Introduction to Operating System
Lab Report 1

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Submitted by:

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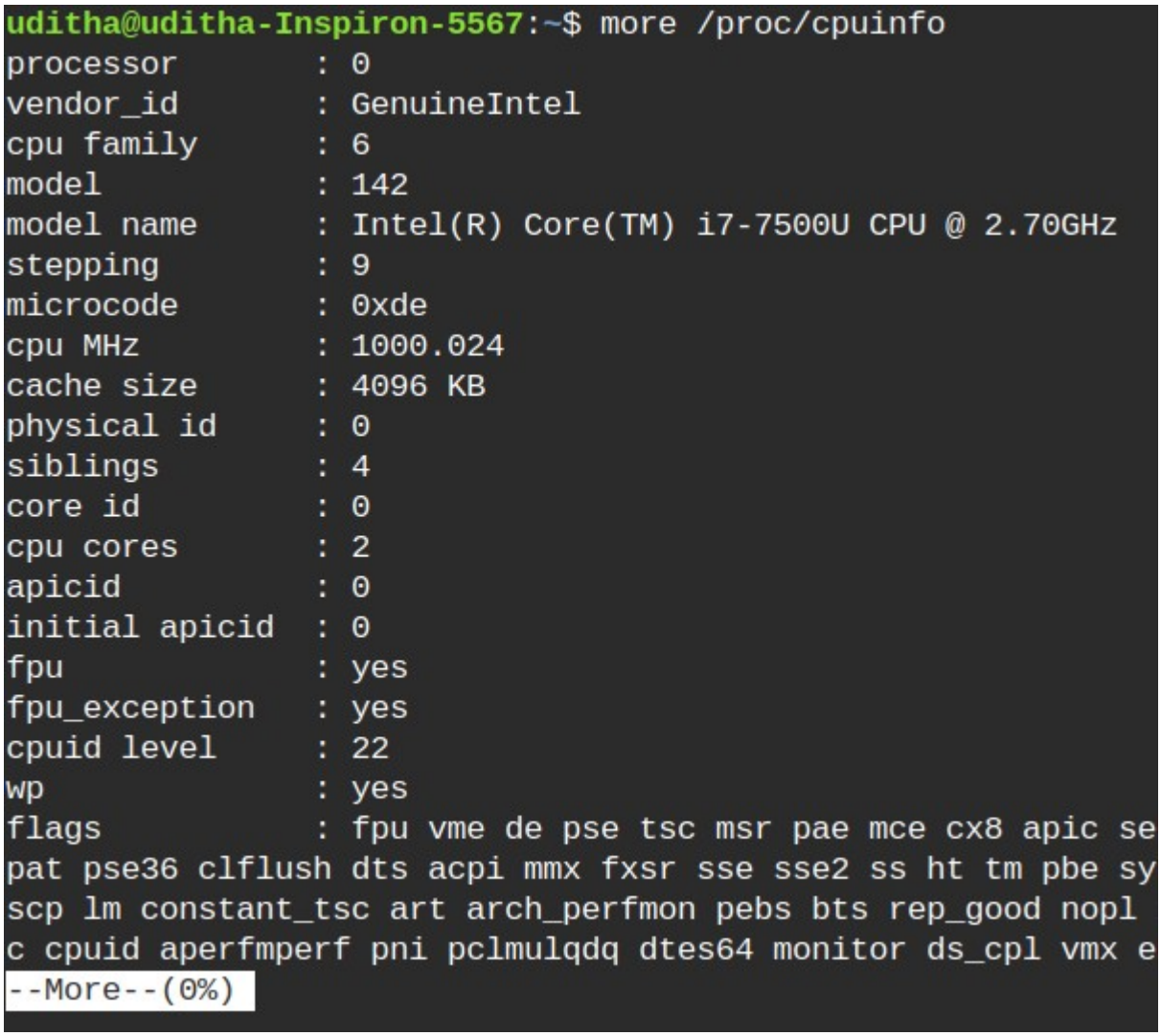
Exercise

1.



a. Cores is the no. of cores that the processsor have. Processor gives the a number to the processors the machine have which is like an id number.

