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 wired Ethernet NIC and crossover cable

Project 13-1

In this hands-on project, you configure and test the DHCP daemon.

1. Turn on your computer. After your Linux system has been loaded, 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.

2. At the command prompt, type `yum install dhcp` and press Enter to install the DHCP server daemon. Type `y` and press Enter when prompted to continue the installation.

3. Edit the `/etc/dhcp/dhcpd.conf` file with a text editor and add the following lines:

```bash
default-lease-time 72000;
option routers IP_address_of_your_class_default_gateway;
option domain-name-servers IP_address_of_your_class_DNS_server;
subnet class_network netmask subnet_mask {
  range class_network.50 class_network.100;
}
```

For example, if your class uses the 192.168.1 network (subnet mask 255.255.255.0) and a default gateway and DNS server of 192.168.1.254, you would add the following lines:

```bash
default-lease-time 72000;
option routers 192.168.1.254;
option domain-name-servers 192.168.1.254;
subnet 192.168.1.0 netmask 255.255.255.0 {
  range 192.168.1.50 192.168.1.100;
}
```

When finished, save your changes and quit the editor.

4. At the command prompt, type `service dhcpd start` and press Enter to start the DHCP daemon.

5. Connect a crossover cable to the Ethernet port on your computer's NIC. Connect the other end of the cable to the Ethernet port on the NIC of your partner's computer.

6. At the command prompt on your partner's computer, type `dhclient eth0` and press Enter to request a DHCP address.

7. At the command prompt on your computer, type `cat /var/lib/dhcpd/dhcpdleases` and press Enter. Note the line that details the lease information.
8. At the command prompt, type `service dhcpd stop` and press Enter to stop the DHCP daemon.

9. Remove the crossover cable from your computer and your partner's computer.

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

**Project 13-2**

In this hands-on project, you configure and test the DNS daemon.

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 `yum install system-config-bind` and press Enter to install the graphical BIND configuration utility. Type `y` and press Enter when prompted to continue the installation.

3. Switch to the gdm by pressing Ctrl+Alt+F2 or Ctrl+Alt+F7 and log in to the GNOME Desktop Environment as `sample user one`, with the password of secret.

4. Once the GNOME Desktop Environment has started, open a BASH shell terminal, type `system-config-bind` and press Enter. When prompted to supply the root user's password, type `secret` and click OK.

5. Highlight DNS Server and click Properties. Add the forwarders option to the Current Options box. Highlight IPv4 Address and supply the IPv4 address of your classroom DNS server for this option and click OK when finished. Click OK to close the DNS server property window. This configures your DNS server to forward requests to the classroom DNS server if it cannot resolve the destination address using the information within its own zone files.

6. Click New, Zone and accept the default zone scope of Internet by clicking OK underneath the Class drop-down box. Next, accept the default zone type of Forward by clicking OK below the Origin Type drop-down box and type the zone name `class.com.` (taking care to include the trailing . in the zone name). Accept the default DNS server zone role of Master (Primary) by clicking OK.

7. Examine the default SOA record parameters. What is the default minimum TTL? Briefly explain what this setting does. Click OK to return to the BIND configuration utility window.

8. Expand your `class.com` zone. What default records are created in this new zone?

9. Highlight the `class.com` zone and click New, A `IPv4 Address`. Type `gateway.class.com` in the Domain Name dialog box (taking care to include the trailing . in the FQDN) and supply the IPv4 address of your classroom's default gateway. Click OK to create the A record.

10. Highlight the `class.com` zone and click New, A `IPv4 Address`. Type `server1.class.com` in the Domain Name dialog box (taking care to include the trailing . in the FQDN) and supply your computer's IPv4 address. Click OK to create the A record.

11. Highlight the `class.com` zone and click New, CNAME `Alias`. Type `alias.class.com` in the Domain Name dialog box and type `server1.class.com` in the Canonical Name dialog box (taking care to include the trailing . in both FQDNs). Click OK to create the CNAME record.

12. Highlight the `class.com` zone and click New, `MX Mail Exchange`. Note the default domain of `class.com` in the Domain Name dialog box and type `server1.class.com` in the MX Mail Exchange dialog box. Click OK to complete the MX Mail Exchange record.
Chapter 13  Configuring Network Services

the Mail Server Name dialog box (taking care to include the trailing . in the FQDN). Click OK to create the MX record.

