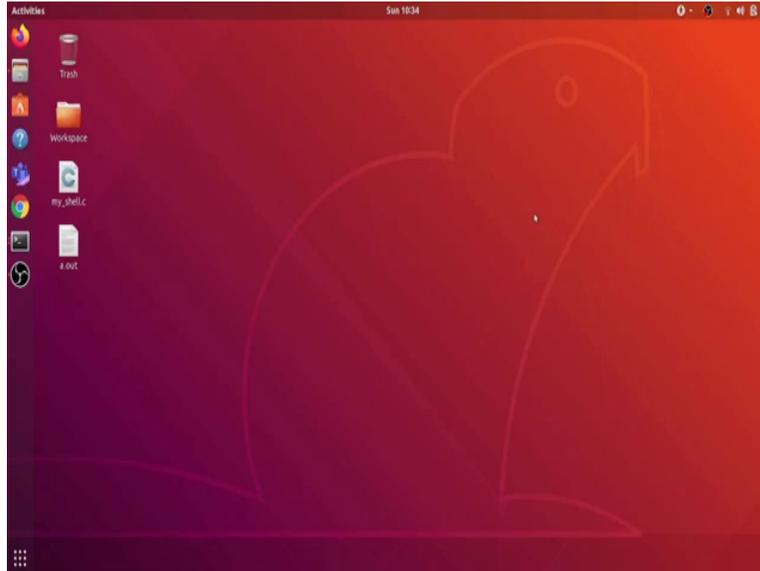


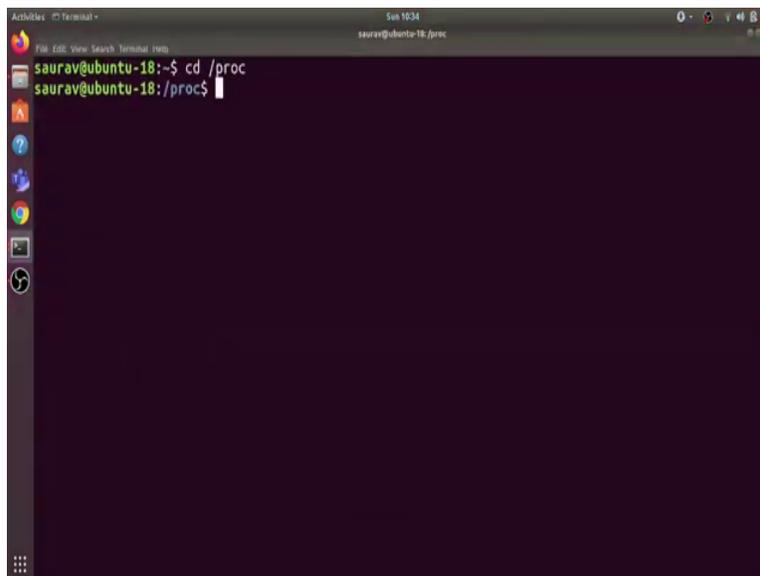
Design and Engineering of Computer Systems
Professor Mythilli Vutukuru
Department of Computer Science and Engineering
Indian Institute of Technology Bombay
Proc file System

(Refer Slide Time: 00:15)



Hi everyone. In this video, we will learn about the proc file system. So, what is a proc file system? Proc file system is a virtual file system, which gives us information about all the different processes running in the kernel, about the hardware and the kernel itself.

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```

saurav@ubuntu-18:/proc$ ls
1          1310 1473 1803 28202 341 488 602 9207  cgroups  mtrr
10         1315 1476 18650 28213 35 489 61 9227   cmdline net
1003      1317 1477 18856 28214 36 490 62 9247   consoles pagetypeinfo
1031      133 1484 1912 28215 372 491 63 927    cpuinfo  partitions
1065      1337 1490 1920 28216 378 492 64 9273   crypto   pressure
1080      134 1493 1925 28217 38 495 65 9274   devices  sched_debug
1086      1343 1496 2 28218 380 50 66 9275   diskstats schedstat
1090      135 15 20 28219 382 503 6883 9276   dma      scsi
1091      1369 150 21 28220 383 504 726 9278   driver   self
11        1370 1507 21415 28221 384 505 729 9279   execdomains slabinfo
1105      1378 1513 21416 28222 39 506 731 929    fb       softirqs
1109      138 1515 22 29 391 507 732 9298   filesystems stat
1111      1392 1520 224 3 393 508 7443 9301   fs       swaps
113       1396 1521 225 30 397 509 751 931   interrupts sys
114       1398 1522 226 303 4 51 752 932   iomem    sysrq-trigger
115       14 1523 23 30710 40 510 756 933   ioports  sysvipc
116       1400 1525 23815 30721 402 511 759 934   irq      thread-self
1164      1408 1559 24 30766 406 512 760 9366   kallsyms timer_list
117       1415 1569 2409 30776 407 519 761 938   kcore    tty
1171      1419 1576 2412 30839 41 52 763 940   keys     uptime
118       1427 1581 2432 31018 4116 526 764 946   key-users version
119       1437 16 253 313 413 53 765 950   kmsg     version_signature
12        1441 1604 256 31541 42 54 7962 952   kpagecgroup vmallocinfo
120       1448 1622 257 31555 424 56 8126 954   kpagecount vmstat

```

So, let us open a terminal and see what all files are there in the proc file system. So, I will do cd slash proc. And if I do ls, so we have a handful of files with some names and then there are many directories. All of them have some numbers as the names. So, what does each of these numbers signify? So, each of these is a process pid.

So, whenever we start a new process, we will have a new directory in this folder and each of that directory will contain information about that process. So, for instance, 1 is the pid of init process. So, this directory will contain information about the init process.

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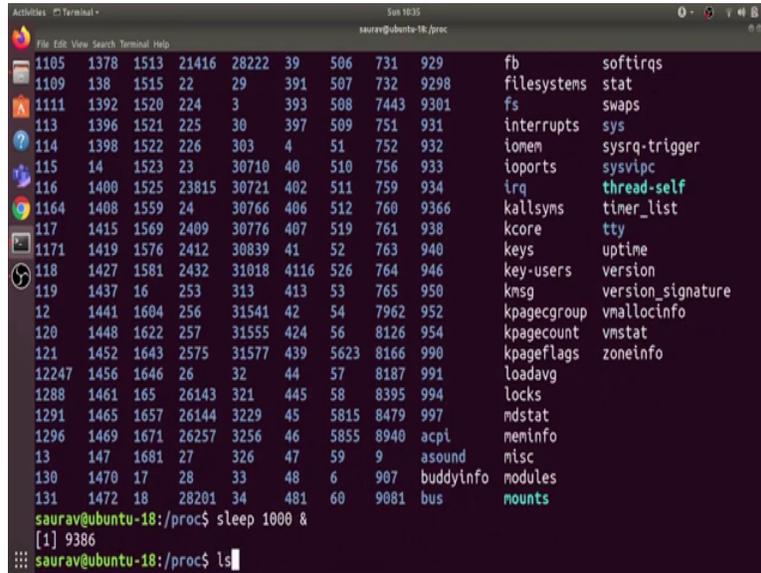
```

saurav@ubuntu-18:/proc$ ls
1105      1378 1513 21416 28222 39 506 731 929    fb       softirqs
1109      138 1515 22 29 391 507 732 9298   filesystems stat
1111      1392 1520 224 3 393 508 7443 9301   fs       swaps
113       1396 1521 225 30 397 509 751 931   interrupts sys
114       1398 1522 226 303 4 51 752 932   iomem    sysrq-trigger
115       14 1523 23 30710 40 510 756 933   ioports  sysvipc
116       1400 1525 23815 30721 402 511 759 934   irq      thread-self
1164      1408 1559 24 30766 406 512 760 9366   kallsyms timer_list
117       1415 1569 2409 30776 407 519 761 938   kcore    tty
1171      1419 1576 2412 30839 41 52 763 940   keys     uptime
118       1427 1581 2432 31018 4116 526 764 946   key-users version
119       1437 16 253 313 413 53 765 950   kmsg     version_signature
12        1441 1604 256 31541 42 54 7962 952   kpagecgroup vmallocinfo
120       1448 1622 257 31555 424 56 8126 954   kpagecount vmstat
121       1452 1643 2575 31577 439 5623 8166 990   kpageflags zoneinfo
12247     1456 1646 26 32 44 57 8187 991   loadavg
1288     1461 165 26143 321 445 58 8395 994   locks
1291     1465 1657 26144 3229 45 5815 8479 997   mdstat
1296     1469 1671 26257 3256 46 5855 8940   acpi     meminfo
13       147 1681 27 326 47 59 9  asound  misc
130     1470 17 28 33 48 6 907  buddyinfo modules
131     1472 18 28201 34 481 60 9081  bus     mounts
saurav@ubuntu-18:/proc$ sleep 1000 &
[1] 9386
saurav@ubuntu-18:/proc$

