



# Monitoring the Power System Family with IBM Tivoli Monitoring

Common Romandie

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## Agenda

**1**

### **IT Service Management**

**2**

### **IBM Tivoli Monitoring Overview**

**3**

### **ITM Agents for Power Systems**

**4**

### **Usage Examples**

**5**

### **Integration**

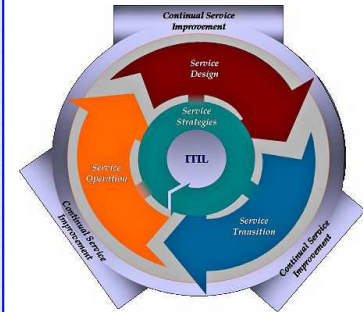
**6**

### **Additional Information – Q&A**

# IT Service Management

## Key Metrics & ITSM processes

- **IT delivers services**
  - A key objective: Service Quality
- **Tools are required to support IT Service Management processes such as:**
  - Monitoring & Event Management
  - Capacity Management
  - Availability Management
  - Incident Management
  - Problem Management
- **How ?**
  - Identifying and being able to collect and process a large amount of Key Metrics:
    - Capacity
    - Availability
    - Performance
    - ...
- **In the world of the Power Systems, IBM Tivoli Monitoring has useful features to collect and process key metrics.**



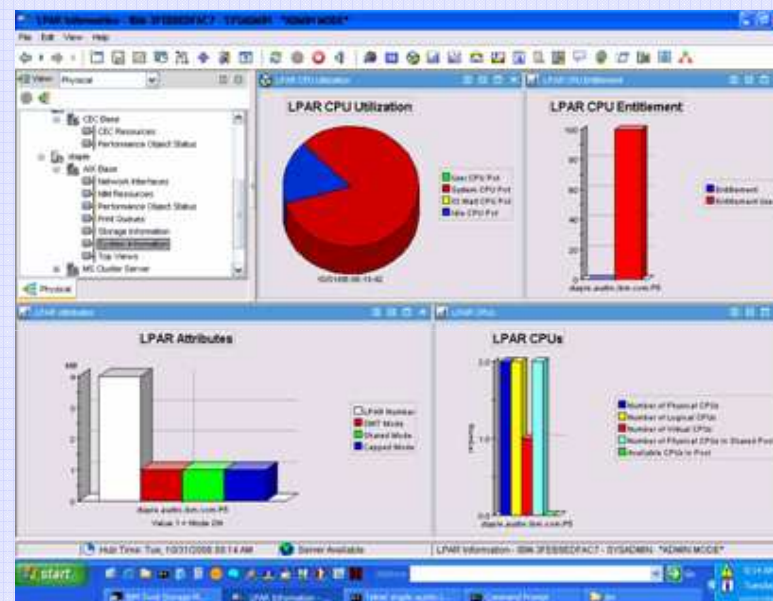
## Agenda

- 1 IT Service Management
- 2 IBM Tivoli Monitoring Overview**
- 3 ITM Agents for Power Systems
- 4 Usage Examples
- 5 Interconnection
- 6 Additional Information – Q&A

# IBM Tivoli Monitoring

## At a glance

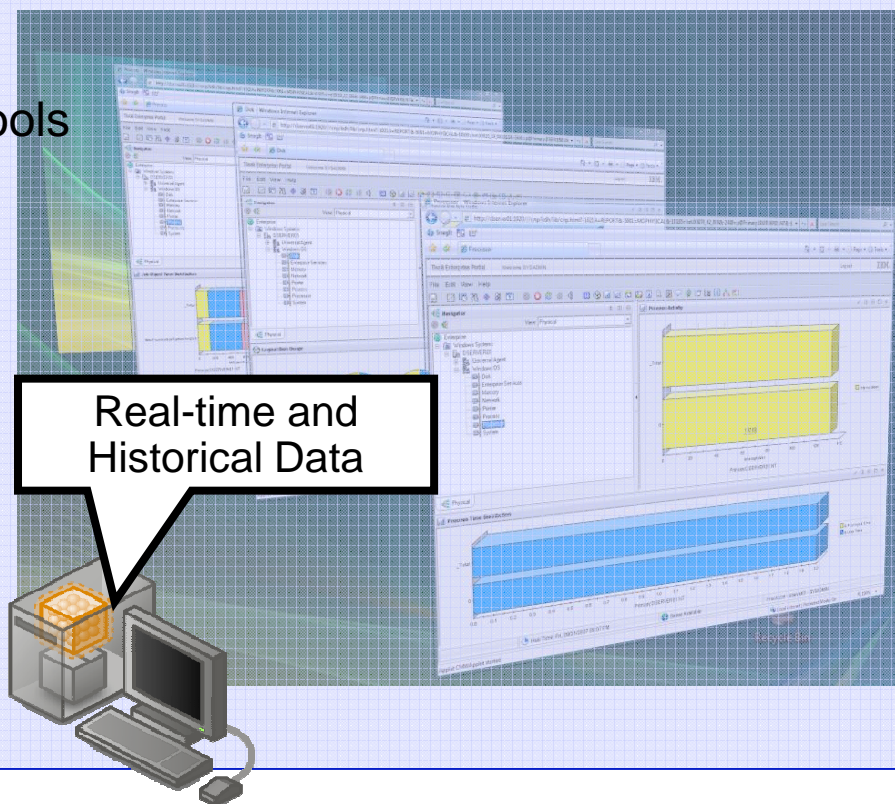
- What is IBM Tivoli Monitoring ?
  - A scalable metric collector (attributes) running on multiple platforms
  - Collected attributes are used for:
    - Monitoring purpose (Situations)
    - Reporting (real-time, historical)
  - An ITM agent provides a collection of attributes
    - Attributes (metrics) are agent specific
  - Provides a powerful portal
    - Administration
    - Reporting
  - Centralized data warehouse
  - Embedded trend analyzer
  - Scalable solution to support from few agents to 10'000 agents
  - ITM servers run on AIX, Windows, Linux, Solaris ...



## IBM Tivoli Monitoring

### IBM Tivoli Data Warehouse (TDW)

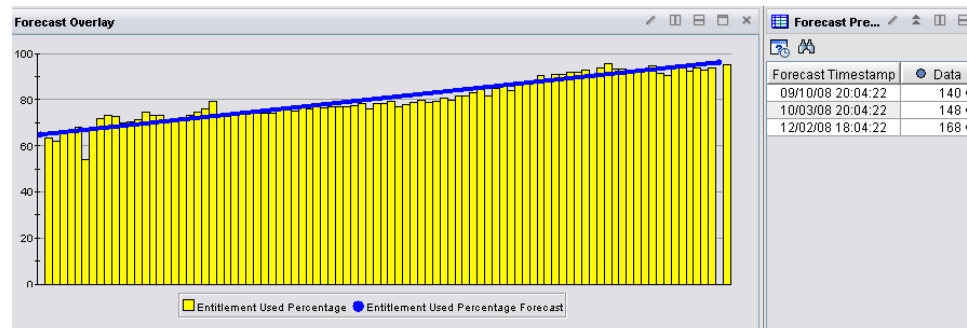
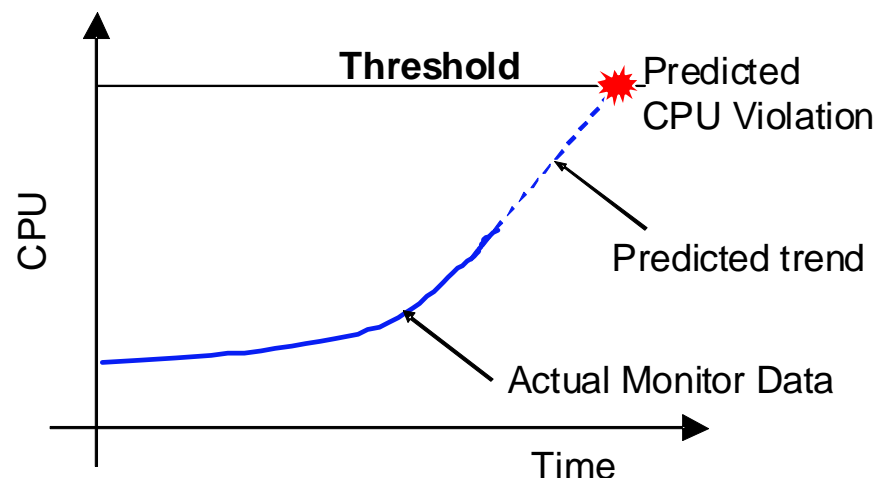
- Tivoli Data Warehouse is the backbone repository and central data store for all historical management data and the basis for Tivoli reporting
- The data is stored, pruned and summarized for ease use and cost savings.
- Provide data to multiple reporting tools
  - ITM portal
  - Tivoli Common Reporting
  - Third party products



