

Module:-COSA(Concept Of Operating System And Administration)

Date:- 31/10/2022

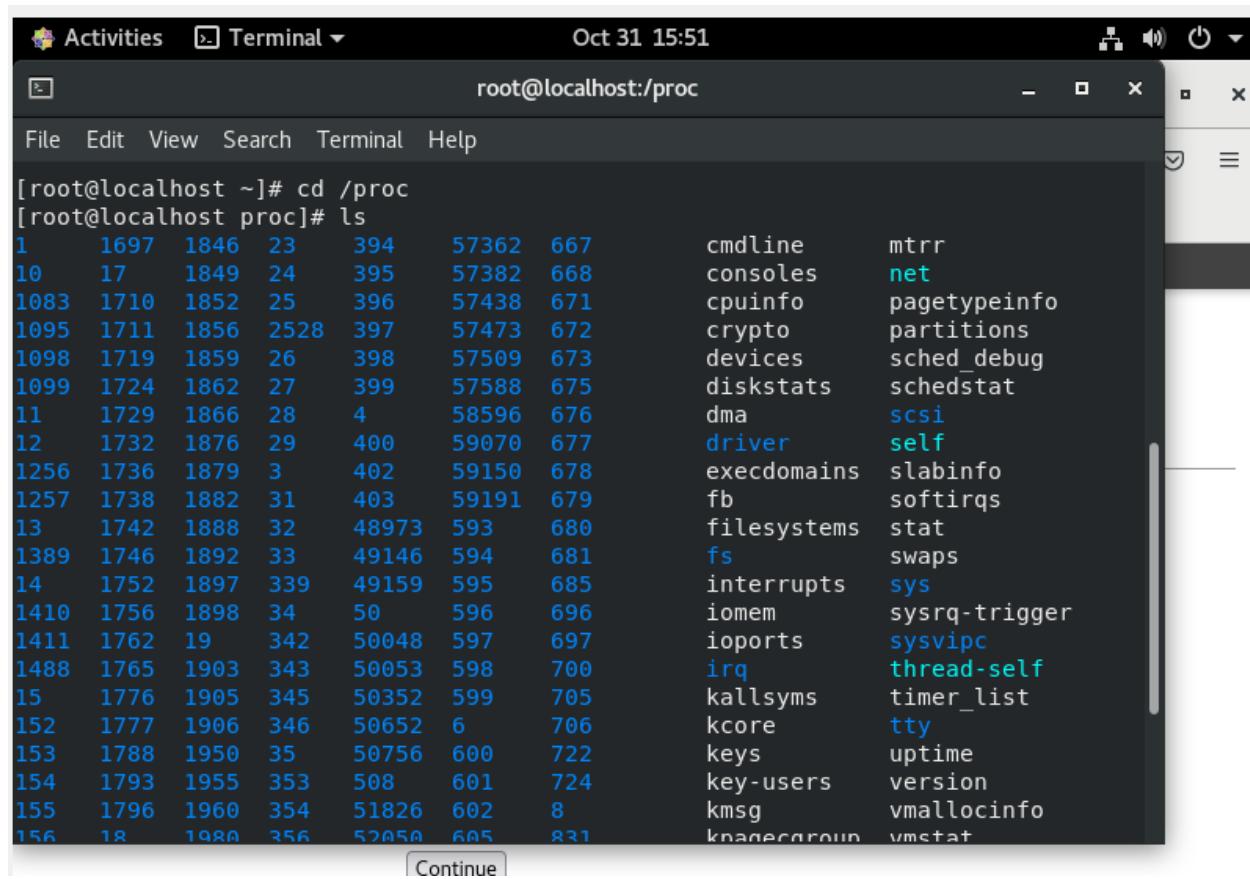
Assignment :- 05

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1. **/proc** :- It is filesystem acts as an interface to internal data structures in the kernel. It can be used to obtain information about the system and to change certain kernel parameters at runtime(sysctl). or we can say It is a temporary file system which stores the CPU or processor data. Below data what we shown in pic. is volatile as the system shutdown it lost. When the system running proc file system generated and use the data.

→ How to Check load on CPU and I/O overtime

```
[root@localhost ~]# glances
[root@localhost ~]# cat /proc/loadavg
0.08 0.32 0.22 3/611 59098
```



The screenshot shows a terminal window titled "root@localhost:/proc". The window displays the output of the command "ls" in the /proc directory. The output lists numerous files and directories, each preceded by a number (e.g., 1, 10, 1083, etc.). The files include cmdline, mtrr, consoles, net, cpuinfo, pagetypeinfo, crypto, partitions, devices, sched_debug, diskstats, schedstat, dma, scsi, driver, self, execdomains, slabinfo, fb, softirqs, filesystems, stat, fs, swaps, interrupts, sys, iomem, sysrq-trigger, ioports, sysvipc, irq, thread-self, kallsyms, timer_list, kcore, tty, keys, uptime, key-users, version, kmsg, vmallocinfo, knapercgroup, and vmstat.

```
[root@localhost ~]# cd /proc
[root@localhost proc]# ls
1      1697  1846  23    394    57362  667      cmdline   mtrr
10     17    1849  24    395    57382  668      consoles  net
1083   1710  1852  25    396    57438  671      cpuinfo   pagetypeinfo
1095   1711  1856  2528  397    57473  672      crypto    partitions
1098   1719  1859  26    398    57509  673      devices   sched_debug
1099   1724  1862  27    399    57588  675      diskstats schedstat
11     1729  1866  28    4      58596  676      dma       scsi
12     1732  1876  29    400    59070  677      driver    self
1256   1736  1879  3     402    59150  678      execdomains slabinfo
1257   1738  1882  31    403    59191  679      fb        softirqs
13     1742  1888  32    48973  593    680      filesystems stat
1389   1746  1892  33    49146  594    681      fs        swaps
14     1752  1897  339   49159  595    685      interrupts sys
1410   1756  1898  34    50     596    696      iomem    sysrq-trigger
1411   1762  19     342   50048  597    697      ioports   sysvipc
1488   1765  1903  343   50053  598    700      irq      thread-self
15     1776  1905  345   50352  599    705      kallsyms timer_list
152    1777  1906  346   50652  6      706      kcore    tty
153    1788  1950  35    50756  600    722      keys     uptime
154    1793  1955  353   508     601    724      key-users version
155    1796  1960  354   51826  602    8       kmsg     vmallocinfo
156    18     1980  356   52050  605    831      knapercgroup vmstat
```

2. **systemctl** :- “systemctl” cmd is used to run, execute and find error .

