

6. Memory Management

Aim:

To perform different memory management commands.

Commands:

1. swapon --summary

```
jimil@jimil-Lenovo-G50-80:~$ swapon --summary
```

Filename	Type	Size	Used	Priority
/swapfile	file	2097148	505184	-2

2. /proc/swaps

```
jimil@jimil-Lenovo-G50-80:~$ cat /proc/swaps
```

Filename	Type	Size	Used	Priority
/swapfile	file	2097148	504160	-2

3. free -h

```
jimil@jimil-Lenovo-G50-80:~$ free -h
```

	total	used	free	shared	buff/cache	available
Mem:	3.8G	1.7G	330M	256M	1.8G	1.6G
Swap:	2.0G	492M	1.5G			

4. top

```

Activities  Terminal  FRI Mar 8, 14:36
jlmil@jlmil-Lenovo-G50-80: ~

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top - 14:36:13 up 22:06, 1 user, load average: 0.99, 1.20, 1.27
Tasks: 301 total, 1 running, 241 sleeping, 0 stopped, 0 zombie
%Cpu(s): 3.8 us, 0.8 sy, 0.0 ni, 94.8 id, 0.6 wa, 0.0 hi, 0.0 si, 0.0 st
KiB Mem : 3958720 total, 335324 free, 1737248 used, 1886148 buff/cache
KiB Swap: 2097148 total, 1592988 free, 504160 used, 1669984 avail Mem

  PID USER      PR  NI    VIRT    RES    SHR S  %CPU  %MEM     TIME+ COMMAND
 1506 jlmil      20   0 413220  74700  39168 S   7.0   1.9   6:49.31 Xorg
 1633 jlmil      20   0 3847648 188596 32324 S   5.0   4.8   9:28.16 gnome-shell
 1885 jlmil      20   0 695204  48904 14884 S   3.0   1.2   0:48.30 plank
28110 jlmil      20   0 655916  37292 26284 S   2.3   0.9   0:02.27 gnome-terminal-
6001 jlmil      20   0 3126472 289484 62144 S   0.7   7.3   1:10.83 chrome
28436 jlmil      20   0 51320    4040  3252 R   0.7   0.1   0:00.15 top
   8 root        0   0     0     0     0 I   0.3   0.0   0:14.94 rcu_sched
1269 kernoops  20   0 56936    76     0 S   0.3   0.0   0:00.45 kerneloops
1510 jlmil      20   0 54852    6908 1608 S   0.3   0.2   0:07.37 dbus-daemon
1639 jlmil      20   0 292068   2284 1604 S   0.3   0.1   0:03.98 gvfsd
27979 jlmil      20   0 2097024 453792 123328 S   0.3  11.5   1:07.28 chrome
28296 root        20   0     0     0     0 I   0.3   0.0   0:00.14 kworker/u8:4
   1 root        20   0 226204   9368 6240 S   0.0   0.2   0:13.03 systemd
   2 root        20   0     0     0     0 S   0.0   0.0   0:00.01 kthreadd
   4 root        0 -20     0     0     0 I   0.0   0.0   0:00.00 kworker/0:0H
   6 root        0 -20     0     0     0 I   0.0   0.0   0:00.00 mm_percpu_wq
   7 root        20   0     0     0     0 S   0.0   0.0   0:00.31 ksoftirqd/0
   9 root        20   0     0     0     0 I   0.0   0.0   0:00.00 rcu_bh
  10 root        rt   0     0     0     0 S   0.0   0.0   0:00.08 migration/0
  11 root        rt   0     0     0     0 S   0.0   0.0   0:00.04 watchdog/0
  12 root        20   0     0     0     0 S   0.0   0.0   0:00.00 cpuhp/0
  13 root        20   0     0     0     0 S   0.0   0.0   0:00.00 cpuhp/1
  14 root        rt   0     0     0     0 S   0.0   0.0   0:00.07 watchdog/1
  15 root        rt   0     0     0     0 S   0.0   0.0   0:00.06 migration/1
  16 root        20   0     0     0     0 S   0.0   0.0   0:00.28 ksoftirqd/1
  18 root        0 -20     0     0     0 I   0.0   0.0   0:00.00 kworker/1:0H
  19 root        20   0     0     0     0 S   0.0   0.0   0:00.00 cpuhp/2
  20 root        rt   0     0     0     0 S   0.0   0.0   0:00.06 watchdog/2
  21 root        rt   0     0     0     0 S   0.0   0.0   0:00.05 migration/2
  22 root        20   0     0     0     0 S   0.0   0.0   0:00.22 ksoftirqd/2
  24 root        0 -20     0     0     0 I   0.0   0.0   0:00.00 kworker/2:0H

