

## EXPERIMENT 7 - Shell Programming

### Aim

To understand and practically apply process management commands, viewing and monitoring processes, terminating, process prioritization and scheduling

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### Tools & Software Used

- **Terminal Emulator:** GNOME Terminal
  - **Shell:** Bash (*Bourne-Again Shell*)
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### Basic Process Commands

1. *ps* - shows currently running processes

```
tush1ta@DESKTOP-PB7EJBL: /mnt/c/Users/LENOVO/OneDrive/Documents/linux lab/New folder
tush1ta@DESKTOP-PB7EJBL:/mnt/c/Users/LENOVO/OneDrive/Documents/linux lab/New folder$
tush1ta@DESKTOP-PB7EJBL:/mnt/c/Users/LENOVO/OneDrive/Documents/linux lab/New folder$ ps
  PID TTY          TIME CMD
   11 tty1      00:00:00 bash
   58 tty1      00:00:00 ps
tush1ta@DESKTOP-PB7EJBL:/mnt/c/Users/LENOVO/OneDrive/Documents/linux lab/New folder$
```

2. *top* - shows running processes dynamically with their CPU and memory usage

```
tush1ta@DESKTOP-PB7EJBL: /mnt/c/Users/LENOVO/OneDrive/Documents/linux lab/New folder
top - 13:00:41 up 7 min, 0 user, load average: 0.52, 0.58, 0.59
Tasks: 4 total, 1 running, 3 sleeping, 0 stopped, 0 zombie
%Cpu(s): 10.0 us, 0.0 sy, 0.0 ni, 90.0 id, 0.0 wa, 0.0 hi, 0.0 si, 0.0 st
MiB Mem : 4001.2 total, 682.5 free, 3318.7 used, 224.0 buff/cache
MiB Swap: 12288.0 total, 11184.9 free, 1103.1 used, 682.5 avail Mem

  PID USER      PR  NI   VIRT   RES   SHR  S  %CPU  %MEM    TIME+  COMMAND
    1 root        0   0    8952    32    28  S   0.0   0.0   0:00.37 init
   10 root        0   0    8952    20    14  S   0.0   0.0   0:00.00 init
   11 tushita    20   0   14112   3876  3780  S   0.0   0.1   0:00.15 bash
   59 tushita    20   0   17336   3788  1572  R   0.0   0.1   0:00.04 top
```

3. *ps*tree - shows process hierarchy

```
tush1ta@DESKTOP-PB7EJBL: /mnt/c/Users/LENOVO/OneDrive/Documents/linux lab/New folder

tush1ta@DESKTOP-PB7EJBL:/mnt/c/Users/LENOVO/OneDrive/Documents/linux lab/New folder$ pstree
init--init--bash--pstree
    {init}
tush1ta@DESKTOP-PB7EJBL:/mnt/c/Users/LENOVO/OneDrive/Documents/linux lab/New folder$ _
```

#### 4. kill<PID> - stops the process

```
tush1ta@DESKTOP-PB7EJBL: /mnt/c/Users/LENOVO/OneDrive/Documents/linux lab/New folder

tush1ta@DESKTOP-PB7EJBL:/mnt/c/Users/LENOVO/OneDrive/Documents/linux lab/New folder$ sleep 30 &
[1] 63
tush1ta@DESKTOP-PB7EJBL:/mnt/c/Users/LENOVO/OneDrive/Documents/linux lab/New folder$ ps
  PID TTY          TIME CMD
   11 tty1      00:00:00 bash
   63 tty1      00:00:00 sleep
   64 tty1      00:00:00 ps
tush1ta@DESKTOP-PB7EJBL:/mnt/c/Users/LENOVO/OneDrive/Documents/linux lab/New folder$ kill 63
tush1ta@DESKTOP-PB7EJBL:/mnt/c/Users/LENOVO/OneDrive/Documents/linux lab/New folder$ ps
  PID TTY          TIME CMD
   11 tty1      00:00:00 bash
   65 tty1      00:00:00 ps
[1]+  Terminated                  sleep 30
tush1ta@DESKTOP-PB7EJBL:/mnt/c/Users/LENOVO/OneDrive/Documents/linux lab/New folder$ _
```