- How many System Run
- How many system active
- How many system show error

→ It's possible to display services' status like follows:-

CMD:-

```
#systemctl -t service
```

UNIT	LOAD	ACTIVE	SUB	DESCRIPTION
abrt-ccpp.service	loaded	active	exited	Install ABRT coredump hook
abrt-oops.service	loaded	active	running	ABRT kernel log watcher
abrt-xorg.service	loaded	active	running	ABRT Xorg log watcher
abrtd.service	loaded	active	running	ABRT Automated Bug Report
accounts-daemon.service	loaded	active	running	Accounts Service
alsa-state.service	loaded	active	running	Manage Sound Card State (P)
atd.service	loaded	active	running	Job spooling tools
auditd.service	loaded	active	running	Security Auditing Service
avahi-daemon.service	loaded	active	running	Avahi mDNS/DNS-SD Stack
bolt.service	loaded	active	running	Thunderbolt system service
chronyd.service	loaded	active	running	NTP client/server
colord.service	loaded	active	running	Manage, Install and Generate color profiles
crond.service	loaded	active	running	Command Scheduler
cups.service	loaded	active	running	CUPS Scheduler
dbus.service	loaded	active	running	D-Bus System Message Bus
dnf-makecache.service	loaded	failed	failed	dnf makecache
dracut-shutdown.service	loaded	active	exited	Restore /run/initramfs on shutdown
firewalld.service	loaded	active	running	firewalld - dynamic firewall
fprintd.service	loaded	active	running	Fingerprint Authentication
fwupd.service	loaded	active	running	Firmware update daemon

→ List of all services

CMD:-

```
systemctl list-unit-files -t service
```

```
[root@localhost ~]# systemctl list-unit-files -t service
UNIT FILE                                     STATE
abrt-ccpp.service                             enabled
abrt-journal-core.service                     disabled
abrt-oops.service                            enabled
abrt-pstoreoops.service                      disabled
abrt-vmcore.service                          enabled
abrt-xorg.service                           enabled
abrtd.service                                enabled
accounts-daemon.service                     enabled
alsa-restore.service                         static
alsa-state.service                           static
anaconda-direct.service                      static
anaconda-nm-config.service                  static
anaconda-noshell.service                    static
anaconda-pre.service                        static
anaconda-shell@.service                     static
anaconda-ssh.service                        static
anaconda-tmux@.service                      static
anaconda.service                            static
arp-ethers.service                          disabled
atd.service                                  enabled
audited.service                            enabled
auth-rpcgss-module.service                 static
autofs.service                             disabled
autovt@.service                            enabled
avahi-daemon.service                       enabled
```

→ Stop and turn OFF auto-start setting a service if you donot need it

CMD:-

`systemctl stop Service Name`

`systemctl disable Service Name`

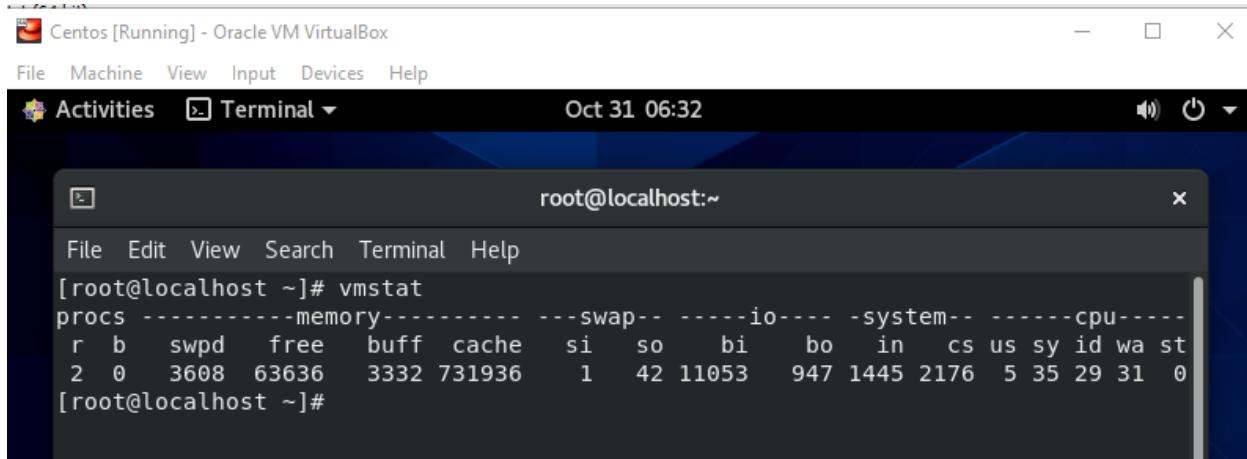
`systemctl enable Service Name`

```
crond.service                               enabled
cups-browsed.service                      disabled
cups.service                                enabled
dbus-org.bluez.service                   enabled
dbus-org.fedoraproject.FirewallD1.service enabled
```

```
[root@localhost ~]# systemctl enable cups-browsed.service
Created symlink /etc/systemd/system/multi-user.target.wants/cups-browsed.service → /usr/lib/systemd/system/cups-browsed.service
[root@localhost ~]# systemctl list-unit-files -t service
```

```
crond.service                               enabled
cups-browsed.service                      enabled
cups.service                                enabled
dbus-org.bluez.service                   enabled
dbus-org.fedoraproject.FirewallD1.service enabled
```

3.vmstat :- It show status of virtual memory.

