

CYSE 270: Linux System for Cybersecurity

Lab 6 – File Permission

Goal

The goal of this lab is to familiarize students with the fundamental tasks of managing user and group accounts in Linux. By completing this lab, students will gain practical experience in creating, modifying, and deleting accounts, as well as managing group memberships and permissions, which are essential skills in system administration and cybersecurity.

Submission Instructions:

- Complete all tasks on your chosen Ubuntu/Kali VM.
- Take screenshots for each numbered step as evidence of successful command execution.
- Save all your screenshots and results in a single PDF or Word document.
- Ensure that all commands are executed correctly and include detailed explanations for each step taken.

Lab 6 – File Permission

You need to configure the system to allow three users to perform the shared folder actions.

Please submit the screenshot for all the steps in a word or pdf file

Task A: Get accounts and groups ready (70 points)

Step 1. Create three groups- **employee**, **payroll**, and **admin**. (You may refer to the slides under Module 2 – Group Management)

Commands >>

1. Create the groups using the groupadd command on a single line of code
 - a. `sudo groupadd employee; sudo groupadd payroll; sudo groupadd admin`
2. Verify the results
 - a. `grep -E 'employee|payroll|admin' /etc/group`
 - b. `cut -d: -f1 /etc/group | grep -E 'employee|payroll|admin'`

```
(carl-lochstampfor@kali)-[~]  
$ sudo groupadd employee; sudo groupadd payroll; sudo groupadd admin  
  
(carl-lochstampfor@kali)-[~]  
$ grep -E 'employee|payroll|admin' /etc/group  
lpadmin:x:121:carl-lochstampfor  
employee:x:1010:  
payroll:x:1011:  
admin:x:1012:  
  
(carl-lochstampfor@kali)-[~]  
$ cut -d: -f1 /etc/group | grep -E 'employee|payroll|admin'  
lpadmin  
employee  
payroll  
admin
```

Step 2. Create three user accounts with a specified home directory for **Sophia, Olivia, and Emma**. Set the primary group for Sophia, Olivia, and Emma to "employee", "payroll", and "admin", respectively. And change their login shell to /bin/bash. **Don't forget to set their passwords.**

Commands >>

1. In one line of code: Users created with specific home directory, setting their groups respectively (Sophia >> employee; Olivia >> payroll; Emma >> admin), and changing their login shell to /bin/bash.
 - a. **sudo useradd -m -d /home/etc/XXXX -g -YYYY -s /bin/bash YYYY &&** \ (press Enter, repeat line, then exclude \ on third and final line)
 - b. **Note:** I chose to lower case all the names for simplicity within Linux.

```
(carl-lochstampfor@kali)-[~]
$ sudo useradd -m -d /home/etc/sohpia -g employee -s /bin/bash sophia 66 \
sudo useradd -m -d /home/etc/olivia -g payroll -s /bin/bash olivia 66 \
cmdand cmdand> sudo useradd -m -d /home/etc/emma -g admin -s /bin/bash emma
[sudo] password for carl-lochstampfor:
```

2. Passwords assigned to each User in one line of code.
 - a. **sudo passwd YYYY;** (repeat for remaining two users respectfully)

```
(carl-lochstampfor@kali)-[~]
$ sudo passwd sophia; sudo passwd olivia; sudo passwd emma
New password:
Retype new password:
passwd: password updated successfully
New password:
Retype new password:
passwd: password updated successfully
New password:
Retype new password:
passwd: password updated successfully
```

3. Verify Passwords are set in the system to their accounts.

- a. **getent passwd sophia; getent passwd olivia; getent passwd emma**

```
(carl-lochstampfor@kali)-[~]
$ getent passwd sophia; getent passwd olivia; getent passwd emma
sophia:x:1007:1010::/home/etc/sohpia:/bin/bash
olivia:x:1008:1011::/home/etc/olivia:/bin/bash
emma:x:1009:1012::/home/etc/emma:/bin/bash
```

