

Assignment 3 – Memory Management

1) Setup additional swap space in the system to solve low memory issue. The swap which you added should be available post reboot.

Fallocate is used to preallocate a space of a specific size for a file

We give read permissions to the swapfile

Then we create a swap file using mkswap command

```
ubuntu@ip-172-31-12-62:~$ sudo fallocate -l 1G /swapfile
ubuntu@ip-172-31-12-62:~$ sudo chmod 600 /swapfile
ubuntu@ip-172-31-12-62:~$ sudo mkswap /swapfile
Setting up swspace version 1, size = 1024 MiB (1073737728 bytes)
no label, UUID=59b9eb78-f3d7-488f-8d2d-307d8ab3d29f
ubuntu@ip-172-31-12-62:~$ sudo swapon /swapfile
ubuntu@ip-172-31-12-62:~$ sudo /etc/fstab
sudo: /etc/fstab: command not found
ubuntu@ip-172-31-12-62:~$ sudo nano /etc/fstab
ubuntu@ip-172-31-12-62:~$
```

To make it Permanent

Edit /etc/fstab

```
GNU nano 1.2 /etc/fstab
LABEL=cloudimg-rootfs / ext4 discard,commit=30,errors=remount-ro 0 1
LABEL=BOOT /boot ext4 defaults 0 2
LABEL=UEFI /boot/efi vfat umask=0077 0 1
UUID=62b9d0a0-0bf4-4cca-94e0-1edf78419514 /Data1 ext4 defaults 0 0
UUID=ac056979-30c9-4e94-8a6e-c398ba529c01 /Data2 ext4 defaults 0 0
UUID=5d20a97a-c2e7-4216-a902-c915f30a656a /Data3 ext4 defaults 0 0
UUID=45426232-c8c5-4637-9fbf-abf27b2c682d /Data ext4 defaults 0 0
/swapfile none swap 0 0
```

To verify

```
ubuntu@ip-172-31-12-62:~$ free -h
              total        used        free      shared  buff/cache   available
Mem:           957Mi       326Mi       425Mi        1.2Mi        358Mi       631Mi
Swap:          1.0Gi          0B        1.0Gi
ubuntu@ip-172-31-12-62:~$ swapon --show
NAME        TYPE      SIZE USED PRIO
/swapfile  file    1024M   0B  -2
```

2) Find out the number of process is in run queue and blocking queue.

To find out the no. of process in running queue and blocking queue we need to run vmstat

```
ubuntu@ip-172-31-12-62:~$ vmstat 1 5
procs -----memory----- ---swap-- ---io--- -system-- -----cpu-----
 r  b    swpd    free    buff  cache    si    so    bi    bo    in    cs  us  sy  id  wa  st  gu
 1  0      0 455556 21620 346092    0    0   493   26   110    0   1   1  83   0  15   0
 0  0      0 455556 21620 346112    0    0    0    0    42   33   0   1  71   0  28   0
 0  0      0 455556 21620 346112    0    0    0    0   26   22   0   0  98   0   2   0
 0  0      0 455556 21620 346112    0    0    0    0   24   20   0   0  58   0  42   0
 0  0      0 455556 21620 346112    0    0    0    0   40   38   0   0  75   0  25   0
ubuntu@ip-172-31-12-62:~$
```

Why use vmstat and not some other tool?

vmstat is designed to show summarized kernel-level process states, memory usage, paging, block I/O, and CPU activity in one compact line. It's one of the few tools that shows:

- Run queue size (r)
- Blocked processes (b)













Most other tools either:

- Don't show this info clearly (iostat, free)
- Are more focused on individual processes (top, htop)
- Require manual interpretation from a UI or interactive output

Key Features of vmstat

	Feature	Why It's Important
	r – Run Queue	Number of processes waiting for CPU
	b – Blocked Queue	Number of processes waiting for I/O
	Compact Output	Easy to script and monitor via cron/logs
	Time-Based Sampling	vmstat 1 5 → Sample every 1s, 5 times
	Lightweight	Consumes almost no system resources

Tool	Shows Run/Block Queue?	Summary View	Good for Real-Time Use?	Custom Interval?
vmstat	✔ Yes (r, b)	✔ Compact	✔ Yes	✔ Yes

top	 Partial (load avg)	 Verbose	 Yes (interactive)	 Manual only
htop	 No direct info	 Verbose	 Yes (interactive)	 Manual only
iostat	 No (only disk I/O)	 I/O focus	 Yes	 Yes