Secure Blockchain For Admission Processing In Educational Institutions

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Abstract

Admission processes in educational institutions often involve paper based or centralized digital systems, which can be prone to fraud, data breaches, and inefficiencies. This project proposes a secure blockchain-based framework to streamline and enhance the admission process. By leveraging blockchain's decentralized and immutable nature, the proposed system aims to provide transparency, security, and efficiency. Key features include secure storage of application data, automated verification of credentials, prevention of data tampering, and enhanced transparency for all stakeholders, this solution addresses the challenges associated with traditional admission systems, such as manual processing, potential for fraud, and lack of trust in the system. Blockchain's cryptographic mechanisms provide robust protection against unauthorized access and data breaches.

Introduction

Block chain provides a creative approach to storing information, executing transactions, conducting tasks, and building trust. Some see Block chain as a revolutionary technology for cryptography and cyber security, with applications ranging from cryptocurrency to healthcare, smart contracts, Internet of things, smart grids governance, supply-chain etc. This research work would offer a detailed analysis of blockchain Security, Privacy and Trust. It further studies the applications of block chain technology in the domain of education and involved challenges. Finally, it proposes a block chain-based framework for secure and reliable student's record management [1]. Block chain, the technology underpinning the Bitcoin currency, is a decentralized sharing ledger that records data from the various parties participating in the Bitcoin network's transactions. The Bitcoin network, in particular, uses the Block chain to store the history of transactions as well as other transactionrelated information, such as the time that the transaction was completed, the sender's (or spender's) address, and the receiver's address. It will assist the spenders in avoiding double-spending. To secure the Block chain's privacy, all of the information is encrypted. The Block chain can also be defined as a shared ledger since it holds all of the information about all Bitcoin transactions [2]. The world of education is transitioning into the modern age. Indeed, technology and education are an excellent match that has grown in popularity in recent years. As a result, educational technology has become a worldwide phenomenon. However, we cannot discuss the use of technologies without discussing the issue of protection. Failure to adhere to adequate protection procedures will result in increased financial and human resource use. Researchers and practitioners have proposed various recommendations, approaches, and strategies that help the decision-making process on the security steps to be adopted after approaches, and strategies that help the decision- making process on the security steps to be adopted after the early implementation of technology in education. Blockchain technology, which has powerful encryption features, is one approach that has recently gained traction.

Background of Blockchain

Blockchain is the core technology used by cryptocurrency, bitcoin, through the maintenance of immutable distributed ledgers in thousands of nodes. This was the definition given by Satoshi Nakamoto [2]. As the name suggests, blockchain is a single list of chained blocks in which each block contains various transactions or some kind of data/information [3]. A blockchain network is known for its safety and security of data. Each block in the blockchain network mainly contains its own hash value, the data/information and hash value of the previous block. Any change made to the data inside a block, results in change of its hash value. This feature makes tampering of data
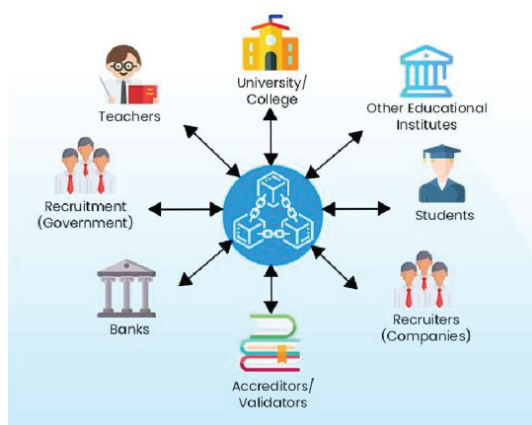
virtually impossible. Broadly speaking, blockchain technology also refers to distributed accounting techniques based on blockchain structure, including distributed consensus, privacy and security protection, peer-to-peer (P2P) communication, network protocols and smart contracts [4]. It has been known to have the ability to transform the current Internet from —The Internet of Information Sharing‖ to—The Internet of Value Exchange‖ [5]. Over the past years, Blockchain Technology has garnered much attention in the fields like finance, healthcare, governance and business operations. The reason blockchain technology has piqued the interest of researchers, industry and programmers around the world is the distinct security features it offers. Blockchain technology maintains its data in the form of distributed, decentralized ledgers. This key attribute of the technology promotes trust and reliability. It guarantees no third-party interference and provides a great amount of transparency to all the parties involved. Essentially, it is a peer-to-peer network which provides traceability and security as all nodes are connected to the adjacent nodes by a cryptographic hash function. There are two general high-level categories for blockchain approaches that have been identified: permissionless, and permissioned. In a permissionless blockchain network, no authorization is required; anyone can read and write to the blockchain. Permissioned blockchain networks limit participation to specific people or organizations and allow finer-grained controls. Based on their requirements and applications, an organization can decide which subset of blockchain technologies they need to apply [6].

