

Experiment No- 06

Aim: Execution of Memory Management Commands

Roll No.	17
Name	Manav Jawrani
Class	D10A
Subject	Unix Lab
Lab Outcome	LO6: To understand memory management and memory management commands in Unix.
Date of Performance/ Submission	16/3/2022-22/3/2022

Aim : To execute memory management commands in UNIX.

Introduction:

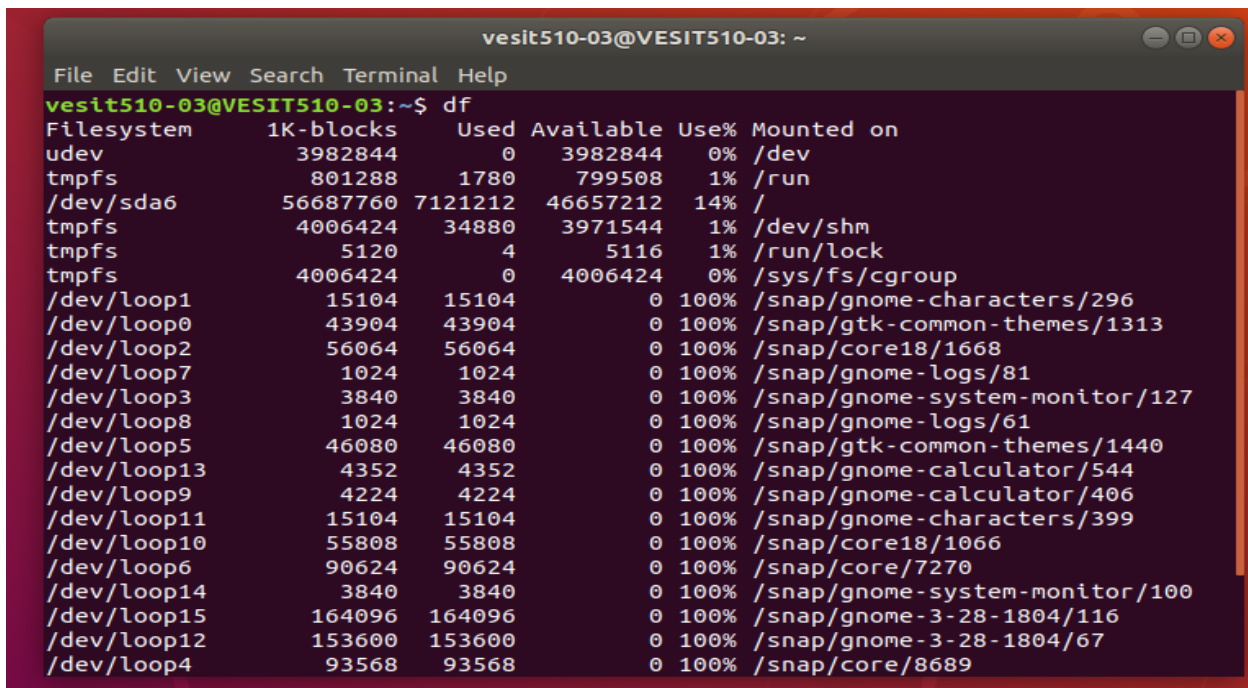
The term Memory can be defined as a collection of data in a specific format. It is used to store instructions and processed data. The memory comprises a large array or group of words or bytes, each with its own location. The primary motive of a computer system is to execute programs. These programs, along with the information they access, should be in the main memory during execution. The CPU fetches instructions from memory according to the value of the program counter.

Memory management is a form of resource management applied to computer memory. The essential requirement of memory management is to provide ways to dynamically allocate portions of memory to programs at their request, and free it for reuse when no longer needed. This is critical to any advanced computer system where more than a single process might be underway at any time.

