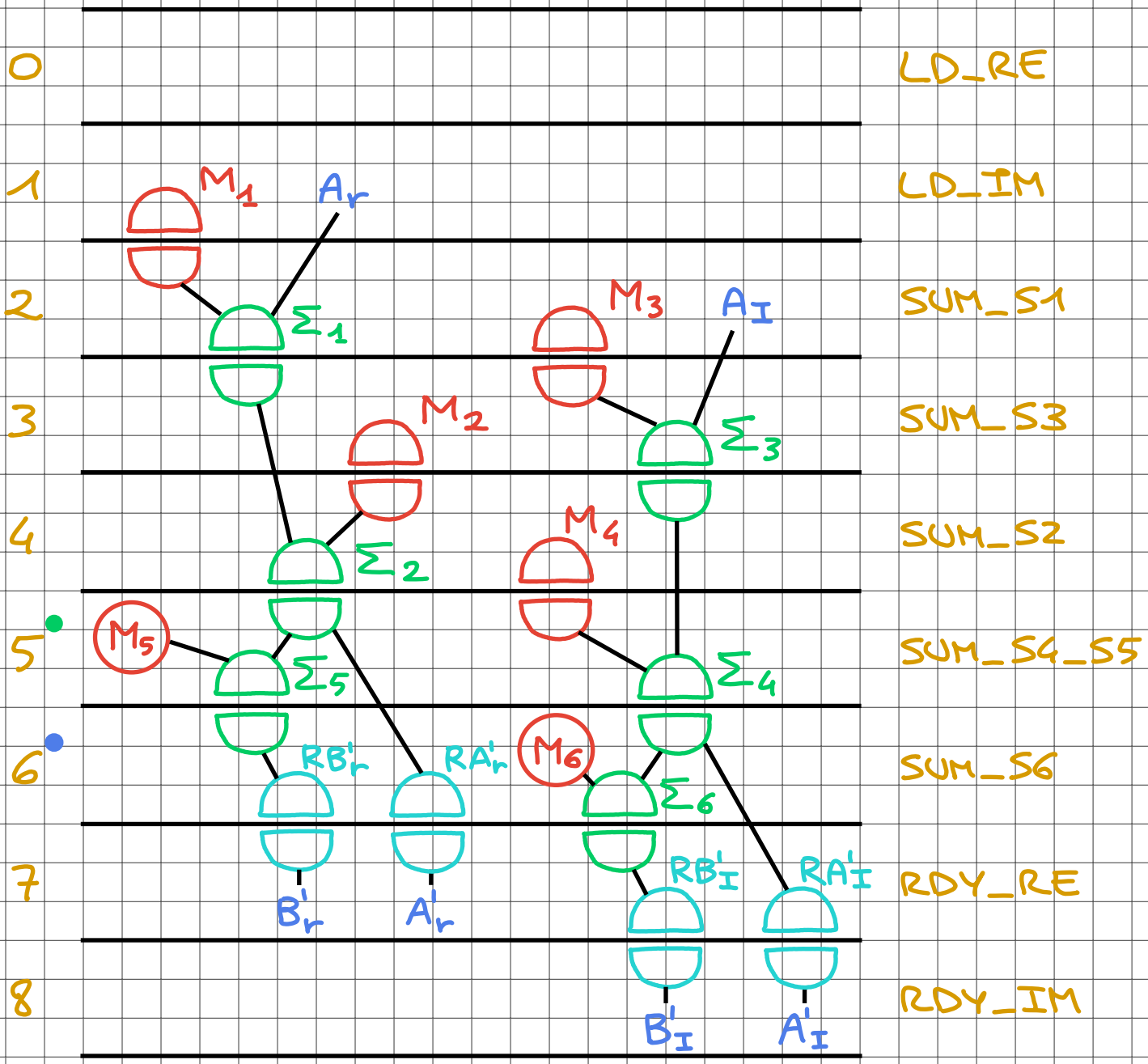
BUTTERFLY DESIGN

CONTROL DATA FLOW GRAPH



● ← CICLO SENSIBILE A START

● ← CICLO CHE FORNISCE DONE

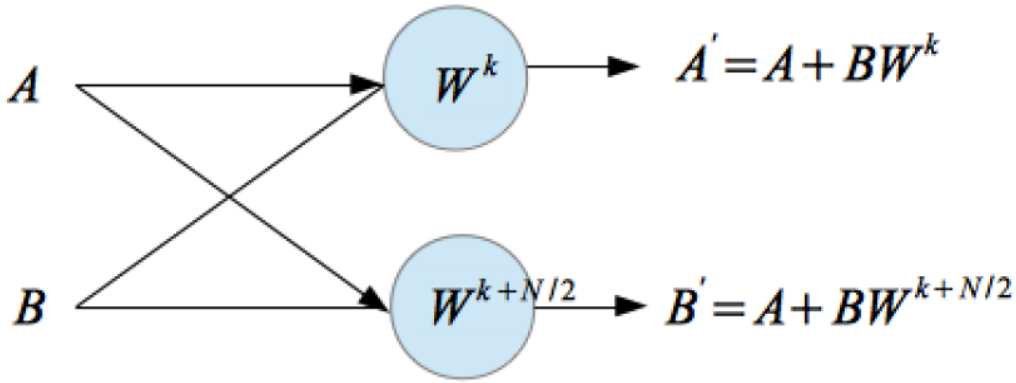
TEMPO DI VITA VARIABILI

	I	II	III	IV	V	VI	VII	VIII
A_r	o	o	o	o	o			
A_i		o	o	o	o	o		
B_r	o	o						
B_i		o	o	o				
W_r	o	o	o	o				
W_i	o	o	o					
M_1		o						
M_2				o				
M_3			o					
M_4					o			
M_5								
M_6								
Σ_1			o	o				
Σ_2					o	o		
Σ_3				o	o			
Σ_4						o	o	
Σ_5						o		
Σ_6							o	
RA'_r						o	o	
RB'_r							o	
RA'_I								o
RB'_I								o

$$M_1 = B_R W_R$$
$$M_2 = B_I W_I$$
$$M_3 = B_R W_I$$
$$M_4 = B_I W_R$$
$$M_5 = 2A_R$$
$$M_6 = 2A_I$$
$$\Sigma_1 = A_R + M_1$$
$$\Sigma_2 = \Sigma_1 - M_2 = A'_R$$
$$\Sigma_3 = A_I + M_3$$
$$\Sigma_4 = \Sigma_3 + M_4 = A'_I$$
$$\Sigma_5 = M_5 - \Sigma_2 = B'_R$$
$$\Sigma_6 = M_6 - \Sigma_4 = B'_I$$

