E-VOTING USING BLOCKCHAIN TECHNOLOGY

[13]Suraj Pawar, [2]Roshani Pawar, [3]Punam Dhomse, [4]Jaya Suryavanshi

[1]Student of B.E. in Information Technology, [2]Student of B.E. in Information Technology,

[3]Student of B.E in Information Technology, [4]Prof of B.E in Information Technology.

[1]Department of Information Technology,

[1]NDMVP'S KBTCOE college of engineering, pune university, Nashik, India

Abstract : Now a days, Blockchain is providing a new platform to create a new type of services which will be secure, reliable, eliminating third parties and anonymous as a distributed system. So, It is the great advantage to use this technology to develop trusted services in any government sector, industrial, banking sector etc. Blockchain mostly focused on the technical and legal issues as the research of this topic is still prominent. Now a day, in our country we see the news of the electoral system, electronic voting machine tampering and it is the centralized system. In the traditional voting system, the security and transparency are not that much develop as it uses the centralized system in which there is only one organization that manages or controls it. In traditional voting system there is full control over the database and system so anyone or any third party can tamper the database. So, it is a great time to develop the e-voting system using blockchain technology to trust within the electoral system in a democracy. For that, we are going to develop the voting system as a decentralized platform. While developing system various concepts such as cryptography, digital certificate, and distributed network are used in a system. Blockchain provides the decentralized platform, so the database is owned by many users so tempering is happened in this system. We also used blockchain technology for developing the system for various government services, finance sector, healthcare, transportation services, supply chain services etc.

Keywords - Blockchain, Cryptography, Consensus, Digital certificate, Hash value.

I.   INTRODUCTION

Voting plays important role in our democratic system. Voting is the important aspect to win the candidate which deserve. Almost all authority allows the amount of budget to provide the more robust voting system. There are many techniques are used to make the voting system more valid like cryptography etc. Today's voting system is centralized. We know that there is an authority present at a polling booth for verifying the voter after verified the ballot paper is hand over and then voter gives a vote to a specific party. However the incidence like security pitfalls that destroy 197 votes from a computer database in United States election in 2008 and in 2015 there was accommodation of 66,000 election votes in New South Wales a state election in Australia raise public concerns on the security of an electronic voting system.

   Blockchain technology is one of the solutions for such problem. In Blockchain the all data is stored in the form of blocks so no one can access that data and also if the data is crashed from one system then also it is available on the other nodes as the blockchain support the decentralized architecture. Blockchain act as a trusted third party for correctness and availability. By understanding the feature and the today's need voting system using blockchain is developed. [1]

   In summary, the cryptocurrency protocol is the main aspect of   security and transparency which they employed. Additionally, these voting systems can work on the limited number of platform and blockchain platform. According to our study, the blockchain has the following features:

1) Platform-independence that means the change in the blockchain protocols should not affect the voting system.

2) Secure it means the data is stored in the block and each block is connected to the other blocks in a chain and all are connected with the hash function.

3) Scalable it means the blockchain is scalable.

Our Contribution:

In this proposed work, we are going to propose an electronic voting system which will support the above-identified feature as follows:

1. Comparing with the traditional voting system, which is centralized which provides paper ballots system or electronic voting system, our voting system takes advantage of a blockchain protocol to eliminate the need for the centralized third party. Our voting system is decentralized which removes the drawbacks of a traditional voting system.

2. Our voting system is developed by blockchain that supports smart contract. The voter is verified first by the information stored in databases and after verifying the voter the ballot is provided to the voter by the administrator.

3. After that at the background the blockchain is work.

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II.   LITERATURE SURVEY

A.   Blockchain technology and Its uses:

The blockchain is a distributed database that store data records that continue to grow, controlled by multiple entities. There are several types of the blockchain.

1.   Permissionless Blockchain:
In this type of blockchain, anyone can write and can participate in consensus in determining the state's validity like Bitcoin or Ethereum. [2]

2.   The Permissioned Blockchain:
This type of blockchain is just the opposite of the previous the type which is operated by a known entity such as consortium blockchain. [2]

3.   Private Blockchain:
In this type of blockchain permitted by only one entity, where there is only one domain of trust. [2]

The Blockchain is consisting of a chain of blocks which contain the data of the node. Each block is connected to the other by holding the hash value of the previous block. The first block of the chain is called "Genesis block" which cannot hold the hash value of any block it has only its own hash value which then holds by next block of the chain. The minimum capacity of each 1Mb to 8Mb maximum and it can be variable. It is not fixed. One block can store the maximum transaction. The hash value of the block is generated by using a different algorithm like SHA256. The hash value of each block is different from each other. No two hash values are similar.

B. Election and Blockchain Technology

E-voting is implemented in countries like Estonia. In the whole world, Estonia is the first country to conduct online voting using blockchain technology since 2005. [2] In 2007 Estonia conducted online voting. This is also implemented in other organization like the Austrian Federation of the student, Switzerland, the Netherland, Norway, and so on but still they face security issues. Although getting lots of attention, the online voting system is not still widely used. The traditional voting system has several problems like tempering of data and when data changes the traces can be easily eliminated.

The solution is to make database public, the database may be visible and owns by many organization so little change is data is traces easily. It is possible by using any distributed architecture and blockchain is one of this architecture. To alter or to delete the data in blockchain is not easy.

III.   ADVANTAGES AND DISADVANTAGES

1)   Advantages:
a)   By using blockchain for e-voting, we can achieve a high level of security and transparency.
b)   The blockchain for e-voting will provide us quicker results.
c)   This system could be used to improve the voting processes inside various companies and organizations, too.

2)   Disadvantages:
a)   The main issue in e-voting using blockchain is authentication because we cannot verify that who is at the other end.
b)   The technology used that is blockchain is still developing technology.
c)   The lack of awareness and understanding can be one of the disadvantages.

