

Computer Network – Practice

1. (3-P18) Consider the GBN protocol with a sender window of size of 3 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 channel does not reorder messages. Answer the following questions:

- a. What are the possible sets of sequence numbers inside the sender's window at time t ? Justify your answer.

Receiver expects k , so last 3 ACKs are $k-1$, $k-2$, $k-3$. If none of these ACKs are received by the sender, then the window of sender is $(k-3, k-2, k-1)$. ACK $k-4$ must be received by sender because if it isn't, packet $k-1$ would not be sent. If all these ACKs are received by the sender, then the window of sender is $(k, k+1, k+2)$. So all possible sets of window are: $(k-3, k-2, k-1)$, $(k-2, k-1, k)$, $(k-1, k, k+1)$, $(k, k+1, k+2)$

- b. 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.

By the same argument in (a), we know they are $k-1$, $k-2$, $k-3$.

2. (3-P24) Host A and Host B are communicating over a TCP connection, and Host B has already received from A all bytes up through byte 358. Suppose Host A then sends two segments to Host B back-to-back. The first and second segments contain 50 and 80 bytes of data, respectively. In the first segment, the sequence number is 359, the source port number is 1028, and the destination port number is 80. Host B sends an acknowledgment whenever it receives a segment from Host A.

- a. In the second segment sent from Host A to B, what are the sequence number, source port number, and destination port number?

The sequence number is 409, the source port number is 1028, and the destination port number is 80

- b. If the first segment arrives before the second segment, in the acknowledgement of the first arriving segment, what is the

acknowledgement number, the source port number and the destination port number?

The acknowledgement number is 409, the source port number is 80, and the destination port number is 1028

- c. If the second segment arrives before the first segment, in the acknowledgment of the first arriving segment, what is the acknowledgment number?

The acknowledgement number is 359, the source port number is 80, and the destination port number is 1028

3. (3-P36) Consider sending a large file from a host to another over a TCP connection that has no loss.

- a. Suppose TCP uses AIMD for its congestion control without slow start. Assuming CongWin increases by 1 MSS every time a batch of ACKs is received and assuming approximately constant round-trip times, how long does it take for CongWin to increase from 1 MSS to 8 MSS (assuming no loss events)?

7RTT

- b. What is the average throughput (in terms of MSS and RTT) for this connection up through time = 7 RTT?

28MSS/7RTT

4. (4-P7) Consider a router with a switch fabric, 2 input ports (A and B) and 2 output ports (C and D). Suppose the switch fabric operates at 1.5 times the line speed.

- a. If, for some reason, all packets from A are destined to D, and all packets from B are destined to C, can a switch fabric be designed so that there is no input port queuing? Explain why or why not in one sentence.

Yes. Use crossbar fabric let A->D, B->C operate at line speed simultaneously.

- b. Suppose now packets from A and B are randomly destined to both C and D. Can a switch fabric be designed so that there is no input port queuing? Explain why or why not in one sentence

No. If A and B both send to C, we'll have input port queuing no matter which switch fabric is used.

5. (4-P14) Consider a subnet with prefix 101.101.101.64/26. Give an example of one IP address (of the form xxx.xxx.xxx.xxx) that can be assigned to this network. Suppose an ISP owns the block of addresses of the form 101.101.128/17. Suppose it wants to create four subnets from this block, with each block having the same number of IP addresses. What are the prefixes (of form a.b.c.d/x) for the four subnets?

101.101.101.65

101.101.128/19, 101.101.160/19, 101.101.192/19, 101.101.224/19

6. (4-P17) Suppose datagrams are limited to 1,500 bytes (including header) between source Host A and destination Host B. Assuming a 20-byte IP header, how many datagrams would be required to send an MP3 consisting of 3 million bytes?

UDP header = 8 bytes

$1500 - 20 - 8 = 1472$ bytes

$3000000 / 1472 = 2038.04$

Need 2039 datagrams

7. (4-P24) Consider the network shown below, and assume that each node initially knows the costs to each of its neighbors. Consider the distance-vector algorithm and show the distance table entries at node z.

		To				
		U	V	X	Y	Z
From	V	2	0	7	7	5
	X	9	7	0	1	2
	Y	9	7	1	0	3
	Z	7	5	2	3	0

