

# Homework Assignment #3 - Due Nov 6 @ 3:50 PM

EE122: Introduction to Communication Networks

Fall 2006

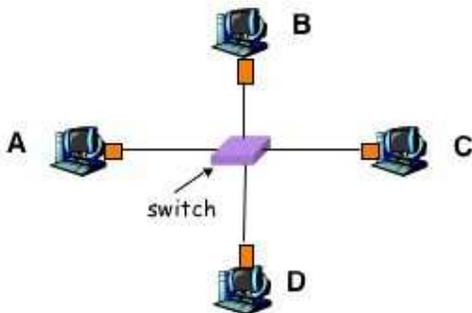
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1. Peterson & Davie, Exercises 2.4, 2.6, 2.21, 2.44, 3.13, 4.13, 4.14, 4.15, 4.17, 4.20, 4.31
  
2. Suppose two nodes,  $A$  and  $B$ , are attached to opposite ends of a 900 m cable, and that they each have one frame of 125 bytes (including all headers and preambles) to send to each other. Both nodes attempt to transmit at time  $t=0$ . Suppose there are four repeaters between  $A$  and  $B$ , each inserting a 20-bit delay. Assume the transmission rate is 10 Mbps, and CSMA/CD with backoff intervals of multiples of 512 bits is used. After the first collision,  $A$  draws  $K=0$  and  $B$  draws  $K=1$  in the exponential backoff protocol. Ignore the jam signal and the inter-delay prior to sending (which we only briefly talked about in lecture).
  - (a) What is the one-way propagation delay (including repeater delays) between  $A$  and  $B$  in seconds? Assume that the signal propagation speed is  $2 \cdot 10^8$  m/sec.
  - (b) At what time (in seconds) is  $A$ 's packet completely delivered to  $B$ ?
  - (c) Now suppose that only  $A$  has a packet to send and that the repeaters are replaced with bridges. Suppose that each bridge has a 20-bit processing delay in addition to a store-and-forward delay. (The bridge does not use cut-through forwarding.) At what time, in seconds, is  $A$ 's packet delivered at  $B$ ?

3. Connect to *amazon.com* using Telnet or a Web browser. Fetch the home page by requesting “/” as the resource, and record the session including its contents using *tcpdump -s 0*.
- What headers does the Amazon web server return, and what cookies does it set?
  - How large is the item returned for the home page?
  - Which of the headers is described in RFC 1945, and for those what is their meaning?
  - Which of the headers is described in RFC 2616, and for those what is their meaning? (For ones whose meaning is the same as in RFC 1945, you can simply note this fact.)
  - For the ones that are not described, for which can you use a search engine to find a page describing their likely meaning? Give the URL of the page and the explanation of the given header field you saw.
  - For the remaining headers (if any), what do you imagine is their likely meaning?
  - How do the headers change if you use HTTP 1.0 vs. HTTP 1.1? (You may need to use Telnet to issue requests with the different versions, rather than your browser, since most browsers don't allow you to choose between HTTP 1.0 and 1.1.)

4. The figure shows four nodes — *A*, *B*, *C* and *D* — connected via a switch.



Suppose the switch has a forwarding table that can hold 10 entries, and when it needs to add a new entry it evicts the oldest entry to make room. Assume *A* has been compromised by an attacker, after which *B* starts communicating with *C*. Suppose *B* sends 10 frames to *C* every second at a steady rate, and whenever *C* receives two of these frames, it sends a single frame in response (so it sends 5 frames every second, at a steady rate). No frames are lost or corrupted.

- On how much of *B*'s communication with *C* can *A* eavesdrop (i.e., it is able to see the traffic)? Explain why. Consider both directions of the communication, and assume the switch starts with an empty forwarding table.

- (b) If  $A$  is able to reprogram the MAC address of its NIC, how can it use this to eavesdrop on more traffic? What must it do to maximize the amount of traffic it can see, and what proportion of the total communication between  $B$  and  $C$  does that amount to?
- (c) Suppose instead  $A$  wishes to disrupt the communication between  $B$  and  $C$ . If it can reprogram the NIC's MAC address, how could  $A$  do this? How many frames must it send?

### **Submission Instructions:**

1. Make sure you are registered with the EECS instructional account system (different from registration for the class). You would have been prompted to register the first time you logged in to your instructional account. You can check your registration status by running the command **check-register**. If you find yourself not registered, run the command **register**.
2. Log in to your instructional account.
3. Create a directory called "hw3" : **mkdir hw3**
4. Change to that directory: **cd hw3**
5. Copy all the files that you wish to submit to this directory.
6. Run the submit program: **submit hw3**
7. Make sure that no error messages are displayed. If some error occurs, retry. If it still occurs, contact the TAs.