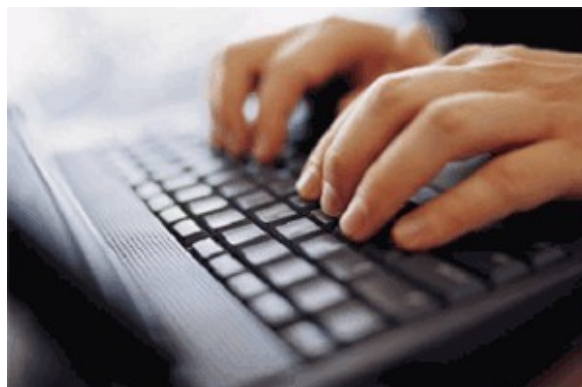Glenn Anderson, IBM Lab Services and Training

IBM

Understanding z/OSMF for the Performance Management Sysprog

Summer SHARE
August 2014
Session 15724
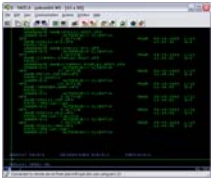
---

z/OSMF: the z/OS Management Facility

IBM

- **z/OSMF is a new product for z/OS customers and provides a modern browser based interface to managing the z/OS system.**
- **z/OSMF helps system programmers to more easily manage and administer a mainframe system by simplifying day to day operations and administration of a z/OS system.**

- **IBM z/OS Management facility (z/OSMF) delivers on IBM's strategy for mainframe simplification and modernization**

- **z/OSMF is a companion product to z/OS, offered at no additional charge z/OSMF 1.11 was the first release, delivered with z/OS 1.11**

- **z/OSMF has it's own product number**
  - ▶ **Product ID for z/OSMF 2.1 is** 5610-A01
  - ▶ **Service & Subscription ID is 5655-S29**

- **Both PIDs must be ordered**

- **It can be ordered in a serverpac with z/OS**
  - ▶ **Or as its own product serverpac**

Why z/OSMF?

- **The IBM z/OS® Management Facility provides a Web-browser based management console for z/OS designed to improve productivity, quality and simplify management**
- Helps the experienced and not so experienced system programmers more easily manage z/OS, by simplifying day to day operations and administration
- z/OS Management Facility helps automate management tasks
  - Can help reduce the learning curve and improve productivity
  - Helps guide users easily through tasks with embedded user assistance (such as wizards)
  - Helps accelerate productivity, making navigation and task steps more seamless.
  - Makes administration more intuitive

3270 green screen

z/OSMF web browser based management Interface

z/OSMF is a companion product to z/OS, offered at no additional charge

---

z/OS simplification focus areas

Software management, Migration, and Maintenance
Planning, installing, and upgrading z/OS systems and products that run on z/OS

Configuration
Adding or changing z/OS system components; enabling new features; defining and updating policies that affect system behavior

Problem and Performance Management
Monitoring z/OS system health; identifying real and potential problems; Analyzing and resolving problems

Simplify and modernize the System Programmer user experience
Deliver solution in a task-oriented browser based user-interface, with end-to-end task simplification, eliminating opportunity for error
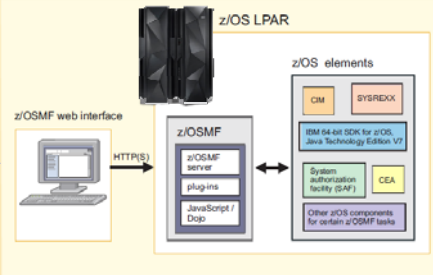
IBM z/OS Management Facility structure

IBM

- **z/OS Management Facility is a Web 2.0 application**

  Uses industry standards (Java™, CIM, DOJO)

  Uses Java; some use z/OS CIM Server – workloads can run on zIIPs, zAAPs.

  New efficient code base: WebSphere Application Server Liberty profile

Java code is zAAP eligible

z/OS CIM Server is eligible for zIIP

---

z/OSMF 2.1 functions

IBM

- **Notifications and Workflow *(R2.1)**
- **Configuration** category
  - **Configuration Assistant for z/OS Communication Server** application
    - Simplified configuration and setup of TCP/IP policy-based networking functions
- **Links** category
  - Links to resources - provides common launch point for accessing resources beyond z/OSMF
- **Performance** category
  - **Capacity Provisioning** (updated)manage connections to CPMs, view reports for domain status, active configuration and active policy.
  - **Resource Monitoring, System Status** - provide integrated performance monitoring of customer's enterprise
  - **Workload Manager Policy Editor** application
    - Facilitate the creation and editing of WLM service definitions, installation of WLM service definitions, and activation of WLM service policies
- **Problem Determination** category
  - **Incident Log :** provide a consolidated list of SVC Dump related problems, along with details and diagnostic data captured with each incident; facilitate sending the data for further diagnostics.
- **Software** category (updated)
  - **Management:** deployment of installed software simpler and safer, manage service levels and product levels
- **z/OS classic Interface** category
- **ISPF Task** integrate existing ISPF into z/OSMF to enable tasks from single interface and ability to launch to ISPF functions directly
- **z/OSMF Administration** category
  - z/OSMF authorization services for administrator:- dynamically add links to non-z/OSMF resources; application linking manager(R13)
- **z/OSMF Settings** category (New!)
  - Manage FTP destinations and systems

z/OSMF V2.1 implementation

- **z/OSMF is rebased on the WebSphere Application Server for z/OS V8.5 Liberty profile**
  - ► **This is expected to provide significant reductions in the resource requirements for z/OSMF**
    - ● **The WASOEM FMID is no longer required and the requirement for separate configuration of the runtime is eliminated.**
    - ● **Result is reduced footprint size, reduced memory requirement and reduced CPU requirement**
  - ► **z/OSMF setup is simplified**
    - ● **Reduced steps to configure z/OSMF**
  - ► **Applying service is easier**
  - ► **Faster startup of application**

