VLSI PROJECT

Title:

Implementation of voting machine in xilinx vivado software using FPGA kit

GROUP-5

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INTRODUCTION:

- A voting machine is an electronic device used to record, cast, and count votes in elections.
- Designed to be user-friendly and secure, these machines streamline the voting process, ensuring accuracy and efficiency.
- They minimize human error, prevent fraud, and offer features like audio ballots and large text displays for accessibility.
- Voting machines also provide quicker results compared to traditional paper ballots, playing a crucial role in modern democracies by maintaining the integrity of the election process.
- As technology advances, voting machines will continue to enhance the efficiency and security of elections.
- The use of voting machines can significantly reduce the time required to tally votes, providing quicker results compared to traditional paper-based methods.
- Voting machines also facilitate accessibility, offering features such as audio ballots and large text displays to assist voters with disabilities.

OBJECTIVE:

Strengthening Electoral Integrity in India

The objective of implementing comprehensive measures, including fingerprint authentication, in Indian elections is to enhance the integrity and transparency of the electoral process. This involves:

1. To Design: Develop a robust and secure biometric verification system, integrating fingerprint authentication and electronic voting machines (EVMs) to ensure accurate voter identification.

2. To Analyze: Evaluate existing voting processes and identify potential vulnerabilities to fraud, ensuring continuous improvement and adaptation based on feedback and technological advancements.

3. To Implement: Deploy fingerprint authentication and other advanced security measures across all polling stations, ensuring accessibility and inclusivity for all eligible voters.

4. To Enhance Security: Protect voter data with stringent data protection measures, ensuring the privacy and security of biometric and other personal information.

5. To Streamline Operations: Improve the efficiency of voter verification and vote counting, reducing administrative burdens and wait times.

6. To Increase Trust: Build public confidence in the electoral system through transparent and fair voting processes.

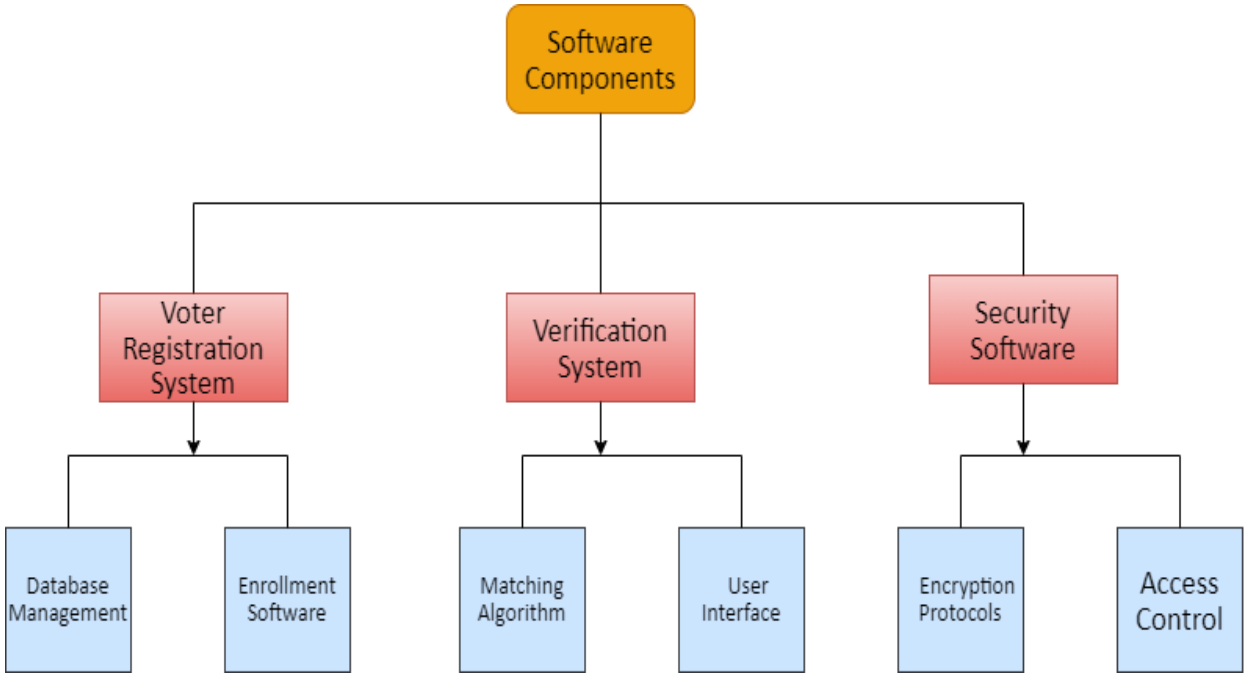
7. To Ensure Inclusivity: Provide secure, accessible voting options for voters with disabilities or special needs, ensuring that all eligible voters can participate in the electoral process.

