File permissions in Linux

Project description

The research team at my organization needed to update the file permissions for specific files and directories within the `projects` directory. The existing permissions did not align with the required authorization levels, potentially compromising system security. To address this, I undertook the following steps to ensure that the permissions were appropriately set.

Check file and directory details

To begin, I used Linux commands in the Bash shell to examine the current permissions of a specific directory in the file system. The primary command I employed was:

```
researcher2@75412723f09f:~/projects$ ls -la
total 32
drwxr-xr-x 3 researcher2 research_team 4096 Aug 24 09:25 .
drwxr-xr-x 3 researcher2 research_team 4096 Aug 24 09:50 ..
-rw--w---- 1 researcher2 research_team   46 Aug 24 09:25 .project_x.txt
drwx--x--- 2 researcher2 research_team 4096 Aug 24 09:25 drafts
-rw-rw-rw- 1 researcher2 research_team   46 Aug 24 09:25 project_k.txt
-rw-r----- 1 researcher2 research_team   46 Aug 24 09:25 project_m.txt
-rw-rw-r-- 1 researcher2 research_team   46 Aug 24 09:25 project_r.txt
-rw-rw-r-- 1 researcher2 research_team   46 Aug 24 09:25 project_t.txt
researcher2@75412723f09f:~/projects$
```

`ls -la` Command: This command displays detailed information about all files and directories, including hidden ones, within the projects directory. The output includes a 10-character string that represents the permissions for each file or directory.

Describe the permissions string

The 10-character string in the permissions column can be broken down to determine the access level for each user type. Here's how the string is structured:

- **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.

Change file permissions

1- **`project_k.txt`**:

```
researcher2@75412723f09f:~/projects$ ls -la
total 32
drwxr-xr-x 3 researcher2 research_team 4096 Aug 24 09:25 .
drwxr-xr-x 3 researcher2 research_team 4096 Aug 24 09:50 ..
-rw--w---- 1 researcher2 research_team   46 Aug 24 09:25 .project_x.txt
drwx--x--- 2 researcher2 research_team 4096 Aug 24 09:25 drafts
-rw-rw-rw- 1 researcher2 research_team   46 Aug 24 09:25 project_k.txt
-rw-r----- 1 researcher2 research_team   46 Aug 24 09:25 project_m.txt
-rw-rw-r-- 1 researcher2 research_team   46 Aug 24 09:25 project_r.txt
-rw-rw-r-- 1 researcher2 research_team   46 Aug 24 09:25 project_t.txt
researcher2@75412723f09f:~/projects$
```

- The research team determined that no files should permit write access for other users. Upon inspection, I found that `project_k.txt` had write permissions enabled for others.

```
researcher2@75412723f09f:~/projects$ chmod o-w project_k.txt
researcher2@75412723f09f:~/projects$ ls -la
total 32
drwxr-xr-x 3 researcher2 research_team 4096 Aug 24 09:25 .
drwxr-xr-x 3 researcher2 research_team 4096 Aug 24 09:50 ..
-rw--w---- 1 researcher2 research_team   46 Aug 24 09:25 .project_x.txt
drwx--x--- 2 researcher2 research_team 4096 Aug 24 09:25 drafts
-rw-rw-r-- 1 researcher2 research_team   46 Aug 24 09:25 project_k.txt
-rw-r----- 1 researcher2 research_team   46 Aug 24 09:25 project_m.txt
-rw-rw-r-- 1 researcher2 research_team   46 Aug 24 09:25 project_r.txt
-rw-rw-r-- 1 researcher2 research_team   46 Aug 24 09:25 project_t.txt
```

Using the `chmod` command, I removed the write permissions for others, ensuring that the file's permissions were correctly aligned with the team's security requirements.

2- **`project_m.txt`**:

```
researcher2@75412723f09f:~/projects$ ls -la
total 32
drwxr-xr-x 3 researcher2 research_team 4096 Aug 24 09:25 .
drwxr-xr-x 3 researcher2 research_team 4096 Aug 24 09:50 ..
-rw--w---- 1 researcher2 research_team   46 Aug 24 09:25 .project_x.txt
drwx--x--- 2 researcher2 research_team 4096 Aug 24 09:25 drafts
-rw-rw-r-- 1 researcher2 research_team   46 Aug 24 09:25 project_k.txt
-rw-r----- 1 researcher2 research_team   46 Aug 24 09:25 project_m.txt
-rw-rw-r-- 1 researcher2 research_team   46 Aug 24 09:25 project_r.txt
-rw-rw-r-- 1 researcher2 research_team   46 Aug 24 09:25 project_t.txt
researcher2@75412723f09f:~/projects$
```

`project_m.txt` is a sensitive file that should not be readable or writable by the group or other users; only the owner (user) should have these permissions.

```
researcher2@75412723f09f:~/projects$ chmod g-r project_m.txt
researcher2@75412723f09f:~/projects$ ls -la
total 32
drwxr-xr-x 3 researcher2 research_team 4096 Aug 24 09:25 .
drwxr-xr-x 3 researcher2 research_team 4096 Aug 24 09:50 ..
-rw--w---- 1 researcher2 research_team   46 Aug 24 09:25 .project_x.txt
drwx--x--- 2 researcher2 research_team 4096 Aug 24 09:25 drafts
-rw-rw-r-- 1 researcher2 research_team   46 Aug 24 09:25 project_k.txt
-rw------- 1 researcher2 research_team   46 Aug 24 09:25 project_m.txt
-rw-rw-r-- 1 researcher2 research_team   46 Aug 24 09:25 project_r.txt
-rw-rw-r-- 1 researcher2 research_team   46 Aug 24 09:25 project_t.txt
```

I listed the contents and permissions of the directory to verify the current settings, then used the `chmod` command to remove the read permissions for the group, securing the file as requested.

