A Blockchain Based Portal for Online E-Voting

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Abstract: *In place of traditional electoral systems, the implementation of e-voting systems is widely adopted which still has major problems in the results. Online voting is an alternative to the old paper voting system and today's popular Electronic Vote Machine (EVM). E-voting systems are very susceptible to manipulation issues, such as alteration of election results by hacking or by the manufacturer of the voting system. To solve this problem, we use distributed ledger technology to create a voting application that is accessible to everyone and everywhere. Blockchain, which is the technology behind the first Bitcoin cryptocurrency, has attracted a lot of attention globally in recent years. This paper proposes a blockchain-based voting system that removes some limitations of existing voting systems. The application is based on the Ethereum blockchain which makes the entire system secure and immutable in nature. The presented implementation is suitable for small-scale elections such as inside corporate homes, meeting rooms, and more.*

Keywords: Blockchain, Ethereum, Ganache, Metamask

I. INTRODUCTION

Blockchain has become a reliable and robust technology unlike traditional server-oriented architectures. Blockchain is a system that collects and validates information in a way that makes it difficult to manipulate, modify, hack, or modify the system. Blockchain is a digital ledger of transactions that are copied to each node and distributed across an entire network of computer systems on the blockchain network. Blockchain is a digital record of copied transactions at each node and distributed over the entire network computer system on the blockchain network [1]. In the beginning, Blockchain is only used for monetary transactions and commercials, but studies have begun to suggest that it may be used in many other areas over time because there are prominent levels of transparency in this system. For this reason, not only money transfers but all kinds of structural information can be kept in this distributed chain, and with the help of some cryptographic methods, the system can are kept safe. Like everyone's property, Marriage certificate, bank book, medical document information, etc., a lot of information can be saved with this system with relevant modifications [2].

Web application that helps event administrators create and manage new voting events. Each voting event is treated as a separate smart contract. The smart contract is a self-directed contract deployed in the blockchain network. The smart contract contains a set of protocols that govern the communication and decision of the contract between the parties, the contract code will be executed when the appropriate event occurs, and conditions are met. All the terms of the agreement can be codified into a smart contract, reducing third-party fiduciary fees.

The voting smart contract contains a voting function, checks the voter whether this voter has voted or not if the voter has not voted, the number of votes is incremented according to a proposal specifically, every successful vote a new block is added to the irreversible Blockchain, and an event is emitted to update the UI for real-time votes [3].

II. MOTIVATION AND RELATED WORK

Our main motivation for this project is to provide a safe vote environment and show that a reliable evolution program can use Blockchain. Because when the has voting rights for everyone with a computer or a mobile phone, all administrative decisions can be made by people and members; or at least the opinion of the people will be more public and more accessible to politicians and managers. This will eventually lead humanity to true direct democracy [5]. This is important to us because elections can be easily corrupt or manipulated, especially in small towns, and even in large cities found in participating countries.[6]

David Khoury et al. proposed an innovative approach based on blockchain technology to solve the trust problem for a decentralized voting platform [1]. The proposed system authenticates and authenticates eligible voters using their confirmed votes via mobile number. Here for each vote, there should be a unique mobile number.

In 2020, Ruhi Tas et al. published a paper on the e-voting system based on blockchain technology, where they classified the following issues: general, integrity, consensus, privacy, coin-based [7].

In 2019 Ms. Spurthi Anjan used UIDAI provided Aadhar card number as a private key along with a public key that generates the digital signature which can be used in e-voting and sent over the blockchain network the create a new block. Here the votes cannot be tempered as they used blockchain technology, which works on a blockchain mechanism.[8]

In Lalitha et al. Ethereum's decentralized Proof-of-Authority (POA) implementation which uses an algorithm that supplies fast transactions through a consensus mechanism based on identity as stake [9].

III. PROPOSED SYSTEM

According to Cetinkaya, the E-Voting system involves three main actors, namely voter, registry authority, and tallying authority. Voter is eligible to vote in an election [4]. Registry Authority is someone or an organization who is responsible to make sure that only the registered voters can give only one vote in an election. Tallying Authority is someone or an organization who is responsible to collect the ballots and count the election results. In our proposed voting system, the registrar and voters are represented by the Ballot Manager and Voter subsystems respectively, while the counting of votes is performed automatically by a function of the smart contract.

