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Sprint 1 Parts 1-3

Part 1

Data Bandwidth: $80 \text{ Mb/sec} = 80 \cdot 2^{20} \text{ bits/sec}$

RTT: 20 ms

Q: total expected time required to transmit a 1 Mbyte file from source host to destination

1 Mbyte = 8 Mbits

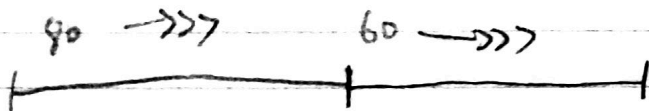
$$8 \text{ Mb} / 80 \text{ Mb} = 0.1 \text{ seconds} = 100 \text{ milliseconds}$$

$$\begin{array}{ccc} 100 \text{ ms} & + & 20 \text{ ms} \\ \text{travel time} & & \text{RTT} \end{array} = \boxed{120 \text{ ms}}$$

Part 2

First Bandwidth: 80 Mb/sec

Second Bandwidth: 60 Mb/sec



$$8 \text{ Mb} / 60 \text{ Mb} = 0.133 = 133 \text{ ms}$$

$$\begin{array}{ccc} 100 \text{ ms} & + & 133 \text{ ms} & + & 20 \text{ ms} \\ \uparrow & & \uparrow & & \uparrow \end{array} = \boxed{253 \text{ ms}}$$

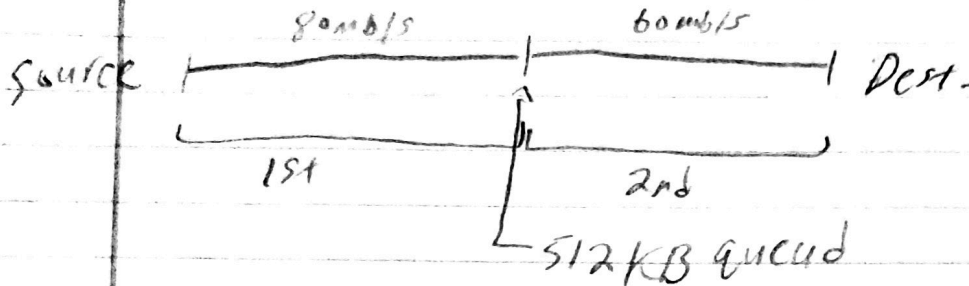
1st link
travel time

2nd link
travel time

RTT

Part 3

Time taken for 1MB file arrival at 2nd link = 100ms



$$512KB = 4096Kb = 4.096Mb / 60Mb = 0.068 \text{ seconds}$$

0.068s = 60.8ms to transfer queued file on 2nd link

$$8Mb / 60Mb = 0.133ms$$

0.133s = 133ms to transfer 1Mb file on 2nd link

$$\text{Total time taken} = 100ms + 60.8ms + 133ms + 20ms$$

$\uparrow \qquad \qquad \uparrow \qquad \qquad \uparrow \qquad \qquad \uparrow$
 1Mb file across 1st link 512KB across 2nd link 1Mb file across 2nd link RTT

$$= \boxed{313.8ms}$$