



SMART INDIA HACKATHON 2023

Team-CertiTrust

SIH1365

Problem Statement - Online Blockchain based certificate generation and validation system for government organization.

Idea description in detail.

1. **Overview:** An online blockchain-based certificate generation and validation system for a government organization is a system that uses blockchain technology to generate and verify certificates issued by the government. This system would be more secure and efficient than traditional certificate systems, which often rely on centralized databases that can be vulnerable to hacking and fraud. To generate a certificate, the government organization would create a new block on the blockchain containing the certificate data. This block would then be verified by all the nodes in the network and added to the blockchain. Once the block is added, the certificate is issued and cannot be revoked. To validate a certificate, the recipient would simply need to verify the certificate hash against the blockchain. If the hash matches, the certificate is valid.

Here are some specific examples of how a blockchain-based certificate generation and validation system could be used by a government organization:

- To issue digital birth certificates, death certificates, marriage certificates, and other civil documents.
- To issue educational certificates, such as diplomas and transcripts.
- To issue professional licenses and certifications.
- To issue passports and other travel documents.

2. Project Objectives:

- **Online Certificate Generation:** Develop a user-friendly platform for organizations to create and issue certificates electronically.
- **Blockchain Integration:** Implement blockchain technology to record certificate data securely and immutably.
- **Certificate Verification:** Create a user interface for individuals and organizations to easily verify the authenticity of certificates.
- **Security:** Ensure that the system is secure, preventing unauthorized access and tampering of certificate data.

- **User-Friendly Interface:** Design an intuitive and easy-to-navigate user interface for both certificate issuers and verifiers
3. **OPERATIONS:** E-certificate generation system which manually creates the certificates based on current students' data. Various centralized methods follow a similar approach for verification. The centralized approaches can't defend against the various network attacks like SQL injection, Collusion, brute force etc. Blockchain approach using decentralized approach. Fog computing or fog networking, also known as fogging, is pushing frontiers of computing applications, data, and services away from centralized cloud to the logical stream of the network edge. Fog networking system works on to build the control, configuration, and management over the Internet backbone rather than the primarily control by network gateways and switches those which are embedded in the LTE network. We can illuminate the fog computing framework as highly virtualized computing infrastructure which provides hierarchical computing facilities with the help of edge server nodes. These fog nodes organize the wide applications and services to store and process the contents in close proximity of end users.

