

Tomasulo

CSEN 702 - Microprocessors Project

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Tomasulo's algorithm is a dynamic scheduling algorithm used in computer architecture to implement out-of-order execution.

Instructions

Each instruction has an instruction type which is one of the following:

[FP_ADD](#), [FP_SUB](#), [FP_MUL](#), [FP_DIV](#), [INT_ADD](#), [INT_ADDI](#), [INT_SUBI](#), [LOAD](#), [STORE](#), [BRANCH](#) depending on whether the instruction is an integer addition or floating point addition or subtraction etc. It also has a status.

Instruction Status:

- [NOT_ISSUED](#) - When creating a new instruction, its status is set to NOT_ISSUED.
- [ISSUED](#) - When the instruction is issued.
- [WAITING_REGISTER](#) - When the instruction is issued but waiting for a register.
- [EXECUTING](#) - When the instruction is now executing in the register.
- [WAITING_WRITE_BACK](#) - When the instruction is done executing but waiting for write back.
- [WRITING_BACK](#) - When the instruction is writing back.
- [FINISHED](#) - When the instruction is finished

Additionally, each instruction stores the destination register and the cycles that the instruction was issued and executed in. This is used for debugging and printing out the result - when each instruction was issued and executed.

Instruction available:

Classes that extend the [Instruction](#) class:

- [AddI](#), [SubI](#), [DADD](#), [FpAdd](#), [FpDiv](#), [FpMul](#), [FpSub](#)
These instructions store their source registers used in the operation.
- [Load](#), [Store](#)
These instructions store the effective address.
- [Branch](#)

The branch instructions store the target address and the source register. Every instruction has an `execute()` function that performs its operation on the given registers.

Reservation Stations

Reservation Stations are hardware structures that facilitate the execution of instructions in an out-of-order processor. They act as buffers or queues for instructions, providing a place for instructions to wait until their operands are available and the execution units are ready.

Each reservation station has 5 attributes.

- Busy: Indicates whether this reservation station is busy or not. This is available for all our reservation stations.
- Tag: The operation performed on to operands.
- Instruction: the instruction stored in this reservation station.
- Remaining Execution Cycles: Stores the number of remaining cycles needed for execution.
- Result

Reservation station types:

- Add, Mul, Store
 - Each reservation station has a `setValues(instruction instruction)` function that sets the status of the instruction to `ISSUED` and stores the Vj, Qj, Vk, Qk with the appropriate values from the register file. If the tag of register in the register file is empty, the Vj or Vk is set to the value in the register file. Otherwise, it sets the status to `WAITING_REGISTER` and sets the Qj or Qk with the tag.
- Load
 - `setValues(instruction instruction)` stores the effective address of the instruction, and changes the status to `ISSUED`

Storage

Register File

- An array of registers. Each register has a tag and a value.

Memory

- An array of float values.

Simulator

Initialization

- The simulator starts by taking input from the user - the latency of each type of instruction and the size of all stations and buffers.
- Initialise the reservation stations.

Parsing Instructions

- The program is read instructions from a text file and each instruction is converted into a corresponding object of a specific instruction type (e.g., floating-point addition, subtraction, multiplication, division, addition with immediate value, subtraction with immediate value, branch if not equal to zero, store, load). These instruction objects are then added to a list for further processing or execution in a Tomasulo-based simulator.

Issue Phase

- Checks the instruction type and issues it to the appropriate reservation station if there is space available. It considers the operands' readiness and updates the reservation station accordingly.

Execution Phase

- Iterates through reservation stations for different instruction types (e.g., addition, multiplication, load, store). For each station, it checks if the operands are ready, decrements the remaining execution cycles, and updates the status accordingly.

Write Phase

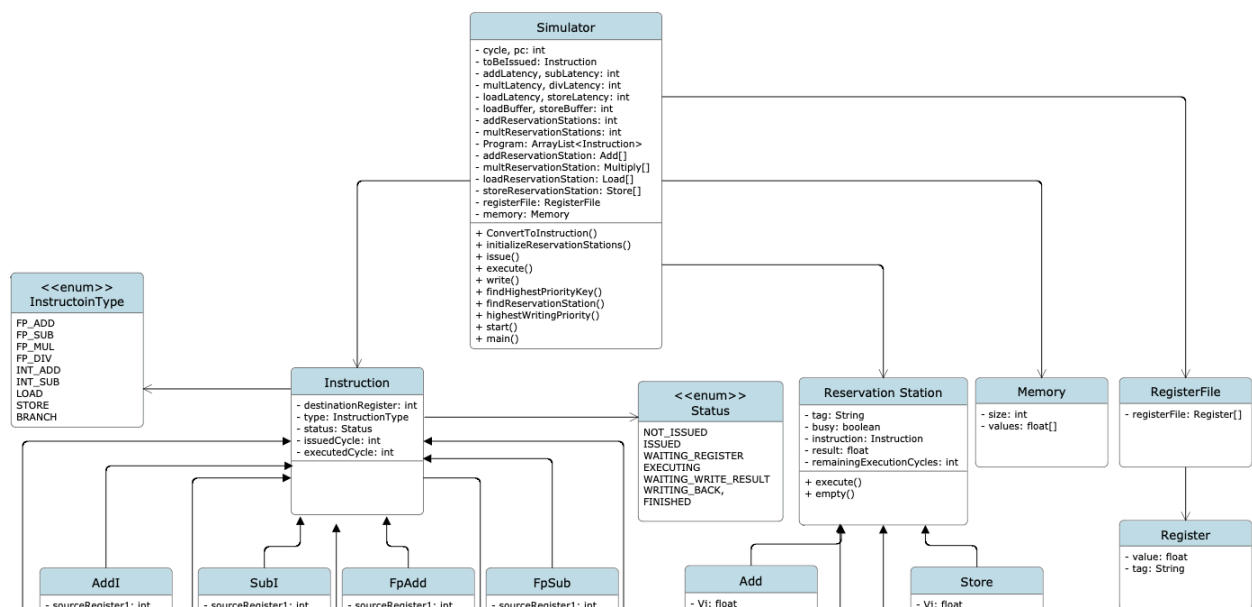
- Writes back results to the register file and updates dependent reservation stations.

Simulation Loop

- Repeats the issue, execute, and write phases in a loop until all instructions are marked as finished.

Final Output

- Prints the final state of the register file and memory.



GUI

We save the state of the program at every cycle, and we use these states to simulate the algorithm cycle by cycle through the GUI.

Tomasulo Simulator

Tomatulo

Enter your instructions here

Run

Table Inputs	
INPUT	VALUE
ADD LATENCY	1
SUB LATENCY	1
MUL LATENCY	1
DIV LATENCY	1
LOAD LATENCY	1
STORE LATENCY	1
ADD/SUB RS SIZE	1
MUL/DIV RS SIZE	1
LOAD RS SIZE	1
STORE RS SIZE	1

Instructions Table				
INSTRUCTION	ISSUE	START EXEC	END EXEC	WRITE BACK
DIV.D F0 F16 F4	1	2	2	3
ADD.D F1 F0 F2	2	4	4	5
ADDI R0 R1 6	6	7	7	0

Integer Register File		
REGISTER	VALUE	WAITING
R1	1	A1
R2	2	
R3	3	
R4	4	
R5	5	
R6	6	
R7	7	
R8	8	
R9	9	
R10	10	

Float Register File		
REGISTER	VALUE	WAITING
F1	3.4	
F2	6.4	
F3	3.0	
F4	4.0	
F5	5.0	
F6	6.0	
F7	7.0	
F8	8.0	
F9	9.0	
F10	10.0	

Memory	
ADDRESS	VALUE
MEM1	1.0
MEM2	2.0
MEM3	3.0
MEM4	4.0
MEM5	5.0
MEM6	6.0
MEM7	7.0
MEM8	8.0
MEM9	9.0
MEM10	10.0

Load Buffer		
LABEL	BUSY	ADDRESS
L1	false	null

Store Buffer				
LABEL	Busy	ADDRESS	V	Q
S1	false	null	null	

ADD/SUB RS					
LABEL	OP	Vj	Vk	Qj	Qk
A1	Addi	2.0	6.0		

Mul/Div RS					
LABEL	OP	Vj	Vk	Qj	Qk
M1		null	null		

Cycle Events	
INSTRUCTION	EVENT
ADDI R0 R1 6	EXECUTING

CYCLE: 7

Test Cases

Test Case #1

Latency/size:

- Add/Sub latency = 4
- Mul/Div latency = 4
- Load/Store latency = 1
- Reservation station sizes = 3 for Add/Sub and store and load, 2 for Mul

Program:

L.D F0 2

MUL.D F4 F0 F2

S.D F4 0

SUBI R15 R15 8

BNEZ R15 LOOP

Output:

Initial Register file:

Float Register File

Register F0 value 1.0 tag null

Register F1 value 2.0 tag null

Register F2 value 3.0 tag null

Register F3 value 4.0 tag null

Register F4 value 5.0 tag null

Register F5 value 6.0 tag null

Register F6 value 7.0 tag null

Register F7 value 8.0 tag null

Register F8 value 9.0 tag null

Register F9 value 10.0 tag null

Register F10 value 11.0 tag null

Register F11 value 12.0 tag null

Register F12 value 13.0 tag null

Register F13 value 14.0 tag null

Register F14 value 15.0 tag null

Register F15 value 16.0 tag null

Register F16 value 17.0 tag null

Register F17 value 18.0 tag null

Register F18 value 19.0 tag null

Register F19 value 20.0 tag null

Register F20 value 21.0 tag null

Register F21 value 22.0 tag null

Register F22 value 23.0 tag null

Register F23 value 24.0 tag null

Register F24 value 25.0 tag null

Register F25 value 26.0 tag null

Register F26 value 27.0 tag null
Register F27 value 28.0 tag null
Register F28 value 29.0 tag null
Register F29 value 30.0 tag null
Register F30 value 31.0 tag null
Register F31 value 32.0 tag null

Integer Register File

Register R0 value 1 tag null
Register R1 value 2 tag null
Register R2 value 3 tag null
Register R3 value 4 tag null
Register R4 value 5 tag null
Register R5 value 6 tag null
Register R6 value 7 tag null
Register R7 value 8 tag null
Register R8 value 9 tag null
Register R9 value 10 tag null
Register R10 value 11 tag null
Register R11 value 12 tag null
Register R12 value 13 tag null
Register R13 value 14 tag null
Register R14 value 15 tag null
Register R15 value 16 tag null
Register R16 value 17 tag null
Register R17 value 18 tag null
Register R18 value 19 tag null
Register R19 value 20 tag null
Register R20 value 21 tag null
Register R21 value 22 tag null
Register R22 value 23 tag null
Register R23 value 24 tag null
Register R24 value 25 tag null
Register R25 value 26 tag null
Register R26 value 27 tag null
Register R27 value 28 tag null
Register R28 value 29 tag null
Register R29 value 30 tag null
Register R30 value 31 tag null
Register R31 value 32 tag null

Cycle: 1

Issuing instruction: Instruction{type=LOAD, status=ISSUED, destination register=0, issued cycle=1, started execution cycle=0, finished execution cycle=0, written cycle=0}

Register file:

Float Register File

Register F0 value 1.0 tag L1
Register F1 value 2.0 tag null

Register F2 value 3.0 tag null
Register F3 value 4.0 tag null
Register F4 value 5.0 tag null
Register F5 value 6.0 tag null
Register F6 value 7.0 tag null
Register F7 value 8.0 tag null
Register F8 value 9.0 tag null
Register F9 value 10.0 tag null
Register F10 value 11.0 tag null
Register F11 value 12.0 tag null
Register F12 value 13.0 tag null
Register F13 value 14.0 tag null
Register F14 value 15.0 tag null
Register F15 value 16.0 tag null
Register F16 value 17.0 tag null
Register F17 value 18.0 tag null
Register F18 value 19.0 tag null
Register F19 value 20.0 tag null
Register F20 value 21.0 tag null
Register F21 value 22.0 tag null
Register F22 value 23.0 tag null
Register F23 value 24.0 tag null
Register F24 value 25.0 tag null
Register F25 value 26.0 tag null
Register F26 value 27.0 tag null
Register F27 value 28.0 tag null
Register F28 value 29.0 tag null
Register F29 value 30.0 tag null
Register F30 value 31.0 tag null
Register F31 value 32.0 tag null

Integer Register File

Register R0 value 1 tag null
Register R1 value 2 tag null
Register R2 value 3 tag null
Register R3 value 4 tag null
Register R4 value 5 tag null
Register R5 value 6 tag null
Register R6 value 7 tag null
Register R7 value 8 tag null
Register R8 value 9 tag null
Register R9 value 10 tag null
Register R10 value 11 tag null
Register R11 value 12 tag null
Register R12 value 13 tag null
Register R13 value 14 tag null
Register R14 value 15 tag null
Register R15 value 16 tag null
Register R16 value 17 tag null

Register R17 value 18 tag null
Register R18 value 19 tag null
Register R19 value 20 tag null
Register R20 value 21 tag null
Register R21 value 22 tag null
Register R22 value 23 tag null
Register R23 value 24 tag null
Register R24 value 25 tag null
Register R25 value 26 tag null
Register R26 value 27 tag null
Register R27 value 28 tag null
Register R28 value 29 tag null
Register R29 value 30 tag null
Register R30 value 31 tag null
Register R31 value 32 tag null

Load Buffers:

{tag='L1', busy=true, A=2}
{tag='L2', busy=false, A=null}
{tag='L3', busy=false, A=null}

Store Buffers:

{tag='S1', busy=false, A=null, Vj=null, Qj='null'}
{tag='S2', busy=false, A=null, Vj=null, Qj='null'}
{tag='S3', busy=false, A=null, Vj=null, Qj='null'}

Add Reservation Stations:

{tag='A1', busy=false, op=0, Vj=null, Vk=null, Qj='null', Qk='null'}
{tag='A2', busy=false, op=0, Vj=null, Vk=null, Qj='null', Qk='null'}
{tag='A3', busy=false, op=0, Vj=null, Vk=null, Qj='null', Qk='null'}

Multiply Reservation Stations:

{tag='M1', busy=false, op=0, Vj=null, Vk=null, Qj='null', Qk='null'}
{tag='M2', busy=false, op=0, Vj=null, Vk=null, Qj='null', Qk='null'}

