



National Textile University

Department of Computer Science

Subject: Operating System

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Reg. number: 23-NTU-CS-1170

Lab no.: lab2 (class task)

Semester: 5th

Class Task

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
```

```
maha@DESKTOP-PDJCJQV: ~
maha@DESKTOP-PDJCJQV:~$ whoami
maha
maha@DESKTOP-PDJCJQV:~$ pwd
/home/maha
maha@DESKTOP-PDJCJQV:~$ uname -a
Linux DESKTOP-PDJCJQV 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
maha@DESKTOP-PDJCJQV:~$ date
Sun Sep 28 06:56:44 PDT 2025
maha@DESKTOP-PDJCJQV:~$
```

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
```

Commands:

1. man ls:

```
maha@DESKTOP-PDJCJQV: ~
LS(1) User Commands LS(1)

NAME
    ls - list directory contents

SYNOPSIS
    ls [OPTION]... [FILE]...

DESCRIPTION
    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
        Manual page ls(1) line 1 (press h for help or q to quit)
```

2. Ls -help

```
maha@DESKTOP-PDJCJQV: ~
maha@DESKTOP-PDJCJQV:~$ 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
        do not list implied entries ending with ~
  -c
        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
        likewise, except do not append '*'
  --file-type
        likewise, except do not append '*'
  --format=WORD
        across -x, commas -m, horizontal -x, long -l,
        single-column -l, verbose -l, 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
        follow symbolic links listed on the command line
  --dereference-command-line-symlink-to-dir
        follow each command line symbolic link
        that points to a directory

  --hide=PATTERN
        do not list implied entries matching shell PATTERN
        (overridden by -a or -A)
```

3. Which ls

```
maha@DESKTOP-PDJCJQV: ~  
maha@DESKTOP-PDJCJQV:~$ which ls  
/usr/bin/ls  
maha@DESKTOP-PDJCJQV:~$
```

4. Type ls

```
maha@DESKTOP-PDJCJQV: ~  
maha@DESKTOP-PDJCJQV:~$ type ls  
ls is aliased to `ls --color=auto`  
maha@DESKTOP-PDJCJQV:~$
```

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
```

1. Ls -l/ :

maha@DESKTOP-PDJCJQV: ~

```
maha@DESKTOP-PDJCJQV:~$ ls -l /
total 2748
lrwxrwxrwx   1 root root      7 Apr 22  2024 bin -> usr/bin
drwxr-xr-x   2 root root    4096 Feb 26  2024 bin.usr-is-merged
drwxr-xr-x   2 root root    4096 Apr 22  2024 boot
drwxr-xr-x  15 root root   3840 Sep 28 06:56 dev
drwxr-xr-x  88 root root    4096 Sep 28 06:56 etc
drwxr-xr-x   4 root root    4096 Sep 28 02:58 home
-rwxrwxrwx   1 root root 2735264 Aug  6 12:54 init
lrwxrwxrwx   1 root root      7 Apr 22  2024 lib -> usr/lib
drwxr-xr-x   2 root root    4096 Apr  8  2024 lib.usr-is-merged
lrwxrwxrwx   1 root root      9 Apr 22  2024 lib64 -> usr/lib64
drwx-----  2 root root   16384 Sep 28 02:55 lost+found
drwxr-xr-x   2 root root    4096 Aug  5 09:55 media
drwxr-xr-x   6 root root    4096 Sep 28 02:55 mnt
drwxr-xr-x   2 root root    4096 Aug  5 09:55 opt
dr-xr-xr-x 190 root root      0 Sep 28 06:55 proc
drwx-----  5 root root    4096 Sep 28 04:59 root
drwxr-xr-x  19 root root     560 Sep 28 06:56 run
lrwxrwxrwx   1 root root      8 Apr 22  2024/sbin -> usr/sbin
drwxr-xr-x   2 root root    4096 Mar 31  2024/sbin.usr-is-merged
drwxr-xr-x   2 root root    4096 Sep 28 02:55 snap
drwxr-xr-x   2 root root    4096 Aug  5 09:55 srv
dr-xr-xr-x  13 root root      0 Sep 28 06:55 sys
drwxrwxrwt   8 root root    4096 Sep 28 06:56 tmp
drwxr-xr-x  12 root root    4096 Aug  5 09:55 usr
drwxr-xr-x  13 root root    4096 Sep 28 02:55 var
maha@DESKTOP-PDJCJQV:~$
```

2. Ls -la

maha@DESKTOP-PDJCJQV: ~

