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Session 3 Report #1

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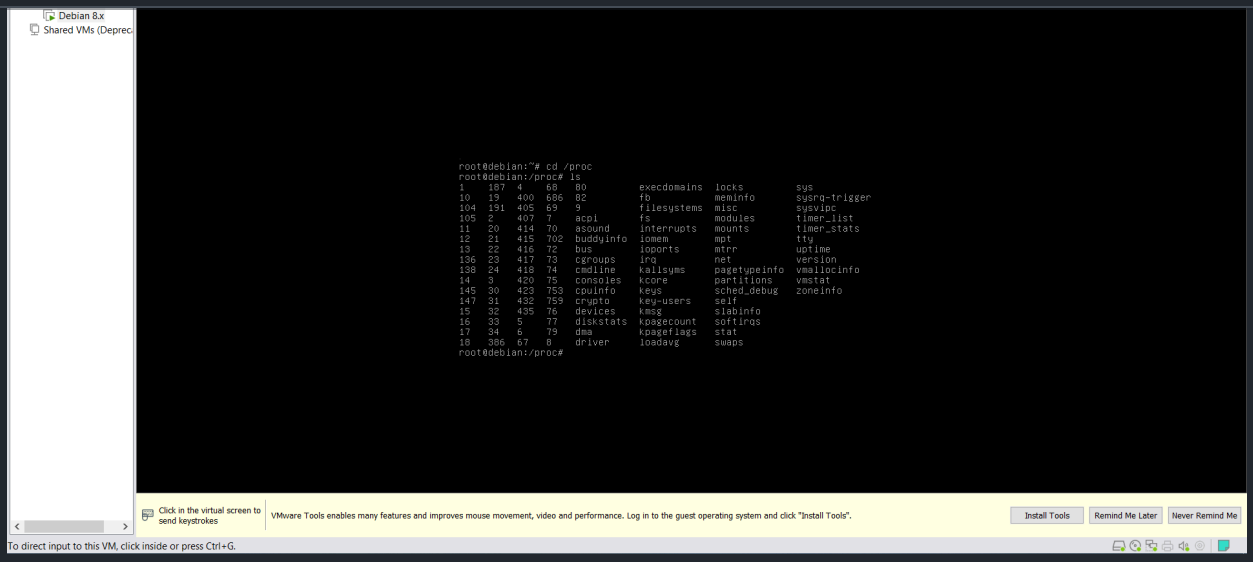
- [x] Read Session Contents.

Section 3.3.1

- [x] Investigate the /proc/ directory
    i. First, we choose Debian 8. Second, with `cd /proc` we entered to /proc branch and then with `ls` we can see the files in this branch.



Better quality:

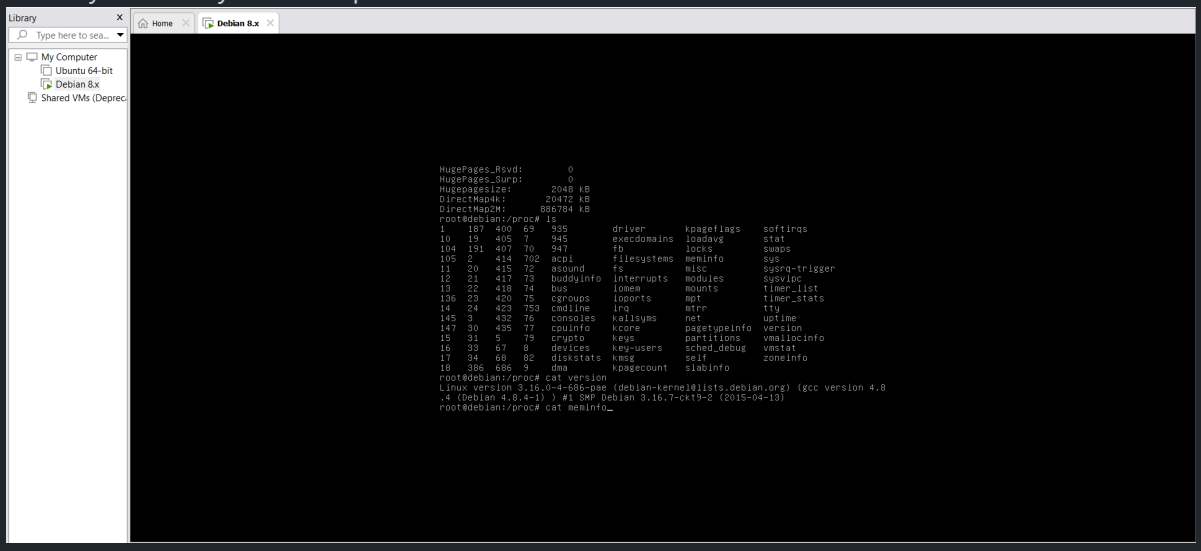
```
root@debian:~# cd /proc
root@debian:/proc# ls
1     187  4     68    80          execdomains  locks          sys
10    19   400   686   82          fb           meminfo        sysrq-trigger
104   191  405   69    9           filesystems  misc           sysvipc
105   2    407   7     acpi        fs           modules        timer_list
11    20   414   70    asound      interrupts   mounts         timer_stats
12    21   415   702   buddyinfo   iomem        mpt            tty
13    22   416   72    bus         ioports      mtrr           uptime
136   23   417   73    cgroups     irq          net            version
138   24   418   74    cmdline     kallsyms     pagetypeinfo   vmallocinfo
14    3    420   75    consoles    kcore        partitions     vmstat
145   30   423   753   cpuinfo     keys         sched_debug    zoneinfo
147   31   432   759   crypto      key-users    self
15    32   435   76    devices     kmsg         slabinfo
16    33   5     77    diskstats   kpagecount   softirqs
17    34   6     79    dma         kpageflags   stat
18    386  67    8     driver      loadavg      swaps
root@debian:/proc# _
```

