



Session V61

Systems Management for z/VM

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Agenda

■ Systems Management Overview

■ System Administrator Tasks

- ▶ Managing user directories, Virtual Systems Management APIs, Installation and Service, Configuration tools

■ Performance and Capacity Planning

- ▶ Virtual Machine Resource Manager, Performance Toolkit for VM, HMF, Capacity on Demand

■ Availability Management

- ▶ Health Monitoring, Recovery and Failover, Automation

■ Data and Security Management

- ▶ System and data backup, ESMs, Authorization and Authentication

■ Other products and websites



Overview

■ What is Systems Management?

- ▶ A set of well-defined control points through which management actions can be driven
- ▶ Sets of tools, policies, and processes to enable systems to become easier to manage as well as more self-managing
- ▶ Administration and managing of guests within our virtualization framework
- ▶ Covers many areas of the system



Overview (cont.)...

■ What are we doing in z/VM today?

- ▶ Developing a framework of documented interfaces for ISV's to exploit to make management tasks easier than before
- ▶ Coordinating efforts with other areas of the business for a more integrated solution
- ▶ Creating more autonomic solutions to allow systems to be more self-managing and self-healing



System Administrator Tasks

■ **Creating and managing virtual images**

- ▶ User Directories, Directory Managers
- ▶ Virtual Systems Management APIs

■ **Installing and servicing software**

- ▶ Installation methods and automation

■ **Configuration and Tailoring**

- ▶ System Configuration
- ▶ I/O Auto configuration



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Directory Management



- ▶ **A user directory describes to CP the configuration and operating characteristics of each virtual machine**
 - managing users on your system
- ▶ **During init, CP checks for an object directory on SYSRES and makes it active**
 - if not found, checks CP-owned volumes or comes up with a default ID of OPERATOR where a valid directory can be created.
- ▶ **Creating or Updating a directory (manually)**
 - Must have privilege class A, B, or C (i.e., MAINT user ID)
 - XEDIT to create/change a CMS file with virtual machine entries (by default USER DIRECT)
 - Use DIRECTXA utility to run the directory-creating program and bring it online.

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Directory Management : IBM Directory Maintenance (DirMaint)

- A CMS application that helps you manage your VM directory
 - ▶ maintains user passwords, authorizations, access to minidisks
- DirMaint provides a command interface for every directory statement, plus commands for managing DirMaint itself.
- Enhanced in Version 4 and Version 5 to support Systems Management APIs.
 - ▶ _DM APIs can be replaced by other directory managers.
- Priced feature that comes installed with your VM system, but must be enabled to use it.



USER VMRMSVM VMRMSVM 64M 128M AG

IPL CMS
ENTRY

SAMPLE DIRECTORY

OPTION APPLMON QUICKDSP

SHARE ABSOLUTE 3%

ACCOUNT MONITOR

MACHINE XA

IUCV *MONITOR MSGLIMIT 255

NAMESAVE MONDCSS

CONSOLE 0009 3215 T

SPOOL 000C 2540 READER *

SPOOL 000D 2540 PUNCH A

SPOOL 000E 1403 A

LINK MAINT 190 190 RR

LINK MAINT 193 193 RR

LINK MAINT 19D 19D RR

LINK MAINT 19E 19E RR

MDISK 191 3390 1783 040 510RES MR READ WRITE MULTIPLE

Virtual System Management APIs

- **Simplifies the effort of developing solutions for managing virtual images**
 - ▶ Linux servers and other guests
 - ▶ running on a single z/VM system
- **APIs enable multiple classes of functions**
 - ▶ Allocation and management of virtual machine resources
 - ▶ Changes to a virtual machine's configuration
 - ▶ Activation and deactivation
 - Individual or Lists of virtual machines
 - ▶ Image Volume management functions
 - ▶ Managing connectivity between virtual machines

