19. When compiling source code into a binary program, which command performs a system check and creates the Makefile?
   a. tar
   b. ./configure
   c. make
   d. make install

20. Which of the following commands can be used to list detailed information about a package, such as its installation date and license?
   a. rpm -qa packagename
   b. rpm -qi packagename
   c. rpm -qf packagename
   d. rpm -q packagename

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 13 installed according to Hands-On Project 2-2
- A floppy disk

Project 11-1

In this hands-on project, you use common compression utilities to compress and uncompress information.

1. Turn on your computer. After your Linux system has been loaded, switch to a command-line terminal (try2) by pressing Ctrl+Alt+F2 and log in to the terminal using the user name of root and the password of secret.

2. At the command prompt, type cp /etc/services - and press Enter to make a copy of the /etc/services file in your current directory. Next, type ls -l at the command prompt and press Enter. How large is the services file?

3. At the command prompt, type compress -v services and press Enter to compress the services file. (The compress utility is not installed by default. You can install it by running the yum install compress command, as shown earlier in this chapter.)
What was the compression ratio? Next, type ls -l at the command prompt and press Enter. What extension does the services file have and how large is it?

4. At the command prompt, type uncompress -v services.Z and press Enter to decompress the services file.

5. At the command prompt, type compress -vr Desktop and press Enter to compress the contents of the Desktop subdirectory. Next, type ls -lr Desktop at the command prompt and press Enter to view the contents of the Desktop directory.
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Which files were compressed? If there were symbolic links in this directory, how could you force the compress utility to compress these files as well?

6. At the command prompt, type `uncompress -vr Desktop` and press Enter to decompress the contents of the Desktop subdirectory. Next, type `ls -1R Desktop` at the command prompt and press Enter to verify that these files were uncompressed.

7. At the command prompt, type `ps -ef | compress -v >psfile.Z` and press Enter to compress the output of the `ps -ef` command to a file called psfile.Z. What was the compression ratio?

8. At the command prompt, type `zmore psfile.Z` and press Enter to view the compressed contents of the psfile.Z file. When finished, press q to quit the zmore utility.

9. At the command prompt, type `gzip -v services` and press Enter to compress the services file. What was the compression ratio? How does this ratio compare with the one obtained in Step 3? Why? Next, type `ls -1` at the command prompt and press Enter. What extension does the services file have and how large is it?

10. At the command prompt, type `gunzip -v services.gz` and press Enter to decompress the services file.

11. At the command prompt, type `gzip -v -9 services` and press Enter to compress the services file. What was the compression ratio? Why?

12. At the command prompt, type `gunzip -v services.gz` and press Enter to decompress the services file.

13. At the command prompt, type `gzip -v -l services` and press Enter to compress the services file. What was the compression ratio? Why?

14. At the command prompt, type `gunzip -v services.gz` and press Enter to decompress the services file.

15. At the command prompt, type `bzip2 -v services` and press Enter to compress the services file. What was the compression ratio? How does this compare with the ratios from Step 3 and Step 9? Why? Next, type `ls -1` at the command prompt and press Enter. What extension does the services file have and how large is it?

16. At the command prompt, type `bunzip2 -v services.bz2` and press Enter to decompress the services file.

17. Type exit and press Enter to log out of your shell.

Project 11-2

In this hands-on project, you create, view, and extract archives using the tar utility.

1. Switch to a command-line terminal (try2) by pressing Ctrl+Alt+F2 and log in to the terminal using the user name of root and the password of secret.

2. At the command prompt, type `tar -cvf test1.tar /etc/samba` and press Enter to create an archive called test1.tar in the current directory that contains the /etc/samba directory and its contents. Next, type `ls -1` at the command prompt and press Enter. How large is the test1.tar file?

3. At the command prompt, type `tar -tvf test1.tar` and press Enter. What is displayed?
4. At the command prompt, type `mkdir /new1` and press Enter. Next, type `cd /new1` at the command prompt to change the current directory to the /new1 directory.

5. At the command prompt, type `tar -xvf /root/test1.tar` and press Enter to extract the contents of the test1.tar archive. Next, type `ls -F` at the command prompt and press Enter to view the contents of the /new1 directory. Was the extraction successful?

6. At the command prompt, type `cd` and press Enter to return to your home directory.

7. At the command prompt, type `tar -xvf test2.tar.gz /etc/samba` and press Enter to create a gzip-compressed archive called test2.tar.gz in the current directory that contains the /etc/samba directory and its contents. Next, type `ls -l` at the command prompt and press Enter. How large is the test2.tar.gz file? How does this compare with the size obtained for test1.tar in Step 2? Why?

