



IBM Software Group | Tivoli Software

Managing the Health and Well-Being of Linux and z/VM

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Agenda

- **Industry Issues**
 - New work loads
 - New monitoring needs
- **Integrated Monitoring**
 - Scenarios
 - A monitoring infrastructure
- **Workspaces**
 - How to use them to manage your system

Challenges with Managing Enterprise Assets

■ Complexity

- Heterogeneous infrastructures consisting of IT and non-IT assets
- Increased interdependency of assets and their effect on the business service
- Operational changes requiring approval of multiple disconnected operational domains

■ Change

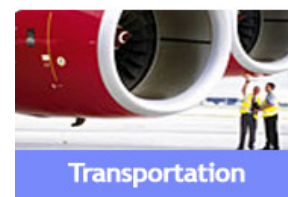
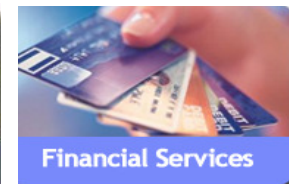
- Industry consolidation, globalization
- Boundaries between Enterprise and IT assets are blurring with IT enabled business assets

■ Compliance

- Regulations, security, audit capabilities

■ Cost

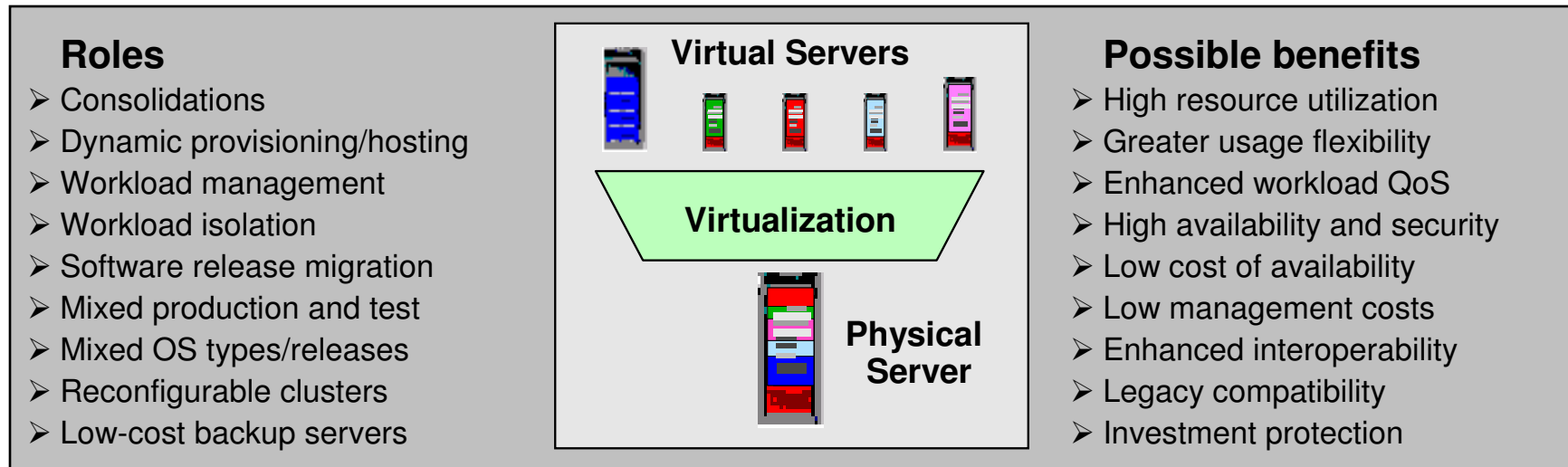
- Management and administration, especially across silos of redundant infrastructure



- 80% of CEOs agree that collaboratively integrating business and technology is key to business growth and innovation
- 40% of CEOs surveyed in the 2004 Global CEO Survey indicated that asset utilization would be a key focus in strengthening financial performance given the impact of anticipated market focus.

¹ IBM Global 2006 CEO Survey

Server Virtualization Business Value



- In the final analysis, the potential virtualization benefits take three forms:
 - **Help reduce hardware costs**
 - Help increase physical resource utilization
 - Small footprints
 - **Can improve flexibility and responsiveness**
 - Virtual resources can be adjusted dynamically to meet new or changing needs and to optimize service level achievement
 - Virtualization is a key enabler of on demand operating environments
 - **Can reduce management costs**
 - Fewer physical servers to manage
 - Many common management tasks become much easier

IBM Consolidation Announcement Highlights

- IBM will consolidate thousands of servers onto approximately 30 System z mainframes
- We expect substantial savings in multiple dimensions: energy, software and system support costs
- Major proof point of IBM's 'Project Big Green' initiative
- The consolidated environment will use 80 percent less energy
- This transformation is enabled by sophisticated virtualization capability provided by System z

IBM'S PROJECT BIG GREEN SPURS GLOBAL SHIFT TO LINUX ON MAINFRAME

Plan to shrink 3,900 computer servers to about 30 mainframes targets 80 percent energy reduction over five years

Optimized environment to increase business flexibility

ARMONK, NY, August 1, 2007 – In one of the most significant transformations of its worldwide data centers in a generation, IBM (NYSE: IBM) today announced that it will consolidate about 3,900 computer servers onto about 30 System z mainframes running the Linux operating system. The company anticipates that the new server environment will consume approximately 80 percent less energy than the current set up and expects significant savings over five years in energy, software and system support costs.

At the same time, the transformation will make IBM's IT infrastructure more flexible to evolving business needs. The initiative is part of Project Big Green, a broad commitment that IBM announced in May to sharply reduce data center energy consumption for IBM and its clients.





An Integrated Monitoring Approach

Tivoli OMEGAMON XE on z/VM and Linux - a Scenario

Problem

- Uneven Linux Guest CPU consumption

Solution

- Use Linux Guest Workload workspace to identify problem Linux guest
- Link to Linux workload/process workspace to identify problem app/process
- Notify app owner of app performance problem

Potential Benefits

- Quicker identification of base problem
- Can manage z/VM and Linux from a single point of control

The screenshot displays the Tivoli OMEGAMON XE interface with several callouts:

- Look at additional data for Linux Guest:** Points to a 'Linux OS' workspace in the left-hand navigation pane.
- Identify problem Linux Guest:** Points to a bar chart titled 'Page Stats' showing memory usage across different Linux guests.
- Link to Linux process workspace:** Points to a 'Process' workspace in the left-hand navigation pane.
- Identify problem app/process on Linux:** Points to a table titled 'Process CPU Percent Usage' showing CPU usage for various processes.

Process	Process ID	Process State	Process System CPU (Percent)	Process User CPU (Percent)	Cumulative Process System CPU	Cumulative Process User CPU	Kernel Priority	Nice Value	Total Subpages	Resident On Subpages
phrasg	3054	4 Sleeping	0.00	0.00	0.00	0.00	18	0	1931	284
phrasg	312	4 Sleeping	0.01	0.00	0.00	0.00	15	0	0	1
phrasg	313	4 Sleeping	0.01	0.00	0.00	0.00	15	0	0	1
phrasg	314	4 Sleeping	0.02	0.01	0.00	0.00	16	0	899	291
phrasg	351	4 Sleeping	0.01	0.00	0.00	0.00	16	0	1751	913
phrasg	2190	4 Sleeping	0.00	0.00	0.00	0.00	17	0	1196	39
phrasg	41	4 Sleeping	0.00	0.00	0.00	0.00	5	-100	0	1
phrasg	4	4 Sleeping	0.00	0.00	0.00	0.00	15	-100	0	1
phrasg	4	4 Sleeping	0.00	0.00	0.00	0.00	16	0	197	6
phrasg	4	4 Sleeping	0.00	0.00	0.00	0.00	15	-100	0	1
phrasg	4	4 Sleeping	0.00	0.00	0.00	0.00	16	0	197	6
phrasg	1	4 Sleeping	0.00	0.00	0.00	0.00	15	-100	0	1