Section 3.3.2

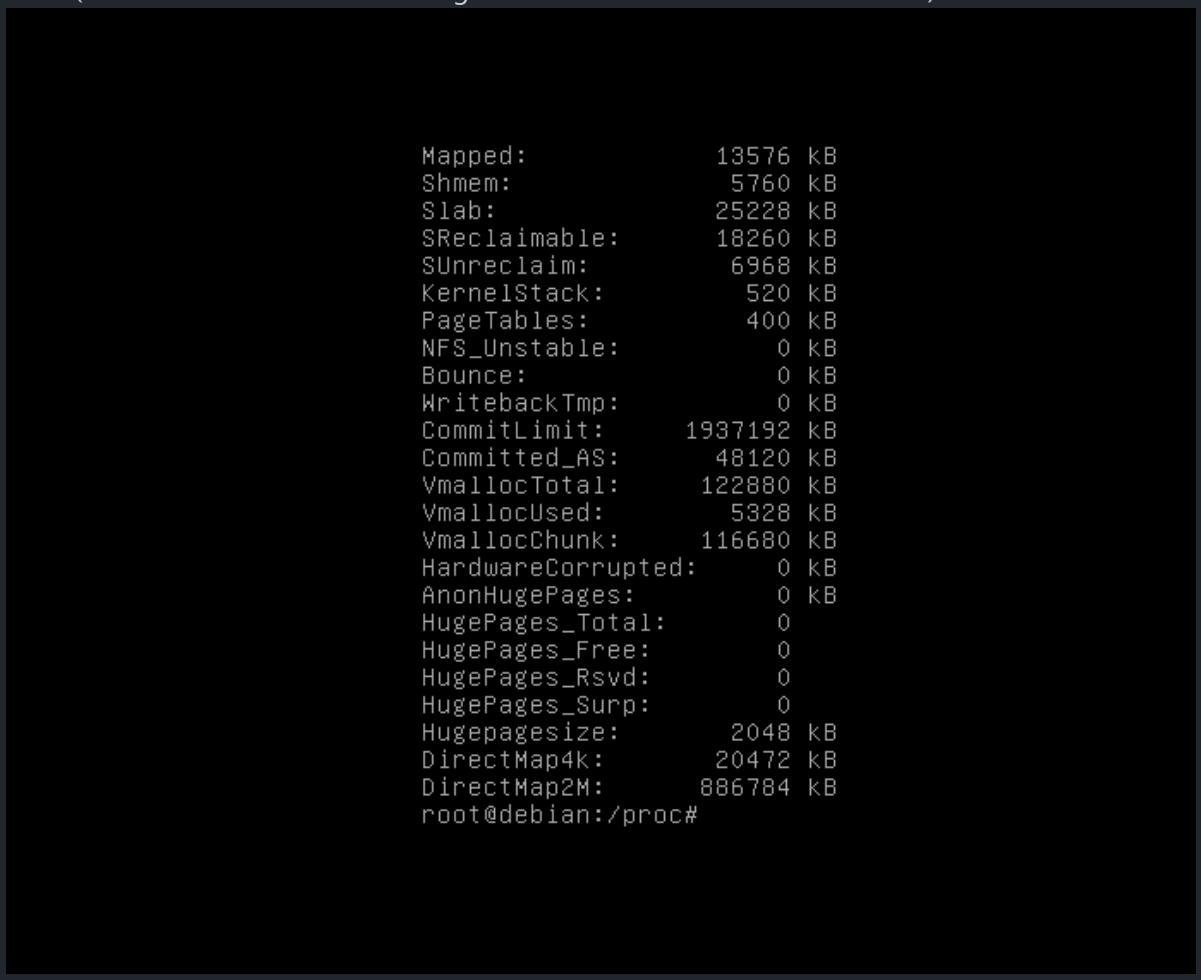
- [x] Do 5 subtasks from 1 to 5:
  - [x] with `cat version` we have:

```
root@debian:/proc# cat version
Linux version 3.16.0-4-686-pae (debian-kernel@lists.debian.org) (gcc version 4.8
.4 (Debian 4.8.4-1) ) #1 SMP Debian 3.16.7-ckt9-2 (2015-04-13)
root@debian:/proc# _
```

meminfo provides information about memory usage, including total memory, free memory, and memory
used by various system components.



result(notice that it is not all the things it contains because I cannot scroll it):



Use `cat meminfo | head -n 10` to see the first lines:

```
MemAvailable:    1922512 kB
Buffers:           27472 kB
Cached:            52484 kB
SwapCached:            0 kB
Active:            62384 kB
Inactive:          29504 kB
Active(anon):      12240 kB
Inactive(anon):     5448 kB
root@debian:/proc#
```

For second one I choose uptime with `cat uptime`. First value is the seconds which system has been running since last
poweroff and the second value is the sum of how much time each core has spent idle in seconds. The
second value may be greater than the overall system uptime on systems with multiple cores. You can see the result:

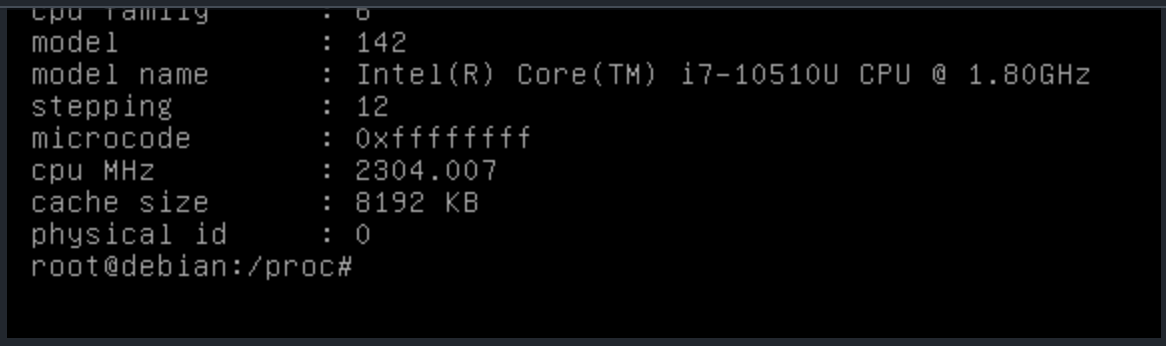
```
Slab:              25228 kB
SReclaimable:      18260 kB
SUnreclaim:         6968 kB
KernelStack:         520 kB
PageTables:          400 kB
NFS_Unstable:          0 kB
Bounce:                0 kB
WritebackTmp:          0 kB
CommitLimit:     1937192 kB
Committed_AS:      48120 kB
VmallocTotal:     122880 kB
VmallocUsed:        5328 kB
VmallocChunk:     116680 kB
HardwareCorrupted:     0 kB
AnonHugePages:         0 kB
HugePages_Total:       0
HugePages_Free:        0
HugePages_Rsvd:        0
HugePages_Surp:        0
Hugepagesize:       2048 kB
DirectMap4k:       20472 kB
DirectMap2M:      886784 kB
root@debian:/proc# cat uptime
1866.97 1843.64
root@debian:/proc# _
```

