

Name: Hitendra Sisodia
Sap Id: 500091910

EXPERIMENT - 1 (LINUX COMMANDS)

1. INPUT/OUTPUT: sudo iotop

```
Total DISK READ: 0.00 B/s | Total DISK WRITE: 0.00 B/s
Current DISK READ: 0.00 B/s | Current DISK WRITE: 92.64 K/s
          TID  PRIO  USER      DISK READ  DISK WRITE  SWAPIN   IO> COMMAND
    1 be/4 root    0.00 B/s    0.00 B/s ?unavailable? [init splash]
    2 be/4 root    0.00 B/s    0.00 B/s ?unavailable? [kthreadd]
    3 be/8 root    0.00 B/s    0.00 B/s ?unavailable? [rcu_gp]
    4 be/8 root    0.00 B/s    0.00 B/s ?unavailable? [rcu_par_gp]
    5 be/8 root    0.00 B/s    0.00 B/s ?unavailable? [slub_flushwq]
    6 be/8 root    0.00 B/s    0.00 B/s ?unavailable? [netns]
    7 be/8 root    0.00 B/s    0.00 B/s ?unavailable? [kworker/0:0H-events_highpri]
    8 be/8 root    0.00 B/s    0.00 B/s ?unavailable? [mm_percpu_wq]
    10 be/8 root   0.00 B/s    0.00 B/s ?unavailable? [rcu_tasks_kthread]
    11 be/4 root   0.00 B/s    0.00 B/s ?unavailable? [rcu_tasks_rude_kthread]
    12 be/4 root   0.00 B/s    0.00 B/s ?unavailable? [rcu_tasks_trace_kthread]
    13 be/4 root   0.00 B/s    0.00 B/s ?unavailable? [ksoftirqd/0]
    14 be/4 root   0.00 B/s    0.00 B/s ?unavailable? [rcu_preempt]
    15 be/4 root   0.00 B/s    0.00 B/s ?unavailable? [migration/0]
    16 rt/4 root   0.00 B/s    0.00 B/s ?unavailable? [idle_inject/0]
    17 rt/4 root   0.00 B/s    0.00 B/s ?unavailable? [kworker/0:1-events]
    18 be/4 root   0.00 B/s    0.00 B/s ?unavailable? [cpuhp/0]
    19 be/4 root   0.00 B/s    0.00 B/s ?unavailable? [cpuhp/1]
    21 rt/4 root   0.00 B/s    0.00 B/s ?unavailable? [idle_inject/1]
    22 rt/4 root   0.00 B/s    0.00 B/s ?unavailable? [migration/1]
    23 be/4 root   0.00 B/s    0.00 B/s ?unavailable? [ksoftirqd/1]
    25 be/0 root   0.00 B/s    0.00 B/s ?unavailable? [kworker/1:0H-events_highpri]
    26 be/4 root   0.00 B/s    0.00 B/s ?unavailable? [cpuhp/2]
    27 rt/4 root   0.00 B/s    0.00 B/s ?unavailable? [idle_inject/2]
    28 rt/4 root   0.00 B/s    0.00 B/s ?unavailable? [migration/2]
    29 be/4 root   0.00 B/s    0.00 B/s ?unavailable? [ksoftirqd/2]
    31 be/0 root   0.00 B/s    0.00 B/s ?unavailable? [kworker/2:0H-events_highpri]
    32 be/4 root   0.00 B/s    0.00 B/s ?unavailable? [cpuhp/3]
    33 rt/4 root   0.00 B/s    0.00 B/s ?unavailable? [idle_inject/3]
    34 rt/4 root   0.00 B/s    0.00 B/s ?unavailable? [migration/3]
    35 be/4 root   0.00 B/s    0.00 B/s ?unavailable? [ksoftirqd/3]
    36 be/4 root   0.00 B/s    0.00 B/s ?unavailable? [kworker/3:0-events]
    38 be/4 root   0.00 B/s    0.00 B/s ?unavailable? [cpuhp/4]
    39 rt/4 root   0.00 B/s    0.00 B/s ?unavailable? [idle_inject/4]

keys: any: refresh q: quit i: ionice o: active p: procs a: accum
sort: r: asc left: SWAPIN right: COMMAND home: TID end: COMMAND
CONFIG_TASK_DELAY_ACCT not enabled in kernel, cannot determine SWAPIN and IO %
```

2. NETWORK: sudo iftop, netstat-tuln

```
root@Ubuntu:/home/ujesh/Desktop# iftop -b 12.5Kb
          TX:          CUM:  6.70KB  peak: 13.2kb
          RX:          CUM:  7.41KB  peak: 15.1kb
          TOTAL:        CUM: 14.1KB   peak: 18.8kb
                                         rates: 240b   483b  1.29kb
                                         0b    1.26kb 1.48kb
                                         240b  1.73kb 2.77kb

          TX:          CUM:  6.70KB  peak: 13.2kb
          RX:          CUM:  7.41KB  peak: 15.1kb
          TOTAL:        CUM: 14.1KB   peak: 18.8kb
                                         rates: 240b   483b  1.29kb
                                         0b    1.26kb 1.48kb
                                         240b  1.73kb 2.77kb

          TX:          CUM:  6.70KB  peak: 13.2kb
          RX:          CUM:  7.41KB  peak: 15.1kb
          TOTAL:        CUM: 14.1KB   peak: 18.8kb
                                         rates: 240b   483b  1.29kb
                                         0b    1.26kb 1.48kb
                                         240b  1.73kb 2.77kb

root@Ubuntu:/home/ujesh/Desktop# netstat -tuln
Active Internet connections (only servers)
Proto Recv-Q Send-Q Local Address           Foreign Address         State
tcp     0      0 127.0.0.53:53            0.0.0.0:*             LISTEN
tcp     0      0 127.0.0.1:41641          0.0.0.0:*             LISTEN
tcp     0      0 127.0.0.1:631          0.0.0.0:*             LISTEN
tcp6    0      0 ::1:631                  ::*:*                LISTEN
udp     0      0 127.0.0.53:53            0.0.0.0:*             LISTEN
udp     0      0 0.0.0.0:41773          0.0.0.0:*             LISTEN
udp     0      0 0.0.0.0:5353           0.0.0.0:*             LISTEN
udp     0      0 0.0.0.0:59645          0.0.0.0:*             LISTEN
udp6    0      0 :::32867                 ::*:*                LISTEN
udp6    0      0 0:::5353                ::*:*
```

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3. MEMORY/DISC: htop, free -h

```
Ubuntu [Running] - Oracle VM VirtualBox
Activities Terminal Sep 12 13:26 root@Ubuntu:/home/ujesh/Desktop
root@Ubuntu:/home/ujesh/Desktop# free -h
              total        used        free      shared  buff/cache   available
Mem:      4.4Gi       1.3Gi       1.5Gi      57Mi       1.7Gi       2.9Gi
Swap:     3.1Gi        0B       3.1Gi
root@Ubuntu:/home/ujesh/Desktop#
```

```
Ubuntu [Running] - Oracle VM VirtualBox
Activities Terminal Sep 12 13:26 root@Ubuntu:/home/ujesh/Desktop
root@Ubuntu:/home/ujesh/Desktop
          0[ ]          1[ ]          2[ ]          3[ ]          4[ ]          5[ ]          6[ ]          7[ ]          8[ ]          9[ ]
          1.5%        1.6%        1.1%        Tasks: 135, 552 thr; 1 running
          1.1%        1.5%        1.1%
Mem[|||||] 1.31G/4.44G Load average: 0.90 1.24 0.74
Swp[OK/3.13G] Uptime: 00:10:03

PID USER PRI NI VIRT RES SHR CPU% MEM% TIME+ Command
2144 ujesh 20 0 5470M 352K 140M S 6.3 7.8 1:43.14 /usr/bin/gnome-shell
3974 root 20 0 2048B 524B 3712 R 2.1 0.1 0:00.38 htop
2187 ujesh 20 0 5470M 352M 140M S 1.6 7.8 0:10.11 /usr/bin/gnome-shell
2185 ujesh 20 0 5470M 352M 140M S 1.6 7.8 0:11.36 /usr/bin/gnome-shell
2186 ujesh 20 0 5470M 352M 140M S 1.0 7.8 0:10.10 /usr/bin/gnome-shell
2188 ujesh 20 0 5470M 352M 140M S 1.0 7.8 0:09.91 /usr/bin/gnome-shell
553 systemd-o 20 0 14824 6784 6016 S 0.5 0.1 0:01.75 /lib/systemd/systemd-oomd
736 root 20 0 1399M 47076 34048 S 0.5 1.0 0:03.37 /usr/bin/contalnerd
786 root 20 0 1399M 47076 34048 S 0.5 1.0 0:00.24 /usr/bin/contalnerd
1835 root 20 0 1999M 72716 51072 S 0.5 1.6 0:00.13 dockerd --group docker --exec-root=/run/snap.docker --data-root=/va
2189 ujesh 20 0 5470M 352M 140M S 0.5 7.8 0:11.26 /usr/bin/gnome-shell
2929 ujesh 20 0 552M 54716 42304 S 0.5 1.2 0:05.99 /usr/libexec/gnome-terminal-server
1 root 20 0 162M 11228 8020 S 0.0 0.2 0:04.06 /sbin/init splash
222 root 19 -1 48392 17280 16000 S 0.0 0.4 0:01.38 /lib/systemd/systemd-journald
274 root 20 0 26912 6784 4736 S 0.0 0.1 0:00.70 /lib/systemd/systemd-udevd
554 systemd-r 20 0 26188 13776 9216 S 0.0 0.3 0:16.99 /lib/systemd/systemd-resolved
556 systemd-t 20 0 89376 7296 6528 S 0.0 0.2 0:00.23 /lib/systemd/systemd-timesyncd
575 systemd-t 20 0 89376 7296 6528 S 0.0 0.2 0:00.60 /lib/systemd/systemd-timesyncd
614 root 20 0 242M 7376 6736 S 0.0 0.2 0:00.41 /usr/libexec/accounts-daemon
615 root 20 0 2812 1664 1664 S 0.0 0.0 0:00.21 /usr/sbin/acpld
618 avah1 20 0 7624 3712 3584 S 0.0 0.1 0:00.24 avah1-daemon: running [Ubuntu.local]
619 root 20 0 18148 2816 2688 S 0.0 0.0 0:00.62 /usr/sbin/cron -f -P
621 messagebus 20 0 10984 6272 3968 S 0.0 0.1 0:03.12 @dbus-daemon --system --address=systemd: --nofork --nopidfile --sys
623 root 0 -20 2784 1664 1536 S 0.0 0.0 0:00.99 /usr/sbin/atopacctd
625 root 20 0 263M 18796 18582 S 0.0 0.4 0:01.94 /usr/sbin/NetworkManager --no-daemon
631 root 20 0 82699 3968 3712 S 0.0 0.1 0:00.12 /usr/sbin/irqbalance --foreground
633 root 20 0 49712 21120 11904 S 0.0 0.5 0:00.65 /usr/bin/python3 /usr/bin/networkd-dlspatcher --run-startup-trigger
635 root 20 0 231M 9916 6856 S 0.0 0.2 0:04.15 /usr/libexec/polkitd --no-debug
637 root 20 0 242M 7376 6736 S 0.0 0.2 0:00.13 /usr/libexec/accounts-daemon
638 root 20 0 242M 7168 6656 S 0.0 0.2 0:00.09 /usr/libexec/power-profiles-daemon
639 syslog 20 0 217M 5804 4352 S 0.0 0.1 0:00.57 /usr/sbin/rsyslogd -n -tNONE
F1Help F2Setup F3Search F4Filter F5Free F6SortByF7Nice F8BNice F9Kill F10Quit
```

