File permissions in Linux

Project description

Linux commands used for managing permissions for files and directories in /home/researcher2/projects/ to remove unauthorized access and ensure data is accessible on need to know basis.

Check file and directory details

```
researcher2@c43cac7c4af2:~$ pwd
/home/researcher2
researcher2@c43cac7c4af2:~$ ls
projects
researcher2@c43cac7c4af2:~$ cd projects
researcher2@c43cac7c4af2:~/projects$ ls -la
total 32
drwxr-xr-x 3 researcher2 research_team 4096 Oct 10 21:14 .
drwxr-xr-x 3 researcher2 research_team 4096 Oct 10 21:17 ..
-rw--w---- 1 researcher2 research_team   46 Oct 10 21:14 .project_x.tx
t
drwx--x--- 2 researcher2 research_team 4096 Oct 10 21:14 drafts
-rw-rw-rw- 1 researcher2 research_team   46 Oct 10 21:14 project_k.txt
-rw-r----- 1 researcher2 research_team   46 Oct 10 21:14 project_m.txt
-rw-rw-r-- 1 researcher2 research_team   46 Oct 10 21:14 project_r.txt
-rw-rw-r-- 1 researcher2 research_team   46 Oct 10 21:14 project_t.txt
researcher2@c43cac7c4af2:~/projects$
```

The ls -la command was used to list the files and directories in /home/researcher2/projects/ directory. The ls command is used for listing files and directories. The argument -l is used to list the permissions for the files and directories. The character a in the command is used to display any hidden files or directories. After running the command, we can see the files in the directory such as project_k.txt, project_m.txt, project_r.txt, and project_t.txt. There is also a hidden file with the name .projects_x.tx. All the hidden files are represented with a dot (.) before the name. Apart from files, there is a drafts directory in the projects directory.

Describe the permissions string

```
researcher2@c43cac7c4af2:~$ pwd
/home/researcher2
researcher2@c43cac7c4af2:~$ ls
projects
researcher2@c43cac7c4af2:~$ cd projects
researcher2@c43cac7c4af2:~/projects$ ls -la
total 32
drwxr-xr-x 3 researcher2 research_team 4096 Oct 10 21:14 .
drwxr-xr-x 3 researcher2 research_team 4096 Oct 10 21:17 ..
-rw--w---- 1 researcher2 research_team   46 Oct 10 21:14 .project_x.tx
t
drwx--x--- 2 researcher2 research_team 4096 Oct 10 21:14 drafts
-rw-rw-rw- 1 researcher2 research_team   46 Oct 10 21:14 project_k.txt
-rw-r----- 1 researcher2 research_team   46 Oct 10 21:14 project_m.txt
-rw-rw-r-- 1 researcher2 research_team   46 Oct 10 21:14 project_r.txt
-rw-rw-r-- 1 researcher2 research_team   46 Oct 10 21:14 project_t.txt
researcher2@c43cac7c4af2:~/projects$
```

The permission string on a file or directory is 10 characters long string that gives information about the permissions owners have to a file or directory.

In the above example, the command line for drafts directory (highlighted in yellow) starts with permission string drwx--x---.

d- The first character of the permission string is d which stands for directory. The permission string for a file starts with hyphen (-) character.

The next 3 characters rwx (i.e., 2nd, 3rd, 4th) in the strings shows us the user permissions. The user in the example is researcher 2 and user of drafts directory has permission to read, write and execute.

After user permissions, the next 3 characters - - x (i.e., 5th, 6th, 7th) represents the permissions for the group i.e., research_team. The research_team group has only execute permissions to the draft directory.

Finally, the last 3 characters - - -(8th, 9th, 10th) represents the permissions for the other users in the system. In the example, no other users have any permissions to the draft directory.

