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Technology • Connections • Results

# Linux System Management for the Mainframe Systems Programmer

Mark Post  
Novell, Inc.

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# Agenda



- Cultural Differences & Similarities
- Terminology
- How Does Linux/390 Compare to Unix System Services?
- How Does Linux/390 Compare to Other Linux platforms?
- What is a Distribution, and why doesn't IBM have one?
- What Hardware Does Linux/390 Support?
- What Networking Connections Does Linux/390 Support?
- Where's SYS1.PARMLIB Kept?
- Do I **Really** Have to Know All This Stuff?

# Agenda (2)



- Linux/390 DASD Management
- Backup and Restore
- Software and Maintenance Management
- Data Sharing with Linux/390 and Other OS
- Job Scheduling
- Security and User Management
- Diagnostic Information Available (or not)
- Editors
- Basic vi Concepts

# Agenda (3)

- Scripting Languages
- System Logs
- Basic Commands
- Advanced Commands
- Kernel Modules, Loading and Unloading
- System Startup and Shutdown
- Performance Management
- Creating Additional Images
- Questions?

# Agenda (4)



- Additional Information Resources
  - Web sites, Redbooks/pieces/tips, Usenet (news), O'Reilly Books
- Command Comparisons

# Cultural Differences & Similarities



- Open Source Community
  - Think of how many people you know from IBMMAIN or IBMVM
- Open Source software
- Software quality
- Where and how you get support
- Expectations of self-reliance
- 3270 terminals vs. VTxxx.
- Is rebooting unnecessarily a sin?
- Install Linux on a PC and use it.

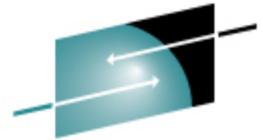
# Terminology

- IPL
- nucleus
- PLPA / LINKLIST
- TSO / CMS
- OSA
- PTF / APAR
- IEBUPDTE
- IEBUPDTE input
- SuperC / COMPARE
- xedit update mode
- boot
- kernel
- kernel modules
- shell
- NIC
- patch
- patch
- diff
- diff
- diff

# Terminology (2)

- paging space
- multi-processor
- systems programmer
- GUI
- pattern matching
- help files
- STC / SVM
- address space
- task (tcb)
- swap partition/volume/file
- SMP
- system administrator
- X / X-Window
- regular expression
- man pages
- daemon
- process
- thread

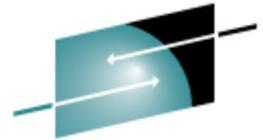
# Terminology (3)



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- runlevel
- device driver
- tarball (tar - tape archive)
  - `tar -cf backup.tar file1 file2 file3 file4`
  - **`tar -xf backup.tar`**
  - `tar -zcf backup.tar.gz file1 file2 file3 file4`
    - Equivalent to tar command followed by gzip command
  - `tar -zcf backup.tgz file1 file2 file3 file4`
  - **`tar -zxf backup.tgz`**
  - `tar -jcf backup.tar.bz2 file1 file2 file3 file4`
    - Uses bzip2 instead of gzip for compression
  - **`tar -jxf backup.tar.bz2`**

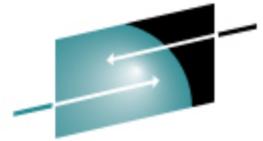
# How Does Linux/390 Compare to...



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- **Unix System Services**
  - Linux/390 is “real” UNIX “under the covers.” Things that run on most other Unix systems can be run on Linux/390, usually without change (assuming source is available).
  - There is no such thing as SMP/E or SES in UNIX / Linux.
  - Option “switches” on various commands are different, due to different shells, or compliance to different standards.
  - The Linux man pages work without extra effort on OS/390 side.
  - There’s no confusion about which TCP/IP parameters are put where.
  - Things that you learn about other UNIX systems are generally easier to apply to Linux than USS.
  - There’s no “other side” (OS/390) to help bail you out when things get messed up.
  - Native ASCII. No EBCDIC <=> ASCII conversions.

