Linux/390 System Management for the Mainframe System Programmer

I know how to do “abc” with my usual OS. How do I do that with Linux/390?

Mark Post

Wednesday, August 24, 2005

Session # 9224

About me

- Mark Post (mark.post@eds.com)
- Senior Infrastructure Specialist (Systems Programmer, “plus”)
- EDS, Auburn Hills, Michigan
- Worked with IBM mainframes since entering college in 1973.
- Supported MVS and VM for GM and EDS
- Linux and Linux/390 Technical Lead since 01/2003

Copyright 2002-2005 by Mark Post

My Linux background

- First installed Slackware Linux on a PC at home in 1998.
- Involved with Linux/390 since May of 2000.
- Co-author of IBM Redbook:“Linux for zSeries and S/390: Distributions,” SG24-6264
- Active in the Linux-390 mailing list hosted by Marist College.
- Webmaster for the linuxvm.org web site.
- Ported Slackware® Linux to the mainframe, released as Slack/390 in July of 2004.

Copyright 2002-2005 by Mark Post

Agenda

- Cultural differences
- 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?

Copyright 2002-2005 by Mark Post

Agenda (2)

- Where's SYS1.PARMLIB kept?
- Do I ***really*** have to know all this stuff?
- Linux/390 DASD management
- Backup and restore
- Software and maintenance management
- Data sharing with Linux/390 and other OS
- Job scheduling

Copyright 2002-2005 by Mark Post

Agenda (3)

- Security and user management
- Diagnostic information available (or not)
- Editors
- Basic vi concepts
- Scripting languages
- System logs
- Basic commands

Copyright 2002-2005 by Mark Post

Agenda (4)

- Advanced commands
- Kernel modules, insmod and modprobe
- System startup and shutdown
- Performance management
- Creating additional images
- Additional information resources
  - Web sites, Redbooks/pieces/tips, Usenet (news), O'Reilly Books
- Command comparisons

Copyright 2002-2005 by Mark Post

Cultural differences

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

Copyright 2002-2005 by Mark Post

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

Copyright 2002-2005 by Mark Post

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

Copyright 2002-2005 by Mark Post

Terminology (3)

- 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 -jcf backup.tar.bz2 file1 file2 file3 file4
  - tar -zxf backup.tgz

Copyright 2002-2005 by Mark Post

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. (Not that USS really uses it either, per se.)
  - 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.

Copyright 2002-2005 by Mark Post

How does Linux/390 compare to...

- Unix System Services (cont.)
  - 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.
  - Source code is available.
  - Default shell is more often bash than (t)csh.

Copyright 2002-2005 by Mark Post

How does Linux/390 compare to...

- Unix System Services (cont.)
  - 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 the package is called Regina.
  - OREXX is available.
  - HLASM is now available from Tachyon Software.

Copyright 2002-2005 by Mark Post

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
  - S/390 specific hardware

Copyright 2002-2005 by Mark Post

What are distributions?

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

Copyright 2002-2005 by Mark Post

Linux/390 hardware support

- 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 Tapes
- SCSI over FCP now available

Copyright 2002-2005 by Mark Post

Linux/390 networking connections

- 3172
- OSA-2 (Token-Ring, Ethernet, Fast Ethernet)
- OSA-Express (Ethernet, Fast Ethernet)
- 2216 (Token Ring, Ethernet)
- QDIO OSA-Express (Gb Ethernet, Fast Ethernet)
- ESCON / CTC (native and under VM)
- IUCV (only under VM)
- HiperSockets (native and under VM)
- Guest LANs (only under VM)
- Cisco CLAW (CIP) - driver by UTS Global

Copyright 2002-2005 by Mark Post

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 ***really*** important ones:

- /etc/passwd
- /etc/shadow
- /etc/group
- /etc/gshadow
- /etc/inittab
- /etc/inetd.conf
- /etc/modules.conf
- /etc/fstab
- /etc/hosts
- /etc/resolv.conf
- /etc/rc.d/...
- /etc/httpd/...
- /etc/sysconfig/...
- /etc/samba/...
- /etc/pam.d/…
- /etc/ssh/...

