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DECENTRALISED BLOCKCHAIN-BASED SECURED E-VOTING SYSTEM

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Abstract: Voting is a fundamental right of every person in every democracy, allowing them to select the future's leaders. Online voting platforms are used to conduct votes and elections in a secure manner. As a digital platform, they eliminate the need to cast your votes using paper or having to gather in person. They also prohibit voters from casting multiple ballots, preserving the validity of your vote. E-voting provides important benefits over ballot-based systems, including greater efficiency and fewer mistakes. By enabling users to vote from any location and on any internet-connected device, the electronic voting system tends to maximize user involvement. The current issues with e-voting could be resolved by expanding it to block chain technology. Here, we suggest a block chain-based voting system that will reduce voting fraud and make the voting process simple, secure and efficient.

IndexTerms - Blockchain, E- voting, Truffle, Ganache, Metamask, Smart Contract, Ethereum, Solidity.

I. INTRODUCTION

In the current system, voting is done by using EVM (electronic voting machine).This method can be replaced by online voting system which will limit the voting frauds. Expanding e-voting into Blockchain technology could be the solution to alleviate the present concerns in e-voting. With this view in mind we are going to develop Online Voting System using Blockchain. This e-voting system has the potential to make the voting process easier and more accessible for elector. The aim of the project is to outline the issues of current voting system by using blockchain technology. A Blockchain is a digital ledger of transition that is duplicate and distributed across the entire network of computer system on the blockchain. It is a system of recording information in a way that it makes impossible to change the system. This project helps people to cast their votes electronically, through a website, mobile app, or any internet-connected device in a more secured way. The existing electoral system is operated manually. Time is consumed since the voter must go to different polling places to cast their vote. And then the use of Electronic voting machines came into action. Eventhough it had many advantages than the ballot paper system it also have high risks of malfunction and security threats. In a democracy, where every vote counts for something. A new online system can replace the current one, reducing vote fraud and improving the efficiency and transparency of both voting and counting. In the existing voting system, time is wasted since the voter must visit multiple booths to cast their ballot. Due to this, a lot of individuals don't turn out to vote, which is one of the most significant and concerning factors. Due to the security threats, there were high risks of frauds in the election results. Malfunction can occur in Electronic Voting Machine. Standing in a long queue in polling booth is difficult for senior citizens. Our suggested solution boosts participation, improves security, and eliminates mistakes in manual counting, resulting in accurate and prompt results publication and receipt of votes for every vote made. Implementing electronic voting is now more affordable, simple, and safe because of blockchain technology. It is a radically new paradigm that can aid in the creation of decentralised systems that guarantee the accuracy, availability, and fault tolerance of the data. The systems are intended to be transformed by this technology. The decentralised networked computer systems that make up blockchain technologies are used to validate and record pure online transactions. They also make up the blockchain, which are ledgers where digital data is connected to one another. The data stored on a blockchain is essentially unchangeable. India now uses an EVM (Electronic Voting Machine) based voting method. There were paper ballots and manual counting before this system. The use of paper ballots was heavily criticised due to fraudulent voting and booth capturing, in which party supporters took control of booths and loaded them with false ballots that were already filled out. It is crucial to replace the current system with a new one in order to reduce fraud and make the voting process traceable and verifiable. As we can see, the internet has sparked a revolution in every conceivable field by attempting to move the current system to an online platform to make the processes quick and user-friendly. We are aware of the reliability of the current system, but that does not exclude us from making improvements to it. Blockchain-based online voting systems may be that first step. A blockchain is a distributed, immutable, incontrovertible, public ledger. The distributed ledger is maintained without a single point of failure, and which are the four key elements that make this new technology operate.

II. RELATED WORKS

2.1. LITERATURE REVIEW

[1] Yannan Li , Willy Susilo , Guomin Yang et al. A Blockchain-Based Self-Tallying Voting Protocol in Decentralized IoT. Decentralised IoT uses self-tallying voting algorithms as a substitute to outdated, centralised voting methods. Architecture provides a physical structure and two unique strategies to address the fairness problems in self-tallying systems.

