

Experiment 3: Linux File Manipulation and System Manipulation I

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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.

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:

```
linuxmint@DESKTOP-KSC4L9L: /mnt/e/linux$ touch newfile.txt
linuxmint@DESKTOP-KSC4L9L: /mnt/e/linux$ touch file1.txt file2.txt file3.txt
linuxmint@DESKTOP-KSC4L9L: /mnt/e/linux$ touch -t 202401151430 dated_file.txt
linuxmint@DESKTOP-KSC4L9L: /mnt/e/linux$ ls
config.txt      file2.txt      scripts        system          todo.txt
dated_file.txt  file3.txt      scripts1       system.txt
docs            newfile.txt    scripts2       system_info.txt
file1.txt       readme.txt     summary.txt    test_project
linuxmint@DESKTOP-KSC4L9L: /mnt/e/linux$ |
```

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:

```
linuxmint@DESKTOP-KSC4L9L: /mnt/e/linux$ cp file1.txt file2.txt
linuxmint@DESKTOP-KSC4L9L: /mnt/e/linux$ touch myfile.txt documents
linuxmint@DESKTOP-KSC4L9L: /mnt/e/linux$ cp myfile.txt documents
linuxmint@DESKTOP-KSC4L9L: /mnt/e/linux$ cp -v myfile.txt documents
'myfile.txt' -> 'documents'
linuxmint@DESKTOP-KSC4L9L: /mnt/e/linux$ touch original.txt
linuxmint@DESKTOP-KSC4L9L: /mnt/e/linux$ cp original.txt backup_original.txt
cp: cannot stat 'original.txt': No such file or directory
linuxmint@DESKTOP-KSC4L9L: /mnt/e/linux$ cp -r file2 backup_file.txt
cp: cannot stat 'file2': No such file or directory
linuxmint@DESKTOP-KSC4L9L: /mnt/e/linux$ cp -r file2 backup_file1.txt
cp: cannot stat 'file2': No such file or directory
linuxmint@DESKTOP-KSC4L9L: /mnt/e/linux$ cp -r file2.txt backup_file.txt
linuxmint@DESKTOP-KSC4L9L: /mnt/e/linux$ |
```

Exercise 3: Viewing File Contents

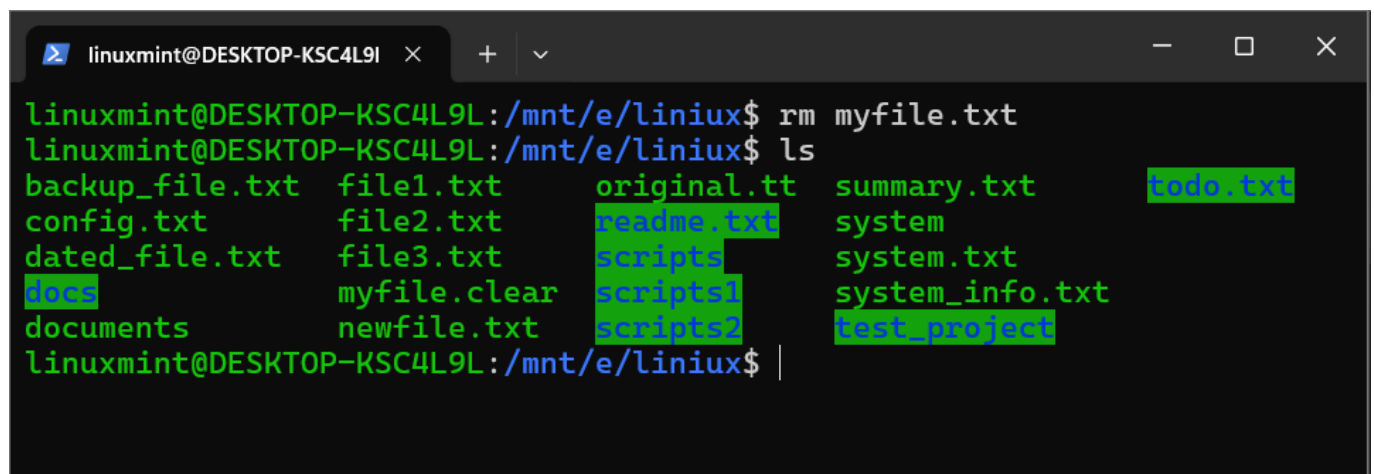
Task Statement:

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:

A terminal window titled 'linuxmint@DESKTOP-KSC4L9L' with standard window controls. The user enters 'rm myfile.txt' and then 'ls'. The 'ls' command outputs a multi-column list of files and directories: 'backup_file.txt', 'config.txt', 'dated_file.txt', 'docs', 'documents', 'linuxmint@DESKTOP-KSC4L9L:/mnt/e/linux\$'. The second column contains 'file1.txt', 'file2.txt', 'file3.txt', 'myfile.clear', 'newfile.txt'. The third column contains 'original.tt', 'readme.txt', 'scripts', 'scripts1', 'scripts2'. The fourth column contains 'summary.txt', 'system', 'system.txt', 'system_info.txt', 'test_project'. The fifth column contains 'todo.txt'.

```
linuxmint@DESKTOP-KSC4L9L:/mnt/e/linux$ rm myfile.txt
linuxmint@DESKTOP-KSC4L9L:/mnt/e/linux$ ls
backup_file.txt  file1.txt      original.tt    summary.txt    todo.txt
config.txt       file2.txt      readme.txt    system
dated_file.txt  file3.txt      scripts       system.txt
docs            myfile.clear   scripts1      system_info.txt
documents        newfile.txt    scripts2      test_project
linuxmint@DESKTOP-KSC4L9L:/mnt/e/linux$ |
```

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:

```

linuxmint@DESKTOP-KSC4L9L: /mnt/e/linux$ mv file3 dir1
linuxmint@DESKTOP-KSC4L9L: /mnt/e/linux$ ls dir1
linuxmint@DESKTOP-KSC4L9L: /mnt/e/linux$ mkdir file4
linuxmint@DESKTOP-KSC4L9L: /mnt/e/linux$ mkdir dir2
linuxmint@DESKTOP-KSC4L9L: /mnt/e/linux$ ls dir2
linuxmint@DESKTOP-KSC4L9L: /mnt/e/linux$ touch fil.txt
linuxmint@DESKTOP-KSC4L9L: /mnt/e/linux$ mkdir file1
linuxmint@DESKTOP-KSC4L9L: /mnt/e/linux$ mv file1 touch.txt
linuxmint@DESKTOP-KSC4L9L: /mnt/e/linux$ ls
backup_file.txt  dirl  myfile.clear  scripts1  system_info.txt
config.txt       docs  newfile.txt   scripts2  test_project
dated_file.txt  documents  original.tt  summary.txt  todo.txt
dir1            fil.txt  readme.txt   system      touch.txt
dir2            file4   scripts      system.txt
linuxmint@DESKTOP-KSC4L9L: /mnt/e/linux$ mv dir1 dir_1
linuxmint@DESKTOP-KSC4L9L: /mnt/e/linux$ ls
backup_file.txt  dirl  myfile.clear  scripts1  system_info.txt
config.txt       docs  newfile.txt   scripts2  test_project
dated_file.txt  documents  original.tt  summary.txt  todo.txt
dir2            fil.txt  readme.txt   system      touch.txt
dir_1           file4   scripts      system.txt
linuxmint@DESKTOP-KSC4L9L: /mnt/e/linux$

```

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:

```
linuxmint@DESKTOP-KSC4L9L: /mnt/e/liniux$ vim act1.sh
linuxmint@DESKTOP-KSC4L9L: /mnt/e/liniux$ bash act1.sh
Please enter your age:
17
You are not eligible to vote yet.
linuxmint@DESKTOP-KSC4L9L: /mnt/e/liniux$ bash act1.sh
Please enter your age:
20
You are eligible to vote.
linuxmint@DESKTOP-KSC4L9L: /mnt/e/liniux$
```

