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CS4480

HW 1

**P1)** Fields inside of () change front login attempt to login attempt.

1. ATM requests customer authorization
   1. ATM to Centralized Computer (CC).
      1. userlogin
      2. (username)
      3. (password)
   2. CC to ATM. [ATM displays login success or error message on receipt of message]
      1. userlogin
      2. (accepted/rejected)
      3. (Error message if rejected)
      4. (Unique Session ID if accepted)
2. ATM requests a balance check of the account
   1. ATM to CC
      1. balancecheck
      2. (Session ID)
   2. CC to ATM [ATM displays the balance in the account]
      1. balancecheck
      2. (Balance amount)
3. ATM requests a withdrawal from the account
   1. ATM to CC
      1. accountwithdrawal
      2. (Session ID)
      3. (Withdrawal amount)
   2. CC to ATM [ATM dispenses money if withdrawal accepted, error otherwise]
      1. accountwithdrawal
      2. (accepted/rejected)
      3. (Error message if rejected)
      4. (New balance if accepted)

**ATM Centralized Computer**

Customer Authorization Request

Customer Authorization Reply

Customer Balance Check

Customer Balance Reply

Customer Withdrawal Request

Customer Withdrawal Reply

Time

Time

**P6)**

1. P6
   1. dprop = m/s
   2. dtrans = L/R
   3. de2e = m/s + L/R
   4. At t=dtrans, the last bit of the packet is just about the leave the host.
   5. At t=dtrans and dprop>dtrans, the first bit is propagating through the link at s\*dtrans.
   6. At t=dtrans and dprop<dtrans,, the first bit is at Host B.
   7. For dprop=dtrans, m/s = L/R. Rearrange: m =sL/r. Values: m = 2.5E8\*120/56E3. m=535714.

**P10)**

* Each link has dprop = d/s, and dtrans = L/R. Additionally, there are two processing delays.
* Total end-to-end delay = d1/s1 + d2/s2 + d3/s3 + L/R1 + L/R2 + L/R3 + 2dproc
* Substitute in values for above equation (Note that L is converted to bits, and all R are same)
* End-to-end delay = 5E6/2.5E8 + 4E6/2.5E8 + 1E6/2.5E8 + 3\*12E3/2E6 + 2\*0.003
* End-to-end delay = 0.064s

**P18)** Raw Trace Information is at the end of this assignment

|  |  |  |
| --- | --- | --- |
|  | http://www.uaa.alaska.edu/ | [www.msu.ru](http://www.msu.ru) (inter-continental) |
| Hour 1 Average Delay (standard deviation) | 73.33 (0.58) | 191 (1) |
| Hour 2 Average Delay (standard deviation) | 74.67 (2.89) | 196.33 (8.39) |
| Hour 3 Average Delay (standard deviation) | 75.33 (2.08) | 202.67 (10.69) |
| Hour 1 Router Count | 14 | 26 |
| Hour 2 Router Count | 14 | 26 |
| Hour 3 Router Count | 14 | 26 |
| Hour 1 ISP Count | 2 | 3 |
| Hour 2 ISP Count | 2 | 3 |
| Hour 3 ISP Count | 2 | 3 |

1. See table.
2. See table, the number of routers never changed.
3. See table. For the intra-continental traceroute, the largest delay is about tied between changing over from Comcast.net to gci.net and going on Comcast.net’s network between Colorado and Washington State. For the inter-continental traceroute, the largest delay is not a connection between ISPs, but a trip in the cogentco.com ISP. This may likely be the signal crossing the Atlantic Ocean. Interesting enough the signal travels this way instead of through Siberia.
4. See above table / c. Overall, the intra-continental connection was faster and the variation between attempts was generally lower. The number of routers was also much lower. The isp counts between the two routes was surprisingly similar though, with only one additional ISP for covering a much larger distance.

**P31)**

1. dtrans = L/R. We must send the packet through the source and two switches.

DtransTotal  = 3L/R, or 3\*8E6/2E6 = 12s.

1. D1stP1stS = L/R, or 10000/2E6 = 0.005s for the first packet to get to the first switch.

The second packet will be at the first switch at 0.01s.

1. The total movement for each packet is 3L/R, with 800 packets, this is 12s total.

The result is the same as sending one huge packet. So there is no gross throughput advantage. However, the destination starts to receive small packets; the data may be able to start to be used right away. For instance, when streaming a video, the destination can start to play the video with the information it has, and doesn’t have to wait for the entire video of data.

1. Using small packets allows other traffic to intermingle with this traffic. Additionally, if there are multiple routes from point A to point B, theoretically packets could take different routes to increase throughput if the bandwidth limitations weren’t at the endpoints.
2. One drawback is that the message must be broken into parts, and reassembled. This uses computer power at both ends. Additionally, each router must read 800 packet headers instead of just one. This may add some processing time that wasn’t accounted for earlier on. Finally, the host and destination might need to check whether each individual packet arrived instead of whether just one packet arrived.