[2] Dongliang Xu, Wei Shi, and Wensheng Zhai et al. Multi-Candidate Voting Model Based on Blockchain. Votes can be counted independently using an anonymity-preserving voting method and asymmetric encryption. ECC encryption and a signature technique to protect voter anonymity during the voting process

[3] Muhammad Shoaib Farooq , Usman Iftikhar, and Adel Khelifi et al. A Framework to Make Voting System Transparent Using Blockchain Technology . Transaction encryption using a cryptographic hash and defence against a 51% attack on the blockchain. The goal is to increase trust between the government and the electorate so that they believe their right to vote is protected.

[4] Somnath Panja , Samiran Bag , Feng Hao , and Bimal Roy et al. A Smart Contract System for Decentralized Borda Count Voting. At the end anyone including a third-party observer will be able to compute the tally. It ensures the maximum voter privacy, and upon the successful completion of the protocol.

[5] Di Wu , Member, IEEE, and Nirwan Ansari et al. A Trust-Evaluation-Enhanced Blockchain-Secured Industrial IoT System. The likelihood of the system making the right authorisation is higher. a vote-based authorisation system that considers trust.

[6] Xinyu Zhang , Aggelos Kiayias , and Thomas Zacharias et al. An Efficient E2E Crowd Verifiable E-Voting System. Precomputed ciphertexts must be created for each voter and each option they might select. EA creates a CRS for the ideal sound NIZK system initially.

[7] Xiang Fu , Huaimin Wang, and Peichang Shi et al. Votes-as-a-Proof (VaaP): Permissioned Blockchain Consensus Protocol Made Simple Protocols are implemented using either Proof of Work (PoW) or Proof of Stake (PoS) public blockchains. Consensus-building in VaaP is a fairly easy process.

III. RESEARCH METHODOLOGY

3.1. PROPOSED METHOD

Due to issues that come up during voting, the current voting system has to be modified. This can be accomplished by replacing the current system with a new one that limits voting frauds, improves the efficiency of vote counting, and aids individuals who are unable to vote. User registration, user login, and admin login are features of an online election system. A system that is unchangeable, transparent, effective, and impenetrable may be implemented with the use of blockchain technology. The blockchain is the most efficient technology for voting systems since it is impossible to add, delete, or modify information within blocks.

- **ETHEREUM:**
  Decentralised and open-source, Ethereum is a blockchain that supports smart contracts. Anyone may publish permanent and unchangeable decentralised apps on Ethereum, allowing users to communicate with them.

- **SMART CONTRACT:**
  Smart contracts eliminate the need for a third party facilitator by acting as self-executing programs that contain the terms and conditions of an agreement between two parties. This effectively gives you complete control over the contract. Smart contracts are simply programmes stored on a block that execute when peer-to-peer determined conditions are met.

- **GANACHE:**
  Ganache is a private Ethereum blockchain ecosystem that simulates the Ethereum blockchain and allows users to interact with smart contracts on their own private blockchain. It is used to create a private Ethereum blockchain on which you can run tests on your solidity contracts.

- **METAMASK:**
  The Ethereum-based decentralised, non-custodial wallet MetaMask enables users to store, purchase, transmit, convert, and trade cryptocurrency tokens. The most straightforward and safe way to connect to blockchain-based applications is using MetaMask.