Copyright 2002-2005 by Mark Post

Do I *really* have to know all this stuff?

- No, but shouldn't you?
- If you really don't want to know what's going on or have a large virtual farm:
  - YaST (SuSE)
  - Nautilus (Red Hat)
  - Webmin (completely perl-based)
  - AdminUX (Green Light Advantage)
  - linuxconf (no longer recommended by RH)
  - Others

Copyright 2002-2005 by Mark Post

Linux/390 DASD management

Quick Overview:

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

Copyright 2002-2005 by Mark Post

Adding/Removing DASD

- For 2.4.x kernels, can be dynamic:
  - **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.)**
- 2.6.x kernels use a completely different means.
- For 2.2.x kernels, requires updating /boot/parmfile, re-running "silo," and rebooting.

Copyright 2002-2005 by Mark Post

Formatting DASD - 2.4.x, 2.6.x

- dasdfmt -b 4096 [-l volser] [-d layout]
  -f /dev/dasd?
  -n 0d18 (only if devfs is in use)
  - dasdfmt -b 4096 -d cdl -f /dev/dasda
  - dasdfmt -b 4096 -d ldl -n 0cf3
  - dasdfmt -b 4096 -d cdl -n 0d2f

- fdasd /dev/dasd?
  - Must create one, two, or three partitions

Copyright 2002-2005 by Mark Post

Formatting DASD - 2.2.x

- dasdfmt -b 4096 [-l volser] -f /dev/dasd?
- dasdfmt -b 4096 [-l volser] -n fc23

Copyright 2002-2005 by Mark Post

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
- 2.2.x Kernels
  - mke2fs -b 4096 /dev/dasd?1
    - mke2fs -b 4096 /dev/dasda1
    - mke2fs -b 4096 /dev/dasdb1
- mkswap /dev/dasd?1 (2.2 kernels)
- mkswap /dev/dasd?1,2,3 (2.4, 2.6 kernels)

Copyright 2002-2005 by Mark Post

File systems vs. directories

/ (root)

/bin

/boot *

/dev

/etc

/home

/lib

/mnt

/opt

/proc

/root (not to be confused with / root)

/sbin

/tmp

/usr

/var

Copyright 2002-2005 by Mark Post

Backup and restore

- Native Linux facilities
  - afio/cpio/tar
- Software packages (Open Source and proprietary)
  - Amanda / offlindr
  - DFSMSdss / DDR
  - Tivoli TSM/ADSM
  - Innovation FDRINSTANT/UPSTREAM
  - CA BrightStor
  - SecureAgent SecureBackup
  - UTS Global TSS-BAR
  - Veritas NetBackup

Copyright 2002-2005 by Mark Post

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.

Copyright 2002-2005 by Mark Post

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.

Copyright 2002-2005 by Mark Post

Software & maintenance management (3)

- Keeping track of security patches is ***very*** important, and people-intensive.
- Getting email notifications from security sources (CERT, etc.) is recommended.
- If you *have* to install 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

Copyright 2002-2005 by Mark Post

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

Copyright 2002-2005 by Mark Post

Data sharing with Linux/390 and other OS

- No direct, hard-wired sharing
- z/OS and z/VM don't "know" ext2
- Linux doesn't "know" VTOCS, etc.
  - Except now it does. But, no security!
- Various network-based methods
  - NFS
  - GFS
  - AFS
  - Samba (SMB / CIFS / MS Networking)
- Under VM - sharing minidisks *read-only* between guests.

