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TABLE OF CONTENT

S.No	CONTENT	Pg No
1	**INTRODUCTION**	3
	1.1 Project Overview	4
	1.2 Purpose	5
2	**LITERATURE SURVEY**	6
	2.1 Existing problem	6
	2.2 References	7
	2.3 Problem Statement Definition	8
3	**IDEATION & PROPOSED SOLUTION**	9
	3.1 Empathy Map Canvas	9
	3.2 Ideation & Brainstorming	10
4	**REQUIREMENT ANALYSIS**	13
	4.1 Functional requirement	13
	4.2 Non-Functional requirements	15
5	**PROJECT DESIGN**	17
	5.1 Data Flow Diagrams & User Stories	17
	5.2 Solution Architecture	19
6	**PROJECT PLANNING & SCHEDULING**	20
	6.1 Technical Architecture	20
	6.2 Sprint Planning & Estimation	21
	6.3 Sprint Delivery Schedule	22
7	**CODING & SOLUTIONING**	24
	7.1 Feature 1	24
	7.2 Feature 2	28
8	**PERFORMANCE TESTING**	29
	8.1 Performance Metrics	29
9	**RESULTS**	31
	9.1 Output Screenshots	31
10	**ADVANTAGES & DISADVANTAGES**	32
11	**CONCLUSION**	34
12	**FUTURE SCOPE**	34
13	**APPENDIX**	36
	Source Code	
	GitHub & Project Demo Link	

ELECTRONIC VOTING SYSTEM

1.INTRODUCTION

Electronic voting systems have become increasingly popular in modern democracies due to their efficiency and convenience. However, traditional electronic voting systems have been plagued by issues such as vote rigging, hacking, and election manipulation, which have led to a lack of trust in the election system among large sections of society around the world. To address these concerns, blockchain technology has emerged as a promising solution for developing secure, transparent, and reliable e-voting systems. By leveraging the decentralized and distributed nature of blockchain, an electronic voting system using blockchain can eliminate the need for intermediaries and provide end-to-end verifiability, ensuring that votes are accurately recorded and counted. In this project, we aim to develop an electronic voting system using blockchain technology that is secure, transparent, and easy-to-use. We will implement and test the e-voting application as a smart contract for the Ethereum network using the blockchain with smart contracts logic, which is one of the most suitable ones. Our system will be designed to ensure that votes are accurately recorded and counted, while also protecting the privacy of the attendees. This introduction sets the stage for a comprehensive exploration of the project's objectives, methodologies, and expected outcomes. In the following sections, we will delve into the mechanics of blockchain technology and how it can be harnessed to develop a secure electronic voting system. We will discuss the advantages of this system over traditional methods, its potential challenges, and the implications for the future of elections in an increasingly digitized world. Ultimately, the Electronic Voting System Using Blockchain represents a significant step forward in the pursuit of a more accessible, secure, and transparent electoral process that is fundamental to the principles of democratic governance.

1.1 PROJECT OVERVIEW

An electronic voting system using blockchain technology is a project that aims to improve the security, transparency, and efficiency of the voting process. The project will leverage the benefits of blockchain technology, such as cryptographic foundations, transparency, and immutability, to create a more secure and tamper-proof voting system. The system will be designed to eliminate the present concerns in the current voting system, such as vote rigging, hacking, election manipulation, and polling booth capturing. The project will require expertise in blockchain technology, smart contract development, user interface design, and testing and evaluation. The project team will need to collaborate closely to ensure that the system is designed, developed, and tested to the highest standards. The project will have significant potential to decrease organizational costs and increase voter turnout.

Objective:

The primary objective of the "Electronic Voting System Using Blockchain" project is to design, develop, and implement a secure and transparent electronic voting system underpinned by blockchain technology. This system will enhance the integrity of the electoral process, promote voter participation, and reduce the costs associated with traditional voting methods, thereby contributing to the evolution of democratic practices. The specific objectives of the project include:

- Implementing a decentralized e-voting system
- Ensuring transparency and auditability
- Enhancing security and privacy
- Improving accessibility and convenience

1.2 PURPOSE

The purpose of the "Electronic Voting System Using Blockchain" project is to fundamentally transform the way elections are conducted, addressing critical challenges that have plagued traditional voting systems for decades. First and foremost, the project aims to establish a voting system that is profoundly secure.

Transparency is another paramount objective. The project will create an immutable and transparent ledger of all votes cast, allowing for real-time verification and post-election audits. This transparency is crucial for building trust among voters and all stakeholders in the electoral process.

Security is paramount in this endeavor. Utilizing blockchain technology, the project seeks to fortify the voting process against external threats, ensuring that the data and results are highly resistant to tampering or hacking. The purpose here is to protect the integrity of the vote and maintain public confidence in the electoral system.

Furthermore, the project seeks to enhance accessibility. By designing a user-friendly electronic voting platform, it will remove many of the physical barriers that restrict voter participation, making the democratic process more inclusive and convenient.

Cost reduction and efficiency are also essential goals. Traditional paper-based elections can be costly and time-consuming, and the project's blockchain-based approach will streamline the voting process, reduce administrative overhead, and potentially save public resources.

Ultimately, the project's purpose is to lay the foundation for a democratic future where elections are secure, transparent, and accessible, fostering trust and participation among citizens while embracing the benefits of cutting-edge blockchain technology.

2. LITERATURE SURVEY

A comprehensive literature survey for the project titled "Electronic Voting System Using Blockchain" reveals a growing body of research and developments in the field of blockchain-based electronic voting systems. Academic and industry studies have explored various aspects of this innovative approach, shedding light on both its potential benefits and challenges. E-Voting Systems using Blockchain: An Exploratory Literature Survey, Vivek et al. (2020) paper proposes a Smart Contracts based implementation and suggests various authentication and security methods, including Elliptical Curve Cryptography, Blind Signature, and Hyperledger Sawtooth Framework. The authors of the paper [9] described the use of blockchain-based e-voting applications in real-world scenarios. They then extracted a set of properties that a blockchain based e-voting application should satisfy to be a fair, transparent and democratic election system.

2.1 EXISTING PROBLEM

1.Lack of voter-verified paper ballots: Many electronic voting machines lack the ability to produce a voter-verified paper ballot, which is a major concern. Without a paper trail, it is impossible to perform meaningful recounts, and the opportunities for fraud exist on a greater scale than ever before.

2.Vulnerabilities to hacking and fraud: Electronic voting machines are vulnerable to hacking and fraud, which can compromise the accuracy and integrity of the voting system. The technology is "black box software," meaning that the public is not allowed access into the software that controls the voting machines. This leaves the public with no idea of how the voting software works, and it can make it easier for fraudulent machines and practices to go undetected.

3.Outdated equipment: Many electronic voting machines are past or near the end of their expected lifespans, and they are no longer manufactured, which can make it difficult or impossible to find replacement parts. Outdated machines suffer frequent breakdowns and create long lines at polling places. They are also more susceptible to error and fraud, risking public confidence in elections.

4.Lack of transparency: Electronic voting technology is extremely opaque, and no one can scrutinize some of the most critical processes of the election, such as collection of ballots and counting of votes, because those processes will be conducted invisibly in electronic circuits. This lack of transparency can make it difficult to detect and prevent fraud.

2.2 REFERENCES

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[9] Gao S., Zheng D., Guo R., Jing C., Hu C. “An Anti-Quantum E-Voting Protocol in Blockchain with Audit Function”. IEEE Access. 2019.