Blockchains could be of different types like public, private, consortium and hybrid. Public blockchains are not owned by anyone. They are open to the public, and anyone can participate as a node in the decision-making process. Private blockchains are just that – private; i.e. they are open only to a consortium or group of individuals or organizations who have decided to share the ledger among themselves [7]. M. SWAN in his work —Blueprint for a new economy‖, says that the growth of blockchain technologies could be divided into three generations – 1) Blockchain 1.0 2) Blockchain 2.0 3) Blockchain 3.0. Blockchain 1.0 relates to development of cryptocurrencies. Blockchain 2.0 widens its scope to include applications based on loans, smart contacts, property and bonds. Blockchain 3.0 explores the possibility of leveraging blockchain technologies for applications other than finance, such as healthcare, governance and education [8].

Problem Statement

Universities around the world go through the elaborate and time-consuming task of sorting the applications, validating them against the criteria norms, verifying their credentials for authenticity and ensuring that these applications are not tampered with. The entire process is not only tedious and time-consuming but is also prone to errors. Along with this there is concern among the applicants about the maintenance of their privacy and the safety of their documents. This necessitates the use of a secure, transparent and tamper-proof platform for information exchange and validation.

Proposed system

This paper proposes the use of consortium blockchain and smart contracts for secure, transparent and automated processing of student applications received by educational institutions. The students applying for admissions in educational institutions need verifying and filtering of valid applications provides a safe and secure platform for processing student applications. This paper looks at blockchain application beyond finance and explains how the student registration and admission process can be made safe and secure for all stakeholders. It promotes a seamless mechanism with reduced turnaround time and increased security and transparency.

. This system makes the admission process efficient and secure by addressing the following key problems:

1. How can we streamline the entire process making the process more meticulous and efficient?

2. How can we authenticate documents received?

3. How can we filter out applications based on specific criteria?

4. How can the stakeholders i.e. the applicants and the institution be assured about the security of the data?

Student Application processing typically involves the following steps:

- Applicants apply online for admissions to educational institutions. They do so by registering/filling in the requisite online application form. They are required to provide personal details, academic/educational data, recommendations, digital credentials 1 issued by the qualifying universities, financial statements and proof of payment of application fees.

- The consortium blockchain gets notification of this application or transaction. The smart contract which works on the 'if-this-then-that' logic filters and selects the valid applications. Since smart contracts are deterministic in nature, they can be run on any node and cannot be tampered or forged and can be instantly verified without any additional procedure. These credentials are virtually impossible to duplicate and can be beneficial to our needs.

Blockchain-Based Admission System:

- Decentralized and tamper-proof record-keeping.

- Real-time credential verification.

- Transparent and secure admissions process and use of Smart Contracts to automate admission steps.

System architecture
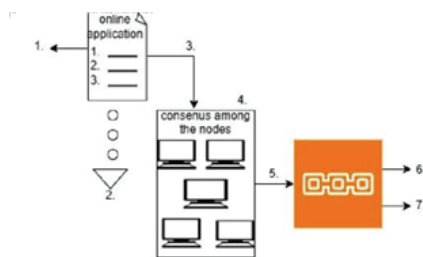
- Personal data
- Academic data
- Digital credentials
- Financial statements
- Proof of payment
    3.   Data/Transaction
    4.   smart contracts for
- Application form validation
- Document Verification
- Admission criteria fulfilment 5.Block/Transaction added

To the blockchain

    6.   Educational Institution
    7.   Student

Aim

This project aims to recognize various block-chain implementation fields that are already in use and potential block chain applications in education. It focuses on three key themes.

(1) Block chain-based educational technologies (2) The opportunities that block chain technology could bring to education, (3) The complexities of implementing block chain technology in education.

Document authentication is a critical topic with a variety of challenging and time-consuming procedures to authenticate. Various reports are also available, including banking notes government documents, transaction documents, and educational certificates [3]. Educational credentials are the most important records granted by universities to students. Fake certificates are easy to make since the issuance mechanism is not straightforward and verifiable. A well-crafted false certificate is often challenging to spot and can be mistaken for the real thing [4]. This work aims to discuss the practical applications of Block chain and further analyses the specific application of Block chain in the educational system. We propose to examine the different facets of blockchain technology's protection and privacy and its implications in educational processes.

