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STUDENT DATA MANAGEMENT SYSTEM USING BLOCKCHAIN

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Abstract - Blockchain technology has the potential to revolutionize the way student information is managed in the education sector. Our report presents the design and implementation of a student information system (SIS) using blockchain technology, which allows students to store and manage their personal and academic information on a decentralized platform. It also enables educators to easily access and verify student data, streamlining the process of enrolment and grading. Results from user studies and technical assessments demonstrate that the system provides a secure and efficient way to store and access student data, while also reducing the workload for educators. Overall, the report highlights the potential of using blockchain technology to improve the management of student education.

Key Words: blockchain, management, data, security, smart contracts, student information system.

1. INTRODUCTION

Blockchain technology can revolutionize how student data is stored and accessed in the education sector. A student information system (SIS) that uses blockchain can provide a secure and decentralized platform for storing student data, reducing administrative work for teachers and increasing data privacy and security. In the past, student data was stored in centralized databases that could be vulnerable to security breaches and data manipulation, and accessing and changing student information often required multiple approvals and steps. A blockchain-based SIS, on the other hand, uses distributed ledger technology to securely store student data in an open and tamper-proof manner. It also allows for decentralized access and management, allowing teachers to verify student data without relying on a central authority and allowing students to manage their own information. This system makes it easier for teachers to access and validate student data, streamlining the registration and grading processes. Overall, using blockchain technology in student data management can greatly improve the education sector. It is expected that decentralized solutions like this will become more widespread in the education sector and beyond as the use of blockchain technology increases.

2. RELATED WORK

This section of the article emphasizes several key characteristics of blockchain and explains a few concepts and theories linked to recent research on blockchain-based educational projects. Additionally, a correlation between the current secondary studies is built.

2.1 **Blockchain for Student Information System: Need of Technological Adoption.**

Blockchain technology[1] has the potential to improve the verification, authentication, and transparency of marks, as well as protect information privacy and improve data transmission efficiency. However, it is still in an early stage of development and there are challenges to be addressed before it can be widely adopted. Educational providers, particularly in higher education, are struggling to fully utilize digital technology as a tool for transformation. The researcher has conducted a review of literature to identify gaps in the current understanding of blockchain and its potential applications.As well as to develop a conceptual framework that can be used to simplify and improve the processing logic and speed applied to student information systems in management institutes. This proposed framework may be useful for future research and can help organizations design strategic policies.

2.2 A blockchain-based models for student information systems.

The models[2] that are suggested are conceptual prototypes. Each model offers a system based on ledgers. The most important data is the area of focus is transactional data. In SIS, a node's creation of a request to write a transaction initiates the beginning of the transaction life cycle. The sender node performs the subsequent actions:
1.Transaction token (T) representing the new transaction is created by the sender node. It digitally signs the transaction using \sits allocated private key. After that, send to a full node.
2.The full node verifies the received transaction using the sender node's public key and approves it if valid data is discovered.
3.Trying to add the transaction to the selected block is the whole node, which has access to the entire list of blocks.

2.3 Research paper on Student Information System.

To construct a system[3] that is both economical and environmentally sustainable, a web-based software was developed to store and maintain student and academic records. Only those with permission can access the vital data about a pupil on this software. The system has numerous security features including user authentication and will only display information that is required. Because one must log in to the portal in order to view any information, and only authorized users are granted access, this program is exceedingly safe. In contrast, file systems have much lower levels of data security than this system.

2.4 Using Blockchain in University Management System.

The method[4] increase security by utilizing hashing and data that is easily accessible thanks to decentralized data storage. By constructing three models based on blockchain, the student data may be saved. We created three blockchain models using blockchain technology. Blockchain-based model architecture is highly suited for processing large amounts of data. Student management systems (SMS) can be handled by universities in a way that considerably increases security. Decentralized data storage will make it easier to store and share data, and it might be built into the Blockchain. Another element of the ledger presents a trustworthy, highly trusted approach for accessing and storing data, serving as a suitable guide for maintaining student management systems (SMS).

