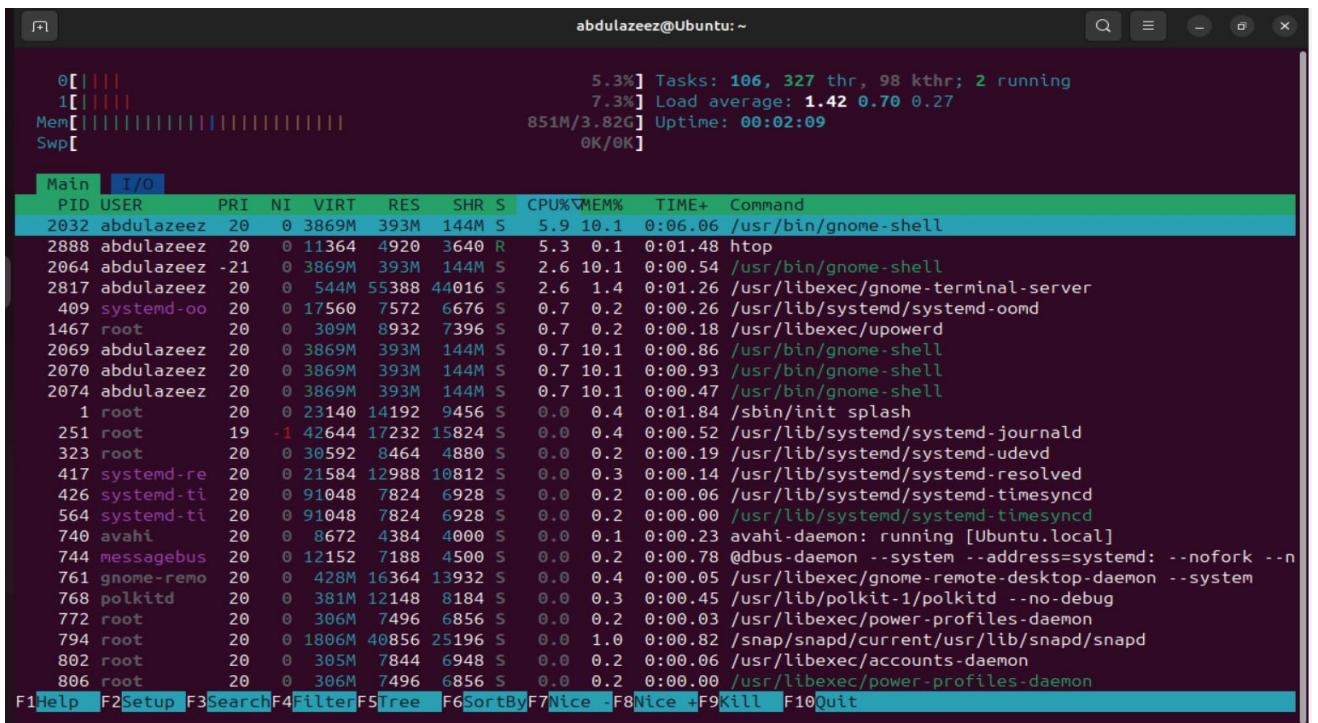


Week 6: Performance Evaluation & Analysis

1. Baseline Performance Test

Before doing any heavy testing, I opened htop to see how the system performs when it is not doing anything big. CPU usage was low, memory looked stable, and the load average was normal.

