

## Blockchain based E-Voting System Using IPFS

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**Abstract** - Voting is a tedious task in this nation. The highest number of controversies and corruptions are involved along this path. A nation needs a fair and unbiased election for the masses to redeem their right to elect the leader of their choice. The latest trends of EVM (Electronic Voting Machine) hacking have taken over the ability to hold a clear and transparent election. In this paper, we discuss an innovative approach by imbibing the latest technologies with the traditional voting methods. The technology involves a secure data storage technique named as block chain which is used for cryptocurrencies and is proven for its security. The votes which are recorded by the EVM will be updated with the cloud-based storage (SAAS). Any changes made to the voting panel or tampering with the votes will cause the hash to break the link and by detecting the manipulated votes, any discrepancy can be removed by marking them as NOTA, hence not affecting the polling by any means. Blockchain technology has a significant feature of Proof of- Work which does not allow the continuous creation of data blocks hence protecting the rapid manipulation of data. Also, this system only requires uploading the hashes created along with the blocks which are stored in a hash table on the cloud. The data of the EVM, when tallied with the hash table, can help in identifying the point of manipulation. Each vote will be treated as a single block of data. Also, as added features of block chain technology, the P2P (Peer to Peer) network allows only communication between two already connected peers Man-in-Middle attacks are impossible in this case as the blockchain proof-of-work does not allow mass updating of data at a time, hence reducing the rate at which votes can be manipulated, hence securing a country's political future.

**Keywords** - Blockchain, Decentralized system, EVM, Data security, IPFS, Encryption, Cloud storage.

**Blockchain:** A blockchain is a digitized, decentralized, public ledger of all crypto currency transactions.

**Decentralized system:** If one server goes down or something happens on a particular node, other nodes can function normally and do not have to wait for victim node's recovery.

**EVM:** The Electronic Voting Machine, also known as EVM, is an electronic device used for casting votes. The EVM aims to make the electoral process secure, fair and transparent.

**Data security:** Blockchain platform ensures that your data is encrypted, which means that modification in data is a difficult task.

**IPFS:** The InterPlanetary File System (IPFS) is a protocol and peer-to-peer network for storing and sharing data in a distributed file system.

**Encryption:** The data encryption is a key technique in the blockchain technology. The way blockchain and encryption security works is based on math, through a mining network.

**Cloud storage:** In Blockchain-based cloud storage, data is divided into multiple encrypted segments that are interlinked through a hashing function.

### I. INTRODUCTION

Voting in this country is the most tedious job to be handled, involving all kinds of corrupted and illegal deeds. Elections in India are conducted exclusively using EVM's developed over the past two decades by a group of government-owned companies. These devices, known in India as EVMs, have been adopted greatly for their simple design, ease of conduct, and robustness. However, recently they have also been marked prey following widespread reports of election irregularities. Despite this criticism, many details of the mechanism have never been publicly discussed, and they have not been subjected to a stringent, independent security evaluation. We conclude that in spite of the machines' simplicity and software trusted computing base, they are vulnerable to indigenous attacks that can modify election results and violate the law of the election commission. Most of the attacks done are physical, by changing the electricals, but if the machine is connected real time to a cloud server and involves an independent screen which shows the confirmation of choice symbolically before placing the final vote, it can help in detecting problems and maintain the integrity of the system. Blockchain technology has primarily been used to store data and the major advantage of this technology is the inertia of the data. This technology was initially implemented by Satoshi Nakamoto in 2008 to imbibe the concept of cryptocurrency (or) bitcoins as a medium of secure electronic exchange of money. According to this technology the data once stored, a hash is generated, the following block stores this hash so as to form a chain of links between the data blocks. The hash generated is calculated from the data and any change in data causes the hash to change. The Proof-of-Work technology which is a part of the Blockchain technology, helps in preventing the modification of data by limiting the hashing rate. Hence, only a certain limited number of blocks can be created or modified at a time, hence lowering the chances of corruption. Moreover, the hashing in this case

requires to be done at every peer node individually to be accepted by all the peers else it is rejected.

## II. PROBLEM IDENTIFICATION

The topic of our project is E- voting using blockchain. There was a strong need of this type of research for the e voting so that they can perform their tasks effectively and efficiently. The E- voting is based on fingerprint so that reduces the fraud in the election. Previously, some of the work had done on some of its related topics but our purpose for this research is to exactly find those factors which help to manage the e voting better.

