

Network Security Lab



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Lab-01:

Task-02 (Virtualization)

- 1) Creating two Virtual machines with same OS but different resource allocations**

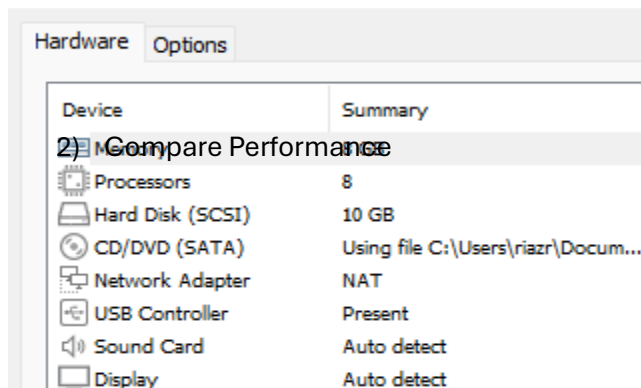
VM 1: with minimal CPU and Memory resources

The cpu and memory resources given to the virtual machine are as follows:

Hardware Options	
Device	Summary
Memory	1 GB
Processors	1
Hard Disk (SCSI)	10 GB
CD/DVD (SATA)	Using file C:\Users\riazr\Docum...
Network Adapter	NAT
USB Controller	Present
Sound Card	Auto detect
Display	Auto detect

VM 2: with High CPU and Memory resources

The cpu and memory resources given to the virtual machine are as follows:



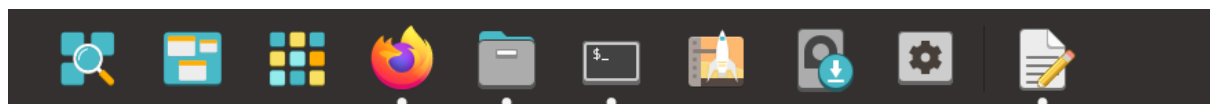
2) Compare Performance

Virtual Machine with Low Resources

Running a file search

```
root@pop-os:/home/pop-os# find / -name 'giki'
find: '/run/user/999/gvfs': Permission denied
find: '/run/user/999/doc': Permission denied
root@pop-os:/home/pop-os#
```