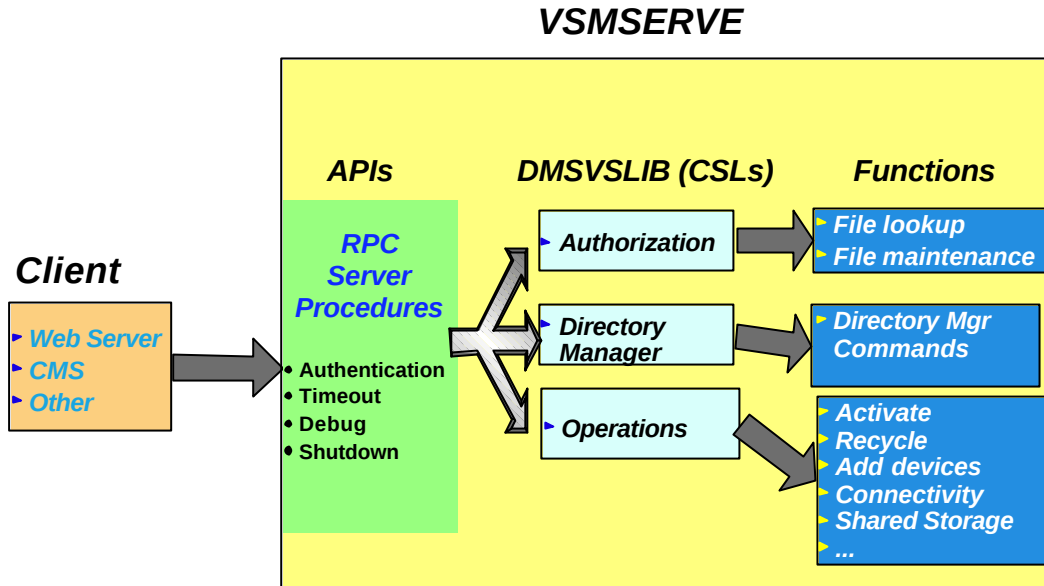


Virtual System Management APIs ...

- **APIs are invoked using Remote Procedure Call (RPC)**
 - ▶ Either remotely or from within the z/VM system
 - ▶ Platform-independent client interface
 - ▶ Callable Services Library Routines perform the requested function
 - ▶ Callable Services Library Routines replaceable to allow customized solutions
- **Security and directory management functions also provided**
 - ▶ API use requires a directory manager
 - ▶ z/VM DirMaint feature supports the APIs
- **Available on z/VM V4.4.0 and above**



The Systems Management Server



IBM Director & Virtualization Engine

- GUI interface using CIM (Common Information Model) Standards
- Includes VE Console, Server, Agents
- Managed Access Point (MAP) Server
 - ▶ Uses Systems Management APIs to invoke CP function
 - ▶ z/VM Center
 - Creation of virtual servers under z/VM
 - Deployment of Linux systems into those virtual servers
 - Allows for autonomic adjustment of users in workloads for CPU and DASD I/O management
- SOD in z/VM 5.2.0 announcement
 - coming soon!



Installation and Service

- **Many components/features are pre-installed**
- **Express Install and Traditional install processes available**
- **z/VM Version 5 can be installed on:**
 - ▶ 3390-formatted DASD volumes
 - ▶ Enterprise Storage Server SCSI disks
- **Installation media options**
 - ▶ DVD, CD-ROM, 3590 and 3480 tapes
- **Automated service process enhanced**
 - ▶ Service disks can be in SFS
 - ▶ Query RSU and PTF levels easier
 - ▶ LOCALMOD command / VMFREM utility for creating and removing local modifications



The logo for IBM eServer, featuring a stylized '@' symbol followed by the word 'server' in a bold, sans-serif font.

