

S H A R E

Technology • Connections • Results



Linux System Management for the Mainframe Systems Programmer

Mark Post
Novell, Inc.

Thursday, March 5th, 2009
9224/9225

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?
- Linux DASD Management

Agenda (2)



- 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
- Scripting Languages
- System Logs

Agenda (3)

- Basic Commands
- Advanced Commands
- Kernel Modules, Loading and Unloading
- System Startup and Shutdown
- Performance Management
- Creating Additional Images
- Questions?
- Additional Information Resources
 - Web sites, Redbooks/pieces/tips, O'Reilly Books
- Command Comparisons

Cultural Differences and Similarities



- Open Source Community
 - Think how many people you know from IBM-MAIN 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.
 - Where your email is, will be where you spend your most time.

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)

- 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...



- 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 z/OS side.
 - There's no confusion about which TCP/IP parameters get used where.
 - Things that you learn about other UNIX systems are generally easier to apply to Linux than USS.

How Does Linux/390 Compare to...



- Unix System Services (cont.)
 - There's no "other side" (z/OS) to help bail you out when things get messed up.
 - Native ASCII. No EBCDIC \Leftrightarrow ASCII conversions.
 - Source code is typically available on Linux.
 - Default shell is more often bash than (t)csh.
 - No 3270 interface/limitations to work around. Which also means no ISPF or PDF.
 - PL/1, CLISTS are not available.
 - REXX is available, but called Regina.
 - OREXX is available, now in Open Source form.

How Does Linux/390 Compare to...



- Other Linux Platforms
 - Very similar, but it lacks a lot of common PC-type hardware
 - 3270 support included for consoles in LPAR mode
 - System z specific hardware

What are Distributions?



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

What Hardware Does Linux/390 Support?



- Any processor that supports the "Halfword Immediate and Relative Branch Feature" instructions added with the G2.
 - Not too many people have to worry about this any more ;)
- For decent performance, IEEE FPU is needed. (G5 and up, MP3000.)
- ECKD and FBA DASD
- 3480/3490/3590/3592 Tapes
 - Including 3592 hardware encryption
- SCSI over FCP, including tape drives and CD/DVD drives
- Crypto cards and Secure Key Entry
- 3270 and 3215 consoles
- Card reader/punch (2540) and printer (1403)

What Networking Connections Does Linux/390 Support?

- 3172
- OSA-2 (Token-Ring, Ethernet, Fast Ethernet)
- OSA-Express (Ethernet, Fast Ethernet)
- 2216 (Token Ring, Ethernet)
- QDIO OSA-Express (and -2 -3) (1 & 10Gb Ethernet, Fast Ethernet)
- ESCON / CTC (native and under z/VM)
- IUCV (z/VM only)
- HiperSockets (native and under z/VM)
- Guest LANs (z/VM only) – NOT the same as VLANs
- VSwitch (z/VM only, requires an OSA for external traffic)
- Cisco CLAW (CIP) - original driver by UTS Global, redone by IBM

Where's SYS1.PARMLIB Kept?

- 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 fairly important ones:
 - /etc/passwd
 - /etc/shadow
 - /etc/group
 - /etc/inittab
 - /etc/inetd.conf
 - /etc/modules.conf
 - /etc/fstab
 - /etc/hosts
 - /etc/resolv.conf
 - /etc/rc.d/...
 - /etc/httpd/...
 - /etc/samba/...
 - /etc/pam.d/...
 - /etc/ssh/...
 - /etc/xinet.d/...

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 DASD Management



Quick Overview:

- Adding and removing DASD
- Preparing DASD for use
- Sample file system layout
- Backing up your DASD

Adding and Removing DASD for 2.4 Kernels (SLES 8, RHEL 3)

- Can be dynamic (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 will likely also be required.)
 - If you do this from YaST, it is done for you

Adding and Removing DASD for 2.6 Kernels (SLES 9 and up, RHEL 4 and up)



- Detection and control block building is dynamic and automatic.
 - Could be as a result of an HMC operation or z/VM ATTACH
- Bringing the device online or offline is manual
 - Use /sbin/chccwdev (change ccw device)
 - `chccwdev --online 0.0.0b01`
 - `chccwdev -e 0.0.0b01`
 - `chccwdev --disable 0.0.0b01`
 - `chccwdev -d 0.0.0b01`
 - Using YaST to activate is best

Formatting DASD - 2.4.x and 2.6.x

- `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!
 - `fdasd -a /dev/dasd?`
 - Automatically creates one partition using the entire disk in non-interactive mode

Creating File Systems

- 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, going away in SLES11)