# How Does Linux/390 Compare to...



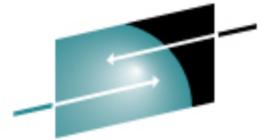
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- **Unix System Services (cont.)**
  - Source code is typically available on Linux.
  - Default shell is more often bash than (t)csch.
  - No 3270 interface/limitations to work around. Which also means no real ISPF. (You can buy a clone of it, though.)
  - PL/1, CLISTs are not available.
  - REXX is available, but called Regina.
  - OREXX is available, now in Open Source form.
  - HLASM is now available from Tachyon Software.
- **Other Linux Platforms**
  - Very similar, but it lacks a lot of common PC-type hardware
  - 3270 support included for consoles in LPAR mode
  - S/390 specific hardware

# What are Distributions?

- VARs
- Packagers
- System Integrators
- Maintainers
- Developers
- Support
- Why doesn't IBM have one?

# Linux/390 Hardware Support



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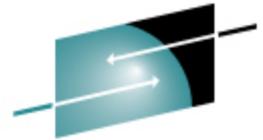
- Any processor that supports the “Halfword Immediate and Relative Branch Feature” instructions added with the G2.
- For decent performance, IEEE FPU is needed. (G5 and up, MP3000.)
- ECKD DASD
- FBA DASD
- 3480/3490/3590/3592 Tapes
  - Including 3592 hardware encryption
- SCSI over FCP, including tape drives
- Crypto cards and Secure Key Entry

# Linux/390 Network Connections



- 3172
- OSA-2 (Token-Ring, Ethernet, Fast Ethernet)
- OSA-Express (Ethernet, Fast Ethernet )
- 2216 (Token Ring, Ethernet )
- QDIO OSA-Express (1 & 10Gb Ethernet, Fast Ethernet)
- ESCON / CTC (native and under VM)
- IUCV (only under VM)
- HiperSockets (native and under VM)
- Guest LANs (only under VM) – NOT the same as VLANs
- VSwitch (only under VM, requires an OSA)
- Cisco CLAW (CIP) - original driver by UTS Global, redone by IBM

# Where's SYS1.PARMLIB Kept?



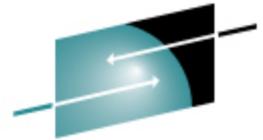
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- Just about everything you need is kept under /etc (at some level of hierarchy).
- Individual text files (or groups of them), since no concept of a PDS in Linux.
- Some *really* important ones:
  - /etc/passwd
  - /etc/shadow
  - /etc/group
  - /etc/inittab
  - /etc/inetd.com
  - /etc/modules.conf
  - /etc/fstab
  - /etc/hosts
  - /etc/resolv.conf
  - /etc/rc.d/...
  - /etc/httpd/...
  - /etc/sysconfig/...
  - /etc/samba/...
  - /etc/pam.d/...
  - /etc/ssh/...

# Do I *Really* Have to Know All This Stuff?

- No, but shouldn't you?
  - Would you let a junior systems programmer or system operator loose on SYS1.PARMLIB or SYSTEM CONFIG via a GUI?
- If you really don't want to know what's going on or have a large virtual farm:
  - YaST (SUSE)
  - Nautilus (Red Hat)
  - GNOME Control Center (SUSE and Red Hat)
  - Webmin (completely Perl-based)
  - Others

# Linux/390 DASD Management

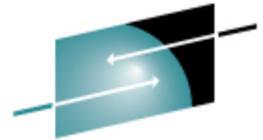


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## Quick Overview:

- Adding and removing DASD
- Preparing DASD for use
  - Formatting
    - 2 kinds of DASD layouts
  - Partitioning (2.4.x & 2.6.x kernels only)
  - Creating file systems and Swap
  - File systems vs. directories
- Backing up your DASD

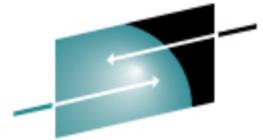
# Adding & Removing DASD



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- For 2.4.x kernels, can be non-disruptive, but manual:
  - **Adding a device**
  - **echo "add device range=*devno-range* " > /proc/dasd/devices**
  - **Disabling a device**
  - **echo "set device range=*devno-range* off " > /proc/dasd/devices**
  - **Enabling a device**
  - **echo "set device range=*devno-range* on " > /proc/dasd/devices**
  - Still want to update /boot/parmfile or /etc/zipl.conf and re-run "zipl" to make the change permanent. (mkinitrd may also be required.)
- The 2.2.x kernels, required updating /boot/parmfile, re-running "silo," and rebooting.

