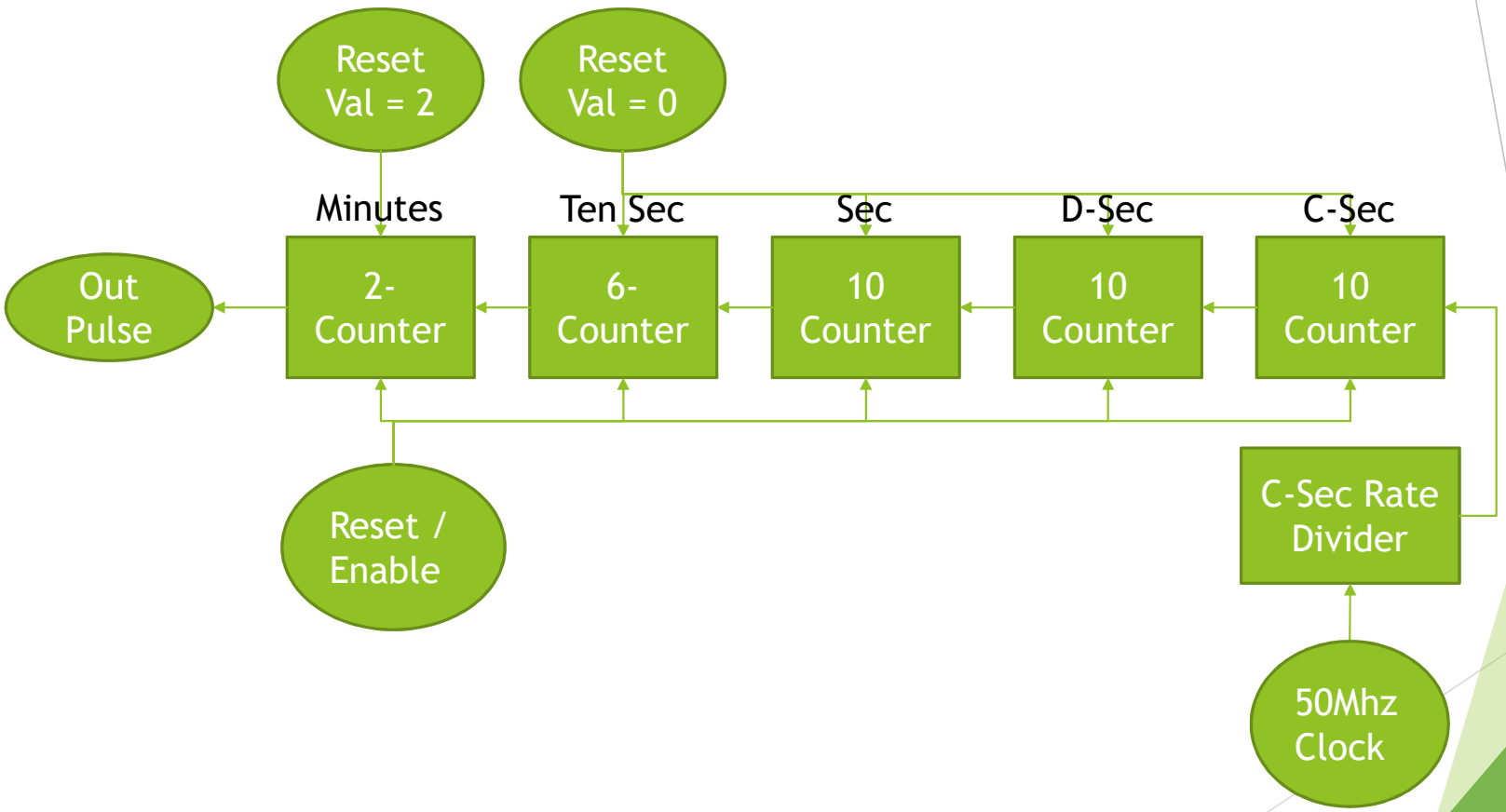
CSC258 Project

By Brendan Neal and Filip Tomin

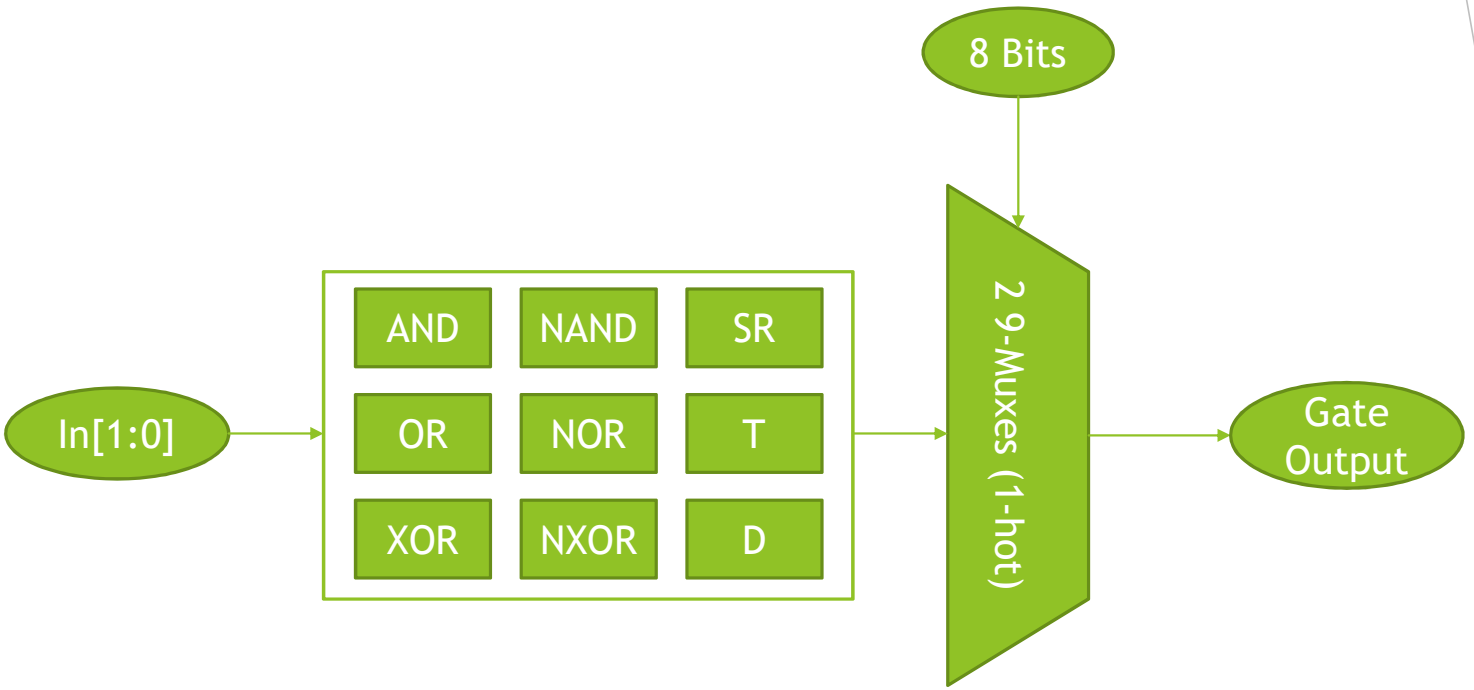
Project Description – Logic Gate Quiz

- Win Condition
  - Solve all 9 gates in 2 minutes
- Rules
  - Logic gates are given randomly
  - Player uses board switches to test the IO of the gate
  - Player inputs a number corresponding to the gate
  - Right number -> move on to next gate
  - Wrong number -> player must select another gate number (with no IO support!)