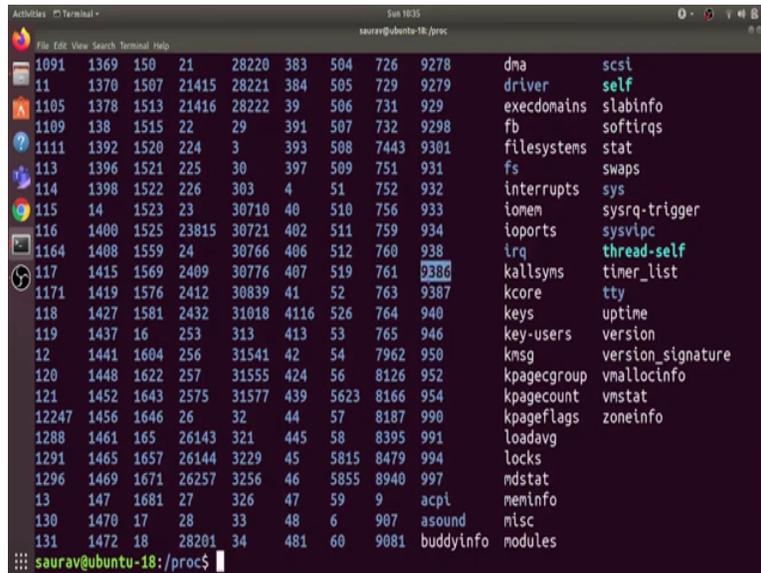
```

Let us start slip process the 1000 and. So, we have 9386 is the PID.

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```
1105 1378 1513 21416 28222 39 506 731 929 fb softirqs
1109 138 1515 22 29 391 507 732 9298 filesystems stat
1111 1392 1520 224 3 393 508 7443 9301 fs swaps
113 1396 1521 225 30 397 509 751 931 interrupts sys
114 1398 1522 226 303 4 51 752 932 iomem sysrq-trigger
115 14 1523 23 30710 40 510 756 933 ioports sysvipc
116 1400 1525 23815 30721 402 511 759 934 irq thread-self
1164 1408 1559 24 30766 406 512 760 9366 kallsyms timer_list
117 1415 1569 2409 30776 407 519 761 938 kcore tty
1171 1419 1576 2412 30839 41 52 763 940 keys uptime
118 1427 1581 2432 31018 4116 526 764 946 key-users version
119 1437 16 253 313 413 53 765 950 kmsg version_signature
12 1441 1604 256 31541 42 54 7962 952 kpagegroup vmallocinfo
120 1448 1622 257 31555 424 56 8126 954 kpagecount vmstat
121 1452 1643 2575 31577 439 5623 8166 990 kpageflags zoneinfo
12247 1456 1646 26 32 44 57 8187 991 loadavg
1288 1461 165 26143 321 445 58 8395 994 locks
1291 1465 1657 26144 3229 45 5815 8479 997 mdstat
1296 1469 1671 26257 3256 46 5855 8940 997 acpi meminfo
13 147 1681 27 326 47 59 9 misc
130 1470 17 28 33 48 6 907 buddyinfo modules
131 1472 18 28201 34 481 60 9081 bus mounts
saurav@ubuntu-18:/proc$ sleep 1000 &
[1] 9386
saurav@ubuntu-18:/proc$ ls
```



```
1091 1369 150 21 28220 383 504 726 9278 dna scsi
11 1370 1507 21415 28221 384 505 729 9279 driver self
1105 1378 1513 21416 28222 39 506 731 929 execdomains slabinfo
1109 138 1515 22 29 391 507 732 9298 fb softirqs
1111 1392 1520 224 3 393 508 7443 9301 filesystems stat
113 1396 1521 225 30 397 509 751 931 fs swaps
114 1398 1522 226 303 4 51 752 932 interrupts sys
115 14 1523 23 30710 40 510 756 933 iomem sysrq-trigger
116 1400 1525 23815 30721 402 511 759 934 ioports sysvipc
1164 1408 1559 24 30766 406 512 760 938 irq thread-self
117 1415 1569 2409 30776 407 519 761 9386 kallsyms timer_list
1171 1419 1576 2412 30839 41 52 763 9387 kcore tty
118 1427 1581 2432 31018 4116 526 764 940 keys uptime
119 1437 16 253 313 413 53 765 946 key-users version
12 1441 1604 256 31541 42 54 7962 950 kmsg version_signature
120 1448 1622 257 31555 424 56 8126 952 kpagegroup vmallocinfo
121 1452 1643 2575 31577 439 5623 8166 954 kpagecount vmstat
12247 1456 1646 26 32 44 57 8187 990 kpageflags zoneinfo
1288 1461 165 26143 321 445 58 8395 991 loadavg
1291 1465 1657 26144 3229 45 5815 8479 994 locks
1296 1469 1671 26257 3256 46 5855 8940 997 mdstat
13 147 1681 27 326 47 59 9 acpi meminfo
130 1470 17 28 33 48 6 907 asound misc
131 1472 18 28201 34 481 60 9081 buddyinfo modules
saurav@ubuntu-18:/proc$
```

Let us do ls. So, you can see that here we have 9386 a directory.

(Refer Slide Time: 01:27)

```
Activities Terminal - Sun 16:35
saurav@ubuntu-18:/proc/9386
File Edit View Search Terminal Help
11 1370 1507 21415 28221 384 505 729 9279 driver self
1105 1378 1513 21416 28222 39 506 731 929 execdomains slabinfo
1109 138 1515 22 29 391 507 732 9298 fb softirqs
1111 1392 1520 224 3 393 508 7443 9301 filesystems stat
113 1396 1521 225 30 397 509 751 931 fs swaps
114 1398 1522 226 303 4 51 752 932 interrupts sys
115 14 1523 23 30710 40 510 756 933 iomem sysrq-trigger
116 1400 1525 23815 30721 402 511 759 934 ioports sysvipc
1164 1408 1559 24 30766 406 512 760 938 irq thread-self
117 1415 1569 2409 30776 407 519 761 9386 kallsyms timer_list
1171 1419 1576 2412 30839 41 52 763 9387 kcore tty
118 1427 1581 2432 31018 4116 526 764 940 keys uptime
119 1437 16 253 313 413 53 765 946 key-users version
12 1441 1604 256 31541 42 54 7962 950 kmsg version_signature
120 1448 1622 257 31555 424 56 8126 952 kpagecgroup vmallocinfo
121 1452 1643 2575 31577 439 5623 8166 954 kpagecount vmstat
12247 1456 1646 26 32 44 57 8187 990 kpageflags zoneinfo
1288 1461 165 26143 321 445 58 8395 991 loadavg
1291 1465 1657 26144 3229 45 5815 8479 994 locks
1296 1469 1671 26257 3256 46 5855 8940 997 ndstat
13 147 1681 27 326 47 59 9 acpi meminfo
130 1470 17 28 33 48 6 907 asound misc
131 1472 18 28201 34 481 60 9081 buddyinfo modules
saurav@ubuntu-18:/proc$ cd 9386
saurav@ubuntu-18:/proc/9386$
```

```
Activities Terminal - Sun 16:35
saurav@ubuntu-18:/proc/9386
File Edit View Search Terminal Help
1171 1419 1576 2412 30839 41 52 763 9387 kcore tty
118 1427 1581 2432 31018 4116 526 764 940 keys uptime
119 1437 16 253 313 413 53 765 946 key-users version
12 1441 1604 256 31541 42 54 7962 950 kmsg version_signature
120 1448 1622 257 31555 424 56 8126 952 kpagecgroup vmallocinfo
121 1452 1643 2575 31577 439 5623 8166 954 kpagecount vmstat
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1291 1465 1657 26144 3229 45 5815 8479 994 locks
1296 1469 1671 26257 3256 46 5855 8940 997 ndstat
13 147 1681 27 326 47 59 9 acpi meminfo
130 1470 17 28 33 48 6 907 asound misc
131 1472 18 28201 34 481 60 9081 buddyinfo modules
saurav@ubuntu-18:/proc$ cd 9386
saurav@ubuntu-18:/proc/9386$ ls
arch_status  cpuset  loginuid  numa_maps  sched      status
attr         cwd     map_files oom_adj    schedstat  syscall
autogroup   environ maps     oom_score  sessionid  task
auxv        exe     mem      oom_score_adj setgroups  timers
cgroup      fd      mountinfo pagemap    smaps      timerslack_ns
clear_refs  fdinfo mounts  patch_state smaps_rollup uid_map
cmdline     gid_map mountstats personality stack       wchan
comm        io      net      projid_map stat
coredump_filter limits ns        root       statm
saurav@ubuntu-18:/proc/9386$
```

```
Activities Terminal - Sun 10/31 saurav@ubuntu-18:/proc/9386
File Edit View Search Terminal Help
118 1427 1581 2432 31018 4116 526 764 940 keys uptime
119 1437 16 253 313 413 53 765 946 key-users version
12 1441 1604 256 31541 42 54 7962 950 kmsg version_signature
120 1448 1622 257 31555 424 56 8126 952 kpagecgroup vmallocinfo
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1291 1465 1657 26144 3229 45 5815 8479 994 locks
1296 1469 1671 26257 3256 46 5855 8940 997 mdstat
13 147 1681 27 326 47 59 9 acpi meminfo
130 1470 17 28 33 48 6 907 asound misc
131 1472 18 28201 34 481 60 9081 buddyinfo modules

saurav@ubuntu-18:/proc$ cd 9386
saurav@ubuntu-18:/proc/9386$ ls
arch_status cpuset loginuid numa_maps sched status
attr cwd map_files oon_adj schedstat syscall
autogroup environ maps oon_score sessionid task
auxv exe men oon_score_adj setgroups timers
cgroup fd mountinfo pagemap smaps timerslack_ns
clear_refs fdinfo mounts patch_state smaps_rollup uid_map
cmdline gid_map mountstats personality stack wchan
comm io net projid_map stat
coredump_filter limits ns root statm

saurav@ubuntu-18:/proc/9386$ cat cmdline
::: sleep1000saurav@ubuntu-18:/proc/9386$
```

```
Activities Terminal - Sun 10/31 saurav@ubuntu-18:/proc/9386
File Edit View Search Terminal Help
118 1427 1581 2432 31018 4116 526 764 940 keys uptime
119 1437 16 253 313 413 53 765 946 key-users version
12 1441 1604 256 31541 42 54 7962 950 kmsg version_signature
120 1448 1622 257 31555 424 56 8126 952 kpagecgroup vmallocinfo
121 1452 1643 2575 31577 439 5623 8166 954 kpagecount vmstat
12247 1456 1646 26 32 44 57 8187 990 kpageflags zoneinfo
1288 1461 165 26143 321 445 58 8395 991 loadavg
1291 1465 1657 26144 3229 45 5815 8479 994 locks
1296 1469 1671 26257 3256 46 5855 8940 997 mdstat
13 147 1681 27 326 47 59 9 acpi meminfo
130 1470 17 28 33 48 6 907 asound misc
131 1472 18 28201 34 481 60 9081 buddyinfo modules

saurav@ubuntu-18:/proc$ cd 9386
saurav@ubuntu-18:/proc/9386$ ls
arch_status cpuset loginuid numa_maps sched status
attr cwd map_files oon_adj schedstat syscall
autogroup environ maps oon_score sessionid task
auxv exe men oon_score_adj setgroups timers
cgroup fd mountinfo pagemap smaps timerslack_ns
clear_refs fdinfo mounts patch_state smaps_rollup uid_map
cmdline gid_map mountstats personality stack wchan
comm io net projid_map stat
coredump_filter limits ns root statm

saurav@ubuntu-18:/proc/9386$ cat cmdline
::: sleep1000saurav@ubuntu-18:/proc/9386$
```

```

saurav@ubuntu-18:/proc/9386$ ls
arch_status  cpuset  loginuid  numa_maps  sched  status
attr         cwd     map_files oon_adj    schedstat  syscall
autogroup   environ maps      oon_score  sessionid  task
auxv       exe     mem       oon_score_adj  setgroups  timers
cgroup     fd      mountinfo pagenap    smaps      timerslack_ns
clear_refs fdinfo  mounts    patch_state  smaps_rollup  uid_map
cmdline    gid_map mountstats personality  stack      wchan
comm       io      net       projid_map  stat
coredump_filter  limits ns         root        statm
saurav@ubuntu-18:/proc/9386$ cat cmdline
::: sleep1000saurav@ubuntu-18:/proc/9386$

