Will Townsend

Dr. E.A. Lu

COSC 370-750

8 February 2021

Homework #1

6a

m/s

6b

L/R

6c

(m/s + L/R)

6d

The last bit just entered the link.

6e

The first bit is still on the link between Host A and B.

6f

The first bit has reached Host B.

6g

$\frac{m}{2.5*10^8} = \frac{120}{56*10^3}$ isolate value m. $m = \frac{120}{56*10^3} * (2.5 * 10^8) = \frac{300*10^8}{56*10^3} = 535714.2857$ meters

10

$$3(d_{proc} + \frac{d_1}{s_1} + \frac{d_2}{s_2} + \frac{d_3}{s_3} + \frac{L}{R_1} + \frac{L}{R_2} + \frac{L}{R_3}) = d_{end-end}$$

So…

Link 1:

$$\frac{5{,}000{,}000\ m}{2.5*10^8 m/s} + \frac{1500\ B}{2000000\ Bps} = 0.02075 \text{ seconds}$$

+

Link 2:

$$\frac{4{,}000{,}000\ m}{2.5*10^8 m/s} + \frac{1500\ B}{2000000\ Bps} = 0.01675 \text{ seconds}$$

+

Link 3:

$$\frac{1{,}000{,}000\ m}{2.5*10^8\ m/s} + \frac{1500\ B}{2000000\ Bps} = 0.00475 \text{ seconds}$$

$$3(Link1 + Link2 + Link3 + (d_{proc} = 0.003)) = d_{end-end} = 0.13575 \text{ seconds}$$

= 135.48 milliseconds

11

Link 1:

$$\frac{5{,}000{,}000\ m}{2.5*10^8 m/s} + \frac{4500\ B}{2000000\ Bps} = 0.02225 \text{ seconds}$$

+

Link 2:

$$\frac{4{,}000{,}000\ m}{2.5*10^8 m/s} + \frac{4500\ B}{2000000\ Bps} = 0.01825 \text{ seconds}$$

+

Link 3:

(Thinking for 11: Since we don't account for the separate transmissions of packets, we can treat it as one packet going through all 3 links)

$$\frac{1{,}000{,}000\ m}{2.5*10^8\ m/s} + \frac{4500\ B}{2000000\ Bps} = 0.00625 \text{ seconds}$$

$Link1 + Link2 + Link3 = d_{end-end}$ = 0.04675 seconds = 46.75 milliseconds

12

$$4\left(\frac{1500\ B}{2\ Mbps}\right) + \left(\frac{750\ B}{2\ Mbps}\right) = d_{queue} \approx 0.00322 \text{ seconds}$$

$$d_{queue} = \frac{nL}{R} + \frac{x}{R}$$

20

$$\min\{R_s, R_c, R/M\}$$

31a

$\frac{1\ Megabytes}{2\ Mbps}$ = .5 seconds to travel to the first switch

$3(.5)$ = 1.5 seconds to complete the traversal

31b

$\frac{.00125\ Megabytes}{2\ Mbps}$ = .000625 seconds for the first segment to reach the first switch

The second would arrive at the first switch in .00125 seconds.

31c

800(.000625)+0.00125 = .50125 seconds to finish with message segmentation.

31d

The reduction in the amount of data allows for easier understanding when errors occur.

31e

The act of message segmentation causes higher bandwidth usage. Additional bits must be used as headers, therefore, making the bandwidth larger.