**Raw Traceroute information for P18**

**Traces at 11:21**

Tracing route to www-virtual.uaa.alaska.edu [137.229.141.83] over a maximum of 30 hops:

1 <1 ms <1 ms <1 ms DD-WRT [192.168.11.1]

2 19 ms 19 ms 40 ms 67.182.220.1

3 12 ms 11 ms 11 ms te-0-7-0-1-sur02.saltlakecity.ut.utah.comcast.net [68.87.220.117]

4 10 ms 10 ms 12 ms te-0-0-0-0-sur01.saltlakecity.ut.utah.comcast.net [68.86.180.94]

5 13 ms 10 ms 11 ms te-0-0-0-4-ar03.saltlakecity.ut.utah.comcast.net [68.86.180.73]

6 23 ms 23 ms 23 ms pos-0-9-0-0-cr01.denver.co.ibone.comcast.net [68.86.90.233]

7 61 ms 46 ms 48 ms pos-0-9-0-0-cr01.seattle.wa.ibone.comcast.net [68.86.88.66]

8 45 ms 52 ms 47 ms be-13-pe03.seattle.wa.ibone.comcast.net [68.86.84.110]

9 46 ms 45 ms 60 ms as8047.seattle.wa.ibone.comcast.net [173.167.56.6]

10 88 ms 73 ms 74 ms 218-129-165-209.gci.net [209.165.129.218]

11 \* \* \* Request timed out.

12 \* \* \* Request timed out.

13 73 ms 76 ms 74 ms 149-170-165-209.klf.static.gci.net [209.165.170.149]

14 73 ms 74 ms 73 ms www-virtual.uaa.alaska.edu [137.229.141.83]

Trace complete.

Tracing route to www.msu.ru [93.180.0.18] over a maximum of 30 hops:

1 <1 ms <1 ms <1 ms DD-WRT [192.168.11.1]

2 109 ms 10 ms 29 ms 67.182.220.1

3 11 ms 27 ms 13 ms te-0-7-0-1-sur02.saltlakecity.ut.utah.comcast.net [68.87.220.117]

4 14 ms 14 ms 15 ms te-0-3-0-2-ar02.sandy.ut.utah.comcast.net [69.139.231.41]

5 16 ms 14 ms 12 ms 162-151-9-149-static.hfc.comcastbusiness.net [162.151.9.149]

6 25 ms 37 ms 27 ms pos-0-2-0-0-cr01.denver.co.ibone.comcast.net [68.86.90.225]

7 23 ms 25 ms 25 ms te3-5.ccr01.den03.atlas.cogentco.com [154.54.10.33]

8 32 ms 25 ms 54 ms te7-1.ccr02.den01.atlas.cogentco.com [154.54.45.185]

9 43 ms 42 ms 42 ms te0-2-0-7.ccr22.mci01.atlas.cogentco.com [154.54.82.214]

10 47 ms 47 ms 46 ms te0-3-0-2.ccr22.ord01.atlas.cogentco.com [154.54.6.213]

11 61 ms 62 ms 68 ms te0-3-0-3.ccr22.yyz02.atlas.cogentco.com [154.54.42.6]

12 77 ms 78 ms 80 ms te0-3-0-5.ccr22.ymq02.atlas.cogentco.com [154.54.42.230]

13 145 ms 160 ms 145 ms te0-4-0-6.ccr22.lpl01.atlas.cogentco.com [154.54.44.214]

14 156 ms 154 ms 155 ms te0-3-0-3.ccr22.ams03.atlas.cogentco.com [154.54.37.125]

15 158 ms 157 ms 157 ms te0-6-0-5.ccr21.ams04.atlas.cogentco.com [130.117.2.66]

16 156 ms 155 ms 170 ms te3-1.mag01.ams04.atlas.cogentco.com [154.54.73.206]

17 175 ms 194 ms 175 ms 149.6.151.154

18 189 ms 190 ms 191 ms tele-1-gw.sth.runnet.ru [194.85.40.242]

19 191 ms 191 ms 191 ms kt12-1-gw.spb.runnet.ru [194.85.40.141]

20 197 ms 196 ms 196 ms tv11-1-gw.msk.runnet.ru [194.85.40.137]

21 196 ms 191 ms 192 ms m9-3-gw.msk.runnet.ru [194.85.40.221]

22 189 ms 190 ms 190 ms msu.msk.runnet.ru [194.190.254.118]

23 192 ms 193 ms 194 ms 93.180.0.146

24 223 ms 217 ms 209 ms 93.180.0.158

25 188 ms 205 ms 188 ms 93.180.0.170

26 190 ms 191 ms 192 ms www.msu.ru [93.180.0.18]

Trace complete.

