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Online voting system using block chain technology

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***Abstract*---**Voting in online is a reasonable option in contrast to both the conventional paper polling form framework and the generally utilized electronic voting machine. An electronic voting site must be safe and secure. Electing honesty, as well as vote straightforwardness and elector protection, are exceptionally significant contemplations. This paper proposes an electronic voting system based on blockchain that overcomes some of the drawbacks of current democratic systems. A P2P (peer-to-peer) Network is utilized to impart a distributed ledger with voting transactions to make a private blockchain. The application is planned so that the client is totally absent of the intricacy of the fundamental design. Every elector is distinguished by their Aadhar number, which has been supported by the public authority. The application utilizes this number to ensure that every citizen just gets one vote. At the point when a vote is submitted as a transaction, it brings each of the peers up to date. Votes are encrypted and hashed prior to being added to the blockchain, which fortifies security and produces a chain of blocks, since each peer both a private key and a public key.

***Keywords*---**blockchain, e-voting, smart contract, privacy, web application, Solana.

Introduction

Elections play a crucial part in democracy because they determine a country's future, but the main worry is that people do not trust the electoral system. Indeed, even the world's most impressive popular governments, like India, US, and Japan, are tormented by imperfect democratic frameworks. The democratic frameworks have created over the long haul, as has the security weakness. Vote fixing, EVM (Electronic Voting Machine) hacking, surveying stall catch, and political decision control are the main points of contention that should be addressed in the current democratic framework [1,10]. The idea of I-voting (internet voting), which allows for a secure balloting process, is being promoted by the revolution in voting systems in several countries. Compared to electronic voting machines or traditional voting methods, the notion of secret suffrage through internet voting has obvious flaws. Though cryptographic voting techniques give transparency while maintaining ballot secrecy and allowing for quick tally, they confront challenges such as secrecy and coercion resistance, receipt theft, and so on [12].

The paper introduces a completely open and decentralized blockchain-based online voting system. Blockchain is a P2P network that is decentralized. The motivation behind implementing blockchain technology is to eliminate centralized control and intermediaries from the equation [5]. Beyond the monetary business, blockchain is being investigated and tried for applications, for example, IoT, clinical or medical care, e-voting, coordinated factors, online business, land, security, and protection. [6]. The concept of a blockchain-based electronic-voting system is similar to that of digital wallets. After authenticating each participant's identification, the system will automatically provide a digital wallet to the users. The digital wallet must contain a single token that represents a single voting opportunity [4]. The token in the user's wallet is transferred to the record or wallet of the competitor whenever a client votes in favor of a rival. Each candidate's wallet has a certain number of tokens that correspond to the number of votes that were cast for him near the finish.

Related Work

From finance to the network of things, blockchain science has uncovered a wide range of applications (IoT). The decentralization aspect of Blockchain technology eliminates the need for any central body to manage it. The knowledge of block-chain technology enables a very advanced and simple technique of performing online transactions [8]. In [2], blockchain techniques and methods in the agricultural field not only improves the schema, domain, and application of blockchain, but it also assists farmers in selecting appropriate pesticides and assists to the development of a trusted network among various agricultural stakeholders.

In the journal, Researchers [1,11] have proposed a particular system in the journal that expects to take care of issues in the central electronic democratic cycle by utilizing Ethereum blockchain in light of a decentralized network that guarantees a solid vote by hashing and encrypting information and making a Peer-to-peer network connected to a distributed ledger that conceals the inward

entanglements from the client, which is the Aadhar-based technique of exceptionally distinguishing the vote. The system for validating the voter using the Aadhar number is not totally secure, hence other elements like as biometric authentication and a One-Time Password verification code must be included (OTP). McCorry et al. suggested a Boardroom Voting System with Maximum Voter Privacy in 2017 [6]. Smart contracts are utilized to provide a voting protocol that is self-tallying. The blockchain is the foundation of the Open Vote Network (OVN) which is an Ethereum-based decentralized application. If voters cast their ballots, the entire protocol must be re-run. The paper [13] discusses and analyses the legal and technological constraints of implementing electronic voting procedures with blockchain. The paper opens with an overview of some of the most common blockchain architectures. Through a case study summary, it investigates the ability of distributed headline technologies, such as electoral mechanisms and the deployment of blockchain-based apps, to improve security and reduce the cost of conducting national elections. Gaby G. Dagher et al. [3] introduced Bronco Vote, a voting system built on blockchain that protects voters' privacy and transparency while ensuring an open, safe, and cost-effective voting system. Bronco Vote makes use of the University-scale Voters Platform, which leverages Ethereum blockchain and smart contracts to handle election administration and auditable voting records. Bronco Vote also employs a number of holomorphic encryption techniques to ensure the safety of voters. Blockchain was employed in the Bitcoin system, which is also known as the decentralized bank system [9]. One of the major sources of database abuse that blockchain can address is the spread of datasets on e-voting platforms. This paper investigates the use of blockchain algorithms to analyze voting data from all polling locations.