Running multiple programs at once



```
root@pop-os: /home/pop-os
top - 17:46:27 up 28 min, 2 users, load average: 0.65, 0.43, 0.43
Tasks: 318 total, 1 running, 317 sleeping, 0 stopped, 0 zombie
%Cpu(s): 2.3 us, 1.8 sy, 0.3 ni, 95.3 id, 0.0 wa, 0.0 hi, 0.2 si, 0.0 st
MiB Mem : 1919.8 total, 199.0 free, 1369.3 used, 351.5 buff/cache
MiB Swap: 1920.0 total, 797.5 free, 1122.5 used. 338.4 avail Mem

  PID USER      PR  NI   VIRT   RES   SHR  S  %CPU  %MEM     TIME+ COMMAND
 1542 pop-os    20   0 393164 44808 19424 S   3.0   2.3   1:03.05 Xorg
 1984 pop-os    20   0 3646728 161276 55168 S   2.6   8.2   0:49.49 gnome-shell
 2930 pop-os    20   0 560904 29964 22764 S   1.7   1.5   0:01.70 gnome-terminal-
 3272 pop-os    20   0 2742960 187532 57828 S   1.7   9.5   0:18.09 Isolated Web Co
 2987 pop-os    26   6 1117448 30172 20884 S   0.7   1.5   0:03.68 nautilus
 4125 root       26   6 23612 4096 3200 R   0.7   0.2   0:00.40 top
 3383 pop-os    20   0 2411564 33540 28544 S   0.3   1.7   0:00.25 Web Content
 3943 root       20   0 0 0 0 I   0.3   0.0   0:00.64 kworker/1:1-events
    1 root     20   0 166276 6788 4960 S   0.0   0.3   0:04.16 systemd
    2 root     20   0 0 0 0 S   0.0   0.0   0:00.00 kthreadd
    3 root     20   0 0 0 0 S   0.0   0.0   0:00.00 pool_workqueue_release
    4 root     0 -20 0 0 0 I   0.0   0.0   0:00.00 kworker/R-rcu_g
    5 root     0 -20 0 0 0 I   0.0   0.0   0:00.00 kworker/R-slub_
    6 root     0 -20 0 0 0 I   0.0   0.0   0:00.00 kworker/R-netns
    9 root     0 -20 0 0 0 I   0.0   0.0   0:00.95 kworker/0:0H-kblockd
   10 root    20   0 0 0 0 I   0.0   0.0   0:00.00 kworker/u512:0-ipv6_addrconf
   11 root     0 -20 0 0 0 I   0.0   0.0   0:00.00 kworker/R-mm_pe
   12 root    20   0 0 0 0 I   0.0   0.0   0:00.00 rcu_tasks_kthread
   13 root    20   0 0 0 0 I   0.0   0.0   0:00.00 rcu_tasks_rude_kthread
   14 root    20   0 0 0 0 I   0.0   0.0   0:00.00 rcu_tasks_trace_kthread
   15 root    20   0 0 0 0 S   0.0   0.0   0:00.35 ksoftirqd/0
   16 root    20   0 0 0 0 I   0.0   0.0   0:00.61 rcu_preempt
   17 root    20   0 0 0 0 S   0.0   0.0   0:00.00 rcu_exp_par_gp_kthread_worker/1
   18 root    20   0 0 0 0 S   0.0   0.0   0:00.00 rcu_exp_gp_kthread_worker
   19 root    rt   0 0 0 0 S   0.0   0.0   0:00.04 migration/0
   20 root   -51   0 0 0 0 S   0.0   0.0   0:00.00 idle_inject/0
   21 root    20   0 0 0 0 S   0.0   0.0   0:00.00 cpuhp/0
   22 root    20   0 0 0 0 S   0.0   0.0   0:00.00 cpuhp/1
   23 root   -51   0 0 0 0 S   0.0   0.0   0:00.00 idle_inject/1
   24 root    rt   0 0 0 0 S   0.0   0.0   0:00.43 migration/1
   25 root    20   0 0 0 0 S   0.0   0.0   0:00.39 ksoftirqd/1
```

This image shows the top command output from a Linux system.

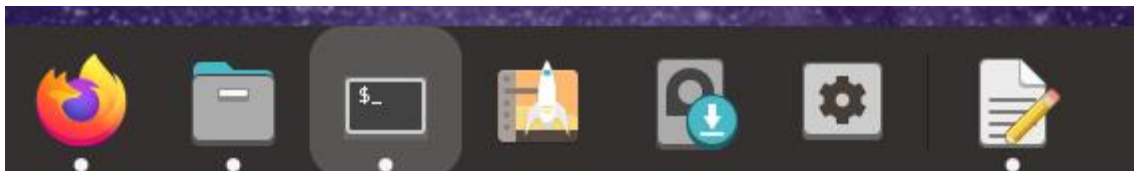
- The system has been running for 28 minutes, with a load average of 0.65, 0.43, and 0.43.
- There are 318 total tasks, with 1 running and 317 sleeping.
- CPU usage is at 2.3%, with 95.3% idle, while memory usage shows 1919.8 MiB total, with 199.0 MiB free.
- The process "Xorg" is using the most CPU at 3%, and "gnome-shell" is using 2.6% CPU and 8.2% memory.
- The top command run by user "root" is consuming 0.2% CPU and 0.2% memory

Virtual Machine with High Resources

Running a file search

```
pop-os@pop-os:~$ sudo su
root@pop-os:/home/pop-os# find / -name 'cybersecurity'
find: '/run/user/999/gvfs': Permission denied
find: '/run/user/999/doc': Permission denied
root@pop-os:/home/pop-os#
```

