

## Blockchain Enabled E-Voting System

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**Abstract**— Innovation impactfully affects that the numerous parts of our public activity. Structuring a twenty four hour comprehensively associated plan enables simple access to a scope of assets and administrations. One main such troublesome development is the Blockchain a keystone to cryptocurrencies. One potential utilization of the blockchain is in e-voting plans. The target of such a plan is given a decentralized design to run and support a voting plot that is open, reasonable, and independently variable. In this paper, we propose a potential new e-voting convention that uses the blockchain as a straightforward polling booth. The convention has been intended to hold fast to crucial e-voting properties just as to offer a level of decentralization and to taken into account the voter to change/update their vote. This paper features the advantages and disadvantages of utilizing blockchain for such a proposition from a reasonable perspective in both the structure advancement and the utilization settings. Finishing up the paper is the potential guide for blockchain innovation to have the capacity to help the complex applications. The blockchain innovation is displayed as the distinct advantage for a significant number of the current advancements.

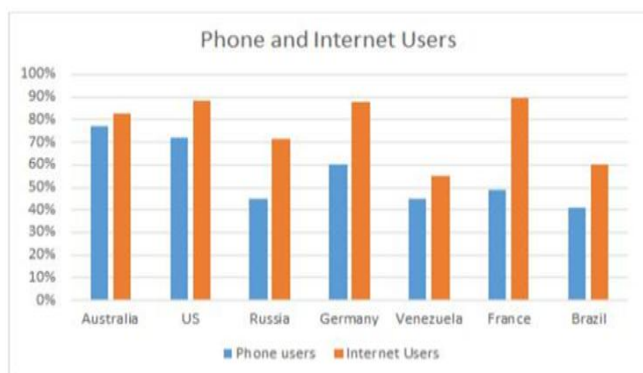
**Keywords**— Blockchain, E-voting, Ganache, Solidity, Metamask

### I. INTRODUCTION

Blockchain innovation is upheld by an appropriated system comprising of an extensive number of interconnected hubs. Every one of these hubs have their own duplicate of the conveyed record that contains the full history of all exchanges, the system has prepared. There is no single specialist that controls the system [8]. If the greater part of the hubs concur, they acknowledge an exchange. This system enables clients to stay unknown. An essential examination of the blockchain innovation recommends that it's a proper reason for e-voting a ballot and, in addition, it could possibly make e-voting a ballot increasingly adequate and reliable[1].

The chart demonstrates the net and cell phone infiltration in the nation. These are the two least prerequisites of a client to cast a ballot. The net penetration is given the greater importance since individuals will have to head to the administration buildings like libraries to vote. To make this system applicable the net penetration should be more than or equals to 90%. Anything below which will need the govt. to take a position into an excessive amount of infrastructure to line up the web association for individuals. These are present insights of the nations on the planet. Substantial number or individuals on the planet are accessing the web each day. As this number develops the proposed framework will wind up plausible.

Decentralized design with the utilization of the straightforward vote casting process. In our work, each of the procedure is spoken to by a lot of brilliant contracts, which are instantiated on the blockchain by the election officer. A smart contract is characterized for every one of the casting a ballot regions of the decision so numerous smart contracts are associated with election [3]. For every voter with its comparing casting a ballot region area, characterized in the voters enrollment stage, the smart contract with the relating area will be incited to the voter after that the client confirms himself when it comes to the utilization of casting a vote. The main contributions presented in this electronic voting or system includes a simple UI template which lists the purpose of the candidates.



Fig[1]: Active internet and mobile users

Ganache a main personal blockchain for the etherum development, provided with 10 accounts which acts like voters who can cast their votes to a particular candidate. Metamask, a bridge that allows the user to communicate with the decentralized Ethereum application and also serves the purpose of voters and for the purpose of validation process. The utilization of blockchain hubs can be trusted and great associated and faults can rapidly be fixed by intervention permitting the data to be initialized by the approved accounts known as the validators for constantly monitoring their computers.

