

OS Project Report

Processes and Memory Management Terminal

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Introduction :

As we all may know that Linux operating systems are vast and complicated. The number of commands that are there for a particular functionality is not just one but many with minor changes. We propose a method that helps visualise the storage facility of the linux operating systems in a better systematic way.

Objective :

1. The problem of displaying the total disk space and its components is to be addressed.
2. The unnecessary files that haven't been used in a long time have to be shown in a way to make the user decide whether to keep them or not.
3. All the current processes that run in a linux system are displayed in linux task manager. It does not address the problem of closing all the processes for a particular application. It does not list down those processes that have to be terminated to completely ensure that the program does not run anymore.

Methodology :

We have addressed these issues with our own custom made command prompt which not only performs the inbuilt commands but also looks after these issues raised with our own commands.

We first created the command prompt using the help of pipes and virtual files.

When a user enters a command we execute it in our code and store them by overriding the `exec()` command. In order to denote that this is a custom made terminal running, we have given our default colorings with a black background for the text.

The heading was aligned at center using the `ioctl(STDOUT_FILENO, TIOCGWINSZ, &w);` command which returns the width of the command prompt.

Arrows that cause `^[A]` sometimes in terminal are also prevented. We have used `getch()` in our terminal to input each and every character. The arrows are analyzed and are removed accordingly.

We address these problems into three major components :

1.pcinfo :

- Lists down the storage status of the operating system (In a more organised way that is easier to understand).
- We get the information from /proc/cpuinfo folder and write it down at couinfo_.txt.
- We also use the df command and write down the results in df.txt.
- Cpu and df are combined using the python files cpu.py and df.py respectively.
- From the large texts, we extract processors,model_name,total_cores,total_caches, and cpu_MHz in cpu.py from the file cpuinfo_.txt.
- In df.py, we extracted information from df.txt to calculate the free space in bytes, Gb and percent availability and it is displayed.

2.findall:

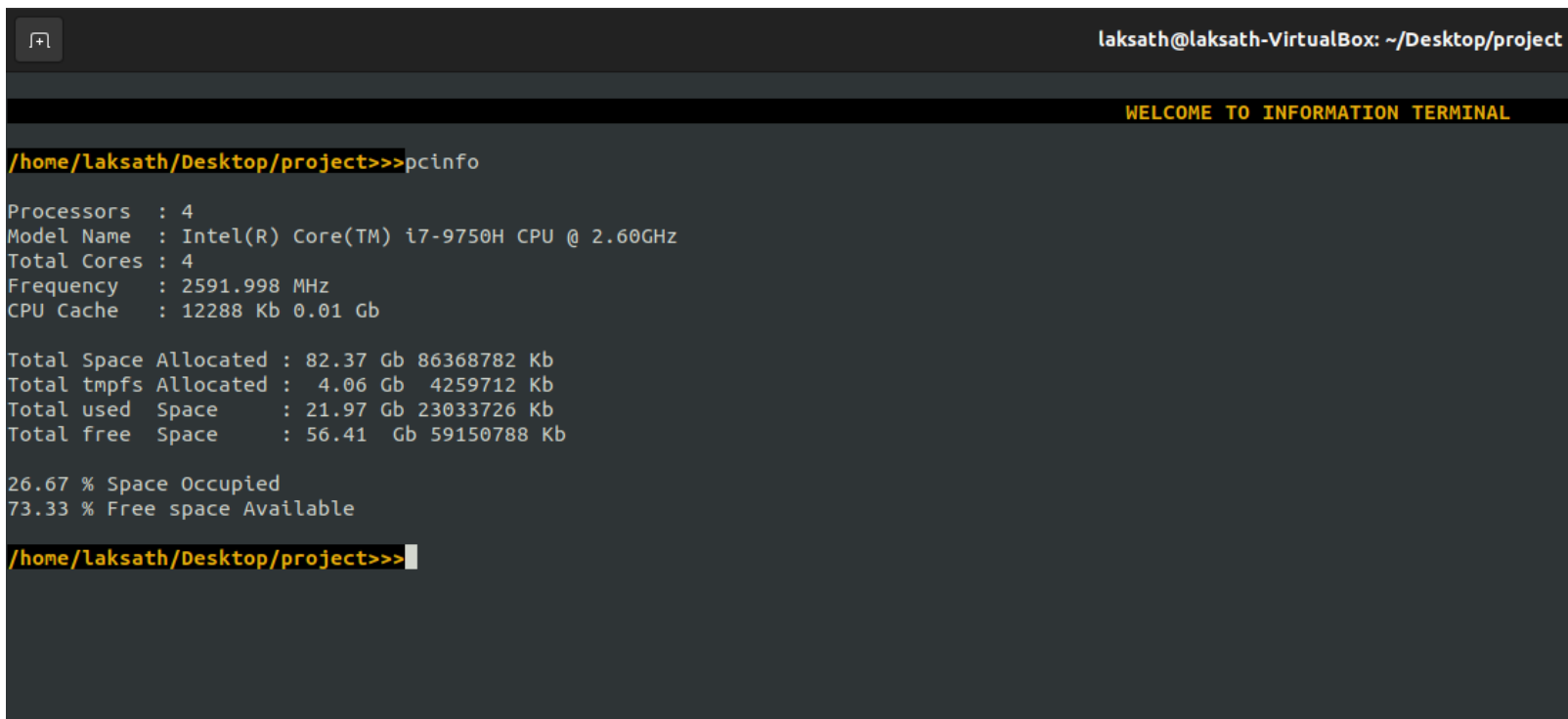
- This command works on any directory which when applied, produces a bar graph that shows the space occupied by each directory/file present in that directory.
- It also shows the last time we have opened a particular file/folder (this way, it helps us know if that file would be unnecessary).
- We have used the plotex library in python to plot the graph and the last used was found using the ls command and only those lines were extracted for a better visualisation.

3.manager:

- Shows the status of all currently running processes.
- We have also provided a custom made functionality to terminate them.
- If we give the name of the application, it would show all its corresponding processes making it easier for us to decide whether to keep/kill that process.
- Advance Option is also provided which constantly updates the terminal with the running processes.
- Firstly , the table is obtained through the top command which is then written into mem_stat.txt file.
- The alignments that are incorrect from the inbuilt command.Hence, they are rectified and are adjusted and changes are made accordingly to display a neat table with process ID and the application's name.
- Then , if we decide to kill an application, we firstly need to terminate all the processes that are related to that particular application.
- Therefore, we input the user's choice of application to be terminated.
- From the mem_stat.txt file, we go line by line and look out for all the processes that belong to that application and we return the processes that belong to that application along with its process IDs.Exisiting linux systems do not have this functionality and Hence we implemented it.
- Then we used kill -9 in our code to terminate a process ID given its process.

