

Decentralized E-Voting System using Blockchain

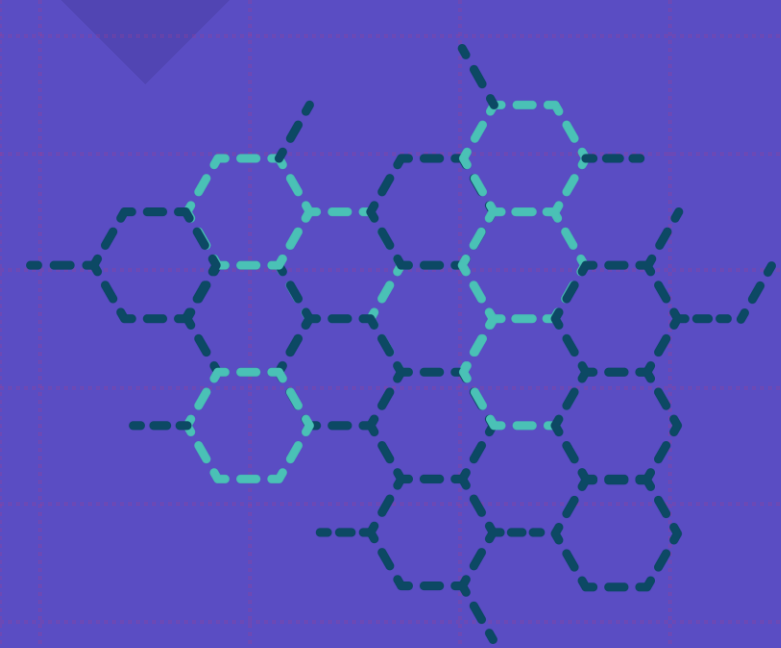


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Introduction



- Modern democracies are built up on voting system, whether traditional ballot based or electronic voting (e-voting)
- Electronic voting is often seen as a tool for making the electoral process more efficient and for increasing trust in its management
- For a robust e-voting scheme, a number of functional and security requirements are specified including transparency, accuracy, auditability, system and data integrity, secrecy/privacy, availability, and distribution of authority

Literature Survey

- In every democracy, the security of an election is a matter of national security. From the dawn of democratically electing candidates, the voting system has been based on pen and paper.
- Electronic voting machines have been viewed as flawed, by the security community, primarily based on physical security concerns. Anyone with physical access to such machine can sabotage the machine, thereby affecting all votes cast on the aforementioned machine[1][2].
- The blockchain mechanism employs a distributed architecture that can prevent system shutdown resulting from malicious cyber attacks; additionally, any user in the blockchain can authenticate data integrity, which satisfies requirements of transparency and impartiality in voting systems[3]

Why do we need it?

- Current voting systems like ballot box voting or electronic voting suffer from various security threats such as DDoS attacks, polling booth capturing, vote alteration and manipulation, malware attacks, etc, and also require huge amounts of paperwork, human resources, and time. This creates a sense of distrust among existing systems.
- Some of the disadvantages are:
 - Long Queues during elections
 - Security Breaches like data leaks, vote tampering.
 - Lot of paperwork involved, hence less eco-friendly and time-consuming.
 - Difficult for differently-abled voters to reach polling booth.
 - Cost of expenditure on elections is high.

Solution

Using blockchain technology, voting process can be made more secure, transparent, immutable, and reliable.



Proposed E-voting system with Blockchain Model

We propose an E-Voting System with blockchain technology. The following are the parts that **will be** involved in the system's infrastructure design.