## Process Prioritization

### 1. nice -n <value> command - starts a process with a specific priority

```
tush1ta@DESKTOP-PB7EJBL: /mnt/c/Users/LENOVO/OneDrive/Documents/linux lab/New folder

tush1ta@DESKTOP-PB7EJBL:/mnt/c/Users/LENOVO/OneDrive/Documents/linux lab/New folder$ nice -n 15 sleep 600 &
[1] 67
tush1ta@DESKTOP-PB7EJBL:/mnt/c/Users/LENOVO/OneDrive/Documents/linux lab/New folder$ nice -n 13 sleep 601 &
[2] 68
tush1ta@DESKTOP-PB7EJBL:/mnt/c/Users/LENOVO/OneDrive/Documents/linux lab/New folder$ nice -n 17 sleep 602 &
[3] 69
tush1ta@DESKTOP-PB7EJBL:/mnt/c/Users/LENOVO/OneDrive/Documents/linux lab/New folder$ ps -o pid,comm,ni,pri -p $(pgrep -d, -f "sleep")
  PID COMMAND      NI PRI
   67 sleep          -15 34
   68 sleep          -13 32
   69 sleep          -17 36
tush1ta@DESKTOP-PB7EJBL:/mnt/c/Users/LENOVO/OneDrive/Documents/linux lab/New folder$ _
```

### 2. renice <value> - p <PID> - change priority of a running process

```
tush1ta@DESKTOP-PB7EJBL: /mnt/c/Users/LENOVO/OneDrive/Documents/linux lab/New folder

69 sleep          -17 36
tush1ta@DESKTOP-PB7EJBL:/mnt/c/Users/LENOVO/OneDrive/Documents/linux lab/New folder$ nice -n 14 sleep 180 &
[4] 72
tush1ta@DESKTOP-PB7EJBL:/mnt/c/Users/LENOVO/OneDrive/Documents/linux lab/New folder$ renice 15 -p 72
72 (process ID) old priority 14, new priority 15
tush1ta@DESKTOP-PB7EJBL:/mnt/c/Users/LENOVO/OneDrive/Documents/linux lab/New folder$ _
```

## Process Scheduling

1. *at <TIME>* - schedules one time tasks (works only with mins, hours & days)

2. *cron* - runs specific tasks at given time / dates

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- |                |                        |  |  |                 |                  |  |  |  |                                |
|----------------|------------------------|--|--|-----------------|------------------|--|--|--|--------------------------------|
| command        |                        |  |  |                 |                  |  |  |  | └─ Day of week (0-6, Sunday=0) |
|                |                        |  |  | └─ Month (1-12) |                  |  |  |  |                                |
|                | └─ Day of month (1-31) |  |  |                 | └─ Minute (0-59) |  |  |  |                                |
| └─ Hour (0-23) |                        |  |  |                 |                  |  |  |  |                                |

## LAB Exercises

### TASK 1: File existence Check

*Script:*

```
tush1ta@DESKTOP-PB7EJBL: /mnt/c/Users/LENOVO/OneDrive/Documents/linux lab/New folder/exp7
#!/bin/bash
echo "Enter filename "
read file

if [ -e "$file" ]
then
    echo "File exists. Contents are:"
    cat "$file"
else
    echo "File does not exist"
    echo "Do you want to create it? (y/n)"
    read choice
    if [ "$choice" = "y" ]; then
        touch "$file"
        echo "File $file created."
    fi
fi
```

*Output:*

```
tush1ta@DESKTOP-PB7EJBL: /mnt/c/Users/LENOVO/OneDrive/Documents/linux lab/New folder/exp7
tush1ta@DESKTOP-PB7EJBL: /mnt/c/Users/LENOVO/OneDrive/Documents/linux lab/New folder/exp7$ ./Task7.1
Enter filename
file1
File does not exist
Do you want to create it? (y/n)
y
File file1 created.
tush1ta@DESKTOP-PB7EJBL: /mnt/c/Users/LENOVO/OneDrive/Documents/linux lab/New folder/exp7$
```

