The Cloud Computing Cookbook

MVMUA
July 17, 2012
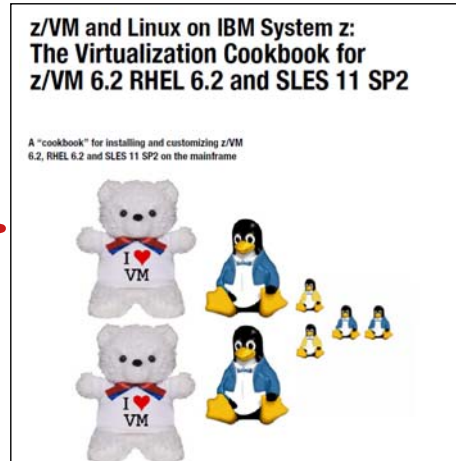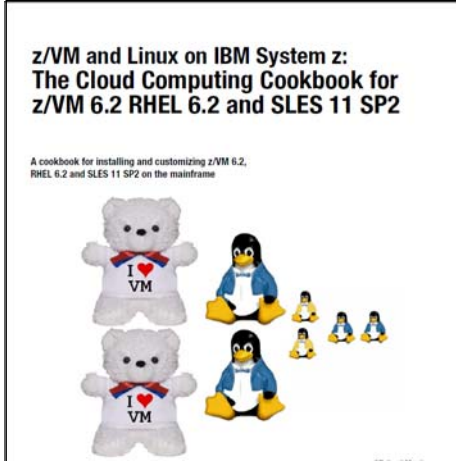Michael Mac Isaac - mikemac at us.ibm.com

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Abstract

The "Virtualization Cookbook" for System z, usually in the form of a Redbook, has been a popular reference for many years. It has been updated for 2012 and renamed "The Cloud Computing Cookbook". This presentation will focus on the latest function provided in z/VM 6.2. New sections of the book, including Live Guest Relocation, some new small REXX EXECs, enabling and using DirMaint and SMAPI, and both RHEL and SLES Linux will be addressed. **It is hoped that new material will be announced at the presentation.**

Overview

- The *Virtualization Cookbooks* and now the *Cloud Computing Cookbook* have always had the same goal in mind: to be a single source for installing and customizing z/VM, installing and customizing Linux, and getting to the point of cloning and making appliances of Linux virtual servers. Over the years, commonly used *Miscellaneous Recipes* have also been documented.

z/VM and Linux on IBM System z:
The Cloud Computing Cookbook for z/VM 6.2 RHEL 6.2 and SLES 11 SP2

A cookbook for installing and customizing z/VM 6.2, RHEL 6.2 and SLES 11 SP2 on the mainframe

z/VM and Linux on IBM System z:
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A "cookbook" for installing and customizing z/VM 6.2, RHEL 6.2 and SLES 11 SP2 on the mainframe

See: http://www.vm.ibm.com/devpages/mikemac/

Overview of entire system

LPARs BVM1 and BVM2: z/VM 6.2 on z114

LPAR 1

IDENTITY MAINT: z/VM system administration
IDENTITY TCPMAINT: TCP/IP administration
IDENTITY TCPIP: TCP/IP stack
IDENTITY AUTOLOG1: z/VM configuration at IPL
IDENTITY DTCVSW1/DTCVSW2: VSWITCH controllers

USER LNXMAINT: CMS files common to Linux systems
IDENTITY LNXADMIN: Linux system administration
USER RH62GOLD - RHEL 6.2 golden image
USER S112GOLD: SLES 11 SP2 golden image
USER LINUX153: Linux virtual server 1
USER LINUX157: Linux virtual server 2

LPAR n

OSA Express   OSA Express

Physical switch

PC Linux NFS server   Desktop machine

Resources:

CPU: 2 IFLs, shared
Memory: 6GB/2GB or more
Disk: 42 3390-3 DASD
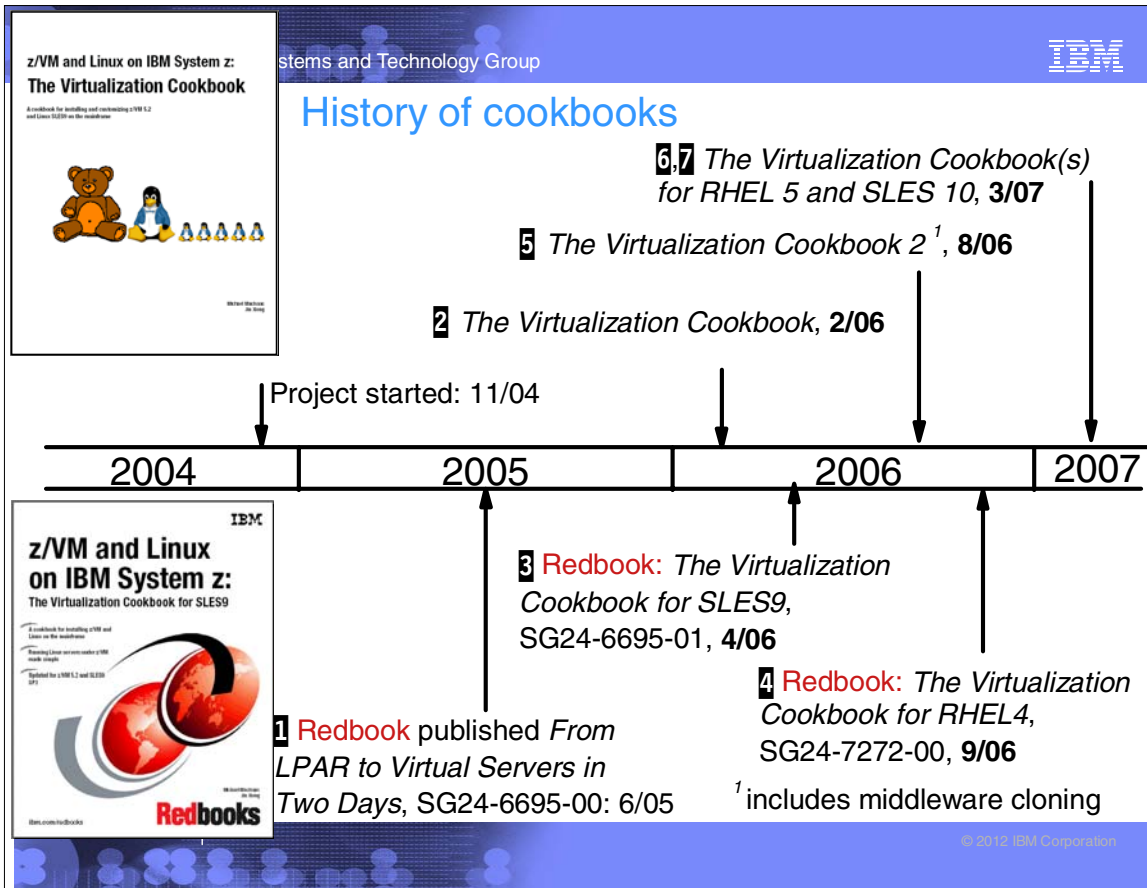Network: 16 OSA-E addresses
TCP/IP   6 TCP/IP addresses
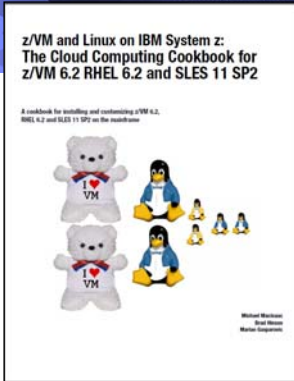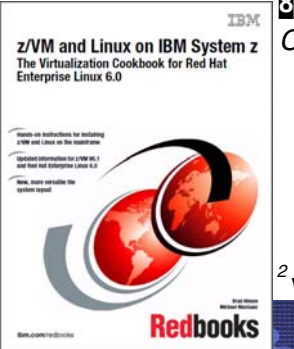
Outline of current book