```

Let us, go inside that directory and let us see what all files there. There are a couple of files, let us start with cmd line, it will give me all the command line arguments which are used to start this process. So we use sleep 1000 showing me that and then there are a couple of soft links here. You can see cwd, exe, all of these are soft links,

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```

saurav@ubuntu-18:/proc/9386$ ls
arch_status  cpuset  loginuid  numa_maps  sched  status
attr         cwd     map_files oon_adj    schedstat  syscall
autogroup   environ maps      oon_score  sessionid  task
auxv       exe     mem       oon_score_adj  setgroups  timers
cgroup     fd      mountinfo pagenap    smaps      timerslack_ns
clear_refs fdinfo  mounts    patch_state  smaps_rollup  uid_map
cmdline    gid_map mountstats personality  stack      wchan
comm       io      net       projid_map  stat
coredump_filter  limits ns         root        statm
saurav@ubuntu-18:/proc/9386$ cat cmdline
::: sleep1000saurav@ubuntu-18:/proc/9386$ ls -l

```

```
Activities Terminal Sun 10/31 saurav@ubuntu-18:/proc/9386
sleep10000saurav@ubuntu-18:/proc/9386$ ls -l
total 0
-r--r--r-- 1 saurav saurav 0 Nov 21 10:35 arch_status
dr-xr-xr-x 2 saurav saurav 0 Nov 21 10:35 attr
-rw-r--r-- 1 saurav saurav 0 Nov 21 10:35 autogroup
-r----- 1 saurav saurav 0 Nov 21 10:35 auxv
-r--r--r-- 1 saurav saurav 0 Nov 21 10:35 cgroup
--w----- 1 saurav saurav 0 Nov 21 10:35 clear_refs
-r--r--r-- 1 saurav saurav 0 Nov 21 10:35 cmdline
-rw-r--r-- 1 saurav saurav 0 Nov 21 10:35 comm
-rw-r--r-- 1 saurav saurav 0 Nov 21 10:35 coredump_filter
-r--r--r-- 1 saurav saurav 0 Nov 21 10:35 cpuset
lrwxrwxrwx 1 saurav saurav 0 Nov 21 10:35 cwd -> /proc
-r----- 1 saurav saurav 0 Nov 21 10:35 environ
lrwxrwxrwx 1 saurav saurav 0 Nov 21 10:35 exe -> /bin/sleep
dr-x----- 2 saurav saurav 0 Nov 21 10:35 fd
dr-x----- 2 saurav saurav 0 Nov 21 10:35 fdinfo
-rw-r--r-- 1 saurav saurav 0 Nov 21 10:35 gid_map
-r----- 1 saurav saurav 0 Nov 21 10:35 io
-r--r--r-- 1 saurav saurav 0 Nov 21 10:35 limits
-rw-r--r-- 1 saurav saurav 0 Nov 21 10:35 loginuid
dr-x----- 2 saurav saurav 0 Nov 21 10:35 map_files
-r--r--r-- 1 saurav saurav 0 Nov 21 10:35 maps
-rw----- 1 saurav saurav 0 Nov 21 10:35 mem
-r--r--r-- 1 saurav saurav 0 Nov 21 10:35 mountinfo
-r--r--r-- 1 saurav saurav 0 Nov 21 10:35 mounts
```

```
Activities Terminal Sun 10/31 saurav@ubuntu-18:/proc/9386
sleep10000saurav@ubuntu-18:/proc/9386$ ls -l
total 0
-r--r--r-- 1 saurav saurav 0 Nov 21 10:35 arch_status
dr-xr-xr-x 2 saurav saurav 0 Nov 21 10:35 attr
-rw-r--r-- 1 saurav saurav 0 Nov 21 10:35 autogroup
-r----- 1 saurav saurav 0 Nov 21 10:35 auxv
-r--r--r-- 1 saurav saurav 0 Nov 21 10:35 cgroup
--w----- 1 saurav saurav 0 Nov 21 10:35 clear_refs
-r--r--r-- 1 saurav saurav 0 Nov 21 10:35 cmdline
-rw-r--r-- 1 saurav saurav 0 Nov 21 10:35 comm
-rw-r--r-- 1 saurav saurav 0 Nov 21 10:35 coredump_filter
-r--r--r-- 1 saurav saurav 0 Nov 21 10:35 cpuset
lrwxrwxrwx 1 saurav saurav 0 Nov 21 10:35 cwd -> /proc
-r----- 1 saurav saurav 0 Nov 21 10:35 environ
lrwxrwxrwx 1 saurav saurav 0 Nov 21 10:35 exe -> /bin/sleep
dr-x----- 2 saurav saurav 0 Nov 21 10:35 fd
dr-x----- 2 saurav saurav 0 Nov 21 10:35 fdinfo
-rw-r--r-- 1 saurav saurav 0 Nov 21 10:35 gid_map
-r----- 1 saurav saurav 0 Nov 21 10:35 io
-r--r--r-- 1 saurav saurav 0 Nov 21 10:35 limits
-rw-r--r-- 1 saurav saurav 0 Nov 21 10:35 loginuid
dr-x----- 2 saurav saurav 0 Nov 21 10:35 map_files
-r--r--r-- 1 saurav saurav 0 Nov 21 10:35 maps
-rw----- 1 saurav saurav 0 Nov 21 10:35 mem
-r--r--r-- 1 saurav saurav 0 Nov 21 10:35 mountinfo
-r--r--r-- 1 saurav saurav 0 Nov 21 10:35 mounts
```

```
Activities Terminal Sun 10:35 saurav@ubuntu:18./proc/9386
sleep1000saurav@ubuntu:~$ cd /proc/9386 && ls -l
total 0
-r--r--r-- 1 saurav saurav 0 Nov 21 10:35 arch_status
dr-xr-xr-x 2 saurav saurav 0 Nov 21 10:35 attr
-rw-r--r-- 1 saurav saurav 0 Nov 21 10:35 autogroup
-r----- 1 saurav saurav 0 Nov 21 10:35 auxv
-r--r--r-- 1 saurav saurav 0 Nov 21 10:35 cgroup
--w----- 1 saurav saurav 0 Nov 21 10:35 clear_refs
-r--r--r-- 1 saurav saurav 0 Nov 21 10:35 cmdline
-rw-r--r-- 1 saurav saurav 0 Nov 21 10:35 comm
-rw-r--r-- 1 saurav saurav 0 Nov 21 10:35 coredump_filter
-r--r--r-- 1 saurav saurav 0 Nov 21 10:35 cpuset
lrwxrwxrwx 1 saurav saurav 0 Nov 21 10:35 cwd -> /proc
-r----- 1 saurav saurav 0 Nov 21 10:35 environ
lrwxrwxrwx 1 saurav saurav 0 Nov 21 10:35 exe -> /bin/sleep
dr-x----- 2 saurav saurav 0 Nov 21 10:35 fd
dr-x----- 2 saurav saurav 0 Nov 21 10:35 fdinfo
-rw-r--r-- 1 saurav saurav 0 Nov 21 10:35 gid_map
-r----- 1 saurav saurav 0 Nov 21 10:35 io
-r--r--r-- 1 saurav saurav 0 Nov 21 10:35 limits
-rw-r--r-- 1 saurav saurav 0 Nov 21 10:35 loginuid
dr-x----- 2 saurav saurav 0 Nov 21 10:35 map_files
-r--r--r-- 1 saurav saurav 0 Nov 21 10:35 maps
-rw----- 1 saurav saurav 0 Nov 21 10:35 mem
-r--r--r-- 1 saurav saurav 0 Nov 21 10:35 mountinfo
-r--r--r-- 1 saurav saurav 0 Nov 21 10:35 mounts
```

```
Activities Terminal Sun 10:35 saurav@ubuntu:18./proc/9386
sleep1000saurav@ubuntu:~$ cd /proc/9386 && ls -l
total 0
-r--r--r-- 1 saurav saurav 0 Nov 21 10:35 arch_status
dr-xr-xr-x 2 saurav saurav 0 Nov 21 10:35 attr
-rw-r--r-- 1 saurav saurav 0 Nov 21 10:35 autogroup
-r----- 1 saurav saurav 0 Nov 21 10:35 auxv
-r--r--r-- 1 saurav saurav 0 Nov 21 10:35 cgroup
--w----- 1 saurav saurav 0 Nov 21 10:35 clear_refs
-r--r--r-- 1 saurav saurav 0 Nov 21 10:35 cmdline
-rw-r--r-- 1 saurav saurav 0 Nov 21 10:35 comm
-rw-r--r-- 1 saurav saurav 0 Nov 21 10:35 coredump_filter
-r--r--r-- 1 saurav saurav 0 Nov 21 10:35 cpuset
lrwxrwxrwx 1 saurav saurav 0 Nov 21 10:35 cwd -> /proc
-r----- 1 saurav saurav 0 Nov 21 10:35 environ
lrwxrwxrwx 1 saurav saurav 0 Nov 21 10:35 exe -> /bin/sleep
dr-x----- 2 saurav saurav 0 Nov 21 10:35 fd
dr-x----- 2 saurav saurav 0 Nov 21 10:35 fdinfo
-rw-r--r-- 1 saurav saurav 0 Nov 21 10:35 gid_map
-r----- 1 saurav saurav 0 Nov 21 10:35 io
-r--r--r-- 1 saurav saurav 0 Nov 21 10:35 limits
-rw-r--r-- 1 saurav saurav 0 Nov 21 10:35 loginuid
dr-x----- 2 saurav saurav 0 Nov 21 10:35 map_files
-r--r--r-- 1 saurav saurav 0 Nov 21 10:35 maps
-rw----- 1 saurav saurav 0 Nov 21 10:35 mem
-r--r--r-- 1 saurav saurav 0 Nov 21 10:35 mountinfo
-r--r--r-- 1 saurav saurav 0 Nov 21 10:35 mounts
```