4. Verify the Users are assigned to their respective Primary groups
 - a. **id YYYY** or **id sophia; id olivia; id emma**

```
(carl-lochstampfor@kali)-[~]  
$ id sophia olivia emma  
uid=1007(sophia) gid=1010(employee) groups=1010(employee)  
uid=1008(olivia) gid=1011(payroll) groups=1011(payroll)  
uid=1009(emma) gid=1012(admin) groups=1012(admin)
```

Step 3. Create a shared group called "your_midas" (replace it with your MIDAS name, **cloch001**) and set this shared group as the above accounts' secondary group. **After this step, remember to check each user's group profile.**

Commands >>

1. Add the group, cloch001
 - a. **sudo groupadd cloch001**
 - b. **getent group cloch001** (verifies group's existence)

```
(carl-lochstampfor@kali)-[~]
$ sudo groupadd cloch001

(carl-lochstampfor@kali)-[~]
$ getent group cloch001
cloch001:x:1013:
```

2. Set the shared group to the three above accounts' secondary group (Sophia, Olivia, Emma)
 - a. **sudo usermod -aG cloch001 YYYY && ** (repeat, excluding \ on third line of code)

```
(carl-lochstampfor@kali)-[~]
$ sudo usermod -aG cloch001 sophia && \
cmdand> sudo usermod -aG cloch001 olivia && \
cmdand cmdand> sudo usermod -aG cloch001 emma
```

3. Verify the Users were set to the same shared Secondary group (cloch001) without removing the Primary group.
 - a. Either **id/groups YYYY; id/groups YYYY; id/groups YYYY**
 - b. **getent group cloch001**

```
(carl-lochstampfor@kali)-[~]
$ id sophia; id olivia; id emma
uid=1007(sophia) gid=1010(employee) groups=1010(employee),1013(cloch001)
uid=1008(olivia) gid=1011 payroll groups=1011 payroll,1013(cloch001)
uid=1009(emma) gid=1012(admin) groups=1012(admin),1013(cloch001)

(carl-lochstampfor@kali)-[~]
$ groups sophia; groups olivia; groups emma
sophia : employee cloch001
olivia : payroll cloch001
emma : admin cloch001
```

```
(carl-lochstampfor@kali)-[~]
$ getent group cloch001
cloch001:x:1013:sophia,olivia,emma
```

Step 4. Create a directory named /home/cyse_project, which is to be owned by the “your_midas” group which is a shared group). **After this step, remember to check the permission of this shared directory.**

Commands >>

1. Verify present working directory.
 - a. **pwd**
2. Create the directory named /home/cyse_project.
 - a. **sudo mkdir /home/cyse_project**
3. Change group ownership of the directory to cloch001.
 - a. **sudo chgrp cloch001 /home/cyse_project**

```
(carl-lochstampfor@kali)-[~]  
$ pwd  
/home/carl-lochstampfor  
  
(carl-lochstampfor@kali)-[~]  
$ sudo mkdir /home/cyse_project  
  
(carl-lochstampfor@kali)-[~]  
$ sudo chgrp cloch001 /home/cyse_project
```

4. Verify Ownership and checked Permissions of this shared directory
 - a. **ls -ld /home/cyse_project**

```
(carl-lochstampfor@kali)-[~]  
$ ls -ld /home/cyse_project  
drwxr-xr-x 2 root cloch001 4096 Jun 28 10:42 /home/cyse_project
```

Step 5. Change the permissions of the /home/cyse_project directory to "**rw-rw-r--**" using the octal method so that only the project group members have access to this directory. **After this step, remember to check the permission of this shared directory.**

Commands >>

1. Changed the permissions of the directory.
 - a. **sudo chmod 770 /home/cyse_project**
2. Verify Ownership and checked Permissions of this shared directory
 - a. **ls -ld /home/cyse_project**



```
(carl-lochstampfor@kali)-[~]  
$ sudo chmod 770 /home/cyse_project  
  
(carl-lochstampfor@kali)-[~]  
$ ls -ld /home/cyse_project  
drwxrwx--- 2 root cloch001 4096 Jun 28 10:42 /home/cyse_project
```

Step 6. Switch to Sophia's account. Change the default permissions using octal method with **umask** command, to "**rw-r**" for Sophia when **she creates a file or directory**. Check the value of **umask**, and permission of a new file after this step.