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2.3 PROBLEM STATEMENT DEFINITION

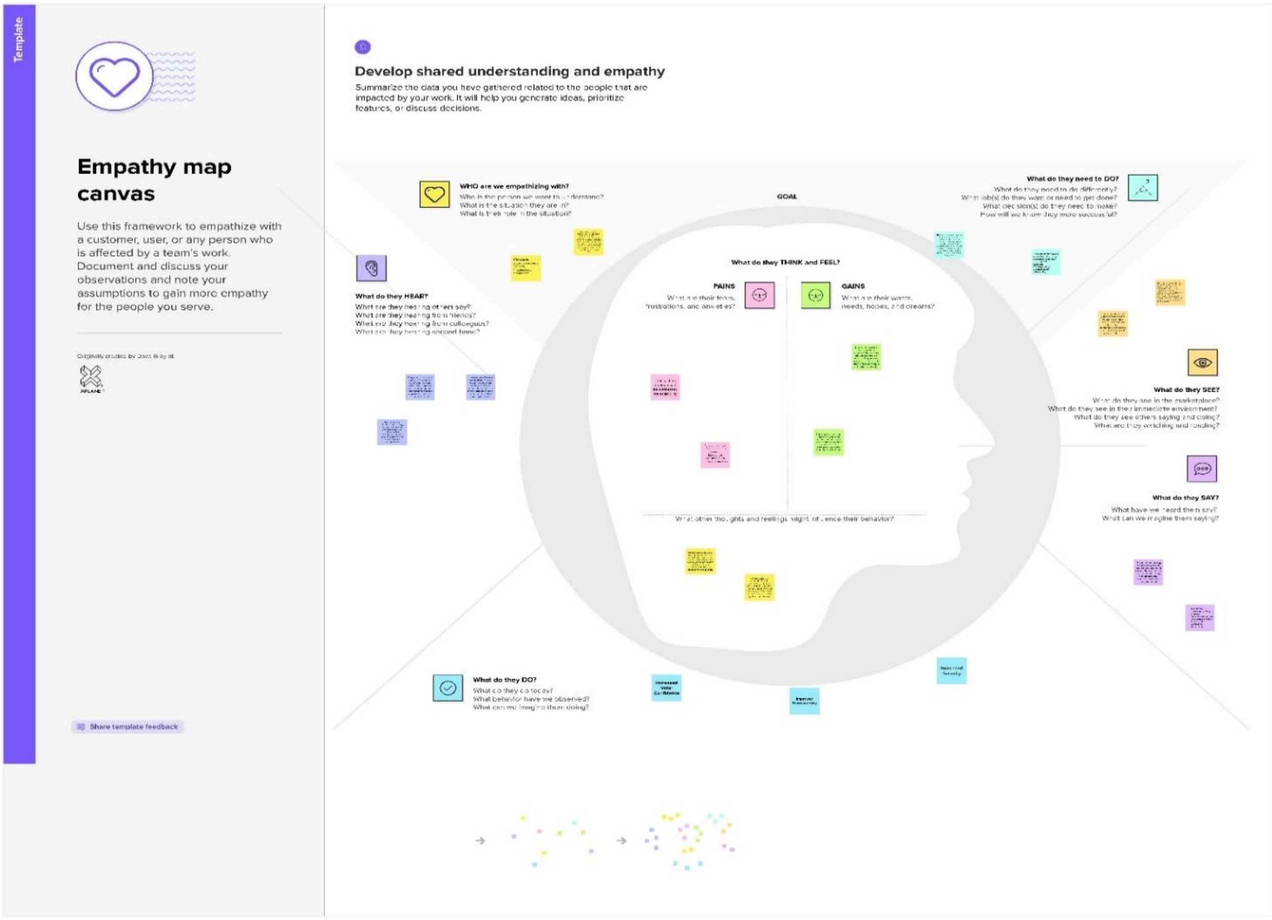
Blockchain is a technology which enables elections to be done transparently. We can avoid rigging or any corrupt activities using the technology and should be able to make sure that the votes are also accounted for on a real-time basis. Design an electronic voting system, using the ethereum blockchain (smart contracts) and more precisely the RPC test which enables account generation with a private and public key. Blockchain electronic voting system using smart contracts.

3.IDEATION & PROPOSED SOLUTION

3.1 EMPATHY MAP CANVAS :

The Empathy Map Canvas can help developers to understand the needs of voters and to design a system that meets those needs. By considering the thoughts, feelings, and behaviors of voters, developers can create a system that is user-friendly and easy to use.

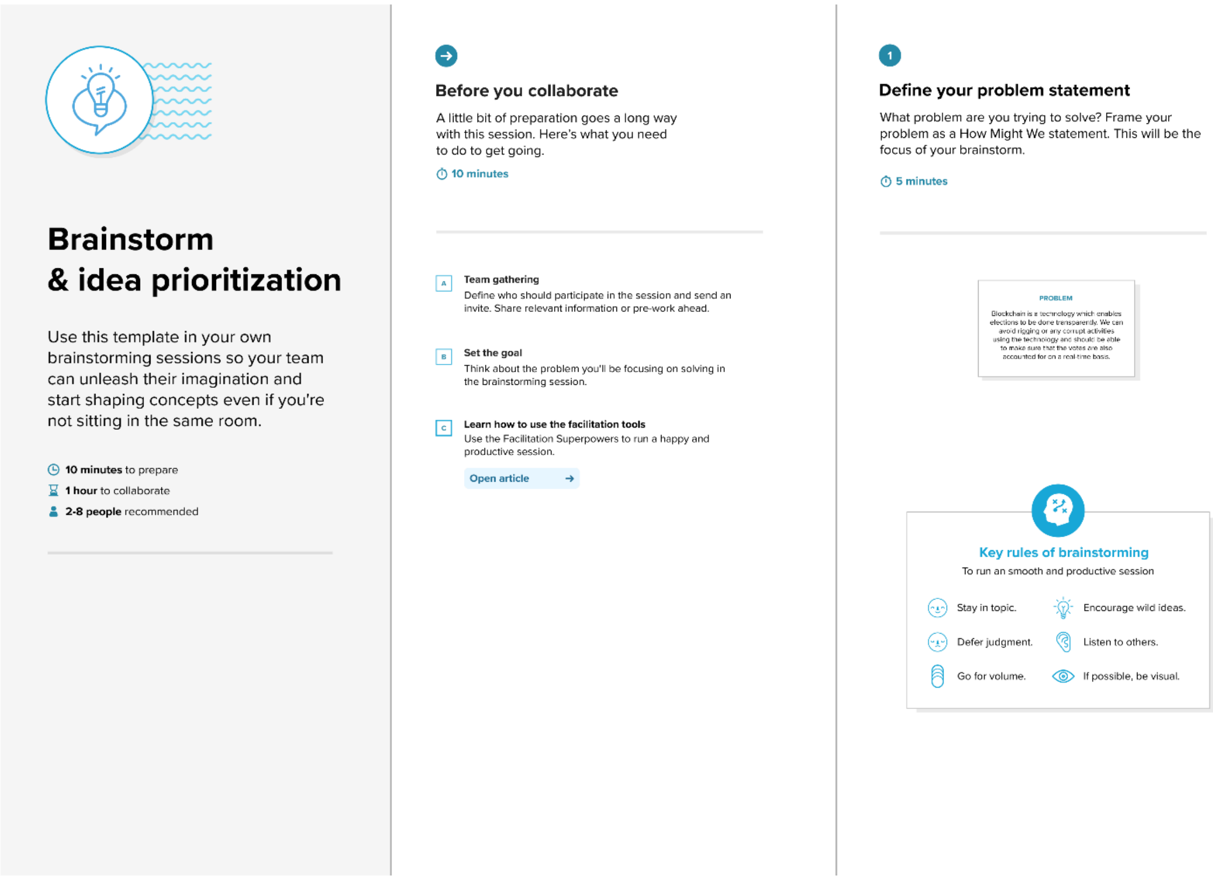
The Empathy Map Canvas is a visual tool used to help teams better understandtheir customers or users. It is often used in design thinking and user experience(UX) research. The canvas is divided into sections for what the user thinks, feels, hears, sees, says, does, and experiences. By filling out the canvas, teams can gain a deeper understanding of the user's perspective and use that information to create more effective products and services.



