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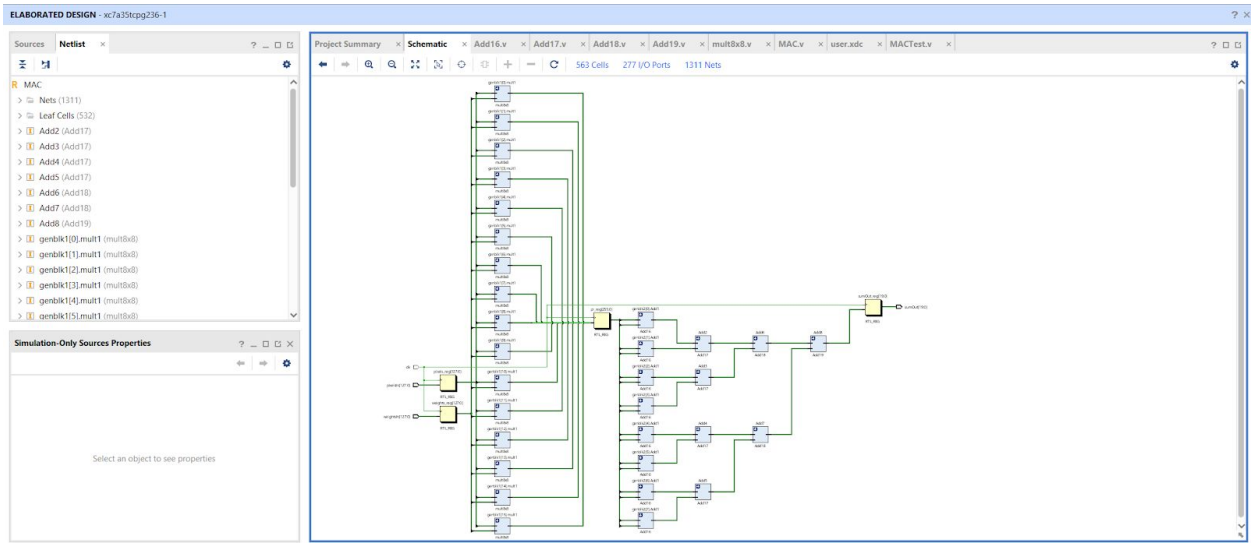
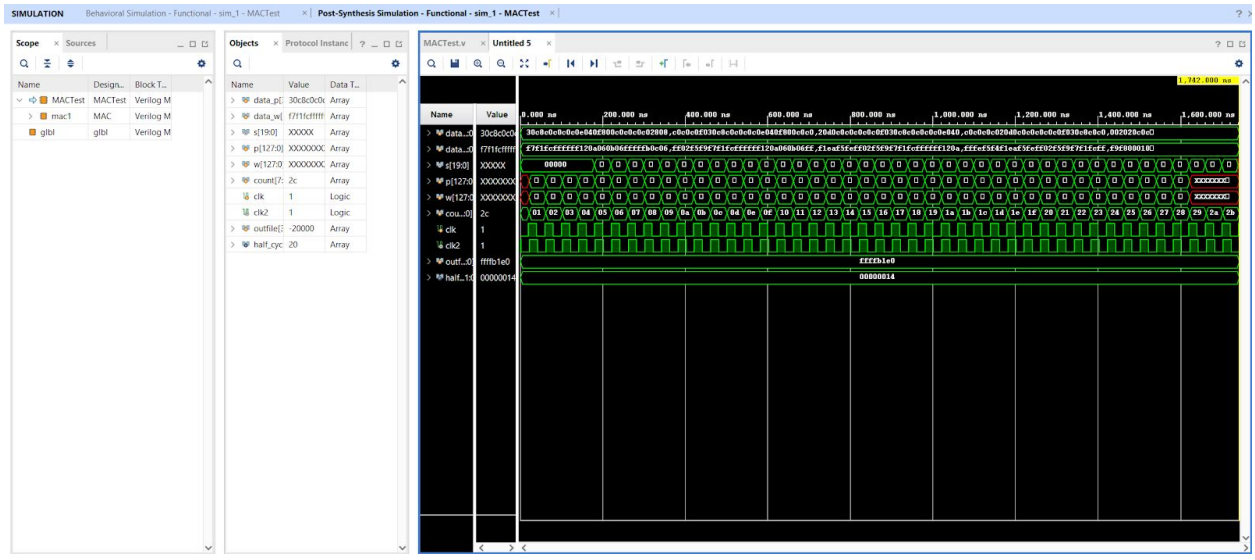
ECE 428
November 21st, 2020

Handwritten Digits Neural Net

For this lab our goal was to create a node that could be used in a neural net in order to recognize handwritten digits. In creating this node we had multiple milestones to meet that guided us towards creating the node for the neural net. Milestone 1 was to create a multiplier and accumulator module that would give us a 20 bit output. For this module we created multiple different adding modules for different bit sizes and a multiplier module.

