Rayat Shikshan Sanstha's

Karmaveer Bhaurao Patil College of Engineering, Satara

Department: Computer Science & Engineering

Academic Year: 2023-24 Semester-VII

Project Synopsis

On

Online Blockchain Based Certificate Generation and Validation

By

1. **Omraj Manoj Jadhav (36)**
2. **Akhilesh Vilas Dange (19)**
3. **Prasenjit Indrajit Bhosale (10)**
4. **Aniket Sanjay Chavan (14)**
5. **Yashashree Sandip Deshmukh (20)**
6. **Akshata Ashok Dhumal (22)**

Of

B. Tech. Computer Science & Engineering

Under the guidance of

Prof. Shabina Sayyad-Modi

(Department of Computer Science & Engineering)

Academic Year 2023-24

I) Introduction:

In today's digital age, the need for secure and convenient methods of certificate generation and validation is paramount. This documentation outlines our project, "Blockchain Innovator," which addresses the inherent security challenges in traditional certificate management systems. Our mission is to provide a seamless and secure platform for generating and validating certificates using blockchain technology.

The lack of a robust and secure system for certificate generation and validation is a prevalent issue in India. Existing methods are often cumbersome, prone to fraud, and do not provide a secure storage solution for users' certificates.

We propose an online certificate management system built on the Ethereum blockchain. This system allows users to generate and store certificates securely, while organizations can effortlessly verify them. Our approach not only enhances security but also streamlines the entire certificate validation process.

II) Literature Review: (Books/research papers/websites referred)

1) Blockchain Technology in Education:

Blockchain technology has gained significant attention in the education sector for its potential to secure and streamline certificate generation and validation processes.

2) Decentralized Identity and Self-Sovereign Identity:

Many projects and research papers focus on the concept of self-sovereign identity using blockchain, which allows individuals to have control over their digital certificates and credentials.

3) Tamper-Proof Certificates:

Blockchain's immutability ensures that certificates are tamper-proof, and this feature is essential for the security of educational credentials.

4) Smart Contracts for Certificate Issuance:

Smart contracts on blockchain platforms can automate the certificate issuance process, ensuring that certificates are only issued when certain criteria are met.

III) Existing System: About Existing System

In the existing traditional system of certificate issuance and verification, users receive their certificates from institutions such as universities, government agencies, or companies through conventional channels. This system has several inherent limitations and challenges that our project aims to address.

- Certificates are easily damaged or stolen because they're just papers or digital files stored on computers.
- Checking if certificates are real takes a long time and is not very reliable. You have to talk directly to the people who gave you the certificates.
- The current system doesn't do a good job of stopping people from making fake certificates. Some people could change their certificates to lie about their qualifications.

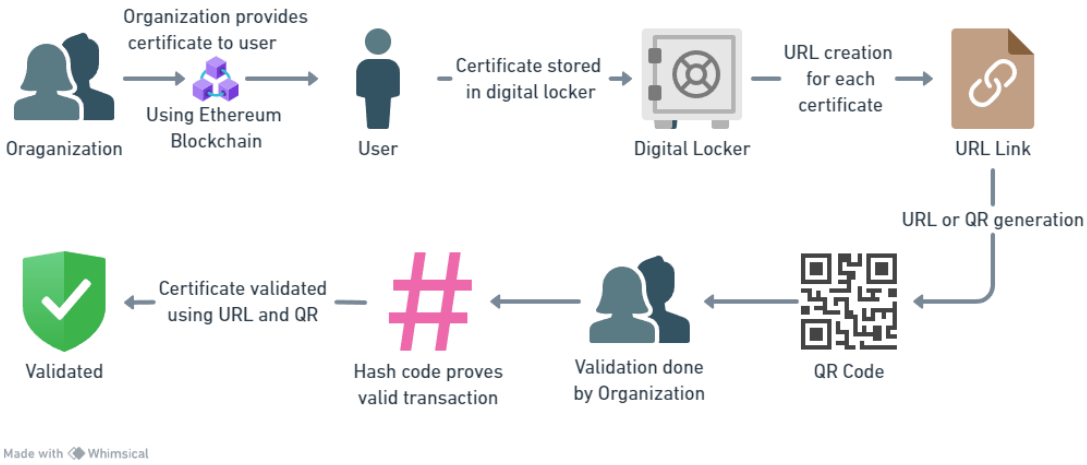
Our project changes how certificates work. We make them secure and easy to check. Universities and companies can put your certificates on the Ethereum blockchain, making them safe and unchangeable. Each certificate gets a special code. We create unique links and QR codes for each certificate, so it's easy to prove they're real. People can quickly check if your certificates are valid. Everything about certificates, from making them to checking them, is recorded safely on the Ethereum blockchain. Our project makes certificates better and more reliable, bringing trust and transparency to the system.

IV) Proposed Work :

(1) Problem Statement:

The traditional way of creating and checking certificates has some big problems. One major issue is that it's too easy for people to make fake certificates, and this can lead to false claims about their qualifications. Also, it's hard to be sure if a certificate is real or fake because there's no reliable and standard way to check. This affects not only individuals but also educational institutions and employers. Our project, "Online Blockchain-Based Certificate Generation and Validation," aims to solve these important problems. We use blockchain technology to make certificates secure and unchangeable. Our goal is to provide a trustworthy and transparent solution that ensures certificates are real and valuable in our digital world.

(2) Architecture: (Block Diagram):



(3) Modules:

1. **Issuing User Certificate:**
   Users receive their certificates from their respective Institutions, such as universities or government agencies.

