

Assignment 5 - Memory & CPU Monitoring (Performance Troubleshooting)

Part 1: Memory Analysis

1. Check RAM and swap usage: `free -h` 2. Identify:

- Total memory
- Used memory
- Available memory
- Swap usage

```
ubuntu@ip-172-31-5-27: ~  
ubuntu@ip-172-31-5-27:~$ free -h  
              total        used        free      shared  buff/cache   available  
Mem:           914Mi       700Mi        80Mi        2.7Mi       290Mi       214Mi  
Swap:           0B           0B           0B
```

Part 2: System Statistics

1. Run: `vmstat 5 5`

2. Observe:

- Memory usage
- Swap in/out
- CPU idle time

```
ubuntu@ip-172-31-5-27:~$ vmstat 5 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  
2  0     0  82672  12240 285532    0    0   1168   120  404    3  1  1  97  0  0  0  
0  0     0  82672  12240 285572    0    0     0     0  233  362  0  0 100  0  0  0  
0  0     0  82672  12248 285572    0    0     0     5  246  373  0  0 100  0  0  0  
0  0     0  82672  12248 285572    0    0     0     0  234  363  0  0 100  0  0  0  
0  0     0  81700  12604 288912    0    0   715     4  369  522  2  1  97  1  0  0  
ubuntu@ip-172-31-5-27:~$
```

Part 3: Load Average Interpretation

1. Run: `uptime`

2. Note the:

- 1-minute
- 5-minute
- 15-minute load averages

```
ubuntu@ip-172-31-5-27:~$ uptime  
16:00:39 up 7 min,  1 user,  load average: 0.00, 0.00, 0.00  
ubuntu@ip-172-31-5-27:~$
```

Part 4: Correlation Exercise

- High load but low CPU usage → what could be the cause?

This means the process are not using the CPU but are waiting for the resources that may include I/O operations. This happens when many processes are blocked and waiting for the disk reads/writes, memory or in sleep which will increase the load but the CPU will remain idle.

- High swap usage → what does it indicate?

This indicates that the physical RAM is not sufficient so the system is moving the inactive memory pages to disk which means more memory usage this may lead to slower performance.

- When does adding RAM help vs optimizing processes?

Adding RAM helps when the system has high swap usage, frequent I/O that makes the system to slow down as they do not fit in the physical memory. Adding more RAM reduces the swaps.

Optimising processes helps when the memory is begin used inefficiently mainly during too many processes or threads that are running. So optimizing this problem will prevent the wastage and improves the stability.