Running multiple programs at the same time



Result of top command

```
root@pop-os: /home/pop-os
top - 16:50:39 up 6 min, 2 users, load average: 0.35, 0.94, 0.59
Tasks: 400 total, 1 running, 399 sleeping, 0 stopped, 0 zombie
%Cpu(s): 1.6 us, 0.9 sy, 0.4 ni, 97.1 id, 0.0 wa, 0.0 hi, 0.1 si, 0.0 st
MiB Mem : 7894.0 total, 828.4 free, 2070.8 used, 4994.7 buff/cache
MiB Swap: 7894.0 total, 7894.0 free, 0.0 used, 4748.9 avail Mem

  PID USER      PR  NI   VIRT   RES   SHR  S  %CPU  %MEM     TIME+ COMMAND
 3683 pop-os    26   6 2765756 315432 105280 S   8.6   3.9   0:24.57 Isolated Web Co
 1706 pop-os    20   0 403444 111324 70876 S   8.3   1.4   0:40.25 Xorg
 2071 pop-os    20   0 4253328 265440 123520 S   4.6   3.3   0:42.19 gnome-shell
 4104 pop-os    20   0 560768 52552 39800 S   3.6   0.7   0:01.90 gnome-terminal-
 3407 pop-os    14  -6 3496704 485132 234400 S   1.7   6.0   0:35.01 firefox-bin
 3674 pop-os    26   6 438268 39648 28160 S   1.7   0.5   0:02.69 Utility Process
   74 root        20   0      0      0      0 I   0.3   0.0   0:00.15 kworker/u513:2-events_freezable_pwr_ef
  135 root        20   0      0      0      0 I   0.3   0.0   0:00.12 kworker/2:1-events
 1174 root        32  12 332172 14208 12672 S   0.3   0.2   0:05.47 touchegg
1651 pop-os     9  -11 120780 15344  8176 S   0.3   0.2   0:01.02 pipewire-pulse
 2805 pop-os    20   0 3047632 53352 36608 S   0.3   0.7   0:02.11 gjs
 3685 pop-os    26   6 2446620 74352 55628 S   0.3   0.9   0:00.40 Isolated Servic
 4248 root        26   6  23620  4224  3200 R   0.3   0.1   0:00.07 top
   1 root        20   0 167420 12520  8520 S   0.0   0.2   0:42.43 systemd
   2 root        20   0      0      0      0 S   0.0   0.0   0:00.04 kthreadd
   3 root        20   0      0      0      0 S   0.0   0.0   0:00.00 pool_workqueue_release
   4 root        0  -20      0      0      0 I   0.0   0.0   0:00.00 kworker/R-rcu_g
   5 root        0  -20      0      0      0 I   0.0   0.0   0:00.00 kworker/R-slub_
   6 root        0  -20      0      0      0 I   0.0   0.0   0:00.00 kworker/R-netns
   8 root        20   0      0      0      0 I   0.0   0.0   0:00.17 kworker/0:1-events
   9 root        0  -20      0      0      0 I   0.0   0.0   0:00.00 kworker/0:0H-events_highpri
  10 root        20   0      0      0      0 I   0.0   0.0   0:00.00 kworker/u512:0-ipv6_addrconf
  11 root        0  -20      0      0      0 I   0.0   0.0   0:00.00 kworker/R-mm_pe
  12 root        20   0      0      0      0 I   0.0   0.0   0:00.00 rcu_tasks_kthread
  13 root        20   0      0      0      0 I   0.0   0.0   0:00.00 rcu_tasks_rude_kthread
  14 root        20   0      0      0      0 I   0.0   0.0   0:00.00 rcu_tasks_trace_kthread
  15 root        20   0      0      0      0 S   0.0   0.0   0:00.07 ksftirqd/0
```

This image shows the output of the top command in a Linux terminal.

- The CPU usage is minimal, with around 1.6% in use and 0% waiting or idle.
- The system has a total of 7894 MiB of memory, with 828.4 MiB used and 4994.7 MiB in cache.
- The highest CPU-consuming process is "Isolated Web Co" using 8.6% of the CPU and 3.9% of memory.
- The user "root" is running the top process, which is consuming 0.3% CPU and 0.1% memory.

Summary

The low-resource VM showed higher CPU and memory usage with slower performance while performing basic tasks like opening applications and searching for files.

Applications took longer to open, and system responsiveness was reduced.

In contrast, the high-resource VM handled tasks more efficiently, with lower CPU and memory utilization, faster task completion, and smoother responsiveness. Overall, the high-resource VM provided a better user experience under similar workloads.

The top output reflects that the high-resource VM had more available memory and lower CPU strain, improving overall performance.