zEnterprise Platform Performance Manager: Overview and Deepdive

Hiren Shah (hiren@us.ibm.com)
IBM
August 10th, 2011
9709
Trademarks

The following are trademarks of the International Business Machines Corporation in the United States, other countries, or both.

Not all common law marks used by IBM are listed on this page. Failure of a mark to appear does not mean that IBM does not use the mark nor does it mean that the product is not actively marketed or is not significant within its relevant market.

Those trademarks followed by ® are registered trademarks of IBM in the United States; all others are trademarks or common law marks of IBM in the United States.

For a complete list of IBM Trademarks, see www.ibm.com/legal/copytrade.shtml:

*, AS/400®, e business(logo)®, DBE, ESCO, eServer, FiCON, IBM®, IBM (logo)®, iSeries®, MVS, OS/390®, pSeries®, RS/6000®, S/30, VM/ESA®, VSE/ESA, WebSphere®, xSeries®, z/OS®, zSeries®, z/VM®, System i, System i5, System p, System p5, System x, System z, System z9®, BladeCenter®

The following are trademarks or registered trademarks of other companies.

Adobe, the Adobe logo, PostScript, and the PostScript logo are either registered trademarks or trademarks of Adobe Systems Incorporated in the United States, and/or other countries.
Cell Broadband Engine is a trademark of Sony Computer Entertainment, Inc. in the United States, other countries, or both and is used under license therefrom.
Java and all Java-based trademarks are trademarks of Sun Microsystems, Inc. in the United States, other countries, or both.
Microsoft, Windows, Windows NT, and the Windows logo are trademarks of Microsoft Corporation in the United States, other countries, or both.
Intel, Intel logo, Intel Inside, Intel Inside logo, Intel Centrino, Intel Centrino logo, Celeron, Intel Xeon, Intel SpeedStep, Itanium, and Pentium are trademarks or registered trademarks of Intel Corporation or its subsidiaries in the United States and other countries.
UNIX is a registered trademark of The Open Group in the United States and other countries.
Linux is a registered trademark of Linus Torvalds in the United States, other countries, or both.
ITIL is a registered trademark, and a registered community trademark of the Office of Government Commerce, and is registered in the U.S. Patent and Trademark Office.
IT Infrastructure Library is a registered trademark of the Central Computer and Telecommunications Agency, which is now part of the Office of Government Commerce.

* All other products may be trademarks or registered trademarks of their respective companies.

Notes:
Performance is in Internal Throughput Rate (ITR) ratio based on measurements and projections using standard IBM benchmarks in a controlled environment. The actual throughput that any user will experience will vary depending upon considerations such as the amount of multiprogramming in the user's job stream, the I/O configuration, the storage configuration, and the workload processed. Therefore, no assurance can be given that an individual user will achieve throughput improvements equivalent to the performance ratios stated here.
IBM hardware products are manufactured from new parts, or new and serviceable used parts. Regardless, our warranty terms apply.
Information about non-IBM products is obtained from the manufacturers of those products or their published announcements. IBM has not tested those products and cannot confirm the performance, compatibility, or any other claims related to non-IBM products. Questions on the capabilities of non-IBM products should be addressed to the suppliers of those products.
Prices subject to change without notice. Contact your IBM representative or Business Partner for the most current pricing in your geography.
Agenda

- Platform Management Objectives
- Workload based monitoring
- Management functions
- Guest Platform Management Provider
- WLM and PPM relationship
Platform Performance Management Objectives
zEnterprise Unified Resource Manager

• Ensemble:
  • A zEnterprise Ensemble is a collection of zEnterprise Nodes managed as a single virtualized pool of server resources
    • Native LPAR and z/VM Virtual Images
    • Power VM Virtual images
    • System X86 Virtual images
    • IBM Smart Analytics Optimizer for DB2
    • IBM DataPower Appliance
  • A zEnterprise Node can be a member of at most one Ensemble

• zEnterprise Unified Resource Manager (zManager)
  • HMC is management console
  • Ensemble-Wide scope of responsibility
  • Hardware configuration and operational control
  • Virtual server life cycle management
  • Virtual network and storage provisioning
  • Energy Management
  • Goal-oriented performance management
zEnterprise Platform Performance Manager

- Platform management component responsible for goal-oriented resource monitoring, management, and reporting across the zEnterprise Ensemble
- Core component responsible for definition and implementation of goal-oriented management policy
- Extend goal oriented approach of z/OS WLM to platform managed resources
- Common approach to monitoring / management of platform resources across zEnterprise
- Orchestration of autonomic management of resources across virtual servers
  - Provide Intelligent Resource Director like function across the zEnterprise
  - Pushes management directives to the SE, Hypervisors, and OS agents as required across the zEnterprise

