Template Week 1 – Bits & Bytes

Student number: 547518

Assignment 1.1: Bits & Bytes intro

What are Bits & Bytes?

A bit is the smallest unit of data in computing. It can have a value of 1 or 0. A byte consists of a group of 8 bits. A byte is the smallest addressable unit of memory. It can represent values from 0 to 255

What is a nibble?

A nibble is 4 bits so half a byte.

What relationship does a nibble have with a hexadecimal value?

Since 4 bits represent a value from 0 to 15 in decimal, which corresponds exactly to a single hexadecimal digit

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

Binary values can be long and hard to read whereas hexadecimal values are more compact and easier to read. So 1 hex = 1 nibble = 4 bits

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

1 byte is 8 bits and 8 bits is 2 nibbles and each nibble is 1 hexadecimal digit so 1 byte is 2 hexadecimal digits like 10101010 in binary is AA in hexadecimal

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

Since an IPv4 address is comprised of 4 decimal numbers. They are separated by 4 dots. As each section is a decimal number they are a represented as 1 byte and 1 byte contains 8 bits. Since there a are 4 bytes its : 4 bytes x 8 bits/byte = 32bits. Therefore a IPv4 subnet is 32 bits in size.

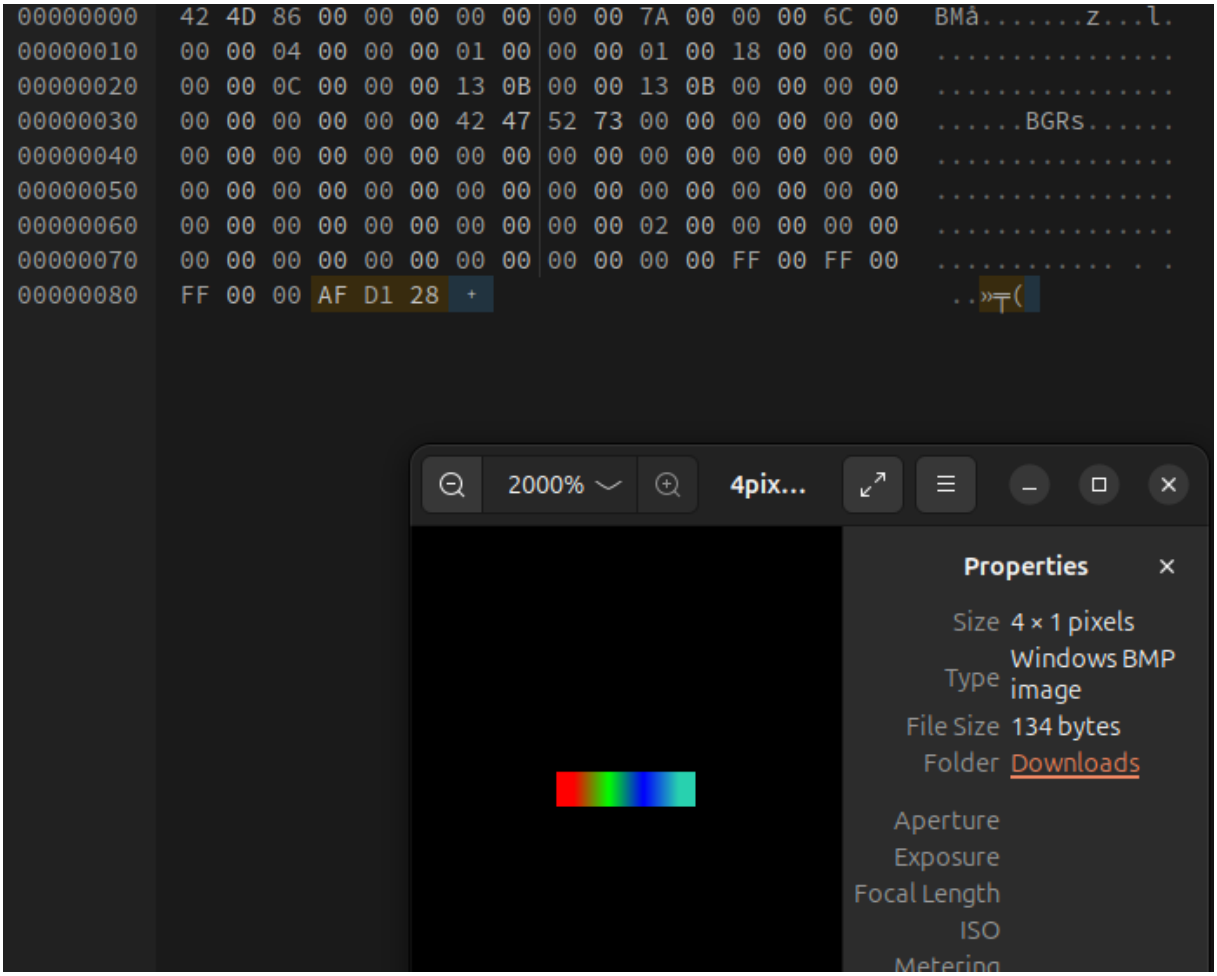
Assignment 1.2: Your favourite color

Hexadecimal color code: **#28D1AF**

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)	#28D1AF	28 D1 AF	28 D1 AF

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.

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

Student number is 547518 so Decimal is 547518
Decimal → Hexadecimal
we divide by 16 and keep the remainders
547518 / 16 = 34219 remainder is 14 = E
34219 / 16 = 2138 remainder is 11 = B
2138 / 16 = 133 remainder is 10 = A
133 / 16 = 8 remainder is 5 = 5
8/16 = 0 remainder is 8 = 8
Hexadecimal is **85ABE**

Decimal → Binary
we can divide by 2 and track the remainders but a faster way is to convert the Hex to Binary
since each hexadecimal is 4 bits in base 2 the hex for 85ABE is
each position in binary is represented as a power of 2 so in 4 bits the left most bit is 2^3
$8 = 2^3$ → 1000
$5 = 2^2 + 2^0$ → 0101
$A = 2^3 + 2^1$ → 1010
$B = 2^3 + 2^1 + 2^0$ → 1011
$E = 2^3 + 2^2 + 2^1$ →1110
we combine them all and get

1000 0101 1010 1011 1110

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