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Batch: 03

## EXPERIMENT: 02

● **Aim:** Use basic networking commands in Linux (ping, tracer, nslookup, netstat, ARP, RARP, ip, ifconfig, dig, and route)

### ● **Theory:**

#### ❖ **What Is Linux**

Linux is an open-source operating system like other operating systems such as Microsoft Windows, Apple Mac OS, iOS, Google android, etc. An operating system is a software that enables the communication between computer hardware and software.

It conveys input to get processed by the processor and brings output to the hardware to display it. This is the basic function of an operating system. Although it performs many other important tasks, let's not talk about that.

#### ❖ **Structure of a Linux System:**

It consists of three parts.

- i. UNIX kernel
- ii. Shells
- iii. Tools and Applications

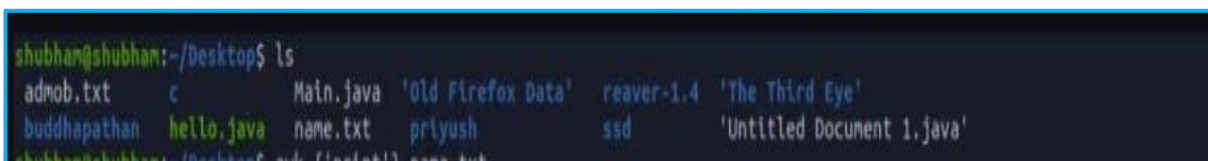
#### ❖ **Linux command:**

The Linux command is a utility of the Linux operating system. All basic and advanced tasks can be done by executing commands. The commands are executed on the Linux terminal. The terminal is a command-line interface to interact with the system, which is similar to the command prompt in the Windows OS.

##### 1) **ls:**

The ls is the list command in Linux. It will show the full list or content of your directory. Just type ls and press the enter key. The whole content will be shown.

Syntax: ls

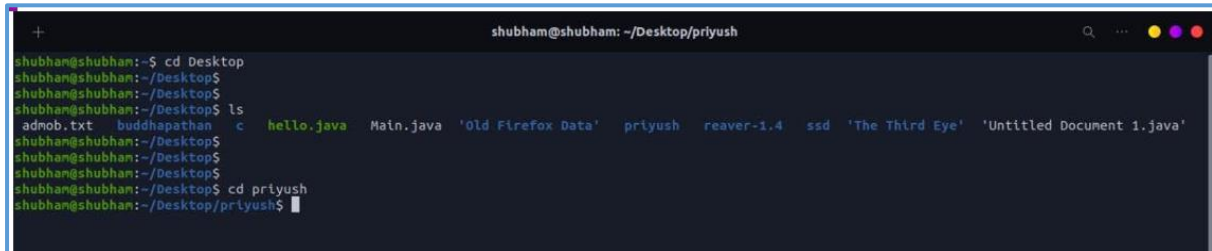


```
shubham@shubham:~/Desktop$ ls
admob.txt  c          Main.java  'Old Firefox Data'  reaver-1.4  'The Third Eye'
buddhapathan  hello.java  name.txt   priyush             ssd          'Untitled Document 1.java'
```

2) cd:

Linux **cd** command is used to change the current working directory ( i.e., in which the current user is working). The "cd" stands for '**change directory**.' It is one of the most frequently used commands in the Linux terminal.

Syntax: cd **<dirname>**

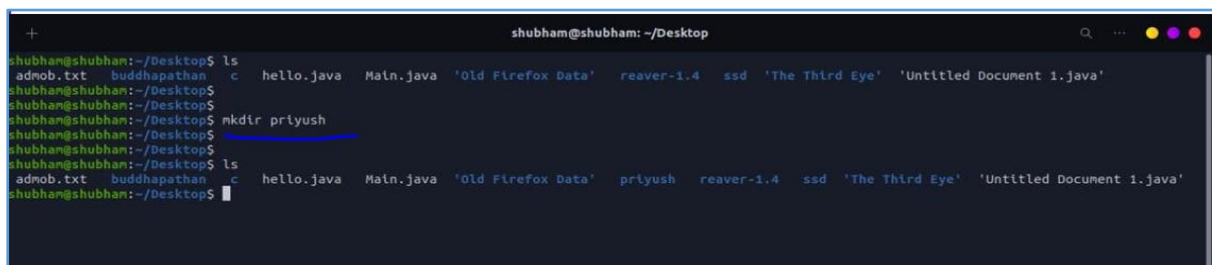


```
shubham@shubham: ~/Desktop/priyush
shubham@shubham:~$ cd Desktop
shubham@shubham:~/Desktop$
shubham@shubham:~/Desktop$ ls
admob.txt  buddhapathan  c  hello.java  Main.java  'Old Firefox Data'  priyush  reaver-1.4  ssd  'The Third Eye'  'Untitled Document 1.java'
shubham@shubham:~/Desktop$
shubham@shubham:~/Desktop$ cd priyush
shubham@shubham:~/Desktop/priyush$
```