6 REGISTRI IN TOTALE NEL DP

Butterfly



$$A' = A + W^K * B$$

$$B' = A + W^{K+\frac{N}{2}} * B$$

$$W^K = W_R + jW_I$$

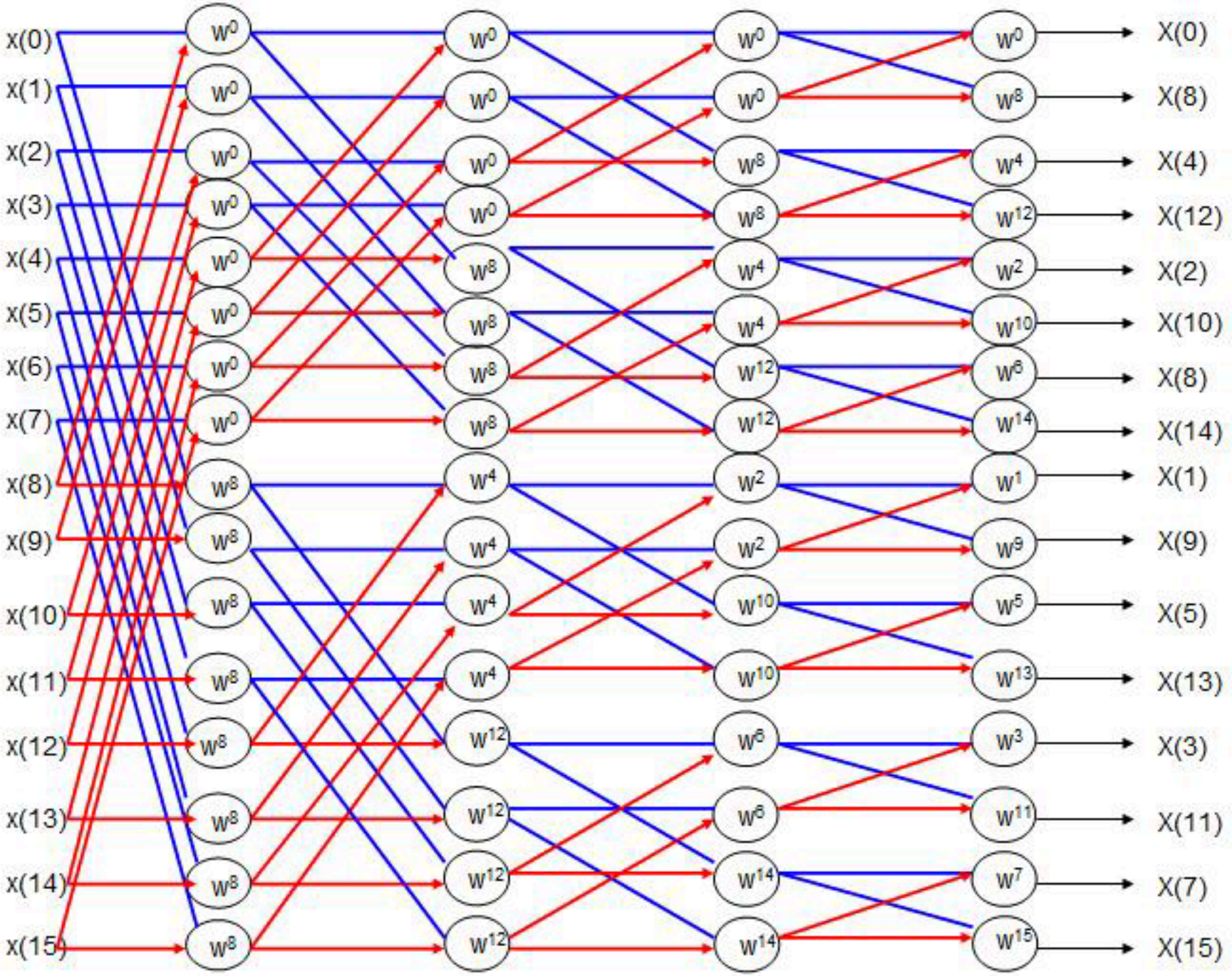
$$W^{K+\frac{N}{2}} = -W_R - jW_I$$

$$A = A_R + jA_I$$

$$A' = A'_R + jA'_I$$

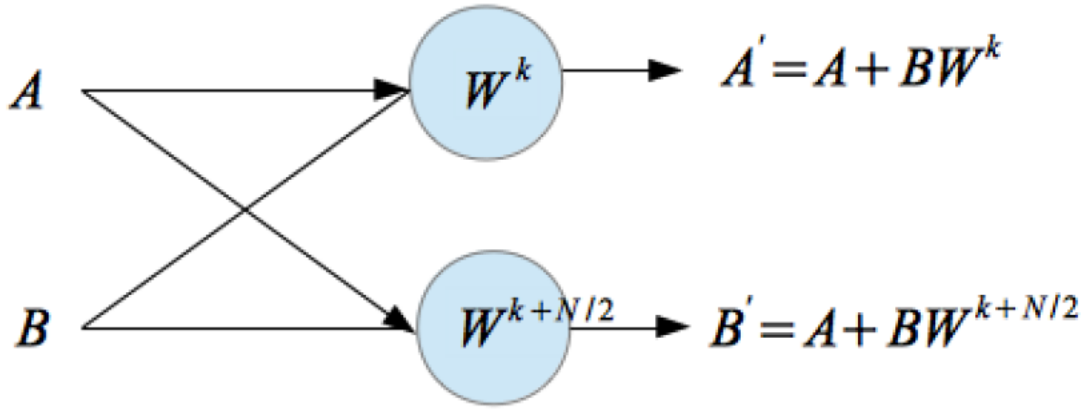
$$B = B_R + jB_I$$

$$B' = B'_R + jB'_I$$


x(0)
x(1)
x(2)
x(3)
x(4)
x(5)
x(6)
x(7)
x(8)
x(9)
x(10)
x(11)
x(12)
x(13)
x(14)
x(15)
X(0)
X(8)
X(4)
X(12)
X(2)
X(10)
X(8)
X(14)
X(1)
X(9)
X(5)
X(13)
X(3)
X(11)
X(7)
X(15)