Tivoli OMEGAMON XE on z/VM and Linux - a Scenario

Problem

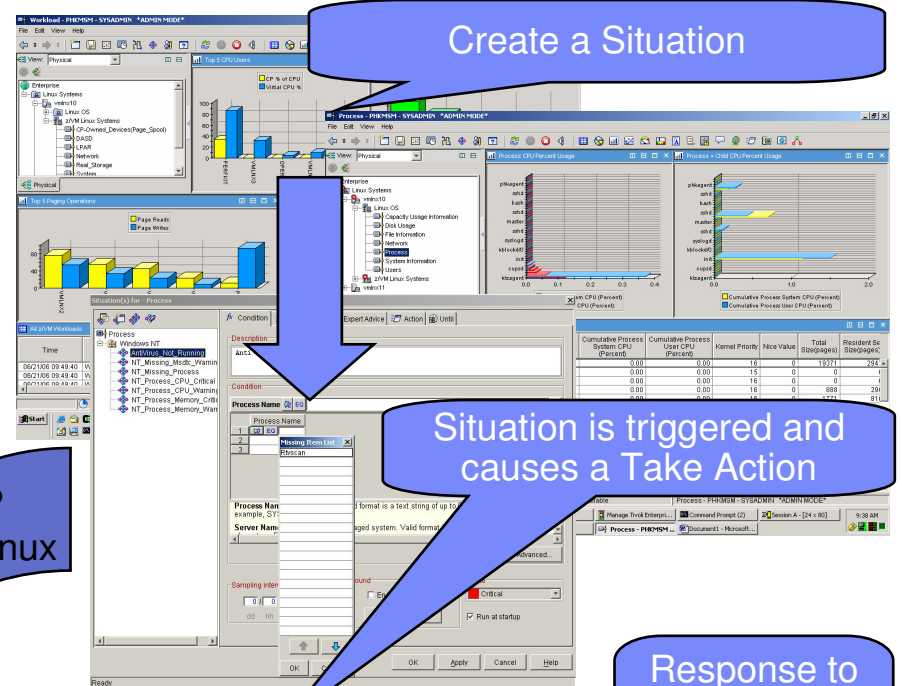
- Uneven Linux guest CPU consumption

Solution

- Use situation to recognize high swapping with high CPU and working set size
- Send message to Operations Manager
- Operations Manager invokes a rule to execute a CP tuning command to allocate more resource to the Linux Guest

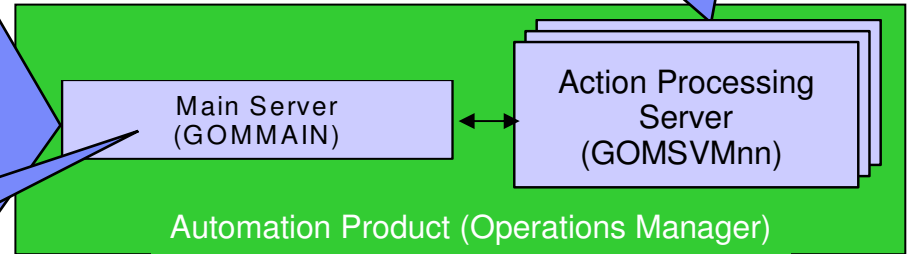
Potential Benefits

- Automated problem resolution
- Integrated solution



Response to problem is automatic

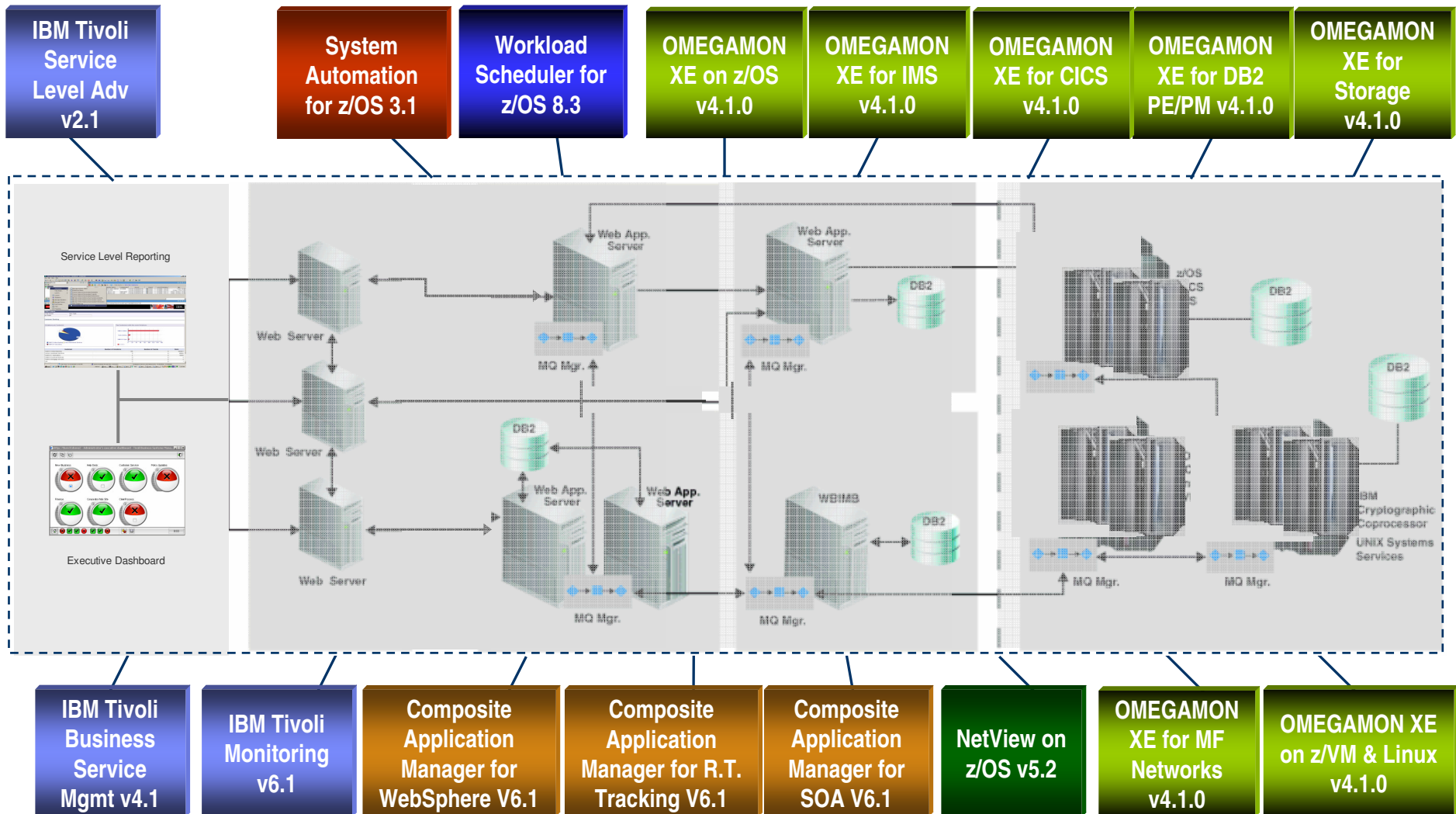
Message is sent and triggers z/VM automation



OMEGAMON XE on z/VM and Linux

- Provides performance monitoring for z/VM and Linux guests
- Linux agents gather performance data from Linux guests
- z/VM agent gathers performance data from z/VM
 - Including z/VM view of guests
 - Uses IBM Performance Toolkit for VM as its data source
- Executes automated actions in response to defined events or situations
- Part of the Tivoli Management Services infrastructure and OMEGAMON family of products
 - Specifically focused on z/VM and Linux guests

End to End Management from Tivoli



IBM Products

- **Systems and Performance Management**
 - OMEGAMON XE on z/VM and Linux
 - Operations Manager for z/VM
- **Storage Management**
 - Backup and Restore Manager for z/VM
 - Tape Manager for z/VM
 - Archive Manager for z/VM

Tivoli Enterprise Portal

Improve your ability to Diagnose and Resolve Problems

The screenshot displays the Tivoli Enterprise Portal interface for monitoring OS/390 UNIX processes. The interface includes a navigation tree on the left, a main dashboard with charts for UNIX Run Time and CPU Times, and a table of OS/390 UNIX Processes for WebSphere at the bottom. Callouts highlight various features: 'Easy to use Browser controls' points to the browser toolbar; 'Selectable Chart Options' points to the chart type selection icons; 'Personalized Views' points to the view icons; 'View Zoom' points to the zoom control; 'Splitter controls' points to the window splitter; 'Intelligent Linking' points to the process table; and 'Persistent customized workspaces' points to the overall workspace layout.

