CS310 LAB-0

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1)

The three commonly used operating systems these days include windows, linux and mac. Windows owned by Microsoft is a user friendly operating system in which most of the interaction is done using the GUI. There is a large amount of softwares that is available for this operating system. Linux on the other hand provides much customization and privileges to the user.

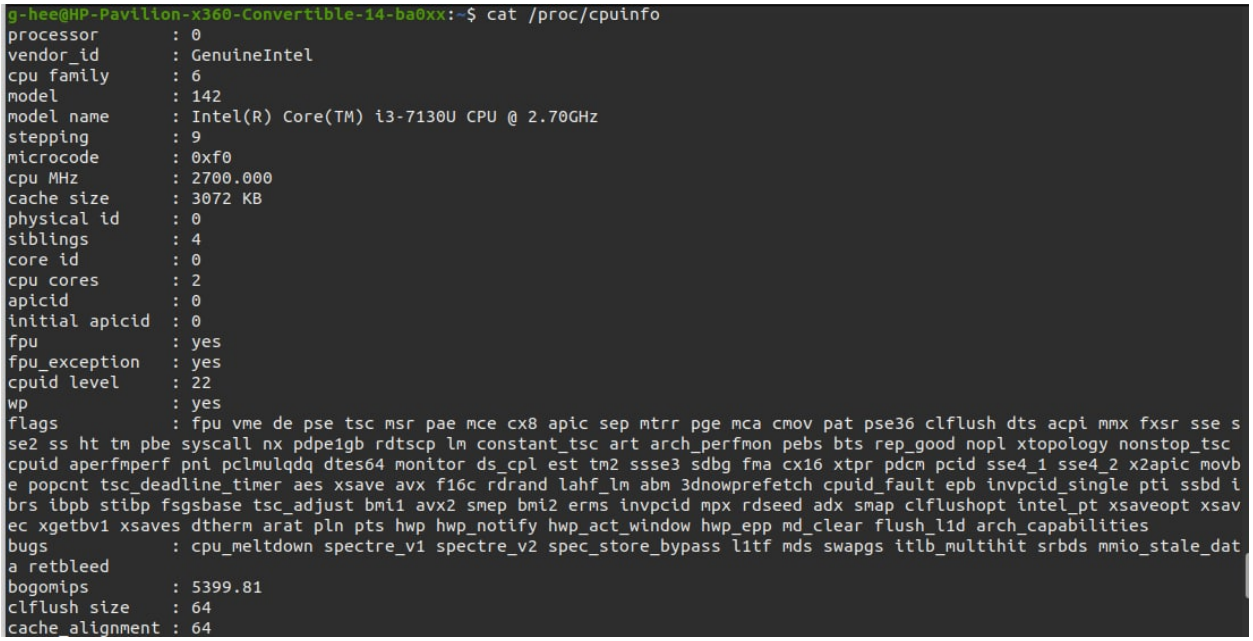
2)

Both will try to use the same input and output device, they will both require different memory, ram and they will try to use the same processor. Different registers will be required to maintain the basic things like program counter and stack counter. Also both the operating systems have different sets of rules and restrictions which will create conflict between them.

3)

Yes, two OS are running at the same time, one is the host OS and the other is a guest OS running on the virtual machine (Ubuntu 18.04).

4)



```
g-hee@HP-Pavilion-x360-Convertible-14-ba0xx:~$ lscpu
Architecture:                    x86_64
CPU op-mode(s):                  32-bit, 64-bit
Byte Order:                      Little Endian
Address sizes:                   39 bits physical, 48 bits virtual
CPU(s):                          4
On-line CPU(s) list:             0-3
Thread(s) per core:              2
Core(s) per socket:              2
Socket(s):                       1
NUMA node(s):                    1
Vendor ID:                       GenuineIntel
CPU family:                      6
Model:                           142
Model name:                      Intel(R) Core(TM) i3-7130U CPU @ 2.70GHz
Stepping:                        9
CPU MHz:                         2700.000
CPU max MHz:                     2700.0000
CPU min MHz:                     400.0000
BogoMIPS:                        5399.81
L1d cache:                       64 KiB
L1i cache:                       64 KiB
L2 cache:                        512 KiB
L3 cache:                        3 MiB
NUMA node0 CPU(s):               0-3
Vulnerability Itlb multihit:     KVM: Mitigation: VMX unsupported
Vulnerability L1tf:              Mitigation; PTE Inversion
Vulnerability Mds:               Mitigation; Clear CPU buffers; SMT vulnerable
Vulnerability Meltdown:          Mitigation; PTI
Vulnerability Mmio stale data:   Mitigation; Clear CPU buffers; SMT vulnerable
Vulnerability Retbleed:          Mitigation; IBRS
```

