CS & IT ENGINEERING

Computer Network

1500 Series

Lecture No.- 07

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Recap of Previous Lecture

Topic Questions Practice

Topic

Topics to be Covered

Topic TCP

Topic UDP

ICMP

[NAT]

#Q. An IPv4 datagram has arrived in which the offset value is 900. The HLEN is 10, and the value of total length field is 500 and m bit is 0. If the number of first byte is x and the last is y then what will be the value of x + y?

$m = 0$ (Last Fragment)

OFFset = 900

No. of data Byte ahead of this Fragment = 8*900 = 7200

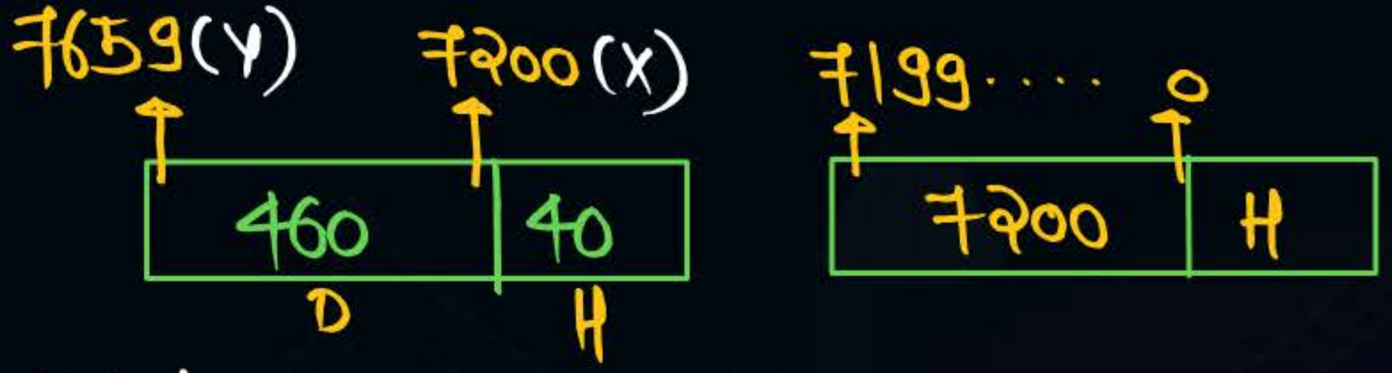
HLEN = 10

Header size = 10*4 = 40 Byte

TL = 500

D + H = 500

D = 500 − 40 = 460



$x + y = 7200 + 7659$

$= 14859$

[MCQ]

#Q. Consider the following protocols:

H.W

P_1 : TCP

P_2 : UDP

P_3 : ICMP

P_4 : IGMP

The order in which router eliminate the datagram from it's buffer is?

A $P_1 > P_2 > P_3 > P_4$

B $P_2 > P_1 > P_3 > P_4$

C $P_3 > P_4 > P_1 > P_2$

D $P_3 > P_4 > P_2 > P_1$

[MCQ]

#Q. A TCP connection is using a window size of 10,000 bytes, and the previous acknowledgement number was 22,001. It receives a segment with acknowledgement number 24,001 and window size advertisement of 10,000. What is the range of sequence number in the window after receiving acknowledgement segment?

H.W

A 22001 – 24000

B 22001 – 32000

C 24001 – 34000

D 24001 – 36000

[MCQ]

#Q. Consider sending a large file from a host to another over a TCP connection that has no loss. Suppose TCP uses AIMD for its congestion control without slow start. Assuming cwnd increases by 1 MSS every time a batch of ACKs is received and assuming approximately constant round-trip times, how many RTTs would it take for cwnd increase from 6 MSS to 12 MSS (assuming no loss events)?

