Hands-on Projects

These projects should be completed in the order given. The hands-on projects presented in this chapter should take a total of three hours to complete. The requirements for this lab include:

* A computer with Fedora Linux installed according to Hands-on Project 2-1
* The ISO image for Ubuntu Server 14.04 installation media (ubuntu-14.04.5-server-amd64.iso)

## Project 6-1

In this hands-on project, you install Ubuntu Server 14.04 Linux within a virtual machine on a Windows computer and examine the LVM partition configuration afterwards.

1. 1. In your virtualization software, create a new virtual machine called Ubuntu Server Linux that has the following characteristics:
   1. 4GB of memory
   2. A 20GB virtual hard disk
   3. The virtual machine DVD drive attached to the ISO file for the Ubuntu Server 14.04 installation media (ubuntu-14.04.5-server-amd64.iso)
2. Start and then connect to your Ubuntu Server Linux virtual machine using your virtualization software.
   1. The Ubuntu Server Linux installation program does not use a graphical desktop. As a result, you must switch between buttons shown on the screen using the Tab key and press Enter to make your selections.
3. At the Language screen, ensure that English is selected and press Enter.
4. At the Ubuntu welcome screen, ensure that Install Ubuntu Server is selected and press Enter.
5. At the Select a language page, ensure that English is selected and press Enter.
6. At the Select your location screen, ensure that United States is selected and press Enter.
7. At the Configure the keyboard screen, select Yes and press Enter. Follow the prompts to complete the detection. When the detection process finds a “us” keyboard layout, select Continue and press Enter.
8. At the Configure the network screen, type a hostname of your hawk email account, select Continue, and press Enter.
9. At the Set up users and passwords page, type **user1** as the full user name, select Continue, and press Enter. When prompted for the simple user name, ensure that **user1** is displayed, select Continue, and press Enter. When prompted for a password for user1, type **LNXrocks!**, select Continue, and press Enter. When prompted to repeat the password, enter **LNXrocks!** again, select Continue, and press Enter.
10. When prompted to encrypt user1’s home directory, ensure that **No** is selected and press Enter.
11. At the Configure the clock screen, ensure that the correct time zone is displayed, select Yes and press Enter. Alternatively, if an incorrect time zone is displayed, select No, press Enter, select your time zone, and press Enter.
12. At the Partition disks screen, note that the default selection is **Guided – use entire disk and set up LVM** and press Enter. Press Enter again to select your disk (sda or hda), and then select Yes and press Enter to write your partition changes to the disk. Note that the full size (approx. 20GB) is used for the volume group, select Continue, and press Enter.
13. At the summary screen, note that Ubuntu will create an LV for the root filesystem with an ext4 filesystem and an LV for swap as well. Select Yes and press Enter to write the changes to the disk and start the installation of the core system packages.
14. At the Configure the package manager (proxy) screen, select Continue, and press Enter.
15. At the Configuring tasksel, ensure that **No automatic updates** are selected and press Enter.
16. At the Software selection screen, **use the spacebar to individually choose all packages** (**except for Manual package selection**), select Continue, and press Enter.
17. At the Configuring mysql-server-5.5 screen, supply a password of **LNXrocks!**, select Continue, and press Enter. When prompted to confirm the password, type **LNXrocks!**, select Continue, and press Enter.
18. At the Postfix Configuration screen, ensure that Internet Site is selected and press Enter. When prompted for a system mail name, ensure that your provided hostname is listed, select Continue, and press Enter.
19. At the configuring dovecot-core screen, ensure that Yes is selected and press Enter to create an SSL encryption certificate. When prompted for the host name used in the certificate, type the hostname you provided in step 8 in place of localhost, select Continue, and press Enter.
20. At the Install the GRUB boot loader on a hard disk screen, ensure that Yes is selected and press Enter.
21. At the Finish the installation screen, ensure that Continue is selected and press Enter to reboot into the new system.
22. After the system has booted, note that a graphical login is not available. Log in as **user1** with the password **LNXrocks!**. At the command prompt, type who and press Enter.
23. The root user password is not set during an Ubuntu Server installation. Instead, the user configured during the installation process (user1) has the ability to configure the root user password following installation. At the command prompt, type **sudo passwd root** and press Enter. Supply **user1**’s password of **LNXrocks!** when prompted and press Enter. Supply a password of **LNXrocks!** for the root user when prompted and press Enter. Confirm the root user password by typing **LNXrocks!** and press Enter.
24. At the command prompt, type **su -** and supply a password of **LNXrocks!** to switch to the root user.
25. At the command prompt, type **df -h** and press Enter. Examine the output of the **df** command.
26. At the command prompt, type **fdisk -l** and press Enter.
27. At the command prompt, type **lvdisplay** and press Enter. Note the logical volumes created for the root filesystem and swap partition within the volume group named after your hostname.
28. **Provide screenshot(s) of steps 22 through 27.**

## Project 6-2

In this hands-on project, you examine installation log files and system information on Fedora Linux and Ubuntu Server Linux.

