Kathmandu University
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A Lab Report

on

"Operating System Lab-I"

[Code No.: COMP 342]

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Questions

Q1: What is Linux?

Linux is an open-source operating system based on the Unix architecture. It manages hardware resources, executes commands, and provides a secure multi-tasking environment. It powers servers, desktops, embedded devices, and even supercomputers. Some of the most popular Linux distributions are ArchLinux, Ubuntu, RedHat, etc.

Q2: The Linux Hierarchical File System

Linux uses a hierarchical file structure that begins at the root directory /. Everything in Linux is a file or a directory, and all paths originate from /. Common directories include:

- /home – User home directories
- /bin – Essential command binaries
- /etc – Configuration files
- /usr – User utilities and applications
- /var – Logs, caches, temporary data

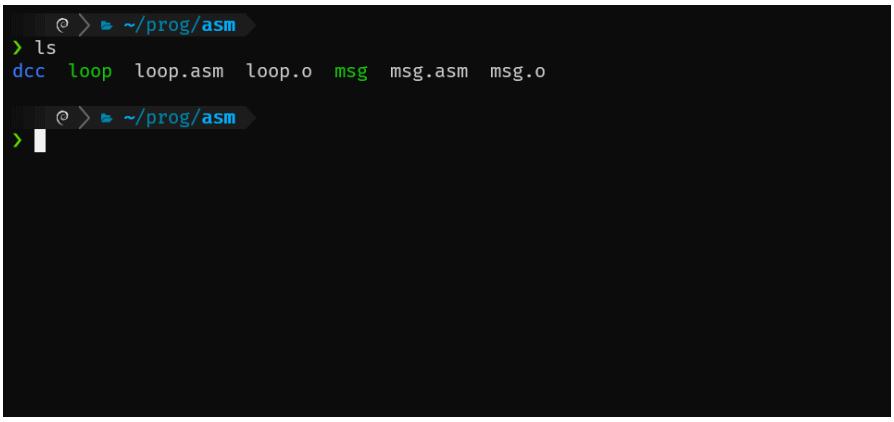
Q3: Importance of Linux commands in Operating Systems

Linux commands are critical because they provide a direct and powerful interface to the operating system. They allow users and administrators to navigate the file system, manage files and directories, monitor system performance, and automate tasks through scripting. Unlike graphical interfaces, command-line commands are faster, use fewer resources, and provide more precise control. Mastering these commands enhances efficiency, troubleshooting capabilities, and overall understanding of how the OS operates, making it indispensable for system administrators, developers, and power users.

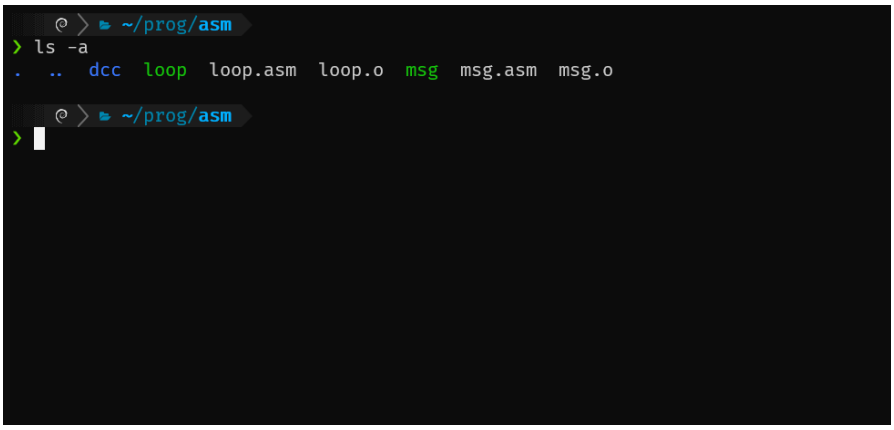
Linux Commands

1. **`pwd`**
   The pwd command prints your current working directory. It tells you exactly where you are located inside the Linux file system. This is extremely useful when navigating through multiple folders, working in scripts, or verifying paths before executing commands that affect files. Since Linux uses a hierarchical file structure starting at the root /, pwd helps ensure you never get lost.

