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Decentralized Voting Platform based on Ethereum Blockchain

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Abstract -Amongst all the challenges conducting a partial and fair voting is still a very big challenge. So to overcome that in this new generation its very important to select the appropriate leader and for that conducting a free and fair election is very important. Blockchain technology is used in this because of its significantly amazing features like Immutability,Transparency,Consensus,etc. As voting is the basic right of every individual hence it should be conducted in a very fair manner with proper guidance because "Today's leader is tomorrow's future" hence it should be feasible for individual to cast their vote. And for this decentralized system is used because with the help of this anyone can vote from anywhere around the globe. Hence we can expect maximum participation rather than the offline voting that are being conducted.

However, traditional voting systems tend to be centralized and are known to suffer from security and efficiency limitations. Hence, there is a trend towards decentralized voting systems, such as those based on blockchain. The latter is a distributed digital ledger within a peer-to-peer network where each participant holds a copy of the ledger with only digitally signed and encrypted transaction attachments.

To develop this we can use the technologies of blockchain like Ganache(To set up Blockchain environment),Truffle(Used as testing framework that is helpful in developing Blockchain Application),Metamask(as an online wallet).

Keywords:- Blockchain, Ethereum Virtual Machine (EVM), E-Voting, Decentralize Voting

I. INTRODUCTION

The durability and stability of blockchain technology set it apart from server-oriented architectures. The system functions by gathering and transmitting data in a manner that makes it challenging to manipulate, alter, hack, or tamper with the system. In its simplest form, a blockchain is a distributed ledger of computer code that registers transactions, repeats each one, and keeps track of them all.

The idea is based on blockchain technology, where each block in the network contains the address of the block before it; this initial block is referred to as the genesis block. Each block includes transactional information, the event's time, this block's location, and the block before it. A block and all succeeding blocks are destroyed if the data in a given block changes, which causes the block's hash to change. The network's blocks are structured in the shape of a Merkle tree. Use proof-of-work, which slows down the production of new blocks and consumes a lot of energy to confirm a valid connection, to prevent interference.

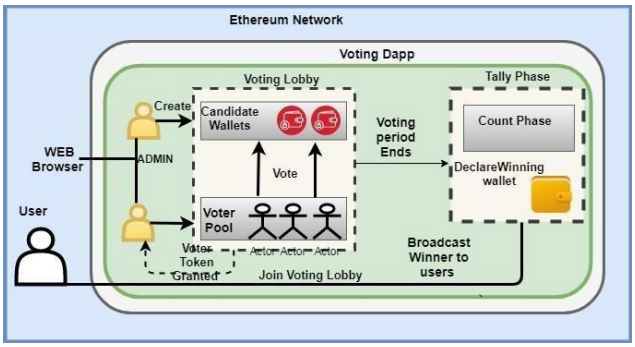
Administrators can create and manage new voting events, each of which is represented as a smart contract, using the online application. Smart contracts are made to control how parties communicate, make decisions, and execute contracts when certain criteria are satisfied. Smart contracts provide a terrific approach to expedite the conventional contracting procedure between two parties with the aid of blockchain technology. The smart contract contains all of the deal's specifics and lowers third parties' expectations. Our system contains two smart contracts: one for event creation and one for user management. Contract execution is triggered by events like expiration.

A voting function in voting smart contracts determines whether a voter has cast a ballot and, if not, increases the amount of votes for a given request. A new irrevocable vote will be added to the blockchain if the vote is successful, and an event will be released to update the UI in real time with the vote. The blockchain is a tamper-proof database that cannot be altered without the use of smart contracts, it is important to note..

Voting smart contracts have a voting function that checks if a voter has voted and increases the number of votes for a particular request if the voter has not voted. If the vote is successful, a new irrevocable vote will be added to the blockchain and an event will be released to update the UI with the vote in real time. It is worth noting that the blockchain is a tamper-proof database that cannot be changed without the use of smart contracts.

To solve the problem of trust in polling stations, David Corey proposes a new blockchain-based approach. The system verifies and verifies voters by asking them to vote based on their mobile phone number. A unique phone number is required for each vote and the process is based on MSISDN. This makes the body transparent and safe.

