REPORT: File Permissions in Linux (Task 2 – OS Security Fundamentals)

1. Objective

The objective of this task is to understand and demonstrate Linux file permissions and ownership mechanisms. Proper file permissions are a critical part of operating system security, as they control access to files and prevent unauthorized actions.

2. Environment Used

- Operating System: Ubuntu Linux (Virtual Machine)
- Tool: Linux Terminal
- User Type: Standard User with sudo privileges

3. Understanding Linux File Permissions

Linux file permissions define what actions can be performed on a file or directory by different users.

Permission Types:

- **r (read)** – Allows viewing the contents of a file
- **w (write)** – Allows modifying the file
- **x (execute)** – Allows executing the file

Permission Categories:

- **User (Owner)** – The creator/owner of the file
- **Group** – Users belonging to the same group
- **Others** – All other users on the system

4. Viewing File Permissions using ls -l

The ls -l command is used to display detailed file information including permissions, owner, group, and file type.

Command Used:

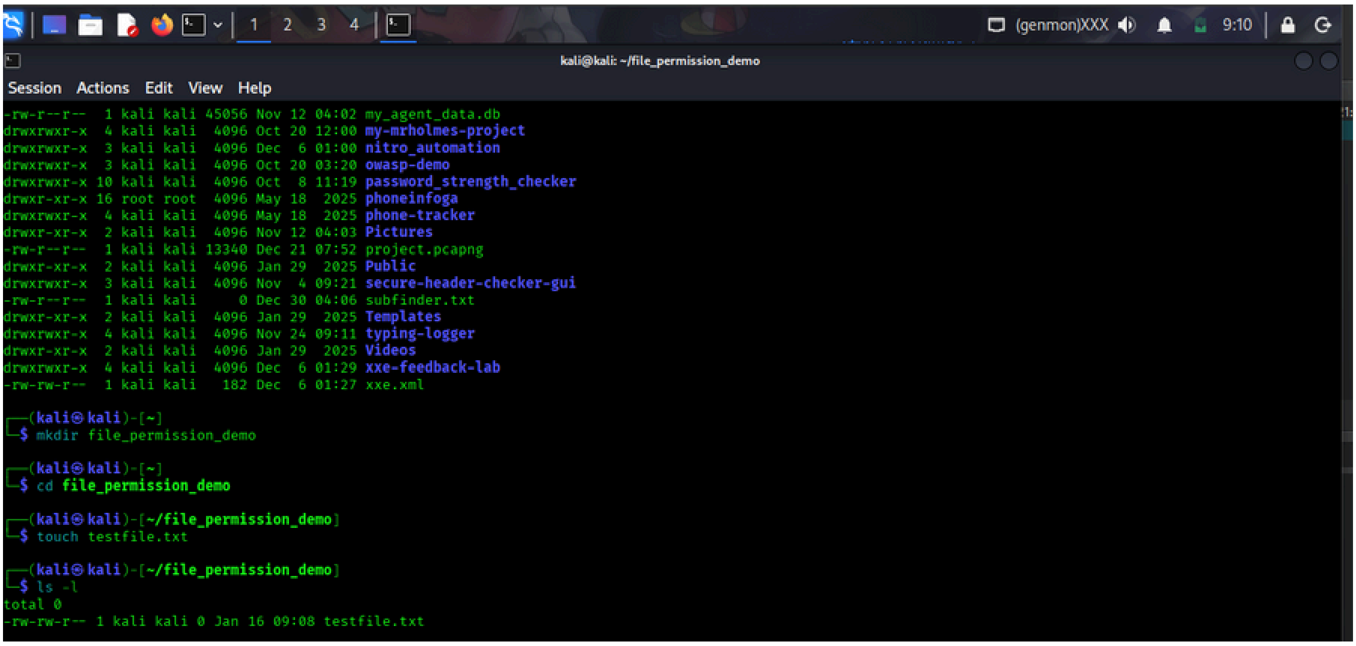
```
ls -l
```

Explanation:

The output shows permissions in the format:

-rw-r--r--

- - indicates a regular file
- First three characters: User permissions
- Next three characters: Group permissions
- Last three characters: Others permissions



```
-rw-r--r--  1 kali kali 45056 Nov 12 04:02 my_agent_data.db
drwxrwxr-x  4 kali kali  4096 Oct 20 12:00 my-mrholmes-project
drwxrwxr-x  3 kali kali  4096 Dec  6 01:00 nitro_automation
drwxrwxr-x  3 kali kali  4096 Oct 20 03:20 owasp-demo
drwxrwxr-x 10 kali kali  4096 Oct  8 11:19 password_strength_checker
drwxr-xr-x 16 root root  4096 May 18  2025 phoneinfoga
drwxrwxr-x  4 kali kali  4096 May 18  2025 phone-tracker
drwxr-xr-x  2 kali kali  4096 Nov 12 04:03 Pictures
-rw-r--r--  1 kali kali 13340 Dec 21 07:52 project.pcapng
drwxr-xr-x  2 kali kali  4096 Jan 29  2025 Public
drwxrwxr-x  3 kali kali  4096 Nov  4 09:21 secure-header-checker-gui
-rw-r--r--  1 kali kali     0 Dec 30 04:06 subfinder.txt
drwxr-xr-x  2 kali kali  4096 Jan 29  2025 Templates
drwxrwxr-x  4 kali kali  4096 Nov 24 09:11 typing-logger
drwxr-xr-x  2 kali kali  4096 Jan 29  2025 Videos
drwxrwxr-x  4 kali kali  4096 Dec  6 01:29 xxe-feedback-lab
-rw-rw-r--  1 kali kali   182 Dec  6 01:27 xxe.xml

┌──(kali㉿kali)-[~]
└─$ mkdir file_permission_demo

┌──(kali㉿kali)-[~]
└─$ cd file_permission_demo

┌──(kali㉿kali)-[~/file_permission_demo]
└─$ touch testfile.txt

┌──(kali㉿kali)-[~/file_permission_demo]
└─$ ls -l
total 0
-rw-rw-r-- 1 kali kali 0 Jan 16 09:08 testfile.txt
```

5. Changing File Permissions using chmod

The chmod command is used to modify file permissions.

Commands Used:

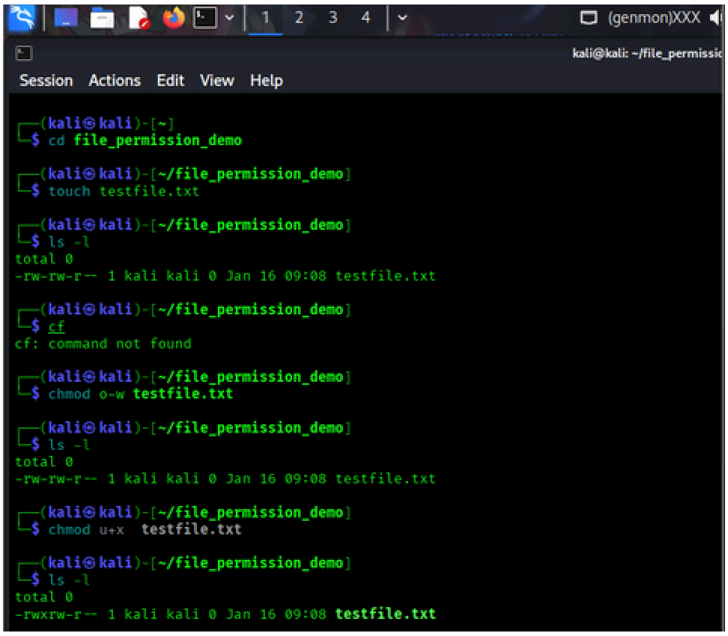
chmod o-w testfile.txt

chmod u+x testfile.txt

Explanation:

- Removed write permission for others
- Added execute permission for the user

This helps restrict unauthorized modifications and control file execution rights.



```
┌──(kali㉿kali)-[~]
└─$ cd file_permission_demo

┌──(kali㉿kali)-[~/file_permission_demo]
└─$ touch testfile.txt

┌──(kali㉿kali)-[~/file_permission_demo]
└─$ ls -l
total 0
-rw-rw-r-- 1 kali kali 0 Jan 16 09:08 testfile.txt

┌──(kali㉿kali)-[~/file_permission_demo]
└─$ cf
cf: command not found

┌──(kali㉿kali)-[~/file_permission_demo]
└─$ chmod o-w testfile.txt

┌──(kali㉿kali)-[~/file_permission_demo]
└─$ ls -l
total 0
-rw-rw-r-- 1 kali kali 0 Jan 16 09:08 testfile.txt

┌──(kali㉿kali)-[~/file_permission_demo]
└─$ chmod u+x  testfile.txt

┌──(kali㉿kali)-[~/file_permission_demo]
└─$ ls -l
total 0
-rwxrw-r-- 1 kali kali 0 Jan 16 09:08 testfile.txt
```

