

HMC Unified Resource Manager Web Services API and User Interface Hints and Tips

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Agenda

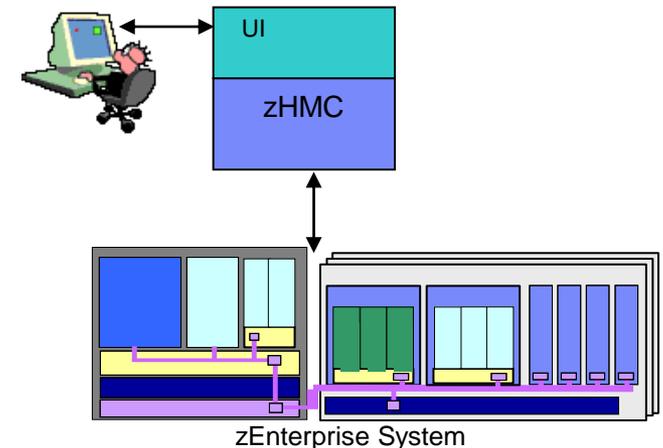
- HMC Web Services API.
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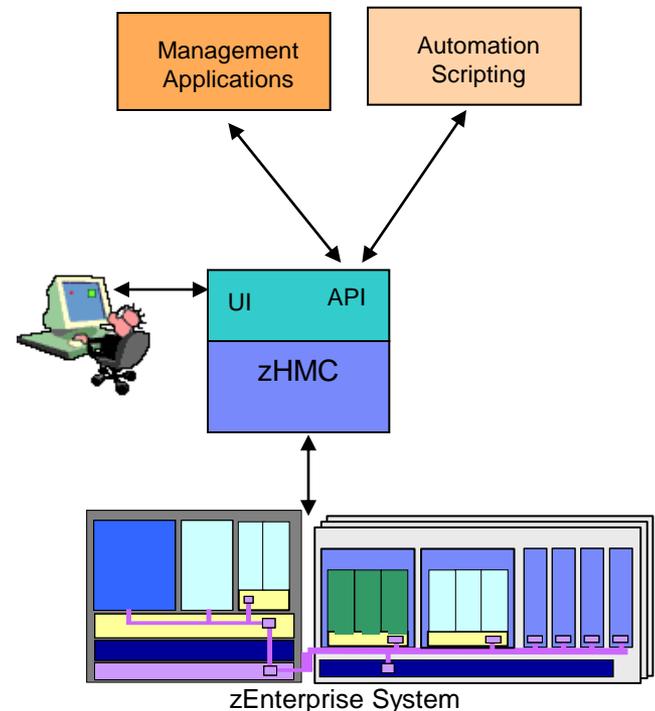
Unified Resource Manager GA1 (HMC 2.11.0) Recap

- New virtualization and ensemble management function in HMC, SE, zBX blades
- Establishes new managed resource types, controls and policy
 - zBX and blades
 - Virtual Servers and Hypervisors
 - Virtual networks on the IEDN
 - Workloads
 - Performance policies on Workloads
- HMC takes on role of the management appliance and access point for zManager
- Unified Resource Manager function surfaced through HMC UI, but this is just a first step



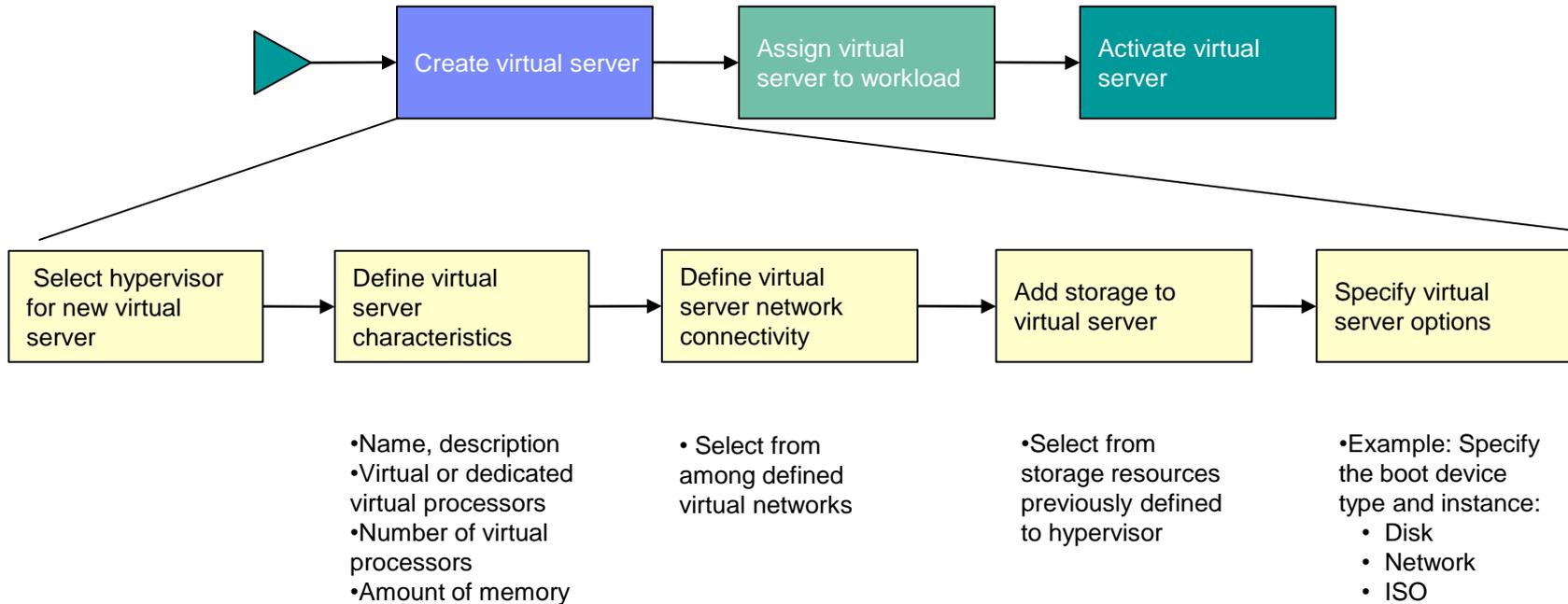
GA2 (HMC 2.11.1) Focus: Enable Management Tools

- GA2 release now allows API access to Unified Resource Manager function
- New HMC Web Services API allows programmatic access to the same underlying Unified Resource Manager 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
 - Etc.
- Goal: Enable management of Unified Resource Manager from external (to HMC) tools
- Priority scenarios: Discovery, Monitoring and Provisioning use cases



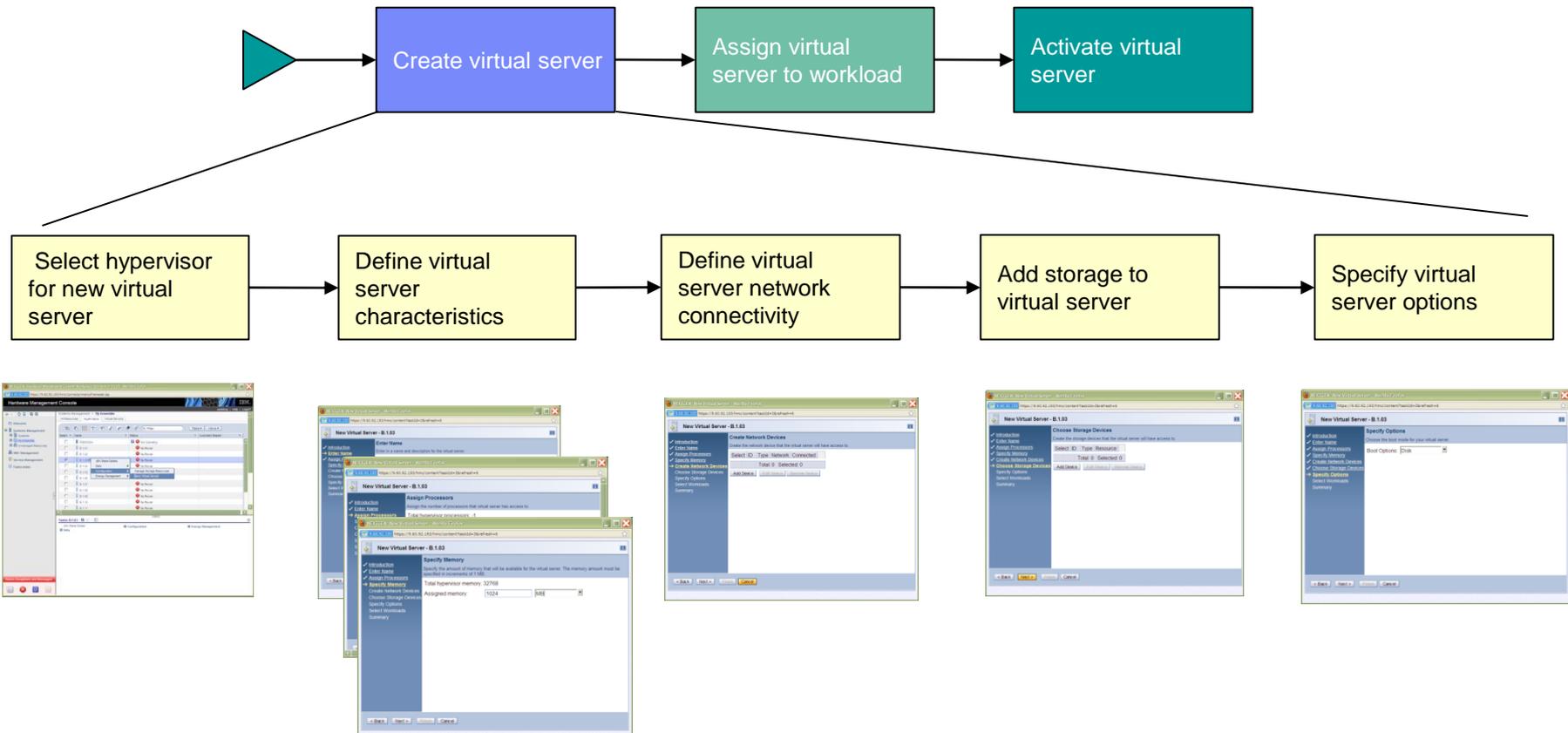
HMC WS API and UI Provide Same Level of Function

- Example: Creating a Virtual Server on an IBM Blade
- Regardless of the interface used, this is accomplished through a series of steps:



HMC WS API and UI Provide Same Level of Function (con't)

