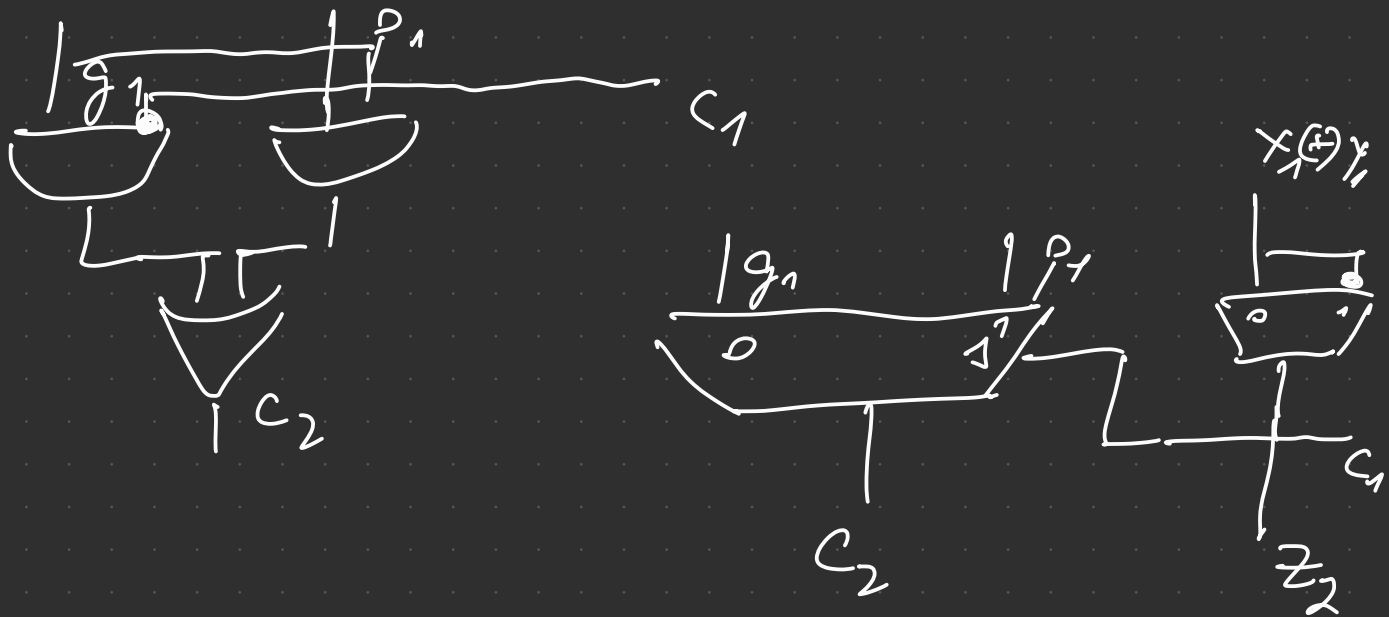
