

# Activity overview

In this lab activity, you'll use Linux commands to configure authorization.

Authorization is the concept of granting access to specific resources in a system. It's important because without authorization any user could access and modify all files belonging to other users or system files. This would certainly be a security risk.

In Linux, file and directory permissions are used to specify who has access to specific files and directories. You'll explore file and directory permissions and change the ownership of a file and a directory to limit who can access them.

As a security analyst, setting appropriate access permissions is critical to protecting sensitive information and maintaining the overall security of a system.

# Scenario

In this scenario, you must examine and manage the permissions on the files in the `/home/researcher2/projects` directory for the `researcher2` user.

The `researcher2` user is part of the `research_team` group.

You must check the permissions for all files in the directory, including any hidden files, to make sure that permissions align with the authorization that should be given. When it doesn't, you must change the permissions.

Here's how you'll do this task: **First**, you'll check the user and group permissions for all files in the `projects` directory. **Next**, you'll check whether any files have incorrect permissions and change the permissions as needed. **Finally**, you'll check the permissions of the `/home/researcher2/projects/drafts` directory and modify these permissions to remove any unauthorized access.

## Task 1. Check file and directory details

In this task, you must explore the permissions of the `projects` directory and the files it contains. The lab starts with `/home/researcher2` as the current working directory. This is because you're changing permissions for files and directories belonging to the `researcher2` user.

1. Navigate to the projects directory.
2. List the contents and permissions of the projects directory.
3. Check whether any hidden files exist in the projects directory.

The permissions of the files in the projects directory are as follows:

```
total 20
drwx--x--- 2 researcher2 research_team 4096 Oct 14 18:40 drafts
-rw-rw-rw- 1 researcher2 research_team  46 Oct 14 18:40 project_k.txt
-rw-r----- 1 researcher2 research_team  46 Oct 14 18:40 project_m.txt
-rw-rw-r--  1 researcher2 research_team  46 Oct 14 18:40 project_r.txt
-rw-rw-r--  1 researcher2 research_team  46 Oct 14 18:40 project_t.txt
```

As you may recall from the video lesson, a 10-character string begins each entry and indicates how the permissions on the file are set. For instance, a directory with full permissions for all owner types would be drwxrwxrwx:

- The 1st character indicates the file type. The d indicates it's a directory. When this character is a hyphen (-), it's a regular file.
- The 2nd-4th 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.
- The 5th-7th 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.
- 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.

```
researcher2@ab405ff824ea:~$ ls
projects
researcher2@ab405ff824ea:~$ cd projects
researcher2@ab405ff824ea:~/projects$ ls
drafts project_k.txt project_m.txt project_r.txt project_t.txt
researcher2@ab405ff824ea:~/projects$ ls -l\
> ^C
researcher2@ab405ff824ea:~/projects$ ls -l
total 20
drwx--x--- 2 researcher2 research_team 4096 Jun 23 04:51 drafts
-rw-rw-rw- 1 researcher2 research_team  46 Jun 23 04:51 project_k.txt
-rw-r----- 1 researcher2 research_team  46 Jun 23 04:51 project_m.txt
-rw-rw-r-- 1 researcher2 research_team  46 Jun 23 04:51 project_r.txt
-rw-rw-r-- 1 researcher2 research_team  46 Jun 23 04:51 project_t.txt
researcher2@ab405ff824ea:~/projects$ ls -a
.  ..  .project_x.txt drafts project_k.txt project_m.txt project_r.txt project_t.txt
researcher2@ab405ff824ea:~/projects$ ls -la
total 32
drwxr-xr-x 3 researcher2 research_team 4096 Jun 23 04:51 .
drwxr-xr-x 3 researcher2 research_team 4096 Jun 23 05:17 ..
-rw--w---- 1 researcher2 research_team  46 Jun 23 04:51 .project_x.txt
drwx--x--- 2 researcher2 research_team 4096 Jun 23 04:51 drafts
-rw-rw-rw- 1 researcher2 research_team  46 Jun 23 04:51 project_k.txt
-rw-r----- 1 researcher2 research_team  46 Jun 23 04:51 project_m.txt
-rw-rw-r-- 1 researcher2 research_team  46 Jun 23 04:51 project_r.txt
-rw-rw-r-- 1 researcher2 research_team  46 Jun 23 04:51 project_t.txt
researcher2@ab405ff824ea:~/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.
2. Change the permissions of the file identified in the previous step so that the owner type of other doesn't have write permissions.
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.
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.