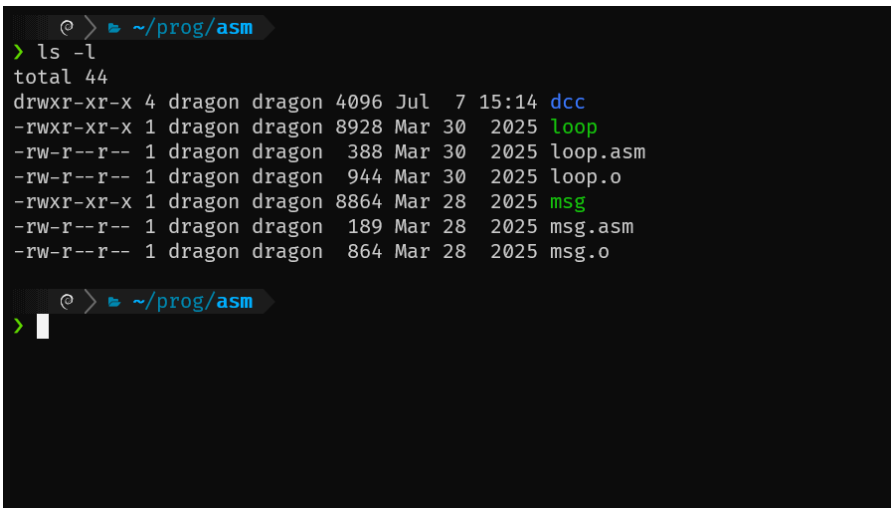
2. **`ls`**
   The ls command lists all files and directories in your current location. It gives a quick overview of the contents of a folder and is one of the most frequently used commands. By default, it shows only visible items (non-hidden files).



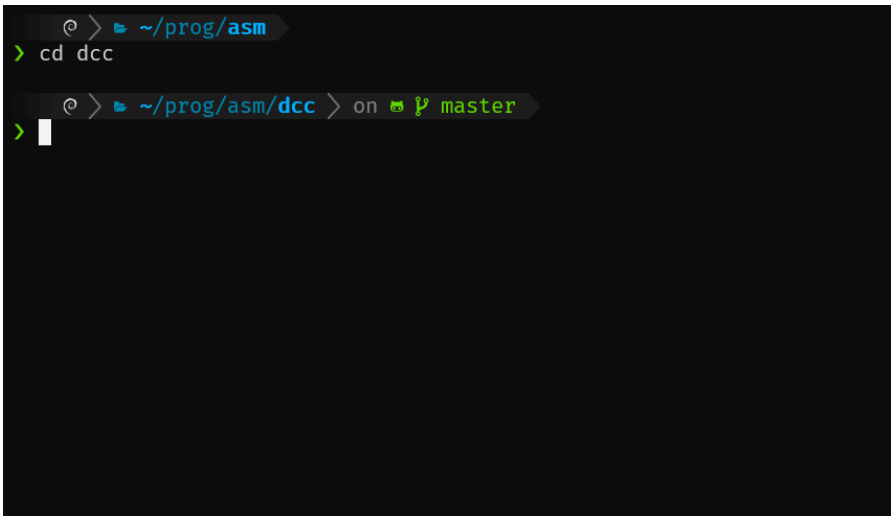
3. **`ls -a`**
   This version of ls displays all files, including hidden ones. Hidden files in Linux start with a dot (.), such as .bashrc or .config. These files usually store configurations and preferences.



