

CS304 – Computer Network

Lab Assignment - 1

Name: Shah Jainam Mukeshbhai

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Section 1

Part 1

1) Ping

Ping is the abbreviation of Packet Internet Groper. This command is used to check the network reachability of the server and the host. It uses ICMP protocol to send echo messages. Each datagram has IP, ICMP header and padded bytes to fill out the package.

ping6 is the IPv6 version of ping

ping takes an IP address or a URL in input and send message “PING” to the server. It gets a response from the server and time is also calculated. The command is *ping <URL>*

```
→ lab1 ping google.co.in
PING google.co.in (216.239.36.117) 56(84) bytes of data.
64 bytes from 216.239.36.117: icmp_seq=1 ttl=56 time=47.9 ms
64 bytes from 216.239.36.117: icmp_seq=2 ttl=56 time=50.4 ms
64 bytes from 216.239.36.117: icmp_seq=3 ttl=56 time=48.4 ms
64 bytes from 216.239.36.117: icmp_seq=4 ttl=56 time=49.1 ms
64 bytes from 216.239.36.117: icmp_seq=5 ttl=56 time=46.7 ms
^C
--- google.co.in ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 4005ms
rtt min/avg/max/mdev = 46.766/48.551/50.408/1.216 ms
```

We have to stop it by *CTRL+C*. We can see min/avg/max time to get response!

Following options are available for *ping* command:

- To put a barrier on the number of packets sent using: `-c <count>`

```
→ lab1 ping -c 5 google.co.in
PING google.co.in (172.217.166.163) 56(84) bytes of data.
64 bytes from bom07s20-in-f3.1e100.net (172.217.166.163): icmp_seq=1 ttl=56 time=43.7 ms
64 bytes from bom07s20-in-f3.1e100.net (172.217.166.163): icmp_seq=2 ttl=56 time=46.4 ms
64 bytes from bom07s20-in-f3.1e100.net (172.217.166.163): icmp_seq=3 ttl=56 time=42.7 ms
64 bytes from bom07s20-in-f3.1e100.net (172.217.166.163): icmp_seq=4 ttl=56 time=43.3 ms
64 bytes from bom07s20-in-f3.1e100.net (172.217.166.163): icmp_seq=5 ttl=56 time=42.7 ms

--- google.co.in ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 4007ms
rtt min/avg/max/mdev = 42.708/43.812/46.462/1.404 ms
```

- To control the size of the packets using: `-s <packetsize>`

```
→ lab1 ping -s 20 -c 5 google.co.in
PING google.co.in (172.217.166.163) 20(48) bytes of data.
28 bytes from bom07s20-in-f3.1e100.net (172.217.166.163): icmp_seq=1 ttl=56 time=42.3 ms
28 bytes from bom07s20-in-f3.1e100.net (172.217.166.163): icmp_seq=2 ttl=56 time=46.3 ms
28 bytes from bom07s20-in-f3.1e100.net (172.217.166.163): icmp_seq=3 ttl=56 time=44.5 ms
28 bytes from bom07s20-in-f3.1e100.net (172.217.166.163): icmp_seq=4 ttl=56 time=84.9 ms
28 bytes from bom07s20-in-f3.1e100.net (172.217.166.163): icmp_seq=5 ttl=56 time=93.6 ms

--- google.co.in ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 4005ms
rtt min/avg/max/mdev = 42.303/62.350/93.625/22.200 ms
```

- We can also change the interval of wait time before sending another packet (by default it's 1). We use `-i <num>`

```
→ lab1 ping -i 3 google.co.in
PING google.co.in (172.217.166.163) 56(84) bytes of data.
64 bytes from bom07s20-in-f3.1e100.net (172.217.166.163): icmp_seq=1 ttl=56 time=43.2 ms
64 bytes from bom07s20-in-f3.1e100.net (172.217.166.163): icmp_seq=2 ttl=56 time=43.8 ms
64 bytes from bom07s20-in-f3.1e100.net (172.217.166.163): icmp_seq=3 ttl=56 time=46.3 ms
64 bytes from bom07s20-in-f3.1e100.net (172.217.166.163): icmp_seq=4 ttl=56 time=97.3 ms
^C
--- google.co.in ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 9008ms
rtt min/avg/max/mdev = 43.241/57.707/97.338/22.911 ms
```

