SHARE in Pittsburgh – Session 15802

Introduction to the Hardware Management Console UI and API

Monday, August 4th 2014

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HMC Development

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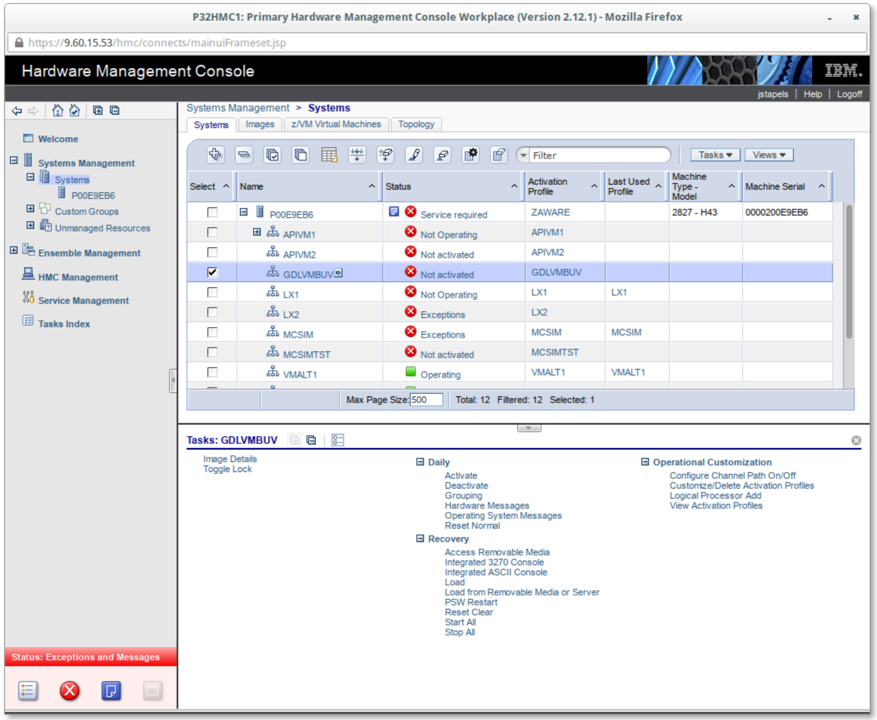
Agenda

- HMC User Interface
  - Tree Style and Classic Style
  - Changing Layout Preferences
  - Animated Tours & Tutorials
  - Classic Style Layout
  - Tree Style Layout
  - Wizard / Details Tasks
- HMC Application Programmer Interfaces
  - Overview
  - CIM
  - SNMP
  - Web Services API

HMC User Interface

HMC User Interface – Default UI Style

Tree Style (default)



P32HMC1: Primary Hardware Management Console Workplace (Version 2.12.1) - Mozilla Firefox

https://9.60.15.53/hmc/connects/mainuiFrameset.jsp

Hardware Management Console

jstapels | Help | Logoff

- Welcome
- ⊟ Systems Management
  - ⊟ Systems
    - P00E9EB6
  - ⊞ Custom Groups
  - ⊞ Unmanaged Resources
- ⊞ Ensemble Management
- HMC Management
- Service Management
- Tasks Index

Status: Exceptions and Messages

Systems Management > **Systems**

Systems | Images | z/VM Virtual Machines | Topology

Filter | Tasks ▾ | Views ▾

Select	Name	Status	Activation Profile	Last Used Profile	Machine Type - Model	Machine Serial
☐	⊟ P00E9EB6	Service required	ZAWARE		2827 - H43	0000200E9EB6
☐	⊞ APIVM1	Not Operating	APIVM1			
☐	APIVM2	Not activated	APIVM2			
☑	GDLVMBUV	Not activated	GDLVMBUV			
☐	LX1	Not Operating	LX1	LX1		
☐	LX2	Exceptions	LX2			
☐	MCSIM	Exceptions	MCSIM	MCSIM		
☐	MCSIMTST	Not activated	MCSIMTST			
☐	VMALT1	Operating	VMALT1	VMALT1		

Max Page Size: 500 Total: 12 Filtered: 12 Selected: 1

Tasks: GDLVMBUV

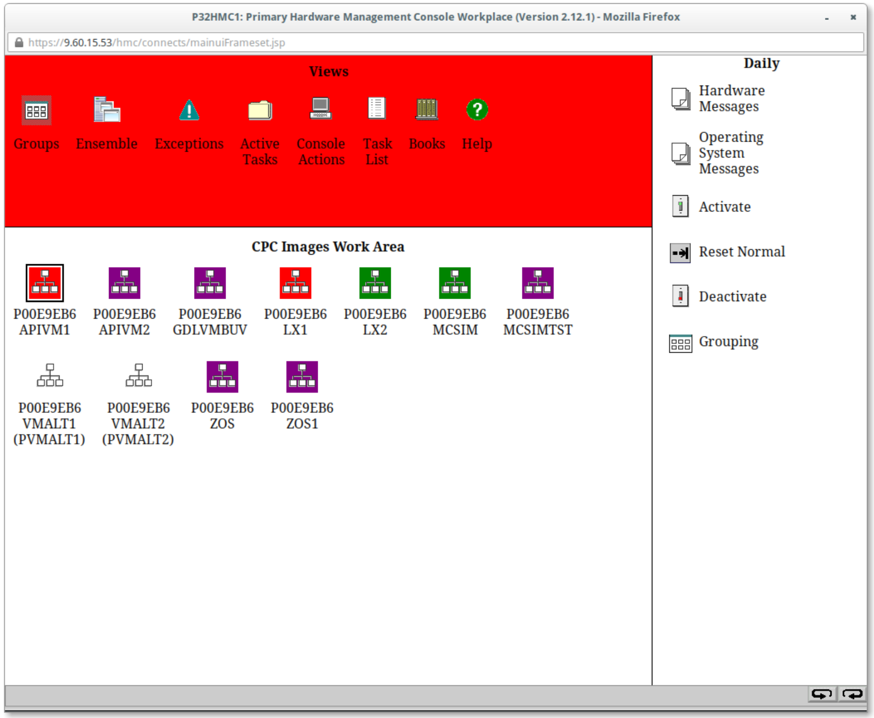
Image Details
Toggle Lock

⊟ Daily
- Activate
- Deactivate
- Grouping
- Hardware Messages
- Operating System Messages
- Reset Normal

⊟ Recovery
- Access Removable Media
- Integrated 3270 Console
- Integrated ASCII Console
- Load
- Load from Removable Media or Server
- PSW Restart
- Reset Clear
- Start All
- Stop All

⊟ Operational Customization
- Configure Channel Path On/Off
- Customize/Delete Activation Profiles
- Logical Processor Add
- View Activation Profiles

Classic Style (optional)



P32HMC1: Primary Hardware Management Console Workplace (Version 2.12.1) - Mozilla Firefox

https://9.60.15.53/hmc/connects/mainuiFrameset.jsp

Views

Groups | Ensemble | Exceptions | Active Tasks | Console Actions | Task List | Books | Help

CPC Images Work Area

P00E9EB6 APIVM1 | P00E9EB6 APIVM2 | P00E9EB6 GDLVMBUV | P00E9EB6 LX1 | P00E9EB6 LX2 | P00E9EB6 MCSIM | P00E9EB6 MCSIMTST

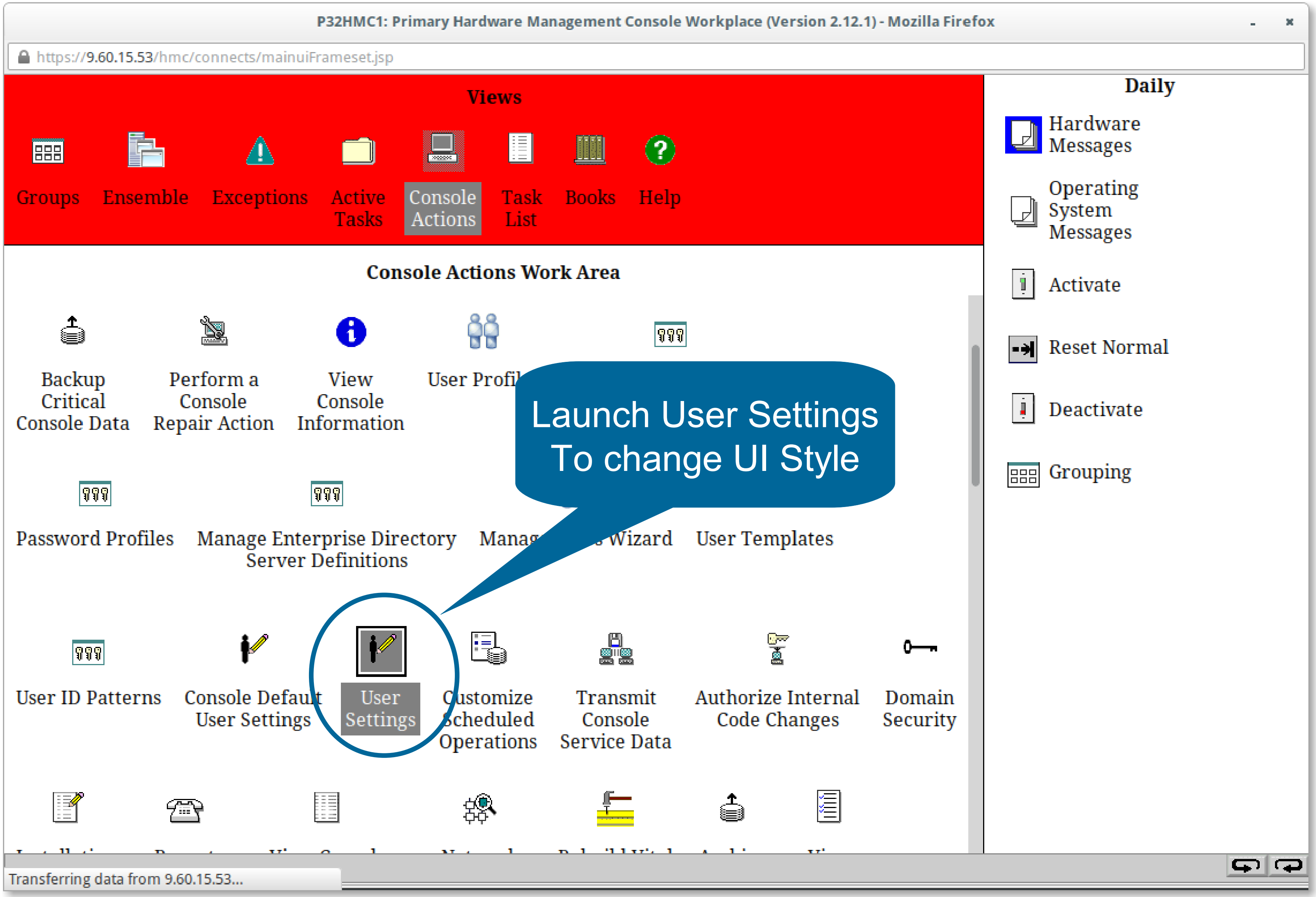
P00E9EB6 VMALT1 (PVMALT1) | P00E9EB6 VMALT2 (PVMALT2) | P00E9EB6 ZOS | P00E9EB6 ZOS1

Daily

- Hardware Messages
- Operating System Messages
- Activate
- Reset Normal
- Deactivate
- Grouping

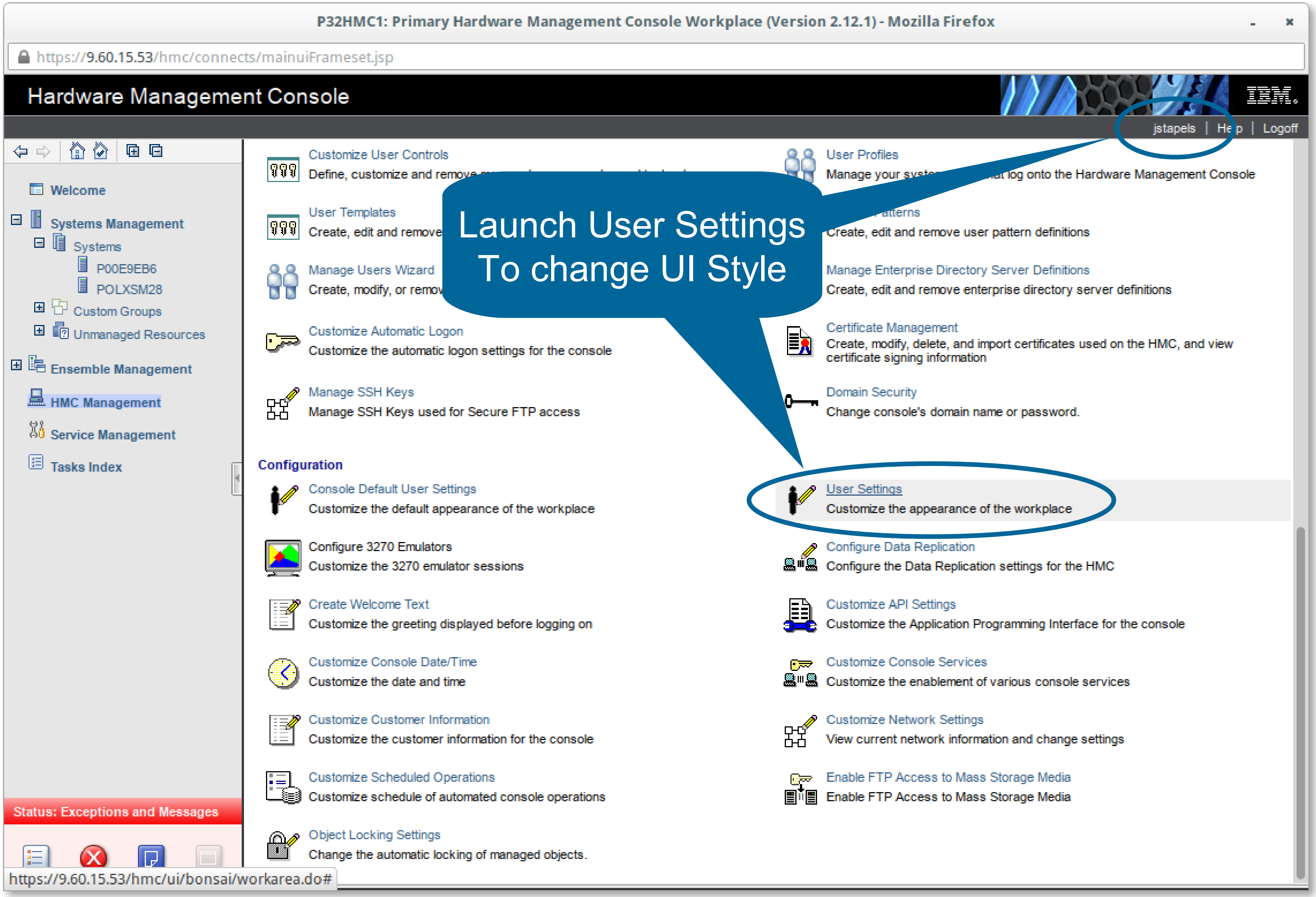
- New users and new installs use Tree Style as default
- PEMODE and SERVICE Ids default to “Classic” style
- Upgrades will retain existing user preferences
- UI style change is immediate – no log off required

HMC User Interface – User Settings (Classic UI)


P32HMC1: Primary Hardware Management Console Workplace (Version 2.12.1) - Mozilla Firefox
https://9.60.15.53/hmc/connects/mainuiFrameset.jsp
Views
Groups
Ensemble
Exceptions
Active Tasks
Console Actions
Task List
Books
Help
Console Actions Work Area
Backup Critical Console Data
Perform a Console Repair Action
View Console Information
User Profil
Password Profiles
Manage Enterprise Directory Server Definitions
Manag
s Wizard
User Templates
User ID Patterns
Console Defaul User Settings
User Settings
Customize Scheduled Operations
Transmit Console Service Data
Authorize Internal Code Changes
Domain Security
Daily
Hardware Messages
Operating System Messages
Activate
Reset Normal
Deactivate
Grouping
Transferring data from 9.60.15.53...

Launch User Settings To change UI Style

HMC User Interface – User Settings (Tree UI)



P32HMC1: Primary Hardware Management Console Workplace (Version 2.12.1) - Mozilla Firefox

https://9.60.15.53/hmc/connects/mainuiFrameset.jsp

Hardware Management Console

jstapels | Help | Logoff

Customize User Controls
Define, customize and remove

User Profiles
Manage your syste... at log onto the Hardware Management Console

User Templates
Create, edit and remove

...atterns
Create, edit and remove user pattern definitions

Manage Users Wizard
Create, modify, or remov

Manage Enterprise Directory Server Definitions
Create, edit and remove enterprise directory server definitions

Customize Automatic Logon
Customize the automatic logon settings for the console

Certificate Management
Create, modify, delete, and import certificates used on the HMC, and view certificate signing information

Manage SSH Keys
Manage SSH Keys used for Secure FTP access

Domain Security
Change console's domain name or password.

