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Voting System using Blockchain Technology

R.Sukesh, S.Nithin, Sumukar Reddy, K.Naveena

UG Students, Department of CSE, Bharath Institute of Higher Education and Research, Chennai, India

R.Prathiba

Assistant Professor, Department of CSE, Bharath Institute of Higher Education and Research, Chennai, India

ABSTRACT: Online voting system is to be the election process carried out on the online platform without any use of traditional ballots paper and EVM. The system should be such that votes being cast by voter would not be rigged or unduly compromised in any shape or form. We are employing blockchain technology for our voting system as it provides decentralized nodes for voting and end to end verification. Blockchain technology gives high-level security and authentication to the voter. Key features of free and fair Development of an electronic voting system that meets the legal needs of legislators has been a challenge for many years. Distributed ledger technologies is a new and thrilling technological innovation in the information technology sector. Blockchain technologies provide an endless number of applications that enjoy sharing economies. This paper seeks to assess the use of blockchain as service to deploy distributed electronic voting systems. The paper invokes the needs of constructing electronic voting systems and delineates the legal and technical constraints of employing block chain as a service towards the realization of such systems.

KEYWORDS: Electronic Voting System, Block Chain ,Distributed Ledger

I. INTRODUCTION

Election is the act of making a decision by a specific individual or group of individuals to elect. Election is a basic right for citizens of most nations. Individuals generally go to a voting booth to vote for their preferred politician. Without a proper voting procedure, there can be confusion all across the nation. Therefore, the voting procedure has to be as genuine as it can be. If a government is prepared to adopt to a voting app, then the government has to ensure the safeguard of data. If data is centrally stored in a server then the data can be easily manipulated which cannot be trusted by citizens of the country. But if blockchain is used to store data, citizens can easily trust the system because data in blockchain cannot be tampered with. Here, I have built a sample voting application based on blockchain which can be enhanced further by publishing future version of the application and new features can be implemented in the future.

Currently it is a basic project where individuals will be able to create a voting poll and other user will be able to vote to determine the winner of the poll. Through this process the voters can be assured of cleanliness of the voting process and can vote peacefully and will be able to accept the result without any question. Election integrity is not just required for democracies to run, but also has a very important effect on public voters' trust and feeling of accountability. Political voting processes are very important in this aspect. From a government's point of view, electronic voting technologies can enhance voter turnout, increase voter confidence, and reignite enthusiasm in the voting process. Studies have indicated that utilizing electronic voting systems can enhance security. In deciding whether to have voting system on blockchain or not, one has to examine why it is considered better than a normal manual voting process. Even though it adds to the worth and strength of democracy, but it is also expected to be a solution to many critical problems, like raising election turnout, simplifying voting for the elderly and disabled, and enhancing access to the polls. In recent times, electronic voting system based on blockchain has gained significance as a solution to some problems that may be associated with e-voting. Because of the blockchains' impossibility of altering, making them a distributed, decentralized, and decentralized ballot box, blockchain-based voting systems have been suggested to be the following initiation of today's electronic voting systems. Voting systems using a blockchain were at first proposed to be the way forward for fair and accurate elections by ending manual voting's associated issues and assuring unbiased and accurate elections.

Electronic voting system security has been among the topics that have been exhaustively covered in literature.

Malfunction consequences, secrecy of ballots, integrity of data, transparency, reliability, illiterate voters, need for professional security, IT expertise, fraud issues, storing equipment, and expense are some of the problems that employing electronic voting can raise. Because of the blockchain's immutability, it is a distributed, decentralized, and decentralized ballot box, voting system on the basis of blockchain has been put forward as the next step in voting systems based on electronic. Governments are motivated to adopt intelligent feasible voting systems and to include continuity of information in voting systems using blockchain technology. It ensures everyone possesses correct knowledge on sustainable assets. It's important to mention that even though the electronic voting system is increasingly utilizing blockchain to enhance security, there are still a number of issues.