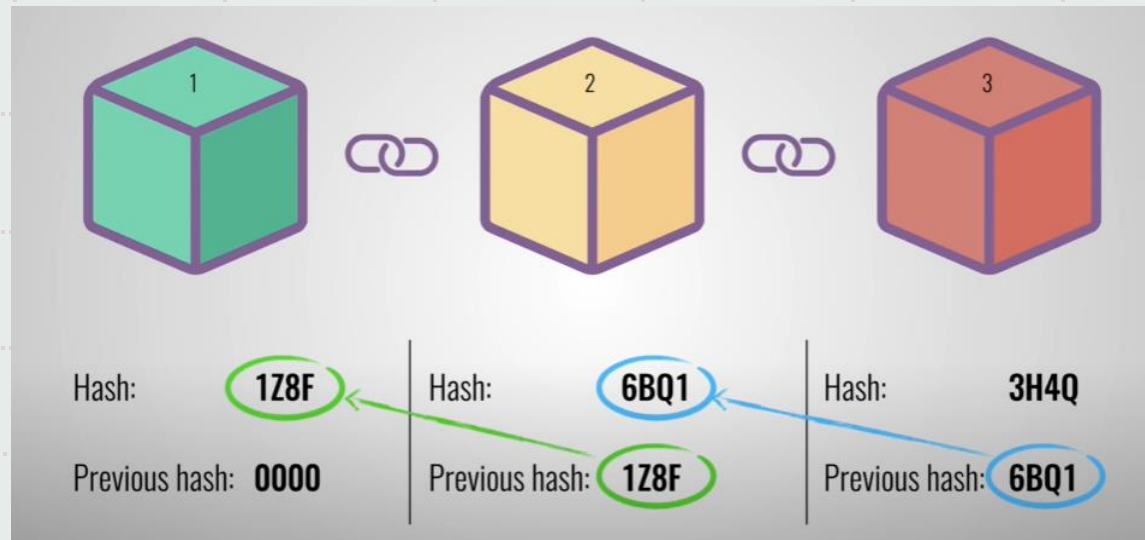
Decentralized system	Blockchain	Aadhar for authentication
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Decentralized system

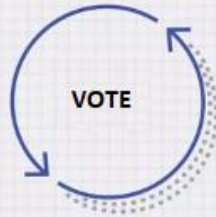
- A decentralized system is an interconnected information system where no single entity is the sole authority. In the context of computing and information technology, decentralized systems usually take the form of networked computers.
- If one server goes down or something happens on a particular node, other nodes can function normally and do not have to wait for victim node's recovery.

Blockchain

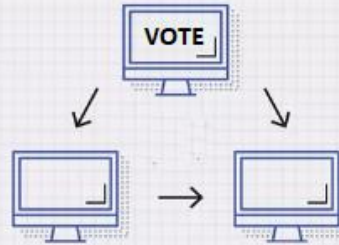
- Blockchain is a specific type of database.
- It differs from a typical database in the way it stores information; blockchains store data in blocks that are then chained together.
- As new data comes in it is entered into a fresh block. Once the block is filled with data it is chained onto the previous block, which makes the data chained together in chronological order.
- Decentralized blockchains are immutable, which means that the data entered is irreversible.



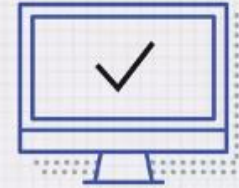
Transaction Process



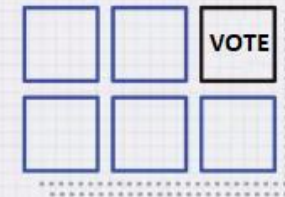
A new transaction is entered.



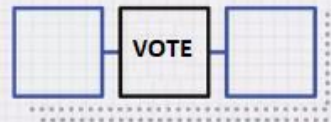
The transaction is then transmitted to a network of peer-to-peer computers scattered across the world.



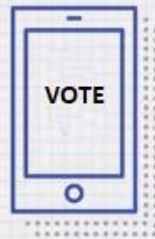
This network of computers then solves equations to confirm the validity of the transaction.



Once confirmed to be legitimate transactions, they are clustered together into blocks.



These blocks are then chained together creating a long history of all transactions that are permanent.



The transaction is complete.

Aadhar for person's authentication

Aadhaar number for person's authentication is used to ensure one vote cast from one person. User will receive a One Time Password for the login on the phone number linked with Aadhaar, which will enable the user to proceed to vote.

