

# 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

## 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

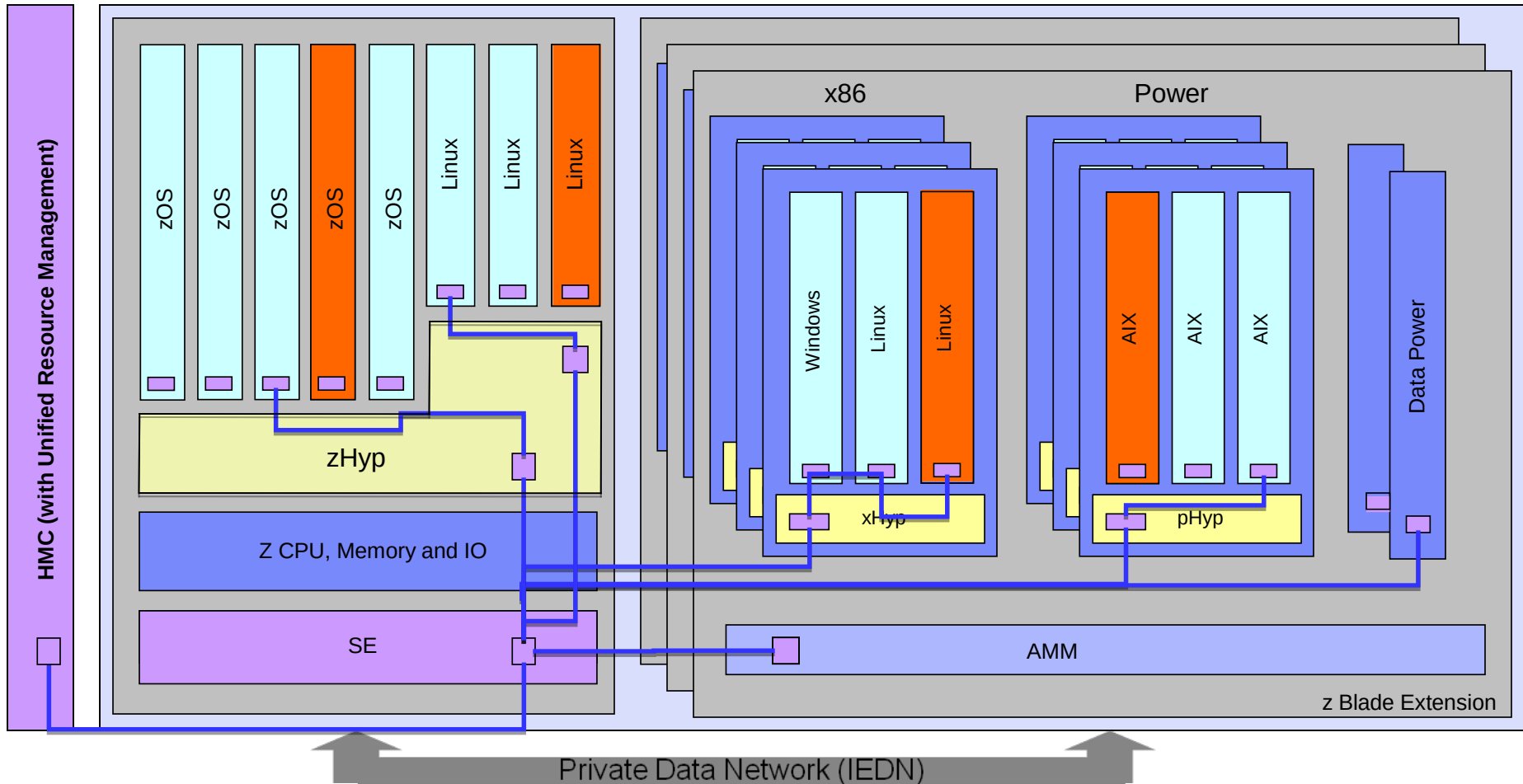
## IBM zEnterprise™ 196 (z196)