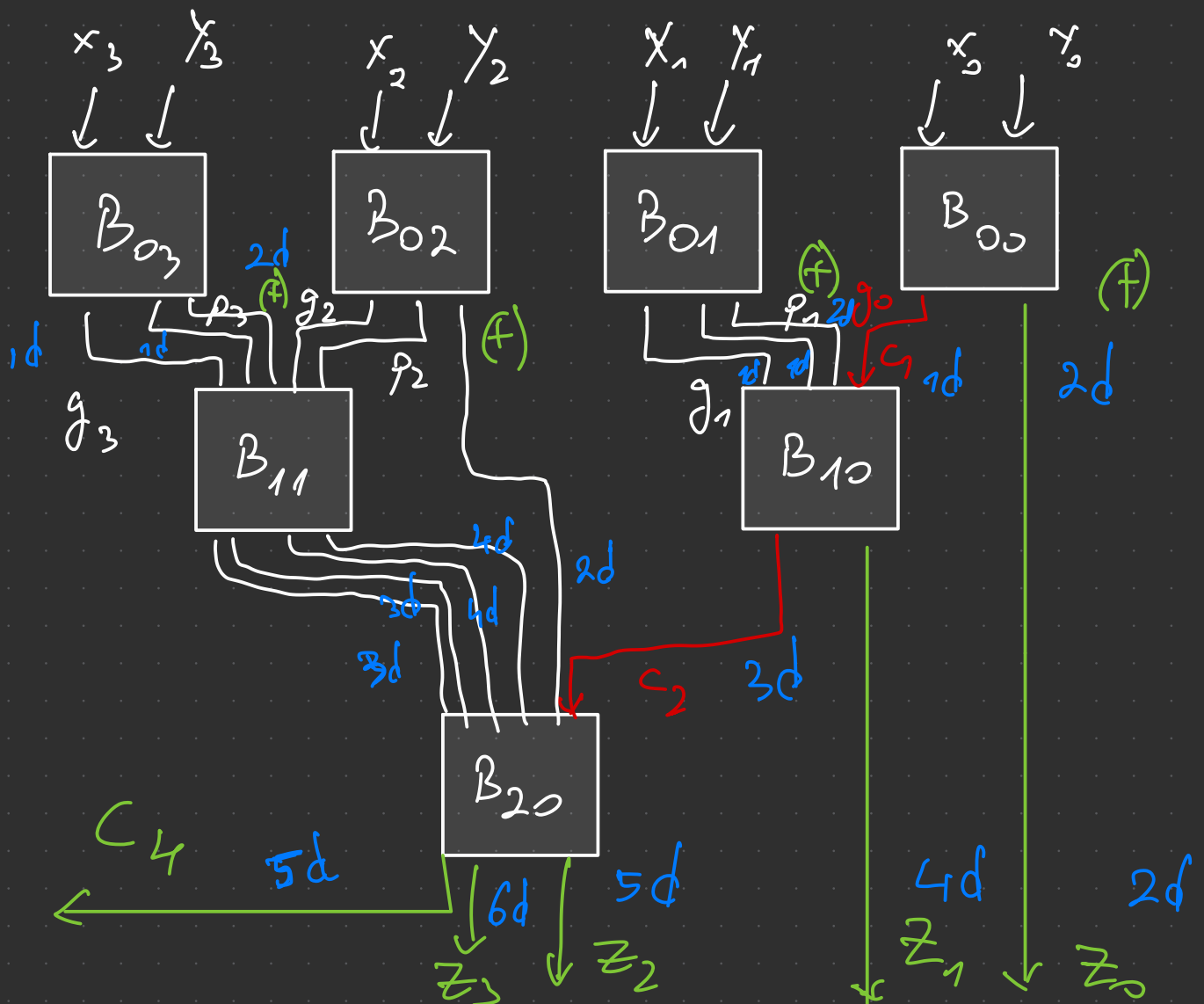