- Using `-q` we output only summary

```
→ lab1 ping -s 20 -c 5 -q google.co.in
PING google.co.in (172.217.166.163) 20(48) bytes of data.

--- google.co.in ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 4006ms
rtt min/avg/max/mdev = 42.379/45.175/49.969/2.860 ms
```


- To stop the command after a particular time interval we use `-w <deadline>`

```
→ lab1 ping -s 20 -c 5 -q -w 5 google.co.in
PING google.co.in (172.217.166.163) 20(48) bytes of data.

--- google.co.in ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 4006ms
rtt min/avg/max/mdev = 43.652/45.025/46.406/1.230 ms
```

2) Traceroute

It traces the route that command had to go through. It utilizes the IP protocol's TTL(time to live) field. It is helpful for knowing all the routes the packet has gone through.

`traceroute advitiya.in` gives all the routes through which packet was gone!

```
→ code git:(master) traceroute advitiya.in
traceroute to advitiya.in (104.27.145.125), 30 hops max, 60 byte packets
 1 172.21.12.2 (172.21.12.2) 3.278 ms 3.269 ms 3.252 ms
 2 103.118.50.2 (103.118.50.2) 5.863 ms * *
 3 118.185.199.190 (118.185.199.190) 10.219 ms 10.199 ms 12.271 ms
 4 * 182.19.106.198 (182.19.106.198) 35.892 ms 35.864 ms
 5 103.29.44.3 (103.29.44.3) 38.053 ms 38.031 ms 35.840 ms
 6 103.29.44.0 (103.29.44.0) 41.431 ms 42.004 ms 40.919 ms
 7 ae31-100-xcrl.mlu.cw.net (213.38.254.33) 143.242 ms 143.498 ms 142.021 ms
 8 mno-b2-link.telia.net (62.115.175.10) 154.242 ms 153.340 ms 163.196 ms
 9 cloudflare-ic-306776-mno-b2.c.telia.net (213.248.94.54) 142.920 ms 151.867 ms 143.041 ms
10 104.27.145.125 (104.27.145.125) 138.142 ms 138.571 ms 148.522 ms
```

Following options can be used with `traceroute`:

- `-4` to use IPv4 and `-6` to use IPv6. Also, `traceroute6` is equivalent to `traceroute -6`

```
→ code git:(master) traceroute -4 google.co.in
traceroute to google.co.in (172.217.166.163), 30 hops max, 60 byte packets
 1 172.21.12.2 (172.21.12.2) 4.902 ms 4.794 ms 4.785 ms
 2 103.118.50.2 (103.118.50.2) 9.281 ms * 9.237 ms
 3 118.185.199.190 (118.185.199.190) 11.180 ms 13.471 ms 13.450 ms
 4 182.19.106.198 (182.19.106.198) 34.477 ms 34.398 ms 34.396 ms
 5 103.29.44.7 (103.29.44.7) 34.368 ms 34.345 ms *
 6 103.29.44.4 (103.29.44.4) 34.279 ms 36.428 ms *
 7 72.14.211.218 (72.14.211.218) 40.657 ms 40.830 ms 40.792 ms
 8 108.170.248.193 (108.170.248.193) 37.507 ms 108.170.248.209 (108.170.248.209) 37.485 ms 37.426 ms
 9 74.125.253.107 (74.125.253.107) 43.558 ms 43.478 ms 43.392 ms
10 bom07s20-in-f3.1e100.net (172.217.166.163) 42.222 ms 42.182 ms 42.124 ms
```

- `-F` option for not breaking or fragmenting the packets

```
→ code git:(master) traceroute -F google.co.in
traceroute to google.co.in (172.217.166.163), 30 hops max, 60 byte packets
 1 172.21.12.2 (172.21.12.2) 3.878 ms 3.859 ms 3.844 ms
 2 103.118.50.2 (103.118.50.2) 6.998 ms 6.990 ms 6.978 ms
 3 118.185.199.190 (118.185.199.190) 11.246 ms 12.291 ms 11.212 ms
 4 182.19.106.198 (182.19.106.198) 31.715 ms 33.696 ms 32.643 ms
 5 103.29.44.7 (103.29.44.7) 31.668 ms 31.630 ms 32.605 ms
 6 103.29.44.4 (103.29.44.4) 31.621 ms 31.409 ms 31.382 ms
 7 72.14.211.218 (72.14.211.218) 42.511 ms 41.697 ms 41.678 ms
 8 108.170.248.193 (108.170.248.193) 36.875 ms 37.420 ms 37.397 ms
 9 74.125.253.107 (74.125.253.107) 37.382 ms 38.652 ms 216.239.57.189 (216.239.57.189) 38.584 ms
10 bom07s20-in-f3.1e100.net (172.217.166.163) 38.522 ms 38.508 ms *
```