3) mkdir:

The mkdir stands for 'make directory'. With the help of mkdir command, you can create a new directory wherever you want in your system. Just type "**mkdir <dir name>**", in place of <dir name> type the name of new directory, you want to create and then press enter.

Syntax: mkdir **<dirname>**

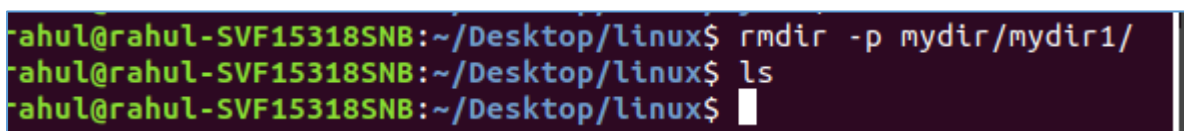


```
shubham@shubham: ~/Desktop
shubham@shubham:~/Desktop$ ls
admob.txt  buddhapathan  c  hello.java  Main.java  'Old Firefox Data'  reaver-1.4  ssd  'The Third Eye'  'Untitled Document 1.java'
shubham@shubham:~/Desktop$
shubham@shubham:~/Desktop$ mkdir priyush
shubham@shubham:~/Desktop$
shubham@shubham:~/Desktop$ ls
admob.txt  buddhapathan  c  hello.java  Main.java  'Old Firefox Data'  priyush  reaver-1.4  ssd  'The Third Eye'  'Untitled Document 1.java'
shubham@shubham:~/Desktop$
```

4) rmdir:

rmdir command is used remove empty directories from the file system in Linux. The rmdir command removes each and every directory specified in the command line only if these directories are empty. So if the specified directory has some directories or files in it then this cannot be removed by rmdir command.

Syntax: rmdir **<dirname>**



```
rahul@rahul-SVF15318SNB:~/Desktop/linux$ rmdir -p mydir/mydir1/
rahul@rahul-SVF15318SNB:~/Desktop/linux$ ls
rahul@rahul-SVF15318SNB:~/Desktop/linux$
```

5) rm:

rm stands for remove here. rm command is used to remove objects such as files, directories, symbolic links and so on from the file system like UNIX.

Syntax: rm <dirname>

```
sssit@JavaTpoint: ~  
sssit@JavaTpoint:~$ ls  
cretecler  Disk1      Downloads  Music      myfile2    Pictures   Templates  
Desktop    Documents  examples.desktop myfile1    office     Public     Videos  
sssit@JavaTpoint:~$  
sssit@JavaTpoint:~$ rm myfile1  
sssit@JavaTpoint:~$  
sssit@JavaTpoint:~$ ls  
cretecler  Disk1      Downloads  Music      office     Public     Videos  
Desktop    Documents  examples.desktop myfile2    Pictures   Templates  
sssit@JavaTpoint:~$
```

6) Man:

man command in Linux is used to display the user manual of any command that we can run on the terminal. It provides a detailed view of the command which includes NAME, SYNOPSIS, DESCRIPTION, OPTIONS, EXIT STATUS, RETURN VALUES, ERRORS, FILES, VERSIONS, EXAMPLES, AUTHORS and SEE ALSO.

Every manual is divided into the following sections:

- Executable programs or shell commands
- System calls (functions provided by the kernel)
- Library calls (functions within program libraries)
- Games
- Special files (usually found in /dev)
- File formats and conventions eg /etc/passwd

Syntax: man

7) Touch:

It is used to create a file without any content. The file created using touch command is empty. The touch command is used to create a file in current working directory.

Syntax: touch <filename>

```
student1@acpce-IT:~/Desktop/test$ touch file.txt
student1@acpce-IT:~/Desktop/test$ ls
file.txt  text.txt
```

8) Cp:

cp stands for copy. This command is used to copy files or group of files or directory. It creates an exact image of a file on a disk with different file name.