2. **Digital Lockers and Blockchain Storage:**
   Each user has a digital locker to securely store their certificates on the Ethereum blockchain using smart contracts, ensuring immutability and security.

3. **Unique Certificate Identifier:**
   Each certificate is associated with a unique hash number that serves as a secure identifier.

4. **Generate unique URL/QR Code::**
   A unique URL or QR code is automatically generated for each certificate, serving as a reference to the certificate stored on the blockchain.

5. **Share Certificates:**
   Users share the URL or generated QR code with organizations and individuals requesting verification.

6. **Organization Verification:**
   Organizations access the **"Blockchain Innovator"** website and use the URL or QR code provided by the user to initiate the authentication process.

7. **Validation:**
   The validation process ensures the authenticity of the certificate. The system authenticates certificates by verifying data stored on the blockchain associated with the provided URL or QR code.

V) Project Objectives :

- **Enhance Document Security:** Develop a highly secure system to protect digital certificates from unauthorized access, forgery, or alterations.
- **Simplify Certificate Issuance:** Establish an efficient process for organizations to issue digital certificates directly on the Ethereum blockchain, reducing paperwork and administrative complexity.
- **Streamline Verification:** Make it easy for individuals and businesses to verify certificate authenticity using unique URLs or QR codes, saving time and effort.
- **Ensure Trust and Transparency:** Record all certificate-related activities on the blockchain to create a transparent and unchangeable audit trail, fostering trust and accountability.
- **Standardize Validation:** Introduce a reliable and standardized method for certificate validation, making it easier to distinguish genuine certificates from counterfeits.
- **Prevent Fraudulent Claims**: Minimize the risk of fraudulent claims by providing a strong and trustworthy system that ensures only legitimate certificates are accepted, benefiting educational institutions, employers, and individuals

VI) Academic Objectives : (Which new technologies need to be learnt for this project work)

- To gain a deep understanding of Blockchain Technology and its Practical Application in Real world problems.
- Develop proficiency in smart contract development on the Ethereum blockchain to create a secure and transparent certificate storage solution.

VII) Requirement analysis:

a) Software requirements:

- **Node.js:** It's like the foundation of our project, helping it run smoothly.
- **Django:** This is a tool that helps in creating web applications and making our project user-friendly.
- **MetaMask:** This software helps connect our project to the Ethereum blockchain, ensuring security.
- **Truffle:** Truffle is like our project's toolbox, helping with smart contract development and Ethereum-related tasks.
- **Ethereum:** This is the blockchain we use to store and secure certificates.
- **Solidity:** It's a programming language that's essential for creating smart contracts.

b) Hardware requirements :

- We'll need specific hardware components to run our project, but these details are still being worked on, so we can't provide the exact requirements yet.

c) Operating System requirements:

- Windows 10+

VIII) Advantages of the Proposed System:

1) **Better Security:** Our system uses blockchain technology, which is super secure and nearly impossible to hack. This means certificates are safe from forgery and unauthorized access.
2) **Certificates Can't Be Altered:** Once certificates are on the blockchain, they can't be changed or faked. This makes sure certificates are always genuine.
3) **Faster Certificate Issuance:** Universities and companies can give out certificates directly on the blockchain, skipping the paperwork. This makes it quicker to get certificates.
4) **Easy Verification:** People can quickly check if certificates are real by using special links or QR codes. It's fast and hassle-free.
5) **Transparency and Trust:** Everything about certificates, from creating them to checking them, is recorded securely. This builds trust and keeps everyone accountable.
6) **Reliable Validation:** Our system brings a consistent and dependable way to check certificates, making it easier for organizations to spot real ones from fakes
7) **Saves Money:** Schools and companies can save money because they won't need to spend as much on paperwork and manual checks. Over time, this can add up to big savings.
8) **Modern and Relevant:** In our digital world, our project keeps certificates up to date and valuable. It's aligned with modern practices.
9) **User-Friendly:** Our system is designed to be easy for everyone to use. People with certificates and those who check them will find it simple and straightforward.

IX) Limitations of the Proposed System:

- **Needs Internet:** Our system depends on the internet for both giving out certificates and checking them. If you're in a place with slow or no internet, it might not work well.
- **Initial Setup Is Tricky:** At the beginning, setting up the system, creating smart contracts, and connecting it to existing systems can be complicated and take some time.

X) Future Scope:

- **AI and Machine Learning:** In the future, we can make our system even smarter by using AI and machine learning. This will help us spot fake certificates more effectively.
- **All devices Support:** We're planning to create mobile apps. This will make it super easy to manage and check certificates using smartphones and tablets.

XI) References:

1) **"Blockchain-Based Verification of Academic Credentials"** by Kimberly Davies (2021): This paper discusses the use of blockchain technology to verify academic credentials and explores its potential benefits for educational institutions and students.

2) **"Blockchain-Based Verification of Educational Certificates"** by Tarun Kumar and Manoj Sain (2020): This research paper explores how blockchain can be employed to enhance the verification of educational certificates and mitigate issues related to fraud and credential authenticity.

3) **"Digital Credential Verification Using Blockchain Technology"** by William Turner and Dilantha Silva (2019): The paper discusses the use of blockchain for digital credential verification, offering insights into the practical implementation of this technology in educational contexts.

Project Group Leader
Omraj Jadhav

Project Guide
Prof. Shabina Sayyad-Modi

Head of Computer Science & Engg. Department
Prof. Dangat G.D.