- 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



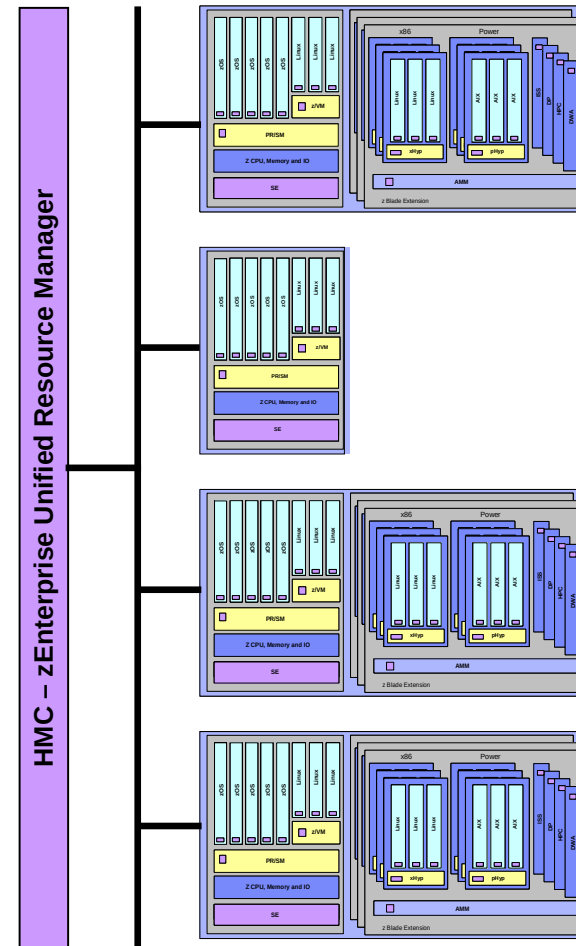
# zEnterprise System

## Workload Resource Groups: Dynamic Mgmt and Reporting



# 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)

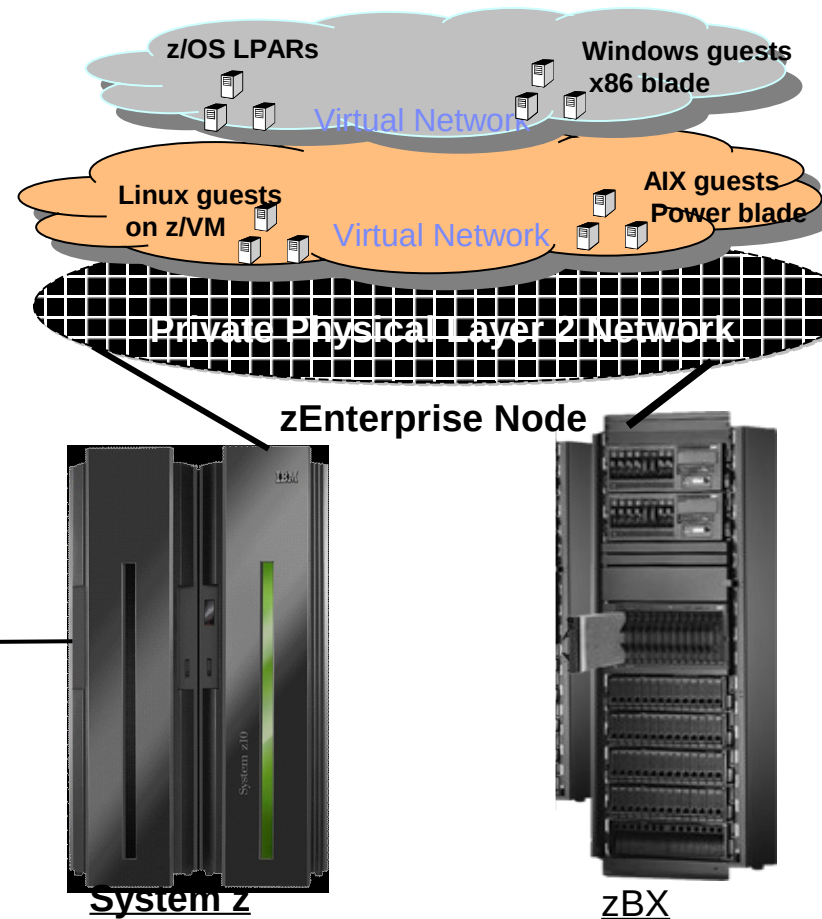


# Hardware Management

- **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

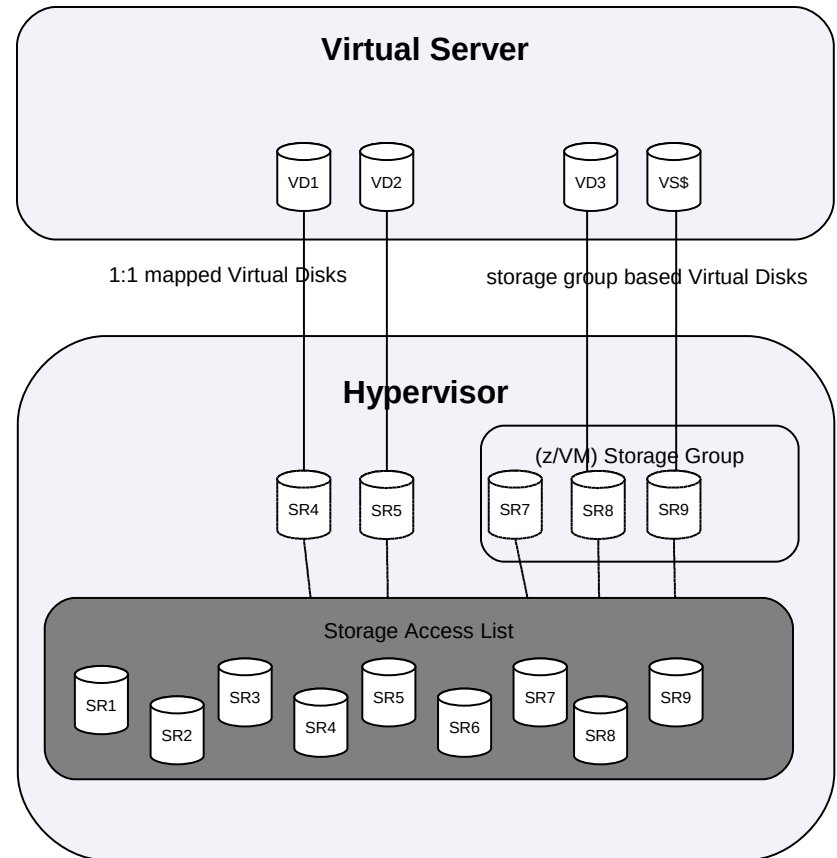
- Access to the IEDN is managed through the Virtual Network Ensemble Management functions in the HMC.
- Management of Virtual Networks.