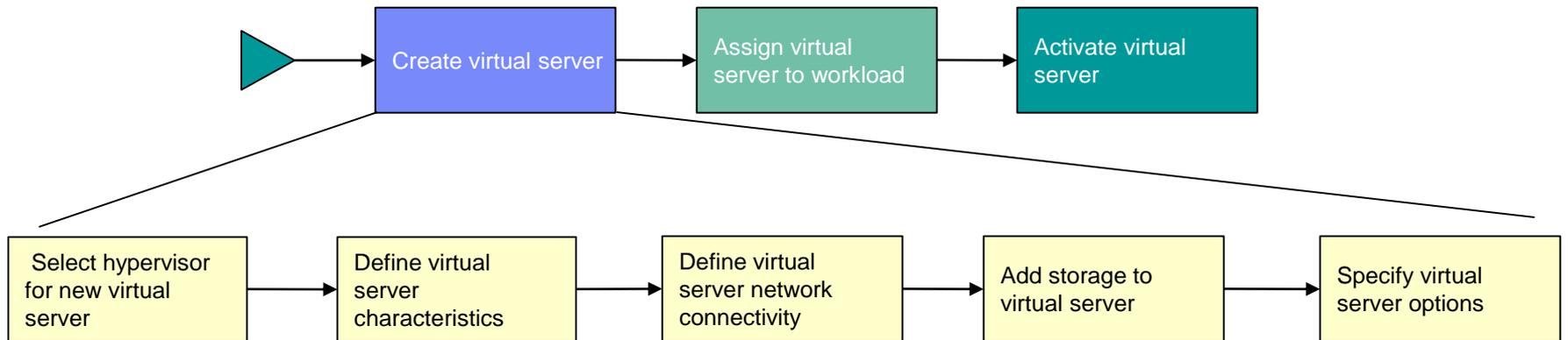
- HMC UI: Steps are accomplished using panels in a wizard-style task



HMC WS API and UI Provide Same Level of Function (con't)

- WS API: Steps are accomplished by calling management primitives of the API

Note: Function names listed below are conceptual, not the actual API syntax



- Call List Hypervisors function to obtain a list of hypervisors
- <Invoking application selects desired hypervisor>

- Call Create Virt Server function specifying selected hypervisor as target and basic VS parameters to get base VS created

- Call List Virt Networks function to obtain current virtual networks
- <Select network>
- Call Add Virt Adapter function specifying new VS as target and virtual network parameters

- Call List Stg Resources function to obtain list of available volumes
- <Select volume>
- Call Add Virt Disk function specifying new VS as target and selected storage resource

- <Select boot device>
- Call Update Virt Server function to set boot device

Summary of API Functional Scope

- Core (Traditional) Entities:
 - List, Get/Set properties
 - Start/Stop/Restart/etc.
 - For CPC, Image, LPAR, Groups, Capacity records, and Console (HMC itself)
- Ensemble
 - List, Get/Set properties
 - Add/Remove CPC members
- Workloads
 - List. Create, Delete
 - Get/Set properties
 - Add/Remove virtual-server members
 - Create/Delete performance policies
 - Get performance report data
- Virtual Networks:
 - List, Create, Delete
 - Get/Set Properties
 - Recovery actions
- Virtualization Hosts (X, P, zVM)
 - List, Get/Set properties
 - Start/Stop
- Virtual Servers (X, P, zVM):
 - List. Create, Delete
 - Get/Set properties
 - Start/Stop
- Storage:
 - Define, List
 - Assign to virtualization hosts
 - Assign to storage groups
- zBX Infrastructure (BladeCenters, Blades):
 - List, Get/Set Properties
 - Get/Set energy management modes
- Service Oriented Functions
 - Metrics retrieval
 - Inventory

HMC Web Services API Characteristics

- HMC Web Services API is a new API implementation in the HMC
 - Includes existing SNMP/CIM function plus new Unified Resource Manager capabilities
 - This new API is the focus for future evolution
 - Existing SNMP and CIM APIs remaining in place with their existing capabilities, may be extended on a case-by-case basis
- Design based on current industry design practices
 - Requests and responses structured as web services based on REST design patterns
 - Data is represented in Javascript Object Notation (JSON)
 - Status and property change notifications delivered via JMS
 - HMC provides an embedded JMS broker configured to support API specific use
- HTTP over TCP/IP Sockets is underlying network transport, SSL for connection security
- Fully documented and supported for customer / ISV use:
 - SC27-2616-00 *System z Hardware Management Console Web Services API*
 - Available on IBM ResourceLink:
<http://www.ibm.com/servers/resourcelink>

Then navigate: Library / zEnterprise 196

What is a REST-oriented Web Service?

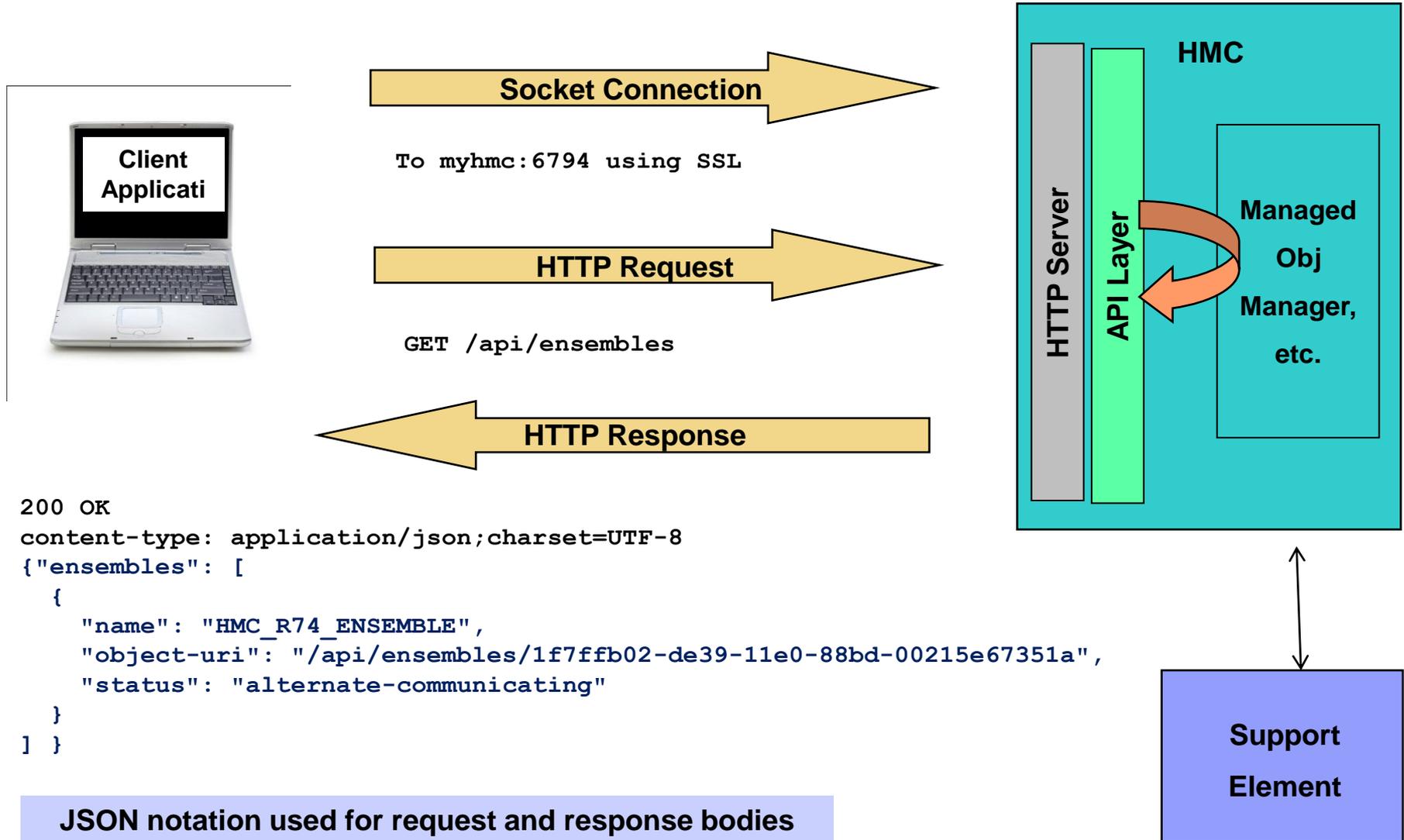
- *REST* = **R**epresentational **S**tate **T**ransfer
 - A style of software interface design
 - Simplifies client – server interactions
 - Introduced in 2000 by Roy Fielding (phD dissertation)
 - Used widely in today’s world wide web services
 - Based on HTTP protocol

- Fundamentals
 - All actions are against a specific resource
 - The resource instance is identified in the HTTP URI for the web service call
 - Type of operation on that resource is specified by using HTTP “method”

- Standard HTTP methods apply across all resources
 - GET – Collect information about a resource
 - POST – Create a new resource, perform other type of operation
 - PUT – Complete update of a resource (all properties)
 - DELETE – Delete a resource

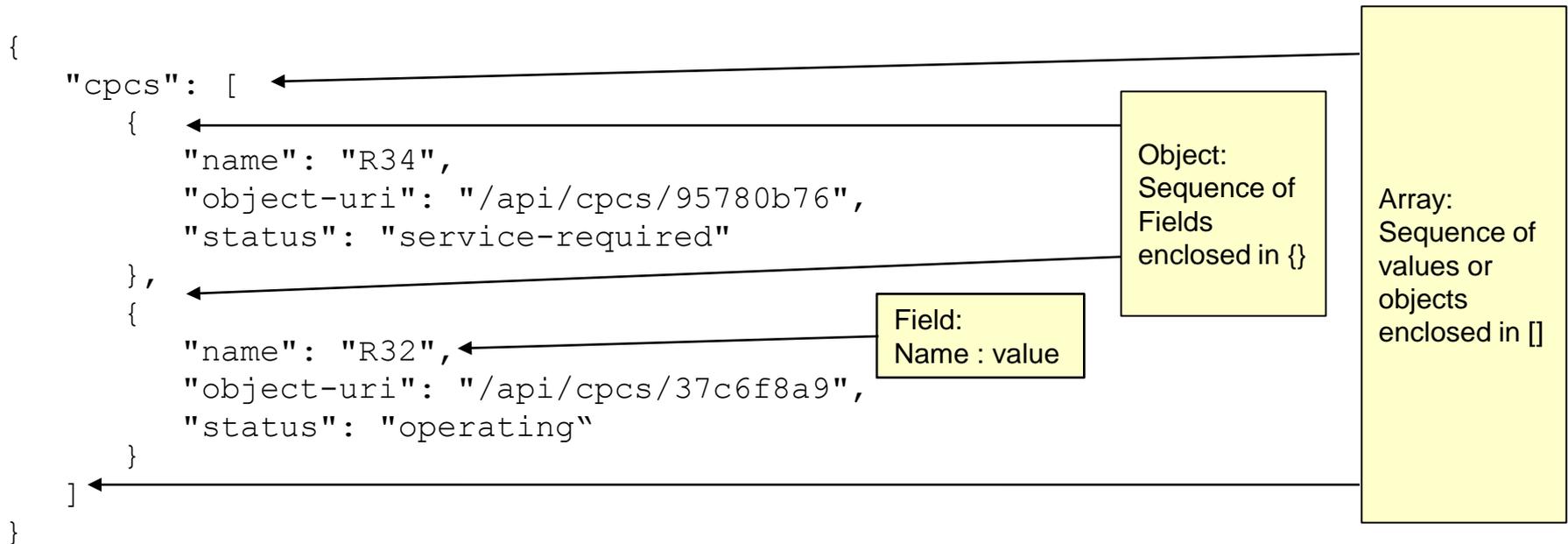
- Generic Examples:
 - To get list of virtual servers: **GET /api/virtual-servers**
 - To get information about a virtual server: **GET /api/virtual-servers/1234**

API Request Flow (Simplified Example)



Javascript Object Notation (JSON)

- Lightweight data interchange format for use between applications
- Much simpler than XML, but still expressive enough
- Used by Google, Yahoo, Web 2.0 applications etc.
- Syntax and tutorials available at www.json.org
- JSON parsers widely available (eg. At json.org)
- Becoming the standard notation used with REST-style APIs