Theory :

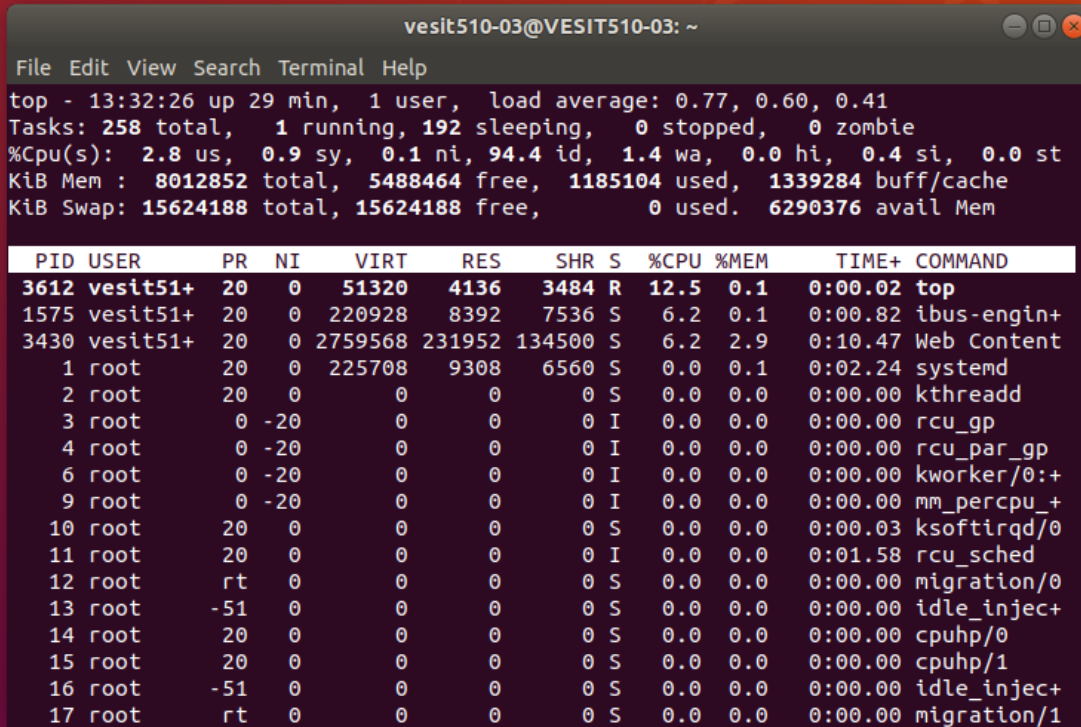
The memory management commands are as follows :

1. **df** - df abbreviation for disk free is a standard Unix command used to display the amount of available disk space for file systems on which the invoking user has appropriate read access.



```
vesit510-03@VESIT510-03: ~  
File Edit View Search Terminal Help  
vesit510-03@VESIT510-03:~$ df  
Filesystem      1K-blocks    Used Available Use% Mounted on  
udev            3982844         0   3982844  0% /dev  
tmpfs           801288        1780    799508  1% /run  
/dev/sda6       56687760 7121212  46657212 14% /  
tmpfs          4006424       34880   3971544  1% /dev/shm  
tmpfs           5120           4        5116  1% /run/lock  
tmpfs          4006424         0   4006424  0% /sys/fs/cgroup  
/dev/loop1       15104       15104         0 100% /snap/gnome-characters/296  
/dev/loop0       43904       43904         0 100% /snap/gtk-common-themes/1313  
/dev/loop2       56064       56064         0 100% /snap/core18/1668  
/dev/loop7        1024        1024         0 100% /snap/gnome-logs/81  
/dev/loop3        3840        3840         0 100% /snap/gnome-system-monitor/127  
/dev/loop8        1024        1024         0 100% /snap/gnome-logs/61  
/dev/loop5       46080       46080         0 100% /snap/gtk-common-themes/1440  
/dev/loop13      4352        4352         0 100% /snap/gnome-calculator/544  
/dev/loop9       4224        4224         0 100% /snap/gnome-calculator/406  
/dev/loop11      15104       15104         0 100% /snap/gnome-characters/399  
/dev/loop10     55808       55808         0 100% /snap/core18/1066  
/dev/loop6       90624       90624         0 100% /snap/core/7270  
/dev/loop14       3840        3840         0 100% /snap/gnome-system-monitor/100  
/dev/loop15     164096     164096         0 100% /snap/gnome-3-28-1804/116  
/dev/loop12     153600     153600         0 100% /snap/gnome-3-28-1804/67  
/dev/loop4       93568       93568         0 100% /snap/core/8689
```

