Operating Systems – COC 3071L

SE 5th A – Fall 2025

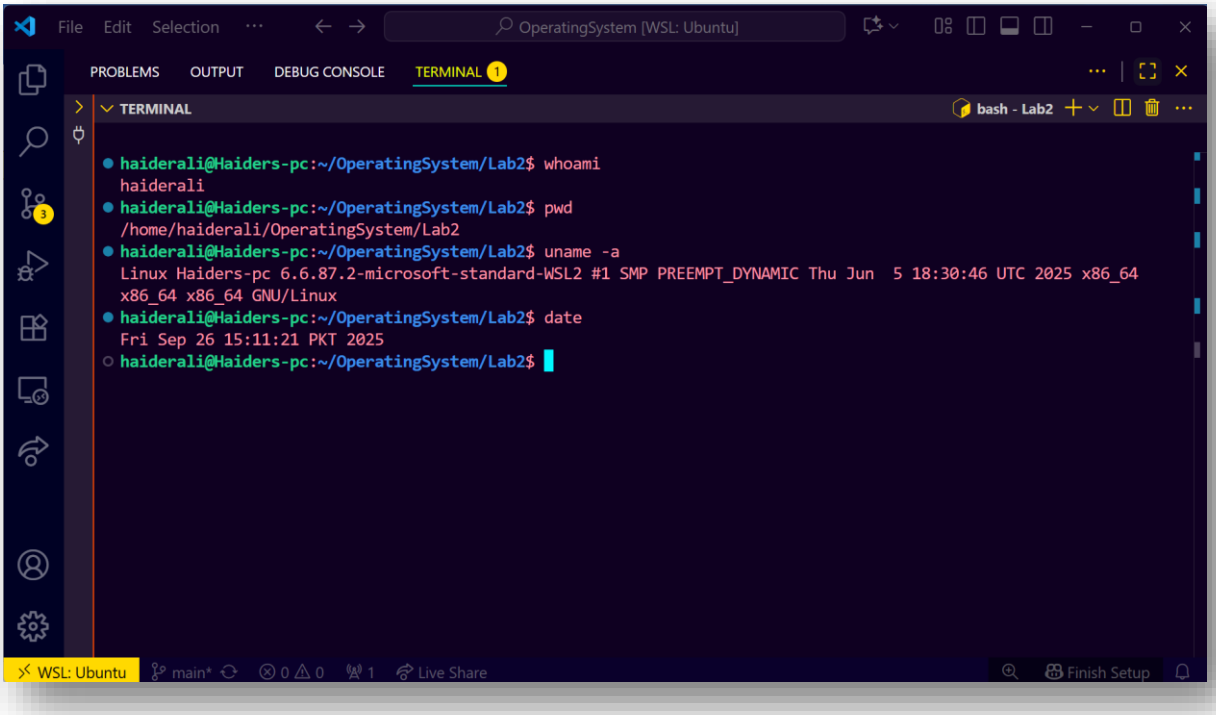
Lab 2: Linux Basics and Introduction

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:**

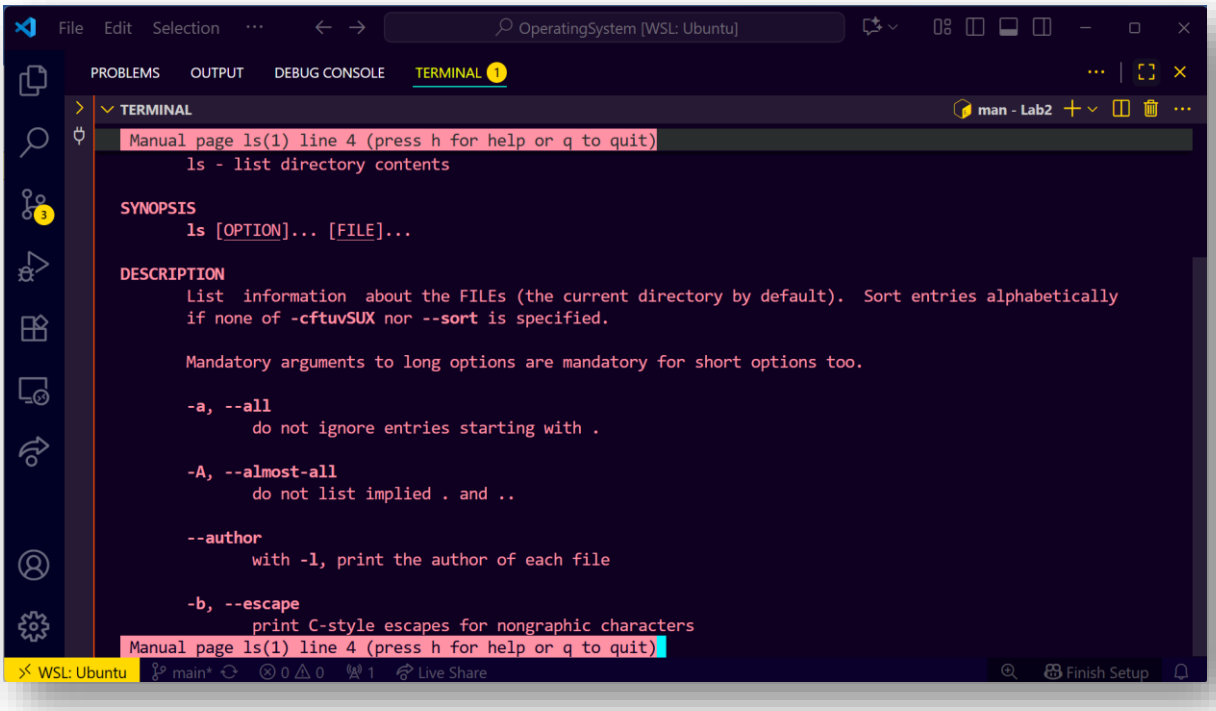
```
# Students open WSL2 terminal and explore
whoami              # Check current user
pwd                 # Print working directory
uname -a            # System information
date                # Current date and time
```

