLAVMKA	CANVM1	34
08/07/08 17:41:55	WLAVMKA	CANVM1	34
08/07/08 17:41:55	WLAVMKA	CANVM1	34
08/07/08 17:41:55	WLAVMKA	CANVM1	34

The bottom status bar shows: Hub Time: Thu, 08/07/2008 05:45 PM, Server Available, DASD Cache - bmadddx3.raleigh.ibm.com - SYSADMIN, and a Windows taskbar with 100% CPU usage and the time 5:41 PM.

DASD Cache Workspace

- ▶ The base address for the Parallel Access Volume (PAV).
- ▶ The percentage of I/O operations that bypassed caching voluntarily
- ▶ The number of bypass cache requests per second
- ▶ The percentage of cache fast write operations, based on total write activity
- ▶ The percentage of cache fast write hits, based on the sum of all cache fast-write operations.
- ▶ The percentage of cache to DASD transfer operations
- ▶ The percentage of cachable read operations, based on total I/O activity
- ▶ The percentage of read hits, based on the sum of all cachable read operations
- ▶ The percentage of total hits (read + DASD fast write + cache fast write), based on the sum of all cachable read and write operations
- ▶ The percentage of write hits (DASD fast write + cache fast write), based on the sum of all DASD and cache fast write operations
- ▶ The caching status. Possible options are:
 - ACTIVATED
 - DEACTIVATED
 - DEACTIVE PENDING
 - UNKNOWN



DASD Cache Workspace (cont)

- ▶ The storage controller subsystem identifier.
- ▶ The percentage of DASD fast write operations that were forced to bypass the cache and access DASD directly due to nonvolatile storage constraints
- ▶ The percentage of DASD fast write hits, based on the sum of all DASD fast-write operations
- ▶ The percentage of DASD fast write operations, based on total write activity.
- ▶ The status of DASD fast write Possible options are:
 - ACTIVATED
 - DEACTIVATED
 - DEACTIVE PENDING
 - UNKNOWN
- ▶ The real address of the storage device managed by the z/VM Control Program.
- ▶ The type and model of the device managed by the z/VM Control Program
- ▶ The dual copy indicator. Possible options are:
 - DUPLEX PAIR AVAILABLE
 - DUPLEX PAIR PENDING
 - FAILED DUPLEX
 - SUSPENDED DUPLEX
 - DUPLEX NOT ACTIVE
 - UNKNOWN

DASD Cache Workspace (cont)

- ▶ The number of fast write I/O requests per second over this storage director
- ▶ The total fast-write rate per second (cache fast write + DASD fast write).
- ▶ The percentage of fast-write read requests
- ▶ The percentage of fast-write read requests that did not need DASD access
- ▶ The sum of normal, sequential, and fast write (for IBM DASD subsystems only) I/O requests, per second (read + write
- ▶ The number of inhibit cache load requests per second.
- ▶ The name assigned to the logical partition
- ▶ The percentage of nonsequential DASD to cache transfer operations
- ▶ The nonsequential read rate (read normal + read cache fast write), per second
- ▶ The number of normal I/O requests, per second, over this storage director
- ▶ The percentage of normal read requests
- ▶ The normal read percentage. That is, the percentage of read requests that did not need DASD access
- ▶ The overall percentage of read requests (normal, sequential, and fast write) to the total I/O activity of the device



DASD Cache Workspace (cont)

- ▶ The overall percentage of read hits. That is, the percentage of read requests that did not need DASD access (normal, sequential, and fast write)
- ▶ The percentage of sequential DASD to cache transfer operations.
- ▶ The number of sequential I/O requests, per second, over this storage director
- ▶ The percentage of sequential read requests. That is, the percentage of read requests that did not require DASD access
- ▶ The percentage of sequential read hits
- ▶ The sequential read rate (read sequential) per second.
- ▶ 3880-13/23 storage director ID. For IBM DASD subsystems, the last two hexadecimal digits of the service set identifier (SSID) will be inserted
- ▶ The number of timeouts that occurred while waiting for data from the control unit
- ▶ The total I/O rate, per second, for the disk as it is recorded by the cache control unit. That is, where multiple systems are connected to one control unit, the total I/O activity from all systems is shown
- ▶ The I/O rate per second, as indicated by subchannel measurement block data for the system that does the monitoring
- ▶ The overall percentage of write hits to write requests. On 3880 control units, this refers to "write normal" hits



Control Unit Cache Workspace

Control Unit Cache - bmaddox3.raleigh.ibm.com - SYSADMIN

File Edit View Help

View: Physical

- Enterprise
 - Linux Systems
 - z/VM Systems
 - vmx011:VL
 - z/VM Linux Systems
 - Channel
 - CP-Owned Devices
 - DASD
 - LPAR
 - Network
 - Real Storage
 - System
 - TCP/IP

Physical

Top 5 Cache Control Unit Rate per Second

Subsystem ID	Cache IO Rate	Subchannel Measurement Block IO Rate
4025A	~3.8	~3.8
4025B	~1.5	~1.5
4003A	~0.8	~0.8
4003	~0.7	~0.7
4032	~0.5	~0.5

Top 5 Cache Control Unit Load Data Time

Subsystem ID	Average Response Time (msec)
4008	~0.50
4009	~0.50
4025A	~0.30
4008	~0.20
4032	~0.20

Top 5 Cache Control Unit Load Busy Percent

Subsystem ID	Busy Percent
4032	~0.1
4034	~0.1
4007	~0.1
4008	~0.1
4009	~0.1

Top 5 Cache Control Unit Data Rate per Second

Subsystem ID	Nonsequential Read Rate	Sequential Read Rate	Fast Write Rate
4032	~0.4	~0.1	~0.1
4034	~0.7	~0.1	~0.1
4007	~0.1	~0.1	~0.1
4008	~0.1	~0.1	~0.1
4009	~0.1	~0.1	~0.1

Top 5 Available Cache Controller Memory

Subsystem ID	Volatile Storage Configured (Mbytes)	Volatile Storage Available (Mbytes)
4008	~4000	~4000
4009	~4000	~4000
4000	~14000	~12000
4000	~14000	~12000
4003	~14000	~12000

Cache Controller Utilization

Time	System ID	LPAR Name	Subsystem ID	Control Unit Type	Volatile Storage Configured Mbytes	Volatile Storage Available Mbytes	Nonvolatile Storage Configured Mbytes	Nonvolatile Storage Available Mbytes	Cache IO Rate	Subchannel Measurement Block IO Rate	Busy Percent	Average Pending Time msec	Average Disconnection Time msec
08/07/08 17:42:55	WLAVMXA	CANVM1	4032	2107-E8	30048	26178	1049	1049	0.3	0.3	0	0.1	-
08/07/08 17:42:55	WLAVMXA	CANVM1	4034	2107-E8	30048	26178	1049	1049	0.7	0.7	0	0.1	-

Hub Time: Thu, 08/07/2008 05:46 PM Server Available Control Unit Cache - bmaddox3.raleigh.ibm.com - SYSADMIN

start Local Dis... Session ... Manage ... Control... Philes a... Window... Microsof... 100% 5:42 PM

Control Unit Cache Workspace

- ▶ The average connected time, in milliseconds.
- ▶ The average disconnected time, in milliseconds.
- ▶ The average function pending time, in milliseconds
- ▶ The average percentage of read hits
- ▶ The average response time, in milliseconds, for the device.
- ▶ The average service time, in milliseconds
- ▶ The average percentage of write hits, for DASD and cache fast write operations
- ▶ The average busy percentage for all connected disks
- ▶ The total I/O activity as it is recorded by the cache control unit
- ▶ The average percentage of cache fast-write operations, based on the sum of all write operations
- ▶ The average percentage of cache fast write hits
- ▶ The type and model of the control unit



Control Unit Cache Workspace (cont)

- ▶ The average percentage of DASD fast write hits
- ▶ The average percentage of DASD fast-write operations, based on the sum of all write operations
- ▶ The total fast-write rate per second
- ▶ The total nonsequential read rate per second.
- ▶ The amount of nonvolatile storage that is available
- ▶ The size of configured nonvolatile storage
- ▶ The average percentage on read operations, based on the sum of read and write
- ▶ The total sequential read rate per second.
- ▶ The total I/O activity as determined from count fields in the subchannel measurement blocks of the system that does the monitoring
- ▶ The subsystem identifier for the control unit
- ▶ The amount of cache storage that is available
- ▶ The size of configured cache storage



Spin Locks Workspace

Spin Locks - bmaddox3.raleigh.ibm.com - SYSADMIN

File Edit View Help

View: Physical

- Enterprise
 - Linux Systems
 - z/VM Systems
 - vmno11:VL
 - z/VM Linux Systems
 - Channel
 - CP Owned Devices
 - DASD
 - LPAR
 - Network
 - Real Storage
 - System
 - TCCP
 - Workload

Physical

Top 5 Locks per Second

Lock Name	Rate per Second
SRMSLOCK	5.0
HCPTRFLK	1.5
SRMNTOLK	1.0
RSAAVQLK	0.0
RSAZQLK	0.0

Top 5 Locks by Duration

Lock Name	Microseconds
HCPTRFLK	210
RSAZQLK	50
SRMNTOLK	40
SRMSLOCK	30
SYSMTLK	20

Top 5 Percent of Elapsed Time in Spin L...

