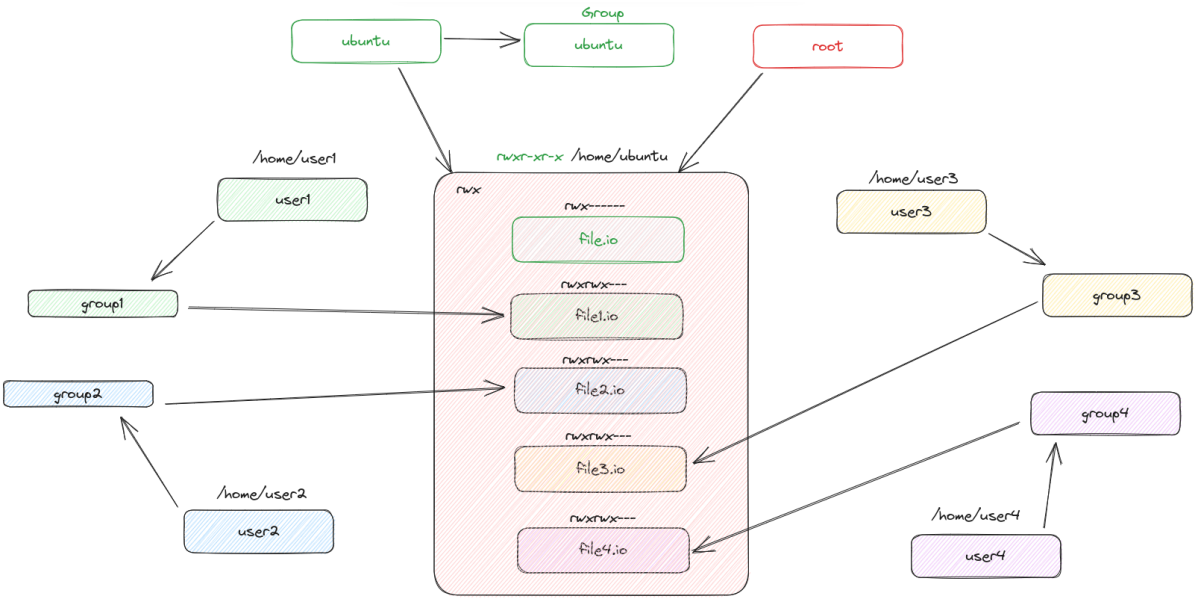
Linux File System & Permission

Contents

Linix Permission Diagram

Here is my own Linux file system and giving permission to groups and users.



Getting Started

▼ Creating Files & Groups in Linux

First of all, we are going to create files under ubuntu user.

```
ubuntu@ip-172-31-5-254:~$ whoami
ubuntu
ubuntu@ip-172-31-5-254:~$ pwd
/home/ubuntu
ubuntu@ip-172-31-5-254:~$ touch file.io file{1..4}.io
ubuntu@ip-172-31-5-254:~$ ls
file.io  file1.io  file2.io  file3.io  file4.io
ubuntu@ip-172-31-5-254:~$ ll *.io
-rw-rw-r-- 1 ubuntu ubuntu 0 Sep  2 18:25 file.io
-rw-rw-r-- 1 ubuntu ubuntu 0 Sep  2 18:25 file1.io
-rw-rw-r-- 1 ubuntu ubuntu 0 Sep  2 18:25 file2.io
-rw-rw-r-- 1 ubuntu ubuntu 0 Sep  2 18:25 file3.io
-rw-rw-r-- 1 ubuntu ubuntu 0 Sep  2 18:25 file4.io
ubuntu@ip-172-31-5-254:~$
```

Then, we are going to create groups {1-4} for Linux permission. Here is the result of creating groups.

```
ubuntu@ip-172-31-5-254:~$ tail -4 /etc/group
group1:x:1001:
group2:x:1002:
group3:x:1003:
group4:x:1004:
ubuntu@ip-172-31-5-254:~$
```

