Networking Terminal Command Understanding

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Ping

```
Last login: Thu Aug 28 10:31:24 on ttys000
adib@192 ~ % ping google.com

PING google.com (142.250.194.46): 56 data bytes
64 bytes from 142.250.194.46: icmp_seq=0 ttl=117 time=36.436 ms
64 bytes from 142.250.194.46: icmp_seq=1 ttl=117 time=37.003 ms
64 bytes from 142.250.194.46: icmp_seq=2 ttl=117 time=37.307 ms
64 bytes from 142.250.194.46: icmp_seq=3 ttl=117 time=37.348 ms
64 bytes from 142.250.194.46: icmp_seq=4 ttl=117 time=37.041 ms
64 bytes from 142.250.194.46: icmp_seq=5 ttl=117 time=36.825 ms
64 bytes from 142.250.194.46: icmp_seq=6 ttl=117 time=36.491 ms
64 bytes from 142.250.194.46: icmp_seq=7 ttl=117 time=36.411 ms
64 bytes from 142.250.194.46: icmp_seq=8 ttl=117 time=37.147 ms
^C
--- google.com ping statistics ---
9 packets transmitted, 9 packets received, 0.0% packet loss
round-trip min/avg/max/stddev = 36.411/36.890/37.348/0.347 ms
[adib@192 ~ % ping -c 3 google.com

PING google.com (142.250.194.46): 56 data bytes
64 bytes from 142.250.194.46: icmp_seq=0 ttl=117 time=38.845 ms
64 bytes from 142.250.194.46: icmp_seq=1 ttl=117 time=36.603 ms
64 bytes from 142.250.194.46: icmp_seq=2 ttl=117 time=37.312 ms

--- google.com ping statistics ---
3 packets transmitted, 3 packets received, 0.0% packet loss
round-trip min/avg/max/stddev = 36.603/37.587/38.845/0.936 ms
adib@192 ~ %
```

Tested network connectivity and round-trip time (also called latency) between my device and a remote server.

Traceroute

```
   brew install --cask openvisualtraceroute
adib@192 ~ % which traceroute

/usr/sbin/traceroute
adib@192 ~ % traceroute google.com

traceroute to google.com (142.250.194.46), 64 hops max, 40 byte packets
 1  192.168.1.1 (192.168.1.1)  3.593 ms  2.634 ms  2.524 ms
 2  172.16.0.1 (172.16.0.1)  7.265 ms  6.173 ms  5.016 ms
 3  123.49.8.204 (123.49.8.204)  7.372 ms  5.080 ms  8.287 ms
 4  123.49.8.122 (123.49.8.122)  12.117 ms  10.983 ms  10.516 ms
 5  123.49.8.125 (123.49.8.125)  10.456 ms  11.156 ms  12.332 ms
 6  123.49.8.33 (123.49.8.33)  18.336 ms  9.683 ms  9.786 ms
 7  123.49.13.89 (123.49.13.89)  10.667 ms  10.290 ms  9.864 ms
 8  142.251.195.122 (142.251.195.122)  36.605 ms  37.317 ms  38.730 ms
 9  * * *
10  209.85.252.70 (209.85.252.70)  38.287 ms
    142.251.76.194 (142.251.76.194)  39.418 ms
    209.85.251.230 (209.85.251.230)  37.933 ms
11  192.178.82.232 (192.178.82.232)  37.772 ms
    192.178.82.236 (192.178.82.236)  37.992 ms
    142.250.63.52 (142.250.63.52)  37.832 ms
12  216.239.62.181 (216.239.62.181)  51.009 ms
    192.178.83.227 (192.178.83.227)  37.314 ms
    del12s02-in-f14.1e100.net (142.250.194.46)  38.124 ms
```

Observed how many packets travel through multiple
routers/hops to reach a destination server.

