

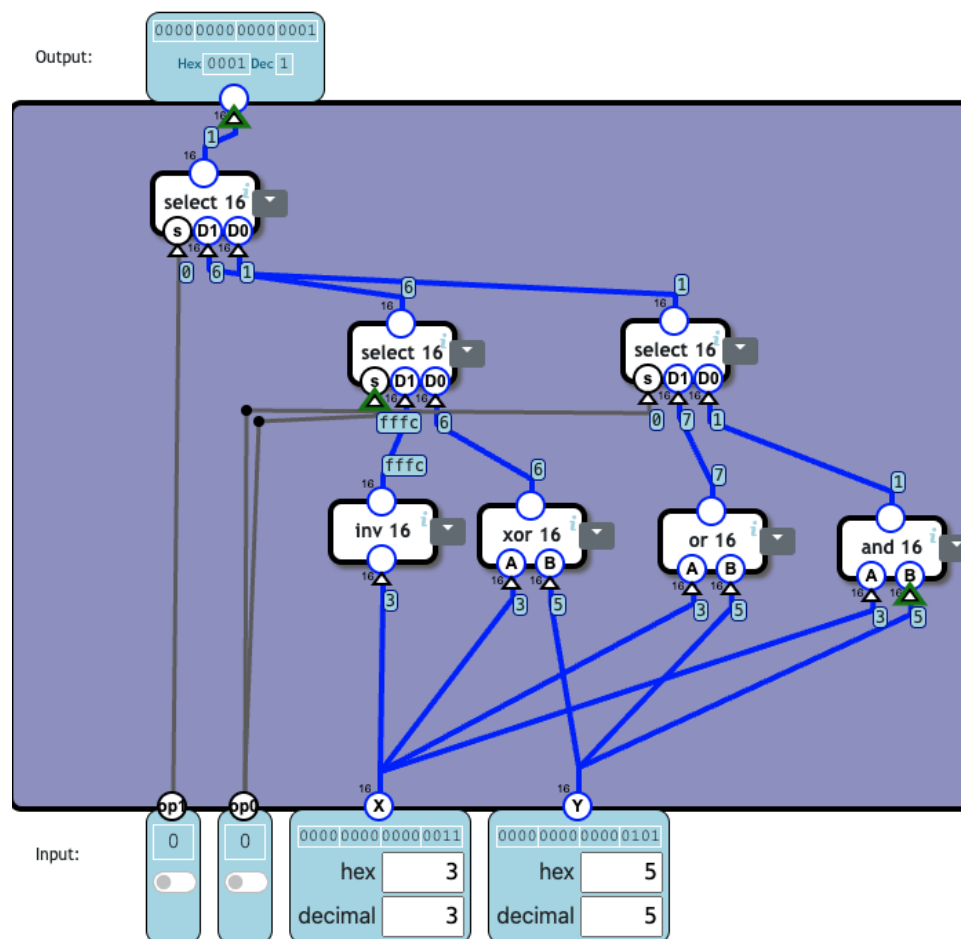
1. Logic Unit

"The core of a processor is the ability to select different operations based on input. We start with a unit which select between four different bitwise-logic operations."

