



## **Department of Computer Science**

**Subject:**

OPERATING SYSTEM

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**Submitted by:**

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**Reg number:**

23-NTU-CS-1123

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**Lab :**

2

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**Semester:**

5<sup>TH</sup>

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# Operating Systems – COC 3071L

SE 5th A – Fall 2025

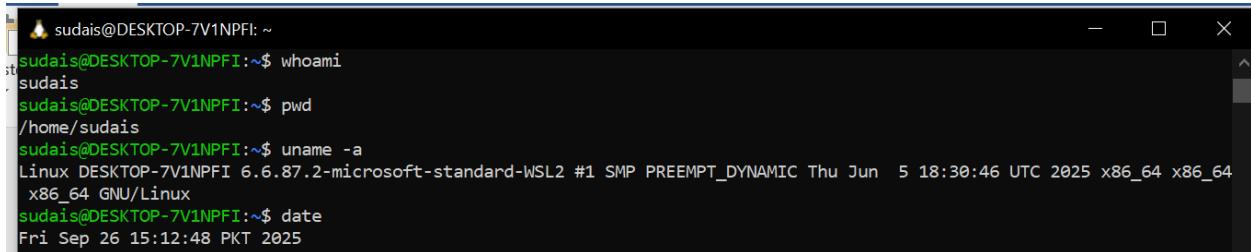
## Lab 2: Linux Basics and Introduction

### Part 1: Linux Environment Orientation

#### 1.1 Understanding the Linux Environment

- Concepts to Cover:
  - What is Linux? Brief history and distributions
  - Linux vs Windows: Key differences
  - Understanding the shell (bash)
  - WSL2 as a Linux environment
- Hands-on Activity:

```
# Students open WSL2 terminal and explore
whoami          # Check current user
pwd             # Print working directory
uname -a        # System information
date            # Current date and time
```



A screenshot of a WSL2 terminal window titled 'sudais@DESKTOP-7V1NPFI: ~'. The window contains the following command-line session:

```
sudais@DESKTOP-7V1NPFI:~$ whoami
sudais
sudais@DESKTOP-7V1NPFI:~$ pwd
/home/sudais
sudais@DESKTOP-7V1NPFI:~$ uname -a
Linux DESKTOP-7V1NPFI 6.6.87.2-microsoft-standard-WSL2 #1 SMP PREEMPT_DYNAMIC Thu Jun  5 18:30:46 UTC 2025 x86_64 x86_64
x86_64 GNU/Linux
sudais@DESKTOP-7V1NPFI:~$ date
Fri Sep 26 15:12:48 PKT 2025
```

#### 1.2 Getting Help in Linux

- Commands to demonstrate:

```
man ls           # Manual pages
ls --help        # Built-in help
which ls         # Location of commands
type ls          # Command type information
```

```
sudais@DESKTOP-7V1NPFI:~$ man ls
sudais@DESKTOP-7V1NPFI:~$ ls --help
Usage: ls [OPTION]... [FILE]...
List information about the FILEs (the current directory by default).
Sort entries alphabetically if none of -cftuvSUX nor --sort is specified.

Mandatory arguments to long options are mandatory for short options too.
  -a, --all          do not ignore entries starting with .
  -A, --almost-all   do not list implied . and ..
  --author          with -l, print the author of each file
  -b, --escape        print C-style escapes for nongraphic characters
  --block-size=SIZE   with -l, scale sizes by SIZE when printing them;
                     e.g., '--block-size=M'; see SIZE format below

  -B, --ignore-backups
  -c                      do not list implied entries ending with ~
                        with -lt: sort by, and show, ctime (time of last
                        change of file status information);
                        with -l: show ctime and sort by name;
                        otherwise: sort by ctime, newest first

  -C                      list entries by columns
  --color[=WHEN]          color the output WHEN; more info below
  -d, --directory         list directories themselves, not their contents
  -D, --dired              generate output designed for Emacs' dired mode
  -f                      list all entries in directory order
  -F, --classify[=WHEN]    append indicator (one of *=@!) to entries WHEN
  --file-type             likewise, except do not append *
  --format=WORD            across -x, commas -m, horizontal -x, long -l,
                        single-column -1, verbose -1, vertical -C

  --full-time             like -l --time-style=full-iso
  -g                      like -l, but do not list owner
  --group-directories-first
                         group directories before files;
                         can be augmented with a --sort option, but any
                         use of --sort=none (-U) disables grouping

  -G, --no-group           in a long listing, don't print group names
  -h, --human-readable     with -l and -s, print sizes like 1K 234M 2G etc.
  --si                      likewise, but use powers of 1000 not 1024
  -H, --dereference-command-line
```

```
sudais@DESKTOP-7V1NPFI: ~
-U do not sort; list entries in directory order
-v
-w, --width=COLS natural sort of (version) numbers within text
-x set output width to COLS. 0 means no limit
-X list entries by lines instead of by columns
--context sort alphabetically by entry extension
--zero print any security context of each file
-end each output line with NUL, not newline
-1 list one file per line
--help display this help and exit
--version output version information and exit

The SIZE argument is an integer and optional unit (example: 10K is 10*1024).
Units are K,M,G,T,P,E,Z,Y,R,Q (powers of 1024) or KB,MB,... (powers of 1000),
Binary prefixes can be used, too: KiB=K, MiB=M, and so on.

The TIME_STYLE argument can be full-iso, long-iso, iso, locale, or +FORMAT.
FORMAT is interpreted like in date(1). If FORMAT is FORMAT1newlineFORMAT2,
then FORMAT1 applies to non-recent files and FORMAT2 to recent files.
TIME_STYLE prefixed with 'posix-' takes effect only outside the POSIX locale.
Also the TIME_STYLE environment variable sets the default style to use.

The WHEN argument defaults to 'always' and can also be 'auto' or 'never'.

Using color to distinguish file types is disabled both by default and
with --color=never. With --color=auto, ls emits color codes only when
standard output is connected to a terminal. The LS_COLORS environment
variable can change the settings. Use the dircolors(1) command to set it.

Exit status:
0 if OK,
1 if minor problems (e.g., cannot access subdirectory),
2 if serious trouble (e.g., cannot access command-line argument).

GNU coreutils online help: <https://www.gnu.org/software/coreutils/>
Report any translation bugs to <https://translationproject.org/team/>
Full documentation <https://www.gnu.org/software/coreutils/ls>
or available locally via: info '(coreutils) ls invocation'
sudais@DESKTOP-7V1NPFI:~$ which ls
/usr/bin/ls
sudais@DESKTOP-7V1NPFI:~$ type ls
ls is aliased to `ls --color=auto'

 Type here to search  
ENG 409 PM  
UK 9/26/2025
```