Memory:

Memory 0 value 1.0
Memory 1 value 2.0
Memory 2 value 3.0
Memory 3 value 4.0
Memory 4 value 5.0
Memory 5 value 6.0
Memory 6 value 7.0
Memory 7 value 8.0
Memory 8 value 9.0
Memory 9 value 10.0

Cycle: 2

Issuing instruction: Instruction{type=FP_MUL, status=ISSUED, destination register=4, issued cycle=2, started execution cycle=0, finished execution cycle=0, written cycle=0}

Executing instruction: Instruction{type=LOAD, status=WAITING_WRITE_RESULT, destination register=0, issued cycle=1, started execution cycle=2, finished execution cycle=2, written cycle=0} Remaining executing cycles: 0

Register file:

Float Register File

Register F0 value 1.0 tag L1
Register F1 value 2.0 tag null
Register F2 value 3.0 tag null
Register F3 value 4.0 tag null
Register F4 value 5.0 tag M1
Register F5 value 6.0 tag null
Register F6 value 7.0 tag null
Register F7 value 8.0 tag null
Register F8 value 9.0 tag null
Register F9 value 10.0 tag null
Register F10 value 11.0 tag null
Register F11 value 12.0 tag null
Register F12 value 13.0 tag null
Register F13 value 14.0 tag null
Register F14 value 15.0 tag null
Register F15 value 16.0 tag null
Register F16 value 17.0 tag null
Register F17 value 18.0 tag null
Register F18 value 19.0 tag null
Register F19 value 20.0 tag null
Register F20 value 21.0 tag null
Register F21 value 22.0 tag null
Register F22 value 23.0 tag null
Register F23 value 24.0 tag null
Register F24 value 25.0 tag null
Register F25 value 26.0 tag null
Register F26 value 27.0 tag null
Register F27 value 28.0 tag null
Register F28 value 29.0 tag null
Register F29 value 30.0 tag null
Register F30 value 31.0 tag null
Register F31 value 32.0 tag null

Integer Register File

Register R0 value 1 tag null
Register R1 value 2 tag null
Register R2 value 3 tag null
Register R3 value 4 tag null
Register R4 value 5 tag null
Register R5 value 6 tag null
Register R6 value 7 tag null
Register R7 value 8 tag null
Register R8 value 9 tag null
Register R9 value 10 tag null

Register R10 value 11 tag null
Register R11 value 12 tag null
Register R12 value 13 tag null
Register R13 value 14 tag null
Register R14 value 15 tag null
Register R15 value 16 tag null
Register R16 value 17 tag null
Register R17 value 18 tag null
Register R18 value 19 tag null
Register R19 value 20 tag null
Register R20 value 21 tag null
Register R21 value 22 tag null
Register R22 value 23 tag null
Register R23 value 24 tag null
Register R24 value 25 tag null
Register R25 value 26 tag null
Register R26 value 27 tag null
Register R27 value 28 tag null
Register R28 value 29 tag null
Register R29 value 30 tag null
Register R30 value 31 tag null
Register R31 value 32 tag null

Load Buffers:

{tag='L1', busy=true, A=2}

{tag='L2', busy=false, A=null}

{tag='L3', busy=false, A=null}

Store Buffers:

{tag='S1', busy=false, A=null, Vj=null, Qj='null'}

{tag='S2', busy=false, A=null, Vj=null, Qj='null'}

{tag='S3', busy=false, A=null, Vj=null, Qj='null'}

Add Reservation Stations:

{tag='A1', busy=false, op=0, Vj=null, Vk=null, Qj='null', Qk='null'}

{tag='A2', busy=false, op=0, Vj=null, Vk=null, Qj='null', Qk='null'}

{tag='A3', busy=false, op=0, Vj=null, Vk=null, Qj='null', Qk='null'}

Multiply Reservation Stations:

{tag='M1', busy=true, op=MUL, Vj=null, Vk=3.0, Qj='L1', Qk='null'}

{tag='M2', busy=false, op=0, Vj=null, Vk=null, Qj='null', Qk='null'}

Memory:

Memory 0 value 1.0

Memory 1 value 2.0

Memory 2 value 3.0

Memory 3 value 4.0

Memory 4 value 5.0

Memory 5 value 6.0

Memory 6 value 7.0

Memory 7 value 8.0

Memory 8 value 9.0

Memory 9 value 10.0

Cycle: 3

Issuing instruction: Instruction{type=STORE, status=ISSUED, destination register=-1, issued cycle=3, started execution cycle=0, finished execution cycle=0, written cycle=0}

Writing instruction: Instruction{type=LOAD, status=WRITING_BACK, destination register=0, issued cycle=1, started execution cycle=2, finished execution cycle=2, written cycle=3}

Register file:

Float Register File

Register F0 value 3.0 tag null

Register F1 value 2.0 tag null

Register F2 value 3.0 tag null

Register F3 value 4.0 tag null

Register F4 value 5.0 tag M1

Register F5 value 6.0 tag null

Register F6 value 7.0 tag null

Register F7 value 8.0 tag null

Register F8 value 9.0 tag null

Register F9 value 10.0 tag null

Register F10 value 11.0 tag null

Register F11 value 12.0 tag null

Register F12 value 13.0 tag null

Register F13 value 14.0 tag null

Register F14 value 15.0 tag null

Register F15 value 16.0 tag null

Register F16 value 17.0 tag null

Register F17 value 18.0 tag null

Register F18 value 19.0 tag null

Register F19 value 20.0 tag null

Register F20 value 21.0 tag null

Register F21 value 22.0 tag null

Register F22 value 23.0 tag null

Register F23 value 24.0 tag null

Register F24 value 25.0 tag null

Register F25 value 26.0 tag null

Register F26 value 27.0 tag null

Register F27 value 28.0 tag null

Register F28 value 29.0 tag null

Register F29 value 30.0 tag null

Register F30 value 31.0 tag null

Register F31 value 32.0 tag null

Integer Register File

Register R0 value 1 tag null

Register R1 value 2 tag null

Register R2 value 3 tag null

Register R3 value 4 tag null

Register R4 value 5 tag null

Register R5 value 6 tag null

Register R6 value 7 tag null
Register R7 value 8 tag null
Register R8 value 9 tag null
Register R9 value 10 tag null
Register R10 value 11 tag null
Register R11 value 12 tag null
Register R12 value 13 tag null
Register R13 value 14 tag null
Register R14 value 15 tag null
Register R15 value 16 tag null
Register R16 value 17 tag null
Register R17 value 18 tag null
Register R18 value 19 tag null
Register R19 value 20 tag null
Register R20 value 21 tag null
Register R21 value 22 tag null
Register R22 value 23 tag null
Register R23 value 24 tag null
Register R24 value 25 tag null
Register R25 value 26 tag null
Register R26 value 27 tag null
Register R27 value 28 tag null
Register R28 value 29 tag null
Register R29 value 30 tag null
Register R30 value 31 tag null
Register R31 value 32 tag null

Load Buffers:

{tag='L1', busy=false, A=null}
{tag='L2', busy=false, A=null}
{tag='L3', busy=false, A=null}

Store Buffers:

{tag='S1', busy=true, A=0, Vj=null, Qj='M1'}
{tag='S2', busy=false, A=null, Vj=null, Qj='null'}
{tag='S3', busy=false, A=null, Vj=null, Qj='null'}

Add Reservation Stations:

{tag='A1', busy=false, op=0, Vj=null, Vk=null, Qj='null', Qk='null'}
{tag='A2', busy=false, op=0, Vj=null, Vk=null, Qj='null', Qk='null'}
{tag='A3', busy=false, op=0, Vj=null, Vk=null, Qj='null', Qk='null'}

Multiply Reservation Stations:

{tag='M1', busy=true, op=MUL, Vj=3.0, Vk=3.0, Qj='null', Qk='null'}
{tag='M2', busy=false, op=0, Vj=null, Vk=null, Qj='null', Qk='null'}

Memory:

Memory 0 value 1.0
Memory 1 value 2.0
Memory 2 value 3.0
Memory 3 value 4.0
Memory 4 value 5.0
Memory 5 value 6.0

Memory 6 value 7.0
Memory 7 value 8.0
Memory 8 value 9.0
Memory 9 value 10.0

Cycle: 4

Issuing instruction: Instruction{type=INT_SUBI, status=ISSUED, destination register=15, issued cycle=4, started execution cycle=0, finished execution cycle=0, written cycle=0}

Executing instruction: Instruction{type=FP_MUL, status=EXECUTING, destination register=4, issued cycle=2, started execution cycle=4, finished execution cycle=0, written cycle=0} Remaining executing cycles: 3

Register file:

Float Register File

Register F0 value 3.0 tag null
Register F1 value 2.0 tag null
Register F2 value 3.0 tag null
Register F3 value 4.0 tag null
Register F4 value 5.0 tag M1
Register F5 value 6.0 tag null
Register F6 value 7.0 tag null
Register F7 value 8.0 tag null
Register F8 value 9.0 tag null
Register F9 value 10.0 tag null
Register F10 value 11.0 tag null
Register F11 value 12.0 tag null
Register F12 value 13.0 tag null
Register F13 value 14.0 tag null
Register F14 value 15.0 tag null
Register F15 value 16.0 tag null
Register F16 value 17.0 tag null
Register F17 value 18.0 tag null
Register F18 value 19.0 tag null
Register F19 value 20.0 tag null
Register F20 value 21.0 tag null
Register F21 value 22.0 tag null
Register F22 value 23.0 tag null
Register F23 value 24.0 tag null
Register F24 value 25.0 tag null
Register F25 value 26.0 tag null
Register F26 value 27.0 tag null
Register F27 value 28.0 tag null
Register F28 value 29.0 tag null
Register F29 value 30.0 tag null
Register F30 value 31.0 tag null
Register F31 value 32.0 tag null

Integer Register File

Register R0 value 1 tag null

Register R1 value 2 tag null
Register R2 value 3 tag null
Register R3 value 4 tag null
Register R4 value 5 tag null
Register R5 value 6 tag null
Register R6 value 7 tag null
Register R7 value 8 tag null
Register R8 value 9 tag null
Register R9 value 10 tag null
Register R10 value 11 tag null
Register R11 value 12 tag null
Register R12 value 13 tag null
Register R13 value 14 tag null
Register R14 value 15 tag null
Register R15 value 16 tag A1
Register R16 value 17 tag null
Register R17 value 18 tag null
Register R18 value 19 tag null
Register R19 value 20 tag null
Register R20 value 21 tag null
Register R21 value 22 tag null
Register R22 value 23 tag null
Register R23 value 24 tag null
Register R24 value 25 tag null
Register R25 value 26 tag null
Register R26 value 27 tag null
Register R27 value 28 tag null
Register R28 value 29 tag null
Register R29 value 30 tag null
Register R30 value 31 tag null
Register R31 value 32 tag null

Load Buffers:

{tag='L1', busy=false, A=null}

{tag='L2', busy=false, A=null}

{tag='L3', busy=false, A=null}

Store Buffers:

{tag='S1', busy=true, A=0, Vj=null, Qj='M1'}

{tag='S2', busy=false, A=null, Vj=null, Qj='null'}

{tag='S3', busy=false, A=null, Vj=null, Qj='null'}

Add Reservation Stations:

{tag='A1', busy=true, op=INT_SUBI, Vj=16.0, Vk=8.0, Qj='null', Qk='null'}

{tag='A2', busy=false, op=0, Vj=null, Vk=null, Qj='null', Qk='null'}

{tag='A3', busy=false, op=0, Vj=null, Vk=null, Qj='null', Qk='null'}

Multiply Reservation Stations:

{tag='M1', busy=true, op=MUL, Vj=3.0, Vk=3.0, Qj='null', Qk='null'}

{tag='M2', busy=false, op=0, Vj=null, Vk=null, Qj='null', Qk='null'}

Memory:

Memory 0 value 1.0

Memory 1 value 2.0
Memory 2 value 3.0
Memory 3 value 4.0
Memory 4 value 5.0
Memory 5 value 6.0
Memory 6 value 7.0
Memory 7 value 8.0
Memory 8 value 9.0
Memory 9 value 10.0

Cycle: 5

Issuing instruction: Instruction{type=BRANCH, status=ISSUED, destination register=-1, issued cycle=5, started execution cycle=0, finished execution cycle=0, written cycle=0}

Executing instruction: Instruction{type=INT_SUBI, status=WAITING_WRITE_RESULT, destination register=15, issued cycle=4, started execution cycle=5, finished execution cycle=5, written cycle=0} Remaning executing cycles: 0

Executing instruction: Instruction{type=FP_MUL, status=EXECUTING, destination register=4, issued cycle=2, started execution cycle=4, finished execution cycle=0, written cycle=0} Remaning executing cycles: 2

Register file:

Float Register File

Register F0 value 3.0 tag null
Register F1 value 2.0 tag null
Register F2 value 3.0 tag null
Register F3 value 4.0 tag null
Register F4 value 5.0 tag M1
Register F5 value 6.0 tag null
Register F6 value 7.0 tag null
Register F7 value 8.0 tag null
Register F8 value 9.0 tag null
Register F9 value 10.0 tag null
Register F10 value 11.0 tag null
Register F11 value 12.0 tag null
Register F12 value 13.0 tag null
Register F13 value 14.0 tag null
Register F14 value 15.0 tag null
Register F15 value 16.0 tag null
Register F16 value 17.0 tag null
Register F17 value 18.0 tag null
Register F18 value 19.0 tag null
Register F19 value 20.0 tag null
Register F20 value 21.0 tag null
Register F21 value 22.0 tag null
Register F22 value 23.0 tag null
Register F23 value 24.0 tag null
Register F24 value 25.0 tag null
Register F25 value 26.0 tag null

Register F26 value 27.0 tag null
Register F27 value 28.0 tag null
Register F28 value 29.0 tag null
Register F29 value 30.0 tag null
Register F30 value 31.0 tag null
Register F31 value 32.0 tag null

