Section A-Research paper
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Implementation and Analysis of Block chain Based DApp for Secure Sharing of Students' Credentials

Mrs. K.Lavanya
Assistant Professor, Department Of IT
Sridevi Women's Engineering College, Telangana
Teachinglavanyak@Gmail.Com

Laxmi Mounika Valivarthi
Btech, Department Of IT
Sridevi Women's Engineering College, Telangana
Valivarthilaxmimounika@Gmail.Com

Shreya Kakulamari
Btech, Department Of IT
Sridevi Women's Engineering College, Telangana
kakulamarishreyakk8@gmail.com

Aindla Raveena Reddy
Btech, Department Of IT
Sridevi Women's Engineering College, Telangana
aindlaraveenareddy@gmail.com

ABSTRACT— The purpose of this study is to use blockchain technology to address the security concerns associated with students sharing their credentials. It then suggests implementing this unique blockchain-based architecture as a decentralized software (DApp). Cost and performance analyses are also performed depending on the results of the trials

INTRODUCTION

Lifelong credentials include things like transcripts, diplomas, degrees, certificates of completion for internships and training, certificates of migration and transfer, certificates of good character, letters of reference, and so on.

The issuing and dissemination of these qualifications is an essential part of our educational ecosystem and has a significant impact on employer recruiting efforts.

Numerous measures are taken by educational institutions to ensure the authenticity of issued credentials, such as the use of a unique identification number, a hologram that can be easily identified, a passport-sized photograph of the student, and the printing of personal information such as the student's date of birth, location of birth, parents' names, registration/enrollment number, and so on. Companies must also check the credentials

they obtain directly from candidates throughout the recruiting process. Many times, businesses will call the original school to confirm the authenticity of an applicant's credentials. This is a laborious, expensive, and lengthy procedure.The advantages and disadvantages of using the technology of blockchain in the classroom have been discussed in many recent studies [1, 2, 3, 4, 5]. However, a prototype of a student-credential sharing platform that can provide services for all participants in the education ecosystem is still needed.The report makes the modest claim of three benefits:In this paper, we propose a unique but pragmatic blockchain-based architecture for securing the multi-party exchange of student credentials, and we construct a prototype of this architecture in the form of an Ethereum-based Decentralized Application (DApp).Developed smart contracts' performance is analyzed in terms of the execution & transaction cost, as well as the execution time of critical operations. The prototype's demo and execution details are available here1.

RELATED WORK

" The Potential and Pitfalls of Blockchain Technology for Classroom Use,"

Blockchain, a widely used information technology, is changing many sectors, including the educational system, in significant ways. Blockchain technology has the potential to hasten China's push toward a more contemporary educational system, meet the country's evolving demands for disease control, and inspire a new approach to how higher education is administered and taught. Since blockchain software is decentralized, tamper-proof, easily identifiable, trackable, open, and transparent, it can facilitate the realization of student-centered educational environments and an open, transparent teaching process, both of which can increase the desire to learn of English majors and the efficiency of student management and training automobiles. This article's goal is to investigate the viability of implementing a leadership and education model for English majors that uses blockchain technology to improve upon the subpar accuracy of current approaches to classifying students' levels of English proficiency. We present a Discrete Hopfield Neural Networking (DHNN)-based model for skill assessment. Before classifying students into five distinct bands based on their English proficiency, a hierarchical analysis is performed to create an assessment index system.Students' English-language skills are classified by the network using the memory associated with of the grouping criteria, and the findings are compared to those of the the BPNN model model. The simulation results demonstrate that the BPNN model achieves an accuracy of 80.0% in classifying data, whereas the DHNN model achieves an accuracy of 100.0%. The accuracy of classification and generalization capacity of the DHNN model have increased, and the model construction method and results are straightforward, proving the model's efficacy.