8. At the command prompt, type `tar -ztf test2.tar.gz` and press Enter. What is displayed?

9. At the command prompt, type `mkdir /new2` and press Enter. Next, type `cd /new2` at the command prompt and press Enter to change the current directory to the /new2 directory.

10. At the command prompt, type `tar -xvf /root/test2.tar.gz` and press Enter to uncompress and extract the contents of the test2.tar.gz archive. Next, type `ls -F` at the command prompt and press Enter to view the contents of the /new2 directory. Was the extraction successful?

11. At the command prompt, type `cd` and press Enter to return to your home directory.

12. Insert a floppy disk into the floppy disk drive of your computer, type `modprobe floppy` at the command prompt, and press Enter.

13. At the command prompt, type `tar -cvf /dev/fd0 /etc/samba` and press Enter to create an archive on the device /dev/fd0 that contains the /etc/samba directory and its contents.

14. At the command prompt, type `tar -tvf /dev/fd0` and press Enter. What is displayed?

15. At the command prompt, type `mkdir /new3` and press Enter. Next, type `cd /new3` at the command prompt and press Enter to change the current directory to the /new3 directory.

16. At the command prompt, type `tar -xvf /dev/fd0` and press Enter to extract the contents of the archive stored on the first floppy disk. Next, type `ls -F` at the command prompt and press Enter to view the contents of the /new3 directory. Was the extraction successful?

17. At the command prompt, type `mount /dev/fd0` and press Enter to mount the floppy from the appropriate entry in /etc/fstab. What error message do you receive and why? Why was the filesystem type not automatically detected? Can this floppy be mounted?

18. At the command prompt, type `rm -Rf /new[123]` and press Enter to remove the directories created in this hands-on project.

19. At the command prompt, type `rm -f /root/test*` and press Enter to remove the tar archives created in this hands-on project.

20. Remove the floppy disk from your floppy disk drive, type `exit`, and press Enter to log out of your shell.
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Project 11-3

In this hands-on project, you create, view, and extract archives using the cpio and dump utilities.

1. Switch to a command-line terminal (try2) by pressing Ctrl+Alt+F2 and log in to the terminal using the user name of root and the password of secret.
2. At the command prompt, type `find /etc/samba | cpio -ovcBL -O test.cpio` and press Enter to create an archive in the file test.cpio that contains the /etc/samba directory and its contents. What does each option indicate in the aforementioned command?
3. At the command prompt, type `cpio -ivtB -I test.cpio` and press Enter. What is displayed? What does each option indicate in the aforementioned command?
4. At the command prompt, type `cpio -ivodump -I test.cpio` and press Enter to extract the contents of the archive in the test.cpio file. To what location were the files extracted? Were any files overwritten? What does each option indicate in the aforementioned command?
5. At the command prompt, type `dump -of test.dump /etc/samba` and press Enter to create an archive of the /etc/samba directory in the archive file test.dump. What type of backup was performed? Will the /etc/dumpdates file be updated?
6. At the command prompt, type `mkdir /new` and press Enter. Next, type `cd /new` at the command prompt and press Enter to change the current directory to the /new directory.
7. At the command prompt, type `restore -tf /root/test.dump` and press Enter. What was displayed? Are absolute or relative pathnames used?
8. Type `ls -F` at the command prompt and press Enter to view the contents of the /new directory. What is displayed? Next, type `ls -RF` at the command prompt and press Enter to view the contents of the /new directory recursively. What is displayed?
9. At the command prompt, type `cd` and press Enter to return to your home directory.
10. At the command prompt, type `rm -Rf /new` and press Enter to remove the directory created in this hands-on project.
11. At the command prompt, type `rm -rf /root/test*` and press Enter to remove the archives created in this hands-on project.
12. Type exit and press Enter to log out of your shell.

Project 11-4

In this hands-on project, you compile and install a program from source code.

1. Switch to the gdm by pressing Ctrl+Alt+F1 or Ctrl+Alt+F7 and log in to the GNOME Desktop Environment using the user name of sample user one and the password of secret.
2. Start the Firefox Web browser and download the gzipped source code tarball for Bluefish 2.0.1 or later from `http://sourceforge.net` to the /home/user1/Downloads folder. The file should be called bluefish-2.0.1.tar.gz. (If you downloaded a version of Bluefish later than 2.0.1, make sure you modify the commands used in this section to reflect the version you have downloaded.)
3. Switch to a command-line terminal (try2) by pressing Ctrl+Alt+F2 and log in to the terminal using the user name of root and the password of secret.
4. At the command prompt, type `cp -user1/Downloads/bluefish-2.0.1.tar.gz` - and press Enter to copy the bluefish source code tarball to your home directory. Does the filename of the bluefish tarball indicate the architecture for which the source code was designed? Explain.

