



The Virtualization Cookbook: Day 1 - z/VM

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Session 9216



Abstract

There is a new redbook with a similar title: *z/VM and Linux on zSeries: From LPAR to Virtual Servers in Two Days*. As the title suggests a goal of the redbook is to allow you to install and configure z/VM, install and configure Linux and be cloning Linux in 2 working days. Rexx EXECs and scripts are provided with the book to make this aggressive goal reality. This talk focus on the first day which includes planning and desktop tools, and then gets into a z/VM 5.1 install from DVD. Once installed, the following topics are addressed:

- * The SYSTEM CONFIG file
- * TCP/IP configuration
- * Paging volumes are configured
- * A user ID for common files is created
- * A highly available VSWITCH is created
- * System startup and shutdown is addressed
- * Security issues and backup are touched upon

While z/VM is being installed, the task of setting up a PC Linux NFS server is addressed. This allows you to supply the EXECs and scripts associated with the book and a Linux install tree. One additional topic of monitoring z/VM is briefly addressed.

Who am I?, who are you?

- Mike Maclsaac, mikemac@us.ibm.com
 - ▶ 19 years at IBM in Kingston and Poughkeepsie, NY
 - ▶ VM+Fortran+REXX
 - ▶ RS/6000, C, ksh
 - ▶ SP/2, C++
 - ▶ OS/390, USS, redbooks
 - ▶ Marketing technical support of z/VM, Linux, IBM software, ...
 - ▶ Wrote much of *z/VM and Linux on zSeries: From LPAR to Virtual Servers in Two Days*
 - <http://www.redbooks.ibm.com/abstracts/sg246695.html>
- Who are you?
 - ▶ Have you tried the steps in this redbook?
 - ▶ Are you thinking about using this redbook?
 - ▶ Have you never heard about this redbook?
 - ▶ ...
 - ▶ Any other categories of attendees?
 - ▶ Any VM gurus?

Overview

- This presentation is based on a redbook and associated files
 - ▶ *z/VM and Linux on zSeries: From LPAR to Virtual Servers in Two Days*
 - <http://www.redbooks.ibm.com/abstracts/sg246695.html>
 - ▶ Authors: Michael Maclsaac, Jin Xiong and Curtis Gearhart
 - ▶ Written: Nov 1 2004 - March 31 2005 (published June 20th)
- Overall goal: approach the concept of *Linux appliances*
 - ▶ Previous titles (rejected by IBM reviewers :)
 - *The zSeries Linux Appliance Cookbook*
 - *From LPAR to Virtual **Blades** in Two Days*
 - ▶ *New title (updated for z/VM 5.2 and SLES-9 SP3):*
 - *z/VM and Linux on IBM System z: **The Virtual Server Cookbook***
- Tangible goal: Install and configure z/VM, then install, configure and clone Linux **in 2 working days**
- 4 usability tests were conducted - 3 achieved the goal
 - ▶ The other guy was too busy to work 2 days straight :))

Overview (cont'd)

- Philosophy:
 - ▶ “*Everything should be made as simple as possible, but not simpler*”
-Albert Einstein
- Choices made in keeping with this philosophy:
 - ▶ "Roll your own" cloning rather than other products
 - Aduva's Onstage, IBM TPM, Levanta are all valid and more sophisticated, complex solutions
 - ▶ USER DIRECT file over directory maintenance products
 - ▶ z/VM user ID must be predefined in order to clone
 - ▶ ECKD DASD - no SCSI/FCP disks
 - ▶ Read/write /usr/ file system over shared read/only
 - Wanted to document a DCSS with XIP2 file systems
 - Ran out of time
 - ▶ Cloning and manual install hinge on CMS parameter files
 - Cloning done from Linux, no VM service machine needed

What is new?