H.W

A. 6 RTTs

B. 7 RTTs

C. 3 RTTs

D. 12 RTTs

[NAT]

#Q. Consider a single TCP connection on a 10 Mbps link with MSS = 1500 bytes and RTT = 150 ms. What is the maximum window size (in segments) achieved? ________

RTT = 150 msec

$B = 10 * 10^6$ bits|sec

1 sec ———— $10 * 10^6$ bits

$150 * 10^{-3}$ sec ————> $150 * \cancel{10^{-3}} * 10 * \cancel{10^6}$ bits

$= 150 * 10 * 10^3$ bits

$= 1500 * 10^3$ bits

Window size $= \frac{1500 * 10^3}{8}$ Byte

= 187,500 Byte

window size = 187,500 Byte

window size (in segments)

$= \frac{187,5\cancel{00}\ \cancel{\text{Byte}}}{15\cancel{00}\ \cancel{\text{Byte}}}$

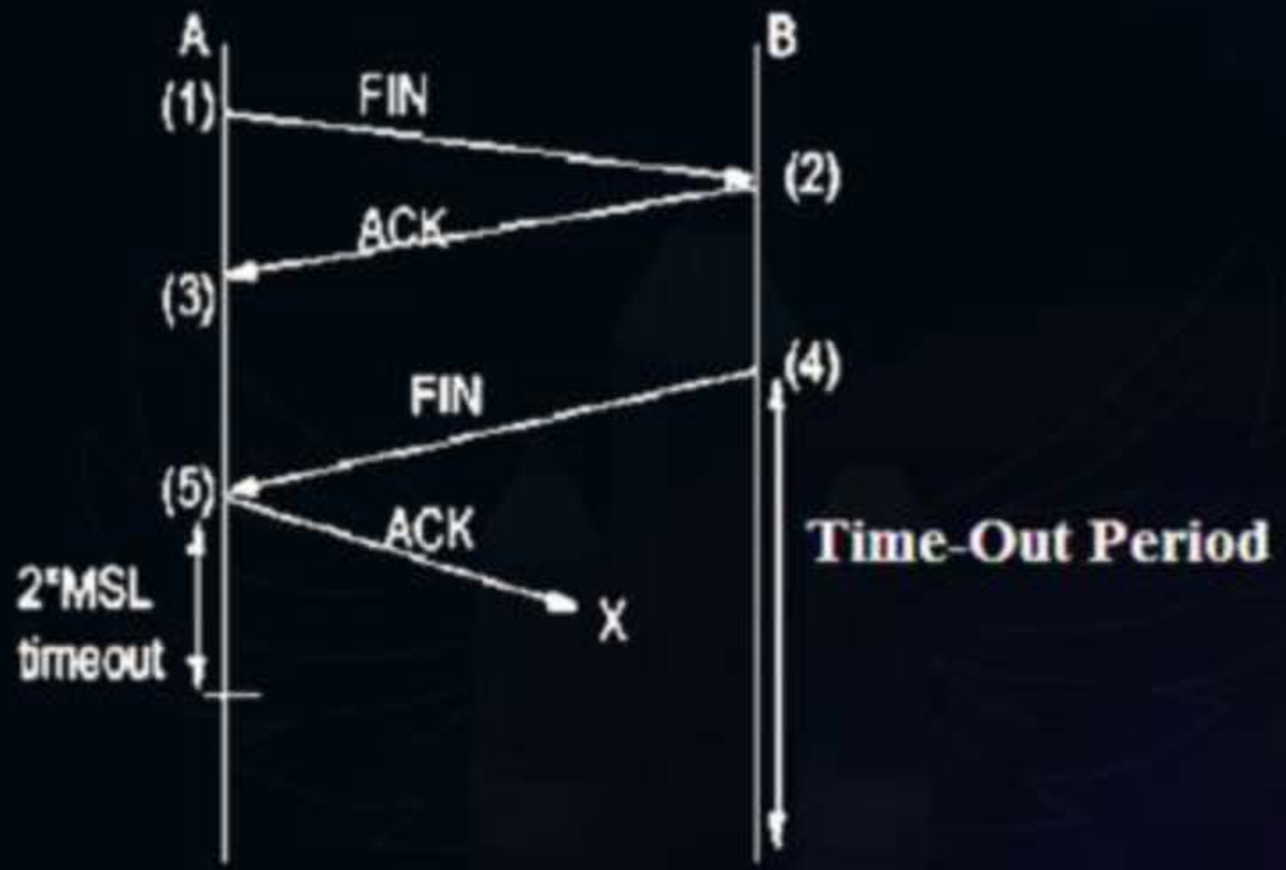
= 125

[MCQ]

Data for the next two question, timeline showing exchange of some segments between TCP A and TCP B during connection termination. X indicates that ACK segment was lost.

H.W

#Q. What are the states of TCP A at (1), (3) and (5) respectively?



A. FIN_WAIT1, TIME_WAIT, FIN_WAIT2.

B. FIN_WAIT1,CLOSE_WAIT, TIME_WAIT.

C. FIN_WAIT1, FIN_WAIT2, TIME_WAIT.

D. FIN_WAIT1, FIN_WAIT2, CLOSE_WAIT.

[MCQ]

#Q. What are the states of TCP B at (2) and (4) respectively?

