Template Week 1 – Bits & Bytes

Student number: 562594

Assignment 1.1: Bits & Bytes intro

What are Bits & Bytes?
A bit is the smallest piece of data in a computer and can be either 0 or 1.
A byte is 8 bits grouped together.

What is a nibble?
A nibble is half a byte. It contains 4 bits.

What relationship does a nibble have with a hexadecimal value?
One nibble (4 bits) is exactly one hexadecimal digit.
4 bits can show 16 values, and hex has 16 symbols.

Why is it wise to display binary data as hexadecimal values?
Hexadecimal values are shorter and easier to read than long binary strings.
It also converts easily because every 4 bits = 1 hex digit.

What kind of relationship does a byte have with a hexadecimal value?
A byte (8 bits) equals two hexadecimal digits because a byte contains two nibbles.

An IPv4 subnet is 32-bit, show with a calculation why this is the case.
IPv4 has four numbers (octets), for example: 192.168.0.1. Each octet is 8 bits: 4 × 8 = 32 bits total.

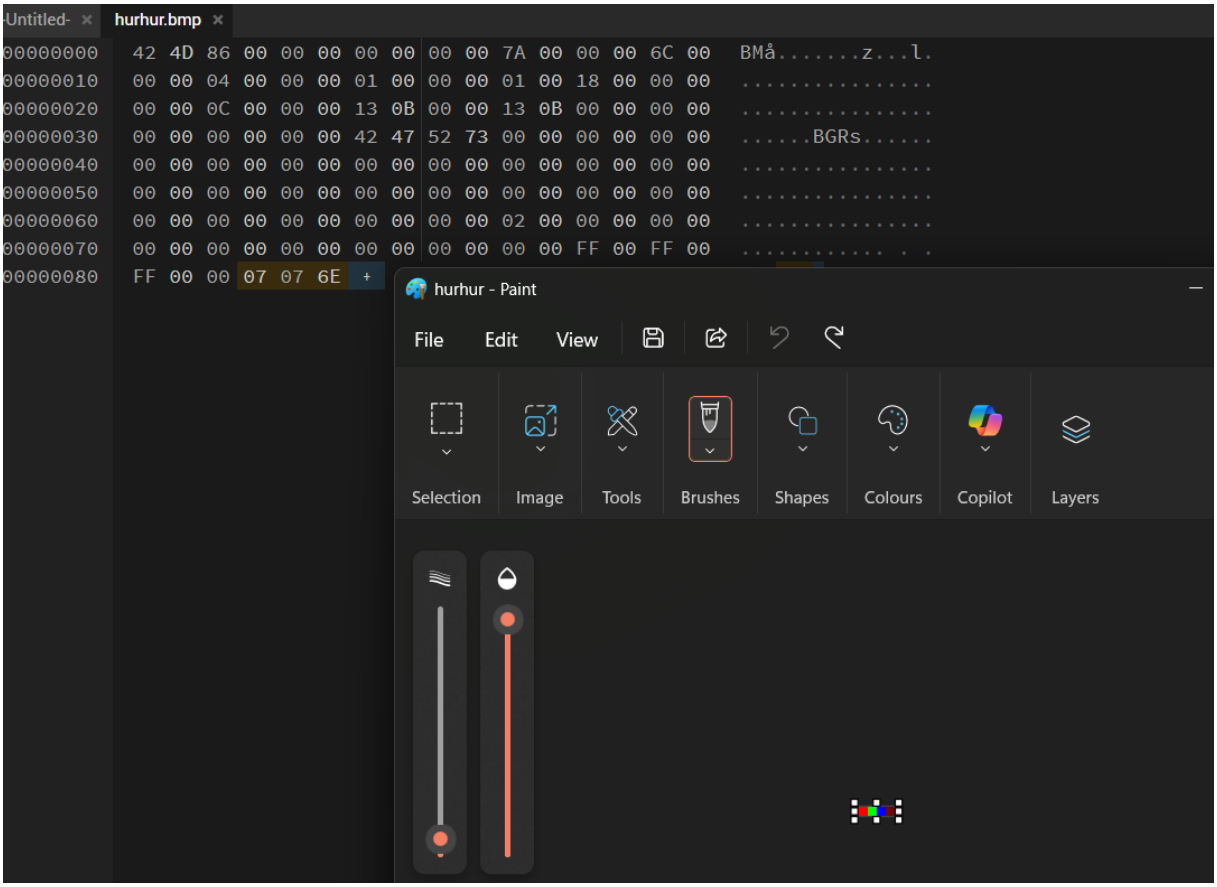
Assignment 1.2: Your favourite color

Hexadecimal color code: #6E0707

Assignment 1.3: Manipulating binary data

Color	Color 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)	6E 07 07	6E 07 07	07 07 6E

Screenshot modified BMP file in hex editor:



Assignment 1.4: Student number to HEX and Binary

Convert your student number to a hexadecimal number and a binary number.
Decimal: 562594
Hexadecimal: 0x895A2
Binary: 0b10001001010110100010

Explain in detail that the calculation is correct. Use the PowerPoint slides of week 1.
Hexadecimal explanation:
Divide 562594 by 16 repeatedly: remainders are 2, A (10), 5, 9, 8.
Reading them backwards gives 895A2.
Check:
$8\times16^4 + 9\times16^3 + 5\times16^2 + 10\times16^1 + 2 = 562594$.

Binary explanation:
Convert by dividing by 2 and noting each remainder; reading them backwards gives 10001001010110100010.
Check:
$2^{19} + 2^{15} + 2^{12} + 2^{10} + 2^8 + 2^7 + 2^5 + 2^1 = 562594$.

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