## III. SCOPE & OBJECTIVE

It may help to establish e-voting systems as a reliable tool to conduct elections, already extensive research has been proposed. This project proposes an analysis of existing e-voting schemes along with their scopes and limitations.

- It satisfies the user requirement.
- Be easy to understand by the voter and operator.
- Have a good user interface.
- User friendly.

The objectives of the systems development and event management are:

1. It provides fault-tolerance, immutability, transparency and full traceability of the stored transaction records, as well as coherent digital representations of physical assets and autonomous transaction executions.
2. It is essential for the stored records to be tamper-proof, while the best case would be if each actor issuing transactions could do that without relying on any centralized third-party intermediary.

## IV. LITERATURE SURVEY

Existing System consist of methods like ballot paper-based voting, Lever voting machine, Punch card and EVM voting machine. The main problem with existing system was time consuming which used to take lot of time for voting. Paper based voting method were used in existing system which also gave the results of fake voting. Also, with EVM based voting there is lot of argument like EVM was hacked, So, such type of system is harmer for democracy country.

Disadvantages of Existing System:

- Lot of paper work required.
- Man power was more.
- Time consuming process.
- EVM may be hacked.

Title	Authors	Problem	Solution	Result
A Study on Decentralized E-Voting System Using Blockchain Technology	1.Mrs. Harsha V. Patil, 2.Mrs. Kanchan G. Rathi, 3.Mrs. Malati V.Tribhuwan  Assistant Professor, Dept. of Computer Science, Dr. D.Y. Patil ACS College, Pimpri , Pune-18, Maharashtra, India	Vote rigging, hacking of the EVM (Electronic voting machine), election manipulation, and polling booth capturing are the major issues in the current voting system	The potential of the blockchain technology and its usefulness in the e-voting scheme. The blockchain will be publicly verifiable and distributed in a way that no one will be able to corrupt it.	The transparency of the block-chain enables more auditing and understanding of elections.
The Future Of Electronic Voting System Using Blockchain	Md. Razu Ahmed, F.M. Javed Mehedi Shamrat, Md. Asraf Ali, Md. Rajib Mia, Mst. Arifa Khatun	the traditional e-voting system has various limitations and challenges for a very long time.	The paper presents a novel secured distributed database of the voter's information, and voter information will be deposited against their private key and digital signature in the central database.	A Blockchain-based secure E- voting system that enables the decentralized database to cast vote in a modern way.
Content Addressed P2P File System for the Web with Blockchain-Based Meta-Data Integrity	Chaitanya Rahalkar, Dhaval Gujar	The standard HTTP protocol has started showing its limitations. With an increased amount of data duplication & accidental deletion of files on the Internet.	A secured and integrity compliant system was proposed using the P2P feature of IPFS and the tamper-proof principle of Blockchain technology.	The four main components namely DHTs, Blockchain, P2P Networks and Content Addressed File System, together, make the model a secured, reliable, and fault-tolerant system.
Decentralized Cloud Storage Using Blockchain	Meet Shah, Mohammedhasan Shaikh,Vishwajeet Mishra,Grinal Tuscano	Cloud storage is one of the leading options to store massive data, however, the centralized storage approach of cloud computing is not secure.	the user's file is encrypted and stored across multiple peers in the network using the IPFS protocol. IPFS creates hash value.	This paper focuses on decentralized secure data storage, high availability of data, and efficient utilization of storage resources.

## V. PROPOSED SYSTEM

The proposed system has been designed and implements successfully using blockchain and fingerprint. The proposed system has the benefit of using a biometric authentication and controls the process of voting avoiding unnecessary things like rigging, ballot papers, casings etc.

We are going to design a system which is more secure, robust, and highly acceptable, more accurate and decentralized. So that no one can change anything in system, trust can be built by everyone. We are developing e-voting in blockchain. In our system, the admin can assign gas value to each voter for only one vote. Before assign gas value to voter and after giving the vote, the voter cannot vote in the system. Once voter can vote the data of the vote will uploaded on IPFS server and IPFS server generates the hash for that vote and that hash will maintained by Ethereum. In IPFS data are stored content-addressed and immutable, they can be complicated to edit.

Advantages of Proposed System:

- User friendly.
- No fake voting because of fingerprint.
- Transparency should be maintained.

- Reduce lots of paper work.
- Avoids invalid voting as it prevents unregistered voters from voting.
- Time conscious, less time required for voting & counting.
- This system allows only authenticated voting than the existing equipment as the person is identified based on his Fingerprint which is unique to each individual.