II. LITERATURE SURVEY

S.No	Paper	Techniques Used	Observations
1	Blockchain-Based E-voting System, M.-V. Vladucu, Z. Zhao, and R. Rojas-Cessa, IEEE Access, 2024	Smart contracts, cryptographic hashing, and public/private key cryptography	Balancing privacy with transparency remains a challenge. Scalability and user accessibility
2	Cryptovoting: A blockchain-based e-Voting System, M. Fusco, M. Pan, F. Pinna, IC3K, Spain, 2024	Zero-Knowledge Proofs and decentralization to protect voter privacy and system integrity	Security and transparency, ensuring tamper-proof elections. Challenges like maintaining voter privacy
3	Voting System Using Blockchain(App), I. S. Al-Maaith, M. Qataweh, A. Quzmar, ICIT, Jordan, 2023	Vote validation and cryptographic hashing to secure and verify votes, decentralization to ensure tamper-proof, transparent results	Ensures immutability and auditability, making election results more trustworthy
4	Secure Blockchain-based Voting System using Homomorphic Encryption, J. Smith, K. Patel, and R. Clark, IEEE Transactions on Blockchain, 2024	Decentralized ledger with multi-signature authentication	Enhances voter privacy while maintaining vote integrity, but faces computational challenges
5	Decentralized Voting Platform using Blockchain, A. Khan, S. Verma, and D. Liu, Journal of Blockchain Technology, 2024	Decentralized ledger with multi-signature authentication	Reduces the risk of vote manipulation, but scalability remains an issue.
6	Privacy-Preserving Blockchain E-Voting System, T. Green and P. Lee, ResearchGate, 2024	Ring signatures and secure multi-party computation	Maintains voter anonymity while securing vote integrity, yet requires efficient computation
7	Blockchain-Enabled E-Voting Framework for Transparent Elections, B. Gupta, A. Roy, MDPI, 2024	Proof-of-Authority (PoA) consensus with cryptographic signatures	Facilitates transparent elections while reducing the computational burden
8	Lightweight Blockchain-Based Voting System, C. He, X. Zhang, ACM Digital Library, 2024	Lightweight consensus protocol and Merkle tree hashing	Enhances performance and reduces energy consumption in blockchain voting.
9	Blockchain Voting with Post-Quantum Cryptography, Y. Li, D. Wang, IEEE Access, 2024	Lattice-based cryptography for post-quantum security	Addresses potential threats from quantum computers, improving future-proof security
10	Scalable and Resilient Blockchain Voting Architecture, N. Brown, A. Davis, ScienceDirect, 2024	Byzantine Fault Tolerance (BFT) for consensus	Enhances scalability and resilience against node failures, maintaining system integrity.

III. METHODOLOGY

The development methodology for a blockchain-based voting system entails a number of phases to enable secure, transparent, and tamper-proof voting. The main phases are listed below:

1. Requirement Analysis

Identify the stakeholders and collect requirements for safe voting.
Study security risks and data integrity requirements.

2. System Design

Architecture Design:

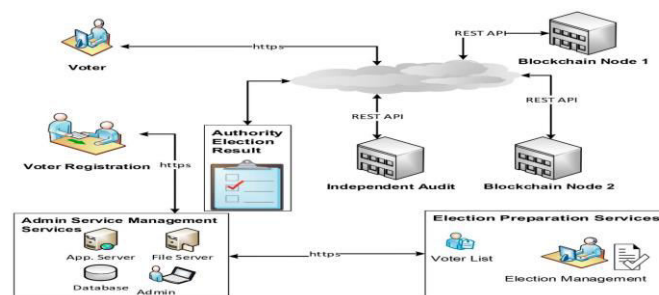


Fig 3.1 Architecture

Smart Contract Design: Establish rules for voting, validation, and tallying.
Cryptographic Mechanisms: Use hashing, digital signatures, and encryption.
User Interface Design: Create an easy-to-use voting interface for submitting votes.

3. Blockchain Network Setup

Choose the blockchain platform (e.g., Ethereum, Hyperledger).
Establish nodes and validators for a decentralized network.
Apply consensus algorithms to confirm votes and provide data integrity.

4. Smart Contract Implementation

Create smart contracts to manage vote casting, validation, and counting.
Add verification mechanisms to validate voter authenticity and vote immutability.
Deploy the contracts to the blockchain network.

5. Front-End and Back-End Development

Front-End: Create a responsive web or mobile app for voters.
Back-End: Interface with blockchain nodes to cast and validate votes.
API Development: Seamlessly integrate front-end and back-end.

6. Testing and Validation

Unit Testing: Validate smart contracts for accuracy and security.
Load Testing: Test multiple votes to check scalability.
Vulnerability Testing: Validate the smart contract logic for weaknesses.

7. Deployment

Deploy the system on a public or private blockchain network.
Set up nodes and validators for operational readiness.

8. Maintenance and Upgrades

Monitor system performance and patch vulnerabilities.

Periodically update blockchain nodes and smart contracts whenever necessary.

Following this approach, the voting system retains scalability and user accessibility alongside improved security, integrity, and transparency.