## TASK 2: Print no.'s from 1 to 10

### Output

```
tush1ta@DESKTOP-PB7EJBL: /mnt/c/Users/LENOVO/OneDrive/Documents/linux lab/New folder/exp7
tush1ta@DESKTOP-PB7EJBL:/mnt/c/Users/LENOVO/OneDrive/Documents/linux lab/New folder/exp7$ vim Task7.2
tush1ta@DESKTOP-PB7EJBL:/mnt/c/Users/LENOVO/OneDrive/Documents/linux lab/New folder/exp7$ ./Task7.2
1
2
3
4
5
6
7
8
9
10
tush1ta@DESKTOP-PB7EJBL:/mnt/c/Users/LENOVO/OneDrive/Documents/linux lab/New folder/exp7$
```

## TASK 3: Count lines, words and characters in a file

### Script:

```
tush1ta@DESKTOP-PB7EJBL: /mnt/c/Users/LENOVO/OneDrive/Documents/linux lab/New folder/exp7
#!/bin/bash
if [ $# -eq 0 ]
then
echo "Usage: $0 filename"
exit 1
fi
file=$1
if [ -e "$file" ]
then
echo "Lines: $(wc -l < $file)"
echo "Words: $(wc -w < $file)"
echo "Characters: $(wc -m < $file)"
else
echo "file not found"
fi
~
~
~
~
```

### Output:

```
tush1ta@DESKTOP-PB7EJBL: /mnt/c/Users/LENOVO/OneDrive/Documents/linux lab/New folder/exp7
tush1ta@DESKTOP-PB7EJBL:/mnt/c/Users/LENOVO/OneDrive/Documents/linux lab/New folder/exp7$ ./Task7.3 file1
Lines: 0
Words: 0
Characters: 0
tush1ta@DESKTOP-PB7EJBL:/mnt/c/Users/LENOVO/OneDrive/Documents/linux lab/New folder/exp7$ _
```

## TASK 4: Factorial of a number using funtion

Script:

```
tush1ta@DESKTOP-PB7EJBL: /mnt/c/Users/LENOVO/OneDrive/Documents/linux lab/New folder/exp7
#!/bin/bash
factorial() {
    num=$1
    fact=1
    while [ "$num" -gt 1 ]
    do
        fact=$((fact * num))
        num=$((num - 1))
    done
    echo $fact
}

echo "Factorial of 5 is $(factorial 5)"
echo "Factorial of 7 is $(factorial 7)"
echo "Factorial of 10 is $(factorial 10)"
~
~
~
```

Output:

```
tush1ta@DESKTOP-PB7EJBL: /mnt/c/Users/LENOVO/OneDrive/Documents/linux lab/New folder/exp7
tush1ta@DESKTOP-PB7EJBL:/mnt/c/Users/LENOVO/OneDrive/Documents/linux lab/New folder/exp7$ ./Task7.4
Factorial of 5 is 120
Factorial of 7 is 5040
Factorial of 10 is 3628800
tush1ta@DESKTOP-PB7EJBL:/mnt/c/Users/LENOVO/OneDrive/Documents/linux lab/New folder/exp7$ _
```

## OBSERVATIONS

- Successfully viewed running processes using ps, top, and pstree.
- Able to terminate processes using kill and control their priority with nice and renice.
- Scheduled tasks using at for one-time execution and cron for recurring jobs.

## CONCLUSION

The experiment enhanced understanding of Linux process management and scheduling.

## EXPERIMENT 8 - Shell Programming

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### Aim

**To understand and demonstrate the concepts of process control and signals, process monitoring and resource usage, process communication and synchronization, background processes and job control, and system monitoring and logging in Linux**

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### Tools & Software Used

- **Operating System:** Ubuntu running on Oracle VirtualBox
  - **Terminal Emulator:** GNOME Terminal
  - **Shell:** Bash (*Bourne-Again Shell*)
- 

## Process Control & signals

- *kill* - used to terminate or send signals to processes

*Syntax:*

`kill [options] <PID>`

*Signals (used as options):*

1. 2 - **SIGINT** (*interrupt*)
2. 15 - **SIGTERM** (*termiante gracefully*)
3. 9 - **SIGKILL** (*force kill*)
4. 19 - **SIGSTOP** (*Stops a process*)
5. 18 - **SIGCONT** (*resumes the stopped process*)