```
Activities Terminal Sun 10:35 saurav@ubuntu-18:/proc/9386
-rw-r--r-- 1 saurav saurav 0 Nov 21 10:35 mounts
-r----- 1 saurav saurav 0 Nov 21 10:35 mountstats
dr-xr-xr-x 59 saurav saurav 0 Nov 21 10:35 net
dr-x--x--x 2 saurav saurav 0 Nov 21 10:35 ns
-rw-r--r-- 1 saurav saurav 0 Nov 21 10:35 numa_maps
-rw-r--r-- 1 saurav saurav 0 Nov 21 10:35 oom_adj
-rw-r--r-- 1 saurav saurav 0 Nov 21 10:35 oom_score
-rw-r--r-- 1 saurav saurav 0 Nov 21 10:35 oom_score_adj
-r----- 1 saurav saurav 0 Nov 21 10:35 pagemap
-r----- 1 saurav saurav 0 Nov 21 10:35 patch_state
-r----- 1 saurav saurav 0 Nov 21 10:35 personality
-rw-r--r-- 1 saurav saurav 0 Nov 21 10:35 projid_map
lrwxrwxrwx 1 saurav saurav 0 Nov 21 10:35 root -> /
-rw-r--r-- 1 saurav saurav 0 Nov 21 10:35 sched
-rw-r--r-- 1 saurav saurav 0 Nov 21 10:35 schedstat
-rw-r--r-- 1 saurav saurav 0 Nov 21 10:35 sessionid
-rw-r--r-- 1 saurav saurav 0 Nov 21 10:35 setgroups
-rw-r--r-- 1 saurav saurav 0 Nov 21 10:35 smaps
-rw-r--r-- 1 saurav saurav 0 Nov 21 10:35 smaps_rollup
-r----- 1 saurav saurav 0 Nov 21 10:35 stack
-rw-r--r-- 1 saurav saurav 0 Nov 21 10:35 stat
-rw-r--r-- 1 saurav saurav 0 Nov 21 10:35 statm
-rw-r--r-- 1 saurav saurav 0 Nov 21 10:35 status
-r----- 1 saurav saurav 0 Nov 21 10:35 syscall
dr-xr-xr-x 3 saurav saurav 0 Nov 21 10:35 task
-rw-r--r-- 1 saurav saurav 0 Nov 21 10:35 timers
```

Let us, list all the files in long form. So, here you can see that exe points to the executable, which is running in this process. So, it is pointing to slash bin slash sleep, which contains the code for sleep command and then there is this cwd link which is pointing to slash proc. So, it is pointing to the current working directory for this process.

And then there is this root, which is pointing to slash and mostly in all of the processes it will be slash except when we use chroot to change the route.

(Refer Slide Time: 02:29)

```
Activities Terminal Sun 10:35 saurav@ubuntu-18:/proc/9386
-rw-r--r-- 1 saurav saurav 0 Nov 21 10:35 oom_adj
-rw-r--r-- 1 saurav saurav 0 Nov 21 10:35 oom_score
-rw-r--r-- 1 saurav saurav 0 Nov 21 10:35 oom_score_adj
-r----- 1 saurav saurav 0 Nov 21 10:35 pagemap
-r----- 1 saurav saurav 0 Nov 21 10:35 patch_state
-r----- 1 saurav saurav 0 Nov 21 10:35 personality
-rw-r--r-- 1 saurav saurav 0 Nov 21 10:35 projid_map
lrwxrwxrwx 1 saurav saurav 0 Nov 21 10:35 root -> /
-rw-r--r-- 1 saurav saurav 0 Nov 21 10:35 sched
-rw-r--r-- 1 saurav saurav 0 Nov 21 10:35 schedstat
-rw-r--r-- 1 saurav saurav 0 Nov 21 10:35 sessionid
-rw-r--r-- 1 saurav saurav 0 Nov 21 10:35 setgroups
-rw-r--r-- 1 saurav saurav 0 Nov 21 10:35 smaps
-rw-r--r-- 1 saurav saurav 0 Nov 21 10:35 smaps_rollup
-r----- 1 saurav saurav 0 Nov 21 10:35 stack
-rw-r--r-- 1 saurav saurav 0 Nov 21 10:35 stat
-rw-r--r-- 1 saurav saurav 0 Nov 21 10:35 statm
-rw-r--r-- 1 saurav saurav 0 Nov 21 10:35 status
-r----- 1 saurav saurav 0 Nov 21 10:35 syscall
dr-xr-xr-x 3 saurav saurav 0 Nov 21 10:35 task
-rw-r--r-- 1 saurav saurav 0 Nov 21 10:35 timerslack_ns
-rw-r--r-- 1 saurav saurav 0 Nov 21 10:35 uid_map
-rw-r--r-- 1 saurav saurav 0 Nov 21 10:35 wchan
saurav@ubuntu-18:/proc/9386$
```

```
Activities Terminal Sun 10:36 saurav@ubuntu-18: /proc/9386
-rw-r--r-- 1 saurav saurav 0 Nov 21 10:35 oom_adj
-r--r--r-- 1 saurav saurav 0 Nov 21 10:35 oom_score
-rw-r--r-- 1 saurav saurav 0 Nov 21 10:35 oom_score_adj
-r----- 1 saurav saurav 0 Nov 21 10:35 pagemap
-r----- 1 saurav saurav 0 Nov 21 10:35 patch_state
-r----- 1 saurav saurav 0 Nov 21 10:35 personality
-rw-r--r-- 1 saurav saurav 0 Nov 21 10:35 projid_map
lrwxrwxrwx 1 saurav saurav 0 Nov 21 10:35 root -> /
-rw-r--r-- 1 saurav saurav 0 Nov 21 10:35 sched
-r--r--r-- 1 saurav saurav 0 Nov 21 10:35 schedstat
-r--r--r-- 1 saurav saurav 0 Nov 21 10:35 sessionid
-rw-r--r-- 1 saurav saurav 0 Nov 21 10:35 setgroups
-r--r--r-- 1 saurav saurav 0 Nov 21 10:35 smaps
-r--r--r-- 1 saurav saurav 0 Nov 21 10:35 smaps_rollup
-r----- 1 saurav saurav 0 Nov 21 10:35 stack
-r--r--r-- 1 saurav saurav 0 Nov 21 10:35 stat
-r--r--r-- 1 saurav saurav 0 Nov 21 10:35 statm
-r--r--r-- 1 saurav saurav 0 Nov 21 10:35 status
-r----- 1 saurav saurav 0 Nov 21 10:35 syscall
dr-xr-xr-x 3 saurav saurav 0 Nov 21 10:35 task
-r--r--r-- 1 saurav saurav 0 Nov 21 10:35 timers
-rw-rw-rw- 1 saurav saurav 0 Nov 21 10:35 timerslack_ns
-rw-r--r-- 1 saurav saurav 0 Nov 21 10:35 uid_map
-r--r--r-- 1 saurav saurav 0 Nov 21 10:35 wchan
::: saurav@ubuntu-18:/proc/9386$ cat status
```

```
Activities Terminal Sun 10:37 saurav@ubuntu-18: /proc/9386
-rw-rw-rw- 1 saurav saurav 0 Nov 21 10:35 timerslack_ns
-rw-r--r-- 1 saurav saurav 0 Nov 21 10:35 uid_map
-r--r--r-- 1 saurav saurav 0 Nov 21 10:35 wchan
saurav@ubuntu-18:/proc/9386$ cat status
Name: sleep
Umask: 0002
State: S (sleeping)
Tgid: 9386
Ngid: 0
Pid: 9386
PPid: 30776
TracerPid: 0
Uid: 1000 1000 1000 1000
Gid: 1000 1000 1000 1000
FDSize: 256
Groups: 4 24 27 30 46 116 126 1000
NSTgid: 9386
NSpid: 9386
NSpgid: 9386
NSsid: 30776
VmPeak: 14580 kB
VmSize: 14580 kB
VmLck: 0 kB
VmPtn: 0 kB
::: VmHWM: 844 kB
```

```
Activities Terminal Sun 10:37 saurav@ubuntu-18:/proc/9386
-rw-rw-rw- 1 saurav saurav 0 Nov 21 10:35 timerslack_ns
-rw-r--r-- 1 saurav saurav 0 Nov 21 10:35 uid_map
-r--r--r-- 1 saurav saurav 0 Nov 21 10:35 wchan
saurav@ubuntu-18:/proc/9386$ cat status
Name: sleep
Umask: 0002
State: S (sleeping)
Tgid: 9386
Ngid: 0
Pid: 9386
PPid: 30776
TracerPid: 0
Uid: 1000 1000 1000 1000
Gid: 1000 1000 1000 1000
FDSize: 256
Groups: 4 24 27 30 46 116 126 1000
NSTgid: 9386
NSpid: 9386
NSpgid: 9386
NSSid: 30776
VmPeak: 14580 kB
VmSize: 14580 kB
VmLck: 0 kB
VmPin: 0 kB
VmHWM: 844 kB
```

```
Activities Terminal Sun 10:37 saurav@ubuntu-18:/proc/9386
-rw-rw-rw- 1 saurav saurav 0 Nov 21 10:35 timerslack_ns
-rw-r--r-- 1 saurav saurav 0 Nov 21 10:35 uid_map
-r--r--r-- 1 saurav saurav 0 Nov 21 10:35 wchan
saurav@ubuntu-18:/proc/9386$ cat status
Name: sleep
Umask: 0002
State: S (sleeping)
Tgid: 9386
Ngid: 0
Pid: 9386
PPid: 30776
TracerPid: 0
Uid: 1000 1000 1000 1000
Gid: 1000 1000 1000 1000
FDSize: 256
Groups: 4 24 27 30 46 116 126 1000
NSTgid: 9386
NSpid: 9386
NSpgid: 9386
NSSid: 30776
VmPeak: 14580 kB
VmSize: 14580 kB
VmLck: 0 kB
VmPin: 0 kB
VmHWM: 844 kB
```



