



E-voting System using Proof of Voting (PoV) Consensus Algorithm using Block Chain Technology

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ABSTRACT: Designing an electronic voting system is the biggest challenge, especially in India. It has to satisfy all the legal functionalities and tamper proof system. E-voting system can be made up of central and distributed network type, but main disadvantage of central network is single point of failure. Blockchain technology is a distributed type network many applications like Electronic medical records (EMR), IoT and E-voting. In this paper we developed an electronic voting system using blockchain technology with powerful Proof-Of-Voting (POV) consensus algorithm. In this paper we evaluate the legal issues that raised in conventional methods and how can we overcome in blockchain technology. In this paper we made one system with PoV which increases security, low cost and low power consumption.

KEY WORDS: Proof-of-voting (POV), Blockchain Technology (BCT), Electronic Voting (E-Voting).

I. INTRODUCTION

In early 80's and 90's some countries used traditional pen, paper method for conduction general and national elections, but in this traditional method there is a chance of doing fraud, misleading the results, due to this the total national security may decreases and cost of the election also increases. There are many studies were made to overcome these issues. E-Voting is one best and accurate method for conducting elections in democratic countries. Now a days many countries are E-voting systems with micro controller, software and program designed. But at some point, of time there may be chance of do tamper or hack the system because of central accessible storage and access. This may lead to misleading of national security and election result. To overcome such type of problems here in this paper we implemented E-voting system with blockchain with the considerations of national security, efficient man power and limits the fraud.

In democratic country the election process should provide some essential qualities:

1. E-voting system should made for willing persons.
2. Voter information and vote casting should keep in secret.
3. Voter id verification and count of votes have to be correct.
4. No other person should not tamper the vote.

Blockchain is a digital trust with decentralized, digitized, public and shared ledger of information that is resistant to tampering. The main features of blockchain technology are;

1. enhanced security features, preventing fraud and data theft.
2. Improve the overall robustness and integrity.
3. Securing edge devices with authentication and data management.
4. Reduce the fishing attacks, DDoS (Distributed denial of service) attacks.

With these features of cryptography, every node in blockchain is linked with hash pointer, verified signed transactions is replicated globally on millions of nodes. For these reasons and features now 33% of organizations are using blockchain technology.



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Section II gives the information about Blockchain as a service for E-voting. Section III describes proof of vote consensus mechanism. Section IV describes security analysis proposed consensus algorithm. Section V describes conclusion and future scope.

II. BLOCKCHAIN AS A SERVICE FOR E-VOTING

In this section we considered E-Voting system based on blockchain technology. Firstly, in this section we will discuss about how to create smart contracts, next discuss about different frameworks in blockchain then how to deploy election using smart contracts and in last about the proposed system.

A. Creating election smart contracts

Smart contracts include identifying the roles that are involved in election like voter, officer, nodal officer. There are different election roles can be made as smart contracts. Figure 1 shows the participants in E-Voting system and how election will be initiated. Firstly, election administrator starts the election and after particular time he closes the election, total election process monitored by election administrator. Next district officer having the information about next sub level like district-wise, next boot officer to the voter last. Boot officer will be in the polling booth and he monitors the election of single polling booth. Smart contracts created for all of them in the network from administrator to voter. To cast vote every node has to make authentication. So that it will give perfect result and no other persons can tamper the network.

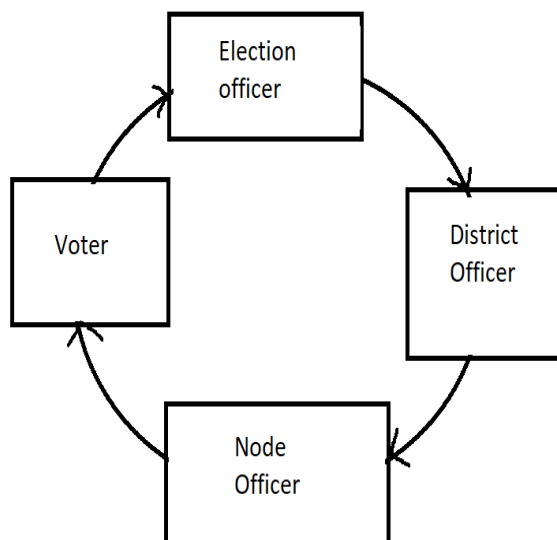


Figure 1: election process initiation using smart contacts

B. Election procedure

Election officer creates decentralized application for election procedure. Main activities of election process using blockchain technology are election creation, voter registration, voter transaction, tallying results and verifying vote. Figure 2 shows how the election process done using proof of vote network.

In this paper we are proposing new consensus method permissioned Proof of voting. After initiating election process election starts with candidates list and smart contracts of every candidate.

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Each ballot smart contract created by node officer to particular candidate and it is verified by district and node officer. Voter registration made by using proof of vote (POV). If the candidate’s smart contract is matching with the ballot smart contract then only voter can cast his vote, if he fails in this process then voter is not allowed to cast his vote. The same work can be done using proof of work (POW) also, but the power consumption is very high in POW where as in POV the power consumption is low. Next session will give the information about POV consensus mechanism. After verification done, tally of votes and voter transaction can be done by conventional methods.