Results :

(i) For pcinfo, regardless of the directory one is in, the following details are displayed :

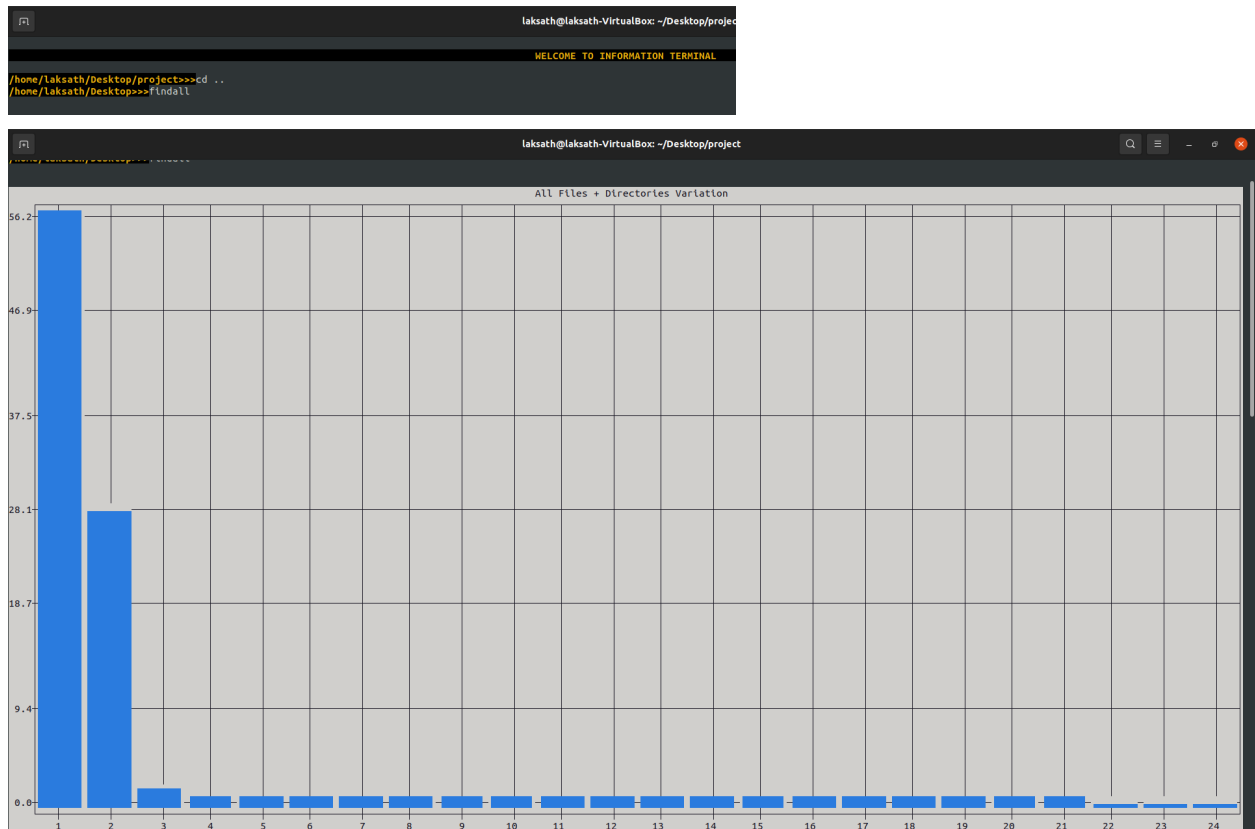


The screenshot shows a terminal window with a dark background. At the top right, the user and host information is displayed: 'laksath@laksath-VirtualBox: ~/Desktop/project'. Below this, a yellow banner reads 'WELCOME TO INFORMATION TERMINAL'. The user has entered the command 'pcinfo' at the prompt. The output displays system information including processor details (4 cores, Intel(R) Core(TM) i7-9750H CPU @ 2.60GHz) and disk space statistics (Total Space Allocated: 82.37 Gb, Total free Space: 56.41 Gb). The terminal prompt is now ready for the next command.

```
laksath@laksath-VirtualBox: ~/Desktop/project  
WELCOME TO INFORMATION TERMINAL  
/home/laksath/Desktop/project>>>pcinfo  
Processors : 4  
Model Name : Intel(R) Core(TM) i7-9750H CPU @ 2.60GHz  
Total Cores : 4  
Frequency : 2591.998 MHz  
CPU Cache : 12288 Kb 0.01 Gb  
  
Total Space Allocated : 82.37 Gb 86368782 Kb  
Total tmpfs Allocated : 4.06 Gb 4259712 Kb  
Total used Space : 21.97 Gb 23033726 Kb  
Total free Space : 56.41 Gb 59150788 Kb  
  
26.67 % Space Occupied  
73.33 % Free space Available  
/home/laksath/Desktop/project>>>
```

The picture is self-explanatory of the functionalities.

(ii) For findall on Desktop directory, we notice the following results :



Firstly, we observe a bar graph plot.

The y axis is the percentage of space occupied of a file/directory.

The x-axis is a range of numbers starting from 1 to n where n is the total number of files/folders in that directory.

```
laksath@laksath-Virt
1->Assignment 2.pdf
2->output.zip
3->lab6.zip
4->FUNCTIONS
5->lab1
6->lab2
7->lab3
8->lab4
9->lab5
10->lab6
11->lab7
12->lab9_10
13->os
14->os_lab
15->os_lab_quiz_2
16->os_quiz_75
17->output
18->project
19->quiz
20->cpuinfo.txt
21->projectcpuinfo_.txt
22->df.txt
23->projectdf.txt
24->file.txt
```