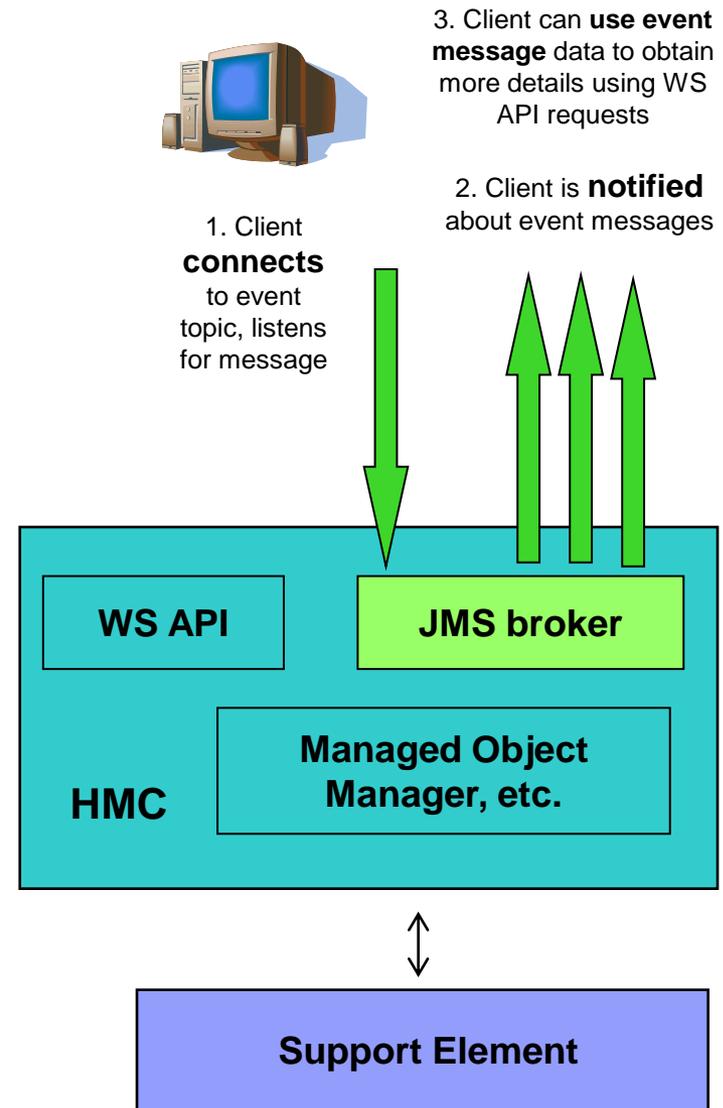
What is Asynchronous Notification?

• Asynchronous Notification

- WS APIs require remote client to repeatedly pull (poll) from HMC server to keep data current
- Asynchronous notification prevents need for constant polling from remote client.
- Allows HMC to push a notification to a remote client about events or state changes on the resource being managed by the HMC/SE e.g. a server is being deactivated

• JMS: Java Message Service

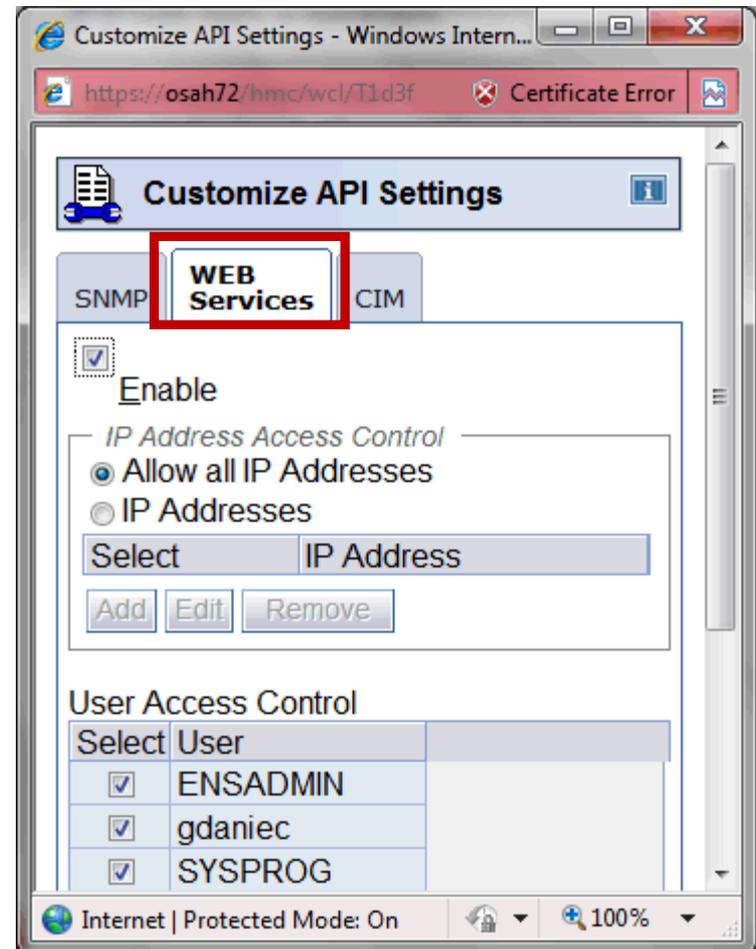
- Used for asynchronous notification
- JMS is an industry standard for messaging, based on J2EE
- HMC embeds Apache ActiveMQ as its JMS provider
- Non-Java clients can connect to broker as well, using STOMP protocol



Web Services API Enablement

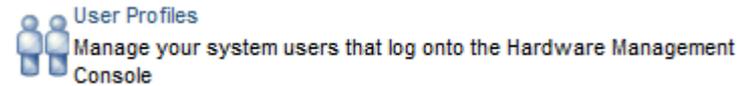
- WS API is Disabled by default
- Overall On / Off switch and other configuration via a new tab in the existing Customize API Settings task
- API enablement is done separately from enabling remote browser access to HMC
- Installation can also optionally control the IP addresses from which API connections can be made
- When enabled HMC listens for API connections on a different TCP/IP port than is used for remote browser access

Customize API Settings
 Customize the Application Programming Interface for the console



Web Services API Access Control

- Connection to API requires authentication under an HMC application login identity
 - All connections to the API specify an HMC user name and password
 - HMC local or LDAP validation of user name and password supposed, same as UI
- New User Profile option controls whether an HMC user can use the API or not
- Individual requests are authorized using the HMC's authorization controls
 - Requests always performed under an HMC user context
 - Authorized under the task and resource roles authorized for that user
 - Existing HMC User Profiles or new User Templates used to configure roles and permissions



OSAH72: User Profiles - Windows Internet Explorer

https://osah72/hmc/wci/T1f21 Certificate Error

User Properties

Timeout Values

Session timeout minutes:

Verify timeout minutes:

Idle timeout minutes:

Minimum time in minutes between password changes:

Invalid Login Attempt Values

Maximum failed attempts before disable delay:

Disable delay in minutes:

Inactivity Values

Disable for inactivity in days:

Never disable for inactivity

Disruptive Confirmations

Require password for disruptive actions

Require text input for disruptive actions

Allow remote access via the web

Allow access to management interfaces

OK Cancel Help

Done Internet | Protected Mode: On 100%

Client Programming Considerations

- Web Services API design is client platform and client programming language neutral
 - This is a key reason behind the choice of a HTTP/Web Services style
 - Client platform can be Windows, AIX, Linux, zLinux, Mac, or z/OS or...
 - Clients can be written in programming languages like C/C++ or Java, or scripting languages like Python, Perl, etc.
 - No need for install HMC-specific client-side libraries to use APIs
- In choosing a client language, look for the following either as built-ins or available via add-on libraries:
 - Support for HTTP
 - Support for SSL
 - Support for creating and parsing JSON documents
 - (Optionally) Support for JMS connections to ApacheMQ using either OpenWire or STOMP protocols (if asynchronous notification capabilities are to be used)
- Python is a very good choice because support for all of the above is readily available

Getting Started with the API: Some Script Snippets (using Python)

- API is session-oriented: All requests are made in the context of an API session
- Basic pattern for an API client:
 1. Establish SSL socket connection with HMC
 2. Logon to open an API session
 3. Make requests using that API session
 4. Logoff to close the API session
- Python code snippets illustrating these steps follows...

1. _Establish an SSL socket connection with the HMC:

```
# Connect to HMC at address <host> with 300 second request timeout
conn = httplib.HTTPSConnection(host, 6794, timeout=300)
conn.connect()
```

Getting Started with the API: Some Script Snippets (using Python)...

2. Log on to the HMC to open an API session:

```
# Log on to HMC as <userid> with password <password>
logon_req = {"userid": userid, "password": password}
req_body = json.dumps(logon_req)
req_hdrs = {"Content-Type": "application/json"}
conn.request("POST", "/api/sessions", req_body, req_hdrs)

response = conn.getresponse()
if response.status != 204:
    # If the response provides a body, always read it.
    resp_body = response.read()
if response.status != 200:
    # Handle failure (eg. wrong password)
    raise Exception("Request failed (status: %d)" % response.status)

# Retrieve session id from response for later use
logon_resp = json.loads(resp_body)
session_id = logon_resp["api-session"]
```

Getting Started with the API: Some Script Snippets (using Python)...

3. Make requests using the API session:

```
# Issue request for HMC's properties
# Use the session id for the session we just created
req_hdrs = {"X-API-Session": session_id}
conn.request ("GET", "/api/console", None, req_hdrs)

response = conn.getresponse()
if response.status != 204:
    resp_body = response.read()
if response.status != 200:
    raise Exception("Request failed (status: %d)" % response.status)

# Convert result JSON into Python objects for processing
console_props = json.loads(resp_body)
print "HMC name is %s." % console_props["name"]
```

Getting Started with the API: Some Script Snippets (using Python)...