- Integration of HMC console support
  - Integrated UI for monitoring, display of workload topology relationships, status alerts, etc
  - Definition of Performance Management Goals and Policy Administration

- Functionality integrated into the Unified Resource Manager
  - Code structured and packaged as System Z firmware
  - Inter-Component communication over trusted internal platform management network
Platform Performance Manager Structure

- Ensemble Performance Mgmt (GUI / Console, Reporting, Workload & Policy Mgmt)
- HMC
  - EPM
- SE
  - NPM
- Hypervisor
- Virtual Server with GPMP
- Guest Platform Mgmt Provider (OS Monitoring)
- Node Performance Mgmt (Policy Mgmt, Data Collection & Aggregation)
- Hypervisor Performance Mgmt (Monitoring, Resource Optimization)
Platform Workload

- A Platform Workload is a grouping mechanism and “management view” of virtual servers supporting a business function
- Provides the context within which associated platform resources are presented, monitored, reported, and managed
- Management policies are associated to Platform Workload
  - Performance Policy
- Workload can be defined by an administrator
  - Requires ‘Automate’ level enabled
  - Requires appropriate role
Workload Performance Policy

• Defines performance goals for virtual servers in a workload
  • Conceptually similar to simplified z/OS WLM Policy

• Provides basis for monitoring and management of platform resources used by virtual servers in a Workload

• Workload to performance policy relationship:
  • A Workload can have multiple performance policies associated with it
  • Single policy is active at a given time
  • Can dynamically change the policy that is active
    • Through the UI
    • Through a timed based schedule
      • Example: Day shift policy / night shift policy
Workload Performance Policy…

- Policy structure:
  - Policy contains a set of service classes
  - Classification rules map each virtual server within the workload to a service class
  - A service class assigns a performance goal and importance

- HMC as console for policy creation and editing
  - Wizard for policy creation
  - Repository for policies under development and saved policies
  - Links to Workload based performance reporting
Define a new Workload
Workload Name

Enter a name, description, and category for the workload.

Name: ShareWkld1
Description: Demo Workload
Category: 

< Back  Next >  Finish  Cancel  Help
Select Virtual Servers

Select virtual servers and custom groups to add into the workload. Adding a custom group into the workload adds all virtual servers in the group.

Show: All virtual servers

Available Virtual Servers:

<table>
<thead>
<tr>
<th>Select</th>
<th>Name</th>
<th>Hypervisor</th>
<th>Workloads</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>r90f1b207v6</td>
<td>B.2.07</td>
<td>WkldForFastHigh</td>
</tr>
<tr>
<td></td>
<td>r90f1b207v7</td>
<td>B.2.07</td>
<td>WkldForModerateMe</td>
</tr>
<tr>
<td></td>
<td>r90f1b207v8</td>
<td>B.2.07</td>
<td>AIXSASPWKLD</td>
</tr>
<tr>
<td></td>
<td>r90f1c1b09v1</td>
<td>B.2.09</td>
<td>Blade 9 10 11 worklo</td>
</tr>
<tr>
<td></td>
<td>r90f1c1b09v2</td>
<td>B.2.09</td>
<td>Blade 9 10 11 worklo</td>
</tr>
<tr>
<td></td>
<td>r90f1c1b09v3</td>
<td>B.2.09</td>
<td>WAS ND Workload</td>
</tr>
<tr>
<td></td>
<td>r90f1c1b09v4</td>
<td>B.2.09</td>
<td></td>
</tr>
<tr>
<td></td>
<td>r90f1c1b09v5</td>
<td>B.2.09</td>
<td></td>
</tr>
<tr>
<td></td>
<td>r90f1c1b09v6</td>
<td>B.2.09</td>
<td></td>
</tr>
<tr>
<td></td>
<td>r90f1c1b09v7</td>
<td>B.2.09</td>
<td></td>
</tr>
</tbody>
</table>

Total: 289  Filtered: 289  Selected: 0

Selected:
- r90f1c1b09v5 (B.2.09)
- r90f1c1b09v6 (B.2.09)
What is the relative importance of this Business function to others?

How important is it to meet the service level objective for the business task?

What is the service level objective?
Association of virtual server that performs specific business function to a Service class.
## Activate Policy

Select the performance policy to activate when the workload is created.

