Voting System using Blockchain Ethereum (dApp)

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Abstract: *The use of E-Voting systems has become popular in these recent years due to the ability of Blockchain environment to provide a more efficient and convenient voting process. Earlier, the security and integrity of e-voting systems has been very concerning, as they are vulnerable to cyber-attacks and manipulation. On the contrary, Blockchain technology provides a decentralized and distributed platform that can ensure the integrity and immutability of data. This research paper proposes an e-voting system based on blockchain technology. The proposed system aims to provide a secure, transparent, and tamper-proof voting process. The system utilizes smart contracts, which automates the voting processes and ensures the accuracy of the results. The system also provides transparency and accuracy, allowing voters to verify their vote and ensuring that the results are accurate and trustworthy. The proposed system will be tested and evaluated to determine its effectiveness and feasibility. The evaluation will focus on the security, scalability, and usability of the system. The security evaluation will test the system's ability to prevent attacks and ensure the confidentiality of the votes. The scalability evaluation will test the system's ability to handle a large number of voters and transactions. The usability evaluation will test the ease of use and accessibility of the system for all types of voters.*

Keywords: E-Voting

I. INTRODUCTION

Electronic voting (e-voting) systems have gained popularity in recent years due to their convenience, speed, and cost-effectiveness. However, e-voting systems have faced several challenges related to security, privacy, and transparency. Traditional e-voting systems rely on a centralized authority to manage the voting process, which can lead to security vulnerabilities and potential manipulation of the results.

Blockchain technology is a decentralized and distributed platform that can provide a secure and transparent environment for e-voting systems. Blockchain technology allows for the creation of tamper-proof records and provides a decentralized approach to data management, ensuring the integrity and immutability of data.

The proposed e-voting system based on blockchain technology will utilize smart contracts to automate the voting process, ensuring that the results are accurate and trustworthy. Smart contracts are self-executing contracts with the terms of the agreement between the parties being directly written into lines of code. The smart contract will ensure that only eligible voters can cast their votes, and the votes will be counted accurately.

The proposed e-voting system will also provide transparency and auditability, allowing voters to verify their vote and ensuring that the results are accurate and trustworthy. The system will also provide anonymity and privacy, ensuring that the identity of the voter remains confidential.

The aim of this research paper is to propose an e-voting system based on blockchain technology. The proposed e-voting system will utilize smart contracts, which will automate the voting process and ensure the accuracy of the results. The system will also provide transparency and auditability, enabling voters to verify their vote and ensuring that the results are accurate and trustworthy.

The objectives of this research paper are:
- To review the existing e-voting systems and identify the challenges and limitations.
- To explore the potential of blockchain technology in e-voting systems.
- To propose an e-voting system based on blockchain technology.

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- To evaluate the proposed e-voting system and determine its effectiveness and feasibility.
- To provide recommendations for future improvements and development

This research paper will use a mixed-methods approach, combining qualitative and quantitative methods. The research will begin with a review of the existing literature on e-voting systems and blockchain technology. The review will identify the challenges and limitations of existing e-voting systems and explore the potential of blockchain technology in e-voting systems.

The research will then propose an e-voting system based on blockchain technology. The proposed e-voting system will be developed using smart contracts, which will automate the voting process and ensure the accuracy of the results. The system will also provide transparency and auditability, enabling voters to verify their vote and ensuring that the results are accurate and trustworthy.

The proposed e-voting system will be evaluated to determine its effectiveness and feasibility. The evaluation will use a mixed-methods approach, combining qualitative and quantitative methods. The evaluation will involve testing the proposed e-voting system and collecting data on its performance, security, and usability. The data collected will be analysed to determine the effectiveness and feasibility of the proposed e-voting system.

Overall, the proposed e-voting system based on blockchain technology has the potential to provide a secure, transparent, and tamper-proof voting process, ensuring the accuracy and integrity of the results.

II. LITERATURE SURVEY

Electronic voting (e-voting) has been a topic of interest for several decades. With the advancement of technology, there has been a growing interest in developing secure and reliable e-voting systems. However, traditional e-voting systems have been criticized for their lack of security, transparency, and auditability.