S

Butterfly



$$A' = (A_R + jA_I) + (W_R + jW_I) * (B_R + jB_I) =$$
$$= (A_R + B_R W_R - B_I W_I) + j(A_I + B_R W_I + B_I W_R)$$

$$B' = (A_R + jA_I) + (-W_R - jW_I) * (B_R + jB_I) =$$
$$= (A_R - B_R W_R + B_I W_I) + j(A_I - B_R W_I - B_I W_R).$$

$$B' = -A'_R + 2A_R + j(2A_I - A'_I).$$

Operatori

$$M_1 = B_R W_R$$
$$M_2 = B_I W_I$$
$$M_3 = B_R W_I$$
$$M_4 = B_I W_R$$
$$M_5 = 2A_R$$
$$M_6 = 2A_I$$
$$\Sigma_1 = A_R + M_1$$
$$\Sigma_2 = \Sigma_1 - M_2 = A'_R$$
$$\Sigma_3 = A_I + M_3$$
$$\Sigma_4 = \Sigma_3 + M_4 = A'_I$$
$$\Sigma_5 = M_5 - \Sigma_2 = B'_R$$
$$\Sigma_6 = M_6 - \Sigma_4 = B'_I$$

Operatori

$$M_1 = B_R W_R$$
$$M_2 = B_I W_I$$
$$M_3 = B_R W_I$$
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$$\Sigma_1 = A_R + M_1$$
$$\Sigma_2 = \Sigma_1 - M_2 = A'_R$$
$$\Sigma_3 = A_I + M_3$$
$$\Sigma_4 = \Sigma_3 + M_4 = A'_I$$
$$\Sigma_5 = M_5 - \Sigma_2 = B'_R$$
$$\Sigma_6 = M_6 - \Sigma_4 = B'_I$$

