Execution Trace

PING

University of Florida

```
C:\Users\romap\csc-249-p4-ping\csc-249-p4-diy-ping-traceroute>python ICMPpinger.py 128.227.36.35
Pinging 128.227.36.35 [128.227.36.35] 3 times using Python:
Ping successful. RTT: 0.03972673416137695 seconds
Ping 1 RTT 39.73 millisec
Ping successful. RTT: 0.040031515121459961 seconds
Ping 2 RTT 40.32 millisec
Ping successful. RTT: 0.0398106575012207 seconds
Ping 3 RTT 39.81 millisec
```

NYU

```
C:\Users\romap\csc-249-p4-ping\csc-249-p4-diy-ping-traceroute>python ICMPpinger.py 108.139.10.77
Pinging 108.139.10.77 [108.139.10.77] 3 times using Python:
Ping successful. RTT: 0.07441353797912598 seconds
Ping 1 RTT 74.41 millisec
Ping successful. RTT: 0.0743398666381836 seconds
Ping 2 RTT 74.34 millisec
Ping successful. RTT: 0.0744321346282959 seconds
Ping 3 RTT 74.43 millisec
```

Drexel

```
C:\Users\romap\csc-249-p4-ping\csc-249-p4-diy-ping-traceroute>python ICMPpinger.py 144.118.67.10
Pinging 144.118.67.10 [144.118.67.10] 3 times using Python:
Ping successful. RTT: 0.014367341995239258 seconds
Ping 1 RTT 14.37 millisec
Ping successful. RTT: 0.013963699340820312 seconds
Ping 2 RTT 13.96 millisec
Ping successful. RTT: 0.013478517532348633 seconds
Ping 3 RTT 13.48 millisec
```

MIT

```
C:\Users\romap\csc-249-p4-ping\csc-249-p4-diy-ping-traceroute>python ICMPpinger.py 23.56.123.79
Pinging 23.56.123.79 [23.56.123.79] 3 times using Python:
Ping successful. RTT: 0.07711291313171387 seconds
Ping 1 RTT 77.11 millisec
Ping successful. RTT: 0.07592415809631348 seconds
Ping 2 RTT 75.92 millisec
Ping successful. RTT: 0.07628631591796875 seconds
Ping 3 RTT 76.29 millisec
```

Poland Spring

```
C:\Users\romap\csc-249-p4-ping\csc-249-p4-diy-ping-traceroute>python ICMPpinger.py 44.199.45.82
Pinging 44.199.45.82 [44.199.45.82] 3 times using Python:
Ping successful. RTT: 0.024462223052978516 seconds
Ping 1 RTT 24.46 millisec
Ping successful. RTT: 0.02094554901123047 seconds
Ping 2 RTT 20.95 millisec
Ping successful. RTT: 0.016390085220336914 seconds
Ping 3 RTT 16.39 millisec
```

Italy Government

```
C:\Users\romap\csc-249-p4-ping\csc-249-p4-diy-ping-traceroute>python ICMPpinger.py 2.17.107.99
Pinging 2.17.107.99 [2.17.107.99] 3 times using Python:
Ping successful. RTT: 0.0881814956665039 seconds
Ping 1 RTT 88.18 millisec
Ping successful. RTT: 0.08677101135253906 seconds
Ping 2 RTT 86.77 millisec
Ping successful. RTT: 0.08636069297790527 seconds
Ping 3 RTT 86.36 millisec
```

Serbia Government

```
C:\Users\romap\csc-249-p4-ping\csc-249-p4-diy-ping-traceroute>python ICMPpinger.py 185.168.19.28
Pinging 185.168.19.28 [185.168.19.28] 3 times using Python:
Ping successful. RTT: 0.10598325729370117 seconds
Ping 1 RTT 105.98 millisec
Ping successful. RTT: 0.10590171813964844 seconds
Ping 2 RTT 105.9 millisec
Ping successful. RTT: 0.11124038696289062 seconds
Ping 3 RTT 111.24 millisec
```