Later on , the file/folder corresponding to that particular index in the x axis is displayed.

```
24 file.txt  
1 Assignment 2.pdf -> 56.23%.  
Most recently used at : 19:33 on 25 Aug.  
2 output.zip -> 27.74%.  
Most recently used at : 23:55 on 24 Oct.  
3 lab6.zip -> 1.61%.  
Most recently used at : 23:41 on 24 Oct.  
4 FUNCTIONS -> 0.8%.  
Most recently used at : 00:08 on 23 Oct.  
5 lab1 -> 0.8%.  
Most recently used at : 08:15 on 14 Sep.  
6 lab2 -> 0.8%.  
Most recently used at : 09:11 on 3 Sep.  
7 lab3 -> 0.8%.  
Most recently used at : 23:56 on 15 Sep.  
8 lab4 -> 0.8%.  
Most recently used at : 20:48 on 27 Sep.  
9 lab5 -> 0.8%.  
Most recently used at : 23:08 on 3 Oct.  
10 lab6 -> 0.8%.  
Most recently used at : 23:14 on 24 Oct.  
11 lab7 -> 0.8%.  
Most recently used at : 15:59 on 10 Nov.
```

```
12 lab9_10 -> 0.8%.  
Most recently used at : 20:45 on 24 Nov.  
13 os -> 0.8%.  
Most recently used at : 16:14 on 22 Oct.  
14 os_lab -> 0.8%.  
Most recently used at : 06:00 on 1 Sep.  
15 os_lab_quiz_2 -> 0.8%.  
Most recently used at : 16:50 on 30 Sep.  
16 os_quiz_75 -> 0.8%.  
Most recently used at : 12:58 on 20 Oct.  
17 output -> 0.8%.  
Most recently used at : 23:54 on 24 Oct.  
18 project -> 0.8%.  
Most recently used at : 16:29 on 3 Dec.  
19 quiz -> 0.8%.  
Most recently used at : 13:55 on 8 Sep.  
20 cpuinfo_.txt -> 0.74%.  
Most recently used at : 12:48 on 30 Nov.  
21 projectcpuinfo_.txt -> 0.74%.  
Most recently used at : 13:37 on 30 Nov.  
22 df.txt -> 0.09%.  
Most recently used at : 12:48 on 30 Nov.  
23 projectdf.txt -> 0.09%.  
Most recently used at : 13:37 on 30 Nov.  
24 file.txt -> 0.0%.  
Most recently used at : 12:42 on 30 Nov.
```

```
/home/Laksath/Desktop>>>
```

We then displayed the Most recently used at to with the time and the date along with the month. This way, it helps us know if that file would be unnecessary.