WebSphere is a brand: WebSphere Application Server is a product

We'll start by clearing up a point of confusion about the term *WebSphere*.
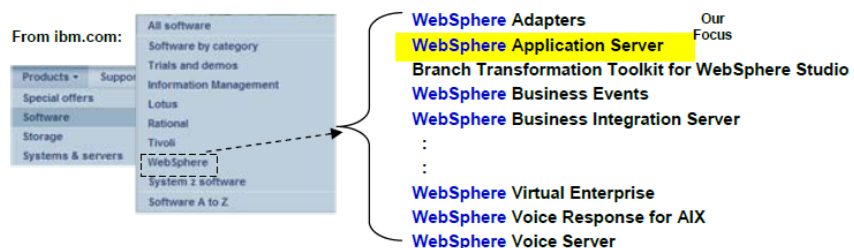
Probably close to 100 products carry the "WebSphere" brand name.

I'm using WebSphere

For many, the term *WebSphere* means *WebSphere Application Server*. Sometimes the acronym WAS is also used informally.

The J2EE application model

IBM

- Components
  - The key focus of application developers; these are the EJBs, Servlets, JSPs, and clients.
  - Many component behaviors can be specified at deployment time, rather than in program code.
- Containers
  - These provide services to components transparently, including transaction support and resource pooling.
  - Containers and connectors conceal complexity and promote portability.
- Connectors
  - These sit under the J2EE platform, defining portable service APIs to plug into existing enterprise vendor offerings.
  - Connectors promote flexibility by enabling a variety of implementations of specific services.

Different kinds of Java programs

IBM

WebSphere Application Server can host (or "run" or "support") several different kinds of applications, all written in Java:

> It is okay not to understand the details of these things. It is better at this point just to understand that different kind of programs exist and listen for these terms when others talk about the WebSphere environment.

WebSphere Application Server

Java virtual machine

- Web Application
- EJB Application
- POJO
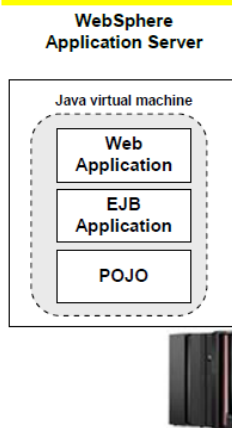
Web application
An application that is accessed with a browser. This typically consists of static files (HTML, JPG/GIF), and Java programs that generate dynamic output:
- Servlets: Java program that contains logic to do things like perform calculations, access data, and format a reply
- JSPs: stands for Java Server Pages, it's a way to create a dynamic web page that can be populated with dynamic content

EJB application
Stands for "Enterprise Java Bean," it's a more sophisticated application that's intended for high-end applications. Two flavors:
- Session Beans: meant to hold the logic of the application
- Entity Beans: meant to represent data as an "object"
Many EJB applications are made up of just session beans -- easier.

Java EE
Too simple a categorization, but okay for now

POJO
Stands for "Plain Old Java Object." It is the simplest form of a Java program and lately more people are returning to simplicity. (POJO commonly applies to the EJB 3.0 environment and Java Batch environment).

A peek inside the application server architecture — IBM

We see that inside our little curved-box picture of the Application Server resides two or more address spaces as well as integration with zWLM:

START command (MVS or Admin Console) — JCL

zWLM
- Manages starting of SRs
- Manages stopping of SRs
- Requests queued to zWLM, then to SR

Controller Region — JVM — Native Code

AppServer — CR SR

zWLM — JCL

Servant Region — JVM — App ●● App — Native Code

SR: Application Infrastructure
- Maintains app JVM runtime
- May support one or more applications
- Connectivity to data from SR
- Min/Max controllable by admin

General Properties
☑ Multiple Instances Enabled
Minimum Number of Instances: 2
Maximum Number of Instances: 4
Apply OK Reset Cancel
Default: min=1, max=1

CR: WAS "Plumbing" Code
- Native and Java
- No application code
- TCP listeners reside here
- Queues requests to WLM

Servant Region — JVM — App ●● App — Native Code

This is a built-in "vertical scaling" mechanism. It also allows for redundancy of application JVM to prevent single point of failure.

Basics of accessing web applications — IBM

`http://www.host.com/PolicyIVP/PolicyServlet`

HTTP PROTOCOL

HTTP Protocol "Catcher" 1 — 2 → **Servlet Engine** Was70Ivp 3

- Three key steps:
  - A *protocol catcher* takes HTTP protocol off network and interprets its meaning.
  - Based on the format of the URL, the request must be directed to the correct application server to execute.
  - The web container must identify which web application and servlet to execute and then use the servlet engine to run the servlet.
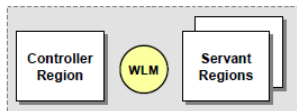
WAS z/OS V8.5 overview

IBM

With WAS z/OS V8.5 we now have two server models to choose from:

Traditional Multi-JVM Model
"Application Server"

| Controller Region | WLM | Servant Regions |

- Two or more JVMs make up an application server instance
- CR does the request handling, SR hosts the applications
- Full Java EE server runtime
- Administration through DMGR and Admin Console as seen in Unit 2
- Includes "Granular RAS" function which we'll explore in this unit
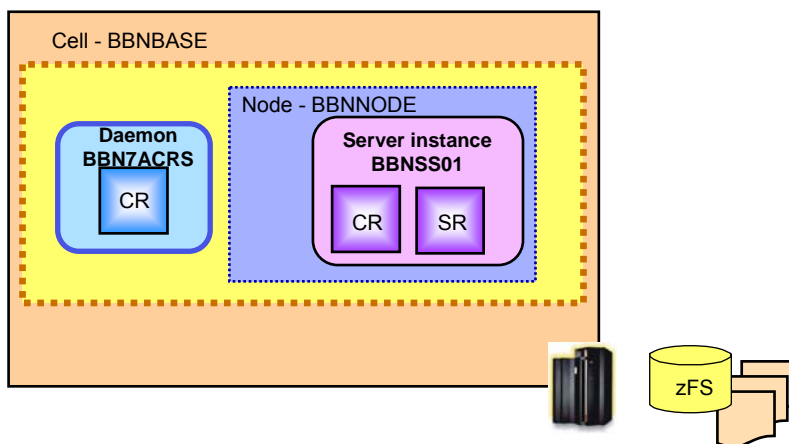
Liberty Profile Model
"Application Server"

Liberty Profile Server Instance
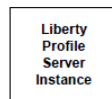
- One JVM makes up an application server instance
- Lightweight, composable and dynamic updates
- Web applications at this time
- Simple configuration and administrative model
- Not part of the traditional WAS cell or administrative model
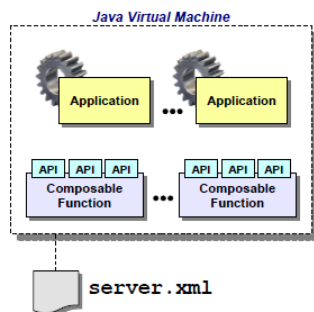

WAS OEM stand-alone server node (z/OSMF 1.13)

z/OS LPAR

Cell - BBNBASE

Daemon
BBN7ACRS

CR

Node - BBNNODE

Server instance BBNSS01

CR SR

zFS

- XML files
- Config properties
- Applications

/zWebSphereOEM/V7R0/config1

- .

Overview of Liberty Profile

IBM

The Liberty Profile is designed to be a single-JVM server model that is lightweight, composable and dynamic:

Java Virtual Machine

Application ... Application

API API API | API API API
Composable Function ... Composable Function

`server.xml`

- **Composable** -- you configure the function the application needs; you don't need to load up everything
- **Dynamic** -- changes to configuration or changes to applications detected and dynamically enabled
- **Subset of traditional WAS function**
  Liberty is not full Java EE, traditional WAS is
- **Upwards application compatibility**
  Apps that run in Liberty will run in traditional WAS ... but not necessarily the other way around since Liberty is subset of traditional WAS
- **Each server is one JVM**
- **Run from UNIX shell or as started task**
- **One required configuration file: `server.xml`**
- **_Not_ part of traditional WAS administrative DMGR, federated node model**
  But there is an ability to manage via the "Job Manager" function of traditional WAS (advanced topic, we won't get into that here)

Optional Liberty address space - Angel

IBM

- Many z/OS services require callers to be _authorized_

  - Typically documented as "in a system key or supervisor state"
  - These services, when abused, have side effects that could impact the stability or integrity of the system so the system requires callers to have extra privileges

- Exploiting most z/OS features requires authorized code

  - Workload management
  - Transaction management
  - SAF (security) interface exploitation
  - Cross-memory communications

- The _Angel_ enables unauthorized Liberty profile servers to access these authorized services

---

One New Enhancement in z/OSMF V2.1
IBM

z/OSMF is designed to use the **Liberty profile** in IBM WebSphere Application Server for z/OS, V8.5, this is expected to improve and simply -

- ▶ **Packaging**: Provide a smaller and faster product package that requires fewer resources. WAS OEM is now removed from z/OSMF, WAS Liberty Profile is part of z/OSMF package, the new package footprint is 300+ MB
- ▶ **Installation and Configuration**: Setup no longer requires two separate configurations for runtime(WASOEM) and application(z/OSMF), reduced to one single stream configuration (one setup only), this change also results fewer overall prompts and variables.
- ▶ **Service**: Follow the normal z/OS model through normal SMPE receive/apply and restart z/OSMF to pick up new service, no longer required separate step for activation
- ▶ **Performance**: Faster startup (<15 seconds);
  Memory requirement(1GB+, previously required 2 GB)

---

z/OSMF V2.1 implementation
IBM

- ▪ **z/OSMF is rebased on the WebSphere Application Server for z/OS V8.5 Liberty profile**
  - ▶ **This is expected to provide significant reductions in the resource requirements for z/OSMF**
    - ● **The WASOEM FMID is no longer required and the requirement for separate configuration of the runtime is eliminated.**
    - ● **Result is reduced footprint size, reduced memory requirement and reduced CPU requirement**
  - ▶ **z/OSMF setup is simplified**
    - ● **Reduced steps to configure z/OSMF**
  - ▶ **Applying service is easier**
 - ▶ **Faster startup of application**

z/OSMF V2.1 FMIDs

- z/OSMF V2.1 consists of nine (9) FMIDs:
  - HSMA210 - z/OS Management Facility core
  - HSMA211 - z/OSMF ISPF
  - HSMA212 - z/OSMF Resource Monitoring
  - HSMA213 - z/OSMF WLM
  - HSMA214 – z/OSMF Software Deployment (really Software Management)
  - HSMA215 - z/OSMF Incident Log
  - HSMA216 - z/OSMF Capacity Provisioning
  - HSMA217 – z/OSMF Workflow
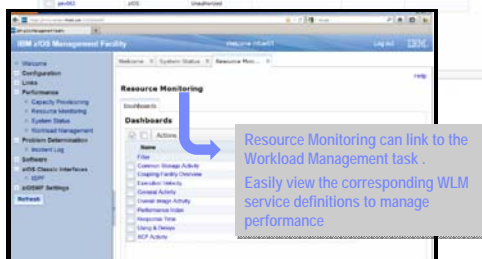 - HSMA21A - z/OSMF Configuration Assistant