IV.   DESIGN

1. Registration:

Registration is the process of validating the voter and allows the voter for further process and if the voter is not valid then the system restricts the voter for further voting system process. The basic need for registration is the voter should be authenticated as a valid voter and can be done by using Challenge-Handshake Authentication Protocol (CHAP) of information and solution. After successful registration of the voter, the voter's email address or an X.509 certificate containing their email address is stored in the database is used by the voting system. [5] After the process of registration is completed and the voter is completely verified then the voter is navigated to a page which is required for voting. [3]

2. Verification and update:

The verification is started after registration is successfully completed. In the verification process, the hash value of the digital signature and the hash value already present in the database is compared. If they both are same then the voter is verified as the valid voter. Otherwise, if both are not the same then the voter is getting refused. The hash value of the digital signature is get calculated by using different algorithms like SHA-256. [3]

3. Voting:

After the registration of the voter, they are navigated to ballot page. The ballot is a simple page which contains the list of candidates according to the address of the voter. This address is used by the voter to generate a token provided by the system by sending and receiving. The voter must be known that to which candidates he/she is going to give the vote and also from which party the candidate is belonging. Once the voter marked his/her vote to the specific candidate then the block of that transactions is broadcasted to the

available blockchain and the database is geting updated that the specific voter is completed   voting and get automatically log out from the system.

 4. The Tally/Audit:

This is the final and last step of voting which is the counting of votes. The audit is taking place after the voting process is completed. An auditing is a process which verified that the integrity of the election has not been destroyed. The candidate's wallet filled with vote token during the voting system. So, the candidate can transfer the vote token. The counting of the vote is started from the process of checking the total no of tokens present in the candidate's wallet as well as the total number of votes gets cast. The total number of the transaction may also be displayed and gives information about the total number of voters who participated in the election. [4]
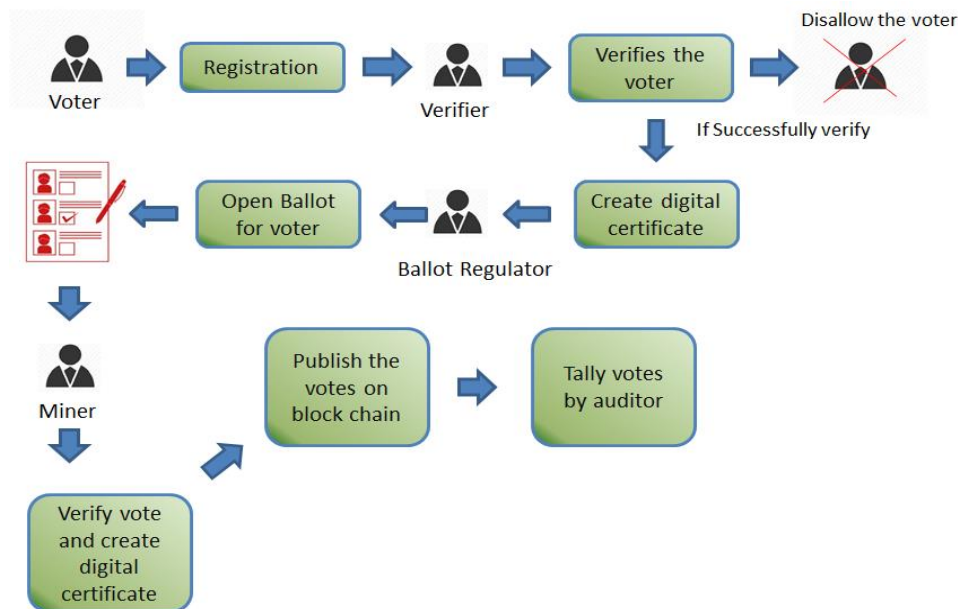
Fig. Design of the E-voting system by using the blockchain technology

V. PLATFORM

To the developed system, there are various platforms as well as languages are used like c++, java, javascript etc. A various platforms like Ethereum [6], Hyperledger Fabric etc. are used. The relative study between to platform is as mentioned below:

Properties	Ethereum	Hyperledger
Network	Public network	Consortium/private network (permissioned)
Cryptocurrency	Ether	No cryptocurrency
Consensus	Proof of work	Practical Byzantine fault tolerance
Smart contract	Solidity(Ethereum specific scripting language)	Chain code
Language	Golang + Python	Golang + java
Maintenance	Ethereum developer community.	Linux foundation.

After studying about the platform we have come to conclusion as the Hyperledger Fabric is the best platform to develop the system as it has many benefits over the Ethereum. Golang is one of the languages used to develop the application of blockchain. Golang is used with the Java for the developed application. Unlike Bitcoin and Ethereum, hyperledger fabric support privacy and confidential transactions. Fabric support the notion the channel, a "subset" of peers within the network that wants to share information confidentially fabric has no notion of mining, use the notion of distributed consensus under a closed environment. [6]

VI.   FUTURE SCOPE

The future scope of e-voting using blockchain is in many sectors where there is a need of election process. Like elections in colleges, any organizations. When it comes to India, the future of blockchain seems to be very bright. The various companies like Infosys, Kotak etc have shown their interest in blockchain technology. Incoming 5 years blockchain technology will be top areas in development. So, the e-voting using blockchain technology will have the great scope in India.

VII .   CONCLUSION

The today's traditional voting system provides the ballot paper for the vote which has too many drawbacks which lead to widespread political unrest in a country. It is necessary for democracy to have the transparent voting system that must have least no of obstacles for a voter to vote. The proposed system is highly transparent and secure and also temper-proof cost efficient as compared to other countries. By understanding all needs of the nation and clients the proposed system satisfies all the requirements.

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