```

5. atop

ATOP - CE-Lab-602-U02				2019/03/08 14:40:18		-----			10s elapsed			
PRC	sys	0.12s	user	0.11s	#proc	255	#zombie	0	#exit	?		
CPU	sys	2%	user	2%	irq	0%	idle	396%	wait	0%		
cpu	sys	1%	user	1%	irq	0%	idle	97%	cpu001 w	0%		
cpu	sys	0%	user	0%	irq	0%	idle	100%	cpu000 w	0%		
cpu	sys	0%	user	0%	irq	0%	idle	99%	cpu002 w	1%		
cpu	sys	0%	user	0%	irq	0%	idle	100%	cpu003 w	0%		
CPL	avg1	0.15	avg5	0.31	avg15	0.30	csw	4352	intr	1698		
MEM	tot	7.7G	free	4.4G	cache	1.2G	buff	129.0M	slab	135.8M		
SWP	tot	2.0G	free	2.0G			vmcom	8.6G	vmlim	5.8G		
DSK		sda	busy	1%	read	0	write	5	avio	10.4 ms		
NET	transport		tcpi	29	tcpo	33	udpi	54	udpo	4		
NET	network		ipi	53	ipo	38	ipfrw	0	deliv	53		
NET	enp3s0	0%	pcki	69	pcko	32	si	5 Kbps	so	3 Kbps		
NET	lo	----	pcki	6	pcko	6	si	0 Kbps	so	0 Kbps		
PID	SYSCPU	USRCPU	VGROW	RGROW	RUID	THR	ST	EXC	S	CPU	CMD	1/4
5431	0.04s	0.00s	0K	0K	students	4	--	-	S	0%	gnome-screensh	
5423	0.03s	0.01s	0K	8K	students	1	--	-	R	0%	atop	
1730	0.01s	0.02s	-24K	-4K	root	2	--	-	S	0%	Xorg	
3526	0.00s	0.02s	-3072K	32K	students	33	--	-	S	0%	chrome	
3584	0.00s	0.02s	0K	208K	students	12	--	-	S	0%	chrome	
4819	0.00s	0.01s	0K	36K	students	15	--	-	S	0%	chrome	
2621	0.01s	0.00s	0K	0K	quest-qk	28	--	-	S	0%	mysald	