3.2. SYSTEM ARCHITECTURE

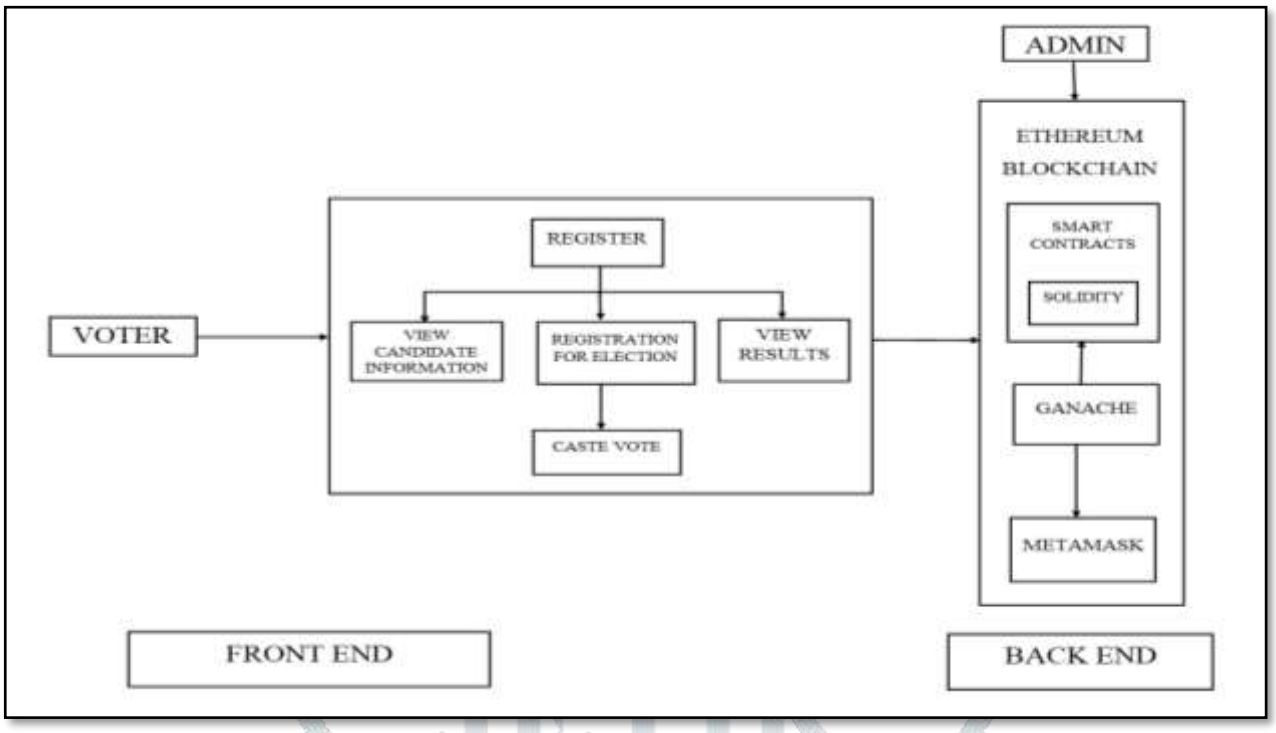

Figure .3.2: Decentralised Blockchain-Based Secured E-Voting System Architecture

3.3. MODULES

3.3.1. CREATION OF WEBPAGE

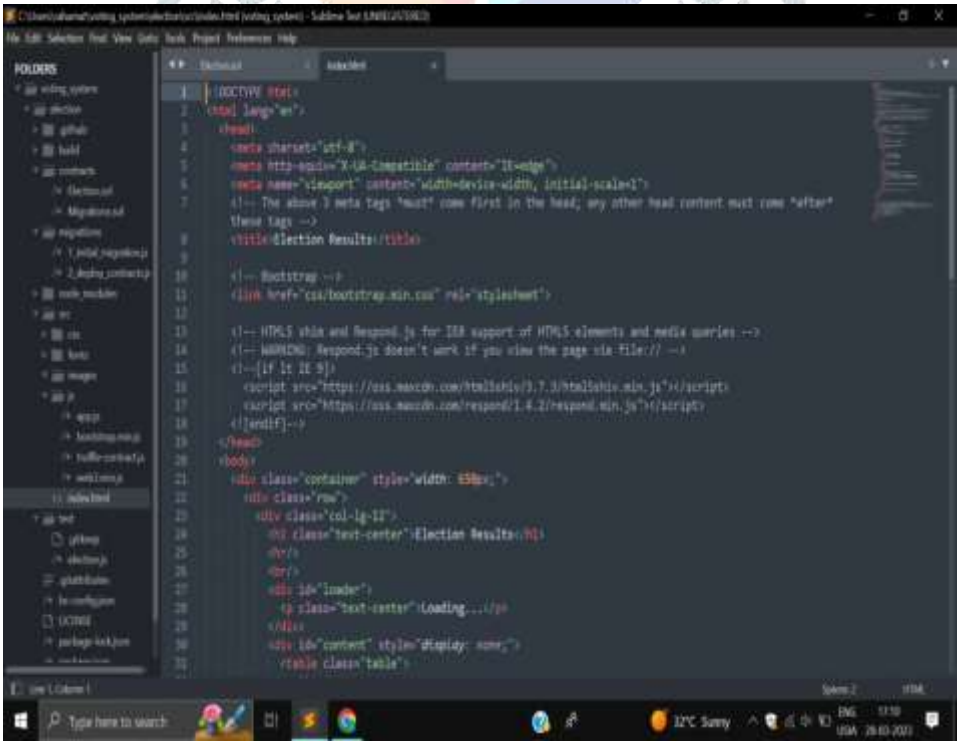

Figure 3.3.1: Webpage creation

- Web page is coded through html and css to display the election results.
- HTML describes the structure of web pages. CSS is used to style and design the web pages.

