

# 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
```

```
root@localhost:/proc
File Edit View Search Terminal Help
[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     1988 356   52050 605    831    kpagegroup  vmstat
Continue
```

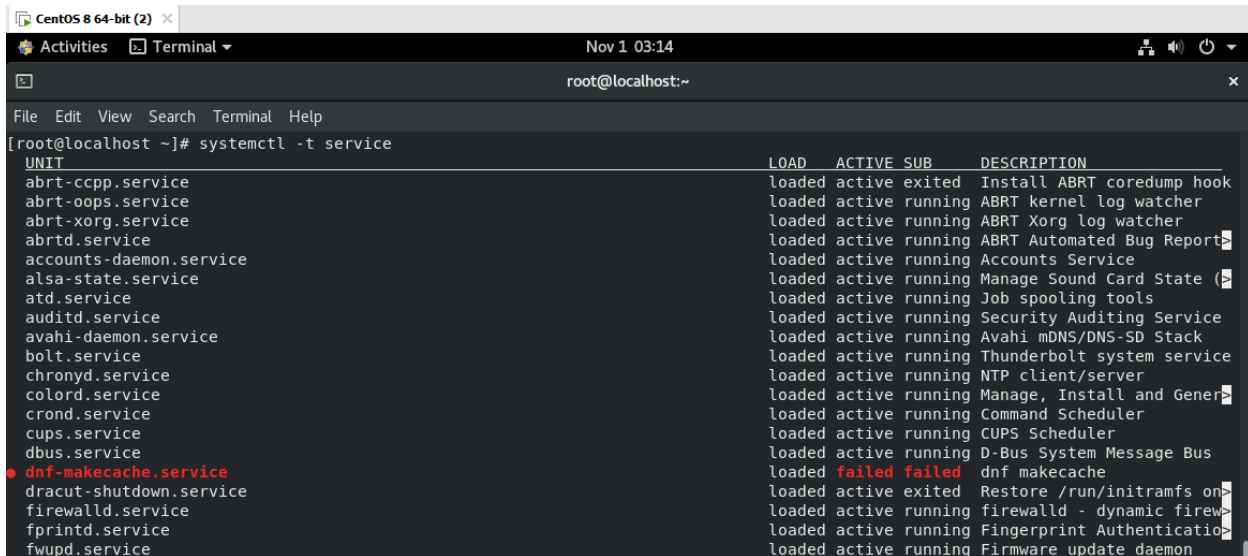
2. **systemctl** :- “systemctl” cmd is used to run, execute and find error .

- 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`



```
CentOS 8 64-bit (2) x
Activities Terminal Nov 1 03:14
root@localhost:~
File Edit View Search Terminal Help
[root@localhost ~]# 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
abrttd.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
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 Gener
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
firewalld.service	loaded	active	running	firewalld - dynamic firew
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`

```
CentOS 8 64-bit (2) x
Activities Terminal Nov 1 03:21 root@localhost:~
File Edit View Search Terminal Help
[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
abrttd.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-sshd.service static
anaconda-tmux@.service static
anaconda.service static
arp-ethers.service disabled
atd.service enabled
auditd.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:-

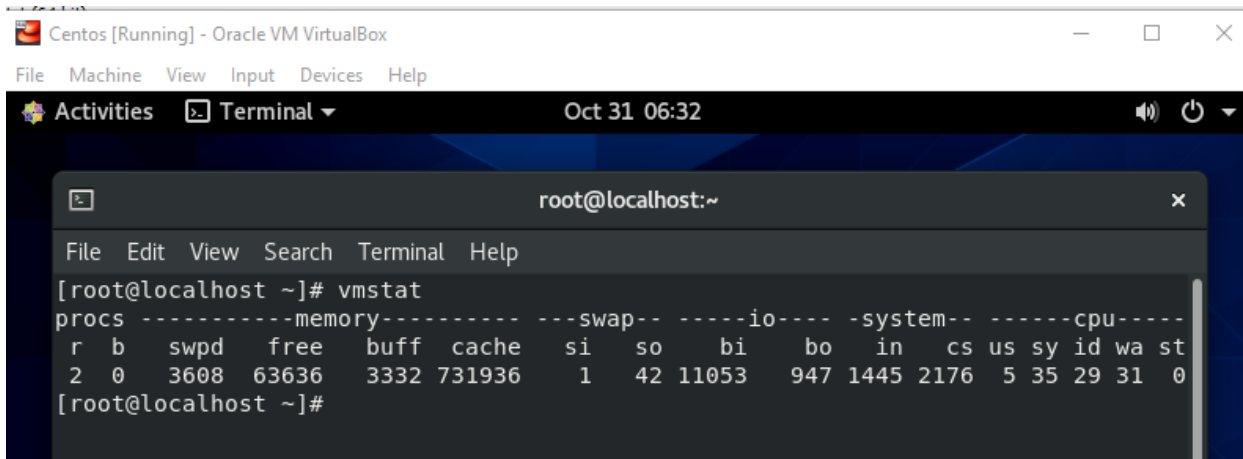
systemctl stop Service Name  
systemctl disable Service Name  
systemctl enable Service Name

```
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.