Integer Register File

Register R0 value 1 tag null
Register R1 value 2 tag null
Register R2 value 3 tag null
Register R3 value 4 tag null
Register R4 value 5 tag null
Register R5 value 6 tag null
Register R6 value 7 tag null
Register R7 value 8 tag null
Register R8 value 9 tag null
Register R9 value 10 tag null
Register R10 value 11 tag null
Register R11 value 12 tag null
Register R12 value 13 tag null
Register R13 value 14 tag null
Register R14 value 15 tag null
Register R15 value 16 tag A1
Register R16 value 17 tag null
Register R17 value 18 tag null
Register R18 value 19 tag null
Register R19 value 20 tag null
Register R20 value 21 tag null
Register R21 value 22 tag null
Register R22 value 23 tag null
Register R23 value 24 tag null
Register R24 value 25 tag null
Register R25 value 26 tag null
Register R26 value 27 tag null
Register R27 value 28 tag null
Register R28 value 29 tag null
Register R29 value 30 tag null
Register R30 value 31 tag null
Register R31 value 32 tag null

Load Buffers:

{tag='L1', busy=false, A=null}
{tag='L2', busy=false, A=null}
{tag='L3', busy=false, A=null}

Store Buffers:

{tag='S1', busy=true, A=0, Vj=null, Qj='M1'}
{tag='S2', busy=false, A=null, Vj=null, Qj='null'}
{tag='S3', busy=false, A=null, Vj=null, Qj='null'}

Add Reservation Stations:

{tag='A1', busy=true, op=INT_SUBI, Vj=16.0, Vk=8.0, Qj='null', Qk='null'}
{tag='A2', busy=true, op=BRANCH, Vj=null, Vk=0.0, Qj='A1', Qk='null'}
{tag='A3', busy=false, op=0, Vj=null, Vk=null, Qj='null', Qk='null'}

Multiply Reservation Stations:

{tag='M1', busy=true, op=MUL, Vj=3.0, Vk=3.0, Qj='null', Qk='null'}
{tag='M2', busy=false, op=0, Vj=null, Vk=null, Qj='null', Qk='null'}

Memory:

Memory 0 value 1.0
Memory 1 value 2.0
Memory 2 value 3.0
Memory 3 value 4.0
Memory 4 value 5.0
Memory 5 value 6.0
Memory 6 value 7.0
Memory 7 value 8.0
Memory 8 value 9.0
Memory 9 value 10.0

Cycle: 6

Executing instruction: Instruction{type=FP_MUL, status=EXECUTING, destination register=4, issued cycle=2, started execution cycle=4, finished execution cycle=0, written cycle=0} Remaning executing cycles: 1

Writing instruction: Instruction{type=INT_SUBI, status=WRITING_BACK, destination register=15, issued cycle=4, started execution cycle=5, finished execution cycle=5, written cycle=6}

Register file:

Float Register File

Register F0 value 3.0 tag null
Register F1 value 2.0 tag null
Register F2 value 3.0 tag null
Register F3 value 4.0 tag null
Register F4 value 5.0 tag M1
Register F5 value 6.0 tag null
Register F6 value 7.0 tag null
Register F7 value 8.0 tag null
Register F8 value 9.0 tag null
Register F9 value 10.0 tag null
Register F10 value 11.0 tag null
Register F11 value 12.0 tag null
Register F12 value 13.0 tag null
Register F13 value 14.0 tag null
Register F14 value 15.0 tag null
Register F15 value 16.0 tag null
Register F16 value 17.0 tag null
Register F17 value 18.0 tag null
Register F18 value 19.0 tag null
Register F19 value 20.0 tag null

Register F20 value 21.0 tag null
Register F21 value 22.0 tag null
Register F22 value 23.0 tag null
Register F23 value 24.0 tag null
Register F24 value 25.0 tag null
Register F25 value 26.0 tag null
Register F26 value 27.0 tag null
Register F27 value 28.0 tag null
Register F28 value 29.0 tag null
Register F29 value 30.0 tag null
Register F30 value 31.0 tag null
Register F31 value 32.0 tag null

Integer Register File

Register R0 value 1 tag null
Register R1 value 2 tag null
Register R2 value 3 tag null
Register R3 value 4 tag null
Register R4 value 5 tag null
Register R5 value 6 tag null
Register R6 value 7 tag null
Register R7 value 8 tag null
Register R8 value 9 tag null
Register R9 value 10 tag null
Register R10 value 11 tag null
Register R11 value 12 tag null
Register R12 value 13 tag null
Register R13 value 14 tag null
Register R14 value 15 tag null
Register R15 value 8 tag null
Register R16 value 17 tag null
Register R17 value 18 tag null
Register R18 value 19 tag null
Register R19 value 20 tag null
Register R20 value 21 tag null
Register R21 value 22 tag null
Register R22 value 23 tag null
Register R23 value 24 tag null
Register R24 value 25 tag null
Register R25 value 26 tag null
Register R26 value 27 tag null
Register R27 value 28 tag null
Register R28 value 29 tag null
Register R29 value 30 tag null
Register R30 value 31 tag null
Register R31 value 32 tag null

Load Buffers:

{tag='L1', busy=false, A=null}
{tag='L2', busy=false, A=null}

{tag='L3', busy=false, A=null}

Store Buffers:

{tag='S1', busy=true, A=0, Vj=null, Qj='M1'}

{tag='S2', busy=false, A=null, Vj=null, Qj='null'}

{tag='S3', busy=false, A=null, Vj=null, Qj='null'}

Add Reservation Stations:

{tag='A1', busy=false, op=0, Vj=null, Vk=null, Qj='null', Qk='null'}

{tag='A2', busy=true, op=BRANCH, Vj=8.0, Vk=0.0, Qj='null', Qk='null'}

{tag='A3', busy=false, op=0, Vj=null, Vk=null, Qj='null', Qk='null'}

Multiply Reservation Stations:

{tag='M1', busy=true, op=MUL, Vj=3.0, Vk=3.0, Qj='null', Qk='null'}

{tag='M2', busy=false, op=0, Vj=null, Vk=null, Qj='null', Qk='null'}

Memory:

Memory 0 value 1.0

Memory 1 value 2.0

Memory 2 value 3.0

Memory 3 value 4.0

Memory 4 value 5.0

Memory 5 value 6.0

Memory 6 value 7.0

Memory 7 value 8.0

Memory 8 value 9.0

Memory 9 value 10.0

Cycle: 7

Executing instruction: Instruction{type=BRANCH, status=WAITING_WRITE_RESULT, destination register=-1, issued cycle=5, started execution cycle=7, finished execution cycle=7, written cycle=0} Remaining executing cycles: 0

Executing instruction: Instruction{type=FP_MUL, status=WAITING_WRITE_RESULT, destination register=4, issued cycle=2, started execution cycle=4, finished execution cycle=7, written cycle=0} Remaining executing cycles: 0

Register file:

Float Register File

Register F0 value 3.0 tag null

Register F1 value 2.0 tag null

Register F2 value 3.0 tag null

Register F3 value 4.0 tag null

Register F4 value 5.0 tag M1

Register F5 value 6.0 tag null

Register F6 value 7.0 tag null

Register F7 value 8.0 tag null

Register F8 value 9.0 tag null

Register F9 value 10.0 tag null

Register F10 value 11.0 tag null

Register F11 value 12.0 tag null

Register F12 value 13.0 tag null

Register F13 value 14.0 tag null

Register F14 value 15.0 tag null
Register F15 value 16.0 tag null
Register F16 value 17.0 tag null
Register F17 value 18.0 tag null
Register F18 value 19.0 tag null
Register F19 value 20.0 tag null
Register F20 value 21.0 tag null
Register F21 value 22.0 tag null
Register F22 value 23.0 tag null
Register F23 value 24.0 tag null
Register F24 value 25.0 tag null
Register F25 value 26.0 tag null
Register F26 value 27.0 tag null
Register F27 value 28.0 tag null
Register F28 value 29.0 tag null
Register F29 value 30.0 tag null
Register F30 value 31.0 tag null
Register F31 value 32.0 tag null

Integer Register File

Register R0 value 1 tag null
Register R1 value 2 tag null
Register R2 value 3 tag null
Register R3 value 4 tag null
Register R4 value 5 tag null
Register R5 value 6 tag null
Register R6 value 7 tag null
Register R7 value 8 tag null
Register R8 value 9 tag null
Register R9 value 10 tag null
Register R10 value 11 tag null
Register R11 value 12 tag null
Register R12 value 13 tag null
Register R13 value 14 tag null
Register R14 value 15 tag null
Register R15 value 8 tag null
Register R16 value 17 tag null
Register R17 value 18 tag null
Register R18 value 19 tag null
Register R19 value 20 tag null
Register R20 value 21 tag null
Register R21 value 22 tag null
Register R22 value 23 tag null
Register R23 value 24 tag null
Register R24 value 25 tag null
Register R25 value 26 tag null
Register R26 value 27 tag null
Register R27 value 28 tag null
Register R28 value 29 tag null

Register R29 value 30 tag null

Register R30 value 31 tag null

Register R31 value 32 tag null

Load Buffers:

{tag='L1', busy=false, A=null}

{tag='L2', busy=false, A=null}

{tag='L3', busy=false, A=null}

Store Buffers:

{tag='S1', busy=true, A=0, Vj=null, Qj='M1'}

{tag='S2', busy=false, A=null, Vj=null, Qj='null'}

{tag='S3', busy=false, A=null, Vj=null, Qj='null'}

Add Reservation Stations:

{tag='A1', busy=false, op=0, Vj=null, Vk=null, Qj='null', Qk='null'}

{tag='A2', busy=true, op=BRANCH, Vj=8.0, Vk=0.0, Qj='null', Qk='null'}

{tag='A3', busy=false, op=0, Vj=null, Vk=null, Qj='null', Qk='null'}

Multiply Reservation Stations:

{tag='M1', busy=true, op=MUL, Vj=3.0, Vk=3.0, Qj='null', Qk='null'}

{tag='M2', busy=false, op=0, Vj=null, Vk=null, Qj='null', Qk='null'}

Memory:

Memory 0 value 1.0

Memory 1 value 2.0

Memory 2 value 3.0

Memory 3 value 4.0

Memory 4 value 5.0

Memory 5 value 6.0

Memory 6 value 7.0

Memory 7 value 8.0

Memory 8 value 9.0

Memory 9 value 10.0

Cycle: 8

Writing instruction: Instruction{type=BRANCH, status=WRITING_BACK, destination register=-1, issued cycle=5, started execution cycle=7, finished execution cycle=7, written cycle=8}

Register file:

Float Register File

Register F0 value 3.0 tag null

Register F1 value 2.0 tag null

Register F2 value 3.0 tag null

Register F3 value 4.0 tag null

Register F4 value 5.0 tag M1

Register F5 value 6.0 tag null

Register F6 value 7.0 tag null

Register F7 value 8.0 tag null

Register F8 value 9.0 tag null

Register F9 value 10.0 tag null

Register F10 value 11.0 tag null

Register F11 value 12.0 tag null
Register F12 value 13.0 tag null
Register F13 value 14.0 tag null
Register F14 value 15.0 tag null
Register F15 value 16.0 tag null
Register F16 value 17.0 tag null
Register F17 value 18.0 tag null
Register F18 value 19.0 tag null
Register F19 value 20.0 tag null
Register F20 value 21.0 tag null
Register F21 value 22.0 tag null
Register F22 value 23.0 tag null
Register F23 value 24.0 tag null
Register F24 value 25.0 tag null
Register F25 value 26.0 tag null
Register F26 value 27.0 tag null
Register F27 value 28.0 tag null
Register F28 value 29.0 tag null
Register F29 value 30.0 tag null
Register F30 value 31.0 tag null
Register F31 value 32.0 tag null

Integer Register File

Register R0 value 1 tag null
Register R1 value 2 tag null
Register R2 value 3 tag null
Register R3 value 4 tag null
Register R4 value 5 tag null
Register R5 value 6 tag null
Register R6 value 7 tag null
Register R7 value 8 tag null
Register R8 value 9 tag null
Register R9 value 10 tag null
Register R10 value 11 tag null
Register R11 value 12 tag null
Register R12 value 13 tag null
Register R13 value 14 tag null
Register R14 value 15 tag null
Register R15 value 8 tag null
Register R16 value 17 tag null
Register R17 value 18 tag null
Register R18 value 19 tag null
Register R19 value 20 tag null
Register R20 value 21 tag null
Register R21 value 22 tag null
Register R22 value 23 tag null
Register R23 value 24 tag null
Register R24 value 25 tag null
Register R25 value 26 tag null

Register R26 value 27 tag null

Register R27 value 28 tag null

Register R28 value 29 tag null

Register R29 value 30 tag null

Register R30 value 31 tag null

Register R31 value 32 tag null

Load Buffers:

{tag='L1', busy=false, A=null}

{tag='L2', busy=false, A=null}

{tag='L3', busy=false, A=null}

Store Buffers:

{tag='S1', busy=true, A=0, Vj=null, Qj='M1'}

{tag='S2', busy=false, A=null, Vj=null, Qj='null'}

{tag='S3', busy=false, A=null, Vj=null, Qj='null'}

Add Reservation Stations:

{tag='A1', busy=false, op=0, Vj=null, Vk=null, Qj='null', Qk='null'}

{tag='A2', busy=false, op=0, Vj=null, Vk=null, Qj='null', Qk='null'}

{tag='A3', busy=false, op=0, Vj=null, Vk=null, Qj='null', Qk='null'}

Multiply Reservation Stations:

{tag='M1', busy=true, op=MUL, Vj=3.0, Vk=3.0, Qj='null', Qk='null'}

{tag='M2', busy=false, op=0, Vj=null, Vk=null, Qj='null', Qk='null'}

Memory:

Memory 0 value 1.0

Memory 1 value 2.0

Memory 2 value 3.0

Memory 3 value 4.0

Memory 4 value 5.0

Memory 5 value 6.0

Memory 6 value 7.0

Memory 7 value 8.0

Memory 8 value 9.0

Memory 9 value 10.0

Cycle: 9

Issuing instruction: Instruction{type=LOAD, status=ISSUED, destination register=0, issued cycle=9, started execution cycle=0, finished execution cycle=0, written cycle=0}

Writing instruction: Instruction{type=FP_MUL, status=WRITING_BACK, destination register=4, issued cycle=2, started execution cycle=4, finished execution cycle=7, written cycle=9}

Register file:

Float Register File

Register F0 value 3.0 tag L1

Register F1 value 2.0 tag null

Register F2 value 3.0 tag null

Register F3 value 4.0 tag null

Register F4 value 9.0 tag null

Register F5 value 6.0 tag null

Register F6 value 7.0 tag null
Register F7 value 8.0 tag null
Register F8 value 9.0 tag null
Register F9 value 10.0 tag null
Register F10 value 11.0 tag null
Register F11 value 12.0 tag null
Register F12 value 13.0 tag null
Register F13 value 14.0 tag null
Register F14 value 15.0 tag null
Register F15 value 16.0 tag null
Register F16 value 17.0 tag null
Register F17 value 18.0 tag null
Register F18 value 19.0 tag null
Register F19 value 20.0 tag null
Register F20 value 21.0 tag null
Register F21 value 22.0 tag null
Register F22 value 23.0 tag null
Register F23 value 24.0 tag null
Register F24 value 25.0 tag null
Register F25 value 26.0 tag null
Register F26 value 27.0 tag null
Register F27 value 28.0 tag null
Register F28 value 29.0 tag null
Register F29 value 30.0 tag null
Register F30 value 31.0 tag null
Register F31 value 32.0 tag null

Integer Register File

Register R0 value 1 tag null
Register R1 value 2 tag null
Register R2 value 3 tag null
Register R3 value 4 tag null
Register R4 value 5 tag null
Register R5 value 6 tag null
Register R6 value 7 tag null
Register R7 value 8 tag null
Register R8 value 9 tag null
Register R9 value 10 tag null
Register R10 value 11 tag null
Register R11 value 12 tag null
Register R12 value 13 tag null
Register R13 value 14 tag null
Register R14 value 15 tag null
Register R15 value 8 tag null
Register R16 value 17 tag null
Register R17 value 18 tag null
Register R18 value 19 tag null
Register R19 value 20 tag null
Register R20 value 21 tag null

Register R21 value 22 tag null
Register R22 value 23 tag null
Register R23 value 24 tag null
Register R24 value 25 tag null
Register R25 value 26 tag null
Register R26 value 27 tag null
Register R27 value 28 tag null
Register R28 value 29 tag null
Register R29 value 30 tag null
Register R30 value 31 tag null
Register R31 value 32 tag null

Load Buffers:

{tag='L1', busy=true, A=2}
{tag='L2', busy=false, A=null}
{tag='L3', busy=false, A=null}

Store Buffers:

{tag='S1', busy=true, A=0, Vj=9.0, Qj='null'}
{tag='S2', busy=false, A=null, Vj=null, Qj='null'}
{tag='S3', busy=false, A=null, Vj=null, Qj='null'}

Add Reservation Stations:

{tag='A1', busy=false, op=0, Vj=null, Vk=null, Qj='null', Qk='null'}
{tag='A2', busy=false, op=0, Vj=null, Vk=null, Qj='null', Qk='null'}
{tag='A3', busy=false, op=0, Vj=null, Vk=null, Qj='null', Qk='null'}

Multiply Reservation Stations:

{tag='M1', busy=false, op=0, Vj=null, Vk=null, Qj='null', Qk='null'}
{tag='M2', busy=false, op=0, Vj=null, Vk=null, Qj='null', Qk='null'}

Memory:

Memory 0 value 1.0
Memory 1 value 2.0
Memory 2 value 3.0
Memory 3 value 4.0
Memory 4 value 5.0
Memory 5 value 6.0
Memory 6 value 7.0
Memory 7 value 8.0
Memory 8 value 9.0
Memory 9 value 10.0

Cycle: 10

Issuing instruction: Instruction{type=FP_MUL, status=ISSUED, destination register=4, issued cycle=10, started execution cycle=0, finished execution cycle=0, written cycle=0}

Executing instruction: Instruction{type=LOAD, status=WAITING_WRITE_RESULT, destination register=0, issued cycle=9, started execution cycle=10, finished execution cycle=10, written cycle=0} Remaning executing cycles: 0

Executing instruction: Instruction{type=STORE, status=FINISHED, destination register=-1, issued cycle=3, started execution cycle=10, finished execution cycle=10, written cycle=0}

Remaning executing cycles: 0

Register file:

Float Register File

Register F0 value 3.0 tag L1
Register F1 value 2.0 tag null
Register F2 value 3.0 tag null
Register F3 value 4.0 tag null
Register F4 value 9.0 tag M1
Register F5 value 6.0 tag null
Register F6 value 7.0 tag null
Register F7 value 8.0 tag null
Register F8 value 9.0 tag null
Register F9 value 10.0 tag null
Register F10 value 11.0 tag null
Register F11 value 12.0 tag null
Register F12 value 13.0 tag null
Register F13 value 14.0 tag null
Register F14 value 15.0 tag null
Register F15 value 16.0 tag null
Register F16 value 17.0 tag null
Register F17 value 18.0 tag null
Register F18 value 19.0 tag null
Register F19 value 20.0 tag null
Register F20 value 21.0 tag null
Register F21 value 22.0 tag null
Register F22 value 23.0 tag null
Register F23 value 24.0 tag null
Register F24 value 25.0 tag null
Register F25 value 26.0 tag null
Register F26 value 27.0 tag null
Register F27 value 28.0 tag null
Register F28 value 29.0 tag null
Register F29 value 30.0 tag null
Register F30 value 31.0 tag null
Register F31 value 32.0 tag null

Integer Register File

Register R0 value 1 tag null
Register R1 value 2 tag null
Register R2 value 3 tag null
Register R3 value 4 tag null
Register R4 value 5 tag null
Register R5 value 6 tag null
Register R6 value 7 tag null
Register R7 value 8 tag null
Register R8 value 9 tag null
Register R9 value 10 tag null
Register R10 value 11 tag null
Register R11 value 12 tag null
Register R12 value 13 tag null

Register R13 value 14 tag null
Register R14 value 15 tag null
Register R15 value 8 tag null
Register R16 value 17 tag null
Register R17 value 18 tag null
Register R18 value 19 tag null
Register R19 value 20 tag null
Register R20 value 21 tag null
Register R21 value 22 tag null
Register R22 value 23 tag null
Register R23 value 24 tag null
Register R24 value 25 tag null
Register R25 value 26 tag null
Register R26 value 27 tag null
Register R27 value 28 tag null
Register R28 value 29 tag null
Register R29 value 30 tag null
Register R30 value 31 tag null
Register R31 value 32 tag null

Load Buffers:

{tag='L1', busy=true, A=2}
{tag='L2', busy=false, A=null}
{tag='L3', busy=false, A=null}

Store Buffers:

{tag='S1', busy=false, A=null, Vj=null, Qj='null'}
{tag='S2', busy=false, A=null, Vj=null, Qj='null'}
{tag='S3', busy=false, A=null, Vj=null, Qj='null'}

Add Reservation Stations:

{tag='A1', busy=false, op=0, Vj=null, Vk=null, Qj='null', Qk='null'}
{tag='A2', busy=false, op=0, Vj=null, Vk=null, Qj='null', Qk='null'}
{tag='A3', busy=false, op=0, Vj=null, Vk=null, Qj='null', Qk='null'}

Multiply Reservation Stations:

{tag='M1', busy=true, op=MUL, Vj=null, Vk=3.0, Qj='L1', Qk='null'}
{tag='M2', busy=false, op=0, Vj=null, Vk=null, Qj='null', Qk='null'}

Memory:

Memory 0 value 9.0
Memory 1 value 2.0
Memory 2 value 3.0
Memory 3 value 4.0
Memory 4 value 5.0
Memory 5 value 6.0
Memory 6 value 7.0
Memory 7 value 8.0
Memory 8 value 9.0
Memory 9 value 10.0

Cycle: 11

Issuing instruction: Instruction{type=STORE, status=ISSUED, destination register=-1, issued cycle=11, started execution cycle=0, finished execution cycle=0, written cycle=0}

Writing instruction: Instruction{type=LOAD, status=WRITING_BACK, destination register=0, issued cycle=9, started execution cycle=10, finished execution cycle=10, written cycle=11}

Register file:

Float Register File

Register F0 value 3.0 tag null
Register F1 value 2.0 tag null
Register F2 value 3.0 tag null
Register F3 value 4.0 tag null
Register F4 value 9.0 tag M1
Register F5 value 6.0 tag null
Register F6 value 7.0 tag null
Register F7 value 8.0 tag null
Register F8 value 9.0 tag null
Register F9 value 10.0 tag null
Register F10 value 11.0 tag null
Register F11 value 12.0 tag null
Register F12 value 13.0 tag null
Register F13 value 14.0 tag null
Register F14 value 15.0 tag null
Register F15 value 16.0 tag null
Register F16 value 17.0 tag null
Register F17 value 18.0 tag null
Register F18 value 19.0 tag null
Register F19 value 20.0 tag null
Register F20 value 21.0 tag null
Register F21 value 22.0 tag null
Register F22 value 23.0 tag null
Register F23 value 24.0 tag null
Register F24 value 25.0 tag null
Register F25 value 26.0 tag null
Register F26 value 27.0 tag null
Register F27 value 28.0 tag null
Register F28 value 29.0 tag null
Register F29 value 30.0 tag null
Register F30 value 31.0 tag null
Register F31 value 32.0 tag null

Integer Register File

Register R0 value 1 tag null
Register R1 value 2 tag null
Register R2 value 3 tag null
Register R3 value 4 tag null
Register R4 value 5 tag null
Register R5 value 6 tag null
Register R6 value 7 tag null
Register R7 value 8 tag null
Register R8 value 9 tag null

Register R9 value 10 tag null
Register R10 value 11 tag null
Register R11 value 12 tag null
Register R12 value 13 tag null
Register R13 value 14 tag null
Register R14 value 15 tag null
Register R15 value 8 tag null
Register R16 value 17 tag null
Register R17 value 18 tag null
Register R18 value 19 tag null
Register R19 value 20 tag null
Register R20 value 21 tag null
Register R21 value 22 tag null
Register R22 value 23 tag null
Register R23 value 24 tag null
Register R24 value 25 tag null
Register R25 value 26 tag null
Register R26 value 27 tag null
Register R27 value 28 tag null
Register R28 value 29 tag null
Register R29 value 30 tag null
Register R30 value 31 tag null
Register R31 value 32 tag null

Load Buffers:

{tag='L1', busy=false, A=null}

{tag='L2', busy=false, A=null}

{tag='L3', busy=false, A=null}

Store Buffers:

{tag='S1', busy=true, A=0, Vj=null, Qj='M1'}

{tag='S2', busy=false, A=null, Vj=null, Qj='null'}

{tag='S3', busy=false, A=null, Vj=null, Qj='null'}

Add Reservation Stations:

{tag='A1', busy=false, op=0, Vj=null, Vk=null, Qj='null', Qk='null'}

{tag='A2', busy=false, op=0, Vj=null, Vk=null, Qj='null', Qk='null'}

{tag='A3', busy=false, op=0, Vj=null, Vk=null, Qj='null', Qk='null'}

Multiply Reservation Stations:

{tag='M1', busy=true, op=MUL, Vj=3.0, Vk=3.0, Qj='null', Qk='null'}

{tag='M2', busy=false, op=0, Vj=null, Vk=null, Qj='null', Qk='null'}

Memory:

Memory 0 value 9.0

Memory 1 value 2.0

Memory 2 value 3.0

Memory 3 value 4.0

Memory 4 value 5.0

Memory 5 value 6.0

Memory 6 value 7.0

Memory 7 value 8.0

Memory 8 value 9.0

Memory 9 value 10.0

Cycle: 12

Issuing instruction: Instruction{type=INT_SUBI, status=ISSUED, destination register=15, issued cycle=12, started execution cycle=0, finished execution cycle=0, written cycle=0}

Executing instruction: Instruction{type=FP_MUL, status=EXECUTING, destination register=4, issued cycle=10, started execution cycle=12, finished execution cycle=0, written cycle=0} Remaning executing cycles: 3

Register file:

Float Register File

Register F0 value 3.0 tag null

Register F1 value 2.0 tag null

Register F2 value 3.0 tag null

Register F3 value 4.0 tag null

Register F4 value 9.0 tag M1

Register F5 value 6.0 tag null

Register F6 value 7.0 tag null

Register F7 value 8.0 tag null

Register F8 value 9.0 tag null

Register F9 value 10.0 tag null

Register F10 value 11.0 tag null

Register F11 value 12.0 tag null

Register F12 value 13.0 tag null

Register F13 value 14.0 tag null

Register F14 value 15.0 tag null

Register F15 value 16.0 tag null

Register F16 value 17.0 tag null

Register F17 value 18.0 tag null

Register F18 value 19.0 tag null

Register F19 value 20.0 tag null

Register F20 value 21.0 tag null

Register F21 value 22.0 tag null

Register F22 value 23.0 tag null

Register F23 value 24.0 tag null

Register F24 value 25.0 tag null

Register F25 value 26.0 tag null

Register F26 value 27.0 tag null

Register F27 value 28.0 tag null

Register F28 value 29.0 tag null

Register F29 value 30.0 tag null

Register F30 value 31.0 tag null

Register F31 value 32.0 tag null

Integer Register File

Register R0 value 1 tag null

Register R1 value 2 tag null

Register R2 value 3 tag null

Register R3 value 4 tag null

Register R4 value 5 tag null
Register R5 value 6 tag null
Register R6 value 7 tag null
Register R7 value 8 tag null
Register R8 value 9 tag null
Register R9 value 10 tag null
Register R10 value 11 tag null
Register R11 value 12 tag null
Register R12 value 13 tag null
Register R13 value 14 tag null
Register R14 value 15 tag null
Register R15 value 8 tag A1
Register R16 value 17 tag null
Register R17 value 18 tag null
Register R18 value 19 tag null
Register R19 value 20 tag null
Register R20 value 21 tag null
Register R21 value 22 tag null
Register R22 value 23 tag null
Register R23 value 24 tag null
Register R24 value 25 tag null
Register R25 value 26 tag null
Register R26 value 27 tag null
Register R27 value 28 tag null
Register R28 value 29 tag null
Register R29 value 30 tag null
Register R30 value 31 tag null
Register R31 value 32 tag null

Load Buffers:

{tag='L1', busy=false, A=null}
{tag='L2', busy=false, A=null}
{tag='L3', busy=false, A=null}