2. **top** - top command is used to show the processes. It provides a dynamic real-time view of the running system. Usually, this command shows the summary information of the system and the list of processes or threads which are currently managed by the Kernel.



```
vesit510-03@VESIT510-03: ~
File Edit View Search Terminal Help
top - 13:32:26 up 29 min,  1 user,  load average: 0.77, 0.60, 0.41
Tasks: 258 total,  1 running, 192 sleeping,  0 stopped,  0 zombie
%Cpu(s):  2.8 us,  0.9 sy,  0.1 ni, 94.4 id,  1.4 wa,  0.0 hi,  0.4 si,  0.0 st
KiB Mem : 8012852 total, 5488464 free, 1185104 used, 1339284 buff/cache
KiB Swap: 15624188 total, 15624188 free,  0 used. 6290376 avail Mem

  PID USER      PR  NI   VIRT   RES   SHR  S  %CPU  %MEM    TIME+  COMMAND
 3612 vesit51+  20   0   51320   4136   3484  R   12.5   0.1   0:00.02  top
 1575 vesit51+  20   0  220928   8392   7536  S    6.2   0.1   0:00.82  ibus-engin+
 3430 vesit51+  20   0 2759568 231952 134500  S    6.2   2.9   0:10.47  Web Content
    1 root      20   0   225708    9308    6560  S    0.0   0.1   0:02.24  systemd
    2 root      20   0         0         0         0  S    0.0   0.0   0:00.00  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:++
    9 root       0 -20         0         0         0  I    0.0   0.0   0:00.00  mm_percpu_+
   10 root      20   0         0         0         0  S    0.0   0.0   0:00.03  ksoftirqd/0
   11 root      20   0         0         0         0  I    0.0   0.0   0:01.58  rcu_sched
   12 root      rt    0         0         0         0  S    0.0   0.0   0:00.00  migration/0
   13 root     -51   0         0         0         0  S    0.0   0.0   0:00.00  idle_injec+
   14 root      20   0         0         0         0  S    0.0   0.0   0:00.00  cpuhp/0
   15 root      20   0         0         0         0  S    0.0   0.0   0:00.00  cpuhp/1
   16 root     -51   0         0         0         0  S    0.0   0.0   0:00.00  idle_injec+
   17 root      rt    0         0         0         0  S    0.0   0.0   0:00.00  migration/1
```

3. **atop** - The atop command is a tool for monitoring system resources in Linux. It displays tons of information related to the amount of load on the system's resources at the process level.

```

vesit510-03@VESIT510-03: ~
File Edit View Search Terminal Help
ATOP - VESIT510-03 2022/03/10 13:39:16 ----- 36m35s elapsed
PRC | sys 1m44s | user 4m59s | #proc 265 | #zombie 0 | #exit 0 |
CPU | sys 5% | user 18% | irq 2% | idle 369% | wait 5% |
cpu | sys 2% | user 5% | irq 0% | idle 91% | cpu002 w 1% |
cpu | sys 1% | user 4% | irq 1% | idle 93% | cpu003 w 1% |
cpu | sys 1% | user 4% | irq 1% | idle 93% | cpu000 w 1% |
cpu | sys 1% | user 4% | irq 1% | idle 93% | cpu001 w 1% |
CPL | avg1 1.09 | avg5 0.93 | avg15 0.65 | csw 5755427 | intr 2667417 |
MEM | tot 7.6G | free 4.8G | cache 1.2G | buff 100.5M | slab 150.9M |
SWP | tot 14.9G | free 14.9G | | vmcom 5.8G | vmlin 18.7G |
DSK | | sda busy 2% | read 17231 | write 10758 | avio 1.58 ms |
NET | transport | tcpi 111673 | tcpo 80414 | udpi 120411 | udpo 10110 |
NET | network | ipi 283901 | ipo 90435 | ipfrw 0 | deliv 259185 |
NET | enp4s0 0% | pcki 494268 | pcko 82557 | si 571 Kbps | so 29 Kbps |
NET | lo ---- | pcki 8245 | pcko 8245 | si 2 Kbps | so 2 Kbps |
*** system and process activity since boot ***
PID SYSCPU USRCPU VGROW RGROW ST EXC THR S CPUNR CPU CMD 1/38
3430 11.29s 76.60s 3.1G 502.1M N- - 33 S 3 4% Web Content
1341 11.48s 60.20s 3.5G 223.6M N- - 14 S 2 3% gnome-shell
3378 11.61s 51.95s 2.9G 307.4M N- - 55 S 0 3% firefox
1351 27.04s 34.10s 2.1G 16788K N- - 3 S 0 3% pulseaudio
1196 15.82s 30.07s 513.3M 62044K N- - 4 S 0 2% Xorg
725 4.51s 7.04s 1.1G 26904K N- - 16 S 1 1% snapd
732 5.18s 4.30s 47516K 3976K N- - 1 S 1 0% avahi-daemon

