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Ballot and Beyond: Exploring Blockchain Voting

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Abstract: ***The conventional voting system faces widespread distrust, necessitating a shift towards democratic voting in nations. The suggested platform offers a framework that can be used to perform blockchain-based digital voting without the need for actual polling places. Our suggested design makes use of adaptable consensus algorithms to enable a scalable blockchain. The voting process can be made more secure by the voting system's application of the Chain Security Algorithm. In the process of carrying out a transaction in the chain, smart contracts offer a safe connection between the user and the network. It has also been argued how secure the voting mechanism based on blockchain is. Furthermore, elaborated are the methods for preventing 51 percent attack on the blockchain and encrypting transactions using cryptographic hashes. Additionally, using Blockchain, the procedure for conducting blockchain transactions during the voting process has been developed. Ultimately, the suggested system's performance review demonstrates that a sizable population can use the system. In conclusion the proposed blockchain-based voting system aims to build trust between government and voters, make the voting process transparent and trustworthy, and improve the level of the electoral system's reliability, traceability, and trust.***

Keywords: Blockchain, 51 percent attack, Democracy, transparent, reliability.

I. INTRODUCTION

What is covered in this chapter: This chapter delves into the motivations behind the project, exploring the drawbacks of existing voting systems, and highlighting the significance of transparent and trustworthy elections. It introduces the proposed solution leveraging blockchain technology and outlines the objectives of the project.

Electronic voting, despite offering cost-effectiveness and automated result generation, has been criticised for its vulnerability to interference and manipulation by individuals with physical access to the system [1]. While it provides advantages such as instant result saving and presentation, the centralised oversight required raises concerns about transparency and voting rights [2]. In contrast, traditional voting incurs expenses for personnel, ballot distribution, and security measures, contributing to significant global election costs [4]. The contemporary shift to electronic voting devices replaces the time-consuming and error-prone aspects of traditional methods, reducing effort and enhancing accuracy [5]. The adoption of Proof of Work in mining new blocks aligns with modern blockchain consensus algorithms . The implementation of a blockchain-based e-voting system presents a clear scope with notable advantages focused on transparency, integrity, and user-friendly accessibility. Administrator functionalities include voter registration, ensuring the eligibility of participants through identity verification and authentication. This meticulous oversight by administrators is pivotal in maintaining the credibility of the entire voting process [6].

For robust auditing and transparency, the system ensures that all voting transactions are securely recorded on the blockchain in a transparent and immutable manner. The decentralised nature of blockchain, where transactions undergo verification by multiple participants, minimises the risk of manipulation or fraud. The immutability of the blockchain further ensures a tamper-proof record, instilling confidence in the integrity of the system [2].

II. LITERATURE SURVEY

Rohit Kumar proposed a secure and decentralised e-voting system that utilises blockchain technology and smart contracts to eliminate the drawbacks of traditional voting methods. The proposed system is a MERN-based web application that offers high security and accessibility to voters. The system uses OTP verification and face verification to authenticate voters, and the voting data is saved as a transaction in a blockchain-based distributed ledger using smart contracts.[A Secure Decentralised E-Voting with Blockchain and Smart Contracts] Dr. V. Vijeya Kaveri introduced a blockchain-based electronic voting system that aims to provide a secure, transparent, and decentralised platform for democratic elections. The proposed system utilises an agreement structure that requires at least 33 percent or sometimes 50 percent of the organisation to reach a consensus, ensuring the integrity of the voting process. The system also employs an encoded key and adjustment proof client IDs to ensure privacy and security. [Blockchain based Reliable Electronic Voting Technology] The proposed framework by Basit Shahzad and Jon Crowcroft utilises effective hashing techniques to ensure the security of electronic voting data.

The concept of block creation and sealing is introduced to make 5 the blockchain adjustable for the polling process. The use of consortium blockchain is suggested to ensure ownership by a governing body and prevent unauthorised access. The paper discusses the effectiveness of the polling process, hashing algorithms' utility, block creation and sealing, data accumulation, and result declaration using the adjustable blockchain method. The proposed framework provides an improved manifestation of the electronic voting process by addressing security and privacy flaws observed in electronic voting. The paper suggests that the use of these techniques can prevent unauthorised access to voting data and ensure the integrity of the voting process.[Trustworthy Electronic Voting Using Adjusted Blockchain Technology] The proposed system by Shreyas Tandon eliminates the need for physical polling stations and the consumption of resources such as EVMs and ballot papers, resulting in lower costs. The proposed system is highly secure and transparent due to the transaction's transparency, immutability, and difficulty of modification once hosted, as a result of smart contracts. The proposed system can be implemented in different countries and political systems, and it eliminates the drawbacks of traditional voting methods such as lack of transparency, poor voter turnout, vote rigging, and others. [E-Matdaan: A Blockchain based Decentralised E-Voting System]

