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January 18, 2024

CS 176A: Homework 1

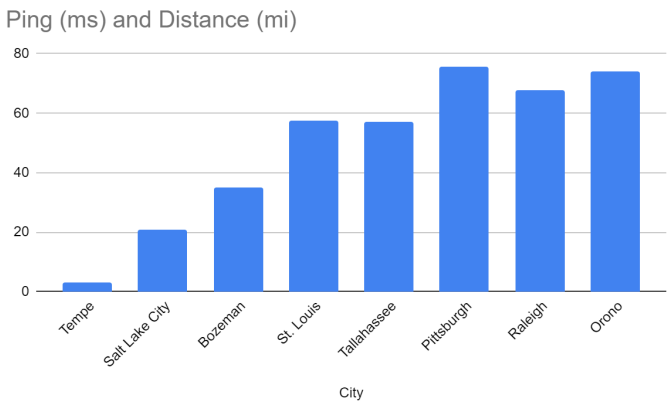
Part 1

1.

a. Ran a ping of 50 packets, the first test was at 1:45pm.
UCLA Average RTT: 3.25 ms
St. Lous Average RTT: 57.53 ms
Second test was at 8pm.
UCLA Average RTT: 3.27 ms
St. Louis Average RTT: 58.91 ms
The difference between universities is most likely caused by geographical distance as UCLA is much closer than St. Louis, and the difference by time is likely due to the fact that at night more students will be sharing the network to do homework whereas in the day time people are out and about or in class, and not all classes require Wi-Fi for students. That being said, the differences are still negligible.

b.

City	Ping (ms)	Distance (mi)
Tempe	3.266	489
Salt Lake City	20.669	766
Bozeman	35.135	1173
St. Louis	57.483	1905
Tallahassee	57.154	2352
Pittsburgh	75.547	2514
Raleigh	67.799	2638
Orono	73.919	3339



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2. Traceroute & Ping to www.airtel.in (India)

```
[dna@csilvm-16 ~]$ traceroute www.airtel.in
traceroute to www.airtel.in (23.209.84.50), 30 hops max, 60 byte packets
 1  _gateway (128.111.30.193)  1.270 ms  1.243 ms  1.232 ms
 2  r1--535-c--1.commserv.ucsb.edu (128.111.252.148)  1.358 ms  1.222 ms  1.181 ms
 3  dc--lax-agg10--ucsb--100g.cenic.net (137.164.23.90)  3.321 ms  3.306 ms  3.294 ms
 4  * * *
 5  * * *
 6  4.59.55.2 (4.59.55.2)  3.526 ms  3.308 ms  3.321 ms
 7  ae11.r01.lax01.icn.netarch.akamai.com (23.207.234.38)  3.555 ms  3.544 ms  3.226 ms
 8  ae3.r01.phx01.icn.netarch.akamai.com (23.32.63.123)  11.178 ms  10.792 ms  10.770 ms
 9  ae1.r02.phx01.ien.netarch.akamai.com (23.207.233.39)  11.432 ms  11.391 ms  11.318 m
s
10  ae5.r02.border.phx01.sdn.netarch.akamai.com (23.207.233.19)  15.026 ms  14.832 ms  1
4.816 ms
11  * * *
12  * * *
13  a23-209-84-50.deploy.static.akamaitechnologies.com (23.209.84.50)  11.542 ms  11.624
 ms  11.468 ms
[dna@csilvm-16 ~]$ ping -c 5 www.airtel.in
PING a1806.dscr.akamai.net (23.209.84.50) 56(84) bytes of data.
64 bytes from a23-209-84-50.deploy.static.akamaitechnologies.com (23.209.84.50): icmp_se
q=1 ttl=56 time=12.2 ms
64 bytes from a23-209-84-50.deploy.static.akamaitechnologies.com (23.209.84.50): icmp_se
q=2 ttl=56 time=12.3 ms
64 bytes from a23-209-84-50.deploy.static.akamaitechnologies.com (23.209.84.50): icmp_se
q=3 ttl=56 time=12.2 ms
64 bytes from a23-209-84-50.deploy.static.akamaitechnologies.com (23.209.84.50): icmp_se
q=4 ttl=56 time=12.1 ms
64 bytes from a23-209-84-50.deploy.static.akamaitechnologies.com (23.209.84.50): icmp_se
q=5 ttl=56 time=12.2 ms

--- a1806.dscr.akamai.net ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 4018ms
rtt min/avg/max/mdev = 12.129/12.197/12.327/0.070 ms
[dna@csilvm-16 ~]$
```

