The Virtualization Cookbook for Red Hat Enterprise Linux 5

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Thursday February 15th, 4:30 PM
Session 9217

Abstract

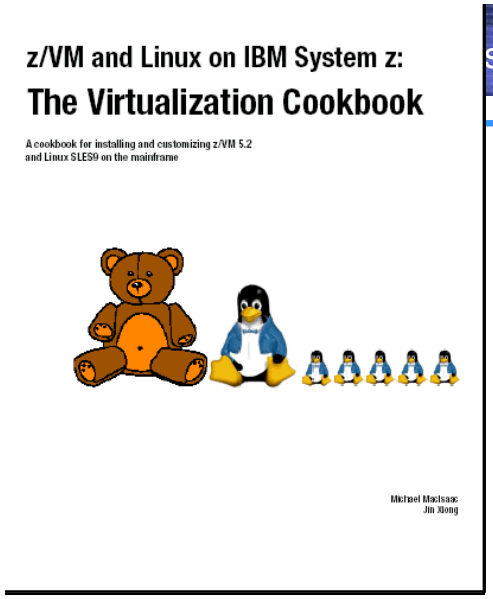
A new book is available: 'IBM z/VM and Linux on IBM System z: Virtualization Cookbook for Red Hat Enterprise Linux 5'. The goal of the book is to allow you to install and configure z/VM, install and configure Linux and be cloning Linux in two working days. Rexx EXECs and shell scripts are provided with the book to make this goal a reality. This presentation is similar to session 9216, but focuses on the items unique to Red Hat, such as the Red Hat Network (RHN) and kickstart.

Outline - by book chapters (common)

1. Introduction to z/VM and Linux
2. Planning
3. Configuring a desktop machine
4. Installing and configuring z/VM
5. Servicing z/VM
6. Configuring an NFS server
7. Installing and configuring Linux
8. Configuring Linux for cloning
9. Installing Linux with kickstart
10. Servicing Linux with Red Hat Network
11. Cloning open source virtual servers
12. Miscellaneous Recipes
13. Monitoring z/VM and Linux
14. Backup and restore

Who are we?, Who are you?

- Mike MacIsaac, mikemac at us.ibm.com
  - zSeries New Technology Center - focus: z/VM and Linux
  - Wrote much of the *z/VM and Linux on zSeries: Virtualization Cookbooks*
- Brad Hinson, bhinson at redhat.com
  - Technical Account Manager
  - Co-wrote RHEL 4 redbook, this RHEL 5 Cookbook
- Who are you?
  - Attended 9216 at 9:30 this morning?
  - Experience with this book:
    - Have you tried the steps in this book or RHEL 4 redbook?
    - Thinking about using this book?
    - Never heard of this book?
  - IT status:
    - Do you have Linux and z/VM in production?
    - In test?
    - Planning a proof of concept?
  - Came to hear a Red Hat employee speak?
  - Any specific information you are hoping for?



Timeline: Redbooks and whitebooks

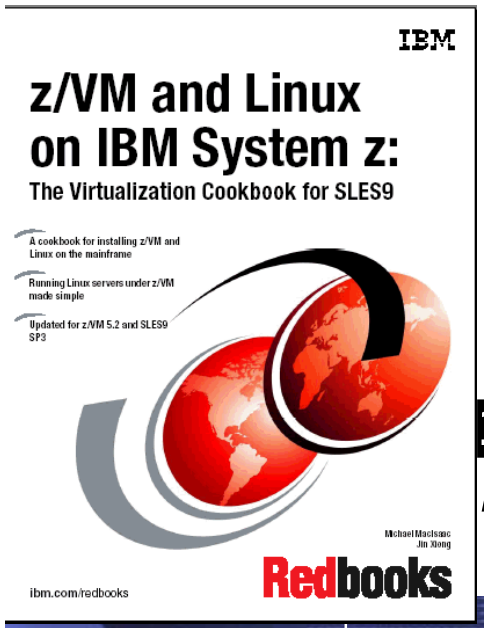
Announcing! => **6,7** *The Virtualization Cookbook(s) for RHEL 5 and SLES 10*, **2/07**

5 *The Virtualization Cookbook 2* published on linuxvm.org, **8/06**

2 *The Virtualization Cookbook* published on linuxvm.org, **2/06**

Project started: 11/04

2004 | 2005 | 2006 | 2007



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

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

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

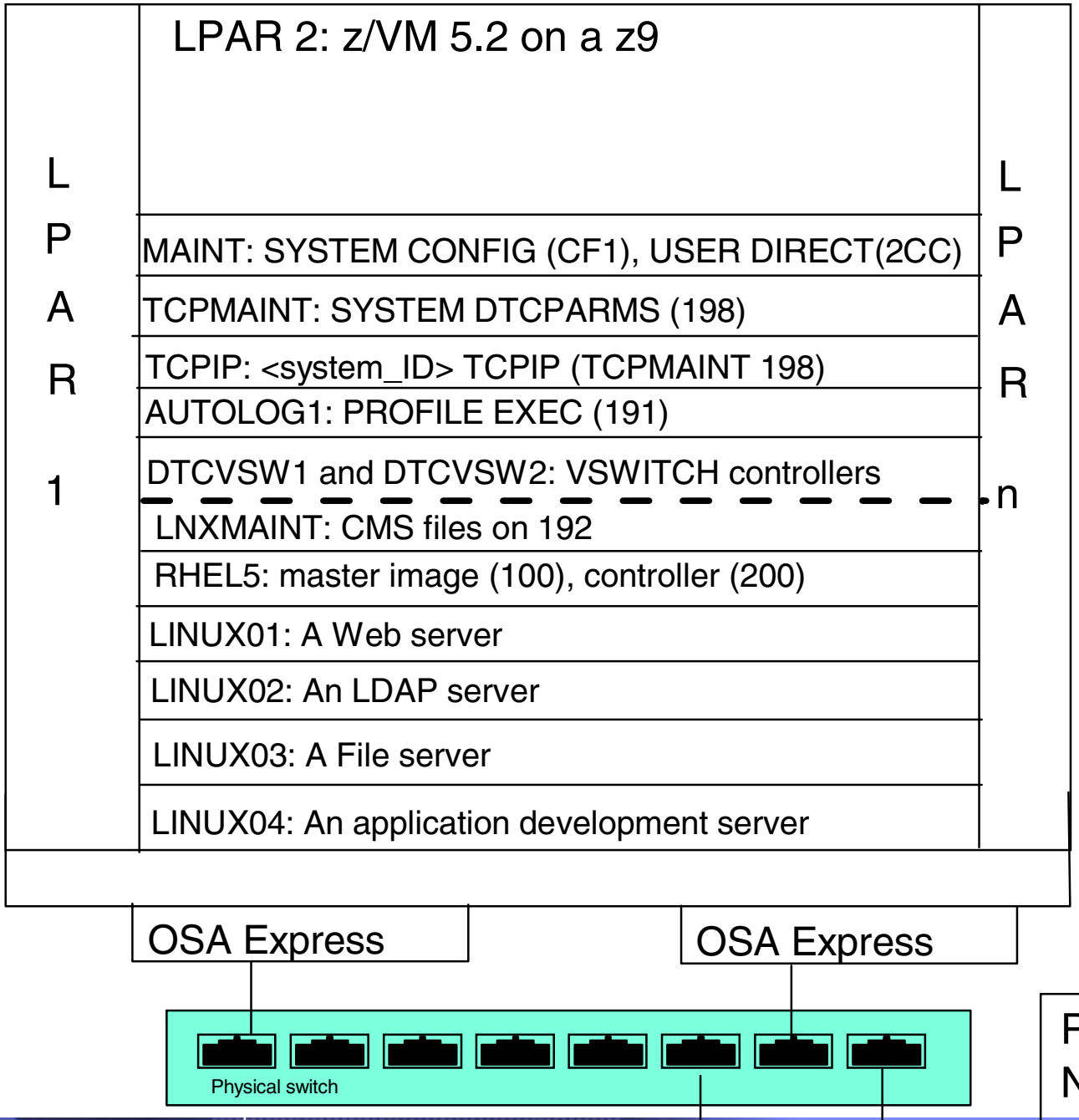
Introduction:

- History: project started 2004: impetus from a zBLC working group
  - Wanted Linux on System z to be appliance-like
- Philosophy
  - Cookbook to install/customize z/VM, install/customize Linux, and clone virtual servers
  - *Everything should be made as simple as possible, but not simpler.* -Albert Einstein
  - Reader (sysadmin) wants to understand all steps, takes ownership
  - Open "source" - free as in beer, free as in liberty
- What is new?
  - Two new cookbooks for RHEL 5, SLES 10
  - 2 VDISK swaps/server => larger root file system
  - Associated controller files are an RPM
  - New section *Centralizing home directories for LDAP users* - brings together:
    - Cloning, LDAP + PAM + NSS, NFS + automount of /home/
  - New section *Rescuing a Linux system*
  - Web application to monitor/log system: Data About z/VM and Linux (DAZL)
  - **clone.sh** script (now in /sbin/) is updated
  - Installing z/VM onto 3390-9s is addressed

Overview (cont'd):

- Choices made in keeping with this philosophy:
  - "Roll your own" cloning rather than other products
  - Other solutions are all valid, more sophisticated, more complex
  - 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
  - Cloning and manual install hinge on CMS parameter files
  - Cloning done from Linux, no VM service machine needed
- Many usability tests conducted
  - Completion now takes about 4 days
- Get the books free on the Web at:
  - http:/linuxvm.org/present/

Block Diagram



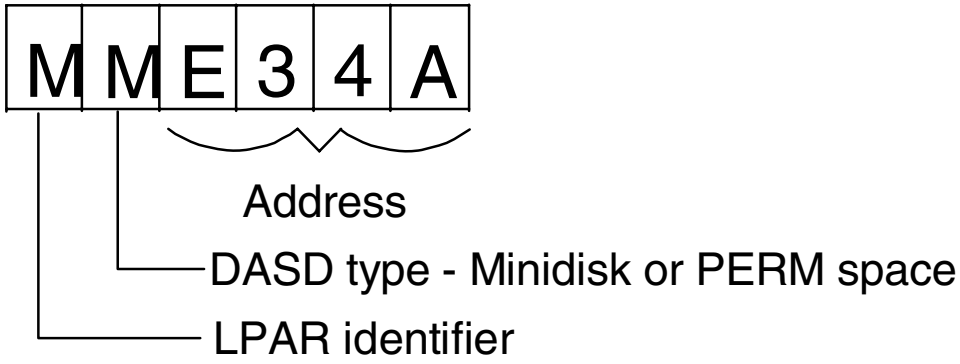
Resources:

CPU: 2 IFLs, shared
Memory: 3GB/1GB
Disk: 24 3390-3 DASD
Network: 16 OSA-E addresses
TCP/IP 8 TCP/IP addresses

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 5.2 on DVD (tape is OK)
  - Linux RHEL 5 DVD ISO images
  - Code associated with redbook - Tar files, also on:
    - http://linuxvm.org/present/
- 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

Configuring a desktop machine

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

Installing and configuring z/VM

- Install z/VM from DVD
  - Install from DVD is documented in some detail
  - Use the Integrated 3270 console on HMC
- Customize TCPIP with IPWIZARD
  - Also configure FTP server
- Customize SYSTEM CONFIG
  - Define a VSWITCH
- Add 5 paging volumes
  - Use supplied CPFORMAT EXEC to format
- 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
- Address z/VM security issues
  - Passwords in USER DIRECT
- Backing/restore system to tape
  - No recipe
- Relabeling system volumes

Servicing z/VM

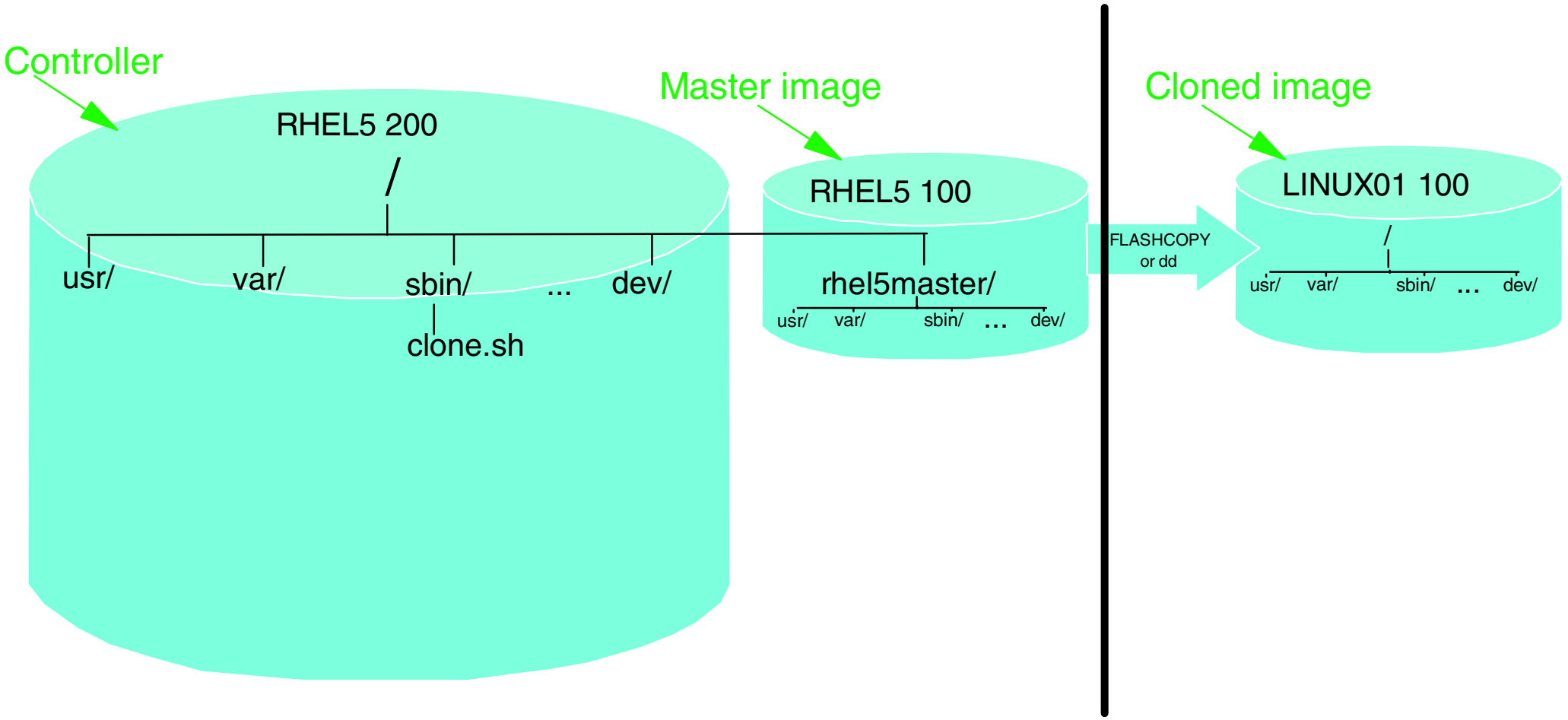
- Apply a Programming Temporary Fix (PTF)
- Apply a Recommended Service Upgrade (RSU)
  - Getting service via Internet FTP
  - SERVICE ALL
  - PUT2PROD
- Determining z/VM's service level
  - Adapted from ibm.com/vm pages

