A Review Of E-Voting System Based on Blockchain Technology

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Abstract

Voting is arguably the most important as well as elementary right in democracy that has existed for the past hundreds of years; it has taken place in the context of a large- and small-scale community. The process transitioned from paper ballots to electronic voting machines (EVM) in the late 20th century, but even with all the advancement, transparency in the election process remained the same. Blockchain technology came in existence in 2008 with the introduction of Bitcoin by Satoshi Nakamoto, and in the last decade we saw enormous growth in development and execution of this technology in various fields e-voting is one of them, blockchain-based e-voting system has potential to improve the election process if utilized to its potential. Blockchain can eliminate the need to print ballot paper as it is secure, immutable and convenient to voters and can make elections more transparent.

Keywords-Blockchain, Machine Learning, SVM

I. Introduction

A blockchain is a secure peer-to-peer(P-2-P) network used for the transaction of digital assets and linked using cryptography. Each record contains a cryptographic hash, a timestamp, and transaction data. Blockchain is an open ledger that enables people to transact using it in a verifiable and permanent way. Its decentralized nature enables it to be secure and tamper-resistant. Records on a blockchain can't be changed retroactively.

A blockchain is a decentralized, distributed, and oftentimes public, digital ledger that is used to record transactions across many computers so that any involved record cannot be altered retroactively, without the alteration of all subsequent blocks. This allows participants to verify and audit transactions independently and relatively inexpensively. A blockchain database is managed autonomously using a P-2-P network and a distributed timestamping server. They are authenticated by mass collaboration powered by collective self-interests. Such a design facilitates robust workflows where participants' uncertainty regarding data security is marginal. The use of a blockchain removes the characteristic of infinite reproducibility from a digital asset. It confirms that each unit of value was transferred only once, solving the longstanding problem of double spending. A blockchain has been described as a value-exchange protocol. And it can maintain title rights because, when properly set up to detail the exchange agreement, it provides a record that compels offer and acceptance.

With the introduction of blockchain technology, decentralized voting systems could be used to improve the election process by eliminating the need for paper ballots and making it easier to vote. The introduction of blockchain in elections could prove to be more reliable, transparent, trusted, and, cost-effective. The objective of this paper is to study various implementations of electronic voting systems based on various blockchain systems and their protocols from multiple scientific research papers.

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II. Related Works

In this study [1] the authors proposed the design and development of a centralized e-voting system called Electron back, the-voters probity i.e., distinguishing between registered and unregistered users, was achieved by integrating the biometric sensor, which enhanced user security. In this study[2] the authors proposed a design of a decentralized electronic voting system based on the Ethereum blockchain with the help of smart contracts and deployed the smart contracts on the local blockchain for this application. Voter's data and candidate detail was stored on the blockchain.

In this study [3] the authors proposed a secure and transparent electronic voting mechanism through IOT devices by using blockchain technology with the aim of resolving various threats and attacks caused by intruders during the polling mechanism in smart cities, and successfully resolved privacy and security flaws by computing the trust of each entity and further storing and analyzing them in a blockchain. The framework showed a better success rate in all simulations against DoS and DDoS threats. In this study[4] the authors proposed a voting system by integrating a smart card as key storage in Tso et al voting application and using AES-256 generated key as password to add security in the form of encryption for user authentication. The user ID is stored on the smart card, the process of reading, writing and, deleting data on the smart card is performed by a system comprising of Arduino Mega 2560, RFID RC-255, and, NodeMCU ESP8266.

In this study[5] the authors proposed an electronic voting system connected to the public blockchain to store the citizen records of the city to decide the eligibility of the voter to cast at a particular polling station. This system uses the concept of both public and private blockchain. In order to be able to cast vote the voter and needs to complete the registration by entering his personal information, the user data is then hashed and sent back to primary data center to authenticate, and if the hashes get matched then the voter is eligible to cast a vote on the day of election. This system offers transparency, confidence and prevents intrusion into the information exchange network.

In this study[6], the authors used "Simple Random Sampling" to implement research trust in blockchain utilization on electronic voting can provide a sample of the number of voters who cast votes, and slovian formula was used to collect samples from selectors, this study was conducted to address the issue of delivering valid results and validating authenticity of voting data. In this study[7], the authors proposed a state-of-the-art e-voting solution and implemented a working e-voting system. I.E., TrustVote; the system was realized twice using public(Ethereum) as well as permissioned(Hyperledger) blockchain for comparison.

In this study[8] the authors have proposed an Ethereum-based electronic voting system, i.e., Votereum. The voting system utilized blockchain technology and smart contracts to enable open and secure elections while protecting voters privacy. The proposed system was deployed on Rinkeby Testnet to observe the feasibility of a blockchain-based e-voting system. In this paper[9] the authors have performed a detailed analysis of various e-voting systems conceptualized by different people and studied the advantages of blockchain over other technologies and different approaches to the system

In this study[10] the authors proposed an e-voting system that can be used in real-world large scale polls by conceptualizing, designing and, deploying VoteChain; a blockchain-based e-voting system, to help bring security and transparency to the polls. In this study[14] the authors proposed integrating Aadhaar ID with the e-voting system to overcome duplication and tampering of votes. The proposed scheme also provides the secured e-voting system by using biometric data and Virtual ID of voters obtained from the Aadhaar database to cast the Vote and using digital signature as the key for the encryption of the votes inside the block.

In This[15] research, the authors combined digitalization with blockchain technology to provide a voting mechanism. Their goals were to provide integrity, anonymity, privacy, and security for voters. With the use of Merkle tree and fingerprint hash, data integrity and anonymity, privacy and, security of the voters was achieved in their proposed digital voting system.

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III. Open Issues

The e-voting systems implemented on public blockchain networks such as Ethereum with the help of smart contracts are energy consuming and expensive to implement due to high deployment fees and gas price, making the election process more expensive and impractical even on a small scale.

The amount of transactions a blockchain can process is limited, and if the number of voters exceeds the number of transactions, the time required to validate the transaction(vote) will increase proportionally.

Blockchain networks can be improved against DoS, DDoS, routing, and DAO attacks by increasing computing power on the network, but there is no protection against 51% attacks.

IV. Conclusion

In this paper we studied various e-voting system designs based on public, private and, permissioned blockchain from the conceptualization to deployment, and use of multiple algorithms to overcome the shortcoming of a traditional blockchain. After Comparing different blockchain types, we found out that private and permissioned blockchain systems performed better and required less time to verify the transaction than the public blockchain.

Although blockchain is one of the safest technology we observed that it was vulnerable to DoS, DDoS and, 51% attacks, and the transactional throughput of blockchain is limited the system slows down in case of large scale election, these are the things that can be further improved before a blockchain based e-voting system can be used in a real-life large scale elections.

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