4. Log off from the HMC to close the API session:

```
# Log off from HMC to free session resources
req_hdrs = {"X-API-Session": session_id}
conn.request("DELETE", "/api/sessions/this-session", None, req_hdrs)

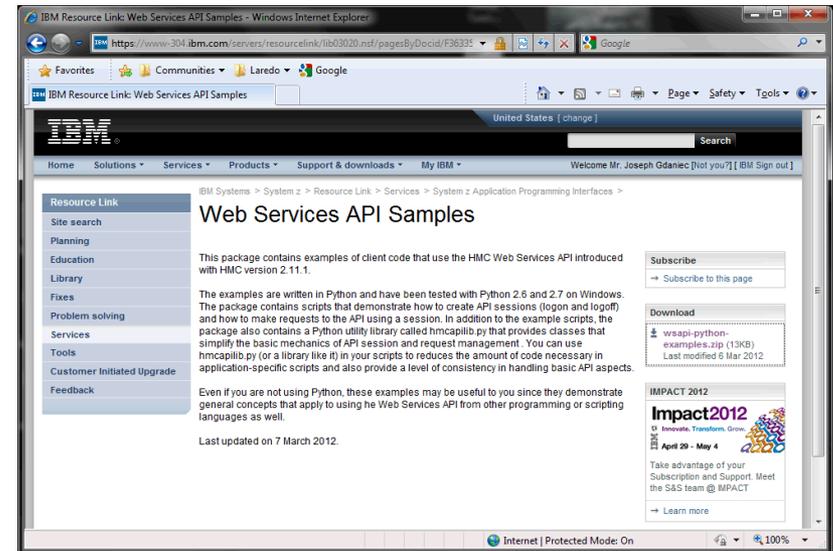
response = conn.getresponse()
if response.status != 204:
    resp_body = response.read()
if response.status != 204:
    raise Exception("Request failed (status: %d)" % response.status)

# On success, no response to process from Logoff
```

Getting Started with the API: Samples

- Python sample code is available on ResourceLink:
<http://www.ibm.com/servers/resourcelink>

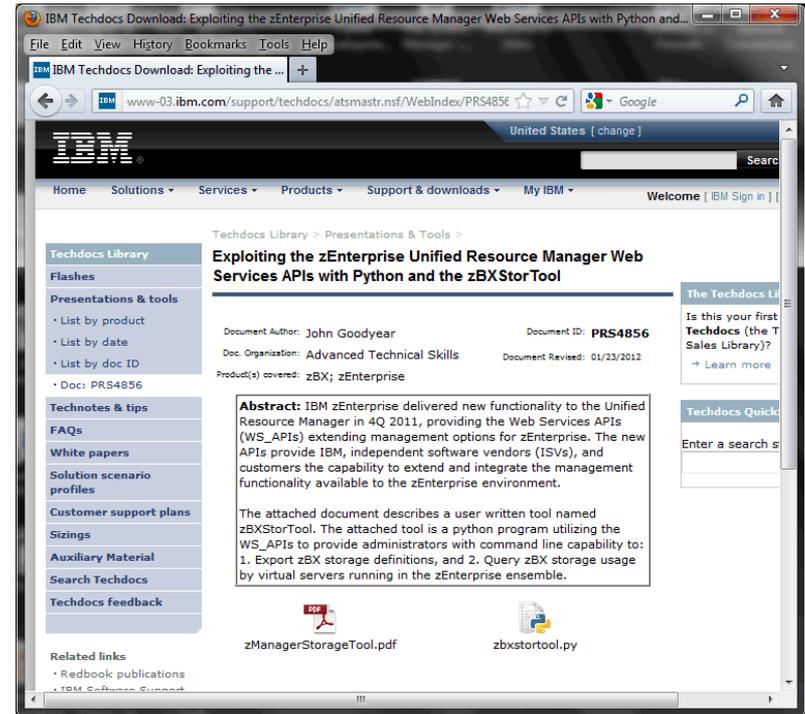
Then navigate:
Services / API / Web Services API Samples



- Package provides simple logon/logoff test script and a script that demonstrates how to create and delete a virtual server using the WS API
- Samples are based on a sample Python utility library (hmcapilib.py) that demonstrates best practices in using the API
 - Handles repetitive aspects of making API requests: logon, logoff, converting to/from JSON, setting HTTP headers, etc.
 - Includes error checking and capturing of error status/reason on errors

Usage Example: zBXStorTool

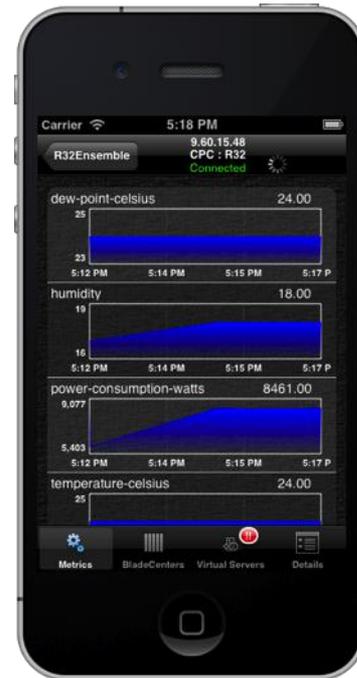
- Developed by John Goodyear of the IBM Washington Systems Center
- Provides functions that simplify storage administration for zEnterprise zBX:
 - Export storage definitions for entire ensemble or filtered by hypervisor
 - Show relationship between virtual servers and the storage resources they use
- Python script and whitepaper with client programming hints and tips
- Provides a more comprehensive example of WS API usage
- Available from the Techdocs Library as document # PRS4856 :
<http://www.ibm.com/support/techdocs/atmastr.nsf/WebIndex/PRS4856>



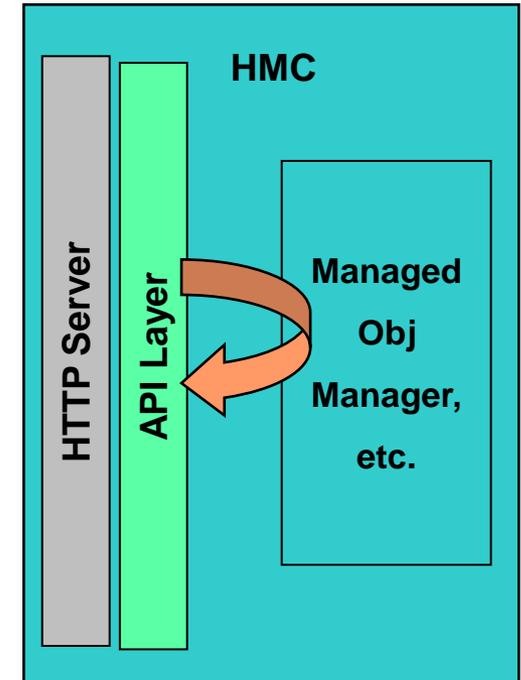
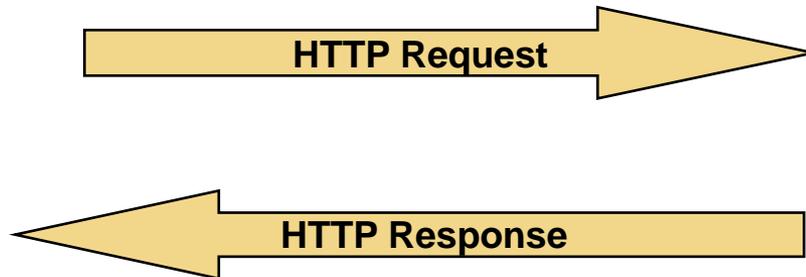
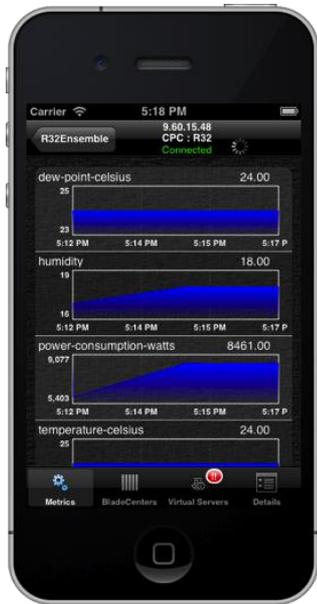
Usage Example: System z Mobile Application Proof of Concept



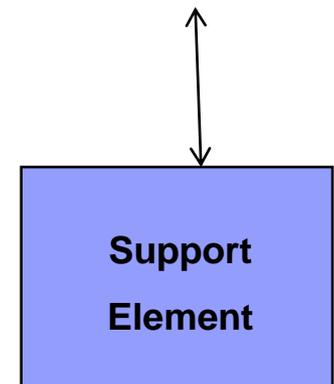
- Proof of Concept Mobile Application for monitoring and controlling a zEnterprise system from a mobile device
- Allows person on the IT floor to grab customizable subset of information about the machine



Mobile Application Proof of Concept – Under the Hood



- Mobile device communicates directly with HMC using the new Web Services API. No intermediate management server needed.
- RESTful orientation of the API makes this easy to do using standard application capabilities on these types of devices
- Authentication and authorization enforcement by the API keeps the environment secure



Tree Style Resource Navigation Enhancements

The screenshot shows the Hardware Management Console interface. On the left is a tree-style navigation pane with categories like Systems Management, Ensemble Management, and HMC Management. The main area is titled 'Systems Management' and contains a table of resources. A yellow callout box labeled 'Work pane tabs' points to the tabs at the top of the main area, which include 'All Resources', 'Images', 'z/VM Virtual Machines', and 'Topology'. Below the tabs is a table with columns for 'Select', 'Name', 'Exceptions', 'Last Used Profile', and 'Description'. The table lists 'Systems', 'Custom Groups', and 'Unmanaged Resources'. At the bottom of the interface, there is a 'Tasks' bar with options like 'Grouping', 'Add Member to Ensemble', and 'Monitors Dashboard'. A status bar at the very bottom shows 'Status: Exceptions and Messages' and a progress indicator 'Transferring data from 9.60.15.48...'.

| Select | Name | Exceptions | Last Used Profile | Description |
|--------------------------|---------------------|------------|-------------------|--|
| <input type="checkbox"/> | Systems | Exceptions | | Contains managed CPC objects. |
| <input type="checkbox"/> | Custom Groups | Exceptions | | Contains all custom groups created. |
| <input type="checkbox"/> | Unmanaged Resources | | | Contains all unmanaged system resources. |

Systems Tabs - Images

HMCIC HAB: Hardware Management Console Workplace (Version 2.12.0) - Mozilla Firefox

9.60.14.63 https://9.60.14.63/hmc/connects/mainuiFrameset.jsp

Hardware Management Console

ENSADMIN | Help | Logoff

Systems Management > Systems

System Images z/VM Virtual Machines Topology

Welcome

Systems Management

Systems

ABRAHAM

HBUV5

M05

R31

R32

Custom Groups

Unmanaged Resources

Ensemble Management

HMC Management

Service Management

Tasks Index

Status: Exceptions and Messages

Tasks: Systems

Transferring data from 9.60.14.63...

| Select | Name | System | Status | Activation Profile | Last Used Profile | OS Name | OS Type | OS Level |
|--------------------------|--------|--------|---------------|--------------------|-------------------|----------|---------|--------------|
| <input type="checkbox"/> | LP1 | HBUV5 | Operating | LP1 | LP1 | | | |
| <input type="checkbox"/> | LP2 | HBUV5 | Operating | LP2 | LP2 | | | |
| <input type="checkbox"/> | LP3 | HBUV5 | Not Operating | | | | | |
| <input type="checkbox"/> | LP4 | HBUV5 | Not Operating | | | | | |
| <input type="checkbox"/> | VM1 | R31 | Not activated | | | | | |
| <input type="checkbox"/> | VM2 | R31 | Not activated | | | | | |
| <input type="checkbox"/> | APIVM1 | R32 | Operating | | | | | |
| <input type="checkbox"/> | APIVM2 | R32 | Not Operating | | | | | |
| <input type="checkbox"/> | CF | R32 | Not Operating | | | | | |
| <input type="checkbox"/> | LX | R32 | Not Operating | LX | LX | | | |
| <input type="checkbox"/> | SAK | R32 | Not Operating | SAK | SAK | | | |
| <input type="checkbox"/> | VM | R32 | Operating | VM | VM | ZFWVMTSA | z/VM | 6.1.0 - 1003 |
| <input type="checkbox"/> | VMALT1 | R32 | Operating | VMALT1 | VMALT1 | VMALT1 | z/VM | 6.2.0 - 1101 |
| <input type="checkbox"/> | VMALT2 | R32 | Operating | VMALT2 | VMALT2 | VMALT2 | z/VM | 6.1.0 - 1003 |
| <input type="checkbox"/> | VMALT3 | R32 | Operating | VMALT3 | | VMALT3 | z/VM | 6.2.0 - 1101 |
| <input type="checkbox"/> | VMSS11 | R32 | Operating | VMSS11 | VMSS11 | | | |

Max Page Size: 500 Total: 18 Filtered: 18 Selected: 0

The **Images** tab allows you to view images at any scope in the Navigation tree

Here, all images defined for all systems in the Systems node are shown.