Clear focal points of e-voting utilizing blockchains incorporates: I) more prominent straightforwardness because of open and disseminated records ii) natural anonymity iii) security and dependability and iv) immutability. Existing works investigate how blockchains can be utilized to improve the e-voting plots or give some solid assurances to the above recorded necessities to the given framework.

### II. RELATED WORK

The peers to this project are **A Secure and Optimally effective Multi-Authority Election Scheme**, proposed a multi-specialist mystery vote decision conspire which would ensure protection, all inclusive unquestionable status and robustness, where voters would take part utilizing a PC, where the fundamental thought is the exertion expected of a voter. In this model, voters make their choice by presenting tickets on a notice load up. The notice board fills in as a communicate channel with memory to the degree that any party can get to its data yet no party can delete anything from the notice board. The ticket does not uncover any data on the vote itself but rather is guaranteed by a going with verification that the tally contains a substantial vote. **Agora** is a closed environment blockchain dependent on the voting arrangement intended for the governments and foundations. This uses their very own Token on to the blockchain for the elections, where governments and organizations buy these tokens for every individual qualified voter. This casting a ballot framework is a multi-layer design which incorporates the blockchain called the Notice Board, which depends on the Skip chain engineering.

#### The problem in existing system

The electronic Voting Machines which were replaced by paper ballots were more secure and safe but it isn't completely secure either. The main objective of the EVM's are is a person who has a brief access to the machine can tamper the votes and potentially change the election outcomes [4]. There may be of two kinds of attacks on a EVM, where the first one can be physical tampering of the machine. The parts of the EVM's can be replaced with the same look-alike parts. And the second attackers may use portable hardware systems to tamper. And more over in order

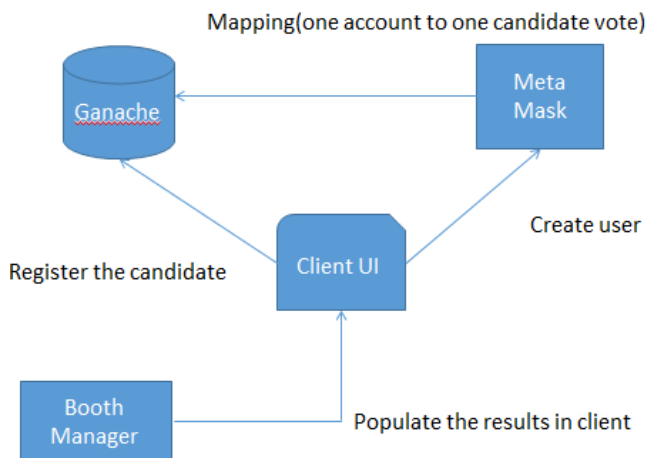
to complete a full election process the amount of time and money put into is very large.

The Election Commission of India are testing the EVM's for tampering of data, so it's not yet completely secure. The tampering of votes may occur at the time of counting is stated that at-least a error of 2% is occurred every time which may be crucial at the time of marginal win for a candidate.

Our system provides a full secure and safe voting method where the user is provided with a public key which he imports in his account in the metamask (dependency to validate the user) after the importing of the public key the voter is provided with the list of candidates he wants to cast his vote for after he submits his vote a transaction receipt and a hash is being stored in his account address so it cannot be changed or re-voted this all data is been stored in a block [7]. And this is being attached to a peer to peer network so if any systems are facing any technical problems the data is displayed in other systems. The address of each block is stored by the previous block, for each user each block is created with their data and added to the chain of network. It is a decentralized application so there is no central agency or audit which needs to be the trusted, anybody can participate and become a node in the system.

### III. METHODOLOGY

The data flow diagram explains the working of the project. Ganache has provided 10 user accounts which acts as a voter (1 account as 1 voter) which has a separate public key and a private key, public key is the user details and also the private key is the confirmation required for validating that particular user. Each user is given a private key, with the use of given private key the user can cast his vote to the candidate who is contesting in a election.



Fig[2]: Working of E-Voting system .

