IT253 - OPERATING SYSTEMS

ASSIGNMENT 1

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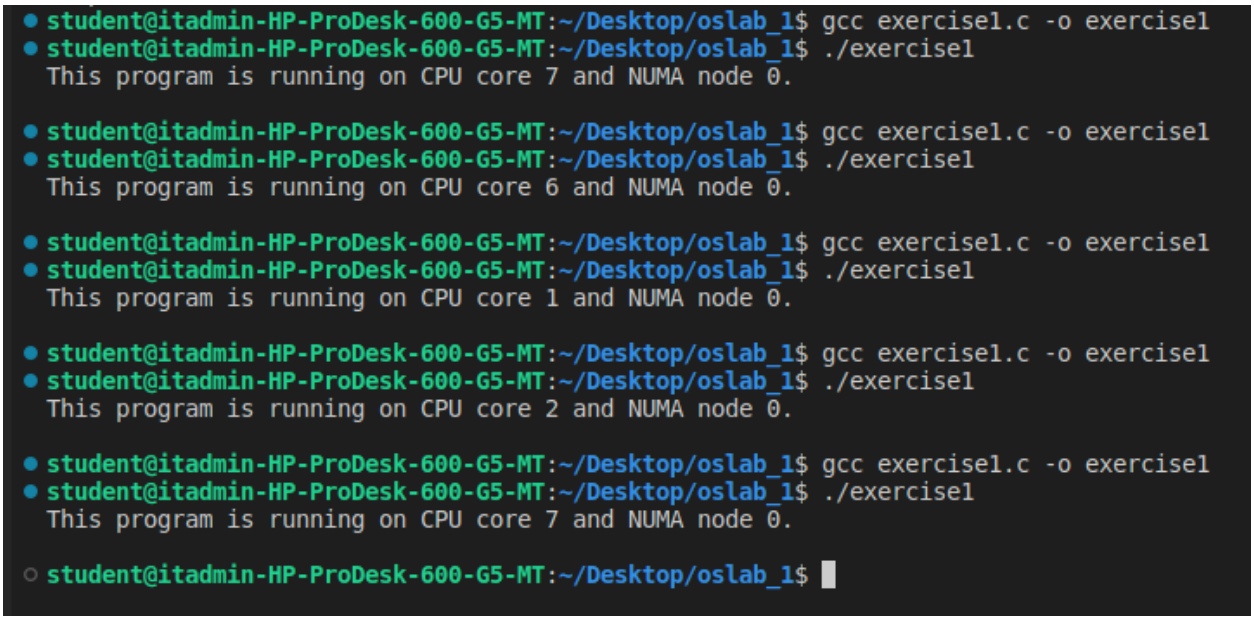
1)



The CPU and NUMA node for each time the code is run are:

1st run: CPU - 7, NUMA - 0
2nd run: CPU - 6, NUMA - 0
3rd run: CPU - 1, NUMA - 0
4th run: CPU - 2, NUMA - 0
5th run: CPU - 7, NUMA - 0

Observation: The code uses the syscall function to call the SYS_getcpu system call, which retrieves the CPU and NUMA node IDs of the current CPU on which the program is running. The program then prints out the CPU and NUMA node IDs using the printf function.

The CPU ID is a unique identifier for the CPU core on which the program is running, while the NUMA node ID is the identifier for the NUMA (Non-Uniform Memory Access) node that the CPU belongs to.

SInce the program is executed 5 times, different CPU and NUMA node IDs are observed. This happened because those values depend on the **system's configuration**, **load on CPU and the number of cores in the processor and which core the system scheduler chooses to run the program on.**

2)

```
student@itadmin-HP-ProDesk-600-G5-MT:~/Desktop/oslab_1$ gcc exercise2.c -o exercise2
student@itadmin-HP-ProDesk-600-G5-MT:~/Desktop/oslab_1$ ./exercise2
Hello, world
student@itadmin-HP-ProDesk-600-G5-MT:~/Desktop/oslab_1$
```

Observation: The difference is that the first program uses direct system calls to write the message to the console and terminate the program. The computer requests a service from the kernel of the operating system. It is a procedure that provides an interface between the process and the OS.
Whereas, the second program uses printf which is a standard library function which operates in user mode.