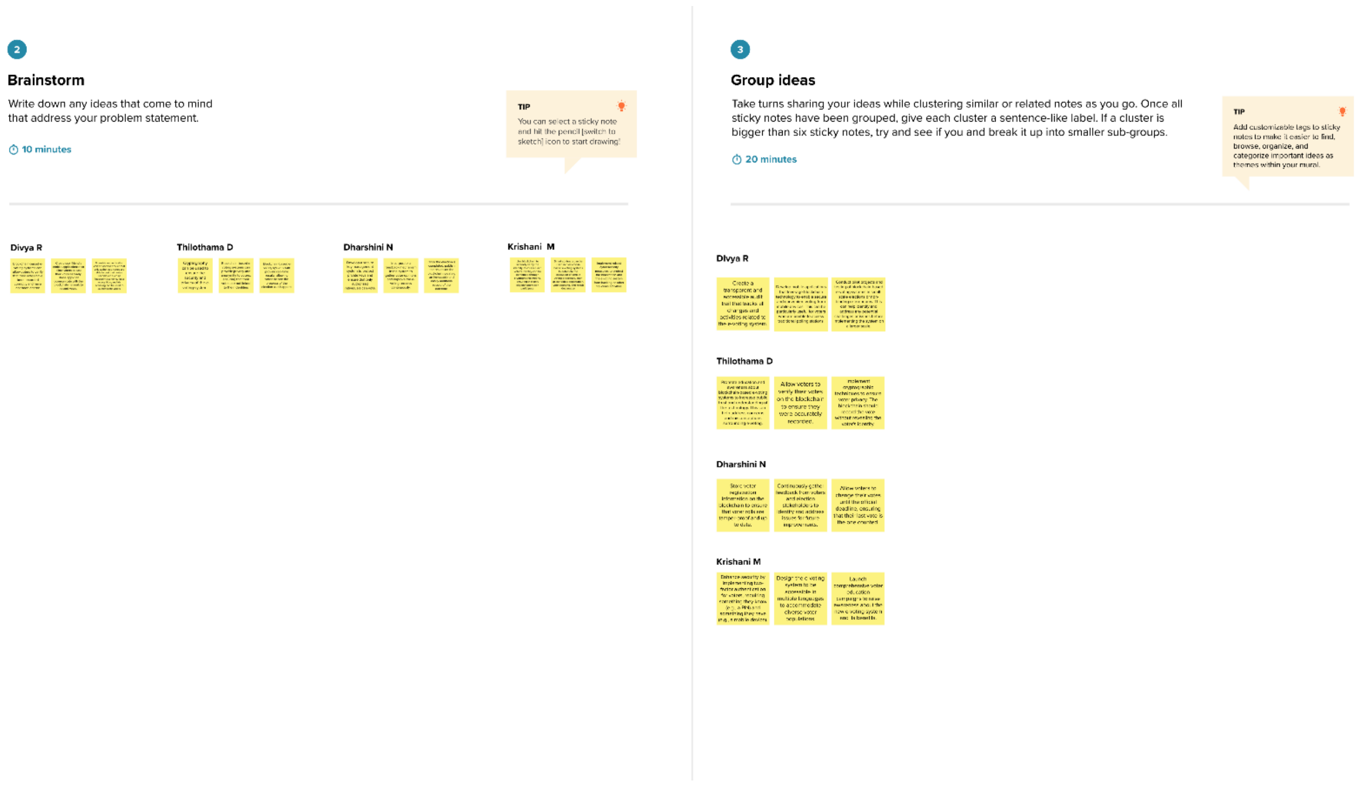
3.2 IDEATION & BRAINSTORMING :

Brainstorming provides a free and open environment that encourages everyone within a team to participate in the creative thinking process that leads to problem solving. Prioritizing volume over value, out-of-the-box ideas are welcome and built upon, and all participants are encouraged to collaborate, helping each other develop a rich amount of creative solutions.

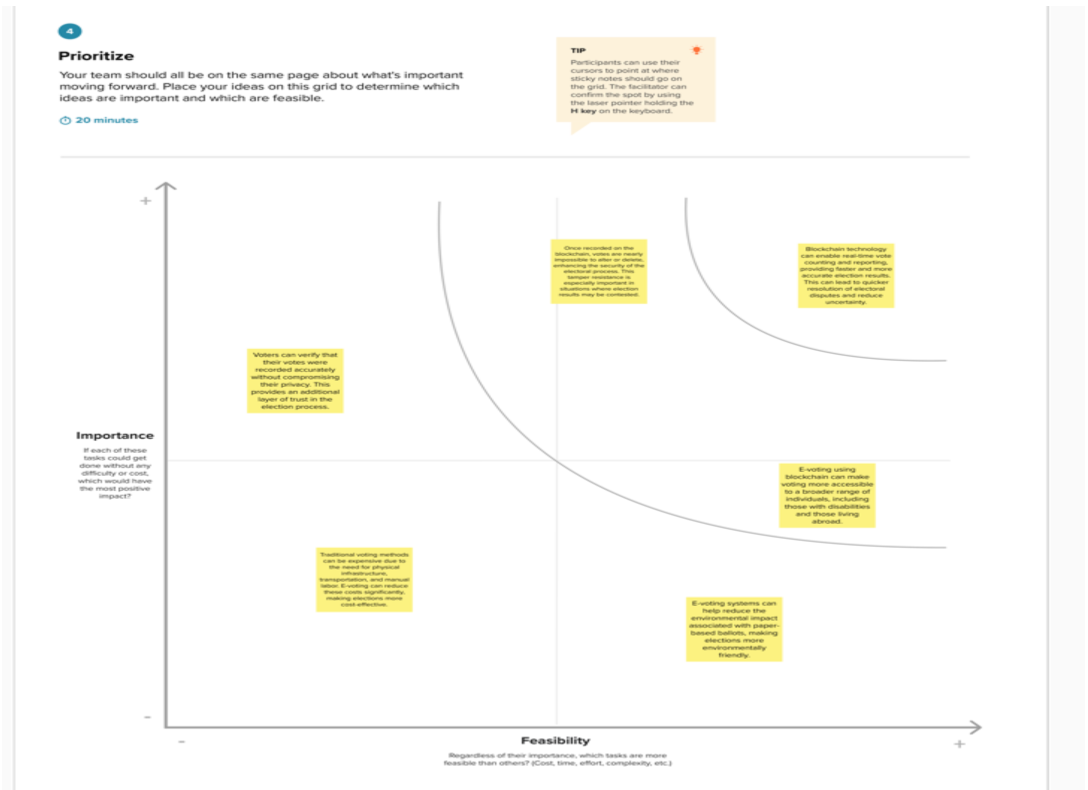
Step-1: Team Gathering, Collaboration and Select the Problem Statement



Step-2: Brainstorm, Idea Listing and Grouping



Step-3: Idea Prioritization



PROPOSED SOLUTIONS:

1. **Blockchain Platform Selection:** The choice of the right blockchain platform is critical. Consider using a permissioned blockchain, such as Hyperledger Fabric or Corda, which offers controlled access to participants. This ensures that only authorized entities, such as eligible voters, election authorities, and auditors, can join the network. Permissioned blockchains provide a secure foundation for electronic voting systems by preventing unauthorized access and tampering.
2. **Secure Identity Verification**: Implement a secure and reliable identity verification mechanism to validate the eligibility of voters. This can include digital identity solutions or biometric authentication. Robust authentication ensures that only legitimate voters can participate, guarding against identity theft and fraud.
3. **Smart Contracts for Voting Rules**: Leverage smart contracts to encode and automate voting rules. Smart contracts can define the eligibility criteria, voting procedures, and verification processes. By using smart contracts, the system can ensure that voters meet all the requirements and that votes are counted accurately, reducing human errors and fraud.
4. **Privacy-Preserving Technologies**: Protect voter privacy by implementing privacy-preserving technologies like zero-knowledge proofs or homomorphic encryption. These cryptographic techniques allow voters to cast their ballots without revealing their choices while maintaining the integrity and verifiability of the overall voting process.
5. **Immutable Voting Records and Transparency**: Record votes on the blockchain to create a tamper-proof and transparent voting trail. The blockchain's immutability ensures that once a vote is cast, it cannot be altered or deleted. This transparency promotes trust in the system, allowing voters, auditors, and the public to independently verify the accuracy of the results.

4. REQUIREMENT ANALYSIS

4.1 FUNCTIONAL REQUIREMENTS

Functional requirements for an electronic voting system using blockchain should encompass a wide range of features and capabilities to ensure the system is secure, reliable, and user-friendly. Below are some key functional requirements for such a system,

Voter Registration and Authentication

The system must implement robust methods for verifying voter identity, such as biometrics and two-factor authentication, to ensure that only eligible voters participate in the election. Registration procedures should be meticulously designed to confirm voter eligibility, creating a secure foundation for the electoral process.