# Adding and Removing DASD in 2.6.x



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- New disks detected automatically
- `/sys/bus/ccw/devices/0.0.0b01@`
- `/sys/bus/ccw/drivers/dasd-eckd/0.0.0b01@`
- `/sys/bus/css/devices/0.0.0016@`
- `/sys/bus/css/drivers/io_subchannel/0.0.0016@`
- `/sys/devices/css0/0.0.0016/`
  - `0.0.0b01/`
    - `bus@`
    - `chpids`
    - `driver@`
    - `pimpampom`
- `/sys/devices/css0/0.0.0016/0.0.0b01/`
  - Availability
  - `bus@`
  - `cmb_enable`
  - `cutype`
  - `devtype`
  - `discipline`
  - `driver@`
  - `online`
  - `readonly`
  - `use_diag`

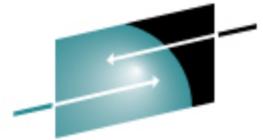
Use `/sbin/chccwdev` instead

```
chccwdev --online 0.0.0b01
```

```
chccwdev -e 0.0.0b01
```

```
chccwdev -d 0.0.0b01
```

# Formatting DASD - 2.4.x, 2.6.x



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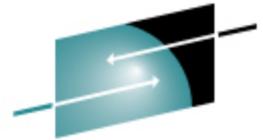
- `dasdfmt -b 4096 [ -l volser ] [ -d layout ] -f /dev/dasd?`
  - `dasdfmt -b 4096 -d cdl -f /dev/dasda`
  - `dasdfmt -b 4096 -f /dev/dasda`
  - `dasdfmt -b 4096 -d ldl -f /dev/dasda`
- `fdasd /dev/dasd?`
  - **Must** create one, two, or three partitions for CDL-formatted volumes
  - Similar to the `fdisk` command
    - `fdisk` is still used for SCSI disks!

# Creating File Systems and Swap

## 2.4.x, 2.6.x Kernels

- `mke2fs -b 4096 /dev/dasd?1,2,3`
  - `mke2fs -b 4096 /dev/dasda1`
  - `mke2fs -b 4096 /dev/dasda2`
  - `mke2fs -b 4096 /dev/dasda3`
  - `mke2fs -b 4096 /dev/dasdb1`
  - `mke2fs -b 4096 /dev/dasdc1`
- Other file system types possible (Red Hat only supports EXT2 & EXT3)
  - `mkfs.reiserfs`
  - `mkfs.ext3`
  - `mkfs.xfs`
  - `mkfs.jfs` (deprecated in SLES10)
- `mkswap /dev/dasd?1,2,3` (`mkswap /dev/dasda1`)

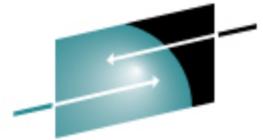
# File Systems and Directories



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- / (root)
- /bin
- /boot \*
- /dev
- /etc
- /home
- /lib, /lib64
- /mnt
- /opt
- /proc
- /root (not to be confused with / root)
- /sbin
- /srv
- /sys
- /tmp
- /usr
- /var

# File Systems and Directories



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- # df -h

Filesystem	Size	Used	Avail	Use%	Mounted on
/dev/dasda1	388M	119M	250M	33%	/
/dev/dasda2	97M	4.2M	88M	5%	/home
/dev/dasda3	74M	21M	50M	30%	/opt
/dev/dasdc1	1.2G	1.1G	100M	92%	/srv
/dev/dasdb1	291M	17M	260M	6%	/tmp
/dev/dasdb2	1.2G	915M	183M	84%	/usr
/dev/dasdb3	245M	69M	164M	30%	/var

# Backup and Restore

- Native Linux facilities
  - afio/cpio/tar
- Software packages (Open Source and proprietary)
  - Bacula, Amanda
  - DFSMSdss / DDR
  - Tivoli TSM/ADSM
  - Innovation FDRINSTANT/UPSTREAM
  - CA BrightStor
  - SecureAgent SecureBackup
  - UTS Global TSS-BAR
  - Veritas NetBackup
- Note that unless you have the backup **server** on the local system and tape drives available, backup data will be sent over the network.

# Software & Maintenance Management



- Since there is no such thing as SMP/E or SES, you have to learn a new mindset.
- There are “binary” packages for several platforms, primarily Intel. Different distributions use different methods to manage those packages: RPM, dpkg.
- Source packages (RPM, tar.gz, etc.) are always available for Open Source software. This is *not* an invitation to compile from source and install without using the same packaging tool as your distribution provider uses.