## Part 2: File System Navigation

### 2.1 Understanding Linux Directory Structure

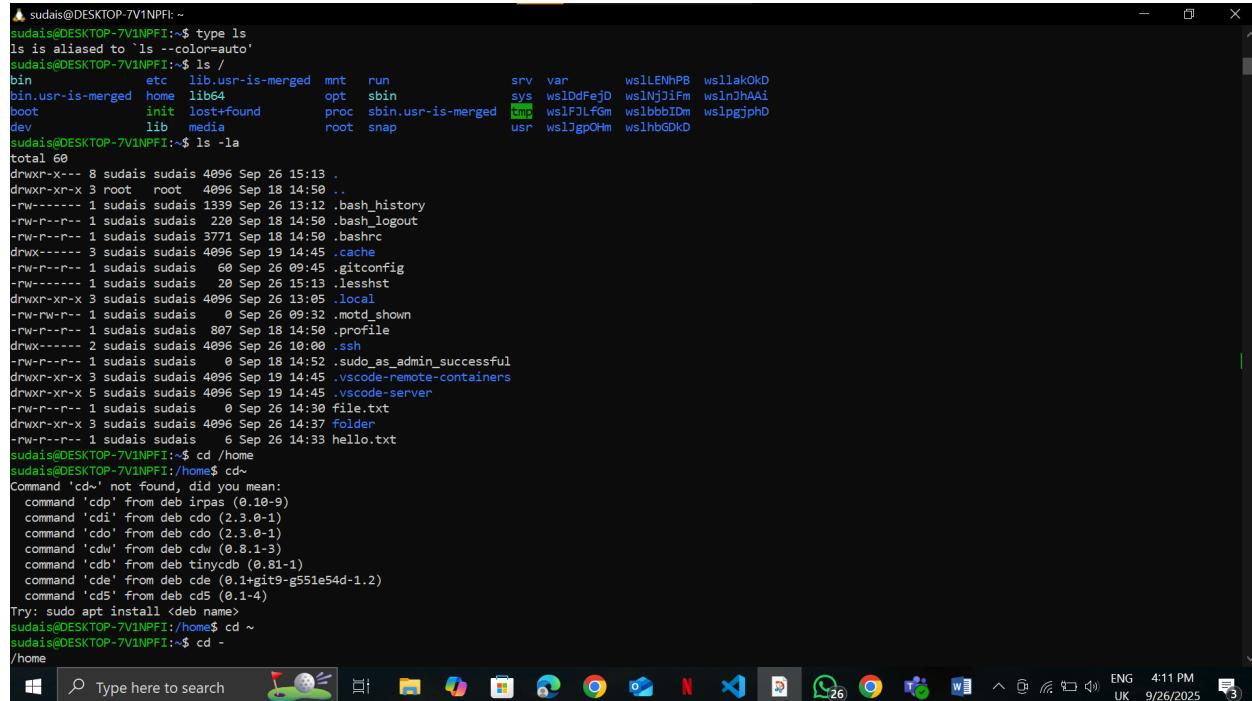
- Concepts to Cover:

- Root directory (/)
- Important directories: /home, /usr, /etc, /var, /tmp

- Absolute vs relative paths
- Hidden files and directories

- Demonstration:

```
ls /          # Root directory contents
ls -la        # Long listing with hidden files
cd /home      # Change directory
cd ~         # Home directory shortcut
cd -         # Previous directory
```

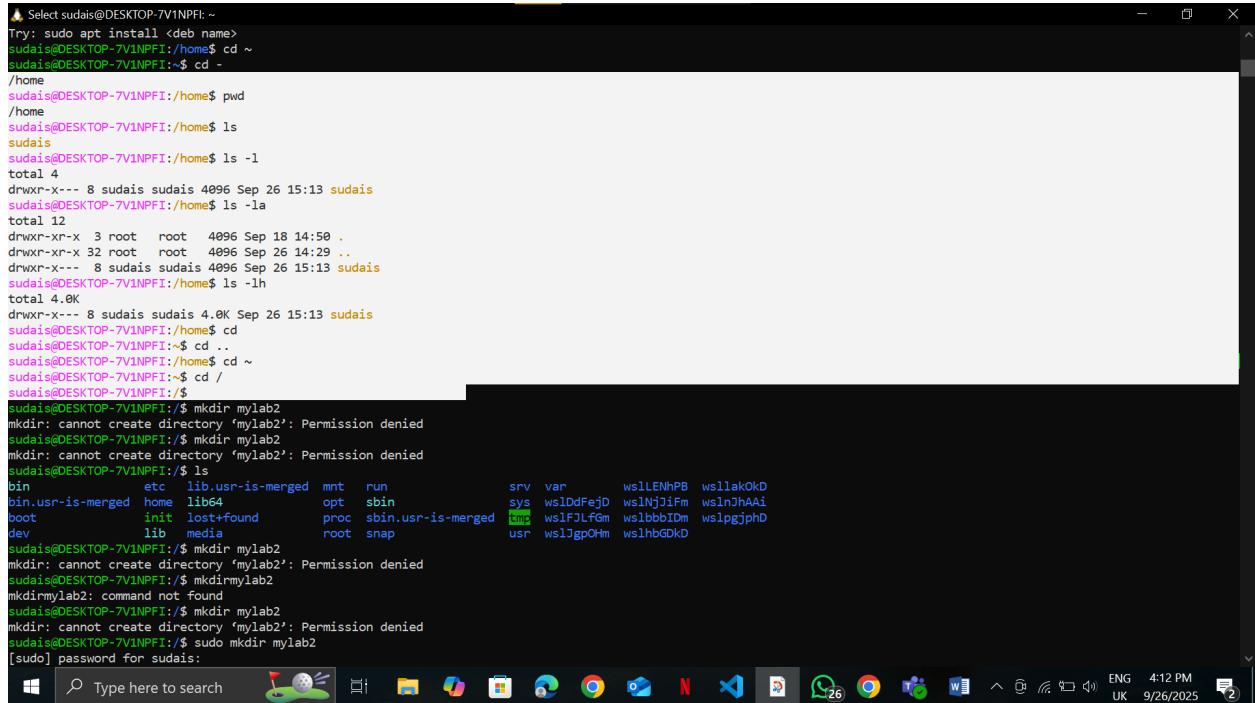


```
sudais@DESKTOP-7V1NPF1:~  
sudais@DESKTOP-7V1NPF1:~$ type ls  
ls is aliased to `ls --color=auto'  
sudais@DESKTOP-7V1NPF1:~$ ls /  
bin          etc    lib usr-is-merged  mnt   run           srv  var       ws1LENhPB ws1laK0D  
bin usr-is-merged home lib64          opt   sbin          sys  wslDdFejD ws1NjJiFm ws1nJhAAi  
boot         init   lost+found      proc  sbin usr-is-merged  tmp  ws1FJLfGm ws1bbbIDm ws1pgjphD  
dev          lib    media          root  snap           usr  ws1Jgp0Hm ws1hbGDkD  
sudais@DESKTOP-7V1NPF1:~$ ls -la  
total 60  
drwxr-x---  8 sudais sudais 4096 Sep 26 15:13 .  
drwxr-xr-X  3 root   root   4096 Sep 18 14:50 ..  
-r--r--r--  1 sudais sudais 1339 Sep 26 13:12 .bash_history  
-r--r--r--  1 sudais sudais 220 Sep 18 14:50 .bash_logout  
-r--r--r--  1 sudais sudais 3771 Sep 18 14:50 .bashrc  
drwxr----- 3 sudais sudais 4096 Sep 19 14:45 .cache  
-rw-r--r--  1 sudais sudais  60 Sep 26 09:45 .gitconfig  
-rw-r--r--  1 sudais sudais  20 Sep 26 15:13 .lessht  
drwxr-xr-x  3 sudais sudais 4096 Sep 26 13:05 .local  
-rw-rw-r--  1 sudais sudais  0 Sep 26 09:32 .motd_shown  
-rw-r--r--  1 sudais sudais  807 Sep 18 14:50 .profile  
drwxr----- 2 sudais sudais 4096 Sep 26 10:00 .ssh  
-rw-r--r--  1 sudais sudais  0 Sep 18 14:52 .sudo_as_admin_successful  
drwxr-xr-x  3 sudais sudais 4096 Sep 19 14:45 .vscode-remote-containers  
drwxr-xr-x  5 sudais sudais 4096 Sep 19 14:45 .vscode-server  
-rw-r--r--  1 sudais sudais  0 Sep 26 14:30 file.txt  
drwxr-xr-x  3 sudais sudais 4096 Sep 26 14:37 folder  
-rw-r--r--  1 sudais sudais  6 Sep 26 14:33 hello.txt  
sudais@DESKTOP-7V1NPF1:~/home$ cd~  
sudais@DESKTOP-7V1NPF1:/home$ cd~  
Command 'cd~' not found, did you mean:  
  command 'cdp' from deb ipras (0.10-9)  
  command 'cdi' from deb cdo (2.3.0-1)  
  command 'cdo' from deb cdo (2.3.0-1)  
  command 'cdw' from deb cdw (0.8.1-3)  
  command 'cdb' from deb tinycdb (0.81-1)  
  command 'cde' from deb cde (0.1+git9-g551e54d-1.2)  
  command 'cd5' from deb cd5 (0.1-4)  
Try: sudo apt install <deb name>  
sudais@DESKTOP-7V1NPF1:/home$ cd ~  
sudais@DESKTOP-7V1NPF1:~$ cd ~  
/home
```

