Experiment [3] : [Linux file and system manipulation]

Name:Prapti Uniyal Roll No.: 590028360 Date: 13-09-2025

Aim:

- To practice Linux file manipulation commands, permissions and ownership, compressing and decompressing

Requirements

- [Any Linux Distro, any kind of text editor (vs code, vim,nano, etc)].

Theory

File manipulation involves operations like creating, reading, writing, moving, deleting or renaming files so that programs can store, retrieve or organize data.System manipulation means changing or controlling the computing environment—such as adjusting system settings, managing processes, and altering permissions or configurations.

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:

```
prapti1011@asus:~$ touch newfile.txt
prapti1011@asus:~$ touch file1.txt file2.txt file3.txt
prapti1011@asus:~$ touch -t 202401151430 dated_file.txt
prapti1011@asus:~$ ls
%14.txt               dir2                    exp2-1.c      file.txt   ftwo                pcheck.sh       script1.sh
%2025000000%09        dir4                    exp2fol       file1      greet.sh            pr.sh           script2.sh
Desktop               dir_1                   exp4.0.sh     file1.txt  important_file.txt  pr1             sort.sh
Experiment2           document_               exp4.sh       file11     lab5.sh             practice        sumcheck.sh
act4                  document_20250912.txt   exp4task1.sh  file2.txt  lcm.sh              practice_linux  task4.sh
act4.c                document_20250914.txt   exp4task2.sh  file22     log.txt             primechec.sh    task41.sh
armcheck.sh           dr1                     exp4task3.sh  file3.txt  myfolder            primecheck.sh   test1
arr.sh                dr2                     exp6-1.sh     file4.txt  new.txt             primecheck1.sh  text1.sh
backup_original.txt   error.log              exp6.5.sh     first.c    newdir              public          text2.sh
dated_file.txt        exp1                    exp6.sh       folder1    newfile.txt         public_folder   text3.sh
debug.sh              exp1.c                  exparg.sh     folder2    notes.txt           readme.txt
dir1                  exp2                    exparr.sh     folder3    original.txt        schript1.sh
dir11                 exp2-1                  experiment-1  fone       palin.sh            script.sh
```

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 doc1.txt doc2.txt
mv old.txt new.txt
rm unwanted_file.txt
rm -r old_dir/
```

Output:

```
prapti1011@asus:~$ touch doc1.txt doc2.txt new.txt old.txt unwanted_file.txt
prapti1011@asus:~$ mkdir old_dir
prapti1011@asus:~$ vim doc1.txt
prapti1011@asus:~$ vim doc2.txt
prapti1011@asus:~$ cat doc1.txt
hello, i am learning file and system manipulation
prapti1011@asus:~$ cat doc2.txt
file and system manipulation are easy
prapti1011@asus:~$ cp doc1.txt backup_doc2.txt
prapti1011@asus:~$ cat doc2.txt
file and system manipulation are easy
prapti1011@asus:~$ cat doc1.txt
hello, i am learning file and system manipulation
prapti1011@asus:~$ cp doc1.txt doc2.txt
prapti1011@asus:~$ cat doc2.txt
hello, i am learning file and system manipulation
prapti1011@asus:~$ vim old.txt
prapti1011@asus:~$ vim new.txt
prapti1011@asus:~$ cat old.txt
old file name:wq

prapti1011@asus:~$ cat new.txt
new file name
prapti1011@asus:~$ mv old.txt new.txt
prapti1011@asus:~$ cat new.txt
old file name:wq

