Experiment [8] : [SHELL PROGAMMING]

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AIM:

- [To learn some new commands in shell progamming and doing tasks based upon them]

Requirements:

- [Any Linux Distro, any kind of text editor (vs code, vim,nano, etc)]

Theory:

These shell scripts demonstrate fundamental Linux process and system management techniques. They cover job control, file comparison, process counting, memory monitoring, and pattern matching using commands. Each script showcases interactive automation and real-time system insights through Bash scripting.

Process control and signals:

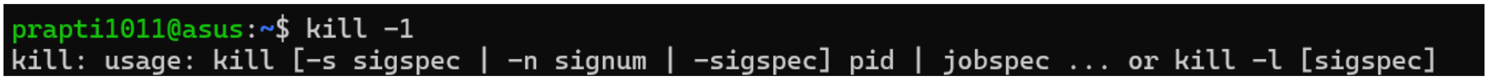
Process can receive signals from the OS or the user to control execution.

Command:

- kill -1 : list all signals

- Some comman signals are:

1). SIGINT (2) : interuppt 2). SIGTERM (15) : terminate gracefully 3). SIGKILL (9) : force kill

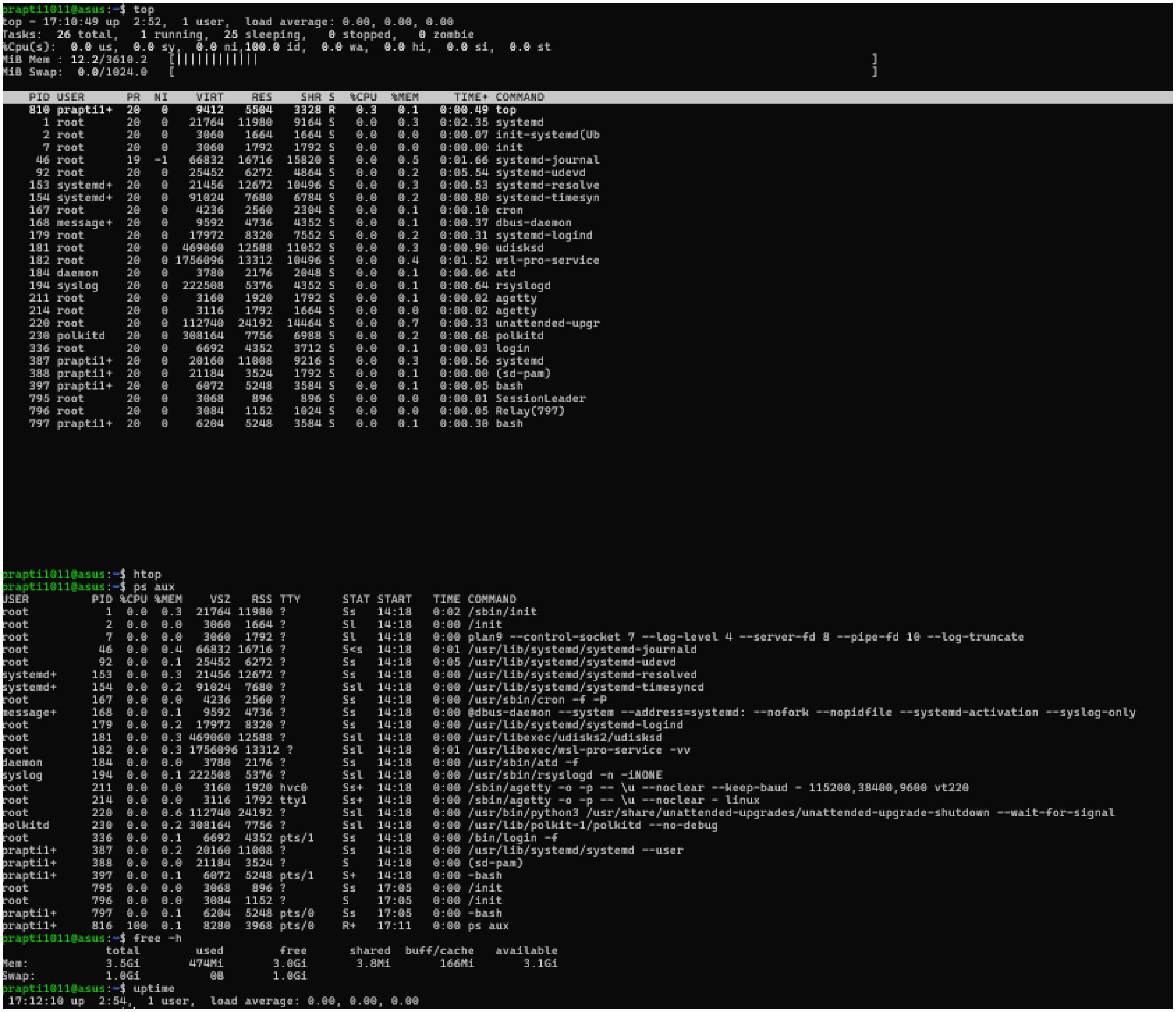


```
prapti1011@asus:~$ kill -1
kill: usage: kill [-s sigspec | -n signum | -sigspec] pid | jobspec ... or kill -l [sigspec]
```

Process monitoring and resource usage:

It includes commands like-

- top
- htop
- ps aux
- free -h
- uptime

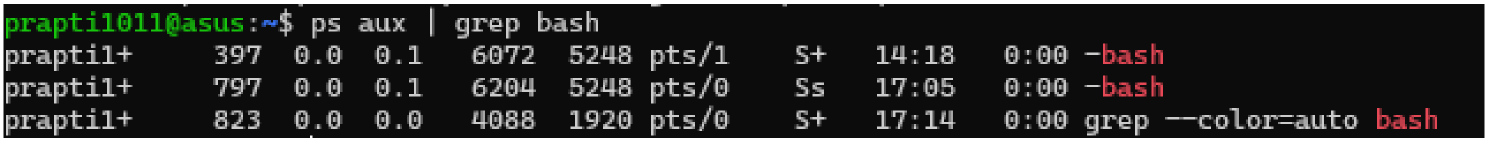


```
praptil011@asus:~$ top
top - 17:10:49 up  2:52,  1 user,  load average: 0.00, 0.00, 0.00
Tasks:  26 total,   1 running,  25 sleeping,   0 stopped,   0 zombie
%Cpu(s):  0.0 us,  0.0 sy,  0.0 ni,100.0 id,  0.0 wa,  0.0 hi,  0.0 si,  0.0 st
MiB Mem : 12.2/3610.2   [|||||||||||||                                                              ]
MiB Swap:  0.0/1024.0   [                                                                           ]

    PID USER      PR  NI    VIRT    RES    SHR S  %CPU  %MEM     TIME+ COMMAND
    810 praptil+  20   0    9412   5504   3328 R   0.3   0.1   0:00.49 top
      1 root      20   0   21764  11980   9164 S   0.0   0.3   0:02.35 systemd
      2 root      20   0    3060   1664   1664 S   0.0   0.0   0:00.07 init-systemd(Ub
      7 root      20   0    3060   1792   1792 S   0.0   0.0   0:00.00 init
     46 root      19  -1   66832  16716  15820 S   0.0   0.5   0:01.66 systemd-journal
     92 root      20   0   25452   6272   4864 S   0.0   0.2   0:05.54 systemd-udevd
    153 systemd+  20   0   21456  12672  10496 S   0.0   0.3   0:00.53 systemd-resolve
    154 systemd+  20   0   91024   7680   6784 S   0.0   0.2   0:00.80 systemd-timesyn
    167 root      20   0    4236   2560   2304 S   0.0   0.1   0:00.10 cron
    168 message+  20   0    9592   4736   4352 S   0.0   0.1   0:00.37 dbus-daemon
    179 root      20   0   17972   8320   7552 S   0.0   0.2   0:00.31 systemd-logind
    181 root      20   0  469060  12588  11052 S   0.0   0.3   0:00.90 udisksd
    182 root      20   0 1756096  13312  10496 S   0.0   0.4   0:01.52 wsl-pro-service
    184 daemon    20   0    3780   2176   2048 S   0.0   0.1   0:00.06 atd
    194 syslog    20   0  222508   5376   4352 S   0.0   0.1   0:00.64 rsyslogd
    211 root      20   0    3160   1920   1792 S   0.0   0.1   0:00.02 agetty
    214 root      20   0    3116   1792   1664 S   0.0   0.0   0:00.02 agetty
    220 root      20   0  112740  24192  14464 S   0.0   0.7   0:00.33 unattended-upgr
    230 polkitd   20   0  308164   7756   6988 S   0.0   0.2   0:00.68 polkitd
    336 root      20   0    6692   4352   3712 S   0.0   0.1   0:00.03 login
    387 praptil+  20   0   20160  11008   9216 S   0.0   0.3   0:00.56 systemd
    388 praptil+  20   0   21184   3524   1792 S   0.0   0.1   0:00.00 (sd-pam)
    397 praptil+  20   0    6072   5248   3584 S   0.0   0.1   0:00.05 bash
    795 root      20   0    3068    896    896 S   0.0   0.0   0:00.01 SessionLeader
    796 root      20   0    3084   1152   1024 S   0.0   0.0   0:00.05 Relay(797)
    797 praptil+  20   0    6204   5248   3584 S   0.0   0.1   0:00.30 bash









praptil011@asus:~$ htop
praptil011@asus:~$ ps aux
USER         PID %CPU %MEM    VSZ   RSS TTY      STAT START   TIME COMMAND
root           1  0.0  0.3  21764 11980 ?        Ss   14:18   0:02 /sbin/init
root           2  0.0  0.0   3060  1664 ?        Sl   14:18   0:00 /init
root           7  0.0  0.0   3060  1792 ?        Sl   14:18   0:00 plan9 --control-socket 7 --log-level 4 --server-fd 8 --pipe-fd 10 --log-truncate
root          46  0.0  0.4  66832 16716 ?        S<s  14:18   0:01 /usr/lib/systemd/systemd-journald
root          92  0.0  0.1  25452  6272 ?        Ss   14:18   0:05 /usr/lib/systemd/systemd-udevd
systemd+     153  0.0  0.3  21456 12672 ?        Ss   14:18   0:00 /usr/lib/systemd/systemd-resolved
systemd+     154  0.0  0.2  91024  7680 ?        Ssl  14:18   0:00 /usr/lib/systemd/systemd-timesyncd
root         167  0.0  0.0   4236  2560 ?        Ss   14:18   0:00 /usr/sbin/cron -f -P
message+     168  0.0  0.1   9592  4736 ?        Ss   14:18   0:00 @dbus-daemon --system --address=systemd: --nofork --nopidfile --systemd-activation --syslog-only
root         179  0.0  0.2  17972  8320 ?        Ss   14:18   0:00 /usr/lib/systemd/systemd-logind
root         181  0.0  0.3 469060 12588 ?        Ssl  14:18   0:00 /usr/libexec/udisks2/udisksd
root         182  0.0  0.3 1756096 13312 ?       Ssl  14:18   0:01 /usr/libexec/wsl-pro-service -vv
daemon       184  0.0  0.0   3780  2176 ?        Ss   14:18   0:00 /usr/sbin/atd -f
syslog       194  0.0  0.1 222508  5376 ?        Ssl  14:18   0:00 /usr/sbin/rsyslogd -n -iNONE
root         211  0.0  0.0   3160  1920 hvc0     Ss+  14:18   0:00 /sbin/agetty -o -p -- \u --noclear --keep-baud - 115200,38400,9600 vt220
root         214  0.0  0.0   3116  1792 tty1     Ss+  14:18   0:00 /sbin/agetty -o -p -- \u --noclear - linux
root         220  0.0  0.6 112740 24192 ?        Ssl  14:18   0:00 /usr/bin/python3 /usr/share/unattended-upgrades/unattended-upgrade-shutdown --wait-for-signal
polkitd      230  0.0  0.2 308164  7756 ?        Ssl  14:18   0:00 /usr/lib/polkit-1/polkitd --no-debug
root         336  0.0  0.1   6692  4352 pts/1    Ss   14:18   0:00 /bin/login -f
praptil+     387  0.0  0.2  20160 11008 ?        Ss   14:18   0:00 /usr/lib/systemd/systemd --user
praptil+     388  0.0  0.0  21184  3524 ?        S    14:18   0:00 (sd-pam)
praptil+     397  0.0  0.1   6072  5248 pts/1    S+   14:18   0:00 -bash
root         795  0.0  0.0   3068   896 ?        Ss   17:05   0:00 /init
root         796  0.0  0.0   3084  1152 ?        S    17:05   0:00 /init
praptil+     797  0.0  0.1   6204  5248 pts/0    Ss   17:05   0:00 -bash
praptil+     816  100  0.1   8280  3968 pts/0    R+   17:11   0:00 ps aux
praptil011@asus:~$ free -h
               total        used        free      shared  buff/cache   available
Mem:           3.5Gi       474Mi       3.0Gi       3.8Mi       166Mi       3.1Gi
Swap:          1.0Gi          0B       1.0Gi
praptil011@asus:~$ uptime
 17:12:10 up  2:54,  1 user,  load average: 0.00, 0.00, 0.00
```

