

→ Arquitectura de computadoras - Ficha 6

1-

- 50% de instrucciones academia memoria $\Rightarrow \% Mem = 0,5$

- 7 líneas $\Rightarrow B/11$

- $mpt = 20 + 10 \times 7 = 60 \text{ ns}$

- $f = 2 \text{ GHz}$

- $CPI_{CPU} = 1$

- hit rate de datos = 92% $\Rightarrow mrd = 8\% = 0,08$

- hit rate de instrucciones = 96% $\Rightarrow mri = 0,04\% = 4\%$

→ M1

$$\hookrightarrow f = 2 \text{ GHz} \Rightarrow mp_{IC} = 60 \times 2 = 240$$

$$CPI = CPI_{CPU} + CPI_{MEM}$$

$$= 1 + ((0,04 + 0,08 \times 0,5) \times 240) = 20,2$$

$$T_{exec} = \frac{CPI \times \#I}{f} = \frac{20,2 \times \#I}{2 \times 10^9} = 5,05 \times 10^{-9} \#I$$

→ M2

- cache líneas 8 bytes

$$mpt = 20 + 10 \times 3 = 100 \text{ ns} \quad mp_{IC} = 100 \times 2 = 200$$

$$mri = 0,02 \quad mrd = 0,04$$

$$CPI = (1 + ((0,02 + 0,04 \times 0,5) \times 200)) = 9$$

$$T_{exec} = \frac{9 \times \#I}{2 \times 10^9} = 4,5 \times 10^{-9}$$

M2

é menor

3-

• 4 blocks

→ F: 250 ps

→ D: 200 ps

→ E: 350 ps

→ W: 150 ps

latency: 50 ps

a)

• even pipeline

$$f = \frac{1}{(250 + 200 + 350 + 150 + 50) \times 10^{-12}} = 1 \times 10^9 \text{ Hz}$$

• even pipeline

$$f = \frac{1}{(350 + 50) \times 10^{-12}} = 2,5 \times 10^9 \text{ Hz}$$

b)

• CPI memoria = 1

• CPI dados = $1,5 \times 0,4 = 0,6$

↓
bothops

• CPI control = $2 \times 0,2 = 0,4$

$$\text{CPI}_{total} = 1 + 0,6 + 0,4 = 2$$

c) CPI memoria = 1

• CPI dados = $0,4 \times 0,5 = 0,2$

• CPI control = $0,4 \times 0,75 = 0,3$

$$\text{CPI}_{total} = 1 + 0,2 + 0,3 = 1,5$$