



z/VM 6.3 Installation or Migration or Upgrade Hands-on Lab 16484, 16485, 16486

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Objectives



- Provide a basic understanding of the z/VM concepts necessary to host Linux guests
 - z/VM virtualization concepts
 - z/VM installation and customization tasks
 - Linux guest creation and cloning tasks
- Provide hands on experience
 - Installing z/VM 6.3
 - Customizing an SSI cluster
 - Creating and cloning Linux images
 - Relocating Linux virtual machines

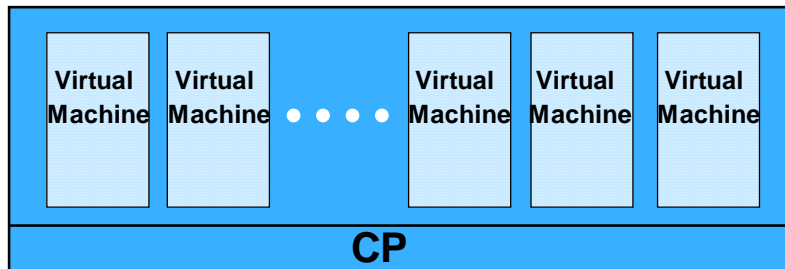
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How Does VM Work?



- The VM operating system uses the real resources assigned to it to create and control "Virtual Machines", control real devices, and simulate devices for the use of virtual machines.



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The Virtual Machine



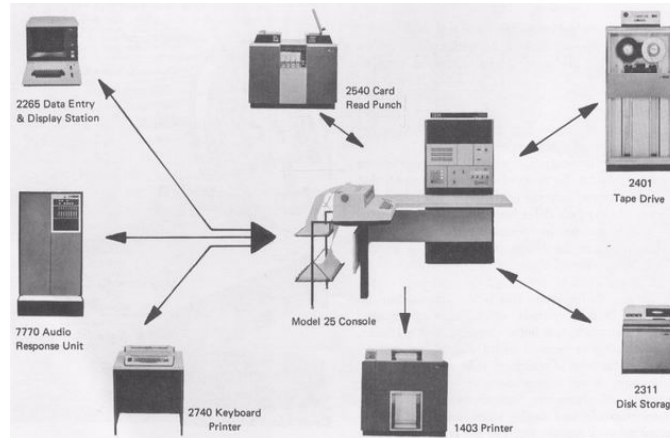
- A virtual machine
 - is a functional simulation of all of the elements of a real computer system.
 - has a name associated with it called the **Userid or Identity**
 - has its initial configuration defined in the **User Directory**
 - is created and its resources are allocated when the userid is **logged on**.
 - may be modified dynamically using CP commands.
 - is completely isolated from
 - other virtual machines
 - the Control Program



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Elements of a Real Computer System(of the 1960s)



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Virtual Processors



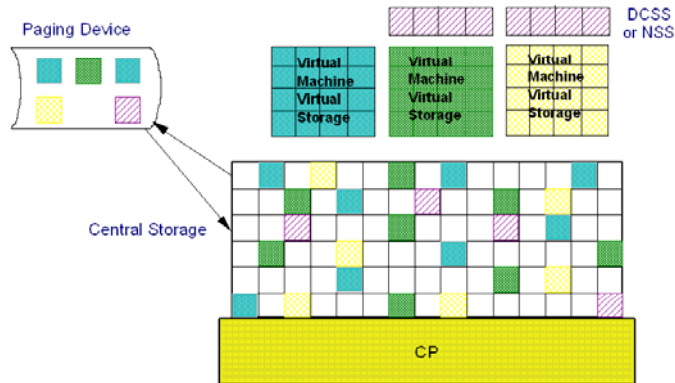
- Each virtual machine may have from 1 to 64 virtual processors which possess all of the characteristics of the real processors on which z/VM is running.
- VM dispatches the virtual processors on the real processors, based on internal algorithms and the performance settings of the virtual machine.
 - Note: z/VM 6.3 now dispatches virtual processors with an awareness of the real hardware topology



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Virtual Storage



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Virtual I/O Devices



- There are several types of virtual devices:
 - Dedicated devices
 - Tape drives, disks, network adapters, etc.
 - Minidisks
 - Allows more granular allocation of disk space
 - Permanent and temporary
 - "Virtual only" devices
 - Virtual Disks in Storage
 - Card readers, printers and punches
 - Virtual channel-to-channel adapters
 - Virtual LAN adapters
 - Virtual Coupling Facilities
- Types of devices in use may effect eligibility for Live Guest Relocation



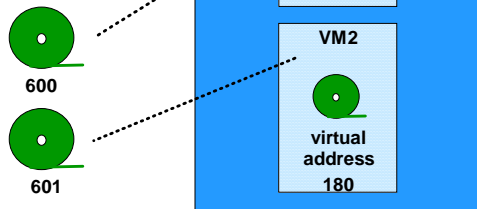
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Dedicated Devices



What CP 'sees':
2 tape drives at real
addresses 600
and 601.
They have been
assigned to virtual
machines VM1
and VM2



What the virtual
machines "see":