  - Virtual Servers must belong to a Virtual Network to communicate on the IEDN
  - Provides network isolation of virtual servers not on same virtual network





# 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

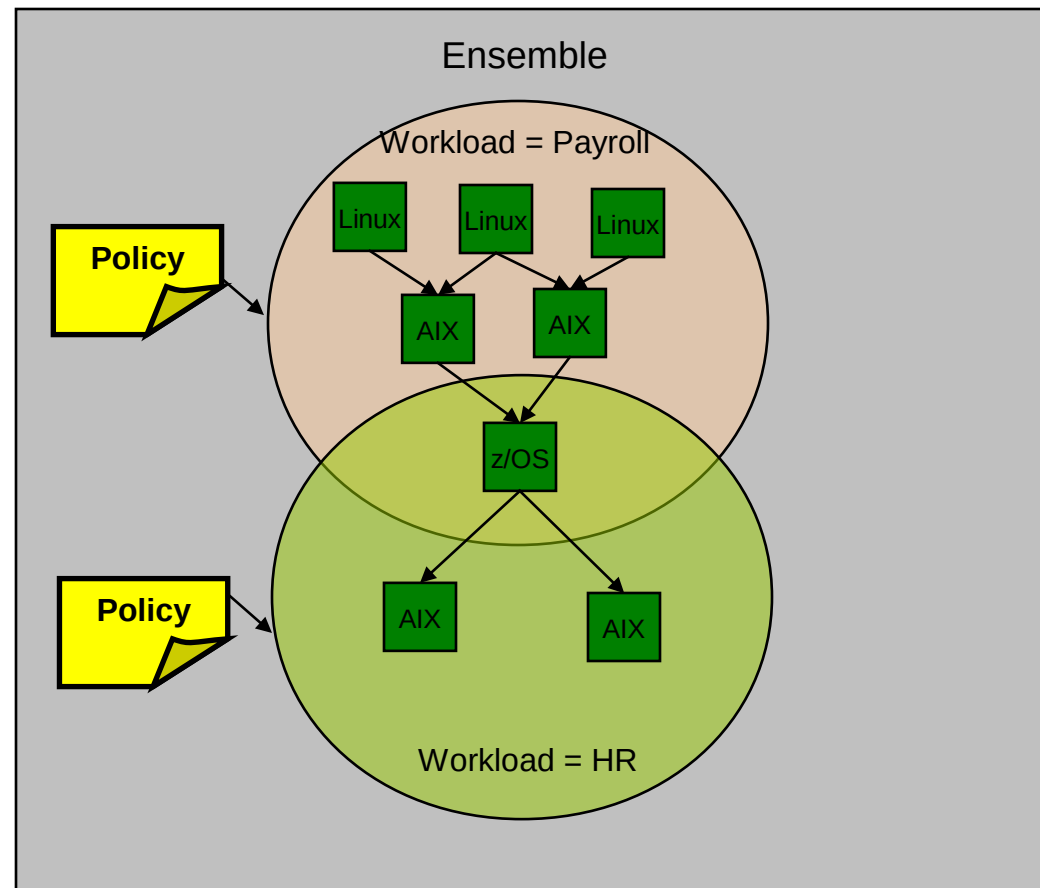
- **Hypervisor management**
  - Start, stop, and query/list hypervisors
  - Update and repair an IBM Blade hypervisor
  - Monitor hypervisors and their resource use via Monitors Dashboard
    - CPU
    - Memory consumption
- **Virtual server life cycle management**
  - Create / delete
  - Define CPU 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**