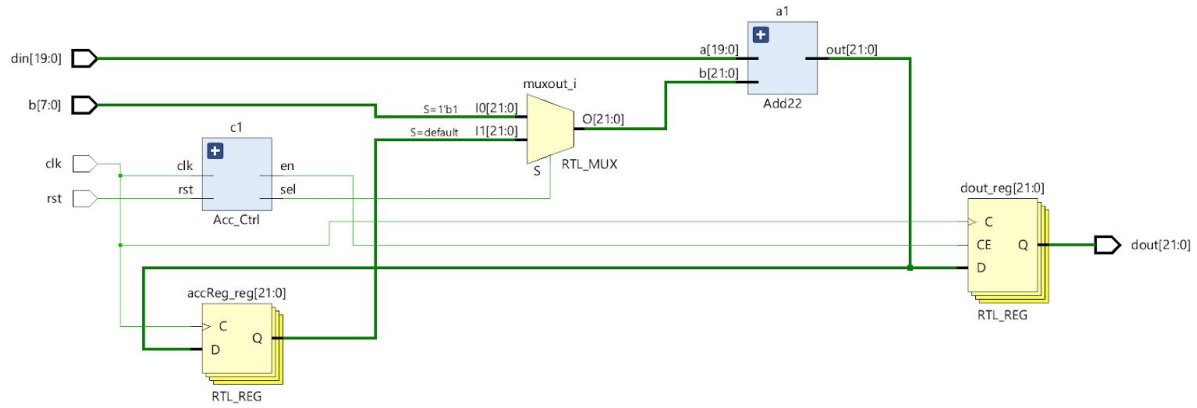


MAC Module Schematic

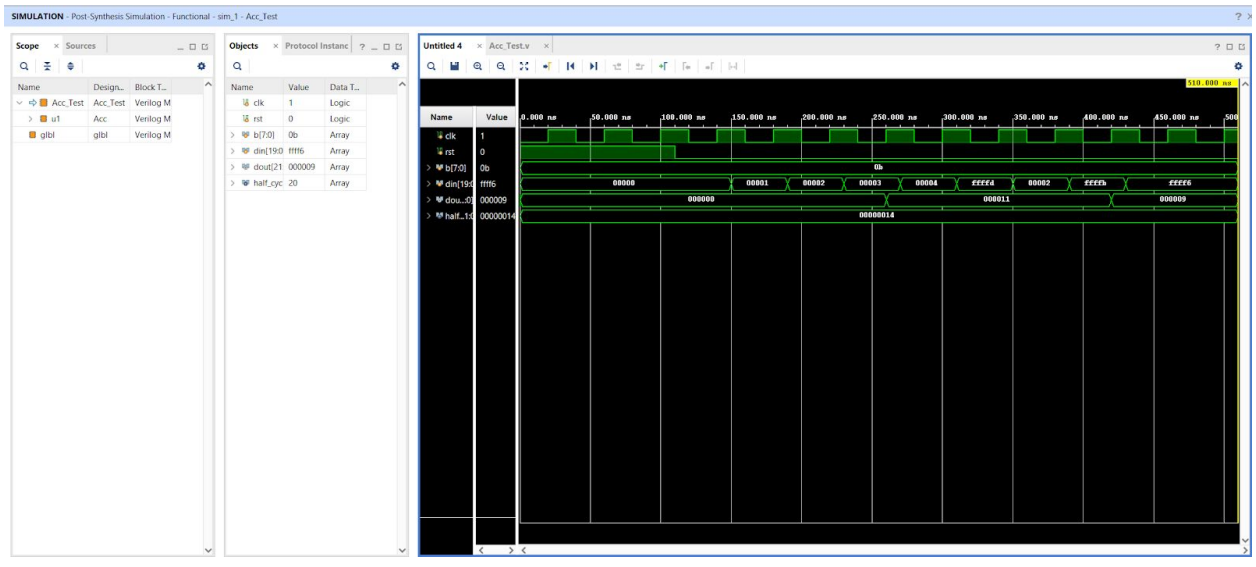


MAC Module Post Synthesis Functional Simulation

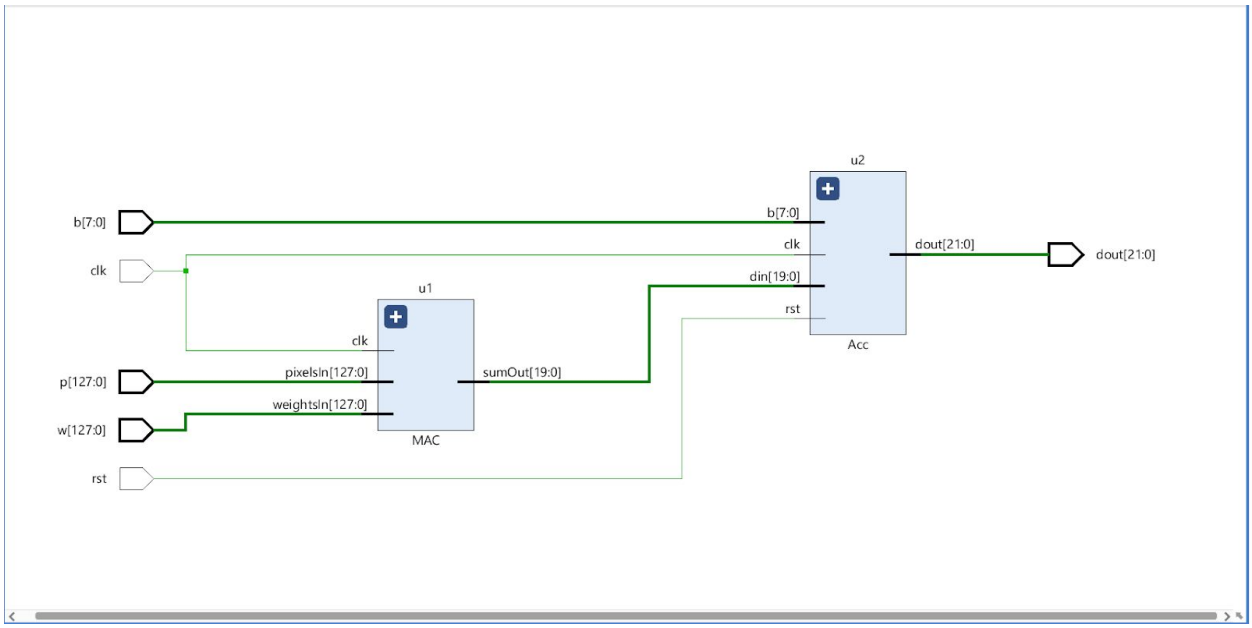
The second milestone in this project was the ACC module that