Exercise 6: Pattern Searching with `grep`

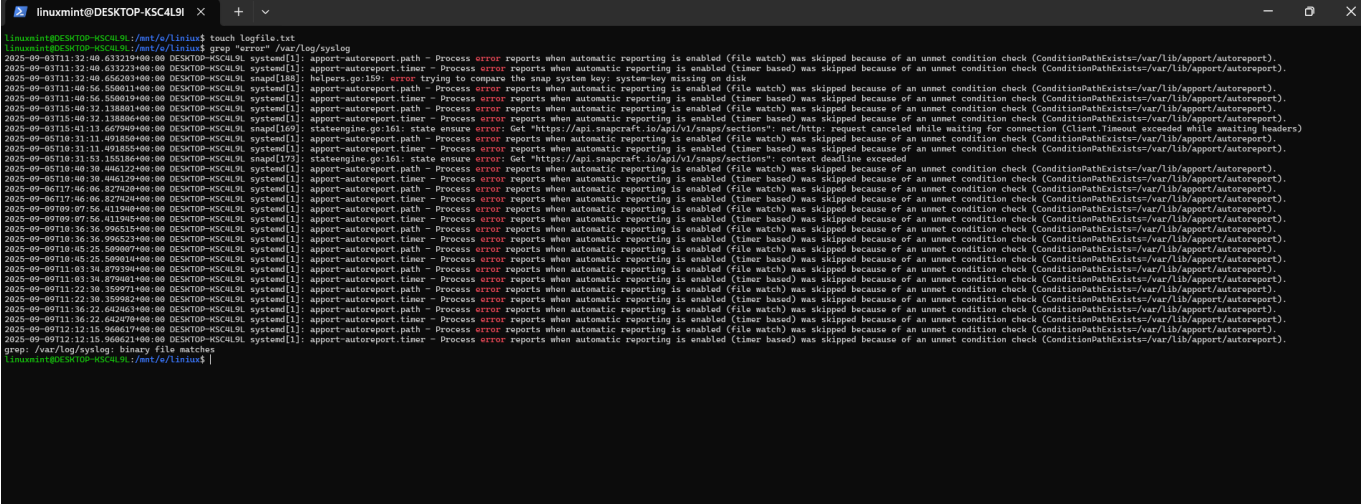
Task Statement:

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: 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:

```

linuxmint@DESKTOP-KSC4L9L  ×  +  ∨

backup_file.txt  fil.txt          original.tt      system_info.txt
config.txt       file1            readme.txt      test_project
dated_file.txt  file1.txt       scripts         todo.txt
dir2            file4           scripts1        touch.txt
dir_1          hello.gz        scripts2
dirl           logfile.txt     summary.txt
docs           myfile.clear    system
linuxmint@DESKTOP-KSC4L9L:/mnt/e/liniux$ gunzip hello.gz
linuxmint@DESKTOP-KSC4L9L:/mnt/e/liniux$ tar -czf archive.tar.gz
tar: Cowardly refusing to create an empty archive
Try 'tar --help' or 'tar --usage' for more information.
linuxmint@DESKTOP-KSC4L9L:/mnt/e/liniux$ tar -czf archive.tar.gz*
tar: Cowardly refusing to create an empty archive
Try 'tar --help' or 'tar --usage' for more information.
linuxmint@DESKTOP-KSC4L9L:/mnt/e/liniux$ tar -czf archive.tar.gz *
linuxmint@DESKTOP-KSC4L9L:/mnt/e/liniux$ ls
act1.sh          docs            myfile.clear    system
archive.tar.gz  documents      newfile.txt     system.txt
backup_file.txt  fil.txt        original.tt     system_info.txt
config.txt       file1          readme.txt      test_project
dated_file.txt  file1.txt     scripts         todo.txt
dir2            file4         scripts1        touch.txt
dir_1          hello         scripts2
dirl           logfile.txt    summary.txt
linuxmint@DESKTOP-KSC4L9L:/mnt/e/liniux$ tar -xzf archive.tar.gz
linuxmint@DESKTOP-KSC4L9L:/mnt/e/liniux$ ls
act1.sh          docs            myfile.clear    system
archive.tar.gz  documents      newfile.txt     system.txt
backup_file.txt  fil.txt        original.tt     system_info.txt
config.txt       file1          readme.txt      test_project
dated_file.txt  file1.txt     scripts         todo.txt
dir2            file4         scripts1        touch.txt
dir_1          hello         scripts2
dirl           logfile.txt    summary.txt
linuxmint@DESKTOP-KSC4L9L:/mnt/e/liniux$ |