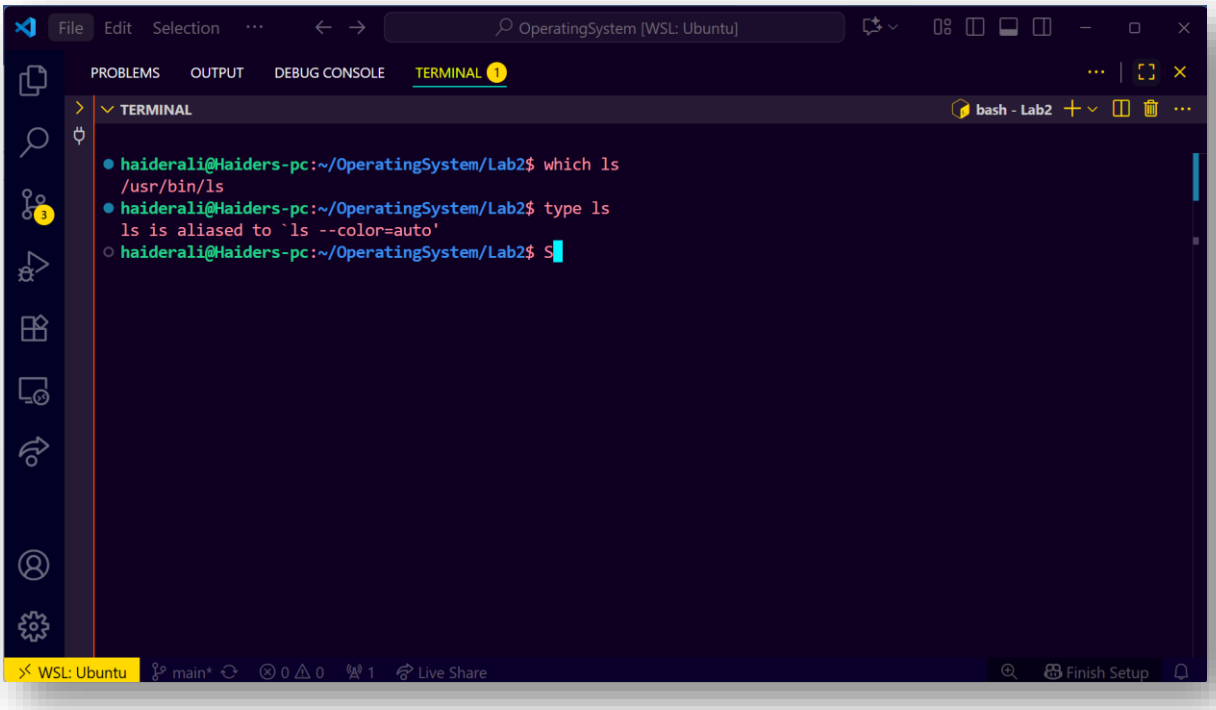


1.2 Getting Help in Linux

- **Commands to demonstrate:**

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



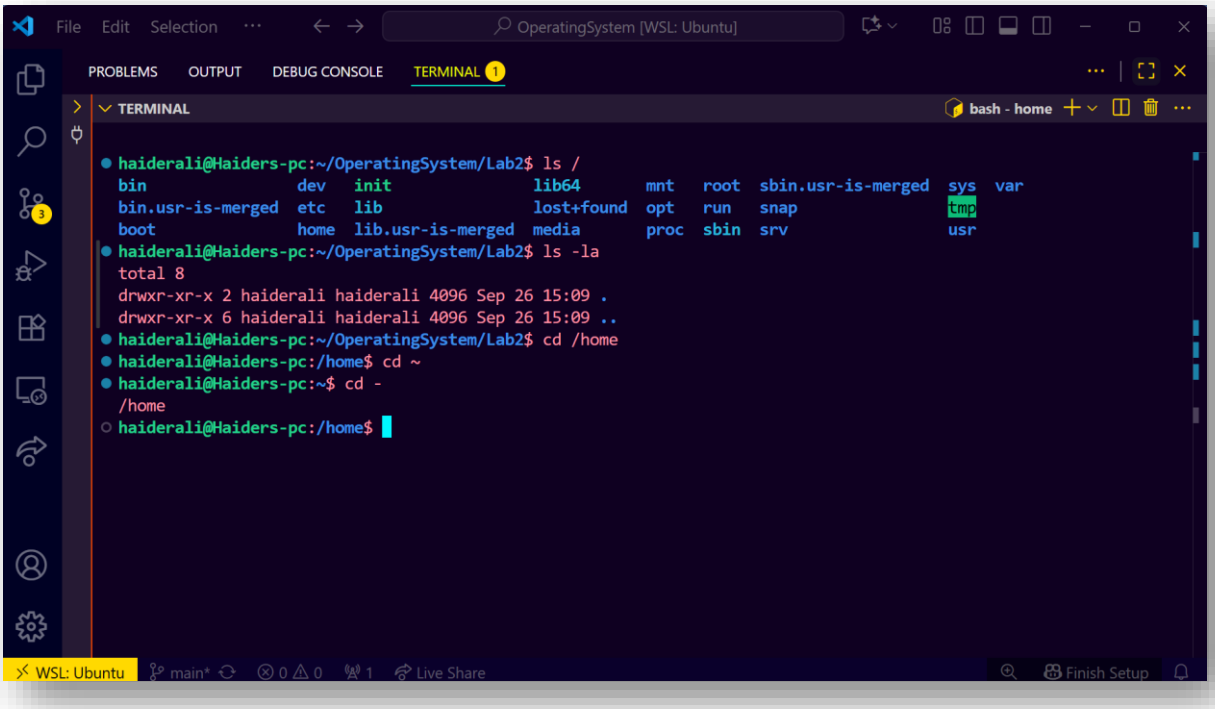


Part 2: File System Navigation

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:**

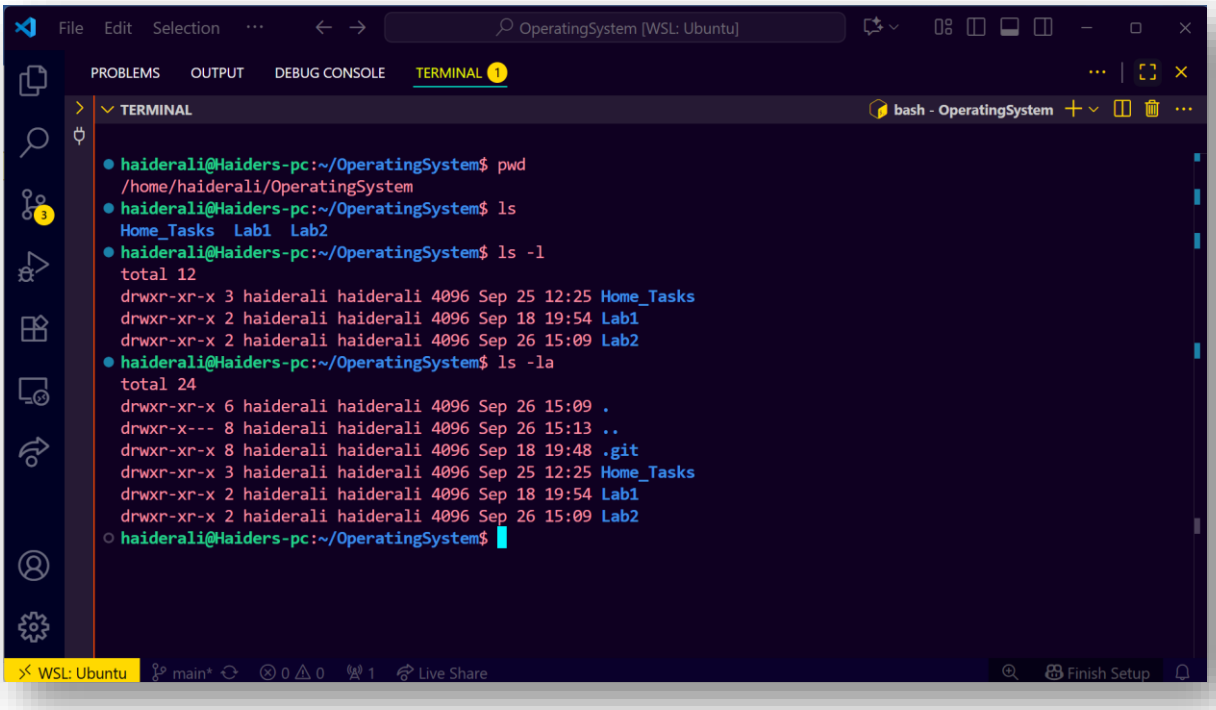
```
ls /            # Root directory contents
ls -la          # Long listing with hidden files
cd /home        # Change directory
cd ~            # Home directory shortcut
cd -            # Previous directory
```