prapti1011@asus:~$ rm unwanted_file.txt
prapti1011@asus:~$ ls
%14.txt               backup.tar.bz2          dir11                 document_20250914.txt  exp2fol       exparg.sh     file3.txt     ftwo                link.txt      original.txt    primecheck1.sh  sumcheck.sh
%2025000000%09        backup.tar.gz           dir2                  dr1                    exp4.0.sh     exparr.sh     file4.txt     greet.sh            log.txt       palin.sh        public          sym.txt
Desktop               backup_doc2.txt         dir4                  dr2                    exp4.sh       experiment-1  file6         hardlink.txt        logfile.txt   pcheck.sh       public_folder   symlink.txt
Experiment2           backup_document.txt     dir_1                 error.log              exp4task1.sh  file.txt      filename.txt  important_file.txt  myfolder      pr.sh           readme.txt      task4.sh
act4                  backup_original.txt     doc1.txt              exp1                   exp4task2.sh  file1         first.c       lab5.sh             new.txt       pr1             schript1.sh     task41.sh
act4.c                dated_file.txt          doc2.txt              exp1.c                 exp4task3.sh  file1.txt     folder1       lar.txt             newdir        practice        script.sh       test1
armcheck.sh           debug.sh                document.txt          exp2                   exp6-1.sh     file11        folder2       large.txt           newfile.txt   practice_linux  script1.sh      text1.sh
arr.sh                dir-1                   document_             exp2-1                 exp6.5.sh     file2.txt     folder3       large.txt.gz        notes.txt     primechec.sh    script2.sh      text2.sh
backup.tar            dir1                    document_20250912.txt exp2-1.c               exp6.sh       file22        fone          lcm.sh              old_dir       primecheck.sh   sort.sh         text3.sh
prapti1011@asus:~$ rm -r old_dir/
prapti1011@asus:~$ ls
