

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

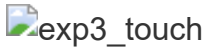
Task Statement:

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:

exp3_touch

Exercise 2: Copying, Moving, and Deleting Files

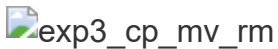
Task Statement:

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:

exp3_cp_mv_rm

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:

 exp3_cat_less

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:

 exp3_permissions

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:

!

 exp3_find

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:

!

 exp3_grep

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:

!

exp3_tar_gzip

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:

exp3_links

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.