UNIVERSITAT POLITÈCNICA DE CATALUNYA
BARCELONATECH
Facultat d'Informàtica de Barcelona

Bits. Exercises

COMPUTER ARCHITECTURE AND OPERATING SYSTEMS

Course 2024/25 Spring Term

Jordi Fornés

UNIVERSITAT POLITÈCNICA DE CATALUNYA
BARCELONATECH
Departament d'Arquitectura de Computadors

BASE CONVERSION. Represent in base 10

$0b10000000$

BASE CONVERSION. Represent in base 10

$$0b10000000 = 2^7 = 128$$

BASE CONVERSION. Represent in base 10

$0b00100000$

BASE CONVERSION. Represent in base 10

$$0b00100000 = 2^5 = 32$$

BASE CONVERSION. Represent in base 10

$0b00001111$

BASE CONVERSION. Represent in base 10

$$0b00001111 = 2^3 + 2^2 + 2^1 + 2^0 = 15$$

BASE CONVERSION. Represent in base 10

$0b11111010$

BASE CONVERSION. Represent in base 10

$$0b11111010 = 2^7 + 2^6 + 2^5 + 2^4 + 2^3 + 2^1 = 250$$

BASE CONVERSION. Represent in base 2

15_{10}

BASE CONVERSION. Represent in base 2

$$15 = 2 \cdot 7 + \mathbf{1}$$
$$7 = 2 \cdot 3 + \mathbf{1}$$
$$3 = 2 \cdot 1 + \mathbf{1}$$
$$1 = 2 \cdot 0 + \mathbf{1}$$

$$15_{10} = 1111_2$$

BASE CONVERSION. Represent in base 2

32_{10}

BASE CONVERSION. Represent in base 2

$$
\begin{aligned}
32 &= 2 \cdot 16 + \mathbf{0} \\
16 &= 2 \cdot 8 + \mathbf{0} \\
8 &= 2 \cdot 4 + \mathbf{0} \\
4 &= 2 \cdot 2 + \mathbf{0} \\
2 &= 2 \cdot 1 + \mathbf{0} \\
1 &= 2 \cdot 0 + \mathbf{1}
\end{aligned}
$$

$32_{10} = 100000_2$

BASE CONVERSION. Represent in base 2

10_{10}

BASE CONVERSION. Represent in base 2

$$10 = 2 \cdot 5 + \mathbf{0}$$
$$5 = 2 \cdot 2 + \mathbf{1}$$
$$2 = 2 \cdot 1 + \mathbf{0}$$
$$1 = 2 \cdot 0 + \mathbf{1}$$

$$10_{10} = 1010_2$$

BASE CONVERSION. Represent in base 16

$0b11111010$

BASE CONVERSION. Represent in base 16

$0b1111 = 0xF$ $0b1010 = 0xA$

$0b11111010 = 0xFA$

4-bits, two's complement representation of the integer

-1_{10}

4-bits, two's complement representation of the integer

$$-1_{10} =\backsim 0001_2 + 1_2 = 1110_2 + 1_2 = 1111_2$$

4-bits, two's complement representation of the integer

-8_{10}

4-bits, two's complement representation of the integer

$$-8_{10} =\backsim 1000_2 + 1_2 = 0111_2 + 1_2 = 1000_2$$

Interpret the hex number $0x11$ as 8-bits Two's complement. Integer value?

$$11_{16} =$$

Interpret the hex number $0x11$ as 8-bits Two's complement. Integer value?

$$11_{16} = 00010001_2 = 2^4 + 2^0 = 16 + 1 = 17$$

Interpret the hex number $0xEB$ as 8-bits Two's complement. Integer value??

$$EB_{16} =$$

Interpret the hex number $0xEB$ as 8-bits Two's complement. Integer value??

$$EB_{16} = 11101011_2 = (-1) \cdot 2^7 + 2^6 + 2^5 + 2^3 + 2^1 + 2^0 = -21$$

Which is the decimal ASCII code of the 'F' char?

Which is the decimal ASCII code of the 'F' char?

$$ord('F') = 70$$

Suposse we are using the standard IEEE 754, 32b, normalized.

Which is the real number represented by the hexadecimal number $0x3fa00000$?

Suposse we are using the standard IEEE 754, 32b, normalized.

Which is the real number represented by the hexadecimal number $0x3fa00000$?

$0x3fa00000 = 0b00111111101000000000000000000000$

$Exp = 01111111_2 = 127$, $E = Exp - E_{max} = 127 - 127 = 0$

$s = 0$, $Mantissa = 1.01000000000000000000000_2 = 1.25$

$0x3fa00000 = 1.25$

Suposse we are using the standard IEEE 754, 32b, normalized.

Which is the real number represented by the hexadecimal number $0x40300000$?

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Which is the real number represented by the hexadecimal number $0x40300000$?

$0x40300000 = 0b01000000001100000000000000000000$

$Exp = 10000000_2 = 128,\ E = Exp - E_{max} = 128 - 127 = 1$

$s = 0,\ Mantissa = 10.11000000000000000000000_2 = 2.75$

$0x40300000 = 2.75$

Suposse we are using the standard IEEE 754, 32b, normalized.

Which is the hexadecimal representation of the real number 0.625?

Suposse we are using the standard IEEE 754, 32b, normalized.

Which is the hexadecimal representation of the real number 0.625?

$s = 0$, $Mantissa = 1.01$, $Exp = -1$,
$E = -1 + 127 = 126 = 0b01111110$

$$0.625 \cdot 2 = \mathbf{1} + 0.25$$
$$0.25 \cdot 2 = \mathbf{0} + 0.5$$
$$0.5 \cdot 2 = \mathbf{1} + 0$$

$0.625 = 0b00111111001000000000000000000000$

$0.625 = 0x3f200000$

Suposse we are using the standard IEEE 754, 32b, normalized.

How is represented ∞ in hexadecimal??

Suposse we are using the standard IEEE 754, 32b, normalized.

How is represented ∞ in hexadecimal?

$s = 0$, $E = 11111111$, $Mantissa = 0 \ldots 0$

$0111\ 1111\ 1000\ 0 \ldots 0 = 0x7f800000$