<table>
<thead>
<tr>
<th>Select</th>
<th>Performance Policy</th>
<th>Business Importance</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>SharePolicy1</td>
<td>Medium</td>
<td>Policy for Share wkld</td>
</tr>
<tr>
<td></td>
<td>Default</td>
<td>Medium</td>
<td>The default workload performance policy</td>
</tr>
</tbody>
</table>

Launch Customize Scheduled Operations to schedule future performance policy activations. The task will be launched after the workload has been created.
Review the policy
Before activation
Workload Monitoring
Workload Based Monitoring and Reporting

• Provide reporting capability that shows usage of platform resources in a Workload context within a zEnterprise Ensemble scope
  • Across virtual servers / partitions supporting the Workload

• Workload goal vs actual reporting

• Drill down from overall Workload “performance health” view to contributions of individual virtual server

• Graphical views
  • Topology, trending graphs, etc

• Links to system activity displays to show hardware utilization views

• Reporting is limited to platform level resources, not trying to replicate tools that report on intra-OS resources and performance
Workload Based Monitoring and Reporting

• Display of current data and fairly recent history
  • Current stake in the ground is 36 hours of history
  • Interval of data displayed is user selectable
  • Granularity of data kept in repository changes over time
    • 1 minute granularity kept for most recent hour
    • 15 minute interval data kept after first hour
## Workload Monitoring Overview

### Workloads Table

<table>
<thead>
<tr>
<th>Name</th>
<th>Virtual Servers</th>
<th>Performance Policy</th>
<th>Performance Policy Status</th>
<th>Performance Policy Business Importance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bookstore Workload</td>
<td>37</td>
<td>Bookstore Policy</td>
<td>Active</td>
<td>Highest</td>
</tr>
<tr>
<td>Default</td>
<td>104</td>
<td>Default</td>
<td>Active</td>
<td>Medium</td>
</tr>
<tr>
<td>GPIMPLinuxStress</td>
<td>47</td>
<td>Default</td>
<td>Active</td>
<td>Medium</td>
</tr>
<tr>
<td>GSSH17Cluster</td>
<td>6</td>
<td>GSSH17Cluster-Policy</td>
<td>Active</td>
<td>Highest</td>
</tr>
<tr>
<td>GSSH24</td>
<td>1</td>
<td>POLGSSH24</td>
<td>Active</td>
<td>High</td>
</tr>
<tr>
<td>GSSP15 and Friends</td>
<td>1</td>
<td>GSSP15-Policy</td>
<td>Active</td>
<td>High</td>
</tr>
<tr>
<td>GSSPbw</td>
<td>2</td>
<td>GSSPbw-Policy</td>
<td>Active</td>
<td>Low</td>
</tr>
<tr>
<td>LinuxTrade</td>
<td>6</td>
<td>OnlineTrades</td>
<td>Active</td>
<td>Medium</td>
</tr>
<tr>
<td>mark0005</td>
<td>3</td>
<td>test</td>
<td>Active</td>
<td>High</td>
</tr>
<tr>
<td>mark0007</td>
<td>2</td>
<td>suselinux</td>
<td>Active</td>
<td>Medium</td>
</tr>
<tr>
<td>mark0009</td>
<td>1</td>
<td>Default</td>
<td>Active</td>
<td>Medium</td>
</tr>
<tr>
<td>MIXOS</td>
<td>9</td>
<td>POMIXOS</td>
<td>Active</td>
<td>High</td>
</tr>
</tbody>
</table>

**Tasks:**
- **Bookstore Workload**
  - Daily
    - Operational Customization
    - Configuration
      - Delete Workload
      - New Performance Policy
      - New Workload
    - Monitor
      - Service Classes Report
      - Virtual Servers Report
      - Workload Resource Adjustments Report
      - Workloads Report
Workload Report

- Workload Report
  - Display high level view of “performance health” of each Workload
  - Indication if a Workload contains service class missing goals
  - Worst performing service class / performance index
  - Details of specific Workloads
    - Graph of PI of worst performing service class
      - Option to graph other service classes
    - Bar graph of virtual server utilization distribution
      - Visualize view of workload overall load
  - Drill down to Workload’s service class report
Compare CPU utilization of all Virtual Servers

Workload health overview

Active Performance Policy

Spread sheet of monitoring Data with “Export” support

Compare CPU utilization of all Virtual Servers Of workload
Service Class Report

• Service Class Report
  • High-level view of each service class in Workload’s performance policy
    • Goal and importance
    • Actual performance
    • Indication if monitoring event is established for service class and event is triggered
    • Service class details
      • Graph of service class performance index
      • Drill down to virtual server report for Workload
Spread sheet of monitoring data with “Export” support and interval can be adjusted.
Monitoring Events

- Monitoring Events (Alerts)
  - Leverage HMC event monitoring
  - Send e-mail when selected metrics reach threshold
    - Service Class PI threshold
    - Virtual Server CPU Utilization threshold
Alert settings based on service level impact