Configure a PC NFS server

- Installing Linux on zSeries is a chicken and egg problem
- Recommendation: install Linux on an Intel-architecture PC
- Server is a temporary NFS server (retire it after chapter 8)
- Steps:
  - Install Linux onto a PC
  - Copy files associated with this book to this NFS server
    - http://linuxvm.org/present/misc/virt-cookbook-RH5.tgz (for RHEL 5)
  - Set up an install directory under /nfs/<distro>/
  - Configure the NFS server to export these two directories

Installing and configuring Linux

- First: a conceptual diagram:
  - Controller/master user ID is dual boot
  - The **clone.sh** script copies the 100 minidisk to target user ID



Installing and configuring Linux (cont'd)

- Create new user ID - SLES10 or RHEL5 - with 7 3390-9s
- Add to z/VM startup - AUTOLOG1's PROFILE EXEC
- Prepare bootstrap files (kernel, RAMdisk, parmfiles) on LNXMAINT 192
- Install master image onto 100 with 101/102 VDISK swaps
- Configure master image
  - Create nightly.sh script
  - Adding additional RPMs
  - Configuring the VNC server
  - Preparing for Online Update
  - Removing unnecessary RPMs
  - Turning off unneeded services
  - Configuring rsyncd
  - Applying service - online update
  - Configuring sitar
  - Setting the software clock accurately
  - Setting system to halt on SIGNAL SHUTDOWN
  - Turning off the hz_timer
  - Modifying zipl.conf
- Install controller onto 200
  - 100 disk is /sles10master/, /backup/ file system, /nfs/ is 4 volume LVM (9GB)

Installing and configuring Linux (cont'd)

- Configure controller
  - Copying files to the controller
  - Adding additional RPMs
  - Configuring the VNC server
  - Removing unnecessary RPMs
  - Turning off unneeded services
  - Applying service if necessary - online update
  - Configuring sitar
  - Installing the cmsfs package
  - Turning on the NFS server
  - Turning on the NTP server
  - Enabling the vmcp module
  - Setting system to halt on SIGNAL SHUTDOWN
  - Turning off the hz_timer
  - Configuring SSH keys
  - Configuring Apache for DAZL
  - Setting ownership of Linux backup directories

Configuring NFS on the controller

- Copying files from NFS server to controller
  - Copying the SLES10 ISO images
  - Copying the files associated with this book
- Configuring the NFS server
- Changing the YaST installation location
- Retire the PC NFS server

Configuring Linux for cloning

- How to clone manually
- How to use the clone.sh script
- Both processes do about the same tasks:
  - Link target ID as 1100
  - Copy from source (100) to target (1100) - use FLASHCOPY if you have it
  - Mount copied file system
  - Modify networking info - usually just IP@ and hostname
  - Detach target disk
  - IPL new clone
  - Modify SSH keys

Installing Linux with Kickstart

- Sections
  - Overview
  - Create an installation server
  - Sample kickstart
  - z/VM changes necessary
  - Live demo
- Overview
  - What is Kickstart?
    - Automated installation via NFS/FTP/HTTP
    - Like a configuration file for installation
    - Kickstart features
      - Pre/Post installation scripts (bash, perl, python, etc.)
      - Package selection with grouping
      - Disk layout (LVM, RAID, etc.)
      - System configuration (authconfig, firewall, timezone, etc.)

Installing Linux with Kickstart *(cont'd)*

- Create an installation server
  - Install tree considerations
    - RHEL 4: ~2.1G, RHEL 5: ~2.9G
    - Can be local or remote
  - Don't reinvent the wheel!
    - Start from this installation's kickstart:

```
# mkdir /nfs/ks
# cp /root/anaconda-ks.cfg /nfs/ks/linux07-ks.cfg
```

    - Customize for new install
    - (Re)start NFS

Installing Linux with Kickstart *(cont'd)*

- Sample kickstart
  - System configuration section:

```
install
reboot
key --skip
nfs --server=server.redhat.com --dir=/path/to/install/tree
lang en_US.UTF-8
network --device eth0 --mtu=4096 --bootproto static \
 --ip 192.168.5.51 --netmask 255.255.255.0 --gateway \
 192.168.5.254 --nameserver 172.16.52.28 --hostname \
 z01.z900.redhat.com
rootpw --iscrypted $1$NROmbbRh$fVXQZB782GaxQ/47DlknM0
firewall --enabled --port=22:tcp
authconfig --enableshadow --enablemd5
selinux --enforcing
timezone America/New_York
bootloader --location=mbr \
 --driveorder=dasda,dasdb,dasdc,dasdd,dasde,dasdf
```

