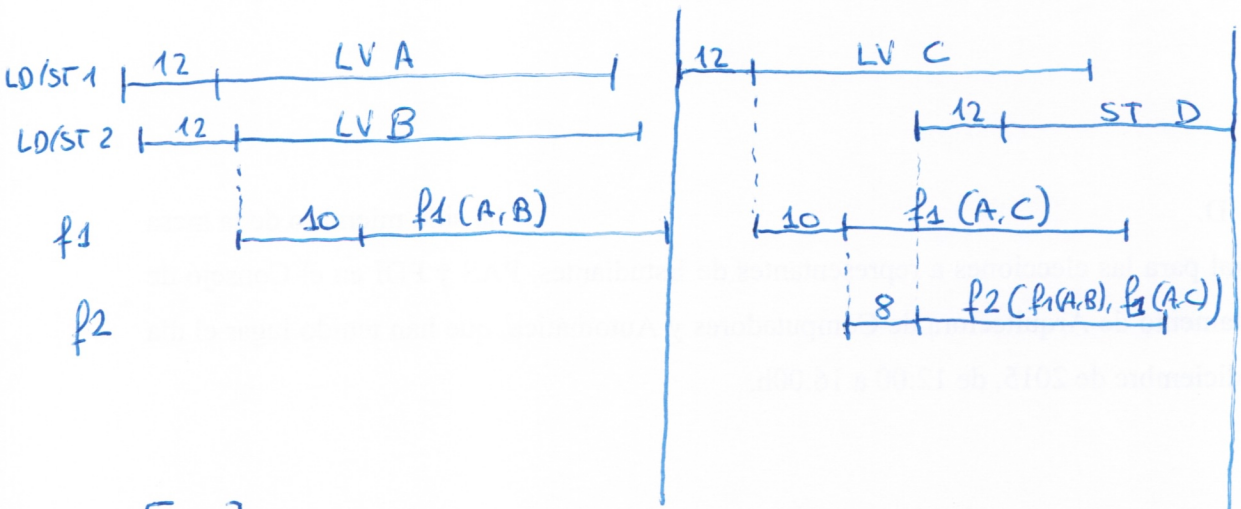
12) $D = f2(f1(A,B), f1(A,C))$ 1000 componentes

$t_c = 2ns$ MVL = 128 f1: 20ns f2: 16ns

2 pipes LD/ST 1UF → F1 1UF → F2

a) f1: $\frac{20ns}{t_c} = 10$ ciclos f2: $\frac{16ns}{t_c} = 8$ ciclos



$T_n = \left\lceil \frac{n}{MVL} \right\rceil \times (T_{loop} + T_{start}) + n \times T_{chime} = \left\lceil \frac{1000}{128} \right\rceil \times (15+12+1+10+12+10+8+12) +$

$+ 1000 \times 2 = 8 \times 80 + 2000 = 2640$ ciclos

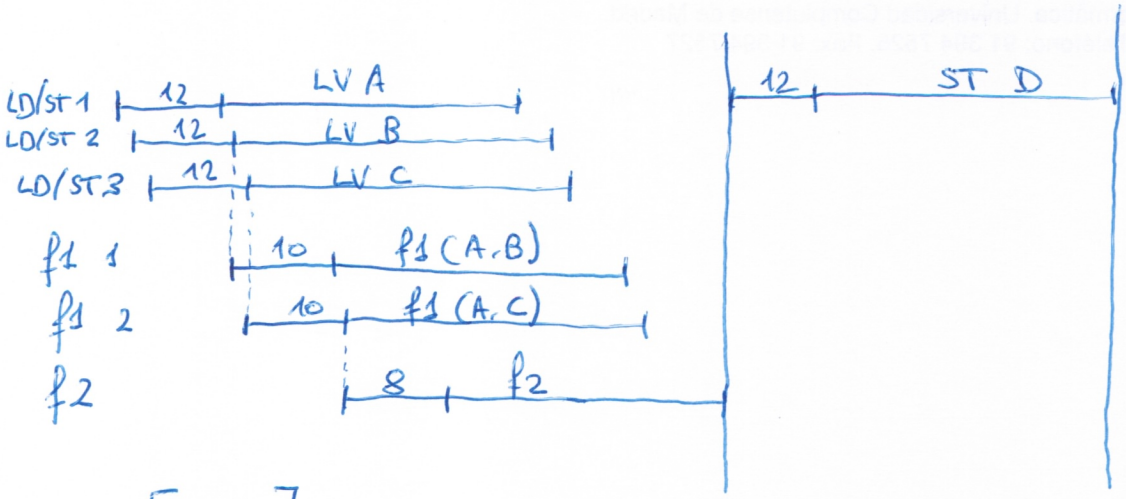
$R = \frac{Nº ops\ PF}{Tiempo} = \frac{3 \times 1000}{2640\ ciclos} = 1'136\ \frac{FLOP}{ciclo}$

$R = \frac{1'136\ FLOP/ciclo}{2 \times 10^{-9}\ s/ciclo} = 568'18\ MFLOPS$

R_∞: $T_{n\to\infty} = \frac{n}{128} \times 80 + 2n = 2'625\,n$

$R_\infty = \lim_{n\to\infty} \frac{3n}{2'625n} = 1'1428\ \frac{FLOP}{ciclo} \Rightarrow R_\infty = \frac{1'1428\ FLOP/ciclo}{2 \times 10^{-9}\ s/ciclo} = 571'42\ MFLOPS$

b) 3 pipes LD/ST // 2 pipes para f1



$$T_n = \left\lceil \frac{1000}{128} \right\rceil \times (15+2+12+10+8+12) + 2 \times 1000 = 8 \times 59 + 2000 = 2472 \text{ ciclos}$$

$$R = \frac{3 \times 1000}{2472 \text{ ciclos}} = 1'2136 \ \frac{\text{FLOP}}{\text{ciclo}} \quad ; \quad R = \frac{1'2136 \ \text{FLOP/ciclo}}{2 \times 10^{-9} \ \text{s/ciclo}} = 606'8 \ \text{MFLOPS}$$

$$R_\infty : \quad T_{n \to \infty} = \frac{n}{128} \times 59 + 2n = 0'46 + 2n = 2'46\,n$$

$$R_\infty = \lim_{n \to \infty} \frac{3n}{2'46\,n} = 1'22 \ \frac{\text{FLOP}}{\text{ciclo}} \Rightarrow R_\infty = \frac{1'22 \ \text{FLOP/ciclo}}{2 \times 10^{-9} \ \text{s/ciclo}} = 610 \ \text{MFLOPS}$$