Alert settings based on utilization on CPU utilization

Event Monitor Editor

Name: Hiren's PI Monitor
Description: Monitor workload performance in prime shift

Event type:
- State Changes
- Hardware Messages
- Operating System Messages
- Security Log
- CPU Utilization
- Performance Index (PI)

Alert settings:
- Workload:
  - GSSF26-27-28
  - GSSH18Cluster
  - GSSP17
  - GSSP17-J80
  - LinuxDaytraderZGF
  - LinuxGA1toGA2

Service Class(es):
- Select:
  - Default: Default
  - GSSH18POL:Default
  - GSSH18POL:GSSH18SC
  - GSSH18POL:GSSH18SLOW

PI threshold: *1.2
Duration (minutes): *10

Event schedule:
- Limit to times: Start Time: 9:00:00 AM, End Time: 10:59:59 AM
- Limit to days: Sunday, Monday, Tuesday, Wednesday, Thursday, Friday, Saturday
- Limit to dates: Start Date: 6/23/11, End Date: 6/24/11

Notification list: *hiren@us.ibm.com
Service Class Alert was triggered
Virtual Server Report

- Virtual server report
  - List of virtual servers associated with the workload
    - Virtual server Service class PI
    - Resource usage
      - Physical CPU utilization
      - OS view of CPU utilization
      - Physical memory used
    - Hypervisor delay percentage
  - CPU Utilization trend for the selected interval

- Launch Monitor dashboard
  - Provides hardware utilization data
Analyze utilization of Specific virtual server Over time interval

Monitoring data Provided by GPMP Running on VS

Resource utilized by VS

REPORT

<table>
<thead>
<tr>
<th>Virtual Server</th>
<th>OS Name</th>
<th>OS Type</th>
<th>OS Level</th>
<th>Virtual Processors</th>
<th>Allocated Memory (NB)</th>
<th>Physical CPU Utilization (%)</th>
<th>Hypervisor CPU Delay (%)</th>
<th>Other Time (%)</th>
<th>Service Class (P)</th>
<th>OS Processes Total CPU Using Samples (%)</th>
<th>OS Processes Total CPU Delay Samples (%)</th>
<th>OS Processes Total I/O Delay Samples (%)</th>
<th>OS Processes Total Page Delay Samples (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>r90b208v1</td>
<td>r00f1b8v1</td>
<td>AIX</td>
<td>6.1.5.2</td>
<td>8</td>
<td>8,192</td>
<td>24.3</td>
<td>30.8</td>
<td></td>
<td>A-Team (1.90)</td>
<td>28.9</td>
<td>21.7</td>
<td>0</td>
<td>49.4</td>
</tr>
<tr>
<td>r90b208v2</td>
<td>r00f1b8v2</td>
<td>AIX</td>
<td>6.1.5.2</td>
<td>8</td>
<td>8,192</td>
<td>11.0</td>
<td>27.8</td>
<td></td>
<td>A-Team (1.50)</td>
<td>16.3</td>
<td>6.0</td>
<td>0</td>
<td>78.7</td>
</tr>
<tr>
<td>r90b208v3</td>
<td>r00f1b8v3</td>
<td>AIX</td>
<td>6.1.5.2</td>
<td>8</td>
<td>4,095</td>
<td>10.4</td>
<td>34.9</td>
<td></td>
<td>B-Team (1.46)</td>
<td>14.5</td>
<td>7.2</td>
<td>0</td>
<td>78.3</td>
</tr>
<tr>
<td>r90b208v4</td>
<td>r00f1b8v4</td>
<td>AIX</td>
<td>6.1.5.2</td>
<td>8</td>
<td>4,095</td>
<td>22.6</td>
<td>35.3</td>
<td></td>
<td>B-Team (1.46)</td>
<td>28.5</td>
<td>22.9</td>
<td>0</td>
<td>48.4</td>
</tr>
<tr>
<td>r90b208v5</td>
<td>r00f1b8v5</td>
<td>AIX</td>
<td>6.1.5.2</td>
<td>8</td>
<td>4,095</td>
<td>10.6</td>
<td>10.0</td>
<td></td>
<td>C-Team (1.00)</td>
<td>14.0</td>
<td>8.1</td>
<td>0</td>
<td>77.9</td>
</tr>
<tr>
<td>r90b208v6</td>
<td>r00f1b8v6</td>
<td>AIX</td>
<td>6.1.5.2</td>
<td>8</td>
<td>4,095</td>
<td>10.5</td>
<td>35.3</td>
<td></td>
<td>C-Team (1.00)</td>
<td>14.0</td>
<td>7.7</td>
<td>0</td>
<td>78.4</td>
</tr>
<tr>
<td>r90b208v7</td>
<td>r00f1b8v7</td>
<td>AIX</td>
<td>6.1.5.2</td>
<td>8</td>
<td>4,095</td>
<td>3.0</td>
<td>28.1</td>
<td></td>
<td>Dead Meat (0.37)</td>
<td>4.5</td>
<td>7.3</td>
<td>0</td>
<td>88.2</td>
</tr>
<tr>
<td>r90b208v8</td>
<td>r00f1b8v8</td>
<td>AIX</td>
<td>6.1.5.2</td>
<td>8</td>
<td>4,095</td>
<td>3.0</td>
<td>28.4</td>
<td></td>
<td>Dead Meat (0.37)</td>
<td>4.5</td>
<td>7.3</td>
<td>0</td>
<td>88.2</td>
</tr>
</tbody>
</table>