1. ***Introduction and z/VM*** - introduces z/VM 6.2, discusses planning, then installation and configuration into a two member SSI with z/VM 6.2.
2. RHEL 6.2 Linux - install, customizing and clone Red Hat Enterprise Linux (RHEL)
3. SLES 11 SP2 Linux - install, customizing and clone SuSE Linux Enterprise Server (SLES)
4. ***Other topics*** - includes chapters on:
   a. **Live Guest Relocation (LGR) between SSI members**
   b. **Configuring DirMaint, SMAPI and RACF**
   c. Monitoring z/VM and Linux
   d. Miscellaneous "recipes"
   e. xCAT - the eXtreme Cloud Administration Toolkit
5. Appendices - includes references, cheat sheets and lists the source code

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History of cookbooks

z/VM and Linux on IBM System z:
The Virtualization Cookbook

6,7 *The Virtualization Cookbook(s) for RHEL 5 and SLES 10*, **3/07**

5 *The Virtualization Cookbook 2* [1], **8/06**

2 *The Virtualization Cookbook*, **2/06**

Project started: 11/04

| 2004 | 2005 | 2006 | 2007 |

z/VM and Linux on IBM System z:
The Virtualization Cookbook for SLES9

3 Redbook: *The Virtualization Cookbook for SLES9*, SG24-6695-01, **4/06**

4 Redbook: *The Virtualization Cookbook for RHEL4*, SG24-7272-00, **9/06**

1 Redbook published *From LPAR to Virtual Servers in Two Days*, SG24-6695-00: 6/05

[1] includes middleware cloning

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History of books (cont'd)

See: http://www.vm.ibm.com/devpages/mikemac/

12 *The Cloud Computing Cookbook for z/VM 6.2, RHEL 6.2 and SLES 11 SP2*, **1/12**

9 *The Virtualization Cookbook for SLES 11*, **2/10**

13 *The Virtualization Cookbook for z/VM 6.2, RHEL 6.2 and SLES 11 SP2*, **7/12**

2008	2009	2010	2011	

8 Redbook: *The Virtualization Cookbook for SLES 10 SP2* [2] , **10/08**

10 Redbook: *The Virtualization Cookbook for SLES 11 SP1*, **1/11**

11 Redbook: *The Virtualization Cookbook for RHEL 6*, **2/11**

[2] w/travelling /home

z/VM and Linux on IBM System z:
The Cloud Computing Cookbook for
z/VM 6.2 RHEL 6.2 and SLES 11 SP2

A cookbook for installing and customizing z/VM 6.2,
RHEL 6.2 and SLES 11 SP2 on the mainframe

Michael Marinson
Brad Hinson
Marian Gasparovic

IBM

z/VM and Linux on IBM System z
The Virtualization Cookbook for Red Hat
Enterprise Linux 6.0

Hands-on instructions for installing
z/VM and Linux on the mainframe

Updated information for z/VM V6.1
and Red Hat Enterprise Linux 6.0

New, more versatile file
system layout

Brad Hinson
Michael Marinson

ibm.com/redbooks

Redbooks

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Changes in the Jan 1, 2012 book

- *z/VM and Linux on IBM System z: The **Cloud Computing** Cookbook for z/VM 6.2 RHEL 6.2 and SLES 11 SP2* has many new sections:
  - ► z/VM sections are updated for 6.2 with a two member SSI setup
  - ► Linux sections are updated for both RHEL 6.2 and SLES 11 SP2, combined in one book
  - ► NFS-exported files are stored in /var/nfs/ rather than /nfs/ in keeping with Linux FHS
  - ► Use of both layer 2 and layer 3 virtual switches
  - ► VSWITCH authorization granted through COMMAND statements in user directory profile
  - ► Section on relabelling z/VM system volumes removed
  - ► New chapter (17) on Live Guest Relocation (LGR) between SSI members
  - ► New chapter (18) on how to install and configure z/VM's DirMaint and SMAPI
  - ► New chapter (21) on how to install and configure xCAT
  - ► New section (19.4) on how to install and configure sysstat on Linux
  - ► Title is buzzword compliant :))

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Changes in the July 17, 2012 book

- *z/VM and Linux on IBM System z: The **Virtualization** Cookbook for z/VM 6.2 RHEL 6.2 and SLES 11 SP2* has many new sections:
  - ▶ Title prefix is back.
  - ▶ Steps for installing RACF into an z/VM 6.2 SSI cluster have been added.
    - − This configuration describes adding the `UseRACF=yes` setting to DirMaint.
  - ▶ z/VM development now recommends the use of layer 2 virtual switches (VSWITCH) exclusively.
  - ▶ How to attach z/VM TCP/IP stack to HA virtual switch.
  - ▶ MAINT's slightly modified PROFILE XEDIT is now copied to the MAINT 19E disk so that it need not be copied to many virtual machines 191 disk.
  - ▶ Service section updated for z/VM 6.2 (now that the first RSU is available).
  - ▶ An update to the CPFORMAT EXEC code has been made available. In the January 2012 version of the code, while in a non-SSI environment, OWNER data was still being written to CP-owned volumes. That issue has been corrected.