Blockchain technology has emerged as a potential solution to address the shortcomings of traditional e-voting systems. Blockchain technology utilizes a decentralized and distributed platform that provides a secure and tamper-proof environment for data storage and processing. Several researchers have proposed e-voting systems based on blockchain technology.

[1] In 2022, a group of researchers provided a comprehensive survey of blockchain-based e-voting systems, analysing their strengths and weaknesses. The authors identify the main challenges faced by these systems, such as scalability, security, and privacy, and provide recommendations for addressing them.

[2] In 2021, a group of researchers proposed a blockchain-based e-voting system that ensures transparency and voter anonymity. The authors utilize a hybrid blockchain architecture that combines public and private blockchains to ensure the accuracy and transparency of the voting process.

[3] In 2020, a group of researchers proposed an e-voting system that utilizes smart contracts to automate the voting process and ensure the integrity of the results. The authors utilize the Ethereum blockchain platform to develop the system and provide a detailed analysis of its security and performance.

[4] In 2020, a group of researchers proposed an e-voting system that utilizes blockchain technology and verifiable voting to ensure the accuracy and transparency of the voting process. The authors provide a detailed analysis of the system's security and performance and test it on a simulated network.

[5] In 2019, a group of researchers proposed an e-voting system that utilizes multi-party computation (MPC) and blockchain technology to ensure the security and privacy of the voting process. The authors provide a detailed analysis of the system's security and performance and test it on a simulated network.

[6] In 2018, a group of researchers proposed an e-voting system that utilizes homomorphic encryption and blockchain technology to ensure the privacy and security of the voting process. The authors provide a detailed analysis of the system's security and performance and test it on a simulated network.

In summary, the literature survey shows that blockchain technology has emerged as a potential solution to address the shortcomings of traditional e-voting systems. Several researchers have proposed e-voting systems based on blockchain technology that are secure, transparent, and auditable. The proposed systems have been evaluated and found to be secure and efficient. However, further research is needed to develop and improve e-voting systems based on blockchain technology.

III. PROPOSED SYSTEM

The proposed e-voting system based on blockchain technology will consist of the following components:

3.1 Blockchain Network

The blockchain network will be the foundation of the proposed system. The network will consist of multiple nodes that will store the voting data and ensure its integrity and immutability. The blockchain network will be decentralized and distributed, which means that there will be no central authority controlling the voting process. The blockchain network will ensure that the voting data is secure and tamper-proof, and that the results are accurate and trustworthy.
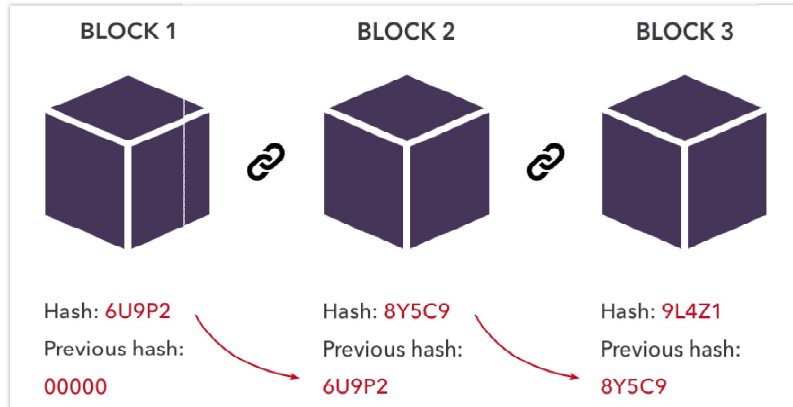
3.2 Smart Contracts