CPU Utilization for Virtual Server r90b208v1

Analyze utilization of Specific virtual server Over time interval

SHARE in Orlando 2011
Hypervisor Report

• Hypervisor report
  • Hypervisor resource utilization
  • List of all virtual servers on hypervisor
    • Virtual server Resource allocations (e.g. Memory, CPU)
    • Virtual server current Resource usage
      • *Physical CPU utilization*
      • *Physical memory used*
    • Hypervisor delay percentage

• Resource adjustment report
  • Resource adjustment actions taken over report interval
**Hypervisor Resource Allocation and utilization**


**Hypervisor Details:**
- Hypervisor: C.1.09
- Processor count: 8
- Total memory allocated for virtual servers: 31,232 MB
- Total CPU consumption: 88.4%
- Total memory: 32,768 MB
- Total allocated processing units: 7.98

**Virtual Servers:**
- Virtual Server: r932c1b09v1
  - Active
  - None
  - Processor Delay: 0.03
  - Allocated Memory: 2,560 MB
  - Dedicated: 0.34
  - Capped: 0.70
  - Processing Units: 0.10
  - Min Memory: 7.00 MB
  - Max Memory: 2,048 MB

- Virtual Server: r932c1b09v10
  - Active
  - None
  - Processor Delay: 1.19
  - Allocated Memory: 2,560 MB
  - Dedicated: 0.58
  - Capped: 0.70
  - Processing Units: 0.10
  - Min Memory: 7.00 MB
  - Max Memory: 4,096 MB

- **Difference due to Dynamic CPU mgmt**

- **in Orlando 2011**
Benefits of GPMP

• Guest Platform Management Provider (GPMP) is a lightweight component of PPM that provides additional monitoring data

• Allows virtual server to be classified with additional attributes such as HostName, SystemName, OS Level etc.

• With instrumented middleware support, GPMP provides metrics that allows detailed transaction topology as transaction hops through heterogeneous platforms in zEnterprise
Benefits of Middleware instrumentation

- Transaction response time reporting
- Multi-tiered work request flow across environments
- Relationship to server resources being consumed
- Same reasoning lead to instrumentation of z/OS subsystems (CICS, IMS, DB2, etc) for z/OS WLM
- OpenGroup Application Response Measurement (ARM) standards based instrumentation.
Basic ARM calls

- arm_register_application
- arm_register_transaction
- arm_start_application
- for (each transaction)
  - arm_start_transaction
  - arm_bind_thread
  - arm_blocked
    - Call downstream sub-transaction
  - arm_unblocked
  - arm_unbind_thread
  - arm_stop_transaction
- arm_stop_application
- arm_destroy_application
Application Response Measurement (ARM)

Standards Based Application Instrumentation

- Application Environment Statistics
  - Topology
  - Work Request Correlators
  - State Information
  - Work Request Processing

- The Open Group ARM Standard V4.0
  - Process registration, deregistration
  - Work request classification, start, and stop

http://www.ibm.com/products/

Web Server

arm_register_application
arm_start_transaction(...)
process request
arm_stop_transaction(...)
arm_stop_application(...)

ARM Services

Application Server

arm_register_application(...)
arm_start_transaction(...)
process request
arm_stop_transaction(...)
arm_stop_application(...)