Process Communication

- command- ps aux | grep bash

It finds running processes with bash.



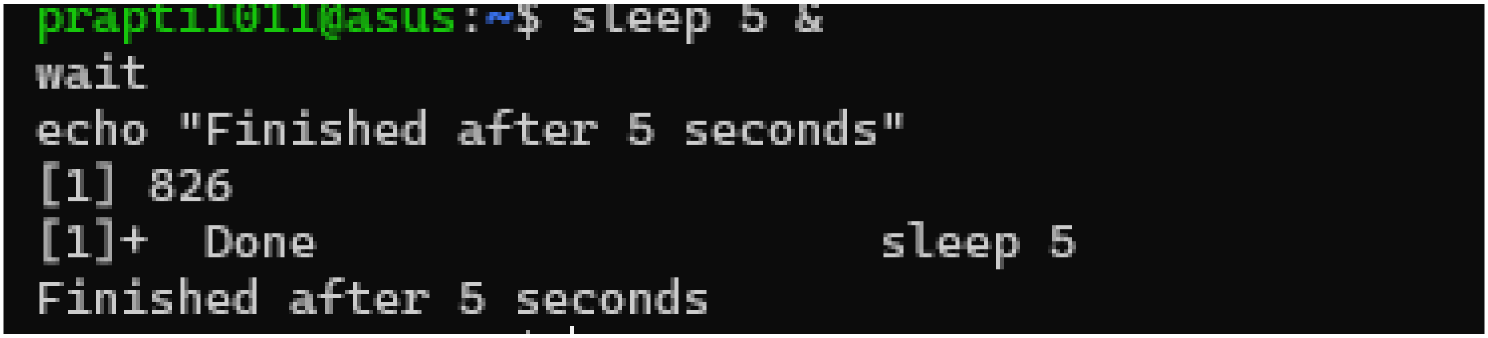
```
praptil011@asus:~$ ps aux | grep bash
praptil+     397  0.0  0.1   6072  5248 pts/1    S+   14:18   0:00 -bash
praptil+     797  0.0  0.1   6204  5248 pts/0    Ss   17:05   0:00 -bash
praptil+     823  0.0  0.0   4088  1920 pts/0    S+   17:14   0:00 grep --color=auto bash
```

Process Synchronization

Process synchronization in Linux is the coordination of multiple processes or threads to ensure data consistency and prevent race conditions when they access shared resources. This is crucial in multi-threaded and multi-process environments where concurrent access to shared data can lead to unpredictable and incorrect results.

- command- wait

Waits for a background job to finish

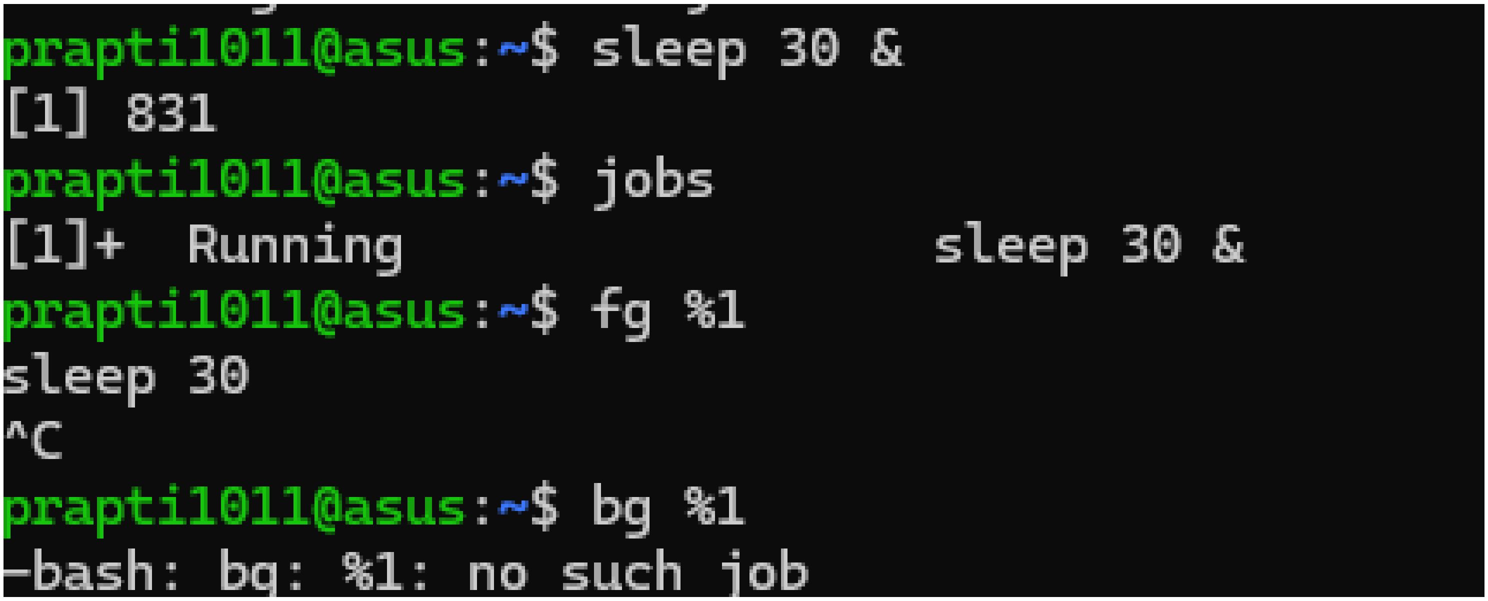


```
prapti1011@asus:~$ sleep 5 &
wait
echo "Finished after 5 seconds"
[1] 826
[1]+  Done                    sleep 5
Finished after 5 seconds
```

Background processes and job control

A background process runs independently of the shell, allowing the user to continue interacting with the terminal while the process executes. This is useful for long-running tasks or when needing to perform other operations simultaneously.