4. VIRTUAL MEMORY

```
Ubuntu [Running] - Oracle VM VirtualBox
Activities Terminal Sep 12 13:27 root@Ubuntu:/home/ujesh/Desktop
root@Ubuntu:/home/ujesh/Desktop
procs -- memory -- swap -- io -- system --cpu --
r b swpd free buff cache sl so bt bo tn cs us sy id wa st
5 0 0 1581540 43688 1712840 0 0 450 27 214 254 3 9 85 2 0
0 0 0 1581540 43688 1712864 0 0 0 0 635 347 2 3 95 0 0
2 0 0 1581540 43688 1712864 0 0 0 0 446 276 1 2 97 0 0
1 0 0 1581540 43688 1712864 0 0 0 4 68 474 1 2 97 0 0
2 0 0 1581540 43752 1712864 0 0 0 336 647 480 2 2 95 1 0
8 0 0 1581540 43752 1712864 0 0 0 0 290 231 0 1 99 0 0
1 0 0 1581540 43752 1712864 0 0 0 0 425 246 2 3 95 0 0
1 0 0 1581540 43752 1712866 0 0 0 0 541 345 1 4 94 0 0
1 0 0 1581540 43752 1712866 0 0 0 0 608 390 1 2 97 0 0
1 0 0 1581540 43752 1712866 0 0 0 0 397 295 0 2 98 0 0
2 0 0 1581540 43752 1712866 0 0 0 0 456 271 4 2 95 0 0
1 0 0 1581540 43752 1712866 0 0 0 0 810 684 1 2 97 0 0
0 0 0 1581540 43752 1712866 0 0 0 550 342 2 2 96 0 0
```

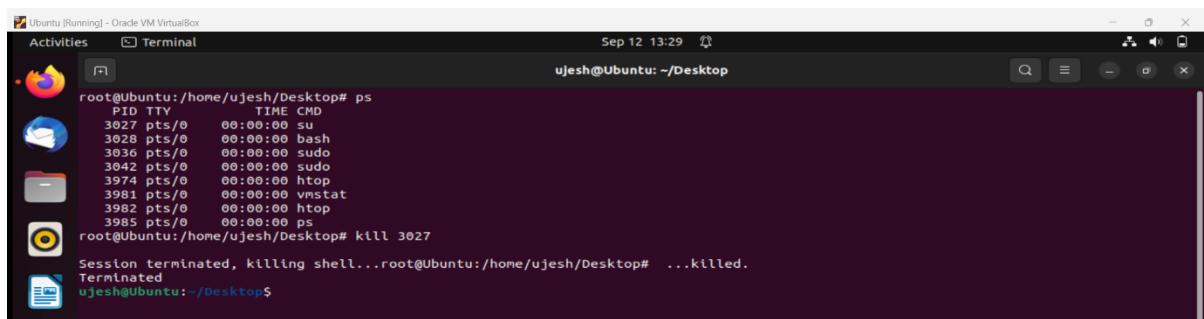
5. SYSTEM PERFORMANCE: htop

```
Ubuntu [Running] - Oracle VM VirtualBox
Activities Terminal Sep 12 13:27 root@Ubuntu:/home/ujesh/Desktop
root@Ubuntu:/home/ujesh/Desktop
          0[ ]          1[ ]          2[ ]          3[ ]          4[ ]          5[ ]          6[ ]          7[ ]          8[ ]          9[ ]
          1.5%        1.6%        1.1%        Tasks: 135, 552 thr; 1 running
          1.1%        1.5%        1.1%
Mem[|||||] 1.31G/4.44G Load average: 0.90 1.24 0.74
Swp[OK/3.13G] Uptime: 00:10:03

PID USER PRI NI VIRT RES SHR CPU% MEM% TIME+ Command
3982 root 20 0 20380 5504 3712 R 2.5 0.1 0:00.36 htop
2144 ujesh 20 0 5470M 352M 140M S 1.9 7.8 1:58.29 /usr/bin/gnome-shell
1808 root 20 0 1396M 40520 34560 S 1.2 1.0 0:00.47 contalnerd --config /run/snap.docker/contalnerd/contalnerd.toml --l
2186 ujesh 20 0 5470M 352M 140M S 1.2 7.8 0:12.35 /usr/bin/gnome-shell
2188 ujesh 20 0 5470M 352M 140M S 0.6 7.8 0:11.95 /usr/bin/gnome-shell
2929 ujesh 20 0 552M 54716 42304 S 0.6 1.2 0:07.25 /usr/libexec/gnome-terminal-server
3196 ujesh 20 0 2844M 288M 142M S 0.6 6.4 0:04.97 /snap/firefox/3008/usr/lib/firefox/firefox
1 root 20 0 162M 11228 8020 S 0.0 0.2 0:04.07 /sbin/init splash
222 root 19 -1 48392 17280 16000 S 0.0 0.4 0:01.40 /lib/systemd/systemd-journald
274 root 20 0 26912 6784 4736 S 0.0 0.1 0:00.78 /lib/systemd/systemd-udevd
553 systemd-o 20 0 14824 6784 6016 S 0.0 0.1 0:01.94 /lib/systemd/systemd-oomd
554 systemd-r 20 0 26188 13776 9216 S 0.0 0.3 0:16.99 /lib/systemd/systemd-resolved
556 systemd-t 20 0 89376 7296 6528 S 0.0 0.2 0:00.23 /lib/systemd/systemd-timesyncd
575 systemd-t 20 0 89376 7296 6528 S 0.0 0.2 0:00.60 /lib/systemd/systemd-timesyncd
614 root 20 0 242M 7376 6736 S 0.0 0.2 0:00.41 /usr/libexec/accounts-daemon
615 root 20 0 2812 1664 1664 S 0.0 0.0 0:00.25 /usr/sbin/acpld
```

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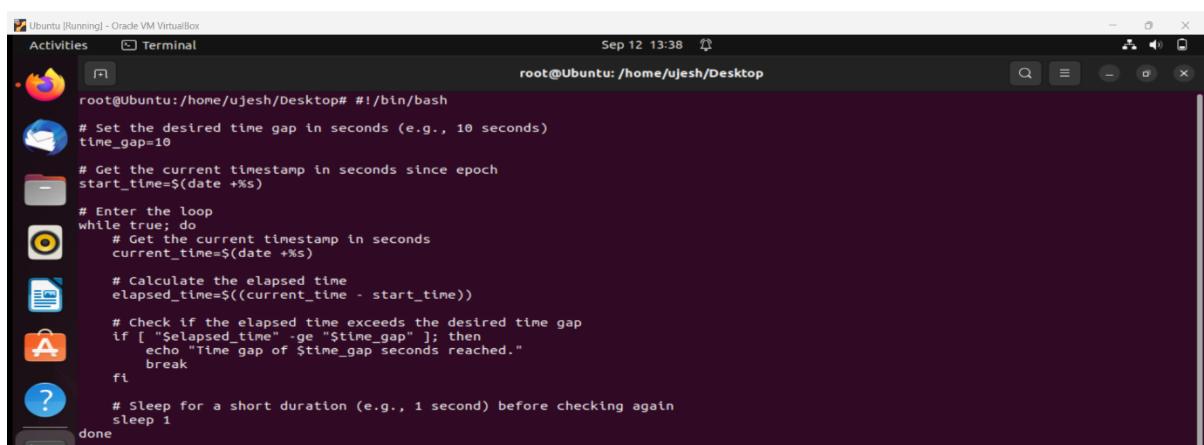
6. RELEASE RESOURCE



A screenshot of an Ubuntu desktop environment within Oracle VM VirtualBox. The terminal window shows a root shell session. The user runs the command `ps` to list processes, then `kill 3027` to terminate a process. The terminal concludes with `Session terminated, killing shell...root@Ubuntu:~/Desktop# ...killed.` and ends with `ujesh@Ubuntu:~/Desktop$`.

```
root@Ubuntu:/home/ujesh/Desktop# ps
  PID TTY      TIME CMD
 3027 pts/0    00:00:00 su
 3028 pts/0    00:00:00 bash
 3036 pts/0    00:00:00 sudo
 3042 pts/0    00:00:00 sudo
 3974 pts/0    00:00:00 htop
 3981 pts/0    00:00:00 vmstat
 3982 pts/0    00:00:00 htop
 3985 pts/0    00:00:00 ps
root@Ubuntu:/home/ujesh/Desktop# kill 3027
Session terminated, killing shell...root@Ubuntu:~/Desktop# ...killed.
Terminated
ujesh@Ubuntu:~/Desktop$
```

7. TIME GAP WITH COUNTER LOOP



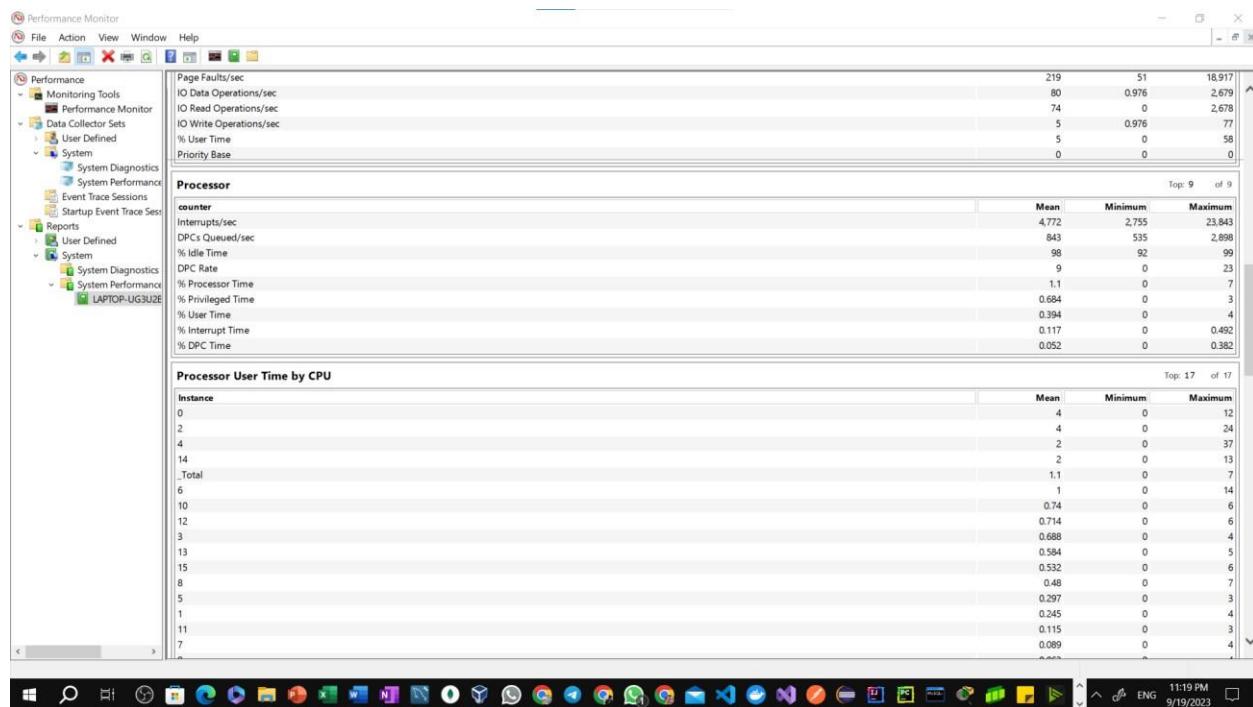
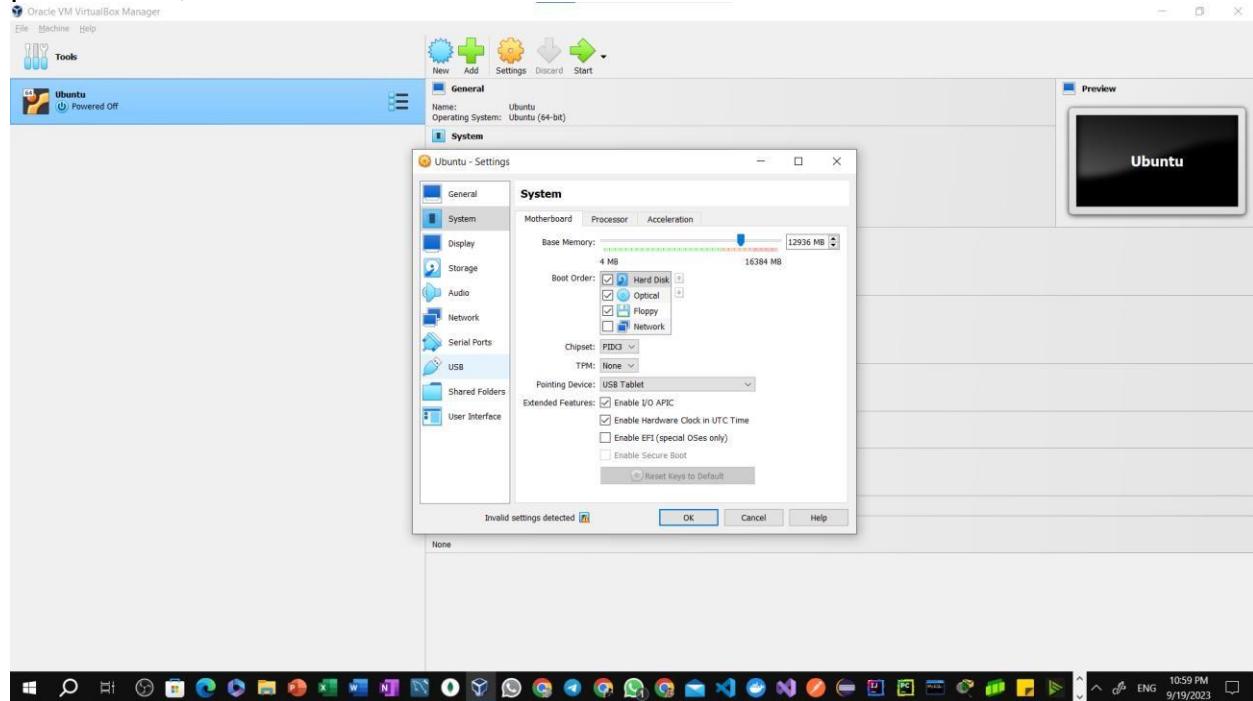
A screenshot of an Ubuntu desktop environment within Oracle VM VirtualBox. The terminal window shows a root shell session running a bash script. The script sets a time gap of 10 seconds, gets the current timestamp, enters a loop where it calculates the elapsed time, checks if it exceeds the gap, and then sleeps for a short duration before checking again. The script ends with `done`.

```
root@Ubuntu:/home/ujesh/Desktop# #!/bin/bash
# Set the desired time gap in seconds (e.g., 10 seconds)
time_gap=10
# Get the current timestamp in seconds since epoch
start_time=$(date +%s)
# Enter the loop
while true; do
    # Get the current timestamp in seconds
    current_time=$(date +%s)
    # Calculate the elapsed time
    elapsed_time=$((current_time - start_time))
    # Check if the elapsed time exceeds the desired time gap
    if [ "$elapsed_time" -ge "$time_gap" ]; then
        echo "Time gap of $time_gap seconds reached."
        break
    fi
    # Sleep for a short duration (e.g., 1 second) before checking again
    sleep 1
done
```

