

Blockchain based E-voting System

Abstract— The use of technology has become important at this point in helping to meet human needs. Due to the increasing use of technology, new challenges are brought in the process of democracy as most people today don't trust their governments, making elections is very important in modern democracy . Elections have a great importance in determining who will rule a nation or an organization or it can be said as it is an event that decides the fate of any nation.

In modern democracy, elections are very important but large sections of society around the world do not trust their election system which is a major concern for democracy.

Even the world's largest democracies like India, United States, still suffer from a flawed electoral system. Vote rigging, hacking of EVM (Electronic voting machine), election manipulation, and polling booth capturing are the major issues in the current voting system

The blockchain is said as emerging, decentralized, and distributed technology that promises to enhance different aspects of many industries. Expanding e-voting into blockchain technology could be the solution to eliminate the present concerns in e-voting system

There is no doubt that the ever changing concept of the blockchain, which is the backbone of the famous cryptocurrency Bitcoin has triggered the start of a new era in the Internet and the online services. While most people focus only on bitcoin and other cryptocurrencies; there are in fact, many operations, both administrative and fintech that can only be done online/offline can now safely be moved to the Internet as online services because of immutability of blockchain. What makes blockchain a powerful tool is its smart contracts and many features which overcomes traditional systems.

Smart contracts are meaningful pieces of codes, to be integrated in the blockchain and executed as scheduled in every step of blockchain updates. E-voting, is another trending, yet critical, topic related to the online services. The blockchain with the smart contracts, emerges as a good candidate to use in developments of safer, cheaper, more secure, more transparent, and easier-to-use e-voting systems. Due to its consistency, widespread use, and provision of smart contracts logic, Ethereum and its network is one of the most suitable ones. An e-voting system must be secure, as it should not allow duplicated votes and be fully transparent, while protecting the privacy of the attendees.

In this project, we have implemented and tested an e-voting

application as a smart contract for the Ethereum network using the Ethereum and the Solidity language.

KeywordsBlockchain, Ethereum, Decentralized, Digitalizing.

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 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. [1]

Blockchain- 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. 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.

2. Literature Survey

A. Votereum: An Ethereum-based E-voting system : Linh Vo-Cao-Thuy, Khoi Cao-Minh, Chuong Dang-Le-Bao and Tuan A. Nguyen, 2019, "Votereum: An Ethereum-based E-voting system", University of Information Technology Vietnam National University HCMC, Vietnam, it reviews the requirements and then propose Votereum, an Electronic voting system that utilizes the blockchain technology. The proposed system is empowered by Ethereum platform, including one server manages the entire system and the other handles all blockchain-related requests.[6]

B. Online Voting: Voting System Using Blockchain:

Vaibhav Anasune, Pradeep Choudhari, Madhura Kelapure and Pranali Shirke Prasad Halgaonkar, "Online Voting: Voting System Using B-chain", 2019, article gives a short review on various methodologies that are used in current voting. The paper will help to build a system that will face the present and upcoming challenges and will remove drawbacks from these previous architectures[5]

C. Decentralized Voting Platform Based on Ethereum Blockchain:

David Khoury, Elie F. Kfoury, Ali Kassem and Hamza Harb, 2018 "Decentralized Voting Platform Based on Ethereum Blockchain", Department of Computer Science American University of Science and Technology, we propose a novel approach for a decentralized trustless voting platform that relies on Block-chain technology to solve the trust issues. The main features of this system include ensuring data integrity and transparency, and enforcing one vote per mobile phone number for every poll with ensured privacy. To accomplish this, the Ethereum Virtual Machine (EVM) is used as the Blockchain runtime environment.[4]

D. Survey on Blockchain Based E-Voting Recording System Design:

G Bhavan, "Survey on Blockchain Based E-Voting Recording System Design" 2018, By adopting blockchain in the distribution of databases on e-voting systems can reduce one of the cheating sources of database manipulation. For encrypting data fetched from fingerprint sensor we are going to use AES algorithm. This research discusses the recording of voting result using blockchain algorithm from every place of election.[7]

E. Blockchain-Based E-Voting System:

Friðrik Þ. Hjálmarsson, Gunnlaugur K. Hreiðarsson, "Blockchain-Based E-Voting System", 2018, School of Computer Science Reykjavik University, Iceland, this paper evaluates the potential of distributed ledger technologies through the description of a case study, namely the process of an election and implementing a blockchain-based application which improves the security and decreases the cost of hosting a nationwide election.[8]

F. Blockchain Based E-Voting Recording System Design:

Rifa Hanifatunnisa and Budi Rahardjo, 2017, "Blockchain Based E-Voting Recording System Design", this recording system occurs when the vote is over. Blockchain technology can be one solution to solve the problems that often occur in the electoral system. The use of hash values in recording the voting

results of each polling station linked to each other makes this recording system more secure and the use of digital signatures makes the system more reliable. The use of the sequence proposed in the blockchain creation process in this system considers that in an electoral system not required for mining as in the Bitcoin system because the voter data and numbers are clear and are not allowed to select more than once, the proposed sequence ensures that all nodes which is legally connected and can avoid collision in transportation.[9]

2.1 Literature Summary

sr.	Name of paper	Technique no
1.	Survey on Blockchain Based E-Voting Recording System Design	1. AES algorithm
2.	Online Voting: Voting System Using Blockchain	1. Cryptographic verification 2. Homomorphic Encryption Technique:
3.	Blockchain-Based E-Voting System	1. Quorum 2. Geth: Go-Ethereum
4.	Blockchain Based E-Voting Digital Signature Recording System Design	1. ECDSA (Elliptic Curve Digital Signature Algorithm) 2. SHA-256 algorithm
5.	Decentralized Voting Platform Based on Cordova Ethereum network Blockchain	1. HTML5 web-app compiled using Apache Cordova 2. Ethereum

6.	Votereum:An Ethereum-based E-voting system	1. External Personal Account(EOA) 2. Contract Account 3. Votereum
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3. Proposed Work

For our architectural design we tried to create a system that doesn't entirely replace the current voting system but rather integrates itself within the current system which we are using today. We decided to do this because the majority of people are familiarized with the current system and the introduction of a new system can create confusion as well as disinterest .

