

COL216

Processor Part 2 Report

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Introduction:

For this assignment we have to design a 32 bit ALU which can perform a subset of operations of a RISC-V architecture. The design and Simulation is to be done on Logisim.

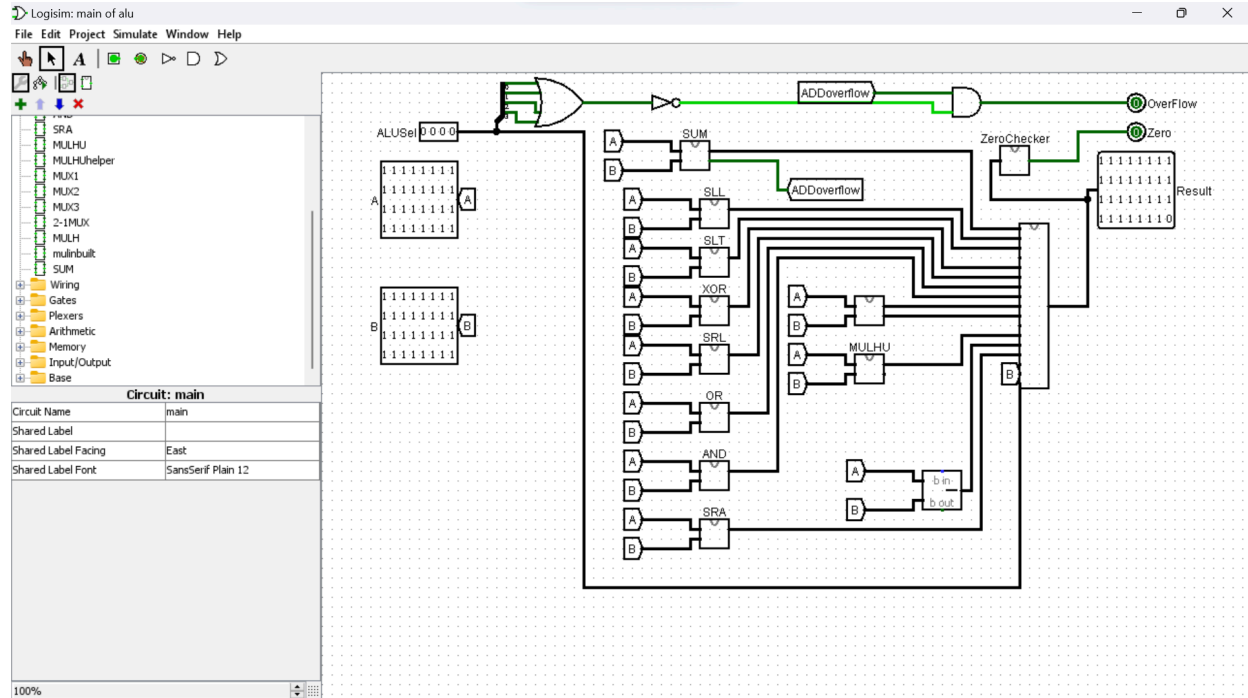
The input and output parameters are as follows:

Port Name	Port Type	Data bus Width[bits]	Description
A	Input	32	Data to use for Input A for ALU operation
B	Input	32	Data to use for Input B for ALU operation
ALUSel	Input	4	Selects which operation to perform
Result	Output	32	Result of ALU operation
OverFlow	Output	1	Overflow tied to ADD operation
Zero	Output	1	Zero flag to mark the contents of ALU as 0