Change file permissions on a hidden file

Hidden File `.project_x.txt`:

The file `.project_x.txt` is an archived, hidden file. It should be readable but not writable by both the user and group, while others should have no permissions.

```
researcher2@75412723f09f:~/projects$ ls -la
total 32
drwxr-xr-x 3 researcher2 research_team 4096 Aug 24 09:25 .
drwxr-xr-x 3 researcher2 research_team 4096 Aug 24 09:50 ..
-rw--w---- 1 researcher2 research_team   46 Aug 24 09:25 .project_x.txt
drwx--x--- 2 researcher2 research_team 4096 Aug 24 09:25 drafts
-rw-rw-r-- 1 researcher2 research_team   46 Aug 24 09:25 project_k.txt
-rw------- 1 researcher2 research_team   46 Aug 24 09:25 project_m.txt
-rw-rw-r-- 1 researcher2 research_team   46 Aug 24 09:25 project_r.txt
-rw-rw-r-- 1 researcher2 research_team   46 Aug 24 09:25 project_t.txt
```

Initially, the file had write permissions, which I removed using `chmod`. I retained the read permission for the user and group while ensuring no other permissions were granted.

```
researcher2@75412723f09f:~/projects$ chmod u-w,g-w,g+r .project_x.txt
researcher2@75412723f09f:~/projects$ ls -la
total 32
drwxr-xr-x 3 researcher2 research_team 4096 Aug 24 09:25 .
drwxr-xr-x 3 researcher2 research_team 4096 Aug 24 09:50 ..
-r--r----- 1 researcher2 research_team   46 Aug 24 09:25 .project_x.txt
drwx--x--- 2 researcher2 research_team 4096 Aug 24 09:25 drafts
-rw-rw-r-- 1 researcher2 research_team   46 Aug 24 09:25 project_k.txt
-rw------- 1 researcher2 research_team   46 Aug 24 09:25 project_m.txt
-rw-rw-r-- 1 researcher2 research_team   46 Aug 24 09:25 project_r.txt
-rw-rw-r-- 1 researcher2 research_team   46 Aug 24 09:25 project_t.txt
researcher2@75412723f09f:~/projects$
```

Change directory permissions

`drafts` Directory:
The `drafts` directory should only be accessible by the `researcher2` user, meaning only `researcher2` should have execute privileges.

```
researcher2@75412723f09f:~/projects$ ls -la
total 32
drwxr-xr-x 3 researcher2 research_team 4096 Aug 24 09:25 .
drwxr-xr-x 3 researcher2 research_team 4096 Aug 24 09:50 ..
-r--r----- 1 researcher2 research_team   46 Aug 24 09:25 .project_x.txt
drwx--x--- 2 researcher2 research_team 4096 Aug 24 09:25 drafts
-rw-rw-r-- 1 researcher2 research_team   46 Aug 24 09:25 project_k.txt
-rw------- 1 researcher2 research_team   46 Aug 24 09:25 project_m.txt
-rw-rw-r-- 1 researcher2 research_team   46 Aug 24 09:25 project_r.txt
-rw-rw-r-- 1 researcher2 research_team   46 Aug 24 09:25 project_t.txt
researcher2@75412723f09f:~/projects$
```

I observed that the group had execute permissions on this directory, which I removed using `chmod` to restrict access exclusively to `researcher2`.

```
researcher2@75412723f09f:~/projects$ chmod g-x drafts/
researcher2@75412723f09f:~/projects$ ls -la
total 32
drwxr-xr-x 3 researcher2 research_team 4096 Aug 24 09:25 .
drwxr-xr-x 3 researcher2 research_team 4096 Aug 24 09:50 ..
-r--r----- 1 researcher2 research_team   46 Aug 24 09:25 .project_x.txt
drwx------ 2 researcher2 research_team 4096 Aug 24 09:25 drafts
-rw-rw-r-- 1 researcher2 research_team   46 Aug 24 09:25 project_k.txt
-rw------- 1 researcher2 research_team   46 Aug 24 09:25 project_m.txt
-rw-rw-r-- 1 researcher2 research_team   46 Aug 24 09:25 project_r.txt
-rw-rw-r-- 1 researcher2 research_team   46 Aug 24 09:25 project_t.txt
```

Summary

In summary, I updated the file and directory permissions within the projects directory to match the authorization levels required by my organization. The process involved using the `ls -la` command to assess existing permissions and employing the `chmod` command to adjust them accordingly. These changes ensured that the files and directories are now secure and accessible only to authorized users.