**LAB 03**

**Binary and hexadecimal numbers**

1. Which of the 2 is the biggest: 1 KB or 1 KiB? Explain!

1KiB is larger: 1kB = 1000 bytes and 1KiB = 1024 bytes

1. An IPv4 address of a network card consists of 32 bits.

So how many network cards can you assign an IPv4 address to?

2 cards

How many bytes does such an IPv4 address consist of?

4 bytes

1. The MAC address of a computer’s network card consists of 6 bytes.

How many network cards can one provide such an MAC address?

1

How many hexadecimal numbers does one need to represent such an MAC address?

12

1. Given: The decimal number (120)10

Requested:

1. Convert this number to the binary number system. Write down all the intermediate steps!

(120)/2 60 0

(60)/2 30 0

(30)/2 15 0

(15)/2 7 1

(7)/2 3 1

(3)/2 1 1

(1)/2 0 1

Answer: 0111 1000

1. Convert this number to the hexadecimal number system. Write down all the intermediate steps!

(120)/16 7 8

(7)/16 0 7

Answer: 78

Check your calculations afterwards using the built-in calculator on your laptop. Choose the “Programmer” mode.

1. Calculate the decimal number corresponding to the binary number (11111111)2

Answer: 255

1. Calculate the binary and decimal number corresponding to the hexadecimal number (1C6)16

Anwser: 000111000110

Answer: 256 + (12 \* 16) + 6 = 454

1. Given: IPv4 address 172.21.16.100 (see earlier exercise: an IPv4 address consists of 32 bits)

Requested: write down this address in binary format. Write down all the intermediate steps!

(127)/2 63 1

(63)/2 31 1

(31)/2 15 1

(15)/2 7 1

(7)/2 3 1

(3)/2 1 1

(1)/2 0 1

(21)/2 10 1

(10)/2 5 0

(5)/2 2 1

(2)/2 1 0

(1)/2 0 1

(16)/2 8 0

(8)/2 4 0

(4)/2 2 0

(2)/2 1 0

(1)/2 0 1

(100)/2 50 0

(50)/2 25 0

(25)/2 12 1

(12)/2 6 0

(6)/2 3 0

(3)/2 1 1

(1)/2 0 1

Answer: 0111 1111.0001 0101.0001 0000.0110 0100

Hint: to do this, convert each of the 4 decimal numbers to the binary number system and use 8 bits for each decimal number (so, if necessary, add leading zeroes).

1. Given: the MAC address 00-11-6B-4E-EA-AD (see earlier exercise: a MAC address consists of 6 bytes)

Requested: write down this address in binary format. Write down all the intermediate steps!

Hint: convert each of the 12 hexadecimal numbers to the binary system

Looking up value from individual character:

Hex Binary

0 0000

1 0001

2 0010

3 0011

4 0100

5 0101

6 0110

7 0111

8 1000

9 1001

A 1010

B 1011

C 1100

D 1101

E 1110

F 1111

Answer: 0000 0000-0001 0001-0110 1011-0100 1110-1110 1010-1010 1101