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VoteChain

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Abstract - **Blockchain** enables secure method of casting votes. **Hyperledger** records all the **transactions**, ensuring fraud detection. Web server facilitates access from **remote systems.** The solution explores the current security shortcomings of the voting system, as well as the feasibility of an online voting system implemented using **blockchain** technology. Despite security risks and concerns, **block-chain data** storage in combination with electronic voting is a progressive and secure option for our voting systems. Blockchain technology makes it possible to attain a highly credible and verifiable election process at an inexpensive cost. VoteChain is a NextGen voting solution which uses technologies such as **blockchain** and **image processing** to achieve E-Voting system

1.INTRODUCTION

Democratic voting is a crucial and serious event in any country. The most common way in which a country votes is through a paper-based system, but is it not time to bring voting into the 21st century of modern technology? Digital voting is the use of electronic devices, such as voting machines or an internet browser, to cast votes. These are sometimes referred to as e-voting when voting using a machine in a polling station, and i-voting when using a web browser. Security of digital voting is always the biggest concern when considering to implement a digital voting system. With such monumental decisions at stake, there can be no doubt about the system's ability to secure data and defend against potential attacks. One way the security issues can be potentially solved is through the technology of blockchains. Blockchain technology [1] originates from the underlying architectural design of the cryptocurrency bitcoin. It is a form of distributed database where records take the form of transactions, a block is a collection of these transactions. With the use of blockchains a secure and robust system for 4 digital voting can be devised [2]. Blockchain technology was first used within Bitcoin and is a public ledger of all transactions [3]. A blockchain stores these transactions in a block, the block eventually becomes completed as more transactions are carried out. Once complete it is then added in a linear, chronological order to the blockchain. The network is a multi-tiered, decentralized infrastructure which houses the two distinct blockchains. As part of design, we have an encryption method based on public and private keys and have implemented a structure where the data is segregated within the blockchain. This segregation has been achieved by getting the constituency level nodes to generate keys pairs. The public keys are then distributed to the connected polling station nodes, which then use the public key to encrypt any vote made to that polling station [4]. The data is then stored in an encrypted format within the blockchain and propagates out to the entire network. Within our proposal we have tried to design a service and system that minimizes the size of attack vectors to prevent potential malicious attacks. We have tried to evaluate and analyze our design from various perspectives to make sure we have thought about each step of the voting process. This section of the report discusses the potential risks associated with our proposal and suggests actions that can be taken to help mitigate them. This report outlines our idea of how blockchain technology could be used to implement a secure digital voting system.

1.1 Existing System

In the existing system of the voting usage of high level man power and investing large amount of money during the election can be seen. Some of the existing systems in the voting system are voting using ballot papers, voting through electro voting machine (EVM). In the EVM the buttons are provided with the display of candidate name and their logo where voters press the button of their willing candidates and cast the vote where the vote is counted by the machine. In the ballot paper voting system, the papers were provided with the candidate's name, party logo and the empty block is provided to fill it with the mark of desired candidate. The authentication in the existing system is through thumb clip art where the voters nail is colored with the ink to avoid duplication and another form oof authentication is by verifying the voter id manually by the authorities before casting the vote. These existing systems lack in the security because these systems can be easily manipulated due to improper authentication in the system.

1.2 Proposed System

We propose a system where the next generation of voting system can be seen. This system was built by observing the issues during the election. Here the data of the voters and the candidates are stored in the blockchain. In this system the user undergoes two factor authentications. After the two-factor authentication user get the access to the system and completes the voting process. Since the blockchain is a decentralized application peer to peer communication is possible which is easy to control. The user interface is built in such a way that it is easy to interact. Since the whole system is a online process it of low cost. Maintaining this system is not that difficult.

2. VOTECHAIN TECHNOLOGY

The VoteChain technology is about virtual voting. In the present world we face high problems during election in India, where many scams are being noticed during the election so to avoid these problems, we are presenting VoteChain technology where we can complete the voting process virtually without any issues. We have also integrated image processing for two factor authentications. Since this whole voting application is online its easy and low-cost project. The interaction between the user and the application is developed in such a way that there is no essay of complication found in using this application.

2.1 Blockchain

A blockchain is essentially a digital ledger of transactions that is duplicated and distributed across the entire network of computer systems on the blockchain. Each block in the chain contains a number of transactions, and every time a new transaction occurs on the blockchain, a record of that transaction is added to every participant's ledger. VoteChain makes use of a blockchain to store all the voting related data.