```
researcher2@ab405ff824ea:~/projects$ ls -la
total 32
drwxr-xr-x 3 researcher2 research_team 4096 Jun 23 04:51 .
drwxr-xr-x 3 researcher2 research_team 4096 Jun 23 05:17 ..
-rw--w---- 1 researcher2 research_team  46 Jun 23 04:51 .project_x.txt
drwx--x--- 2 researcher2 research_team 4096 Jun 23 04:51 drafts
-rw-rw-rw- 1 researcher2 research_team  46 Jun 23 04:51 project_k.txt
-rw-r----- 1 researcher2 research_team  46 Jun 23 04:51 project_m.txt
-rw-rw-r-- 1 researcher2 research_team  46 Jun 23 04:51 project_r.txt
-rw-rw-r-- 1 researcher2 research_team  46 Jun 23 04:51 project_t.txt
researcher2@ab405ff824ea:~/projects$ chmod o-w project_k.txt
researcher2@ab405ff824ea:~/projects$ ls
drafts project_k.txt project_m.txt project_r.txt project_t.txt
researcher2@ab405ff824ea:~/projects$ ls -la
total 32
drwxr-xr-x 3 researcher2 research_team 4096 Jun 23 04:51 .
drwxr-xr-x 3 researcher2 research_team 4096 Jun 23 05:17 ..
-rw--w---- 1 researcher2 research_team  46 Jun 23 04:51 .project_x.txt
drwx--x--- 2 researcher2 research_team 4096 Jun 23 04:51 drafts
-rw-rw-r-- 1 researcher2 research_team  46 Jun 23 04:51 project_k.txt
-rw-r----- 1 researcher2 research_team  46 Jun 23 04:51 project_m.txt
-rw-rw-r-- 1 researcher2 research_team  46 Jun 23 04:51 project_r.txt
-rw-rw-r-- 1 researcher2 research_team  46 Jun 23 04:51 project_t.txt
researcher2@ab405ff824ea:~/projects$ chmod g-r project_m.txt
researcher2@ab405ff824ea:~/projects$ ls -la
total 32
drwxr-xr-x 3 researcher2 research_team 4096 Jun 23 04:51 .
drwxr-xr-x 3 researcher2 research_team 4096 Jun 23 05:17 ..
-rw--w---- 1 researcher2 research_team  46 Jun 23 04:51 .project_x.txt
drwx--x--- 2 researcher2 research_team 4096 Jun 23 04:51 drafts
-rw-rw-r-- 1 researcher2 research_team  46 Jun 23 04:51 project_k.txt
-rw----- 1 researcher2 research_team  46 Jun 23 04:51 project_m.txt
-rw-rw-r-- 1 researcher2 research_team  46 Jun 23 04:51 project_r.txt
-rw-rw-r-- 1 researcher2 research_team  46 Jun 23 04:51 project_t.txt
researcher2@ab405ff824ea:~/projects$
```

## Task 3. Change file permissions on a hidden file

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.
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.