By integrating these measures, the aim is to uphold the democratic values of India and ensure that elections are conducted in a free, fair, and transparent manner.

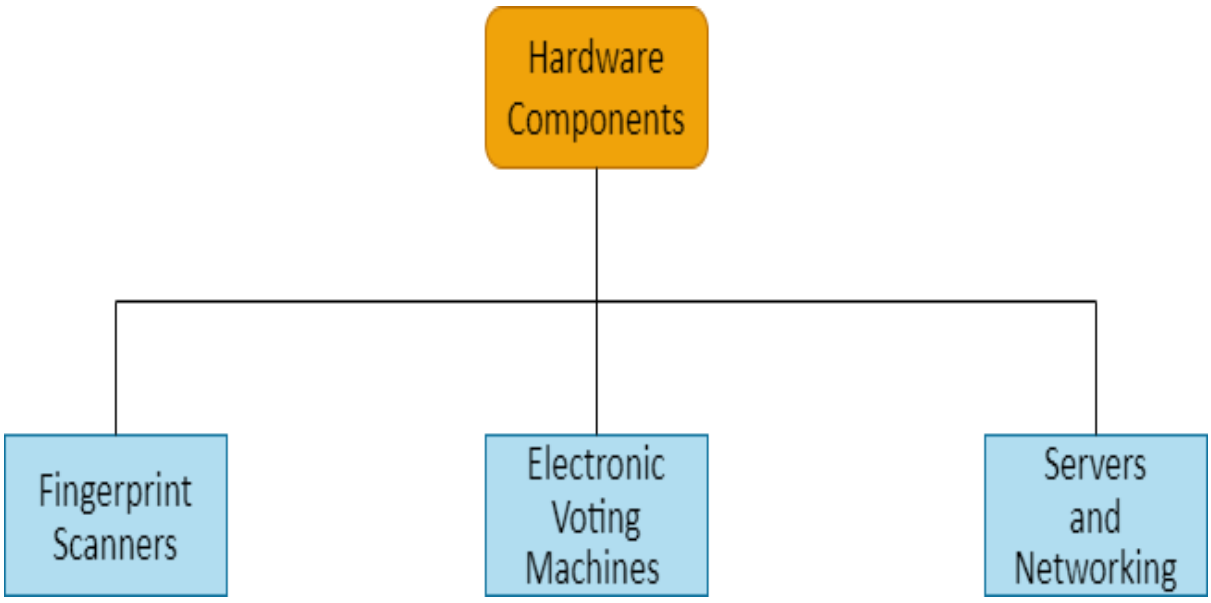
Methodology for Implementing Fingerprint Authentication in Indian Elections

1. System Design

- Software Components:



- Hardware Components:



2. Implementation Phases

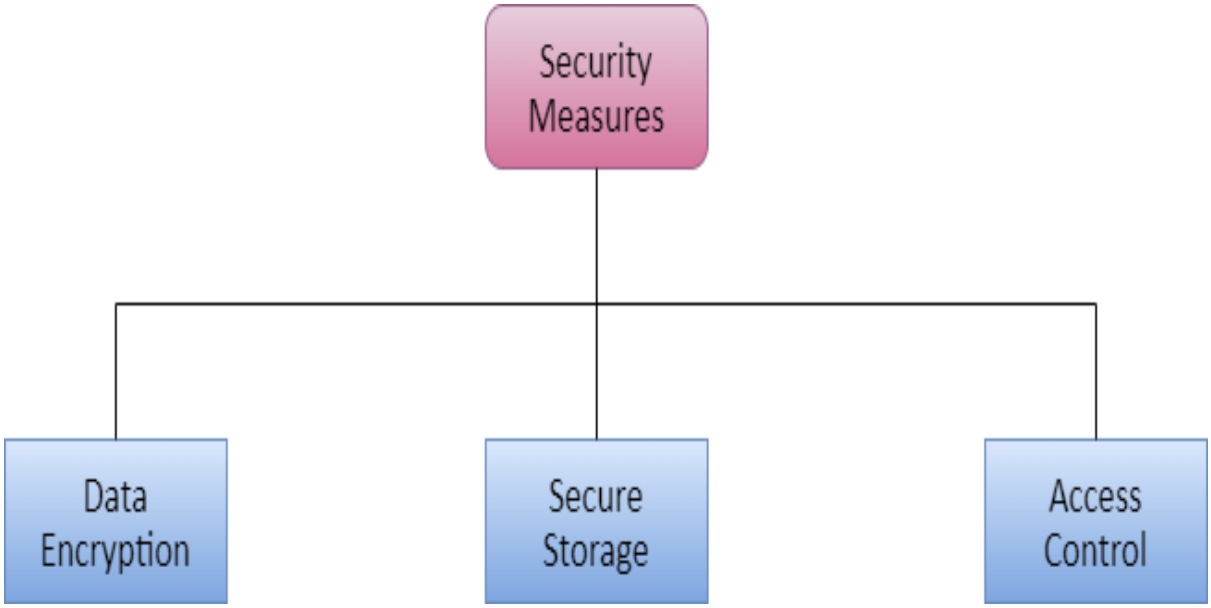
a. Pilot Phase:

- Pilot Testing:
  - Conduct pilot testing in select regions to assess the feasibility and functionality of the system.
- Feedback Collection:
  - Gather feedback from voters, polling officials, and other stakeholders to identify and address issues.

b. Full-Scale Deployment:

- Training:
  - Train polling staff and officials on the use of fingerprint authentication systems and EVMs.
- Installation:
  - Deploy fingerprint scanners and integrated EVMs across all polling stations.
- Public Awareness Campaigns:
  - Inform the public about the new system, its benefits, and how to use it.

3. Security Measures

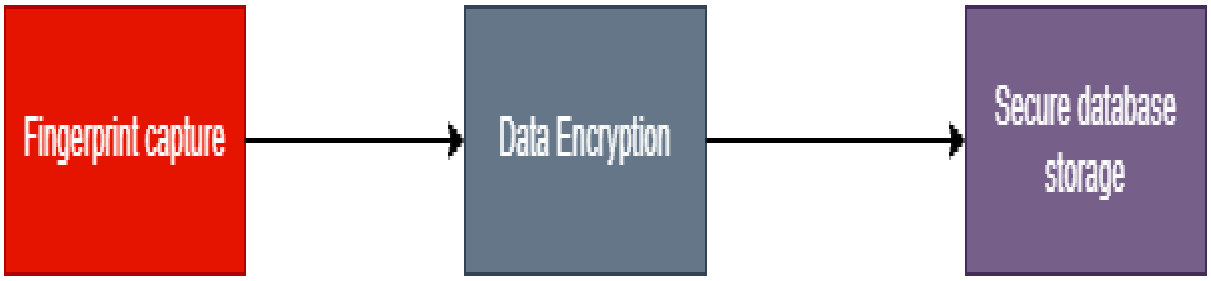


4. Continuous Evaluation and Improvement

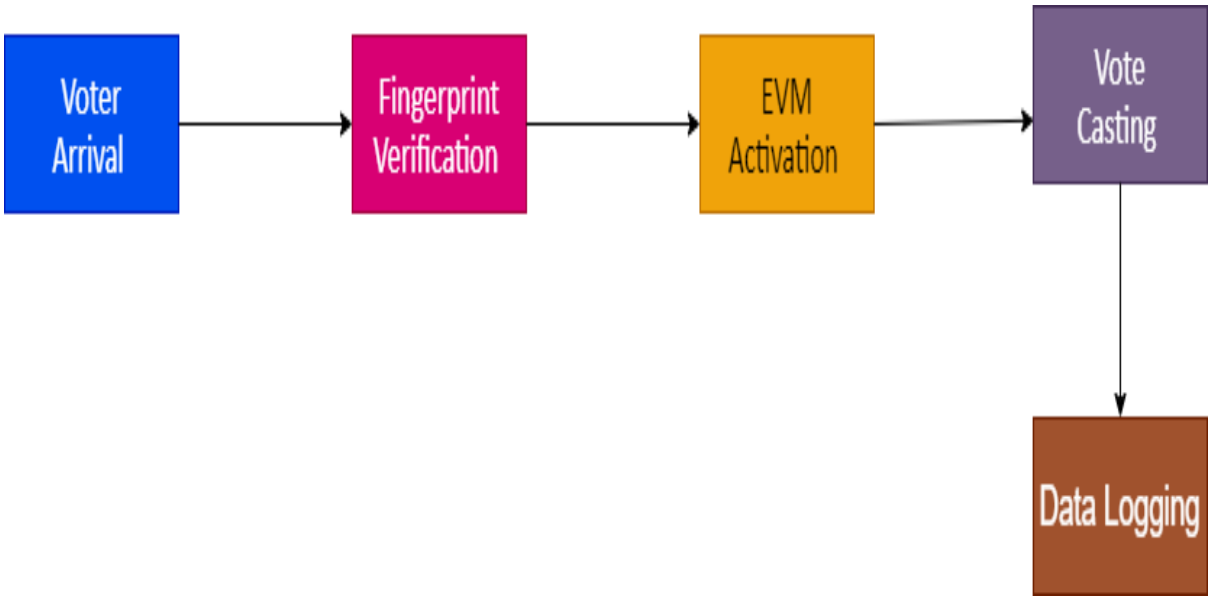
- Monitoring:
  - Establish real-time monitoring systems to detect and address any issues promptly.
- Feedback Loop:
  - Create a feedback mechanism for continuous improvement based on user experience and technological advancements.
- Regular Audits:
  - Conduct regular security audits and system evaluations to maintain the integrity of the electoral process.