Systems Tabs - Images

HMCICHAB: Hardware Management Console Workplace (Version 2.12.0) - Mozilla Firefox
 https://9.60.14.63/hmc/connects/mainuiFrameset.jsp

Hardware Management Console
 ENSADMIN | Help | Logoff

Systems Management > Systems > R32

Images z/VM Virtual Machines Topology

| Select | Name | Status | Activation Profile | Last Used Profile | OS Name | OS Type | OS Level |
|--------------------------|--------|---------------|--------------------|-------------------|---------|---------|----------|
| <input type="checkbox"/> | APIVM1 | Operating | APIVM1 | APIVM1 | APIVM1 | z/VM | 6.2.0 |
| <input type="checkbox"/> | APIVM2 | Not Operating | APIVM2 | APIVM2 | | | |
| <input type="checkbox"/> | CF | Not Operating | | | | | |
| <input type="checkbox"/> | LX | Not Operating | | | | | |
| <input type="checkbox"/> | SAK | Not Operating | | | | | |
| <input type="checkbox"/> | VM | Operating | | | | | |
| <input type="checkbox"/> | VMALT1 | Operating | | | | | |
| <input type="checkbox"/> | VMALT2 | Operating | | | | | |
| <input type="checkbox"/> | VMALT3 | Operating | | | | | |
| <input type="checkbox"/> | VMSSH1 | Operating | | | | | |
| <input type="checkbox"/> | VMSSH2 | Operating | VMSSH2 | VMSSH2 | | | |
| <input type="checkbox"/> | ZOS | Operating | ZOS | ZOS | ZOS1 | z/OS | V1R13 |

Max Page Size: 500 Total: 12 Filtered: 12 Selected: 0

Tasks: R32

- CPC Details
- Toggle Lock
- Daily
 - Activate
 - Deactivate
 - Grouping
 - Hardware Messages
 - Operating System Messages
- Recovery
- Service
- Change Management
- Remote Customization
- Operational Customization
- Object Definition
- Configuration
- Energy Management
- Monitor

Status: Exceptions and Messages

Transferring data from 9.60.14.63...

The resources defined for a specific image may be viewed by selecting the image Navigation pane tree.

Here, **images** defined on the selected image "R32" are shown.

Ensemble Tabs

The screenshot shows the Hardware Management Console interface. The main content area is titled "Ensemble Management" and contains a table of system components. A yellow callout box with the text "Ensemble work pane tabs" points to the top navigation bar of the Ensemble Management section, which includes tabs for "Ensemble", "Virtual Servers", "Hypervisors", "Blades", "Topology", and "Getting Started".

| Select | Name | Status | z/VM Processor Management | PowerVM Processor Management | Load Balancing | Description |
|--------------------------|-----------|--------------------------------|---------------------------|------------------------------|----------------|-------------|
| <input type="checkbox"/> | Hydra | Communicating to the alternate | ✓ | ✓ | ✓ | FVT Test |
| <input type="checkbox"/> | Members | Exceptions | | | | |
| <input type="checkbox"/> | R91 | Service Required | | | | |
| <input type="checkbox"/> | R93 | Service Required | | | | |
| <input type="checkbox"/> | Workloads | | | | | |

Max Page Size: 600 Total: 5 Filtered: 5 Selected: 0

Tasks: Ensemble Management

- Add Member to Ensemble
- Ensemble Management Guide
- Manage Alternate HMC

Status: Exceptions and Messages

Read 9.12.16.234

Ensemble Tabs – Virtual Servers

The **Virtual Servers** tab allows you to view virtual servers at any scope in the Navigation tree

Here, all virtual servers defined in the ensemble “hydra” are shown. This includes virtual servers for all (R91 and R93) nodes.

| Select | Name | Member | Hypervi... | Status | Processors | Memory (MB) | Workload(s) | Type |
|--------------------------|-----------------|--------|------------|---------------|------------|-------------|---------------------------|---------|
| <input type="checkbox"/> | P1A2 | R93 | R93 | Not Activated | | | Default | PR/SM |
| <input type="checkbox"/> | P1A3 | R93 | R93 | Not Activated | | | Default | PR/SM |
| <input type="checkbox"/> | P1A4 | R93 | R93 | Not Activated | | | Default | PR/SM |
| <input type="checkbox"/> | P1CFA3 | R93 | R93 | Not Activated | | | Default | PR/SM |
| <input type="checkbox"/> | P1CFA4 | R93 | R93 | Not Activated | | | Default | PR/SM |
| <input type="checkbox"/> | POST62 | R93 | VML1 | Not Activated | | | Default | z/VM |
| <input type="checkbox"/> | PRA1 | R93 | R93 | Not Activated | | | Default | PR/SM |
| <input type="checkbox"/> | R91_B_1_12_VS01 | R91 | B.1.12 | Operating | 1 | 1,024 | Default | PowerVM |
| <input type="checkbox"/> | R91_B_1_12_VS02 | R91 | B.1.12 | Not Operating | 2 | 2,048 | Default | PowerVM |
| <input type="checkbox"/> | R91_B_1_12_VS03 | R91 | B.1.12 | Starting | 4 | 8,192 | Default | PowerVM |
| <input type="checkbox"/> | r91B1_01v1 | R91 | B.1.01 | Operating | 4 | 10,240 | Blade01_09Workload, PET p | PowerVM |
| <input type="checkbox"/> | r91B1_02v1 | R91 | B.1.02 | Operating | 1 | 3,328 | PET zBookstore Workload | PowerVM |
| <input type="checkbox"/> | r91B1_02v2 | R91 | B.1.02 | Operating | 1 | 3,328 | PET zBookstore Workload | PowerVM |
| <input type="checkbox"/> | r91B1_02v3 | R91 | B.1.02 | Operating | 1 | 3,328 | PET zBookstore Workload | PowerVM |
| <input type="checkbox"/> | r91B1_02v4 | R91 | B.1.02 | Operating | 1 | 3,328 | PET zBookstore Workload | PowerVM |
| <input type="checkbox"/> | r91B1_02v5 | R91 | B.1.02 | Operating | 1 | 3,328 | PET zBookstore Workload | PowerVM |
| <input type="checkbox"/> | r91B1_02v6 | R91 | B.1.02 | Operating | 1 | 3,328 | PET zBookstore Workload | PowerVM |

Max Page Size: 600 Total: 579 Filtered: 579 Selected: 0

Transferring data from 9.12.16.234...

Ensemble Tabs – Hypervisors

R93HMC1: Primary Hardware Management Console Workplace (Version 2.11.1) - Mozilla Firefox
 9.12.16.234 https://9.12.16.234/hmc/connects/mainuiFrameset.jsp

Hardware Management Console

Ensemble Management > Hydra

Ensemble Resources Virtual Servers **Hypervisors** Blades Topol

Hydra

| Select | Name | Member | Status | Processors | Memory (MB) | Type | Auto Start | Shutdown Timeout (s) | Processor Management |
|--------------------------|--------|--------|---------------------------|------------|-------------|---------|------------|----------------------|----------------------|
| <input type="checkbox"/> | B.1.09 | R91 | Operating | 1 | 32,768 | PowerVM | ✓ | 300 | |
| <input type="checkbox"/> | B.1.10 | R91 | Operating | 1 | 32,768 | PowerVM | ✓ | 300 | |
| <input type="checkbox"/> | B.1.11 | R91 | Operating | 1 | 32,768 | PowerVM | ✓ | 300 | |
| <input type="checkbox"/> | B.1.12 | R91 | Operating | 1 | 32,768 | PowerVM | ✓ | 300 | |
| <input type="checkbox"/> | B.1.13 | R91 | Operating | 1 | 32,768 | PowerVM | ✓ | 300 | |
| <input type="checkbox"/> | B.1.14 | R91 | Operating | 1 | 32,768 | PowerVM | ✓ | 300 | |
| <input type="checkbox"/> | C.2.01 | R91 | Operating | 2 | 131,072 | x Hyp | ✓ | 300 | |
| <input type="checkbox"/> | C.2.02 | R91 | Operating | 2 | 131,072 | x Hyp | ✓ | 300 | |
| <input type="checkbox"/> | C.2.03 | R91 | Operating | 2 | 131,072 | x Hyp | ✓ | 300 | |
| <input type="checkbox"/> | C.2.04 | R91 | Operating | 2 | 131,072 | x Hyp | ✓ | 300 | |
| <input type="checkbox"/> | R93 | | Communications not active | | | PR/SM | | | |
| <input type="checkbox"/> | B.1.01 | R93 | Communications not active | 1 | 65,536 | PowerVM | ✓ | 300 | |

Max Page Size: 600 Total: 80 Filtered: 80 Selected: 0

Tasks: Hydra

Ensemble Details
Toggle Lock

Configuration
 Add Member to Ensemble
 Delete Ensemble
 Manage Alternate HMC
 Manage Storage Resources
 Manage Virtual Networks
 New Virtual Server

Monitor
 Load Balancing Report
 Monitors Dashboard
 Network Monitors Dashboard
 Workloads Report

Status: Exceptions and Messages

Transferring data from 9.12.16.234...

The **Hypervisors** tab allows you to view hypervisors at any scope in the navigation tree

Here, all hypervisors defined in the ensemble “hydra” are shown. This includes hypervisors for all (R91 and R93) member nodes.

Ensemble Tabs – Blades

The **Blades** tab allows you to view BladeCenters and Blades at any scope in the Navigation tree

Here, all BladeCenters and Blades defined in the ensemble “hydra” are shown. This includes blades for all (R91 and R93) nodes.

| Select | Name | Member | Status | Power Usage (W) | Location | Machine Type - Model | Serial Number | Type |
|--------------------------|--------|--------|---------------------------|-----------------|----------|----------------------|---------------|----------|
| <input type="checkbox"/> | B.1 | R91 | Operating | 3,142 | B10B | 8852 - PHD | 99E2223 | |
| <input type="checkbox"/> | B.2 | R91 | Operating | 548 | B01B | 8852 - PHD | 99E2254 | |
| <input type="checkbox"/> | C.1 | R91 | Operating | 2,064 | C10B | 8852 - PHD | 99E1503 | |
| <input type="checkbox"/> | C.2 | R91 | Operating | 1,892 | C01B | 8852 - PHD | 99E2282 | |
| <input type="checkbox"/> | C.2.01 | R91 | Operating | 216 | C01BBS01 | 7873 - AC1 | 06ZN829 | System x |
| <input type="checkbox"/> | C.2.02 | R91 | Operating | 214 | C01BBS02 | 7873 - AC1 | 06ZN824 | System x |
| <input type="checkbox"/> | C.2.03 | R91 | Operating | 213 | C01BBS03 | 7873 - AC1 | 06ZN825 | System x |
| <input type="checkbox"/> | C.2.04 | R91 | Operating | 217 | C01BBS04 | 7873 - AC1 | 06ZN831 | System x |
| <input type="checkbox"/> | B.1 | R93 | Communications not active | 4,135 | B10B | 8852 - PER | KQNGGDY | |
| <input type="checkbox"/> | B.2 | R93 | Communications not active | 793 | B01B | 8852 - PFM | KQRZDTD | |
| <input type="checkbox"/> | C.1 | R93 | Communications not active | 4,062 | C10B | 8852 - PHD | 99E1460 | |
| <input type="checkbox"/> | C.2 | R93 | Communications not active | 2,444 | C01B | 8852 - PHD | 99E1490 | |

Max Page Size: 600 Total: 14 Filtered: 14 Selected: 0

Tasks: Hydra

- Ensemble Details
 - Toggle Lock
- Configuration
 - Add Member to Ensemble
 - Delete Ensemble
 - Manage Alternate HMC
 - Manage Storage Resources
 - Manage Virtual Networks
 - New Virtual Server
- Monitor
 - Load Balancing Report
 - Monitors Dashboard
 - Network Monitors Dashboard
 - Workloads Report

Status: Exceptions and Messages

Transferring data from 9.12.16.234...