- Add ′ & ′ at the end of a command to run it in background immediately.
- jobs - shows background jobs.
- fg % - brings job 1 to foreground.
- bg % - resumes job 1 in background.



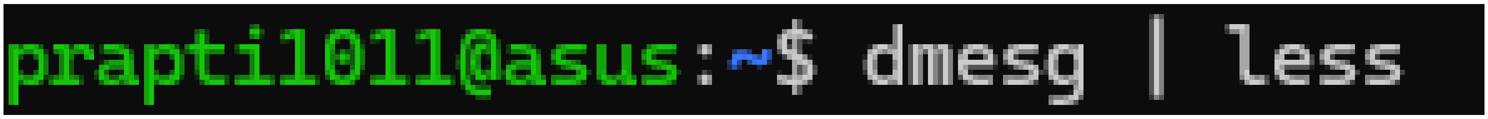
```
prapti1011@asus:~$ sleep 30 &
[1] 831
prapti1011@asus:~$ jobs
[1]+  Running                 sleep 30 &
prapti1011@asus:~$ fg %1
sleep 30
^C
prapti1011@asus:~$ bg %1
-bash: bg: %1: no such job
```

System monitoring and logging

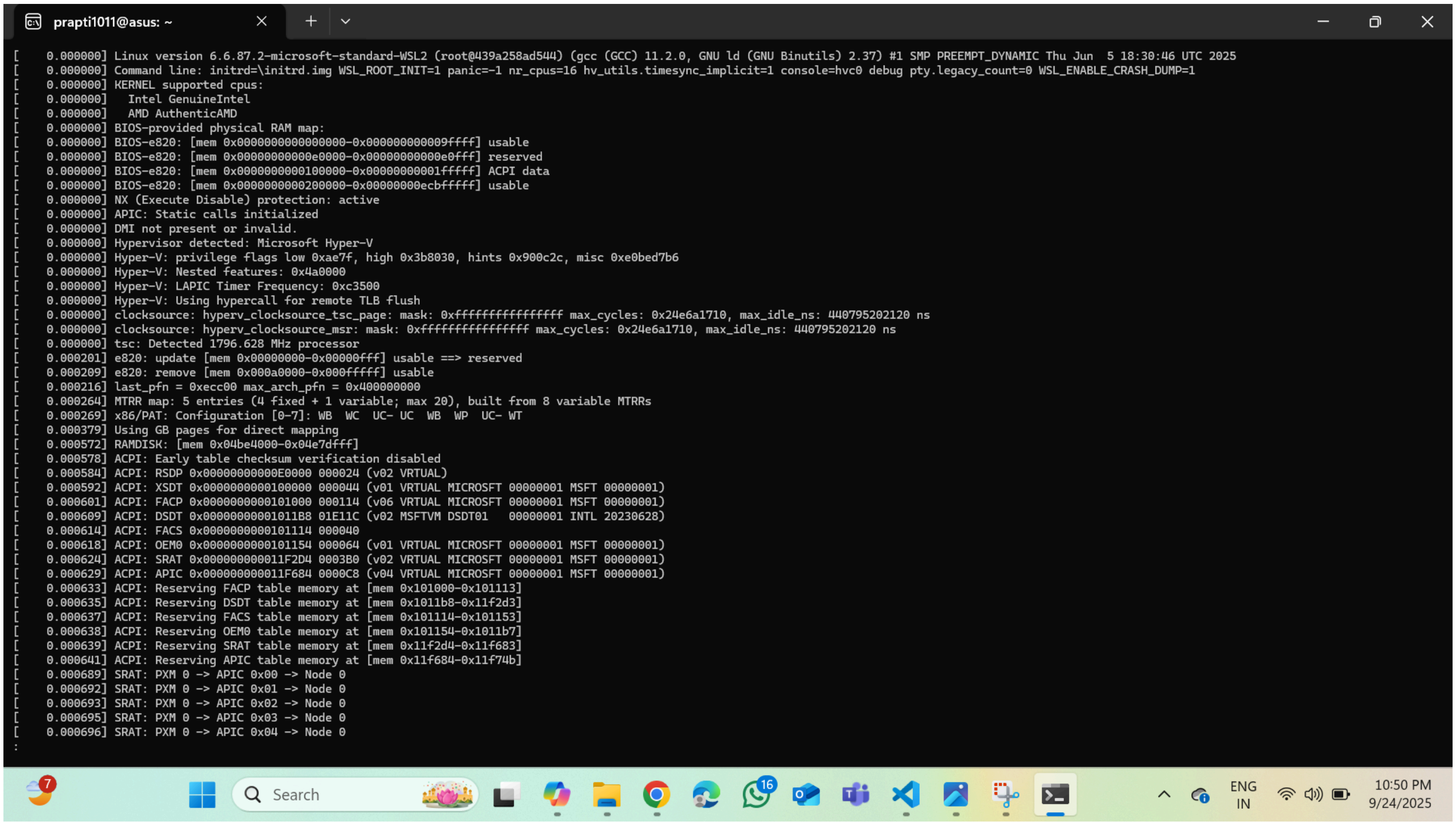
System monitoring involves tracking various aspects of your Linux system in real-time or near real-time. System monitoring and logging in Linux are crucial for maintaining system health, troubleshooting issues, ensuring security, and analyzing performance.

- dmesg | less - system messages
- journalctl - system logs
- last - tells last logged in users

