

COEN 313  
Dynamic Scheduling HW

3.15

1. Not pipelined

Iteration	Instruction	Issues	Executes	Mem accesses	Write CDB	Comment
1	fld	3	4	5	6	
1	fmul.d	4	19	20	21	15 cycle pen for fmul.d
1	fld	5	6	7	8	
1	fadd.d	6	16	17	18	10 cycle pen for fadd.d
1	fsd	7	19	20	21	Need to wait for A0 to complete & CDB result
1	addi	8	9	10	11	
1	addi	9	10	11	12	
1	sltu	10	11	12	13	
1	bnez	11	12	13	14	End of 1st iteration
2	fld	12	13	14	15	
2	fmul.d	20	35	36	37	Wait for FU to be free + 15 cycle pen for fmul.d
2	fld	21	22	23	24	
2	fadd.d	22	32	33	34	10 cycle pen for fadd.d
2	fsd	23	35	36	37	Need to wait for A1 to complete & CDB result
2	addi	24	25	26	27	
2	addi	25	26	27	28	
2	sltu	26	27	28	29	
2	bnez	27	28	29	30	End of 2nd iteration

3	fld	28	29	30	31	
3	fmul.d	36	51	52	53	Wait for FU to be free + 15 cycle pen for fmul.d
3	fld	37	38	39	40	
3	fadd.d	38	48	49	50	10 cycle pen for fadd.d
3	fsd	39	51	52	53	Need to wait for A0 to complete & CDB result
3	addi	40	41	42	43	
3	addi	41	42	43	44	
3	sltu	42	43	44	45	
3	bnez	43	44	45	46	End of 3rd iteration

After 1st iteration:

	Integer		FP adder		FP multiplier		Load		Store
I0	<del>x1-8</del>	A0	F4 F6	M0	F2 F0	<del>L0</del>	<del>x1-0</del>	S0	x2 A0
I0	<del>x2-8</del>	A1		M1		<del>L0</del>	<del>x2-0</del>	S1	
I0		A2				L0		S2	
I1						L1		S3	
I2						L2		S4	

After 2nd iteration:

	Integer		FP adder		FP multiplier		Load		Store
I0	<del>x1-8</del>	A0	<del>F4 F6</del>	M0	<del>F2 F0</del>	<del>L0</del>	<del>x1-0</del>	<del>S0</del>	<del>x2 A0</del>
I0	<del>x2-8</del>	A1	F4 F6	M1	F2 F0	<del>L0</del>	<del>x2-0</del>	S1	x2 A1
I0		A2				L0		S2	

I1			L1		S3	
I2			L2		S4	

After 3rd iteration:

	Integer		FP adder		FP multiplier		Load		Store
I0	x1-8	A0	F4 F6	M0	F2 F0	L0	x1-0	S0	x2 A0
I0	x2-8	A1	F4 F6	M1	F2 F0	L0	x2-0	S1	x2 A1
I0		A2				L0		S2	
I1						L1		S3	
I2						L2		S4	

## 2. Pipelined

Iteration	Instruction	Issues	Executes	Mem accesses	Write CDB	Comment
1	fld	3	4	5	6	
1	fmul.d	4	19	20	21	15 cycle pen for fmul.d
1	fld	5	6	7	8	
1	fadd.d	6	16	17	18	10 cycle pen for fadd.d
1	fsd	7	19	20	21	Need to wait for A0 to complete & CDB result
1	addi	8	9	10	11	
1	addi	9	10	11	12	
1	sltu	10	11	12	13	
1	bnez	11	12	13	14	End of 1st iteration
2	fld	12	13	14	15	

2	fmul.d	13	28	29	30	15 cycle pen for fmul.d
2	fld	14	15	16	17	
2	fadd.d	15	25	26	27	10 cycle pen for fadd.d
2	fsd	16	28	29	30	Need to wait for A1 to complete & CDB result
2	addi	17	18	19	20	
2	addi	18	19	20	21	
2	sltu	19	20	21	22	
2	bnez	20	21	22	23	End of 2nd iteration
3	fld	21	22	23	24	
3	fmul.d	22	37	38	39	15 cycle pen for fmul.d
3	fld	23	24	25	26	
3	fadd.d	24	34	35	36	10 cycle pen for fadd.d
3	fsd	25	37	38	39	Need to wait for A0 to complete & CDB result
3	addi	26	27	28	29	
3	addi	27	28	29	30	
3	sltu	28	29	30	31	
3	bnez	29	30	31	32	End of 3rd iteration

After 1st iteration:

	Integer		FP adder		FP multiplier		Load		Store
10	x1-8	A0	F4 F6	M0	F2 F0	L0	x1-0	S0	x2 A0
10	x2-8	A1		M1		L0	x2-0	S1	
10		A2				L0		S2	

I1				L1		S3	
I2				L2		S4	

After 2nd iteration:

	Integer		FP adder		FP multiplier		Load		Store
I0	<del>x1-8</del>	A0	<del>F4 F6</del>	M0	<del>F2 F0</del>	<del>L0</del>	<del>x1-0</del>	S0	<del>x2-A0</del>
I0	<del>x2-8</del>	A1	<del>F4 F6</del>	M1	<del>F2 F0</del>	<del>L0</del>	<del>x2-0</del>	S1	<del>x2-A1</del>
I0		A2				L0		S2	
I1						L1		S3	
I2						L2		S4	

After 3rd iteration:

	Integer		FP adder		FP multiplier		Load		Store
I0	<del>x1-8</del>	A0	<del>F4 F6</del>	M0	<del>F2 F0</del>	<del>L0</del>	<del>x1-0</del>	S0	<del>x2-A0</del>
I0	<del>x2-8</del>	A1	<del>F4 F6</del>	M1	<del>F2 F0</del>	<del>L0</del>	<del>x2-0</del>	S1	<del>x2-A1</del>
I0		A2				L0		S2	
I1						L1		S3	
I2						L2		S4	