

Institute of Computer Technology
B. Tech Computer Science and Engineering
Subject: BOSS (2CSE204)

PRACTICAL-6

AIM: - To learn about monitoring and managing Linux processes.

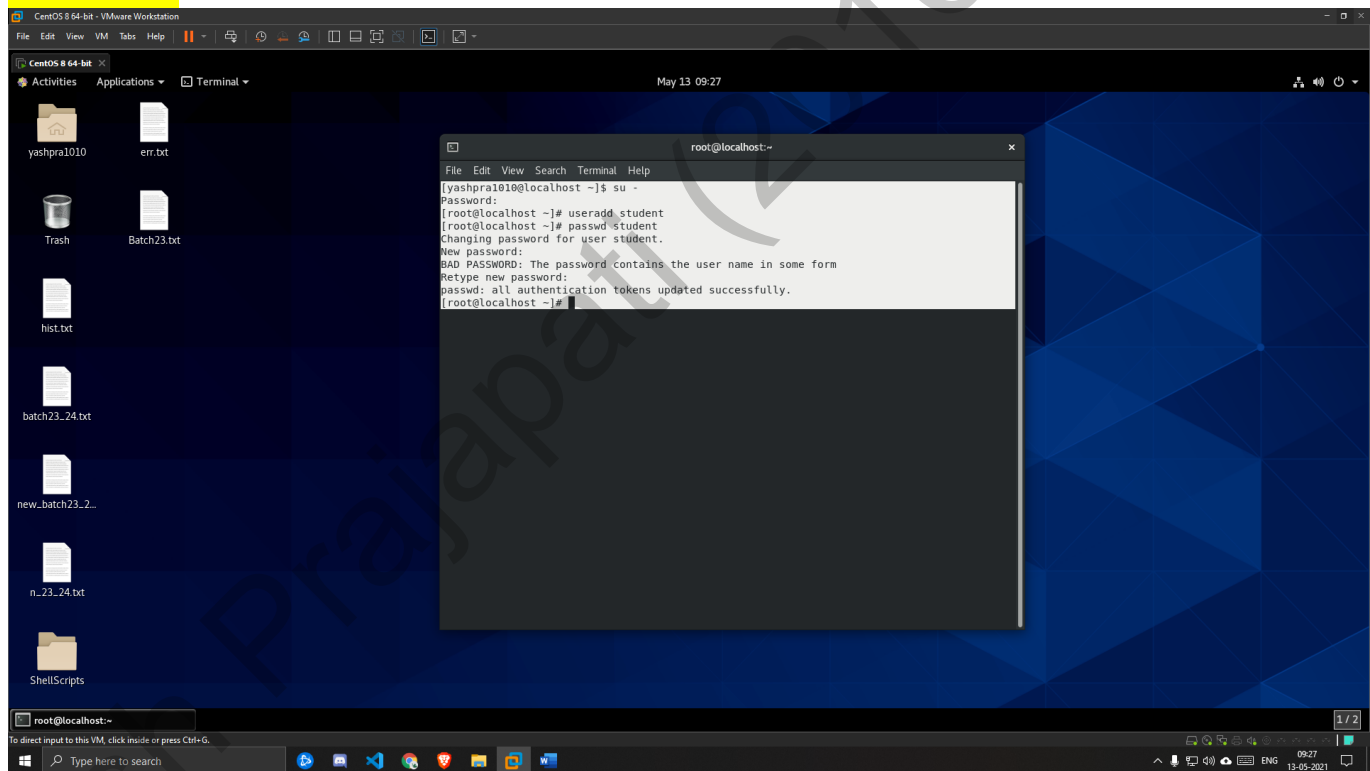
Commands:

1. **top** – It is used to show the processes in linux.
2. **ps** – It is used to show information of running processes in linux.
3. **kill** – It is used to kill/terminate the process in linux.
4. **pkill** - It is used to kill/terminate the process using process name in linux.
5. **jobs** – It is used to list the running jobs in linux.
6. **fg** – It changes the process to foreground environment.
7. **bg** – It is used to place foreground processes to background.

Exercise:

1. **Create new user student and set password “student123”.**

SOLUTION:



```
root@localhost:~# su -
[yashpra1010@localhost ~]$ su -
Password:
[root@localhost ~]# useradd student
[root@localhost ~]# passwd student
Changing password for user student.
New password:
BAD PASSWORD: The password contains the user name in some form
Retype new password:
passwd: all authentication tokens updated successfully.
[root@localhost ~]#
```

2. Switch to student user. Open two terminal windows side by side. In this section, these terminals are referred to as left and right. Create a script called process101, which will generate artificial CPU load. Create the script in the /home/student/bin directory.

```
#!/bin/bash
while true; do
    var=1
    while [[ var -lt 50000 ]]; do
        var=$((var+1))
    done
    sleep 1
done
```

SOLUTION:

```
[yashpra101@localhost ~]$ su -
Password:
[root@localhost ~]# useradd student
[root@localhost ~]# passwd student
Changing password for user student.
New password:
BAD PASSWORD: The password contains the user name in some form
Retype new password:
passwd: all authentication tokens updated successfully.
[root@localhost ~]# clear

[root@localhost ~]# su - student
[student@localhost ~]$ pwd
/home/student
[student@localhost ~]$ mkdir bin
[student@localhost ~]$ cd bin
[student@localhost bin]$ pwd
/home/student/bin
[student@localhost bin]$ vi process101
[student@localhost bin]$ cat process101
#!/bin/bash
while true; do
    var=1
    while [[ var -lt 50000 ]]; do
        var=$((var+1))
    done
    sleep 1
done
[student@localhost bin]$
```

