Installing Redhat 6.1 or SuSE SLES 11 SP1 in a System z FCP Environment - Hands-on-Lab

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Agenda

- **Introduction**
  - Brief History of Linux®
  - Hardware Requirements and Linux Distributions
  - Linux File System and Common Linux Commands
  - Intro to Lab and Installation Overview

- **Basic Lab Exercises**
  - Installation of Linux on System z
    - Marist (2.2)
    - SUSE SLES11 SP1 (2.6) (installed on FCP attached SCSI devices)
    - Red Hat Enterprise Linux 6.1 (2.6) (installed on FCP attached SCSI devices)

- **Basic Linux System Administration**

- **Elective Lab Exercises**
  - Create a multi-path logical volume (SUSE/Red Hat)
  - Rebuild the Linux Kernel (Marist)
  - Using Linux as a Firewall
  - Using Linux as a DNS with BIND
  - File serving with Samba
  - Apache Web Server Installation and Customization
  - KDE Installation
Brief History of Linux
What is Linux?

- Linux is the kernel of a UNIX® technology (-like) operating system, originally developed by Linus Torvalds.
- It was developed / tested by the Open Source community.
  - Highly disciplined / structured
  - High quality
  - Secure
  - Stable
- Not just for Intel® processor-powered PCs
  - PowerPC®, Sparc, Alpha, System z ...
  - Over 100 platforms supported today.
What is Linux on IBM System z?

- A native IBM System z operating environment
  - Pure Linux, an ASCII environment
  - Exploits IBM System z hardware, including IEEE floating point
- Not a unique version of Linux or other operating system
- Not a replacement for other IBM System z operating systems
Hardware Requirements
Linux Distributions
Hardware Requirements

- **Processors**
  - IBM zEnterprise System (z196 and z114)
  - Z10 EC, z10 BC, z9 EC, z9 BC, z990, z800, z900
  - 9672 G2 - G6 (IBM only supports G5+)
  - Multiprise® 2000 (not supported by IBM)
  - Multiprise 3000
  - P/390, R/390, Integrated Server (not supported by IBM)

- **Central storage**
  - 256MB - 768MB minimum available for installation

- **DASD**
  - At least one
    - ECKD 3390-9 DASD device or
    - FCP attached SCSI LUN of 5GB or more

- **System console**
  - Hardware Management Console (LPAR or basic mode)
  - Virtual 3215 console (VM)

- **Workstation with CD-ROM for installation**

- **Network connectivity is required to acquire installation materials**
Major Distributions

- **SUSE LINUX - Enterprise Server 11 for IBM Mainframes**
- **Red Hat — Enterprise Linux 6**
  - [www.redhat.com](http://www.redhat.com)
- **Marist College - 2.2.16 kernel**
  - [linux390.marist.edu](http://www.marist.edu)
- **Debian — GNU/Linux Version 3 for S/390**
  - [www.debian.org/ports/s390/](http://www.debian.org/ports/s390/)
- **Slackware - Slack/390**
  - [http://www.slack390.org](http://www.slack390.org)
- **CentOS**
  - [http://www.centos.org/](http://www.centos.org/)
One Important Web Site

www.linuxvm.org
Linux File System
File System Structure (Marist Lab System)
## Directory Usage

<table>
<thead>
<tr>
<th>Directory</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>/</td>
<td>root directory</td>
</tr>
<tr>
<td>/boot</td>
<td>boot files (kernel, parm file, system map)</td>
</tr>
<tr>
<td>/home</td>
<td>user directories</td>
</tr>
<tr>
<td>/dev</td>
<td>device files that represent system hardware</td>
</tr>
<tr>
<td>/etc</td>
<td>important system configuration files</td>
</tr>
<tr>
<td>/bin</td>
<td>commands needed to start the system</td>
</tr>
<tr>
<td>/sbin</td>
<td>critical system binaries, commands reserved for the superuser</td>
</tr>
<tr>
<td>/usr/doc</td>
<td>documentation files</td>
</tr>
<tr>
<td>/usr/man</td>
<td>manual files</td>
</tr>
<tr>
<td>/usr/src</td>
<td>source code for the system software</td>
</tr>
<tr>
<td>/usr/src/linux</td>
<td>the kernel sources</td>
</tr>
<tr>
<td>/tmp</td>
<td>temporary files</td>
</tr>
<tr>
<td>/var</td>
<td>configuration files (linked from /usr)</td>
</tr>
<tr>
<td>/lib</td>
<td>shared libraries</td>
</tr>
<tr>
<td>/proc</td>
<td>the process file system</td>
</tr>
<tr>
<td>/mnt</td>
<td>mount point for temporarily mounted filesystems</td>
</tr>
<tr>
<td>/usr</td>
<td>additional utilities and applications</td>
</tr>
</tbody>
</table>
Basic Configuration Files