2.5 Blockchain in Student Registration System.

Verifying certifications, credentials (credits), attendance, and other documentation like personal essays, letters of reference, project reports, dissertations, etc. is one of the hardest problems in the faculty entrance office. The traditional faculty admissions process will be impacted by blockchain in the following ways: sharing and certification validation. Further efforts to verify paper certificates are desired by the third parties. By requesting that the issuance certification authority, or certification authorities, keep a long-run archive, verification can occasionally be accomplished[5]. By replacing the paper-based approach, blockchain technology may assist in the digital transformation of certification processes. Additionally, it enables users to confirm the legitimacy of uploaded certificates and their own identity without having to obtain additional confirmation from the certificate provider. Therefore, it won't be necessary for colleges or universities to check the user's credentials.

2.6 Registration Student Model for Higher Education with Blockchain Platform.

The blockchain model[6] that has been put forth is based on fundamental and common business operations carried out by various colleges. The data processed is evaluated in real-time to maintain the data up to date, thoroughly vetted, and accurate. This architecture provides open and dispersed data and information integration for each stakeholder in the higher education institution as well as potential students themselves. The use of this blockchain in every step of the registration process for potential students can offer solutions to issues with lost student registration data, other unwanted things. This issue arises because the data is not verified, which provides the offenders a chance to fabricate it and sell it to those who ask for it. It is not just criminal institutions that are capable of doing this; even legitimate institutions are capable of doing this. Thus, the blockchain concept can be applied to numerous processes that take place in institutions or educational institutions. A prospective student's initial registration process at a higher education institution up until the end of his enrollment is included in this study.

2.7 A Review of Blockchain based Educational Projects.

The educational projects have a number of advantages, particularly the decentralized approach, which resolves many issues with regard to security, reduced paperwork, and employment-related issues. Adopting a common blockchain[7] to handle many billions of device-to-device transactions will significantly save the costs associated with operating big centralized data centers and will appropriately address calculation and capacity needs over the billions of devices. This will stop any one network node from causing the system as a whole to collapse in the end. For the past few years, these initiatives have been utilised to connect a variety of students and educators, and they will continue to assist small-scale IoT devices.

2.8 A Study of Student Information Management Software.

The system[8] has essentially met the requirements for the functions in the demand analysis. After successful login, the user may access the system interface. The modules that make up the student information management system include user management, class management, test subject management, and student accomplishment management. Logging is only allowed if the validation is successful. The entire system is simple to use and keep up. Due to the limited project funding available to schools, it is necessary to choose and employ the most cost-effective systems and products in order to increase the performance/cost ratio, provided that the functional requirements, system performances, and system safety and reliability can all be guaranteed. Higher standards for software robustness and reliability are then suggested. The system should be open and have a standardized, transparent external interface. But it is inefficient, not secure and as reliable as blockchain based information system.

2.9 Development of a Student Database Management System for a University

The system[9] was based on database management system. The site was created with the very basic intention of dynamically keeping student data such as mid-marks, semester grades, CGPA, SGPA, personal data, attendance, and teacher data. Coding that was clear and easy was used to program the portal. The portal may be designed easily and in the desired way with the aid of extremely user-friendly technologies, such as the Oracle 12c database, SQL Developer for database access, and Eclipse Mars 2.0 Integrated Development Environment. The portal may operate on an intranet since it has an integrated local server running Apache Tomcat 8.0 with server port 8015 and connector port 8020. The portal utilizes the following to improve its appearance and usability. Web pages were created using the Hypertext Markup Language (HTML). Web pages

were programmed using JavaScript, while the styling of the web page was done using CSS.

3. PROPOSED SYSTEM

The flowchart (Figure 2.1) given shows the flow in what way the project works:

Student logs in to the system: The student starts by entering their special login information into the system.

The student has access to their files: The student can access their records, which include grades, transcripts, enrollment history, and other pertinent data, once they have logged in.

The student asks for confirmation: The system allows students to request verification of their credentials, such as a degree or certification, if they require it.

To the appropriate authority is sent a request for verification: A university or other professional body, for example, receives the verification request for assessment and approval.

The blockchain stores verification: If the verification is accepted, a smart contract is created and stored on the blockchain. This guarantees that the verification is kept in a safe location.

The blockchain stores verification: If the verification is accepted, it is stored there as a smart contract. This guarantees that the verification is saved in a safe and unchangeable way.

Authorized parties have access to and can check the verification: Any authorized party, such as a university or company, can access the system and check the student's verification.