3. In the right window, run the top utility.

SOLUTION:

```
top - 08:21:33 up 7 min, 1 user, load average: 0.09, 0.55, 0.39
Tasks: 298 total, 1 running, 297 sleeping, 0 stopped, 0 zombie
%Cpu(s): 0.9 us, 0.4 sy, 0.0 ni, 98.5 id, 0.0 wa, 0.1 hi, 0.1 si, 0.0 st
MiB Mem : 3711.4 total, 1430.6 free, 1393.5 used, 887.3 buff/cache
MiB Swap: 4032.0 total, 4032.0 free, 0.0 used, 2061.6 avail Mem

  PID USER      PR  NI  VIRT  RES  SHR S %CPU  %MEM    TIME+  COMMAND
2318 yashpra+  20   0 3779144 277752 113036 S   0.0   7.3   0:22.56 gnome-shell
3024 yashpra+  20   0 533120 43004 31944 S   0.7   1.1   0:01.81 gnome-terminal-
1176 root       20   0 426392 31344 16468 S   0.3   0.8   0:00.85 tuned
2395 yashpra+  20   0 462800 11304  8672 S   0.3   0.3   0:00.87 ibus-daemon
2500 root       20   0 205216 32256 10308 S   0.3   0.8   0:01.47 sssd kcm
1 root      20   0 245664 14248  9196 S   0.0   0.4   0:24.75 systemd
2 root      20   0 0 0 0 S   0.0   0.0   0:00.03 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
5 root      20   0 0 0 0 I   0.0   0.0   0:00.00 kworker/0:0-cgroup_pidlist_destroy
6 root      0 -20 0 0 0 I   0.0   0.0   0:00.00 kworker/0:0H-kblockd
8 root      20   0 0 0 0 I   0.0   0.0   0:00.36 kworker/u256:0-events_unbound
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 ksoftirqd/0
11 root     20   0 0 0 0 I   0.0   0.0   0:00.74 rcu_sched
12 root     rt    0 0 0 0 S   0.0   0.0   0:00.00 migration/0
13 root     rt    0 0 0 0 S   0.0   0.0   0:00.00 watchdog/0
```

4. In the left terminal shell, determine the number of logical CPUs on the virtual machine. Run the process101 script in the background.

SOLUTION:

```

[student@localhost bin]$ lscpu
Architecture:          x86_64
CPU op-mode(s):        32-bit, 64-bit
Byte Order:            Little Endian
CPU(s):                4
On-line CPU(s) list:   0-3
Thread(s) per core:    1
Core(s) per socket:    2
Socket(s):              2
NUMA node(s):          1
Vendor ID:              AuthenticAMD
CPU family:             23
Model:                 24
Model name:             AMD Ryzen 3 3300U with Radeon Vega Mobile Gfx
Stepping:               1
CPU MHz:               2096.063
BogoMIPS:              4192.12
Hypervisor vendor:     VMware
Virtualization type:   full
L1d cache:             32K
L1i cache:             64K
L2 cache:              512K
L3 cache:              4096K
NUMA node0 CPU(s):     0-3
Flags:                 fpu vme de pse tsc msr pae mce cx8 apic sep mtrr pge mca cmov pat pse36 clflush mmx fxsr sse sse2 ht syscall nx mmxext fxsr_opt n