Creating Swap

- `mkswap /dev/dasd?1,2,3`
 - `mkswap /dev/dasda1`
 - `mkswap /dev/dasdb3`
- For z/VM shops, VDISK is very good for Linux paging volumes
 - Make sure you have enough real storage for this
 - Make sure you have a good z/VM performance monitor to watch out for problems
 - Use SWAPGEN EXEC from Sine Nomine Associates to initialize the VDISK from CMS before booting into Linux

File Systems and Directories

/ (root)

/bin

/boot *

/dev

/etc

/home

/lib, lib64

/mnt

/opt

/proc

/root (Not to be confused
with / root)

/sbin

/srv

/sys

/tmp

/usr

/var

Sample File System Layout



```
# 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 are available, backup data will be sent over the network.

Software and 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 and 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.
 - Part of the pain will be acting as the maintainer of that package, since you won't be getting support for it elsewhere.

Software and Maintenance Management (3)



- 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`
 - For SUSE and Red Hat, the `rpmbuild` command does all this
- Keeping track of security patches is **very** important, and can be people-intensive.
- Getting email notifications from trusted security industry sources (CERT, etc.) is recommended.

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)
 - OCFS2, GFS
- 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
 - PBSPro
 - UC4:global
 - Xi-Batch

Security and User Management



- 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)



- 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)



- 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)



- 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)

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 Part 2)

- Perl
- ash / bash / csh / tcsh / ksh / ksh93 / zsh
- Regina (REXX)
- OREXX (31-bit only at the moment)
- 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
- grep
- cat
- less / more
- man
- info
- mount
- umount
- ps
- mkdir
- rmdir
- pushd
- popd
- which
- reboot
- shutdown

Advanced Commands

- chmod
- chown
- df
- du
- file
- head
- tail
- ifconfig
- route
- host / nslookup
- gzip / bzip2
- find
- locate
- dmesg
- su
- sudo
- telinit
- lsmmod
- modinfo
- mkinitrd
- **zipl**

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

- 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/modprobe command
 - read from `/etc/modules.conf` or `/etc/modprobe.conf` by modprobe and the kernel.

Loading Kernel Modules (2)

- 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 | grep ext3
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



- 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)



- 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



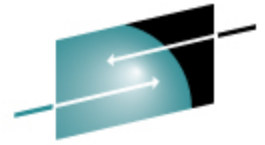
- Some “standalone” native Linux tools:
 - top, ntop, httpperf, sar, iostat, gkrellm, pload, statnet, Big Brother, Hobbit, iptraf, sysstat, vmstat
 - Understand that in a shared environment, such as z/VM (or even LPAR), these will *all* be lying to you in certain ways.
 - SLES10 and RHEL5 are the first 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



- AutoYaST (SUSE) and Kickstart (RHEL)
- Some commercial tools, none of them cheap
- Can be done with home grown tools
- IBM Redbooks:
 - Linux on IBM zSeries and S/390: ISP/ASP Solutions, SG24-6299
 - z/VM and Linux on IBM System z The Virtualization Cookbook for SLES 10 SP2, SG24-7493
 - z/VM and Linux on IBM System z The Virtualization Cookbook for Red Hat Enterprise Linux 5.2, SG24-7492

Questions?



S H A R E

Technology • Connections • Results



Additional Information - Web Sites



- <http://linuxvm.org/>
- <http://www.marist.edu/htbin/wlvindex?linux-390>
(Linux/390 mailing list subscription and archives)
- <http://www.ibm.com/developerworks/linux/linux390/>
- <http://www.kernel.org/>
- <http://www.linux.org/>
- <http://www.tldp.org/>
(The Linux Documentation Project)
- <http://www.redbooks.ibm.com/>

Additional Information - Redbooks



- 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
- Linux on zSeries and S/390: Large Scale Linux Deployment, SG24-6824
- Linux on zSeries and S/390: Performance Measurement and Tuning, SG24-6926

Additional Information – Rebooks (2)



- z/VM and Linux on IBM System z The Virtualization Cookbook for SLES 10 SP2, SG24-7493
- z/VM and Linux on IBM System z: The Virtualization Cookbook for Red Hat Enterprise Linux 5.2, SG24-7492
- Linux for IBM System z9 and IBM zSeries, SG24-6694