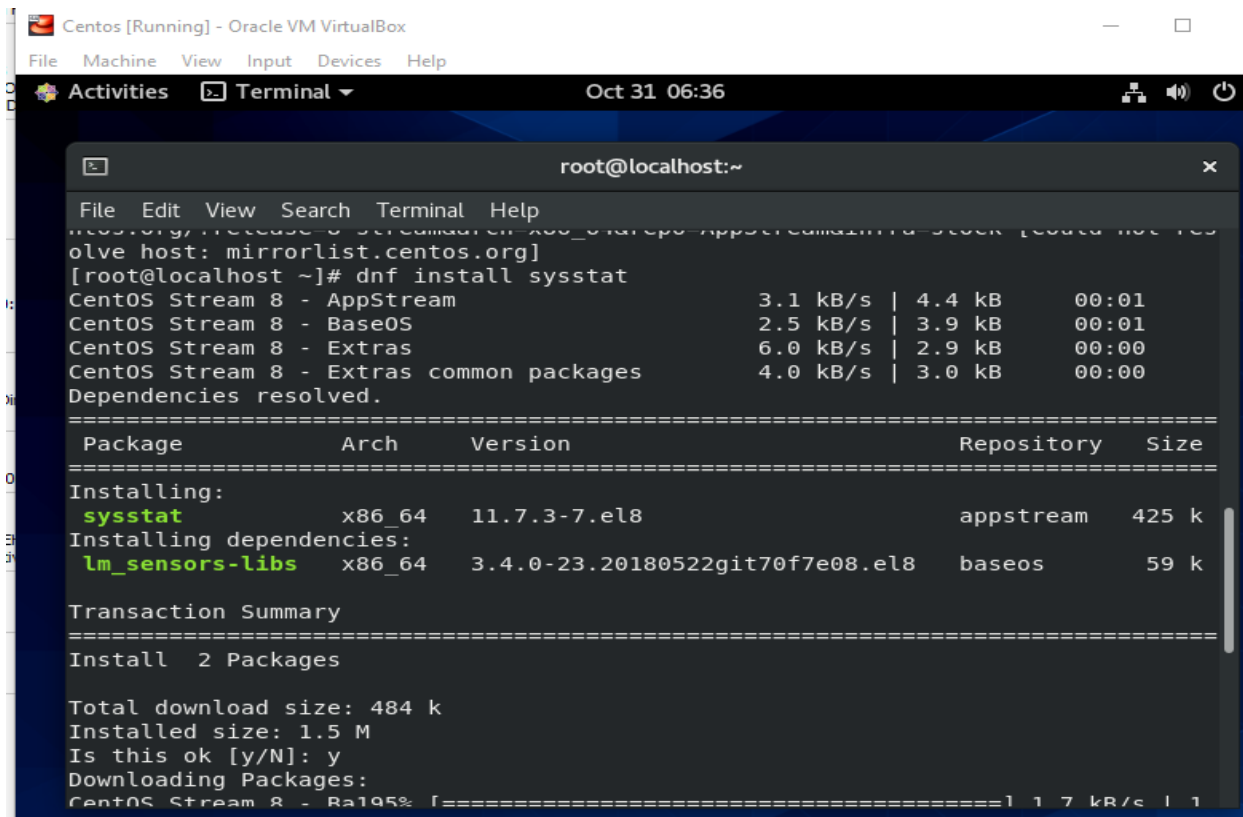
```
Centos [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
Activities Terminal Oct 31 06:32

root@localhost:~
File Edit View Search Terminal Help
[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, cifsioestat and sa tools.

**CMD:-System Activity Report (sar)**

dnf install sysstat



