Homework 4 Solutions

Problem 1:

(a) The bytes ("A1", "B2", …) appear on the wire in order, but the bits in each byte appear in reverse order:

Hex component	In binary	In binary reversed
A1	1010 0000	0000 0101
B2	1011 0010	0100 1101
C3	1100 0011	1100 0011
D4	1101 0100	0010 1011
E5	1110 0101	1010 0111
F6	1111 0110	0110 1111

Therefore, the address on the wire is :

```
0000 0101 0100 1101 1100 0011 0010 1011 1010 0111 0110 1111
```

(b) The smallest payload length is 48B and the header/footer has 18B. The overhead is 18B/48B = 37.5%. Another way to calculate the overhead is 18B/(48B+18B) = 27.3%.

(c) The frame size is 1000B = 8000b. A frame is put on the wire for $\frac{8000 \text{ b}}{10^9 \text{ b/sec}} = 8 \times 10^{-6}$ sec or 8 μsec. A noise of 10 msec can therefore destroy up to x frames, where

$$x \cdot 8 \ \mu\text{sec} = 10 \text{ msec}.$$

This gives $x = 1250$. Up to 1250 frames can be destroyed.

(d) The minimum ethernet package payload is 48B. Therefore, 8B padding have to be added to the payload.

Problem 2:

```
88 42 30 00 38 f9 d3 90   56 5a 64 a5 c3 69 52 4d
64 a5 c3 5e ac 95 30 ca   00 00 9b aa 00 20 56 00
00 00 c2 99 19 cd bf 61   68 9f 82 f0 08 f3 66 63
```

Each byte in the hex-dump corresponds to two hex digits. Thus, the first two bytes of the frame are frame control. We expand them into binary:

```
1000 1000 0100 0010
```

and then reverse each byte

```
0001 0001 0100 0010
```

The first two bits are the version (00), the second two bits are the type (01), which incidentally is a data frame, and the next four bits is the subtype. The next byte contains flags. The one that interests us are the first two bits (01), which means To DS is zero and From DS is one. This package come from the distribution system and goes to a recipient in the BSS. The only other flag set is the Protected Flag. The next two bytes `30 00` are the duration field. After reversing the bits, we get `0000 1100 0000 0000`, which incidentally gives us a duration of 48 microseconds.

According to the DS fields, we can now interpret the addresses: 38:f9:d3:90 is the receiver, 64:a5:c3:69:52 is the access point (a.k.a. transmitter), and 64:a5:c3:5e:ac:95 is the sender, i.e. the router. You might notice that receiver and access point are manufactured by Apple.