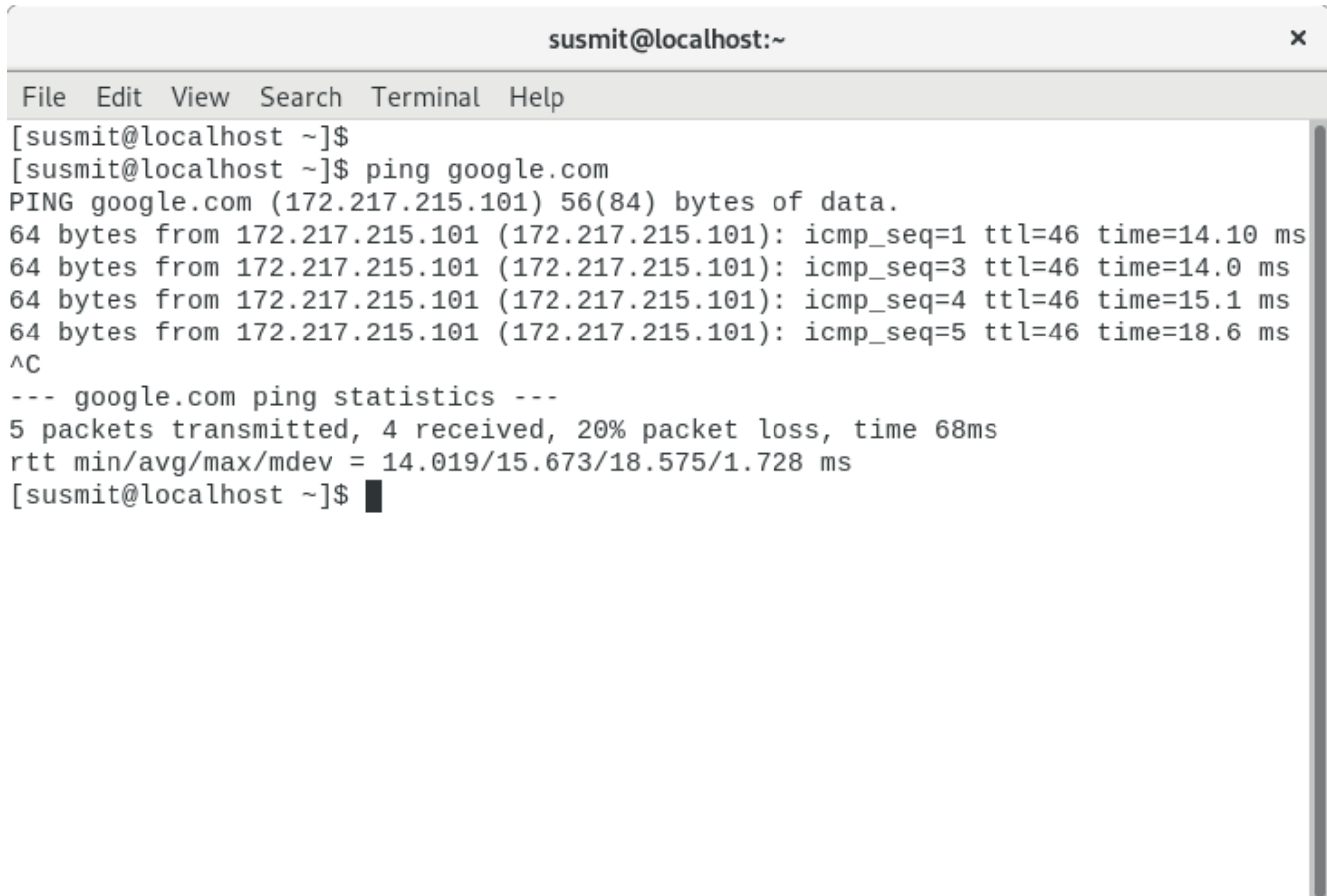


## CSC4200 – Homework 1 - Solution

1. Run **ping** between two instances and record the output. (5pts)

A terminal window titled 'susmit@localhost:~' with a menu bar (File, Edit, View, Search, Terminal, Help). The terminal shows the execution of 'ping google.com' and its output. The output includes four lines of ping data, a control character '^C', and a summary of ping statistics.

```
susmit@localhost:~  
File Edit View Search Terminal Help  
[susmit@localhost ~]$  
[susmit@localhost ~]$ ping google.com  
PING google.com (172.217.215.101) 56(84) bytes of data.  
64 bytes from 172.217.215.101 (172.217.215.101): icmp_seq=1 ttl=46 time=14.10 ms  
64 bytes from 172.217.215.101 (172.217.215.101): icmp_seq=3 ttl=46 time=14.0 ms  
64 bytes from 172.217.215.101 (172.217.215.101): icmp_seq=4 ttl=46 time=15.1 ms  
64 bytes from 172.217.215.101 (172.217.215.101): icmp_seq=5 ttl=46 time=18.6 ms  
^C  
--- google.com ping statistics ---  
5 packets transmitted, 4 received, 20% packet loss, time 68ms  
rtt min/avg/max/mdev = 14.019/15.673/18.575/1.728 ms  
[susmit@localhost ~]$
```

2. Submit the output and a table that briefly explains each field of the output. (20pts)

**Ans:** 172.217.215.101 – IP address

56 (84) bytes – Ping packet size, header + dummy data

64 bytes – Ping reply

ICMP seq 1 – Reply from Hop 1, Reply's TTL 46, Round trip time = 14.10

### 3. Install traceroute (apt install traceroute)

### 4. Run **traceroute** to google.com, record the output (5 pts)

```
susmit@localhost:~$ ping google.com
PING google.com (172.217.215.101) 56(84) bytes of data:
64 bytes from 172.217.215.101 (172.217.215.101): icmp_seq=1 ttl=46 time=14.10 ms
64 bytes from 172.217.215.101 (172.217.215.101): icmp_seq=3 ttl=46 time=14.0 ms
64 bytes from 172.217.215.101 (172.217.215.101): icmp_seq=4 ttl=46 time=15.1 ms
64 bytes from 172.217.215.101 (172.217.215.101): icmp_seq=5 ttl=46 time=18.6 ms
^C
--- google.com ping statistics ---
5 packets transmitted, 4 received, 20% packet loss, time 68ms
rtt min/avg/max/mdev = 14.019/15.673/18.575/1.728 ms
[susmit@localhost ~]$ traceroute google.com
traceroute to google.com (172.217.215.139), 30 hops max, 60 byte packets
 1 _gateway (192.168.3.1) 0.963 ms 0.962 ms 1.005 ms
