

# CSE340 - Computer Networks Lab

## Lab Assignment 2

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### 1 . ifconfig

- This interface configuration utility for system/network administration in Unix/Linux operating systems to configure . It manages and query network interface parameters via command line interface or in a system configuration script. The ifconfig command is also used to check the assigned IP address of a server. It is used for displaying current network configuration information, netmask or broadcast address to a network interface, creating an alias for network interface, setting up hardware address and enabling or disable network interfaces.

- ipconfig (internet protocol configuration): a console application in Microsoft Windows that displays all current TCP/IP network configuration values and can modify Dynamic Host Configuration Protocol DHCP and Domain Name System DNS settings.

→ Installation for ubuntu : `sudo apt-get install net-tools`

→ ifconfig : View All Network Setting

→ ifconfig -a : to display all the interfaces available, even if they are down

It returns **lo** is the loopback interface. This is a special network interface that the system uses to communicate with itself. **wlan0** is the name of the first wireless interface on the system. Additional wireless interfaces would be named wlan1, wlan2, etc. **en** is for Ethernet **o** is for on-board . **eno [number]** The number is a firmware/BIOS provided index .

```
Activities Terminal Sep 1 6:32 PM
mansimansi-HP-Pavillon-Laptop-15-cc1xx:~
mansimansi-HP-Pavillon-Laptop-15-cc1xx:~$ ifconfig -a
eno1: flags=4099<UP,BROADCAST,MULTICAST> mtu 1500
    ether b4:b6:86:d1:e9:10 txqueuelen 1000 (Ethernet)
    RX packets 0 bytes 0 (0.0 B)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 0 bytes 0 (0.0 B)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

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 5195 bytes 595792 (595.7 KB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 5195 bytes 595792 (595.7 KB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

wlo1: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 172.20.10.6 netmask 255.255.255.240 broadcast 172.20.10.15
    inet6 fe80::cd03:7e1f:6e1d:7f4c prefixlen 64 scopeid 0x20<link>
    ether 5c:5f:67:04:ec:69 txqueuelen 1000 (Ethernet)
    RX packets 231473 bytes 224669666 (224.6 MB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 124168 bytes 24786968 (24.7 MB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

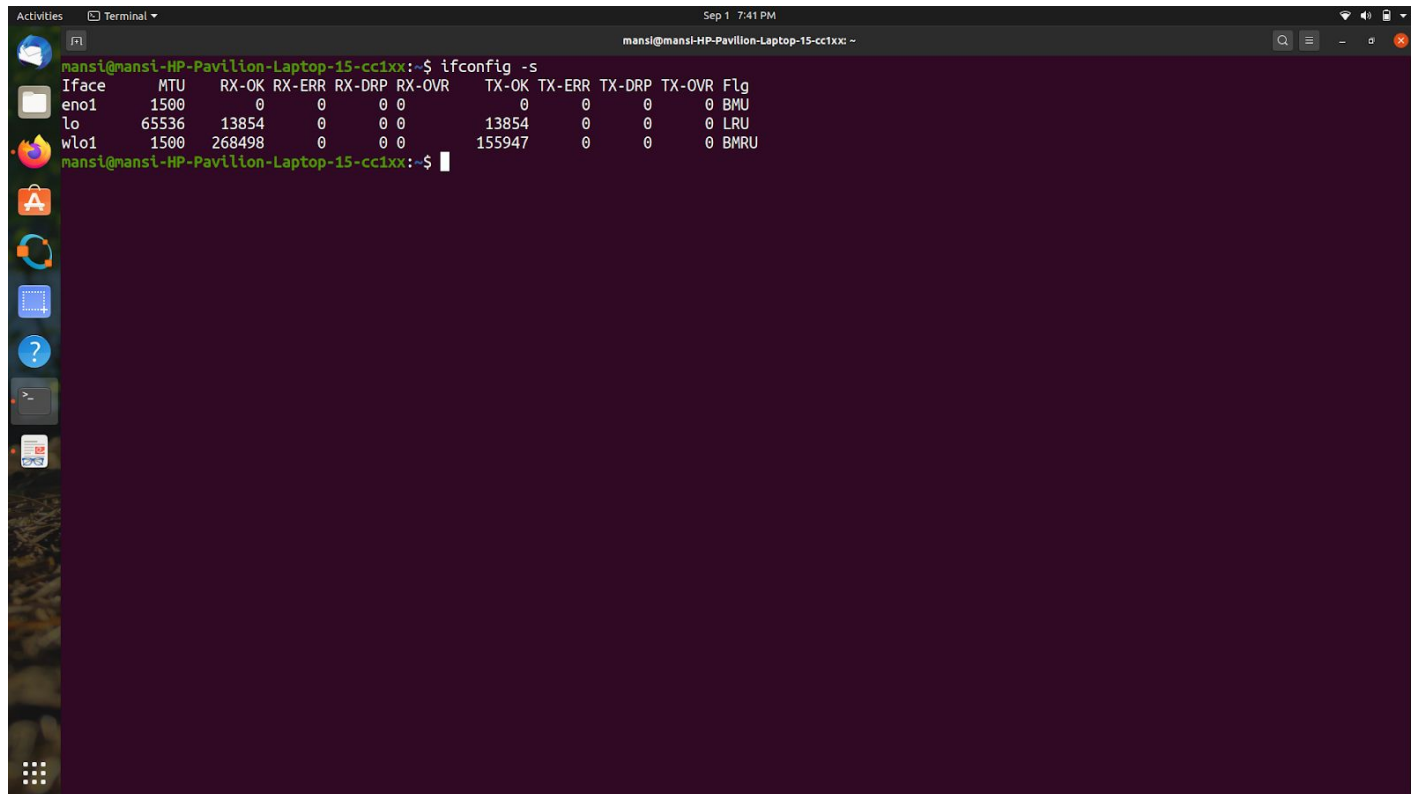
mansimansi-HP-Pavillon-Laptop-15-cc1xx:~$
```

→ifconfig eno1:It will display details of specific network interfaces.

```
Activities Terminal Sep 1 7:09 PM
mansimansi-HP-Pavillon-Laptop-15-cc1xx:~
mansimansi-HP-Pavillon-Laptop-15-cc1xx:~$ ifconfig eno1
eno1: flags=4099<UP,BROADCAST,MULTICAST> mtu 1500
    ether b4:b6:86:d1:e9:10 txqueuelen 1000 (Ethernet)
    RX packets 0 bytes 0 (0.0 B)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 0 bytes 0 (0.0 B)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

mansimansi-HP-Pavillon-Laptop-15-cc1xx:~$
```

→ `ifconfig -s` :Display a short list, instead of details

A terminal window titled 'Terminal' with a dark purple background. The prompt is 'mansimansi-HP-Pavilion-Laptop-15-cc1xx:~\$'. The command 'ifconfig -s' has been executed, displaying a table of network interface statistics. The table has columns: Iface, MTU, RX-OK, RX-ERR, RX-DRP, RX-OVR, TX-OK, TX-ERR, TX-DRP, TX-OVR, and Flg. The data rows are: eno1 (MTU 1500, RX-OK 0, RX-ERR 0, RX-DRP 0, RX-OVR 0, TX-OK 0, TX-ERR 0, TX-DRP 0, TX-OVR 0, Flg BMU), lo (MTU 65536, RX-OK 13854, RX-ERR 0, RX-DRP 0, RX-OVR 0, TX-OK 13854, TX-ERR 0, TX-DRP 0, TX-OVR 0, Flg LRU), and wlo1 (MTU 1500, RX-OK 268498, RX-ERR 0, RX-DRP 0, RX-OVR 0, TX-OK 155947, TX-ERR 0, TX-DRP 0, TX-OVR 0, Flg BMRU).

Iface	MTU	RX-OK	RX-ERR	RX-DRP	RX-OVR	TX-OK	TX-ERR	TX-DRP	TX-OVR	Flg
eno1	1500	0	0	0	0	0	0	0	0	BMU
lo	65536	13854	0	0	0	13854	0	0	0	LRU
wlo1	1500	268498	0	0	0	155947	0	0	0	BMRU

→ `ifconfig interface up`:This option is used to activate the driver for the given interface.