Commands >>

1. Switch to Sophia's account.

a. **su - sophia**

```
(carl-lochstampfor@kali)-[~]  
$ su - sophia  
Password:  
(sophia@kali)-[~]  
$
```

2. Change the default permissions with umask.

a. **umask 027**

```
(sophia@kali)-[~]  
$ umask 027  
  
(sophia@kali)-[~]  
$ umask  
0027
```

3. Check the value of umask, and permission of a new file (i.e., testfile.txt).

a. **touch testfile.txt && \ls -l testfile.txt**

```
(sophia@kali)-[~]  
$ touch testfile.txt && \  
> ls -l testfile.txt  
-rw-r----- 1 sophia employee 0 Jun 28 11:27 testfile.txt
```


Step 7. Create a new file called "Sophia_homework" in the home directory of Sophia and put your name in the file as content. **After this step, remember to check the content and the permission of the new file. (ls -l Sophia_homework).**

Commands >>

1. Switch to Sophia's account (if not done already)
a. su - sophia
2. Create the new file in Sophia's home directory, putting my name into the file as content.
a. echo "Carl Lochstampfor" > ~/Sophia_homework
3. Verify the file contents.
a. cat ~/Sophia_homework
4. Verify the permission of the new file
a. ls -l ~/Sophia_homework

```
(sophia@kali)-[~]  
$ echo "Carl Lochstampfor" > ~/Sophia_homework  
  
(sophia@kali)-[~]  
$ cat ~/Sophia_homework  
Carl Lochstampfor  
  
(sophia@kali)-[~]  
$ ls -l Sophia_homework  
-rw-r----- 1 sophia employee 18 Jun 28 11:46 Sophia_homework  
  
(sophia@kali)-[~]  
$ ls -l ~/Sophia_homework  
-rw-r----- 1 sophia employee 18 Jun 28 11:46 /home/etc/sohpia/Sophia_homework
```

Step 8. Copy "Sophia_homework" to the /home/cyse_project directory. **After this step, remember to check the permission of the file in the shared directory.**

Commands >>

1. Verify I am in Sophia's account (if not done already)
 - a. **whoami**
2. Copy the file to the /home/cyse_project directory
 - a. **cp ~/Sophia_homework /home/cyse_project/**
3. Verify the file permission in the shared directory.
 - a. **ls -l /home/cyse_project/Sophia_homework**

```
(sophia@kali)-[~]  
$ whoami  
sophia  
  
(sophia@kali)-[~]  
$ cp ~/Sophia_homework /home/cyse_project/  
  
(sophia@kali)-[~]  
$ ls -l /home/cyse_project/Sophia_homework  
-rw-r----- 1 sophia employee 18 Jun 28 11:57 /home/cyse_project/Sophia_homework
```

Step 9. Switch to Emma's account. Try to read "Sophia_homework" in the /home/cyse_project Directory.

Commands >>

1. Switch to Emma's account
a. **su - emma**
2. Attempt to read the file as Emma in the directory (result = permission denied; not a member of the appropriate group)
a. **cat /home/cyse_project/Sophia_homework**
3. Verify I am in Emma's account (if not done already)
a. **whoami**

```
(sophia@kali)-[~]
$ su - emma
Password:
(emma@kali)-[~]
$ cat /home/cyse_project/Sophia_homework
cat: /home/cyse_project/Sophia_homework: Permission denied

(emma@kali)-[~]
$ whoami
emma
```

Step 10. Exit out of Emma's account and Sophia's account.

Commands >>

1. Exit out of Emma's account; exit out of Sophia's account
 - a. **exit**
2. Verify which user account and print the present directory I am in
 - a. **whoami; pwd**

```
(emma@kali)-[~]
$ exit
logout

(sophia@kali)-[~]
$ exit
logout

(carl-lochstampfor@kali)-[~]
$ whoami
carl-lochstampfor

(carl-lochstampfor@kali)-[~]
$ pwd
/home/carl-lochstampfor
```

Task B: Set SGID permission (15 points)

Step 1. Switch to root or the regular user's account. To allow group members to access the files shared in the shared directory, you need to fix the sharing issue by setting the correct **SGID** group values to **/home/cyse_project** directory.