```
maha@DESKTOP-PDJCJQV:~$ ls -la
total 80
drwxr-x--- 10 maha maha 4096 Sep 28 07:00 .
drwxr-xr-x  4 root root 4096 Sep 28 02:58 ..
-rw-----  1 maha maha 1721 Sep 28 06:52 .bash_history
-rw-r--r--  1 maha maha  220 Sep 28 02:58 .bash_logout
-rw-r--r--  1 maha maha 3771 Sep 28 02:58 .bashrc
drwx-----  4 maha maha 4096 Sep 28 05:13 .cache
drwxr-xr-x  3 maha maha 4096 Sep 28 05:05 .dotnet
drwxr-xr-x  8 maha maha 4096 Sep 28 06:51 .git
-rw-r--r--  1 maha maha   63 Sep 28 03:43 .gitconfig
-rw-----  1 maha maha   20 Sep 28 07:00 .lessht
drwxr-xr-x  3 maha maha 4096 Sep 28 04:13 .local
-rw-rw-r--  1 maha maha    0 Sep 28 03:03 .motd_shown
-rw-r--r--  1 maha maha  807 Sep 28 02:58 .profile
drwx-----  2 maha maha 4096 Sep 28 04:08 .ssh
-rw-r--r--  1 maha maha    0 Sep 28 03:16 .sudo_as_admin_successful
drwxr-xr-x  3 maha maha 4096 Sep 28 05:05 .vscode-remote-containers
drwxr-xr-x  5 maha maha 4096 Sep 28 05:05 .vscode-server
drwxr-xr-x  3 maha maha 4096 Sep 28 06:44 1170-OS_LAB-
-rwxr-xr-x  1 maha maha 15968 Sep 28 04:17 program
maha@DESKTOP-PDJCJQV:~$
```

3. Cd /home

maha@DESKTOP-PDJCJQV: /home

```
maha@DESKTOP-PDJCJQV:~$ cd /home  
maha@DESKTOP-PDJCJQV:/home$
```

4. Cd ~

maha@DESKTOP-PDJCJQV: ~

```
maha@DESKTOP-PDJCJQV:~$ cd /home  
maha@DESKTOP-PDJCJQV:/home$ cd ~  
maha@DESKTOP-PDJCJQV:~$
```

5. Cd -

maha@DESKTOP-PDJCJQV: /home

```
maha@DESKTOP-PDJCJQV:~$ cd /home
maha@DESKTOP-PDJCJQV:/home$ cd ~
maha@DESKTOP-PDJCJQV:~$ cd -
/home
maha@DESKTOP-PDJCJQV:/home$
```

2.2 Basic Navigation Commands (15 minutes)

- Commands to practice:

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

Commands:

1. Pwd
2. Ls
3. Ls -l
4. Ls -ls