# Software & Maintenance Management (2)



- In a number of cases, there is no binary available for Linux/390. Compiling from source is the only option. This can be **very** easy or **very** difficult, depending on the package.
- You will become very familiar with the ‘tar,’ ‘gzip,’ and ‘make’ commands. Most likely ‘patch’ and ‘diff’ as well.
- Once you start down that road, you are no longer a Linux user, but a Linux developer, with all the pain that can entail.

# Software & Maintenance Management (3)



- Keeping track of security patches is **very** important, and people-intensive.
- Getting email notifications from trusted security industry sources (CERT, etc.) is recommended.
- If you *have* to compile a package from source, it probably won't be too difficult.
  - `tar -zxf package.name.tar.gz`
  - `cd package-directory`
  - `./configure`
  - `make`, and then `make install`

# Using RPM

- VERY high-level!
  - rpm -i package.name.rpm (install)
  - rpm -e package.name (remove)
  - rpm -q package.name (query)
  - rpm -ql package.name
  - rpm -qlp package.name.rpm
  - rpm -qa
  - rpm -qf /path/to/file/name
- dpkg on Debian-based systems
- pkgtools on Slack/390 systems

# Data Sharing With Linux and Other OSes

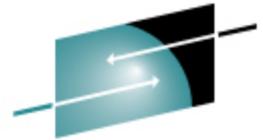


- No direct, hard-wired sharing
- z/OS doesn't "know" ext2
  - z/VM does, but only usable when the Linux system is down
- Linux does "know" VTOCS, etc.
  - **But, no security!** (your audit compliance folks won't like you)
- Various network-based methods and clustering file systems
  - NFS
  - AFS
  - Samba (SMB / CIFS / MS Networking)
  - GFS, OCFS2 (OCFS2 is not quite ready for production use)
- Under VM - sharing minidisks *read-only* between guests.

# Job Scheduling

- Linux native facilities
  - cron
  - at
- Open Source:
  - DQS
  - queue
  - OpenPBS
  - generic NQS
- Proprietary
  - Avatar
  - Computer Associates
  - ESP
  - Jobtrac
  - PBSPPro
  - UC4:global
  - Xi-Batch

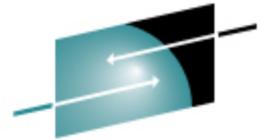
# Security and User Management



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- Security is an ongoing process, not a status. It must be constantly attended to for you to have any chance at all.
- Most successful security breaches come from employees of a company, not outsiders.
- In contrast to typical mainframe security, Linux security is more network oriented.
- If possible, have a UNIX security person handle your Linux security needs.

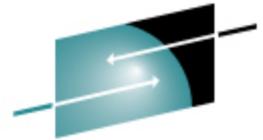
# Security and User Management (2)



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- Turn off *ALL* unnecessary services: telnet, ftp, smtp, time, finger, http, pop3, imap, login, shell, printer, nfs, etc., etc.
- Use OpenSSH instead of telnet, ftp, rlogin, rsh, rexec, rlogin, etc..
- Use TCP Wrappers (/etc/hosts.allow, etc.) if you have to use an insecure protocol.
- Review your system logs regularly.
- Monitor security alerts from your suppliers, and from various security organizations.

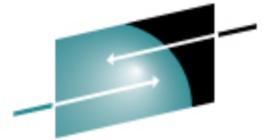
# Security and User Management (3)



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- Don't lump all your users into one group (typically "users" - SUSE default).
- Don't create a separate group for each user (Red Hat's approach).
- Try to have reasonable groups defined so that people can share data appropriately, and put the proper users into them.
- Don't give *anyone* a UID of zero unless it's absolutely necessary (and even then think about other ways to avoid it).

# Security and User Management (4)



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- Various tools are available for adding, deleting and changing user and group definitions. All information about users and groups are in plain text files.
- SUSE has YaST
- Red Hat has Nautilus and redhat-config-\* tools
- Webmin is popular
- useradd, userdel, usermod, groupadd, groupdel, groupmod are the common command-line tools

# Security and User Management (5)



- Protect the password of “root” very carefully.
- Login as “yourself” and su to root only when really needed.
- Consider using /etc/sudoers to grant some selected command authority to designated people.
- If you're running a Linux that doesn't use PAM (pluggable authentication modules), consider using /etc/suauth to allow designated people to “su” using their own password.