Operatori

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$$M_3 = B_R W_I$$
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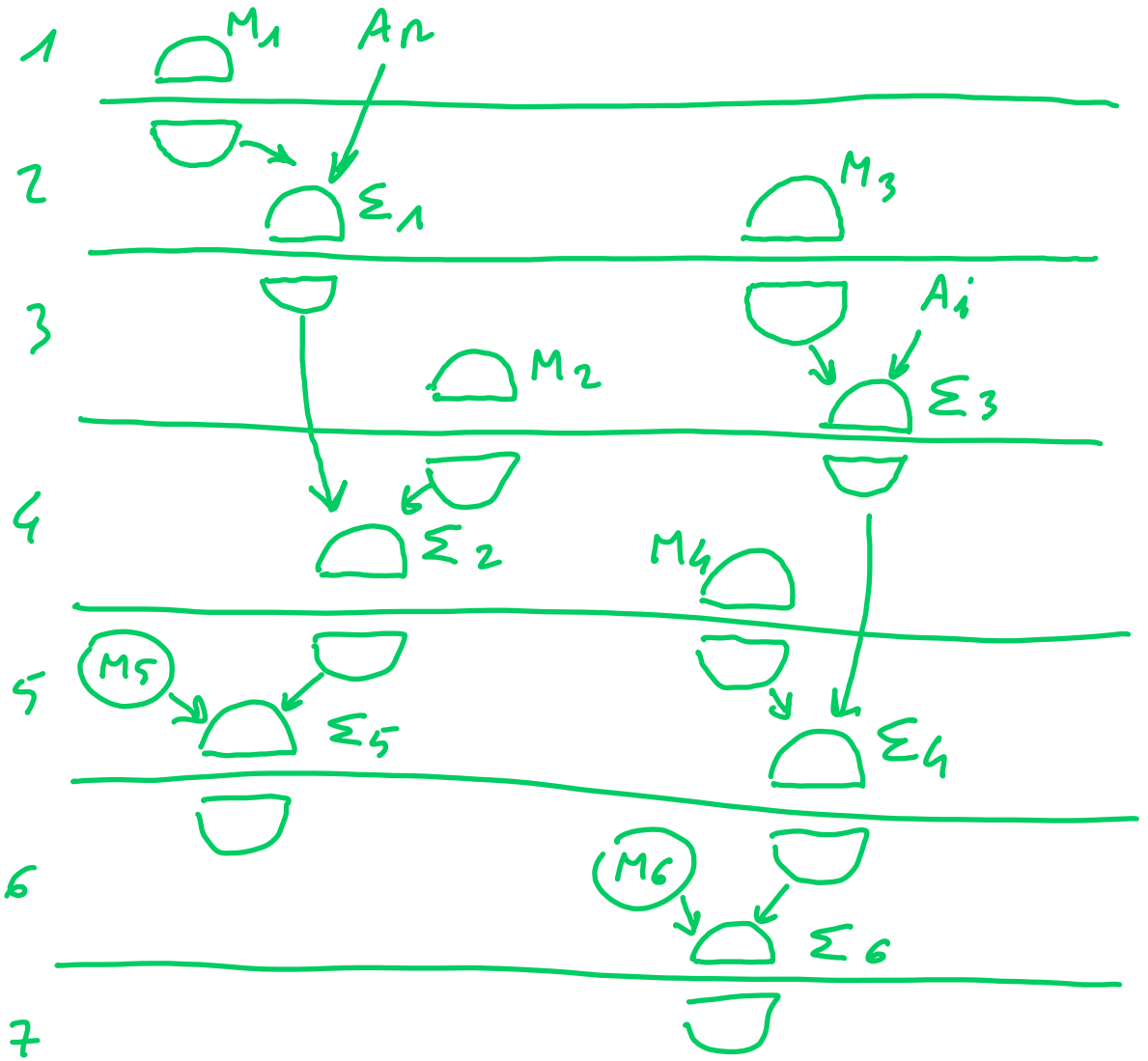
