International Conference on Innovative Research in Engineering, Management and Sciences
International Journal of Scientific Research in Computer Science, Engineering and Information Technology
© 2019 IJSRCSEIT | Volume 4 | Issue 9 | ISSN : 2456-3307

WeVote – Secure voting using Blockchain

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ABSTRACT

The blockchain technology has been showing promising application opportunities since its beginnings. Blockchain was introduced to many areas from the original cryptocurrency to the present smart contract. By examining famous blockchain schemes, we perform a systematic study of the safety threats to blockchain and how this blockchain concept can be applied to the current voting system in India. We also review this blockchain voting system's safety and stability against fraud. We also propose some future directions for stimulating study attempts in this field.

Keywords : Blockchain, Voting, Distributed ledger, Security and Database.

I. INTRODUCTION

Indian elections are performed almost solely using electronic voting machines created by a couple of government-owned companies over the previous two centuries. These systems, known as EVMs in India, have been commended for their easy design, ease of use, and reliability, but have also been criticized lately following extensive election irregularities reports. Despite this criticism [1], many details of the design of the devices have never been revealed openly, nor have they been subjected to a strict, autonomous safety assessment. Here we try to propose a system where the Indian voting system can be integrated with the blockchain technology to provide safer and risk-free voting [2], [3]. We define the design and operation of the machine in detail, and we assess its safety in the light of the appropriate processes for election. We conclude that they are susceptible to severe assaults that can change election results and breach the secrecy of the ballot despite the simplicity of the computers and minimal software trusted computing base and the same can be overcome by the integration with blockchain [4].

A blockchain is essentially a distributed record database, or a public ledger of all transactions or digital events executed and shared between participating parties [5]. Each government ledger transaction is confirmed by agreement of a majority of system respondents. Once entered, it is never possible to erase data. The blockchain includes a certain and verifiable record of each transaction that has ever been produced [6]. The most common instance of using blockchain technology is Bitcoin, the decentralized peer-to-peer digital currency [7]. The digital currency bitcoin itself is extremely contentious, but the underlying blockchain technology worked flawlessly and discovered a broad variety of applications in both the economic [8] and non-financial world [9]. The integration of Indian voting system with blockchain paves way towards secure voting in India. Blockchain makes sure that once the vote has been registered, the data cannot be tampered with in any manner. The primary

hypothesis is that in the digital internet globe, the blockchain is setting up a scheme to create a distributed consensus. This enables participating organizations to understand for certain that, by generating an irrefutable record in a government ledger, a digital incident occurred. It opens the door to the development of a centralized, open and scalable, democratic digital economy.

II. EXISTING SYSTEM

Voting in India is conducted by electronic voting machines or EVM, which was first introduced in 1982 [10]. More than 2.3 million EVMs will be used in 2019 elections as compared with 1.8 million ones in 2014.To check for foul play, vehicles transporting the EVMs will be fitted with GPS devices to monitor their movements. The EVMs allows vote counting to be completed in up to three hours compared with manual counting, which could take 30 to 40 hours. The electoral body also uses digital cameras, videotaping of speeches and the use of wireless networks during the election process. In the current elections, Voter Verifiable Paper Audit Trail (VVPAT) machines will be used along with EVMs at all polling stations after opposition parties questioned the EVMs' accuracy. The VVPAT [11] allows the voter to cross-check the votes. "Ever since EVMs were introduced in 1982, they have been questioned and challenged, but they have stood judicial scrutiny and they stood the test of time," Quraishi, the former electoral body chief said.

III. PROPOSED SYSTEM

The proposed system applies block-chain technology to distinguish the current dataset with the original one and hence identify any type of alteration or fraudulent activity performed. The original dataset is what is collected at the time of elections, which is basically the collection of details of each and every vote that was casted by the voters. The information includes the voter's information and the candidate to which he/she had voted for. This information which is stored in this database is directly sent to the administrator (in case of elections, the administrator can be the election commission) and then it acts as a master table and can be used as a reference material to discover whether there has been any sort of modification to the data that is received later on through the polling booths.

The interface is provided is a web based platform that consists of two halves, one for the administration and the other for the voters. The administrator is able to put together the list of the eligible candidates, they also have the authority to cross verify each registered voter. On the other hand the votes can register themselves for each elections through their Aadhar number and a couple of other details as well as cast votes that will then be securely stored through the help of blockchain.