Introduction - Planning - bill of materials

- ▪ Hardware
  - ▶ System z LPARs (2 or 4 for SSI)
    - − IFLs
    - − Memory (aka *storage*)
    - − DASD (aka *storage* :))
    - − Two OSA cards for HA VSWITCH (One is OK)
  - ▶ Temporary Distributed server
- ▪ Software
  - ▶ z/VM 6.2
  - ▶ Linux
    - − SLES-11 SP2
    - − RHEL 6.2
  - ▶ Code associated with book: http://www.vm.ibm.com/devpages/mikemac/CKB-VM62.tgz
- ▪ Networking resources
  - ▶ TCP/IP addresses for z/VM SSI members
  - ▶ One TCP/IP address for each Linux
  - ▶ DNS names

Introduction - Planning (cont'd)

```
┌─┬─┬─┬─┬─┬─┐
│M│M│E│3│4│A│
└─┴─┴─┴─┴─┴─┘
```
Address
DASD type - Minidisk or PERM space
LPAR identifier

- Conventions
  - ▶ Volume labeling convention
    - – Volume labels are only 6 chars
    - – Using device address in last 4 chars:
      - • Guarantees unique labels
      - • First character is LPAR identifier
      - • Second character is function (P=page, S=spool, M=minidisk)
  - ▶ File naming convention
    - – File that is shipped with VM/Linux - ORIG or .orig suffix
    - – File that was last working - WRKS or .works
- Password convention - z/VM admin, Linux admin, Linux users
  - ▶ Worksheets - 2 sets of 4 worksheets
  - ▶ Populated set of worksheets for examples used in the book
  - ▶ Blank set of worksheets for
    - – z/VM resources
    - – Linux resources
    - – z/VM DASD
    - – Linux virtual machines
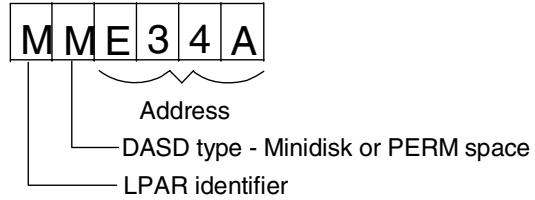
Introduction - Configure a desktop machine

- SSH client
  - ▶ PuTTY is described
    - – Set SSH protocol to "2 only"
    - – Add rows, columns, scrollback buffer
    - – Save sessions
- VNC client
  - ▶ Recommended for install of Linux, some software
  - ▶ RealVNC is described
- 3270 emulator
  - ▶ Set Enter and Clear key if possible
  - ▶ Set to use 43 lines
  - ▶ Set to Reconnect after logoff
  - ▶ For Linux, x3270 is most popular

Introduction - Configure a PC server

- Installing Linux on zSeries is a chicken and egg problem
- Recommendation: install Linux on an Intel box as a temporary NFS server:
  - ▶ Install Linux onto a PC
  - ▶ Copy files associated with this book to this NFS server
  - ▶ Untar to /var/nfs/CKB-VM62/
  - ▶ Set up an install directory under /var/nfs/<distro>/
  - ▶ Configure the NFS server to export these two directories

Installing and configuring z/VM

- Obtain z/VM through electronic download
- Configure an FTP server for z/VM installation
- Install z/VM from DVD or FTP server
- Customize TCPIP - z/VM stack, FTP server
- Customize SYSTEM CONFIG
  - ▶ Define VSWITCHes, other configuration
- Add volumes for paging and minidisks
  - ▶ CPFORMAT EXEC is included
- Create LNXMAINT for common CMS files- kernels, RAMdisks, PARMfiles, etc.
- Customize system startup and shutdown
  - ▶ SHUTDOWN z/VM signals Linux servers to shutdown
  - ▶ IPL of z/VM autologs (boots) important Linux servers
- z/VM security issues

Obtain z/VM through Electronic Download

- Go to the z/VM service page:
  http://www.vm.ibm.com/service/
- Click on the link **IBM Shopz** in the section *IBM Support Portals*
  - ▶ Sign in by clicking on the link *Sign in for registered users* in the upper right
  - ▶ Click on the link **create new software orders**
  - ▶ On *Step 1*, click on the radio button **z/VM Products** and choose **VM SDO version 6** in the dropdown menu to the right. Click Continue.
  - ▶ On *Step 2*, select a hardware system on which you plan to run z/VM
  - ▶ On *Step 3*, first filter, select **VM - VM Base Product**, second filter, select **Show all products** then click **Show catalog**
  - ▶ Select **z/VM V6 3390 System DDR** and click **Continue**
  - ▶ On *Step 4*, verify the order and click **Continue**
  - ▶ On *Step 5*, verify the entitlements and click **Continue**
  - ▶ On *Step 6*, for the *Preferred media*, select **Internet** and click **Continue**
  - ▶ On *Step 7*, review and click **Submit**

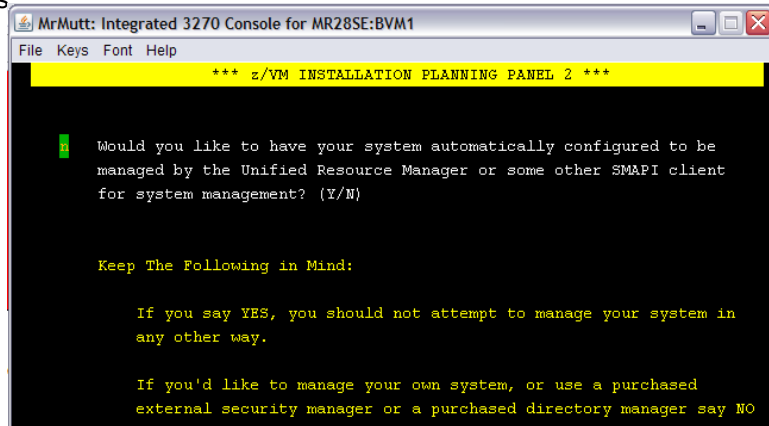# Configure an FTP server for z/VM installation

- Prepare the z/VM product install files
- Install the FTP server
- Configure the FTP server
  - ▶ Anonymous or not?
- Test the anonymous FTP server
- Aside: interesting fact:

```
gpok240:/nfs # du -sh sles11sp2 rhel6.2 zvm62
13G     sles11sp2
5.3G    rhel6.2
4.1G    zvm62
```
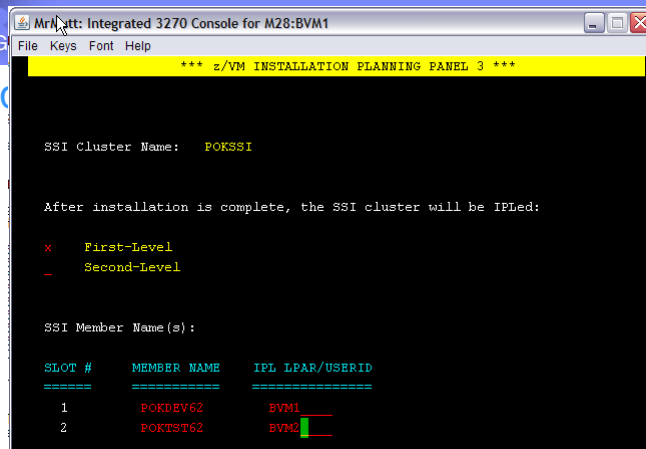
Install z/VM from DVD or FTP server

