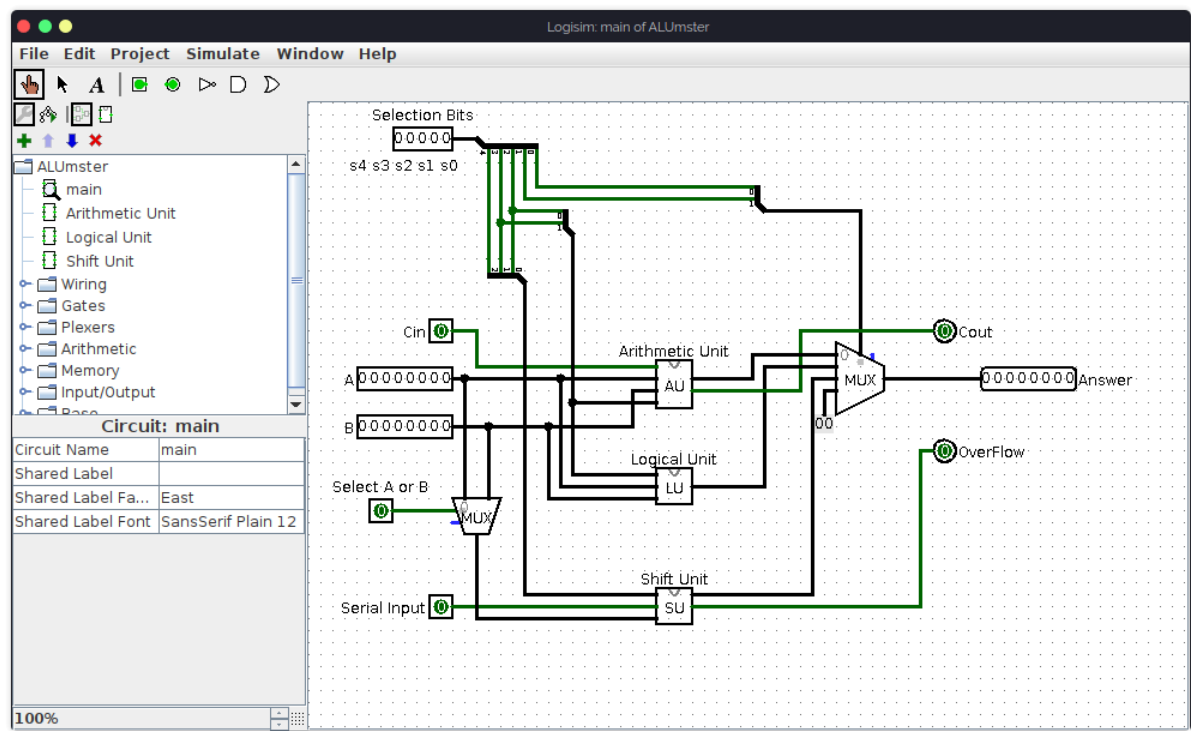# Arithmetic, Logic and Shift Unit (ALSU) Report

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This is my arithmetic logic and shift unit implemented in the Logisim.

In this circuit we have two main inputs A & B, both are 8-bit long, five selection inputs S0 to S4, a Cin input, Select A or B for Shift Unit and Serial Input for Shift Unit. As output 8-bit output is answer and Cout and Overflow bit are provided.

Selection Description:

Table 1: Selecting Unit

S1	S0	Description
0	0	Arithmetic Unit Activate
0	1	Logical Unit Activate
1	0	Shift Unit Activate

Table 2: Selecting Operation in Arithmetic Unit

S3	S2	Cin	Description
0	0	0	Add
0	0	1	Add with carry
0	1	0	Subtract with carry
0	1	1	Subtract
1	0	0	Transfer A
1	0	1	Increment A
1	1	0	Decrement A
1	1	1	Transfer A

Table 3: Selecting Operation in Logic Unit

S3	S2	Description
0	0	AND Operation
0	1	OR Operation
1	0	XOR Operation
1	1	NOT Operation

