

# Lab – Authentication, Authorization, and Accounting

## Objectives

- Given a scenario, select the appropriate authentication, authorization, or access control
- Install and configure security controls when performing account management, based on best practices

### Part 1: Adding Groups, Users, and Passwords on a Linux System

#### Part 2: Verify Users, Groups, and Passwords

#### Part 3: Using Symbolic Permissions

#### Part 4: Absolute Permissions

## Background / Scenario

You will be conducting host security practices using the Linux command line by performing the following tasks:

- Adding Groups, Users, and Passwords
- Verifying Groups, Users, and Passwords
- Setting Symbolic Permissions
- Setting Absolute Permissions

## Required Resources

- PC with Ubuntu 16.0.4 LTS installed in a VirtualBox or VMware virtual machine.

## Part 1: Adding Groups, Users, and Passwords on a Linux System

In this part, you will add users, groups, and passwords to the local host machine.

### Step 1: Open a terminal window in Ubuntu.

- Log in to Ubuntu using the following credentials:

User: **cisco**

Password: **password**



- b. Click on the **terminal** icon to open a terminal.



**Step 2: Escalate privileges to the root level by entering the `sudo su` command. Enter the password password when prompted.**

```
cisco@ubuntu:~$ sudo su
```

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

**Step 3: Add a new group named HR by entering the command `groupadd HR`.**

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

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

## Part 2: Verify Users, Groups, and Passwords

**Step 1: Verify the new group has been added to the group file list by entering `cat /etc/group`.**

```
root@ubuntu:/home/cisco# cat /etc/group
```

```
root@ubuntu:/home/cisco# cat /etc/group
root:x:0:
daemon:x:1:
bin:x:2:
sys:x:3:
adm:x:4:syslog,cisco
Bob:x:1002:
Eve:x:1003:
Eric:x:1004:
HR:x:1005:
root@ubuntu:/home/cisco#
```

The new group HR will be added to the bottom of the `/etc/group` file with a group ID of 1005.

### Step 2: Add a new user named jenny.

```
root@ubuntu:/home/cisco# adduser jenny
```

- When prompted for a new password, type **lasocial**. Press **Enter**.
- When prompted again, type **lasocial**. Press **Enter**.
- When prompted for a full name, type **Jenny**. Press **Enter**.
- For the rest of the configurations, press **Enter** until when asked is the information correct.
- Type **Y** for yes and press **Enter**.

```
root@ubuntu:/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' ...
Enter new UNIX password:
Retype new UNIX password:
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
```

### Step 3: Place the user jenny in the HR group.

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

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

### Step 4: Add another new user named joe.

```
root@ubuntu:/home/cisco# adduser joe
```

- When prompted for a new password, type **tooth**. Press **Enter**.
- When prompted again, type **tooth**. Press **Enter**.
- When prompted for a full name, type **Joe**. Press **Enter**.
- For the rest of the configurations, press **Enter** until when asked is the information correct.

- e. Type **Y** for yes and press **Enter**.

```
root@ubuntu:/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' ...
Enter new UNIX password:
Retype new UNIX password:
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
```

- f. Place the user joe in the HR group.

```
root@ubuntu:/home/cisco# usermod -G HR joe
```

```
root@ubuntu:/home/cisco# usermod -G HR joe
root@ubuntu:/home/cisco#
```

**Step 5: Verify the newly created users in the passwd file.**

```
root@ubuntu:/home/cisco# cat /etc/passwd
```

```
root@ubuntu:/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
eve:x:1003:1003::/home/eve:
eric:x:1004:1004::/home/eric:
jenny:x:1005:1006:Jenny,,,:/home/jenny:/bin/bash
joe:x:1006:1007:Joe,,,:/home/joe:/bin/bash
```

**Step 6: View the created users in the shadow file.**

```
root@ubuntu:/home/cisco# cat /etc/shadow
```

### Part 3: Using Symbolic Permissions

- Step 1: While on the Ubuntu system, press and hold the keys CTRL+ALT+F1 until the screen changes to the tty1 Terminal.**

```
Ubuntu 16.04 LTS ubuntu tty1
ubuntu login:
```

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**Note:** If you are unable to use tty1 terminal, return to graphical user interface (GUI) of the host by using **CTRL+ALT+F7** and open a terminal window in the GUI Ubuntu OS. At the prompt, enter **su -l jenny** at the prompt and enter the password **lasocial**. Proceed to Step 4.

```
cisco@ubuntu:~$ su -l jenny
```

```
cisco@ubuntu:~$ su -l jenny
Password:
jenny@ubuntu:~$
```

**Note:** If CTRL+ALT+F7 did not work, try CTRL+ALT+F8.

**Step 2:** Once on the Terminal login screen, type **jenny** and press Enter.

**Step 3:** When prompted for the password, type **lasocial** and press Enter.

**Step 4:** After a successful login, you will see the **jenny@ubuntu:~\$** prompt.

```
Ubuntu 16.04 LTS ubuntu tty1
ubuntu login: jenny
Password:
Welcome to Ubuntu 16.04 LTS (GNU/Linux 4.4.0-24-generic x86_64)

 * Documentation:  https://help.ubuntu.com/

15 packages can be updated.
0 updates are security updates.

The programs included with the Ubuntu system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*/copyright.

Ubuntu comes with ABSOLUTELY NO WARRANTY, to the extent permitted by
applicable law.

jenny@ubuntu:~$
```

Since we are not logged in as the *root* (superuser), we are presented with the dollar sign instead of the # if we were to be logged in as the user root.