# zEnterprise 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

# Platform Workload Resource Group

- 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**

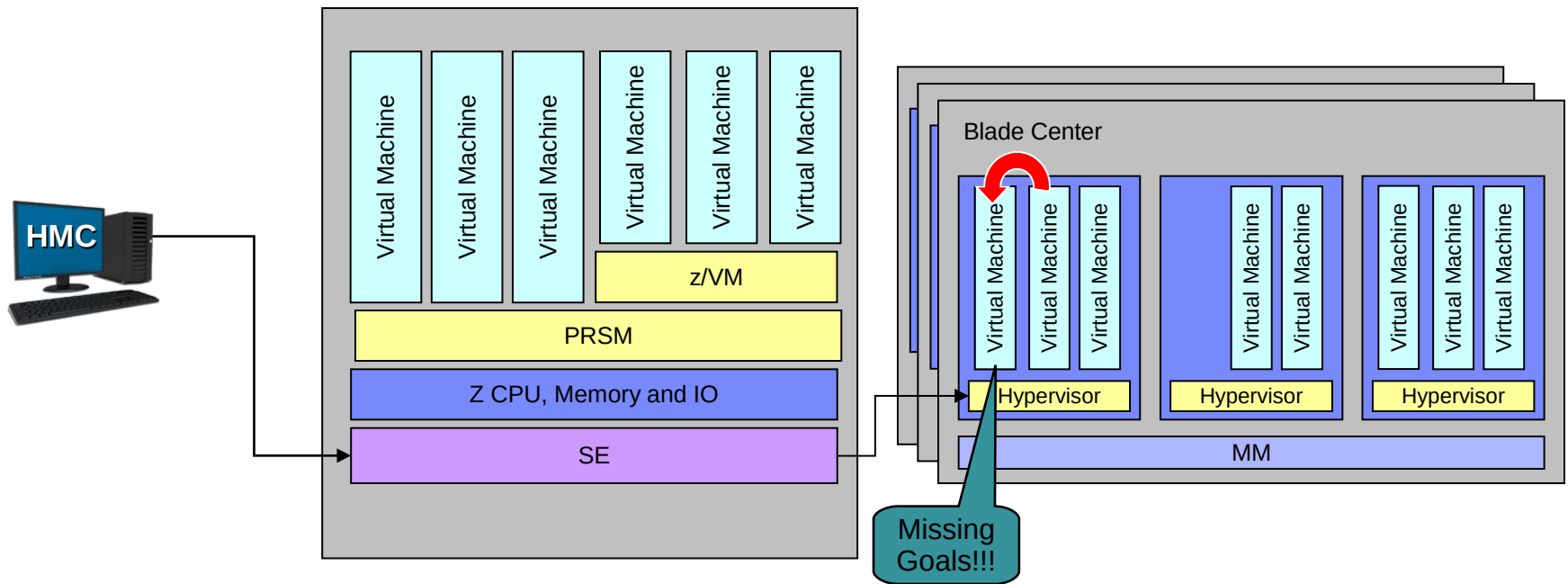
- Virtual Networks across IEDN, allowing drilling down to resources that comprise the virtual network: virtual switches, virtual servers, virtual network interfaces
  - These views show the performance between the virtual switch and the guest
  - Provide data “by” virtual network (i.e., by VLAN) and 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**