## 2.2 Basic Navigation Commands (15 minutes)

- Commands to practice:

```
pwd      # Present working directory
ls       # List directory contents
ls -l    # Long format
ls -la   # Include hidden files
ls -lh   # Human readable sizes
cd      # Change directory
cd ..   # Parent directory
cd ~    # Home directory
cd /    # Root directory
```



The screenshot shows a Windows terminal window with a black background and white text. The user is navigating through their home directory (~) and listing files with various commands like pwd, ls, and cd. They attempt to create a directory named 'mylab2' but receive permission denied errors because they are not root. Finally, they use sudo to run the command successfully.

```
Administrator:~ Select sudais@DESKTOP-7V1NPFI: ~
Try: sudo apt install <deb name>
sudais@DESKTOP-7V1NPFI:~/home$ cd ~
sudais@DESKTOP-7V1NPFI:~$ cd -
/home
sudais@DESKTOP-7V1NPFI:~/home$ pwd
/home
sudais@DESKTOP-7V1NPFI:~/home$ ls
sudais.s
sudais@DESKTOP-7V1NPFI:~/home$ ls -l
total 4
drwxr-x--- 8 sudais sudais 4096 Sep 26 15:13 sudais
sudais@DESKTOP-7V1NPFI:~/home$ ls -la
total 12
drwxr-xr-x  3 root  root  4096 Sep 18 14:50 .
drwxr-xr-x 32 root  root  4096 Sep 26 14:29 ..
drwxr-x---  8 sudais sudais 4096 Sep 26 15:13 sudais
sudais@DESKTOP-7V1NPFI:~/home$ ls -lh
total 4.0K
drwxr-x--- 8 sudais sudais 4.0K Sep 26 15:13 sudais
sudais@DESKTOP-7V1NPFI:~/home$ cd ..
sudais@DESKTOP-7V1NPFI:~$ cd ~
sudais@DESKTOP-7V1NPFI:~$ cd /
sudais@DESKTOP-7V1NPFI:/$
sudais@DESKTOP-7V1NPFI:~$ mkdir mylab2
mkdir: cannot create directory 'mylab2': Permission denied
sudais@DESKTOP-7V1NPFI:~$ mkdir mylab2
mkdir: cannot create directory 'mylab2': Permission denied
sudais@DESKTOP-7V1NPFI:~$ ls
bin          etc          lib.usr-is-merged  mnt        run           srv          var          ws1LENHPB  wsl1lakOkD
bin usr-is-merged  home         lib64        opt          sbin          sys          ws1DdFejD  ws1NjjFm  ws1nJhAAi
boot         init         lost+found     proc       sbin.usr-is-merged  tmp          ws1FJLfdm  ws1bbbiDm  ws1pgjphD
dev          lib          media        root        snap          usr          ws1JgpOHm  ws1hb6DkD
sudais@DESKTOP-7V1NPFI:~$ mkdir mylab2
mkdir: cannot create directory 'mylab2': Permission denied
sudais@DESKTOP-7V1NPFI:~$ mkdir mylab2
mkdir: cannot create directory 'mylab2': Permission denied
sudais@DESKTOP-7V1NPFI:~$ sudo mkdir mylab2
[sudo] password for sudais:
```

## Part 3: File and Directory Operations

### \*\*3.1 Creating and Managing Files/Directories

- Commands to demonstrate:

```
mkdir mylab2          # Create directory
mkdir -p test/sub/dir # Create nested directories
touch file1.txt       # Create empty file
touch file2.txt file3.txt # Multiple files

# Text editors introduction
nano hello.txt        # Simple text editor
# OR
echo "Hello Linux!" > hello.txt # Redirect output to file
```