Easy to use Browser controls

Selectable Chart Options

Personalized Views

View Zoom

Splitter controls

Intelligent Linking

Persistent customized workspaces

Navigation Tree

UNIX Run Time

CPU Times

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_+Pthrea...	Running_not_in_kernel_wait	50462821	1	50462821	50462821	
Normal	Multiple_Tasks_In_Process_+Pthrea...	Running_not_in_kernel_wait	33685615	1	33685615	33685615	
Normal	Multiple_Tasks_In_Process_+Pthrea...	Running_not_in_kernel_wait	50462832	1	50462832	50462832	
Normal	Multiple_Tasks_In_Process_+Pthrea...	Running_not_in_kernel_wait	33685672	1	33685672	33685672	
Swapped_Out	Multiple_Tasks_In_Process_+Pthrea...	Running_not_in_kernel_wait	16908492	1	16908492	16908492	
Swapped_Out	Multiple_Tasks_In_Process_+Pthrea...	Running_not_in_kernel_wait	33685727	1	33685727	33685727	
Normal	Multiple_Tasks_In_Process_+Pthrea...	Running_not_in_kernel_wait	16908519	1	16908519	16908519	
Normal	Multiple_Tasks_In_Process_+Pthrea...	Running_not_in_kernel_wait	50462998	1	50462998	50462998	

Available Performance Metrics

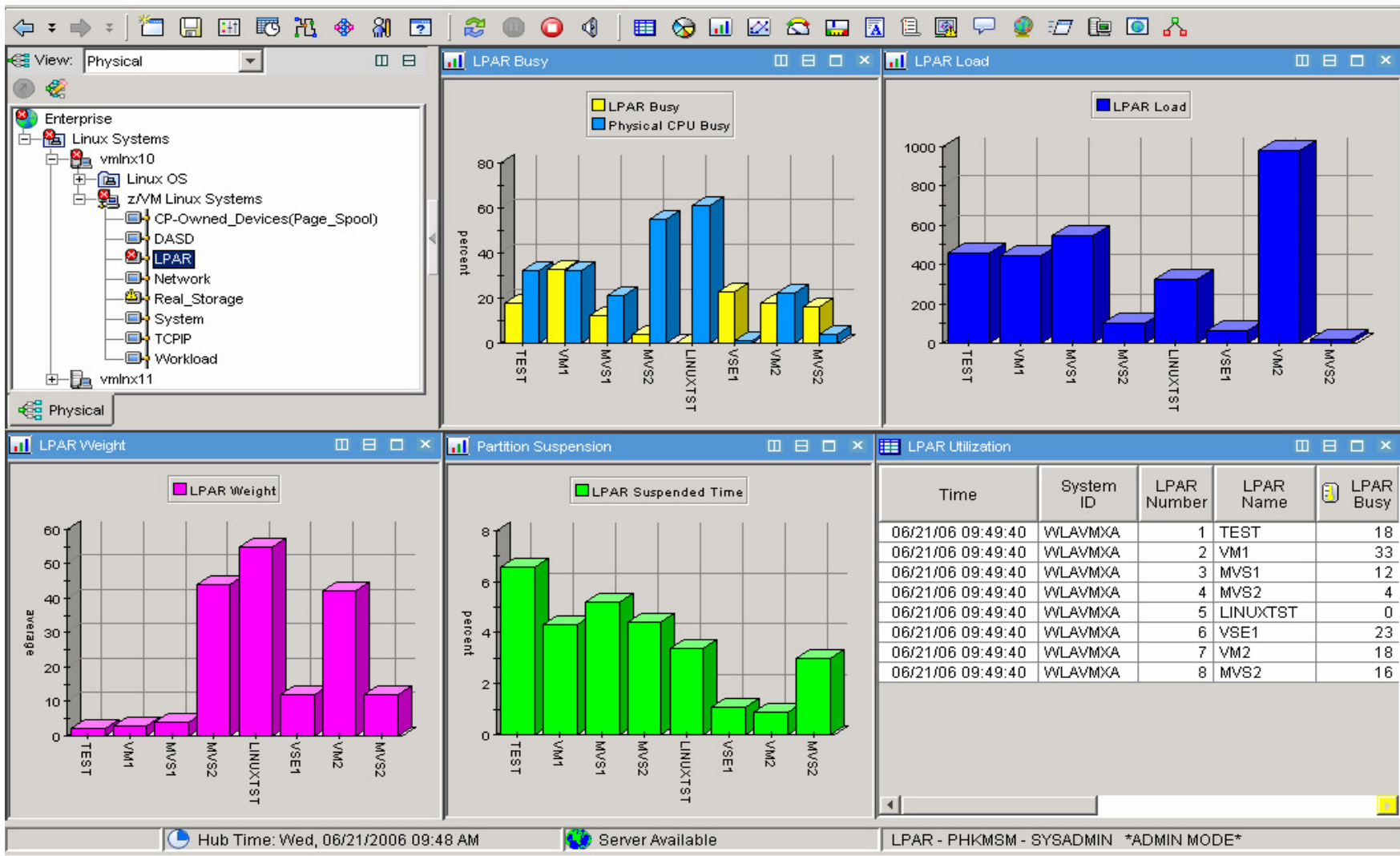
z/VM

- **z/VM Linux Default Workspace**
- **PAGING and SPOOLING Utilization**
- **DASD**
- **LPAR Utilization**
- **NETWORK Utilization (Hiper Socket and Virtual Switch)**
- **REAL STORAGE Utilization**
- **TCPIP Utilization – Server**
- **TCPIP Utilization – Users**
- **SYSTEM Utilization**
- **System Terminal Workspace**
- **Workload (z/VM User ID) Activity**
- **Linux Workload Workspace**
- **AppIData Workspace**