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Experiment - 2

(To change the memory size of guest OS from hypervisor control panel & observe the change in performance)



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Performance Monitor

Disk

Hot Files

Disk Breakdown

Physical Disk

Physical Disk Counters

| counter | Instance | Mean | Minimum | Maximum |
|------------------------------|----------|---------|---------|------------|
| % Disk Read Time | Total | 0.572 | 0 | 18 |
| % Disk Time | Total | 1.018 | 0.011 | 18 |
| % Disk Write Time | Total | 0.446 | 0.009 | 2 |
| Avg. Disk Bytes/Read | Total | 27.767 | 0 | 61,440 |
| Avg. Disk Bytes/Transfer | Total | 24,644 | 6,349 | 65,536 |
| Avg. Disk Bytes/Write | Total | 18,150 | 6,349 | 65,536 |
| Avg. Disk Queue Length | Total | 0.01 | 0 | 0.181 |
| Avg. Disk Read Queue Length | Total | 0.006 | 0 | 0.179 |
| Avg. Disk Write Queue Length | Total | 0.004 | 0 | 0.025 |
| Current Disk Queue Length | Total | 0.016 | 0 | 1 |
| Disk Bytes/sec | Total | 780,507 | 64,562 | 26,912,823 |
| Disk Read Bytes/sec | Total | 593,836 | 0 | 25,754,937 |
| Disk Reads/sec | Total | 21 | 0 | 917 |
| Disk Transfers/sec | Total | 32 | 0.985 | 957 |
| Disk Write Bytes/sec | Total | 186,671 | 64,562 | 1,157,885 |
| Disk Writes/sec | Total | 10 | 0.985 | 78 |
| Split IO/Sec | Total | 0.333 | 0 | 4 |

Physical Disk Percent Idle Time

| Instance | Mean | Minimum | Maximum |
|----------|------|---------|---------|
| D C: D: | 99 | 82 | 100 |
| Total | 99 | 82 | 100 |

Physical Disk Average Second Counters

| counter | Instance | Mean | Minimum | Maximum |
|------------------------|----------|------|---------|---------|
| Avg. Disk sec/Read | D C: D: | 0 | 0 | 0.005 |
| Avg. Disk sec/Transfer | D C: D: | 0 | 0 | 0.004 |

Performance Monitor

Counters

Memory

| counter | Instance | Mean | Minimum | Maximum |
|--|----------------|----------------|----------------|---------|
| % Committed Bytes In Use | 43 | 43 | 43 | 43 |
| Available Bytes | 12,395,649,662 | 12,377,419,776 | 12,431,413,248 | |
| Cache Bytes | 63,880,679 | 62,859,120 | 65,331,200 | |
| Cache Faults/sec | 17 | 0 | 337 | |
| Commit Limit | 21,714,522,112 | 21,714,522,112 | 21,714,522,112 | |
| Committed Bytes | 9,382,176,936 | 9,354,559,488 | 9,420,410,880 | |
| Demand Zero Faults/sec | 608 | 47 | 11,912 | |
| Free & Zero Page List Bytes | 11,474,209,406 | 11,452,727,296 | 11,523,174,400 | |
| Free System Page Table Entries | 1,135,706,036 | 12,412,988 | 4,294,967,285 | |
| Long-Term Average Standby Cache Lifetime (s) | 14,400 | 14,400 | 14,400 | |
| Modified Page List Bytes | 39,933,516 | 26,828,800 | 55,533,568 | |
| Page Faults/sec | 982 | 69 | 20,085 | |
| Page Reads/sec | 28 | 0 | 1,175 | |
| Page Writes/sec | 0 | 0 | 0 | |
| Pages Input/sec | 151 | 0 | 6,537 | |
| Pages Output/sec | 0 | 0 | 0 | |
| Pages/sec | 151 | 0 | 6,537 | |
| Pool Nonpaged Allocs | 0 | 0 | 0 | |
| Pool Nonpaged Bytes | 599,800,312 | 598,814,720 | 600,227,840 | |
| Pool Paged Allocs | 0 | 0 | 0 | |
| Pool Paged Bytes | 647,096,152 | 646,320,128 | 647,360,512 | |
| Pool Paged Resident Bytes | 291,787,692 | 289,906,688 | 292,585,472 | |
| Standby Cache Core Bytes | 177,636,940 | 176,558,080 | 179,355,648 | |
| Standby Cache Normal Priority Bytes | 483,758,281 | 479,125,504 | 494,825,472 | |
| Standby Cache Reserve Bytes | 260,045,035 | 242,638,848 | 267,710,464 | |
| System Cache Resident Bytes | 63,880,679 | 62,853,120 | 65,331,200 | |
| Transition Faults/sec | 348 | 0 | 12,771 | |
| Transition Pages RePurposed/sec | 0 | 0 | 0 | |
| Write Copies/sec | 7 | 0 | 322 | |

Handle Count

| Instance | Mean | Minimum | Maximum |
|----------|--------|---------|---------|
| Total | 83,907 | 83,287 | 84,857 |

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The screenshot displays a Windows desktop environment with several open windows:

- Performance Monitor**: Shows system performance metrics. A table for "IO Other Operations/sec" shows values for Priority Base (441), User Time (116), and Idle Time (107). Another table for "Processor" shows various processor-related counters like DPCs Queued/sec, DPC Rate, and % Processor Time.
- Oracle VM VirtualBox Manager**: Manages virtual machines. It shows an "Ubuntu" VM running. The "System" tab of the settings window is open, displaying configuration for the motherboard, processor, and memory. The base memory is set to 3329 MB, and the boot order is set to "Hard Disk".
- Taskbar**: Shows the Windows Start button, search bar, and a row of pinned and recently used application icons.
- System Tray**: Displays the date (9/19/2023), time (11:28 PM), and battery status.

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Performance Monitor

Hot Files

Disk Breakdown

Physical Disk

Physical Disk Counters

| Instance | Mean | Minimum | Maximum |
|----------|---------|---------|-----------|
| _Total | 0.308 | 0 | 3 |
| _Total | 0.738 | 0.008 | 4 |
| _Total | 0.43 | 0.008 | 2 |
| Total | 29.946 | 0 | 65.536 |
| Total | 24.230 | 6.476 | 67.174 |
| Total | 21.188 | 5.908 | 67.174 |
| Total | 0.007 | 0 | 0.036 |
| Total | 0.003 | 0 | 0.032 |
| Total | 0.004 | 0 | 0.019 |
| Total | 0 | 0 | 0 |
| Total | 473.416 | 64.877 | 5,633.087 |
| Total | 203.193 | 0 | 5,517.874 |
| Total | 7 | 0 | 180 |
| Total | 20 | 0.99 | 191 |
| Total | 270.233 | 64.877 | 2,871.631 |
| Total | 13 | 0.99 | 105 |
| Total | 0.433 | 0 | 4 |

Physical Disk Percent Idle Time

| Instance | Mean | Minimum | Maximum |
|----------|------|---------|---------|
| D C: D: | 99 | 97 | 100 |
| _Total | 99 | 97 | 100 |

Physical Disk Average Second Counters

| counter | Instance | Mean | Minimum | Maximum |
|------------------------|----------|------|---------|---------|
| Avg. Disk sec/Read | D C: D: | 0 | 0 | 0.005 |
| Avg. Disk sec/Transfer | D C: D: | 0 | 0 | 0.003 |
| Avg. Disk sec/Write | D C: D: | 0 | 0 | 0.003 |

Performance Monitor

Counters

Memory

| Mean | Minimum | Maximum |
|----------------|----------------|----------------|
| 62 | 62 | 63 |
| 7,772,289,528 | 7,748,300,800 | 7,798,935,552 |
| 173,716,195 | 173,268,992 | 175,267,840 |
| 32 | 0 | 394 |
| 21,713,008,405 | 21,712,871,424 | 21,713,362,944 |
| 13,559,847,886 | 13,536,415,744 | 13,589,110,784 |
| 1,768 | 1,169 | 14,588 |
| 5,012,934,522 | 4,993,298,432 | 5,033,326,640 |
| 1,697,349,691 | 1,408,371 | 4,294,967,295 |
| 14,400 | 14,400 | 14,400 |
| 149,032,893 | 135,880,704 | 162,312,192 |
| 1,989 | 1,083 | 14,812 |
| 4 | 0 | 186 |
| 0 | 0 | 0 |
| 30 | 0 | 1,348 |
| 0 | 0 | 0 |
| 30 | 0 | 1,348 |
| 0 | 0 | 0 |
| 602,190,563 | 601,092,096 | 604,745,728 |
| 0 | 0 | 0 |
| 659,881,313 | 659,652,608 | 659,939,328 |
| 374,875,119 | 372,019,200 | 375,646,256 |
| 168,756,812 | 167,981,056 | 169,517,056 |
| 1,836,688,569 | 1,834,582,016 | 1,838,682,112 |
| 753,909,626 | 749,486,080 | 764,346,368 |
| 173,716,195 | 173,268,992 | 175,267,840 |
| 327 | 38 | 5,809 |
| 0 | 0 | 0 |
| 5 | 0 | 243 |