Configuration

Console Default User Settings
Customize the default appearance of the workplace

User Settings
Customize the appearance of the workplace

Configure 3270 Emulators
Customize the 3270 emulator sessions

Configure Data Replication
Configure the Data Replication settings for the HMC

Create Welcome Text
Customize the greeting displayed before logging on

Customize API Settings
Customize the Application Programming Interface for the console

Customize Console Date/Time
Customize the date and time

Customize Console Services
Customize the enablement of various console services

Customize Customer Information
Customize the customer information for the console

Customize Network Settings
View current network information and change settings

Customize Scheduled Operations
Customize schedule of automated console operations

Enable FTP Access to Mass Storage Media
Enable FTP Access to Mass Storage Media

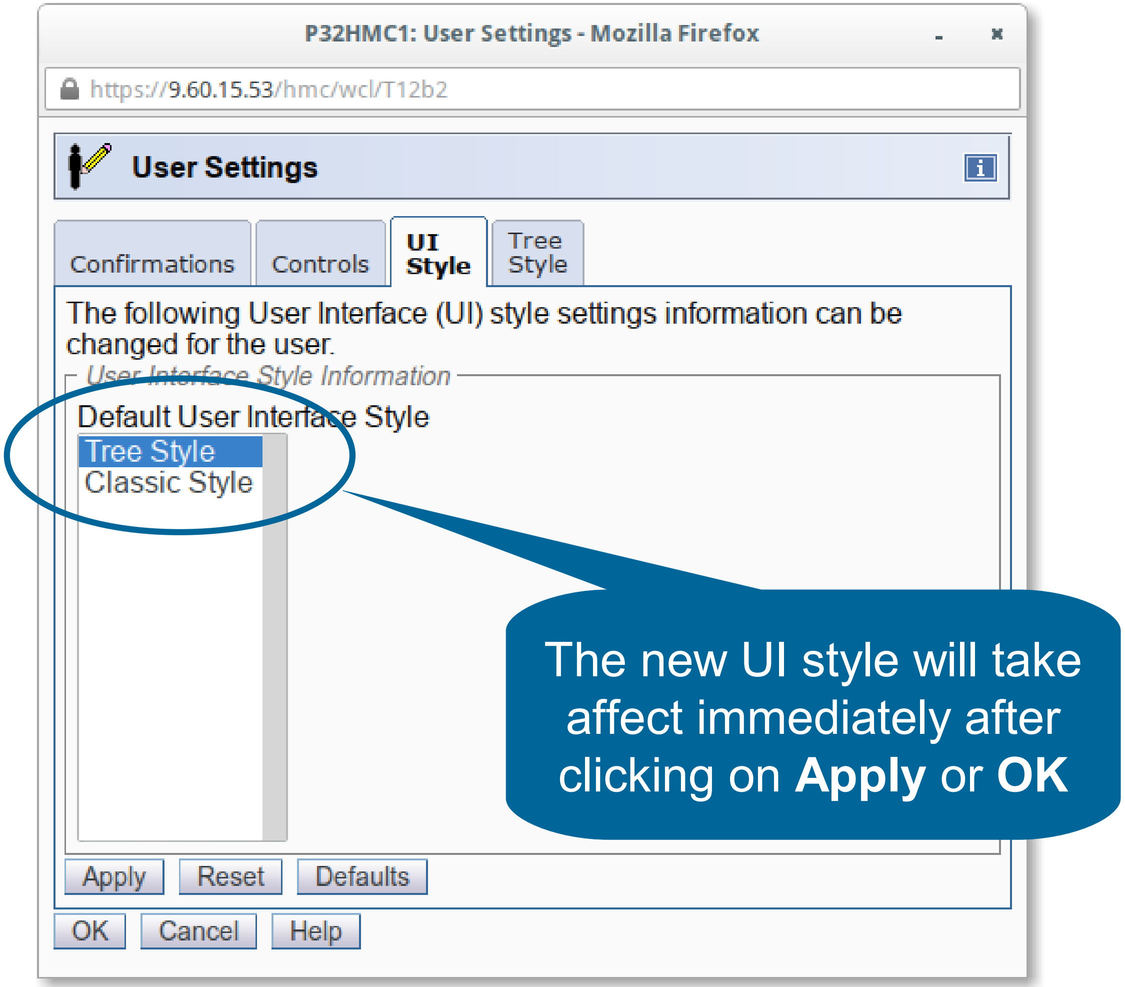
Object Locking Settings
Change the automatic locking of managed objects.

https://9.60.15.53/hmc/ui/bonsai/workarea.do#

Launch User Settings
To change UI Style

HMC User Interface – User Settings (UI Style)

- Select **UI Style** tab and then choose the user interface style



The following User Interface (UI) style settings information can be changed for the user.

User Interface Style Information

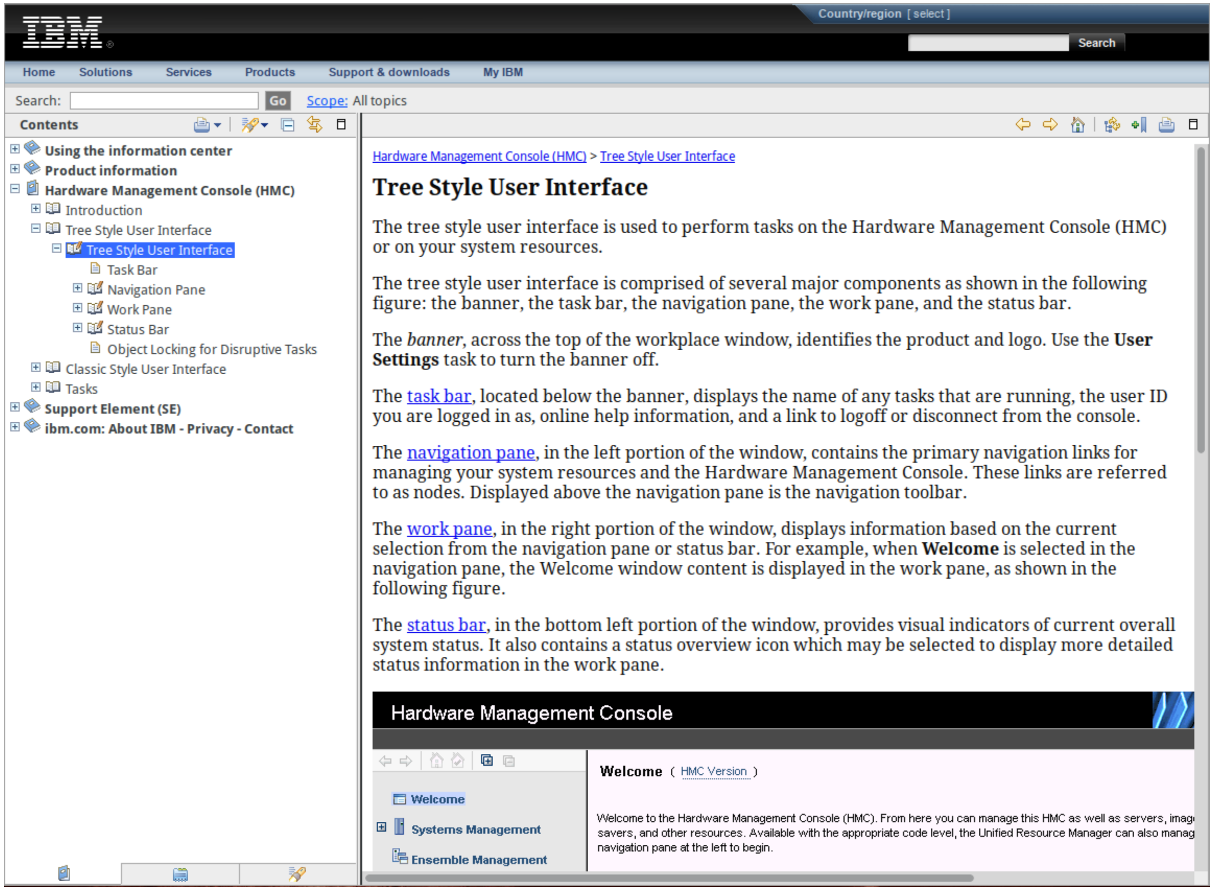
Default User Interface Style

- Tree Style
- Classic Style

The new UI style will take affect immediately after clicking on **Apply** or **OK**

HMC User Interface – Getting Help

- Help can be found on IBM Information Center
  - http://pic.dhe.ibm.com/infocenter/hwmca/v2r12m1/index.jsp



- Using the information center
- Product information
- Hardware Management Console (HMC)
  - Introduction
  - Tree Style User Interface
    - Tree Style User Interface
      - Task Bar
      - Navigation Pane
      - Work Pane
      - Status Bar
      - Object Locking for Disruptive Tasks
  - Classic Style User Interface
  - Tasks
- Support Element (SE)
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Hardware Management Console (HMC) > Tree Style User Interface

Tree Style User Interface

The tree style user interface is used to perform tasks on the Hardware Management Console (HMC) or on your system resources.

The tree style user interface is comprised of several major components as shown in the following figure: the banner, the task bar, the navigation pane, the work pane, and the status bar.

The *banner*, across the top of the workplace window, identifies the product and logo. Use the **User Settings** task to turn the banner off.

The task bar, located below the banner, displays the name of any tasks that are running, the user ID you are logged in as, online help information, and a link to logoff or disconnect from the console.

The navigation pane, in the left portion of the window, contains the primary navigation links for managing your system resources and the Hardware Management Console. These links are referred to as nodes. Displayed above the navigation pane is the navigation toolbar.

The work pane, in the right portion of the window, displays information based on the current selection from the navigation pane or status bar. For example, when **Welcome** is selected in the navigation pane, the Welcome window content is displayed in the work pane, as shown in the following figure.

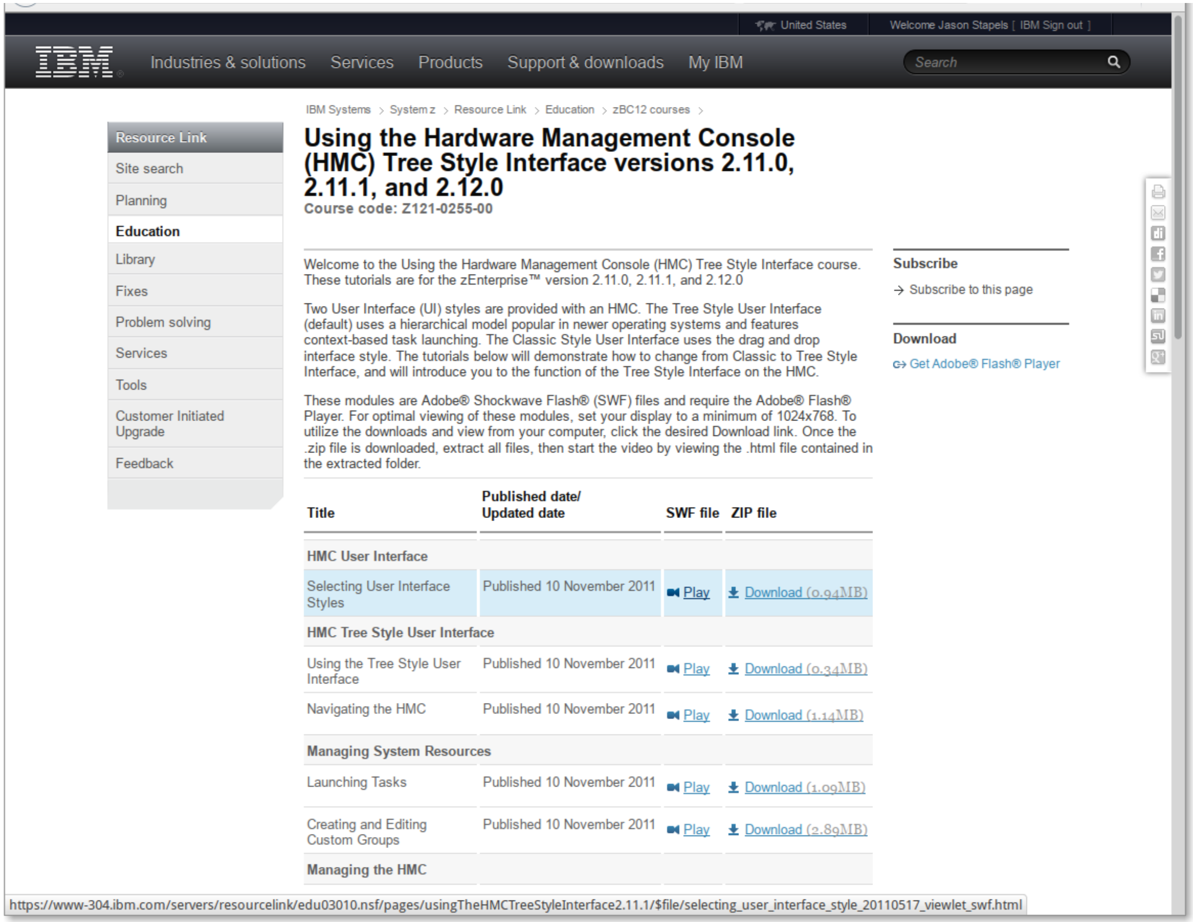
The status bar, in the bottom left portion of the window, provides visual indicators of current overall system status. It also contains a status overview icon which may be selected to display more detailed status information in the work pane.

Welcome (HMC Version)

Welcome to the Hardware Management Console (HMC). From here you can manage this HMC as well as servers, imag
savers, and other resources. Available with the appropriate code level, the Unified Resource Manager can also manag
navigation pane at the left to begin.

HMC User Interface – Getting Help (cont.)

- Walkthroughs & tutorials can be found on IBM Resource Link
  - http://www.ibm.com/servers/resourcelink



Using the Hardware Management Console (HMC) Tree Style Interface versions 2.11.0, 2.11.1, and 2.12.0

Course code: Z121-0255-00

Welcome to the Using the Hardware Management Console (HMC) Tree Style Interface course. These tutorials are for the zEnterprise™ version 2.11.0, 2.11.1, and 2.12.0

Two User Interface (UI) styles are provided with an HMC. The Tree Style User Interface (default) uses a hierarchical model popular in newer operating systems and features context-based task launching. The Classic Style User Interface uses the drag and drop interface style. The tutorials below will demonstrate how to change from Classic to Tree Style Interface, and will introduce you to the function of the Tree Style Interface on the HMC.

These modules are Adobe® Shockwave Flash® (SWF) files and require the Adobe® Flash® Player. For optimal viewing of these modules, set your display to a minimum of 1024x768. To utilize the downloads and view from your computer, click the desired Download link. Once the .zip file is downloaded, extract all files, then start the video by viewing the .html file contained in the extracted folder.

Title	Published date/ Updated date	SWF file	ZIP file
HMC User Interface			
Selecting User Interface Styles	Published 10 November 2011	Play	Download (0.94MB)
HMC Tree Style User Interface			
Using the Tree Style User Interface	Published 10 November 2011	Play	Download (0.34MB)
Navigating the HMC	Published 10 November 2011	Play	Download (1.14MB)
Managing System Resources			
Launching Tasks	Published 10 November 2011	Play	Download (1.09MB)
Creating and Editing Custom Groups	Published 10 November 2011	Play	Download (2.89MB)
Managing the HMC			

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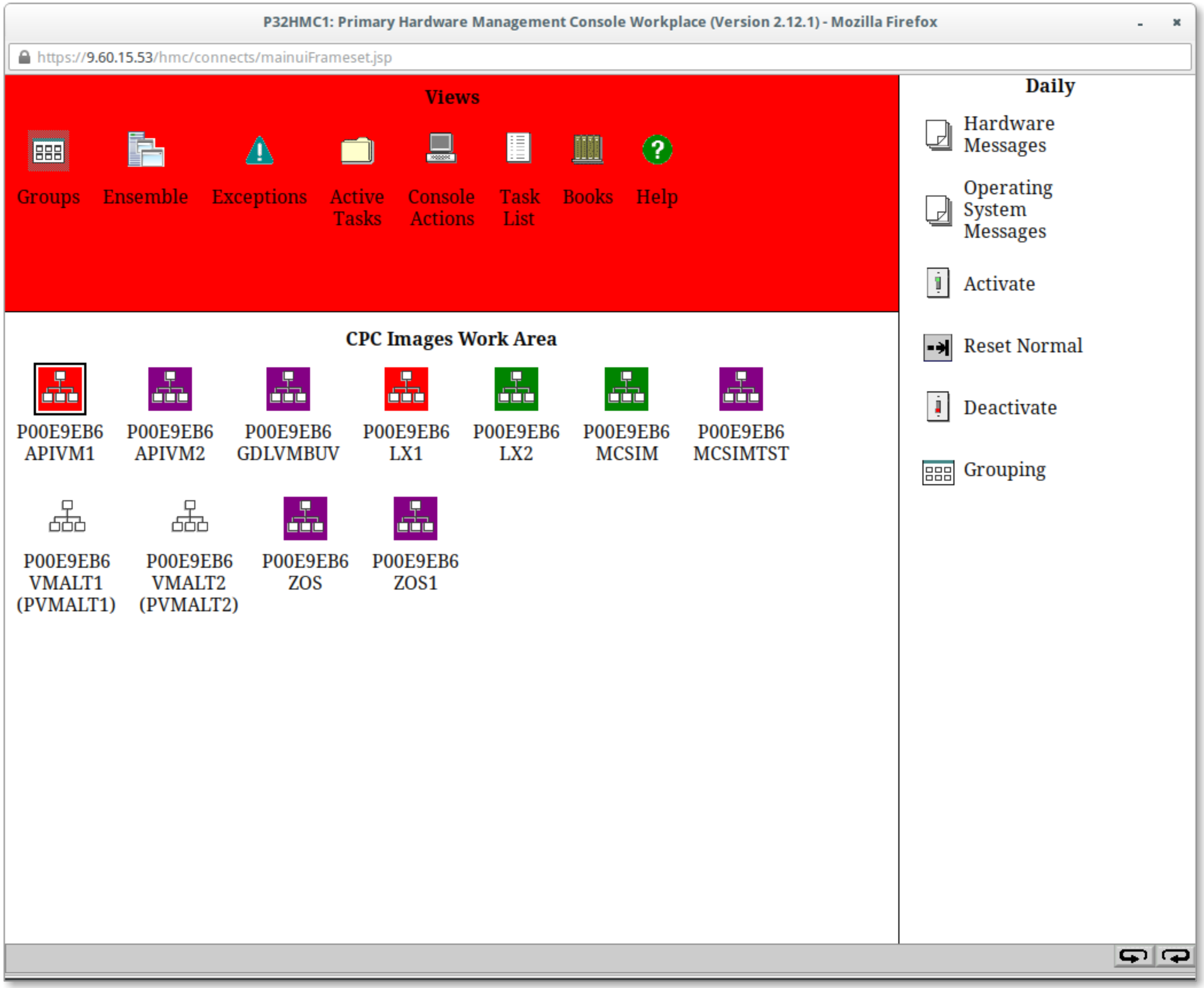
https://www-304.ibm.com/servers/resourcelink/edu03010.nsf/pages/usingTheHMCTreeStyleInterface2.11.1/$file/selecting_user_interface_style_20110517_viewlet_swf.html

