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Computer Networking

## Lab Experiment

### Output(s):

Command 1 : man ifconfig :: interface configurator. It is one of the most basic command.

```
apsit@apsit-HP-ProDesk-600-G4-PCI-MT:~$ man ifconfig
apsit@apsit-HP-ProDesk-600-G4-PCI-MT:~$ ifconfig -a
eno1: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 192.168.98.14 netmask 255.255.0.0 broadcast 192.168.255.255
    inet6 fe80::f90f:4141:d269:a5d8 prefixlen 64 scopeid 0x20<link>
    ether c8:d9:d2:29:6e:24 txqueuelen 1000 (Ethernet)
    RX packets 53717 bytes 20176097 (20.1 MB)
    RX errors 0 dropped 329 overruns 0 frame 0
    TX packets 3540 bytes 534295 (534.2 KB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
    device interrupt 16 memory 0xf0000000-f0020000

lo: flags=73<UP,LOOPBACK,RUNNING> mtu 65536
    inet 127.0.0.1 netmask 255.0.0.0
    inet6 ::1 prefixlen 128 scopeid 0x10<host>
    loop txqueuelen 1000 (Local Loopback)
    RX packets 679 bytes 92523 (92.5 KB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 679 bytes 92523 (92.5 KB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

apsit@apsit-HP-ProDesk-600-G4-PCI-MT:~$ ifconfig -s
Iface      MTU      RX-OK RX-ERR RX-DRP RX-OVR      TX-OK TX-ERR TX-DRP TX-OVR Flg
eno1       1500      54489    0    333 0          3540    0     0    0 BMRU
lo         65536      679     0     0 0          679     0     0    0 LRU

apsit@apsit-HP-ProDesk-600-G4-PCI-MT:~$ ifconfig -v
eno1: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 192.168.98.14 netmask 255.255.0.0 broadcast 192.168.255.255
    inet6 fe80::f90f:4141:d269:a5d8 prefixlen 64 scopeid 0x20<link>
    ether c8:d9:d2:29:6e:24 txqueuelen 1000 (Ethernet)
    RX packets 55112 bytes 20324857 (20.3 MB)
    RX errors 0 dropped 334 overruns 0 frame 0
    TX packets 3541 bytes 534365 (534.3 KB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
    device interrupt 16 memory 0xf0000000-f0020000
```

**Command 2 : man ip :: This is the latest and updated version of ifconfig command.**

```
apsit@apsit-HP-ProDesk-600-G4-PCI-MT:~$ ip addr show
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1/8 scope host lo
        valid_lft forever preferred_lft forever
    inet6 ::1/128 scope host
        valid_lft forever preferred_lft forever
2: eno1: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP group default qlen 1000
    link/ether c8:d9:d2:29:6e:24 brd ff:ff:ff:ff:ff:ff
    inet 192.168.98.14/16 brd 192.168.255.255 scope global noprefixroute eno1
        valid_lft forever preferred_lft forever
    inet6 fe80::f90f:4141:d269:a5d8/64 scope link noprefixroute
        valid_lft forever preferred_lft forever
apsit@apsit-HP-ProDesk-600-G4-PCI-MT:~$ ip a show lo
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1/8 scope host lo
        valid_lft forever preferred_lft forever
    inet6 ::1/128 scope host
        valid_lft forever preferred_lft forever
apsit@apsit-HP-ProDesk-600-G4-PCI-MT:~$
```

**Command 3 : man traceroute :: used to troubleshoot the network**

If you don't have the traceroute service installed in your system, you can install it using the following command:

```
sudo apt-get install inetutils-traceroute
```

```
apsit@apsit-HP-ProDesk-600-G4-PCI-MT:~$ traceroute -f google.com
traceroute: impossible distance `google.com'
apsit@apsit-HP-ProDesk-600-G4-PCI-MT:~$ traceroute google.com
traceroute to google.com (142.250.67.174), 64 hops max
 1  192.168.192.193  0.379ms  0.338ms  0.366ms
 2  103.123.226.97  0.619ms  0.630ms  0.524ms
 3  103.41.34.193  1.624ms  1.442ms  1.419ms
 4  103.123.225.33  1.599ms  1.602ms  1.329ms
 5  142.250.167.25  1.722ms  1.659ms  1.774ms
 6  * * *
 7  142.251.77.94  2.997ms  1.945ms  2.665ms
 8  142.250.227.75  2.927ms  2.645ms  2.866ms
 9  142.250.67.174  2.478ms  2.946ms  3.069ms
```