- `-f <first_ttl>` option to start for that number of hop

```
→ code git:(master) traceroute -f 10 google.co.in
traceroute to google.co.in (172.217.166.163), 30 hops max, 60 byte packets
10 * bom07s20-in-f3.1e100.net (172.217.166.163) 36.889 ms *
```

- `-g <gate>` option to route the packet through the gate
(Big ss so not showing)
- `-m <max_ttl>` option for setting a barrier on number of hop

```
→ code git:(master) traceroute -m 3 google.com
traceroute to google.com (216.239.32.117), 3 hops max, 60 byte packets
 1 172.21.12.2 (172.21.12.2) 7.414 ms 7.302 ms 7.281 ms
 2 103.118.50.2 (103.118.50.2) 7.237 ms 7.194 ms 7.149 ms
 3 118.185.199.190 (118.185.199.190) 12.673 ms 12.603 ms 9.902 ms
```

- `-n` for not resolving the IP addresses

```
→ code git:(master) traceroute -n google.co.in
traceroute to google.co.in (172.217.166.163), 30 hops max, 60 byte packets
 1 172.21.12.2 6.691 ms 6.668 ms 6.624 ms
 2 103.118.50.2 6.601 ms 6.572 ms *
 3 118.185.199.190 12.510 ms 12.481 ms 12.412 ms
 4 182.19.106.198 31.463 ms 32.625 ms 31.424 ms
 5 103.29.44.7 32.562 ms 32.534 ms 32.505 ms
 6 103.29.44.4 32.429 ms 31.118 ms 31.077 ms
 7 * 72.14.211.218 40.698 ms 40.694 ms
 8 108.170.248.209 37.552 ms 37.452 ms 108.170.248.193 37.446 ms
 9 216.239.57.189 37.797 ms * 37.679 ms
10 172.217.166.163 36.605 ms 36.575 ms 37.521 ms
```

3) NSlookup

Nslookup is an abbreviation of Name Server Lookup. It is used to query Internet domain name servers(for getting DNS info). It is used to get an IP address and solving DNS problems and errors.

It has both interactive and non-interactive modes. Interactive is used for a wide range of querying while non-interactive mode just returns the information needed.

Following options can be used while using nslookup:

- Get IP address using `nslookup google.co.in`

```
→ code git:(master) nslookup google.co.in
Server:      127.0.1.1
Address:     127.0.1.1#53

Non-authoritative answer:
Name:   google.co.in
Address: 172.217.166.163
```

- Reverse it and get the DNS

```
→ code git:(master) nslookup 172.217.166.163
Server:      127.0.1.1
Address:     127.0.1.1#53

Non-authoritative answer:
163.166.217.172.in-addr.arpa    name = bom07s20-in-f3.1e100.net.

Authoritative answers can be found from:
217.172.in-addr.arpa    nameserver = ns4.google.com.
217.172.in-addr.arpa    nameserver = ns3.google.com.
217.172.in-addr.arpa    nameserver = ns2.google.com.
217.172.in-addr.arpa    nameserver = ns1.google.com.
ns1.google.com    internet address = 216.239.32.10
ns1.google.com    has AAAA address 2001:4860:4802:32::a
ns2.google.com    internet address = 216.239.34.10
ns2.google.com    has AAAA address 2001:4860:4802:34::a
ns3.google.com    internet address = 216.239.36.10
ns3.google.com    has AAAA address 2001:4860:4802:36::a
ns4.google.com    internet address = 216.239.38.10
ns4.google.com    has AAAA address 2001:4860:4802:38::a
```