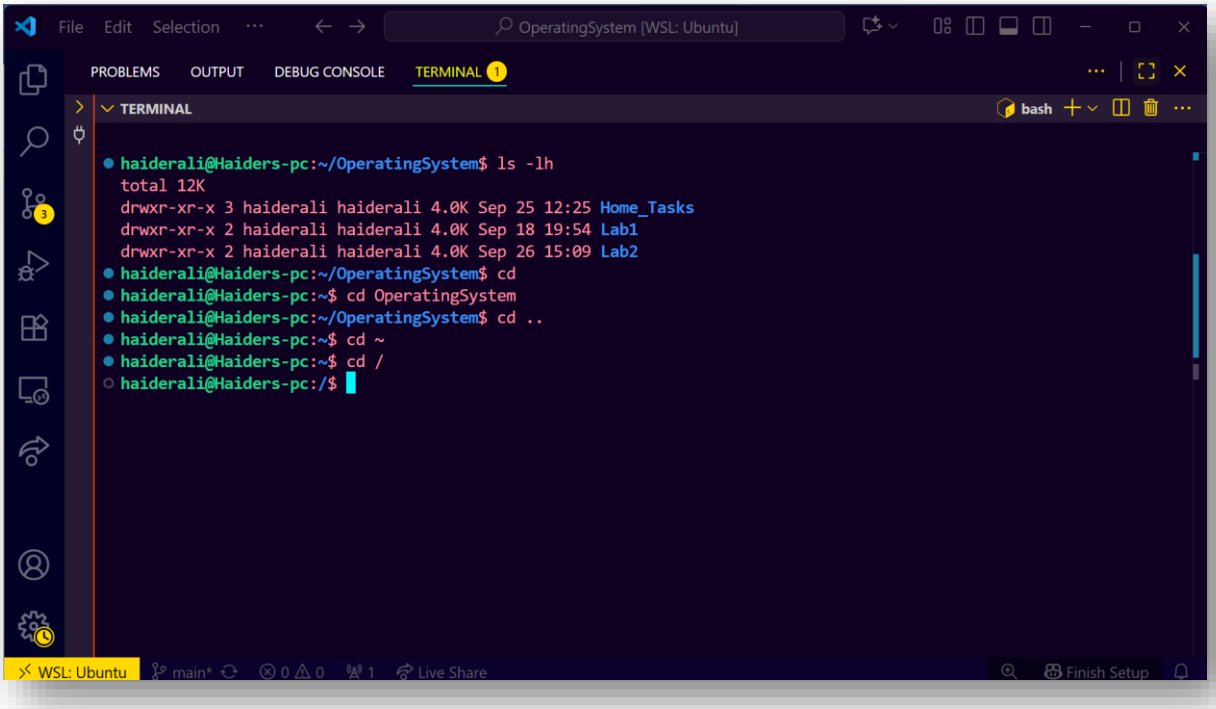


2.2 Basic Navigation Commands (15 minutes)

- **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
```





Part 3: File and Directory Operations

**3.1 Creating and Managing Files/Directories

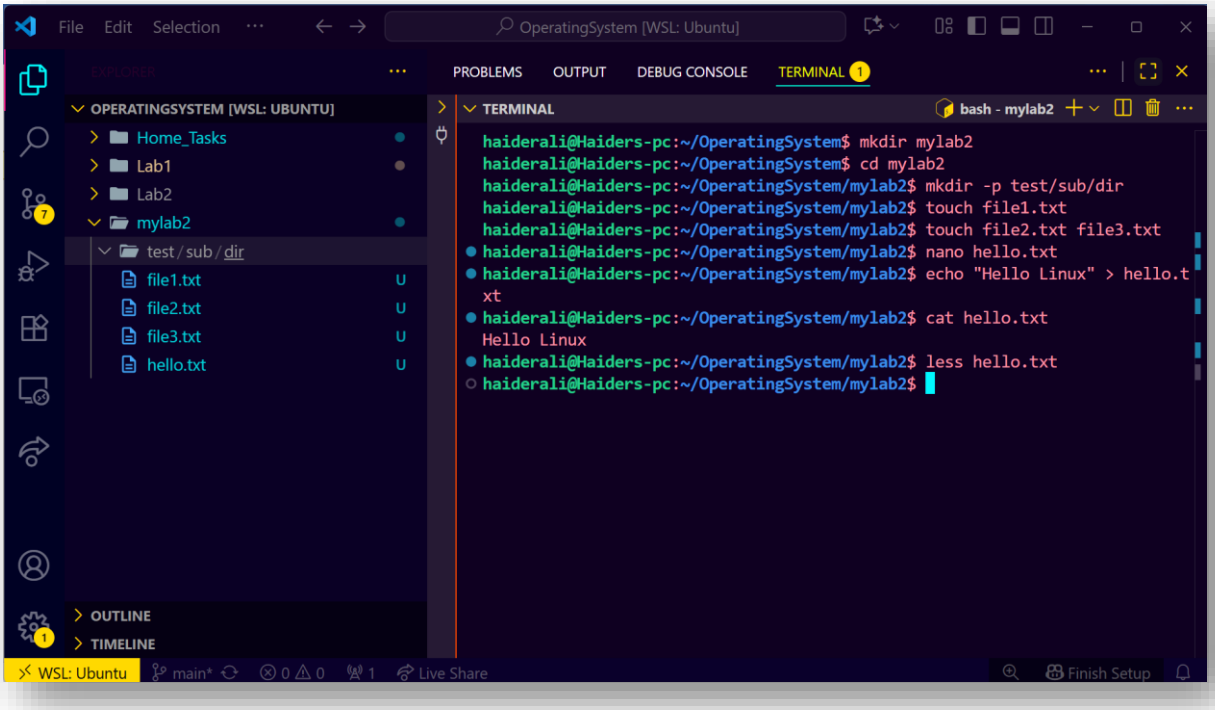
- **Commands to demonstrate:**

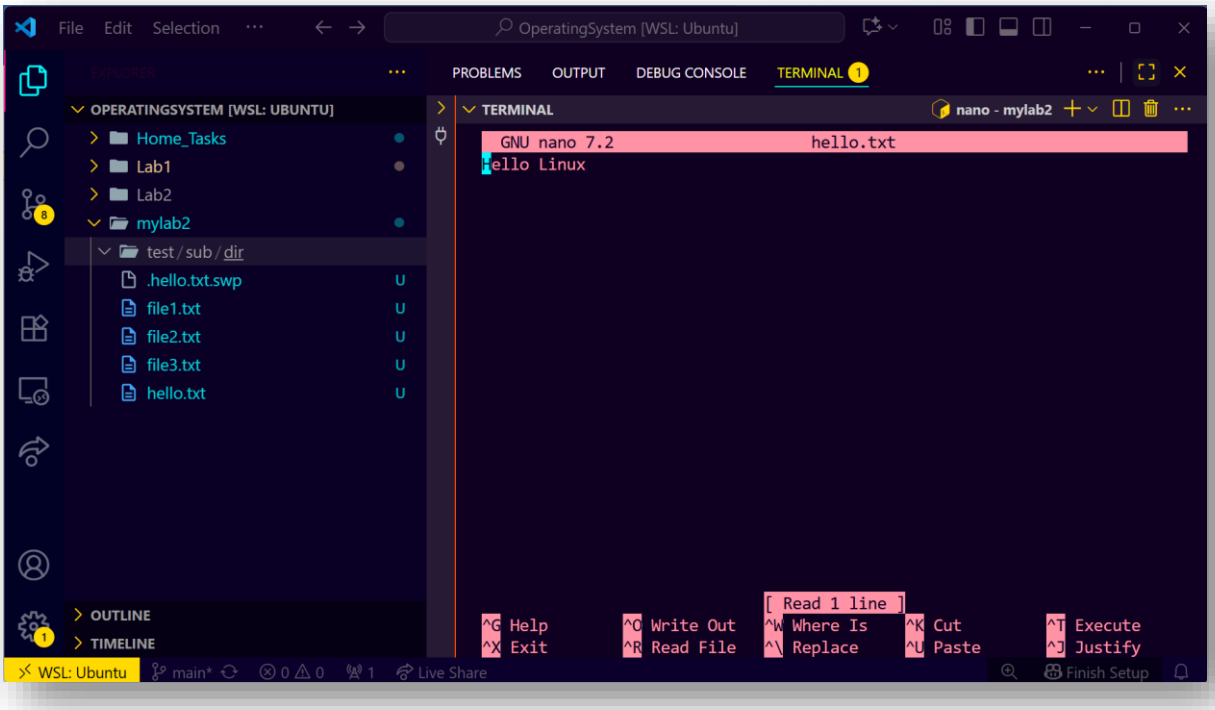
```
mkdir mylab2            # Create directory
mkdir -p test/sub/dir   # Create nested directories
touch file1.txt         # Create empty file
touch file2.txt file3.txt  # Multiple files