/etc/fstab - tells Linux what filesystems to mount when it starts
/etc/inittab - parameters for the init process
/etc/sysconfig/network - general network configuration for Red Hat and Marist Linux

/etc/sysconfig/network-scripts/ifcfg-iucv0
/etc/sysconfig/network-scripts/ifcfg-ctc0
- interface specific configuration files for Red Hat and Marist Linux

/etc/motd - "Message of the Day" file, contents are displayed when users login
/etc/passwd - Contains user names, numbers, home directories, and login shell
/etc/group - Contains user groups
/etc/shadow - Contains passwords
/etc/hosts - Contains hostname to IP address assignments.
Linux Commands
# Linux Commands Used in Class

<table>
<thead>
<tr>
<th>Command</th>
<th>Syntax</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>adduser</strong></td>
<td>Creates a directory and an entry in the passwd file for a new user</td>
<td><code>adduser userid</code></td>
</tr>
<tr>
<td><strong>cat</strong></td>
<td>&quot;Concatenate&quot; View, create, and concatenate files</td>
<td><code>cat [options] [inputfile] [outputfile]</code></td>
</tr>
</tbody>
</table>
| **cd** | "Change Directory" Used to change from your current working directory to another directory | `cd directory | ~username` | `cd /mnt/etc` Change directory to /mnt/etc  
`cd ~linlab01` Change directory to /home/linlab01 |
| **cp** | "Copy" Copy a file | `cp source destination` | `cp fstab fstab.save` |
| **dasdfmt** | "DASD Format" Formats a device to be managed by the LINUX dasd driver | `dasdfmt [-tvy] [-s start_track] [-e end_track][-b blocksize] -f devicename | -n 390_devno`  
where:  
- `v` = verbose, to display more messages  
- `y` = omits the prompt to reconfirm the format request  
- `t` = test mode (the device will not be formatted) | `dasdfmt -f /dev/dasda -b 4096`  
Formats device /dev/dasda with a blocksize of 4096 |
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<tr>
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<tr>
<td><strong>df</strong></td>
<td>&quot;disk free&quot;&lt;br&gt;Reports file system disk space usage</td>
<td>df [-h]&lt;br&gt;where -h = display output in more human readable form&lt;br&gt;df -h</td>
</tr>
<tr>
<td><strong>du</strong></td>
<td>&quot;disk used&quot;&lt;br&gt;Reports the space occupied by the current (or named) directory and all directories within it</td>
<td>du [directory] [-sh]&lt;br&gt;where -h = display output in more human readable form&lt;br&gt;du -h</td>
</tr>
<tr>
<td><strong>ed</strong></td>
<td>&quot;edit&quot;&lt;br&gt;Invokes the ed text editor</td>
<td>ed filename</td>
</tr>
<tr>
<td><strong>find</strong></td>
<td>Locate files in a directory based on search criteria</td>
<td>find [/directory]&lt;br&gt;[-name filename]&lt;br&gt;[-atime (+-)&lt;br&gt;days_since_last_access]&lt;br&gt;[-mtime&lt;br&gt;days_since_last_modified]&lt;br&gt;[-ok command {}]&lt;br&gt;[-print]&lt;br&gt;find /home -name temp size +100 -atime +5 ok rm {}&lt;br&gt;Finds files named temp in the home directories larger than 100 blocks that have not been accessed in the last 5 days. When a file is located, you are asked if you want to delete</td>
</tr>
<tr>
<td><strong>free</strong></td>
<td>Display amount of free and used memory</td>
<td>free</td>
</tr>
</tbody>
</table>
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</table>
| gcc     | gcc [-o output_filename] [options] source_filename | gcc -o mountpw mountpw.c  
Compile the mountpw.c file into a binary executable file called mountpw. |
| ifconfig | ifconfig [interface options | address] | ifconfig iucv0 9.130.240.161 pointopoint 9.130.240.101 mtu 9216  
Activate the iucv0 interface at IP address 9.130.240.161 with a point-to-point connection to IP address 9.130.240.101 using a Maximum Transmission Unit size of 9216 bytes. |
| kill    | kill [PID] [-options] | kill 93 -HUP  
Stop process number 93 and restart |
| last    | last | lastlog |
| lastlog | Format and print contents of the last login file | lastlog |
## Linux Commands Used in Class