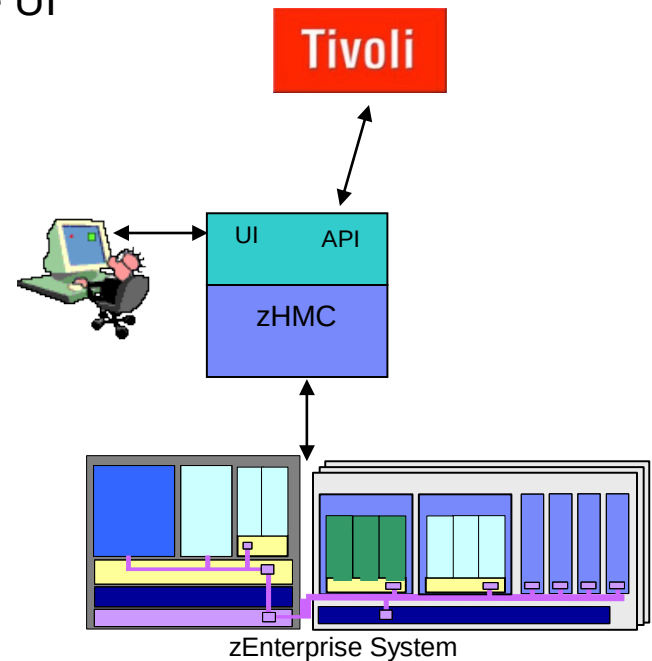
# Managing Resources across Virtual Servers



- **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 effected Workloads of moving resources to virtual server
  - If good trade-off based on policy, redistribute processor resources