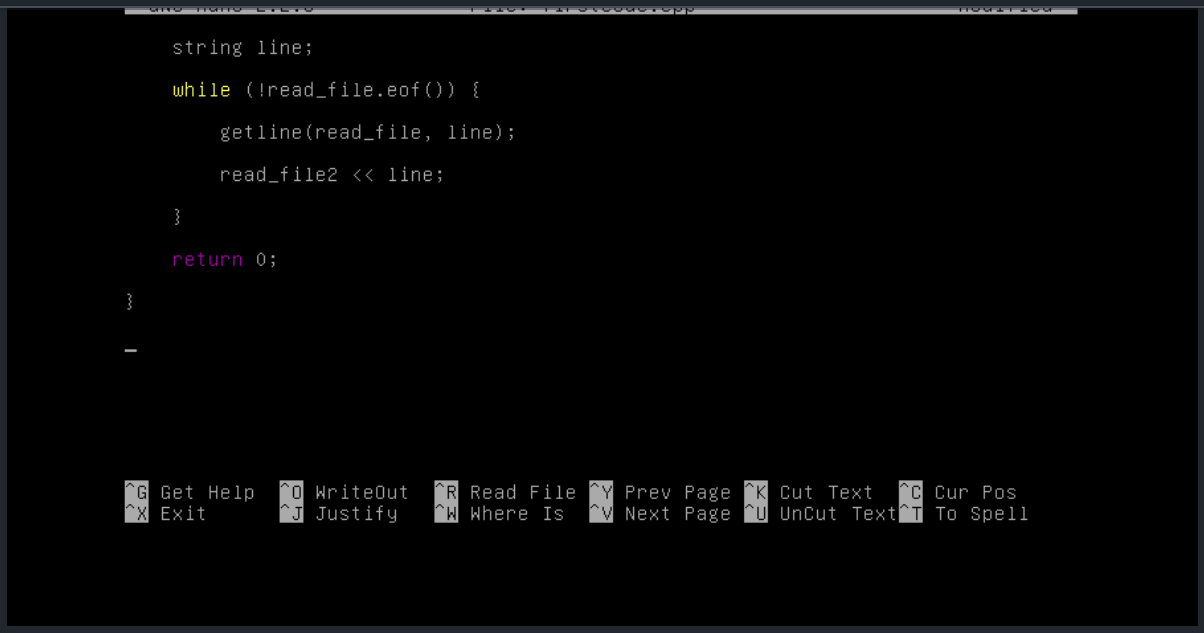
I choose one more. cpuinfo with `cat cpuinfo` contains information about the CPU(s) installed on the system, such as processor type, model, number of cores. As I have scrolling probelm, I use `cat cpuinfo | head -n 10` to see the first lines of the result, too:

```
SReclaimable:      18260 kB
SUnreclaim:         6968 kB
KernelStack:         520 kB
PageTables:          400 kB
NFS_Unstable:          0 kB
Bounce:                0 kB
WritebackTmp:          0 kB
CommitLimit:     1937192 kB
Committed_AS:      48120 kB
VmallocTotal:     122880 kB
VmallocUsed:        5328 kB
VmallocChunk:     116680 kB
HardwareCorrupted:     0 kB
AnonHugePages:         0 kB
HugePages_Total:       0
HugePages_Free:        0
HugePages_Rsvd:        0
HugePages_Surp:        0
Hugepagesize:       2048 kB
DirectMap4k:       20472 kB
DirectMap2M:      886784 kB
root@debian:/proc# cat uptime
1866.97 1843.64
root@debian:/proc# cat cpuinfo_
```

```
siblings        : 1
core id         : 0
cpu cores       : 1
apicid          : 0
initial apicid  : 0
fdiv_bug        : no
f00f_bug        : no
coma_bug        : no
fpu             : yes
fpu_exception   : yes
cpuid level     : 22
wp              : yes
flags           : fpu vme de pse tsc msr pae mce cx8 apic sep mtrr pge mca cmov
pat pse36 clflush mmx fxsr sse sse2 ss nx pdpe1gb rdtscp lm constant_tsc arch_pe
rfmon xtopology tsc_reliable nonstop_tsc eagerfpu pni pclmulqdq ssse3 fma cx16 p
cid sse4_1 sse4_2 x2apic movbe popcnt tsc_deadline_timer aes xsave avx f16c rdra
nd hypervisor lahf_lm abm 3dnowprefetch arat xsaveopt fsgsbase tsc_adjust bmi1 a
vx2 smep bmi2 invpcid rdseed adx smap clflushopt
bogomips        : 4608.01
clflush size    : 64
cache_alignment : 64
address sizes   : 45 bits physical, 48 bits virtual
power management:

root@debian:/proc#
```


cpu family : 6
model : 142
model name : Intel(R) Core(TM) i7-10510U CPU @ 1.80GHz
stepping : 12
microcode : 0xffffffff
cpu MHz : 2304.007
cache size : 8192 KB
physical id : 0
root@debian:/proc#



The complete code is:

```cpp
#include <bits/stdc++.h>

using namespace std;

int main() {
    fstream read_file;
    read_file.open("/proc/version", ios::in);
    if (!read_file.is_open()) {
        perror("Error!");
        return 1;
    }
    fstream read_file2;
    read_file2.open("./Linux Version.txt", ios::out | ios::app);
    if (!read_file2.is_open()) {
        perror("Error!");
        return 1;
    }
    string line;
    while (!read_file.eof()) {
        getline(read_file, line);
        read_file2 << line;
    }
    return 0;
}
```

can see the result:

```
root@debian:/#
root@debian:/# g++ firstcode.cpp -o firstcode
root@debian:/# ./firstcode
root@debian:/# ls
bin   firstcode      initrd.img.old     lost+found  proc  srv  var
boot  firstcode.cpp  lib                media       root  sys  vmlinuz
dev   home           Linux Version.txt  mnt         run   tmp  vmlinuz.old
etc   initrd.img     live-build         opt         sbin  usr
root@debian:/# cat Linux\ Version.txt
Linux version 3.16.0-4-686-pae (debian-kernel@lists.debian.org) (gcc version 4.8
.4 (Debian 4.8.4-1) ) #1 SMP Debian 3.16.7-ckt9-2 (2015-04-13)root@debian:/# _
```

- [x] We would get an error because /proc/version is a `read only` file and you cannot write on it.

```
root@debian:/proc# echo "I am AmirReza" > version
bash: echo: write error: Input/output error
root@debian:/proc#
```

Section 3.3.3

- [x] Write (in English or Persian) about each file in /proc/(PID) directory:

First you see contents of /proc:

```
root@debian:/proc# ls
1       1522   23489  418  79          diskstats    kpagecount    softirqs
10      16     23497  423  8           dma          kpageflags    stat
1010    17     23498  435  82          driver       loadavg       swaps
1011    1708   2367   5    9           execdomains  locks         sys
1015    18     23825  67   9693        fb           meminfo       sysrq-trigger
1016    187    23827  68   984         filesystems  misc          sysvipc
104     19     24     69   acpi        fs           modules       timer_list
10418   191    3      7    asound      interrupts   mounts        timer_stats
105     2      30     70   buddyinfo   iomem        mpt           tty
11      20     31     702  bus         ioports      mtrr          uptime
12      21     33     72   cgroups     irq          net           version
13      21561  3675   73   cmdline     kallsyms     pagetypeinfo  vmallocinfo
136     23     400    75   consoles    kcore        partitions    vmstat
14      23389  405    753  cpuinfo     keys         sched_debug   zoneinfo
145     23404  407    76   crypto      key-users    self
15      23475  414    77   devices     kmsg         slabinfo
root@debian:/proc#
```