```

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:

```

linuxmint@DESKTOP-KSC4L9L: /mnt/e/liniux$ ln fil.txt hardlink_fil
linuxmint@DESKTOP-KSC4L9L: /mnt/e/liniux$ ls -li
total 8
1688849860268080 -rwxrwxrwx 1 linuxmint linuxmint 386 Oct 29 14:31 act1.sh
1125899906846772 -rwxrwxrwx 1 linuxmint linuxmint 1584 Oct 29 14:41 achieve.tar.gz
1125899906846761 -rwxrwxrwx 1 linuxmint linuxmint 0 Oct 29 14:10 backup_file.txt
1688849860268024 -rwxrwxrwx 1 linuxmint linuxmint 7 Oct 29 13:20 config.txt
1125899906846756 -rwxrwxrwx 1 linuxmint linuxmint 0 Jan 15 2024 dated_file.txt
1407374883557414 drwxrwxrwx 1 linuxmint linuxmint 4096 Oct 29 14:24 dirs
1125899906846754 drwxrwxrwx 1 linuxmint linuxmint 4096 Oct 29 14:24 dir_1
1125899906846753 -rwxrwxrwx 1 linuxmint linuxmint 0 Oct 29 14:02 dirl
1407374883557359 drwxrwxrwx 1 linuxmint linuxmint 4096 Oct 29 12:46 docs
1125899906846759 -rwxrwxrwx 1 linuxmint linuxmint 0 Oct 29 14:08 documents
844424930136119 drwxrwxrwx 1 linuxmint linuxmint 4096 Oct 29 14:50 exper.txt
1407374883557418 -rwxrwxrwx 2 linuxmint linuxmint 0 Oct 29 14:25 fil.txt
844424930136114 drwxrwxrwx 1 linuxmint linuxmint 4096 Oct 29 14:37 file1
844424930136113 drwxrwxrwx 1 linuxmint linuxmint 4096 Oct 29 14:35 file1.txt
1407374883557411 drwxrwxrwx 1 linuxmint linuxmint 4096 Oct 29 14:24 file2
1407374883557418 -rwxrwxrwx 2 linuxmint linuxmint 0 Oct 29 14:25 hardlink_fil
1407374883557427 -rwxrwxrwx 1 linuxmint linuxmint 0 Oct 29 14:38 hello
844424930136117 drwxrwxrwx 1 linuxmint linuxmint 4096 Oct 29 14:48 hi
844424930136118 drwxrwxrwx 1 linuxmint linuxmint 4096 Oct 29 14:49 hi.txt
1970324836978735 -rwxrwxrwx 1 linuxmint linuxmint 0 Oct 29 14:33 logfile.txt
1125899906846757 -rwxrwxrwx 1 linuxmint linuxmint 0 Oct 29 14:06 myfile.clear
1688849860268064 -rwxrwxrwx 1 linuxmint linuxmint 0 Oct 29 14:01 newfile.txt
1125899906846760 -rwxrwxrwx 1 linuxmint linuxmint 0 Oct 29 14:08 original.tt
844424930136081 drwxrwxrwx 1 linuxmint linuxmint 4096 Oct 29 13:35 readme.txt
1407374883557362 drwxrwxrwx 1 linuxmint linuxmint 4096 Oct 29 13:36 scripts
1970324836978681 drwxrwxrwx 1 linuxmint linuxmint 4096 Oct 29 13:21 scripts1
1407374883557370 drwxrwxrwx 1 linuxmint linuxmint 4096 Oct 29 13:21 scripts2
1125899906846740 -rwxrwxrwx 1 linuxmint linuxmint 38 Oct 29 13:42 summary.txt
1688849860268028 -rwxrwxrwx 1 linuxmint linuxmint 10 Oct 29 13:22 system
1125899906846735 -rwxrwxrwx 1 linuxmint linuxmint 10 Oct 29 13:22 system.txt
1688849860268027 -rwxrwxrwx 1 linuxmint linuxmint 953 Oct 29 13:26 system_info.txt
1407374883557355 drwxrwxrwx 1 linuxmint linuxmint 4096 Oct 29 12:41 test_project
844424930136080 drwxrwxrwx 1 linuxmint linuxmint 4096 Oct 29 13:28 todo.txt
1125899906846763 drwxrwxrwx 1 linuxmint linuxmint 4096 Oct 29 14:25 touch.txt
linuxmint@DESKTOP-KSC4L9L: /mnt/e/liniux$ mkdir symlink_fil
linuxmint@DESKTOP-KSC4L9L: /mnt/e/liniux$ ls -ls fil.txt symlink_fil
0 fil.txt

symlink_fil:
total 0
linuxmint@DESKTOP-KSC4L9L: /mnt/e/liniux$ ls
act1.sh          dir_1          exper.txt      hardlink_fil    myfile.clear    scripts1       system.txt
achieve.tar.gz  dir_1          fil.txt        hello           newfile.txt    scripts2       system_info.txt
backup_file.txt dirl           file1          hi              original.tt     summary.txt    test_project
config.txt      docs          file1.txt     hi.txt          readme.txt     symlink_fil    todo.txt
dated_file.txt  documents    file2          logfile.txt     scripts        system         touch.txt
linuxmint@DESKTOP-KSC4L9L: /mnt/e/liniux$ |

```

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.