**Step 5:** View your present directory.

```
jenny@ubuntu:~$ pwd
```

```
jenny@ubuntu:~$ pwd
/home/jenny
```

**Step 6:** Go back one directory level to the **/home** directory.

```
jenny@ubuntu:~$ cd ..
```

```
jenny@ubuntu:~$ cd ..
jenny@ubuntu:/home$
```

### Step 7: List all directories and their permissions.

```
jenny@ubuntu:/home$ ls -l
```

```
jenny@ubuntu:/home$ ls -l
total 12
drwxr-xr-x 17 cisco cisco 4096 Jun 28 18:04 cisco
drwxr-xr-x  3 jenny jenny 4096 Jun 28 23:28 jenny
drwxr-xr-x  2 joe  joe   4096 Jun 28 19:18 joe
jenny@ubuntu:/home$
```

The Linux operating system has a total of 10 letters or dashes in the permissions fields:

- The first field is a dash for a file and a d for a directory
- The 2<sup>nd</sup> through 4<sup>th</sup> fields are for the user
- The 5<sup>th</sup> through 7<sup>th</sup> fields are for the group
- The 8<sup>th</sup> through 10<sup>th</sup> fields are for others (accounts other than those in the group)

The diagram shows a terminal output of a file permission string: `drwxr-xr-x 31 student student 4096 Apr 20 14:28 student`. The first field `drwxr-xr-x` is highlighted in red and labeled "1st field". The next three fields `31 student student` are highlighted in blue and labeled "2nd - 4th fields (user)". The next three fields `student student` are highlighted in yellow and labeled "5th - 7th fields (group)". The final field `student` is highlighted in orange and labeled "8th - 10th fields (other)".

### Step 8: Enter Joe's folder as Jenny by typing the command `cd joe`.

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

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

Notice that we are able to go into *Joe's home folder*.

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

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

### Step 9: Press and hold CTRL+ALT+F2 to switch to another Terminal session (tty2).

```
Ubuntu 16.04 LTS ubuntu tty2
ubuntu login: _
```

**Step 10: Login as the user root with the password secretpassword.**

```
Ubuntu 16.04 LTS ubuntu tty2
ubuntu login: root
Password:
Welcome to Ubuntu 16.04 LTS (GNU/Linux 4.4.0-24-generic x86_64)

 * Documentation:  https://help.ubuntu.com/

15 packages can be updated.
0 updates are security updates.
```

**Note:** If you are unable to use tty2 terminal, return to graphical user interface (GUI) of the host by using **CTRL+ALT+F7** and open a terminal window in the GUI Ubuntu OS. At the prompt, enter **sudo -i** at the prompt and enter the password **password**.

```
cisco@ubuntu:~$ sudo -i
[sudo] password for cisco:
root@ubuntu:~#
```

**Step 11: Change to the /home directory.**

```
root@ubuntu:~# cd /home
```

```
root@ubuntu:~# cd /home
root@ubuntu:/home#
```

**Step 12: Change the “other” permission on joe’s folder by making it non-executable.**

```
root@ubuntu:/home# chmod o-x joe
```

```
root@ubuntu:/home# chmod o-x joe
root@ubuntu:/home#
```

**Step 13: List the directories once more with their respective permissions.**

```
root@ubuntu:/home# ls -l
```

```
root@ubuntu:/home# ls -l
total 12
drwxr-xr-x 17 cisco cisco 4096 Jun 28 18:04 cisco
drwxr-xr-x  3 jenny jenny 4096 Jun 28 23:52 jenny
drwxr-xr--  2 joe   joe   4096 Jun 28 19:18 joe
root@ubuntu:/home#
```

Notice now that there are two dashes in the “others” field for joe’s folder.

**Step 14: Press and hold CTRL+ALT+F1 to switch back to the other Terminal session (tty1).  
Make sure you are viewing the following command prompt: jenny@ubuntu:/home\$.**

**Step 15: Attempt to go into Joe’s folder once more.**

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

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

Notice that we do not have the permissions to do so.