Configuration process overview
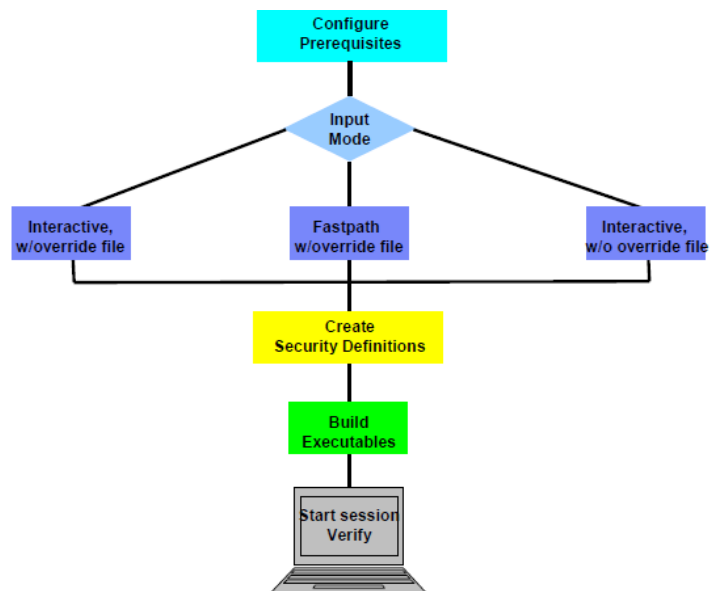
System Status and Resource Monitoring

IBM

- System Status is an RMF based workload reporting application that provides a performance status of sysplexes
- The status indicator informs you whether or not workloads are meeting WLM goals
- You can Monitor z/OS and Linux workloads and view workload resource metrics

Performance Index Status column for a quick indicator of sysplex health
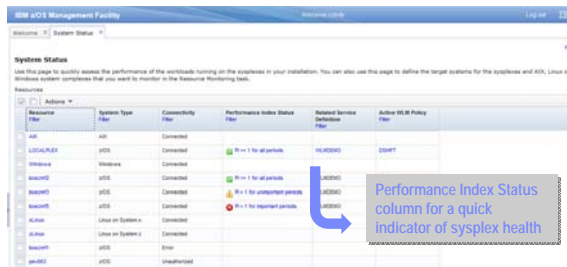
The System Status task links to WLM (e.g. linking to service definitions and active WLM policies), and the WLM application links to the System Status task.

Resource Monitoring can link to the Workload Management task .

Easily view the corresponding WLM service definitions to manage performance

Resource Monitoring

IBM

- Provide real time status on systems or sysplexes defined to system status task
- Monitor most RMF Monitor III metrics, create and save custom views, and display real-time performance data as bar charts.
- Use the RMF XP capabilities to allow you to monitor the zBX, combining metrics on a customizable dashboard to view the health of the zEnterprise Ensemble
- Define and customize monitoring dashboards to focus more precisely on specific workloads
- Link to view appropriate WLM Service definitions

Quickly assess resource health

RMF Product Overview

IBM

RMF Spreadsheet Reporter

RMF Performance Data Portal

z/OSMF Resource Monitoring

RMF Distributed Data Server (GPMSERVE) & RMF XP (GPM4CIM)

RMF Postprocessor
Historical Reporting,
Analysis and Planning

RMF Monitor II and III
Real-Time Reporting,
Problem Determination

RMF Sysplex Data Server and APIs

CIM Client APIs

SMF

RMF
Data Gatherer

RMF
Monitor I

RMF
Monitor II
background

RMF
Monitor III

VSAM

AIX & Linux
CIM Provider

---

z/OSMF Resource Monitoring

IBM

Infrastructure

Browser

SYSA:RMFGAT   SYSB:RMFGAT

z/OSMF
Resource
Monitoring

DDS on
PRODPLEX

DDS on
LOCALPLEX

DDS on
TESTPLEX

SYSA:RMFGAT   SYSB:RMFGAT

SYSA:RMFGAT   SYSB:RMFGAT

- Browser connects to z/OSMF
- z/OSMF Resource Monitoring can connect to all systems where the RMF Distributed Data Server (DDS) is running
- DDS retrieves z/OS performance data from all images of the sysplex where the RMF Monitor III gatherer is active

z/OSMF Resource Monitoring

The Resource Model

- The Sysplex is the top-level resource
- The resource identifier consists of three parts:
  - High level qualifier
  - Resource Name
  - Resource Type

MVS Image
I/O Subsystem
All SSIDs
SSID
All LCUs
LCU
All Channels
Channel
All Volumes
Volume
Processor
Storage
Auxiliary Storage
Central Storage
CSA, SQA,
ECSA, ESQA
Expanded Storage
Enqueue
Operator
Subsystems
JES, XCF, HSM

Sysplex

CPC
LPAR
Coupling Facility
CF Structure

```
,SYSDPLEX,SYSPLEX
  ,SYSF,MVS_IMAGE
    SYSF,*,I/O_SUBSYSTEM
      SYSF,*,ALL_SSIDS
      SYSF,*,ALL_LCUS
      SYSF,*,ALL_CHANNELS
      SYSF,*,ALL_VOLUMES
      SYSF,*,ZFS
    SYSF,*,PROCESSOR
    SYSF,*,STORAGE
    SYSF,*,ENQUEUE
    SYSF,*,OPERATOR
    SYSF,*,SW_SUBSYSTEMS
  ,SYSE,MVS_IMAGE
  ,SYSD,MVS_IMAGE
  ,CF01,COUPLING_FACILITY
  ,CF02,COUPLING_FACILITY
  ,70B82,CPC
```

Resource monitoring security

Security

z/OSMF Resource Monitoring

This service is invoked on behalf of the WAS servant userid.