(iii) For manager , we notice the following :

```
laksath@laksath-
/home/Laksath/Desktop>>>manager
top - 16:39:03 up 2 days, 23:01, 1 user, load average: 0.25, 0.28, 0.29
Tasks: 290 total, 1 running, 289 sleeping, 0 stopped, 0 zombie
%Cpu(s): 15.6 us, 1.6 sy, 0.0 ni, 82.8 id, 0.0 wa, 0.0 hi, 0.0 si, 0.0 st
Mem Mem : 5935.5 total, 302.8 free, 3014.3 used, 2618.4 buff/cache
Mem Swap: 2048.0 total, 1297.0 free, 751.0 used, 2523.1 avail Mem

  PID USER      PR  NI  VIRT  RES  SHR  S  %CPU  %MEM    TIME+  COMMAND
 5002 laksath   20   0 5860952 494324 95172 S   50.0   8.1 145:05.07 gnome-shell
 6214 laksath   20   0 388184    7744  5936 S    6.2   0.1  0:35.45ibus-daemon
185475 laksath   20   0 16.3g  58680  56044 S    6.2   1.0  4:47.98 chrome
190245 laksath   20   0 20.4g 352588 114768 S    6.2   5.8  8:06.78 chrome
195683 laksath   20   0 558600  56436 44512 S    6.2   0.9  0:04.79 gnome-terminal-
 1 root      20   0 166200  11252  6544 S    0.0   0.2  0:17.16 systemd
 2 root      20   0      0      0      0 S    0.0   0.0  0:00.04 kthreadd
 3 root      20  -20      0      0      0 I    0.0   0.0  0:00.00 rcu_gp
 4 root      20  -20      0      0      0 I    0.0   0.0  0:00.00 rcu_par_gp
 6 root      20  -20      0      0      0 I    0.0   0.0  0:00.00 kworker/0:0H-events_highpri
 9 root      20  -20      0      0      0 I    0.0   0.0  0:00.00 mm_percpu_wq
10 root      20   0      0      0      0 S    0.0   0.0  0:00.00 rcu_tasks_rude
11 root      20   0      0      0      0 S    0.0   0.0  0:00.00 rcu_tasks_trace
12 root      20   0      0      0      0 S    0.0   0.0  0:01.70 ksoftirqd/0
13 root      20   0      0      0      0 I    0.0   0.0  1:05.20 rcu_sched
14 root      rt    0      0      0      0 S    0.0   0.0  0:01.70 migration/0
15 root      -51   0      0      0      0 S    0.0   0.0  0:00.00 idle_inject/0
16 root      20   0      0      0      0 S    0.0   0.0  0:00.00 cpuhp/0
17 root      20   0      0      0      0 S    0.0   0.0  0:00.00 cpuhp/1
18 root      -51   0      0      0      0 S    0.0   0.0  0:00.00 idle_inject/1
19 root      rt    0      0      0      0 S    0.0   0.0  0:02.02 migration/1
20 root      20   0      0      0      0 S    0.0   0.0  0:01.47 ksoftirqd/1
22 root      0 -20      0      0      0 I    0.0   0.0  0:00.00 kworker/1:0H-events_highpri
23 root      20   0      0      0      0 S    0.0   0.0  0:00.00 cpuhp/2
24 root      -51   0      0      0      0 S    0.0   0.0  0:00.00 idle_inject/2
25 root      rt    0      0      0      0 S    0.0   0.0  0:01.81 migration/2
26 root      20   0      0      0      0 S    0.0   0.0  0:01.43 ksoftirqd/2
28 root      0 -20      0      0      0 I    0.0   0.0  0:00.00 kworker/2:0H-events_highpri
29 root      20   0      0      0      0 S    0.0   0.0  0:00.00 cpuhp/3
30 root      -51   0      0      0      0 S    0.0   0.0  0:00.00 idle_inject/3
31 root      rt    0      0      0      0 S    0.0   0.0  0:01.83 migration/3
32 root      20   0      0      0      0 S    0.0   0.0  0:02.17 ksoftirqd/3
34 root      0 -20      0      0      0 I    0.0   0.0  0:00.00 kworker/3:0H-kblockd
35 root      20   0      0      0      0 S    0.0   0.0  0:00.00 kdevtmpfs
36 root      0 -20      0      0      0 I    0.0   0.0  0:00.00 netns
37 root      0 -20      0      0      0 I    0.0   0.0  0:00.00 inet_frag_wq
38 root      20   0      0      0      0 S    0.0   0.0  0:00.00 kauditd
39 root      20   0      0      0      0 S    0.0   0.0  0:00.25 khungtaskd
40 root      20   0      0      0      0 S    0.0   0.0  0:00.00 oom_reaper
41 root      0 -20      0      0      0 I    0.0   0.0  0:00.00 writeback
42 root      20   0      0      0      0 S    0.0   0.0  0:11.51 kcompactd0
43 root      25   5      0      0      0 S    0.0   0.0  0:00.00 ksm
44 root      39  19      0      0      0 S    0.0   0.0  0:00.61 khugepaged
92 root      0 -20      0      0      0 I    0.0   0.0  0:00.00 kintegrityd
93 root      0 -20      0      0      0 I    0.0   0.0  0:00.00 kblockd
94 root      0 -20      0      0      0 I    0.0   0.0  0:00.00 blkcg_punt_bio
95 root      0 -20      0      0      0 I    0.0   0.0  0:00.00 tpm_dev_wq
96 root      0 -20      0      0      0 I    0.0   0.0  0:00.00 ata_sff
97 root      0 -20      0      0      0 I    0.0   0.0  0:00.00 md
```

```
laksath@laksath-Virt
  PID USER      PR  NI  VIRT  RES  SHR  S  %CPU  %MEM    TIME+  COMMAND
 5002 laksath   20   0 5860952 494324 95172 S   50.0   8.1 145:05.07 gnome-shell
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185475 laksath   20   0 16.3g  58680  56044 S    6.2   1.0  4:47.98 chrome
190245 laksath   20   0 20.4g 352588 114768 S    6.2   5.8  8:06.78 chrome
195683 laksath   20   0 558600  56436 44512 S    6.2   0.9  0:04.79 gnome-terminal-
 1 root      20   0 166200  11252  6544 S    0.0   0.2  0:17.16 systemd
 2 root      20   0      0      0      0 S    0.0   0.0  0:00.04 kthreadd
 3 root      20  -20      0      0      0 I    0.0   0.0  0:00.00 rcu_gp
 4 root      20  -20      0      0      0 I    0.0   0.0  0:00.00 rcu_par_gp
 6 root      20  -20      0      0      0 I    0.0   0.0  0:00.00 kworker/0:0H-events_highpri
 9 root      20  -20      0      0      0 I    0.0   0.0  0:00.00 mm_percpu_wq
10 root      20   0      0      0      0 S    0.0   0.0  0:00.00 rcu_tasks_rude
11 root      20   0      0      0      0 S    0.0   0.0  0:00.00 rcu_tasks_trace
12 root      20   0      0      0      0 S    0.0   0.0  0:01.70 ksoftirqd/0
13 root      20   0      0      0      0 I    0.0   0.0  1:05.20 rcu_sched
14 root      rt    0      0      0      0 S    0.0   0.0  0:01.70 migration/0
15 root      -51   0      0      0      0 S    0.0   0.0  0:00.00 idle_inject/0
16 root      20   0      0      0      0 S    0.0   0.0  0:00.00 cpuhp/0
17 root      20   0      0      0      0 S    0.0   0.0  0:00.00 cpuhp/1
18 root      -51   0      0      0      0 S    0.0   0.0  0:00.00 idle_inject/1
19 root      rt    0      0      0      0 S    0.0   0.0  0:02.02 migration/1
20 root      20   0      0      0      0 S    0.0   0.0  0:01.47 ksoftirqd/1
22 root      0 -20      0      0      0 I    0.0   0.0  0:00.00 kworker/1:0H-events_highpri
23 root      20   0      0      0      0 S    0.0   0.0  0:00.00 cpuhp/2
24 root      -51   0      0      0      0 S    0.0   0.0  0:00.00 idle_inject/2
25 root      rt    0      0      0      0 S    0.0   0.0  0:01.81 migration/2
26 root      20   0      0      0      0 S    0.0   0.0  0:01.43 ksoftirqd/2
28 root      0 -20      0      0      0 I    0.0   0.0  0:00.00 kworker/2:0H-events_highpri
29 root      20   0      0      0      0 S    0.0   0.0  0:00.00 cpuhp/3
30 root      -51   0      0      0      0 S    0.0   0.0  0:00.00 idle_inject/3
31 root      rt    0      0      0      0 S    0.0   0.0  0:01.83 migration/3
32 root      20   0      0      0      0 S    0.0   0.0  0:02.17 ksoftirqd/3
34 root      0 -20      0      0      0 I    0.0   0.0  0:00.00 kworker/3:0H-kblockd
35 root      20   0      0      0      0 S    0.0   0.0  0:00.00 kdevtmpfs
36 root      0 -20      0      0      0 I    0.0   0.0  0:00.00 netns
37 root      0 -20      0      0      0 I    0.0   0.0  0:00.00 inet_frag_wq
38 root      20   0      0      0      0 S    0.0   0.0  0:00.00 kauditd
39 root      20   0      0      0      0 S    0.0   0.0  0:00.25 khungtaskd
40 root      20   0      0      0      0 S    0.0   0.0  0:00.00 oom_reaper
41 root      0 -20      0      0      0 I    0.0   0.0  0:00.00 writeback
42 root      20   0      0      0      0 S    0.0   0.0  0:11.51 kcompactd0
43 root      25   5      0      0      0 S    0.0   0.0  0:00.00 ksm
44 root      39  19      0      0      0 S    0.0   0.0  0:00.61 khugepaged
92 root      0 -20      0      0      0 I    0.0   0.0  0:00.00 kintegrityd
93 root      0 -20      0      0      0 I    0.0   0.0  0:00.00 kblockd
94 root      0 -20      0      0      0 I    0.0   0.0  0:00.00 blkcg_punt_bio
95 root      0 -20      0      0      0 I    0.0   0.0  0:00.00 tpm_dev_wq
96 root      0 -20      0      0      0 I    0.0   0.0  0:00.00 ata_sff
97 root      0 -20      0      0      0 I    0.0   0.0  0:00.00 md

1 Advanced Option
2 Kill a process
3 Exit
```

On entering manager, we create the following.

