



CSEN 602: Operating Systems – Spring '18  
Mini-project I – Report

---

---

Team ID:22

{22}

---

Perihan Mohamed Kamel 37-4034  
Seif Eldin Ahmed AbdElMonsef 37-5628

## 1. Part I – System Calls

### 1.1 System Call #1:

- System call command: `ps aux`
- Output screenshot:

```

guest-pa1p6f@pery-VirtualBox:~$ /proc
bash: /proc: Is a directory
guest-pa1p6f@pery-VirtualBox:~$ /proc/{pid}
bash: /proc/{pid}: No such file or directory
guest-pa1p6f@pery-VirtualBox:~$ ps aux
bash: ps: No such file or directory
guest-pa1p6f@pery-VirtualBox:~$ ps aux
USER          PID %CPU %MEM    VSZ   RSS TTY      STAT START   TIME COMMAND
root            1  0.3  0.1 185324 5860 ?        Ss   18:52   0:01 [systemd]
root            2  0.0  0.0      0     0 ?        S    18:52   0:00 [kthreadd]
root            4  0.0  0.0      0     0 ?        S<   18:52   0:00 [kworker/0:0H]
root            5  0.0  0.0      0     0 ?        S    18:52   0:00 [kworker/u2:0]
root            6  0.0  0.0      0     0 ?        S    18:52   0:00 [ksoftirqd/0]
root            7  0.0  0.0      0     0 ?        S    18:52   0:00 [rcu_sched]
root            8  0.0  0.0      0     0 ?        S    18:52   0:00 [rcu_bh]
root            9  0.0  0.0      0     0 ?        S    18:52   0:00 [migration/0]
root           10  0.0  0.0      0     0 ?        S<   18:52   0:00 [lru-add-drain]
root           11  0.0  0.0      0     0 ?        S    18:52   0:00 [watchdog/0]
root           12  0.0  0.0      0     0 ?        S    18:52   0:00 [cpuhp/0]
root           13  0.0  0.0      0     0 ?        S    18:52   0:00 [kdevtmpfs]
root           14  0.0  0.0      0     0 ?        S<   18:52   0:00 [netns]
root           15  0.0  0.0      0     0 ?        S    18:52   0:00 [khungtaskd]
root           16  0.0  0.0      0     0 ?        S    18:52   0:00 [oom_reaper]
root           17  0.0  0.0      0     0 ?        S<   18:52   0:00 [writeback]
root           18  0.0  0.0      0     0 ?        S    18:52   0:00 [kcompactd0]
root           19  0.0  0.0      0     0 ?        SN   18:52   0:00 [ksmd]
root           20  0.0  0.0      0     0 ?        SN   18:52   0:00 [khugepaged]
root           21  0.0  0.0      0     0 ?        S<   18:52   0:00 [crypto]
root           22  0.0  0.0      0     0 ?        S<   18:52   0:00 [kintegrityd]
root           23  0.0  0.0      0     0 ?        S<   18:52   0:00 [bioset]
root           24  0.0  0.0      0     0 ?        S<   18:52   0:00 [kblockd]
root           25  0.0  0.0      0     0 ?        S<   18:52   0:00 [ata_sff]
root           26  0.0  0.0      0     0 ?        S<   18:52   0:00 [md]
root           27  0.0  0.0      0     0 ?        S<   18:52   0:00 [devfreq_wq]
root           28  0.0  0.0      0     0 ?        S<   18:52   0:00 [watchdogd]
root           29  0.0  0.0      0     0 ?        S    18:52   0:00 [kworker/u2:1]
root           30  0.0  0.0      0     0 ?        S    18:52   0:00 [kworker/0:1]
root           32  0.0  0.0      0     0 ?        S    18:52   0:00 [kauditd]

```

- Brief description of the output: *it showed us all the users' processes, show the process listed in a user oriented fashion and show us the processes not just attached to terminals but such as services as well, User for user owning the process, PID for process id, %cpu it is the cpu time used divided by the time the process has been running, %MEM is the ratio of the process's resident size to the physical memory of the machine, VSZ is the virtual memory usage of entire process, RSS is the resident set size, TTY is the Terminal, STAT is multi character process state, START is starting time or date of process, TIME is cumulative CPU time and COMMAND is the command with all its arguments.*

