

Performance and Academic Evaluation of Individuals using Blockchain Records

^{#1}Jeet Shah, ^{#2}Abhinandan Shetty, ^{#3}Shilpa Das

¹jeetshah96@yahoo.co.in

²abhishetty76@gmail.com

³shilpadas.soajuly2013@gmail.com



^{#123}Department of Computer Science and Engineering
School of Engineering and Technology, Jain University Bangalore, India

ABSTRACT

Blockchain is the underlying technology for crypto currencies. Blockchains are based upon the concept of decentralization, which is obtained through distributed ledgers, which is maintained by every node being part of the chain. Another interesting concept of Blockchain is that of Permissioned- Blockchain which solves the problem of scalability, in which smart contracts are implemented to give specific set of nodes the powers of validation of information to be added on to the link. In this paper, we suggest a new novel use of the blockchain, which can be used for evaluating an individual's performance in his/her academic career. We are using the information stored on the chain to suggest an idea of evaluation where consistency and proof of genuine work is at the highest echelon.

ARTICLE INFO

Article History

Received: 5th December 2017

Received in revised form :

5th December 2017

Accepted: 7th December 2017

Published online :

7th December 2017

I. INTRODUCTION

Pothole Blockchain is the new upcoming technology which is certainly used for storing information in a decentralized fashion where the data is stored in a ledger which is distributed and spread across all the nodes in the chain. This strategy was majorly implemented to invent the concepts and become a permission to make digital or hard copies of all or part of this work for personal or classroom use is granted without fee provided that copies are not made or distributed for profit or commercial advantage and that copies bear this notice and the full citation on the first page. To copy otherwise, to republish, to post on servers or to redistribute to lists, requires prior specific permission and/or a fee. baseline for Cryptocurrencies to eliminate the banking infrastructure and any authorization of one set of groups of currency. As discussed in [1]-[2], Blockchain was suggested for cryptocurrency but due to its decentralized way of distribution of data across all the nodes it was later thought of as problem solver for many current questions. With the further implementation and restrictions, provided by Blockchain it also discusses further work, which can be done.

Blockchain faced an important challenge of scalability where when implemented with large number of nodes faced the problem of consensus management and authentication of

genuine users. Then the concept of Permissioned-Blockchain was introduced where with the same decentralized format specific pre-defined set of nodes were chosen as the authorization party who would validate the information and only after their regulatory method is approved the information was added in the Blockchain. One such ideology is discussed in [3] where several problems faced by Permissioned-Blockchain were addressed and rectified and the budding version of Hyperledger Fabric was discussed. This hyper ledger fabric is intuitively the base of current business level implementation of blockchain. In [4], it was also extensively proved that Blockchains could be used to store such information, which will enable data integrity. However, it does not provide reliability of the data, which is stored; but in contrast, it provides extremely secure environment and architecture.

Now at the current age where Blockchain is at its budding stage it is extremely important to beat around the bush and innovate existing mechanisms with current technologies. One such idea was put up in [5] where innovators suggested holding educational records in a Blockchain, which provides decentralized fashion of storing information where, no fake records can be added and manufactured, and hence solving many current day problems in scrutinizing correct and legit

work done. In the expedited work done in Blockchain for education, it was proposed in [6] about the security, issues faced by storage of educational records as a Meta data in other platforms than Blockchain. Hypothetically, it has been deduced the security concerns along with recognition of fake and invalid documents that are not genuine can be rectified with the implementation of Blockchains in storage of information of related to educational record.

Blockchain is one such technology, which will replace current centralized fashion of storing information. To do this it should have appropriate architecture, which acts as the baseline for storing any kind of information, which can be stored on the chain. In references from [7]-[10] it is extensively discussed about the architecture of Blockchain for storing information apart from cryptocurrencies based mechanism. With eliminating conjectures about the functioning, these papers discuss the zenith possibility of storing personal as well as public information on Blockchain, which would in turn provide maximum security with a smooth workflow. In addition, the papers suggest about integration of Blockchains along with different platforms or dynamic web pages.