5)

```
g-hee@HP-Pavilion-x360-Convertible-14-ba0xx:~$ ps u
USER         PID %CPU %MEM    VSZ   RSS TTY      STAT START   TIME COMMAND
g-hee       1537  0.0  0.0 164016  6504 tty2     Ssl+ 20:25   0:00 /usr/lib/gdm3/gdm-x-session --run-script env GNOME_SHE
g-hee       1543  2.5  0.7 532220 90776 tty2     Sl+  20:25   3:44 /usr/lib/xorg/Xorg vt2 -displayfd 3 -auth /run/user/10
g-hee       1577  0.0  0.1 188096 13720 tty2     Sl+  20:25   0:00 /usr/libexec/gnome-session-binary --systemd --systemd
g-hee       3233  0.0  0.0  10884  5236 pts/0    Ss   21:35   0:00 bash
g-hee       8044  0.0  0.0  11496  3268 pts/0    R+   22:52   0:00 ps u
g-hee@HP-Pavilion-x360-Convertible-14-ba0xx:~$
```

```
g-hee@HP-Pavilion-x360-Convertible-14-ba0xx:~$ top

top - 22:55:26 up  2:30,  1 user,  load average: 0.56, 0.51, 0.49
Tasks: 247 total,   1 running, 246 sleeping,   0 stopped,   0 zombie
%Cpu(s):  4.3 us,  1.3 sy,  0.0 ni, 94.2 id,  0.1 wa,  0.0 hi,  0.1 si,  0.0 st
MiB Mem :  11842.5 total,   6436.5 free,   2235.1 used,   3170.9 buff/cache
MiB Swap:   1897.4 total,   1897.4 free,      0.0 used.   8672.1 avail Mem

    PID USER      PR  NI    VIRT    RES    SHR S  %CPU  %MEM     TIME+ COMMAND
   1696 g-hee     20   0 4490656 302632 109540 S   8.9   2.5   5:15.18 gnome-shell
   1543 g-hee     20   0  537120  90788  55792 S   5.0   0.7   3:54.55 Xorg
   7053 g-hee     20   0 1129.1g 323104 131388 S   2.3   2.7   8:11.72 brave
   2491 g-hee     20   0   32.8g 378384 186384 S   1.7   3.1   4:52.82 brave
   2529 g-hee     20   0   32.5g 117104  92792 S   1.3   1.0   1:27.44 brave
   5339 g-hee     20   0 1125.0g 188680 100808 S   1.0   1.6   0:27.38 brave
    788 message+  20   0   10004   6572   3836 S   0.7   0.1   0:08.25 dbus-daemon
   8098 g-hee     20   0   11988   4048   3272 R   0.7   0.0   0:00.11 top
     14 root      20   0       0      0      0 I   0.3   0.0   0:06.11 rcu_sched
     15 root      rt   0       0      0      0 S   0.3   0.0   0:00.05 migration/0
     21 root      20   0       0      0      0 S   0.3   0.0   0:03.40 ksoftirqd/1
    790 root      20   0  336548  20444  16848 S   0.3   0.2   0:22.75 NetworkManager
   1225 geoclue   20   0  508860  20292  14464 S   0.3   0.2   0:05.50 geoclue
   5118 g-hee     20   0 1419628 429020 191916 S   0.3   3.5   4:10.45 telegram-deskto
   5988 root      20   0       0      0      0 I   0.3   0.0   0:02.26 kworker/u8:3-events_power_efficient
   7274 root      20   0       0      0      0 I   0.3   0.0   0:11.59 kworker/1:0-events
      1 root      20   0  168348  11600   8208 S   0.0   0.1   0:02.18 systemd
      2 root      20   0       0      0      0 S   0.0   0.0   0:00.00 kthreadd
```

Top 5 processes which are running are:

	Memory(%)	Time
Gnome-shell:	2.5	5:15
Xorg	0.7	3:54
Brave	8.4	8:11
Dbus-daemon	0.1	0:08
Top	0.0	0:00

6) `ps aux | grep <process-name>` – to find the pid and other information about the process
`kill <pid>` – to kill that process
After running the `yes` command to run a never ending process, and kill it:

```
g-hee@HP-Pavilion-x360-Convertible-14-ba0xx:~$ ps aux|grep yes
g-hee       9339  0.0  0.0   8908   716 pts/0    S+   23:34   0:00 grep --color=auto yes
g-hee@HP-Pavilion-x360-Convertible-14-ba0xx:~$ kill 9339
```

7)

Foreground processes are the processes that require interaction by the user. Background processes are the processes that do not require any user intervention and run independently..