5. At the command prompt, type `tar -zxvf bluefish-2.0.1.tar.gz` and press Enter to uncompress and extract the contents of the tarball. Next, type `ls -F` at the command prompt and press Enter. What directory was created?

6. At the command prompt, type `cd bluefish-2.0.1` and press Enter. Next, type `ls -F` at the command prompt and press Enter. Is there an executable configuration program? Are there README and INSTALL files present?

7. At the command prompt, type `less README` and press Enter. Scroll through the output on the terminal screen. What does the bluefish program do? When finished, press q to quit the less utility.

8. At the command prompt, type `less INSTALL` and press Enter. Scroll through the output on the terminal screen. What does this file contain? When finished, press q to quit the less utility.

9. At the command prompt, type `./configure` and press Enter. What does this program do? Near the bottom of the output, can you see whether the Makefile was created successfully?

10. At the command prompt, type `make` and press Enter. This step should take about five minutes, depending on the speed of your computer. What does the make program do? Which program compiles the different parts of the program?

11. At the command prompt, type `make install` and press Enter. What does the make install command do?

12. At the command prompt, type `cd` and press Enter to return to your home directory. Next, type `rm -Rf bluefish-2.0.1` to remove the source code directory for bluefish.

13. At the command prompt, type `which bluefish` and press Enter. Which directory contains the bluefish executable program? Is a central database updated with this information as it was when the bluefish RPM was installed in this chapter?

14. Type `exit` and press Enter to log out of your shell.

15. Switch back to your GNOME Desktop Environment by pressing `Ctrl+Alt+F1` or `Ctrl+Alt+F7` and open a BASH terminal.

16. Type `bluefish &` at the command prompt and press Enter. Observe the bluefish interface. When finished, close the bluefish program, close the terminal shell, and log out of the GNOME Desktop Environment.

**Project 11-5**

In this hands-on project, you use the `rpm` and `yum` commands to install, view, and remove an RPM package on your system.

1. Switch to a command-line terminal (tty2) by pressing `Ctrl+Alt+F2` and log in to the terminal using the user name of root and the password of secret.
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2. At the command prompt, type `rpm -qa | less` and press Enter to view the RPM packages installed on your computer. Are there many of them? Briefly scroll through the list and press q when finished to exit the less utility.

3. At the command prompt, type `rpm -q tripwire` and press Enter. Is Tripwire installed on your computer?

4. At the command prompt, type `yum install tripwire` and press Enter. What architecture is indicated in the filename for this RPM? Press y when prompted to continue the installation.

5. At the command prompt, type `rpm -q tripwire` and press Enter. Has the Tripwire package been installed successfully?

6. At the command prompt, type `rpm -qi tripwire` and press Enter to view the information about the Tripwire package. What does the Tripwire program do? What license does this package use?

7. At the command prompt, type `rpm -ql tripwire` and press Enter to view the locations of all files that belong to the Tripwire package. Which file is the executable program itself?

8. At the command prompt, type `rpm -qc tripwire` and press Enter to view the configuration files for the Tripwire package. How many configuration files does the Tripwire package have?

9. At the command prompt, type `rpm -e tripwire` and press Enter. What does this option to the rpm command do?

10. At the command prompt, type `rpm -q tripwire` and press Enter. Is Tripwire installed?

11. Type `exit` and press Enter to log out of your shell.

Discovery Exercises

1. Go to www.sourceforge.net and www.freshmeat.net and obtain software of your choice to install. Are most packages available as source code in tarball format and as compiled binaries in RPM format? Download two RPM files for your architecture. Execute both programs.

2. Write the command that can be used to perform the following:
   a. Compress the symbolic link /root/sfile using the `compress` utility and display the compression ratio.
   b. Compress the contents of the directory /root/dir1 using the gzip utility and display the compression ratio.
   c. Decompress the file /root/letter.bz2.
   d. Compress the file /root/letter using gzip fast compression.
   e. Find the compression ratio of the file /root/letter.gz.
   f. Perform a test compression of the file /root/sample using the bzip2 utility.
   g. Compress the file /root/sample using the bzip2 utility while minimizing memory usage during the compression.