HMC User Interface – Classic Style Layout



P32HMC1: Primary Hardware Management Console Workplace (Version 2.12.1) - Mozilla Firefox

https://9.60.15.53/hmc/connects/mainuiFrameset.jsp

Views

Groups · Ensemble · Exceptions · Active Tasks · Console Actions · Task List · Books · Help

CPC Images Work Area

P00E9EB6 APIVM1 · P00E9EB6 APIVM2 · P00E9EB6 GDLVMBUV · P00E9EB6 LX1 · P00E9EB6 LX2 · P00E9EB6 MCSIM · P00E9EB6 MCSIMTST

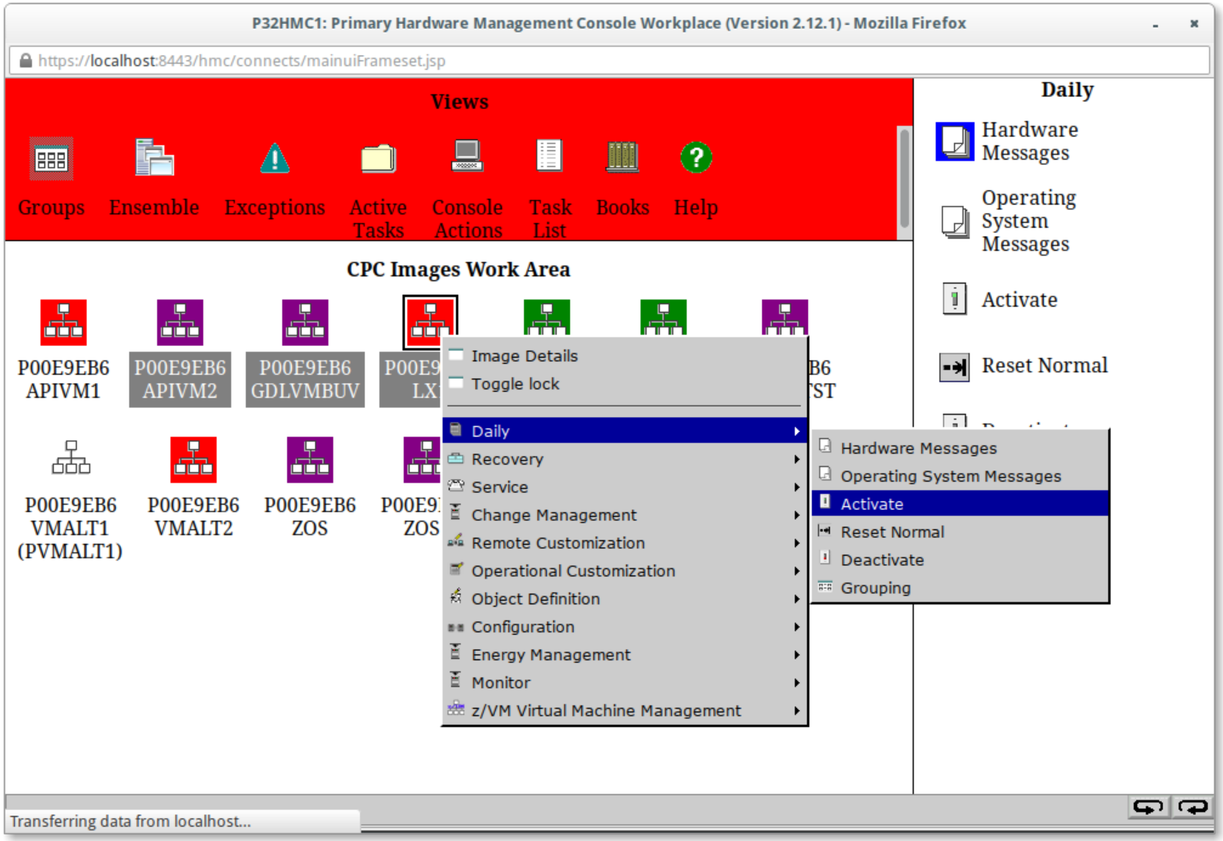
P00E9EB6 VMALT1 (PVMALT1) · P00E9EB6 VMALT2 (PVMALT2) · P00E9EB6 ZOS · P00E9EB6 ZOS1

Daily

- Hardware Messages
- Operating System Messages
- Activate
- Reset Normal
- Deactivate
- Grouping

HMC User Interface – Classic Style Layout (cont.)

- Tasks can be launched against targets:
  - Through a right-click pop-up menu
  - Dragging and dropping on the task



P32HMC1: Primary Hardware Management Console Workplace (Version 2.12.1) - Mozilla Firefox

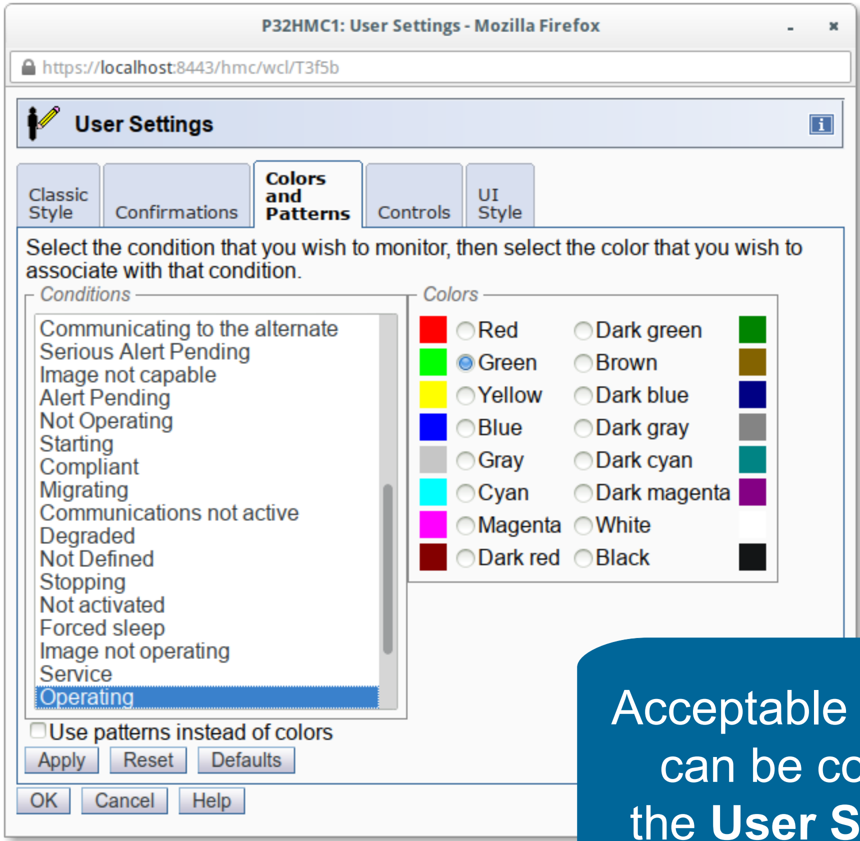
https://localhost:8443/hmc/connects/mainuiFrameset.jsp

Transferring data from localhost...

HMC User Interface – Classic Style Layout (cont.)

- Classic Style UI uses colors and patterns to identify statuses
  - Configured in the **User Settings** task

User Settings



P32HMC1: User Settings - Mozilla Firefox

https://localhost:8443/hmc/wcl/T3f5b

User Settings

Select the condition that you wish to monitor, then select the color that you wish to associate with that condition.

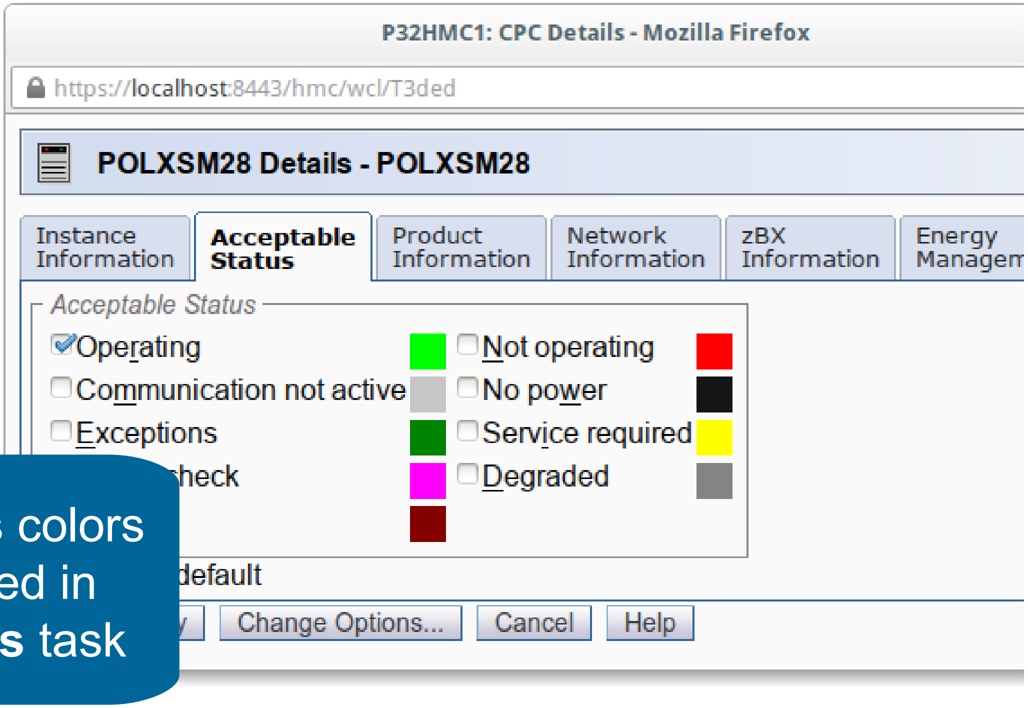
Conditions

Communicating to the alternate
Serious Alert Pending
Image not capable
Alert Pending
Not Operating
Starting
Compliant
Migrating
Communications not active
Degraded
Not Defined
Stopping
Not activated
Forced sleep
Image not operating
Service
Operating

Colors

🟥 ○ Red	○ Dark green 🟩		
🟩 ● Green	○ Brown 🟫		
🟨 ○ Yellow	○ Dark blue 🟦		
🟦 ○ Blue	○ Dark gray ⬛		
⬜ ○ Gray	○ Dark cyan 🟦		
🟦 ○ Cyan	○ Dark magenta 🟪		
🟪 ○ Magenta	○ White ⬜		
🟥 ○ Dark red	○ Black ⬛		

□ Use patterns instead of colors



P32HMC1: CPC Details - Mozilla Firefox

https://localhost:8443/hmc/wcl/T3ded

POLXSM28 Details - POLXSM28

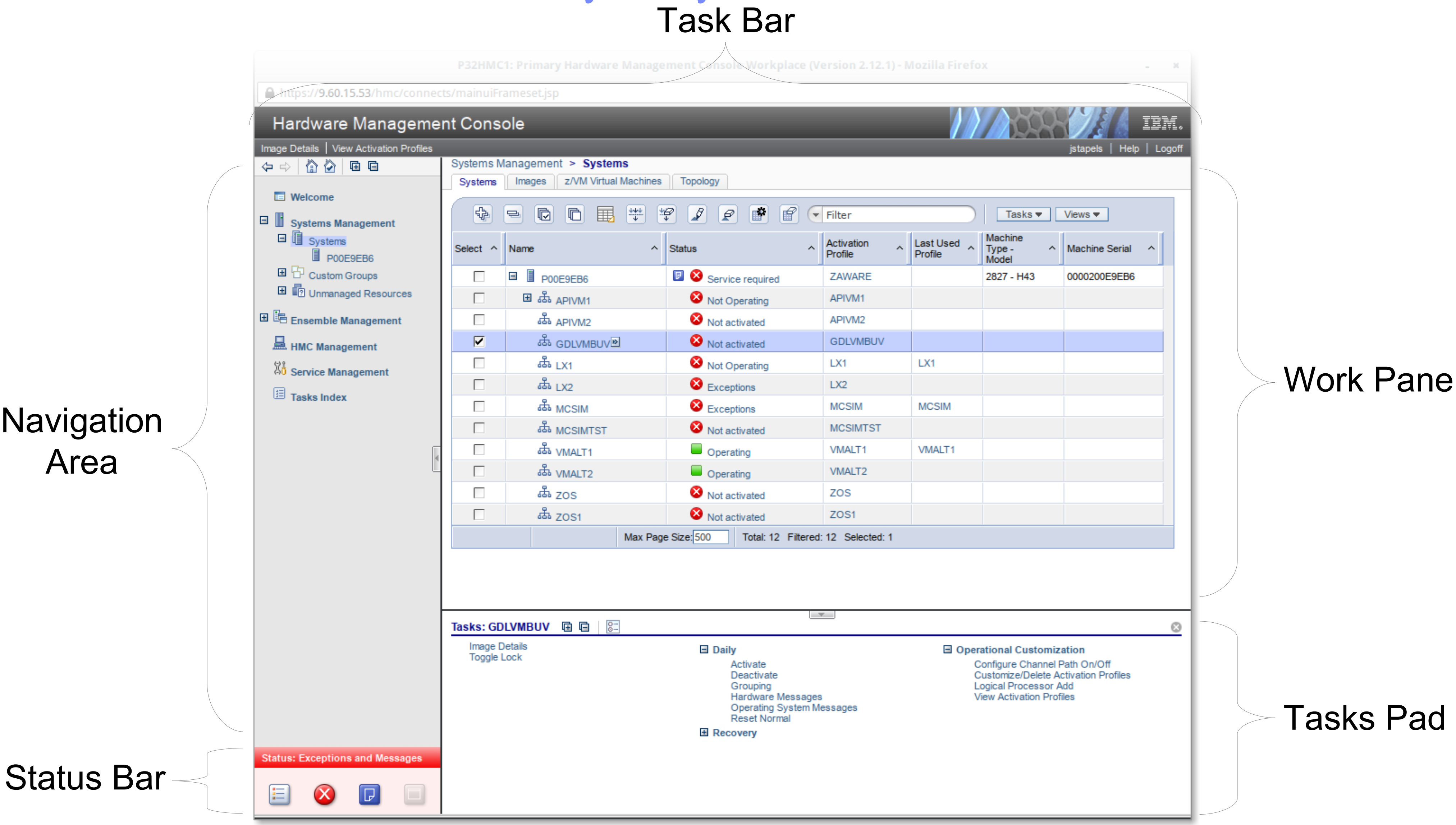
Acceptable Status

☑ Operating 🟩 □ Not operating 🟥
□ Communication not active ⬜ □ No power ⬛
□ Exceptions 🟩 □ Service required 🟨
heck 🟪 □ Degraded ⬛
🟥

default

Acceptable Status colors can be configured in the **User Settings** task

HMC User Interface – Tree Style Layout



P32HMC1: Primary Hardware Management Console Workplace (Version 2.12.1) - Mozilla Firefox

https://9.60.15.53/hmc/connects/mainuiFrameset.jsp

Hardware Management Console

Image Details | View Activation Profiles   jstapels | Help | Logoff

- Welcome
- ⊟ Systems Management
  - ⊟ Systems
    - P00E9EB6
  - ⊞ Custom Groups
  - ⊞ Unmanaged Resources
- ⊞ Ensemble Management
- HMC Management
- Service Management
- Tasks Index

Status: Exceptions and Messages

Systems Management > **Systems**

Systems | Images | z/VM Virtual Machines | Topology

Filter   Tasks ▾   Views ▾

Select	Name	Status	Activation Profile	Last Used Profile	Machine Type - Model	Machine Serial
□	⊟ P00E9EB6	Service required	ZAWARE		2827 - H43	0000200E9EB6
□	⊞ APIVM1	Not Operating	APIVM1			
□	APIVM2	Not activated	APIVM2			
☑	GDLVMBUV	Not activated	GDLVMBUV			
□	LX1	Not Operating	LX1	LX1		
□	LX2	Exceptions	LX2			
□	MCSIM	Exceptions	MCSIM	MCSIM		
□	MCSIMTST	Not activated	MCSIMTST			
□	VMALT1	Operating	VMALT1	VMALT1		
□	VMALT2	Operating	VMALT2			
□	ZOS	Not activated	ZOS			
□	ZOS1	Not activated	ZOS1			

