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Managing the Student Results using Block Chain to Facilitate all the Stakeholders of Educational System

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Abstract: ***This paper expounds the use of Blockchain to record marks of students as it is very tedious to record and verify candidate's credentials for academia and employer purpose. We find it very difficult to maintain the student marks for any college or university. Any educational institution is duty bound to provide the student results at any point of time. Result of a student can be challenged at any point of time. So, any institute is supposed to store and maintain the results over a period of time. In this paper, an attempt has been made to solve some of the difficulties of students' result management system. Now education uses Bitcoin technology to record credentials. We have used Block chain technology to record student's achievements in a cheap, secure and public way. It is also beneficial for employer to spend valuable time checking educational credentials by having to call universities or to pay a third party to do so. In this paper, we have used ethereum as the underlying blockchain due to its large scalability and ease of use. For development, we used Truffle to develop smart contracts and integrated it with the frontend using Web3JS. For deployment, our smart contracts on the blockchain network, we have used Infura and frontend will be deployed on Heroku for user interaction. My block chain is currently on Ropsten Testnet.***

Keywords: ***crptocurrency, block chain, timestamp hyperledger, Bitcoin, Ethereum, Smart contracts***

I. INTRODUCTION

Blockchain is a chain of blocks contains a list of transaction or data and each block points to the previous block. It is basically a chain of trust because each block connected with cryptography. Each block contains a cryptographic hash of previous block and a timestamp .It is a distributed ledger. Once a data is recorded, it is difficult to change the data. It is foundation of Bitcoin. Bitcoin is digital currency invented in 2008. Bitcoin is implemented using Blockchain. Bitcoin is one of the use case of blockchain.We can better understand the concept by this example. In the traditional system, if we want to transfer money from one peer to another, then it is done with the involvement of third party. It takes more than 1 day to transfer money.

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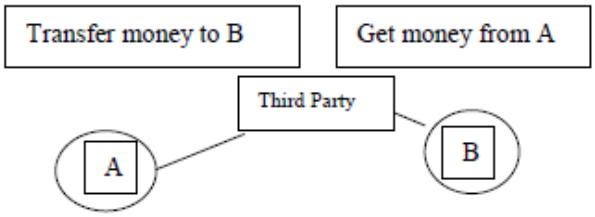


But the transfer of money using blockchain does not require any third party.

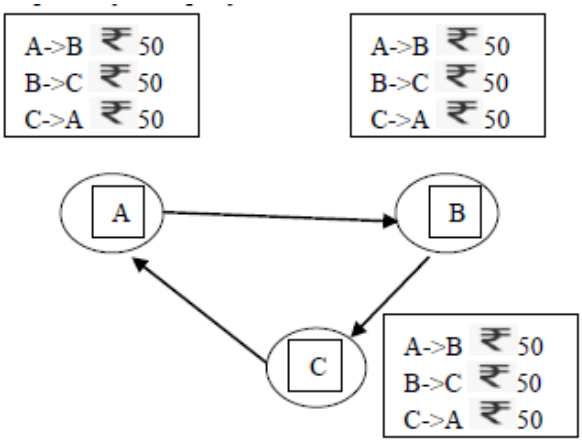


Fig 1. Process of transfer of money using blockchain

Suppose three people want to transfer money using block chain then each peer will store transaction in its own copy. There is no central authority. If A want to transfer 50 rupees to B then this transaction store in the block of A,B,C.Similarly B want to transfer some money to C then this transaction will also save in all blocks. So all peers in the network will have its own copy of block in which details of transaction is stored. It takes less than second to transfer money.

Block chain is based on **four principles.**

1. **Replication**-Copies of block are available on every node in the network.
2. **No central Authority**- There is no third party concept in blockchain.
3. **Irreversibility**-Once the transaction recorded in the block no one can change it.
4. **Accessibility**-Each block is accessible by everyone.

In the block chain, a user has a public and a secret key. The secret key is used for signing transaction, while the public key is used to address the system.

Identity of someone is not needed in Blockchain.A transaction can have multiple inputs and outputs. Transactions are transferred.

- Evolution of block chain

Bitcoin in 2008 used the technology in 2008.It was Bitcoin 1.0 version .After that there are different version of Bitcoin.

Table1. Evolution of block chain

Bitcoin 1.0	Bitcoin 2.0	Bitcoin 3.0	Bitcoin 4.0
Bitcoin	Ethereum	Hyperledger	Delnit
Litecoin	Zcoin	NEO	Polkadot

II. LITERATURE REVIEW

Goal and research Question:

1. Identify the need the research question
2. After identification of research paper select the quality data related to result.