- Using `-type=any` we can get all DNS records

```
→ code git:(master) nslookup -type=any google.com
Server:      127.0.1.1
Address:     127.0.1.1#53

Non-authoritative answer:
Name:   google.com
Address: 172.217.174.238
google.com    nameserver = ns2.google.com.
google.com    nameserver = ns4.google.com.
google.com    nameserver = ns1.google.com.
google.com    nameserver = ns3.google.com.

Authoritative answers can be found from:
google.com    nameserver = ns1.google.com.
google.com    nameserver = ns3.google.com.
google.com    nameserver = ns4.google.com.
google.com    nameserver = ns2.google.com.
ns1.google.com    internet address = 216.239.32.10
ns1.google.com    has AAAA address 2001:4860:4802:32::a
ns2.google.com    internet address = 216.239.34.10
ns2.google.com    has AAAA address 2001:4860:4802:34::a
ns3.google.com    internet address = 216.239.36.10
ns3.google.com    has AAAA address 2001:4860:4802:36::a
ns4.google.com    internet address = 216.239.38.10
ns4.google.com    has AAAA address 2001:4860:4802:38::a
```

- Using `-type=ns` we can get all name servers associated with it

```
→ code git:(master) nslookup -type=ns google.com
Server:          127.0.1.1
Address:         127.0.1.1#53

Non-authoritative answer:
google.com      nameserver = ns3.google.com.
google.com      nameserver = ns4.google.com.
google.com      nameserver = ns2.google.com.
google.com      nameserver = ns1.google.com.

Authoritative answers can be found from:
ns1.google.com  internet address = 216.239.32.10
ns1.google.com  has AAAA address 2001:4860:4802:32::a
ns2.google.com  internet address = 216.239.34.10
ns2.google.com  has AAAA address 2001:4860:4802:34::a
ns3.google.com  internet address = 216.239.36.10
ns3.google.com  has AAAA address 2001:4860:4802:36::a
ns4.google.com  internet address = 216.239.38.10
ns4.google.com  has AAAA address 2001:4860:4802:38::a
```

- Using `-timeout=<value>` to timeout of host lookup

```
→ code git:(master) nslookup -timeout=1 advitiya.in
Server:          127.0.1.1
Address:         127.0.1.1#53

Non-authoritative answer:
Name:   advitiya.in
Address: 104.27.144.125
Name:   advitiya.in
Address: 104.27.145.125
```

Here we are getting a response within time.

4) NetStat

It prints information about the Linux networking subsystem. This command helps us by displaying network connections, routing tables, and some other statistics.

By running the command `netstat` we get the following output:

```

➤ code git:(master) netstat
Active Internet connections (w/o servers)
Proto Recv-Q Send-Q Local Address           Foreign Address         State
tcp        0      0 172.21.13.169:53864     74.125.24.189:https    ESTABLISHED
tcp        0      1 172.21.13.169:34012    ec2-35-160-211-13:https SYN_SENT
tcp        0      0 localhost:41619         localhost:58278        ESTABLISHED
tcp        0      0 localhost:41888         localhost:51537        ESTABLISHED
tcp        0      0 localhost:35039         localhost:34050        ESTABLISHED
tcp        0      0 172.21.13.169:39310    bom05s15-in-f14.1:https ESTABLISHED
tcp        0      0 localhost:57626         localhost:59043        ESTABLISHED
tcp        0      0 172.21.13.169:39308    bom05s15-in-f14.1:https ESTABLISHED
tcp        0      0 172.21.13.169:58800    ec2-34-210-129-19:https ESTABLISHED
tcp        0      0 localhost:52009         localhost:51026        ESTABLISHED
tcp        0      1 172.21.13.169:58822    ec2-34-210-129-19:https SYN_SENT
tcp        0      0 172.21.13.169:58802    ec2-34-210-129-19:https ESTABLISHED
tcp        0      0 localhost:58599         localhost:46904        ESTABLISHED
tcp        0      0 localhost:8888          localhost:48026        ESTABLISHED
tcp        0      1 172.21.13.169:58824    ec2-34-210-129-19:https SYN_SENT
tcp        0      0 localhost:37814         localhost:42481        ESTABLISHED

```

Following options can be used:

- To list all TCP ports use *netstat -at*

```

➤ code git:(master) netstat -at
Active Internet connections (servers and established)
Proto Recv-Q Send-Q Local Address           Foreign Address         State
tcp        0      0 localhost:40257         *:*                     LISTEN
tcp        0      0 localhost:59043         *:*                     LISTEN
tcp        0      0 *:8100                  *:*                     LISTEN
tcp        0      0 *:8101                  *:*                     LISTEN
tcp        0      0 *:8102                  *:*                     LISTEN
tcp        0      0 localhost:58599         *:*                     LISTEN
tcp        0      0 *:8008                  *:*                     LISTEN
tcp        0      0 localhost:46921         *:*                     LISTEN
tcp        0      0 localhost:52009         *:*                     LISTEN
tcp        0      0 localhost:27017         *:*                     LISTEN
tcp        0      0 *:5900                  *:*                     LISTEN
tcp        0      0 localhost:39149         *:*                     LISTEN
tcp        0      0 localhost:44655         *:*                     LISTEN
tcp        0      0 *:43057                 *:*                     LISTEN
tcp        0      0 localhost:42481         *:*                     LISTEN
tcp        0      0 localhost:51537         *:*                     LISTEN
tcp        0      0 localhost:41619         *:*                     LISTEN
tcp        0      0 *:57621                 *:*                     LISTEN
tcp        0      0 0 Alienware-15-R3:domain *:*                     LISTEN
tcp        0      0 *:ssh                   *:*                     LISTEN
tcp        0      0 localhost:ipp           *:*                     LISTEN
tcp        0      0 localhost:8888          *:*                     LISTEN
tcp        0      0 localhost:postgresql    *:*                     LISTEN
tcp        0      0 localhost:5433          *:*                     LISTEN
tcp        0      0 localhost:45791         *:*                     LISTEN
tcp        0      0 localhost:35039         *:*                     LISTEN
tcp        0      0 172.21.13.169:53864     74.125.24.189:https    ESTABLISHED

```

- For UDP ports use *netstat -au*

```

➤ code git:(master) netstat -au
Active Internet connections (servers and established)
Proto Recv-Q Send-Q Local Address           Foreign Address         State
udp        0      0 *:ipp                   *:*                     ESTABLISHED
udp        0      0 localhost:58008         localhost:58008        ESTABLISHED
udp        0      0 *:50203                 *:*                     ESTABLISHED
udp        0      0 localhost:33914         localhost:33914        ESTABLISHED
udp        0      0 localhost:42731         Alienware-15-R3:domain ESTABLISHED
udp        0      0 *:1900                  *:*                     ESTABLISHED
udp        0      0 *:53895                 *:*                     ESTABLISHED
udp        0      0 *:mdns                  *:*                     ESTABLISHED
udp        0      0 *:54825                 *:*                     ESTABLISHED
udp        0      0 *:39248                 *:*                     ESTABLISHED
udp        0      0 Alienware-15-R3:domain *:*                     ESTABLISHED
udp        0      0 *:bootpc                *:*                     ESTABLISHED
udp        0      0 *:57621                 *:*                     ESTABLISHED
udp6       0      0 [::]:mdns               [::]:*                  ESTABLISHED
udp6       0      0 [::]:47765              [::]:*                  ESTABLISHED

```

- *netstat -l* for only listening ports

- `netstat -lt` all listening TCP ports

```

→ code git:(master) netstat -lt
Active Internet connections (only servers)
Proto Recv-Q Send-Q Local Address           Foreign Address         State
tcp      0      0 localhost:40257         *:*                     LISTEN
tcp      0      0 localhost:59043         *:*                     LISTEN
tcp      0      0 *:8100                  *:*                     LISTEN
tcp      0      0 *:8101                  *:*                     LISTEN
tcp      0      0 *:8102                  *:*                     LISTEN
tcp      0      0 localhost:58599         *:*                     LISTEN
tcp      0      0 *:8008                  *:*                     LISTEN
tcp      0      0 localhost:46921         *:*                     LISTEN
tcp      0      0 localhost:52009         *:*                     LISTEN
tcp      0      0 localhost:27017         *:*                     LISTEN
tcp      0      0 *:5900                  *:*                     LISTEN
tcp      0      0 localhost:39149         *:*                     LISTEN
tcp      0      0 localhost:44655         *:*                     LISTEN
tcp      0      0 *:43057                 *:*                     LISTEN
tcp      0      0 localhost:42483         *:*                     LISTEN

