FPGA STACKER

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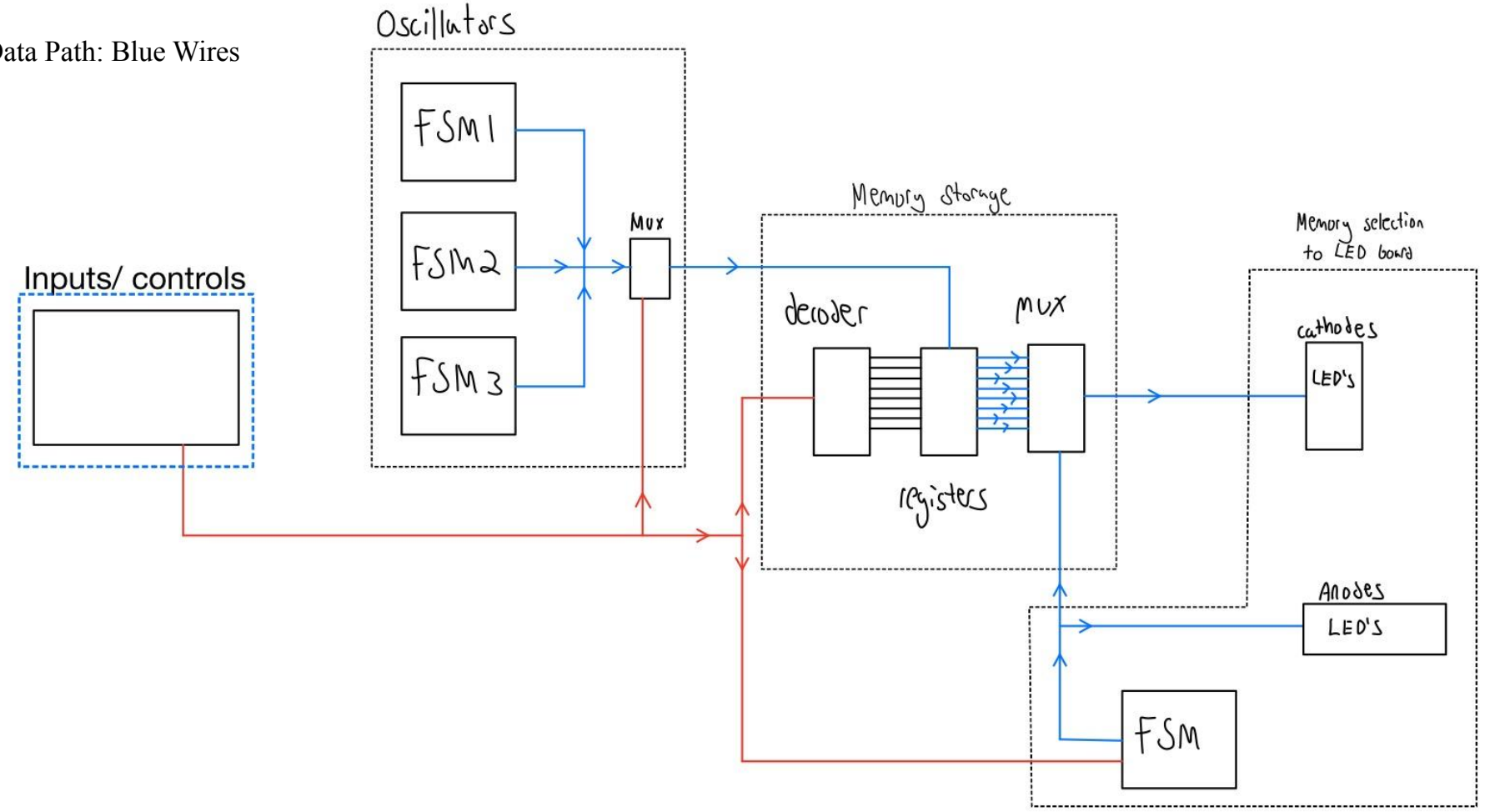
Project Objective and Summary

- As a group, we decided to implement the arcade game known as stacker.
  - Here is an example: https://youtu.be/L0A5PABiT5A?t=39
  - As you can see, the objective is to line up the current rows blocks with that of the previous rows. If you don't line up at least 1 block, then the game is lost.
- In essence, our circuit is based on three different FSM's that output 8-bits each and represent three, two, or one blocks being lit up. We default on three blocks and then reduce the number as the game goes on. To store these values, we send the signal to a bank of registers, with a 3-to-8 decoder acting as the enable address. Depending on the row we are in, we will then select both a current and previous register's data to be displayed on our matrix LED board.