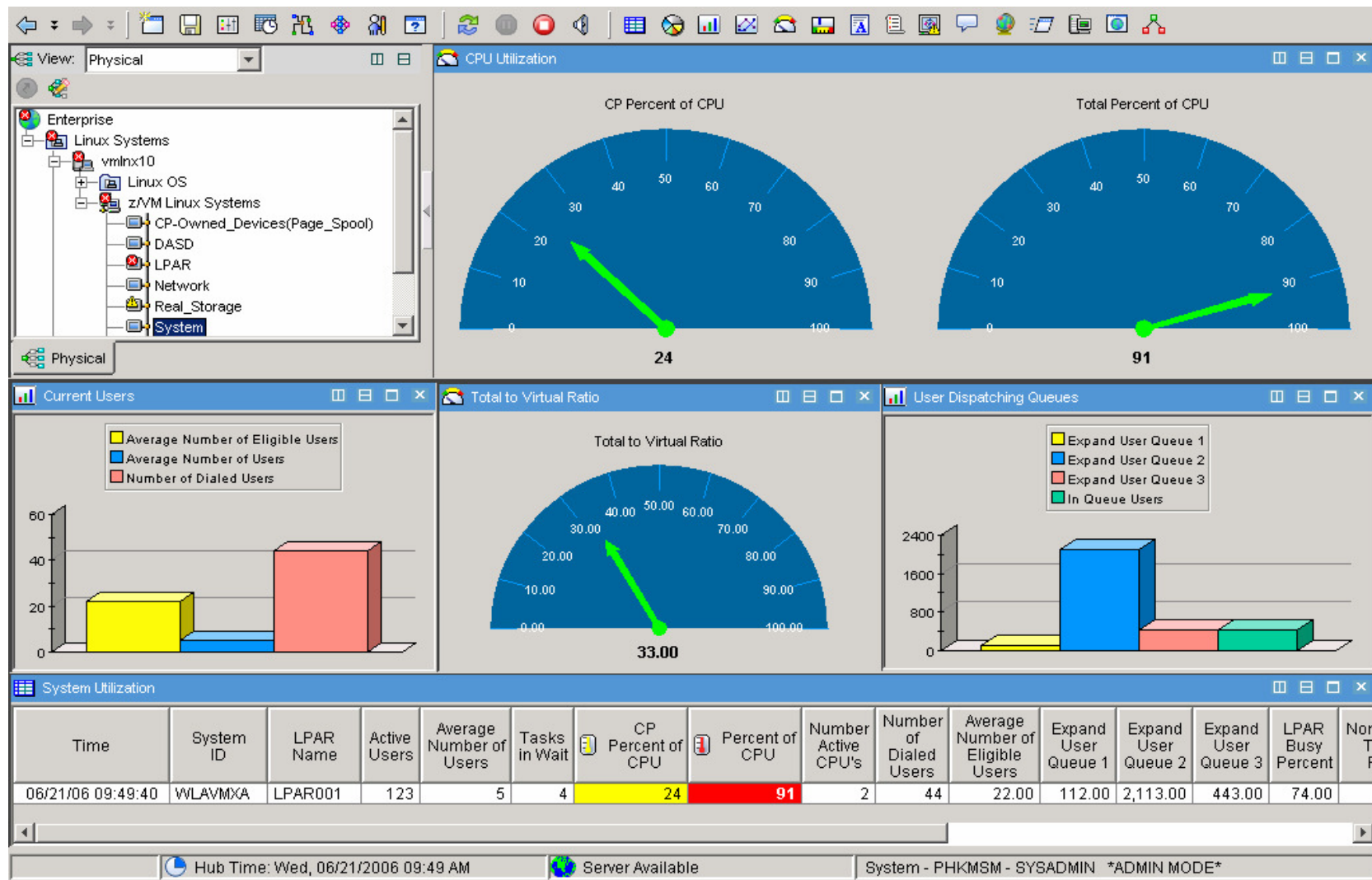
Linux

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

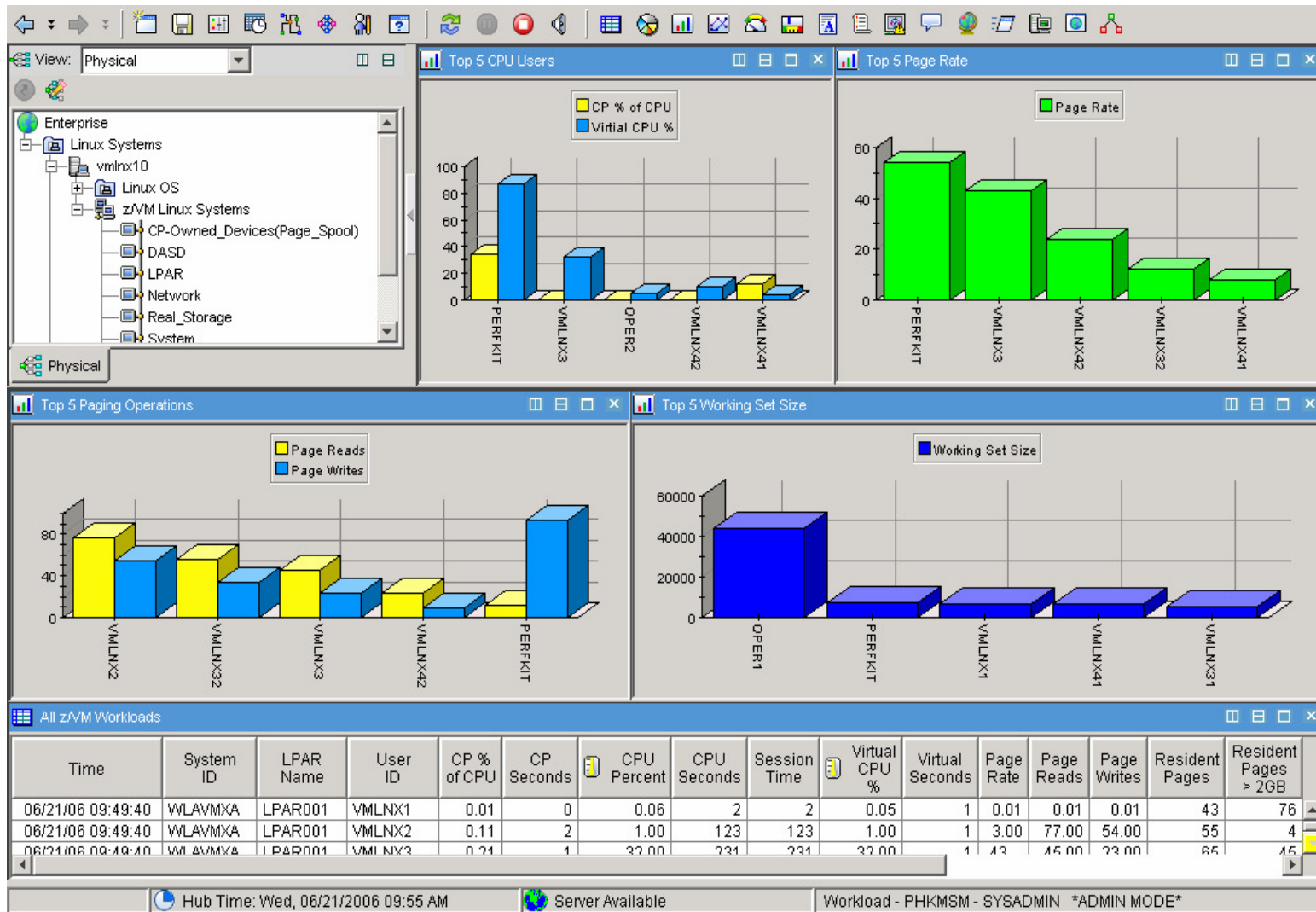
LPAR Utilization (z/VM)



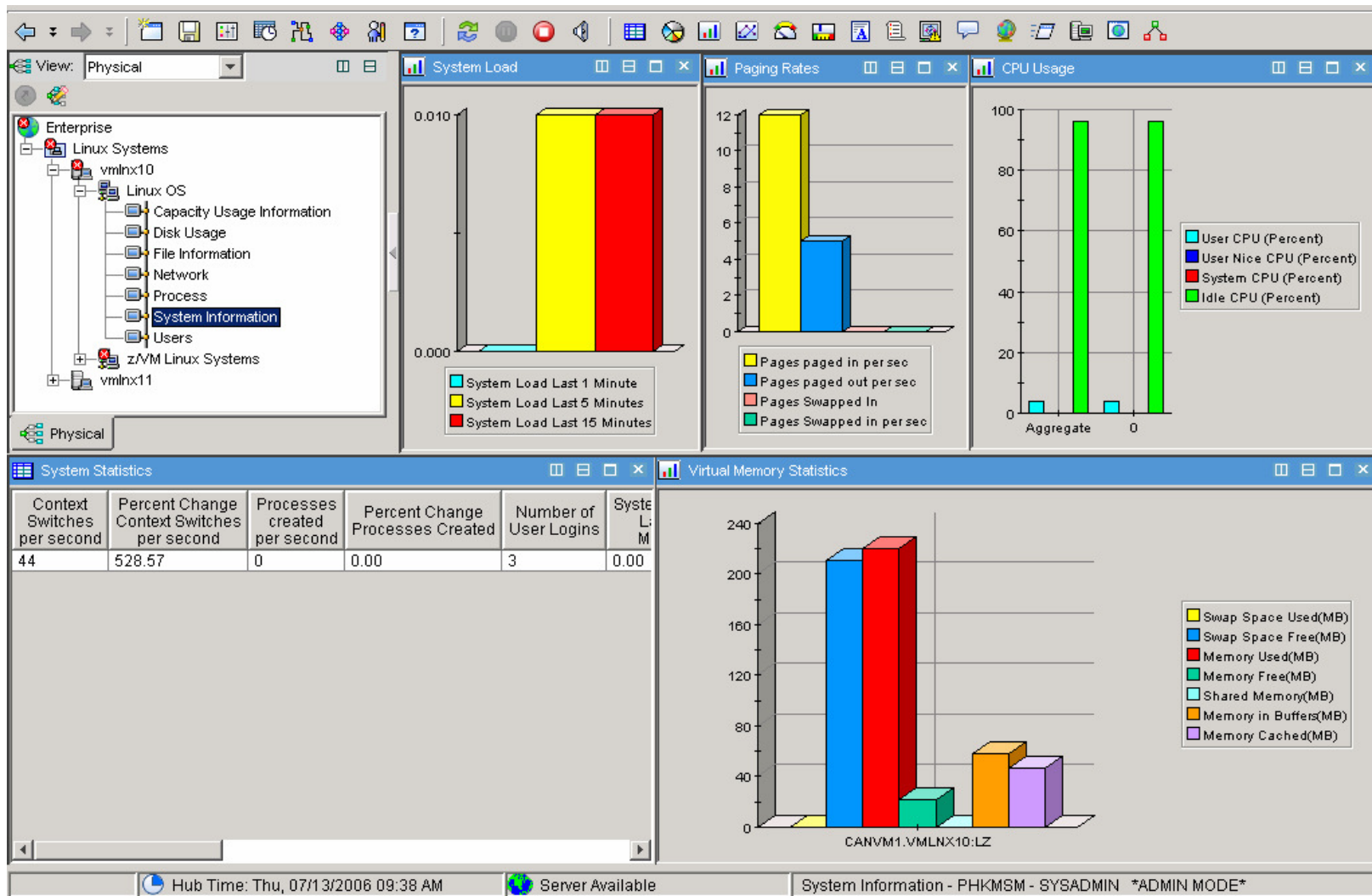
SYSTEM Utilization (z/VM)