```

4. **free** - The free command gives information about used and unused memory usage and swap memory of a system. By default, it displays memory in kb (kilobytes). Memory mainly consists of RAM (random access memory) and swap memory.

```

vesit510-03@VESIT510-03: ~
File Edit View Search Terminal Help
vesit510-03@VESIT510-03:~$ free
              total        used        free      shared    buff/cache   available
Mem:            8012852      1192168      5494596      255064      1326088      6295488
Swap:          15624188           0      15624188
vesit510-03@VESIT510-03:~$ 

```

5. **proc mem** - On Unix you can use the command `cat /proc/meminfo` to determine how much memory the computer has. This command displays the information stored in the meminfo file located in the /proc directory. The total amount of memory will be displayed as **MemTotal**, shown in the example in bold.

```
vesit510-03@VESIT510-03: ~  
File Edit View Search Terminal Help  
  
vesit510-03@VESIT510-03:~$ cat /proc/meminfo  
MemTotal:      8012852 kB  
MemFree:       5503432 kB  
MemAvailable:  6303660 kB  
Buffers:       99592 kB  
Cached:        1133484 kB  
SwapCached:    0 kB  
Active:        1499596 kB  
Inactive:      639484 kB  
Active(anon):  1027000 kB  
Inactive(anon): 133140 kB  
Active(file):  472596 kB  
Inactive(file): 506344 kB  
Unevictable:   119896 kB  
Mlocked:       16 kB  
SwapTotal:     15624188 kB  
SwapFree:      15624188 kB  
Dirty:         4724 kB  
Writeback:     0 kB  
AnonPages:     1025944 kB  
Mapped:        445440 kB  
Shmem:         254128 kB  
KReclaimable:  91408 kB
```

6. **htop** - htop is a command line utility that allows the user to interactively monitor the system's vital resources or server's processes in real time.

```

vesit510-03@VESIT510-03: ~
File Edit View Search Terminal Help

0[|] 2.4%] Tasks: 139, 452 thr, 115 kthr; 1 runni
1[|] 1.3%] Load average: 0.62 0.58 0.40
2[|] 0.7%] Uptime: 00:30:04
3[|] 3.4%]
Mem[|||||] 1.12G/7.64G
Swp[ ] 0K/14.9G

PID USER      PRI  NI  VIRT   RES   SHR  S  CPU%-MEM%  TIME+  Command
3641 vesit510-0 20    0   8244  4676  3216 R   1.0  0.1  0:00.19 /snap/htop/3359/
3430 vesit510-0 20    0 2694M  213M  131M S   0.0  2.7  0:10.55 /usr/lib/firefox
732  avahi      20    0 47388  3788  3268 S   2.0  0.0  0:05.76 avahi-daemon: ru
1196 vesit510-0 20    0 495M  58732 42696 S   1.0  0.7  0:22.94 /usr/lib/xorg/Xo
3387 vesit510-0 20    0 2855M  272M  146M S   0.0  3.5  0:00.83 /usr/lib/firefox
3623 vesit510-0 20    0 782M  37280 28340 S   0.7  0.5  0:00.18 /usr/lib/gnome-t
1    root      20    0 220M  9308  6560 S   0.0  0.1  0:02.26 /sbin/init splas
326  root      19   -1 133M  31020 29904 S   0.0  0.4  0:00.32 /lib/systemd/sys
346  root      20    0 47988  6044  3140 S   0.0  0.1  0:00.83 /lib/systemd/sys
659  systemd-re 20    0 70896  6240  5492 S   0.0  0.1  0:00.65 /lib/systemd/sys
660  62583      20    0 142M  3264  2708 S   0.0  0.0  0:00.35 /lib/systemd/sys
671  62583      20    0 142M  3264  2708 S   0.0  0.0  0:00.20 /lib/systemd/sys
720  root      20    0 38424  3252  2972 S   0.0  0.0  0:00.00 /usr/sbin/cron -
721  root      20    0 182M  9292  8492 S   0.0  0.1  0:00.14 /usr/sbin/therma
F1Help F2Setup F3Search F4Filter F5Tree F6SortBy F7Nice - F8Nice + F9Kill F10Quit