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

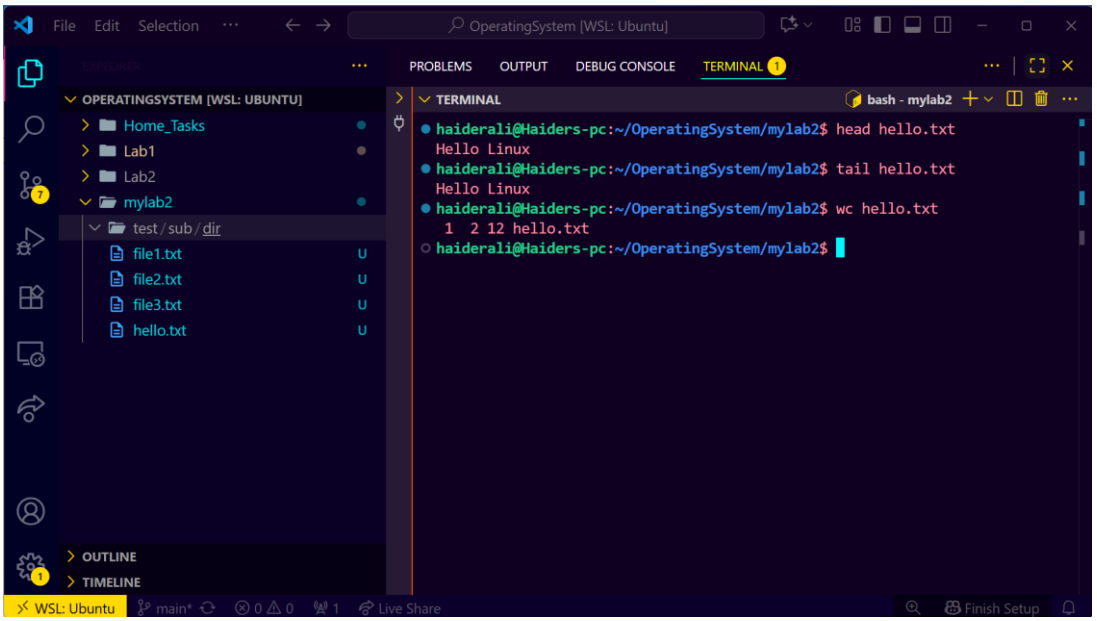
- **File viewing commands:**

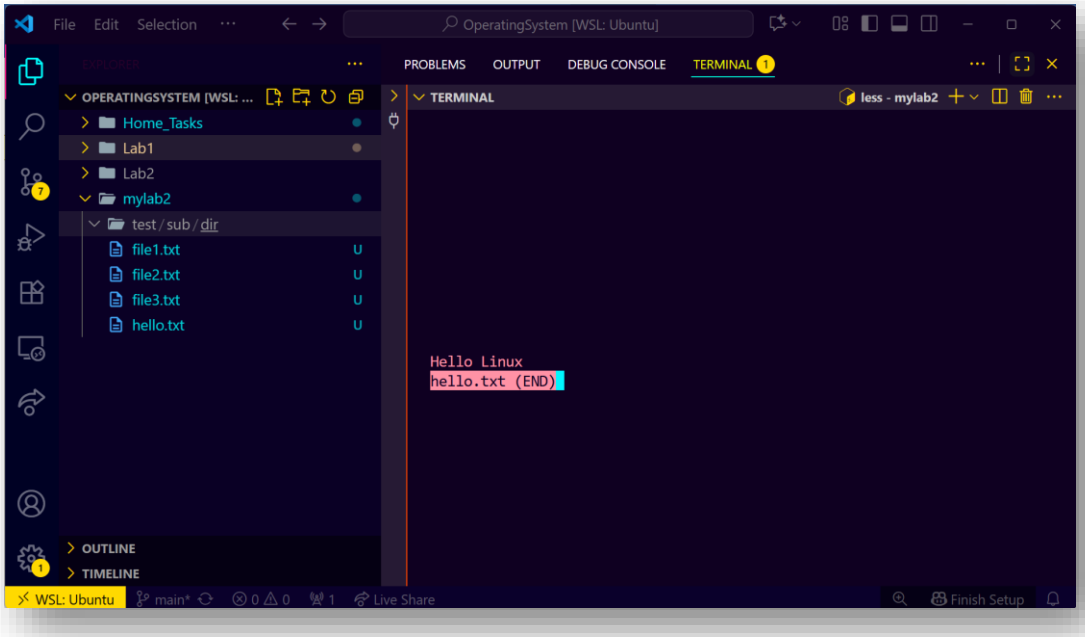
```
cat hello.txt           # Display file contents
less hello.txt          # Page through file
head hello.txt          # First 10 lines
```

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




File Edit Selection
OperatingSystem [WSL: Ubuntu]
PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL 1
OPERATINGSYSTEM [WSL: UBUNTU]
Home_Tasks
Lab1
Lab2
mylab2
test / sub / dir
.hello.txt.swp U
file1.txt U
file2.txt U
file3.txt U
hello.txt U
TERMINAL
nano - mylab2
GNU nano 7.2 hello.txt
Hello Linux
[Read 1 line]
^G Help ^O Write Out ^W Where Is ^K Cut ^T Execute
^X Exit ^R Read File ^\ Replace ^U Paste ^J Justify
OUTLINE
TIMELINE
WSL: Ubuntu main* 0 0 1 Live Share Finish Setup