Then, we choose process 1:

```
1010   17     23498  435  82          driver       loadavg       swaps
1011   1708   2367   5    9           execdomains  locks         sys
1015   18     23825  67   9693        fb           meminfo       sysrq-trigger
1016   187    23827  68   984         filesystems  misc          sysvipc
104    19     24     69   acpi        fs           modules       timer_list
10418  191    3      7    asound      interrupts   mounts        timer_stats
105    2      30     70   buddyinfo   iomem        mpt           tty
11     20     31     702  bus         ioports      mtrr          uptime
12     21     33     72   cgroups     irq          net           version
13     21561  3675   73   cmdline     kallsyms     pagetypeinfo  vmallocinfo
136    23     400    75   consoles    kcore        partitions    vmstat
14     23389  405    753  cpuinfo     keys         sched_debug   zoneinfo
145    23404  407    76   crypto      key-users    self
15     23475  414    77   devices     kmsg         slabinfo
root@debian:/proc# cd 1
root@debian:/proc/1# ls
attr             cpuset    limits      net            root       status
autogroup        cwd       loginuid    ns             sched      syscall
auxv             environ   map_files   oom_adj        sessionid  task
cgroup           exe       maps        oom_score      setgroups  timers
clear_refs       fd        mem         oom_score_adj  smaps      uid_map
cmdline          fdinfo    mountinfo   pagemap        stack      wchan
comm             gid_map   mounts      personality    stat
coredump_filter  io        mountstats  projid_map     statm
root@debian:/proc/1#
```

After that for cmdline the result is:

```
root@debian:/proc/1# cat cmdline
/lib/systemd/systemd--system--deserialize17root@debian:/proc/1#
```

ii. `environ` : This file contains the initial environment that was set when the currently executing program was started

via execve. It Represented as a null-separated list of strings. Each string represents an environment variable in the format name=value, and the list is terminated by an additional null character.

```
root@debian:/proc/1# cat environ
SHLVL=1HOME=/init=/sbin/initTERM=linuxdrop_caps=BOOT_IMAGE=/boot/vmlinuz-3.16.0-
4-686-paePATH=/sbin:/usr/sbin:/bin:/usr/bininitrd=/install/initrd.gzPWD=/rootmnt
=/rootroot@debian:/proc/1# _
```

```
1 (systemd) S 0 1 1 0 -1 4202752 32047 189866 41 308 146 223 126 318 20 0 1 0 8
23134208 957 4294967295 3076435968 3077682088 3218410400 3218408320 3075501964 0
 671173123 4096 1260 3239730448 0 0 17 0 0 0 9 0 0 3077687744 3077755068 3086626
816 3218415368 3218415415 3218415415 3218415591 0
root@debian:/proc/1# _
```

```
root@debian:/proc/1# cat status | head -n 15
Name:   systemd
State:  S (sleeping)
Tgid:   1
Ngid:   0
Pid:    1
PPid:   0
TracerPid:      0
Uid:    0       0       0       0
Gid:    0       0       0       0
FDSize: 256
Groups:
VmPeak:    23616 kB
VmSize:    22592 kB
VmLck:         0 kB
VmPin:         0 kB
root@debian:/proc/1#
```

And other lines:

```
VmData:    18444 kB
VmStk:       136 kB
VmExe:      1220 kB
VmLib:      2616 kB
VmPTE:        32 kB
VmSwap:        0 kB
Threads:       1
SigQ:   0/16074
SigPnd: 0000000000000000
ShdPnd: 0000000000000000
SigBlk: 7be3c0fe28014a03
SigIgn: 0000000000001000
SigCgt: 00000001800004ec
CapInh: 0000000000000000
CapPrm: 000000ffffffffff
CapEff: 000000ffffffffff
CapBnd: 000000ffffffffff
Seccomp:       0
Cpus_allowed:   1
Cpus_allowed_list:      0
Mems_allowed:   1
Mems_allowed_list:      0
voluntary_ctxt_switches:        1837
nonvoluntary_ctxt_switches:     29898
root@debian:/proc/1#
```

```
5648 957 702 305 0 4645 0
root@debian:/proc/1# _
```

vi. `cwd` : This file is a symbolic link that points to the current working directory of the process. The current
working directory is the directory from which the process was started or the directory it was in when it started execution.

```
root@debian:/proc/1# cat cwd
cat: cwd: Is a directory
root@debian:/proc/1#
```

vii. `exe` : Contents of /proc/[PID]/exe will provide you with the absolute path to the executable file associated with the process. This can be useful for identifying the program that a particular process represents.

```
root@debian:/proc/1# readlink -v ./exe
/lib/systemd/systemd
root@debian:/proc/1# _
```

viii. `root` : Provide you with the absolute path of the root directory for the filesystem that the process sees. Actually, this file is a symbolic link that points to the process's root directory, and behaves in the same way as exe.

```
root@debian:/proc/1# file root
root: symbolic link to /
root@debian:/proc/1# readlink -v root
/
root@debian:/proc/1#
```

- [x] Place your script for shwoing PID of running porcesses and their name here:

```
  GNU nano 2.2.6                File: 2.sh

#!/bin/bash

for pid in /proc/[0-9]*; do
        if [ -d "$pid" ]; then
                pid_number=$(basename "$pid")

                if [ -f "$pid/comm" ]; then
                        name=$(cat "$pid/comm")
                        echo "PID: $pid_number Name: $name"
                fi
        fi
done

                        [ Read 12 lines ]
^G Get Help  ^O WriteOut  ^R Read File ^Y Prev Page ^K Cut Text  ^C Cur Pos
^X Exit      ^J Justify   ^W Where Is  ^V Next Page ^U UnCut Text^T To Spell
```

Because of my scrolling problem, I show you first 20 lines and final lines:

```
root@debian:/# bash 2.sh | head -n 20
PID: 1 Name: systemd
PID: 10 Name: watchdog/0
PID: 1010 Name: nano
PID: 1011 Name: nano
PID: 1015 Name: su
PID: 1016 Name: bash
PID: 104 Name: jbd2/sda1-8
PID: 10418 Name: exim4
PID: 105 Name: ext4-rsv-conver
PID: 11 Name: khelper
PID: 12 Name: kdevtmpfs
PID: 13 Name: netns
PID: 136 Name: kauditd
PID: 14 Name: khungtaskd
PID: 145 Name: systemd-journal
PID: 15 Name: writeback
PID: 1522 Name: cron
PID: 16 Name: ksmd
PID: 17 Name: khugepaged
PID: 1708 Name: bluetoothd
root@debian:/#
```

```
PID: 414 Name: rpc.idmapd
PID: 418 Name: atd
PID: 423 Name: dbus-daemon
PID: 435 Name: login
PID: 5 Name: kworker/0:0H
PID: 67 Name: ata_sff
PID: 68 Name: mpt_poll_0
PID: 69 Name: khubd
PID: 7 Name: rcu_sched
PID: 70 Name: mpt/0
PID: 702 Name: dhclient
PID: 72 Name: scsi_eh_0
PID: 73 Name: scsi_tmf_0
PID: 75 Name: scsi_eh_1
PID: 753 Name: bash
PID: 76 Name: scsi_tmf_1
PID: 77 Name: scsi_eh_2
PID: 79 Name: scsi_tmf_2
PID: 8 Name: rcu_bh
PID: 82 Name: kworker/0:1H
PID: 9 Name: migration/0
PID: 9693 Name: rsyslogd
PID: 984 Name: nano
root@debian:/#
```

I wrote another script too but it shows all the processes:

```
  GNU nano 2.2.6                File: 3.sh

!/bin/bash
ps  -eo pid,comm --no-headers | awk '{print $1,$2}'
```