```
Activities Terminal - Sun 10:37 saurav@ubuntu-18:/proc/9386
File Edit View Search Terminal Help
----- 1 saurav saurav 0 Nov 21 10:35 eivU Oll
lRwxRwxRwx 1 saurav saurav 0 Nov 21 10:35 exe -> /bin/sleep
dr-x----- 2 saurav saurav 0 Nov 21 10:35 fdinfo
-rw-r--r-- 1 saurav saurav 0 Nov 21 10:35 gid_map
-r----- 1 saurav saurav 0 Nov 21 10:35 io
-r--r--r-- 1 saurav saurav 0 Nov 21 10:35 limits
-rw-r--r-- 1 saurav saurav 0 Nov 21 10:35 loginuid
dr-x----- 2 saurav saurav 0 Nov 21 10:35 map_files
-r--r--r-- 1 saurav saurav 0 Nov 21 10:35 maps
-rw----- 1 saurav saurav 0 Nov 21 10:35 mem
-r--r--r-- 1 saurav saurav 0 Nov 21 10:35 mountinfo
-r--r--r-- 1 saurav saurav 0 Nov 21 10:35 mounts
-r----- 1 saurav saurav 0 Nov 21 10:35 mountstats
dr-xr-xr-x 59 saurav saurav 0 Nov 21 10:35 net
dr-x--x--x 2 saurav saurav 0 Nov 21 10:35 ns
-r--r--r-- 1 saurav saurav 0 Nov 21 10:35 numa_maps
-rw-r--r-- 1 saurav saurav 0 Nov 21 10:35 oom_adj
-r--r--r-- 1 saurav saurav 0 Nov 21 10:35 oom_score
-rw-r--r-- 1 saurav saurav 0 Nov 21 10:35 oom_score_adj
-r----- 1 saurav saurav 0 Nov 21 10:35 pagemap
-r----- 1 saurav saurav 0 Nov 21 10:35 patch_state
-r----- 1 saurav saurav 0 Nov 21 10:35 personality
-rw-r--r-- 1 saurav saurav 0 Nov 21 10:35 projid_map
lRwxRwxRwx 1 saurav saurav 0 Nov 21 10:35 root -> /
-rw-r--r-- 1 saurav saurav 0 Nov 21 10:35 sched
```

And let us see what else do we have. Then there is this fd folder, which contains links to all the open file descriptors.

(Refer Slide Time: 02:55)

```
Activities Terminal - Sun 10:37 saurav@ubuntu-18:/proc/9386/fd
File Edit View Search Terminal Help
-rw-r--r-- 1 saurav saurav 0 Nov 21 10:35 projid_map
lRwxRwxRwx 1 saurav saurav 0 Nov 21 10:35 root -> /
-rw-r--r-- 1 saurav saurav 0 Nov 21 10:35 sched
-r--r--r-- 1 saurav saurav 0 Nov 21 10:35 schedstat
-r--r--r-- 1 saurav saurav 0 Nov 21 10:35 sessionid
-rw-r--r-- 1 saurav saurav 0 Nov 21 10:35 setgroups
-r--r--r-- 1 saurav saurav 0 Nov 21 10:35 smaps
-r--r--r-- 1 saurav saurav 0 Nov 21 10:35 smaps_rollup
-r----- 1 saurav saurav 0 Nov 21 10:35 stack
-r--r--r-- 1 saurav saurav 0 Nov 21 10:35 stat
-r--r--r-- 1 saurav saurav 0 Nov 21 10:35 statm
-r--r--r-- 1 saurav saurav 0 Nov 21 10:35 status
-r----- 1 saurav saurav 0 Nov 21 10:35 syscall
dr-xr-xr-x 3 saurav saurav 0 Nov 21 10:35 task
-r--r--r-- 1 saurav saurav 0 Nov 21 10:35 timers
-rw-rw-rw 1 saurav saurav 0 Nov 21 10:35 timerslack_ns
-rw-r--r-- 1 saurav saurav 0 Nov 21 10:35 uid_map
-r--r--r-- 1 saurav saurav 0 Nov 21 10:35 wchan
saurav@ubuntu-18:/proc/9386$ cd fd
saurav@ubuntu-18:/proc/9386/fd$ ls -l
total 0
lRwx----- 1 saurav saurav 64 Nov 21 10:37 0 -> /dev/pts/0
lRwx----- 1 saurav saurav 64 Nov 21 10:37 1 -> /dev/pts/0
lRwx----- 1 saurav saurav 64 Nov 21 10:37 2 -> /dev/pts/0
saurav@ubuntu-18:/proc/9386/fd$
```

So if I do cd fd, and let us list all the file descriptors. So, here we are all the input output and error are pointing to this terminology is dev slash pts slash 0.

(Refer Slide Time: 03:09)

```
Activities Terminal - Sun 10:37 saurav@ubuntu-18:/proc/9386
File Edit View Search Terminal Help
lrwxrwxrwx 1 saurav saurav 0 Nov 21 10:35 root -> /
-rw-r--r-- 1 saurav saurav 0 Nov 21 10:35 sched
-r--r--r-- 1 saurav saurav 0 Nov 21 10:35 schedstat
-r--r--r-- 1 saurav saurav 0 Nov 21 10:35 sessionid
-rw-r--r-- 1 saurav saurav 0 Nov 21 10:35 setgroups
-r--r--r-- 1 saurav saurav 0 Nov 21 10:35 smaps
-r--r--r-- 1 saurav saurav 0 Nov 21 10:35 smaps_rollup
-r----- 1 saurav saurav 0 Nov 21 10:35 stack
-r--r--r-- 1 saurav saurav 0 Nov 21 10:35 stat
-r--r--r-- 1 saurav saurav 0 Nov 21 10:35 statm
-r--r--r-- 1 saurav saurav 0 Nov 21 10:35 status
-r----- 1 saurav saurav 0 Nov 21 10:35 syscall
dr-xr-xr-x 3 saurav saurav 0 Nov 21 10:35 task
-r--r--r-- 1 saurav saurav 0 Nov 21 10:35 timers
-rw-rw-rw- 1 saurav saurav 0 Nov 21 10:35 timerslack_ns
-rw-r--r-- 1 saurav saurav 0 Nov 21 10:35 uid_map
-r--r--r-- 1 saurav saurav 0 Nov 21 10:35 wchan
saurav@ubuntu-18:/proc/9386$ cd fd
saurav@ubuntu-18:/proc/9386/fd$ ls -l
total 0
lrwx----- 1 saurav saurav 64 Nov 21 10:37 0 -> /dev/pts/0
lrwx----- 1 saurav saurav 64 Nov 21 10:37 1 -> /dev/pts/0
lrwx----- 1 saurav saurav 64 Nov 21 10:37 2 -> /dev/pts/0
saurav@ubuntu-18:/proc/9386/fd$ cd ..
saurav@ubuntu-18:/proc/9386$
```

```
Activities Terminal - Sun 10:38 saurav@ubuntu-18:/proc/9386
File Edit View Search Terminal Help
saurav@ubuntu-18:/proc/9386$ ls -l
total 0
-r--r--r-- 1 saurav saurav 0 Nov 21 10:35 arch_status
dr-xr-xr-x 2 saurav saurav 0 Nov 21 10:35 attr
-rw-r--r-- 1 saurav saurav 0 Nov 21 10:35 autogroup
-r----- 1 saurav saurav 0 Nov 21 10:35 auxv
-r--r--r-- 1 saurav saurav 0 Nov 21 10:35 cgroup
--w----- 1 saurav saurav 0 Nov 21 10:35 clear_refs
-r--r--r-- 1 saurav saurav 0 Nov 21 10:35 cmdline
-rw-r--r-- 1 saurav saurav 0 Nov 21 10:35 comm
-rw-r--r-- 1 saurav saurav 0 Nov 21 10:35 coredump_filter
-r--r--r-- 1 saurav saurav 0 Nov 21 10:35 cpuset
lrwxrwxrwx 1 saurav saurav 0 Nov 21 10:35 cwd -> /proc
-r----- 1 saurav saurav 0 Nov 21 10:35 environ
lrwxrwxrwx 1 saurav saurav 0 Nov 21 10:35 exe -> /bin/sleep
dr-x----- 2 saurav saurav 0 Nov 21 10:35 fd
dr-x----- 2 saurav saurav 0 Nov 21 10:35 fdinfo
-rw-r--r-- 1 saurav saurav 0 Nov 21 10:35 gid_map
-r----- 1 saurav saurav 0 Nov 21 10:35 io
-r--r--r-- 1 saurav saurav 0 Nov 21 10:35 limits
-rw-r--r-- 1 saurav saurav 0 Nov 21 10:35 loginuid
dr-x----- 2 saurav saurav 0 Nov 21 10:35 map_files
-r--r--r-- 1 saurav saurav 0 Nov 21 10:35 maps
-rw----- 1 saurav saurav 0 Nov 21 10:35 mem
-r--r--r-- 1 saurav saurav 0 Nov 21 10:35 mountinfo
-r--r--r-- 1 saurav saurav 0 Nov 21 10:35 mountr
```

Then we have this environ file which contains all the environment variables for this process.

(Refer Slide Time: 03:16)

```
Activities Terminal Sun 10:38 saurav@ubuntu-18:/proc/9386
File Edit View Search Terminal Help
lrwxrwxrwx 1 saurav saurav 0 Nov 21 10:35 root -> /
-rw-r--r-- 1 saurav saurav 0 Nov 21 10:35 sched
-r--r--r-- 1 saurav saurav 0 Nov 21 10:35 schedstat
-r--r--r-- 1 saurav saurav 0 Nov 21 10:35 sessionid
-rw-r--r-- 1 saurav saurav 0 Nov 21 10:35 setgroups
-r--r--r-- 1 saurav saurav 0 Nov 21 10:35 smaps
-r--r--r-- 1 saurav saurav 0 Nov 21 10:35 smaps_rollup
-r----- 1 saurav saurav 0 Nov 21 10:35 stack
-r--r--r-- 1 saurav saurav 0 Nov 21 10:35 stat
-r--r--r-- 1 saurav saurav 0 Nov 21 10:35 statm
-r--r--r-- 1 saurav saurav 0 Nov 21 10:35 status
-r----- 1 saurav saurav 0 Nov 21 10:35 syscall
dr-xr-xr-x 3 saurav saurav 0 Nov 21 10:35 task
-r--r--r-- 1 saurav saurav 0 Nov 21 10:35 timers
-rw-rw-rw- 1 saurav saurav 0 Nov 21 10:35 timerslack_ns
-rw-r--r-- 1 saurav saurav 0 Nov 21 10:35 uid_map
-r--r--r-- 1 saurav saurav 0 Nov 21 10:35 wchan
saurav@ubuntu-18:/proc/9386$ cd fd
saurav@ubuntu-18:/proc/9386/fd$ ls -l
total 0
lrwx----- 1 saurav saurav 64 Nov 21 10:37 0 -> /dev/pts/0
lrwx----- 1 saurav saurav 64 Nov 21 10:37 1 -> /dev/pts/0
lrwx----- 1 saurav saurav 64 Nov 21 10:37 2 -> /dev/pts/0
saurav@ubuntu-18:/proc/9386/fd$ cd ..
saurav@ubuntu-18:/proc/9386$ cat environ
```

