

LAB 4 - ALU8

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The main purpose of this lab was to develop a deeper understanding of Logisim and build an ALU8 chip from subcircuits.

We start off by making a 1-bit adder. We use the 1-bit adder to make a 4-bit adder and then further use the 4-bit adder to make an 8-bit adder. Then we went on to implement circuits of addition, subtraction, AND, XOR, right shift and left shift. For the left and right shift, we used splitters to shift the bits. For addition and subtraction, we used our bitwise adders to implement them. In subtraction, we complement one of the inputs. Bitwise AND and XOR were simply implemented using their respective gates. Addition and subtraction also had an overflow flag attached to them so that the overflow flag will output 1 if there is an overflow error in the operation. We further used all these subcircuits to make our ALU8 chip. We connected multiplexers and our flagger circuit to the chip. A flagger circuit used an OR gate with 8 inputs and then was connected to a NOT gate to get ZF. It was also connected to a splitter and the last bit was SF. ALU takes input A, input B, Cin, OP and outputs Cout, F, Signed flag, Zero flag, and overflow flag. The signed flag will output 1 if it is signed and zero flags will output 1 if there is no single bit of 1 in the input.

ALU is the Arithmetic and Logic Unit which performs all the arithmetic and logical operations such as addition, subtraction, logical AND, OR etc. The lab implements it using sub-circuits.