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

**Step 16: Type exit followed by pressing Enter to logout of the Terminal session.**

## Part 4: Absolute Permissions

**Step 1: Login as the user joe with the password tooth while on tty1.**

```
Ubuntu 16.04 LTS ubuntu tty1
ubuntu login: joe
Password:
Welcome to Ubuntu 16.04 LTS (GNU/Linux 4.4.0-24-generic x86_64)
* Documentation:  https://help.ubuntu.com/
```

**Note:** If you are unable to use tty1 terminal, return to graphical user interface (GUI) of the host by using **CTRL+ALT+F7** and open a terminal window in the GUI Ubuntu OS. At the prompt, enter **sudo -l joe** at the prompt and enter the password **tooth**.

```
jenny@ubuntu:/home$ exit
logout
cisco@ubuntu:~$ su -l joe
Password:
joe@ubuntu:~$
```

**Step 2: Print your current working directory.**

```
joe@ubuntu:~$ pwd
```

```
joe@ubuntu:~$ pwd
/home/joe
joe@ubuntu:~$
```

**Step 3: Go back one directory level to the /home directory.**

```
joe@ubuntu:~$ cd ..
```

```
joe@ubuntu:~$ cd ..  
joe@ubuntu:/home$
```

**Step 4: List all directories and their permissions in the current working directory.**

```
joe@ubuntu:/home~$ ls -l
```

```
joe@ubuntu:/home$ ls -l  
total 12  
drwxr-xr-x 17 cisco cisco 4096 Jun 28 18:04 cisco  
drwxr-xr-x  3 jenny jenny 4096 Jun 28 23:52 jenny  
drwxr-xr--  3 joe   joe   4096 Jun 29 00:12 joe  
joe@ubuntu:/home$
```

Notice that Joe’s folder is set so that “others” are not able to access the folder.

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

- The user will get read, write and execute permissions
- The group will get read and write permissions
- Others will get read access

Breakdown of how 764 represents these 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

**Step 5: 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@ubuntu:/home$ chmod 705 joe
```

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

**Step 6: List the file permissions of the current directory to see that the absolute changes were made.**

```
joe@ubuntu:/home$ ls -l
```

```
joe@ubuntu:/home$ ls -l
total 12
drwxr-xr-x 17 cisco cisco 4096 Jun 28 18:04 cisco
drwxr-xr-x  3 jenny jenny 4096 Jun 28 23:52 jenny
drwx--r-x  3 joe  joe  4096 Jun 29 00:12 joe
joe@ubuntu:/home$
```

**Step 7: Change to the /home/joe directory.**

```
joe@ubuntu:/home$ cd joe
```

```
joe@ubuntu:/home$ cd joe
joe@ubuntu:~$
```

**Step 8: Create a simple text file named test.txt using touch.**

```
joe@ubuntu:~$ touch test.txt
```

```
joe@ubuntu:~$ touch test.txt
joe@ubuntu:~$
```

- a. Type **exit** followed by pressing **Enter** to log out of Joe’s session.

- b. While on the tty1 Terminal, log back in as **jenny** and enter the password **lasocial**. Press **Enter**.

```
Ubuntu 16.04 LTS ubuntu tty1
ubuntu login: jenny
Password:
```

**Note:** If you are unable to use tty1 terminal, return to graphical user interface (GUI) of the host by using **CTRL+ALT+F7** and open a terminal window in the GUI Ubuntu OS. At the prompt, enter **su -l jenny** at the prompt and enter the password **lasocial**.

```
cisco@ubuntu:~$ su -l jenny
```

```
joe@ubuntu:~$ exit
logout
cisco@ubuntu:~$ su -l jenny
Password:
jenny@ubuntu:~$
```

**Step 9: Change to the /home directory.**

```
jenny@ubuntu:~$ cd /home
```

```
jenny@ubuntu:~$ cd /home
jenny@ubuntu:/home$
```

**Step 10: List all directories with their respective permissions.**

```
jenny@ubuntu:/home$ ls -l
```

```
jenny@ubuntu:/home$ ls -l
total 12
drwxr-xr-x 17 cisco cisco 4096 Jun 28 18:04 cisco
drwxr-xr-x  3 jenny jenny 4096 Jun 28 23:52 jenny
drwx---r-x  3 joe  joe  4096 Jun 29 00:32 joe
jenny@ubuntu:/home$
```

**Step 11: Change to the /home/joe directory and list the content of the directory.**

```
jenny@ubuntu:/home$ cd joe
jenny@ubuntu:/home/joe$ ls -l
```

```
jenny@ubuntu:/home$ cd joe
jenny@ubuntu:/home/joe$ ls -l
total 12
-rw-r--r-- 1 joe joe 8980 Jun 28 19:18 examples.desktop
-rw-rw-r-- 1 joe joe   0 Jun 29 00:22 test.txt
jenny@ubuntu:/home/joe$
```

Notice that we are able to enter Joe’s folder and read the files within the directory. We are able to see the *test.txt* file.

**Step 12: Attempt to create a file.**

```
jenny@ubuntu:/home/joe$ touch jenny.txt
```

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

Notice we do not have permission to create the file.

**Step 13: Close all remaining windows.**