 2 host-192-199-190-1.twlakes.net (192.199.190.1) 4.255 ms 4.457 ms 5.734 ms
 3 gnbo-edge-193.inet.twlakes.net (63.135.176.193) 5.856 ms gnbo-edge-197.inet.twlakes.net (63.135.176.197) 5.894 ms gnbo-edge-193.inet.twlakes.net (63.135.176.193) 6.891 ms
 4 xe-11-1-0.edge2.Atlanta4.Level3.net (4.53.238.73) 40.807 ms 204.29.12.233 (204.29.12.233) 15.118 ms 14.940 ms
 5 204.29.13.229 (204.29.13.229) 17.105 ms 72.14.210.3 (72.14.210.3) 15.134 ms 204.29.13.224 (204.29.13.224) 15.436 ms
 6 204.29.13.227 (204.29.13.227) 15.279 ms 108.170.249.163 (108.170.249.163) 13.382 ms 108.170.249.35 (108.170.249.35) 13.437 ms
 7 204.29.15.63 (204.29.15.63) 12.317 ms 209.85.248.247 (209.85.248.247) 12.963 ms 108.170.236.236 (108.170.236.236) 12.710 ms
 8 aix.pri.atl.google.com (198.32.132.41) 15.069 ms^C
[susmit@localhost ~]$
[susmit@localhost ~]$ traceroute google.com
traceroute to google.com (172.217.215.101), 30 hops max, 60 byte packets
 1 _gateway (192.168.3.1) 0.968 ms 1.278 ms 1.357 ms
 2 host-192-199-190-1.twlakes.net (192.199.190.1) 3.168 ms 3.558 ms 3.685 ms
 3 gnbo-edge-193.inet.twlakes.net (63.135.176.193) 4.530 ms gnbo-edge-197.inet.twlakes.net (63.135.176.197) 3.300 ms gnbo-edge-193.inet.twlakes.net (63.135.176.193) 4.737 ms
 4 xe-11-1-0.edge2.Atlanta4.Level3.net (4.53.238.73) 38.208 ms 38.334 ms 204.29.12.233 (204.29.12.233) 12.583 ms
 5 72.14.210.3 (72.14.210.3) 12.262 ms 12.110 ms *
 6 204.29.13.231 (204.29.13.231) 14.809 ms 108.170.249.162 (108.170.249.162) 11.175 ms 204.29.13.231 (204.29.13.231) 13.240 ms
 7 204.29.15.63 (204.29.15.63) 10.848 ms 204.29.13.239 (204.29.13.239) 13.168 ms 64.233.175.251 (64.233.175.251) 13.104 ms
 8 72.14.239.17 (72.14.239.17) 11.192 ms 209.85.243.2 (209.85.243.2) 11.737 ms 209.85.240.202 (209.85.240.202) 13.100 ms
 9 209.85.243.173 (209.85.243.173) 16.917 ms 108.170.236.169 (108.170.236.169) 16.287 ms 108.170.249.35 (108.170.249.35) 17.302 ms
10 64.233.175.251 (64.233.175.251) 16.425 ms * 209.85.250.96 (209.85.250.96) 15.783 ms
11 108.170.228.161 (108.170.228.161) 11.447 ms * 108.170.236.123 (108.170.236.123) 11.989 ms
12 * * 209.85.243.9 (209.85.243.9) 17.806 ms
13 * *
14 * *
15 * *
16 * *
17 * *
18 * * 172.217.215.101 (172.217.215.101) 11.252 ms
[susmit@localhost ~]$
```

