Formate portabile IEEE 754

- Reprezentarea nr. în virgulă flotantă

$$X = X_m * B^{X_E}$$

X_m — mantisa

B — baza

X_E — exponent

$N = 0.55$ (8 bit)

$N' = .10001100$

$N' = 0.546875$

$\varepsilon' = N - N' = 0,003125$

0.55	· 2	
1.10	· 2	1
0.20	· 2	0
0.40	· 2	0
0.80	· 2	0
1.60	· 2	1
1.20	· 2	1
0,40	⋮	0

$N'' = .1000110011001100$ (16 bit)

$N^u = 0.5499877929 6875$

$\varepsilon^u = 0.0000122070 3125$

$\varepsilon' > \varepsilon''$

→ intreg.

Sign

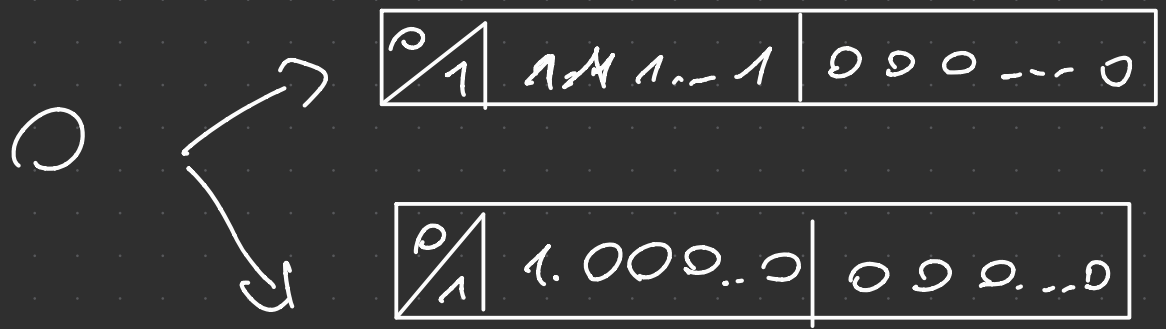
↑ precision

↓ range

$$X_M = S \cdot X_M^*$$

SM : $-2^{n-1}+1$ 111...1

X_E ⇄ C2 : -2^{n-1} 1000...0



bias $\begin{cases} 2^{n-1}-1 & SM \\ 2^{n-1} & C2 \end{cases}$

SM: $x_E \in [1-2^{n-1} ; 2^{n-1}-1] \longrightarrow$

$\xrightarrow{+2^{n-1}-1} [0, 2^n-1]$

C2 $x_E \in [-2^{n-1} ; 2^{n-1}-1] \xrightarrow{+2^{n-1}}$

$\longrightarrow [0, 2^n-1]$

$0.110 = 110 \cdot 2^{-3}$

$= 0.0110 \cdot 2$

→ MSB al Exponentului ←

$+\frac{7}{8} = 0.111_{SM}$

$-\frac{7}{8} = 1.111_{SM}$

$\frac{1}{2} \leq |x_M| < 1$

bias 127 (SM)

128 C2

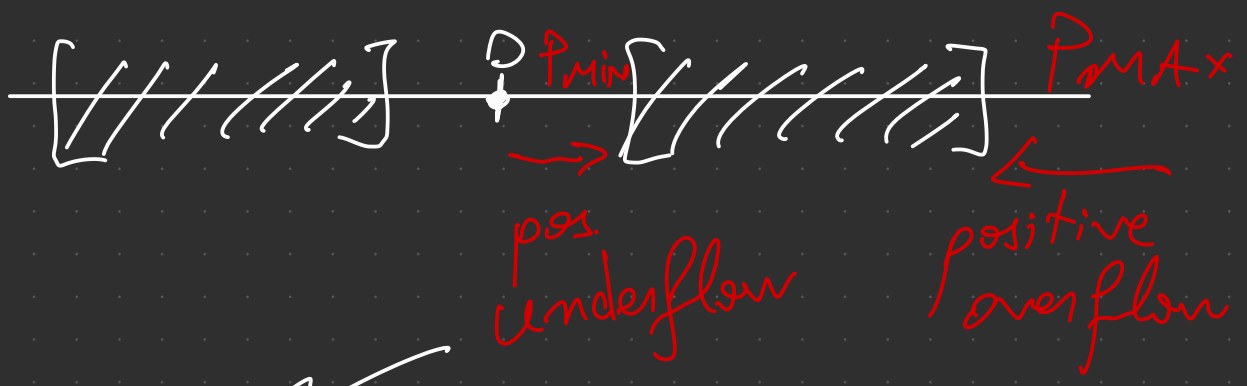
$x_S = (1.)\, x_S^*$ $\quad 1 \leq x_S < 2$

$x_M = 0.\, x_M^*$

hidden bit

+1 bit pt. mantisă

$$x = (-1)^S * 2^{x_E - \text{exces}} * (1.x_S^*)$$



val. atât de mică (nu poate fi repr.)