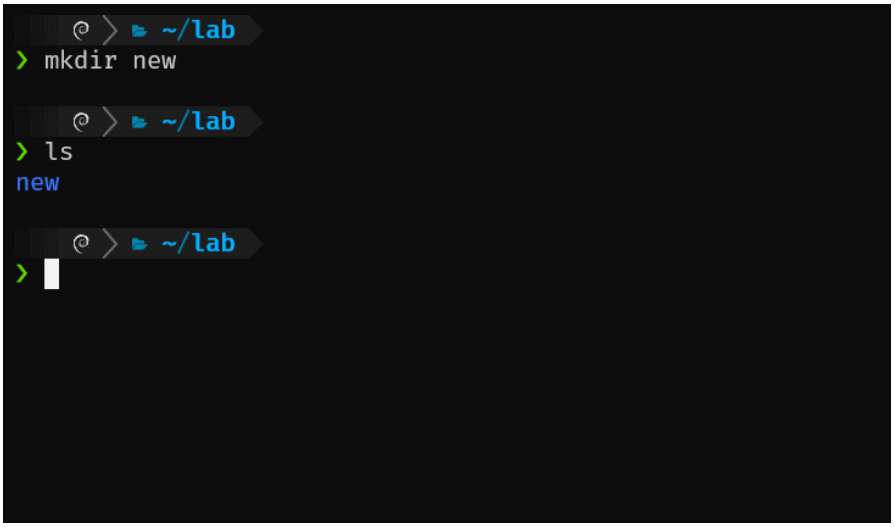
4. **`ls -l`**
   The -l option displays a long, detailed listing. It includes file permissions, owner, group, size, and last modification time. This format is essential for understanding access rights and managing file security.



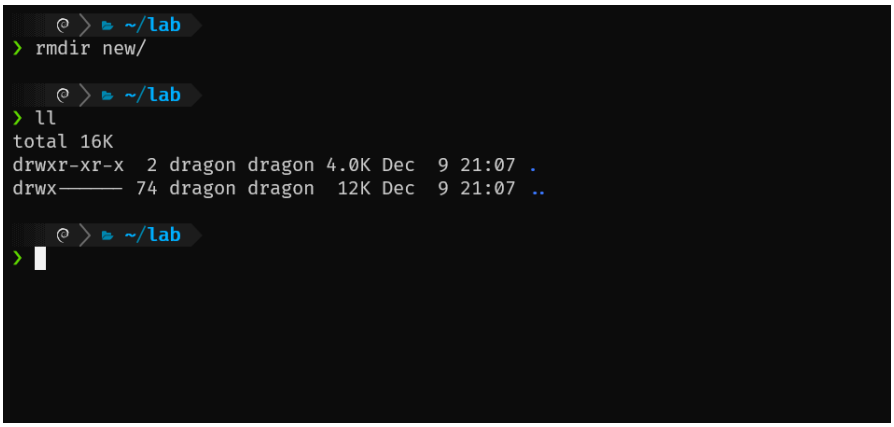
5. **`cd`**
   The cd command lets you move between directories. It is used to navigate the Linux filesystem. You can move into subdirectories, return to the parent directory using `cd ..`, or jump to a specific absolute path.



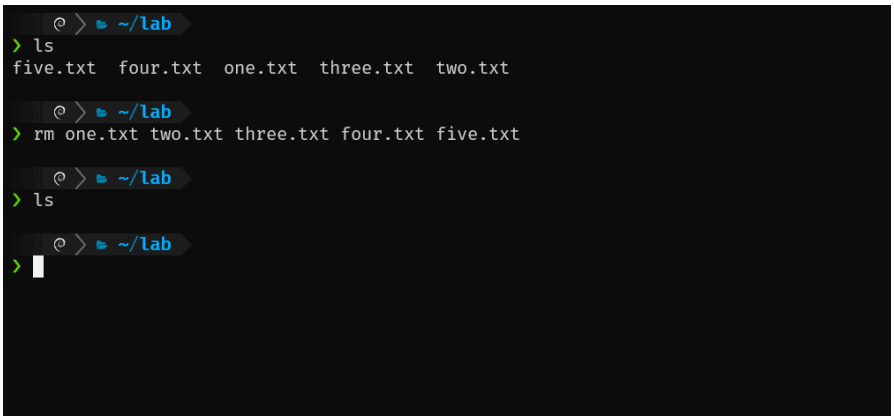
6. **`mkdir`**
   mkdir creates a new directory. It is commonly used to organize files by grouping them into folders. You can also create multiple folders at once, or even nested folders using `mkdir -p`.



