Experiment 3: Linux File Manipulation and System Manipulation I

Name: vinit kumar Roll No.: 590029353 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:

```
PS C:\Users\HP\OneDrive\Desktop\class 3> wsl
vinit@LAPTOP-P8DCHODS:/mnt/c/Users/HP/OneDrive/Desktop/class 3$ bash
vinit@LAPTOP-P8DCHODS:/mnt/c/Users/HP/OneDrive/Desktop/class 3$ touch newfile.txt
vinit@LAPTOP-P8DCHODS:/mnt/c/Users/HP/OneDrive/Desktop/class 3$ touch file1.txt file2.txt file3.txt
vinit@LAPTOP-P8DCHODS:/mnt/c/Users/HP/OneDrive/Desktop/class 3$ touch -t 202401151430
touch: missing file operand
Try 'touch --help' for more information.
vinit@LAPTOP-P8DCHODS:/mnt/c/Users/HP/OneDrive/Desktop/class 3$ |
```

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:

```
vinit@LAPTOP-P8DCHODS:/mnt/c/Users/HP/OneDrive/Desktop/class 3$ cp document.txt backup_document.txt
cp: cannot stat 'document.txt': No such file or directory
vinit@LAPTOP-P8DCHODS:/mnt/c/Users/HP/OneDrive/Desktop/class 3$ mv oldname.tyxt newname.txt
mv: cannot stat 'oldname.tyxt': No such file or directory
vinit@LAPTOP-P8DCHODS:/mnt/c/Users/HP/OneDrive/Desktop/class 3$ rm unwanted_file.txt
rm: cannot remove 'unwanted_file.txt': No such file or directory
vinit@LAPTOP-P8DCHODS:/mnt/c/Users/HP/OneDrive/Desktop/class 3$ rm -r old_directory/
rm: cannot remove 'old_directory/': No such file or directory
vinit@LAPTOP-P8DCHODS:/mnt/c/Users/HP/OneDrive/Desktop/class 3$ |
```

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:

```
vinit@LAPTOP-P8DCHODS:/mnt/c/Users/HP/OneDrive/Desktop/class 3$ head -n 5 filename.txt
head: cannot open 'filename.txt' for reading: No such file or directory
vinit@LAPTOP-P8DCHODS:/mnt/c/Users/HP/OneDrive/Desktop/class 3$ tail -n 20 filename.txt
tail: cannot open 'filename.txt' for reading: No such file or directory
vinit@LAPTOP-P8DCHODS:/mnt/c/Users/HP/OneDrive/Desktop/class 3$ |
```

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:

```
vinit@LAPTOP-P8DCHODS:/mnt/c/Users/HP/OneDrive/Desktop/class 3$ ls -l
total 0
-rwxrwxrwx 1 vinit vinit 0 Oct 30 16:19 file1.txt
-rwxrwxrwx 1 vinit vinit 0 Oct 30 16:19 file2.txt
-rwxrwxrwx 1 vinit vinit 0 Oct 30 16:19 file3.txt
-rwxrwxrwx 1 vinit vinit 0 Oct 30 16:18 newfile.txt
vinit@LAPTOP-P8DCHODS:/mnt/c/Users/HP/OneDrive/Desktop/class 3$ chmod 755 script.sh
chmod: cannot access 'script.sh': No such file or directory
vinit@LAPTOP-P8DCHODS:/mnt/c/Users/HP/OneDrive/Desktop/class 3$ chmod u+x script.sh
chmod: cannot access 'script.sh': No such file or directory
vinit@LAPTOP-P8DCHODS:/mnt/c/Users/HP/OneDrive/Desktop/class 3$ sudo chown newuser:newgroup file.txt
[sudo] password for vinit:
Sorry, try again.
[sudo] password for vinit:
Sorry, try again.
[sudo] password for vinit:
chown: invalid user: 'newuser:newgroup'
vinit@LAPTOP-P8DCHODS:/mnt/c/Users/HP/OneDrive/Desktop/class 3$ chgrp developers project.txt
chgrp: invalid group: 'developers'
vinit@LAPTOP-P8DCHODS:/mnt/c/Users/HP/OneDrive/Desktop/class 3$
```