Block Diagram

1. Voter Registration Process

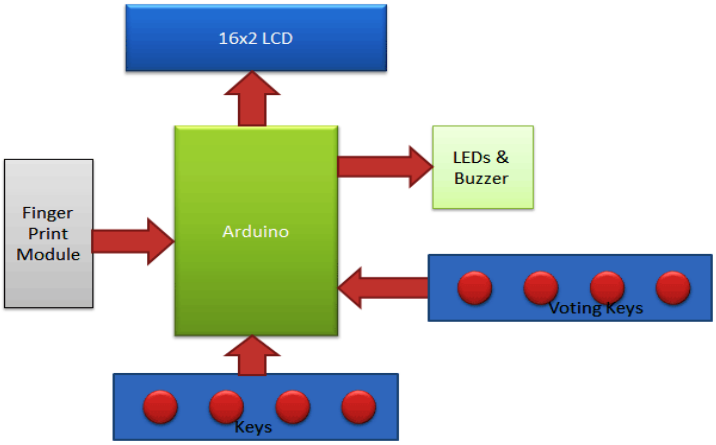


2. Voting Process:

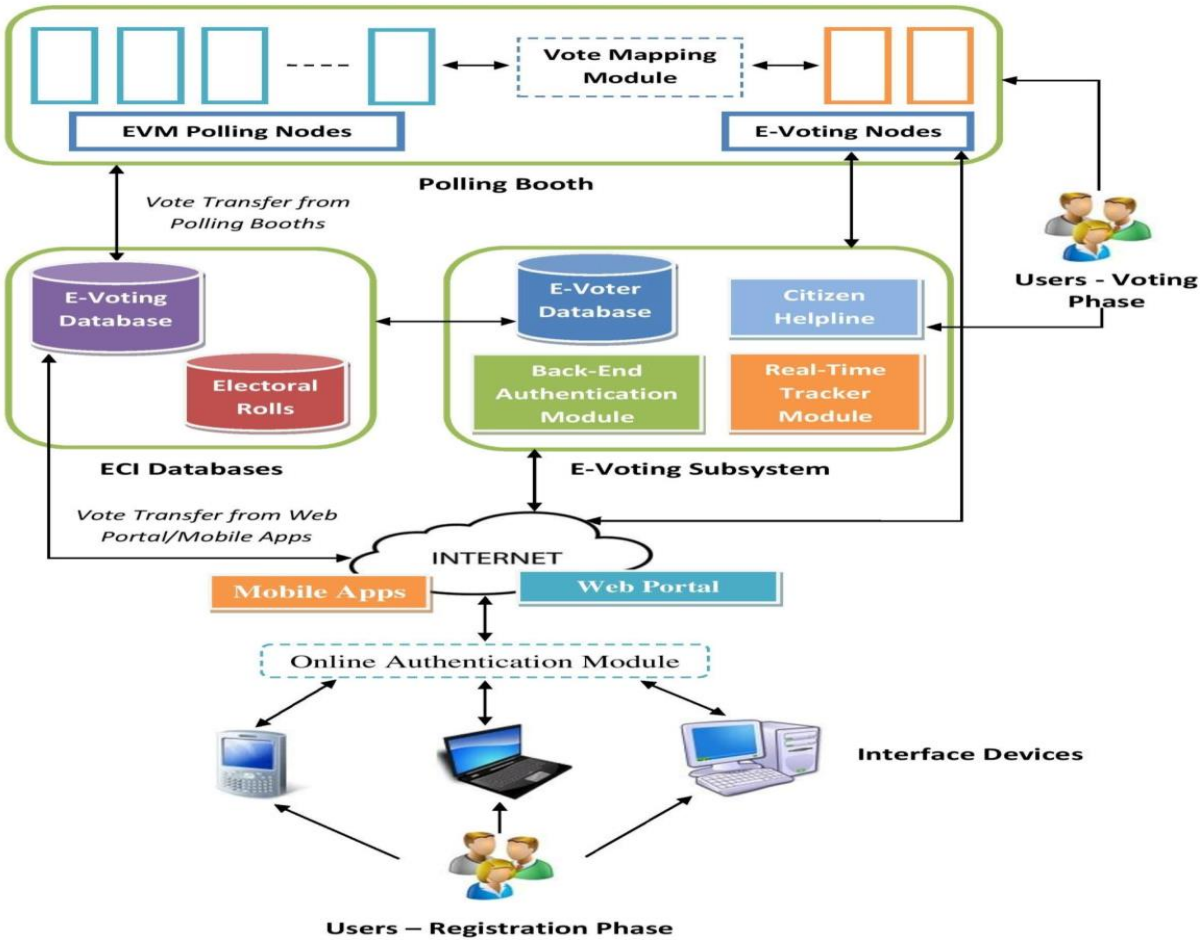


Circuit Schematic

1. Fingerprint Scanner:



2. EVM Integration:



Steps to be followed for implementation of Voting machine using FPGA kit

- Open xilinx vivado software>create New project>create File>give file name(module name)
- Select

Product category:General Purpose

Family:Artix-7

Package:cg324

Speed value: -1

Select Xc7a100tcsg324-1

- Enter the code

```
module voting_machine(
    input wire clk,
    input wire reset,
    input wire vote_party1,
    input wire vote_party2,
    input wire illegal_vote,
    output reg led_output
);

reg [1:0] count_party1 = 2'b0;
reg [1:0] count_party2 = 2'b0;
reg [1:0] count_illegal = 2'b0;

always @(posedge clk or posedge reset) begin