Syntax: cp <filename1 to filename 2>

```
shubham@shubham:~/Desktop$ cp name.txt post.txt
shubham@shubham:~/Desktop$
shubham@shubham:~/Desktop$
```

9) mv:

This command is used to move a file from one location to other, that is from one directory to other.

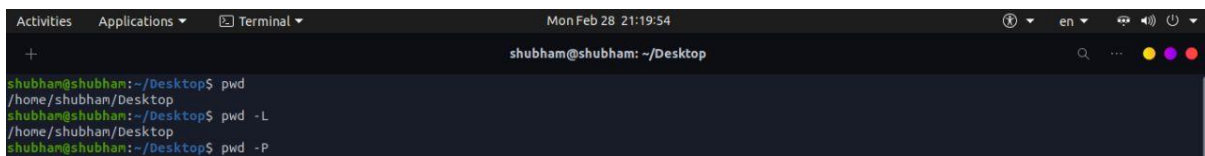
Syntax: mv <filename1 to filename 2>

```
shubham@shubham:~/Desktop$
shubham@shubham:~/Desktop$ mv name.txt c
shubham@shubham:~/Desktop$
```

10) pwd:

'pwd' stands for 'Print Working Directory'. As the name states, command 'pwd' prints the current working directory or simply the directory user is, at present. It prints the current directory name with the complete path starting from root (/).

Syntax: pwd



```
shubham@shubham:~/Desktop$ pwd
/home/shubham/Desktop
shubham@shubham:~/Desktop$ pwd -L
/home/shubham/Desktop
shubham@shubham:~/Desktop$ pwd -P
/home/shubham/Desktop
```

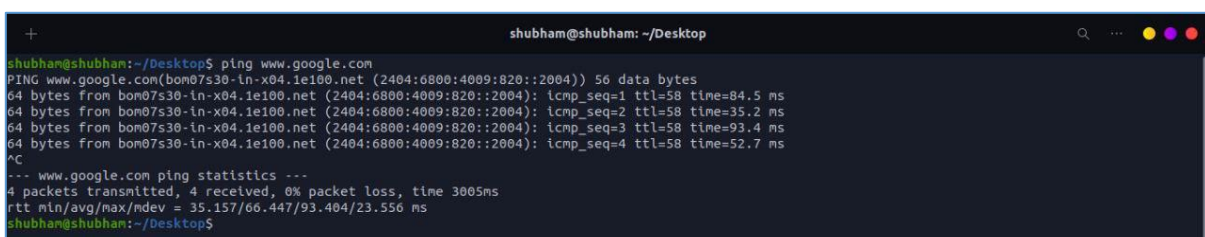
❖ Basic networking commands:

"A computer network is a set of devices connected through links. A node can be computer, printer, or any other device capable of sending or receiving the data. The links connecting the nodes are known as communication channels."

1) ping:

Ping is used to **testing a network host capacity to interact with another host**. Just enter the command Ping, followed by the target host's name or IP address. The ping utilities seem to be the most common network tool. This is performed by using **the Internet Control Message Protocol (ICMP)**, which allows the echo packet to be sent to the destination host and a listening mechanism.