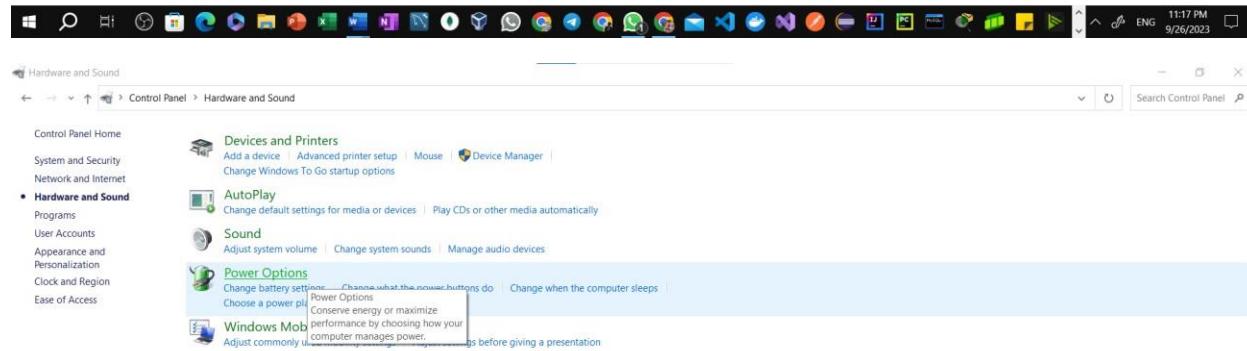
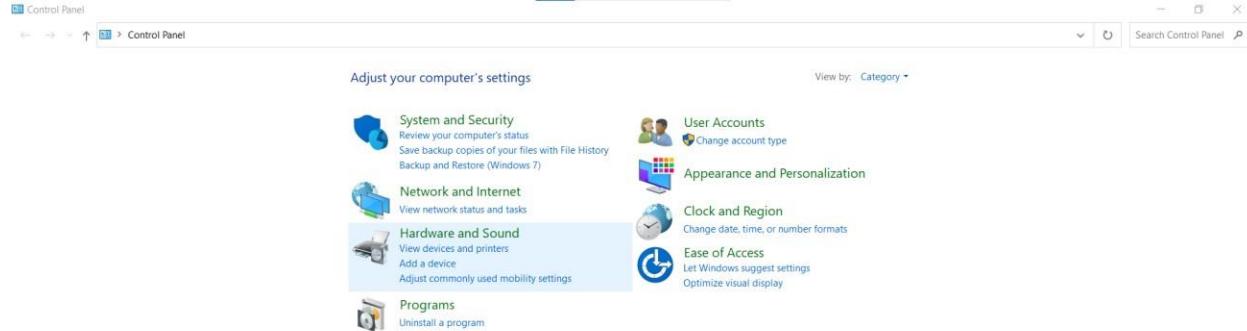
Handle Count

| Mean | Minimum | Maximum |
|--------|---------|---------|
| 92,657 | 91,795 | 93,532 |

Name: Hitendra Sisodia
Sap Id: 500091910

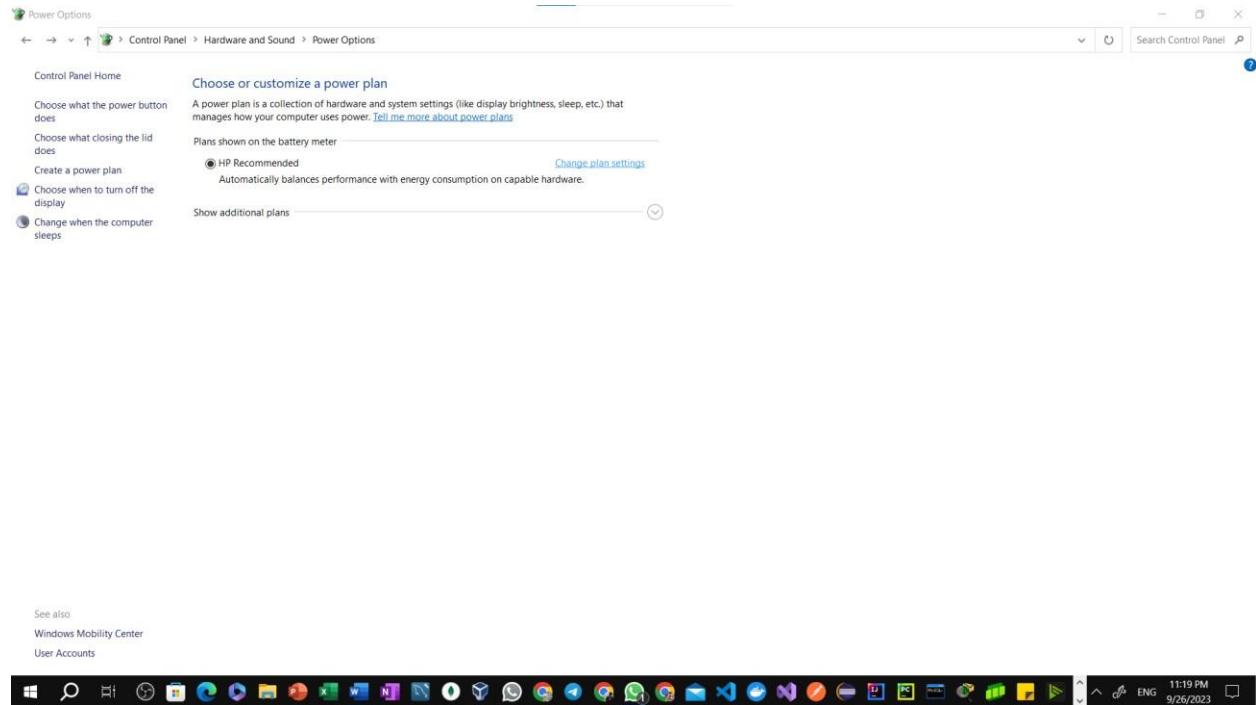
Experiment - 3

1. Study and explore the following tools/commands for performance monitoring

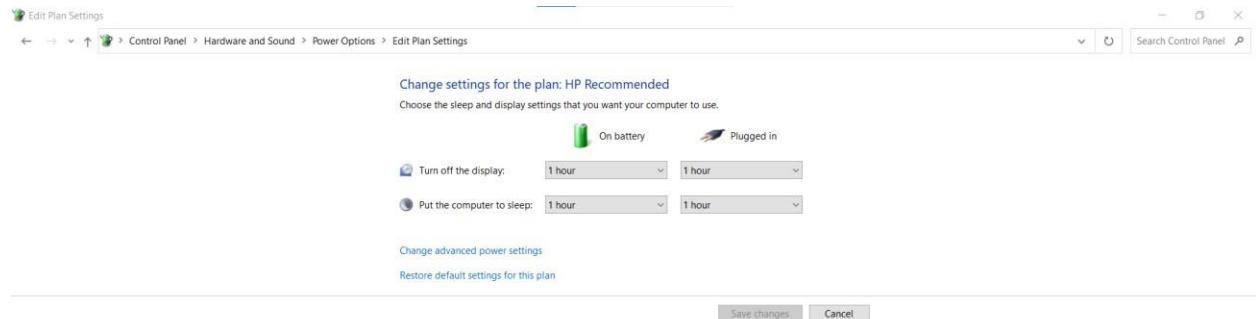


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Sap Id: 500091910

Once you are in Power Options you can customize one of the pre-configured plans by selecting the ‘change plan settings options...

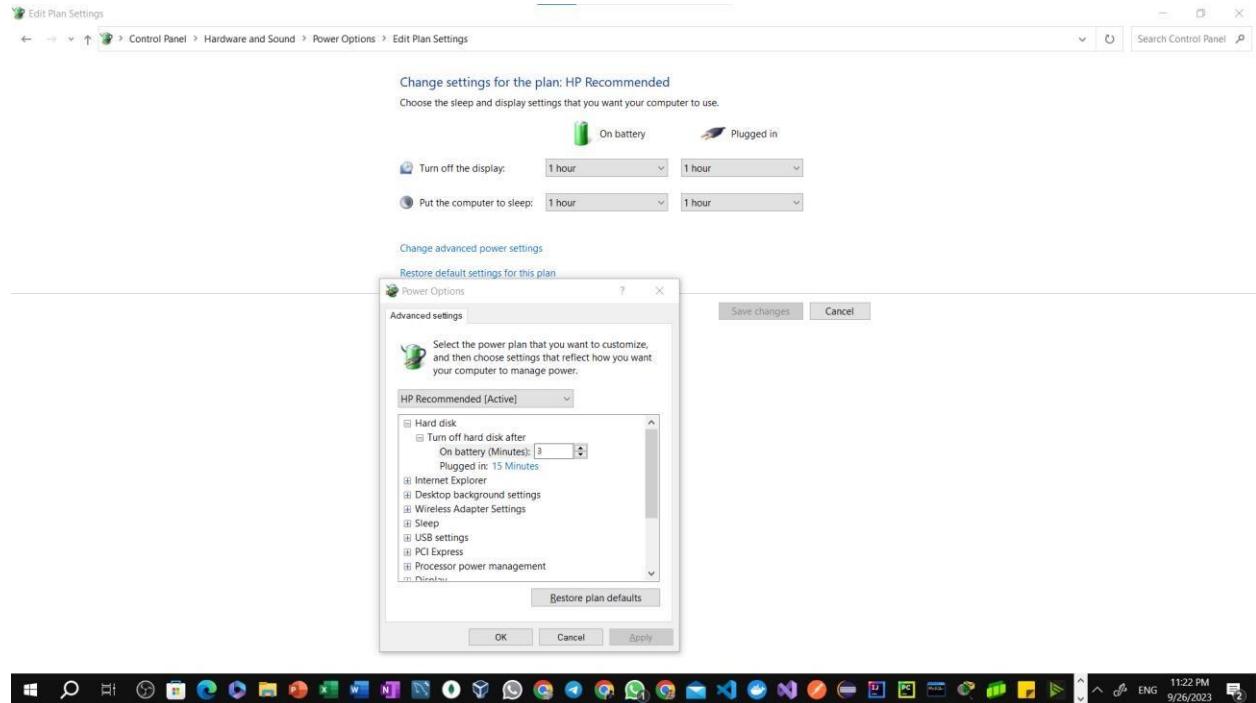


...and setting the amount of time before ‘turn off display’ and ‘put the computer to sleep’ actions are initiated. These can be set for when the computer is plugged in and when it is on battery (if you have a laptop)

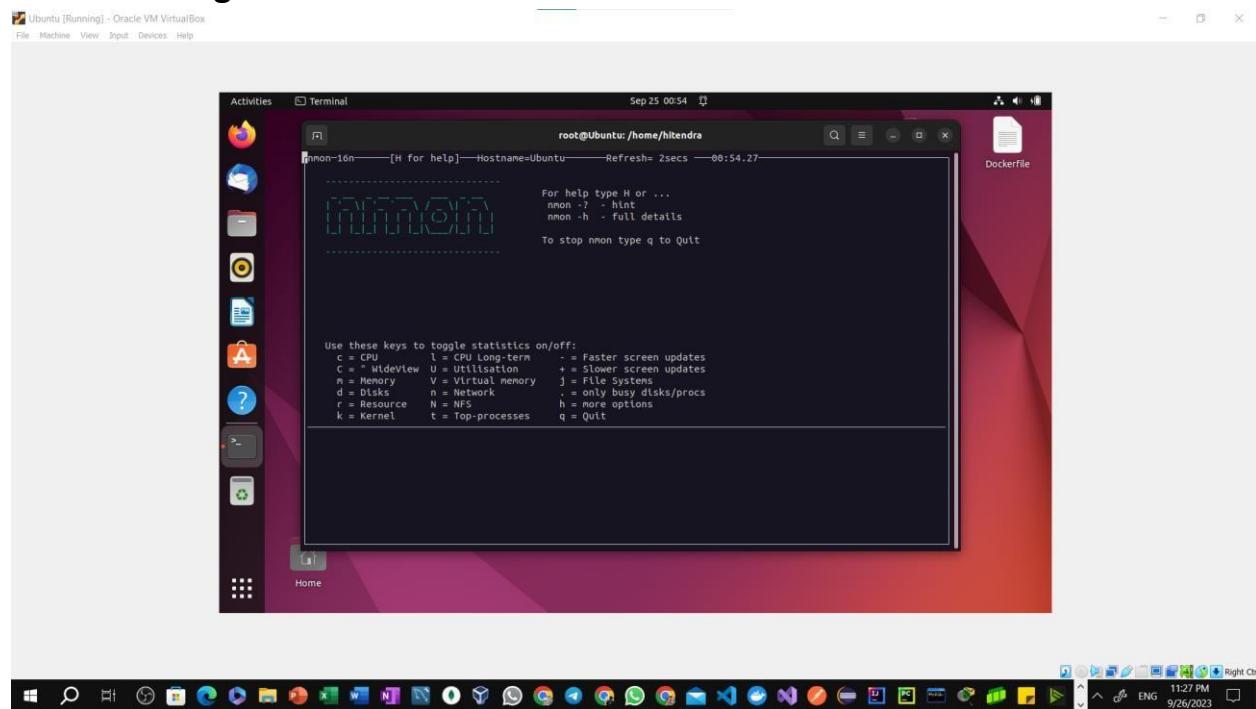


Name: Hitendra Sisodia
Sap Id: 500091910

To change more settings, click on “Change advanced power settings”. Here you will be able to enable or set values for a variety of Power Management options.