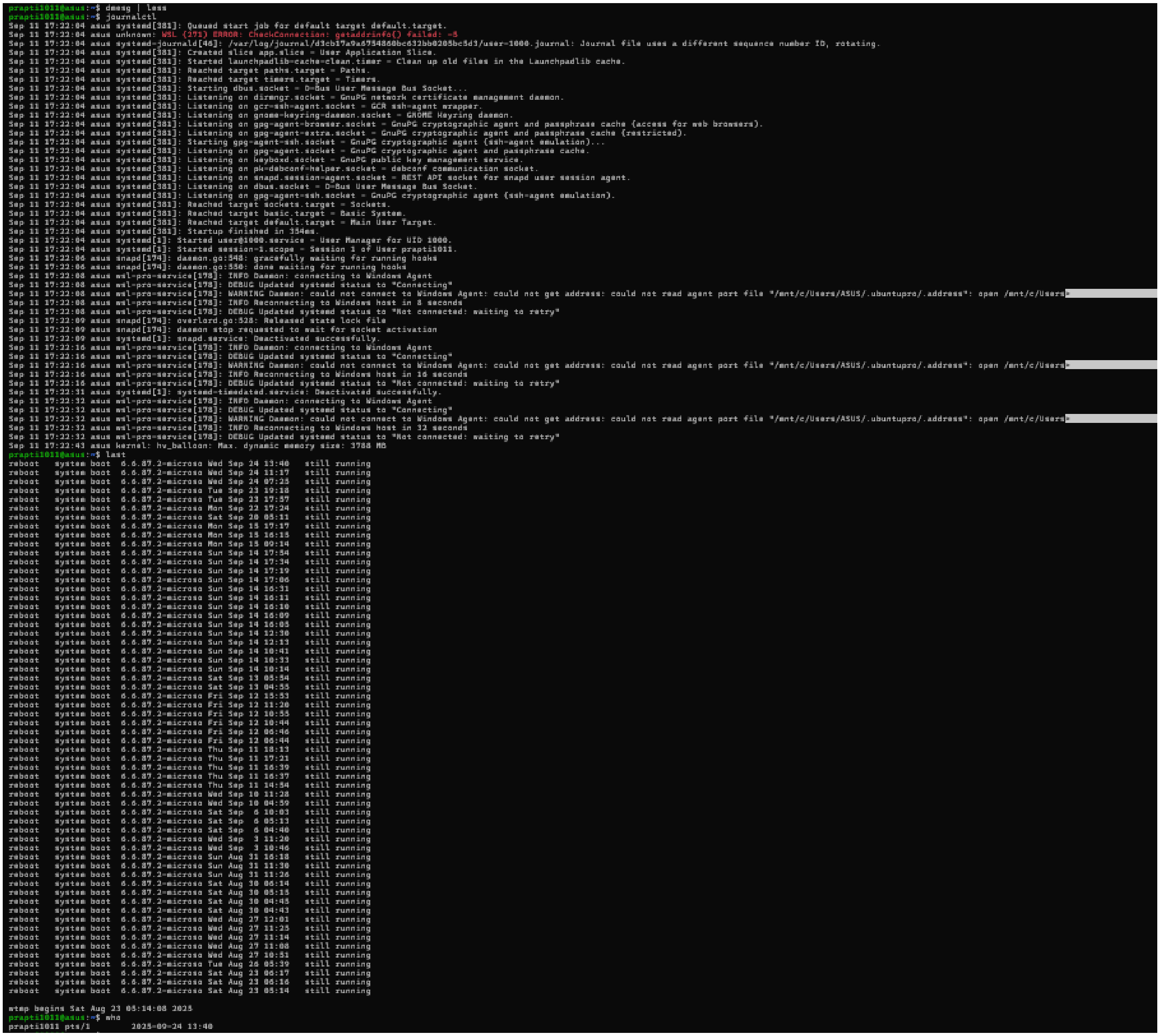
- who or we - users currently logged in



```
prapti1011@asus:~$ dmesg | less
```



```
[    0.000000] Linux version 6.6.87.2-microsoft-standard-WSL2 (root@439a258ad544) (gcc (GCC) 11.2.0, GNU ld (GNU Binutils) 2.37) #1 SMP PREEMPT_DYNAMIC Thu Jun  5 18:30:46 UTC 2025
[    0.000000] Command line: initrd=\initrd.img WSL_ROOT_INIT=1 panic=-1 nr_cpus=16 hv_utils.timesync_implicit=1 console=hvc0 debug pty.legacy_count=0 WSL_ENABLE_CRASH_DUMP=1
[    0.000000] KERNEL supported cpus:
[    0.000000]   Intel GenuineIntel
[    0.000000]   AMD AuthenticAMD
[    0.000000] BIOS-provided physical RAM map:
[    0.000000] BIOS-e820: [mem 0x0000000000000000-0x000000000009ffff] usable
[    0.000000] BIOS-e820: [mem 0x00000000000e0000-0x00000000000e0fff] reserved
[    0.000000] BIOS-e820: [mem 0x0000000000100000-0x00000000001fffff] ACPI data
[    0.000000] BIOS-e820: [mem 0x0000000000200000-0x00000000ecbfffff] usable
[    0.000000] NX (Execute Disable) protection: active
[    0.000000] APIC: Static calls initialized
[    0.000000] DMI not present or invalid.
[    0.000000] Hypervisor detected: Microsoft Hyper-V
[    0.000000] Hyper-V: privilege flags low 0xae7f, high 0x3b8030, hints 0x900c2c, misc 0xe0bed7b6
[    0.000000] Hyper-V: Nested features: 0x4a0000
[    0.000000] Hyper-V: LAPIC Timer Frequency: 0xc3500
[    0.000000] Hyper-V: Using hypercall for remote TLB flush
[    0.000000] clocksource: hyperv_clocksource_tsc_page: mask: 0xffffffffffffffff max_cycles: 0x24e6a1710, max_idle_ns: 440795202120 ns
[    0.000000] clocksource: hyperv_clocksource_msr: mask: 0xffffffffffffffff max_cycles: 0x24e6a1710, max_idle_ns: 440795202120 ns
[    0.000000] tsc: Detected 1796.628 MHz processor
[    0.000201] e820: update [mem 0x00000000-0x00000fff] usable ==> reserved
[    0.000209] e820: remove [mem 0x000a0000-0x000fffff] usable
[    0.000216] last_pfn = 0xecc00 max_arch_pfn = 0x400000000
[    0.000264] MTRR map: 5 entries (4 fixed + 1 variable; max 20), built from 8 variable MTRRs
[    0.000269] x86/PAT: Configuration [0-7]: WB  WC  UC- UC  WB  WP  UC- WT
[    0.000379] Using GB pages for direct mapping
[    0.000572] RAMDISK: [mem 0x04be4000-0x04e7dfff]
[    0.000578] ACPI: Early table checksum verification disabled
[    0.000584] ACPI: RSDP 0x00000000000E0000 000024 (v02 VRTUAL)
[    0.000592] ACPI: XSDT 0x0000000000100000 000044 (v01 VRTUAL MICROSFT 00000001 MSFT 00000001)
[    0.000601] ACPI: FACP 0x0000000000101000 000114 (v06 VRTUAL MICROSFT 00000001 MSFT 00000001)
[    0.000609] ACPI: DSDT 0x00000000001011B8 01E11C (v02 MSFTVM DSDT01   00000001 INTL 20230628)
[    0.000614] ACPI: FACS 0x0000000000101114 000040
[    0.000618] ACPI: OEM0 0x0000000000101154 000064 (v01 VRTUAL MICROSFT 00000001 MSFT 00000001)
[    0.000624] ACPI: SRAT 0x000000000011F2D4 0003B0 (v02 VRTUAL MICROSFT 00000001 MSFT 00000001)
[    0.000629] ACPI: APIC 0x000000000011F684 0000C8 (v04 VRTUAL MICROSFT 00000001 MSFT 00000001)
[    0.000633] ACPI: Reserving FACP table memory at [mem 0x101000-0x101113]
[    0.000635] ACPI: Reserving DSDT table memory at [mem 0x1011b8-0x11f2d3]
[    0.000637] ACPI: Reserving FACS table memory at [mem 0x101114-0x101153]
[    0.000638] ACPI: Reserving OEM0 table memory at [mem 0x101154-0x1011b7]
[    0.000639] ACPI: Reserving SRAT table memory at [mem 0x11f2d4-0x11f683]
[    0.000641] ACPI: Reserving APIC table memory at [mem 0x11f684-0x11f74b]
[    0.000689] SRAT: PXM 0 -> APIC 0x00 -> Node 0
[    0.000692] SRAT: PXM 0 -> APIC 0x01 -> Node 0
[    0.000693] SRAT: PXM 0 -> APIC 0x02 -> Node 0
[    0.000695] SRAT: PXM 0 -> APIC 0x03 -> Node 0
[    0.000696] SRAT: PXM 0 -> APIC 0x04 -> Node 0
:
```



```
praptii1011@asus:~$ dmesg | less
praptii1011@asus:~$ journalctl
Sep 11 17:22:04 asus systemd[381]: Queued start job for default target default.target.
Sep 11 17:22:04 asus unknown: WSL (271) ERROR: CheckConnection: getaddrinfo() failed: -5
Sep 11 17:22:04 asus systemd-journald[46]: /var/log/journal/d3cb17a9a6754860bc632bb0205bc5d3/user-1000.journal: Journal file uses a different sequence number ID, rotating.
Sep 11 17:22:04 asus systemd[381]: Created slice app.slice - User Application Slice.
Sep 11 17:22:04 asus systemd[381]: Started launchpadlib-cache-clean.timer - Clean up old files in the Launchpadlib cache.
Sep 11 17:22:04 asus systemd[381]: Reached target paths.target - Paths.
Sep 11 17:22:04 asus systemd[381]: Reached target timers.target - Timers.
Sep 11 17:22:04 asus systemd[381]: Starting dbus.socket - D-Bus User Message Bus Socket...
Sep 11 17:22:04 asus systemd[381]: Listening on dirmngr.socket - GnuPG network certificate management daemon.
Sep 11 17:22:04 asus systemd[381]: Listening on gcr-ssh-agent.socket - GCR ssh-agent wrapper.
Sep 11 17:22:04 asus systemd[381]: Listening on gnome-keyring-daemon.socket - GNOME Keyring daemon.
Sep 11 17:22:04 asus systemd[381]: Listening on gpg-agent-browser.socket - GnuPG cryptographic agent and passphrase cache (access for web browsers).
Sep 11 17:22:04 asus systemd[381]: Listening on gpg-agent-extra.socket - GnuPG cryptographic agent and passphrase cache (restricted).
Sep 11 17:22:04 asus systemd[381]: Starting gpg-agent-ssh.socket - GnuPG cryptographic agent (ssh-agent emulation)...
Sep 11 17:22:04 asus systemd[381]: Listening on gpg-agent.socket - GnuPG cryptographic agent and passphrase cache.
Sep 11 17:22:04 asus systemd[381]: Listening on keyboxd.socket - GnuPG public key management service.
Sep 11 17:22:04 asus systemd[381]: Listening on pk-debconf-helper.socket - debconf communication socket.
Sep 11 17:22:04 asus systemd[381]: Listening on snapd.session-agent.socket - REST API socket for snapd user session agent.
Sep 11 17:22:04 asus systemd[381]: Listening on dbus.socket - D-Bus User Message Bus Socket.
Sep 11 17:22:04 asus systemd[381]: Listening on gpg-agent-ssh.socket - GnuPG cryptographic agent (ssh-agent emulation).
Sep 11 17:22:04 asus systemd[381]: Reached target sockets.target - Sockets.
Sep 11 17:22:04 asus systemd[381]: Reached target basic.target - Basic System.
Sep 11 17:22:04 asus systemd[381]: Reached target default.target - Main User Target.
Sep 11 17:22:04 asus systemd[381]: Startup finished in 354ms.
Sep 11 17:22:04 asus systemd[1]: Started user@1000.service - User Manager for UID 1000.
Sep 11 17:22:04 asus systemd[1]: Started session-1.scope - Session 1 of User praptii1011.
Sep 11 17:22:06 asus snapd[174]: daemon.go:548: gracefully waiting for running hooks
Sep 11 17:22:06 asus snapd[174]: daemon.go:550: done waiting for running hooks
Sep 11 17:22:08 asus wsl-pro-service[178]: INFO Daemon: connecting to Windows Agent
Sep 11 17:22:08 asus wsl-pro-service[178]: DEBUG Updated systemd status to "Connecting"
Sep 11 17:22:08 asus wsl-pro-service[178]: WARNING Daemon: could not connect to Windows Agent: could not get address: could not read agent port file "/mnt/c/Users/ASUS/.ubuntupro/.address": open /mnt/c/Users>
Sep 11 17:22:08 asus wsl-pro-service[178]: INFO Reconnecting to Windows host in 8 seconds
Sep 11 17:22:08 asus wsl-pro-service[178]: DEBUG Updated systemd status to "Not connected: waiting to retry"
Sep 11 17:22:09 asus snapd[174]: overlord.go:528: Released state lock file
Sep 11 17:22:09 asus snapd[174]: daemon stop requested to wait for socket activation
Sep 11 17:22:09 asus systemd[1]: snapd.service: Deactivated successfully.
Sep 11 17:22:16 asus wsl-pro-service[178]: INFO Daemon: connecting to Windows Agent
Sep 11 17:22:16 asus wsl-pro-service[178]: DEBUG Updated systemd status to "Connecting"
Sep 11 17:22:16 asus wsl-pro-service[178]: WARNING Daemon: could not connect to Windows Agent: could not get address: could not read agent port file "/mnt/c/Users/ASUS/.ubuntupro/.address": open /mnt/c/Users>
Sep 11 17:22:16 asus wsl-pro-service[178]: INFO Reconnecting to Windows host in 16 seconds
Sep 11 17:22:16 asus wsl-pro-service[178]: DEBUG Updated systemd status to "Not connected: waiting to retry"
Sep 11 17:22:31 asus systemd[1]: systemd-timedated.service: Deactivated successfully.
Sep 11 17:22:32 asus wsl-pro-service[178]: INFO Daemon: connecting to Windows Agent
Sep 11 17:22:32 asus wsl-pro-service[178]: DEBUG Updated systemd status to "Connecting"
Sep 11 17:22:32 asus wsl-pro-service[178]: WARNING Daemon: could not connect to Windows Agent: could not get address: could not read agent port file "/mnt/c/Users/ASUS/.ubuntupro/.address": open /mnt/c/Users>
Sep 11 17:22:32 asus wsl-pro-service[178]: INFO Reconnecting to Windows host in 32 seconds
Sep 11 17:22:32 asus wsl-pro-service[178]: DEBUG Updated systemd status to "Not connected: waiting to retry"
Sep 11 17:22:43 asus kernel: hv_balloon: Max. dynamic memory size: 3788 MB
praptii1011@asus:~$ last
reboot   system boot  6.6.87.2-microso Wed Sep 24 13:40   still running
reboot   system boot  6.6.87.2-microso Wed Sep 24 11:17   still running
reboot   system boot  6.6.87.2-microso Wed Sep 24 07:25   still running
reboot   system boot  6.6.87.2-microso Tue Sep 23 19:18   still running
reboot   system boot  6.6.87.2-microso Tue Sep 23 17:57   still running
reboot   system boot  6.6.87.2-microso Mon Sep 22 17:24   still running
reboot   system boot  6.6.87.2-microso Sat Sep 20 05:11   still running
reboot   system boot  6.6.87.2-microso Mon Sep 15 17:17   still running
reboot   system boot  6.6.87.2-microso Mon Sep 15 16:15   still running
reboot   system boot  6.6.87.2-microso Mon Sep 15 09:14   still running
reboot   system boot  6.6.87.2-microso Sun Sep 14 17:54   still running
reboot   system boot  6.6.87.2-microso Sun Sep 14 17:34   still running
reboot   system boot  6.6.87.2-microso Sun Sep 14 17:19   still running
reboot   system boot  6.6.87.2-microso Sun Sep 14 17:06   still running
reboot   system boot  6.6.87.2-microso Sun Sep 14 16:31   still running
reboot   system boot  6.6.87.2-microso Sun Sep 14 16:11   still running
reboot   system boot  6.6.87.2-microso Sun Sep 14 16:10   still running
reboot   system boot  6.6.87.2-microso Sun Sep 14 16:09   still running
reboot   system boot  6.6.87.2-microso Sun Sep 14 16:05   still running
reboot   system boot  6.6.87.2-microso Sun Sep 14 12:30   still running
reboot   system boot  6.6.87.2-microso Sun Sep 14 12:13   still running
reboot   system boot  6.6.87.2-microso Sun Sep 14 10:41   still running
reboot   system boot  6.6.87.2-microso Sun Sep 14 10:33   still running
reboot   system boot  6.6.87.2-microso Sun Sep 14 10:14   still running
reboot   system boot  6.6.87.2-microso Sat Sep 13 05:54   still running
reboot   system boot  6.6.87.2-microso Sat Sep 13 04:55   still running
reboot   system boot  6.6.87.2-microso Fri Sep 12 15:53   still running
reboot   system boot  6.6.87.2-microso Fri Sep 12 11:20   still running
reboot   system boot  6.6.87.2-microso Fri Sep 12 10:55   still running
reboot   system boot  6.6.87.2-microso Fri Sep 12 10:44   still running
reboot   system boot  6.6.87.2-microso Fri Sep 12 06:46   still running
reboot   system boot  6.6.87.2-microso Fri Sep 12 06:44   still running
reboot   system boot  6.6.87.2-microso Thu Sep 11 18:13   still running
reboot   system boot  6.6.87.2-microso Thu Sep 11 17:21   still running
reboot   system boot  6.6.87.2-microso Thu Sep 11 16:39   still running
reboot   system boot  6.6.87.2-microso Thu Sep 11 16:37   still running
reboot   system boot  6.6.87.2-microso Thu Sep 11 14:54   still running
reboot   system boot  6.6.87.2-microso Wed Sep 10 11:28   still running
reboot   system boot  6.6.87.2-microso Wed Sep 10 04:59   still running
reboot   system boot  6.6.87.2-microso Sat Sep  6 10:03   still running
reboot   system boot  6.6.87.2-microso Sat Sep  6 05:13   still running
reboot   system boot  6.6.87.2-microso Sat Sep  6 04:40   still running
reboot   system boot  6.6.87.2-microso Wed Sep  3 11:20   still running
reboot   system boot  6.6.87.2-microso Wed Sep  3 10:46   still running
reboot   system boot  6.6.87.2-microso Sun Aug 31 16:18   still running
reboot   system boot  6.6.87.2-microso Sun Aug 31 11:30   still running
reboot   system boot  6.6.87.2-microso Sun Aug 31 11:26   still running
reboot   system boot  6.6.87.2-microso Sat Aug 30 06:14   still running
reboot   system boot  6.6.87.2-microso Sat Aug 30 05:15   still running
reboot   system boot  6.6.87.2-microso Sat Aug 30 04:45   still running
reboot   system boot  6.6.87.2-microso Sat Aug 30 04:43   still running
reboot   system boot  6.6.87.2-microso Wed Aug 27 12:01   still running
reboot   system boot  6.6.87.2-microso Wed Aug 27 11:25   still running
reboot   system boot  6.6.87.2-microso Wed Aug 27 11:14   still running
reboot   system boot  6.6.87.2-microso Wed Aug 27 11:08   still running
reboot   system boot  6.6.87.2-microso Wed Aug 27 10:51   still running
reboot   system boot  6.6.87.2-microso Tue Aug 26 05:39   still running
reboot   system boot  6.6.87.2-microso Sat Aug 23 06:17   still running
reboot   system boot  6.6.87.2-microso Sat Aug 23 06:16   still running
reboot   system boot  6.6.87.2-microso Sat Aug 23 05:14   still running

wtmp begins Sat Aug 23 05:14:08 2025
praptii1011@asus:~$ who
praptii1011 pts/1        2025-09-24 13:40
```