Ballot Creation and Distribution

The system should enable the creation, secure storage, and distribution of digital ballots, while preserving the secrecy of individual votes. This means that voters can make their choices with confidence, knowing that their selections remain private and cannot be linked back to them.

Voting Process:

A user-friendly interface should be provided to cast votes, with a confirmation mechanism in place to allow voters to review and confirm their choices. Security measures must be robust to prevent any form of tampering or fraudulent activities during the voting process.

Auditing and Verification:

The public should have access to the blockchain for auditing and verifying the voting process, promoting transparency. Tools for independent parties to scrutinize the election results are essential in fostering trust in the system.

Blockchain Infrastructure:

The system needs to integrate a blockchain network, ensuring decentralization, transparency, and immutability in storing and validating votes. Integration with a consensus mechanism like proof of work or proof of stake enhances the security of the blockchain.

Security and Privacy:

Voter data and votes must be encrypted to protect against unauthorized access, with anonymity and unlinkability measures in place to secure the identities of voters. The system should be vigilant in detecting and preventing any malicious activities.

Results Reporting:

The system should enable real-time or near real-time tallying of votes, offering transparent and easily accessible reporting of results. Secure transmission and storage of these results are paramount to safeguard the integrity of the outcome.

Accessibility:

The system must be accessible to all eligible voters, including those with disabilities, and offer support for multiple languages, ensuring inclusivity and equal opportunity for all participants.

Resilience and Redundancy:

To guarantee continuous operation and prevent system failures, the system should implement measures to enhance resilience and redundancy within the blockchain network. This helps maintain data integrity and prevent loss.

Scalability:

As the number of voters and votes can vary greatly, the system should be designed to handle a large volume without performance degradation. Scalability ensures that the system remains responsive and efficient during high-demand periods.

4.2 NON-FUNCTIONAL REQUIREMENTS

Performance:

Ensuring the performance of the electronic voting system is crucial. The system must provide timely responses to user actions, guaranteeing minimal response times, and maintain a high level of throughput to handle a significant number of votes efficiently. Load balancing mechanisms should be in place to distribute the processing load evenly across blockchain nodes, optimizing the system's performance during election periods.

Scalability:

Scalability is a vital non-functional requirement, as the system should be capable of adapting to increasing user and vote loads. It should support both horizontal and vertical scaling to accommodate growing demand, thereby maintaining a seamless voting experience for users.

Security:

Security is paramount in an electronic voting system. The system should employ robust data encryption methods to protect voter data, both in transit and at rest. It must also ensure the blockchain network's security by implementing defenses against attacks like 51% attacks and Sybil attacks. Distributed Denial of Service (DDoS) protection mechanisms should be in place to safeguard the system from malicious disruptions.

Reliability:

To build trust among users, the system must be highly reliable. This involves ensuring high availability during election periods with minimal downtime, establishing fault tolerance through redundancy and failover mechanisms, and maintaining regular backups and disaster recovery procedures to protect against data loss.

Usability:

The user experience is critical, so the system must provide an intuitive and user-friendly interface, regardless of the voter's technical expertise. Accessibility features should be in place to ensure that the system is usable by individuals .

Interoperability:

Interoperability is key to successful integration with other systems, such as government-issued identity verification services and external databases. The ability to seamlessly communicate with these systems ensures the accuracy and security of voter data.

Maintainability:

Maintaining the system's long-term viability is essential. It should be designed with modular components for ease of updates and replacements. Version control mechanisms are crucial for effective management of software changes and upgrades.

Auditability and Transparency:

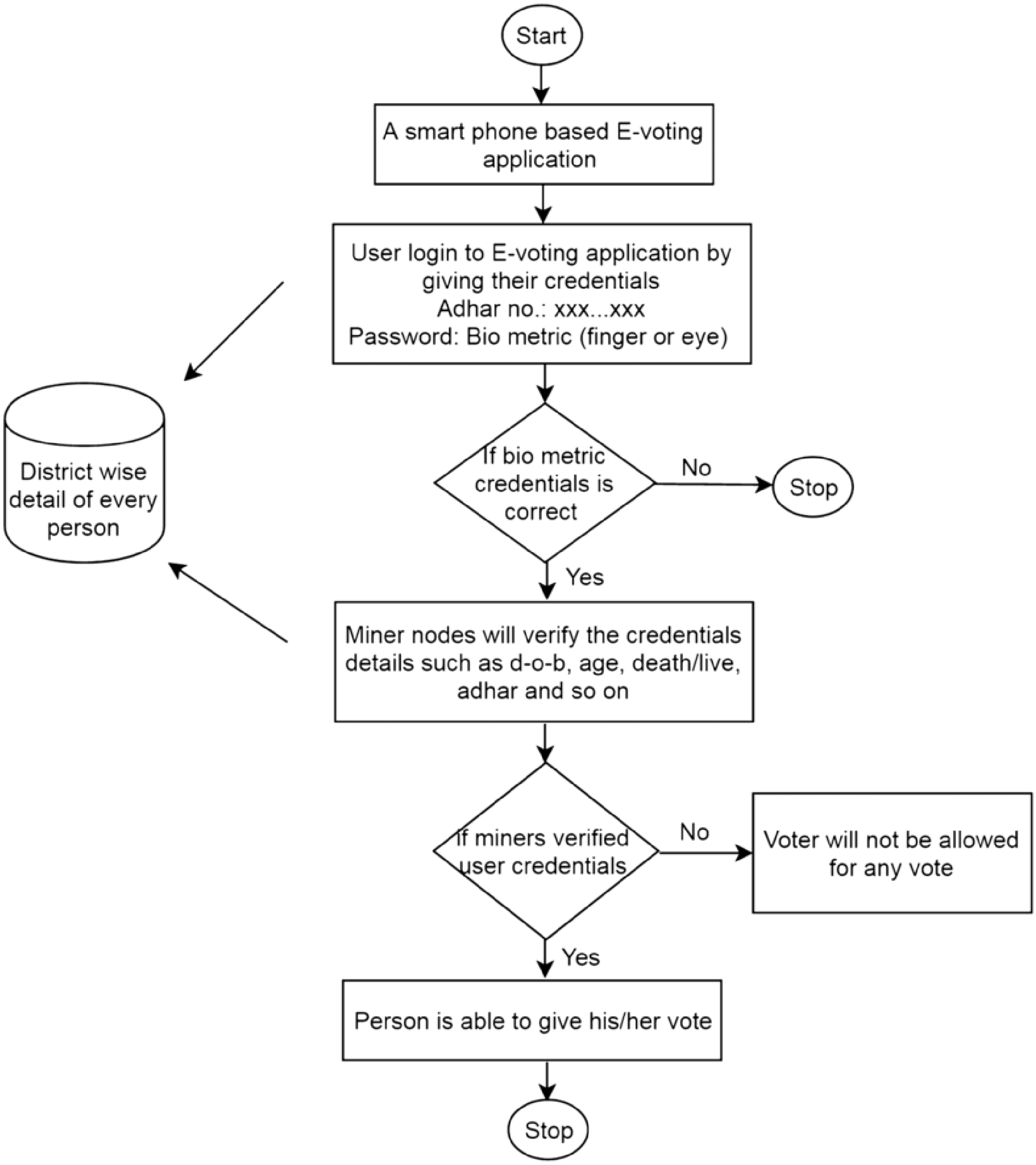
The system must maintain an immutable ledger, guaranteeing transparency and an audit trail for all system activities and user interactions. This is vital for building trust in the electoral process and demonstrating the system's accountability.

Compliance and Legal Requirements:

To operate within the bounds of the law, the system should comply with data privacy and electoral regulations. This includes safeguarding voter information and adhering to the relevant legal and regulatory standards for elections and electronic voting.