%14.txt               backup.tar.bz2          dir11                 document_20250914.txt  exp2fol       exparg.sh     file3.txt     ftwo                link.txt      palin.sh        public          sym.txt
%2025000000%09        backup.tar.gz           dir2                  dr1                    exp4.0.sh     exparr.sh     file4.txt     greet.sh            log.txt       pcheck.sh       public_folder   symlink.txt
Desktop               backup_doc2.txt         dir4                  dr2                    exp4.sh       experiment-1  file6         hardlink.txt        logfile.txt   pr.sh           readme.txt      task4.sh
Experiment2           backup_document.txt     dir_1                 error.log              exp4task1.sh  file.txt      filename.txt  important_file.txt  myfolder      pr1             schript1.sh     task41.sh
act4                  backup_original.txt     doc1.txt              exp1                   exp4task2.sh  file1         first.c       lab5.sh             new.txt       practice        script.sh       test1
act4.c                dated_file.txt          doc2.txt              exp1.c                 exp4task3.sh  file1.txt     folder1       lar.txt             newdir        practice_linux  script1.sh      text1.sh
armcheck.sh           debug.sh                document.txt          exp2                   exp6-1.sh     file11        folder2       large.txt           newfile.txt   primechec.sh    script2.sh      text2.sh
arr.sh                dir-1                   document_             exp2-1                 exp6.5.sh     file2.txt     folder3       large.txt.gz        notes.txt     primecheck.sh   sort.sh         text3.sh
```

Exercise 3: Viewing File Contents

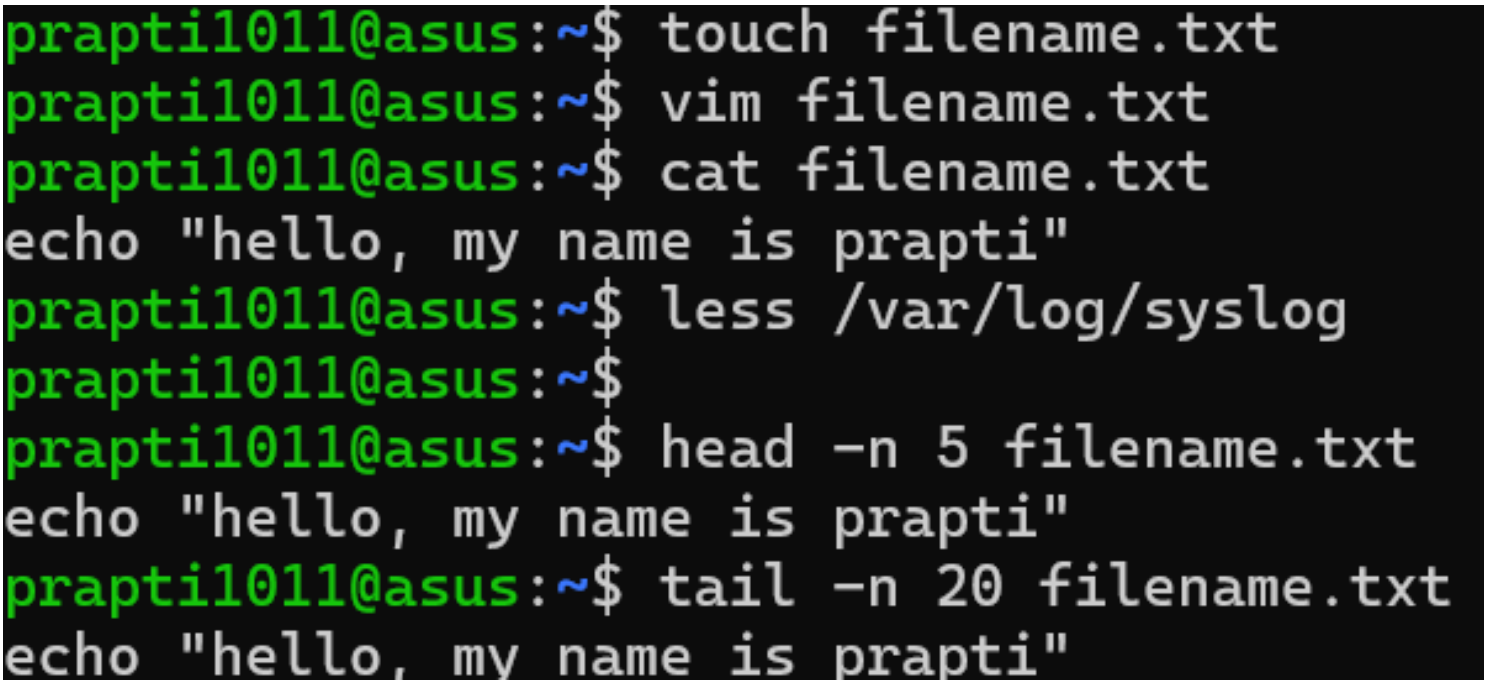
Task Statement:

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:



Exercise 4: File Permissions and Ownership

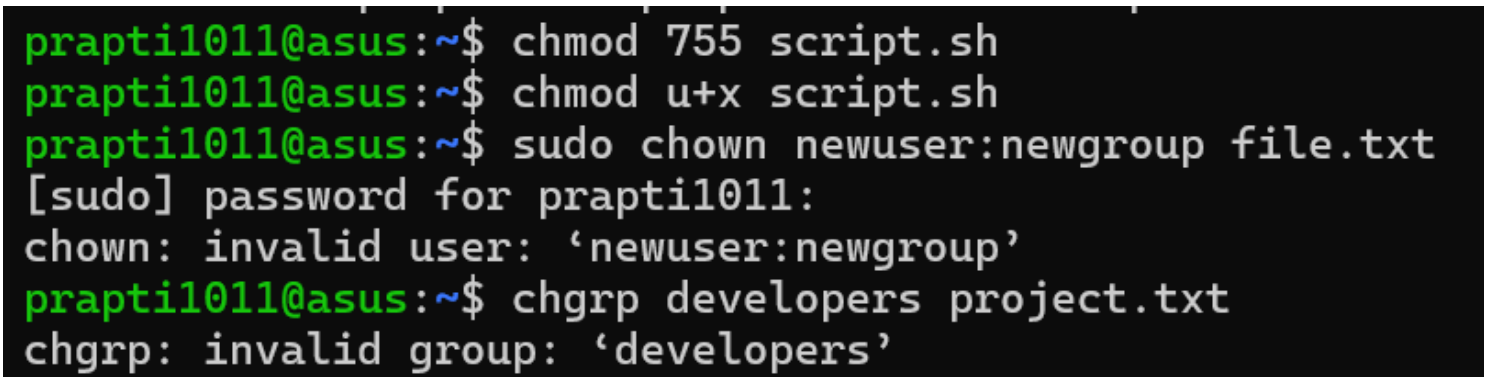
Task Statement:

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:



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:

```
prapti1011@asus:~$ find /home -name "*.txt"
/home/prapti1011/backup_original.txt
/home/prapti1011/file4.txt
/home/prapti1011/backup_document.txt
/home/prapti1011/document_20250914.txt
/home/prapti1011/document_20250912.txt
/home/prapti1011/filename.txt
/home/prapti1011/readme.txt
/home/prapti1011/file.txt
/home/prapti1011/new.txt
/home/prapti1011/newfile.txt
/home/prapti1011/log.txt
/home/prapti1011/practice_linux/readme.txt
/home/prapti1011/original.txt
/home/prapti1011/dated_file.txt
/home/prapti1011/%14.txt
/home/prapti1011/file2.txt
/home/prapti1011/file3.txt
/home/prapti1011/file1.txt
/home/prapti1011/document.txt
/home/prapti1011/notes.txt
/home/prapti1011/important_file.txt
prapti1011@asus:~$ find /home -type f -size +100M
prapti1011@asus:~$ find /etc -name "*conf*"
/etc/sysctl.conf
/etc/dbus-1/system.d/com.ubuntu.SoftwareProperties.conf
/etc/mke2fs.conf
/etc/landscape/client.conf
/etc/xdg/user-dirs.conf
/etc/resolv.conf
/etc/adduser.conf
/etc/ld.so.conf
/etc/sensors3.conf
/etc/cracklib/cracklib.conf
/etc/apport/crashdb.conf
/etc/wsl-distribution.conf
/etc/depmod.d/ubuntu.conf
/etc/debconf.conf
```

