

Frauds Avoidance of Digital Educational Certificates Using Blockchain

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Abstract- This research paper highlights the Blockchain technology for the educational certificates. The current paper proposed that Blockchain can be used to secure the educational data like academic credentials and academic certificates. This paper first introduces the core problem which we are facing in the educational sector and then talk about some use cases in education using Blockchain. We are using the Blockchain to reduce the frauds in education institutions. Another benefit of using Blockchain technology is to reduce the data management costs. Blockchain technology permits for consumers to verify the validity of certificates straight against the Blockchain, without the requirement to communicate with the organization that initially delivered them. At the end we will compare our proposed model with some other Blockchain models in education. This Blockchain technology can also be implemented for many other educational data with a little changes.

Index Terms- Blockchain, Frauds, Cost management, Bitcoin, Education, Security, Certificates, CAs, Third parties, Sharing, Ethereum

I. INTRODUCTION

Blockchain is a decentralized transaction and data management technology developed first for Bitcoin cryptocurrency [1]. Currently Blockchain technology can be seen in various fields such as cryptocurrencies in the financial area like Bitcoin, Ethereum, and Zcash etc [2]. Just like other industries, Blockchain has power to revolutionize the future of education. First of all we can deliberate our problem statement in education. Why Blockchain is important in education? Our educational system is centralized. All the educational certificates and other information are mainly managed by schools, colleges or universities. Our first and foremost problem in education is the fraudulent and illegitimate academic documentation. People want quick access to postsecondary or tertiary education so they obtain an illegal way to find fake certificates. A good example of fake certificates are “Diploma Mills”. It can be easily generated by modern technology [3]. Some of the universities like Linköping University are issuing digital certificates. And no doubt that these digital certificates have reduced the waiting time for students. But still in this case hacking and modification is easy by hackers, if they access the administration access [4]. “Blockchain records are stored permanently, so documents such as degrees and course certificates can be secured and verified, regardless of whether or not a user has access to an institution’s record-keeping system [5].”

The second problem is mutual verification done by institutions. In education system, manual verification is almost impossible due to bulk amount of data. Blockchain can eliminate fraud by avoiding manual verification of transcripts and other documents. Blockchain is a distributed database solution that maintains a continuously growing list of data records that are confirmed by the nodes participating in it. The best thing in the Blockchain is that all the nodes are all anonymous [1]. The third challenge in education industry is the sharing of documents and academic certificate in a safe and quick way. The Blockchain can give an opportunity for users or students to independently and privately verify that shared records are authentic and unadulterated.

Why we need a system for all educational certificates? We need a secure system to manage and authenticate all the student records. Mostly the authentication can be done by the schools, universities or an education commission by manual way. With the invention of this system, students can check and even manage their records easily, universities can authenticate the degrees and certificates by a secure and quick way. The most important feature is the detection of the frauds in the educational sector. Until so far, there is no standard platform for the online authentication of the educational records. Within education, activities likely to be disrupted by Blockchain technology include the award of qualifications, licensing and accreditation, management of student records, intellectual property management and payments Blockchain technology will provide Self-sovereignty, Trust, Transparency & Provenance, Immutability, Disintermediation and Collaboration [1]. What is the big challenge in the educational section? There is a constant regulations in the education sector. This problem is making an expectation gap because students want their needs met quickly and with zero error [5].

What we are going to do? We are making Blockchain smart contacts in the education sector. Everyone will have a smart contact. These smart contact can be tracked and managed with a minimum of effort. We can even link two or more smart contact. By doing this, two or more universities can be linked publically and they can share their records with imitations of access. Distributed ledger technology could help ease other administrative burdens as well [6].

II. RESEARCH BACKGROUND

Blockchain is still new in education so there are not too many research papers on it. There is a prototype of educational certificate developed at the MIT Media Lab and by Learning Machine which is named as Blockcerts. Blockcerts is the first open standard for creating, issuing, viewing, and verifying Blockchain-based certificates [7]. There are several papers written on securing educational credentials. Educational Credentials must transferred in secure way. There is already a detailed publication by the Joint Research Centre (JRC), the European Commission’s science and knowledge service on this topic. This paper presents the fundamental principles of the Blockchain focusing on its potential for the education sector [1]. This research paper has the same agenda but it try to hide some of their limitations. The JRC paper did not describe the cryptographic techniques but we will discuss some use cases to get some useful results by using cryptographic techniques. There is another recent research on education done by Cognizant. They discussed the 5 use cases in the Blockchain. They filled some gaps which were left by JRC research. They gave a detailed overview that how a student can store her information by using digital certificates.