6. htop

```

Activities Terminal Fri Mar 8, 14:37
jlmil@jlmil-Lenovo-G50-80: ~

1 [ ] Tasks: 78, 0 thr: 1 running
2 [ ] Load average: 0.62 1.05 1.21
3 [ ] Uptime: 22:08:17
4 [ ]
Mem [ ] 1.94G/3.78G
Swp [ ] 491M/2.00G

PID USER      PRI  NI  VIRT   RES   SHR  S  CPU% MEM%   TIME+  Command
28480 jlmil      20    0 32508 4160  3188 R   2.6   0.1   0:00.61 htop
27979 jlmil      20    0 2050M 444M  120M S   1.3  11.5  1:09.71 /snap/chromium/621/usr/lib/chromium-browser/chrome --type=renderer --field-trial-handle
6001 jlmil      20    0 3128M 289M  62228 S   1.3   7.5  1:14.62 /snap/chromium/621/usr/lib/chromium-browser/chrome --no-default-browser-check --no-flr
1633 jlmil      20    0 3761M 194M  35124 S   0.6   5.0  9:31.77 /usr/bin/gnome-shell
6288 jlmil      20    0 3540M 115M  65752 S   0.6   3.0  0:06.11 /snap/chromium/621/usr/lib/chromium-browser/chrome --type=renderer --field-trial-handle
1506 jlmil      20    0 403M 74232 38684 S   0.0   1.9  6:51.68 /usr/lib/xorg/Xorg vt2 -displayfd 3 -auth /run/user/1000/gdm/Xauthority -background non
28110 jlmil      20    0 640M 37368 26284 S   0.0   0.9  0:02.80 /usr/lib/gnome-terminal/gnome-terminal-server
28167 jlmil      20    0 1845M 338M  108M S   0.0   8.8  1:14.50 /snap/chromium/621/usr/lib/chromium-browser/chrome --type=renderer --field-trial-handle
1486 jlmil      20    0 7740M 4520  3204 S   0.0   0.1  0:01.77 /lib/systemd/systemd --user
1504 jlmil      20    0 207M 2028  1748 S   0.0   0.1  0:00.00 /usr/lib/gdm3/gdm-x-session --run-script env GNOME_SHELL_SESSION_MODE=ubuntu gnome-sess
1510 jlmil      20    0 54852 6908  1608 S   0.0   0.2  0:07.39 /usr/bin/dbus-daemon --session --address=systemd: --nofork --nopidfile --systemd-activa
1513 jlmil      20    0 554M 3828  2536 S   0.0   0.1  0:00.40 /usr/lib/gnome-session/gnome-session-binary --session=ubuntu
1609 jlmil      20    0 341M 1920  1820 S   0.0   0.0  0:00.01 /usr/lib/at-spi2-core/at-spi-bus-launcher
1614 jlmil      20    0 50052 1460  1116 S   0.0   0.0  0:00.48 /usr/bin/dbus-daemon --config-file=/usr/share/defaults/at-spi2/accessibility.conf --nof
1616 jlmil      20    0 215M 1964  1692 S   0.0   0.0  0:04.43 /usr/lib/at-spi2-core/at-spi2-registrd --use-gnome-session
1639 jlmil      20    0 285M 2284  1604 S   0.0   0.1  0:03.99 /usr/lib/gvfs/gvfsd
1644 jlmil      20    0 406M 1320  1316 S   0.0   0.0  0:00.01 /usr/lib/gvfs/gvfsd-fuse /run/user/1000/gvfs -f -o big_writes
1649 jlmil      9 -11 2169M 9104  6496 S   0.0   0.2  0:04.40 /usr/bin/pulseaudio --start --log-target=syslog
1671 jlmil      20    0 353M 3588  2080 S   0.0   0.1  0:15.13 ibus-daemon --xim --panel disable
1675 jlmil      20    0 673M 2068  1172 S   0.0   0.1  0:00.12 /usr/lib/gnome-shell/gnome-shell-calendar-server
1677 jlmil      20    0 274M 2244  2012 S   0.0   0.1  0:00.01 /usr/lib/ibus/ibus-dconf
1679 jlmil      20    0 337M 6200  4512 S   0.0   0.2  0:00.54 /usr/lib/ibus/ibus-x11 --kill-daemon
1681 jlmil      20    0 272M 1492  1440 S   0.0   0.0  0:00.08 /usr/lib/ibus/ibus-portal
1697 jlmil      20    0 299M 4368  2452 S   0.0   0.1  0:03.69 /usr/lib/gvfs/gvfs-udisks2-volume-monitor
1701 jlmil      20    0 819M 3560  2512 S   0.0   0.1  0:00.15 /usr/lib/evolution/evolution-source-registry
1708 jlmil      20    0 282M 1704  1348 S   0.0   0.0  0:00.03 /usr/lib/gvfs/gvfs-gphoto2-volume-monitor
1711 jlmil      20    0 756M 2432  2932 S   0.0   0.1  0:00.27 /usr/lib/gnome-online-accounts/goa-daemon
1717 jlmil      20    0 267M 1496  1220 S   0.0   0.0  0:00.03 /usr/lib/gvfs/gvfs-goa-volume-monitor
F1:help F2:setup F3:search F4:filter F5:tree F6:sortby F7:nice F8:nice F9:kill F10:quit

