

Computer Networks Question Set 1

September 2007

1. (5 points) A network in the Internet has the classless IP address 190.24.1.0/30.
 - a. The subnet mask for this network is _____.
 - b. The network address of this network is _____.
 - c. The broadcast address of this network is _____.
 - d. The maximum number of host IPs in this network is _____.
 - e. The maximum number of host IPs in 190.24.1.0/29 is _____.

2. (12 points) Bob plans to run a Web server on a computer at home after getting a Westell DSL modem (also called an ADSL transceiver) from Cincinnati Bell. This modem is NAT enabled and has a DSL jack to connect to the phone line and a LAN jack for the “inside”. In order to allow other computers to go online, Bob connects the WAN (“outside”) connector of a Linksys NAT router to the LAN jack of the Westell and the computer to one of the LAN connectors of the Linksys. The inside local addresses served by the Linksys are limited to 192.168.1/24 and those served by the Westell are in the range of 192.168.200/24. Cincinnati Bell provides a persistent global IP for the subscription and that is 71.72.218.55. Bob configures the Linksys’s WAN address to be 192.168.200.101 and server computer’s 192.168.1.3. Bob would like to run his Web server at TCP port 80 on the local computer but make it accessible from the Internet as <http://71.72.218.55:9008>. How would Bob configure the address translation (port forwarding) tables of the Westell and the Linksys to make this work? (Notice that Bob only needs to specify the inbound translations.)

3. (12 points) There is a 16-bit checksum field in the IP header. Answer the following questions about the IP checksum.
 - a. What does the checksum cover, the header or the whole packet?
 - b. How is the checksum computed?
 - c. Who checks the checksum, the routers or the destination host or both?
 - d. What happens when the checksum is incorrect?

4. (12 points) What are the purposes of the following timers in TCP?
 - a. Connection establishment timer
 - b. Retransmission timer
 - c. Persistence timer
 - d. Keepalive timer
 - e. Delayed acknowledgment timer
 - f. TIME_WAIT timer

5. (9 points) The congestion control mechanism of TCP-Reno is often described as AIMD (additive increase, multiplicative decrease). Describe this mechanism.

Computer Networks, Question Set 2

1 . (5 pt) Consider the queuing delay in a router buffer (in the outbound link). Suppose all packets are L bits, the transmission rate is R bps, and that N packets simultaneously arrive at the buffer every LN/R seconds. Find the average of the queuing delay.

2 . (15 pt) Consider sending a large file of F bits from host A to host B . There are $k + 1$ links (that is, k switches) between A and B , and there are no queuing delays. Host A segments the file into segments of S bits each and adds 40 bytes of header to each segment, forming segments of length $L=320+S$ bits. Each link has a propagation rate of R bps. Find the value of S that minimizes the delay of moving the file from host A to host B . Disregard propagation delay.

3 . (15 pt) Consider a communication between two hosts, which are connected via a channel of 1Gbps. The round trip time is 30ms. The hosts use a packet size of 1200 bytes for the data plus 50 bytes for the header. As soon as the last byte of a packet has been received, the receiver will send back an acknowledgment inside a header. How large must the window size of the receiver be so that the channel between the sender and receiver is busy 50% of the time?

4 . (15 pt) Assume that 1010111 is the block of data which is going to be transmitted by using the CRC error checking method via the generator 10010. Find the bit pattern which the transmitter will send.

Points: 50