- The book is in the process of being updated!
 - ▶ What has been removed?
 - Chapter 10: *Virtual communications server*
 - Chapter 11: *Virtual communications controller server*
 - Section 9.5: *An Eclipse application development system*
 - Appendix A: *The SYSVINIT package*
 - Description of creating two VSWITCH controllers
 - CPLABEL EXEC - doesn't work for new volumes
 - ▶ What has been added?
 - VNC - Client on Windows, Server on zSeries Linux
 - Description of adding second controller (SLES9X, SLES9)
 - A recipe to create a logical volume
 - Performance Toolkit: Web browser support
 - New chapter 10: *Servicing z/VM*
 - A recipe for a DCSS/XIP2 shared file system

What is new? (cont'd)

- ▶ What has changed?
 - Title: *z/VM and Linux on IBM System z9: The Virtualization Cookbook*
 - z/VM 5.2, not z/VM 5.1
 - SLES-9 SP3, not SLES-9 SP1
 - Term *master image* is used rather than *golden image*
 - Less magic, more concepts, fewer *associated files*
 - **vmcp** module/command has replaced cpint package/**hcp** command (but cpint can still be used for pre SLES9 SP3)
 - FLASHCOPY call removed from CPFORMAT EXEC
 - The mksles9root.sh script has been updated
 - For SLES9 SP3
 - To work around YaST Patch Update CD function
 - Updated clone.sh script to avoid user interaction
 - Not prompted for root password
 - ~root/.ssh/known_hosts is updated w/o **ssh** command

Outline for the two presentations

Focus on z/VM sections in first hour

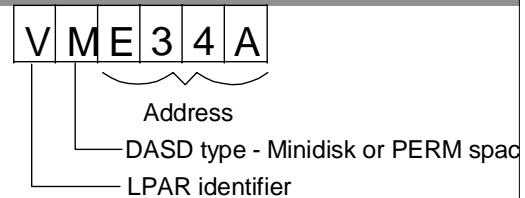
- **Planning**
- **Configuring a Windows desktop**
- **Installing and configuring z/VM**
- **Configuring an NFS server**
- ---
- Install and configure Linux
- Configure NFS on controller
- Configure Linux for cloning
- Basic Linux virtual servers
- A virtual communications server
- A virtual communications controller server
- **Monitoring z/VM and Linux**
- Backup and restore
- **Appendix - Relabel z/VM system volumes**

Planning - bill of materials

- Hardware
 - zSeries LPAR - 2 IFLs recommended
 - 3GB central:1GB expanded storage (1.5G:512M OK)
 - 24 3390-3 DASD or more (ask for 32 :))
 - Two OSA cards for HA VSWITCH (One is OK)
 - Temporary Linux PC for NFS server (or equivalent)
- Software
 - z/VM 5.1 (5.2) on DVD (tape is OK)
 - SLES-9 SP1 (SP3) Linux distro ISO images
 - Code associated with redbook
 - <ftp://www.redbooks.ibm.com/redbooks/SG246695/>
- Networking resources
 - TCP/IP address for z/VM
 - One TCP/IP address for each Linux (ask for 16 or more :))
 - DNS names (helpful but not required)

Planning (cont'd)

- 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 (1) z/VM resources, (2) Linux resources, (3) z/VM DASD, (4) Linux user IDs



