A Blockchain-Based Verification System for Academic Certificates

Shivam Bundele[1], Abhishek Nilkhan[2], Swadhin Das[3], Rutuja Kadu[4]

U.G. Student, Department of Computer Engineering, DY Patil School Of Engineering Collage, Pune, India

Associate Professor, Department of Computer Engineering, DY Patil School Of Engineering Collage, Pune, India

Abstract: *Millions of students complete their education each year and go on to do higher studies or a corporate job. In this case student credentials are verified through a lengthy document verificationprocess. This results in significant overhead as documents are transferred between institutions for verification. There is a need for an automated credential verification system which can reduce the time required for the document verification process. Blockchain Technology can be used to reduce overhead and reduce the time taken for document verification from days to mere seconds. In this work, an attempt has been made to develop a Blockchain-based verification system for academic certificates. With the advent of public Blockchain like Ethereum, DApps (Decentralized Applications) and Smart contracts, scalable and cost effective solutions can be implemented to reduce overhead and make document verification a seamless process.*

Keywords*: Decentralized Applications*

I. INTRODUCTION

A blockchain-based certificate verification system utilizes the inherent characteristics of blockchain technology to securely and transparently verify the authenticity of certificates. Traditionally, verifying certificates such as educational degrees, professional qualifications, or licenses has relied on centralized authorities, making the process prone to fraud, manipulation, and inefficiency. However, by leveraging blockchain, we can create a decentralized and tamper-proof system that ensures the integrity of certificates and enables easy and trustless verification. In this system, each certificate is converted into a digital format and assigned a unique identifier, typically a hash, using cryptographic algorithms. These hashed certificates are then stored on a blockchain, a distributed and immutable ledger that records transactions and data in a transparent manner. The blockchain ensures that once a certificate is recorded, it cannot be altered or removed, guaranteeing its integrity.To verify a certificate, the verifier can simply retrieve the certificate's hash from the blockchain and compare it with the hash of the presented certificate. If the hashes match, the certificate is considered valid and authentic. This process eliminates the need for manual verification by centralized authorities, saving time, reducing costs, and enhancing trust in the verification process.

II. RELATED WORK

Blockchain: Blockchain is an open standard developed by Learning Machine and the MIT Media Lab for creating, issuing, and verifying blockchain-based digital certificates. It allows educational institutions and organizations to issue tamper-proof digital certificates that can be independently verified by anyone

MIT's Digital Diploma: In 2017, the Massachusetts Institute of Technology (MIT) became one of the first educational institutions to issue digital diplomas using blockchain technology. MIT's digital diplomas are anchored to the Bitcoin blockchain, ensuring their integrity and allowing graduates to share and verify their credentials easily.

OpenCerts: OpenCerts is an open-source project led by the Government Technology Agency (GovTech) of Singapore. It enables the issuance and verification of educational certificates on the Ethereum blockchain. OpenCerts provides a user-friendly interface for issuing institutions to create tamper-proof digital certificates and for employers or educational institutions to verify them.

University of Melbourne's MicroCerts: The University of Melbourne in Australia has implemented a blockchain-based certificate verification system called MicroCerts. It allows the university to issue digital micro-credentials and certificates

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19

that are stored on the blockchain, providing a secure and transparent method for verifying the qualifications of students and professionals.

Learning Machine and Malta's National Credentials Verification System: In collaboration with the Maltese government, Learning Machine developed a blockchain-based national credentials verification system for Malta. The system enables individuals to securely store their academic certificates and qualifications on the blockchain and share them with employers or educational institutions for verification.

III. METHODOLOGY

Identify requirements and stakeholders: Define the requirements of the certificate verification system and identify the key stakeholders involved, such as educational institutions, certificate issuers, employers, and certificate holders.Choose a suitable blockchain platform: Select a blockchain platform that aligns with the specific requirements of the system. Consider factors such as scalability, security, consensus mechanism, smart contract functionality, and community support. Ethereum, Hyperledger Fabric, and Corda are some commonly used blockchain platforms for certificate verification systems.

Design the smart contract: Develop a smart contract that defines the logic and data structure for storing and verifying certificates on the blockchain. The smart contract should include functions for issuing certificates, storing certificate data, generating unique identifiers (e.g., hashes), and verifying certificates based on theiridentifiers.Develop the user interfaces: Build user interfaces for different stakeholders, such as educational institutions, certificate holders, and verifiers. These interfaces should facilitate certificate issuance, display certificates, and provide mechanisms for verification.Implement certificate issuance process: Define the process for issuing digital certificates on the blockchain. This may involve integrating with existing systems or developing new workflows to ensure accurate and secure certificate issuance. The process should capture relevant information, such as certificate details, issuer information, and certificate holder identification.

IV. LITERATURE SURVE

[1], in a permissioned Blockchain (Hyperledger Fabric), a user, depending upon the kind of authorization given to it, on login can query or manipulate any Blockchain data. This paper highlights the effects of resume fraud. Authors have created a platform for companies and universities using HyperLedger. Institutions can store student data and companies can store recruiting info on the platform. Users can query or manipulate student or recruit. [2], the main method is to create a hash of the fingerprints of the students which will be stored in the block and for verification, the recruiter just needs to scan the fingerprints of the candidate.[3] published in the year 2020, Simply using the hash number which was generated while creating a block as a corresponding to the original document and verifier can use this 'hash-key' to fetch the original document from the Blockchain.[4], the certificate's data is stored in the permissioned and secured network, a student can request for its certificate and the employers can verify the certificate using the hash. Using OpenZepellin to make this p2p model more secure and   IPFS   (Interplanetary   File   System) for storing certificates.