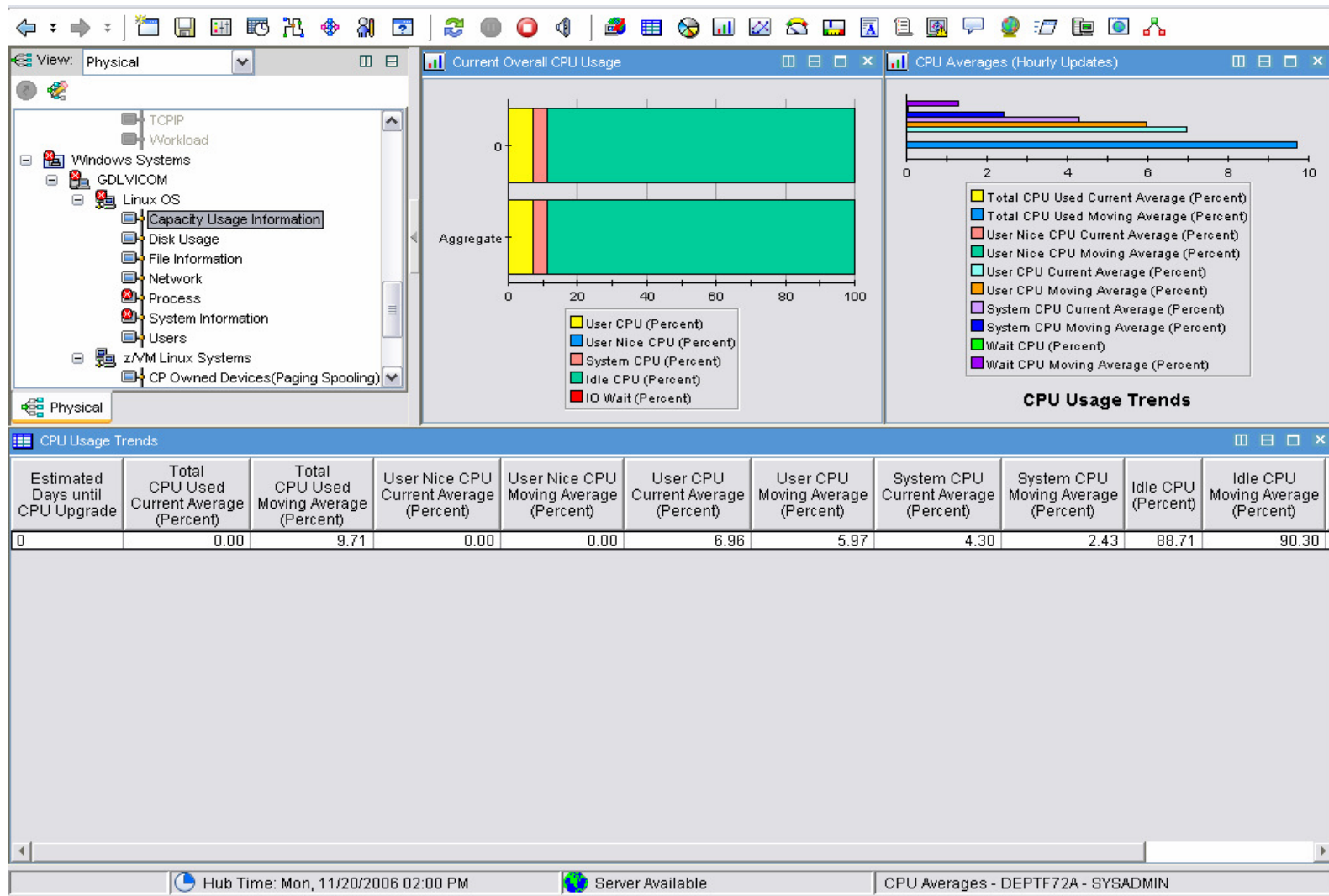
WORKLOAD (z/VM User ID) Activity



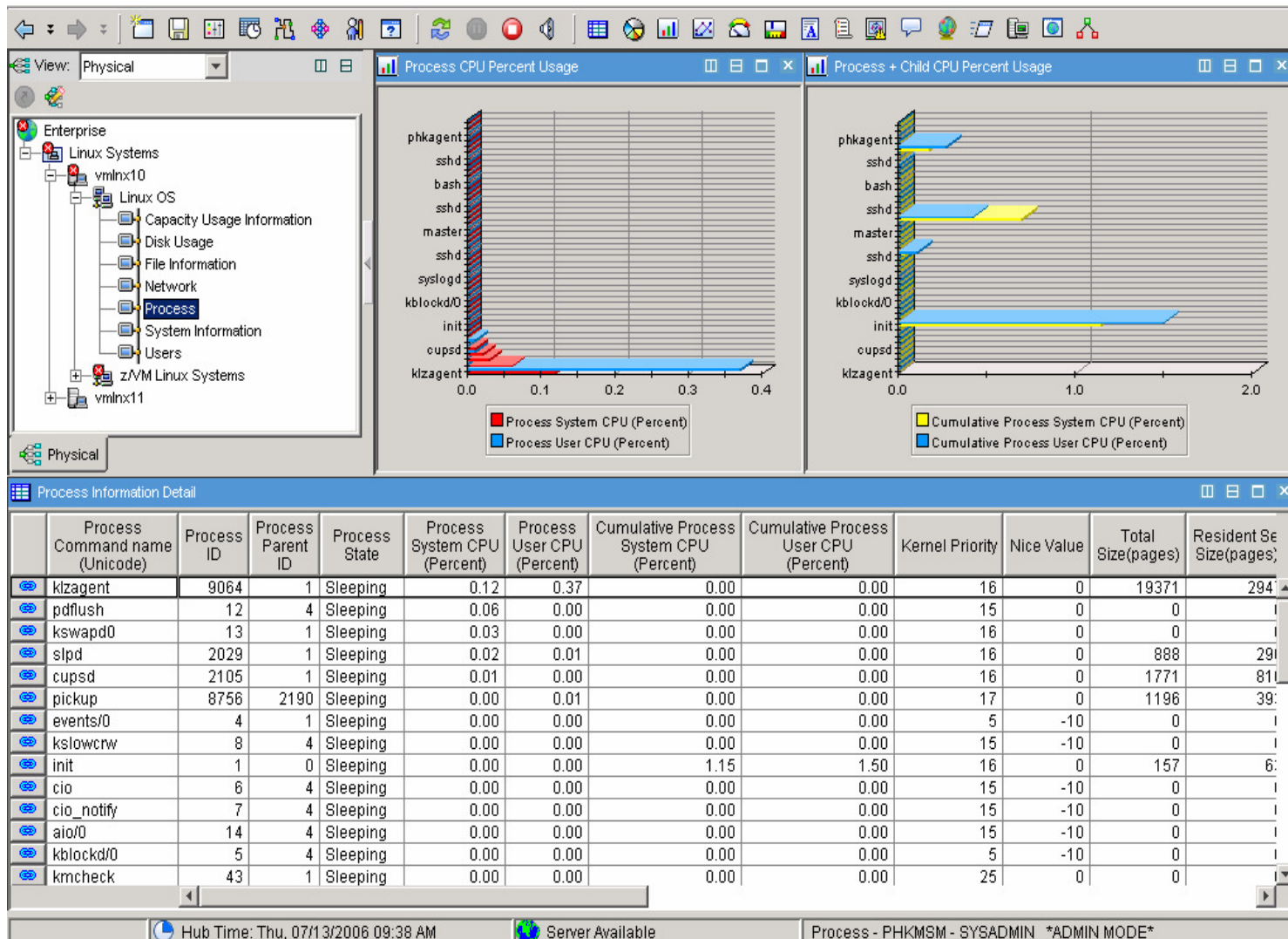
System Information (Linux)



CPU Averages (Linux)



Processes (Linux)



Automation Using 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 recommended actions (Expert Advice) and/or automated responses to take place when the situation becomes true (Take Action)
- Each management agent comes with a set of pre-defined situations that start running as soon as the management agent is connected
- Each situation may examine the values of one or more attributes

Situation Analysis

The screenshot displays the Tivoli Enterprise Console interface for a situation analysis. The main window shows a tree view on the left with 'Enterprise' expanded to 'Windows Systems' and 'IBM-734U41Z8ERV'. The 'Physical' view is active, showing a table of 'Initial Situation Values' and a table of 'Current Situation Values'. Both tables show a 31% and 10% processor time respectively. The 'Expert Advice' panel provides a description of the situation: 'Percent of time all processors are busy is too high.' and lists possible causes, including a looping application. The 'Take Action' panel offers options like 'Start Service' and 'Stop Service'.