▼ Creating Users in Linux

After creating groups and files under ubuntu user, we are going to create users {1-4} including /home directory (-m command) and attah each of them to repestive groups {1-4}. Here is the command how to create users in Linux.

```
ubuntu@ip-172-31-5-254:~$ sudo useradd -m user1 -G group1 -s /bin/bash
ubuntu@ip-172-31-5-254:~$ sudo useradd -m user2 -G group2 -s /bin/bash
ubuntu@ip-172-31-5-254:~$ sudo useradd -m user3 -G group3 -s /bin/bash
ubuntu@ip-172-31-5-254:~$ sudo useradd -m user4 -G group4 -s /bin/bash
```

Then, we can check it by using the following commands how each user attached to each group.

```
ubuntu@ip-172-31-5-254:~$ tail -4 /etc/passwd
user1:x:1001:1005::/home/user1:/bin/bash
user2:x:1002:1006::/home/user2:/bin/bash
user3:x:1003:1007::/home/user3:/bin/bash
user4:x:1004:1008::/home/user4:/bin/bash
```

```
ubuntu@ip-172-31-5-254:~$ tail -8 /etc/group
group1:x:1001:user1
group2:x:1002:user2
group3:x:1003:user3
group4:x:1004:user4
user1:x:1005:
user2:x:1006:
user3:x:1007:
user4:x:1008:
```

▼ Changing Permission

In this step, we are going to change our ubuntu user directory permission first under home directory. We are going to give full access to ubuntu user and, read and execute to both group and other user. Here is the result.

```
ubuntu@ip-172-31-5-254:~$ chmod 755 /home/ubuntu/
ubuntu@ip-172-31-5-254:~$ ll /home/
total 28
drwxr-xr-x  7 root   root   4096 Sep  2 18:29 ./
drwxr-xr-x 19 root   root   4096 Sep  2 18:21 ../
drwxr-xr-x  4 ubuntu ubuntu 4096 Sep  2 18:38 ubuntu/
drwxr-x---  2 user1  user1  4096 Sep  2 18:50 user1/
drwxr-x---  2 user2  user2  4096 Sep  2 18:29 user2/
drwxr-x---  2 user3  user3  4096 Sep  2 18:29 user3/
drwxr-x---  2 user4  user4  4096 Sep  2 18:29 user4/
```

In this step, we are going to change the group owner in order to access each file which is related to each group. For example, uses1 is attached to group1 and it can only full access to file1.io. For this case, we can write these command as follow:

```
ubuntu@ip-172-31-5-254:~$ sudo chown ubuntu:group1 file1.io
ubuntu@ip-172-31-5-254:~$ sudo chown ubuntu:group2 file2.io
ubuntu@ip-172-31-5-254:~$ sudo chown ubuntu:group3 file3.io
ubuntu@ip-172-31-5-254:~$ sudo chown ubuntu:group4 file4.io
ubuntu@ip-172-31-5-254:~$ ll *.io
-rwxrwxr-- 1 ubuntu ubuntu 53 Sep  2 18:37 file.io*
-rwxrwxr-- 1 ubuntu group1 55 Sep  2 18:38 file1.io*
-rwxrwxr-- 1 ubuntu group2 52 Sep  2 18:38 file2.io*
-rwxrwxr-- 1 ubuntu group3 52 Sep  2 18:39 file3.io*
-rwxrwxr-- 1 ubuntu group4 57 Sep  2 18:40 file4.io*
```

After that, we are going to give permssion to each file (file*.io) to full access for both ubuntu (owner) and each respective group but no permission to others. We can check file permission as follow.

```
ubuntu@ip-172-31-5-254:~$ ll *.io
-rwxrwxr-- 1 ubuntu ubuntu 53 Sep  2 18:37 file.io*
-rwxrwxr-- 1 ubuntu group1 55 Sep  2 18:38 file1.io*
-rwxrwxr-- 1 ubuntu group2 52 Sep  2 18:38 file2.io*
-rwxrwxr-- 1 ubuntu group3 52 Sep  2 18:39 file3.io*
-rwxrwxr-- 1 ubuntu group4 57 Sep  2 18:40 file4.io*
ubuntu@ip-172-31-5-254:~$ chmod 770 *.io
ubuntu@ip-172-31-5-254:~$ ll *.io
-rwxrwx--- 1 ubuntu ubuntu 53 Sep  2 18:37 file.io*
-rwxrwx--- 1 ubuntu group1 55 Sep  2 18:38 file1.io*
-rwxrwx--- 1 ubuntu group2 52 Sep  2 18:38 file2.io*
-rwxrwx--- 1 ubuntu group3 52 Sep  2 18:39 file3.io*
-rwxrwx--- 1 ubuntu group4 57 Sep  2 18:40 file4.io*
```