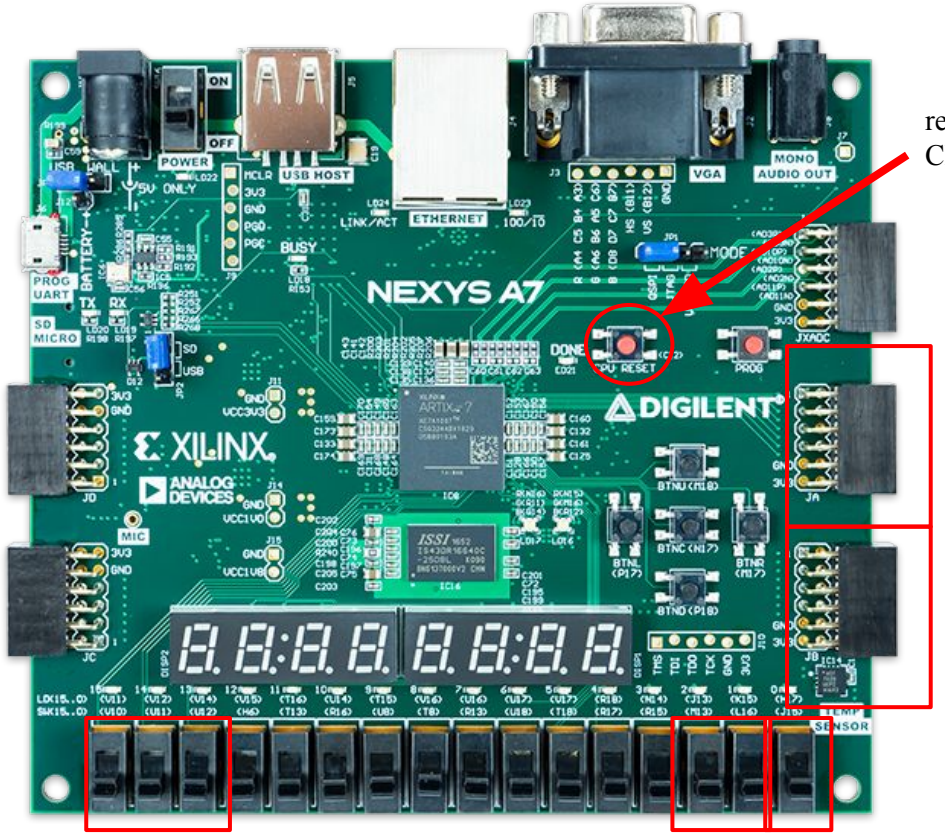
Controls & Data Path

Control Signal: Red Wires

Data Path: Blue Wires



Controls



resetn is tied to the CPU_Reset button

The display is controlled by pmod ports JA(1-4,7-10) and JB(1-4,7-10)