Both of these paper covers the basics of Blockchain and how it work? But the use cases discussed in the both papers are totally different. We also got many information from some websites about the application of Blockchain in education. Like VTRADEtech discussed the use of Blockchain in primary schools. They are also agreed that keeping the records on a Blockchain-based system allows schools to assure the authenticity of any certificates and decrease the frauds [6]. Our main concentration of this paper is to furnish the existing use cases discussed in the recent research. We covered more use cases for writing this research paper. Of course, we took help from previous papers to apply the same methods but with some recent advances. We are going to provide a complete flowchart of our use cases. We will also make a prototype to prove some of the hypothesis done by JRC. Our main motive is to explore the limitations of previous research. Blockchain technology is growing really fast. Almost, 90% of European countries banks were reconnoitering Blockchain in 2018. It is estimated that the Blockchain market will upswing up to 20 billion dollars till 2024. Internet of Things (IoT) is struggling to make our lives better [9]. More and more people are involving in this technology and fresh revolutions can be grasped every day.

III. METHOD

We followed some steps for our research methodology. First one is literature review. Literature review can provide a systematic review and can increase the efficiency of our research paper. In the first method, we gathered the data from internet. This is a significant step to review the detailed procedure of Blockchain and it has many other aspects. This method also helped us to eliminate the irrelevant articles for research work and it also check the quality of the recent articles. Next step was the extracting the data from the selected articles. We only extract the data which are related to our problem statements. We searched the data from famous websites ACM Digital Library, Google Scholar, and IEEE Explore to find the relevant articles for our topic. Last step is to analyze the information which is collected by the previous steps. We also analyzed the Bitcoin to implement the technology of Bitcoin in the educational sector. The following section will describe how these steps were performed to make the use cases to reduce the frauds in education institutions.

All the research paper is based on three problem statements

Why Blockchain is important in education?

How mutual verification is done by institutions?

Why we need a system for all educational certificates?

In the first procedure, based on our problem statements we formulated some search query strings like “Blockchain and Education”, “Application of Blockchain in Education” and so on (see Table 1).

Table 1. Searched Query Strings

| Database | Query Strings |
|---------------------|---|
| ACM digital library | (Blockchain in Education), (Application of Blockchain in Education), (Blockchain and Education), (Blockchain and Digital Certificates) and (Securing Educational certificates by Blockchain), (Certificates management) |
| IEEE Xplore | (Blockchain in Education), (Application of Blockchain in Education), (Blockchain and Education), (Blockchain and Digital Certificates) and (Securing Educational certificates by Blockchain), (Digital Certificates) |
| Google Scholar | (Blockchain in Education), (Application of Blockchain in Education), (Blockchain and Education), (Certificates management) |

Next step is to exclude the articles and we defined some criteria to skip the articles. An article was declined if 1) it's not in English language. 2) If paper is available but incomplete. 3) If it's based on old technology 4) if it's more theoretical and not practical. 5) The articles having duplicate material also removed. In the last step, data was analyzed. We mostly focused on the headings in the selected articles like abstract, applications, drawbacks, future works, conclusion and challenges. We wrote all the use cases by the data analysis of all these headings.

IV. USE CASES

We developed three use cases based on asymmetrical cryptography. Our first use case is generation of digital certificate.