7. **`rmdir`**
   This command removes an empty directory. It cannot delete directories that contain files. It is useful for cleaning up folder structures or removing temporary empty folders. To remove the folder there must be a folder that is created.



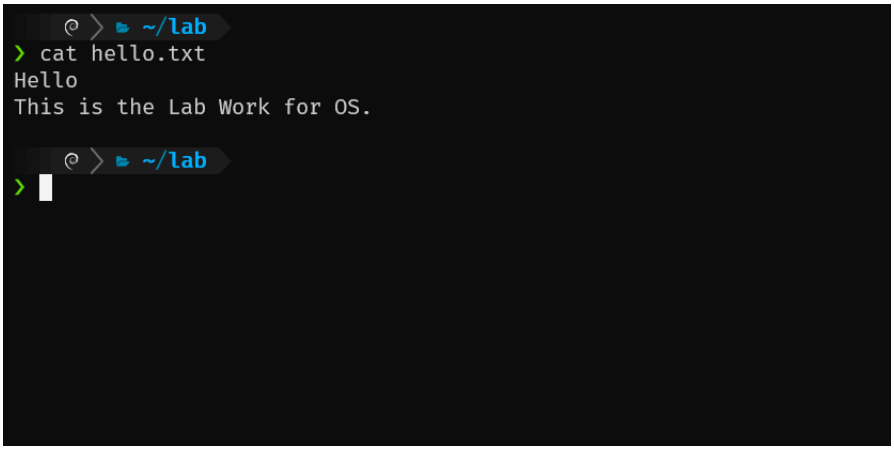
8. **`rm`**
   The rm command deletes files permanently (no recycle bin). It should be used carefully because deleted files are not easily recoverable. You can also remove multiple files at once.



9. **`rm -r folder_name`**
   The -r option stands for recursive deletion. It removes a directory and everything inside it — files, subfolders, and all. This is powerful and potentially dangerous, so double-check the directory before executing.

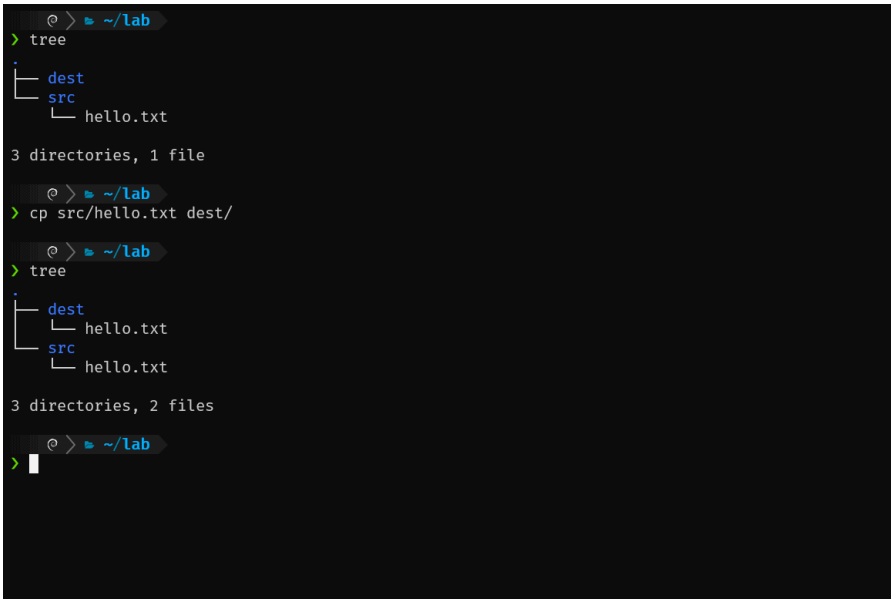
10. **`touch`**
    touch is used to create an empty file or update the timestamp of an existing file. It is commonly used in scripting or when preparing placeholder files.

11. **`cat`**
    The cat command reads and displays the content of a file directly in the terminal. It is also used to combine files or create files using output redirection.