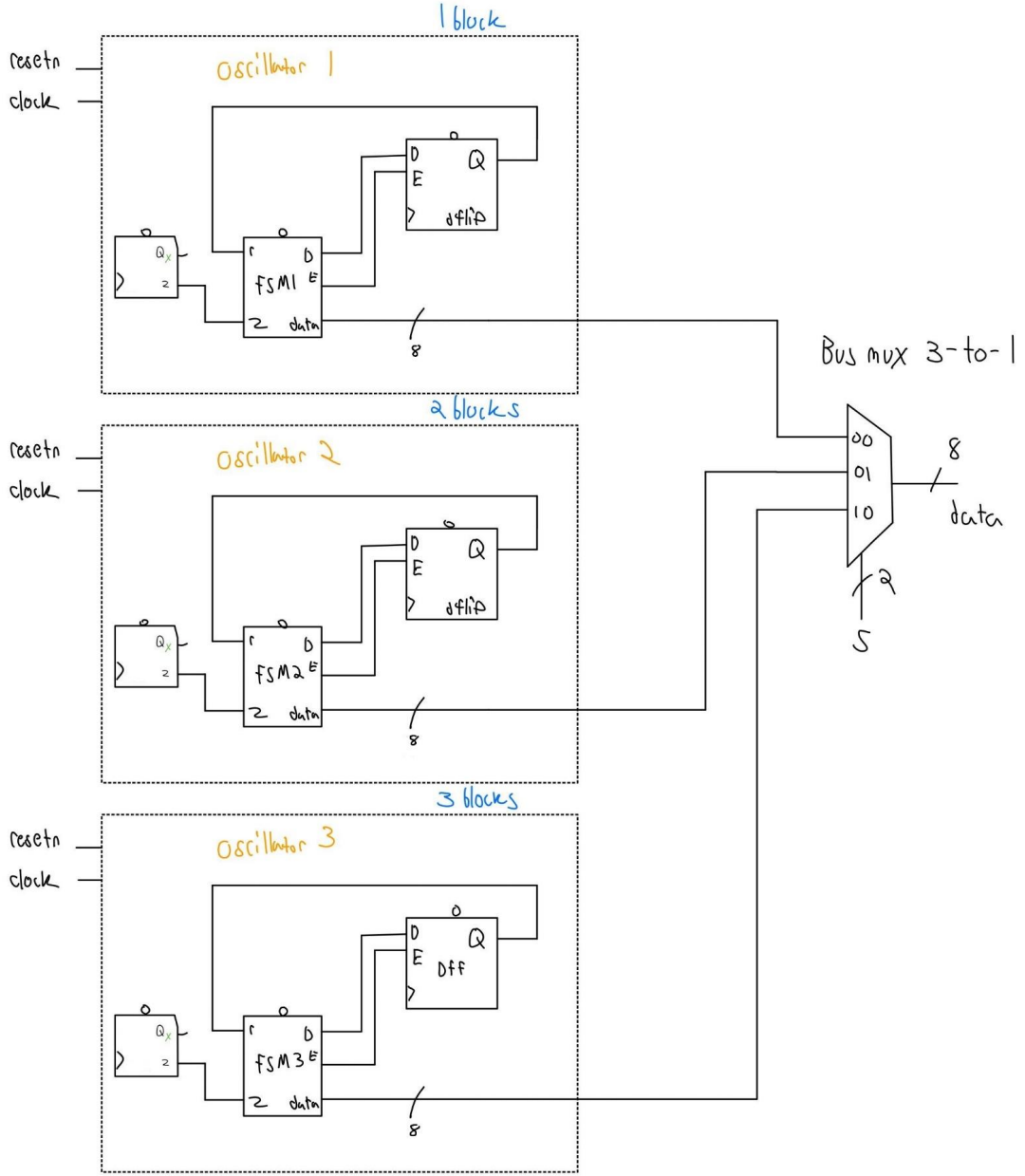
Switches 13-15 control the address for the decoder