```
Centos [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
Activities Terminal Oct 31 06:36

root@localhost:~
File Edit View Search Terminal Help
[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 - Ba105% [=====1 1 7 kB/s | 1
```

→ To show the version of sysstat utility

CMD :-

mpstat -V

→ mpstat command without using any flags or options will display the global average activities 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 :-

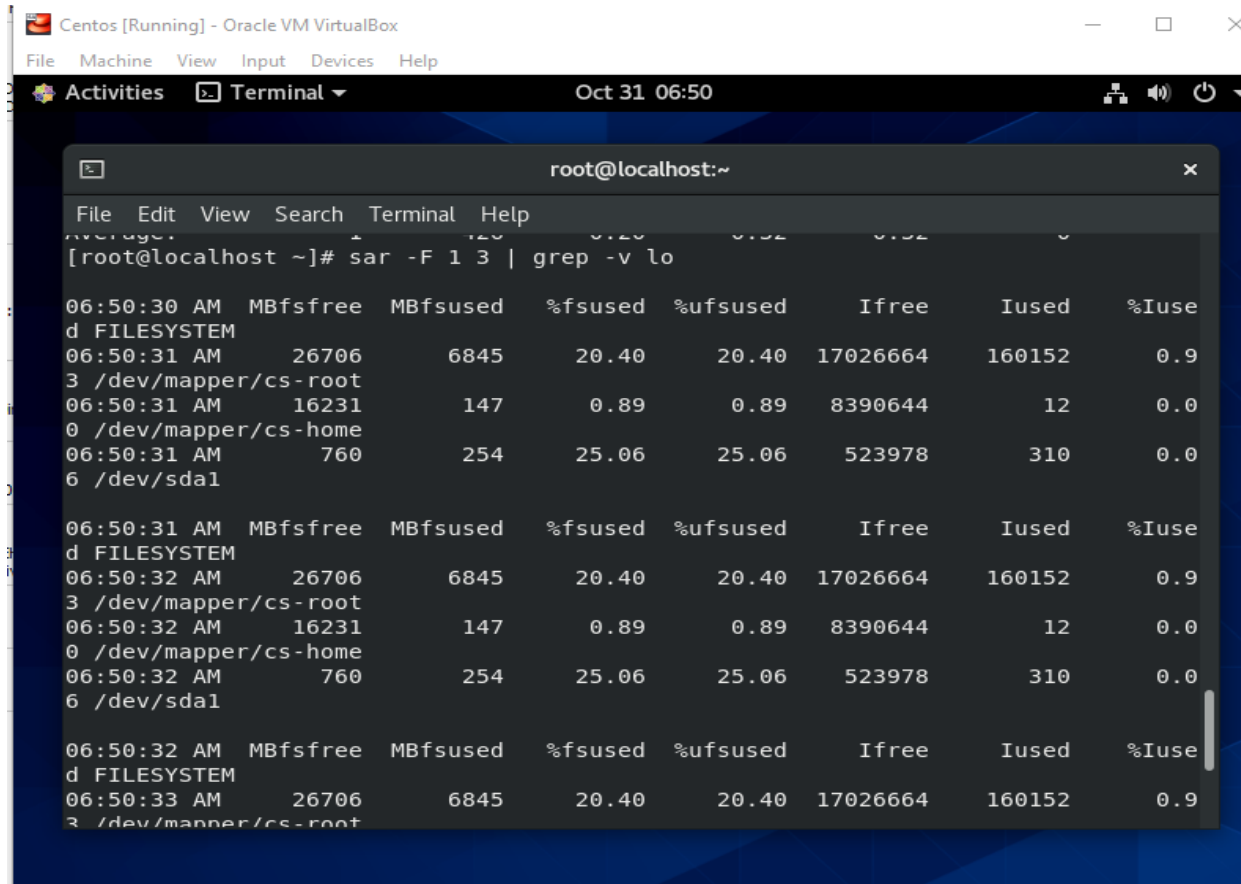
sar -q    2                      5  
         ↓                      ↓  
         Load Avg.    total no of Process

```
0.00 07.37
[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`



```
Centos [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
Activities Terminal Oct 31 06:50

root@localhost:~
File Edit View Search Terminal Help
Average: 1 426 0.20 0.32 0.32 0
[root@localhost ~]# sar -F 1 3 | grep -v lo

06:50:30 AM MBfsfree MBfsused %fsused %ufsused Ifree Iused %Iuse
d FILESYSTEM
06:50:31 AM 26706 6845 20.40 20.40 17026664 160152 0.9
3 /dev/mapper/cs-root
06:50:31 AM 16231 147 0.89 0.89 8390644 12 0.0
0 /dev/mapper/cs-home
06:50:31 AM 760 254 25.06 25.06 523978 310 0.0
6 /dev/sda1

06:50:31 AM MBfsfree MBfsused %fsused %ufsused Ifree Iused %Iuse
d FILESYSTEM
06:50:32 AM 26706 6845 20.40 20.40 17026664 160152 0.9
3 /dev/mapper/cs-root
06:50:32 AM 16231 147 0.89 0.89 8390644 12 0.0
0 /dev/mapper/cs-home
06:50:32 AM 760 254 25.06 25.06 523978 310 0.0
6 /dev/sda1

06:50:32 AM MBfsfree MBfsused %fsused %ufsused Ifree Iused %Iuse
d FILESYSTEM
06:50:33 AM 26706 6845 20.40 20.40 17026664 160152 0.9
3 /dev/mapper/cs-root
```