Result:

```
2 kthreadd
3 ksoftirqd/0
5 kworker/0:0H
7 rcu_sched
8 rcu_bh
9 migration/0
10 watchdog/0
11 khelper
12 kdevtmpfs
13 netns
14 khungtaskd
15 writeback
16 ksmd
17 khugepaged
18 crypto
19 kintegrityd
20 bioset
21 kblockd
23 kswapd0
root@debian:/# _
```

```
1010 nano
1011 nano
1015 su
1016 bash
1522 cron
1708 bluetoothd
2367 sshd
3675 nano
9693 rsyslogd
10418 exim4
21561 systemd-udevd
23389 kworker/u2:0
23404 kworker/u2:2
23523 cat
23535 cat
23545 cat
23590 kworker/0:1
23825 systemd-logind
23827 rpcbind
24687 kworker/0:0
24702 kworker/0:2
24703 bash
24705 ps
24706 awk
root@debian:/# _
```

- [x] Place your source code for a program that shows details of a program by receiving PID:

```
 GNU nano 2.2.6              File: secondcode.sh                    Modified

#!bin/bash

echo "pocess info for pid $1"
process_name=$(awk '{print $2}' /proc/$1/stat)
echo "pocess name : $process_name"
process_status=$(awk '{print $3}' /proc/$1/stat)
echo "pocess status: $process_status"
memory_usage=$(awk '{print $24}' /proc/$1/stat)
echo "memory usage : $memory_usage pages"
uid=$(awk '{print $8}' /proc/$1/stat)
gid=$(awk '{print $9}' /proc/$1/stat)
echo "user id: $uid, group id: $gid"

thread_number=$(awk '{print$20}' /proc/$1/stat)
echo "number of threads : $thread_number"

command_line=$(tr '\0' ' ' < /proc/$1/cmdline)
echo "Command line: $command_line"


^G Get Help  ^O WriteOut  ^R Read File ^Y Prev Page ^K Cut Text  ^C Cur Pos
^X Exit      ^J Justify   ^W Where Is  ^V Next Page ^U UnCut Text^T To Spell
```

Some results for some pids:

```
root@debian:/# bash secondcode.sh 753
pocess info for pid 753
pocess name : (bash)
pocess status: S
memory usage : 1096 pages
user id: 24854, group id: 4202752
number of threads : 1
Command line: -bash
root@debian:/#
```

```
root@debian:/# bash secondcode.sh 30
pocess info for pid 30
pocess name : (kthrotld)
pocess status: S
memory usage : 0 pages
user id: -1, group id: 69247072
number of threads : 1
Command line:
root@debian:/# _
```

```
root@debian:/# bash secondcode.sh 1
pocess info for pid 1
pocess name : (systemd)
pocess status: S
memory usage : 957 pages
user id: -1, group id: 4202752
number of threads : 1
Command line: /lib/systemd/systemd --system --deserialize 17
root@debian:/# _
```

Now, CPP:

```
    string comm = "/proc/" + pid + "/comm";
    string name = readinggg(comm);
    cout << "Name: " << name << endl;
    string memory = memreadd(pid);
    vector<string> args = readdcmd(pid);
    cout << "Memory: " << memory << endl;
    vector<string> vars = readenvv(pid);
    cout << "Args: ";

    for (const string& arg : args) {
        cout << arg << " ";
    }

    cout << endl;
    cout << "Vars: " << endl;

    for (const string& var : vars) {
        cout << var << endl;
    }

    return 0;
}
```

```
vector<string> readdcmd(const string& pid) {
    string path = "/proc/" + pid + "/cmdline";
    string cmd = readinggg(path);
    vector<string> args;
    stringstream ss(cmd);
    string arg;
    while (getline( &: ss,  &: arg,  delim: '\0')) {
        args.push_back(arg);
    }
    return args;
}
```

```
    string path = "/proc/" + pid + "/environ";
    string env = readinggg(path);
    vector<string> vars;
    stringstream ss(env);
    string var;
    while (getline( &: ss,  &: var,  delim: '\0')) {
        vars.push_back(var);
    }
    return vars;
}
```

```
 GNU nano 2.2.6          File: secondcode.cpp                    Modified

    cout << endl;

    cout << "Vars: " << endl;


    for (const string& var : vars) {

        cout << var << endl;

    }


    return 0;

}


^G Get Help  ^O WriteOut  ^R Read File ^Y Prev Page ^K Cut Text  ^C Cur Pos
^X Exit      ^J Justify   ^W Where Is  ^V Next Page ^U UnCut Text^T To Spell
```

The result of .cpp code for pid = 1227:

```
Name: systemd-journal
Memory:    11672 kB
Args:
/lib/systemd/systemd-journald
Vars:
LANG=en_US.UTF-8
LANGUAGE=en_US:en
PATH=/usr/local/sbin:/usr/local/bin:/usr/sbin:/usr/bin:/sbin:/bin
NOTIFY_SOCKET=/run/systemd/notify
LISTEN_PID=1227
LISTEN_FDS=11
LISTEN_FDNAMES=systemd-journald-audit.socket:systemd-journald.socket:systemd-journald.socket:systemc
-journald-dev-log.socket:stored:stored:stored:stored:stored:stored:stored
WATCHDOG_PID=1227
WATCHDOG_USEC=180000000
INVOCATION_ID=055ce0d6a45440b5be24e392796161ca
RUNTIME_DIRECTORY=/run/systemd/journal
SYSTEMD_EXEC_PID=1227
```

```
Args:
(sd-pam)
Vars:
SHLVL=1
HOME=/
init=/sbin/init
TERM=linux
BOOT_IMAGE=/boot/vmlinuz-6.1.94
drop_caps=
PATH=/sbin:/usr/sbin:/bin:/usr/bin
PWD=/
rootmnt=/root
```

Section 3.3.4

- [x] Write (in English or Persian) about each file in /proc/ directory:

```
MemTotal:        2072156 kB
MemFree:          538052 kB
MemAvailable:    1847388 kB
Buffers:          127116 kB
Cached:          1285164 kB
SwapCached:            0 kB
Active:           878580 kB
Inactive:         550496 kB
Active(anon):      17152 kB
Inactive(anon):     5416 kB
Active(file):     861428 kB
Inactive(file):   545080 kB
Unevictable:           0 kB
Mlocked:               0 kB
HighTotal:       1189768 kB
HighFree:         333176 kB
LowTotal:         882388 kB
LowFree:          204876 kB
SwapTotal:        901116 kB
SwapFree:         901116 kB
root@debian:/proc# _
```

```
Mapped:            21588 kB
Shmem:              5772 kB
Slab:              95028 kB
SReclaimable:      86404 kB
SUnreclaim:         8624 kB
KernelStack:         608 kB
PageTables:          664 kB
NFS_Unstable:          0 kB
Bounce:                0 kB
WritebackTmp:          0 kB
CommitLimit:     1937192 kB
Committed_AS:      71188 kB
VmallocTotal:     122880 kB
VmallocUsed:        6048 kB
VmallocChunk:     115840 kB
HardwareCorrupted:     0 kB
AnonHugePages:         0 kB
HugePages_Total:       0
HugePages_Free:        0
HugePages_Rsvd:        0
HugePages_Surp:        0
Hugepagesize:       2048 kB
DirectMap4k:       24568 kB
DirectMap2M:      882688 kB
root@debian:/proc#
```

```
root@debian:/proc# cat version
Linux version 3.16.0-4-686-pae (debian-kernel@lists.debian.org) (gcc version 4.8
.4 (Debian 4.8.4-1) ) #1 SMP Debian 3.16.7-ckt9-2 (2015-04-13)
root@debian:/proc#
```

