

## File permissions in Linux

### Project description

The research team at my organization needs to updated the file permissions for certain files and directories within the projects directory. I'm responsible for reviewing and adjusting permissions to align with the intended authorization and enhance system security.

To complete this task, I performed the following tasks:

### Check file and directory details

The following code demonstrates how I used Linux commands to determine the existing permissions set for a specific directory in the file system

```
researcher2@b1c4d57603c4:~$ pwd
/home/researcher2
researcher2@b1c4d57603c4:~$ ls
projects
researcher2@b1c4d57603c4:~$ cd projects
researcher2@b1c4d57603c4:~/projects$ ls
drafts project_k.txt project_m.txt project_r.txt project_t.txt
researcher2@b1c4d57603c4:~/projects$ ls -l
total 20
drwx--x--- 2 researcher2 research_team 4096 Oct 17 14:12 drafts
-rw-rw-rw- 1 researcher2 research_team  46 Oct 17 14:12 project_k.txt
-rw-r----- 1 researcher2 research_team  46 Oct 17 14:12 project_m.txt
-rw-rw-r-- 1 researcher2 research_team  46 Oct 17 14:12 project_r.txt
-rw-rw-r-- 1 researcher2 research_team  46 Oct 17 14:12 project_t.txt
researcher2@b1c4d57603c4:~/projects$ ls -la
total 32
drwxr-xr-x 3 researcher2 research_team 4096 Oct 17 14:12 .
drwxr-xr-x 3 researcher2 research_team 4096 Oct 17 14:47 ..
-rw--w---- 1 researcher2 research_team  46 Oct 17 14:12 .project_x.txt
drwx--x--- 2 researcher2 research_team 4096 Oct 17 14:12 drafts
-rw-rw-rw- 1 researcher2 research_team  46 Oct 17 14:12 project_k.txt
-rw-r----- 1 researcher2 research_team  46 Oct 17 14:12 project_m.txt
-rw-rw-r-- 1 researcher2 research_team  46 Oct 17 14:12 project_r.txt
-rw-rw-r-- 1 researcher2 research_team  46 Oct 17 14:12 project_t.txt
researcher2@b1c4d57603c4:~/projects$
```

The first line of the screenshot displays the command I entered `pwd` command prints the working directory onto the screen.

Then I used `cd` command to navigate to projects directory and then I used the `ls` command with the `-l` option to display a detailed listing of the file contents. The detail returned weren't enough, I also wanted to see the hidden files so I used the `ls` command with the `-la` option. The code lists all contents of the projects directory.

The output of my command indicates that there is one directory named `drafts`, one hidden file named `.project_x.txt`, and five other project files.

The 10-character string in the first column represents the permissions set on each file or directory.

### Describe the permissions string

The 10-character string can be deconstructed to determine who is authorized to access the file and their specific permissions. The characters and what they represent are as follows:

- **1st character:** This character is either a `d` or hyphen (`-`) and indicates the file type. If it's a `d`, it's a directory. If it's a hyphen (`-`), it's a regular file.
- **2nd-4th characters:** These characters indicate the read (`r`), write (`w`), and execute (`x`) permissions for the user. When one of these characters is a hyphen (`-`) instead, it indicates that this permission is not granted to the user.
- **5th-7th characters:** These characters indicate the read (`r`), write (`w`), and execute (`x`) permissions for the group. When one of these characters is a hyphen (`-`) instead, it indicates that this permission is not granted for the group.
- **8th-10th characters:** These characters indicate the read (`r`), write (`w`), and execute (`x`) permissions for other. This owner type consists of all other users on the system apart from the user and the group. When one of these characters is a hyphen (`-`) instead, that indicates that this permission is not granted for other.

For examples the permissions for `drafts` are: `drwx--x---`

Since the first character is a `d` indicates is a directory, if it was a file we will see a hyphen (`-`) at the beginning

From 2 to 4 refers to the user, which in this case has permission to read, write and execute, then we have the group that doesn't have permission to read and write (we see a hyphen instead of `r` or `w`) but has permission to execute.

Then we have other that don't have any permission.

### Change file permissions

The organization determined that other shouldn't have write access to any of their files. To comply with this, I referred to the file permissions that I previously returned. I determined `project_k.txt` must have the write access removed for other.