Lock Name	Percent
HCPTRFLK	0.010
SRMNTOLK	0.000
RSAAVQLK	0.000
RSAZQLK	0.000
HCPTRFLK	0.000

Spin Lock Activity

Time	System ID	LPAR Name	Lock Name	Total Spin Lock Calls per Second	Time Spinning on Locks in Microseconds	Time Spinning on Locks Percent	Exclusive Spin Lock Rate per Second
08/07/08 17:...			K	0.0	22.40	0.00	0.0
08/07/08 17:...			K	0.0	0.00	0.00	0.0
08/07/08 17:...			K	0.0	0.00	0.00	0.0
08/07/08 17:44:54	WLAVMKA	CANVM1	BUTDLKEY	0.0	0.00	0.00	0.0
08/07/08 17:44:54	WLAVMKA	CANVM1	HCPTRFLK	0.0	0.00	0.00	0.0
08/07/08 17:44:54	WLAVMKA	CANVM1	RSAZQLK	0.0	38.90	0.00	0.0
08/07/08 17:44:54	WLAVMKA	CANVM1	HCPRCCSL	0.0	0.00	0.00	0.0
08/07/08 17:44:54	WLAVMKA	CANVM1	RSASQLK	0.0	0.00	0.00	0.0
08/07/08 17:44:54	WLAVMKA	CANVM1	HCPRCCMA	0.0	0.00	0.00	0.0
08/07/08 17:44:54	WLAVMKA	CANVM1	RCCSFQL	0.0	0.00	0.00	0.0
08/07/08 17:44:54	WLAVMKA	CANVM1	RSANQLK	0.0	0.00	0.00	0.0
08/07/08 17:44:54	WLAVMKA	CANVM1	RSANQLK	0.0	0.00	0.00	0.0

Hub Time: Thu, 08/07/2008 05:48 PM Server Available Spin Locks - bmaddox3.raleigh.ibm.com - SYSADMIN

start Local Dis... Session ... Manage ... Spin Lo... Philes a... Window... Microsof... 100% 5:44 PM

Spin Locks Workspace

- ▶ The name of the data space
- ▶ The virtual device number of the VDISK
- ▶ The number of locked data space pages
- ▶ The number of links to the virtual disk
- ▶ The number of slots occupied on auxiliary storage
- ▶ The number of data space pages moved from central storage to expanded storage, per second
- ▶ The number of data space pages read from DASD, per second
- ▶ The number of data space pages stolen per second
- ▶ The number of data space pages moved from expanded storage to central storage, per second
- ▶ The number of data space pages migrated from expanded storage to DASD, per second
- ▶ The number of data space pages written to DASD, per second
- ▶ The number of data space pages resident in central storage
- ▶ The user ID of the owner of the VDISK
- ▶ The size of the VDISK,
- ▶ The virtual I/O rate, per second, to the VDISK
- ▶ The number of XSTORE blocks occupied by the data space



Virtual Disk Workspace

The screenshot displays the VDISK management interface with several monitoring components:

- Physical View:** A tree view on the left showing the hierarchy from Enterprise down to z/Virtual Linux Systems, including Channel, CP Owned Devices, D/ASD, LPAR, Network, Real Storage, System, TCP/IP, and Workload.
- Top 5 Paging Rates per Second:** A 3D bar chart showing rates for Pages Read from DASD, Pages Stolen, and Pages Written to DASD per second for three VDISK owners (0334, 0335, 0333).
- Top 5 Expanded Storage Paging Rates per Second:** A 3D bar chart showing rates for Pages to Central Storage, Pages to DASD, and Pages from Central Storage per second for the same three VDISK owners.
- Top 5 Pages in Use:** A 3D bar chart showing counts for Resident Pages, Locked Pages, Occupied Slots, and XSTORE Pages for the three VDISK owners.
- Virtual Disk Activity Table:** A table listing activity for three VDISKs.

Time	System ID	LPAR Name	VDISK Owner	Device Number	VDISK Size	Number of Links	Virtual I/O's per Second	Pages Stolen per Second	Page from per Second
08/07/08 17:52:54	WLAVMXA	CANVM1	NEILLRD	0334	500,000	1	0.63	0.00	
08/07/08 17:52:54	WLAVMXA	CANVM1	NEILLRD	0335	100,000	1	0.18	0.00	
08/07/08 17:52:54	WLAVMXA	CANVM1	NEILLRD	0333	1,000,000	1	0.97	0.00	

System status: Hub Time: Thu, 08/07/2008 05:56 PM | Server Available | VDISK - bmaddox3.raleigh.ibm.com - SYSADMIN

Virtual Disk Workspace

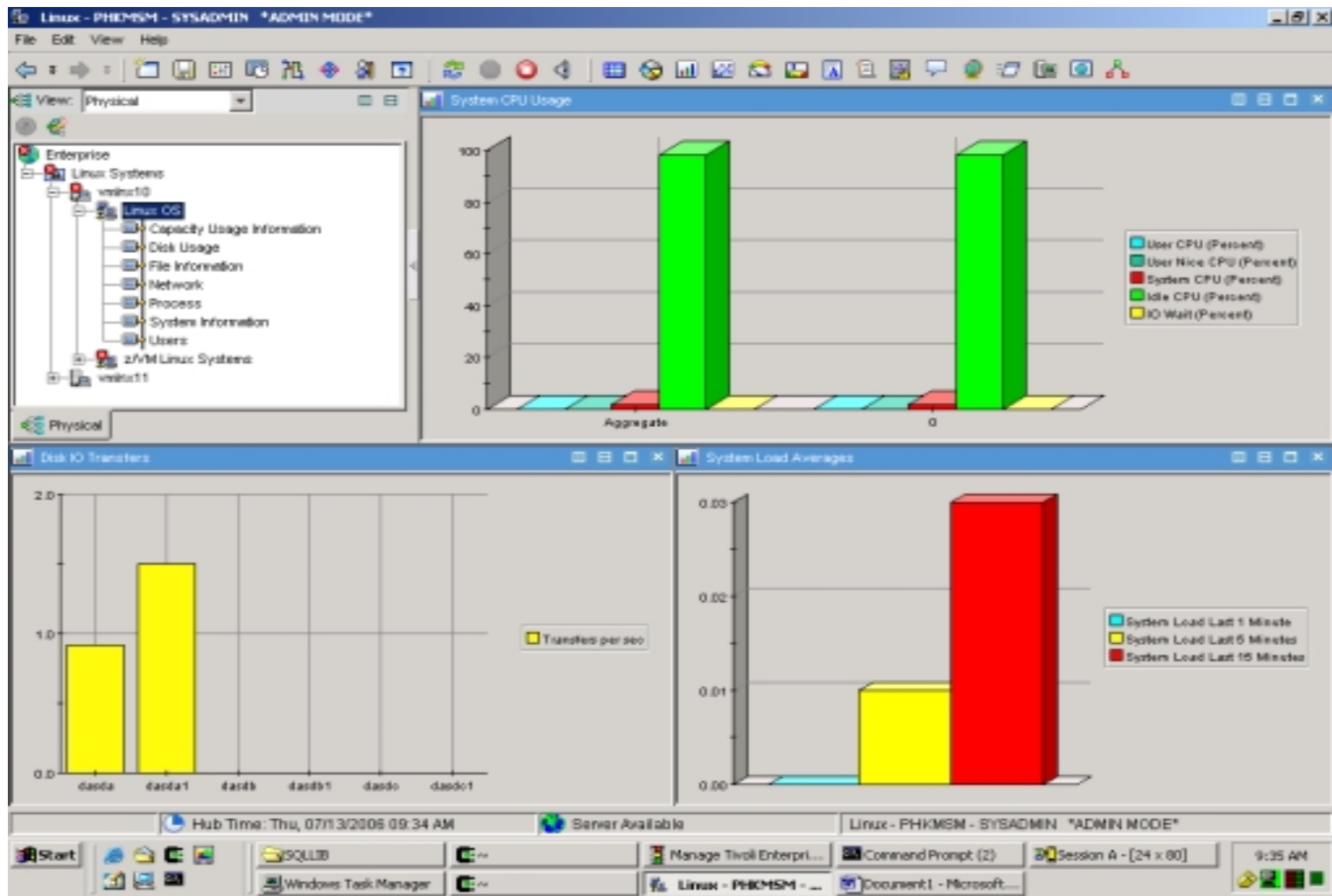
- ▶ The name of the data space
- ▶ The virtual device number of the VDISK
- ▶ The number of locked data space pages
- ▶ The number of links to the virtual disk.
- ▶ The number of slots occupied on auxiliary storage
- ▶ The number of data space pages moved from central storage to expanded storage, per second
- ▶ The number of data space pages read from DASD, per second
- ▶ The number of data space pages stolen per second
- ▶ The number of data space pages moved from expanded storage to central storage, per second
- ▶ The number of data space pages migrated from expanded storage to DASD, per second
- ▶ The number of data space pages written to DASD, per second
- ▶ The number of data space pages resident in central storage
- ▶ The user ID of the owner of the VDISK
- ▶ The size of the VDISK
- ▶ The virtual I/O rate, per second, to the VDISK
- ▶ The number of XSTORE blocks occupied by the data space

Linux on zSeries Primary Workspaces

- **Linux OS**
- **Capacity Usage**
- **Disk Usage**
- **File Information**
- **Network**
- **Process**
- **System Information**
- **Users**