## OUTPUT:

```
tush1ta@DESKTOP-PB7EJBL: /mnt/c/Users/LENOVO/OneDrive/Documents/linux lab/New folder/exp8
tush1ta@DESKTOP-PB7EJBL: /mnt/c/Users/LENOVO/OneDrive/Documents/linux lab/New folder/exp8$ script script.log
Script started, output log file is 'script.log'.
tush1ta@DESKTOP-PB7EJBL: /mnt/c/Users/LENOVO/OneDrive/Documents/linux lab/New folder/exp8$ sleep 1000 &
[1] 195
tush1ta@DESKTOP-PB7EJBL: /mnt/c/Users/LENOVO/OneDrive/Documents/linux lab/New folder/exp8$ kill -15 195
tush1ta@DESKTOP-PB7EJBL: /mnt/c/Users/LENOVO/OneDrive/Documents/linux lab/New folder/exp8$ ps
  PID TTY          TIME CMD
  189 pts/0    00:00:00 bash
  196 pts/0    00:00:00 ps
[1]+  Terminated                  sleep 1000
tush1ta@DESKTOP-PB7EJBL: /mnt/c/Users/LENOVO/OneDrive/Documents/linux lab/New folder/exp8$ sleep 1000 &
[1] 197
tush1ta@DESKTOP-PB7EJBL: /mnt/c/Users/LENOVO/OneDrive/Documents/linux lab/New folder/exp8$ kill -9 197
[1]+  Killed                        sleep 1000
tush1ta@DESKTOP-PB7EJBL: /mnt/c/Users/LENOVO/OneDrive/Documents/linux lab/New folder/exp8$ ps
  PID TTY          TIME CMD
  189 pts/0    00:00:00 bash
  198 pts/0    00:00:00 ps
tush1ta@DESKTOP-PB7EJBL: /mnt/c/Users/LENOVO/OneDrive/Documents/linux lab/New folder/exp8$ sleep 1000 &
[1] 199
tush1ta@DESKTOP-PB7EJBL: /mnt/c/Users/LENOVO/OneDrive/Documents/linux lab/New folder/exp8$ kill -2 199
tush1ta@DESKTOP-PB7EJBL: /mnt/c/Users/LENOVO/OneDrive/Documents/linux lab/New folder/exp8$ ps
  PID TTY          TIME CMD
  189 pts/0    00:00:00 bash
  200 pts/0    00:00:00 ps
[1]+  Interrupt                    sleep 1000
tush1ta@DESKTOP-PB7EJBL: /mnt/c/Users/LENOVO/OneDrive/Documents/linux lab/New folder/exp8$ sleep 1000 &
[1] 201
tush1ta@DESKTOP-PB7EJBL: /mnt/c/Users/LENOVO/OneDrive/Documents/linux lab/New folder/exp8$ kill -19 201
tush1ta@DESKTOP-PB7EJBL: /mnt/c/Users/LENOVO/OneDrive/Documents/linux lab/New folder/exp8$ ps
  PID TTY          TIME CMD
  189 pts/0    00:00:00 bash
  201 pts/0    00:00:00 sleep
  202 pts/0    00:00:00 ps
```

## Process Monitoring and Resource Usage

1. **top - live view of processes, CPU, memory**

## OUTPUT:

```
tush1ta@DESKTOP-PB7EJBL: /mnt/c/Users/LENOVO/OneDrive/Documents/linux lab/New folder/exp8
top - 19:06:24 up 6:13, 0 user, load average: 0.52, 0.58, 0.59
Tasks: 7 total, 1 running, 5 sleeping, 1 stopped, 0 zombie
%Cpu(s): 0.0 us, 10.0 sy, 0.0 ni, 90.0 id, 0.0 wa, 0.0 hi, 0.0 si, 0.0 st
MiB Mem : 4001.2 total, 595.7 free, 3405.6 used, 224.0 buff/cache
MiB Swap: 12288.0 total, 10975.1 free, 1312.9 used, 595.7 avail Mem

  PID USER      PR  NI   VIRT   RES   SHR  S  %CPU  %MEM    TIME+  COMMAND
    1 root        0   0    8952    328    284  S   0.0   0.0   0:00.39 init
   172 root        0   0    8952    232    180  S   0.0   0.0   0:00.01 init
   173 tush1ta    20   0   14112   3868   3776  S   0.0   0.1   0:00.20 bash
   188 tush1ta    20   0   11184   1076    996  S   0.0   0.0   0:00.31 script
   189 tush1ta    20   0   14244   3952   3856  S   0.0   0.1   0:00.16 bash
   201 tush1ta    20   0   11164    928    772  T   0.0   0.0   0:00.01 sleep
   312 tush1ta    20   0   17336   3792   1572  R   0.0   0.1   0:00.01 top
```