IBM z/OS Management Facility
User ID: zosmfad
Password or pass phrase
Log in
HttpRequest.getRemoteUser()

HTTP Header

Base64 encoded string

IRRSPK00()
The callable service IRRSPK00 returns a passticket for a specific userid and an application name

The passticket is associated with the z/OSMF login userid

RMF Distributed Data Server

__passwd()   RACROUTE REQUEST=VERIFY

RACF

13

Resource Monitoring – Predefined Dashboards

Resource Monitoring – Predefined Dashboards

7/29/2014

Resource Monitoring – Predefined Dashboards

Resource Monitoring – New Dashboard

15

Resource Monitoring – New Dashboard

z/OSMF Resource Monitoring & RMF XP

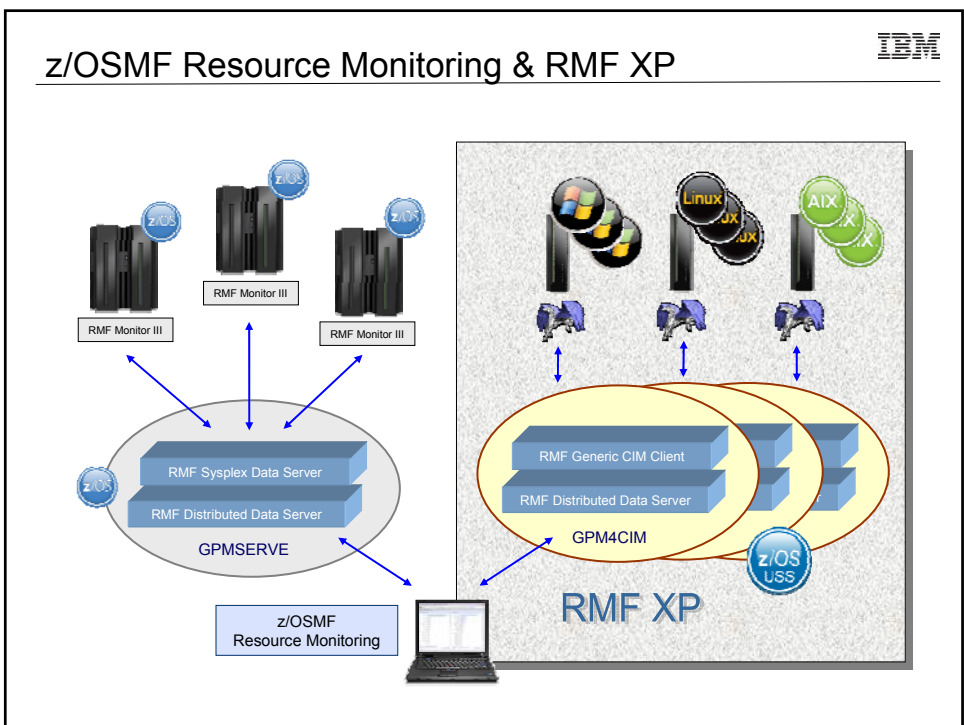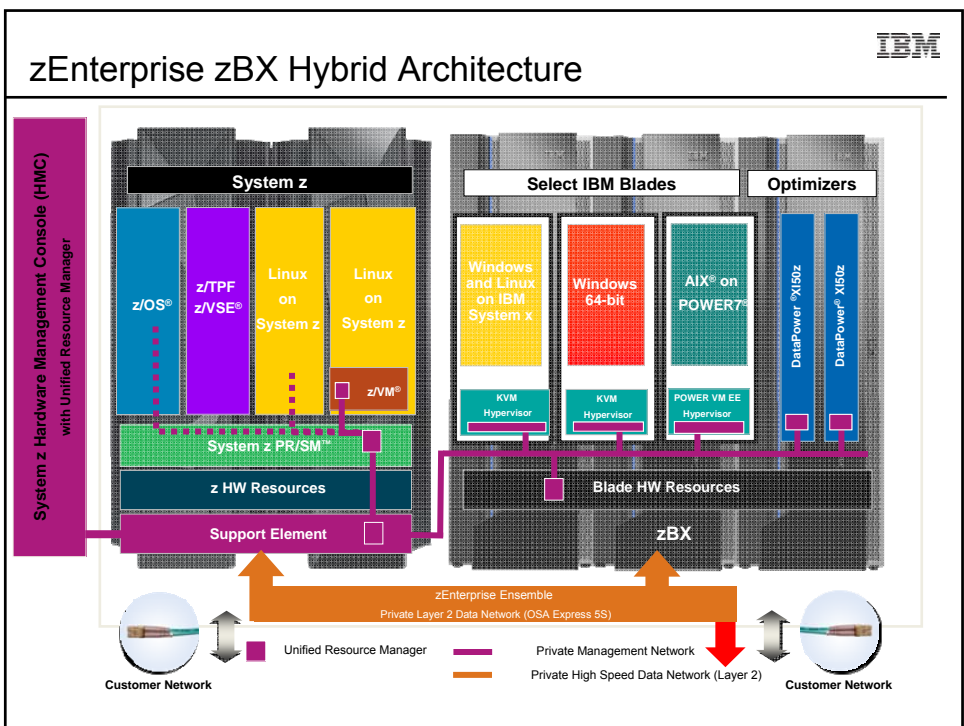- RMF XP is the solution for Cross Platform Performance Monitoring