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:

```
init@LAPTOP-P8DCHODS:/mnt/c/Users/HP/OneDrive/Desktop/class 3$ find/home -name"*.txt"
-bash: find/home: No such file or directory
init@LAPTOP-P8DCHODS:/mnt/c/Users/HP/OneDrive/Desktop/class 3$ find/home -type f -size +100m
-bash: find/home: No such file or directory
init@LAPTOP-P8DCHODS:/mnt/c/Users/HP/OneDrive/Desktop/class 3$ find/etc -name "*conf"
-bash: find/etc: No such file or directory
init@LAPTOP-P8DCHODS:/mnt/c/Users/HP/OneDrive/Desktop/class 3$ find/tmp -type f -empty -delete
-bash: find/tmp: No such file or directory
init@LAPTOP-P8DCHODS:/mnt/c/Users/HP/OneDrive/Desktop/class 3$
```

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:

```
vinit@LAPTOP-P8DCHODS:/mnt/c/Users/HP/OneDrive/Desktop/class 3$ grep "erroe" /var/log/syslog
vinit@LAPTOP-P8DCHODS:/mnt/c/Users/HP/OneDrive/Desktop/class 3$ grep -i "error" logfile.txt
grep: logfile.txt: No such file or directory
vinit@LAPTOP-P8DCHODS:/mnt/c/Users/HP/OneDrive/Desktop/class 3$ grep -r "function" ~/code/
grep: /home/vinit/code/: No such file or directory
vinit@LAPTOP-P8DCHODS:/mnt/c/Users/HP/OneDrive/Desktop/class 3$ grep -n "todo" *.txt
vinit@LAPTOP-P8DCHODS:/mnt/c/Users/HP/OneDrive/Desktop/class 3$
```

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:

```
vinit@LAPTOP-P8DCHODS:/mnt/c/Users/HP/OneDrive/Desktop/class 3$ 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
vinit@LAPTOP-P8DCHODS:/mnt/c/Users/HP/OneDrive/Desktop/class 3$ tar -xzf backup.tar.gz -c /restore/
tar: You may not specify more than one '-Acdtrux', '--delete' or  '--test-label' option
Try 'tar --help' or 'tar --usage' for more information.
vinit@LAPTOP-P8DCHODS:/mnt/c/Users/HP/OneDrive/Desktop/class 3$ gzip largefile.txt
gzip: largefile.txt: No such file or directory
vinit@LAPTOP-P8DCHODS:/mnt/c/Users/HP/OneDrive/Desktop/class 3$ gunzip largefile.txt.gz
gzip: largefile.txt.gz: No such file or directory
vinit@LAPTOP-P8DCHODS:/mnt/c/Users/HP/OneDrive/Desktop/class 3$
```

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:

```
vinit@LAPTOP-P8DCHODS:/mnt/c/Users/HP/OneDrive/Desktop/class 3$ echo "hello" > original.txt
vinit@LAPTOP-P8DCHODS:/mnt/c/Users/HP/OneDrive/Desktop/class 3$ ln original.txt hardlink.txt
vinit@LAPTOP-P8DCHODS:/mnt/c/Users/HP/OneDrive/Desktop/class 3$ ln -s original.txt symlink.txt
vinit@LAPTOP-P8DCHODS:/mnt/c/Users/HP/OneDrive/Desktop/class 3$ ls -li original.txt hardlink.txt symlink.txt
6755399441073834 -rwxrwxrwx 2 vinit vinit  6 Oct 30 16:39 hardlink.txt
6755399441073834 -rwxrwxrwx 2 vinit vinit  6 Oct 30 16:39 original.txt
2251799814494029 lrwxrwxrwx 1 vinit vinit 12 Oct 30 16:40 symlink.txt -> original.txt
vinit@LAPTOP-P8DCHODS:/mnt/c/Users/HP/OneDrive/Desktop/class 3$
```

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.