Kathmandu University

Department of Computer Science and Engineering

Dhulikhel, Kavre

Lab Report 1
[Code No: COMP 307]

Submitted by:

Aayush Dahal (16)

Group: CS60 (III/I)

Submitted to:
Ms. Rabina Shrestha
Department of Computer Science and Engineering

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Q1. What is Linux?

Linux is a free, open-source operating system that follows Unix design principles. First released by Linus Torvalds in 1991, it's now among the most common operating systems in the world. People choose Linux for its dependability, security, and versatility. It powers diverse devices including Android phones, web servers, supercomputers, and laptops. Unlike commercial operating systems, Linux's source code is freely available for anyone to view, edit, and share.

Q2. Explain the Linux Hierarchical File System.

The Linux file system is organized in a hierarchical tree structure that begins at the root directory, represented by /. Every file and folder extends from this main root. Some important directories are:

- **/home** – Stores personal folders for regular users
- **/root** – The home directory for the system's administrator
- **/bin** – Contains essential command-line programs
- **/usr** – Contains user applications and related data
- **/var** – Includes files that change frequently, such as logs
- **/tmp** – Used for temporary files
- **/etc – Holds system configuration files**

Q3. Explain the importance of Linux commands in Operating Systems..

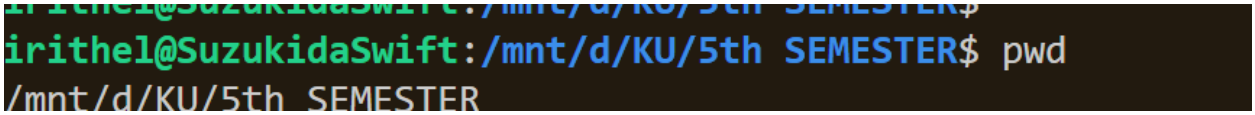
Linux commands are essential tools for working with the operating system. They allow users to:

- Move around and organize the file system
- Handle administrative tasks and adjust system settings
- Automate routine actions using scripts
- Check system performance and solve problems
- Manage users, permissions, and security settings

Some widely used linux commands, their description and use cases

1. pwd (Print Working Directory)

The pwd command displays the absolute path of your current directory location in the file system. When you open the terminal, you start in your home directory, and this command helps you identify where you are in the directory hierarchy.



2. Listing commands

ls

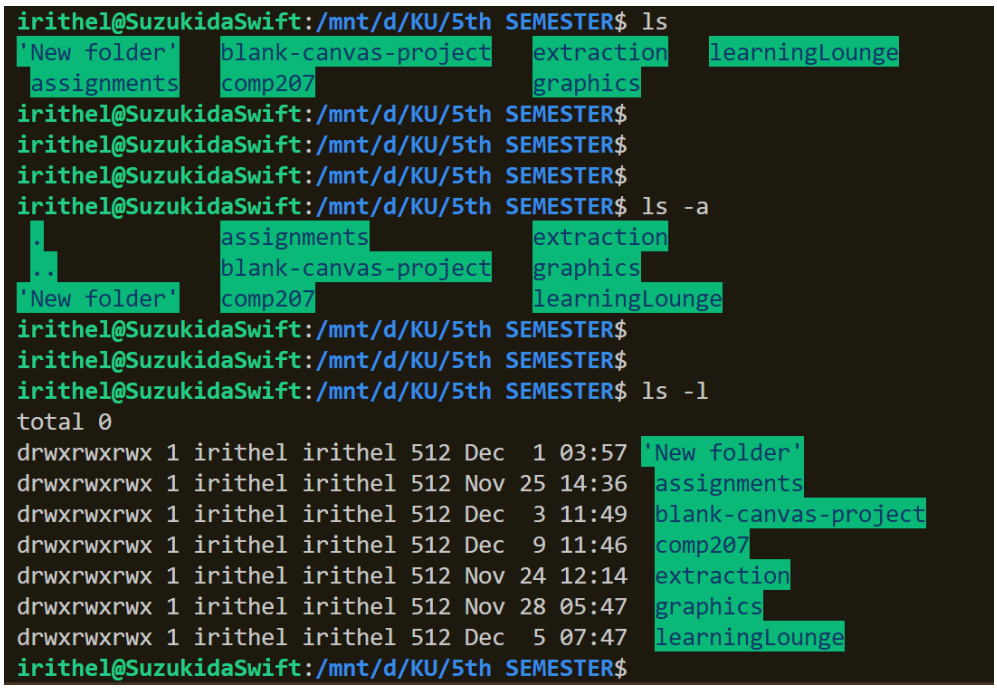
The ls command lists all files and directories in the current directory. It provides a quick overview of contents without needing a file manager, displaying items alphabetically by default.

ls -a

The ls -a command shows all files including hidden files that start with a dot (.). In Linux, configuration files are often hidden, and this flag reveals them along with . (current directory) and .. (parent directory).

ls -l

The ls -l command displays detailed information about files including permissions, owner, group, size, and modification date. The first character indicates file type (- for file, d for directory).



