6.033 Traceroute

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I Round Trip Times

1. For all four hosts, I had a packet loss of 0%. This means I had a 100% successful response for each host.

Website	www.csail.mit.edu	www.berkeley.mit.edu	www.uwa.edu.au	www.kyoto-u.ac.jp
Minimum	0.628	89.980	293.195	188.764
Average	0.753	90.126	293.321	188.925
Maximum	0.860	90.269	293.501	189.137

Table 1: All values are in milliseconds

2. If we look at each of the rount trip times, we see that the csail link had the smallest RTT while the longest was for the university in Australia. If we take into consideration of our current geographic location of the athena server, we see that the csail is the closet while the unsw in Australia is the farthest. Thus, we have a different minimum in RTT for each host due to the proximity in geographic location.

3. The changes in round trip are due to the file sizes being of a larger size. However, this seems blatantly true only for the csail site because it is close. Those, it would take longer because the RTT is only dependent on the file size and not the geographic distance. However, for the berkeley site, the RTT is mostly based on the geographic distance because there seems to be very little change in the average. Thus, the time it takes to process the file size is covered when the file is being processed over from and back to us.

Website	56	512	1024	2056
www.csail.mit.edu	0.668	0.735	1.218	3.410
www.kyoto-u.ac.jp	90.285	90.325	90.468	90.486

Table 2: All values are in milliseconds

4. For the first site: www.wits.ac.za, I had a 0% reponse rate. In other words, I had a 100% failure. For microsoft.com, I had a reponse rate of 100% just as before. The reason for the failure could be that the first site actually forwards us to a different IP, thus the ping is not able to track the url. It could also be due to the site not following the ICMP protocol, which leads to ping not being able to follow.

II Understanding Internet routes using traceroute

5. Traceroute uses the value given in the ttl (time to live) file inside the ICMP packet which would have the time exceeded message to be sent back from the router. Thus, we know which router we are at from these messages. Incrementing the ttl field by one puts us to the next router and have a new message. This happens until we reach a ICMP "port unreachable."

6. This response was the one given when called traceroute from the athena machine to standard's machine

```
    traceroute to 134.79.197.200 (134.79.197.200), 30 hops max, 60 byte packets
 1  18.9.64.3 (18.9.64.3)  0.476 ms  0.697 ms  0.686 ms
 2  BACKBONE-RTR-1.MIT.EDU (18.168.1.1)  0.545 ms  0.541 ms  0.644 ms
 3  DMZ-RTR-1-BACKBONE-RTR-1.MIT.EDU (18.192.1.1)  1.799 ms  2.064 ms  2.183 ms
 4  NY32-RTR-1-DMZ-RTR-1.MIT.EDU (18.192.5.2)  7.241 ms  7.347 ms  7.337 ms
 5  aofasdn1-mit.es.net (198.124.216.97)  7.433 ms  7.793 ms  8.105 ms
 6  washcr5-ip-a-aofacr5.es.net (134.55.36.34)  12.203 ms  12.191 ms  12.242 ms
 7  chiccr5-ip-a-washcr5.es.net (134.55.36.45)  29.300 ms  29.636 ms  29.916 ms
 8  kanscr5-ip-a-chiccr5.es.net (134.55.43.82)  40.280 ms  40.314 ms  40.514 ms
 9  denvcr5-ip-a-kanscr5.es.net (134.55.49.57)  50.861 ms  50.829 ms  51.570 ms
10  sacrcr5-ip-a-denvcr5.es.net (134.55.50.201)  71.798 ms  71.921 ms  72.433 ms
11  sunncr5-ip-a-sacrcr5.es.net (134.55.40.6)  74.440 ms  74.453 ms  74.332 ms
12  rtr-border2-p2p-sunn-cr5.slac.stanford.edu (192.68.191.234)  74.772 ms
75.261 ms  7
5.066 ms
13  * * *
14  * * *
15  * * *
16  * * *
17  * * *
18  * * *
19  * * *
20  * * *
21  * * *
22  * * *
23  * * *
24  * * *
25  * * *
26  * * *
27  * * *
28  * * *
29  * * *
30  * * *
```