allows us to add the results of four MAC modules. In making this milestone we also made a module that combines both the MAC and ACC, called the MAC_ACC.



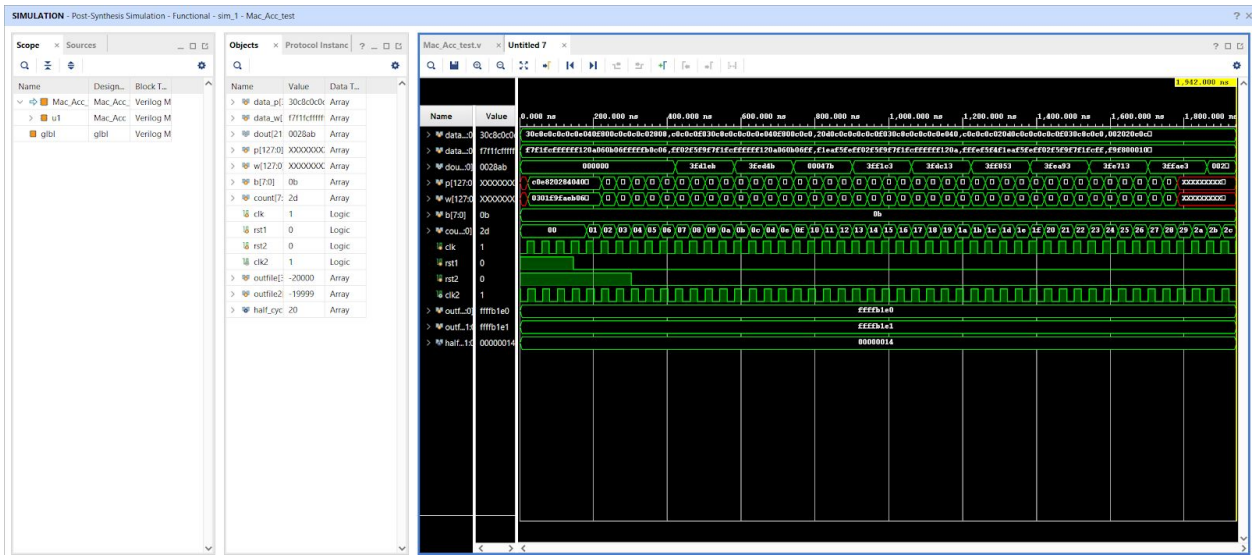
ACC Control Schematic



ACC Post Synthesis Functional Simulation.