Aadhar for person's authentication

1. Phone number sign-in for authenticating a voter is done using the Firebase UI provided by google platform.
2. phone number of the voter is passed to the `PhoneAuthProvider.verifyPhoneNumber` method to request that Firebase verify the user's phone number.
3. Once the voter's phone number is verified successfully, the voter is authenticated and redirected to voting page.

Technology Stack



HTML

CSS

JavaScript

Node JS

Express JS

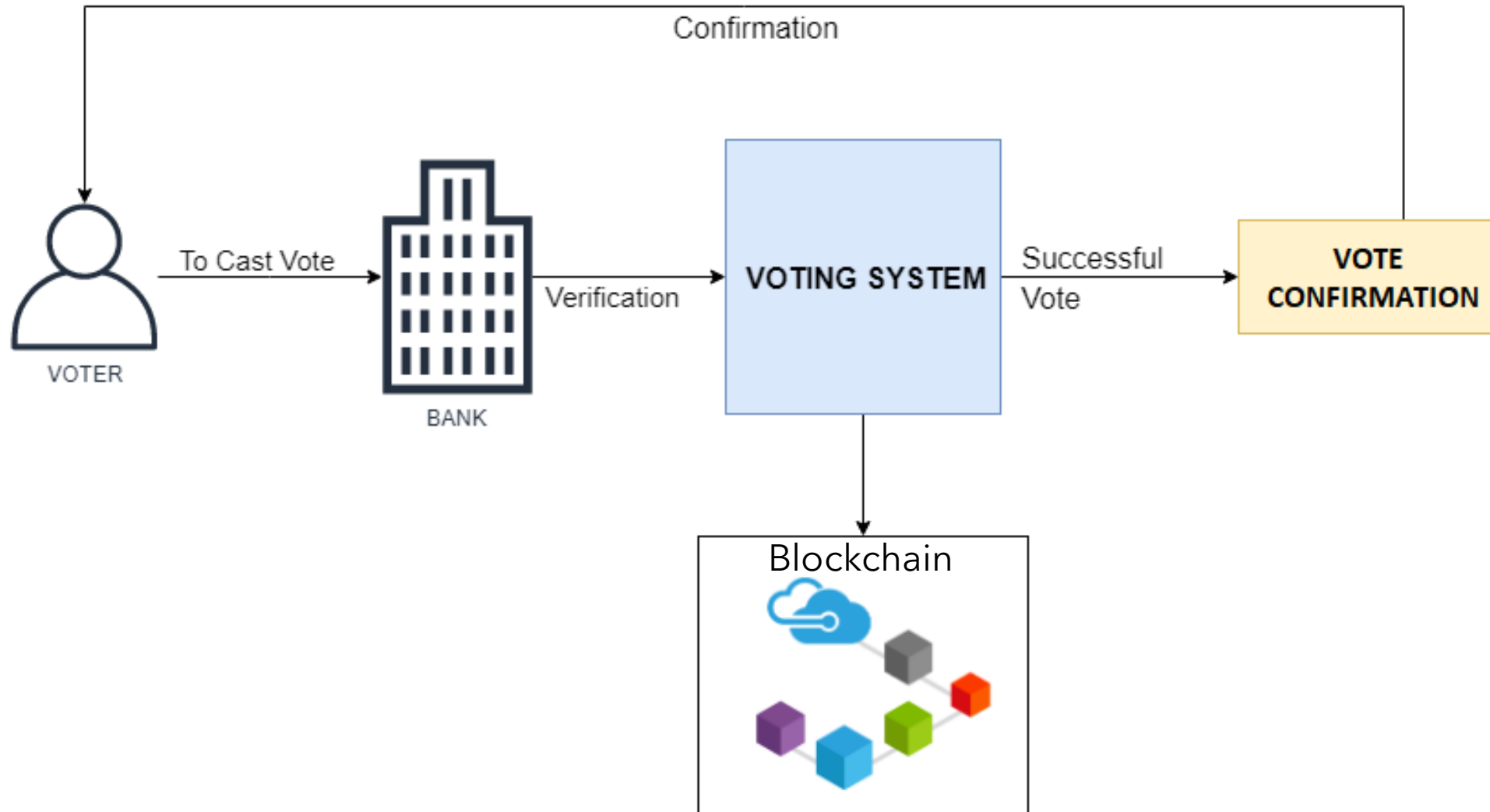
Ethereum

Web3

Methodology



Voting System Workflow