3.3.2. IMPLEMENTATION OF SMART CONTRACTS THROUGH SOLIDITY

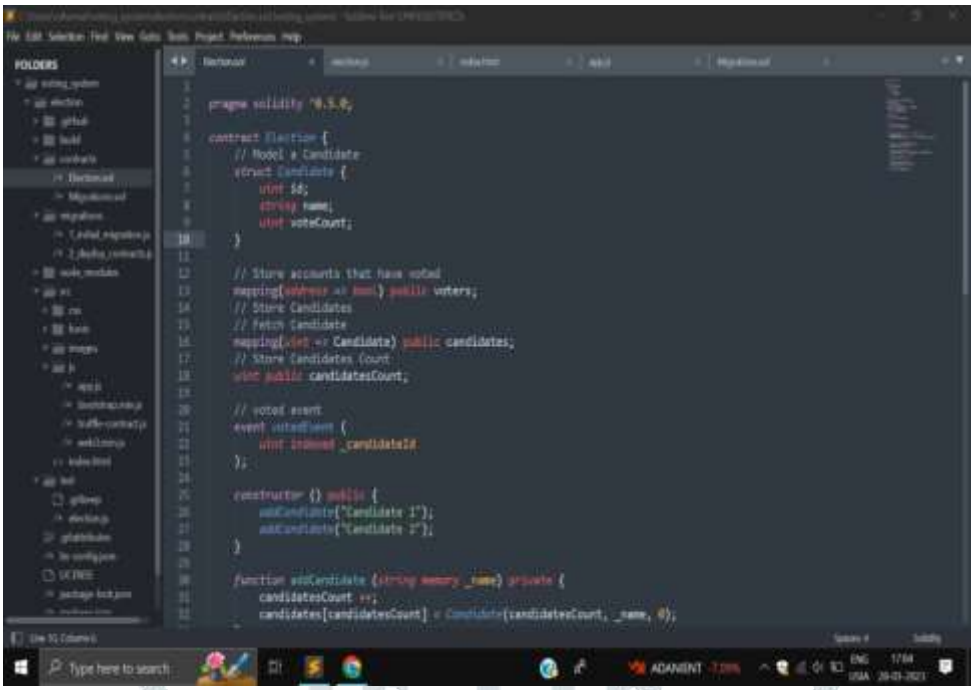

Figure 3.3.2: Implementation of Smart Contract

- Smart contracts are built using the Solidity programming language on several blockchain platforms.
- In the blockchain system, it's used to establish smart contracts that generate a chain of transaction records.