→ `ifconfig interface down` : to deactivate the driver for the given interface.

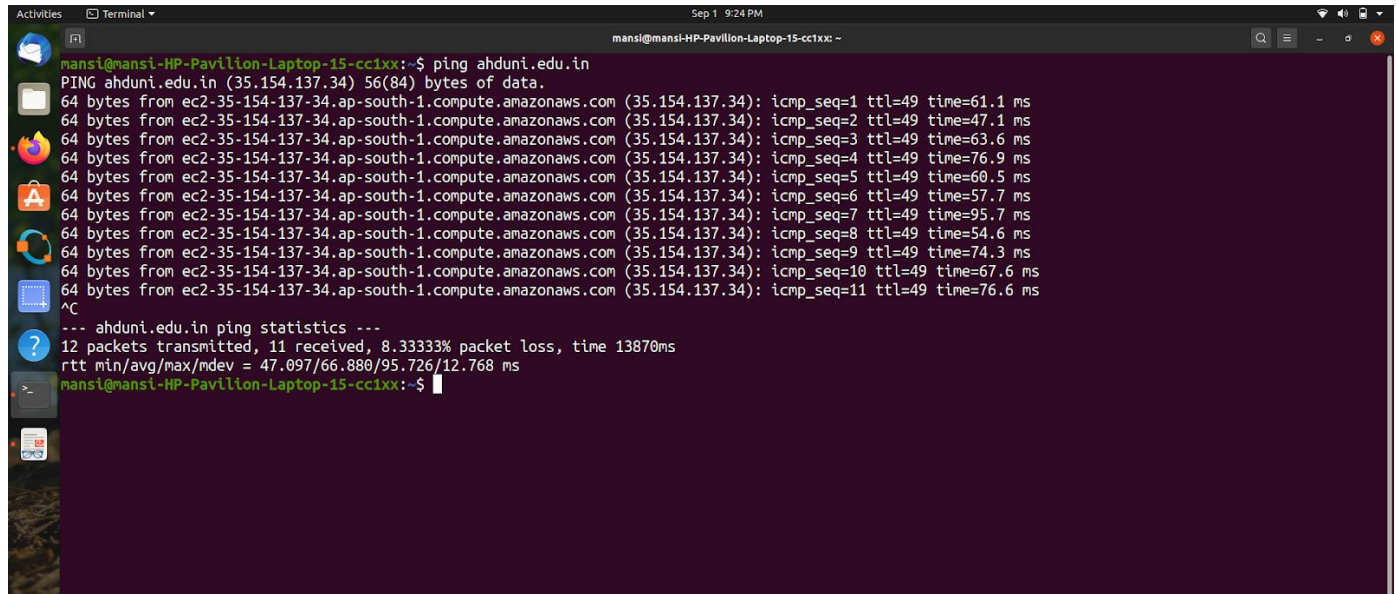
## 2 . ping

• PING (Packet Internet Groper) command is used to check the network connectivity between host and server/host. This command takes as input the IP address or the URL and sends a data packet to the specified address with the message “PING” and gets a response from the server/host this time is recorded which is called latency. Fast ping low latency means faster connection. Ping uses ICMP(Internet Control Message Protocol) to send an ICMP echo message to the specified host if that host is available then it sends ICMP reply message .That response shows the URL you’re pinging, the IP address associated with that URL, and the size of the packets being sent on the first line. The next four lines show the replies from each individual packet, including the time (in milliseconds) it took for the response and the time-to-live (TTL) of the packet, which is the amount of time that must pass before the packet is discarded. At the bottom, you’ll see a summary that shows how many packets were sent and received, as well as the minimum, maximum, and average response time.

• If you get a successful response, you know that all the networking devices between you and that destination are working, including the network adapter in your computer, your router, and whatever devices exist on the internet between your router and the destination. Ping your router to see if you can reach it. If you can’t successfully ping an internet location, you can then try pinging your router. A successful response lets you know that your local network is

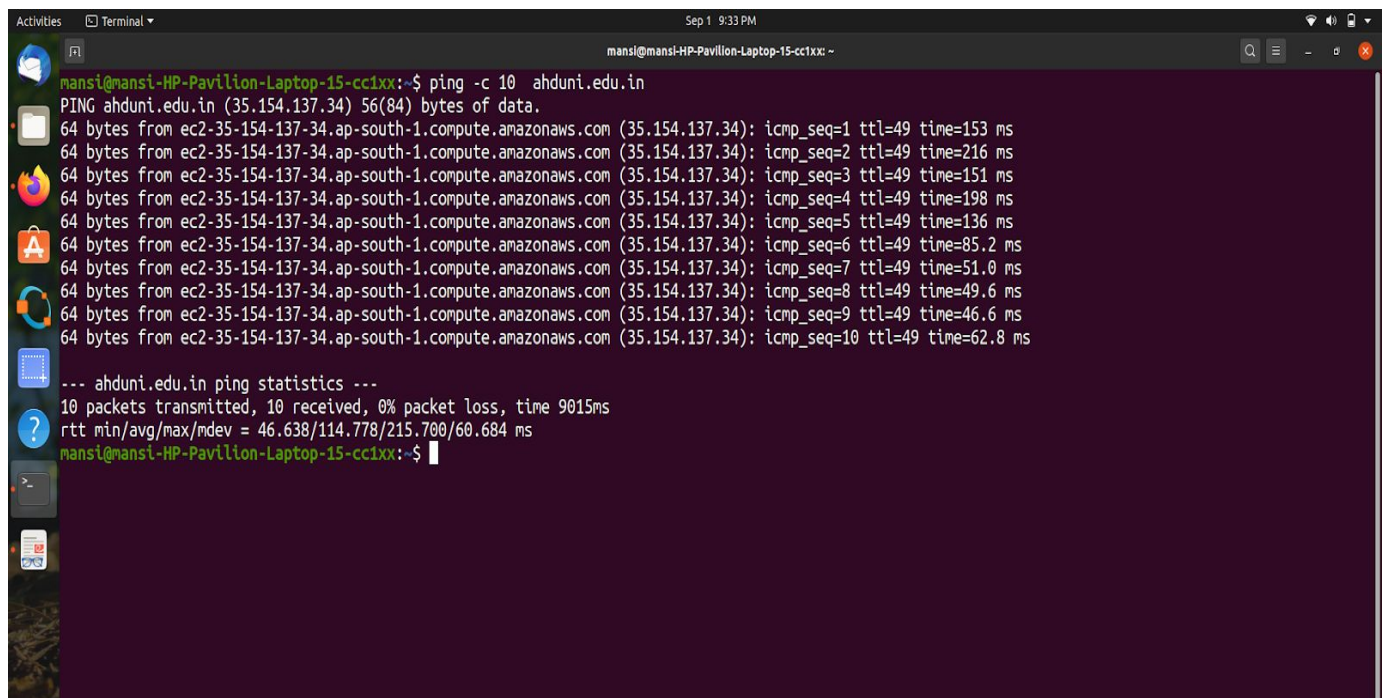
working okay, and that the problem reaching the internet location is somewhere out of your control

