File permissions in Linux

Project description

In this project, I executed a series of Linux commands to manage file permissions within the `/home/researcher2/projects` directory, focusing on enhancing data security and access control. Initially, I assessed the current directory structure and file permissions using `ls -la`, identifying areas where security improvements were necessary. The table below summarizes the initial permissions and the security policies implemented for each file and directory:

Check file and directory details:

File Name	Current Permissions	Security Policy Implemented

`project_k.txt`	User = read, write
	Group = read, write
	Other = read, write
		Adjusted to restrict write permissions for ‘Other’ users only

`project_m.txt`	User = read, write
	Group = read
	Other = none
		Revoked read permissions for ‘Group’ and ‘Other’ users, ensuring exclusive access for ‘User’ (reasercher2)

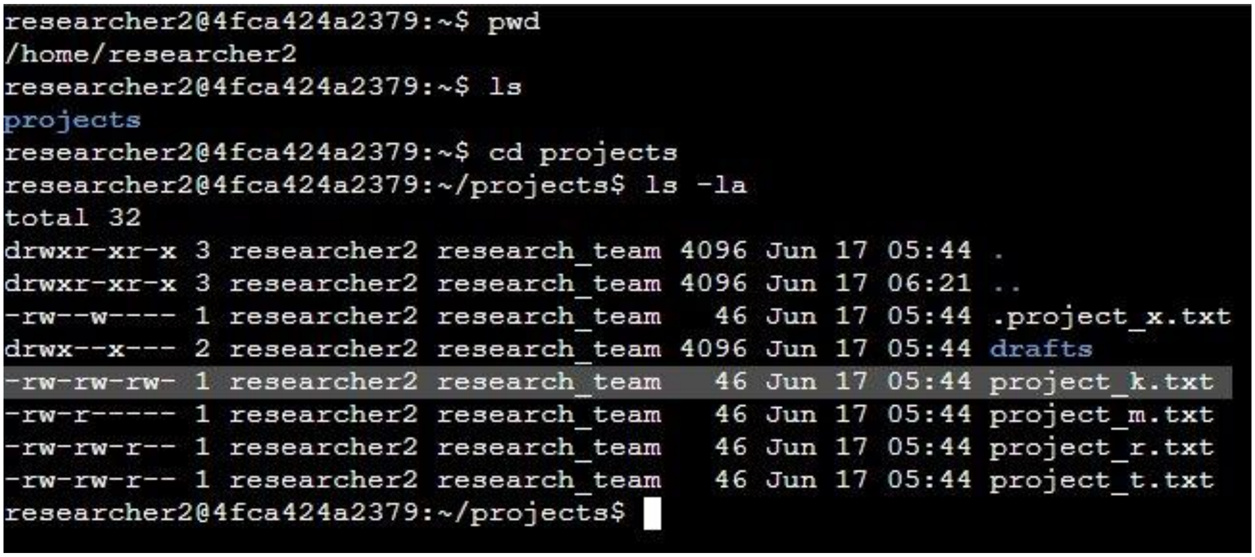
`.project_x.txt`	User = read, write
	Group = write
	Other = none
		Adjusted to remove write permissions for ‘Users’ and ‘Group’, while retaining read access for both

`drafts`	User = read, write, execute
	Group = execute
	Other = none
		Restructured to remove execute permissions for ‘Group’, ensuring exclusive execute privileges for ‘User’ (researcher2)

First, I ran `pwd` to check my current directory. If I am in the right path `(/home/researcher2`), I then display the directory contents using `ls` to check if the `projects` directory exists. After confirming its existence, I navigate into the projects directory using `cd projects`, and finally run `ls -la` to display the permissions of all files, including hidden ones.

In this task, I 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 other users to write to files. The file that had write permissions for others was `project_k.txt`.