ARM Services

correlator

TC=WL1
Hop 0
ARM 4.0 Instrumented Middleware

- Web Server support:
  - WebSphere provided plugin
    - IHS/Apache
    - IIS
    - Domino
    - iPlanet
- WebSphere Application Server
  - WAS 6.0, WAS 7.0
- DB2 Universal Database
Enable ARM Services on Middleware Applications

- Ensure Guest Platform Management Provider status in HMC
- Ensure that user account under which the application will run is authorized to the ARM services
- Enable ARM services on the middleware application
- Verify that ARM is enabled
  - “lsarm –a” command
Workload Monitoring Overview…

Transaction Hops and topology report

- Different hops involved in processing of business transaction
  - Based on OpenGroup ARM Standard instrumentation
  - Middleware instrumentation to ARM APIs
  - Guest Platform Management Provider (GPMP) collects the transaction statistics
  - Provides detail view of resources consumed by instrumented applications
### Hops and Topology report with GPMP active

**Details for Bl4de4Medium:**
- **Workload:** WkldForBlade4and6
- **Performance goal:** Velocity - Moderate
- **Performance policy:** Blade45Po
- **Business importance:** Medium
- **Performance:** Fast

#### Report Interval:
- Starting: 6/23/11 5:41:43 PM

#### Table:

<table>
<thead>
<tr>
<th>Name</th>
<th>Hop Number</th>
<th>Group Name</th>
<th>Successful Transactions</th>
<th>Failed Transactions</th>
<th>Stopped Transactions</th>
<th>Inflight Transactions</th>
<th>Queue Time (s)</th>
<th>Execution Time (s)</th>
<th>Successful Average Response Time (s)</th>
<th>Inflight Average Response Time (s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hop 0</td>
<td>0</td>
<td></td>
<td>57,744</td>
<td>0</td>
<td>0</td>
<td>230</td>
<td>0.000000</td>
<td>0.000260</td>
<td>3.742155</td>
<td>1.882512</td>
</tr>
<tr>
<td>IBM DB2 Universal Database</td>
<td>0</td>
<td>db2inst1</td>
<td>126</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.000000</td>
<td>0.000000</td>
<td>0.000047</td>
<td>0.000000</td>
</tr>
<tr>
<td>IBM Webserving Plugin</td>
<td>0</td>
<td>IBM_HTTP_Server</td>
<td>57,618</td>
<td>0</td>
<td>0</td>
<td>230</td>
<td>0.000000</td>
<td>0.000261</td>
<td>3.750339</td>
<td>1.862512</td>
</tr>
<tr>
<td>r93f2c1b09v2</td>
<td>0</td>
<td></td>
<td>57,618</td>
<td>0</td>
<td>0</td>
<td>230</td>
<td>0.000000</td>
<td>0.000281</td>
<td>3.750339</td>
<td>1.862512</td>
</tr>
<tr>
<td>Hop 1</td>
<td>1</td>
<td></td>
<td>4,175</td>
<td>0</td>
<td>0</td>
<td>45</td>
<td>0.000000</td>
<td>0.005133</td>
<td>0.710933</td>
<td>0.582881</td>
</tr>
<tr>
<td>WebSphere:APPLICATION_SERVER</td>
<td>1</td>
<td>server1</td>
<td>4,175</td>
<td>0</td>
<td>0</td>
<td>45</td>
<td>0.000000</td>
<td>0.005133</td>
<td>0.710933</td>
<td>0.582881</td>
</tr>
<tr>
<td>r93f2c1b09v1</td>
<td>1</td>
<td></td>
<td>4,175</td>
<td>0</td>
<td>0</td>
<td>45</td>
<td>0.000000</td>
<td>0.005133</td>
<td>0.710933</td>
<td>0.582881</td>
</tr>
<tr>
<td>Hop 2</td>
<td>2</td>
<td></td>
<td>63,408</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>0.000000</td>
<td>0.000579</td>
<td>0.000579</td>
<td>0.003900</td>
</tr>
<tr>
<td>IBM DB2 Universal Database</td>
<td>2</td>
<td>db2inst1</td>
<td>63,408</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>0.000000</td>
<td>0.000579</td>
<td>0.000579</td>
<td>0.003900</td>
</tr>
<tr>
<td>r93f2c1b09v1</td>
<td>2</td>
<td></td>
<td>63,408</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>0.000000</td>
<td>0.000579</td>
<td>0.000579</td>
<td>0.003900</td>
</tr>
</tbody>
</table>

**Questions:**
- **Do we have any failure?**
- **How much time it took for transaction execution?**
Virtual Server Topology derived from ARM data provided by GPMP

Drill down to specific Server to get details About application and resource utilization
**CPU Time used by Apache**

### Virtual Server Statistics:
- Physical CPU utilization: 25.2%
- Hypervisor CPU delay: 27.3%
- Idle time: 32.2%
- Other time: 0.0%

### OS Processes Totals:
- CPU using samples: 7.0%
- CPU delay samples: 92.9%
- Page delay samples: 0.0%
- I/O delay samples: 0.0%