b. cores=2

c. Processors=1

d. frequency of each processor=1000.024 MHz

e. physical memory= 4MB cache

f. free memory

g.total no. of forks since the boot up of this machine =0

h context switches the system has performed since startup =0

2.

```
top - 10:44:24 up  1:26,  1 user,  load average: 1.22, 1.20, 0.95
Tasks: 280 total,   2 running, 222 sleeping,   0 stopped,   0 zombie
%Cpu(s): 27.8 us,  0.9 sy,  0.0 ni, 69.1 id,  0.0 wa,  0.0 hi,  2.2 si,  0.0 st
KiB Mem :  7955572 total,  3133612 free,  2445172 used,  2376788 buff/cache
KiB Swap:  2097148 total,  2097148 free,        0 used.  4540620 avail Mem

  PID USER      PR  NI    VIRT    RES    SHR S  %CPU %MEM     TIME+ COMMAND
 4624 uditha    20   0    4380    864    800 R 100.0  0.0   1:53.09 cpu
 1972 uditha    20   0 4251196 378000 193684 S   5.0  4.8   2:41.95 gnome-shell
 4302 uditha    20   0 3026384 219024 131584 S   4.0  2.8   0:34.52 Web Content
 1255 uditha    20   0 2092836 134248  91136 S   1.7  1.7   1:40.07 Xorg
 3843 uditha    20   0 3629712 380348 192396 S   1.3  4.8   3:40.82 firefox
 3932 uditha    20   0 2627984 130800  96868 S   1.0  1.6   0:11.85 Privileged Cont
 3963 uditha    20   0 3237368 366028 124288 S   1.0  4.6   3:41.14 Web Content
  548 root     -51   0       0      0      0 S   0.7  0.0   0:05.14 irq/51-DELL0767
    1 root      20   0  225684   9316   6644 S   0.3  0.1   0:03.93 systemd
 3593 root      20   0       0      0      0 I   0.3  0.0   0:01.82 kworker/u8:14-e
 4672 uditha    20   0   44220   3984   3284 R   0.3  0.1   0:00.21 top
    2 root      20   0       0      0      0 S   0.0  0.0   0:00.00 kthreadd
    3 root       0 -20       0      0      0 I   0.0  0.0   0:00.00 rcu_gp
    4 root       0 -20       0      0      0 I   0.0  0.0   0:00.00 rcu_par_gp
    6 root       0 -20       0      0      0 I   0.0  0.0   0:00.00 kworker/0:0H-kb
    9 root       0 -20       0      0      0 I   0.0  0.0   0:00.00 mm_percpu_wq
   10 root      20   0       0      0      0 S   0.0  0.0   0:00.05 ksoftirqd/0
   11 root      20   0       0      0      0 I   0.0  0.0   0:01.95 rcu_sched
   12 root      rt   0       0      0      0 S   0.0  0.0   0:00.02 migration/0
   13 root     -51   0       0      0      0 S   0.0  0.0   0:00.00 idle_inject/0
   14 root      20   0       0      0      0 S   0.0  0.0   0:00.00 cpuhp/0
   15 root      20   0       0      0      0 S   0.0  0.0   0:00.00 cpuhp/1
   16 root     -51   0       0      0      0 S   0.0  0.0   0:00.00 idle_inject/1
   17 root      rt   0       0      0      0 S   0.0  0.0   0:00.12 migration/1
   18 root      20   0       0      0      0 S   0.0  0.0   0:00.07 ksoftirqd/1
```

(a)PID of the process running the cpu command is **4624**.
(b)This process consumes **100%** cpu and **0%** memory.
(c)Current state of the process is **Running.**