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</table>
| **ln** | "link"  
Creates a link between one file and another. This allows the file to be located in one place and referenced in another.  
`ln [-s] source linkname`
where: `-s = symbolic link` | `ln -s init.d/named S60named`
Creates a symbolic link which allows you to reference the file "named" in the "init.d" directory by the linkname of "S60named". |
| **ls** | "list"  
Displays the contents of a directory  
`ls [-al]`
where: `-a = all  
`l = long format` | `ls -al`
Lists all files in the current directory in the long format. |
| **mkdir** | "Make directory"  
Creates a sub-directory under the current working directory  
`mkdir directory_name` | `mkdir boot`
Creates an empty directory called "boot". |
| **mke2fs** | "make ext2 file system"  
Creates a native LINUX ext2 file system  
`mke2fs devicename [-b blocksize]` | `mke2fs /dev/mnda -b 4096`
Creates a file system of type ext2 on device mnda with a blocksize of 4096. |
| **mkswap** | "make a swap partition"  
Used to create a LINUX swap partition  
`mkswap partitionname` | `mkswap /dev/mndb`
Makes minidisk device /dev/mndb a swap partition. |
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<tr>
<td><strong>mount</strong></td>
<td><code>mount [-t type] [-o accesstype] device mountlocation</code></td>
<td><code>mount -t ext2 -o ro /dev/mnda /mnt</code>&lt;br&gt;Makes device mnda, which contains an ext2 file system, accessible to the Linux system at location (directory) mnt, with read-only access.</td>
</tr>
<tr>
<td><strong>mv</strong></td>
<td><code>mv source destination</code></td>
<td><code>mv ifcfg-ctc0 ifcfg-iucv0</code>&lt;br&gt; Renames the file ifcfg-ctc0 to ifcfg-iucv0</td>
</tr>
<tr>
<td><strong>nslookup</strong></td>
<td><code>nslookup</code></td>
<td><code>nslookup</code>&lt;br&gt;Usage: Enter &quot;nslookup&quot; to begin an interactive session with the tool. Enter a host name. nslookup will respond with the fully qualified name of the host and it's IP address. To end the interactive session, enter</td>
</tr>
<tr>
<td><strong>passwd</strong></td>
<td><code>passwd userid</code></td>
<td><code>password linlab01</code>&lt;br&gt;Enter the password when prompted.</td>
</tr>
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<td><strong>ps</strong></td>
<td>&quot;process&quot; Displays the processes running on your system. Often used in conjunction with the kill</td>
<td><strong>ps</strong> [-efl] where: e = select all processes f = provide full output listing l = display in the long</td>
</tr>
<tr>
<td><strong>rm</strong></td>
<td>&quot;remove&quot; Erase a file</td>
<td><strong>rm</strong> filename</td>
</tr>
<tr>
<td><strong>route</strong></td>
<td>Used to manipulate the Linux kernel's routing table.</td>
<td><strong>route</strong> [interface options]</td>
</tr>
<tr>
<td><strong>rpm</strong></td>
<td>&quot;Redhat Package Manager&quot; Installs products packaged by the Redhat Package Manager</td>
<td><strong>rpm</strong> [-ivh --nodeps] [-qlp] <strong>packagename.rpm</strong> where: --nodeps = no dependency checking i = install a new package v = verbose h = display a progress indicator (hash marks) during installation q = query package info l = list all files in the package p = queries the packagefile</td>
</tr>
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<td><strong>shutdown</strong></td>
<td>`shutdown [-r</td>
<td>-h] [now]` where: h = halt the system after it shuts down r = reboot after shutdown now = start the shutdown process immediately without warnings to</td>
</tr>
<tr>
<td><strong>silo</strong></td>
<td>silo [-f image_file] [-d boot_device] [-p parmfile] [-b boot_sector_file] -t2 Note: -t2 indicates &quot;test level 2&quot;. Although this is not a parameter you would expect to use, it is still necessary at the current kernel level to write the IPL record.</td>
<td><code>silo -f image.vm.bin -d /dev/dasda -p image.vm.parm -b ipleckd.boot</code> Creates an IPL record on device /dev/dasda using the image.vm.bin kernel image, the image.vm.parm kernel parameter file, and the ipleckd.boot boot sector file.</td>
</tr>
<tr>
<td><strong>swapon</strong></td>
<td><code>swapon partitionname [-s]</code> where: s = display usage information</td>
<td><code>swapon /dev/mndb</code> Tells Linux to begin using the swap partition /dev/mndb</td>
</tr>
<tr>
<td><strong>tail</strong></td>
<td><code>tail [-number_of_lines] filename</code> The default number of lines shown is 10</td>
<td><code>tail -20 /var/log/messages</code> Displays the last 20 lines of the file &quot;messages&quot;</td>
</tr>
</tbody>
</table>
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<tr>
<td><code>tar</code></td>
<td>tar [-xzvfc] input_fn</td>
<td>tar -xzv /tmp/initfs_big_Marist.tgz</td>
</tr>
<tr>
<td></td>
<td>output_fn</td>
<td>Extracts and uncompresses the files and directory structure from the file named initfs_big_Marist.tgz, listing all files as it works.</td>
</tr>
<tr>
<td></td>
<td>where: x = extracts files and directories from an archived file</td>
<td></td>
</tr>
<tr>
<td></td>
<td>z = zip (compress) or uncompress files</td>
<td></td>
</tr>
<tr>
<td></td>
<td>v = verbose - tells tar to list the files being archived or unarchived</td>
<td></td>
</tr>
<tr>
<td></td>
<td>f = specifies a filename for the archive file</td>
<td></td>
</tr>
<tr>
<td></td>
<td>c = creates an archive file</td>
<td></td>
</tr>
<tr>
<td><code>top</code></td>
<td>Display top CPU processes</td>
<td>top</td>
</tr>
<tr>
<td><code>umount</code></td>
<td>Unmount a mounted file system</td>
<td>umount mountlocation</td>
</tr>
<tr>
<td><code>uptime</code></td>
<td>Tell how long the system has been running</td>
<td>uptime</td>
</tr>
<tr>
<td><code>w</code></td>
<td>Show who is logged on, and resource usage</td>
<td>w</td>
</tr>
<tr>
<td><code>who</code></td>
<td>Show who is logged on</td>
<td>who</td>
</tr>
<tr>
<td><code>whoami</code></td>
<td>Show effective userid</td>
<td>whoami</td>
</tr>
</tbody>
</table>
ed Editor