This response was given when called traceroute from the standard machine to the athena machine

```
    traceroute to 18.9.64.21 (18.9.64.21), 30 hops max, 40 byte packets
 1  rtr-servcore1-serv01-webserv.slac.stanford.edu (134.79.197.130)  0.867 ms
0.741 ms  0.676 ms
 2  rtr-core1-p2p-serv01-01.slac.stanford.edu (134.79.253.249)  0.455 ms  0.354 ms
0.396 ms
 3  rtr-fwcore1-trust-p2p-core1.slac.stanford.edu (134.79.254.134)  0.806 ms
0.785 ms  0.813 ms
 4  rtr-core1-p2p-fwcore1-untrust.slac.stanford.edu (134.79.254.137)  0.950 ms
1.041 ms  0.957 ms
 5  * * *
 6  sunncr5-ip-c-slac.slac.stanford.edu (192.68.191.233)  1.937 ms  1.656 ms
1.799 ms
 7  sacrcr5-ip-a-sunncr5.es.net (134.55.40.5)  4.193 ms  4.183 ms  4.197 ms
 8  denvcr5-ip-a-sacrcr5.es.net (134.55.50.202)  25.340 ms  25.334 ms  25.676 ms
 9  kanscr5-ip-a-denvcr5.es.net (134.55.49.58)  35.973 ms  35.809 ms  35.869 ms
10  chiccr5-ip-a-kanscr5.es.net (134.55.43.81)  46.865 ms  46.841 ms  46.710 ms
11  washcr5-ip-a-chiccr5.es.net (134.55.36.46)  63.951 ms  64.037 ms  63.715 ms
12  * * *
13  198.124.216.98 (198.124.216.98)  69.401 ms  69.077 ms  69.688 ms
14  * * *
15  backbone-rtr-1-dmz-rtr-1.mit.edu (18.192.1.2)  75.575 ms  75.457 ms  75.438 ms
16  oc11-rtr-1-backbone-2.mit.edu (18.168.1.41)  75.511 ms  75.599 ms  75.708 ms
```

```
17   mint-square.mit.edu (18.9.64.21)   74.902 ms   75.146 ms   75.160 ms
```

7. We can see that the traceroute for both the slac and athena are not traverserd in both directions. There are some similar routes taken, but there are some different. Take for instance the athena traceroute. We see there are much more MIT.edu based routes than in the slac traceroute. This is also true for the slac traceroute that there are more slac.stanford.edu routes than in the athena traceroute. This is true because when calling traceroute from the athena machine, the machine can determine a better way due to the border gateway protocol. Thus, calls more in the MIT servers to provide a faster way. This is also true for the slac stanfard servers. They find better ways to route the call, and thus have more slac routes.

III Blackholes

8. What we get there is that there is a series of asterisks after the MITNET.HELICON-EXT.CSAIL.MIT.EDU. We know we get astericks if there were no response after 5 seconds. Thus, what we get here means the packet was somehow dropped or lost because we got no response back for quite a bit of time.

```
  1  18.9.64.3 (18.9.64.3)   1.945 ms   2.010 ms   2.104 ms
 2  * * *
 3  MITNET.HELICON-EXT.CSAIL.MIT.EDU (18.4.7.65)   4.434 ms   4.408 ms   4.368 ms
 4  * * *
 5  * * *
 6  * * *
 7  * * *
 8  * * *
 9  * * *
10  * * *
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```

IV Border Gateway Protocol (BGP)

9. So, we can take a look at the pathway on the last column for the table. At the end of the path, we get an i for the destination AS. WE know that the destination has to be MIT, thus, the AS number of i corresponds to MIT because all paths must lead to a 18.0.0.0 address.

10. We look again at the paths column. We see what numbers are right before the i because these numbers are the direct link to MIT. The only number that is right before an i is a 3. Thus, the AS number that is a direct link to MIT is 3 only.

11. This assignmnet took me about 2 hours.