Configuration & Tailoring

- **System configuration information resides on a parm disk**
 - ▶ CMS-formatted minidisk that CP can read during IPL
 - ▶ Defines many system options
- **SYSTEM CONFIG file has information to define the system itself**
 - ▶ I/O Device definitions
 - ▶ System definition parameters
- **LOGO CONFIG has information about creation and configuring logos**
 - ▶ Choosing logos, input area, online messages, status area

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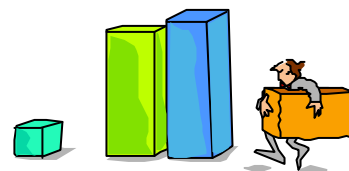
I/O Auto-Configuration (HCD and HCM for z/VM)

- **A tool to define and manage z/VM I/O configuration**
 - ▶ Rather than updating IOCDS manually
- **HCD (Hardware Configuration Definition) ported from z/OS**
 - ▶ Validates configuration definitions at data-entry time
 - ▶ Creates and maintains the I/O Definition File (IODF)
 - ▶ Dynamically changes I/O configuration using CP Dynamic I/O
 - ▶ Maintains synchronization between dynamic I/O changes and IODF
- **Hardware Configuration Manager (HCM)**
 - ▶ Runs on a Windows PC connected to z/VM via TCP/IP, and displays I/O topology in graphic form
 - ▶ Provides GUI and CLI to configure system (interacting with HCD)
- **z/VM HCD TCP/IP Dispatcher**
 - ▶ Performs the communication between HCD and HCM



Performance and Capacity Planning

- **Resource and Workload management**
 - ▶ Virtual Machine Resource Manager (VMRM)
- **Monitoring and resource instrumentation**
 - ▶ Performance Toolkit for VM
 - ▶ VMRM
 - ▶ Host Management Facility
 - ▶ IBM Operations Manager for z/VM V1.1
- **Project future capacity needs based on performance history**
 - ▶ Capacity on Demand
 - ▶ Performance Toolkit for VM



VM Resource Manager

■ Virtual Machine Resource Manager (VMRM)

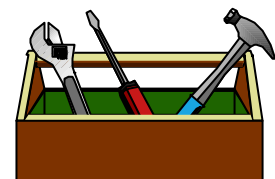
- ▶ Manages performance of selected virtual machines based on customer-defined goals for CPU and DASD I/O performance
- ▶ VMRM service virtual machine accepts:
 - Workload definitions (a single workload can include multiple virtual machines)
 - Goal specifications
 - Importance of achieving defined goals
 - optionally a new configuration file to put into production at a later time
- ▶ VMRM adjusts user CPU shares or I/O priority based on:
 - Velocity goals set for the user's workload class
 - Virtual machine CPU and/or I/O achievement levels
- ▶ Provides Application Monitor Data (APPLDATA)
- ▶ Systems Management APIs provided for configuration file management



Performance Toolkit for VM (FL440 and FL510)

■ z/VM feature (based on the FCON/ESA product)

- ▶ Priced on a one-time charge, per-processor basis
- ▶ Replaces VMPRF and RTM



■ Functional highlights

- ▶ Provides an immediate view of system performance
- ▶ Post processes its own history files or CP Monitor data
- ▶ Threshold monitoring, User loop detection
- ▶ Can monitor remote systems
- ▶ Results can be graphically viewed by a web browser
- ▶ Processes Linux APPLDATA; reduce use of RMF DDS interface
- ▶ Combines and displays both VM and Linux data
- ▶ New report for SCSI devices



Linux Details Selection

FCX224 CPU 9672 SER 15585 Interval 01:28:00 - 01:29:00 Perf. Monitor

Linux Performance Data Selection for System NC

System Data

Processes created per second	0.733
Context switches per second	52.36
Apache: Requests per second	0.017
Bytes per request	425
Busy threads	1
Idle threads	4
404 Errors per minute	0

S	Perform. Reports	Description
_	LXCPU NC	CPU utilization details <- - - - -
_	LXMEM NC	Memory utilization & activity details
_	LXNETWRK NC	Network activity (overall & by device)
_	LXFILSYS NC	File system size and utilization