1. On your **Ubuntu Server** Linux virtual machine, log into the command-line terminal (tty1) using the user name of **root** and the password of **LNXrocks!**.
2. Provide a long listing of the **/var/log/installer** directory. Notice the installation logs generated in this directory.
3. At the command prompt, type **egrep -i “(error|warn)” /var/log/installer/syslog** and press Enter, view any warnings or errors that occurred during your installation.
4. At the command prompt, type **ls –F /proc** and press Enter to view the file and directory contents of the proc filesystem.
5. At the command prompt, type **less /proc/cpuinfo** and press Enter. Review the CPU info provided. Type q to quit the less utility.
6. At the command prompt, type **less /proc/modules** and press Enter. Review the loaded modules. Type q to quit the less utility.
7. At the command prompt, type **less /proc/meminfo** and press Enter. Review the memory info.Type q to quit the less utility.
8. At the command prompt, type **dmesg | less** and press Enter. Observe the entries during the boot process. Type q to quit the less utility.
9. At the command prompt, type **less /var/log/boot.log** and press Enter. Review each entry in the file. Type q to quit the less utility.
10. At the command prompt, type **less /var/log/syslog** and press Enter. Review the output from syslog. Type q to quit the less utility.
11. **Provide screenshot(s) of steps 2 through 10.**
12. At the command prompt, type **poweroff** and press Enter to shut down your Ubuntu Server Linux virtual machine.
13. Boot your **Fedora Linux** virtual machine. After your Linux system has loaded, open the graphical terminal of your choice. Log in to the terminal using the user name of **root** and the password of **LNXrocks!**.
14. Provide a long listing of the **/var/log/** directory.
15. At the command prompt, type **egrep -iR “(error|warn)” /var/log/anaconda/** and press Enter. View any warnings or errors that occurred during your installation.
16. At the command prompt, type **ls –F /proc** and press Enter to view the file and directory contents of the proc filesystem. Do the contents look similar to those from Ubuntu Server Linux? Next, type **less /proc/cpuinfo** and press Enter. Type q to quit the less utility.
17. At the command prompt, type **dmesg | less** and press Enter. Observe the entries. Type q to quit the less utility.
18. At the command prompt, type **journalctl –b | less** and press Enter. Review each entry. Type q to quit the less utility.
19. **Provide screenshot(s) of steps 14 through 18.**
20. At the command prompt, type **poweroff** and press Enter to shut down your Fedora Linux virtual machine.

## Project 6-3

In this hands-on project, you install ZFS support on Ubuntu Server and configure the ZFS filesystem.

1. Boot your Ubuntu Server Linux virtual machine. After your Linux system has loaded, log into the command-line terminal (tty1) using the user name of **root** and the password of **LNXrocks!**.
2. At the command prompt, type **apt-get update** and press Enter to update the repositories we will utilize for the below install.
3. At the command prompt, type **apt-get -y install build-essential gawk zlib1g-dev uuid-dev vim-nox python-software-properties** and press Enter to download and install ZFS prerequisite packages. Ubuntu Server Linux uses a different package manager than Fedora Linux. The apt-get command is functionally equivalent to the yum command that you used in previous chapters to download and install software from Internet repositories. Both apt-get and yum are discussed in Chapter 11.
4. At the command prompt, type **add-apt-repository ppa:zfs-native/stable** and press Enter, and then press Enter again to add the location of the online ZFS software repository on the Internet to the Ubuntu installer. Next, type **apt-get update** and press Enter to update the Ubuntu installer with the new repository information.
5. At the command prompt, type **apt-get install ubuntu-zfs** and press Enter to install ZFS on your Ubuntu Server Linux system.
6. Edit the /etc/modules file and *add the following lines to the end of the file*. When finished, save your changes and quit the vim editor.

**spl**

**zavl**

**znvpair**

**zunicode**

**zcommon**

**zfs**

1. At the command prompt, type **modprobe zfs** and press Enter to load the zfs module in the kernel. At the command prompt, type **update-initramfs -u** and press Enter to update the disk and module support for the image used to load kernel modules at boot time.
2. Utilize the **vim** command to edit the **/etc/init/zpool-import.conf** file and change the following:

modprobe zfs zfs\_autoimport\_disable=1

to

modprobe zfs zfs\_autoimport\_disable=0

1. Use **vim** to edit the **/etc/rc.local** file and add the following above exit 0:

zfs mount -a

1. These steps allow ZFS to mount the zpools we create upon reboot of the system. Without these changes, our configuration would not persist reboot.
2. **Provide screenshot(s) of steps 2 through 9.**
3. Although ZFS normally works with device files for additional disk devices (/dev/sdb1, / dev/sdc1, /dev/sdd1, and so on), ZFS can work with nearly any device or file that can be used to store data. As a result, we’ll create four empty files using the dd command that we’ll treat as four separate disks to practice ZFS commands. Run the following commands to create four 128MB files called /disk1, /disk2, /disk3, and /disk4:

**dd if=/dev/zero of=/disk1 bs=1024k count=128**

**dd if=/dev/zero of=/disk2 bs=1024k count=128**

**dd if=/dev/zero of=/disk3 bs=1024k count=128**

**dd if=/dev/zero of=/disk4 bs=1024k count=128**

1. Provide a long list with the human readable option of the root of the filesystem to confirm the 4 created files are 128MB.
2. At the command prompt, type **zpool create webstorage /disk1** and press Enter to create a simple ZFS volume called webstorage from the space on /disk1. Next, type **zpool list** at the command prompt and press Enter to view your configuration.
3. At the command prompt, type **cp /etc/hosts /webstorage** and press Enter to copy the /etc/hosts file to the new ZFS filesystem . Next, provide a long listing of the **/webstorage** directory to view the contents of the filesystem. The /etc/hosts file should have been copied successfully.
4. At the command prompt, type **zpool destroy webstorage** and press Enter to remove the webstorage volume.
5. At the command prompt, type **zpool create webstorage mirror /disk1 /disk2** and press Enter to create a mirrored ZFS volume called webstorage from the space on /disk1 and /disk2. Next, type **zpool list** at the command prompt and press Enter to view your configuration. Following this, type **zpool status webstorage** at the command prompt and press Enter. Notice no errors are reported.
6. At the command prompt, type **dd if=/dev/random of=/disk1 bs=512 count=1** and press Enter to overwrite a portion of /disk1 using the dd command, simulating disk corruption. Next, type **zpool scrub webstorage** at the command prompt and press Enter to update the status of the ZFS filesystem, and then type **zpool status webstorage** at the command prompt and press Enter. Does you mirror have any problems listed?
7. At the command prompt, type **zpool detach webstorage /disk1** and press Enter to remove the bad disk (/disk1) from the mirror, and then type **zpool status webstorage** at the command prompt and press Enter to verify that it is no longer listed.
8. **Provide screenshot(s) of steps 9 through 16.**
9. At the command prompt, type **zpool attach webstorage /disk2 /disk3** and press Enter to mirror the data on /disk2 to a new disk (/disk3), and then type **zpool status webstorage** at the command prompt and press Enter. Is the mirror fully functional using /disk2 and /disk3?
10. At the command prompt, type **zpool iostat -v webstorage** and press Enter to view the input and output statistics for your mirror. Next, type **zpool destroy webstorage** and press Enter to remove the webstorage mirror.
11. At the command prompt, type **zpool create webstorage raidz /disk2 /disk3 /disk4** and press Enter to create a RAID-Z volume called webstorage using /disk2, /disk3 and /disk4, and then type **zpool status webstorage** at the command prompt and press Enter to verify the results. Next, type **zpool iostat -v webstorage** and press Enter to view the input and output statistics for your RAID-Z volume.
12. At the command prompt, type each of the following commands in turn and press Enter to create three subdirectories under /webstorage:

**mkdir /webstorage/site1**

**mkdir /webstorage/site2**

**mkdir /webstorage/site3**

1. At the command prompt, type **zfs list** and press Enter. Are the site1, site2, and site3 directories listed? Next, type each of the following commands in turn and press Enter to create three subfilesystems for site1, site2, and site3:

**zfs create webstorage/site1**

**zfs create webstorage/site2**

**zfs create webstorage/site3**

1. At the command prompt, type **zfs list** and press Enter. Are the site1, site2, and site3 directories listed?
2. At the command prompt, type **zfs get all webstorage/site1** and press Enter to view the available options for the site1 subfilesystem. Next, type **zfs set quota=10G webstorage/site1** at the command prompt and press Enter to set a quota of 10GB for the subfilesystem. Next, type **zfs get all webstorage/site1** and **grep** for quota. Was your quota listed? Why will this quota never be applied to the webstorage/site1 subfilesystem? (Hint: Think of the total size of the webstorage volume)
3. **Provide screenshot(s) of steps 18 through 24.**
4. At the command prompt, type **poweroff** and press Enter to shut down your Ubuntu Server Linux virtual machine.

## Project 6-4

In this hands-on project, you use system rescue on both Fedora Linux and Ubuntu Server Linux to check your root filesystem for errors and change the root user’s password.