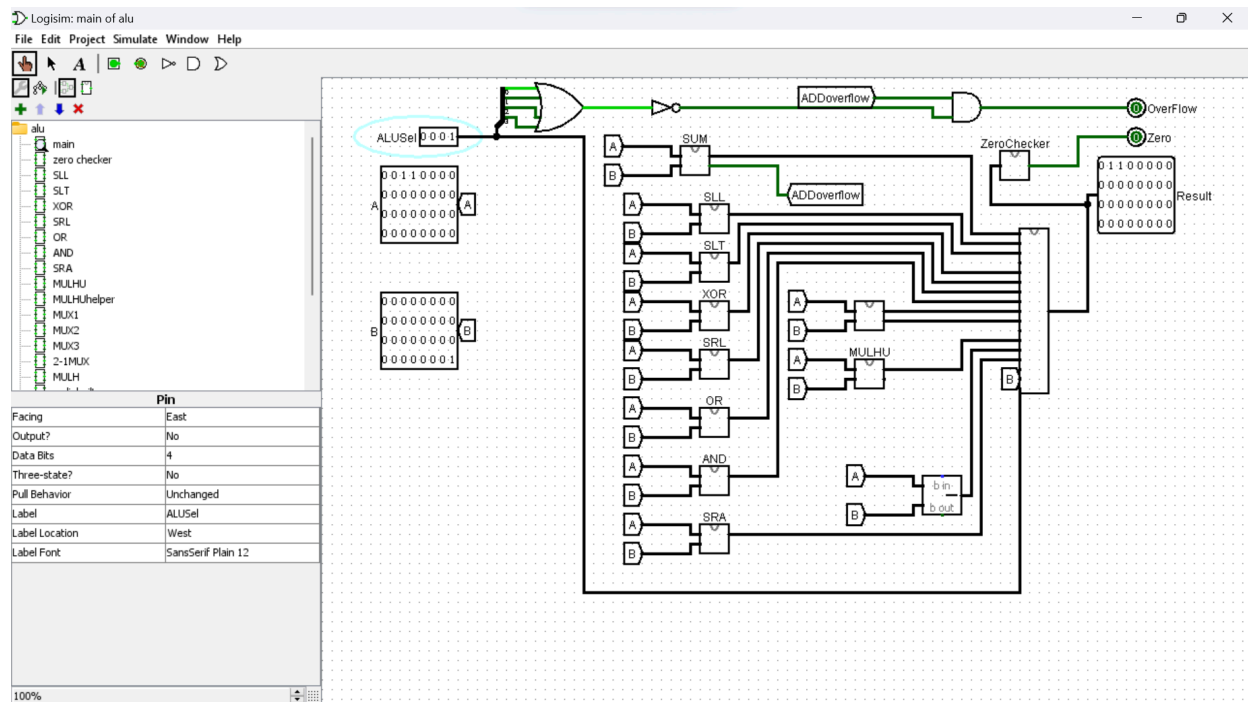
Results:

Following are the snippets of the working of our ALU.