III. CONSENSUS FOR E-VOTING SYSTEM

Consensus is important concept in block chain technology. Block Chain Technology (BCT) is a distributed technology so that anybody can enter in to the network if it is permission less BCT. Every node and process have to maintain same data and understanding. In permissioned BCT all nodes are known to each other where as in permission less BCT nodes are unknown to each other. Some malicious nodes may not follow the consensus due to that voting data may get leaked.

In this proposed consensus algorithm, it will predict the malicious nodes and removes it from the Block Chain. In E-voting system it is important to remove some failures like byzantine failure, security failure, crash failure, software failure and temporal failure. Figure 2 shows how the consensus achieved in distributed system. In block chain if any of the node is behaving like malicious (attacker) then automatically detected by proof of vote (PoV) algorithm and those attackers will be removed from block chain.

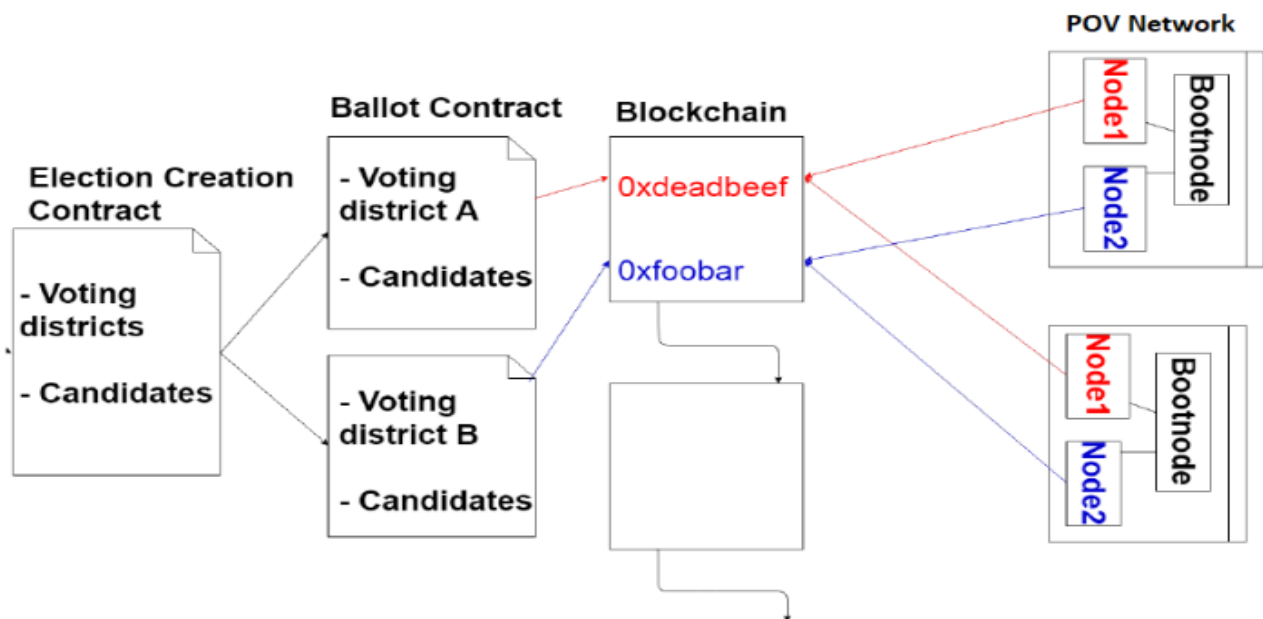


Figure 2: Election procedure using smart contracts

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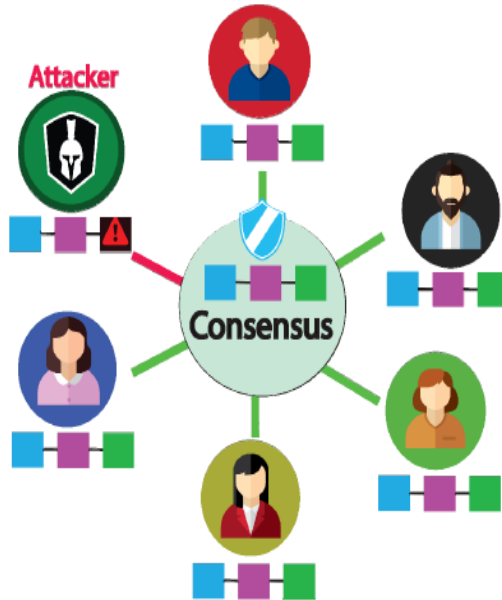


Figure 3: consensus in proof of vote (PoV)

IV. SECURITY ANALYSIS OF CONSENSUS ALGORITHM

In this we will discuss about security analysis of E-voting using POW and POV consensus algorithms. E-voting system using BCT is a distributed type network. Every ballot box in the network act as node and every node is connected to network. This distributed network does not allow any other malicious nodes. In this paper security analysis is made by byzantine failures. In POW the byzantine failure percentage is more comparing with POV. The statistical analysis will prove the result. Table 1 will give the total information about this.

Table 1: Comparison statement of POW vs POV

Consensus Mechanism	Byzantine failures	Smart contracts
Proof-Of-Work (POW)	5%	Very slow
Proof-Of-Voting (POV)	3.2%	Fast

V. CONCLUSION

In this paper, we introduced a unique, blockchain-based electronic voting system that utilizes smart contracts to enable secure and cost-efficient election while guaranteeing voters privacy. We have outlined the systems architecture, the design, and a security analysis of the system.

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