



National Textile University

Department of Computer Science

Subject: Operating System

Submitted to: Sir Nasir

Submitted by: Amina

Reg. number: 23-NTU-CS-1136

Lab no.: lab3

Semester:5th

2. Linux Process Commands

2.1 Viewing Processes

1- ps → Process Status



A terminal window titled 'amina@DESKTOP-SEP18NK: ~' with standard window controls. The prompt is 'amina@DESKTOP-SEP18NK:~\$'. The command 'ps' has been entered, and the output is displayed as a table with four columns: PID, TTY, TIME, and CMD. The output shows two processes: PID 5765 (bash) and PID 23873 (ps). The prompt is now 'amina@DESKTOP-SEP18NK:~\$ |'.

```
amina@DESKTOP-SEP18NK:~$ ps
  PID TTY          TIME CMD
 5765 pts/7        00:00:00 bash
23873 pts/7        00:00:00 ps
amina@DESKTOP-SEP18NK:~$ |
```

2- ps -ef → Full list of all processes

```
amina@DESKTOP-SEP18NK: ~  
amina@DESKTOP-SEP18NK:~$ ps  
  PID TTY          TIME CMD  
  5765 pts/7        00:00:00 bash  
 23873 pts/7        00:00:00 ps  
amina@DESKTOP-SEP18NK:~$  
amina@DESKTOP-SEP18NK:~$ ps -ef  
UID          PID    PPID  C STIME TTY          TIME CMD  
root           1        0  0 14:03 ?           00:00:01 /sbin/init  
root           2        1  0 14:03 ?           00:00:00 /init  
root           8        2  0 14:03 ?           00:00:04 plan9 --control-socket 7 --log-lev  
root          44        1  0 14:03 ?           00:00:00 /usr/lib/systemd/systemd-journald  
root          94        1  0 14:03 ?           00:00:00 /usr/lib/systemd/systemd-udev  
systemd+     109        1  0 14:03 ?           00:00:00 /usr/lib/systemd/systemd-resolved  
systemd+     110        1  0 14:03 ?           00:00:00 /usr/lib/systemd/systemd-timesyncd  
root         162        1  0 14:03 ?           00:00:00 /usr/sbin/cron -f -P  
message+    163        1  0 14:03 ?           00:00:00 @dbus-daemon --system --address=sy  
root        170        1  0 14:03 ?           00:00:00 /usr/lib/systemd/systemd-logind  
root        172        1  0 14:03 ?           00:00:00 /usr/libexec/wsl-pro-service -vv  
root        174        1  0 14:03 hvc0       00:00:00 /sbin/agetty -o -p -- \u --noclear  
syslog      194        1  0 14:03 ?           00:00:00 /usr/sbin/rsyslogd -n -iNONE  
root        197        1  0 14:03 tty1       00:00:00 /sbin/agetty -o -p -- \u --noclear  
root        203        1  0 14:03 ?           00:00:00 /usr/bin/python3 /usr/share/unatte  
root        301        2  0 14:03 pts/1      00:00:00 /bin/login -f  
amina       346        1  0 14:03 ?           00:00:00 /usr/lib/systemd/systemd --user  
amina       347       346  0 14:03 ?           00:00:00 (sd-pam)  
amina       366       301  0 14:03 pts/1      00:00:00 -bash  
root       4488        2  0 14:26 ?           00:00:00 /init  
root       4489      4488  0 14:26 ?           00:00:00 /init  
amina      4490      4489  0 14:26 pts/0      00:00:00 sh -c "$VSCODE_WSL_EXT_LOCATION/sc  
amina      4491      4490  0 14:26 pts/0      00:00:00 sh /mnt/c/Users/Amina/.vscode/exte  
amina      4497      4491  0 14:26 pts/0      00:00:00 sh /home/amina/.vscode-server/bin/  
amina      4501      4497  1 14:26 pts/0      00:00:44 /home/amina/.vscode-server/bin/385  
amina      4521      4501  0 14:26 pts/0      00:00:13 /home/amina/.vscode-server/bin/385  
root        5104        2  0 14:29 ?           00:00:00 /init  
root        5105      5104  0 14:29 ?           00:00:01 /init  
amina      5110      5105  0 14:29 pts/4      00:00:02 /home/amina/.vscode-server/bin/385  
root        5117        2  0 14:29 ?           00:00:00 /init  
root        5118      5117  0 14:29 ?           00:00:00 /init  
amina      5119      5118  0 14:29 pts/5      00:00:01 /home/amina/.vscode-server/bin/385  
amina      5125      4501  0 14:29 pts/0      00:00:01 /home/amina/.vscode-server/bin/385  
amina      5146      4501  3 14:29 pts/0      00:02:06 /home/amina/.vscode-server/bin/385  
amina      5165      4521  0 14:29 pts/6      00:00:00 /bin/bash --init-file /home/amina/  
root        5760        2  0 14:30 ?           00:00:00 /init  
root        5761      5760  0 14:30 ?           00:00:00 /init  
amina      5765      5761  0 14:30 pts/7      00:00:00 -bash  
root        6902        2  0 14:34 ?           00:00:00 /init  
root        6903      6902  0 14:34 ?           00:00:00 /init  
amina      6904      6903  0 14:34 pts/2      00:00:02 /home/amina/.vscode-server/bin/385
```