Commands:

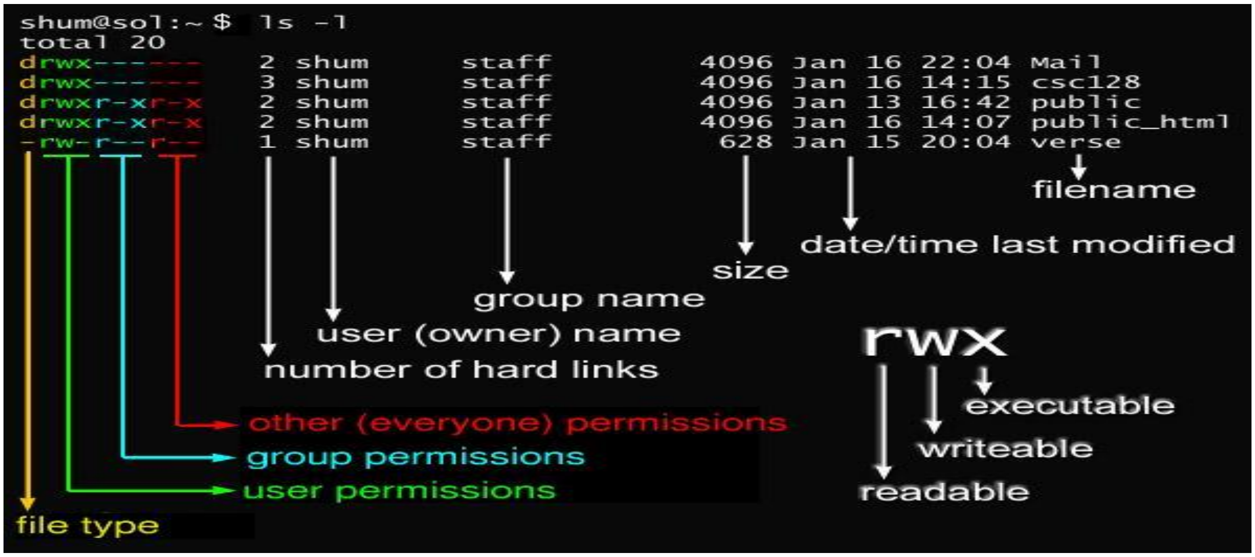


```
researcher2@4fca424a2379:~$ pwd
/home/researcher2
researcher2@4fca424a2379:~$ ls
projects
researcher2@4fca424a2379:~$ cd projects
researcher2@4fca424a2379:~/projects$ ls -la
total 32
drwxr-xr-x 3 researcher2 research_team 4096 Jun 17 05:44 .
drwxr-xr-x 3 researcher2 research_team 4096 Jun 17 06:21 ..
-rw--w---- 1 researcher2 research_team   46 Jun 17 05:44 .project_x.txt
drwx--x--- 2 researcher2 research_team 4096 Jun 17 05:44 drafts
-rw-rw-rw- 1 researcher2 research_team   46 Jun 17 05:44 project_k.txt
-rw-r----- 1 researcher2 research_team   46 Jun 17 05:44 project_m.txt
-rw-rw-r-- 1 researcher2 research_team   46 Jun 17 05:44 project_r.txt
-rw-rw-r-- 1 researcher2 research_team   46 Jun 17 05:44 project_t.txt
researcher2@4fca424a2379:~/projects$
```

Describe the permissions string

Let's take the permissions string for project_k.txt as an example: `-rw-rw-rw-`.

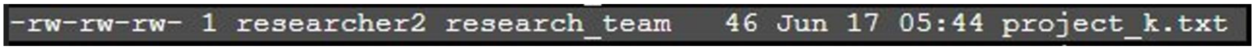
- File type: The first character indicates the type of the file. A `-` means it is a regular file. If it was a directory, it would be a `d`.
- User permissions: The next three characters (`rw-`) indicate the permissions for the user (owner) of the file. `r` means readable, `w` means writable, and `-` means not executable.
- Group permissions: The next three characters (`rw-`) indicate the permissions for the group.
- Other permissions: The final three characters (`rw-`) indicate the permissions for others (everyone else).



```
shum@sol:~ $ ls -l
total 20
drwx------   2 shum    staff       4096 Jan 16 22:04 Mail
drwx------   3 shum    staff       4096 Jan 16 14:15 csc128
drwxr-xr-x   2 shum    staff       4096 Jan 13 16:42 public
drwxr-xr-x   2 shum    staff       4096 Jan 16 14:07 public_html
-rw-r--r--   1 shum    staff        628 Jan 15 20:04 verse
```

Source: https://remy.parkland.edu/~smauney/csc128/fig_permissions.jpg

Here is a breakdown of the full `ls -la` output for one line:



```
-rw-rw-rw- 1 researcher2 research_team   46 Jun 17 05:44 project_k.txt
```