2. Study and explore the following tools/commands for performance monitoring

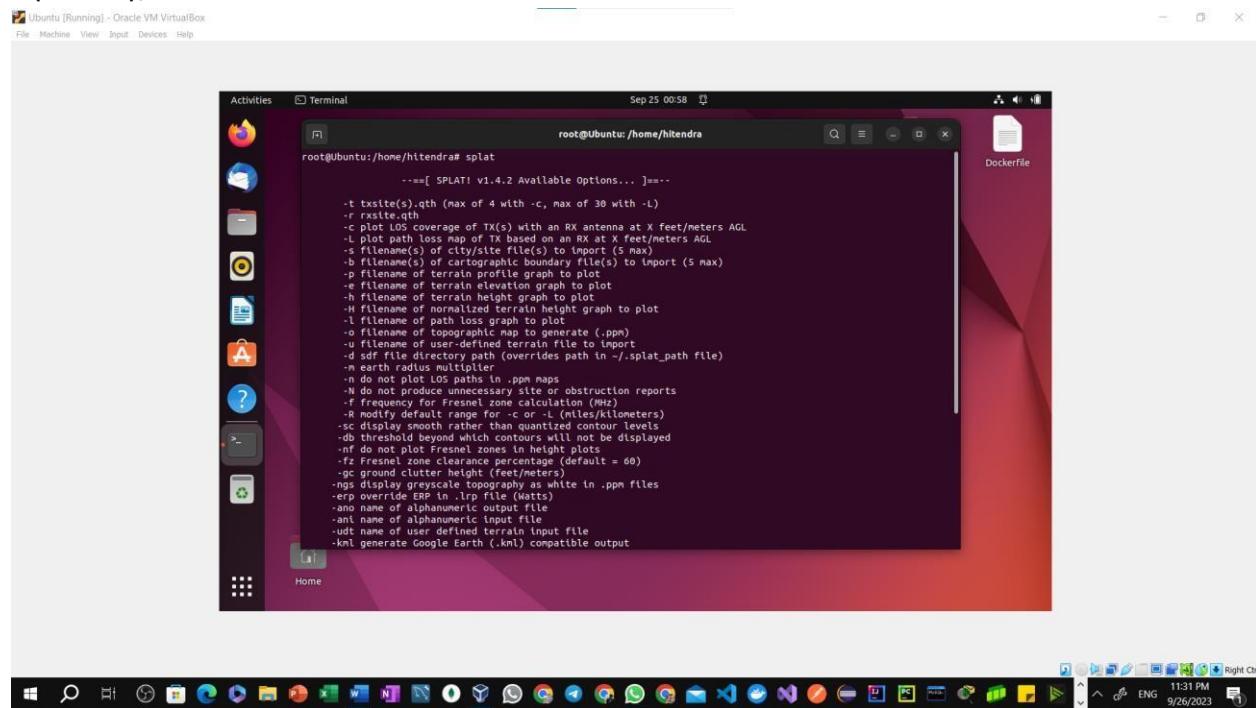


Name: Hitendra Sisodia
Sap Id: 500091910

- **simple performance lock analysis tool**

The Simple Performance Lock Analysis Tool (splat) is a software tool that generates reports on the use of synchronization locks. These include the simple and complex locks.

Some of the flags that can be used are: -i (inputfile), -n (namefile), -o(outputfile), -d(detail), etc.



A screenshot of a Linux desktop environment showing a terminal window. The terminal window title is "root@Ubuntu:/home/hitendra# splat". The terminal displays the usage information for the splat command, which includes various options for plotting LOS coverage, path loss maps, terrain profile graphs, and height graphs. The desktop background is a red and orange abstract pattern. The taskbar at the bottom shows various application icons, and the system tray indicates the date and time as "Sep 26 11:31 PM" and "9/26/2023".

```
root@Ubuntu:/home/hitendra# splat
     ...=[ SPLAT! V1.4.2 Available Options... ]=...
  -t txsite(s).qth (max of 4 with -c, max of 30 with -L)
  -r rxsite.qth
  -c plot LOS coverage of TX(s) with an RX antenna at X feet/meters AGL
  -L plot path loss map of TX based on an RX at X feet/meters AGL
  -s filename(s) of city/site file(s) to import (5 max)
  -b filename(s) of base site file(s) to import (5 max)
  -p filename of terrain profile graph to plot
  -h filename of terrain elevation graph to plot
  -n do not plot LOS paths in .ppm maps
  -N do not produce unnecessary site or obstruction reports
  -f frequency for Fresnel zone calculations (meters/kilometers)
  -m display smooth rather than quantized contour levels
  -db threshold beyond which contours will not be displayed
  -nf do not plot Fresnel zones in height plots
  -fz Fresnel zone clearance percentage (default = 60)
  -lg generate clutter height (feet/meters)
  -np display grayscale maps with white in .ppm files
  -erp override ERP in .lrp file (Watts)
  -ano name of alphanumeric output file
  -ant name of alphanumeric input file
  -uds name of user defined terrain input file
  -kml generate Google Earth (.kml) compatible output
```

- **tracing queues using commands like strmqtrc**

This command is used to enable tracing.

The command has optional parameters that specify the level of tracing you want:

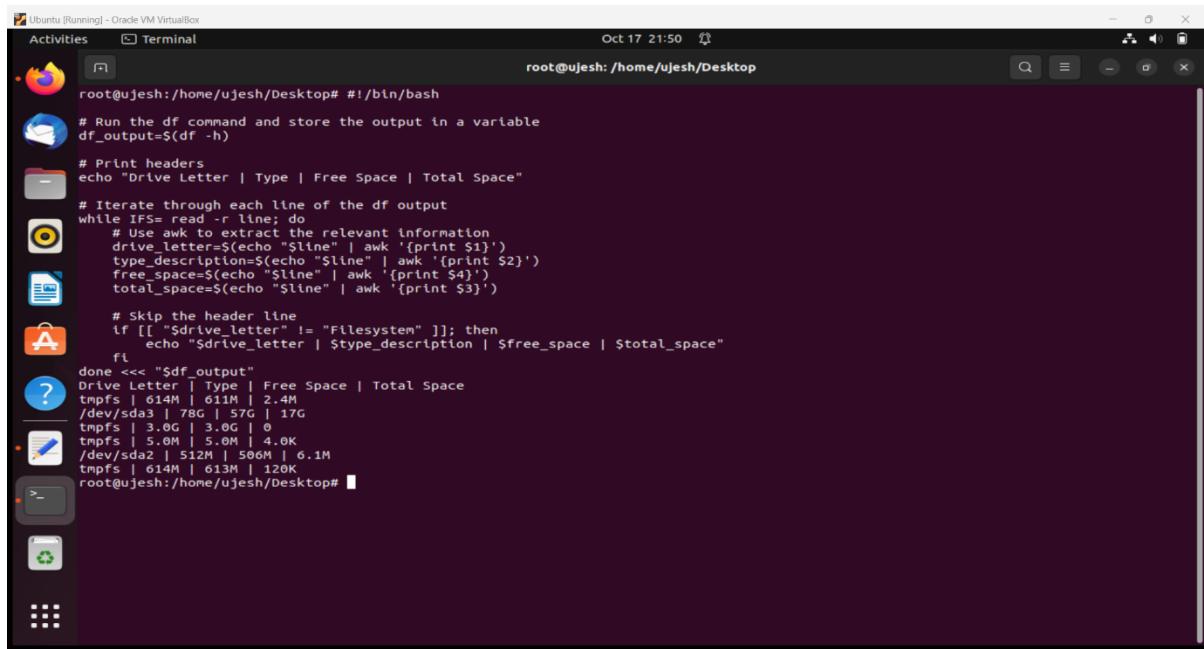
- One or more queue managers
- Levels of trace detail
- One or more IBM® MQ processes
- Specific threads within customer applications
- Event

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Experiment - 5

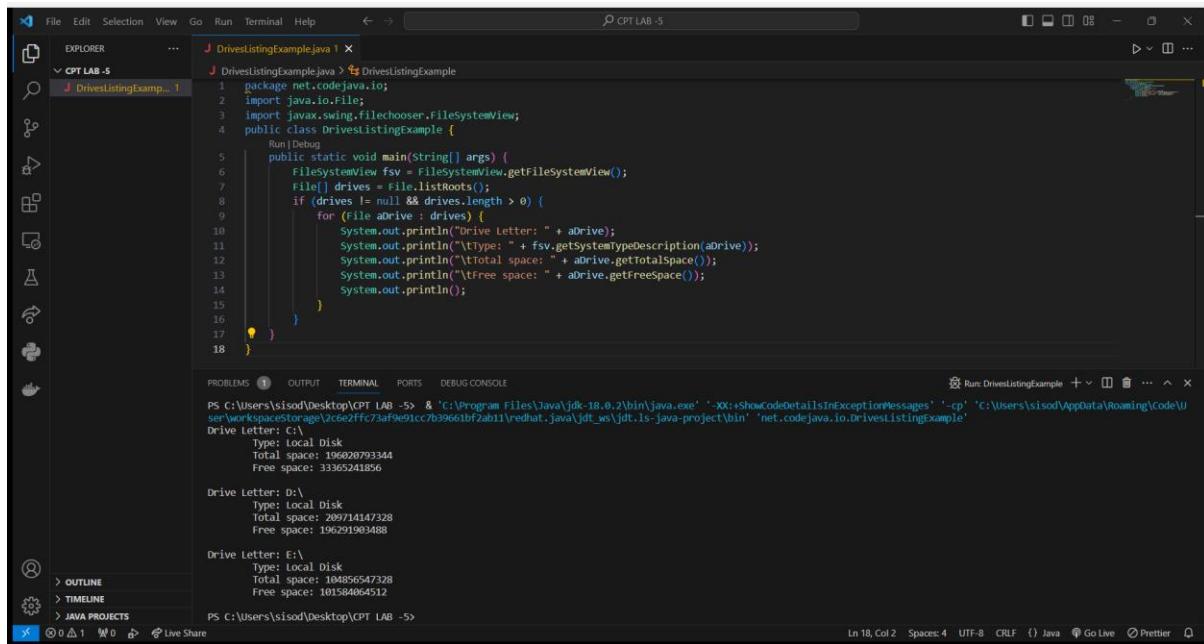
QUES 1. Write a program that lists all available disk Partitions with their drive letters, type descriptions, free spaces and total spaces.