```

researcher2@ab405ff824ea:~/projects$ ls -la
total 32
drwxr-xr-x 3 researcher2 research_team 4096 Jun 23 04:51 .
drwxr-xr-x 3 researcher2 research_team 4096 Jun 23 05:17 ..
-rw--w---- 1 researcher2 research_team  46 Jun 23 04:51 .project_x.txt
drwx--x--- 2 researcher2 research_team 4096 Jun 23 04:51 drafts
-rw-rw-r-- 1 researcher2 research_team  46 Jun 23 04:51 project_k.txt
-rw----- 1 researcher2 research_team  46 Jun 23 04:51 project_m.txt
-rw-rw-r-- 1 researcher2 research_team  46 Jun 23 04:51 project_r.txt
-rw-rw-r-- 1 researcher2 research_team  46 Jun 23 04:51 project_t.txt
researcher2@ab405ff824ea:~/projects$ chmod u-w, g-w .project_x.txt
chmod: invalid mode: 'u-w,'
Try 'chmod --help' for more information.
researcher2@ab405ff824ea:~/projects$ chmod u-w,g-w .project_x.txt
researcher2@ab405ff824ea:~/projects$ ls -la
total 32
drwxr-xr-x 3 researcher2 research_team 4096 Jun 23 04:51 .
drwxr-xr-x 3 researcher2 research_team 4096 Jun 23 05:17 ..
-r----- 1 researcher2 research_team  46 Jun 23 04:51 .project_x.txt
drwx--x--- 2 researcher2 research_team 4096 Jun 23 04:51 drafts
-rw-rw-r-- 1 researcher2 research_team  46 Jun 23 04:51 project_k.txt
-rw----- 1 researcher2 research_team  46 Jun 23 04:51 project_m.txt
-rw-rw-r-- 1 researcher2 research_team  46 Jun 23 04:51 project_r.txt
-rw-rw-r-- 1 researcher2 research_team  46 Jun 23 04:51 project_t.txt
researcher2@ab405ff824ea:~/projects$ chmod u-w,g-w,g+r .project_x.txt
researcher2@ab405ff824ea:~/projects$ ls -la
total 32
drwxr-xr-x 3 researcher2 research_team 4096 Jun 23 04:51 .
drwxr-xr-x 3 researcher2 research_team 4096 Jun 23 05:17 ..
-r--r----- 1 researcher2 research_team  46 Jun 23 04:51 .project_x.txt
drwx--x--- 2 researcher2 research_team 4096 Jun 23 04:51 drafts
-rw-rw-r-- 1 researcher2 research_team  46 Jun 23 04:51 project_k.txt
-rw----- 1 researcher2 research_team  46 Jun 23 04:51 project_m.txt
-rw-rw-r-- 1 researcher2 research_team  46 Jun 23 04:51 project_r.txt
-rw-rw-r-- 1 researcher2 research_team  46 Jun 23 04:51 project_t.txt
researcher2@ab405ff824ea:~/projects$ █

```



## Task 4. Change directory permissions

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

```
researcher2@ab405ff824ea:~/projects/drafts$ pwd
/home/researcher2/projects/drafts
researcher2@ab405ff824ea:~/projects/drafts$ ls -la
total 8
drwx--x--- 2 researcher2 research_team 4096 Jun 23 04:51 .
drwxr-xr-x 3 researcher2 research_team 4096 Jun 23 04:51 ..
researcher2@ab405ff824ea:~/projects/drafts$ chmod g-x drafts
chmod: cannot access 'drafts': No such file or directory
researcher2@ab405ff824ea:~/projects/drafts$ chmod g-x drafts
chmod: cannot access 'drafts': No such file or directory
researcher2@ab405ff824ea:~/projects/drafts$ ls
researcher2@ab405ff824ea:~/projects/drafts$ cd..
-bash: cd..: command not found
researcher2@ab405ff824ea:~/projects/drafts$ cd ..
researcher2@ab405ff824ea:~/projects$ chmod g-x drafts
researcher2@ab405ff824ea:~/projects$ ls -la
total 32
drwxr-xr-x 3 researcher2 research_team 4096 Jun 23 04:51 .
drwxr-xr-x 3 researcher2 research_team 4096 Jun 23 05:17 ..
-r--r----- 1 researcher2 research_team  46 Jun 23 04:51 .project_x.txt
drwx----- 2 researcher2 research_team 4096 Jun 23 04:51 drafts
-rw-rw-r-- 1 researcher2 research_team  46 Jun 23 04:51 project_k.txt
-rw----- 1 researcher2 research_team  46 Jun 23 04:51 project_m.txt
-rw-rw-r-- 1 researcher2 research_team  46 Jun 23 04:51 project_r.txt
-rw-rw-r-- 1 researcher2 research_team  46 Jun 23 04:51 project_t.txt
researcher2@ab405ff824ea:~/projects$
```

# Conclusion

Great work!

You now have practical experience in using basic Linux Bash shell commands to

- examine file and directory permissions,
- change permissions on files, and
- change permissions on directories.

This is an important milestone on your journey toward managing authorization in Linux!