File permissions in Linux

Project description

The research team have tasked me with altering the file permissions of the contents of the `projects` directory as they do not currently reflect the appropriate levels of authorisation required to keep the system secure. I will begin by first examining the current file permissions, then altering them to suit.

Check file and directory details

First, I need to check the current directory contents and the associated permissions. I can do this by running the `ls -la` command as shown in the screenshot below:

```
researcher2@fd1df5a185e9:~/projects$ ls -la
total 32
drwxr-xr-x 3 researcher2 research_team 4096 Jan 30 19:00 .
drwxr-xr-x 3 researcher2 research_team 4096 Jan 30 19:43 ..
-rw--w---- 1 researcher2 research_team   46 Jan 30 19:00 .project_x.txt
drwx--x--- 2 researcher2 research_team 4096 Jan 30 19:00 drafts
-rw-rw-rw- 1 researcher2 research_team   46 Jan 30 19:00 project_k.txt
-rw-r----- 1 researcher2 research_team   46 Jan 30 19:00 project_m.txt
-rw-rw-r-- 1 researcher2 research_team   46 Jan 30 19:00 project_r.txt
-rw-rw-r-- 1 researcher2 research_team   46 Jan 30 19:00 project_t.txt
researcher2@fd1df5a185e9:~/projects$
```

The top of the screenshot indicates the command `ls -la` and below is the output. The `ls` command lists the files within the `projects` directory, the `-la` flag lists the contents as a list (with all details including file permissions) and shows all files (including hidden files). I have included a screenshot of the `ls` command without the `-la` flag for comparison below:

```
researcher2@fd1df5a185e9:~/projects$ ls
drafts  project_k.txt  project_m.txt  project_r.txt  project_t.txt
researcher2@fd1df5a185e9:~/projects$
```

The output of the command indicates that there is a directory called `drafts`, a hidden file called `.project_x.txt` and four other project files. The 10 character string that can be seen in the first column represents the current permissions set on each file or directory.

Describe the permissions string

The 10 character string can be deconstructed to determine who is authorised to access the file and their specific permissions. The characters, and what they represent, are as follows:

- **1st Character:** This is either a `d` or a hyphen (`-`) and indicates the file type. A `d` indicates a directory, a `-` indicates a regular file.
- **2nd – 4th Characters:** These indicate the read (`r`), write (`w`) and execute (`x`) permissions for the user. When one of these is a `-` it indicates that this permission is not granted to the user.
- **5th – 7th Characters:** These indicate the read (`r`), write (`w`) and execute (`x`) permissions for the group. When one of these is a `-` it indicates that this permission is not granted to the group.
- **8th – 10th Characters:** These indicate the read (`r`), write (`w`) and execute (`x`) permissions for other. This owner consists of all other users on the system apart from the user and the group. When one of these is a `-` it 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 `-`, this indicates that `project_t.txt` is a file, not a directory. The second, fifth and eighth characters are all `r`, which indicates that the 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 organisation does not allow other to have write access on any files. Based on the output of the directory contents, it appears that `project_k.txt` allows other to write to that file. I need to remove the write permissions from this file, to do this I can use the `chmod` command as demonstrated below:

```
researcher2@fd1df5a185e9:~/projects$ chmod o-w project_k.txt
researcher2@fd1df5a185e9:~/projects$ ls -la
total 32
drwxr-xr-x 3 researcher2 research_team 4096 Jan 30 19:00 .
drwxr-xr-x 3 researcher2 research_team 4096 Jan 30 19:43 ..
-rw--w---- 1 researcher2 research_team   46 Jan 30 19:00 .project_x.txt
drwx--x--- 2 researcher2 research_team 4096 Jan 30 19:00 drafts
-rw-rw-r-- 1 researcher2 research_team   46 Jan 30 19:00 project_k.txt
-rw-r----- 1 researcher2 research_team   46 Jan 30 19:00 project_m.txt
-rw-rw-r-- 1 researcher2 research_team   46 Jan 30 19:00 project_r.txt
-rw-rw-r-- 1 researcher2 research_team   46 Jan 30 19:00 project_t.txt
researcher2@fd1df5a185e9:~/projects$
```

The first two lines in the screenshot display the commands I used, the others display the output of the `ls -la` command. The `chmod` command changes the permissions on a selected file or directory. The first argument after the command indicates the permissions to be changed, and the second specifies the file or directory. In this example I removed write permissions for other from the `project_k.txt file`, using the `o-w` option, I then used `ls -la` to confirm the changes.

Change file permissions on a hidden file

The research team have archived `.project_x.txt` which is why it's a hidden file, I know this because the filename starts with a period (`.`). This should not have write permissions for anyone, but the user and group should be able to read the file. I will use the `chmod` command again to alter the file permissions to suit, as demonstrated in the screenshot below:

```
researcher2@fd1df5a185e9:~/projects$ chmod u=r,g=r .project_x.txt
researcher2@fd1df5a185e9:~/projects$ ls -la
total 32
drwxr-xr-x 3 researcher2 research_team 4096 Jan 30 19:00 .
drwxr-xr-x 3 researcher2 research_team 4096 Jan 30 19:43 ..
-r--r----- 1 researcher2 research_team   46 Jan 30 19:00 .project_x.txt
drwx--x--- 2 researcher2 research_team 4096 Jan 30 19:00 drafts
-rw-rw-r-- 1 researcher2 research_team   46 Jan 30 19:00 project_k.txt
-rw-r----- 1 researcher2 research_team   46 Jan 30 19:00 project_m.txt
-rw-rw-r-- 1 researcher2 research_team   46 Jan 30 19:00 project_r.txt
-rw-rw-r-- 1 researcher2 research_team   46 Jan 30 19:00 project_t.txt
researcher2@fd1df5a185e9:~/projects$
```

The first two lines of the screenshot display the commands I used, the others display the output of the `ls -la` command. In this example, I removed write permissions from the user and group, and added read permissions to the group using the `=` option. This overwrites all current permissions to that of which you choose (in this example it was read).

Change directory permissions

The organisation 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. I will again use the `chmod` command to remove execute permissions for the group, as demonstrated in the screenshot below:

```
researcher2@fd1df5a185e9:~/projects$ chmod g-x drafts/
researcher2@fd1df5a185e9:~/projects$ ls -la
total 32
drwxr-xr-x 3 researcher2 research_team 4096 Jan 30 19:00 .
drwxr-xr-x 3 researcher2 research_team 4096 Jan 30 19:43 ..
-r--r----- 1 researcher2 research_team   46 Jan 30 19:00 .project_x.txt
drwx------ 2 researcher2 research_team 4096 Jan 30 19:00 drafts
-rw-rw-r-- 1 researcher2 research_team   46 Jan 30 19:00 project_k.txt
-rw-r----- 1 researcher2 research_team   46 Jan 30 19:00 project_m.txt
-rw-rw-r-- 1 researcher2 research_team   46 Jan 30 19:00 project_r.txt
-rw-rw-r-- 1 researcher2 research_team   46 Jan 30 19:00 project_t.txt
researcher2@fd1df5a185e9:~/projects$
```

The first two lines of the screenshot show the commands I used, the other lines display the output of the `ls -la` command. I could see that the group had execute permissions, so I used the `chmod` command with the `g-x` option 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 authorisation levels required by my organisation for the files and directories within the `projects` directory. I first listed the directory contents, and all associated permissions using the `ls -la` command. This allowed me to assess the further actions I needed to take to change the permissions using the `chmod` command with the appropriate options to alter the permissions to suit the organization's requests.