8)

A process is a program that is loaded in the memory along with all the resources it needs to operate whereas a thread is a single execution within a process. The number threads can vary from one to many depending upon the type of process. A single thread means there is only one thing happening in the process whereas in a multi-threaded process there are a number of things happening at the same time.

9)

RAM is a type of volatile memory that stores the currently used data. It stores the data temporarily and once the computer is turned off the data is lost. **Swap** memory enables the OS to provide memory to a program when the system runs out of RAM. **Cache** memory is faster than RAM but also costlier and provides faster access to memory.

10)

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

void fact(int n)
{
        if (n == 0)
                return;
        printf("recursive call: %d times\n", n);
        func(n-1);
}

int main()
{
    // here we are allocating the memory in the stack
    int a = 2;
    // malloc helps us allocate the memory in the heap
    int *b = (int *) malloc(sizeof(int)); *b = 3;
    fact(a);
    free(b);
    return 0;
}
```

12)

```c
#include <stdio.h>
int main()
{
        int arr[5] = {8, 10, 7, 2, 9};
        printf("%d\n", arr[5]);
        return 0;
}
```

The program ran and gave an output as a garbage value.This is because C and C++ do not check array boundaries. The program may or may not crash but it is very probable that the program causes a segmentation fault.

13)

We are using `ip addr` to check our ip.

```
g-hee@HP-Pavilion-x360-Convertible-14-ba0xx:~$ ip addr
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1/8 scope host lo
       valid_lft forever preferred_lft forever
    inet6 ::1/128 scope host
       valid_lft forever preferred_lft forever
2: wlp3s0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc noqueue state UP group default qlen 1000
    link/ether 00:23:15:e2:d2:b8 brd ff:ff:ff:ff:ff:ff
    inet 192.168.43.164/24 brd 192.168.43.255 scope global dynamic noprefixroute wlp3s0
       valid_lft 3001sec preferred_lft 3001sec
    inet6 2409:4056:100:45c0:6db9:8fe4:338f:a9ec/64 scope global temporary dynamic
       valid_lft 3322sec preferred_lft 3322sec
    inet6 2409:4056:100:45c0:ca6c:84f7:4346:bc1a/64 scope global dynamic mngtmpaddr noprefixroute
       valid_lft 3322sec preferred_lft 3322sec
    inet6 fe80::3485:b626:e1f8:42f6/64 scope link noprefixroute
       valid_lft forever preferred_lft forever
g-hee@HP-Pavilion-x360-Convertible-14-ba0xx:~$
```

We can see our ip address is 192.168.43.164.

14)

```
g-hee@HP-Pavilion-x360-Convertible-14-ba0xx:~$ ping -c 1 google.com
PING google.com(del03s13-in-x0e.1e100.net (2404:6800:4002:808::200e)) 56 data bytes
64 bytes from del03s13-in-x0e.1e100.net (2404:6800:4002:808::200e): icmp_seq=1 ttl=117 time=58.2 ms

--- google.com ping statistics ---
1 packets transmitted, 1 received, 0% packet loss, time 0ms
rtt min/avg/max/mdev = 58.240/58.240/58.240/0.000 ms
g-hee@HP-Pavilion-x360-Convertible-14-ba0xx:~$ ping -c 1 iitmandi.ac.in
PING iitmandi.ac.in (204.197.248.190) 56(84) bytes of data.
64 bytes from 204.197.248.190 (204.197.248.190): icmp_seq=1 ttl=40 time=356 ms

--- iitmandi.ac.in ping statistics ---
1 packets transmitted, 1 received, 0% packet loss, time 0ms
rtt min/avg/max/mdev = 355.783/355.783/355.783/0.000 ms
g-hee@HP-Pavilion-x360-Convertible-14-ba0xx:~$ ping -c 1 facebook.com
PING facebook.com(edge-star-mini6-shv-02-del1.facebook.com (2a03:2880:f144:181:face:b00c:0:25de)) 56 data bytes
64 bytes from edge-star-mini6-shv-02-del1.facebook.com (2a03:2880:f144:181:face:b00c:0:25de): icmp_seq=1 ttl=57 time=72.3 ms

