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Blockchain Enabled Decentralized E-Voting Application Using Face Authentication

Shivam Singh, Shriprasad Wable, Pandurang Kharose, Prof. Mayuri Vengurlekar

Final Year Student, Dept. of Computer Engineering, KJ College of Engineering and Management Research, Pune,
India

Final Year Student, Dept. of Computer Engineering, KJ College of Engineering and Management Research, Pune,
India

Final Year Student, Dept. of Computer Engineering, KJ College of Engineering and Management Research, Pune,
India

Faculty, Dept. of Computer Engineering, KJ College Of Engineering and Management Research, Pune, India

ABSTRACT: E-voting was introduced in India in year 1982, the underlying technology of EVM has remained the same and transparency and integrity has always been the issue even with the rise of Internet, nearly four decades has passed since any noticeable change was introduced in voting process. Blockchain came into existence in 2008 with the introduction of Bitcoin, it provided solution to various problems some of them being security, immutability and transparency, blockchain is the only existing Technology which can replace the current voting system. The aim of this paper is to design, develop and implement an online voting system with advanced security features such as face authentication on Ethereum blockchain network.

KEYWORDS: E-voting, Online voting, voting Dapp, Biometric, face authentication, Blockchain, Ethereum.

I. INTRODUCTION

Voting is considered as expression of democracy where the citizen of a country come together to decide its fate, this process needs to be secure, fare and provides an easy, convenient way for its citizens to access. At present, e-voting is the main method used in National elections in various countries around the world.

Conducting elections over the internet can be made possible with the help of advanced features of blockchain such as integrity, auditability, voter secrecy, immutability and, transparency.

The main goal of this paper is to develop a multi-platform online decentralized e-voting application using flutter framework with additional security features such as multifactor authentication and face biometric authentication in Firebase ML library with the help of TensorFlow Lite and then deploying the application using truffle development environment on Ethereum Virtual Machine.

II. RELATED WORK

In [1] the author proposed an Ethereum blockchain-based e-voting system, namely Votereum. Blockchain Technology was utilized, and solidity smart contracts were used to enable safe and open elections while protecting voters identity and privacy the system was deployed on Rinkeby testnet to observe the feasibility of this voting system.

In [2], the author proposed a decentralized e-voting system by integrating Aadhaar ID to overcome tampering or duplication of votes the voting system utilizes The Aadhaar database for retrieving data such as biometric and virtual ID and comparing them to that of it voters and upon verification the ballot would be cast using digital signature as a key for encryption of votes.

In [3] the author proposed a state of the art e-voting system called VoteChain that can be deployed in large scale Real world elections by conceptualizing, developing and, deploying the voting system to help bring security and transparency to the elections.

In [4] the author proposed voting mechanism through IOT devices by using blockchain Technology with the aim of resolving various attacks and threats caused by Intruder during the polls, this framework showed a better success rate against DDoS and DOS attacks.

III. PROPOSED SYSTEM

A. System Overview

The decentralized E-voting application is based on Ethereum blockchain and solidity smart contracts put together with the help of Truffle development environment along with flutter framework with additional security feature provided with the help of TensorFlow Lite machine learning model deployed over Google Firebase for face authentication. The main goal of this application is to provide easy and secure platform independent e-voting system which a user can utilize through internet without risking his privacy.

B. Election Process

The voting process is divided into four phases as follows.

1. Election Creation Phase.

This is the first phase of the voting process, In this phase the election administrator initializes a new election by providing necessary information such as ballot name, names of candidates, timing of vote casting and results as well as distributing funds to the voters which can later be used for casting vote.

2. Voter Registration Phase.

This phase is necessary for validating user identity by taking the personal information of the user and determining their eligibility and also recording their biometric data for future. Once a voter successfully complete this process, a user account is generated which is used for successfully casting a vote.

3. Voting Phase.

Once the election is successfully created by election administrator and the voter has also successfully created an account, then the voter can participate in the elections and cast their vote with the pre allocated funds through their crypto wallets and after completion of this process the vote is recorded on blockchain.