1. In Linux



```
Ubuntu [Running] - Oracle VM VirtualBox
Activities Terminal
root@ujesh:/home/ujesh/Desktop# #!/bin/bash
# Run the df command and store the output in a variable
df_output=$(df -h)
# Print headers
echo "Drive Letter | Type | Free Space | Total Space"
# Iterate through each line of the df output
while IFS= read -r line; do
    # Use awk to extract the relevant information
    drive_letter=$(echo "$line" | awk '{print $1}')
    type_description=$(echo "$line" | awk '{print $2}')
    free_space=$(echo "$line" | awk '{print $4}')
    total_space=$(echo "$line" | awk '{print $3}')
    # Skip the header line
    if [[ "$drive_letter" != "Filesystem" ]]; then
        echo "$drive_letter | $type_description | $free_space | $total_space"
    fi
done <<< "Sdf_output"
Drive Letter | Type | Free Space | Total Space
tmpfs | 614M | 611M | 2.4M
/dev/sda3 | 78G | 57G | 17G
tmpfs | 3.0G | 3.0G | 0
tmpfs | 5.0M | 5.0M | 4.0K
/dev/sda2 | 512M | 506M | 6.1M
tmpfs | 614M | 613M | 120K
root@ujesh:/home/ujesh/Desktop#
```

2. In windows



```
File Edit Selection View Go Run Terminal Help CPT LAB -5
EXPLORER DrivesListingExample.java 1
DrivesListingExample.java > DrivesListingExample
1 package net.codejava.io;
2 import java.io.File;
3 import javax.swing.filechooser.FileSystemView;
4 public class DriveslistingExample {
5     public static void main(String[] args) {
6         FileSystemView fsv = FileSystemView.getFileSystemView();
7         File[] drives = fsv.listRoots();
8         if (drives != null && drives.length > 0) {
9             for (File adrive : drives) {
10                 System.out.println("Drive letter: " + adrive);
11                 System.out.println("Type: " + fsv.getSystemTypeDescription(aDrive));
12                 System.out.println("Total space: " + aDrive.getTotalSpace());
13                 System.out.println("Free space: " + aDrive.getFreeSpace());
14                 System.out.println();
15             }
16         }
17     }
18 }
```

PROBLEMS OUTPUT TERMINAL PORTS DEBUG CONSOLE

```
PS C:\Users\sisod\Desktop\CPT LAB -5> & "C:\Program Files\Java\jdk-18.0.2\bin\java.exe" '-XX:+showCodeDetailsInExceptionMessages' '-cp' 'C:\Users\sisod\AppData\Roaming\Code\User\workspaceStorage\2c6e2ff73af9e91cc7b39661bf2ab11\redhat.java\jdt_ws\jdt.ls\java-project\bin' 'net.codejava.io.DrivesListingExample'
Drive Letter: C:
Type: Local Disk
Total space: 19662079344
Free space: 3365241896

Drive Letter: D:
Type: Local Disk
Total space: 289714147328
Free space: 196291993488

Drive Letter: E:
Type: Local Disk
Total space: 104856547328
Free space: 10158406512
```

OUTLINE > TIMELINE > JAVA PROJECTS PS C:\Users\sisod\Desktop\CPT LAB -5>

Name: Hitendra Sisodia
Sap Id: 500091910

QUES 2. Write a program in java to generate CPU load (CPU usage upto 100%)

A screenshot of a Linux desktop environment (Ubuntu) running in Oracle VM VirtualBox. On the left, there's a dock with various icons. In the center, a terminal window titled "Text Editor" shows the following Java code:

```
1 public class CPUloadGenerator {
2     public static void main(String[] args) {
3         System.out.println("Generating maximum CPU load...");
4
5         while (true) {
6             // Perform a computationally intensive task
7             for (int i = 0; i < Integer.MAX_VALUE; i++) {
8                 double result = Math.sqrt(i);
9             }
10        }
11    }
12 }
```

The terminal window also displays system status information at the top: "Oct 17 23:35". Below the code, the terminal prompt is "Java > Tab Width: 8 > Ln 1, Col 1 > INS".

A screenshot of a Linux terminal window (Terminal) showing the output of the "htop" command. The window title is "ujesh@ujesh: ~". The output shows a list of processes with columns for PID, USER, PRI, NI, VIRT, RES, SHR, S, CPU%, %MEM, TIME+, and Command. The "Command" column highlights the process with PID 2242, which is running "/usr/bin/gnome-shell". Other processes listed include root tasks like "crond", "systemd-journald", and "systemd-timesyncd", as well as user processes like "gnome-shell", "gvfs-afc-volume-monitor", and "accounts-daemon". The terminal window has a dark theme and includes a status bar at the bottom with various keyboard shortcuts.

Name: Hitendra Sisodia
Sap Id: 500091910

Ubuntu [Running] - Oracle VM VirtualBox

Activities Terminal Oct 17 23:31 ujesh@ujesh: ~

Mem[1.49G/5.99G] Swap[0K/3.13G] Tasks: 134, 560 thr; 2 running Load average: 0.48 1.14 0.64 Uptime: 00:05:40

| PID | USER | PRI | NICE | VIRT | RES | SHR | S | CPU% US | MEM% | TIME+ 0:15:53 | Command |
|------|------------------|-----|------|-------|-------|-------|---|------------|------|------------------|--|
| 4403 | ujesh | 20 | 0 | 4134M | 34280 | 25832 | S | 112, 0.5 | 0.6% | 0:15:53 | java CPULoadGenerator |
| 4404 | ujesh | 20 | 0 | 4134M | 34280 | 25832 | R | 111, 0.5 | 0.0% | 0:15:44 | java CPULoadGenerator |
| 2242 | ujesh | 20 | 0 | 5515M | 358M | 136M | S | 1.5 | 5.8 | 0:13:91 | /usr/bin/gnome-shell |
| 602 | systemd- <o></o> | 20 | 0 | 14824 | 6784 | 6016 | S | 0.7 | 0.1 | 0:00:77 | /lib/systemd/systemd-oomd |
| 2261 | ujesh | 20 | 0 | 5515M | 358M | 136M | S | 0.7 | 5.8 | 0:07:91 | /usr/bin/gnome-shell |
| 2262 | ujesh | 20 | 0 | 5515M | 358M | 136M | S | 0.7 | 5.8 | 0:07:21 | /usr/bin/gnome-shell |
| 2265 | ujesh | 20 | 0 | 5515M | 358M | 136M | S | 0.7 | 5.8 | 0:07:51 | /usr/bin/gnome-shell |
| 2699 | ujesh | 20 | 0 | 3198M | 72400 | 53544 | S | 0.7 | 1.2 | 0:01:94 | gjs /usr/share/gnome-shell/extensions/ding@rastersoft.com/ding.js - |
| 3517 | ujesh | 20 | 0 | 11.0G | 334M | 103M | S | 0.7 | 5.5 | 0:26:65 | /snap/firefox/3068/usr/lib/firefox/firefox -contentproc -childid 4 |
| 4322 | ujesh | 20 | 0 | 20588 | 5376 | 3584 | R | 0.7 | 0.1 | 0:01:06 | htop |
| 1 | root | 20 | 0 | 162M | 11680 | 8096 | S | 0.0 | 0.2 | 0:04:34 | /sbin/init splash |
| 221 | root | 19 | -1 | 48256 | 17408 | 16000 | S | 0.0 | 0.3 | 0:01:27 | /lib/systemd/systemd-journald |
| 277 | root | 20 | 0 | 26944 | 6656 | 4608 | S | 0.0 | 0.1 | 0:00:61 | /lib/systemd/systemd-udevd |
| 603 | systemd- <r></r> | 20 | 0 | 25792 | 13672 | 9472 | S | 0.0 | 0.2 | 0:00:67 | /lib/systemd/systemd-resolved |
| 604 | systemd-t | 20 | 0 | 89376 | 7296 | 6528 | S | 0.0 | 0.1 | 0:00:21 | /lib/systemd/systemd-timesyncd |
| 612 | systemd-t | 20 | 0 | 89376 | 7296 | 6528 | S | 0.0 | 0.1 | 0:00:01 | /lib/systemd/systemd-timesyncd |
| 663 | root | 20 | 0 | 242M | 7628 | 6860 | S | 0.0 | 0.1 | 0:00:32 | /usr/libexec/accounts-daemon |
| 664 | root | 20 | 0 | 2812 | 1664 | 1664 | S | 0.0 | 0.0 | 0:00:06 | /usr/sbin/acpid |
| 667 | avahi | 20 | 0 | 7624 | 3840 | 3584 | S | 0.0 | 0.1 | 0:00:23 | avahi-daemon: running [ujesh.local] |
| 668 | root | 20 | 0 | 18148 | 2688 | 2560 | S | 0.0 | 0.0 | 0:00:08 | /usr/sbin/cron -f -P |
| 670 | root | 0 | -20 | 2784 | 1664 | 1536 | S | 0.0 | 0.0 | 0:00:75 | /usr/sbin/atopacctd |
| 672 | messagebus | 20 | 0 | 11016 | 6272 | 3840 | S | 0.0 | 0.1 | 0:02:66 | @dbus-daemon --system --address=/systemd: --nofork --nopidfile --sys |
| 674 | root | 20 | 0 | 263M | 18972 | 15900 | S | 0.0 | 0.3 | 0:01:50 | /usr/sbin/NetworkManager --no-daemon |
| 681 | root | 20 | 0 | 82696 | 3840 | 3584 | S | 0.0 | 0.1 | 0:00:05 | /usr/sbin/lrqbalance --foreground |
| 682 | root | 20 | 0 | 49844 | 20992 | 11904 | S | 0.0 | 0.3 | 0:00:67 | /usr/bin/python3 /usr/bin/networkd-dispatcher --run-startup-trigger |
| 683 | root | 20 | 0 | 231M | 10324 | 6988 | S | 0.0 | 0.2 | 0:03:96 | /usr/libexec/polkitd --no-debug |
| 684 | root | 20 | 0 | 242M | 7296 | 6784 | S | 0.0 | 0.1 | 0:00:12 | /usr/libexec/power-profiles-daemon |
| 685 | syslog | 20 | 0 | 217M | 5768 | 4352 | S | 0.0 | 0.1 | 0:00:38 | /usr/sbin/rsyslog -n -lNONE |
| 687 | root | 20 | 0 | 1432M | 29728 | 19328 | S | 0.0 | 0.5 | 0:05:47 | /usr/lib/snapd/snapd |
| 688 | root | 20 | 0 | 239M | 6528 | 6144 | S | 0.0 | 0.1 | 0:00:07 | /usr/libexec/switcheroo-control |
| 689 | root | 20 | 0 | 23636 | 7876 | 6784 | S | 0.0 | 0.1 | 0:00:58 | /lib/systemd/systemd-logind |

F1Help F2Setup F3Search F4Filter F5Tree F6SortBy F7Nicer F8Nicer F9XLL F10Quit

CPT LAB-5

File Edit Selection View Go Run Terminal Help

EXPLORER J CPULoadGenerator.java J DrivesListingExample.java

```
1 public class CPULoadGenerator {  
2     public static void main(String[] args) {  
3         int numThreads = 16; // Number of threads to create  
4         int numCores = 8; // Number of CPU cores  
5         for (int i = 0; i < numThreads; i++) {  
6             Thread thread = new CPULoadingThread(i, numCores);  
7             thread.start();  
8         }  
9     }  
10    static class CPULoadingThread extends Thread {  
11        private int threadId;  
12        private int numCores;  
13        public CPULoadingThread(int threadId, int numCores) {  
14            this.threadId = threadId;  
15            this.numCores = numCores;  
16        }  
17        @Override  
18        public void run() {  
19            while (true) {  
20                System.out.println("Generating CPU Workload...");  
21                // Simulate a CPU-intensive task  
22                for (int i = 0; i < Integer.MAX_VALUE; i++) {  
23                    // Do some calculations  
24                }  
25            }  
26        }  
27    }  
28}
```