Ifconfig

```
adib@192 ~ % ifconfig

lo0: flags=8049<UP,LOOPBACK,RUNNING,MULTICAST> mtu 16384
        options=1203<RXCSUM,TXCSUM,TXSTATUS,SW_TIMESTAMP>
        inet 127.0.0.1 netmask 0xff000000
        inet6 ::1 prefixlen 128
        inet6 fe80::1%lo0 prefixlen 64 scopeid 0x1
        nd6 options=201<PERFORMNUD,DAD>
gif0: flags=8010<POINTOPOINT,MULTICAST> mtu 1280
stf0: flags=0<> mtu 1280
anpi0: flags=8863<UP,BROADCAST,SMART,RUNNING,SIMPLEX,MULTICAST> mtu 1500
        options=400<CHANNEL_IO>
        ether b6:90:0a:f2:ef:74
        media: none
        status: inactive
anpi1: flags=8863<UP,BROADCAST,SMART,RUNNING,SIMPLEX,MULTICAST> mtu 1500
        options=400<CHANNEL_IO>
        ether b6:90:0a:f2:ef:75
        media: none
        status: inactive
en3: flags=8863<UP,BROADCAST,SMART,RUNNING,SIMPLEX,MULTICAST> mtu 1500
        options=400<CHANNEL_IO>
        ether b6:90:0a:f2:ef:54
        nd6 options=201<PERFORMNUD,DAD>
        media: none
        status: inactive
en4: flags=8863<UP,BROADCAST,SMART,RUNNING,SIMPLEX,MULTICAST> mtu 1500
        options=400<CHANNEL_IO>
        ether b6:90:0a:f2:ef:55
        nd6 options=201<PERFORMNUD,DAD>
        media: none
        status: inactive
en1: flags=8963<UP,BROADCAST,SMART,RUNNING,PROMISC,SIMPLEX,MULTICAST> mtu 1500
        options=460<TSO4,TSO6,CHANNEL_IO>
        ether 36:de:e1:e9:f1:80
        media: autoselect <full-duplex>
        status: inactive
en2: flags=8963<UP,BROADCAST,SMART,RUNNING,PROMISC,SIMPLEX,MULTICAST> mtu 1500
        options=460<TSO4,TSO6,CHANNEL_IO>
        ether 36:de:e1:e9:f1:84
        media: autoselect <full-duplex>
        status: inactive
bridge0: flags=8863<UP,BROADCAST,SMART,RUNNING,SIMPLEX,MULTICAST> mtu 1500
        options=63<RXCSUM,TXCSUM,TSO4,TSO6>
        ether 36:de:e1:e9:f1:80
        Configuration:
                id 0:0:0:0:0:0 priority 0 hellotime 0 fwddelay 0
                maxage 0 holdcnt 0 proto stp maxaddr 100 timeout 1200
                root id 0:0:0:0:0:0 priority 0 ifcost 0 port 0
                ipfilter disabled flags 0x0
```

We can check network interface details, as well as IP address, subnet mask, and MAC address.

ARP

```
adib@192 ~ % arp -a
192.168.1.1 (192.168.1.1) at 5c:a4:f4:c2:66:94 on en0 ifscope [ethernet]
192.168.1.13 (192.168.1.13) at 9a:a2:cc:cb:a9:3 on en0 ifscope [ethernet]
192.168.1.43 (192.168.1.43) at 4e:32:cf:5a:12:7f on en0 ifscope [ethernet]
192.168.1.255 (192.168.1.255) at ff:ff:ff:ff:ff:ff on en0 ifscope [ethernet]
mdns.mcast.net (224.0.0.251) at 1:0:5e:0:0:fb on en0 ifscope permanent [ethernet]
```

Understood how IP addresses are mapped to MAC addresses within the local network.

RARP

Learned that Reverse ARP maps a MAC address back to its corresponding IP address, though it's mostly replaced by DHCP today.

NSLOOKUP

```
adib@192 ~ % nslookup google.com

Server:         192.168.1.1
Address:        192.168.1.1#53

Non-authoritative answer:
Name:    google.com
Address: 142.250.192.174
```

Practiced resolving domain names into IP addresses using a DNS server.

NETSTAT


```
adib@192 ~ % netstat -an

Active Internet connections (including servers)
Proto Recv-Q Send-Q  Local Address          Foreign Address        (state)
tcp4       0      0  192.168.1.50.50432     3.233.158.26.443       ESTABLISHED
tcp4       0      0  192.168.1.50.50431     3.233.158.26.443       ESTABLISHED
tcp4       0      0  192.168.1.50.50428     104.18.39.21.443       ESTABLISHED
tcp4       0      0  192.168.1.50.50427     172.64.148.235.443     ESTABLISHED
tcp4       0      0  192.168.1.50.50426     172.64.155.209.443     ESTABLISHED
tcp4       0      0  192.168.1.50.50425     104.18.32.47.443       ESTABLISHED
tcp4       0      0  192.168.1.50.50424     104.18.32.47.443       ESTABLISHED
tcp4       0      0  192.168.1.50.50419     34.120.52.64.443       ESTABLISHED
tcp4       0      0  192.168.1.50.50417     34.120.52.64.443       ESTABLISHED
tcp4       0      0  192.168.1.50.50413     74.125.24.188.5228     ESTABLISHED
tcp4       0      0  192.168.1.50.50412     74.125.24.188.5228     ESTABLISHED
tcp4       0      0  192.168.1.50.50411     57.144.186.144.443     ESTABLISHED
tcp4       0      0  192.168.1.50.50410     157.240.1.58.443       ESTABLISHED
tcp4       0      0  192.168.1.50.50409     57.144.186.141.443     ESTABLISHED
tcp4       0      0  192.168.1.50.50408     57.144.186.141.443     ESTABLISHED
tcp4       0      0  192.168.1.50.50407     57.144.186.141.443     ESTABLISHED
tcp4       0      0  192.168.1.50.50406     157.240.1.23.443       ESTABLISHED
tcp6       0      0  *.50399                *.*                    LISTEN
```

active connections, listening ports, and ongoing network sessions