## 1.2 System Call #2:

- System call command: *top*
- Output screenshot:

```

guest-pa1p6f@pery-VirtualBox: ~
top - 19:30:03 up 37 min, 1 user, load average: 0.00, 0.02, 0.04
Tasks: 154 total, 2 running, 152 sleeping, 0 stopped, 0 zombie
%Cpu(s): 1.3 us, 0.3 sy, 0.0 ni, 97.7 id, 0.7 wa, 0.0 hi, 0.0 si, 0.0 st
KiB Mem : 3081224 total, 1429804 free, 908824 used, 742596 buff/cache
KiB Swap: 3148796 total, 3148796 free, 0 used, 1924180 avail Mem

  PID USER      PR  NI   VIRT   RES   SHR  S  %CPU  %MEM     TIME+ COMMAND
 1669 guest-p+  20   0 1273480 234792 76640 S   1.0   7.6   1:03.10 complz
 2394 guest-p+  20   0 595980 36276 28436 S   0.3   1.2   0:02.46 gnome-terminal-
 2428 guest-p+  20   0 48872 3696 3156 R   0.3   0.1   0:02.66 top
    1 root      20   0     0     0     0 S   0.0   0.0   0:01.56 systemd
    2 root      20   0     0     0     0 S   0.0   0.0   0:00.00 kthreadd
    4 root      20   0     0     0     0 S   0.0   0.0   0:00.00 kworker/0:0H
    6 root      20   0     0     0     0 S   0.0   0.0   0:00.14 ksoftirqd/0
    7 root      20   0     0     0     0 S   0.0   0.0   0:00.23 rcu_sched
    8 root      20   0     0     0     0 S   0.0   0.0   0:00.00 rcu_bh
    9 root      rt   0     0     0     0 S   0.0   0.0   0:00.00 migration/0
   10 root      0 -20    0     0     0 S   0.0   0.0   0:00.00 lru-add-drain
   11 root      rt   0     0     0     0 S   0.0   0.0   0:00.00 watchdog/0
   12 root      20   0     0     0     0 S   0.0   0.0   0:00.00 cpuhp/0
   13 root      20   0     0     0     0 S   0.0   0.0   0:00.00 kdevtmpfs
   14 root      0 -20    0     0     0 S   0.0   0.0   0:00.00 netns
   15 root      20   0     0     0     0 S   0.0   0.0   0:00.00 khungtaskd
   16 root      20   0     0     0     0 S   0.0   0.0   0:00.00 oom_reaper
   17 root      0 -20    0     0     0 S   0.0   0.0   0:00.00 writeback
   18 root      20   0     0     0     0 S   0.0   0.0   0:00.00 kcompactd0
   19 root      25   5     0     0     0 S   0.0   0.0   0:00.00 ksmd
   20 root      39  19     0     0     0 S   0.0   0.0   0:00.00 khugepaged
   21 root      0 -20    0     0     0 S   0.0   0.0   0:00.00 crypto
   22 root      0 -20    0     0     0 S   0.0   0.0   0:00.00 kintegrityd
   23 root      0 -20    0     0     0 S   0.0   0.0   0:00.00 bioset
   24 root      0 -20    0     0     0 S   0.0   0.0   0:00.00 kblockd
   25 root      0 -20    0     0     0 S   0.0   0.0   0:00.00 ata_sff
   26 root      0 -20    0     0     0 S   0.0   0.0   0:00.00 md
   27 root      0 -20    0     0     0 S   0.0   0.0   0:00.00 devfreq_wq
   28 root      0 -20    0     0     0 S   0.0   0.0   0:00.00 watchdogd
   32 root      20   0     0     0     0 R   0.0   0.0   0:00.11 kauditd
   33 root      20   0     0     0     0 S   0.0   0.0   0:00.00 kswapd0
  
```

Brief description of the output: The top program provides a dynamic real-time view of a running system. It can display system summary information as well as a list of processes or threads currently being managed by the Linux kernel. The types of system summary information shown and the types, order and size of information displayed for processes are all user configurable and that configuration can be made persistent across restarts.