  - Disk formatting options:

```
#zerombr yes
#clearpart --all --initlabel
```

  - vs.

```
#clearpart --all
```

Installing Linux with Kickstart *(cont'd)*

- Sample kickstart (cont'd)
  - Disk partitioning:

```
part /boot --fstype ext3 --size=100 --ondisk=dasda
part swap --fstype swap --size=512 --ondisk=dasda
part pv.2 --size=1 --grow --ondisk=dasda
part pv.3 --size=1 --grow --ondisk=dasdb
part pv.4 --size=1 --grow --ondisk=dasdc
part pv.5 --size=1 --grow --ondisk=dasdd
part pv.6 --size=1 --grow --ondisk=dasde
part pv.7 --size=1 --grow --ondisk=dasdf
volgroup VolGroup00 --pesize=32768 pv.2 pv.3 pv.4 pv.5 pv.6 pv.7
logvol / --fstype ext3 --name=LogVol00 --vgname=VolGroup00 \
 --size=1 --grow
```

  - Package selection:

```
%packages
@base
@core

+packagename
-packagename
```

Installing Linux with Kickstart *(cont'd)*

- Post install configuration:

```
%post
echo /dev/dasdg1 swap swap defaults,pri=1 0 0 >> /etc/fstab

echo ARP=no >> /etc/sysconfig/network-scripts/ifcfg-eth0
echo alias eth1 qeth >> /etc/modprobe.conf
echo alias hsi0 qeth >> /etc/modprobe.conf

cat > /etc/sysconfig/network-scripts/ifcfg-eth1 << EOF
DEVICE=eth1
IPADDR=192.168.5.61
BOOTPROTO=static
MTU=4096
NETMASK=255.255.255.0
NETTYPE=qeth
ONBOOT=yes
PORTNAME=UNASSIGNED
SUBCHANNELS=0.0.0700,0.0.0701,0.0.0702
ARP=no
EOF

cat > /etc/sysconfig/network-scripts/ifcfg-hsi0 << EOF
DEVICE=hsi0
IPADDR=192.168.50.51
BOOTPROTO=static
MTU=8192
NETMASK=255.255.255.0
```

Installing Linux with Kickstart *(cont'd)*

- Post install configuration (cont'd)

```
NETTYPE=qeth
ONBOOT=yes
PORTNAME=UNASSIGNED
SUBCHANNELS=0.0.0800,0.0.0801,0.0.0802
EOF

echo alias scsi_hostadapter0 zfcp >> /etc/modprobe.conf
cat > /etc/zfcp.conf << EOF
0.0.010a 0x01 0x5005076300c4156d 0x00 0x5614000000000000
0.0.010a 0x02 0x5005076300c8156d 0x00 0x5714000000000000
EOF

/sbin/chkconfig cups off
/sbin/chkconfig iptables off
/sbin/chkconfig ip6tables off
/sbin/chkconfig auditd off
/sbin/chkconfig haldaemon off
/sbin/chkconfig atd off
/sbin/chkconfig kudzu off
/sbin/chkconfig mdmonitor off
/sbin/chkconfig rpcgssd off
/sbin/chkconfig rpcidmapd off
/sbin/chkconfig anacron off
/sbin/chkconfig mcstrans off
/sbin/chkconfig yum-updatesd off
```

Installing Linux with Kickstart *(cont'd)*

- Post install configuration (cont'd)

```
cat > /etc/yum.repos.d/rhel5.repo << EOF
[RHEL5]
name=RHEL 5
baseurl=file:///path/to/nfs/install/tree

EOF
```

- z/VM changes necessary
  - Format and label DASD:

```
CPFORMAT xxxx AS PERM
```

    - CPFORMAT is a wrapper EXEC around CPFMTXA
  - Define new user ID
    - USER DIRECT on MAINT 2CC
  - Add user to AUTOLOG1's PROFILE EXEC:

```
XAUTOLOG userid

SET VSWITCH vsw1 GRANT userid
```

  - Create PARM file for kickstart
    - New options:

```
ks=nfs:hostname:/path/to/kickstart/linux07-ks.cfg
RUNKS=1 cmdline
```

- LIVE DEMO!
- Pros/Cons of Kickstart vs. Cloning
  - Speed vs. flexibility

Servicing Linux with Red Hat Network

- Sections
  - Overview
  - Registering your system
  - Using the web interface
  - Red Hat Satellite/Proxy
- Overview
  - What is Red Hat Network?
    - Manage packages
      - Install/update packages or groups of packages
      - Automatic dependency resolution
      - Update from GA to official update with one command
    - Manage systems
      - Centralized view
      - Manage groups of systems
    - Manage subscriptions/entitlements
- Registering your system
  - rhn_register (text and graphical)
  - rhnreg_ks (non-interactive)
  - Creates online profile
  - Checks in every few hours (customizable)

Servicing Linux with Red Hat Network *(cont'd)*

- Registering your system (cont'd)
  - Assigned to base channel
  - Activation key (optional)
- Using the web interface
  - LIVE DEMO!
- Red Hat Satellite
  - Red Hat Network on your network
    - Security
      - Client and server inside firewall
      - Update manually with regular ISO images
    - Performance
  - Package download at LAN speed
    - Control
      - Custom channels
      - Internal or external database
- Red Hat Proxy
  - Customized squid cache (http proxy)
    - Systems register to proxy
    - Proxy registers to RHN or Satellite

Package management for disconnected systems

- Configuring the server
  - Requirements: NFS/FTP/HTTP server, install tree
  - Install tree
  - Yum repository (/Server/repodata)
- Configuring the client
  - Automount the install tree:

```
# vi /etc/auto.master
...
/nfs    /etc/auto.controller

# vi /etc/auto.controller
rhel5           -ro,hard,intr <server>:/nfs/rhel5

# mkdir /nfs
# service autofs restart
Stopping automount: [ OK ]
Starting automount: [ OK ]
# ls /nfs/rhel5
EULA       README-or.html RELEASE-NOTES-ja.html
eula.en_US README-pa.html RELEASE-NOTES-ko.html
...
```

Package management for disconnected systems

- Create yum .repo file:

```
# vi /etc/yum.repos.d/rhel5.repo
[RHEL5]
name=Red Hat Enterprise Linux 5
baseurl=file:///nfs/rhel5/Server
```

- Import GPG key:

```
# rpm --import /nfs/rhel5/RPM-GPG-KEY
```

- Update packages on server
  - Add packages directly to Server/ directory
    - Optional: maintain multiple install trees, .repo files
    - Production, test
    - RHEL 5.0, 5.1, etc.
    - Custom packages
  - yum install createrepo
  - Create new yum repository:

```
# cd /nfs/rhel5/Server
# mv repodata repodata.orig
# createrepo /nfs/rhel5/Server
```