With the increase in number of people in educational sector as students, it is extremely important that any technology implemented to solve certain specific issues of the domain is scalable in nature. Blockchain not being scalable is extremely difficult to implement for a wider database and therefore several innovative work has been proposed to make it more and more scalable. One such mechanism is suggested in [11] where indexing of the blocks or chiefly the information is suggested where since the total amount of data increases and Blockchain being imposter to linked list it becomes extremely important to traverse along the data. Therefore one interesting technique is suggested in [11] where indexing for the blocks or the data is suggested which would enable fast and easy access of the data in the chain. This addresses one genre of problem of scalability where the size of information can be accessed easily. Another such interesting methodology was proposed in [12] where an architecture suggested that human curators or examiners are better than any machine, which is implemented. To contradict such hypothesis a mechanism was suggested where machines could be made equally smarter. We use this hypothesis where machine is made a curator better or equivalently good as humans. The major contributions of this paper are as follows:

- With the increased need in skilled labour in corporations and high scrutiny process involved in selection in educational institutes, it is extremely important that both of these activities are done with extreme precision and the reliability of the mechanism.
- We suggest a mechanism based on Block chain technology in which the records of every individual is stored on the Blockchain, in this system every individual previous achievements and accomplishments on the blockchain.

- Blockchain works on the concept of decentralization, where every node in the Blockchain contains a ledger of all the information. The consistency of the Blockchain is maintained by updating the ledger of every node once the validation of the information is done or new information has been added.
- Since all the records added by the individuals are of extreme importance it is regulatory to form an organization which is transparent enough to validate these documents, therefore we propose the idea to be implemented on the concepts of permissioned-blockchain where some specific set of nodes are giving authority to authenticate the documents before being added to the blockchain.
- We propose this idea to rank every participant in the Blockchain, which would help distinguish amongst the cream students and in turn help students bolster their profiles.

II. WORKING PRINCIPLE

Owing to the growing competition in the education sector, people are in a race to make themselves available in the creamy layer. Students are competing for the best colleges, Employees are competing to acquire the best skills and Employers are in a race to hire the best employees which in turn helps them emerge as the leading player in their respective industries. Unfortunately, there is no such platform, which unifies all these problems and provides a solution at a single stop.

One of the most important problems we are trying to address is that a student may be forced to learn something that he or she is not interested to learn. Forced learning will neither help the student nor the system as it is investing its valuable resources on a result-yielding zero. Now there is a possibility that a student is not interested in a certain subject but he or she might be keen on learning something but there is a chance that even they are unsure about what it is they want to learn. There is no platform that makes an effort to understand what a student wants to learn and then educate them about the subject, which the student wants to take, once they decide what they want to learn. Now the student may be confused as to where to head once a certain skill is acquired. Again, there is no entity, which guides a certain student as to what needs to be done to continue using this newly learnt skill and proceed in a direction, which will help the student keeping in mind the domain the student is interested in.

Now, there are instances where students go to the extent of using influence or a known person in the industry to acquire fake certificates or internships in order to stand a better chance at getting their dream job. This is a disadvantage to the student as well as the employer. There is no proof of work that needs to be submitted in order to authenticate a certain document produced by a student. There are several organizations online, which help the student, build their projects and create fake internship

certificate, there-fore it is extremely important to differentiate between the creamy users from the ones that have used such platforms to build their profile. We are trying to resolve another problem which is failure to have a system to rate students across streams and provide a sense of what students lack.

Another problem is where a student is working in a very remote field and there is no one to help him/her with research in that particular field. Now there has to be someone working in the same field somewhere across the country who is also working in the same field. There is no way for them to know of each other and collaborate to work on the same topic. A student will have to do with whatever available resources within their reach in order to complete a research.

All the problems that have been addressed above can be solved with a unified platform that implements the concepts of Block chains and Machine Learning.

2.1 How does the work mechanism function and what are its components?

The idea is based on blockchain technology which is used to store the educational records which can further be used to evaluate the echelon a person has reached in his/her educational career.