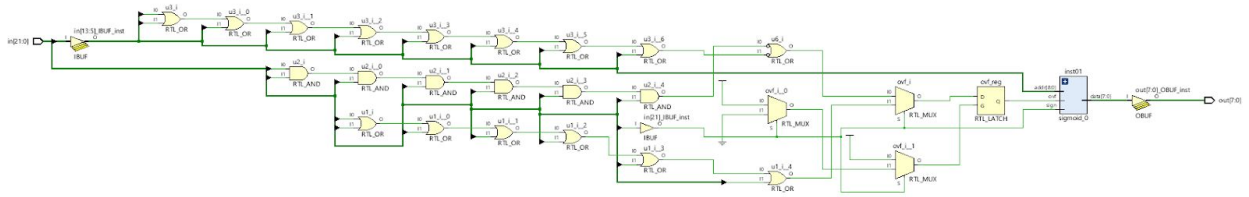


MAC_ACC Schematic

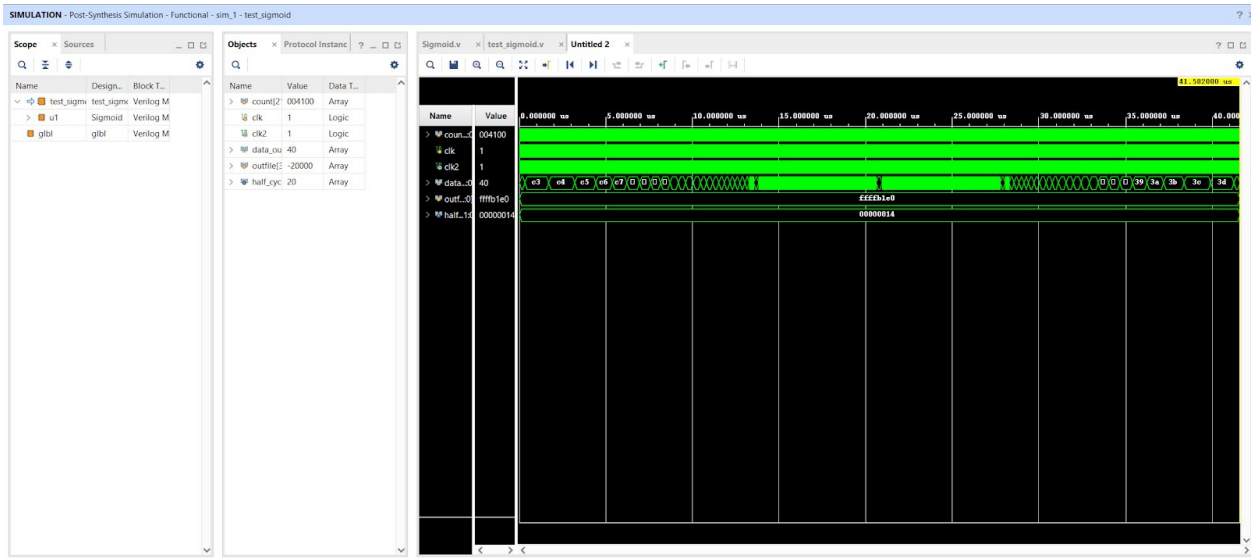


MAC_ACC Post Synthesis Functional Simulation

Milestone 3 involved using the sigmoid IP block with an IP wrapper to implement the activation function. Like in milestone 2 we wrapped the IP wrapper and IP block into a module called the Sigmoid module.