# Conditional Sum Adder CSuA

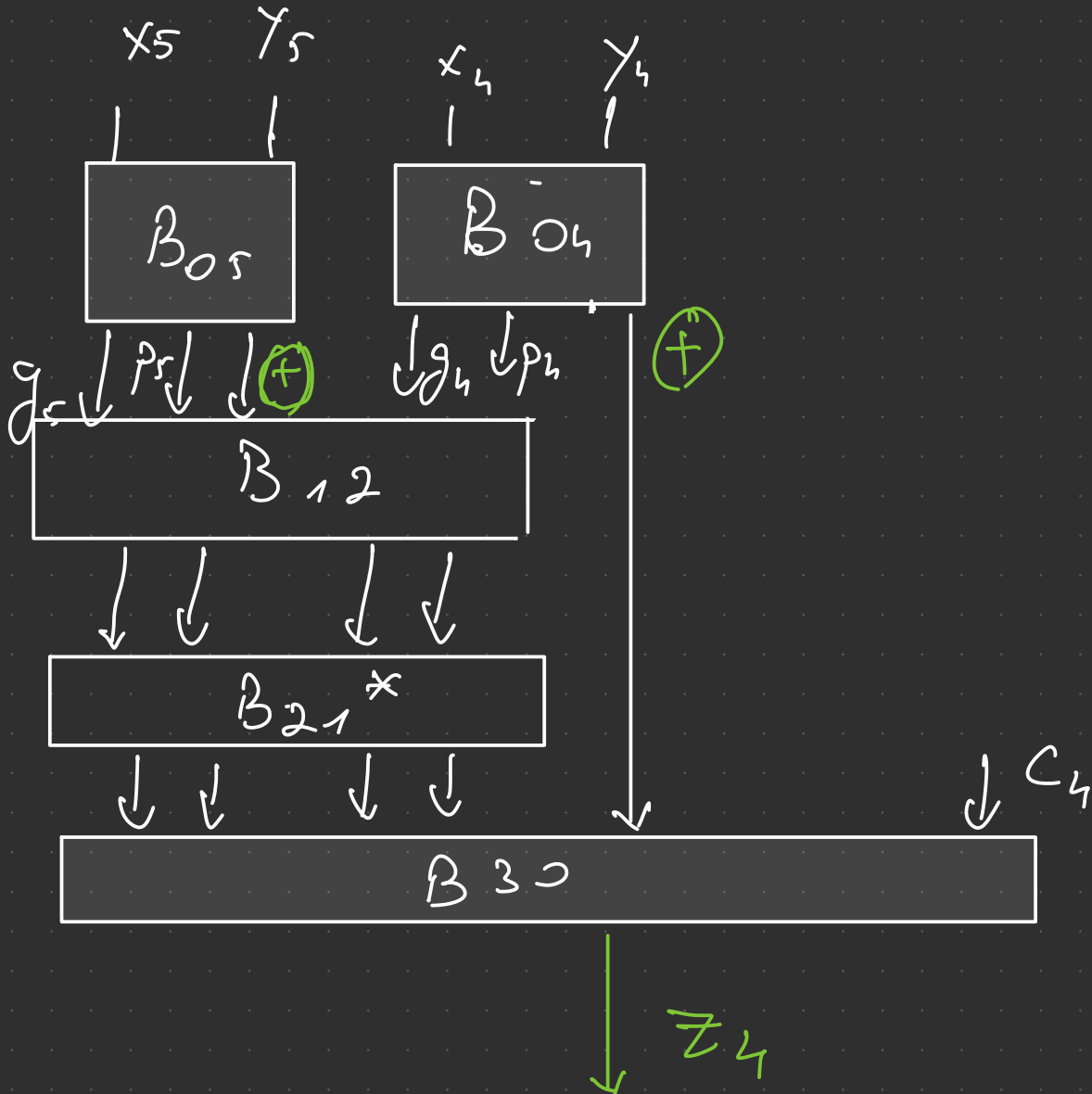


Intan zeri



$$n \text{ bits} \quad \Delta_{CS_uA}^z - n = 2d + 2 \lceil \log_2 n \rceil$$

$$\Delta_{CS_uA}^{\text{cont}} = 1d + 2 \lceil \log_2 n \rceil d$$



→ obligatoriu transport de intrare 0

$CS_u A$	$CS_e A$	ML-CLA	RCA
$\delta_Z = 18d$	$\delta_Z = 258d$	$\delta_Z = 31d$	$\delta_Z = 512d$
$\delta_{Cont} = 17d$	$\delta_{Cont} = 258d$	$\delta_{Cont} = 19d$	$\delta_{Cont} = 512d$

$$X = 0110010011$$

$$Y = 1101101110$$

[illegible]

$x = 0110010011$

$$Y = 1101101110$$

		9	8	7	6	5	4	3	2	1	0
x		0	1	1	0	0	1	0	0	1	1
y		1	1	0	1	1	0	1	1	1	0
Block Level	Carry	C	S	C	S	C	S	C	S	C	S
i=0	0	0	1	1	0	0	1	0	0	1	1
	1	1	0	1	1	0	1	0	1	1	0
i=1	0	1	0	0	1	1	0	1	1	0	1
	1	1	0	1	1	0	0	1	0	0	0
i=2	0	1	0	0	0	1	1	1	1	0	0
	1	1	0	1	1	0	0	0	0	0	0
i=3	0	1	0	0	0	0	0	0	0	0	1
	1	1	0	1	0	0	0	0	0	0	0
i=4	0	1	0	1	0	0	0	0	0	0	0
	1	1	0	1	0	0	0	0	0	0	0



