Assignment 1

13 May 2022 21:08

1) Assume that on RTT is of 80MS. An RTT = 2×TP is a propagation delay. Initially 2×RTT of 'hand shake' is Required to setup before data is sent. The file that would be transmitted is broken into packet of size 1 kB, so find the total time required to transfer 1.5 MB file in the following cases

a) The band width is 10 mbps and data packets can be sent continiously.

b) The band width is 10 Mbps but after we finish sending each data packets. we must wait for RTT before sending next data packet.

a) We need two RTT for hand shake

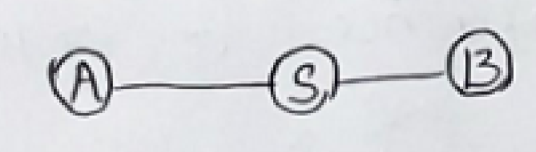
T_F = transmission time => $\frac{1.5\times10^6\times8}{10\times10^6} = 1.2\ sec = 1200\ ms$

total time = $(2\times RTT) + T_F + T_P$
= 160 + 1200 + 40
= 1400 ms = 1.4 sec

2) Host A and B are each connected with a switch S via 10 mbps links as in the bellow figure propagation delay in each link is 20 μs. S is a stored and forward device It begin retransmit a packet after 35 μs it receive it

a) as a single packet

b) as two 5000 bit packets



a) Given $t_p = 20\mu s$

$t_F = \frac{10000}{10\times10^6} = 1000\ \mu s$

to S => time = $t_p + t_F$ = 20 + 1000 = 1020 μs

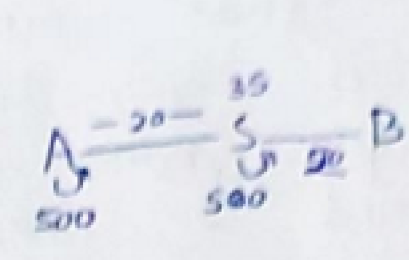
then it wait 35 μs at S then it start transmiting to B

so time = 1020 μs + 35 μs + 100 μs + 20 μs
= 2075 μs

b) We compute $t_F = \frac{5000}{10\times10^6} = 500\mu s$

so time required to send one bit

= 520 μs + 35 + 520 μs
= 1075 μs



After 1055 μs the switch can retransmit so the second bit

= 1075 μs + 520 μs = 1575 μs.

1) b) transmission time of 1500 packet = $\frac{1.5\times10^6\times8}{10\times10^6}$ = 1.2 sec = 1200 MS

total time = 2×RTT + T_F + T_P + 1499 × RTT
= 2×80 + 1.200 ms + 40 + 1499 × 80
= 121.32 Sec

3) Considere a closed loop network with bandwidth 100 mbps and propagation speed of 2×10^8 m/s what would be the loop be to exactly contain one 250 byte packet.

No of bit = 250×8 = 2000 bits

~~t_{prop} =~~

$t_{trans} = \frac{2000}{100\times10^6} = 20\mu s$

let circumference of the loop be x

=> $\frac{x}{2\times10^8} = \frac{2000}{100\times10^6}$

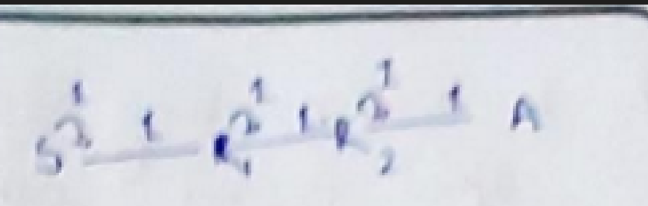
=> $x = \frac{2000}{100\times10^6}\times2\times10^8 = 4000\ m$

4) Consider a source computer (S) transmit a file size of 10^6 bit to a destination computer (D) over a network with two router (R_1 and R_2) and three link (L_1, L_2, L_3)

L_1 connects S to R_1
L_2 connects R_1 to R_2
L_3 connects R_2 to D

each link of length 100 km, signal level 10^8 m/s Bandwidth is 1 mbps, Let file ~~break~~ ~~break~~ broken down to 1000 packet each of size 1000 bits. find total time ?

T_p for each link = $\frac{10^5 m}{10^8 m/s} = 10^{-3} sec = 1\ ms$



total T_p = 3 ms

total transmission delay = $3\times\frac{1000}{10^6}$ = 3ms

packet will take 6 ms to reach D while first packet was reaching D, remaining 999 packet transmiting parallaly

D get each packets at 1 μs from R_2

so total time = 999 μs + 6 μs
= 1005 μs.

6) A system has n layer protocol hierachy. Application generates message of length M byte. At each of the layer an h-byte of header is added. what fraction of band width is filled with header

Layer 1 = m+h
layer 2 = m+2h
Layer n = m+nh

no of header for n layer = nh

so Ratio = $\frac{nh}{m+nh}$

7) An image is 1024×768 pixels with 3 byte/pixel. Assume the image is uncomposed. how long it takes to transmit 56 kbps modem channel? over 1 Mbps modem channel? 100 mbps ethernet?

Total no of bits = 1024 × 768 × 3×8 = 18,874,368 bits

over 56 kbps modem = $\frac{bits}{56\times10^3}$ = 5.62 min

over 1 mbps modem = $\frac{bits}{10^6}$ = 18.87 sec

over 100 mbps = $\frac{bits}{10^8}$ = 0.1887 sec

8. A 100km long cable runs at T_1 data rate. The propagation speed in the cable is 2/3 of speed of light. How many bit fits in the table?

propagation speed = $T_p = 2/3 \times 3\times10^8$
= 2×10^8 m/sec
= 2×10^5 km/sec
= 2×10^2 km/ms

$\propto T_p = \frac{d}{s}$

=> Data rate = 1.544 mbps

so the 100 km long wire will be filled = $\frac{100}{2\times10^2}$ ms
= 0.5 ms
= 500 μs

1 sec = 1.544 mbits
=> 1 sec = 1.544×10^6 bit
=> $10^6 \mu sec = 1.544\times10^6$ bit
=> 1 μs = 1.544 bit
=> 500 μs = 1.544 × 500 = 778 bit.

9) Suppose we need to download a book contain 80 pages each pages is 20 line. with 80 charecter, each charecter require 8 bit. what is bit-rate require to download the book is 30 sec.

no of bits = 80×20×80×8 = 1024000 bits

bitrate require to download book in 30sec = $\frac{1024000}{30}$

= 34133.34 bps
= 34.134 kbps