    if (reset) begin
        count_party1 <= 2'b0;
        count_party2 <= 2'b0;
        count_illegal <= 2'b0;
        led_output <= 0;
    end else begin
        if (vote_party1 && !vote_party2 && !illegal_vote) begin
            count_party1 <= count_party1 + 1;
```

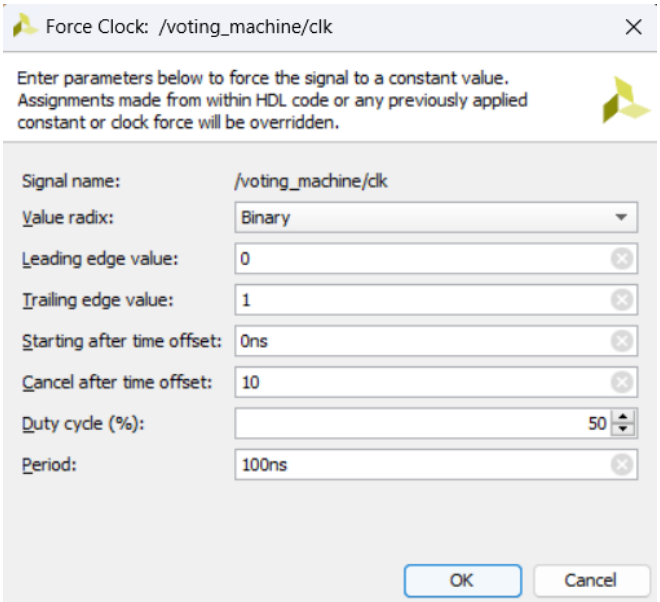
```
            end else if (vote_party2 && !vote_party1 && !illegal_vote) begin
                count_party2 <= count_party2 + 1;
            end else if (illegal_vote && !vote_party1 && !vote_party2) begin
                count_illegal <= count_illegal + 1;
            end

            // Check if Party 1 has more votes than Party 2
            if (count_party1 > count_party2) begin
                led_output <= 1;
            end else begin
                led_output <= 0;
            end
        end
    end
endmodule
```