- Start the z/VM install
  - ► Important screens (below and next chart)
- Copy a vanilla z/VM system to DASD
- IPL the first SSI member
  - ► New IPL Parms:
  ```
  ==> q iplparms
  ```
  ```
  FN=SYSTEM        FT=CONFIG        PDNUM=1        PDVOL=D964
  ```
- IPL remaining SSI members
- Verify the installation
- Configure TCP/IP

MrMutt: Integrated 3270 Console for MR28SE:BVM1

File Keys Font Help

```
                    *** z/VM INSTALLATION PLANNING PANEL 2 ***


   n    Would you like to have your system automatically configured to be
        managed by the Unified Resource Manager or some other SMAPI client
        for system management? (Y/N)


        Keep The Following in Mind:


          If you say YES, you should not attempt to manage your system in
          any other way.


          If you'd like to manage your own system, or use a purchased
          external security manager or a purchased directory manager say NO
```

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z/VM install screens (cont'd

MrMutt: Integrated 3270 Console for M28:BVM1

File Keys Font Help

```
                    *** z/VM INSTALLATION PLANNING PANEL 3 ***



   SSI Cluster Name:    POKSSI


   After installation is complete, the SSI cluster will be IPLed:

   x     First-Level
   _     Second-Level



   SSI Member Name(s):

   SLOT #       MEMBER NAME       IPL LPAR/USERID
   ======       ===========       ===============
     1          POKDEV62          BVM1
     2          POKTST62          BVM2
```

MrMutt: Integrated 3270 Console for MR28SE:BVM1

File Keys Font Help

```
              *** z/VM INSTALLATION VOLUME DEFINITION ***


        TYPE      LABEL     ADDRESS                FORMAT (Y/N)
        ======    =======   =======                ============
     COMMON       CV6284    6284                         Y
     RELVOL       CV6285    6285
     RELVOL2      CV6286    6286
     RELVOL3      CV6287    6287


        TYPE      LABEL     ADDRESS       TYPE      LABEL     ADDRESS
        ======    =======   =======       ======    =======   =======
POKDEV62                              POKTST62
     RES          JV6280    6280          RES       WV639B    639B
     SPOOL        JS6281    6281          SPOOL     WS639C    639C
     PAGE         JP6282    6282          PAGE      WP639D    639D
     WORK         JV6283    6283          WORK      WV639E    639E
```

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z/VM 6.2 SSI block diagram

CEC 1

M01RES MAINT 123	M01S01 $SPOOL$ A01
M01P01 $PAGE$ A01	M01W01 MAINT 124

M02RES MAINT 123	M02S01 $SPOOL$ A02
M02P01 $PAGE$ A02	M02W01 MAINT 124

Member 1 — SYS_ID_1

Member 2 — SYS_ID_2

ISFC communications

Shared Disks:
- VMCOM1 PMAINT 133
- 620RL1 MAINT620 131
- 620RL2 MAINT620 132
- 620RL3 RELVOL3

Member 3 — SYS_ID_3

Member 4 — SYS_ID_4

Common LAN

CEC 2

M03RES MAINT 123	M03S01 $SPOOL$ A01
M03P01 $PAGE$ A01	M03W01 MAINT 124

M04RES MAINT 123	M04S01 $SPOOL$ A01
M04P01 $PAGE$ A01	M04W01 MAINT 124

SSI block diagram - values used in book

CEC 1: M28

JV6280 RES: MAINT 123	JV6281 $SPOOL$ A01
JV6282 $PAGE$ A01	JV6283 W01: MAINT 124

WV639B RES: MAINT 123	WV639C $SPOOL$ A02
WV639D $PAGE$ A02	WV639E W01: MAINT 124

LPAR 1: **BVM1** — SysID: **POKDEV62**

LPAR 2: **BVM2** — SysID: **POKTST62**

ISFC communications

Shared Disks:
- CV6284 PMAINT 133
- CV6285 MAINT620 131
- CV6286 MAINT620 132
- CV6287 RELVOL3

LPAR 3: _____ — SysID: _____

LPAR 4: _____ — SysID: _____

Common LAN

CEC 2: _____

_____ RES: MAINT 123	_____ $SPOOL$ A03
_____ $PAGE$ A03	_____ W01: MAINT 124

_____ RES: MAINT 123	_____ $SPOOL$ A04
_____ $PAGE$ A04	_____ W01: MAINT 124

Customize z/VM TCP/IP stack and FTP server

- Recommend IPWIZARD for TCPIP configuration
  - ▶ Run once for each SSI member
  - ▶ Configure XEDIT profile on TCPMAINT
- Recommend turning on z/VM FTP server
  - ▶ Run once for each SSI member
- New: Attach the z/VM TCP/IP stack to the HA VSWITCH
  - ▶ Comment out `:attach.` line in SYSTEM DTCPARMS
  - ▶ Modify PROFILE TCPIP: OSA rdev => 0600 vdev
  - ▶ Grant TCPIP access to VSW1 in user directory

Customize SYSTEM CONFIG file

- Recommendations
  - ▶ Increase retrieve key capacity - from 20 to 99
  - ▶ Allow VDISKs to be created for swap spaces
    - – Using SWAPGEN EXEC is common to create in-memory Linux swap spaces
  - ▶ Turn off the Disconnect Timeout feature
    - – So Linux virtual machines are not forced off by SYSTEM
  - ▶ Define layer 2 and 3 virtual switches
    - – Layer 2 is now recommended
  - ▶ Set up "Equivalency IDs" - new for z/VM 6.2

```
/* Add EQID statements for OSA addresses and unique MAC IDs */
POKDEV62: begin
  rdev 4200-420f eqid osaset1 type osa
  rdev 4300-430f eqid osaset1 type osa
  vmlan macprefix 02000b
POKDEV62: end
POKTST62: begin
  rdev 4200-420f eqid osaset1 type osa
  rdev 4300-430f eqid osaset1 type osa
  vmlan macprefix 02000c
POKTST62: end
```

CPFORMAT EXEC

```
==> cpformat
Synopsis:

  Format and label DASD as page, perm, spool or temp disk space
  The label written to each DASD is W<t><xxxx> where:
    <t> is type - P (page), M (perm), S (spool) or T (Temp disk)
    <xxxx> is the 4 digit address

Syntax is:
                   <--------------<
  >>--CPFORMAT--.-vdev--------.--AS---.-PERM-.--------->< 
                '-vdev1-vdev2-'        '-PAGE-'
                                       '-SPOL-'
                                       '-TEMP-'
Example:
==> att a775-a779 *
A775-A779 ATTACHED TO MAINT
==> cpformat a775-a779 as page
...

New: Owner information is added to CP-owned devices
```