"GradubiquÉ: A Distributed Academic Transcript Database Built on the Blockchain,"

Although blockchain technology is still in its infancy, it has seen widespread adoption over the past few years. In the beginning, there was Bitcoin, a distributed and decentralized database used to record crypto-currency financial transactions. Bitcoin transactions are sent and verified by the network anonymously. The protocol used by Bitcoin and its functioning are so trustworthy that they have motivated developers to improve blockchain technology and use it outside the cryptocurrency industry. As awareness of blockchain's security and fault tolerance has spread within consortiums, so has the desire for private and non-cryptocurrency solutions. We provide a primer on blockchain technology by comparing Bitcoin, Ethereum, & Hyperledger Fabric, the three most widely used blockchain topologies. Then, we construct Gradubique, a blockchain infrastructure based on Hyperledger Fabric. Teachers at any institution may use Gradubique to share students' course and test marks. Gradubique makes it possible to export transcripts for use by universities and employers. The blockchain system ensures safety. Because of its dispersed structure, the network may make standardization & translation of transcripts almost free of charge.

"Allow students to keep their credentials with the help of blockchain technology,"

Southern New Mexico Community College's strategic plan served as inspiration when the college's enrollment services department began exploring digital diploma, transcript, and other credential delivery options. According to the plan's chief online education officer and chief information officer, the distribution of technology from the institution to the students was a top priority.

"EduCTX: A Distributed Ledger Technology (Blockchain) Credit Exchange,"

By eliminating the need for a central authority to record or verify transactions or store user data, blockchain technology makes possible a truly decentralized system. Every single transaction that has ever taken place is recorded in an immutable public ledger. We offer EduCTX, a worldwide network for higher education credit based on blockchain technology. The ECTS (European Credit Transmission and Accumulation System) serves as the conceptual backbone of this platform. It represents a globally recognized, decentralized credit and grading system for higher education that may provide a unified perspective for students and HEIs, as well as other prospective stakeholders like enterprises, institutions, and organizations. We provide a working prototype of the environment based on the publically available Ark Blockchain Platform to demonstrate its viability. Credits earned by students for courses taken and passed will be represented by ECTX tokens, which will be

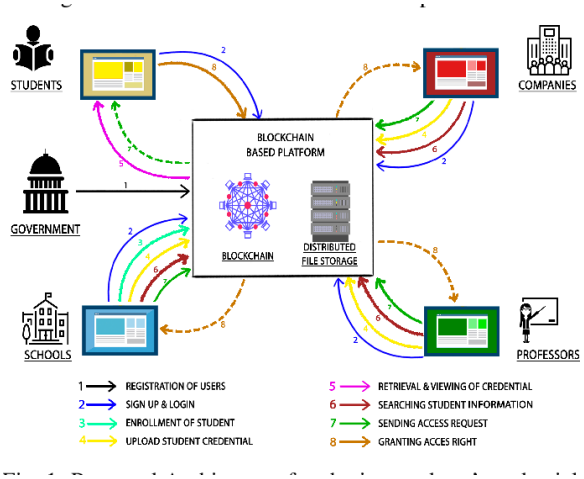
processed, managed, and controlled by EduCTX through a globally decentralized peer-to-peer network. Peers on the blockchain network are HEIs. The platform represents an early stage in the development of a more open and technologically sophisticated approach to higher education. The EduCTX platform is the foundation of the EduCTX project, which seeks to eliminate linguistic and bureaucratic obstacles to higher education by encouraging HEIs to collaborate on the development of a universal, streamlined, and efficient learning environment. In light of this, we strongly suggest that HEIs join the EduCTX project and the EduCTX bitcoin network.

"Education without trust? An academic grading blockchain,"

In order to keep student grades and supply a cryptocurrency, we have created an Ethereum-based blockchain system for usage by a university. After conducting a qualitative study on the similarities and differences between universities and distributed autonomous organizations (DAOs) on Ethereum, we uncovered numerous areas of contention. Among them are conflicts involving (i)trust-building techniques, (ii)limits to transparency, and (iii)values in procedure. In this document, we describe how we put our plan into action and what we did to test its effectiveness.