3.3.3. UTILIZING THE WEB3ETHEREUM TO ACCESS THE GNANCHE ACCOUNT

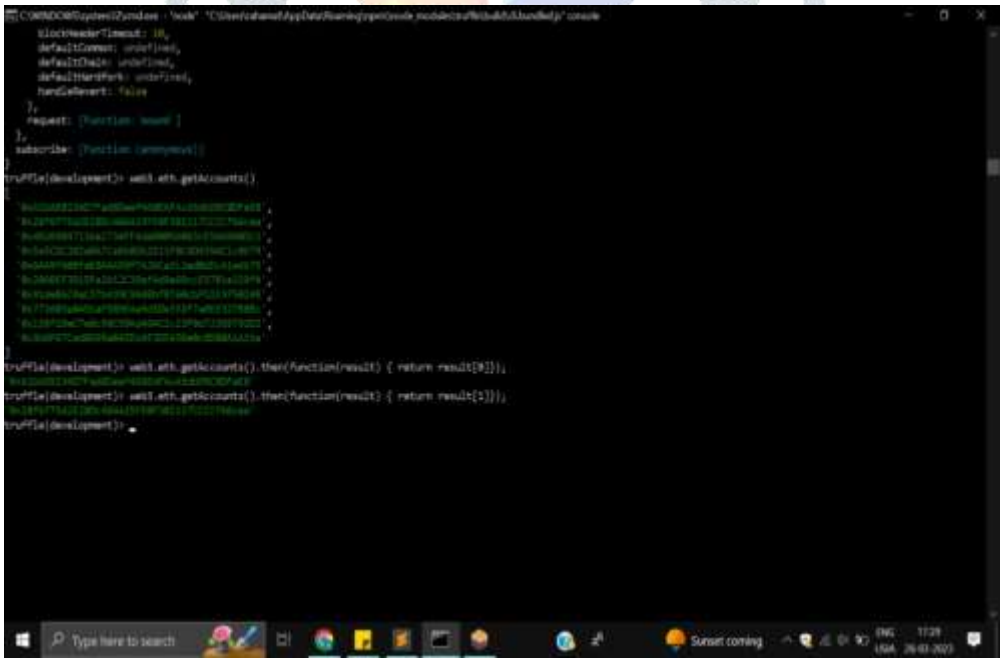

Figure 3.3.3: Accessing Ganache Account

- Web3 is an open-source and encompass the decentralized applications built on blockchain. Ethereum is used to access the Ganache accounts.
- Ganache is used in MetaMask when creating new accounts i.e., it’s public and private key is accessed to caste vote.

3.3.4. CONNECTING THE METAMASK TO WEB PAGE

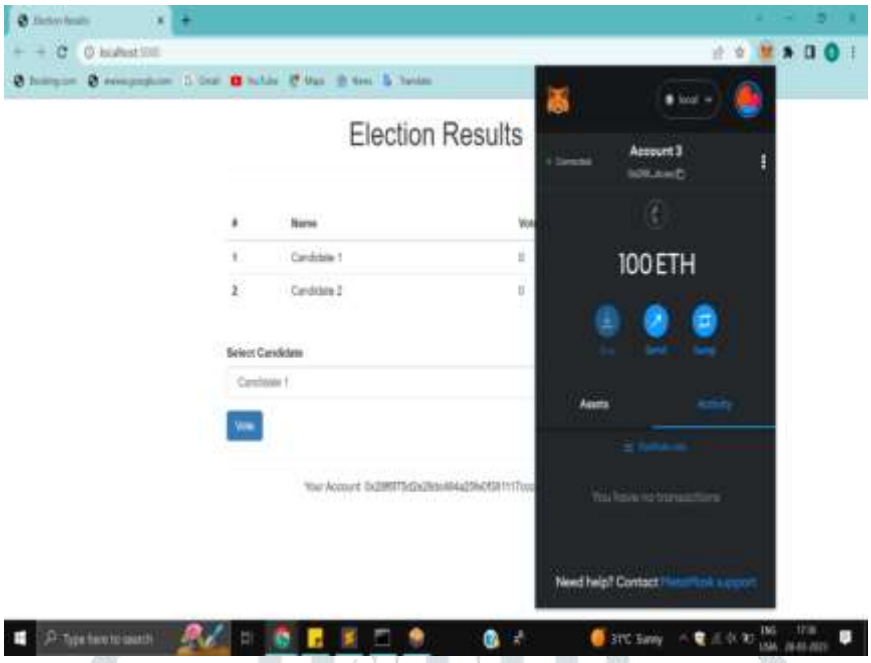

Figure 3.3.4: Connecting to MetaMask

- MetaMask is a software cryptocurrency wallet.Through a browser plugin, users may access their Ethereum wallet.
- MetaMask access the Ganache private and public key for creating accounts to connect with browser.

