# COMP4097 Mobile Computing
# Assignment 2

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November 20, 2019

**1. a)** As the hamming code (7 4) requires a message length of 4, we split it into 2 parts: 1000 and 1010.

The first part (assuming the pattern M7 M6 M5 P4 M3 P2 P1) is:

1 0 0 _ 0 _ _
*P1:* _001 $\rightarrow 0+0+1=1$ (*odd*) $\rightarrow$ 1001
1 0 0 _ 0 _ 1
*P2:* _001 $\rightarrow 0+0+1=1$ (*odd*) $\rightarrow$ 1001
1 0 0 _ 0 1 1
*P4:* _101 $\rightarrow 1+0+1=2$ (*even*) $\rightarrow$ 0101
1 0 0 0 0 1 1

The second part is:

1 0 1 _ 0 _ _
*P1:* _001 $\rightarrow 0+1+1=2$ (*even*) $\rightarrow$ 0011
1 0 1 _ 0 _ 0
*P2:* _001 $\rightarrow 0+0+1=1$ (*odd*) $\rightarrow$ 1001
1 0 1 _ 0 1 0
*P4:* _101 $\rightarrow 1+0+1=2$ (*even*) $\rightarrow$ 0101
1 0 1 0 0 1 0

So the message transmitted to Station B will be 1001011 1010010

**1. b)** We receive 2 messages: 1011011 and 1011010.

For the first message we check all parity bits:
P1: 1011 $\rightarrow 1+0+1+1=3$ ✗
P2: 1001 $\rightarrow 1+0+0+1=2$ ✓
P4: 1101 $\rightarrow 1+1+0+1=3$ ✗

Correcting the message with P1 + P4 = 5 to 1001011.

We check the parity bits in the second message:
P1: 0011 $\rightarrow 0+0+1+1=2$ ✓
P2: 1001 $\rightarrow 1+0+0+1=2$ ✓
P4: 1101 $\rightarrow 1+1+0+1=3$ ✗
Correcting the message with P4 = 4 to 1010010.

**1. c)** We again receive 2 messages after the spike: 1100111 and 1011010.

The first message check results in:
P1: 1101 $\rightarrow 1+1+0+1=3$ ✗
P2: 1111 $\rightarrow 1+1+1+1=4$ ✓
P4: 0011 $\rightarrow 0+0+1+1=2$ ✓
Correcting the message with P1 = 1 to 1100110.

The second message check:
P1: 0011 $\rightarrow 0+0+1+1=2$ ✓
P2: 1001 $\rightarrow 1+0+0+1=2$ ✓
P4: 1101 $\rightarrow 1+1+0+1=3$ ✗
Correcting the message with P4 = 4 to 1010010.

The channel seems to be quite unreliable but we manage to fix all errors thanks to the hamming code encoding.

**2. a)** The equation for calculating the rate can be summarized as:

$$\frac{\text{payload bytes} * 8 * 1000}{\# \text{ slots} * 0.625 * 1000}$$

An ACL Link (Asynchronous Connection-Less) using DM5 and maximum number of bytes can achieve a rate of $\frac{224*8*1000}{5*0.625*1000} \approx 477.8kb/s$ as indicated in the table under asymmetric rate.

The reverse connection rate uses DM1 so we adjust the number of payload bytes to 17 and and number of slots to 1 so we get $\frac{17*8*1000}{1*0.625*1000} \approx 108.8kb/s$.

**2. b)** $2Mb = 2000kb$ so with a transfer speed of $477.8kbps$ we can transfer the image in $\approx 4.1s$.

**2. c)** Since the high quality stream requires a minimum transfer speed of $256kbps$, which is below our theoretical maximum of $477.8kbps$, the connection will be stable.

The "professional" grade mp3 transfer requires $512kbps$ transfer rate, which exceeds our limits. Certain packets will therefore come delayed or not at all which will result in stuttering in the audio.

**2. d)** An SCO HV3 link only supports a maximum connection speed of $64kbps$, which is way below our limit. Most packets will not arrive at the slave on time or at all and will be dropped. The listening experience will be drastically diminished.

**3. a)** Given the frequency reuse of 7 and a semi-random distribution of the initial cell frequencies (2-4-6-3-5-7) we construct a hexagonal latice as shown in figure 1.

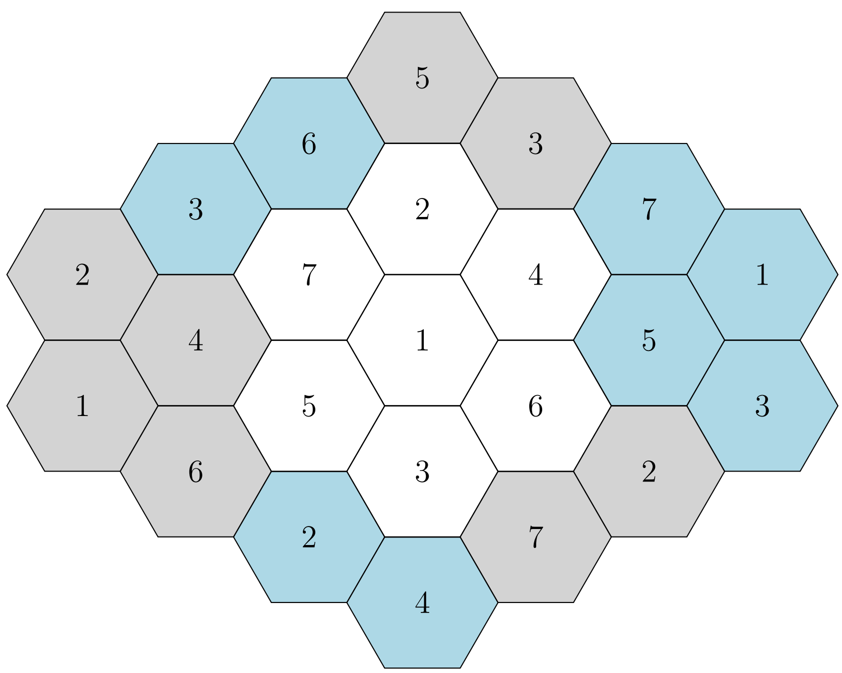


Figure 1: Suggested cell layout using frequency reuse of 7

The cell area can be calculated as $1.5\sqrt{3}R^2$. Since our radius is 1km for each cell, one cell covers the surface of $\approx 2.6km^2$. Our are consists of 23 segments which totals an area of $\approx 59.8km^2$.

**3. b)**