It displays all the processes along with the process id and the name of the application the process belongs to.

As you may notice,

The third and fourth line both belong to the chrome application.

Killing either one of the processes does not guarantee the process termination.

Therefore , we need to kill all the processes that belong to chrome.

1 Advanced Option :

Choosing the Advanced option provides the info about all the processes that are changing constantly with too much information about each and every process that runs in the background.

```
laksath@laksath-VirtualBox: ~/Desktop/project

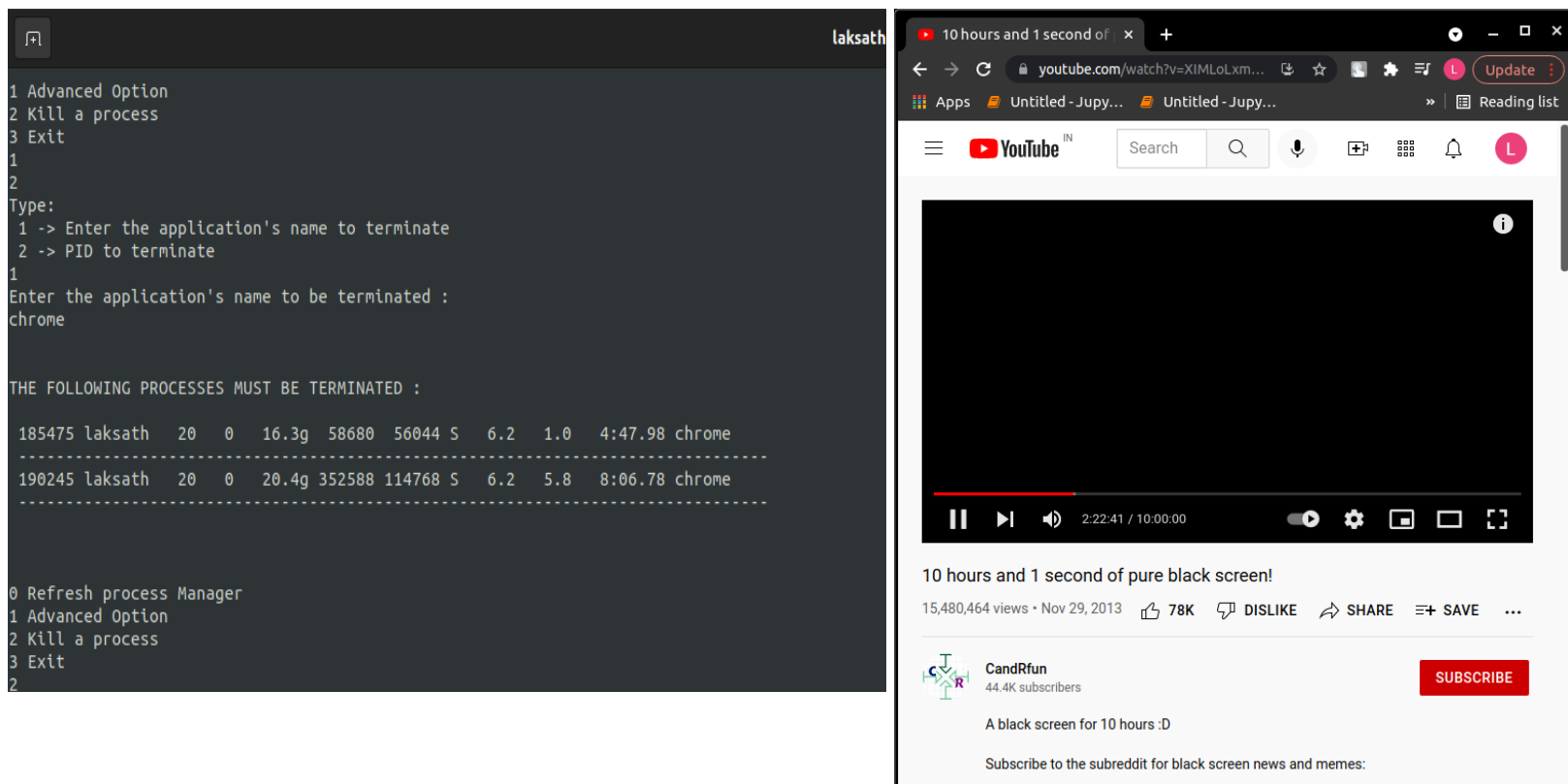
0[||||| 4.7%] Tasks: 167, 601 thr: 1 running
1[||||| 4.0%] Load average: 0.10 0.22 0.26
2[||||| 3.3%] Uptime: 2 days, 23:03:57
3[||||| 4.6%]
Mem[||||| 3.12G/5.80G]
Swp[||||| 751M/2.00G]

PID USER PRI NI VIRT RES SHR S CPU% MEM% TIME+ Command
5062 laksath 20 0 5731M 488M 99M S 4.0 8.2 2h25:18 /usr/bin/gnome-shell
117829 laksath 20 0 51.9G 368M 76860 S 0.0 5.2 32:54.86 /snap/code/82/usr/share/code/code --type=renderer --disable-color-correct-rendering --no-sandbox --field-trial-handle=1940306423315614283,16605871
5015 laksath 20 0 5731M 488M 99M S 1.3 8.2 20:37.96 /usr/bin/gnome-shell
5019 laksath 20 0 5731M 488M 99M S 1.3 8.2 19:45.72 /usr/bin/gnome-shell
5017 laksath 20 0 5731M 488M 99M S 0.7 8.2 19:41.44 /usr/bin/gnome-shell
5016 laksath 20 0 5731M 488M 99M S 0.7 8.2 19:39.22 /usr/bin/gnome-shell
6462 laksath 20 0 17.1C 289M 127M S 0.0 3.5 14:05.88 /opt/google/chrome/chrome --enable-crashpad
6122 laksath 20 0 233M 57812 36376 S 0.7 1.0 9:26.47 /usr/bin/Xwayland:0 -rootless -noreset -accessx -core -auth /run/user/1000/.mutter-Xwaylandauth.073VC1 -listen 4 -listen 5 -displayfd 6 -Intfd 7
190245 laksath 20 0 20.9C 345M 112M S 6.0 5.8 8:14.27 /opt/google/chrome/chrome --type=renderer --field-trial-handle=9155833127557490712,12266908089599759352,131072 --disable-gpu-compositing --lang=en
117811 laksath 20 0 560M 88956 54184 S 0.0 1.5 6:53.03 /snap/code/82/usr/share/code/code --type=renderer --field-trial-handle=1940306423315614283,16605871626942302762,131072 --disable-features=Cooki
117837 laksath 20 0 51.9C 389M 76860 S 0.0 5.2 6:31.29 /snap/code/82/usr/share/code/code --type=renderer --disable-color-correct-rendering --no-sandbox --field-trial-handle=1940306423315614283,16605871
117817 laksath 20 0 560M 88956 54184 S 0.0 1.5 5:28.52 /snap/code/82/usr/share/code/code --type=renderer --field-trial-handle=1940306423315614283,16605871626942302762,131072 --disable-features=Cooki
6112 laksath 20 0 149M 1860 1612 S 0.7 0.0 5:21.65 /usr/bin/VBoxClient --draganddrop
6361 laksath 20 0 149M 1860 1612 S 0.0 0.0 5:21.64 /usr/bin/VBoxClient --draganddrop
7944 laksath 20 0 20.8C 114M 81168 S 0.0 1.9 5:12.72 /opt/google/chrome/chrome --type=renderer --field-trial-handle=9155833127557490712,12266908089599759352,131072 --lang=en-GB --enable-crashpad --cr
185475 laksath 20 0 16.6C 58680 56044 S 4.7 1.0 4:52.74 /opt/google/chrome/chrome --type=renderer --field-trial-handle=9155833127557490712,12266908089599759352,131072 --enable-crashpad --crashpad-han
117770 laksath 20 0 37.7C 99604 47020 S 0.0 1.6 4:48.71 /snap/code/82/usr/share/code/code --type=renderer --new-window /home/laksath/Desktop/project
185482 laksath 20 0 16.6C 58680 56044 S 3.3 1.0 4:32.70 /opt/google/chrome/chrome --type=renderer --field-trial-handle=9155833127557490712,12266908089599759352,131072 --enable-crashpad --crashpad-han
117848 laksath 20 0 37.3C 157M 21424 S 0.0 2.7 4:17.33 /snap/code/82/usr/share/code/code --ms-enable-electron-run-as-node /home/laksath/.vscode/extensions/ms-vscode.cpptools-1.7.1/bin/cpptools
118021 laksath 20 0 1624M 82240 10624 S 0.7 1.4 3:37.27 /home/laksath/.vscode/extensions/ms-vscode.cpptools-1.7.1/bin/cpptools