3- ps -ef | grep bash

```
amina@DESKTOP-SEP18NK: ~  
amina@DESKTOP-SEP18NK:~$ ps -ef | grep bash  
amina      366      301  0 14:03 pts/1    00:00:00 -bash  
amina      5165     4521  0 14:29 pts/6    00:00:00 /bin/bash --init-file /home/amina/.vscode-server  
/bin/385651c938df8a906869abee516bffd0ddb9829/out/vs/workbench/contrib/terminal/common/scripts/shell  
Integration-bash.sh  
amina      5765     5761  0 14:30 pts/7    00:00:00 -bash  
amina      8053     4521  0 14:38 pts/8    00:00:00 /bin/bash --init-file /home/amina/.vscode-server  
/bin/385651c938df8a906869abee516bffd0ddb9829/out/vs/workbench/contrib/terminal/common/scripts/shell  
Integration-bash.sh  
amina     24370     5765  0 15:32 pts/7    00:00:00 grep --color=auto bash  
amina@DESKTOP-SEP18NK:~$ |
```

2.2 Monitoring Processes Interactively top → Dynamic process viewer

1- Top

```
amina@DESKTOP-SEP18NK: ~  
amina@DESKTOP-SEP18NK:~$ top  
top - 15:33:23 up 1:29, 1 user, load average: 0.04, 0.10, 0.08  
Tasks: 50 total, 1 running, 49 sleeping, 0 stopped, 0 zombie  
%Cpu(s): 0.4 us, 0.9 sy, 0.0 ni, 98.5 id, 0.1 wa, 0.0 hi, 0.1 si, 0.0 st  
MiB Mem : 7846.2 total, 5419.3 free, 2370.4 used, 213.2 buff/cache  
MiB Swap: 2048.0 total, 2048.0 free, 0.0 used. 5475.8 avail Mem
```