## IBM Tivoli Monitoring

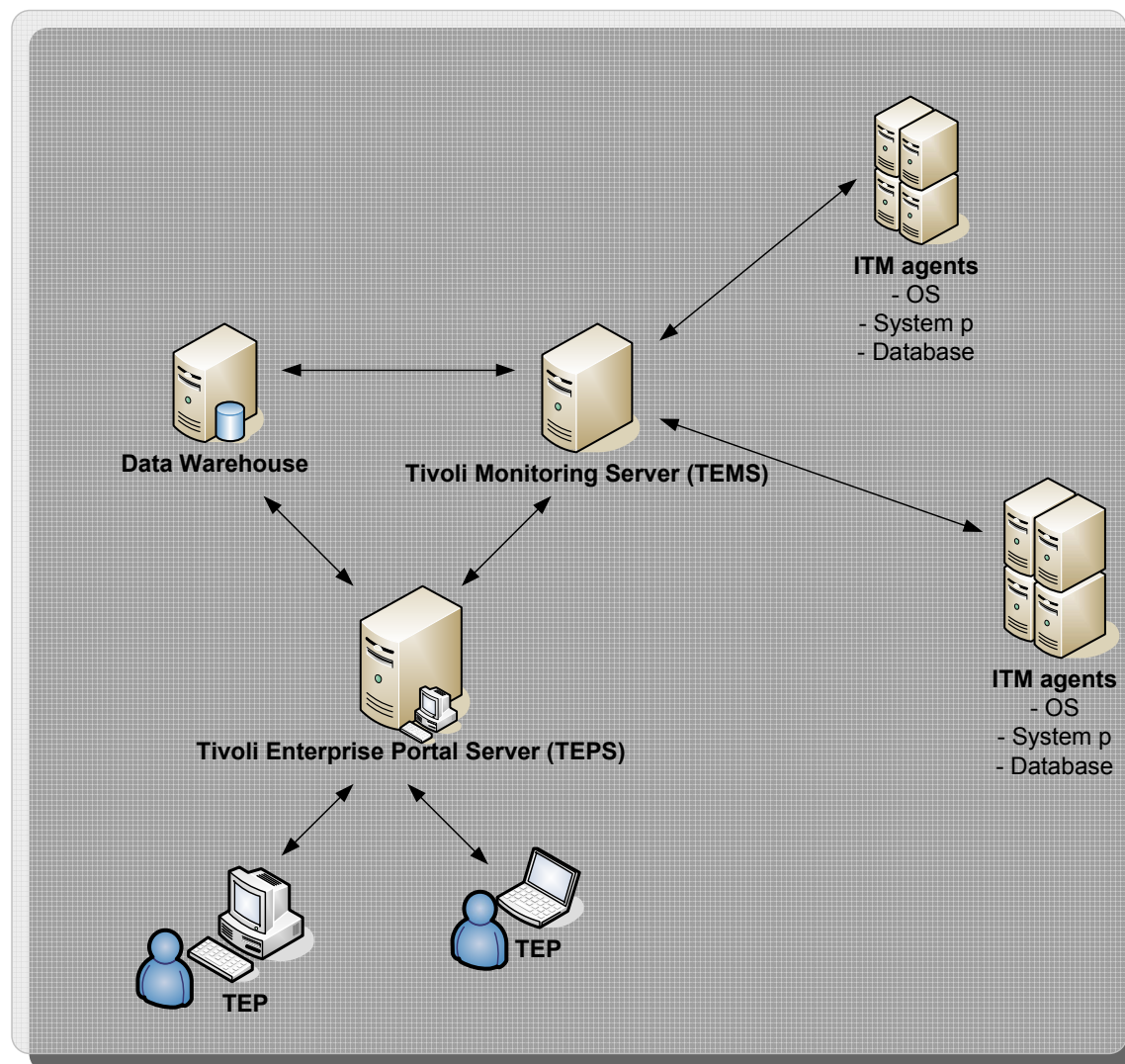
### Predict resource constraints with Tivoli Performance Analyzer

- Future predictions based off historical warehoused data.
- Predict when CPU, Memory, Storage and Network will meet limitations.
- Proactively respond to near-term & long term performance problems
- Warehouse future trends for capacity analysis reports



## IBM Tivoli Monitoring Main components – Simple View

- ITM agent
  - Collects the metrics (attributes).
- TEMS
  - Execute the monitoring policies (Situations) and more !
- TEPS
  - Stores the reports and enables the management of ITM from the GUI.
- TEP
  - End user portal
- Data Warehouse
  - Stores the metrics collected by the ITM agents.



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- 3 ITM Agents for Power Systems**
- 4 Usage Examples
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- 6 Additional Information – Q&A

## Tivoli Monitoring for Power Systems - Overview

### ■ System p agents

- CEC agent
- HMC agent
- VIOS agent
- AIX Premium agent



Allow the visibility within virtualized Power System environments

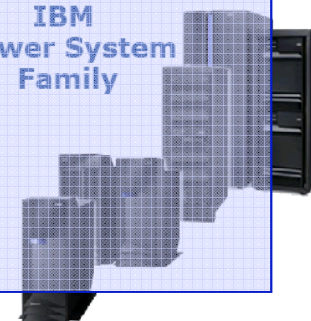
### ■ Operating System agents

- Unix agent (AIX)
- Unix agent (Linux)
- Unix Log Alert agent
- i5/OS agent



Allow the visibility within the Operating System layer

IBM  
Power System  
Family



# Tivoli Monitoring for Power Systems – System p agents

Current version: v 6.2.2

## ■ System p agents

### - CEC agent

- installed on an LPAR (AIX) or preinstalled on VIOS
- collects metrics through the HMC or IVM
- collects metrics about the Central Electronics Complex (CEC) resources

AIX 5.3 TL5, 6.1  
VIOS V2.1.3, Fix Pack 23  
HMC V6, V7

### - HMC agent

- installed on LPAR (AIX partition)
- remotely monitors HMC
- collects metrics about the Hardware Management Console resources

AIX 5.3 TL5, 6.1  
HMC V6, V7

### - VIOS Premium agent

- preinstalled on VIOS
- collects metrics about the VIOS resources

VIOS V2.1.3, Fix Pack 23

### - AIX Premium agent

- installed on LPAR
- Collects metrics about the LPAR & AIX resources

AIX 5.3 TL5, 6.1

## Tivoli Monitoring for Power Systems – System p agents

### Attributes Groups & Attributes

- **An attribute group is a group of metrics (attributes) collected by the ITM agent**
- **System p agents**
  - **CEC agent**: 9 attribute groups
    - AMS, CPU Pool, LPAR, CEC ...
    - Example: **Global CEC** attribute group
      - The number of partitions on the CEC.
      - Total number of CPUs in the CEC.
      - The number of CPUs allocated to logical partitions.
      - The number of CPUs unallocated in the CEC.
      - The percentage of allocated CPUs.
      - The number of CPUs in shared pool.
      - The total amount of memory in the CEC.
      - The amount of memory allocated to logical partitions
      - ....
  - **HMC agent**: 10 attribute groups
    - CPU, File Systems, Managed CEC, Physical Memory ...
  - **VIOS Premium agent**: 40 attributes groups
    - CPU, Disk, MPIO, Memory, Processes, Network ...
  - **AIX Premium agent**: 41 attribute groups
    - CPU, MPIO, Network adapter, Memory, Volume, WPAR ...

Useful attributes (metrics) for  
capacity management of the  
CEC

# Tivoli Monitoring for Power Systems – OS agents

Current version: v 6.2.2

## ■ Operating System agents

- **Unix agent (AIX)**
  - installed on LPAR
  - collects metrics about the AIX resources
- **Unix agent (Linux)**
  - installed on LPAR
  - collects metrics about the Linux resources
- **Unix Log Alert agent**
  - installed on LPAR (AIX)
  - collect the content of log files, errorlog ...
- **i5/OS agent**
  - installed on LPAR
  - collects metrics about the i5/OS resources