Operating System Version	% Processor Time	Processor	Server Name	Timestamp
5.1	31	Total	Primary:IBM-734U41Z8ERV:NT	08/12/05 17:55:07

Operating System Version	% Processor Time	Processor	Server Name	Timestamp
5.1	10	Total	Primary:IBM-734U41Z8ERV:NT	08/12/05 17:55:07

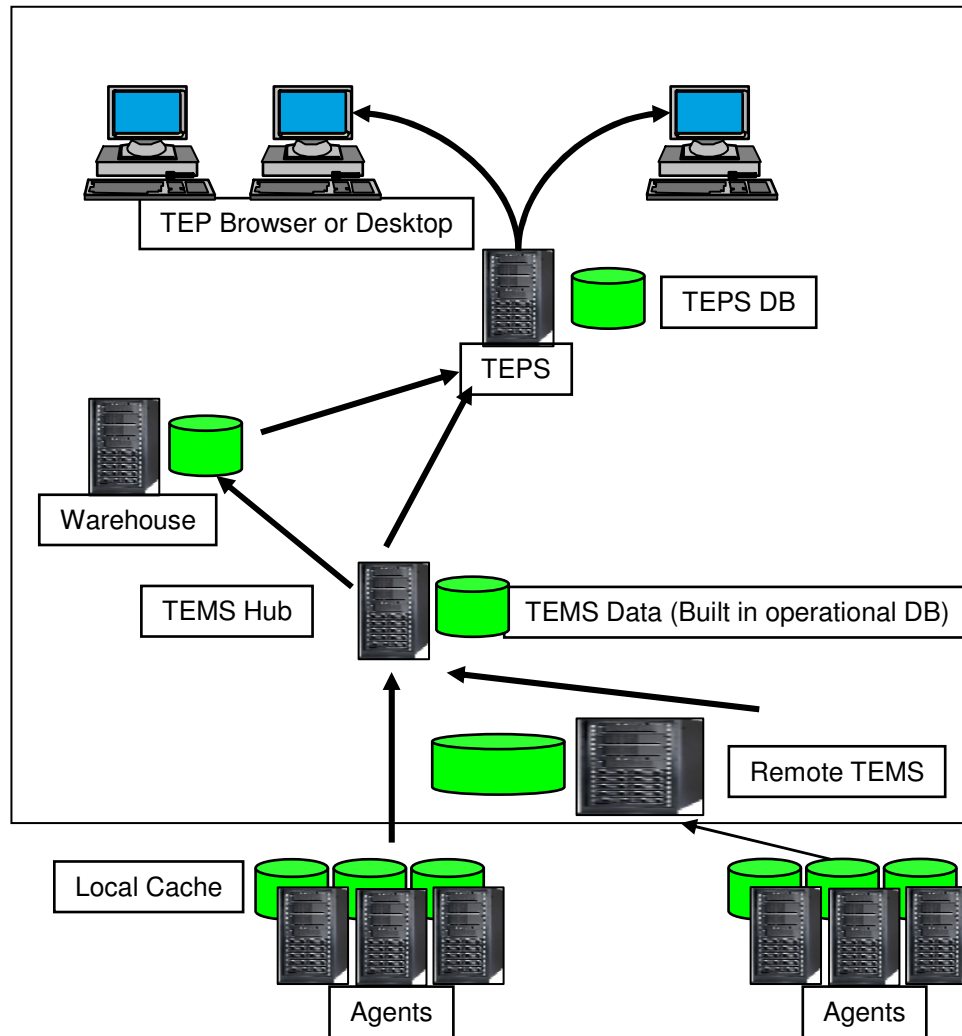
Initial Cause

Current State

Expert Advice

Take action to fix the problem

TMS/OMEGAMON XE Architecture Overview

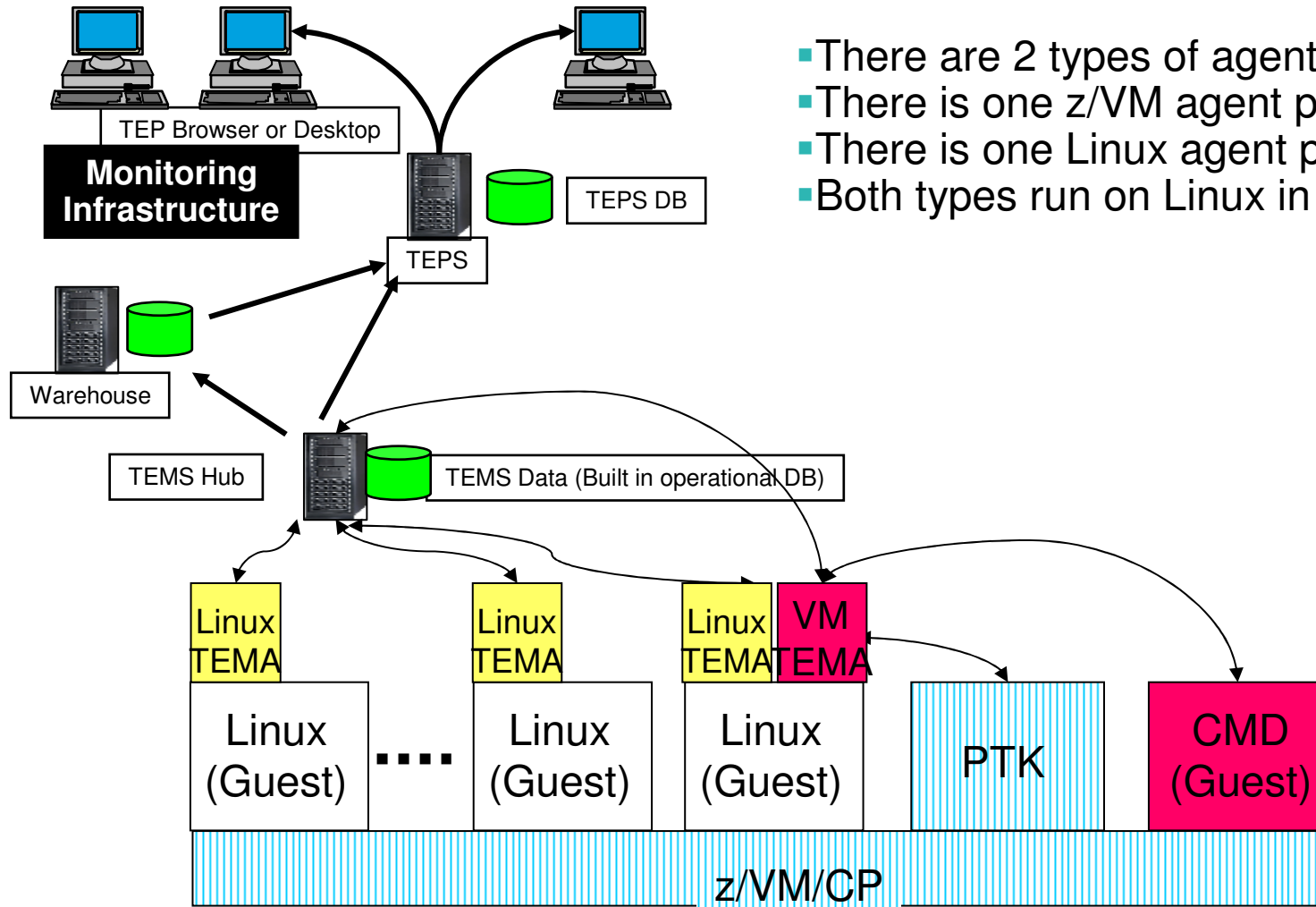


Key:

- TEP – Tivoli Enterprise Portal
- TEPS – Tivoli Enterprise Portal Server
- TDW – Tivoli Data Warehouse
- TEMS – Tivoli Enterprise Monitoring Server
- TEMA – Tivoli Enterprise Monitoring Agent

Monitoring Infrastructure

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 in this release

Summary – OMEGAMON XE on z/VM and Linux

- New addition to the IBM Tivoli and OMEGAMON family of products
- Specific focus on performance of z/VM and Linux guests
- Breadth and depth of available metrics
- Single workstation to view alerts and perform situational analysis
- Automated actions in response to defined events
- Integrates with broader Systems Management portfolio

Thank You for Joining Us today!