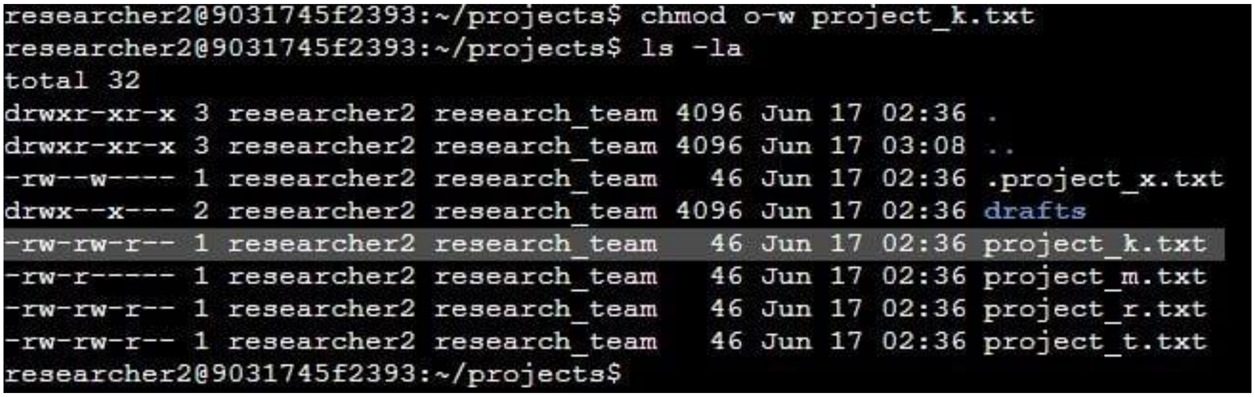
- File type and permissions `-rw-rw-rw-`
- Number of hard link `1`
- User (owner) name: `researcher2`
- Group name: `research_team`

- Size: `46` (in bytes)
- Date/time last modified: `Jun 17 05:44`
- File name: `project_k.txt`

The file `project_k.txt` is owned by `researcher2` and belongs to the `research_team` group. It has a size of 46 bytes and was last modified on June 17th at 05:44. The file permissions `-rw-rw-rw-` indicate that `researcher2` and members of the `research_team` group have both read and write access to the file, while all other users also have read and write access. To adhere to security policies, the permissions of `project_k.txt` should be adjusted to ensure that other users do not have write access, thereby maintaining data integrity and security within the system.

Change file permissions for project_k.txt

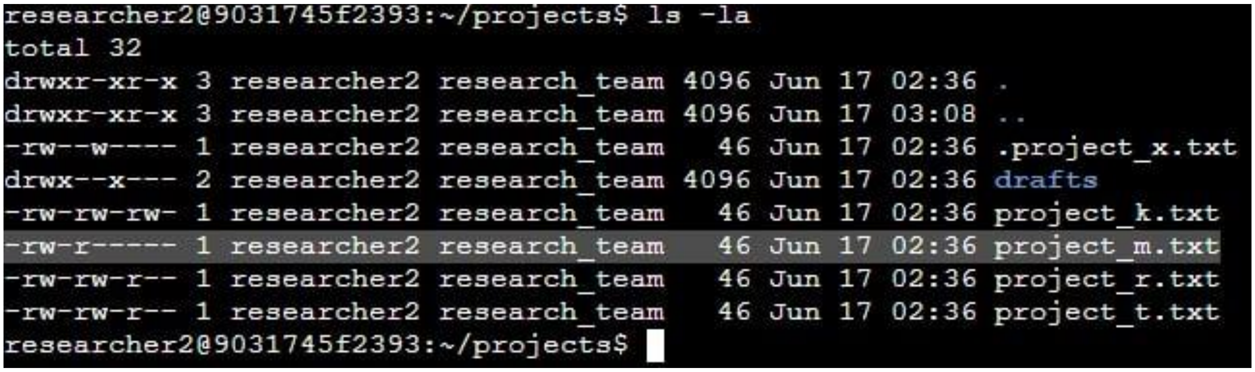
After identifying that `project_k.txt` granted write access to all users, I promptly ran `chmod o-w project_k.txt` to restrict write permissions to only the file's owner (`researcher2`) and members of the group (`research_team`). This adjustment ensures compliance with security standards, safeguarding data integrity. I immediately verified the changes with `ls -la`.