Add volumes for paging and minidisks

- Copy the CPFORMAT EXEC
- Format volumes for page space
  - ► Use the CPFORMAT EXEC with "**for page**"
- Format DASD for minidisks
  - ► Use the CPFORMAT EXEC with "**for perm**"
- Update the SYSTEM CONFIG file. e.g.:

```
POKDEV62: BEGIN
  CP_Owned Slot 251 JP628A
  CP_Owned Slot 252 JP6288
  CP_Owned Slot 253 JP6233
  CP_Owned Slot 254 JP6232
  CP_Owned Slot 255 JV6282
POKDEV62: END

POKTST62: BEGIN
  CP_Owned Slot 251 WP633E
  CP_Owned Slot 252 WP633C
  CP_Owned Slot 253 WP633B
  CP_Owned Slot 254 WP628B
  CP_Owned Slot 255 WV639D
POKTST62: END
...
User_Volume_List CV6285 CV6286 CV6287
User_Volume_Include JM6*
```

23-24

Create LNXMAINT for common CMS files

- Define virtual machine
- Customize virtual machine
- Copy files
  - ► 191 disk: `PROFILE EXEC, PROFILE XEDIT`
  - ► 192 disk: Common Linux files
    ```
    PROFILE EXEC
    PROFILE XEDIT
    SAMPLE CONF-RH6
    SAMPLE PARM-S11
    SWAPGEN EXEC
    RHEL62 EXEC
    SAMPLE PARM-RH6
    SLES11S2 EXEC
    <Linux> RAMDISK
    <Linux> KERNEL
    ```

Customizing z/VM startup and shutdown

- Add a minidisk link to AUTOLOG1 user directory entry
- Call a startup EXEC common to all SSI members - NEW - this has been removed:
  ```
  /* Common code to be run at SSI IPL time */
  "CP XAUTOLOG TCPIP" /* Autolog TCPIP */
  "CP SET MDC STOR 0M 128M" /* Limit minidisk cache in CSTOR */
  "CP SET MDC XSTORE 0M 0M" /* Disable minidisk cache in XSTOR */

  "CP SET SIGNAL SHUTDOWN 600" /* Allow guests 10 min to shut down */
  ```
- Start Linux virtual machines on appropriate SSI members
  ```
  /* Start Linux systems on SSI member 1 */
  "CP XAUTOLOG LINUX01"

  "CP XAUTOLOG LINUX02"
  ```
- Test a SHUTDOWN REIPL

SSISHUTD and SSICMD EXECs

```
==> ssishutd help
Synopsis:
  SHUTDOWN or SHUTDOWN REIPL an SSI cluster

Syntax is:
   >>--SSISHUTD-----.---------.----------><
                    '--REIPL--'

==> ssicmd
Synopsis:
SSICMD cmd

cmd is a command to be issued on each of the members
  in the SSI cluster using the AT command.

Example:
==> ssicmd q proc
POKDEV62:
PROCESSOR 00 MASTER CP
PROCESSOR 01 ALTERNATE CP

POKTST62:
PROCESSOR 00 MASTER CP
PROCESSOR 01 ALTERNATE CP
```

---

z/VM security issues

- Change passwords in USER DIRECT
- Use a z/VM Security product?
  - ▶ IBM RACF
  - ▶ CA VM:Secure
- The paper *z/VM Security and Integrity*
  - ▶ http://www.vm.ibm.com/library/zvmsecint.pdf

Servicing z/VM

- Apply a Programming Temporary Fix (PTF)
  - ▶ Get service from Internet
  - ▶ Receive, apply and build
  - ▶ Put into production
- Apply a Recommended Service Upgrade (RSU)
  - ▶ New: RSU6202 is now available and documented
- Determining z/VM's service level

Tangent - <X>aaS

- Software as a Service (SaaS)
- Platform as a Service (PaaS)
- Infrastructure as a Service (IaaS)

Heterogeneous Virtual Infrastructure Management
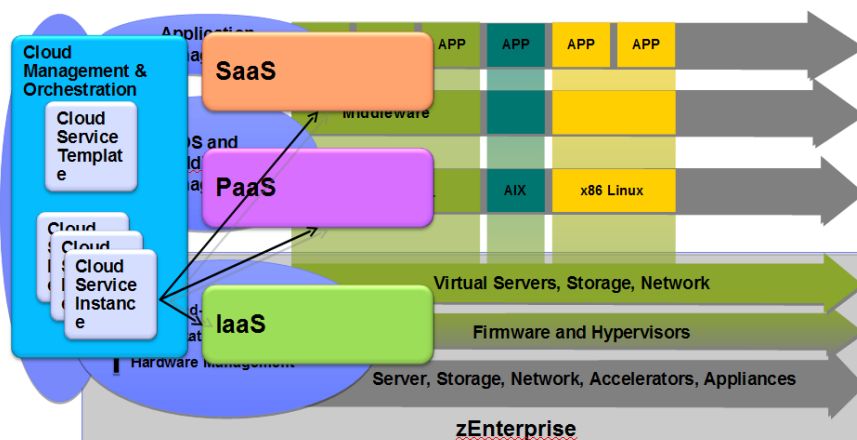
Tangent - virtualization terminology

- User ID
- Virtual machine
- Guest
- Container

z/VM Live Guest Relocation (LGR)

- LGR considerations
  - ► USERs are relocatable, not IDENTITYs
  - ► Memory size (central, expanded)
  - ► Link and resource contention
  - ► Add `OPTION CHPIDV ONE` to the Linux PROFILE in user directory
  - ► Linux must not have CMS disks at relocate time
    - – Disks can be detached at Linux boot time
    - – Added to /etc/rc.d/rc.local:
      ```
      ...
      chshut halt vmcmd logoff
      chshut poff vmcmd logoff
      modprobe vmcp
      vmcp det 190
      vmcp det 191
      vmcp det 19d
      vmcp det 19e
      rmmod vmcp
      ```
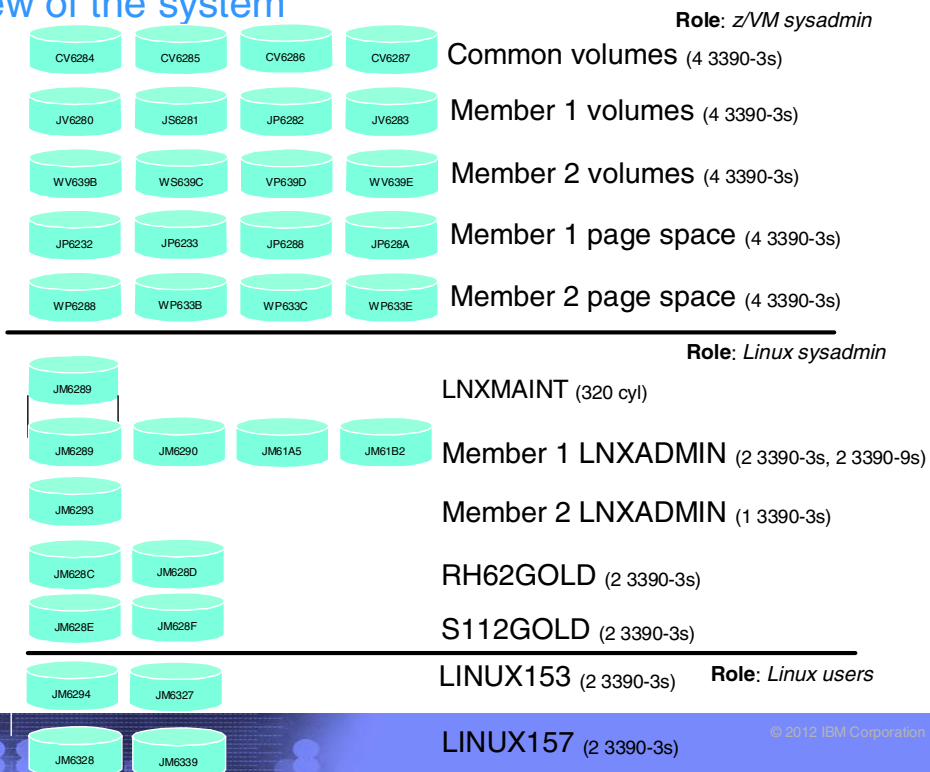
- Relocate a Linux system
  ```
  ==> vmrelocate test <user ID> <target system ID>

  ==> vmrelocate move <user ID> <target system ID>
  ```
  - ► Demo?

