

Experiment 3: Linux File Manipulation and System Manipulation I

Name: Aditya Mishra Roll No.: 590029219 Date: 2025-09-23

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.

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`.

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).

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:

```
aditya_mishra@DESKTOP-RNE59RQ:/mnt/c/Users/dell/exp3$ touch -t 202401151430  
dated_file.txt  
aditya_mishra@DESKTOP-RNE59RQ:/mnt/c/Users/dell/exp3$ touch file1.txt  
aditya_mishra@DESKTOP-RNE59RQ:/mnt/c/Users/dell/exp3$ touch file1.txt  
aditya_mishra@DESKTOP-RNE59RQ:/mnt/c/Users/dell/exp3$  
aditya_mishra@DESKTOP-RNE59RQ:/mnt/c/Users/dell/exp3$ touch file2.txt  
aditya_mishra@DESKTOP-RNE59RQ:/mnt/c/Users/dell/exp3$ touch file3.txt  
aditya_mishra@DESKTOP-RNE59RQ:/mnt/c/Users/dell/exp3$ ls  
daily_logs dated_file.txt file1.txt file2.txt file3.txt newfile.txt  
aditya_mishra@DESKTOP-RNE59RQ:/mnt/c/Users/dell/exp3$
```

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:

```
aditya_mishra@DESKTOP-RNE59RQ:/mnt/c/Users/dell/exp3$ mv f1.txt file1.txt
mv: cannot stat 'f1.txt': No such file or directory
aditya_mishra@DESKTOP-RNE59RQ:/mnt/c/Users/dell/exp3$ mv f1.txt file1.txt
mv: cannot stat 'f1.txt': No such file or directory
aditya_mishra@DESKTOP-RNE59RQ:/mnt/c/Users/dell/exp3$ mv file1.txt file4.txt
aditya_mishra@DESKTOP-RNE59RQ:/mnt/c/Users/dell/exp3$ ls
daily_logs dated_file.txt file2.txt file3.txt file4.txt newfile.txt
aditya_mishra@DESKTOP-RNE59RQ:/mnt/c/Users/dell/exp3$ echo "Hello this is for file 1" >> file1.txt
aditya_mishra@DESKTOP-RNE59RQ:/mnt/c/Users/dell/exp3$ cat cat file1.txt
cat: cat: No such file or directory
Hello this is for file 1
aditya_mishra@DESKTOP-RNE59RQ:/mnt/c/Users/dell/exp3$ echo "Hello this is for file 1" >> file4.txt
aditya_mishra@DESKTOP-RNE59RQ:/mnt/c/Users/dell/exp3$ cat cat file4.txt
cat: cat: No such file or directory
Hello this is for file 1
aditya_mishra@DESKTOP-RNE59RQ:/mnt/c/Users/dell/exp3$ cp file4.txt f2.txt
aditya_mishra@DESKTOP-RNE59RQ:/mnt/c/Users/dell/exp3$ cat f2.txt
Hello this is for file 1
aditya_mishra@DESKTOP-RNE59RQ:/mnt/c/Users/dell/exp3$ rm f3.txt
rm: cannot remove 'f3.txt': No such file or directory
aditya_mishra@DESKTOP-RNE59RQ:/mnt/c/Users/dell/exp3$ rm file3.txt
aditya_mishra@DESKTOP-RNE59RQ:/mnt/c/Users/dell/exp3$ |
```

Exercise 3: Viewing File Contents

Task Statement:

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

Command(s):

```
cat filename.txt
head -n 5 filename.txt
tail -n 20 filename.txt
```

Output:

```
aditya_mishra@DESKTOP-RNE59RQ:/mnt/c/Users/dell/exp3$ cat file4.txt
Hello this is for file 1
aditya_mishra@DESKTOP-RNE59RQ:/mnt/c/Users/dell/exp3$ head -n 3 file4.txt
Hello this is for file 1
aditya_mishra@DESKTOP-RNE59RQ:/mnt/c/Users/dell/exp3$ tail -n 3 file4.txt
Hello this is for file 1
aditya_mishra@DESKTOP-RNE59RQ:/mnt/c/Users/dell/exp3$
```

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
```

Output:

```
aditya_mishra@DESKTOP-RNE59RQ:/mnt/c/Users/dell/exp3$ ls -l
total 0
-rwxrwxrwx 1 aditya_mishra aditya_mishra 0 Nov 15 16:33 daily_logs
-rwxrwxrwx 1 aditya_mishra aditya_mishra 0 Jan 15 2024 dated_file.txt
-rwxrwxrwx 1 aditya_mishra aditya_mishra 26 Nov 15 16:50 f2.txt
-rwxrwxrwx 1 aditya_mishra aditya_mishra 41 Nov 15 17:06 f4.txt
-rwxrwxrwx 1 aditya_mishra aditya_mishra 26 Nov 15 16:49 file1.txt
-rwxrwxrwx 1 aditya_mishra aditya_mishra 41 Nov 15 17:05 file2.txt
-rwxrwxrwx 1 aditya_mishra aditya_mishra 26 Nov 15 16:50 file4.txt
-rwxrwxrwx 1 aditya_mishra aditya_mishra 0 Nov 15 16:40 newfile.txt
aditya_mishra@DESKTOP-RNE59RQ:/mnt/c/Users/dell/exp3$ chmod 755 script.sh
chmod: cannot access 'script.sh': No such file or directory
aditya_mishra@DESKTOP-RNE59RQ:/mnt/c/Users/dell/exp3$ chmod 755 f4.txt
aditya_mishra@DESKTOP-RNE59RQ:/mnt/c/Users/dell/exp3$ chmod u+x f4.txt
aditya_mishra@DESKTOP-RNE59RQ:/mnt/c/Users/dell/exp3$
```

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:

```
aditya_mishra@DESKTOP-RNE59RQ:/mnt/c/Users/dell/exp3$ find /home -name "*.txt"
/home/aditya_mishra/daily_log.txt
/home/aditya_mishra/daily_logs/log_2025-11-11.txt
/home/aditya_mishra/daily_logs/log_2025-11-08.txt
/home/aditya_mishra/local_mail/mailbox_2025-11-11.txt
aditya_mishra@DESKTOP-RNE59RQ:/mnt/c/Users/dell/exp3$ find /home -type f -size +1M
aditya_mishra@DESKTOP-RNE59RQ:/mnt/c/Users/dell/exp3$ find /home -type f -size +100M
aditya_mishra@DESKTOP-RNE59RQ:/mnt/c/Users/dell/exp3$ find /etc -name "*conf*"
/etc/mke2fs.conf
/etc/xattr.conf
/etc/host.conf
/etc/sysctl.conf
/etc/ldap/ldap.conf
/etc/ubuntu-adantage/uclient.conf
/etc/gnutls/config
/etc/gai.conf
/etc/gtk-3.0/im-multipress.conf
/etc/selinux/semanage.conf
/etc/ucf.conf
/etc/python3/debian_config
/etc/landscape/client.conf
/etc/cloud/templates/timesyncd.conf.tmpl
/etc/cloud/templates/ntp.conf.openbsd.tmpl
/etc/cloud/templates/chrony.conf.opensuse.tmpl
/etc/cloud/templates/ntp.conf.ubuntu.tmpl
/etc/cloud/templates/chrony.conf.opensuse-microos.tmpl
/etc/cloud/templates/chrony.conf.alpine.tmpl
/etc/cloud/templates/chrony.conf.opensuse-tumbleweed.tmpl
/etc/cloud/templates/chrony.conf.opensuse-leap.tmpl
/etc/cloud/templates/chrony.conf.fedora.tmpl
/etc/cloud/templates/ntp.conf.freebsd.tmpl
/etc/cloud/templates/chrony.conf.photon.tmpl
/etc/cloud/templates/chrony.conf.ubuntu.tmpl
/etc/cloud/templates/systemd.resolved.conf.tmpl
/etc/cloud/templates/chrony.conf.sle-micro.tmpl
/etc/cloud/templates/chrony.conf.cos.tmpl
/etc/cloud/templates/chrony.conf.freebsd.tmpl
```

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:

```
aditya_mishra@DESKTOP-RNE59RQ:/mnt/c/Users/dell/exp3$ touch file4.txt
aditya_mishra@DESKTOP-RNE59RQ:/mnt/c/Users/dell/exp3$ grep "error" /var/log/
syslog
2025-11-09T14:24:27.493116+00:00 DESKTOP-RNE59RQ systemd[1]: apport-autorepo
rt.path - Process error reports when automatic reporting is enabled (file wa
tch) was skipped because of an unmet condition check (ConditionPathExists=/v
ar/lib/apport/autoreport).
2025-11-09T14:24:27.493120+00:00 DESKTOP-RNE59RQ systemd[1]: apport-autorepo
rt.timer - Process error reports when automatic reporting is enabled (timer
based) was skipped because of an unmet condition check (ConditionPathExists=
/var/lib/apport/autoreport).
2025-11-09T14:33:40.195434+00:00 DESKTOP-RNE59RQ systemd[1]: apport-autorepo
rt.path - Process error reports when automatic reporting is enabled (file wa
tch) was skipped because of an unmet condition check (ConditionPathExists=/v
ar/lib/apport/autoreport).
2025-11-09T14:33:40.195437+00:00 DESKTOP-RNE59RQ systemd[1]: apport-autorepo
rt.timer - Process error reports when automatic reporting is enabled (timer
based) was skipped because of an unmet condition check (ConditionPathExists=
/var/lib/apport/autoreport).
2025-11-11T10:38:10.245011+00:00 DESKTOP-RNE59RQ systemd[1]: apport-autorepo
rt.path - Process error reports when automatic reporting is enabled (file wa
tch) was skipped because of an unmet condition check (ConditionPathExists=/v
ar/lib/apport/autoreport).
2025-11-11T10:38:10.245024+00:00 DESKTOP-RNE59RQ systemd[1]: apport-autorepo
rt.timer - Process error reports when automatic reporting is enabled (timer
based) was skipped because of an unmet condition check (ConditionPathExists=
/var/lib/apport/autoreport).
2025-11-11T10:39:00.006556+00:00 DESKTOP-RNE59RQ snapd[201]: stateengine.go:
161: state ensure error: decode new commands catalog: context deadline excee
ded (Client.Timeout or context cancellation while reading body)
2025-11-15T16:28:22.505255+00:00 DESKTOP-RNE59RQ systemd[1]: apport-autorepo
rt.path - Process error reports when automatic reporting is enabled (file wa
tch) was skipped because of an unmet condition check (ConditionPathExists=/v
ar/lib/apport/autoreport).
2025-11-15T16:28:22.505258+00:00 DESKTOP-RNE59RQ systemd[1]: apport-autorepo
rt.timer - Process error reports when automatic reporting is enabled (timer
based) was skipped because of an unmet condition check (ConditionPathExists=
/var/lib/apport/autoreport).
2025-11-15T16:29:42.814092+00:00 DESKTOP-RNE59RQ systemd[1]: apport-autorepo
rt.path - Process error reports when automatic reporting is enabled (file wa
tch) was skipped because of an unmet condition check (ConditionPathExists=/v
```

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:

```
aditya_mishra@DESKTOP-RNE59RQ:/mnt/c/Users/dell/exp3$ gzip file4.txt
aditya_mishra@DESKTOP-RNE59RQ:/mnt/c/Users/dell/exp3$ ls
daily_logs      f2.txt  file1.txt  file4.txt.gz
dated_file.txt  f4.txt  file2.txt  newfile.txt
aditya_mishra@DESKTOP-RNE59RQ:/mnt/c/Users/dell/exp3$ gunzip file4.txt.gz
aditya_mishra@DESKTOP-RNE59RQ:/mnt/c/Users/dell/exp3$ ls
daily_logs      f2.txt  file1.txt  file4.txt
dated_file.txt  f4.txt  file2.txt  newfile.txt
aditya_mishra@DESKTOP-RNE59RQ:/mnt/c/Users/dell/exp3$ tar -czf backup.tar.gz
/home/user/documents
tar: Removing leading '/' from member names
tar: /home/user/documents: Cannot stat: No such file or directory
tar: Exiting with failure status due to previous errors
aditya_mishra@DESKTOP-RNE59RQ:/mnt/c/Users/dell/exp3$ tar -czf archive.tar.g
z *
aditya_mishra@DESKTOP-RNE59RQ:/mnt/c/Users/dell/exp3$ ls
archive.tar.gz  daily_logs      f2.txt  file1.txt  file4.txt
backup.tar.gz   dated_file.txt  f4.txt  file2.txt  newfile.txt
aditya_mishra@DESKTOP-RNE59RQ:/mnt/c/Users/dell/exp3$ tar -xzf archive.tar.g
z
aditya_mishra@DESKTOP-RNE59RQ:/mnt/c/Users/dell/exp3$ ls
archive.tar.gz  daily_logs      f2.txt  file1.txt  file4.txt
backup.tar.gz   dated_file.txt  f4.txt  file2.txt  newfile.txt
aditya_mishra@DESKTOP-RNE59RQ:/mnt/c/Users/dell/exp3$
```

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:

```
aditya_mishra@DESKTOP-RNE59RQ:/mnt/c/Users/dell/exp3$ ln file4.txt hardlink_file4
aditya_mishra@DESKTOP-RNE59RQ:/mnt/c/Users/dell/exp3$ ls -li
total 0
1125899906957830 -rwxrwxrwx 1 aditya_mishra aditya_mishra 402 Nov 15 17:24 archive.tar.gz
1688849860345651 -rwxrwxrwx 1 aditya_mishra aditya_mishra 45 Nov 15 17:22 backup.tar.gz
2251799813766965 -rwxrwxrwx 1 aditya_mishra aditya_mishra 0 Nov 15 16:33 daily_logs
1125899906957837 -rwxrwxrwx 1 aditya_mishra aditya_mishra 0 Jan 15 2024 dated_file.txt
1125899906924328 -rwxrwxrwx 1 aditya_mishra aditya_mishra 26 Nov 15 16:50 f2.txt
1688849860345687 -rwxrwxrwx 1 aditya_mishra aditya_mishra 41 Nov 15 17:06 f4.txt
1970324837056282 -rwxrwxrwx 1 aditya_mishra aditya_mishra 26 Nov 15 16:49 file1.txt
844424930247182 -rwxrwxrwx 1 aditya_mishra aditya_mishra 41 Nov 15 17:05 file2.txt
3940649674064366 -rwxrwxrwx 2 aditya_mishra aditya_mishra 26 Nov 15 17:18 file4.txt
3940649674064366 -rwxrwxrwx 2 aditya_mishra aditya_mishra 26 Nov 15 17:18 hardlink_file4
844424930247183 -rwxrwxrwx 1 aditya_mishra aditya_mishra 0 Nov 15 16:40 newfile.txt
aditya_mishra@DESKTOP-RNE59RQ:/mnt/c/Users/dell/exp3$ ln -s file4.txt symlink_file4
aditya_mishra@DESKTOP-RNE59RQ:/mnt/c/Users/dell/exp3$ ls -l
total 0
-rwxrwxrwx 1 aditya_mishra aditya_mishra 402 Nov 15 17:24 archive.tar.gz
-rwxrwxrwx 1 aditya_mishra aditya_mishra 45 Nov 15 17:22 backup.tar.gz
-rwxrwxrwx 1 aditya_mishra aditya_mishra 0 Nov 15 16:33 daily_logs
-rwxrwxrwx 1 aditya_mishra aditya_mishra 0 Jan 15 2024 dated_file.txt
-rwxrwxrwx 1 aditya_mishra aditya_mishra 26 Nov 15 16:50 f2.txt
-rwxrwxrwx 1 aditya_mishra aditya_mishra 41 Nov 15 17:06 f4.txt
-rwxrwxrwx 1 aditya_mishra aditya_mishra 26 Nov 15 16:49 file1.txt
-rwxrwxrwx 1 aditya_mishra aditya_mishra 41 Nov 15 17:05 file2.txt
-rwxrwxrwx 2 aditya_mishra aditya_mishra 26 Nov 15 17:18 file4.txt
-rwxrwxrwx 2 aditya_mishra aditya_mishra 26 Nov 15 17:18 hardlink_file4
-rwxrwxrwx 1 aditya_mishra aditya_mishra 0 Nov 15 16:40 newfile.txt
```

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.

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.

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.

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.