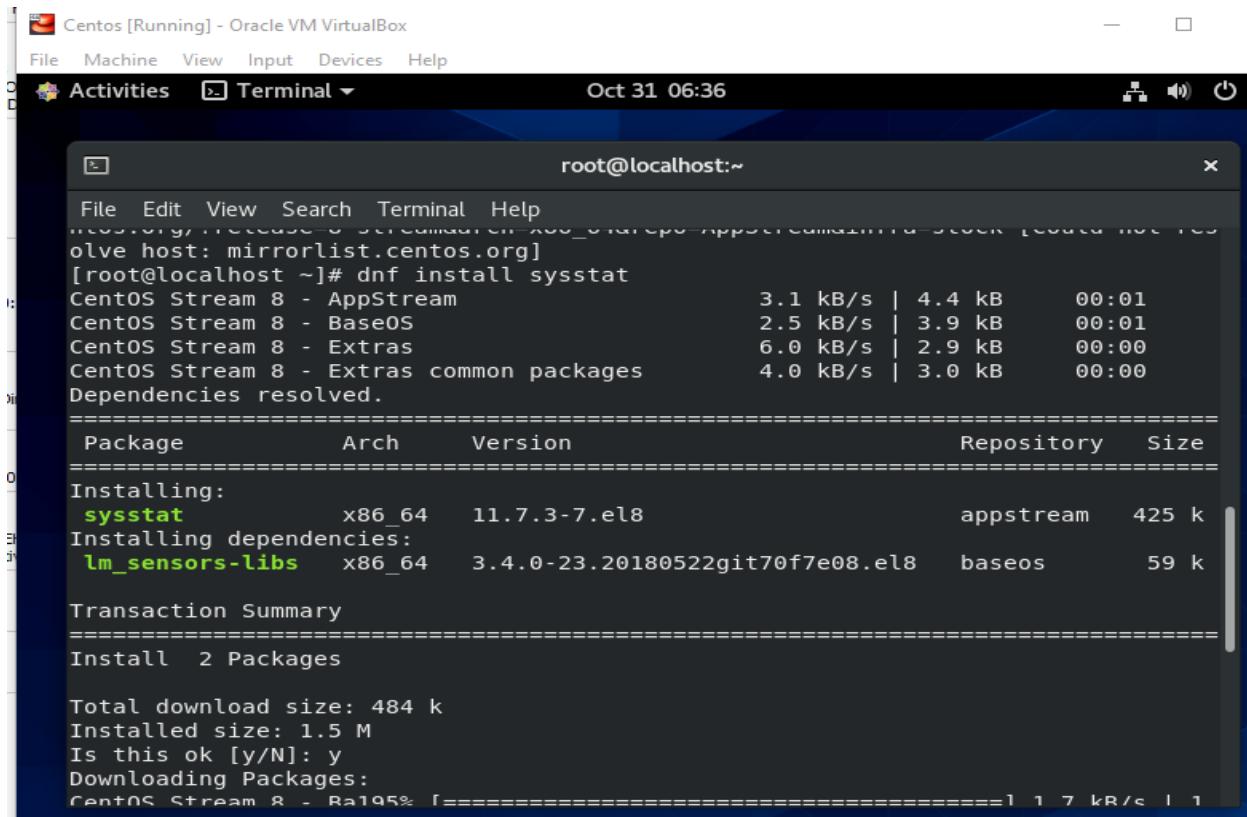


```
[root@localhost ~]# vmstat
procs      memory          swap      io      system      cpu
r b    swpd    free    buff    cache    si    so    bi    bo    in    cs    us    sy    id    wa    st
2 0    3608   63636   3332 731936     1    42 11053    947 1445 2176    5 35 29 31    0
[root@localhost ~]#
```

4.sysstat:- System Activity Report (sar) The sysstat utilities are a collection of performance monitoring tools for Linux. It also include sar, sadf, mpstat, iostat, tapestat, pidstat, cfsiostat and sa tools.

CMD:-System Activity Report (sar)

dnf install sysstat



```
[root@localhost ~]# dnf install sysstat
CentOS Stream 8 - AppStream           3.1 kB/s | 4.4 kB    00:01
CentOS Stream 8 - BaseOS              2.5 kB/s | 3.9 kB    00:01
CentOS Stream 8 - Extras              6.0 kB/s | 2.9 kB    00:00
CentOS Stream 8 - Extras common packages 4.0 kB/s | 3.0 kB    00:00
Dependencies resolved.
=====
# Package           Arch   Version       Repository Size
=====
# Installing:
#  sysstat          x86_64  11.7.3-7.el8      appstream   425 k
Installing dependencies:
#  lm_sensors-libs  x86_64  3.4.0-23.20180522git70f7e08.el8  baseos      59 k

Transaction Summary
=====
Install 2 Packages

Total download size: 484 k
Installed size: 1.5 M
Is this ok [y/N]: y
Downloading Packages:
CentOS Stream 8 - Baseos [=====1 1 7 kB/s] 1 1
```

→ To show the version of sysstat utility

CMD :-

mpstat -V

- mpstat command without using any flags or options will display the global average activites by All CPUs.

```
[root@localhost ~]# mpstat
Linux 4.18.0-383.el8.x86_64 (localhost.localdomain) 10/31/2022 _x86_64_
(1 CPU)

06:36:52 AM CPU %usr %nice %sys %iowait %irq %soft %steal %guest
%gnice %idle
06:36:52 AM all 2.31 0.02 6.89 9.83 9.66 3.33 0.00 0.00
0.00 67.97
```

- Using mpstat with option ‘-P’ (Indicate Processor Number) and ‘ALL’, will display statistics about all CPUs one by one starting from 0

CMD:-

mpstat -P ALL

```
[root@localhost ~]# mpstat -P ALL
Linux 4.18.0-383.el8.x86_64 (localhost.localdomain) 10/31/2022 _x86_64_
(1 CPU)

06:38:55 AM CPU %usr %nice %sys %iowait %irq %soft %steal %guest
%gnice %idle
06:38:55 AM all 1.76 0.02 6.40 7.28 11.41 5.56 0.00 0.00
0.00 67.57
06:38:55 AM 0 1.76 0.02 6.40 7.28 11.41 5.56 0.00 0.00
0.00 67.57
[root@localhost ~]#
```

5.sar(System Activity Reporter):- “sar” helps to get the reports about whole system’s

- To check run queue length, total number of processes and load average

CMD :-

sar -q 2 5

Load Avg. total no of Process

```

0.00 07.57
[root@localhost ~]# sar -q 2 5
Linux 4.18.0-383.el8.x86_64 (localhost.localdomain)      10/31/2022      _x86_64_
(1 CPU)

06:43:49 AM  runq-sz  plist-sz    ldavg-1    ldavg-5    ldavg-15    blocked
06:43:51 AM        2        426      0.08      0.30      0.31          0
06:43:53 AM        3        426      0.24      0.33      0.32          0
06:43:55 AM        1        426      0.24      0.33      0.32          0
06:43:57 AM        0        426      0.22      0.32      0.32          0
06:43:59 AM        1        426      0.22      0.32      0.32          0
Average:         1        426      0.20      0.32      0.32          0
[root@localhost ~]#

```

→ To check statistics about the mounted file systems using -F

CMD:-

`sar -F 1 3 | egrep -v lo`

The screenshot shows a terminal window titled "root@localhost:~". The terminal displays the command `sar -F 1 3 | grep -v lo` and its output. The output shows disk usage statistics for three different partitions over three samples. The columns include MBfsfree, MBfsused, %fsused, %ufsused, Ifree, Iused, and %Iuse.

Time	MBfsfree	MBfsused	%fsused	%ufsused	Ifree	Iused	%Iuse
06:50:30 AM	26706	6845	20.40	20.40	17026664	160152	0.9
06:50:31 AM	16231	147	0.89	0.89	8390644	12	0.0
06:50:31 AM	760	254	25.06	25.06	523978	310	0.0
06:50:31 AM	26706	6845	20.40	20.40	17026664	160152	0.9
06:50:32 AM	16231	147	0.89	0.89	8390644	12	0.0
06:50:32 AM	760	254	25.06	25.06	523978	310	0.0
06:50:32 AM	26706	6845	20.40	20.40	17026664	160152	0.9
06:50:33 AM	26706	6845	20.40	20.40	17026664	160152	0.9

→ To print memory statistics use -r option

```
[root@localhost ~]# sar -r 1 3
Linux 4.18.0-383.el8.x86_64 (localhost.localdomain)      10/31/2022      _x86_64_
(1 CPU)

06:52:11 AM kmemfree    kbavail   kbmemused %memused   kbbuffers   kbcached   kbcommi
t %commit   kbactive   kbinact   kbdirty
06:52:12 AM      78468     864640    1777832    95.77        4     886608    333164
4     83.07    649804     872124          0
06:52:13 AM      78348     864628    1777952    95.78        4     886716    333164
4     83.07    649912     872128          0
06:52:14 AM      78288     864568    1778012    95.78        4     886716    333164
4     83.07    649912     872156          0
Average:       78368     864612    1777932    95.78        4     886680    333164
4     83.07    649876     872136          0
[root@localhost ~]#
```

6.pidstat:- It is used for process monitoring and current threads, which are being managed by kernel. pidstat can also check the status about child processes and threads.

