C Basics

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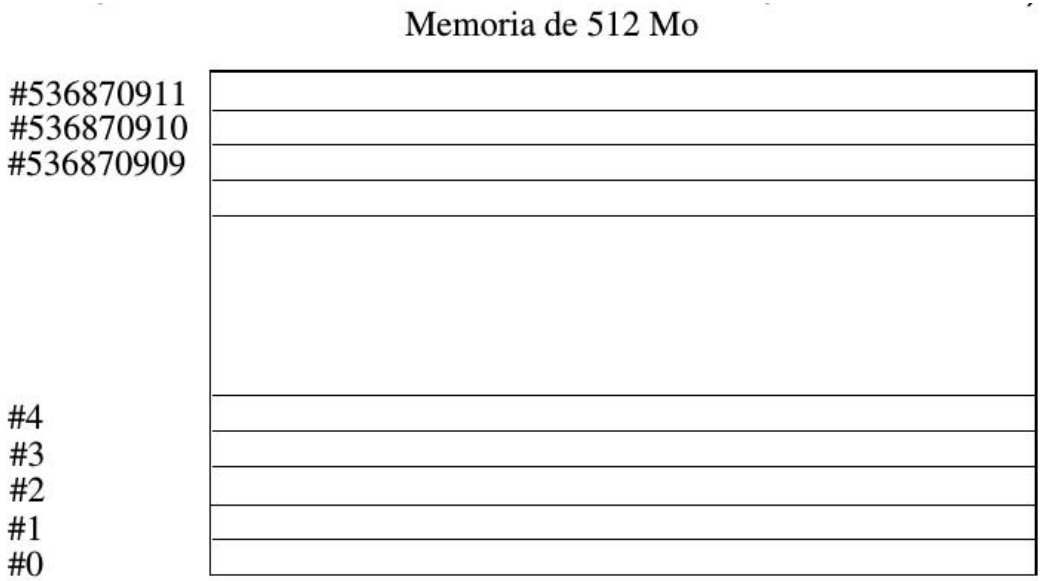
Data Types I

The memory can be viewed as a bytes serie, directionable components; each byte has their unique direction in memory (32 bits in 32 bits machine)



Data Types II

- Generally speaking, a k-bits system has registers and buses of k-bits. We can have a system manipulator of 32 bits on a OS of 64 bits but not otherwise.
- A data type defines: number of bytes to use for a data and the way to use each byte.
- Elemental types: **characters**, **integers** and **floating points** (for real numbers).
- There is no standard in data types size but

$$1 == \text{sizeof(char)} \leq \text{sizeof(short)} \leq \text{sizeof(int)} \leq \text{sizeof(float)} \leq \text{sizeof(double)} \leq \text{sizeof(long double)}$$

sizeof(x) returns the bytes number of the variable x: variable type or only type.

Data Types III

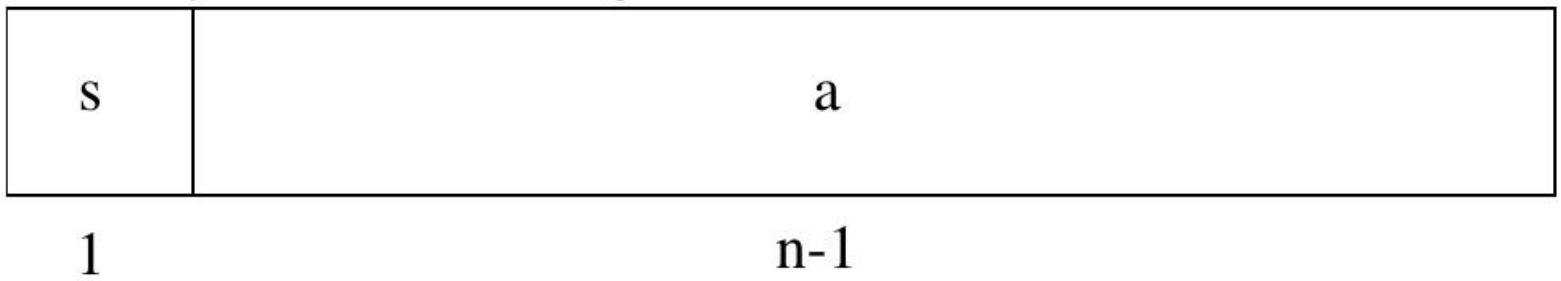
In a 32 bits machine

char	1	$[-128, 127]$
short	2	$[-32768, 32767]$
int	4	$[-2147483648, 2147483647]$
long	4	$[-2147483648, 2147483647]$
float	4	$[1.18 \times 10^{-38}, 3.4 \times 10^{38}]$
double	8	$[2.2 \times 10^{-308}, 1.8 \times 10^{308}]$
long double	10	$[1.18 \times 10^{-4932}, 3.4 \times 10^{4932}]$
apuntadores	4	$[0, 2^{32} - 1]$

unsigned of a type take only the positive values.

Integer Types I

To represent a subset on $\mathbb{N}$



For n bits to represent the number

- The most important bit is for the sign: $s = 0$ for positive
- A positive number presented in base 2 over $n - 1$ bits

$$a = \sum_{i=0}^{n-2} a_i 2^i$$

Integer Types II

Negative integers

- Two's complement. Used for a faster sum of numbers.
- Only one representation of 1.
- Basically is the one's complement plus 1

$$a = \sum_{i=0}^{n-1}(1 - a_i)2^i + 1 = 2^n - |a|$$

Floating Point Types I