3) a)

```
student@itadmin-HP-ProDesk-600-G5-MT:~/Desktop/oslab_1$ gcc exercise3_1.c -o exercise3_1
student@itadmin-HP-ProDesk-600-G5-MT:~/Desktop/oslab_1$ ./exercise3_1
Hello world!
Hello world!
student@itadmin-HP-ProDesk-600-G5-MT:~/Desktop/oslab_1$
```

Ans: The output of the program is Hello World!, which is **printed 2 times**.

3) b)

```
student@itadmin-HP-ProDesk-600-G5-MT:~/Desktop/oslab_1$ gcc exercise3_2.c -o exercise3_2
student@itadmin-HP-ProDesk-600-G5-MT:~/Desktop/oslab_1$ ./exercise3_2
Hello World
Hello World
Hello World
Hello World
Hello World
Hello World
Hello World
Hello World
student@itadmin-HP-ProDesk-600-G5-MT:~/Desktop/oslab_1$
```

Ans: Analyzing the number of processes created by each fork(), a tree-like hierarchy is observed. In the above exercise, there were 3 forks, so the processes created by each fork can be seen as the following:

The main process: P0
Processes created by the 1st fork: P1
Processes created by the 2nd fork: P2, P3
Processes created by the 3rd fork: P4, P5, P6, P7

The total number of processes is given by the formula = 2^n, where **n is the number of fork system calls**. Since here n = 3, $2^3 = 8$.

Hence, **“Hello World!’ is printed 8 times.**

The total number of child processes is given by the formula = 2^n-1, because the main process is not included.

PTO

4)

$ps

```
student@itadmin-HP-ProDesk-600-G5-MT:~/Desktop/oslab_1$ ps
    PID TTY          TIME CMD
   9950 pts/2    00:00:00 bash
  11592 pts/2    00:00:00 ps
```