South African Government

```
C:\Users\romap\csc-249-p4-ping\csc-249-p4-diy-ping-traceroute>python ICMPpinger.py 164.151.129.20
Pinging 164.151.129.20 [164.151.129.20] 3 times using Python:
Ping successful. RTT: 0.22532272338867188 seconds
Ping 1 RTT 225.32 millisec
Ping successful. RTT: 0.22544622421264648 seconds
Ping 2 RTT 225.45 millisec
Ping successful. RTT: 0.22546887397766113 seconds
Ping 3 RTT 225.47 millisec
```

Nigeria Government

```
C:\Users\romap\csc-249-p4-ping\csc-249-p4-diy-ping-traceroute>python ICMPpinger.py 197.159.69.150
Pinging 197.159.69.150 [197.159.69.150] 3 times using Python:
Ping successful. RTT: 0.196224211264648438 seconds
Ping 1 RTT 196.22 millisec
Ping successful. RTT: 0.19353532791137695 seconds
Ping 2 RTT 193.54 millisec
Ping successful. RTT: 0.194549560546875 seconds
Ping 3 RTT 194.55 millisec
```

Uzbekistan Government

```
C:\Users\romap\csc-249-p4-ping\csc-249-p4-diy-ping-traceroute>python ICMPpinger.py 91.212.89.224
Pinging 91.212.89.224 [91.212.89.224] 3 times using Python:
Ping successful. RTT: 0.18374919891357422 seconds
Ping 1 RTT 183.75 millisec
Ping successful. RTT: 0.17458200454711914 seconds
Ping 2 RTT 174.58 millisec
Ping successful. RTT: 0.17611217498779297 seconds
Ping 3 RTT 176.11 millisec
```

TRACEROUTE

University of Florida

```
C:\Users\romap\csc-249-p4-ping\csc-249-p4-diy-ping-traceroute>python ICMPtraceroute.py 128.227.36.35
 1 rtt=8 ms 131.229.147.254
 2 rtt=25 ms 131.229.11.142
 3 rtt=20 ms 131.229.10.104
 4 rtt=3 ms 134.241.249.33
 5 rtt=6 ms 69.16.1.33
 6 rtt=9 ms 18.2.8.89
 7 rtt=12 ms 192.5.89.57
 8 rtt=15 ms 192.5.89.222
 9 rtt=40 ms 163.253.1.42
10 rtt=40 ms 163.253.1.116
11 rtt=40 ms 163.253.1.107
12 rtt=39 ms 163.253.1.135
13 rtt=44 ms 163.253.1.100
14 rtt=41 ms 163.253.2.33
15 rtt=40 ms 108.59.25.20
16 rtt=41 ms 108.59.31.149
17 rtt=45 ms 108.59.31.151
18 rtt=46 ms 108.59.26.115
19 rtt=49 ms 128.227.236.174
20 rtt=42 ms 128.227.236.176
21 rtt=42 ms 128.227.69.193
22 rtt=45 ms 128.227.95.248
23 rtt=45 ms 128.227.95.161
24 rtt=43 ms 128.227.36.35
```

NYU

```
C:\Users\romap\csc-249-p4-ping\csc-249-p4-diy-ping-traceroute>python ICMPtraceroute.py 108.139.10.77
 1 rtt=7 ms 131.229.147.254
 2 rtt=13 ms 131.229.11.142
 3 rtt=23 ms 131.229.10.104
 4 rtt=5 ms 134.241.249.33
 5 rtt=7 ms 69.16.1.33
 6 rtt=7 ms 65.175.24.205
 7 rtt=72 ms 141.136.105.134
 8 rtt=72 ms 209.120.154.226
 * * * Request timed out.
 * * * Request timed out.
 * * * Request timed out.
 * * * Request timed out.
 * * * Request timed out.
 * * * Request timed out.
 * * * Request timed out.
 * * * Request timed out.
 * * * Request timed out.
 * * * Request timed out.
 * * * Request timed out.
 * * * Request timed out.
15 rtt=77 ms 108.139.10.77
```