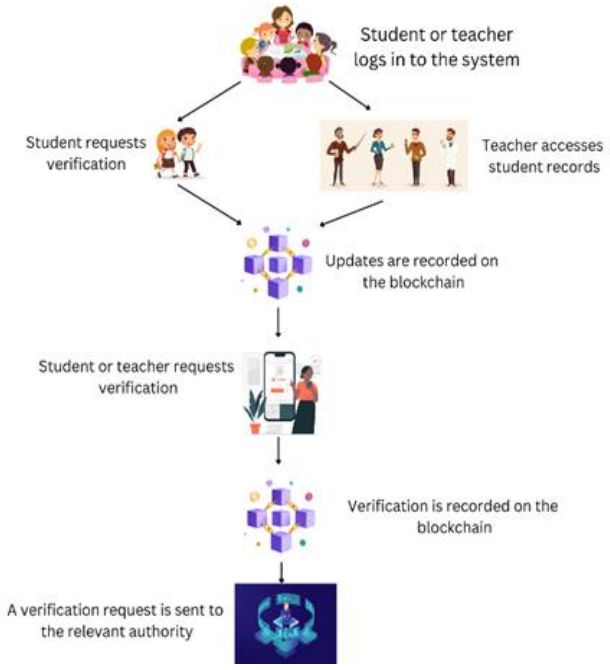

Figure 2.1: Proposed Blockchain Model

Student records can be updated: Through the system, the student can also change their records, for example, by adding new courses or accomplishments.

Information is updated on the blockchain: The blockchain's smart contract technology ensures that any alterations to the student's records are permanently and securely stored.

4. TECHNOLOGIES

Blockchain platform: A blockchain-based student information system will probably be constructed on top of an Ethereum, Hyperledger Fabric, or Corda-based blockchain platform. In order to create and implement smart contracts, which are used to store and manage student records on the blockchain, these platforms offer the fundamental architecture and resources required.

Smart contracts: These self-executing contracts are created by writing the terms of the contract between the buyer and seller straight into lines of code. They are utilised to securely, openly, and immutably handle and preserve student records on the blockchain.

Programming Language: The smart contracts will be created using a programming language, such as Solidity for Ethereum, Go for Hyperledger Fabric, or Java for Corda.

Development environment: Writing, testing, and deploying the smart contracts will be done in a development environment, such as Remix (for Ethereum), the Hyperledger Fabric SDK, or the Corda SDK.

User interface: Users will be able to interact with the student information system using a user interface, such as a web-based UI, a mobile app, or a desktop program.

Database: The student records that are kept on the blockchain will be kept in a database, such as a conventional relational database (like MySQL, PostgreSQL) or a NoSQL database (like MongoDB).

Cloud platform: The student information system may be hosted on a cloud platform, such AWS or Azure, to increase its scalability and accessibility for users.

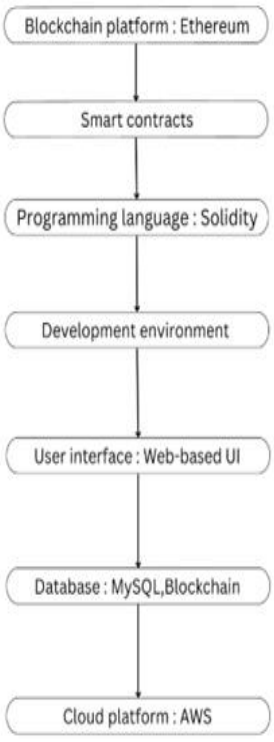

Figure 3.1: Implementation Process

5. CONCLUSIONS

In conclusion, the project aims to provide a secure and efficient way for students to store and manage their personal and academic information using blockchain technology. By logging into the system, students can access their records, which include grades, transcripts, enrollment history, and other pertinent data. They can also request verification of their credentials, such as a degree or certification, which is sent to the appropriate authority for assessment and approval. If the verification is accepted, it is stored on the blockchain as a smart contract, ensuring its safe and unchangeable location. Authorized parties, such as universities or companies, can access the system and check the student's verification. Additionally, students can update their records through the system, with any changes being permanently and securely stored on the blockchain. Overall, the project demonstrates the potential of using blockchain technology to improve the management of student information in the education sector. Currently, the website frontend is developed and the resources needed for the project have been collected. In the next phase, incorporating of blockchain platform to the backend of the website will be done, and any modifications for the system proposed will be accomplished.

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