```

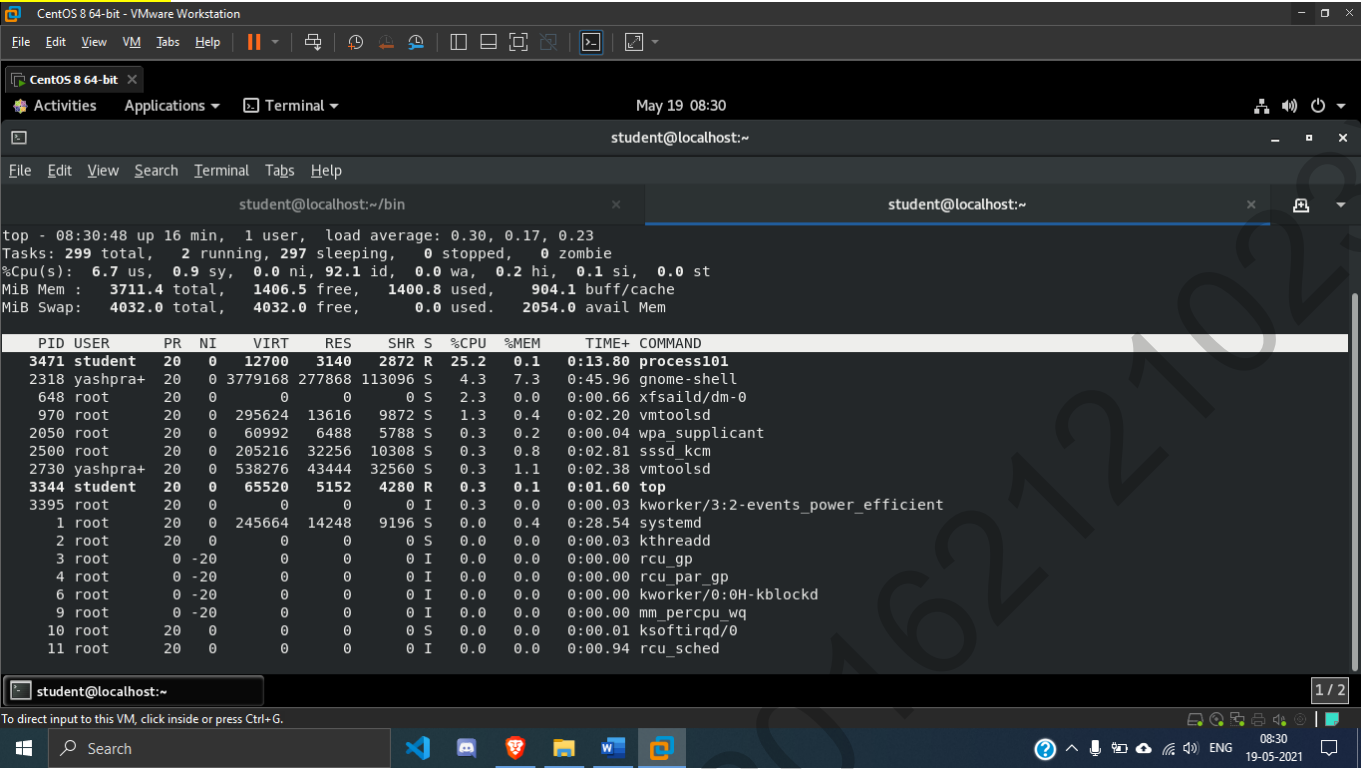
```

aes xsave avx f16c rdrand hypervisor lahf_lm cmp_legacy extapic cr8_legacy abm sse4a misalignsse 3dnowprefetch osvw topoext ssbd ibpb vmcall fsgsbase
bmi1 avx2 smep bmi2 rdseed adx smap clflushopt sha_ni xsaveopt xsavec xgetbv1 xsaves clzero arat overflow_recov succor
[student@localhost bin]$ man sleep
[student@localhost bin]$ ls
process101
[student@localhost bin]$ process101 &
[1] 3454
[student@localhost bin]$ -bash: /home/student/bin/process101: Permission denied
^C
[1]+  Exit 126                  process101
[student@localhost bin]$ process101 &
[1] 3465
-bash: /home/student/bin/process101: Permission denied
[student@localhost bin]$ ls -l process
ls: cannot access 'process': No such file or directory
[1]+  Exit 126                  process101
[student@localhost bin]$ ls -l process101
-rw-rw-r--. 1 student student 97 May 19 08:19 process101
[student@localhost bin]$ chmod 777 process101
[student@localhost bin]$ ls -l process101
-rwxrwxrwx. 1 student student 97 May 19 08:19 process101
[student@localhost bin]$ process101 &
[1] 3471
[student@localhost bin]$

```

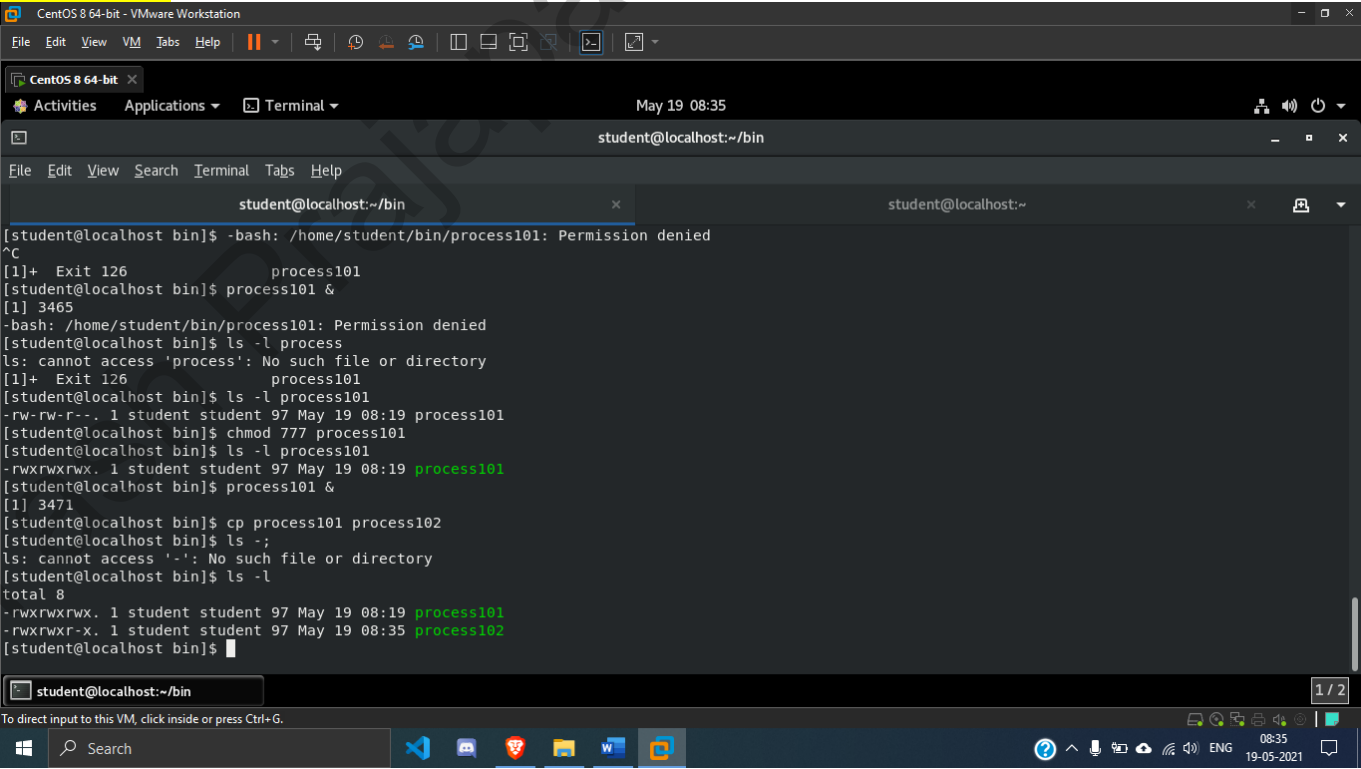
5. In the right terminal shell, observe the top display, running tasks & CPU load.