### Application Environment Server Response Time Data:

<table>
<thead>
<tr>
<th>Application Environment</th>
<th>Group Name</th>
<th>Successful Transactions</th>
<th>Failed Transactions</th>
<th>Stopped Transactions</th>
<th>Inflight Transactions</th>
<th>Queue Time (s)</th>
<th>Execution Time (s)</th>
<th>Successful Average Response Time (s)</th>
<th>Inflight Average Response Time (s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>IBM Webserving Plugin</td>
<td>Apache/2.2.3 (Linux/SUSE)</td>
<td>409,359</td>
<td>6,034</td>
<td>18,728</td>
<td>0</td>
<td>0.000000</td>
<td>0.000494</td>
<td>0.000494</td>
<td>0.000000</td>
</tr>
</tbody>
</table>

### Application Environment Server Utilization:

<table>
<thead>
<tr>
<th>Application Environment</th>
<th>Group Name</th>
<th>CPU Time (s)</th>
<th>CPU Using Samples (%)</th>
<th>CPU Delay Samples (%)</th>
<th>Page Delay Samples (%)</th>
<th>I/O Delay Samples (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>IBM Webserving Plugin</td>
<td>Apache/2.2.3 (Linux/SUSE)</td>
<td>0.000000</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>IBM Webserving Plugin</td>
<td>Apache/2.2.3 (Linux/SUSE)</td>
<td>445.264282</td>
<td>7.9</td>
<td>91.0</td>
<td>0.0</td>
<td>1.2</td>
</tr>
</tbody>
</table>
Management Functions
Managing Resources across Virtual Servers on Power Blade

- Manage processor resources across virtual servers to achieve workload goals
- Detect that a virtual server is part of Workload not achieving goals
- Determine that the virtual server performance can be improved with additional resources
- Project impact on all effected Workloads of moving resources to virtual server
- If good trade-off based on policy, redistribute processor resources
Managing Resources across z/VM Virtual Machines

- Manage processor resources across z/VM virtual machines
  - Detect that a virtual machine that is part of Workload is not achieving goals
  - Determine that the virtual machine performance can be improved with additional resources
  - Project impact on all effected Workloads of moving resources to virtual machine
  - If good trade-off based on policy, redistribute processor resources
Resource Adjustment Report

Examine resource adjustment action performed by PPM to help work meet its performance goal.

Explain why resource adjustment action was not performed.

<table>
<thead>
<tr>
<th>Receiver Virtual Servers</th>
<th>Receiver Workload</th>
<th>Receiver Service Class</th>
<th>Receiver Processing Units After (Before)</th>
<th>Donor Virtual Servers</th>
<th>Donor Workload</th>
<th>Donor Processing Units After (Before)</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Buyer 1</td>
<td>Weinheimer Agriculture Parts</td>
<td>Buyers</td>
<td>0.52 (0.50)</td>
<td>Payroll App</td>
<td>Payroll</td>
<td>0.49 (0.50)</td>
<td>Jul 11, 2010 4:13:18 PM</td>
</tr>
<tr>
<td>Buyer 1</td>
<td>Weinheimer Agriculture Parts</td>
<td>Buyers</td>
<td>0.52 (0.50)</td>
<td>Vendor 1</td>
<td>Weinheimer Agriculture Parts</td>
<td>0.49 (0.50)</td>
<td>Jul 11, 2010 4:13:18 PM</td>
</tr>
</tbody>
</table>

Total: 2 Filtered: 2
Co-operative management with z/OS WLM

- z/OS provides differentiated service to PPM classified work
- Transaction coming to z/OS needs to be ARM instrumented
- WLM service definition needs to map PPM service classes to z/OS WLM service classes
- PPM service class associated with transaction is used by WLM to classify work unit to a different WLM service class.
- WLM manages the resources based on the goal assigned to this specific service class.
Setup for co-operative mgmt with z/OS WLM

<table>
<thead>
<tr>
<th>Action</th>
<th>Type</th>
<th>Name</th>
<th>Start</th>
<th>Service</th>
<th>Report</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>ESC</td>
<td>SrvClsFo 1</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>ESC</td>
<td>rFastest 9</td>
<td>9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>ESC</td>
<td>Highest 17</td>
<td>17</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>ESC</td>
<td>SrvClsFo 1</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>ESC</td>
<td>rFastHig 9</td>
<td>9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>ESC</td>
<td>h</td>
<td>17</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>ESC</td>
<td>SrvClsFo 1</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>ESC</td>
<td>rModerat 9</td>
<td>9</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Monitoring with RMF

```
Session B - [24 x 80]  
RMF V1R12 Sysplex Summary - ZGPLEX  
Command ===> _  

WLM Samples: 400  Systems: 5  Date: 09/28/10  Time: 12.38.20  Range: 100  Sec

SSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSS
```

