



Electronic Voting System Leveraging Blockchain

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Abstract

E-Voting system using block chain works as a step towards creating secure and transparent environment for elections. Where the users will be able to cast their votes only once and will be able to view the total votes casted in real-time without having the permission to edit the same after elections get over. The working of block chains will ensure the votes are maintained and the systems are not rigged by any third party. The secure E-Voting system, uses block chain Which is a decentralized peer-to-peer transaction ledger. Every vote that is casted will be considered as an individual transaction. These votes will be counted and the results will then be announced. To limit the voting frauds and to make the voting and counting process very transparent, this system is required to convenient for the voters as well as this system minimize the cost for conducting the election, this is definitely cheaper method as compared to the current view of conducting election, Voting is a very important issue which can be beneficial in term of choosing the right leader in an election. A good leader can bring prosperity to a country and also can lead the country in the right direction every time. However, elections are surrounds with ballot forgery, coercion and multiple voting issues. Moreover, while giving votes, a person has to wait in a long queue and it is a very time-consuming process. In this paper, a fully decentralized e-voting system based on block chain technology is proposed. This protocol utilizes smart contract into the e-voting system to deal with security issues, accuracy and voters' privacy during the vote. The protocol results in a transparent, non-editable and independently verifiable procedure that discards all the intended fraudulent activities occurring

during the election process by removing the least participation of the third party and enabling voters' right during the election. Both transparency and coercion are obtained at the same time.

Keywords: Blockchain; Ethereum; Secure Voting; Decentralized Voting System.

1. Introduction

Extensive research has been done on electronic voting systems that enable voters to vote at their convenience using a mobile phone, computer or any other electronic device. Still, none of these technologies have been incorporated on a larger scale due to inherent security threats/concerns [9] that these systems might pose to the integrity of the voting process. In this paper, we discuss electronic voting system using blockchain, a secure and robust system that ensures anonymity of the voter, transparency, and robust functioning [8].

Blockchain: Block chain is a distributed database in which data are shared with the participant of the node and each participant holds the same copy of the data. Block chain has properties like distributed, pseudonymity, data integrity etc. [2] [5] The blockchain is a digital platform for digital assets. It consists of a continuously growing list of records known as blocks that are linked and secured using cryptography [7] [10]. Major usage of Blockchain has been in all cryptocurrency transactions, mainly Bitcoin. However, they are increasingly being used in a number of other applications because of their inherent resistance to modification to the transaction/block/whole distributed ledger, Blockchain [1] [11].

2. Proposed System

The user will have to login into the voting system using his credential. The successful casting, the system will generate an input that contains the voter's unique number along with voter's

information as well as the hash of the previous block. This method will ensure the uniqueness of both input and output. After a block is created and depending on the candidate selected, the information is recorded in the corresponding block chain . Each block gets linked to the previously cast vote. After the election period is over results will then be made available to all voters on their dashboard by the admin. This paper is aimed at developing a decentralized blockchain based e-voting system. This ensures that the voting process is safe and unalterable.

3. Proposed System Architecture

The Paper is implemented on ethereum as the development platform and also the blockchain network. As ethereum provides a vast variety of tools which can be used in the development of decentralized apps. The ethereum community is a vast community of developers and they develop the platform of ethereum which provides the platform for development of applications. Ethereum has ethereum virtual machine which provides a software development environment for decentralized apps. The miners solve a complex algorithmic problem which generates a nonce value which makes a link with previous block and by this process all the blocks are connected to form a blockchain. The data is stored in blockchain. This provides the ideal platform for the purpose of our paper. The main concern in E- Voting is how to protect the user's identity yet preserve transparency and integrity of data. To solve this problem ethereum provides the different hash values to users in the network through which it is almost impossible to identify the individual. The transactions done in the ethereum network is visible to everyone in the network and can be validated. Hence it is transparent to all the nodes in the network [3] [4]. To maintain the integrity of the data the data is not stored in a particular location but it is spread across the network which acts as a distributed database [6]. So that the data immutable and very difficult to manipulate, by this process the integrity of the data is maintained. It provides a peer to peer communication where all the applications run on ethereum network.

During voting time each voter must be provided a ethereum wallet which will consist of limited amount of ether which will be used to vote for the candidate. The votes will be recorded in the blockchain using the smart contract which will validate and verify the voter and vote.