III. SYSTEM ARCHITECTURE

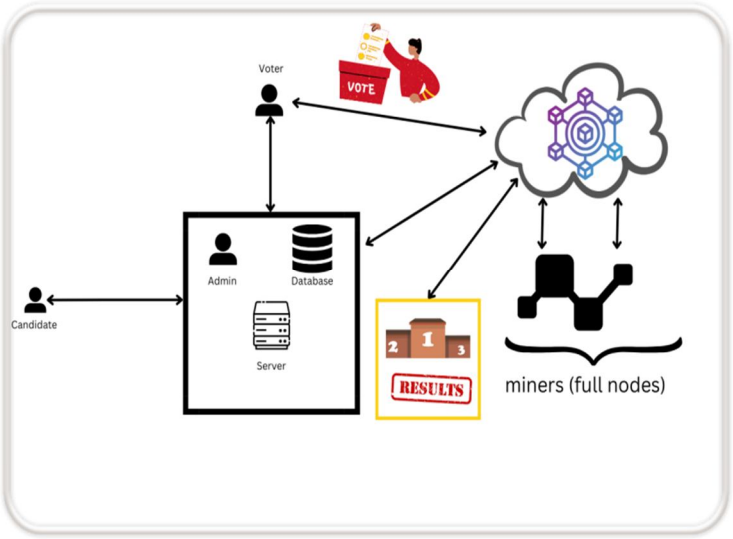

Fig 1. Architecture

IV. PERFORMANCE PARAMETERS

Blockchain voting systems are critical to assess their efficiency and effectiveness. Here are four key performance parameters:

1) *Transaction Processing Speed:* This parameter measures how quickly the blockchain can process voting transactions. Faster transaction processing ensures that votes are recorded in a timely manner, reducing delays in the voting process.
2) *Scalability:* Scalability refers to the blockchain's ability to handle an increasing number of voters and transactions. A scalable blockchain voting system can accommodate a larger voter base without significantly degrading performance.
3) *Security and Resistance to Attacks:* Security is paramount in voting systems. Parameters related to security, such as the resistance to 51 percent attacks and the immutability of the voting data, are critical to ensure the integrity of the election process.
4) *Accessibility and User-Friendliness:* Parameters related to accessibility, such as the ease of use of the voting platform and the inclusivity of the system, are essential. A user-friendly interface and accessible options for all voters are vital to encourage participation and ensure the system is efficient.

V. EFFICIENCY ISSUES

Efficiency issues in blockchain voting can manifest in various ways, including slow speed, susceptibility to 51 percent attacks, limited accessibility, and time consumption:

1) *Slow Speed:* Slow confirmation times: Many blockchain networks have slower transaction confirmation times, which can result in delays in vote processing. - Network congestion: High levels of network activity can lead to slower transaction processing and longer confirmation times, hindering the efficiency of the voting process.
2) *51 percent Attack:* Security vulnerability: A 51 percent attack occurs when an entity or group of miners controls more than 50 percent of the network's computational power. In the context of voting, this could lead to vote manipulation, undermining the integrity of the election.
3) *Accessibility:* Digital divide: Blockchain voting may not be accessible to all citizens, as it relies on internet access and digital devices. This can lead to exclusion and unequal participation, which is an efficiency issue in terms of inclusivity. - Complex user experience: The complexity of using blockchain technology can deter voters who are less tech-savvy, reducing accessibility.
4) *Time Consumption:* Lengthy voter authentication: Extensive voter authentication and identity verification processes can consume a significant amount of time, making the voting process less efficient. - Slower voter turnout: Blockchain voting might discourage some voters due to the time it takes to complete the process, potentially reducing voter turnout.

Efficiency issues in blockchain voting should be carefully addressed to ensure that the voting process is secure, inclusive, and accessible, and that it does not deter voters due to long waiting times or complex procedures. Balancing security and efficiency is a key challenge in the development of blockchain-based voting systems.

VI. CONCLUSION

This project report takes a deep dive into the intricate world of blockchain based e-voting systems. Our approach involved a thorough examination, including a comparative analysis using literature reviews, case studies, and simulations. The goal? To unravel the secrets of creating a secure e-voting system. Our proposed framework, grounded in the cutting-edge blockchain technology, stands as a robust solution, enhancing transparency, reliability, and scalability while allowing for flexible consensus algorithms. The result is a digital voting experience that eliminates the need for traditional physical polling stations. As we unpack our findings, we shine a light on the significant advantages of our proposed system. It's not just about making the voting process transparent; it's about boosting reliability and trust in the entire electoral process. However, we don't shy away from addressing the potential challenges and hurdles that could come with implementing this innovative system.