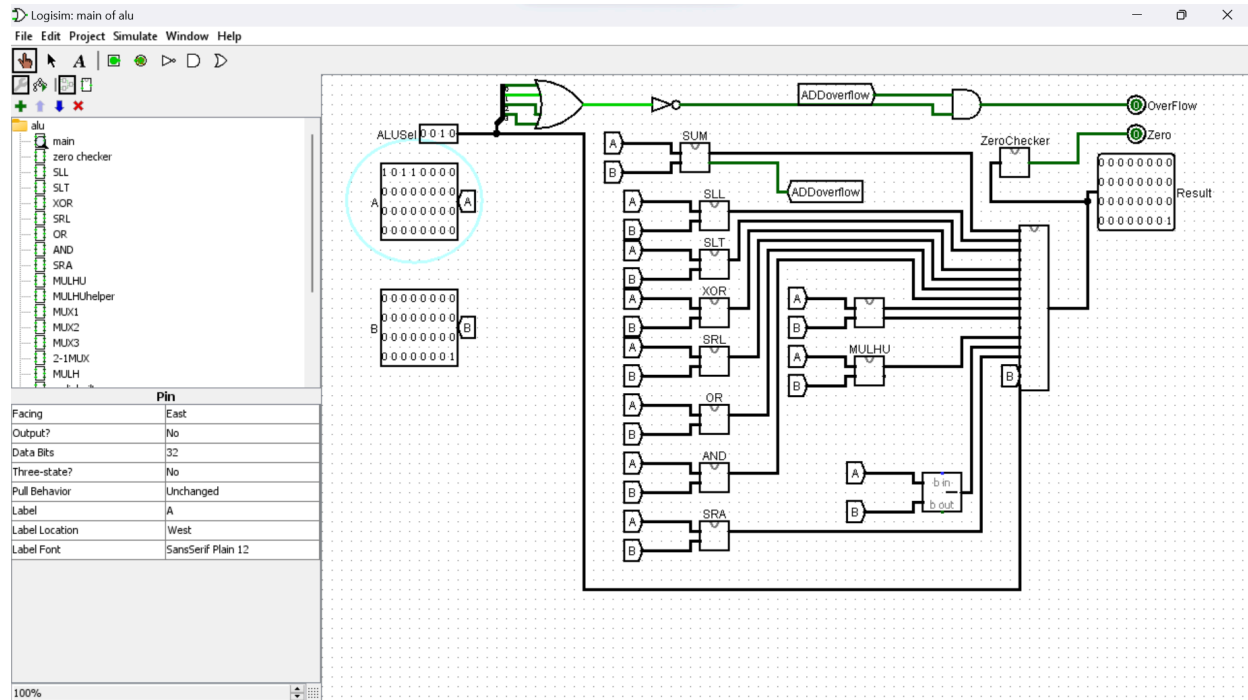
1. Operation : SUM



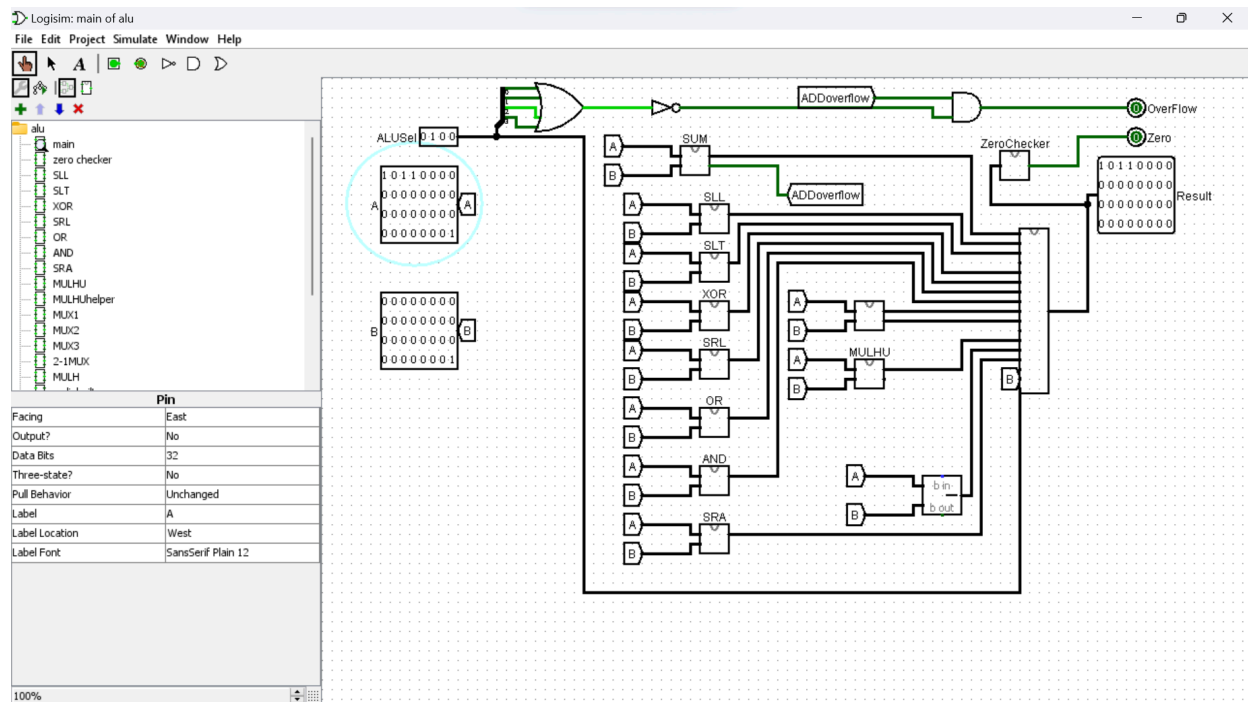
2. Operation : SLL



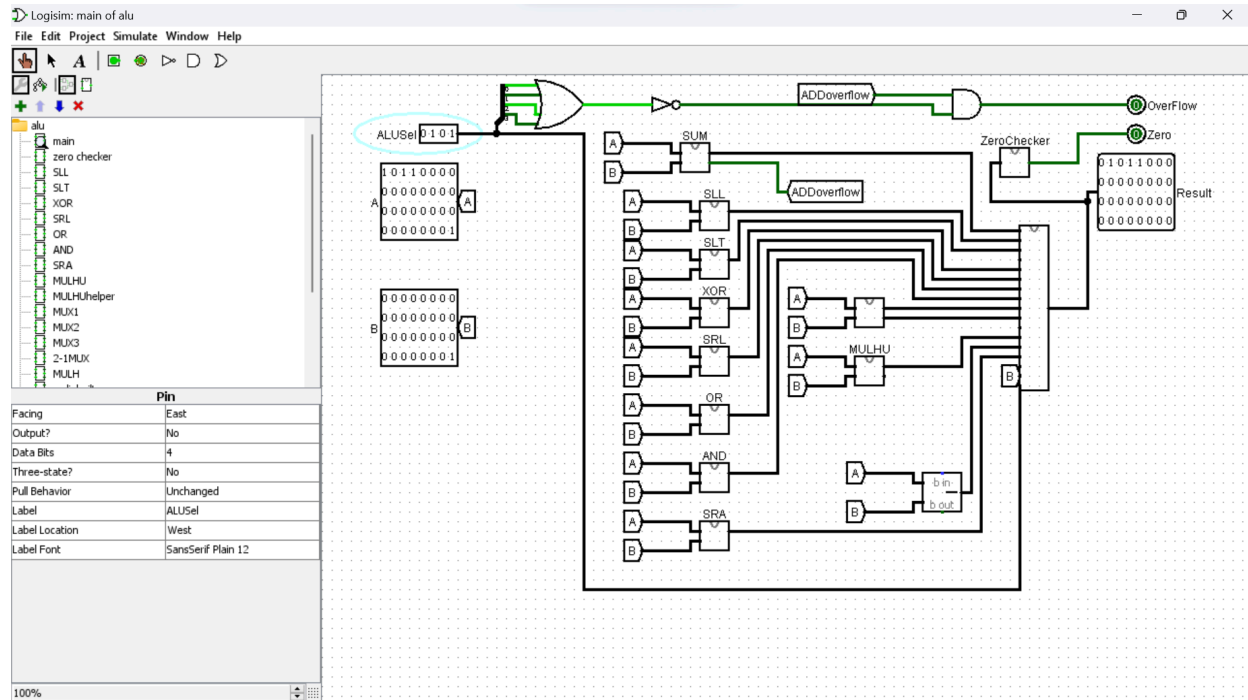
3. Operation : SLT



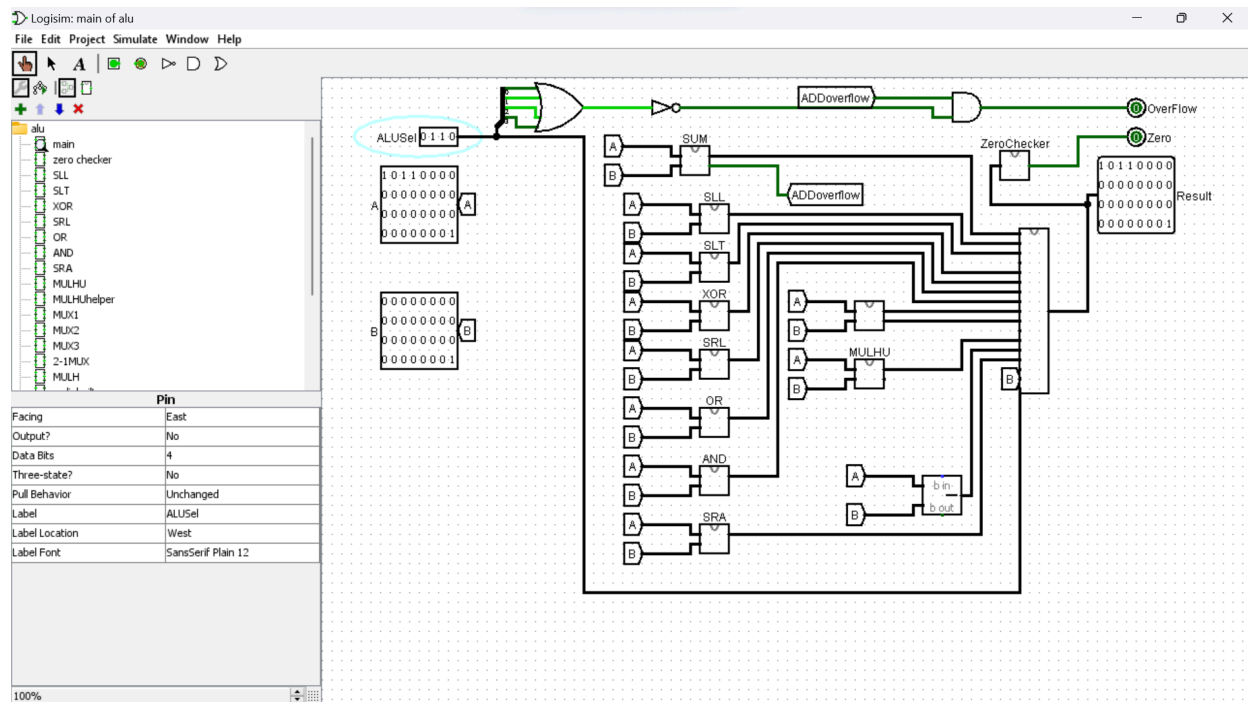
4. Operation : XOR