Switches 2-3 control the block count

Switch 1 is our “drop” button

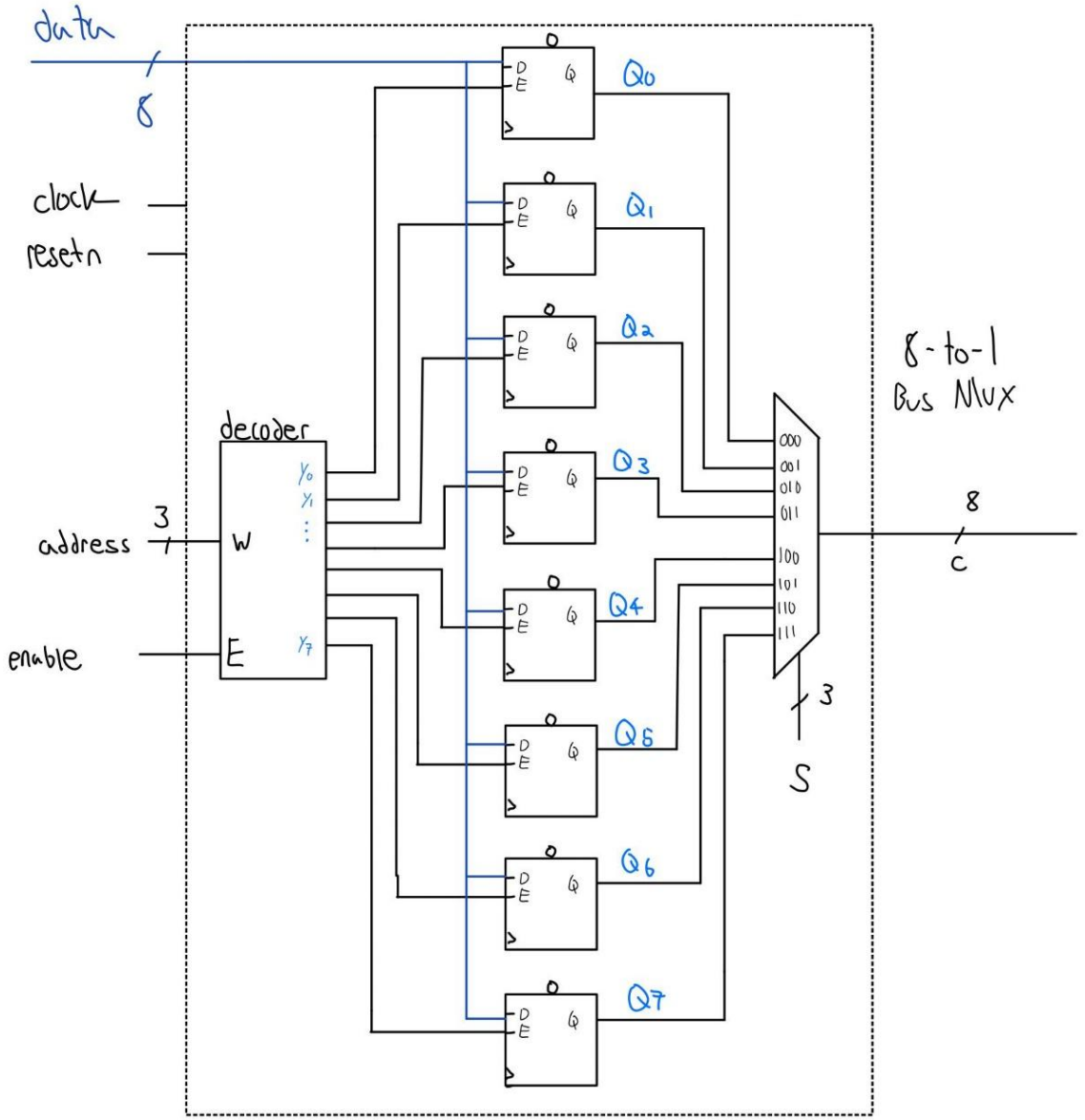
FSM Oscillators

- Three FSMs generate an oscillating signal that we used for our game data.
- Each oscillator was created to generate a differen number of high bits per signal.
  - For example, oscillator 2 will produce two high values in the 8-bit range.
- The Mux is controlled by switches, and we can select which FSM's data is sent through the circuit