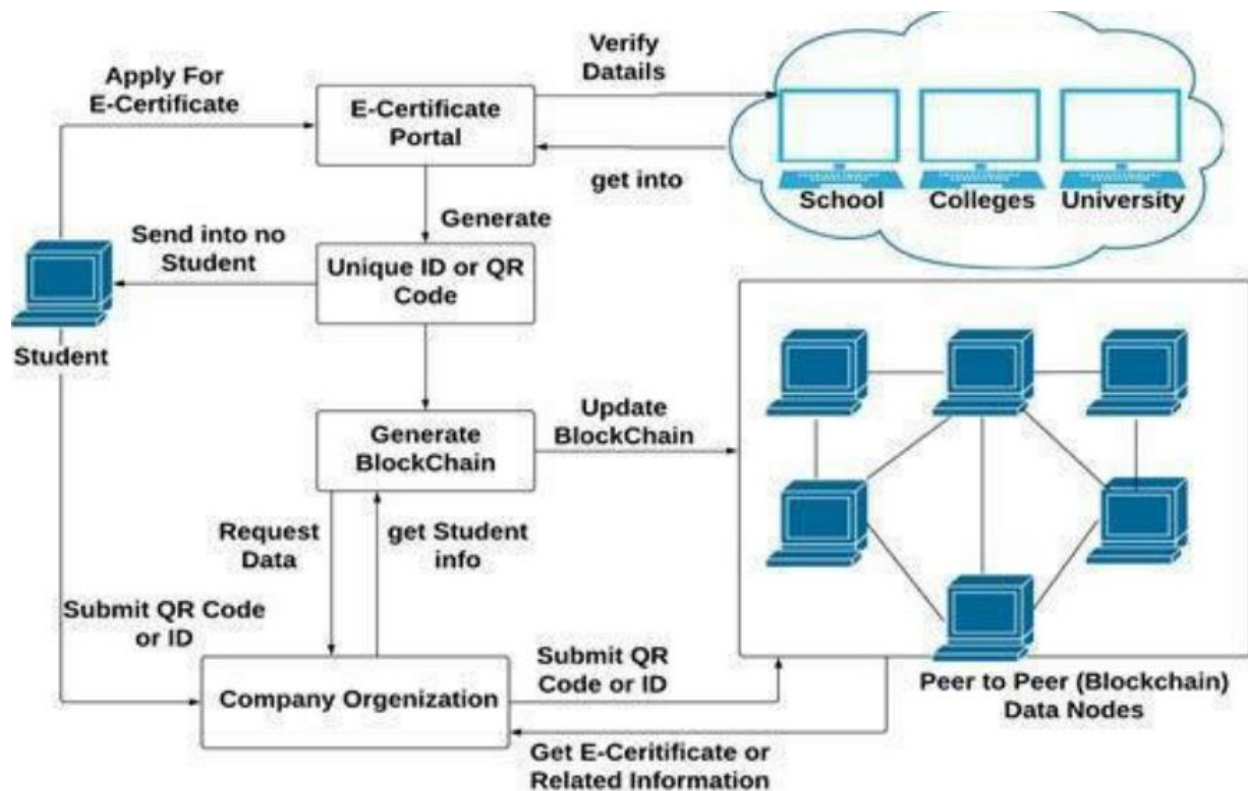


Fig.1 System Architecture of the Project

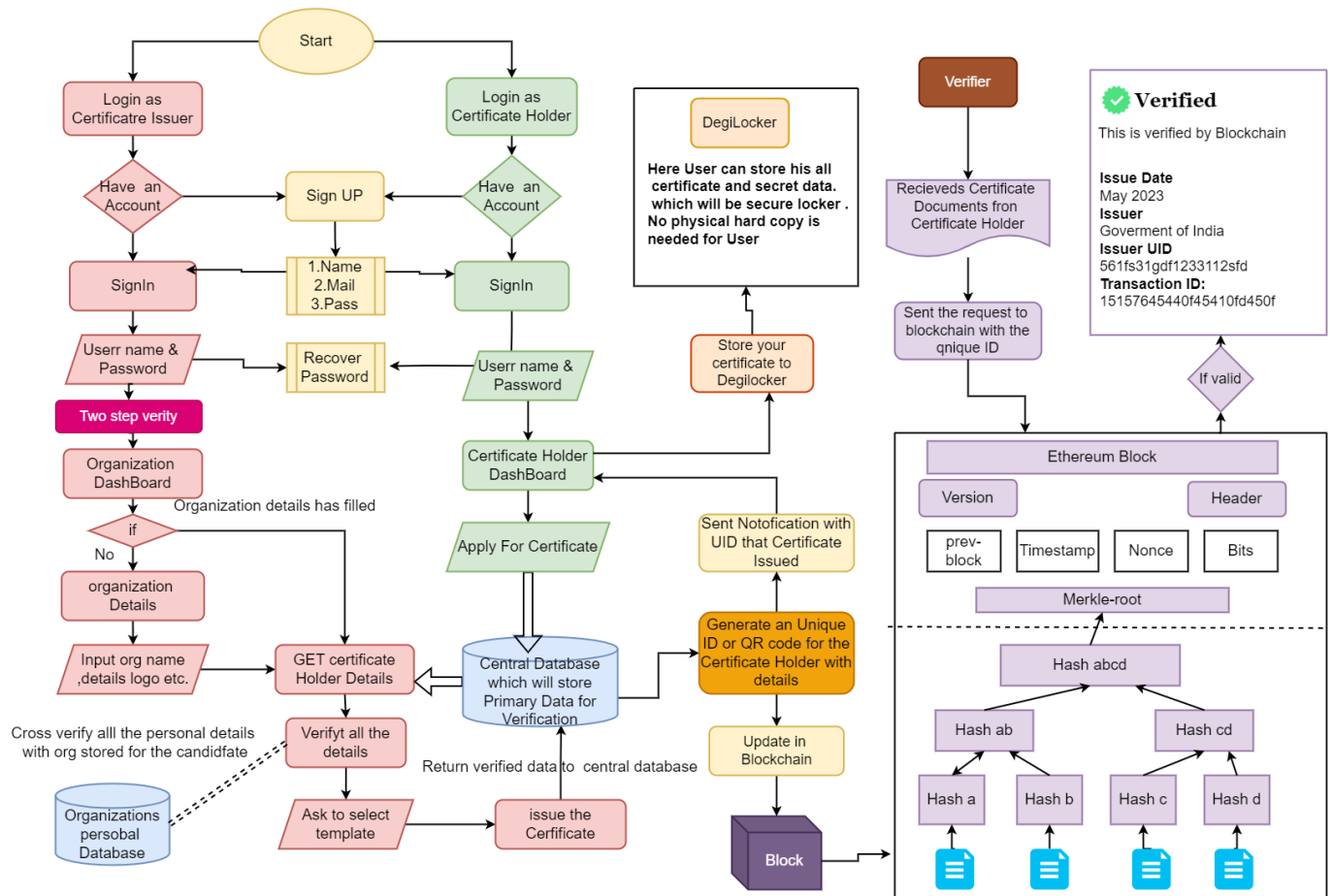