Traceroute & Ping to www.ntt.co.jp (Japan)

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```
traceroute[dna@csilvm-16 ~]$ traceroute www.ntt.co.jp
traceroute to www.ntt.co.jp (183.181.99.39), 30 hops max, 60 byte packets
 1  _gateway (128.111.30.193)  4.052 ms  3.995 ms  3.981 ms
 2  r1--535-c--1.commserv.ucsb.edu (128.111.252.148)  4.542 ms  4.498 ms  4.463 ms
 3  dc--lax-agg10--ucsb--100g.cenic.net (137.164.23.90)  5.690 ms  5.675 ms  5.659 ms
 4  dc-lax-agg8--lax-agg10-300g.cenic.net (137.164.11.71)  4.004 ms  3.983 ms  4.173 ms
 5  hundredge-0-0-0-24.10.core2.losa.net.internet2.edu (64.57.20.82)  6.128 ms  6.111 ms
  5.987 ms
 6  fourhundredge-0-0-0-49.4079.agg2.losa2.net.internet2.edu (163.253.1.199)  4.299 ms
6.110 ms  6.079 ms
 7  lax001ix00.iij.net (206.223.123.23)  3.470 ms  6.465 ms  6.534 ms
 8  osk004bb01.IIJ.Net (58.138.88.117)  109.311 ms  109.294 ms osk004bb00.IIJ.Net (58.13
8.88.113)  106.331 ms
 9  osk004ix55.IIJ.Net (58.138.106.254)  109.270 ms  109.260 ms  108.911 ms
10  202.232.8.86 (202.232.8.86)  112.798 ms  111.801 ms  113.124 ms
11  103.3.0.23 (103.3.0.23)  125.370 ms  125.357 ms  127.573 ms
12  * * *
13  * * *
14  * * *
15  * * *
16  * * *
17  * * *
18  * * *
19  * * *
20  * * *
21  * * *
22  * * *
23  * * *
24  * * *
25  * * *
26  * * *
27  * * *
28  * * *
29  * * *
30  * * *
[dna@csilvm-16 ~]$ ping -c 5 www.ntt.co.jp
PING www.ntt.co.jp (183.181.99.39) 56(84) bytes of data.
64 bytes from sv138.xbiz.ne.jp (183.181.99.39): icmp_seq=1 ttl=50 time=112 ms
64 bytes from sv138.xbiz.ne.jp (183.181.99.39): icmp_seq=2 ttl=50 time=112 ms
64 bytes from sv138.xbiz.ne.jp (183.181.99.39): icmp_seq=3 ttl=50 time=112 ms
64 bytes from sv138.xbiz.ne.jp (183.181.99.39): icmp_seq=4 ttl=50 time=112 ms
64 bytes from sv138.xbiz.ne.jp (183.181.99.39): icmp_seq=5 ttl=50 time=112 ms

--- www.ntt.co.jp ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 4015ms
rtt min/avg/max/mdev = 111.933/112.023/112.123/0.078 ms
[dna@csilvm-16 ~]$
```

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Traceroute & Ping to www.de-cix.net (Germany)