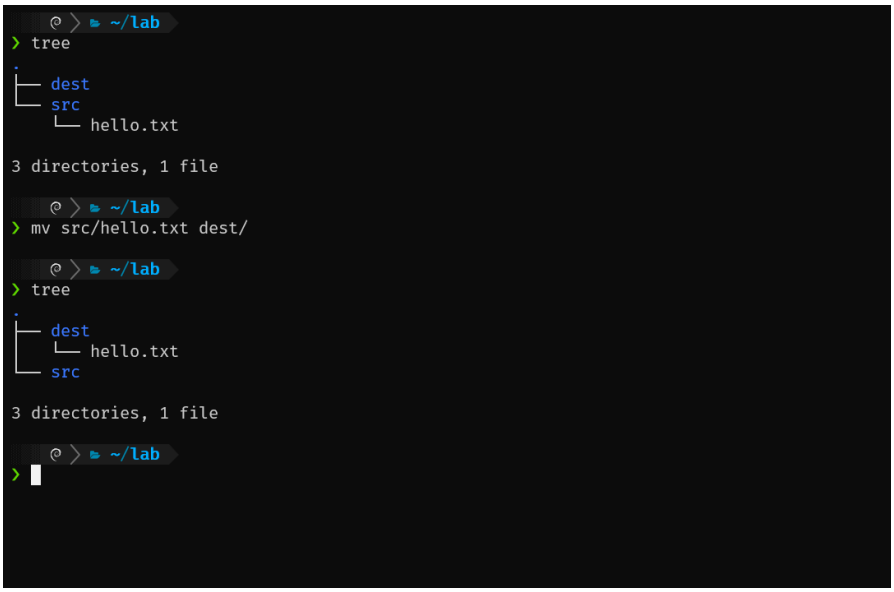


12. **`nano, vi, jed`**
    These are terminal-based text editors. nano is beginner-friendly, vi (or vim) is a powerful editor popular among developers, and jed provides a lightweight interface. They allow editing, writing, and saving files directly from the terminal.

13. **cp**
    cp copies files from one place to another. You can also copy directories using the -r option. This command is essential for backups, duplication, and organizing files.



14. **mv**
    mv allows you to move or rename files and directories. Renaming is simply a move within the same folder. It's used for reorganizing or updating file names.



15. **`locate`**
    This command searches for files by name. It uses a system database, which makes the search extremely fast. It's ideal for finding misplaced files.

16. **`echo`**
    Prints text or variable values to the terminal. It is commonly used in scripts to produce messages, debug values, or write text into files using redirection.

```
~/lab
❯ echo "Hello"
Hello

~/lab
❯
```

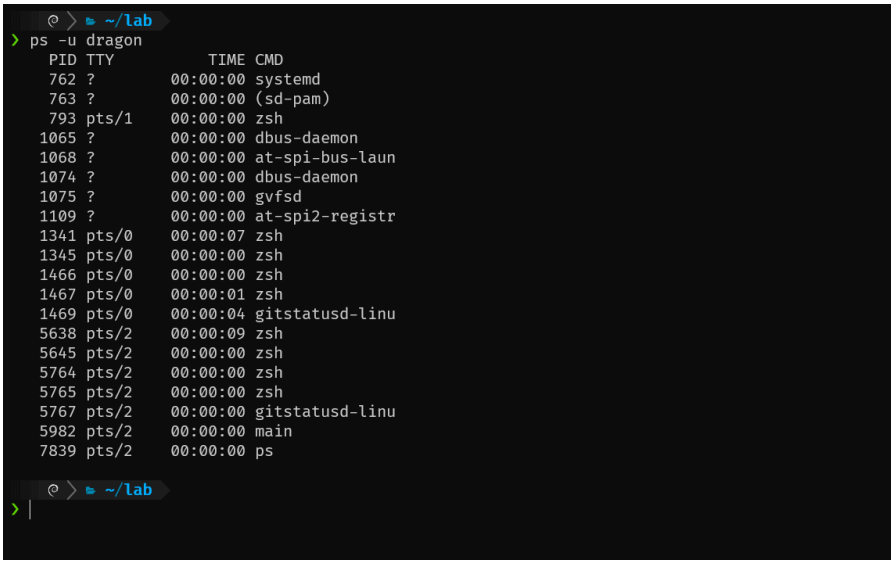
17. **`uname -a`**
    Shows complete system information, including kernel version, machine architecture, hostname, and operating system. Useful for debugging or checking system specs.

```
~/lab                                                    system at 08:44:38 AM
❯ uname -a
Linux dragon 6.6.87.2-microsoft-standard-WSL2 #1 SMP PREEMPT_DYNAMIC Thu Jun  5 18:30:46 UTC 2025 x86_64 GNU/Linux

~/lab                                                    system at 08:44:43 AM
❯
```