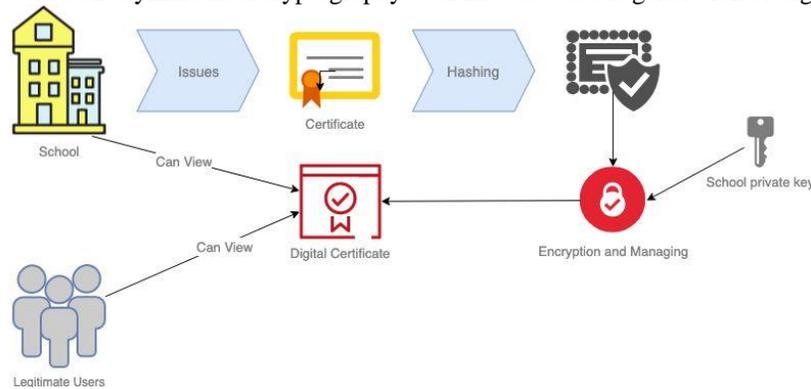


Figure 1: Creation of digital Certificate

1. The procedure of creating a digital certificate is really simple. This procedure is done by the school using some tools. First step is to hashed the certificate and generate a fixed length code. Next step is to use the asymmetric algorithm to generate the digital certificate by using school private key. This digital certificate is added to Blockchain and any legitimate user can see these details. A use case diagram is shown below. By using asymmetric cryptography we can also confirm that only school has the right to build this certificate. And only those users can view the certificates who are legitimate users. Once your information entered in Blockchain, then it's neither get lost nor tampered.

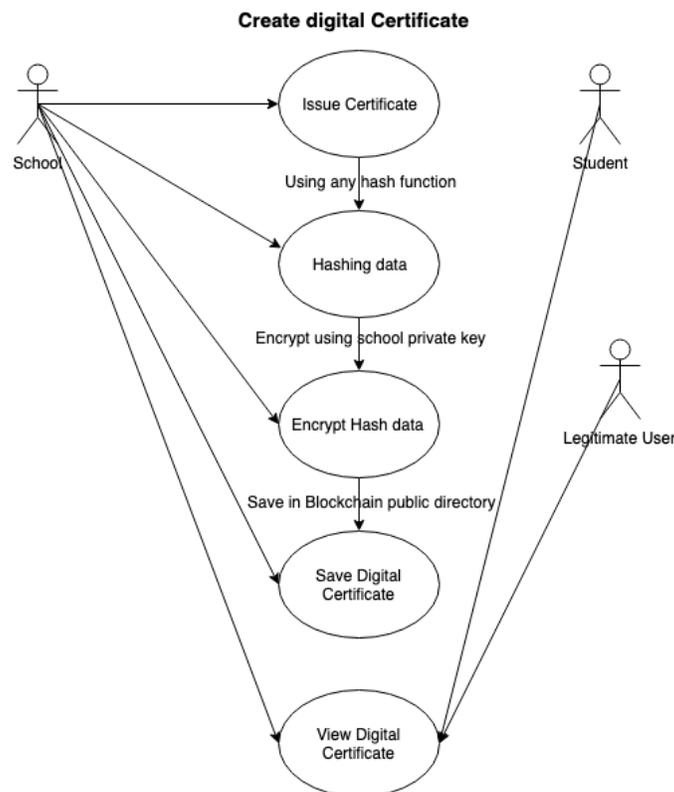


Figure 2: Use Case Diagram for Creation of digital certificate

2. The second use case is the verification of the digital certificate. As we know our second problem that “**Manual verification is impossible.**” Blockchain provides a perfect solution for verification. “Verifiability, for instance of the authenticity of academic qualifications, is a very important capability: Blockchain enables you to check that a record was genuinely made by who it says that it

was made, and that its content has not been tampered with. Another capability is that it is a ‘multi-write database’: it allows records to be added by different parties who do not necessarily trust each other. These parties should also be interested in the same data [8].” This kind of verification can eliminate the manual work and many middle parties which are involved in the verification of documents. It can also save significant amount of time and money.