So in order to cast his vote user selects a particular candidate name in the UI template and clicks on Vote. Metamask is a dependency for the Google chrome extension which validates the user by importing his account in order to cast his vote [5]. The private key of the user is imported for validating the user to cast his vote. Once the vote has been initialized a final confirmation is being asked by Metamask to the user to if there is no changes in the casting their vote to that candidate. Once the vote is casted the Client UI displays the total vote count for each candidate and increments as the number of votes increase[6].

#### Modules involved in E-Voting are:

1. Election Administrators
2. Voters
3. District Nodes
4. Booth Manager

**Election Administrators:** Deal with the lifecycle of an election. Various believed organizations are selected for this job. The election directors indicate the decision type and make a fore-referenced election, arrangement tallies, register voters, choose the lifetime of the election and appoint permissioned hubs. Election heads make election tickets utilizing a decentralized application(dApp). This decentralized application communicates with an election creation smart contract, in which election officer generates a list of candidates and voting regions.

**Voters:** For elections to which they are qualified for, voters can validate themselves, load the election tallies, make their choice and confirm their vote after an election is finished. Voters can be compensated for the casting a ballot with tokens when they make their choice in an election soon, which could be woven with in a smart city venture.

**District Nodes:** At the point when the decision executives make an election, every one of the tally smart contracts, constituting each casting a ballot locale, are conveyed onto the blockchain. when the new poll smart contracts are made, every one of the relating locale hubs are offered authorization to collaborate with their respective vote smart contract. At the point when an individual voter makes his choice from his relating smart-contract, the vote information is confirmed by the majority of the comparing district hubs and each vote they concur on are annexed onto the blockchain when block time has come to expire.

**Booth Manager:** Every organization, with the permissioned access to the system has a bootnode. A bootnode serves the purpose of finding another district node and establishing the interface. The bootnodes don't keep any condition of the blockchain and is kept running on a static IP with the goal that district nodes discover its neighbouring nodes quicker.

## IV. EXPERIMENT AND RESULTS

With these above mentioned verification modules, a user can cast his vote after he submits his vote a transaction receipt and a hash is being stored in his account address so it cannot be changed or re-voted, as this all data is being stored in a blockchain. Hence it is very difficult for an individual to tamper the data. Our system revolves around having secure, reliable and easy to use interface and is more advantageous compared to other systems