Max Page Size: 500   Total: 12   Filtered: 12   Selected: 1

Tasks: GDLVMBUV

Image Details
Toggle Lock

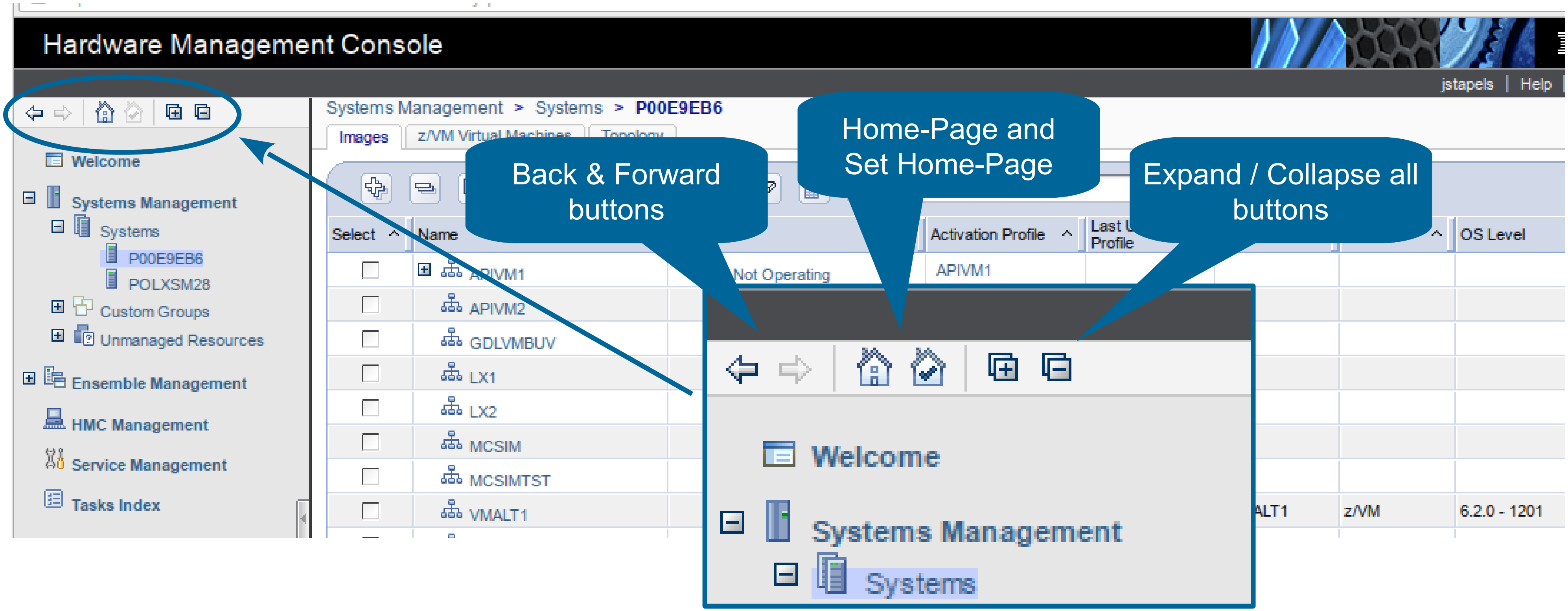
⊟ Daily
- Activate
- Deactivate
- Grouping
- Hardware Messages
- Operating System Messages
- Reset Normal

⊞ Recovery

⊟ Operational Customization
- Configure Channel Path On/Off
- Customize/Delete Activation Profiles
- Logical Processor Add
- View Activation Profiles

HMC User Interface – Navigation Area

- Allows quickly jumping between sections of the Tree UI
- Navigate between previous selections
- Set a homepage



Back & Forward buttons

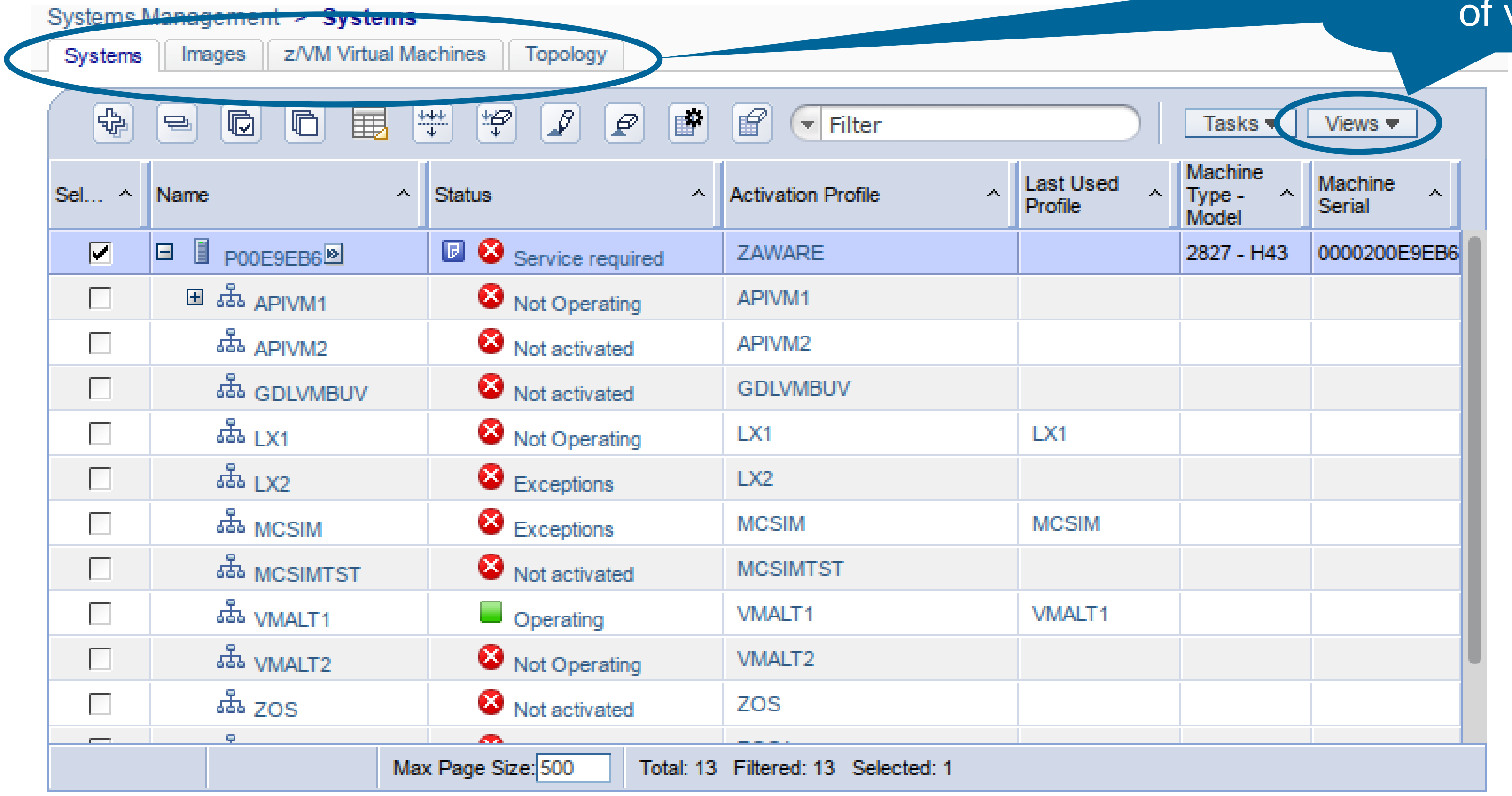
Home-Page and Set Home-Page

Expand / Collapse all buttons

HMC User Interface – Work Pane

- Lists objects based on your current navigation area
- View properties and perform operations

Switch between different types of views



Sel...	Name	Status	Activation Profile	Last Used Profile	Machine Type - Model	Machine Serial
☑	⊟ P00E9EB6	Service required	ZAWARE		2827 - H43	0000200E9EB6
□	⊞ APIVM1	Not Operating	APIVM1			
□	APIVM2	Not activated	APIVM2			
□	GDLVMBUV	Not activated	GDLVMBUV			
□	LX1	Not Operating	LX1	LX1		
□	LX2	Exceptions	LX2			
□	MCSIM	Exceptions	MCSIM	MCSIM		
□	MCSIMTST	Not activated	MCSIMTST			
□	VMALT1	Operating	VMALT1	VMALT1		
□	VMALT2	Not Operating	VMALT2			
□	ZOS	Not activated	ZOS			

Max Page Size: 500 Total: 13 Filtered: 13 Selected: 1

HMC User Interface – Work Pane (cont.)

(1) Expand / Collapse All

(2) Select / Deselect All

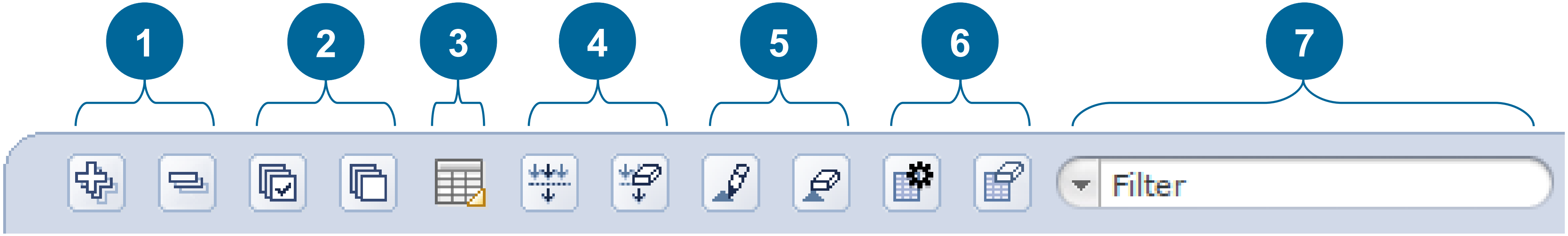
(3) Export Data

(4) Configure / Clear Filtering

(5) Edit / Clear Sorting

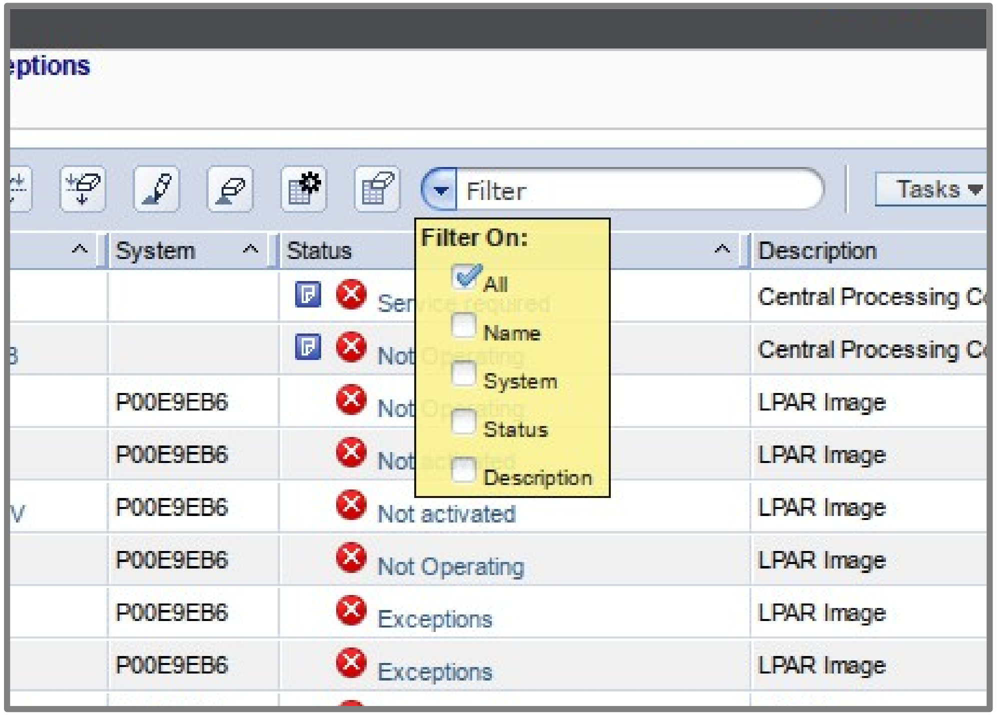
(6) Display / Hide / Reset Columns

(7) Filter on Specific Text



HMC User Interface – Work Pane (cont.)

- When filtering, you can select criteria to search against:
  - All
  - Name
  - System
  - Status
  - Description



ptions

Filter

Tasks

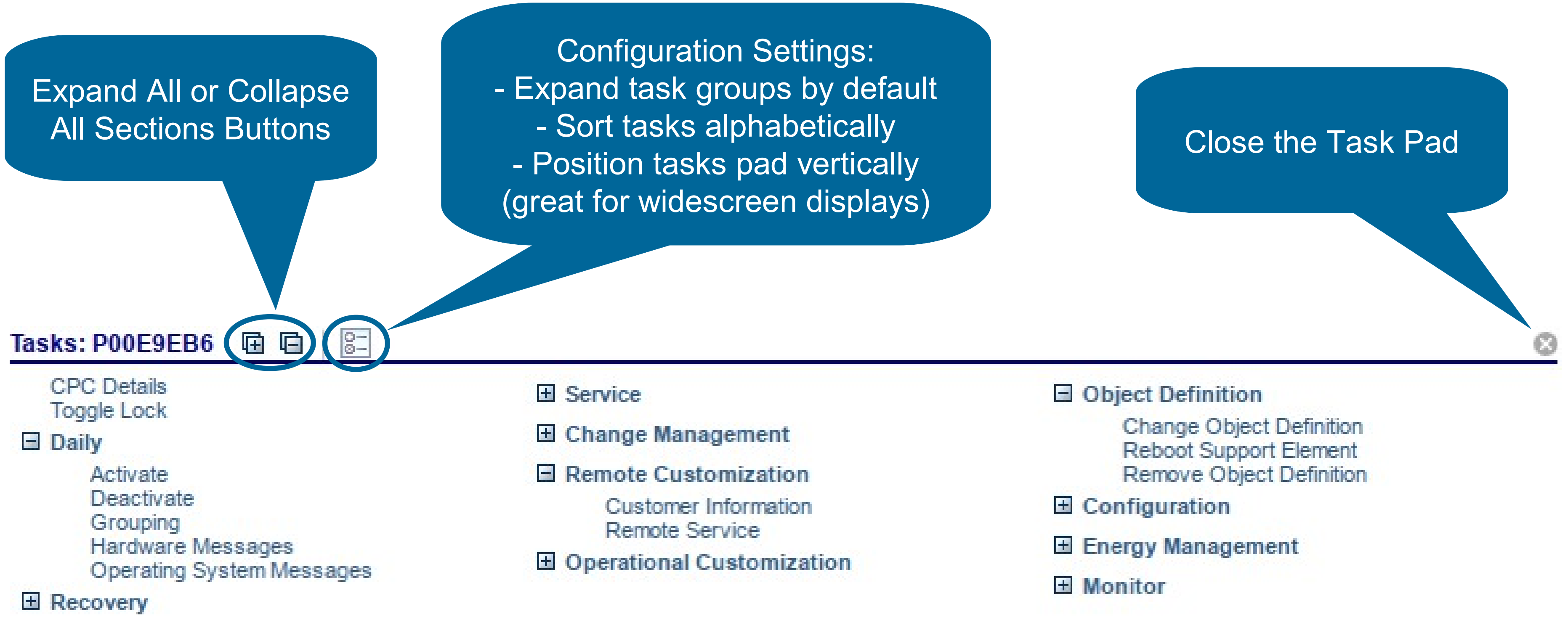
Filter On:

☑ All
☐ Name
☐ System
☐ Status
☐ Description

System	Status	Description
	Service required	Central Processing C
	Not Operating	Central Processing C
P00E9EB6	Not Operating	LPAR Image
P00E9EB6	Not activated	LPAR Image
P00E9EB6	Not activated	LPAR Image
P00E9EB6	Not Operating	LPAR Image
P00E9EB6	Exceptions	LPAR Image
P00E9EB6	Exceptions	LPAR Image

HMC User Interface – Tasks Pad

- Displays valid actions based on the selected object(s)
- Automatically hides actions if the target(s) would be invalid



Expand All or Collapse All Sections Buttons

Configuration Settings:
- Expand task groups by default
- Sort tasks alphabetically
- Position tasks pad vertically (great for widescreen displays)

