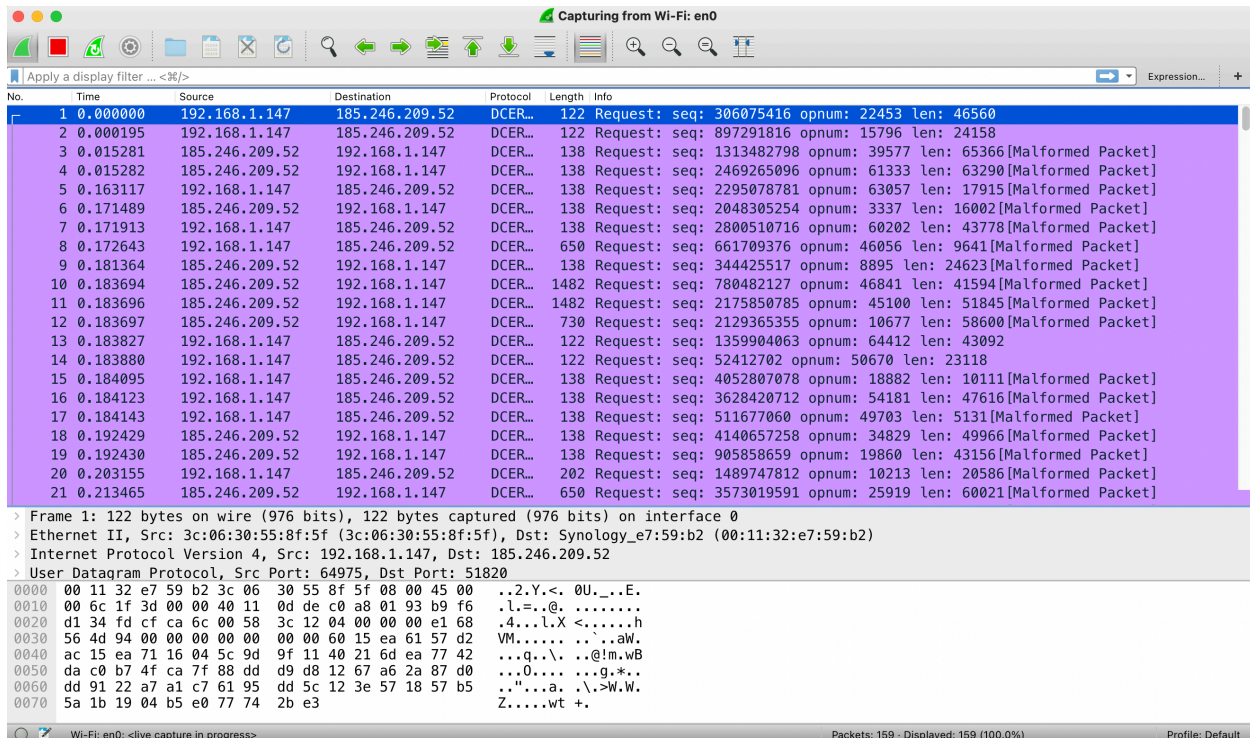# Homework 2 Solutions

Problem 1:

Problem 2:

Apparently, the first proposal for spread spectrum was for the control of torpedoes. Heddy Lamarr, better known as an actress, and George Antheil, a composer, proposed it to the US Navy who found it too cumbersome and did not trust its reliability. Spread spectrum was used as an anti-jamming ploy. Lamarr contributed the idea of the spread spectrum whereas Antheil used his experience in mechanical music for the design of the necessary clock work. A patent was given for the invention in 1942.

This Month in Physics, June 2011, AMERICAN PHYSICAL SOCIETY

Problem 3:

According to the Shannon formula, the maximum data rate is
$$8000 \times \log_2(500 + 1) = 71749$$
bits per second.

Problem 4:

A million characters corresponds to 8×10^6 bits. It takes

$$\frac{8 \times 10^6}{2 \times 10^3} \text{ sec } = 4 \times 10^3 \text{ sec} = 66.667 \text{ min}$$

or an hour and 6 minutes and 40 seconds.