```
[dna@csilvm-16 ~]$ traceroute www.de-cix.net
traceroute to www.de-cix.net (217.29.41.49), 30 hops max, 60 byte packets
 1  _gateway (128.111.30.193)  1.765 ms  1.782 ms  1.783 ms
 2  r1--535-c--1.commserv.ucsb.edu (128.111.252.148)  1.231 ms  1.201 ms  1.172 ms
 3  dc--lax-agg10--ucsb--100g.cenic.net (137.164.23.90)  3.170 ms  3.235 ms  3.104 ms
 4  * * *
 5  ae1.3110.edge4.Frankfurt1.level3.net (4.69.163.106)  150.383 ms  150.336 ms  148.69
2 ms
 6  te2-2.c102.f.de.plusline.net (212.162.24.58)  149.558 ms  149.278 ms  151.053 ms
 7  82.98.102.54 (82.98.102.54)  149.476 ms te3-1.c302.f.de.plusline.net (82.98.102.5)
 149.618 ms  149.644 ms
 8  82.98.103.2 (82.98.103.2)  149.724 ms  151.750 ms  151.569 ms
 9  82.98.102.175 (82.98.102.175)  151.685 ms  151.567 ms  151.357 ms
10  213.83.57.134 (213.83.57.134)  151.213 ms  151.284 ms  151.157 ms
11  vpro0049.proserver.punkt.de (217.29.41.49)  147.117 ms  148.848 ms  149.010 ms
[dna@csilvm-16 ~]$ ping -c 5 www.de-cix.net
PING www.de-cix.net (217.29.41.49) 56(84) bytes of data.
64 bytes from vpro0049.proserver.punkt.de (217.29.41.49): icmp_seq=1 ttl=54 time=147 ms
64 bytes from vpro0049.proserver.punkt.de (217.29.41.49): icmp_seq=2 ttl=54 time=147 ms
64 bytes from vpro0049.proserver.punkt.de (217.29.41.49): icmp_seq=3 ttl=54 time=147 ms
64 bytes from vpro0049.proserver.punkt.de (217.29.41.49): icmp_seq=4 ttl=54 time=147 ms
64 bytes from vpro0049.proserver.punkt.de (217.29.41.49): icmp_seq=5 ttl=54 time=147 ms

--- www.de-cix.net ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 4019ms
rtt min/avg/max/mdev = 146.902/147.115/147.299/0.146 ms
```

The number of hops correlates with an increased RTT as subsequent hops create the potential for more delays. That being said, each hop is different and some may add much more delay while others add very little, making it possible for a small number of hops to add more time. This can be seen with Germany, which only took 11 hops but had an average RTT of 147 ms, whereas Japan took 30+ hops but the RTT was 112ms.

Similarly to RTT, an increased number of hops is generally going to increase as geographical distance does. It is ultimately dependent on the location of intermediary nodes but generally speaking that is the rule.

3.

a. The IETF covers the following areas:
   i. Applications and Real-time area (art) - Chapters 1 & 2
   ii. General Area (gen) - Spread across book
   iii. Internal Area (int) - Spread across book
   iv. Operations and Management area (ops) - Chapter 6
   v. Routing Area (rtg) - Chapters 4 & 5
   vi. Security Area (sec) - Chapter 8
   vii. Transport Area (tsv) - Chapter 3

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b. The mission is to produce high quality, relevant technical and engineering documents that influence the way people design, use and manage the Internet in such a way as to make it work better
c. “Rough consensus” means that unanimous consensus is not required, rather just a general agreement which considers all opinions to make a generally beneficial decision for all.
“Running code” refers to the IETF’s preference for using protocols and standards which will be relevant to real-life applications rather than theoretical models.

Part 2: Wireshark

1. The protocols listed are
    a. ARP
    b. DNS
    c. HTTP
    d. ICMP
    e. IGMPv2
    f. STP
    g. TCP
2. It took 0.068591275 seconds since the request was sent to receive OK.
3. The Internet address of gaia.cs.umass.edu is 128.119.245.12