**Command 4 : man tracepath :: used to detect network delays.**

```
apsit@apsit-HP-ProDesk-600-G4-PCI-MT:~$ tracepath google.com
1?: [LOCALHOST] pmtu 1500
 1: _gateway 0.435ms
 1: _gateway 0.567ms
 2: jnpl.jeebr.net 1.101ms
 3: no reply
 4: 103.123.225.33 2.707ms
 5: 142.250.167.25 2.428ms asymm 9
 6: no reply
 7: no reply
 8: no reply
 9: no reply
10: no reply
11: no reply
12: no reply
13: no reply
14: no reply
15: no reply
16: no reply
17: no reply
18: no reply
19: no reply
20: no reply
```

**Command 5 : man ping :: Packet INternet Groper. checks for the network connectivity between two nodes**

```
apsit@apsit-HP-ProDesk-600-G4-PCI-MT:~$ ping google.com
PING google.com (142.251.42.46) 56(84) bytes of data.
64 bytes from bom12s20-in-f14.1e100.net (142.251.42.46): icmp_seq=1 ttl=118 time=1.90 ms
64 bytes from bom12s20-in-f14.1e100.net (142.251.42.46): icmp_seq=2 ttl=118 time=1.63 ms
64 bytes from bom12s20-in-f14.1e100.net (142.251.42.46): icmp_seq=3 ttl=118 time=9.59 ms
64 bytes from bom12s20-in-f14.1e100.net (142.251.42.46): icmp_seq=4 ttl=118 time=2.45 ms
64 bytes from bom12s20-in-f14.1e100.net (142.251.42.46): icmp_seq=5 ttl=118 time=1.55 ms
64 bytes from bom12s20-in-f14.1e100.net (142.251.42.46): icmp_seq=6 ttl=118 time=1.85 ms
64 bytes from bom12s20-in-f14.1e100.net (142.251.42.46): icmp_seq=7 ttl=118 time=1.58 ms
64 bytes from bom12s20-in-f14.1e100.net (142.251.42.46): icmp_seq=8 ttl=118 time=1.73 ms
64 bytes from bom12s20-in-f14.1e100.net (142.251.42.46): icmp_seq=9 ttl=118 time=1.87 ms
64 bytes from bom12s20-in-f14.1e100.net (142.251.42.46): icmp_seq=10 ttl=118 time=1.78 ms
64 bytes from bom12s20-in-f14.1e100.net (142.251.42.46): icmp_seq=11 ttl=118 time=2.94 ms
64 bytes from bom12s20-in-f14.1e100.net (142.251.42.46): icmp_seq=12 ttl=118 time=1.54 ms
64 bytes from bom12s20-in-f14.1e100.net (142.251.42.46): icmp_seq=13 ttl=118 time=1.87 ms
64 bytes from bom12s20-in-f14.1e100.net (142.251.42.46): icmp_seq=14 ttl=118 time=1.79 ms
64 bytes from bom12s20-in-f14.1e100.net (142.251.42.46): icmp_seq=15 ttl=118 time=1.76 ms
64 bytes from bom12s20-in-f14.1e100.net (142.251.42.46): icmp_seq=16 ttl=118 time=3.54 ms
64 bytes from bom12s20-in-f14.1e100.net (142.251.42.46): icmp_seq=17 ttl=118 time=3.26 ms
64 bytes from bom12s20-in-f14.1e100.net (142.251.42.46): icmp_seq=18 ttl=118 time=2.57 ms
64 bytes from bom12s20-in-f14.1e100.net (142.251.42.46): icmp_seq=19 ttl=118 time=4.04 ms
64 bytes from bom12s20-in-f14.1e100.net (142.251.42.46): icmp_seq=20 ttl=118 time=8.91 ms
64 bytes from bom12s20-in-f14.1e100.net (142.251.42.46): icmp_seq=21 ttl=118 time=3.37 ms
64 bytes from bom12s20-in-f14.1e100.net (142.251.42.46): icmp_seq=22 ttl=118 time=5.06 ms
64 bytes from bom12s20-in-f14.1e100.net (142.251.42.46): icmp_seq=23 ttl=118 time=2.33 ms
64 bytes from bom12s20-in-f14.1e100.net (142.251.42.46): icmp_seq=24 ttl=118 time=1.66 ms
64 bytes from bom12s20-in-f14.1e100.net (142.251.42.46): icmp_seq=25 ttl=118 time=10.3 ms
64 bytes from bom12s20-in-f14.1e100.net (142.251.42.46): icmp_seq=26 ttl=118 time=9.01 ms
64 bytes from bom12s20-in-f14.1e100.net (142.251.42.46): icmp_seq=27 ttl=118 time=12.3 ms
64 bytes from bom12s20-in-f14.1e100.net (142.251.42.46): icmp_seq=28 ttl=118 time=1.71 ms
64 bytes from bom12s20-in-f14.1e100.net (142.251.42.46): icmp_seq=29 ttl=118 time=1.67 ms
64 bytes from bom12s20-in-f14.1e100.net (142.251.42.46): icmp_seq=30 ttl=118 time=1.81 ms
```

```
apsit@apsit-HP-ProDesk-600-G4-PCI-MT:~$ ping -c 2 google.com
PING google.com (142.250.67.174) 56(84) bytes of data.
64 bytes from bom12s07-in-f14.1e100.net (142.250.67.174): icmp_seq=1 ttl=118 time=4.47 ms
64 bytes from bom12s07-in-f14.1e100.net (142.250.67.174): icmp_seq=2 ttl=118 time=4.61 ms

--- google.com ping statistics ---
2 packets transmitted, 2 received, 0% packet loss, time 1001ms
rtt min/avg/max/mdev = 4.478/4.544/4.610/0.066 ms
```