→ To print all active and non-active tasks use the option ‘-p’ (processes).

CMD:-

pidstat -p ALL

```
[root@localhost ~]# pidstat -p ALL
Linux 4.18.0-383.el8.x86_64 (localhost.localdomain)      10/31/2022      _x86_64_
(1 CPU)

06:55:53 AM   UID      PID  %usr %system  %guest  %wait  %CPU   CPU  Comm
nd
06:55:53 AM     0        1  0.01   0.07   0.00   0.19   0.08   0  syste
md
06:55:53 AM     0        2  0.00   0.00   0.00   0.01   0.00   0  kthre
add
06:55:53 AM     0        3  0.00   0.00   0.00   0.00   0.00   0  rcu_g
p
06:55:53 AM     0        4  0.00   0.00   0.00   0.00   0.00   0  rcu_p
ar_gp
06:55:53 AM     0        6  0.00   0.00   0.00   0.00   0.00   0  kwork
er/0:0H-events_highpri
06:55:53 AM     0        8  0.00   0.00   0.00   0.00   0.00   0  mm_pe
rcpu_wq
06:55:53 AM     0        9  0.00   0.00   0.00   0.00   0.00   0  rcu_t
asks_rude_
06:55:53 AM     0       10  0.00   0.00   0.00   0.00   0.00   0  rcu_t
acks_trace
```

→ Using pidstat command with ‘-d 2’ option, we can get I/O statistics within 2 seconds interval to get refreshed statistics. This option can be handy in situation, where your system is undergoing heavy I/O and you want to get clues about the processes consuming high resources.

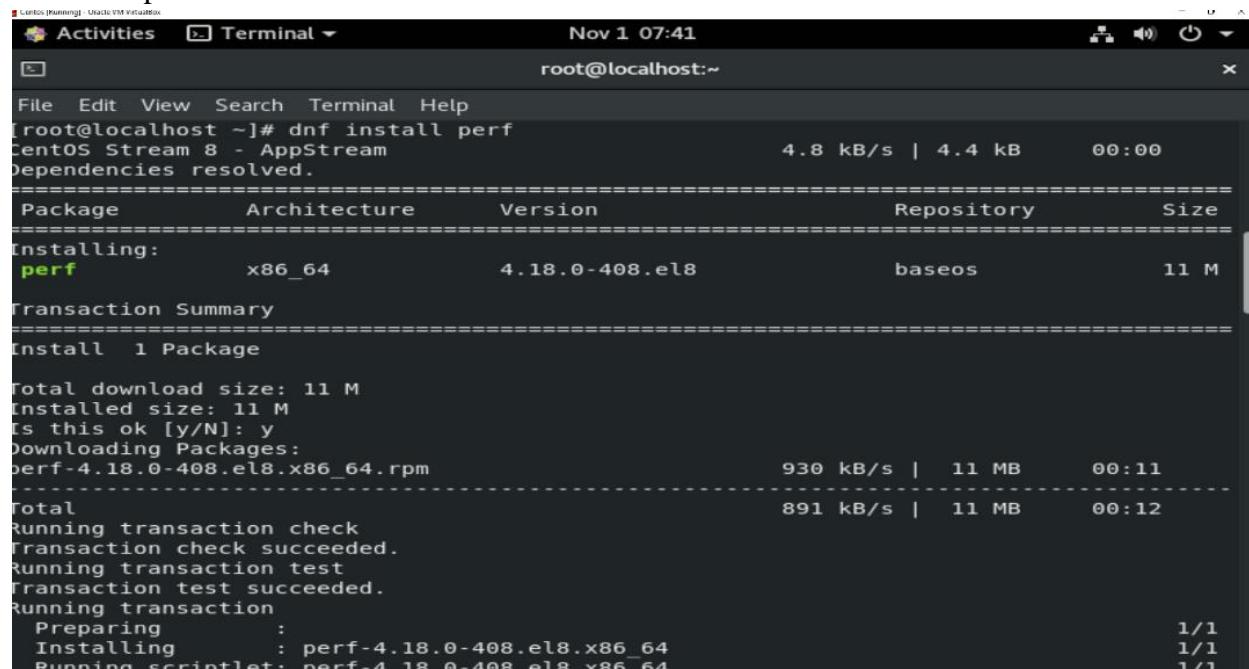
CMD :-

```
pidstat -d 2 n z
```

7.perf:- Performance monitoring for the Linux Kernel. It gives report which parameters passed or failed or skipped those parameters which is not applicable for the systems.

CMD:-

```
dnf install perf
```



The screenshot shows a terminal window titled 'Activities' with a sub-tab 'Terminal'. The title bar indicates the date and time as 'Nov 1 07:41' and the user as 'root@localhost:~'. The terminal output shows the command 'dnf install perf' being run, along with its progress and transaction summary. The transaction summary shows one package being installed: 'perf' version 4.18.0-408.el8. The transaction completed successfully with a total download size of 11 M and a total installed size of 11 M.

```
[root@localhost ~]# dnf install perf
[CentOS Stream 8 - AppStream]
Dependencies resolved.
=====
Package           Architecture      Version            Repository      Size
=====
Installing:
perf              x86_64          4.18.0-408.el8   baseos        11 M
Transaction Summary
=====
Install 1 Package
Total download size: 11 M
Installed size: 11 M
Is this ok [y/N]: y
Downloading Packages:
perf-4.18.0-408.el8.x86_64.rpm          930 kB/s | 11 MB  00:11
Total                                         891 kB/s | 11 MB  00:12
Running transaction check
Transaction check succeeded.
Running transaction test
Transaction test succeeded.
Running transaction
  Preparing           : 1/1
  Installing         : perf-4.18.0-408.el8.x86_64 1/1
  Running scriptlet: perf-4.18.0-408.el8.x86_64 1/1
```