→ ping ahduni.edu.in

A terminal window titled 'Terminal' with a dark background. The prompt is 'manshi@mansi-HP-Pavilion-Laptop-15-cc1xx: ~'. The command 'ping ahduni.edu.in' has been executed. The output shows 11 successful pings, each with 64 bytes of data, a TTL of 49, and varying response times between approximately 47ms and 95ms. The statistics at the bottom indicate 12 packets transmitted, 11 received, an 8.33333% packet loss, and a total time of 13870ms. The round-trip time (rtt) statistics are: min/avg/max/mdev = 47.097/66.880/95.726/12.768 ms.

```
manshi@mansi-HP-Pavilion-Laptop-15-cc1xx:~$ ping ahduni.edu.in
PING ahduni.edu.in (35.154.137.34) 56(84) bytes of data:
64 bytes from ec2-35-154-137-34.ap-south-1.compute.amazonaws.com (35.154.137.34): icmp_seq=1 ttl=49 time=61.1 ms
64 bytes from ec2-35-154-137-34.ap-south-1.compute.amazonaws.com (35.154.137.34): icmp_seq=2 ttl=49 time=47.1 ms
64 bytes from ec2-35-154-137-34.ap-south-1.compute.amazonaws.com (35.154.137.34): icmp_seq=3 ttl=49 time=63.6 ms
64 bytes from ec2-35-154-137-34.ap-south-1.compute.amazonaws.com (35.154.137.34): icmp_seq=4 ttl=49 time=76.9 ms
64 bytes from ec2-35-154-137-34.ap-south-1.compute.amazonaws.com (35.154.137.34): icmp_seq=5 ttl=49 time=60.5 ms
64 bytes from ec2-35-154-137-34.ap-south-1.compute.amazonaws.com (35.154.137.34): icmp_seq=6 ttl=49 time=57.7 ms
64 bytes from ec2-35-154-137-34.ap-south-1.compute.amazonaws.com (35.154.137.34): icmp_seq=7 ttl=49 time=95.7 ms
64 bytes from ec2-35-154-137-34.ap-south-1.compute.amazonaws.com (35.154.137.34): icmp_seq=8 ttl=49 time=54.6 ms
64 bytes from ec2-35-154-137-34.ap-south-1.compute.amazonaws.com (35.154.137.34): icmp_seq=9 ttl=49 time=74.3 ms
64 bytes from ec2-35-154-137-34.ap-south-1.compute.amazonaws.com (35.154.137.34): icmp_seq=10 ttl=49 time=67.6 ms
64 bytes from ec2-35-154-137-34.ap-south-1.compute.amazonaws.com (35.154.137.34): icmp_seq=11 ttl=49 time=76.6 ms
^C
--- ahduni.edu.in ping statistics ---
12 packets transmitted, 11 received, 8.33333% packet loss, time 13870ms
rtt min/avg/max/mdev = 47.097/66.880/95.726/12.768 ms
manshi@mansi-HP-Pavilion-Laptop-15-cc1xx:~$
```

→ ping -c 10 ahduni.edu.in :controlling number of pings

A terminal window titled 'Terminal' with a dark background. The prompt is 'manshi@mansi-HP-Pavilion-Laptop-15-cc1xx: ~'. The command 'ping -c 10 ahduni.edu.in' has been executed. The output shows 10 successful pings, each with 64 bytes of data, a TTL of 49, and varying response times between approximately 46ms and 216ms. The statistics at the bottom indicate 10 packets transmitted, 10 received, 0% packet loss, and a total time of 9015ms. The round-trip time (rtt) statistics are: min/avg/max/mdev = 46.638/114.778/215.700/60.684 ms.

```
manshi@mansi-HP-Pavilion-Laptop-15-cc1xx:~$ ping -c 10 ahduni.edu.in
PING ahduni.edu.in (35.154.137.34) 56(84) bytes of data:
64 bytes from ec2-35-154-137-34.ap-south-1.compute.amazonaws.com (35.154.137.34): icmp_seq=1 ttl=49 time=153 ms
64 bytes from ec2-35-154-137-34.ap-south-1.compute.amazonaws.com (35.154.137.34): icmp_seq=2 ttl=49 time=216 ms
64 bytes from ec2-35-154-137-34.ap-south-1.compute.amazonaws.com (35.154.137.34): icmp_seq=3 ttl=49 time=151 ms
64 bytes from ec2-35-154-137-34.ap-south-1.compute.amazonaws.com (35.154.137.34): icmp_seq=4 ttl=49 time=198 ms
64 bytes from ec2-35-154-137-34.ap-south-1.compute.amazonaws.com (35.154.137.34): icmp_seq=5 ttl=49 time=136 ms
64 bytes from ec2-35-154-137-34.ap-south-1.compute.amazonaws.com (35.154.137.34): icmp_seq=6 ttl=49 time=85.2 ms
64 bytes from ec2-35-154-137-34.ap-south-1.compute.amazonaws.com (35.154.137.34): icmp_seq=7 ttl=49 time=51.0 ms
64 bytes from ec2-35-154-137-34.ap-south-1.compute.amazonaws.com (35.154.137.34): icmp_seq=8 ttl=49 time=49.6 ms
64 bytes from ec2-35-154-137-34.ap-south-1.compute.amazonaws.com (35.154.137.34): icmp_seq=9 ttl=49 time=46.6 ms
64 bytes from ec2-35-154-137-34.ap-south-1.compute.amazonaws.com (35.154.137.34): icmp_seq=10 ttl=49 time=62.8 ms
--- ahduni.edu.in ping statistics ---
10 packets transmitted, 10 received, 0% packet loss, time 9015ms
rtt min/avg/max/mdev = 46.638/114.778/215.700/60.684 ms
manshi@mansi-HP-Pavilion-Laptop-15-cc1xx:~$
```

→ ping -s 30 -c 10 ahduni.edu.in :controlling the size of packet send

```
Activities Terminal Sep 1 9:41 PM
mansi@mansi-HP-Pavilion-Laptop-15-cc1xx:~$ ping -s 30 -c 10 ahduni.edu.in
PING ahduni.edu.in (35.154.137.34) 30(58) bytes of data.
38 bytes from ec2-35-154-137-34.ap-south-1.compute.amazonaws.com (35.154.137.34): icmp_seq=1 ttl=49 time=59.6 ms
38 bytes from ec2-35-154-137-34.ap-south-1.compute.amazonaws.com (35.154.137.34): icmp_seq=2 ttl=49 time=50.8 ms
38 bytes from ec2-35-154-137-34.ap-south-1.compute.amazonaws.com (35.154.137.34): icmp_seq=3 ttl=49 time=51.6 ms
38 bytes from ec2-35-154-137-34.ap-south-1.compute.amazonaws.com (35.154.137.34): icmp_seq=4 ttl=49 time=53.7 ms
38 bytes from ec2-35-154-137-34.ap-south-1.compute.amazonaws.com (35.154.137.34): icmp_seq=5 ttl=49 time=51.8 ms
38 bytes from ec2-35-154-137-34.ap-south-1.compute.amazonaws.com (35.154.137.34): icmp_seq=6 ttl=49 time=42.7 ms
38 bytes from ec2-35-154-137-34.ap-south-1.compute.amazonaws.com (35.154.137.34): icmp_seq=7 ttl=49 time=65.7 ms
38 bytes from ec2-35-154-137-34.ap-south-1.compute.amazonaws.com (35.154.137.34): icmp_seq=8 ttl=49 time=49.1 ms
38 bytes from ec2-35-154-137-34.ap-south-1.compute.amazonaws.com (35.154.137.34): icmp_seq=9 ttl=49 time=77.9 ms
38 bytes from ec2-35-154-137-34.ap-south-1.compute.amazonaws.com (35.154.137.34): icmp_seq=10 ttl=49 time=42.6 ms

--- ahduni.edu.in ping statistics ---
10 packets transmitted, 10 received, 0% packet loss, time 9010ms
rtt min/avg/max/mdev = 42.587/54.551/77.908/10.194 ms
mansi@mansi-HP-Pavilion-Laptop-15-cc1xx:~$
```

### 3 . nslookup

nslookup (stands for “Name Server Lookup”) is a useful command for getting information from a DNS server. It is a network administration tool for querying the Domain Name System (DNS) to obtain domain name or IP address mapping or any other specific DNS record. It is also used to troubleshoot DNS related problems

→nslookup website

```
Activities Terminal Sep 2 2:41 PM
mansi@mansi-HP-Pavilion-Laptop-15-cc1xx:~$ nslookup google.com
Server:      127.0.0.53
Address:     127.0.0.53#53

Non-authoritative answer:
Name:   google.com
Address: 142.250.67.238
Name:   google.com
Address: 2404:6800:4009:814::200e
Screenshot mansi-HP-Pavilion-Laptop-15-cc1xx:~$
```