5.PROJECT DESIGN

5.1 DATA FLOW DIAGRAM:

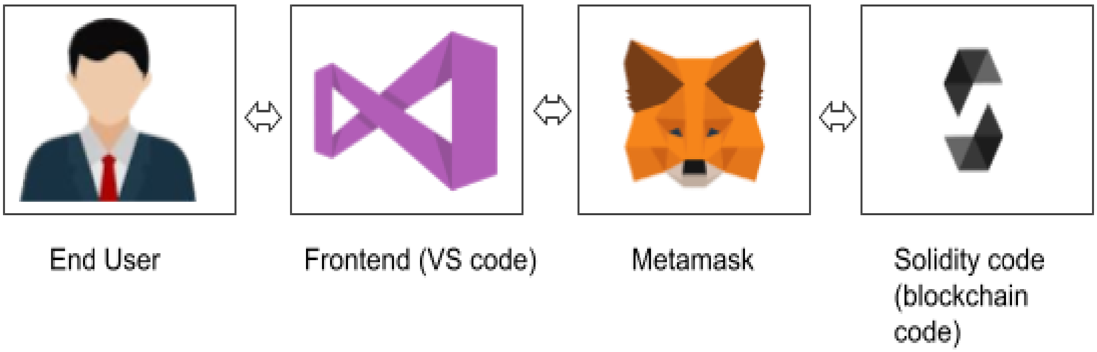


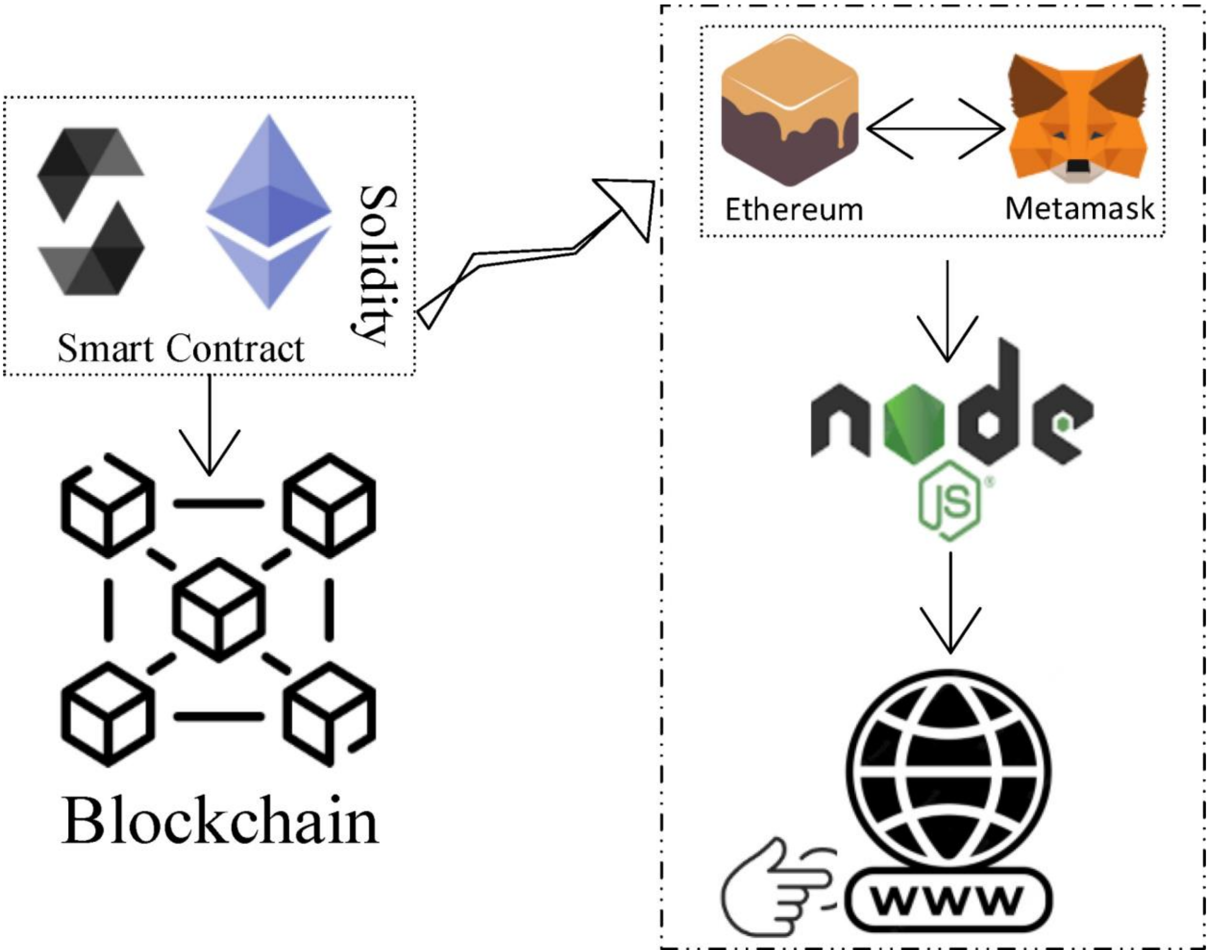
User Stories:

- As a voter, I want to securely and conveniently cast my vote from any location using a mobile app, ensuring the integrity of my vote.
- As a voter, I want to receive a unique and verifiable digital identity for the voting system to prevent fraud and ensure that only eligible voters can participate.
- As a voter, I want to be able to verify that my vote was successfully recorded on the blockchain and that it has not been altered or tampered with.
- As a voter, I want to have the option to change my vote at any time before the voting deadline to ensure that my most recent choice is counted.
- As an election official, I want to have a user-friendly interface for managing the election process, including voter registration, candidate submission, and vote counting.
- As an election official, I want to be able to view real-time statistics and reports on voter turnout, ensuring the transparency of the election.
- As an election official, I want to easily audit and verify the blockchain to confirm the accuracy and integrity of the election results.
- As a candidate, I want to be able to submit my candidacy electronically and monitor the election process, including real-time vote counts.
- As a candidate, I want the assurance that the voting system is secure and tamper-proof to maintain trust in the electoral process.
- As an auditor or third-party verifier, I want access to the blockchain data to independently validate the election results and ensure transparency.
- As a government agency, I want a cost-effective and efficient solution that reduces the expenses associated with traditional paper-based voting systems.

5.2 SOLUTION ARCHITECTURE :

Solution Architecture:

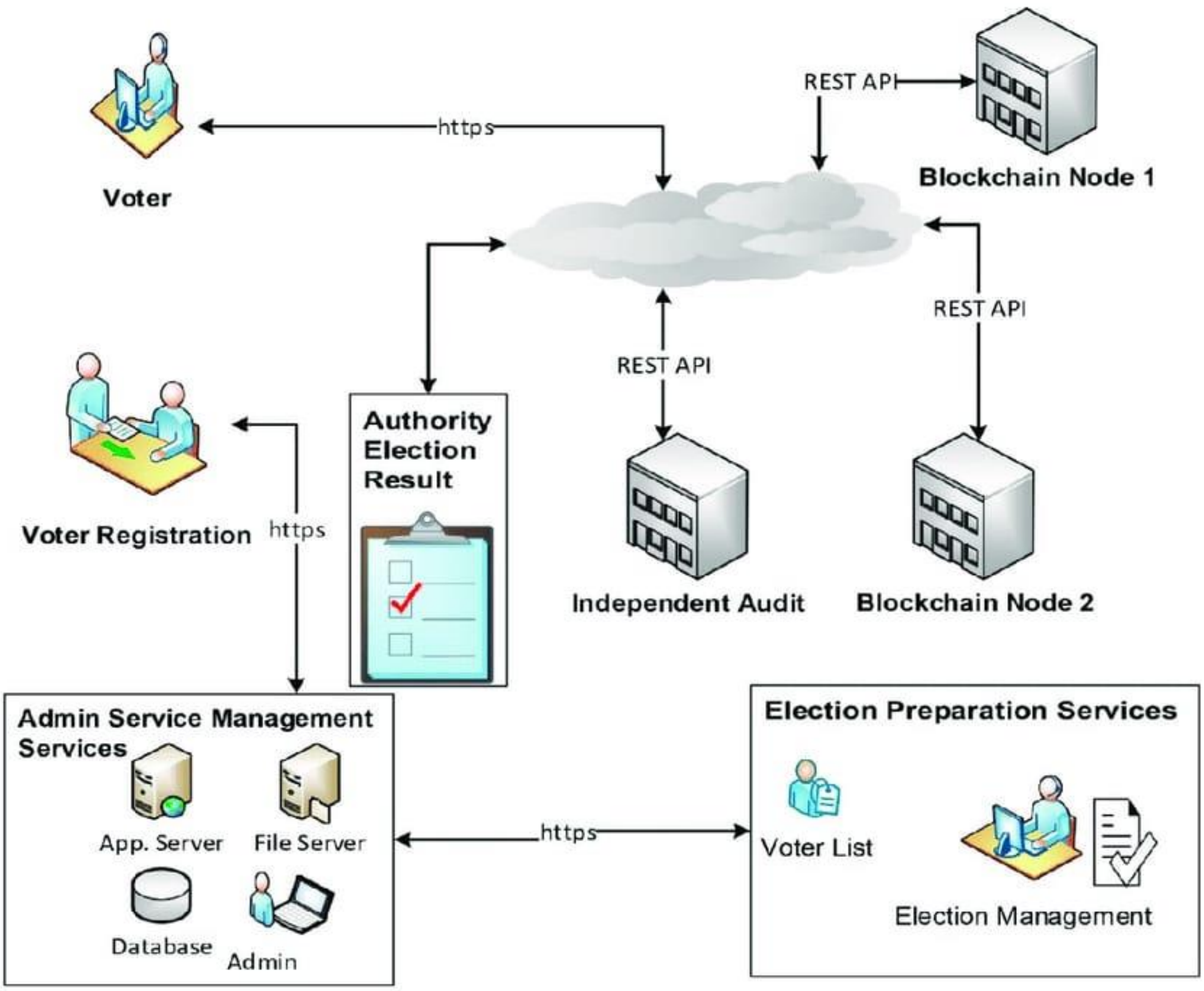




6.PROJECT PLANNING & SCHEDULING

6.1 TECHNICAL ARCHITECTURE

The technical architecture diagram for an electronic voting system utilizing blockchain technology features a distributed and secure framework designed to enhance the integrity and transparency of the voting process. At its core, a permissioned blockchain network forms the foundation, with nodes representing various stakeholders, including voters, government entities, and election administrators.



6.2 SPRINT PLANNING & ESTIMATION

Sprint planning and estimation for an E-Voting system using blockchain can be a complex process, and it's essential to break down the project into manageable tasks and allocate resources effectively.

Define the Project Goals and Scope: Clearly define the objectives and scope of your E-Voting system. Determine what features and functionality are essential for the initial release.

- **Task Breakdown:** Break down user stories into smaller, manageable tasks. For E-Voting, these could include tasks like designing the user interface, developing smart contracts, setting up the blockchain infrastructure, and conducting security audits.
- **Assign Tasks and Responsibilities:** Assign tasks to team members based on their skills and availability. Ensure that each task has a responsible team member.
- **Velocity Measurement:** After a few sprints, measure your team's velocity (i.e., how much work they can complete in a sprint). This helps in more accurate future planning and estimation.
- **Review and Adapt:** At the end of each sprint, hold a sprint review meeting to assess what was accomplished and gather feedback from stakeholders. Use this feedback to adapt the project plan and backlog.
- **Blockchain Considerations:** Given that this project involves blockchain, consider the unique challenges and complexities associated with blockchain technology.
- **Security and Compliance:** E-Voting systems require a high level of security and compliance. Plan for security audits and testing as an integral part of your sprints.
- **User Acceptance Testing:** Allocate time in your sprints for user acceptance testing to ensure that the system functions as intended and is user-friendly.

6.3 SPRINT DELIVERY SCHEDULE

Creating a Sprint Delivery Schedule for E-Voting using Blockchain is a complex project that requires careful planning and execution. Below is a high-level sprint delivery schedule with key milestones for such a project. Please note that the actual schedule may vary depending on the project's scope, team size, and other factors. This schedule is designed for a hypothetical 6-month project with six sprints.

Sprint 1: Project Initiation and Planning

- Define project goals and objectives.
- Identify stakeholders and create a communication plan.
- Create a project team with roles and responsibilities.
- Develop a high-level project plan.
- Initial feasibility study.

Sprint 2: Blockchain Technology Selection

- Research and evaluate blockchain platforms.
- Select the most suitable blockchain technology.
- Set up a development environment.
- Identify security requirements.
- Create a prototype blockchain network for testing.

Sprint 3: E-Voting System Design

- Create the system architecture.
- Design the user interface.
- Define the smart contracts for voting.
- Establish a secure data storage system.

Sprint 4: Development of Core Features

- Develop the core e-voting system components.
- Implement the smart contracts.
- Create user registration and authentication features.
- Implement voting process logic.
- Begin security testing and code reviews.

Sprint 5: Testing and Security

- Conduct thorough system testing.
- Identify and address security vulnerabilities.
- Implement encryption and data protection measures.
- Perform penetration testing.
- Prepare documentation for system audit.

Sprint 6: Deployment and Final Testing

- Deploy the e-voting system on a test network.
- Conduct a full-scale mock election.
- Fine-tune the system based on test results.
- Perform a security audit and address any findings.
- Prepare for the final deployment.
- Create user guides and training materials.

Post-Sprint Activities

- Deploy the e-voting system in a production environment.
- Conduct user training.
- Monitor and support the live system.
- Plan for future updates and improvements.

7.CODING AND SOLUTION :

7.1 FEATURE 1

```
    // SPDX-License-Identifier: MIT

pragma solidity ^0.8.0;

contract VoteSystem{

   address public owner;

   constructor(){

       owner = msg.sender;

   }

 struct candidate {

     uint voterId;

     string name;

     uint age;

     uint voteCount;

 }

 mapping (uint => candidate) candidateMap;

 struct voters {

     uint voterId;
```

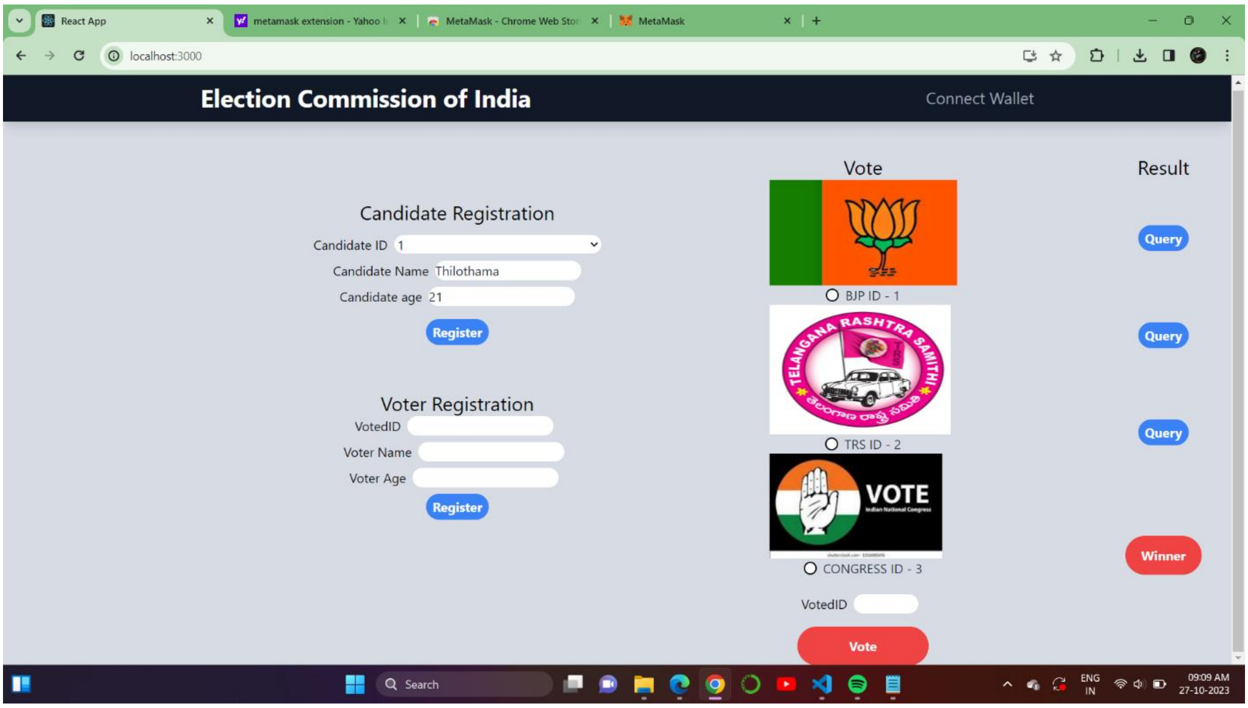
```
    string name;

    uint age;

    bool votingState;

 }

 mapping (uint => voters) votersMap;

 mapping (uint=>bool) registeredVoter;

 modifier checkVoterVoted(uint _votersVoterId){

    require (votersMap[_votersVoterId].votingState == false);

    _;

 }

modifier checkRegisteredVoter(uint _votersVoterId){

       require(registeredVoter[_votersVoterId]==true, "Voter is not Registered");

       _;

}

uint[] voterIdlist;

uint[] candidateIdList;


 function enrollCandidate(uint _voterId,string memory _name,uint  _age )  public {

 require (_age >= 25);
```

```
require (candidateMap[_voterId].voterId != _voterId);

   candidateMap[_voterId].voterId = _voterId;

   candidateMap[_voterId].name = _name;

   candidateMap[_voterId].age = _age;

   candidateIdList.push(_voterId);

}

function enrollVoter(uint _voterId,string memory _name,uint _age) public
returns(bool){

require (_age >= 18);

require (votersMap[_voterId].voterId != _voterId);

    votersMap[_voterId].voterId = _voterId;

    votersMap[_voterId].name = _name;

    votersMap[_voterId].age = _age;

    voterIdlist.push(_voterId);

   return registeredVoter[_voterId]=true;

}

function getCandidateDetails(uint _voterId) view public returns(uint,string
memory,uint,uint) {
```

```
    return
(candidateMap[_voterId].voterId,candidateMap[_voterId].name,candidateMap[_voterId].age,candidateMap[_voterId].voteCount);

 }

 function getVoterDetails(uint _voterId) view public returns (uint,string memory,uint,bool)}

    return
(votersMap[_voterId].voterId,votersMap[_voterId].name,votersMap[_voterId].age,votersMap[_voterId].votingState);

 }

 function vote(uint _candidateVoterId,uint _votersVoterId) public checkVoterVoted(_votersVoterId) checkRegisteredVoter(_votersVoterId) {

    candidateMap[_candidateVoterId].voteCount += 1;

    votersMap[_votersVoterId].votingState = true;

 }

 function getVotecountOf(uint _voterId) view public returns(uint){

      require(msg.sender== owner, "Only owner is allowed to Check Results");

    return candidateMap[_voterId].voteCount;

 }

 function getVoterList() view public returns (uint[] memory){

   return   voterIdlist;
```

```
   }

function getCandidateList() view public returns(uint[] memory)

return candidateIdList;

}

}
```