- File viewing commands:

```
cat hello.txt         # Display file contents
less hello.txt        # Page through file
head hello.txt        # First 10 lines
```

```
tail hello.txt        # Last 10 lines
wc hello.txt          # Word count
```

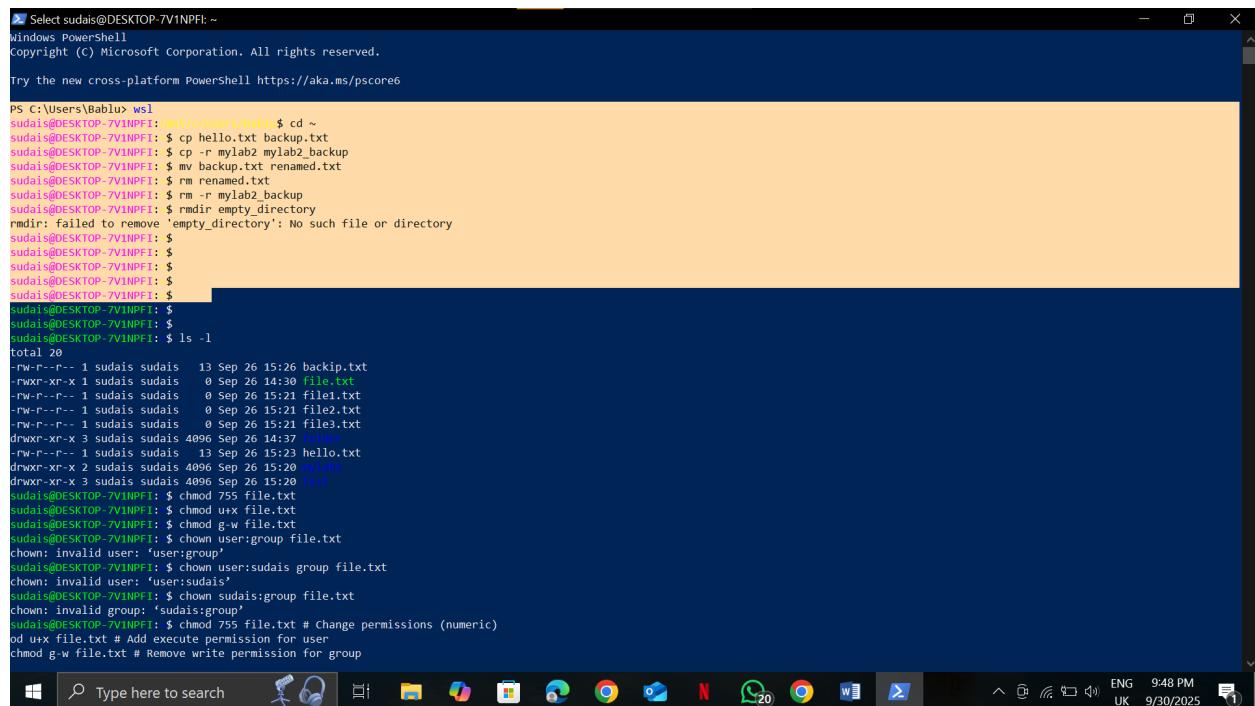
```
Administrator: Select sudais@DESKTOP-7V1NPF1: ~
sudais@DESKTOP-7V1NPF1:~$ mkdir mylab2
sudais@DESKTOP-7V1NPF1:~$ ls
file.txt folder hello.txt mylab2
sudais@DESKTOP-7V1NPF1:~$ mkdir -p test/sub/dir
sudais@DESKTOP-7V1NPF1:~$ touch file1.txt
sudais@DESKTOP-7V1NPF1:~$ touch file2.txt file3.txt
sudais@DESKTOP-7V1NPF1:~$ nano hello.txt
sudais@DESKTOP-7V1NPF1:~$ echo "Hello Linux!" > hello.txt
sudais@DESKTOP-7V1NPF1:~$ cat hello.txt
Hello Linux!
sudais@DESKTOP-7V1NPF1:~$ less hello.txt
sudais@DESKTOP-7V1NPF1:~$ head hello.txt
Hello Linux!
sudais@DESKTOP-7V1NPF1:~$ tail hello.txt
Hello Linux!
sudais@DESKTOP-7V1NPF1:~$ wc hello.txt
1 2 13 hello.txt
sudais@DESKTOP-7V1NPF1:~$ cp hello.txt backup.txt
sudais@DESKTOP-7V1NPF1:~$ cp hello.txt backup.txt
sudais@DESKTOP-7V1NPF1:~$ cp -r mylab2 mylab2_backup
sudais@DESKTOP-7V1NPF1:~$ mv backup.txt renamed.txt
sudais@DESKTOP-7V1NPF1:~$ rm renamed.txt
sudais@DESKTOP-7V1NPF1:~$ rm -r mylab2_backup
sudais@DESKTOP-7V1NPF1:~$ rmdir empty_directory
rmdir: failed to remove 'empty_directory': No such file or directory
sudais@DESKTOP-7V1NPF1:~$ cp hello.txt backup.txt
sudais@DESKTOP-7V1NPF1:~$ cp -r mylab2 mylab2_backup
sudais@DESKTOP-7V1NPF1:~$ mv backup.txt renamed.txt
sudais@DESKTOP-7V1NPF1:~$ rm renamed.txt
sudais@DESKTOP-7V1NPF1:~$ rm -r mylab2_backup
sudais@DESKTOP-7V1NPF1:~$ rmdir empty_directory
rmdir: failed to remove 'empty_directory': No such file or directory
sudais@DESKTOP-7V1NPF1:~$ ls -l
total 20
-rw-r--r-- 1 sudais sudais 13 Sep 26 15:26 backup.txt
-rw-r--r-- 1 sudais sudais 0 Sep 26 14:30 file.txt
-rw-r--r-- 1 sudais sudais 0 Sep 26 15:21 file1.txt
-rw-r--r-- 1 sudais sudais 0 Sep 26 15:21 file2.txt
-rw-r--r-- 1 sudais sudais 0 Sep 26 15:21 file3.txt
```

## 3.2 Copying, Moving, and Deleting

- Commands to practice:

```
cp hello.txt backup.txt      # Copy file
cp -r mylab2 mylab2_backup  # Copy directory recursively
mv backup.txt renamed.txt   # Move/rename file
rm renamed.txt               # Remove file
rm -r mylab2_backup          # Remove directory
rmdir empty_directory        # Remove empty directory
```