Methodology

Solana is a decentralized blockchain which is used to increase scalability without sacrificing decentralization and security. It has high potential which can reach up to 50,000 TPS (Transaction Per Second) which enables a faster transaction It is used to authenticate and validate large number of users at the same time. And its average cost per transaction. compared to Ethereum can only handle less than 15 Transaction Per Second. The architecture of the entire process in the voting system is shown in fig. 1.

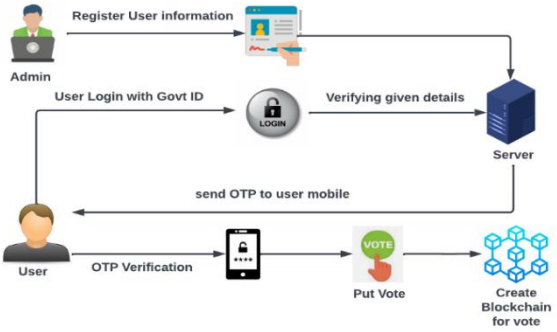

Fig. 1. Architecture diagram of processing system

Login Module

The user must complete the registration form as the initial step in the voting system. The authentication information has already been saved in the Firebase database. When the user fills out and submit for the next page, it verifies that the person is an authorized user. It verifies that the information entered by users and the information kept in the firebase are identical. It ensures that no unauthorized users are allowed to vote. It will proceed to the next module after verifying if the user is permitted. Figure 2 depicts the registration module's process flow.

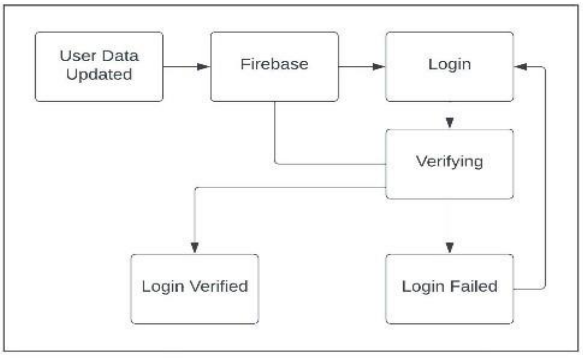

Fig. 2. Login module

OTP Verification

After the user has been authorized, the next module is to generate an OTP (One Time Password) (fig. 3). When the user data is verified, the OTP is generated by retrieving the mobile number from the firebase. The system may generate OTP for the targeted mobile numbers using Firebase base authentication. It redirects to the voting page after the OTP is verified.

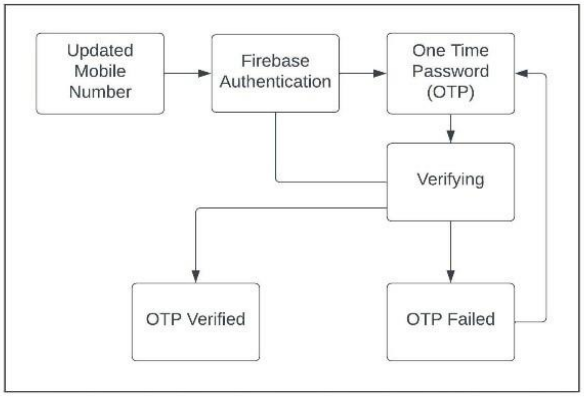

Fig. 3. OTP verification

Wallet Key Generation

Between the OTP generation and the voting module, a process called private key generation takes place. The API instantly creates a wallet with a private key as soon as the voter is validated. A private key is a very large number that is used in cryptography. The SHA 256 hash function generates the private key, which is a unique ID for each user. To create digital signatures that can be easily verified without revealing the secret key, private keys are employed. A private key can be used as the wallet's user ID, and 1 SOL token will be added to it. This SOL token is required to cast a vote. Fig. 4 depicts the private key generation.

