18-345 Introduction to Telecommunication Networks
Quiz 3
October 15, 2008

Problem 1 (4 points)
For Stop and Wait ARQ protocols:

a) Why are timeouts necessary?

Protocol needs to be kept A and B can't wait for each other forever

b) Why are sequence frames necessary?

A and B must know when a packet is a retransmission.

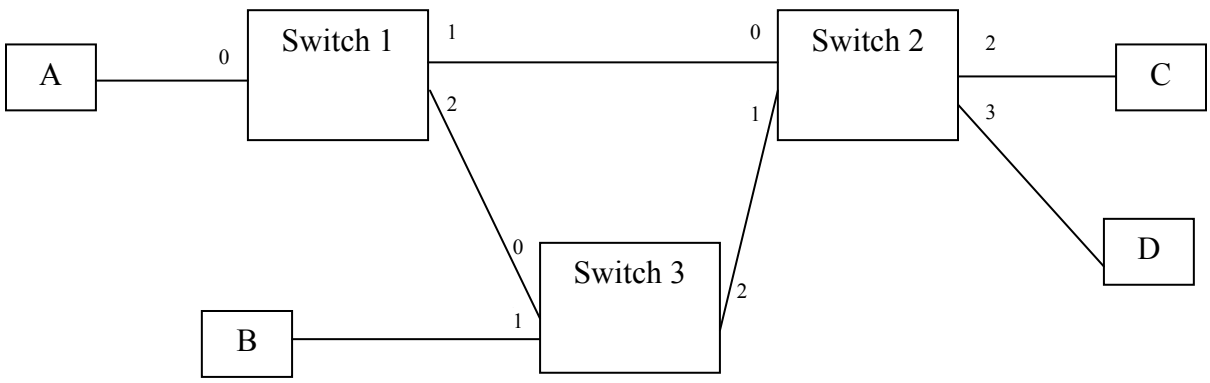
Problem 2 (2 points)
You are running the ARQ specified below. Frames are 20Bytes, tproc = 3ms , tprop= 5ms R=10Mbps

For Go Back N: what is the delay/ RTT and how big should window Ws be?

Delay = 2(tprop+tproc) = 2(3+5) = 16ms

Delay X BandWidth = 16000 bits
16000/(1 frame=160) = 1000 frames can be on the line so Ws = 1001

Problem 3 (5 points)
Consider the following circuit-switched network configuration. The forwarding tables of the 3 switches are listed below. Each entry lists the incoming port, VCI of the incoming VC, and the corresponding outgoing port & outgoing VCI. Looking at the entries in the tables, list the paths (including VCI's) taken by all the virtual circuits that currently are established in the network. (3 pts)



Switch 1:

In-port	In-VCI	Out-port	Out-VCI
0	1	1	1
0	2	2	1

Switch 2:

In-port	In-VCI	Out-port	Out-VCI
0	1	2	1
1	1	3	1
1	2	3	2

Switch 3:

In-port	In-VCI	Out-port	Out-VCI
0	1	2	2
1	2	2	1

Solution: **Paths:**

i. A-S1-S2-C (VCIs: 1,1,1)

ii. B-S3-S2-D (VCIs: 2,1,1)

iii. A-S1-S3-S2-D (VCIs: 2,1,2,2)

Problem 4 (2 points)
Describe a one advantage for RAT and one advantage for RAR.

RAR can check for errors, RAT allows the next node to transmit faster

Problem 5 (4 points)
Describe the importance of delay bandwidth product in the context of:

a. Stop and wait protocol.

In stop and wait protocol, the delay bandwidth product gives an idea of the amount of data that could have been sent in the idle period. Therefore, the bigger the delay bandwidth product is, the lower is the efficiency of stop and wait protocol.

b. Go back N protocol.

In go back N, the delay bandwidth product can be used to decide the right window size. Therefore, delay bandwidth product gives an idea of the number of packets that should be sent in order to keep the channel busy, which can be used to decide the size of the sender window.

Problem 6 (4 points)
Describe the collision vulnerability in ALOHA and how slotted ALOHA reduces it.

In ALOHA there is the risk that a message sent during another message. The vulnerability window for the collision is 2m where m is the length of the message in time. This is because the collision can happen at any time during the message, worst case being right at the end.

In Slotted ALOHA there are fixed times that a message can be sent. All messages are synchronized this way. The maximum collision window is therefore only m.