Configure DirMaint and SMAPI

- Configure DirMaint
  - ▶ Enable DirMaint
  - ▶ Tailor DirMaint
  - ▶ Customize the EXTENT CONTROL file
  - ▶ Start DirMaint
  - ▶ Test DirMaint
  - ▶ Test DirMaint at IPL time
- Configure SMAPI
  - ▶ Set up basic SMAPI configuration
  - ▶ Turn off ensembles
  - ▶ Start SMAPI at IPL time
  - ▶ Test SMAPI
- Some common DirMaint tasks
  - ▶ Update a user directory entry
  - ▶ Edit the EXTENT CONTROL file
  - ▶ Get a copy of the user directory
  - ▶ Add an IDENTITY
- New: Section on RACF

DASD view of the system

Role: *z/VM sysadmin*

| CV6284 | CV6285 | CV6286 | CV6287 | Common volumes (4 3390-3s) |

| JV6280 | JS6281 | JP6282 | JV6283 | Member 1 volumes (4 3390-3s) |

| WV639B | WS639C | VP639D | WV639E | Member 2 volumes (4 3390-3s) |

| JP6232 | JP6233 | JP6288 | JP628A | Member 1 page space (4 3390-3s) |

| WP6288 | WP633B | WP633C | WP633E | Member 2 page space (4 3390-3s) |

Role: *Linux sysadmin*

JM6289 — LNXMAINT (320 cyl)

| JM6289 | JM6290 | JM61A5 | JM61B2 | Member 1 LNXADMIN (2 3390-3s, 2 3390-9s) |

JM6293 — Member 2 LNXADMIN (1 3390-3s)

| JM628C | JM628D | RH62GOLD (2 3390-3s) |

| JM628E | JM628F | S112GOLD (2 3390-3s) |

Role: *Linux users*

| JM6294 | JM6327 | LINUX153 (2 3390-3s) |

| JM6328 | JM6339 | LINUX157 (2 3390-3s) |

Install and configure RHEL 6.2 on LNXADMIN

- Install the golden image (7.1)
  - ▶ Create the IDENTITY LNXADMIN
  - ▶ Set LNXADMIN to start at IPL time
  - ▶ Prepare the RHEL 6.2 bootstrap files
  - ▶ Install RHEL 6.2 Linux
  - ▶ Boot the new system from disk
- Configure the Linux administration system (7.2)
  - ▶ Copy RHEL 6.2 install tree/other files from PC to LNXADMIN
  - ▶ Configure yum
  - ▶ Turn off unneeded services
  - ▶ Configure the VNC server
  - ▶ Set system to halt on SIGNAL SHUTDOWN
  - ▶ Turn on NFS server
  - ▶ Configure SSH keys
  - ▶ Change order of swap disks
  - ▶ Insert vmcp module
  - ▶ Reboot/verify changes

Install and configure the RHEL 6.2 golden image

- Install the golden image
  - ▶ Create the RH62GOLD virtual machine
  - ▶ Prepare the RH62GOLD parameter files
  - ▶ Install RHEL 6.2 on the golden image
    - – File system layout with LVMs
  - ▶ Verify the installation
- Configure the golden image
  - ▶ Configure automount of the install tree
  - ▶ Configure yum for online updates
  - ▶ Turn off unneeded services
  - ▶ Configure the VNC server
  - ▶ System to halt on SIGNAL SHUTDOWN
  - ▶ Configure SSH keys and boot time settings
  - ▶ Change the order of the swap disks
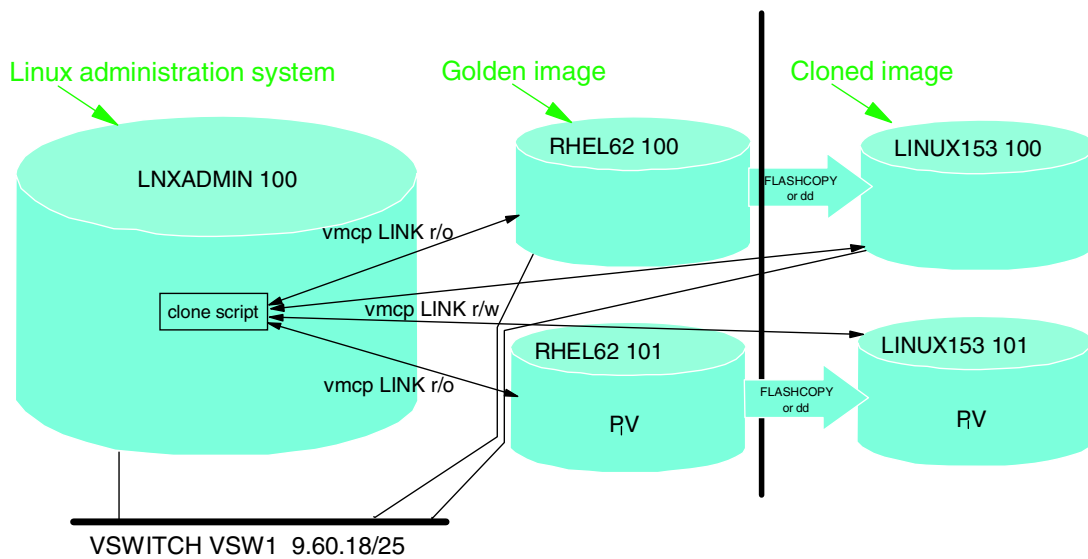 - ▶ Reboot system and verify changes
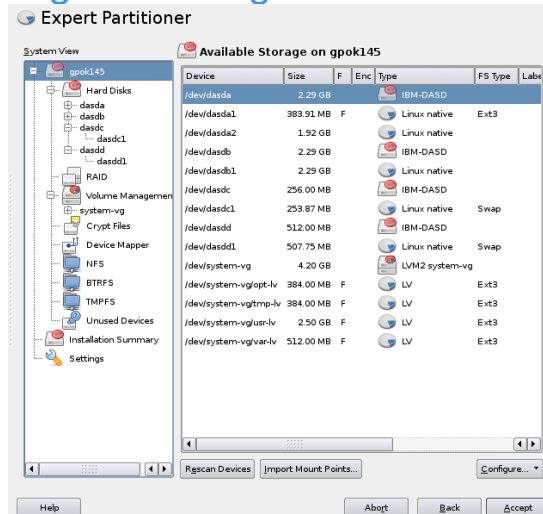
Mount point§	Logical volume name§	Size§
/usr/§	usr-lv§	2.5 GB§
/var/§	var-lv§	512 MB§
/opt/§	opt-lv§	384 MB§
/tmp/§	tmp-lv§	384 MB§