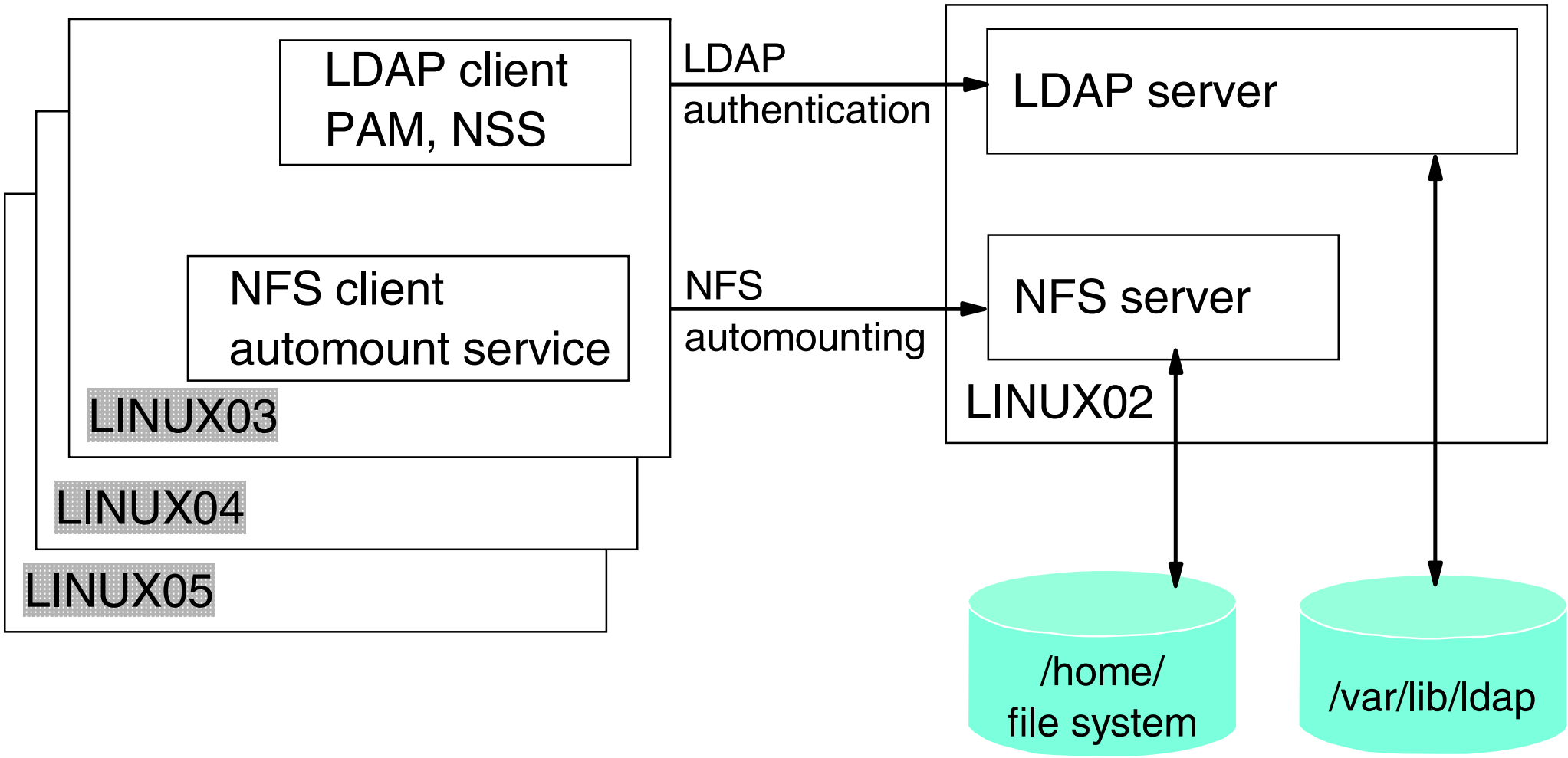
Cloning open source virtual servers

- Clone and customize 4 open source virtual servers
  - LINUX01 - Web server
    - apache2 RPMs
    - Turning on a firewall
  - LINUX02 - LDAP server
    - openldap RPMs
    - Migrate /etc/ users and groups via PADL migration tools
  - LINUX03
    - File server - Samba
    - Create one new Samba user, one new file share
  - LINUX04 - Application development server
    - Python, Perl, tcl, PHP
    - C/C++
    - Java
    - etc.

Miscellaneous recipes

- Other tasks you might want to do:
  - Adding a logical volume (LVM) via line commands
    - Aside: Rule of GUI administration tools:
      - *First learn line commands to perform a task and know what files are changed. Then use a GUI tool to do the same task if it is faster or more usable.*
  - Extending a logical volume
  - Centralizing home directories for LDAP users - brings together
    - LDAP in LINUX02
    - Logical volume just created
    - PAM, NSS for authentication
    - Automount NFS for "traveling" /home/
  - Rescuing a Linux system

Miscellaneous recipes (cont'd)