A. Advantages:

- Provides easy registration for voters.
- Being a total software solution, it does not allow maintenance factor to be considered much.
- The accuracy level of actual vote distribution would be high as compared to hardware-based solutions (EVMs).
- Successful detection of any type of unwanted modification.
- Record of total candidates and votes casted can be easily maintained.
- Unlike EVMs that can only record a maximum of 2000 votes per machine [12], the proposed system can take as many votes as possible.
- It will allow to conduct a much more fair electoral process.

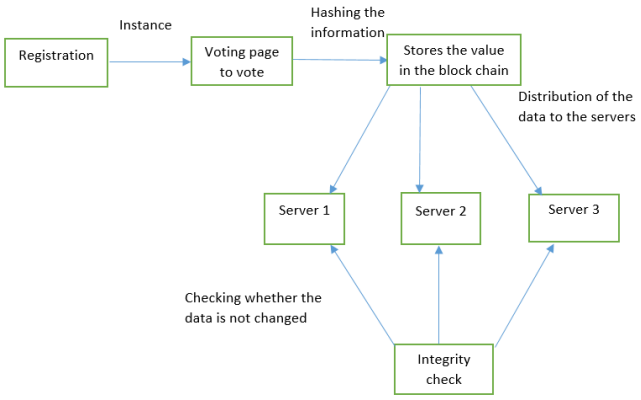

Fig. 1 System Architecture.

IV. IMPLEMENTATION

The project WeVote is implemented using the technical stack. The components of this stack are MongoDB, ExpressJS, and NodeJs. MongoDB is used to store the details of the voter and candidate. Since the database is a non-structural database, so it is easy to extend the fields of the database and add different types of data. The data is stored in JSON format which helps in retrieving and displaying the data as the project is a web-based project which makes the thing easier.

MongoDB is well known for its scalability and as well s flexibility and as to make sure the application can be used for future use and many parameters can be included as the day passes many parameters can be introduced where the scalability of the MongoDB comes into the picture where we can change the documents.

As the application is a web-based application, we tried to use NodeJS to make the connection between the database and the front-end. When compared to the python NodeJS is much more faster, as on the day of voting many people would try to access the website and the request made to the server by the people who are voting will be behemoth and the server can't give a quick and accurate response, so NodeJS is used instead of python.

We have designed a class for a particular voter where we store his personal information and this detail will be checked to make sure that the person giving the details is the actual person by the admin. And also, we have made two step authentications using Aadhar number. So as to check fraud and decrease the amount of people who cast extra votes by providing invalid information.

Then when a person casts a vote, his voter registration number along with is Aadhar number will be hashed and added to the block chain and this block chain will be distributed every time a person votes to a dedicated server which has the chain of votes and if someone tries to access the information and tries to change the information of the voting details, the person can only change the details of that particular server and the administrator has the authority to check the integrity of the files in each server, thereby coming to know whether the files are changed are not.

ExpressJS is a framework for NodeJS which makes the routing of requests from clients to route much easier and helps in faster development of the application. The given application uses this technology stack to develop the application.

V. CONCLUSION

Since the inception of the concept of blockchain, it has been related to crypto currency and not been widely used for other applications in different fields. The proposed program titled WeVote is a blockchain-based e-Voting system that could help take a step forward towards a more secure and fair electoral process. It takes advantage of the security features of blockchain to provide a more trusted platform to conduct the voting process. What we have presented is a prototype that implements the general idea of blockchain through a web-based platform. It enables the casting of votes and stores that data in a form that if altered with, can be detected with ease hence avoiding any fraudulent activities that might usually take place. The system mainly aims at removing hacked voter registration databases and EVMs. The voters, therefore, have a more reliable source which makes sure that their choices are properly recorded and goes to the intended candidates only. Another beneficiary of the

proposed system is the Election Commission, it gets the data directly from the voters and does not have to go through a rigorous process of validation to make sure of the integrity of the data.

The proposed solution can help to transform the current voting system from physical records of data to a much more secure and efficient version based on blockchain technology. In the future, we plan to test this out in a small real-life environment that includes actual voters, candidates and a committee to monitor the whole operation. A small example could be electing prefects to form student unions in schools. After successfully verifying the use cases we further plan to bring the system on a mobile platform to enable the voters living overseas or remote locations to take part in the elections on the go. There can be more improvements made after the system is made available on mobile, for instance, voter registration can be done through a facial recognition system. Then the user data and the votes can be kept in a cloud-based storage facility, and later each voter can be verified through their voter IDs as well as their facial data that can be compared through image processing.

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