# Diagnostic Information

- strace
- ulimit (to enable core dumps)
- gdb
- uptime
- top
- ksymoops
- vmstat
- supportconfig/siga (SUSE)
- iostat
- sar
- netstat
- ping
- traceroute
- system logs
- dmesg
- standalone dump
- sysreport (Red Hat)

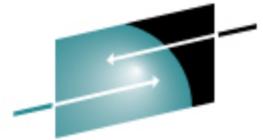
# Editors (Holy War fodder)

- vi / vim / elvis
- emacs / xemacs
- joe
- jed
- jove
- ed (sed)
- nano
- pico
- ne
- ned (3270 enabled)
- Nedit
- THE (The Hessling Editor)

**No native free (no cost) ISPF/PDF clones.  
(2 proprietary ones)**

# Basic vi Concepts

- Cursor keys work as expected (or h-j-k-l), as do Page up and Page Down, Delete and Backspace (when ssh client is properly configured).
- Two important modes: command, insert.
- I'm pretty unfamiliar with vi, so I basically use insert mode and command mode.
- Insert button = insert mode (twice = replace)
- ESC = exit insert/command mode.



## Basic vi Concepts (2)

- `:set smd` or `:set showmode`
  - gives visual indicator of what mode you're in
- `:d` = delete a line
- `:w` = write updated file to disk
- `:x` = write updated file to disk and exit
- `:q` = quit if no updates have been made since the last save (`:w`)
- `:q!` = quit regardless
- `:help` = help me!

# Scripting Languages (Holy War Cont.)

- Perl
- ash / bash / csh / tcsh / ksh / ksh93 / zsh
- Regina (REXX)
- OREXX
- Python (can also be compiled)
- Ruby
- Tcl
- The list goes on...

# System Logs

- Most of what you want will be in `/var/log/`, or in a subdirectory of it.
- Names and contents vary by distribution
  - Look at `/etc/syslog.conf` if you're interested
- Reviewing them *frequently* is important
- Samples:
  - `/var/log/messages`
  - `/var/log/syslog`
  - `/var/log/debug`
  - `/var/log/boot.log`
  - `/var/log/dmesg`
  - `/var/log/proftpd.log`
  - `/var/log/maillog`
  - `/var/log/warn`
  - `/var/log/httpd/...`
  - `/var/log/samba/...`

# Basic Commands

- **rm -rf /**
- cd
- cp
- mv
- rm
- ls
- find
- grep
- cat
- less / more
- man
- info
- mount
- umount
- mkdir
- rmdir
- ps
- pushd
- popd
- which
- zipl**

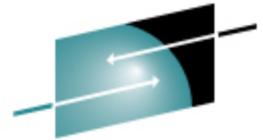
# Advanced Commands

- ifconfig
- route
- host / nslookup
- su
- sudo
- gzip / bzip2
- last
- chmod
- chown
- dmesg
- du
- df
- locate
- top
- sed
- head
- tail
- wget
- export
- file
- telinit

# Kernel Modules

- The kernel, along with kernel modules, contains all the code necessary to run as an operating system. This includes device drivers, file system drivers, networking code, etc.
- Kernel modules are parts of the kernel that don't have to be compiled into the kernel itself (but can be if you want to).
- This can allow you to update these components on the fly, without rebooting.

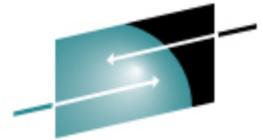
# Loading Kernel Modules



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- Since modules are *not* in the kernel, how do they get loaded into kernel storage?
  - insmod
  - modprobe
  - dynamically by the kernel if `/etc/modules.conf` or `/etc/modprobe.conf` has the right data in it.
- How does the module get it's parameters?
  - provided on insmod command
  - read from `/etc/modules.conf` or `/etc/modprobe.conf` by modprobe and the kernel.

# Loading Kernel Modules



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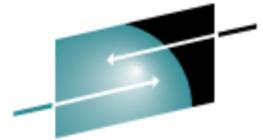
- How does the kernel find the module?
  - Usually in `/lib/modules/kernelver/...`
    - `/lib/modules/2.6.16.27-0.9-smp/`
  - `depmod -a` command creates a cross reference of the modules and where they are located, and writes it into `/lib/modules/kernelver/modules.???` files.
  - `modprobe` figures out the dependencies and loads the modules in the right order. `insmod` does not do this.