**Hands-on Exercise:** Students create a directory structure, add files, and practice file operations.



The screenshot shows a Windows PowerShell window titled "Select sudais@DESKTOP-7V1NPF1: ~". The terminal session demonstrates various file management commands:

```
cp hello.txt backup.txt      # Copy file
cp -r mylab2 mylab2_backup  # Copy directory recursively
mv backup.txt renamed.txt   # Move/rename file
rm renamed.txt               # Remove file
rm -r mylab2_backup          # Remove directory
rmdir empty_directory        # Remove empty directory

rmdir: failed to remove 'empty_directory': No such file or directory
sudais@DESKTOP-7V1NPF1: $
```

After removing the empty directory, the user attempts to run the command again but receives an error message indicating it's not found. The user then lists all files in the current directory to verify the removal:

```
sudais@DESKTOP-7V1NPF1: $ ls -l
total 20
-rw-r--r-- 1 sudais sudais 13 Sep 26 15:26 backup.txt
-rwxr-xr-x 1 sudais sudais 0 Sep 26 14:30 file.txt
-rw-r--r-- 1 sudais sudais 0 Sep 26 15:21 file1.txt
-rw-r--r-- 1 sudais sudais 0 Sep 26 15:21 file2.txt
-rw-r--r-- 1 sudais sudais 0 Sep 26 15:21 file3.txt
drwxr-xr-x 3 sudais sudais 4096 Sep 26 14:37 folder
-rw-r--r-- 1 sudais sudais 13 Sep 26 15:23 hello.txt
drwxr-xr-x 2 sudais sudais 4096 Sep 26 15:20 mylab2
drwxr-xr-x 3 sudais sudais 4096 Sep 26 15:20 test
sudais@DESKTOP-7V1NPF1: $ chmod 755 file.txt
sudais@DESKTOP-7V1NPF1: $ chmod uix file.txt
sudais@DESKTOP-7V1NPF1: $ chmod g-w file.txt
sudais@DESKTOP-7V1NPF1: $ chown user:group file.txt
chown: invalid user: 'user:group'
sudais@DESKTOP-7V1NPF1: $ chown user:sudais group file.txt
chown: invalid user: 'user:sudais'
sudais@DESKTOP-7V1NPF1: $ chown sudais:group file.txt
chown: invalid group: 'sudais:group'
sudais@DESKTOP-7V1NPF1: $ chmod 755 file.txt # Change permissions (numeric)
od u+x file.txt # Add execute permission for user
chmod g-w file.txt # Remove write permission for group
```

The taskbar at the bottom of the window shows various application icons, and the system tray indicates the date and time as "9/30/2025 9:48 PM".

## Part 4: File Permissions and Ownership

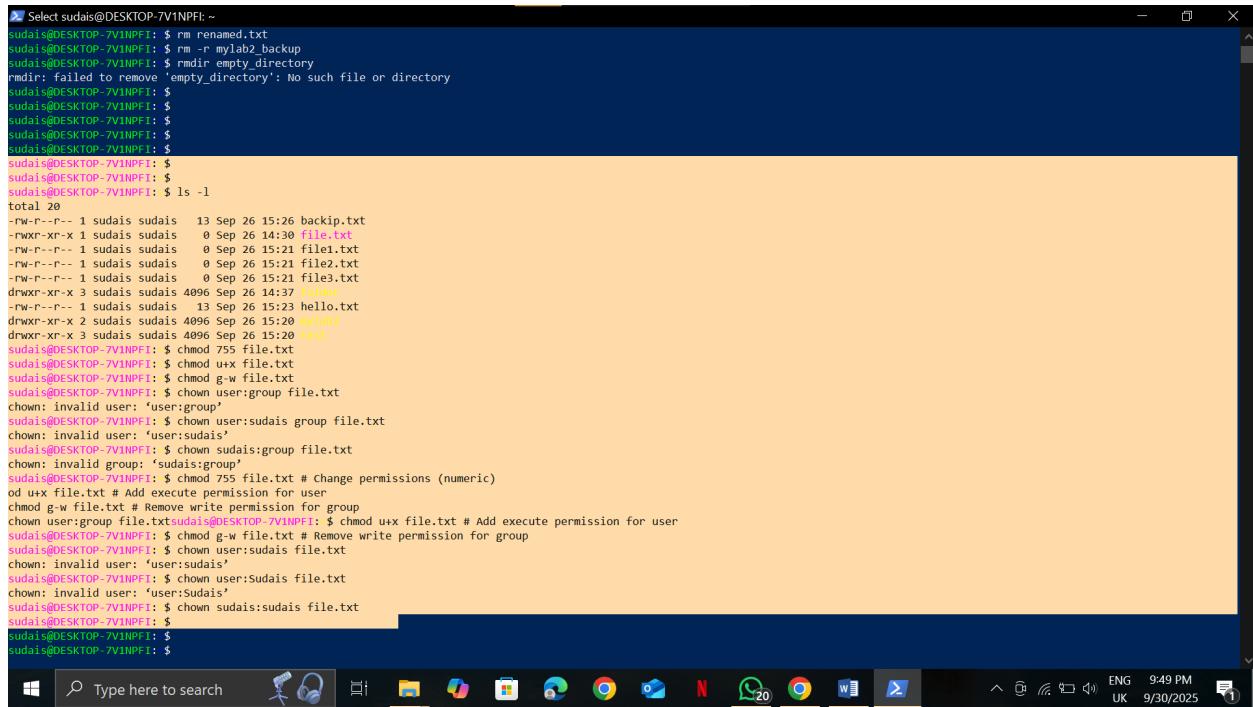
### 4.1 Understanding File Permissions

- Concepts to Cover:

- Permission types: read (r), write (w), execute (x)
- Permission groups: user (u), group (g), others (o)
- Numeric notation: 755, 644, etc.