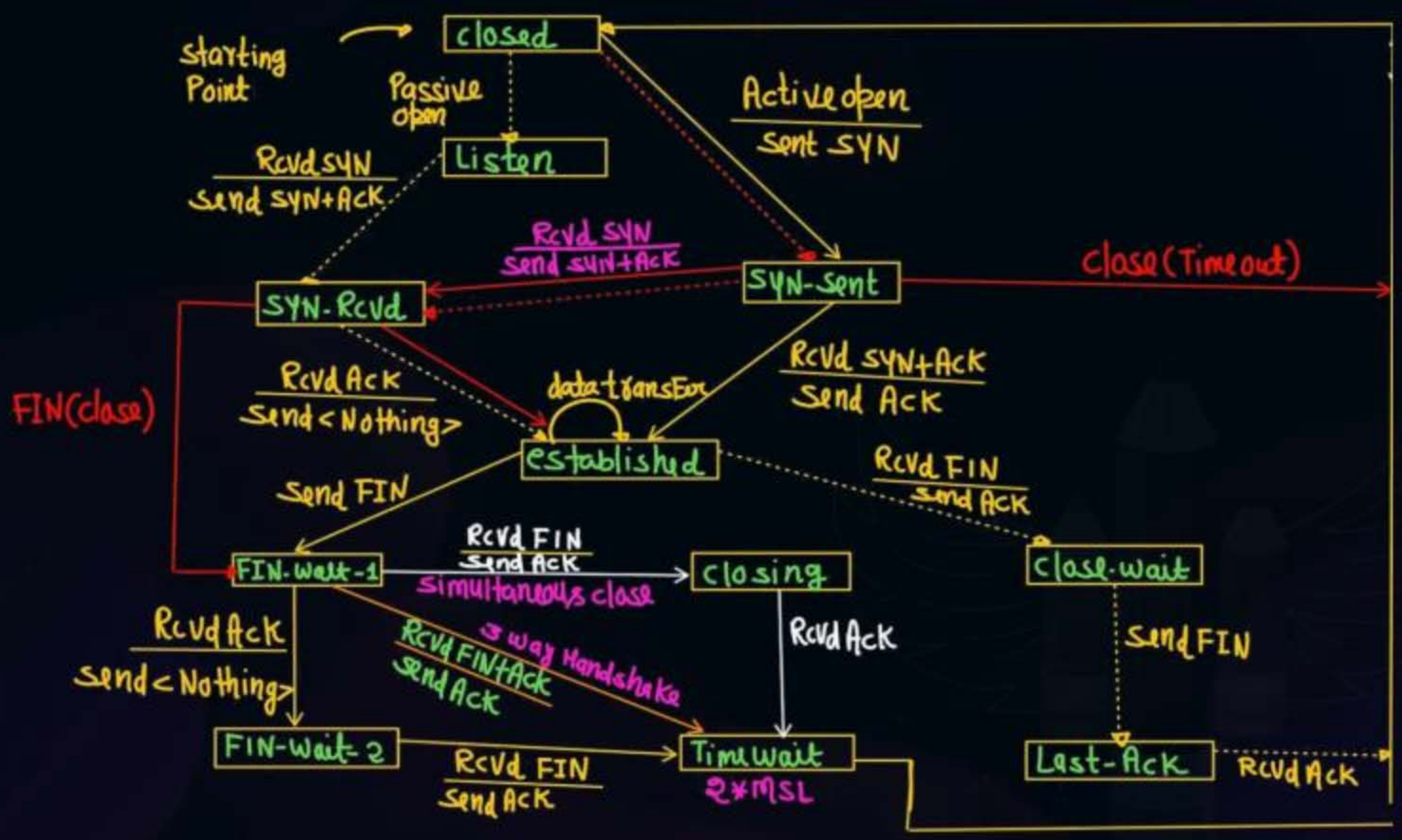
H.W

A. FIN_WAIT1, FIN_WAIT2

B. CLOSE_WAIT, FIN_WAIT2

C. CLOSE_WAIT, TIME_WAIT

D. CLOSE_WAIT, LAST_ACK


starting Point
closed
Passive open
Active open
Sent SYN
Listen
Rcvd SYN
send SYN+ACK
Rcvd SYN
send SYN+ACK
SYN-Sent
close(Timeout)
SYN-Rcvd
FIN(close)
Rcvd Ack
Send <Nothing>
data transfer
Rcvd SYN+Ack
Send Ack
established
Send FIN
Rcvd FIN
Send Ack
FIN-Wait-1
Rcvd FIN
Send Ack
simultaneous close
closing
Close-wait
Rcvd Ack
Send <Nothing>
Rcvd FIN+Ack
Send Ack
3 way Handshake
Rcvd Ack
Send FIN
FIN-Wait-2
Rcvd FIN
Send Ack
Time wait
2*MSL
Last-Ack
Rcvd Ack

[MSQ]

#Q. The first Few Hexadecimal digits of TCP Header are given
5EFA 00 FD 001C 3297
Which of the following statement is/are correct ?

H·W

A. Source port =24314 & Destination port =253

B. Source port =20480 & Destination port =253

C. Packet is going from client to server

D. Packet is going server to client

[NAT]

#Q. Consider a network of two workstations A and B and connected to a bus, operated in a slotted manner using the simple ALOHA protocol. A and B each have many frames to transmit. Suppose A and B implement the following strategy: each will attempt to transmit within any particular slot with respective probability pa (0.4) and pb(0.5), independently of each other. If both transmit on the same slot, the slot is wasted due to collision and the frames have to be re-transmitted. What is the efficiency of the scheme? ______ Ans: (.5)

$P_A = 0.4$

$P_B = 0.5$

efficiency $= P_A(1-P_B) + P_B(1-P_A)$

$= 0.4 * 0.5 + 0.5 * 0.6$

$= .2 + .3 = .5$

[NAT]