# Unloading Kernel Modules

- The `rmmod` command is used to do the unloading
- Kernel modules must be unused to be unloaded
  - The `jbd` module is in use by the `ext3` module and cannot be unloaded

```
# lsmod
jbd      62880  1 ext3
```
- There is a `-f` (force) parameter to `rmmod`, but under normal circumstances it would be unwise to use it.
  - `CONFIG_MODULE_FORCE_UNLOAD=Y` must have been specified in the kernel config for it to work.

# System Startup and Shutdown

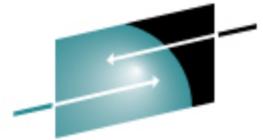


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- From the HMC, just like any other OS, except no loadparms are needed/used.
- From VM, there are usually some CMS/CP commands issued in PROFILE EXEC, followed by a 'CP IPL devno CLEAR'
- From VM, you can still IPL from the reader, if desired.
- snIPL (simple network IPL)
- How the rest of the system is brought up by init is a very complex process, beyond the scope of this talk.

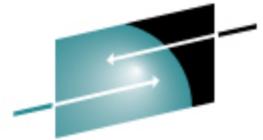
# System Startup and Shutdown (2)



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- When shutting down, it is important to do it *properly*. File system corruption and data loss can result otherwise.
- Use the halt, reboot or shutdown command.
- You can use shutdown to warn any logged on users, and/or set the shutdown to some time in the future.
- The shutdown command has options to reboot, halt, or cancel a previous shutdown command.
- The ctrlaltdel entry in /etc/inittab can be used to automate this by listening for LPAR or z/VM shutdown signals:  
`ca::ctrlaltdel:/sbin/shutdown -h -t 4 now`

# Performance Management



**S H A R E**

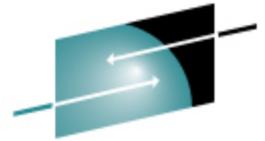
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- Some “standalone” native Linux tools:
  - top, ntop, httpperf, sar, iostat, gkrellm, pload, statnet, Big Brother, Hobbit, iptraf
  - Understand that in a shared environment, such as z/VM (or even LPAR), these will *all* be lying to you in certain ways. SLES10 and RHEL5 are the first versions that use a kernel that has the code necessary to correct this.
- Proprietary products
  - Velocity Software ESALPS
  - BMC MAINVIEW
  - IBM Performance Toolkit
  - OMEGAMON XE

# Creating Additional Images

- Some commercial tools, none of them cheap
- Can be done with home grown tools
- IBM Redbook “Linux on IBM zSeries and S/390: ISP/ASP Solutions,” SG24-6299
- z/VM and Linux on IBM System z: The Virtualization Cookbook for SLES10
- z/VM and Linux on IBM System z: The Virtualization Cookbook for RHEL5

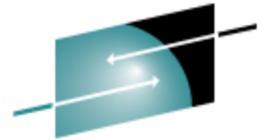
# Questions?



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# Additional Information - Web Sites



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- <http://linuxvm.org/>
- <http://www.marist.edu/htbin/wlvindex?linux-390>  
(Linux/390 mailing list subscription and archives)
- <http://www.slack390.org/>
- <http://www.kernel.org/>
- <http://www.linux.org/>
- <http://www.tldp.org/>  
(The Linux Documentation Project)

# Additional Information - Redbooks



- <http://www.redbooks.ibm.com/>
- Linux for S/390, SG24-4987
- Linux for zSeries and S/390: Distributions, SG24-6264
- Linux on zSeries and S/390: ISP/ASP Solutions, SG24-6299
- Linux on zSeries and S/390: Application Development, SG24-6807
- Linux on zSeries and S/390: System Management, SG24-6820

# Additional Information - Redbooks (2)



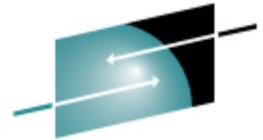
- Linux on zSeries and S/390: Large Scale Linux Deployment, SG24-6824
- Linux on zSeries and S/390: Performance Measurement and Tuning, SG24-6926
- Linux with zSeries and ESS: Essentials, SG24-7025
- Experiences with Oracle for Linux on zSeries, SG24-6552
- SAP on DB2 UDB for OS/390 and z/OS: Implementing Application Servers on Linux for zSeries, SG24-6847