3.(a)

```
uditha@uditha-Inspiron-5567:/media/uditha/BECE3AFF4DF32F79/Operating Systems/Labs/Lab1/intro-code$ ps aux | grep 'cpu-print'
uditha    5285 55.7  0.0   4512   804 pts/1    S+   10:57   0:02 ./cpu-print
uditha@uditha-Inspiron-5567:/media/uditha/BECE3AFF4DF32F79/Operating Systems/Labs/Lab1/intro-code$ top

top - 10:58:41 up  1:40,  1 user,  load average: 3.17, 1.62, 1.13
Tasks: 280 total,   2 running, 224 sleeping,   0 stopped,   0 zombie
%Cpu(s): 21.1 us, 25.5 sy,  0.0 ni, 50.9 id,  1.3 wa,  0.0 hi,  1.3 si,  0.0 st
KiB Mem :  7955572 total,  2751484 free,  2768144 used,  2435944 buff/cache
KiB Swap:  2097148 total,  2097148 free,        0 used.  4186488 avail Mem

  PID USER      PR  NI    VIRT    RES    SHR S  %CPU %MEM     TIME+ COMMAND
 5101 uditha    20   0  763888  47512  30076 R  82.7  0.6   1:20.51 gnome-terminal-
 5285 uditha    20   0    4512    804    740 S  54.5  0.0   0:53.45 cpu-print
 3620 root      20   0       0      0      0 I  15.9  0.0   0:12.76 kworker/u8:40-e
 4673 root      20   0       0      0      0 I  14.6  0.0   0:06.08 kworker/u8:0-ev
 5287 root      20   0       0      0      0 I  12.3  0.0   0:11.96 kworker/u8:4-ev
 5255 root      20   0       0      0      0 I   8.0  0.0   0:10.52 kworker/u8:2-ev
 1972 uditha    20   0 4251240 381160 193768 S   6.3  4.8   3:40.31 gnome-shell
 1255 uditha    20   0 2093540 136196  93084 S   3.0  1.7   2:26.28 Xorg
 4302 uditha    20   0 3023636 287832 128312 S   3.0  3.6   1:06.23 Web Content
    1 root      20   0  225684   9316   6644 S   0.7  0.1   0:06.06 systemd
 5323 uditha    20   0   44232   4204   3488 R   0.7  0.1   0:00.12 top
```

(b) To find parent process we can use ps -F and ppid which it displays is the parent process id. Again using ps -F with ppid will give the parent of the parent. We can do this recursively to find all ancestors of the process.

```
uditha@uditha-Inspiron-5567:/media/uditha/BECE3AFF4DF32F79/8th Sem/Operating Sys
tems/Labs/Lab1/intro-code$ ps -F 12605
UID          PID  PPID  C    SZ   RSS PSR STIME TTY      STAT   TIME CMD
uditha     12605 12567 56  1128   792   1 13:11 pts/0    R+     0:25 ./cpu-print
uditha@uditha-Inspiron-5567:/media/uditha/BECE3AFF4DF32F79/8th Sem/Operating Sys
tems/Labs/Lab1/intro-code$ ps -F 12567
UID          PID  PPID  C    SZ   RSS PSR STIME TTY      STAT   TIME CMD
uditha     12567 12559  0  5844  5640   3 13:11 pts/0    Ss     0:00 bash
uditha@uditha-Inspiron-5567:/media/uditha/BECE3AFF4DF32F79/8th Sem/Operating Sys
tems/Labs/Lab1/intro-code$ ps -F 12559
UID          PID  PPID  C    SZ   RSS PSR STIME TTY      STAT   TIME CMD
uditha     12559  1220 72 181828 42704   3 13:11 ?        Rsl    1:03 /usr/lib/gnom
uditha@uditha-Inspiron-5567:/media/uditha/BECE3AFF4DF32F79/8th Sem/Operating Sys
tems/Labs/Lab1/intro-code$ ps -F 1220
UID          PID  PPID  C    SZ   RSS PSR STIME TTY      STAT   TIME CMD
uditha      1220     1  0 19345  8472   3 Mar22 ?        Ss     0:00 /lib/systemd/
uditha@uditha-Inspiron-5567:/media/uditha/BECE3AFF4DF32F79/8th Sem/Operating Sys
tems/Labs/Lab1/intro-code$ ps -F 1
UID          PID  PPID  C    SZ   RSS PSR STIME TTY      STAT   TIME CMD
root           1     0  0 56512  9756   1 Mar22 ?        Ss     0:41 /sbin/init sp
```

Another way to find ancestors is to use pstree -spa which gives all ansesors of the process till systemd. As shown below.

```
uditha@uditha-Inspiron-5567:/media/uditha/BECE3AFF4DF32F79/8th Sem/(
tems/Labs/Lab1/intro-code$ pstree -spa 12605
systemd,1 splash
  └─systemd,1220 --user
      └─gnome-terminal-,12559
          └─bash,12567
              └─cpu-print,12605
```

