Template Week 1 – Bits & Bytes

Student number: 591658

Assignment 1.1: Bits & Bytes intro

What are Bits & Bytes?

- A bit is a binary digit, the smallest unit of data in a computer. It can represent 2 values: either 0 or 1.
- A byte is a group of 8 bits. A byte can represent 256 values (2^8 =256). Byte is the standard unit that is used to represent a character such as a symbol or letter.

What is a nibble?

A nibble is a group of 4 bits or half a byte.

What relationship does a nibble have with a hexadecimal value?

The hexadecimal number system uses 16 different symbols

4 bits can represent 16 different sequences (2^4=16)

=> A hexadecimal digit is a compact way to write a 4-bit sequence.

A nibble is a group of 4 bits, so 1 nibble value corresponds to 1 hexadecimal digit.

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

Binary numbers are long and hard to read for human eyes. Hexadecimal is shorter while still reserves the underlying bit patterns.

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

A byte is 8 bits

A hexadecimal digit is 4 bits

=> 1 byte can be represented by 2 hexadecimal digits.

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

An IPv4 IP address is written in the form of 4 octets, separated by dot. Each octet is 8 bits

8x4 = 32 bits

=> The IPv4 address space contains 2^{32} addresses (4,294,967,296 addresses)

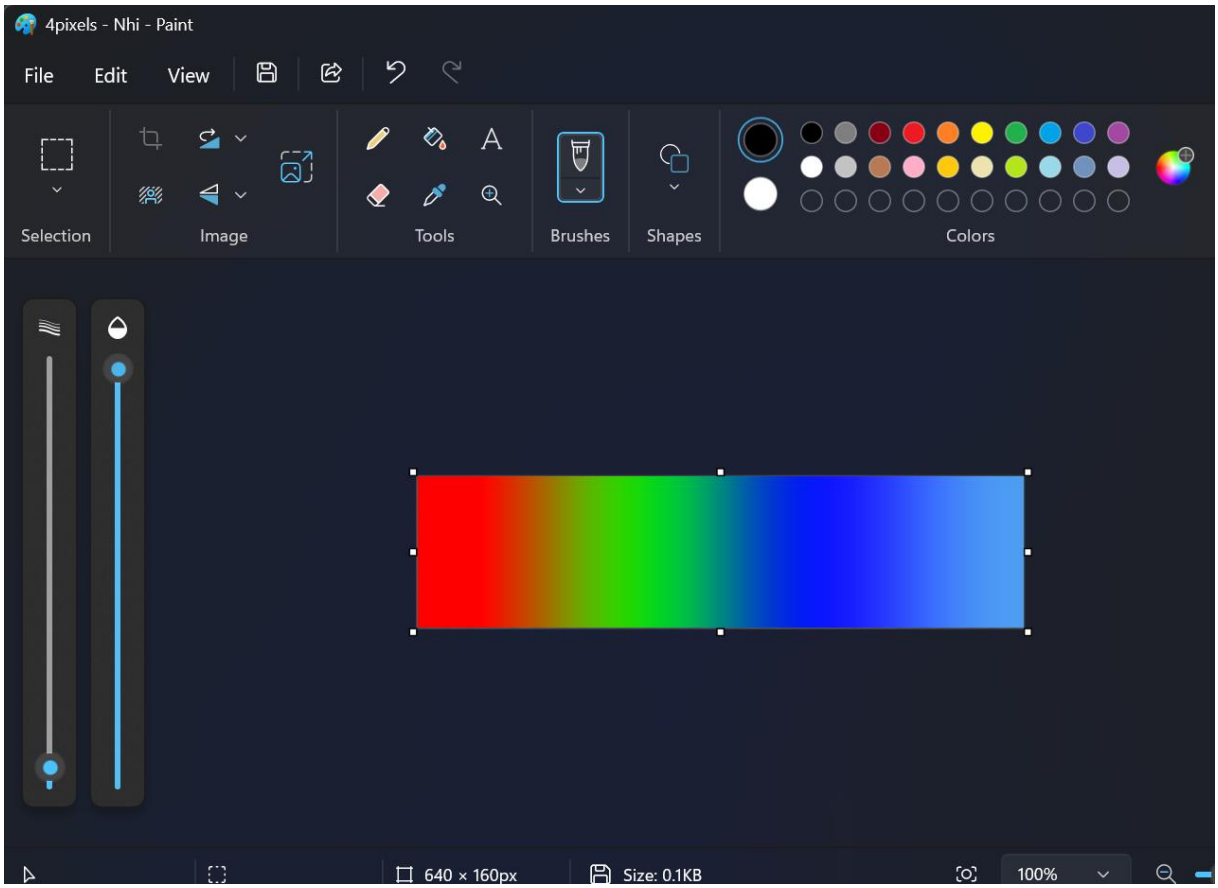
Assignment 1.2: Your favourite color

Hexadecimal color code: 4287F5

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)	4287F5	42 87 F5	F5 87 42

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.

My student number: 591658

Convert to hexadecimal number: 9072A

Convert to binary number: 1001 0000 0111 0010 1010

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

Convert 591658 to hexadecimal number:

591658 ÷ 16 = 36978 remainder 10 (A in hexadecimal)

36978 ÷ 16 = 2311 remainder 2

2311 ÷ 16 = 144 remainder 7

11 ÷ 16 = 9 remainder 0

9 ÷ 16 = 0 remainder 9

Reading the remainders from bottom to top, we get the hexadecimal number 9072A

Each hexadecimal number represents 4-bit binary numbers

9 => 1001

0 => 0000

7 => 0111

2 => 0010

A => 1010

Hexadecimal 9072A = binary 1001 0000 0111 0010 1010

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