Member Node Tabs

Resources defined for a specific member may be viewed by selecting the member in the Navigation pane.

Here, **virtual servers** defined on the selected member node "R91" are shown.

The screenshot shows the Hardware Management Console interface. The navigation pane on the left has 'R91' selected under 'Members'. The main area displays the 'Virtual Servers' tab for member R91, showing a table of resources. The table has columns for Name, Hypervisor, Status, Processors, Memory (MB), Workload(s), and Type. The resources listed include various virtual servers and physical components like routers and GSSM units.

| Select | Name | Hypervisor | Status | Processors | Memory (MB) | Workload(s) | Type |
|--------------------------|-----------------|------------|---------------|------------|-------------|-------------------------|---------|
| <input type="checkbox"/> | R91_B_1_12_VS02 | B.1.12 | Not Operating | 2 | 2,048 | Default | PowerVM |
| <input type="checkbox"/> | r91B1_13v2 | B.1.13 | Not Operating | 1 | 1,024 | Default | PowerVM |
| <input type="checkbox"/> | r91C2_01v1 | C.2.01 | Not Operating | 2 | 4,096 | PET pBookstore Workload | x Hyp |
| <input type="checkbox"/> | r91C2_01v8 | C.2.01 | Not Operating | 2 | 4,096 | PET pBookstore Workload | x Hyp |
| <input type="checkbox"/> | R91_B_1_12_VS03 | B.1.12 | Starting | 4 | 8,192 | Default | PowerVM |
| <input type="checkbox"/> | ROUTER3L | VMLX02 | Operating | 1 | 1,024 | Default | z/VM |
| <input type="checkbox"/> | GSSM02 | VMLX03 | Operating | 1 | 1,024 | Default | z/VM |
| <input type="checkbox"/> | GSSM01 | VMLX03 | Operating | 1 | 1,024 | Default | z/VM |
| <input type="checkbox"/> | GSSH09 | VMLX02 | Operating | 2 | 3,072 | Default | z/VM |
| <input type="checkbox"/> | CF22 | R91 | Operating | | | Default | PR/SM |
| <input type="checkbox"/> | CF3 | R91 | Operating | | | Default | PR/SM |

Max Page Size: 600 Total: 97 Filtered: 97 Selected: 0

Tasks: R91

- CPC Details
- Toggle Lock
- Daily
- Recovery
- Service
- Change Management
- Remote Customization
- Operational Customization
- Object Definition
- Configuration
- Energy Management
- Monitor

Status: Exceptions and Messages

Transferring data from 9.12.16.234...

Ensemble Guide Task

Guide task encapsulates tasks that may need to be performed to manage an ensemble.

Tasks may be launched directly from the guide.

Use this guide to assist you with setting up an ensemble. Click any of the links to take you directly to about your ensemble, such as steps completed or number of members added.

[Notes](#)

Before you begin:

- [Customize User Controls](#) (Optional) View and manage task and resource roles introduced for ensemble management.
- [User Profiles](#) (Optional) View and manage users and assign roles.
- [View Documentation](#) (Optional) Read on-line documents to assist you in setting up your ensemble.

Task

| Task | Allows you to... |
|--|---|
| Manage Alternate HMC | Choose another HMC and start the Manage Alternate HMC task to assign it as an alternate HMC. |
| Create Ensemble | Create an ensemble. An HMC can manage only one Ensemble. |
| Add Member to Ensemble | Add a member to the ensemble. A functional ensemble must have at least one member, but it can have up to eight. |
| Entitle zBX blades | Use the Perform Model Conversion task in the Support Element (SE) to entitle blades if installed. You can use the Single Object Operations task to access the SE console. |
| Manage Storage Resources | Add or remove storage resources and storage groups. |
| Manage Virtual Networks | Add or remove virtual networks. Manage which hosts are connected to virtual networks. |
| Configure Top-of-rack (TOR) Switch | Configure top-of-rack switches for connectivity outside of the IEDN. |
| New Virtual Server | Create a virtual server on a hypervisor in this ensemble. |
| Mount Virtual Media | Install your operating system and applications. If you plan on including this virtual server in a workload you can install the guest platform management provider (GPMP). |
| Activate | Activate a virtual server to power it on. |
| Open Text Console | Open a console window to a virtual server. |
| Monitors Dashboard | View system virtual server performance metrics. |
| New Workload | Create a workload for this ensemble. A workload allows related virtual servers to be monitored and managed based on policy. |
| New Performance Policy | Define performance goals for the virtual servers in a workload. |
| Workloads Report | Monitor a workload based on its performance policy. |

Create Virtual Server – Ensemble Management Guide

Use this guide to assist you with setting up an ensemble. Click any of the links to take you directly to the tasks. Click the notes link to add notes about your ensemble, such as steps completed or number of members added.

Before you begin:

- Customize User Controls (Optional) View and manage task and resource roles introduced for ensemble management.
- User Profiles (Optional) View and manage users and assign roles.
- View Documentation (Optional) Read on-line documents to assist you in setting up your ensemble.

Task **Allows you to...**

- [Manage A...](#) ... task to assign it as an alternate HMC.
- [Create En...](#) ... must have at least one member, but it can have
- [Add Mem...](#) ... ment (SE) to entitle blades if installed. You can console.
- [Entitle zB...](#) ...
- [Manage Storage Resources](#) Add or remove storage resources and storage groups.
- [Manage Virtual Networks](#) Add or remove virtual networks. Manage which hosts are conne
- [Configure Top-of-rack \(TOR\) Switch](#) Configure top-of-rack switches for connectivity outside of the IE
- [New Virtual Server](#) Create a virtual server on a hypervisor in this ensemble.
- [Install Oper...](#) Install your operating system and applications. If you plan on inc can install the guest platform management provider (GPMP).
- [Activate](#) Activate a virtual server to power it on.
- [Open Text Console](#) Open a console window to a virtual server.
- [Monitors Dashboard](#) View system virtual server performance metrics.
- [New Workload](#) Create a workload for this ensemble. A workload allows related managed based on policy.
- [New Performance Policy](#) Define performance goals for the virtual servers in a workload.
- [Workloads Report](#) Monitor a workload based on its performance policy.

From the Ensemble Management Guide, click **New Virtual Server**, then select a hypervisor target in the dialog.

Creating virtual servers is made easy by making the task available in several contexts.

Create Virtual Server - NotZBX14Ensemble

--- Select Action --- Filter

| Select ^ | Hypervisor ^ | Status ^ | Virtual Servers ^ |
|-----------------------|--------------|-----------|-------------------|
| <input type="radio"/> | B.1.01 | Operating | 6 |
| <input type="radio"/> | B.1.02 | Operating | 8 |
| <input type="radio"/> | B.1.03 | Operating | 5 |
| <input type="radio"/> | R06 | Operating | 29 |
| <input type="radio"/> | VM0B | Operating | 3 |
| <input type="radio"/> | ZGG | Operating | 0 |

Total: 6 Filtered: 6 Selected: 0

OK Cancel

Create Virtual Server – Ensemble Target

You may also select the ensemble object in the main UI, click on the **New Virtual Server** task, and then select a hypervisor target from the pop-up dialog.

Hardware Management Console

Manage Virtual Networks

Ensemble Management

Ensemble | Virtual Servers | Hypervisors | Topology

| Select | Name | Status |
|-------------------------------------|------------------|--------|
| <input checked="" type="checkbox"/> | AgParts Ensemble | |
| <input type="checkbox"/> | Members | OK |
| <input type="checkbox"/> | PZBONZAI | Not C |
| <input type="checkbox"/> | Workloads | |
| <input type="checkbox"/> | aset | |
| <input type="checkbox"/> | Default | |

Tasks: AgParts Ensemble

Ensemble Details
Toggle Lock

Status: Exceptions and Messages

HMC1: New Virtual Server - Mozilla Firefox: IBM Edition

http://9.56.198.149:8080/hmc/content?taskId=12&refresh=26

Create Virtual Server - NotZBX14Ensemble

--- Select Action ---

| Select | Hypervisor | Status | Virtual Servers |
|-----------------------|------------|-----------|-----------------|
| <input type="radio"/> | B.1.01 | Operating | 6 |
| <input type="radio"/> | B.1.02 | Operating | 8 |
| <input type="radio"/> | B.1.03 | Operating | 5 |
| <input type="radio"/> | R06 | Operating | 29 |
| <input type="radio"/> | VM0B | Operating | 3 |
| <input type="radio"/> | ZGG | Operating | 0 |

Total: 6 Filtered: 6 Selected: 0

OK Cancel

Manage Storage Resources
Manage Virtual Networks
New Virtual Server
New Virtual Server

Create Virtual Server – Hypervisor Target

Hardware Management Console

Ensemble Management > hydra

Ensemble Resources Virtual Servers **Hypervisors** Blades Topology

| Sel... | Name | Member | Status | | | | | |
|-------------------------------------|------------|--------|------------------|---|---------|---------|---|---------|
| <input checked="" type="checkbox"/> | C.2.01 | R91 | | | | | | |
| <input type="checkbox"/> | C.2.02 | R91 | | | | | | |
| <input type="checkbox"/> | C.2.03 | R91 | Operating | 2 | 131,072 | x Hyp | ✓ | |
| <input type="checkbox"/> | C.2.04 | R91 | Operating | 2 | 131,072 | x Hyp | ✓ | |
| <input type="checkbox"/> | R93ZBX | R93ZBX | Service Required | | | PR/SM | | |
| <input type="checkbox"/> | VML1 (ZGF) | R93ZBX | Operating | | | z/VM | – | Default |
| <input type="checkbox"/> | VML2 (ZGN) | R93ZBX | Operating | | | z/VM | – | Default |
| <input type="checkbox"/> | C.1.01 | R93ZBX | Operating | 1 | 65,536 | PowerVM | ✓ | |
| <input type="checkbox"/> | C.1.02 | R93ZBX | | | | | | |
| <input type="checkbox"/> | C.1.03 | R93ZBX | | | | | | |
| <input type="checkbox"/> | C.1.04 | R93ZBX | | | | | | |
| <input type="checkbox"/> | C.1.05 | R93ZBX | | | | | | |
| <input type="checkbox"/> | C.1.06 | R93ZBX | | | | | | |
| <input type="checkbox"/> | C.1.07 | R93ZBX | | | | | | |

Tasks: B.1.01...

zBX Blade Details Service Configuration
 Daily Operational Customization Manage Storage Resources
New Virtual Server
 Energy Management

Status: Exceptions and Messages

Transferring data from 9.12.16.234...