```
Activities Terminal Sun 10:39 saurav@ubuntu-18:/proc/9386
File Edit View Search Terminal Help
-rw-r--r-- 1 saurav saurav 0 Nov 21 10:35 utx_map
-r--r--r-- 1 saurav saurav 0 Nov 21 10:35 wchan
saurav@ubuntu-18:/proc/9386$ cd fd
saurav@ubuntu-18:/proc/9386/fd$ ls -l
total 0
lrwx----- 1 saurav saurav 64 Nov 21 10:37 0 -> /dev/pts/0
lrwx----- 1 saurav saurav 64 Nov 21 10:37 1 -> /dev/pts/0
lrwx----- 1 saurav saurav 64 Nov 21 10:37 2 -> /dev/pts/0
saurav@ubuntu-18:/proc/9386/fd$ cd ..
saurav@ubuntu-18:/proc/9386$ cat environ
CLUTTER_IM_MODULE=xtd LIBRARY_PATH=/home/saurav/Desktop/Workspace/qsin-master/libLS_COLORS=rs
=0:dt=01;34:ln=01;36:mh=00:pi=40;33:so=01;35:do=01;35:bd=40;33;01:cd=40;33;01:or=40;31;01:mi=00:
su=37;41:sg=30;43:ca=30;41:tw=30;42:ow=34;42:st=37;44:ex=01;32:*.tar=01;31:*.tgz=01;31:*.arc=01;
31:*.arj=01;31:*.taz=01;31:*.lha=01;31:*.lz4=01;31:*.lzh=01;31:*.lzma=01;31:*.tlz=01;31:*.txz=01
;31:*.tzo=01;31:*.t7z=01;31:*.zip=01;31:*.z=01;31:*.Z=01;31:*.dz=01;31:*.gz=01;31:*.lrz=01;31:*.
lz=01;31:*.lzo=01;31:*.xz=01;31:*.zst=01;31:*.tzst=01;31:*.bz2=01;31:*.bz=01;31:*.tbz=01;31:*.tb
z2=01;31:*.tz=01;31:*.deb=01;31:*.rpm=01;31:*.jar=01;31:*.war=01;31:*.ear=01;31:*.sar=01;31:*.ra
r=01;31:*.alz=01;31:*.ace=01;31:*.zoo=01;31:*.cpio=01;31:*.7z=01;31:*.rz=01;31:*.cab=01;31:*.wim
=01;31:*.swm=01;31:*.dwm=01;31:*.esd=01;31:*.jpg=01;35:*.jpeg=01;35:*.mjpg=01;35:*.mjpeg=01;35:*.
gif=01;35:*.bmp=01;35:*.pbm=01;35:*.pgm=01;35:*.ppm=01;35:*.tga=01;35:*.xbm=01;35:*.xpm=01;35:*.
tif=01;35:*.tiff=01;35:*.png=01;35:*.svg=01;35:*.svgz=01;35:*.mng=01;35:*.pcx=01;35:*.mov=01;35
:*.mpg=01;35:*.mpeg=01;35:*.m2v=01;35:*.mkv=01;35:*.webm=01;35:*.ogm=01;35:*.mp4=01;35:*.m4v=01;
35:*.mp4v=01;35:*.vob=01;35:*.qt=01;35:*.nuv=01;35:*.wmv=01;35:*.asf=01;35:*.rm=01;35:*.rmvb=01;
35:*.flc=01;35:*.avi=01;35:*.fli=01;35:*.flv=01;35:*.gl=01;35:*.dl=01;35:*.xcf=01;35:*.xwd=01;35
:*.yuv=01;35:*.cgm=01;35:*.emf=01;35:*.ogv=01;35:*.ogx=01;35:*.aac=00;36:*.au=00;36:*.flac=00;36
:*.m4a=00;36:*.mid=00;36:*.midi=00;36:*.mka=00;36:*.mp3=00;36:*.mpc=00;36:*.ogg=00;36:*.ra=00;36
```

```

.tiff=01;35*.tiff=01;35*.png=01;35*.svg=01;35*.mng=01;35*.pcx=01;35*.mov=01;35
:*.*.mpg=01;35*.mpeg=01;35*.m2v=01;35*.mkv=01;35*.webm=01;35*.ogm=01;35*.mp4=01;35*.m4v=01;
35*.mp4v=01;35*.vob=01;35*.qt=01;35*.nuv=01;35*.wmv=01;35*.asf=01;35*.rm=01;35*.rmvb=01;
35*.flc=01;35*.avi=01;35*.fli=01;35*.flv=01;35*.gl=01;35*.dl=01;35*.xcf=01;35*.xwd=01;35
:*.*.yuv=01;35*.cgm=01;35*.enf=01;35*.ogv=01;35*.ogx=01;35*.aac=00;36*.au=00;36*.flac=00;36
:*.*.m4a=00;36*.mid=00;36*.midi=00;36*.nka=00;36*.mp3=00;36*.mpc=00;36*.ogg=00;36*.ra=00;36
:*.*.wav=00;36*.oga=00;36*.opus=00;36*.spx=00;36*.xspf=00;36:LESSCLOSE=/usr/bin/lesspipe %s %s
XDG_MENU_PREFIX=gnome-LANG=en-INDISPLAY=:0LDPWD=/home/sauravGNOME_SHELL_SESSION_MODE=ubuntuCOLO
RTERM=truecolorUSERNAME=sauravXDG_VTNR=1SSH_AUTH_SOCK=/run/user/1000/keyring/sshXDG_SESSION_ID=1
USER=sauravDESKTOP_SESSION=ubuntuQT4_IM_MODULE=ximTEXTDOMAINDIR=/usr/share/locale/GNOME_TERMINAL
_SCREEN=/org/gnome/Terminal/screen/a2f7815d_3137_4f7b_9e5d_2a795441002FPWD=/procHOME=/home/saura
VTEXTDOMAIN=in-configSSH_AGENT_PID=1288QT_ACCESSIBILITY=1XDG_SESSION_TYPE=x11XDG_DATA_DIRS=/usr
/share/ubuntu:/usr/local/share:/usr/share:/var/lib/napd/desktopXDG_SESSION_DESKTOP=ubuntuGJS_D
EBUG_OUTPUT=stderrGTK_MODULES=gail:atk-bridgeQSIM_PREFIX=/home/saurav/Desktop/Workspace/qsin-mas
terWINDOWPATH=1TERM=xterm-256colorSHELL=/bin/bashVTE_VERSION=5202QT_IM_MODULE=ibusXMODIFIERS=@im
=ibusIM_CONFIG_PHASE=2XDG_CURRENT_DESKTOP=ubuntu:GNOMEGPG_AGENT_INFO=/run/user/1000/gnupg/S.gpg
-agent:0:1GNOME_TERMINAL_SERVICE=:1.658XDG_SEAT=seat0SHLVL=1LANGUAGE=en-IN:enGDMSESSION=ubuntuGNO
ME_DESKTOP_SESSION_ID=this-is-deprecatedLOGNAME=sauravBUS_SESSION_BUS_ADDRESS=unix:path=/run/us
er/1000/busXDG_RUNTIME_DIR=/run/user/1000XAUTHORITY=/run/user/1000/gdm/XauthorityXDG_CONFIG_DIRS
=/etc/xdg/xdg-ubuntu:/etc/xdgPATH=/usr/local/sbin:/usr/local/bin:/usr/sbin:/usr/bin:/sbin:/bin:/
usr/games:/usr/local/games:/snap/bin:/home/saurav/Desktop/Workspace/qsin-master/tools/gcc-linaro
-5.3-2016.02-x86_64_aarch64-linux-gnu/bin:/usr/local/go/binGJS_DEBUG_TOPICS=JS ERROR;JS LOGSESSI
ON_MANAGER=local/ubuntu-18:/tmp/.ICE-unix/1171,unix/ubuntu-18:/tmp/.ICE-unix/1171LESSOPEN=| /u
sr/bin/lesspipe %sGTK_IM_MODULE=ibus=/bin/sleepsaurav@ubuntu-18:/proc/9386$ cd ..
::: saurav@ubuntu-18:/proc$ ls

```

```

saurav@ubuntu-18:/proc$ ls
1      131  1470  1681  27   3256  45   58   8187  buddyinfo  misc
10     1310 1472  17   28   326   46   5815  8479  bus         modules
1003   1315 1473  18   28201 33   47   5855  8940  cgroups    mounts
1031   1317 1476  1803 28202 34   48   59   9      cmdln     ntrr
1065   133  1477  18650 28213 341  481  6   9081   consoles  net
1080   1337 1484  18856 28214 35   488  60  9227   cpufreq   pagetypeinfo
1086   134  1490  1912  28215 36   489  602  927   crypto     partitions
1090   1343 1493  1920  28216 372  490  61  9273   devices    pressure
1091   135  1496  1925  28217 378  491  62  9274   diskstats  sched_debug
11     1369  15   2      28218 38   492  63  929   dma         schedstat
1105   1370  150  20    28219 380  495  64  9298   driver      scsi
1109   1378  1507  21    28220 382  50   65  9301   execdomains self
1111   138  1513  21415 28221 383  503  66  931   fb          slabinfo
113   1392  1515  21416 28222 384  504  6883 932   filesystems softirqs
114   1396  1520  22    29    39   505  726  933   fs          stat
115   1398  1521  224   3     391  506  729  934   interrupts  swaps
116   14   1522  225   30    393  507  731  938   ionem       sys
1164   1400  1523  226   303   397  508  732  9386   ioports    sysrq-trigger
117   1408  1525  23    30710 4   509  7443 940   irq         sysvipc
1171   1415  1559  23815 30721 40   51   751  9450   kallsyms   thread-self
118   1419  1569  24    30766 402  510  752  946   kcore      timer_list
119   1427  1576  2409  30776 406  511  756  950   keys       tty
12    1437  1581  2412  30839 407  512  759  952   key-users  uptime
::: 120  1441  16   2432  31018 41  519  760  9532   kmsg       version
::: 121  1448  1604  252  312  4116  52  761  954   kmemcg     version_group

```

So if I cat environ, so it has a lot of environment variable set, for instance, CLUTTER_IM_MODULE is set to xim, so on and so forth. Let us, go back and see what all files were there. Then there is this cpufreq file, which gives me information about the CPU.

(Refer Slide Time: 03:37)