--- facebook.com ping statistics ---
1 packets transmitted, 1 received, 0% packet loss, time 0ms
rtt min/avg/max/mdev = 72.290/72.290/72.290/0.000 ms
g-hee@HP-Pavilion-x360-Convertible-14-ba0xx:~$ ping -c 1 amazon.in
PING amazon.in (52.95.116.115) 56(84) bytes of data.
64 bytes from 52.95.116.115 (52.95.116.115): icmp_seq=1 ttl=226 time=223 ms

--- amazon.in ping statistics ---
1 packets transmitted, 1 received, 0% packet loss, time 0ms
rtt min/avg/max/mdev = 222.766/222.766/222.766/0.000 ms
g-hee@HP-Pavilion-x360-Convertible-14-ba0xx:~$ ping -c 1 flipkart.com
PING flipkart.com (163.53.78.110) 56(84) bytes of data.
64 bytes from 163.53.78.110 (163.53.78.110): icmp_seq=1 ttl=52 time=123 ms

--- flipkart.com ping statistics ---
1 packets transmitted, 1 received, 0% packet loss, time 0ms
rtt min/avg/max/mdev = 123.065/123.065/123.065/0.000 ms
```

Latency of google.com - 58.2ms
Latency of iitmandi.ac.in - 356ms
Latency of facebook.com - 72.3ms
Latency of amazon.in - 223 ms
Latency of flipkart.com - 123ms

15)

Linux provides us with two commands: ‘curl’ and ‘wget’ that allow us to send HTTP requests without the use of a web browser or any other interactive app. These commands enable us to perform non-interactive upload and download.

If we use ‘curl’ and ‘wget’ to get a page from a website, the ‘curl’ command shows the output on the console whereas the ‘wget’ command downloads the page into a file.

‘curl’ is basically a general purpose tool for transferring data to and from a server and supports a large number of protocols: DICT, FILE,FTPS, GOPHER, IMAP, LDAP, POP3, RTMP, RTSP, TFTP, TELNET, SMB, SMBS, SMTP, SMTPS, SCP and SFTP. On the other hand, ‘wget’ is basically a network downloader.

16)

Configuring proxy depends upon the operating system we are using and some applications do not use the system proxy by default and we have to set their proxy separately.

To set the https_proxy environment variable:

export https_proxy=http://’proxyip’:’port’

To set the http_proxy environment variable:

export http_proxy=http://’proxyip’:’port’

To set the ftp_proxy environment variable:

export http_proxy=http://’proxyip’:’port’

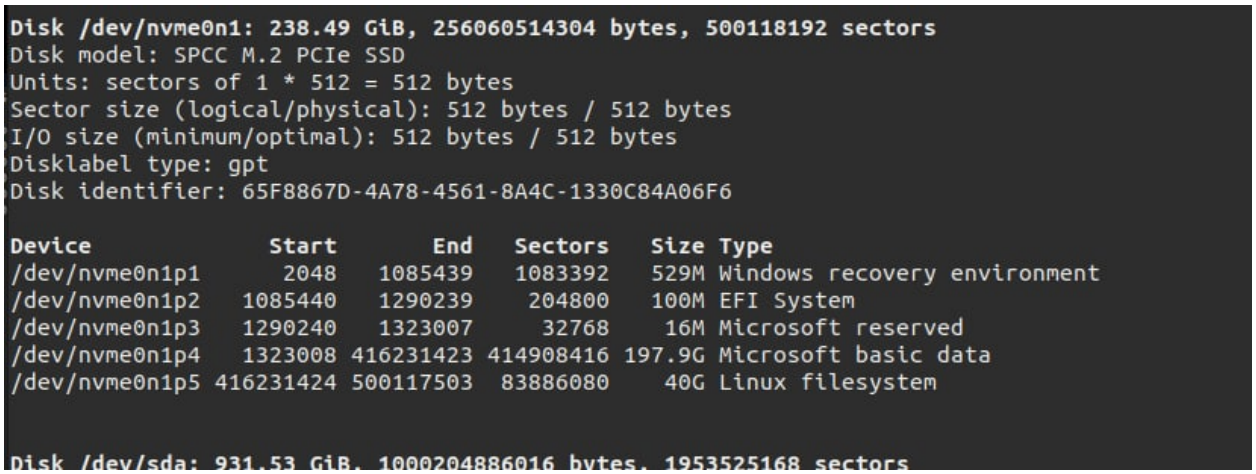
For example in our case:

export http_proxy=”http://gateway.iitmandi.ac.in:8080”

export https_proxy=”http://gateway.iitmandi.ac.in:8080”

export ftp_proxy=”ftp://gateway.iitmandi.ac.in:8080”

17)