→ To perform sanity test in the system

CMD :-

```
perf test
```

```

File Edit View Search Terminal Help
[root@localhost ~]# perf test
1: vmlinux symtab matches kallsyms : Skip
2: Detect openat syscall event : Ok
3: Detect openat syscall event on all cpus : Ok
4: Read samples using the mmap interface : Ok
5: Test data source output : Ok
6: Parse event definition strings : Ok
7: Simple expression parser : Ok
8: PERF_RECORD_* events & perf_sample fields : Ok
9: Parse perf pmu format : Ok
10: PMU events :
10.1: PMU event table sanity : Ok
10.2: PMU event map aliases : Ok
10.3: Parsing of PMU event table metrics : Skip (some metric s failed)
10.4: Parsing of PMU event table metrics with fake PMUs : Ok
11: DSO data read : Ok
12: DSO data cache : Ok
13: DSO data reopen : Ok
14: Roundtrip evsel->name : Ok
15: Parse sched tracepoints fields : Ok
16: syscalls:sys_enter_openat event fields : Ok
17: Setup struct perf_event_attr : Ok
18: Match and link multiple hists : Ok
19: 'import perf' in python : Ok
20: Breakpoint overflow signal handler : Ok
21: Breakpoint overflow sampling : Ok
22: Breakpoint accounting : Ok

```

8. turbostat:- Report processor frequency and idle statistics. It gives the report about the processor performance.

CMD :-

turbostat

```

File Edit View Search Terminal Help
[root@localhost ~]# turbostat
turbostat version 21.05.04 - Len Brown <lenb@kernel.org>
CPUID(0): GenuineIntel 0x16 CPUID levels
CPUID(1): family:model:stepping 0x6:9:e:a (6:158:10) microcode 0xffffffff
CPUID(0x80000000): max_extended_levels: 0x80000008
CPUID(1): SSE3 - - - TSC MSR - HT -
CPUID(6): No-APERF, No-TURBO, No-DTS, No-PTM, No-HWP, No-HWPnotify, No-HWPwindow
, No-HWPepp, No-HWPpkg, No-EPB
cpu0: MSR_IA32_MISC_ENABLE: 0x000851809 (TCC EIST MWAIT PREFETCH TURBO)
CPUID(7): No-SGX
CPUID(0x16): base_mhz: 0 max_mhz: 0 bus_mhz: 0
cpu0: MSR_MISC_PWR_MGMT: 0x00000000 (ENable-EIST_Coordination DISable-EPB DISabl
e-OOB)
RAPL: inf sec. Joule Counter Range, at 0 Watts
cpu0: MSR_PLATFORM_INFO: 0x80800000002000
8 * 100.0 = 800.0 MHz max efficiency frequency
32 * 100.0 = 3200.0 MHz base frequency
cpu0: MSR_IA32_POWER_CTL: 0x00000000 (C1E auto-promotion: DISabled)
cpu0: MSR_TURBO_RATIO_LIMIT: 0x2a2a2a2a
42 * 100.0 = 4200.0 MHz max turbo 4 active cores
42 * 100.0 = 4200.0 MHz max turbo 3 active cores
42 * 100.0 = 4200.0 MHz max turbo 2 active cores
42 * 100.0 = 4200.0 MHz max turbo 1 active cores
cpu0: MSR_CONFIG_TDP_NOMINAL: 0x00000000 (base ratio=0)

```

9. iostat:- Report central processing unit (CPU) statistics and input/output statistics for devices and partitions.-

```
[root@localhost ~]# iostat
Linux 4.18.0-383.el8.x86_64 (localhost.localdomain)      11/01/2022      _x86_64_
(1 CPU)

avg-cpu: %user   %nice %system %iowait  %steal   %idle
          0.26    0.00   1.96   0.60    0.00   97.17

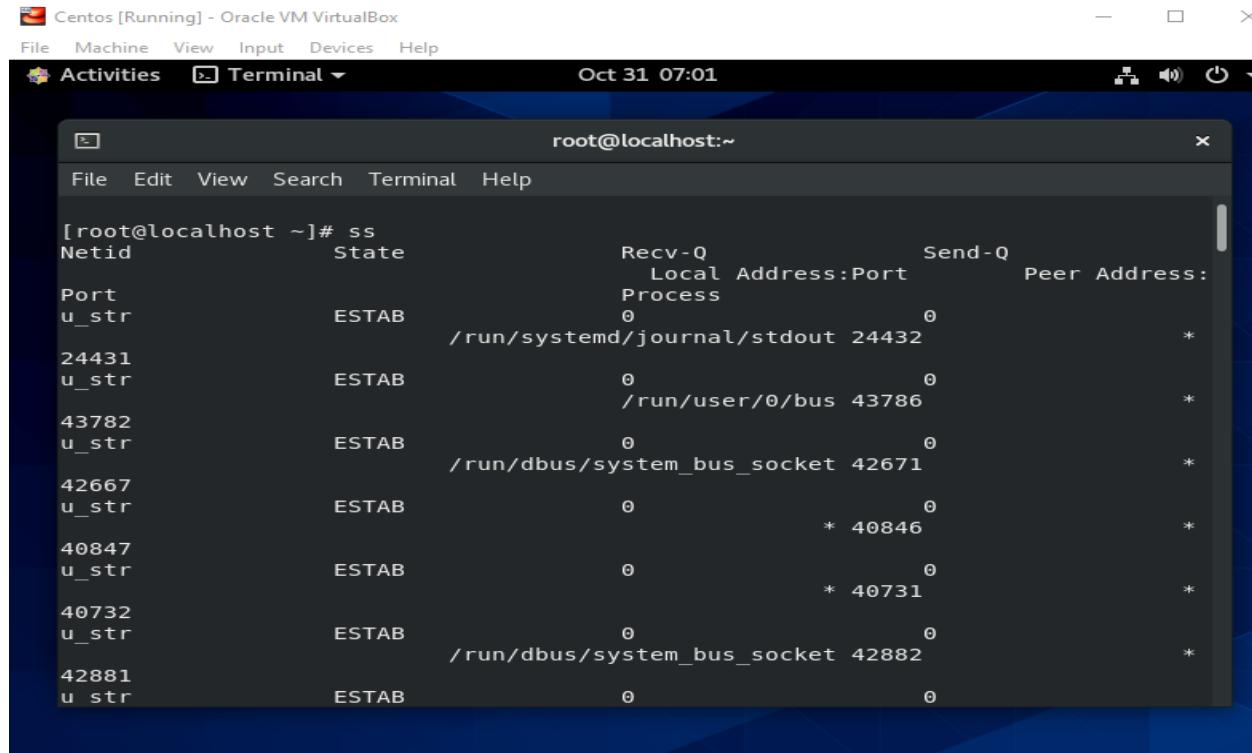
Device      tps    kB_read/s    kB_wrtn/s    kB_read    kB_wrtn
sda       4.12    132.22     65.06  12052268  5930057
scd0      0.00    0.00     0.00        2         0
dm-0      1.88   116.14     24.46 10586533  2229236
dm-1     14.00    15.48     40.56 1411252  3696668
dm-2      0.00    0.03     0.02    2545     2068
```

10. irqbalance:- It distribute hardware interrupts across processors on multiprocessor system in order to increase performance. It will find a balance between power savings and optimal performance. Its work is invisible to us. The daemon balances savings in power consumption with performance. The irqbalance configuration file is /etc/sysconfig/irqbalance allows the selection of which CPU's which may be assigned which interrupts.