VM1 - 1 tape drive
at address 180

VM2 - 1 tape drive
at address 180

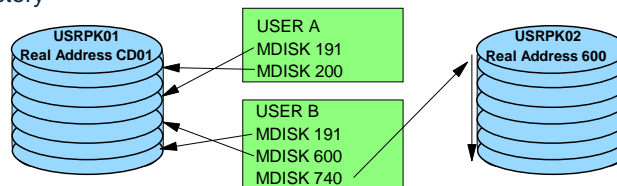
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Minidisks



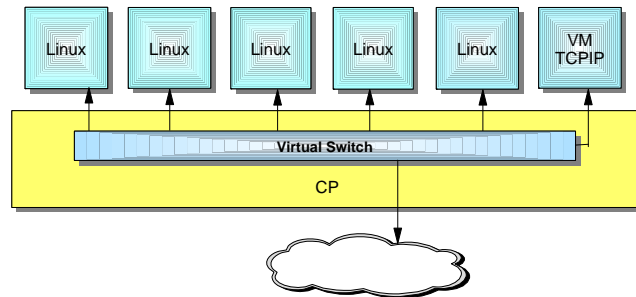
- A minidisk (mdisk) is a portion of a real DASD device which has been allocated for use by a virtual machine.
 - It can be as small as 1 cylinder or as large as the entire DASD device
 - It appears as a real dasd device to the virtual machine
 - with the same device characteristics as the real device on which it resides
 - The owner, location, and virtual address are defined in the User Directory



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Virtual LAN Adapters Virtual Switches (z/VM 4.4 +)



New Virtual Switches allow virtual QDIO connections to physical LAN segments without requiring a router

- Allows virtual machines to be in the same subnet with the physical LAN segment
- Potentially reduces overhead associated with QDIO Adapters

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Virtual Console



▪ Simulates the operation of a real system console

- Commands provide "virtual" hardware functions
 - IPL, Start/Stop, Display/Store, etc.
- Virtual device for use as operating system console
 - Emulates a 3215 or 3270 device
 - May be either
 - **Connected** - associated with the real device (3270) where the virtual machine was logged on
 - **Disconnected** - not associated with any real device
 - > Logged on and later disconnected or initialized in the disconnected state (AUTOLOG)
 - > Operations in the virtual machine continue
 - > Commands may still be issued to the virtual machine
 - > Console messages can be saved or passed to other virtual machines
 - > Most server virtual machines run disconnected
 - > Logon process reconnects a virtual machine to a display
 - > Console must be in this state for relocation



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Logging On a Virtual Machine



```
Session A - [13 x 80]
File Edit View Communication Actions Window Help
~/VM ONLINE

          LLLL  11  9999  666          #####
          7    1 1  0  888          # 0 0 #
          2    1 1  000  6666         # #####
          L    1  1  1  6  6  6       # #####
          //    1111  1  888         # 0 0 #
#####  #####  #####  #####  #####  #####
#  ##  ##  ##  ##  ##  ##  ##  ##  ##  ##  ##
#  ##  ##  ##  ##  ##  ##  ##  ##  ##  ##  ##
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#  ##  ##  ##  ##  ##  ##  ##  ##  ##  ##  ##
#####  #####  #####  #####  #####  #####

      built on IUM Virtualization Technology
      IUM Washington System Center, Gaithersburg, Maryland

Fill in your USERNAME and PASSWORD and press ENTER
(Your password will not appear when you type it)
USERNAME ---->
PASSWORD ---->
COMMAND ---->

VM RC0D  T03P10
Connected to remote server/host 9.82.24.196 using port 23
```

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LOGON PROCESS



```
Session A [45 x 80]
File Edit View Communication Actions Window Help
~/VM ONLINE

LOGON VMT010
ICPLNH102L DNSD 11W1 forced R/O: N/A by VHM010
ICPLNH102L DNSD 0200 forced R/O: N/A by VHM010
ICPLNH102L DNSD 0201 forced R/O: N/A by VHM010
NTC 0RC0 is connected; device 0RC0-0RC0 defined
~/VM Version 8 Release 8.0, Service Level 1002 (64-bit)
built on IUM Virtualization Technology
There is no LOGMSG data
TIME: 0001 0001, NO TIME, NO TIME
LOGON AT 16:11:02 EST MONDAY 02/17/14
DARD 0202 DEFTNFD
DARD F101 DETACHED
DNSD 0200 DLINCHLD
DNSD 0201 DLINCHLD
~/VM Ver. 8.0 2014 01 21 14:02

VM RC0D  T03P10
Connected to remote server/host 9.82.24.196 using port 23
```

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CP Commands



- CP commands are used to alter or query the state of the virtual machine or the VM system and all associated real and virtual devices.
 - The CP commands a user may issue are restricted by the user's assigned Privilege class.
- CP commands are not case sensitive.
- Commands can be passed directly to CP, bypassing the virtual machine operating system
 - Use the PA1 key to enter the CP environment and issue commands.
 - Precede the command with #CP
 - We will change this to %CP in the lab