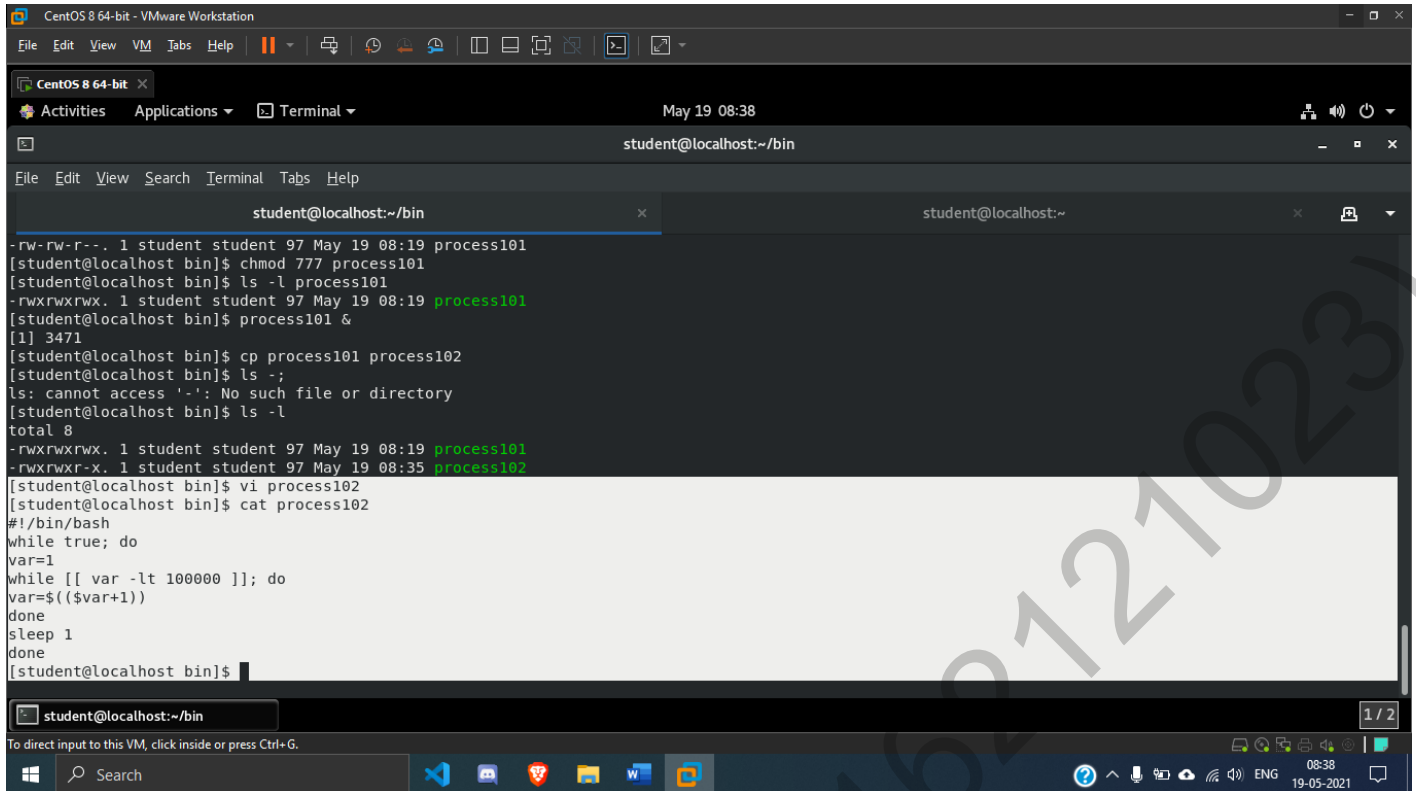
SOLUTION:



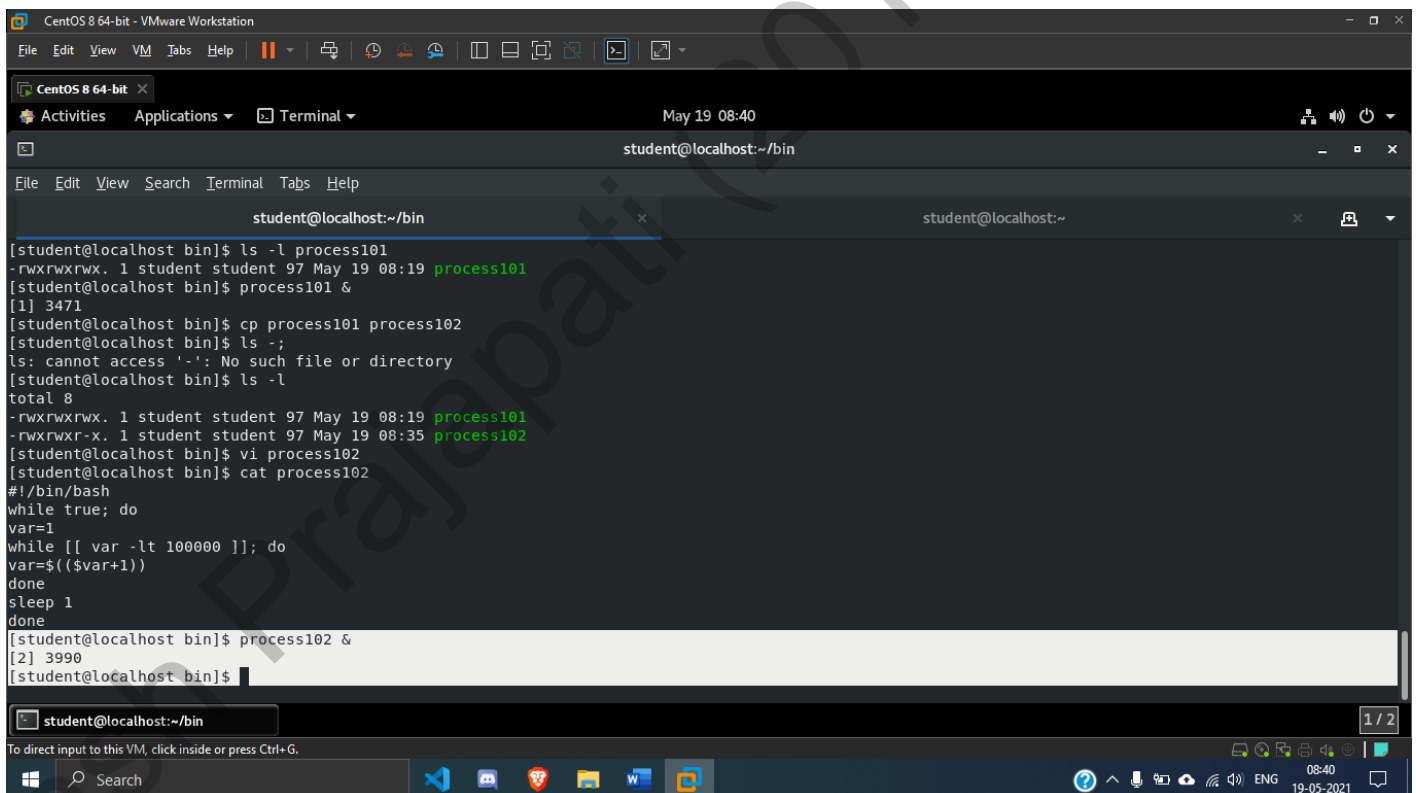
6. Copy the process101 script to a new file called process102. Edit the script to create more artificial CPU load. Increase the load from fifty thousand to one hundred thousand. Start the process102 process in the background.

SOLUTION:





```
CentOS 8 64-bit - VMware Workstation
File Edit View VM Tabs Help
CentOS 8 64-bit x
Activities Applications Terminal May 19 08:38
student@localhost:~/bin
File Edit View Search Terminal Tabs Help
student@localhost:~/bin x student@localhost:~ x
-rw-rw-r--. 1 student student 97 May 19 08:19 process101
[student@localhost bin]$ chmod 777 process101
[student@localhost bin]$ ls -l process101
-rwxrwxrwx. 1 student student 97 May 19 08:19 process101
[student@localhost bin]$ process101 &
[1] 3471
[student@localhost bin]$ cp process101 process102
[student@localhost bin]$ ls -;
ls: cannot access '-': No such file or directory
[student@localhost bin]$ ls -l
total 8
-rwxrwxrwx. 1 student student 97 May 19 08:19 process101
-rwxrwxr-x. 1 student student 97 May 19 08:35 process102
[student@localhost bin]$ vi process102
[student@localhost bin]$ cat process102
#!/bin/bash
while true; do
var=1
while [[ var -lt 100000 ]]; do
var=$((var+1))
done
sleep 1
done
[student@localhost bin]$
```



```
CentOS 8 64-bit - VMware Workstation
File Edit View VM Tabs Help
CentOS 8 64-bit x
Activities Applications Terminal May 19 08:40
student@localhost:~/bin
File Edit View Search Terminal Tabs Help
student@localhost:~/bin x student@localhost:~ x
[student@localhost bin]$ ls -l process101
-rwxrwxrwx. 1 student student 97 May 19 08:19 process101
[student@localhost bin]$ process101 &
[1] 3471
[student@localhost bin]$ cp process101 process102
[student@localhost bin]$ ls -;
ls: cannot access '-': No such file or directory
[student@localhost bin]$ ls -l
total 8
-rwxrwxrwx. 1 student student 97 May 19 08:19 process101
-rwxrwxr-x. 1 student student 97 May 19 08:35 process102
[student@localhost bin]$ vi process102
[student@localhost bin]$ cat process102
#!/bin/bash
while true; do
var=1
while [[ var -lt 100000 ]]; do
var=$((var+1))
done
sleep 1
done
[student@localhost bin]$ process102 &
[2] 3990
[student@localhost bin]$
```