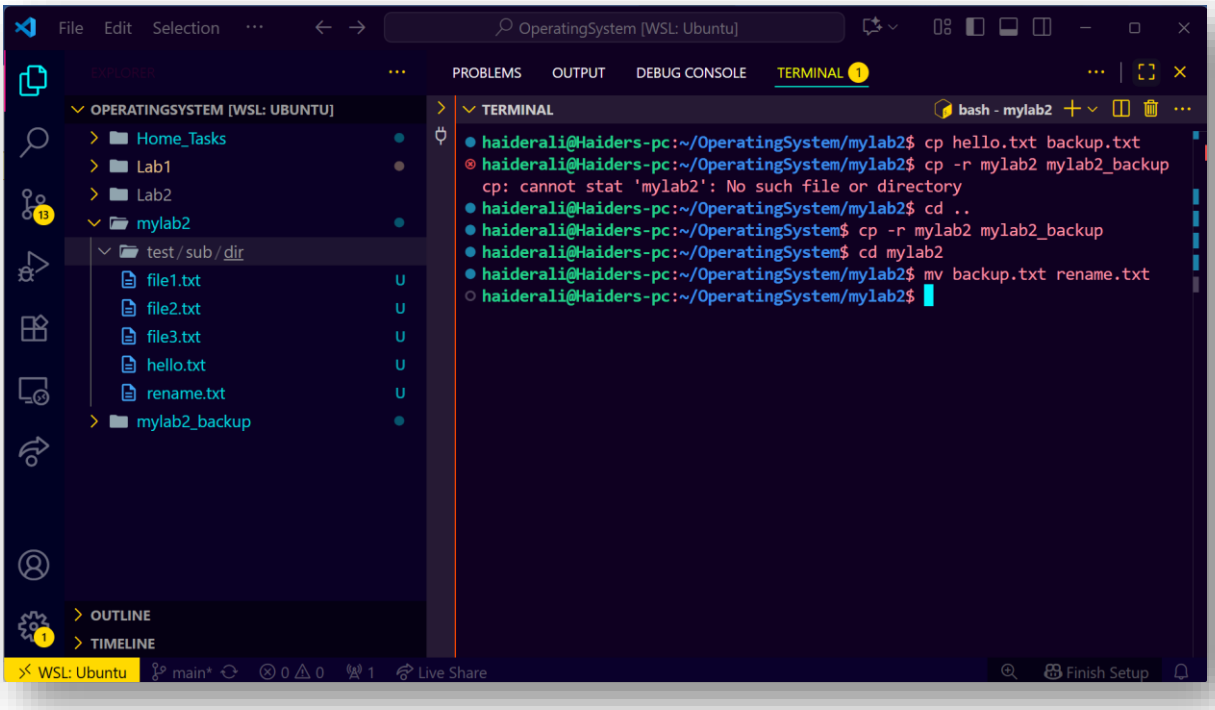


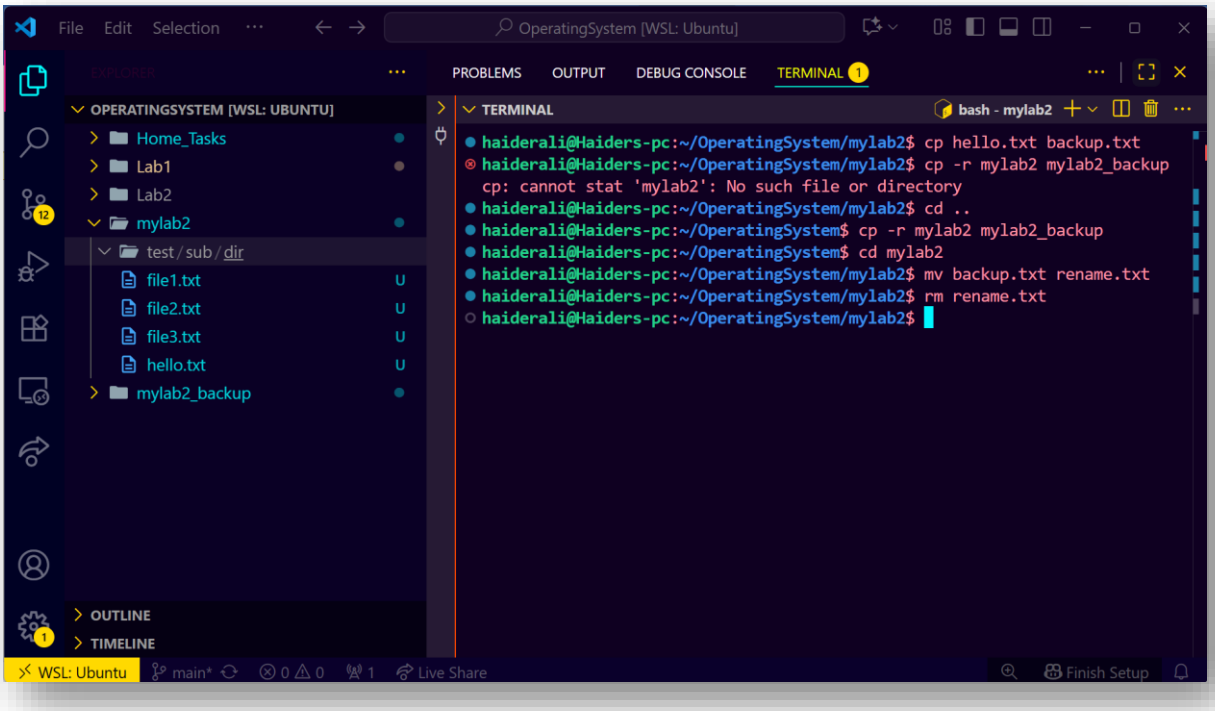


3.2 Copying, Moving, and Deleting

- **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
```


File Edit Selection
OperatingSystem [WSL: Ubuntu]
PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL 1
OPERATINGSYSTEM [WSL: UBUNTU]
Home_Tasks
Lab1
Lab2
mylab2
test / sub / dir
file1.txt U
file2.txt U
file3.txt U
hello.txt U
rename.txt U
mylab2_backup
TERMINAL
bash - mylab2
haiderali@Haiders-pc:~/OperatingSystem/mylab2$ cp hello.txt backup.txt
haiderali@Haiders-pc:~/OperatingSystem/mylab2$ cp -r mylab2 mylab2_backup
cp: cannot stat 'mylab2': No such file or directory
haiderali@Haiders-pc:~/OperatingSystem/mylab2$ cd ..
haiderali@Haiders-pc:~/OperatingSystem$ cp -r mylab2 mylab2_backup
haiderali@Haiders-pc:~/OperatingSystem$ cd mylab2
haiderali@Haiders-pc:~/OperatingSystem/mylab2$ mv backup.txt rename.txt
haiderali@Haiders-pc:~/OperatingSystem/mylab2$
OUTLINE
TIMELINE
WSL: Ubuntu
main*
Live Share
Finish Setup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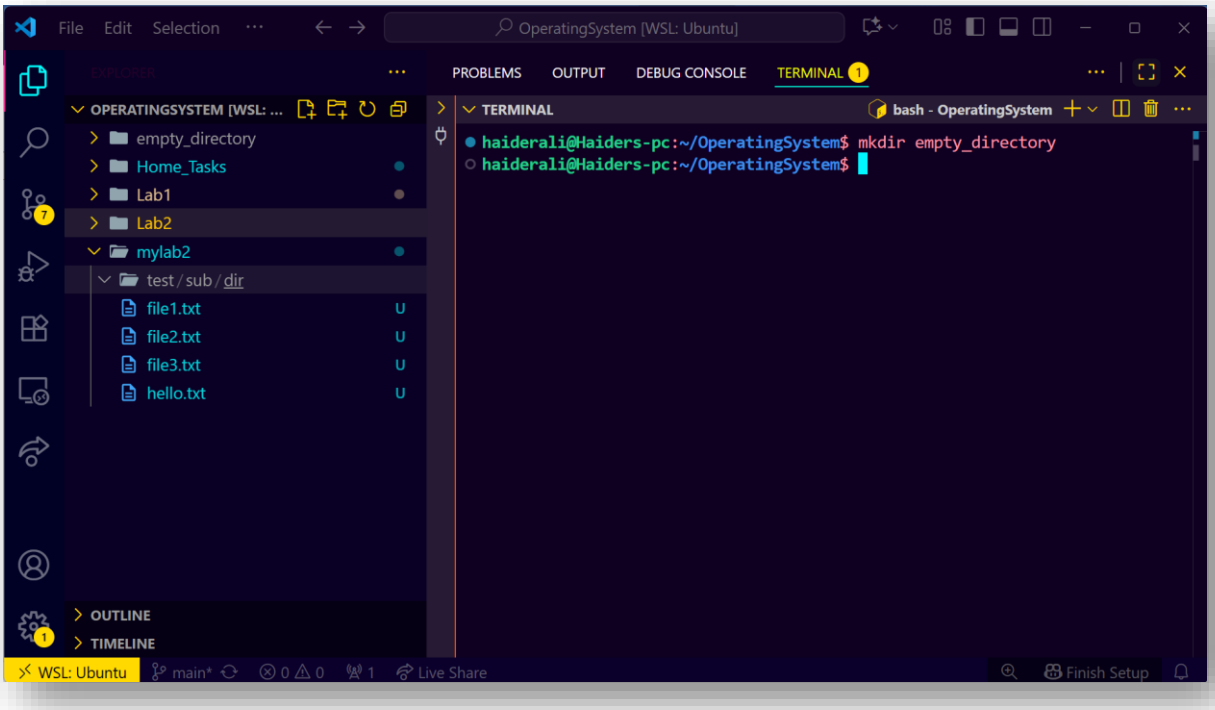
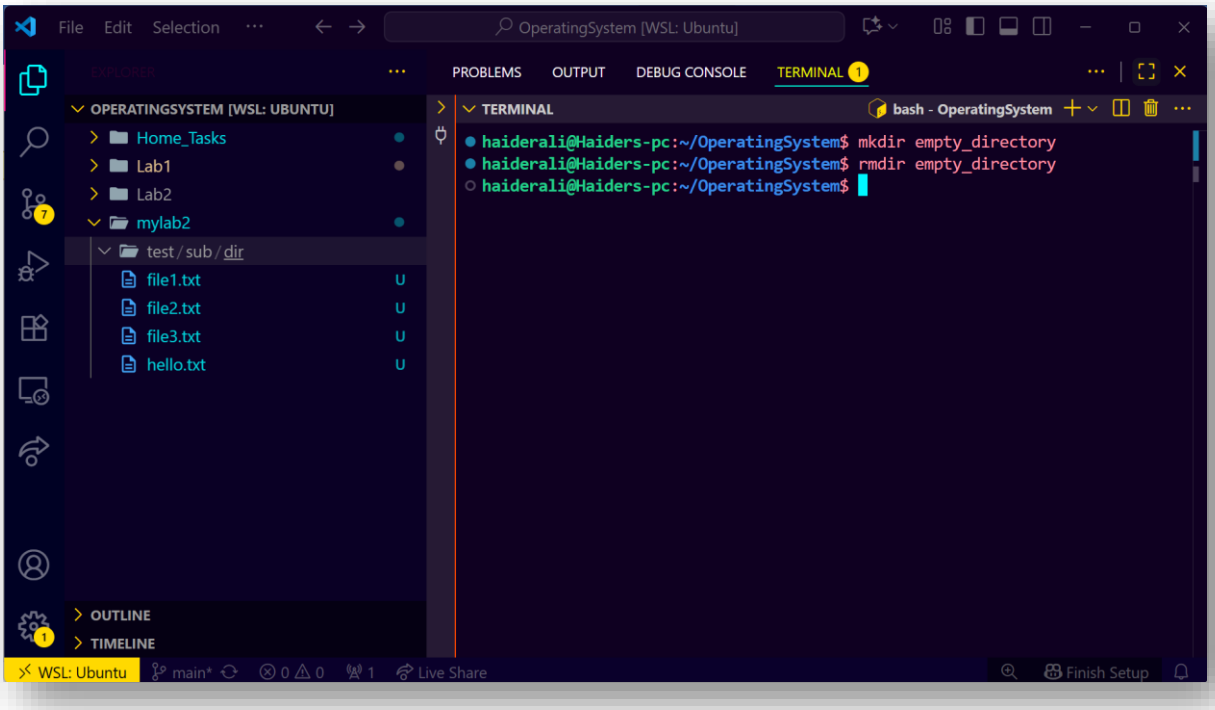
OperatingSystem [WSL: Ubuntu]
PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL 1
OPERATINGSYSTEM [WSL: UBUNTU]
Home_Tasks
Lab1
Lab2
mylab2
test / sub / dir
file1.txt U
file2.txt U
file3.txt U
hello.txt U
mylab2_backup
TERMINAL
bash - mylab2
haiderali@Haiders-pc:~/OperatingSystem/mylab2$ cp hello.txt backup.txt
haiderali@Haiders-pc:~/OperatingSystem/mylab2$ cp -r mylab2 mylab2_backup
cp: cannot stat 'mylab2': No such file or directory
haiderali@Haiders-pc:~/OperatingSystem/mylab2$ cd ..
haiderali@Haiders-pc:~/OperatingSystem$ cp -r mylab2 mylab2_backup
haiderali@Haiders-pc:~/OperatingSystem$ cd mylab2
haiderali@Haiders-pc:~/OperatingSystem/mylab2$ mv backup.txt rename.txt
haiderali@Haiders-pc:~/OperatingSystem/mylab2$ rm rename.txt
haiderali@Haiders-pc:~/OperatingSystem/mylab2$
OUTLINE
TIMELINE
WSL: Ubuntu
main*
Live Share
Finish Setup





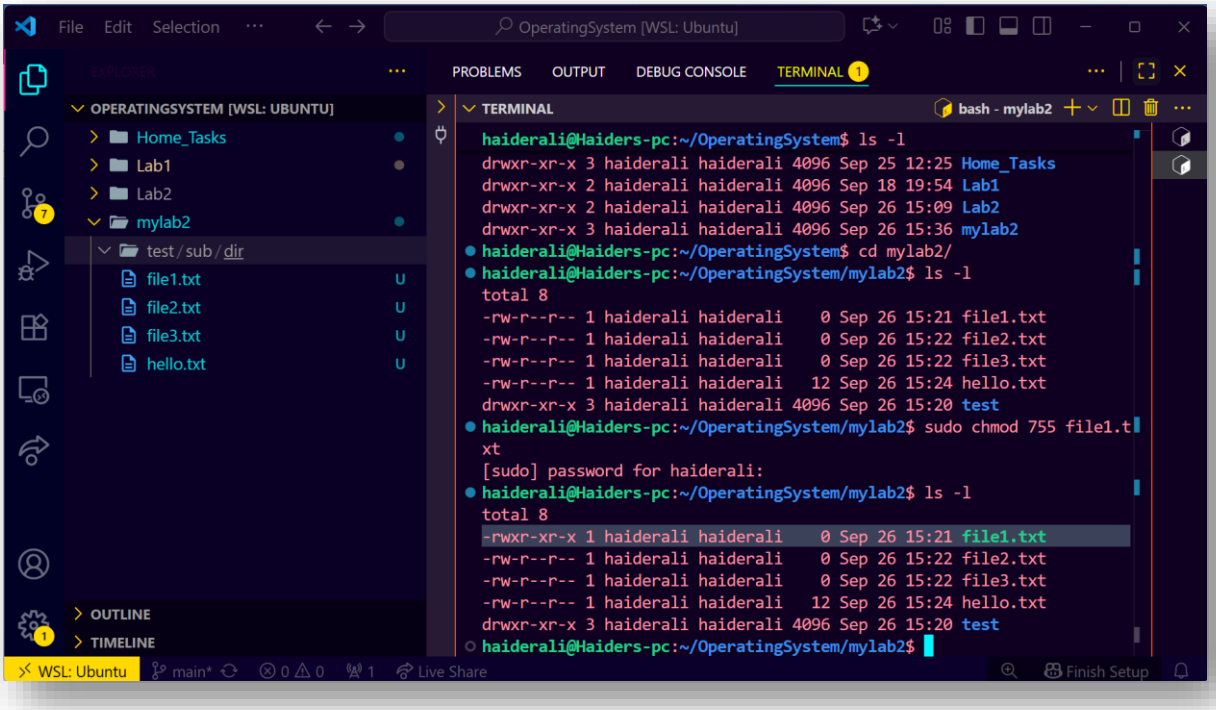
Hands-on Exercise: Students create a directory structure, add files, and practice file operations.

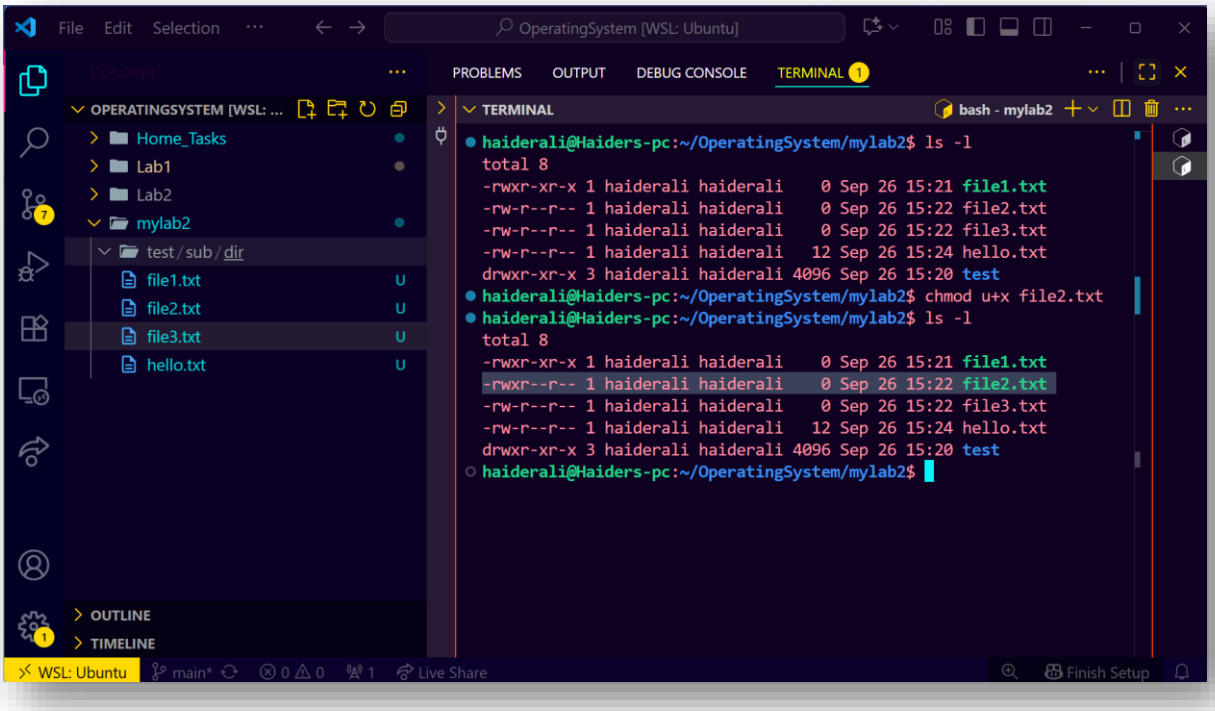
Part 4: File Permissions and Ownership

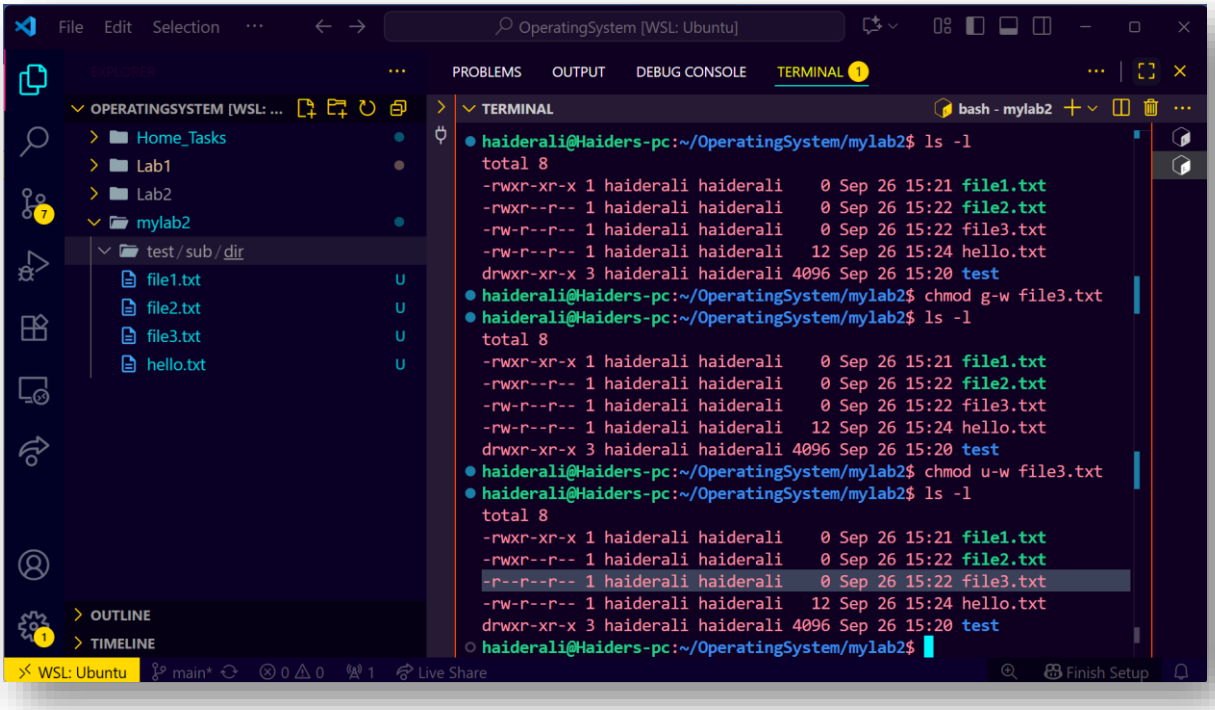
4.1 Understanding File Permissions

- **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)
```