Drexel

```
C:\Users\romap\csc-249-p4-ping\csc-249-p4-diy-ping-traceroute>python ICMPtraceroute.py 144.118.67.10
 1 rtt=8 ms 131.229.147.254
 2 rtt=13 ms 131.229.11.142
 3 rtt=16 ms 131.229.10.104
 4 rtt=2 ms 134.241.249.33
 5 rtt=6 ms 69.16.1.33
 6 rtt=5 ms 18.2.8.89
 7 rtt=7 ms 192.5.89.57
 8 rtt=14 ms 192.5.89.222
 9 rtt=17 ms 163.253.1.241
10 rtt=11 ms 204.238.76.33
11 rtt=14 ms 204.238.76.85
12 rtt=16 ms 144.118.0.222
13 rtt=15 ms 144.118.1.26
14 rtt=16 ms 144.118.67.10
```

MIT

```
C:\Users\romap\csc-249-p4-ping\csc-249-p4-diy-ping-traceroute>python ICMPtraceroute.py 23.56.123.79
 1 rtt=12 ms 131.229.147.254
 2 rtt=13 ms 131.229.11.142
 3 rtt=19 ms 131.229.10.104
 4 rtt=5 ms 134.241.249.33
 5 rtt=5 ms 69.16.1.33
 6 rtt=10 ms 65.175.24.205
 7 rtt=13 ms 213.200.121.6
 8 rtt=13 ms 98.124.184.66
 * * * Request timed out.
 * * * Request timed out.
 * * * Request timed out.
 * * * Request timed out.
11 rtt=78 ms 23.32.63.27
12 rtt=77 ms 23.207.232.39
13 rtt=88 ms 23.203.158.23
 * * * Request timed out.
 * * * Request timed out.
 * * * Request timed out.
 * * * Request timed out.
 * * * Request timed out.
 * * * Request timed out.
17 rtt=79 ms 23.56.123.79
```

Poland Spring

```
C:\Users\romap\csc-249-p4-ping\csc-249-p4-diy-ping-traceroute>python ICMPtraceroute.py 44.199.45.82
 1 rtt=7 ms 131.229.147.254
 2 rtt=98 ms 131.229.11.142
 3 rtt=20 ms 131.229.10.104
 4 rtt=5 ms 134.241.249.33
 5 rtt=13 ms 69.16.1.33
 6 rtt=5 ms 18.2.8.89
 7 rtt=15 ms 192.5.89.57
 8 rtt=14 ms 192.5.89.222
 9 rtt=20 ms 163.253.1.40
10 rtt=20 ms 163.253.1.116
11 rtt=26 ms 163.253.1.127
12 rtt=20 ms 99.82.179.32
* * * Request timed out.
* * * Request timed out.
* * * Request timed out.
* * * Request timed out.
* * * Request timed out.
* * * Request timed out.
* * * Request timed out.
* * * Request timed out.
17 rtt=18 ms 44.199.45.82
```

Italy Government

```
C:\Users\romap\csc-249-p4-ping\csc-249-p4-diy-ping-traceroute>python ICMPtraceroute.py 2.17.107.99
 1 rtt=7 ms 131.229.147.254
 2 rtt=24 ms 131.229.11.142
 3 rtt=15 ms 131.229.10.104
 4 rtt=2 ms 134.241.249.33
 5 rtt=4 ms 69.16.1.33
 6 rtt=6 ms 65.175.24.205
 7 rtt=87 ms 89.149.134.50
 8 rtt=93 ms 154.14.67.26
 9 rtt=86 ms 2.17.107.99
```

Serbia Government

```
C:\Users\romap\csc-249-p4-ping\csc-249-p4-diy-ping-traceroute>python ICMPtraceroute.py 185.168.19.28
 1 rtt=10 ms 131.229.147.254
 2 rtt=26 ms 131.229.11.142
 3 rtt=20 ms 131.229.10.104
 4 rtt=2 ms 134.241.249.33
 5 rtt=2 ms 69.16.1.33
 6 rtt=6 ms 65.175.24.205
 7 rtt=109 ms 213.200.127.46
 8 rtt=101 ms 89.202.166.42
 9 rtt=108 ms 89.216.5.254
10 rtt=111 ms 89.216.5.254
11 rtt=109 ms 82.117.192.103
12 rtt=108 ms 185.29.100.39
13 rtt=113 ms 185.168.19.28
```