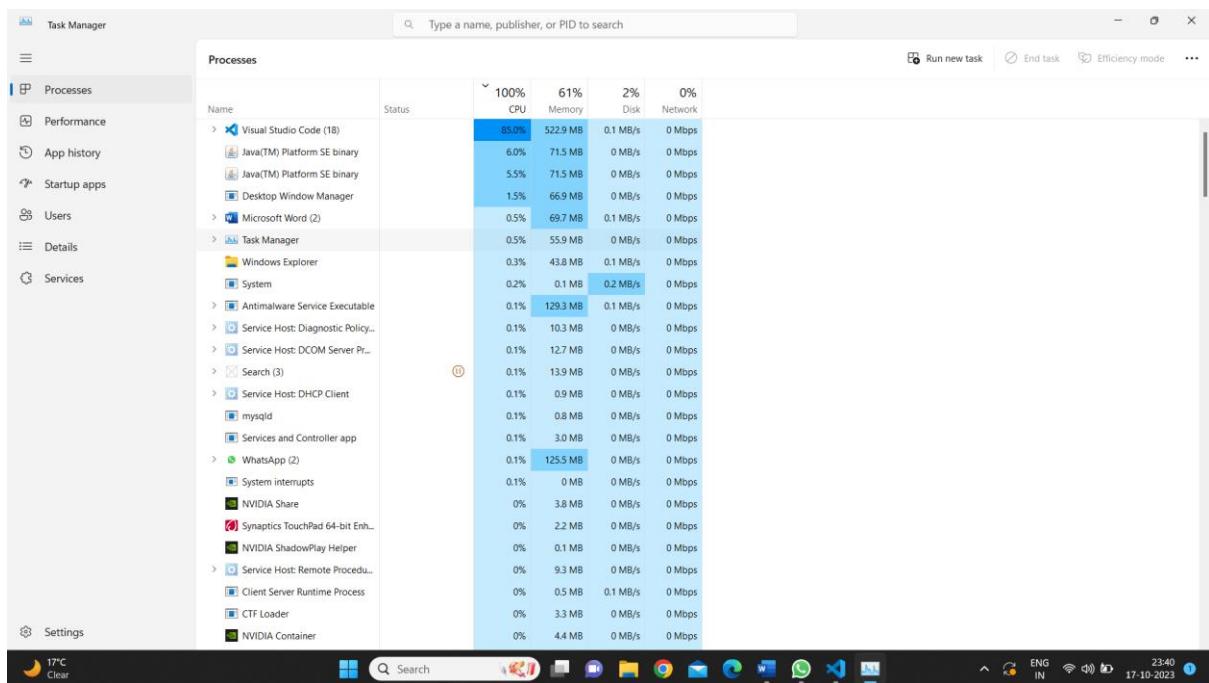
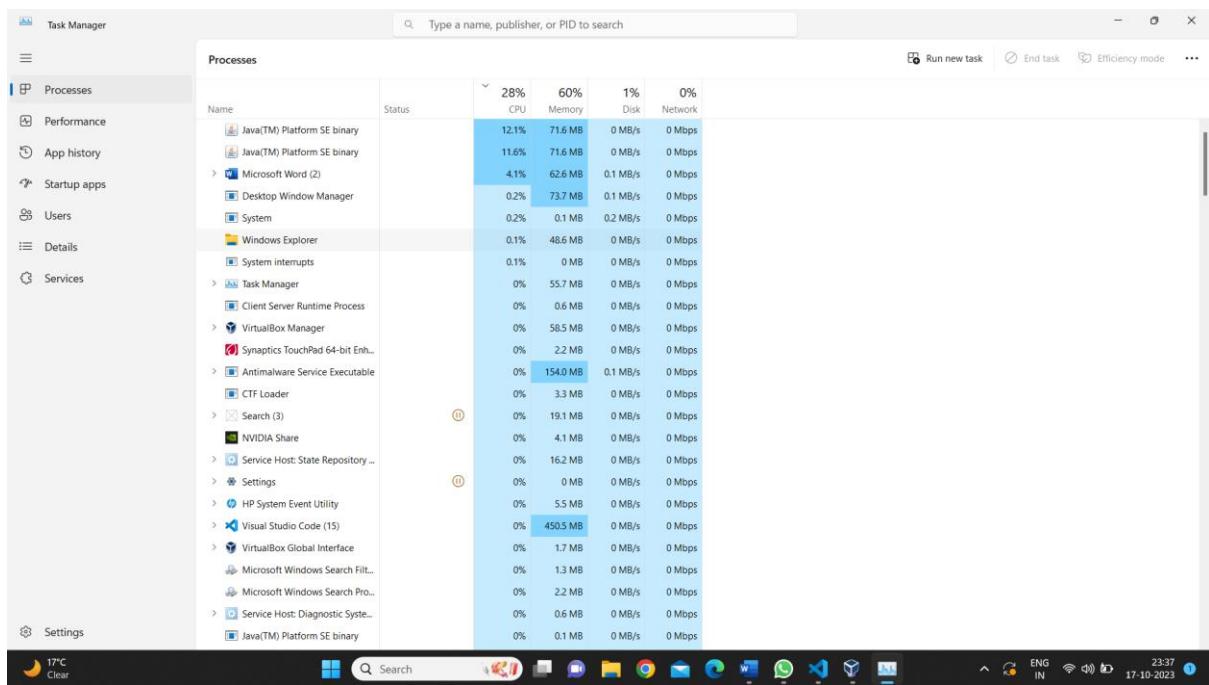
PROBLEMS OUTPUT TERMINAL PORTS DEBUG CONSOLE

Generating CPU Workload...
Generating CPU Workload...
Generating CPU Workload...
Generating CPU Workload...
Generating CPU Workload...

powershell Run: CPULoadGener...

Ln 28, Col 2 Spaces: 4 UTF-8 CRLF () Java Go Live Prettier

Name: Hitendra Sisodia
Sap Id: 500091910



Name: Hitendra Sisodia
Sap Id: 500091910

Experiment - 6

1. Write a java program to check the memory used by java application?

The screenshot shows the Microsoft Visual Studio Code (VS Code) interface. The top bar includes 'File', 'Edit', 'Selection', 'View', 'Go', 'Run', and 'Live Share' buttons. The title bar says 'CPT LAB VS'. The left sidebar has icons for Explorer, Search, Find, Open, and Outline. The 'EXPLORER' view shows a project named 'CPT LAB VS' containing files: AddressBook.java, AddressBook1.java, CPUloadGen..., DrivesListingProg..., FactorialCalculator..., GreetingApp.java, and ToDoList.java. The main editor area displays Java code for 'AddressBook.java' and 'Contact.java'. The code defines a 'Contact' class with private fields 'name' and 'phoneNumber', and methods for getting their values. It also defines an 'AddressBook' class with a static 'main' method that initializes a scanner and runtime object, and a loop that calculates memory usage.

```
AddressBook.java x
AddressBook.java > Contact > getPhoneNumber()
1 import java.util.ArrayList;
2 import java.util.Scanner;
3
4 class Contact {
5     private String name;
6     private String phoneNumber;
7
8     public Contact(String name, String phoneNumber) {
9         this.name = name;
10        this.phoneNumber = phoneNumber;
11    }
12
13     public String getName() {
14         return name;
15     }
16
17     public String getPhoneNumber() {
18         return phoneNumber;
19     }
20 }
21
22 public class AddressBook {
23     Run | Debug
24     public static void main(String[] args) {
25         ArrayList<Contact> contacts = new ArrayList<>();
26         Scanner scanner = new Scanner(System.in);
27         Runtime runtime = Runtime.getRuntime(); // Memory usage monitoring
28
29         while (true) {
30             long totalMemoryKB = runtime.totalMemory() / 1024;
31             long freeMemoryKB = runtime.freeMemory() / 1024;
32             long usedMemoryKB = (totalMemoryKB - freeMemoryKB);
```

The screenshot shows a Java development environment with the following details:

- File Menu:** File, Edit, Selection, View, Go, Run, ...
- Toolbar:** Back, Forward, Search bar (CPT LAB VS), Minimize, Maximize, Close.
- Left Sidebar (EXPLORER):** Shows the project structure under CPT LAB VS:
 - AddressBook.java
 - AddressBook1.java
 - CPUloadGen...
 - DrivesListingProgr...
 - FactorialCalculator...
 - GreetingApp.java
 - ToDoList.java
- Code Editor:** The current file is AddressBook.java, specifically the getPhoneNumber() method. The code implements a menu system for adding contacts and printing contact details.
- Bottom Status Bar:** Lines 18, Col 28, Spaces: 4, UTF-8, CRLF, { } Java, Go Live, Prettier.

```
AddressBook.java x
AddressBook.java > Contact > getPhoneNumber()

System.out.println("Total Memory: " + totalMemoryKB + " KB");
System.out.println("Used Memory: " + usedMemoryKB + " KB");
System.out.println("Free Memory: " + freeMemoryKB + " KB");
System.out.println("Max Memory: " + (Runtime.maxMemory() / 1024) + " KB");

System.out.println("Address Book Menu:");
System.out.println("1. Add Contact");
System.out.println("2. View Contacts");
System.out.println("3. Search Contact by Name");
System.out.println("4. Exit");
System.out.print("Enter your choice: ");

int choice = scanner.nextInt();
scanner.nextLine(); // Consume the newline character

switch (choice) {
    case 1:
        System.out.print("Enter the contact's name: ");
        String name = scanner.nextLine();
        System.out.print("Enter the contact's phone number: ");
        String phoneNumber = scanner.nextLine();
        Contact newContact = new Contact(name, phoneNumber);
        contacts.add(newContact);
        System.out.println("Contact added!");
        break;
    case 2:
        System.out.println("Contacts:");
        for (Contact contact : contacts) {
            System.out.println("Name: " + contact.getName() + " | Phone: " + contact.getPhoneNumber());
        }
        break;
}
```

Name: Hitendra Sisodia

Sap Id: 500091910

The screenshot shows the Microsoft Visual Studio Code interface with the following details:

- File Explorer:** Shows the project structure under "CPT LAB VS" with files: AddressBook.java, AddressBook1.java, CPUloadGen..._2, DrivesListingProgr..., FactorialCalculator..., GreetingApp.java, and ToDoList.java.
- Code Editor:** Displays the AddressBook.java code. The code implements a menu system for an address book application. It includes a switch statement with cases for adding contacts, viewing contacts, searching by name, and exiting. It also handles user input for names and phone numbers.
- Bottom Status Bar:** Shows the current line (Ln 18), column (Col 28), spaces (Spaces: 4), encoding (UTF-8), and file type (Java). Other icons include Go Live and Prettier.

The screenshot shows the Microsoft Visual Studio Code interface with the following details:

- File Explorer:** Shows the project structure under "CPT LAB VS" with files: AddressBook.java, AddressBook1.java, CPUloadGen..._2, DrivesListingProgr..., FactorialCalculator..., GreetingApp.java, and ToDoList.java.
- Terminal:** Displays the output of running the AddressBook.java application in a Windows PowerShell window. The application starts, displays a menu, adds a contact named "ujesh" with phone number "8005128274", and then exits.
- Bottom Status Bar:** Shows the current line (Ln 18), column (Col 28), spaces (Spaces: 4), encoding (UTF-8), and file type (Java). Other icons include Go Live and Prettier.