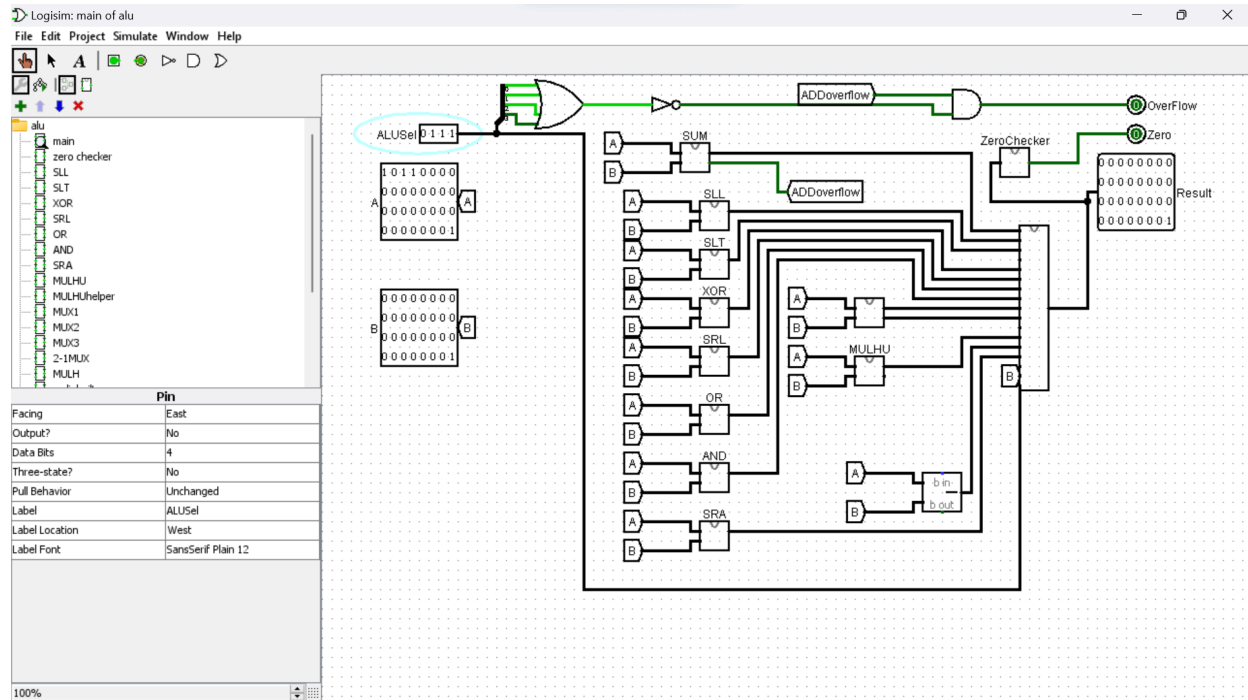
5. Operation : SRL



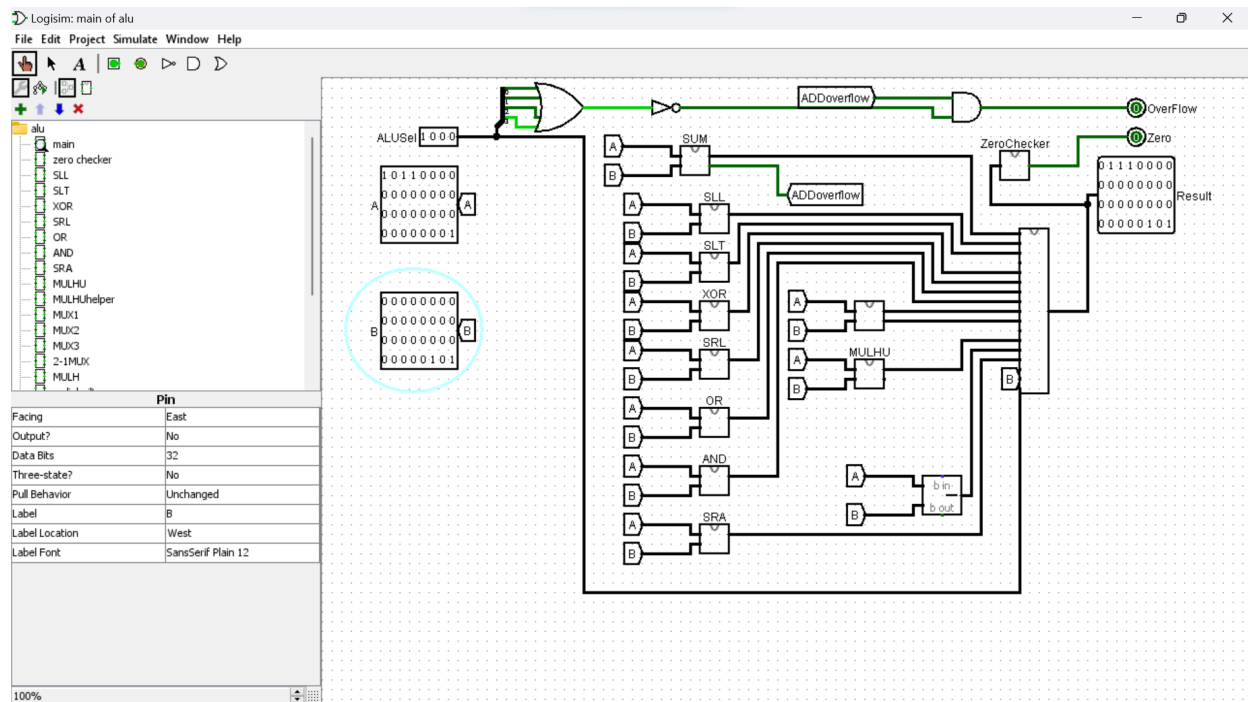
6. Operation : OR



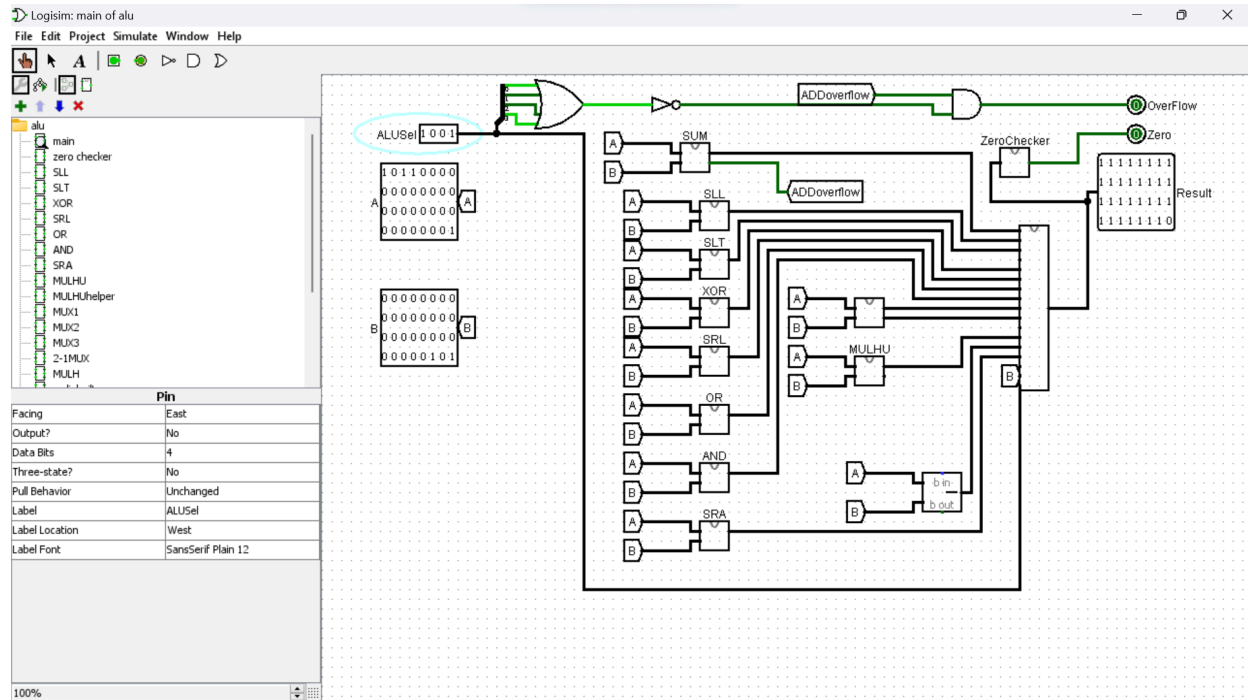
7. Operation : AND



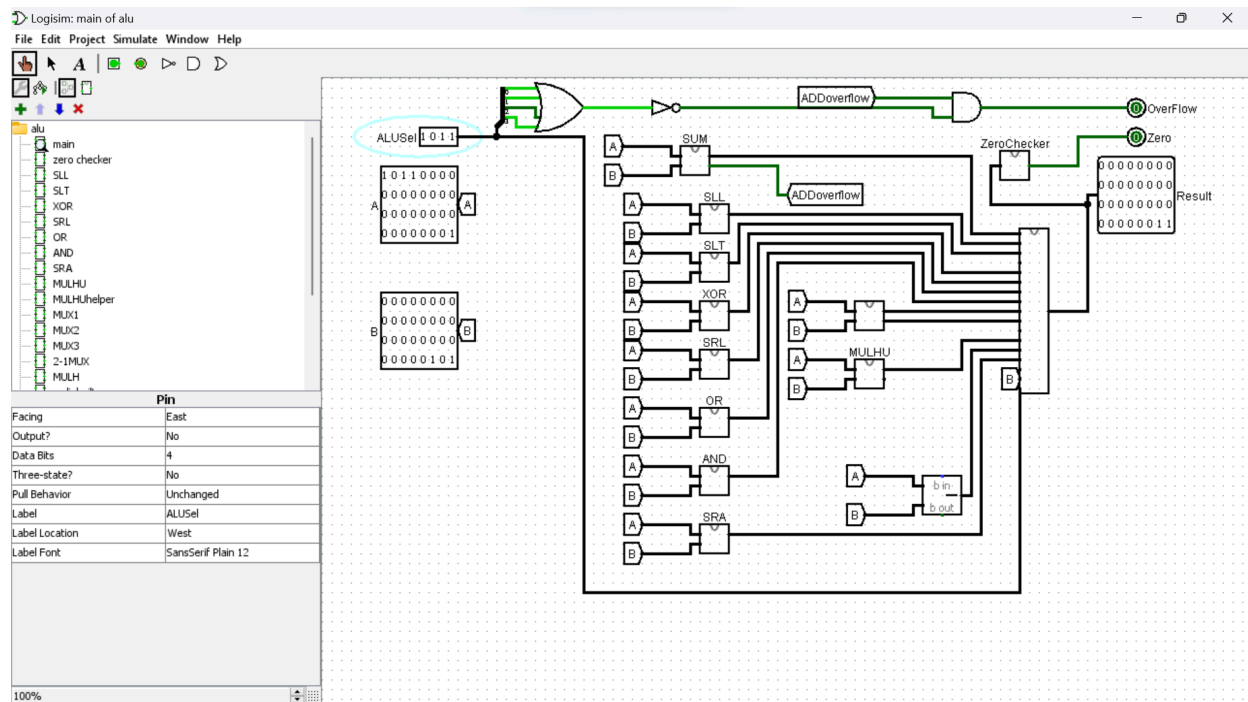
8. Operation : MUL



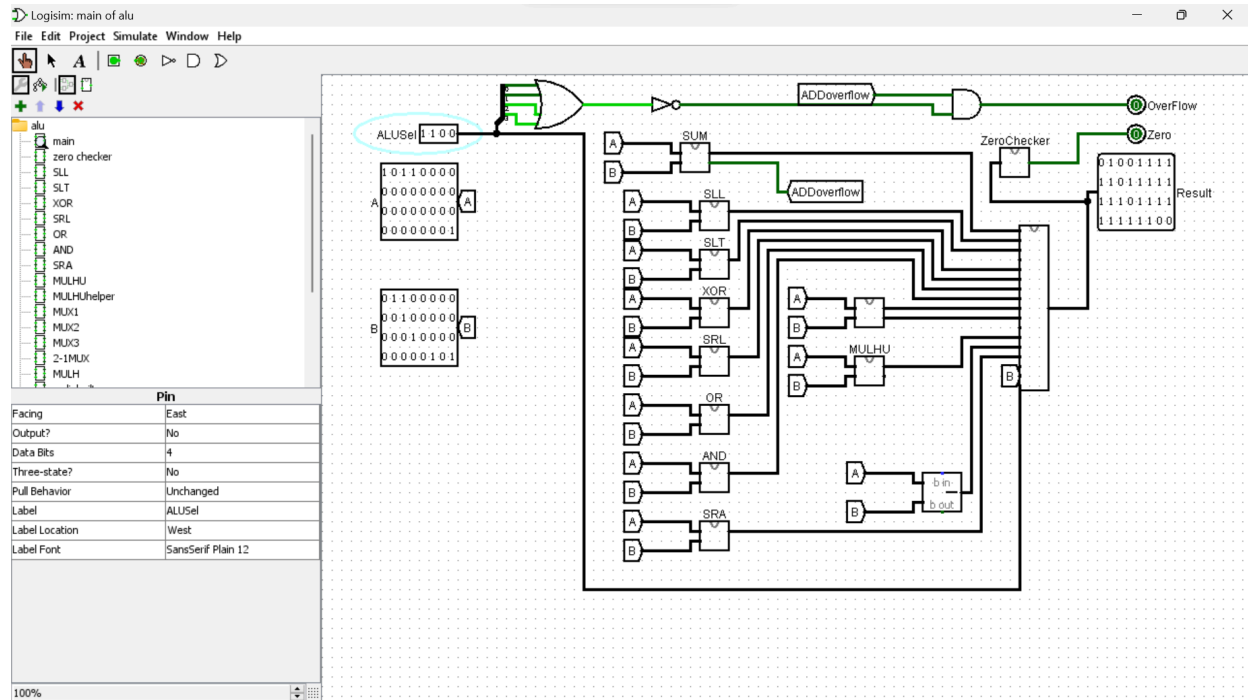