# Additional Information - Redbooks (3)



- e-Business Intelligence: Leveraging DB2 for Linux on S/390, SG24-5687
- e-Business Intelligence: Data Mart Solutions with DB2 for Linux on zSeries, SG24-6294

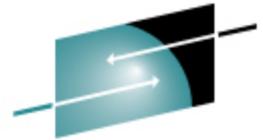
# Additional Information - Redpieces



**S H A R E**  
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- Implementing Linux in your Network using Samba, redp0023
- Building Linux Systems Under IBM VM, redp0120
- Linux on zSeries and S/390: High Availability for z/VM and Linux, redp0220
- Linux on zSeries and S/390: Securing Linux for zSeries with a Central z/OS LDAP Server (RACF), redp0221
- Linux on zSeries and S/390: Server Consolidation with Linux for zSeries, redp0222
- Linux on zSeries and S/390: Cloning Linux Images in z/VM, redp0301

# Additional Information - Redpieces (2)



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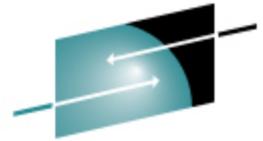
- Linux on zSeries and S/390: TCP/IP Broadcast on z/VM Guest LAN, redp3596
- Linux on zSeries and S/390: Managing a Samba Server from z/VM, redp3604
- Linux on zSeries and S/390: Porting LEAF to Linux on zSeries, redp3627
- Linux on zSeries and S/390: Virtual Router Redundancy Protocol on VM Guest LANs, redp3657
- Linux on zSeries and S/390: z/VM Configuration for WebSphere Deployments, redp3661

# Additional Information - Redpieces (3)



- Linux on zSeries and S/390: Building SuSE SLES8 Systems under z/VM, redp3687
- Linux on zSeries and S/390: VSWITCH and VLAN Features of z/VM 4.4, redp3719
- e-commerce Patterns for Linux on zSeries Using WebSphere Commerce Suite V5.1 Patterns for e-business series, redp0411
- Getting Started with zSeries Fibre Channel Protocol, redp0205
- WebSphere Portal Installation on Linux for zSeries, redp3699
- Open Your Windows with Samba on Linux, redp3780

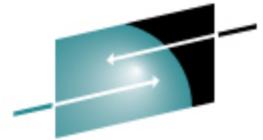
# Additional Information - Hints & Tips



**S H A R E**  
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- Linux on zSeries: Configuring gcc as a cross-compiler, tips0005
- Dynamic management of DASD devices in Linux running on zSeries, tips0023
- Formatting and Labeling a DASD Volume for Linux Guests Running Under z/VM, tips0275
- Partitioning DASD for Linux Guests Running under z/VM, tips0277

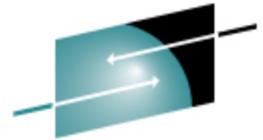
# Additional Information - O'Reilly Books



**S H A R E**  
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- \* Apache: The Definitive Guide, 2nd Edition
- Apache Pocket Reference
- \* Building Internet Firewalls, 2nd Ed
- \* DNS and BIND, 4th Edition
- \* Learning Perl, 3rd Edition
- \* Learning the bash Shell, 2nd Edition
- \* Learning the vi Editor, 6th Edition
- MySQL & mSQL
- \* Perl Cookbook
- Perl for System Administration
- Perl for Web Site Management
- Perl in a Nutshell

# Additional Information - O'Reilly Books



**S H A R E**  
Technology • Connections • Results

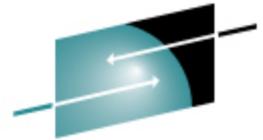
- \* Practical UNIX & Internet Security, 2nd Edition
- \* Programming Perl, 3rd Edition
- \* Running Linux, 3rd Edition
- Samba Pocket Reference
- sed & awk Pocket Reference
- \* sed & awk, 2nd Edition
- \* sendmail, 2nd Edition
- sendmail Desktop Reference
- \* SSH, The Secure Shell: The Definitive Guide
- \* TCP/IP Network Administration, 2nd Edition
- \* Using Samba - **comes with the software**
- vi Editor Pocket Reference

