zEnterprise.

Freedom by Design

IBM® zEnterprise™ System Unified Resource Manager Overview and Update
Agenda

- Introduction
- Management Enablement Levels
- Use Case Scenario
  - Operational Controls
  - Hypervisor Management
  - Virtual Server Lifecycle Management
  - Workload Context
- Platform Performance Management
- Network Management
- Energy Management
- External Management Enablement
- Related Facilities
Introduction

- Integrate optimizers and blades into the System z ecosystem
  - IBM Smart Analytics Optimizer
  - Power 7 Blade
  - System x Blade
  - DataPower XI50z

- Provide unified management of resources across different architectures through virtualization
  - z/VM and (Linux) virtual machines
  - PowerVM and (AIX) virtual servers
  - System x hypervisor and (Linux and Windows) virtual servers

- Support optional IBM® zEnterprise™ BladeCenter® Extension (zBX) housing racks of BladeCenters
Introduction …

- Hardware Management Console (HMC) extended to provide System z values to zBX componentry
  - Secure SSL based remote access (optional)
  - Full complement of certificate management capabilities
  - Complete user management suite
  - Full function user definition
  - Highly flexible password rule definition
  - Centralized authentication using LDAP
  - Full access controls for tasks and resources allowed for each user (i.e., User Roles)
  - Automatic replication of configuration data
  - Full function embedded firewall
HMC Connectivity

AT&T Global Network

AT&T Firewall

Internet

IBM Firewall

IBM Servers

HMC - A

HMC - B

System z® Servers

Private LAN

WAN

Client Firewall

Client Workstations

Internet

AT&T Firewall

IBM Firewall

IBM Servers

Client Workstations
zEnterprise Ensemble

- A zEnterprise Ensemble is a collection of 1..8 zEnterprise Nodes managed as a single virtualized pool of server resources
- A zEnterprise Node is a single zCEC with 0..4 racks with up to 1..2 blade centers per rack
- A zEnterprise node can be a member of only a single ensemble
- The ensemble is the management scope for the Unified Resource Manager
- A primary / alternate pair of HMCs provide the management console for the ensemble
  - The alternative HMC takes over in case the primary fails
Management Function Suites

- **Manage**
  - Monitoring and trend reporting of CPU energy efficiency, simplifying energy management
  - New monitor dashboard (augments System Activity Display), giving a broader view of system resource use
  - Integrated hardware management across all elements of the system, simplifying resource management
  - Automatic resource discovery and inventory for all elements of the system, easing configuration management
  - Private and physically isolated internal service management network connecting all zEnterprise resources, enabling secure systems management
  - Private and secure data network (IEDN) with strict access control across heterogeneous environments, simplifying interconnection and communications security
  - Integrated PR/SM and PowerVM hypervisors, enabling management from a single point of control
  - Virtual server lifecycle management, enabling directed and dynamic virtual server resource provisioning on all hypervisors (PR/SM, z/VM, PowerVM) and integrated storage, network, and ensemble configuration
  - Maximum potential power, enabling power redistribution

- **Automate**
  - Workloads defined as representations of physical and virtual resources in the context of named business processes, providing insight into workload relationships and dependencies
  - Performance service-level policy definition and performance monitoring, reporting, and resource optimization aligned with customer-defined workload service levels, allowing virtual CPU capacity to be adjusted across a hypervisor
  - Static power savings and energy management, enabling cost savings
Ensemble Management Users and Roles

- New task and resource roles enable isolation across management disciplines
- New predefined users EnsOperator and EnsAdmin