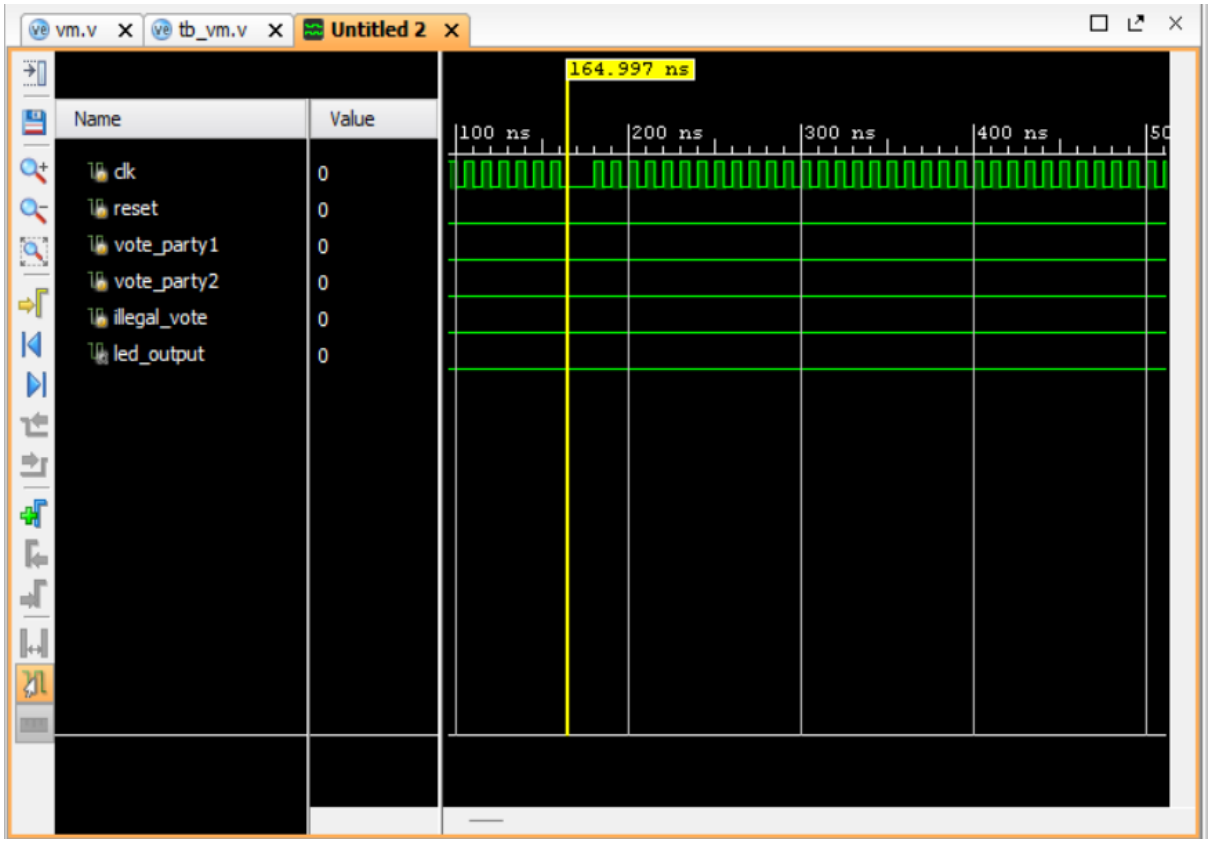
- Project manager>Design source>right click and select “Add sources”>Add or create simulation sources>create file>Enter the code

```
module voting_machine_tb;

// Declare testbench signals
reg clk;
reg reset;
reg vote_party1;
reg vote_party2;
reg illegal_vote;
wire led_output;

// Instantiate the voting machine module
voting_machine uut (
    .clk(clk),
    .reset(reset),
    .vote_party1(vote_party1),
    .vote_party2(vote_party2),
    .illegal_vote(illegal_vote),
    .led_output(led_output)
);

// Clock generation
initial begin
    clk = 0;
    forever #5 clk = ~clk; // Toggle clock every 5 time units
```