```

7. glances

```

Activities Terminal Fri Mar 8, 14:43
jlmil@jlmil-Lenovo-G50-80: ~

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jlmil-Lenovo-G50-80 (Ubuntu 18.04 64bit / Linux 4.15.0-45-generic) Uptime: 22:13:48

CPU [ ] 6.4% user: 5.8% nice: 0.0% ctx_sw: 598 MEM - 61.8% active: 1.95G SWAP - 23.8% LOAD 4-core
MEM [ ] 61.8% system: 0.6% iowait: 1.3% sw_int: 539 total: 3.78G inactive: 1.22G total: 2.00G 1 min: 2.79
SWAP [ ] 23.8% idle: 92.3% steal: 0.0% free: 2.33G buffers: 215M used: 488M 5 min: 1.68
      1.52G 15 min: 1.36

NETWORK Rx/s Tx/s TASKS 299 (785 thr), 1 run, 244 slp, 54 oth sorted automatically by cpu_percent, flat view
enp2s0 23Kb 15Kb
lo 792b 792b

DISK I/O R/s W/s CPU% MEM% VIRT RES PID USER NI S TIME+ R/s W/s Command
loop0 0 0 2.1 7.4 3.07G 286M 6001 jlmil 0 R 0:05.10 0 0 /snap/chromium/621/usr/lib/chromium-browser/chrome
loop1 0 0 0.3 0.2 709M 8.53M 1383 gdm 0 S 0:02.30 0 0 /snap/chromium/621/usr/lib/chromium-browser/chrome --n
loop10 0 0 0.3 1.0 710M 36.9M 29434 jlmil 0 S 0:00.45 0 0 gsd-color
loop11 0 0 0.3 1.8 168M 71.4M 15639 root -1 S 0:02.91 0 0 /lib/systemd/systemd-journald
loop12 0 0 0.3 0.0 0 0 28611 root 0 ? 0:00.40 0 0 kworker/u8:0
loop13 0 0 0.3 1.6 970M 60.7M 6176 jlmil 0 S 0:56.86 0 0 /snap/chromium/621/usr/lib/chromium-browser/chrome
loop14 0 0 0.0 0.1 372M 2.75M 3429 jlmil 0 S 0:00.60 0 0 gvfsd-dnssd --spawner :1.22 /org/gtk/gvfs/exec_spaw/3
loop15 0 0 0.0 0.0 0 0 42 root 0 S 0:00.00 0 0 ksmd
loop16 0 0 0.0 0.0 0 0 25 root 0 S 0:00.00 0 0 cpuphp/3
loop17 0 0 0.0 0.0 0 0 204 root 0 S 0:00.50 0 0 i915/signal:1
loop18 0 0 0.0 0.0 0 0 45 root -20 ? 0:00.00 0 0 kintegrityd
loop19 0 0 0.0 0.0 0 0 28628 root 0 ? 0:00.30 0 0 kworker/3:4
loop2 0 0 0.0 0.1 546M 3.01M 1170 gdm 0 S 0:00.18 0 0 gnome-session-binary --autostart /usr/share/gdm/greete
loop20 0 0 0.0 0.2 297M 6.46M 1051 root 0 S 0:01.20 0 0 polkitd --no-debug
loop21 0 0 0.0 0.0 0 0 28030 root 0 ? 0:00.00 0 0 kworker/3:2
loop22 0 0 0.0 0.0 179M 752K 1340 rtkit 1 S 0:00.23 0 0 rtkit-daemon
loop23 0 0 0.0 0.7 842M 27.1M 1006 root 0 S 0:30.45 0 0 /usr/lib/snapd/snapd
loop24 0 0 0.0 0.0 0 0 28296 root 0 ? 0:00.51 0 0 kworker/u8:4
loop25 0 0 0.0 0.1 50.7M 3.91M 974 messagebu 0 S 0:07.65 0 0 /usr/bin/dbus-daemon --system --address=systemd: --nof
loop26 0 0 0.0 0.3 400M 11.2M 6131 jlmil 0 S 0:35.23 0 0 /snap/chromium/621/usr/lib/chromium-browser/chrome --t
loop27 0 0 0.0 0.0 0 0 384 root -20 S 0:00.00 0 0 loop21
loop28 0 0 0.0 0.1 442M 4.39M 1749 jlmil 0 S 0:02.61 0 0 gsd-sharing
loop29 0 0 0.0 0.0 0 0 98 root -20 ? 0:00.00 0 0 kthrotld
loop3 0 0
loop30 0 0
2019-03-08 14:43:06 No warning or critical alert detected

