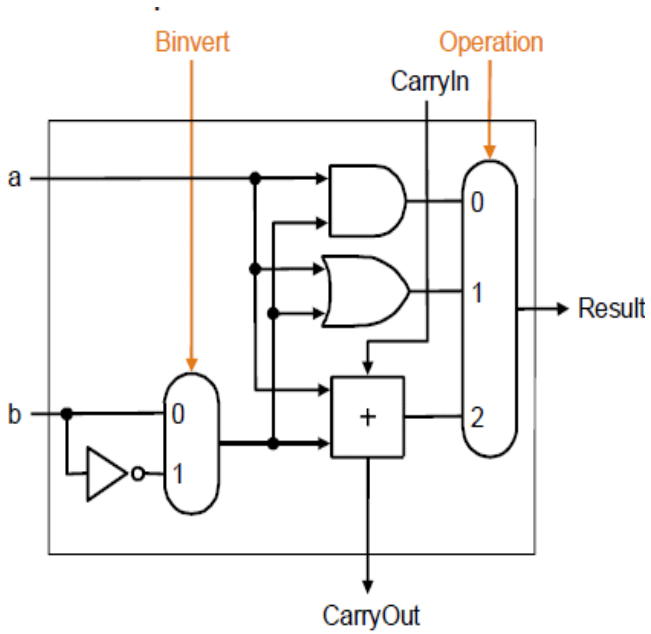
COMP2611: Computer Organization

4-bit ALU and processor in Logisim

Reminder : 1-bit ALU that does AND, OR, Addition, Subtraction

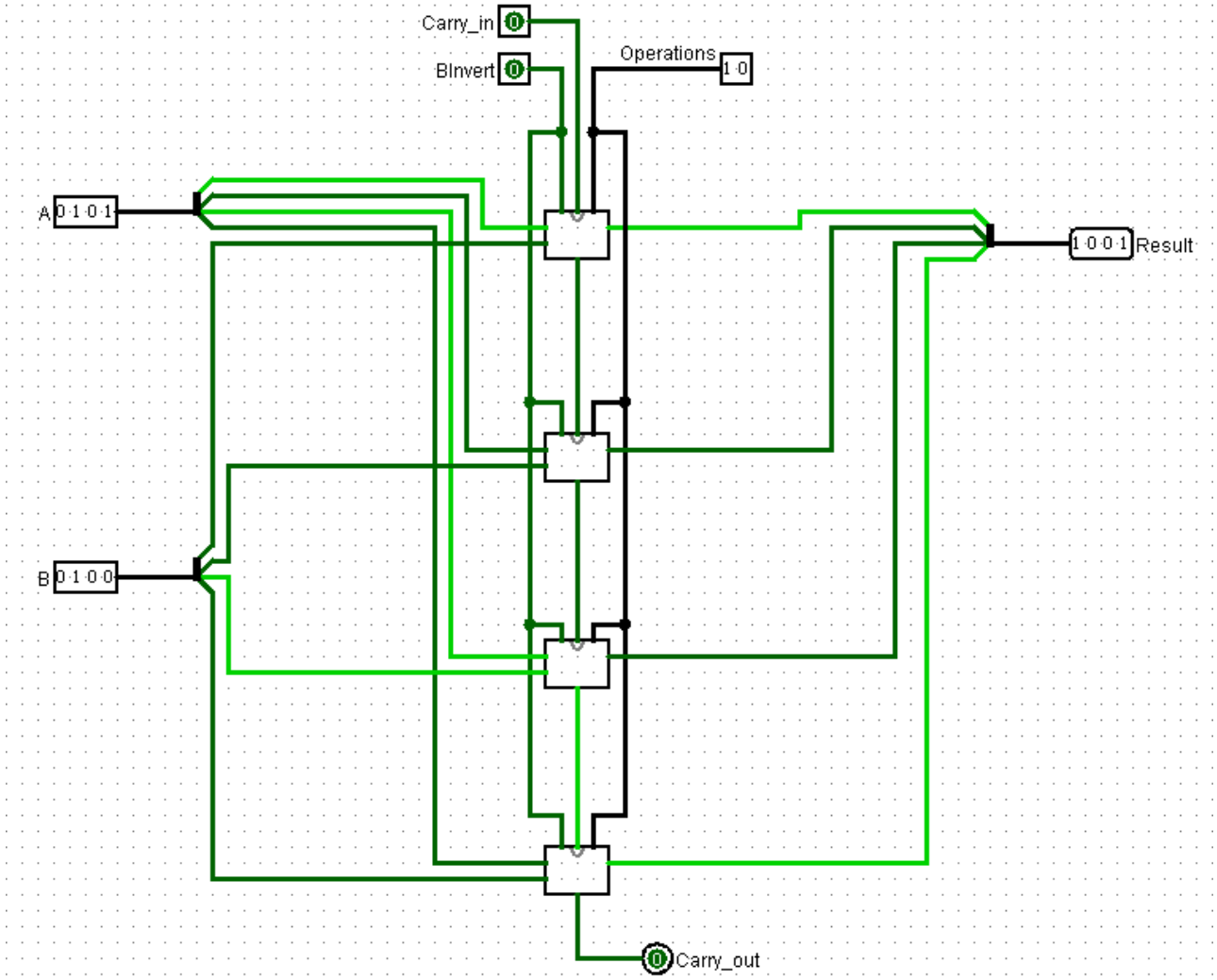
- The 1-bit ALU we are going to build can perform AND, OR, Addition and Subtraction operations on two 1-bit inputs.