- RMF XP supports the Operating Systems running on
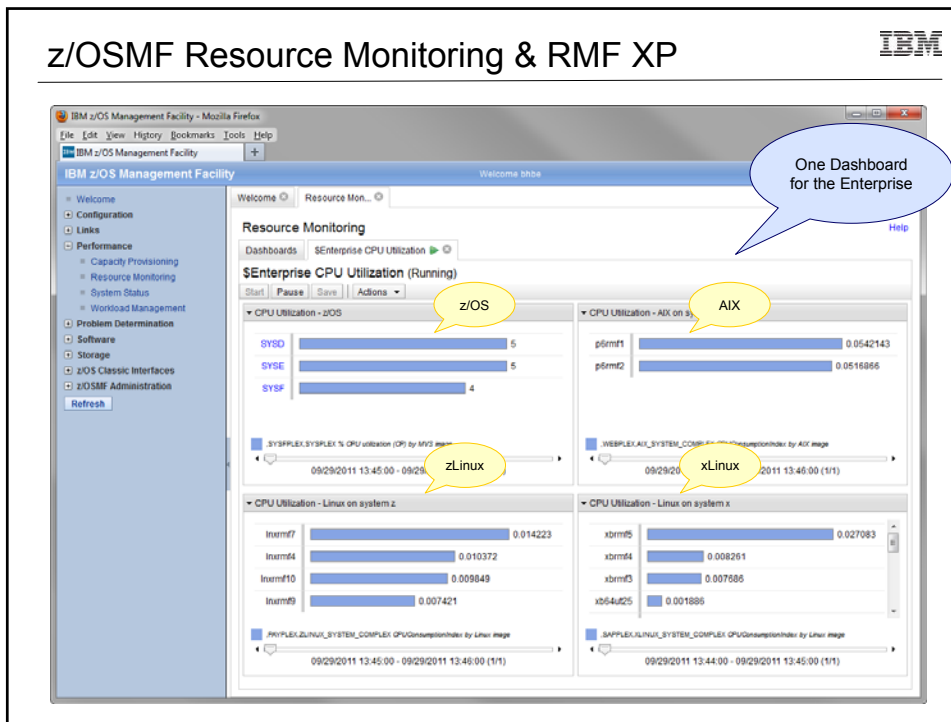 - x Blades
  - p Blades

- In addition RMF XP supports Linux on System z
  - LPAR Mode
  - VM Guest Mode

7/29/2014

zEnterprise zBX Hybrid Architecture

z/OSMF Resource Monitoring & RMF XP

17

z/OSMF Resource Monitoring & RMF XP

IBM

z/OSMF V2.1 Workload Management

IBM

- Simplify creation, modification and review of z/OS Workload manager service definitions
- Accelerate the time to establish service definitions with built in best practices
- Easily install/extract service definitions and edit them
- Activate service policies and monitor WLM status
- View performance data for the currently active service classes, service policies, and service definition with the Resource Monitoring plug-in
- Link automatically to Resource Monitoring and System Status

Test show it is 10X Faster to Review and Update WLM Policies with z/OSMF than through typical manual means
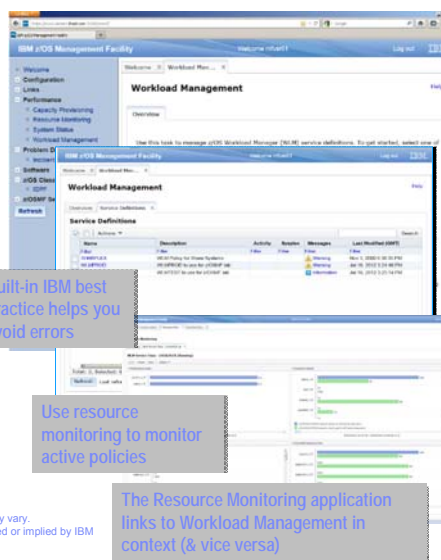

All performance information was determined in a controlled environment. Actual results may vary.
Performance information is provided "AS IS" and no warranties or guarantees are expressed or implied by IBM

z/OSMF Workload Management

- Integrates repository to store service definitions
- Import and export of service definitions in XML format
- Printing of service definitions
- Creation, editing, reviewing of service definitions in tabular format
- Direct navigation between policy elements during editing/viewing of service definitions
- Best-practice checking for service definitions
- Supports the installation of service definitions and the activation of service policies
- Displays WLM status of systems in sysplex
- Different authorization levels for viewing, modifying and installing service definition
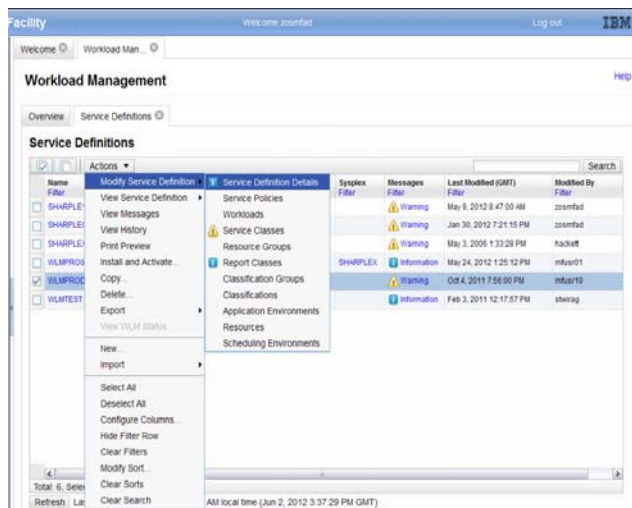
z/OSMF Workload Management – Some Benefits