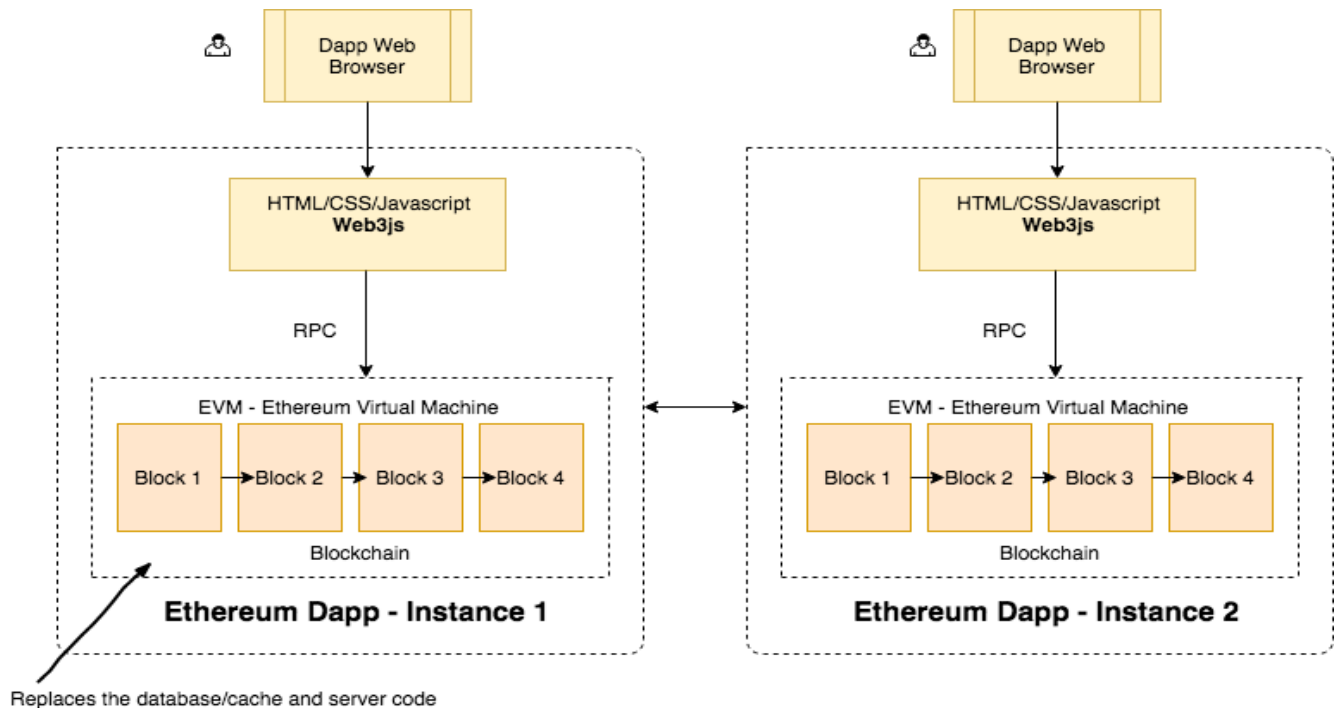


Figure.1. System Architecture

Ethereum platform is depicted in Figure.1. Every client (browser) communicates with it's own instance of the application. There is no central server to which all clients connect to. This means, every person who wants to interact with a dapp (Decentralized Application) will need a full copy of the block chain running on their computer/phone etc. That means, before you can use an application, you have to download the entire block chain and then start using the application.

4. The Process flow in the proposed system

The main activities of election process are depicted in Figure.2. and they are described in the following sub section.

4.1. Election Creation

Election administrators create election ballots using a decentralized app(dApp). This decentralized app interacts with an election creation smart contract, in which the administrator defines a list of candidates and voting districts. This smart contract creates a set of ballot smart contracts and deploys them onto the blockchain, with a list of the candidates, for each voting district, where each voting district is a parameter in each ballot smart contract. When the election is created, each corresponding district node is given permission to interact with his corresponding ballot smartcontract.

