CSE 524 (Fall 2004): Midterm Exam

NAME (please print): _____

1. DNS
   a. (5 pts) Each Internet host has at least one local name server and one authoritative name server. What role does each of these servers have in DNS?

   b. (5 pts) The administrator of a large web server farm decides to perform load balancing by taking the NCSA DNS approach of giving out names based on the load of servers in the farm, but reducing the TTL of replies to milliseconds. Explain how such an approach might negatively impact the latency and throughput of web transfers to the server farm.

   c. (10 pts) Explain the difference between an A record, an NS record, and an MX record in DNS.

2. Web servers
   a. (5 pts) What is the motivation behind the Host: request header in HTTP?

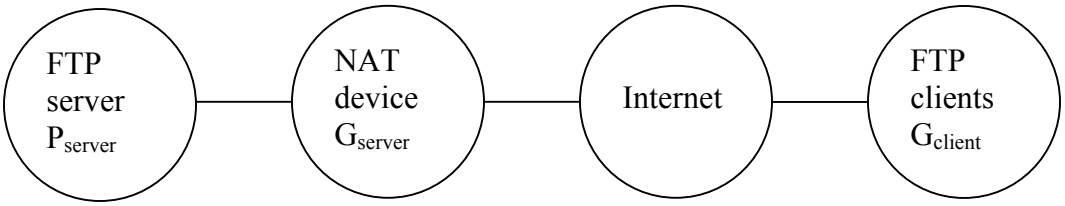
   b. (5 pts) List one advantage and one disadvantage of using a single, pipelined, persistent HTTP 1.1 connection versus parallel HTTP 1.0 connections

   c. (5 pts) List one advantage and one disadvantage of layer 5 (URL-based) load balancing versus load balancing based on server load.

   d. (5 pts) List one advantage and one disadvantage of layer 3, source IP-based load balancing versus load balancing based on server load.

3. FTP

Consider a NAT device with a globally addressable IP address of G_{server}, that sits in front of an FTP server with a private IP address of P_{server}. In this setup, the NAT device sends all incoming packets from the Internet to the FTP server after translating the destination IP field from G_{server} to P_{server}. In addition, it forwards all packets destined for the Internet from the FTP server after translating the source IP address from P_{server} to G_{server}. It does not modify port numbers in either direction.



a. (10 pts) Can this FTP server support normal mode transfers for clients with globally addressable IP addresses? If not, what modifications to the FTP protocol payload must the NAT make to support normal mode transfers?

b. (10 pts) Can this FTP server support passive mode transfers for clients with globally addressable IP addresses? If not, what modifications to the FTP protocol payload must the NAT make to support passive mode transfers.

4. Transport layer
   a. (5 pts) Explain the difference at the receiver between Go-Back-N and Selective Repeat

   b. (5 pts) Explain the mechanism TCP uses to implement flow control

   c. (5 pts) Explain how Jacobson modified the RTO estimator of TCP to be more accurate.

   d. (5 pts) Explain how Karn modified the RTT estimator of TCP to be more accurate.

5. TCP congestion control
   For the following question, assume that a TCP Tahoe stack is being used with an initial cwnd of 1 and with delayed acknowledgements disabled. Consider an application connection that needs to transfer 18 segments worth of data.

   a. (5 pts) Assuming no loss in the first 7 segments of the transfer, what is the value of cwnd after the 7th acknowledgement is received?

   b. (5 pts) Which segments are transmitted upon the receipt of the 7th acknowledgement?

   c. (5 pts) Assuming the 8th segment sent is lost, but no subsequent packets are lost. What is the value of cwnd at the end of the connection when all 18 application segments have been acknowledged? For this question, assume the acknowledgement for the retransmitted segment does **not** clock an increase in cwnd.

   d. (5 pts) What effect will halving the RTT of the connection have on the overall transfer time?