Store Buffers:

{tag='S1', busy=true, A=0, Vj=null, Qj='M1'}
{tag='S2', busy=false, A=null, Vj=null, Qj='null'}
{tag='S3', busy=false, A=null, Vj=null, Qj='null'}

Add Reservation Stations:

{tag='A1', busy=true, op=INT_SUBI, Vj=8.0, Vk=8.0, Qj='null', Qk='null'}
{tag='A2', busy=false, op=0, Vj=null, Vk=null, Qj='null', Qk='null'}
{tag='A3', busy=false, op=0, Vj=null, Vk=null, Qj='null', Qk='null'}

Multiply Reservation Stations:

{tag='M1', busy=true, op=MUL, Vj=3.0, Vk=3.0, Qj='null', Qk='null'}
{tag='M2', busy=false, op=0, Vj=null, Vk=null, Qj='null', Qk='null'}

Memory:

Memory 0 value 9.0
Memory 1 value 2.0
Memory 2 value 3.0
Memory 3 value 4.0

Memory 4 value 5.0
Memory 5 value 6.0
Memory 6 value 7.0
Memory 7 value 8.0
Memory 8 value 9.0
Memory 9 value 10.0

Cycle: 13

Issuing instruction: Instruction{type=BRANCH, status=ISSUED, destination register=-1, issued cycle=13, started execution cycle=0, finished execution cycle=0, written cycle=0}

Executing instruction: Instruction{type=INT_SUBI, status=WAITING_WRITE_RESULT, destination register=15, issued cycle=12, started execution cycle=13, finished execution cycle=13, written cycle=0} Remaning executing cycles: 0

Executing instruction: Instruction{type=FP_MUL, status=EXECUTING, destination register=4, issued cycle=10, started execution cycle=12, finished execution cycle=0, written cycle=0} Remaning executing cycles: 2

Register file:

Float Register File

Register F0 value 3.0 tag null
Register F1 value 2.0 tag null
Register F2 value 3.0 tag null
Register F3 value 4.0 tag null
Register F4 value 9.0 tag M1
Register F5 value 6.0 tag null
Register F6 value 7.0 tag null
Register F7 value 8.0 tag null
Register F8 value 9.0 tag null
Register F9 value 10.0 tag null
Register F10 value 11.0 tag null
Register F11 value 12.0 tag null
Register F12 value 13.0 tag null
Register F13 value 14.0 tag null
Register F14 value 15.0 tag null
Register F15 value 16.0 tag null
Register F16 value 17.0 tag null
Register F17 value 18.0 tag null
Register F18 value 19.0 tag null
Register F19 value 20.0 tag null
Register F20 value 21.0 tag null
Register F21 value 22.0 tag null
Register F22 value 23.0 tag null
Register F23 value 24.0 tag null
Register F24 value 25.0 tag null
Register F25 value 26.0 tag null
Register F26 value 27.0 tag null
Register F27 value 28.0 tag null
Register F28 value 29.0 tag null

Register F29 value 30.0 tag null

Register F30 value 31.0 tag null

Register F31 value 32.0 tag null

Integer Register File

Register R0 value 1 tag null

Register R1 value 2 tag null

Register R2 value 3 tag null

Register R3 value 4 tag null

Register R4 value 5 tag null

Register R5 value 6 tag null

Register R6 value 7 tag null

Register R7 value 8 tag null

Register R8 value 9 tag null

Register R9 value 10 tag null

Register R10 value 11 tag null

Register R11 value 12 tag null

Register R12 value 13 tag null

Register R13 value 14 tag null

Register R14 value 15 tag null

Register R15 value 8 tag A1

Register R16 value 17 tag null

Register R17 value 18 tag null

Register R18 value 19 tag null

Register R19 value 20 tag null

Register R20 value 21 tag null

Register R21 value 22 tag null

Register R22 value 23 tag null

Register R23 value 24 tag null

Register R24 value 25 tag null

Register R25 value 26 tag null

Register R26 value 27 tag null

Register R27 value 28 tag null

Register R28 value 29 tag null

Register R29 value 30 tag null

Register R30 value 31 tag null

Register R31 value 32 tag null

Load Buffers:

{tag='L1', busy=false, A=null}

{tag='L2', busy=false, A=null}

{tag='L3', busy=false, A=null}

Store Buffers:

{tag='S1', busy=true, A=0, Vj=null, Qj='M1'}

{tag='S2', busy=false, A=null, Vj=null, Qj='null'}

{tag='S3', busy=false, A=null, Vj=null, Qj='null'}

Add Reservation Stations:

{tag='A1', busy=true, op=INT_SUBI, Vj=8.0, Vk=8.0, Qj='null', Qk='null'}

{tag='A2', busy=true, op=BRANCH, Vj=null, Vk=0.0, Qj='A1', Qk='null'}

{tag='A3', busy=false, op=0, Vj=null, Vk=null, Qj='null', Qk='null'}

Multiply Reservation Stations:

{tag='M1', busy=true, op=MUL, Vj=3.0, Vk=3.0, Qj='null', Qk='null'}

{tag='M2', busy=false, op=0, Vj=null, Vk=null, Qj='null', Qk='null'}

Memory:

Memory 0 value 9.0

Memory 1 value 2.0

Memory 2 value 3.0

Memory 3 value 4.0

Memory 4 value 5.0

Memory 5 value 6.0

Memory 6 value 7.0

Memory 7 value 8.0

Memory 8 value 9.0

Memory 9 value 10.0

Cycle: 14

Executing instruction: Instruction{type=FP_MUL, status=EXECUTING, destination register=4, issued cycle=10, started execution cycle=12, finished execution cycle=0, written cycle=0} Remaning executing cycles: 1

Writing instruction: Instruction{type=INT_SUBI, status=WRITING_BACK, destination register=15, issued cycle=12, started execution cycle=13, finished execution cycle=13, written cycle=14}

Register file:

Float Register File

Register F0 value 3.0 tag null

Register F1 value 2.0 tag null

Register F2 value 3.0 tag null

Register F3 value 4.0 tag null

Register F4 value 9.0 tag M1

Register F5 value 6.0 tag null

Register F6 value 7.0 tag null

Register F7 value 8.0 tag null

Register F8 value 9.0 tag null

Register F9 value 10.0 tag null

Register F10 value 11.0 tag null

Register F11 value 12.0 tag null

Register F12 value 13.0 tag null

Register F13 value 14.0 tag null

Register F14 value 15.0 tag null

Register F15 value 16.0 tag null

Register F16 value 17.0 tag null

Register F17 value 18.0 tag null

Register F18 value 19.0 tag null

Register F19 value 20.0 tag null

Register F20 value 21.0 tag null

Register F21 value 22.0 tag null

Register F22 value 23.0 tag null

Register F23 value 24.0 tag null
Register F24 value 25.0 tag null
Register F25 value 26.0 tag null
Register F26 value 27.0 tag null
Register F27 value 28.0 tag null
Register F28 value 29.0 tag null
Register F29 value 30.0 tag null
Register F30 value 31.0 tag null
Register F31 value 32.0 tag null

Integer Register File

Register R0 value 1 tag null
Register R1 value 2 tag null
Register R2 value 3 tag null
Register R3 value 4 tag null
Register R4 value 5 tag null
Register R5 value 6 tag null
Register R6 value 7 tag null
Register R7 value 8 tag null
Register R8 value 9 tag null
Register R9 value 10 tag null
Register R10 value 11 tag null
Register R11 value 12 tag null
Register R12 value 13 tag null
Register R13 value 14 tag null
Register R14 value 15 tag null
Register R15 value 0 tag null
Register R16 value 17 tag null
Register R17 value 18 tag null
Register R18 value 19 tag null
Register R19 value 20 tag null
Register R20 value 21 tag null
Register R21 value 22 tag null
Register R22 value 23 tag null
Register R23 value 24 tag null
Register R24 value 25 tag null
Register R25 value 26 tag null
Register R26 value 27 tag null
Register R27 value 28 tag null
Register R28 value 29 tag null
Register R29 value 30 tag null
Register R30 value 31 tag null
Register R31 value 32 tag null

Load Buffers:

{tag='L1', busy=false, A=null}
{tag='L2', busy=false, A=null}
{tag='L3', busy=false, A=null}

Store Buffers:

{tag='S1', busy=true, A=0, Vj=null, Qj='M1'}

{tag='S2', busy=false, A=null, Vj=null, Qj='null'}

{tag='S3', busy=false, A=null, Vj=null, Qj='null'}

Add Reservation Stations:

{tag='A1', busy=false, op=0, Vj=null, Vk=null, Qj='null', Qk='null'}

{tag='A2', busy=true, op=BRANCH, Vj=0.0, Vk=0.0, Qj='null', Qk='null'}

{tag='A3', busy=false, op=0, Vj=null, Vk=null, Qj='null', Qk='null'}

Multiply Reservation Stations:

{tag='M1', busy=true, op=MUL, Vj=3.0, Vk=3.0, Qj='null', Qk='null'}

{tag='M2', busy=false, op=0, Vj=null, Vk=null, Qj='null', Qk='null'}

Memory:

Memory 0 value 9.0

Memory 1 value 2.0

Memory 2 value 3.0

Memory 3 value 4.0

Memory 4 value 5.0

Memory 5 value 6.0

Memory 6 value 7.0

Memory 7 value 8.0

Memory 8 value 9.0

Memory 9 value 10.0

Cycle: 15

Executing instruction: Instruction{type=BRANCH, status=WAITING_WRITE_RESULT, destination register=-1, issued cycle=13, started execution cycle=15, finished execution cycle=15, written cycle=0} Remaning executing cycles: 0

Executing instruction: Instruction{type=FP_MUL, status=WAITING_WRITE_RESULT, destination register=4, issued cycle=10, started execution cycle=12, finished execution cycle=15, written cycle=0} Remaning executing cycles: 0

Register file:

Float Register File

Register F0 value 3.0 tag null

Register F1 value 2.0 tag null

Register F2 value 3.0 tag null

Register F3 value 4.0 tag null

Register F4 value 9.0 tag M1

Register F5 value 6.0 tag null

Register F6 value 7.0 tag null

Register F7 value 8.0 tag null

Register F8 value 9.0 tag null

Register F9 value 10.0 tag null

Register F10 value 11.0 tag null

Register F11 value 12.0 tag null

Register F12 value 13.0 tag null

Register F13 value 14.0 tag null

Register F14 value 15.0 tag null

Register F15 value 16.0 tag null

Register F16 value 17.0 tag null

Register F17 value 18.0 tag null
Register F18 value 19.0 tag null
Register F19 value 20.0 tag null
Register F20 value 21.0 tag null
Register F21 value 22.0 tag null
Register F22 value 23.0 tag null
Register F23 value 24.0 tag null
Register F24 value 25.0 tag null
Register F25 value 26.0 tag null
Register F26 value 27.0 tag null
Register F27 value 28.0 tag null
Register F28 value 29.0 tag null
Register F29 value 30.0 tag null
Register F30 value 31.0 tag null
Register F31 value 32.0 tag null

Integer Register File

Register R0 value 1 tag null
Register R1 value 2 tag null
Register R2 value 3 tag null
Register R3 value 4 tag null
Register R4 value 5 tag null
Register R5 value 6 tag null
Register R6 value 7 tag null
Register R7 value 8 tag null
Register R8 value 9 tag null
Register R9 value 10 tag null
Register R10 value 11 tag null
Register R11 value 12 tag null
Register R12 value 13 tag null
Register R13 value 14 tag null
Register R14 value 15 tag null
Register R15 value 0 tag null
Register R16 value 17 tag null
Register R17 value 18 tag null
Register R18 value 19 tag null
Register R19 value 20 tag null
Register R20 value 21 tag null
Register R21 value 22 tag null
Register R22 value 23 tag null
Register R23 value 24 tag null
Register R24 value 25 tag null
Register R25 value 26 tag null
Register R26 value 27 tag null
Register R27 value 28 tag null
Register R28 value 29 tag null
Register R29 value 30 tag null
Register R30 value 31 tag null
Register R31 value 32 tag null

Load Buffers:

{tag='L1', busy=false, A=null}

{tag='L2', busy=false, A=null}

{tag='L3', busy=false, A=null}

Store Buffers:

{tag='S1', busy=true, A=0, Vj=null, Qj='M1'}

{tag='S2', busy=false, A=null, Vj=null, Qj='null'}

{tag='S3', busy=false, A=null, Vj=null, Qj='null'}

Add Reservation Stations:

{tag='A1', busy=false, op=0, Vj=null, Vk=null, Qj='null', Qk='null'}

{tag='A2', busy=true, op=BRANCH, Vj=0.0, Vk=0.0, Qj='null', Qk='null'}

{tag='A3', busy=false, op=0, Vj=null, Vk=null, Qj='null', Qk='null'}

Multiply Reservation Stations:

{tag='M1', busy=true, op=MUL, Vj=3.0, Vk=3.0, Qj='null', Qk='null'}

{tag='M2', busy=false, op=0, Vj=null, Vk=null, Qj='null', Qk='null'}

Memory:

Memory 0 value 9.0

Memory 1 value 2.0

Memory 2 value 3.0

Memory 3 value 4.0

Memory 4 value 5.0

Memory 5 value 6.0

Memory 6 value 7.0

Memory 7 value 8.0

Memory 8 value 9.0

Memory 9 value 10.0

Cycle: 16

Writing instruction: Instruction{type=BRANCH, status=WRITING_BACK, destination register=-1, issued cycle=13, started execution cycle=15, finished execution cycle=15, written cycle=16}

Register file:

Float Register File

Register F0 value 3.0 tag null

Register F1 value 2.0 tag null

Register F2 value 3.0 tag null

Register F3 value 4.0 tag null

Register F4 value 9.0 tag M1

Register F5 value 6.0 tag null

Register F6 value 7.0 tag null

Register F7 value 8.0 tag null

Register F8 value 9.0 tag null

Register F9 value 10.0 tag null

Register F10 value 11.0 tag null

Register F11 value 12.0 tag null

Register F12 value 13.0 tag null

Register F13 value 14.0 tag null

Register F14 value 15.0 tag null
Register F15 value 16.0 tag null
Register F16 value 17.0 tag null
Register F17 value 18.0 tag null
Register F18 value 19.0 tag null
Register F19 value 20.0 tag null
Register F20 value 21.0 tag null
Register F21 value 22.0 tag null
Register F22 value 23.0 tag null
Register F23 value 24.0 tag null
Register F24 value 25.0 tag null
Register F25 value 26.0 tag null
Register F26 value 27.0 tag null
Register F27 value 28.0 tag null
Register F28 value 29.0 tag null
Register F29 value 30.0 tag null
Register F30 value 31.0 tag null
Register F31 value 32.0 tag null