File Edit Selection
OperatingSystem [WSL: Ubuntu]
PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL 1
OPERATINGSYSTEM [WSL: ...
Home_Tasks
Lab1
Lab2
mylab2
test / sub / dir
file1.txt U
file2.txt U
file3.txt U
hello.txt U
TERMINAL
bash - mylab2
haiderali@Haiders-pc:~/OperatingSystem/mylab2$ ls -l
total 8
-rwxr-xr-x 1 haiderali haiderali 0 Sep 26 15:21 file1.txt
-rw-r--r-- 1 haiderali haiderali 0 Sep 26 15:22 file2.txt
-rw-r--r-- 1 haiderali haiderali 0 Sep 26 15:22 file3.txt
-rw-r--r-- 1 haiderali haiderali 12 Sep 26 15:24 hello.txt
drwxr-xr-x 3 haiderali haiderali 4096 Sep 26 15:20 test
haiderali@Haiders-pc:~/OperatingSystem/mylab2$ chmod u+x file2.txt
haiderali@Haiders-pc:~/OperatingSystem/mylab2$ ls -l
total 8
-rwxr-xr-x 1 haiderali haiderali 0 Sep 26 15:21 file1.txt
-rwxr--r-- 1 haiderali haiderali 0 Sep 26 15:22 file2.txt
-rw-r--r-- 1 haiderali haiderali 0 Sep 26 15:22 file3.txt
-rw-r--r-- 1 haiderali haiderali 12 Sep 26 15:24 hello.txt
drwxr-xr-x 3 haiderali haiderali 4096 Sep 26 15:20 test
haiderali@Haiders-pc:~/OperatingSystem/mylab2$
OUTLINE
TIMELINE
WSL: Ubuntu main* 0 0 1 Live Share
Finish Setup


