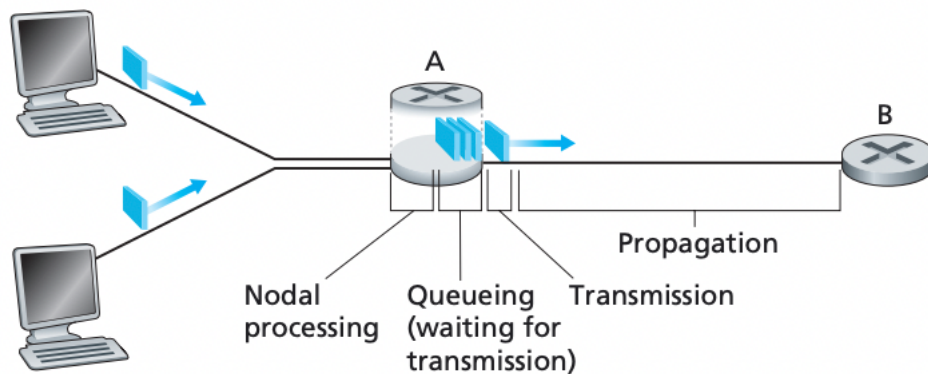


COMP3234 Computer and Communication Networks / ELEC3443 Computer Networks

Written Assignment 1

Q1. Consider the network illustrated below. Assume the two hosts on the left of the figure start transmitting packets of 1500 bytes at the same time towards Router B. Suppose the link rates between the hosts and Router A is 4-Mbps. One link has a 6-ms propagation delay and the other has a 2-ms propagation delay. Will queuing delay occur at Router A?



Q2. Consider distributing a file of $F = 15$ Gbits to N peers. The server has an upload rate of $u_s = 30$ Mbps, and each peer has a download rate of $d_i = 2$ Mbps and an upload rate of u . For $N = 10, 100$, and $1,000$ and $u = 300$ Kbps, 700 Kbps, and 2 Mbps, fill in the charts below to show the **minimum distribution time** for each of the combinations of N and u for both client-server distribution and P2P distribution.

Client-server model

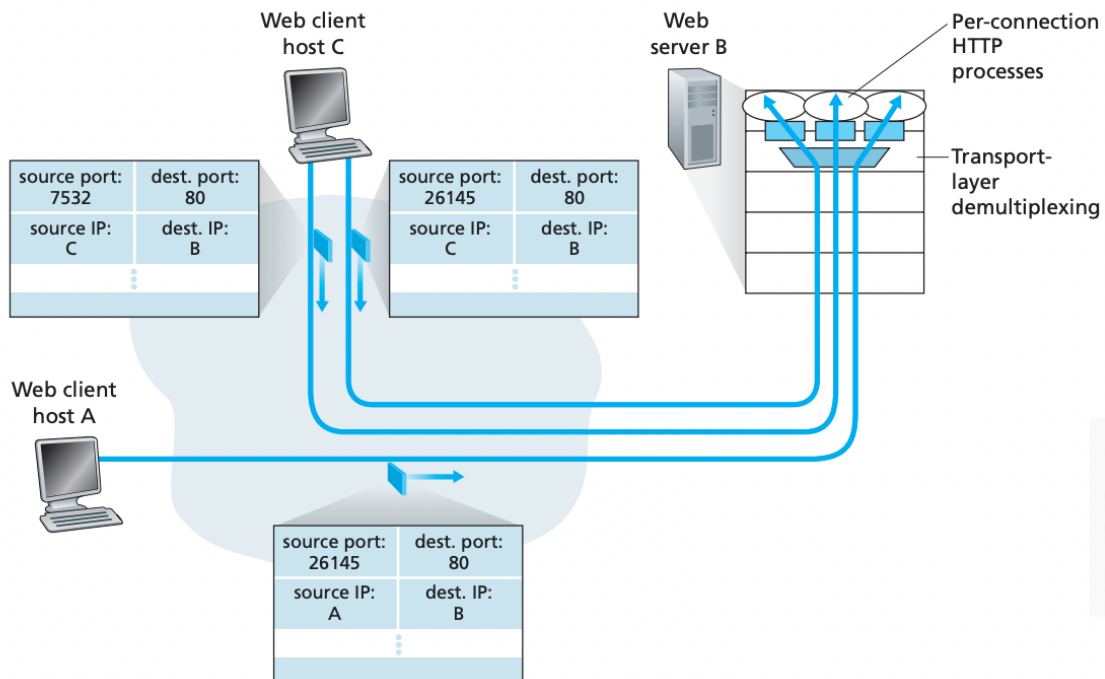
	$N=10$	$N=100$	$N=1000$
$u = 300$ Kbps			
$u = 700$ Kbps			
$u = 2$ Mbps			

P2P distribution

	$N=10$	$N=100$	$N=1000$
$u = 300$ Kbps			
$u = 700$ Kbps			
$u = 2$ Mbps			

Q3. Consider the figure below.

- What are the source and destination port values in the segments flowing from the server back to the clients' processes?
- What are the IP addresses in the network-layer datagrams carrying the transport-layer segments? (Suppose the IP addresses of the hosts A, B, and C are a, b, c, respectively, where a, b, c are distinct.)



Q4. Consider the GBN protocol with a sender window size of 4 and a sequence number range of 1,024. Suppose that at time t , the next in-order packet that the receiver is expecting has a sequence number of k . Assume that the medium does not reorder messages. Answer the following questions:

- What are the possible sets of sequence numbers inside the sender's window at time t ? Justify your answer.
- What are all possible values of the ACK field in all possible messages currently propagating back to the sender at time t ? Justify your answer.

Q5. Suppose Host A and Host B use a GBN protocol with window size $N = 3$ and a long-enough range of sequence numbers. Assume Host A sends six application messages to Host B and that all messages are correctly received, except for the first acknowledgment and the fifth data segment. Draw a timing diagram (similar to the Figure below), showing the data segments and the acknowledgments sent along with the corresponding sequence and acknowledge numbers, respectively.