Name: Hitendra Sisodia
Sap Id: 500091910

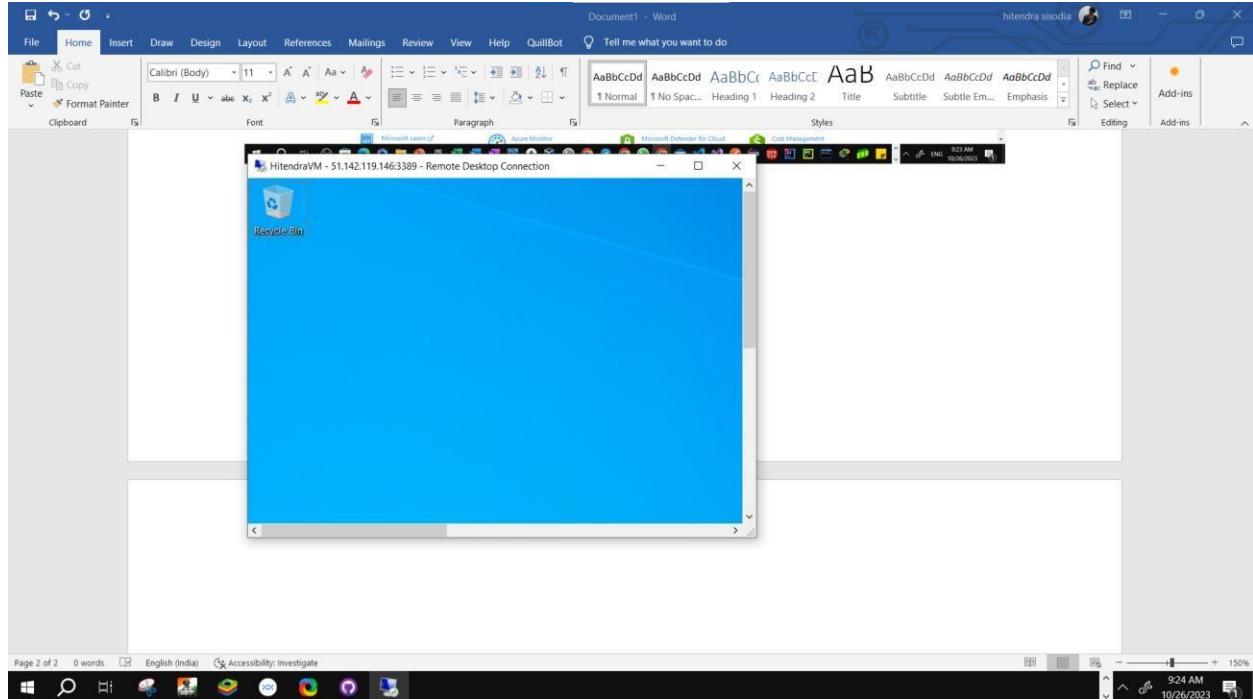
Experiment - 7

Remote Desktop Protocol (RDP) is used while connecting two computers over a network. In an RDP setup, a computer/client connects to another computer running RDP server software. The client computer creates an RDP file for storing the connection settings to the server. The client has to open only the RDP file to connect to the server in the future.

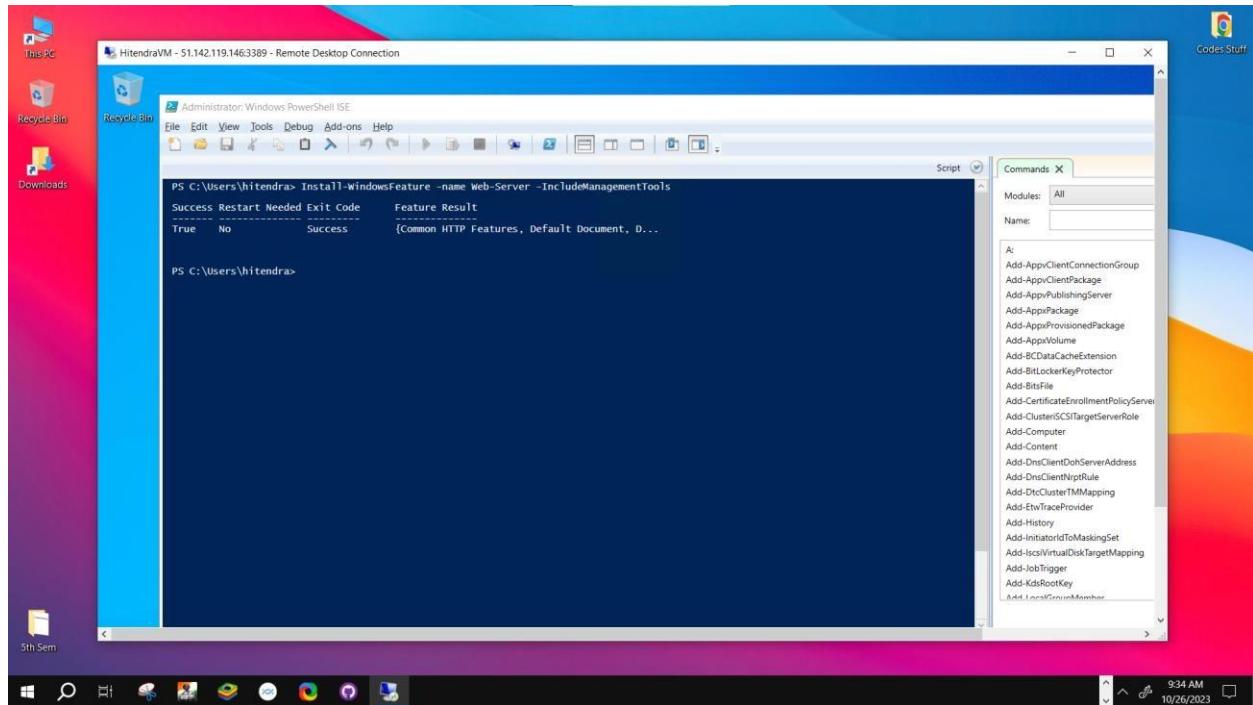
The screenshot shows the Microsoft Azure portal interface. On the left, a sidebar for the 'HitendraVM' virtual machine lists options like Overview, Activity log, Access control (IAM), Tags, and Connect. Under 'Connect', 'Native RDP' is selected. The main pane displays connection details: Admin username 'hitendra', Port '3389', and Just-in-time policy 'Unsupported by plan'. Below this, a 'Most common' section shows the 'Native RDP' option selected. A 'Native RDP' configuration window is open on the right, titled 'Native RDP'. It contains three steps: 1. 'Configure prerequisites for Native RDP' (status: Prerequisites configured), which includes a note about port 3389 access; 2. 'Open Remote Desktop Connection (on Windows)' (status: Opened), which includes a note about changing the port; 3. 'Download and open the RDP file' (status: Downloaded). Other information includes a 'Forgot password?' link and a 'Reset password' button. The status bar at the bottom shows the date as 10/26/2023 and the time as 9:22 AM.

The screenshot shows the Microsoft Azure portal home page. At the top, there's a navigation bar with links for Home, Subscriptions, Resource groups, All resources, and Dashboard. Below the navigation bar, there's a section titled 'Azure services' with icons for Create a resource, Virtual machines, Quickstart Center, App Services, Storage accounts, SQL databases, Azure Cosmos DB, Kubernetes services, Function App, and More services. A 'Resources' section follows, showing a table of recent and favorite resources. The 'Recent' tab is selected, displaying 'HitendraVM' (Virtual machine) and 'HitendraVM_group' (Resource group) with their last viewed times. Below this is a 'Navigate' section with links for Subscriptions, Resource groups, All resources, and Dashboard. At the bottom, there's a 'Tools' section with icons for Microsoft Learn, Azure Monitor, Microsoft Defender for Cloud, Cost Management, and other Azure services. The status bar at the bottom shows the date as 10/26/2023 and the time as 9:23 AM.

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Sap Id: 500091910



Install-WindowsFeature -name Web-Server -IncludeManagementTools



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Experiment - 9

Q. Create a database with customer name and create index for it also set buffer size.

```
Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.

mysql> show databases
    -> ;
+-----+
| Database      |
+-----+
| demo          |
| flipkart      |
| hitendra_demo |
| information_schema |
| lab           |
| mysql          |
| performance_schema |
| sys           |
| we            |
| zomato         |
+-----+
10 rows in set (0.11 sec)
```

```
mysql> create table customers(
    -> customerID int primary key comment 'unique identifier for the customer',
    -> firstname varchar(50) comment 'first name of the customer',
    -> lastname varchar(50) comment 'last name of the customer'
    -> -- other columns..
    -> );
Query OK, 0 rows affected (0.07 sec)

mysql>
```

```
mysql> create table orders(
    -> orderID int primary key,
    -> customerID int,
    -> orderdate date,
    -> -- other columns...
    -> foreign key (customerID) references customers(customerID)
    -> );
Query OK, 0 rows affected (0.03 sec)
```

```
mysql> create index idx_customer_lastname on customers(lastname);
Query OK, 0 rows affected (0.07 sec)
Records: 0  Duplicates: 0  Warnings: 0
```

```
mysql> create tablespace yourtablespace;
Query OK, 0 rows affected (0.03 sec)
```

```
mysql> set global innodb_buffer_pool_size = 4294967296; -- 4GB in bytes
Query OK, 0 rows affected (0.01 sec)
```

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Experiment - 10

Q. Identify and explore different query optimization methods

1. Working with database indexes

```
mysql> create index idx_customer_lastname_new on customers(lastname);
Query OK, 0 rows affected, 1 warning (0.07 sec)
Records: 0 Duplicates: 0 Warnings: 1

mysql> show index from customers;
+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+
| Table | Non_unique | Key_name      | Seq_in_index | Column_name | Collation | Cardinality | Sub_part | Packed | Null | Index_type | Comment | Index_comment | Visible | Expression |
+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+
| customers |     0 | PRIMARY       |           1 | customerID | A          |        0 |          0 |    YES |   NULL | BTREE    |         |           | YES    |    NULL   |
| customers |     1 | idx_customer_lastname |       1 | lastname    | A          |        0 |          0 |    YES |   BTREE | BTREE    |         |           | YES    |    NULL   |
| customers |     1 | idx_customer_lastname_new |       1 | lastname    | A          |        0 |          0 |    YES |   BTREE | BTREE    |         |           | YES    |    NULL   |
+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+
3 rows in set (0.03 sec)

mysql> drop index idx_customer_lastname on customers;
Query OK, 0 rows affected (0.01 sec)
Records: 0 Duplicates: 0 Warnings: 0

mysql>
```

2. Normalize database

3NF (Third Normal Form): All columns are functionally dependent only on the primary key. No transitive dependencies.

```
mysql> create table customers(
-> customerID int primary key,
-> customername varchar(50)
-> );
Query OK, 0 rows affected (0.03 sec)

mysql> create table products(
-> productID int primary key,
-> productname varchar(50)
-> );
Query OK, 0 rows affected (0.01 sec)

mysql> create table orders(
-> orderID int primary key,
-> customerID int,
-> orderdate date,
-> foreign key (customerID) references customers(customerID)
-> );
Query OK, 0 rows affected (0.02 sec)

mysql> create table orderdetails(
-> orderID int,
-> productID int,
-> quantity int,
-> primary key (orderID,productID),
-> foreign key(orderID) references orders(orderID),
-> foreign key(productID) references products(productID)
-> );
ERROR 1072 (42000): Key column 'profuctID' doesn't exist in table
mysql> create table orderdetails(
-> orderID int,
-> productID int,
-> quantity int,
-> primary key (orderID,productID),
-> foreign key(orderID) references orders(orderID),
-> foreign key(productID) references products(productID)
-> );
Query OK, 0 rows affected (0.02 sec)

mysql>
```

Name- Hitendra Sisodia
Sap id- 500091910

3. Adjust MySQL configuration parameter (e.g. buffer size,query cache size,etc.)

```
mysql> set global innodb_buffer_pool_size = 4294967296; -- 4GB in bytes
Query OK, 0 rows affected (0.04 sec)
```

max_connections: Limit the maximum number of simultaneous client connections

```
mysql> set global max_connections = 100;
Query OK, 0 rows affected (0.00 sec)

mysql>
```

table_open_cache: Set the number of open tables allowed in the table cache.

```
mysql> set global table_open_cache = 2000;
Query OK, 0 rows affected (0.00 sec)
```

4. Identify and rewrite slow queries

```
mysql> select * from orders;
+-----+-----+-----+
| order_id | user_id | order_date |
+-----+-----+-----+
| B-25601 |      1 | 01-04-2018 |
| B-26011 |      1 | 12-02-2019 |
| B-26074 |      1 | 21-03-2019 |
| B-25602 |      2 | 01-04-2018 |
| B-26012 |      2 | 13-02-2019 |
| B-26075 |      2 | 21-03-2019 |
| B-25603 |      3 | 03-04-2018 |
| B-26013 |      3 | 13-02-2019 |
| B-26076 |      3 | 21-03-2019 |
| B-25604 |      4 | 03-04-2018 |
```

5. Now try to replace slow queries

```
mysql> select * from orders where user_id=3;
+-----+-----+-----+
| order_id | user_id | order_date |
+-----+-----+-----+
| B-25603 |      3 | 03-04-2018 |
| B-26013 |      3 | 13-02-2019 |
| B-26076 |      3 | 21-03-2019 |
+-----+-----+-----+
3 rows in set (0.00 sec)
```