Commands >>

1. Switch to the root/regular user's account.
a. `sudo -i`
2. Fixing/updating the group access in the shared directory. Setting the SGID bit on **/home/cyse_project**
a. `sudo chmod 2770 /home/cyse_project`

```
(carl-lochstampfor@kali)-[~]
$ sudo -i
[sudo] password for carl-lochstampfor:
(root@kali)-[~]
# sudo chmod 2770 /home/cyse_project
```

3. Setting the SGID bit on **/home/cyse_project**
a. `ls -ld /home/cyse_project`

```
(root@kali)-[~]
# ls -ld /home/cyse_project
drwxrws— 2 root cloch001 4096 Jun 28 11:57 /home/cyse_project
```

Step 2. Switch to Sophia's account. Copy "Sophia_homework" to the /home/cyse_project directory as "Sophia_homework2".

Commands >>

1. Switch to Sophia

a. **su - Sophia**

```
(root@kali)-[/home/cyse_project]
# su - sophia
(sophia@kali)-[~]
$ whoami
sophia
```

2. Copy the file to /home/cyse_project directory

a. **cp ~/Sophia_homework /home/cyse_project/Sophia_homework2**

```
(sophia@kali)-[~]
$ cp ~/Sophia_homework /home/cyse_project/Sophia_homework2
```

3. Verify the result

a. **ls -l /home/cyse_project/Sophia_homework2**

```
(sophia@kali)-[~]
$ ls -l /home/cyse_project/Sophia_homework2
-rw-r--r-- 1 sophia cloch001 18 Jun 28 12:30 /home/cyse_project/Sophia_homework2
```

Step 3. Switch to Emma's account. Try to read "Sophia_homework2" in the /home/cyse_project directory.

Commands >>

1. Switch to Emma's account
 - a. **su - emma**
2. Attempt to read the file as Emma in the directory (result = contents accessed and disclosed)
 - a. **cat /home/cyse_project/Sophia_homework2**
3. Verify I am in Emma's account (if not done already or to double-check)
 - a. **whoami**

```
(sophia@kali)-[~]
$ su - emma
Password:
(emma@kali)-[~]
$ cat /home/cyse_project/Sophia_homework2
Carl Lochstampfor

(emma@kali)-[~]
$ ls -l /home/cyse_project
total 4
-rw-r-- 1 sophia cloch001 18 Jun 28 12:30 Sophia_homework2
```

Task C: Unset SGID permissions (15 points)

Step 1. Switch to root or the regular user's account. To disallow group members to access the files in the shared folder, you need to fix the sharing issue by setting the correct SGID group values to /home/cyse_project directory to remove the group user read permission.

Commands >>

1. Exit from the existing accounts.
 - a. **exit**
2. Switch to the root account (if not done already)
 - a. **sudo -i**
3. Verify which user account and print the present directory I am in
 - a. **whoami; pwd**

```
(emma@kali)-[~]
$ exit
logout

(sophia@kali)-[~]
$ exit
logout

(root@kali)-[/home/cyse_project]
# pwd
/home/cyse_project

(root@kali)-[/home/cyse_project]
# whoami
root
```

4. Set SGID and remove all group and others' permissions
 - a. **Sudo chmod 2700 /home/cyse_project**
 - b. Verify the change:
 - i. **ls -ld /home/cyse_project**
 - ii. **stat /home/cyse_project**

```
(root@kali)-[~]
# sudo chmod 2700 /home/cyse_project

(root@kali)-[~]
# ls -ld /home/cyse_project
drwx--S--- 2 root cloch001 4096 Jun 28 17:53 /home/cyse_project

(root@kali)-[~]
# stat /home/cyse_project
File: /home/cyse_project
Size: 4096      Blocks: 8      IO Block: 4096   directory
Device: 8,1    Inode: 319092   Links: 2
Access: (2700/drwx--S---)  Uid: (  0/   root)   Gid: (1013/cloch001)
Access: 2025-06-28 18:01:55.460072717 -0400
Modify: 2025-06-28 17:53:18.552053713 -0400
Change: 2025-06-28 18:17:47.012107700 -0400
Birth: 2025-06-28 10:42:11.092156412 -0400
```