**Traces at 12:36**

Tracing route to www-virtual.uaa.alaska.edu [137.229.141.83] over a maximum of 30 hops:

1 <1 ms <1 ms <1 ms DD-WRT [192.168.11.1]

2 32 ms 40 ms 28 ms 67.182.220.1

3 21 ms 11 ms 10 ms te-0-7-0-1-sur02.saltlakecity.ut.utah.comcast.net [68.87.220.117]

4 17 ms 10 ms 11 ms te-0-0-0-0-sur01.saltlakecity.ut.utah.comcast.net [68.86.180.94]

5 16 ms 10 ms 31 ms te-0-0-0-4-ar03.saltlakecity.ut.utah.comcast.net [68.86.180.73]

6 24 ms 23 ms 39 ms pos-0-9-0-0-cr01.denver.co.ibone.comcast.net [68.86.90.233]

7 51 ms 63 ms 51 ms pos-0-9-0-0-cr01.seattle.wa.ibone.comcast.net [68.86.88.66]

8 50 ms 44 ms 47 ms be-13-pe03.seattle.wa.ibone.comcast.net [68.86.84.110]

9 46 ms 49 ms 44 ms as8047.seattle.wa.ibone.comcast.net [173.167.56.6]

10 73 ms 94 ms 78 ms 218-129-165-209.gci.net [209.165.129.218]

11 \* \* \* Request timed out.

12 \* \* \* Request timed out.

13 73 ms 73 ms 78 ms 149-170-165-209.klf.static.gci.net [209.165.170.149]

14 73 ms 73 ms 78 ms www-virtual.uaa.alaska.edu [137.229.141.83]

Trace complete.

Tracing route to www.msu.ru [93.180.0.18] over a maximum of 30 hops:

1 <1 ms <1 ms <1 ms DD-WRT [192.168.11.1]

2 38 ms 25 ms 29 ms 67.182.220.1

3 12 ms 11 ms 14 ms te-0-7-0-1-sur02.saltlakecity.ut.utah.comcast.net [68.87.220.117]

4 16 ms 14 ms 15 ms te-0-3-0-2-ar02.sandy.ut.utah.comcast.net [69.139.231.41]

5 15 ms 15 ms 15 ms 162-151-9-149-static.hfc.comcastbusiness.net [162.151.9.149]

6 27 ms 28 ms 23 ms pos-0-2-0-0-cr01.denver.co.ibone.comcast.net [68.86.90.225]

7 103 ms 224 ms 218 ms te3-5.ccr01.den03.atlas.cogentco.com [154.54.10.33]

8 280 ms 223 ms \* te7-1.ccr02.den01.atlas.cogentco.com [154.54.45.185]

9 46 ms 42 ms 43 ms te0-2-0-7.ccr22.mci01.atlas.cogentco.com [154.54.82.214]

10 50 ms 49 ms 54 ms te0-3-0-2.ccr22.ord01.atlas.cogentco.com [154.54.6.213]

11 64 ms 63 ms 69 ms te0-3-0-3.ccr22.yyz02.atlas.cogentco.com [154.54.42.6]

12 77 ms 79 ms 85 ms te0-3-0-5.ccr22.ymq02.atlas.cogentco.com [154.54.42.230]

13 145 ms 145 ms 146 ms te0-4-0-6.ccr22.lpl01.atlas.cogentco.com [154.54.44.214]

14 154 ms 158 ms 160 ms te0-3-0-3.ccr22.ams03.atlas.cogentco.com [154.54.37.125]

15 162 ms 157 ms 157 ms te0-6-0-5.ccr21.ams04.atlas.cogentco.com [130.117.2.66]

16 155 ms 172 ms 154 ms te3-1.mag01.ams04.atlas.cogentco.com [154.54.73.206]

17 179 ms 179 ms 177 ms 149.6.151.154

18 200 ms 188 ms 210 ms tele-1-gw.sth.runnet.ru [194.85.40.242]

19 190 ms 193 ms 194 ms kt12-1-gw.spb.runnet.ru [194.85.40.141]

20 200 ms 196 ms 196 ms tv11-1-gw.msk.runnet.ru [194.85.40.137]

21 196 ms 191 ms 191 ms m9-3-gw.msk.runnet.ru [194.85.40.221]

22 188 ms 189 ms 188 ms msu.msk.runnet.ru [194.190.254.118]

23 192 ms 193 ms 199 ms 93.180.0.146

24 194 ms 196 ms 193 ms 93.180.0.158

25 189 ms 188 ms 189 ms 93.180.0.170

26 192 ms 191 ms 206 ms www.msu.ru [93.180.0.18]

Trace complete.