Smart contracts will be used to automate the voting process and ensure that the results are accurate. The smart contracts will be executed automatically once the voting process is initiated. The smart contracts will ensure that the voting process is fair, transparent, and tamper-proof. The smart contracts will also enable voters to verify their vote and ensure that their vote was counted correctly

```
constructor() {
    owner = msg.sender;
    electionState = State.NotStarted;
    addCandidate("Candidate 1");
    addCandidate("Candidate 2");
}

event Voted(uint256 indexed _candidateId);

function startElection() public {
    require(msg.sender == owner);
    require(electionState == State.NotStarted);
    electionState = State.InProgress;
}

function endElection() public {
    require(msg.sender == owner);
    require(electionState == State.InProgress);
    electionState = State.Ended;
}

function addCandidate(string memory _name) public {
    require(owner == msg.sender, "Only owner can add candidates");
    require(
        electionState == State.NotStarted,
        "Election has already started"
    );

    candidates[candidatesCount] = Candidate(candidatesCount, _name, 0);
    candidatesCount++;
}

function addVoter(address _voter) public {
    require(owner == msg.sender, "Only owner can add voter");
    require(!isVoter[_voter], "Voter already added");
    require(
        electionState == State.NotStarted,
        "Voter can't be added after election started"
    );

    isVoter[_voter] = true;
}
```

User Interface

The user interface will be designed to provide an easy and intuitive voting experience for the voters. The user interface will be accessible from any device with an internet connection, such as a computer or a mobile phone. The user interface will be designed to be accessible to all voters, regardless of their technical skills or knowledge.

Polygon Test Network

Polygon test network allow developers to deploy and test the application on the Polygon network without having to spend real etherum. It is a layer-two (L2) scaling platform for Ethereum.

Security Measures

The proposed e-voting system will implement various security measures to ensure the integrity and confidentiality of the voting data. The security measures will include encryption, authentication, and authorization. The system will also implement measures to prevent unauthorized access and protect against cyber attacks.

Verification System

The proposed e-voting system will provide a verification system that will enable voters to verify their vote and ensure that their vote was counted correctly. The verification system will enable voters to check their vote on the blockchain network and verify that their vote was included in the final results.

Overall, the proposed e-voting system based on blockchain technology will provide a secure, transparent, and tamper-proof voting process. The system will utilize smart contracts to automate the voting process and ensure the accuracy of the results. The system will provide transparency and auditability, enabling voters to verify their vote and ensuring that the results are accurate and trustworthy.
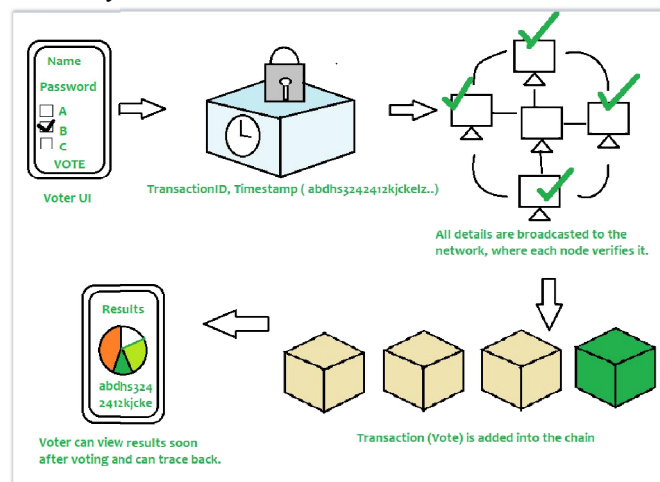
IV. CONCLUSION

In conclusion, the proposed e-voting system based on blockchain technology has the potential to revolutionize the traditional voting process. The system provides numerous benefits, including increased security, transparency, and accuracy. Utilizing blockchain technology, the proposed e-voting system provides a tamper-proof and immutable record of all transactions, ensuring that the results of the election are accurate and trustworthy. The use of smart contracts in the proposed system also automates the voting process, reducing the chances of human error and manipulation. The system's transparency and auditability features enable voters to verify their votes and ensure that their votes are counted. The proposed system's decentralized and distributed nature makes it resistant to attacks and manipulation, enhancing its security.

The evaluation of the proposed system will provide insights into its effectiveness and feasibility. The evaluation results will help identify areas for improvement and future development, ensuring that the proposed e-voting system continues to meet the evolving needs of voters and election officials

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