Linux OS



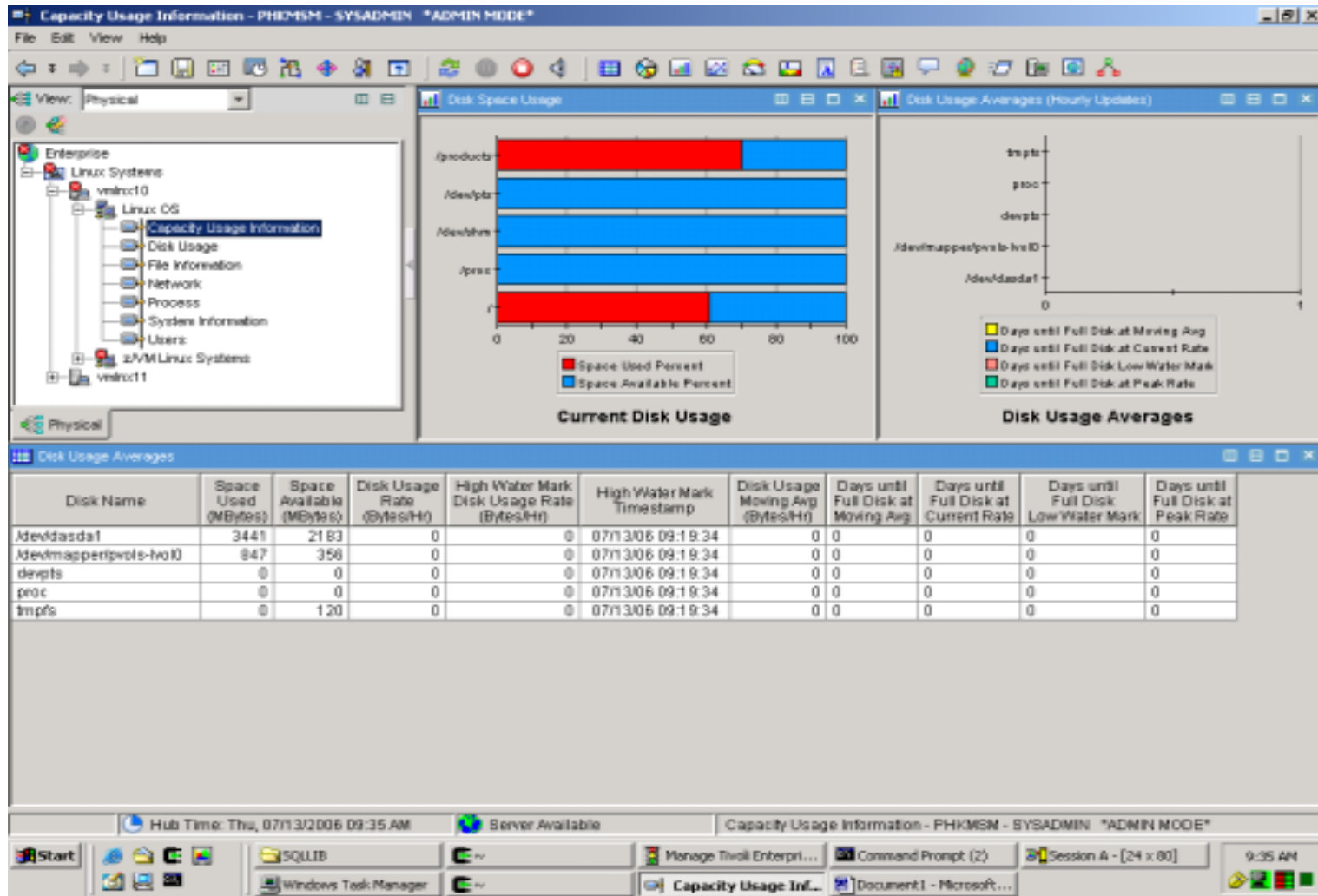
Linux OS Workspace

- **Linux OS Workspace**
 - ▶ This workspace displays overall system data for the Linux system

- **Linux OS**

- **Description**
 - ▶ Bar chart showing the percentages of CPU usage, by user CPU, user nice, system, and idle categories
 - ▶ Bar chart showing the number of transfers per second that were issued to each device
 - ▶ Bar chart showing the load on the system's processor during the previous one, five, and fifteen minutes

Capacity Usage



Capacity Usage Workspace

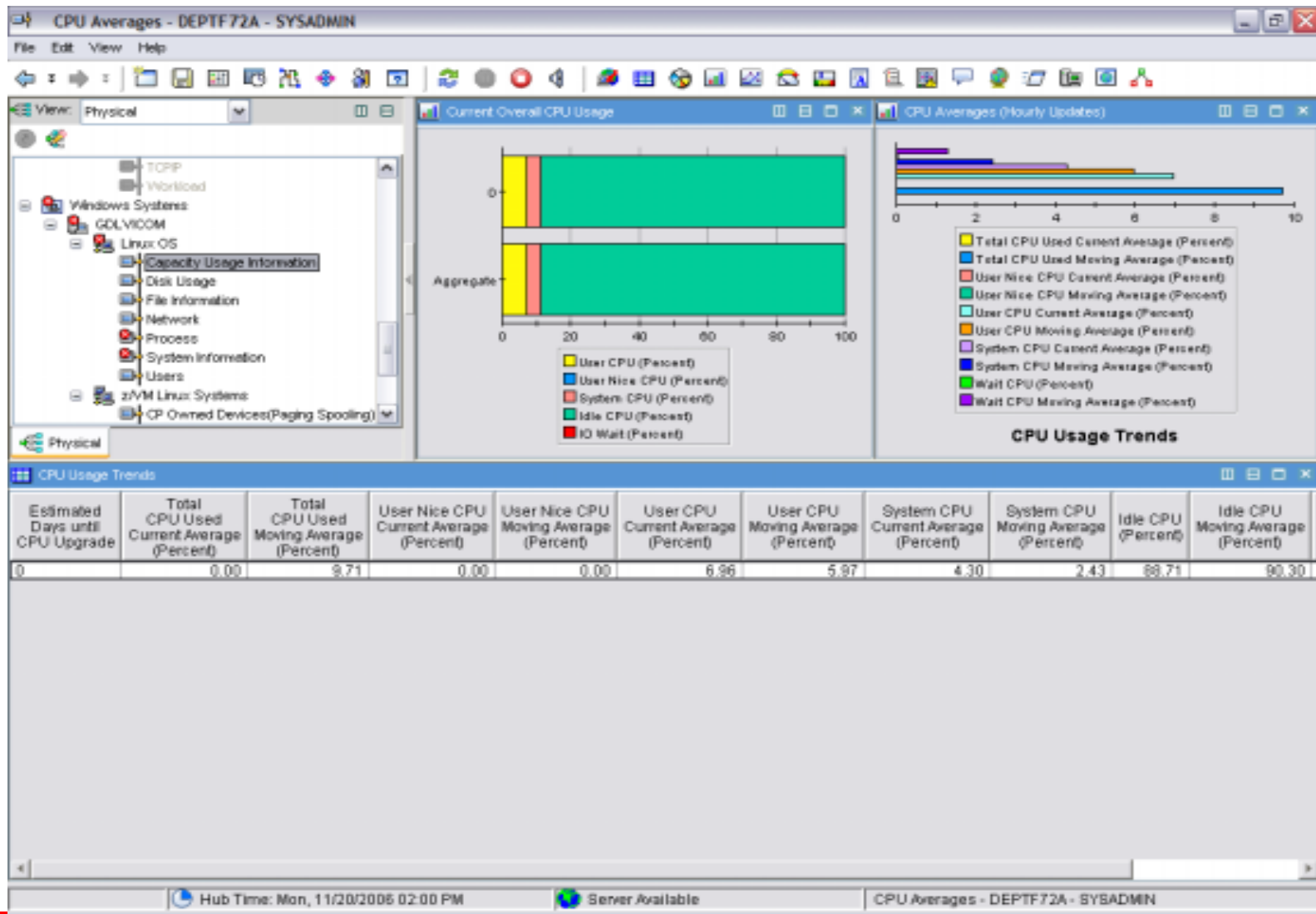
■ Capacity Usage Information Workspace

- ▶ This workspace displays the health of your system by providing CPU, disk, and swap space usage statistics.

■ Description

- ▶ The name of the physical disk partition where the file system is mounted.
- ▶ The amount of disk space currently in use on a file system, expressed in megabytes.
- ▶ The amount of unused space currently available to non-superusers on a file system, expressed in megabytes.
- ▶ The bytes per hour of disk usage over the last sample period.
- ▶ The bytes per hour rate that represents the high water mark of disk usage.
- ▶ The date and time that the disk usage reaches a high water mark
- ▶ The bytes per hour of disk usage averaged over all previous samples.
- ▶ The number of days until the disk is full based on the moving average rate of disk usage.
- ▶ The number of days until the disk is full based on the current rate of disk usage.
- ▶ The number of days until the disk is full based on the disk usage rate that represents the low water mark.
- ▶ The number of days until the disk is full based on the peak rate of disk usage.

CPU Averages



CPU Averages Workspace

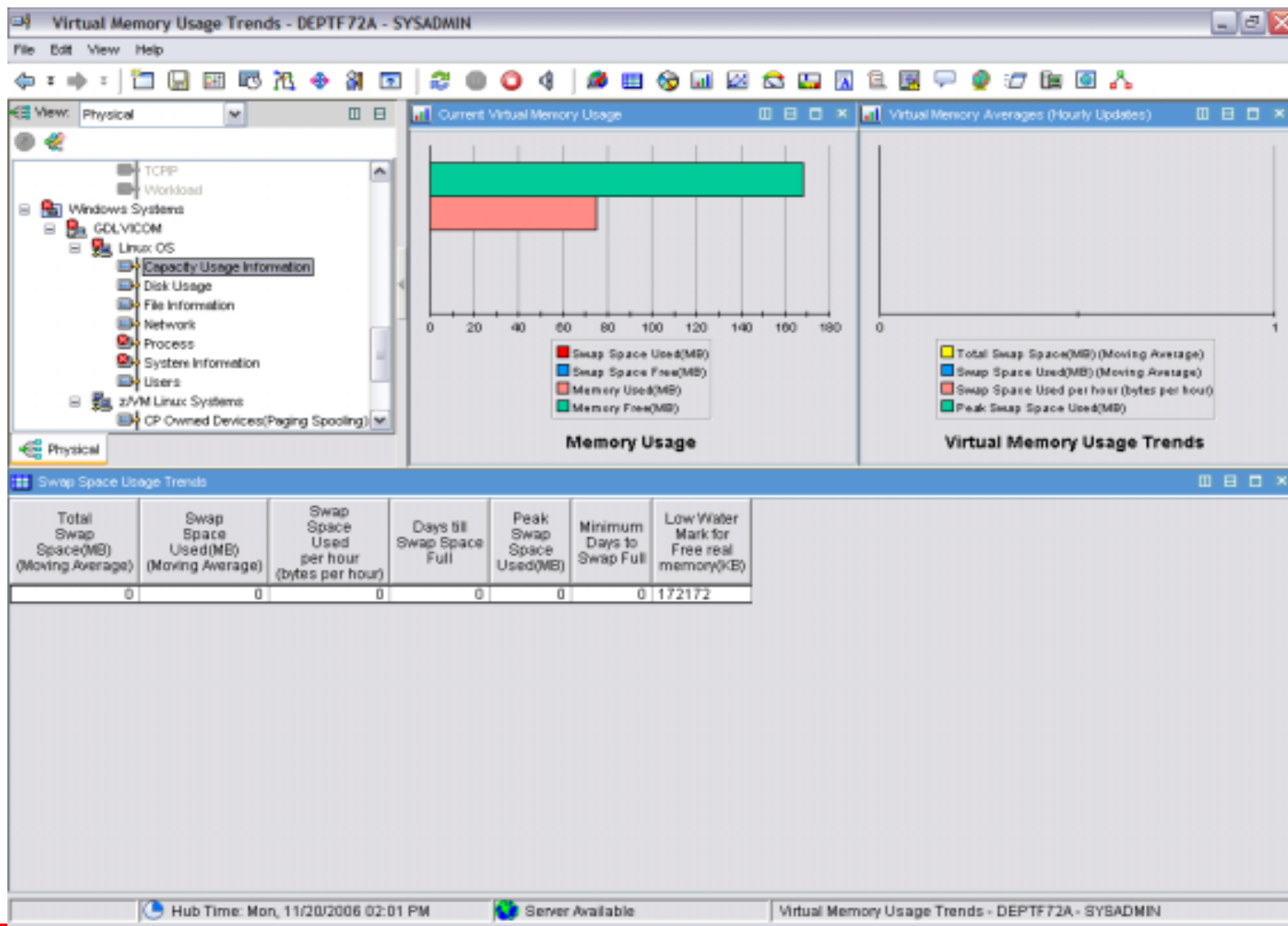
■ CPU Averages Workspace

- ▶ This workspace displays the average CPU usage and shows trends that might indicate whether the usage is increasing

■ Description

- ▶ The number of days until CPU Usage Moving average hits 100% rate.
- ▶ The current average of CPU usage, expressed as a percentage.
- ▶ The moving average of CPU usage, expressed as a percentage
- ▶ The current average of the user nice CPU time, expressed as a percentage
- ▶ The moving average of the user nice CPU time, expressed as a percentage.
- ▶ The current average of the user CPU time, expressed as a percentage.
- ▶ The moving average of the user CPU time, expressed as a percentage.
- ▶ The current average of the system CPU time, expressed as a percentage
- ▶ The moving average of the system CPU time, expressed as a percentage.
- ▶ The current average of the system's idle CPU time, expressed as a percentage.
- ▶ The moving average of the system's idle CPU time, expressed as a percentage.
- ▶ The current average of the wait CPU time, expressed as a percentage.
- ▶ The moving current average of the wait CPU time, expressed as a percentage.