13. Expand your class.com zone. Are the new records visible?

14. Expand the zone that represents your classroom network. Are PTR records available for reverse lookups?

15. Click Save. Click OK when prompted to save your changes to the configuration files on the hard drive. Log out of the GNOME Desktop Environment.

16. Close the BIND configuration utility and switch back to try2 by pressing Ctrl+Alt+F2.

17. At the command prompt, type service named start and press Enter to start the DNS name daemon.

18. At the command prompt, type chconfig --level 5 named on and press Enter to ensure that the DNS name daemon is started when the system enters runlevel 5.

19. Edit the /etc/resolv.conf file with a text editor and remove any existing nameserver lines. Add the line nameserver 127.0.0.1 to ensure that your Linux computer uses the local DNS server daemon for name resolution. Save your changes and quit the editor when finished.

20. At the command prompt, type ping -c 4 gateway.class.com and press Enter. Was the name resolved successfully? Explain.

21. At the command prompt, type ping -c 4 server1.class.com and press Enter. Was the name resolved successfully? Explain.

22. At the command prompt, type ping -c 4 alias.class.com and press Enter. Was the name resolved successfully? Explain.

23. At the command prompt, type ping -c 4 www.yahoo.com and press Enter. Was the name resolved successfully? Explain.

24. At the command prompt, type dig @localhost class.com ANY and press Enter. Are your resource records returned successfully?

25. At the command prompt, type less /var/named/chroot/etc/named.conf and press Enter. View the entries. Is class.com a master zone? Do you see a line that forwards unknown requests to your classroom DNS server? Press q when finished.

26. At the command prompt, type cat /var/named/chroot/var/named/class.com.db and press Enter. View the entries. Are your resource records present?

27. At the command prompt, type cat /var/named/chroot/var/named/network_id.db and press Enter where network ID is your classroom network ID. View the entries. Are PTR resource records present?

28. At the command prompt, type less /var/named/chroot/var/named/named.root and press Enter. View the entries. What do these entries represent?

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

Project 13-3

In this hands-on project, you configure and update your NTP daemon.

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 `chkconfig --list ntpd` and press Enter. Note the runlevels that the NTP daemon is started in.

3. Edit the `/etc/ntp.conf` file with a text editor. Note the default NTP servers that are queried for time information. Next, add the following line (where `network` is your classroom network and `subnet_mask` is the associated subnet mask):

   ```
   restrict network mask subnet_mask nomodify notrap
   ```

   When finished, save your changes and quit the editor.

4. At the command prompt, type `service ntpd stop` and press Enter to stop the NTP daemon.

5. At the command prompt, type `ntpd -u 0.fedora.pool.ntp.org` and press Enter to synchronize your clock with the first time server listed in `/etc/ntp.conf`. Repeat this command several times until the offset is very low.

6. At the command prompt, type `service ntpd start` and press Enter to start the NTP daemon.

7. At the command prompt, type `ntpq -p` and press Enter to view information about the time servers that you are synchronizing with (peers).

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

**Project 13-4**

In this hands-on project, you configure the Apache Web server and test daemon permissions to files on the system.

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 `grep DocumentRoot /etc/httpd/conf/httpd.conf` and press Enter. What is the document root directory?

3. At the command prompt, type `grep DirectoryIndex /etc/httpd/conf/httpd.conf` and press Enter. What file(s) will automatically be handed out by the Apache daemon from the document root directory?

4. At the command prompt, type `grep "User" /etc/httpd/conf/httpd.conf` and press Enter. What user does the Apache daemon run as locally?

5. At the command prompt, type `grep "Group" /etc/httpd/conf/httpd.conf` and press Enter. What user does the Apache daemon run as locally?

6. At the command prompt, type `apachectl configtest` and press Enter. Are there any syntax errors within your `/etc/httpd/conf/httpd.conf` file?