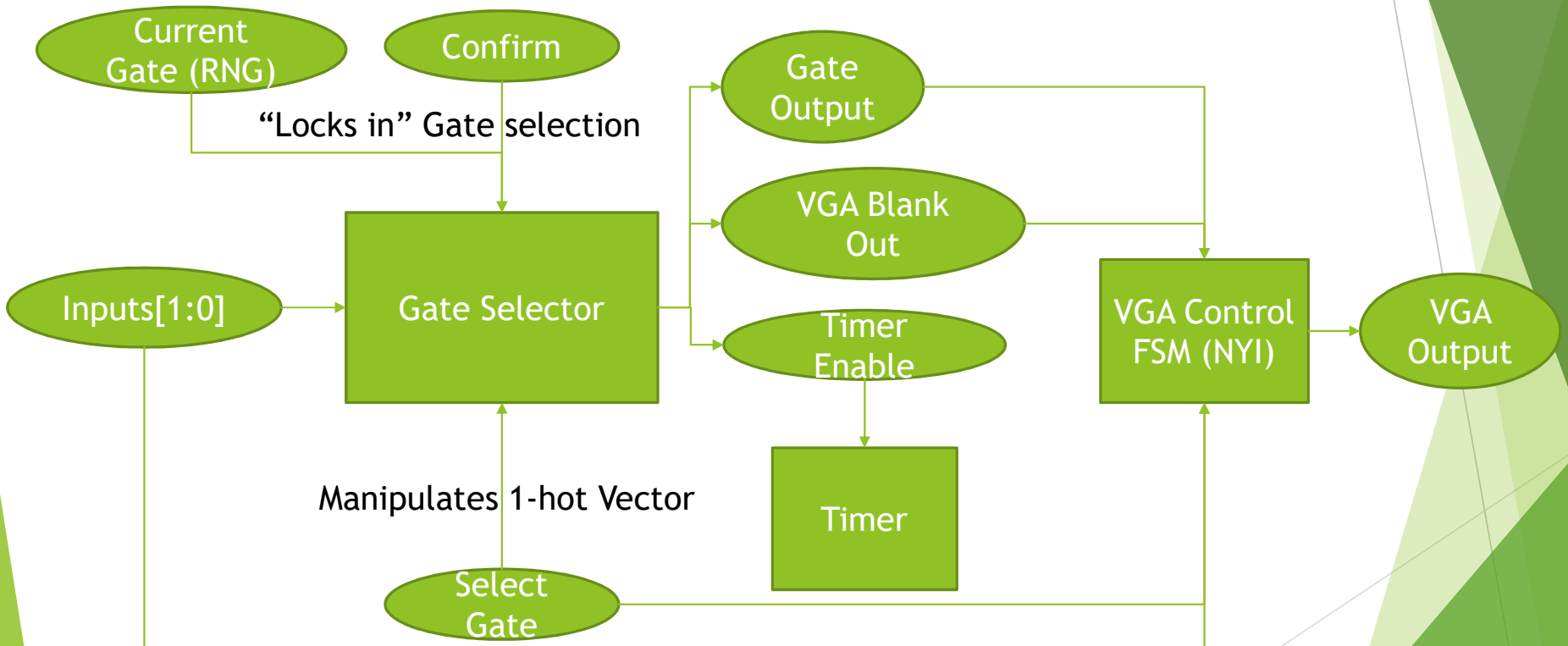
Block Diagram - Timer



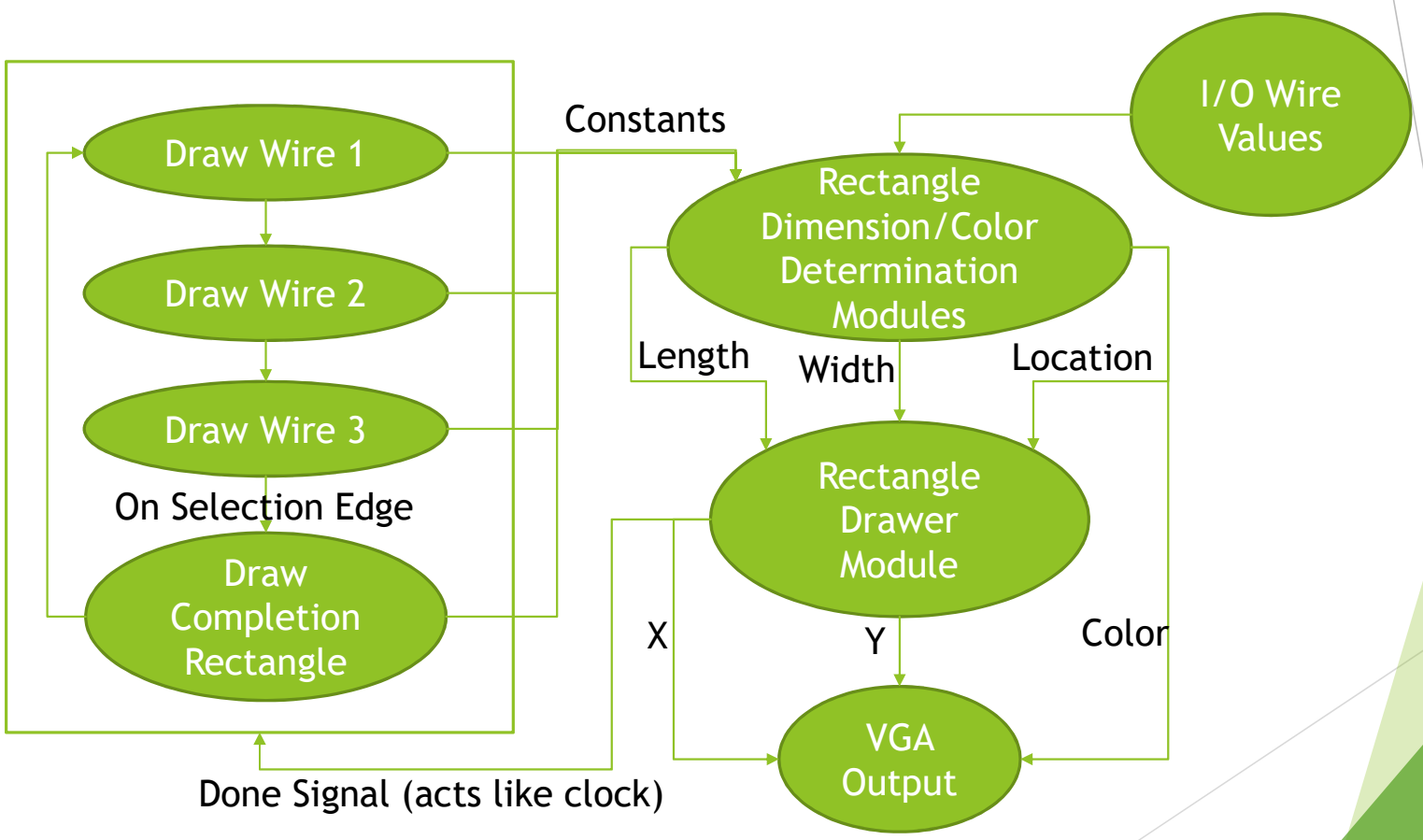
Block Diagram – Gate Selector



Block Diagram – Gate Control



Block Diagram – VGA FSM (NYI)



Interesting Aspects

- Two minute timer (not hex!)
  - Designed with modularity in mind – can be changed to any time limit!
  - Harder to get working than we thought
- Gate Selector
  - Works flawlessly
  - Easy to incorporate in the final design

Difficulties (first milestone)

- Board switches were inconsistent
  - Made testing the gate select difficult
- Timer odd-second skip issue
  - Timer would skip every odd second (e.g. 37 sec -> 35 sec -> …)
- Not being able to properly simulate the timer in MS
  - Timer values were completely uncertain in MS but the timer actually worked on the board
  - Meant we could only do our testing and editing during lab hours
- MS compiles differently compared to QP
  - We had to edit code that compiled in MS in order for it to compile in QP