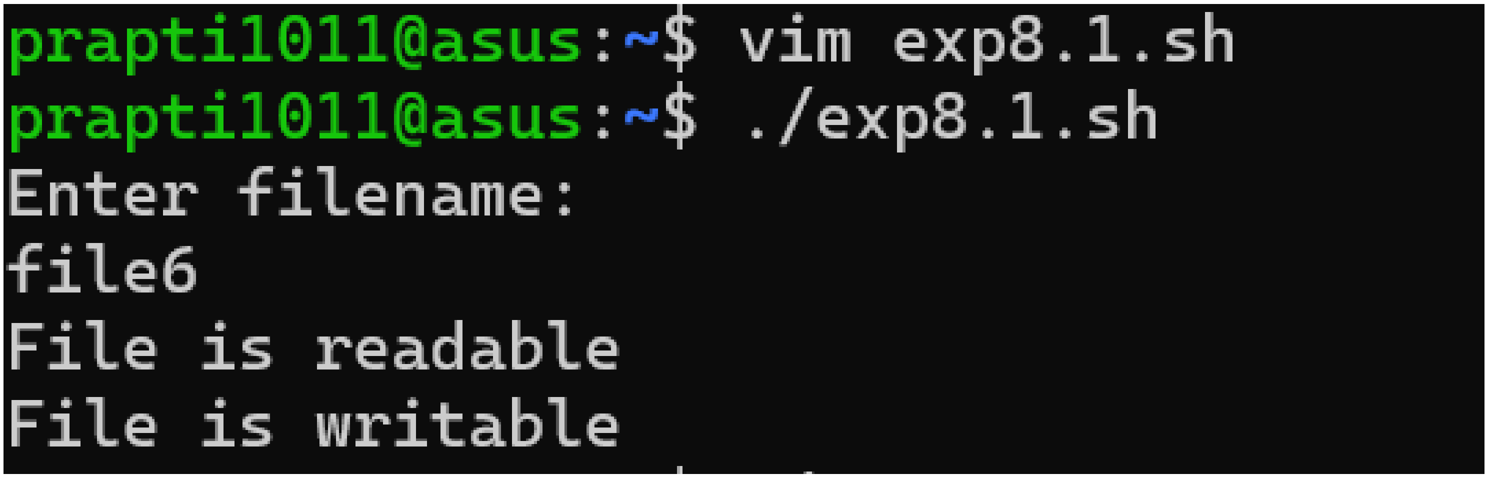
Lab Task [1]: [Check file permissions]

Command(s):

```
#!/bin/bash
echo "Enter filename:"
read file

if [ -e "$file" ]; then
    [ -r "$file" ] && echo "File is readable"
    [ -w "$file" ] && echo "File is writable"
    [ -x "$file" ] && echo "File is executable"
else
```

```
    echo "File does not exist."
fi
```