117860 laksath 20 0 37.3C 80748 39132 S 0.0 1.3 3:36.78 /snap/code/82/usr/share/code/code --type=renderer --disable-color-correct-rendering --no-sandbox --field-trial-handle=1940306423315614283,16605871
7194 laksath 20 0 17.1C 269M 127M S 0.0 3.5 3:24.19 /opt/google/chrome/chrome --enable-crashpad
180010 laksath 20 0 4839M 325M 46932 S 0.0 4.3 1:54.02 /home/laksath/.vscode/extensions/ms-vscode.cpptools-1.7.1/bin/cpptools-srv 118021 [21713B5E-8CD1-4904-A093-248DF2A74EA6]
7226 laksath 20 0 16.7C 87196 72964 S 0.0 1.4 1:46.23 /opt/google/chrome/chrome --type=utility --utility-sub-type=network.mojom.NetworkService --field-trial-handle=9155833127557490712,1226690808959975
127682 laksath 20 0 1624M 82240 10624 S 0.0 1.4 1:43.33 /home/laksath/.vscode/extensions/ms-vscode.cpptools-1.7.1/bin/cpptools
117942 laksath 20 0 41.4C 175M 19788 S 0.0 3.0 1:40.41 /snap/code/82/usr/share/code/code --ms-enable-electron-run-as-node /home/laksath/.vscode/extensions/ms-python.py-lance-2021.11.2/dist/server
190256 laksath 20 0 20.9C 345M 112M S 1.3 5.8 1:39.10 /opt/google/chrome/chrome --type=renderer --field-trial-handle=9155833127557490712,12266908089599759352,131072 --disable-gpu-compositing --lang=en
7229 laksath 20 0 16.7C 87196 72964 S 0.0 1.4 1:32.57 /opt/google/chrome/chrome --type=utility --utility-sub-type=network.mojom.NetworkService --field-trial-handle=9155833127557490712,1226690808959975
4899 laksath 9 11 2718M 15164 11016 S 1.3 0.2 1:24.36 /usr/bin/pulseaudio --daemonize=no --log-target=journal
117832 laksath 20 0 51.9C 389M 76860 S 0.0 5.2 1:23.85 /snap/code/82/usr/share/code/code --type=renderer --disable-color-correct-rendering --no-sandbox --field-trial-handle=1940306423315614283,16605871
117890 laksath 20 0 37.3C 28376 19444 S 0.0 0.5 1:21.85 /snap/code/82/usr/share/code/code --ms-enable-electron-run-as-node /snap/code/82/usr/share/code/resources/app/out/bootsrap-for-k
7947 laksath 20 0 20.8C 114M 81168 S 0.0 1.9 1:19.26 /opt/google/chrome/chrome --type=renderer --field-trial-handle=9155833127557490712,12266908089599759352,131072 --lang=en-GB --enable-crashpad --cr
800 root 35 15 10800 7736 2272 S 0.7 0.1 1:14.36 /usr/sbin/preload s /var/lib/preload/preload.state
693 root 0 0 324M 14656 11692 S 0.0 0.2 1:11.98 /usr/lib/NetworkManager --no-daemon
5079 laksath 20 0 614M 3096 17996 S 0.0 0.6 1:10.92 /usr/libexec/goa-daemon
117815 laksath 20 0 560M 88956 54184 S 0.0 1.5 0:56.63 /snap/code/82/usr/share/code/code --type=renderer --field-trial-handle=1940306423315614283,16605871626942302762,131072 --disable-features=Cooki
190267 laksath 20 0 20.9C 345M 112M S 0.7 5.8 1:06.57 /opt/google/chrome/chrome --type=renderer --field-trial-handle=9155833127557490712,12266908089599759352,131072 --disable-gpu-compositing --lang=en
4943 laksath -6 2718M 15164 11016 S 0.7 0.2 0:56.19 /usr/bin/pulseaudio --daemonize=no --log-target=journal
5025 laksath 20 0 5731M 488M 99M S 0.0 8.2 0:49.15 /usr/bin/gnome-shell
118029 laksath 20 0 1624M 82240 10624 S 0.0 1.4 0:46.03 /home/laksath/.vscode/extensions/ms-vscode.cpptools-1.7.1/bin/cpptools
190250 laksath 20 0 20.9C 345M 112M S 1.3 5.8 0:44.09 /opt/google/chrome/chrome --type=renderer --field-trial-handle=9155833127557490712,12266908089599759352,131072 --disable-gpu-compositing --lang=en
4670 root 20 0 361M 4196 13880 S 0.0 0.7 0:43.37 /usr/libexec/packagelint
6064 laksath 20 0 1625M 473M 10452 S 0.0 8.0 0:41.37 /snap/snap-store/547/usr/bin/snap-store --gappication-service
103551 laksath 20 0 20.8C 167M 82512 S 0.0 2.8 0:36.99 /opt/google/chrome/chrome --type=renderer --field-trial-handle=9155833127557490712,12266908089599759352,131072 --disable-gpu-compositing --lang=en
6214 laksath 20 0 379M 7744 5936 S 0.0 0.1 0:35.46 ibus-daemon -panel disable -r -xnm
19126 laksath 20 0 17.1
```

