CS 536 lab2

Problem 2:

Part one:

Pinging from amber02 to amber06 with 10 messages.
With our c program the RTT are:
[2.38 , 0.56 , 0.54 , 0.58 , 0.51 , 0.55 , 0.48 , 0.58 , 0.58 , 0.48]
With ping program in bin:
[0.815 , 0.587 , 0.526 , 0.687 , 0.701 , 0.751 , 0.933 , 0.935 , 0.829 , 0.712]
We can see that on average the round trip time of the ICMP ping is longer than the one with our UDP program. This is contrary to our expectation that ICMP ping would be faster because it is in a lower layer. There can be multiple reasons for this. For example, Some networks might prioritize UDP traffic over ICMP traffic, leading to faster RTTs for UDP packets compared to ICMP ping packets.

Part two:

Pinging from mc17 to amber05:
With our c program:
[0.76 , 0.37 , 0.35 , 0.34 , 0.36 , 0.44 , 0.30 , 0.37 , 0.35 , 0.28]
With ping program in bin:
[0.378 , 0.681, 0.511 , 0.642, 0.356, 0.709 , 0.745, 0.700 , 0.400 , 0.711]
We can again see that similar to the previous part, the ICMP ping takes longer than our UDP ping. We also see that with both methods, pinging from mc17 in LWSN to amber05 in HAAS takes less time compared to pinging two systems in HAAS. This difference can be completely random and due to a higher traffic between amber06 and amber02, but it can also due to faster machines and better connections in LWSN compared to HAAS.

Part three:

We did 10 ICMP pings from amber05:
West Coast: *www.stanford.edu* : 171.67.215.200
Distance: 1900 miles or 3000 KMs
Latency estimate based on SOL : 10 ms.
Ping RTTs: [56.8 , 60.9 , 61.9 , 64.7 , 59.7 , 104 , 56.8 , 58.5 , 57 , 56.9]
Divided by 2: [28.4 , 30.45, 30.95, 32.35, 29.85, 52 , 28.4 , 29.25 , 28.5 , 28.45]

East Coast: *www.columbia.edu* : 128.59.105.24
Distance to NYC: 680 miles or 1100 km
Latency estimate based on SOL : 3.6 ms.
Ping RTTs: [25.4 , 25 , 25.1 , 25.6 , 25.1 , 25.2 , 25.5 , 25.4 , 25.3 , 25.3]

Divided by 2: [12.7 , 12.5, 12.55 , 12.8, 12.55 , 12.6 , 12.75 , 12.7 , 12.65 , 12.65]

Europe: *www.eth.edu* : 129.132.19.216
Distance 4500 mile or 7200 KMs
Latency estimate based on SOL : 24 ms.
Ping RTTs: [118 , 117, 117, 117, 117, 117, 118, 117, 117, 118]
Divided by 2: [59 , 58.5, 58.5, 58.5, 58.5, 58.5, 59, 58.5, 58.5, 59]

Asia: *www.hkust.edu.hk* : 143.89.12.134
Distance: 7900 mile or 12700 km
Latency estimate based on SOL : 42.36 ms.
Pings : all ping RTTs were 197 ms
Divided by 2: 98.5

Other (australia) : *www.sydney.edu.au* : 20.248.131.216
Distance: 9250 miles or 14900 km
Latency estimate based on SOL : 49.7 ms.
Ping RTTs: [196, 194, 194, 194, 194, 194, 194, 197, 213, 194]
Divided by 2: [98, 97, 97, 97, 97, 97, 97, 98.5, 106.5, 97]

Discussion:
As expected, the RTT and one-way delay increase as the distance increases. We can see that one-way delay is significantly higher than the delay that was estimated based on the speed of light. That is due to the overhead from routing and intermediate devices like routers and switches that have to process packets.

Problem 3:

Addressing client termination:
There are different ways to handle termination of client processes. One way to do it is to set a timeout period or define an alarm that resets any time a packet is received. In this case, when no packet is received for some time, the client can consider all the unreceived packets lost, and terminate. We can change this timer in multiple ways. For example we can calculate an estimate of the transmission time between the server and client and set the timer value to this amount. Or we can calculate an estimate of the transfer of the entire file, and automatically finish the process once this time has passed.

Transmission benchmark:
Transferring files from amber05 (the server) to amber06 (the client):
Each one experimented 5 times.

With 1400 byte packets:

File size	Total time in ms	bps
2560	5.398 , 8.53, 7.85 , 6.88 , 6.25	3793997, 2400937, 2605929, 2975014, 3273134
25600	165.379, 5.88, 8.03, 4.44 , 7.23	1238367, 34788517, 25507535, 46126126, 28318584
256000	71.282, 11.557 , 12.60, 13.75 , 12.44	28730955 , 177208618, 162449432 , 148902137, 164550859

With 1000 byte packets

File size	Total time in ms	bps
2560	66.30 , 3.96 , 9.29 , 4.53 , 5.78	308875, 5166498 , 2203809 , 4519973 , 3541414
25600	61.466 , 7.902 , 7.46 , 7.30 , 6.11	3331923, 25917489, 27445725 , 28027918 , 33502371
256000	10.541, 12.67 , 40.41, 85.15 , 112.96	182145906, 119318181, 50670493 , 24051673 , 16654874

We can see that as expected, transmission time increases as the file size increases. We can see that on average transmission takes longer with smaller packets. This increase is more evident in bigger files. However it needs to be mentioned that this difference in our experiment might be completely random and needs more evaluation.

Bonus:

The power difference for 1m wire was -4.82 dBm and for the longer 11m wire was -6.47 dBm