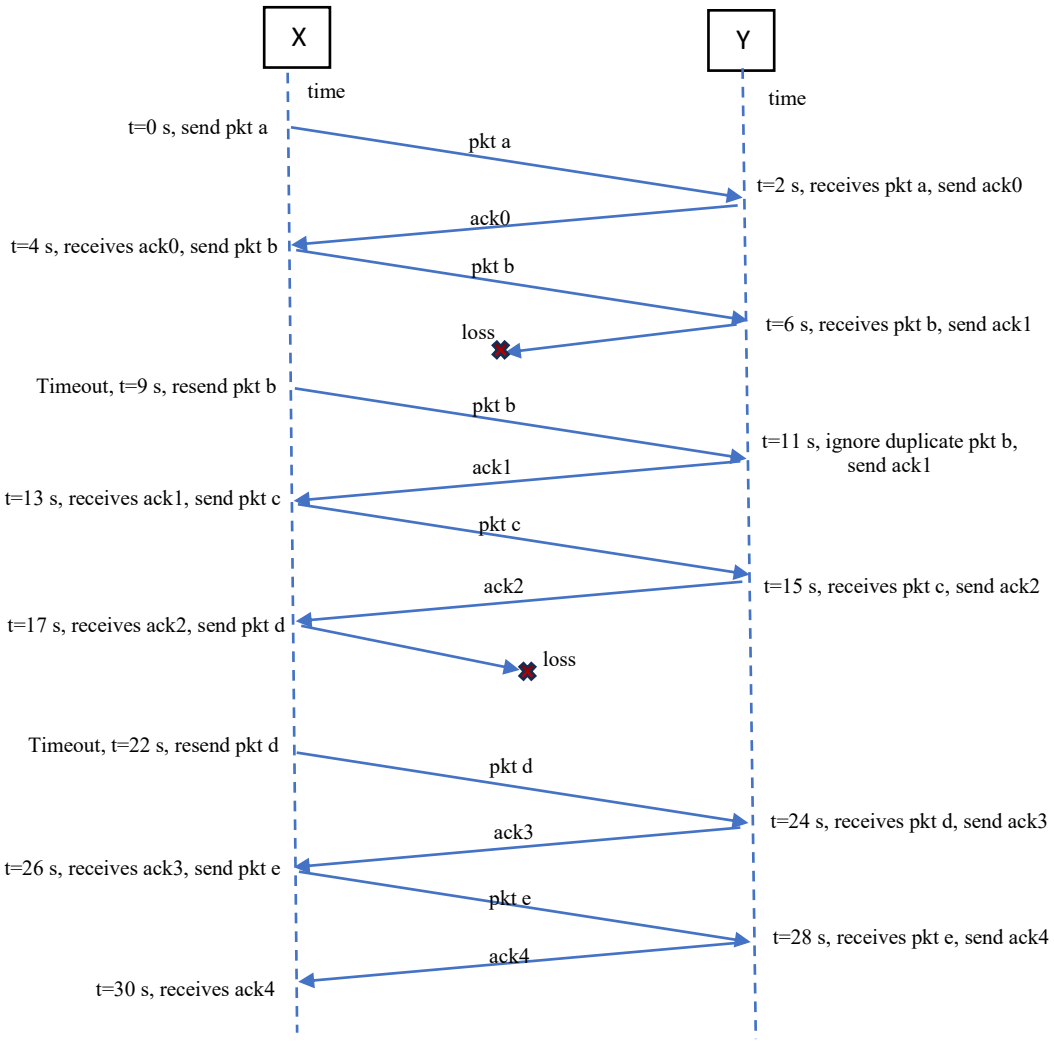
Esra Şekerci

2698215

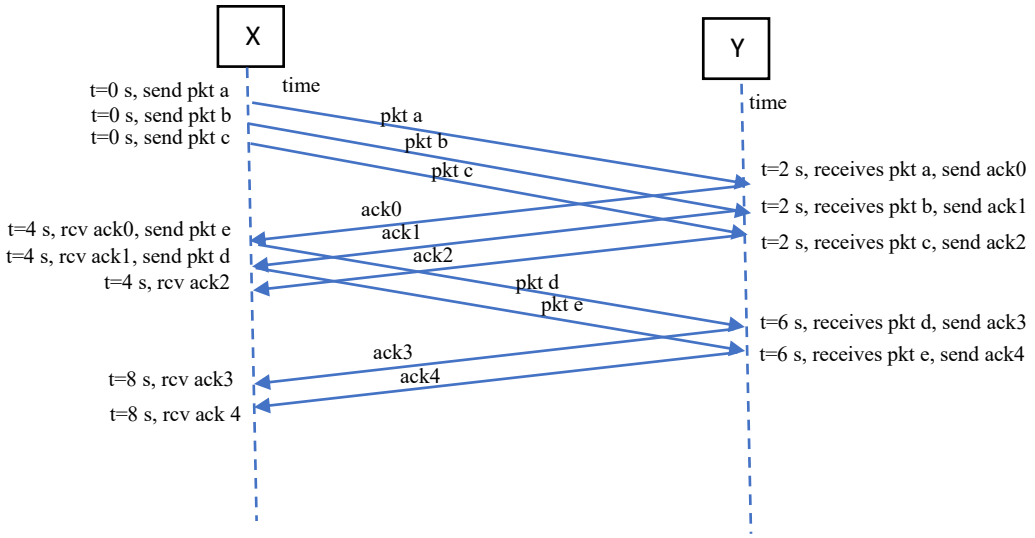
