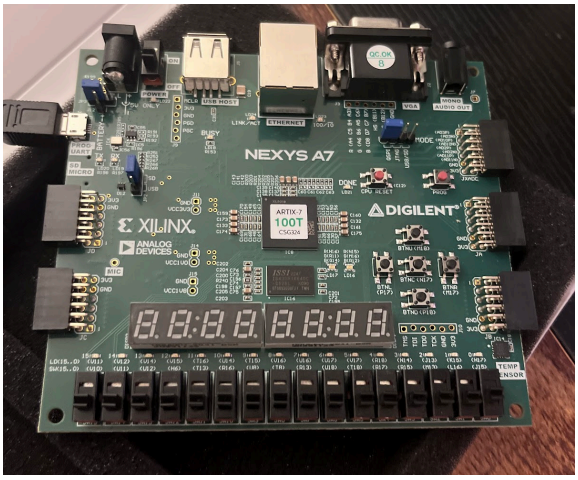
LAB 1
Switches to turn on LEDs on FPGA board
By Nicholas Williams
ECE3300
6/18/2025

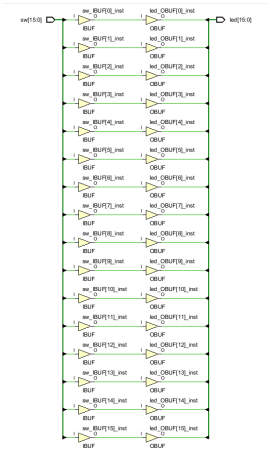
Introduction

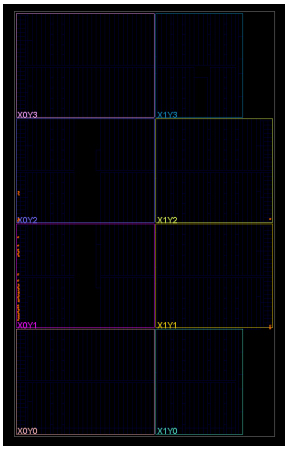
We have been learning how to program our FPGA board in verilog through Vivado. We have been exploring the use cases of switches and using that to learn IO controls on the board. In this lab we will be using the board's switches to drive LEDs on a FPGA board. Below there is a board that is plugged in without the power on. This board has not been flashed with any program.



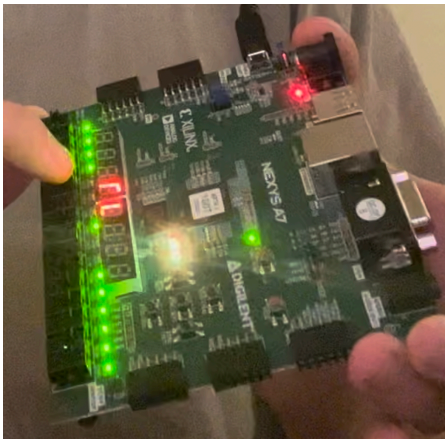
Body of report

This lab shows the broader use case of using the IO output system and how to upload code into a board and drive its function. I first started writing the code and following instructions left by the video and professor. I still had to run multiple levels of test in order to achieve intended results in this lab. Firstly, through the Vivado software that was utilizing verilog I ran a simulation that then used a downloaded copy of the board in software form that was supplied through Vivado. This then allowed for the next step of synthesis which instantiates and verifies low level gate design to make sure that it can translate the code into gate design. This design gets made into a gate design that can be shown below. Next, I used the implementation part to run the design and code which determines the physical resources on the FPGA. This can be seen below. Then after the implementation I ran the bitstream which could finally run all the tasks on the board.





Once the previous steps had been made I saw the FPGA led light up with the switch that was intended to light it up. The expectations of the lab was to see if the led would turn on when the switch was on and stay on when it was on, then turn off when the switch turned off. In the lab the intended effect was found on the board. In the photo below there is a picture that shows the first 6 led on with 2 off the 1 on then 3 off and lastly 4 on. After completion the resources used is shown below



Name	Constraints	Status	WNS	TNS	WHS	THS	WBSS	TPWS	Total Power	Failed Routes	Methodology	RQA Score	QoR Suggestions	LUT	FF	BRAM	URAM	DSP	Start	Elapsed
✓ synth_1	constrs_1	synth_design Complete!												0	0	0	0	0	6/18/25, 8:07 PM	00:00:57
✓ impl_1	constrs_1	write_bitstream Complete!	NA	NA	NA	NA		NA	12.060	0				0	0	0	0	0	6/18/25, 8:09 PM	00:01:51

Summary and conclusion

In summary I found that the program Vivado was a great tool to help get the board up and running. I also developed a deeper understanding of the INPUT/OUTPUT commands and usages in having to use the xdc file to call on board resources.

https://youtu.be/qsHmOsJ2Slo