Table 4: Selecting Operation in Shift Unit

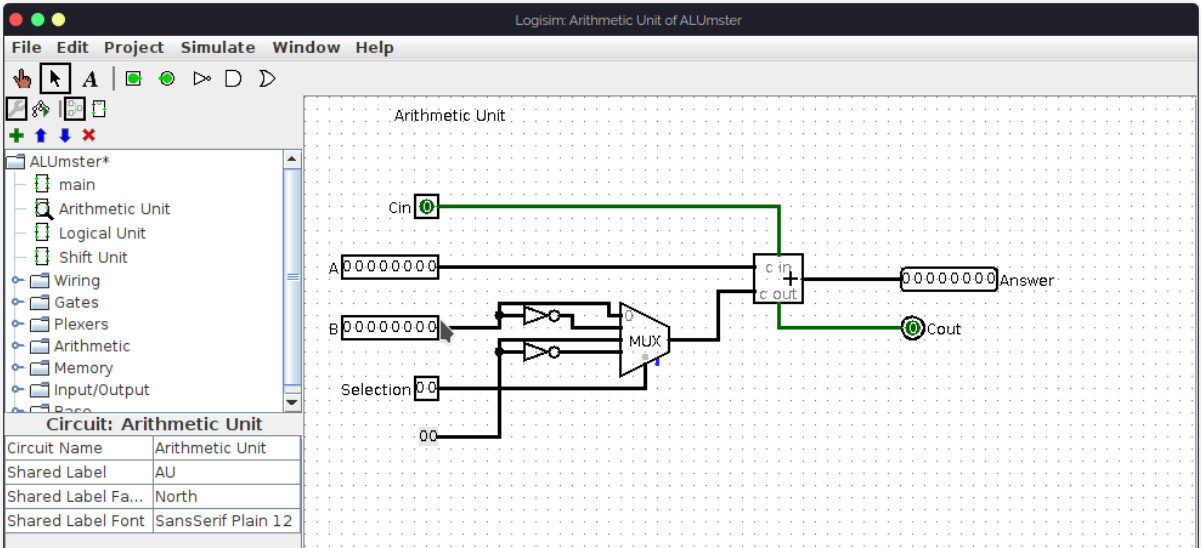| S4	S3	S2	Description
0	0	0	Logical Shift Left
0	0	1	Logical Shift Right
0	1	0	Circular Shift Left
0	1	1	Circular Shift Right
1	0	0	Arithmetic Shift Left
1	0	1	Arithmetic Shift Right

Image above is Screenshot of Arithmetic Unit. Along with inputs of A & B, Selection bits S2, S3 and Cin are inputs of this sub circuit. S2, S3 and Cin decides operation according to the table 2 above. Output of this circuit is handled by main circuit.
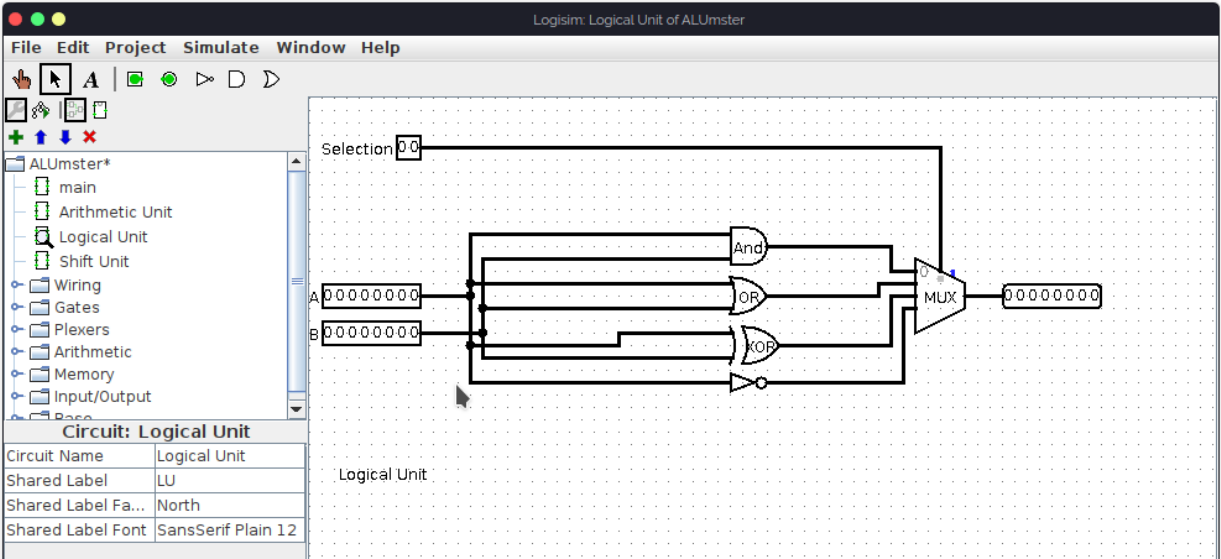