Fig.1- Platform Design



II. RELATED WORK

Manoj Srinivas is investigating the usage of blockchain apps as a service to produce e-voting in the meantime. Web apps, event management, smart contracts, IPFS, and Metamask are suggested for the platform. By including candidates and displaying voting results in real time, the web application is used to create voting events. Duplicate votes are never accepted by the smart contract, and each user is only permitted to cast one vote. Web servers that are deployed online are hosted by IPFS, and users can create and manage their own private keys via Metamask.

Ruhi Taseto's whitepaper provides an overview of electronic voting using blockchain technology. It provides an overview of current research in electronic voting using blockchain technology, dividing the main topics of electronic voting into five categories: general, privacy, coinbase, integrity, and consensus.

Kurbatov proposed using blockchain technology to create an anonymous electronic vote using a ring signature function to ensure the anonymity of voters while maintaining the integrity, fairness and transparency of the business history. This method defines the sender's voting rights. In this way, end users act as voters and each user's vote is added to the decentralized list. To prevent fraud, users cannot create new transactions with other groups.

Anja uses her Aadhaar in UIDAI as the private key for voting along with the public key to create a digital voter record. After the digital signature is sent to the blockchain to create a new block. Users can authenticate in the voting UI using standard Aadhaar authentication methods such as OTP or biometrics. Unlike traditional databases, blockchains work on a decentralized basis and ensure the trust of votes.

Hjalmarsson evaluated the feasibility of service-oriented blockchain applications using electronic voting. In this way, a smart contract is used to represent each election in electronic voting, which is sampled by the election manager via the blockchain.

Each vote is handled by the electronic voting system in accordance with blockchain transactions, and each voter is provided with a special identity number for validation. Subhash provides an Ethereum Dapp architecture that creates business applications on the open blockchain. The back-end is made up of one or more smart contracts with related logic, and the front-end is comparable to a website or application. Larisa created a Proof-of-Authority (POA) blockchain that was accepted by GoEthereum.It employs an algorithm to facilitate quick transactions using a consensus identity based on stakes. Khan explained the procedure using a number of tools, including ganache, the truffle framework, npm, and metamask.Each vote is handled by the electronic voting system in accordance with blockchain transactions, and each voter is provided with a special identity number for validation. Subhash provides an Ethereum Dapp architecture that creates business applications on the open blockchain. The back-end is made up of one or more smart contracts with related logic, and the front-end is comparable to a website or application. Larisa created the Proof-of-Authority (POA) blockchain, which uses an algorithm to facilitate quick transactions through a consensus identity based on stake. Khan explained the procedure using a number of tools, including ganache, the truffle framework, npm, and metamask.

While Ganache manages an internal blockchain that can be accessible through Metamask, smart contracts are imported into the blockchain using the Truffle framework. The Ganache technology hosts a local blockchain that Metamask connects to, and voters log into the voting website using their Metamask credentials. Using the Truffle technology, Solidity smart contracts may be transferred to regional blockchains. When a voter clicks to cast their ballot, Metamask enables them to move Ether between accounts. An precise amount of Ether is allocated to all voter accounts, and each user with an Ethereum address is given a distinct ID and private key..

Ganache manages an internal blockchain that can be accessed using Metamask, while Truffle delivers smart contracts to the blockchain. To access the voting website, voters log in using their Metamask. The native blockchain is operated by the Ganache tool, and connections are made via Metamask. The Truffle framework enables the migration of Solidity-created smart contracts to the native blockchain. Voters can move ether between accounts using Metamask when they click to vote.

III. LITERATURE-SURVEY

We propose to create an electronic voting on the Ethereum blockchain using smart contracts written in the Solidity programming language. The system will solve the problems faced by existing electronic voting machines. With no intermediaries involved in the process, voters can be assured that their votes are counted correctly, increasing voter confidence. The platform will increase the security and transparency of voting by ensuring the integrity and information transfer of the voting process. Our team has developed a system using the Ethereum blockchain that allows us to use smart contracts on the blockchain network.
Therefore, the blockchain works as a subset of the system and all the business logic is written in smart contracts.