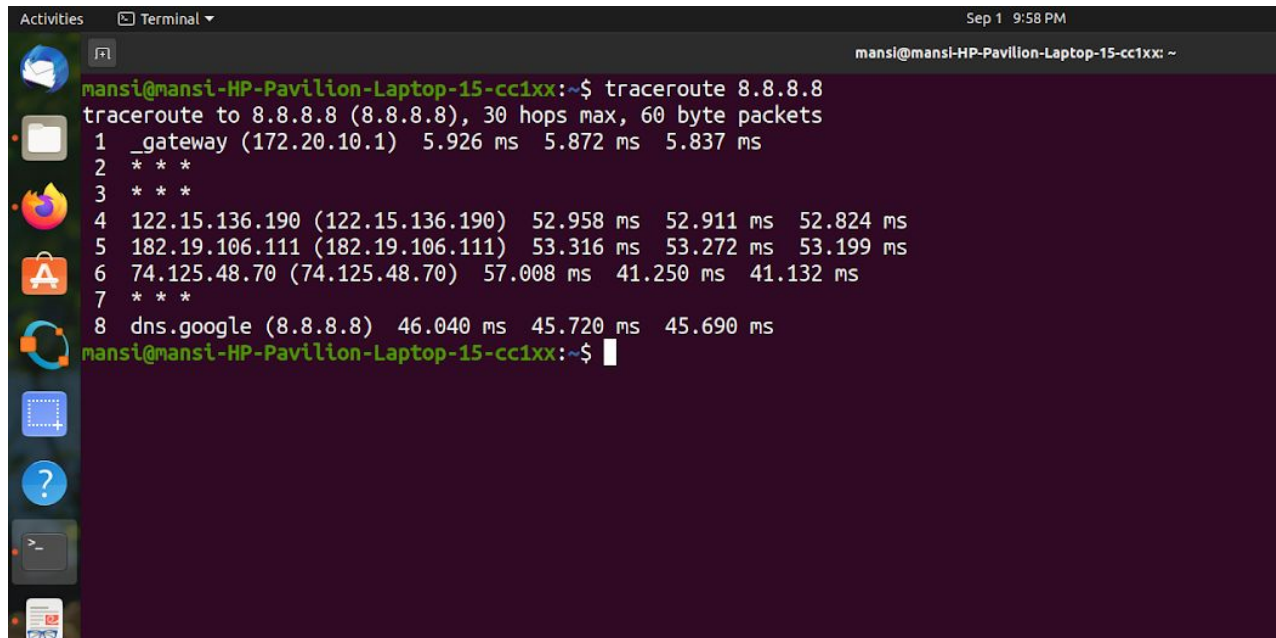


## 4 . traceroute

When packets are sent across the internet, they must hop from network to network. The traceroute command traces the route that packets take to reach the host. It will show you how many hops it takes to reach the host and how long it took between each hop. This allows you to diagnose potential networking bottlenecks. (If the system working on a network is delivering a higher volume of data than what is supported by the existing capacity of the network, then a network bottleneck will occur. A common computing bottleneck culprit is network data interruption caused by microprocessor circuitry or TCP/IP).

The first column corresponds to the hop count. The second column represents the address of that hop and after that, you see three space-separated times in milliseconds. This command sends three packets to the hop and each of the time refers to the time taken by the packet to reach the hop.

→traceroute 8.8.8.8



```
Activities Terminal Sep 1 9:58 PM
mansi@mansi-HP-Pavilion-Laptop-15-cc1xx: ~
mansi@mansi-HP-Pavilion-Laptop-15-cc1xx:~$ traceroute 8.8.8.8
traceroute to 8.8.8.8 (8.8.8.8), 30 hops max, 60 byte packets
 1 _gateway (172.20.10.1)  5.926 ms  5.872 ms  5.837 ms
 2 * * *
 3 * * *
 4 122.15.136.190 (122.15.136.190)  52.958 ms  52.911 ms  52.824 ms
 5 182.19.106.111 (182.19.106.111)  53.316 ms  53.272 ms  53.199 ms
 6 74.125.48.70 (74.125.48.70)  57.008 ms  41.250 ms  41.132 ms
 7 * * *
 8 dns.google (8.8.8.8)  46.040 ms  45.720 ms  45.690 ms
mansi@mansi-HP-Pavilion-Laptop-15-cc1xx:~$
```

→traceroute -4 8.8.8.8:To display ipv4

```
Activities Terminal Sep 1 10:01 PM
mansi@mansi-HP-Pavilion-Laptop-15-cc1xx:~$ traceroute -4 8.8.8.8
traceroute to 8.8.8.8 (8.8.8.8), 30 hops max, 60 byte packets
 1 _gateway (172.20.10.1) 77.138 ms 77.093 ms 77.053 ms
 2 * * *
 3 * * *
 4 122.15.136.190 (122.15.136.190) 127.618 ms 127.504 ms 127.482 ms
 5 182.19.106.111 (182.19.106.111) 127.443 ms 127.418 ms 127.350 ms
 6 74.125.48.70 (74.125.48.70) 131.493 ms 44.066 ms 43.976 ms
 7 * * *
 8 dns.google (8.8.8.8) 61.775 ms 61.684 ms 58.644 ms
mansi@mansi-HP-Pavilion-Laptop-15-cc1xx:~$
```

→ traceroute -6 google.com To display ipv6

```
Activities Terminal Sep 1 10:03 PM
mansi@mansi-HP-Pavilion-Laptop-15-cc1xx:~$ traceroute -6 google.com
traceroute to google.com (2404:6800:4009:814::200e), 30 hops max, 80 byte packets
connect: Network is unreachable
mansi@mansi-HP-Pavilion-Laptop-15-cc1xx:~$
```

## 5 . netstat

When packets are sent across the internet, they must hop from network to network. The traceroute command traces the route that packets take to reach the host. It will show you how many hops it takes to reach the host and how long it took between each hop. This allows you to diagnose potential networking bottlenecks. (If the system working on a network is delivering a higher volume of data than what is supported by the existing capacity of the network, then a network bottleneck will occur. A common computing bottleneck culprit is network data interruption caused by microprocessor circuitry or TCP/IP).

→ netstat -a :List all ports.

```

mansi@mansi-HP-Pavillon-Laptop-15-cc1xx:~$ 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        0      0 mansi-HP-Pavillon:54130 bom07s16-in-f1.1e:https ESTABLISHED
tcp        0      0 mansi-HP-Pavillon:41274 35.165.120.205:https    ESTABLISHED
tcp        0      0 mansi-HP-Pavillon:39702 117.18.237.29:http      ESTABLISHED
tcp        0      0 mansi-HP-Pavillon:46170 52.179.186.74:https     TIME_WAIT
tcp        0      0 mansi-HP-Pavillon:32872 205.180.87.178:https    ESTABLISHED
tcp        0      0 mansi-HP-Pavillon:53016 bom12s01-in-f2.1e:https ESTABLISHED
tcp        0      0 mansi-HP-Pavillon:57870 bom07s20-in-f14.1:https ESTABLISHED
tcp        0      0 mansi-HP-Pavillon:50060 bom12s04-in-f14.1:https ESTABLISHED
tcp        0      0 mansi-HP-Pavillon:60188 bom07s24-in-f10.1:https ESTABLISHED
tcp        0      0 mansi-HP-Pavillon:33344 103.231.98.193:https    ESTABLISHED
tcp        0      0 mansi-HP-Pavillon:53062 bom12s01-in-f2.1e:https ESTABLISHED
tcp        0      0 mansi-HP-Pavillon:50058 bom12s04-in-f14.1:https ESTABLISHED
tcp        0      0 mansi-HP-Pavillon:47372 ec2-13-126-187-24:https ESTABLISHED
tcp        0      0 mansi-HP-Pavillon:48644 server-13-227-235:https  ESTABLISHED
tcp        0      0 mansi-HP-Pavillon:39216 13.230.175.32:https     ESTABLISHED
tcp        0      0 mansi-HP-Pavillon:51904 a23-203-37-79:dep:https ESTABLISHED
tcp        0      0 mansi-HP-Pavillon:57676 bom12s06-in-f1.1e:https TIME_WAIT
tcp        0      0 mansi-HP-Pavillon:51906 a23-203-37-79:dep:https ESTABLISHED
tcp        0      0 mansi-HP-Pavillon:45322 74.118.186.210:https    ESTABLISHED
tcp        0      0 mansi-HP-Pavillon:54606 ads.us.e-planning:https ESTABLISHED
tcp        0      0 mansi-HP-Pavillon:48836 hkg12s10-in-f36.1:https ESTABLISHED
tcp        0      0 mansi-HP-Pavillon:60190 bom07s24-in-f10.1:https ESTABLISHED
tcp        0      0 mansi-HP-Pavillon:48834 hkg12s10-in-f36.1:https ESTABLISHED
tcp        0      0 mansi-HP-Pavillon:41558 8.159.244.35.bc.g:https ESTABLISHED
tcp        0      0 mansi-HP-Pavillon:43794 bom05s10-in-f141:https  ESTABLISHED
tcp        0      0 mansi-HP-Pavillon:53060 bom12s01-in-f2.1e:https ESTABLISHED
tcp        0      0 mansi-HP-Pavillon:51154 bom07s24-in-f2.1e:https ESTABLISHED
tcp6       0      0 :::localhost:ipp       :::*                    LISTEN
udp        0      0 localhost:domain       0.0.0.0:*               ESTABLISHED
udp        0      0 mansi-HP-Pavillon:bootpc _gateway:bootps        ESTABLISHED
udp        0      0 0.0.0.0:631            0.0.0.0:*               ESTABLISHED
udp        0      0 0.0.0.0:37988          0.0.0.0:*               ESTABLISHED
udp        0      0 0.0.0.0:mdns           0.0.0.0:*               ESTABLISHED
udp6       0      0 :::41590               :::*                    ESTABLISHED