IS 504 – Homework 2, due 3 Dec 2023

1.

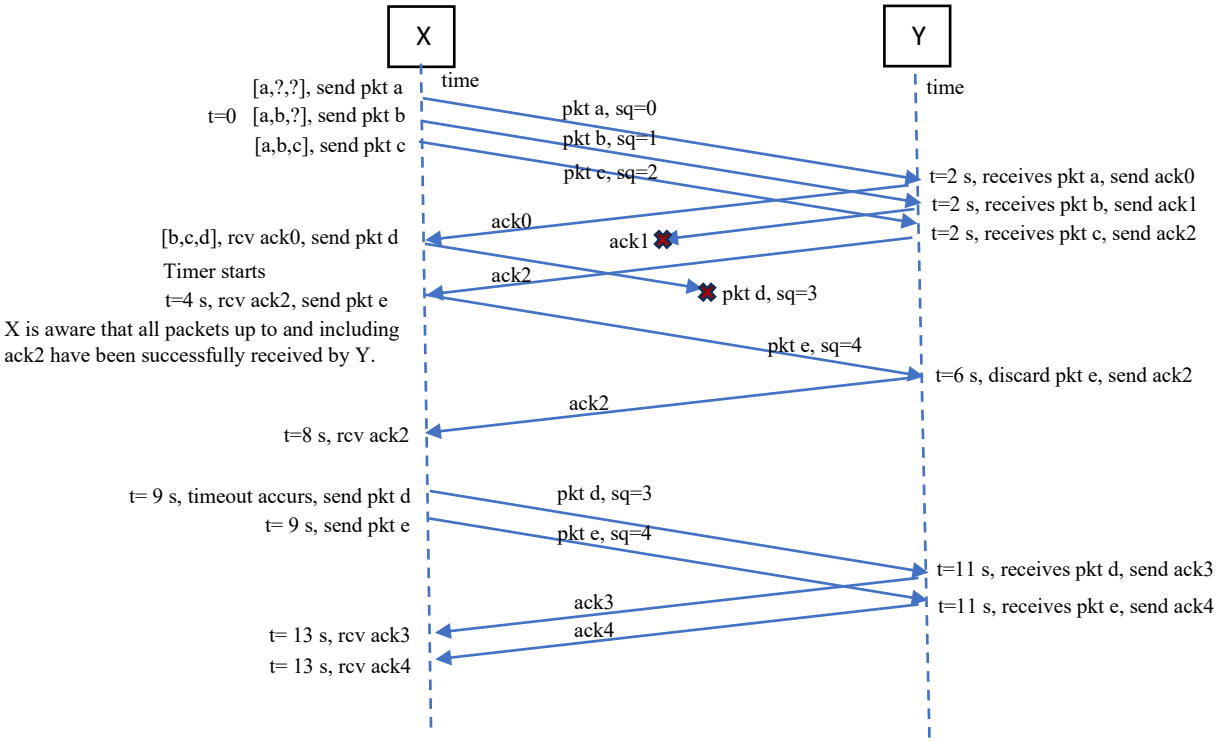
a. The stop and wait protocol, time-sapce diagram:



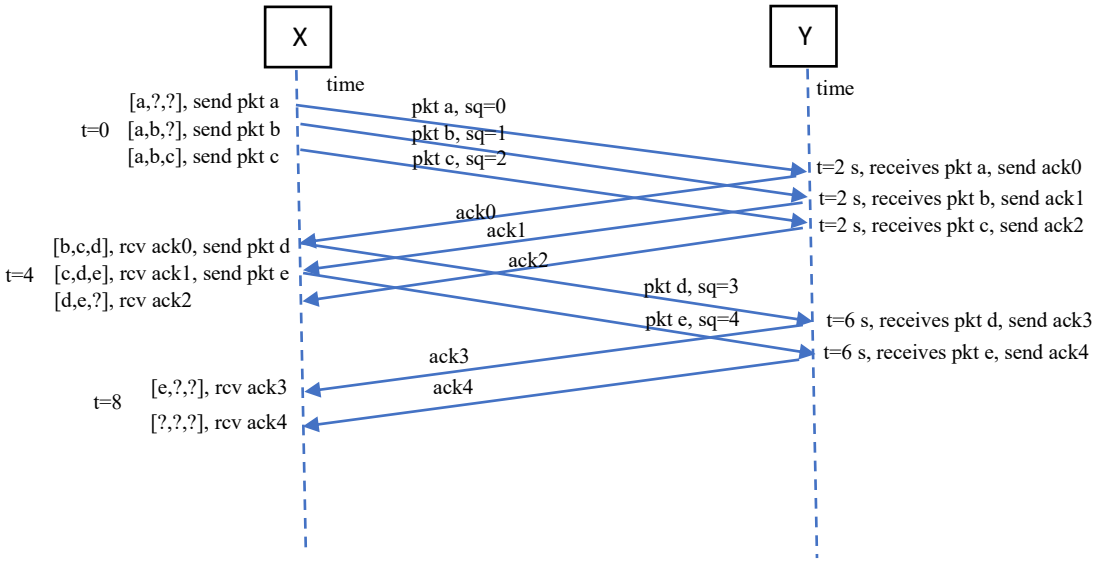
b. The Go-Back-N protocol with window size=3



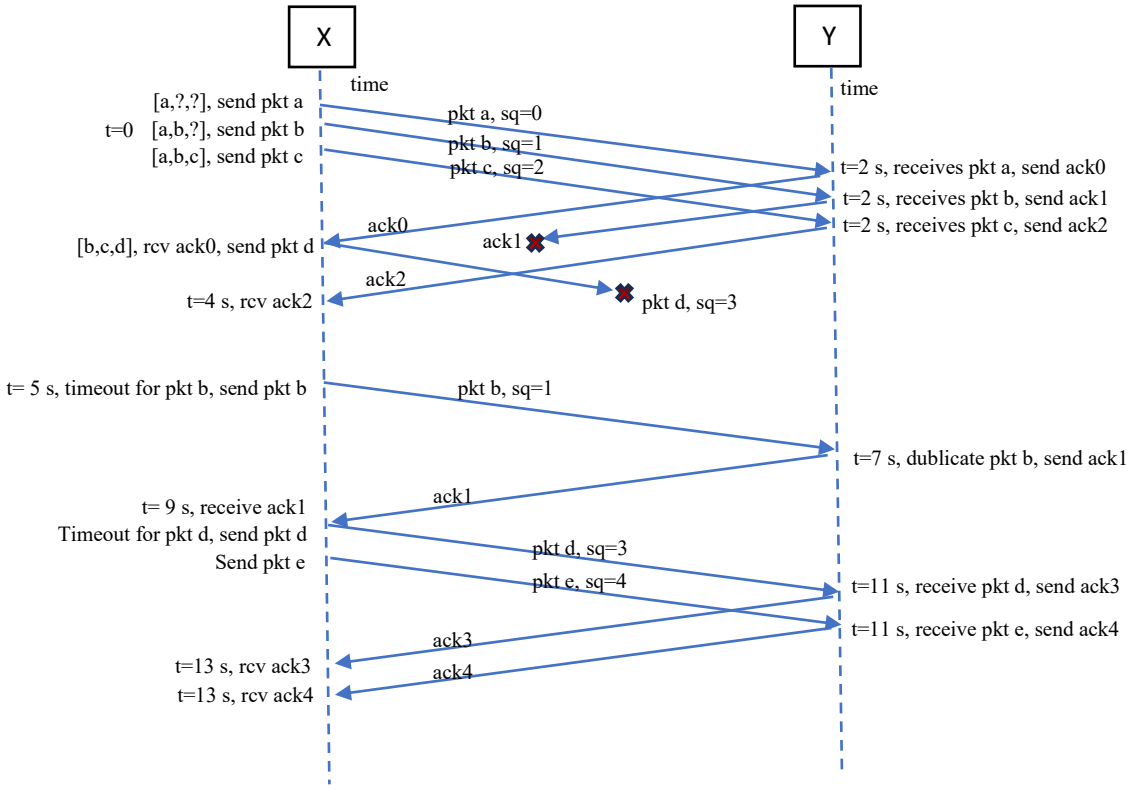
c. The Go-Back-N protocol, window size=3 (first acknowledgement sent for the data packets "b" is lost, the data packet containing "d" is lost on the first transmission attempt)