3.1 System Architecture

The system architecture is given in Figure 1. Each block is described in this Section.

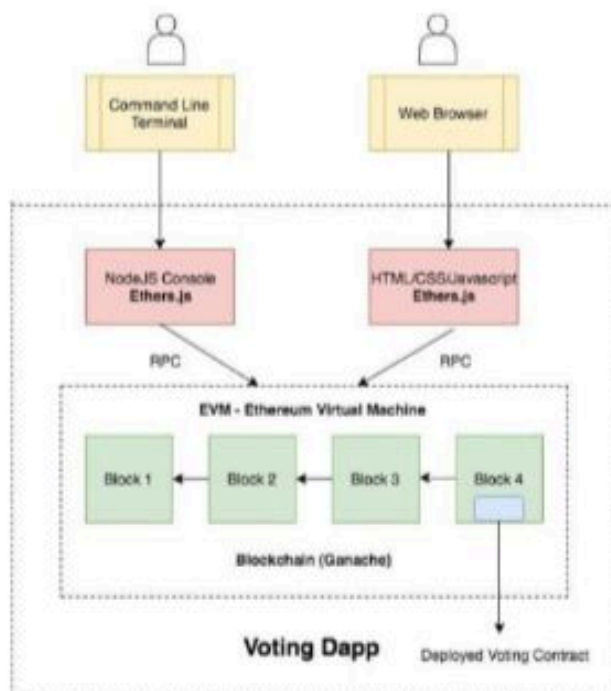


Fig. 1 Proposed system architecture

The first step of our design is the registration process, verifying a voter is essential in establishing security within the system. Making sure that someone's identity isn't being misused for fraudulent purposes is important, especially when voting is considered because every vote matters. To allow users to register to vote our proposed service utilizes Recognition devices & valid identity card number to cross check whether the user is present in the database or not /whether he is eligible to vote or not. After that a unique hash address is given to voter using which he can cast a vote. Each hash is supplied with Ethers by which he can cast vote once.

During the voting day the voter will visit the polling booth he/she will undergo a verification process and then using the address given to him he/she will cast a vote then he will be automatically logged out. The voters will also get live status of voting.

3.2 Requirement Analysis

The implementation detail is given in this section. The entire system is divided into two sub-system a registration system & a voting system.

Registration System:

A voting registration System is developed using Html/Css front-end and SQL back-end which contains the user's personal details already stored for eg: One can consider this as an Aadhar database.

A biometric device would be used for validation purpose. If the user is a valid user then he/her is handed a hash code /address which is used as a credential for login into the voting machine.

Voting System:

The voting system can be considered as a replacement for EVM. It is a decentralized app with a front-end in Bootstrap or Html and a Blockchain in back-end. The smart contract is written in solidity language. The candidate name with symbol of candidate is mentioned in smart-contract. A smart contract is the actual logic piece of entire voting system.

Each and every change made in a blockchain is called a Transaction. Transaction is the way, by which the external world interacts with the Ethereum network. Transaction is used when we wish to modify or update the state stored in the Ethereum network. Each Transaction requires a transaction fee or service charge. Within an Ethereum network circulates a native currency: ether. Ether is mainly used as the transaction fee or service charge also

called gas fee. In this project we are using Ganache-CLI. This speeds up the process of setting up a private network and transactions are mined almost immediately.

MetaMask is a bridge that allows you to visit the distributed web of tomorrow in your browser today. It allows you to run Ethereum dApps right in your browser without running a full Ethereum node. [2][3]

3.1 Software

Table 3.2 Software details

Operating System	Windows 7
Programming Language	Solidity,HTML,Bootstrap
Database	MySQL

3.2 Hardware

Table 3.1 Hardware details

Processor	3.5 GHz Intel
HDD	1TB
RAM	8 GB

4. Conclusion

In this project, we introduced a blockchain-based electronic voting system that utilizes smart contracts to enable secure and cost-efficient election while guaranteeing voters privacy. We have shown that the blockchain technology offers a new possibility to overcome the limitations and adoption barriers of electronic voting systems which ensures the election security and integrity and lays the ground for transparency. Using an Ethereum private blockchain, it is possible to send hundreds of transactions per second onto the blockchain, utilizing every aspect of the smart contract to ease the load [13] on the blockchain. For countries of

greater size, some additional measures would be needed to support greater throughput of transactions per second.

The transparency of the block-chain enables more auditing and understanding of elections. These attributes are some of the requirements of a voting system. These characteristics come from decentralized networks, and can bring more democratic processes to elections, especially to direct election systems. For e-voting to become more open, transparent, and independently auditable, a potential solution would be to base it on blockchain technology. This project explores the potential of blockchain technology and its usefulness in the e-voting scheme. The blockchain will be publicly verifiable and distributed in a way that no one will be able to corrupt it.

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