# Carry Save Adder

→ sumă în formă redundantă

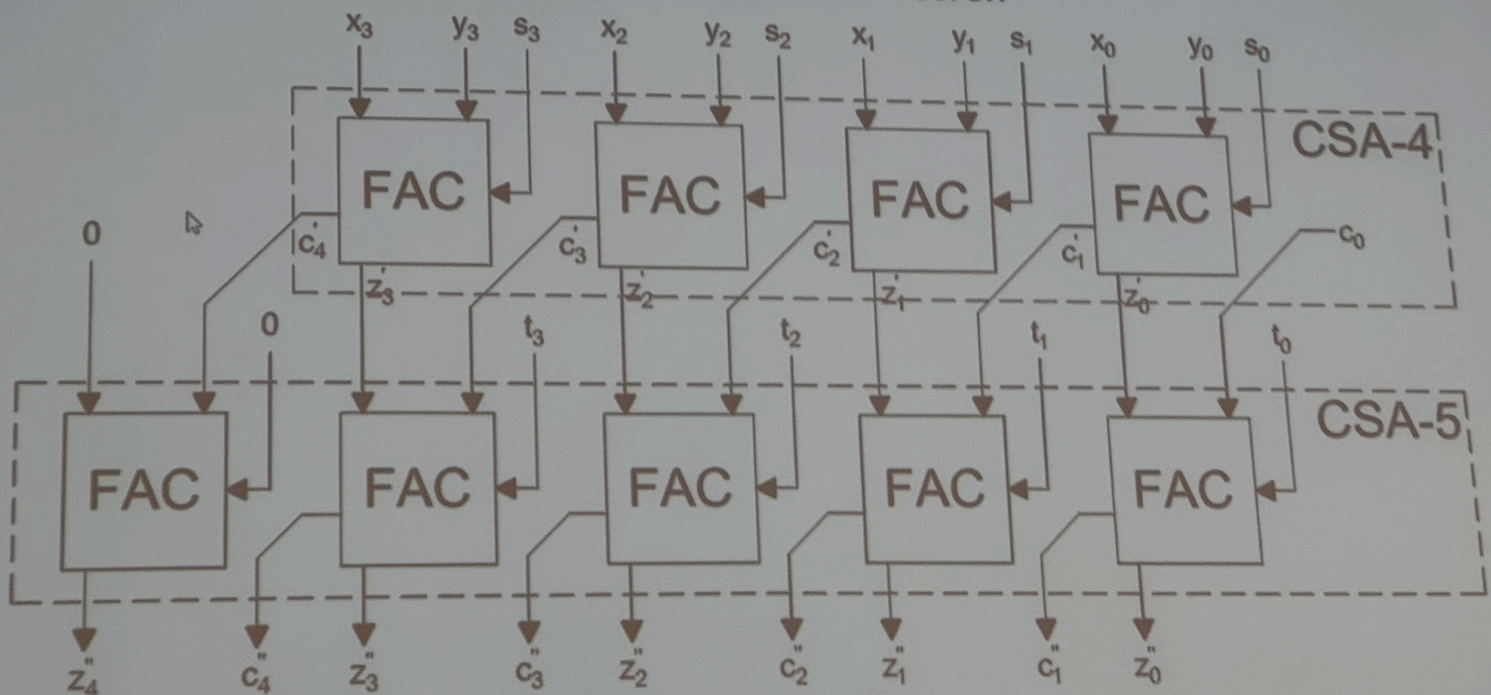
→ 2 vectori  $\begin{cases} \text{sumă} \\ \text{transport} \end{cases}$

→ adunarea multi operand

$x, y, s, t$  pe 4 biți  $Z = x + y + s + t$

- ▶ sumă în format redundant: 2 vectori  $\begin{cases} \text{sumă} \\ \text{transport} \end{cases}$
- ▶ vectorul transport este cu o poziție mai semnificativ decât cel sumă
- ▶ permite realizarea adunării multi-operand

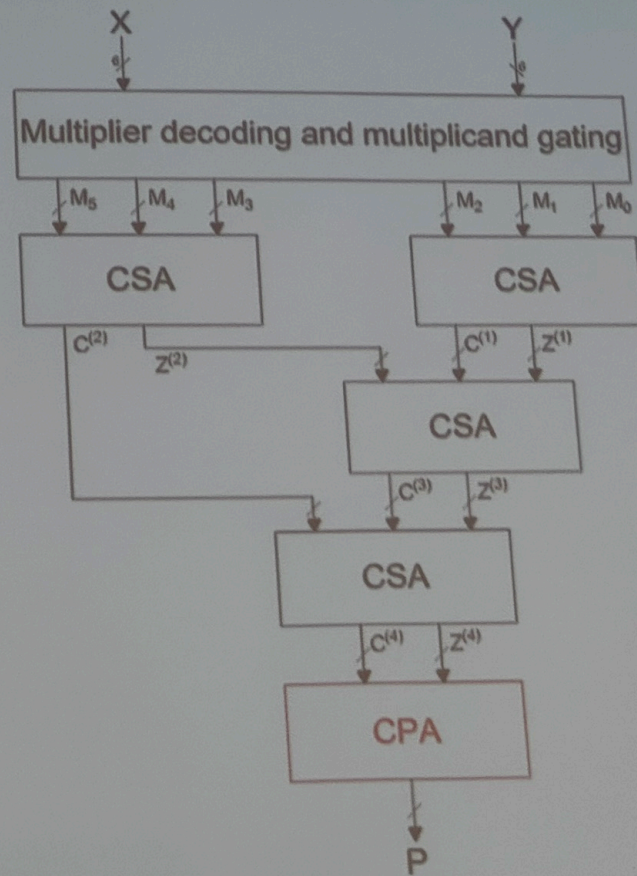
Se consideră operandii  $X, Y, S$  și  $T$ , pe 4 biți. Suma  $Z = X + Y + S + T$  poate fi calculată astfel:





- facilitează realizarea operației de înmulțire (combi-național)

Fie  $X$  și  $Y$  fără semn pe 6 biți. Produsul  $P = X * Y$  este obținut prin adunarea produselor de 1-bit  $M_i = x_i * Y * 2^i$



$$X = \begin{array}{r} x_5 \ x_4 \ x_3 \ / \ x_2 \ x_1 \ x_0 \\ 1 \ 0 \ 1 \ / \ 1 \ 0 \ 1 \end{array} = 45$$

$$Y = \begin{array}{r} 1 \ 0 \ 0 \ 1 \end{array} = 9$$

$$405$$

$$M_i = x_i \cdot Y \cdot 2^i$$

$M_0$		1 0 0 1	$M_3$		1 0 0 1
$M_1$		0 0 0 0	$M_4$		0 0 0 0
$M_2$		1 0 0 1	$M_5$		1 0 0 1
$Z^{(1)}$		1 0 1 1 0 1	$Z^{(2)}$		1 0 1 1 0 1
$C^{(1)}$		0 0 0 0 0 0	$C^{(2)}$		0 0 0 0 0 0

$C^{(1)} \times 2$

$2C^{(1)}$  0 0 0 0 0 0 0 0 | 0

$Z^{(1)}$  0 0 0 1 0 1 1 0 1

$Z^{(2)}$  1 0 1 1 0 1 0 0 0

---

$Z^{(3)}$  1 0 1 0 0 0 1 0 1

$C^{(3)}$  0 0 0 1 0 1 0 0 0

---

$2C^{(3)}$  0 0 0 1 0 1 0 0 0

$Z^{(3)}$  1 0 1 0 0 0 1 0 1

$2 \times C^{(2)}$  0 0 0 0 0 0

---

$Z^{(4)}$  0 1 0 0 0 1 0 1 0 1

$C^{(4)}$  0 0 0 1 0 0 0 0 0 0

$2C^{(4)}$  0 0 0 1 0 0 0 0 0 0

$Z^{(4)}$  0 1 0 0 0 1 0 1 0 1

405

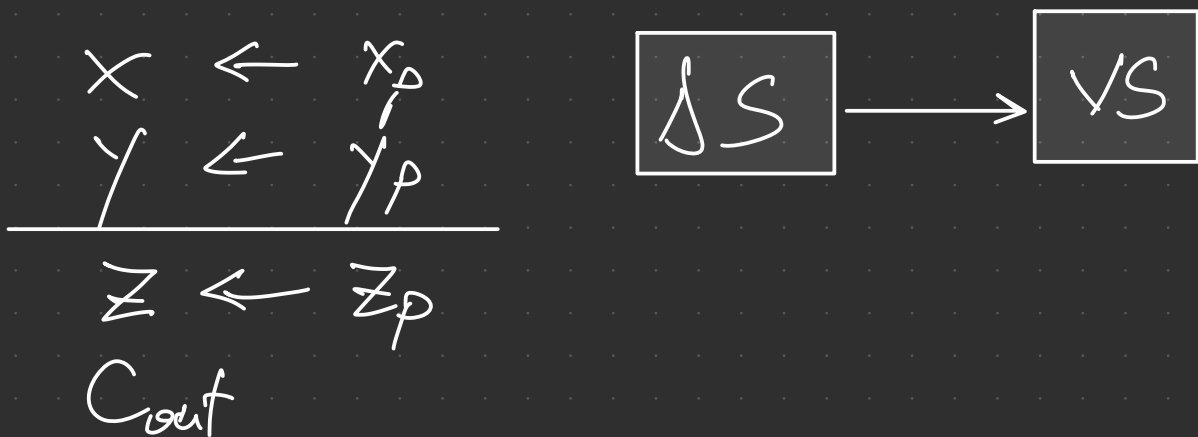
---

$P$  0 0 1 1 0 0 1 0 1 0 1

# Calcul fiabil

- disponibilitate
- fiabilitate
- mentenabilitate

## Sumatoare binare cu control de paritate



$$x_p = x_{n-1} \oplus x_{n-2} \oplus \dots \oplus x_0$$

$$y_p = y_{n-1} \oplus \dots \oplus y_0$$

$$z_p = \text{---} \parallel \text{---}$$

$$z_i = x_i \oplus y_i \oplus c_i$$

$$z_p = x_p \oplus y_p \oplus \underbrace{(c_{n-1} \oplus c_{n-2} \oplus \dots \oplus c_0)}_{c_p}$$