AIX 5.2, 5.3, 6.1

RedHat Enterprise Linux AS 4 & 5  
SUSE Linux Enterprise Server 9 & 10

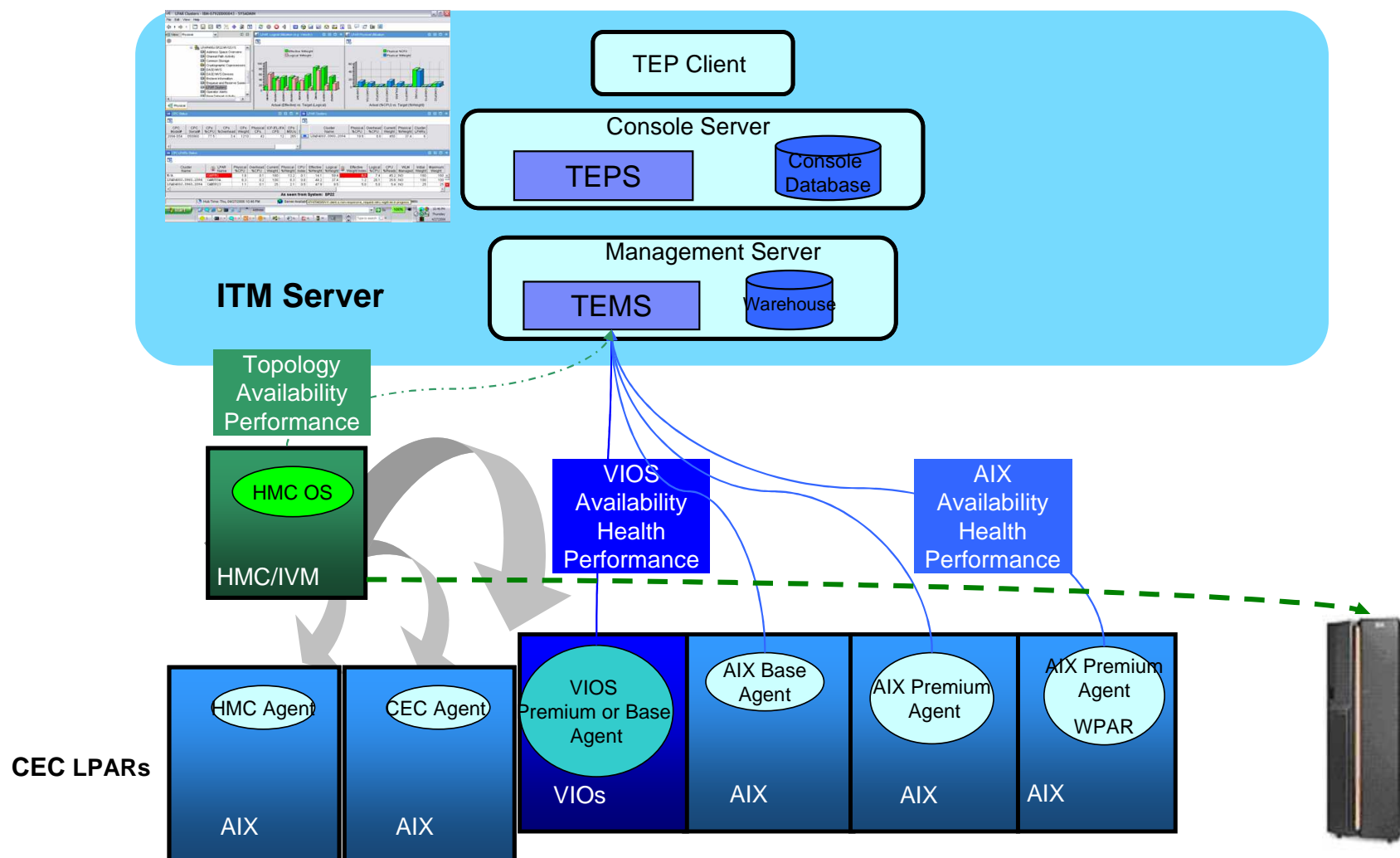
RedHat Enterprise Linux AS 4 & 5  
SUSE Linux Enterprise Server 9 & 10  
AIX 5.2, 5.3, 6.1

i5/OS V5R3  
i5/OS V5R4  
i5/OS V6R1 – IBM i

## Tivoli Monitoring for Power Systems – OS agents

- **An attribute group is a group of metrics (attributes) collected by the ITM agent**
- **Operating System agents**
  - **Unix agent (AIX):** 24 attribute groups
    - CPU, Memory, Processes, File Systems, Users, Network ...
  - **Unix agent (Linux):** 31 attribute groups
    - CPU, Files, Network, Processes, Memory, Users, NFS, RPC ...
  - **Unix Log Alert agent:** 2 attribute groups
    - Log entries, Monitored logs
  - **i5/OS agent:** 71 attribute groups
    - ASP, Jobs, Sub-systems, Users, Network, Message Queues ...

# ITM System p & AIX agents: Internals



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## ITM CEC Agent – Usage Example

### ▪ **Benefit**

- Helps determine how efficiently the resources of a frame are being utilized
- Helps determine if LPAR resources are over/under utilized against their entitlement
- Helps determine effectiveness of Active Memory Expansion

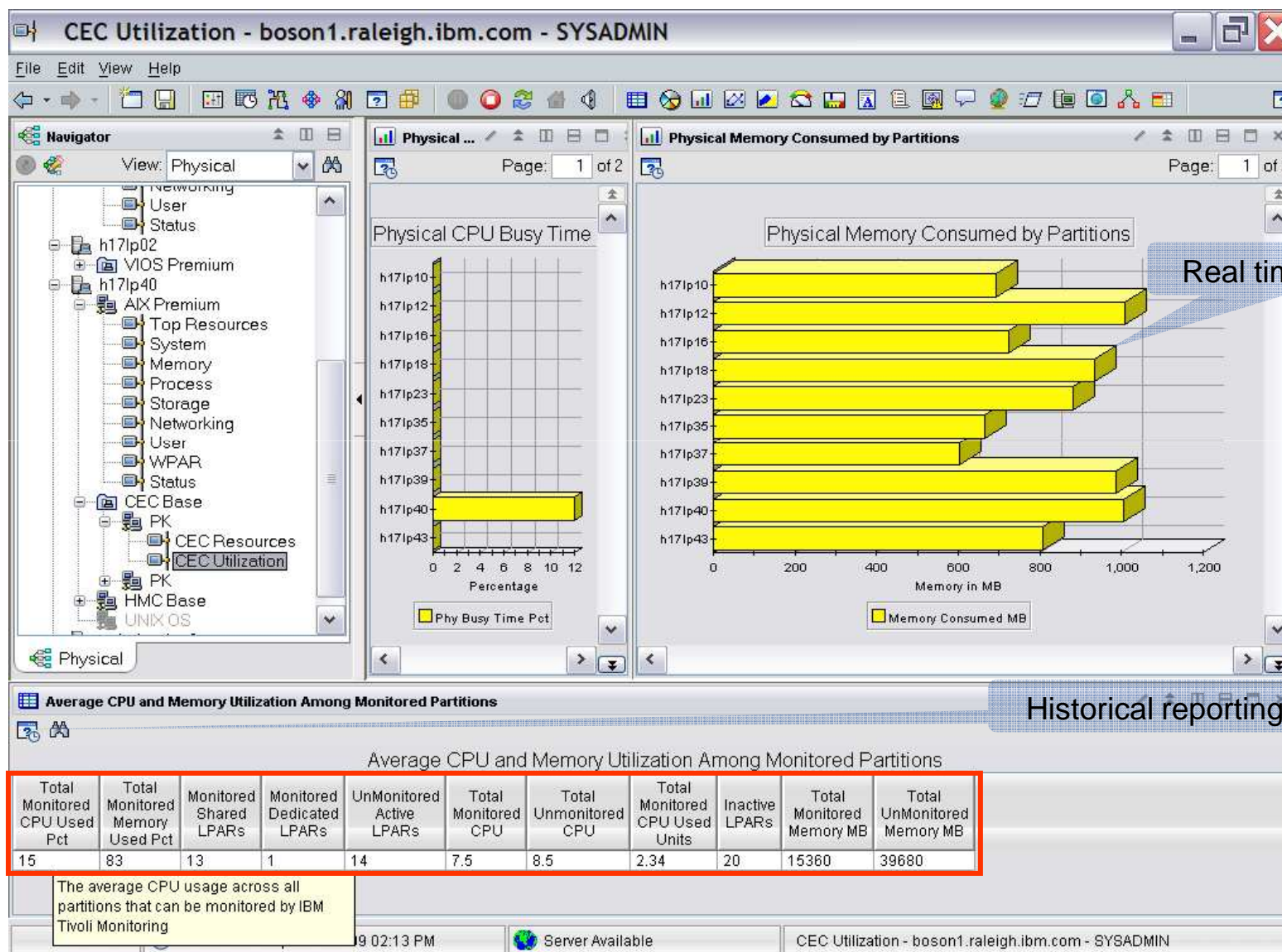
### ▪ **Overview of the entire frame**

- Inventory of resources such as CPU, memory
- Resource allocation to individual LPARS, Pools
- Information regarding number of LPARS, processor, CEC modes
- Active memory expansion metrics

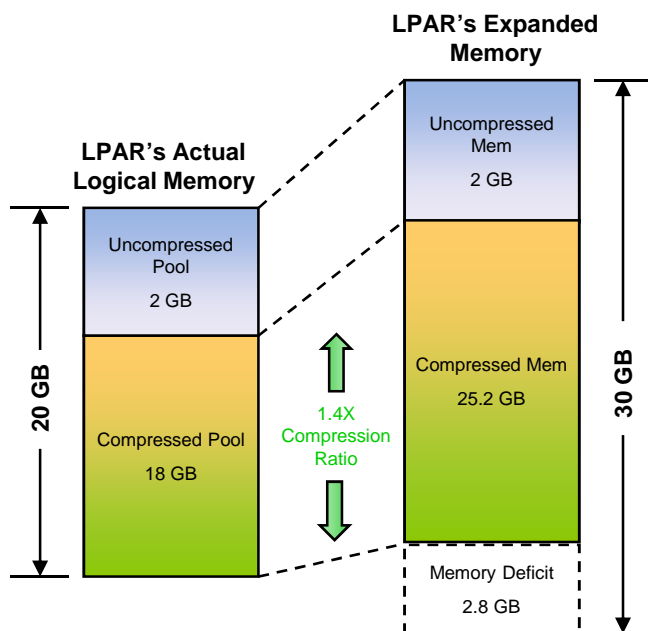
### ▪ **Integration with System Director**

- Contextually launch to make configuration changes, etc.