PID	USER	PR	NI	VIRT	RES	SHR	S	%CPU	%MEM	TIME+	COMMAND
6934	amina	20	0	53.2g	909520	65104	S	3.7	11.3	2:39.69	node
5146	amina	20	0	52.6g	781592	60160	S	2.7	9.7	2:09.10	node
4521	amina	20	0	1142620	76272	48256	S	0.3	0.9	0:13.45	node
24715	amina	20	0	9308	5504	3328	R	0.3	0.1	0:00.03	top
1	root	20	0	21848	12100	9028	S	0.0	0.2	0:01.19	systemd
2	root	20	0	3072	1920	1792	S	0.0	0.0	0:00.03	init-systemd(Ub
8	root	20	0	3124	2192	1920	S	0.0	0.0	0:04.44	init
44	root	19	-1	66744	16784	15888	S	0.0	0.2	0:00.65	systemd-journal
94	root	20	0	25236	6144	4864	S	0.0	0.1	0:00.82	systemd-udev
109	systemd+	20	0	21456	12160	10112	S	0.0	0.2	0:00.16	systemd-resolve
110	systemd+	20	0	91024	7680	6784	S	0.0	0.1	0:00.19	systemd-timesyn
162	root	20	0	4236	2432	2304	S	0.0	0.0	0:00.03	cron
163	message+	20	0	9628	4864	4480	S	0.0	0.1	0:00.22	dbus-daemon
170	root	20	0	17972	8192	7296	S	0.0	0.1	0:00.18	systemd-logind
172	root	20	0	1756096	12672	10368	S	0.0	0.2	0:00.37	wsl-pro-service
174	root	20	0	3160	1920	1792	S	0.0	0.0	0:00.01	agetty
194	syslog	20	0	222508	5248	4224	S	0.0	0.1	0:00.22	rsyslogd
197	root	20	0	3116	1792	1664	S	0.0	0.0	0:00.01	agetty
203	root	20	0	107032	21888	12800	S	0.0	0.3	0:00.17	unattended-upgr
301	root	20	0	6824	4352	3712	S	0.0	0.1	0:00.02	login
346	amina	20	0	20312	11136	9216	S	0.0	0.1	0:00.15	systemd
347	amina	20	0	21148	3516	1792	S	0.0	0.0	0:00.00	(sd-pam)
366	amina	20	0	6072	4992	3456	S	0.0	0.1	0:00.03	bash
4488	root	20	0	3088	1028	896	S	0.0	0.0	0:00.00	SessionLeader
4489	root	20	0	3088	1164	1024	S	0.0	0.0	0:00.00	Relay(4490)
4490	amina	20	0	2800	1664	1664	S	0.0	0.0	0:00.01	sh
4491	amina	20	0	2800	1792	1792	S	0.0	0.0	0:00.00	sh
4497	amina	20	0	2800	1792	1792	S	0.0	0.0	0:00.00	sh
4501	amina	20	0	11.3g	166396	53376	S	0.0	2.1	0:44.48	node
5104	root	20	0	3080	1028	896	S	0.0	0.0	0:00.00	SessionLeader
5105	root	20	0	3096	1036	896	S	0.0	0.0	0:01.31	Relay(5110)
5110	amina	20	0	1035276	78500	44032	S	0.0	1.0	0:02.93	node
5117	root	20	0	3080	1028	896	S	0.0	0.0	0:00.00	SessionLeader
5118	root	20	0	3096	1164	1024	S	0.0	0.0	0:00.47	Relay(5119)
5119	amina	20	0	1012568	55296	44032	S	0.0	0.7	0:01.71	node
5125	amina	20	0	1262052	60072	48128	S	0.0	0.7	0:01.13	node
5165	amina	20	0	6208	5120	3456	S	0.0	0.1	0:00.05	bash
5760	root	20	0	3076	1028	896	S	0.0	0.0	0:00.00	SessionLeader
5761	root	20	0	3092	1032	896	S	0.0	0.0	0:00.01	Relay(5765)
5765	amina	20	0	6072	5120	3584	S	0.0	0.1	0:00.09	bash

2.3 Foreground and Background Jobs

Foreground: A process that takes control of the terminal until it finishes.

→ You cannot type new commands until it finishes.

sleep 30

Background: Add & to run without blocking.

→ Terminal is free while the command runs.

sleep 30 &

Check background jobs:

Jobs

Bring a job to foreground:

fg %1

Resume suspended job in background:

bg %1

```
amina@DESKTOP-SEP18NK: ~  
amina@DESKTOP-SEP18NK:~$ sleep 30  
amina@DESKTOP-SEP18NK:~$ sleep 30 &  
[1] 26193  
amina@DESKTOP-SEP18NK:~$ jobs  
[1]+  Running                  sleep 30 &  
amina@DESKTOP-SEP18NK:~$ fg %1  
sleep 30  
amina@DESKTOP-SEP18NK:~$ bg %1  
-bash: bg: %1: no such job  
amina@DESKTOP-SEP18NK:~$ |
```

2.4 Process Identification

pidof sleep

ps -ef | grep firefox

```
amina@DESKTOP-SEP18NK: ~$ pidof sleep
amina@DESKTOP-SEP18NK:~$ ps -ef | grep firefox
amina      27070      5765  0 15:40 pts/7    00:00:00 grep --color=auto  firefox
amina@DESKTOP-SEP18NK:~$
```