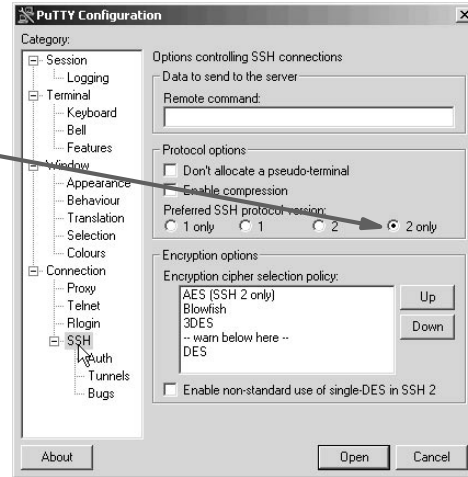
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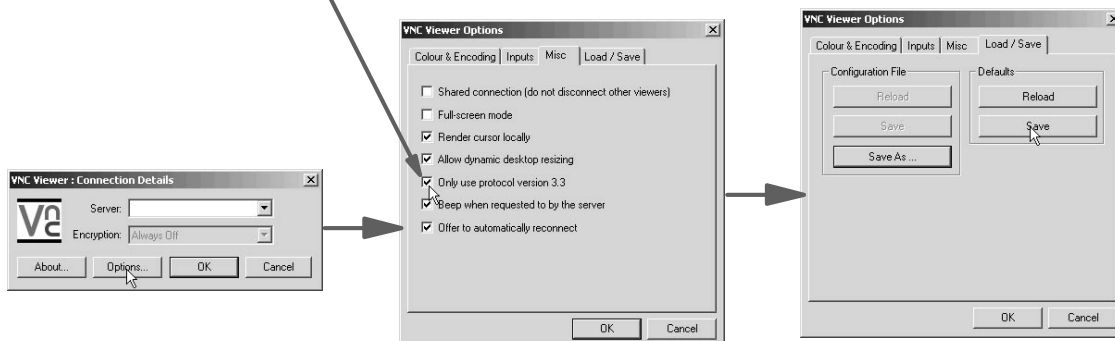
Configuring a Windows desktop

- SSH client
 - ▶ PuTTY is described
 - Set SSH protocol to "2 only"
 - Add rows and columns
 - Save sessions
- 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



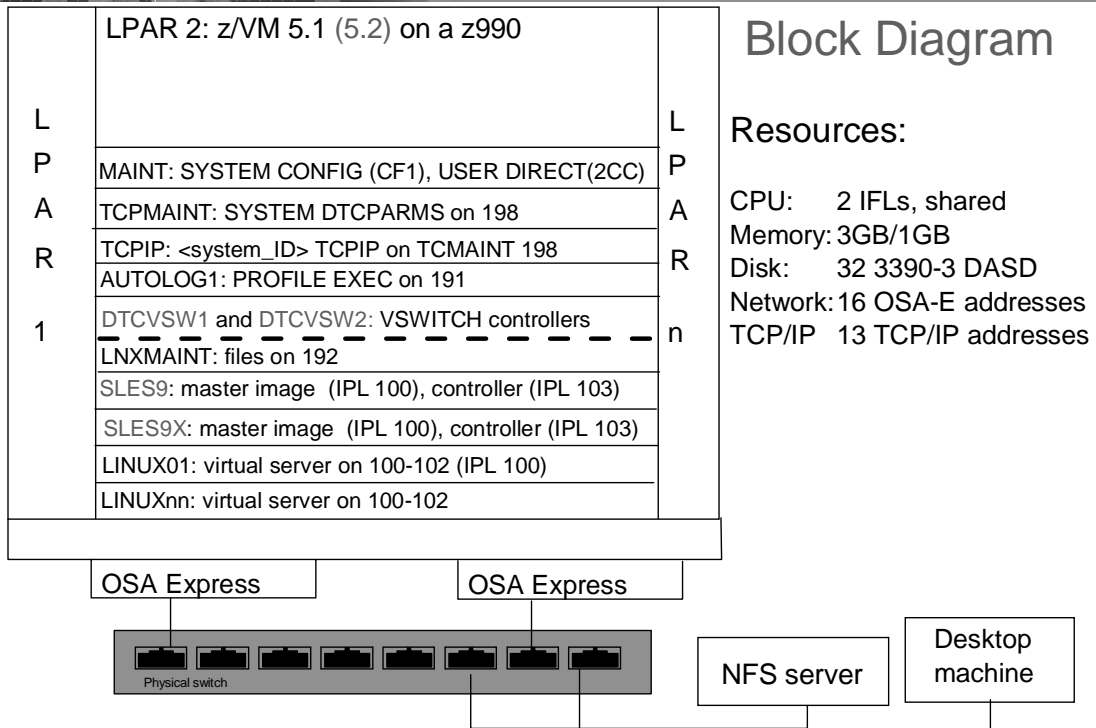
Configuring a Windows desktop (cont'd)