→ 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 kbmemfree   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

```
Centos [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
Activities Terminal Oct 31 06:57

root@localhost:~
File Edit View Search Terminal Help
[ -u ] [ -V ] [ -v ] [ -w ] [ -C <command> ] [ -G <process_name> ] [ --human ]
[ -p { <pid> [,...] | SELF | ALL } ] [ -T { TASK | CHILD | 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   Comma
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
asks_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.

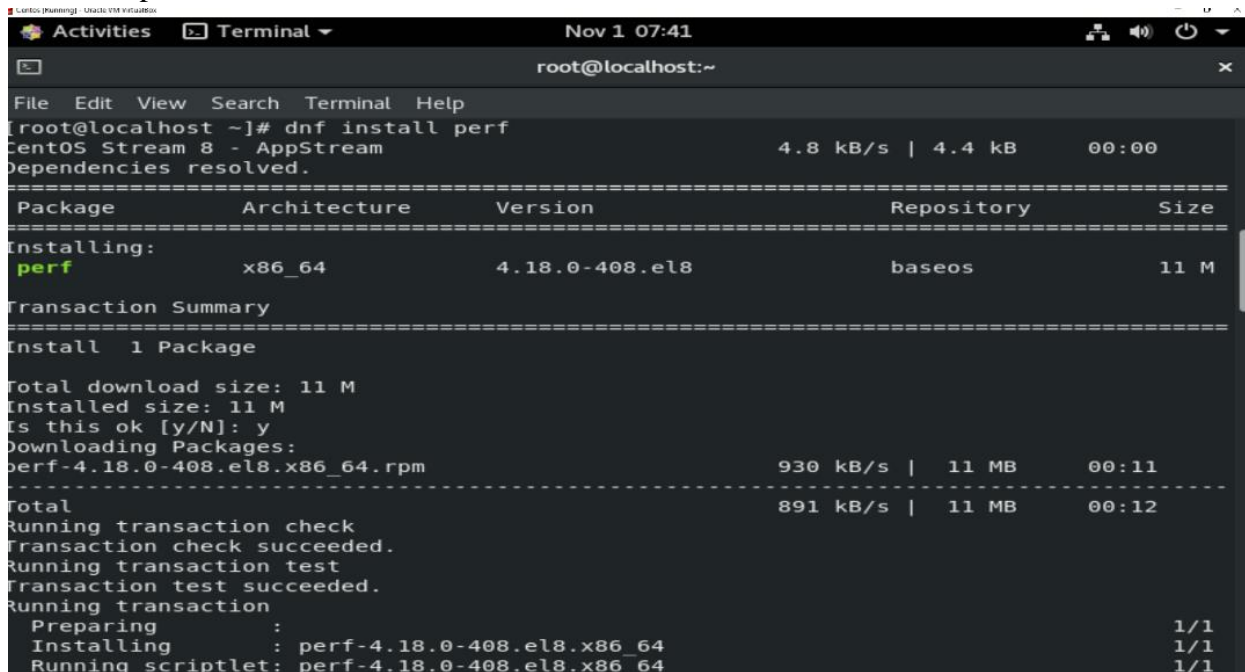
CMD :-

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



```

root@localhost:~
File Edit View Search Terminal Help
[root@localhost ~]# dnf install perf
CentOS Stream 8 - AppStream                               4.8 kB/s | 4.4 kB      00:00
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