$ps -eo pid,tid,class,rtprio,ni,pri,psr,pcpu,stat,wchan:14,comm

```
student@itadmin-HP-ProDesk-600-G5-MT:~/Desktop/oslab_1$ ps -eo pid,tid,class,rtprio,ni,pri,psr,pcpu,stat,wchan:14,comm
    PID     TID CLS RTPRIO  NI PRI PSR %CPU STAT WCHAN          COMMAND
      1       1 TS       -   0  19   3  0.2 Ss   -              systemd
      2       2 TS       -   0  19   4  0.0 S    -              kthreadd
      3       3 TS       - -20  39   0  0.0 I<   -              rcu_gp
      4       4 TS       - -20  39   0  0.0 I<   -              rcu_par_gp
      6       6 TS       - -20  39   0  0.0 I<   -              kworker/0:0H-kblockd
      8       8 TS       - -20  39   0  0.0 I<   -              mm_percpu_wq
      9       9 TS       -   0  19   0  0.0 S    -              ksoftirqd/0
     10      10 TS       -   0  19   0  0.1 I    -              rcu_sched
     11      11 FF      99   - 139   0  0.0 S    -              migration/0
     12      12 FF      50   -  90   0  0.0 S    -              idle_inject/0
     14      14 TS       -   0  19   0  0.0 S    -              cpuhp/0
     15      15 TS       -   0  19   1  0.0 S    -              cpuhp/1
     16      16 FF      50   -  90   1  0.0 S    -              idle_inject/1
     17      17 FF      99   - 139   1  0.0 S    -              migration/1
     18      18 TS       -   0  19   1  0.0 S    -              ksoftirqd/1
     19      19 TS       -   0  19   1  0.0 I    -              kworker/1:0-events
     20      20 TS       - -20  39   1  0.0 I<   -              kworker/1:0H-kblockd
     21      21 TS       -   0  19   2  0.0 S    -              cpuhp/2
     22      22 FF      50   -  90   2  0.0 S    -              idle_inject/2
     23      23 FF      99   - 139   2  0.0 S    -              migration/2
     24      24 TS       -   0  19   2  0.0 S    -              ksoftirqd/2
     26      26 TS       - -20  39   2  0.0 I<   -              kworker/2:0H-kblockd
     27      27 TS       -   0  19   3  0.0 S    -              cpuhp/3
     28      28 FF      50   -  90   3  0.0 S    -              idle_inject/3
     29      29 FF      99   - 139   3  0.0 S    -              migration/3
     30      30 TS       -   0  19   3  0.0 S    -              ksoftirqd/3
     32      32 TS       - -20  39   3  0.0 I<   -              kworker/3:0H-kblockd
     33      33 TS       -   0  19   4  0.0 S    -              cpuhp/4
     34      34 FF      50   -  90   4  0.0 S    -              idle_inject/4
     35      35 FF      99   - 139   4  0.0 S    -              migration/4
     36      36 TS       -   0  19   4  0.0 S    -              ksoftirqd/4
     38      38 TS       - -20  39   4  0.0 I<   -              kworker/4:0H-kblockd
     39      39 TS       -   0  19   5  0.0 S    -              cpuhp/5
     40      40 FF      50   -  90   5  0.0 S    -              idle_inject/5
     41      41 FF      99   - 139   5  0.0 S    -              migration/5
     42      42 TS       -   0  19   5  0.0 S    -              ksoftirqd/5
     44      44 TS       - -20  39   5  0.0 I<   -              kworker/5:0H-kblockd
     45      45 TS       -   0  19   6  0.0 S    -              cpuhp/6
     46      46 FF      50   -  90   6  0.0 S    -              idle_inject/6
     47      47 FF      99   - 139   6  0.0 S    -              migration/6
     48      48 TS       -   0  19   6  0.0 S    -              ksoftirqd/6
     50      50 TS       - -20  39   6  0.0 I<   -              kworker/6:0H-kblockd
     51      51 TS       -   0  19   7  0.0 S    -              cpuhp/7
     52      52 FF      50   -  90   7  0.0 S    -              idle_inject/7
     53      53 FF      99   - 139   7  0.0 S    -              migration/7
     54      54 TS       -   0  19   7  0.0 S    -              ksoftirqd/7
     56      56 TS       - -20  39   7  0.0 I<   -              kworker/7:0H-kblockd
     57      57 TS       -   0  19   0  0.0 S    -              kdevtmpfs
     58      58 TS       - -20  39   3  0.0 I<   -              netns
     59      59 TS       -   0  19   2  0.0 S    -              rcu_tasks_kthre
     60      60 TS       -   0  19   6  0.0 S    -              kauditd
     61      61 TS       -   0  19   3  0.0 S    -              khungtaskd
     62      62 TS       -   0  19   2  0.0 S    -              oom_reaper
     63      63 TS       - -20  39   2  0.0 I<   -              writeback
     64      64 TS       -   0  19   4  0.0 S    -              kcompactd0
```