<table>
<thead>
<tr>
<th>Role</th>
<th>Description</th>
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<tbody>
<tr>
<td>Ensemble Administrator</td>
<td>Responsible for creating and managing the zGryphon ensemble</td>
</tr>
<tr>
<td></td>
<td>Create Ensemble, Add Member...</td>
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<tr>
<td>Virtual Network Administrator</td>
<td>Responsible for Managing Virtual Networks, Hosts, and MAC Prefixes</td>
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<tr>
<td></td>
<td>Manage Virtual Networks, Add Hosts to Virtual Networks, Create VLAN IDs...</td>
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<tr>
<td>Virtual Server Administrator</td>
<td>Responsible for managing virtual servers</td>
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<td></td>
<td>New /Modify Virtual Server, Add Virtual Disk, Migrate...</td>
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<tr>
<td>Virtual Server Operator</td>
<td>Responsible for performing and scheduling virtual server activation/deactivation,</td>
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<tr>
<td></td>
<td>mounting virtual media</td>
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<td></td>
<td>Activate, Deactivate, Mount Virtual Media, Console session...</td>
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<tr>
<td>Storage Resource Administrator</td>
<td>Responsible for managing storage resources – Storage Access Lists, WWPNs,</td>
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<td></td>
<td>z/VM Storage Groups</td>
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<td>Export WWPN, Import SAL, Add Storage Resources...</td>
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<tr>
<td>Workload Administrator</td>
<td>Responsible for managing workloads</td>
</tr>
<tr>
<td></td>
<td>New /Modify workload, Add / Remove Virtual Servers..</td>
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<tr>
<td>Performance Management</td>
<td>Responsible for managing performance policies</td>
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<tr>
<td>Administrator</td>
<td>New /Modify performance policy, Import policy</td>
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<tr>
<td>Performance Management</td>
<td>Responsible for performing and scheduling policy activations and creating</td>
</tr>
<tr>
<td>Operator</td>
<td>threshold notifications</td>
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<td></td>
<td>Activate, Export Policy, Monitor System Events</td>
</tr>
<tr>
<td>Energy Management Administrator</td>
<td>Responsible for managing power settings including power capping and power</td>
</tr>
<tr>
<td></td>
<td>savings</td>
</tr>
<tr>
<td></td>
<td>Set Power Cap, Set Power Savings Mode, Set zBX Power Policy</td>
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</tbody>
</table>
Operational Controls (Manage Suite)

- Change Management
  - View Firmware Information (BladeCenters and Blades)
  - Retrieve Firmware Changes
  - Change Firmware Levels
  - Backup/Restore Critical Data (accelerator configuration data backed up as part of System z Support Element backup; restored on replacement of accelerator)

- Problem Management
  - Automatic Error Logging and FFDC Data Collection
  - Problem Analysis and Call Home Reporting
  - View Hardware Messages
  - View Open Problems
  - Manual Problem Reporting and Data Collection

- Guided Repair and Verification
Operational Controls ...

- Configuration Management
  - Vital Product Data
  - Edit Frame Layout
    • Frames, Switches, BladeCenters
    • MES Support (Add/Remove)
    • Management Enablement
  - Capacity on Demand
    • Permanent Customer-Initiated Upgrades

- Operations Management
  - Blade Power On and Power Off
  - Upstream SNMP/CIM API Automation Management
  - Event Notification (based on logged events or state changes)
  - Scheduled Operations (Firmware Update, Activate, Deactivate, ...)
  - Time Synchronization
  - Operational Network Settings (IP address, group name, role)
  - Launch Full Device Console
Operational Controls ...

- Performance Management
  - System Activity Display (CPU, Memory, I/O, Network)
  - Energy Consumption and Temperature Monitoring
  - Transmit System Availability Data (TSAD)

- Business Management
  - User Management
  - Auditing
  - Device Status and Details
  - Automatic Service Network Configuration
  - Documentation

- Ensemble Management
  - Create Ensemble
Hypervisor Management (Manage Suite)

- Blades are virtualized
- Hypervisors managed as firmware
  - Automatically loaded
  - Managed through HMC
  - Not customer-accessible
- Basic hypervisor management tasks
  - Deploy and initialize hypervisor (Blade)
  - Start, stop, and query/list hypervisors
  - Update and repair hypervisor (Blade)
  - Monitor hypervisors and their resource use (System Activity Display)
    - CPU, Memory consumption
  - Manage ISO images (Blade)
  - Create virtual networks
  - Manage storage resources
  - Allow agents in virtual server operating systems to communicate with a manager running in the hypervisor or the hypervisor management stack
Virtual Server Lifecycle Management (Manage Suite)

- Create
  - CPU – virtual, shared, dedicated; share (initial/minimum/maximum)
  - Memory – initial/defined
  - Network
  - Console – text/graphical
  - Storage
  - Virtual DVD

- List
- Start/Stop
- View/Modify configuration
- Migrate definition
- Delete
Workload Context (Manage/Automate Suite)

- Ensemble-scoped management
- Workload definition
- Workload-based performance policy definition
Use Case Scenario

- **Workload components**
  - z/OS DB2
  - IBM Smart Analytics Optimizer
  - Linux on z with WAS on z/VM
  - AIX on Power Web server

- **Existing infrastructure**
  - System z CPC
  - z/OS LPAR with DB2
  - z/VM LPAR

- **New infrastructure**
  - INMN and IEDN
  - zBX Model 2
  - Smart Analytics Optimizer
  - Power Blade
Existing Infrastructure
New Infrastructure