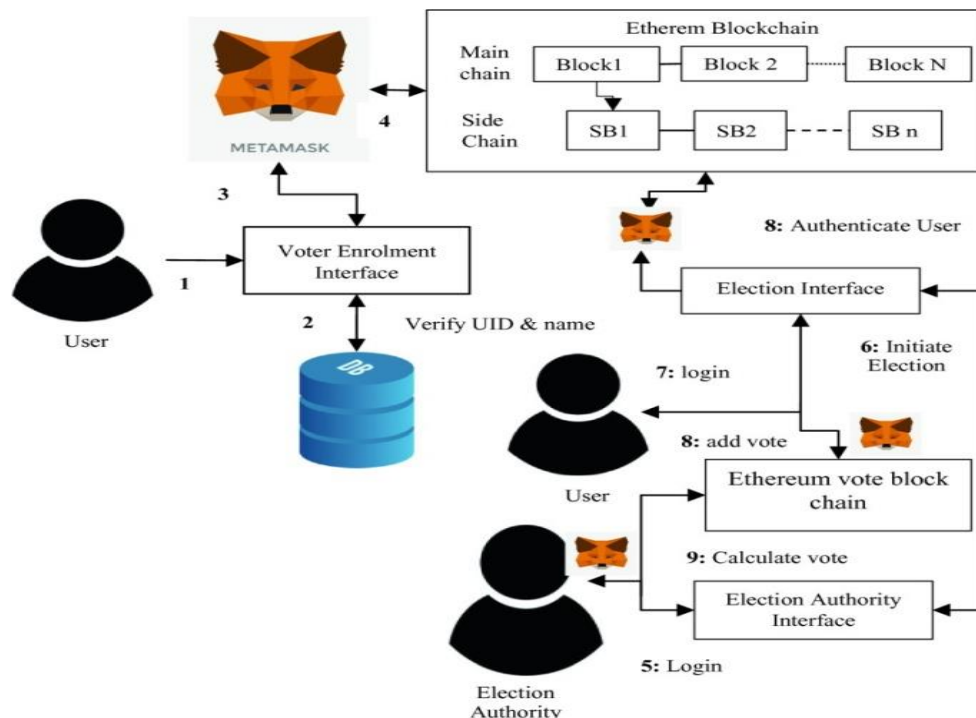


Figure.2. Activities flow diagram

4.2. Voter Registration

The registration of voter phase is conducted by the election administrators. When an election is created the election administrators must define a deterministic list of eligible voters. This requires a component for a government individual. Using such verification services, each of the eligible voter should have an Aadhaar number and phone number and information on what voting district the voter is located in. For each eligible voter, a corresponding wallet would be

generated for the voter. The voter wallet generated for each individual voter should be unique for each election the voter is eligible for and a NIZKP could be integrated to generate such wallet so that the system itself does not know which wallet matches an individual voter.

4.3. Vote Transaction

When an individual votes at a voting district, the voter interacts with a ballot smart contract with the same voting district as is defined for any individual voter. This smart contract interacts with the block chain via the corresponding district node, which appends the vote to the block chain if consensus is reached between the majority of the corresponding district nodes.

4.4. Verifying Vote

As was mentioned earlier, each individual voter receives the transaction ID of his/her vote. Each individual voter can go to his government official and present their transaction ID after authenticating himself using his electronic ID and its corresponding PIN. The government official, utilizing district node access to the blockchain, uses the blockchain explorer to locate the transaction with the corresponding transaction ID on the blockchain. The voter can therefore see his vote on the blockchain, verifying that it was counted and counted correctly.

Table 1. Software Requirements

Operating System	Windows 10
Software	Ganache, Metamask, Truffle, NodeJs, Sublime Text Language used CSS, HTML, Javascript
Data Base	MySql
Back End	Solidity

5. Future Enhancement

Apart from state elections, this blockchain based voting system, could also facilitate voting processes inside private organizations and college elections. This technology can even be used to facilitate the process in reality shows like Talent Hunt shows, where vote of viewers matters the most.

6. Conclusion

E-voting is an emerging concept or solution of voting to carry out activities with accuracy and reliability. Moreover, block chain is an interesting and attractive technology that provides transparency of data and is a topic of high demand. As the process of election must be handled with care in order to avoid unusual circumstances and occurring. Therefore, this protocol might reduce the constraints of 14 manual voting and other E-voting systems based on block chain that uses least involvement of the third party. Also, the reduction of third party completely is a proof of healthy election which is enabled by using the assistance of Smart Contract. The coercion is also prevented by the concept of random generation of groups using Smart Contract. The techniques used in the protocol is quite simpler and easily understandable and designed to reduce memory and time consumption to make tasks faster. As a result, this protocol fulfils all the previously defined properties of the referred paper along with the prevention of coercion with transparency. The voters can monitor the whole process and their privacy is also maintained to avoid any sort of issues. Furthermore, a replacement of the metadata can be taken in consideration to make this protocol widely used in all areas.

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