```

7. **total mem info** - This command is used to show the total memory.

```

vesit510-03@VESIT510-03: ~
File Edit View Search Terminal Help
vesit510-03@VESIT510-03:~$ grep MemTotal /proc/meminfo
MemTotal:      8012852 kB
vesit510-03@VESIT510-03:~$ 

```

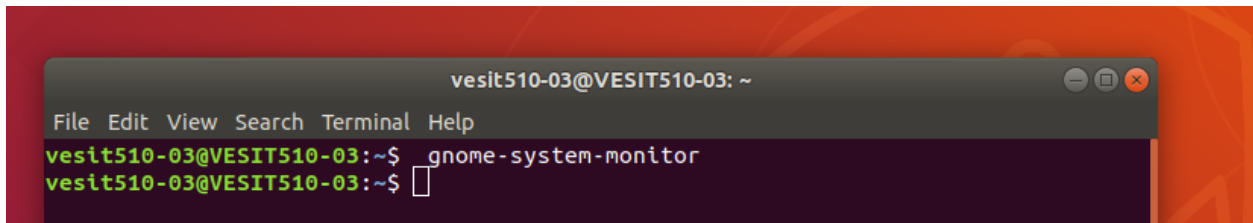
8. **vmstat** - vmstat command in Unix is a performance monitoring command of the system as it gives the information about processes, memory, paging, block IO, disk, and CPU scheduling.

```

vesit510-03@VESIT510-03: ~
File Edit View Search Terminal Help
vesit510-03@VESIT510-03:~$ vmstat
procs -----memory----- ---swap-- ----io---- -system-- -----cpu-----
r  b   swpd   free   buff   cache   si   so    bi    bo    in   cs  us  sy  id  wa  st
0  0       0 5521880 99676 1226940    0    0   116   46  218  442  3  1 94  1
0
vesit510-03@VESIT510-03:~$ 

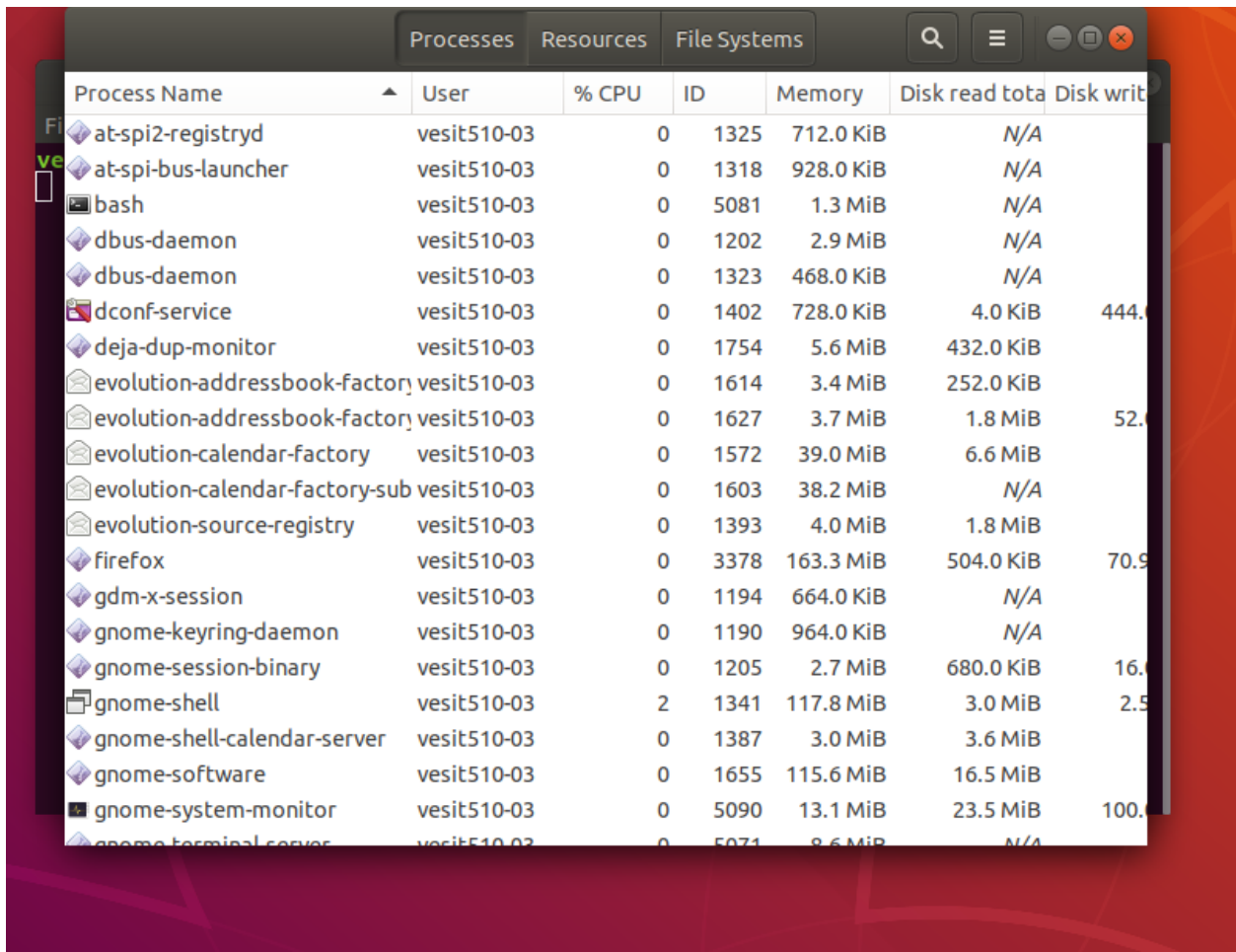
```