iii. `uptime`: Contains two numbers: the system's uptime (the time since the system was booted) in seconds, and the
amount of time the system has spent in idle mode. This file provides a quick way to determine how long the system has been running and its idle time.

```
root@debian:/proc# cat uptime
28491.83 27962.52
root@debian:/proc#
```

iv. `stat`: Provides information about various system-wide statistics, including CPU utilization, interrupts,
context switches, and more (kernel/system statistics.)

```
root@debian:/proc# cat stat
cpu  7307 0 7444 2808724 2901 9 4488 0 0 0
cpu0 7307 0 7444 2808724 2901 9 4488 0 0 0
intr 701114 54 36839 0 0 0 0 0 0 1 0 0 0 37491 0 0 28266 0 88983 62 164895 0 0 0
 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
ctxt 1994431
btime 1721042165
processes 57364
procs_running 1
procs_blocked 0
softirq 796286 1 250619 71322 160779 101027 0 31623 0 1984 178931
root@debian:/proc#
```

```
root@debian:/proc# cat mounts | head -n 15
rootfs / rootfs rw 0 0
sysfs /sys sysfs rw,nosuid,nodev,noexec,relatime 0 0
proc /proc proc rw,nosuid,nodev,noexec,relatime 0 0
udev /dev devtmpfs rw,relatime,size=10240k,nr_inodes=216948,mode=755 0 0
devpts /dev/pts devpts rw,nosuid,noexec,relatime,gid=5,mode=620,ptmxmode=000 0 0
tmpfs /run tmpfs rw,nosuid,relatime,size=414432k,mode=755 0 0
/dev/sda1 / ext4 rw,relatime,errors=remount-ro,data=ordered 0 0
securityfs /sys/kernel/security securityfs rw,nosuid,nodev,noexec,relatime 0 0
tmpfs /dev/shm tmpfs rw,nosuid,nodev 0 0
tmpfs /run/lock tmpfs rw,nosuid,nodev,noexec,relatime,size=5120k 0 0
tmpfs /sys/fs/cgroup tmpfs ro,nosuid,nodev,noexec,mode=755 0 0
cgroup /sys/fs/cgroup/systemd cgroup rw,nosuid,nodev,noexec,relatime,xattr,relea
se_agent=/lib/systemd/systemd-cgroups-agent,name=systemd 0 0
pstore /sys/fs/pstore pstore rw,nosuid,nodev,noexec,relatime 0 0
cgroup /sys/fs/cgroup/cpuset cgroup rw,nosuid,nodev,noexec,relatime,cpuset 0 0
cgroup /sys/fs/cgroup/cpu,cpuacct cgroup rw,nosuid,nodev,noexec,relatime,cpu,cpu
acct 0 0
root@debian:/proc# _
```

```
    securityfs /sys/kernel/security securityfs rw,nosuid,nodev,noexec,relatime 0 0
    tmpfs /dev/shm tmpfs rw,nosuid,nodev 0 0
    tmpfs /run/lock tmpfs rw,nosuid,nodev,noexec,relatime,size=5120k 0 0
    tmpfs /sys/fs/cgroup tmpfs ro,nosuid,nodev,noexec,mode=755 0 0
    cgroup /sys/fs/cgroup/systemd cgroup rw,nosuid,nodev,noexec,relatime,xattr,relea
    se_agent=/lib/systemd/systemd-cgroups-agent,name=systemd 0 0
    pstore /sys/fs/pstore pstore rw,nosuid,nodev,noexec,relatime 0 0
    cgroup /sys/fs/cgroup/cpuset cgroup rw,nosuid,nodev,noexec,relatime,cpuset 0 0
    cgroup /sys/fs/cgroup/cpu,cpuacct cgroup rw,nosuid,nodev,noexec,relatime,cpu,cpu
    acct 0 0
    cgroup /sys/fs/cgroup/devices cgroup rw,nosuid,nodev,noexec,relatime,devices 0 0
    cgroup /sys/fs/cgroup/freezer cgroup rw,nosuid,nodev,noexec,relatime,freezer 0 0
    cgroup /sys/fs/cgroup/net_cls,net_prio cgroup rw,nosuid,nodev,noexec,relatime,ne
    t_cls,net_prio 0 0
    cgroup /sys/fs/cgroup/blkio cgroup rw,nosuid,nodev,noexec,relatime,blkio 0 0
    cgroup /sys/fs/cgroup/perf_event cgroup rw,nosuid,nodev,noexec,relatime,perf_eve
    nt 0 0
    tmpfs /etc/machine-id tmpfs ro,relatime,size=414432k,mode=755 0 0
    systemd-1 /proc/sys/fs/binfmt_misc autofs rw,relatime,fd=22,pgrp=1,timeout=300,m
    inproto=5,maxproto=5,direct 0 0
    debugfs /sys/kernel/debug debugfs rw,relatime 0 0
    mqueue /dev/mqueue mqueue rw,relatime 0 0
    hugetlbfs /dev/hugepages hugetlbfs rw,relatime 0 0
    rpc_pipefs /run/rpc_pipefs rpc_pipefs rw,relatime 0 0
    root@debian:/proc# _
```

vi. `net` : Contains various files and subdirectories related to networking. It provides access to real-time information about network-related statistics, configuration, and connections.

```
root@debian:/proc# cd net
root@debian:/proc/net# ls
anycast6      hci            ip_mr_cache  nfsfs      rt6_stats     stat
arp           icmp           ip_mr_vif    packet     rt_acct       tcp
bnep          icmp6          ipv6_route   protocols  rt_cache      tcp6
connector     if_inet6       l2cap        psched     sco           udp
dev           igmp           mcfilter     ptype      snmp          udp6
dev_mcast     igmp6          mcfilter6    raw        snmp6         udplite
dev_snmp6     ip6_flowlabel  netfilter    raw6       sockstat      udplite6
fib_trie      ip6_mr_cache   netlink      route      sockstat6     unix
fib_triestat  ip6_mr_vif     netstat      rpc        softnet_stat  wireless
root@debian:/proc/net#
```