7.2 FEATURE 2



8.PERFORMANCE TESTING

8.1 PERFORMANCE METRICS

These performance metrics collectively offer a comprehensive assessment of the effectiveness, reliability, and security of an electronic voting system using blockchain, addressing the concerns and expectations of voters, election officials, and other stakeholders.

Transaction Throughput: Transaction throughput measures the number of votes processed per unit of time, indicating the system's capacity to handle a high volume of votes efficiently. A high throughput is essential, especially during peak voting periods, to prevent delays and ensure that votes are counted promptly.

Security and Immunity to Attacks: Security is paramount in an electronic voting system. Measuring the system's resilience against cyberattacks, tampering, or unauthorized access is crucial. Metrics should assess the system's ability to maintain the integrity of votes and protect sensitive data, as well as its resistance to breaches or attacks.

Consensus Algorithm Efficiency: The efficiency of the consensus algorithm used within the blockchain network is critical. Metrics in this category include block confirmation times and the system's ability to reach consensus quickly and accurately, as this directly impacts the speed and reliability of vote recording.

Fault Tolerance and System Uptime: The ability of the system to continue functioning in the face of hardware failures, network disruptions, or other unexpected issues is vital. Metrics here assess the system's uptime and resilience, helping ensure that voters can cast their votes without interruption.

Auditability and Transparency: An electronic voting system's auditability is a key performance metric. It assesses the transparency of the blockchain, making it easy for stakeholders to audit and verify votes, contributing to trust and confidence in the electoral process.

Privacy and Anonymity: To protect voters' privacy and anonymity, the system's performance in maintaining confidential voter identities and choices should be measured. Metrics in this category can examine the system's ability to safeguard personal data.

Scalability: As the number of voters and transactions increases, the system must scale efficiently to accommodate this growth without sacrificing performance. Scalability metrics gauge the system's capacity to expand and handle additional loads.

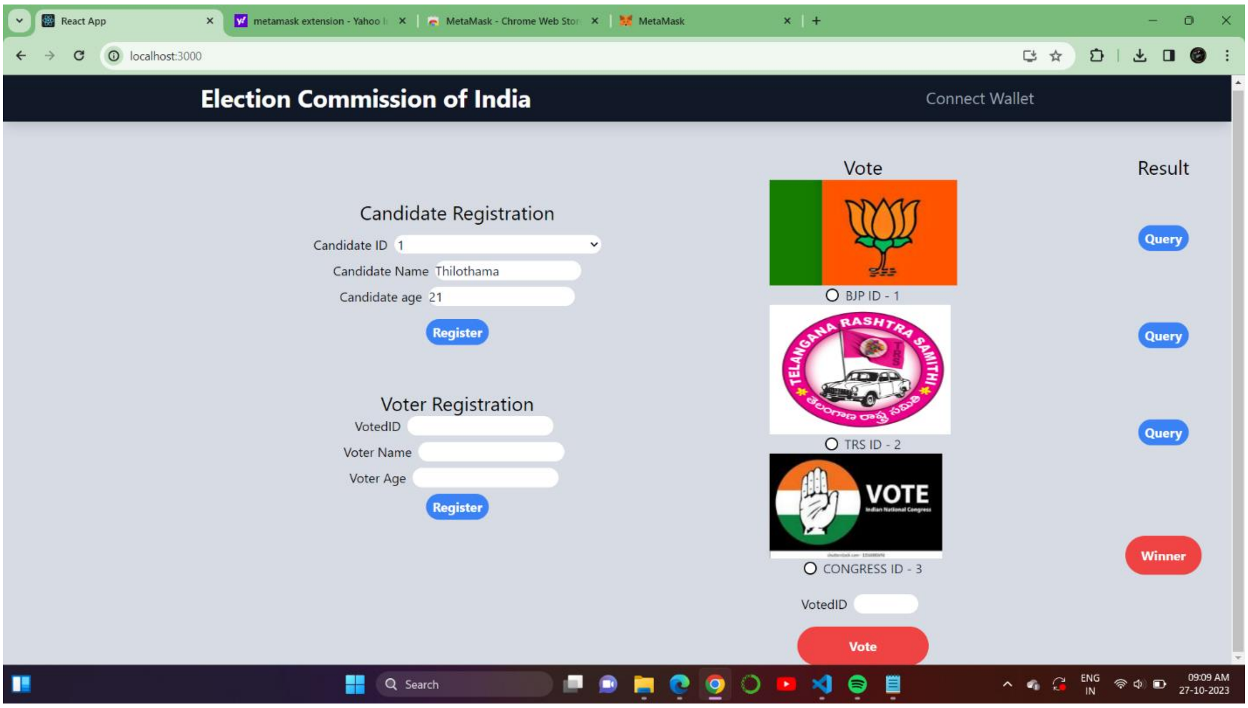
Usability and Accessibility: The ease of use for both voters and election administrators is crucial. Usability metrics evaluate the user-friendliness of the system, while accessibility metrics ensure compliance with standards to accommodate voters with disabilities.

Energy Efficiency: The environmental impact of the blockchain network is a consideration. Energy efficiency metrics measure the system's energy consumption, providing insight into its sustainability and eco-friendliness.

Voting Verification and Reporting Speed: The ability of voters to verify that their votes were correctly recorded and counted is essential for trust in the system. Additionally, reporting speed metrics evaluate how quickly election results can be disseminated to the public, facilitating timely and accurate information sharing.

9.RESULTS

9.1 OUTPUT SCREENSHOTS:



10.ADVANTAGES AND DISADVANTAGES :

ADVANTAGES:

Enhanced Security: Blockchain technology provides a high level of security through its decentralized and tamper-resistant nature. Once a vote is recorded on the blockchain, it becomes nearly impossible to alter or manipulate, ensuring the integrity of the voting process.