# ITM CEC Agent: Overall Frame Utilization



# ITM CEC Agent - Active Memory Expansion



Memory Expansion Factor = 1.5X = 30GB / 20GB



## Memory Deficit

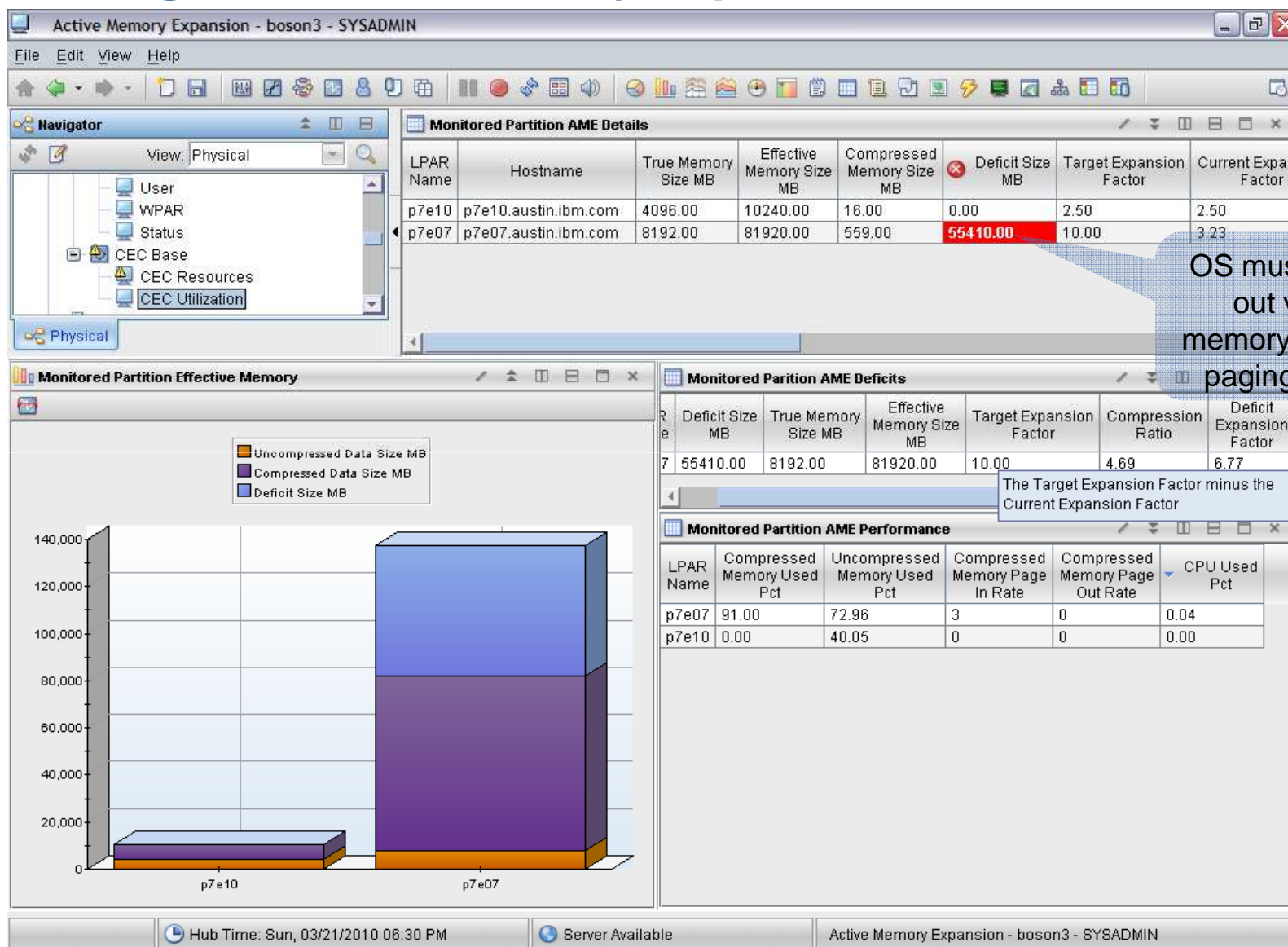
- Workload's data does not compress small enough to achieve desired expanded memory size
- Results in a "hole" in expanded memory

## Identifying a Memory Deficit

## Resolving a memory deficit

- The memory expansion factor can be reduced (thus reducing the expanded memory size of the LPAR)
- To keep the expanded memory size the same, reduce the memory expansion factor and increase the amount of memory configured to the LPAR

# ITM CEC Agent - Active Memory Expansion



OS must paging out virtual memory pages to paging space.

## ITM AIX Premium & Unix Logs - Usage Example

### ▪ **Benefits**

- Insight into resource utilization on LPARs and WPARs
- Which processes are using the most resource?
- Alerts based on errors in logs

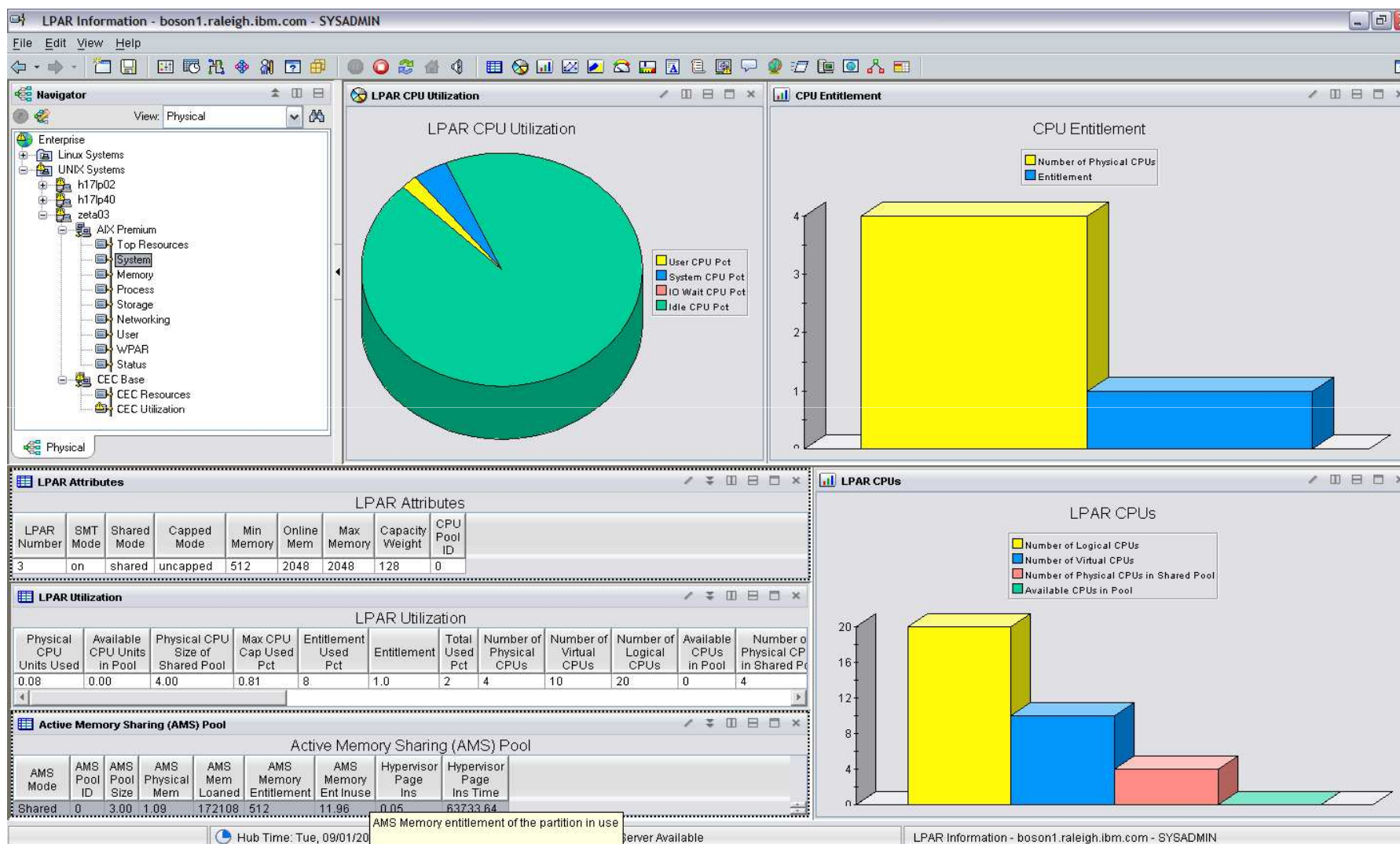
### ▪ **AIX Premium Agent**

- CPU / memory usage & load
- Processes & their cpu usage
- Resource consumption by individual WPARs
- Storage & Network usage
- Active Memory Expansion information
- Network bandwidth

