Datum, Data & CPU

bool: ▭

char: ▭

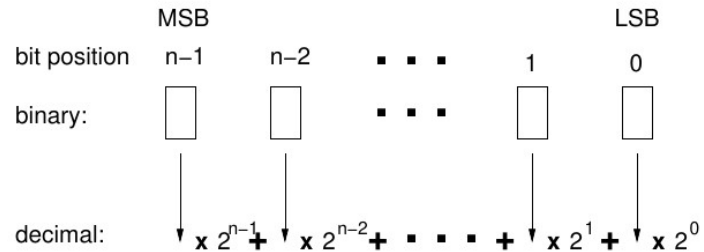**int**: ▭▭▭▭

double: ▭▭▭▭▭▭▭▭

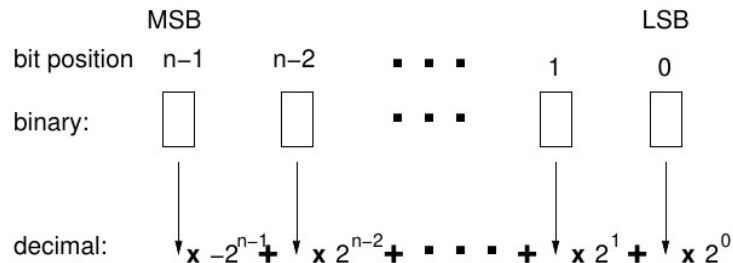- One Datum, Plural Data
- CPU

0100|011 → 🙂 → file.txt
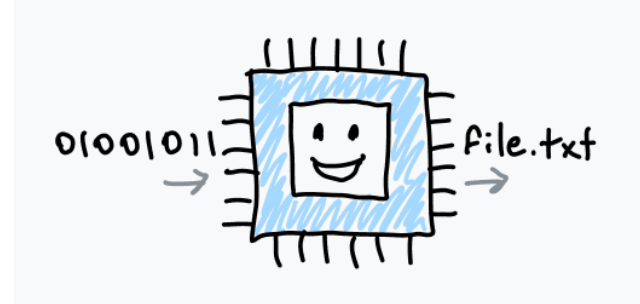
Binary Data

- 1 Bit can hold the values 0 or 1
- 1 Bit has 2 possible values
- 1 Bit has the value-range [0..1]

Binary to Unsigned Decimal Integer

MSB ... LSB

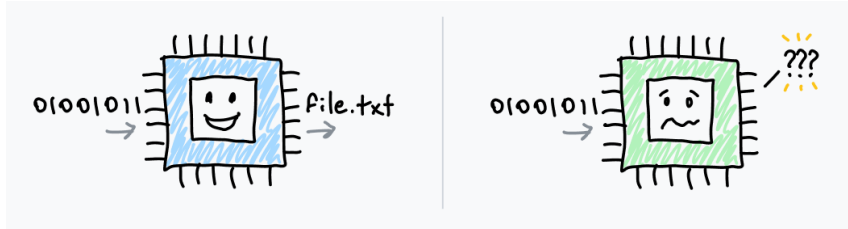bit position $n-1$ $n-2$ ...   1   0

binary:

decimal: $\times 2^{n-1} + \times 2^{n-2} + \cdots + \times 2^1 + \times 2^0$

Binary to Signed Decimal Integer

MSB ... LSB

bit position $n-1$ $n-2$ ...   1   0

binary:

decimal: $\times -2^{n-1} + \times 2^{n-2} + \cdots + \times 2^1 + \times 2^0$

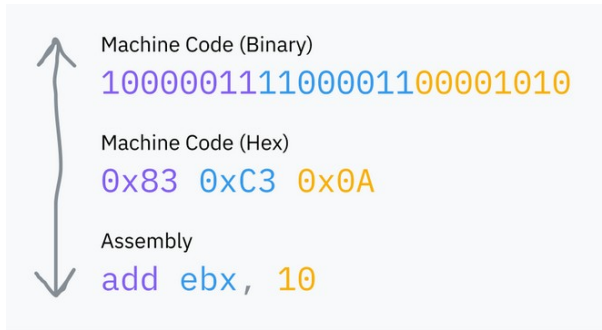| Binary	Unsigned Decimal	Signed Decimal
000	0	0
001	1	1
010	2	2
011	3	3
100	4	-4
101	5	-3
110	6	-2
111	7	-1

Value-Range of 3 Bits

- Unsigned $[\,0\,..7] = [\,2^0\,..\,2^3-1]$
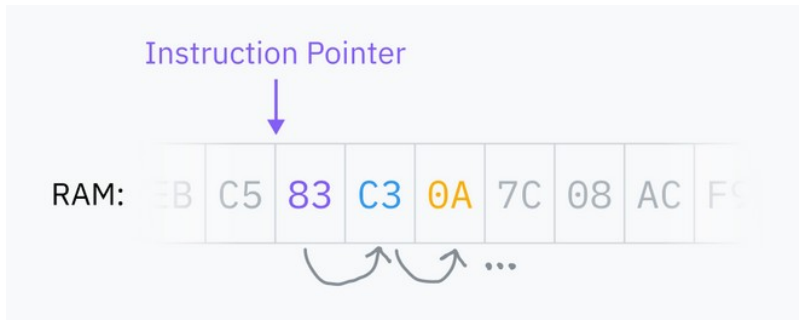- Signed $[-4\,..3] = [-2^2\,..\,2^2-1]$

CPU & Data

- What shall be done with the data?
- How do I tell the CPU what to do?

- CPU Instructions / Commands (Machine Code)
- Machine Code is also data

- The CPU processes commands sequentially
- The CPU can skip commands and jump etc.