Callout 1: You may also select a specific hypervisor from the **Hypervisors** tab in the main UI and then click on the **New Virtual Server** task.

Callout 2: In this example we would create a PowerVM based virtual server based on the hypervisor selection in the table. z/VM or x Hyp based virtual servers may also be created in the same way. Simply select the appropriate hypervisor target for the New Virtual Server task.

Create Virtual Server – Tasks Index

R93HMC1: Primary Hardware Management Console Workplace (Version 2.11.1) - Mozilla Firefox

9.12.16.234 https://9.12.16.234/hmc/connects/mainuiFrameset.jsp

Hardware Management Console

pedebug | Help | Logoff

Tasks Index

The Tasks Index provides direct access to all permitted tasks.
New Virtual Server may also be launched from here.

| Name | Count | Description |
|--------------------------------------|-------|--|
| Monitors Das | 3 | Display processor and channel activity on selected CPCs |
| Monitor System | 2 | Add, edit, test, enable, disable, or delete system event monitors |
| Mount Virtual | 39 | Upload and mount virtual media on a Virtual Server. |
| Network Diag | 9 | Display network diagnostic information for the console |
| New Performance Policy | 0 | Create a new performance policy for the workload. |
| New Virtual Server | 103 | Create a new virtual server on a System X Blade or System P Blade |
| New Virtual Server Based On | 17 | Create new virtual servers based on an existing virtual server. |
| New Workload | 0 | Create a new ensemble workload. |
| Object Locking Settings | 2 | Change the automatic locking of managed objects. |
| Offload Virtual RETAIN Data to Remov | 11 | Offload saved RETAIN problem data to Removable Media |
| Open Graphical Console | 47 | Open the virtual server graphical console |
| Open Text Console | 87 | Open the virtual server text console |
| Operating System Messages | 54 | Display operating system messages from selected objects |
| OSA Advanced Facilities | 0 | Use advanced tasks for monitoring and operating selected OSA c |
| Perform a Console Repair Action | 0 | Display online instructions for repairing console |
| Perform Console Trace | 18 | Display and manage console trace controls |
| Perform Problem Analysis | 5 | Start problem Analysis of selected CPC |
| Perform Support Actions | 6 | Perform support oriented tasks |
| Perform Transfer Rate Test | 1 | Perform a test to determine the transfer rate to the selected obje |
| Product Engineering Directed Chang | 0 | Manage temporary internal code changes from IBM PE for select |
| PSW Restart | 121 | Program status word restart |

Total: 212 Filtered: 212

Status: Exceptions and Messages

Waiting for 9.12.16.234...

Create Virtual Server - Based On Another Virtual Server

The screenshot displays the IBM Hardware Management Console interface. The browser window title is 'JENKSHMC: Hardware Management Console Workplace (Version 2.11.0) - Mozilla Firefox: IBM Edition'. The URL is 'https://9.60.92.240/hmc/connects/mainuiFrameset.jsp'. The main content area shows the 'Ensemble Management > AgParts Ensemble' view, with a table of virtual servers. A yellow callout box highlights the text: 'The New Virtual Server Based On task provides the capability to create one or more virtual servers at based on an existing virtual server.' At the bottom, the 'Tasks: Buyer 1' panel is visible, with the 'New Virtual Server Based On' task highlighted in a red box.

| Sele | Name | Membe | Hypervisc | Status | Start Automatical | Processor Manager | Workload(s) | Type | Description |
|-------------------------------------|--------------|----------|-----------|------------|-------------------|-------------------|-------------|---------|------------------------------|
| <input checked="" type="checkbox"/> | Buyer 1 | PJBONSAI | B.2.02 | Status Che | — | ✓ | Default | PowerVI | Buyer v 1.23 WAS v7.0 resour |
| <input type="checkbox"/> | Payroll Proc | PJBONSAI | B.2.01 | Status Che | — | ✓ | Default | PowerVI | Payroll Processing resources |

Max Page Size: 500 Total: 8 Filtered: 2 Selected: 1

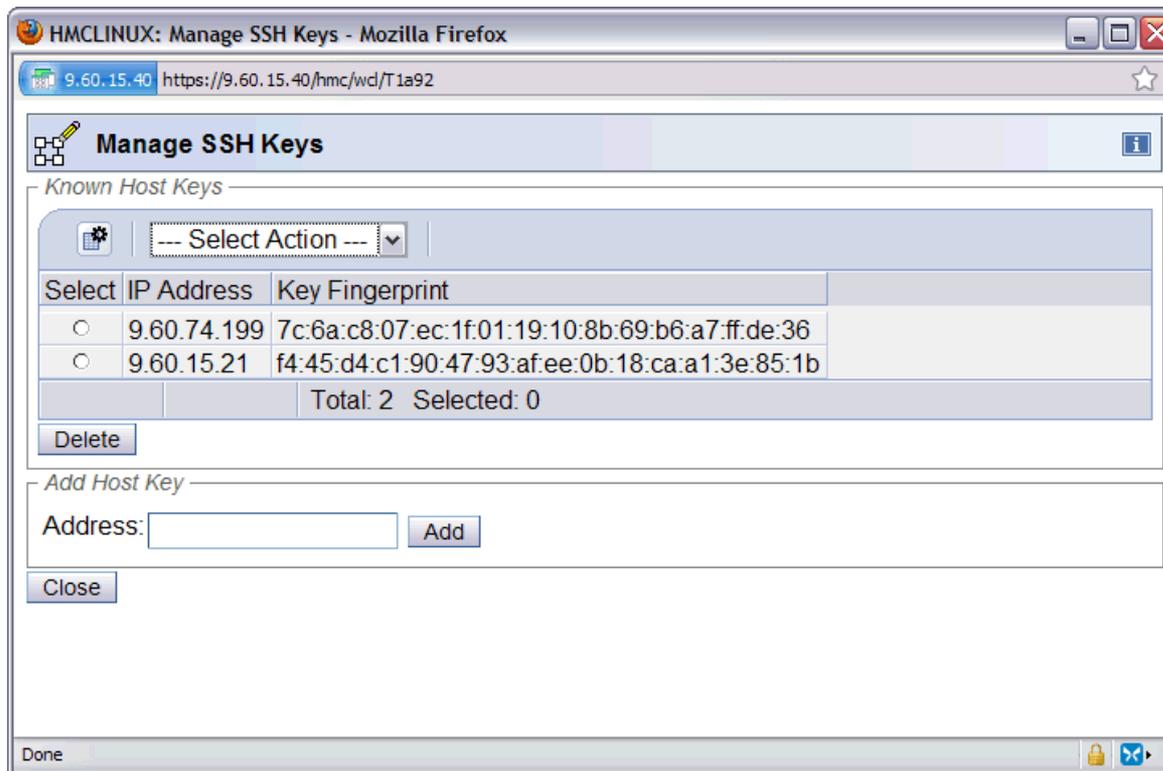
Tasks: Buyer 1

- Virtual Server Details
- Daily
 - Activate
 - Deactivate
 - Grouping
- Operational Customization
 - Customize Scheduled Operations
- Configuration
 - Delete Virtual Server
 - Migrate Virtual Server
 - Mount Virtual Media
 - Open Text Console
 - New Virtual Server Based On**

Status: Exceptions and Messages

Secure FTP Support

- Allow secure FTP connection from a HMC/SE FTP client to a customer FTP server
- SSH File Transfer Protocol which is an extension of the Secure Shell protocol
- Manage SSH Keys task allows the customer import public keys associated with a host address – added to both HMC and SE.



Secure FTP support - Tasks

- Tasks utilizing FTP now provide a selection for the Secure Host connection.
 - Input/Output (I/O) Configuration -> Import/Export Source File ->FTP Location
 - Customize Scheduled Operations (Audit and Log Management only)
 - Retrieve Internal Code -> Retrieve code changes from FTP site to the selected objects
 - Change Console Internal Code -> Retrieve Internal Code Changes ->Retrieve code changes from FTP site to the HMC
 - Advanced Facilities->Card Specific Advanced Facilities->Manual Configuration Options->Import/Export source file by FTP (For OSA-ICC PCHIDS only – Channel Type=OSC)

P1020304: Input/output (I/O) Configuration

File Transfer Information - P1020304

Please enter the target information (IP address, userid, password, and file name) that will be used for exporting, then click "OK".

Source configuration data set: A0
 Source configuration data set name: STARTER

IP address *

User identification *

Password *

Use secure FTP

OK **Cancel** **Help**

"Use secure FTP" checkbox to enable

Disruptive Action Confirmation

- User Profiles task provides option to requires text input for disruptive actions.
- The required text is either the OS Name or System Name

User Properties

Timeout Values

Session timeout minutes:

Verify timeout minutes:

Idle timeout minutes:

Minimum time in minutes between password changes:

Invalid Login Attempt Values

Maximum failed attempts before disable delay:

Disable delay in minutes:

Inactivity Values

Disable for inactivity in days:

Never disable for inactivity

Disruptive Confirmations

Require password for disruptive actions

Require text input for disruptive actions

Allow remote access via the web

OK Cancel Help

New "Require text input for disruptive actions" checkbox

Disruptive Action Confirmation - Deactivate



Disruptive Task Confirmation : Deactivate - GDLVMBUV



Attention: The Deactivate task is disruptive.

Executing the Deactivate task may adversely affect the objects listed below. Review the confirmation text for each object before continuing with the task.

Objects that will be

The Operating System Name was added to the Disruptive Action Confirmation panel.

| System Name | Type | OS Name | Status | Confirmation Text |
|-------------------|-------|----------|-----------|--|
| GDLVMBUV:CECSIMVM | Image | GDLVMBUV | Operating | Deactivate causes operations to be disrupted, since the target is currently in use and operating normally. |
| GDLVMBUV:ZLNK | Image | | Operating | Deactivate causes operations to be disrupted, since the target is currently in use and operating normally. |
| GDLVMBUV:ZVM53 | Image | ZVMV5R30 | Operating | Deactivate causes operations to be disrupted, since the target is currently in use and operating normally. |
| GDLVMBUV:ZVM54 | Image | ZVMV5R40 | Operating | Deactivate causes operations to be disrupted, since the target is currently in use and operating normally. |
| GDLVMBUV:ZVM61 | Image | ZFWVMTS1 | Operating | Deactivate causes operations to be disrupted, since the target is currently in use and operating normally. |

Do you want to execute the Deactivate task?

Type the password below for user "SYSPROG" then click "Yes".

Yes

No

Help

Disruptive Action Confirmation – Deactivate Text Entry



Disruptive Task Confirmation : Deactivate



Attention: The Deactivate task is disruptive.

Executing the Deactivate task may adversely affect the objects listed below. Review the confirmation text for each object before continuing with the Deactivate task.

Objects that will be affected by the Deactivate task are:

New Confirmation Text entry field

| System Name | Type | OS Name | Status | Confirmation Text | Confirmation Status |
|-------------|-------|---------|-----------|----------------------|---------------------|
| LP01 | Image | | Operating | <input type="text"/> | |
| LP02 | Image | | Operating | <input type="text"/> | |
| LP03 | Image | | Operating | <input type="text"/> | |

Type the OS Name, if available, otherwise the System Name as the confirmation text for the objects which still need to be confirmed, then click "Confirm". Otherwise click "Cancel" to cancel this task.