Configure RHEL 6.2 for cloning

- Define two new virtual machines
- Clone a virtual server manually
- Clone a virtual server automatically
- Review system status

Cloning Linux

- Cloning block diagram:

Linux administration system

Golden image

Cloned image

LNXADMIN 100

RHEL62 100

LINUX153 100

FLASHCOPY or dd

vmcp LINK r/o

clone script

vmcp LINK r/w

RHEL62 101

LINUX153 101

PiV

FLASHCOPY or dd
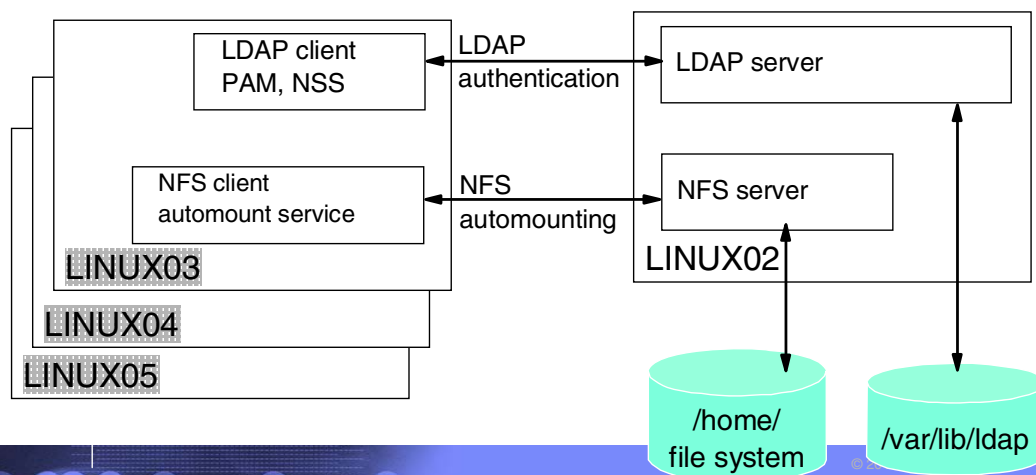
PiV

vmcp LINK r/o

VSWITCH VSW1 9.60.18/25

Install Linux with kickstart

- Configure the Linux Administration system for kickstart
- Configure a virtual machine for kickstart
- "Kickstart" RHEL 6.2 to the virtual machine

Create RHEL 6.2 appliances

- Create a Web Server appliance
- Create an application development appliance
- Create an LDAP appliance
- Create a file and print server appliance
- Also: "travelling /home" (details in SLES 10 SP2 book)
  - ▶ Brings together LDAP, LVM, PAM/NSS, Automount and NFS

| LDAP client PAM, NSS | LDAP authentication | LDAP server |
| NFS client automount service | NFS automounting | NFS server |

LINUX03
LINUX04
LINUX05

LINUX02

/home/ file system

/var/lib/ldap

Service Linux with the Red Hat Network

- Register your system with RHN
- Install and update packages with yum
- Manage your systems with RHN

Install SLES 11 SP2 on LNXADMIN

- Review the identity LNXADMIN
- Prepare the SLES 11 SP2 bootstrap files
- Install SLES 11 SP2 on to LNXADMIN
- Configure the Linux administration system
  - ▶ Copy files to the RHEL Linux administration system (large LV)
  - ▶ Reset install location
  - ▶ Turn off unneeded services
  - ▶ Apply service
  - ▶ Install the cmsfs package
  - ▶ Enable vmcp
  - ▶ Set system to halt on SIGNAL SHUTDOWN
  - ▶ Modify zipl.conf
  - ▶ Reboot and verify changes

Install the SLES 11 SP2 golden image

- Create the S112GOLD virtual machine
- Create the S112GOLD parameter file
- Install the SLES 11 SP2 golden image
  - ► Logical volumes for flexibility:
- Configure SLES 11 SP2 golden image
  - ► Configure the VNC server
  - ► Prepare for YaST Online Update
  - ► Turn off unneeded services
  - ► Apply service with Online Update
  - ► Configure /etc/inittab
  - ► Configure SSH keys
  - ► Modify zipl.conf
  - ► Cleanup temporary files
  - ► Reboot and verify changes

Mount point	Logical volume name	Size
/usr/	usr-lv	2.5 GB
/var/	var-lv	512 MB
/opt/	opt-lv	384 MB
/tmp/	tmp-lv	384 MB

Clone SLES 11 SP2

- Clone a virtual server manually
- Clone a virtual server automatically

Create SLES 11 SP2 appliances

- Create a Web Server appliance
- Create an LDAP appliance
- Create a file and print server appliance
- Create an application development appliance