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Operating Systems



- Once a virtual machine has been created by VM, it needs an operating system or standalone program to perform work. Operating systems are loaded into the virtual machine through the IPL (Initial Program Load) process, just like a real machine.
- Some of the operating systems that can run under VM are:
 - CMS
 - Linux for IBM System z
 - OS/390, z/OS
 - VSE
 - TPF
 - VM

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CMS



- The CMS component of VM provides an interactive environment for users to:
 - Write, test, debug and run applications
 - Create and edit files
 - Process batch jobs
- CMS facilities include:
 - Shared File System
 - Pipelines
 - OpenExtensions
 - XEDIT
 - HELP Facility

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Single System Image Feature Clustered Hypervisor with Live Guest Relocation



- Provided as an optional priced feature.
- Connect up to four z/VM systems as members of a Single System Image (SSI) cluster
- Provides a set of shared resources for member systems and their hosted virtual machines
- Cluster members can be run on the same or different System z servers
- Simplifies systems management of a multi-z/VM environment

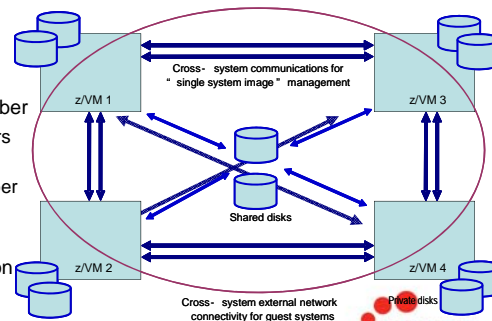
Single user directory

Cluster management from any member

- Apply maintenance to all members in the cluster from one location
- Issue commands from one member to operate on another

Built-in cross-member capabilities

Resource coordination and protection of network and disks



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Non-SSI Install



- SSI ready
 - DASD layout
 - Directory format
 - Minidisk layout
- Install on ECKD or SCSI LUNs
 - SSI requires z/VM install on ECKD
 - 3390-9 6 volumes
 - 3390-3 10 volumes

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Migration to SSI



- Prepare member specific user volume
 - Used to convert single configuration user to multiconfiguration user
- Update System Config file
 - Add SSI statements
 - Qualify statements
- Update User Directory
- Manage user spool files
- Prepare CP-Owned volumes
 - Add ownership information
 - Create Persistent Data Record on common volume
- Modify startup parameters of cluster wide sfs pool (vmfsfs)
- Shutdown and cold start
- Load spool files
- Change USER DIRECT to SSI Enabled
- Clean up

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Clone Member to Create Second SSI Member



- Second member requires 6 3390-3 or 4 3390-9 system volumes
 - Also member specific user volume
- Prepare CP-Owned volumes for member 2
- Create TCP/IP config for member 2
- Update config files for other service machines
- Update AUTOLOG1
- Copy source system and member specific user volumes to target volumes
- Update DIRMAINT config
- Update USER DIRECT
- Update SYSTEM CONFIG
- Configure CTCAs between members
- IPL member 2
- Update VMSES/E inventory
- Build saved segments and NSS
- Start service virtual machines
- Test and verify

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Upgrade Installation

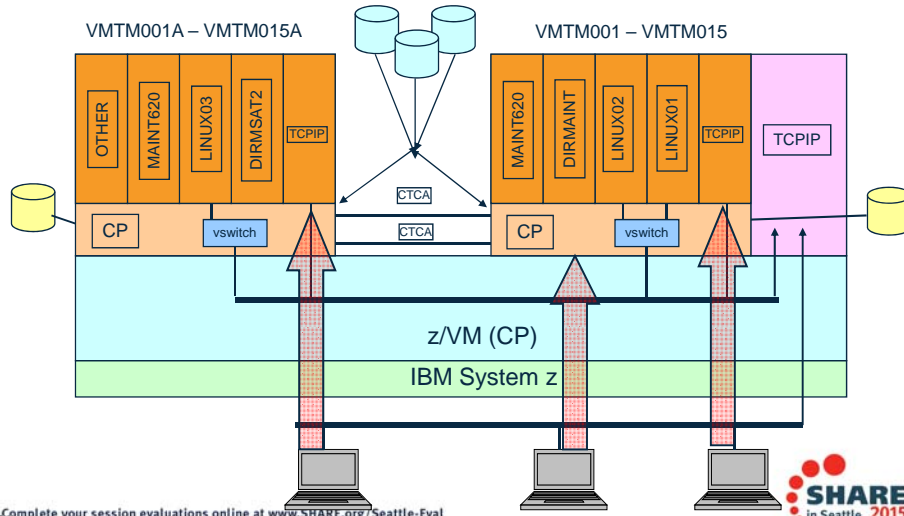


- New for z/VM 6.3
- Limited to migrations from z/VM 6.2 (non-SSI or SSI)
- Addresses problems with traditional migration in SSI clusters
 - Supports upgrading one member at a time
 - Minimal disruption of the source system being migrated
 - Ensures that z/VM 6.3 levels of cluster wide tools are available to all members of the cluster
 - E.g. DIRECTXA, CPFMTXA ...
- Most additional DASD needed for upgrade can be returned to DASD pool after upgrade

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LAB Environment



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