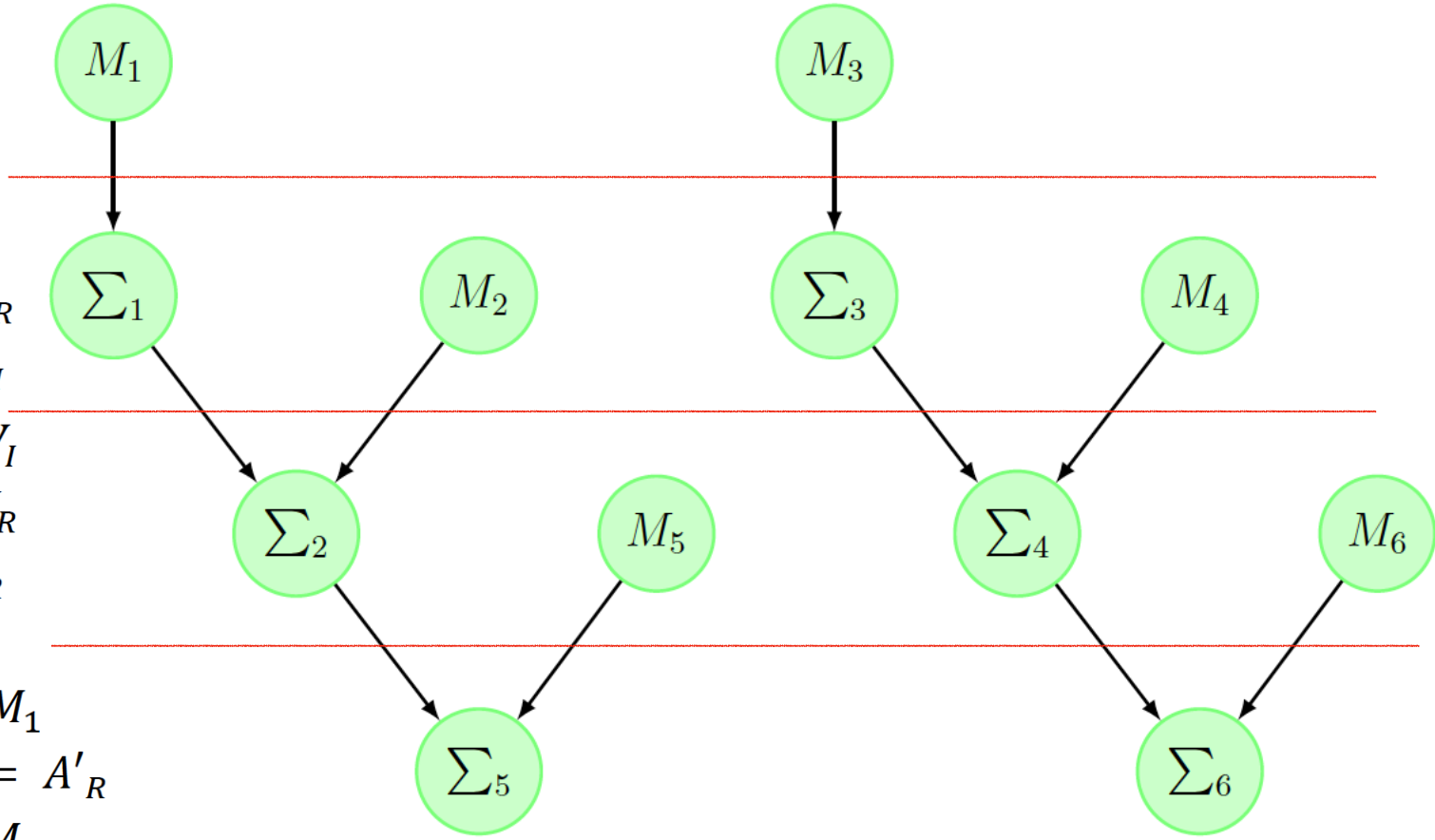
$$\Sigma_4 = \Sigma_3 + M_4 = A'_I$$
$$\Sigma_5 = M_5 - \Sigma_2 = B'_R$$
$$\Sigma_6 = M_6 - \Sigma_4 = B'_I$$



