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
```

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.

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)
```

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
```