HW

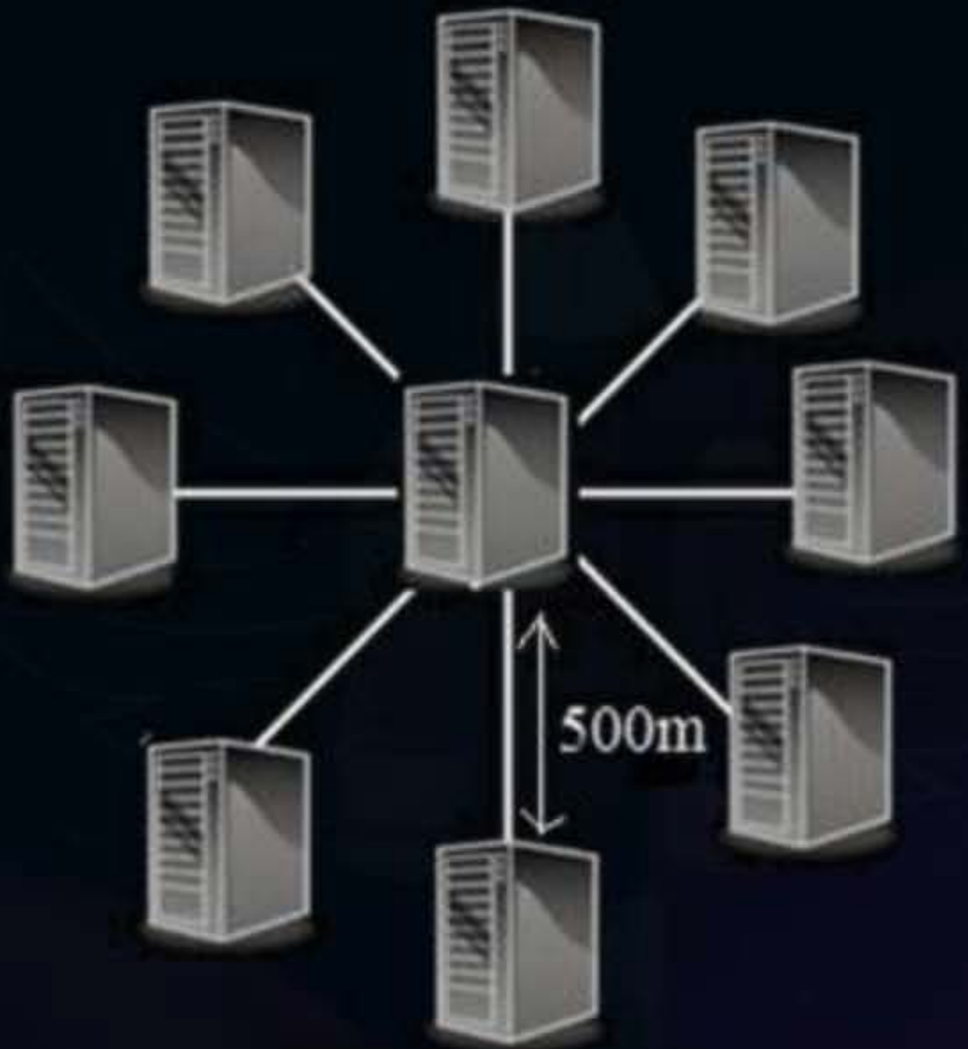
#Q. suppose two nodes, A and B, are attached to opposite ends of a 900-meter cable which includes four repeaters inserted between A and B each inserting a 20-bit transmission delay. A and B each have one frame of 1,000 bits (including all headers and preambles) to send to each other. Both nodes attempt to transmit at time t = 0. Assume the transmission rate is 10Mbps, and CSMA/CD with back off intervals of multiples of 512 bits transmission time is used. After the first collision, A draws 0 and B draws 1 in the exponential backoff protocol. Ignore the jam signal. Assume that a station must wait for extra propagation time to seize the signal of aborted transmission after it detect the collision. If the signal propagation speed is 2 ▯ 108 m/sec, then what is the one-way propagation delay (including repeater delays) between A and B (in microseconds)? ________

[NAT]

H.W

#Q. Consider the 1 Gbps CSMA/CD broadcasts star in which no two hosts are now more than 500m apart, The CSMA/CD specification requires that if a collision occurs, it must detect the collision before it finishes transmitting a packet.

