

# File permissions in Linux

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## Project description

The research team at my organization needs to update the file permissions for certain files and directories within the projects directory. The permissions do not currently reflect the level of authorization that should be given. Checking and updating these permissions will help keep their system secure. 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@6ea3ca5a5a43:~/projects$ ls -la
total 32
drwxr-xr-x 3 researcher2 research_team 4096 Jan 24 06:45 .
drwxr-xr-x 3 researcher2 research_team 4096 Jan 24 07:00 ..
-rw--w---- 1 researcher2 research_team    46 Jan 24 06:45 .project_x.txt
drwxr-x--- 2 researcher2 research_team 4096 Jan 24 06:45 drafts
-rw-rw-rw- 1 researcher2 research_team    46 Jan 24 06:45 project_k.txt
-rw-r----- 1 researcher2 research_team    46 Jan 24 06:45 project_m.txt
-rw-rw-r-- 1 researcher2 research_team    46 Jan 24 06:45 project_r.txt
-rw-rw-r-- 1 researcher2 research_team    46 Jan 24 06:45 project_t.txt
researcher2@6ea3ca5a5a43:~/projects$ █
```

- The command used in the screenshot is **ls -la**, where the ls part of the command displays all the files of projects directory and -l displays permissions given to each file and directory, using -la includes hidden files and system entries.
- Every directory in Linux contains two built-in entries:
  - .. (current directory)
  - ... (parent directory)
- These are not user-created files; they are part of the filesystem structure.
- The output shows 1 directory named **drafts**, a hidden file named **.project\_x.txt** and four other project files.

- `[.]` represents the current directory which shows the permissions, owner, group, and metadata of the directory you are currently in. Useful for understanding whether you can read, write, or execute inside this folder.
- `[..]` represents the parent directory which displays the permissions and metadata of the directory one level above which is important for understanding whether you can navigate upward or access parent folders.

## 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 example, the file permissions for ***project\_t.txt*** are **-rw-rw-r--**. Since the first character is a hyphen **(-)**, this indicates that ***project\_t.txt*** is a file, not a directory. The second, fifth, and eighth characters are all **r**, which indicates that user, group, and other all have read permissions. The third and sixth characters are **w**, which indicates that only the user and group have write permissions. No one has execute permissions for ***project\_t.txt***.

## 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@9a31a42d27e6:~/projects$ chmod o-w project_k.txt
researcher2@9a31a42d27e6:~/projects$ ls -l
total 20
drwx--x--- 2 researcher2 research_team 4096 Jan 24 07:54 drafts
-rw-rw-r-- 1 researcher2 research_team   46 Jan 24 07:54 project_k.txt
-rw-r----- 1 researcher2 research_team   46 Jan 24 07:54 project_m.txt
-rw-rw-r-- 1 researcher2 research_team   46 Jan 24 07:54 project_r.txt
-rw-rw-r-- 1 researcher2 research_team   46 Jan 24 07:54 project_t.txt
researcher2@9a31a42d27e6:~/projects$ []
```

- The screenshot above shows the chmod command that is used to change permissions for 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@808aa29f0fe3:~/projects$ chmod u-w,g-w,g+r .project_x.txt
researcher2@808aa29f0fe3:~/projects$ ls -la
total 32
drwxr-xr-x 3 researcher2 research_team 4096 Jan 24 08:03 .
drwxr-xr-x 3 researcher2 research_team 4096 Jan 24 08:26 ..
-r--r----- 1 researcher2 research_team   46 Jan 24 08:03 .project_x.txt
drwx--x--- 2 researcher2 research_team 4096 Jan 24 08:03 drafts
-rw-rw-rw- 1 researcher2 research_team   46 Jan 24 08:03 project_k.txt
-rw-r----- 1 researcher2 research_team   46 Jan 24 08:03 project_m.txt
-rw-rw-r-- 1 researcher2 research_team   46 Jan 24 08:03 project_r.txt
-rw-rw-r-- 1 researcher2 research_team   46 Jan 24 08:03 project_t.txt
researcher2@808aa29f0fe3:~/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 with **u-w**.
- Then, I removed write permissions from the group with **g-w**, and added read permissions to the group with **g+r**.

## 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@808aa29f0fe3:~/projects$ chmod g-x drafts
researcher2@808aa29f0fe3:~/projects$ ls -la
total 32
drwxr-xr-x 3 researcher2 research_team 4096 Jan 24 08:03 .
drwxr-xr-x 3 researcher2 research_team 4096 Jan 24 08:26 ..
-r--r---- 1 researcher2 research_team 46 Jan 24 08:03 .project_x.txt
drwx----- 2 researcher2 research_team 4096 Jan 24 08:03 drafts
-rw-rw-rw- 1 researcher2 research_team 46 Jan 24 08:03 project_k.txt
-rw-r----- 1 researcher2 research_team 46 Jan 24 08:03 project_m.txt
-rw-rw-r-- 1 researcher2 research_team 46 Jan 24 08:03 project_r.txt
-rw-rw-r-- 1 researcher2 research_team 46 Jan 24 08:03 project_t.txt
researcher2@808aa29f0fe3:~/projects$ []
```

- 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.

## 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.