In our proposed paper, we implemented a voting system based on the Ethereum blockchain, governed by smart contracts and written in the Solidity programming language. Through this blockchain platform, there is no possibility of data tampering and ensures fair voting events. The system is designed using the Ethereum blockchain allowing us to deploy smart contracts on the blockchain network. Thus, the blockchain acts as a backend of the system where all the business logic is written in the smart contract. Following points are important and should be considered while implementing e-voting system:

1. The voting system should verify the identity of the voter and only authenticate the eligible voters.
2. The e-voting system is not allowed to access invalid candidates. Each voter should have a unique opportunity to vote, meaning that the system will prevent double vote.
3. It should supply complete privacy to voters and the votes should not be traceable.
4. It should not falsify anyone's vote, nor does the system allow a single authority to control the counting of votes.
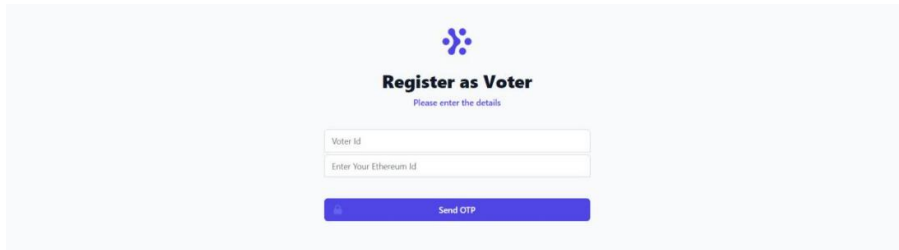
To meet the requirements of our e-voting system, votes to be controlled by the environment. We set up a network based on proof of work to achieve our goals. Proof-of-work uses an algorithm that confirms via a Cryptocurrency-based consensus mechanism as a stake. Each voter will interact with the client-side application to invoke the smart contract to vote. The client-side application uses the Metamask to communicate with a node on which the smart contract is deployed. We explain our step in following steps

- **Step 1**: - First, we need to create a private local Ethereum Blockchain network using Ganache and deploy our smart contract on the Blockchain network. Each voter in the network interacts with the smart contract using a client-side application and Metamask to vote.
- **Step 2:** - When users log in to the app, they have to choose to log in as organizer or voter. If the user is logged in as an administrator, then an election event can be held in the system. When users log in to the app, they have to choose to log in as organizer or voter. If the user is logged in as an administrator, then an election event can be held in the system. If a user is logged in as a voter, that user can vote in the voting event by connecting their metamask wallet address to the application.
- **Step 3:** - Each time a voter votes for a particular candidate in the voting event, a smart contract is invoked and the number of votes for that candidate is incremented by a set value and the client-side user interface (UI) is automatically updated
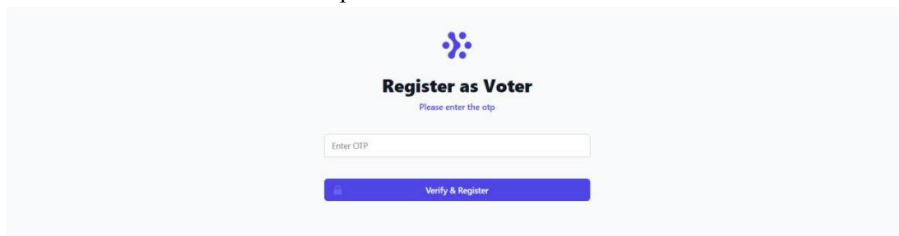
Impact Factor: **6.252**

IV. IMPLEMENTATION

4.1 Voter Registration

First, the user is asked to enter their voter id and ethereum account address in the input boxes below. An OTP is sent to the voter's registered mobile number.
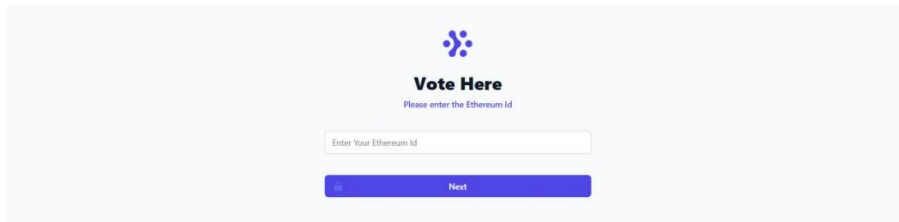
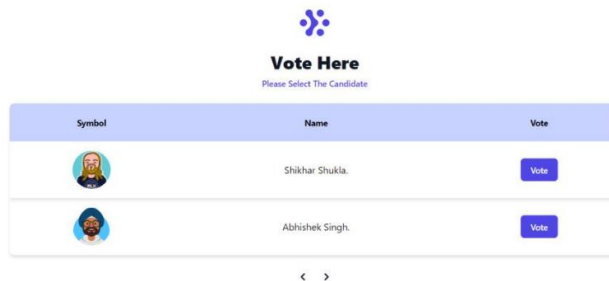Then the user is asked to enter their OTP in the input box.