Syntax: ping **<option>** **<destination>**

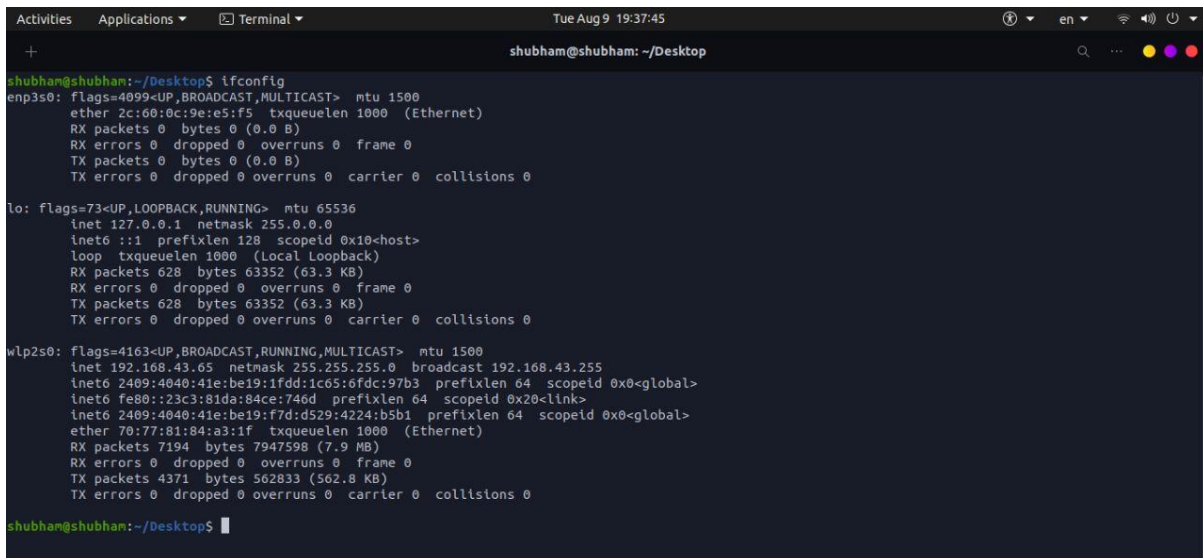


```
shubham@shubham:~/Desktop$ ping www.google.com
PING www.google.com (bom07s30-in-x04.1e100.net (2404:6800:4009:820::2004)) 56 data bytes
64 bytes from bom07s30-in-x04.1e100.net (2404:6800:4009:820::2004): icmp_seq=1 ttl=58 time=84.5 ms
64 bytes from bom07s30-in-x04.1e100.net (2404:6800:4009:820::2004): icmp_seq=2 ttl=58 time=35.2 ms
64 bytes from bom07s30-in-x04.1e100.net (2404:6800:4009:820::2004): icmp_seq=3 ttl=58 time=93.4 ms
64 bytes from bom07s30-in-x04.1e100.net (2404:6800:4009:820::2004): icmp_seq=4 ttl=58 time=52.7 ms
^C
--- www.google.com ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 3005ms
rtt min/avg/max/mdev = 35.157/66.447/93.404/23.556 ms
shubham@shubham:~/Desktop$
```

## 2) ipconfig:

The command `ipconfig` will *display basic details about the device's IP address configuration*. Just type `Ipconfig` in the Windows prompt and the IP, subnet mask and default gateway that the current device will be presented. If you have to see full information, then type on command prompt `config-all` and then you will see full information.

Syntax: `ipconfig`



```
shubham@shubham: ~/Desktop$ ifconfig
enp3s0: flags=4099<UP,BROADCAST,MULTICAST> mtu 1500
        ether 2c:68:0c:9e:e5:f5 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 628 bytes 63352 (63.3 KB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 628 bytes 63352 (63.3 KB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

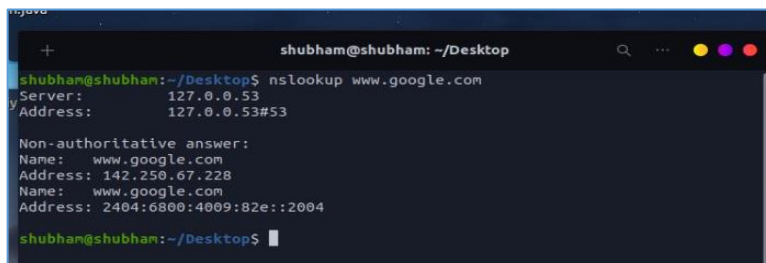
wlp2s0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 192.168.43.65 netmask 255.255.255.0 broadcast 192.168.43.255
    inet6 2409:4040:41e:be19:1fdd:1c65:6fdc:97b3 prefixlen 64 scopeid 0x0<global>
    inet6 fe80::23c3:81da:84ce:746d prefixlen 64 scopeid 0x20<link>
    inet6 2409:4040:41e:be19:f7d:d529:4224:b5b1 prefixlen 64 scopeid 0x0<global>
    ether 70:77:81:84:a3:1f txqueuelen 1000 (Ethernet)
    RX packets 7194 bytes 7947598 (7.9 MB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 4371 bytes 562833 (562.8 KB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

shubham@shubham: ~/Desktop$
```

## 3) nslookup:

`nslookup` command queries the DNS in order to fetch the IP address or the *domain name from DNS records*.