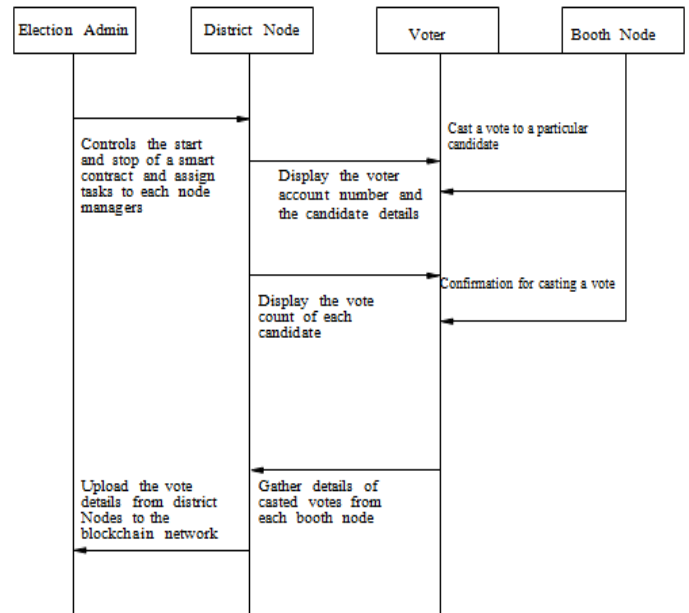
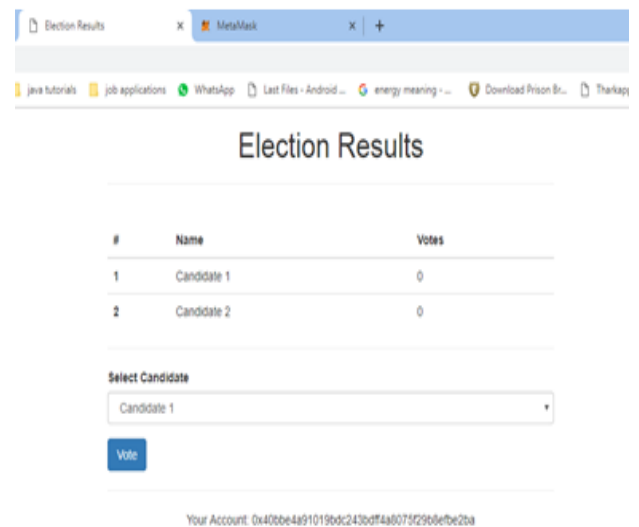
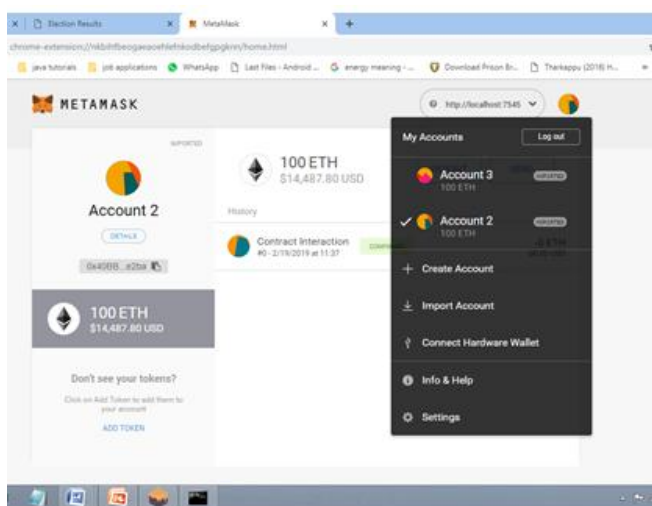
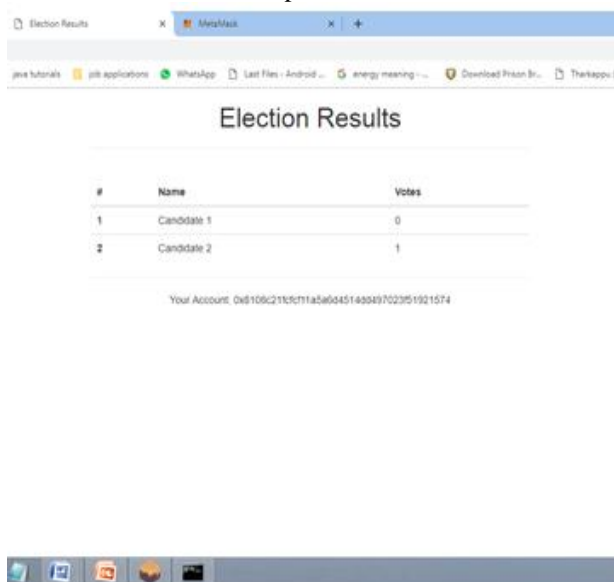


Fig [3]: sequence of interactions in E-Voting





Fig[5]: Importing of voters details and validating the voter process



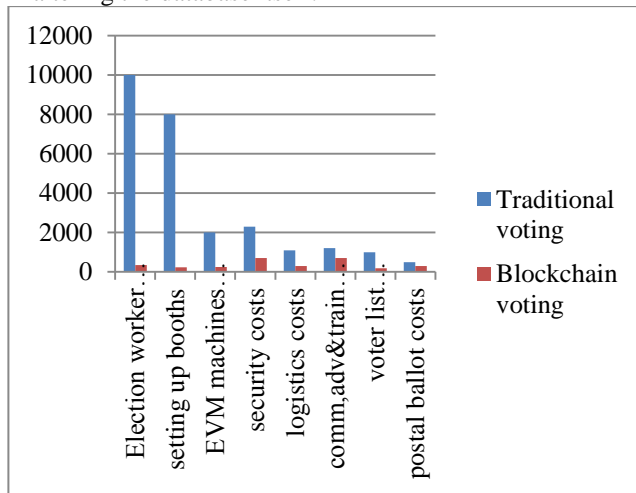
Fig[6]: The total vote count for each candidate is displayed