	Without WLM Policy Editor** in z/OSMF using WLM Administrative Application	With WLM Policy Editor** in z/OSMF
Optimization of a service definition based on best-practices	Read through WLM-related manuals and identify best-practices. Print out the service definition and investigate it with respect to proposed best-practices. If required, modify the policy elements correspondingly. **Hours (or days when done initially)**	Check the best-practice hints the GUI displays for policy elements. If required, modify the policy elements correspondingly. **Minutes (or hours when done initially)**
Review of service definitions for daily changes, migration, consolidation	To get an overview of a service definition you have to print it to a data set, download the data set, and print it out or feed it into the *Service Definition Formatter tool* to filter and sort policy elements. **5-10 minutes until review can start**	Open a service definition from the service definition repository. Navigate through it using links. Filter and sort policy elements in the tables. **Seconds until review can start**
Transfer policy elements from a test service definition to a production service definition	Print out the test service definition and update the production service definition by typing in the changes. **Up to several minutes per policy element**	Open the test and production service definition simultaneously and copy over the changed policy elements via copy&paste operations. **Seconds per policy element**

** Based on IBM laboratory results, your results may vary

Service Definition Editing

- Simplified creation, modification and review of service definitions
  - Policy elements are presented in tables
  - Tables can be filtered and sorted
  - Direct editing of policy elements within tables
  - Best-practice hints are displayed automatically while specifying policy elements
  - Several service definitions can be opened simultaneously
  - Cut, Copy, Paste of policy elements between service definitions

Transfer of Service Definition Elements

- Multiple table elements can be copied from one service definition to another service definition with one copy&paste operation
  1. Open the source service definition(s) in *View* tab(s) and switch to the table with the elements that you want to copy over
  2. Open the target service definition in a *Modify* tab and switch to the same table
  3. Select the elements in the table in the *View* tab and select action *Copy to clipboard*
  4. Switch to the *Modify* tab and trigger table action *Paste*

- You can copy&paste multiple table elements within the same service definition
  - E.g. you can copy the Periods of a Service Class from the Service Classes table to a Service Class Overrides table of a Service Policy if you want to make only small goal changes in the Service Policy
  - E.g. you can duplicate Classification Rules and insert them under another parent Classification Rule

Fine-grained Authorization (V1.13)

IBM

- Separate authorization levels for
  - Viewing of service definitions, service policies, and WLM status
  - Installation and activation of service policies
  - Modification of service definitions

- In repository authorization mode the WLM authorization of roles is controlled by three tasks on the Roles panel:
  - Workload Management
  - Workload Management Install
  - Workload Management Modify
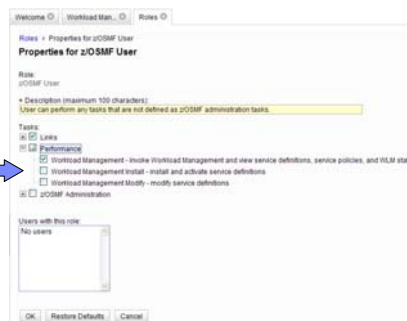
- In SAF authorization mode the WLM authorization of roles is controlled via the SAF resource names:
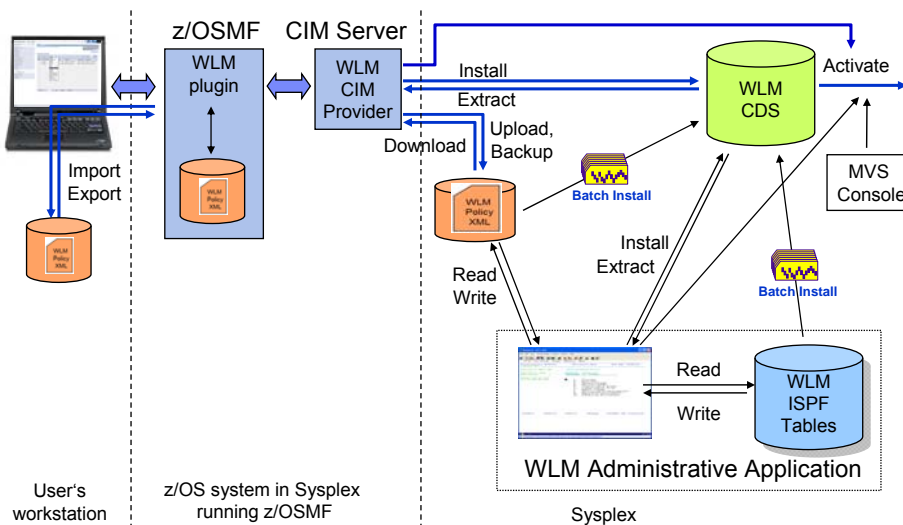 - ZOSMF.WORKLOAD_MANAGEMENT.WORKLOAD_MANAGEMENT.VIEW
  - ZOSMF.WORKLOAD_MANAGEMENT.WORKLOAD_MANAGEMENT.INSTALL
  - ZOSMF.WORKLOAD_MANAGEMENT.WORKLOAD_MANAGEMENT.MODIFY

- To enable a role to launch the Workload Management task it is not sufficient to provide authorization for 'installation' or 'modification'; in addition the role has to be authorized for 'viewing'.

