

# File permissions in Linux

## Project description

The research team at my organization needs to update file and directory permissions in the projects directory because the current settings don't match the required access levels. Reviewing and updating these permissions will improve system security. To address this, I completed 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;

The first line of the screenshot displays the command I entered, while the subsequent lines show its output. This command lists all the contents of the projects directory. I used the 'ls -la' command to obtain a detailed listing, including hidden files. The output displays one directory named 'drafts', one hidden file called '.project\_x.txt', and five other project files. The 10-character string in the first column represents the permissions assigned to each file or directory.

```
researcher2@8ecae71c0a2d:~$ pwd
/home/researcher2
researcher2@8ecae71c0a2d:~$ cd projects
researcher2@8ecae71c0a2d:~/projects$ ls -la
total 32
drwxr-xr-x 3 researcher2 research_team 4096 Jul 29 19:19 .
drwxr-xr-x 3 researcher2 research_team 4096 Jul 29 19:50 ..
-rw--w---- 1 researcher2 research_team  46 Jul 29 19:19 .project_
x.txt
drwx--x--- 2 researcher2 research_team 4096 Jul 29 19:19 drafts
-rw-rw-rw- 1 researcher2 research_team  46 Jul 29 19:19 project_k
.txt
-rw-r----- 1 researcher2 research_team  46 Jul 29 19:19 project_m
.txt
-rw-rw-r-- 1 researcher2 research_team  46 Jul 29 19:19 project_r
.txt
-rw-rw-r-- 1 researcher2 research_team  46 Jul 29 19:19 project_t
.txt
researcher2@8ecae71c0a2d:~/projects$
```

## 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 a 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 others. 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 others.

## Change file permissions

The organization determined that others 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 others.

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

```
researcher2@8ecae71c0a2d:~/projects$ chmod o-w project_k.txt
researcher2@8ecae71c0a2d:~/projects$ ls -la
total 32
drwxr-xr-x 3 researcher2 research_team 4096 Jul 29 19:19 .
drwxr-xr-x 3 researcher2 research_team 4096 Jul 29 19:50 ..
-rw--w---- 1 researcher2 research_team  46 Jul 29 19:19 .project_
x.txt
drwx--x--- 2 researcher2 research_team 4096 Jul 29 19:19 drafts
-rw-rw-r-- 1 researcher2 research_team  46 Jul 29 19:19 project_k
.txt
-rw-r----- 1 researcher2 research_team  46 Jul 29 19:19 project_m
.txt
-rw-rw-r-- 1 researcher2 research_team  46 Jul 29 19:19 project_r
.txt
-rw-rw-r-- 1 researcher2 research_team  46 Jul 29 19:19 project_t
.txt
researcher2@8ecae71c0a2d:~/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 others 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:

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 with `u-w`. Then, I removed write permissions from the group with `g-w`, and added read permissions to the group with `g+r`.

```
researcher2@8ecae71c0a2d:~/projects$ chmod u-w,g-w,g+r .project_x
.txt
researcher2@8ecae71c0a2d:~/projects$ ls -la
total 32
drwxr-xr-x 3 researcher2 research_team 4096 Jul 29 19:19 .
drwxr-xr-x 3 researcher2 research_team 4096 Jul 29 19:50 ..
-r--r----- 1 researcher2 research_team  46 Jul 29 19:19 .project_
x.txt
drwx--x--- 2 researcher2 research_team 4096 Jul 29 19:19 drafts
-rw-rw-r-- 1 researcher2 research_team  46 Jul 29 19:19 project_k
.txt
-rw-r----- 1 researcher2 research_team  46 Jul 29 19:19 project_m
.txt
-rw-rw-r-- 1 researcher2 research_team  46 Jul 29 19:19 project_r
.txt
-rw-rw-r-- 1 researcher2 research_team  46 Jul 29 19:19 project_t
.txt
researcher2@8ecae71c0a2d:~/projects$
```

## 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:

The output here displays the permission listing for several files and directories. Line 1 indicates the current directory (`projects`), and line 2 indicates the parent directory (`home`). Line 3 indicates a regular file titled `.project_x.txt`. Line 4 is the directory (`drafts`) with restricted permissions. Here you can see that only `researcher2` has execute permissions. It was 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.

```
researcher2@8ecae71c0a2d:~/projects$ chmod g-x drafts
researcher2@8ecae71c0a2d:~/projects$ ls -la
total 32
drwxr-xr-x 3 researcher2 research_team 4096 Jul 29 19:19 .
drwxr-xr-x 3 researcher2 research_team 4096 Jul 29 19:50 ..
-r--r----- 1 researcher2 research_team  46 Jul 29 19:19 .project_
x.txt
drwx----- 2 researcher2 research_team 4096 Jul 29 19:19 drafts
-rw-rw-r-- 1 researcher2 research_team  46 Jul 29 19:19 project_k
.txt
-rw-r----- 1 researcher2 research_team  46 Jul 29 19:19 project_m
.txt
-rw-rw-r-- 1 researcher2 research_team  46 Jul 29 19:19 project_r
.txt
-rw-rw-r-- 1 researcher2 research_team  46 Jul 29 19:19 project_t
.txt
researcher2@8ecae71c0a2d:~/projects$
```

## 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.

