Lab - Configure Authentication and Authorization in Linux

Objectives

Part 1: Add a New Group for Users

Part 2: Add Users to the New Group

Part 3: Switch Users and Modify Permissions

Part 4: Modify Permissions in Absolute Mode

Background / Scenario

In this lab, you will use the Linux command line to create a group for new users and add users to the group. Each user will be assigned a password for authenticating at login. Then you will modify permissions to authorize read, write, and execute privileges for both users and groups.

Required Resources

PC with the **CSE-LABVM** installed in VirtualBox

Instructions

Part 1: Add a New Group for Users

In this part, you will add a new group for users to the virtual machine.

Step 1: Open a terminal window in the CSE-LABVM.

a. Launch the **CSE-LABVM**.

b. Double-click the **Terminal** icon to open a terminal.

Step 2: Escalate privileges to the root level.

Enter the **sudo su** command and enter **password** as the password when prompted.

```
cisco@labvm:~$ sudo su
[sudo] password for cisco:
root@labvm:/home/cisco#
```

Step 3: Add a new group named HR.

Enter the **groupadd HR** command.

```
root@ubuntu:/home/cisco# groupadd HR
```

Step 4: Verify the new group has been added.

Enter the **cat /etc/group** command to verify that HR was added.

```
root@labvm:/home/cisco# cat /etc/group
root:x:0:
daemon:x:1:
bin:x:2:
sys:x:3:
```

```
<output omitted>
Alice:x:1000:
Bob:x:1001:
Eve:x:1002:
Eric:x:1003:
Xnobody:x:1004:
HR:x:1005:
```

The new group HR is shown at the bottom of the /etc/group file with a group ID of 1005.

Part 2: Add Users to the New Group

In this part, you will add user accounts for Jenny and Joe to the HR group.

Step 1: Add Jenny as a new user and move her to the HR group.

a. Complete the following to add Jenny as a user:

1) Enter the **adduser jenny** command and press **Enter**.
2) Enter **jenPass** as the password, and then press **Enter**.
3) Re-type the new password, and then press **Enter**.
4) Enter **Jenny** for Full Name, and then press **Enter**.
5) For the rest of the configuration, press **Enter**.
6) Enter **Y** to verify the information is correct, and then press **Enter**.

```
root@labvm:/home/cisco# adduser jenny
Adding user `jenny' ...
Adding new group `jenny' (1006) ...
Adding new user `jenny' (1005) with group `jenny' ...
Creating home directory `/home/jenny' ...
Copying files from `/etc/skel' ...
New password: jenPass
Retype new password: jenPass
passwd: password updated successfully
Changing the user information for jenny
Enter the new value, or press ENTER for the default
        Full Name []: Jenny
        Room Number []:
        Work Phone []:
        Home Phone []:
        Other []:
Is the information correct? [Y/n] Y
root@labvm:/home/cisco#
```

b. Move **jenny** to the HR group. Enter the **usermod -G HR jenny** command to move **jenny** to the HR group.

```
root@ubuntu:/home/cisco# usermod –G HR jenny
```

Step 2: Add Joe as a new user and move him to the HR group.

a. Enter the **adduser joe** command and then complete the steps to assign **joe** the password **joePass** and full name **Joe**.

```
root@labvm:/home/cisco# adduser joe
Adding user `joe' ...
Adding new group `joe' (1007) ...
Adding new user `joe' (1006) with group `joe' ...
Creating home directory `/home/joe' ...
Copying files from `/etc/skel' ...
New password: joePass
Retype new password: joePass
passwd: password updated successfully
Changing the user information for joe
Enter the new value, or press ENTER for the default
        Full Name []: Joe
        Room Number []:
        Work Phone []:
        Home Phone []:
        Other []:
Is the information correct? [Y/n] Y
```

b. Place the user **joe** in the HR group.

```
root@labvm:/home/cisco# usermod –G HR joe
```

Step 3: Verify the newly created users in the passwd file.

Enter the **cat /etc/passwd** command to verify the new users in the passwd file.

```
root@labvm:/home/cisco# cat /etc/passwd
root:x:0:0:root:/root:/bin/bash
daemon:x:1:1:daemon:/usr/sbin:/usr/sbin/nologin
bin:x:2:2:bin:/bin:/usr/sbin/nologin
sys:x:3:3:sys:/dev:/usr/sbin/nologin
<output omitted>
Xnobody:x:1004:1004::/home/Xnobody:/bin/sh
jenny:x:1005:1006:Jenny,,,:/home/jenny:/bin/bash
joe:x:1006:1007:Joe,,,:/home/joe:/bin/bash
```

Step 4: View the created users in the shadow file.