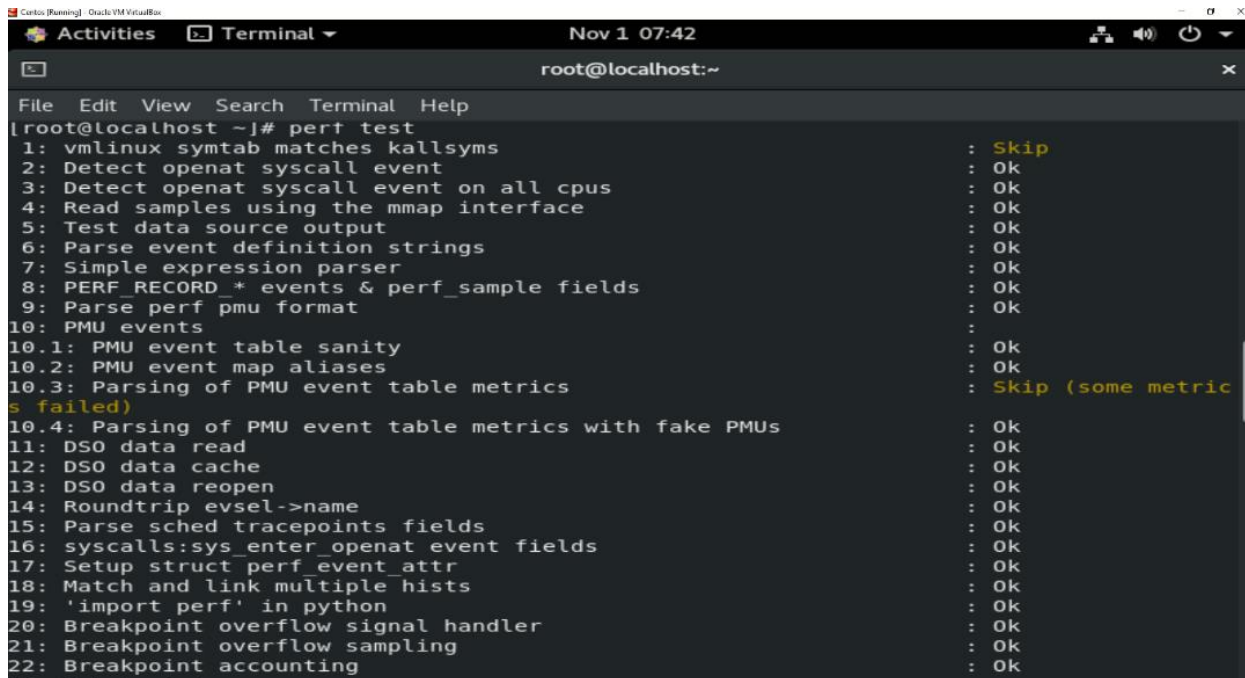
```

→ To perform sanity test in the system

CMD :-

perf test



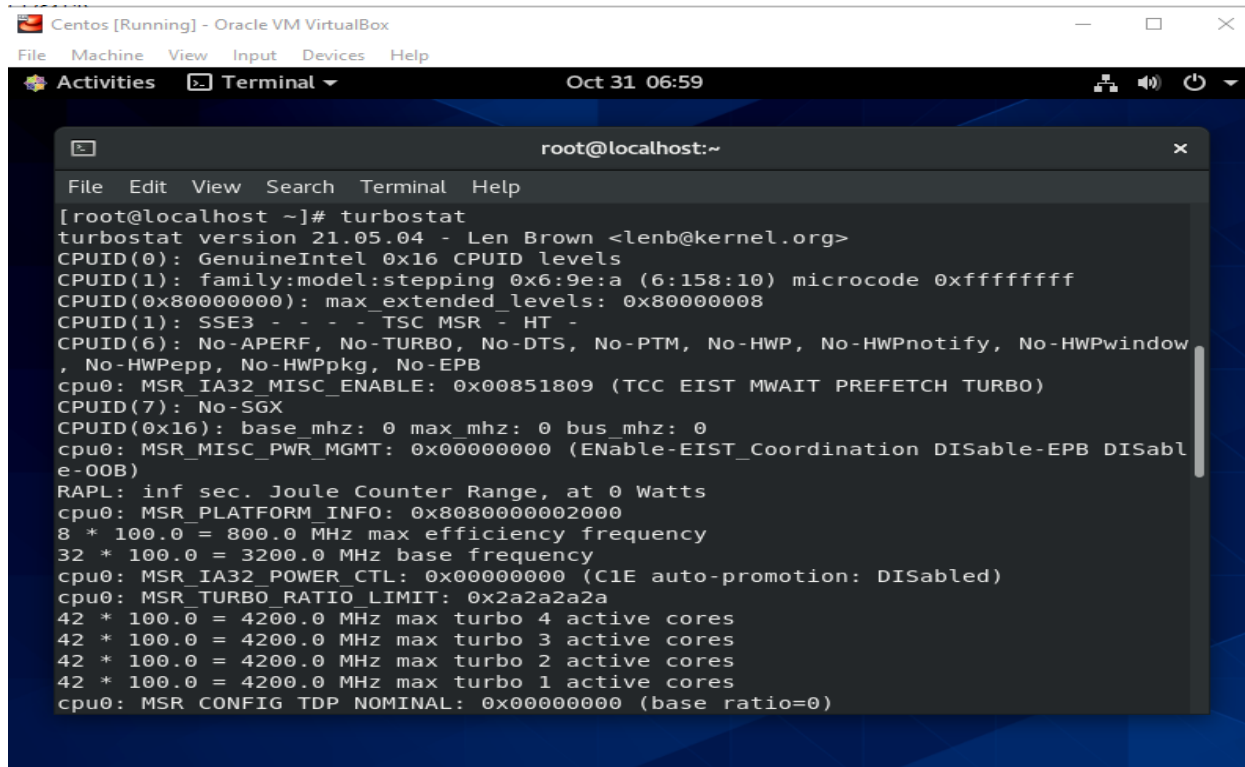