```

- `netstat -lu` for all UDP listening ports

```

→ code git:(master) netstat -lu
Active Internet connections (only servers)
Proto Recv-Q Send-Q Local Address           Foreign Address         State
udp      0      0 *:ipp                   *:*                     LISTEN
udp      0      0 *:50203                 *:*                     LISTEN
udp      0      0 *:1900                  *:*                     LISTEN
udp      0      0 *:53895                 *:*                     LISTEN
udp      0      0 *:mdns                  *:*                     LISTEN
udp      0      0 *:54825                 *:*                     LISTEN
udp      0      0 *:39248                 *:*                     LISTEN
udp      0      0 Alienware-15-R3:domain *:*                     LISTEN
udp      0      0 *:bootpc                *:*                     LISTEN
udp      0      0 *:57621                 *:*                     LISTEN
udp6     0      0 [::]:mdns               [::]:*                  LISTEN
udp6     0      0 [::]:47765              [::]:*                  LISTEN
→ code git:(master) netstat -lt

```

- `netstat -st` statistics of TCP ports

```

→ code git:(master) netstat -st
IcmpMsg:
  InType0: 40
  InType3: 493
  InType11: 127
  OutType3: 395
  OutType8: 48
Tcp:
  30649 active connections openings
  7085 passive connection openings
  95 failed connection attempts
  936 connection resets received
  41 connections established
  2757138 segments received
  2972187 segments send out
  8459 segments retransmitted
  352 bad segments received.
  13764 resets sent
UdpLite:
TcpExt:
  10 packets pruned from receive queue because of socket buffer overrun
  16062 TCP sockets finished time wait in fast timer
  133 packets rejects in established connections because of timestamp
  34263 delayed acks sent

```

- `netstat -r` for kernel routing information

```

→ code git:(master) netstat -r
Kernel IP routing table
Destination        Gateway            Genmask           Flags   MSS Window  irtt  Iface
default            172.21.12.1       0.0.0.0           UG      0 0        0     wlp61s0
one.one.one.one    172.21.12.1       255.255.255.255  UGH     0 0        0     wlp61s0
link-local         *                  255.255.0.0       U        0 0        0     wlp61s0
172.21.12.0        *                  255.255.252.0    U        0 0        0     wlp61s0

```

- `netstat -ap | grep ssh` to get port of program running

```

→ code git:(master) netstat -ap | grep ssh
(Not all processes could be identified, non-owned process info
will not be shown, you would have to be root to see it all.)
tcp      0      0 *:ssh                   *:*                     LISTEN
tcp6     0      0 [::]:ssh                [::]:*                  LISTEN
unix      2      0 [ ACC ] STREAM LISTENING 32548 - /run/user/1000/keyring/ssh
→ code git:(master)

```


5) Ipconfig/ ifconfig

It is used to configure the network interface of the kernel. It is used at boot time to set up interfaces as necessary. After that, it is usually only needed when debugging or when system tuning is needed.

If no arguments are given, *ifconfig* outputs all the currently active interfaces and their status.

```
→ code git:(master) ifconfig
enp60s0  Link encap:Ethernet  HWaddr a4:4c:c8:2d:dd:f6
         UP BROADCAST MULTICAST  MTU:1500  Metric:1
         RX packets:0 errors:0 dropped:0 overruns:0 frame:0
         TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
         collisions:0 txqueuelen:1000
         RX bytes:0 (0.0 B)  TX bytes:0 (0.0 B)
         Interrupt:16

lo       Link encap:Local Loopback
         inet addr:127.0.0.1  Mask:255.0.0.0
         inet6 addr: ::1/128 Scope:Host
         UP LOOPBACK RUNNING  MTU:65536  Metric:1
         RX packets:325364 errors:0 dropped:0 overruns:0 frame:0
         TX packets:325364 errors:0 dropped:0 overruns:0 carrier:0
         collisions:0 txqueuelen:1000
         RX bytes:62372933 (62.3 MB)  TX bytes:62372933 (62.3 MB)

wlp61s0  Link encap:Ethernet  HWaddr 9c:b6:d0:e8:90:0f
         inet addr:172.21.13.169  Bcast:172.21.15.255  Mask:255.255.252.0
         inet6 addr: fe80::1380:26c9:62e6:4c52/64 Scope:Link
         UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
         RX packets:7490358 errors:0 dropped:0 overruns:0 frame:0
         TX packets:3257933 errors:0 dropped:0 overruns:0 carrier:0
         collisions:0 txqueuelen:1000
         RX bytes:8017760012 (8.0 GB)  TX bytes:1467088124 (1.4 GB)
```