3. cd (Change Directory)

The cd command navigates between directories in the file system. Use cd .. to move to the parent directory, cd ~ or just cd to go home, and cd - to return to previous directory.

```
irithel@SuzukidaSwift:/mnt/d/KU/5th SEMESTER$ cd comp207/
irithel@SuzukidaSwift:/mnt/d/KU/5th SEMESTER/comp207$ pwd
/mnt/d/KU/5th SEMESTER/comp207
irithel@SuzukidaSwift:/mnt/d/KU/5th SEMESTER/comp207$
irithel@SuzukidaSwift:/mnt/d/KU/5th SEMESTER/comp207$
irithel@SuzukidaSwift:/mnt/d/KU/5th SEMESTER/comp207$ cd ..
irithel@SuzukidaSwift:/mnt/d/KU/5th SEMESTER$
```

4. mkdir and rmdir

mkdir

The mkdir command creates new directories in the current location or specified path. You can create multiple directories at once or use -p flag to create nested directory structures like mkdir -p parent/child/grandchild.

rmdir

The rmdir command removes empty directories only. If a directory contains files, it will fail with an error, providing a safety mechanism against accidental deletion of important data.

```
irithel@SuzukidaSwift:/mnt/d/KU/5th SEMESTER/comp207$ mkdir demo
irithel@SuzukidaSwift:/mnt/d/KU/5th SEMESTER/comp207$
irithel@SuzukidaSwift:/mnt/d/KU/5th SEMESTER/comp207$ ls
README.md  demo  ss
irithel@SuzukidaSwift:/mnt/d/KU/5th SEMESTER/comp207$
irithel@SuzukidaSwift:/mnt/d/KU/5th SEMESTER/comp207$ rmfir demo
Command 'rmfir' not found, did you mean:
  command 'rmdir' from deb coreutils (9.4-2ubuntu2)
Try: sudo apt install <deb name>
irithel@SuzukidaSwift:/mnt/d/KU/5th SEMESTER/comp207$
irithel@SuzukidaSwift:/mnt/d/KU/5th SEMESTER/comp207$
irithel@SuzukidaSwift:/mnt/d/KU/5th SEMESTER/comp207$ rmdir demo
irithel@SuzukidaSwift:/mnt/d/KU/5th SEMESTER/comp207$
irithel@SuzukidaSwift:/mnt/d/KU/5th SEMESTER/comp207$
irithel@SuzukidaSwift:/mnt/d/KU/5th SEMESTER/comp207$ ls
README.md  ss
```

5. File manipulation commands

touch

The touch command creates new empty files or updates timestamps of existing files. It's commonly used to quickly create placeholder files that will be edited later.

vim (Text Editor)
The vim editor is a simple, beginner-friendly command-line text editor.

cat (concatenation)
The cat command displays entire file contents in the terminal. It can also concatenate multiple files and display them together. For large files, use less or more for better navigation.

cp
The cp command copies files or directories while keeping the original intact. Use -r flag for directories, -i for confirmation prompts, and -v for verbose output showing what's being copied.

echo
The echo command prints text or variable values to the terminal. Use > to write to files or >> to append. It's useful in scripts for displaying messages and creating simple text files.

```
irithel@SuzukidaSwift:/mnt/d/KU/5th SEMESTER/comp207$ touch comp.text
irithel@SuzukidaSwift:/mnt/d/KU/5th SEMESTER/comp207$ vim sample.txt
irithel@SuzukidaSwift:/mnt/d/KU/5th SEMESTER/comp207$
irithel@SuzukidaSwift:/mnt/d/KU/5th SEMESTER/comp207$ cat sample.txt
cat: sample.txt: No such file or directory
irithel@SuzukidaSwift:/mnt/d/KU/5th SEMESTER/comp207$
irithel@SuzukidaSwift:/mnt/d/KU/5th SEMESTER/comp207$ cat comp.text
irithel@SuzukidaSwift:/mnt/d/KU/5th SEMESTER/comp207$
irithel@SuzukidaSwift:/mnt/d/KU/5th SEMESTER/comp207$ cp comp.text co
py.text
irithel@SuzukidaSwift:/mnt/d/KU/5th SEMESTER/comp207$
irithel@SuzukidaSwift:/mnt/d/KU/5th SEMESTER/comp207$ echo "computer 307 opera
ting system" > comp.txt
```

6. mv and rm

mv: The mv command moves files to new locations or renames them. Unlike cp, it removes the original from source location. Use -i flag to prevent accidental overwrites of existing files.