Integer Register File

Register R0 value 1 tag null
Register R1 value 2 tag null
Register R2 value 3 tag null
Register R3 value 4 tag null
Register R4 value 5 tag null
Register R5 value 6 tag null
Register R6 value 7 tag null
Register R7 value 8 tag null
Register R8 value 9 tag null
Register R9 value 10 tag null
Register R10 value 11 tag null
Register R11 value 12 tag null
Register R12 value 13 tag null
Register R13 value 14 tag null
Register R14 value 15 tag null
Register R15 value 0 tag null
Register R16 value 17 tag null
Register R17 value 18 tag null
Register R18 value 19 tag null
Register R19 value 20 tag null
Register R20 value 21 tag null
Register R21 value 22 tag null
Register R22 value 23 tag null
Register R23 value 24 tag null
Register R24 value 25 tag null
Register R25 value 26 tag null
Register R26 value 27 tag null
Register R27 value 28 tag null
Register R28 value 29 tag null

Register R29 value 30 tag null

Register R30 value 31 tag null

Register R31 value 32 tag null

Load Buffers:

{tag='L1', busy=false, A=null}

{tag='L2', busy=false, A=null}

{tag='L3', busy=false, A=null}

Store Buffers:

{tag='S1', busy=true, A=0, Vj=null, Qj='M1'}

{tag='S2', busy=false, A=null, Vj=null, Qj='null'}

{tag='S3', busy=false, A=null, Vj=null, Qj='null'}

Add Reservation Stations:

{tag='A1', busy=false, op=0, Vj=null, Vk=null, Qj='null', Qk='null'}

{tag='A2', busy=false, op=0, Vj=null, Vk=null, Qj='null', Qk='null'}

{tag='A3', busy=false, op=0, Vj=null, Vk=null, Qj='null', Qk='null'}

Multiply Reservation Stations:

{tag='M1', busy=true, op=MUL, Vj=3.0, Vk=3.0, Qj='null', Qk='null'}

{tag='M2', busy=false, op=0, Vj=null, Vk=null, Qj='null', Qk='null'}

Memory:

Memory 0 value 9.0

Memory 1 value 2.0

Memory 2 value 3.0

Memory 3 value 4.0

Memory 4 value 5.0

Memory 5 value 6.0

Memory 6 value 7.0

Memory 7 value 8.0

Memory 8 value 9.0

Memory 9 value 10.0

Cycle: 17

Writing instruction: Instruction{type=FP_MUL, status=WRITING_BACK, destination register=4, issued cycle=10, started execution cycle=12, finished execution cycle=15, written cycle=17}

Register file:

Float Register File

Register F0 value 3.0 tag null

Register F1 value 2.0 tag null

Register F2 value 3.0 tag null

Register F3 value 4.0 tag null

Register F4 value 9.0 tag null

Register F5 value 6.0 tag null

Register F6 value 7.0 tag null

Register F7 value 8.0 tag null

Register F8 value 9.0 tag null

Register F9 value 10.0 tag null

Register F10 value 11.0 tag null

Register F11 value 12.0 tag null
Register F12 value 13.0 tag null
Register F13 value 14.0 tag null
Register F14 value 15.0 tag null
Register F15 value 16.0 tag null
Register F16 value 17.0 tag null
Register F17 value 18.0 tag null
Register F18 value 19.0 tag null
Register F19 value 20.0 tag null
Register F20 value 21.0 tag null
Register F21 value 22.0 tag null
Register F22 value 23.0 tag null
Register F23 value 24.0 tag null
Register F24 value 25.0 tag null
Register F25 value 26.0 tag null
Register F26 value 27.0 tag null
Register F27 value 28.0 tag null
Register F28 value 29.0 tag null
Register F29 value 30.0 tag null
Register F30 value 31.0 tag null
Register F31 value 32.0 tag null

Integer Register File

Register R0 value 1 tag null
Register R1 value 2 tag null
Register R2 value 3 tag null
Register R3 value 4 tag null
Register R4 value 5 tag null
Register R5 value 6 tag null
Register R6 value 7 tag null
Register R7 value 8 tag null
Register R8 value 9 tag null
Register R9 value 10 tag null
Register R10 value 11 tag null
Register R11 value 12 tag null
Register R12 value 13 tag null
Register R13 value 14 tag null
Register R14 value 15 tag null
Register R15 value 0 tag null
Register R16 value 17 tag null
Register R17 value 18 tag null
Register R18 value 19 tag null
Register R19 value 20 tag null
Register R20 value 21 tag null
Register R21 value 22 tag null
Register R22 value 23 tag null
Register R23 value 24 tag null
Register R24 value 25 tag null
Register R25 value 26 tag null

Register R26 value 27 tag null
Register R27 value 28 tag null
Register R28 value 29 tag null
Register R29 value 30 tag null
Register R30 value 31 tag null
Register R31 value 32 tag null

Load Buffers:

{tag='L1', busy=false, A=null}
{tag='L2', busy=false, A=null}
{tag='L3', busy=false, A=null}

Store Buffers:

{tag='S1', busy=true, A=0, Vj=9.0, Qj='null'}
{tag='S2', busy=false, A=null, Vj=null, Qj='null'}
{tag='S3', busy=false, A=null, Vj=null, Qj='null'}

Add Reservation Stations:

{tag='A1', busy=false, op=0, Vj=null, Vk=null, Qj='null', Qk='null'}
{tag='A2', busy=false, op=0, Vj=null, Vk=null, Qj='null', Qk='null'}
{tag='A3', busy=false, op=0, Vj=null, Vk=null, Qj='null', Qk='null'}

Multiply Reservation Stations:

{tag='M1', busy=false, op=0, Vj=null, Vk=null, Qj='null', Qk='null'}
{tag='M2', busy=false, op=0, Vj=null, Vk=null, Qj='null', Qk='null'}

Memory:

Memory 0 value 9.0
Memory 1 value 2.0
Memory 2 value 3.0
Memory 3 value 4.0
Memory 4 value 5.0
Memory 5 value 6.0
Memory 6 value 7.0
Memory 7 value 8.0
Memory 8 value 9.0
Memory 9 value 10.0

Cycle: 18

Executing instruction: Instruction{type=STORE, status=FINISHED, destination register=-1, issued cycle=11, started execution cycle=18, finished execution cycle=18, written cycle=0}

Remaning executing cycles: 0

Register file:

Float Register File

Register F0 value 3.0 tag null
Register F1 value 2.0 tag null
Register F2 value 3.0 tag null
Register F3 value 4.0 tag null
Register F4 value 9.0 tag null
Register F5 value 6.0 tag null
Register F6 value 7.0 tag null
Register F7 value 8.0 tag null

Register F8 value 9.0 tag null
Register F9 value 10.0 tag null
Register F10 value 11.0 tag null
Register F11 value 12.0 tag null
Register F12 value 13.0 tag null
Register F13 value 14.0 tag null
Register F14 value 15.0 tag null
Register F15 value 16.0 tag null
Register F16 value 17.0 tag null
Register F17 value 18.0 tag null
Register F18 value 19.0 tag null
Register F19 value 20.0 tag null
Register F20 value 21.0 tag null
Register F21 value 22.0 tag null
Register F22 value 23.0 tag null
Register F23 value 24.0 tag null
Register F24 value 25.0 tag null
Register F25 value 26.0 tag null
Register F26 value 27.0 tag null
Register F27 value 28.0 tag null
Register F28 value 29.0 tag null
Register F29 value 30.0 tag null
Register F30 value 31.0 tag null
Register F31 value 32.0 tag null
Integer Register File
Register R0 value 1 tag null
Register R1 value 2 tag null
Register R2 value 3 tag null
Register R3 value 4 tag null
Register R4 value 5 tag null
Register R5 value 6 tag null
Register R6 value 7 tag null
Register R7 value 8 tag null
Register R8 value 9 tag null
Register R9 value 10 tag null
Register R10 value 11 tag null
Register R11 value 12 tag null
Register R12 value 13 tag null
Register R13 value 14 tag null
Register R14 value 15 tag null
Register R15 value 0 tag null
Register R16 value 17 tag null
Register R17 value 18 tag null
Register R18 value 19 tag null
Register R19 value 20 tag null
Register R20 value 21 tag null
Register R21 value 22 tag null
Register R22 value 23 tag null

Register R23 value 24 tag null
Register R24 value 25 tag null
Register R25 value 26 tag null
Register R26 value 27 tag null
Register R27 value 28 tag null
Register R28 value 29 tag null
Register R29 value 30 tag null
Register R30 value 31 tag null
Register R31 value 32 tag null

Load Buffers:

{tag='L1', busy=false, A=null}
{tag='L2', busy=false, A=null}
{tag='L3', busy=false, A=null}

Store Buffers:

{tag='S1', busy=false, A=null, Vj=null, Qj='null'}
{tag='S2', busy=false, A=null, Vj=null, Qj='null'}
{tag='S3', busy=false, A=null, Vj=null, Qj='null'}

Add Reservation Stations:

{tag='A1', busy=false, op=0, Vj=null, Vk=null, Qj='null', Qk='null'}
{tag='A2', busy=false, op=0, Vj=null, Vk=null, Qj='null', Qk='null'}
{tag='A3', busy=false, op=0, Vj=null, Vk=null, Qj='null', Qk='null'}

Multiply Reservation Stations:

{tag='M1', busy=false, op=0, Vj=null, Vk=null, Qj='null', Qk='null'}
{tag='M2', busy=false, op=0, Vj=null, Vk=null, Qj='null', Qk='null'}

Memory:

Memory 0 value 9.0
Memory 1 value 2.0
Memory 2 value 3.0
Memory 3 value 4.0
Memory 4 value 5.0
Memory 5 value 6.0
Memory 6 value 7.0
Memory 7 value 8.0
Memory 8 value 9.0
Memory 9 value 10.0

Queue:

Instruction{type=LOAD, status=FINISHED, destination register=0, issued cycle=1, started execution cycle=2, finished execution cycle=2, written cycle=3}
Instruction{type=FP_MUL, status=FINISHED, destination register=4, issued cycle=2, started execution cycle=4, finished execution cycle=7, written cycle=9}
Instruction{type=STORE, status=FINISHED, destination register=-1, issued cycle=3, started execution cycle=10, finished execution cycle=10, written cycle=0}
Instruction{type=INT_SUBI, status=FINISHED, destination register=15, issued cycle=4, started execution cycle=5, finished execution cycle=5, written cycle=6}
Instruction{type=BRANCH, status=FINISHED, destination register=-1, issued cycle=5, started execution cycle=7, finished execution cycle=7, written cycle=8}
Instruction{type=LOAD, status=FINISHED, destination register=0, issued cycle=9, started execution cycle=10, finished execution cycle=10, written cycle=11}

Instruction{type=FP_MUL, status=FINISHED, destination register=4, issued cycle=10, started execution cycle=12, finished execution cycle=15, written cycle=17}
 Instruction{type=STORE, status=FINISHED, destination register=-1, issued cycle=11, started execution cycle=18, finished execution cycle=18, written cycle=0}
 Instruction{type=INT_SUBI, status=FINISHED, destination register=15, issued cycle=12, started execution cycle=13, finished execution cycle=13, written cycle=14}
 Instruction{type=BRANCH, status=FINISHED, destination register=-1, issued cycle=13, started execution cycle=15, finished execution cycle=15, written cycle=16}

Test Case #2

Latency/size:

- Add/Sub latency = 2
- Mul/Div latency = 2
- Load/Store latency = 1
- Reservation station sizes = 2 for Add and Mul, 0 for load and store since we don't need them

Program:

DIV.D F0 F16 F4
 ADD.D F1 F0 F2
 ADDI R0 R1 6
 DADD R1 R0 R4

Output:

Initial Register file:

Float Register File

Register F0 value 1.0 tag null
 Register F1 value 2.0 tag null
 Register F2 value 3.0 tag null
 Register F3 value 4.0 tag null
 Register F4 value 5.0 tag null
 Register F5 value 6.0 tag null
 Register F6 value 7.0 tag null
 Register F7 value 8.0 tag null
 Register F8 value 9.0 tag null
 Register F9 value 10.0 tag null
 Register F10 value 11.0 tag null
 Register F11 value 12.0 tag null
 Register F12 value 13.0 tag null
 Register F13 value 14.0 tag null
 Register F14 value 15.0 tag null
 Register F15 value 16.0 tag null
 Register F16 value 17.0 tag null

Register F17 value 18.0 tag null
Register F18 value 19.0 tag null
Register F19 value 20.0 tag null
Register F20 value 21.0 tag null
Register F21 value 22.0 tag null
Register F22 value 23.0 tag null
Register F23 value 24.0 tag null
Register F24 value 25.0 tag null
Register F25 value 26.0 tag null
Register F26 value 27.0 tag null
Register F27 value 28.0 tag null
Register F28 value 29.0 tag null
Register F29 value 30.0 tag null
Register F30 value 31.0 tag null
Register F31 value 32.0 tag null

Integer Register File

Register R0 value 1 tag null
Register R1 value 2 tag null
Register R2 value 3 tag null
Register R3 value 4 tag null
Register R4 value 5 tag null
Register R5 value 6 tag null
Register R6 value 7 tag null
Register R7 value 8 tag null
Register R8 value 9 tag null
Register R9 value 10 tag null
Register R10 value 11 tag null
Register R11 value 12 tag null
Register R12 value 13 tag null
Register R13 value 14 tag null
Register R14 value 15 tag null
Register R15 value 16 tag null
Register R16 value 17 tag null
Register R17 value 18 tag null
Register R18 value 19 tag null
Register R19 value 20 tag null
Register R20 value 21 tag null
Register R21 value 22 tag null
Register R22 value 23 tag null
Register R23 value 24 tag null
Register R24 value 25 tag null
Register R25 value 26 tag null
Register R26 value 27 tag null
Register R27 value 28 tag null
Register R28 value 29 tag null
Register R29 value 30 tag null
Register R30 value 31 tag null
Register R31 value 32 tag null