op1 and op0 determine operations performed on X and Y

Halved by SELECT from op0 then determined by SELECT from op1

op1	op0	output
0	0	X and Y
0	1	X or Y
1	0	X xor Y
1	1	invert X

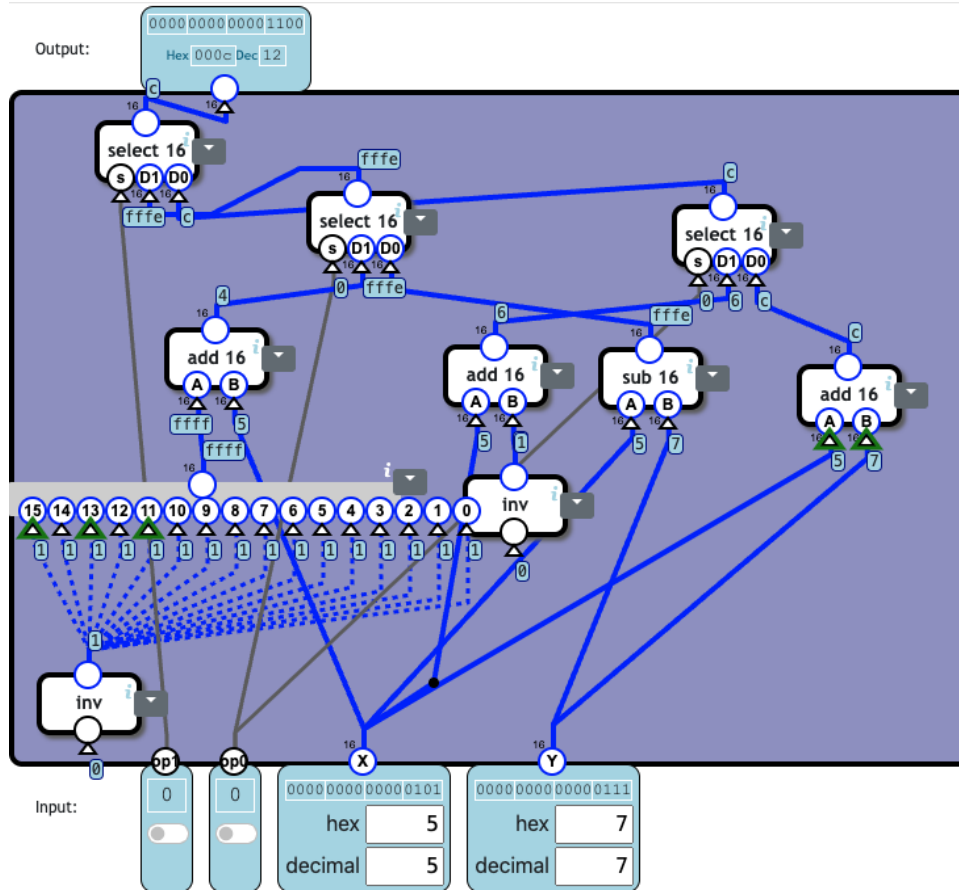


2. Arithmetic Unit

Same 4 operation selection performed with 3 SELECT gates,

- Increment done by adding inverse of zero
- Decrement done by adding inverse of zero of all 16 bits (negative sign plus reversed 1's and 0's, representing a negative 1)
- Add done with simple add operation
- Subtract done with simple subtract operation