rm: The rm command permanently deletes files from the file system. Unlike moving to trash, this cannot be easily undone, so use with caution and consider using -i flag for confirmation prompts.

```
irithel@SuzukidaSwift:/mnt/d/KU/5th SEMESTER/comp207$ mv copy.text rename
irithel@SuzukidaSwift:/mnt/d/KU/5th SEMESTER/comp207$
irithel@SuzukidaSwift:/mnt/d/KU/5th SEMESTER/comp207$ rm renamed.txt
irithel@SuzukidaSwift:/mnt/d/KU/5th SEMESTER/comp207$
irithel@SuzukidaSwift:/mnt/d/KU/5th SEMESTER/comp207$
irithel@SuzukidaSwift:/mnt/d/KU/5th SEMESTER/comp207$
irithel@SuzukidaSwift:/mnt/d/KU/5th SEMESTER/comp207$ mkdir -p test/a/b
irithel@SuzukidaSwift:/mnt/d/KU/5th SEMESTER/comp207$
irithel@SuzukidaSwift:/mnt/d/KU/5th SEMESTER/comp207$
irithel@SuzukidaSwift:/mnt/d/KU/5th SEMESTER/comp207$
irithel@SuzukidaSwift:/mnt/d/KU/5th SEMESTER/comp207$
irithel@SuzukidaSwift:/mnt/d/KU/5th SEMESTER/comp207$ rm -r test
```

7. head and tail

head: The head command shows the first 10 lines of a file by default. Use -n option to specify different number of lines, which is useful for quickly previewing file contents.

tail: The tail command displays the last 10 lines of a file by default. Use -f flag to continuously monitor new lines being added, which is particularly useful for watching log files in real-time.

```
irithel@SuzukidaSwift:/mnt/d/KU/5th SEMESTER/comp207$ head comp.txt
computer 307 operating system
irithel@SuzukidaSwift:/mnt/d/KU/5th SEMESTER/comp207$
irithel@SuzukidaSwift:/mnt/d/KU/5th SEMESTER/comp207$
irithel@SuzukidaSwift:/mnt/d/KU/5th SEMESTER/comp207$
irithel@SuzukidaSwift:/mnt/d/KU/5th SEMESTER/comp207$ tail comp.txt
computer 307 operating system
```

Fewer lines of content in the sample.txt file caused the same thing to display in both the cases

8. history (Command History)

The history command displays previously executed commands with numbers. Use !number to re-execute a specific command, which is helpful for recalling complex commands without retyping them.

```
irithel@SuzukidaSwift:/mnt/d/KU/5th SEMESTER/comp207$ history
    1  code -install-extension ms-vsxode-remote.remote-wsl
    2  ls
    3  pwd
    4  cd ..
    5  ls
    6  p
    7  clr
    8  cls
    9  clear
   10  pwd
   11  ls
   12  ls -a
   13  ls -l
   14  cd comp207/
   15  pwd
   16  cd ..
   17  cd comp207/
   18  ls
   19  mkdir demo
   20  ls
   21  rmfir demo
   22  rmdir demo
   23  ls
   24  touch comp.text
   25  vim sample.txt
   26  cat sample.txt
   27  cat comp.text
   28  cp comp.text copy.text
   29  echo "computer 307 operating system" > comp.txt
   30  rm renamed.txt
   31  mv copy.txt renamed.txt
  32* mv copy.txt renamed.txt
   33  mv copy.text renamed.txt
   34  rm renamed.txt
   35  mkdir -p test/a/b
   36  rm -r test
   37  grep "computer" comp.txt
   38  find . -name "comp*"
   39  chmod 755 comp.txt
   40  head comp.txt
   41  tail comp.txt
   42  history
```

9. uname -a

The uname -a command displays detailed system information including kernel name, version, machine hardware name, processor type, and operating system.
This is useful for system diagnostics and checking system specifications.

```
irithel@SuzukidaSwift:/mnt/d/KU/5th SEMESTER/comp207$
irithel@SuzukidaSwift:/mnt/d/KU/5th SEMESTER/comp207$
irithel@SuzukidaSwift:/mnt/d/KU/5th SEMESTER/comp207$ uname -a
Linux SuzukidaSwift 6.6.87.2-microsoft-standard-WSL2 #1 SMP PREEMPT_DYNAMIC Th
u Jun  5 18:30:46 UTC 2025 x86_64 x86_64 x86_64 GNU/Linux
```

10.System information commands

df -h (Disk Space Usage)

The df -h command shows disk space usage for all mounted file systems in human-readable format. It displays total size, used space, available space, and usage percentage for each partition.

du -sh (Directory Size)

The du -sh command displays the total size of a directory in human-readable format. The -s flag provides a summary instead of listing each subdirectory separately, making output cleaner.

ps (Process Status)