**Command 6 : man netstat :: network statistics.** It provides statistical figures about different interfaces.

```
apsit@apsit-HP-ProDesk-600-G4-PCI-MT:~$ netstat -a
Active Internet connections (servers and established)
Proto Recv-Q Send-Q Local Address           Foreign Address         State
tcp        0      0 localhost:domain        0.0.0.0:*               LISTEN
tcp        0      0 localhost:ipp           0.0.0.0:*               LISTEN
tcp        1      1 apsit-HP-ProDesk-:39978 _gateway:8090          LAST_ACK
tcp        1      1 apsit-HP-ProDesk-:39982 _gateway:8090          CLOSE_WAIT
tcp6       0      0 ip6-localhost:ipp      [::]:*                 LISTEN
udp        0      0 0.0.0.0:36146          0.0.0.0:*
udp        0      0 localhost:domain       0.0.0.0:*
udp        0      0 0.0.0.0:ipp           0.0.0.0:*
udp        0      0 0.0.0.0:46110         0.0.0.0:*
udp        0      0 224.0.0.251:mdns       0.0.0.0:*
udp        0      0 0.0.0.0:mdns          0.0.0.0:*
udp6       0      0 [::]:48480            [::]:*
udp6       0      0 [::]:mdns             [::]:*
raw       1536    0 0.0.0.0:icmp           0.0.0.0:*               7
raw      28416    0 0.0.0.0:icmp           0.0.0.0:*               7
raw     77568    0 0.0.0.0:icmp           0.0.0.0:*               7
raw    212992    0 0.0.0.0:icmp           0.0.0.0:*               7
raw6     8448    0 [::]:ipv6-icmp         [::]:*                  7
raw6    15360    0 [::]:ipv6-icmp         [::]:*                  7
raw6    22272    0 [::]:ipv6-icmp         [::]:*                  7
raw6       0      0 [::]:ipv6-icmp         [::]:*                  7
Active UNIX domain sockets (servers and established)
Proto RefCnt Flags       Type       State      I-Node    Path
unix   2      [ ACC ]     STREAM    LISTENING   30082    /tmp/.ICE-unix/1044
unix   2      [  ]      DGRAM          32918    /run/user/1000/systemd/notify
unix   2      [  ]      DGRAM          27147    /run/user/121/systemd/notify
unix   2      [ ACC ]     SEQPACKET LISTENING   1860     /run/udev/control
unix   2      [ ACC ]     STREAM    LISTENING   32921    /run/user/1000/systemd/private
unix   2      [ ACC ]     STREAM    LISTENING   27386    /tmp/.X11-unix/X1024
unix   2      [ ACC ]     STREAM    LISTENING   27150    /run/user/121/systemd/private
unix   2      [ ACC ]     STREAM    LISTENING   32925    /run/user/1000/gnupg/S.dirmngr
unix   2      [ ACC ]     STREAM    LISTENING   27154    /run/user/121/gnupg/S.gpg-agent.extra
```