```

```

mansi@mansi-HP-Pavillon-Laptop-15-cc1xx:~$ netstat -l
Active UNIX domain sockets (servers and established)
Proto RefCnt Flags       Type       I-Node      State       Path
unix 2      [ ACC ] SEQPACKET LISTENING   17846      /run/udev/control
unix 2      [ ] DGRAM      LISTENING   34469      /run/user/1000/systemd/notify
unix 2      [ ACC ] STREAM     LISTENING   34472      /run/user/1000/systemd/private
unix 2      [ ACC ] STREAM     LISTENING   34477      /run/user/1000/bus
unix 2      [ ACC ] STREAM     LISTENING   34478      /run/user/1000/gnupg/S.dirmngr
unix 2      [ ACC ] STREAM     LISTENING   34479      /run/user/1000/gnupg/S.gpg-agent.browser
unix 2      [ ACC ] STREAM     LISTENING   34480      /run/user/1000/gnupg/S.gpg-agent.extra
unix 2      [ ACC ] STREAM     LISTENING   24386      @/tmp/dbus-bQR5h9uy
unix 2      [ ACC ] STREAM     LISTENING   34481      /run/user/1000/gnupg/S.gpg-agent.ssh
unix 2      [ ACC ] STREAM     LISTENING   34482      /run/user/1000/gnupg/S.gpg-agent
unix 2      [ ACC ] STREAM     LISTENING   34483      /run/user/1000/pk-debconf/socket
unix 2      [ ] DGRAM      LISTENING   305289     /run/wpa_supplicant/wlo1
unix 2      [ ACC ] STREAM     LISTENING   34484      /run/user/1000/pulse/native
unix 2      [ ACC ] STREAM     LISTENING   34485      /run/user/1000/snapd-session-agent.socket
unix 2      [ ] DGRAM      LISTENING   305316     /run/wpa_supplicant/p2p-dev-wlo1
unix 2      [ ACC ] STREAM     LISTENING   42349      @/tmp/.ICE-unix/1912
unix 2      [ ACC ] STREAM     LISTENING   39142      /run/user/1000/krnlring/control
unix 2      [ ACC ] STREAM     LISTENING   39263      @/tmp/.X11-unix/X0
unix 2      [ ACC ] STREAM     LISTENING   24385      @/tmp/dbus-cq43j7jc
unix 2      [ ACC ] STREAM     LISTENING   37608      /run/user/1000/krnlring/pkcs11
unix 2      [ ACC ] STREAM     LISTENING   35838      /run/user/1000/krnlring/ssh
unix 2      [ ACC ] STREAM     LISTENING   43130      @/tmp/dbus-aax3skp2V0
unix 2      [ ACC ] STREAM     LISTENING   34700      @/home/mansi/.cache/ibus/dbus-1792B3Ec
unix 2      [ ACC ] STREAM     LISTENING   39264      /tmp/.X11-unix/X0
unix 2      [ ACC ] STREAM     LISTENING   42066      @/tmp/dbus-qkGikejF
unix 2      [ ACC ] STREAM     LISTENING   42180      /tmp/ssh-IqX0F7pEKH4/agent.1721
unix 2      [ ACC ] STREAM     LISTENING   42067      @/tmp/dbus-Us1tq7na
unix 4      [ ] DGRAM      LISTENING   17816      /run/systemd/notify
unix 2      [ ACC ] STREAM     LISTENING   17819      /run/systemd/private
unix 2      [ ACC ] STREAM     LISTENING   17821      /run/systemd/userdb/io.systemd.DynamicUser
unix 2      [ ] DGRAM      LISTENING   17830      /run/systemd/journal/syslog
unix 2      [ ACC ] STREAM     LISTENING   17832      /run/systemd/fscck.progress
unix 17     [ ] DGRAM      LISTENING   17840      /run/systemd/journal/dev-log
unix 2      [ ACC ] STREAM     LISTENING   210010     @/dbus-vfs-daemon/socket-dYbYbHou
unix 2      [ ACC ] STREAM     LISTENING   29782      /run/acpid.socket
unix 2      [ ACC ] STREAM     LISTENING   17842      /run/systemd/journal/stdout

```

→ netstat -l :List only listening ports.



```

mansi@mansi-HP-Pavilion-Laptop-15-cc1xx:~$ netstat -l
Active Internet connections (only servers)
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
tcp6       0      0 ip6-localhost:ipp       [::]:*                  LISTEN
udp        0      0 localhost:domain        0.0.0.0:*               LISTEN
udp        0      0 0.0.0.0:631             0.0.0.0:*               LISTEN
udp        0      0 0.0.0.0:37988           0.0.0.0:*               LISTEN
udp        0      0 0.0.0.0:mdns             0.0.0.0:*               LISTEN
udp6       0      0 [::]:41590              [::]:*                  LISTEN
udp6       0      0 [::]:mdns                [::]:*                  LISTEN
udp6       0      0 [::]:ipv6-icmp          [::]:*                  LISTEN
Active UNIX domain sockets (only servers)
Proto RefCnt Flags               Type               State         I-Node  Path
unix   2      [ ACC ] SEQPACKET         LISTENING      17846   /run/udev/control
unix   2      [ ACC ] STREAM            LISTENING      34472   /run/user/1000/systemd/private
unix   2      [ ACC ] STREAM            LISTENING      34477   /run/user/1000/bus
unix   2      [ ACC ] STREAM            LISTENING      34478   /run/user/1000/gnupg/S.dirmngr
unix   2      [ ACC ] STREAM            LISTENING      34479   /run/user/1000/gnupg/S.gpg-agent.browser
unix   2      [ ACC ] STREAM            LISTENING      34480   /run/user/1000/gnupg/S.gpg-agent.extra
unix   2      [ ACC ] STREAM            LISTENING      24386   @/tmp/dbus-bQR5h9uy
unix   2      [ ACC ] STREAM            LISTENING      34481   /run/user/1000/gnupg/S.gpg-agent.ssh
unix   2      [ ACC ] STREAM            LISTENING      34482   /run/user/1000/gnupg/S.gpg-agent
unix   2      [ ACC ] STREAM            LISTENING      34483   /run/user/1000/pk-debconf-socket
unix   2      [ ACC ] STREAM            LISTENING      34484   /run/user/1000/pulse/native
unix   2      [ ACC ] STREAM            LISTENING      34485   /run/user/1000/snapsd-session-agent.socket
unix   2      [ ACC ] STREAM            LISTENING      42349   @/tmp/.ICE-unix/1912
unix   2      [ ACC ] STREAM            LISTENING      39142   /run/user/1000/keyring/control
unix   2      [ ACC ] STREAM            LISTENING      39263   @/tmp/.X11-unix/X0
unix   2      [ ACC ] STREAM            LISTENING      24385   @/tmp/dbus-cg43j7jc
unix   2      [ ACC ] STREAM            LISTENING      37608   /run/user/1000/keyring/pkcs11
unix   2      [ ACC ] STREAM            LISTENING      35838   /run/user/1000/keyring/ssh
unix   2      [ ACC ] STREAM            LISTENING      43130   @/tmp/dbus-aax3skpZVD
unix   2      [ ACC ] STREAM            LISTENING      34700   @/home/mansi/.cache/ibus/dbus-1792B3Ec
unix   2      [ ACC ] STREAM            LISTENING      39264   /tmp/.X11-unix/X0
unix   2      [ ACC ] STREAM            LISTENING      42066   @/tmp/dbus-qkGikejF
unix   2      [ ACC ] STREAM            LISTENING      42180   /tmp/ssh-IqX0F7pEKH4/agent.1721
unix   2      [ ACC ] STREAM            LISTENING      42067   @/tmp/dbus-Us1tq7na