9. system monitor - It is used to show/monitor all the running processes.
Input command line:



```
vesit510-03@VESIT510-03: ~  
File Edit View Search Terminal Help  
vesit510-03@VESIT510-03:~$ gnome-system-monitor  
vesit510-03@VESIT510-03:~$
```

Output screen:



Process Name	User	% CPU	ID	Memory	Disk read tota	Disk writ
at-spi2-registryd	vesit510-03	0	1325	712.0 KiB	N/A	
at-spi-bus-launcher	vesit510-03	0	1318	928.0 KiB	N/A	
bash	vesit510-03	0	5081	1.3 MiB	N/A	
dbus-daemon	vesit510-03	0	1202	2.9 MiB	N/A	
dbus-daemon	vesit510-03	0	1323	468.0 KiB	N/A	
dconf-service	vesit510-03	0	1402	728.0 KiB	4.0 KiB	444.0
deja-dup-monitor	vesit510-03	0	1754	5.6 MiB	432.0 KiB	
evolution-addressbook-factory	vesit510-03	0	1614	3.4 MiB	252.0 KiB	
evolution-addressbook-factory	vesit510-03	0	1627	3.7 MiB	1.8 MiB	52.0
evolution-calendar-factory	vesit510-03	0	1572	39.0 MiB	6.6 MiB	
evolution-calendar-factory-sub	vesit510-03	0	1603	38.2 MiB	N/A	
evolution-source-registry	vesit510-03	0	1393	4.0 MiB	1.8 MiB	
firefox	vesit510-03	0	3378	163.3 MiB	504.0 KiB	70.9
gdm-x-session	vesit510-03	0	1194	664.0 KiB	N/A	
gnome-keyring-daemon	vesit510-03	0	1190	964.0 KiB	N/A	
gnome-session-binary	vesit510-03	0	1205	2.7 MiB	680.0 KiB	16.0
gnome-shell	vesit510-03	2	1341	117.8 MiB	3.0 MiB	2.5
gnome-shell-calendar-server	vesit510-03	0	1387	3.0 MiB	3.6 MiB	
gnome-software	vesit510-03	0	1655	115.6 MiB	16.5 MiB	
gnome-system-monitor	vesit510-03	0	5090	13.1 MiB	23.5 MiB	100.0
gnome-terminal-server	vesit510-03	0	5071	8.6 MiB	N/A	

Conclusion - We have understood and performed the memory management commands in UNIX.