▼ Adding Some Words in Created files

Now, we are going to put some words into each file as follow.

```
ubuntu@ip-172-31-5-254:~$ cat file.io
This file is for ubuntu,ubuntu group and root users.
ubuntu@ip-172-31-5-254:~$ cat file1.io
This file is for ubuntu and group1/user1.
But others do not have any permission.
ubuntu@ip-172-31-5-254:~$ cat file2.io
This file is for ubuntu, group2/user2.
But others do not have any permissions.
ubuntu@ip-172-31-5-254:~$ cat file3.io
This file is for ubuntu, group3/user3.
But others do not have any permissions.
ubuntu@ip-172-31-5-254:~$ cat file4.io
This file is for ubuntu and group4/user4.
But others do not have any permission.
```

▼ Accessing Related File from User1

First, we need to switch ubuntu user to user1 in order to access its related file (file1.io).

- Here is user1 information.

```
ubuntu@ip-172-31-5-254:~$ su user1
Password:
user1@ip-172-31-5-254:/home/ubuntu$ whoami
user1
user1@ip-172-31-5-254:/home/ubuntu$ groups
user1 group1
user1@ip-172-31-5-254:/home/ubuntu$ cd
user1@ip-172-31-5-254:~$ pwd
/home/user1
user1@ip-172-31-5-254:~$ ll /home/
total 28
drwxr-xr-x  7 root   root   4096 Sep  2 18:29 ./
drwxr-xr-x 19 root   root   4096 Sep  2 18:21 ../
drwx--x--x  4 ubuntu ubuntu 4096 Sep  2 18:38 ubuntu/
drwxr-x---  2 user1  user1  4096 Sep  2 18:50 user1/
drwxr-x---  2 user2  user2  4096 Sep  2 18:29 user2/
drwxr-x---  2 user3  user3  4096 Sep  2 18:29 user3/
drwxr-x---  2 user4  user4  4096 Sep  2 18:29 user4/
user1@ip-172-31-5-254:~$ cd /home/ubuntu/
user1@ip-172-31-5-254:/home/ubuntu$ ls
file.io  file1.io  file2.io  file3.io  file4.io
user1@ip-172-31-5-254:/home/ubuntu$ ll *.io
-rwxrwx--- 1 ubuntu ubuntu 53 Sep  2 18:37 file.io*
-rwxrwx--- 1 ubuntu group1 55 Sep  2 18:38 file1.io*
-rwxrwx--- 1 ubuntu group2 52 Sep  2 18:38 file2.io*
-rwxrwx--- 1 ubuntu group3 52 Sep  2 18:39 file3.io*
-rwxrwx--- 1 ubuntu group4 57 Sep  2 18:40 file4.io*
```

- User1 can acees file1.io successfully but not other files such as file.io, file2.io.

```
user1@ip-172-31-5-254:/home/ubuntu$ cat file.io
cat: file.io: Permission denied
user1@ip-172-31-5-254:/home/ubuntu$ cat file1.io
This file is for ubuntu and group1 and other can read.
user1@ip-172-31-5-254:/home/ubuntu$ cat file.io
cat: file.io: Permission denied
user1@ip-172-31-5-254:/home/ubuntu$ cat file1.io
This file is for ubuntu and group1/user1.
But others do not have any permission.
user1@ip-172-31-5-254:/home/ubuntu$ cat file2.io
cat: file2.io: Permission denied
user1@ip-172-31-5-254:/home/ubuntu$ cat file3.io
cat: file3.io: Permission denied
user1@ip-172-31-5-254:/home/ubuntu$ cat file4.io
cat: file4.io: Permission denied
```

▼ Accessing Related File from User2

Next, we need to switch ubuntu user to user2 in order to access its related file (file2.io).