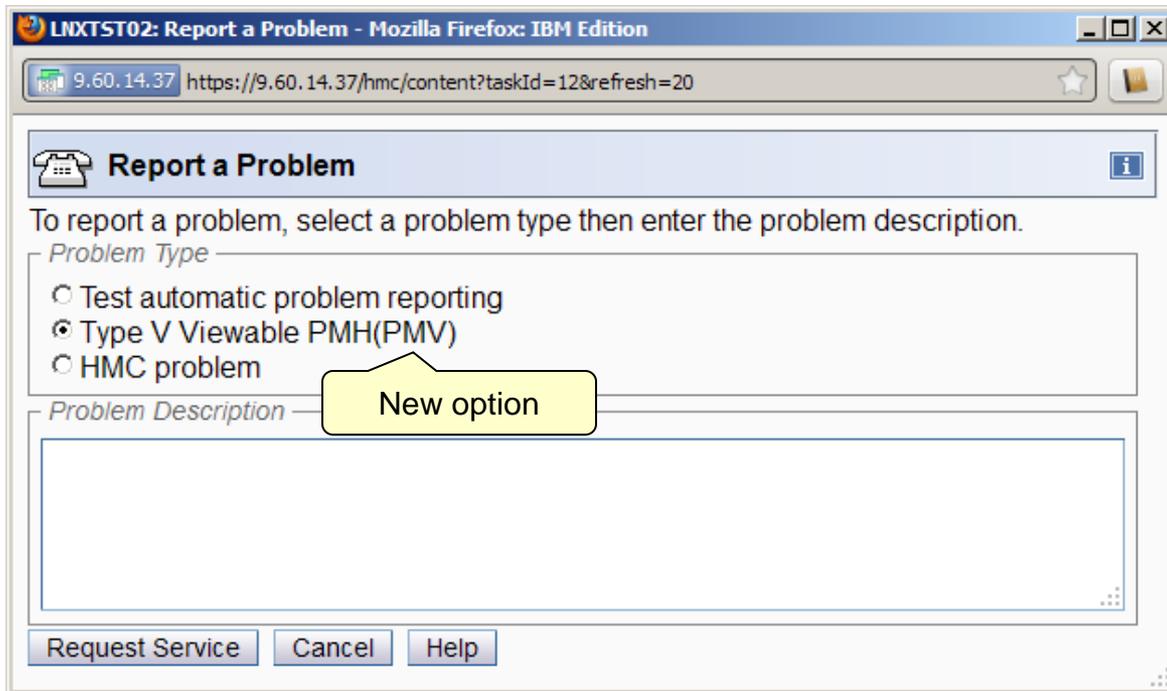
Confirm

Cancel

Help

Problem Management Viewable (PMV) Records

- Create, View, or Edit Problem Management Viewable (PMV) records issued to the IBM Service Support System (Retain) for the Hardware Management Console or selected servers (CPCs).
- Typically used to report issues to the IBM Service Support System for errors that are not automatically recorded by the console.



Report a Problem

To report a problem, select a problem type then enter the problem description.

Problem Type

Test automatic problem reporting

Type V Viewable PMH(PMV)

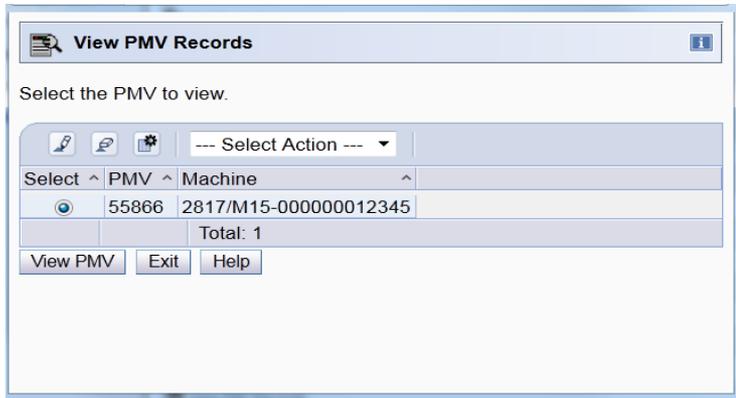
HMC problem

Problem Description

Request Service Cancel Help

Problem Management Viewable (PMV) Records – View, Edit, Comment

- View, edit, or add comments to PMV records to interact with IBM service



View PMV Records

Details of PMV 55866

```

+SYSTEM GENERATED TEXT--D/T2817PMV--                               11/12/13-21:04 -UT
PROB TYPE: V                CONNECT ID: 0
CPN: 3      REF: 28000911 REF_EXT: 00000000 REF_EXT2: 00000000 STATUS: 00
CEC LOCATION: A00M CEC S/N: 000060004135 HMC M/T: 7327  HMC MOD: PAA
COMPILE ID: PCOMFILE
CONCURRENT: UNKNOWN
REFERENCE CODE SEARCH LIST NOT AVAILABLE
FRU INFORMATION NOT AVAILABLE
+SYSTEM GENERATED TEXT--D/T2817PMV--                               11/12/13-21:04 -UT
CURRENT EC/CHANGE LEVEL STATUS:
SUBSYSTEM -EC LEVEL  -P/N  -MCL (RCD) (ACT) (ACC) -ACT DATE & TIME
SYSTEM     N48180    45D8928      210  210  55   12-13-2011 15:26
ENABLE3    N48175    41U8030       0    0    0    00-00-0000 00:00
PUBS       N48178    45D8926       0    0    0    00-00-0000 00:00
          
```

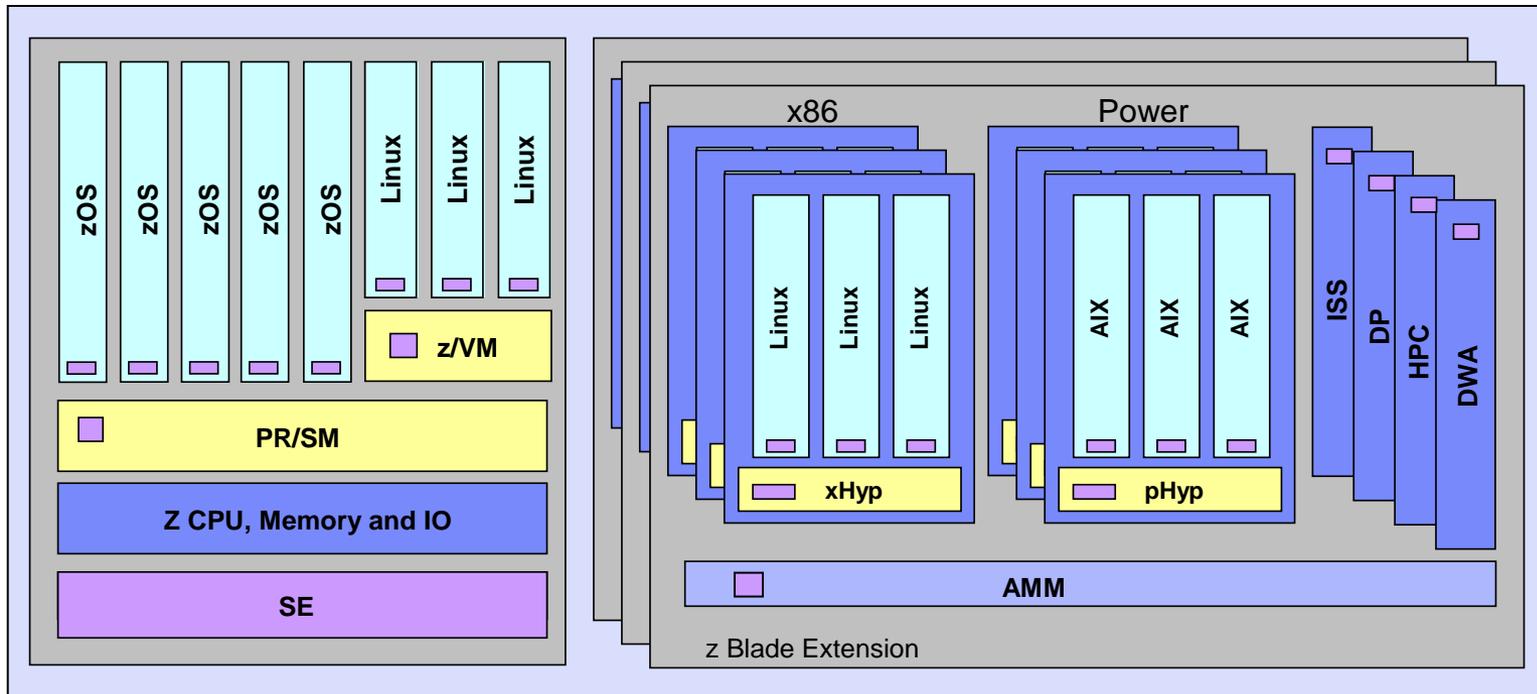
Add Comment
Refresh PMV
Add Attachment
View Available Attachments
View Downloaded Attachments
Cancel

Information and Education Resources – Resource Link

- IBM Resource Link (<http://www.ibm.com/servers/resourcelink>)
 - System z HW publication library - click on "Library"
<https://www.ibm.com/servers/resourcelink/hom03010.nsf/pages/library?OpenDocument&login>
 - System z HW education & Hardware Management Console, click on "Education"
<https://www.ibm.com/servers/resourcelink/hom03010.nsf/pages/education?OpenDocument&login>
 - System z HW Customer Initiated Upgrade, click on "Customer initiated upgrade"
<https://www.ibm.com/servers/resourcelink/hom03010.nsf/pages/customerInitiatedUpgrade?OpenDocument&login>

Backup

Unified Resource Manager GA1 Recap



- Unified Resource Manager GA1 put in place the building blocks:
 - Consistent hardware management of Z, P and X resources
 - Integrated POWER and System X hypervisors managed as System Z components
 - Fully encapsulated management network to allow secure and reliable control
 - Firmware managed data network to provide interconnect at application level
 - Virtualization management across Z, P and X hypervisors
 - Policy based workload optimization managed by firmware

HMC System Support

- The new HMC Version 2.11.1 will support the systems/SE (Support Element) versions shown in the table.
- The 2.11.1 HMC will support up to two 10/100/1000 Mb Ethernet LANs (1 Gb LAN support)
 - Optional HMC External Switch available as 1 Gb
 - Internal z196 switch for HMC to SE LAN connection has 1 Gb ports

| Machine Family | Machine Type | Firmware Driver | SE Version |
|----------------|--------------|-----------------|-------------------|
| z114 | 2818 | 93 | 2.11.1 |
| z196 | 2817 | 93, 86 | 2.11.1, 2.11.0 |
| z10 BC | 2098 | 79 | 2.10.2 |
| z10 EC | 2097 | 79 | 2.10.2 |
| z9 BC | 2096 | 67 | 2.9.2 |
| z9 EC | 2094 | 67 | 2.9.2 |
| z890 | 2086 | 55 | 1.8.2 |
| z990 | 2084 | 55 | 1.8.2 |
| z800 | 2066 | 3G | 1.7.3 |
| z900 | 2064 | 3G | 1.7.3 |
| 9672 G6 | 9672/9674 | 26 | 1.6.2 |
| 9672 G5 | 9672/9674 | 26 | 1.6.2 |