There are three types of owners:

1. User : The owner who is the creato of the file

2. Group: The user is usually part of a group. A group consists of several users
3. Other: All the other users in a system is part of this owner type

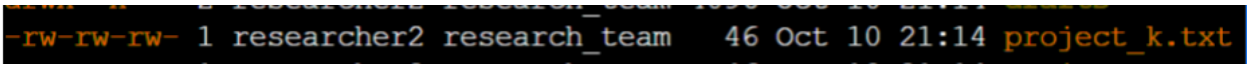
There are three types of permissions on a file or directory:

1. Read - Allows you read the content of the file. Read permission to a directory allows owner to read all the files in the directory.
2. Write- Allows you to modify or change the file. Write permission to a directory allows owner to create new files in the directory
3. Execute- Allows you to to execute a file if it is executable. Executable permission to a directory allows owner to enter into the directory and access its files.

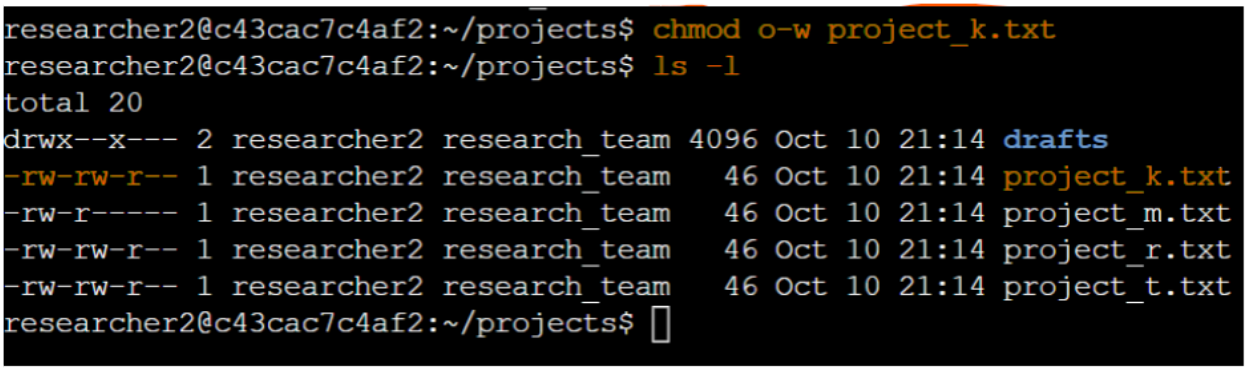
Change file permissions

1. Permissions for project_k.txt

The permission string for file project_k.txt shows that the apart from the user of the file adn the group, the other owner also have write permission which means anyone on the system can make changes to the file.



To change the permissions for other user, chmod o-w project_k.txt command was used.
The first argument of chmod command is o-w. The letter o in the argument stands for other user type and w stands for write permission. This argument o-w is used to take out write permissions for project_k.txt file.



2. Permissions for project_m.txt

The user had read and write permissions for the file project_m.txt. The group also had read permissions for the file which needed to be taken out.

```
-rw-r----- 1 researcher2 research_team   46 Oct 10 21:14 project_m.txt
```

In this case, chmod g-r projects_m.txt command was used to take out the read permission from the group so only the user have access to the file. The g in the argument stands for group and r stands for read permission.

```
researcher2@c43cac7c4af2:~/projects$ chmod g-r project_m.txt
researcher2@c43cac7c4af2:~/projects$ ls -l
total 20
drwx--x--- 2 researcher2 research_team 4096 Oct 10 21:14 drafts
-rw-rw-r-- 1 researcher2 research_team   46 Oct 10 21:14 project_k.txt
-rw------- 1 researcher2 research_team   46 Oct 10 21:14 project_m.txt
-rw-rw-r-- 1 researcher2 research_team   46 Oct 10 21:14 project_r.txt
-rw-rw-r-- 1 researcher2 research_team   46 Oct 10 21:14 project_t.txt
```