2. **htop - user friendly version of top**

## OUTPUT:

```
tush1ta@DESKTOP-PB7EJBL: /mnt/c/Users/LENOVO/OneDrive/Documents/linux lab/New folder/exp8
top - 19:06:24 up 6:13, 0 user, load average: 0.52, 0.58, 0.59
Tasks: 7 total, 1 running, 5 sleeping, 1 stopped, 0 zombie
%Cpu(s): 0.0 us, 10.0 sy, 0.0 ni, 90.0 id, 0.0 wa, 0.0 hi, 0.0 si, 0.0 st
MiB Mem : 4001.2 total, 595.7 free, 3405.6 used, 224.0 buff/cache
MiB Swap: 12288.0 total, 10975.1 free, 1312.9 used, 595.7 avail Mem

  PID USER      PR  NI   VIRT    RES    SHR   S   %CPU  %MEM    TIME+  COMMAND
    1 root        20   0   8952    328    284   S   0.0   0.0   0:00.39 init
  172 root        20   0   8952    232    180   S   0.0   0.0   0:00.01 init
  173 tush1ta     20   0  14112   3868   3776   S   0.0   0.1   0:00.20 bash
  188 tush1ta     20   0  11184   1076    996   S   0.0   0.0   0:00.31 script
  189 tush1ta     20   0  14244   3952   3856   S   0.0   0.1   0:00.16 bash
  201 tush1ta     20   0  11164    928    772   T   0.0   0.0   0:00.01 sleep
  312 tush1ta     20   0  17336   3792   1572   R   0.0   0.1   0:00.01 top
```

### 3. ps aux - snapshot of all processes

## OUTPUT:

```
tush1ta@DESKTOP-PB7EJBL: /mnt/c/Users/LENOVO/OneDrive/Documents/linux lab/New folder/exp8
tush1ta@DESKTOP-PB7EJBL: /mnt/c/Users/LENOVO/OneDrive/Documents/linux lab/New folder/exp8$ ps aux
USER      PID  %CPU  %MEM    VSZ   RSS TTY      STAT START   TIME COMMAND
root         1   0.0   0.0   8952   328 ?        Ssl   12:53   0:00 /init
root       172   0.0   0.0   8952   232 tty1     Ss    18:57   0:00 /init
tush1ta   173   0.0   0.0  14112  3868 tty1     S    18:57   0:00 -bash
tush1ta   188   0.0   0.0  11184  1076 tty1     S    18:59   0:00 script script.log
tush1ta   189   0.0   0.0  14244  3952 pts/0    Ss    18:59   0:00 bash -i
tush1ta   201   0.0   0.0  11164   928 pts/0    T    19:01   0:00 sleep 1000
tush1ta   313   0.0   0.0  16312  2764 pts/0    R    19:09   0:00 ps aux
tush1ta@DESKTOP-PB7EJBL: /mnt/c/Users/LENOVO/OneDrive/Documents/linux lab/New folder/exp8$
```

### 4. free -h - show memory usage

```
tush1ta@DESKTOP-PB7EJBL: /mnt/c/Users/LENOVO/OneDrive/Documents/linux lab/New folder/exp8
tush1ta@DESKTOP-PB7EJBL: /mnt/c/Users/LENOVO/OneDrive/Documents/linux lab/New folder/exp8$ free -h
              total        used        free      shared  buff/cache   available
Mem:          3.9Gi          3.1Gi          874Mi         17Mi         223Mi          874Mi
Swap:          12Gi          1.4Gi           10Gi
tush1ta@DESKTOP-PB7EJBL: /mnt/c/Users/LENOVO/OneDrive/Documents/linux lab/New folder/exp8$
```