METHODOLOGY

Figure 1 depicts an architecture with five primary players, blockchain technology, and remote file hosting. The interactions between various parties are regulated by the decentralized application and the smart contracts.



Student Credential Exchange Proposed Architecture

Next, we'll talk about how different parties may contribute. The government issues individual identification numbers to each participant.All the other parties' accounts will be based on these identities. A school's enrollment roster is the source of the credentials it must issue and distribute to its pupils. On the other hand, a new school may require to examine the student's transcripts and other documents supplied by their prior school(s) before admitting them. Viewing academic credentials is a popular request among students. In addition, students must have a mechanism through which to make their credentials available to the target institution upon application or the hiring organization upon request. Applicants' academic and professional records are something all hiring companies need to see.

On the other hand, students might get certificates of completion after completing an internship or training program. When hiring for academic employment (Ph.D., Postdoc, etc.), professors, like businesses, look at applicants' qualifications. Teachers could also be expected to provide interns with a letter of reference or a formal internship completion certificate.

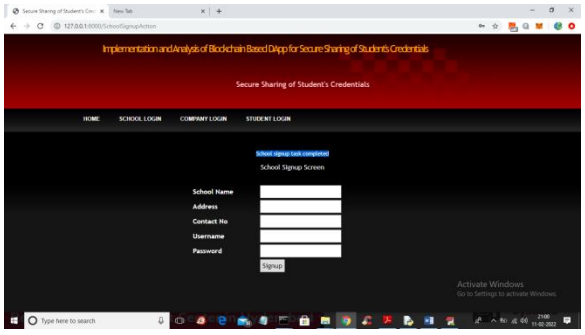
The proposed architecture's fundamental features are (i) User Registration, which creates a unique identifier for each user.

The government agency may decide how to implement the system of creating unique IDs. (ii) User registration and login, which facilitates future logins by making use of previously established information; (iii) student enrollment, which takes place at the point of admission. (iv) Credential Uploading: by Institution/Employer/Professor,

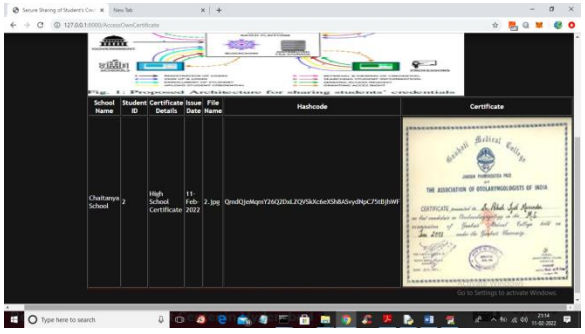
(v) Credential Viewing and Retrieval: lets students see and recover their credentials Stakeholders can search students' information (students control which data is shared), schools, teachers, and employers can request access to a student's credentials, and students can approve or deny these requests for access to their data by using the system's grant access right feature.

RESULT AND DISCUSSION

Blockchain has built-in protection against security and Distributed Access (DApp), which means the same application information will be kept at a number of nodes or servers and, in the event of a server outage, users will still have access to the data via the remaining nodes. Each piece of data is treated as a transaction on the blockchain, and each transaction is given a unique HASHCODE. The Blockchain protocol requires all previous HASHCODES from all nodes to be confirmed before a new block is added. A node is considered compromised and might be asked to recover if its HASHCODE does not match any other node's.Previously, all student IDs were stored in a single, vulnerable server. Blockchain technology eliminates this risk by decentralizing the storage of student IDs.



Login and sign up for the student business



Check Your Credentials

CONCLUSION

In the study, a blockchain-based architecture for the safe transfer of student IDs is presented.

Additionally, a DApp is built and evaluated for efficiency in terms of both cost and runtime. In the future, we want to expand on this work by combining privacy considerations with security concerns.

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