

3. I2OE: IO Front-End/Issue, OOO Completion, Early Commit

Example Execution Diagrams

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
a: mul x1, x2, x3	F	D	I	Y0	Y1	Y2	Y3	W												
b: addi x11, x10, 1		F	D	I	X	W														
c: mul x5, x1, x4			F	D	I	I	I	Y0	Y1	Y2	Y3	W								
d: mul x7, x5, x6				F	D	D	D	I	I	I	I	Y0	Y1	Y2	Y3	W				
e: addi x12, x11, 1					F	F	F	D	D	D	D	I	X	W						
f: addi x13, x12, 1								F	F	F	F	D	I	X	W					
g: addi x14, x12, 2												F	D	I	I	X	W			

Stall due to structural hazard on writeback part

		WA Entry							
cycle	D	I	x1	x5	x7	x11	x12	x13	x14
0									
1	a								
2	b	a							
3	c	b	10000						
4			00000			00010			
5			00000			00001			
6	d	c	00010						
7			00001	10000					
8				01000					
9				00100					
10	e	d		00010					
11	f	e		00001	10000				
12	g	f			01000		00010		
13		g			00100		00001	00010	
14		g			00010			00001	
15					00001				00010

Stall with c

BYPASS

STRUCTURAL HAZARD!

with g "sees" structural hazard