

# FPGA Security System

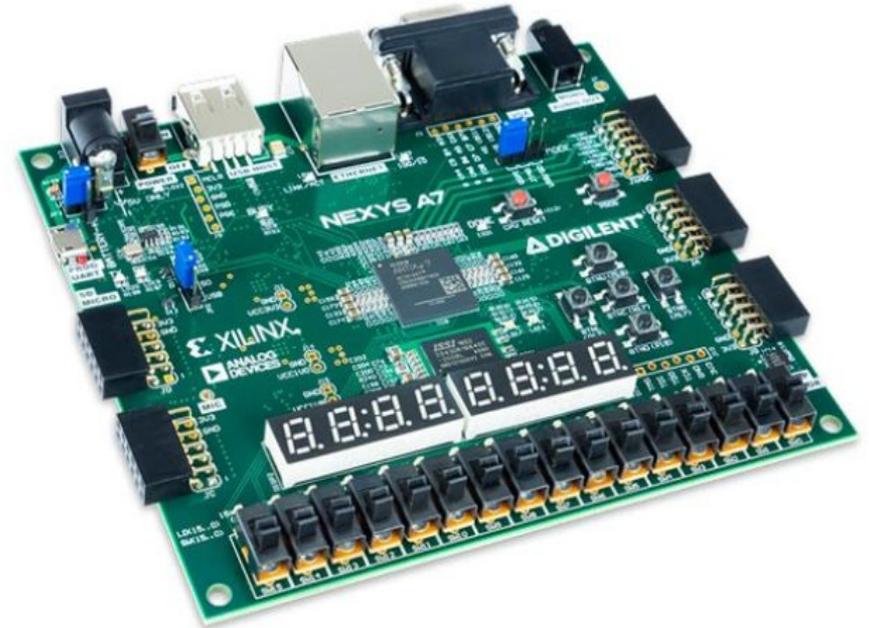
## Team Members

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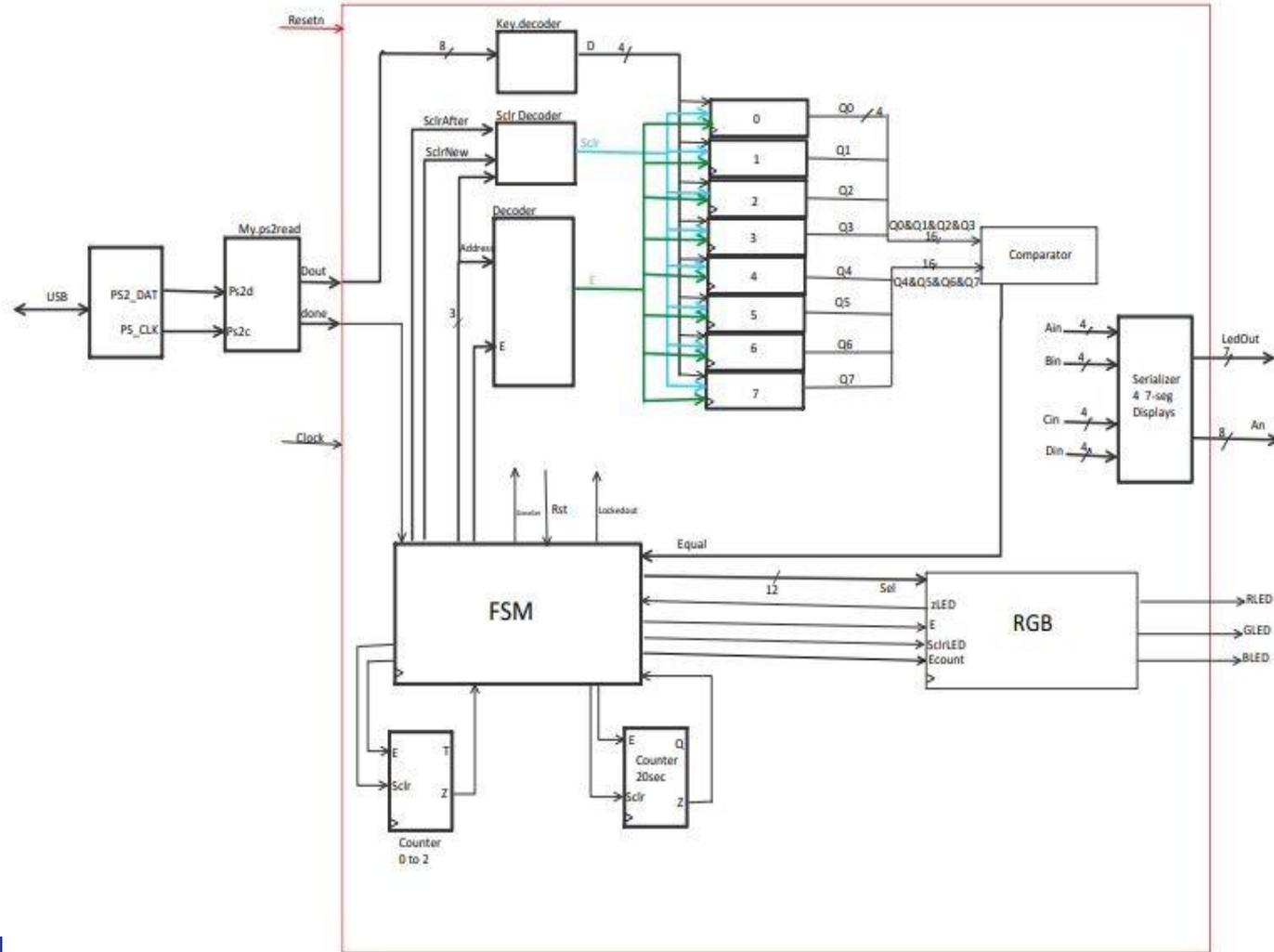
# Introduction

