Homework Assignment #1 - Due Sept 21 @ 3:50 PM

EE122: Introduction to Communication Networks

(Fall 2007)

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Turn in via email to **jortiz@cs.berkeley.edu** (Jorge Ortiz). Latex submissions preferred (including source), other format (i.e. Word doc, text) also accepted.

1. **Kurose & Ross**
   Chapter 1, p. 71: P8, P18, and P24.
   Chapter 4, p. 422: P11, P14, and P16.

   For Chapter 4 problem P16, the question "What are their characteristics?" means to describe the structure of the fragmented packets (i.e. How many bytes? What field values are set? etc.)

2. **File Transfer**

   Calculate the total time to transmit a 1500 KB file over a link in the following cases, assuming the one way delay in either direction is 40ms, and an initial RTT of "handshaking" before any data is sent. (Note: 1 KB = 2^{10} bytes, 1 Mbps = 10^6 bits/s).

   (a) The bandwidth is 1 Mbps, the packet size including the header is 1 KB of which the header is 40 bytes, and the data packets are sent continuously and never lost.

   (b) Same as (1), but after we finish transmitting a packet we must wait for one RTT before transmitting the next packet.

   (c) Same as (1), but the link bandwidth is "infinite" (the transmission time is assumed to be zero). We start by sending one packet in the first RTT (2^0), during the second RTT we send two (2^1) packets, during the third RTT we send four (2^2), and so on. (Any idea why we might want to do something like this?)

3. **Ping**

The ping program determines the round-trip-time (RTT) to any host on the Internet. Using a computer on campus, ping the following hosts: mit.edu (Cambridge, MA), cornell.edu (Ithaca, NY), princeton.edu (Princeton, NJ), cmu.edu (Pittsburgh, PA), wisc.edu (Madison, WI), uchicago.edu (Chicago, IL), utexas.edu (Austin, TX), utah.edu (Salt Lake City, UT). For each of these locations find the physical distance from Berkeley using google maps (maps.google.com).

(a) Plot a graph (using your favorite plotting program like gnuplot or excel) where the X-axis represents the distance to each city, and the Y-axis represents the ratio between the RTT as measured by the ping program and the shortest possible time T along the driving route returned by Google maps.

(b) Give two reasons why the Y-values you plot are larger than 2.

4. **RFCs**

The Request for Comments (RFC) documents define and standardize the bulk of the protocols used in the Internet. They are published on behalf of the Internet Engineering Task Force (IETF), which forms the main standards body of the Internet. If you want to understand a protocol in full detail (especially to write your own implementation of it), these are the documents to refer to.

(a) In Bellovin's April Fool's RFC, he describes a method for identifying malicious packets in the network and the actions that a system should take if this packet type is identified.

Search http://rfc-editor.org to locate this document

Once you find the document, read it and answering the following:

i. How many IP header bits does the mechanism require?

ii. How does an end-system react to the settings?

(b) A great strength of the IP protocol is how it provides the "glue" to communicate data over a series of widely varying, lower-layer network ("link") technologies. Using http://rfc-editor.org (or whatever search means you want to use, providing you work by yourself), locate RFCs that refer to transmitting IP over <XXXX>, where <XXXX> is some link technology. For example, RFC 201 is "Transmitting IP traffic over ARCNET networks".

List all the different lower-layer networking technologies for which you can find an RFC whose title indicates it defines how to send IP packets (or datagrams, or traffic) over that technology. Give both the name of the technology and the RFC defining the transmission. Can you find more than 20?