The following code demonstrates how I used Linux commands to do this:

```
researcher2@b1c4d57603c4:~/projects$ chmod o-w project_k.txt
researcher2@b1c4d57603c4:~/projects$ ls -la
total 32
drwxr-xr-x 3 researcher2 research_team 4096 Oct 17 14:12 .
drwxr-xr-x 3 researcher2 research_team 4096 Oct 17 14:47 ..
-rw--w---- 1 researcher2 research_team  46 Oct 17 14:12 .project_x.txt
drwx--x--- 2 researcher2 research_team 4096 Oct 17 14:12 drafts
-rw-rw-r-- 1 researcher2 research_team  46 Oct 17 14:12 project_k.txt
-rw-r----- 1 researcher2 research_team  46 Oct 17 14:12 project_m.txt
-rw-rw-r-- 1 researcher2 research_team  46 Oct 17 14:12 project_r.txt
-rw-rw-r-- 1 researcher2 research_team  46 Oct 17 14:12 project_t.txt
researcher2@b1c4d57603c4:~/projects$
```

The first two lines of the screenshot display the commands I entered, and the other lines display the output of the second command. The `chmod` command changes the permissions on files and directories. The first argument indicates what permissions should be changed, and the second argument specifies the file or directory. In this example, I removed write permissions from other for the `project_k.txt` file. After this, I used `ls -la` to review the updates I made.

### Change file permissions on a hidden file

The research team at my organization recently archived `project_x.txt`. They do not want anyone to have write access to this project, but the user and group should have read access.

The following code demonstrates how I used Linux commands to change the permissions:

```
researcher2@b1c4d57603c4:~/projects$ chmod u=r,g=r .project_x.txt
researcher2@b1c4d57603c4:~/projects$ ls -la
total 32
drwxr-xr-x 3 researcher2 research_team 4096 Oct 17 14:12 .
drwxr-xr-x 3 researcher2 research_team 4096 Oct 17 14:47 ..
-r--r----- 1 researcher2 research_team  46 Oct 17 14:12 .project_x.txt
drwx--x--- 2 researcher2 research_team 4096 Oct 17 14:12 drafts
-rw-rw-r-- 1 researcher2 research_team  46 Oct 17 14:12 project_k.txt
-rw-r----- 1 researcher2 research_team  46 Oct 17 14:12 project_m.txt
-rw-rw-r-- 1 researcher2 research_team  46 Oct 17 14:12 project_r.txt
-rw-rw-r-- 1 researcher2 research_team  46 Oct 17 14:12 project_t.txt
researcher2@b1c4d57603c4:~/projects$
```

The first two lines of the screenshot display the commands I entered, and the other lines display the output of the second command. I know `.project_x.txt` is a hidden file because it starts with a period (.). In this example, I removed write permissions from the user and group, and added read permissions to the group. I removed write permissions from the user and from the group, and added read permissions to the group by using `u=r` and `g=r`.

The = sets, or assigns, the permissions exactly as specified. This command overwrites existing permissions.

### Change directory permissions

My organization only wants the researcher2 user to have access to the drafts directory and its contents. This means that no one other than researcher2 should have execute permissions.

The following code demonstrates how I used Linux commands to change the permissions:

```
researcher2@b1c4d57603c4:~/projects$ chmod g-x drafts
researcher2@b1c4d57603c4:~/projects$ ls -la
total 32
drwxr-xr-x 3 researcher2 research_team 4096 Oct 17 14:12 .
drwxr-xr-x 3 researcher2 research_team 4096 Oct 17 14:47 ..
-r--r----- 1 researcher2 research_team  46 Oct 17 14:12 .project_x.txt
drwx----- 2 researcher2 research_team 4096 Oct 17 14:12 drafts
-rw-rw-r-- 1 researcher2 research_team  46 Oct 17 14:12 project_k.txt
-rw-r----- 1 researcher2 research_team  46 Oct 17 14:12 project_m.txt
-rw-rw-r-- 1 researcher2 research_team  46 Oct 17 14:12 project_r.txt
-rw-rw-r-- 1 researcher2 research_team  46 Oct 17 14:12 project_t.txt
```

The first two lines of the screenshot display the commands I entered, and the other lines display the output of the second command. I previously determined that the group had execute permissions, so I used the chmod command to remove them. The researcher2 user already had execute permissions, so they did not need to be added.

### Summary

I changed multiple permissions to match the level of authorization my organization wanted for files and directories in the projects directory. The first step in this was using ls -la to check the permissions for the directory. This informed my decisions in the following steps. I then used the chmod command multiple times to change the permissions on files and directories.