Virtual Memory Usage Trends



Virtual Memory Usage Trends Workspace

■ Virtual Memory Usage Trends Workspace

- ▶ This workspace displays information about current memory usage and usage and swap space usage trends

■ Description

- ▶ The moving average of total swap space, expressed in megabytes.
- ▶ The moving average of swap space used, expressed in megabytes
- ▶ The swap space usage rate, expressed in bytes per hour.
- ▶ The predicted number of days until swap space is completely used (moving average).
- ▶ The minimum number of days until swap space is completely used (peak rate based).
- ▶ The lowest level that free real memory has reached, expressed in kilobytes.

Disk Usage

The screenshot displays the Tivoli Disk Usage tool interface. The left pane shows a tree view of the system hierarchy, including Enterprise, Linux Systems, and z/VM Linux Systems. The main area is divided into several panels:

- Space Used Percent:** A 3D bar chart showing the percentage of space used for various mount points. The x-axis ranges from 0 to 70. The y-axis lists mount points: /devpts, /tmp, /proc, and /dev/sda1.
- Inodes Used Percent:** A 3D bar chart showing the percentage of inodes used for the same mount points. The x-axis ranges from 0 to 1.
- Disk Usage Table:** A table with columns for Mount Point (Unicode), Disk Name, Size (MBytes), Space Used (MBytes), Space Available (MBytes), Total Inodes, and Inop Use.
- Disk Space:** A 3D bar chart showing the total space used (red) and space available (green) for each mount point. The x-axis ranges from 0 to 6000 MBytes.

Mount Point (Unicode)	Disk Name	Size (MBytes)	Space Used (MBytes)	Space Available (MBytes)	Total Inodes	Inop Use
/	rdew/sda1	5624	3441	2182	0	0
/proc	proc	0	0	0	30928	0
/dev/shm	tmpfs	120	0	120	0	0
/dev/pts	devpts	0	0	0	0	0
/products	rdew/mapper/pvo...	1203	847	356	0	0

Disk Usage Workspace

▪ Disk Usage Workspace

- ▶ This workspace displays information about the health of storage space within your monitored systems

▪ Description

- ▶ The path name of the directory to which a file system is mounted. This is the virtual name for the directory.
- ▶ The name of the physical disk partition where the file system is mounted
- ▶ The total size of a file system, expressed in megabytes.
- ▶ The amount of disk space currently in use on a file system, expressed in megabytes
- ▶ The amount of unused space currently available to non-superusers on a file system, expressed in megabytes
- ▶ The number of inodes allocated on a file system
- ▶ The number of inodes currently allocated to files on the file system.
- ▶ The number of inodes currently available on your file system.
- ▶ The space currently used on the file system, expressed as a percentage of the sum of used and available space.
- ▶ The percentage of inodes currently allocated to files, calculated by dividing the Inodes Used value by the Total Inodes value.
- ▶ The file system type, such as hsfs, nfs, tmpfs, and ufs.
- ▶ The amount of unused space currently available to non-superusers on a file system, expressed as a percentage.

File Information

The screenshot shows the Tivoli File Information tool interface. On the left, a tree view displays the hierarchy: Enterprise > Linux: Systems > vmnic10 > Linux: OS > File Information. The main area is split into two panes. The top pane, titled 'File Size - Top Ten', contains a 3D bar chart showing the size of various directories in Megabytes. The 'dev' directory is the largest at 0.116 MB. The bottom pane is a table listing the top ten largest files.

Path (Unicode)	File (Unicode)	Size MB	Owner (Unicode)	Group (Unicode)	Last Changed Time	Last Accessed Time	Links	Access	Type	Link Name (Unicode)
/	dev	0.116	root	root	06/26/06 10:29:05	07/13/06 04:25:44	12	1363	Dir	
/	sbin	0.010	root	root	08/18/05 09:48:42	07/13/06 04:30:27	3	1363	Dir	
/	etc	0.008	root	root	06/30/06 14:04:27	07/13/06 04:25:49	90	1363	Dir	
/	lib	0.003	root	root	08/18/05 09:32:30	07/13/06 04:25:55	12	1363	Dir	
/	bin	0.002	root	root	11/04/05 15:57:34	07/13/06 04:25:44	2	1363	Dir	
/	..	0.000	root	root	06/26/06 10:26:10	07/13/06 09:40:00	23	1363	Dir	
/	mnt	0.000	root	root	06/26/06 14:19:11	07/10/06 01:48:30	6	1363	Dir	
/	opt	0.000	root	root	11/04/05 16:05:42	07/13/06 04:25:56	7	1363	Dir	
/	.	0.000	root	root	06/26/06 10:26:10	07/13/06 09:40:00	23	1363	Dir	
/	tmp	0.000	root	root	07/13/06 09:30:01	07/10/06 01:48:52	15	3361	Dir	

File Information Workspace

- **File Information Workspace**

- ▶ This workspace displays information about the top ten files in size on your system

- **Description**

- ▶ The path name of the directory to which a file system is mounted. This is the virtual name for the directory.
- ▶ The name of the file
- ▶ The size of the file in megabytes
- ▶ The owner of the file
- ▶ The group that the file belongs to
- ▶ The date of the last time the file was changed
- ▶ The date of the last time the file was accessed
- ▶ The number of links to the file
- ▶ The access permissions for the file
- ▶ Whether the file is a file or a directory
- ▶ The link name of the file

File Information

The screenshot displays the Tivoli File Information tool interface. On the left, a tree view shows the system structure, with 'File Information' selected under 'Linux OS'. The main area is split into two panes: 'File Size - Top Ten' and 'All Files'.

File Size - Top Ten: A 3D bar chart showing the size of the top 10 files in Megabytes. The 'dev' directory is the largest at 120 MB.

File Name	Size (MB)
dev	120.000
a.out	13.000
hogmem	13.000
sbin	10.000
etc	7.000
lib64	3.000
bin	3.000
tvoll	3.000
lib	2.000
root	1.000
tmp	1.000

All Files: A table listing files with columns for Path, File, Size MB, Owner, Group, Last Changed Time, Last Accessed Time, Links, Access, Type, and Link Name.

Path	File	Size MB	Owner	Group	Last Changed Time	Last Accessed Time	Links	Access	Type	Link Name
/	dev	120.000	root	root	08/04/06 07:14:58	09/13/06 04:16:11	14	755	Dir	
/	a.out	13.000	root	root	10/11/05 12:19:20	01/08/06 07:10:42	1	755	File	
/	hogmem	13.000	root	root	10/11/05 12:19:38	07/28/06 07:34:29	1	755	File	
/	sbin	10.000	root	root	01/26/06 05:38:34	09/13/06 08:07:54	3	755	Dir	
/	etc	7.000	root	root	08/07/06 12:12:52	09/13/06 04:16:11	84	755	Dir	
/	lib64	3.000	root	root	01/25/06 08:30:05	09/13/06 04:16:48	5	755	Dir	
/	bin	3.000	root	root	03/22/06 12:43:39	09/13/06 07:59:20	2	755	Dir	
/	tvoll	3.000	root	root	09/13/06 08:03:32	09/13/06 08:31:11	5	777	Dir	
/	lib	2.000	root	root	01/25/06 08:20:59	09/13/06 04:16:12	11	755	Dir	
/	root	1.000	root	root	08/16/06 14:03:04	09/13/06 08:00:51	16	700	Dir	
/	tmp	1.000	root	root	09/13/06 08:30:01	09/07/06 12:08:09	10	1777	Dir	
/	StartupErrorMessage	0.000	root	root	08/04/06 07:14:40	07/28/06 07:34:29	1	644	File	
/	hogmem.c	0.000	root	root	10/11/05 12:19:14	07/28/06 07:34:29	1	644	File	
/	secrets.tdb	0.000	root	root	03/15/05 12:50:42	03/15/05 12:50:42	1	600	File	
/	kalens	0.000	root	root	08/03/06 11:13:43	08/22/06 12:53:47	1	755	File	
/	linuxShare	0.000	root	root	06/20/05 10:09:18	09/13/06 04:16:48	2	755	Dir	
/	linuxImages	0.000	root	root	08/17/06 17:08:12	09/13/06 04:16:48	2	755	Dir	
/	zmpms_started	0.000	root	root	08/04/06 04:49:55	08/04/06 04:49:55	1	644	File	

At the bottom, the status bar shows 'Hub Time: Mon, 11/20/2006 02:02 PM', 'Server Available', and the window title 'All Files - DEPTF72A - SYSADMIN'.

All Files Information Workspace

■ All Files Information Workspace

- ▶ This workspace displays information about all the files on your system

■ Description

- ▶ The path name of the directory to which a file system is mounted. This is the virtual name for the directory.
- ▶ The name of the file
- ▶ The size of the file in megabytes
- ▶ The owner of the file
- ▶ The group that the file belongs to
- ▶ The date of the last time the file was changed
- ▶ The date of the last time the file was accessed
- ▶ The number of links to the file
- ▶ The access permissions for the file
- ▶ Whether the file is a file or a directory
- ▶ The link name of the file

Network

The screenshot displays the Tivoli Network Manager interface. On the left, a tree view shows the system hierarchy: Enterprise > Linux Systems > vmlnx10 > Linux OS > Network. The main area is divided into three panes:

- Physical:** A tree view showing the network topology.
- Network Errors:** A 3D bar chart showing error counts for interfaces 'lo', 'eth0', and 'si0'. The legend indicates Input Errors (red), Output Errors (yellow), and Collisions (green).
- Network Activity:** A 2D bar chart showing activity for 'lo', 'eth0', and 'si0'. The legend indicates Packets Received per sec (yellow) and Packets Transmitted per sec (blue).