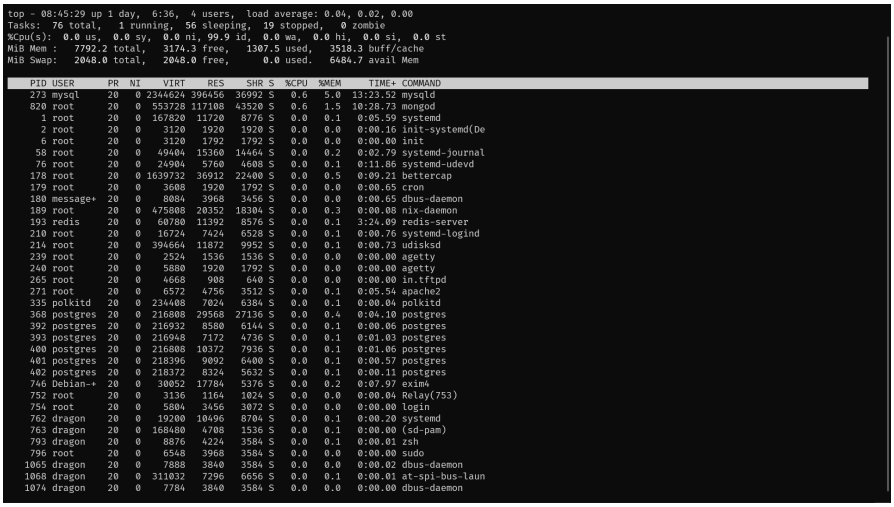
18. **`df -h`**
    Displays disk usage in human-readable format (MB/GB). It shows total size, used space, available space, and mounted filesystems. Handy for monitoring storage.

```
~/lab
❯ df -h
Filesystem      Size  Used Avail Use% Mounted on
none            3.9G     0  3.9G   0% /usr/lib/modules/6.6.87.2-microsoft-standard-WSL2
none            3.9G  4.0K  3.9G   1% /mnt/wsl
drivers         477G  312G  165G  66% /usr/lib/wsl/drivers
/dev/sdd       1007G   78G  879G   9% /
none            3.9G  200K  3.9G   1% /mnt/wslg
none            3.9G     0  3.9G   0% /usr/lib/wsl/lib
rootfs          3.8G  2.7M  3.8G   1% /init
none            3.8G     0  3.8G   0% /dev
none            3.9G  572K  3.9G   1% /run
none            3.9G     0  3.9G   0% /run/lock
none            3.9G  1.1M  3.9G   1% /run/shm
none            3.9G   80K  3.9G   1% /mnt/wslg/versions.txt
none            3.9G   80K  3.9G   1% /mnt/wslg/doc
C:\             477G  312G  165G  66% /mnt/c
tmpfs           780M   12K  780M   1% /run/user/1000

~/lab
❯
```

19. **`ps -u $USER`**
    Lists all currently running processes for your user. It displays process IDs, CPU usage, memory usage, and command names. Very useful for identifying unnecessary or stuck processes.



20. **`top`**
    Displays real-time system activity. It shows active processes, CPU load, memory usage, and system uptime. It's one of the most important performance-monitoring commands.



21. **`chmod`**
    Modifies file permissions. Permissions control who can read, write, or execute a file. chmod is essential for running scripts, securing files, and managing access rights.