

BLOCKCHAIN IN EDUCATION: APPLICATION OF BLOCKCHAIN TECHNOLOGY FOR VERIFICATION OF DIGITAL DIPLOMAS

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Abstract

Currently, technologies are developing very quickly and the need for information security is constantly increasing. In this connection, Blockchain technology is becoming in demand, which allows us to keep information safety and integrity. In addition, the technology enables the creation of a decentralized environment where transactions and data are take place without any third party organization. We proposed a decentralized web resource based on the Ethereum platform for managing student credits. The decentralized application (Dapp), will process, manage and control tokens, which represent credits that students gain for completed certain courses. The credit system is a first step towards a more transparent and technologically advanced form which could be used by universities and students to manage credits. The novelty of this scientific research is official documents of the educational process issued by universities as a transcript, a diploma with attachments, a certificate for additional education are not secured against unauthorized changes to critical data. It became necessary to apply a new approach to secure storage of records with data on academic performance at all stages of the learning process.

Keywords: blockchain, verification, digital diploma, personal data, Ethereum.

Аннотация

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БЛОКЧЕЙН В ОБРАЗОВАНИИ: ПРИМЕНЕНИЕ ТЕХНОЛОГИИ БЛОКЧЕЙН ДЛЯ ВЕРИФИКАЦИИ ДИПЛОМОВ

В настоящее время технологии развиваются очень быстро и потребность в информационной безопасности постоянно растет. В связи с этим технология Blockchain становится востребованной, что позволяет нам сохранять безопасность и целостность информации. Кроме того, технология позволяет создавать децентрализованную среду, в которой транзакции и данные осуществляются без какой-либо сторонней организации. Мы предложили децентрализованный веб-ресурс на основе платформы Ethereum для управления кредитами студентов. Децентрализованное приложение (Dapp) будет обрабатывать, управлять и контролировать токены, которые представляют собой кредиты, которые студенты получают за прохождение определенных курсов. Кредитная система является первым шагом к более прозрачной и технологически продвинутой форме, которая может использоваться университетами и студентами для управления кредитами. Новизной данного научного исследования заключается в создании информационного веб-ресурса на базе технологии Блокчейн. Благодаря этому ресурсу, появляется возможность сделать отслеживание оценок студентов и получать достоверную информацию о высшем образовании. При этом полностью исключается возможность вносить изменения в существующие записи.

Ключевые слова: блокчейн, верификация, цифровой диплом, персональные данные, Ethereum.

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БЛОКЧЕЙН БІЛІМ САЛАСЫНДА: БЛОКЧЕЙН ТЕХНОЛОГИЯСЫН ДИПЛОМДЫ ТЕКСЕРУ ҮШІН ҚОЛДАНУ

Аңдатпа

Қазіргі уақытта технологиялар өте тез дамып келеді және ақпараттық қауіпсіздікке деген қажеттілік үнемі артып келеді. Осыған байланысты, Blockchain технологиясы сұранысқа ие болуда, бұл бізге ақпараттық қауіпсіздік пен тұтастықты сақтауға мүмкіндік береді. Сонымен қатар, технология орталықтандырылмаған ортаны құруға мүмкіндік береді, онда транзакциялар мен мәліметтер үшінші тарап ұйымысыз жүзеге асырылады.

Біз студенттердің нәтижелерін басқару үшін Ethereum платформасына негізделген орталықтандырылмаған веб-ресурстарды ұсындық. Орталықтандырылмаған бағдарлама (Dapp) студенттерге белгілі бір курстардан алған нәтижелерін білдіретін жетондарды өңдейді, басқарады және басқарады. Несиелік жүйе – бұл университеттер мен студенттер несиелерді басқаруда қолдана алатын ашық және технологиялық тұрғыдан жетілдірілген формаға алғашқы қадам. Бұл ғылыми зерттеудің жаңалығы – Блокчейн технологиясына негізделген веб-ақпараттық ресурстарды құру. Осы ресурстың арқасында студенттердің бағаларын бақылауға және жоғары білім туралы сенімді ақпарат алуға мүмкіндік туады. Бұл қолданыстағы жазбаларға өзгерістер енгізу мүмкіндігін толығымен жояды.