2.2 Ethereum

Ethereum is a decentralized open source blockchain featuring smart contract functionality. Ether is the native cryptocurrency token of the Ethereum platform.

2.3 DAPP

DAAPS are decentralized applications that are used in the block chain which helps in the p2p communication.

2.4 Solidity

Solidity is an object-oriented programming language for writing smart contracts. It is used for implementing smart contracts on various blockchain platforms, such as Ethereum

2.5 Ganache

Ganache is a personal blockchain for rapid Ethereum application development.

2.6 Facial Recognition

Facial recognition is put in place to provide 2 factor authentications, it is implemented using OpenCV. OpenCV is a library of programming functions mainly aimed at real-time computer vision.

3. STRUCTURE OF DATA TRANSACTION in BLOCKCHAIN

Blockchain data structure is a back-to-back list of transaction blocks, ordered. It can be saved as a flat file or in a simple database. Each block is identified by a hash, created using the SHA256 cryptographic hash algorithm in the block header. Each block identifies the previous block, also known as the parent block.

A hash is a mathematical algorithm that maps out the size data of an object with a small adjusted size thread. In the case of SHA 256, the result is a 32-byte cable. The effect of 32 bytes makes it impossible to undo the output, because the function was designed for one-way operation.

The concept of using hash functions to create complete ways to search for data in a database.

Each block contains its parent's hash inside its header. There is a set of chains that go back to the first block made, also known as the genesis block, which is joined together in a series of hashes. The "block hash" field is within the block header and thus the current block hash depends on the parent hash. The child's identity changes when the parent's identity changes

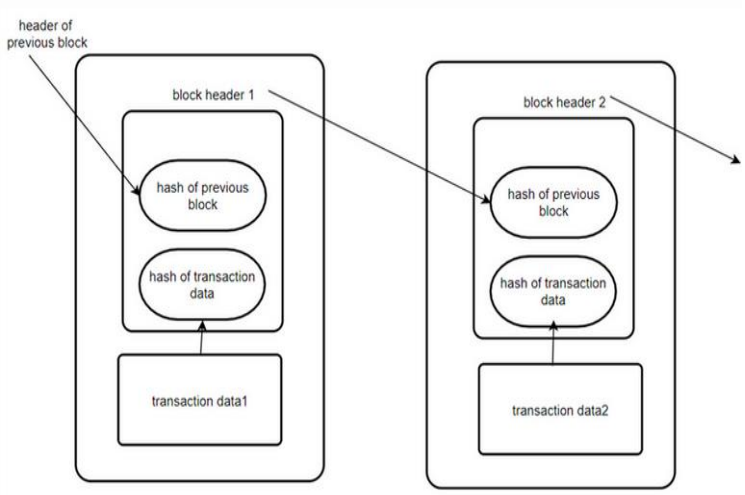

Fig -1: Blockchain Structure

4. UML DIAGRAMS

The UML Diagrams pertaining to the project are given below.

4.1 Data Flow Diagram

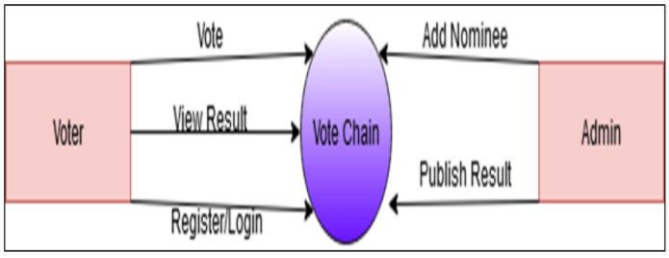

Fig -2: 0-Level Data flow Diagram

The User who is the Vote here first completes the Registration process, the registration data is stored on the blockchain and is again used to verify the login when the voter logs in again, the voter is then able to cast his vote which gets stored on the blockchain, From the Admin side, he is able to add nominees and finally when the voting period ends is able to publish the results all of which happens on the blockchain, the voter is then able to view the results.