IV. RESULT

MetaMask first asks the user to connect their project to blockchain

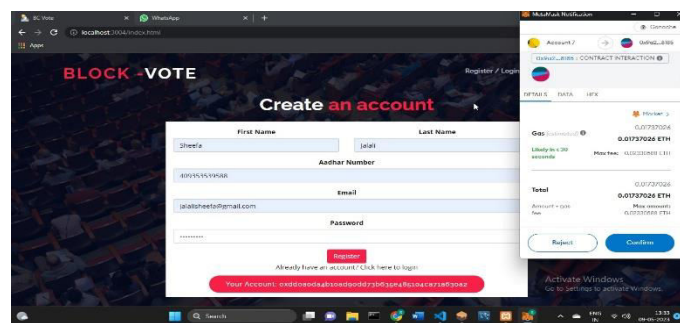


Figure 4.1 Connect Metamask

Once the user is connected, the admin can now set up the election that is add candidates and start and end the election.

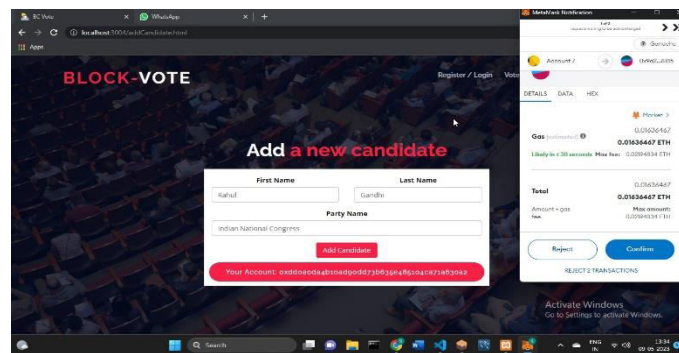


Figure 4.2 Accept Transactions

The admins can also view the election details such as vote tally and voters' details.

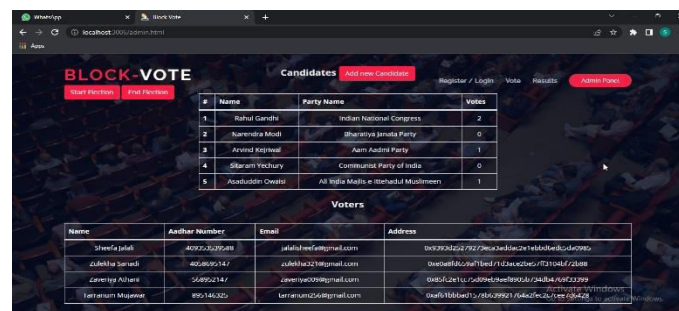


Figure 4.3 Check Voters and Candidates

Once the voting process is deployed voters can register for the voting process.

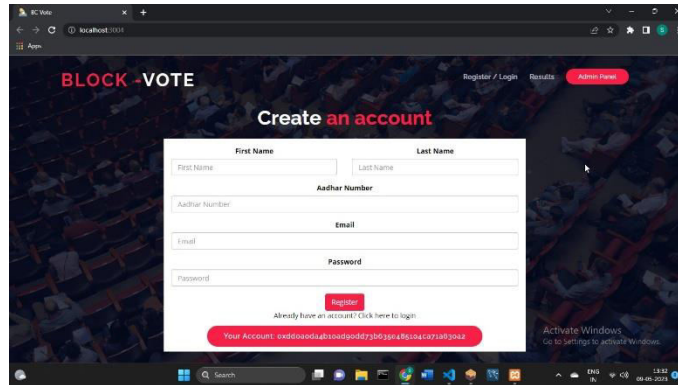


Figure 4.4 Register for vote

Voters will the cast their vote by choosing their preferred candidate.