Түйін сөздер: блокчейн, верификация, сандық диплом, жеке мәліметтер, Ethereum.

1 Problem definition

Falsification of qualifications is widespread throughout the world. 30% of senior executives represent qualifications they do not possess. There are enough paid services on the Internet for the production of fake diplomas. The Google search engine returns more than 24 million results for the query “fake diplomas”. Validation of the authenticity of diplomas and applications is a complex, inconvenient and time-consuming and expensive operation. This can be especially noticed when employers apply to the place of study of the applicant with a request to confirm the authenticity of the documents on graduation from the educational institution. Every year, about 500 thousand requests come to the Ministry of Education and Science to confirm the authenticity of diplomas. The Ministry of Education and Science, in turn, due to the lack of a common database, cannot independently determine the authenticity, since all copies of documents are stored in the university's archive in the graduate's personal file. In this regard, the Ministry of Education and Science applies to universities to obtain accurate information. The process of obtaining feedback from universities takes 1-2 weeks, which is critical for employers.

This paper aims to show some practical implementation to solve this kind of problems via using blockchain. Development of an information system for a unified digital register of official documents of the educational process in universities based on blockchain technology integrated into an international platform to ensure cryptographic protection and integrity of digitized data stored in a decentralized system and provide a flexible opportunity to verify the authenticity of official documents.

2 Methodology

- Take the Ethereum platform as a basis, passing certified courses in application development on the Ethereum platform.
- Development of the program logic of smart contracts, which allows you to record the student's progress throughout the entire educational period and, when fulfilling pre-regulated consensus, form official documents of the learning process.

3 Related works

After the appearance of Bitcoin [1] in 2009, Blockchain technology has been applied to many fields, including medicine [2, 3], economics [4], Internet of things [5], education [6, 7], voting [8] and so on. Its underlying technique has shown promising applications prospects and attracted lots of attentions from academia and industry. Besides cryptocurrency one of the relevant areas is blockchain in education, however, the studies on the blockchain technology are still very new, reflections on the education are still at the beginning stage. Therefore, some of these few studies of the filed are briefly summarized.

One of the studies addresses the value decentralized ledgers, in particular those based on blockchain, may bring to stakeholders within the educational sector, with a particular focus on its potential for digital accreditation of personal and academic learning. As well as focuses on the feasibility, challenges, benefits and risks of the Blockchain as applied to formal and non-formal education credentials [9]. This postgraduate dissertation study addresses some problems that centralized e-learning platforms may encounter and emphasizes the importance of decentralized access control in solving these problems. In this study, a model proposal for decentralized access systems is presented. In the realization of this model, blockchain structure was utilized. Thus, it is argued that the integrity, correctness, deniability, and traceability of e-learning sources can be achieved. The mean response time was used as a metric when evaluating the proposed model. The two different network environments (such as the Local Area Network (LAN) and the Cloud Web Service (i.e. Amazon Web Service)) are compared. It is stated that LAN environment represents the most appropriate condition and the cloud environment represents the real situation in the real world. The average response time in the LAN environment is faster (about 1.5 times) than in the cloud environment, but when

the number of customers is large, the difference in average response time between these two environments becomes insignificant [10].

Another study describes a decentralized learning system CHiLO which utilizes e-books. In this study provided a basic demonstration of the first stage “content exchange” and demonstrated the making of e-books while protecting copyright by using the blockchain [11].

A study in which using blockchain as a tool for tracking and verification of official degrees is addressed the main concepts of blockchain and the particular implementation of Blockcerts as an opensource solution devoted to the certification and verification of documents. As well as briefly introduce the Higher Education market in Europe to determine the volume, geography and trend of the economic sector to address the developed solution [12].

In this research blockchain in education address the fundamentals and developments of blockchain technology and suggests a reflection and a debate which should address in the near future the impact, or not, of blockchain in education [13].

