

Template Week 1 – Bits & Bytes

Student number: 589892

Assignment 1.1: Bits & Bytes intro

What are Bits & Bytes?

Bits (binary digits) are the smallest pieces of data a computer uses. They can only exist out of 0 and 1 and every 0 or 1 signifies as on or off . They are used for every single thing a computer loads, shows or saves.

A Byte consists of 8 bits. A single byte can represent 256 different values and they are often used to measure file sizes, such as 1MB which is 1,048,576 bytes.

What is a nibble?

A nibble consists of 4 bits, and is half of a byte. It can represent 16 different values and is therefore commonly used to represent a single number or hex digit.

What relationship does a nibble have with a hexadecimal value?

A nibble can be converted to a hex digit.

nibble: 1001

value of nibble = $(1 \times 8)(0 \times 4)(0 \times 2)(1 \times 1) = 8 + 0 + 0 + 1 = 9$. Hex digit = 9

So binary 1001 equals 9 Hex.

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

When you read or write only binary data it can take really long and is less efficient than if you display it in a hexadecimal since a hexadecimal contains 4 bits.

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

A byte contains 2 nibbles (or 8 bits) which means you can get 2 hexadecimal values out of one byte.

Every color component in RGB uses 2 hexadecimal values. So with a byte you can get one color component for a color.

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

Every Ipv4 Subnet has 4 different values ranging from 0-255. For example: 255.255.0.0

And for every number it contains 1 byte aka 8 bits.

Calculation:

$255 = 1111\ 1111, (1 \times 128)(1 \times 64)(1 \times 32)(1 \times 16)(1 \times 8)(1 \times 4)(1 \times 2)(1 \times 1)$

$255 = 1111\ 1111, (1 \times 128)(1 \times 64)(1 \times 32)(1 \times 16)(1 \times 8)(1 \times 4)(1 \times 2)(1 \times 1)$

$0 = 0000\ 0000, (0 \times 128)(0 \times 64)(0 \times 32)(0 \times 16)(0 \times 8)(0 \times 4)(0 \times 2)(0 \times 1)$

Assignment 1.2: Your favourite color

Hexadecimal color code:

#a62ce8

Assignment 1.3: Manipulating binary data

Color	Color code hexadecimaal (RGB)	Big Endian	Little Endian
RED	#ff0000		
GREEN	#00ff00		
BLUE	#0000ff		
WHITE	#ffffff		
Favourite (previous assignment)	#a62ce8		

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.

589892

binary:

5, 0000 0101

8, 0000 1000

9, 0000 1001

8, 0000 1000

9, 0000 1001

2, 0000 0010

Hexadecimal:

Start with 589892

$$589,892 \div 16 = 36,868 \text{ remainder } 4$$

$$36,868 \div 16 = 2,304 \text{ remainder } 4$$

$$2,304 \div 16 = 144 \text{ remainder } 0$$

$$144 \div 16 = 9 \text{ remainder } 0$$

$$9 \div 16 = 0 \text{ remainder } 9$$

Hexidecimal = 44009

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