- Commands to demonstrate:

```
ls -l                      # View permissions
chmod 755 file.txt          # Change permissions (numeric)
chmod u+x file.txt          # Add execute permission for user
chmod g-w file.txt          # Remove write permission for group
chown user:group file.txt   # Change ownership (if applicable)
```



The screenshot shows a Windows command-line interface (cmd) window. The user, sudais, is performing various file operations and demonstrating file permissions. The terminal output is as follows:

```
Select sudais@DESKTOP-7V1NPF1: ~
sudais@DESKTOP-7V1NPF1: $ rm renamed.txt
sudais@DESKTOP-7V1NPF1: $ rm -r mylab2_backup
sudais@DESKTOP-7V1NPF1: $ rmdir empty_directory
rmdir: failed to remove 'empty_directory': No such file or directory
sudais@DESKTOP-7V1NPF1: $
sudais@DESKTOP-7V1NPF1: $
sudais@DESKTOP-7V1NPF1: $
sudais@DESKTOP-7V1NPF1: $
sudais@DESKTOP-7V1NPF1: $
sudais@DESKTOP-7V1NPF1: $ ls -l
total 20
-rw-r--r-- 1 sudais sudais 13 Sep 26 15:26 backup.txt
-rwxr-xr-x 1 sudais sudais 0 Sep 26 14:30 file.txt
-rw-r--r-- 1 sudais sudais 0 Sep 26 15:21 file1.txt
-rw-r--r-- 1 sudais sudais 0 Sep 26 15:21 file2.txt
-rw-r--r-- 1 sudais sudais 0 Sep 26 15:21 file3.txt
drwxr-xr-x 3 sudais sudais 4096 Sep 26 14:37 folder
-rw-r--r-- 1 sudais sudais 13 Sep 26 15:23 hello.txt
drwxr-xr-x 2 sudais sudais 4096 Sep 26 15:20 mylab2
drwxr-xr-x 3 sudais sudais 4096 Sep 26 15:20 test
sudais@DESKTOP-7V1NPF1: $ chmod 755 file.txt
sudais@DESKTOP-7V1NPF1: $ chmod u+x file.txt
sudais@DESKTOP-7V1NPF1: $ chmod g-w file.txt
sudais@DESKTOP-7V1NPF1: $ chown user:group file.txt
chown: invalid user: 'user:group'
sudais@DESKTOP-7V1NPF1: $ chown user:sudais group file.txt
chown: invalid user: 'user:sudais'
sudais@DESKTOP-7V1NPF1: $ chown sudais:group file.txt
chown: invalid group: 'sudais:group'
sudais@DESKTOP-7V1NPF1: $ chmod 755 file.txt # Change permissions (numeric)
od u+x file.txt # Add execute permission for user
chmod g-w file.txt # Remove write permission for group
chown user:group file.txt sudais@DESKTOP-7V1NPF1: $ chmod u+x file.txt # Add execute permission for user
sudais@DESKTOP-7V1NPF1: $ chmod g-w file.txt # Remove write permission for group
sudais@DESKTOP-7V1NPF1: $ chown user:sudais file.txt
chown: invalid user: 'user:sudais'
sudais@DESKTOP-7V1NPF1: $ chown user:Sudais file.txt
sudais@DESKTOP-7V1NPF1: $ chown sudais:sudais file.txt
sudais@DESKTOP-7V1NPF1: $ 
sudais@DESKTOP-7V1NPF1: $ 
sudais@DESKTOP-7V1NPF1: $ 
```

# Part 5: Text Processing and Utilities

## 5.1 Essential Text Commands

- Commands to demonstrate:

```
grep "pattern" file.txt      # Search for patterns  
grep -i "pattern" file.txt  # Case-insensitive search  
grep -n "pattern" file.txt  # Show line numbers
```

The screenshot shows a Windows terminal window with a dark blue background. The command history includes:

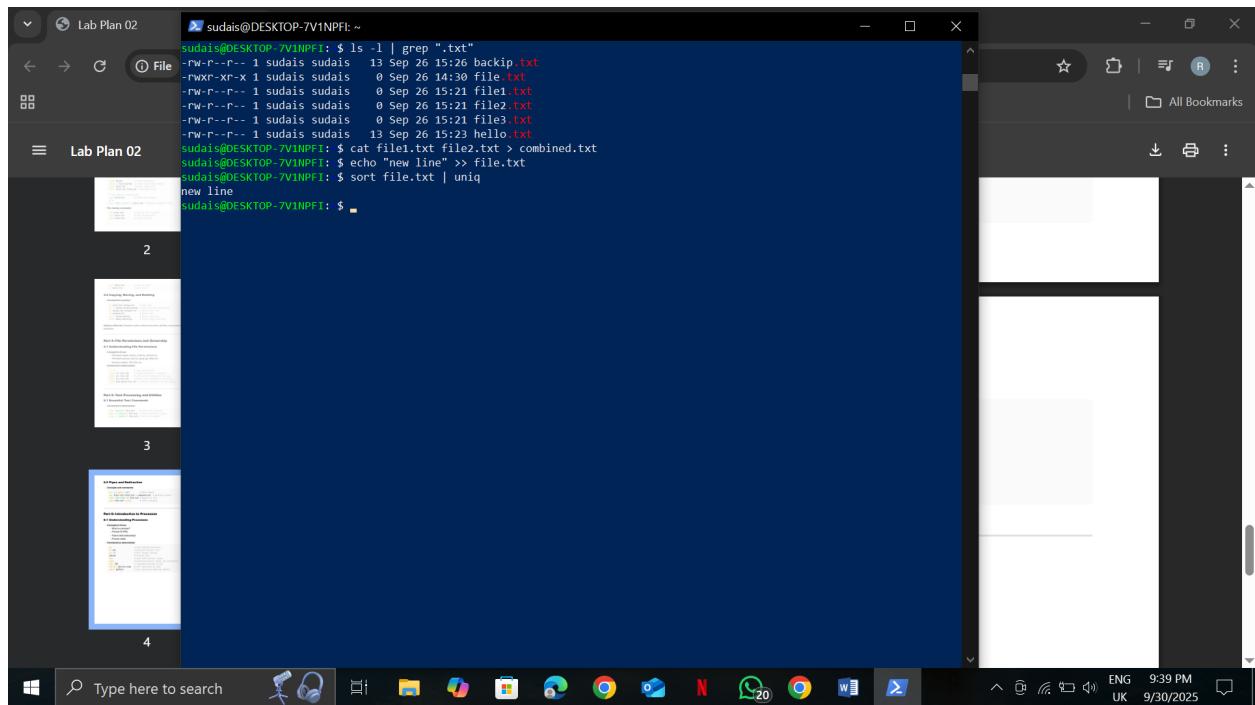
- \$ grep "pattern" file.txt # Search for patterns
- \$ grep -i "pattern" file.txt # Case-insensitive search
- \$ grep -n "pattern" file.txt # Show line numbers
- \$ grep "pattern" file.txt # Case-insensitive search
- \$ grep -n "pattern" file.txt
- \$ grep -i "pattern" file.txt
- \$ grep -n "pattern" file.txt
- \$ ls -l | grep ".txt"
- rw-r--r-- 1 sudais sudais 13 Sep 26 15:26 backup.txt
- rwxr-xr-x 1 sudais sudais 0 Sep 26 14:30 file.txt
- rw-r--r-- 1 sudais sudais 0 Sep 26 15:21 file1.txt
- rw-r--r-- 1 sudais sudais 0 Sep 26 15:21 file2.txt
- rw-r--r-- 1 sudais sudais 0 Sep 26 15:21 file3.txt
- rw-r--r-- 1 sudais sudais 13 Sep 26 15:23 hello.txt
- \$ cat file1.txt file2.txt > combined.txt
- \$ echo "new line" >> file.txt
- \$ sort file.txt | uniq

The taskbar at the bottom shows various icons for Microsoft Office applications like Word, Excel, and PowerPoint, as well as other utilities like File Explorer and Task View.