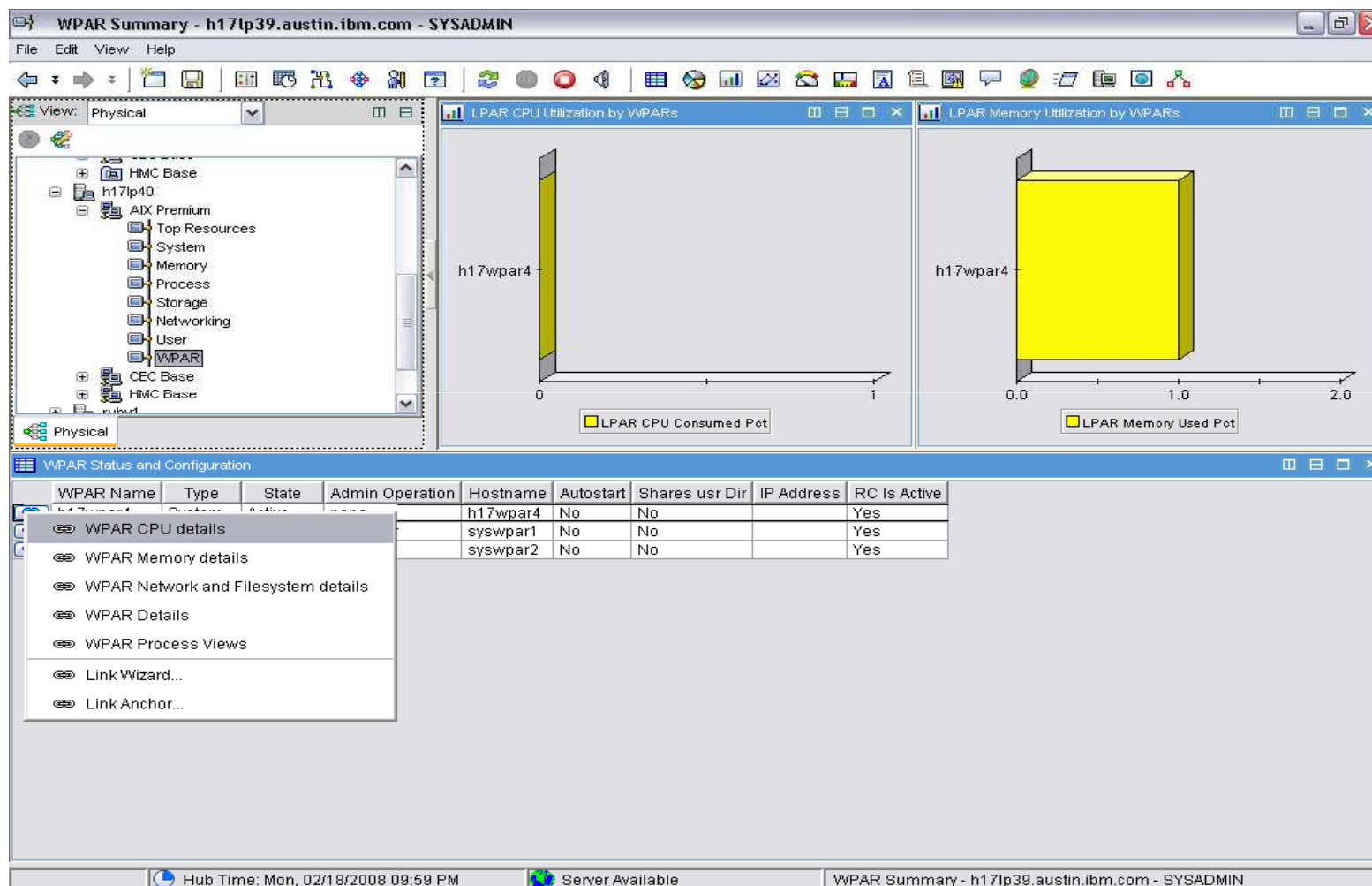
### ▪ **Tivoli Monitoring for Unix Logs**

- Monitor system and user logs
- Customizable alerts based on messages in the logs
- Hardware alerts

# ITM AIX Premium Agent: LPAR Attributes & Utilization



# ITM AIX Premium Agent - WPAR Supplementary Workspace links



## ITM VIOS Agent – Usage Example

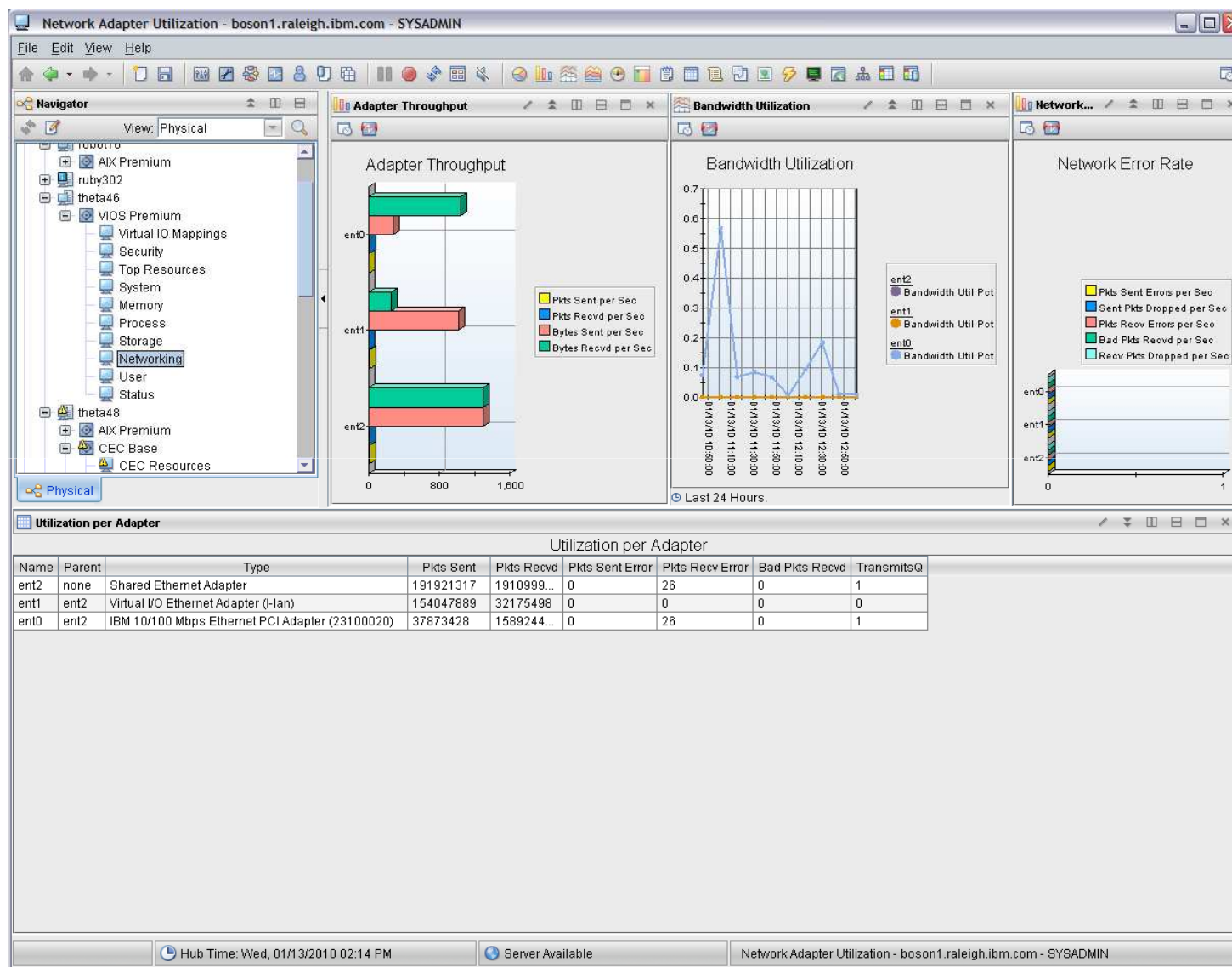
### ▪ **Benefits**

- Monitors the availability & health of the VIOS LPAR
- Monitors the availability and performance of VIOS resources – as they relate to client LPAR

### ▪ **Features**

- Mapping between physical network / storage devices and virtual devices
- Device Status
- CPU/Memory usage
- Storage I/O & disk usage
- Physical Network Adapter bandwidth utilization; SEA throughput/VLAN throughput

# ITM VIOS agent: Network Adapters Bandwidth Utilization



# ITM VIOS Agent - Device Status

Status - lep2003e.raleigh.ibm.com - SYSADMIN \*ADMIN MODE\*

File Edit View Help

Navigator View: Physical

- cache7
  - AIK Premium
  - h17lp02
    - VIOS Premium
      - Virtual IO Mappings
      - Security
      - Top Resources
      - System
      - Memory
      - Process
      - Storage
      - Networking
      - User
      - Status
  - h17lp40
    - AIK Premium
    - Top Resources
    - System
    - Memory
    - Process
    - Storage
    - Networking
    - User
    - WPAR
    - Status
    - CEC Base
      - CEC Resources
      - CEC Utilization
    - HMC Base
      - System
      - Managed Systems
- ipv4-081
- ipv4-083
- ruby102
- ruby200
- Windows Systems