Linux CPU Utilization Details

FCX230 CPU 9672 SER 15585 Interval 01:33:00 - 01:34:00 Perf. Monitor

Linux CPU Utilization for System NC

	<--- Percent CPU Utilization ---->					<-Accumulated	
(s)->	Total	User	Kernel	Nice	Idle	TotTm	UserTm
Processor	0.70	0.06	0.64	0	99.29	---	---
KernTm							
>>Mean>>							

cpu0	0.78	0.06	0.71	0	99.21	---	---

cpu1	0.73	0.18	0.54	0	99.26	---	---

cpu2	0.48	0	0.48	0	99.51	---	---

cpu3	0.86	0.01	0.84	0	99.13	---	---

Process Name							
syslogd.293	0.78	0	0.78	0	---	3657	36.08
3621							
nmbd.499	0.46	0.03	0.43	0	---	9166	1649
7517							
apachegat.29502	0.3	...	0.3	...	---	353.9	1.48
352.5							
gengat.29511	0.3	...	0.3	...	---	498.0	1.37

Host Management Facility (HMF)

- **SystemView Host Management Facility/VM**
- **Set of interfaces designed to manage VM systems**
- **Can monitor status of SVM's and restart SVM's it finds down**
- **Has function to schedule and automate system events at specific times or timeframes you specify**
- **Some of the functions now provided by Performance Toolkit**



Capacity on Demand

- **Supports On/Off Capacity on Demand (On/OffCoD) and Capacity Backup Upgrade (CBU) capabilities of zSeries servers**
 - ▶ When usage spikes occur, customers can bring additional processors online and make payments for the added capacity on a daily basis
 - ▶ Recognizes processor configuration and capacity changes
 - ▶ Report configuration changes to the system operator and any guest system that supports configuration change notification
 - ▶ Report capacity changes to guests that support capacity measurements for billing purposes
 - ▶ Reflect capacity changes in z/VM monitor and accounting data



IBM Operations Manager for z/VM V1.1

- New priced product to automate routine tasks
- Helps operators interpret messages and determine corrective actions
- Events can be scheduled to perform tasks at specific times
- Executes defined actions to automatically respond to specific issues
- Allows for monitoring and managing z/VM resources automatically



Availability Management

■ Health Monitoring

- ▶ VM Monitor to gather data that can be retrieved by applications or VM itself
- ▶ History data available to study trends
- ▶ INDICATE and MONITOR commands



■ High availability

- ▶ Recovery and failover support
 - Hyperswap command
 - Vswitch failover
 - Shutdown signal processing

■ Automation

- ▶ Feeding health data to a facility such as a service machine that takes additional action
 - ex. VMRM, Performance Toolkit, IBM Operations Manager



Monitoring

- **Periodic collection of performance data for early detection of problems and their cause**
- **System performance measurement commands available**
 - ▶ MONITOR commands
 - controls selection, collection, and reporting of data from the host system
 - Data communicated to applications using the *Monitor system service
 - ▶ INDICATE command
 - gives information on the use of and contention for system resources
- **Performance Toolkit for VM is a performance analysis program**
 - ▶ History data provided to study trends



Recovery and Failover

- **HYPERSWAP command**
 - ▶ Performs Disaster Recovery failover processing on Peer-To-Peer Remote Copy (PPRC)-linked DASD
- **Enhanced Vswitch failover**
 - ▶ Swap from a failing OSA-Express device to a backup device, or a TCP/IP controller to a backup controller
- **Shutdown Signals**
 - ▶ Allows virtual machines to enable for shutdown signals and set shutdown intervals so cleanup processing can be performed before an actual shutdown occurs
 - ▶ Shared File System (SFS) supports Automated Shutdown
 - Helps maintain integrity of SFS data
 - Filepool virtual machines enabled for shutdown signals



Security Management

- **VM has basic security functions for access and change control**

- **Authentication**

- ▶ Knowing who is accessing the system or its resources
 - VM uses what you know (password) to establish your identity
- ▶ User ID and password needed to access VM resources
 - or a portal can map an authenticated user to a VM user ID
 - anonymous access explicitly enabled by system admin possible



Security (cont.)...