- VNC client or X server
 - ▶ RealVNC client is recommended
 - ▶ Must set option *Use Only protocol version 3.3* in recent clients



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Install and configure z/VM

- Install z/VM from DVD
 - ▶ Install from DVD is documented in some detail
 - ▶ Use the *Integrated 3270 console* on HMC
 - ▶ Bug in INSTDVD EXEC (z/VM 5.1) fixed, not worked around
- Configure z/VM - Overview
 - ▶ Customize SYSTEM CONFIG
 - ▶ Customize TCPIP with IPWIZARD
 - ▶ Add paging volumes
 - ▶ Create a common CMS user ID - LNXMAINT
 - ▶ Create a highly available VSWITCH (much easier)
 - ▶ Customize startup and shutdown
 - ▶ Address security issues
- Backup system to tape
 - ▶ Modify system labels
 - ▶ Restore system

Configure z/VM

- ▶ Customize SYSTEM CONFIG
 - Change system name
 - Allow users to create VDISKS
 - Define a highly available VSWITCH named VSW1
 - Run CPSYNTAX
- ▶ Customize TCPIP with IPWIZARD
 - Use this tool ONCE - after that, edit files
 - Configure TCP/IP to start in AUTOLOG1's PROFILE EXEC
 - Rename PROFILE TCPIP to <system_ID> TCPIP
 - Configure FTP server, Shutdown, reIPL
- ▶ Add paging volumes - 5 new volumes are recommended
 - Format the volumes - CPFORMAT EXEC is written
 - Wrapper around CPFMTXA
 - Previously switched between FLASHCOPY and CPFMTXA
 - Update SYSTEM CONFIG w/paging volumes and reIPL

CPFORMAT and CPLABEL EXECs - details

cpformat

Synopsis:

Format one or a range of DASD as page, perm, spool or temp disk space

The label written to each DASD is V<t><xxxx> where:

<t> is type - P (page), M (perm), S (spool) or T (Temp disk)

<xxxx> is the 4 digit address

Syntax is:

```

                                     .-PAGE-.
>>--CPFORMAT--.rdev-----.-AS---+PERM+-----><
      | <-----< |           '-SPOL-'
      '-rdev1-rdev2-----'
```

Example:

```
==> att <a775-a779> *
```

```
A775-A779 ATTACHED TO MAINT
```

```
==> cpformat <a775-a779> as page
```

cplabel

Synopsis:

LABEL and ALLOCATE DASD as page, perm, spool or temp disk space

The label written to each DASD is V<t><xxxx> where:

<t> is type - P (page), M (perm), S (spool)

<xxxx> is the 4 digit address

CPFORMAT EXEC - details

```

firstChar = 'V'
parse upper arg dasds "AS " type
if ((dasds = '') | (dasds = '?')) then call help
labelPrefix = getLabelPrefix(firstChar type)
numDasd = parseDasd(dasds)
answer = areYouSure(type)
if (answer = 'Y') then /* the user is sure */
do
  retVal = doFormat(labelPrefix numDasd type)
  call doReport
end
else
  retVal = 2
exit retVal
doFormat: procedure expose dasdList.
  arg labelPrefix numDasd type
  'CP TERM MORE 1 1'
  do i = 1 to numDasd
    retVal = 1
    label = getLabel(labelPrefix dasdList.i)
    if (i // 2 = 0) then
      retVal = tryFLASHCOPY(dasdList.1 dasdList.i label)
    if (retVal <> 0) then
      call formatOne(dasdList.i type label)
  end /* do i = */
  'CP TERM MORE 50 10'
return 0 /* from doFormat */
```

