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DApp (Decentralized Application) Development and Evaluation for Safe Student Credential Sharing on the Blockchain

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ABSTRACT

Decentralized Application is majorly used for sharing the most important information of the students' among various users. Blockchain technology is used to address security concerns associated with students' credential sharing. A revolutionary blockchain-based architecture is proposed, and the application is then built as a distributed one (DApp). In order to avoid the counterfeiting of the students' credentials the features of block chain technology are more widely used. This application is used to share the credentials of the student by the college/school directly to student and those data can be used by the companies those who recruit students can directly access students' data by getting the permission from students' without any third-party involvement, this saves time and money. Ethereum framework is used to create an application in which Truffle framework is used to make the developer's life easier by creating smart contracts and has the migration and uses web3.js as it is beginner friendly. Furthermore, the results of the tests are used to analyses both costs and efficiency.

Keywords: Blockchain, Ethereum, DApp, Smart Contracts

1. INTRODUCTION

A person's vital credentials include their transcripts, diplomas, degrees, certificates of completion for internships and training, certificates of completion for migration and transfers, certificates of good character, letters of reference, etc. [10]. The issuing and dissemination of such credentials is a crucial part of our educational ecosystem and is widely valued by businesses in their hiring efforts [13]. Educational institutions use a variety of measures, including the assignment of a unique identification number, the application of a distinguishable hologram, the attachment of a passport-sized photograph of the student, and the printing of personal information like the student's date of birth, where they were born, parents' names, registration/enrolment number, and so on, to confirm authenticity of the credentials that are issued [11]. A company must also check the credentials it gets directly from candidates throughout the hiring process. The reverse is also true; sometimes, businesses will get in touch with the issuing school to confirm the authenticity of an applicant's credentials. To put it simply, it's a lengthy, expensive, and time-consuming procedure. Papers [1, 2], [3], [4], and [5] are examples of recent works that discuss the merits and demerits of implementing block chain technology in the classroom. The primary benefit of using block chain technology for sharing students' credentials is that certificates issued by educational institutions can be counterfeited, but this technology addresses the issue by storing certificate images in the form of hash codes that cannot be accessed by anyone [6], [7]. The Inter Planetary File System (IPFS) is typically used for storing data like certificate images in the form of cryptographic hashes [8], [9]. This does not allow users to share information with specific parties. The education ecosystem would benefit from a prototype student-credential sharing platform that would be useful to all parties involved. The data in block chain is stored in the form of blocks and for every new transaction a new block will be created that is linked to previous block [12]. This study makes three quite modest statements about its significance: To facilitate the safe transfer of student credentials between different parties, we propose a unique but practical block chain-based architecture and create a Decentralized Application (DApp) on the Ethereum block chain to test its viability. The performance of the created smart contracts is evaluated by calculating the time it takes for critical activities to complete and the amount of money it costs to execute them.

2. RELATED WORK

"The potential and difficulties of using block chain technology in the classroom "Block chain technology is one of the most cutting-edge developments of recent years, and it is gaining widespread interest from a wide range of sectors, including the academic community. This is largely because to its many desirable properties, including decentralisation, transparency, traceability, security, & dependability. Nevertheless, despite its potential, block chain technology is still struggling to get widespread support. That's why we set out to do what we did: evaluate previous research that's tackled the problems associated with using block chain technology in academic settings. Among the records that were initially reviewed, 32

publications were selected for full-text analysis, covering the years 2017 through 2022. In this overview to report and categorise 14 difficulties, The technology-organization-environment (TOE) framework was used. Furthermore, our analysis revealed that, in contrast to technology constraints, the literature paid less attention to organizational and environmental barriers.

" Gradubique is a block chain-based repository for student transcripts,"

Although still in its infancy, block chain technology has seen widespread adoption over the last several years. Bitcoin, a distributed and decentralised ledger for keeping track of crypt-currency transactions, was the first widely-known application based on block chain technology. Bitcoin's network members anonymously move funds and verify transactions. Because to the trustworthiness of the Bitcoin network and its operations, developers have been motivated to improve block chain technologies and apply them outside the realm of cryptocurrencies. Blockchain's security and fault tolerance have led to a boom in need for private and non-cryptocurrency solutions among consortium. We provide an overview of Bitcoins, Ethereum, and Hyper ledger Fabric, the three most well-known block chain architectures, to help set the stage for understanding block chain technology. After that, we create Gradubique, a block chain platform based on Hyper ledger Fabric. Any school's teachers may use Gradubique to share student performance data, including test and course grades. Gradubique transcripts may be downloaded by prospective employers and graduate institutions. The block chain system ensures safety. As the network is decentralised, it may be possible to provide tools for automatic transcript standardization and translation at no additional expense.