11. ss:- It is a Network tool which is used for displaying network socket related information on a Linux system. The tool displays more detailed information than the “netstat” command which is used for displaying active socket connections

CMD :-

ss



```
Centos [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
Activities Terminal Oct 31 07:01
root@localhost:~
```

The terminal window shows the following output of the 'ss' command:

```
[root@localhost ~]# ss
Netid      State      Recv-Q      Send-Q      Local Address:Port      Peer Address:
Port
u_str      ESTAB      0           0           /run/systemd/journal/stdout 24432          *
24431
u_str      ESTAB      0           0           /run/user/0/bus            43786          *
43782
u_str      ESTAB      0           0           /run/dbus/system_bus_socket 42671          *
42667
u_str      ESTAB      0           0           * 40846                  *
40847
u_str      ESTAB      0           0           * 40731                  *
40732
u_str      ESTAB      0           0           /run/dbus/system_bus_socket 42882          *
42881
u_str      ESTAB      0           0           
```

→ To retrieve a list of both listening and non-listening ports using the -a

CMD:-

ss -a

```
[root@localhost ~]# ss -a
Netid State      Recv-Q Send-Q          Local Address:Port          Peer Address:
Port
nl  UNCONN      0      0          rtnl:kernel                   *
nl  UNCONN      0      0          rtnl:evolution-addre/2607    *
nl  UNCONN      0      0          rtnl:-104856237              *
nl  UNCONN      0      0          rtnl:gnome-software/2630    *
nl  UNCONN      0      0          rtnl:evolution-calen/2562   *
nl  UNCONN      0      0          rtnl:avahi-daemon/1035     *
nl  UNCONN      0      0          rtnl:1757                     *
nl  UNCONN      0      0          rtnl:goa-daemon/2425       *
nl  UNCONN      0      0          rtnl:firefox/3281           *
nl  UNCONN      0      0          rtnl:1992295763             *
nl  UNCONN      0      0          rtnl:2059404286             *
nl  UNCONN      0      0          rtnl:NetworkManager/1167   *
```

→ To display listening sockets only, use the “-l” flag

CMD:-

ss -l

```
[root@localhost ~]# ss -l
Netid State      Recv-Q Send-Q          Local Address:Port          Peer Address:Port
Port
nl  UNCONN      0      0          rtnl:kernel                   *
nl  UNCONN      0      0          rtnl:evolution-addre/2607    *
nl  UNCONN      0      0          rtnl:-104856237              *
nl  UNCONN      0      0          rtnl:gnome-software/2630    *
nl  UNCONN      0      0          rtnl:evolution-calen/2562   *
nl  UNCONN      0      0          rtnl:avahi-daemon/1035     *
nl  UNCONN      0      0          rtnl:1757                     *
nl  UNCONN      0      0          rtnl:goa-daemon/2425       *
nl  UNCONN      0      0          rtnl:firefox/3281           *
nl  UNCONN      0      0          rtnl:1992295763             *
nl  UNCONN      0      0          rtnl:2059404286             *
nl  UNCONN      0      0          rtnl:NetworkManager/1167   *
nl  UNCONN      0      0          rtnl:abrt-applet/2660      *
nl  UNCONN      0      0          rtnl:firefox/3281           *
nl  UNCONN      0      0          rtnl:gnome-software/2630    *
nl  UNCONN      0      0          rtnl:abrt-applet/2660      *
nl  UNCONN      0      0          rtnl:evolution-addre/2607    *
nl  UNCONN      0      0          rtnl:evolution-calen/2562   *
nl  UNCONN      0      0          rtnl:goa-daemon/2425       *
nl  UNCONN      0      0          rtnl:1757                     *
nl  UNCONN      0      0          rtnl:NetworkManager/1167   *
nl  UNCONN      0      0          rtnl:avahi-daemon/1035     *
nl  UNCONN      0      0          rtnl:2059404286             *
nl  UNCONN      768     0          tcpdiag:kernel               *
nl  UNCONN     4352     0          tcpdiag:ss/8550            *
```

→ To display all TCP connection, use the –t

CMD :-

ss -t

State	Recv-Q	Send-Q	Local Address:Port	Peer Address:Port
ESTAB	0	0	192.168.213.129:45602	34.120.158.37:https
ESTAB	0	0	192.168.213.129:49002	52.35.225.239:https
ESTAB	0	0	192.168.213.129:42132	142.251.42.37:https
ESTAB	0	0	192.168.213.129:58264	142.250.193.165:https
ESTAB	0	0	192.168.213.129:37710	172.217.166.67:https
ESTAB	0	0	192.168.213.129:49450	142.251.42.14:https
ESTAB	0	0	192.168.213.129:42134	142.251.42.37:https
ESTAB	0	0	192.168.213.129:44034	142.250.183.106:https

→ To view all the listening TCP socket connection use the “-lt”

CMD:-

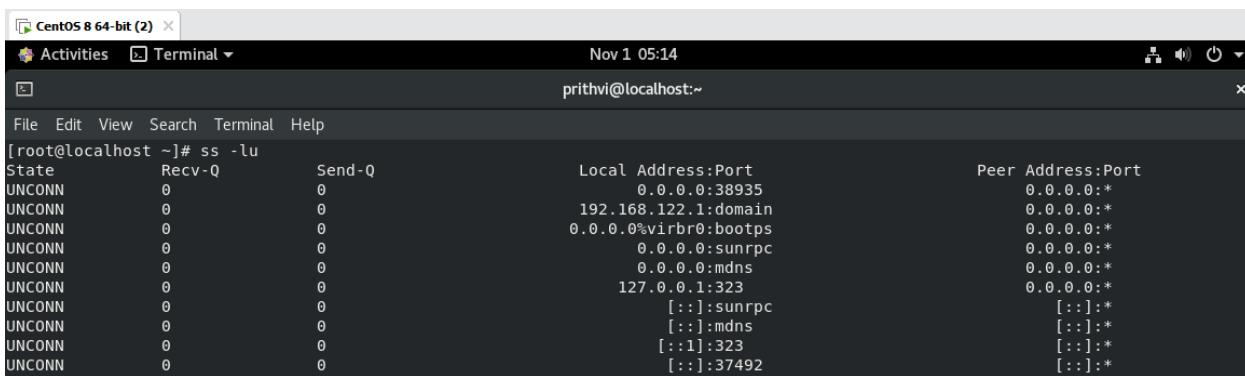
ss -lt

State	Recv-Q	Send-Q	Local Address:Port	Peer Address:Port
LISTEN	0	128	0.0.0.0:sunrpc	0.0.0.0:*
LISTEN	0	32	192.168.122.1:domain	0.0.0.0:*
LISTEN	0	128	0.0.0.0:ssh	0.0.0.0:*
LISTEN	0	5	127.0.0.1:ipp	0.0.0.0:*
LISTEN	0	128	[::]:sunrpc	[::]:*
LISTEN	0	128	[::]:ssh	[::]:*
LISTEN	0	5	[::1]:ipp	[::]:*

→ To list listening UDP connection use “-lu” option.

