

Homework 3

*Assigned: Oct. 15, 2015**Due: Oct. 22, 2015*

1. (10') What are the challenges of implementing power line communications? How does HomePlug AV achieve the high speed transmission over power lines and provide QoS support for data streams?
2. (10') Suppose that the bits to be sent are
0 1 1 0 1 0 1 1 0 1 1 1 0 0 0 1 1 1 0 0 0 1 0 1 1 0.
What is the code word if Hamming code is used as the method for Forward Error Correction? Assume that bit 17 in the code word is flipped during transmission, how does the receiver correct the error? Show the process.
3. (10') In HomePlug AV, if two logical AVLNs are neighbors, how do they avoid interference with each other?
4. (10') Two methods can be used to decode the convolutional codes. We covered the Viterbi decoding in class. Read the document and find the another decoding method — Sequential Decoding by Fano algorithm, which uses a threshold value to determine when it has to turn back (backtrack). What is the problem if the threshold value is too high? What is the problem if the threshold value is too low? We do not have a threshold problem in the Viterbi decoding. Why?
5. (20') Use the shift registers on slide 4 to encode the input 0 1 0 1 1 0 0 1.
 - a) What is the output?
 - b) If we use the 2/3 puncturing matrix on slide 49 of PLC, what is the output?
 - c) Assume the 4-th bit in the output of b) is flipped. Will the decoder be able to figure out the original input? Show the process.