## 1.3 System Call #3:

- System call command: *top*  
*Kill 2510*  
*top*
- Output screenshot:

```

top - 19:43:43 up 51 min, 1 user, load average: 0.30, 0.10, 0.03
Tasks: 155 total, 2 running, 153 sleeping, 0 stopped, 0 zombie
%Cpu(s): 12.0 us, 2.1 sy, 0.0 ni, 85.9 id, 0.0 wa, 0.0 hi, 0.0 si, 0.0 st
KiB Mem : 3081224 total, 1472672 free, 870820 used, 737732 buff/cache
KiB Swap: 3148796 total, 3148796 free, 0 used, 1968520 avail Mem

  PID USER      PR  NI   VIRT    RES    SHR  S  %CPU  %MEM   TIME+ COMMAND
 1669 guest-p+  20   0 1277592 238720 76636 S   8.3   7.7   1:25.03 complz
 2510 guest-p+  20   0 1938976 230268 92328 S   3.7   7.5   0:03.84 firefox
 839  root      20   0      0      0      0 S   2.3   0.0   0:16.96 Xorg
2394  guest-p+  20   0 596300 36216 28436 S   0.7   1.2   0:04.13 gnome-terminal-
 6  root      20   0      0      0      0 S   0.3   0.0   0:00.16 ksoftirqd/0
2574  guest-p+  20   0 48876 3672 3116 R   0.3   0.1   0:00.01 top
 1  root      20   0      0      0      0 S   0.0   0.0   0:01.56 systemd
 2  root      20   0      0      0      0 S   0.0   0.0   0:00.00 kthreadd
 4  root      20  -20      0      0      0 S   0.0   0.0   0:00.00 kworker/0:0H
 7  root      20   0      0      0      0 S   0.0   0.0   0:00.27 rcu_sched
 8  root      20   0      0      0      0 S   0.0   0.0   0:00.00 rcu_bh
 9  root      rt    0      0      0      0 S   0.0   0.0   0:00.00 migration/0
10  root      0 -20      0      0      0 S   0.0   0.0   0:00.00 lru-add-drain
11  root      rt    0      0      0      0 S   0.0   0.0   0:00.00 watchdog/0
12  root      20   0      0      0      0 S   0.0   0.0   0:00.00 cpuhp/0
13  root      20   0      0      0      0 S   0.0   0.0   0:00.00 kdevtmpfs
14  root      0 -20      0      0      0 S   0.0   0.0   0:00.00 netns
15  root      20   0      0      0      0 S   0.0   0.0   0:00.00 khungtaskd
16  root      20   0      0      0      0 S   0.0   0.0   0:00.00 oom_reaper
17  root      0 -20      0      0      0 S   0.0   0.0   0:00.00 writeback
18  root      20   0      0      0      0 S   0.0   0.0   0:00.00 kcompactd0
19  root      25   5      0      0      0 S   0.0   0.0   0:00.00 ksm
20  root      39  19      0      0      0 S   0.0   0.0   0:00.81 khugepaged
21  root      0 -20      0      0      0 S   0.0   0.0   0:00.00 crypto
22  root      0 -20      0      0      0 S   0.0   0.0   0:00.00 kintegrityd
23  root      0 -20      0      0      0 S   0.0   0.0   0:00.00 bioset
24  root      0 -20      0      0      0 S   0.0   0.0   0:00.00 kblockd
25  root      0 -20      0      0      0 S   0.0   0.0   0:00.00 ata_sff
26  root      0 -20      0      0      0 S   0.0   0.0   0:00.00 md
27  root      0 -20      0      0      0 S   0.0   0.0   0:00.00 devfreq_wq
28  root      0 -20      0      0      0 S   0.0   0.0   0:00.00 watchdogd