op1	op0	output
0	0	$X + Y$
1	0	$X - Y$
0	1	$X + 1$
1	1	$X - 1$

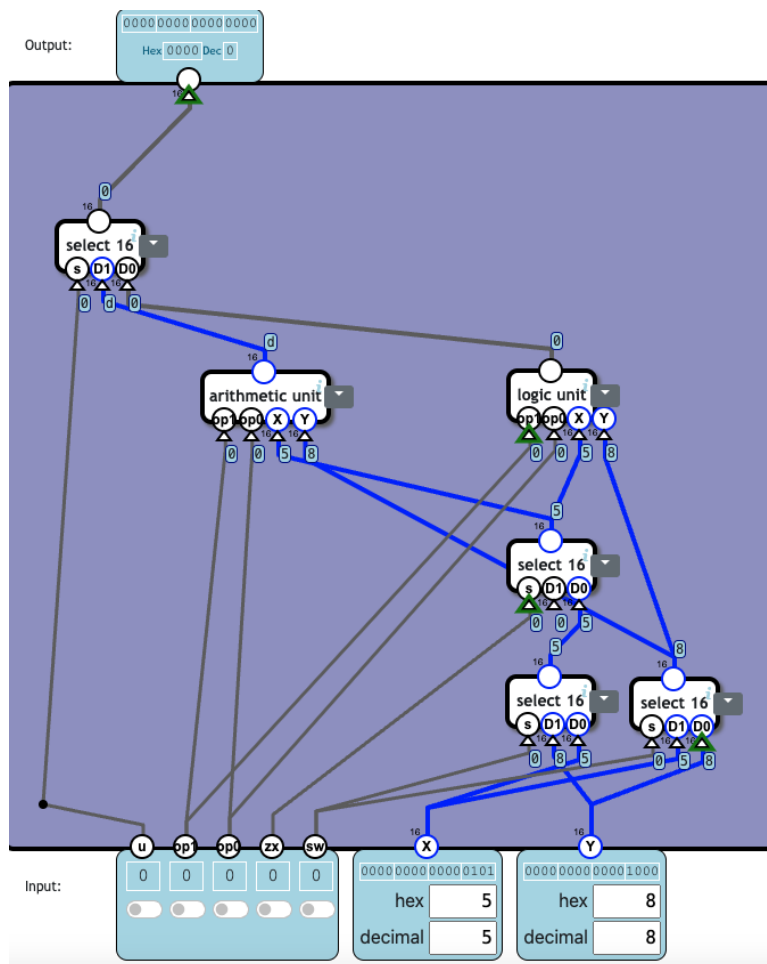


3. Arithmetic Logic Unit

When the sw flag is 1, the X and Y inputs are swapped.

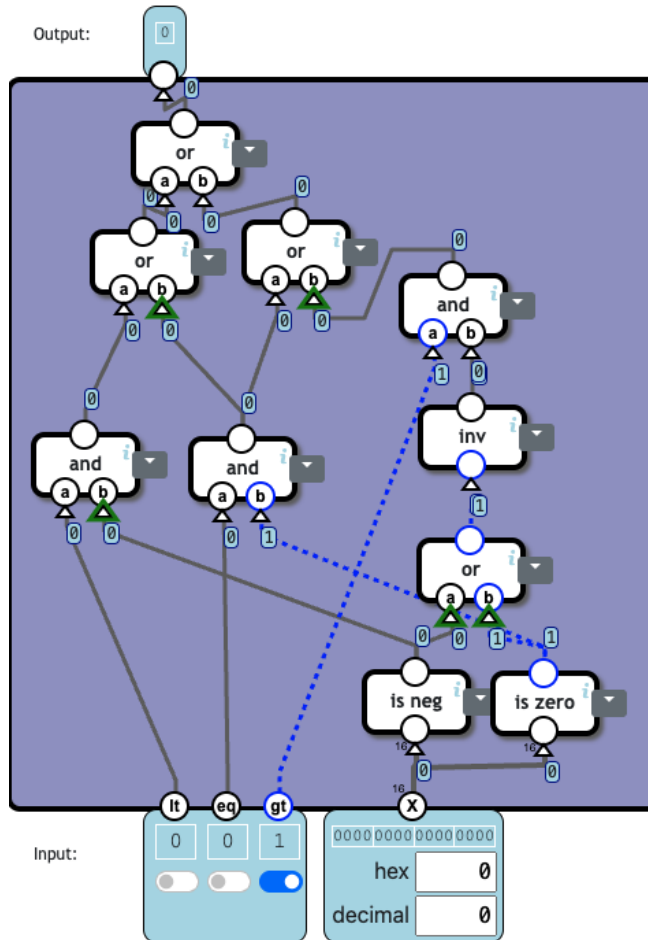
When the zx flag is 1, the left operand is replaced with 0.

Input			Output
u	op1	op0	
0	0	0	X and Y
0	0	1	X or Y
0	1	0	X xor Y
0	1	1	invert X
1	0	0	X + Y
1	1	0	X - Y
1	0	1	X + 1
1	1	1	X - 1



1. Condition

Solution using ANDs



More efficient solution using NANDs