IV. RESULTS AND DISCUSSION

4.1. USER CASTE THEIR VOTE

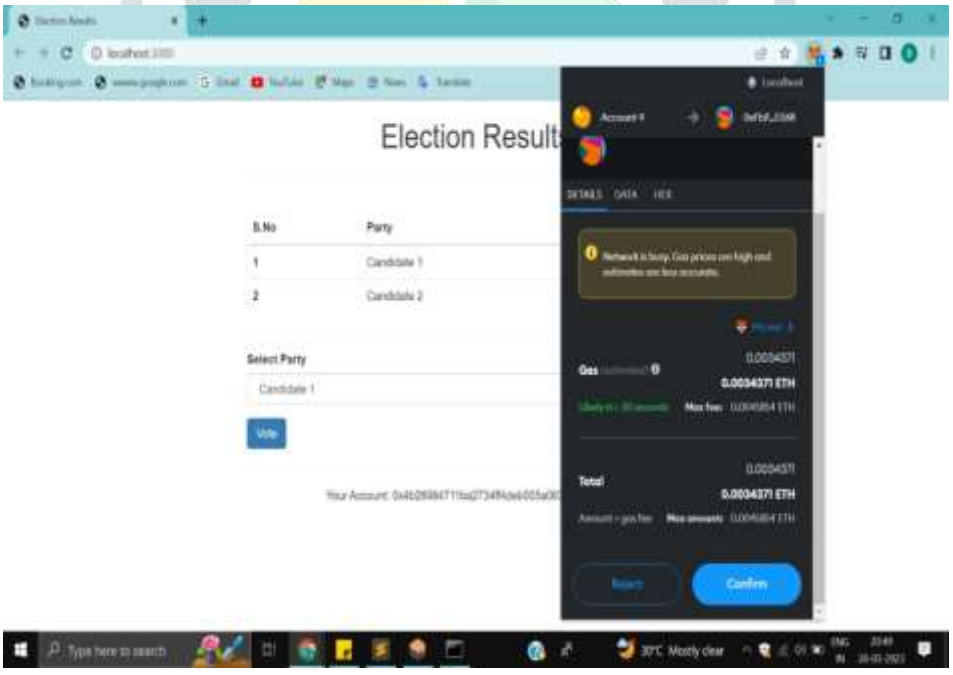

Fig 4.1: User Caste Vote

- MetaMask is connected to the browser. Then using Ganache, new accounts are created in MetaMask.
- After that, user can do digital transaction using their account to caste their vote in election.

4.2. ELECTION RESULTS

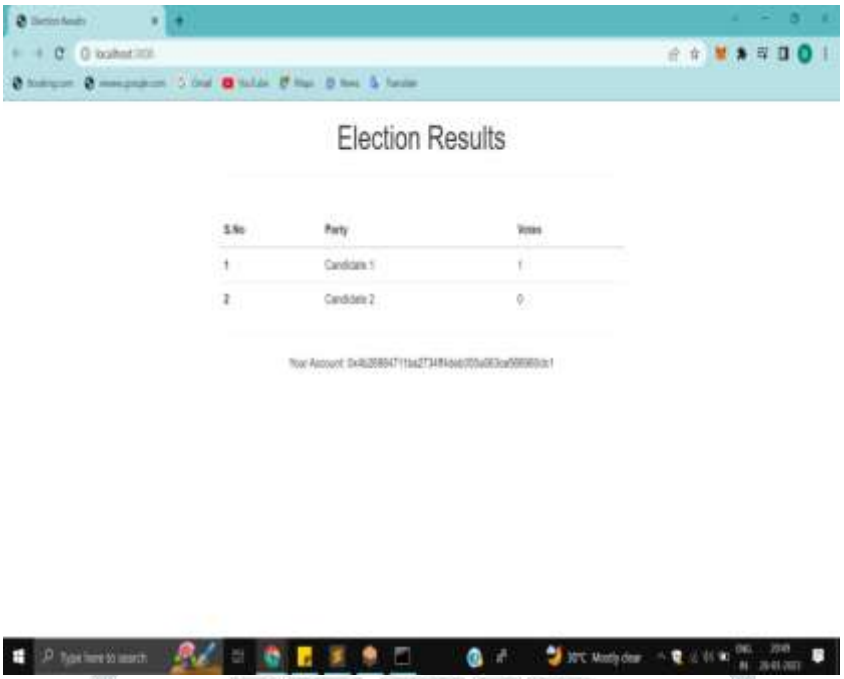

Figure 4.2: Voting Result

- In this web page, the Election results are displayed. It provides the enhanced security in voting process.
- Hence the user can vote once in online voting system.

V. CONCLUSION

In this project, we proposed an electronic voting system based on blockchain that protects voters' privacy while enabling secure and affordable elections. By providing a fresh way around electronic voting methods' drawbacks and adoption difficulties, blockchain technology protects election security and integrity and paves the way for transparency. Utilizing every attribute of the smart contract to reduce the load on the blockchain, it is possible to transfer hundreds of transactions per second into an Ethereum private blockchain. We have made an effort to create a user interface for the decentralised application that will simplify the voting procedure. 30% of the total work that has to be done can be presumed to be the UI component. The blockchain technology, which will be in charge of the trustworthy voting process, makes up the majority of this system.

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