# Additional Information - O'Reilly Books



- \* Networking CD Bookshelf
  - TCP/IP Network Administration, 2nd Edition
  - sendmail, 2nd Edition
  - sendmail Desktop Reference
  - DNS and BIND, 3rd Edition
  - Practical UNIX & Internet Security, 2nd Edition
  - Building Internet Firewalls
  
- \* The Perl CD Bookshelf, Version 2.0
  - Programming Perl, 3rd Edition
  - Perl for System Administration
  - Perl in a Nutshell
  - Perl Cookbook
  - Advanced Perl Programming

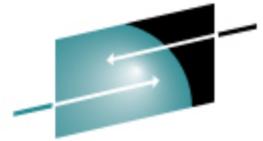
# Additional Information - O'Reilly Books



**S H A R E**  
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- \* The Linux Web Server CD Bookshelf
  - Running Linux, 3rd Edition
  - Linux in a Nutshell, 3rd Edition
  - Apache: The Definitive Guide, 2nd Edition
  - MySQL & mSQL
  - Programming the Perl DBI
  - CGI Programming with Perl, 2nd Edition

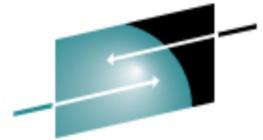
# Command Comparison



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<u>MVS</u>	<u>VM</u>	<u>Linux</u>	<u>DOS</u>
• LISTC	• L	• ls / locate	• dir
• LISTD	• L (L	• file	• attrib
• LIST	• TYPE	• cat	• type
• COPY	• COPY	• cp	• copy
• MOVE	• MOVE	• mv	• move
• RENAME	• RENAME	• mv	• ren
• DELETE	• ERASE	• rm	• del
• HELP	• HELP	• man / info	• help
• ICKDSF	• FORMAT	• dasdfmt / mke2fs	• format

# Command Comparison (2)



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## MVS

- SEND
- LISTB
- LOGOFF
- PRINTDS
- V ONLINE
- V OFFLINE
- D TS
- D TS,L
- D A,L

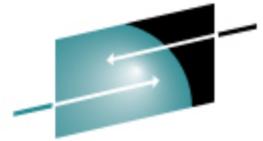
## VM

- TELL / MSG / NOTE
- LOGOFF
- PRINT
- ATTACH
- DETACH
- Q U
- Q N
- Q N

## Linux

- write / talk / wall
- /etc/motd
- exit
- lpr
- mount
- umount
- uptime
- users / w
- ps -ax

# Command Comparison (3)



**SHARE**  
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<u>Linux</u>	<u>DOS</u>	<u>Linux</u>	<u>DOS</u>
<ul style="list-style-type: none"><li>• cd</li></ul>	<ul style="list-style-type: none"><li>• cd</li></ul>	<ul style="list-style-type: none"><li>• host</li></ul>	<ul style="list-style-type: none"><li>• nslookup</li></ul>
<ul style="list-style-type: none"><li>• mkdir</li></ul>	<ul style="list-style-type: none"><li>• mkdir</li></ul>	<ul style="list-style-type: none"><li>• nslookup</li></ul>	<ul style="list-style-type: none"><li>• nslookup</li></ul>
<ul style="list-style-type: none"><li>• rmdir</li></ul>	<ul style="list-style-type: none"><li>• rmdir</li></ul>	<ul style="list-style-type: none"><li>• netstat</li></ul>	<ul style="list-style-type: none"><li>• netstat</li></ul>
<ul style="list-style-type: none"><li>• less / more</li></ul>	<ul style="list-style-type: none"><li>• more</li></ul>	<ul style="list-style-type: none"><li>• route</li></ul>	<ul style="list-style-type: none"><li>• route print</li></ul>
<ul style="list-style-type: none"><li>• ping</li></ul>	<ul style="list-style-type: none"><li>• ping</li></ul>	<ul style="list-style-type: none"><li>• find</li></ul>	<ul style="list-style-type: none"><li>• find</li></ul>
<ul style="list-style-type: none"><li>• traceroute</li></ul>	<ul style="list-style-type: none"><li>• tracert</li></ul>	<ul style="list-style-type: none"><li>• set</li></ul>	<ul style="list-style-type: none"><li>• set</li></ul>
		<ul style="list-style-type: none"><li>• export</li></ul>	<ul style="list-style-type: none"><li>• set</li></ul>