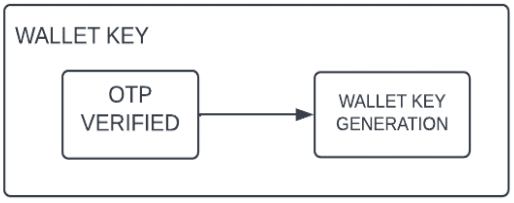

Fig. 4. Wallet key generation

Voting

This voting system's core module is the voting page. A user will be directed to the voting page after creating a wallet with a private key. The candidates for the election are listed on the voting page. In the backend, separate wallets will be created for each of the candidates. Only administrators have access to those wallets. When a user votes for a candidate, 1 SOL token is transferred from the voter's wallet to the candidate's wallet. To complete their vote, a user must click the candidate's emblem and then confirm by providing the name of preferred political party. Fig 5 depicts the voting process.

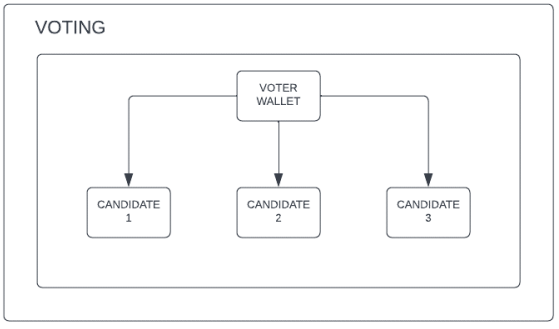

Fig. 5. Voting diagram

Voting Result

The user will be led to the result module after casting their vote. Users will not be allowed to return to the previous page or vote again once the user have successfully cast their vote. The tokens collected in each candidate's wallet will be calculated to determine the election result [7], as shown in fig 6. The party with the greatest number of tokens will be declared the winner.

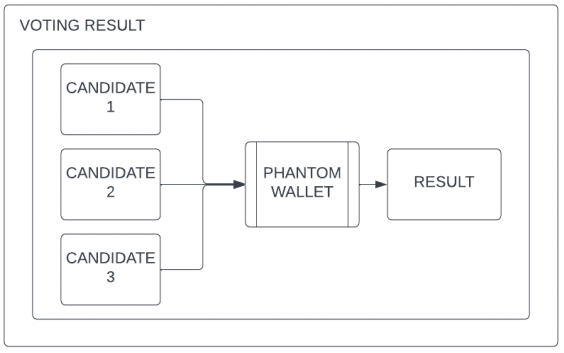

Fig. 6. Counting the votes

Process in the system

Login page

The admin completes the registration process by pre-record the voter details in firebase firestore. The firebase contains user and candidate information such as Aadhar numbers and voter ID, as well as all of the relevant facts in the firebase. The user will access the login page by entering their Aadhar number and voter ID as shown in fig. 7.

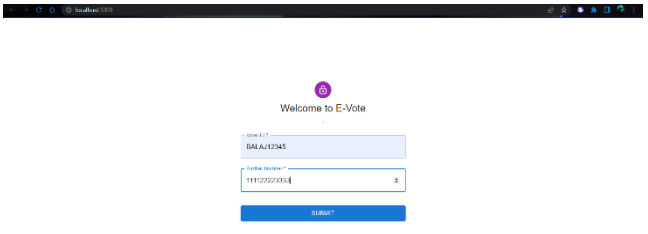

Fig. 7. Login page

OTP Verification

After the user has provided their information, it will be confirmed by Firebase, which has already been updated by the administrator following confirmation. As the fig. shows, the OTP will be sent to the connected Aadhar mobile number after

the user clicks the reCAPTCHA button. After you enter your OTP, it will be confirmed and you will be taken to the voting page.

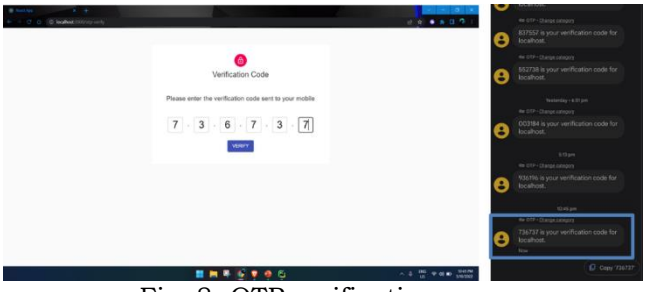

Fig. 8. OTP verification page

Voting page

Once the user enters the voting page, the user will be created a wallet with a private key. The voting page lists the candidates and the user have to click the logo of their favorite party. Once the click is made, a pop-up window will open. The user has to confirm their vote by type the name of the candidate in that window as shown in fig. 9.