```

→ netstat -lt :List only listening TCP ports.

```

mansi@mansi-HP-Pavilion-Laptop-15-cc1xx:~$ netstat -lt
Active Internet connections (only servers)
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
tcp6       0      0 ip6-localhost:ipp       [::]:*                  LISTEN
mansi@mansi-HP-Pavilion-Laptop-15-cc1xx:~$

```

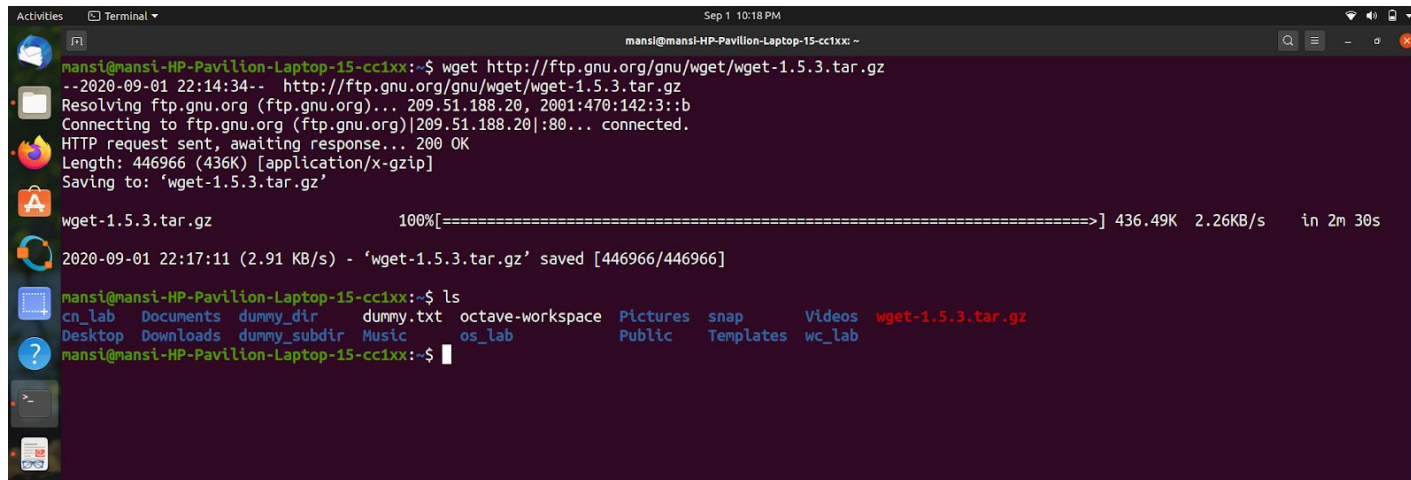
## 6 . wget

The wget command is a command line utility for downloading files from the Internet. It supports downloading multiple files, downloading in the background, resuming downloads, limiting the bandwidth used for downloads and viewing headers. It is also a non-interactive network downloader. It means that it can work in the background, while

the user is not logged on. The beauty of this is that most of the browsers require constant user's presence and it may be a hindrance when transferring a lot of data and this is where this command will help to start a retrieval and disconnect from the system letting wget finish the work. If a download fails due to network problems, it will keep retrying until the whole file has been retrieved. If the server supports re-getting, it will instruct the server to continue the download from where it left off.

→ Installation for ubuntu : `sudo apt install wget`

→ `wget http://ftp.gnu.org/gnu/wget/wget-1.5.3.tar.gz`

A terminal window on a Linux system showing the execution of the wget command to download a file from the internet. The terminal output shows the command being run, the connection to the server, the file size, and the progress of the download. The download is complete, and the file is saved to the current directory. The terminal also shows the contents of the current directory after the download.

```
mansi@mansi-HP-Pavillon-Laptop-15-cc1xx:~$ wget http://ftp.gnu.org/gnu/wget/wget-1.5.3.tar.gz
--2020-09-01 22:14:34-- http://ftp.gnu.org/gnu/wget/wget-1.5.3.tar.gz
Resolving ftp.gnu.org (ftp.gnu.org)... 209.51.188.20, 2001:470:142:3::b
Connecting to ftp.gnu.org (ftp.gnu.org)|209.51.188.20|:80... connected.
HTTP request sent, awaiting response... 200 OK
Length: 446966 (436K) [application/x-gzip]
Saving to: 'wget-1.5.3.tar.gz'

wget-1.5.3.tar.gz                  100%[=====>] 436.49K  2.26KB/s   in 2m 30s

2020-09-01 22:17:11 (2.91 KB/s) - 'wget-1.5.3.tar.gz' saved [446966/446966]

mansi@mansi-HP-Pavillon-Laptop-15-cc1xx:~$ ls
cn_lab  Documents  dummy_dir  dummy.txt  octave-workspace  Pictures  snap  Videos  wget-1.5.3.tar.gz
Desktop Downloads dummy_subdir Music      os_lab    Public  Templates wc_lab
```