2 Choosing to kill a process provides 2 choices.

We can either directly enter the process ID (2nd option) (or) If we are not sure, we shall choose the first type and enter the application's name to be terminated (chrome in this case) (option 1).

We don't delete all the processes, we rather display the information about it.

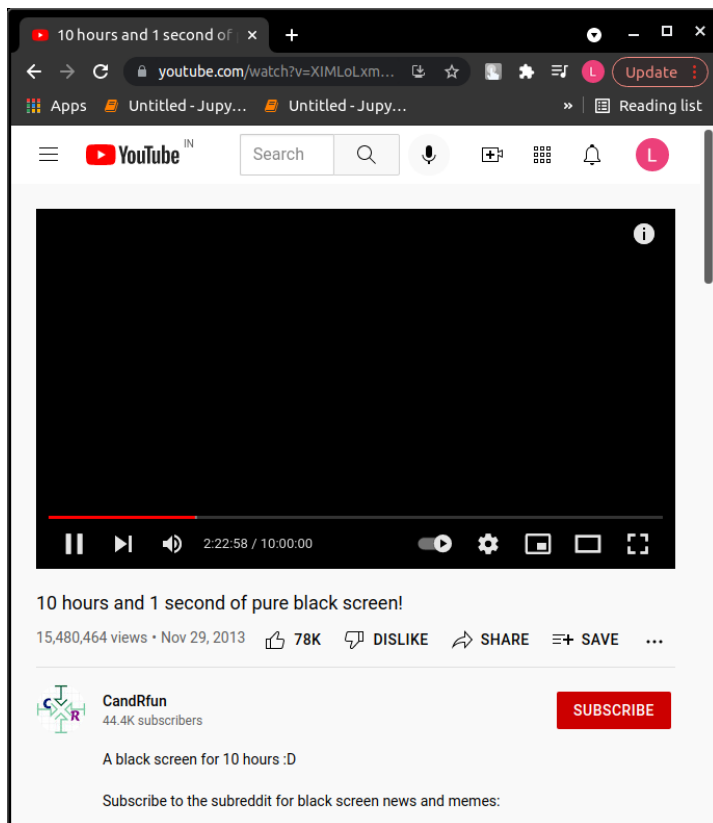


Here we have chosen option 1. We wanted to kill all the chrome processes.

Here, as we can see, we have a chrome application with a Youtube video running.

There are 2 processes that are running with pids : 185475 and 190245 respectively.


```
2
Type:
1 -> Enter the application's name to terminate
2 -> PID to terminate
2
Enter the process ID to be terminated :
185475
0 Refresh process Manager
1 Advanced Option
2 Kill a process
3 Exit
2
```



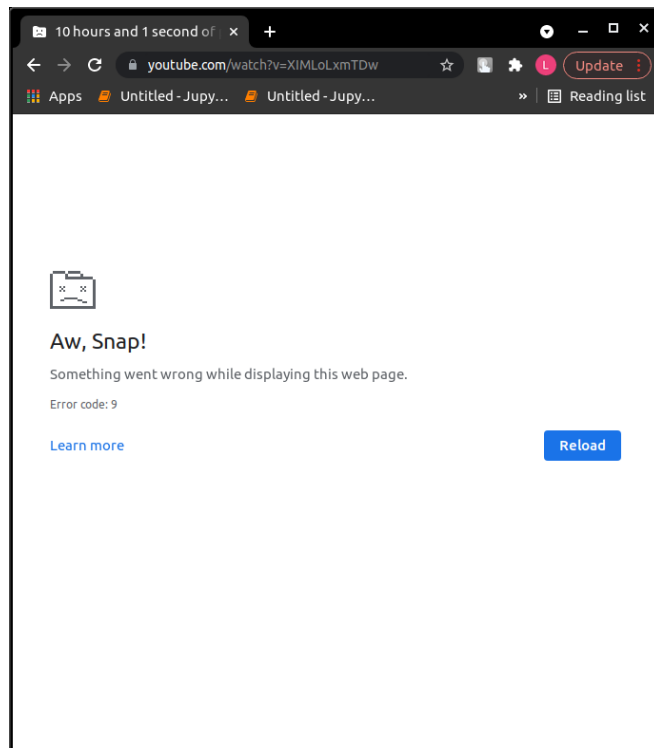
Now to terminate these 2 processes, we need to choose type 2 in the Kill a process option.

We specified process ID 185475 to terminate and we can see the video is still playing which means the chrome process is not yet terminated.