```
maha@DESKTOP-PDJCJQV: ~  
maha@DESKTOP-PDJCJQV:~$ pwd  
/home/maha  
maha@DESKTOP-PDJCJQV:~$ ls  
1170-OS_LAB- program  
maha@DESKTOP-PDJCJQV:~$ ls -i  
55448 1170-OS_LAB- 44317 program  
maha@DESKTOP-PDJCJQV:~$ ls -la  
total 80  
drwxr-x--- 10 maha maha 4096 Sep 28 07:00 .  
drwxr-xr-x  4 root root 4096 Sep 28 02:58 ..  
-rw----- 1 maha maha 1721 Sep 28 06:52 .bash_history  
-rw-r--r--  1 maha maha  220 Sep 28 02:58 .bash_logout  
-rw-r--r--  1 maha maha 3771 Sep 28 02:58 .bashrc  
drwx----- 4 maha maha 4096 Sep 28 05:13 .cache  
drwxr-xr-x  3 maha maha 4096 Sep 28 05:05 .dotnet  
drwxr-xr-x  8 maha maha 4096 Sep 28 06:51 .git  
-rw-r--r--  1 maha maha  63 Sep 28 03:43 .gitconfig  
-rw----- 1 maha maha  20 Sep 28 07:00 .lesshtdrwxr-xr-x  3 maha maha 4096 Sep 28 04:13 .local  
-rw-rw-r--  1 maha maha  0 Sep 28 03:03 .motd_shown  
-rw-r--r--  1 maha maha 807 Sep 28 02:58 .profiledrwx----- 2 maha maha 4096 Sep 28 04:08 .ssh  
-rw-r--r--  1 maha maha  0 Sep 28 03:16 .sudo_as_admin_successful  
drwxr-xr-x  3 maha maha 4096 Sep 28 05:05 .vscode-remote-containers  
drwxr-xr-x  5 maha maha 4096 Sep 28 05:05 .vscode-server  
drwxr-xr-x  3 maha maha 4096 Sep 28 06:44 1170-OS_LAB-  
-rwxr-xr-x  1 maha maha 15968 Sep 28 04:17 program
```

5. Ls -lh
6. Cd
7. cd..
8. cd ~
9. cd /

```
maha@DESKTOP-PDJCJQV: /  
maha@DESKTOP-PDJCJQV:~$ ls -lh  
total 20K  
drwxr-xr-x 3 maha maha 4.0K Sep 28 06:44 1170-OS_LAB-  
-rwxr-xr-x 1 maha maha 16K Sep 28 04:17 program  
maha@DESKTOP-PDJCJQV:~$ cd  
maha@DESKTOP-PDJCJQV:~$ cd ..  
maha@DESKTOP-PDJCJQV:/home$ cd ~  
maha@DESKTOP-PDJCJQV:~$ cd /  
maha@DESKTOP-PDJCJQV:/$
```

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
```

maha@DESKTOP-PDJCJQV: ~

```
maha@DESKTOP-PDJCJQV:~$ sudo mkdir /mylab2
[sudo] password for maha:
maha@DESKTOP-PDJCJQV:~$ mkdir -p test/sub/dir
maha@DESKTOP-PDJCJQV:~$ touch file1.txt
maha@DESKTOP-PDJCJQV:~$ touch file2.txt
maha@DESKTOP-PDJCJQV:~$ nano hello.txt
maha@DESKTOP-PDJCJQV:~$ cat hello.txt
hi this is my test file
```

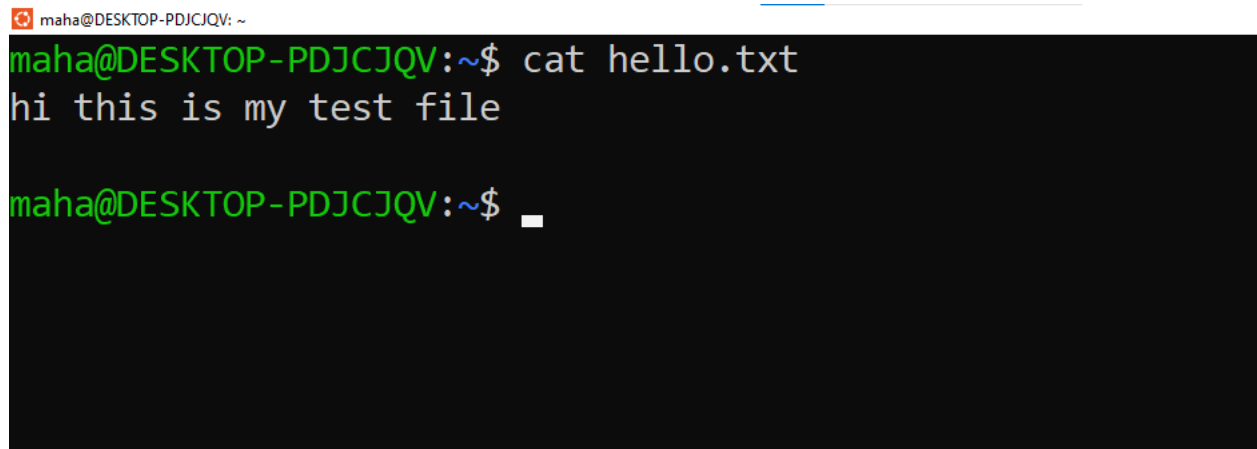
- File viewing commands:

```
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
```