(c)when we use *./cpu-print > tmptmp.txt &* we get the following

```
uditha@uditha-Inspiron-5567:~$ ps -F 3147
UID          PID  PPID  C    SZ   RSS PSR STIME TTY      STAT   TIME CMD
uditha      3147  3103 50  1128   768   0 20:14 pts/1    D      0:21 ./cpu-print
uditha@uditha-Inspiron-5567:~$ ls -la /proc/3147/fd
total 0
dr-x------ 2 uditha uditha  0 Mar 22 20:15 .
dr-xr-xr-x 9 uditha uditha  0 Mar 22 20:14 ..
lrwx------ 1 uditha uditha 64 Mar 22 20:15 0 -> /dev/pts/1
l-wx------ 1 uditha uditha 64 Mar 22 20:15 1 -> /tmp/tmp.txt
lrwx------ 1 uditha uditha 64 Mar 22 20:15 2 -> /dev/pts/1
uditha@uditha-Inspiron-5567:~$
```

In the process the input (given by 0) is given by dev/pts/1 which is terminal 1. Output (given by 1) is written to tmp/tmp.txt which is a text file in /tmp directory. And if an error(given by 2) occurs in the process it will be displayed in dev/pts/1.

If we use only ./cpu-print we get the following. Which is all input,output and error are displayed in the terminal.

```
uditha@uditha-Inspiron-5567:~$ ls -la /proc/4039/fd
total 0
dr-x------ 2 uditha uditha  0 Mar 22 20:27 .
dr-xr-xr-x 9 uditha uditha  0 Mar 22 20:27 ..
lrwx------ 1 uditha uditha 64 Mar 22 20:27 0 -> /dev/pts/1
lrwx------ 1 uditha uditha 64 Mar 22 20:27 1 -> /dev/pts/1
lrwx------ 1 uditha uditha 64 Mar 22 20:27 2 -> /dev/pts/1
uditha@uditha-Inspiron-5567:~$
```

(d) ./cpu-print | grep hello & gives the following,

```
uditha@uditha-Inspiron-5567:~$ ps -F 4800
UID          PID  PPID  C    SZ   RSS PSR STIME TTY      STAT   TIME CMD
uditha      4800  4761 15  3608  1136   3 20:52 pts/1    S      0:05 grep --color=auto hello
uditha@uditha-Inspiron-5567:~$ ls -la /proc/4800/fd
total 0
dr-x------ 2 uditha uditha  0 Mar 22 20:53 .
dr-xr-xr-x 9 uditha uditha  0 Mar 22 20:52 ..
lr-x------ 1 uditha uditha 64 Mar 22 20:53 0 -> 'pipe:[70735]'
lrwx------ 1 uditha uditha 64 Mar 22 20:53 1 -> /dev/pts/1
lrwx------ 1 uditha uditha 64 Mar 22 20:53 2 -> /dev/pts/1
uditha@uditha-Inspiron-5567:~$ ps -F 4799
UID          PID  PPID  C    SZ   RSS PSR STIME TTY      STAT   TIME CMD
uditha      4799  4761 99  1128   796   3 20:52 pts/1    R      1:23 ./cpu-print
uditha@uditha-Inspiron-5567:~$ ls -la /proc/4799/fd
total 0
dr-x------ 2 uditha uditha  0 Mar 22 20:54 .
dr-xr-xr-x 9 uditha uditha  0 Mar 22 20:52 ..
lrwx------ 1 uditha uditha 64 Mar 22 20:54 0 -> /dev/pts/1
l-wx------ 1 uditha uditha 64 Mar 22 20:54 1 -> 'pipe:[70735]'
lrwx------ 1 uditha uditha 64 Mar 22 20:54 2 -> /dev/pts/1
uditha@uditha-Inspiron-5567:~$
```

In this case the output of process 4799 is given as the input of process 4800 which creating pipe [70735]. Pipe 70735 is the path which connects the output of process 4799 to input of process 4800.

(4)

VSZ is the virtual size allocated to process while rss is the size really physically allocated to the process in KB.

For memory1 process 8304 Kb is allocated virtually but only 792 Kb of that is physically allocated in RAM.

For memory2 process 8296 Kb is allocated virtually but only 3248 Kb of that is physically allocated in RAM.

```
uditha@uditha-Inspiron-5567:~$ ps -p 7366 -o pid,user,sz,rss,vsz,command
  PID USER        SZ   RSS    VSZ COMMAND
 7366 uditha    2076   792   8304 ./memory1
uditha@uditha-Inspiron-5567:~$ ps -p 7388 -o pid,user,sz,rss,vsz,command
  PID USER        SZ   RSS    VSZ COMMAND
 7388 uditha    2074  3248   8296 ./memory2
uditha@uditha-Inspiron-5567:~$
```