

# File permissions in Linux

## Project description

I'm tasked with examining and managing the permissions on the file in `/home/researcher2/projects` directory for the `researcher2` user for a particular organization. The current permissions within the organization do not currently follow the principle of least privilege, and in general, do not reflect the level of authorization that should be given to certain users.

## Check file and directory details

The terminal shows how I determined my current directory, `Projects`, and accessed the current permissions within the files using the Linux command `ls -l`.

```
researcher2@cbed12a4cba4:~$ cd /home/researcher2/projects
researcher2@cbed12a4cba4:~/projects$ pwd
/home/researcher2/projects
researcher2@cbed12a4cba4:~/projects$ ls -l
total 20
drwx--x--- 2 researcher2 research_team 4096 May 27 01:11 drafts
-rw-rw-rw- 1 researcher2 research_team  46 May 27 01:11 project_k.txt
-rw-r----- 1 researcher2 research_team  46 May 27 01:11 project_m.txt
-rw-rw-r-- 1 researcher2 research_team  46 May 27 01:11 project_r.txt
-rw-rw-r-- 1 researcher2 research_team  46 May 27 01:11 project_t.txt
researcher2@cbed12a4cba4:~/projects$
```

The code shows how I accessed the hidden files using the Linux Command `ls -la`. It was then determined that the hidden file was `.project_x.txt`, as it starts with a dot.

```
researcher2@cbed12a4cba4:~/projects$ ls -la
total 32
drwxr-xr-x 3 researcher2 research_team 4096 May 27 01:11 .
drwxr-xr-x 3 researcher2 research_team 4096 May 27 01:33 ..
-rw--w---- 1 researcher2 research_team  46 May 27 01:11 .project_x.txt
drwx--x--- 2 researcher2 research_team 4096 May 27 01:11 drafts
-rw-rw-rw- 1 researcher2 research_team  46 May 27 01:11 project_k.txt
-rw-r----- 1 researcher2 research_team  46 May 27 01:11 project_m.txt
-rw-rw-r-- 1 researcher2 research_team  46 May 27 01:11 project_r.txt
-rw-rw-r-- 1 researcher2 research_team  46 May 27 01:11 project_t.txt
researcher2@cbed12a4cba4:~/projects$
```

## Describe the permissions string

The 10-character string can be used to determine who is authorized to access the file and what authorization they have.

- The **1st character** can either be a `d` or a hyphen (`-`); this determines the file type. A `d` indicates a directory, and a hyphen (`-`) indicates it's a regular file.
- The **2nd - 4th** character indicates the user permissions: a `r` indicates reading permission, a `w` indicates writing permission, and `x` indicates execute. If any of these characters are a hyphen (`-`), the user does not have that permission.
- The **5th - 7th** characters indicate the group's permission. The same rules apply as described for the 2nd - 4th character.
- The **8th - 10th** characters indicate others' permission. The same rules apply as described for 2nd - 4th.

For example, for the hidden file `.project_x.txt`, the file permissions are `-rw--w----`.

The file permission indicates that the `.project_x.txt` is a file and not a directory.

Furthermore, the file has read and write permission for the user, write permission for the group, and no permission for others.

## Change file permissions

The terminal shows that I am determining whether `project_k.txt` has write permission granted to other users. The following command, `chmod o-w project_k.txt`, shows me removing write permission from `project_k.txt`, as it was determined that other users do in fact have write permission. Furthermore, it was determined that `project_m.txt` had

unauthorized read permission for group users. The following command, `chmod g-r project_m.txt`, shows me removing read permission from `project_m.txt`.

```
researcher2@cbed12a4cba4:~/projects$ ls -la
total 32
drwxr-xr-x 3 researcher2 research_team 4096 May 27 01:11 .
drwxr-xr-x 3 researcher2 research_team 4096 May 27 01:33 ..
-rw--w---- 1 researcher2 research_team  46 May 27 01:11 .project_x.txt
drwx--x--- 2 researcher2 research_team 4096 May 27 01:11 drafts
-rw-rw-rw- 1 researcher2 research_team  46 May 27 01:11 project_k.txt
-rw-r----- 1 researcher2 research_team  46 May 27 01:11 project_m.txt
-rw-rw-r-- 1 researcher2 research_team  46 May 27 01:11 project_r.txt
-rw-rw-r-- 1 researcher2 research_team  46 May 27 01:11 project_t.txt
researcher2@cbed12a4cba4:~/projects$ chmod o-w project_k.txt
researcher2@cbed12a4cba4:~/projects$ chmod g-r project_m.txt
researcher2@cbed12a4cba4:~/projects$
```