Below the graphs is a table titled "Network Devices" with the following data:

Network Interface Name	Interface IP Address	Interface Status	Total Collisions	Collisions per minute	Collisions (Percent)	Input FIFO Buffer Overruns	Carrier Losses	Errors (Percent)	Input Errors per minute	Output Errors per minute	Input Errors	Output Errors	Packet Framing Errors	Received Count (KBytes)
lo	127.0.0.1	UP	0	0	0	0	0	0	0	0	0	0	0	4263
eth0	9.42.42.210	UP	0	0	0	0	0	0	0	0	0	0	0	40177
si0		DOWN	0	0	0	0	0	0	0	0	0	0	0	0

The Windows taskbar at the bottom shows the system time as 9:37 AM on Thursday, 07/13/2006. Open applications include SQLLIB, Windows Task Manager, Manage Tivoli Enterpri..., Command Prompt (2), Session A - [24 x 80], Network - PHEMSM..., and Document1 - Microsoft...

Network Workspace

- **Network Workspace**

- ▶ This workspace displays information about the network components within your monitored systems

- **Description**

- ▶ The Dynamic Name Server (DNS) entry associated with the IP address of the network interface.
- ▶ The Internet Protocol (IP) address of the network interface.
- ▶ An indication of whether or not a network interface is currently available
- ▶ The number of times during the sampling period that a packet transmitted by the network interface collided with another packet.
- ▶ The number of times a packet collided with another packet per minute.
- ▶ Of the total number of packets transmitted in this sample period, the percentage involved in a collision.
- ▶ The number of input FIFO buffer overruns that occurred during the sampling period.
- ▶ The number of carrier losses that occurred in the interface
- ▶ Of the total number of packets received and transmitted, the percentage that were in error during this sample period.
- ▶ The number of packets with errors received per minute by the interface.
- ▶ The number of packet transmission errors per minute during the monitoring interval.
- ▶ The number of packets received with errors in the interface.
- ▶ The number of packets packet transmission errors in the interface.
- ▶ The number of packet framing errors that occurred in the interface.
- ▶ The number of packets received by the interface during the sampling period
- ▶ The number of bytes received per second by the interface.
- ▶ The number of kilobytes transmitted by an interface since boot time.
- ▶ The number of bytes received per second by the interface.
- ▶ The number of packets received by the interface during the sampling period.
- ▶ The number of packets received per second by the interface.
- ▶ The number of input packets dropped by the device driver.
- ▶ The number of output packets dropped by the device driver.
- ▶ The number of output FIFO buffer overruns that occurred during the sampling period.
- ▶ The number of packets transmitted by the interface during the sampling period.
- ▶ The number of packets transmitted per second by the interface.
- ▶ The maximum packet size (in bytes) for the specified network interface



Sockets Information

The screenshot displays the 'Sockets Information - DEPTF72A - SYSADMIN' window. It features a navigation tree on the left, two charts at the top, and a table of socket services at the bottom.

Sockets Used by Protocol Chart: A horizontal bar chart showing the number of sockets used by protocol. The x-axis ranges from -40 to 240. The y-axis lists protocols: RAW (Total), UDP, TCP, and FRAS. The RAW (Total) bar is the longest, extending to approximately 240. The legend indicates blue bars for 'Sockets in use' and red bars for 'Highest Sockets Used'.

Network Activity Chart: A 3D bar chart showing network activity for interfaces: lo, eth0, and hsi0. The y-axis represents packets per second, ranging from 0 to 40. The legend indicates yellow bars for 'Packets Received per sec' and blue bars for 'Packets Transmitted per sec'. The hsi0 interface shows the highest activity, with both received and transmitted packets around 38-40 per second.

Sockets Services Information Table:

Socket Owner Name (Unicode)	Local Port	Socket Protocol	Receive Queue (Bytes)	Send Queue (Bytes)	Local Address	Local Service Name	Foreign Address	Socket State	Socket UID	Socket inode	Foreign Port
root	38078	TCP	0	0	9.60.9.55	*	9.27.131.184	TIME WAIT	0	0	1918
root	38076	TCP	0	0	127.0.0.1	*	127.0.0.1	TIME WAIT	0	0	3661
root	38074	TCP	0	0	127.0.0.1	*	127.0.0.1	TIME WAIT	0	0	1920
candle	38050	TCP	0	0	*	*	*	LISTEN	1001	498271	0
root	2049	TCP	0	0	*	*	*	LISTEN	0	7270	0
candle	1920	TCP	0	0	*	*	*	LISTEN	1001	498276	0
root	32770	TCP	0	0	*	*	*	LISTEN	0	7283	0
candle	38052	TCP	0	0	*	*	*	LISTEN	1001	498273	0
root	5801	TCP	0	0	*	*	*	LISTEN	0	7666	0
root	5802	TCP	0	0	*	*	*	LISTEN	0	7667	0
root	5803	TCP	0	0	*	*	*	LISTEN	0	7668	0
root	139	TCP	0	0	*	*	*	LISTEN	0	7189	0
root	427	TCP	0	0	9.60.9.55	*	*	LISTEN	0	7054	0
root	427	TCP	0	0	127.0.0.1	*	*	LISTEN	0	7053	0
candle	3661	TCP	0	0	*	*	*	LISTEN	1001	498278	0
root	5901	TCP	0	0	*	*	*	LISTEN	0	7663	0
root	5902	TCP	0	0	*	*	*	LISTEN	0	7664	0
root	5903	TCP	0	0	*	*	*	LISTEN	0	7665	0

Sockets Information Workspace

■ Sockets Information Workspace

- ▶ This workspace displays information about the socket connections within your monitored systems

■ Description

- ▶ The user name associated with the user ID that owns or started the socket connection.
- ▶ The local port number.
- ▶ Protocol used by the socket.
- ▶ The count of bytes not copied by the user program connected to this socket.
- ▶ The count of bytes not acknowledged by the remote host.
- ▶ The address of the local end of the socket, presented as a dotted IP address.
- ▶ The local port number translated to a service name from the etc/services subdirectory.
- ▶ The address of the remote end of the socket.
- ▶ The state of the socket.
- ▶ The user ID of the owner of the socket.
- ▶ The inode used by the socket.
- ▶ The number of the foreign port.

RPC Statistics

RPC Total Server Calls Received	RPC Server Calls Rejected	RPC Server Call Authorization Failures	RPC Server Invalid Client Request	RPC Packets with Malformed Header	RPC Client Calls	RPC Calls Retransmitted	Times Authentication Refreshed
24	0	0	0	0	0	0	0

RPC Statistics Workspace

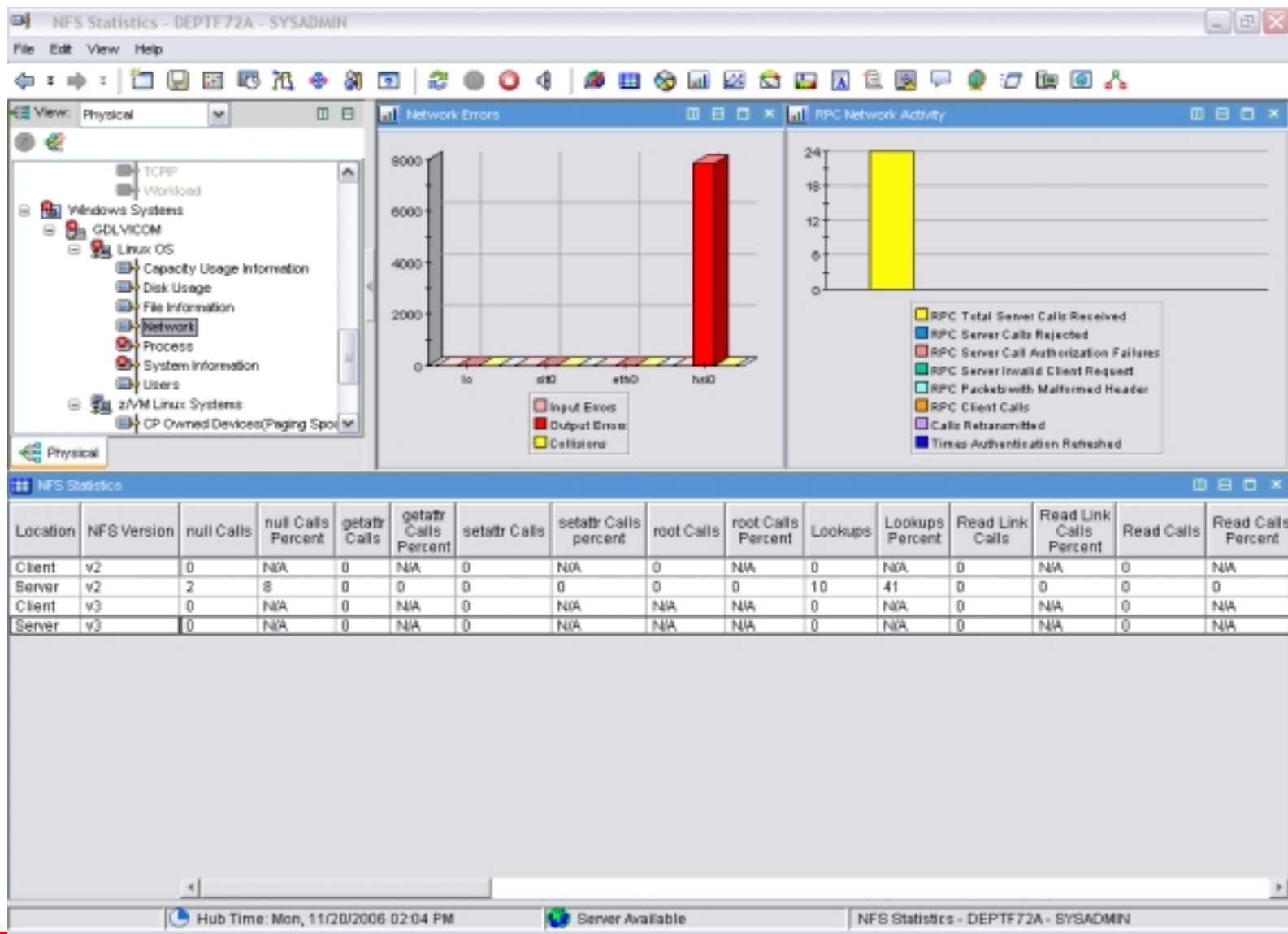
■ RPC Statistics Workspace

- ▶ This workspace displays statistics on the number and type of remote procedure calls being made to the server and clients

■ Description

- ▶ The total number of calls made to the server (both valid and not valid).
- ▶ The number of calls made to the server, which were rejected.
- ▶ The number of packets that were received at the server with authorizations that were not valid.
- ▶ The number of packets that were received at the server, which had client requests that were not valid
- ▶ The number of packets that were received at the server with header records that were not properly formatted.
- ▶ The number of calls to the server made by the server's clients.
- ▶ The number of client calls that needed to be transmitted again.
- ▶ The number of times the authentication of a client was refreshed.