…

```
    6833    6833 TS       -   0  19   0  0.1 Sl   unix_stream_re cpptools
    6891    6891 TS       -   0  19   7  0.0 Sl   futex_wait_que cpptools-srv
    6913    6913 TS       -   0  19   3  0.0 Sl   pipe_wait      oosplash
    6950    6950 TS       -   0  19   5  0.0 Sl   poll_schedule_ soffice.bin
    7039    7039 TS       -   0  19   1  0.0 Ss+  poll_schedule_ bash
    7106    7106 TS       -   0  19   4  0.2 Sl   poll_schedule_ evince
    7111    7111 TS       -   0  19   0  0.0 Sl   poll_schedule_ evinced
    7656    7656 TS       -   0  19   1  0.0 Sl   poll_schedule_ RDD Process
    7658    7658 TS       -   0  19   0  0.0 Sl   poll_schedule_ Utility Process
    7669    7669 TS       -   0  19   5  0.1 Sl   poll_schedule_ Isolated Web Co
    7803    7803 TS       -   0  19   0  0.5 Sl   poll_schedule_ Isolated Web Co
    8077    8077 TS       -   0  19   4  0.0 I    -              kworker/4:1-cgroup_destroy
    8080    8080 TS       -   0  19   5  0.0 I    -              kworker/5:2-events
    8095    8095 TS       -   0  19   0  0.0 Sl   poll_schedule_ eog
    8126    8126 TS       -   0  19   2  0.0 I    -              kworker/2:2-memcg_kmem_cache
    8191    8191 TS       -   0  19   1  0.0 Sl   pipe_wait      sd_dummy
    8194    8194 TS       -   0  19   3  0.0 Sl   pipe_wait      sd_espeak-ng
    8203    8203 TS       -   0  19   7  0.0 Sl   pipe_wait      sd_generic
    8207    8207 TS       -   0  19   1  0.0 Ssl  poll_schedule_ speech-dispatch
    8638    8638 TS       -   0  19   3  0.0 Sl   futex_wait_que cpptools-srv
    8704    8704 TS       -   0  19   4  0.0 I    -              kworker/4:0-events
    9016    9016 TS       -   0  19   7  0.0 Sl   futex_wait_que cpptools-srv
    9237    9237 TS       -   0  19   3  0.0 I    -              kworker/3:1-cgroup_destroy
    9357    9357 TS       -   0  19   3  0.0 Sl   futex_wait_que cpptools-srv
    9392    9392 TS       -   0  19   0  0.0 I    -              kworker/0:3-events
    9396    9396 TS       -   0  19   2  0.0 I    -              kworker/2:0-events
    9438    9438 TS       -   0  19   6  0.0 I    -              kworker/6:2-events
    9792    9792 TS       -   0  19   1  0.0 I    -              kworker/1:1-events
    9950    9950 TS       -   0  19   6  0.0 Ss   do_wait        bash
   10226   10226 TS       -   0  19   5  0.0 I    -              kworker/5:0-events
   10469   10469 TS       -   0  19   3  0.6 Sl   poll_schedule_ Isolated Web Co
   10633   10633 TS       -   0  19   0  0.1 I    -              kworker/u16:0-i915
   10724   10724 TS       -   0  19   5  0.1 Sl   poll_schedule_ Isolated Web Co
   10912   10912 TS       -   0  19   1  0.2 I    -              kworker/u16:3-events_unbound
   10990   10990 TS       -   0  19   0  0.0 I    -              kworker/0:0-memcg_kmem_cache
   10993   10993 TS       -   0  19   3  0.0 I    -              kworker/3:2-events
   11010   11010 TS       -   0  19   3  0.2 I    -              kworker/u16:2-events_unbound
   11134   11134 TS       -   0  19   7  0.3 I    -              kworker/7:6-events
   11135   11135 TS       -   0  19   7  0.0 I    -              kworker/7:7-events
   11140   11140 TS       -   0  19   2  0.0 Sl   poll_schedule_ Isolated Web Co
   11185   11185 TS       -   0  19   0  0.0 Sl   poll_schedule_ Isolated Web Co
   11230   11230 TS       -   0  19   0  0.0 Sl   poll_schedule_ Web Content
   11278   11278 TS       -   0  19   2  0.0 Sl   poll_schedule_ Web Content
   11281   11281 TS       -   0  19   2  0.0 Sl   poll_schedule_ Web Content
   11679   11679 TS       -   0  19   5  0.0 Sl   ep_poll        code
   11856   11856 TS       -   0  19   2  0.0 I    -              kworker/2:1-cgroup_destroy
   11858   11858 TS       -   0  19   0  0.0 I    -              kworker/0:1-events
   11909   11909 TS       -   0  19   0  0.0 I    -              kworker/0:2-events
   11910   11910 TS       -   0  19   1  0.0 I    -              kworker/1:2-events
   11911   11911 TS       -   0  19   2  0.1 I    -              kworker/u16:1-events_unbound
   11958   11958 TS       -   0  19   3  0.0 I    -              kworker/3:0-cgroup_destroy
   11966   11966 TS       -   0  19   1  0.0 I    -              kworker/1:3
   11967   11967 TS       -   0  19   3  0.0 I    -              kworker/3:3
   12143   12143 TS       -   0  19   5  0.0 I    -              kworker/5:1
   12144   12144 TS       -   0  19   2  0.0 I    -              kworker/2:3-events
   12145   12145 TS       -   0  19   7  0.0 I    -              kworker/7:0-events
   12324   12324 TS       -   0  19   7  0.0 R+   -              ps
student@itadmin-HP-ProDesk-600-G5-MT:~/Desktop/oslab_1$
```

