

Template Week 1 – Bits & Bytes

Student number: 568524

Assignment 1.1: Bits & Bytes intro

What are Bits & Bytes?

A single place or symbol in a binary number is called a Bit, each bit can either be 0 or 1.

A byte is consist of 8 bits.

What is a nibble?

A nibble is a 4-bit number (half a byte).

What relationship does a nibble have with a hexadecimal value?

A single hexadecimal digit is directly equivalent to a 4-bit nibble, as both can represent 16 distinct values.

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

hexadecimal makes binary data readable, manageable and undrestandable.

It is so easy to recognize F3A5 than 1111001110100101

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

A byte, which consists of 8 bits, has a direct and convenient relationship with hexadecimal values because a byte can be represented using two hexadecimal digits. For instant,

If we split (11010110) into two 4-bit nibbles and convert each nibble into hexidecimal we will have D6
Thus, the byte 11010110 in binary is equivalent to D6 in hexadecimal.

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

These 32 bits are typically grouped into four octets (8 bits each) for readability.

Four octets = $8 + 8 + 8 + 8 = 32$ bits

$255.0.0.0 = 11111111.00000000.00000000.00000000$

$255.255.0.0 = 11111111.11111111.00000000.00000000$

$255.255.255.0 = 11111111.11111111.11111111.00000000$

(Each one has 32 bits total)

Assignment 1.2: Your favourite colour

Hexadecimal colour code: #750af7

Assignment 1.3: Manipulating binary data

Colour	Colour code hexadecimal (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)	#750af7	75 0A F7	F7 0A 75

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.

My student number is 568524

Binary: to convert this number to binary we should divide it by 2 and record quotient and the remainder

$$568524 \div 2 = 284262, \text{ Remainder: } 0$$

$$284262 \div 2 = 142131, \text{ Remainder: } 0$$

$$142131 \div 2 = 71065, \text{ Remainder: } 1$$

$$71065 \div 2 = 35532, \text{ Remainder: } 1$$

$$35532 \div 2 = 17766, \text{ Remainder: } 0$$

$$17766 \div 2 = 8883, \text{ Remainder: } 0$$

$$8883 \div 2 = 4441, \text{ Remainder: } 1$$

$$4441 \div 2 = 2220, \text{ Remainder: } 1$$

...

The answer is : 10001011010111101100

To convert the student number to hexadecimal number we need to divide it by 16 and keep track of remainders. We need to keep in mind that letters A-F are (10,11,12,13,14,15).

$$\text{Quotient: } 568524 \div 16 = 35532, \text{ Remainder: } 568524 - 35532 \times 16 = 12 \rightarrow \text{C in hexadecimal}$$

$$\text{Quotient: } 35532 \div 16 = 2220, \text{ Remainder: } 35532 - 2220 \times 16 = 12 \rightarrow \text{C}$$

$$\text{Quotient: } 2220 \div 16 = 138, \text{ Remainder: } 2220 - 138 \times 16 = 12 \rightarrow \text{C}$$

$$\text{Quotient: } 138 \div 16 = 8, \text{ Remainder: } 138 - 8 \times 16 = 10 \rightarrow \text{A}$$

$$\text{Quotient: } 8 \div 16 = 0, \text{ Remainder: } 8 - 0 \times 16 = 8 \rightarrow 8$$

The answer is : 8A3CC

Ready? Save this file and export it as a pdf file with the name: [week1.pdf](#)