- Here is user2 information.

```
ubuntu@ip-172-31-5-254:~$ su user2
Password:
user2@ip-172-31-5-254:/home/ubuntu$ whoami
user2
user2@ip-172-31-5-254:/home/ubuntu$ groups
user2 group2
user2@ip-172-31-5-254:/home/ubuntu$ cd
user2@ip-172-31-5-254:~$ pwd
/home/user2
user2@ip-172-31-5-254:~$ ll /home/ubuntu/*.io
-rwxrwx--- 1 ubuntu ubuntu 53 Sep  2 18:37 /home/ubuntu/file.io*
-rwxrwx--- 1 ubuntu group1 81 Sep  2 18:56 /home/ubuntu/file1.io*
-rwxrwx--- 1 ubuntu group2 79 Sep  2 18:56 /home/ubuntu/file2.io*
-rwxrwx--- 1 ubuntu group3 79 Sep  2 18:57 /home/ubuntu/file3.io*
-rwxrwx--- 1 ubuntu group4 81 Sep  2 18:57 /home/ubuntu/file4.io*
```

- User2 can acees file2.io successfully but not other files such as file.io, file3.io.

```
user2@ip-172-31-5-254:~$ cd /home/ubuntu/
user2@ip-172-31-5-254:/home/ubuntu$ cat file.io
cat: file.io: Permission denied
user2@ip-172-31-5-254:/home/ubuntu$ cat file1.io
cat: file1.io: Permission denied
user2@ip-172-31-5-254:/home/ubuntu$ cat file2.io
This file is for ubuntu, group2/user2.
But others do not have any permissions.
user2@ip-172-31-5-254:/home/ubuntu$ cat file3.io
cat: file3.io: Permission denied
user2@ip-172-31-5-254:/home/ubuntu$ cat file4.io
cat: file4.io: Permission denied
user2@ip-172-31-5-254:/home/ubuntu$
```

▼ Accessing Related File from User3

Next, we need to switch ubuntu user to user3 in order to access its related file (file3.io).

- Here is user3 information.

```
ubuntu@ip-172-31-5-254:~$ su user3
Password:
user3@ip-172-31-5-254:/home/ubuntu$ whoami
user3
user3@ip-172-31-5-254:/home/ubuntu$ groups
user3 group3
user3@ip-172-31-5-254:/home/ubuntu$ cd
user3@ip-172-31-5-254:~$ pwd
/home/user3
```

- User3 can acees file3.io successfully but not other files such as file.io, file4.io.

```
user3@ip-172-31-5-254:/home/ubuntu$ cat file.io
cat: file.io: Permission denied
user3@ip-172-31-5-254:/home/ubuntu$ cat file1.io
cat: file1.io: Permission denied
user3@ip-172-31-5-254:/home/ubuntu$ cat file2.io
cat: file2.io: Permission denied
user3@ip-172-31-5-254:/home/ubuntu$ cat file3.io
This file is for ubuntu, group3/user3.
But others do not have any permissions.
user3@ip-172-31-5-254:/home/ubuntu$ cat file4.io
cat: file4.io: Permission denied
```

- In addition, we had given full permission to each group to its related file. Therefore, we can also write its related file but not others which are not related to this group. For example, user3 can edit file3.io but not others such as file.io, file4.io.

```
user3@ip-172-31-5-254:/home/ubuntu$ echo "Write Test in group3/user3" >> file1.io
bash: file1.io: Permission denied
user3@ip-172-31-5-254:/home/ubuntu$ echo "Write Test in group3/user3" >> file.io
bash: file.io: Permission denied
user3@ip-172-31-5-254:/home/ubuntu$ echo "Write Test in group3/user3" >> file3.io
user3@ip-172-31-5-254:/home/ubuntu$ cat file3.io
This file is for ubuntu, group3/user3.
But others do not have any permissions.
Write Test in group3/user3
```

▼ Accessing Related File from User4

Finally, we need to switch ubuntu user to user4 in order to access its related file (file4.io).