If the OTP were correct, the voter would be displayed a success message instead of an error message.
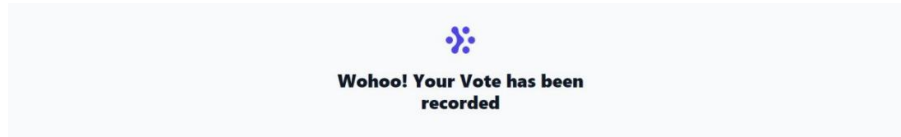
4.2 Cast Vote

Initially, take Ethereum ID as input and show the candidates according to the district they belong in a list as shown in the above figure.

The voter can cast a vote to the candidate to his choices by clicking on the Vote button, the ethereum id is handled by the metamask, and an appropriate message is displayed to the voter.

Wohoo! Your Vote has been recorded

4.3 Show Results

After the declaration of results, the results will be displayed on the Voter's Cafe Page. The leaderboard for the party-wise (overall) results will look as shown below. The results are sorted in decreasing order of seats. We will also show the seats won by individual candidates in a line below the leaderboard.

The leaderboard for the candidate-wise (constituency) results will look as shown below. The user needs to enter the pin code for the constituency to get its result. The results are sorted in decreasing order of votes.
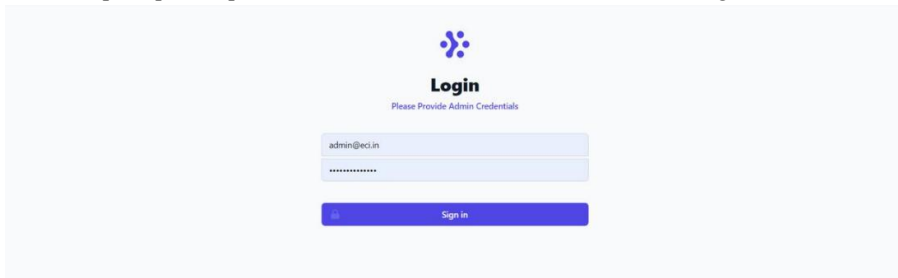
4.4 Admin Login Page

In this module admin is prompted to provide his Email Id and Password credentials to get access to the Admin Dashboard.
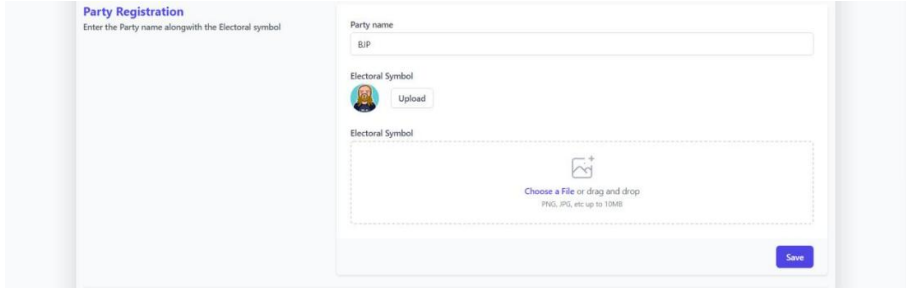
4.5 Party Registration

Form input is taken for the Party name and its electoral symbol. This electoral symbol image is uploaded to the Cloudinary API.

4.6 Candidate Registration

Form input is taken for the Candidate's name and the constituency he is standing from in the election. The candidate also chooses his party from a dropdown, and if he does not belong to any party, he selects his electoral symbol.

4.7 Start Voting Phase

This button changes the election phase from Voter Registration to Voting Period.

4.8 Declare Election Result

This button declares the election result to be viewed on the web app. It is functional only after the set time interval for the voting period ends automatically.

V. ADVANTAGES AND CHALLENGES

Blockchain based e-voting system supplies following benefits:

1. Votes are cryptographically secured.
2. Votes once stored are immutable and tamper-proof which preserves voter's privacy and anonymity.
3. This system may increase the voter's participation
4. It promotes transparency and clarity to the system which promotes transparency and clarity of the system
5. Voting results are publicly auditable

However, blockchain systems are complex in nature, which can hinder its widespread adoption. For e-voting systems continuous internet access is another concern. For many users' authentication and validation, blockchain requires much energy. Therefore, using a blockchain-based voting system for national elections requires more research on its consensus.

VI. CONCLUSION AND FUTURE WORK

In this paper we have proposed we have proposed a blockchain based e-voting system which runs on the Ethereum blockchain. It shows that blockchain technology can overcome the limitations of centralized voting systems. In future work, the feasibility of blockchain based e-voting system for large-scale election should be analysed. This system could be improved further to make it more eligible for National Elections which can be done by integrating it with identification APIs (like Aadhar, Election Card API) by latest blockchain projects.

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