Fig.2 Flowchart of the Project

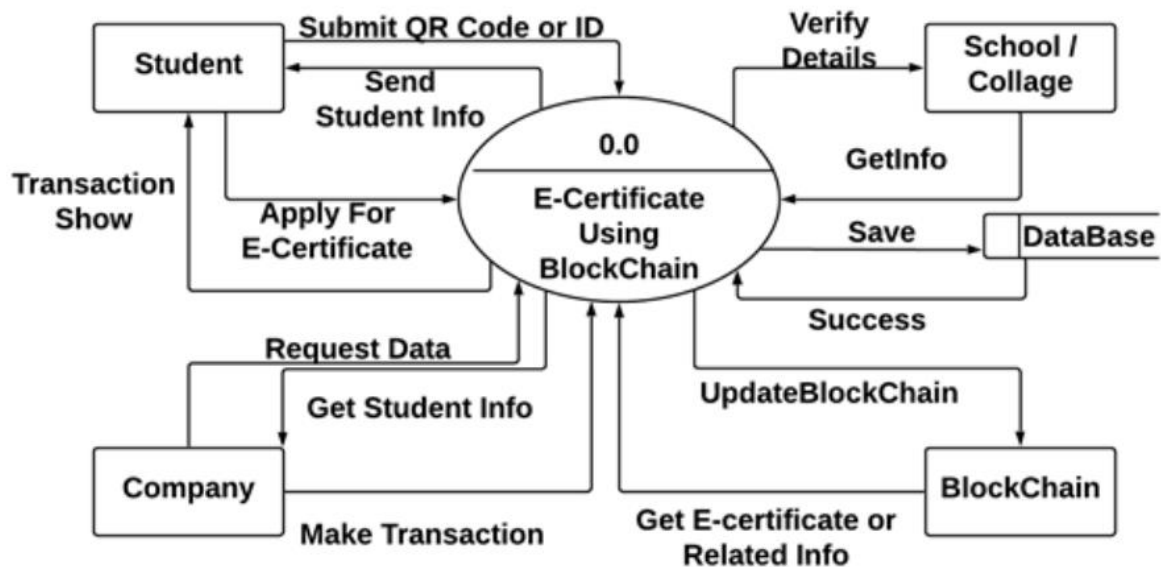


Fig.2 Developer Architecture of the Project:

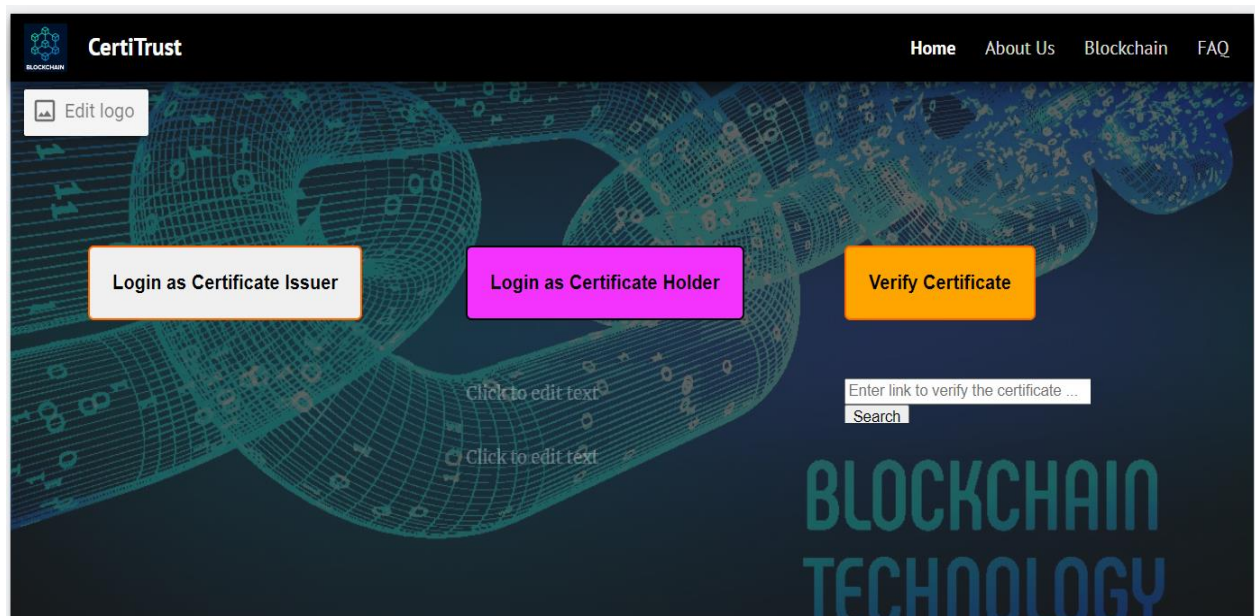
4. Methodology

The project followed the Agile methodology, allowing for iterative development and continuous feedback. The key steps included:

- **Requirements Gathering:** Understanding the needs of certificate issuers and verifiers.
- **Design:** Creating wireframes and mockups for the user interface.
- **Development:** Building the platform and integrating blockchain technology.
- **Testing:** Rigorous testing to identify and fix any issues.
- **Deployment:** Launching the platform for real-world use.
- **Smart Contracts:** Developed smart contracts to store certificate data on the blockchain.

5. User Interface

5.1 Home page



5.2. User interface for the students to Register and Login

Login

Username

admin

Password

.....

Don't have an account? [Register Now.](#)

[Forgot password?](#)

Login

Registration

Username*

Required. 150 characters or fewer. Letters, digits and @/./+/-/_ only.

First name

Email address


Password*

Retype Password*

[Back to login](#)