- ❑ Our FPGA Security System allows the user to create a passcode from a combination of 4 numbers.
- ❑ The interface consists of a keyboard, an RGB LED, and the 7-segment serializer
- ❑ The system has the ability to grant or deny access, locking the user out of the system, and clear the current input



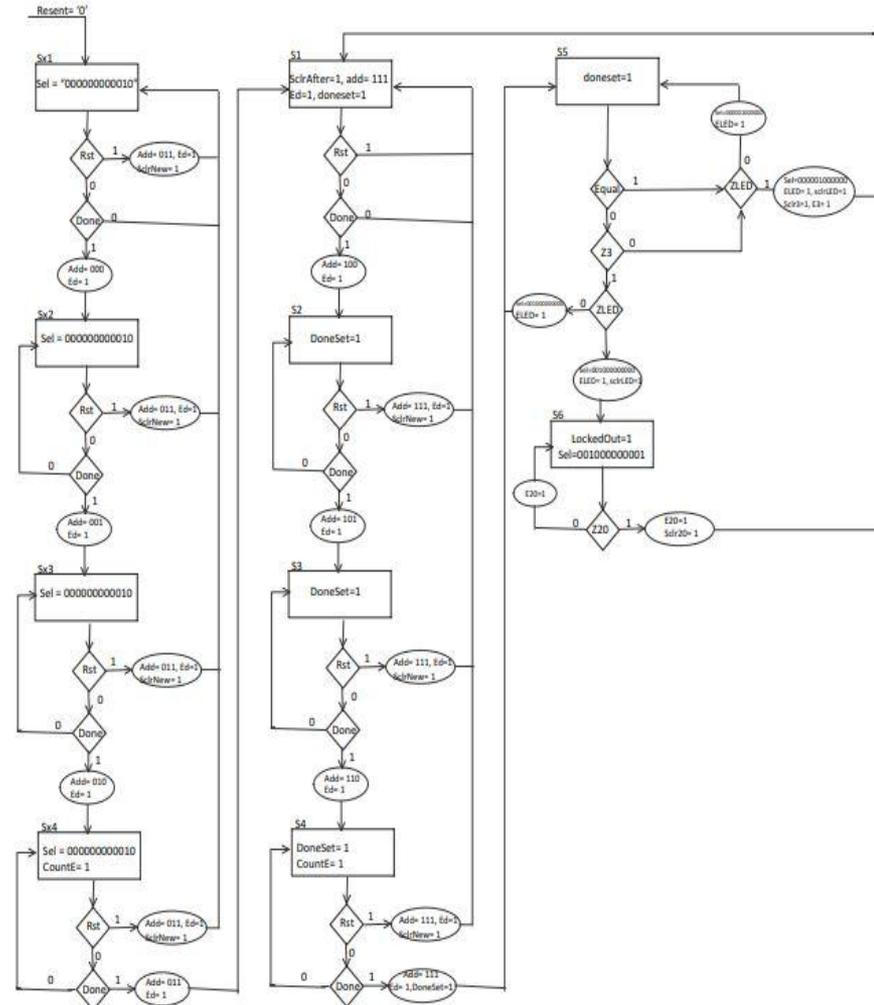
# Components used for the circuit

- Register
- Mux
- FSM
- Decoder
- Counter
- Comparator



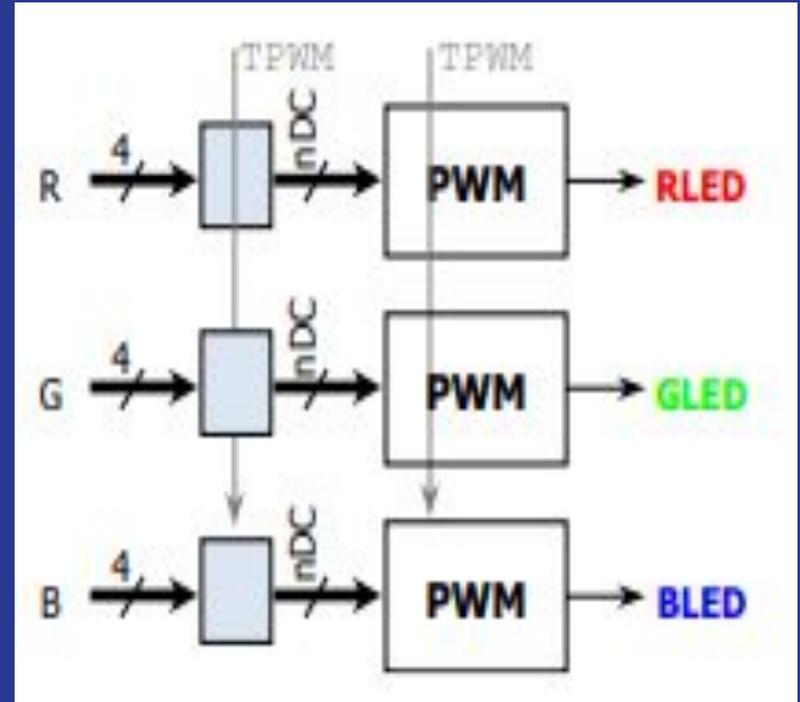
# FSM

- Starting from the Resetrn to the first state.
- The RGB LED color is blue.
- After getting the data from the keyboard the done signal is received.
- The enable for the decoder will be one and the address 000 is sent.
- This process repeats until state 4. After the final keystroke, the doneSet is received. If the code guess is accurate, the RGB LED color changes to green and the process returns to state 1. If not, the color of the RGB LED changes to red, and the system will lock out after three incorrect guesses.



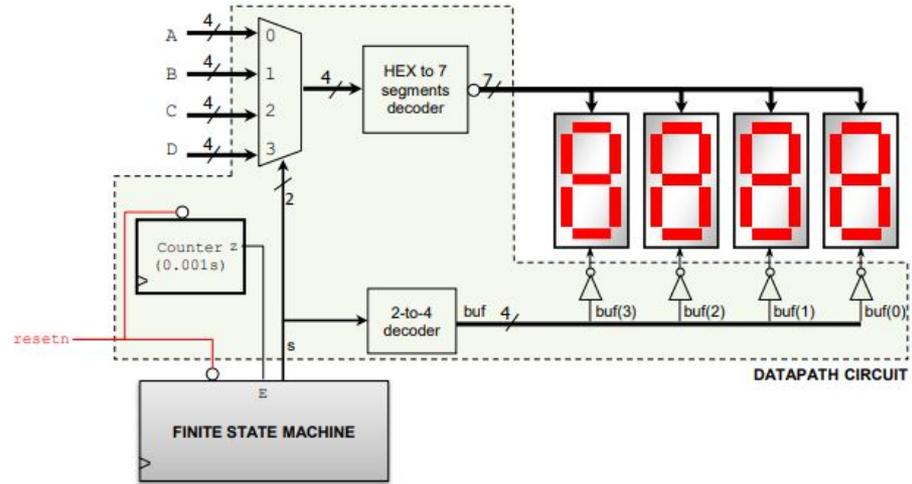
# RGB LED

- ❑ Used for feedback
- ❑ PWM is used to control the LED
- ❑ At startup, LED is blue
- ❑ Correct combination will show green light
- ❑ Incorrect combination will show red light
- ❑ Timeout will show purple light for 20s



# Seven-Segment Serializer

- ❑ The seven-segment display is used in this project to display the numbers which the user enters by using the keyboard.
- ❑ When there are no input numbers, 0000 is displayed.



# Decoders and Keyboard

- ❑ First decoder decides which register will be enabled based of the “address” signal from the FSM
- ❑ Second decoder will decode the scan code from the keyboard to a 4 bit number of 0-9
- ❑ The third decoder will clear the correct code registers or the guessed code registers based on where in the FSM the program currently is. Like the first decoder, it is controlled by the “address” signal from the FSM.

- ❑ Every key has its own scan code definition which follows the prefix 'F0' or 'E0' for the extended keys
- ❑ Input from the keyboard is used for the security code



# Simulation



# Project Challenges

- ❑ How to store the numbers effectively.
- ❑ How to enable and clear out the registers

# Alternatives and Improvements:

- ❑ Using an LCD for displaying prompt messages
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# Demo Video

<https://www.youtube.com/watch?v=HNynQbJ7iyQ>