**Command 7 : man arp :: Address Resolution Protocol.**

```
apsit@apsit-HP-ProDesk-600-G4-PCI-MT:~$ arp
Address                  HWtype  HWaddress      Flags Mask    Iface
_gateway                ether    c8:4f:86:05:06:24 C             eno1
apsit@apsit-HP-ProDesk-600-G4-PCI-MT:~$ arp -a
_gateway (192.168.192.193) at c8:4f:86:05:06:24 [ether] on eno1
```

**Command 8 : dig :: Domain Information Groper**

```
apsit@apsit-HP-ProDesk-600-G4-PCI-MT:~$ dig apsit.edu.in

; <<>> DiG 9.11.3-1ubuntu1.17-Ubuntu <<>> apsit.edu.in
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 61706
;; flags: qr rd ra; QUERY: 1, ANSWER: 2, AUTHORITY: 0, ADDITIONAL: 1

;; OPT PSEUDOSECTION:
;; EDNS: version: 0, flags:; udp: 65494
;; QUESTION SECTION:
;apsit.edu.in.                IN      A

;; ANSWER SECTION:
apsit.edu.in.                280     IN      A      172.67.184.115
apsit.edu.in.                280     IN      A      104.21.19.16

;; Query time: 1 msec
;; SERVER: 127.0.0.53#53(127.0.0.53)
;; WHEN: Tue Jul 12 14:02:05 IST 2022
;; MSG SIZE rcvd: 73
```

### Command 9 : ss :: replacement for netstat command

```
apsit@apsit-HP-ProDesk-600-G4-PCI-MT:~$ ss
Netid State      Recv-Q Send-Q           Local Address:Port              Peer Address:Port
u_seq ESTAB        0      0           @0000e 37116                        * 37117
u_seq ESTAB        0      0           @0000f 40006                        * 40007
u_seq ESTAB        0      0           @00013 36322                        * 36323
u_seq ESTAB        0      0           @00012 36320                        * 36321
u_seq ESTAB        0      0           @00011 37117                        * 37116
u_seq ESTAB        0      0           @00010 40007                        * 40006
u_str ESTAB        0      0      /run/user/1000/bus 45859                        * 47234
u_str ESTAB        0      0                * 36913                        * 36023
u_str ESTAB        0      0                * 28464                        * 35853
u_str ESTAB        0      0      /run/user/1000/pulse/native 32413                        * 33968
u_str ESTAB        0      0      /run/user/121/bus 27453                        * 28252
u_str ESTAB        0      0      /run/systemd/journal/stdout 20276                        * 26102
u_str ESTAB        0      0 @/dbus-vfs-daemon/socket-z3ekSEcv 48579                        * 48578
u_str ESTAB        0      0                * 43968                        * 48574
u_str ESTAB        0      0                * 37146                        * 37147
u_str ESTAB        0      0                * 36362                        * 33722
u_str ESTAB        0      0                * 33461                        * 32596
u_str ESTAB        0      0                * 35388                        * 36104
u_str ESTAB        0      0      /run/user/1000/bus 33432                        * 36924
u_str ESTAB        0      0                * 32528                        * 33369
u_str ESTAB        0      0                * 35056                        * 35847
u_str ESTAB        0      0 @/tmp/dbus-kK0jtGKeFz 32863                        * 32014
u_str ESTAB        0      0                * 32723                        * 35478
u_str ESTAB        0      0                * 35176                        * 33303
u_str ESTAB        0      0                * 28336                        * 28337
u_str ESTAB        0      0                * 35111                        * 33075
u_str ESTAB        0      0                * 28378                        * 32338
u_str ESTAB        0      0                * 28308                        * 26613
u_str ESTAB        0      0                * 26130                        * 20453
u_str ESTAB        0      0 @/tmp/.X11-unix/X0 33773                        * 37192
u_seq ESTAB        0      0                * 36323                        * 36322
```

### Command 10 : hostname :: simple command used to view and set the hostname

```
apsit@apsit-HP-ProDesk-600-G4-PCI-MT:~$ hostname
apsit-HP-ProDesk-600-G4-PCI-MT
apsit@apsit-HP-ProDesk-600-G4-PCI-MT:~$ sudo hostname Mokshada
[sudo] password for apsit:
apsit@apsit-HP-ProDesk-600-G4-PCI-MT:~$ hostname
Mokshada
```