## 5.2 Pipes and Redirection

- Concepts and commands:

```
ls -l | grep ".txt"          # Pipe output
cat file1.txt file2.txt > combined.txt # Redirect output
echo "new line" >> file.txt # Append to file
sort file.txt | uniq        # Chain commands
```



## **Part 6: Introduction to Processes**

## **6.1 Understanding Processes**

- **Concepts to Cover:**

- What is a process?
  - Process ID (PID)
  - Parent-child relationships
  - Process states

- **Commands to demonstrate:**

```
[sudais@DESKTOP-TV1NPF1: ~
-rw-r--r-- 1 sudais sudais 13 Sep 26 15:23 hello.txt
sudais@DESKTOP-TV1NPF1: $ cat file1.txt file2.txt > combined.txt
sudais@DESKTOP-TV1NPF1: $ echo "new line" >> file.txt
sudais@DESKTOP-TV1NPF1: $ sort file.txt | uniq
new line
sudais@DESKTOP-TV1NPF1: $
sudais@DESKTOP-TV1NPF1: $
sudais@DESKTOP-TV1NPF1: $
sudais@DESKTOP-TV1NPF1: $
sudais@DESKTOP-TV1NPF1: $ ps
  PID TTY      TIME CMD
 308 pts/0   00:00:00 bash
 528 pts/0   00:00:00 ps
sudais@DESKTOP-TV1NPF1: $ ps aux
USER      PID %CPU %MEM VSZ RSS TTY      STAT START   TIME COMMAND
root      1  0.1  0.3 21644 12356 ?    Ss 21:22  0:01 /sbin/init
root      2  0.0  0.0 3072 1664 ?    S 21:22  0:00 /init
root      7  0.0  0.0 3072 1792 ?    S L 21:22  0:00 plan9 --control-socket 7 --log-level 4 --server-fd 8
root     49  0.0  0.4 66812 16856 ?   S< 21:22  0:00 /usr/lib/systemd/systemd-journald
root     94  0.0  0.1 25140 6272 ?    Ss 21:22  0:00 /usr/lib/systemd/systemd-udev
systemd+ 114  0.0  0.3 21456 12544 ?   Ss 21:22  0:00 /usr/lib/systemd/systemd-resolved
systemd+ 115  0.0  0.1 91924 7680 ?    Ss 21:22  0:00 /usr/lib/systemd/systemd-timesyncd
root     159  0.0  0.0 4236 2560 ?    Ss 21:22  0:00 /usr/sbin/cron -f -P
message+ 160  0.0  0.1 9624 4864 ?    Ss 21:22  0:00 @dbus-daemon --system --address=systemd: --nofork --nroot
sr/lib/systemd/systemd-logind
root     178  0.0  0.3 1755840 12544 ?   S L 21:22  0:00 /usr/libexec/wsl-pro-service -vv
syslog   182  0.0  0.1 225098 5504 ?   Ss 21:22  0:00 /usr/sbin/rsyslogd -n -NONE
root     185  0.0  0.0 3169 1920 hvc0  S+ 21:22  0:00 /sbin/getty -o p -- \u -nuclear --keep-baud - 1152root
bin/agetty -o p -- \u -nuclear - linux
root     207  0.0  0.5 107012 22016 ?   Ss 21:22  0:00 /usr/bin/python3 /usr/share/unattended-upgrades/unatrtroot
nit
root     304  0.0  0.0 3092 1152 ?    S 21:22  0:00 /init
sudais   308  0.0  0.1 6072 4992 pts/0  Ss 21:22  0:00 /bin/bash
root     310  0.0  0.1 6828 4224 pts/1  Ss 21:22  0:00 /bin/login -f
sudais   357  0.0  0.2 20316 11008 ?   Ss 21:22  0:00 /usr/lib/systemd/systemd -user
sudais   358  0.0  0.0 21152 3520 ?   S 21:22  0:00 (sd-pam)
sudais   383  0.0  0.1 6072 4992 pts/1  S+ 21:22  0:00 /bin/bash
sudais   529  0.0  0.1 8286 4096 pts/0  R+ 21:43  0:00 ps aux
sudais@DESKTOP-TV1NPF1: $ ps -ef
UID      PID  PPID C STIME TTY      TIME CMD
root      1    0  0 21:22 ?    0:00:01 /sbin/init
root      2    1  0 21:22 ?    0:00:00 /init
root      7    2  0 21:22 ?    0:00:00 plan9 --control-socket 7 --log-level 4 --server-fd 8 --pipe-fd 10 --root
systemd-journald