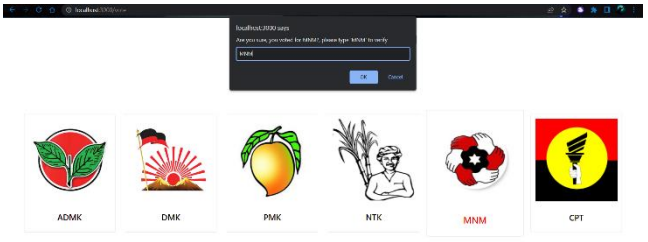

Fig. 9. Voting page

Validating vote

When the vote is validating, the page will be as in fig. 10. On background the tokens form the voter's wallet is sent to the candidate's wallet. On successful completion of transaction, the system moves on to the result page.

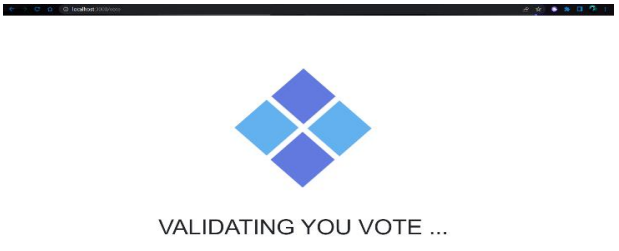

Fig. 10. Validating page

Voting Result

The result page is the final page of the complete voting system. After the user voted, the user automatically leads to the result page. As shown in Figure. 11, this page consists of chart which is a live presentation of the votes casted for every candidate. After the election times out, the candidate with the highest tokens or votes are considered to be the winner

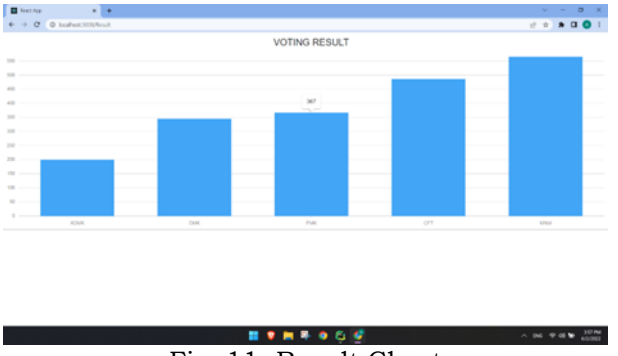

Fig. 11. Result Chart

The figure 12 shows the user's token added to the candidate's wallet after the vote is made.

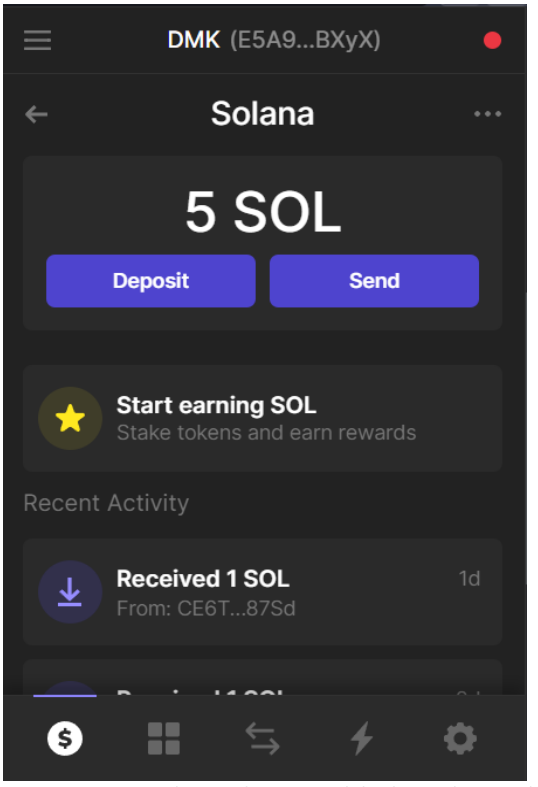

Fig. 12. Screenshot of SOL added to the wallet

Conclusion and future work

This study describes a Solana blockchain-based online voting system. It demonstrates how blockchain technology can overcome the drawbacks of the traditional centralized voting systems. This version makes use of the Solana blockchain as the transactions done in a test network and firebase database is used to store voter accounts, candidate information, and votes. Smart contracts are used in this implementation. On a virtual client, this implementation is tested. In Future, the present OTP module which is used for authorization will be incorporated with a fingerprint module which ensures better security.

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