Performance Problems

1.

Expected time = $\frac{\text{filesize}}{\text{bandwidth}}$ + latency

Round-Trip Latency = 20ms

$80\frac{\text{Mbits}}{\text{sec.}} = 80 * 2^{20}\frac{\text{Bits}}{\text{sec.}}$

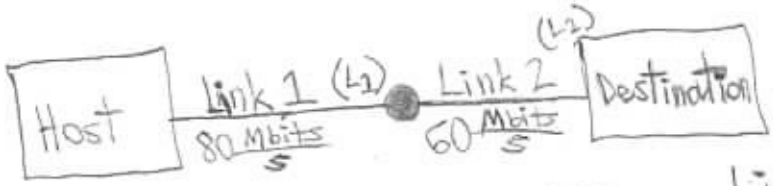
File Size: 1MB

$= \frac{1\text{MB}}{80 \cdot 2^{20}\frac{\text{Bits}}{\text{s}}} + \underset{\text{(1-way)}}{10\text{ms}}$

$= \frac{2^{20}\text{Bytes}}{10 \cdot 2^{23}\frac{\text{Bits}}{\text{s}}} + 10\text{ms} = \frac{2^{23}\text{Bits}}{10 \cdot 2^{23}\frac{\text{Bits}}{\text{s}}} + 10\text{ms}$

$= \frac{1}{10}\text{s} + 10\text{ms} =$ **0.110 seconds**

2.



$\frac{\text{file size}}{\text{bandwidth}}$ + latency

RTL = 20ms; File Size = 1MB

Link 2: $\frac{2^{23}\text{ bits}}{60 \cdot 2^{20}\frac{\text{Bits}}{\text{s}}} + \text{latency}_{L_2}$

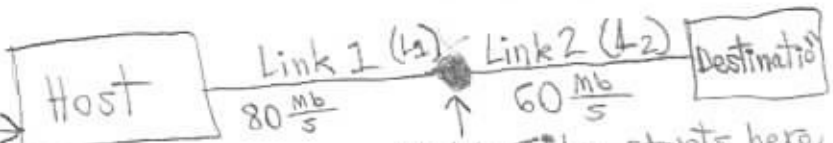
$= \frac{2^{23}\text{ bits}}{15 \cdot 2^{22}\frac{\text{Bits}}{\text{s}}} + \text{latency}_{L_2}$

$= \frac{2\text{ bits}}{15\frac{\text{bits}}{\text{s}}} + L_2 = \frac{2}{15}\text{s} + L_2$

Expected Time $= \underset{\text{(above)}}{\frac{2}{15}\text{s}} + \underset{\text{(1-way latency)}}{\frac{1}{10}\text{s}} + \frac{1}{100}\text{s} = 0.110 + \frac{2}{15}$

$\approx$ **0.243s**

3.



original 1MB File (F_1) start

Expected Time $= \underset{\text{(Part 2)}}{0.243\text{s}} + \frac{512\text{KB}}{60 \cdot 2^{20}\frac{\text{bits}}{\text{s}}} = 0.243\text{s} + \frac{2^{22}\text{ bits}}{15 \cdot 2^{22}\frac{\text{bits}}{\text{s}}} = 0.243\text{s} + \frac{1}{15}$

$=$ **0.310s**