This is because it is important that we also kill the other process which makes sure that the entire chrome process is shutdown.

```
Type:
1 -> Enter the application's name to terminate
2 -> PID to terminate
2
Enter the process ID to be terminated :
190245
0 Refresh process Manager
1 Advanced Option
2 Kill a process
3 Exit
0
top - 16:39:03 up 2 days, 23:01, 1 user, load average: 0.25, 0.28, 0.29
Tasks: 290 total, 1 running, 289 sleeping, 0 stopped, 0 zombie
%Cpu(s): 15.6 us, 1.6 sy, 0.0 ni, 82.8 id, 0.0 wa, 0.0 hi, 0.0 si, 0.0 st
MiB Mem : 5935.5 total, 302.8 free, 3014.3 used, 2618.4 buff/cache
MiB Swap: 2048.0 total, 1297.0 free, 751.0 used. 2523.1 avail Mem
```

PID	USER	PR	NI	VIRT	RES	SHR	S	%CPU	%MEM	TIME+	COMMAND
5002	laksath	20	0	5860952	494324	95172	S	50.0	8.1	145:05.07	gnome-shell



- Now, after we terminated the chrome process with process ID 190245, we can see that the video stopped playing as that process has been killed by our program.
- Error Code 9 appears because the process has been killed suddenly from our local operating system.
- This is how we completely terminate applications running in linux systems.
- However, the existing softwares fails to provide these functionalities and therefore, we have shown the above implementations.

- Once again , to check if the chrome processes are still running, we can refresh the Process Manager by typing in 0.

```

laksath@laksath-Virtua
+

  PID USER      PR  NI   VIRT    RES    SHR  S  %CPU  %MEM     TIME+ COMMAND
  5002 laksath   20   0 5872552 503732 104480 S   33.3   8.3 146:18.53 gnome-shell
    1 root      20   0 166200   11132   6424 S    0.0   0.2  0:17.20 systemd
    2 root      20   0         0         0      0 S    0.0   0.0  0:00.04 kthreadd
    3 root       0 -20         0         0      0 I    0.0   0.0  0:00.00 rcu_gp
    4 root       0 -20         0         0      0 I    0.0   0.0  0:00.00 rcu_par_gp
    6 root       0 -20         0         0      0 I    0.0   0.0  0:00.00 kworker/0:0H-events_highpri
    9 root       0 -20         0         0      0 I    0.0   0.0  0:00.00 mm_percpu_wq
   10 root      20   0         0         0      0 S    0.0   0.0  0:00.00 rcu_tasks_rude_
   11 root      20   0         0         0      0 S    0.0   0.0  0:00.00 rcu_tasks_trace
   12 root      20   0         0         0      0 S    0.0   0.0  0:01.72 ksoftirqd/0
   13 root      20   0         0         0      0 I    0.0   0.0  1:05.72 rcu_sched
   14 root      rt    0         0         0      0 S    0.0   0.0  0:01.71 migration/0
   15 root     -51   0         0         0      0 S    0.0   0.0  0:00.00 idle_inject/0
   16 root      20   0         0         0      0 S    0.0   0.0  0:00.00 cpuhp/0
   17 root      20   0         0         0      0 S    0.0   0.0  0:00.00 cpuhp/1
   18 root     -51   0         0         0      0 S    0.0   0.0  0:00.00 idle_inject/1
   19 root      rt    0         0         0      0 S    0.0   0.0  0:02.03 migration/1
   20 root      20   0         0         0      0 S    0.0   0.0  0:01.49 ksoftirqd/1
   22 root       0 -20         0         0      0 I    0.0   0.0  0:00.00 kworker/1:0H-events_highpri
   23 root      20   0         0         0      0 S    0.0   0.0  0:00.00 cpuhp/2
   24 root     -51   0         0         0      0 S    0.0   0.0  0:00.00 idle_inject/2
   25 root      rt    0         0         0      0 S    0.0   0.0  0:01.82 migration/2
   26 root      20   0         0         0      0 S    0.0   0.0  0:01.46 ksoftirqd/2
   28 root       0 -20         0         0      0 I    0.0   0.0  0:00.00 kworker/2:0H-events_highpri
   29 root      20   0         0         0      0 S    0.0   0.0  0:00.00 cpuhp/3
   30 root     -51   0         0         0      0 S    0.0   0.0  0:00.00 idle_inject/3
   31 root      rt    0         0         0      0 S    0.0   0.0  0:01.84 migration/3
   32 root      20   0         0         0      0 S    0.0   0.0  0:02.19 ksoftirqd/3
   34 root       0 -20         0         0      0 I    0.0   0.0  0:00.00 kworker/3:0H-kblockd
   35 root      20   0         0         0      0 S    0.0   0.0  0:00.00 kdevtmpfs
   36 root       0 -20         0         0      0 I    0.0   0.0  0:00.00 netns
   37 root       0 -20         0         0      0 I    0.0   0.0  0:00.00 inet_frag_wq
   38 root      20   0         0         0      0 S    0.0   0.0  0:00.00 kauditd
   39 root      20   0         0         0      0 S    0.0   0.0  0:00.25 khungtaskd
   40 root      20   0         0         0      0 S    0.0   0.0  0:00.00 oom_reaper
   41 root       0 -20         0         0      0 I    0.0   0.0  0:00.00 writeback
   42 root      20   0         0         0      0 S    0.0   0.0  0:11.68 kcompactd0
   43 root      25   5         0         0      0 S    0.0   0.0  0:00.00 ksm
   44 root      39  19         0         0      0 S    0.0   0.0  0:00.62 khugepaged
   92 root       0 -20         0         0      0 I    0.0   0.0  0:00.00 kintegrityd
   93 root       0 -20         0         0      0 I    0.0   0.0  0:00.00 kblockd
   94 root       0 -20         0         0      0 I    0.0   0.0  0:00.00 blkcg_punt_bio
   95 root       0 -20         0         0      0 I    0.0   0.0  0:00.00 tpm_dev_wq
   96 root       0 -20         0         0      0 I    0.0   0.0  0:00.00 ata_sff
   97 root       0 -20         0         0      0 I    0.0   0.0  0:00.00 md
   98 root       0 -20         0         0      0 I    0.0   0.0  0:00.00 edac-poller
   99 root       0 -20         0         0      0 I    0.0   0.0  0:00.00 devfreq_wq
  100 root     -51   0         0         0      0 S    0.0   0.0  0:00.00 watchdogd
  103 root       0 -20         0         0      0 I    0.0   0.0  0:05.28 kworker/0:1H-kblockd
  105 root      20   0         0         0      0 S    0.0   0.0  0:08.68 kswapd0

1 Advanced Option
2 Kill a process
3 Exit

```

As we can notice, the chrome process is not there anymore.

Link to the project :

<https://drive.google.com/drive/folders/1IVWGa0-lAV7aFNx4cIXWEJZAAZlILx3v?usp=sharing>

How to run :

1. Go to the project's directory.
2. run : `g++ cmd.cpp; ./a.out;`

All the other python files are linked to it directly.

So, this single command is sufficient to run the entire project.