7. In the right terminal shell, confirm that the process is running and using the most CPU resources.

SOLUTION:

```

top - 08:42:45 up 28 min, 1 user, load average: 0.62, 0.46, 0.33
Tasks: 297 total, 3 running, 294 sleeping, 0 stopped, 0 zombie
%Cpu(s): 14.8 us, 1.9 sy, 0.0 ni, 82.9 id, 0.0 wa, 0.3 hi, 0.0 si, 0.0 st
MiB Mem : 3711.4 total, 1401.9 free, 1405.2 used, 904.3 buff/cache
MiB Swap: 4032.0 total, 4032.0 free, 0.0 used, 2049.7 avail Mem

  PID USER      PR  NI   VIRT   RES   SHR  S  %CPU  %MEM    TIME+  COMMAND
 3990 student    20   0  12700   3132  2868  R   33.1   0.1   1:24.93 process102
 3471 student    20   0  12700   3140  2872  R   26.8   0.1   2:56.94 process101
 2318 yashpra+   20   0 3779152 277600 113096  S    7.0   7.3   1:04.63 gnome-shell
 3024 yashpra+   20   0 533252  43776 32008  S    1.0   1.2   0:06.13 gnome-terminal-
 526  root      -51   0     0     0     0  S    0.3   0.0   0:00.21 irq/16-vmwgfx
 970  root      20   0 295656  13624  9872  S    0.3   0.4   0:02.87 vmtoolsd
2500  root      20   0 205216  32256 10308  S    0.3   0.8   0:04.53 ssd kcm
2730 yashpra+   20   0 541492  46348 32560  S    0.3   1.2   0:03.26 vmtoolsd
3343 root       20   0     0     0     0  I    0.3   0.0   0:00.80 kworker/0:1-events
3344 student    20   0  65520   5152  4280  R    0.3   0.1   0:03.52 top
3455 root      20   0     0     0     0  I    0.3   0.0   0:00.24 kworker/u256:0-events_unbound
3795 root      20   0     0     0     0  I    0.3   0.0   0:00.08 kworker/3:1-events_power_efficient
   1  root      20   0 245664  14248  9196  S    0.0   0.4   0:28.71 systemd
   2  root      20   0     0     0     0  S    0.0   0.0   0:00.03 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-kblockd
  
```

8. Copy process101 to a new script called process103. Increase the addition count to eight hundred thousand. Start process103 in the background. Confirm that the load average is above 1. It may take a few minutes for the load average to change.

SOLUTION:

```

while true; do
var=1
while [[ var -lt 100000 ]]; do
var=$((var+1))
done
sleep 1
done
[student@localhost bin]$ process102 &
[2] 3990
[student@localhost bin]$ cp process101 process103
[student@localhost bin]$ vi process1-3
[student@localhost bin]$ vi process103
[student@localhost bin]$ cat process103
#!/bin/bash
while true; do
var=1
while [[ var -lt 800000 ]]; do
var=$((var+1))
done
sleep 1
done
[student@localhost bin]$ process103 &
[3] 4762
[student@localhost bin]$
  
```

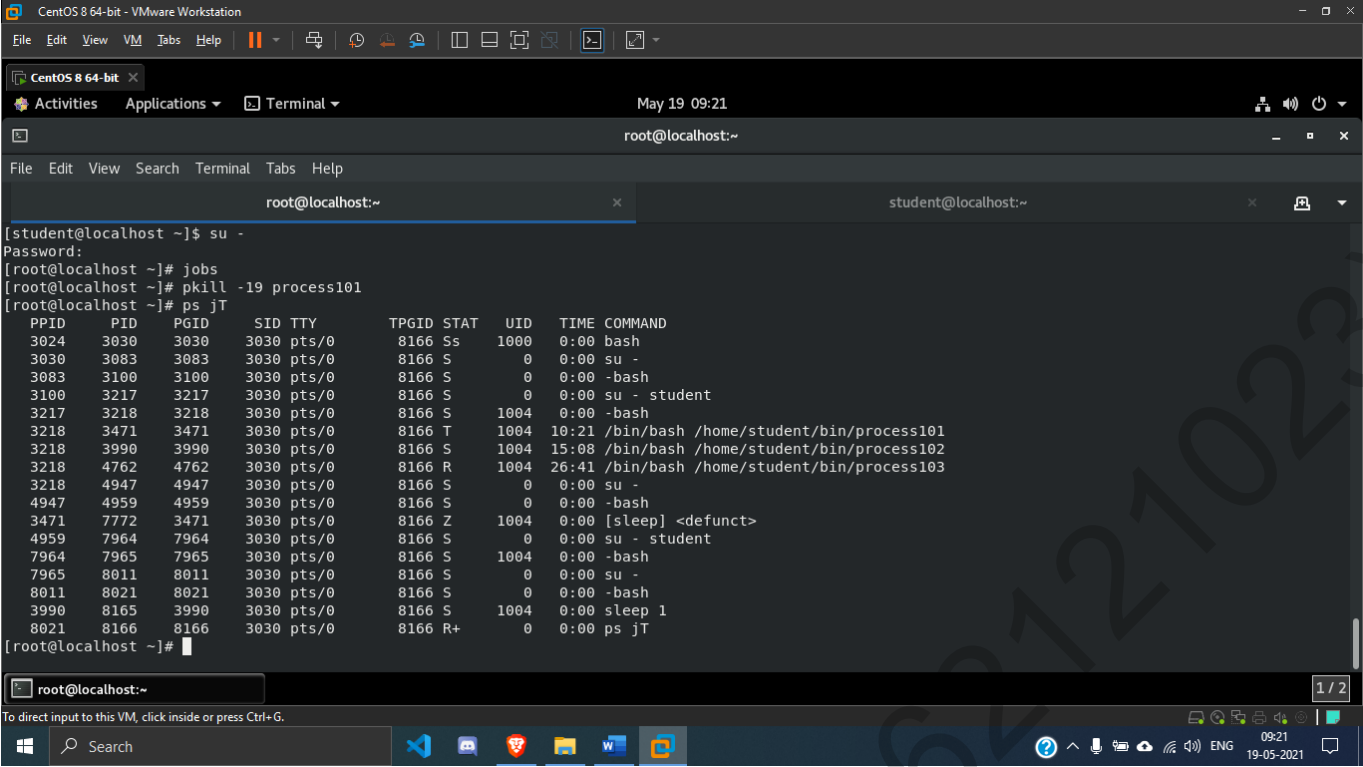
```
top - 08:47:50 up 33 min, 1 user, load average: 1.04, 0.60, 0.41
Tasks: 307 total, 2 running, 305 sleeping, 0 stopped, 0 zombie
%Cpu(s): 29.3 us, 3.7 sy, 0.0 ni, 66.6 id, 0.0 wa, 0.5 hi, 0.0 si, 0.0 st
MiB Mem : 3711.4 total, 1399.9 free, 1406.9 used, 904.6 buff/cache
MiB Swap: 4032.0 total, 4032.0 free, 0.0 used, 2047.9 avail Mem

  PID USER      PR  NI   VIRT   RES   SHR  S  %CPU  %MEM    TIME+  COMMAND
 4762 student    20   0  12700   3128  2868  R   66.1   0.1   0:58.48 process103
3990 student    20   0  12700   3132  2868  S   36.9   0.1   3:19.46 process102
3471 student    20   0  12700   3140  2872  S   18.9   0.1   4:07.63 process101
2318 yashpra+   20   0 3779168 277760 113096  S    9.3   7.3   1:14.24 gnome-shell
 972 rngd       20   0  160112   6724   5900  S    1.0   0.2   0:08.93 rngd
2395 yashpra+   20   0  462800  11304   8672  S    0.7   0.3   0:02.41 ibus-daemon
3024 yashpra+   20   0  533252  43940  32008  S    0.7   1.2   0:07.26 gnome-terminal-
1410 root       20   0  209436   6488   4916  S    0.3   0.2   0:00.86 rsyslogd
2500 root       20   0  205216  32256  10308  S    0.3   0.8   0:05.31 sssd_kcm
2650 yashpra+   20   0  229124   9212   8152  S    0.3   0.2   0:00.72 ibus-engine-sim
   1 root       20   0  245664  14248   9196  S    0.0   0.4   0:35.90 systemd
   2 root       20   0      0      0      0  S    0.0   0.0   0:00.04 kthreadd
   3 root       20  -20      0      0      0  S    0.0   0.0   0:00.00 rcu_gp
   4 root       20  -20      0      0      0  S    0.0   0.0   0:00.00 rcu_par_gp
   6 root       20  -20      0      0      0  S    0.0   0.0   0:00.00 kworker/0:0H-kblockd
   9 root       20  -20      0      0      0  S    0.0   0.0   0:00.00 mm_percpu_wq
  10 root       20   0      0      0      0  S    0.0   0.0   0:00.02 ksoftirqd/0
```