```
Disk /dev/nvme0n1: 238.49 GiB, 256060514304 bytes, 500118192 sectors
Disk model: SPCC M.2 PCIe SSD
Units: sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disklabel type: gpt
Disk identifier: 65F8867D-4A78-4561-8A4C-1330C84A06F6

Device             Start       End   Sectors   Size Type
/dev/nvme0n1p1      2048   1085439   1083392   529M Windows recovery environment
/dev/nvme0n1p2   1085440   1290239    204800   100M EFI System
/dev/nvme0n1p3   1290240   1323007     32768    16M Microsoft reserved
/dev/nvme0n1p4   1323008 416231423 414908416 197.9G Microsoft basic data
/dev/nvme0n1p5 416231424 500117503  83886080    40G Linux filesystem


Disk /dev/sda: 931.53 GiB, 1000204886016 bytes, 1953525168 sectors
```

18)

```
g-hee@HP-Pavilion-x360-Convertible-14-ba0xx:~$ netstat
Active Internet connections (w/o servers)
Proto Recv-Q Send-Q Local Address           Foreign Address         State
tcp        0      0 HP-Pavilion-x360-:53332 10.7.0.1:http-alt       TIME_WAIT
tcp        0      0 HP-Pavilion-x360-:53328 10.7.0.1:http-alt       TIME_WAIT
tcp        0      0 HP-Pavilion-x360-:53330 10.7.0.1:http-alt       TIME_WAIT
tcp        0      0 HP-Pavilion-x360-:53334 10.7.0.1:http-alt       TIME_WAIT
udp        0      0 HP-Pavilion-x360:bootpc 10.7.0.1:bootps         ESTABLISHED
Active UNIX domain sockets (w/o servers)
Proto RefCnt Flags       Type       State         I-Node   Path
unix  2      [ ]         DGRAM      CONNECTED     42736    /run/user/1000/systemd/notify
unix  4      [ ]         DGRAM      CONNECTED     18991    /run/systemd/notify
unix  2      [ ]         DGRAM                    19005    /run/systemd/journal/syslog
unix  23     [ ]         DGRAM      CONNECTED     19015    /run/systemd/journal/dev-log
unix  8      [ ]         DGRAM      CONNECTED     19019    /run/systemd/journal/socket
unix  3      [ ]         SEQPACKET  CONNECTED     51835    @0000d
unix  3      [ ]         SEQPACKET  CONNECTED     51855    @0000e
unix  3      [ ]         SEQPACKET  CONNECTED     51857    @0000f
unix  3      [ ]         SEQPACKET  CONNECTED     51834    @0000a
unix  3      [ ]         SEQPACKET  CONNECTED     54497    @0000b
unix  3      [ ]         SEQPACKET  CONNECTED     54498    @0000c
unix  2      [ ]         DGRAM                    31595    /run/wpa_supplicant/wlp3s0
unix  2      [ ]         DGRAM                    36154    /run/wpa_supplicant/p2p-dev-wlp3s0
unix  3      [ ]         STREAM     CONNECTED     45821
unix  3      [ ]         STREAM     CONNECTED     31848
unix  3      [ ]         STREAM     CONNECTED     46889
unix  3      [ ]         STREAM     CONNECTED     56163
unix  3      [ ]         STREAM     CONNECTED     53465
unix  3      [ ]         STREAM     CONNECTED     48288    /run/user/1000/bus
unix  3      [ ]         STREAM     CONNECTED     48269
unix  3      [ ]         STREAM     CONNECTED     42862
```

```
g-hee@HP-Pavilion-x360-Convertible-14-ba0xx:~$ vmstat
procs -----------memory---------- ---swap-- -----io---- -system-- ------cpu-----
 r  b   swpd   free   buff  cache   si   so    bi    bo   in   cs us sy id wa st
 2  1      0 8836964  99708 2077992    0    0   103    42   59  111  1  0 98  0  0
g-hee@HP-Pavilion-x360-Convertible-14-ba0xx:~$
```