So a blockchain based implementation is required where a predefined set of achievements like internships, paper publications, languages known, certificates, projects, courses(on MOOC platforms) etc are stored in the repositories of the proprietor. Every time a person/student accomplishes a new attribute for any one of the previously mentioned achievements, a new block is added to his/her chain where a structure holds the information about the achievement. For example the date when acquired, governing body under which the achievement was obtained, marks/percentage scored, etc such features will be added to the block so that when referred by some other node in the chain a clear cut distinction is available as to what was achieved by the student. The genesis block, which is the first block, will be implemented in this way:-

Since this technology is coming in picture when many people already have a lot of information to be added therefore the genesis block will be block with the maximum amount of data where the student/employee will hold his/her past information about all the achievements. Beyond this the user depending upon their achievements on a periodic manner will add every block.

The following are the components of the mechanism -

1. Blockchain
2. Data analytics
3. Machine Learning (to create the test which will be used for validation)
4. Solidity (a programming language which is used to write the smart contracts)

2.2 What are the potential benefits of the proposed methodology?

A platform that unifies the best components of social media and continuous assessment, which paves the way to E-Learning and promises complete education. Students can learn and are certified at the comfort of home while attending school and writing traditional exams, which can in-turn, be added into a platform. A student will be sure of what he wants to learn with the help of various psychometric tests, which help in determining the domain he/she is interested in and a career he/she wants to focus on.

2.3 Authentication of Certificates, Internships and Research papers

It has never been easier with certain proof of work, having to be provided to deem a certain certificate as valid.

Intelligent system which will frame questions based on the certificate provided and hence authenticate a piece of paper submitted in favour of the candidate. Patents and research papers cannot be stolen because of continuous checking by the platform on the various documents submitted.

2.4 Giving a user rating to users in the most appropriate standardized way:

As a lot of transparency is obtained, it helps us rate the users based on their work done. This has two positive outcomes:

1. It helps the recruiter understand who among the all of the applicants is the best depending upon the profile of the user which has been validated by our platform.
2. In addition, this platform creates a sense of healthy competition where every user would now want to be on the top list of the leader board, which would help them become the cream users.

III. SYSTEM MODEL

The following describes the system model for our proposed work, which has been depicted by Fig 3.1 -

1. The information, which is to be accessed using the Blockchain, can be stored in either of the following ways:

- Directly the information can be stored in the Blockchain using the hash of the data. The data to be stored can be encrypted using some cryptographic algorithms like MD5, SHA256 or SHA512 and the hash of the data can be obtained. This hash can be stored in the OPRETURN variable. The only problem with this kind of storage is that only a maximum amount of 40 bytes can be stored.
- IPFS – Inter Planetary File System can be used which is easy to interface with the Blockchain and the web pages in case any dynamic or static web page is used to create the GUI. This is a kind of

database management system where the information is accessed using the transactions. These transactions are stored in the Blockchain rather than the actual information being stored on the Blockchain.

- HDFS - Hadoop Distributed File System is similar to IPFS but follows Big Data concepts where again the data is accessed using the transactions which are stored in the Blockchain rather the actual data being stored in the Blockchain.
- The fourth method and the most reliable technique of storing the information is the usage of static database which is extremely easy to incorporate with the Hyperledger. Since in this paper we suggest the usage of Permissioned-Blockchain it is advisable to use Hyperledger, which gives feasibility and addresses the problem of scalability. CouchDB is the state database, which is mostly used and recommended.