Output:



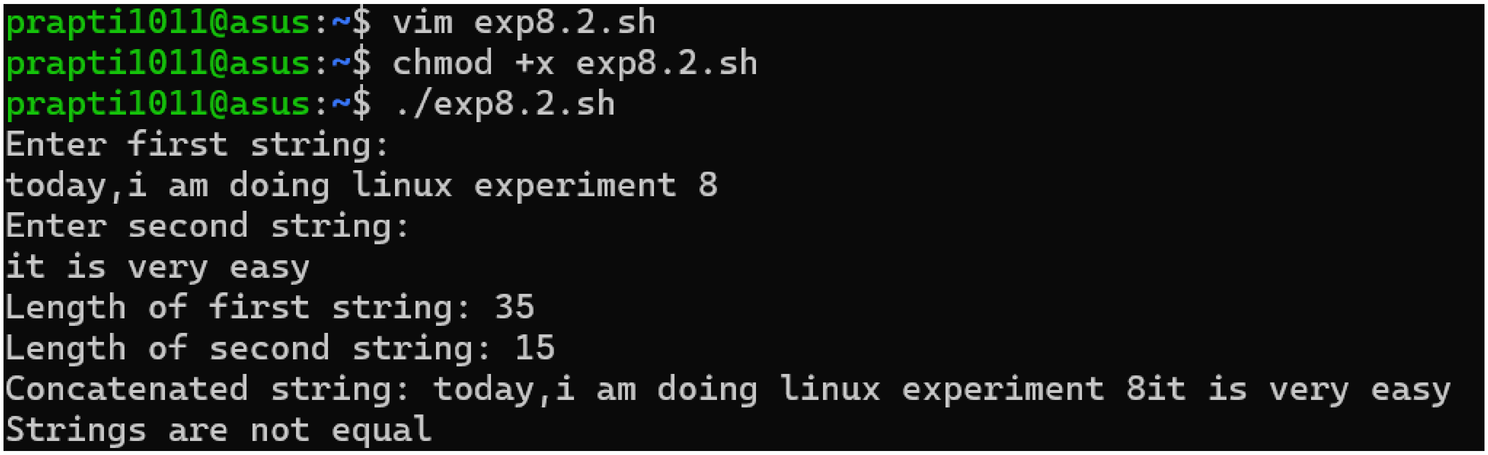
```
prapti1011@asus:~$ vim exp8.1.sh
prapti1011@asus:~$ ./exp8.1.sh
Enter filename:
file6
File is readable
File is writable
```

Lab Task [2]: [String operations]

Command(s):

```
#!/bin/bash
echo "Enter first string:"
read str1
echo "Enter second string:"
read str2

# String length
echo "Length of first string: ${#str1}"
echo "Length of second string: ${#str2}"

# Concatenation
concat="$str1$str2"
echo "Concatenated string: $concat"

# Comparison
if [ "$str1" = "$str2" ]; then
    echo "Strings are equal"
else
    echo "Strings are not equal"
fi
```

Output:



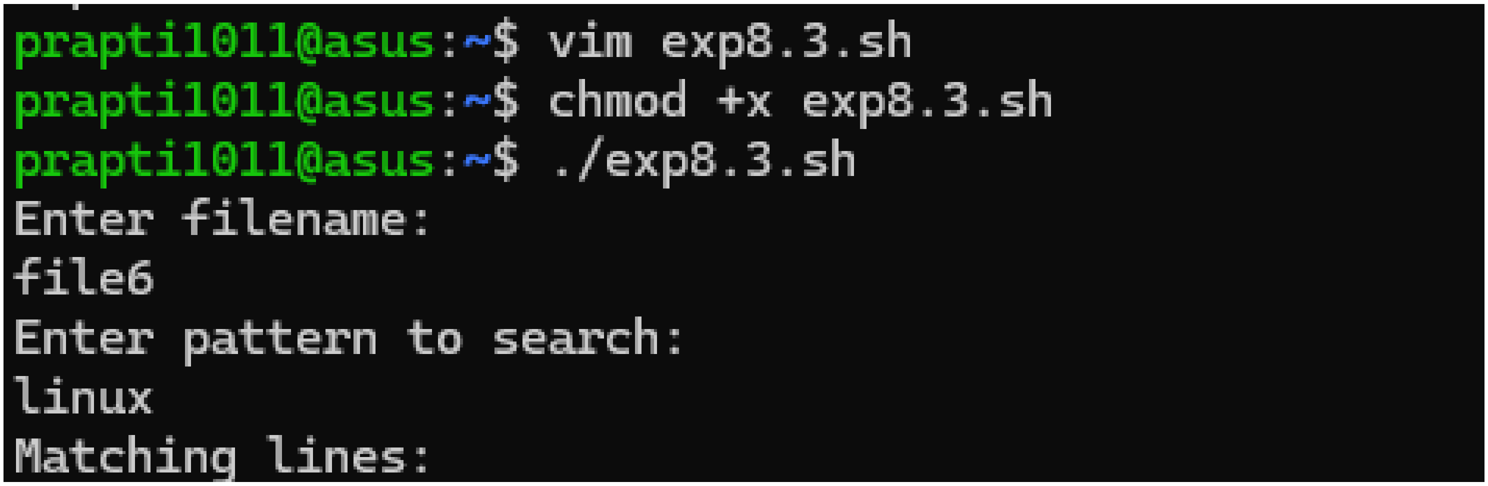
```
praptil011@asus:~$ vim exp8.2.sh
praptil011@asus:~$ chmod +x exp8.2.sh
praptil011@asus:~$ ./exp8.2.sh
Enter first string:
today,i am doing linux experiment 8
Enter second string:
it is very easy
Length of first string: 35
Length of second string: 15
Concatenated string: today,i am doing linux experiment 8it is very easy
Strings are not equal
```

Lab Task [3]: [Search for a pattern in a file]

Command(s):

```
#!/bin/bash
echo "Enter filename:"
read file
echo "Enter pattern to search:"
read pattern

if [ -e "$file" ]; then
    echo "Matching lines:"
    grep "$pattern" "$file"
else
    echo "File not found!"
fi
```

Output:



```
praptil011@asus:~$ vim exp8.3.sh
praptil011@asus:~$ chmod +x exp8.3.sh
praptil011@asus:~$ ./exp8.3.sh
Enter filename:
file6
Enter pattern to search:
linux
Matching lines:
```

New command(s) used in the code-

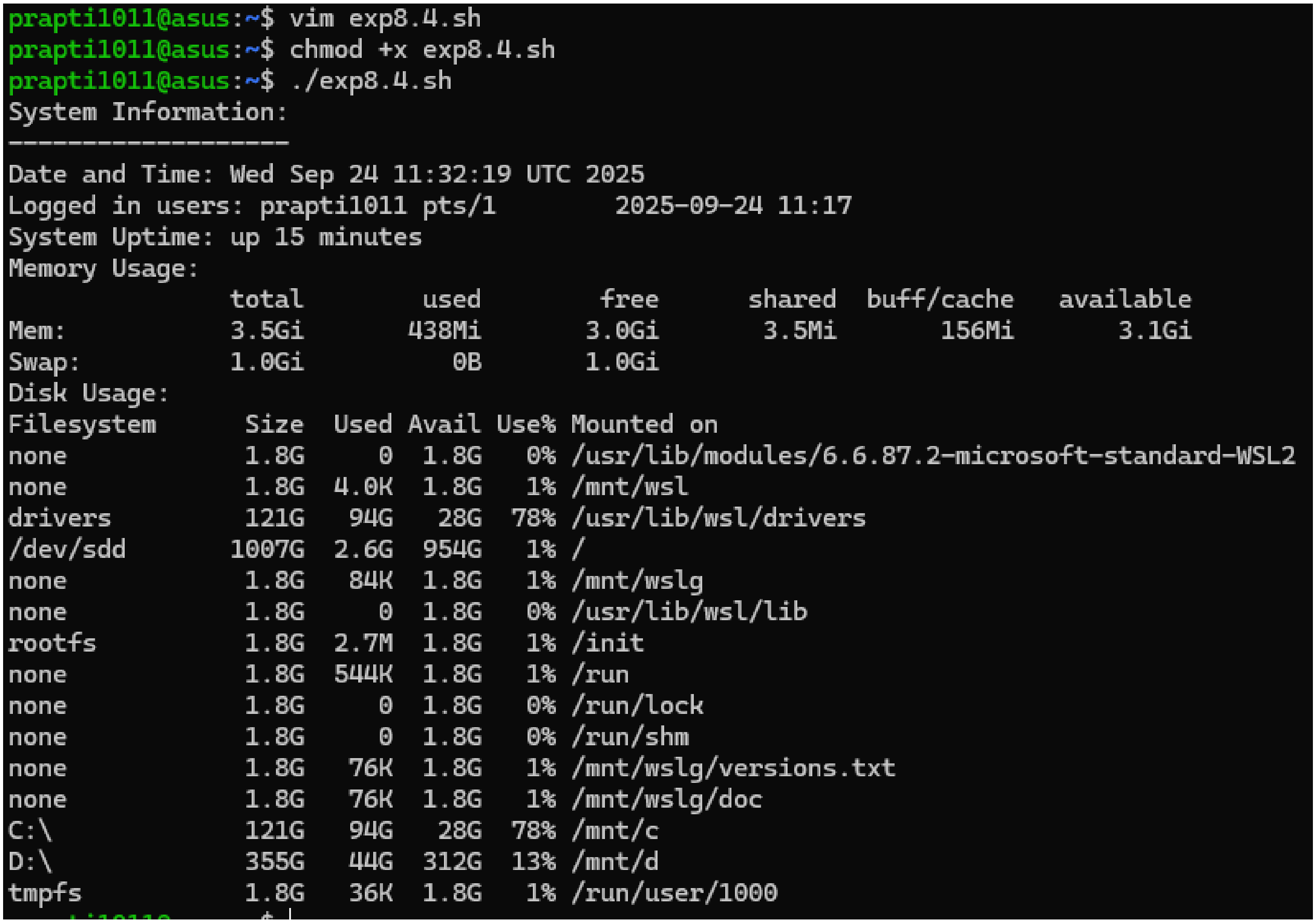
- grep pattern file : searches for matching lines.