- The ed editor has two modes:

  - Command mode - everything you type in is considered to be a command. Some commands you will be using are:
    - `number` positions the editor at line number
    - `a` append (add) text after the current line
    - `c` change a line
    - `i` insert text before the current line
    - `d` delete the current line
    - `p` display (print) lines
    - `w` save (write) lines
    - `q` end (quit) the editing session
    - `.` refers to the current line
    - `$` refers to the last line

  - Input mode - after you have entered the `a`, `c`, or `i` subcommands, everything that follows will be text, until a period (.) is entered on a line by itself.
Sample ed Session

```
ed fstab
1 .c
/dev/mnda  /  ext2  defaults,errors=remount-ro 0 1
1,$p
1,$w
q
```

- This sequence of commands will:
  - begin editing on the file "fstab"
  - position the editor at line 1 in the file
  - indicate that the line is to be changed
  - enter the exact text that should replace the current line of text
  - indicate the end of changes
  - position the editor at line 1 and display (print) the file
  - position the editor at line 1 and save (write) the file
  - end (quit) the editing session
Installation Overview
Basic Installation Steps

- Acquire Linux Distribution
  - Kernel image
  - Ram disk
  - File system

- Prepare Environment
  - Configure virtual machine or LPAR
  - Gather network parameters
  - Create a boot parameter file
    - Provides information needed by the kernel at boot time
      - `mem=` defines the amount of storage to be used by Linux
      - `mdisk=` specifies the devices to be used by the minidisk driver (VM)
      - `dasd=` specifies the devices to be used by the dasd driver
      - `iucv=` identifies the virtual machine(s) to be connected via IUCV (VM)
      - `root=` specifies the device containing the root file system

- Load the kernel, parm file and ram disk into storage

- Build the file system and configure system
Initial System Build

1. Kernel-image
   VM based

2. Parm file

3. initrd

Blocksize = F 80

Pun to RDR

IPL-RDR

Blocksize = F 1024

initrd

Parm file

Parm file

Kernel-image
tape based

parm file

Kernel

IPL-Tape

Write to Tape

x'000000'
Build and Configure File System

Now that Linux is up and running you can

- Create the file system
- Create a swap volume
- Make the system bootable
  - Format a boot device
  - Put boot files on the device
    - kernel image
    - parameter file
    - IPL text
  - Run Silo (2.2.16) or zipl (2.4+)
Hands-On Lab - Virtual Machine Configuration

mem=128m
mdisk=200,202,400
dasd=300
root=/dev/mnda ro

Shared Volume
400 mdisk /dev/mndc

memory

swap partition

Large file system
200 mdisk /dev/mnda

boot device
202 mdisk /dev/mndb

300 dasd /dev/dasda
Lab Network Configuration
Marist

Class Network

IBM System z

LINLAB01 9.82.56.131
TCP/IP 9.82.56.1 9.82.56.30
LINLAB30 9.82.56.160

IUCV

CP
Lab Network Configuration
Red Hat Enterprise Linux 6.1 & SUSE SLES11 SP1

IBM System z

TCP/IP
9.82.56.1

LINLAB01
9.82.56.91

LINLAB30
9.82.56.120

Guest LAN

IBM System z