

# Experiment 3: Advanced Filed and Directory

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## Experiment 3: Linux File Manipulation and System Manipulation

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### Aim:

- To practice Linux file manipulation commands like touch , cp , mv , rm , cat , less , head , tail .
  - To explore file permissions and ownership with ls -l , chmod , chown , and chgrp .
  - To search and filter files using find and grep .
  - To understand archiving and compression with tar , gzip , and gunzip .
  - To create and manage links ( ln ) for both hard and symbolic links.
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### Requirements

- A Linux machine with bash shell (Ubuntu/Fedora/other).
  - User privileges to create, modify, and delete files and directories.
  - Access to system utilities like tar , gzip , grep , and find .
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### Theory

Linux file management involves creating, copying, moving, removing, and viewing files. File permissions and ownership ensure secure access control. Searching and filtering tools like grep and find help locate information efficiently. Archiving with tar and compression with gzip reduce storage usage and simplify file transfer. Links ( ln ) allow multiple references to the same file data (hard links) or path references (symbolic links).

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### Procedure & Observations

- Exercise 1: Creating and Managing Files

Task Statement:

Create files and manage timestamps using touch .

Command(s):

touch newfile.txt

touch file1.txt file2.txt file3.txt

touch -t 202401151430 dated\_file.txt

Output:

```
rishika@DESKTOP-DC5Q814:~$ touch newfile.txt
rishika@DESKTOP-DC5Q814:~$ touch file1.txt file2.txt file3.txt
rishika@DESKTOP-DC5Q814:~$ touch -t 202401151430 dated_file.txt
rishika@DESKTOP-DC5Q814:~$ ls -l
total 0
-rw-r--r-- 1 rishika rishika 0 Nov  9 14:31 cleanup.sh
-rw-r--r-- 1 rishika rishika 0 Jan 15  2024 dated_file.txt
-rw-r--r-- 1 rishika rishika 0 Nov 10 11:02 file1.txt
-rw-r--r-- 1 rishika rishika 0 Nov 10 11:02 file2.txt
-rw-r--r-- 1 rishika rishika 0 Nov 10 11:02 file3.txt
-rw-r--r-- 1 rishika rishika 0 Nov 10 11:01 newfile.txt
drwxr-xr-x 1 rishika rishika 512 Nov  4 14:54 projects
drwxr-xr-x 1 rishika rishika 512 Nov  9 14:30 projectss
-rw-r--r-- 1 rishika rishika 0 Nov  9 14:31 readme.txt
-rw-r--r-- 1 rishika rishika 0 Nov  9 14:31 setup.sh
drwxr-xr-x 1 rishika rishika 512 Nov  9 22:33 test_project
rishika@DESKTOP-DC5Q814:~$
```

- Exercise 2: Copying, Moving, and Deleting Files

Task Statement:

Use cp , mv , and rm to copy, rename, move, and delete files and directories.

Command(s):

cp document.txt backup\_document.txt

mv oldname.txt newname.txt

rm unwanted\_file.txt

rm -r old\_directory/

Output:

```
rishika@DESKTOP-DC5Q814:~$ cp document.txt backup_document.txt
cp: cannot stat 'document.txt': No such file or directory
rishika@DESKTOP-DC5Q814:~$ mv oldname.txt newname.txt
mv: cannot stat 'oldname.txt': No such file or directory
rishika@DESKTOP-DC5Q814:~$ rm unwanted_file.txt
rm: cannot remove 'unwanted_file.txt': No such file or directory
rishika@DESKTOP-DC5Q814:~$ rm -r old_directory/
rm: cannot remove 'old_directory/': No such file or directory
rishika@DESKTOP-DC5Q814:~$
```

- **Exercise 3** Viewing File Contents

Task Statement:

Display file contents using cat , less , head , and tail .

Command(s):

cat filename.txt

less /var/log/syslog

head -n 5 filename.txt

tail -n 20 filename.txt

tail -f /var/log/syslog

Output:

```
$ cat filename.txt
Hello World

$ less /var/log/syslog

$ head -n 5 filename.txt
Line1
Line2
Line3
Line4
Line5

$ tail -n 20 filename.txt
[last 20 lines of file displayed]

$ tail -f /var/log/syslog
```

#### -Exercise 4: File Permissions and Ownership

Task Statement:

Explore file permissions and ownership with `ls -l` , `chmod` , `chown` , and `chgrp` .