DFG (ALAP)



$$M_1 = B_R W_R$$
$$M_2 = B_I W_I$$
$$M_3 = B_R W_I$$
$$M_4 = B_I W_R$$
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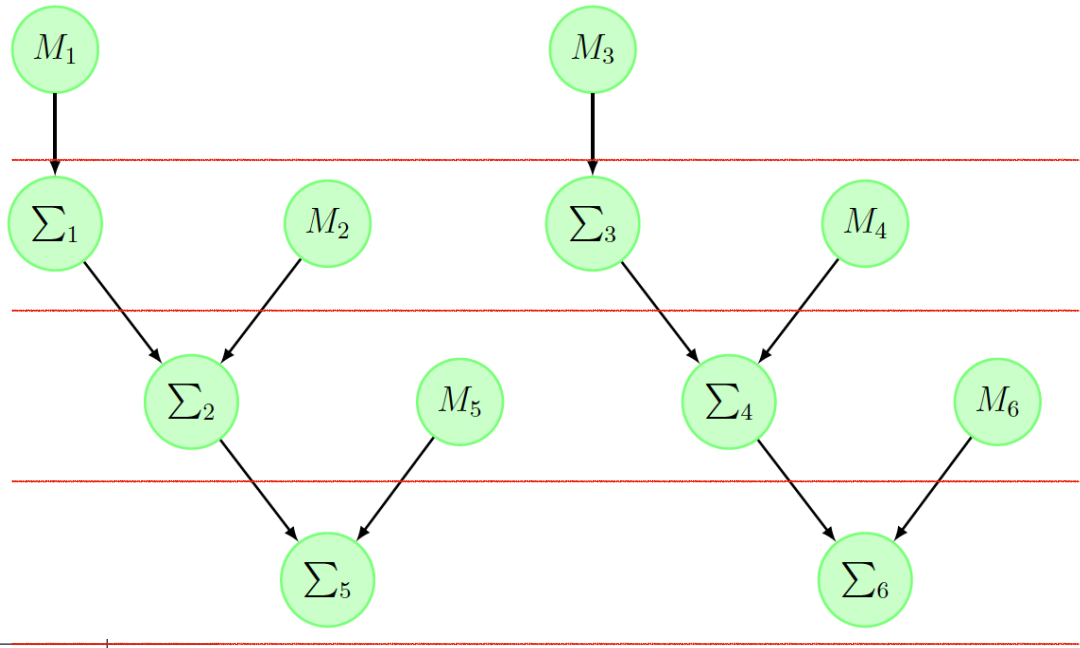
$$\Sigma_2 = \Sigma_1 - M_2 = A'_R$$
$$\Sigma_3 = A_I + M_3$$
$$\Sigma_4 = \Sigma_3 + M_4 = A'_I$$
$$\Sigma_5 = M_5 - \Sigma_2 = B'_R$$
$$\Sigma_6 = M_6 - \Sigma_4 = B'_I$$

VARIABLE TIMELIFE (ALAP)

	I step	II step	III step	IV step	End
A_r	X	X	X		
A_i	X	X	X		
B_r	X				
B_i	X	X			
W_r	X	X			
W_i	X	X			
M_i		X			
M_3		X			
$\sum_1$			X		
$\sum_3$			X		
M_2			X		
M_4			X		
M_5				X	
M_6				X	
$\sum_2$				X	
$\sum_4$				X	
$\sum_5$					X
$\sum_6$					X



DFG (ASAP)

$$M_1 = B_R W_R$$
$$M_2 = B_I W_I$$
$$M_3 = B_R W_I$$
$$M_4 = B_I W_R$$
$$M_5 = 2A_R$$
$$M_6 = 2A_I$$
$$\Sigma_1 = A_R + M_1$$
$$\Sigma_2 = \Sigma_1 - M_2 = A'_R$$
$$\Sigma_3 = A_I + M_3$$
$$\Sigma_4 = \Sigma_3 + M_4 = A'_I$$
$$\Sigma_5 = M_5 - \Sigma_2 = B'_R$$
$$\Sigma_6 = M_6 - \Sigma_4 = B'_I$$