Syntax: `nslookup <domainName>`



```
shubham@shubham: ~/Desktop$ nslookup www.google.com
Server:      127.0.0.53
Address:     127.0.0.53#53

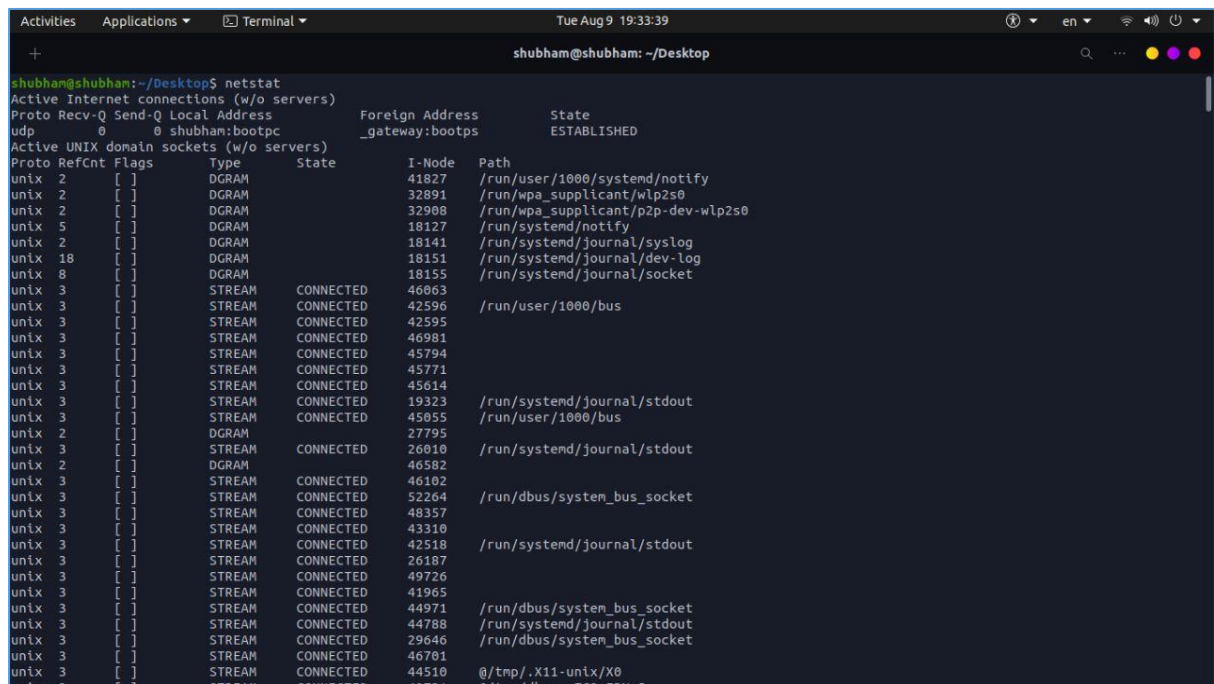
Non-authoritative answer:
Name:   www.google.com
Address: 142.250.67.228
Name:   www.google.com
Address: 2404:6800:4009:82e::2004

shubham@shubham: ~/Desktop$
```

#### 4) netstat:

netstat (Network Statistics) is the command that is used to *display routing table, connection information*, the status of ports, etc. This command works with Linux Network Subsystem.