Close the Task Pad

Tasks: P00E9EB6

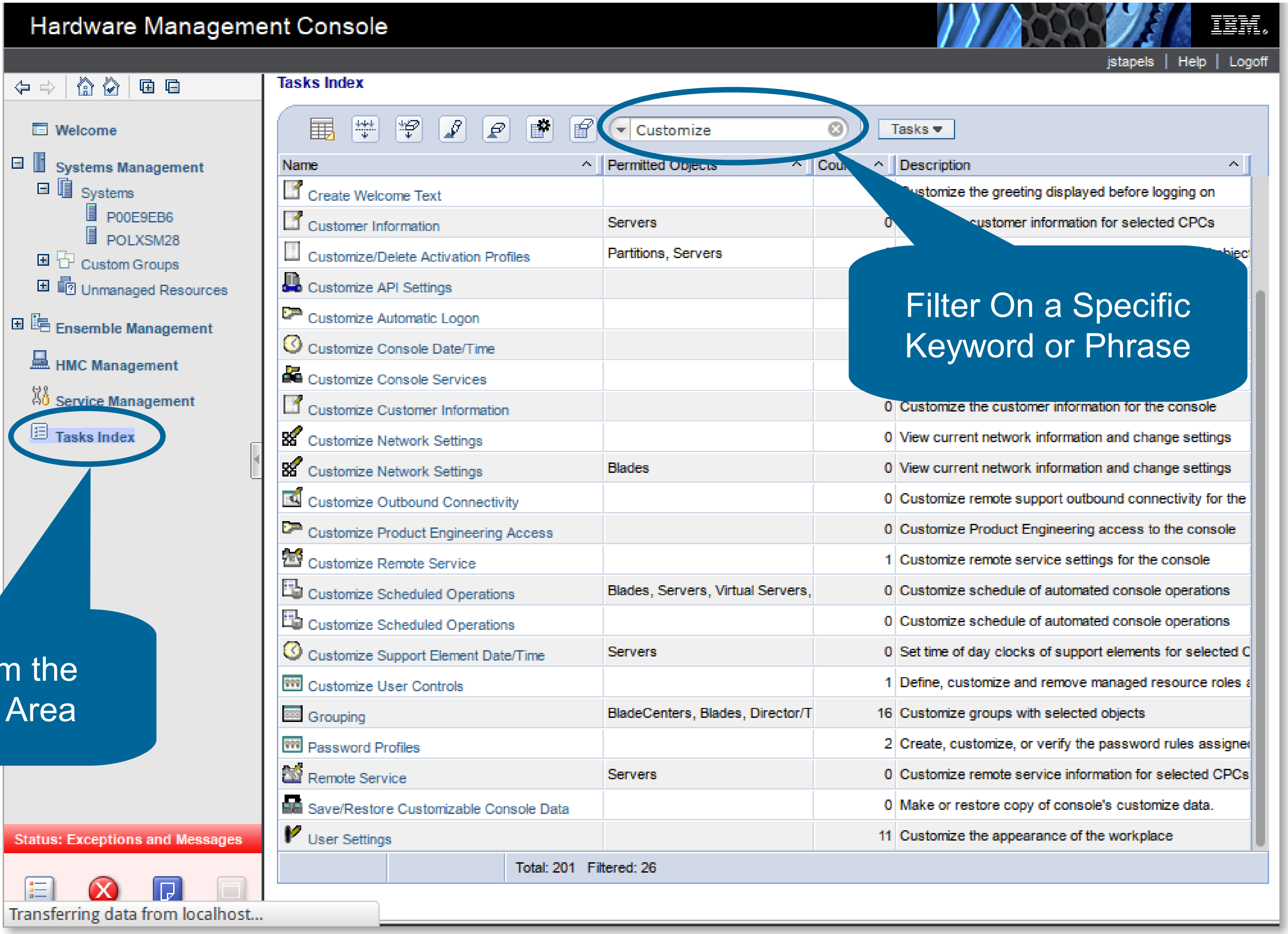
CPC Details
Toggle Lock
⊟ Daily
Activate
Deactivate
Grouping
Hardware Messages
Operating System Messages
⊞ Recovery

⊞ Service
⊞ Change Management
⊟ Remote Customization
Customer Information
Remote Service
⊞ Operational Customization

⊟ Object Definition
Change Object Definition
Reboot Support Element
Remove Object Definition
⊞ Configuration
⊞ Energy Management
⊞ Monitor

HMC User Interface – Tasks Index

- Lists all available tasks making it easy to search for a specific task



Hardware Management Console

jstapels | Help | Logoff

Welcome
Systems Management
Systems
P00E9EB6
POLXSM28
Custom Groups
Unmanaged Resources
Ensemble Management
HMC Management
Service Management
Tasks Index

Status: Exceptions and Messages

Transferring data from localhost...

Tasks Index

Customize

Tasks ▾

Name	Permitted Objects	Cou	Description
Create Welcome Text			ustomize the greeting displayed before logging on
Customer Information	Servers	0	customer information for selected CPCs
Customize/Delete Activation Profiles	Partitions, Servers		bjec
Customize API Settings			
Customize Automatic Logon			
Customize Console Date/Time			
Customize Console Services			
Customize Customer Information		0	Customize the customer information for the console
Customize Network Settings		0	View current network information and change settings
Customize Network Settings	Blades	0	View current network information and change settings
Customize Outbound Connectivity		0	Customize remote support outbound connectivity for the
Customize Product Engineering Access		0	Customize Product Engineering access to the console
Customize Remote Service		1	Customize remote service settings for the console
Customize Scheduled Operations	Blades, Servers, Virtual Servers,	0	Customize schedule of automated console operations
Customize Scheduled Operations		0	Customize schedule of automated console operations
Customize Support Element Date/Time	Servers	0	Set time of day clocks of support elements for selected C
Customize User Controls		1	Define, customize and remove managed resource roles a
Grouping	BladeCenters, Blades, Director/T	16	Customize groups with selected objects
Password Profiles		2	Create, customize, or verify the password rules assigne
Remote Service	Servers	0	Customize remote service information for selected CPCs
Save/Restore Customizable Console Data		0	Make or restore copy of console's customize data.
User Settings		11	Customize the appearance of the workplace

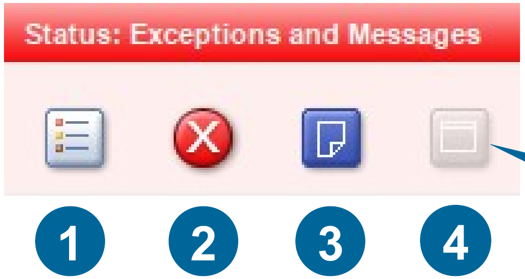
Total: 201 Filtered: 26

Filter On a Specific Keyword or Phrase

Access from the Navigation Area

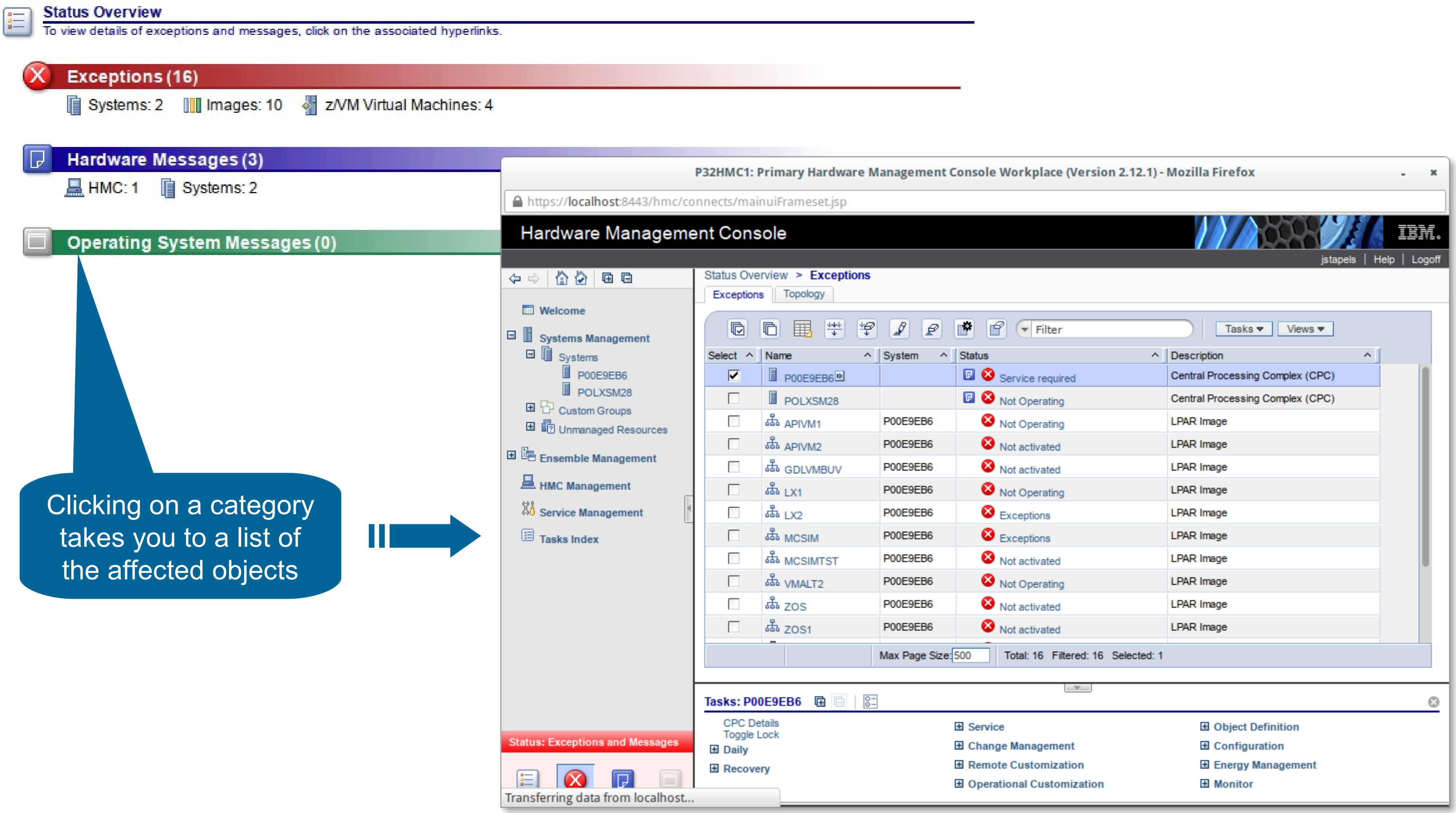
HMC User Interface – Status Area

- At a glance view showing the status of your machines
- Quick jump to:
  - (1) Status Overview – Shows a summary of all affects objects
  - (2) Exceptions – List all objects with exceptions
  - (3) Hardware Messages – Lists all objects with hardware messages
  - (4) Operating System Messages – Lists all objects with OS Messages



A disabled icon indicates that no notices of that type currently exist.

HMC User Interface – Status Area (cont.)



Status Overview

To view details of exceptions and messages, click on the associated hyperlinks.

Exceptions (16)

Systems: 2 Images: 10 z/VM Virtual Machines: 4

Hardware Messages (3)

HMC: 1 Systems: 2

Operating System Messages (0)

Clicking on a category takes you to a list of the affected objects

P32HMC1: Primary Hardware Management Console Workplace (Version 2.12.1) - Mozilla Firefox

https://localhost:8443/hmc/connects/mainuiFrameset.jsp

Hardware Management Console

jstapels | Help | Logoff

Status Overview > Exceptions

Select	Name	System	Status	Description
☑	P00E9EB6		Service required	Central Processing Complex (CPC)
□	POLXSM28		Not Operating	Central Processing Complex (CPC)
□	APIVM1	P00E9EB6	Not Operating	LPAR Image
□	APIVM2	P00E9EB6	Not activated	LPAR Image
□	GDLVMBUV	P00E9EB6	Not activated	LPAR Image
□	LX1	P00E9EB6	Not Operating	LPAR Image
□	LX2	P00E9EB6	Exceptions	LPAR Image
□	MCSIM	P00E9EB6	Exceptions	LPAR Image
□	MCSIMTST	P00E9EB6	Not activated	LPAR Image
□	VMALT2	P00E9EB6	Not Operating	LPAR Image
□	ZOS	P00E9EB6	Not activated	LPAR Image
□	ZOS1	P00E9EB6	Not activated	LPAR Image

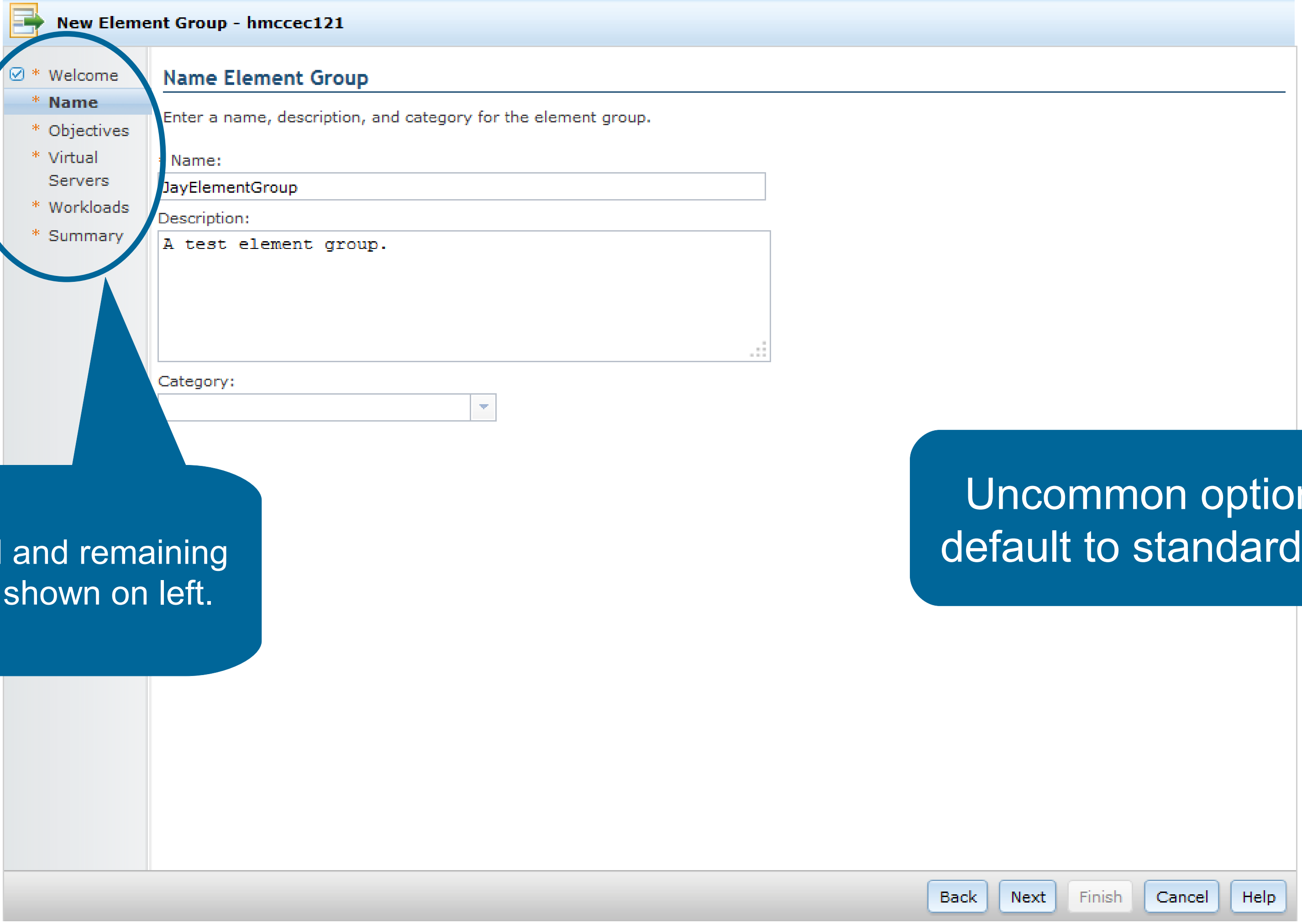
Max Page Size: 500 Total: 16 Filtered: 16 Selected: 1

Tasks: P00E9EB6

Transferring data from localhost...

HMC User Interface – Wizard Tasks

- Wizard style tasks guide you step by step


New Element Group - hmccec121

Name Element Group

Enter a name, description, and category for the element group.

* Name: JayElementGroup

Description: A test element group.