Transparency and Auditability: The blockchain ledger is transparent and can be audited by anyone. This transparency enhances trust in the electoral process, allowing voters and election officials to independently verify the results, reducing the potential for fraud.

Immutable Records: Votes recorded on a blockchain are permanent and cannot be deleted or changed. This immutability ensures that a historical record of all votes is maintained, making the system highly resistant to fraud or data loss.

Voter Verification: Blockchain-based voting systems can provide secure and verifiable digital identities for voters, reducing the risk of impersonation or fraudulent voting.

Accessibility: Electronic voting systems can be designed to be accessible to a wide range of individuals, including those with disabilities, through various digital interfaces and accommodations.

Efficiency and Reduced Costs: Compared to traditional paper-based systems, electronic voting using blockchain technology can significantly reduce the cost and administrative burden of organizing elections.

Convenience: Voters can cast their ballots from virtually anywhere using a secure mobile app or website, increasing convenience and potentially boosting voter turnout.

Real-Time Results: With blockchain-based systems, election results can be tabulated in real time, providing quicker and more accurate reporting to the public, candidates, and election officials.

DISADVANTAGES :

Digital Divide: Not everyone has equal access to technology. Electronic voting assumes that all citizens have access to smartphones, computers, and the internet, which can exclude those who lack the necessary resources or digital literacy, potentially creating a digital divide.

Security Concerns: While blockchain technology is highly secure, the devices used to access the voting system may not be. Malware, hacking, and vulnerabilities in user devices can compromise the security of the voting process.

Voter Privacy: Maintaining the privacy of voters is a challenge in electronic voting systems. While blockchain offers anonymity, it's still possible for third parties or malicious actors to breach voter privacy during the voting process.

Voter Verification: Ensuring the identity of voters in an online environment can be challenging. Digital identities can be stolen or spoofed, leading to potential instances of voter fraud.

Blockchain Scalability: Blockchain networks may face scalability issues when dealing with a large number of transactions during a high-turnout election, potentially leading to delays and slower processing times.

Complexity: Blockchain technology can be complex for the average voter to understand, potentially leading to confusion and mistrust in the voting process.

Technical Challenges: Maintenance, updates, and technical issues can disrupt the functioning of the voting system. Software bugs, connectivity problems, or other technical challenges may result in disenfranchisement.

11.CONCLUSION :

The use of blockchain technology in e-voting systems has several advantages, including increased security, transparency, and accessibility. Based on the research, the following conclusions can be drawn:

- E-voting systems based on blockchain technology can eliminate the need to print ballot papers or open polling stations, allowing voters to vote from wherever there is an internet connection
- The use of blockchain technology can ensure that each vote is counted correctly, and no third party can tamper with any vote
- Blockchain-based e-voting systems can be more secure, cheaper, more transparent, and easier to use than traditional voting systems
- The implementation of a decentralized e-voting system using blockchain technology can enhance the integrity and accessibility of the electoral process

Overall, the use of blockchain technology in e-voting systems has the potential to revolutionize the way we conduct elections, making them more secure, transparent, and accessible to all. However, there are still open research challenges that need to be addressed, such as scalability, privacy, and auditability.

12.FUTURE SCOPE:

The use of blockchain technology in e-voting systems has gained attention due to its potential to enhance transparency, security, and accessibility in the voting process. While there are still challenges and concerns to address, there is a significant future scope for e-voting using blockchain technology. Here are some key points to consider:

1. Security and Transparency: Blockchain's decentralized and immutable ledger can significantly enhance the security and transparency of e-voting systems.

Each vote is recorded as a transaction on the blockchain, making it nearly impossible to alter or tamper with the results.

2. Accessibility: E-voting via blockchain can make the voting process more accessible to a wider range of voters. People can vote from the comfort of their homes, which can be particularly beneficial for those with disabilities or who are unable to physically visit polling stations.
3. Reduced Fraud: Blockchain can reduce the potential for voter fraud by ensuring that each voter can only cast one vote and by securely verifying the identities of voters.
4. Verifiability: Blockchain-based e-voting systems can provide a means for voters to verify that their votes were counted correctly. This can enhance trust in the electoral process.
5. Cost Efficiency: Implementing e-voting using blockchain technology can potentially reduce the cost associated with traditional paper-based voting methods.
6. International Voting: E-voting with blockchain could enable expatriates or international travelers to vote in their home country's elections, reducing the barriers that often prevent them from participating in their home country's democratic process.
7. Remote Voting: In the context of remote or online voting, blockchain can provide a secure and transparent means for citizens to cast their votes without physically visiting a polling station.
8. Tamper-Proof Records: Once a vote is recorded on a blockchain, it is extremely difficult to alter or erase. This tamper-proof aspect of blockchain can ensure the integrity of voting records.
9. Decentralization: Blockchain is inherently decentralized, reducing the risk of a single point of failure or manipulation. It can enhance the resilience of e-voting systems against cyberattacks

13. APPENDIX :

SOURCE CODE

```
// SPDX-License-Identifier: MIT

pragma solidity ^0.8.0;

contract VoteSystem{

    address public owner;

    constructor(){

        owner = msg.sender;

    }

 struct candidate {

     uint voterId;

     string name;

     uint age;

     uint voteCount;

 }

 mapping (uint => candidate) candidateMap;

 struct voters {

     uint voterId;

     string name;
```

```
    uint age;

    bool votingState;

 }

 mapping (uint => voters) votersMap;

 mapping (uint=>bool) registeredVoter;

 modifier checkVoterVoted(uint _votersVoterId){

    require (votersMap[_votersVoterId].votingState == false);

    _;

 }

modifier checkRegisteredVoter(uint _votersVoterId){

       require(registeredVoter[_votersVoterId]==true, "Voter is not Registered");

       _;

}

uint[] voterIdlist;

uint[] candidateIdList;

 function enrollCandidate(uint _voterId,string memory _name,uint  _age )  public {

 require (_age >= 25);

 require (candidateMap[_voterId].voterId != _voterId);

   candidateMap[_voterId].voterId = _voterId;
```

```
   candidateMap[_voterId].name = _name;

   candidateMap[_voterId].age = _age;

   candidateIdList.push(_voterId);

 }

 function enrollVoter(uint _voterId,string memory _name,uint _age)  public
returns(bool){

require (_age >= 18);

require (votersMap[_voterId].voterId != _voterId);

    votersMap[_voterId].voterId = _voterId;

    votersMap[_voterId].name = _name;

    votersMap[_voterId].age = _age;

    voterIdlist.push(_voterId);

   return registeredVoter[_voterId]=true;

 }

 function getCandidateDetails(uint _voterId) view public returns(uint,string
memory,uint,uint) {

    return
(candidateMap[_voterId].voterId,candidateMap[_voterId].name,candidateMap[_v
oterId].age,candidateMap[_voterId].voteCount);

 }
```

```
function getVoterDetails(uint _voterId) view public returns (uint,string memory,uint,bool)}

    return (votersMap[_voterId].voterId,votersMap[_voterId].name,votersMap[_voterId].age ,votersMap[_voterId].votingState);

 }

 function vote(uint _candidateVoterId,uint _votersVoterId) public checkVoterVoted(_votersVoterId) checkRegisteredVoter(_votersVoterId) {

    candidateMap[_candidateVoterId].voteCount += 1;

    votersMap[_votersVoterId].votingState = true;

 }

 function getVotecountOf(uint _voterId) view public returns(uint){

      require(msg.sender== owner, "Only owner is allowed to Check Results");

    return candidateMap[_voterId].voteCount;

 }

 function getVoterList() view public returns (uint[] memory){

   return   voterIdlist;

   }

 function getCandidateList() view public returns(uint[] memory)

 return candidateIdList;
```

}

}

GitHub & Project Demo Link:

GitHub link: https://github.com/Krishani-M/NM-BLOCKCHAIN-DEVELOPMENT-ELECTRONIC-VOITNG-SYSTEM/upload

Project Demo Link:

https://drive.google.com/file/d/1SNf1yhJJkUXgKNCrgyCq4MFexf8Lf7JK/view?usp=drivesdk