EE122–Fall 2013 — Solutions to Homework 1

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Problem 1

(1)

$$\frac{600 * 10^3}{3 * 10^8} + \frac{1200 * 8}{4 * 10^6} = 4.4\text{ms}$$

(2)

(a)

$$\frac{600 * 10^3}{3 * 10^8} + \frac{10 * 10^6}{1000} * \frac{(1000 + 60) * 8}{4 * 10^6} = 21202\text{ms}$$

(b)

$$\frac{10 * 8 * 10^6}{\frac{600 * 10^3}{3 * 10^8} + \frac{10 * 8 * 10^6}{1000} * \frac{1000 + 600}{4 * 10^6}} \approx 3.77 * 10^3\text{bits/ms}$$

(3)

$$\frac{1000 * 8}{4 * 10^6} + \frac{600 * 10^3}{3 * 10^8} + 250 * 10^{-9} + \frac{80 * 8}{4 * 10^6} + \frac{600 * 10^3}{3 * 10^8} = 6.41\text{ms}$$

(4)

$$(\frac{1000 * 8}{4 * 10^6} + \frac{600 * 10^3}{3 * 10^8} + \frac{80 * 8}{4 * 10^6} + \frac{600 * 10^3}{3 * 10^8}) * \frac{10 * 10^3}{1000} = 61.6\text{ms}$$

Problem 2

$\frac{1500 * 8}{10^6} = 0.012\text{s}$
$\frac{1500 * 8}{500 * 10^3} = 0.024\text{s}$
$\frac{1500 * 8}{10^6} = 0.012\text{s}$
$\frac{1500 * 8}{2 * 10^6} = 0.006\text{s}$
$\frac{1500 * 8}{10^6} + 2 * 10^{-3} = 0.014\text{s}$
$\frac{1500 * 8}{500 * 10^3} + 20 * 10^{-3} = 0.044\text{s}$
$\frac{1500 * 8}{10^6} + 30 * 10^{-3} = 0.042\text{s}$
$\frac{1500 * 8}{2 * 10^6} + 2 * 10^{-3} = 0.008\text{s}$

Part (1)

$0.014 + 0.044 + 0.042 + 0.008 = 0.108\text{s} = 108\text{ms}$

Part (2)

$0.014 + 20 * 10^{-3} + 3 * 0.024 + 0.042 + 0.008 = 0.156\text{s} = 156\text{ms}$

Part(3)

(a)

5 packets are dropped and 15packets reach Bob.

(b)

Packet 11, Packet 13,Packet 15, Packet 17, Packet 19 are dropped.

(4)

Because $\frac{0.00075}{0.0015} = 1/2$ and $\frac{0.0015}{0.003} = 1/2$
The fraction of his packets are lost is:
$\frac{1}{2} + \frac{1}{2} \times \frac{1}{2} = \frac{3}{4}$

(5)

(a)

$0.014 + 20 * 10^{-3} + 5.5 * 0.024 + 0.042 + 0.008 = 0.216\text{s} = 216\text{ms}$

(b)

$0.008 + 30 * 10^{-3} + 5.5 * 0.012 + 20 * 10^{-3} + 5.5 * 0.024 + 0.014 = 0.27\text{s} = 270\text{ms}$

Problem 3

(1)

$$Z * 2 * 10^{-3} + \frac{D}{B} * (Z - 1) + \frac{D * M}{B * P}$$

(2)

$$Z * 2 * 10^{-3} + \frac{h}{B} * (Z - 1) + \frac{D * M}{B * P}$$

(3)

$$Z * 2 * 10^{-3} + Z * \frac{k}{B} + Z * 2 * 10^{-3} + \frac{k}{B} + Z * 2 * 10^{-3} + \frac{M}{B}$$

(4)

(a)

$T_{S\&F} = 8*2*10^{-3} + \frac{1550*8}{50*10^6} * (8-1) + \frac{1550*8*3000*8}{50*10^6*(1550*8-50*8)} = 0.018232\text{s} = 18.232\text{ms}$

$T_{CTR} = 8*2*10^{-3} + \frac{50*8}{59*10^6} * (8-1) + \frac{1550*8*3000*8}{50*10^6*(1550*8-50*8)} = 0.016543\text{s} = 16.543\text{ms}$

$T_{CS} = 8*2*10^{-3} + 8*\frac{100*8}{50*10^6} + 8*2*10^{-3} + \frac{100*8}{50*10^6} + 8*2*10^{-3} + \frac{3000*8}{50*10^6} = 0.0486\text{s} = 48.6\text{ms}$

So "Cut through routing" will transmit a 3000 byte le fastest.

(b)

$T_{S\&F} = 8 * 2 * 10^{-3} + \frac{1550*8}{50*10^6} * (8-1) + \frac{1550*8*30*8*10^6}{50*10^6*(1550*8-50*8)} = 4.978\text{s}$

$T_{CTR} = 8 * 2 * 10^{-3} + \frac{50*8}{59*10^6} * (8-1) + \frac{1550*8*30*8*10^6}{50*10^6*(1550*8-50*8)} = 4.976\text{s}$

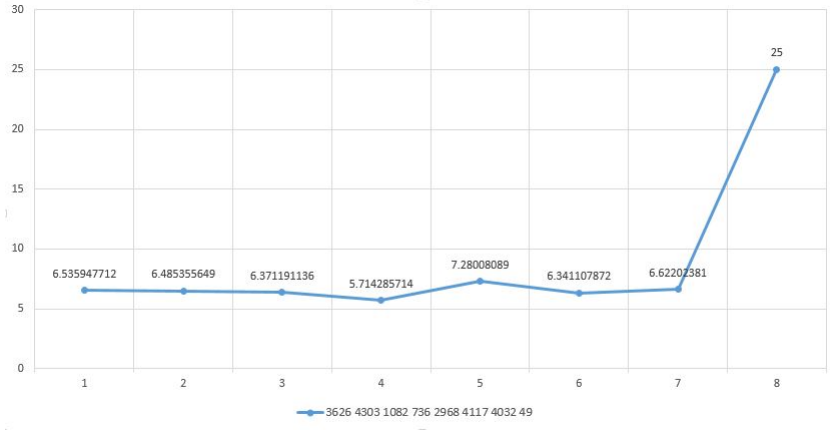
$T_{CS} = 8*2*10^{-3} + 8*\frac{100*8}{50*10^6} + 8*2*10^{-3} + \frac{100*8}{50*10^6} + 8*2*10^{-3} + \frac{30*8*10^6}{50*10^6} = 4.848\text{s}$

So "circuit switching" will transmit a 30MB le fastest.

Problem 4

(1)

cmu.edu (Pittsburgh, PA)ping=79ms, dis=3626km, T=12.087ms
cs.brown.edu (Providence, RI)ping=93ms, dis=4303km, T=14.34ms
washington.edu (Seattle, WA)ping=23ms, dis=1082km, T=3.61ms
ucsd.edu (San Diego, CA)ping=14ms, dis=736km, T=2.45ms
uchicago.edu (Chicago, IL)ping=72ms, dis=2968km, T=9.89ms
columbia.edu (New York, NY)ping=87ms, dis=4117km, T=13.72ms
odu.edu (Norfolk, VA)ping=89ms, dis=4032km, T=13.44ms
stanford.edu (Palo Alto, CA)ping=4ms, dis=49km, T=0.16ms



(2)

Because there are transmitting delay, queuing delay, router processing time. The distance of transmission is actually larger than the direct distance that we got from the website. Also the transmitting speed can not reach the speed of light.