```
Activities Terminal - Sun 10:39 saurav@ubuntu-18:/proc
File Edit View Search Terminal Help
1090 1343 1493 1920 28216 372 490 61 9273 devices pressure
1091 135 1496 1925 28217 378 491 62 9274 diskstats sched_debug
11 dna schedstat
1105 1370 150 20 28219 380 495 64 9298 driver scsi
1109 1378 1507 21 28220 382 50 65 9301 execdomains self
1111 138 1513 21415 28221 383 503 66 931 fb slabinfo
113 1392 1515 21416 28222 384 504 6883 932 filesystems softirqs
114 1396 1520 22 29 39 505 726 933 fs stat
115 1398 1521 224 3 391 506 729 934 interrupts swaps
116 14 1522 225 30 393 507 731 938 ionem sys
1164 1400 1523 226 303 397 508 732 9386 ioports sysrq-trigger
117 1408 1525 23 30710 4 509 7443 940 irq sysvipc
1171 1415 1559 23815 30721 40 51 751 9450 kallsyms thread-self
118 1419 1569 24 30766 402 510 752 946 kcore timer_list
119 1427 1576 2409 30776 406 511 756 950 keys tty
12 key-users uptime
120 1441 16 2432 31018 41 519 760 9532 kmsg version
121 1448 1604 253 313 4116 52 761 954 kpagecgroup version_signature
12247 1452 1622 256 31541 413 526 763 990 kpagecount vmlallocinfo
1288 1456 1643 257 31555 42 53 764 991 kpageflags vmstat
1291 1461 1646 26 31577 424 54 765 994 loadavg zoneinfo
1296 1465 165 26143 32 439 56 7962 997 locks
13 1469 1657 26144 321 44 5623 8126 acpi mdstat
130 147 1671 26257 3229 445 57 8166 asound meninfo
saurav@ubuntu-18:/proc$ cat cpuidinfo
```

```
Activities Terminal - Sun 10:39 saurav@ubuntu-18:/proc
File Edit View Search Terminal Help
fmon pebs bts rep_good nopl xtopology nonstop_tsc cpuid aperfmperf pni pclmulqdq dtes64 monitor
ds_cpl vnx est tm2 sse3 sdbg fma cx16 xtpr pdcm pcid sse4_1 sse4_2 x2apic movbe popcnt tsc_dead
line_timer aes xsave avx f16c rdrand lahf_lm abm 3dnowprefetch cpuid_fault epb invpcid_single pt
i ssbd ibrs ibpb stibp tpr_shadow vnmi flexpriority ept vpid ept_ad fsgsbase tsc_adjust bmi1 avx
2 smep bmi2 erms invpcid mpx rdseed adx snap clflushopt intel_pt xsaveopt xsavec xgetbv1 xsaves
dtherm ida arat pln pts hwp hwp_notify hwp_act_window hwp_epp md_clear flush_lid
bugs : cpu_meltdown spectre_v1 spectre_v2 spec_store_bypass l1tf mds swapgs itlb_mult
ihlt srbds
bogomips : 3999.93
clflush size : 64
cache_alignment : 64
address sizes : 39 bits physical, 48 bits virtual
power management:
processor : 7
vendor_id : GenuineIntel
cpu family : 6
model : 142
model name : Intel(R) Core(TM) i7-8550U CPU @ 1.80GHz
stepping : 10
microcode : 0xea
cpu MHz : 800.005
cache size : 8192 KB
physical id : 0
siblings : 8
```

If I do cpuidinfo, so it gives me information about each other processor, because I have 8 processors, so at least all of them from 0 to 7. And it shows me the vendor which is Intel, then it is a 1.80 gigahertz processor, and some other information.

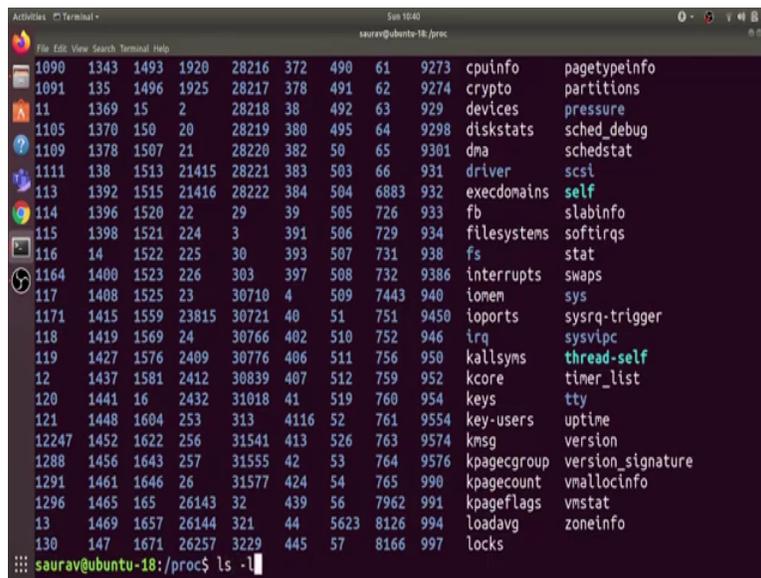
(Refer Slide Time: 03:58)

```
Activities Terminal - Sun 10:39 saurav@ubuntu-18:/proc
File Edit View Search Terminal Help
core id      : 3
cpu cores   : 4
apicid      : 7
initial apicid : 7
fpu         : yes
fpu_exception : yes
cpuid level : 22
wp          : yes
flags       : fpu vme de pse tsc msr pae mce cx8 apic sep ntrr pge mca cmov pat pse36 clflush
h dts acpi mmx fxsr sse sse2 ss ht tm pbe syscall nx pdpe1gb rdtscp lm constant_tsc art arch_per
fmon pebs bts rep_good nopl xtopology nonstop_tsc cpuid aperfperf pni pclmulqdq dtes64 monitor
ds_cpl vnx est t2n2 sse3 sdbg fma cx16 xtpr pcdm pcid sse4_1 sse4_2 x2apic movbe popcnt tsc_dead
line_timer aes xsave avx f16c rdrand lahf_lm abm 3dnowprefetch cpuid_fault epb invpcid_single pt
i ssbd ibrs ibpb stibp tpr_shadow vnmi flexpriority ept vpid ept_ad fsgsbase tsc_adjust bmi1 avx
2 smep bmi2 erms invpcid mpx rdseed adx smap clflushopt intel_pt xsaveopt xsavec xgetbv1 xsaves
dtherm ida arat pln pts hwp hwp_notify hwp_act_window hwp_epp md_clear flush_lid
bugs        : cpu_meltdown spectre_v1 spectre_v2 spec_store_bypass l1tf mds swapgs itlb_mult
ihit srbds
bogonips    : 3999.93
clflush size : 64
cache_alignment : 64
address sizes : 39 bits physical, 48 bits virtual
power management:
saurav@ubuntu-18:/proc$ cat meminfo
```

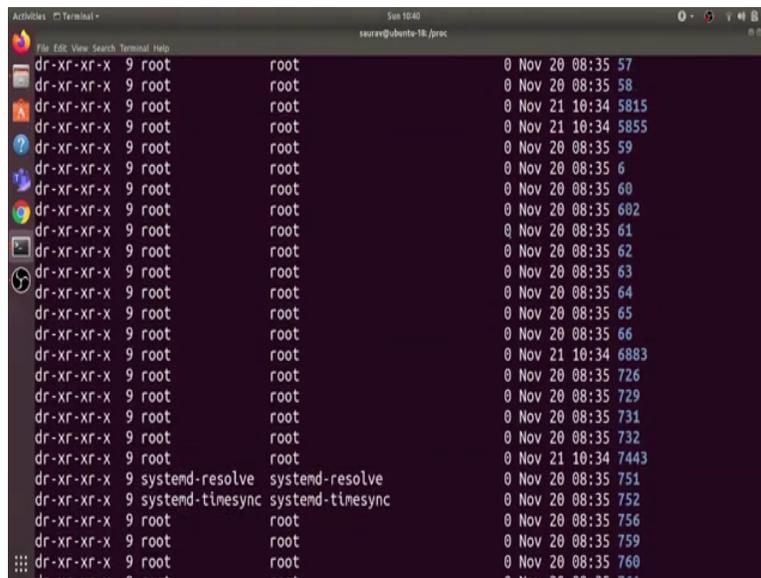
```
Activities Terminal - Sun 10:39 saurav@ubuntu-18:/proc
File Edit View Search Terminal Help
clflush size : 64
cache_alignment : 64
address sizes : 39 bits physical, 48 bits virtual
power management:
saurav@ubuntu-18:/proc$ cat meminfo
MemTotal: 16238796 kB
MemFree: 8757656 kB
MemAvailable: 14273356 kB
Buffers: 184676 kB
Cached: 5739776 kB
SwapCached: 0 kB
Active: 3954316 kB
Inactive: 2678904 kB
Active(anon): 1031256 kB
Inactive(anon): 33704 kB
Active(file): 2923060 kB
Inactive(file): 2645200 kB
Unevictable: 321024 kB
Mlocked: 32 kB
SwapTotal: 15625212 kB
SwapFree: 15625212 kB
Dirty: 792 kB
Writeback: 0 kB
AnonPages: 1029888 kB
```

Similarly, there is a meminfo file, which gives me information about the memory. It shows me, which is the total memory, which is free memory available memory, etc.

(Refer Slide Time: 04:10)



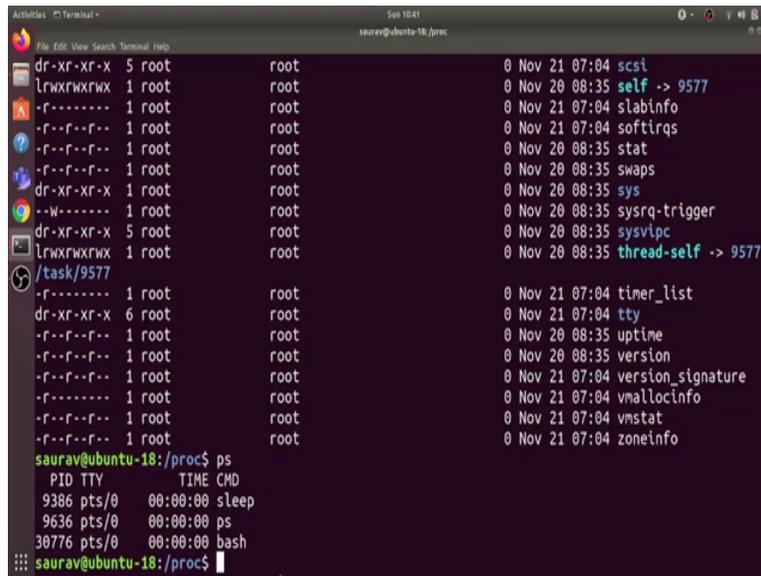
```
1090 1343 1493 1920 28216 372 490 61 9273 cpuinfo pagetypeinfo
1091 135 1496 1925 28217 378 491 62 9274 crypto partitions
11 1369 15 2 28218 38 492 63 929 devices pressure
1105 1370 150 20 28219 380 495 64 9298 diskstats sched_debug
1109 1378 1507 21 28220 382 50 65 9301 dma schedstat
1111 138 1513 21415 28221 383 503 66 931 driver scsi
113 1392 1515 21416 28222 384 504 6883 932 execdomains self
114 1396 1520 22 29 39 505 726 933 fb slabinfo
115 1398 1521 224 3 391 506 729 934 filesystems softirqs
116 14 1522 225 30 393 507 731 938 fs stat
1164 1400 1523 226 303 397 508 732 9386 interrupts swaps
117 1408 1525 23 30710 4 509 7443 940 ionen sys
1171 1415 1559 23815 30721 40 51 751 9450 ioports sysrq-trigger
118 1419 1569 24 30766 402 510 752 946 irq sysvipc
119 1427 1576 2409 30776 406 511 756 950 kallsyms thread-self
12 1437 1581 2412 30839 407 512 759 952 kcore timer_list
120 1441 16 2432 31018 41 519 760 954 keys tty
121 1448 1604 253 313 4116 52 761 9554 key-users uptime
12247 1452 1622 256 31541 413 526 763 9574 kmsg version
1288 1456 1643 257 31555 42 53 764 9576 kpagegroup version_signature
1291 1461 1646 26 31577 424 54 765 990 kpagecount vmallocinfo
1296 1465 165 26143 32 439 56 7962 991 kpageflags vmstat
13 1469 1657 26144 321 44 5623 8126 994 loadavg zoneinfo
130 147 1671 26257 3229 445 57 8166 997 locks
```