What is the size of the minimum packet in above network (in bytes)? (Assume the speed of propagation is 2×10^8 m/s.)________



[MCQ]

Data for the next two questions, assuming there are N active nodes the efficiency of slotted Aloha is $Np(1-p)^{N-1}$

#Q. What is the value of p that maximizes this expression?

$$\cancel{N}\times\frac{1}{\cancel{N}}\left(1-\frac{1}{N}\right)^{N-1}$$

$$\left(1-\frac{1}{N}\right)^{N-1}$$

- A. N
- B. 1/N
- C. e
- D. $1/e$

[MCQ]

#Q. Using the value of p found in question above find the efficiency of slotted Aloha by letting N approach infinity. Hint: (1-1/N)^N approaches 1/e as N approaches infinity.

A N

B 1/N

C e

D $1/e$

$$\lim_{N \to \infty} \left(1 - \frac{1}{N}\right)^{N-1}$$

$$= \frac{1}{e}$$

[MCQ]

#Q. Two host A and B are connected over a sequence of N links, each of transmission rate R and propagation delay D. All packet switches are store-and-forward. Host A sends a file of size F to host B, as a sequence of back-to-back packets of size L. The transfer time for the file is F/R + 9L/R + 10msec. Assume no queuing and processing delays. Which of the following is true?

A. N=1 link, D=10msec.

B. N=9 links, D=1msec.

C. N=10 links, D=1msec.

D. N=10 links, D=10msec.

No. OF Links | Hops (X) = N , B = R , Propagation delay (P_d) = D

File size = F

Packet size = L

$$T_d = \frac{\text{Pkt size}}{\text{Bandwidth}} = \frac{L}{R}$$

$$\text{Total time} = \frac{F}{R} + 9\frac{L}{R} + 10$$

$$\text{No. OF Pkts (N)} = \frac{F}{L}$$

X → Hops , and 'N' Pkts

$$\text{Total time} = X[T_d + P_d] + X-1\,[\cancel{Q_d + Pr_d}]_{0} + N-1\,(T_d)$$

$$\frac{F}{R} + 9\frac{L}{R} + 10 = N\left[\frac{L}{R} + D\right] + \left(\frac{F}{L} - 1\right)\frac{L}{R}$$

$$\boxed{N = 10,\ D = 1}$$

$$10\left[\frac{L}{R} + 1\right] + \left(\frac{F}{L} - 1\right)\frac{L}{R}$$

$$10\frac{L}{R} + 10 + \frac{F}{\cancel{L}} * \frac{\cancel{L}}{R} - \frac{L}{R}$$

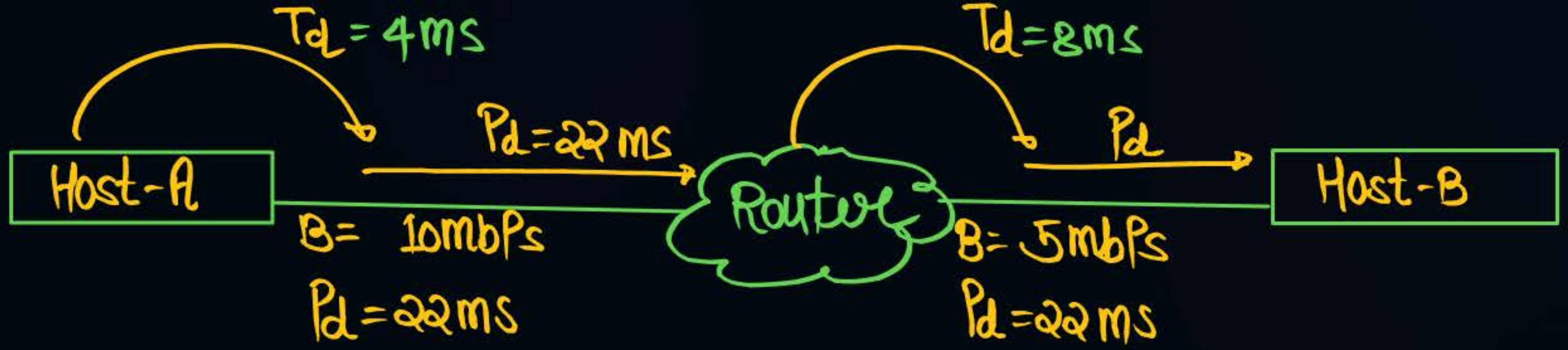
$$10\frac{L}{R} + 10 + \frac{F}{R} - \frac{L}{R}$$

$$9\frac{L}{R} + 10 + \frac{F}{R}$$

[NAT]