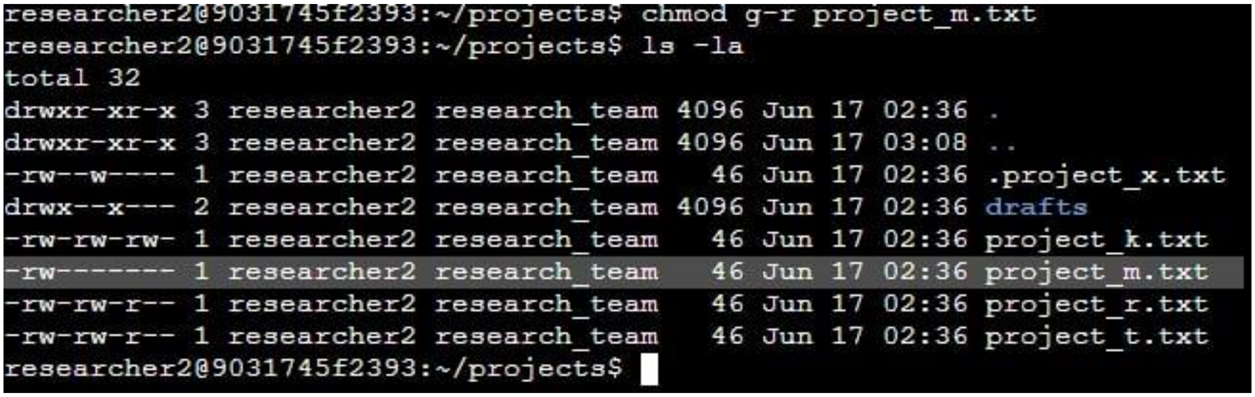
```
researcher2@9031745f2393:~/projects$ chmod o-w project_k.txt
researcher2@9031745f2393:~/projects$ ls -la
total 32
drwxr-xr-x 3 researcher2 research_team 4096 Jun 17 02:36 .
drwxr-xr-x 3 researcher2 research_team 4096 Jun 17 03:08 ..
-rw--w---- 1 researcher2 research_team   46 Jun 17 02:36 .project_x.txt
drwx--x--- 2 researcher2 research_team 4096 Jun 17 02:36 drafts
-rw-rw-r-- 1 researcher2 research_team   46 Jun 17 02:36 project_k.txt
-rw-r----- 1 researcher2 research_team   46 Jun 17 02:36 project_m.txt
-rw-rw-r-- 1 researcher2 research_team   46 Jun 17 02:36 project_r.txt
-rw-rw-r-- 1 researcher2 research_team   46 Jun 17 02:36 project_t.txt
researcher2@9031745f2393:~/projects$
```

Change file permissions for project_m.txt

The file `project_m.txt` is a restricted file that should not be readable or writable by the group or others; only the user (`researcher2`) should have these permissions. After confirming the current directory contents and permissions with `ls -la`, I executed `chmod g-r project_m.txt` to revoke read permissions for the group. This adjustment ensures that only the owner can read or modify `project_m.txt`, enhancing data security and access control.