Commands:

1. Cat hello.txt

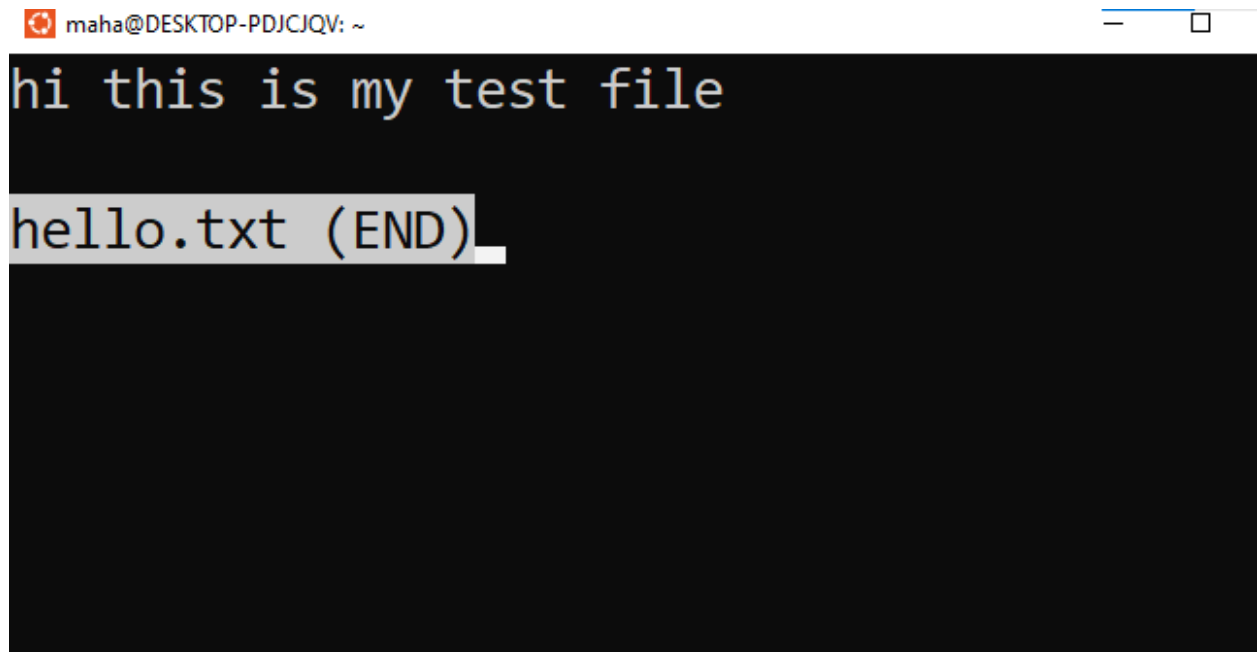


A terminal window titled 'maha@DESKTOP-PDJCJQV: ~' with a red icon. The prompt is 'maha@DESKTOP-PDJCJQV:~\$'. The command 'cat hello.txt' has been entered, and the output 'hi this is my test file' is displayed on the next line. The prompt 'maha@DESKTOP-PDJCJQV:~\$' is shown again on the following line, followed by a white cursor block.

```
maha@DESKTOP-PDJCJQV:~$ cat hello.txt
hi this is my test file

maha@DESKTOP-PDJCJQV:~$
```