```
File Edit View Search Terminal Help
[root@localhost ~]# perf test
1: vmlinux sytab matches kallsyms : Skip
2: Detect openat syscall event : Ok
3: Detect openat syscall event on all cpus : Ok
4: Read samples using the mmap interface : Ok
5: Test data source output : Ok
6: Parse event definition strings : 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 metrics 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 histograms : 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



```
Centos [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
Activities Terminal
root@localhost:~
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 0x6:9e: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-HWPcpl, No-HWPpkg, No-EPB
cpu0: MSR_IA32_MISC_ENABLE: 0x00851809 (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 DISable-00B)
RAPL: inf sec. Joule Counter Range, at 0 Watts
cpu0: MSR_PLATFORM_INFO: 0x8080000002000
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

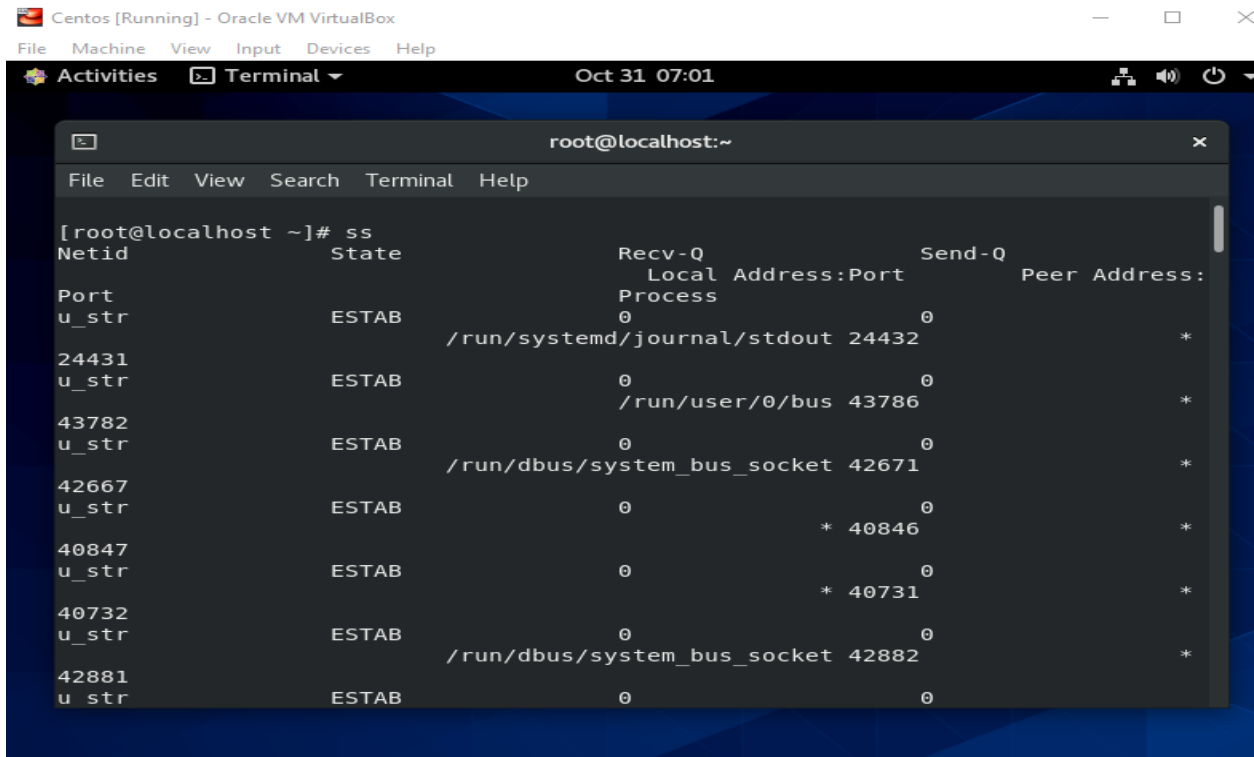
Device            tps    kB_read/s    kB_wrtn/s    kB_read    kB_wrtn
sda                 4.12        132.22         65.06    12052268    5930057
sdc0                 0.00         0.00         0.00         2         0
dm-0                 1.88        116.14         24.46    10586533    2229236
dm-1                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. It 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 that the “netstat” command which is used for displaying active socket connections

CMD :-

ss



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

[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