Physical

Device Status

| Name   | Parent | State     | Class   | Type            |
|--------|--------|-----------|---------|-----------------|
| en0    | inet0  | Stopped   | if      | en              |
| en3    | inet0  | Available | if      | en              |
| ent0   | pci2   | Available | adapter | 14108902        |
| ent1   | pci2   | Stopped   | adapter | 14108902        |
| ent2   | vio0   | Available | adapter | IBM_I-lan       |
| ent3   |        | Available | adapter | sea             |
| hdisk0 | scsi0  | Available | disk    | scsd            |
| hdisk1 | scsi0  | Available | disk    | scsd            |
| iscsi0 |        | Available | driver  | iscsi           |
| lo0    | inet0  | Available | if      | lo              |
| pager0 | vbsd0  | Available | adapter | pager           |
| scsi0  | pci3   | Available | adapter | sym1010         |
| vasi0  | vio0   | Available | adapter | IBM_VASI-1      |
| vbsd0  | vasi0  | Available | adapter | vbsd            |
| vhost0 | vio0   | Available | adapter | IBM_v-scsi-host |
| vhost1 | vio0   | Available | adapter | IBM_v-scsi-host |
| vhost2 | vio0   | Available | adapter | IBM_v-scsi-host |
| vhost3 | vio0   | Available | adapter | IBM_v-scsi-host |
| vsas0  | vio0   | Available | adapter | hvtterm1        |

Hub Time: Wed, 10/08/2008 08:10 PM Server Available Status - lep2003e.raleigh.ibm.com - SYSADMIN \*ADMIN MODE\*

## ITM HMC Agent – Usage Example

### ▪ **Benefits**

- Ensures availability of the hardware management console and reports on the status of systems managed by the HMC.
- Provides configuration information for CECs and LPARs managed by the HMC

### ▪ **Features**

- Provides configuration information on all the managed systems connected to the HMC
- Events to notify operators/administrators of LPAR moves, adds or deletes
- Monitors the resource (CPU, memory, storage, network) usage on the HMC

# ITM HMC Agent - Managed CECs & LPAR Events

Managed CECs - 9.42.23.40 - SYSADMIN

File Edit View Help

Navigator View: Physical

- Memory
- Process
- Storage
- Networking
- User
- WPAR
- Status
- CEC Base
  - CEC Reso
  - CEC Utiliza
- HMC Base
  - ipv4::PH
  - System
  - Manage
- p7-hmc::PH
  - System
  - Manage
- robot16
  - AIX Premium
  - CEC Base
  - HMC Base
- theta46
  - VIOS Premium
- Windows Systems
- ITMWINVM2
  - Warehouse Pr
  - Configurati
  - Statistics
  - Summarizati
  - Configurati
  - Statistics

Physical

Managed CECs

| CEC Name                 | State     | Active Partitions | CPU Total | CPU allocated | CPU unallocated | Total Shared CPUs | Total Mem MB | Allocated Mem MB | Unallocated Mem MB | Num proc pools | Num mem pools | CEC Model |
|--------------------------|-----------|-------------------|-----------|---------------|-----------------|-------------------|--------------|------------------|--------------------|----------------|---------------|-----------|
| venus                    | Operating | 4                 | 2.0       | 1.9           | 0.1             | 0.0               | 16384        | 12800            | 3584               | 1              | 0             | 9117-MMA  |
| solar                    | Operating | 1                 | 4.0       | 4.0           | 0.0             | 0.0               | 24576        | 3968             | 20608              | 1              | 0             | 9117-MMA  |
| Link to LPARs by CECName |           |                   |           |               |                 |                   |              |                  |                    |                |               |           |
| lunar                    | Operating | 5                 | 2.0       | 2.0           | 0.0             | 0.0               | 16384        | 15296            | 1088               | 1              | 0             | 9117-MMA  |
| mars                     | Standby   | 0                 | 0.0       | 0.0           | 0.0             | 0.0               | 0            | 0                | 0                  | 0              | 0             | 9117-MMA  |
| galileo                  | Operating | 5                 | 4.0       | 3.0           | 1.0             | 0.0               | 16384        | 11648            | 4736               | 1              | 0             | 9117-MMA  |

Events

| Time                     | Event        | LPAR Name | LPAR Num | CEC Name | Src CEC Mfg | Src CEC Model | Src CEC SN | Dest CEC Name | Dest CEC Mfg | Dest CEC Model | Dest CEC SN | Dest LPAR Num |
|--------------------------|--------------|-----------|----------|----------|-------------|---------------|------------|---------------|--------------|----------------|-------------|---------------|
| Wed Feb 24 15:21:25 2010 | LPAR created | ipv4-240  | 5        | mercury  | IBM         | 9117-MMA      | 06E05A1    |               |              |                |             | Not Collected |
| Wed Feb 24 15:21:25 2010 | LPAR deleted | ipv6-240  | 5        | mercury  | IBM         | 9117-MMA      | 06E05A1    |               |              |                |             | Not Collected |

Hub Time: Wed, 02/24/2010 02:45 PM Server Available Managed CECs - 9.42.23.40 - SYSADMIN

# ITM HMC Agent - Managed LPARs

Logical Partitions - 9.42.23.40 - SYSADMIN

File Edit View Help

Navigator

View: Physical

- Memory
- Process
- Storage
- Networking
- User
- WPAR
- Status
- CEC Base
  - CEC Resources
  - CEC Utilization
- HMC Base
  - ipv4::PH
    - System
    - Managed CECs
  - p7-hmc::PH
    - System
    - Managed CECs
- robot16
  - AIX Premium
  - CEC Base
  - HMC Base

Physical

CEC Navig...

| CEC Name | Active Partitions |
|----------|-------------------|
| venus    | 4                 |
| lunar    | 5                 |
| mars     | 0                 |
| galileo  | 5                 |

Link to LPARs by CECName

venus Logical Partitions

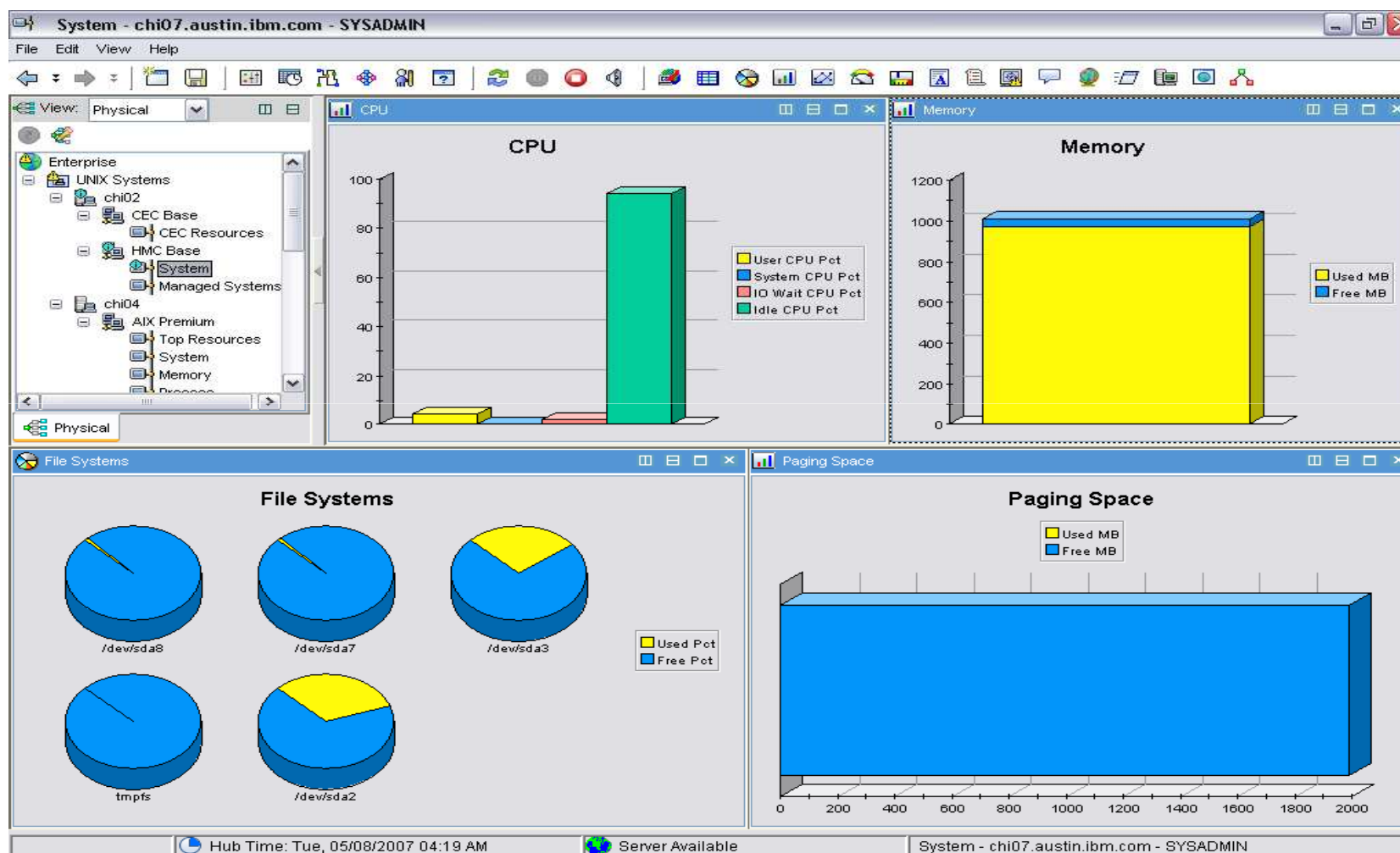
| LPAR Name    | State         | Hostname                | Partition ID | Environment | OS Version | Shared Mode | Capped Mode | CEC name |
|--------------|---------------|-------------------------|--------------|-------------|------------|-------------|-------------|----------|
| ipv4-241     | Running       | ipv4-241.austin.ibm.com | 1            | aixlinux    | AIX 6.1    | shared      | cap         | venus    |
| ipv4-240vios | Running       | ipv4-240.austin.ibm.com | 2            | vioserver   | AIX 6.1    | shared      | cap         | venus    |
| ipv4-242     | Running       | ipv4-242.austin.ibm.com | 3            | aixlinux    | AIX 5.3    | shared      | cap         | venus    |
| ipv4-243     | Not Activated | ipv4-243                | 4            | aixlinux    |            | shared      | cap         | venus    |
| ipv4-244     | Not Activated | ipv4-244                | 5            | aixlinux    |            | shared      | cap         | venus    |
| ipv4-245     | Running       | ipv4-245.austin.ibm.com | 6            | aixlinux    |            | shared      | cap         | venus    |
| ipv4-246     | Not Activated | ipv4-246                | 7            | aixlinux    |            | shared      | cap         | venus    |
| ipv4-247     | Not Activated | ipv4-247                | 8            | aixlinux    |            | shared      | cap         | venus    |
| ipv4-248     | Not Activated | ipv4-248                | 9            | aixlinux    |            | shared      | cap         | venus    |