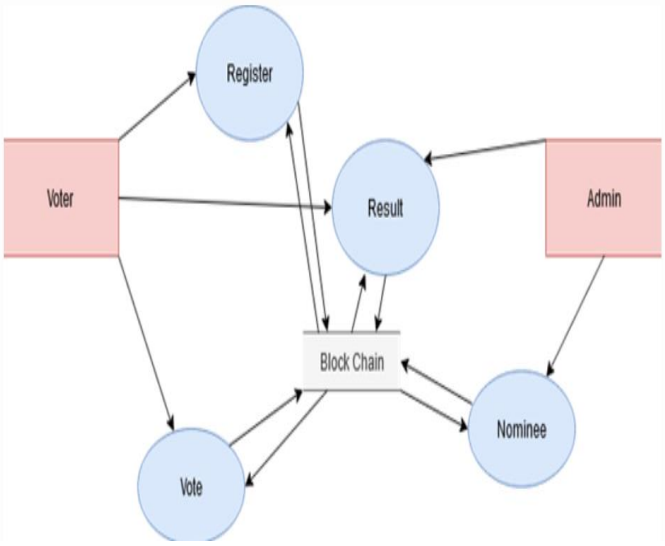

Fig -3: 1st-Level Data flow Diagram

4.2 Use Case Diagram

The Actors of the system are the User/Voter and Admin and the use Cases are Register, Get Identity, Voting System, Integrity Check, Vote, View Result etc.

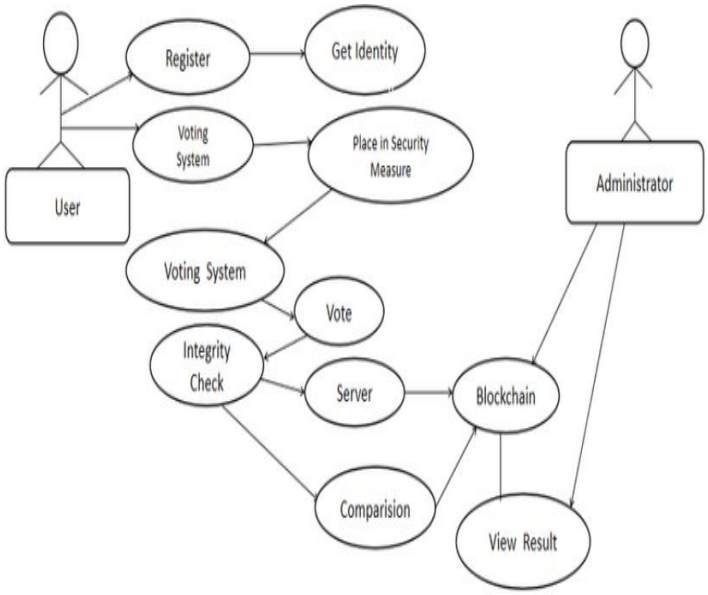

Fig -4: Use Case Diagram

4.3 Sequence Diagram

The Sequence of the voting process is as follows; The Voter initiates the Registration process, The system then authenticates the user and sends an OTP if successfully authenticated, on entering the OTP the voter gets access to the dashboard where he able to cast his vote and view the results.

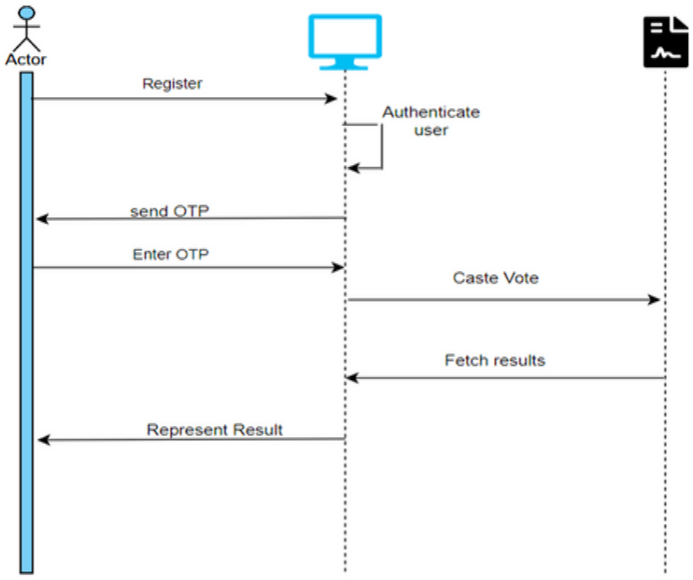

Fig -5: Sequence Diagram

5. VOTECHAIN ARCHITECTURE

First voters register themselves through registration form after which it is validated by API (Application Programming Interface). Then during online voting process, the voting takes place inside a Dapp. The basic structure is shown below. Smart contracts are in charge of reading and writing data to the blockchain, as well as executing business logic.