- **Authorization**

- ▶ Ensuring users have access only to resources specifically permitted
- ▶ Native CP auth can be supplemented by an External Security Manager (ESM) such as RACF

- **Authorization is based on:**

- ▶ VM User ID (who you are)
- ▶ UNIX UID/GID
- ▶ Privilege classes
- ▶ Directory authorizations
- ▶ ESM access control list



Data management

■ IBM Backup and Restore Manager for z/VM V1.1

- ▶ Flexibility
 - Backup only what is needed via include, exclude, and masking statements in configuration file
 - Mix and match source and target types
- ▶ Productivity
 - Review of backup job before submission
 - User driven restores with no administrator interaction
- ▶ Control
 - Each user can only access restore data owned by him/her
 - Automatic aging and pruning of backup catalog
 - Consistent backups using the object directory



Data management (cont.)

■ IBM Tape Manager for z/VM V1.1

- ▶ Automate daily tape operations
 - Manage mount requests
 - Control tape access
 - Perform label verification
 - Expire tapes
- ▶ Efficiently manage tapes and tape devices
 - Share devices
 - Control access to individual tapes in an Automated Tape Library (ATL)
- ▶ Improve productivity
 - Notify and interact with operator on behalf of user
 - Support manual and ATL mount requests
 - Perform label verification before and after tape use



Data management (cont.)

■ **IBM Archive Manager for z/VM V1.1**

- ▶ Allows you to archive CMS and non-CMS data on disk or tape
- ▶ Helps administrators control DASD usage and reclaim space
- ▶ Easy retrieval of data at the filename filetype level
- ▶ Protects archived data by enabling administrators to control access



Other Systems Management Products

■ **Levanta by Levanta (formerly Linuxcare)**

- ▶ configure, update, replicate virtual Linux servers for zSeries under z/VM
 - <http://www.levanta.com>

■ **VMGUIOP by Sine Nomine Associates**

- ▶ simplifies admin tasks of managing VM operations through a graphical user interface
- ▶ **SYSVINIT** - utility that brings UNIX-like "init" processing to VM
- ▶ **CoTangent** - Coming soon to a website near you...
 - <http://www.sinenomine.net>



Other Systems Management Products (cont.)

- **zMon and ESALPS, et al by Velocity Software, Inc.**
 - ▶ Performance monitor and complete performance packages
 - <http://www.velocitysoftware.com>
- **Directory and Security products by Computer Associates**
 - ▶ Manages user directories and security of your system
 - <http://www.ca.com/solutions>
- **Mainview for VM Systems Cloning by BMC Software**
 - ▶ Clones Linux images
 - <http://www.bmc.com>
- **IBM Tivoli products**
 - ▶ Wide range of systems management and security products
 - <http://www.ibm.com/software/tivoli>



Other Systems Management Products (cont.)

- **Other ISV's, related products, licensed products websites:**
 - ▶ <http://www.ibm.com/vm/vendor>
 - ▶ <http://www.ibm.com/vm/related>
 - ▶ <http://www.ibm.com/vm/techinfo/lpmigr>
- **Disclaimer: This is not an exhaustive list. These are a few examples of products available from vendors for z/VM.**



Future areas of emphasis

■ **Ease-of-Use**

- ▶ Configuration
- ▶ Systems Management APIs
- ▶ Installation, service, release-to-release upgrades

■ **Performance Monitoring and Reporting**

- ▶ Performance Toolkit enhancements
- ▶ Virtual Machine Resource Manager
- ▶ Workload goal definitions

■ **Autonomic computing**

- ▶ Based on user-supplied definitions
- ▶ Self-Managing, Self-Healing



Summary

■ **Systems Management covers many areas of the system and a wide range of tasks**

■ **Many system functions and tools available**

- ▶ both IBM and vendor products

■ **Continued commitment to address customer needs**

- ▶ enhancements each release
- ▶ based on your requirements !





► **Contact info:** caseyct@us.ibm.com

► **Updated presentation:**

<http://www.vm.ibm.com/events/zser0509.html>