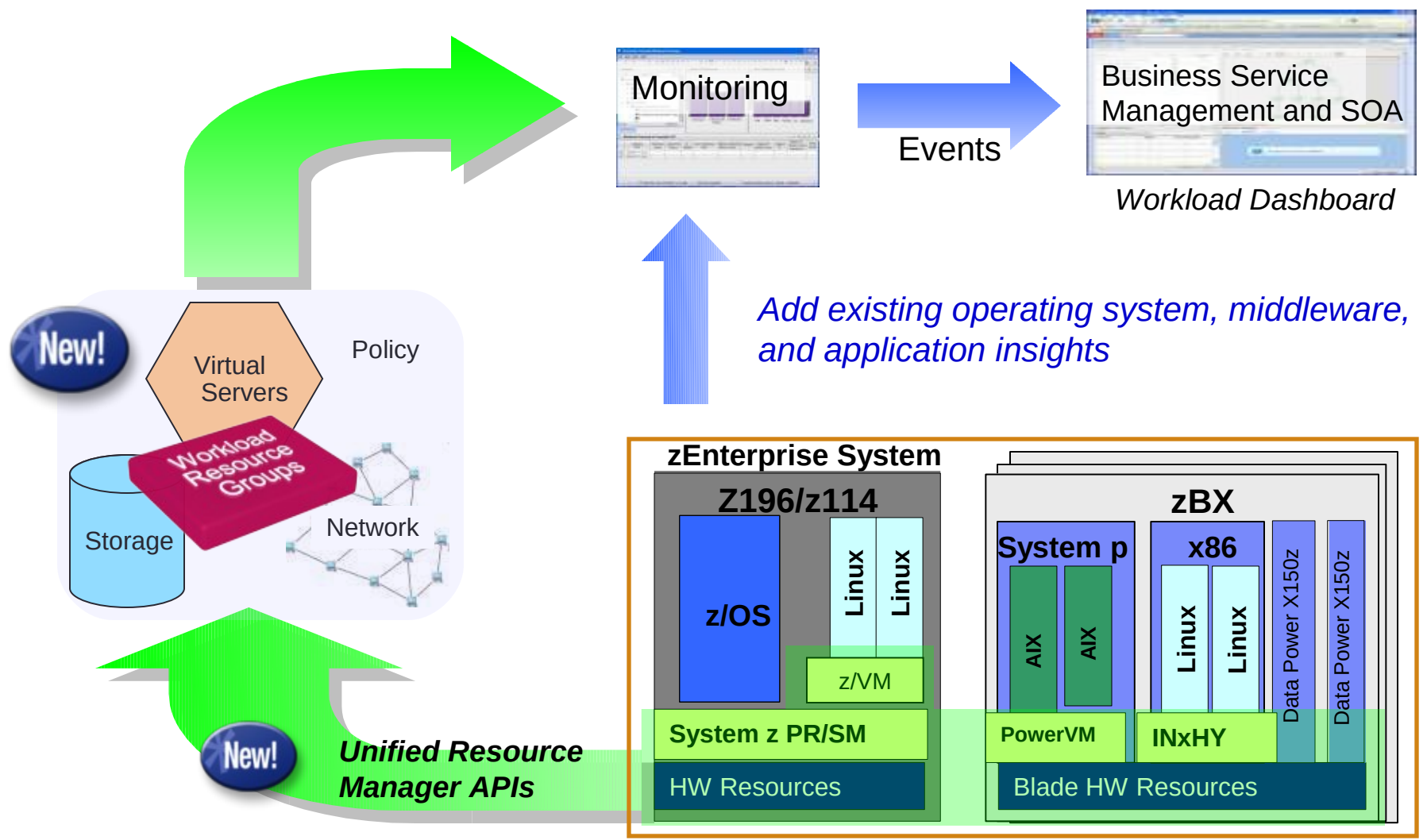
# Enabling External Management Tools

- **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

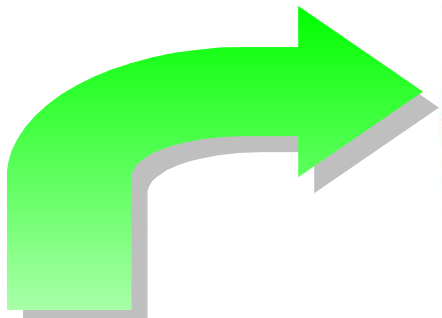


Tivoli System Automation can ensure availability of Workload Resource Groups and Business Services

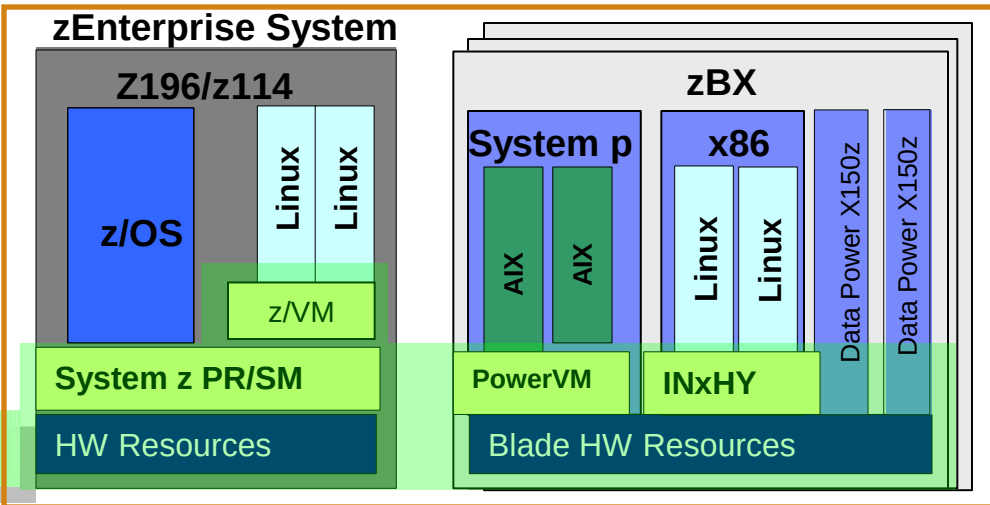
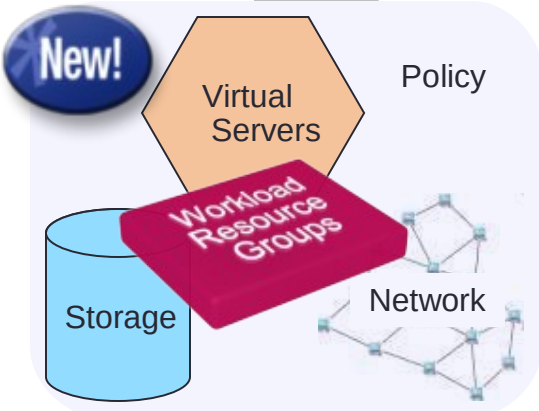
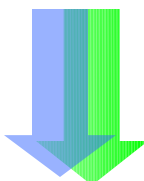


← Policy

Automate Operations



*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