Enter the **cat /etc/shadow** command to verify the new users in the shadow file.

```
root@labvm:/home/cisco# cat /etc/shadow
root:!:18704:0:99999:7:::
daemon:*:18704:0:99999:7:::
bin:*:18704:0:99999:7:::
sys:*:18704:0:99999:7:::
<output omitted>
Xnobody:!:18704:0:99999:7:::
jenny:$6$VmEFD7wi6zHV8VH5$m2K8U2wpONkvTXzf9uSxSHitbcwAQMEmNiYg8ICnBpdct9dxqr3Hh8EGvxaIasa9fUw.mtB4GGkQYvoZHAFSa/:18705:0:99999:7:::
joe:$6$Ga2C7801c2vb7ias$G9OdK91gnLCnq.5vgpUJjn0/KyWKkXmRemqoGJgBFH0QejpmRYZxQhmS42eZG0SBApc1Z2Q/gsfwuD6oLUh.W.:18705:0:99999:7:::
```

Part 3: Switch Users and Modify Permissions

In this part, you will login as jenny, explore directories, and change permissions.

Step 1: Switch user from root to jenny.

a. To switch to Jenny's desktop, click **Menu** at the bottom left of the desktop, and then click **Logout**.

b. Click **Switch User** from the dialog box.

c. Click **Jenny** from the list of available users and enter the password **jenPass**.

d. Jenny's desktop loads. From here, you can right click the desktop and choose **Open in Terminal**.

```
jenny@labvm:~/Desktop$
```

Step 2: Explore Jenny's environment.

a. Enter the **pwd** command to print the current directory, and then navigate to the **/home** directory with the **cd ../..** command.

```
jenny@labvm:~/Desktop$ pwd
/home/jenny/Desktop
jenny@labvm:~/Desktop$ cd ../..
jenny@labvm:/home$
```

b. Enter the **ls -l** command to list all directories in **/home**, their permissions, and their users.

```
jenny@labvm:/home$ ls -l
total 28
drwxr-xr-x  2 Alice Alice 4096 Mar 18 21:58 Alice
drwxr-xr-x  2 Bob   Bob   4096 Mar 18 21:58 Bob
drwxr-xr-x 12 cisco cisco 4096 Mar 19 20:02 cisco
drwxr-xr-x  2 Eric  Eric  4096 Mar 18 21:58 Eric
drwxr-xr-x  2 Eve   Eve   4096 Mar 18 21:58 Eve
drwxr-xr-x  9 jenny jenny 4096 Mar 19 19:58 jenny
drwxr-xr-x  2 joe   joe   4096 Mar 19 19:44 joe
```

The Linux operating system has a total of 10 letters or dashes in the permissions fields. For example, these home directories have the following permissions: drwxr-xr-x.

- A **d** in the first field indicates that this is a directory. A dash (**-**) would mean that it is a file.
- The next set of three characters is for user permission (**rwx**). For example, the user, **jenny**, owns the directory and can **r**ead, **w**rite, and e**x**ecute the file.
- The second set of three characters is for group permissions (**r-x**). The group is **jenny**, meaning that no group, other than jenny, can write to this directory.
- The third set of three characters is for any other user or group permissions (**r-x**). Any other user or group on the computer can read or execute, but not write to the directory.

c. As Jenny, enter command **cd joe** to enter Joe's directory. Notice that we are able to navigate to Joe's directory because the permission for others is **r-x**. The x allows anyone to enter the directory.

```
jenny@labvm:/home$ cd joe
jenny@labvm:/home/joe$
```

d. While in Joe's directory, enter the **touch new.txt** command to create a file. You are denied because user **jenny** does not have permission to write to Joe's directory.

```
jenny@labvm:/home/joe$ touch new.txt
```

```
touch: cannot touch 'new.txt': Permission denied
jenny@labvm:/home/joe$
```

e. Enter the **cd ..** command to exit Joe's home directory.

```
jenny@labvm:/home/joe$ cd ..
jenny@labvm:/home$
```

Step 3: Login as root.