Memory Storage & Register Selection

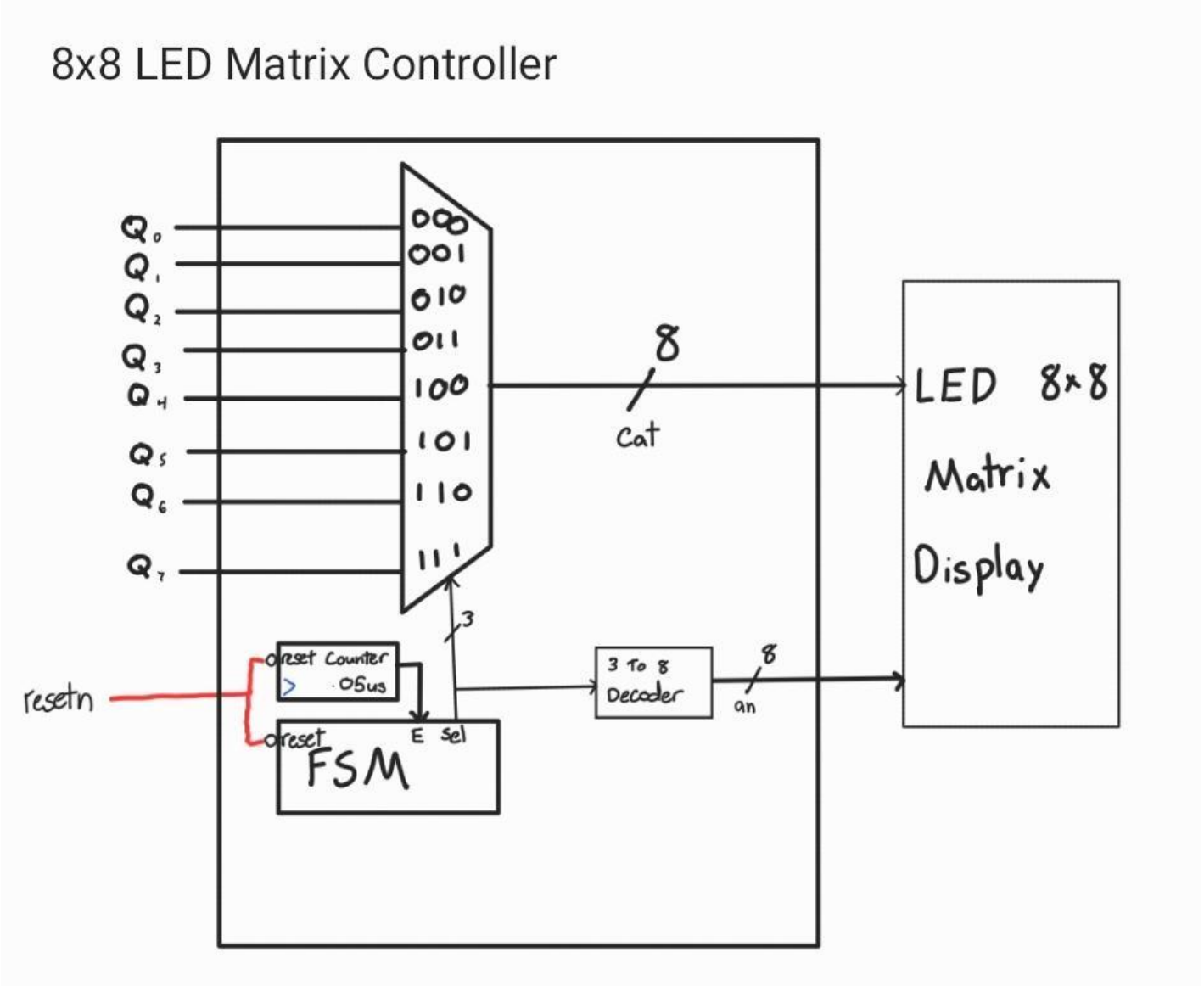
- This portion acts very similarly to the Pseudo-RAM in lab 5.
- 8-bit data in will be sent to our register of choice via our control switches.
- Each register represents a single row on our LED board
  - e.g., register zero represents row one.
- The mux will then select which register we will want to output.



Memory Selection and LED Board

- This portion displays what register data is sent to the 8x8 LED matrix

- The FSM creates the selector for the MUX.
  - The selector is also decoded to select which row of 8 is grounded at a single time



Live Demonstration