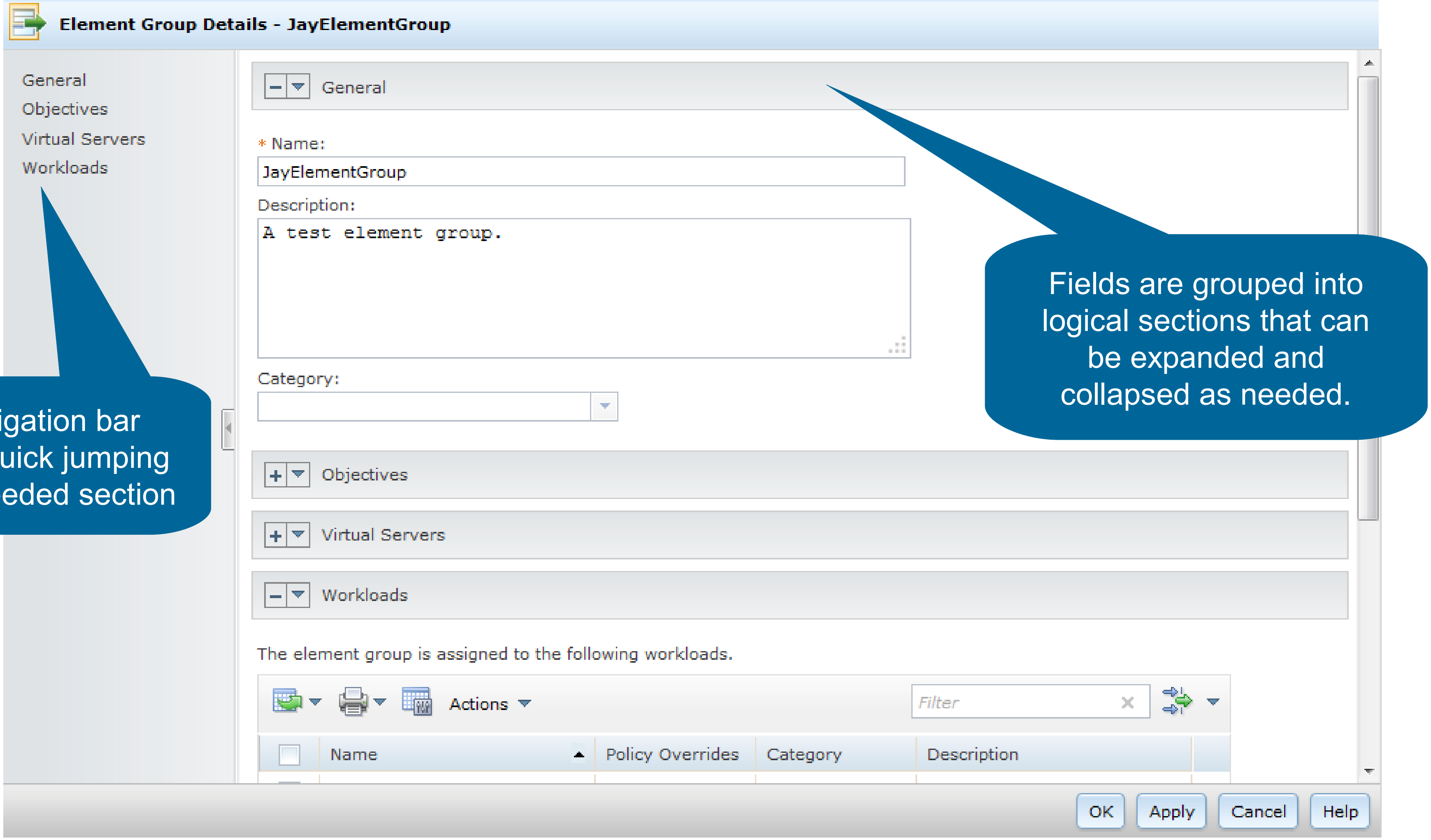
Category:

Completed and remaining steps are shown on left.

Uncommon options are default to standard values

HMC User Interface – Details Tasks

- Details tasks show all available options on a single panel



Element Group Details - JayElementGroup

General

* Name: JayElementGroup

Description: A test element group.

Category:

Objectives

Virtual Servers

Workloads

The element group is assigned to the following workloads.

☐	Name	Policy Overrides	Category	Description

A navigation bar allows quick jumping to the needed section

Fields are grouped into logical sections that can be expanded and collapsed as needed.

HMC APIs

HMC APIs – Overview

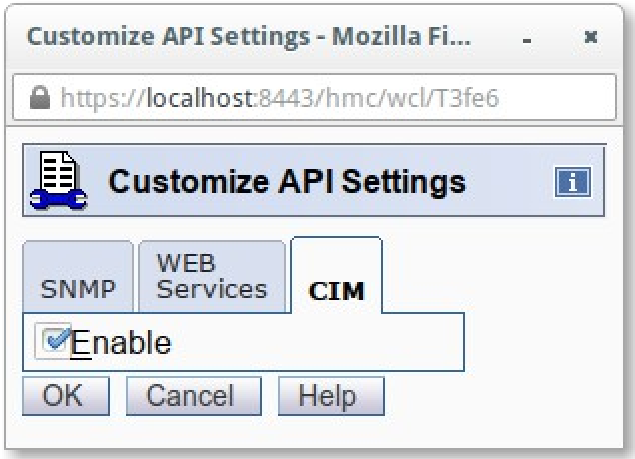
- Application Programmer Interfaces (APIs) are designed to provide an open set of interfaces and a workstation platform for system management application providers
  - They specify how you can write your own components to interact with an HMC and the objects it manages
- The HMC provides three types of APIs
  - Common Information Model (CIM) Management Interface
  - Simple Network Management Protocol (SNMP)
  - Web Services API
- Enabling the APIs is done through the **Customize API Settings** task

Customize API Settings

Customize the Application Programming Interface for the console

HMC APIs – Using CIM

- Enable on the HMC
  - Launch the **Customize API Settings** task
  - Select the **CIM** tab
  - Check the **Enable** checkbox
- Configuring your CIM client
  - HMC only accepts SSL (HTTPS) client connections
  - Use the TCP/IP address of your HMC
  - CIM server listens for requests on TCP port 5989
  - Authenticate using the user name and password of an existing HMC user
  - Ensure user profile is configured to **Allow remote access via the web**
- Documentation available on **IBM Resource Link**:
  - SB10-7154-06 *System z Common Interface Model Management Interface*



Customize API Settings - Mozilla Fi...

https://localhost:8443/hmc/wcl/T3fe6

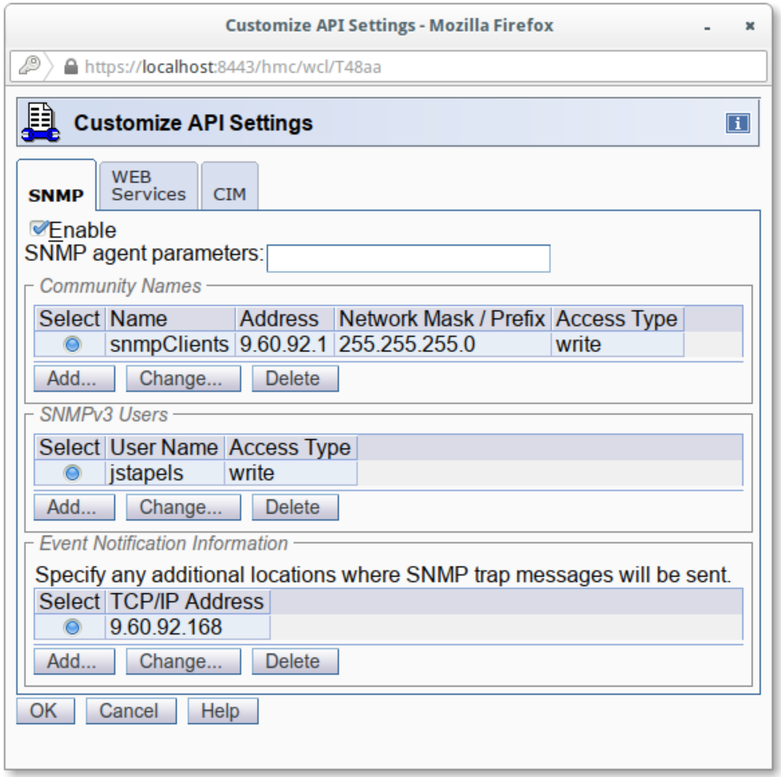
Customize API Settings

SNMP | WEB Services | CIM

☑ Enable

HMC APIs – Using SNMP

- Enable on the HMC
  - Launch the **Customize API Settings** task
  - Select **SNMP** tab and the **Enable** checkbox
  - Enter in a community name and network
  - Add an SNMP user and select an access type
  - Enter the TCP/IP address of any SNMP trap servers (traps are sent to TCP port 162)


Customize API Settings - Mozilla Firefox
https://localhost:8443/hmc/wcl/T48aa
Customize API Settings
SNMP
WEB Services
CIM
Add...
Change...
Delete
OK
Cancel
Help

☑ Enable

SNMP agent parameters:

Community Names

Select	Name	Address	Network Mask / Prefix	Access Type
●	snmpClients	9.60.92.1	255.255.255.0	write

SNMPv3 Users

Select	User Name	Access Type
●	jstapels	write

Event Notification Information

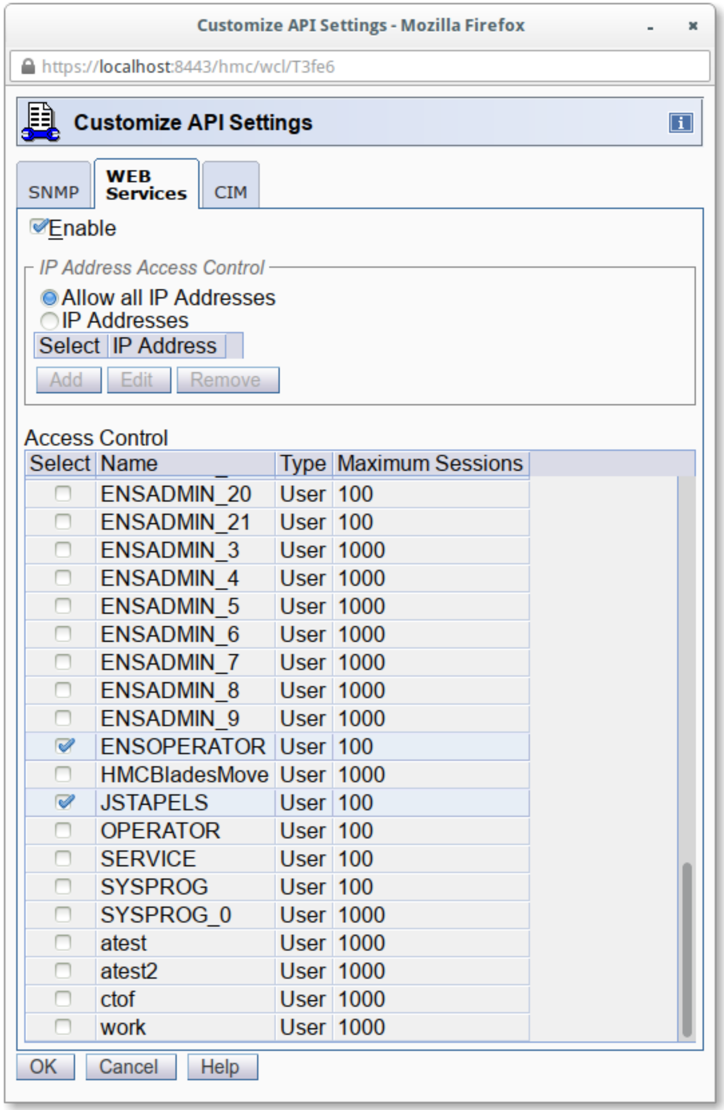
Specify any additional locations where SNMP trap messages will be sent.

Select	TCP/IP Address
●	9.60.92.168

- Configuring your SNMP client
  - The HMC uses the standard SNMP UDP/TCP port 161
  - Authenticate using the configured community, user name and password
- Documentation available on **IBM Resource Link**
  - SB10-7030-16: *System z Application Programming Interfaces*

HMC APIs – Using Web Services API

- Enable on the HMC
  - Launch the **Customize API Settings** task
  - Select the **WEB Services** tab
  - Limit access based on IP as needed
  - Enable access control by user name
- Configuring your API client
  - HMC accepts standard SSL encrypted (HTTPS) requests on TCP port 6794
  - Authenticate using the user name and password
  - Ensure user profile has been configured to **Allow access to management interfaces**
- Documentation available on **IBM Resource Link:**
  - *SC27-2626-00a: System z Hardware Management Console Web Services API*


Customize API Settings - Mozilla Firefox
https://localhost:8443/hmc/wcl/T3fe6
Customize API Settings
SNMP
WEB Services
CIM

☑ Enable

IP Address Access Control

● Allow all IP Addresses
○ IP Addresses

Select	IP Address

Access Control

Select	Name	Type	Maximum Sessions
□	ENSADMIN_20	User	100
□	ENSADMIN_21	User	100
□	ENSADMIN_3	User	1000
□	ENSADMIN_4	User	1000
□	ENSADMIN_5	User	1000
□	ENSADMIN_6	User	1000
□	ENSADMIN_7	User	1000
□	ENSADMIN_8	User	1000
□	ENSADMIN_9	User	1000
☑	ENSOPERATOR	User	100
□	HMCBladesMove	User	1000
☑	JSTAPELS	User	100
□	OPERATOR	User	100
□	SERVICE	User	100
□	SYSPROG	User	100
□	SYSPROG_0	User	1000
□	atest	User	1000
□	atest2	User	1000
□	ctof	User	1000
□	work	User	1000

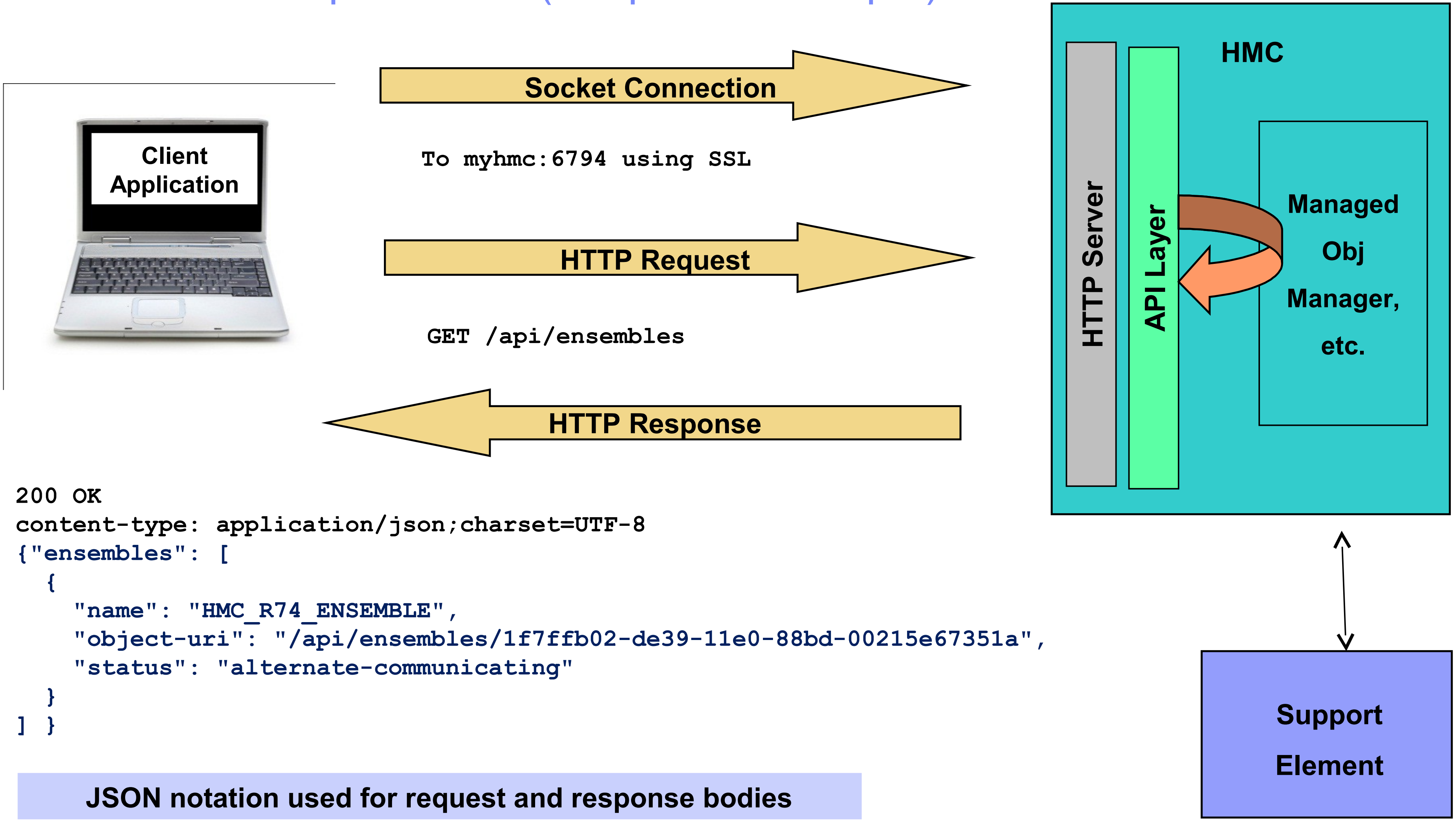
HMC APIs – HMC Web Services API Characteristics

- HMC Web Services API is the latest API implementation
  - Includes existing SNMP/CIM function
  - This 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 Java Messaging Services (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

HMC APIs – What is a REST-oriented Web Service?