NFS Statistics



NFS Statistics Workspace

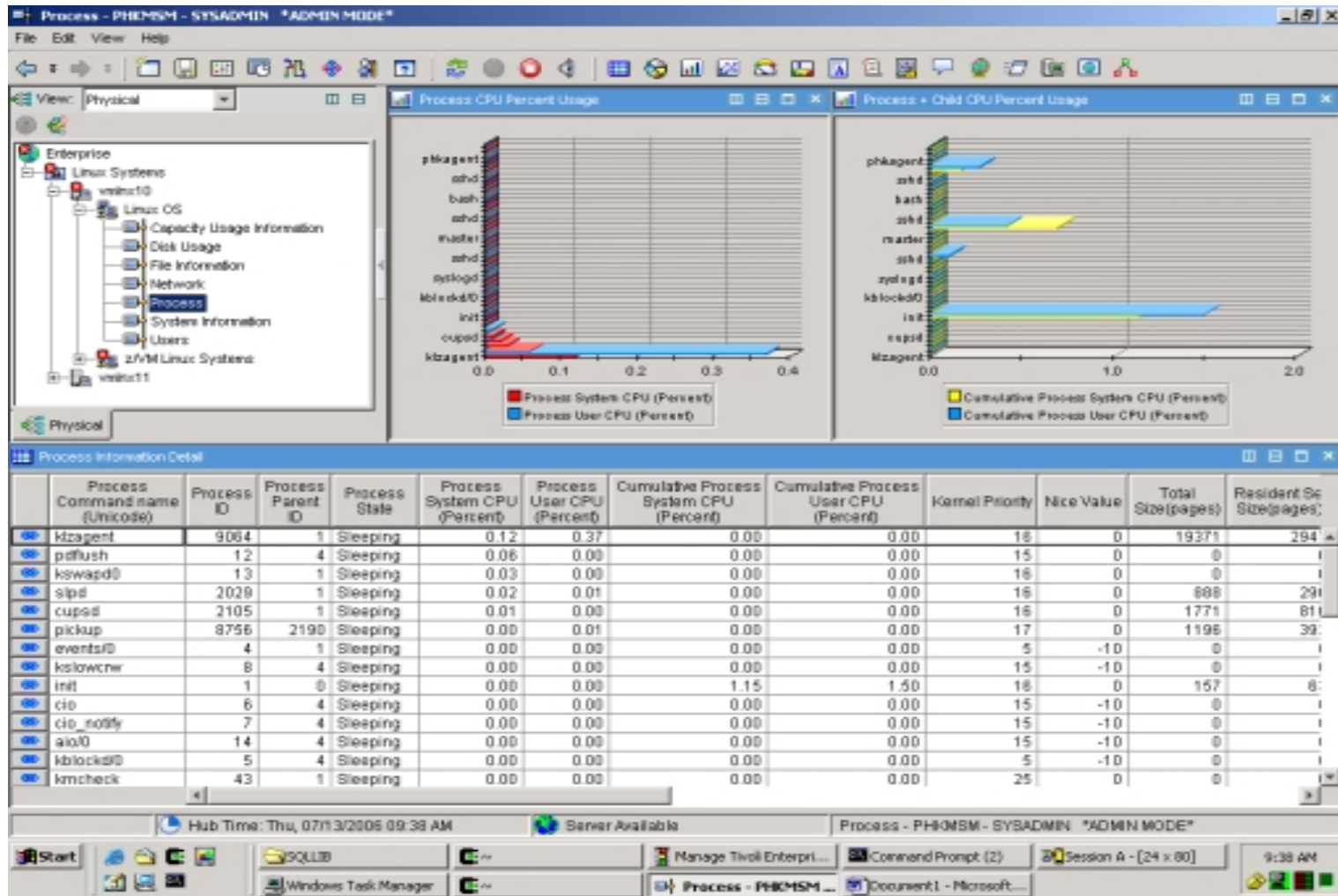
- **NFS Statistics Workspace**

- ▶ This workspace displays statistics on the operations involving the Network File System

- **Description**

- ▶ The location of the origin of the call in the Network File System.
- ▶ The software version associated with the NFS server.
- ▶ The number of calls made to the NFS server from NFS clients which contained no data
- ▶ Of the total number of calls made to the NFS server, the percentage that contained no data.
- ▶ The number of calls made to the NFS server which contained a get attribute (getattr) operation.
- ▶ Of the total number of calls made to the NFS server, the percentage that contained get attribute (getattr) operations.
- ▶ The number of calls made to the NFS server which contained a set attribute (setattr) operation.
- ▶ Of the total number of calls made to the NFS server, the percentage that contained a set attribute (setattr) operation.
- ▶ The number of calls made to the NFS server which contained root calls.
- ▶ Of the total number of calls made to the NFS server, the percentage that were root calls
- ▶ The number of read directory plus (readdirplus) calls made to the NFS server to return the name, the file ID, attributes, and file handle.
- ▶ The number of total calls and percentage of calls that were:
 - Lookups
 - Read link
 - Read
 - Write cache
 - Writes
 - File creates
 - Remove files
 - Rename files
 - Link
 - Symbolic link
 - Make directory
 - Remove directory
 - Read directory
 - File system statistics
 - Access
 - Make node
 - File system info
 - Pathconf
 - Commit

Process



Process Workspace

- **Process Workspace**

- ▶ This workspace displays the health of specific processes within your monitored systems

- **Description**

- ▶ The name of the process command.
- ▶ The identifier of the process.
- ▶ The identifier for the parent process.
- ▶ The state of the process (Sleeping, Disk, Running, Zombie, Trace, Dead, or N/A).
- ▶ The percentage of CPU time spent in kernel mode by process.
- ▶ The percentage of CPU time spent in user mode by process.
- ▶ The percentage of cumulative CPU time spent in kernel mode by process.
- ▶ The percentage of cumulative CPU time spent in user mode by process.
- ▶ The kernel scheduling priority.
- ▶ The standard Linux nice level.
- ▶ The number of pages that the process has in real memory.
- ▶ The number of pages the process has in real memory.
- ▶ The number of pages of shared (mmap'd) memory.
- ▶ The number of pages of text resident (mmap'd) memory.
- ▶ The number of pages of shared (mmap'd) memory.
- ▶ The size of the data set based on the number of pages.
- ▶ Pages that have been modified (dirty) in buffer (main memory), but not yet copied to the cache
- ▶ The data size (in kilobytes) of the virtual memory.
- ▶ The size (in kilobytes) of locked pages of the virtual memory
- ▶ The data size (in kilobytes) of the virtual memory.
- ▶ The stack size (in kilobytes) of the virtual memory.
- ▶ The executable size (in kilobytes) of the virtual memory.
- ▶ The library size (in kilobytes) of the virtual memory.
- ▶ The total number of minor page faults (including child processes) since the start of the process.
- ▶ The total number of major page faults (including child processes) since the start of the process.
- ▶ The process command line string.
- ▶ The ID of the process CPU.
- ▶ Of the total system CPU usage, the percentage that was user CPU usage.

Process User

The screenshot displays the 'Process User Information' window for DEPTF72A - SYSADMIN. It features a navigation tree on the left, two CPU usage charts, and a table of process details.

Process CPU Percent Usage Chart: Shows CPU usage for processes: rshes1, ping, xinetd, slpd, cto_notlly, smbd, bash, rshes1, rshes1. The x-axis represents CPU percentage from 0 to 5.

Process + Child CPU Percent Usage Chart: Shows cumulative CPU usage for processes: rshes1, ping, xinetd, slpd, cto_notlly, smbd, bash, rshes1, rshes1. The x-axis represents cumulative CPU percentage from 0 to 14.

Process User Information Table:

Process ID	Real User name (Unicode)	Effective User ID	Saved User ID	File System User ID	Real Group ID	Effective Group ID	Saved Group ID	File System Group ID	Effective User name (Unicode)	Saved User name (Unicode)	File System User name (Unicode)	Real Group name (Unicode)	Effective Group name (Unicode)	File System Group name (Unicode)
1	root	0	0	0	0	0	0	0	root	root	root	root	root	root
2	root	0	0	0	0	0	0	0	root	root	root	root	root	root
3	root	0	0	0	0	0	0	0	root	root	root	root	root	root
4	root	0	0	0	0	0	0	0	root	root	root	root	root	root
5	root	0	0	0	0	0	0	0	root	root	root	root	root	root
6	root	0	0	0	0	0	0	0	root	root	root	root	root	root
43	root	0	0	0	0	0	0	0	root	root	root	root	root	root
44	root	0	0	0	0	0	0	0	root	root	root	root	root	root
45	root	0	0	0	0	0	0	0	root	root	root	root	root	root
100	root	0	0	0	0	0	0	0	root	root	root	root	root	root
105	root	0	0	0	0	0	0	0	root	root	root	root	root	root
104	root	0	0	0	0	0	0	0	root	root	root	root	root	root
658	root	0	0	0	0	0	0	0	root	root	root	root	root	root
1035	root	0	0	0	0	0	0	0	root	root	root	root	root	root
1208	root	0	0	0	0	0	0	0	root	root	root	root	root	root

Hub Time: Mon, 11/20/2006 02:04 PM | Server Available | Process User Information - DEPTF72A - SYSADMIN