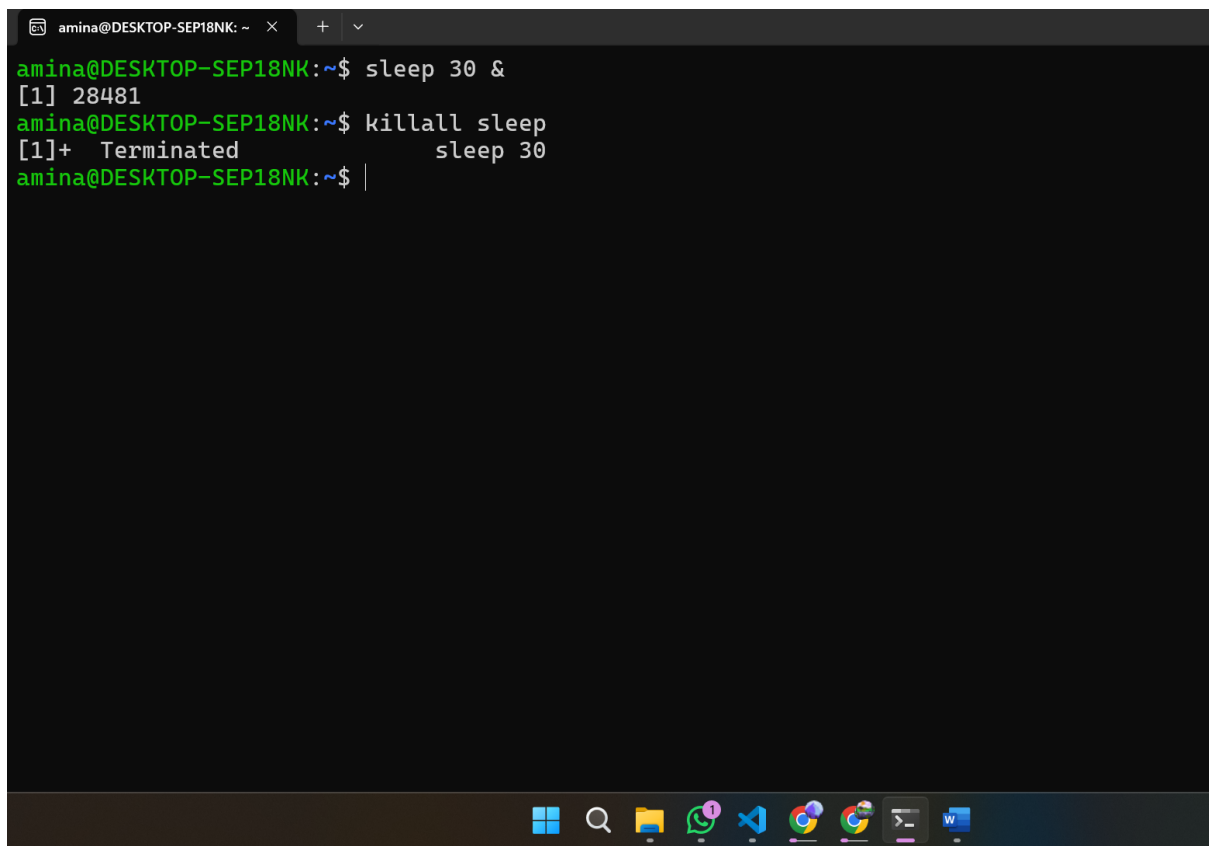
2.5 Killing Processes

Kill by PID:

kill -9 3421

```
amina@DESKTOP-SEP18NK: ~$ sleep 30 &
[1] 28128
amina@DESKTOP-SEP18NK:~$ kill 28128
amina@DESKTOP-SEP18NK:~$ jobs
[1]+  Terminated                  sleep 30
amina@DESKTOP-SEP18NK:~$
```


killall sleep



```
amina@DESKTOP-SEP18NK: ~  
amina@DESKTOP-SEP18NK:~$ sleep 30 &  
[1] 28481  
amina@DESKTOP-SEP18NK:~$ killall sleep  
[1]+  Terminated                  sleep 30  
amina@DESKTOP-SEP18NK:~$ |
```

Practice Task:

1- yes > /dev/null &

```
amina@DESKTOP-SEP18NK: ~$ yes > /dev/null &
[1] 28687
amina@DESKTOP-SEP18NK:~$ |
```

2- Find it with
`ps -ef | grep yes`

```
amina@DESKTOP-SEP18NK: ~$ yes > /dev/null &
[1] 28687
amina@DESKTOP-SEP18NK:~$ ps -ef | grep yes
amina      28687      5765  99 15:45 pts/7    00:01:27 yes
amina      29183      5765   0 15:46 pts/7    00:00:00 grep --color=auto yes
amina@DESKTOP-SEP18NK:~$ |
```