Following options can be used with *ifconfig*:

- *-a* (same as above)
- *-s* to show a shortlist

```
→ code git:(master) ifconfig -s
Iface  MTU Met  RX-OK RX-ERR RX-DRP RX-OVR    TX-OK TX-ERR TX-DRP TX-OVR Flg
enp60s0  1500 0      0      0      0      0      0      0      0      0 0 BMU
lo       65536 0    325567      0      0      0    325567      0      0      0 0 LRU
wlp61s0  1500 0    7491521      0      0      0    3258984      0      0      0 0 BMRU
```

- *-v* for more details

Output same as *ifconfig*

- *ifconfig interface up* to make that interface driver up
- *ifconfig interface down* to make that interface driver down

6) Hostname

This command is used for displaying the system's DNS name and for setting or displaying its hostname or NIS(Network Information System) domain name. A hostname is basically name given to the computer and is uniquely identified over a network.

We can get it by running simply *hostname*.

```
→ code git:(master) hostname
Alienware-15-R3
```

Following are the options which can be used along with it:

- *-a* for getting any alias names

```
Alienware-15-R3
→ code git:(master) hostname -a
→ code git:(master)
```

- *-b* to set up a hostname
- *-d* to get domain if local domains are set
- *-i* to get the IP address

```
→ code git:(master) hostname -i
127.0.1.1
```

Host is at this IP which was also observed during the socket programming part.

- *sudo hostname NEW_HOSTNAME* for setting new hostname

Part 2

A. Checking the RTT

I am sending 10 packets using *ping -c 10 <site>*.

Site	Min RTT(ms)	Avg RTT(ms)	Max RTT(ms)
iitrpr.ac.in	2.862	4.392	6.768

google.com	35.405	37.287	39.848
google.co.in	37.792	51.713	82.812
gmail.com	41.233	43.162	43.977
facebook.com	34.846	36.265	38.967
wikipedia.org	190.148	243.422	299.230
india.gov.in	100% packet loss		
nationalgeographic.com	239.893	275.444	331.489
nkn.gov.in	100% packet loss		
irctc.co.in	100% packet loss		

B. Observing the packets lost

Site	Packets lost
iitrpr.ac.in	0%
google.com	0%
google.co.in	10%
gmail.com	0%
facebook.com	0%
wikipedia.org	0%
india.gov.in	100%
nationalgeographic.com	20%
nkn.gov.in	100%
irctc.co.in	100%

C. Changing the default ping packet size

The default size is 56 bytes and after ICMP header(8 bytes) it becomes 64 bytes.


```
PING google.co.in (172.217.166.163) 56(84) bytes of data:
64 bytes from bom07s20-in-f3.1e100.net (172.217.166.163): icmp_seq=1 ttl=56 time=37.8 ms
64 bytes from bom07s20-in-f3.1e100.net (172.217.166.163): icmp_seq=2 ttl=56 time=38.2 ms
64 bytes from bom07s20-in-f3.1e100.net (172.217.166.163): icmp_seq=3 ttl=56 time=37.7 ms
64 bytes from bom07s20-in-f3.1e100.net (172.217.166.163): icmp_seq=4 ttl=56 time=39.8 ms
64 bytes from bom07s20-in-f3.1e100.net (172.217.166.163): icmp_seq=5 ttl=56 time=58.7 ms
64 bytes from bom07s20-in-f3.1e100.net (172.217.166.163): icmp_seq=6 ttl=56 time=81.2 ms
64 bytes from bom07s20-in-f3.1e100.net (172.217.166.163): icmp_seq=7 ttl=56 time=50.0 ms
64 bytes from bom07s20-in-f3.1e100.net (172.217.166.163): icmp_seq=9 ttl=56 time=82.8 ms
64 bytes from bom07s20-in-f3.1e100.net (172.217.166.163): icmp_seq=10 ttl=56 time=38.8 ms
```

We can see the size in above SS.

We can change it by using `-s <num>` option of the ping command. Following is the output corresponding to 100 ping packet size.