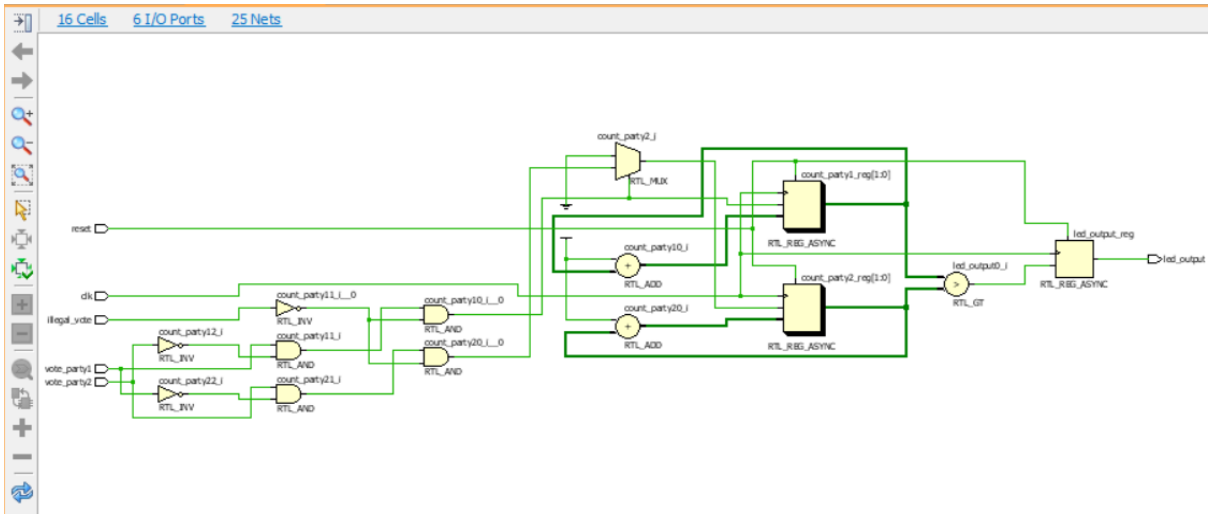
```
end

// Apply test vectors
initial begin
   // Initialize inputs
   reset = 1;
   vote_party1 = 0;
   vote_party2 = 0;
   illegal_vote = 0;

   // Apply reset
   #15 reset = 0; // Wait 15 time units to clear reset signal

   // Apply test votes
   // Simulate Party 1 getting more votes than Party 2
   #10 vote_party1 = 1; // Vote for party 1
   #10 vote_party1 = 0; // Clear vote signal
   #20 vote_party2 = 1; // Vote for party 2
   #10 vote_party2 = 0; // Clear vote signal

   // Finish simulation after some time
   #100 $finish;
end

// Monitor signals
initial begin
   $monitor("At time %t, led_output = %b", $time, led_output);
end

endmodule
```

- Go to Run simulation>Run behavioral simulation>right click on clock and give force clock





- In RTL analysis>open elaborated design



- In schematic window, on the top change the “default Layout” to “I/O planning”
- Go to I/O ports[bottom panel]>select scalar ports
- Give I/O std as LMCMOS33
- Go to package pins>Give input as