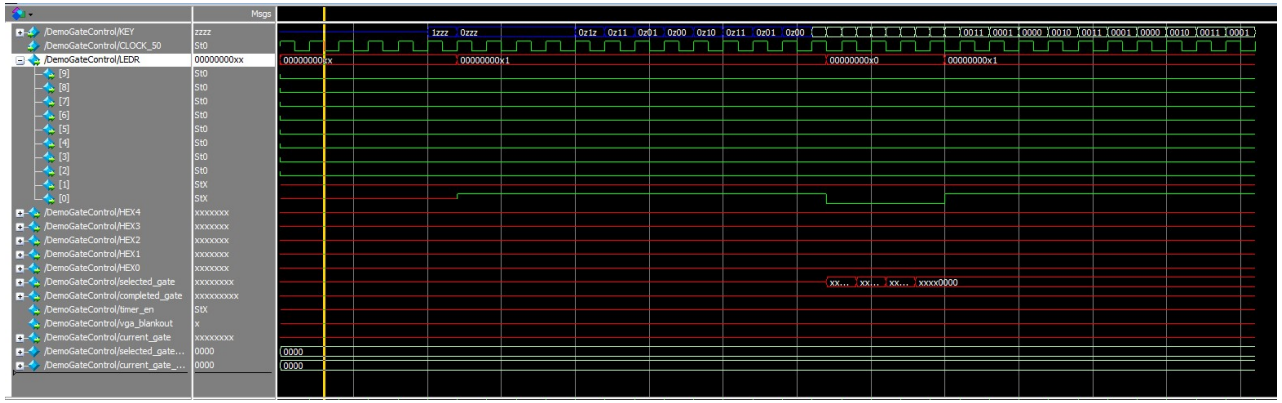
Difficulties (second milestone)

- Timer odd-second skip issue was still occurring
  - Managed to fix it by changing <= to = for assignments in an always block (???)
- Getting our background loaded on to the VGA
  - Had some misunderstandings about the maximum resolution allowed
- Figuring out how to properly draw things on the VGA
  - Stuff can’t be drawn in parallel!

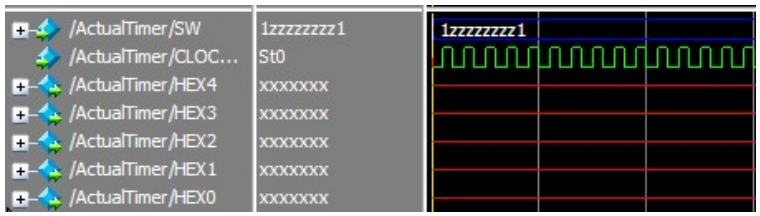
Difficulties (last milestone)

- Timer broke again
  - We loaded the newer code onto the board and it still had the same odd-skip issue
  - Random lines started appearing on HEX5 (even though we never used it in our code)
- Getting the gate control working
  - We decided to abandon the VGA implementation because it would take too much time, and use the board IO instead
  - MS once again failed to produce any meaningful results when testing (uncertain values)
  - When restricted to using the boards we were unable to debug this component in time
- Boards wouldn't load our project (third lab session)
  - We have no idea why this happened – our code was compiling but not loading
- Note: we have a more recent version of our DemoGateControl.v on the lab computers but it doesn't work as it can't load onto the board

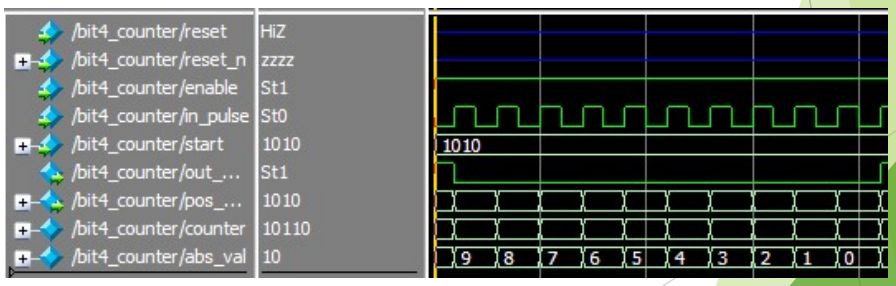
ModelSim Uncertainty Images



MS gate control simulation uncertainties



MS timer simulation uncertainties



Underlying component of timer works properly

Lessons Learned

- MS compiles differently than QP
- Things that work on MS may not work on QP and vice versa
- <= may not always be appropriate for an always block
- Sometimes the board is the source of your problems
- Sometimes uncertain things in MS work on the board

Component Authorship

Milestone / Lab	Filip Tomin	Brendan Neal
First	Gate Selection	Timer
Second	Fixing timer	VGA (code and mif image)
Third	Random Generation and VGA, AbstractGateControl	VGA, DemoGateControl