Process User Workspace

- **Process User Workspace**

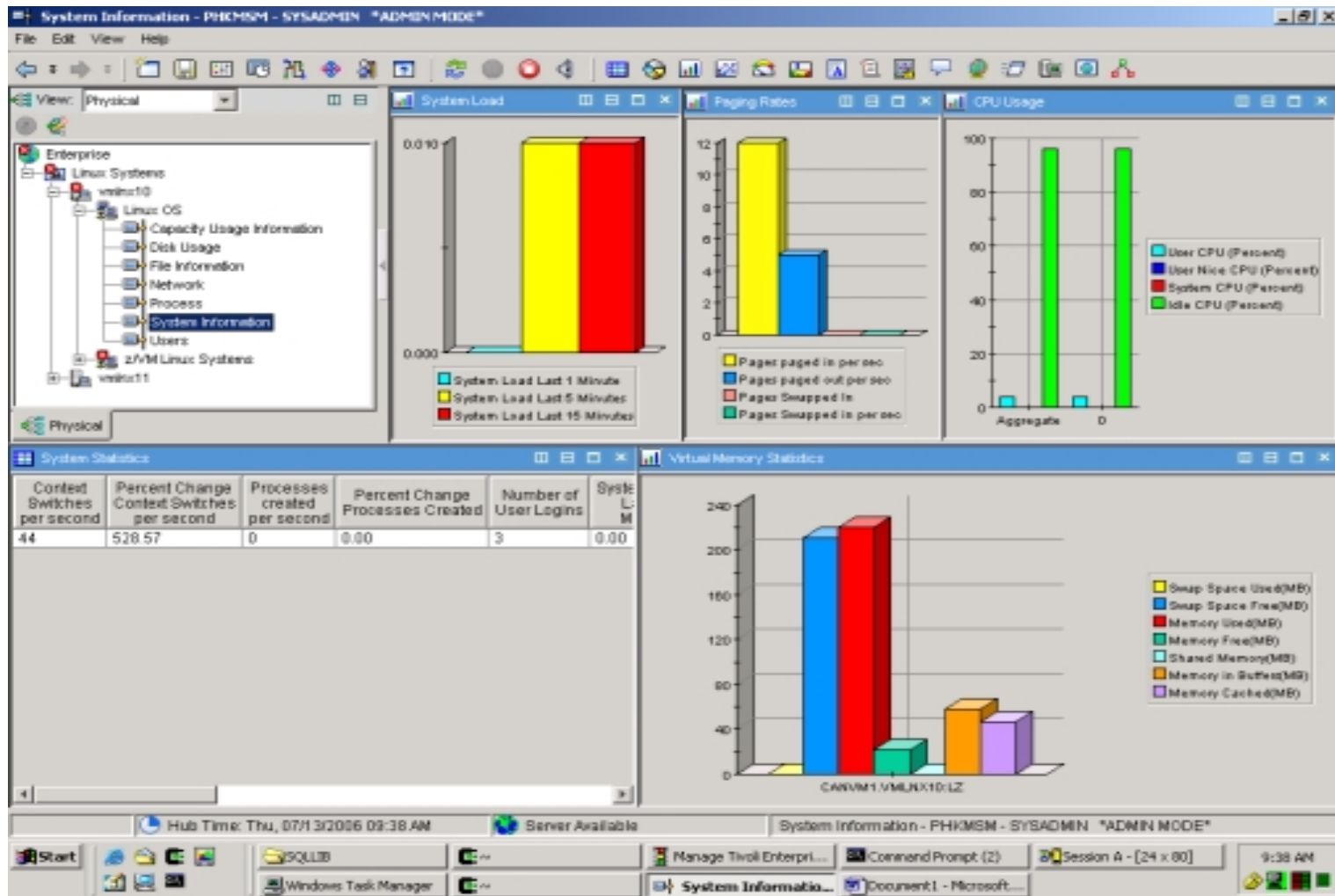
- ▶ This workspace displays process owners of your monitored Linux system and details their usage

- **Description**

- ▶ The identifier associated with the process.
- ▶ The identifier of the effective user.
- ▶ The identifier of the saved user.
- ▶ The identifier of the file system user.
- ▶ The identifier of the real group.
- ▶ The identifier of the effective group.
- ▶ The identifier of the saved group.
- ▶ The identifier of the file system group.
- ▶ The name of the effective user.
- ▶ The name of the saved user.
- ▶ The name of the file system user.
- ▶ The name of the real group.
- ▶ The effective group name.
- ▶ The name of the file system group.
- ▶ The name of the saved group.



System Information



System Information Workspace

■ System Information Workspace

- ▶ This workspace displays data associated with CPU usage, system loads, and process creation

■ Description

- ▶ The number of context switches per second.
- ▶ The percentage change in the number of context switches per second.
- ▶ The number of processes created per second.
- ▶ The percentage change in the number of processes per second.
- ▶ The current number of users logged in.
- ▶ The load on the system for the last minute.
- ▶ The load on the system for the last five minutes.
- ▶ The load on the system for the last fifteen minutes.
- ▶ The system uptime in number of seconds.
- ▶ The total number of pages paged in.
- ▶ The total number of pages paged in per second.
- ▶ The total number of pages paged out.
- ▶ The total number of pages paged out per second.
- ▶ The total number of pages swapped in.
- ▶ The total number of pages swapped in per second.
- ▶ The total number of pages swapped out.
- ▶ The total number of pages swapped out per second.
- ▶ The total number of pages faults per second (both major and minor).
- ▶ The total number of major faults per second.

Virtual Memory Statistics

The screenshot displays the 'Virtual Memory Statistics - DEPTF72A - SYSADMIN' window. It features a tree view on the left, two line graphs at the top right, a table at the bottom left, and a 3D bar chart at the bottom right.

Virtual Memory Information Table:

Total Swap Space(MB)	Swap Space Used(MB)	Swap Space Free(MB)	Total Memory(MB)	Memory Used(MB)	Memory Free(MB)	Shared Memory(MB)
0.00	0.00	0.00	243.35	75.22	168.13	0.00

Virtual Memory Statistics 3D Bar Chart:

The chart shows memory usage for the process 'GDLVICOM.LZ'. The Y-axis represents memory in MB, ranging from 0 to 180. The legend includes:

- Swap Space Used(MB): Yellow bar (value: 234)
- Swap Space Free(MB): Blue bar (value: 467)
- Memory Used(MB): Red bar (value: 75.22)
- Memory Free(MB): Green bar (value: 168.13)
- Shared Memory(MB): Cyan bar (value: 0.00)
- Memory in Buffer(MB): Orange bar (value: 16.81)
- Memory Cached(MB): Purple bar (value: 16.81)

Virtual Memory Workspace

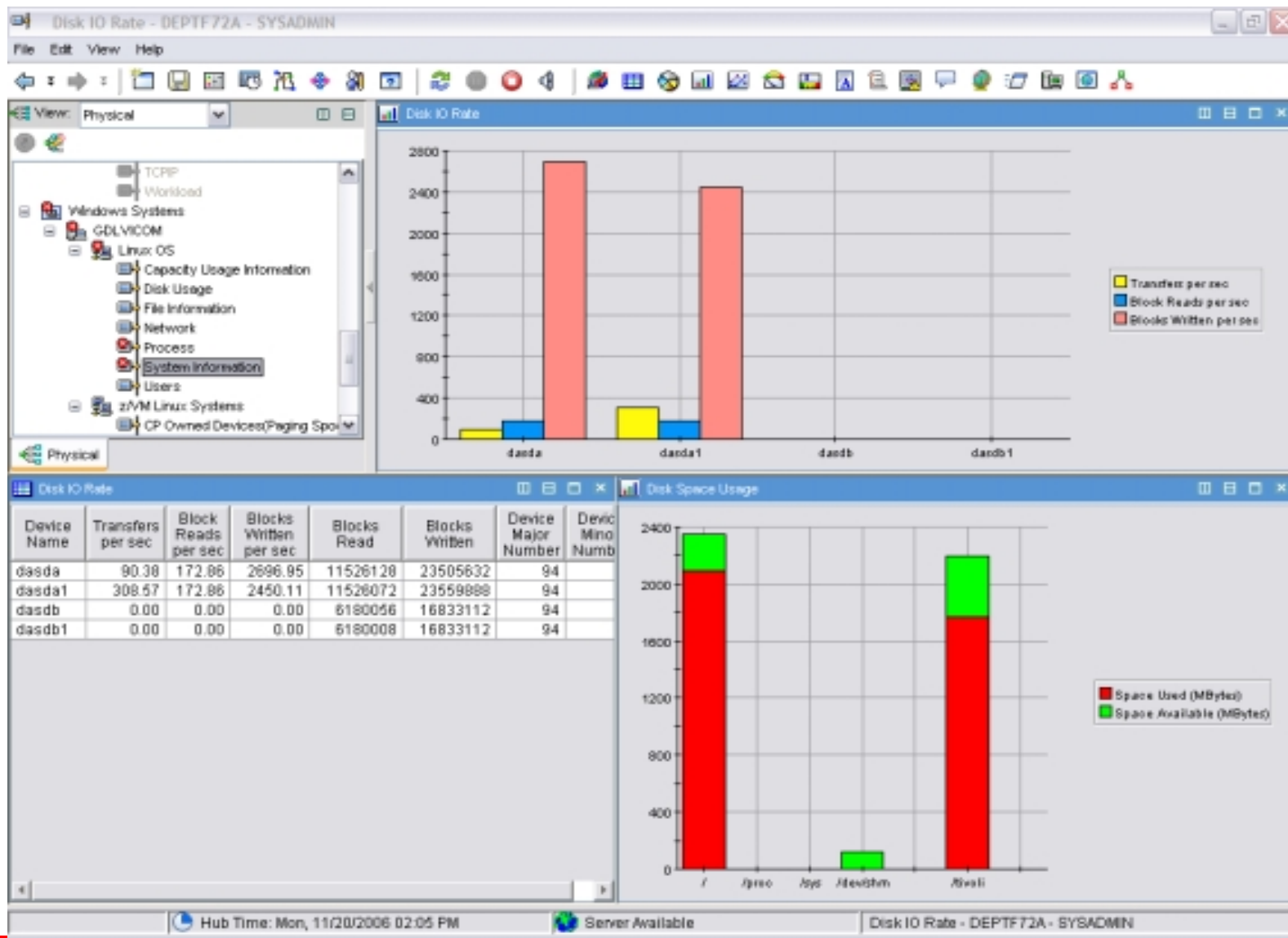
- **Virtual Memory Workspace**

- ▶ This workspace displays data associated with memory usage.

- **Description**

- ▶ The total size (in megabytes) of swap space.
- ▶ The size (in megabytes) of swap space used.
- ▶ The size (in megabytes) of swap space free.
- ▶ The total size (in megabytes) of physical memory.
- ▶ The size (in megabytes) of physical memory used.
- ▶ The size (in megabytes) of physical memory free.
- ▶ The size (in megabytes) of physical memory shared.
- ▶ The size (in megabytes) of physical memory in buffers.
- ▶ The size (in megabytes) of physical memory cached.