"EduCTX: A Credit Exchange for College Students Built on Block chain"

Decentralized environments, in which no one entity has access to either transactions or data, are made possible by block chain technology. With a public ledger, all completed transactions are recorded so that they may be independently verified. Our team has proposed a block chain-powered network called EduCTX for international college credit transfer. The ECTA idea, upon which this platform is founded, is used to manage monetary transactions (ECTS). It's a decentralised credit and grading system for higher education that's trusted throughout the world and can provide a uniform perspective for students and HEIs around the world. We demonstrate the viability of this ecosystem by presenting a working prototype built on top of the publicly available Ark Block chain Platform. Tokens known as ECTX will be used to represent course completion credits and will be processed, managed, and controlled by EduCTX, a decentralised peer-to-peer network operating on a worldwide scale. The peers of the distributed ledger are Higher education institutions (HEI's). This platform is an early-stage effort to make higher education more open and technologically savvy. The foundation of the EduCTX project is the EduCTX platform, which seeks to eliminate linguistic and bureaucratic hurdles to higher education by encouraging HEIs to collaborate on the development of a universal, streamlined, and efficient platform. This is why HEIs are being called to join the EduCTX project and the EduCTX block chain network.

3. METHODOLOGY

Next, we'll talk about how different parties may contribute. All citizens are given official identification by the government. Individual accounts for all other parties involved are then set up using these identities. In order to grant and distribute credentials, schools maintain a list of students who are currently enrolled at that institution. Nonetheless, a new school may need to review the student's transcripts and other documents supplied by their former institution if the student applies to enroll there (s). College-goers are interested in seeing a copy of your transcript. In addition, applicants need a mechanism to make their credentials available to their preferred institution upon application or employer throughout the hiring process. Applicants' academic and professional records are something all hiring organizations must see. Instead, students would get certificates upon finishing an internship or training programme. In order to fill jobs such as Ph.D., Postdoc, etc., professors, like businesses, must look at the applicant's qualifications. Instead, instructors may need to provide students with a certificate of completion for an internship or a letter of reference.
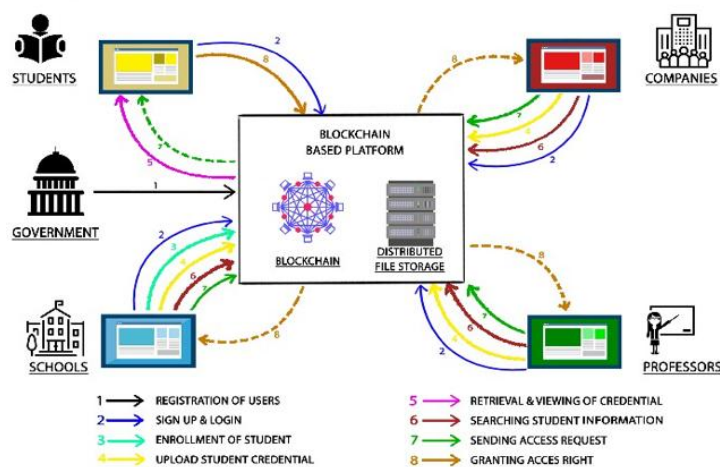