3- Kill it with

`kill -9 <id>`

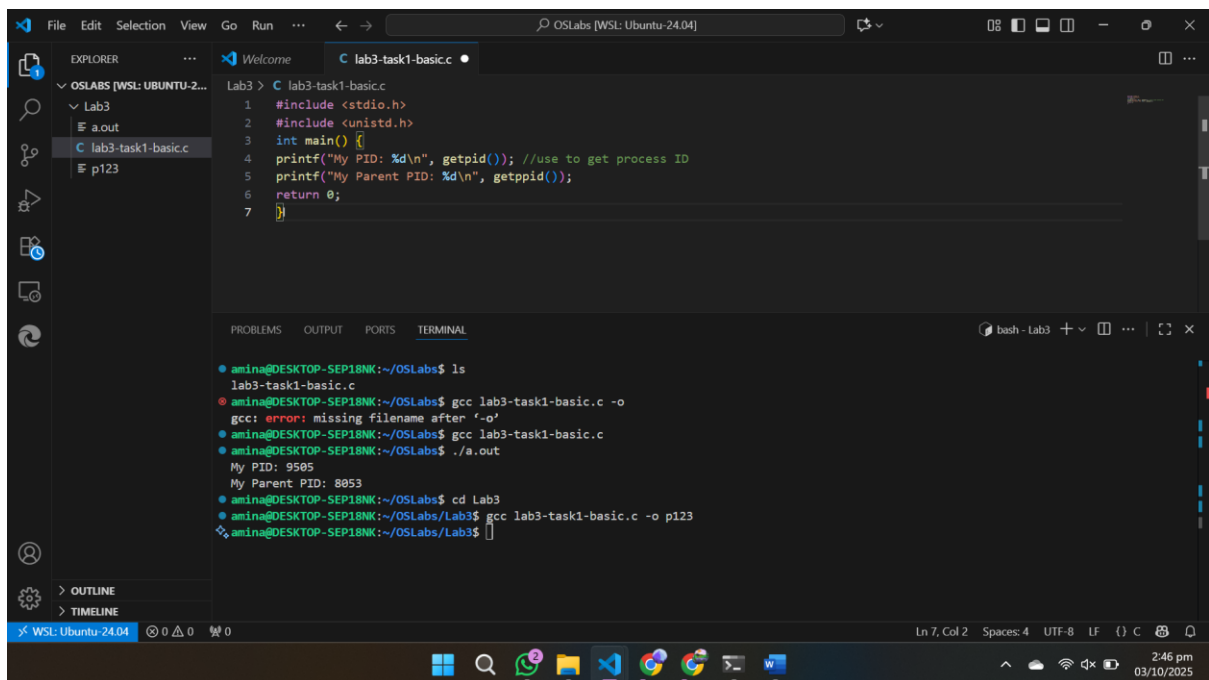
```
amina@DESKTOP-SEP18NK:~$ kill -9 <PID>
-bash: syntax error near unexpected token `newline'
amina@DESKTOP-SEP18NK:~$ kill -9 28687
amina@DESKTOP-SEP18NK:~$ jobs
[1]+  Killed                  yes > /dev/null
amina@DESKTOP-SEP18NK:~$ |
```

3. C Programs on Processes Program

1: Print PID and PPID

task1

Program 1: Print PID and PPID



```
File Edit Selection View Go Run ... OS Labs [WSL: Ubuntu-24.04]
EXPLORER
  OS LABS [WSL: UBUNTU-24.04]
    Lab3
      a.out
      C lab3-task1-basic.c
      p123
  C lab3-task1-basic.c
    1 #include <stdio.h>
    2 #include <unistd.h>
    3 int main() {
    4     printf("My PID: %d\n", getpid()); //use to get process ID
    5     printf("My Parent PID: %d\n", getppid());
    6     return 0;
    7 }

TERMINAL
  amina@DESKTOP-SEP18NK:~/OSLabs$ ls
  lab3-task1-basic.c
  amina@DESKTOP-SEP18NK:~/OSLabs$ gcc lab3-task1-basic.c -o
  gcc: error: missing filename after '-o'
  amina@DESKTOP-SEP18NK:~/OSLabs$ gcc lab3-task1-basic.c
  amina@DESKTOP-SEP18NK:~/OSLabs$ ./a.out
  My PID: 9505
  My Parent PID: 8053
  amina@DESKTOP-SEP18NK:~/OSLabs$ cd Lab3
  amina@DESKTOP-SEP18NK:~/OSLabs/Lab3$ gcc lab3-task1-basic.c -o p123
  amina@DESKTOP-SEP18NK:~/OSLabs/Lab3$
```

Task2:

Program 2: Fork – Creating Child Process

```
Lab3 > C task2SimpleProcess.c > main()
1 #include <stdio.h>
2 #include <unistd.h>
3 int main() {
4     pid_t pid = fork(); // create a new process
5     if (pid == 0) {
6         // This block runs in the child process
7         printf("Child: PID=%d, Parent=%d\n", getpid(), getppid());
8     } else {
9         // This block runs in the parent process
10        printf("Parent: PID=%d, Child=%d\n", getpid(), pid);
11    }
12    return 0;
13 }
```

```
amina@DESKTOP-SEP18NK:~/OSLabs/Lab3$ gcc task2.c -o simpleprocess
amina@DESKTOP-SEP18NK:~/OSLabs/Lab3$ ./simpleprocess
Parent: PID=13719, Child=13720
Child: PID=13720, Parent=13719
```

Task3:

Program 3: Execl – Replacing a Process

```
Lab3 > C task3-exe.c > main()
1 #include <stdio.h>
2 #include <unistd.h>
3 int main() {
4     pid_t pid = fork(); // create a new process
5     if (pid == 0) {
6         // This block runs in the child process
7         printf("Child: PID=%d, Parent=%d\n", getpid(), getppid());
8     } else {
9         // This block runs in the parent process
10        printf("Parent: PID=%d, Child=%d\n", getpid(), pid);
11    }
12    return 0;
13 }
```

```
amina@DESKTOP-SEP18NK:~/OSLabs/Lab3$ gcc task3-exe.c -o execute
amina@DESKTOP-SEP18NK:~/OSLabs/Lab3$ ./execute
Parent still running...
total 76
-rwxr-xr-x 1 amina amina 16064 Oct 3 14:42 a.out
-rwxr-xr-x 1 amina amina 16048 Oct 3 15:00 execute
-rw-r--r-- 1 amina amina 162 Oct 3 14:37 lab3-task1-basic.c
-rwxr-xr-x 1 amina amina 16064 Oct 3 14:45 p123
-rwxr-xr-x 1 amina amina 16088 Oct 3 14:57 simpleprocess
-rw-r--r-- 1 amina amina 303 Oct 3 14:56 task2SimpleProcess.c
-rw-r--r-- 1 amina amina 231 Oct 3 14:59 task3-exe.c

amina@DESKTOP-SEP18NK:~/OSLabs/Lab3$ ls
a.out execute lab3-task1-basic.c p123 simpleprocess task2SimpleProcess.c task3-exe.c
amina@DESKTOP-SEP18NK:~/OSLabs/Lab3$
```

Tasl4:

Program 4: Wait – Synchronization

File Edit Selection View Go Run ...

OSLabs [WSL: Ubuntu-24.04]

task4-wait.c

EXPLORER

OSLabs

Lab3

a.out

execute

lab3-task1-basic.c

p123

simpleprocess

task2SimpleProcess.c

task3-exe.c

task4-wait.c

wait

Lab3 > C task4-wait.c > main()

1 #include <stdio.h>

2 #include <unistd.h>

3 #include <sys/wait.h>

4 int main() {

5 pid_t pid = fork();

6 if (pid == 0) {

7 execlp("ls", "ls", "-l", NULL);

8 printf("This will not print if exec succeeds.\n");

9 } else {

10 waitpid(pid, NULL, 0); // Wait for the child process to finish

11 printf("Parent still running...\n");

PROBLEMS OUTPUT PORTS TERMINAL

bash - Lab3

amina@DESKTOP-SEP18NK:~/OSLabs/Lab3\$ gcc task3-exe.c -o execute

amina@DESKTOP-SEP18NK:~/OSLabs/Lab3\$./execute

Parent still running...

total 76

-rwxr-xr-x 1 amina amina 16064 Oct 3 14:42 a.out ...

total 96

-rwxr-xr-x 1 amina amina 16064 Oct 3 14:42 a.out

-rwxr-xr-x 1 amina amina 16048 Oct 3 15:00 execute

-rw-r--r-- 1 amina amina 163 Oct 3 15:04 lab3-task1-basic.c

-rwxr-xr-x 1 amina amina 16064 Oct 3 14:45 p123

-rwxr-xr-x 1 amina amina 16088 Oct 3 14:57 simpleprocess

-rw-r--r-- 1 amina amina 327 Oct 3 15:04 task2SimpleProcess.c

-rw-r--r-- 1 amina amina 231 Oct 3 15:05 task3-exe.c

-rw-r--r-- 1 amina amina 316 Oct 3 15:06 task4-wait.c

-rwxr-xr-x 1 amina amina 16096 Oct 3 15:06 wait

Parent still running...

amina@DESKTOP-SEP18NK:~/OSLabs/Lab3\$

WSL: Ubuntu-24.04

Ln 12, Col 2 Spaces: 4 UTF-8 LF {} C Linux

3:17 pm 03/10/2025