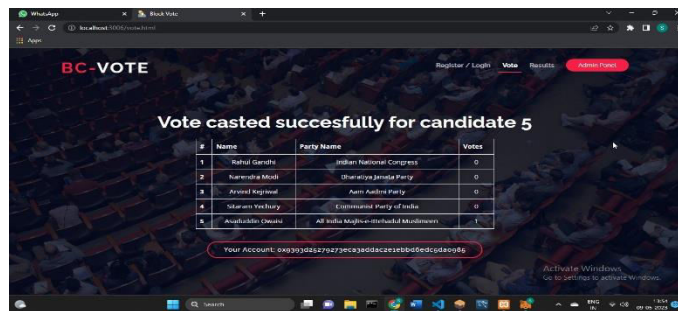


Figure 4.5 Vote your Candidate

Results page

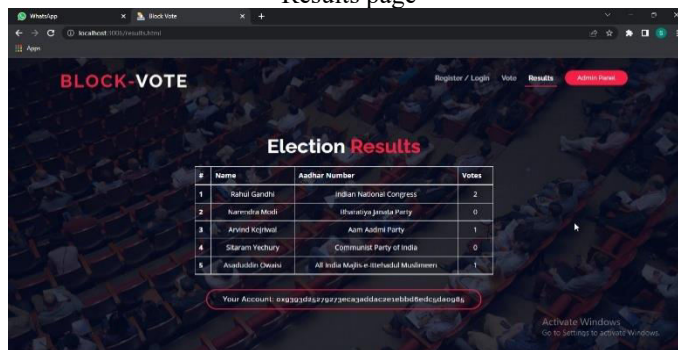


Figure 4.6 Check Results

V. CONCLUSION

Conclusion

The implementation of a blockchain-based voting system presents a revolutionary approach to conducting secure, transparent, and tamper-proof elections. By leveraging blockchain's decentralized nature, this system ensures that votes are immutable, verifiable, and protected against fraud. The use of smart contracts automates vote counting, reducing human errors and increasing efficiency. Additionally, features like end-to-end encryption, multi-factor authentication,

and zero-knowledge proofs help maintain voter anonymity while ensuring election integrity. While the system has several advantages, challenges such as scalability, regulatory approval, and user adoption need to be addressed for widespread implementation. Overall, blockchain technology has the potential to modernize electoral processes, making them more accessible, cost-effective, and trustworthy.

VI. FUTURE SCOPE

- 1 **Integration with National ID Systems** – Linking blockchain voting with government-issued digital IDs can enhance authentication and security.
- 2 **AI-Powered Fraud Detection** – Implementing artificial intelligence to detect and prevent suspicious activities in real time.
- 3 **Interoperability with Other Technologies** – Combining blockchain with biometrics, IoT devices, or cloud computing to enhance the voting experience.
- 4 **Scalability Improvements** – Exploring advanced blockchain models like sharding or Layer-2 solutions to handle large-scale elections efficiently.
- 5 **Legal and Regulatory Adoption** – Working with governments and regulatory bodies to establish legal frameworks for blockchain-based elections.
- 6 **Decentralized Autonomous Elections (DAE)** – Using blockchain to create self-executing election processes with minimal human intervention.
- 7 **Global Adoption** – Expanding blockchain voting beyond national elections to corporate voting, shareholder meetings, and organizational decision-making.

As blockchain technology evolves, its role in electoral systems is expected to grow, leading to a future where digital voting is not only secure and efficient but also universally accepted and trusted.

REFERENCES

- 1 **Nakamoto, S. (2008).** Bitcoin: A Peer-to-Peer Electronic Cash System. Retrieved from <https://bitcoin.org/bitcoin.pdf>
This paper introduces blockchain technology, which serves as the foundation for secure voting systems.
- 2 **Zyskind, G., Nathan, O., & Pentland, A. (2015).** Decentralizing Privacy: Using Blockchain to Protect Personal Data. 2015 IEEE Security and Privacy Workshops (SPW), pp. 180-184.
Discusses how blockchain can be used to enhance privacy and security in digital applications.
- 3 **Khan, B., Arshad, J., & Khan, M. K. (2021).** Blockchain-Based Electronic Voting: A Systematic Literature Review. IEEE Access, 9, 158982-159002.
A comprehensive review of blockchain-based voting systems, their challenges, and proposed solutions.
- 4 **Voatz. (2020).** Mobile Voting Using Blockchain Technology. Retrieved from <https://voatz.com>
Provides insights into real-world implementation and pilot programs of blockchain-based voting systems.
- 5 **Follow My Vote. (2018).** End-to-End Verifiable Blockchain Voting System. Retrieved from <https://followmyvote.com>
Explains how blockchain can be used to create verifiable and transparent elections.
- 6 **Hjalmarsson, F., Janson, C., Abom, M., & Huvio, E. (2018).** Blockchain-Based E-Voting System. Proceedings of the 2018 21st International Conference on Information Fusion (FUSION).
Discusses the feasibility and design considerations of using blockchain for voting systems.
- 7 **Tschorsch, F., & Scheuermann, B. (2016).** Bitcoin and Beyond: A Technical Survey on Decentralized Digital Currencies. IEEE Communications Surveys & Tutorials, 18(3), 2084-2123.
Provides technical insights into blockchain consensus mechanisms that can be applied to secure voting.
- 8 **Agora. (2019).** Blockchain-Based Election Solutions. Retrieved from <https://agora.vote>
A real-world example of blockchain voting used in governmental elections.
- 9 P. Pulivarthy and P. Whig, "Bias and fairness addressing discrimination in ai systems," Advances in human and social aspects of technology book series, pp. 103–126, 2024.
- 10 **Swan, M. (2015).** Blockchain: Blueprint for a New Economy. O'Reilly Media.
Explores various blockchain applications, including electronic voting
- 11 **Hyperledger Fabric Documentation.** (n.d.). Retrieved from <https://hyperledger-fabric.readthedocs.io>
Details the use of permissioned blockchain for enterprise applications, including voting systems



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