9. Operation : MULH



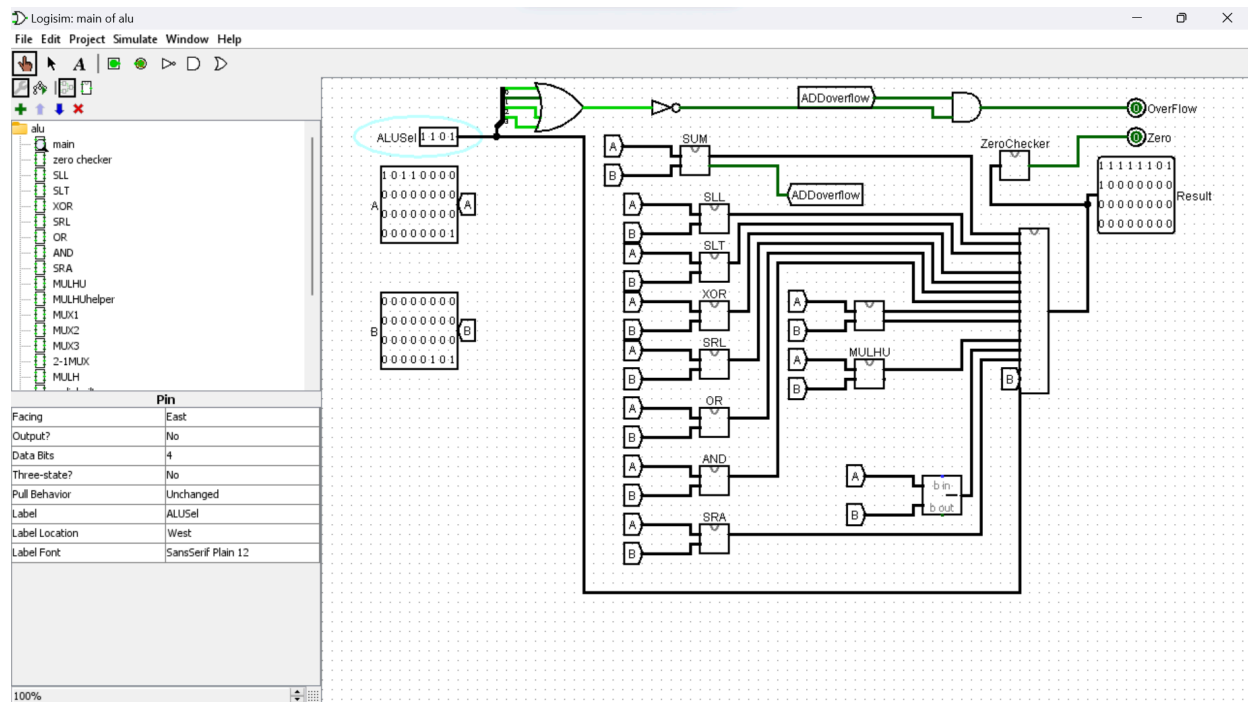
10. Operation : MULHU



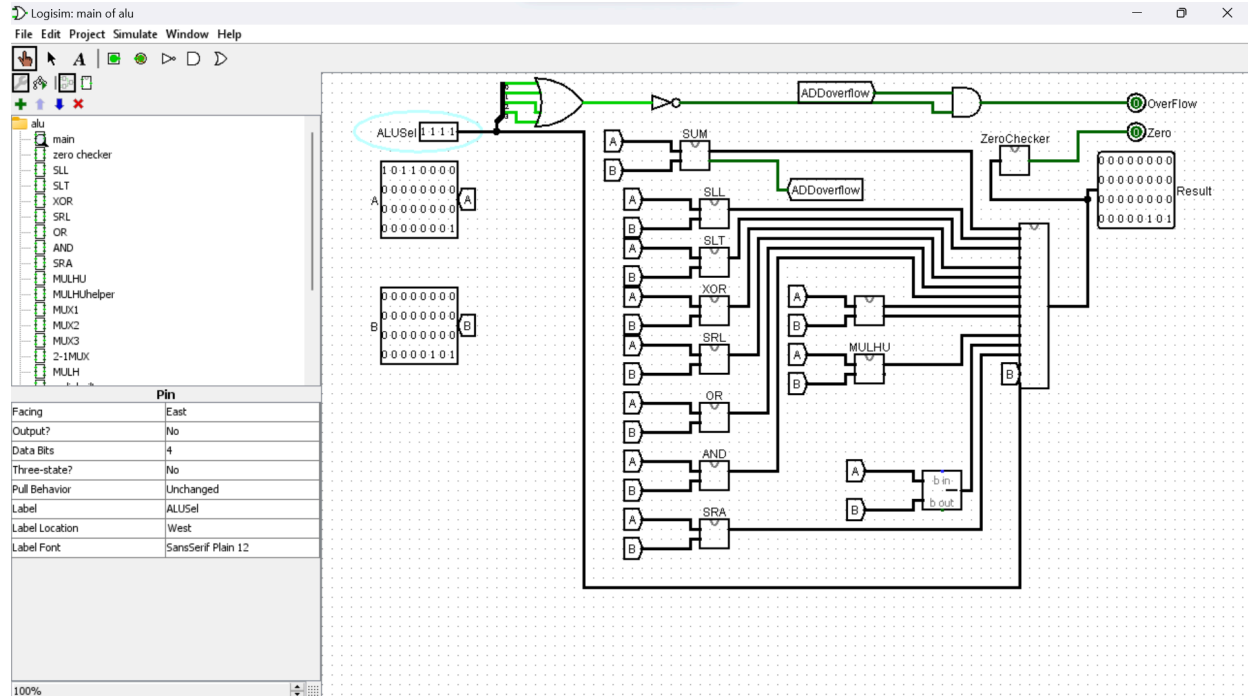
11. Operation : SUB



12. Operation : SRA



13. Operation : BSEL



Other observations:

During the development phase of the ALU we ran into an error called 'Oscillations Apparent'. As per the author of Logisim, this issue occurs when Logisim is unable to find a stable output after a fixed number of iterations. We encountered this issue when we extended our Unsigned Multiplier to do Signed Multiplication too. Later we used the default multiplier for signed multiplication.

Even though the author said that it was highly unlikely to get such error, we managed to obtain the error. Even after changing the number of iterations before giving the error to maximum the error still pertained. 😊

<http://www.cburch.com/logisim/docs/2.7/en/html/guide/prop/oscillate.html#:~:text=Logisim%20detects%20oscillation%20using%20a.25%25%20of%20the%20iterations.>

<http://www.cburch.com/logisim/docs/2.0.0/guide/prop/oscillate.html>