

Department of Computer Science and Engineering, National Sun Yat-sen University
Second Semester of 2003 Ph.D. Qualifying Exam: Computer Networks

1. Video applications typically run over UDP rather than TCP because they cannot tolerate retransmission delays. However, this means video applications are not constrained by TCP's congestion-control algorithm. What impact does this have on TCP traffic? Be specific about the consequences. Fortunately, these video applications often use RTP, which results in RTCP "receiver reports" being sent from the sink back to the source. These reports are sent periodically (e.g., once a second) and include the percentage of packets successfully received in the last reporting period. Describe how the source might use this information to adjust its rate in a TCP-compatible way. (12%)
2. What is the relationship between a domain name (i.e., cse.nsysu.edu.tw) and an IP subnet number (e.g., 140.117.168.0)? Do all hosts on the subnet have to be identified by the same name server? What about reverse lookup? (12%)
3. Suppose the filter-based firewall is used to block all incoming Telnet connections, but to allow outbound Telnet connections. One approach would be to block all inbound packets to the designated Telnet port (23).
 - (a) We might want to block inbound packets to other ports as well, but what inbound TCP connections must be permitted in order not to interfere with outbound Telnet? (10%)
 - (b) Now suppose your firewall is allowed to use the TCP header *Flags* bits in addition to the port numbers. Explain how you can achieve the desired Telnet effect here while at the same time allowing no inbound TCP connections. (10%)
4. Suppose the Ethernet transmission algorithm is modified as follows: After each successful transmission attempt, a host waits one or two slot times before attempting to transmit again, and otherwise backs off the usual way.
 - (a) Show how the strategy above can now lead to a pair of hosts capturing the Ethernet, alternating transmissions, and locking out a third. (10%)
 - (b) Propose an alternative approach, for example, by modifying the exponential backoff. What aspects of a station's history might be used as parameters to the modified backoff? (10%)
5. IP current uses 32-bit addresses. If we could redesign IP to use the 6-byte MAC address instead of the 32-bit address, would we be able to eliminate the need for ARP? Explain why or why not. (10%)
6. (a) The 4.3BSD Tahoe release only performed slow start if the destination was on a different network. How do you think "different network" was determined? (b) Why does TCP need persist timer? (c) What is the silly window syndrome? (10%)
7. Why does interactive data flow deteriorate the TCP performance? How can you improve the TCP performance? (8%)

8. Congestion avoidance and slow start are independent algorithms with different objectives. In practice they are implemented together. Please describe when we are doing congestion avoidance and when we are doing slow start. (8%)