30KB ($K \to 10^3$)

#Q. Hosts A and B are connected to each other via router R. R is a store-and-forward router. The bandwidth from A to R is 10Mbps, and the bandwidth from R to B is 5Mbps. The one-way latency of each link is 22ms. Assume host A sends a 30KB file to host B. assume each packet is acknowledged. The file is divided into 6 packets of the same size. How long would it take to send the entire file assuming that the sender cannot send a new packet before it receives an acknowledgment for the previous packet from the receiver B? (The transfer time is the time interval measure at source A from the time the first segment is sent until the acknowledgement of the last segment is received). Ignore the transmission time of the acknowledgements. ___600(ms)___



File size = 30KB

No. of Pkts (N) = 6

Packet size = $\frac{\cancel{30KB}}{\cancel{6}} = 5KB$

$$T_d(Pkt)_{Host(A)} = \frac{Pkt\,size}{B} = \frac{5 * 10^3 * 8 \text{ bits}}{10 * 10^6 \text{ bits/sec}}$$

$$= 4 * 10^{-3} \text{ sec} = 4ms$$

$$T_d(Pkt)_{Router} = \frac{Pkt\,size}{Bandwidth} = \frac{5 * 10^3 * 8 \text{ bits}}{5 * 10^6 \text{ bits/sec}}$$

$$= 8 * 10^{-3} \text{ sec} = 8 \text{ msec}$$

Total time to transfer 1^{st} PKt = $4 + 22 + 8 + 22 = 56$ msec

Time For Ack = $22 + 22 = 44$ msec

Total time taken to transfer 1^{st} successfully = $56ms + 44ms = 100$ msec

" " " " " 6 PKt successfully = $6 * 100 = 600$ msec

[NAT]

#Q. What is the total time (time elapsed between the transmission of the first bit of data and the reception of the last bit of the data) required (in μs) to transfer three frames of size 5000-bit each back-to-back on a 1 Gbps ($1Gbps = 10^9$ bps) ethernet with three switches in the path? Assume that propagation delay each link is 10 μs and that the switch begins transmitting the packet after the first 128-bits have been received.__________(Round off to two decimal places)

No. OF PKts|Frames(N) = 3

Frame size = 5000 bits

$$T_d(\text{Frame}) = \frac{5000 \text{ bits}}{10^9 \text{ bits/sec}} = 5 \times 10^{-6} \text{ sec} = 5 \mu\text{sec}$$

A —— S1 —— S2 —— S3 —— B

No. OF Hops (X) = 4

$P_d = 10 \mu\text{sec}$

For X → Hops and 'N' Packet

$$\boxed{\text{Total time} = X\,[T_d + P_d] + X-1\,(\underline{Q_d + P_{rd}}) + (N-1)\,T_d}$$

$$4\,[5+10] + 3 * \cdot 128 + 2 * 5$$

$$= 60 + 3 * 0 \cdot 128 + 10$$

$$= \underline{\underline{70 \cdot 384}}$$

Delay at switch

$$= \frac{128 \text{ bits}}{10^9 \text{ bits/sec}}$$

$$= 128 * 10^{-9} \text{ sec}$$

$$= \cdot 128 * 10^{-6} \text{ sec}$$

$$= \cdot 128\ \mu\text{sec}$$

2 mins Summary

Topic One IPv4

Topic Two

Topic Three

Topic Four

Topic Five

THANK - YOU