The zEnterprise Unified Resource Manager
Agenda

- IBM zEnterprise and The Unified Resource Manager
  - Objectives
  - Structure

- The Unified Resource Manager Functional Overview
  - Overview of major functions
  - Monitoring and Management capabilities
  - Interfaces
zEnterprise:

A system of systems that unifies IT for optimized service delivery

zEnterprise Unified Resource Manager

- Unifies management of resources, extending IBM System z qualities of service end-to-end across workloads
- zEnterprise firmware that provides platform, hardware and workload-aware resource management

IBM zEnterprise™ 196 (z196)

- Optimized to host large scale database, transaction, and mission critical applications
- The Most efficient platform for Large-scale Linux consolidation
- Capable of massive scale up

zEnterprise BladeCenter Extension (zBX)

- Selected IBM POWER7™ blades and IBM System x® Blades for tens of thousands of AIX® and Linux applications
- High performance optimizers and appliances to accelerate time to insight and reduce cost
- Dedicated high performance private network
zEnterprise System

Workload Resource Groups: Dynamic Mgmt and Reporting

HMC (with Unified Resource Management)

ZOS  ZOS  ZOS  ZOS  Linux  Linux  Linux

zHyp

Z CPU, Memory and IO

SE

x86

Windows  Linux  Linux

Power

AIX  AIX  AIX

Data Power

AMM

z Blade Extension

Private Data Network (IEDN)
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
zEnterprise Networking

- Network Simplification with the zEnterprise Network: Intra Ensemble Data Network (IEDN)
  - Single physical, ethernet network combines System z CPC using OSA and Blade Center extension (zBx)
  - Provides the data network for communications in the ensemble
  - Physical network is virtualized through the System z and blade hypervisors
  - Physical and virtual networks are managed from a central point of management

- Secure communications (between System z and zBx)
  - Physical security
  - Server access to physical and virtual networks is controlled by the Unified Resource Manager

- High Availability
  - Redundant network hardware

- Unique System z QoS
  - Isolated / dedicated equipment
  - Special purpose dedicated data network & OSA-Express (no encryption required)
Hardware Management

- Integrated Hardware Management across all elements of the multi-platform environment
  - Operational Controls
  - Firmware Inventory, Update, and Service
  - Hardware and Firmware Problem Detection, Reporting, and Call Home, Field Guided Repair and Verify
  - Physical Hardware Configuration, Backup, and Restore
  - Integrated Discovery and Resource Inventory
Network Virtualization

- Access to the IEDN is managed through the Virtual Network Ensemble Management functions in the HMC.

  - Management of Virtual Networks.
    - Virtual Servers must belong to a Virtual Network to communicate on the IEDN.
    - Provides network isolation of virtual servers not on the same virtual network.
Storage

- Virtual Servers see Virtual Disks
- Virtual Disks may be either
  - 1:1 mapped storage resources
  - or for z/VM a minidisk created from a storage group
- Storage Resources are
  - ECKD volumes (z/VM only)
  - FCP Logical Units (z/VM and IBM Blade hypervisors)
- Manage Storage Access Lists
  - exists per hypervisor
  - defines accessible storage resources
    - storage resources typically appear in different Storage Access Lists
- Support Server and Storage Admin Roles:
  - Server Admin
    - Identifies ensemble storage requirements
    - Assign storage resources to hypervisors
  - Storage admin
    - Assigns storage to the ensemble
    - Configures SAN
- z/OS Storage mgt approach unchanged
Hypervisor and Virtual Server Management

- **Hypervisor management**
  - Start, stop, and query/list hypervisors
  - Update and repair an IBM Blade hypervisor
  - Monitor hypervisors and their resource use via Monitors Dashboard
    - CPU
    - Memory consumption
- **Virtual server life cycle management**
  - Create / delete
  - Define CPU and memory
  - Attach to virtual networks
  - Attach to virtual disks
  - Attach virtual DVD images
- **Start / stop virtual servers**
  - Support scheduled operations
- **Monitor virtual server resource usage through Monitors Dashboard**
- **Move a virtual server definition to another hypervisor**
zEnterprisce Performance Management

- **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
  - Workload monitoring and reporting based on management policy
  - Common approach to monitoring / management of platform resources across zEnterprise
  - Extend goal oriented approach of z/OS WLM to platform managed resources
  - Orchestration of autonomic management of resources across virtual servers
    - Provide Intelligent Resource Director like function across the zEnterprise
    - Management function will evolve over time
  - 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
A Workload Resource Group 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 Workload Resource Groups:
- Performance Policy

Workload Resource Group definitions can be provided by higher level system management functions or created at the HMC.
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
  - CPU, memory, network resource usage

- 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
Network Monitors Dashboard

- **User Interface display that shows the following major views**
  - Virtual Networks across IEDN, allowing drilling down to resources that comprise the virtual network: virtual switches, virtual servers, virtual network interfaces
    - These views show the performance between the virtual switch and the guest
    - Provide data “by” virtual network (i.e., by VLAN) and across all virtual networks
  - Physical Interfaces to the IEDN
    - Virtual Switch Uplink interfaces to the physical interfaces that connect to the IEDN
    - External TOR ports connected to a router
  - Physical Switches - TORs and ESMs

- **From the metrics collected, show**
  - Performance statistics such as transfer rates over intervals
  - Both cumulative and interval metrics
  - Also includes raw metrics as collected
  - Resource state/status where available
  - Resource utilization relationships (e.g., Servers using an OSA)

- **Network Monitors Dashboard provides both current and historical displays**
Managing Resources across Virtual Servers

- 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 affected Workloads of moving resources to virtual server
  - If good trade-off based on policy, redistribute processor resources
Enabling External Management Tools

- Provide API access to Unified Resource Manager function
- API allows programmatic access to the same underlying function as is accessed via the HMC UI
  - Same resource types, instances and policy
  - API functions corresponding to views and tasks in the UI
    - Listing resource instances
    - Creating, changing, deleting resource instances
    - Operational control of resource instances
    - Monitoring
    - Etc.
- Enables management of an ensemble from external (to HMC) tools
- Key scenarios: Discovery, Monitoring and Provisioning use cases
Tivoli monitoring can track and manage Workload Resource Groups across zEnterprise

Add existing operating system, middleware, and application insights
Tivoli System Automation can ensure availability of Workload Resource Groups and Business Services.

Integrated Workload availability for normal operations and disaster recovery!
Unified Resource Manager Summary

- **Integrated Ensemble Management Firmware**
  - Major virtualization and management functions are pre-integrated with the system, with less do-it-yourself planning, assembling, testing, …
  - System elements are developed, configured, and tested to work together compatibly
  - Integrate, virtualize, monitor, and manage platform resources in accordance with specified business workload objectives
  - Providing transparent value to all hosted software stacks
  - Built-in capability for upward integration with Tivoli Service Management