```
CentOS 8 64-bit (2) x
Nov 1 05:00
prithvi@localhost:~
File Edit View Search Terminal Help
[prithvi@localhost ~]$ ss -a
Netid State      Recv-Q Send-Q               Local Address:Port               Peer Address:Port
rtnl UNCONN      0      0                  rtnl:kernel                       *
rtnl UNCONN      0      0          rtnl:evolution-addre/2607      *
rtnl UNCONN      0      0          rtnl:-104856237                    *
rtnl UNCONN      0      0          rtnl:gnome-software/2630          *
rtnl UNCONN      0      0          rtnl:evolution-calen/2562        *
rtnl UNCONN      0      0          rtnl:avahi-daemon/1035           *
rtnl UNCONN      0      0                  rtnl:1757                         *
rtnl UNCONN      0      0          rtnl:goa-daemon/2425             *
rtnl UNCONN      0      0          rtnl:firefox/3281                *
rtnl UNCONN      0      0          rtnl:1992295763                 *
rtnl UNCONN      0      0          rtnl:2059404286                 *
rtnl UNCONN      0      0          rtnl:NetworkManager/1167        *
```

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

CMD:-

ss -l

```
CentOS 8 64-bit (2) x
Nov 1 05:05
prithvi@localhost:~
File Edit View Search Terminal Help
[prithvi@localhost ~]$ ss -l
Netid State      Recv-Q Send-Q               Local Address:Port               Peer Address:Port
rtnl UNCONN      0      0                  rtnl:kernel                       *
rtnl UNCONN      0      0          rtnl:evolution-addre/2607      *
rtnl UNCONN      0      0          rtnl:-104856237                    *
rtnl UNCONN      0      0          rtnl:gnome-software/2630          *
rtnl UNCONN      0      0          rtnl:evolution-calen/2562        *
rtnl UNCONN      0      0          rtnl:avahi-daemon/1035           *
rtnl UNCONN      0      0                  rtnl:1757                         *
rtnl UNCONN      0      0          rtnl:goa-daemon/2425             *
rtnl UNCONN      0      0          rtnl:firefox/3281                *
rtnl UNCONN      0      0          rtnl:1992295763                 *
rtnl UNCONN      0      0          rtnl:2059404286                 *
rtnl UNCONN      0      0          rtnl:NetworkManager/1167        *
rtnl UNCONN      0      0          rtnl:abrt-applet/2660            *
rtnl UNCONN      0      0          rtnl:firefox/3281                *
rtnl UNCONN      0      0          rtnl:gnome-software/2630          *
rtnl UNCONN      0      0          rtnl:abrt-applet/2660            *
rtnl UNCONN      0      0          rtnl:evolution-addre/2607      *
rtnl UNCONN      0      0          rtnl:evolution-calen/2562        *
rtnl UNCONN      0      0          rtnl:goa-daemon/2425             *
rtnl UNCONN      0      0                  rtnl:1757                         *
rtnl UNCONN      0      0          rtnl:NetworkManager/1167        *
rtnl UNCONN      0      0          rtnl:avahi-daemon/1035           *
rtnl UNCONN      0      0          rtnl:2059404286                 *
tcpdiag UNCONN 768      0      0          tcpdiag:kernel                    *
tcpdiag UNCONN 4352     0      0          tcpdiag:ss/8550                   *
```

→To display all TCP connection, use the “-t”

CMD :-

ss -t

```
[root@localhost ~]# 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

```
[root@localhost ~]# 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          [::]:ipp                  [::]:*
```

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

CMD:-

ss -lu

```
CentOS 8 64-bit (2) x
Activities Terminal Nov 1 05:14
prithvi@localhost:~
File Edit View Search Terminal Help
[root@localhost ~]# 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           [::]:323                  [::]:*
UNCONN     0            0           [::]:37492                [::]:*
```

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

CMD:-

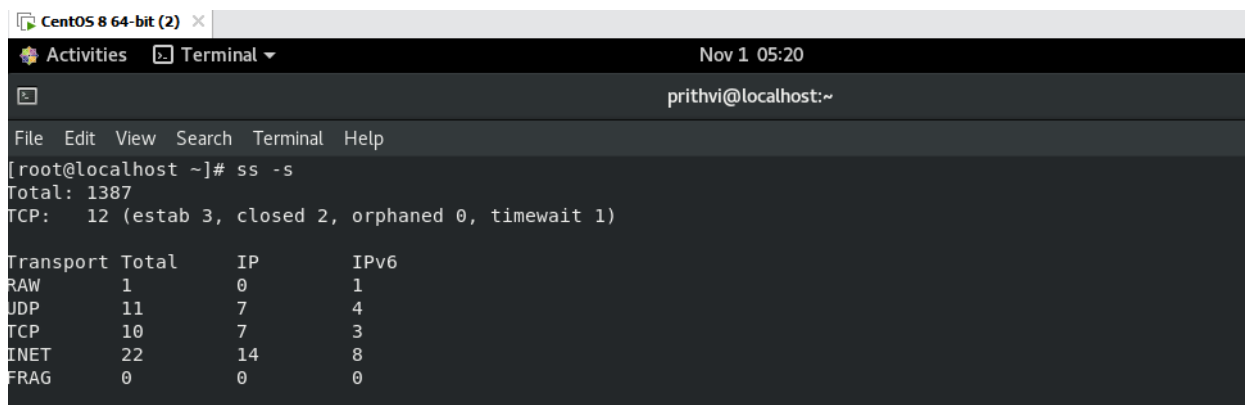
ss -p

```
[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) x
Activities Terminal Nov 1 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.