```
dr-xr-xr-x 9 root root 0 Nov 20 08:35 57
dr-xr-xr-x 9 root root 0 Nov 20 08:35 58
dr-xr-xr-x 9 root root 0 Nov 21 10:34 5815
dr-xr-xr-x 9 root root 0 Nov 21 10:34 5855
dr-xr-xr-x 9 root root 0 Nov 20 08:35 59
dr-xr-xr-x 9 root root 0 Nov 20 08:35 6
dr-xr-xr-x 9 root root 0 Nov 20 08:35 60
dr-xr-xr-x 9 root root 0 Nov 20 08:35 602
dr-xr-xr-x 9 root root 0 Nov 20 08:35 61
dr-xr-xr-x 9 root root 0 Nov 20 08:35 62
dr-xr-xr-x 9 root root 0 Nov 20 08:35 63
dr-xr-xr-x 9 root root 0 Nov 20 08:35 64
dr-xr-xr-x 9 root root 0 Nov 20 08:35 65
dr-xr-xr-x 9 root root 0 Nov 20 08:35 66
dr-xr-xr-x 9 root root 0 Nov 21 10:34 6883
dr-xr-xr-x 9 root root 0 Nov 20 08:35 726
dr-xr-xr-x 9 root root 0 Nov 20 08:35 729
dr-xr-xr-x 9 root root 0 Nov 20 08:35 731
dr-xr-xr-x 9 root root 0 Nov 20 08:35 732
dr-xr-xr-x 9 root root 0 Nov 21 10:34 7443
dr-xr-xr-x 9 systemd-resolve systemd-resolve 0 Nov 20 08:35 751
dr-xr-xr-x 9 systemd-timesync systemd-timesync 0 Nov 20 08:35 752
dr-xr-xr-x 9 root root 0 Nov 20 08:35 756
dr-xr-xr-x 9 root root 0 Nov 20 08:35 759
dr-xr-xr-x 9 root root 0 Nov 20 08:35 760
```

So that's how you can get various information. And one more thing if I listed in a long format, then you can see that all of these directories have size 0. And why is that so because, as I had mentioned, it is a virtual file system. So, it does not use any disk space, any space in the hard drive. So, all of these are of size 0 and it is created in memory when the system boots up, and when the system shuts down, it dissolves this and then we just have an empty proc folder.

(Refer Slide Time: 04:45)



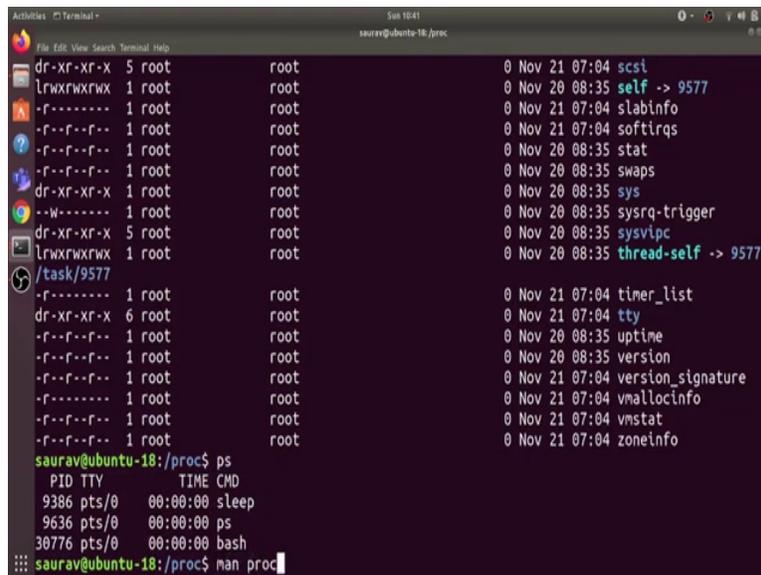
```
dr-xr-xr-x 5 root root 0 Nov 21 07:04 scsi
lrwxrwxrwx 1 root root 0 Nov 20 08:35 self -> 9577
-r----- 1 root root 0 Nov 21 07:04 slabinfo
-r--r--r-- 1 root root 0 Nov 21 07:04 softirqs
-r--r--r-- 1 root root 0 Nov 20 08:35 stat
-r--r--r-- 1 root root 0 Nov 20 08:35 swaps
dr-xr-xr-x 1 root root 0 Nov 20 08:35 sys
--W----- 1 root root 0 Nov 20 08:35 sysrq-trigger
dr-xr-xr-x 5 root root 0 Nov 20 08:35 sysvipc
lrwxrwxrwx 1 root root 0 Nov 20 08:35 thread-self -> 9577

/task/9577
-r----- 1 root root 0 Nov 21 07:04 timer_list
dr-xr-xr-x 6 root root 0 Nov 21 07:04 tty
-r--r--r-- 1 root root 0 Nov 20 08:35 uptime
-r--r--r-- 1 root root 0 Nov 20 08:35 version
-r--r--r-- 1 root root 0 Nov 21 07:04 version_signature
-r----- 1 root root 0 Nov 21 07:04 vmallocinfo
-r--r--r-- 1 root root 0 Nov 21 07:04 vmstat
-r--r--r-- 1 root root 0 Nov 21 07:04 zoneinfo

saurav@ubuntu-18:/proc$ ps
  PID TTY          TIME CMD
 9386 pts/0    00:00:00 sleep
 9636 pts/0    00:00:00 ps
30776 pts/0    00:00:00 bash
saurav@ubuntu-18:/proc$
```

Then we had learned in the previous videos about different commands such as ps which lists the current processes. So, all of these commands actually use data from the proc file system and just display it in a user friendly format.

(Refer Slide Time: 04:59)



```
dr-xr-xr-x 5 root root 0 Nov 21 07:04 scsi
lrwxrwxrwx 1 root root 0 Nov 20 08:35 self -> 9577
-r----- 1 root root 0 Nov 21 07:04 slabinfo
-r--r--r-- 1 root root 0 Nov 21 07:04 softirqs
-r--r--r-- 1 root root 0 Nov 20 08:35 stat
-r--r--r-- 1 root root 0 Nov 20 08:35 swaps
dr-xr-xr-x 1 root root 0 Nov 20 08:35 sys
--W----- 1 root root 0 Nov 20 08:35 sysrq-trigger
dr-xr-xr-x 5 root root 0 Nov 20 08:35 sysvipc
lrwxrwxrwx 1 root root 0 Nov 20 08:35 thread-self -> 9577

/task/9577
-r----- 1 root root 0 Nov 21 07:04 timer_list
dr-xr-xr-x 6 root root 0 Nov 21 07:04 tty
-r--r--r-- 1 root root 0 Nov 20 08:35 uptime
-r--r--r-- 1 root root 0 Nov 20 08:35 version
-r--r--r-- 1 root root 0 Nov 21 07:04 version_signature
-r----- 1 root root 0 Nov 21 07:04 vmallocinfo
-r--r--r-- 1 root root 0 Nov 21 07:04 vmstat
-r--r--r-- 1 root root 0 Nov 21 07:04 zoneinfo

saurav@ubuntu-18:/proc$ ps
  PID TTY          TIME CMD
 9386 pts/0    00:00:00 sleep
 9636 pts/0    00:00:00 ps
30776 pts/0    00:00:00 bash
saurav@ubuntu-18:/proc$ man proc
```

```
as though /proc was mounted with hidepid=0. This group should be used instead
of approaches such as putting nonroot users into the sudoers(5) file.

Files and directories
The following list describes many of the files and directories under the /proc hierar-
chy.

/proc/[pid]
There is a numerical subdirectory for each running process; the subdirectory is
named by the process ID.

Each /proc/[pid] subdirectory contains the pseudo-files and directories
described below. These files are normally owned by the effective user and
effective group ID of the process. However, as a security measure, the owner-
ship is made root:root if the process's "dumpable" attribute is set to a value
other than 1. This attribute may change for the following reasons:

* The attribute was explicitly set via the prctl(2) PR_SET_DUMPABLE operation.

* The attribute was reset to the value in the file /proc/sys/fs/suid_dumpable
(described below), for the reasons described in prctl(2).

Resetting the "dumpable" attribute to 1 reverts the ownership of the
/proc/[pid]/* files to the process's real UID and real GID.

Manual page proc(5) line 48 (press h for help or q to quit)
```

And we also have a man page for proc file system. So, if you do `man proc`. So, it shows that there is a numerical subdirectory for each running process in slash proc slash pid and then within each PID folder there are various other sub directories or files. You can read about all of this if you want. So, that is it about the proc file system. Thanks and have a nice day.