To achieve my goal of review we find the following questions (RQ).

RQ) How the block chain change the education system?

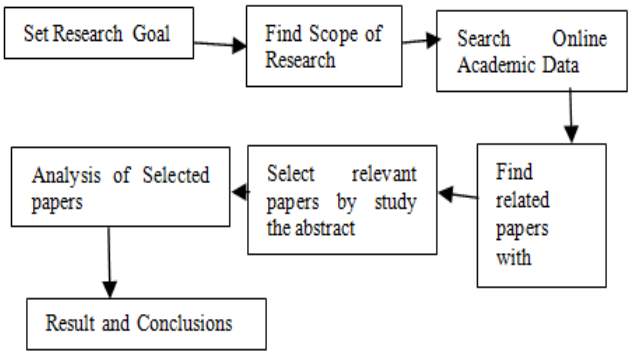


Fig 2: Process of Research leading to Results

Why Blockchain Technology is used?

Blockchain has many applications in education. It provides high security at very low cost. Uses of blockchain are the revolutionary hang in every field like banking, education, Industry. Records of students can be bitterly manage by blockchain.Students credential on blockchain shows transparency and accountability.The table below shows the related use case of blockhain and reference to the related paper.

RQ shows in table 2

Table 2. Use case of blockhain and reference to the related paper.

Research Paper Reference Numbers.	Usecase
[10]	Block chain is used in education to record the certificates of students .This will provide benefits to institution and students.
[13]	Blockchain can be utilized for competencies outcome management.
[5]	Blockchain can be used to evaluate students professional ability
	Blockchain can be used to secure collaborative learning environment.
[9]	Blockchain can be use to transfer fees and credits.
[8]	Blockchain can be used in education to enhance student interaction in e-learning.

III. WORK FLOW OF METHODOLOGY

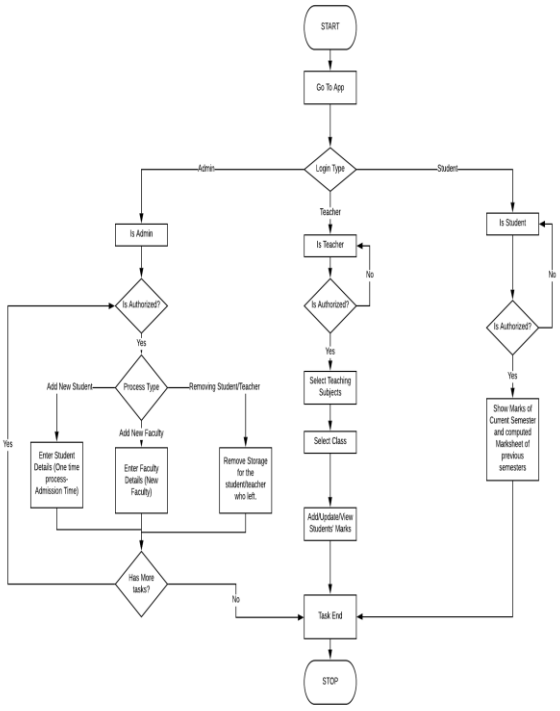


Fig3. Implementation of Students Marks on Blockchain

First, Smart contracts are developed to provide the backend functionality to the DApp. They are used to define the main backed of the decentralized application and they will directly interact with the underlying blockchain. After developing the smart contracts, we develop the frontend using HTML5 and CSS3 (bootstrap) for our DApp. We used web3JS for the interaction between frontend and smart contracts.

In our DApp, admin (of that institute) inputs the details about courses, branches, subjects, teachers, and students. Once these details are fed by the admin to the system (to the blockchain), teachers can then use the DApp to fill the marks and students can view the same. In ethereum, users are identified by their unique public key, so when admin will fill the details of students and teachers, he will assign unique addresses to each one of them which will be generated automatically and using those addresses only other users can access the portal. These addresses ensure that the user can only access the portal which they are meant to.

IV. RESULT AND DISCUSSION

Below are the snapshots of the screen which every user will see respectively. The best way to interact with the DApp is to use metamask. It is a browser extension which will help the user to interact with ethereum without having the complete chain on the machine.

