Munster Technological University

Computer Science Dept.

COMP6042 Operating Systems in Practice

Spring 2024

Lab 7

Date: Week-starting March 18**,** 2024 - your COMP1-group scheduled Lab-class.

- Attendance at your Lab class is strongly recommended.
- You may be asked show your lecturer your working questions.
- *For answering descriptive questions, we recommend **not to use cut & paste**; use **your own words**.*

- Login to your ***Linux Ubuntu V22.04.x LTS*** virtual machine.
- ***Download this*** pdf-document (in a folder created for this module and Lab class).
- ***Create & Open*** your solutions-file, ***answer*** the questions, ***save*** the file.
- Use the Snipping tool program to copy extracts from your terminal sessions into your document, to help answer questions.
- This is a practice Lab. No Canvas Submission

Document as much as possible in your report. Take snipping of the terminal showing the sequence of commands you type.

Before you start the questions:

- Create a directory (i.e. folder) in your home directory called **Lab_7**.
- Therefore, open a terminal and then type:

```
cd ~
pwd
mkdir Lab_7
ls -l          ← Make sure you can see the directory Lab_7 in the list.
```

- Finally, close the terminal.

Question 1

*Run a **process**; look at the process using **ps** command; **kill** the process.*

1. Open a terminal (we consider this *terminal 1*).
2. Run the command: **ping www.rte.ie**

3. Open a second terminal (we consider this *terminal 2*).
4. Use the **ps aux** command to look at the processes. Clearly indicate the line which shows the ping program running [*it is probably around the third last line*].

5. Identify the process id, PID, of the **ping** program [*look for the second field in the line on the left which should be a 4 digit number specifying the PID number of the program(process)*].
6. Kill the **ping** program using the **kill** command (format: *kill -9 process_id*)
   [*note: you must type **kill -9 process_id** where you replace 'process_id' with the actual number of the process*].
7. Verify that the **ping** process is now terminated, by repeating the **ps aux** command above. Your terminal 1 screen should confirm that the ping program is terminated, (displaying the word '***Killed***').

8. Close the 2 terminals.

Question 2

*Explore and describe the **top** command in detail. Your descriptions should make reference to your snippings.*

1. Open a terminal.
2. Run the **top** command. Search through your slides for information relating to the top command.
3. Write a report describing the top command. You must use your own words; do not cut&paste from your class notes and/or the internet/manual. Explain as much as you can about the information displayed by the top command, using snippings where appropriate.
4. Close the terminal.

Question 3

*Discuss **hard** and **soft linking** of files (open your notes/slides for Cptr. 6).*

1. Open a terminal.
2. Change to your home directory by typing: **cd ~**
3. Change to the Lab_7 folder by typing: **cd Lab_7**
4. Check that you are in the correct directory by typing: **pwd**
5. Create a file called ***myfile***. Write 5 lines of your own choice, and then save the file.
   [To create the file type: **nano myfile]**
6. Type: **ls –il**
7. Create a hard link to the file by typing: **ln myfile hfile**
8. Create a soft link to the file by typing: **ln -s myfile sfile**

   NOTE:
   You can use the cat command to display a file's contents; example: **cat myfile**
   To display your directory also showing the ***inode*** numbers, type: **ls –il**

9. What you notice about the ***inodes*** displayed by the **ls** command.
10. What is a **hard link**? What is a hard link used for? Why are hard links used in Linux?
    Use the above files to illustrate your understanding, and clearly describe each aspect of hard links in relation to the original file.
11. What is a **soft link**? What is a soft link used for? Why are soft links used in Linux?
    Use the above files to illustrate your understanding, and clearly describe each aspect of soft links in relation to the original file.
12. Close the terminal.

Question 4

*Explore the **at** command to launch a process at a particular time.*

1. Open a terminal.
2. Change to your home directory by typing: **cd ~**
3. Change to the Lab_7 folder by typing: **cd Lab_7**
4. Check that you are in the correct directory by typing: **pwd**
5. Type: **man at**

   If the at command is not installed, type:

   sudo apt update

   sudo apt install at

   [***Note**: If apt-get will not work for you, it is probably because the Linux updating is currently occurring, therefore, you will have to shut down the Linux VM and restart it, and try again.*]

6. Type the command **ps –aux | grep atd** to view the ***daemon atd*** belonging to the "**at**" application.

7. Write a very simple ***script***-program which sends its output a file.

   Type **nano myprog1** and enter the following three lines:

   echo "My first line of output" >> hold

   echo "My second line of output" >> hold

   echo "My third line of output" >> hold

8. After saving the file, make it a program by changing permissions **chmod 750 myprog1**
9. Schedule your ***myprog1 script***-program to run in **2** minutes time, by typing:

   at now + 2 minutes –f myprog1
10. Type **ls** Does the ***hold*** file exist?
11. After 2 minutes, type **ls** [you must wait at least two minutes]. Does the ***hold*** file exist?
12. Explain, in detail, what has happened and why.
13. Type **cat hold** to see the contents of the ***hold*** file.

14. What is a daemon? Refer to the examples that you completed in this question, in your answer.

End Lab 07