```


8. vmstat

```
jimil@jimil-Lenovo-G50-80:~$ 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 499040 315684 221512 1655204 9   31   306   218  400 1365 17   4   70
8  0
```

Addition of swap space:

1 . Check if system has swap space configured:

```
jimil@jimil-Lenovo-G50-80:~$ swapon --show
NAME          TYPE          SIZE USED PRIO
/dev/sda5 partition      2G   0B  -1
```

2. free -h

```
jimil@jimil-Lenovo-G50-80:~$ free -h
              total        used        free      shared  buff/cache   available
Mem:           7.7G         2.0G         3.9G          312M         1.8G         5.1G
Swap:          2.0G           0B         2.0G
```

3. Check current disk usage: df -h

```
jimil@jimil-Lenovo-G50-80:~$ df -h
Filesystem      Size  Used Avail Use% Mounted on
udev            3.9G   0    3.9G   0% /dev
tmpfs           788M   9.8M 779M   2% /run
/dev/sda1       367G   57G 292G  17% /
tmpfs           3.9G   32M 3.9G   1% /dev/shm
tmpfs           5.0M   4.0K 5.0M   1% /run/lock
tmpfs           3.9G   0    3.9G   0% /sys/fs/cgroup
/dev/loop1      170M  170M   0 100% /snap/gimp/105
/dev/loop0       91M   91M   0 100% /snap/core/6350
/dev/loop2      288M  288M   0 100% /snap/onlyoffice-desktopeditors/29
/dev/loop3      170M  170M   0 100% /snap/gimp/101
/dev/loop4       92M   92M   0 100% /snap/core/6259
/dev/loop5      156M  156M   0 100% /snap/brave/57
/dev/loop6       54M   54M   0 100% /snap/core18/594
/dev/loop7       90M   90M   0 100% /snap/core/6130
/dev/loop8       54M   54M   0 100% /snap/core18/536
/dev/loop9      225M  225M   0 100% /snap/polarr/9
/dev/loop10     170M  170M   0 100% /snap/gimp/110
```

```
/dev/loop11      35M   35M    0 100% /snap/gtk-common-themes/818
/dev/loop13      54M   54M    0 100% /snap/core18/677
/dev/loop12     125M  125M    0 100% /snap/vscode/75
tmpfs            788M   68K   788M    1% /run/user/1001
```

4. Creating swap file:

```
jimil@jimil-Lenovo-G50-80:~$ sudo dd if=/dev/zero of=/swapfile bs=2M
count=1
1+0 records in
1+0 records out
2097152 bytes (2.1 MB, 2.0 MiB) copied, 0.00431001 s, 487 MB/s
```

Prepare swapfile:

```
jimil@jimil-Lenovo-G50-80:~$ sudo chmod 600 /swapfile
jimil@jimil-Lenovo-G50-80:~$ sudo mkswap /swapfile
Setting up swapspace version 1, size = 2 MiB (2093056 bytes)
no label, UUID=a7774ce6-951e-47b0-b5d8-191899648001
```

Enable the swapfile:

```
jimil@jimil-Lenovo-G50-80:~$ sudo swapon /swapfile
```

Check addition of swap space:

```
jimil@jimil-Lenovo-G50-80:~$ sudo swapon -s
Filename                Type      Size    Used    Priority
/dev/sda5               partition 2095100  0        -1
/swapfile               file      2044    0        -2
```

Remove and deactivate swapfile:

1. First, deactivate the swap using the following command:

```
jimil@jimil-Lenovo-G50-80:~$ sudo swapoff -v /swapfile
swapoff /swapfile
```

2. Delete the swap file:

```
jimil@jimil-Lenovo-G50-80:~$ sudo rm /swapfile
```

3. Check if system resumed to original state:

```
jimil@jimil-Lenovo-G50-80:~$ sudo swapon -s
```

Filename	Type	Size	Used	Priority
/dev/sda5	partition	2095100	0	-1

Conclusion:

Thus, through this experiment, I studied and implemented swap space management using Linux commands.