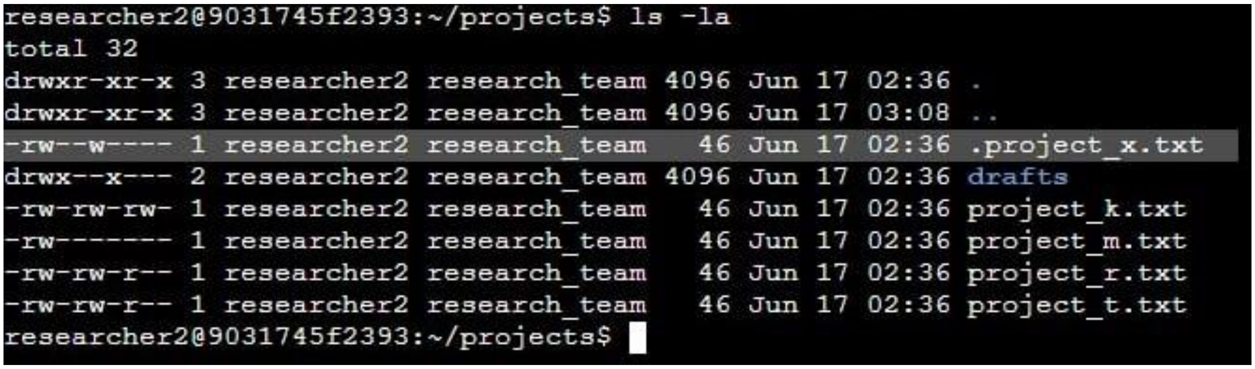
```
researcher2@9031745f2393:~/projects$ ls -la
total 32
drwxr-xr-x 3 researcher2 research_team 4096 Jun 17 02:36 .
drwxr-xr-x 3 researcher2 research_team 4096 Jun 17 03:08 ..
-rw--w---- 1 researcher2 research_team   46 Jun 17 02:36 .project_x.txt
drwx--x--- 2 researcher2 research_team 4096 Jun 17 02:36 drafts
-rw-rw-rw- 1 researcher2 research_team   46 Jun 17 02:36 project_k.txt
-rw-r----- 1 researcher2 research_team   46 Jun 17 02:36 project_m.txt
-rw-rw-r-- 1 researcher2 research_team   46 Jun 17 02:36 project_r.txt
-rw-rw-r-- 1 researcher2 research_team   46 Jun 17 02:36 project_t.txt
researcher2@9031745f2393:~/projects$
```



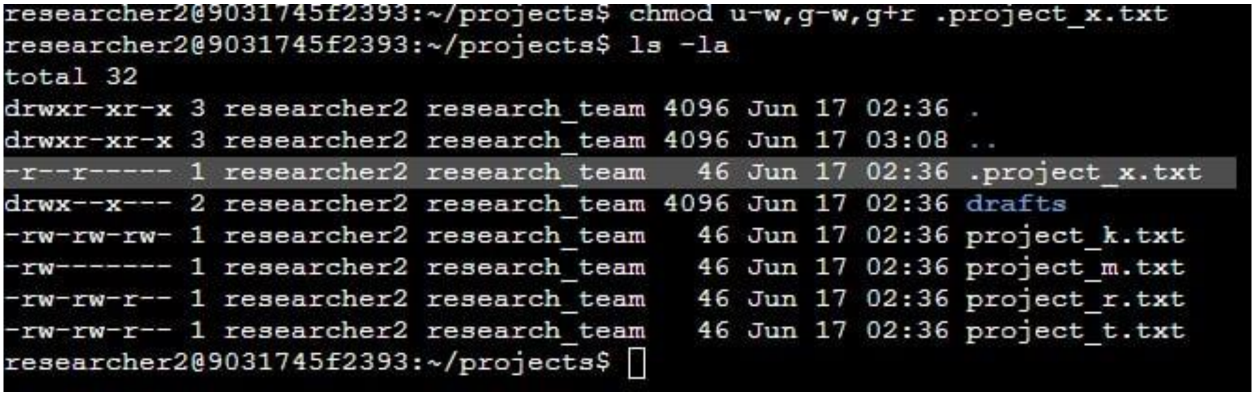
```
researcher2@9031745f2393:~/projects$ chmod g-r project_m.txt
researcher2@9031745f2393:~/projects$ ls -la
total 32
drwxr-xr-x 3 researcher2 research_team 4096 Jun 17 02:36 .
drwxr-xr-x 3 researcher2 research_team 4096 Jun 17 03:08 ..
-rw--w---- 1 researcher2 research_team   46 Jun 17 02:36 .project_x.txt
drwx--x--- 2 researcher2 research_team 4096 Jun 17 02:36 drafts
-rw-rw-rw- 1 researcher2 research_team   46 Jun 17 02:36 project_k.txt
-rw------- 1 researcher2 research_team   46 Jun 17 02:36 project_m.txt
-rw-rw-r-- 1 researcher2 research_team   46 Jun 17 02:36 project_r.txt
-rw-rw-r-- 1 researcher2 research_team   46 Jun 17 02:36 project_t.txt
researcher2@9031745f2393:~/projects$
```

Change file permissions for .project_x.txt

The file `.project_x.txt` is a hidden file that has been archived and should not be writable by anyone, while allowing both the `user` and `group` to read it. To achieve this, I utilized `chmod u-w,g-w,g+r .project_x.txt` command. This command removes write permissions for the `owner` and `group` (`u-w,g-w`) while adding read permissions for the group (`g+r`). This configuration ensures that the file remains accessible for reading while preventing accidental modifications, thus maintaining data integrity.