Copyright 2002-2005 by Mark Post

Job scheduling

- Linux native facilities
  - cron
  - at
- Open Source:
  - DQS
  - queue
  - OpenPBS
  - generic NQS
- Proprietary
  - CA-7 Agent
  - Jobtrac
  - CA Scheduler
  - PBSPro

Copyright 2002-2005 by Mark Post

Security and user management

- Security in 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.

Copyright 2002-2005 by Mark Post

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 shadow password utilities.
- Use TCP Wrappers (/etc/hosts.allow, etc.)
- Review your system logs regularly.
- Monitor security alerts from your suppliers, and from various security organizations.

Copyright 2002-2005 by Mark Post

Security and user management (3)

- Don’t lump all your users into one group (typically “users”).
- 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).

Copyright 2002-2005 by Mark Post

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
- linuxconf was popular, but should not be used
- useradd, userdel, usermod, groupadd, groupdel, groupmod are common

Copyright 2002-2005 by Mark Post

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/suauth to allow designated people to “su” using their own password.
- Consider using /etc/sudoers to grant some selected command authority to designated people.

Copyright 2002-2005 by Mark Post

Diagnostic information

- strace
- ulimit (to enable core dumps)
- gdb
- uptime
- top
- ksymoops
- netstat
- ping
- traceroute
- system logs
- dmesg
- standalone dump (2.4.x and 2.6.x kernels only)

Copyright 2002-2005 by Mark Post

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 ISPF/PDF clones.
(2 proprietary ones)

Copyright 2002-2005 by Mark Post

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 to visual mode.

Copyright 2002-2005 by Mark Post

Basic vi concepts (2)

- :set smd or :set showmode
  - gives visual indicator 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!

Copyright 2002-2005 by Mark Post

Scripting languages (Holy War cont.)

- perl
- ash / bash / csh / tcsh / ksh / ksh93 / zsh
- Regina (REXX)
- OREXX
- Tcl

Copyright 2002-2005 by Mark Post

System logs

- Most of what you want will be in /var/log, or in a subdirectory of it.
- Names and contents vary by distribution
- 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/...

Copyright 2002-2005 by Mark Post

Basic commands

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

Copyright 2002-2005 by Mark Post

Advanced commands

- ifconfig
- netstat
- route
- ping
- host / nslookup
- traceroute
- su
- sudo
- gzip / bzip2
- last
- chmod
- chown
- dmesg
- du
- df
- locate
- top
- sed
- head
- tail
- silo / zipl
- wget
- export
- file
- insmod
- modprobe
- lsmod
- rmmod
- telinit

Copyright 2002-2005 by Mark Post

Kernel modules, insmod and modprobe

- The kernel 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.

Copyright 2002-2005 by Mark Post

Kernel modules, insmod and modprobe (2)

- 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 has the right data in it.
- How does the module get it's parameters?
  - provided on insmod command
  - read from /etc/modules.conf by modprobe and the kernel.

Copyright 2002-2005 by Mark Post

Kernel modules, insmod and modprobe (3)

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

Copyright 2002-2005 by Mark Post

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.

Copyright 2002-2005 by Mark Post

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.

Copyright 2002-2005 by Mark Post

Performance management

- Some “standalone” native Linux tools:
  - top, ntop, httperf, sar, iostat, gkrellm, pload, statnet, Big Brother, iptraf
  - Understand that in a shared environment, such as z/VM, these will *all* be lying to you in certain ways.
- Proprietary products
  - Velocity Software ESALPS (under z/VM)
  - BMC MAINVIEW
  - Candle OMEGAMON XE

Copyright 2002-2005 by Mark Post

Creating additional images

- Some commercial tools
- Can be done with home grown tools
- For large “penguin farms,” knowing what to share between images and how is key.
- IBM Redbook “Linux on IBM zSeries and S/390: ISP/ASP Solutions,” SG24-6299

Copyright 2002-2005 by Mark Post

Questions?