Blockchain-setup:

To meet electronic voting requirements, the voting system must be protected from the environment in which it operates. To achieve this goal, we propose to create an Ethereum consensus proof-of-work network. This is how the algorithm works and validates transactions using cryptography as a stake in the consensus mechanism. To vote, each voter will interact with a requestor app that requests a smart contract. Clients using Metamask communicate with nodes using smart contracts.The following steps summarize the process:

Step 1:
Users can log in as either a host or a voter in the system's first stage. A person can create new voting events if they are logged in as the host or administrator. Voters can use the site after an event has been organised and cast their ballots for the one that the organiser has chosen. The blockchain deploys a new smart contract each time a new event is produced. When a voter registers for an event, they can take part and cast their vote for a particular candidate using the event ID provided by the organiser.

Step 2:
After a vote is cast, the candidate's total number of votes is increased by the stated amount, and the smart contract event is triggered. On the client side, this event instantly refreshes the user interface. It is made sure that each voter can only cast one ballot.

Step 3:
As soon as a voter casts a ballot for a candidate, all ballots are promptly counted, and the client-side vote total is immediately updated. Because of this, there is no need for smart contracts to count the votes, and the results of the election are available right away.

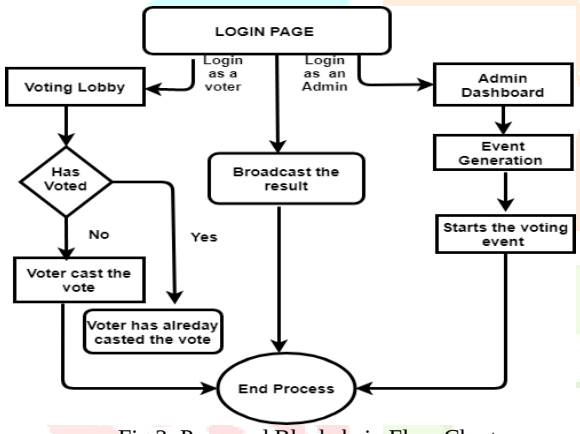


Fig.2- Proposed Blockchain Flow Chart

The blockchain used to verify votes and check vote totals will be hosted by a public EVM instance. A public function that increases the candidate's vote total is called to cast a ballot. Since this function is available to the entire smart contract, it can be called from either the UI or the client.

IV.IMPLEMENTATION

The proposed idea will be executed on the Ethereum blockchain, leveraging the advantages of decentralized applications. The Truffle framework can be utilized to facilitate the development and deployment of the project.

Fig. 3 User Interface of the Voting System

Fig 4: Real Time Result Updation

This function refreshes the UI in real-time each time a new block is added to the blockchain and an event is released. The finished block is confirmed and put to the chain after completion. Despite the fact that vote counts are made public, users' identities are kept private thanks to the one-way nature of hashing. The voting UI or an authorised implementation of this public endpoint can be used to access the private vote display function in order to count votes. As seen in (Figure 2), this function returns comprehensive vote totals that can be further changed to provide a breakdown by party or location.

Blockchain relies on a broadcast mechanism, which offers a high level of trustworthiness in recorded votes, as opposed to traditional databases. The veracity of the data stored on a block is ensured by its validity. Additionally, this model uses nodes rather than a completely decentralised voting platform on the blockchain to take advantage of blockchain technology's benefits.

V. CONCLUSIONS AND FUTURE WORK

Our research paper focuses on the development of a decentralized electronic voting system using the Ethereum blockchain. The objective behind the creation of this system is to enhance the safety, speed, cost-effectiveness, and transparency of the public voting process. This is crucial in today's society, as it promotes more transparent democracy, and enables voters to cast their ballots with just a single click. The system promotes transparency by enabling voters to check the results of their ballots online from any location in the world. With the help of this platform, valid elections can be held without the involvement of third parties. It saves money, time, and ensures election integrity by being more dependable and durable than traditional pen-and-paper voting systems.

We have connected the system with the ID authentication API and used machine learning techniques for user authentication and facial recognition to assure system security. In order to improve the platform's usability, security, and dependability, we are also making use of the advantages of blockchain technologies like Chain-link and IPFS.

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