Change file permissions on a hidden file

In projects directory, ls -la command was used to list all the files and directories including hidden ones. After running the command, the output showed a hidden file with the name **.project_x.txt**. The permission string fro the file showed that both the user and the group had write permission.

```
researcher2@c43cac7c4af2:~/projects$ ls -la
total 32
drwxr-xr-x 3 researcher2 research_team 4096 Oct 10 21:14 .
drwxr-xr-x 3 researcher2 research_team 4096 Oct 10 21:17 ..
-rw--w---- 1 researcher2 research_team   46 Oct 10 21:14 .project_x.tx
t
drwx--x--- 2 researcher2 research_team 4096 Oct 10 21:14 drafts
-rw-rw-r-- 1 researcher2 research_team   46 Oct 10 21:14 project_k.txt
-rw------- 1 researcher2 research_team   46 Oct 10 21:14 project_m.txt
-rw-rw-r-- 1 researcher2 research_team   46 Oct 10 21:14 project_r.txt
-rw-rw-r-- 1 researcher2 research_team   46 Oct 10 21:14 project_t.txt
```

In this step, the permissions for the .project_x.txt file were changed so that both the user and the group only have read permissions so that no one can make changes tothe file. The command chmod u=r,g=r .project_x.txt was used. Alternatively, we could have also used chmod u-w,g+r,g-w .project_x.txt. In both cases the result would have been the same i.e., both user and group would only have read permission for the file.

```
researcher2@c43cac7c4af2:~/projects$ chmod u=r,g=r .project_x.txt
```

After the changing the permissions, ls -la command was used to list files to make sure the change took place.

```
researcher2@c43cac7c4af2:~/projects$ chmod u=r,g=r .project_x.txt
researcher2@c43cac7c4af2:~/projects$ ls -la
total 32
drwxr-xr-x 3 researcher2 research_team 4096 Oct 10 21:14 .
drwxr-xr-x 3 researcher2 research_team 4096 Oct 10 21:17 ..
-r--r----- 1 researcher2 research_team   46 Oct 10 21:14 .project_x.tx
t
drwx--x--- 2 researcher2 research_team 4096 Oct 10 21:14 drafts
-rw-rw-r-- 1 researcher2 research_team   46 Oct 10 21:14 project_k.txt
-rw------- 1 researcher2 research_team   46 Oct 10 21:14 project_m.txt
-rw-rw-r-- 1 researcher2 research_team   46 Oct 10 21:14 project_r.txt
-rw-rw-r-- 1 researcher2 research_team   46 Oct 10 21:14 project_t.txt
```

Change directory permissions

In /home/reasearcher2/projects/ directory, ls -l command was used to list the files and directories, alongwith, the permissions. The command showed that the group had the execute permission for the drafts directory which was for the personal use of the user only. In this case, chmod g-x drafts command was used to take away the execute permission from the group.

```
researcher2@c43cac7c4af2:~/projects$ ls -l
total 20
drwx--x--- 2 researcher2 research_team 4096 Oct 10 21:14 drafts
-rw-rw-r-- 1 researcher2 research_team   46 Oct 10 21:14 project_k.txt
-rw------- 1 researcher2 research_team   46 Oct 10 21:14 project_m.txt
-rw-rw-r-- 1 researcher2 research_team   46 Oct 10 21:14 project_r.txt
-rw-rw-r-- 1 researcher2 research_team   46 Oct 10 21:14 project_t.txt
researcher2@c43cac7c4af2:~/projects$ chmod g-x drafts
researcher2@c43cac7c4af2:~/projects$ ls -l
total 20
drwx------ 2 researcher2 research_team 4096 Oct 10 21:14 drafts
-rw-rw-r-- 1 researcher2 research_team   46 Oct 10 21:14 project_k.txt
-rw------- 1 researcher2 research_team   46 Oct 10 21:14 project_m.txt
-rw-rw-r-- 1 researcher2 research_team   46 Oct 10 21:14 project_r.txt
-rw-rw-r-- 1 researcher2 research_team   46 Oct 10 21:14 project_t.txt
```

Summary

In this project, the command ls -l and ls -la was used to list normal alongwith, hidden files and directories with permission string for various users. The permissions for certain files and directories were altered using chmod command to prevent unauthorized access.