7. Edit the `/var/www/html/index.html` file with a text editor such as vi. Are there any entries? Add the following lines:

   ```html
   <html>
   <body>
   <h1>My sample website</h1>
   </body>
   </html>
   ```

   When finished, save your changes and quit the editor.
8. At the command prompt, type `service httpd start` and press Enter to start Apache.
9. At the command prompt, type `chkconfig --level 5 httpd on` and press Enter to ensure that Apache is started when the system enters runlevel 5.
10. At the command prompt, type `curl http://server1.class.com/` and press Enter. Was your Web page successfully returned by Apache?
11. At the command prompt, type `ab -n 1000 http://server1.class.com/` and press Enter. How long did Apache take to respond to 1,000 requests?
12. At the command prompt, type `ls /etc/httpd/logs/access_log` and press Enter. How many Web page hits are shown? Explain.
13. Switch to the gdm by pressing Ctrl+Alt+F2 or Ctrl+Alt+F7 and log in to the GNOME Desktop Environment as `sample user one` using the password of secret.
14. Open the Firefox Web browser. Enter `http://server1.class.com` as the location. Is your Web page displayed?
15. Switch back to your command-line terminal (tty2) by pressing Ctrl+Alt+F2.
16. At the command prompt, type `ls -l /var/www/html/index.html` and press Enter. Who owns the file? What is the group owner? What category do the Apache daemons use when they run as the user apache and group apache?
17. At the command prompt, type `chmod 640 /var/www/html/index.html` and press Enter.
18. Switch to the graphical terminal by pressing Ctrl+Alt+F1 or Ctrl+Alt+F7 and refresh the Web page in your Firefox Web browser. What error message do you receive?
19. Switch back to your command-line terminal (tty2) by pressing Ctrl+Alt+F2.
21. Switch to the graphical terminal by pressing Ctrl+Alt+F1 or Ctrl+Alt+F7 and refresh the Web page in your Firefox Web browser. Was the Apache daemon able to read the index.html file? Log out of the GNOME Desktop Environment.
22. Switch back to your command-line terminal (tty2) by pressing Ctrl+Alt+F2.
23. Type `exit` and press Enter to log out of your shell.

**Project 13-5**

In this hands-on project, you configure and test Samba file sharing.

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.
2. Edit the `/etc/samba/smb.conf` file with a text editor such as vi. Add the following line underneath the `[global]` line in this file:

   ```
   netbios name = serverX
   ```

   where X is a unique number assigned to you by your instructor. When finished, save your changes and quit the editor.
Hands-On Projects

3. At the command prompt, type `smbpasswd -a root` and press Enter. When prompted, supply the password of secret. Repeat the same password when prompted a second time.

4. At the command prompt, type `service smb start; service nmb start` and press Enter. What daemons were started?

5. At the command prompt, type `smbclient -L server1X` and press Enter where X is the unique number assigned to you by your instructor. Supply your Samba password of secret when prompted. Do you see your shared home directory? Do you see any printer shares?

6. At the command prompt, type `smbclient //server1X/root` and press Enter where X is the unique number assigned to you by your instructor. Supply your Samba password of secret when prompted.

7. At the `smb:/>` prompt, type `dir` and press Enter. Are you in your home directory?

8. At the `smb:/>` prompt, type `exit` and press Enter.

9. Edit the `/etc/samba/smb.conf` file again with a text editor such as vi. Add the following lines to the end of the file:

   ```
   [newshare]
   comment = Web Content
   path = /var/www/html
   public = yes
   read only = no
   ```

   When finished, save your changes and quit the editor.

10. At the command prompt, type `testparm` and press Enter. Were any syntax errors reported within `/etc/samba/smb.conf`? Press Enter to view your Samba configuration.

11. At the command prompt, type `service smb restart; service nmb restart` and press Enter.

12. At the command prompt, type `smbclient -L server1X` and press Enter where X is the unique number assigned to you by your instructor. Supply your Samba password of secret when prompted. Do you see your new shared directory?

13. At the command prompt, type `smbclient //server1X/newshare` and press Enter where X is the unique number assigned to you by your instructor. Supply your Samba password of secret when prompted.

14. At the `smb:/>` prompt, type `dir` and press Enter. Are you in the `/var/www/html` directory?

15. At the `smb:/>` prompt, type `exit` and press Enter.

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

Project 13-6

In this hands-on project, you export the `/etc` directory using NFS and access it across the network using the `mount` command.

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.
620 Chapter 13 Configuring Network Services

2. Edit the `/etc/exports` file with a text editor such as vi. Are there any entries? Add a line that reads:

```
/etc *(rw, root_squash)
```

When finished, save your changes and quit the editor.

