L04
Linux/390 System Management for the Mainframe Systems Programmer
Mark Post

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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
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.
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?
Agenda (2)

• What networking connections does Linux/390 support?
• Where’s SYS1.PARMLIB kept?
• Do I really have to know all this stuff?
• Linux/390 DASD management
• Questions?
• Additional information resources
  • Web sites, Redbooks/pieces/tips, Usenet (news), O’Reilly Books
• Command comparisons
Cultural differences

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

- 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...

• 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.
How does Linux/390 compare to...

- Unix System Services (cont.)
  - 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...

• Unix System Services (cont.)
  • Source code is available.
  • Default shell is more often bash than (t)csh.
  • 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
- System Integrators
- Packagers
- Maintainers
- Developers
- Support
- Why doesn’t IBM have one?
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
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)
- VSwitch (only under VM, requires an OSA)
- Cisco CLAW (CIP) - driver by UTS Global
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/…
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
Quick Overview:
• 2 kinds of DASD layouts, cd1 and ldl.
• Adding/removing DASD
• Preparing DASD for use
  • Formatting
  • 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

• 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.)

• For 2.2.x kernels, requires updating /boot/parmfile, re-running “silo,” and rebooting.
Adding/Removing DASD in 2.6.x

- /sys/bus/ccw/devices/0.0.0601@
- /sys/bus/ccw/drivers/dasd-eckd/0.0.0601@
- /sys/bus/css/devices/0.0.0016@
- /sys/bus/css/drivers/io_subchannel/0.0.0016@
- /sys/devices/css0/0.0.0016/
  - 0.0.0601/
    - bus@
    - chpids
    - driver@
    - pimpampom
- /sys/devices/css0/0.0.0016/0.0.0601/
  - Availability
  - bus@
  - cmb_enable
  - cutype
  - devtype
  - discipline
  - driver@
  - online
  - readonly
  - use_diag

Use /sbin/chccwdev instead
chccwdev --online 0.0.0601
chccwdev --e 0.0.0601
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
Formatting DASD - 2.2.x

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

- dasdfmt -b 4096 [ -l volser ] -n fc23
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)
File systems vs. directories

/ (root)  /opt
/bin     /proc
/boot *   /root (not to be confused with / root)
/dev     /sbin
/etc     /sys
/home    /tmp
/lib     /usr
/mnt     /var
Questions?
Additional information - web sites

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

- 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)

- 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
Additional information – Redpieces (4)

• WebSphere Portal Installation on Linux for zSeries, redp3699
• Open Your Windows with Samba on Linux, redp3780
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
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.devel
- linux.redhat.install
- linux.redhat.pam
- linux.redhat.rpm
- linux.samba
- linux.sources.kernel
Additional information - O’Reilly books

  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 (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

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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
Additional information - O’Reilly books (4)

* The Linux Web Server CD Bookshelf
  Running Linux, 3rd Edition
  Linux in a Nutshell, 3rd Edition
  MySQL & mSQL
  Programming the Perl DBI
  CGI Programming with Perl, 2nd Edition
## Command comparison

<table>
<thead>
<tr>
<th>MVS</th>
<th>VM</th>
<th>Linux</th>
<th>DOS</th>
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<tbody>
<tr>
<td>LISTC</td>
<td>L</td>
<td>ls / locate</td>
<td>dir</td>
</tr>
<tr>
<td>LISTD</td>
<td>L (L</td>
<td>file</td>
<td>attrib</td>
</tr>
<tr>
<td>LIST</td>
<td>TYPE</td>
<td>cat</td>
<td>type</td>
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<tr>
<td>COPY</td>
<td>COPY</td>
<td>cp</td>
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<td>MOVE</td>
<td>MOVE</td>
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<td>RENAME</td>
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<td>DELETE</td>
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<td>HELP</td>
<td>HELP</td>
<td>man / info</td>
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<td>ICKDSF</td>
<td>FORMAT</td>
<td>dasdfmt / mke2fs</td>
<td>format</td>
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# Command Comparison (2)

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<thead>
<tr>
<th>MVS</th>
<th>VM</th>
<th>Linux</th>
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<tbody>
<tr>
<td>SEND</td>
<td>TELL / MSG / NOTE</td>
<td>write / talk / wall</td>
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<td>LISTB</td>
<td>LOGOFF</td>
<td>/etc/motd</td>
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<tr>
<td>LOGOFF</td>
<td>PRINT</td>
<td>exit</td>
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<td>PRINTDS</td>
<td>ATTACH</td>
<td>lpr</td>
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<td>V ONLINE</td>
<td>DETACH</td>
<td>mount</td>
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<td>V OFFLINE</td>
<td>Q U</td>
<td>umount</td>
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<td>D TS</td>
<td>Q N</td>
<td>uptime</td>
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<td>D TS,L</td>
<td>Q N</td>
<td>users / w</td>
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<td>D A,L</td>
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<td>ps -ax</td>
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## Command comparison (3)

<table>
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<th>Linux</th>
<th>DOS</th>
<th>Linux</th>
<th>DOS</th>
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<tbody>
<tr>
<td>cd</td>
<td>cd</td>
<td>host</td>
<td>nslookup</td>
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<td>mkdir</td>
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<td>nslookup</td>
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<td>netstat</td>
<td>netstat</td>
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<td>less / more</td>
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<td>set</td>
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<td>export</td>
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