$ps -U root -u root u

```
student@itadmin-HP-ProDesk-600-G5-MT:~/Desktop/oslab_1$ ps -U root -u root u
USER         PID %CPU %MEM    VSZ   RSS TTY      STAT START   TIME COMMAND
root           1  0.2  0.0 168648 12016 ?        Ss   15:01   0:13 /sbin/init splash
root           2  0.0  0.0      0     0 ?        S    15:01   0:00 [kthreadd]
root           3  0.0  0.0      0     0 ?        I<   15:01   0:00 [rcu_gp]
root           4  0.0  0.0      0     0 ?        I<   15:01   0:00 [rcu_par_gp]
root           6  0.0  0.0      0     0 ?        I<   15:01   0:00 [kworker/0:0H-kblockd]
root           8  0.0  0.0      0     0 ?        I<   15:01   0:00 [mm_percpu_wq]
root           9  0.0  0.0      0     0 ?        S    15:01   0:00 [ksoftirqd/0]
root          10  0.1  0.0      0     0 ?        I    15:01   0:07 [rcu_sched]
root          11  0.0  0.0      0     0 ?        S    15:01   0:00 [migration/0]
root          12  0.0  0.0      0     0 ?        S    15:01   0:00 [idle_inject/0]
root          14  0.0  0.0      0     0 ?        S    15:01   0:00 [cpuhp/0]
root          15  0.0  0.0      0     0 ?        S    15:01   0:00 [cpuhp/1]
root          16  0.0  0.0      0     0 ?        S    15:01   0:00 [idle_inject/1]
root          17  0.0  0.0      0     0 ?        S    15:01   0:00 [migration/1]
root          18  0.0  0.0      0     0 ?        S    15:01   0:00 [ksoftirqd/1]
root          19  0.0  0.0      0     0 ?        I    15:01   0:00 [kworker/1:0-mm_percpu_wq]
root          20  0.0  0.0      0     0 ?        I<   15:01   0:00 [kworker/1:0H-kblockd]
root          21  0.0  0.0      0     0 ?        S    15:01   0:00 [cpuhp/2]
root          22  0.0  0.0      0     0 ?        S    15:01   0:00 [idle_inject/2]
root          23  0.0  0.0      0     0 ?        S    15:01   0:00 [migration/2]
root          24  0.0  0.0      0     0 ?        S    15:01   0:00 [ksoftirqd/2]
root          26  0.0  0.0      0     0 ?        I<   15:01   0:00 [kworker/2:0H-kblockd]
root          27  0.0  0.0      0     0 ?        S    15:01   0:00 [cpuhp/3]
root          28  0.0  0.0      0     0 ?        S    15:01   0:00 [idle_inject/3]
root          29  0.0  0.0      0     0 ?        S    15:01   0:00 [migration/3]
root          30  0.0  0.0      0     0 ?        S    15:01   0:00 [ksoftirqd/3]
root          32  0.0  0.0      0     0 ?        I<   15:01   0:00 [kworker/3:0H-kblockd]
root          33  0.0  0.0      0     0 ?        S    15:01   0:00 [cpuhp/4]
root          34  0.0  0.0      0     0 ?        S    15:01   0:00 [idle_inject/4]
root          35  0.0  0.0      0     0 ?        S    15:01   0:00 [migration/4]
root          36  0.0  0.0      0     0 ?        S    15:01   0:00 [ksoftirqd/4]
root          38  0.0  0.0      0     0 ?        I<   15:01   0:00 [kworker/4:0H-kblockd]
root          39  0.0  0.0      0     0 ?        S    15:01   0:00 [cpuhp/5]
root          40  0.0  0.0      0     0 ?        S    15:01   0:00 [idle_inject/5]
root          41  0.0  0.0      0     0 ?        S    15:01   0:00 [migration/5]
root          42  0.0  0.0      0     0 ?        S    15:01   0:00 [ksoftirqd/5]
root          44  0.0  0.0      0     0 ?        I<   15:01   0:00 [kworker/5:0H-kblockd]
root          45  0.0  0.0      0     0 ?        S    15:01   0:00 [cpuhp/6]
root          46  0.0  0.0      0     0 ?        S    15:01   0:00 [idle_inject/6]
root          47  0.0  0.0      0     0 ?        S    15:01   0:00 [migration/6]
root          48  0.0  0.0      0     0 ?        S    15:01   0:00 [ksoftirqd/6]
root          50  0.0  0.0      0     0 ?        I<   15:01   0:00 [kworker/6:0H-kblockd]
root          51  0.0  0.0      0     0 ?        S    15:01   0:00 [cpuhp/7]
root          52  0.0  0.0      0     0 ?        S    15:01   0:00 [idle_inject/7]
root          53  0.0  0.0      0     0 ?        S    15:01   0:00 [migration/7]
root          54  0.0  0.0      0     0 ?        S    15:01   0:00 [ksoftirqd/7]
root          56  0.0  0.0      0     0 ?        I<   15:01   0:00 [kworker/7:0H-kblockd]
root          57  0.0  0.0      0     0 ?        S    15:01   0:00 [kdevtmpfs]
root          58  0.0  0.0      0     0 ?        I<   15:01   0:00 [netns]
root          59  0.0  0.0      0     0 ?        S    15:01   0:00 [rcu_tasks_kthre]
root          60  0.0  0.0      0     0 ?        S    15:01   0:00 [kauditd]
root          61  0.0  0.0      0     0 ?        S    15:01   0:00 [khungtaskd]
root          62  0.0  0.0      0     0 ?        S    15:01   0:00 [oom_reaper]
root          63  0.0  0.0      0     0 ?        I<   15:01   0:00 [writeback]
root          64  0.0  0.0      0     0 ?        S    15:01   0:00 [kcompactd0]
root          65  0.0  0.0      0     0 ?        SN   15:01   0:00 [ksmd]
```