are load average figures giving the number of jobs in the run queue (state R) or waiting for disk I/O (state D) averaged over 1, 5, and 15 minutes. They are the same as the load average numbers given by uptime(1) and other programs. The fourth field consists of two numbers separated by a slash (/). The first of these is the number of currently runnable kernel scheduling entities (processes, threads). The value after the slash is the number of kernel scheduling entities

```
root@debian:/proc# cat loadavg
0.00 0.02 0.05 1/77 24940
root@debian:/proc#
```

```
root@debian:/proc# cat interrupts | head -n 15
           CPU0
  0:         54   IO-APIC-edge      timer
  1:      37198   IO-APIC-edge      i8042
  8:          1   IO-APIC-edge      rtc0
  9:          0   IO-APIC-fasteoi   acpi
 12:      37903   IO-APIC-edge      i8042
 14:          0   IO-APIC-edge      ata_piix
 15:      28814   IO-APIC-edge      ata_piix
 16:          0   IO-APIC-fasteoi   snd_ens1371, vmwgfx
 17:      88990   IO-APIC-fasteoi   ehci_hcd:usb2, ioc0
 18:         62   IO-APIC-fasteoi   uhci_hcd:usb1
 19:     164983   IO-APIC-fasteoi   eth0
 40:          0   PCI-MSI-edge      PCIe PME, pciehp
 41:          0   PCI-MSI-edge      PCIe PME, pciehp
 42:          0   PCI-MSI-edge      PCIe PME, pciehp
root@debian:/proc#
```

```
 66:          0   PCI-MSI-edge      PCIe PME, pciehp
 67:          0   PCI-MSI-edge      PCIe PME, pciehp
 68:          0   PCI-MSI-edge      PCIe PME, pciehp
 69:          0   PCI-MSI-edge      PCIe PME, pciehp
 70:          0   PCI-MSI-edge      PCIe PME, pciehp
 71:          0   PCI-MSI-edge      PCIe PME, pciehp
 72:          0   PCI-MSI-edge      vmw_vmci
 73:          0   PCI-MSI-edge      vmw_vmci
NMI:          0   Non-maskable interrupts
LOC:     349007   Local timer interrupts
SPU:          0   Spurious interrupts
PMI:          0   Performance monitoring interrupts
IWI:          2   IRQ work interrupts
RTR:          0   APIC ICR read retries
RES:          0   Rescheduling interrupts
CAL:          0   Function call interrupts
TLB:          0   TLB shootdowns
TRM:          0   Thermal event interrupts
THR:          0   Threshold APIC interrupts
MCE:          0   Machine check exceptions
MCP:         98   Machine check polls
HYP:          0   Hypervisor callback interrupts
ERR:          0
MIS:          0
root@debian:/proc# _
```

```
root@debian:/proc# cat ioports | head -n 20
0000-0cf7 : PCI Bus 0000:00
  0000-001f : dma1
  0020-0021 : PNP0001:00
    0020-0021 : pic1
  0040-0043 : timer0
  0050-0053 : timer1
  0060-0060 : keyboard
  0061-0061 : PNP0800:00
  0064-0064 : keyboard
  0070-0071 : rtc0
  0080-008f : dma page reg
  00a0-00a1 : PNP0001:00
    00a0-00a1 : pic2
  00c0-00df : dma2
  00f0-00ff : fpu
  0170-0177 : 0000:00:07.1
    0170-0177 : ata_piix
  01f0-01f7 : 0000:00:07.1
    01f0-01f7 : ata_piix
  0376-0376 : 0000:00:07.1
root@debian:/proc# _
```

```
    1070-107f : 0000:00:0f.0
      1070-107f : vmwgfx probe
    1080-10bf : 0000:00:07.7
      1080-10bf : vmw_vmci
    1400-14ff : 0000:00:10.0
    2000-3fff : PCI Bus 0000:02
      2000-207f : 0000:02:01.0
        2000-201f : pcnet32_probe_pci
      2080-20bf : 0000:02:02.0
        2080-20bf : Ensoniq AudioPCI
      20c0-20df : 0000:02:00.0
        20c0-20df : uhci_hcd
    4000-4fff : PCI Bus 0000:03
    5000-5fff : PCI Bus 0000:0b
    6000-6fff : PCI Bus 0000:13
    7000-7fff : PCI Bus 0000:1b
    8000-8fff : PCI Bus 0000:04
    9000-9fff : PCI Bus 0000:0c
    a000-afff : PCI Bus 0000:14
    b000-bfff : PCI Bus 0000:1c
    c000-cfff : PCI Bus 0000:05
    d000-dfff : PCI Bus 0000:0d
    e000-efff : PCI Bus 0000:15
    fce0-fcff : pnp 00:06
  root@debian:/proc# _
```

```
nodev   sysfs
nodev   rootfs
nodev   ramfs
nodev   bdev
nodev   proc
nodev   cgroup
nodev   cpuset
nodev   tmpfs
nodev   devtmpfs
nodev   debugfs
nodev   securityfs
nodev   sockfs
nodev   pipefs
nodev   devpts
nodev   hugetlbfs
nodev   pstore
nodev   mqueue
        ext3
        ext2
        ext4
root@debian:/proc#
```

```
nodev   bdev
nodev   proc
nodev   cgroup
nodev   cpuset
nodev   tmpfs
nodev   devtmpfs
nodev   debugfs
nodev   securityfs
nodev   sockfs
nodev   pipefs
nodev   devpts
nodev   hugetlbfs
nodev   pstore
nodev   mqueue
        ext3
        ext2
        ext4
nodev   autofs
nodev   rpc_pipefs
nodev   nfs
nodev   nfs4
nodev   nfsd
        udf
        iso9660
root@debian:/proc#
```

```
root@debian:/proc# cat cpuinfo | head -n 20
processor       : 0
vendor_id       : GenuineIntel
cpu family      : 6
model           : 142
model name      : Intel(R) Core(TM) i7-10510U CPU @ 1.80GHz
stepping        : 12
microcode       : 0xffffffff
cpu MHz         : 2304.007
cache size      : 8192 KB
physical id     : 0
siblings        : 1
core id         : 0
cpu cores       : 1
apicid          : 0
initial apicid  : 0
fdiv_bug        : no
f00f_bug        : no
coma_bug        : no
fpu             : yes
fpu_exception   : yes
root@debian:/proc# _
```

```
siblings        : 1
core id         : 0
cpu cores       : 1
apicid          : 0
initial apicid  : 0
fdiv_bug        : no
f00f_bug        : no
coma_bug        : no
fpu             : yes
fpu_exception   : yes
cpuid level     : 22
wp              : yes
flags           : fpu vme de pse tsc msr pae mce cx8 apic sep mtrr pge mca cmov
pat pse36 clflush mmx fxsr sse sse2 ss nx pdpe1gb rdtscp lm constant_tsc arch_pe
rfmon xtopology tsc_reliable nonstop_tsc eagerfpu pni pclmulqdq ssse3 fma cx16 p
cid sse4_1 sse4_2 x2apic movbe popcnt tsc_deadline_timer aes xsave avx f16c rdra
nd hypervisor lahf_lm abm 3dnowprefetch arat xsaveopt fsgsbase tsc_adjust bmi1 a
vx2 smep bmi2 invpcid rdseed adx smap clflushopt
bogomips        : 4608.01
clflush size    : 64
cache_alignment : 64
address sizes   : 45 bits physical, 48 bits virtual
power management:

root@debian:/proc#
```

xii. `cmdline` : Information about the kernel command line parameters that were passed to the operating system during boot.

```
root@debian:/proc# cat cmdline
BOOT_IMAGE=/boot/vmlinuz-3.16.0-4-686-pae root=UUID=739232c1-3e92-4d9a-9a45-5e58
75776450 ro initrd=/install/initrd.gz quiet
root@debian:/proc#
```