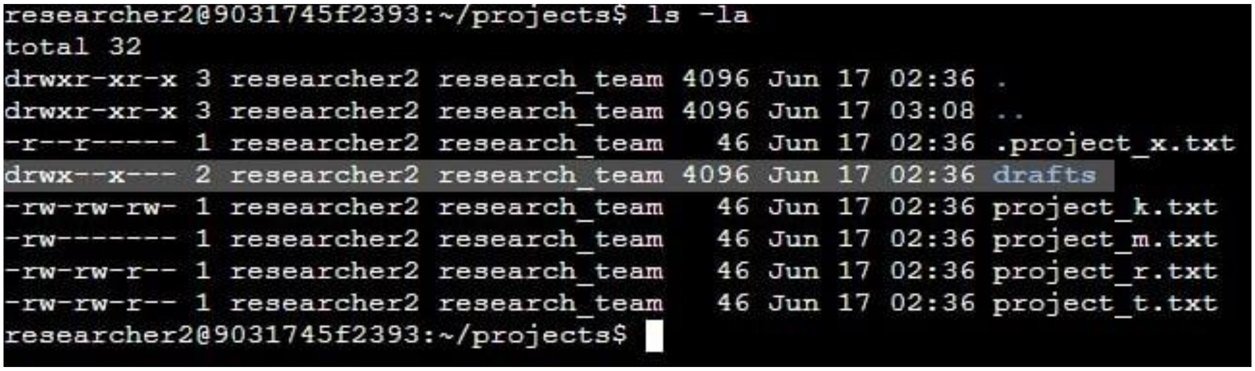
```
researcher2@9031745f2393:~/projects$ ls -la
total 32
drwxr-xr-x 3 researcher2 research_team 4096 Jun 17 02:36 .
drwxr-xr-x 3 researcher2 research_team 4096 Jun 17 03:08 ..
-rw--w---- 1 researcher2 research_team   46 Jun 17 02:36 .project_x.txt
drwx--x--- 2 researcher2 research_team 4096 Jun 17 02:36 drafts
-rw-rw-rw- 1 researcher2 research_team   46 Jun 17 02:36 project_k.txt
-rw------- 1 researcher2 research_team   46 Jun 17 02:36 project_m.txt
-rw-rw-r-- 1 researcher2 research_team   46 Jun 17 02:36 project_r.txt
-rw-rw-r-- 1 researcher2 research_team   46 Jun 17 02:36 project_t.txt
researcher2@9031745f2393:~/projects$
```



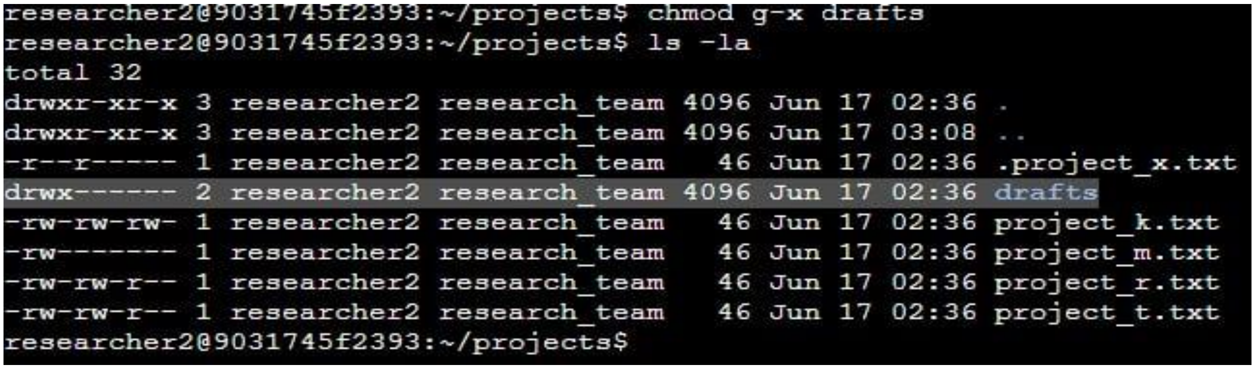
```
researcher2@9031745f2393:~/projects$ chmod u-w,g-w,g+r .project_x.txt
researcher2@9031745f2393:~/projects$ ls -la
total 32
drwxr-xr-x 3 researcher2 research_team 4096 Jun 17 02:36 .
drwxr-xr-x 3 researcher2 research_team 4096 Jun 17 03:08 ..
-r--r----- 1 researcher2 research_team   46 Jun 17 02:36 .project_x.txt
drwx--x--- 2 researcher2 research_team 4096 Jun 17 02:36 drafts
-rw-rw-rw- 1 researcher2 research_team   46 Jun 17 02:36 project_k.txt
-rw------- 1 researcher2 research_team   46 Jun 17 02:36 project_m.txt
-rw-rw-r-- 1 researcher2 research_team   46 Jun 17 02:36 project_r.txt
-rw-rw-r-- 1 researcher2 research_team   46 Jun 17 02:36 project_t.txt
researcher2@9031745f2393:~/projects$
```