Image above is screenshot of Logical Unit. Here A, B and S2, S3 selection bits are input. Output is logical operation between A and B according to the selection S2, S3. *Refer table 3.*
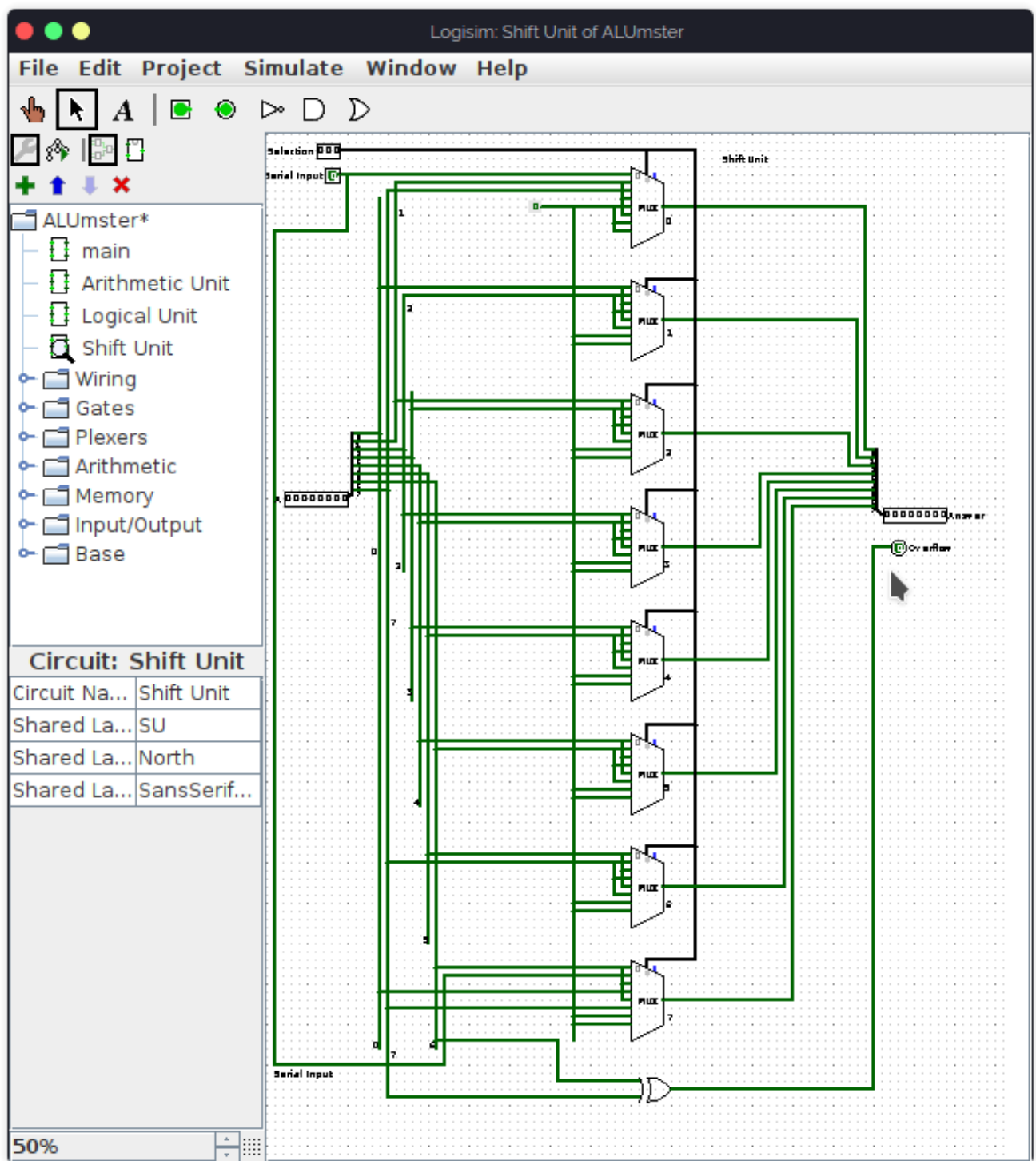
Image above is screenshot of shift unit. Selection of A or B will be done in main circuit. After selection input will be fed to this shift unit along with serial input and S4, S3, S2 selection inputs. Output will be given. *Refer Table 4*

With these outputs of 3 Units, multiplexer in the main circuit will give output according to the S0 and S1. *Refer Table 1*