→ `wget -O wger.zip http://ftp.gnu.org/gnu/wget/wget-1.5.3.tar.gz`

```
Activities Terminal Sep 1 10:20 PM
mansimansi-HP-Pavillon-Laptop-15-cc1xx:~
mansimansi-HP-Pavillon-Laptop-15-cc1xx:~$ wget -O wget.zip http://ftp.gnu.org/gnu/wget/wget-1.5.3.tar.gz
--2020-09-01 22:19:25-- http://ftp.gnu.org/gnu/wget/wget-1.5.3.tar.gz
Resolving ftp.gnu.org (ftp.gnu.org)... 209.51.188.20, 2001:470:142:3::b
Connecting to ftp.gnu.org (ftp.gnu.org)|209.51.188.20|:80... connected.
HTTP request sent, awaiting response... 200 OK
Length: 446966 (436K) [application/x-gzip]
Saving to: 'wget.zip'

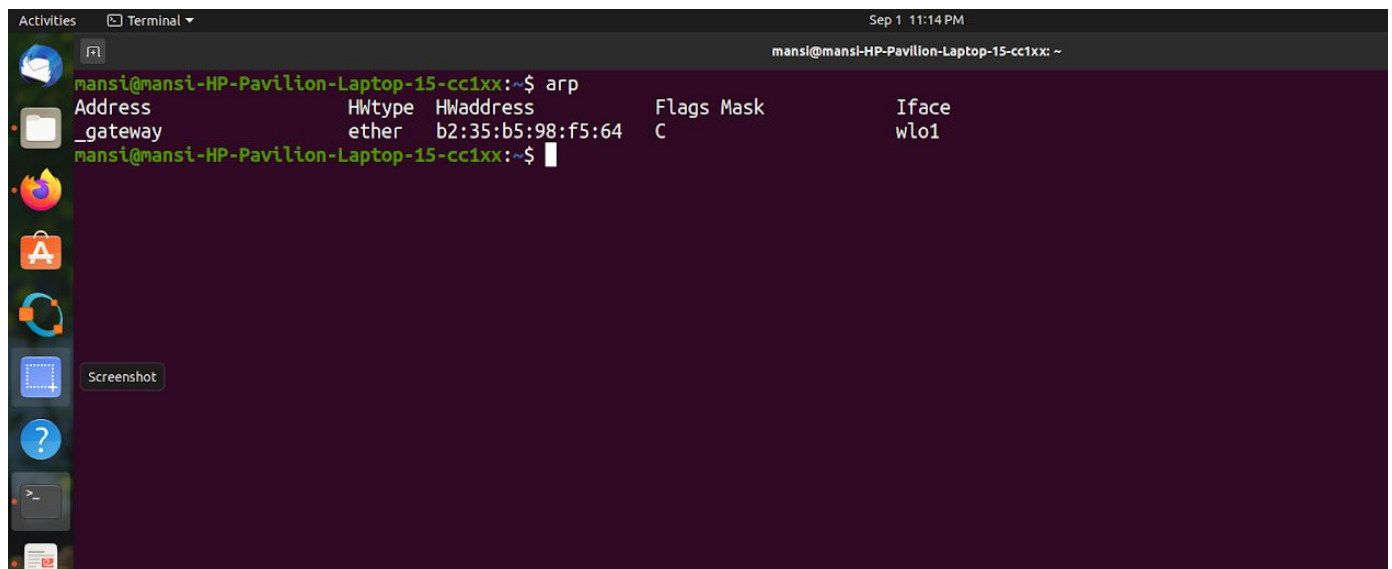
wget.zip                               100%[=====>] 436.49K  6.19KB/s  in 82s

2020-09-01 22:20:48 (5.32 KB/s) - 'wget.zip' saved [446966/446966]

mansimansi-HP-Pavillon-Laptop-15-cc1xx:~$ ls
cn_lab  Documents  dummy_dir  dummy.txt  octave-workspace  Pictures  snap  Videos  wget-1.5.3.tar.gz
Desktop Downloads  dummy_subdir  Music      os_lab        Public   Templates  wc_lab  wget.zip
mansimansi-HP-Pavillon-Laptop-15-cc1xx:~$
```

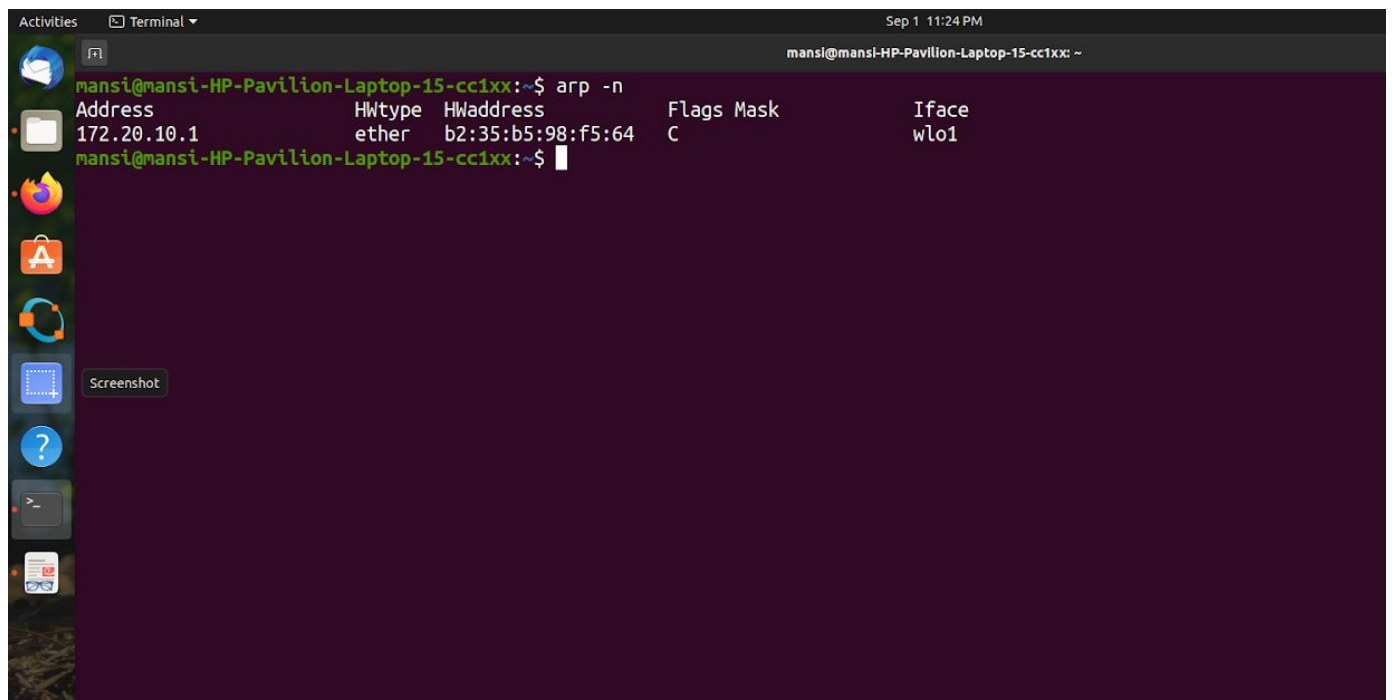
## 7 . arp

ARP [ Address Resolution Protocol] It is used to find the media access control address (MAC address) of a network neighbour for a given IPv4 address. An ARP cache is a simple mapping of IP addresses to MAC addresses. Each time a computer's TCP/IP stack uses ARP to determine the Media Access Control (MAC) address for an IP address, it records the mapping in the ARP cache so that future ARP lookups go faster. arp command is used to manipulate the system ARP cache. More specifically, it manipulates or displays the kernel's IPv4 network neighbour cache and can add entries to the table, delete one, or display the current content.

A terminal window titled 'Terminal' with a dark purple background. The prompt is 'mansi@mansi-HP-Pavilion-Laptop-15-cc1xx:~\$'. The command 'arp' has been executed, displaying a table of ARP entries. The table has columns: Address, HWtype, HWaddress, Flags, Mask, and Iface. One entry is shown for the gateway at IP 172.20.10.1, with hardware address b2:35:b5:98:f5:64 on interface wlo1.

```
mansi@mansi-HP-Pavilion-Laptop-15-cc1xx:~$ arp
Address            HWtype  HWaddress      Flags Mask    Iface
_gateway          ether    b2:35:b5:98:f5:64   C         wlo1
mansi@mansi-HP-Pavilion-Laptop-15-cc1xx:~$
```