```

```

top - 19:45:07 up 52 min, 1 user, load average: 0.08, 0.07, 0.02
Tasks: 153 total, 2 running, 151 sleeping, 0 stopped, 0 zombie
%Cpu(s): 3.0 us, 0.3 sy, 0.0 ni, 94.3 id, 2.3 wa, 0.0 hi, 0.0 si, 0.0 st
KiB Mem : 3081224 total, 1619444 free, 728200 used, 733580 buff/cache
KiB Swap: 3148796 total, 3148796 free, 0 used, 2115428 avail Mem

  PID USER      PR  NI   VIRT    RES    SHR  S  %CPU  %MEM   TIME+ COMMAND
 1669 guest-p+  20   0 1277592 238720 76636 S   2.0   7.7   1:26.93 complz
 839  root      20   0      0      0      0 S   0.7   0.0   0:17.39 Xorg
2394  guest-p+  20   0 596300 36220 28436 S   0.3   1.2   0:04.29 gnome-terminal-
2578  guest-p+  20   0 48876 3764 3212 R   0.3   0.1   0:00.01 top
 1  root      20   0      0      0      0 S   0.0   0.0   0:01.56 systemd
 2  root      20   0      0      0      0 S   0.0   0.0   0:00.00 kthreadd
 4  root      20  -20      0      0      0 S   0.0   0.0   0:00.00 kworker/0:0H
 6  root      20   0      0      0      0 S   0.0   0.0   0:00.16 ksoftirqd/0
 7  root      20   0      0      0      0 S   0.0   0.0   0:00.28 rcu_sched
 8  root      20   0      0      0      0 S   0.0   0.0   0:00.00 rcu_bh
 9  root      rt    0      0      0      0 S   0.0   0.0   0:00.00 migration/0
10  root      0 -20      0      0      0 S   0.0   0.0   0:00.00 lru-add-drain
11  root      rt    0      0      0      0 S   0.0   0.0   0:00.00 watchdog/0
12  root      20   0      0      0      0 S   0.0   0.0   0:00.00 cpuhp/0
13  root      20   0      0      0      0 S   0.0   0.0   0:00.00 kdevtmpfs
14  root      0 -20      0      0      0 S   0.0   0.0   0:00.00 netns
15  root      20   0      0      0      0 S   0.0   0.0   0:00.00 khungtaskd
16  root      20   0      0      0      0 S   0.0   0.0   0:00.00 oom_reaper
17  root      0 -20      0      0      0 S   0.0   0.0   0:00.00 writeback

```

- Brief description of the output: *the firefox process was found in the process table from the TOP system call and when I call Kill and the ID of the firefox and then called TOP again the process of firefox is not found anymore because of the kill system call.*

## 2. Part II – Directory Duplication Process in C

```
#include <sys/types.h>
```

```
#include <sys/stat.h>
```

```
#include <unistd.h>
```

```
#include <stdio.h>
```

```
#include <string.h>
```

```
#include <stdlib.h>
```

```
/*
```

```
Other include statements may be needed !
```

```
*/
```

```
int main() {
```

```
char path[50];
```

```
printf("Please enter your path\n");
```

```
scanf("%s",path);
```

```
char name[50];
```

```
printf("Please enter the directory name\n");
```

```
scanf("%s",name);
```

```
char pa[50];  
strcpy(pa,path);  
strcat(pa,"/");
```

```
strcat(pa,name);
```

```
// char * directoryName = argv[1]; /* Directory name to be created */
```

```
struct stat st = {0};
```

```
if (stat(pa, &st) == -1) {  
    mkdir(pa, 0700);  
}  
else  
{ int a;  
    char final[300];  
    for( a = 1; a < 20; a++){  
        char s[200] ;  
        char *str = pa;  
        char buf[30];  
        sprintf(buf,"%d",a);  
        strcpy(final,pa);  
        strcat(final,buf);  
        printf("%s",final);
```

```
if (stat(final, &st) == -1) {
```

```
mkdir(final, 0700);  
break;  
}  
}  
}  
  
/*  
    Rest of implementation goes here  
*/  
  
}
```

*Make sure to convert this file to PDF*