CMD:-

ss -lu



State	Recv-Q	Send-Q	Local Address:Port	Peer Address:Port
UNCONN	0	0	0.0.0.0:38935	0.0.0.0:*
UNCONN	0	0	192.168.122.1:domain	0.0.0.0:*
UNCONN	0	0	0.0.0.0:virbr0:bootps	0.0.0.0:*
UNCONN	0	0	0.0.0.0:sunrpc	0.0.0.0:*
UNCONN	0	0	0.0.0.0:mdns	0.0.0.0:*
UNCONN	0	0	127.0.0.1:323	0.0.0.0:*
UNCONN	0	0	[::]:sunrpc	[::]:*
UNCONN	0	0	[::]:mdns	[::]:*
UNCONN	0	0	[::1]:323	[::]:*
UNCONN	0	0	[::]:37492	[::]:*

→ To display the process IDs related to socket connections, use the -p flag as shown

CMD:-

ss -p

```
[root@localhost ~]# ss -p
Netid State    Recv-Q Send-Q          Local Address:Port          Peer Address:Port
u_seq ESTAB    0      0          * 103371          * 0
users:(("firefox",pid=3281,fd=255))
u_str ESTAB    0      0          * 51004           * 51005
users:(("gsd-media-keys",pid=2508,fd=8))
u_str ESTAB    0      0          * 43242           * 43244
users:(("gsd-screensaver",pid=2047,fd=1))
u_str ESTAB    0      0          * 43011           * 43013
users:(("gsd-media-keys",pid=2026,fd=1))
u_str ESTAB    0      0          * 29020           * 29019
users:(("auditd",pid=972,fd=9))
u_str ESTAB    0      0          * 48542           * 48543
users:(("ibus-x11",pid=2381,fd=5))
u_str ESTAB    0      0          /run/dbus/system_bus_socket 46861          * 46860
users:(("dbus-daemon",pid=1040,fd=30))
u_str ESTAB    0      0          /run/user/0/bus 46850          * 46767
users:(("dbus-daemon",pid=2238,fd=14))
u_str ESTAB    0      0          * 42212           * 42213
users:(("upowerd",pid=1981,fd=5))
u_str ESTAB    0      0          /run/systemd/journal/stdout 50049          * 50046
users:(("systemd-journal",pid=598,fd=151),("systemd",pid=1,fd=169))
u_str ESTAB    0      0          /run/dbus/system_bus_socket 45950          * 45949
users:(("dbus-daemon",pid=1040,fd=28))
```

→ To display summary statistics, using the “-s” option.

CMD:-

SS -S

```
CentOS 8 64-bit (2) ×
Activities Terminal ▾ Nov 01 05:20
prithvi@localhost:~
```

File Edit View Search Terminal Help

```
[root@localhost ~]# ss -s
Total: 1387
TCP:   12 (estab 3, closed 2, orphaned 0, timewait 1)

Transport Total      IP          IPv6
RAW      1            0            1
UDP     11            7            4
TCP     10            7            3
INET    22            14           8
FRAG    0             0            0
```

12.numastat:- The “numastat” tool is used to display node memory statistics of processes and operating systems from the kernel memory allocator. Each NUMA has different memory policies.

```
Cortos [Running] Oracle VM VirtualBox
Activities Terminal Nov 1 08:28
root@localhost:~ x

File Edit View Search Terminal Help
[root@localhost ~]# numastat
bash: numastat: command not found...
Install package 'numactl' to provide command 'numastat'? [N/y] y

* Waiting in queue...
* Loading list of packages....
The following packages have to be installed:
  numactl-2.0.12-13.el8.x86_64    Library for tuning for Non Uniform Memory Access machines
Proceed with changes? [N/y] y

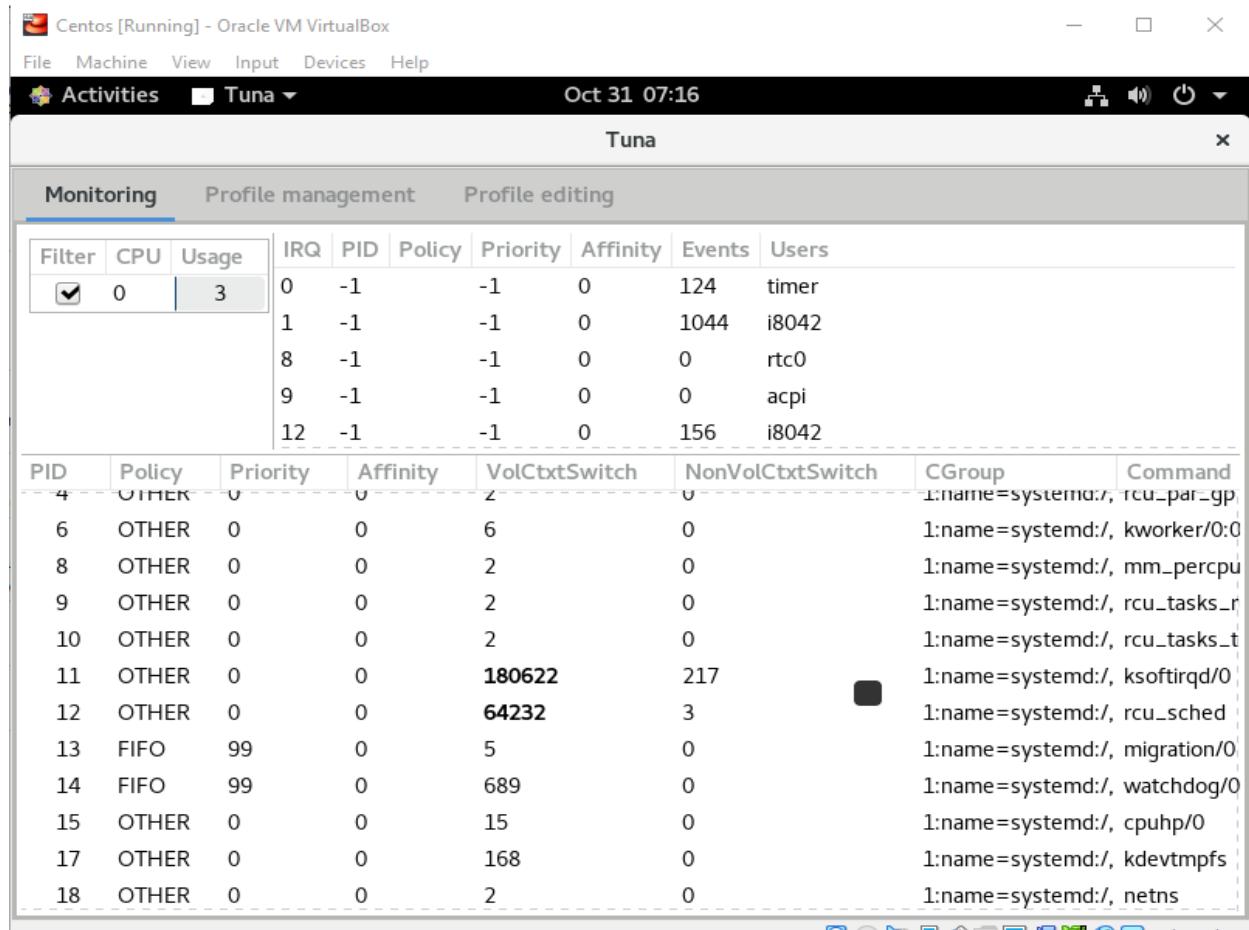
* Waiting in queue...
* Waiting for authentication...
* Waiting in queue...
* Downloading packages...
* Requesting data...
* Testing changes...
* Installing packages...
          node0
numa_hit           20523672
numa_miss           0
numa_foreign          0
interleave_hit       28740
local_node          20523672
other_node            0
```

```
[root@localhost ~]# numastat
          node0
numa_hit           20539555
numa_miss           0
numa_foreign          0
interleave_hit       28740
local_node          20539555
other_node            0
[root@localhost ~]# █
```