Syntax: `netstat`



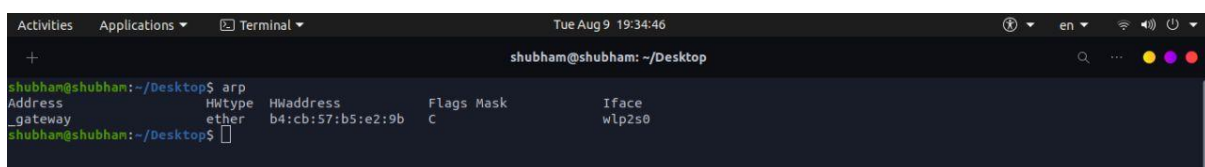
```
shubham@shubham: ~/Desktop$ netstat
Active Internet connections (w/o servers)
Proto Recv-Q Send-Q Local Address           Foreign Address         State
udp        0      0 shubham:bootpc         _gateway:bootps        ESTABLISHED

Active UNIX domain sockets (w/o servers)
Proto RefCnt Flags   Type       State           I-Node  Path
unix    2      0      DGRAM      -           41827    /run/user/1000/systemd/notify
unix    2      0      DGRAM      -           32891    /run/wpa_supplicant/wlp2s0
unix    2      0      DGRAM      -           32908    /run/wpa_supplicant/p2p-dev-wlp2s0
unix    5      0      DGRAM      -           18127    /run/systemd/notify
unix    2      0      DGRAM      -           18141    /run/systemd/journal/syslog
unix   18      0      DGRAM      -           18151    /run/systemd/journal/dev-log
unix    8      0      DGRAM      -           18155    /run/systemd/journal/socket
unix    3      0      STREAM     CONNECTED   46063    /run/user/1000/bus
unix    3      0      STREAM     CONNECTED   42596    /run/user/1000/bus
unix    3      0      STREAM     CONNECTED   42595
unix    3      0      STREAM     CONNECTED   46981
unix    3      0      STREAM     CONNECTED   45794
unix    3      0      STREAM     CONNECTED   45771
unix    3      0      STREAM     CONNECTED   45614
unix    3      0      STREAM     CONNECTED   19323    /run/systemd/journal/stdout
unix    3      0      STREAM     CONNECTED   45055    /run/user/1000/bus
unix    2      0      DGRAM      -           27795
unix    3      0      STREAM     CONNECTED   26010    /run/systemd/journal/stdout
unix    2      0      DGRAM      -           46582
unix    3      0      STREAM     CONNECTED   46102
unix    3      0      STREAM     CONNECTED   52264    /run/dbus/system_bus_socket
unix    3      0      STREAM     CONNECTED   48357
unix    3      0      STREAM     CONNECTED   43310
unix    3      0      STREAM     CONNECTED   42518    /run/systemd/journal/stdout
unix    3      0      STREAM     CONNECTED   26187
unix    3      0      STREAM     CONNECTED   49726
unix    3      0      STREAM     CONNECTED   41965
unix    3      0      STREAM     CONNECTED   44971    /run/dbus/system_bus_socket
unix    3      0      STREAM     CONNECTED   44788    /run/systemd/journal/stdout
unix    3      0      STREAM     CONNECTED   29646    /run/dbus/system_bus_socket
unix    3      0      STREAM     CONNECTED   46701
unix    3      0      STREAM     CONNECTED   44510    @/tmp/.X11-unix/X0
unix    3      0      STREAM     CONNECTED   40731    /run/dbus/system_bus_socket
```

#### 5) arp:

To send IP packets, a computer needs two addresses. These addresses are the *MAC address and the IP address*. A MAC address is the physical or hardware address of the NIC. An IP address is the logical or software address of NIC. If a computer knows the IP address of the destination computer but it does not know the MAC address of the destination computer, it uses the ARP protocol to know the MAC address of the destination computer.

Syntax: `arp`



```
shubham@shubham: ~/Desktop$ arp
Address      HWtype  HWaddress      Flags Mask    Iface
_gateway    ether    b4:cb:57:b5:e2:9b    C             wlp2s0
shubham@shubham: ~/Desktop$
```



## 6) rarp:

rarp manipulates the kernel's RARP table in various ways. The primary options are clearing an address mapping entry and manually setting up one. For debugging purposes, the rarp program also allows a complete dump of the RARP table.

Syntax: rarp

## 7) Ip:

Ip command in Linux is present in the net-tools which is used for *performing several network administration tasks*. IP stands for Internet Protocol. This command is used to show or manipulate routing, devices, and tunnels.

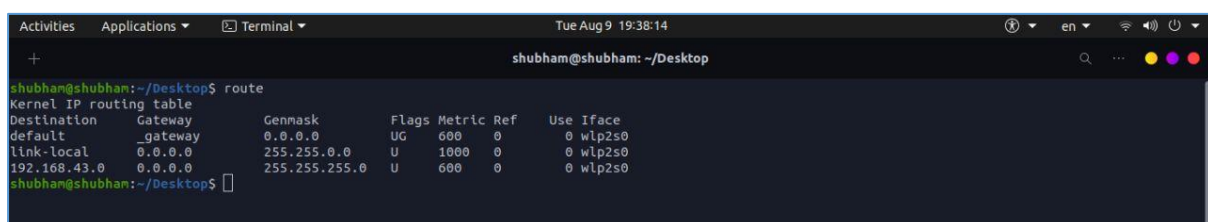
Syntax: Ip

```
javatpoint@javatpoint-Inspiron-3542:~$ ip address 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: enp7s0: <NO-CARRIER,BROADCAST,MULTICAST,UP> mtu 1500 qdisc fq_codel state DOWN group default qlen 1000
    link/ether 74:e6:e2:02:93:b8 brd ff:ff:ff:ff:ff:ff
3: wlp6s0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc noqueue state UP group default qlen 1000
    link/ether 00:71:cc:00:e2:89 brd ff:ff:ff:ff:ff:ff
    inet 192.168.1.103/16 brd 192.168.255.255 scope global dynamic noprefixroute wlp6s0
        valid_lft 25210sec preferred_lft 25210sec
    inet6 2405:204:a708:91ad:200d:c1b9:1172:87c9/64 scope global temporary dynamic
        valid_lft 6811sec preferred_lft 2311sec
    inet6 2405:204:a708:91ad:4cb5:51da:541d:b834/64 scope global dynamic mngtmpa
        valid_lft 6811sec preferred_lft 2311sec
    inet6 fe80::6475:6e63:aa97:3634/64 scope link noprefixroute
        valid_lft forever preferred_lft forever
```