Hub Time: Wed, 02/24/2010 02:47 PM

Server Available

Logical Partitions - 9.42.23.40 - SYSADMIN

# ITM HMC Agent - HMC System Resources



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# CEC ITM Agent - Integration with IBM Systems Director

- **Dedicated workspace**
  - ITM workspace dedicated for IBM Systems Director.
- **Easy navigation**
  - Easy navigation to this workspace from several agent and Situation event details workspaces.
- **System Director Web UI**
  - The view of the workspace is initialized with the relevant IBM Systems Director Web UI view (embedded view).

The screenshot displays the IBM Systems Director interface. The top pane shows the 'Initial Situation Values' table with columns: UnMonitored Active LPARs, Total Monitored Memory Used Pct, Node, Timestamp, Monitored Shared LPARs, Machine ID, Monitored Dedicated LPARs, and In. The table contains one row with 72 UnMonitored Active LPARs. The bottom pane shows the 'Current Situation Values' table with the same structure and data. The 'Take Action' pane at the bottom left shows a 'Select Action' button. The bottom right pane shows the 'IBM Systems Director' web UI with a 'Welcome' message and a table of resources.

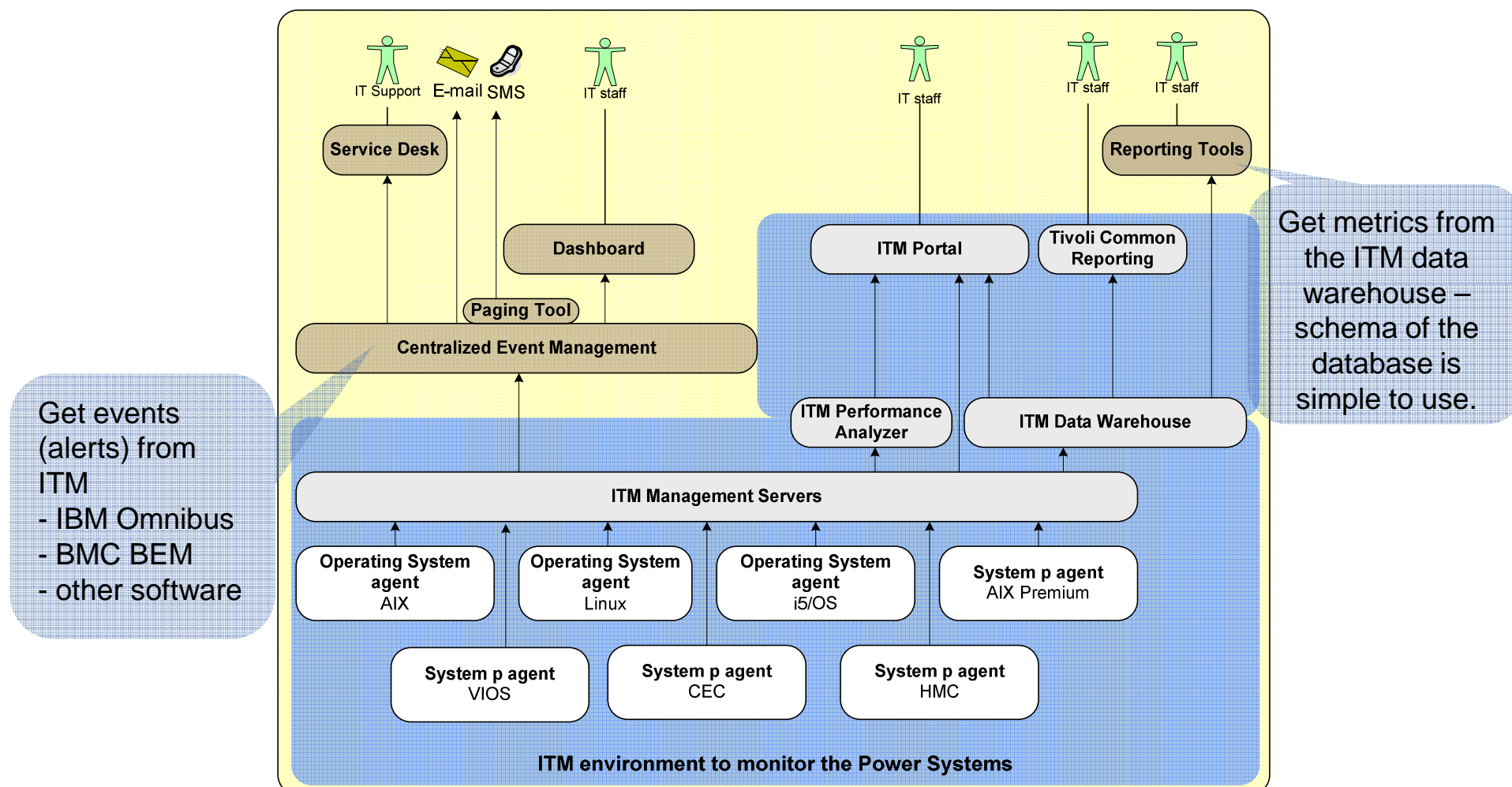
| UnMonitored Active LPARs | Total Monitored Memory Used Pct | Node           | Timestamp         | Monitored Shared LPARs | Machine ID | Monitored Dedicated LPARs | In |
|--------------------------|---------------------------------|----------------|-------------------|------------------------|------------|---------------------------|----|
| 72                       |                                 | bluecloud02.PK | 09/01/09 07:46:33 | 3                      | C9991D4C   | 1                         | 0  |

| UnMonitored Active LPARs | Total Monitored Memory Used Pct | Node           | Timestamp         | Monitored Shared LPARs | Machine ID | Monitored Dedicated LPARs | In |
|--------------------------|---------------------------------|----------------|-------------------|------------------------|------------|---------------------------|----|
| 72                       |                                 | bluecloud02.PK | 09/01/09 07:46:33 | 3                      | C9991D4C   | 1                         | 0  |

| Name       | Access | Problems | Compliance | Changed...      |
|------------|--------|----------|------------|-----------------|
| 10-16619   | OK     | OK       | OK         | Sep 1, 2009 ... |
| soa-a-vios | OK     | OK       | OK         | Sep 1, 2009 ... |
| soa-a1     | OK     | OK       | OK         | Sep 1, 2009 ... |
| soa-a2     | OK     | OK       | OK         | Sep 1, 2009 ... |
| soa-a3     | OK     | OK       | OK         | Sep 1, 2009 ... |
| soa-a4     | OK     | OK       | OK         | Sep 1, 2009 ... |
| soa-a5     | OK     | OK       | OK         | Sep 1, 2009 ... |

## Integrating ITM to your Service Management Tools

- To support your IT Service Management processes, the integration of ITM to your existing Service Management tools might be considered.