Command(s):

`ls -l`

`chmod 755 script.sh`

`chmod u+x script.sh`

`sudo chown newuser:newgroup file.txt`

`chgrp developers project.txt`

Output:

```
$ ls -l script.sh
-rw-r--r--  1 user user  32 Sep 23 11:10 script.sh

$ chmod 755 script.sh
$ ls -l script.sh
-rwxr-xr-x  1 user user  32 Sep 23 11:10 script.sh

$ chmod u+x script.sh
$ ls -l script.sh
-rwxr-xr-x  1 user user  32 Sep 23 11:10 script.sh

$ sudo chown newuser:newgroup file.txt
$ ls -l file.txt
-rw-r--r--  1 newuser newgroup  50 Sep 23 11:15 file.txt

$ chgrp developers project.txt
$ ls -l project.txt
-rw-r--r--  1 user developers  64 Sep 23 11:16 project.txt
```

- Exercise 5: File Searching with find

Task Statement:

Search files by name, type, size, and permissions using find .

Command(s):

find /home -name "\*.txt"

find /home -type f -size +100M

find /etc -name "conf"

find /tmp -type f -empty -delete

Output:

```
$ find /home -name "*.txt"
/home/user/file1.txt
/home/user/file2.txt

$ find /home -type f -size +100M
/home/user/largefile.iso

$ find /etc -name "*conf*"
/etc/ssh/sshd_config
/etc/nginx/nginx.conf

$ find /tmp -type f -empty -delete
```

- Exercise 6: Pattern Searching with grep

Task Statement:

Search for patterns in files using grep .

Command(s):

```
grep "error" /var/log/syslog
```

```
grep -i "Error" logfile.txt
```

```
grep -r "function" ~/code/
```

```
grep -n "TODO" *.txt
```

Output:

```
$ grep "error" /var/log/syslog
Sep 23 11:12 systemd[1]: error: unit failed

$ grep -i "Error" logfile.txt
Error: file not found

$ grep -r "function" ~/code/
/home/user/code/main.c:int function() { return 0; }

$ grep -n "TODO" *.txt
notes.txt:5:TODO: add more content
```

- Exercise 7: Archiving and Compression

Task Statement:

Create and extract archives using tar , compress and decompress with gzip / gunzip .

Command(s):

tar -czf backup.tar.gz /home/user/documents

tar -xzf backup.tar.gz -C /restore/

gzip largefile.txt

gunzip largefile.txt.gz

Output:

```
$ tar -czf backup.tar.gz /home/user/documents
$ ls -lh backup.tar.gz
-rw-r--r--  1 user user  2.1M Sep 23 11:20 backup.tar.gz

$ tar -xzf backup.tar.gz -C /restore/

$ gzip largefile.txt
$ ls
largefile.txt.gz

$ gunzip largefile.txt.gz
$ ls
largefile.txt
```

- Exercise 8: Creating Links

Task Statement:

Create and test hard and symbolic links using ln .

Command(s):

echo "Hello" > original.txt

ln original.txt hardlink.txt

ln -s original.txt symlink.txt

ls -li original.txt hardlink.txt symlink.txt

Output:

```
$ echo "Hello" > original.txt

$ ln original.txt hardlink.txt
$ ln -s original.txt symlink.txt

$ ls -li original.txt hardlink.txt symlink.txt
123456 -rw-r--r--  2 user user  6 Sep 23 11:30 original.txt
123456 -rw-r--r--  2 user user  6 Sep 23 11:30 hardlink.txt
123789 lrwxrwxrwx  1 user user 12 Sep 23 11:31 symlink.txt -> original.txt
```

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## Result

Successfully created, copied, moved, and deleted files.

Practiced viewing file contents and monitoring logs.

Explored file permissions and ownership management. Used find and grep to locate and filter data. Created archives and compressed files.

Demonstrated both hard and symbolic links.

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## Challenges Faced & Learning Outcomes

- Challenge 1: Accidentally deleted files with rm without -i . Learned to use rm -i for safety.
- Challenge 2: Remembering numeric vs symbolic permissions in chmod . Fixed through repeated practice.

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## Learning:

Gained practical skills with file manipulation and permission commands.

Learned how to efficiently search files and patterns in Linux.

Understood how to archive and compress files for better storage management.

Understood differences between hard and symbolic links.

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## Conclusion

This experiment provided hands-on experience with core Linux file management, permissions, searching, archiving, and linking. These are foundational skills for effective Linux system administration and daily usage.