Template Week 1 – Bits & Bytes

Student number: 529471

Assignment 1.1: Bits & Bytes intro

What are Bits & Bytes?

A bit is a binary digit, which is a single place or a symbol in a binary number. Each bit can either be 1 or 0.

Eight bits together in a set is called a byte.

What is a nibble?

A nibble is half a byte (4-bits), sometimes spelled nybble or nyble.

What relationship does a nibble have with a hexadecimal value?

A nibble is 4-bits, and it can represent 16 different values since $2^4 = 16$, and hexadecimal number system is base-16. Therefore, a nibble represents one hexadecimal digit.

Why is it wise to display binary data as hexadecimal values?

Yes, as the conversion of a hexadecimal value to binary is much more straightforward than the conversion of a decimal number to binary.

What kind of relationship does a byte have with a hexadecimal value?

A byte (8-bits) is two nibbles (4-bits), therefore it represents 2 hexadecimal digits.

An IPv4 subnet is 32-bit, show with a calculation why this is the case.

IPv4 addresses are structured as a series of 4 octets (groups of 8 bits each). Each octet is a value between 0 and 255, that's why it can be represented by 8 bits since $2^8 = 256$. If we multiply the bits per octet by the total number of octets, we get 32 bits in total as shown in the calculation below.

8(bits per octet) x 4(octets) = 32 bits

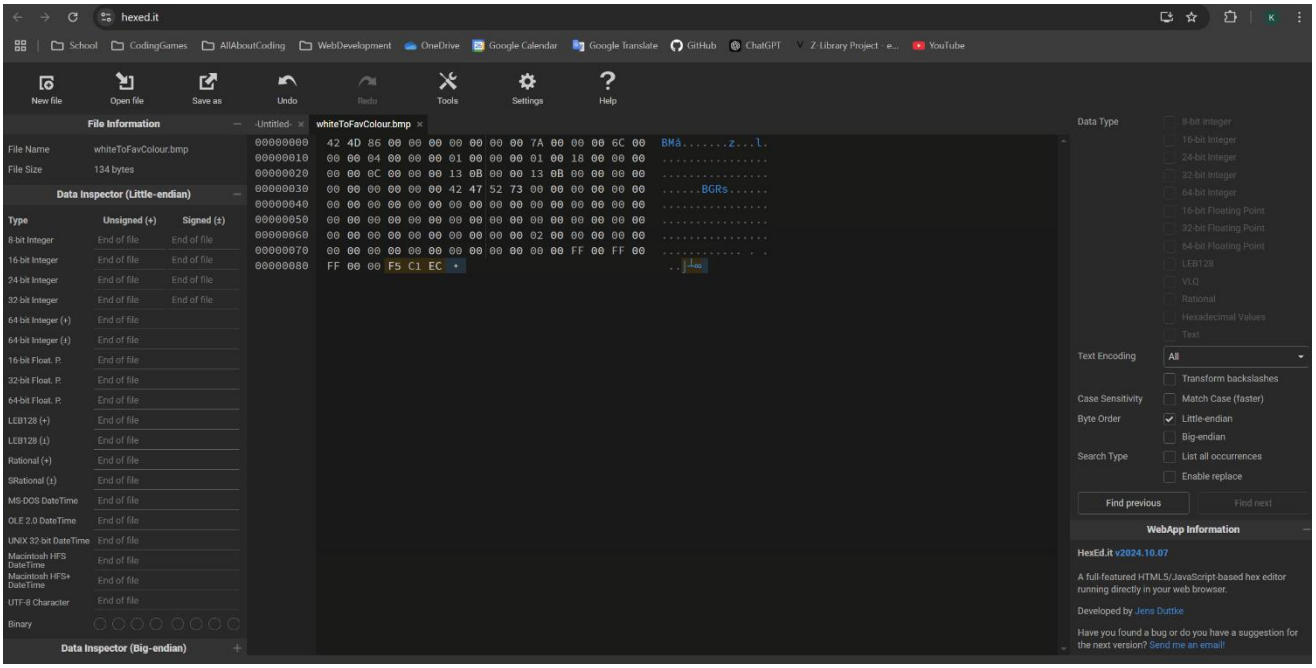
Assignment 1.2: Your favourite colour

Hexadecimal colour code: #F5C1EC

Assignment 1.3: Manipulating binary data

Colour	Colour code hexadecimaal (RGB)	Big Endian	Little Endian
RED	#FF0000	FF 00 00	00 00 FF
GREEN	#00FF00	00 FF 00	00 FF 00
BLUE	#0000FF	00 00 FF	FF 00 00
WHITE	#FFFFFF	FF FF FF	FF FF FF
Favourite (previous assignment)	#F5C1EC	F5 C1 EC	EC C1 F5

Screenshot modified BMP file in hex editor:



Bonus point assignment – week 1

Convert your student number to a hexadecimal number and a binary number.

Explain in detail that the calculation is correct. Use the PowerPoint slides of week 1.

Student Number: 52947

Hexadecimal

Because hexadecimal number system is base-16, we divide the decimal number by 16 and get the remainder then repeat the same calculation for each quotient until the result of the division reaches 0. Here's the calculation of the conversion of my student number to hexadecimal:

529471 / 16 = 33091 remainder → 15 (F in hex)

33091 / 16 = 2068 remainder → 3

2068 / 16 = 129 remainder → 4

129 / 16 = 8 remainder → 1

8 / 16 = 0 remainder → 8

Result = F3418

Binary

Because the decimal number is too big and converting it to binary (base-2, so divide by 2 until 0 is reached) would take too long, we convert from its hexadecimal value 0xF3418:

F is 15 so that's → 1111

3 → 0011

4 → 0100

1 → 0001

8 → 1000

Result = 1111 0011 0100 0001 1000

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