- REST = **Re**presentational **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

HMC APIs – Request Flow (Simplified Example)



```
To myhmc:6794 using SSL
```

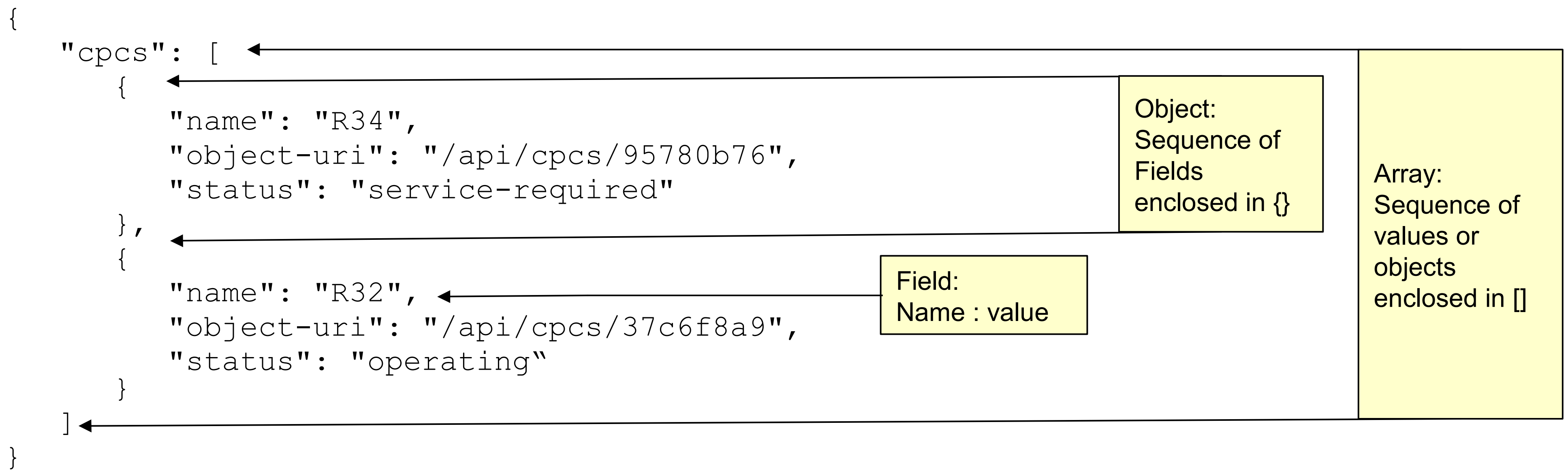
```
GET /api/ensembles
```

```
200 OK
content-type: application/json;charset=UTF-8
{"ensembles": [
  {
    "name": "HMC_R74_ENSEMBLE",
    "object-uri": "/api/ensembles/1f7ffb02-de39-11e0-88bd-00215e67351a",
    "status": "alternate-communicating"
  }
] }
```

JSON notation used for request and response bodies

HMC APIs – 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



```
{
   "cpcs": [
      {
         "name": "R34",
         "object-uri": "/api/cpcs/95780b76",
         "status": "service-required"
      },
      {
         "name": "R32",
         "object-uri": "/api/cpcs/37c6f8a9",
         "status": "operating‟
      }
   ]
}
```

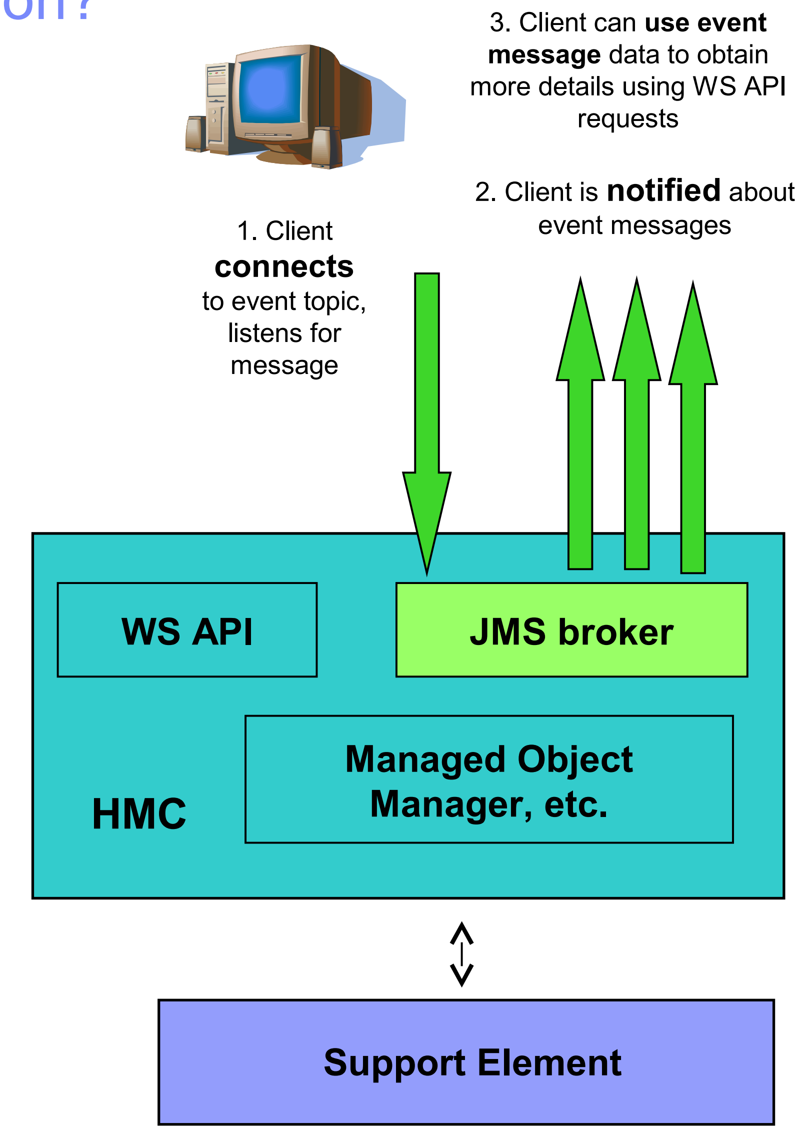
Object:
Sequence of
Fields
enclosed in {}

Array:
Sequence of
values or
objects
enclosed in []

Field:
Name : value

HMC 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


3. Client can **use event message** data to obtain more details using WS API requests
2. Client is **notified** about event messages
1. Client **connects** to event topic, listens for message
WS API
JMS broker
Managed Object Manager, etc.
HMC
Support Element

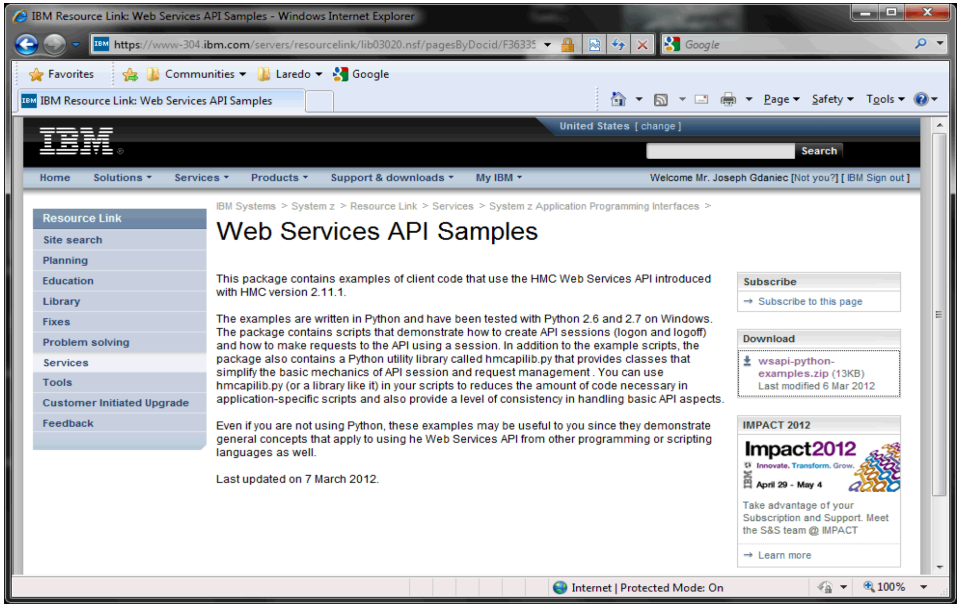
Client Programming Considerations

- 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: Samples

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

  Then navigate:
  Services / API / Web Services API Samples


IBM Resource Link: Web Services API Samples - Windows Internet Explorer
https://www-304.ibm.com/servers/resourcelink/lib03020.nsf/pagesByDocid/F36335
Google
Favorites
Communities
Laredo
Google
IBM Resource Link: Web Services API Samples
Page
Safety
Tools
IBM
United States [change]
Search
Home
Solutions
Services
Products
Support & downloads
My IBM
Welcome Mr. Joseph Gdaniec [Not you?] [IBM Sign out]
IBM Systems > System z > Resource Link > Services > System z Application Programming Interfaces >
Resource Link
Site search
Planning
Education
Library
Fixes
Problem solving
Services
Tools
Customer Initiated Upgrade
Feedback
Subscribe
→ Subscribe to this page
Download
wsapi-python-examples.zip (13KB)
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100%

Web Services API Samples

This package contains examples of client code that use the HMC Web Services API introduced with HMC version 2.11.1.

The examples are written in Python and have been tested with Python 2.6 and 2.7 on Windows. The package contains scripts that demonstrate how to create API sessions (logon and logoff) and how to make requests to the API using a session. In addition to the example scripts, the package also contains a Python utility library called hmcapilib.py that provides classes that simplify the basic mechanics of API session and request management . You can use hmcapilib.py (or a library like it) in your scripts to reduces the amount of code necessary in application-specific scripts and also provide a level of consistency in handling basic API aspects.

Even if you are not using Python, these examples may be useful to you since they demonstrate general concepts that apply to using he Web Services API from other programming or scripting languages as well.

Last updated on 7 March 2012.

- 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

धन्यवाद
Hindi

Kiitos
Finnish

ขอบคุณ
Thai

Спасибо
Russian

Gracias
Spanish

شكراً
Arabic

多謝
Traditional Chinese

Thank You
English

Dank U wel
Dutch

Takk
Norwegian

Tack
Swedish

Grazie
Italian

Obrigado
Portuguese

Merci
French

多谢
Simplified Chinese

நன்றி
Tamil

ありがとうございました
Japanese

Danke
German

감사합니다
Korean

Q&A

SHARE in Pittsburgh – Session 15802

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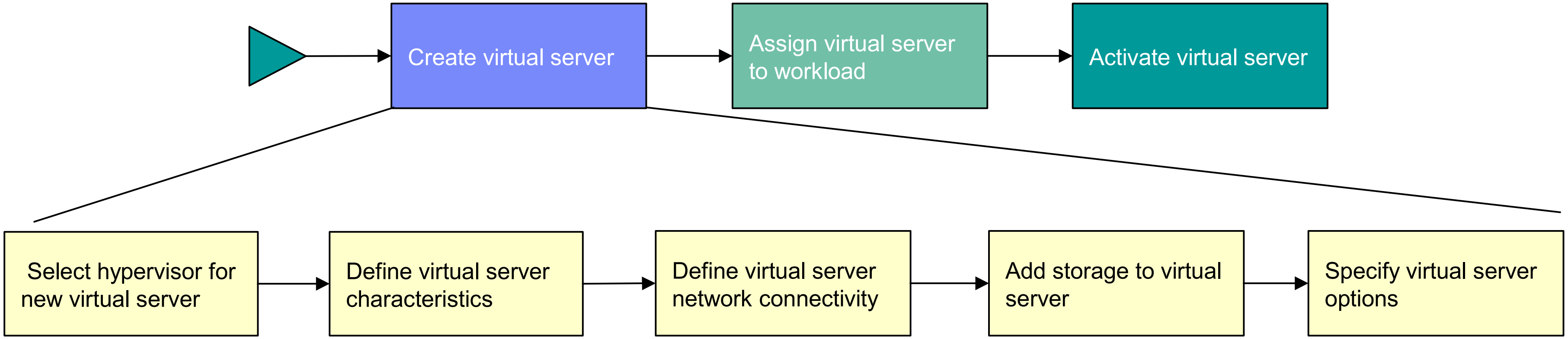
Backup API Slides

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:


Create virtual server
Assign virtual server to workload
Activate virtual server
Select hypervisor for new virtual server
Define virtual server characteristics
Define virtual server network connectivity
Add storage to virtual server
Specify virtual server options

- Name, description
- Virtual or dedicated virtual processors
- Number of virtual processors
- Amount of memory

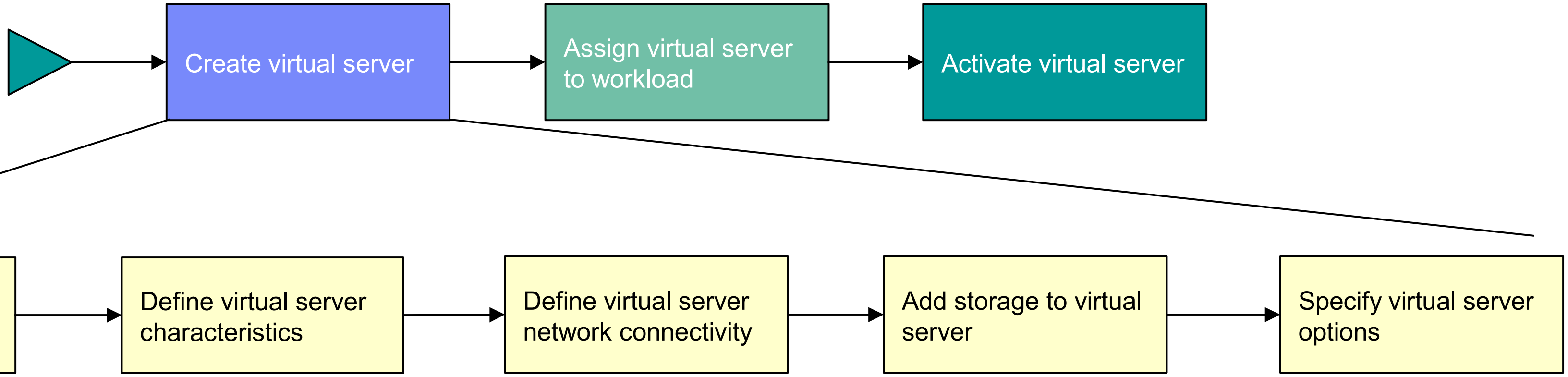
- Select from among defined virtual networks

- Select from storage resources previously defined to hypervisor

- Example: Specify the boot device type and instance:
  - Disk
  - Network
  - ISO

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

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


Create virtual server

Assign virtual server to workload

Activate virtual server

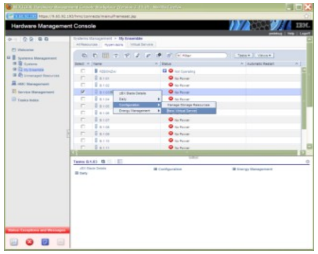
Select hypervisor for new virtual server

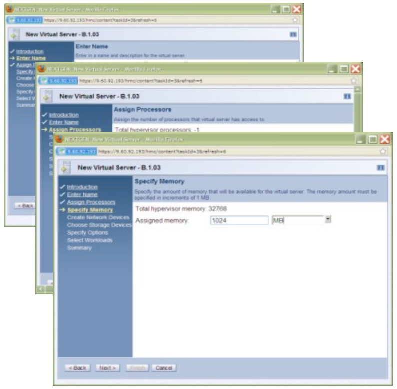
Define virtual server characteristics

Define virtual server network connectivity

Add storage to virtual server

Specify virtual server options




New Virtual Server - B.1.03

Enter Name

Enter in a name and description for the virtual server.

New Virtual Server - B.1.03

Assign Processors

Assign the number of processors that virtual server has access to.

Total hypervisor processors: -1

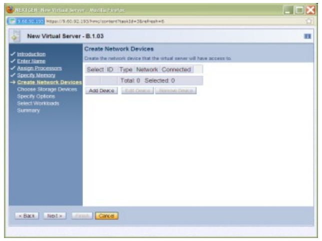
New Virtual Server - B.1.03

Specify Memory

Specify the amount of memory that will be available for the virtual server. The memory amount must be specified in increments of 1 MB.

Total hypervisor memory: 32768

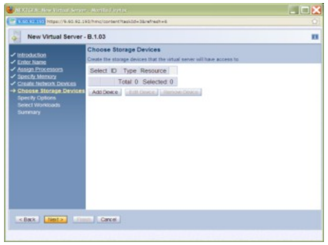
Assigned memory: 1024 MB


New Virtual Server - B.1.03

Create Network Devices

Create the network device that the virtual server will have access to.