9. In the left terminal shell, become root. Suspend the process101 process. List the remaining jobs. Observe that the process state for process101 is now T.

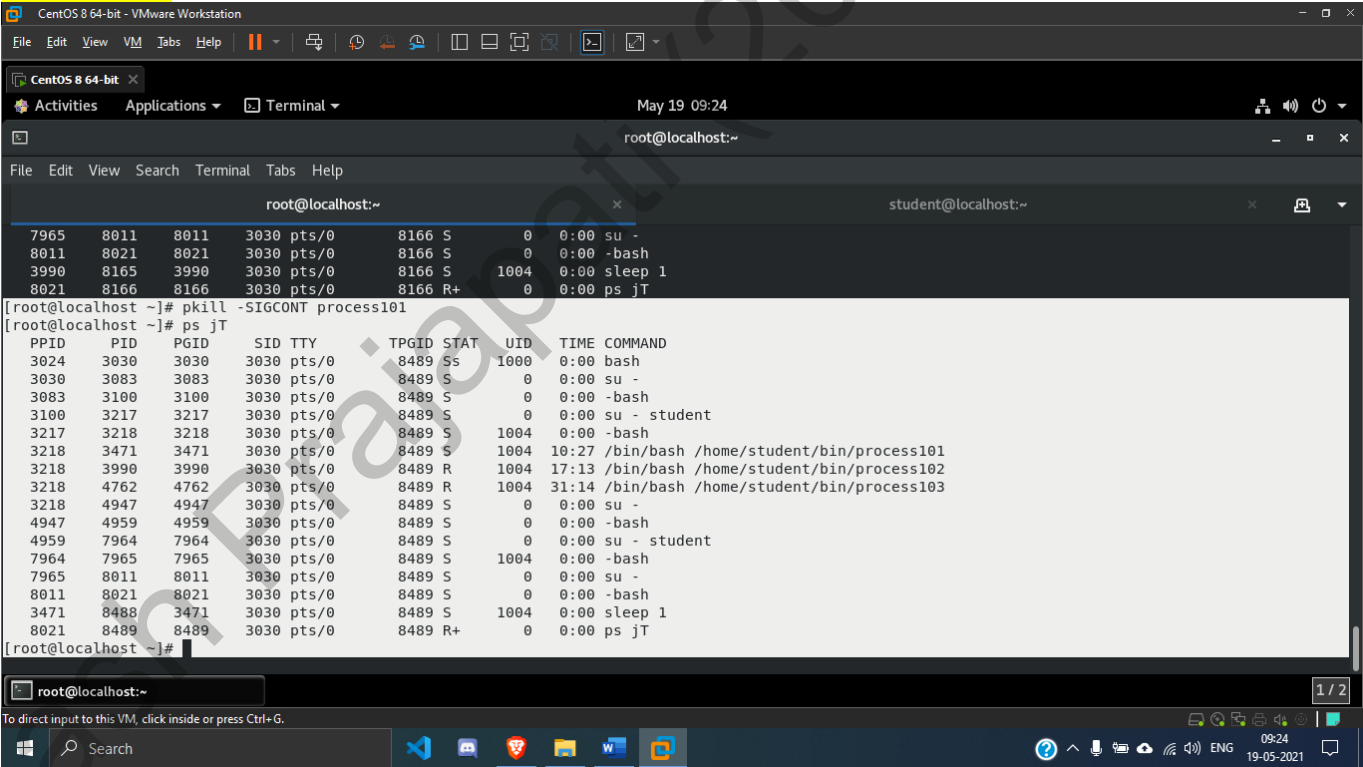
SOLUTION:

```
[student@localhost bin]$ cp process101 process103
[student@localhost bin]$ vi process1-3
[student@localhost bin]$ vi process103
[student@localhost bin]$ cat process103
#!/bin/bash
while true; do
var=1
while [[ var -lt 800000 ]]; do
var=$((var+1))
done
sleep 1
done
[student@localhost bin]$ process103 &
[3] 4762
[student@localhost bin]$ su -
Password:
[root@localhost ~]# pkill -19 process101
[root@localhost ~]# su - student
[student@localhost ~]$ jobs
[student@localhost ~]$ su -
Password:
[root@localhost ~]# jobs
[root@localhost ~]# pkill -19 process101
[root@localhost ~]#
```