Lab Task [4]: [Display system information]

Command(s):

```
#!/bin/bash
echo "System Information:"
echo "--------------------"
echo "Date and Time: $(date)"
echo "Logged in users: $(who)"
echo "System Uptime: $(uptime -p)"
echo "Memory Usage:"
free -h
echo "Disk Usage:"
df -h
```

Output:



```
prapti1011@asus:~$ vim exp8.4.sh
prapti1011@asus:~$ chmod +x exp8.4.sh
prapti1011@asus:~$ ./exp8.4.sh
System Information:
--------------------
Date and Time: Wed Sep 24 11:32:19 UTC 2025
Logged in users: prapti1011 pts/1        2025-09-24 11:17
System Uptime: up 15 minutes
Memory Usage:
               total        used        free      shared  buff/cache   available
Mem:           3.5Gi       438Mi       3.0Gi       3.5Mi       156Mi       3.1Gi
Swap:          1.0Gi          0B       1.0Gi
Disk Usage:
Filesystem      Size  Used Avail Use% Mounted on
none            1.8G     0  1.8G   0% /usr/lib/modules/6.6.87.2-microsoft-standard-WSL2
none            1.8G  4.0K  1.8G   1% /mnt/wsl
drivers         121G   94G   28G  78% /usr/lib/wsl/drivers
/dev/sdd       1007G  2.6G  954G   1% /
none            1.8G   84K  1.8G   1% /mnt/wslg
none            1.8G     0  1.8G   0% /usr/lib/wsl/lib
rootfs          1.8G  2.7M  1.8G   1% /init
none            1.8G  544K  1.8G   1% /run
none            1.8G     0  1.8G   0% /run/lock
none            1.8G     0  1.8G   0% /run/shm
none            1.8G   76K  1.8G   1% /mnt/wslg/versions.txt
none            1.8G   76K  1.8G   1% /mnt/wslg/doc
C:\             121G   94G   28G  78% /mnt/c
D:\             355G   44G  312G  13% /mnt/d
tmpfs           1.8G   36K  1.8G   1% /run/user/1000
```

New command(s) used in the code-

- date : current date and time
- who : list logged in users
- uptime -p : pretty uptime format
- free -h : memory usage in human-readable format
- df -h : disk usage

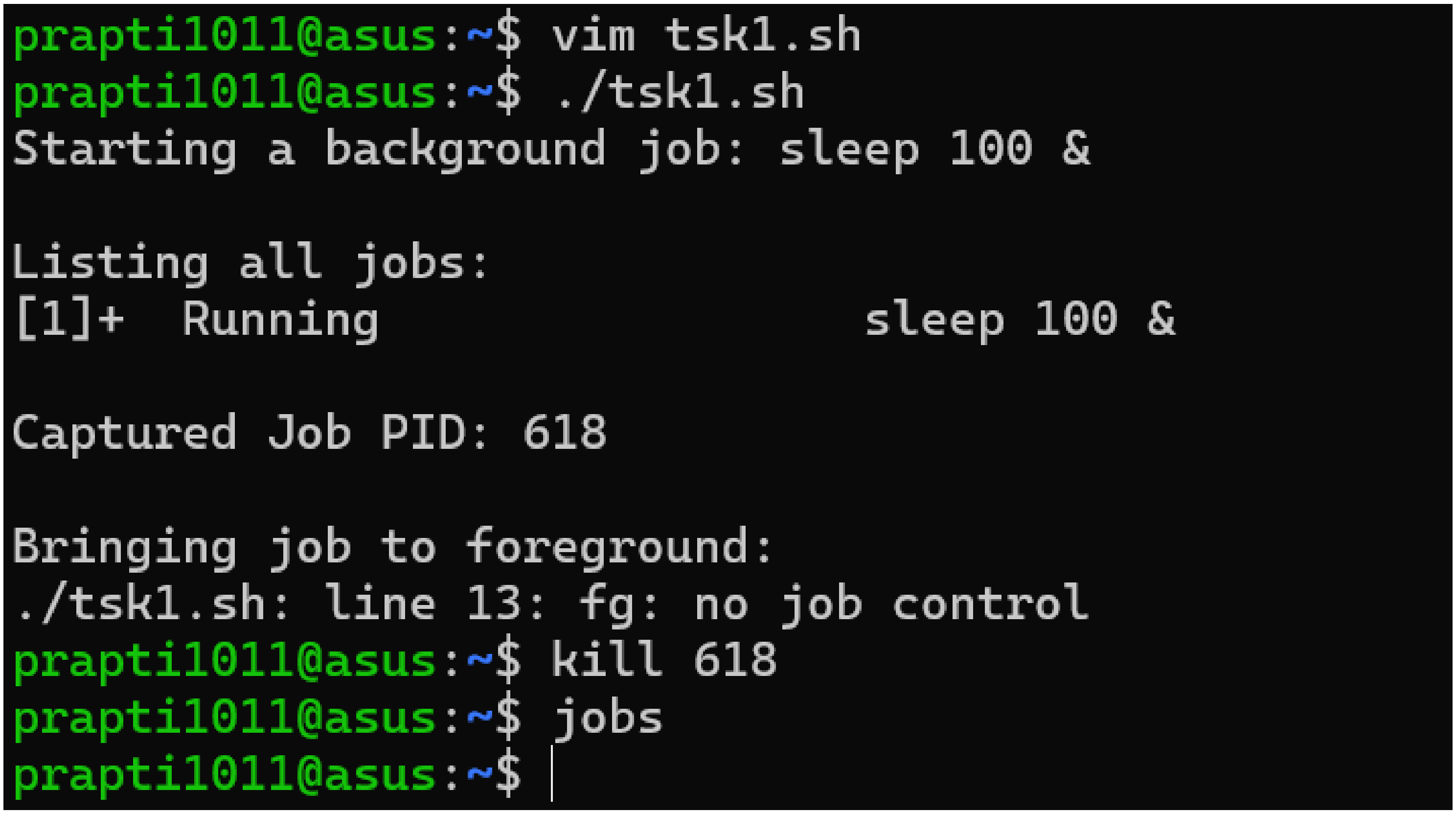
ASSIGNMENT

Exercise 1 : Write a script that starts a background job ,lists all the jobs,brings the job to the foreground and then terminates it.

Command(s)

```
#!/bin/bash

echo "Starting a background job: sleep 100 &"
sleep 100 &

echo -e "\nListing all jobs:"
jobs

job_id=$(jobs -p)
echo -e "\nCaptured Job PID: $job_id"

echo -e "\nBringing job to foreground:"
fg %1
```

Output :



```
prapti1011@asus:~$ vim tsk1.sh
prapti1011@asus:~$ ./tsk1.sh
Starting a background job: sleep 100 &

Listing all jobs:
[1]+  Running                 sleep 100 &

Captured Job PID: 618

Bringing job to foreground:
./tsk1.sh: line 13: fg: no job control
prapti1011@asus:~$ kill 618
prapti1011@asus:~$ jobs
prapti1011@asus:~$ 
```

* The command “jobs” does not give any output which means that the jobs are already terminated.

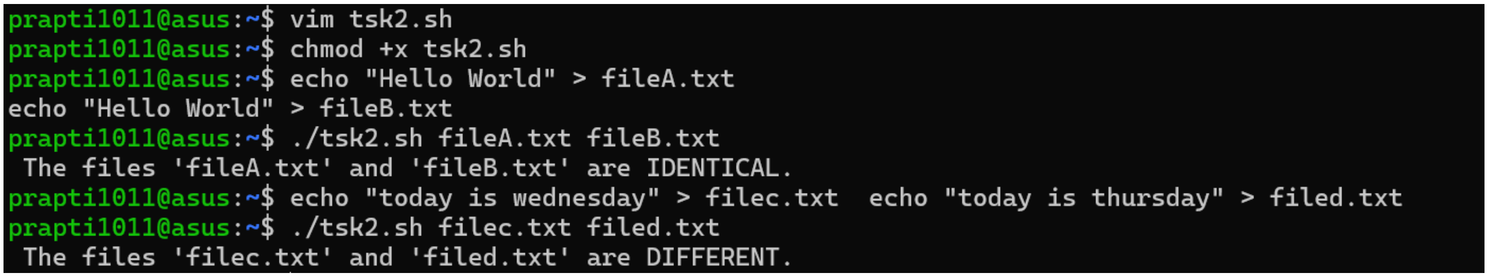
Exercise 2 : Create a script that compares two files and displays whether their contents are identical or different.