2. Less hello.txt



A terminal window titled 'maha@DESKTOP-PDJCJQV: ~' with a red icon and window controls (minimize, maximize, close). The prompt is 'maha@DESKTOP-PDJCJQV: ~\$'. The command 'less hello.txt' has been entered, and the output 'hi this is my test file' is displayed on the next line. The prompt 'maha@DESKTOP-PDJCJQV: ~\$' is shown again on the following line, followed by a white cursor block.

```
maha@DESKTOP-PDJCJQV: ~$ less hello.txt
hi this is my test file

hello.txt (END)
```

3. Head hello.txt

maha@DESKTOP-PDJCJQV: ~

```
maha@DESKTOP-PDJCJQV:~$ head hello.txt  
hi this is my test file
```

```
maha@DESKTOP-PDJCJQV:~$
```

4. Tail hello.txt
5. Wc hello.txt

maha@DESKTOP-PDJCJQV: ~

```
maha@DESKTOP-PDJCJQV:~$ tail hello.txt  
hi this is my test file
```

```
maha@DESKTOP-PDJCJQV:~$ wc hello.txt  
 2  6 26 hello.txt
```

```
maha@DESKTOP-PDJCJQV:~$
```

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
```

maha@DESKTOP-PDJCJQV: ~

```
maha@DESKTOP-PDJCJQV:~$ cp hello.txt backup.txt
maha@DESKTOP-PDJCJQV:~$ cp -r mylab2 mylab2_backup
maha@DESKTOP-PDJCJQV:~$ mv backup.txt renamed.txt
maha@DESKTOP-PDJCJQV:~$ rm renamed.txt
maha@DESKTOP-PDJCJQV:~$ rm -r mylab2_backup
maha@DESKTOP-PDJCJQV:~$ rmdir empty_directory
rmdir: failed to remove 'empty_directory': No such file or directory
maha@DESKTOP-PDJCJQV:~$
```

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)
```

maha@DESKTOP-PDJCJQV: ~

```
maha@DESKTOP-PDJCJQV:~$ sudo chmod 755 hello.txt
[sudo] password for maha:
maha@DESKTOP-PDJCJQV:~$ sudo chmod u+x hello.txt
maha@DESKTOP-PDJCJQV:~$ ls
1170-OS_LAB- file1.txt file2.txt hello.txt mylab2 program test
maha@DESKTOP-PDJCJQV:~$ ls -l
total 32
drwxr-xr-x 3 maha maha 4096 Sep 28 06:44 1170-OS_LAB-
-rw-r--r-- 1 maha maha  0 Sep 28 07:17 file1.txt
-rw-r--r-- 1 maha maha  0 Sep 28 07:17 file2.txt
-rwxr-xr-x 1 maha maha  26 Sep 28 07:18 hello.txt
drwxr-xr-x 2 maha maha 4096 Sep 28 07:26 mylab2
-rwxr-xr-x 1 maha maha 15968 Sep 28 04:17 program
drwxr-xr-x 3 maha maha 4096 Sep 28 07:17 test
maha@DESKTOP-PDJCJQV:~$ sudo chmod g-w hello.txt
maha@DESKTOP-PDJCJQV:~$
```

maha@DESKTOP-PDJCJQV: ~

```
maha@DESKTOP-PDJCJQV:~$ chown maha:maha hello.txt
maha@DESKTOP-PDJCJQV:~$ ls -l
total 32
drwxr-xr-x 3 maha maha 4096 Sep 28 06:44 1170-OS_LAB-
-rw-r--r-- 1 maha maha  0 Sep 28 07:17 file1.txt
-rw-r--r-- 1 maha maha  0 Sep 28 07:17 file2.txt
-rwxr-xr-x 1 maha maha  26 Sep 28 07:18 hello.txt
drwxr-xr-x 2 maha maha 4096 Sep 28 07:26 mylab2
-rwxr-xr-x 1 maha maha 15968 Sep 28 04:17 program
drwxr-xr-x 3 maha maha 4096 Sep 28 07:17 test
maha@DESKTOP-PDJCJQV:~$
```

.....