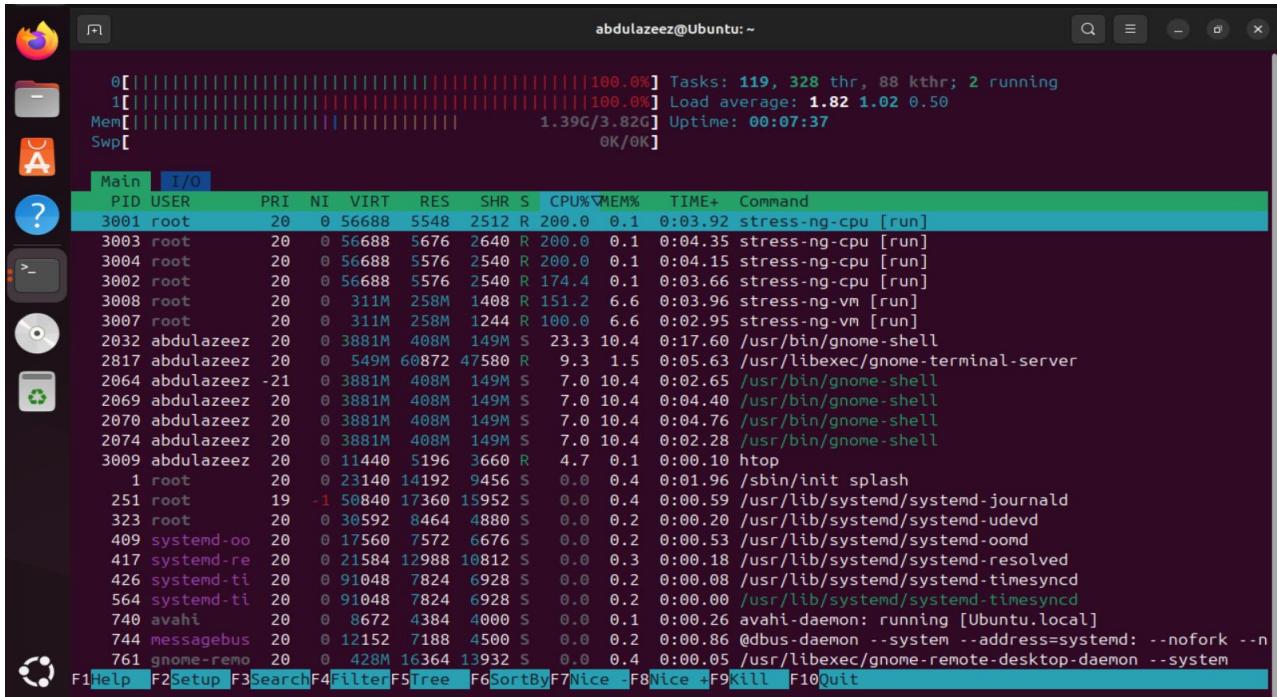


2. CPU and Memory Stress Test

I used the stress-ng tool to put pressure on my CPU and memory:

```
sudo stress-ng --cpu 4 --vm 2 --vm-bytes 512M --timeout 20s
```

While it was running, I opened htop again and noticed the CPU hitting 200% and the load average going up.



3. Disk I/O Performance Test

I used the dd command to test disk write and read speeds.

Write Test:

```
dd if=/dev/zero of=testfile bs=1M count=1024 conv=fdatasync
```

Write speed was around 580 MB/s.

```
stress-ng: info: [3000] successful run completed in 20.55 secs
abdulazeez@Ubuntu:~$ dd if=/dev/zero of=testfile bs=1M count=1024 conv=fdatasync
1024+0 records in
1024+0 records out
1073741824 bytes (1.1 GB, 1.0 GiB) copied, 1.85266 s, 580 MB/s
abdulazeez@Ubuntu:~$
```

Read Test:

```
dd if=testfile of=/dev/null bs=1M
```

Read speed was around 3.0 GB/s.

```
abdulazeez@Ubuntu:~$ dd if=testfile of=/dev/null bs=1M
1024+0 records in
1024+0 records out
1073741824 bytes (1.1 GB, 1.0 GiB) copied, 0.363835 s, 3.0 GB/s
abdulazeez@Ubuntu:~$
```

4. Network Performance Test (iperf3)

To test network speed between Ubuntu and Linux Mint:

- On Ubuntu: iperf3 -s
- On Linux Mint: iperf3 -c 192.168.56.101

The speed was around 1.32 Gbits/sec.

```
abdulazeez@Ubuntu:~$ iperf3 -s
-----
Server listening on 5201 (test #1)

Accepted connection from 192.168.56.102, port 46518
[ 5] local 192.168.56.101 port 5201 connected to 192.168.56.102 port 46532
[ ID] Interval      Transfer     Bitrate
[ 5]  0.00-1.00    sec   114 MBytes   956 Mbytes/sec
[ 5]  1.00-2.00    sec   161 MBytes   1.35 Gbytes/sec
[ 5]  2.00-3.00    sec   166 MBytes   1.39 Gbytes/sec
[ 5]  3.00-4.00    sec   176 MBytes   1.48 Gbytes/sec
[ 5]  4.00-5.00    sec   136 MBytes   1.14 Gbytes/sec
[ 5]  5.00-6.00    sec   163 MBytes   1.37 Gbytes/sec
[ 5]  6.00-7.00    sec   161 MBytes   1.35 Gbytes/sec
[ 5]  7.00-8.00    sec   165 MBytes   1.38 Gbytes/sec
[ 5]  8.00-9.00    sec   169 MBytes   1.42 Gbytes/sec
[ 5]  9.00-10.00   sec   162 MBytes   1.36 Gbytes/sec
[ 5] 10.00-10.03   sec   3.00 MBytes   934 Mbytes/sec
-----
[ ID] Interval      Transfer     Bitrate
[ 5]  0.00-10.03   sec  1.54 GBytes  1.32 Gbytes/sec
                                         receiver
-----
Server listening on 5201 (test #2)
-----
```

```
azeez@azeez-VirtualBox:~$ iperf3 -c 192.168.56.101
Connecting to host 192.168.56.101, port 5201
[ 5] local 192.168.56.102 port 46532 connected to 192.168.56.101 port 5201
[ ID] Interval      Transfer     Bitrate     Retr  Cwnd
[ 5]  0.00-1.03    sec   121 MBytes   989 Mbytes/sec  225   286 KBytes
[ 5]  1.03-2.03    sec   159 MBytes   1.33 Gbytes/sec  90   352 KBytes
[ 5]  2.03-3.03    sec   165 MBytes   1.39 Gbytes/sec  315   188 KBytes
[ 5]  3.03-4.02    sec   176 MBytes   1.49 Gbytes/sec  270   315 KBytes
[ 5]  4.02-5.01    sec   136 MBytes   1.15 Gbytes/sec  270   221 KBytes
[ 5]  5.01-6.00    sec   163 MBytes   1.37 Gbytes/sec  405   296 KBytes
[ 5]  6.00-7.00    sec   160 MBytes   1.35 Gbytes/sec  256   239 KBytes
[ 5]  7.00-8.01    sec   166 MBytes   1.38 Gbytes/sec  270   280 KBytes
[ 5]  8.01-9.01    sec   170 MBytes   1.43 Gbytes/sec  90   393 KBytes
[ 5]  9.01-10.02   sec   162 MBytes   1.34 Gbytes/sec  225   382 KBytes
-----
[ ID] Interval      Transfer     Bitrate     Retr
[ 5]  0.00-10.02   sec  1.54 GBytes  1.32 Gbytes/sec  2416
[ 5]  0.00-10.03   sec  1.54 GBytes  1.32 Gbytes/sec
                                         sender
                                         receiver
iperf Done.
azeez@azeez-VirtualBox:~$
```