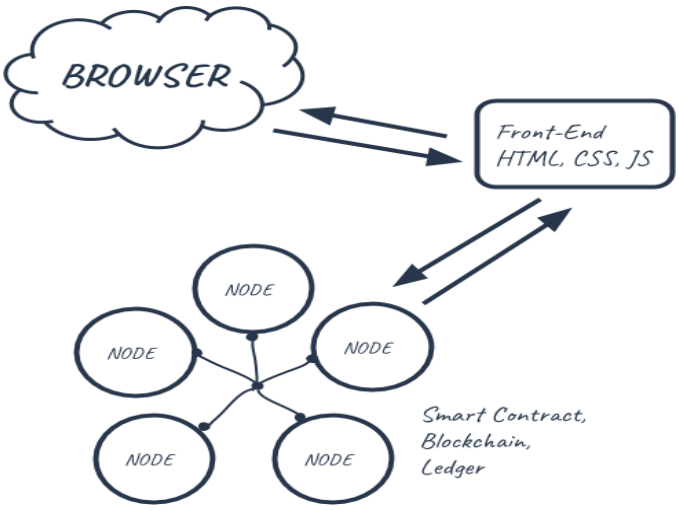

Fig -6: Basic System Architecture

The user undergoes Aadhaar verification, OTP (one time password) verification as well as facial recognition, the face

is trained during the sign-up process. After the sign in verification is completed, the user gets access to the dashboard where he can cast his vote, upon casting his vote he is able to view the results in detail along with graphical representations.

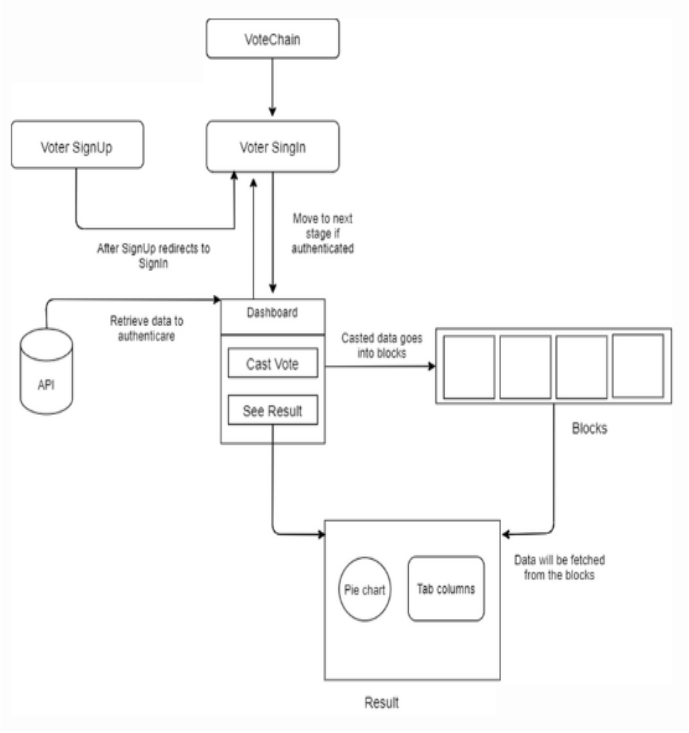

Fig -7: Complete System Architecture

6. IMPLEMENTATION AND RESULT

Using the above-mentioned technologies of blockchain, face recognition etc. we have built a DApp which consists firstly of a registration page where the voter registers himself only after which he is allowed to vote, the registration process consists of multi factor authentications such as Aadhaar, face recognition and OTP, the training for the voters facial recognition occurs during the registration after which it is used to verify the voter at every login.

After a successful login, the voter gets access to the dashboard where he is able to cast his vote and also view the result if it has been published, the ability to vote is disabled after the user has voted once to prevent multiple votes, the results are presented in a detailed manner, graphical representations are also provided.

A separate dashboard exists for the admin which takes care of adding nominees and publishing the result once the voting period ends.

7. CONCLUSION

In our proposed system we have tried to solve multiple problems that we currently face. Nonresident people could can also caste vote to their country during election using this system. There will be no issues of counting, manipulation during voting. The system is highly secure, low cost, easy access and more efficient. Here authentication is also done in proper method.

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