10. Resume the process101 process.

SOLUTION:



11. Terminate process101, process102, and process103 using the command line.
Confirm that the processes no longer display in top.

SOLUTION:

```
CentOS 8 64-bit - VMware Workstation
File Edit View VM Tabs Help
CentOS 8 64-bit x
Activities Applications Terminal May 19 09:30
root@localhost:~
File Edit View Search Terminal Tabs Help
root@localhost:~ student@localhost:~
4959 7964 7964 3030 pts/0 8489 S 0 0:00 su - student
7964 7965 7965 3030 pts/0 8489 S 1004 0:00 -bash
7965 8011 8011 3030 pts/0 8489 S 0 0:00 su -
8011 8021 8021 3030 pts/0 8489 S 0 0:00 -bash
3471 8488 3471 3030 pts/0 8489 S 1004 0:00 sleep 1
8021 8489 8489 3030 pts/0 8489 R+ 0 0:00 ps jT
[root@localhost ~]# pkill process101
[root@localhost ~]# pkill process102
[root@localhost ~]# pkill process103
[root@localhost ~]# ps jT
PPID PID PGID SID TTY TP6ID STAT UID TIME COMMAND
3024 3030 3030 3030 pts/0 8892 Ss 1000 0:00 bash
3030 3083 3083 3030 pts/0 8892 S 0 0:00 su -
3083 3100 3100 3030 pts/0 8892 S 0 0:00 -bash
3100 3217 3217 3030 pts/0 8892 S 0 0:00 su - student
3217 3218 3218 3030 pts/0 8892 S 1004 0:00 -bash
3218 4947 4947 3030 pts/0 8892 S 0 0:00 su -
4947 4959 4959 3030 pts/0 8892 S 0 0:00 -bash
4959 7964 7964 3030 pts/0 8892 S 0 0:00 su - student
7964 7965 7965 3030 pts/0 8892 S 1004 0:00 -bash
7965 8011 8011 3030 pts/0 8892 S 0 0:00 su -
8011 8021 8021 3030 pts/0 8892 S 0 0:00 -bash
8021 8892 8892 3030 pts/0 8892 R+ 0 0:00 ps jT
[root@localhost ~]#
```

```
CentOS 8 64-bit - VMware Workstation
File Edit View VM Tabs Help
CentOS 8 64-bit x
Activities Applications Terminal May 19 09:30
student@localhost:~
File Edit View Search Terminal Tabs Help
root@localhost:~ student@localhost:~
top - 09:30:20 up 1:15, 1 user, load average: 0.64, 1.09, 1.23
Tasks: 303 total, 1 running, 302 sleeping, 0 stopped, 0 zombie
%Cpu(s): 2.1 us, 1.0 sy, 0.0 ni, 96.7 id, 0.0 wa, 0.2 hi, 0.0 si, 0.0 st
MiB Mem : 3711.4 total, 1377.6 free, 1424.0 used, 909.7 buff/cache
MiB Swap: 4032.0 total, 4032.0 free, 0.0 used, 2030.6 avail Mem

  PID USER      PR  NI   VIRT   RES   SHR  S  %CPU  %MEM    TIME+  COMMAND
 2318 yashpra+  20   0 3781468 280332 113260 S  12.6   7.4   2:11.32 gnome-shell
 3024 yashpra+  20   0 533508  44116 32008 S   1.0   1.2   0:15.00 gnome-terminal-
 2395 yashpra+  20   0 462800  11304  8672 S   0.3   0.3   0:05.07 ibus-daemon
 2500 root      20   0 205216  32256 10308 S   0.3   0.8   0:11.61 sssd_kcm
 2730 yashpra+  20   0 538172  43440 32588 S   0.3   1.1   0:08.78 vmtoolsd
 3344 student   20   0 65520   5152  4280 R   0.3   0.1   0:17.20 top
 8562 root      20   0 0        0      0 I   0.3   0.0   0:00.05 kworker/u256:1-events_unbound
    1 root      20   0 245664  14280  9196 S   0.0   0.4   0:39.05 systemd
    2 root      20   0 0        0      0 S   0.0   0.0   0:00.05 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-kblockd
    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   0:00.04 ksoftirqd/0
   11 root      20   0 0        0      0 I   0.0   0.0   0:03.79 rcu_sched
   12 root      rt   0 0        0      0 S   0.0   0.0   0:00.00 migration/0
   13 root      rt   0 0        0      0 S   0.0   0.0   0:00.00 watchdog/0
```

12. In the left terminal shell, exit from the root user. In the right terminal shell stop the top command.

SOLUTION:

