

# File permissions in Linux

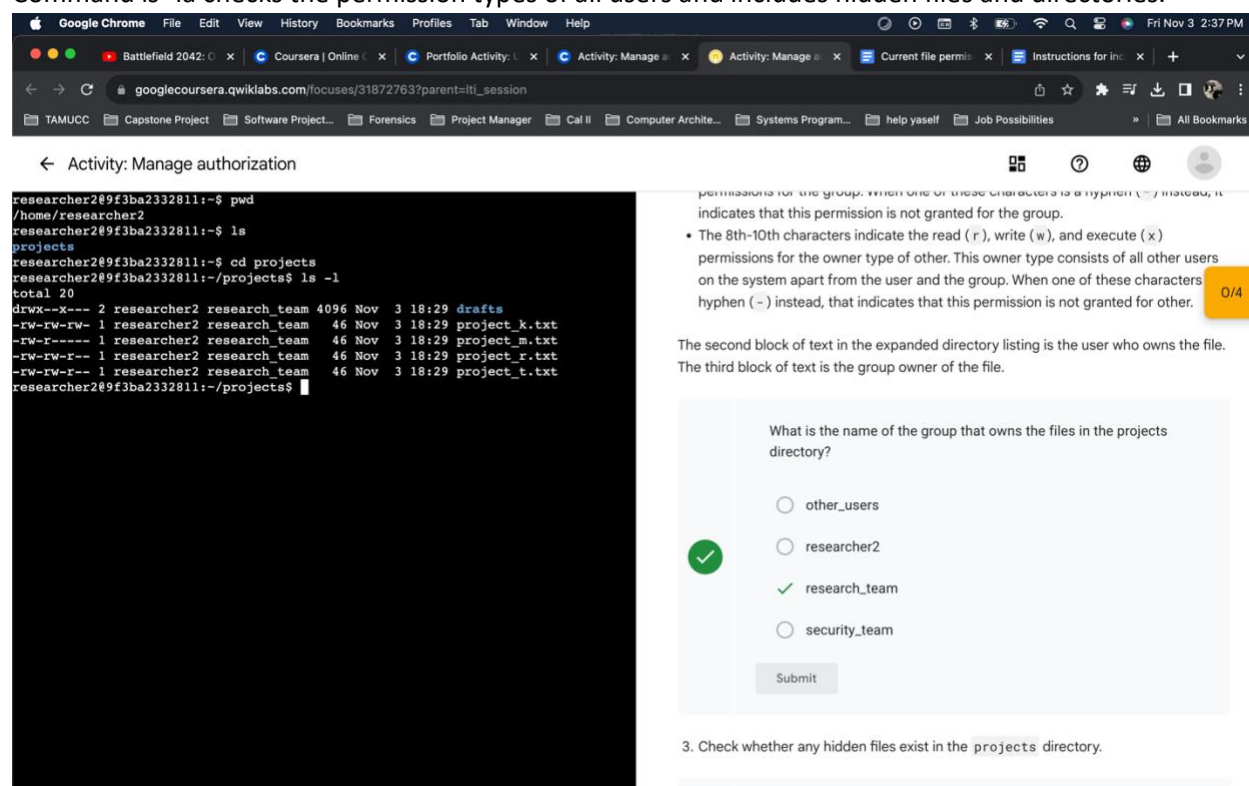
## Project description

In this project, we go through basic, but critical, Linux commands that help the administrator adjust file and directory privileges for the three types of users.

## Check file and directory details

Command: `ls -l` checks the permission types of all user groups in that directory, including the directory itself.

Command `ls -la` checks the permission types of all users and includes hidden files and directories.



Activity: Manage authorization

```
researcher2@9f3ba2332811:~$ pwd
/home/researcher2
researcher2@9f3ba2332811:~$ ls
projects
researcher2@9f3ba2332811:~$ cd projects
researcher2@9f3ba2332811:~/projects$ ls -l
total 20
drwx--x--- 2 researcher2 research_team 4096 Nov 3 18:29 drafts
-rw-rw-rw- 1 researcher2 research_team 46 Nov 3 18:29 project_k.txt
-rw-r----- 1 researcher2 research_team 46 Nov 3 18:29 project_m.txt
-rw-rw-rw- 1 researcher2 research_team 46 Nov 3 18:29 project_r.txt
-rw-rw-rw- 1 researcher2 research_team 46 Nov 3 18:29 project_t.txt
researcher2@9f3ba2332811:~/projects$
```

permissions for the group. When one of these characters is a hyphen (-) instead, it indicates that this permission is not granted for the group.

- The 8th-10th characters indicate the read (r), write (w), and execute (x) permissions for the owner type of 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.

The second block of text in the expanded directory listing is the user who owns the file. The third block of text is the group owner of the file.

What is the name of the group that owns the files in the projects directory?

☐ other\_users

☒ researcher2

☒ research\_team

☐ security\_team

Submit

3. Check whether any hidden files exist in the `projects` directory.

Activity: Manage authorization

```

researcher2@9f3ba2332811:~$ pwd
/home/researcher2
researcher2@9f3ba2332811:~$ ls
projects
researcher2@9f3ba2332811:~$ cd projects
researcher2@9f3ba2332811:~/projects$ ls -l
total 20
drwx--x--- 2 researcher2 research_team 4096 Nov 3 18:29 drafts
-rw-rw-rw- 1 researcher2 research_team 46 Nov 3 18:29 project_k.txt
-rw-r----- 1 researcher2 research_team 46 Nov 3 18:29 project_m.txt
-rw-rw-r-- 1 researcher2 research_team 46 Nov 3 18:29 project_r.txt
-rw-rw-r-- 1 researcher2 research_team 46 Nov 3 18:29 project_t.txt
researcher2@9f3ba2332811:~/projects$ ls -la
. .project_x.txt project_k.txt project_r.txt
.. drafts project_m.txt project_t.txt
researcher2@9f3ba2332811:~/projects$

```

0/4

Submit

3. Check whether any hidden files exist in the `projects` directory.

Which of these files is hidden in the `projects` directory?

☐ There are no hidden files  
☐ `.project_r.txt`  
☐ `.project_m.txt`  
☒ `.project_x.txt`

Submit

Click [Check my progress](#) to verify that you have completed this task correctly.

## Describe the permissions string

`drwxrwxrwx` – in a directory, this string lists the privileges of all groups starting with the user, group, and then other.

`-rwxrwxrws` – this lists the privileges of all groups for a file. The 10 character string that begins with the dash indicates that we're dealing with a file, and not a directory.

# Change file permissions

Here in this part of the project, we're checking to see if there's a file in this directory that allows the other group to write to any files. We check the 10 character string to see the permissions of the user groups in all the files within that directory. By looking at the string, we see that there is a file that allows the other group to write to it. To fix this, we use `chmod o-w projects_k.txt` to remove the write permission of the other – 'o' group.

Google Chrome

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Activity: Manage authorization

```
researcher2@9f3ba2332811:~$ pwd
/home/researcher2
researcher2@9f3ba2332811:~$ ls
projects
researcher2@9f3ba2332811:~$ cd projects
researcher2@9f3ba2332811:~/projects$ ls -l
total 20
drwx--x--- 2 researcher2 research_team 4096 Nov 3 18:29 drafts
-rw-rw-rw- 1 researcher2 research_team 46 Nov 3 18:29 project_k.txt
-rw-r----- 1 researcher2 research_team 46 Nov 3 18:29 project_m.txt
-rw-rw-rw- 1 researcher2 research_team 46 Nov 3 18:29 project_r.txt
-rw-rw-rw- 1 researcher2 research_team 46 Nov 3 18:29 project_t.txt
researcher2@9f3ba2332811:~/projects$ ls -la
. .project_x.txt project_k.txt project_r.txt
.. drafts project_m.txt project_t.txt
researcher2@9f3ba2332811:~/projects$ chmod o-w project_k.txt
researcher2@9f3ba2332811:~/projects$ ls -l
total 20
drwx--x--- 2 researcher2 research_team 4096 Nov 3 18:29 drafts
-rw-rw-r-- 1 researcher2 research_team 46 Nov 3 18:29 project_k.txt
-rw-r----- 1 researcher2 research_team 46 Nov 3 18:29 project_m.txt
-rw-rw-rw- 1 researcher2 research_team 46 Nov 3 18:29 project_r.txt
-rw-rw-rw- 1 researcher2 research_team 46 Nov 3 18:29 project_t.txt
researcher2@9f3ba2332811:~/projects$
```

## Task 2. Change file permissions

In this task, you must determine whether any files have incorrect permissions and then change the permissions as needed. This action will remove unauthorized access and strengthen security on the system.

None of the files should allow the other users to write to files.

1. Check whether any files in the `projects` directory have write permissions for the owner type of other.

Which file grants other users write permissions?

☐ project\_l.txt

☒ project\_k.txt

☐ project\_m.txt

Submit

2. Change the permissions of the file identified in the previous step so that the owner type of other doesn't have write permissions.

Activity: Manage authorization

```
researcher2@9f3ba2332811:~$ pwd
/home/researcher2
researcher2@9f3ba2332811:~$ ls
projects
researcher2@9f3ba2332811:~$ cd projects
researcher2@9f3ba2332811:~/projects$ ls -l
total 20
drwx--x--- 2 researcher2 research_team 4096 Nov 3 18:29 drafts
-rw-rw-rw- 1 researcher2 research_team 46 Nov 3 18:29 project_k.txt
-rw-r----- 1 researcher2 research_team 46 Nov 3 18:29 project_m.txt
-rw-rw-rw- 1 researcher2 research_team 46 Nov 3 18:29 project_r.txt
-rw-rw-rw- 1 researcher2 research_team 46 Nov 3 18:29 project_t.txt
researcher2@9f3ba2332811:~/projects$ ls -la
. .project_x.txt project_k.txt project_r.txt
.. drafts project_m.txt project_t.txt
researcher2@9f3ba2332811:~/projects$ chmod o-w project_k.txt
researcher2@9f3ba2332811:~/projects$ ls -l
total 20
drwx--x--- 2 researcher2 research_team 4096 Nov 3 18:29 drafts
-rw-rw-rw- 1 researcher2 research_team 46 Nov 3 18:29 project_k.txt
-rw-r----- 1 researcher2 research_team 46 Nov 3 18:29 project_m.txt
-rw-rw-rw- 1 researcher2 research_team 46 Nov 3 18:29 project_r.txt
-rw-rw-rw- 1 researcher2 research_team 46 Nov 3 18:29 project_t.txt
researcher2@9f3ba2332811:~/projects$ chmod g-r project_m.txt
researcher2@9f3ba2332811:~/projects$ ls -l
total 20
drwx--x--- 2 researcher2 research_team 4096 Nov 3 18:29 drafts
-rw-rw-rw- 1 researcher2 research_team 46 Nov 3 18:29 project_k.txt
-rw-r----- 1 researcher2 research_team 46 Nov 3 18:29 project_m.txt
-rw-rw-rw- 1 researcher2 research_team 46 Nov 3 18:29 project_r.txt
-rw-rw-rw- 1 researcher2 research_team 46 Nov 3 18:29 project_t.txt
researcher2@9f3ba2332811:~/projects$
```

3. The file `project_m.txt` is a restricted file and should not be readable or writable by the group or other; only the user should have these permissions on this file. List the contents and permissions of the current directory and check if the group has read or write permissions.

What are the group permissions on the `project_m.txt` file?

☒ Read only

☐ Read and write

☐ Read, write, and execute

Submit

4. Use the `chmod` command to change permissions of the `project_m.txt` file so that the group doesn't have read or write permissions.

Click [Check my progress](#) to verify that you have completed this task correctly.

☐ Change file permissions

[Check my progress](#)

Here in the above screenshot we want to make sure that only the user group can read and write to the `project_m.txt` file. We notice by looking at the string of characters that the group permissions are read only. We need to fix this by using `chmod g-r project_m.txt`. Now, when checking the string again, we see that for the file, only the user is capable of reading and writing.

## Change file permissions on a hidden file

Here we want to adjust the permissions for the groups on a hidden file. To find hidden files along with the permissions, we use the command: `ls -la`. We find that there is a file, `.project_x.txt`. It has been archived, and should not be written by anyone. But we see that this isn't true. To change this, we enter in the commands: `chmod u-w .project_x.txt` to remove the write permission for the user, `chmod g+r .project_x.txt` so the group can read the file, and `chmod g-w .project_x.txt` to remove the write permission for the group. Voila.

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TAMUCC Capstone Project Software Project... Forensics Project Manager Cal II Computer Archite... Systems Program... help yaself Job Possibilities All Bookmarks

Activity: Manage authorization

```
total 20
drwx--x--x 2 researcher2 research_team 4096 Nov 3 18:29 drafts
-rw-rw-r-- 1 researcher2 research_team 46 Nov 3 18:29 project_k.txt
-rw-r----- 1 researcher2 research_team 46 Nov 3 18:29 project_m.txt
-rw-rw-r-- 1 researcher2 research_team 46 Nov 3 18:29 project_r.txt
-rw-rw-r-- 1 researcher2 research_team 46 Nov 3 18:29 project_t.txt
researcher2@9f3ba2332811:~/projects$ chmod g-r project_m.txt
researcher2@9f3ba2332811:~/projects$ ls -l
total 20
drwx--x--x 2 researcher2 research_team 4096 Nov 3 18:29 drafts
-rw-rw-r-- 1 researcher2 research_team 46 Nov 3 18:29 project_k.txt
-rw-r----- 1 researcher2 research_team 46 Nov 3 18:29 project_m.txt
-rw-rw-r-- 1 researcher2 research_team 46 Nov 3 18:29 project_r.txt
-rw-rw-r-- 1 researcher2 research_team 46 Nov 3 18:29 project_t.txt
researcher2@9f3ba2332811:~/projects$ ls -la
total 32
drwxr-xr-x 3 researcher2 research_team 4096 Nov 3 18:29 .
drwxr-xr-x 3 researcher2 research_team 4096 Nov 3 19:30 ..
-rw--w---- 1 researcher2 research_team 46 Nov 3 18:29 .project_x.txt
drwx--x--x 2 researcher2 research_team 4096 Nov 3 18:29 drafts
-rw-rw-r-- 1 researcher2 research_team 46 Nov 3 18:29 project_k.txt
-rw-r----- 1 researcher2 research_team 46 Nov 3 18:29 project_m.txt
-rw-rw-r-- 1 researcher2 research_team 46 Nov 3 18:29 project_r.txt
-rw-rw-r-- 1 researcher2 research_team 46 Nov 3 18:29 project_t.txt
researcher2@9f3ba2332811:~/projects$ chmod u-w .project_x.txt
researcher2@9f3ba2332811:~/projects$ chmod g+r .project_x.txt
researcher2@9f3ba2332811:~/projects$ chmod g-w .project_x.txt
researcher2@9f3ba2332811:~/projects$ ls -la
total 32
drwxr-xr-x 3 researcher2 research_team 4096 Nov 3 18:29 .
drwxr-xr-x 3 researcher2 research_team 4096 Nov 3 19:30 ..
-r--r----- 1 researcher2 research_team 46 Nov 3 18:29 .project_x.txt
drwx--x--x 2 researcher2 research_team 4096 Nov 3 18:29 drafts
-rw-rw-r-- 1 researcher2 research_team 46 Nov 3 18:29 project_k.txt
-rw-r----- 1 researcher2 research_team 46 Nov 3 18:29 project_m.txt
-rw-rw-r-- 1 researcher2 research_team 46 Nov 3 18:29 project_r.txt
-rw-rw-r-- 1 researcher2 research_team 46 Nov 3 18:29 project_t.txt
researcher2@9f3ba2332811:~/projects$
```

In this task, you must determine if a hidden file has incorrect permissions and then change the permissions as needed. This action will further remove unauthorized access and strengthen security on the system.

The file `.project_x.txt` is a hidden file that has been archived and should not be written to by anyone. (The user and group should still be able to read this file.)

1. Check the permissions of the hidden file `.project_x.txt` and answer the question that follows.

Which owner type has the incorrect write permissions?

☒ The user and the group

☐ Just the group

☐ Just the user

Submit

2. Change the permissions of the file `.project_x.txt` so that both the user and the group can read, but not write to, the file.

*Note: Be sure to start the name of a hidden file with a period (.)*

# Change directory permissions

The screenshot shows a web browser window with the address bar displaying `googlecoursera.qwiklabs.com/focuses/31872763?parent=ltl_session`. The browser tabs include "Battlefield 2042: Office...", "Coursera | Online Cour...", "Portfolio Activity: Use L...", "Activity: Manage author...", "Current file permission...", and "Instructions for includin...". The browser's bookmark bar shows various folders like "TAMUCC", "Capstone Project", "Software Project...", "Forensics", "Project Manager", "Cal II", "Computer Archite...", "Systems Program...", "help yaseff", and "Job Possibilities".

The main content area is titled "Activity: Manage authorization". It is divided into two panes. The left pane shows a terminal window with the following commands and output:

```
drwx--x--- 2 researcher2 research_team 4096 Nov 3 18:29 drafts
-rw-rw-r-- 1 researcher2 research_team 46 Nov 3 18:29 project_k.txt
-rw-rw-r-- 1 researcher2 research_team 46 Nov 3 18:29 project_m.txt
-rw-rw-r-- 1 researcher2 research_team 46 Nov 3 18:29 project_r.txt
-rw-rw-r-- 1 researcher2 research_team 46 Nov 3 18:29 project_t.txt
researcher2@9f3ba2332811:~/projects$ chmod u-w .project_x.txt
researcher2@9f3ba2332811:~/projects$ chmod g+r .project_x.txt
researcher2@9f3ba2332811:~/projects$ chmod g-w .project_x.txt
researcher2@9f3ba2332811:~/projects$ ls -la
total 32
drwxr-xr-x 3 researcher2 research_team 4096 Nov 3 18:29 .
drwxr-xr-x 3 researcher2 research_team 4096 Nov 3 18:30 ..
-rw-r--r-- 1 researcher2 research_team 46 Nov 3 18:29 project_x.txt
drwx--x--- 2 researcher2 research_team 4096 Nov 3 18:29 drafts
-rw-rw-r-- 1 researcher2 research_team 46 Nov 3 18:29 project_k.txt
-rw-rw-r-- 1 researcher2 research_team 46 Nov 3 18:29 project_m.txt
-rw-rw-r-- 1 researcher2 research_team 46 Nov 3 18:29 project_r.txt
-rw-rw-r-- 1 researcher2 research_team 46 Nov 3 18:29 project_t.txt
researcher2@9f3ba2332811:~/projects$ pwd
/home/researcher2/projects
researcher2@9f3ba2332811:~/projects$ ls
drafts project_k.txt project_m.txt project_r.txt project_t.txt
researcher2@9f3ba2332811:~/projects$ ls -l
total 20
drwx--x--- 2 researcher2 research_team 4096 Nov 3 18:29 drafts
-rw-rw-r-- 1 researcher2 research_team 46 Nov 3 18:29 project_k.txt
-rw-rw-r-- 1 researcher2 research_team 46 Nov 3 18:29 project_m.txt
-rw-rw-r-- 1 researcher2 research_team 46 Nov 3 18:29 project_r.txt
-rw-rw-r-- 1 researcher2 research_team 46 Nov 3 18:29 project_t.txt
researcher2@9f3ba2332811:~/projects$ chmod g-x drafts
researcher2@9f3ba2332811:~/projects$ ls -l
total 20
drwx----- 2 researcher2 research_team 4096 Nov 3 18:29 drafts
-rw-rw-r-- 1 researcher2 research_team 46 Nov 3 18:29 project_k.txt
-rw-rw-r-- 1 researcher2 research_team 46 Nov 3 18:29 project_m.txt
-rw-rw-r-- 1 researcher2 research_team 46 Nov 3 18:29 project_r.txt
-rw-rw-r-- 1 researcher2 research_team 46 Nov 3 18:29 project_t.txt
researcher2@9f3ba2332811:~/projects$
```

The right pane is titled "Task 4. Change directory permissions". It contains the following text:

In this task, you must change the permissions of a directory. First, you'll check the group permissions of the `/home/researcher2/projects/drafts` directory and then modify the permissions as required. (You should be in the `projects` directory while managing the permissions of its subdirectory `drafts`.)

Only the `researcher2` user should be allowed to access the `drafts` directory and its contents. (This means that only `researcher2` should have execute privileges.)

1. Check the permissions of the `drafts` directory and answer the following question.

Does the group have permissions set to access the drafts directory and its contents?

☒ No  
☒ Yes

Submit

2. Remove the execute permission for the group from the `drafts` directory.

Click [Check my progress](#) to verify that you have completed this task correctly.

In the above screenshot, we see that changing the directory permissions is almost the same as changing a file's permissions! The only difference is that we're not including a file extension.

## Summary

Well, it was a short project. We see that using `ls -l`, `ls -la`, and `chmod` are critical commands in processing the permissions of users. It's vital for good security practices, as operating on least privilege principle, we want the right people to view and adjust the files they need, while keeping other less qualified, and sometimes dangerous actors, out of the picture.