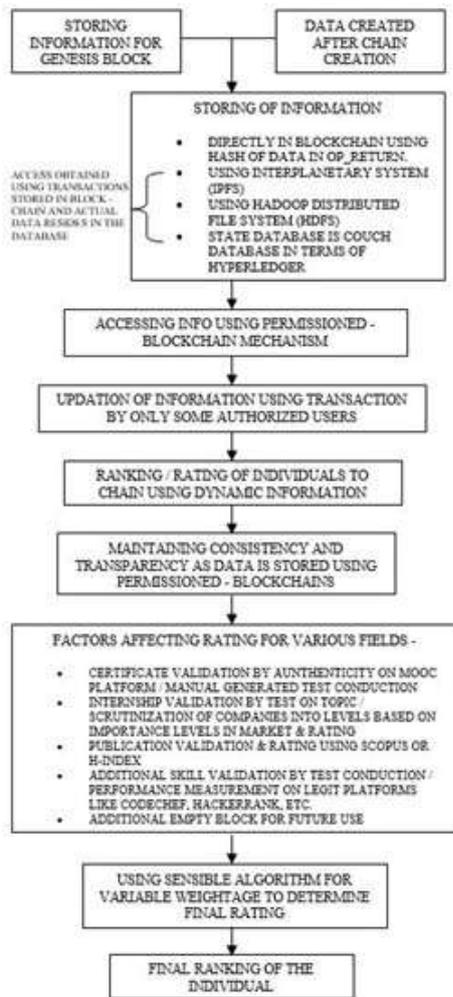


FIG. 3.1 SYSTEM MODEL AND WORKFLOW

2. Accessing the information should be done using the Permissioned-Blockchain or the Hyper-ledger. Specific set of nodes are given the authorization permission to validate the information and only these set of nodes are allowed to validate the transactions, which are to be added.

3. Any information, which is either added or accessed in the Blockchain, is done using the transactions. These transitions are the information which is stored in the Blockchain and updated throughout all the ledgers which are part of the chain.

4. This information, which is stored in the database, should be used at any time to rank the individuals. In this way the rankings will be dynamic and mutable.

5. The information, which is stored using Permissioned-Blockchain, is consistent and since Blockchain is used transparency can be maintained.

6. Different factors for each field should be used in order to provide the ranking as listed below:

- Certifications can be validated by the authenticity and strictness of the examination pattern followed by the MOOC platform or any other council issuing the certificate. Another methodology would be to manually test the individuals on the respective domain their certification is issued for.
- Internships can be validated by either conducting the test manually or another technique, which can be used, is by dividing the companies into different levels depending upon their market reputation and then upon different tiers of company the individuals rating can be decided. The HR of the company can also be contacted to cross-verify the certificate.
- Publications can be validated by using the Scopus index, WOS or Google Scholar, which basically gives the importance of the journal and publication owing it depending upon their acceptance rate and scrutiny process.
- Additional skills can be examined by manually conducting the test or by considering the performance of their respective skills on platforms like CodeShef, Hacker-Rank, etc which conduct tests for the individuals and base their rankings depending upon their performance.

7. Similarly, all the attributes can be rated individually on various factors in a mutually exclusive manner so that the individual rating of each attribute does not affect the rating of another.

8. Finally we could use algorithms which can be used to find out the overall ranking depending upon the previously calculated individual ratings for each attribute so that an overall ranking is obtained.

The ranking would not be only based upon the amount of work, which is done but also the quantity and the efforts taken to complete the task. Since the validation of the process is extremely rigid this proves the genuine completion of the work and would also prove the knowledge of the work done.

IV. CONCLUSION

Our paper provides a platform that will help maintain the record of every user in a decentralized manner by everyone and then using this information a standardized rating can be given to every user, which will be a key eliminator between the legit and non-legit users. This will aid many organizations like World Education Society (WES) and MNC's fail to distinguish between the users, which are capable, and ones, which are not.

In addition, one big factor every organization or institution look for in a user is the stability. No resume or portfolio can prove the stability of any user. Using this platform since a timestamp can be maintained in the structure of every achievement gained which is also considered in providing the UR to the user this creates a sense of stability requirement, which is extremely important. The major drawback of the proposed idea would be the breakage of the cryptographic algorithms on which the entire Blockchain idea is formulated. Since these algorithms are the reason behind the security of Blockchain, which provides the transparency it is extremely important that these algorithms are in safe hands and are not exploited. Along with this, the internal algorithms to rank the individuals could also be tampered so that a better rating is obtained, this would make the entire idea obsolete.