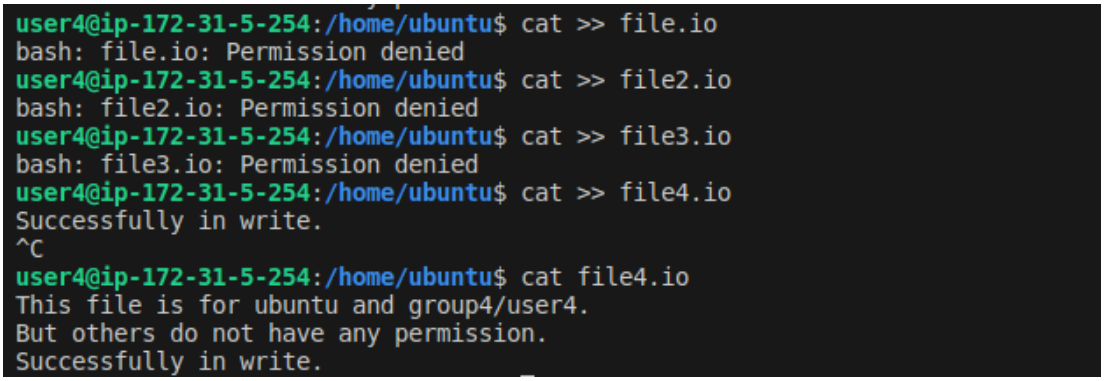
- Here is user4 information.

```
ubuntu@ip-172-31-5-254:~$ su user4
Password:
user4@ip-172-31-5-254:/home/ubuntu$ cd
user4@ip-172-31-5-254:~$ whoami
user4
user4@ip-172-31-5-254:~$ groups
user4 group4
user4@ip-172-31-5-254:~$ pwd
/home/user4
user4@ip-172-31-5-254:~$ ll /home/ubuntu/*.io
-rwxrwx--- 1 ubuntu ubuntu  53 Sep  2 18:37 /home/ubuntu/file.io*
-rwxrwx--- 1 ubuntu group1  81 Sep  2 18:56 /home/ubuntu/file1.io*
-rwxrwx--- 1 ubuntu group2  79 Sep  2 18:56 /home/ubuntu/file2.io*
-rwxrwx--- 1 ubuntu group3 106 Sep  2 19:06 /home/ubuntu/file3.io*
-rwxrwx--- 1 ubuntu group4 104 Sep  2 19:10 /home/ubuntu/file4.io*
```

- User4 can acees file4.io successfully but not other files such as file.io, file3.io.

```
user4@ip-172-31-5-254:/home/ubuntu$ ls
file.io  file1.io  file2.io  file3.io  file4.io
user4@ip-172-31-5-254:/home/ubuntu$ cat file.io
cat: file.io: Permission denied
user4@ip-172-31-5-254:/home/ubuntu$ cat file1.io
cat: file1.io: Permission denied
user4@ip-172-31-5-254:/home/ubuntu$ cat file2.io
cat: file2.io: Permission denied
user4@ip-172-31-5-254:/home/ubuntu$ cat file3.io
cat: file3.io: Permission denied
user4@ip-172-31-5-254:/home/ubuntu$ cat file4.io
This file is for ubuntu and group4/user4.
But others do not have any permission.
```

- Successfully full access in user4 to file4.io.


user4@ip-172-31-5-254:/home/ubuntu$ cat >> file.io
bash: file.io: Permission denied
user4@ip-172-31-5-254:/home/ubuntu$ cat >> file2.io
bash: file2.io: Permission denied
user4@ip-172-31-5-254:/home/ubuntu$ cat >> file3.io
bash: file3.io: Permission denied
user4@ip-172-31-5-254:/home/ubuntu$ cat >> file4.io
Successfully in write.
^C
user4@ip-172-31-5-254:/home/ubuntu$ cat file4.io
This file is for ubuntu and group4/user4.
But others do not have any permission.
Successfully in write.