4. Results Phase.

This is the last phase of entire voting process, once the voting phase has ended in the stipulated time then the results are displayed, voters can then check whether their vote has been cast or not. Total number of participants can also be known by checking the total number of votes.

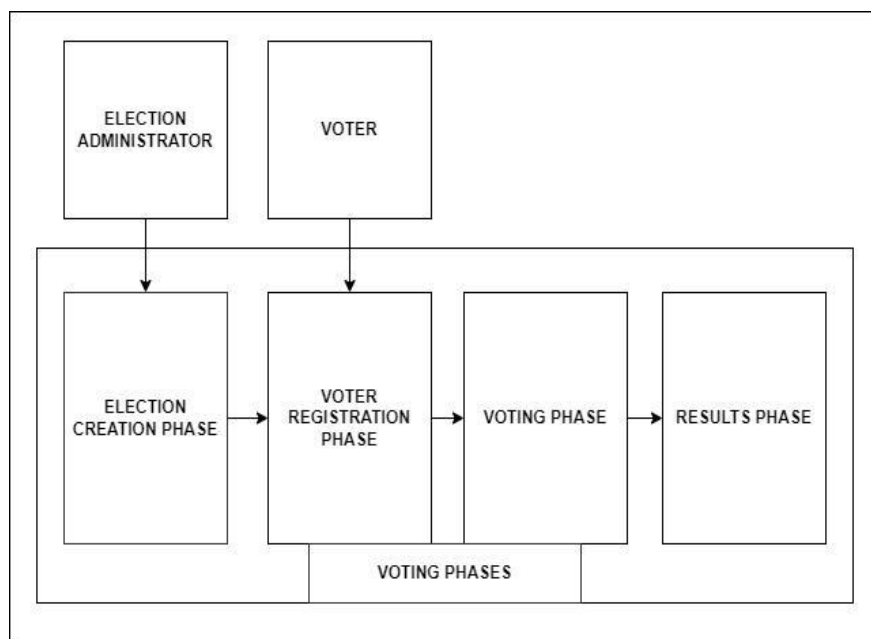


Fig.1. Phases of voting process.

IV. IMPLEMENTATION

A. System Architecture.

i. Flutter Framework.

Flutter is an open source framework developed by Google for building attractive, natively compiled, multi-platform applications from a single codebase.

Here we are using flutter for designing the front-end of the application and also because it can be run on multiple platforms such as android, IOS, Windows and, web. The entirety of front-end is designed using dart programming language.

ii. Google Firebase

Firebase is a development platform for mobile and web applications, here we are using utilizing the database for storing voter credentials for registering and logging in the application.

The TensorFlow Lite library used for performing face authentication is incorporated using Firebase ML Vision model.

iii. Truffle Development Framework.

Truffle is the most widely used tool for blockchain application development it is a world-class development environment and testing framework, it also provides automated testing for Rapid development.

The solidity smart contracts are tested and deployed by Built-in smart contract compilation, linking, deployment and binary management.

iv. Ganache

Ganache is a tool for creating a private Ethereum blockchain, on which we tested Solidity contracts. When compared to Remix, it has additional features.

v. Matamask Wallet.

Metamask is a cryptocurrency wallet that interacts with the Ethereum network through software. Users can utilize a browser extension or a mobile app to access their Ethereum wallet, which can then be used to interact with decentralized applications.

In the voting phase the token transaction takes place using Metamask wallet.

V. CONCLUSION AND FUTURE WORK

In this paper, blockchain enabled decentralized e-voting application using face authentication

is presented, the application was able to overcome the limitations of security concerns in centralized e-voting system using blockchain Technology.

The evaluation result of this paper showed that by using blockchain voting system various challenges where address such as transparency universal verifiability was satisfied. It was also discovered that the system although achieves various shortcomings of centralized blockchain system.

Proposed e-voting system also in across some limitation such as lower transaction throughput in case of large scale elections and the blockchain network was also vulnerable to 51% attacks, these are the few drawbacks that needs to improve to better improve the performance of the system.

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