### 5. uptime - system load averages

## OUTPUT:

## Process Communication

- Pipes | - to pass output of one command to another



## OUTPUT:

```
tush1ta@DESKTOP-PB7EJBL: /mnt/c/Users/LENOVO/OneDrive/Documents/linux lab/New folder/exp8
tush1ta@DESKTOP-PB7EJBL: /mnt/c/Users/LENOVO/OneDrive/Documents/linux lab/New folder/exp8$ ps aux | grep bash
tush1ta  173  0.0  0.0 14112 3868 tty1    S   18:57   0:00 -bash
tush1ta  189  0.0  0.1 14244 4160 pts/0    Ss  18:59   0:00 bash -i
tush1ta  318  0.0  0.0 12128 1304 pts/0    S   19:12   0:00 grep --color=auto bash
tush1ta@DESKTOP-PB7EJBL: /mnt/c/Users/LENOVO/OneDrive/Documents/linux lab/New folder/exp8$ _
```

## Process Synchronization

*To prevent conflicts, processes can be synchronized*

- **wait** - used to pause the execution of a script until all the background processes complete.

### Script:

```
tush1ta@DESKTOP-PB7EJBL: /mnt/c/Users/LENOVO/OneDrive/Documents/linux lab/New folder/exp8
#!/bin/bash
echo " Starting Processes"
nice -n 4 sleep 5 &
PID1=$!
wait
echo " sleep 5 is completed with PID = $PID1 "

nice -n 6 sleep 3 &
PID2=$!
wait
echo " sleep 3 is completed with PID = $PID3 "
echo "ALL processes are completed"

#end
~
~
~
```

### Output:

```
tush1ta@DESKTOP-PB7EJBL: /mnt/c/Users/LENOVO/OneDrive/Documents/linux lab/New folder/exp8
tush1ta@DESKTOP-PB7EJBL: /mnt/c/Users/LENOVO/OneDrive/Documents/linux lab/New folder/exp8$ vim task8.sh
tush1ta@DESKTOP-PB7EJBL: /mnt/c/Users/LENOVO/OneDrive/Documents/linux lab/New folder/exp8$ ./task8.sh
Starting Processes
sleep 5 is completed with PID = 329
sleep 3 is completed with PID =
ALL processes are completed
tush1ta@DESKTOP-PB7EJBL: /mnt/c/Users/LENOVO/OneDrive/Documents/linux lab/New folder/exp8$
```

- **wait <PID>** - waits for a particular job to finish

### SCRIPT:

```

tush1ta@DESKTOP-PB7EJBL: /mnt/c/Users/LENOVO/OneDrive/Documents/linux lab/New folder/exp8
#!/bin/bash
echo " Starting Processes"
nice -n 4 sleep 7 &
PID1=$!
echo "Started sleep 5 with PID = $PID1 "

nice -n 6 sleep 3 &
PID2=$!
echo "Started sleep 3 with PID = $PID2"

nice -n 7 sleep 10 &
PID3=$!
echo " Started  sleep 7 with PID = $PID3"

wait $PID2

echo "Processes with PID $PID2 completed"
echo "Processes with PIDs $PID1 and $PID3 are still running in the background"
#end
~
~
~

```

## OUTPUT:

```

tush1ta@DESKTOP-PB7EJBL: /mnt/c/Users/LENOVO/OneDrive/Documents/linux lab/New folder/exp8
tush1ta@DESKTOP-PB7EJBL: /mnt/c/Users/LENOVO/OneDrive/Documents/linux lab/New folder/exp8$ ./task8.sh
Starting Processes
Started sleep 5 with PID = 346
Started sleep 3 with PID = 347
Started sleep 7 with PID = 348
Processes with PID 347 completed
Processes with PIDs 346 and 348 are still running in the background
tush1ta@DESKTOP-PB7EJBL: /mnt/c/Users/LENOVO/OneDrive/Documents/linux lab/New folder/exp8$

```

## Background Process and Job control

1. **&** - used to run a process in background
2. **jobs** - shows background jobs
3. **fg %1** - brings job 1 to foreground
4. **bg %1** - resume job 1 in background