Cycle: 1

Issuing instruction: Instruction{type=FP_DIV, status=ISSUED, destination register=0, issued cycle=1, started execution cycle=0, finished execution cycle=0, written cycle=0}

Register file:

Float Register File

Register F0 value 1.0 tag M1
Register F1 value 2.0 tag null
Register F2 value 3.0 tag null
Register F3 value 4.0 tag null
Register F4 value 5.0 tag null
Register F5 value 6.0 tag null
Register F6 value 7.0 tag null
Register F7 value 8.0 tag null
Register F8 value 9.0 tag null
Register F9 value 10.0 tag null
Register F10 value 11.0 tag null
Register F11 value 12.0 tag null
Register F12 value 13.0 tag null
Register F13 value 14.0 tag null
Register F14 value 15.0 tag null
Register F15 value 16.0 tag null
Register F16 value 17.0 tag null
Register F17 value 18.0 tag null
Register F18 value 19.0 tag null
Register F19 value 20.0 tag null
Register F20 value 21.0 tag null
Register F21 value 22.0 tag null
Register F22 value 23.0 tag null
Register F23 value 24.0 tag null
Register F24 value 25.0 tag null
Register F25 value 26.0 tag null
Register F26 value 27.0 tag null
Register F27 value 28.0 tag null
Register F28 value 29.0 tag null
Register F29 value 30.0 tag null
Register F30 value 31.0 tag null
Register F31 value 32.0 tag null

Integer Register File

Register R0 value 1 tag null
Register R1 value 2 tag null
Register R2 value 3 tag null
Register R3 value 4 tag null
Register R4 value 5 tag null
Register R5 value 6 tag null
Register R6 value 7 tag null
Register R7 value 8 tag null

Register R8 value 9 tag null
Register R9 value 10 tag null
Register R10 value 11 tag null
Register R11 value 12 tag null
Register R12 value 13 tag null
Register R13 value 14 tag null
Register R14 value 15 tag null
Register R15 value 16 tag null
Register R16 value 17 tag null
Register R17 value 18 tag null
Register R18 value 19 tag null
Register R19 value 20 tag null
Register R20 value 21 tag null
Register R21 value 22 tag null
Register R22 value 23 tag null
Register R23 value 24 tag null
Register R24 value 25 tag null
Register R25 value 26 tag null
Register R26 value 27 tag null
Register R27 value 28 tag null
Register R28 value 29 tag null
Register R29 value 30 tag null
Register R30 value 31 tag null
Register R31 value 32 tag null

Load Buffers:

Store Buffers:

Add Reservation Stations:

{tag='A1', busy=false, op=0, Vj=null, Vk=null, Qj='null', Qk='null'}

{tag='A2', busy=false, op=0, Vj=null, Vk=null, Qj='null', Qk='null'}

Multiply Reservation Stations:

{tag='M1', busy=true, op=DIV, Vj=17.0, Vk=5.0, Qj='null', Qk='null'}

{tag='M2', busy=false, op=0, Vj=null, Vk=null, Qj='null', Qk='null'}

Memory:

Memory 0 value 1.0

Memory 1 value 2.0

Memory 2 value 3.0

Memory 3 value 4.0

Memory 4 value 5.0

Memory 5 value 6.0

Memory 6 value 7.0

Memory 7 value 8.0

Memory 8 value 9.0

Memory 9 value 10.0

Cycle: 2

Issuing instruction: Instruction{type=FP_ADD, status=ISSUED, destination register=1, issued cycle=2, started execution cycle=0, finished execution cycle=0, written cycle=0}

Executing instruction: Instruction{type=FP_DIV, status=EXECUTING, destination register=0, issued cycle=1, started execution cycle=2, finished execution cycle=0, written cycle=0}

Remaning executing cycles: 1

Register file:

Float Register File

Register F0 value 1.0 tag M1

Register F1 value 2.0 tag A1

Register F2 value 3.0 tag null

Register F3 value 4.0 tag null

Register F4 value 5.0 tag null

Register F5 value 6.0 tag null

Register F6 value 7.0 tag null

Register F7 value 8.0 tag null

Register F8 value 9.0 tag null

Register F9 value 10.0 tag null

Register F10 value 11.0 tag null

Register F11 value 12.0 tag null

Register F12 value 13.0 tag null

Register F13 value 14.0 tag null

Register F14 value 15.0 tag null

Register F15 value 16.0 tag null

Register F16 value 17.0 tag null

Register F17 value 18.0 tag null

Register F18 value 19.0 tag null

Register F19 value 20.0 tag null

Register F20 value 21.0 tag null

Register F21 value 22.0 tag null

Register F22 value 23.0 tag null

Register F23 value 24.0 tag null

Register F24 value 25.0 tag null

Register F25 value 26.0 tag null

Register F26 value 27.0 tag null

Register F27 value 28.0 tag null

Register F28 value 29.0 tag null

Register F29 value 30.0 tag null

Register F30 value 31.0 tag null

Register F31 value 32.0 tag null

Integer Register File

Register R0 value 1 tag null

Register R1 value 2 tag null

Register R2 value 3 tag null

Register R3 value 4 tag null

Register R4 value 5 tag null

Register R5 value 6 tag null

Register R6 value 7 tag null

Register R7 value 8 tag null

Register R8 value 9 tag null

Register R9 value 10 tag null

Register R10 value 11 tag null
Register R11 value 12 tag null
Register R12 value 13 tag null
Register R13 value 14 tag null
Register R14 value 15 tag null
Register R15 value 16 tag null
Register R16 value 17 tag null
Register R17 value 18 tag null
Register R18 value 19 tag null
Register R19 value 20 tag null
Register R20 value 21 tag null
Register R21 value 22 tag null
Register R22 value 23 tag null
Register R23 value 24 tag null
Register R24 value 25 tag null
Register R25 value 26 tag null
Register R26 value 27 tag null
Register R27 value 28 tag null
Register R28 value 29 tag null
Register R29 value 30 tag null
Register R30 value 31 tag null
Register R31 value 32 tag null

Load Buffers:

Store Buffers:

Add Reservation Stations:

{tag='A1', busy=true, op=FP_ADD, Vj=null, Vk=3.0, Qj='M1', Qk='null'}

{tag='A2', busy=false, op=0, Vj=null, Vk=null, Qj='null', Qk='null'}

Multiply Reservation Stations:

{tag='M1', busy=true, op=DIV, Vj=17.0, Vk=5.0, Qj='null', Qk='null'}

{tag='M2', busy=false, op=0, Vj=null, Vk=null, Qj='null', Qk='null'}

Memory:

Memory 0 value 1.0

Memory 1 value 2.0

Memory 2 value 3.0

Memory 3 value 4.0

Memory 4 value 5.0

Memory 5 value 6.0

Memory 6 value 7.0

Memory 7 value 8.0

Memory 8 value 9.0

Memory 9 value 10.0

Cycle: 3

Issuing instruction: Instruction{type=INT_ADDI, status=ISSUED, destination register=0, issued cycle=3, started execution cycle=0, finished execution cycle=0, written cycle=0}

Executing instruction: Instruction{type=FP_DIV, status=WAITING_WRITE_RESULT, destination register=0, issued cycle=1, started execution cycle=2, finished execution cycle=3, written cycle=0} Remaining executing cycles: 0

Register file:

Float Register File

Register F0 value 1.0 tag M1
Register F1 value 2.0 tag A1
Register F2 value 3.0 tag null
Register F3 value 4.0 tag null
Register F4 value 5.0 tag null
Register F5 value 6.0 tag null
Register F6 value 7.0 tag null
Register F7 value 8.0 tag null
Register F8 value 9.0 tag null
Register F9 value 10.0 tag null
Register F10 value 11.0 tag null
Register F11 value 12.0 tag null
Register F12 value 13.0 tag null
Register F13 value 14.0 tag null
Register F14 value 15.0 tag null
Register F15 value 16.0 tag null
Register F16 value 17.0 tag null
Register F17 value 18.0 tag null
Register F18 value 19.0 tag null
Register F19 value 20.0 tag null
Register F20 value 21.0 tag null
Register F21 value 22.0 tag null
Register F22 value 23.0 tag null
Register F23 value 24.0 tag null
Register F24 value 25.0 tag null
Register F25 value 26.0 tag null
Register F26 value 27.0 tag null
Register F27 value 28.0 tag null
Register F28 value 29.0 tag null
Register F29 value 30.0 tag null
Register F30 value 31.0 tag null
Register F31 value 32.0 tag null

Integer Register File

Register R0 value 1 tag A2
Register R1 value 2 tag null
Register R2 value 3 tag null
Register R3 value 4 tag null
Register R4 value 5 tag null
Register R5 value 6 tag null
Register R6 value 7 tag null
Register R7 value 8 tag null
Register R8 value 9 tag null
Register R9 value 10 tag null

Register R10 value 11 tag null
Register R11 value 12 tag null
Register R12 value 13 tag null
Register R13 value 14 tag null
Register R14 value 15 tag null
Register R15 value 16 tag null
Register R16 value 17 tag null
Register R17 value 18 tag null
Register R18 value 19 tag null
Register R19 value 20 tag null
Register R20 value 21 tag null
Register R21 value 22 tag null
Register R22 value 23 tag null
Register R23 value 24 tag null
Register R24 value 25 tag null
Register R25 value 26 tag null
Register R26 value 27 tag null
Register R27 value 28 tag null
Register R28 value 29 tag null
Register R29 value 30 tag null
Register R30 value 31 tag null
Register R31 value 32 tag null

Load Buffers:

Store Buffers:

Add Reservation Stations:

{tag='A1', busy=true, op=FP_ADD, Vj=null, Vk=3.0, Qj='M1', Qk='null'}

{tag='A2', busy=true, op=INT_ADDI, Vj=2.0, Vk=6.0, Qj='null', Qk='null'}

Multiply Reservation Stations:

{tag='M1', busy=true, op=DIV, Vj=17.0, Vk=5.0, Qj='null', Qk='null'}

{tag='M2', busy=false, op=0, Vj=null, Vk=null, Qj='null', Qk='null'}

Memory:

Memory 0 value 1.0

Memory 1 value 2.0

Memory 2 value 3.0

Memory 3 value 4.0

Memory 4 value 5.0

Memory 5 value 6.0

Memory 6 value 7.0

Memory 7 value 8.0

Memory 8 value 9.0

Memory 9 value 10.0

Cycle: 4

Executing instruction: Instruction{type=INT_ADDI, status=WAITING_WRITE_RESULT, destination register=0, issued cycle=3, started execution cycle=4, finished execution cycle=4, written cycle=0} Remaining executing cycles: 0

Writing instruction: Instruction{type=FP_DIV, status=WRITING_BACK, destination register=0, issued cycle=1, started execution cycle=2, finished execution cycle=3, written cycle=4}

Register file:

Float Register File

Register F0 value 3.4 tag null
Register F1 value 2.0 tag A1
Register F2 value 3.0 tag null
Register F3 value 4.0 tag null
Register F4 value 5.0 tag null
Register F5 value 6.0 tag null
Register F6 value 7.0 tag null
Register F7 value 8.0 tag null
Register F8 value 9.0 tag null
Register F9 value 10.0 tag null
Register F10 value 11.0 tag null
Register F11 value 12.0 tag null
Register F12 value 13.0 tag null
Register F13 value 14.0 tag null
Register F14 value 15.0 tag null
Register F15 value 16.0 tag null
Register F16 value 17.0 tag null
Register F17 value 18.0 tag null
Register F18 value 19.0 tag null
Register F19 value 20.0 tag null
Register F20 value 21.0 tag null
Register F21 value 22.0 tag null
Register F22 value 23.0 tag null
Register F23 value 24.0 tag null
Register F24 value 25.0 tag null
Register F25 value 26.0 tag null
Register F26 value 27.0 tag null
Register F27 value 28.0 tag null
Register F28 value 29.0 tag null
Register F29 value 30.0 tag null
Register F30 value 31.0 tag null
Register F31 value 32.0 tag null

Integer Register File

Register R0 value 1 tag A2
Register R1 value 2 tag null
Register R2 value 3 tag null
Register R3 value 4 tag null
Register R4 value 5 tag null
Register R5 value 6 tag null
Register R6 value 7 tag null
Register R7 value 8 tag null
Register R8 value 9 tag null
Register R9 value 10 tag null

Register R10 value 11 tag null
Register R11 value 12 tag null
Register R12 value 13 tag null
Register R13 value 14 tag null
Register R14 value 15 tag null
Register R15 value 16 tag null
Register R16 value 17 tag null
Register R17 value 18 tag null
Register R18 value 19 tag null
Register R19 value 20 tag null
Register R20 value 21 tag null
Register R21 value 22 tag null
Register R22 value 23 tag null
Register R23 value 24 tag null
Register R24 value 25 tag null
Register R25 value 26 tag null
Register R26 value 27 tag null
Register R27 value 28 tag null
Register R28 value 29 tag null
Register R29 value 30 tag null
Register R30 value 31 tag null
Register R31 value 32 tag null

Load Buffers:

Store Buffers:

Add Reservation Stations:

{tag='A1', busy=true, op=FP_ADD, Vj=3.4, Vk=3.0, Qj='null', Qk='null'}

{tag='A2', busy=true, op=INT_ADDI, Vj=2.0, Vk=6.0, Qj='null', Qk='null'}

Multiply Reservation Stations:

{tag='M1', busy=false, op=0, Vj=null, Vk=null, Qj='null', Qk='null'}

{tag='M2', busy=false, op=0, Vj=null, Vk=null, Qj='null', Qk='null'}

Memory:

Memory 0 value 1.0

Memory 1 value 2.0

Memory 2 value 3.0

Memory 3 value 4.0

Memory 4 value 5.0

Memory 5 value 6.0

Memory 6 value 7.0

Memory 7 value 8.0

Memory 8 value 9.0

Memory 9 value 10.0

Cycle: 5

Executing instruction: Instruction{type=FP_ADD, status=EXECUTING, destination register=1, issued cycle=2, started execution cycle=5, finished execution cycle=0, written cycle=0} Remaning executing cycles: 1