- DB2
- z/OS
- z/VM
- PR/SM
- zCPC
- Power blade
- Smart Analytics Optimizer
- z/BX
- PSCN
- HMC
Create Ensemble

- DB2
- z/OS
- z/VM
- PR/SM
- zCPC

INMN

IEDN

PSCN

PowerVM

Power blade

Smart Analytics Optimizer

z/BX

HMC

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Associate Smart Analytics Optimizer with z/OS LPAR
Associate Storage Resources with z/VM LPAR
Create Virtual Server on z/VM
Define New Virtual Server Storage Requirements
Connect New Virtual Server to IEDN

- DB2
- z/OS
- z/VM
- PR/SM
- zCPC
- INMN
- IEDN
- PowerVM
- Power blade
- Smart Analytics Optimizer
- z/BX
- HMC
- PSCN
Install Operating System
Install WAS
Associate Storage Resources with Power Blade

IBM zEnterprise System Unified Resource Manager

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Create Virtual Server on Power Blade

- DB2
- WAS
- Linux
- z/OS
- z/VM
- PR/SM
- zCPC
- PowerVM
- Power blade
- Smart Analytics Optimizer
- z/BX

IBM zEnterprise System Unified Resource Manager

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Define New Virtual Server Storage Requirements
Connect New Virtual Server to IEDN
Install Operating System
Install Apache
Workload Resource Group

- Workload Resource Group is a grouping mechanism and “management view” of virtual servers supporting a business application.

- Provides context within which associated platform resources are presented, monitored, reported, and managed.

- Performance policy is associated with Workload.
Workload Performance Policy

- Defines performance goals for virtual servers in a Workload Resource Group
  - Conceptually similar to simplified z/OS WLM Policy
- Provides basis for monitoring and management of platform resources used by virtual servers in a Workload Resource Group
- Workload Resource Group to performance policy relationship:
  - Multiple performance policies associated with a workload
  - Single policy active at a given time
  - Can dynamically change which policy is active
    - Through the UI
    - Through a time-based schedule
    - Through the API
    - Example: Day shift / night shift policy
Workload Performance Policy...

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

- HMC UI supports policy creation and editing
  - Wizard for policy creation
  - Repository for policies under development and saved policies
  - Links to Workload-based performance reporting
Define Workload and Performance Policy
Platform Performance Management (Automate Suite)

- Platform resource monitoring based on performance policy
  - Ensemble
  - Workload
  - Virtual Server
- Dynamic, goal-oriented resource management
  - Manage CPU across virtual servers within a hypervisor instance
Workload Resource Group Monitoring and Reporting

- Provide monitoring on the HMC based on a Workload Resource Group context
- Display of current data and fairly recent history
  - Up to 36 hours of history is kept
  - Interval of data displayed is user selectable
  - Granularity of data kept changes over time
    - 1 minute granularity kept for most recent hour
    - 15 minute interval data kept after first hour

- Workload Resource Group Report
  - Display high level view of “performance health” of each Workload Resource Group
  - Indication if a Workload Resource Group 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
Managing Resources across Virtual Servers

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

- Manage CPU resources across z/VM virtual machines
  - Detect that a virtual machine is part of a workload not achieving its goals
  - Determine that virtual machine performance can be improved with additional resources
  - Project effect on all relevant Workloads of moving resources to virtual machine
  - If good trade-off based on policy, redistribute resources
Network Management (Manage Suite)

- Create Virtual Connection Object (VCO)
  - Name
  - VLAN identifier
  - List of authorized servers
- Connect virtual server to VCO via vNIC with assigned vMAC
Virtual Networks and Access Controls

Configure (allow) all VLANs here:

Network Access Control
Energy Management

- Power saving controls (Automate Suite)
- Maximum potential power controls (Manage Suite)
External Management Enablement

- **Objective:** Provide API access to zManager functions

  - API will allow programmatic access to the underlying Unified Resource Manager functions exploited by the User Interface
    - Same resource types, instances and policies
    - API functions correspond to views and tasks in the UI
      - Listing resource instances
      - Creating, changing, deleting resource instances
      - Operational control of resource instances

- **Goal:** Enable management of Unified Resource Manager from external (to HMC) tools

- **Priority scenarios:** Discovery, Monitoring, and Provisioning use cases
Related Facilities

- **Scheduled Operations**
  - Allows functions to be performed at designated times on designated days

- **Grouping**
  - Allows resources (e.g., virtual servers) to be aggregated so that functions can be performed on them with a single action (e.g., activation)

- **Event Monitoring**
  - Sends e-mail notifications to designated users when particular circumstances arise (e.g., virtual server failure)
Questions?