```

```
Select sudais@DESKTOP-7V1NPF1: ~
└─[unattended-upgr]—[unattended-upgr]
  └─wsl-pro-service—?*[{wsl-pro-service}]
sudais@DESKTOP-7V1NPF1: ~
sudais@DESKTOP-7V1NPF1: ~
sudais@DESKTOP-7V1NPF1: ~
sudais@DESKTOP-7V1NPF1: ~
sudais@DESKTOP-7V1NPF1: ~ top
top - 21:44:51 up 22 min, 1 user, load average: 0.01, 0.00, 0.00
Tasks: 23 total, 1 running, 22 sleeping, 0 stopped, 0 zombie
%Cpu(s): 0.0 us, 0.1 sy, 0.0 ni, 99.9 id, 0.0 wa, 0.0 hi, 0.0 si, 0.0 st
MiB Mem : 3843.2 total, 3410.8 free, 447.1 used, 106.5 buff/cache
MiB Swap: 1024.0 total, 1024.0 free, 0.0 used. 3396.1 avail Mem

PID USER PR NI VIRT RES SHR S %CPU %MEM TIME+ COMMAND
1 root 20 0 21644 12356 9284 S 0.0 0.3 0:01.33 systemd
2 root 20 0 3072 1664 1664 S 0.0 0.0 0:00.01 init+systemd[ub
7 root 20 0 3072 1792 1792 S 0.0 0.0 0:00.00 init
49 root 19 -1 66812 16856 15960 S 0.0 0.4 0:00.37 systemd-journal
94 root 20 0 25140 6272 4992 S 0.0 0.2 0:00.18 systemd-udevd
114 systemd+ 20 0 21456 12544 10368 S 0.0 0.3 0:00.20 systemd-resolve
115 systemd+ 20 0 91024 7680 6784 S 0.0 0.2 0:00.13 systemd-timesyn
159 root 20 0 4236 2560 2432 S 0.0 0.1 0:00.00 cron
160 messenger+ 20 0 9624 4864 4352 S 0.0 0.1 0:00.10 dbus-daemon
174 root 20 0 17964 8448 7552 S 0.0 0.2 0:00.13 systemd-logind
178 root 20 0 1755840 12544 10624 S 0.0 0.3 0:00.18 wsl-pro-service
182 syslogd 20 0 222588 5504 4352 S 0.0 0.1 0:00.11 rsyslogd
185 root 20 0 3160 1920 1792 S 0.0 0.0 0:00.01 getty
201 root 20 0 3116 1664 1664 S 0.0 0.0 0:00.01 getty
207 root 20 0 107012 22016 12928 S 0.0 0.6 0:00.22 unattended-upgr
303 root 20 0 3076 768 768 S 0.0 0.0 0:00.00 SessionLeader
304 root 20 0 3092 1152 1024 S 0.0 0.0 0:00.00 Relay(308)
308 sudais 20 0 6072 4992 3456 S 0.0 0.1 0:00.13 bash
310 root 20 0 6820 4224 3712 S 0.0 0.1 0:00.01 login
357 sudais 20 0 29316 11008 9988 S 0.0 0.3 0:00.21 systemd
358 sudais 20 0 21152 3520 1792 S 0.0 0.1 0:00.00 (sd-pam)
383 sudais 20 0 6072 4992 3456 S 0.0 0.1 0:00.05 hash
532 sudais 20 0 9296 5504 3328 R 0.0 0.1 0:00.04 top
top - 21:45:07 up 22 min, 1 user, load average: 0.00, 0.00, 0.00
Tasks: 23 total, 1 running, 22 sleeping, 0 stopped, 0 zombie
%Cpu(s): 0.0/0.2 0[
MiB Mem : 3843.2 total, 3411.0 free, 446.9 used, 106.5 buff/cache
MiB Swap: 1024.0 total, 1024.0 free, 0.0 used. 3396.3 avail Mem

PID USER PR NI VIRT RES SHR S %CPU %MEM TIME+ COMMAND
1 root 20 0 21644 12356 9284 S 0.0 0.3 0:01.33 systemd
```

```
sudais@DESKTOP-TV1NPFI: ~
sudais   383  0.  0.1   6972  4992 pts/1   S+  21:22  0:00 -bash
sudais   529  0.  0.1   8280  4096 pts/0   R+  21:43  0:00 ps aux
sudais@DESKTOP-TV1NPFI: $ ps aux
UID      PID  PPID C STIME TTY          TIME CMD
root      1    0 21:22 ?  0:00:01 /sbin/init
root      2    1 21:22 ?  0:00:00 /init
root      7    2 0 21:22 ?  0:00:00 plan9 --control-socket 7 --log-level 4 --server-fd 8 --pipe-fd 10 --root
systemd-journal
root     94    1 0 21:22 ?  0:00:00 /usr/lib/systemd/systemd-udevd
systemd+ 114    1 0 21:22 ?  0:00:00 /usr/lib/systemd/systemd-resolved
systemd+ 115    1 0 21:22 ?  0:00:00 /usr/lib/systemd/systemd-timesyncd
root    159    1 0 21:22 ?  0:00:00 /usr/sbin/cron -f -P
message+ 160    1 0 21:22 ?  0:00:00 @dbus-daemon --system --address=systemd: --nofork --nopidfile --sysroot
systemd-logind
root    178    1 0 21:22 ?  0:00:00 /usr/libexec/wsl-pro-service -vv
syslog   182    1 0 21:22 ?  0:00:00 /usr/sbin/syslogd -n -INONE
root    185    1 0 21:22 hvc0  0:00:00 /sbin/getty -o -p -u --noclear --keep-baud - 115200,38400,9600 vroot
p -- `u --noclear - linux
root    207    1 0 21:22 ?  0:00:00 /usr/bin/python3 /usr/share/unattended-upgrades/unattended-upgrade-sroot
root    304    303 0 21:22 ?  0:00:00 /init
sudais   308    304 0 21:22 pts/0  0:00:00 -bash
root    310    2 0 21:22 pts/1  0:00:00 /bin/login -f
sudais   357    1 0 21:22 ?  0:00:00 /usr/lib/systemd/systemd --user
sudais   358    357 0 21:22 ?  0:00:00 (sd-pam)
sudais   383    310 0 21:22 pts/1  0:00:00 -bash
sudais   530    308 0 21:43 pts/0  0:00:00 ps -ef
sudais@DESKTOP-TV1NPFI: $ pstree
systemd--2*[agetty]
           |--cron
           |--dbus-daemon
           |--init-systemd(Up)---SessionLeader---Relay(308)---bash---pstree
           |           |---init---(init)
           |           |---login---bash
           |           |---(init)-systemd(Up)
           |---rsyslogd---3*[(rsyslogd)]
           |---systemd---(sd-pam)
           |---systemd-journal
           |---systemd-logind
           |---systemd-resolve
           |---systemd-timesyncd---(systemd-timesyn)
           |---systemd-udevd
           |---unattended-upgr---(unattended-upgr)
           |---wsl-pro-service---7*[(wsl-pro-service)]
```

```
sudais@DESKTOP-7V1NPF1: ~
sudais@DESKTOP-7V1NPF1: $ htop
Command 'htop' not found, but can be installed with:
sudo snap install htop # version 3.4.1, or
sudo apt install htop # version 3.2.2.2
See 'snap info htop' for additional versions.
sudais@DESKTOP-7V1NPF1: $
sudais@DESKTOP-7V1NPF1: $
sudais@DESKTOP-7V1NPF1: $
sudais@DESKTOP-7V1NPF1: $ kill PID
:bash: kill: PID: arguments must be process or job IDs
sudais@DESKTOP-7V1NPF1: $
sudais@DESKTOP-7V1NPF1: $
sudais@DESKTOP-7V1NPF1: $
sudais@DESKTOP-7V1NPF1: $ killall process_name
process_name: no process found
sudais@DESKTOP-7V1NPF1: $ killall pstree
pstree: no process found
sudais@DESKTOP-7V1NPF1: $
sudais@DESKTOP-7V1NPF1: $
sudais@DESKTOP-7V1NPF1: $ pkill pattern
sudais@DESKTOP-7V1NPF1: $
```