1. In your virtualization software, ensure that the DVD for your Fedora Linux virtual machine is attached to the ISO image for Fedora 24 Live (Fedora-Workstation-Live-x86\_64-24-1.2.iso). Next, start and then connect to your Fedora Linux virtual machine using your virtualization software.
2. At the Fedora Live welcome screen, press Enter to boot Fedora Live.
3. Once the graphical desktop and Welcome to Fedora screen have loaded, select the option Try Fedora and click Close when prompted.
4. Navigate to Activities, Show Applications, Utilities, Terminal within the GNOME desktop to open a BASH terminal.
5. At the command prompt, type **su - root** and press Enter to switch to the root user.
6. At the command prompt, type **df -h** and press Enter to view the mounted filesystems. Is the root filesystem on your hard disk mounted?
7. At the command prompt, type **fsck -f /dev/mapper/fedora-root** and press Enter to check your (/) root filesystem for errors.
8. At the command prompt, type **mount /dev/mapper/fedora-root /mnt** and press Enter to mount the (/) root filesystem on your hard disk to the /mnt directory on the Fedora live system. Next, type **mount /dev/sda1 /mnt/boot** and press Enter to mount the /boot filesystem on your hard disk to the /mnt/boot directory on the Fedora live system. Next, type **mount -t proc proc /mnt/proc** and press Enter to mount the /proc filesystem.
9. At the command prompt, type **chroot /mnt** and press Enter to switch from the root filesystem on your Live Fedora system to the root filesystem on your hard disk. Next, type **ls /root** and press Enter. Do you recognize the files?
10. At the command prompt, type **passwd** root and press Enter. Supply a new root user password of **Secret123** and press Enter when prompted (twice).
11. Click the power icon in the upper-right corner, select the power icon that appears, and click Power Off to shut down your Fedora Live installation image.
12. **In the Settings for your virtual machine in your virtualization software, ensure that the DVD drive is no longer attached to the Fedora ISO image.**
13. Finally, start your Fedora Linux virtual machine using your virtualization software. After the system has loaded, switch to a command-line terminal (tty2) by pressing Ctrl+Alt+F3 and log in to the terminal using the user name of **root** and the password of **Secret123**. Were you successful?
14. At the command prompt, type **passwd** and press Enter. Supply a new root user password of **LNXrocks!** and press Enter when prompted (twice).
15. **Provide screenshot(s) of steps 5 through 14.**
16. At the command prompt, type **poweroff** and press Enter to shut down your Fedora Linux virtual machine.
17. In your virtualization software, ensure that the DVD for your Ubuntu Server Linux virtual machine is attached to the ISO image for Ubuntu Server 14.04 (ubuntu-14.04.5- server-amd64.iso). Next, start and then connect to your Ubuntu Server Linux virtual machine using your virtualization software.
18. At the language screen, ensure that English is selected and press Enter.
19. At the Ubuntu welcome screen, navigate to the Rescue a broken system option and press Enter.
20. At the Select a language page, ensure that English is selected and press Enter.
21. At the Select your location screen, ensure that United States is selected and press Enter.
22. At the Configure the keyboard screen, select Yes and press Enter. Follow the prompts to complete the detection. When the detection process finds a “us” keyboard layout, select Continue and press Enter.
23. At the Configure the network screen, view the default hostname supplied, select Continue, and press Enter.
24. At the Configure the clock screen, ensure that the correct time zone is displayed, select Yes, and press Enter. Alternatively, if an incorrect time zone is displayed, select No, press Enter, select your time zone, and press Enter.
25. At the Enter rescue mode screen, select /dev/Ubuntu-server-vg/root and press Enter. When prompted to also mount the /boot partition, ensure that Yes is selected and press Enter.
26. At the Enter rescue mode screen, view the options. Select Execute a shell in /dev/Ubuntu-server-vg/root and press Enter. Ensure that Continue is selected and press Enter when prompted. This will change the root to the mounted / (root) filesystem on your hard disk with the chroot command.
27. At the command prompt, type **df** and press Enter to view the mounted filesystems. Is the root filesystem on your hard disk mounted?
28. At the command prompt, type **passwd** root and press Enter. Supply a new root user password of **Secret123** and press Enter when prompted (twice).
29. At the command prompt, type exit and press Enter.
30. At the Enter rescue mode screen, select Reboot the system and press Enter.
31. **In the Settings for your virtual machine in your virtualization software, ensure that the DVD drive is no longer attached to the Ubuntu Server ISO image.**
32. After the system has loaded, log into the command-line terminal (tty1) using the user name of **root** and the password of **Secret123**.
33. At the command prompt, type **passwd** and press Enter. Supply a new root user password of **LNXrocks!** and press Enter when prompted (twice).
34. **Provide screenshot(s) of steps 18 through 33.**