### 5. Submit the output and a table that briefly explains each field (20 pts)

**Ans:** google.com (172.217.215.139), 30 hops max, 60 byte packets – Destination IP, Max hop (TTL), 60 byte packet

| Hop # | RTT 1    | RTT 2    | RTT 3    | Name/IP Address |
|-------|----------|----------|----------|-----------------|
| 1     | 0.968 ms | 1.278 ms | 1.357 ms | 192.168.3.1     |

## 6. Run **ifconfig** and record the output. (5pts)

```
susmit@localhost:~  
File Edit View Search Terminal Help  
if[susmit@localhost ~]$ ifconfig  
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 2679  bytes 226129 (220.8 KiB)  
    RX errors 0  dropped 0  overruns 0  frame 0  
    TX packets 2679  bytes 226129 (220.8 KiB)  
    TX errors 0  dropped 0  overruns 0  carrier 0  collisions 0  
  
virbr0: flags=4099<UP,BROADCAST,MULTICAST>  mtu 1500  
    inet 192.168.122.1  netmask 255.255.255.0  broadcast 192.168.122.255  
    ether 52:54:00:86:38:14  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  
  
wlp3s0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500  
    inet 192.168.3.45  netmask 255.255.255.0  broadcast 192.168.3.255  
    inet6 fd3d:3cf2:a529:1:97b0:d73e:78e:c77b  prefixlen 64  scopeid 0x0<global>  
    inet6 fe80::bf3f:239c:4567:f31c  prefixlen 64  scopeid 0x20<link>  
    ether 84:3a:4b:d2:2f:c4  txqueuelen 1000  (Ethernet)  
    RX packets 6503349  bytes 9099871352 (8.4 GiB)  
    RX errors 0  dropped 0  overruns 0  frame 0  
    TX packets 2704598  bytes 596812086 (569.1 MiB)  
    TX errors 0  dropped 0  overruns 0  carrier 0  collisions 0  
  
[susmit@localhost ~]$ █
```

## 7. Submit the output and the following information for an interface that is *not* **"lo"**: IP address, Ethernet Address, netmask, and MTU (20pts)

wlp3s0:  
IP: 192.168.3.45  
netmask 255.255.255.0  
ether 84:3a:4b:d2:2f:c4  
mtu 1500

## 8. Run **ip route show** and submit the output (5 pts)

```
susmit@localhost:~  
File Edit View Search Terminal Help  
[susmit@localhost ~]$ ip route show  
default via 192.168.3.1 dev wlp3s0 proto dhcp metric 600  
192.168.3.0/24 dev wlp3s0 proto kernel scope link src 192.168.3.45 metric 600  
192.168.122.0/24 dev virbr0 proto kernel scope link src 192.168.122.1 linkdown  
[susmit@localhost ~]$
```

9. Explain the first line of the output (20 pts)

**Ans:** Default route to the Internet (or any IP address not in the same network) is via device wlp3s0 (wireless card, Layer 2) that connects us to gateway 192.168.3.1 that connects us to the Internet. We learned this route using DHCP protocol and the cost for sending packet over this interface is 600.