Copyright 2002-2005 by Mark Post

Additional information - web sites

- http://linuxvm.org/
  (Largely Linux/390 specific)
- http://www.marist.edu/htbin/wlvindex?linux-390
  (Linux/390 mailing list)
- http://www.slack390.org/
- http://www.kernel.org/
- http://www.linux.org/
- http://www.tldp.org/
  (The Linux Documentation Project)

Copyright 2002-2005 by Mark Post

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

Copyright 2002-2005 by Mark Post

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

Copyright 2002-2005 by Mark Post

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

Copyright 2002-2005 by Mark Post

Additional information – Redpieces

- 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

Copyright 2002-2005 by Mark Post

Additional information – Redpieces (2)

- Linux on zSeries and S/390: Cloning Linux Images in z/VM, redp0301
- 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

Copyright 2002-2005 by Mark Post

Additional information – Redpieces (3)

- Linux on zSeries and S/390: z/VM Configuration for WebSphere Deployments, redp3661
- 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

Copyright 2002-2005 by Mark Post

Additional information – Redpieces (4)

- WebSphere Portal Installation on Linux for zSeries, redp3699
- Open Your Windows with Samba on Linux, redp3780

Copyright 2002-2005 by Mark Post

Additional information – Hints & Tips

- 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

Copyright 2002-2005 by Mark Post

Additional information - Usenet ("news")

- alt.os.linux.dial-up
- alt.os.linux.redhat
- alt.os.linux.slackware
- alt.os.linux.suse
- alt.os.linux.turbolinux
- comp.os.linux.admin
- comp.os.linux.advocacy
- comp.os.linux.announce
- comp.os.linux.development.apps
- comp.os.linux.development.system
- comp.os.linux.hardware
- comp.os.linux.help
- comp.os.linux.misc
- comp.os.linux.networking
- comp.os.linux.questions
- comp.os.linux.redhat
- comp.os.linux.security
- comp.os.linux.setup
- comp.os.linux.x
- comp.protocols.smb (Samba, mainly)
- linux.debian.devel.mentors
- linux.debian.devel.qa
- linux.debian.devel.release
- linux.debian.ports.s390
- linux.debian.project
- linux.debian.project
- linux.debian.security
- linux.dev.c-programming
- linux.dev.kernel
- linux.dev.laptop
- linux.dev.newbie
- linux.help
- linux.kernel
- linux.net.masquerade
- linux.redhat.announce
- linux.redhat.devel
- linux.redhat.install
- linux.redhat.pam
- linux.redhat.rpm
- linux.samba
- linux.sources.kernel

Copyright 2002-2005 by Mark Post

Additional information - O'Reilly books

* 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

Copyright 2002-2005 by Mark Post

Additional information - O'Reilly books (2)

* 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

Copyright 2002-2005 by Mark Post

Additional information - O'Reilly books (3)

* 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

Copyright 2002-2005 by Mark Post

Additional information - O'Reilly books (4)

* 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

Copyright 2002-2005 by Mark Post

Command comparison

MVS	VM	Linux	DOS
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

Copyright 2002-2005 by Mark Post

Command Comparison (2)

MVS	VM	Linux
•SEND	•TELL / MSG / NOTE	•write / talk / wall
•LISTB		•/etc/motd
•LOGOFF	•LOGOFF	•exit
•PRINTDS	•PRINT	•lpr
•V ONLINE	•ATTACH	•mount
•V OFFLINE	•DETACH	•umount
•D TS	•Q U	•uptime
•D TS,L	•Q N	•users / w
•D A,L	•Q N	•ps -ax

Copyright 2002-2005 by Mark Post

Command comparison (3)

Linux	DOS	Linux	DOS
• cd	• cd	• nslookup	• nslookup
• mkdir	• mkdir	• nslookup	• nslookup
• rmdir	• rmdir	• netstat	• netstat
• less / more	• more	• route print	• route print
• ping	• ping	• find	• find
• traceroute	• tracert	• set	• set
		• set	• set

Copyright 2002-2005 by Mark Post