V. FUTURE SCOPE

The Blockchain module is connected to the Rinke by Test Network via a API, the module interacts with the email and web-app modules through REST API. The Email module uses the Gmail API which ensures security aspects of the emails along with listening for emails and sending it.A Flask based web app is slow, when compared with the other new web technologies. Moreover, in an OCR based technology, there's always a trade-off between speed and accuracy of the model, as accuracy is our main objective, it has some minimal effect on the overall speed of the web app and the email module. Also, the OCR module currently only works for scanned documents and for a certain certificate.

VI. PROPOSED SYSTEM

In this proposed system, we provide a platform to store and verify the student credentials using blockchain technology. With the help of the unique certificate ID, student can verify the certificate and also the company can verify whether the certificate provided by the student is authorized or notAs the blockchain is distributed in nature and is popularly known as

a distributed ledger, it is not easy to tamper the data stored in a block. The modules of the system are college, student and company. The main features of the project are enrolling the student and uploading the certificate onto the blockchain, both of which are done by college authorities. Students can view their certificates by logging in to their account.
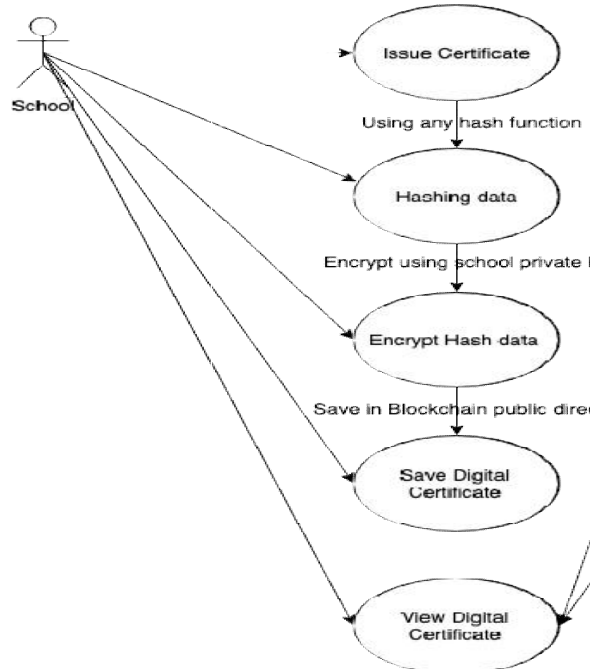
VII. EXPERIMENTAL RESULT

On the home page, we have option to login to our corresponding account as shown in Fig. 2. On logging into collge account, the college authorities have the option to enroll students and upload their certificates on to the Ethereum blockchain as shown in Fig. 3. A metamask notification pops up to confirm and perform the transaction. College can also view the certificates and details of all the students as shown in Fig. 4. As shown in Fig. 5, students can view the certificate by logging into thier account using their id provivded by the college
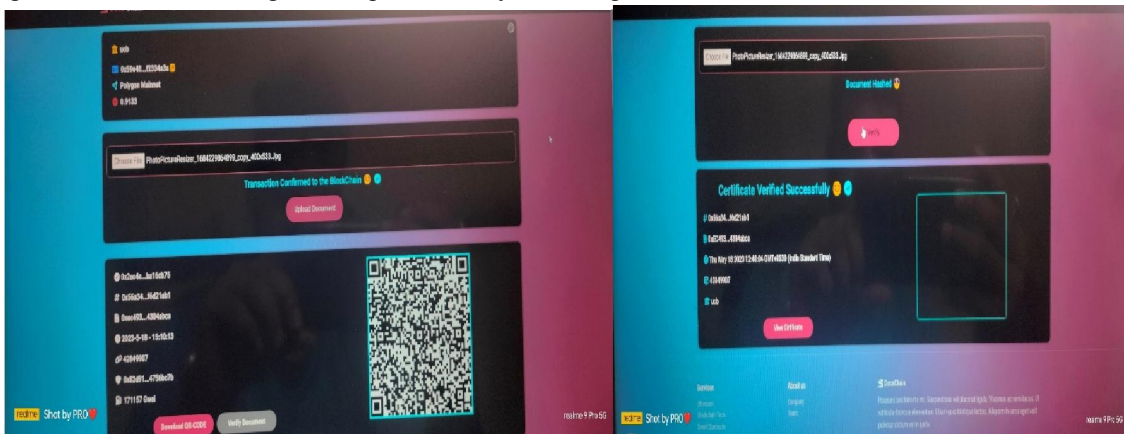
Transaction Verified and Document Verified   Document uploaded

VIII. CONCLUSION

The data stored in a blockchain will be protected as no one can tamper it or add new transactions to it with a back date. The generated unique ID for each transaction is later used to verify the certificates. This system can be used by all the universities and colleges, in order to provide extra security to the certificates and the students' data. The problem of fake certificates can be eradicated and there will be no question of its validation. In the future, this can be extended to provide

integrity to any type of documents not only to the education sector but also to government sectors where a digital document time stamp is required. Not only to store the student marks information but also to store their employment and experience data, and can also be tracked by using this proposed system.

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