→arp -n : shows numerical addresses instead of symbolic host, port or usernames

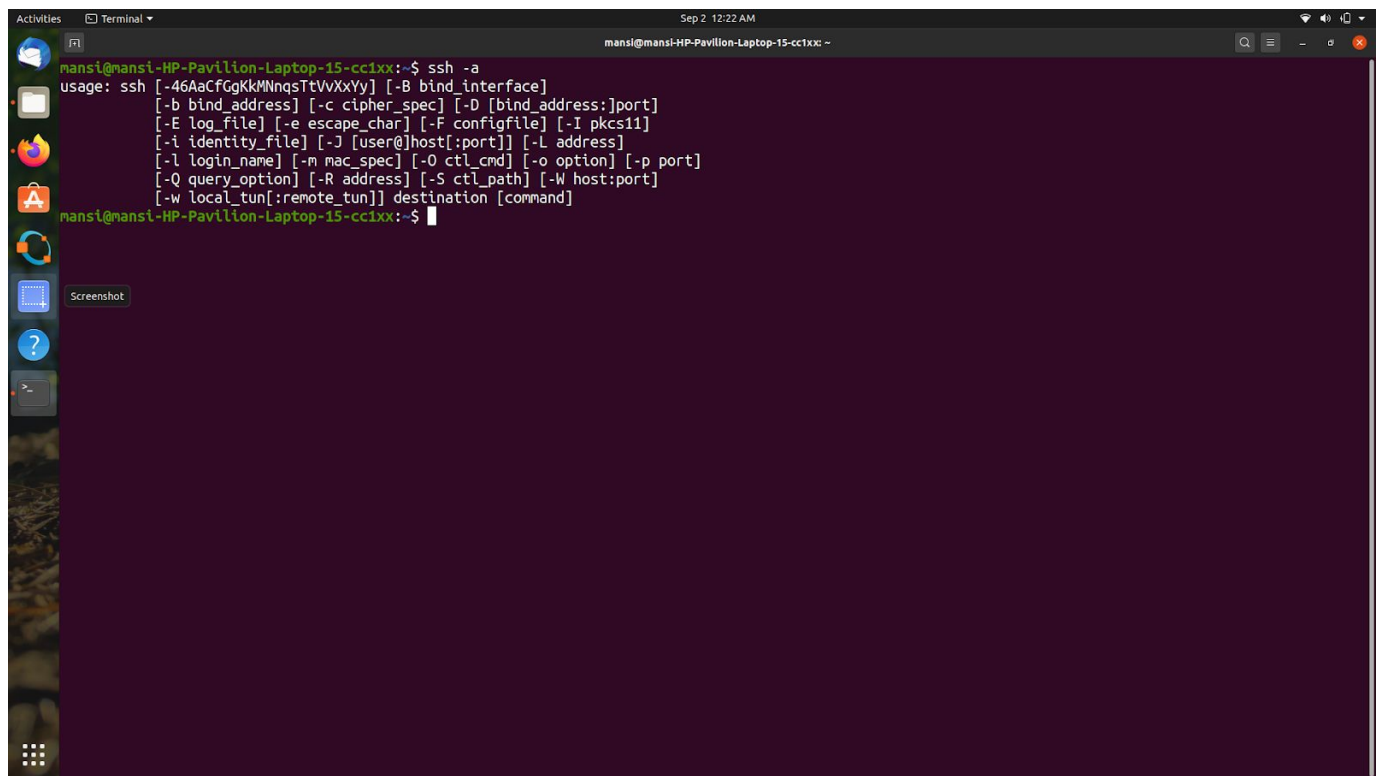
A terminal window titled 'Terminal' with a dark purple background. The prompt is 'mansi@mansi-HP-Pavilion-Laptop-15-cc1xx:~\$'. The command 'arp -n' has been executed, displaying a table of ARP entries with numerical IP addresses. The table has columns: Address, HWtype, HWaddress, Flags, Mask, and Iface. One entry is shown for the gateway at IP 172.20.10.1, with hardware address b2:35:b5:98:f5:64 on interface wlo1.

```
mansi@mansi-HP-Pavilion-Laptop-15-cc1xx:~$ arp -n
Address            HWtype  HWaddress      Flags Mask    Iface
172.20.10.1        ether    b2:35:b5:98:f5:64   C         wlo1
mansi@mansi-HP-Pavilion-Laptop-15-cc1xx:~$
```

## 8 . ssh

ssh stands for “Secure Shell” . The ssh command provides a secure encrypted connection between two hosts(remote server/system) over an insecure network. This connection can also be used for terminal access, file transfers, and for tunneling other applications .It transfers inputs from the client to the host and relays back the output. ssh runs at TCP/IP port 22.



A terminal window titled 'Terminal' with a dark background. The prompt is 'mansi@mansi-HP-Pavilion-Laptop-15-cc1xx:~\$'. The user has entered 'ssh -a', which has triggered a usage message. The message lists various options for the ssh command, including bind interface, bind address, cipher spec, log file, escape char, configfile, pkcs11, identity file, user/host/port, login name, mac spec, ctl cmd, option, port, query option, address, ctl\_path, host/port, and local\_tun/remote\_tun/destination/command. The prompt returns to 'mansi@mansi-HP-Pavilion-Laptop-15-cc1xx:~\$' after the message.

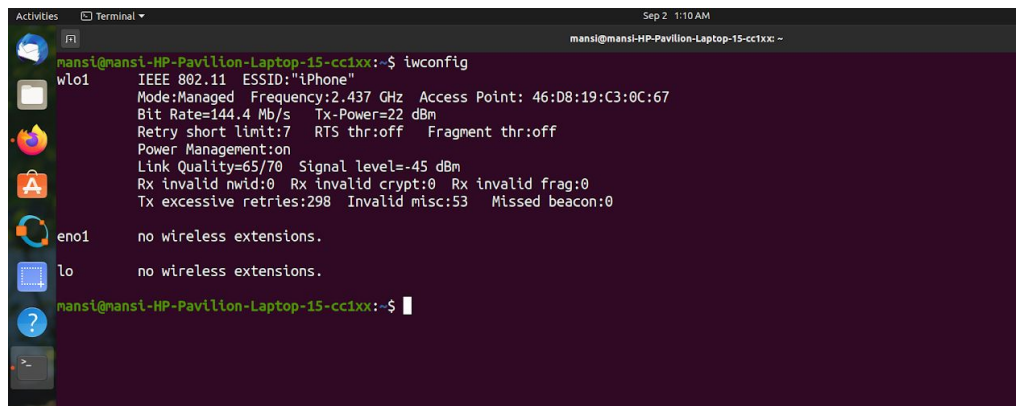
```
mansi@mansi-HP-Pavilion-Laptop-15-cc1xx:~$ ssh -a
usage: ssh [-46AaCfGgKkMMnqsTtVvXxYy] [-B bind_interface]
          [-b bind_address] [-c cipher_spec] [-D [bind_address:]port]
          [-E log_file] [-e escape_char] [-F configfile] [-I pkcs11]
          [-i identity_file] [-J [user@]host[:port]] [-L address]
          [-l login_name] [-m mac_spec] [-O ctl_cmd] [-o option] [-p port]
          [-Q query_option] [-R address] [-S ctl_path] [-W host:port]
          [-w local_tun[:remote_tun]] destination [command]
mansi@mansi-HP-Pavilion-Laptop-15-cc1xx:~$
```

## 9 . ftp

ftp is the user interface to the Internet standard File Transfer Protocol. The program allows a user to transfer files to and from a remote network site

## 10 . iwconfig

iwconfig command in Linux is like ipconfig command, in the sense it works with kernel-resident network interface but it is dedicated to wireless networking interfaces only. It is used to set the parameters of the network interface that are particular to the wireless operation like SSID, frequency etc. *iwconfig* may also be used to display the parameters, and the wireless statistics which are extracted from */proc/net/wireless*.

A terminal window titled 'Terminal' with a dark background. The prompt is 'mansi@mansi-HP-Pavilion-Laptop-15-cc1xx:~\$'. The user has entered 'iwconfig', which has triggered a detailed output for the 'wlo1' interface. The output shows IEEE 802.11 settings, including ESSID 'iPhone', Mode 'Managed', Frequency '2.437 GHz', Access Point '46:D8:19:C3:0C:67', Bit Rate '144.4 Mb/s', Tx-Power '22 dBm', Retry short limit '7', RTS thr 'off', Fragment thr 'off', Power Management 'on', Link Quality '65/70', Signal level '-45 dBm', and various statistics like Rx invalid nwid, Rx invalid crypt, Rx invalid frag, Tx excessive retries, Invalid misc, and Missed beacon. Below this, it shows 'eno1' and 'lo' both having 'no wireless extensions.' The prompt returns to 'mansi@mansi-HP-Pavilion-Laptop-15-cc1xx:~\$' after the output.

```
mansi@mansi-HP-Pavilion-Laptop-15-cc1xx:~$ iwconfig
wlo1      IEEE 802.11  ESSID:"iPhone"
          Mode:Managed  Frequency:2.437 GHz  Access Point: 46:D8:19:C3:0C:67
          Bit Rate=144.4 Mb/s   Tx-Power=22 dBm
          Retry short limit:7   RTS thr:off   Fragment thr:off
          Power Management:on
          Link Quality=65/70   Signal level=-45 dBm
          Rx invalid nwid:0   Rx invalid crypt:0   Rx invalid frag:0
          Tx excessive retries:298   Invalid misc:53   Missed beacon:0

eno1      no wireless extensions.

lo        no wireless extensions.

mansi@mansi-HP-Pavilion-Laptop-15-cc1xx:~$
```