- A 4-bit ALU can be built using 4 of the 1-bit ALUs shown above. Each 1-bit ALU will take care of the operations for exactly one bit.

Building the 4-bit ALU 1/4

- One possible design of a 4-bit ALU.



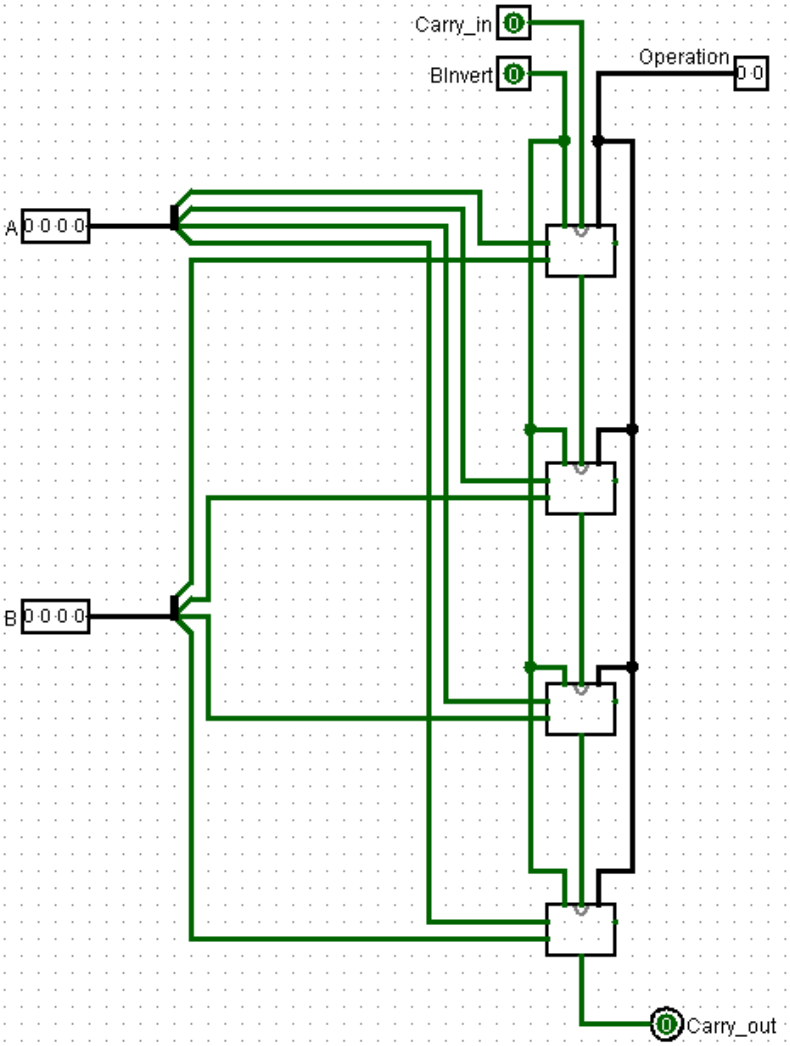
Building the 4-bit ALU 2/4

- Load the logisim files "1-bit-adder.circ", "3-input-multiplexor.circ", "1-bit-alu.circ" made in last lab, by clicking "Project->Load Library->Logisim Library";

- Drag the 1-bit-alu circuit four times into canvas for connection;
  - Pay attention to the connections of Carry_In/Carry_Out between 1-bit ALUs;
  - Pay attention to the connections of operation bits between 1-bit ALUs;
  - Pay attention to the connections of BInvert bits between 1-bit ALUs;

Building the 4-bit ALU 3/4

- Drag two input pins "A" and "B", each as an operand with 4-bit data width;
- Connect these two input pins with four 1-bit ALUs correctly (note that splitters may be used);
- Drag an output pin as the "Carry_Out", and connect it correctly.



Building the 4-bit ALU 4/4

- Drag an output pin as "result" and connect it correctly (note that a splitter may also need to be used to facilitate the 4-bit output).
- After finishing all the connections, check the 4-bit ALU for its correctness.

Processor

- One possible design of an 8-bit processor.
- Reference link: http://minnie.tuhs.org/CompArch/Tutes/week03.html