```
/etc/logrotate.conf
prapti1011@asus:~$ find /tmp -type f -empty -delete
find: ‘/tmp/systemd-private-dc40e2c14d4140429ccb18bca5b55472-systemd-logind.service-9oLmUT’: Permission denied
find: ‘/tmp/systemd-private-dc40e2c14d4140429ccb18bca5b55472-systemd-timesyncd.service-Vdbxxi’: Permission denied
find: ‘/tmp/systemd-private-dc40e2c14d4140429ccb18bca5b55472-polkit.service-Ly8QVl’: Permission denied
find: ‘/tmp/snap-private-tmp’: Permission denied
find: ‘/tmp/systemd-private-dc40e2c14d4140429ccb18bca5b55472-wsl-pro.service-XKQvRj’: Permission denied
find: ‘/tmp/systemd-private-dc40e2c14d4140429ccb18bca5b55472-systemd-resolved.service-k8mxZ7’: Permission denied
```

Exercise 6: Pattern Searching with `grep`

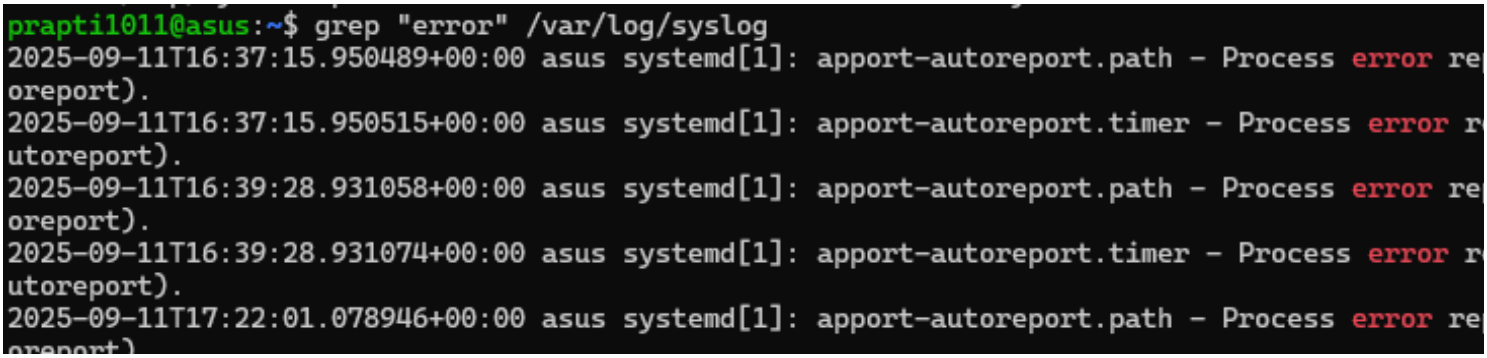
Task Statement:

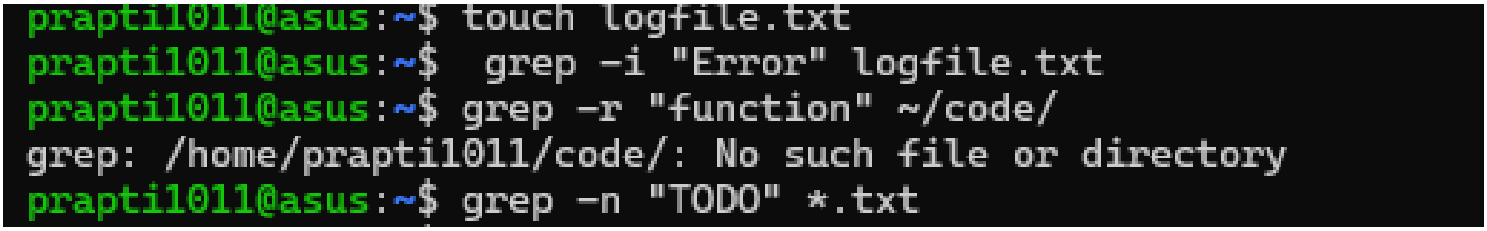
Search for patterns in files using `grep`.

Command(s):