3. At the command prompt, type `exportfs -a` and press Enter.

4. At the command prompt, type `service nfs start ; service nfslock start` and press Enter to start the NFS daemons.

5. At the command prompt, type `mount -t nfs localhost:/etc /mnt` and press Enter.

6. At the command prompt, type `mount` and press Enter. What is mounted to the `/mnt` directory?

7. At the command prompt, type `cd /mnt` and press Enter. Next, type `ls -F` at the command prompt and press Enter. What directory are you observing? Type `ls -F /etc` at the command prompt and press Enter. Is the output on the terminal screen identical?

8. At the command prompt, type `cd` and press Enter to return to your home directory. Next, type `umount /mnt` at the command prompt and press Enter to umount the NFS filesystem.

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

Project 13-7
In this hands-on project, you configure and use the Very Secure FTP daemon.

1. Switch to a command-line terminal (`tty`) 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/hosts /var/ftp ; chmod 444 /var/ftp/hosts` and press Enter to copy the file `/etc/hosts` to the `/var/ftp` directory and ensure that everyone has read permission to it.

3. At the command prompt, type `service vsftpd start` and press Enter to start the Very Secure FTP daemon.

4. At the command prompt, type `chkconfig --level 5 vsftpd on` and press Enter to ensure that the Very Secure FTP daemon is started when the system enters runlevel 5.

5. At the command prompt, type `ftp localhost` and press Enter. Log in as user1 using the password of secret when prompted.

6. At the ftp> prompt, type `dir` and press Enter to list the contents of the `/home/user1` directory.

7. At the ftp> prompt, type `cd /etc` and press Enter to change the current working directory on the FTP client to `/etc`.

8. At the ftp> prompt, type `put inittab` and press Enter to upload the inittab file to the remote FTP server.

9. At the ftp> prompt, type `dir` and press Enter to list the contents of the `/home/user1` directory. Was the inittab file uploaded successfully?

10. At the ftp> prompt, type `cd /` and press Enter to change the current working directory on the FTP client to `/`.

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11. At the ftp> prompt, type `get inittab` and press Enter to download the inittab file to the / directory on the local computer.

12. At the ftp> prompt, type `help` and press Enter to list the commands available within the FTP client program.

13. At the ftp> prompt, type `bye` and press Enter to exit the FTP client program.

14. At the command prompt, type `ls /` and press Enter. Was the inittab file downloaded to the / directory successfully?

15. At the command prompt, type `ftp localhost` and press Enter. Log in as `anonymous` using the password of nothing when prompted (the actual password is not relevant for the anonymous user; you could use any password).

16. At the ftp> prompt, type `dir` and press Enter to list the contents of the /usr/ftp directory.

17. At the ftp> prompt, type `lcd /` and press Enter to change the current working directory on the FTP client to /.

18. At the ftp> prompt, type `get hosts` and press Enter to download the hosts file to the / directory on the local computer.

19. At the ftp> prompt, type `bye` and press Enter to exit the FTP client program.

20. At the command prompt, type `ls /` and press Enter. Was the hosts file downloaded to the / directory successfully?

21. At the command prompt, type `ftp localhost` and press Enter. Log in as the root user with the password of secret when prompted. What error did you receive?

22. At the ftp> prompt, type `bye` and press Enter to exit the FTP client program.

23. Edit the `/etc/vsftpd/ftpusers` and `/etc/vsftpd/user_list` files with a text editor and remove the following line:

   `root`

When finished, save your changes and quit the editor.

24. At the command prompt, type `service vsftpd restart` and press Enter to restart the Very Secure FTP daemon.

25. At the command prompt, type `ftp localhost` and press Enter. Log in as the root user with the password of secret when prompted.

26. At the ftp> prompt, type `dir` and press Enter to list the contents of the /root directory.

27. At the ftp> prompt, type `bye` and press Enter to exit the FTP client program.

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

29. Switch to the gdm by pressing Ctrl+Alt+F2 or Ctrl+Alt+F7 and log in to the GNOME Desktop Environment as `sample user one` with the password of secret.

30. Open the Firefox Web browser, enter the location `ftp://server1.class.com`, and press Enter. What directory are you placed in and why?

31. Enter the location `ftp://root:secret@server1.class.com` in the Firefox Web browser and press Enter. What directory are you placed in and why?

32. Close the Firefox Web browser and log out of the GNOME Desktop Environment.
Chapter 13  Configuring Network Services

Project 13-8
In this hands-on project, you view and send e-mail using the Sendmail e-mail daemon.