Monitor and tune z/VM and Linux

- Use basic z/VM commands
- The z/VM Performance Toolkit
  - ▶ Configure the z/VM Performance Toolkit
  - ▶ Configure Web Browser support
  - ▶ Configure PERFSVM
  - ▶ Start the z/VM Performance Toolkit
  - ▶ Use the z/VM Performance Toolkit
- Monitor Linux performance data from the kernel
- Monitor Linux with sysstat
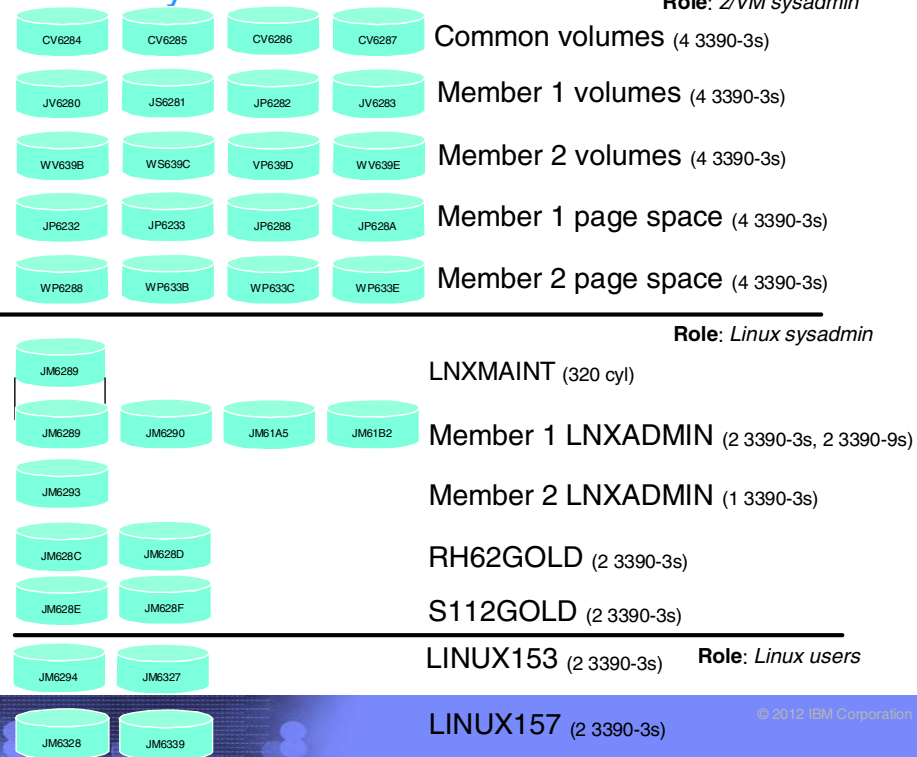- A GOOD GOAL: Get to z/VM and Linux historical graphs quickly

Miscellaneous Recipes

- Add disk space to virtual machines
- Add a logical volume
- Extend an existing logical volume
- Add SCSI/FCP disks
  - ▶ As emuldated devices (aka "EDEVs")
  - ▶ As real devices
- Rescue a Linux system
- Set up memory hot plugging
- Utilize the cpuplugd service
- Hardware cryptographic support for OpenSSH
- The X window system
- Centralizing home directories for LDAP users

---

xCAT

- Overview of xCAT
- Install the xCAT Management Node
  - ▶ Turn off SE Linux on RHEL 6.2
  - ▶ Download and unwind the xCAT Management Node install files
  - ▶ Create repositories for the xCAT code
  - ▶ Install the xCAT management node
- Install the xCAT User Interface
- Install the xCAT Hardware Control Point
  - ▶ Add a privilege class to LNXADMIN
  - ▶ Initialize the xCAT database
  - ▶ Define nodes
  - ▶ Configure networking servers
- xCAT tasks
  - ▶ Kickstart a RHEL 6.2 system
  - ▶ Clone a SLES 11 SP2 system
  - ▶ <hoped for more>

DASD view of the system

Role: *z/VM sysadmin*

| CV6284 | CV6285 | CV6286 | CV6287 |

Common volumes (4 3390-3s)

| JV6280 | JS6281 | JP6282 | JV6283 |

Member 1 volumes (4 3390-3s)

| WV639B | WS639C | VP639D | WV639E |

Member 2 volumes (4 3390-3s)

| JP6232 | JP6233 | JP6288 | JP628A |

Member 1 page space (4 3390-3s)

| WP6288 | WP633B | WP633C | WP633E |

Member 2 page space (4 3390-3s)

Role: *Linux sysadmin*

| JM6289 |

LNXMAINT (320 cyl)

| JM6289 | JM6290 | JM61A5 | JM61B2 |

Member 1 LNXADMIN (2 3390-3s, 2 3390-9s)

| JM6293 |

Member 2 LNXADMIN (1 3390-3s)

| JM628C | JM628D |

RH62GOLD (2 3390-3s)

| JM628E | JM628F |

S112GOLD (2 3390-3s)

| JM6294 | JM6327 |

LINUX153 (2 3390-3s) **Role**: *Linux users*

| JM6328 | JM6339 |

LINUX157 (2 3390-3s)

Files in the associated tar file

```
CKB-VM62/README.txt
CKB-VM62/disclaimer.txt

CKB-VM62/rhel62/
CKB-VM62/rhel62/clone-1.0-11.s390x.rpm

CKB-VM62/sles11sp2/
CKB-VM62/sles11sp2/clone.sh

CKB-VM62/vm/
CKB-VM62/vm/lnxmaint/
CKB-VM62/vm/lnxmaint/rhel62.exec
CKB-VM62/vm/lnxmaint/sample.parm-rh6
CKB-VM62/vm/lnxmaint/sample.conf-rh6
CKB-VM62/vm/lnxmaint/sample.parm-s11
CKB-VM62/vm/lnxmaint/profile.exec
CKB-VM62/vm/lnxmaint/sles11s2.exec
CKB-VM62/vm/lnxmaint/swapgen.exec

CKB-VM62/vm/maint/
CKB-VM62/vm/maint/callsm1.exec
CKB-VM62/vm/maint/ssicmd.exec
CKB-VM62/vm/maint/chpw620.xedit
CKB-VM62/vm/maint/ssishutd.exec
CKB-VM62/vm/maint/cpformat.exec
```

Uses of the book?

- Reference
- Education aid
  - ► e.g. "Here's a 2nd level virtual machine, 6 IP@s and 10 mod-9s - have at it"
- Practice
- Basis for a certification?
  - ► Could a person install z/VM, install Linux, customize and be cloning appliances in *one* day?

Resources

- All *Virtualization Cookbooks* and other papers:
  - ► http://www.vm.ibm.com/devpages/mikemac/
- *The* Linux for zSeries and S/390 portal
  - ► http://linuxvm.org/
- The linux-390 list server
  - ► http://www2.marist.edu/htbin/wlvindex?linux-390
- The IBMVM list server
  - ► http://www.lsoft.com/scripts/wl.exe?SL1=IBMVM&H=LISTSERV.UARK.EDU
- Linux for zSeries and S/390 developerWorks®
  - ► http://awlinux1.alphaworks.ibm.com/developerworks/linux390/index.shtml
- Red Hat Enterprise Linux evaluation
  - ► http://www.redhat.com/rhel/server/mainframe/
- SUSE LINUX Enterprise Server evaluation
  - ► http://www.novell.com/products/linuxenterpriseserver/eval.html
- z/VM publications
  - ► http://www.vm.ibm.com/pubs/
- z/VM performance tips
  - ► http://www.vm.ibm.com/perf/tips/

Questions

- Are there any questions?