<table>
<thead>
<tr>
<th>Name</th>
<th>T</th>
<th>I</th>
<th>Goal Exec</th>
<th>Goal Vel</th>
<th>Act Vel</th>
<th>Goal Act</th>
<th>Act Goal</th>
<th>Act Actual</th>
<th>Indx</th>
<th>Trans Ended</th>
<th>Avg. Resp. Time</th>
<th>Exec Time</th>
<th>Actual Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>DATABASE</td>
<td>W</td>
<td></td>
<td>0.4</td>
<td>0.4</td>
<td>0.50</td>
<td>80%</td>
<td>100%</td>
<td>0.50</td>
<td>500</td>
<td>2765</td>
<td>0.009</td>
<td>0.009</td>
<td>0.009</td>
</tr>
<tr>
<td>DDF</td>
<td>S</td>
<td></td>
<td>0.0</td>
<td>0.0</td>
<td>0.50</td>
<td>80%</td>
<td>100%</td>
<td>0.50</td>
<td>500</td>
<td>0.010</td>
<td>0.016</td>
<td>0.016</td>
<td>0.016</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td>0.00</td>
<td>AVG</td>
<td>0.008</td>
<td>AVG</td>
<td>0.02</td>
<td>922.3</td>
<td>0.008</td>
<td>0.008</td>
<td>0.008</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3</td>
<td></td>
<td></td>
<td>0.00</td>
<td>AVG</td>
<td>0.009</td>
<td>AVG</td>
<td>0.02</td>
<td>899.3</td>
<td>0.009</td>
<td>0.009</td>
<td>0.009</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.90</td>
<td>AVG</td>
<td>0.009</td>
<td>AVG</td>
<td>0.02</td>
<td>943.7</td>
<td>0.009</td>
<td>0.009</td>
<td>0.009</td>
</tr>
<tr>
<td>GPFASHIG</td>
<td>S</td>
<td>2</td>
<td>0.0</td>
<td>0.0</td>
<td>0.50</td>
<td>AVG</td>
<td>0.008</td>
<td>AVG</td>
<td>0.02</td>
<td>922.3</td>
<td>0.008</td>
<td>0.008</td>
<td>0.008</td>
</tr>
<tr>
<td>GPFSTHST</td>
<td>S</td>
<td>1</td>
<td>0.0</td>
<td>0.0</td>
<td>0.50</td>
<td>AVG</td>
<td>0.009</td>
<td>AVG</td>
<td>0.02</td>
<td>899.3</td>
<td>0.009</td>
<td>0.009</td>
<td>0.009</td>
</tr>
<tr>
<td>GPMODMED</td>
<td>S</td>
<td>3</td>
<td>0.0</td>
<td>0.0</td>
<td>0.50</td>
<td>AVG</td>
<td>0.009</td>
<td>AVG</td>
<td>0.02</td>
<td>943.7</td>
<td>0.009</td>
<td>0.009</td>
<td>0.009</td>
</tr>
<tr>
<td>VERYHIGH</td>
<td>S</td>
<td>2</td>
<td>40</td>
<td>0.0</td>
<td>0.50</td>
<td>AVG</td>
<td>0.008</td>
<td>AVG</td>
<td>0.02</td>
<td>922.3</td>
<td>0.008</td>
<td>0.008</td>
<td>0.008</td>
</tr>
<tr>
<td>STCTASKS</td>
<td>W</td>
<td></td>
<td>78</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.060</td>
<td>0.490</td>
<td>0.336</td>
<td>0.826</td>
</tr>
<tr>
<td>STC</td>
<td>S</td>
<td>3</td>
<td>30</td>
<td>0.0</td>
<td>0.50</td>
<td>AVG</td>
<td>0.009</td>
<td>AVG</td>
<td>0.02</td>
<td>899.3</td>
<td>0.009</td>
<td>0.009</td>
<td>0.009</td>
</tr>
<tr>
<td>SYSTEM</td>
<td>W</td>
<td></td>
<td>94</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.180</td>
<td>0.061</td>
<td>0.009</td>
<td>0.070</td>
</tr>
</tbody>
</table>

In Orlando 2011
Platform Performance Manager Summary

• Extend z/OS goal oriented workload management concepts across zEnterprise mixed processors environment
• Integrated function of zEnterprise Unified Resource Manager firmware
• Workload based goal oriented policy definition
• Monitoring and reporting in context of Workload and associated performance policy
• Goal oriented resource management
Thank You