...

```
root         791  0.0  0.0   2540   716 ?        Ss   15:01   0:00 /usr/sbin/acpid
root         797  0.0  0.0   9636  3196 ?        Ss   15:01   0:00 /usr/sbin/cron -f
root         799  0.0  0.0  29256  9992 ?        Ss   15:01   0:00 /usr/sbin/cupsd -l
root         802  0.0  0.0 262540 20256 ?        Ssl  15:01   0:01 /usr/sbin/NetworkManager --no-daemon
root         806  0.0  0.0   2500    76 ?        S<   15:01   0:00 /usr/sbin/atopacctd
root         810  0.0  0.0  81896  3704 ?        Ssl  15:01   0:00 /usr/sbin/irqbalance --foreground
root         813  0.0  0.0  40168 21012 ?        Ss   15:01   0:00 /usr/bin/python3 /usr/bin/networkd-dispatcher --run-startup-triggers
root         817  0.0  0.0 241408 12068 ?        Ssl  15:01   0:01 /usr/lib/policykit-1/polkitd --no-debug
root         827  0.0  0.1 1614496 43400 ?       Ssl  15:01   0:02 /usr/lib/snapd/snapd
root         831  0.0  0.0 235596  6176 ?        Ssl  15:01   0:00 /usr/libexec/switcheroo-control
root         836  0.0  0.0  17692  8488 ?        Ss   15:01   0:00 /lib/systemd/systemd-logind
root         838  0.0  0.0 126260  9456 ?        Ssl  15:01   0:00 /usr/sbin/thermald --systemd --dbus-enable --adaptive
root         847  0.0  0.0 394124 13080 ?        Ssl  15:01   0:00 /usr/lib/udisks2/udisksd
root         853  0.0  0.0  13680  4880 ?        Ss   15:01   0:00 /sbin/wpa_supplicant -u -s -O /run/wpa_supplicant
root         879  0.0  0.0  17168 16364 ?        S<Ls 15:01   0:02 /usr/bin/atop -R -w /var/log/atop/atop_20230221 600
root         892  0.0  0.0  14560  3096 ?        Ss   15:01   0:00 /usr/bin/vmware-usbarbitrator
root         908  0.0  0.0 181000 17752 ?        Ssl  15:01   0:00 /usr/sbin/cups-browsed
root         924  0.0  0.0 241372 11616 ?        Ssl  15:01   0:00 /usr/sbin/ModemManager
root         966  0.0  0.0      0     0 ?        I<   15:01   0:00 [iprt-VBoxWQueue]
root         970  0.0  0.0 239712  8644 ?        Ssl  15:01   0:00 /usr/sbin/gdm3
root         980  0.0  0.0      0     0 ?        S    15:01   0:00 [iprt-VBoxTscThr]
root         982  0.0  0.0  12284  6924 ?        Ss   15:01   0:00 sshd: /usr/sbin/sshd -D [listener] 0 of 10-100 startups
root        1066  0.0  0.0 118372 23116 ?        Ssl  15:01   0:00 /usr/bin/python3 /usr/share/unattended-upgrades/unattended-upgrade-shutdown --wait-for-signal
root        1118  0.0  0.0   6744  4324 ?        Ss   15:01   0:00 /usr/sbin/apache2 -k start
root        1299  0.0  0.0 252196  9660 ?        Ssl  15:01   0:00 /usr/lib/upower/upowerd
root        2082  0.0  0.0 167288  9772 ?        Sl   15:01   0:00 gdm-session-worker [pam/gdm-password]
root        4059  0.0  0.1 391432 33444 ?        Ssl  15:02   0:00 /usr/libexec/fwupd/fwupd