- Linux with zSeries and ESS: Essentials, SG24-7025
- Fibre Channel Protocol for Linux and z/VM on IBM System z, SG24-7266
- HiperSockets Implementation Guide, SG24-6816
- Problem Determination for Linux on System z, SG24-7599
- Achieving High Availability on Linux for System z with Linux-HA Release 2, SG24-7711

Additional Information – Rebooks (3)



- Experiences with Oracle for Linux on zSeries, SG24-6552
- Experiences with Oracle 10g Database for Linux on zSeries, SG24-6482
- Using Oracle Solutions on Linux for System z, SG24-7573
- Using Discontiguous Shared Segments and XIP2 Filesystems With Oracle Database 10g on Linux for IBM System z, SG24-7285
- SAP on DB2 UDB for OS/390 and z/OS: Implementing Application Servers on Linux for zSeries, SG24-6847
- 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 – Rebooks (4)



- Linux on IBM eServer zSeries and S/390: Best Security Practices, SG24-7023
- Introduction to the New Mainframe: Security, SG24-6776
- Introduction to the New Mainframe: z/VM Basics, SG24-7316
- Running Linux on IBM System z9 and zSeries under z/VM, SG24-6311
- z/VM and Linux Operations for z/OS System Programmers, SG24-7603

Additional Information - Redpieces



- Advanced LDAP User Authentication: Limiting Access to Linux Systems Using the Host Attribute, REDP-3863
- Linux on IBM zSeries and S/390: Securing Linux for zSeries with a Central z/OS LDAP Server (RACF), REDP-0221
- Linux on IBM eServer zSeries and S/390: Virtual Router Redundancy Protocol on VM Guest LANs, REDP-3657
- Linux on IBM eServer zSeries and S/390: VSWITCH and VLAN Features of z/VM 4.4, REDP-3719
- Networking Overview for Linux on zSeries, REDP-3901
- Sharing and maintaining Linux under z/VM, REDP-4322

Additional Information - Redpieces (2)



- A Shared WebSphere Application Server Installation for Linux on zSeries, REDP-3998
- WebSphere Portal Installation on Linux for zSeries, REDP-3699
- WebSphere Portal Server for Linux on zSeries and z9, REDP-4175
- Linux on IBM eServer zSeries and S/390: z/VM Configuration for WebSphere Deployments, REDP-3661
- e-commerce Patterns for Linux on zSeries Using WebSphere Commerce Suite V5.1 Patterns for e-business series, REDP-0411

Additional Information - Redpieces (3)



- Accounting and Monitoring for z/VM Linux guest machines, REDP-3818
- Linux Performance and Tuning Guidelines, REDP-4285
- Cloning FCP-attached SCSI Disks on SLES9 Linux for zSeries Systems, REDP-3871
- Introducing N_Port Identifier Virtualization for IBM System z9, REDP-4125
- Using Cryptographic Adapters for Web Servers with Linux on IBM System z9 and zSeries, REDP-4131
- Using the Oracle Grid Control Server with a Database on Linux for System z, REDP-4443

Additional Information - Hints & Tips



- 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
- Configuring Logical Volume Management (LVM) on Linux for zSeries, TIPS0128
- Creating a User Home directory when you use LDAP Authentication, TIPS0410

Additional Information - Hints & Tips (2)



- IBM eServer zSeries Linux Fibre Channel Adapter Device Driver Configuration for Tape Devices, TIPS0249
- The CP SET LOADDEV command, TIPS0440
- Capacity Test of IFL vs. CP, TIPS0479
- Securing VNC Network Traffic Using SSH Port Forwarding, TIPS0408
- Installing Oracle 10gR2 on SLES10 Linux on System z - July 10, 2007, TIPS0669

Additional Information - O'Reilly Books



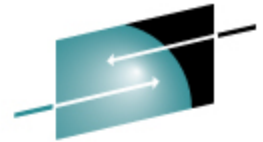
- Apache: The Definitive Guide
- Building Internet Firewalls
- DNS and BIND
- Learning the bash Shell
- Learning the vi and Vim Editors
- Learning Perl
- Perl Cookbook
- Perl for System Administration
- Programming Perl

Additional Information - O'Reilly Books (2)



- Practical UNIX & Internet Security
- Running Linux
- sed & awk
- sendmail
- sendmail Desktop Reference
- SSH, The Secure Shell: The Definitive Guide
- TCP/IP Network Administration
- Using Samba

Command Comparison



SHARE
Technology • Connections • Results

MVS

- LISTC
- LISTD
- LIST
- COPY
- MOVE
- RENAME
- DELETE
- HELP
- ICKDSF

VM

- L
- L (L
- TYPE
- COPY
- MOVE
- RENAME
- ERASE
- HELP
- FORMAT

Linux

- ls / locate
- file
- cat
- cp
- mv
- mv
- rm
- man / info
- dasdfmt /
mke2fs

DOS

- dir
- attrib
- type
- copy
- move
- ren
- del
- help
- format

Command Comparison (2)

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)

Linux

- cd
- mkdir
- rmdir
- less / more
- ping
- traceroute

DOS

- cd
- mkdir
- rmdir
- more
- ping
- tracert

Linux

- host
- nslookup
- netstat
- route
- find
- set
- export

DOS

- nslookup
- nslookup
- netstat
- route print
- find
- set
- set