South Africa Government

```
C:\Users\romap\csc-249-p4-ping\csc-249-p4-diy-ping-traceroute>python ICMPtraceroute.py 164.151.129.20
 1 rtt=13 ms 131.229.147.254
 2 rtt=25 ms 131.229.11.142
 3 rtt=23 ms 131.229.10.104
 4 rtt=2 ms 134.241.249.33
 5 rtt=2 ms 69.16.1.33
 6 rtt=4 ms 69.16.0.9
 7 rtt=6 ms 38.104.218.13
 8 rtt=7 ms 154.54.41.129
 9 rtt=69 ms 154.54.82.37
10 rtt=70 ms 154.54.62.6
11 rtt=70 ms 149.6.148.130
12 rtt=234 ms 168.209.100.58
13 rtt=234 ms 168.209.100.58
14 rtt=232 ms 196.26.0.201
15 rtt=226 ms 168.209.129.138
16 rtt=235 ms 168.209.90.7
17 rtt=226 ms 168.209.131.135
18 rtt=235 ms 197.97.72.54
* * * Request timed out.
* * * Request timed out.
* * * Request timed out.
* * * Request timed out.
20 rtt=225 ms 164.151.129.20
```

Nigeria Government

```
C:\Users\romap\csc-249-p4-ping\csc-249-p4-diy-ping-traceroute>python ICMPtraceroute.py 197.159.69.150
 1 rtt=74 ms 131.229.147.254
 2 rtt=15 ms 131.229.11.142
 3 rtt=23 ms 131.229.10.104
 4 rtt=2 ms 134.241.249.33
 5 rtt=4 ms 69.16.1.33
 6 rtt=9 ms 69.16.0.9
 7 rtt=7 ms 38.104.218.13
 8 rtt=8 ms 154.54.41.129
 9 rtt=71 ms 154.54.82.37
10 rtt=75 ms 154.54.57.70
11 rtt=111 ms 154.54.61.117
12 rtt=101 ms 154.54.61.106
13 rtt=108 ms 154.54.61.213
14 rtt=172 ms 149.6.144.98
15 rtt=178 ms 154.113.144.169
16 rtt=173 ms 154.113.20.54
17 rtt=201 ms 10.0.26.41
18 rtt=194 ms 10.0.26.17
19 rtt=195 ms 10.0.26.5
20 rtt=197 ms 10.160.10.190
* * * Request timed out.
* * * Request timed out.
21 rtt=200 ms 10.160.70.11
* * * Request timed out.
* * * Request timed out.
22 rtt=196 ms 10.160.70.1
* * * Request timed out.
* * * Request timed out.
* * * Request timed out.
* * * Request timed out.
* * * Request timed out.
* * * Request timed out.
25 rtt=194 ms 197.159.69.150
```
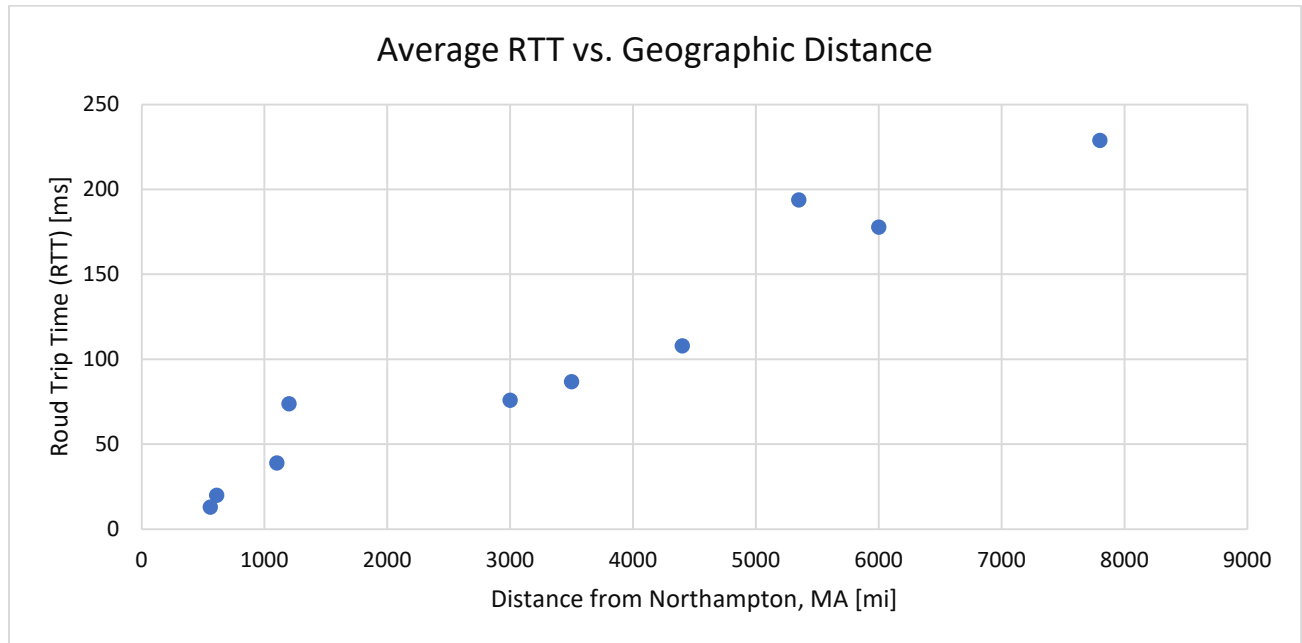
Uzbekistan Government

```
C:\Users\romap\csc-249-p4-ping\csc-249-p4-diy-ping-traceroute>python ICMPtraceroute.py 91.212.89.224
 1 rtt=9 ms 131.229.147.254
 2 rtt=17 ms 131.229.11.142
 3 rtt=24 ms 131.229.10.104
 4 rtt=3 ms 134.241.249.33
 5 rtt=2 ms 69.16.1.33