Site	Min RTT(ms)	Avg RTT(ms)	Max RTT(ms)	Packet Loss
iitrpr.ac.in	3.045	27.654	107.757	0%
google.com	37.140	38.209	39.590	0%
google.co.in	36.267	38.848	41.698	0%
gmail.com	40.757	41.684	42.421	0%
facebook.com	34.966	36.404	38.177	0%
wikipedia.org	202.344	248.149	306.817	0%
india.gov.in	-	-	-	100%
nationalgeographic.com	12.610	16.066	22.584	0%
nkn.gov.in	-	-	-	100%
irctc.co.in	-	-	-	100%

D.



Active Network Connections

IITRPR (default)

General

Interface: 802.11 WiFi (wlp61s0)
Hardware Address: 9C:B6:D0:E8:90:0F
Driver: ath10k_pci
Speed: 6 Mb/s
Security: WPA/WPA2

IPv4

IP Address: 172.21.13.169
Broadcast Address: 172.21.15.255
Subnet Mask: 255.255.252.0
Default Route: 172.21.12.1
Primary DNS: 172.30.4.14
Secondary DNS: 8.8.8.8

IPv6

IP Address: fe80::1380:26c9:62e6:4c52/64

```
* code git:(master) traceroute google.com
traceroute to google.com (216.239.38.117), 30 hops max, 60 byte packets
 1 172.21.12.2 (172.21.12.2) 3.074 ms 4.083 ms 2.970 ms
 2 103.118.50.2 (103.118.50.2) 7.223 ms * *
 3 118.185.199.190 (118.185.199.190) 11.410 ms 11.373 ms 11.350 ms
 4 * 182.19.106.198 (182.19.106.198) 32.788 ms
 5 103.29.44.7 (103.29.44.7) 31.409 ms 31.395 ms *
 6 * 103.29.44.4 (103.29.44.4) 32.059 ms 32.019 ms
 7 * 72.14.211.218 (72.14.211.218) 43.493 ms 41.206 ms
 8 108.170.248.161 (108.170.248.161) 36.479 ms 108.170.248.193 (108.170.248.193) 36.438 ms 108.170.248.177 (108.170.248.177) 39.308 ms
 9 209.85.246.5 (209.85.246.5) 40.608 ms 216.239.62.237 (216.239.62.237) 42.747 ms 74.125.251.133 (74.125.251.133) 42.517 ms
10 216.239.38.117 (216.239.38.117) 42.487 ms 42.176 ms 42.145 ms
```

- Hop 1 corresponds to the default route. It decides the packet forwarding rule when no specific route is given.
- Hop 2 corresponds to the public IP of IIT Ropar. We can see it by searching my IP on google.
- Hop 3 corresponds to the IP of internet provider of IIT Ropar. (As inferred from results of google, the network is of Vodafone. Link: <https://en.asytech.cn/check-ip/118.185.199.66>)
- Hop 4 corresponds to the ISP of India in Asia continent. The data for this tracing info indicates that the connection to this host has an assigned address in India. The timezone of the physical address of this host is Asia/Kolkata. Source : <http://tools.tracemyip.org/lookup/182.19.106.198>
- From hop 5 onwards, it changes for different sites.

Section 2

1) Making normal server.py and client.py

The server can handle one client a time and keep 5 waiting in the queue!

2) Handle more than one client

This was done using threading library and making a new thread for each client connection.

3) Run on different machines

Bind server to 0.0.0.0. After that we can access it through the IP of the server.

```
→ part3 ping 172.21.13.169 -s 100 -c 5
PING 172.21.13.169 (172.21.13.169) 100(128) bytes of data.
108 bytes from 172.21.13.169: icmp_seq=1 ttl=64 time=0.048 ms
108 bytes from 172.21.13.169: icmp_seq=2 ttl=64 time=0.049 ms
108 bytes from 172.21.13.169: icmp_seq=3 ttl=64 time=0.045 ms
108 bytes from 172.21.13.169: icmp_seq=4 ttl=64 time=0.046 ms
108 bytes from 172.21.13.169: icmp_seq=5 ttl=64 time=0.048 ms

--- 172.21.13.169 ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 4075ms
rtt min/avg/max/mdev = 0.045/0.047/0.049/0.004 ms
```

Bandwidth is 108 Bytes / 0.047 ms = 18.382 mbps.

4) Communications through different hosts

Used routing table file for 4 host communication. Also it is configurable. The client can exit on Typing command EXIT