File Edit Selection
OperatingSystem [WSL: Ubuntu]
PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL 1
OPERATINGSYSTEM [WSL: ...
Home_Tasks
Lab1
Lab2
mylab2
test / sub / dir
file1.txt U
file2.txt U
file3.txt U
hello.txt U
TERMINAL
bash - mylab2
haiderali@Haiders-pc:~/OperatingSystem/mylab2$ ls -l
total 8
-rwxr-xr-x 1 haiderali haiderali 0 Sep 26 15:21 file1.txt
-rwxr--r-- 1 haiderali haiderali 0 Sep 26 15:22 file2.txt
-rw-r--r-- 1 haiderali haiderali 0 Sep 26 15:22 file3.txt
-rw-r--r-- 1 haiderali haiderali 12 Sep 26 15:24 hello.txt
drwxr-xr-x 3 haiderali haiderali 4096 Sep 26 15:20 test
haiderali@Haiders-pc:~/OperatingSystem/mylab2$ chmod g-w file3.txt
haiderali@Haiders-pc:~/OperatingSystem/mylab2$ ls -l
total 8
-rwxr-xr-x 1 haiderali haiderali 0 Sep 26 15:21 file1.txt
-rwxr--r-- 1 haiderali haiderali 0 Sep 26 15:22 file2.txt
-rw-r--r-- 1 haiderali haiderali 0 Sep 26 15:22 file3.txt
-rw-r--r-- 1 haiderali haiderali 12 Sep 26 15:24 hello.txt
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haiderali@Haiders-pc:~/OperatingSystem/mylab2$ chmod u-w file3.txt
haiderali@Haiders-pc:~/OperatingSystem/mylab2$ ls -l
total 8
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-rwxr--r-- 1 haiderali haiderali 0 Sep 26 15:22 file2.txt
-r--r--r-- 1 haiderali haiderali 0 Sep 26 15:22 file3.txt
-rw-r--r-- 1 haiderali haiderali 12 Sep 26 15:24 hello.txt
drwxr-xr-x 3 haiderali haiderali 4096 Sep 26 15:20 test
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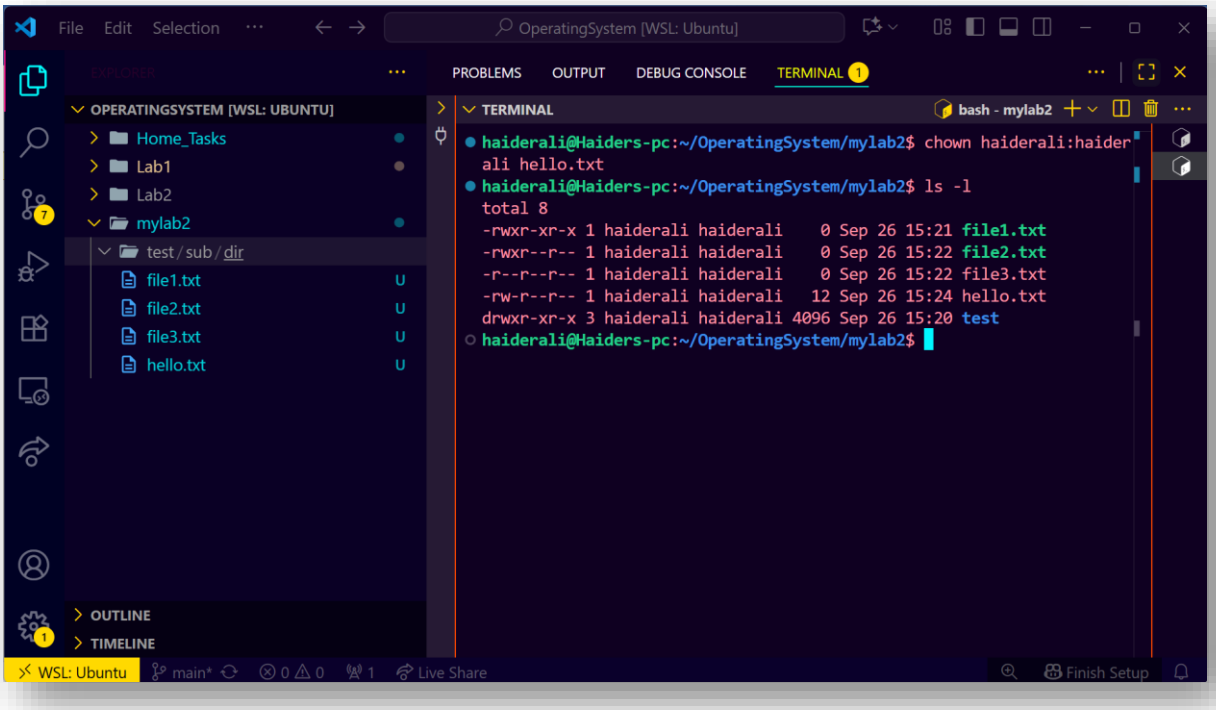
WSL: Ubuntu main* 0 0 1 Live Share
Finish Setup

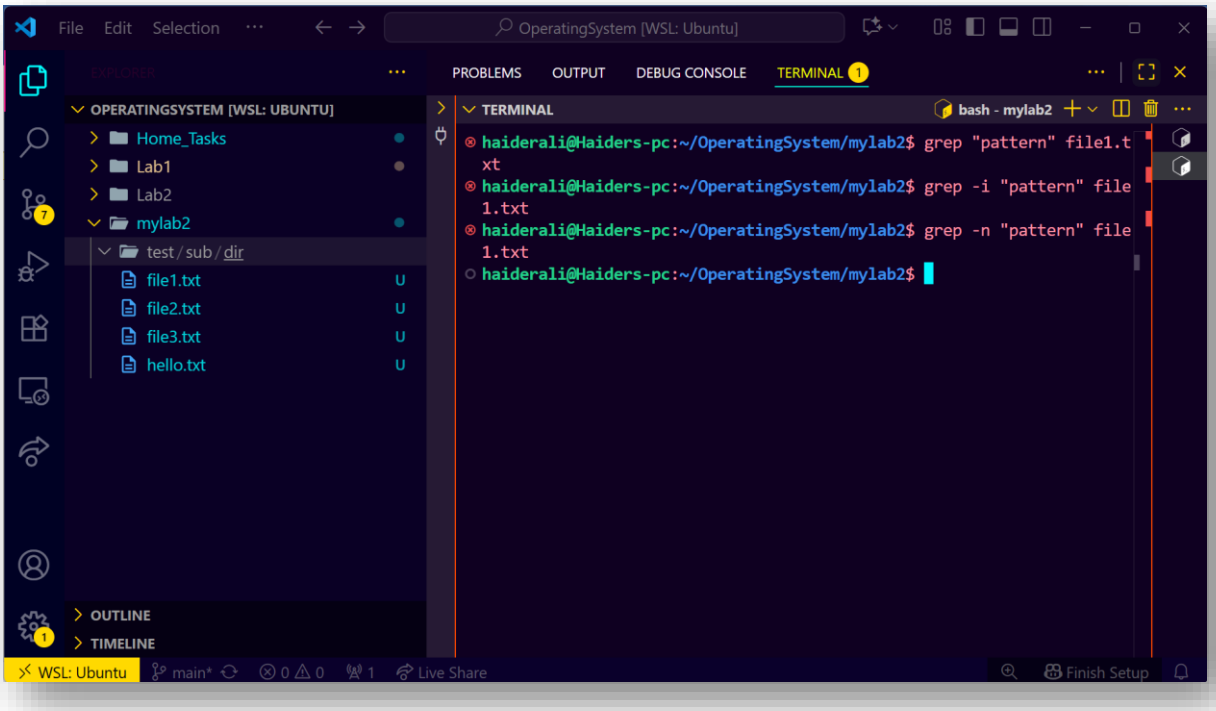


Part 5: Text Processing and Utilities

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
```



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:**

```
ps                    # Show current processes
ps aux                # Detailed process list
ps -ef                # Full format listing
pstree                # Process tree
top                   # Real-time process viewer
htop                  # Enhanced process viewer (if available)
kill PID              # Terminate process by PID
killall process_name  # Kill processes by name
pkill pattern         # Kill processes matching pattern
```