d. The Selective Repeat protocol with window size=3

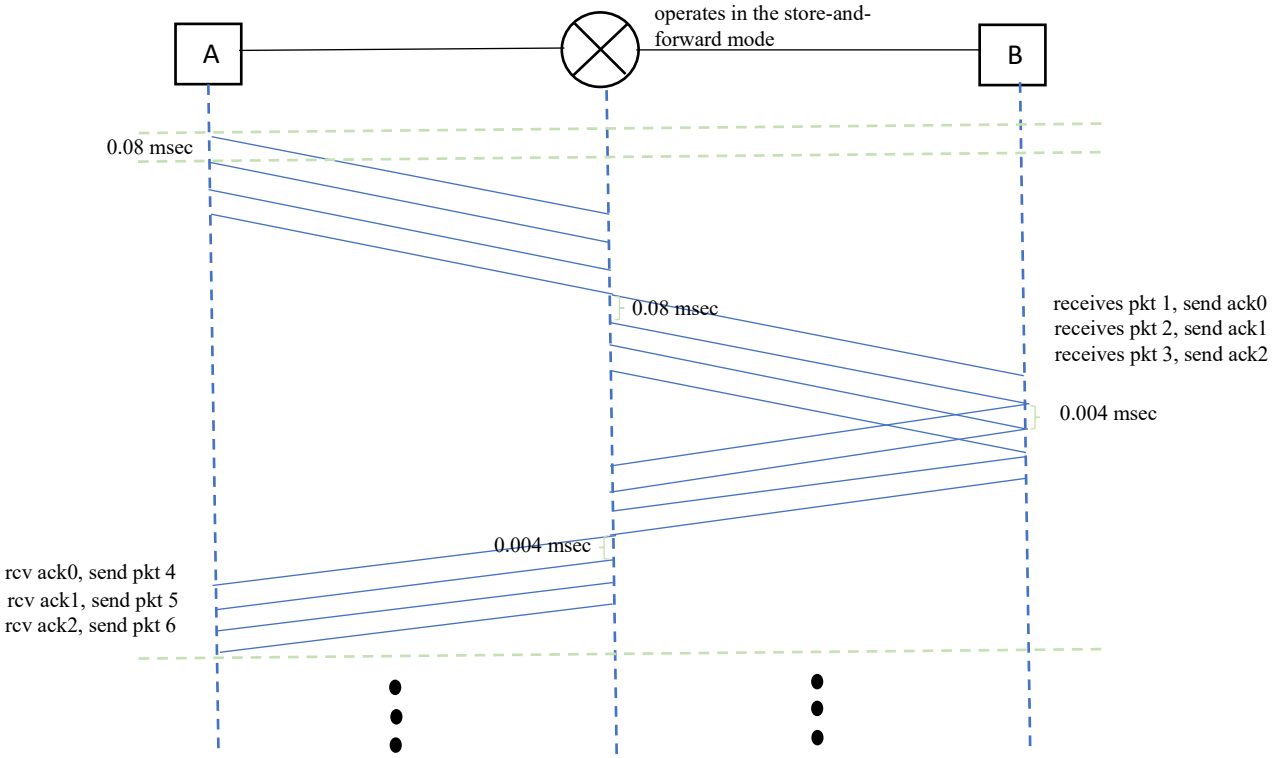


e. The Selective Repeat protocol, window size=3 (first acknowledgement sent for the data packets “b” is lost, the data packet containing “d” is lost on the first transmission attempt)



2.

a. Number of packets to send = n = 100 packets
Length of data in each packet = m = 8000 bits
Number of acknowledgement = na = 100 acknowledgments
Length of each acknowledgement = ma = 400 bits
Transmission rate (A to router & router to B) = r = 100 Mbps = 1 * 10^8 bits/sec
Packet transmission delay = m/r = 8000 / 1*10^8 = 8 * 10^(-5) = 0.08 msec
Transmission delay for acknowledgement = ma/r = 400 / 1*10^8 = 4 * 10^(-6) = 0.004 msec
Distance between A to router & router to B = x = 20 km = 20 * 10^3 m
Signal propagation speed = c = 2 * 10^8 m/sec
Propagation delay = dprop = x/c = 0.1 msec



According to the time-space diagram,

dtrans.packet*2 + dprop*4 + dtrans.ack*2 delay time of transmission of one packet from A to B and transmission of one acknowledge packet from B to A.

3 packets can be sent and A get ack in every Tpacket = (0.08*6) + (4*0.1) + (0.004*6)= 0.904 msec

Therefore, 99 packets can be delivered and A get ack in 0.904 * (99/3) = 29.832 msec

The last packet can be delivered and A get ack in 0.16 + 0.4 + 0.008 = 0.568 msec

Then total time is 29.832 + 0.568 = 30.4 msec until host A is sure that host B has received the packets.

b. The minimum window size, that minimizes the time required to transfer 100 data packets to Host B, should be:

   Wmin = (Tpacket/dtrans.packet)
   Since Tpacket = 0.904 msec and dtrans.packet = 0.08
   0.904 / 0.08 = 11.8 then Wmin = 11

c. When the window size is 11, A transfers 100 data packets to host B (until A is sure that B received the packets) in [(0.08*22) + (4*0.1) + (0.004*22)] * (99/11) + 0.568 = 20.8 msec