root        8077  0.0  0.0      0     0 ?        I    15:27   0:00 [kworker/4:1-events]
root        8080  0.0  0.0      0     0 ?        I    15:27   0:00 [kworker/5:2-events]
root        8704  0.0  0.0      0     0 ?        I    15:32   0:00 [kworker/4:0-events]
root        9237  0.0  0.0      0     0 ?        I    15:37   0:00 [kworker/3:1-cgroup_destroy]
root        9396  0.0  0.0      0     0 ?        I    15:39   0:00 [kworker/2:0-events]
root        9438  0.0  0.0      0     0 ?        I    15:39   0:00 [kworker/6:2-memcg_kmem_cache]
root        9792  0.0  0.0      0     0 ?        I    15:41   0:00 [kworker/1:1-events]
root       10226  0.0  0.0      0     0 ?        I    15:44   0:00 [kworker/5:0-cgroup_destroy]
root       10912  0.2  0.0      0     0 ?        I    16:03   0:05 [kworker/u16:3-events_unbound]
root       10990  0.0  0.0      0     0 ?        I    16:09   0:00 [kworker/0:0-events]
root       10993  0.0  0.0      0     0 ?        I    16:09   0:00 [kworker/3:2-mm_percpu_wq]
root       11010  0.1  0.0      0     0 ?        I    16:11   0:03 [kworker/u16:2-i915]
root       11134  0.2  0.0      0     0 ?        I    16:19   0:03 [kworker/7:6-cgroup_destroy]
root       11135  0.0  0.0      0     0 ?        I    16:19   0:00 [kworker/7:7-events]
root       11858  0.0  0.0      0     0 ?        I    16:30   0:00 [kworker/0:1-mm_percpu_wq]
root       11909  0.0  0.0      0     0 ?        I    16:30   0:00 [kworker/0:2-events]
root       11911  0.1  0.0      0     0 ?        I    16:30   0:00 [kworker/u16:1-events_unbound]
root       11966  0.0  0.0      0     0 ?        I    16:30   0:00 [kworker/1:3-events]
root       12143  0.0  0.0      0     0 ?        I    16:32   0:00 [kworker/5:1-mm_percpu_wq]
root       12144  0.0  0.0      0     0 ?        I    16:32   0:00 [kworker/2:3-events]
root       12145  0.2  0.0      0     0 ?        I    16:32   0:00 [kworker/7:0-mm_percpu_wq]
root       12421  0.0  0.0      0     0 ?        I    16:34   0:00 [kworker/6:0-memcg_kmem_cache]
root       12469  0.0  0.0      0     0 ?        I    16:34   0:00 [kworker/4:2-mm_percpu_wq]
root       12488  0.0  0.0      0     0 ?        I    16:34   0:00 [kworker/7:1]
root       12494  0.0  0.0      0     0 ?        I    16:34   0:00 [kworker/5:3]
root       12581  0.0  0.0      0     0 ?        I    16:35   0:00 [kworker/u16:0-i915]
root       12582  0.0  0.0      0     0 ?        I    16:35   0:00 [kworker/4:3-events]
root       12598  0.0  0.0      0     0 ?        I    16:36   0:00 [kworker/0:3-events]
root       12599  0.0  0.0      0     0 ?        I    16:36   0:00 [kworker/0:4-events]
root       12600  0.0  0.0      0     0 ?        I    16:36   0:00 [kworker/0:5-events]
student@itadmin-MP-ProDesk-600-G5-MT:~/Desktop/oslab_1$
```