```

Certo [Running] - Oracle VM VirtualBox
Activities Terminal Nov 1 08:28
root@localhost:~

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 scheduler 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.

```

Certo [Running] - Oracle VM VirtualBox
Activities Terminal Nov 1 08:35
root@localhost:~

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

```

Centos [Running] - Oracle VM VirtualBox

File Machine View Input Devices Help

Activities Tuna Oct 31 07:16

Tuna

Monitoring Profile management Profile editing

Filter	CPU	Usage	IRQ	PID	Policy	Priority	Affinity	Events	Users
<input checked="" type="checkbox"/>	0	3	0	-1		-1	0	124	timer
			1	-1		-1	0	1044	i8042
			8	-1		-1	0	0	rtc0
			9	-1		-1	0	0	acpi
			12	-1		-1	0	156	i8042

PID	Policy	Priority	Affinity	VolCtxtSwitch	NonVolCtxtSwitch	CGroup	Command
4	OTHER	0	0	2	0	1:name=systemd:/, rcu_par_gp	
6	OTHER	0	0	6	0	1:name=systemd:/, kworker/0:0	
8	OTHER	0	0	2	0	1:name=systemd:/, mm_percpu	
9	OTHER	0	0	2	0	1:name=systemd:/, rcu_tasks_r	
10	OTHER	0	0	2	0	1:name=systemd:/, rcu_tasks_t	
11	OTHER	0	0	180622	217	1:name=systemd:/, ksoftirqd/0	
12	OTHER	0	0	64232	3	1:name=systemd:/, rcu_sched	
13	FIFO	99	0	5	0	1:name=systemd:/, migration/0	
14	FIFO	99	0	689	0	1:name=systemd:/, watchdog/0	
15	OTHER	0	0	15	0	1:name=systemd:/, cpuhp/0	
17	OTHER	0	0	168	0	1:name=systemd:/, kdevtmpfs	
18	OTHER	0	0	2	0	1:name=systemd:/, netns	

**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) x
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

```
CentOS 8 64-bit (2) x
Activities Terminal Nov 1 05:41
prithvi@localhost:~
File Edit View Search Terminal Help
[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

```
CentOS 8 64-bit (2) x
Activities Terminal Nov 1 05:44
prithvi@localhost:~
File Edit View Search Terminal Help
[root@localhost ~]# ethtool -i ens160
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 ~]#
```

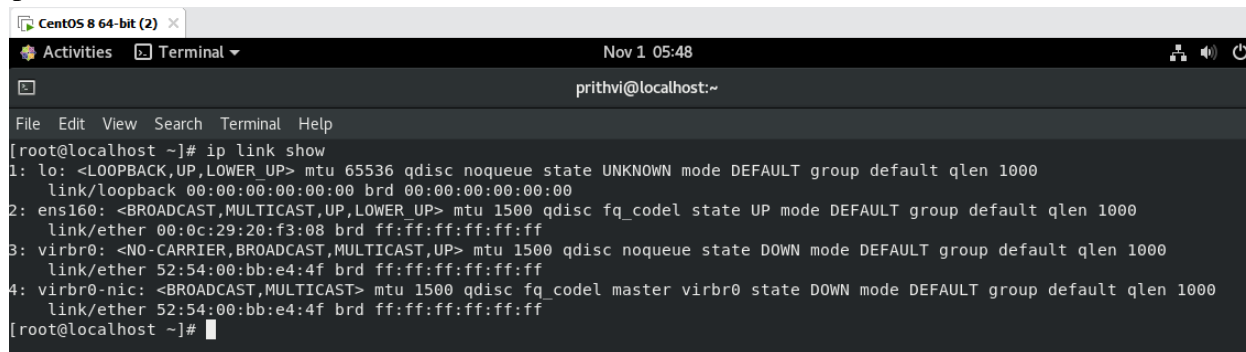
**15.ip :-** This commands is used to show or manipulate routing, devices and tunnels. It is similar to ifconfig command.



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

CMD:-

ip link show



```
CentOS 8 64-bit (2) x
Activities Terminal Nov 1 05:48
prithvi@localhost:~
File Edit View Search Terminal Help
[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: <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 ~]#
```