**Traces at 13:31**

Tracing route to www-virtual.uaa.alaska.edu [137.229.141.83] over a maximum of 30 hops:

1 <1 ms <1 ms <1 ms DD-WRT [192.168.11.1]

2 32 ms 19 ms 30 ms 67.182.220.1

3 18 ms 10 ms 10 ms te-0-7-0-1-sur02.saltlakecity.ut.utah.comcast.net [68.87.220.117]

4 10 ms 11 ms 12 ms te-0-0-0-0-sur01.saltlakecity.ut.utah.comcast.net [68.86.180.94]

5 11 ms 15 ms 31 ms te-0-0-0-4-ar03.saltlakecity.ut.utah.comcast.net [68.86.180.73]

6 34 ms 26 ms 35 ms pos-0-9-0-0-cr01.denver.co.ibone.comcast.net [68.86.90.233]

7 48 ms 49 ms 47 ms pos-0-9-0-0-cr01.seattle.wa.ibone.comcast.net [68.86.88.66]

8 45 ms 46 ms 46 ms be-13-pe03.seattle.wa.ibone.comcast.net [68.86.84.110]

9 46 ms 45 ms 50 ms as8047.seattle.wa.ibone.comcast.net [173.167.56.6]

10 90 ms 73 ms 77 ms 218-129-165-209.gci.net [209.165.129.218]

11 \* \* \* Request timed out.

12 \* \* \* Request timed out.

13 74 ms 74 ms 75 ms 149-170-165-209.klf.static.gci.net [209.165.170.149]

14 77 ms 76 ms 73 ms www-virtual.uaa.alaska.edu [137.229.141.83]

Trace complete.

Tracing route to www.msu.ru [93.180.0.18] over a maximum of 30 hops:

1 <1 ms <1 ms <1 ms DD-WRT [192.168.11.1]

2 38 ms 24 ms 22 ms 67.182.220.1

3 13 ms 14 ms 11 ms te-0-7-0-1-sur02.saltlakecity.ut.utah.comcast.net [68.87.220.117]

4 18 ms 14 ms 16 ms te-0-3-0-2-ar02.sandy.ut.utah.comcast.net [69.139.231.41]

5 14 ms 15 ms 15 ms 162-151-9-149-static.hfc.comcastbusiness.net [162.151.9.149]

6 24 ms 27 ms 24 ms pos-0-2-0-0-cr01.denver.co.ibone.comcast.net [68.86.90.225]

7 24 ms 23 ms 27 ms te3-5.ccr01.den03.atlas.cogentco.com [154.54.10.33]

8 28 ms \* \* te7-1.ccr02.den01.atlas.cogentco.com [154.54.45.185]

9 43 ms 42 ms 44 ms te0-2-0-7.ccr22.mci01.atlas.cogentco.com [154.54.82.214]

10 47 ms 48 ms 51 ms te0-3-0-2.ccr22.ord01.atlas.cogentco.com [154.54.6.213]

11 72 ms 63 ms 62 ms te0-3-0-3.ccr22.yyz02.atlas.cogentco.com [154.54.42.6]

12 79 ms 79 ms 78 ms te0-3-0-5.ccr22.ymq02.atlas.cogentco.com [154.54.42.230]

13 150 ms 146 ms 144 ms te0-4-0-6.ccr22.lpl01.atlas.cogentco.com [154.54.44.214]

14 154 ms 157 ms 155 ms te0-3-0-3.ccr22.ams03.atlas.cogentco.com [154.54.37.125]

15 158 ms 162 ms 158 ms te0-6-0-5.ccr21.ams04.atlas.cogentco.com [130.117.2.66]

16 153 ms 156 ms 174 ms te3-1.mag01.ams04.atlas.cogentco.com [154.54.73.206]

17 180 ms 176 ms 174 ms 149.6.151.154

18 188 ms 189 ms 190 ms tele-1-gw.sth.runnet.ru [194.85.40.242]

19 191 ms 198 ms 193 ms kt12-1-gw.spb.runnet.ru [194.85.40.141]

20 199 ms 197 ms 196 ms tv11-1-gw.msk.runnet.ru [194.85.40.137]

21 194 ms 191 ms 191 ms m9-3-gw.msk.runnet.ru [194.85.40.221]

22 189 ms 189 ms 193 ms msu.msk.runnet.ru [194.190.254.118]

23 220 ms 196 ms 198 ms 93.180.0.146

24 200 ms 194 ms 193 ms 93.180.0.158

25 192 ms 190 ms 188 ms 93.180.0.170

26 212 ms 191 ms 205 ms www.msu.ru [93.180.0.18]

Trace complete.