## Change file permissions on a hidden file

The terminal shows me accessing all the permissions, including the hidden files in the project directory, using the command `ls -la`. The terminal shows me identifying that the hidden file `.project_x.txt` had unauthorized write permissions for both the user and the group. The following commands, `chmod u-w .project_x.txt` and `chmod g-w .project_x.txt`, show me removing the permissions. Lastly, the command `chmod g+r .project_x.txt` shows me adding the read command to the user.

```

researcher2@cbed12a4cba4:~/projects$ ls -la
total 32
drwxr-xr-x 3 researcher2 research_team 4096 May 27 01:11 .
drwxr-xr-x 3 researcher2 research_team 4096 May 27 01:33 ..
-rw--w---- 1 researcher2 research_team  46 May 27 01:11 .project_x.txt
drwx--x--- 2 researcher2 research_team 4096 May 27 01:11 drafts
-rw-rw-r-- 1 researcher2 research_team  46 May 27 01:11 project_k.txt
-rw----- 1 researcher2 research_team  46 May 27 01:11 project_m.txt
-rw-rw-r-- 1 researcher2 research_team  46 May 27 01:11 project_r.txt
-rw-rw-r-- 1 researcher2 research_team  46 May 27 01:11 project_t.txt
researcher2@cbed12a4cba4:~/projects$ chmod u-w .project_x.txt
researcher2@cbed12a4cba4:~/projects$ chmod g-w .project_x.txt
researcher2@cbed12a4cba4:~/projects$ ls -la
total 32
drwxr-xr-x 3 researcher2 research_team 4096 May 27 01:11 .
drwxr-xr-x 3 researcher2 research_team 4096 May 27 01:33 ..
-r----- 1 researcher2 research_team  46 May 27 01:11 .project_x.txt
drwx--x--- 2 researcher2 research_team 4096 May 27 01:11 drafts
-rw-rw-r-- 1 researcher2 research_team  46 May 27 01:11 project_k.txt
-rw----- 1 researcher2 research_team  46 May 27 01:11 project_m.txt
-rw-rw-r-- 1 researcher2 research_team  46 May 27 01:11 project_r.txt
-rw-rw-r-- 1 researcher2 research_team  46 May 27 01:11 project_t.txt
researcher2@cbed12a4cba4:~/projects$ chmod g+r .project_x.txt
researcher2@cbed12a4cba4:~/projects$ █

```

## Change directory permissions

The terminal shows me determining which users should have access to the `drafts` subdirectory. It was determined that groups had unauthorized access to the `drafts` subdirectory. The following command, `chmod g-x drafts`, shows me removing access from the user groups.

```
researcher2@49b73cee4a12:~/projects$ ls -l
total 20
drwx--x--- 2 researcher2 research_team 4096 May 27 02:27 drafts
-rw-rw-r-- 1 researcher2 research_team  46 May 27 02:27 project_k.txt
-rw----- 1 researcher2 research_team  46 May 27 02:27 project_m.txt
-rw-rw-r-- 1 researcher2 research_team  46 May 27 02:27 project_r.txt
-rw-rw-r-- 1 researcher2 research_team  46 May 27 02:27 project_t.txt
researcher2@49b73cee4a12:~/projects$ chmod g-x drafts
researcher2@49b73cee4a12:~/projects$ ls -la
total 32
drwxr-xr-x 3 researcher2 research_team 4096 May 27 02:27 .
drwxr-xr-x 3 researcher2 research_team 4096 May 27 02:51 ..
-r--r----- 1 researcher2 research_team  46 May 27 02:27 .project_x.txt
drwx----- 2 researcher2 research_team 4096 May 27 02:27 drafts
-rw-rw-r-- 1 researcher2 research_team  46 May 27 02:27 project_k.txt
-rw-rw-r-- 1 researcher2 research_team  46 May 27 02:27 project_m.txt
-rw-rw-r-- 1 researcher2 research_team  46 May 27 02:27 project_r.txt
-rw-rw-r-- 1 researcher2 research_team  46 May 27 02:27 project_t.txt
researcher2@49b73cee4a12:~/projects$ █
```

## Summary

During this activity, I used the `ls -l` and `ls -la` command to access the permissions of files and directories. During the activity i used the command, `chmod` multiple times to add or remove privileges from files and directories.