4 Implementaions

Scenario:

- Student to complete studies at the university they must get 240 loans throughout the four year, for this will be separate smart contract
- After the semester of study, an employee (teacher) of the university with certain access rights to information about academic performance of university students transfers to the loans to student’s view
- Upon successful accumulation of all loans, smart contracts will register a diploma for this student

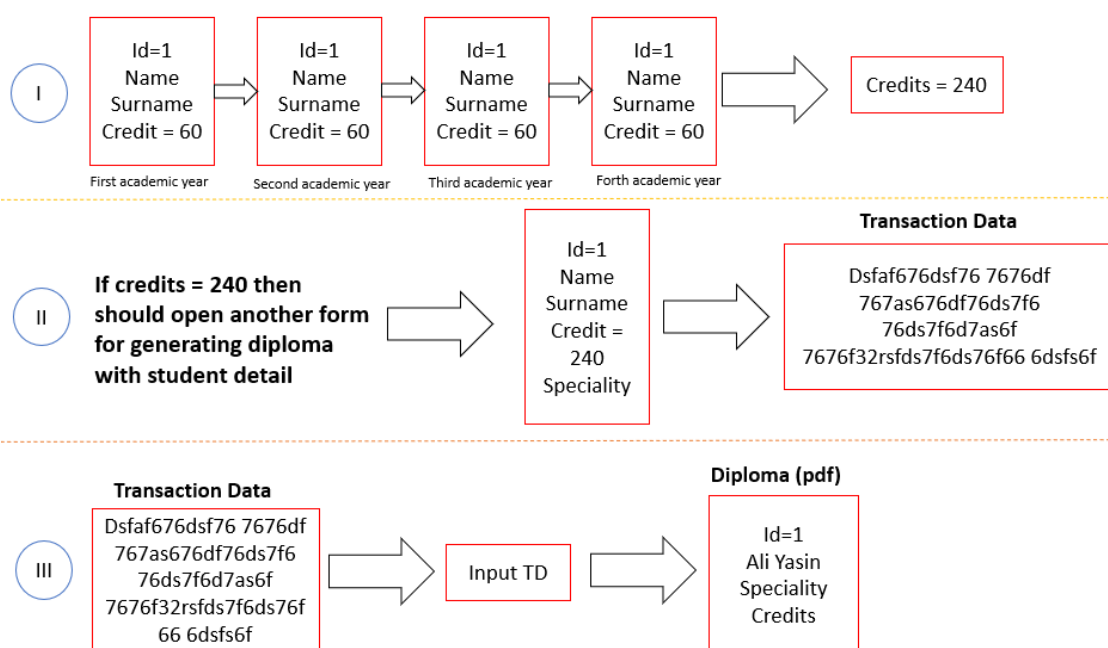


Figure 1. The process of the verification of a student's educational achievements

4.1 Student profile form

In this stage carried out filling the form with information such as student id, fullname of student and credits.

5 Conclusion and future research

Blockchain technology, which was originally mentioned along with Bitcoin and other crypto coins, is seen as a revolutionary technology in the near future in almost every field such as finance to engineering, education to health. As regarding to this technology there are a lot of work which conducted especially in the finance sector, however, we can say that we are at the beginning of the road, especially with respect to studies conducted in the field of education.

The data stability and permanence features of blockchain technology will be very suitable for the storing of educational data. For example if the universities in our country hold the records in the student information systems on the blockchain, an unchangeable and reliable common pool of data for grade equivalence and graduation information will be provided to access.

As a result of all this, the following practical of this scientific research can be noted:

- Blockchain technology is becoming popular not just a financial sphere, but also are entering into more and more new spheres such as medicine, education, etc.

- The practical implementation of the blockchain technology in education showed that using this technology for track student's grading system in higher education is quite possible, as well as, identification of transaction data which contained detail information about a block.

In future studies, it is thought that developing document verification page in order to put obtaining information (transaction data) from the blockchain server. If the transaction information of the control code is found in the database, after the document control code on the digital certificate is entered into this page, the data stored in the blockchain is fetched through smart contract and the authenticity of the document is proved.

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