```
grep "error" /var/log/syslog
grep -i "Error" logfile.txt
grep -r "function" ~/code/
grep -n "TODO" *.txt
```

Output:





Exercise 7: File archiving and compressing

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 large.txt
gunzip large.txt.gz
```

Output:

```
praptil011@asus:~$ touch file6
praptil011@asus:~$ tar -cf backup.tar file6
praptil011@asus:~$ ls
%14.txt         backup_document.txt  document_              exp2-1.c      exparg.sh     file4.txt     important_file.txt  original.txt    public          task41.sh
%2025000000%09  backup_original.txt  document_20250912.txt  exp2fol       exparr.sh     file6         lab5.sh             palin.sh        public_folder   test1
Desktop         dated_file.txt       document_20250914.txt  exp4.0.sh     experiment-1  filename.txt  lcm.sh              pcheck.sh       readme.txt      text1.sh
Experiment2     debug.sh             dr1                    exp4.sh       file.txt      first.c       log.txt             pr.sh           schript1.sh     text2.sh
act4            dir1                 dr2                    exp4task1.sh  file1         folder1       logfile.txt         prl             script.sh       text3.sh
act4.c          dir11                error.log              exp4task2.sh  file1.txt     folder2       myfolder            practice        script1.sh
armcheck.sh     dir2                 exp1                   exp4task3.sh  file11        folder3       new.txt             practice_linux  script2.sh
arr.sh          dir4                 exp1.c                 exp6-1.sh     file2.txt     fone          newdir              primechec.sh    sort.sh
backup.tar      dir_1                exp2                   exp6.5.sh     file22        ftwo          newfile.txt         primecheck.sh   sumcheck.sh
backup.tar.gz   document.txt         exp2-1                 exp6.sh       file3.txt     greet.sh      notes.txt           primecheck1.sh  task4.sh
praptil011@asus:~$ tar -czf backup.tar.gz file11
praptil011@asus:~$ ls
%14.txt         backup_document.txt  document_              exp2-1.c      exparg.sh     file4.txt     important_file.txt  original.txt    public          task41.sh
%2025000000%09  backup_original.txt  document_20250912.txt  exp2fol       exparr.sh     file6         lab5.sh             palin.sh        public_folder   test1
Desktop         dated_file.txt       document_20250914.txt  exp4.0.sh     experiment-1  filename.txt  lcm.sh              pcheck.sh       readme.txt      text1.sh
Experiment2     debug.sh             dr1                    exp4.sh       file.txt      first.c       log.txt             pr.sh           schript1.sh     text2.sh
act4            dir1                 dr2                    exp4task1.sh  file1         folder1       logfile.txt         prl             script.sh       text3.sh
act4.c          dir11                error.log              exp4task2.sh  file1.txt     folder2       myfolder            practice        script1.sh
armcheck.sh     dir2                 exp1                   exp4task3.sh  file11        folder3       new.txt             practice_linux  script2.sh
arr.sh          dir4                 exp1.c                 exp6-1.sh     file2.txt     fone          newdir              primechec.sh    sort.sh
backup.tar      dir_1                exp2                   exp6.5.sh     file22        ftwo          newfile.txt         primecheck.sh   sumcheck.sh
backup.tar.gz   document.txt         exp2-1                 exp6.sh       file3.txt     greet.sh      notes.txt           primecheck1.sh  task4.sh
praptil011@asus:~$ tar -cjf backup.tar.bz2 file6
praptil011@asus:~$ ls
%14.txt         backup.tar.gz        document.txt           exp2-1        exp6.sh       file3.txt     greet.sh            notes.txt       primecheck1.sh  task4.sh
%2025000000%09  backup_document.txt  document_              exp2-1.c      exparg.sh     file4.txt     important_file.txt  original.txt    public          task41.sh
Desktop         backup_original.txt  document_20250912.txt  exp2fol       exparr.sh     file6         lab5.sh             palin.sh        public_folder   test1
Experiment2     dated_file.txt       document_20250914.txt  exp4.0.sh     experiment-1  filename.txt  lcm.sh              pcheck.sh       readme.txt      text1.sh
act4            debug.sh             dr1                    exp4.sh       file.txt      first.c       log.txt             pr.sh           schript1.sh     text2.sh
act4.c          dir1                 dr2                    exp4task1.sh  file1         folder1       logfile.txt         prl             script.sh       text3.sh
armcheck.sh     dir11                error.log              exp4task2.sh  file1.txt     folder2       myfolder            practice        script1.sh
arr.sh          dir2                 exp1                   exp4task3.sh  file11        folder3       new.txt             practice_linux  script2.sh
backup.tar      dir4                 exp1.c                 exp6-1.sh     file2.txt     fone          newdir              primechec.sh    sort.sh
backup.tar.bz2  dir_1                exp2                   exp6.5.sh     file22        ftwo          newfile.txt         primecheck.sh   sumcheck.sh
praptil011@asus:~$ tar -cvf backup.tar file6
file6
praptil011@asus:~$ tar -xf backup.tar -C dir_1
tar: dir_1: Cannot open: Not a directory
tar: Error is not recoverable: exiting now
praptil011@asus:~$ mkdir dir_1
mkdir: cannot create directory ‘dir_1’: File exists
praptil011@asus:~$ mkdir dir-1
praptil011@asus:~$  tar -xf backup.tar -C dir-1
praptil011@asus:~$ ls
%14.txt         backup.tar.gz        dir_1                  exp2          exp6.5.sh     file22        ftwo          newfile.txt     primecheck.sh   sumcheck.sh
%2025000000%09  backup_document.txt  document.txt           exp2-1        exp6.sh       file3.txt     greet.sh      notes.txt       primecheck1.sh  task4.sh
Desktop         backup_original.txt  document_              exp2-1.c      exparg.sh     file4.txt     important_file.txt  original.txt    public          task41.sh
Experiment2     dated_file.txt       document_20250912.txt  exp2fol       exparr.sh     file6         lab5.sh             palin.sh        public_folder   test1
act4            debug.sh             document_20250914.txt  exp4.0.sh     experiment-1  filename.txt  lcm.sh              pcheck.sh       readme.txt      text1.sh
act4.c          dir-1                dr1                    exp4.sh       file.txt      first.c       log.txt             pr.sh           schript1.sh     text2.sh
armcheck.sh     dir1                 dr2                    exp4task1.sh  file1         folder1       logfile.txt         prl             script.sh       text3.sh
arr.sh          dir11                error.log              exp4task2.sh  file1.txt     folder2       myfolder            practice        script1.sh
backup.tar      dir2                 exp1                   exp4task3.sh  file11        folder3       new.txt             practice_linux  script2.sh
backup.tar.bz2  dir4                 exp1.c                 exp6-1.sh     file2.txt     fone          newdir              primechec.sh    sort.sh
praptil011@asus:~$ tar -xzf backup.tar.gz file6
tar: file6: Not found in archive
tar: Exiting with failure status due to previous errors
```

```
praptil011@asus:~$ touch lar.txt
praptil011@asus:~$ vim lar.txt
praptil011@asus:~$ gzip lar.txt
praptil011@asus:~$ gunzip lar.txt
praptil011@asus:~$
```