Change directory permissions

The drafts directory should only be accessible to the `researcher2` user, meaning only `researcher2` should have execute privileges. To enforce this restriction, I executed `chmod g-x drafts`. This command removes execute permissions for the group on the drafts directory, ensuring that only the owner (`researcher2`) can access its contents. This measure enhances security by limiting access to sensitive data and project materials.



```
researcher2@9031745f2393:~/projects$ ls -la
total 32
drwxr-xr-x 3 researcher2 research_team 4096 Jun 17 02:36 .
drwxr-xr-x 3 researcher2 research_team 4096 Jun 17 03:08 ..
-r--r----- 1 researcher2 research_team   46 Jun 17 02:36 .project_x.txt
drwx--x--- 2 researcher2 research_team 4096 Jun 17 02:36 drafts
-rw-rw-rw- 1 researcher2 research_team   46 Jun 17 02:36 project_k.txt
-rw------- 1 researcher2 research_team   46 Jun 17 02:36 project_m.txt
-rw-rw-r-- 1 researcher2 research_team   46 Jun 17 02:36 project_r.txt
-rw-rw-r-- 1 researcher2 research_team   46 Jun 17 02:36 project_t.txt
researcher2@9031745f2393:~/projects$
```



```
researcher2@9031745f2393:~/projects$ chmod g-x drafts
researcher2@9031745f2393:~/projects$ ls -la
total 32
drwxr-xr-x 3 researcher2 research_team 4096 Jun 17 02:36 .
drwxr-xr-x 3 researcher2 research_team 4096 Jun 17 03:08 ..
-r--r----- 1 researcher2 research_team   46 Jun 17 02:36 .project_x.txt
drwx------ 2 researcher2 research_team 4096 Jun 17 02:36 drafts
-rw-rw-rw- 1 researcher2 research_team   46 Jun 17 02:36 project_k.txt
-rw------- 1 researcher2 research_team   46 Jun 17 02:36 project_m.txt
-rw-rw-r-- 1 researcher2 research_team   46 Jun 17 02:36 project_r.txt
-rw-rw-r-- 1 researcher2 research_team   46 Jun 17 02:36 project_t.txt
researcher2@9031745f2393:~/projects$
```

Summary

In this project, I executed a series of essential tasks using Linux commands to manage file and directory permissions within the /home/researcher2/projects directory. Beginning with a thorough examination of current permissions using pwd, ls, and ls -la commands, I ensured that all files, including hidden ones, were correctly configured to align with security policies. Each file's permissions were meticulously reviewed, and adjustments were made where necessary to eliminate unauthorized access. Specifically, I modified permissions for project_k.txt to restrict write access to only the file's owner and group members, ensuring data integrity and security. Additionally, I secured project_m.txt by removing group read permissions and ensured .project_x.txt remained readable but not writable by anyone except the owner and group. Finally, I restricted access to the drafts directory to only the researcher2 user by revoking execute permissions for the group. These actions collectively bolstered system security by strictly controlling access to sensitive files and directories, adhering to best practices in authorization management.