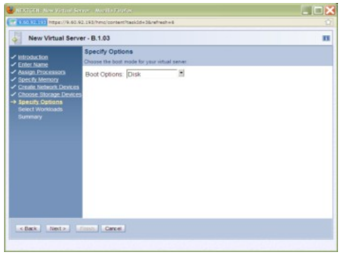
Select	ID	Type	Network	Connected
		Total: 0 Selected: 0		


New Virtual Server - B.1.03

Choose Storage Devices

Create the storage devices that the virtual server will have access to

Select	ID	Type	Resource
		Total: 0 Selected: 0	


New Virtual Server - B.1.03

Specify Options

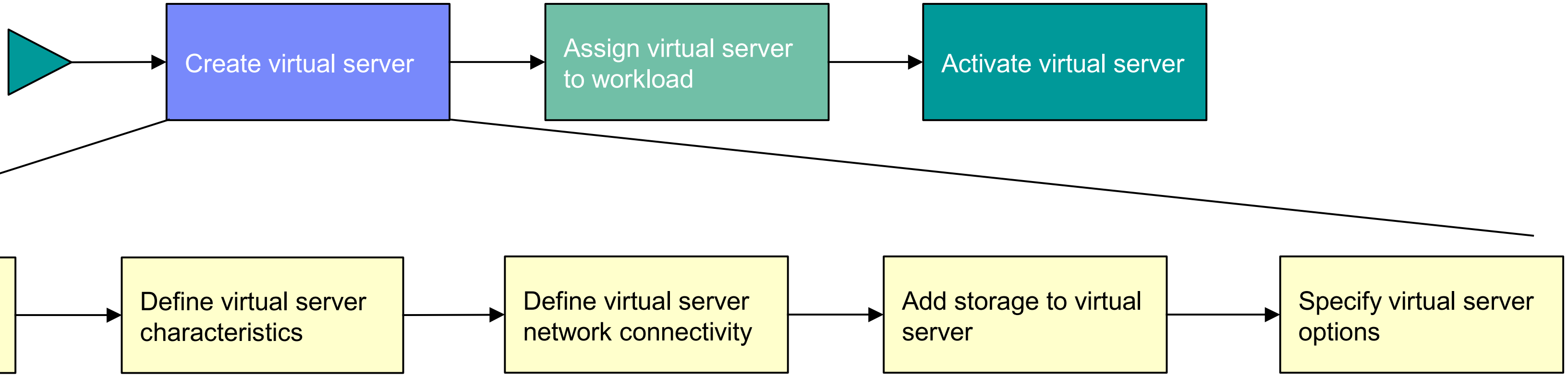
Choose the boot mode for your virtual server

Boot Options: Disk

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



Create virtual server

Assign virtual server to workload

Activate virtual server

Select hypervisor for new virtual server

Define virtual server characteristics

Define virtual server network connectivity

Add storage to virtual server

Specify virtual server options

- 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 Resourcces function to obtain list of available volumes
- <Select volume>

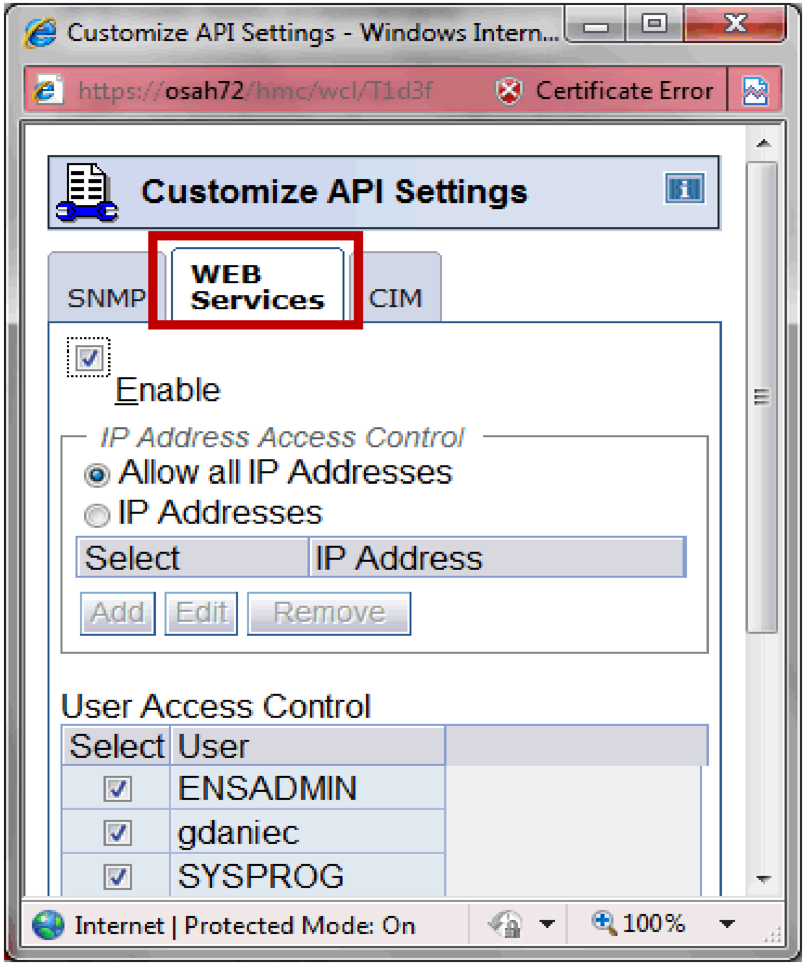
Call Add Virt Disk function specifying new VS as target and selected storage resource

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

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 remove 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

Customize API Settings
Customize the Application Programming Interface for the console



Customize API Settings - Windows Intern...

https://osah72/hmc/wcl/T1d3f Certificate Error

Customize API Settings

☑ Enable

IP Address Access Control

● Allow all IP Addresses
○ IP Addresses

Select	IP Address

User Access Control

Select	User
☑	ENSADMIN
☑	gdaniec
☑	SYSPROG

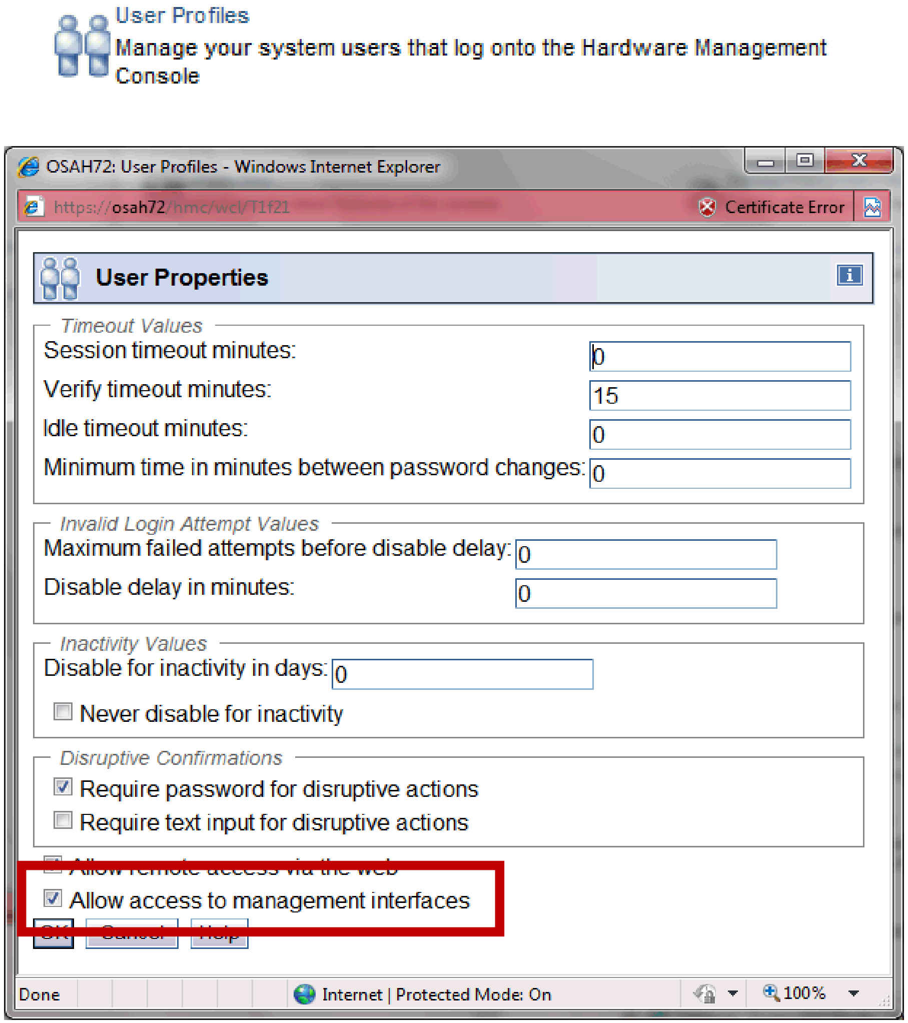
Internet | Protected Mode: On 100%

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



User Profiles
Manage your system users that log onto the Hardware Management Console

OSAH72: User Profiles - Windows Internet Explorer
https://osah72/hmc/wcl/T1f21 Certificate Error

User Properties

Timeout Values
Session timeout minutes: 0
Verify timeout minutes: 15
Idle timeout minutes: 0
Minimum time in minutes between password changes: 0

Invalid Login Attempt Values
Maximum failed attempts before disable delay: 0
Disable delay in minutes: 0

Inactivity Values
Disable for inactivity in days: 0
□ 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

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

1. Establish an SSL socket connection with the HMC:

- Python code snippets illustrating these steps follows…

```
# 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}
1 req_body = json.dumps(logon_req)
  req_hdrs = {"Content-Type": "application/json"}
  conn.request("POST", "/api/sessions", req_body, req_hdrs)

2 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 psasword)
     raise Exception("Request failed (status: %d)" % response.status)

  # Retrieve session id from response for later use
3 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
1 req_hdrs = {"X-API-Session": session_id}
  conn.request("GET", "/api/console", None, req_hdrs)

2 response = conn.getresponse()
  if response.status != 204:
     resp_body = response.read()
  if response.status != 200:
     raise Exception("Request failed (status: %d)" %
3 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:

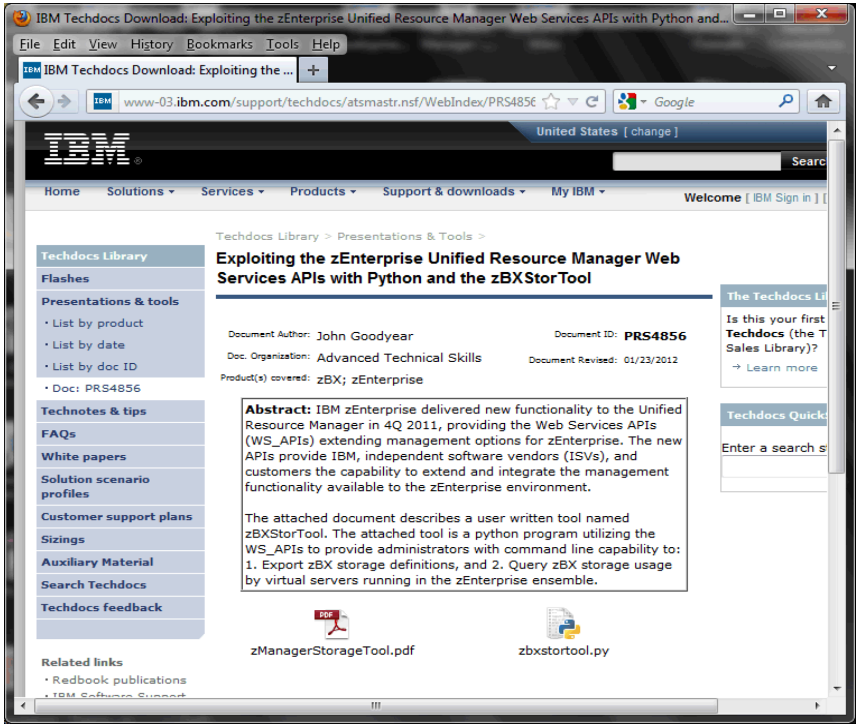
```
  # Log off from HMC to free session resources
1 req_hdrs = {"X-API-Session": session_id}
  conn.request("DELETE", "/api/sessions/this-session", None, req_hdrs)

  response = conn.getresponse()
2 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
```

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/atsmastr.nsf/WebIndex/PRS4856



Exploiting the zEnterprise Unified Resource Manager Web Services APIs with Python and the zBXStorTool

Document Author: John Goodyear
Doc. Organization: Advanced Technical Skills
Product(s) covered: zBX; zEnterprise
Document ID: PRS4856
Document Revised: 01/23/2012

Abstract: IBM zEnterprise delivered new functionality to the Unified Resource Manager in 4Q 2011, providing the Web Services APIs (WS_APIs) extending management options for zEnterprise. The new APIs provide IBM, independent software vendors (ISVs), and customers the capability to extend and integrate the management functionality available to the zEnterprise environment.

The attached document describes a user written tool named zBXStorTool. The attached tool is a python program utilizing the WS_APIs to provide administrators with command line capability to: 1. Export zBX storage definitions, and 2. Query zBX storage usage by virtual servers running in the zEnterprise ensemble.

zManagerStorageTool.pdf

zbxstortool.py

UsageExample: System z Mobile Application Proof of Concept

- Proof of Concept Mobile Application for monitoring and controlling a zEnterprise system from a mobile device
- Allows pe IT
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  subset o about
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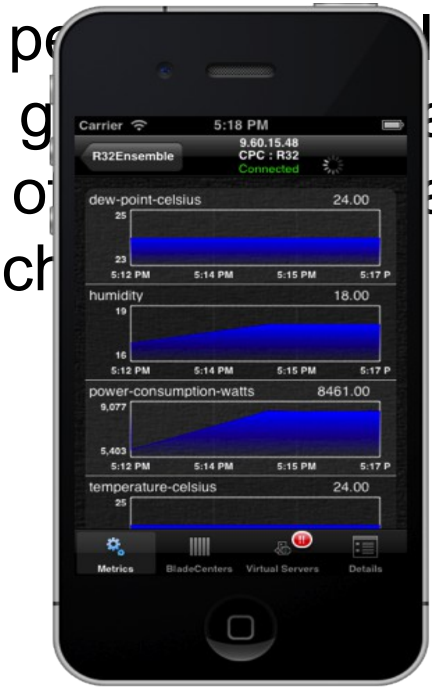
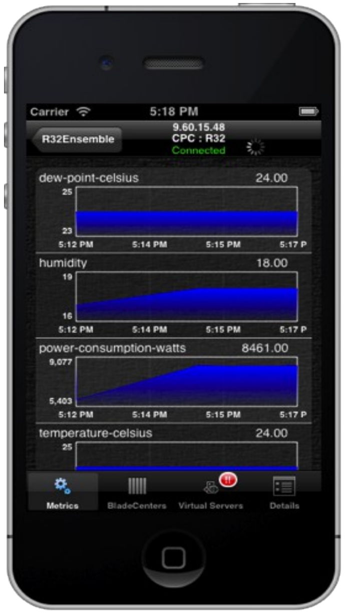
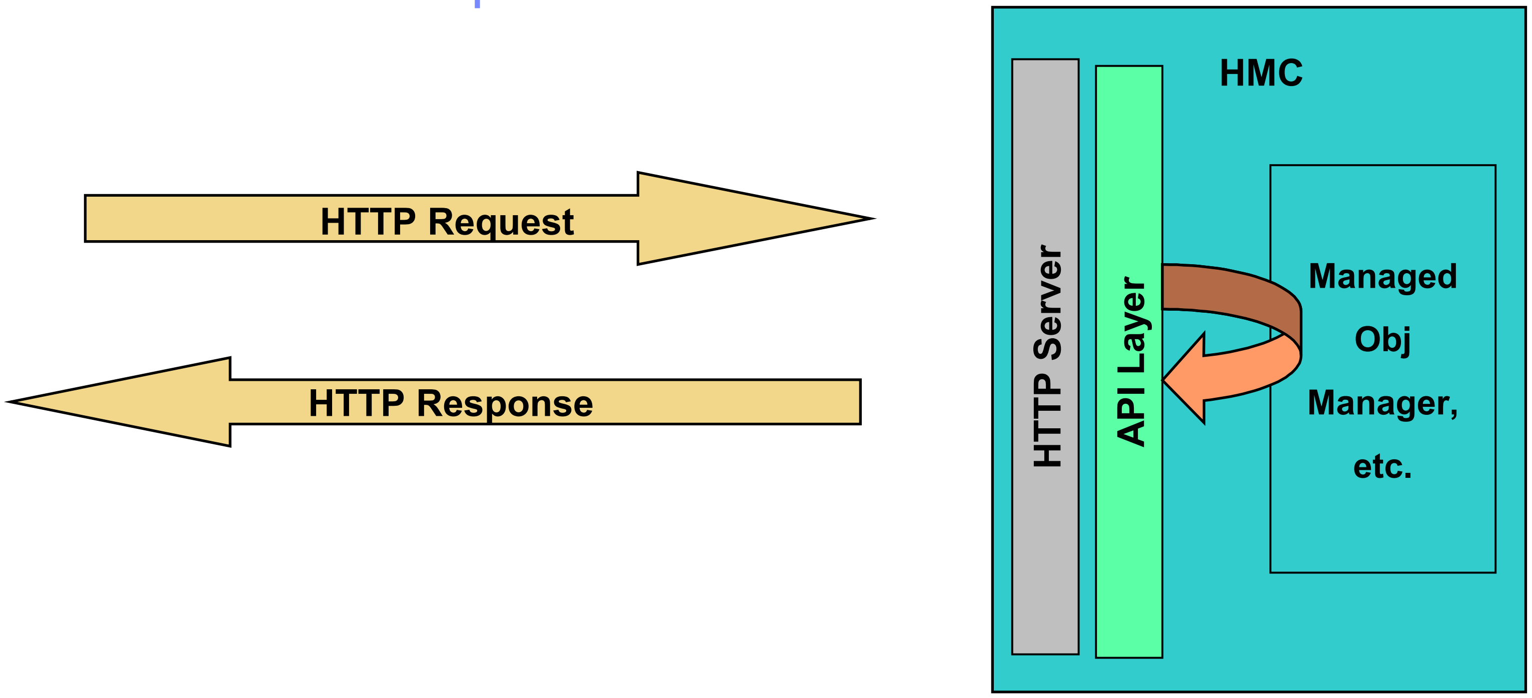
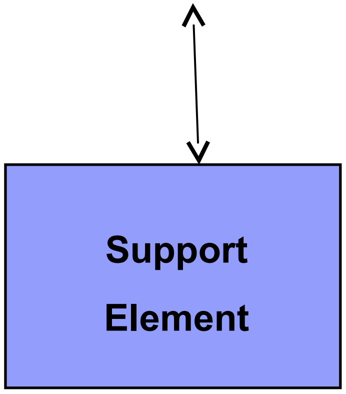


Mobile Application Proof of Concept – Under the Hood







- 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