Disk I/O Rate



Disk I/O Rate Workspace

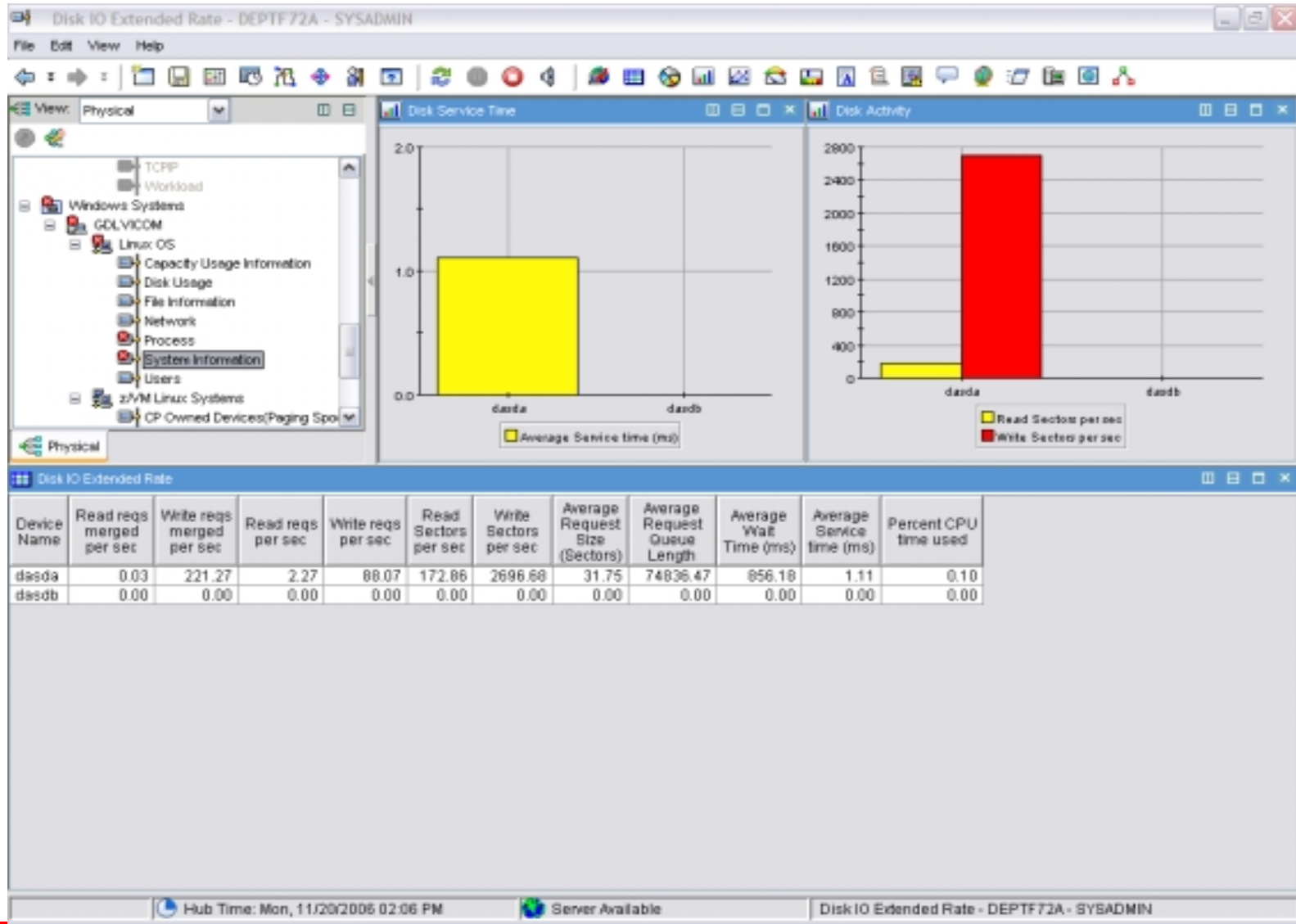
- **Disk I/O Rate Workspace**

- ▶ This workspace displays input/output statistics, including the transfer rates, block read rates, and block write rates

- **Description**

- ▶ The name of the device as it appears under the dev subdirectory.
- ▶ The number of transfers per second that were issued to the device.
- ▶ The amount of data read from the drive expressed in a number of blocks per second.
- ▶ The amount of data written to the drive expressed in a number of blocks per second.
- ▶ The total number of blocks read.
- ▶ The total number of blocks written.
- ▶ The major number of the device.
- ▶ The distinctive minor number for device.

Disk I/O Extended Rate



Disk I/O Extended Rate Workspace

- **Disk I/O Extended Rate Workspace**

- ▶ This workspace displays input/output statistics and calculations

- **Description**

- ▶ The name of the device as it appears under the dev subdirectory.
- ▶ The number of read requests merged, per second, that were issued to the device.
- ▶ The number of write requests merged that were issued, per second, to the device.
- ▶ The number of read requests that were issued, per second, to the device.
- ▶ The number of write requests that were issued, per second, to the device.
- ▶ The number of sectors read, per second, from the device.
- ▶ The number of sectors written to the device, per second.
- ▶ The average size (in sectors) of the requests that were issued to the device.
- ▶ The average queue length of the requests that were issued to the device.
- ▶ The average time (in milliseconds) for I/O requests issued to the device to be served.
- ▶ The average service time (in milliseconds) for I/O requests that were issued to the device.
- ▶ Percentage of CPU time during which I/O requests were issued to the device.

System Configuration

The screenshot displays the 'System Configuration - DEPTF72A - SYSADMIN' application window. The interface includes a menu bar (File, Edit, View, Help), a toolbar, and a tree view on the left showing a hierarchy of system components like TCP/IP, Workload, Windows Systems, GDLVICOM, Linux OS, Capacity Usage Information, Disk Usage, File Information, Network, Process, System Information, Users, z/VM Linux Systems, and CP Owned Devices/Paging Spool. The main area is divided into several panes:

- CPU Usage:** A 3D stacked bar chart showing CPU usage for 'Aggregate' and '0'. The legend indicates: User CPU (Percent) in yellow, User Nice CPU (Percent) in blue, System CPU (Percent) in red, and Idle CPU (Percent) in green. The 'Aggregate' bar shows approximately 10% User CPU, 1% User Nice CPU, 1% System CPU, and 88% Idle CPU. The '0' bar shows 0% for all categories.
- Processor Configuration Information:** A table with the following data:

Processor ID	Processor Cache Size (Kb)	Processor Clock Speed (MHz)	Processor Family Number	Processor Model Number	Processor Model Name	Processor Vendor ID
75	52	72.000	18	86	strval	strval
- OS Version Information:** A table with the following data:

System Name	gcc version	OS Name	OS Vendor Information	OS Version
GDLVICOMLZ	3.3.3	Linux	SuSE Linux	2.6.5-7.232-s390x

The status bar at the bottom shows 'Hub Time: Mon, 11/20/2006 02:06 PM', 'Server Available', and 'System Configuration - DEPTF72A - SYSADMIN'.

System Configuration Workspace

■ System Configuration Workspace

- ▶ This workspace displays information about CPU usage, the processor's configuration, and operating system level

■ Description

- ▶ The identification number of the processor.
- ▶ The size of the processor cache in kilobytes.
- ▶ The speed of the processor clock in megahertz.
- ▶ The family number of the processor.
- ▶ The model number of the processor.
- ▶ The model name of the processor.
- ▶ The identification of the processor's vendor or manufacturer.
- ▶ The name of the host system.
- ▶ The version of the GNU Compiler Collection (GCC) used to compile the kernel.
- ▶ The name of the operating system.
- ▶ The name of the operating system's vendor or manufacturer.
- ▶ The version of the operating system.



Users

The screenshot displays the Tivoli Enterprise console interface. The main window is titled "Users - PHKMSM - SYSADMIN 'ADMIN MODE'". It features a navigation tree on the left with categories like "Enterprise", "Linux: Systems", "Linux: OS", and "z/VM Linux: Systems". The "Users" option is selected under "Linux: OS".

The central pane shows "Process User Information" with a table of active processes:

Process ID	Effective UserID	Saved UserID	File System UserID	Real Group ID	Effective Group ID	Saved Group ID	File System Group ID	Real User name (Unicode)	Effective User name (Unicode)	Saved User name (Unicode)
1	0	0	0	0	0	0	0	root	root	root
2	0	0	0	0	0	0	0	root	root	root
3	0	0	0	0	0	0	0	root	root	root
4	0	0	0	0	0	0	0	root	root	root
5	0	0	0	0	0	0	0	root	root	root
6	0	0	0	0	0	0	0	root	root	root
7	0	0	0	0	0	0	0	root	root	root
8	0	0	0	0	0	0	0	root	root	root
10	0	0	0	0	0	0	0	root	root	root
11	0	0	0	0	0	0	0	root	root	root
12	0	0	0	0	0	0	0	root	root	root
14	0	0	0	0	0	0	0	root	root	root
13	0	0	0	0	0	0	0	root	root	root
17	0	0	0	0	0	0	0	root	root	root

Below this, the "User Login Information" pane shows a table of active users:

User Name (Unicode)	User Login PID	Line	Login Time	Idle Time	Hostname(From)
brmadd	2946	pts/0	06/26/06 10:33:36	06:23:54	linux3.raleigh.ibm.com
candle	5828	pts/1	07/11/2006 10:18:42	00:19:11	phkmsm.raleigh.ibm.com
candle	29332	pts/2	06/03/06 11:10:14	00:00:24	phkmsm.raleigh.ibm.com

To the right, the "Total User Logins" pane displays a bar chart showing login activity over time. The x-axis represents time from 0 to 100, and the y-axis represents the number of logins. A green vertical bar indicates a peak in activity around the 10-minute mark. Below the chart, the number "3" is displayed, likely representing the total number of logins.

The bottom status bar shows the system time as "Thu, 07/13/2006 09:39 AM", the server status as "Server Available", and the current user as "Users - PHKMSM - SYSADMIN 'ADMIN MODE'". The taskbar at the very bottom shows various open applications including "SQLLIB", "Windows Task Manager", "Manage Tivoli Enterpri...", "Command Prompt (2)", "Session A - [24 x 80]", and "Document1 - Microsoft...".