CSEE-5110: HW quiz 4, Oct 8, 2015

1. (10 points total)

   (a) (5 points) Suppose you want to implement fast-forward and reverse for MPEG streams. What problems do you run into if you limit your mechanism to displaying I frames only?

   You are limited to arrival rate of the I frames

   (b) (5 points) Which combination of MPEG frames is best for transmission over a network experiencing high loss:

   A. IBBBBPBBBBI . . . or **B.** IBPBIBPIBPI . . .

   answer is A

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2. (10 points total)
   Suppose you have the following IPv4 address 28.15.43.11

   (a) (5 points) Give the big-endian binary representation of this address.

be 00011100 00001111 00101011 00001011

(b) (5 points) Give the little-endian binary representation of this address.
le 00001011 00101011 00001111 00011100

3. (10 points total)
Let $p = 0.4$ be the fraction of machines in a network that are big endian; the remaining $1 - p$ fraction are little-endian. Suppose we choose two machines at random and send an `int` from one to the other.

   (a) (5 points) Give the average number of byte-order conversions needed for big-endian network byte order.

$$0 \times 0.4^2 + 1 \times 2(0.4 \times 0.6) + 2 \times 0.6^2 = 0 + 0.48 + 0.72 = 1.2$$

   (b) (5 points) Give the average number of byte-order conversions needed for receiver-makes-right network byte order.

$$0 \times 0.4^2 + 1 \times 2(0.6 \times 0.4) + 0 \times 0.6^2 = 0 + 0.48 + 0 = 0.48$$

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4. (10 points total)

   (a) (5 points) Assume the letter a occurs 60% of the time, b occurs 20% of the time , and c and d each occurs 10% of the time. Give an encoding of each letter as a bit string that provides optimal compression. (Hint: construct a Huffman code) $a = 1$, $b = 01$, $c = 001$, $d = 000$
   or $a = 0$, $b = 10$, $c = 110$, $d = 111$
   or $a = 1$, $b = 00$, $c = 011$, $d = 010$
   or $a = 0$, $b = 11$, $c = 100$, $d = 101$
   Depending on how you connect the tree and how the leaves are labeled, the code may be different. However, if constructed correctly, the code will be a prefix code and the mean length of the code will always be the same in each case.

   (b) (5 points) What is the percentage of compression you achieve above?

0.6*1 + 0.2*2 + 0.1*3 + 0.1*3 = 1.6
(1 - (1.6/2))*100 = 20%