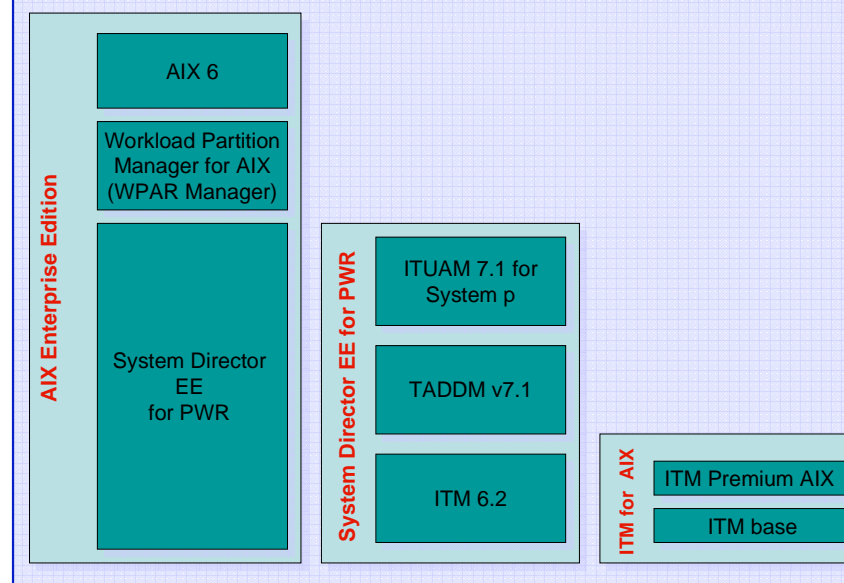
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## Understand the IBM Portfolio

| Product                                      | Licensing Mode | Who ?     |
|--|----------------|-----------|
| AIX Enterprise Edition                       | PROC           | STG       |
| System Director Enterprise Edition for Power | PROC           | STG       |
| ITM  | PVU            | SWG       |
| System Director                              | Free *         | STG (Web) |
|  |                |           |

### IBM System Director Enterprise Edition for Power

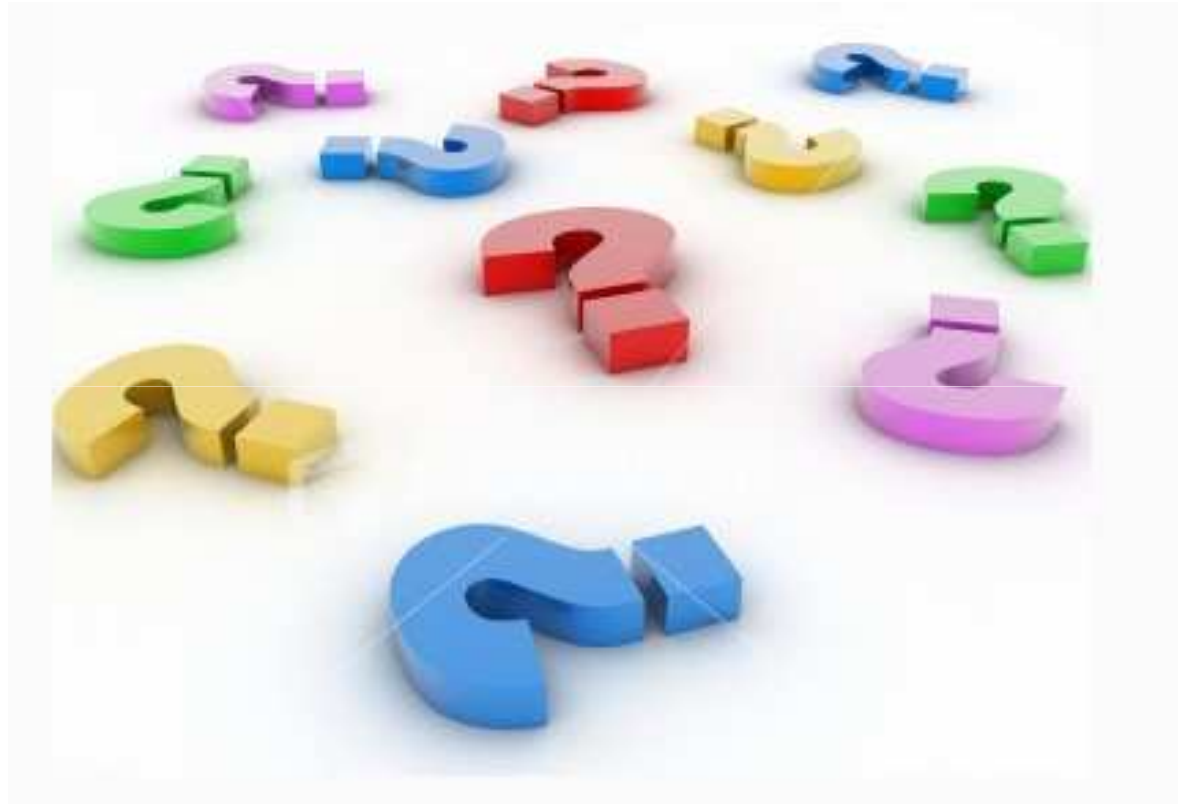


## Useful Pointers

- **System p Virtualization Best Practices:**
  - <http://www.ibm.com/developerworks/wikis/display/tivolimonitoring/System+p+Virtualization+Best+Practices>
- **System p agents user's guide (6.2.2):**
  - [http://publib.boulder.ibm.com/infocenter/tivihelp/v15r1/topic/com.ibm.itm.doc\\_6.2.2/systemP\\_6.2.2.htm](http://publib.boulder.ibm.com/infocenter/tivihelp/v15r1/topic/com.ibm.itm.doc_6.2.2/systemP_6.2.2.htm)
- **OS agents user's guides (6.2.2):**
  - [http://publib.boulder.ibm.com/infocenter/tivihelp/v15r1/topic/com.ibm.itm.doc\\_6.2.2/using.htm](http://publib.boulder.ibm.com/infocenter/tivihelp/v15r1/topic/com.ibm.itm.doc_6.2.2/using.htm)
- **IBM Redbooks:**
  - <http://www.redbooks.ibm.com> (search key "Tivoli Monitoring")
- **IBM Tivoli Monitoring Forum:**
  - <http://www.ibm.com/developerworks/forums/forum.jspa?forumID=796>
- **Tivoli Software Group – Suisse Romande:**
  - Pierantonio Marchesini: [mpie@ch.ibm.com](mailto:mpie@ch.ibm.com)
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## Questions ?





## Backup slides



## ITM VIOS Agent: N-Port ID Virtualization (NPIV) Mapping

**NPIV Mappings - boson1.raleigh.ibm.com - SYSADMIN**

File Edit View Help

Navigator View: Physical

- AXI Premium
  - CEC Base
    - PK
    - PK
  - HMC Base
    - System
  - Managed Systems
  - UNIX OS
  - npiv-mt-vios3
    - VIOS Premium
      - Virtual IO Mappings**
      - Security
      - Top Resources
      - System

Physical

**NPIV Fibre Channel Port**

| Physical Fibre Channel Port | Physical FCP Location Code | Total Ports | Available Ports |
|-----------------------------|----------------------------|-------------|-----------------|
| fcs0                        | U789C.001.DQD2272-P1-C3-T1 | 64          | 63              |
| fcs1                        | U789C.001.DQD2272-P1-C3-T2 | 64          | 64              |

**NPIV Mappings**

| Physical Fibre Channel Port | NPIV Server Adapter Name | Server Slot Number | Client Partition Name | Client Partition ID | NPIV Client Adapter Name | Client Slot Number | Client Partition OS | Physical FCP Location Code | WWPN Primary   | WWPN Secondary   |
|-----------------------------|--------------------------|--------------------|-----------------------|---------------------|--------------------------|--------------------|---------------------|----------------------------|--|--|
|                             | vfchost0                 | 11                 | mt-client03           | 7                   |                          | 4                  |                     |                            |  |  |
|                             | vfchost1                 | 12                 | mt-client11           | 9                   |                          | 5                  |                     |                            |  |  |
|                             | vfchost2                 | 13                 | mt-client13           | 12                  |                          | 5                  |                     |                            |  |  |
|                             | vfchost3                 | 14                 | mt-client14           | 13                  |                          | 4                  |                     |                            |  |  |
|                             | vfchost4                 | 15                 | mt-client14           | 13                  |                          | 5                  |                     |                            |  |  |
| fcs0                        | vfchost5                 | 18                 | Linux_DONT_TOUCH      | 8                   | host2                    | 3                  | CHLin...            | U789C.001.DQD2272-P1-C3-T1 | c050760045310054<br>c050760045310052<br>c05076004531007e | c050760045310053<br>c050760045310053<br>c05076004531007f |

Hub Time: Tue, 05/05/2009 01:50 PM Server Available NPIV Mappings - boson1.raleigh.ibm.com - SYSADMIN

# VIOS Agent: Network Adapter Utilization