Another drawback of Blockchain is of scalability, which means that with the increased in number of nodes the consistency provided by Blockchain remains intact and is not hampered with increase in number of nodes. However, this issue has been addressed by the concept of Permissioned-Blockchain, which is implemented using the Hyperledger frameworks, but still this concept is completely theoretical and does not guarantee the proper functionality of the Blockchain.

V. FUTURE WORK

With the increase in the need for maintaining records for a longer time and making them easily accessible this kind of storage can come in handy and would also maintain the consistency and security of the records for the amount of time required. Extensively formulated algorithms could be used in place of what are suggested in this paper so that more efficient and accurate output of the overall ranking can be obtained.

In this paper, we suggest a new mechanism of using the Blockchain as Hyperledger with Couch database at the back-end, theoretically this being an extremely efficient idea can be implemented for storing multiple records, which will reduce the paper work and improve availability of these documents. Documents like government ID's, Healthcare related records, etc could be stored using this mechanism. The most important feature of this mechanism could be deriving the attributes for inventing data-mining algorithms on this database so that a more clear and distinct output can be derived from the data which is available in the database about the performance of the individuals.

In this paper, we suggest using Machine Learning where depending upon the previous tests and finding out weakness

a continuous evaluation should be established where out of a pool of questions the machine has cognitive abilities to pick up questions which would actually test whether the individual is improving his/her knowledge base and therefore improving the overall score obtained on this platform.

REFERENCES

1. Satoshi Nakamoto. Bitcoin: A Peer-To-Peer Electronic Cash System (2008).
2. Christoer Koch, Gina C. Pieters. Blockchain Technology Disrupting Traditional Records Systems, In Financial Insights - Dallas Federal Reserve Bank, 6, 2 (July 2017).
3. Marko Vukolic. Rethinking Permissioned Blockchains, In Bcc '17 Proceedings Of The Acm Workshop On Blockchain, Cryptocurrencies And Contracts, (April 2017), 3 - 7.
4. Victoria Louise Lemieux. Trusting Records: Is Blockchain Technology The Answer?, Records Management Journal, 26, 2 (April 2016) 110 - 139.
5. Mike Sharples, John Domingue. The Blockchain and Kudos: A Distributed System for Educational Record, Reputation and Reward, In European Conference on Technology Enhanced Learning, EC - TEL 2016: Adaptive and Adaptable Learning (Sep. 2016) 490 - 496.
6. Xu, Yuqin, Shangli Zhao, Lanju Kong, Yongqing Zheng, Shidong Zhang, and Qingzhong Li. ECBC: A High Performance Educational Certificate Blockchain with Efficient Query. In International Colloquium on Theoretical Aspects of Computing (ICTAC - 2017), Lecture Notes In Computer Science, Springer, 10580, Cham (Oct. 2017) 288-304.
7. Kathryn Swan, Adrian Cunningham, Anne Robertson. Establishing A High Standard For Electronic Records Management Within The Australian Public Sector, Records Management Journal, 12, 3 (2002) 79-86.
8. Aliza Ismail, Adnan Jamaludin. Towards Establishing A Framework For Managing Trusted Records In The Electronic Environment, Records Management Journal, 19, 2 (2009) 135 - 146.
9. Guy Zyskind, Oz Nathan, Alex 'Sandy' Pentland. Decentralizing Privacy: Using Blockchain To Protect Personal Data, In 2015 IEEE CS Security And Privacy Workshops (2015) 180 - 184.
10. Michael Nycyk. Records Management Practices In Construction Industries: Australian Perspectives, Records Management Journal, 18, 2 (2008) 140 - 149.
11. Alan Third, John Domingue. Linked Data Indexing Of Distributed Ledgers, In Wwv '17 Companion Proceedings Of The 26TH International Conference On World Wide Web Companion (April 2017) 1431 - 1436.
12. Alina Patelli, Peter R. Lewis, Aniko Ekart, Hai Wang, Ian Nabney, David Bennett, Ralph Lucas, Alex Cole. An Architecture For The Autonomic Curation Of Crowd-sourced Knowledge, In Cluster Computing, 20, 3 (September 2017) 2031 - 2046.