Literature review

Introduction

The admission process in educational institutions is a critical phase that involves the collection, verification, and evaluation of student information. Traditional methods often rely on centralized databases and manual verification processes, which can be susceptible to data breaches and human error. In recent years, the application of blockchain technology in education has gained attention for its potential to provide a secure and

transparent framework for admission processing. Blockchain Technology in Education Blockchain is a decentralized and immutable ledger technology that records transactions across a network of computers. In the context of education, blockchain offers a novel approach to secure data management and verification. Each transaction, or "block," is cryptographically linked to the previous one, ensuring data integrity and tamper resistance. This makes it an ideal candidate for enhancing the admission process in educational institutions.

Benefits of Secure Blockchain-Based Admission Processing

1. **Immutability and Tamper Resistance:** - Once data is recorded on the blockchain, it cannot be altered or deleted, ensuring the integrity of admission records.

2. **Transparent Verification:** - Educational institutions, students, and relevant authorities can transparently verify the authenticity of admission documents and credentials.

3. **Data Security and Privacy:** - Blockchain employs cryptographic techniques to secure data, reducing the risk of unauthorized access or data breaches.

4. **Reduced Administrative Overheads: -** Automation

This project aims to recognize various block-chain implementation fields that are already in use and potential block chain applications in education. It focuses on three key themes.

(1) Block chain-based educational technologies (2) The opportunities that block chain technology could bring to education, of verification processes can lead to significant time and cost savings for educational institutions

5. **Elimination of Third-Party Verification:** Traditional verification methods often rely on third-party agencies. Blockchain-based systems can streamline this process, reducing reliance on external entities.

Blockchain-based systems can streamline this process, reducing reliance on external entities. Use Cases and Implementations. Several studies have explored the implementation of blockchain in admission processing:

1. "Blockchain-Based University Admission System (Smith et al., 2019): - This study presents a conceptual framework for a blockchain-based admission system, emphasizing its potential to enhance data security and streamline the admission process.

2. "A Decentralized Framework for Educational Credentials Verification using Blockchain" (KokorisKogias et al., 2020): - The authors propose a decentralized approach for verifying educational credentials, ensuring data integrity and privacy.

3. "Enhancing Educational Processes with Blockchain: A Systematic Review"** (Aljawarneh et al., 2021):- This systematic review provides a comprehensive overview of blockchain applications in education, including admission processing. Challenges and Considerations While the adoption of blockchain in education holds promise, there are several challenges to be addressed:

1.   Scalability: - Blockchain networks need to handle a large volume of transactions, which can pose scalability challenges.

2.   Regulatory Compliance: - Educational institutions must navigate legal and regulatory frameworks governing data privacy and security.

3.   User Adoption and Education: - Stakeholders, including students and administrative staff, may require training and education on using blockchain-based systems.

Existing System

Centralized Database Systems

- Student records, credentials, and applications stored in centralized databases.
- Dependent on central authorities to manage and secure data.

Challenges Faced in Traditional Systems

A hybrid deep learning approach will be employed, combining:

- BiLSTM or Transformer models to capture sequential dependencies.
- Attention mechanisms to emphasize key sarcastic words and emojis. Lexicon-based augmentation to improve interpretability and robustness.

Model Training and Evaluation

1.   Data Security Risks:

Centralized databases are vulnerable to hacking, tampering, and unauthorized access

2.   Data Integrity Issues:

Student credentials (degrees, transcripts, etc.) can be altered or forged, leading to low trust in the system.

3.   Fraudulent Admissions

Manipulation of records may allow unauthorized individuals to gain admission.

4.   Delayed Verification Process:

Verifying academic records can be slow, especially when third-party institutions are involved in manual verification.

5.   High Administrative Costs

Requires significant paperwork, manual checks, and coordination across institutions, increasing overhead

Conclusion

Blockchain is a ground-breaking system that enables people to record transactions on a decentralized, public ledger without the need for a central authority. The educational system will benefit from Blockchain in a variety of ways. The technology is ideal for storing, exchanging, and networking sensitive data in a safe manner. Many systems can be made quicker, simpler, and better with the aid of this advanced device. It bridges the difference between credentialing, copyright rights, and speedy connectivity. These traditional systems would almost certainly benefit from Blockchain in the near future. New innovations are introduced into our lives, and we must use them responsibly for change to go in the right direction. Current students will be living in a brand-new world! We should encourage them, accept the reforms, and learn how to improve things. Blockchain is a rapidly spreading technology, and it will be a pillar for many applications in the next few years. A suggestion for future work is to continue this work by conducting more interviews to identify some additional characteristics for the current application areas of Blockchain. In particular, the field of education in detail. Make Educational courses that explain blockchain technology at a reasonable cost so many people can join and review the smart contracts in more detail and study the potential risks within this area.

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