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.
2. At the command prompt, type `ps -ef | grep sendmail` and press Enter. Is the Sendmail daemon running?
3. Edit the `/etc/aliases` file with a text editor and add the following line:
   ```
   admin: root
   ```
   When finished, save your changes and quit the editor.
4. At the command prompt, type `newaliases` and press Enter to update the aliases database using the information within the `/etc/aliases` file.
5. At the command prompt, type `mail admin user1` and press Enter to compose a new e-mail to the users admin and user1. When prompted for a subject, type `Test email` and press Enter. Next, type `This is a test email that will be delivered using the Sendmail daemon` and press Enter. Next, type `. (a period)` and press Enter to complete and send the e-mail.
6. At the command prompt, type `mail` to check your mailbox for e-mail messages. The last e-mail should have a subject line of Test e-mail. If you don’t see this message, type `z` to advance to the next screen of messages. Note the number of the e-mail message that has the subject line of Test e-mail and type this number at the & prompt to read your e-mail message. Type `q` when finished to exit the mail program.
7. At the command prompt, type `telnet localhost 25` and press Enter. Can you tell that you are interacting with the Sendmail daemon?
8. Type `EHLO server1.class.com` and press Enter. Does your Sendmail daemon support ESMTP? Type `quit` and press Enter to quit the telnet session.
9. Type `exit` and press Enter to log out of your shell.

Project 13-9
In this hands-on project, you create, query, and manage a database using PostgreSQL.

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.
2. At the command prompt, type `rpm -qi postgresql` and press Enter. Is the PostgreSQL server installed?
3. At the command prompt, type `passwd postgres` and press Enter. Type a password of secret and press Enter at both prompts to set a password of secret for the postgres user account.
4. At the command prompt, type `service postgresql initdb` and press Enter to initialize the PostgreSQL system databases.
5. At the command prompt, type `service postgresql start` and press Enter to start the PostgreSQL server.
6. Switch to a different command-line terminal (try3) by pressing Ctrl+Alt+F3 and log in to the terminal using the user name of postgres and the password of secret.

7. At the command prompt, type `createdb sales` and press Enter.

8. At the command prompt, type `psql sales` and press Enter to start the PostgreSQL utility.

9. At the `sales=#` prompt, type `\l` and press Enter to view the databases on your PostgreSQL server. The postgres database stores all information used internally by the PostgreSQL server, and the template databases are used when creating new databases. Note that your sales database is listed and uses the UTF-8 character set for information.

10. At the `sales=#` prompt, type `CREATE TABLE customer (Name char(20), Address char(40), Balance char(12))` and press Enter to create a customer table that has three fields (Name, Address, Balance).

11. At the `sales=#` prompt, type `\d` and press Enter to view the tables within your database. Is the customer database listed?

12. At the `sales=#` prompt, type `\d customer` and press Enter to view the fields within the customer table. How many characters are allowed in each of the three fields?

13. At the `sales=#` prompt, type `INSERT INTO customer VALUES (‘Lily Bopeep’, ‘123 Rutherford Lane’, ‘526.80’)` and press Enter to add a record to your table.

14. At the `sales=#` prompt, type `INSERT INTO customer VALUES (‘Harvey Lipshitz’, ‘51 King Street’, ‘122.19’)`, and press Enter to add a record to your table.

15. At the `sales=#` prompt, type `INSERT INTO customer VALUES (‘John Escobar’, ‘14-6919 Franklin Drive’, ‘709.66’)`, and press Enter to add a record to your table.

16. At the `sales=#` prompt, type `SELECT * FROM customer` and press Enter to view all records within your table.

17. At the `sales=#` prompt, type `SELECT * FROM customer ORDER BY Balance DESC` and press Enter to view all records within your table in descending order by balance.

18. At the `sales=#` prompt, type `SELECT * FROM customer WHERE Name = ‘Harvey Lipshitz’` and press Enter to view the record for Harvey Lipshitz.

19. At the `sales=#` prompt, type `CREATE USER bob WITH PASSWORD ‘supersecret’` and press Enter to create a user account within PostgreSQL that can access the customer database.

20. At the `sales=#` prompt, type `GRANT ALL PRIVILEGES ON customer TO bob` and press Enter to grant SELECT, UPDATE, DELETE, and INSERT permission on the customer table to the bob user.

21. At the `sales=#` prompt, type `\q` and press Enter to quit the PostgreSQL utility.

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