	Delay	E.g	Pipeline
1. Read After Write			
1. RAW-1			
(a) Non-lw			

+ without forwarding (sw also cause RAW)	+2 (still +2)	sll $t3, x, x
		sw $t3, 0(x)
		add x, $t3, $t3
			F D E M W
			F / / D E M W

+ with forwarding	+0	sll $t3, x, x slt x, $t3, x	F D E M W F D E M W
(b) lw			
+ without forwarding	+2	lw $t3, x(x) srl x, $t3, x	F D E M W F / / D E M W F D E M W

+ with forwarding	+1	lw $t3, x(x)
		srl x, $t3, x
		sw x, x($t3)
			F D E M W
			F D / E M W
			F / D E M W

2. RAW-2			
(a) Non-lw			
+ without forwarding (sw also cause RAW) (*) NOT always will have +1	+1	sll $t3, x, x xxx x, x, x slt x, $t3, x	F D E M W F D E M W F / D E M W
+ with forwarding	+0	sll $t3, x, x xxx x, x, x slt x, $t3, x	F D E M W F D E M W F D E M W
(b) lw			
+ without forwarding	+1	lw $t3, x(x) xxx x, x, x srl x, $t3, x	F D E M W F D E M W F / D E M W

+ load Word with forwarding
(3rd instruction RAW on the 1st)
	+0	lw $t3, x(x)
		xxx x, x, x
		sw x, x($t3)
			F D E M W
			F D E M W
			F D E M W

3. Branch**			
i) at MEM/Decode, ii) no forwarding iii) *imm* after write (non-lw/lw)*		sll/lw $t3, x beq $t3, x, L	F D E M W / / F D E M W
i) at MEM, ii) forwarding iii) *imm* after write (non-lw)*		sll $t3, x, x beq $t3, x, L	F D E M W F D E M W
i) at MEM, ii) forwarding, iii) *imm* after write (lw)*		lw $t3, x (x) beq $t3, x, L	F D E M W F / D E M W
i) at Decode, ii) forwarding iii) *imm* after write (non-lw)*	RAW1: +1 / RAW2: +0	sll $t3, x, x beq $t3, x, L	F D E M W F / D E M W
i) at Decode, ii) forwarding iii) *imm* after write (lw)*	+2 / +1	lw $t3, x (x) beq $t3, x, L	F D E M W F / / D E M W
4. After-branch (Control Hazard)			
No prediction / wrong prediction (at MEM) No prediction / wrong prediction (at Decode)	+3 +1		F D E M W / / / F D E M W
Correct prediction	+0		F D E M W F D E M W
Delayed branching	Fail: +1/0 Success: +0		

MEM OR no forwarding follow RAW

Early branching (+) forwarding

Special Cases

(1) If SAME line has RAW-1 and RAW-2, then only add delay for RAW-1

(2) If ever RAW-1 followed by RAW-2, then only add delay for RAW-1

**be careful, doesn't consider being 2-after write, but rule of thumb is just -1 the "imm after write" case