 6 rtt=6 ms 69.16.0.9
 7 rtt=8 ms 38.104.218.13
 8 rtt=7 ms 154.54.41.129
 9 rtt=69 ms 154.54.82.37
10 rtt=82 ms 130.117.51.42
11 rtt=86 ms 154.54.38.210
12 rtt=89 ms 154.54.61.230
13 rtt=100 ms 154.54.61.242
14 rtt=106 ms 154.54.36.90
15 rtt=159 ms 149.6.168.154
16 rtt=167 ms 195.69.191.40
17 rtt=174 ms 195.69.191.46
18 rtt=175 ms 195.69.189.32
19 rtt=167 ms 195.69.189.251
20 rtt=168 ms 84.54.64.122
21 rtt=175 ms 84.54.69.174
* * * Request timed out.
* * * Request timed out.
* * * Request timed out.
* * * Request timed out.
24 rtt=174 ms 91.212.89.224
```

Performance Analysis – Used My Own Code

PING Analysis

Average RTT vs. Geographic Distance

(Scatterplot: x-axis labeled "Distance from Northampton, MA [mi]" ranging 0 to 9000; y-axis labeled "Roud Trip Time (RTT) [ms]" ranging 0 to 250.)

1. Are RTT and geographic distance correlated positively, negatively, or not at all? If applicable, also comment on the strength of correlation (weak vs. strong).

According to the scatterplot data, there is a positive correlation between RTT and geographic distance.

2. Why do you think you observe this trend (or lack thereof)?

This makes sense, as a packet would take longer to travel to a destination and return if the destination is farther away. There is a tangible aspect to packet transmission (fiber optics), and the farther away the destination is, the more of a distance the data must physically travel to get there, which takes time.

In selecting my locations (5 domestic and 5 international), I was sure to use the location of the IP address, rather than the location of the place (and did not use Google Maps coordinates). For example, the Italian Government's official website has an IP address from Belgium. Thus, I used the distance from Northampton to Belgium. I'm hypothesizing that because I did this, the correlation appears to be relatively strong, which makes sense since the distance between my laptop and the physical location of the destination IP is accurate and would therefore increase proportionally.