13.tuna:- It is a tool that can be used to adjust scheduler tunables such as such as schedulaer policy, RT priority and CPU affinity. It also allows the user to see the results of these changes. Most Tuna operations can be performed on either the command line or in the GUI.

```
Cortos [Running] Oracle VM VirtualBox
Activities Terminal Nov 1 08:35
root@localhost:~ x

File Edit View Search Terminal Help
[root@localhost ~]# tuna
profileName = example.conf
[root@localhost ~]# █
```



14.ethtool:- It is a networking utility on Linux. It is used to configure Ethernet devices on Linux. ethtool can also be used to find a lot of information about connected Ethernet devices on your Linux computer.

→ To show the version of ethtool

CMD :-

ethtool –version

```
CentOS 8 64-bit (2) 
Activities Terminal Nov 1 05:37
prithvi@localhost:~ 
File Edit View Search Terminal Help
[root@localhost ~]# ethtool --version
ethtool version 5.0
[root@localhost ~]#
```

→ To display the information about a NIC (Network Interface Card)

CMD :-

ethtool enp0s3

```
[root@localhost ~]# ethtool ens160
Settings for ens160:
  Supported ports: [ TP ]
  Supported link modes:  1000baseT/Full
                         10000baseT/Full
  Supported pause frame use: No
  Supports auto-negotiation: No
  Supported FEC modes: Not reported
  Advertised link modes: Not reported
  Advertised pause frame use: No
  Advertised auto-negotiation: No
  Advertised FEC modes: Not reported
  Speed: 10000Mb/s
  Duplex: Full
  Port: Twisted Pair
  PHYAD: 0
  Transceiver: internal
  Auto-negotiation: off
  MDI-X: Unknown
  Supports Wake-on: uag
  Wake-on: d
  Link detected: yes
```

→ To check for the driver used

CMD :-

```
ethtool -i enp0s3
```

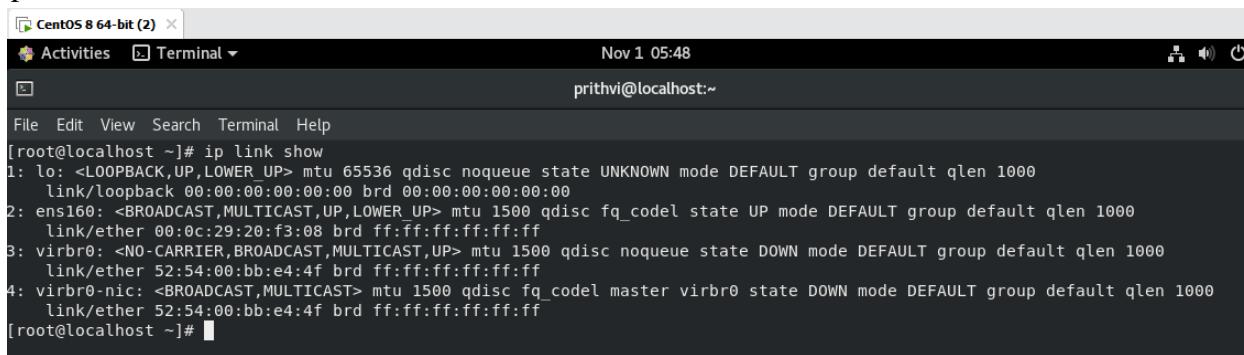
```
[root@localhost ~]# ethtool -i enp0s3
driver: vmxnet3
version: 1.4.17.0-k-NAPI
firmware-version:
expansion-rom-version:
bus-info: 0000:03:00.0
supports-statistics: yes
supports-test: no
supports-eeprom-access: no
supports-register-dump: yes
supports-priv-flags: no
[root@localhost ~]#
```

15.ip :- This command is used to show or manipulate routing, devices and tunnels. It is similar to ifconfig command.

→ To find the assigned names of all the available network interfaces of your computer

CMD:-

ip link show



The screenshot shows a terminal window titled "CentOS 8 64-bit (2)" with the command "ip link show" run by root. The output lists four network interfaces: lo (loopback), ens160 (ethernet), virbr0 (bridge), and virbr0-nic (veth pair). Each interface is shown with its MTU, queueing discipline (qdisc), state, link layer information (MAC address), and broadcast address.

```
[root@localhost ~]# ip link show
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN mode DEFAULT group default qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
2: ens160: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP mode DEFAULT group default qlen 1000
    link/ether 00:0c:29:20:f3:08 brd ff:ff:ff:ff:ff:ff
3: virbr0: <NO-CARRIER,BROADCAST,MULTICAST,UP> mtu 1500 qdisc noqueue state DOWN mode DEFAULT group default qlen 1000
    link/ether 52:54:00:bb:e4:4f brd ff:ff:ff:ff:ff:ff
4: virbr0-nic: <NO-CARRIER,BROADCAST,MULTICAST> mtu 1500 qdisc fq_codel master virbr0 state DOWN mode DEFAULT group default qlen 1000
    link/ether 52:54:00:bb:e4:4f brd ff:ff:ff:ff:ff:ff
[root@localhost ~]#
```