Go to www.ibm.com/software/systemz to:

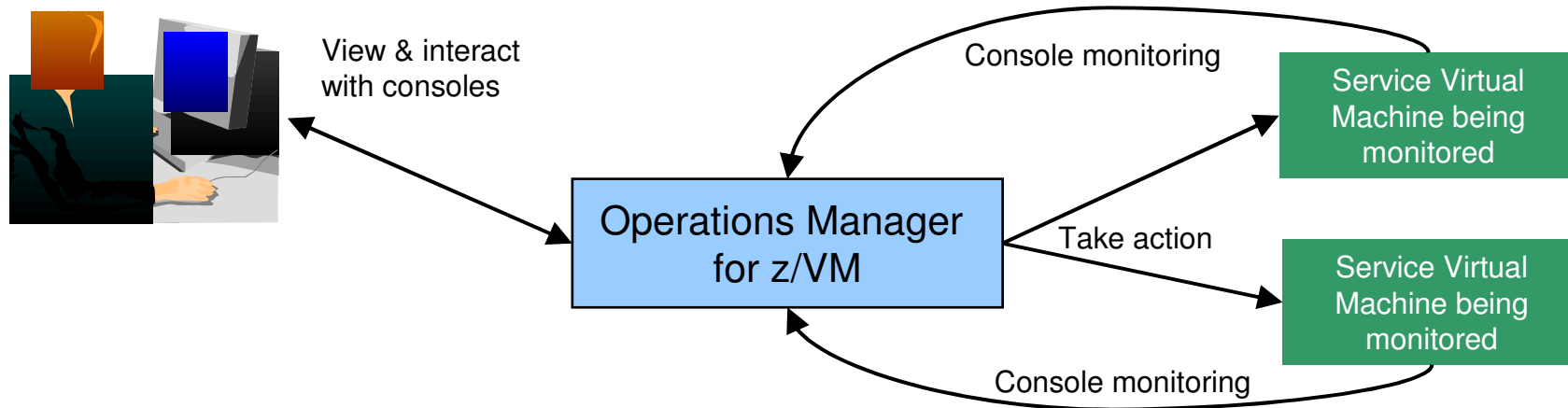
- ▶ Replay this teleconference
- ▶ Replay previously broadcast teleconferences
- ▶ Register for upcoming events

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



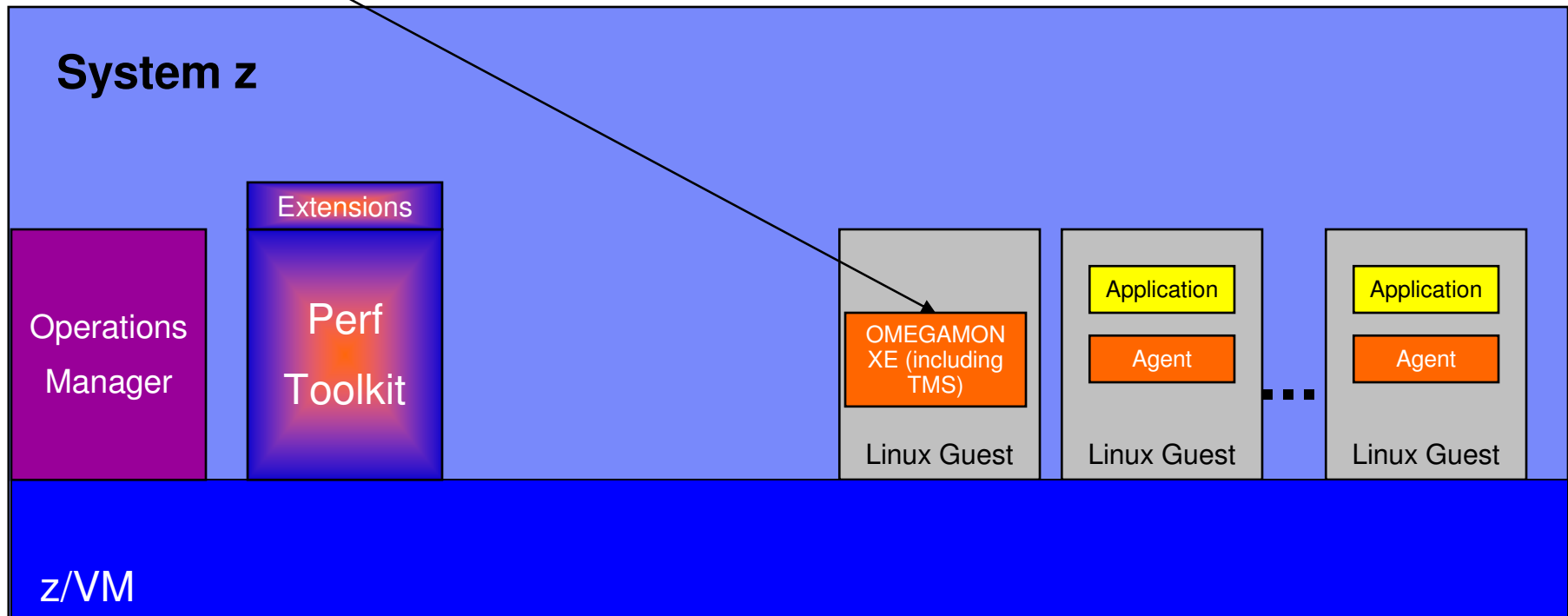
Web browser

➤ OMEGAMON XE on z/VM and Linux

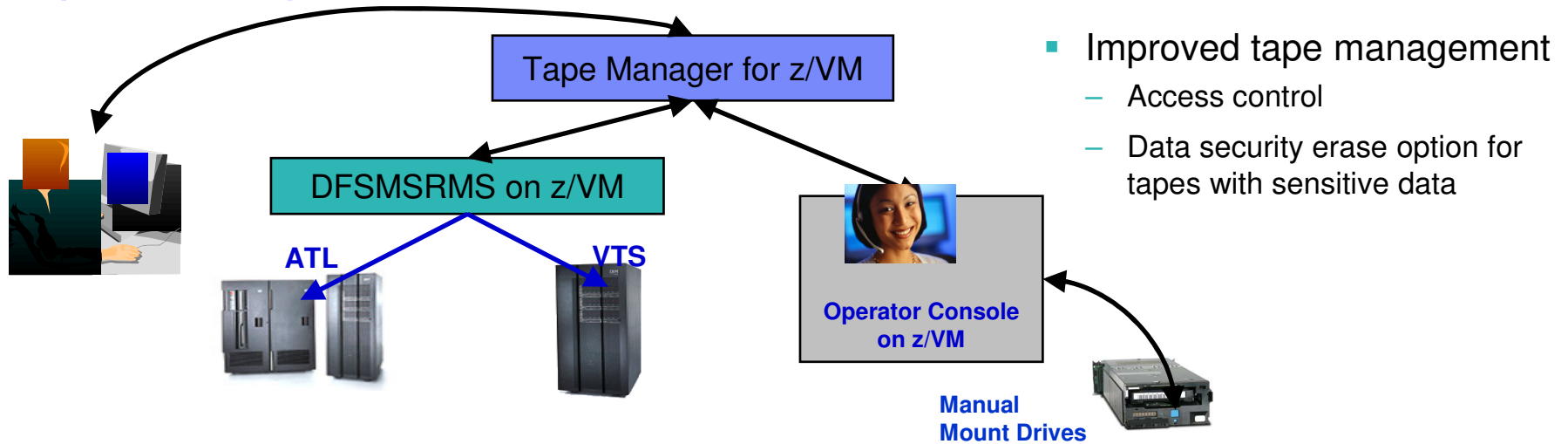
- Performance monitoring for z/VM and Linux guests
- Part of Tivoli Management Services (TMS) infrastructure