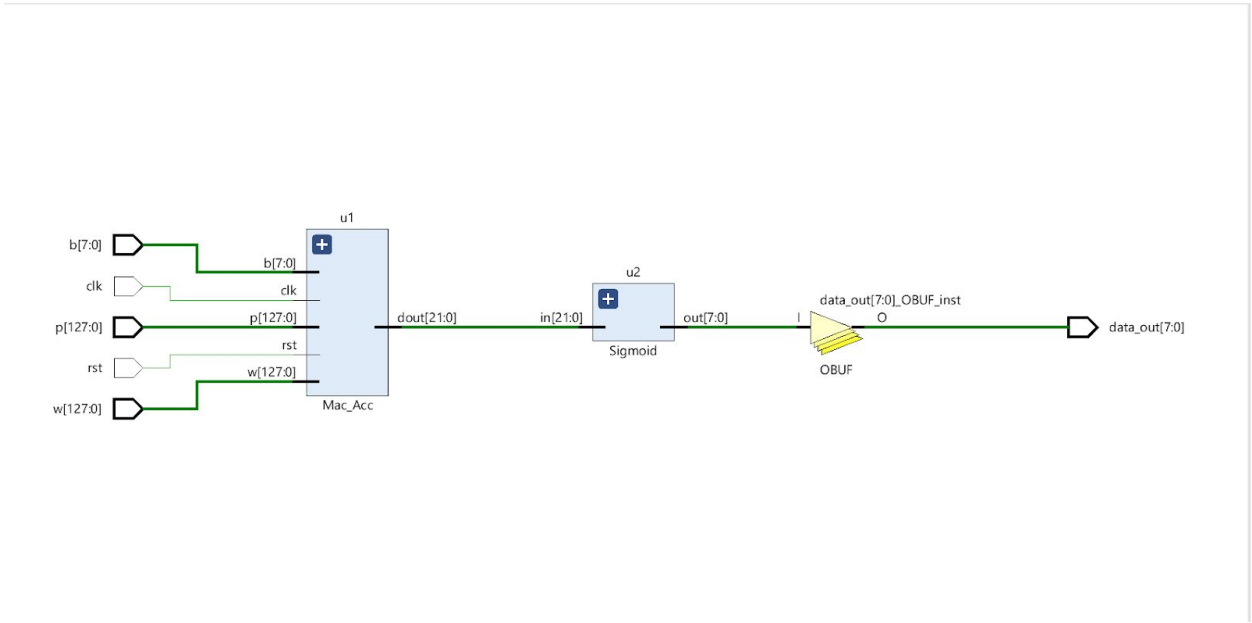


Sigmoid Module Schematic

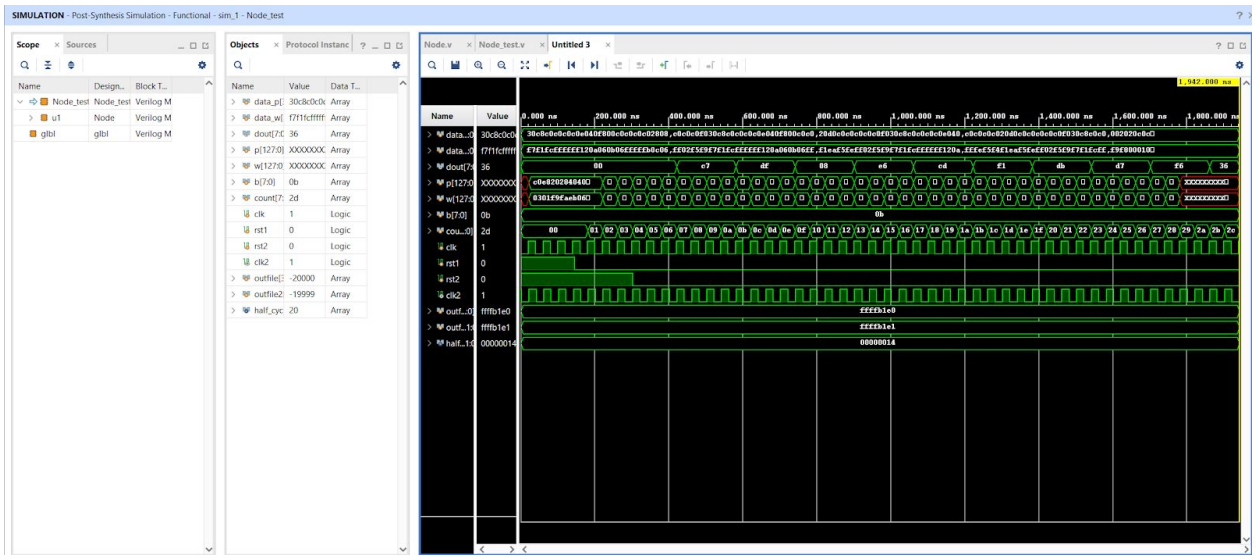


Sigmoid Post Synthesis Functional Simulation

To end the project we took all the milestones and wrapped them together into a module called Node and tested it with the data provided to confirm that the node worked successfully.



Node Schematic



Node Post Synthesis Functional Simulation