Exercise 8: Creating Links

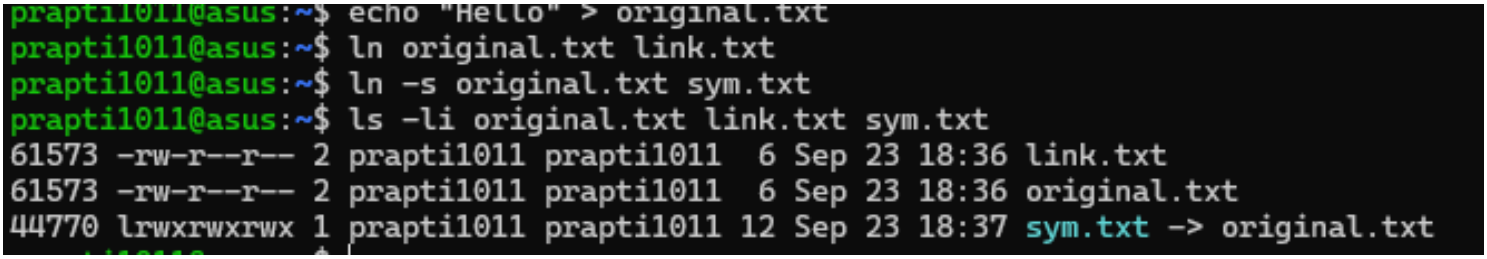
Task Statement:

Create and test hard and symbolic links using `ln`.

Command(s):

```
echo "Hello" > original.txt
ln original.txt link.txt
ln -s original.txt sym.txt
ls -li original.txt link.txt sym.txt
```

Output:



Challenges faced:

- Remembering numeric vs symbolic permissions in `chmod`. Fixed through repeated practice.

Learning:

- Learned how to efficiently search files and patterns in Linux.
- Understood how to archive and compress files for better storage management.

Result

Learned file and system manipulation efficiently with the help of the exercises performed above.