6. Changing File Ownership using chown

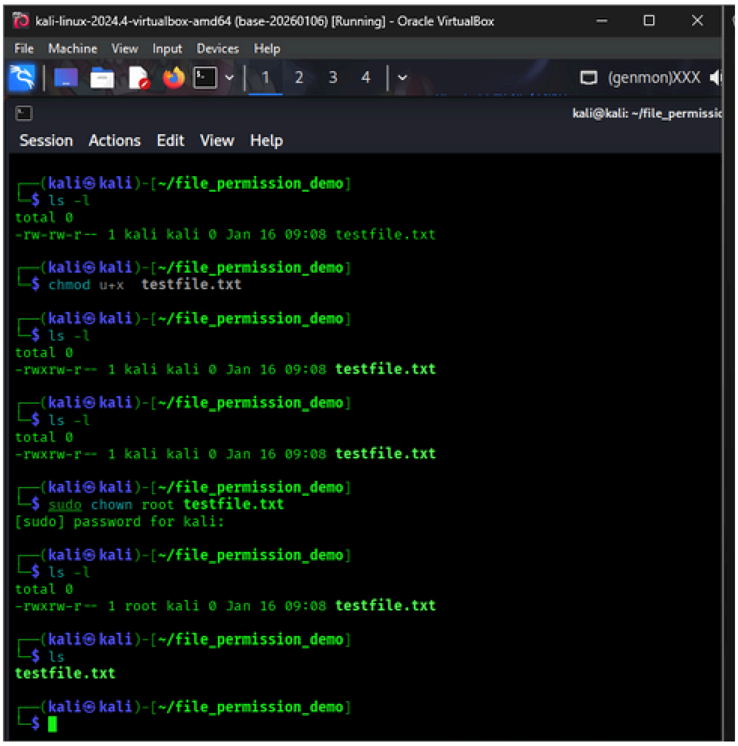
The chown command is used to change the owner of a file.

Command Used:

sudo chown root testfile.txt

Explanation:

The ownership of the file was changed from a normal user to the root user. File ownership control is important to protect sensitive system files.



kali-linux-2024.4-virtualbox-amd64 (base-20260106) [Running] - Oracle VirtualBox
File Machine View Input Devices Help
(genmon)XXX
kali@kali: ~/file_permissic
Session Actions Edit View Help

```
┌──(kali㉿kali)-[~/file_permission_demo]
└─$ ls -l
total 0
-rw-rw-r-- 1 kali kali 0 Jan 16 09:08 testfile.txt

┌──(kali㉿kali)-[~/file_permission_demo]
└─$ chmod u+x  testfile.txt

┌──(kali㉿kali)-[~/file_permission_demo]
└─$ ls -l
total 0
-rwxrw-r-- 1 kali kali 0 Jan 16 09:08 testfile.txt

┌──(kali㉿kali)-[~/file_permission_demo]
└─$ ls -l
total 0
-rwxrw-r-- 1 kali kali 0 Jan 16 09:08 testfile.txt

┌──(kali㉿kali)-[~/file_permission_demo]
└─$ sudo chown root testfile.txt
[sudo] password for kali:

┌──(kali㉿kali)-[~/file_permission_demo]
└─$ ls -l
total 0
-rwxrw-r-- 1 root kali 0 Jan 16 09:08 testfile.txt

┌──(kali㉿kali)-[~/file_permission_demo]
└─$ ls
testfile.txt

┌──(kali㉿kali)-[~/file_permission_demo]
└─$ 
```

7. Security Importance of File Permissions

- Prevents unauthorized access to files
- Protects sensitive system data
- Supports the principle of least privilege
- Reduces risk of privilege escalation attacks

8. Conclusion

Understanding and correctly configuring file permissions and ownership is a fundamental aspect of Linux operating system security. Proper permission management strengthens system security and reduces potential attack vectors.