## 8) route:

The route command *displays and manipulate IP* routing table for your system. A router is a device which is basically used to determine the best way to route packets to a destination.

Syntax: route



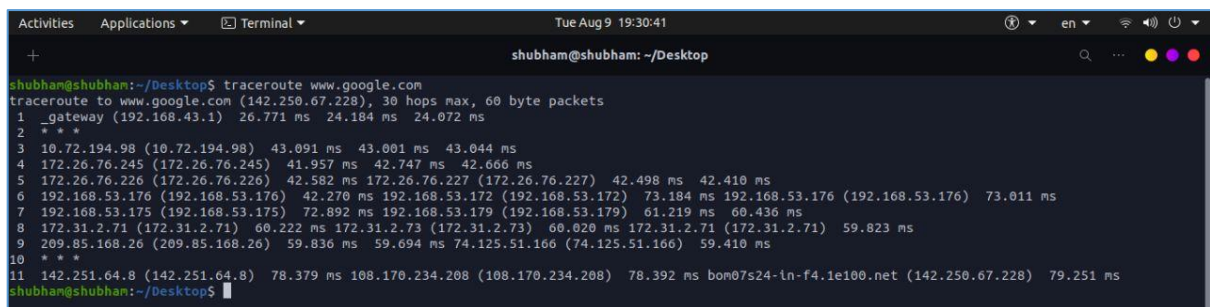
```
shubham@shubham: ~/Desktop$ route
Kernel IP routing table
Destination Gateway Genmask Flags Metric Ref Use Iface
default _gateway 0.0.0.0 UG 600 0 0 wlp2s0
link-local 0.0.0.0 255.255.0.0 U 1000 0 0 wlp2s0
192.168.43.0 0.0.0.0 255.255.255.0 U 600 0 0 wlp2s0
shubham@shubham:~/Desktop$
```



### 9) tracert:

This command is used to diagnose path-related problems. On an IP network, *routers exchange IP packets* between the source and the destination. `tracert` command is a Command Prompt command which is used to get the network packet being sent and received and the number of hops required for that packet to reach to target.

Syntax: `tracert [OPTION...] HOST`



```

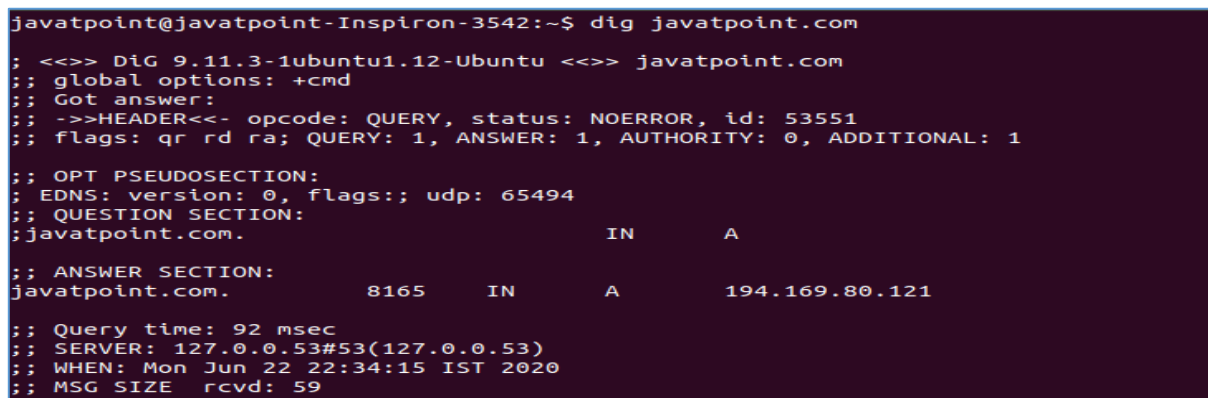
Activities Applications Terminal Tue Aug 9 19:30:41
shubham@shubham: ~/Desktop
shubham@shubham:~/Desktop$ tracert www.google.com
tracert to www.google.com (142.250.67.228), 30 hops max, 60 byte packets
 1  _gateway (192.168.43.1)  26.771 ms  24.184 ms  24.072 ms
 2  * * *
 3  10.72.194.98 (10.72.194.98)  43.091 ms  43.001 ms  43.044 ms
 4  172.26.76.245 (172.26.76.245)  41.957 ms  42.747 ms  42.666 ms
 5  172.26.76.226 (172.26.76.226)  42.582 ms  172.26.76.227 (172.26.76.227)  42.498 ms  42.410 ms
 6  192.168.53.176 (192.168.53.176)  42.270 ms  192.168.53.172 (192.168.53.172)  73.184 ms  192.168.53.176 (192.168.53.176)  73.011 ms
 7  192.168.53.175 (192.168.53.175)  72.892 ms  192.168.53.179 (192.168.53.179)  61.219 ms  60.436 ms
 8  172.31.2.71 (172.31.2.71)  60.222 ms  172.31.2.73 (172.31.2.73)  60.020 ms  172.31.2.71 (172.31.2.71)  59.823 ms
 9  209.85.168.26 (209.85.168.26)  59.836 ms  59.694 ms  74.125.51.166 (74.125.51.166)  59.410 ms
10  * * *
11  142.251.64.8 (142.251.64.8)  78.379 ms  108.170.234.208 (108.170.234.208)  78.392 ms  bom07s24-lin-f4.1e100.net (142.250.67.228)  79.251 ms
shubham@shubham:~/Desktop$