Writing instruction: Instruction{type=INT_ADDI, status=WRITING_BACK, destination register=0, issued cycle=3, started execution cycle=4, finished execution cycle=4, written cycle=5}

Register file:

Float Register File

Register F0 value 3.4 tag null
Register F1 value 2.0 tag A1
Register F2 value 3.0 tag null
Register F3 value 4.0 tag null
Register F4 value 5.0 tag null
Register F5 value 6.0 tag null
Register F6 value 7.0 tag null
Register F7 value 8.0 tag null
Register F8 value 9.0 tag null
Register F9 value 10.0 tag null
Register F10 value 11.0 tag null
Register F11 value 12.0 tag null
Register F12 value 13.0 tag null
Register F13 value 14.0 tag null
Register F14 value 15.0 tag null
Register F15 value 16.0 tag null
Register F16 value 17.0 tag null
Register F17 value 18.0 tag null
Register F18 value 19.0 tag null
Register F19 value 20.0 tag null
Register F20 value 21.0 tag null
Register F21 value 22.0 tag null
Register F22 value 23.0 tag null
Register F23 value 24.0 tag null
Register F24 value 25.0 tag null
Register F25 value 26.0 tag null
Register F26 value 27.0 tag null
Register F27 value 28.0 tag null
Register F28 value 29.0 tag null
Register F29 value 30.0 tag null
Register F30 value 31.0 tag null
Register F31 value 32.0 tag null

Integer Register File

Register R0 value 8 tag null
Register R1 value 2 tag null
Register R2 value 3 tag null
Register R3 value 4 tag null
Register R4 value 5 tag null
Register R5 value 6 tag null
Register R6 value 7 tag null
Register R7 value 8 tag null
Register R8 value 9 tag null
Register R9 value 10 tag null

Register R10 value 11 tag null
Register R11 value 12 tag null
Register R12 value 13 tag null
Register R13 value 14 tag null
Register R14 value 15 tag null
Register R15 value 16 tag null
Register R16 value 17 tag null
Register R17 value 18 tag null
Register R18 value 19 tag null
Register R19 value 20 tag null
Register R20 value 21 tag null
Register R21 value 22 tag null
Register R22 value 23 tag null
Register R23 value 24 tag null
Register R24 value 25 tag null
Register R25 value 26 tag null
Register R26 value 27 tag null
Register R27 value 28 tag null
Register R28 value 29 tag null
Register R29 value 30 tag null
Register R30 value 31 tag null
Register R31 value 32 tag null

Load Buffers:

Store Buffers:

Add Reservation Stations:

{tag='A1', busy=true, op=FP_ADD, Vj=3.4, Vk=3.0, Qj='null', Qk='null'}

{tag='A2', busy=false, op=0, Vj=null, Vk=null, Qj='null', Qk='null'}

Multiply Reservation Stations:

{tag='M1', busy=false, op=0, Vj=null, Vk=null, Qj='null', Qk='null'}

{tag='M2', busy=false, op=0, Vj=null, Vk=null, Qj='null', Qk='null'}

Memory:

Memory 0 value 1.0

Memory 1 value 2.0

Memory 2 value 3.0

Memory 3 value 4.0

Memory 4 value 5.0

Memory 5 value 6.0

Memory 6 value 7.0

Memory 7 value 8.0

Memory 8 value 9.0

Memory 9 value 10.0

Cycle: 6

Issuing instruction: Instruction{type=INT_ADD, status=ISSUED, destination register=1, issued cycle=6, started execution cycle=0, finished execution cycle=0, written cycle=0}

Executing instruction: Instruction{type=FP_ADD, status=WAITING_WRITE_RESULT, destination register=1, issued cycle=2, started execution cycle=5, finished execution cycle=6, written cycle=0} Remaining executing cycles: 0

Register file:

Float Register File

Register F0 value 3.4 tag null
Register F1 value 2.0 tag A1
Register F2 value 3.0 tag null
Register F3 value 4.0 tag null
Register F4 value 5.0 tag null
Register F5 value 6.0 tag null
Register F6 value 7.0 tag null
Register F7 value 8.0 tag null
Register F8 value 9.0 tag null
Register F9 value 10.0 tag null
Register F10 value 11.0 tag null
Register F11 value 12.0 tag null
Register F12 value 13.0 tag null
Register F13 value 14.0 tag null
Register F14 value 15.0 tag null
Register F15 value 16.0 tag null
Register F16 value 17.0 tag null
Register F17 value 18.0 tag null
Register F18 value 19.0 tag null
Register F19 value 20.0 tag null
Register F20 value 21.0 tag null
Register F21 value 22.0 tag null
Register F22 value 23.0 tag null
Register F23 value 24.0 tag null
Register F24 value 25.0 tag null
Register F25 value 26.0 tag null
Register F26 value 27.0 tag null
Register F27 value 28.0 tag null
Register F28 value 29.0 tag null
Register F29 value 30.0 tag null
Register F30 value 31.0 tag null
Register F31 value 32.0 tag null

Integer Register File

Register R0 value 8 tag null
Register R1 value 2 tag A2
Register R2 value 3 tag null
Register R3 value 4 tag null
Register R4 value 5 tag null
Register R5 value 6 tag null
Register R6 value 7 tag null
Register R7 value 8 tag null
Register R8 value 9 tag null
Register R9 value 10 tag null

Register R10 value 11 tag null
Register R11 value 12 tag null
Register R12 value 13 tag null
Register R13 value 14 tag null
Register R14 value 15 tag null
Register R15 value 16 tag null
Register R16 value 17 tag null
Register R17 value 18 tag null
Register R18 value 19 tag null
Register R19 value 20 tag null
Register R20 value 21 tag null
Register R21 value 22 tag null
Register R22 value 23 tag null
Register R23 value 24 tag null
Register R24 value 25 tag null
Register R25 value 26 tag null
Register R26 value 27 tag null
Register R27 value 28 tag null
Register R28 value 29 tag null
Register R29 value 30 tag null
Register R30 value 31 tag null
Register R31 value 32 tag null

Load Buffers:

Store Buffers:

Add Reservation Stations:

{tag='A1', busy=true, op=FP_ADD, Vj=3.4, Vk=3.0, Qj='null', Qk='null'}

{tag='A2', busy=true, op=INT_ADD, Vj=8.0, Vk=5.0, Qj='null', Qk='null'}

Multiply Reservation Stations:

{tag='M1', busy=false, op=0, Vj=null, Vk=null, Qj='null', Qk='null'}

{tag='M2', busy=false, op=0, Vj=null, Vk=null, Qj='null', Qk='null'}

Memory:

Memory 0 value 1.0

Memory 1 value 2.0

Memory 2 value 3.0

Memory 3 value 4.0

Memory 4 value 5.0

Memory 5 value 6.0

Memory 6 value 7.0

Memory 7 value 8.0

Memory 8 value 9.0

Memory 9 value 10.0

Cycle: 7

Executing instruction: Instruction{type=INT_ADD, status=WAITING_WRITE_RESULT, destination register=1, issued cycle=6, started execution cycle=7, finished execution cycle=7, written cycle=0} Remaining executing cycles: 0

Writing instruction: Instruction{type=FP_ADD, status=WRITING_BACK, destination register=1, issued cycle=2, started execution cycle=5, finished execution cycle=6, written cycle=7}

Register file:

Float Register File

Register F0 value 3.4 tag null
Register F1 value 6.4 tag null
Register F2 value 3.0 tag null
Register F3 value 4.0 tag null
Register F4 value 5.0 tag null
Register F5 value 6.0 tag null
Register F6 value 7.0 tag null
Register F7 value 8.0 tag null
Register F8 value 9.0 tag null
Register F9 value 10.0 tag null
Register F10 value 11.0 tag null
Register F11 value 12.0 tag null
Register F12 value 13.0 tag null
Register F13 value 14.0 tag null
Register F14 value 15.0 tag null
Register F15 value 16.0 tag null
Register F16 value 17.0 tag null
Register F17 value 18.0 tag null
Register F18 value 19.0 tag null
Register F19 value 20.0 tag null
Register F20 value 21.0 tag null
Register F21 value 22.0 tag null
Register F22 value 23.0 tag null
Register F23 value 24.0 tag null
Register F24 value 25.0 tag null
Register F25 value 26.0 tag null
Register F26 value 27.0 tag null
Register F27 value 28.0 tag null
Register F28 value 29.0 tag null
Register F29 value 30.0 tag null
Register F30 value 31.0 tag null
Register F31 value 32.0 tag null

Integer Register File

Register R0 value 8 tag null
Register R1 value 2 tag A2
Register R2 value 3 tag null
Register R3 value 4 tag null
Register R4 value 5 tag null
Register R5 value 6 tag null
Register R6 value 7 tag null
Register R7 value 8 tag null
Register R8 value 9 tag null
Register R9 value 10 tag null

Register R10 value 11 tag null
Register R11 value 12 tag null
Register R12 value 13 tag null
Register R13 value 14 tag null
Register R14 value 15 tag null
Register R15 value 16 tag null
Register R16 value 17 tag null
Register R17 value 18 tag null
Register R18 value 19 tag null
Register R19 value 20 tag null
Register R20 value 21 tag null
Register R21 value 22 tag null
Register R22 value 23 tag null
Register R23 value 24 tag null
Register R24 value 25 tag null
Register R25 value 26 tag null
Register R26 value 27 tag null
Register R27 value 28 tag null
Register R28 value 29 tag null
Register R29 value 30 tag null
Register R30 value 31 tag null
Register R31 value 32 tag null

Load Buffers:

Store Buffers:

Add Reservation Stations:

{tag='A1', busy=false, op=0, Vj=null, Vk=null, Qj='null', Qk='null'}

{tag='A2', busy=true, op=INT_ADD, Vj=8.0, Vk=5.0, Qj='null', Qk='null'}

Multiply Reservation Stations:

{tag='M1', busy=false, op=0, Vj=null, Vk=null, Qj='null', Qk='null'}

{tag='M2', busy=false, op=0, Vj=null, Vk=null, Qj='null', Qk='null'}

Memory:

Memory 0 value 1.0

Memory 1 value 2.0

Memory 2 value 3.0

Memory 3 value 4.0

Memory 4 value 5.0

Memory 5 value 6.0

Memory 6 value 7.0

Memory 7 value 8.0

Memory 8 value 9.0

Memory 9 value 10.0

Cycle: 8

Writing instruction: Instruction{type=INT_ADD, status=WRITING_BACK, destination register=1, issued cycle=6, started execution cycle=7, finished execution cycle=7, written cycle=8}

Register file:

Float Register File

Register F0 value 3.4 tag null
Register F1 value 6.4 tag null
Register F2 value 3.0 tag null
Register F3 value 4.0 tag null
Register F4 value 5.0 tag null
Register F5 value 6.0 tag null
Register F6 value 7.0 tag null
Register F7 value 8.0 tag null
Register F8 value 9.0 tag null
Register F9 value 10.0 tag null
Register F10 value 11.0 tag null
Register F11 value 12.0 tag null
Register F12 value 13.0 tag null
Register F13 value 14.0 tag null
Register F14 value 15.0 tag null
Register F15 value 16.0 tag null
Register F16 value 17.0 tag null
Register F17 value 18.0 tag null
Register F18 value 19.0 tag null
Register F19 value 20.0 tag null
Register F20 value 21.0 tag null
Register F21 value 22.0 tag null
Register F22 value 23.0 tag null
Register F23 value 24.0 tag null
Register F24 value 25.0 tag null
Register F25 value 26.0 tag null
Register F26 value 27.0 tag null
Register F27 value 28.0 tag null
Register F28 value 29.0 tag null
Register F29 value 30.0 tag null
Register F30 value 31.0 tag null
Register F31 value 32.0 tag null

Integer Register File

Register R0 value 8 tag null
Register R1 value 13 tag null
Register R2 value 3 tag null
Register R3 value 4 tag null
Register R4 value 5 tag null
Register R5 value 6 tag null
Register R6 value 7 tag null
Register R7 value 8 tag null
Register R8 value 9 tag null
Register R9 value 10 tag null
Register R10 value 11 tag null
Register R11 value 12 tag null
Register R12 value 13 tag null
Register R13 value 14 tag null

Register R14 value 15 tag null
Register R15 value 16 tag null
Register R16 value 17 tag null
Register R17 value 18 tag null
Register R18 value 19 tag null
Register R19 value 20 tag null
Register R20 value 21 tag null
Register R21 value 22 tag null
Register R22 value 23 tag null
Register R23 value 24 tag null
Register R24 value 25 tag null
Register R25 value 26 tag null
Register R26 value 27 tag null
Register R27 value 28 tag null
Register R28 value 29 tag null
Register R29 value 30 tag null
Register R30 value 31 tag null
Register R31 value 32 tag null

Load Buffers:

Store Buffers:

Add Reservation Stations:

{tag='A1', busy=false, op=0, Vj=null, Vk=null, Qj='null', Qk='null'}

{tag='A2', busy=false, op=0, Vj=null, Vk=null, Qj='null', Qk='null'}

Multiply Reservation Stations:

{tag='M1', busy=false, op=0, Vj=null, Vk=null, Qj='null', Qk='null'}

{tag='M2', busy=false, op=0, Vj=null, Vk=null, Qj='null', Qk='null'}

Memory:

Memory 0 value 1.0

Memory 1 value 2.0

Memory 2 value 3.0

Memory 3 value 4.0

Memory 4 value 5.0

Memory 5 value 6.0

Memory 6 value 7.0

Memory 7 value 8.0

Memory 8 value 9.0

Memory 9 value 10.0

Queue:

Instruction{type=FP_DIV, status=FINISHED, destination register=0, issued cycle=1, started execution cycle=2, finished execution cycle=3, written cycle=4}

Instruction{type=FP_ADD, status=FINISHED, destination register=1, issued cycle=2, started execution cycle=5, finished execution cycle=6, written cycle=7}

Instruction{type=INT_ADDI, status=FINISHED, destination register=0, issued cycle=3, started execution cycle=4, finished execution cycle=4, written cycle=5}

Instruction{type=INT_ADD, status=FINISHED, destination register=1, issued cycle=6, started execution cycle=7, finished execution cycle=7, written cycle=8}