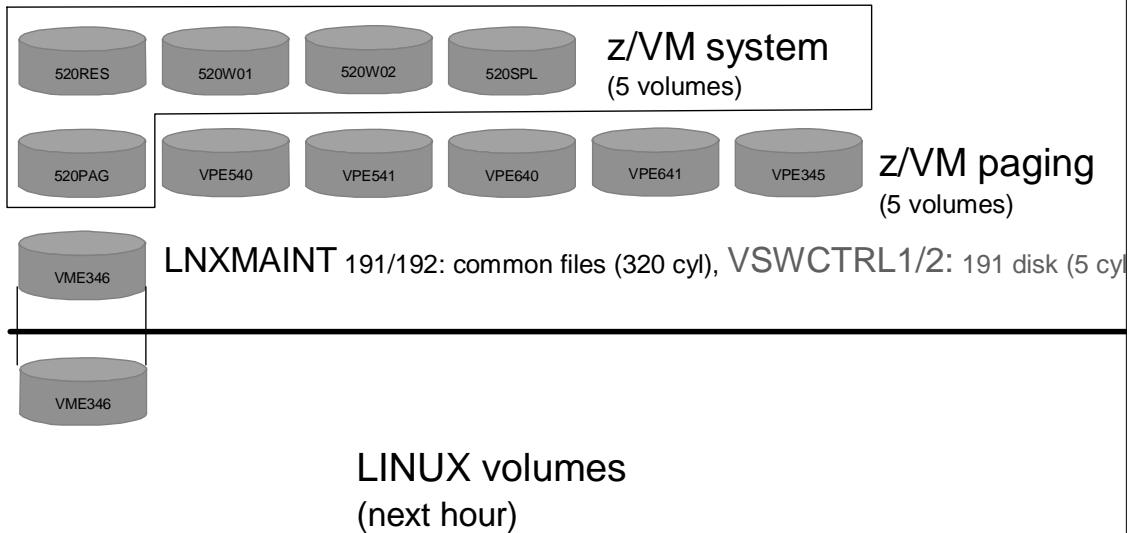
Configure z/VM (cont'd)

- ▶ Create a common CMS user ID - LNXMAINT
 - LNXMAINT 192 is a minidisk for common CMS files
 - Define user ID in USER DIRECT
 - Define dummy minidisks of cylinder 0 in USER \$ALLOCS
 - Logon and copy files associated with the book
- ▶ Create a highly available VSWITCH
 - Define two VSWITCH controller user IDs
 - Configure files on TCPMAINT 198 disk
 - Shutdown and ReIPL
- ▶ To speed running the DISKMAP command DISKMAPP is written
 - Simply an EXEC/XEDIT pair that:
 - Runs DISKMAP
 - Edits USER DISKMAP with subcommand "ALL /gap/|/overlap/"
 - You should always see only one gap of 501 cylinders

Configure z/VM (cont'd)

- ▶ Customize startup and shutdown - you have a choice
 - Configure AUTOLOG1's PROFILE EXEC
 - **XAUTOLOG** TCPIP and two VSWITCH controllers
 - Disable minidisk cache in XSTOR - **set mdc xstore 0m 0m**
 - Overcommit memory - **set srm storbuf 300% 250% 200%**
 - Send signals to Linux to shutdown - **set signal shutdown 180**
 - Give Linux IDs access to Vswitch:
 - ◆ **set vswitch vsw1 grant <id>**
 - **XAUTOLOG** each Linux ID (if desired)
 - Sine Nomine's SYSVINIT package is also documented
- ▶ Security issues, relabel system labels, back up system
 - CHANGEPW XEDIT is written to change USER DIRECT passwords
 - CHPW52 XEDIT is updated for z/VM 5.2
 - Backup system to tape (no recipe)
 - Modify 510xxx, 520xxx labels? (more later)
 - Restore system from tape (no recipe)