Joe may not want Jenny to be able to read the contents of his directory. Root access or another superuser can change the directory permissions to deny Jenny, or any other user or group, read access to Joe's home directory.

a. Login as user **cisco** with **password** as the password. User the **su cisco** command.

```
jenny@labvm:/home$ su cisco
Password:
```

b. Enter the **sudo -i** command to switch to root and enter **password** as the password.

```
cisco@labvm:~$ sudo -i
[sudo] password for cisco: password
```

Step 4: Modify the permissions for Joe's home directory.

Navigate to the home directory and enter the **chmod o-x joe** command to change the permission on Joe's home directory to non-executable for other users and groups.

```
root@labvm:~# cd /home
root@labvm:/home# chmod o-x joe
root@labvm:/home# ls -1
total 28
drwxr-xr-x  2 Alice Alice  4096 Mar 18 21:58
drwxr-xr-x  2 Bob   Bob    4096 Mar 18 21:58
drwxr-xr-x 12 cisco cisco  4096 Mar 19 20:02
drwxr-xr-x  2 Eric  Eric   4096 Mar 18 21:58
drwxr-xr-x  2 Eve   Eve    4096 Mar 18 21:58
drwxr-xr-x  9 jenny jenny  4096 Mar 20 14:02
drwxr-xr--  2 joe   joe    4096 Mar 19 19:44
```

Step 5: Verify Jenny can no longer access Joe's directory.

a. Logout as **root** and the user **cisco**.

```
root@labvm:/home# exit
logout
cisco@labvm:~$ exit
logout
jenny@labvm:/home$
```

b. Enter the **cd joe** command to attempt to navigate to Joe's directory. Notice that permission is denied.

```
jenny@labvm:/home$ cd joe
bash: cd: joe: Permission denied
jenny@labvm:/home$
```

The chart below shows examples of other ways the **chmod** command can be used:

chmod command	Results
chmod u+rwx	Adds read, write, and execute permissions for the user
chmod u+rw	Adds read and write permission for the user
chmod o+r	Adds read permission for others
chmod g-rwx	Removes read, write, and execute permissions for the group

Part 4: Modify Permissions in Absolute Mode

In the previous part, you changed permissions in symbolic mode. In symbolic mode, the administrator uses the **chmod** command with a combination of letters and symbols to add or remove permissions. In this part, you will use **chmod** command and octal values to set permissions for each triplet of permissions (rwx) for user, group, and other.

Step 1: Switch user from jenny to joe.

a. To switch to Joe's desktop, click **Menu** at the top left of the desktop. At the bottom of the dropdown menu, click the button with the tool tip **End the current session**.

b. Click **Switch User** from the dialog box.

c. Click **Joe** from the list of available users and enter the password **joePass**.

d. Joe's desktop loads. From here, you can right click the desktop and choose **Open in Terminal**.

```
joe@labvm:~/Desktop$
```

Step 2: Explore Joe's environment.

a. Enter the **pwd** command to print the current directory, and then navigate to the **/home** directory with the **cd ../..** command.

```
joe@labvm:~/Desktop$ pwd
/home/joe/Desktop
joe@labvm:~/Desktop$ cd ../..
joe@labvm:/home$
```

b. Enter the **ls -l** command to list all directories in **/home**, their permissions, and their users. Notice that Joe's directory is set so that "others" are not able to access it.

```
joe@labvm:/home$ ls -l
total 28
drwxr-xr-x  2 Alice Alice 4096 Mar 18 21:58 Alice
drwxr-xr-x  2 Bob   Bob   4096 Mar 18 21:58 Bob
drwxr-xr-x 12 cisco cisco 4096 Mar 19 20:02 cisco
drwxr-xr-x  2 Eric  Eric  4096 Mar 18 21:58 Eric
drwxr-xr-x  2 Eve   Eve   4096 Mar 18 21:58 Eve
drwxr-xr-x  9 jenny jenny 4096 Mar 20 14:02 jenny
drwxr-xr--  9 joe   joe   4096 Mar 20 15:01 joe
```

Step 3: Use absolute mode to modify, and then verify the permissions for Joe's directory.

The other way of assigning permissions besides using symbolic permissions is the use of absolute permissions. Absolute permissions use a three-digit octal number to represent the permissions for owner, group and other.