- [x] Place your source code for a program that shows details of processor:


GNU nano 2.2.6 File: thirdcode.cpp Modified
}
}
cpuinfo.close();
cout << "Model Name: " << model << endl;
cout << "CPU MHz: " << freq << endl;
cout << "Cache Size: " << cache << endl;
return 0;
}
^G Get Help ^O WriteOut ^R Read File ^Y Prev Page ^K Cut Text ^C Cur Pos
^X Exit ^J Justify ^W Where Is ^V Next Page ^U UnCut Text ^T To Spell

```
Model Name: Intel(R) Core(TM) i7-10510U CPU @ 1.80GHz
CPU MHz: 2304.007 MHz
Cache Size: 8192 KB
root@debian:/#
```

```cpp
#include <iostream>
#include <string>
#include <fstream>

using namespace std;

int main() {
    ifstream cpuinfo("/proc/cpuinfo");
    string line;
    string model;
    string freq;
    string cache;

    while (getline(cpuinfo, line)) {
        if (line.find("cache size") != string::npos) {
            cache = line.substr(line.find(":") + 2);
        }  else if (line.find("cpu MHz") != string::npos) {
            freq = line.substr(line.find(":") + 2) + " MHz";
        } else if (line.find("model name") != string::npos) {
            model = line.substr(line.find(":") + 2);
        }
    }
    cpuinfo.close();
    cout << "Model Name: " << model << endl;
    cout << "CPU MHz: " << freq << endl;
    cout << "Cache Size: " << cache << endl;
    return 0;
}
```

- [x] Place your source code for a program that shows details of memory management sub-system:

```
 GNU nano 2.2.6            File: fourthcode.cpp                      Modified

            tmem = std::stol(line.substr(line.find(":") + 1));
        } else if (line.find("MemFree:") != std::string::npos) {
            fmem = std::stol(line.substr(line.find(":") + 1));
        }
    }
    long umem = tmem - fmem;
    std::cout << "Total Memory(MB): " << tmem / 1024 << std::endl;
    std::cout << "Used Memory(MB): " << umem / 1024 << std::endl;
    std::cout << "Free Memory(MB): " << fmem / 1024 << std::endl;

    return 0;
}_

^G Get Help  ^O WriteOut  ^R Read File ^Y Prev Page ^K Cut Text  ^C Cur Pos
^X Exit      ^J Justify   ^W Where Is  ^V Next Page ^U UnCut Text^T To Spell
```

Result:

```
root@debian:/# g++ -std=c++11 fourthcode.cpp -o fourthcode
root@debian:/# ./foutrhcode
bash: ./foutrhcode: No such file or directory
root@debian:/# ./fourthcode
Total Memory(MB): 2023
Used Memory(MB): 1499
Free Memory(MB): 523
root@debian:/#
```

```cpp
#include <string>
int main() {
    std::ifstream meminfo("/proc/meminfo");
    std::string line;
    long tmem = 0;
    long fmem = 0;
    while (std::getline(meminfo, line)) {
        if (line.find("MemTotal:") != std::string::npos) {
            tmem = std::stol(line.substr(line.find(":") + 1));
        } else if (line.find("MemFree:") != std::string::npos) {
            fmem = std::stol(line.substr(line.find(":") + 1));
        }
    }
    long umem = tmem - fmem;
    std::cout << "Total Memory(MB): " << tmem / 1024 << std::endl;
    std::cout << "Used Memory(MB): " << umem / 1024 << std::endl;
    std::cout << "Free Memory(MB): " << fmem / 1024 << std::endl;

    return 0;
}
```

- [x] Write your description about five important files at /proc/sys/kernel:

  - [x] `panic`: This file controls the behavior of the kernel when a critical error (panic) occurs. By default, it contains a value of 0, which means that the kernel will not automatically reboot the system when a panic occurs. However, you can set it to a different value (such as 1) to enable automatic rebooting upon kernel panic.

```
root@debian:/# cd /proc/sys/kernel
root@debian:/proc/sys/kernel# cat panic
0
root@debian:/proc/sys/kernel# _
```

used to identify it on the network.

```
root@debian:/# cd /proc/sys/kernel
root@debian:/proc/sys/kernel# cat panic
0
root@debian:/proc/sys/kernel# cat hostname
debian
root@debian:/proc/sys/kernel#
```

- [x] `osrelease` : This file contains the kernel release version of the operating system.

```
root@debian:/# cd /proc/sys/kernel
root@debian:/proc/sys/kernel# cat panic
0
root@debian:/proc/sys/kernel# cat hostname
debian
root@debian:/proc/sys/kernel# cat osrelease
3.16.0-4-686-pae
root@debian:/proc/sys/kernel# _
```

- [x] `core_pattern` : This file specifies the pattern used to name core dump files when a process crashes. By default, core dump files are named "core" and written to the current working directory of the process, but this can be changed by modifying this file.

```
root@debian:/proc/sys/kernel# cat core_pattern
core
root@debian:/proc/sys/kernel# _
```

- [x] `pid_max` : This file contains the maximum value that can be assigned to a process ID (PID).

```
root@debian:/proc/sys/kernel# cat pid_max
32768
root@debian:/proc/sys/kernel#
```

6th:

- [x] `shmall` : This file sets the total amount of shared memory that can be allocated on the system.

```
root@debian:/proc/sys/kernel# cat shmall
4278190079
root@debian:/proc/sys/kernel#
```

- [x] Write your description about /proc/self file

using the virtual filesystem interface provided by /proc. This directory provides detailed information and controls for the current process, such as its memory usage (/proc/self/statm), environment variables (/proc/self/environ), file descriptors (/proc/self/fd), and more. It's particularly useful for applications and scripts that need to access or manipulate their own process information dynamically at runtime. In other words, when a process accesses this symbolic link, it resolves to the process's own /proc/[pid] directory. It shows which process is running it, to make sure we go into the directory and see the process that is running it

```
nonvoluntary_ctxt_switches:     310
root@debian:/proc/self# cat status | head -n 20
Name:   bash
State:  R (running)
Tgid:   1016
Ngid:   0
Pid:    1016
PPid:   1015
TracerPid:      0
Uid:    0       0       0       0
Gid:    0       0       0       0
FDSize: 256
Groups: 0
VmPeak:     5504 kB
VmSize:     5484 kB
VmLck:         0 kB
VmPin:         0 kB
VmHWM:      3540 kB
VmRSS:      3540 kB
VmData:      292 kB
VmStk:       136 kB
VmExe:      1060 kB
root@debian:/proc/self#
```

Source Code Submission

please submit all your codes in a zip file

- [x] OS-LAB-report3-99101087-99100422.zip

Amirreza81 added the documentation label yesterday

Assignees

No one—assign yourself

documentation

Projects

None yet

Milestone

No milestone

Development

Create a branch for this issue or link a pull request.

1 participant

Pin issue