End of 1 day - DASD view



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Configure an NFS server

- ▶ Installing Linux on zSeries is a *chicken and egg* problem
- ▶ Recommendation: install Linux on an Intel PC
 - Server is a temporary NFS server
 - Contents later moved to controller
- ▶ Copy files associated with this book to this NFS server
 - ftp://www.redbooks.ibm.com/redbooks/SG246695/
 - lpar2vs-small.tgz~1MB - all associated files
 - lpar2vs.tgz ~50MB - includes z/VM and Linux manuals
 - virt-cookbook.tgz ~55KB - all associated files - ftp://???
- ▶ Copy SLES-9 .iso images + Service Pack .iso images
- ▶ Create a SLES9 install tree
 - mksles9root script - looks for 6 SLES9 ISO and 2 SP1 ISO images

```
# ./mksles9root.sh s390x
Making a SLES9 install tree ...
SP3 ISO images found ...
The tree named sles9xsp3root/ will be SLES9 + SP3 ...
Making the directory structure ...
Copying SLES9 ISO images ...
Mounting and copying SLES-9-s390x-RC5a-CD1.iso ...
```

Configure an NFS server

- ▶ Creates a SLES9 install tree (cont'd)

```
# cd /nfs/sles9x/sles9xsp3root
# ls -l
lrwxrwxrwx 1 root root 14 Jan 12 11:35 boot -> sles9/CD1/boot
lrwxrwxrwx 1 root root 17 Jan 12 11:35 content -> sles9/CD1/content
lrwxrwxrwx 1 root root 21 Jan 12 11:35 control.xml -> sles9/CD1/control.xml
drwxr-xr-x 7 root root 4096 Jan 12 11:16 core9
lrwxrwxrwx 1 root root 22 Jan 12 11:35 driverupdate -> sp3-9/CD1/driverupdate
lrwxrwxrwx 1 root root 15 Jan 12 11:35 linux -> sp3-9/CD1/linux
lrwxrwxrwx 1 root root 17 Jan 12 11:35 media.1 -> sles9/CD1/media.1
dr-xr-xr-x 3 root root 4096 Dec 20 07:21 s390x
drwxr-xr-x 3 root root 4096 Jan 12 11:16 sles9
drwxr-xr-x 5 root root 4096 Jan 12 11:16 sp3-9
drwxr-xr-x 2 root root 4096 Jan 12 11:35 yast
# cat yast/instorder
/sp3-9/CD1 /sp3-9/CD1
/sles9/CD1 /sles9/CD1
/core9/CD1 /core9/CD1
```

- ▶ Configure NFS

- Modify /etc/exports

```
# tail -2 /etc/exports
/nfs/virt-cookbook * (ro, sync)
/nfs/sles9x/sles9xsp3root * (ro, sync)
```

- Configure NFS to start with **chkconfig** command

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Monitoring z/VM and Linux

- ▶ Using the INDICATE and other basic commands
 - Using INDICATE written by Bill Bitner
 - Using other QUERY and HELP commands
- ▶ z/VM Performance Toolkit
 - How to configure basic and as a Web server
 - How to use (brief)
- ▶ Monitoring Linux - two options
 - With the Linux RMF data gatherer (aka rmfpm)
 - Tar file downloaded from IBM FTP site
 - Modify a configuration file and run
 - Monitor data can be viewed via a browser
 - With APPLMON data gatherer built into SLES9 kernel
 - Must load three modules
 - Must turn on via kernel /proc variables
- ▶ Linux images can be registered with the Performance Toolkit

Resources

- Redbook *z/VM and Linux on zSeries: From LPAR to Virtual Servers in Two Days*
 - ▶ <http://www.redbooks.ibm.com/abstracts/sg246695.html>
- Files associated with the redbook
 - ▶ <ftp://www.redbooks.ibm.com/redbooks/SG246695/>
- *The Linux for zSeries and S/390 portal*
 - ▶ <http://linuxvm.org/>
- The linux-390 list server
 - ▶ <http://www2.marist.edu/htbin/wlvindex?linux-390>
- Linux for zSeries and S/390 developerWorks®
 - ▶ <http://awlinux1.alphaworks.ibm.com/developerworks/linux390/index.shtml>
- SUSE LINUX Enterprise Server 9 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 - ???

Q: What is the
answer to life?
A: 42

But what is the
question of life?