➤ 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

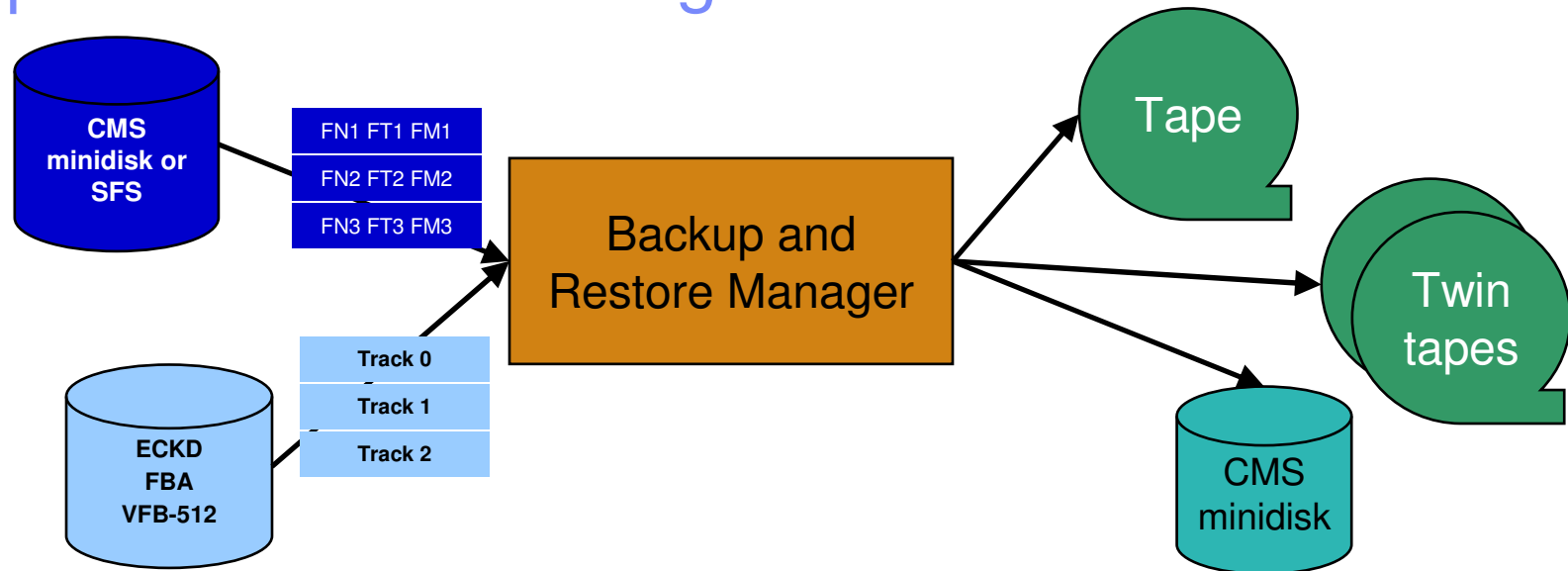


Tape Manager for z/VM



- 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

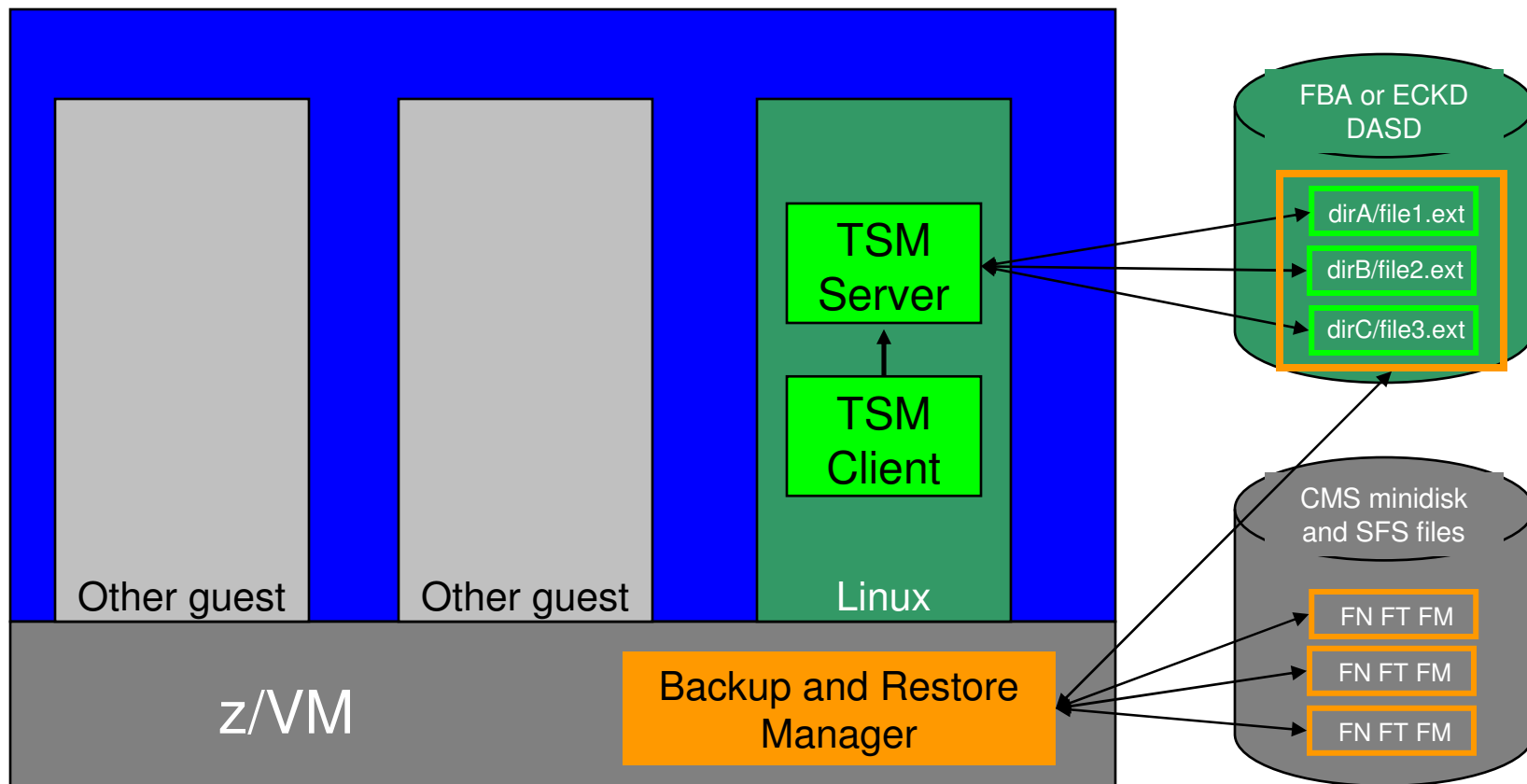
Backup and Restore Manager for z/VM



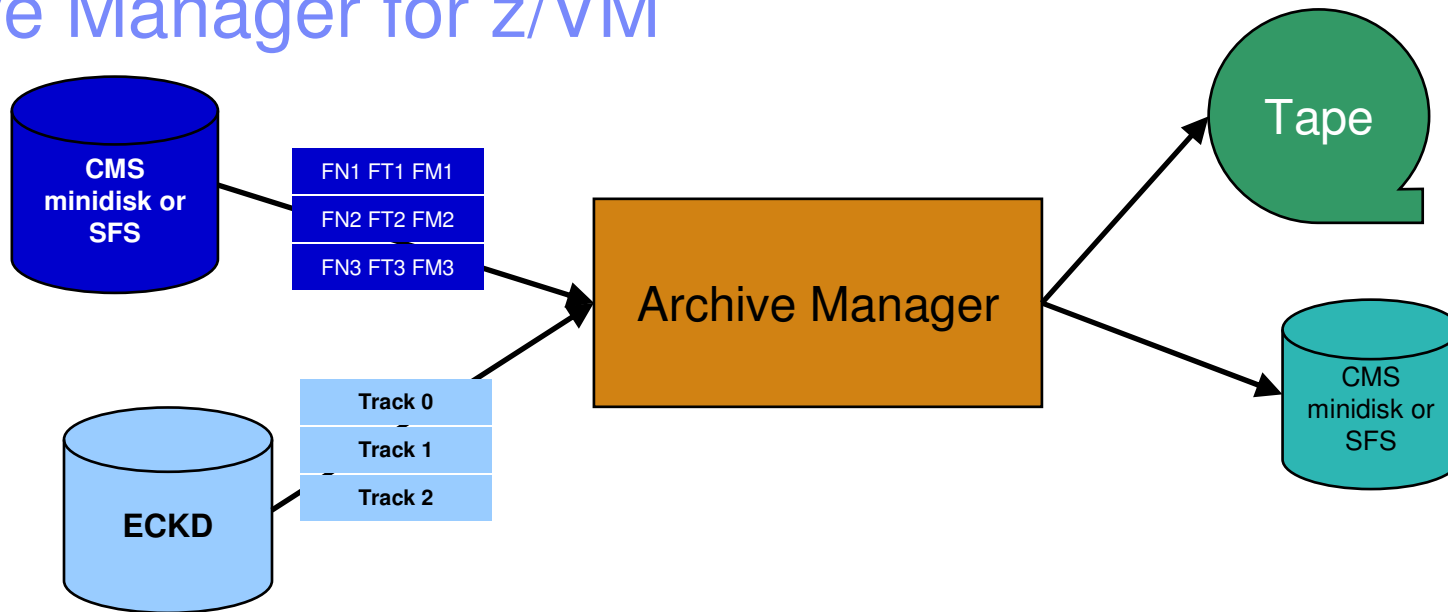
- **System backups available for Disaster Recovery**
- **Guest backups available for restoring to a previous state/level**
- **Backups of user data available for**
 - Restoring to a previous state/level
 - Replacing files accidentally erased
- **Flexible selection of data to back up**
 - Include/exclude 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