P_{MAX}

0	1111110	,111...	- -	1

$$P_{MAX} = (-1)^0 * 2^{254-127} * 1.\underbrace{11\ldots1}_{23}$$

$$P_{MAX} = 2^{127}\left(2 - 2^{-23}\right)_{38}$$

$$10_{(2)} - 0.\underbrace{00\ldots01}_{2^{-23}}$$

$$\simeq 3.4 \cdot 10$$

P_{MIN}

0	0000000	.000_ _0

$$P_{MIN} = (-1)^0 \cdot 2^{1-127} \cdot (1.00\_\_0)$$

$$= 2^{-126} \simeq 1.18 \cdot 10^{-38}$$

N/a N/ -> Not a number

$$X_E = X_{E_{MAX}} = 2\pi$$

$$X_S^* \neq 0$$

$$\pm\infty \qquad a=b=\frac{P_{MAX}}{\sqrt{2}}$$

$$\sqrt{a^2+b^2} = \sqrt{\frac{P_{MAX}^2}{2} + \frac{P_{MAX}^2}{2}} = \text{flush to } P_{MAX}$$

$$= \sqrt{\frac{P_{MAX}}{2} + \frac{P_{MAX}}{2}} = \sqrt{P_{MAX}}$$

$$X_E = X_{E_{MAX}} = 2\pi$$

$$X_S^* = 0$$

c) ± 0 $\quad x_E = x_{E_{min}} = 0$

$$x_S^* = 0$$

$$x_\Delta = (-1)^S * 2^{1-bias} * (0.x_S^*)$$

75.046875 Repr. IEEE 754

hidden bit

$(1)001\,011.\,00000\,11 * 2^0$

0.046875	· 2	$= 1.001011000011$
0.093750	· 2	0 $\quad * 2^6$
0.187500	· 2	0
0.375000	· 2	0
0.750000	· 2	0
1.500000	· 2	1
1.000000		1

$x_E = 6 + bias = 6 + 127 = 10000101$

$x_S^* = .0101100000011\ldots 0$ (23)

0	10000101	00101100000011002	0

4 2 9 6 1 8 0 ... 0

C 1A E 0000 16

1 1000 0001 0101 1100 0 ... 0

S x_E x_S^*

$X = (-1)^S * 2^{x_E - 127} (1.010111)$

Format IBM

bias în exces de $64 = 2^{7-1}$

-> baza 16

$16^{x_E} = 2^{4 * x_E}$

S	x_E	x_M^*
<1>	<7>	<24>

$75.046875 = 01001011.000011_{16} \cdot 16^2$

$0.01001011000011 * 16^2$

$X_E = 2 + bias = 66 = 1000010$

$X_M = .0100101100001100\ldots0$ (24)

0	1000010	01001011000011000000
	4 2	4 B 0 C 0 0

C1AE 0000 ->

-> 1100 0001 1010 1110 00...0

$X_E = 65$

$X = (-1)^1 \cdot 16^{65-64} * (0.1010111)$

$= -2^4 * 0.\ldots = -10{,}875$

Cap. 2

Analiza funcțională și sinteza dispozitivelor de adunare și scădere, binară și zecimală

2.1) Sumator serial

$X = x_{n-1}\ x_{n-2} \dots (x_1)(x_0)$

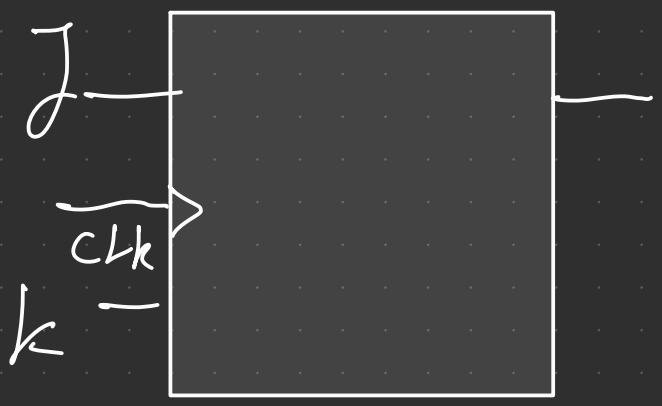
$Y = y_{n-1}\ y_{n-2} \dots (y_1)(y_0)$

Avantaje:
- Suprafață ↓
- Consum Energ ↓
- Frecv. operare ↑

Dezavantaje
- Latență rez. final ↑

→ LSDF (Least significant digit first)

→ MSDF (Most ....)



$$Q(t+1) = J\overline{Q(t)} + \overline{K}\,Q(t)$$

Q(t)	Q(t+1)	set J	reset K
0	0	0	*
0	1	1	*
1	0	*	1
1	1	*	0

w \ in	x, y = 0,0	0,1	1,1	1,0
0	0/0	0/1	1/0	0/1
1	0/1	1/0	1/1	1/0

in				out	
w	x	y	j	k	z
0	0	0	0	*	0
0	0	1	0	*	1
0	1	0	0	*	1
0	1	1	1	*	0
1	0	0			

$$a \cdot b + c \cdot d = = \overline{\overline{a \cdot b} \cdot \overline{c \cdot d}}$$

NANS GATES