```

### 10) dig:

Linux `dig` command stands for Domain Information Groper. This command is used for tasks related to *DNS lookup to query DNS name servers*. It mainly deals with troubleshooting DNS related problems. It is a flexible utility for examining the DNS (Domain Name Servers). It is used to perform the DNS lookups and returns the queried answers from the name server.

Syntax: `dig [OPTION...]`



```

javatpoint@javatpoint-Inspiron-3542:~$ dig javatpoint.com
; <<>> DiG 9.11.3-ubuntu1.12-Ubuntu <<>> javatpoint.com
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 53551
;; flags: qr rd ra; QUERY: 1, ANSWER: 1, AUTHORITY: 0, ADDITIONAL: 1

;; OPT PSEUDOSECTION:
; EDNS: version: 0, flags:; udp: 65494
;; QUESTION SECTION:
;javatpoint.com.                IN      A

;; ANSWER SECTION:
javatpoint.com.                8165    IN      A      194.169.80.121

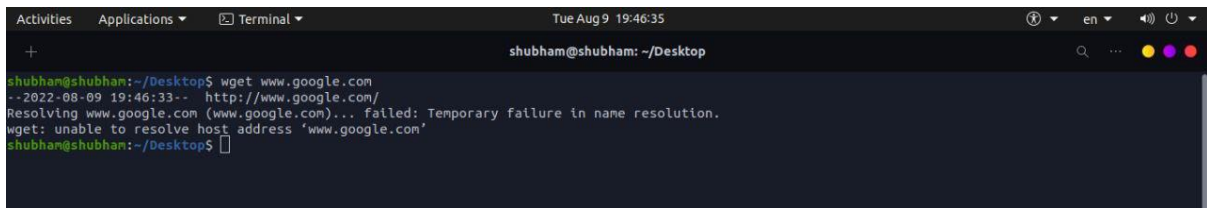
;; Query time: 92 msec
;; SERVER: 127.0.0.53#53(127.0.0.53)
;; WHEN: Mon Jun 22 22:34:15 IST 2020
;; MSG SIZE rcvd: 59

```

11) wget :

Wget is the non-interactive network downloader which is used to download files from the server even when the user has not logged on to the system and it can work in the background without hindering the current process.

Syntax: wget <fileLink>



```
Activities Applications Terminal Tue Aug 9 19:46:35
shubham@shubham: ~/Desktop
shubham@shubham:~/Desktop$ wget www.google.com
--2022-08-09 19:46:33-- http://www.google.com/
Resolving www.google.com (www.google.com)... failed: Temporary failure in name resolution.
wget: unable to resolve host address 'www.google.com'
shubham@shubham:~/Desktop$
```

● **Conclusion:** Hence, we have implemented **basic as well as networking basic networking** commands in Linux (ping, tracert, nslookup, netstat, ARP, RARP, ip, ifconfig, dig, and route).