**Blockchain voting over the traditional method Analysis**

| Traditional Voting   | Blockchain E-Voting   |
|--|---|
| The Expenses required for 1 crore election workers (Rs. 15,000/- person) – Rs. 15,000 crores | The Expenses required to maintainance a team (infrastructures of the software) 250 Crores |
| Cost of setting up 10 lakh booths (Rs. 1 lakh per booth) – Rs. 10,000 crores                 | Booths will be set only in backward places Rs200 Crores                                   |
| Cost of EVM machines (including maintenance) – Rs. 2000 crores                               | Use of personal laptops and laptops provided by the EC in the backward                    |

|  |  |
|--|--|
|  | places- Rs. 200 Crores   |
| Cost of security – Rs. 2000 crores                                   | Cost of Security less than the traditional voting approximately – Rs. 500 Crores   |
| Cost of Logistics – Rs. 1000 crores                                  | Cost of Logistics –Rs. 200 Crores  |
| Cost of communication, advertisement, training – Rs. 1000 crores     | Cost of communication, advertisement, training – Rs. 500 Crores                    |
| Cost of Voter list preparation, voter registration – Rs. 1000 crores | Cost of Voter list preparation, voter registration Online – Rs. 120 crores(online) |
| Postal ballot cost, counting centers etc. – Rs. 500 crores           | Postal ballot cost, counting centers etc. Online – Rs. 300 crores                  |
| Total = Rs. 32,500 crores  | Total =Rs. 2270 Crores   |

- The ballot boxes arrive to a location from different polling districts for counting.
- For each polling district the number of voted list is taken to consideration. A counter which checks the number coming out of ballot box equals the number supposed to be there.
- The problem here is that there may be disputes because the ballot papers maybe unclear.
- And there is a possibility or a chance of recount of votes in Traditional method but our system counts the votes once.
- In our system the data is shared through out the network where as in traditional method there can be a chance of altering the database itself.



Fig[7]: Analysis of traditional &blockchain voting

The above graph explains us the expenses included for each worker who are working for the election commission at the time of election. There are various expenses such as cost for setting up booths, EVM machines, security, transportation etc., which sums up to a total of 32,500. In our blockchain voting the cost of setting up booths is very less because the setting can be done only in remote places where the people have a very less lack of knowledge and also the maintenance cost are less as all the data needs to be maintained and monitored time to time. The security issues which may occur in traditional method leads to mismatch of records. This clearly explains that the blockchain voting costs less when compared to that of the traditional voting.

## V. CONCLUSION & FUTURE WORK

Adapting computerized process of casting ballot frameworks to make the open discretionary procedure less expensive, quicker and simpler, is a convincing one in present day society. Making the discretionary procedure less expensive and faster, standardizes it according to the voters, evacuates a specific power hindrance between the voter and the chosen authority and puts a specific measure of weight on the chosen authority. It likewise opens the entryway for a more straightforward type of majority rule government, enabling voters to express their will on individual bills and suggestions.

We presented the one of a kind blockchain based electronic casting a ballot framework that uses smart contracts to empower secure and cost effective decision while ensuring voters protection. Utilizing an Ethereum private blockchain, it is conceivable to send several exchanges for each second on to the blockchain, using each part of the smart contract to facilitate the heap on the blockchain[2]. Decentralized architecture with transparent vote casting process, and manipulations of votes are nearly impossible.

Future enhancements include more security features like two way verification, face detection and Aadhar card

detection. An Application will be developed on the mobile platform where the user can able to cast his vote from the mobile.

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