## OUTPUT:

```
tush1ta@DESKTOP-PB7EJBL: /mnt/c/Users/LENOVO/OneDrive/Documents/linux lab/New folder/exp8
tush1ta@DESKTOP-PB7EJBL: /mnt/c/Users/LENOVO/OneDrive/Documents/linux lab/New folder/exp8$ sleep 10 &
[2] 349
tush1ta@DESKTOP-PB7EJBL: /mnt/c/Users/LENOVO/OneDrive/Documents/linux lab/New folder/exp8$ jobs
[1]+  Stopped                  sleep 1000
[2]-  Running                  sleep 10 &
tush1ta@DESKTOP-PB7EJBL: /mnt/c/Users/LENOVO/OneDrive/Documents/linux lab/New folder/exp8$ jobs
[1]+  Stopped                  sleep 1000
[2]-  Done                    sleep 10
tush1ta@DESKTOP-PB7EJBL: /mnt/c/Users/LENOVO/OneDrive/Documents/linux lab/New folder/exp8$ sleep 10 &
[2] 350
tush1ta@DESKTOP-PB7EJBL: /mnt/c/Users/LENOVO/OneDrive/Documents/linux lab/New folder/exp8$ fg %1
sleep 1000
tush1ta@DESKTOP-PB7EJBL: /mnt/c/Users/LENOVO/OneDrive/Documents/linux lab/New folder/exp8$ jobs
[2]+  Running                  sleep 10 &
tush1ta@DESKTOP-PB7EJBL: /mnt/c/Users/LENOVO/OneDrive/Documents/linux lab/New folder/exp8$ sleep 10
^Z[2]  Done                    sleep 10
[3]+  Stopped                  sleep 10
tush1ta@DESKTOP-PB7EJBL: /mnt/c/Users/LENOVO/OneDrive/Documents/linux lab/New folder/exp8$ bg %1
bash: bg: %1: no such job
tush1ta@DESKTOP-PB7EJBL: /mnt/c/Users/LENOVO/OneDrive/Documents/linux lab/New folder/exp8$ jobs
[3]+  Stopped                  sleep 10
tush1ta@DESKTOP-PB7EJBL: /mnt/c/Users/LENOVO/OneDrive/Documents/linux lab/New folder/exp8$ _
```

## System Monitoring and logging

1. dmesg | less - **kernel/ system messages**

## OUTPUT:

2. journalctl - \*\*systemlogs

## OUTPUT:

```
tush1ta@DESKTOP-PB7EJBL: /mnt/c/Users/LENOVO/OneDrive/Documents/linux lab/New folder/exp8
tush1ta@DESKTOP-PB7EJBL: /mnt/c/Users/LENOVO/OneDrive/Documents/linux lab/New folder/exp8$ journalctl
No journal files were found.
-- No entries --
tush1ta@DESKTOP-PB7EJBL: /mnt/c/Users/LENOVO/OneDrive/Documents/linux lab/New folder/exp8$ _
```

3. Last - Logged-in users

```
tush1ta@DESKTOP-PB7EJBL: /mnt/c/Users/LENOVO/OneDrive/Documents/linux lab/New folder/exp8
tush1ta@DESKTOP-PB7EJBL: /mnt/c/Users/LENOVO/OneDrive/Documents/linux lab/New folder/exp8$ last -n 3
wtm begins Fri Sep 12 16:20:54 2025
tush1ta@DESKTOP-PB7EJBL: /mnt/c/Users/LENOVO/OneDrive/Documents/linux lab/New folder/exp8$
tush1ta@DESKTOP-PB7EJBL: /mnt/c/Users/LENOVO/OneDrive/Documents/linux lab/New folder/exp8$ last -n 5 reboot
wtm begins Fri Sep 12 16:20:54 2025
tush1ta@DESKTOP-PB7EJBL: /mnt/c/Users/LENOVO/OneDrive/Documents/linux lab/New folder/exp8$ last shutdown
wtm begins Fri Sep 12 16:20:54 2025
tush1ta@DESKTOP-PB7EJBL: /mnt/c/Users/LENOVO/OneDrive/Documents/linux lab/New folder/exp8$ _
```

4. who or w - **user currently logged-in**

OUTPUT:

```
tush1ta@DESKTOP-PB7EJBL: /mnt/c/Users/LENOVO/OneDrive/Documents/linux lab/New folder/exp8
tush1ta@DESKTOP-PB7EJBL:/mnt/c/Users/LENOVO/OneDrive/Documents/linux lab/New folder/exp8$ w
 20:04:31 up  7:11,  0 user,  load average: 0.52, 0.58, 0.59
USER      TTY      FROM              LOGIN@   IDLE   JCPU   PCPU   WHAT
tush1ta@DESKTOP-PB7EJBL:/mnt/c/Users/LENOVO/OneDrive/Documents/linux lab/New folder/exp8$ _
```

## LAB Exercises

### TASK 1: Check File Permissions

Write a script that checks the file permissions of a given file and displays whether it is readable, writable, or executable by the current user.