Command(s)

```
#!/bin/bash

if [ "$#" -ne 2 ]; then
    echo "Usage: $0 <file1> <file2>"
    exit 1
fi

file1="$1"
file2="$2"

if [ ! -f "$file1" ]; then
    echo "Error: '$file1' does not exist."
    exit 1
fi

if [ ! -f "$file2" ]; then
    echo "Error: '$file2' does not exist."
    exit 1
fi
```

```
if diff "$file1" "$file2" > /dev/null; then
    echo " The files '$file1' and '$file2' are IDENTICAL."
else
    echo " The files '$file1' and '$file2' are DIFFERENT."
fi
```

Output :



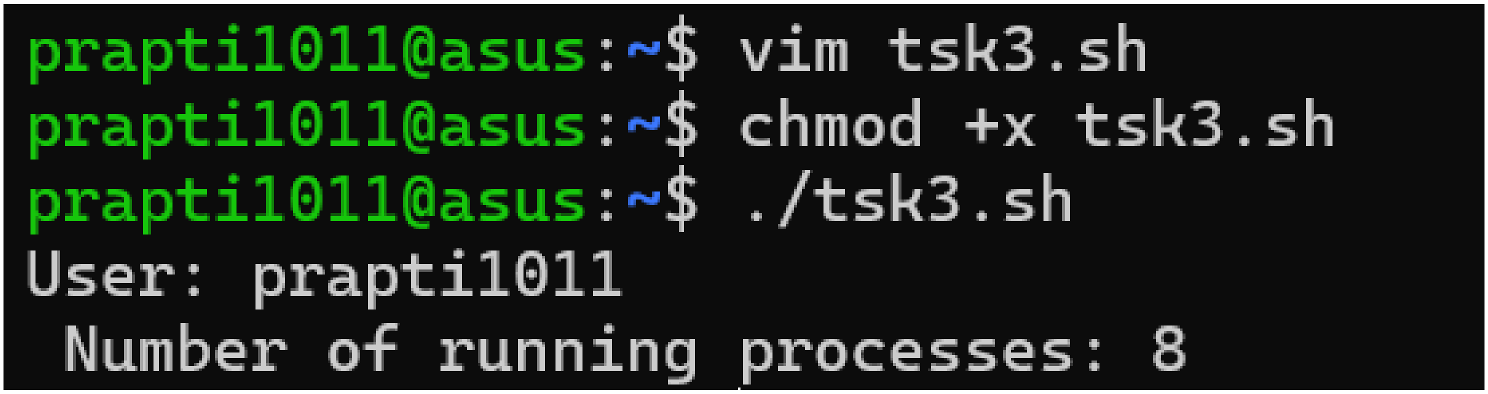
```
prapti1011@asus:~$ vim tsk2.sh
prapti1011@asus:~$ chmod +x tsk2.sh
prapti1011@asus:~$ echo "Hello World" > fileA.txt
echo "Hello World" > fileB.txt
prapti1011@asus:~$ ./tsk2.sh fileA.txt fileB.txt
 The files 'fileA.txt' and 'fileB.txt' are IDENTICAL.
prapti1011@asus:~$ echo "today is wednesday" > filec.txt  echo "today is thursday" > filed.txt
prapti1011@asus:~$ ./tsk2.sh filec.txt filed.txt
 The files 'filec.txt' and 'filed.txt' are DIFFERENT.
```

Exercise 3 : Write a script that counts the number of processes currently being run by your user

Command(s)

```
#!/bin/bash

user=$(whoami)

process_count=$(ps -u "$user" --no-headers | wc -l)

echo "User: $user"
echo " Number of running processes: $process_count"
```

Output :



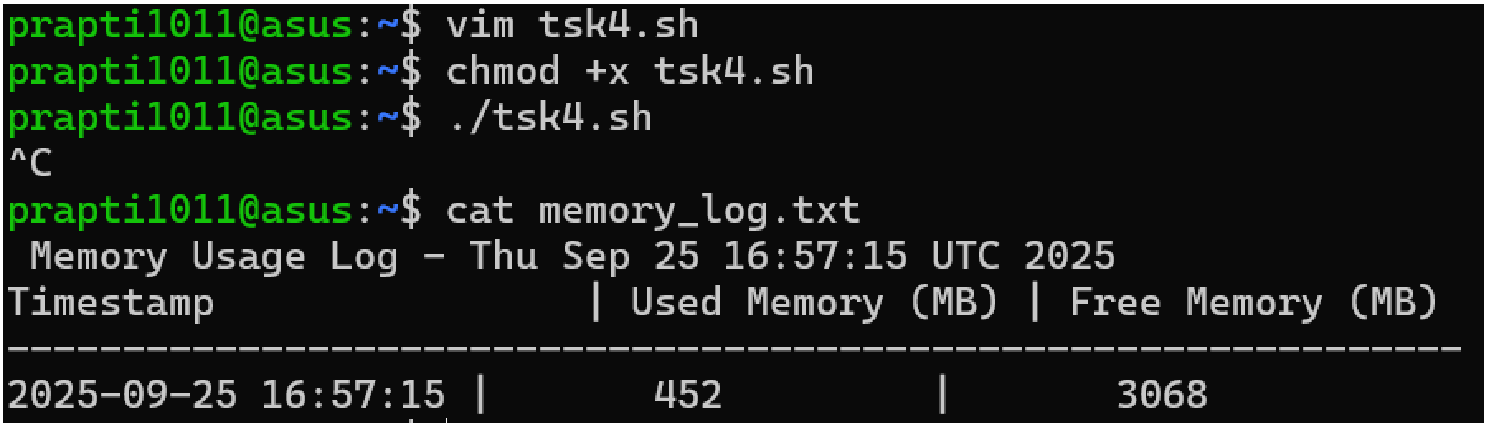
```
prapti1011@asus:~$ vim tsk3.sh
prapti1011@asus:~$ chmod +x tsk3.sh
prapti1011@asus:~$ ./tsk3.sh
User: prapti1011
 Number of running processes: 8
```

Exercise 4 : Develop a script that monitors memory usage every 5 seconds and logs it into a file.

Command(s)

```
#!/bin/bash

log_file="memory_log.txt"

# Header for the log file
echo " Memory Usage Log - $(date)" > "$log_file"
echo "Timestamp                | Used Memory (MB) | Free Memory (MB)" >> "$log_file"
echo "----------------------------------------------------------------" >> "$log_file"

# Infinite loop to log memory every 5 seconds
while true; do
    # Get memory stats using free -m
    mem_info=$(free -m | grep Mem)
    used=$(echo "$mem_info" | awk '{print $3}')
    free=$(echo "$mem_info" | awk '{print $4}')
    timestamp=$(date '+%Y-%m-%d %H:%M:%S')

    # Log to file
    echo "$timestamp |       $used         |       $free" >> "$log_file"

    # Wait for 5 seconds
    sleep 5
done
```

Output :



```
praptil011@asus:~$ vim tsk4.sh
praptil011@asus:~$ chmod +x tsk4.sh
praptil011@asus:~$ ./tsk4.sh
^C
praptil011@asus:~$ cat memory_log.txt
 Memory Usage Log - Thu Sep 25 16:57:15 UTC 2025
Timestamp                | Used Memory (MB) | Free Memory (MB)
----------------------------------------------------------------
2025-09-25 16:57:15 |       452         |       3068
```

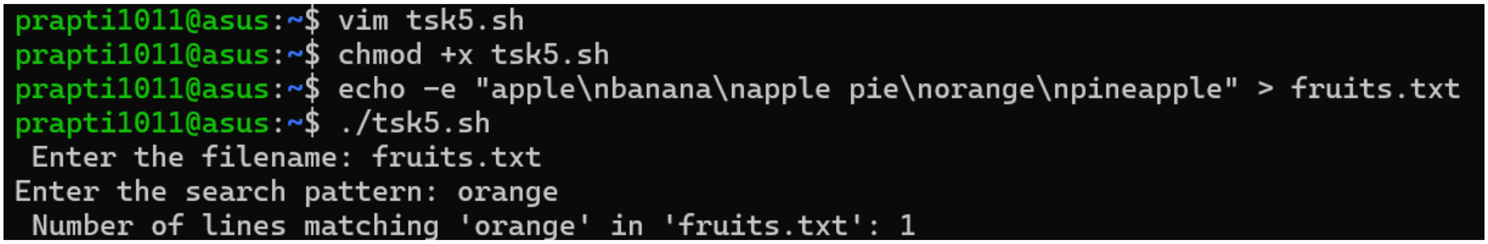
Exercise 5 : Write a script that prompts for a filename and a search pattern, then displays the count of matching lines.

Command(s)

```
#!/bin/bash
```

```
read -p " Enter the filename: " filename

# Check if file exists
if [ ! -f "$filename" ]; then
    echo " Error: File '$filename' not found."
    exit 1
fi

# Prompt for search pattern
read -p "Enter the search pattern: " pattern

# Count matching lines
match_count=$(grep -c "$pattern" "$filename")

echo " Number of lines matching '$pattern' in '$filename': $match_count"
```

Output :



```
prapti1011@asus:~$ vim tsk5.sh
prapti1011@asus:~$ chmod +x tsk5.sh
prapti1011@asus:~$ echo -e "apple\nbanana\napple pie\norange\npineapple" > fruits.txt
prapti1011@asus:~$ ./tsk5.sh
 Enter the filename: fruits.txt
Enter the search pattern: orange
 Number of lines matching 'orange' in 'fruits.txt': 1
```

Challenges faced:

- Forgetting to quote variables in conditions — resolved by using `"$var"` to avoid word splitting.

Learning:

- Learned command-line argument handling for automation.

Result:

- The exercises and assignments were successfully completed for Shell Progamming