The table below outlines each absolute value and its corresponding permissions:

Number	Permissions
7	Read, Write, and Execute
6	Read and Write
5	Read and Execute
4	Read
3	Write and Execute
2	Write
1	Execute
0	None

By typing the **chmod 764 examplefile** command, the "examplefile" will be assigned the follow permissions:

Digit	Binary Equivalent	Permission
7 (user)	111	1-Read 1-Write 1-Execute
6 (group)	110	1-Read 1-Write 0-No Execute
4 (others)	100	1-Read 0-No Write 0-No Execute

a. Modify the “others” field for Joe’s folder so that others will be able read and execute but not write while still maintaining the “user” field to read, write, and execute.

```
joe@labvm:/home$ chmod 705 joe
```

b. List the file permissions of the current directory to see that the absolute changes were made.

```
joe@labvm:/home$ ls -l
total 28
drwxr-xr-x  2 Alice Alice 4096 Mar 18 21:58 Alice
drwxr-xr-x  2 Bob   Bob   4096 Mar 18 21:58 Bob
drwxr-xr-x 12 cisco cisco 4096 Mar 19 20:02 cisco
drwxr-xr-x  2 Eric  Eric  4096 Mar 18 21:58 Eric
drwxr-xr-x  2 Eve   Eve   4096 Mar 18 21:58 Eve
drwxr-xr-x  9 jenny jenny 4096 Mar 20 14:02 jenny
drwx---r-x  9 joe   joe   4096 Mar 20 15:01 joe
joe@labvm:/home$
```

Step 4: Create a file in the joe directory.

Switch to the joe directory, use the **touch test.txt** command to create a file, and then list the contents of the directory.

```
joe@labvm:/home$ cd joe
joe@labvm:~$ touch test.txt
joe@labvm:~$ ls -l
total 12
drwxr-xr-x 2 joe joe 4096 Mar 20 15:00 Desktop
drwxr-xr-x 2 joe joe 4096 Mar 20 15:00 Documents
drwxr-xr-x 2 joe joe 4096 Mar 20 15:00 Downloads
-rw-rw-r-- 1 joe joe    0 Mar 20 15:33 test.txt
joe@labvm:~$
```

Step 5: Switch user from joe to jenny.

a. To switch to Jenny's desktop, click **Menu** at the top left of the desktop. At the bottom of the dropdown menu, click the button with the tool tip **End the current session**.

b. Click **Switch User** from the dialog box.

c. Click **Jenny** from the list of available users and enter the password **jenPass**.

d. Jenny's desktop loads. From here, you can right click the desktop and choose **Open in Terminal**.

```
jenny@labvm:~/Desktop$
```

Step 6: Change to the home directory and list its contents.

```
jenny@labvm:~/Desktop$ cd ../..
jenny@labvm:/home$ ls -l
total 28
drwxr-xr-x  2 Alice Alice 4096 Mar 18 21:58 Alice
drwxr-xr-x  2 Bob   Bob   4096 Mar 18 21:58 Bob
drwxr-xr-x 12 cisco cisco 4096 Mar 19 20:02 cisco
drwxr-xr-x  2 Eric  Eric  4096 Mar 18 21:58 Eric
drwxr-xr-x  2 Eve   Eve   4096 Mar 18 21:58 Eve
drwxr-xr-x  9 jenny jenny 4096 Mar 20 14:02 jenny
drwx---r-x  9 joe   joe   4096 Mar 20 15:01 joe
jenny@labvm:/home$
```

Step 7: Change to the joe directory and list the contents of the directory.

Notice that user jenny, as a member of "others", has read access to the joe directory and also has read access for the "test.txt" file.

```
jenny@labvm:/home$ cd joe
jenny@labvm:/home/joe$ ls -l
total 12
drwxr-xr-x 2 joe joe 4096 Mar 20 15:00 Desktop
drwxr-xr-x 2 joe joe 4096 Mar 20 15:00 Documents
drwxr-xr-x 2 joe joe 4096 Mar 20 15:00 Downloads
-rw-rw-r-- 1 joe joe    0 Mar 22 14:33 test.txt
jenny@labvm:/home/joe$
```

Step 8: Attempt to create a file in the joe directory.

Notice how user jenny is denied permission to write to the joe directory.

```
jenny@labvm:/home/joe$ touch jenny.txt
touch: cannot touch 'jenny.txt': Permission denied
jenny@labvm:/home/joe$
```

Step 9: Switch user from jenny to cisco and close the VM.

a. Click **Menu** at the top left of the desktop. At the bottom of the dropdown menu, click the button with the tool tip **End the current session**.

b. Click **Switch User** from the dialog box.

c. Click **Cybersecurity Analyst** from the list of available users and enter **password** as the password.

d. Click **File** > **Close**, choose **Save the machine state**, and then click **OK**.