The user just needs to sign up in import their address in the extension to interact with ethereum. Every transaction which changes the state of the chain will require certain amount of fee which is known as gas, so for every transaction which the admin and teacher will perform a gas will be charged, but for students no gas will be charged as they are just viewing the state (marks). Each transaction can be seen on the ethereum block explorer. This will show the authenticity of every mark sheet which will be generated at the end of each semester.

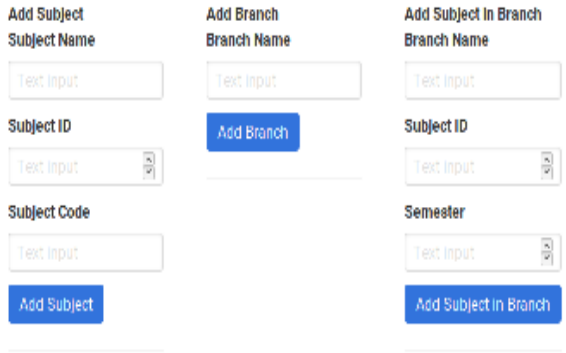


Fig 4, Admin View

Admin should add courses, branches, subjects, teachers, and students' details.

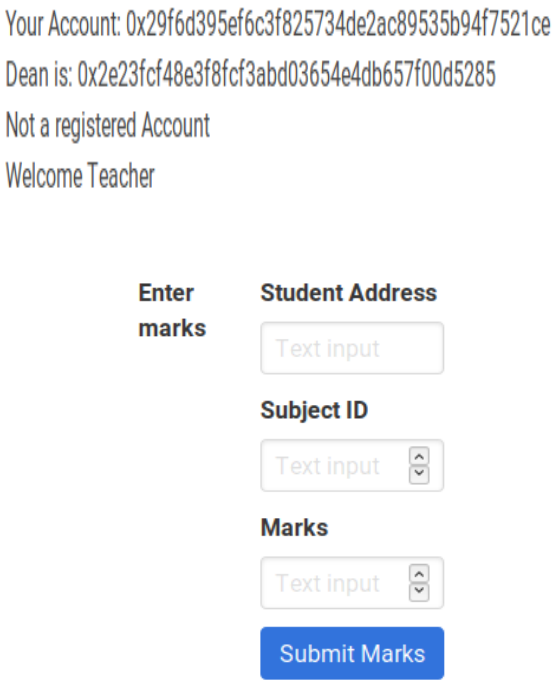


Fig5. Teacher's View

Teacher should add students' mars' and can also view marks.

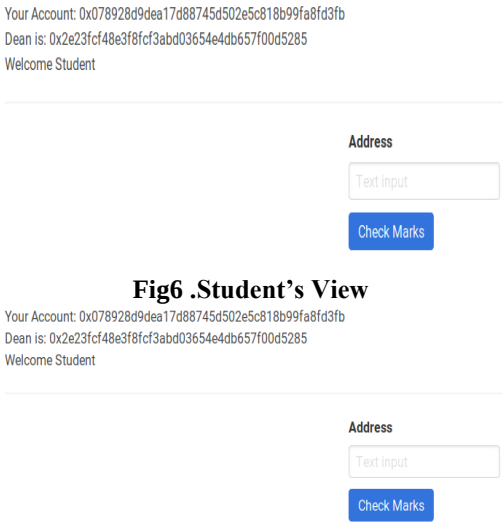
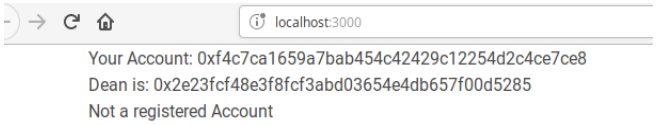


Fig6 .Student's View

Fig 7.Unregistered address

Any user whose address is not stored in the DApp will not be able to access the marks or any info.



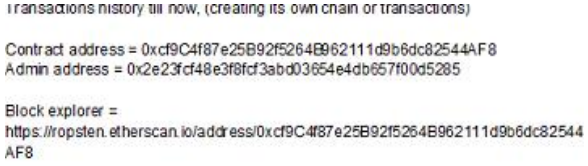


FIG 8. TRANSACTION HISTORY

V. LIMITATION AND CONCLUSION

In this paper, we have provided authentic marks to students by storing them using Block chain Technology. It will not only save time but also be available anywhere. In future, we will store personal documents of students so that each student will be the administrator of its own identity. Currently the proposed system demands nominal fees to be paid every time for a new transaction. Fetching the result at times can take more time due to slow computation.

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