1. A to B

64,000 bits/s analog to digital at A

448 bit packets

4,000,000 bit/s transfer

Prop delay is 18m sec, .018 sec

One link, N=1

L/R=448/64000 Analog to digital packet size A:B

L/R=448/4000000 Transfer rate of packet along the connection

L/R=448/64000 digital packet size to analog at B

.018 sec for time to transfer across one link for propagation delay

**.032112 seconds or 32.112ms**

1. Buffer

D = delay = 10ms+10ms = 20ms

N=10

.1 packet every ms (1 packet every 10 ms)

**Arrival rate=10/30ms=0.3333packets/ms=1packet/3ms**

1. NetTracing:
2. **Paris, France**

Tracing route to 81.31.10.57 [81.31.10.57]...

hop rtt rtt rtt ip address fully qualified domain name

1 3 1 1 169.254.158.58

2 1 1 1 169.48.118.156 ae103.ppr01.dal13.networklayer.com

3 0 0 0 169.48.118.128 80.76.30a9.ip4.static.sl-reverse.com

4 3 \* 4 169.45.18.40 ae16.cbs02.dr01.dal04.networklayer.com

5 67 1 3 169.45.18.101 65.12.2da9.ip4.static.sl-reverse.com

6 1 4 1 213.248.101.8 dls-b22-link.telia.net

7 \* \* \*

8 \* \* \*

9 \* \* \*

10 \* \* \*

Trace aborted

-- end –

**To Trelon, France:**

Tracing route to 109.28.133.246 [109.28.133.246]...

hop rtt rtt rtt ip address fully qualified domain name

1 2 1 1 169.254.158.58

2 1 1 1 169.48.118.160 ae103.ppr03.dal13.networklayer.com

3 0 0 0 169.48.118.140 8c.76.30a9.ip4.static.sl-reverse.com

4 2 2 \* 169.45.18.42 ae17.cbs02.dr01.dal04.networklayer.com

5 \* 24 \* 169.45.18.5 ae2.cbs01.eq01.chi01.networklayer.com

6 44 \* \* 50.97.17.49 ae0.cbs02.tl01.nyc01.networklayer.com

7 \* \* \*

8 112 112 112 169.45.19.67 ae0.dar01.lon06.networklayer.com

9 115 111 111 169.45.19.78 ae16.cbs02.eq01.lon03.networklayer.com

10 120 120 120 50.97.19.174 ae0.cbs01.eq01.par02.networklayer.com

11 117 117 117 50.97.19.141 ae5.dar01.fra02.networklayer.com

12 119 120 119 195.42.144.66 sfr.equinix-ix.fr

13 127 127 132 109.5.232.114 114.232.5.109.rev.sfr.net

14 127 127 127 109.5.232.114 114.232.5.109.rev.sfr.net

15 126 126 126 86.65.233.162 162.233.65.86.rev.sfr.net

16 127 126 126 86.64.253.230 230.253.64.86.rev.sfr.net

17 126 126 126 93.20.110.82 82.110.20.93.rev.sfr.net

18 \* \* \*

19 \* \* \*

20 \* \* \*

21 \* \* \*

Trace aborted

-- end –

**\*No Links are the same, besides the original source (expected). The transatlantic link is not the same.**

2. France and Germany:

**Paris, France:**

Tracing route to 81.31.10.57 [81.31.10.57]...

hop rtt rtt rtt ip address fully qualified domain name

1 3 1 1 169.254.158.58

2 1 1 1 169.48.118.156 ae103.ppr01.dal13.networklayer.com

3 0 0 0 169.48.118.128 80.76.30a9.ip4.static.sl-reverse.com

4 3 \* 4 169.45.18.40 ae16.cbs02.dr01.dal04.networklayer.com

5 67 1 3 169.45.18.101 65.12.2da9.ip4.static.sl-reverse.com

6 1 4 1 213.248.101.8 dls-b22-link.telia.net

7 \* \* \*

8 \* \* \*

9 \* \* \*

10 \* \* \*

Trace aborted

-- end –

**Hamburg, Germany:**

Tracing route to 89.247.124.228 [89.247.124.228]...