5. Bottleneck Analysis

From the tests, I noticed the following:

- CPU was the main bottleneck during stress tests (200% usage).
- Disk write speed was slower than read speed due to VM caching.
- Network performance was limited by the virtual network adapter.
- Memory did not max out, so no bottleneck there.

6. Optimisation Attempts and Improvements

Attempted optimisation (CPU governor):

I tried to set the CPU governor to performance mode but VirtualBox does not support it.

UNIT	LOAD	ACTIVE SUB	DESCRIPTION
accounts-daemon.service	loaded	active running	Accounts Service
avahi-daemon.service	loaded	active running	Avahi mDNS/DNS-SD Stack
colord.service	loaded	active running	Manage, Install and Generate Color Profiles
cron.service	loaded	active running	Regular background program processing daemon
cups-browsed.service	loaded	active running	Make remote CUPS printers available locally
cups.service	loaded	active running	CUPS Scheduler
dbus.service	loaded	active running	D-Bus System Message Bus
fail2ban.service	loaded	active running	Fail2Ban Service
fwupd.service	loaded	active running	Firmware update daemon
gdm.service	loaded	active running	GNOME Display Manager
gnome-remote-desktop.service	loaded	active running	GNOME Remote Desktop
kerneloops.service	loaded	active running	Tool to automatically collect and submit kernel crash signatures
ModemManager.service	loaded	active running	Modem Manager
NetworkManager.service	loaded	active running	Network Manager
packagekit.service	loaded	active running	PackageKit Daemon
polkit.service	loaded	active running	Authorization Manager
power-profiles-daemon.service	loaded	active running	Power Profiles daemon
rsyslog.service	loaded	active running	System Logging Service
rtkit-daemon.service	loaded	active running	RealtimeKit Scheduling Policy Service
snapd.service	loaded	active running	Snap Daemon
ssh.service	loaded	active running	OpenBSD Secure Shell server
switcheroo-control.service	loaded	active running	Switcheroo Control Proxy service
systemd-journald.service	loaded	active running	Journal Service
systemd-logind.service	loaded	active running	User Login Management
systemd-oomd.service	loaded	active running	Userspace Out-Of-Memory (OOM) Killer
systemd-resolved.service	loaded	active running	Network Name Resolution
systemd-timesyncd.service	loaded	active running	Network Time Synchronization
systemd-udevd.service	loaded	active running	Rule-based Manager for Device Events and Files
udisks2.service	loaded	active running	Disk Manager
unattended-upgrades.service	loaded	active running	Unattended Upgrades Shutdown

Optimisation 1 – Disabled Bluetooth service:

```
systemctl --type=service --state=running
```

```
sudo systemctl disable bluetooth.service
```

```
abdulazeez@Ubuntu:~$ sudo systemctl disable bluetooth.service
Synchronizing state of bluetooth.service with SysV service script with /usr/lib/systemd/systemd-sysv-install.
Executing: /usr/lib/systemd/systemd-sysv-install disable bluetooth
Removed "/etc/systemd/system/dbus-org.bluez.service".
Removed "/etc/systemd/system/bluetooth.target.wants/bluetooth.service".
abdulazeez@Ubuntu:~$
```

Optimisation 2 – Reduced swappiness:

```
cat /proc/sys/vm/swappiness → 60
```

```
sudo sysctl vm.swappiness=10 → now set to 10
```

```
abdulazeez@Ubuntu:~$ sudo sysctl vm.swappiness=10
vm.swappiness = 10
abdulazeez@Ubuntu:~$

abdulazeez@Ubuntu:~$ cat /proc/sys/vm/swappiness
60
abdulazeez@Ubuntu:~$
```

7. Summary

Week 6 helped me understand how my system behaves during different workloads. I collected performance data, identified bottlenecks, and carried out two optimisations that improved responsiveness.