## VI. BLOCKCHAIN & ETHERIUM

If this technology is so complex, why call it "blockchain?" At its most basic level, blockchain is literally just a chain of blocks, but not in the traditional sense of those words. When we say the words "block" and "chain" in this context, we are actually talking about digital information (the "block") stored in a public database (the "chain").

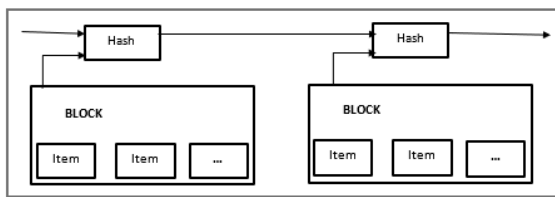


Fig 1: Blockchain

“Blocks” on the blockchain are made up of digital pieces of information. Specifically, they have three parts:

1. Blocks store information about transactions, say the date, time, and dollar amount of your most recent purchase from Amazon. (NOTE: This Amazon example is for illustrative purchases; Amazon retail does not work on a blockchain principle)
2. Blocks store information about who is participating in transactions. A block for your splurge purchase from Amazon would record your name along with Amazon.com, Inc. Instead of using your actual name, your purchase is recorded without any identifying information using a unique “digital signature,” sort of like a username.
3. Blocks store information that distinguishes them from other blocks. Much like you and I have names to distinguish us from one another, each block stores a unique code called a “hash” that allows us to tell it apart from every other block. Let’s say you made your splurge purchase on Amazon, but while it’s in transit, you decide you just can’t resist and need a second one. Even though the details of your new transaction would look nearly identical to your earlier purchase, we can still tell the blocks apart because of their unique codes.

While the block in the example above is being used to store a single purchase from Amazon, the reality is a little different. A single block on the blockchain can actually store up to 1 MB of data. Depending on the size of the transactions, that means a single block can house a few thousand transactions under one roof.

Ethereum is an open platform that enables developers to build and deploy decentralized applications such as smart contracts and other complex legal and financial applications. You can think of Ethereum as a programmable Bitcoin where developers can use the underlying blockchain to create markets, shared ledgers, digital organizations, and other endless possibilities that need immutable data and agreements, all without the need for a middleman. Released in 2015, Ethereum is the brainchild of the prodigious Vitalik Buterin, who saw the potential uses of Bitcoin’s underlying blockchain technology as the next steps in furthering the expansion of the blockchain community. Ethereum is now currently the cryptocurrency with the second highest coin market cap and is expected by some to surpass Bitcoin as both a valued investment and as the world’s most popular cryptocurrency.

The InterPlanetary File System (IPFS) is a protocol and peer-to-peer network for storing and sharing data in a distributed file

system. IPFS uses content-addressing to uniquely identify each file in a global namespace connecting all computing devices. IPFS is a file sharing system that can be leveraged to more efficiently store and share large files. It relies on cryptographic hashes that can easily be stored on a blockchain.

In IPFS you separate the steps into two parts:

1. Identify the file with content addressing, via the hash. Ask who has it.
2. When you have the hash, then you ask the network you’re connected to “Who has this content (hash)?” and you connect to the corresponding nodes and download it.

## Here’s how IPFS works

Take a look at what happens when you add a file to IPFS.

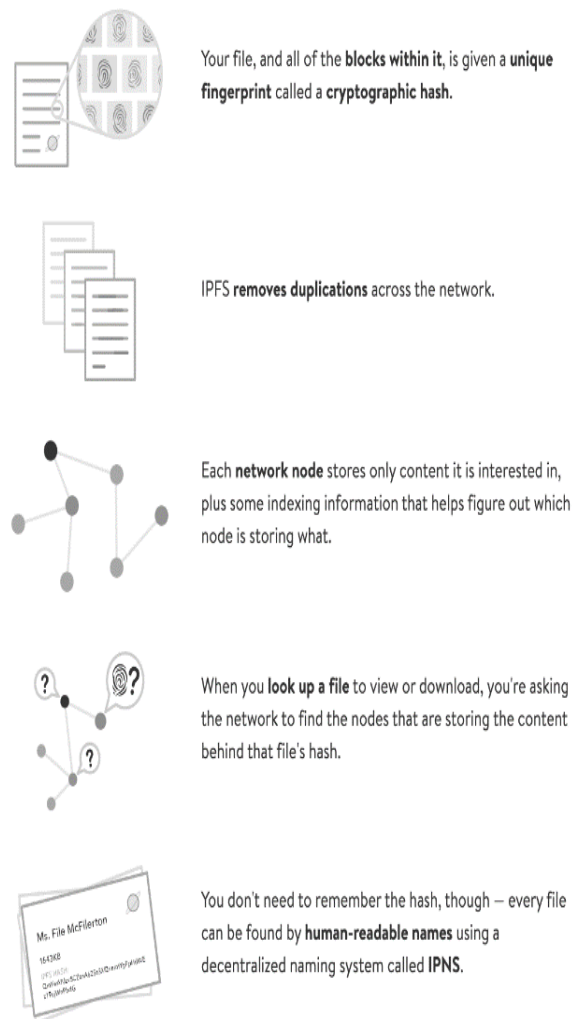


Fig 2: Working of IPFS

**VII. WORKFLOW**

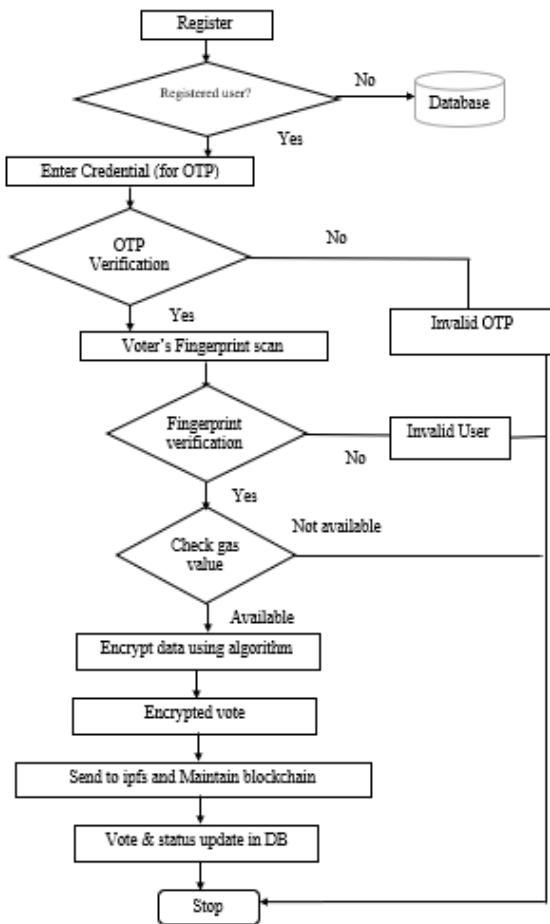


Fig 3: Flowchart

Initially if the user is new then he/she needs to register and the data will be stored in the database and if he is already registered then the system will ask for his credentials for verification. If the OTP is invalid then the process will stop else if the verification is successful then the system will ask for user's fingerprint. If the fingerprint doesn't match then the system will stop. After successful verification of fingerprint, the system will check gas value. The admin can assign gas value to each voter for only one vote and if the gas value is not available then the system stops. On the availability of gas value, blockchain uses digital signature (SHA256) algorithm to maintain/verify integrity of the data, this will encrypt the data. Once voter can vote, the data of the vote will be uploaded on IPFS server and IPFS server generates the hash for that vote and that hash will be maintained by Ethereum. At the end the status of the vote will get updated in the database.

**VIII. CONCLUSION**

In this project, we introduced a unique, blockchain-based electronic voting system that utilizes smart contracts to enable secure and cost-efficient election while guaranteeing voters privacy. We have outlined the systems architecture, the design, and a security analysis of the system. By comparison to previous work, we have shown that the blockchain technology

offers a new possibility for democratic countries to advance from the pen and paper election scheme, to a more cost- and time-efficient election scheme, while increasing the security measures of the today's scheme and offer new possibilities of transparency. Implementing IPFS server-based solutions as well as blockchain for security will improve on the transparency for the critics and also improve the security on the ballot information that is collected. Hence, the paper successfully demonstrates a way to improve the political future in the country especially India.

**IX. FUTURE MODIFICATION**

As future work we would like to advance our system design and implementation to work with fully encrypted voting details, including the voting percentage with hourly. We also use options like eye scanner, face recognition and etc. Better networks can be used for faster storing and avoiding further network vulnerabilities. Cryptocurrency security is increasing day by day and hence improved security qualities will enhance the system.

1. Can create real time application.
2. Availability of notification

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