  Clk:P4

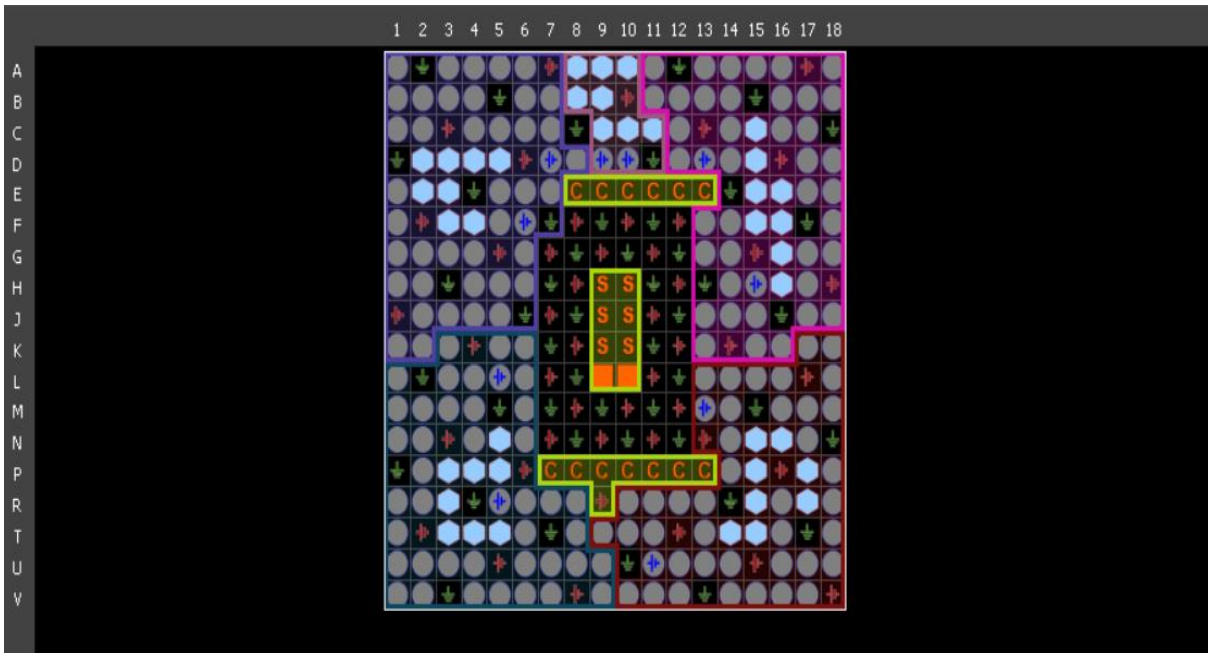
  Illegal_vote:P3

Led_output:U1

Reset:T1

Voteparty_1:T3

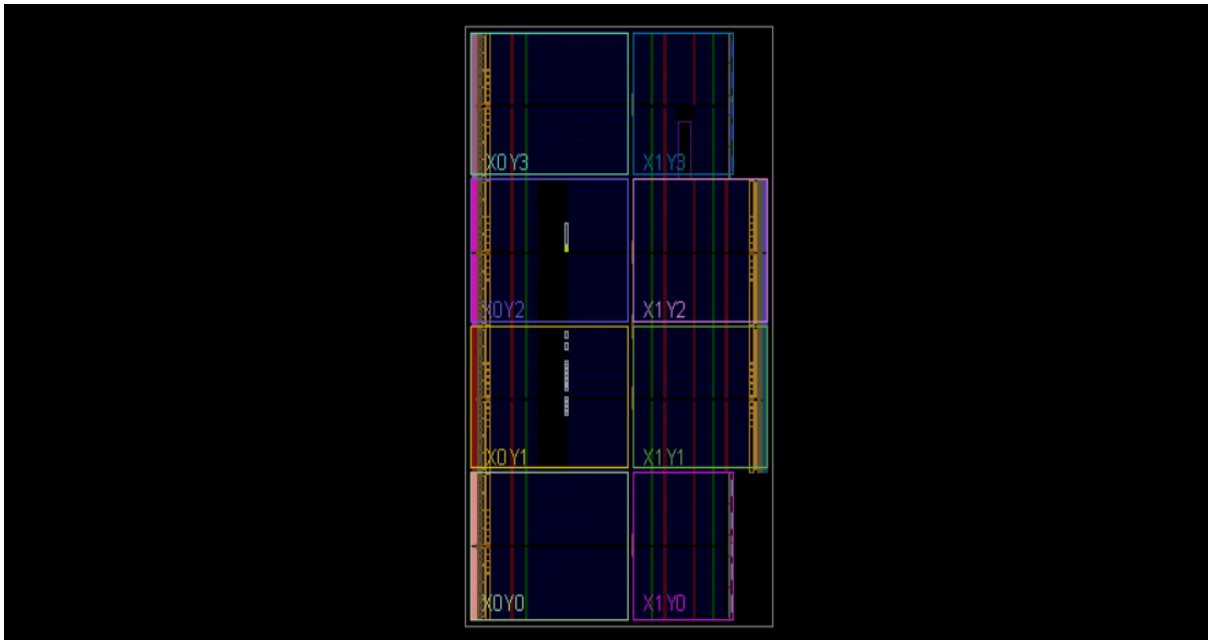
Voteparty_2:U2



- Select save constraint[below edit button]
- From flow navigator>select Run suynthesis
- After successful synthesis>A pop appears>select Run implementation>click ok
- After finishing, another pop up appears, before selecting any option; connect the FPGA kit to CPU
- After Bit stream generation>choose open implementated design
- In flow navigator>program and debug>open hardware manager

  At top[green bar]>select open target>Auto connect

  At same bar>Program device>select the one which is shown>program



Overall Conclusion:

Enhancing Electoral Integrity in India with Fingerprint Authentication

This project aimed to enhance the integrity and transparency of the electoral process in India by integrating fingerprint authentication with electronic voting systems. By employing advanced biometric verification, we addressed significant challenges such as voter fraud, impersonation, and inefficiencies in voter verification. The project involved a comprehensive methodology encompassing the design, analysis, and implementation of both software and hardware components.

The successful design and implementation of fingerprint authentication on FPGA demonstrate the project's practicality and potential impact. By leveraging advanced biometric technology and robust hardware solutions, we significantly enhanced the integrity and efficiency of the electoral process in India. This project not only addresses current challenges but also sets the foundation for a more secure and trustworthy democratic system. Through continued evaluation and adaptation, we can ensure that the electoral process remains fair, transparent, and inclusive for all citizens.

Key Achievements:

1. Robust System Design: We developed a robust biometric verification system, integrating fingerprint authentication with electronic voting machines (EVMs) to ensure accurate voter identification.

2. Secure Data Handling: Implemented stringent data protection measures, including encryption and secure storage, to safeguard biometric information and maintain voter privacy.

3. Enhanced Voting Process: Improved the efficiency of voter verification and vote counting, reducing administrative burdens and wait times, and ensuring a smoother voting experience.

4. Inclusivity: Ensured the system is accessible to all eligible voters, including those with disabilities, by providing alternative authentication methods.

5. Public Confidence: Increased public trust in the electoral process through transparent and reliable voting methods.

VIDEO LINK:

https://drive.google.com/file/d/1eSEFInGATKdhR9Z_tQ9CmlDrxsCJqm2-/view?usp=sharing