Register

5.3. Certificate Creation Interface

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Certificate Generation Form

Title

Description

Department


Issue Date

Validity Date

University Name

Generate Certificate

5.4. Verification interface

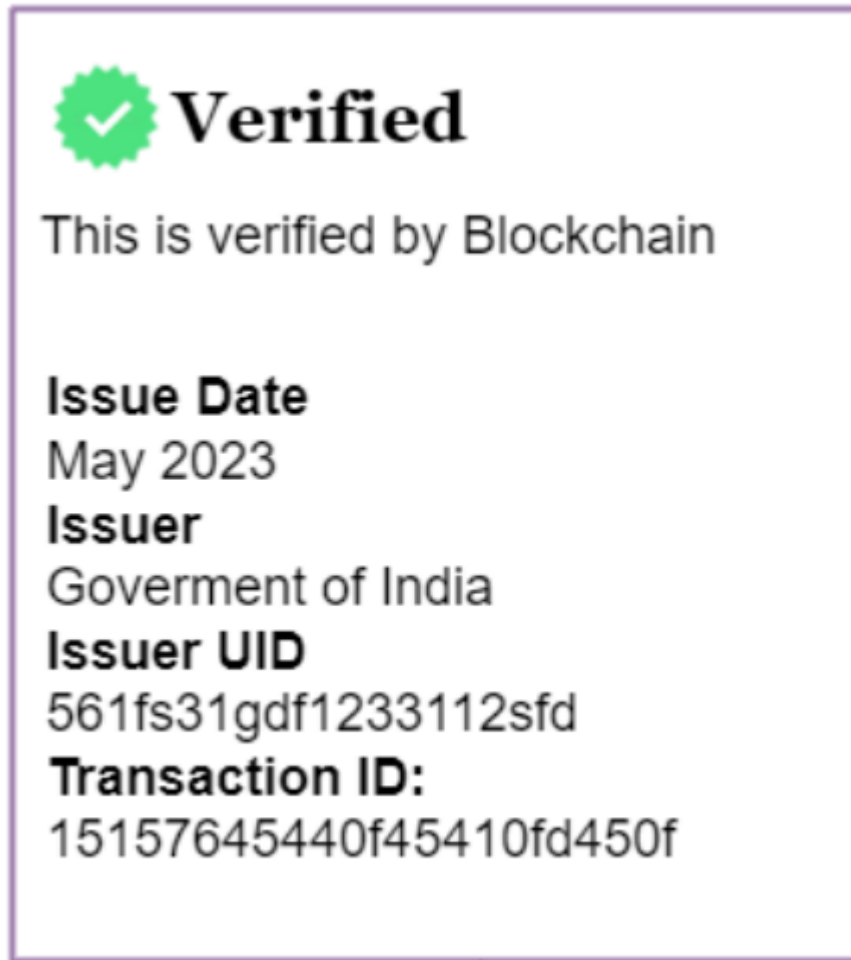
 **CertiTrust**

Verify Certificate

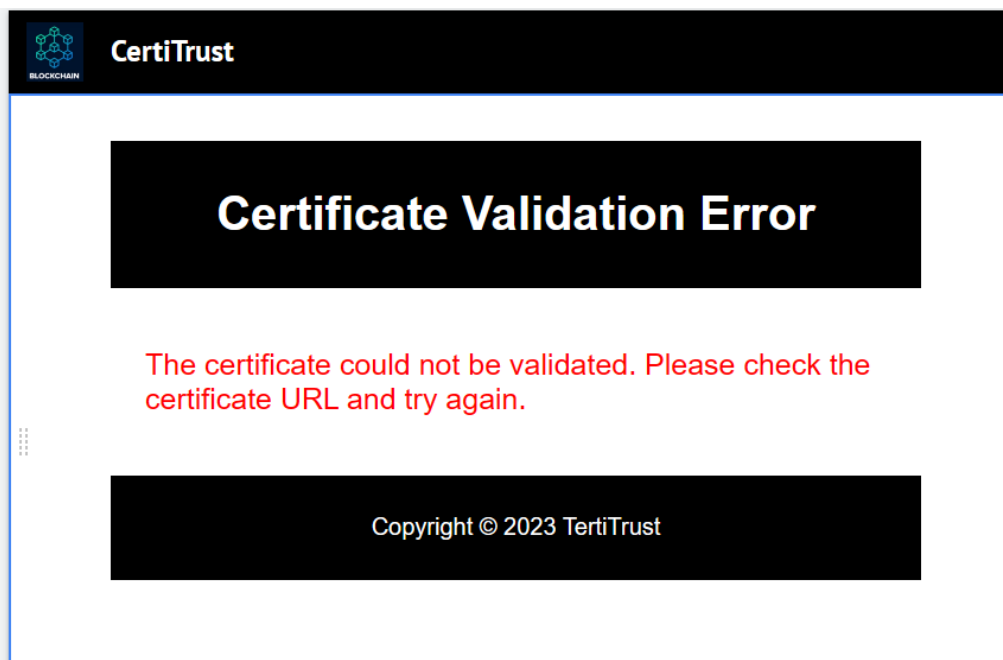
Enter link to verify the certificate ...

Search

5.5. Certificate Template



5.6. Sample Invalid Certificate



6. Benefits and Impact

The project has several benefits and impacts:

- **Security:** Certificates are tamper-proof due to blockchain technology.
- **Efficiency:** Faster certificate issuance and verification processes.
- **Cost Savings:** Reduction in printing and administrative costs.
- **Transparency:** Easy access to certificate records on the blockchain.
- **Global Accessibility:** Anyone can verify certificates from anywhere.
- **Blockchain Learning Curve:** Understanding and implementing blockchain technology required a learning curve.
- **Regulatory Compliance:** Ensuring compliance with legal and regulatory requirements.
- **User Adoption:** Encouraging users to shift from traditional methods to the online platform.

7. Challenges Faced

Challenges encountered during the project include:

- **Blockchain Learning Curve:** Understanding and implementing blockchain technology required a learning curve.
- **Regulatory Compliance:** Ensuring compliance with legal and regulatory requirements.
- **User Adoption:** Encouraging users to shift from traditional methods to the online platform.

8. Conclusion

The "Online Certificate Generation and Validation Using Blockchain" project has successfully addressed the inefficiencies and security concerns associated with traditional certificate issuance and validation. By harnessing blockchain technology, it has provided a secure and efficient solution that benefits both certificate issuers and verifiers.