Service Definition: Process Overview

IBM

Install

Activate

Extract

Upload, Backup

Download

Import Export

Read Write

Install Extract

Read

Write

Batch Install

Batch Install

MVS Console

WLM plugin

WLM CIM Provider

WLM CDS

WLM ISPF Tables

WLM Administrative Application

z/OSMF

CIM Server

User's workstation

z/OS system in Sysplex running z/OSMF

Sysplex

Capacity Provisioning in z/OSMF V2.1

IBM

- **The z/OS Capacity Provisioning Manager can help you to monitor your systems for short term capacity fluctuations**

- **Helps you manage the physical server capacity as well as defined capacity and group capacity limits in use.**

- **Based on On/Off Capacity on Demand (CoD), temporary capacity can be automatically activated / deactivated based on a user defined policy or on command**

- **Manage, install, import /export and also activate domain configurations and policies**

- **Manage connections to Provisioning Manager and transfer provisioning policies and domain configurations from a central shared repository.**

- **Display reports about domain status,**

z/OSMF V2.1 Capacity Provisioning supports all of the functions available in the Microsoft Windows-based Capacity Provisioning Control Center.*

*Microsoft Windows based Capacity Provisioning Control Center is no longer available in z/OS V2.1

The Capacity Provisioning infrastructure

IBM
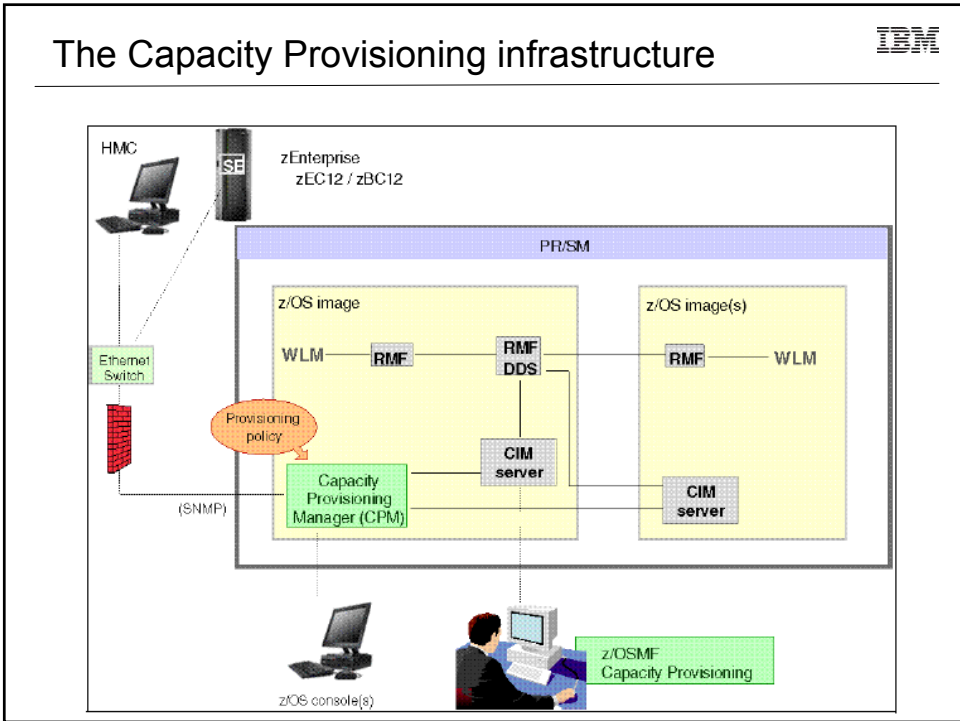
Additional information

IBM

- **z/OS Management Facility website**
  - ► http://ibm.com/systems/z/os/zos/zosmf/
  - ► Provides links to all documentation and publications
- **IBM z/OS Management Facility education modules in IBM Education Assistant**
  - ► http://publib.boulder.ibm.com/infocenter/ieduasst/stgv1r0/index.jsp
  - ► Scroll down to z/OS Management Facility
- **z/OS Hot Topics, Issue 21, 23, 25 and 27:**
  - ► http://ibm.com/systems/z/os/zos/bkserv/hot_topics.html
- **Program Directory for z/OS Management Facility (GI11-9847)**
  - ► http://www-03.ibm.com/systems/z/os/zos/zosmf/moreinfo/index.html
- **IBM z/OS Management Facility Configuration Guide (SA38-0657)**
  - ► http://www-03.ibm.com/systems/z/os/zos/zosmf/moreinfo/index.html
- **IBM z/OS Management Facility Programming (SA32-1066)**
  - ► http://www-03.ibm.com/systems/z/os/zos/zosmf/moreinfo/index.html
- **IBM z/OS Management Facility Information center**
  - ► http://publib.boulder.ibm.com/infocenter/zosmf/vxrx/index.jsp
- **z/OS Management Facility V2.1 Resource Requirements**
  - ► **http://www-.ibm.com/support/techdocs/atsmastr.nsf/Web/WhitePapers**
- **z/OS Management Facility 2.1 Redbook**

Glenn Anderson, IBM Lab Services and Training

IBM

Understanding z/OSMF for the Performance Management Sysprog

Thanks for Attending!

Summer SHARE
August 2014
Session 15724