

Iter.	Instruction	P (start-stop)	I (start-stop)	M (clock)	CDB-write (C)(clock)	Commit (clock)	Comments
1	L.D F2,0(R1)	1-4	2	3	4	5	
1	MUL.D F4,F2,F0						
1	L.D F6,400(R1)						
1	DIV.D F6,F4,F6						
1	S.D F6,400(R1)						
1	ADDI R1,R1,8						
1	SGTI R3,R1,800						
1	BEQ R3,R0,etic						
2	L.D F2,0(R1)						
2	MUL.D F4,F2,F0						
2	L.D F6,400(R1)						
2	DIV.D F6,F4,F6						
2	S.D F6,400(R1)						
2	ADDI R1,R1,8						
2	SGTI R3,R1,800						
2	BEQ R3,R0,etic						
3	L.D F2,0(R1)						
3	MUL.D F4,F2,F0						
3	L.D F6,400(R1)						
3	DIV.D F6,F4,F6						
3	S.D F6,400(R1)						
3	ADDI R1,R1,8						
3	SGTI R3,R1,800						
3	BEQ R3,R0,etic						

## Exercise (working hypothesis)

- the pipeline implements a single-dispatch policy
  - the instructions after a branch are executed speculatively
  - the issue stage (I) calculates the address of the actual reads and writes;
  - reads require 1 clock cycle; writes require 0 clock cycles (write buffer + split-cache);
  - there's only one CDB
  - dispatch stage (P) and complete stage (C) require 1 clock cycle
  - there are separated integer units for the calculation of the actual address, for arithmetic and logical operations, for the evaluation of the branch condition
  - the functional units do not take advantage of pipelining techniques internally (reservation stations are busy until the end of CDB-write)
  - the load buffer has 5 slots
  - the store buffer has 5 slots (writes wait for the operand in the store buffer, i.e., in the issue stage)
  - the rest of the processor and has the following characteristics:
- | Type of Func.Unit           | No. of Func.Units | Cycles for stage I | No. of reserv. stations |
|-----------------------------|-------------------|--------------------|-------------------------|
| • Integer (effective addr.) | 1                 | 1                  | 2                       |
| • Integer (op. A-L)         | 1                 | 1                  | 2                       |
| • Integer (branch calc.)    | 1                 | 1                  | 2                       |
| • FP Adder                  | 1                 | 4                  | 3                       |
| • FP Multiplier             | 1                 | 8                  | 3                       |
| • FP Divider                | 1                 | 15                 | 2                       |