hop rtt rtt rtt ip address fully qualified domain name

1 8 1 1 169.254.158.58

2 1 1 1 169.48.118.162 ae103.ppr04.dal13.networklayer.com

3 0 0 0 169.48.118.142 8e.76.30a9.ip4.static.sl-reverse.com

4 3 \* \* 169.45.18.42 ae17.cbs02.dr01.dal04.networklayer.com

5 26 \* 26 169.45.18.5 ae2.cbs01.eq01.chi01.networklayer.com

6 45 \* 44 50.97.17.49 ae0.cbs02.tl01.nyc01.networklayer.com

7 115 114 \* 169.45.19.47 ae1.cbs01.tg01.lon01.networklayer.com

8 114 113 113 169.45.18.13 d.12.2da9.ip4.static.sl-reverse.com

9 111 111 111 195.66.224.245 lon1ip1.versatel.de

10 127 126 127 62.214.38.89

11 127 127 127 62.214.37.222

12 \* \* \*

13 \* \* \*

14 \* \* \*

15 \* \* \*

Trace aborted

-- end –

**\*No links are the same; the transatlantic is not the same.**

1. **China, Guangzhou:**

Tracing route to 14.124.104.44 [14.124.104.44]...

hop rtt rtt rtt ip address fully qualified domain name

1 1 1 1 169.254.158.58

2 1 3 1 169.48.118.160 ae103.ppr03.dal13.networklayer.com

3 0 0 0 169.48.118.132 84.76.30a9.ip4.static.sl-reverse.com

4 \* 2 2 169.45.18.86 ae16.cbs01.eq01.dal03.networklayer.com

5 1 1 1 50.97.17.53 ae33.bbr01.eq01.dal03.networklayer.com

6 1 2 2 157.238.224.225 ae-6.a01.dllstx09.us.bb.gin.ntt.net

7 \* \* \*

8 42 41 41 129.250.7.69 ae-5.r22.lsanca07.us.bb.gin.ntt.net

9 41 41 41 129.250.3.17 ae-1.r00.lsanca07.us.bb.gin.ntt.net

10 43 45 43 129.250.2.104 ae-0.a00.lsanca07.us.bb.gin.ntt.net

11 50 47 48 218.30.53.108

12 39 39 39 202.97.92.46

13 259 255 255 202.97.99.217

14 252 252 252 202.97.12.26

15 265 255 255 202.97.94.129

16 257 255 258 121.8.109.66

17 \* \* \*

18 \* \* \*

19 \* \* \*

20 \* \* \*

Trace aborted

-- end –

**Jiangsu, China:**

Tracing route to 180.117.218.63 [180.117.218.63]...

hop rtt rtt rtt ip address fully qualified domain name

1 2 1 1 169.254.158.58

2 1 4 12 169.48.118.158 ae103.ppr02.dal13.networklayer.com

3 1 0 0 169.48.118.130 82.76.30a9.ip4.static.sl-reverse.com

4 \* \* \*

5 2 1 1 169.45.18.97 61.12.2da9.ip4.static.sl-reverse.com

6 2 2 2 128.241.1.109 ae-33.a02.dllstx09.us.bb.gin.ntt.net

7 \* 3 \* 129.250.4.205 ae-10.r24.dllstx09.us.bb.gin.ntt.net

8 45 45 44 129.250.7.69 ae-5.r22.lsanca07.us.bb.gin.ntt.net

9 44 44 44 129.250.3.17 ae-1.r00.lsanca07.us.bb.gin.ntt.net

10 49 46 47 129.250.2.104 ae-0.a00.lsanca07.us.bb.gin.ntt.net

11 46 47 48 218.30.53.108

12 40 39 40 202.97.90.117

13 255 256 255 202.97.99.153

14 255 255 255 202.97.50.194

15 \* \* \*

16 249 247 247 202.97.92.6

17 267 303 266 58.218.227.250

18 267 268 268 221.229.140.214

19 265 265 265 180.117.218.63

Trace complete

-- end --

**\*The two traces split on the second hop then converge again at IP 129.250.7.69, then split again once they get to China**

1. Propagation delay is 0.06s

5,000,000 = R

1,500,000= L

1. A continuous sending takes 0.36s
2. 50 packets one-at-a-time takes (30,000/5Mb\*50+0.06\*50) = 3.3s
3. Sending packets individually will take more time.
4. GET Response:
5. The server successfully found the document. The reply was given at 31 of August 2018 at 17:46:08.
6. The document was last modified Mon. 13 August 2018 17:02:10
7. There are 58799 bytes in the document.
8. The first five bytes are: 6892e. The server did **not** agree to a permanent connection.