5. Remove group read (rd) permission from the directory
 - a. **Sudo chmod g-r /home/cyse_project**
6. Verify results
 - a. **ls -ld /home/cyse_project**

```
(root@kali)-[/home/cyse_project]
# sudo chmod g-r /home/cyse_project

(root@kali)-[/home/cyse_project]
# ls -ld /home/cyse_project
drwx-ws--- 2 root cloch001 4096 Jun 28 12:30 /home/cyse_project
```

Step 2. Switch to Sophia's account. Copy "Sophia_homework" to the /home/cyse_project directory as "Sophia_homework3".

Commands >>

1. Switch to Sophia's account
 - o **su - sophia**
2. Copy file to /home/cyse_project directory as YYYY3
 - o **Cp ~/Sophia_homework /home/cyse_project/Sophia_homework3**
3. Results: permission denied

```
(root@kali)-[/home]
# su - sophia
(sophia@kali)-[~]
$ cp ~/Sophia_homework /home/cyse_project/Sophia_homework3
cp: cannot stat '/home/cyse_project/Sophia_homework3': Permission denied
```

Step 3. Switch to Olivia's account. Try to read "Sophia_home3" in the /home/cyse_project directory.

Commands >>

1. Switch to Olivia's account
 - a. **su - olivia**
2. Attempt to read the file
 - a. **cat /home/cyse_project/Sophia_homework3**
3. Results: permission denied

```
(sophia@kali)-[~]
$ su - olivia
Password:
(olivia@kali)-[~]
$ cat /home/cyse_project/Sophia_homework3
cat: /home/cyse_project/Sophia_homework3: Permission denied
```

Extra credit: Sticky Bit (10 points)

Step 1. Switch to Olivia's account. Delete "Sophia_homework" in the /home/cyse_project directory.

Command >>

1. Switch to Olivia's account (or verify you are in it)
a. su - olivia (whoami)
2. Attempt to delete the file (results = permission denied)
a. rm /home/cyse_project/Sophia_homework

```
(olivia@kali)-[~]  
$ whoami  
olivia  
  
(olivia@kali)-[~]  
$ rm /home/cyse_project/Sophia_homework  
rm: cannot remove '/home/cyse_project/Sophia_homework': Permission denied
```

Step 2. Switch to root account. Set the sticky bit permission, to make files can only be removed by the owner of the file.

Command >>

1. Switch to root account
 - a. **su -**
2. Set the stick bit
 - a. **sudo chmod +t /home/cyse_project**
 - b. **sudo chmod 3700 /home/cyse_project**
3. Verify it
 - a. **ls -ld /home/cyse_project**

```
(root@kali)-[/home]
# su -
(root@kali)-[~]
# sudo chmod +t /home/cyse_project/

(root@kali)-[~]
# sudo chmod 3700 /home/cyse_project

(root@kali)-[~]
# ls -ld /home/cyse_project
drwx--S--T 2 root cloch001 4096 Jun 28 18:19 /home/cyse_project
```

Step 3. Switch to Olivia's account. Try to delete "Sophia_homework3" in the /home/cyse_project directory. Can you delete it this time? Why?

Command >>

1. Switch to Olivia's account
 - a. **su - olivia**
2. Attempt to delete the file (result = Operation not permitted)
 - a. **rm /home/cyse_project/Sophia_homework3**
3. **Reason for Operation not permitted?**
 - a. Olivia is not the owner of the file because of the sticky bit.
 - b. Only the **owner of the file**, the **owner of the directory** (root), or **root** itself can delete files inside the directory.
 - c. Thus, Olivia cannot delete the file, even if she had write access to the directory.

```
(root@kali)-[/home]
# su - olivia
(olivia@kali)-[~]
$ rm /home/cyse_project/Sophia_homework3
rm: remove write-protected regular empty file '/home/cyse_project/Sophia_homework3'? y
rm: cannot remove '/home/cyse_project/Sophia_homework3': Operation not permitted
```