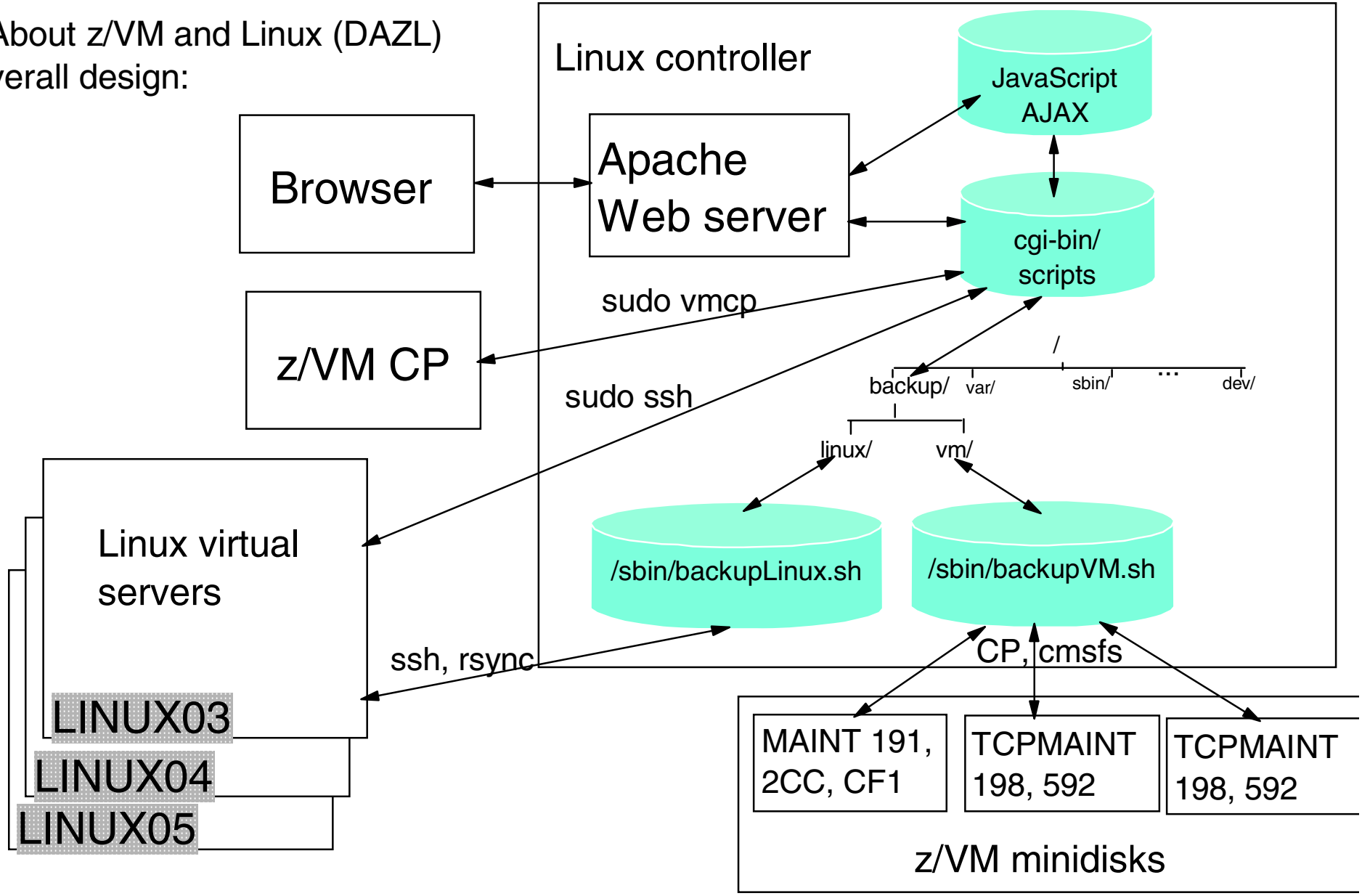


Monitoring z/VM and Linux

- 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 rmfpms)
  - With APPLMON data gatherer built into SLES9 kernel
- Linux images can be registered with the Performance Toolkit
- New Web app: Data About z/VM and Linux
  - Disclaimer:
    - Not formally supported,
    - Not heavily tested,
    - "Quick and dirty"
  - Does not replace IBM Director!
    - See "*IBM Director 5.2 on System Z with z/VM Center extensions*"
      - Session 9219, Friday at 9:30

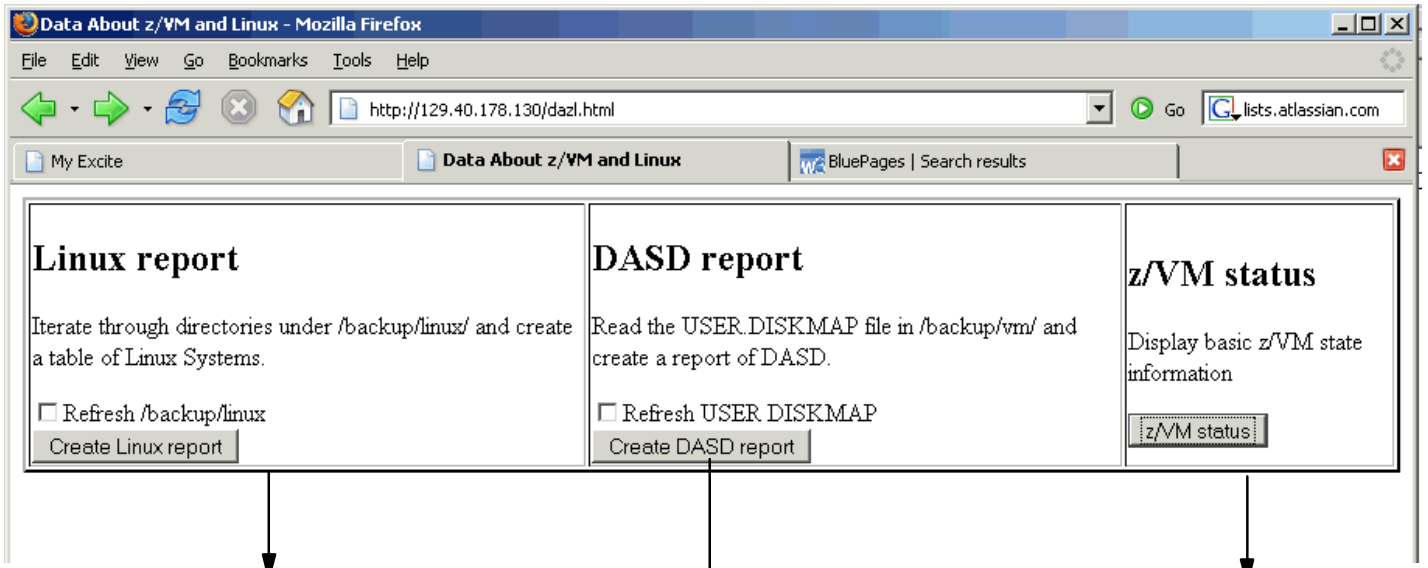
Monitoring z/VM and Linux (cont'd)

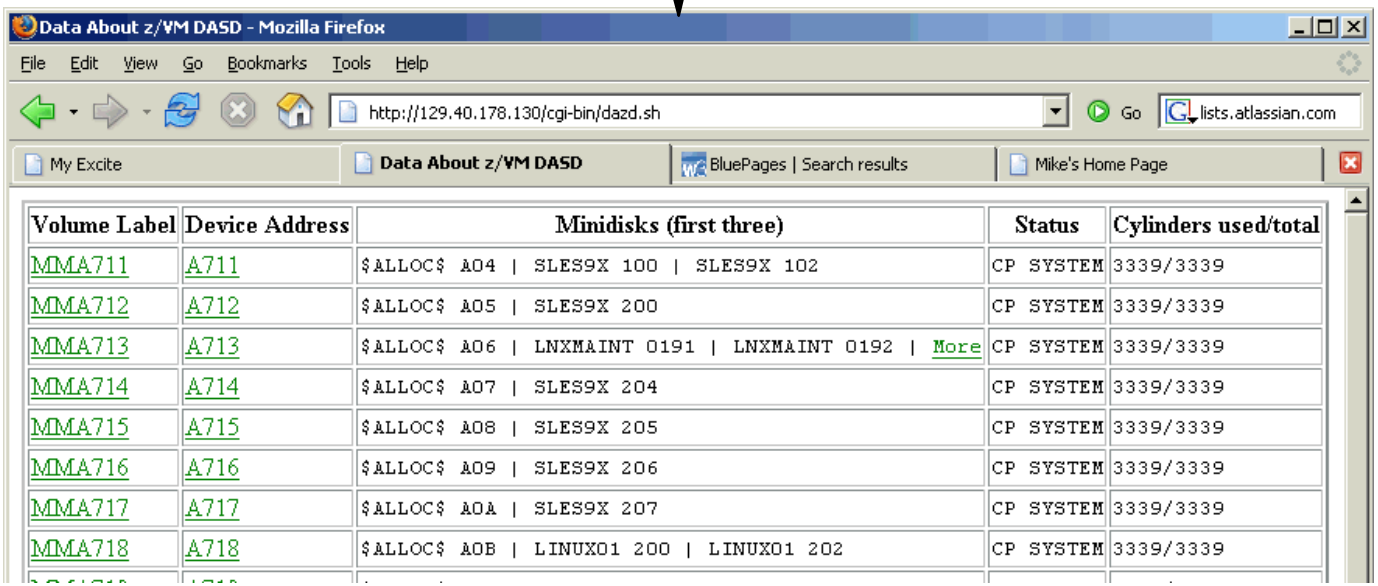
- Data About z/VM and Linux (DAZL)
  - Overall design:



Monitoring z/VM and Linux (cont'd)

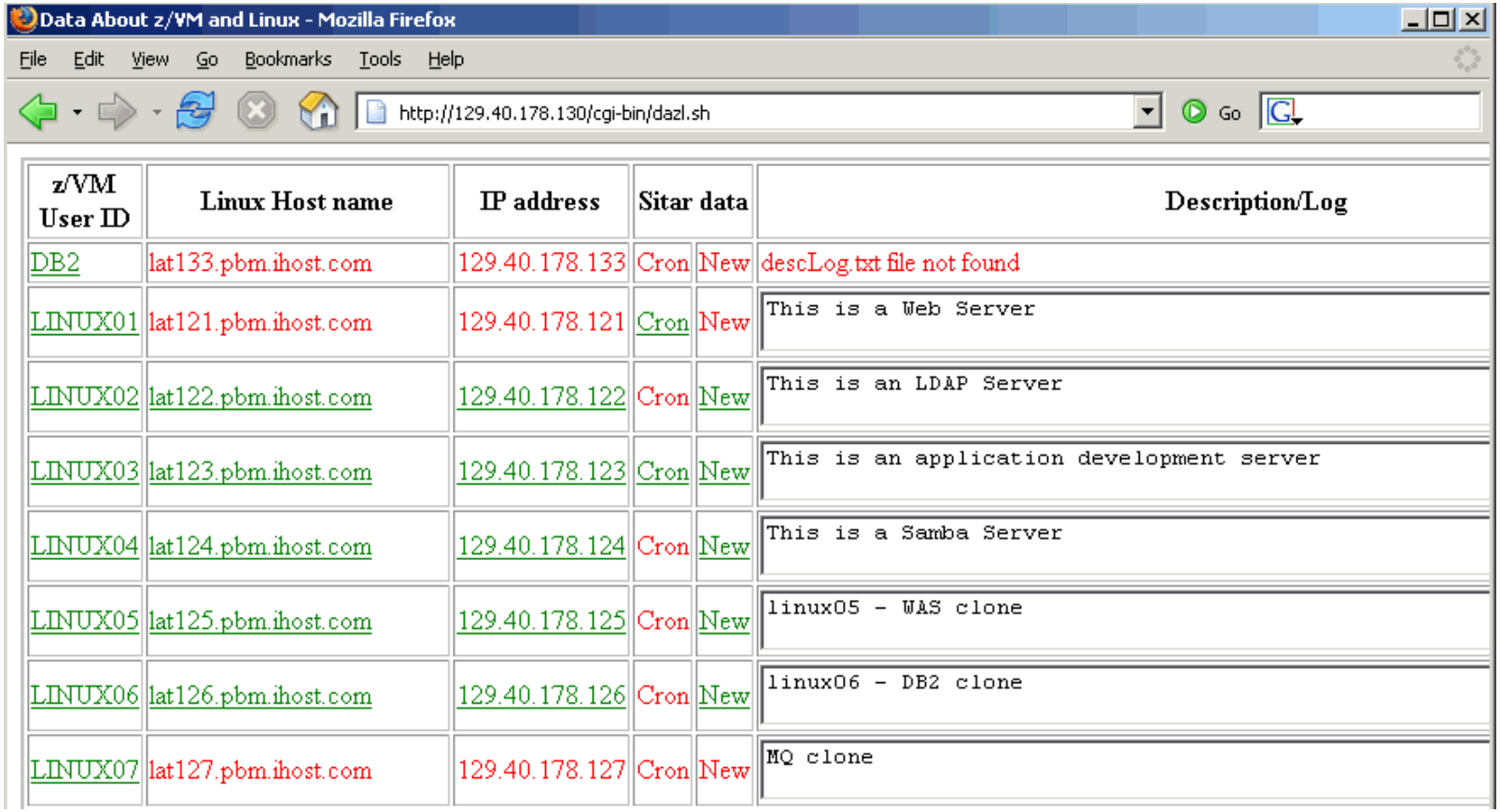
- DAZL Screen shots:





Monitoring z/VM and Linux (cont'd)

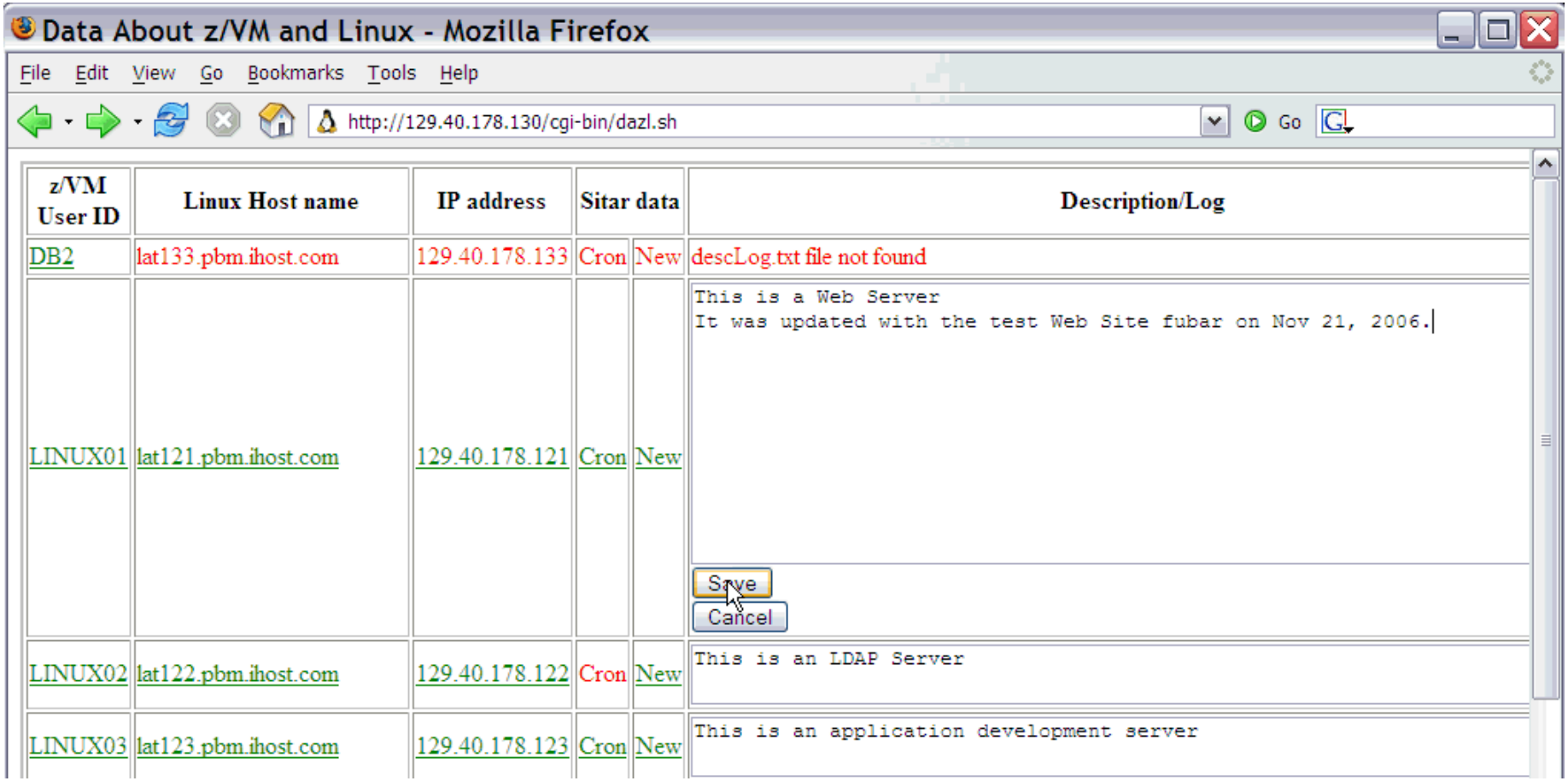
- DAZL Linux report:



z/VM User ID	Linux Host name	IP address	Sitar data		Description/Log
DB2	lat133.pbm.ihost.com	129.40.178.133	Cron	New	descLog.txt file not found
LINUX01	lat121.pbm.ihost.com	129.40.178.121	Cron	New	This is a Web Server
LINUX02	lat122.pbm.ihost.com	129.40.178.122	Cron	New	This is an LDAP Server
LINUX03	lat123.pbm.ihost.com	129.40.178.123	Cron	New	This is an application development server
LINUX04	lat124.pbm.ihost.com	129.40.178.124	Cron	New	This is a Samba Server
LINUX05	lat125.pbm.ihost.com	129.40.178.125	Cron	New	linux05 - WAS clone
LINUX06	lat126.pbm.ihost.com	129.40.178.126	Cron	New	linux06 - DB2 clone
LINUX07	lat127.pbm.ihost.com	129.40.178.127	Cron	New	MQ clone

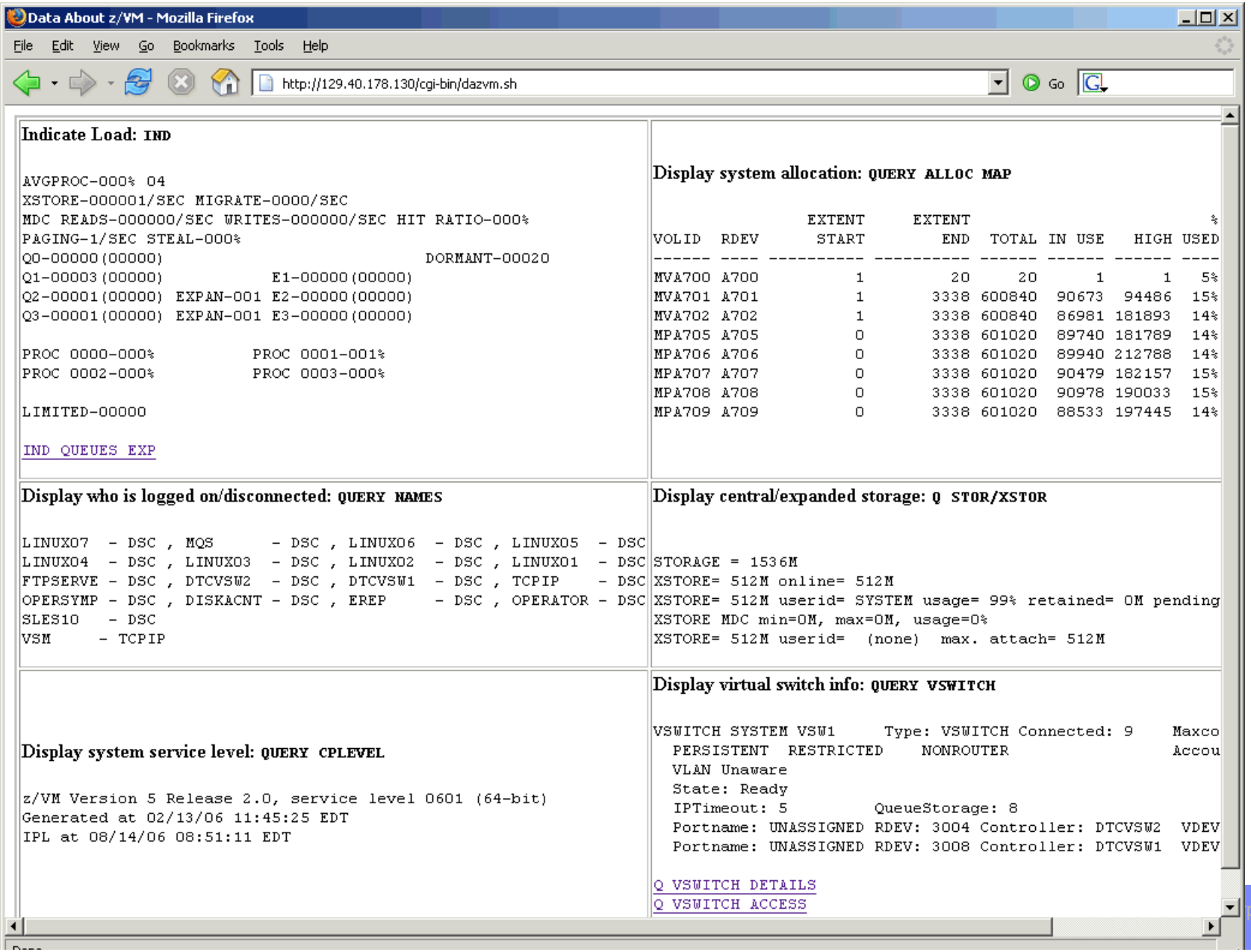
Monitoring z/VM and Linux (cont'd)

- DAZL editing in place:



Monitoring z/VM and Linux (cont'd)

- DAZL z/VM report:



Live Demo

Resources

- Book *z/VM and Linux on System z: The Virtualization Cookbook for RHEL 5* (publish Feb 28?)
  - http://linuxvm.org/present/virt-cookbook-RH5.pdf
- Files associated with the RHEL 5 book (Feb 28?)
  - ftp://linuxvm.org/present/virt-cookbook-RH5.tgz
- *RHEL 5 Install Guide*
  - http://www.redhat.com/docs/manuals/enterprise/RHEL-5-manual/
- *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 - ???