TRACE ROUTE ANALYSIS

Number of Hops vs. Geographic Distance
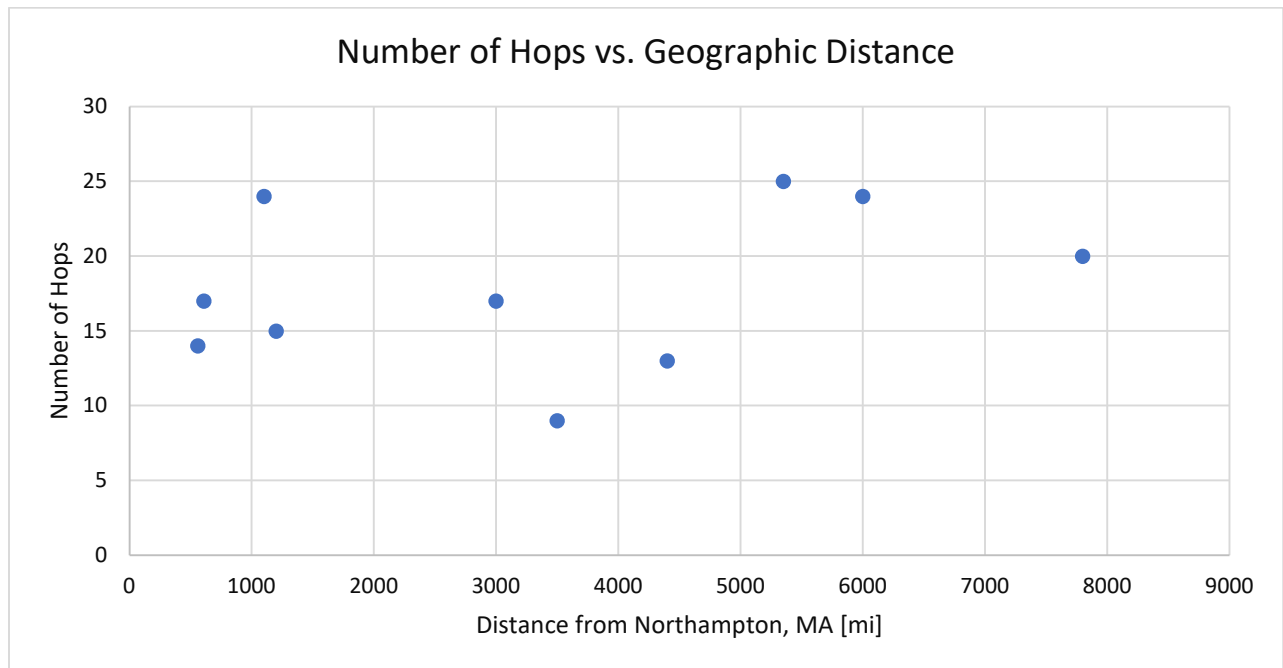
1. Are # hops and geographic distance correlated positively, negatively, or not at all? If applicable, also comment on the strength of correlation (weak vs. strong).

There does not appear to be a correlation between distance from my laptop to the destination and the number of hops that the packet made to reach the destination.

2. Why do you think you observe this trend (or lack thereof)?

It may seem counterintuitive at first since one would think that the path between sources and far away destinations have more routers between them. However, there are a few different reasons why I could be seeing the absence of a trend, the first being network topology. The distance between the source and destination does not necessarily say anything about the path that the packet takes to travel. Two locations that tend to have a lot of traffic to each other might have a more efficient or high-speed connection installed to take the burden off the network. Because of this, there would be fewer hops. Secondly, since half the destinations were international, the packets were traveling overseas. Packets traveling overseas cover long distances with relatively few hops since it's underwater and there aren't any intermediate stops to make. Finally, routers use dynamic routing protocols that will select the fastest routing path, which may or may not be the route with the fewest hops. Individual routing connections often use different speeds, or may have different concentrations of traffic, so it may actually be faster for a packet to be routed through a path with more hops.