The conclusion serves as a synthesis of our research journey, encapsulating key discoveries and underscoring the pivotal role of our proposed blockchain-based solution in fortifying the integrity of electoral processes. Looking ahead, the conclusion doesn't mark the end; it's a transition to the future. We gaze forward, envisioning the ongoing evolution of blockchain based e-voting systems. Our recommendations emphasise the critical need for continuous research and development efforts – an essential push to overcome the identified hurdles. These efforts aren't just suggestions; they're prerequisites for seamlessly integrating our transformative voting solution into the intricate fabric of real-world elections. Thus, this report doesn't just wrap up a project; it propels us into an exciting phase of change in the landscape of how we approach voting systems.

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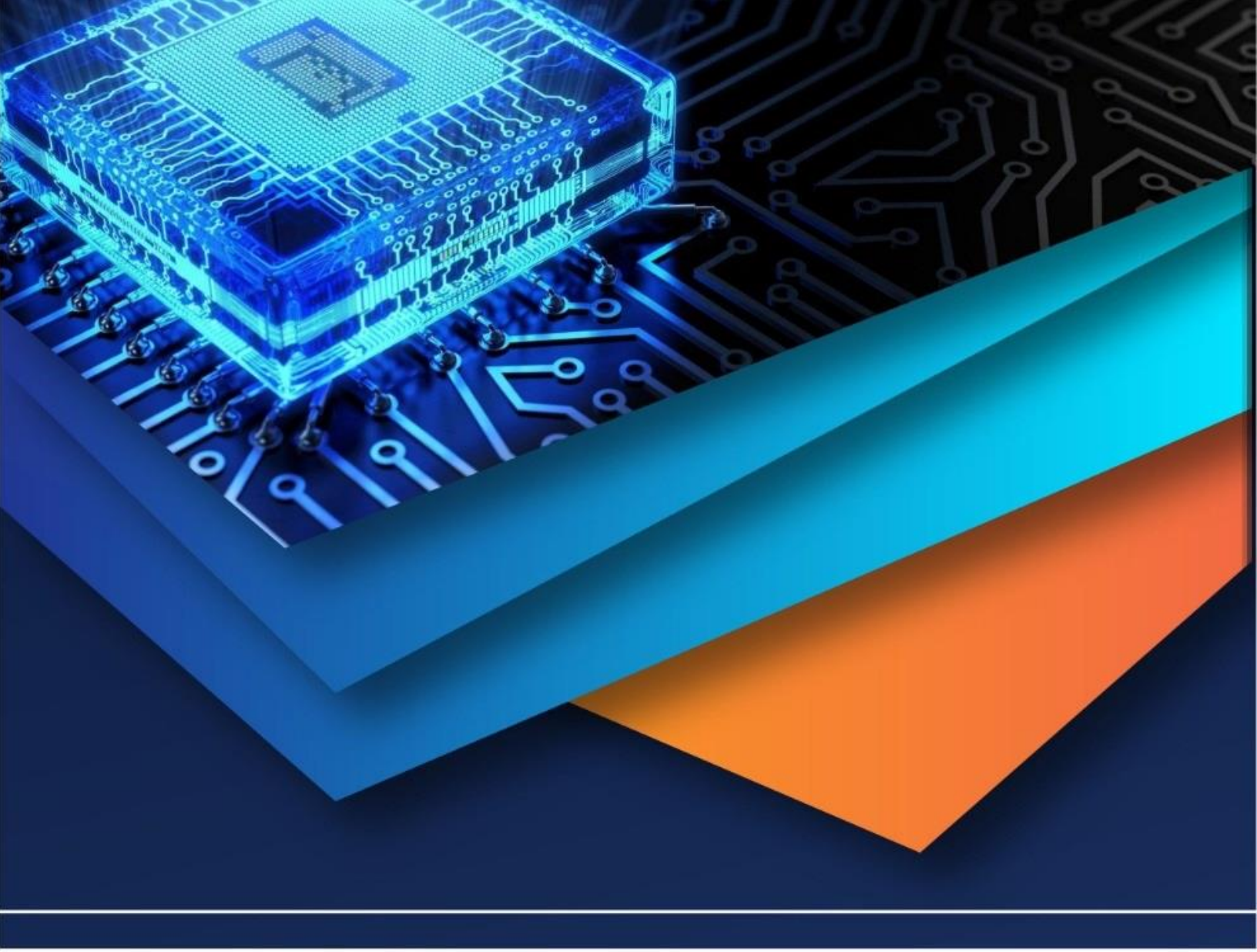

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