### TASK 2: String Operations

Create a script that prompts the user to enter a string and then performs operations like string length, string concatenation, and string comparison.

### TASK 3: Search for a Pattern in a file

Write a script that searches for a specific pattern in a given file and displays the matching lines.

### TASK 4: Display System Information

Create a script that displays various system information like the current date and time, logged-in users, system uptime, etc.

Output:

```
tush1ta@DESKTOP-PB7EJBL: /mnt/c/Users/LENOVO/OneDrive/Documents/linux lab/New folder
tush1ta@DESKTOP-PB7EJBL: /mnt/c/Users/LENOVO/OneDrive/Documents/linux lab/New folder$ ./exp_8.sh
Enter filename:
file.txt
File is readable
File is writable
File is executable
tush1ta@DESKTOP-PB7EJBL: /mnt/c/Users/LENOVO/OneDrive/Documents/linux lab/New folder$ vim exp_8.sh
tush1ta@DESKTOP-PB7EJBL: /mnt/c/Users/LENOVO/OneDrive/Documents/linux lab/New folder$ ./exp_8.sh
Enter first string:
12
Enter second string:
4
Length of first string: 2
Length of second string: 1
Concatenated string:
Strings are not equal
tush1ta@DESKTOP-PB7EJBL: /mnt/c/Users/LENOVO/OneDrive/Documents/linux lab/New folder$ vim exp_8.sh
tush1ta@DESKTOP-PB7EJBL: /mnt/c/Users/LENOVO/OneDrive/Documents/linux lab/New folder$ ./exp_8.sh
Enter filename:
file.txt
Enter pattern to search:
echo
Matching lines:
echo "Line: $line"
echo "Existing..."; break
echo "You entered: $n"
tush1ta@DESKTOP-PB7EJBL: /mnt/c/Users/LENOVO/OneDrive/Documents/linux lab/New folder$ vim exp_8.sh
tush1ta@DESKTOP-PB7EJBL: /mnt/c/Users/LENOVO/OneDrive/Documents/linux lab/New folder$ ./exp_8.sh
System Information:
-----
Date and Time: Wed Sep 24 11:56:43 UTC 2025
Logged in users:
System Uptime: up 5 hours, 25 minutes
Memory Usage:

```

	total	used	free	shared	buff/cache	available
Mem:	3.9Gi	2.9Gi	1.0Gi	17Mi	229Mi	1.0Gi
Swap:	12Gi	1.5Gi	10Gi			

```

Disk Usage:

```

Filesystem	Size	Used	Avail	Use%	Mounted on
rootfs	238G	109G	130G	46%	/
none	238G	109G	130G	46%	/dev

The image shows a Windows terminal window with a dark blue background. The terminal displays the execution of a script named exp\_8.sh. The script prompts for a filename (file.txt) and checks its permissions (readable, writable, executable). It then prompts for two strings (12 and 4) and checks if their lengths are equal. The script also prompts for a filename (file.txt) and a pattern to search (echo), and then displays the matching lines. Finally, the script displays system information, including the date and time, logged in users, system uptime, memory usage, and disk usage.

## OBSERVATIONS

- kill, wait and job control commands (&, jobs, fg, bg) worked as expected.
- top, htop, ps aux, and free -h provided real-time process and resource information.
- Pipes (|) enabled inter-process communication.
- System monitoring commands (dmesg, journalctl, last, who) displayed logs and user activity correctly.
- Lab exercises executed successfully with expected outputs.

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## CONCLUSION

- The experiment demonstrated process control, monitoring, communication, and synchronization in Linux.
- Background job management and system monitoring help efficiently manage processes.
- Shell scripting with process commands enables effective automation and resource tracking.