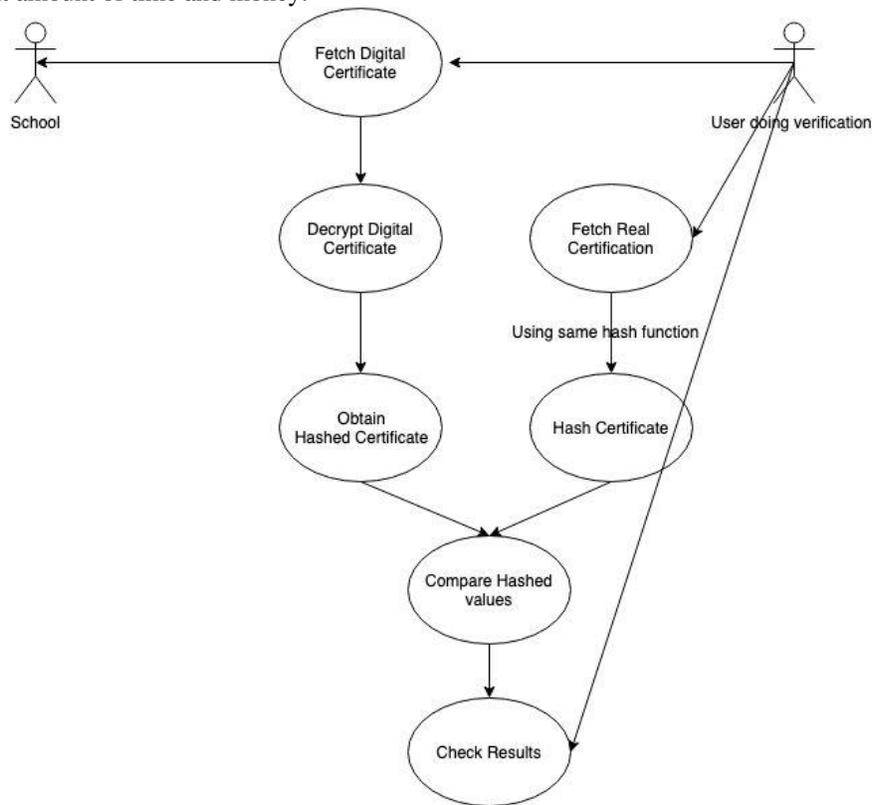


Figure 3: Verification of Digital Certificate

3. Once you got certificates from your school and it's also verified. The next step is sharing. You can be anyone, a Job seeker, advance learner or Job providers. Once your data is on Blockchain. There is no need for trusted parties or CAs. Anyone can authenticate educational certificates without interference from the certificate publisher. It's also simple to share the certificates with others using Blockchain. You just need to send a URL or badge via email or social media. There is no need to authenticate the certificates again and again once it is placed on the Blockchain.

Sharing Credentials through Blockchain

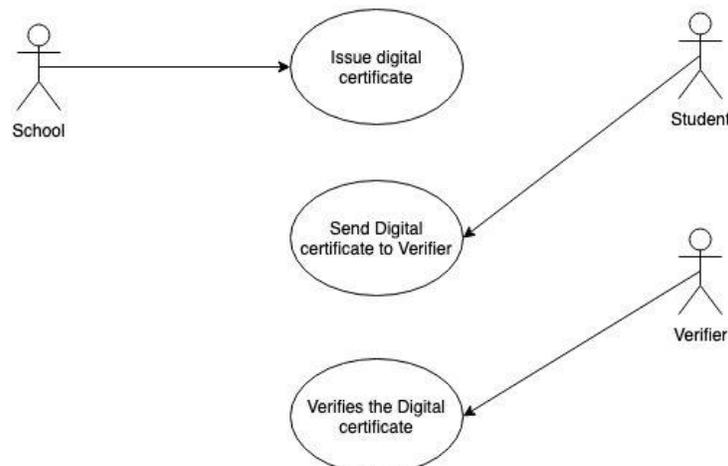


Figure 4: Sharing Credentials through Blockchain

V. CONCLUSION

What's the biggest problem in education section? Education is facing huge problem of frauds and tampering. U.S.-based Council for Higher Education Accreditation has projected that almost 100,000 fake degrees are sold yearly. One of the law professors from Ohio State also noticed that there are almost 500,000 Americans, who are having fake degrees. No doubt that universities are working to secure their credentials but still it's not enough. What we did in this research? We gave a Blockchain-enabled solution to verify the degrees issued by accredited universities to save time and money of students. These use cases can become a solid base for the implementation of fraud avoidance in education. We proposed a Blockchain certification platform to avoid from the CAs in school. Many big companies are working on it like IBM, Sony, MachineLearning, Blockcerts and RecordsKeeper.[10].

What can Blockchain do in future? Blockchain can overcome the loopholes in the current system. If we take the example of Bitcoin then it can be replaced with the PayPal or other money exchange system. Ethereum can make the world smarter and faster with more flexible smart contracts. If we relate this Blockchain technology back with the internet technology then both have something common. For the internet, no one cares today. For Blockchain, no one will care tomorrow.

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