Figure 1: Work Down Structure

4. RESULT AND DISCUSSION

After the student's credentials are entered and the certificates are uploaded, they will be securely kept on the block chain. After this is done, if we need to update the certificates, we may do so by clicking the update certificate button on the screen below.The certificates will be safely stored on the block chain when the student's credentials have been inputted and the certificates have been uploaded. If we find that our certificates require updating when this is complete, we may do it by selecting the update certificate option on the screen below.
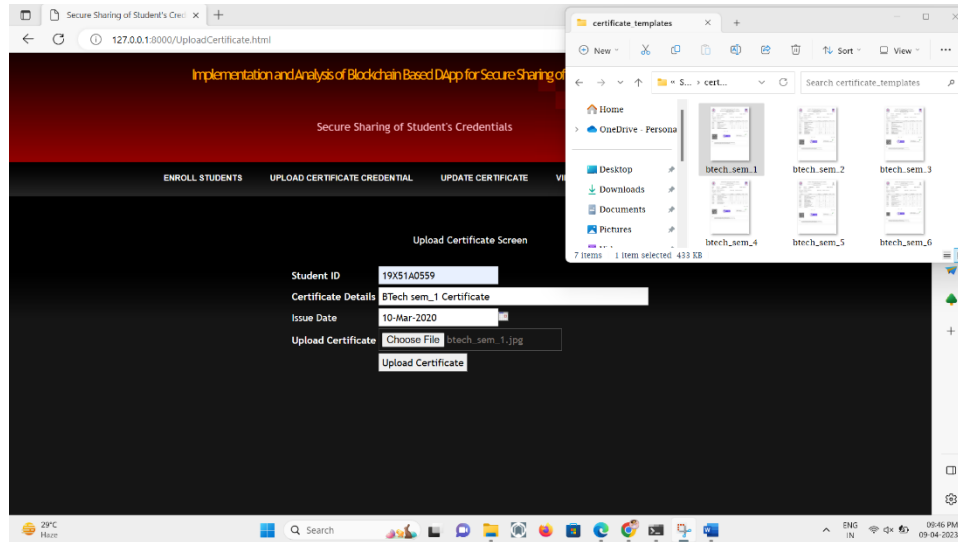

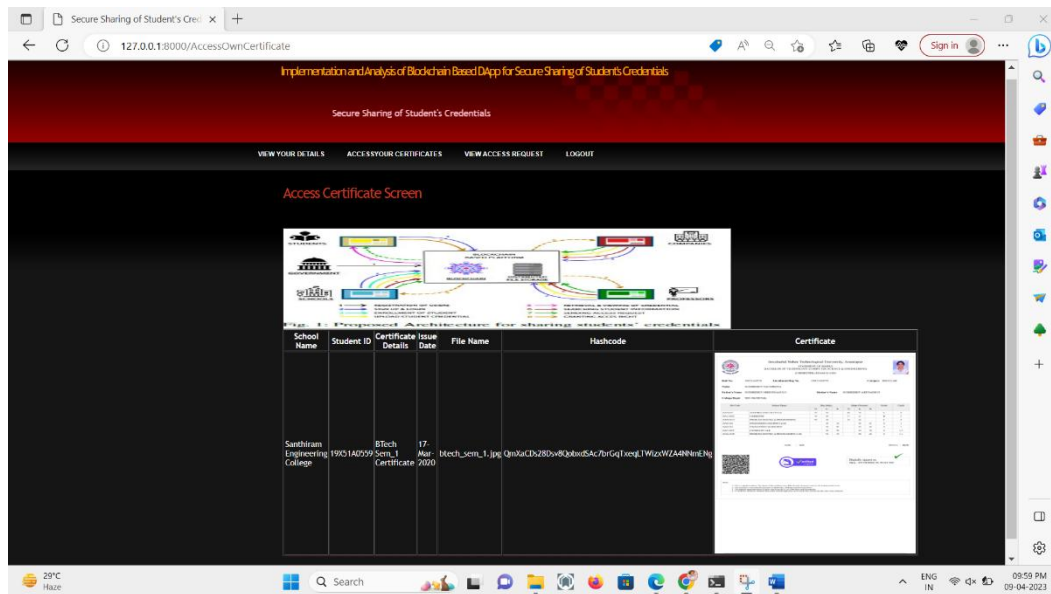**Figure 2: Uploading Certificates by School Screen**

Figure 3: View Student's Credentials by Student Screen

5. CONCLUSION

Sharing the students' credentials is the major problem for the organizations to issue to the students. For resolving such issues, a decentralized application (DApp) has been built using Block chain technology which provides the security and decentralization features. During this framework development the regulation of educational body and convenience of the student, both factors are being considered. This application develops a good communication in between the students and organizations. The security and authenticity are being ensured by the smart contracts in the block chain. In the study, a block chain-based architecture for the safe transfer of student IDs is presented. More so, the efficiency is evaluated based on the money and time and hence a DApp is built. We want to expand the current effort in the future to include privacy in addition to security.

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