The ps command displays information about currently running processes including process ID (PID), terminal, CPU time, and command name. Use without options to see basic user processes.

```
irithel@SuzukidaSwift:/mnt/d/KU/5th SEMESTER/comp207$ 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         232G  154G   78G  67% /usr/lib/wsl/drivers
/dev/sdd       1007G  1.5G  955G   1% /
none            3.9G   72K  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            3.9G  536K  3.9G   1% /run
none            3.9G     0  3.9G   0% /run/lock
none            3.9G     0  3.9G   0% /run/shm
none            3.9G   76K  3.9G   1% /mnt/wslg/versions.txt
none            3.9G   76K  3.9G   1% /mnt/wslg/doc
C:\             232G  154G   78G  67% /mnt/c
D:\             245G   21G  224G   9% /mnt/d
tmpfs           779M   20K  779M   1% /run/user/1000
irithel@SuzukidaSwift:/mnt/d/KU/5th SEMESTER/comp207$
irithel@SuzukidaSwift:/mnt/d/KU/5th SEMESTER/comp207$
irithel@SuzukidaSwift:/mnt/d/KU/5th SEMESTER/comp207$ du -sh ~
217M    /home/irithel
irithel@SuzukidaSwift:/mnt/d/KU/5th SEMESTER/comp207$
irithel@SuzukidaSwift:/mnt/d/KU/5th SEMESTER/comp207$
irithel@SuzukidaSwift:/mnt/d/KU/5th SEMESTER/comp207$
irithel@SuzukidaSwift:/mnt/d/KU/5th SEMESTER/comp207$ ps aux
USER         PID %CPU %MEM    VSZ   RSS TTY      STAT START   TIME COMMAND
root           1  0.0  0.1  21776 12252 ?        Ss   14:37   0:00 /sbin/init
root           2  0.0  0.0   3120  1920 ?        Sl   14:37   0:00 /init
root           7  0.0  0.0   3120  1792 ?        Sl   14:37   0:00 plan9 --con
root          43  0.0  0.1  50352 15616 ?        S<s  14:37   0:00 /usr/lib/sy
root          94  0.0  0.0  25120  6400 ?        Ss   14:37   0:01 /usr/lib/sy
systemd+     105  0.0  0.1  21456 12032 ?        Ss   14:37   0:00 /usr/lib/sy
systemd+     106  0.0  0.0  91024  7680 ?        Ssl  14:37   0:00 /usr/lib/sy
root         174  0.0  0.0   4236  2560 ?        Ss   14:37   0:00 /usr/sbin/c
message+     175  0.0  0.0   9628  4736 ?        Ss   14:37   0:00 @dbus-daemo
root         182  0.0  0.1  17960  8448 ?        Ss   14:37   0:00 /usr/lib/sy
root         185  0.0  0.1 1755584 12160 ?       Ssl  14:37   0:00 /usr/libexe
root         195  0.0  0.0   3160  1920 hvc0     Ss+  14:37   0:00 /sbin/agett
syslog       199  0.0  0.0 222508  5376 ?        Ssl  14:37   0:00 /usr/sbin/r
root         206  0.0  0.0   3116  1792 tty1     Ss+  14:37   0:00 /sbin/agett
root         212  0.0  0.2 107032 22528 ?        Ssl  14:37   0:00 /usr/bin/py
root         293  0.0  0.0   3136   896 ?        Ss   14:37   0:00 /init
root         294  0.0  0.0   3136  1160 ?        S    14:37   0:00 /init
irithel      295  0.0  0.0   6204  5120 pts/0    Ss   14:37   0:00 -bash
root         296  0.0  0.0   6696  4352 pts/1    Ss   14:37   0:00 /bin/login
irithel      339  0.0  0.1  20308 11008 ?        Ss   14:37   0:00 /usr/lib/sy
irithel      340  0.0  0.0  21148  3516 ?        S    14:37   0:00 (sd-pam)
irithel      352  0.0  0.0   6056  4992 pts/1    S+   14:37   0:00 -bash
irithel     1097  0.0  0.0   8280  4096 pts/0    R+   15:34   0:00 ps aux
```

11.User and system commands

whoami (Current User)
Explanation: The whoami command displays the username of the currently logged-in user. It's useful in scripts to verify user identity or when switching between multiple user accounts.

uptime (System Uptime)

The uptime command shows how long the system has been running, number of logged-in users, and system load averages for 1, 5, and 15 minutes. This helps assess system stability and performance.

man (Manual Pages)

Explanation: The man command displays detailed manual pages for other commands, providing usage information, options, and examples. Use arrow keys to scroll and press q to quit the manual viewer.

date (Display Date and Time)

Explanation: The date command shows the current system date and time in various formats. With appropriate permissions, it can also be used to set the system date and time.