Results

Authentication
of admin
authority

Voting | Login

localhost:3000



Decentralized E-Voting System using
Blockchain

admin

••••••••

Login


Made with ❤️ by NITH

Results

Authenticating
voters with the
help of their
Aadhaar

Verify Aadhaar

localhost:3000/login



Verify Aadhaar

Aadhaar No

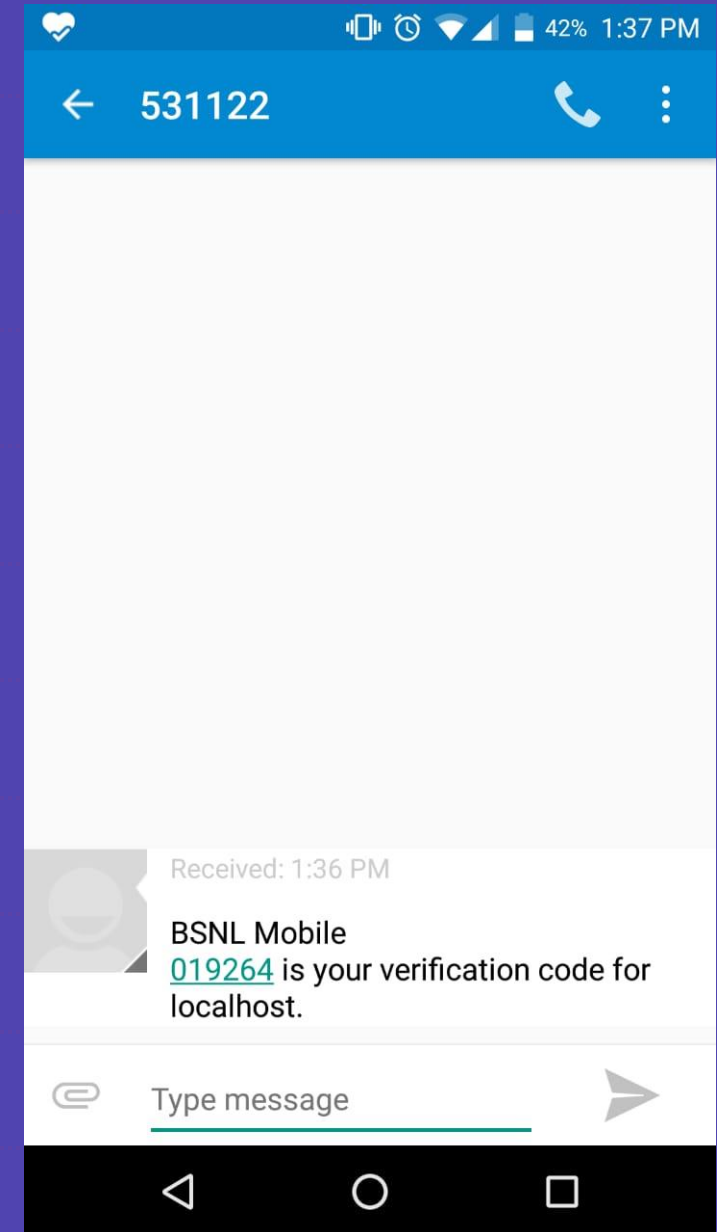
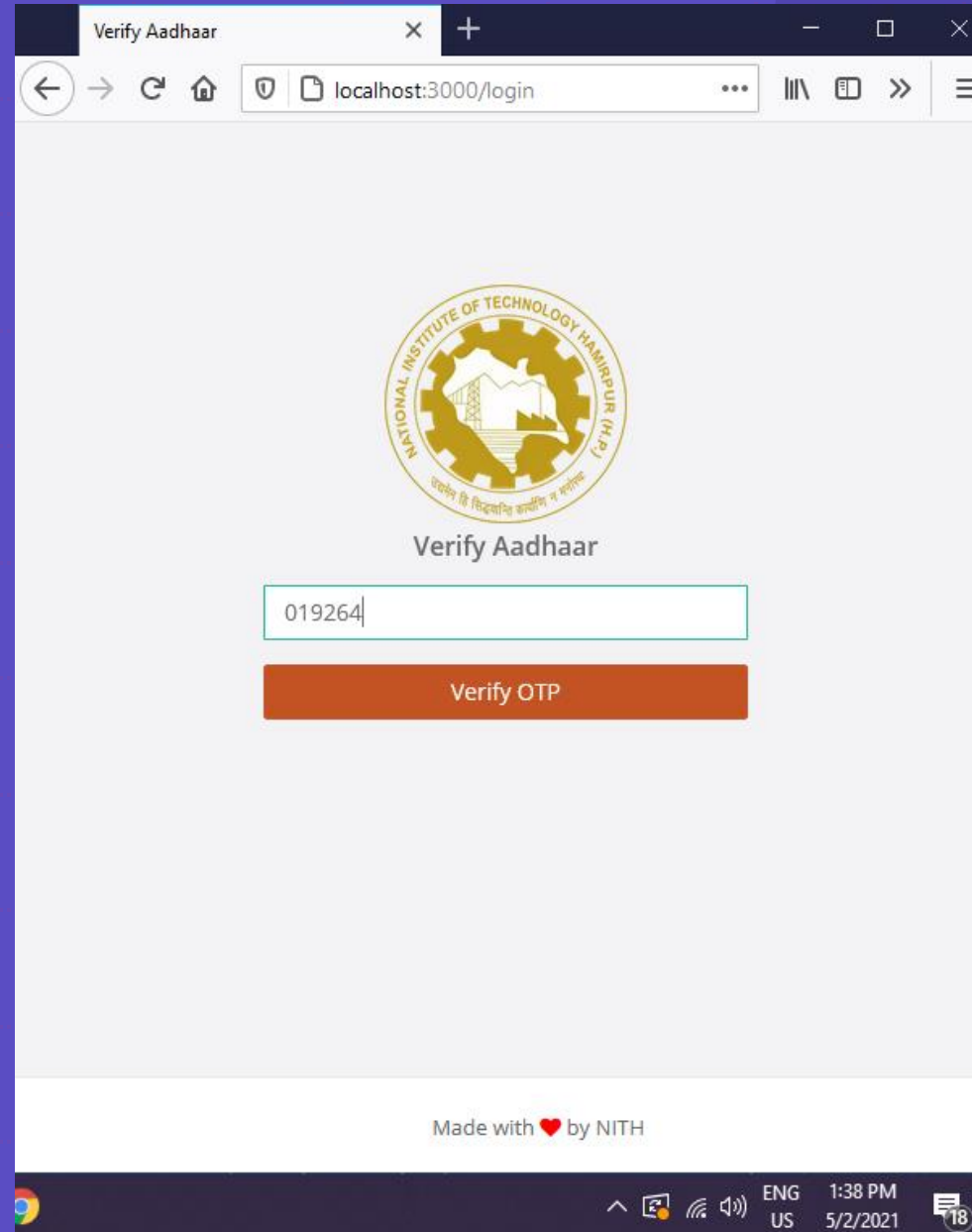
Get OTP

protected by reCAPTCHA
Privacy - Terms

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Results

OTP generated
and received
on user's
phone



Results

Voting system interface

Voting system

localhost:3000/info

Decentralized E-Voting System using Blockchain

Candidate 1

☐ Vote

It starts by standing with the poor, listening to voices unheard, and recognizing potential where others see despair.

Candidate 2

☒ Vote

My purpose is to unite the world through sport to create a healthy planet, active communities and an equal playing field for all.

Candidate 3

☐ Vote

It's the radical idea of creating hope in a cynical world. Changing the way the world tackles poverty and building a world based on dignity.

Candidate 4

☐ Vote

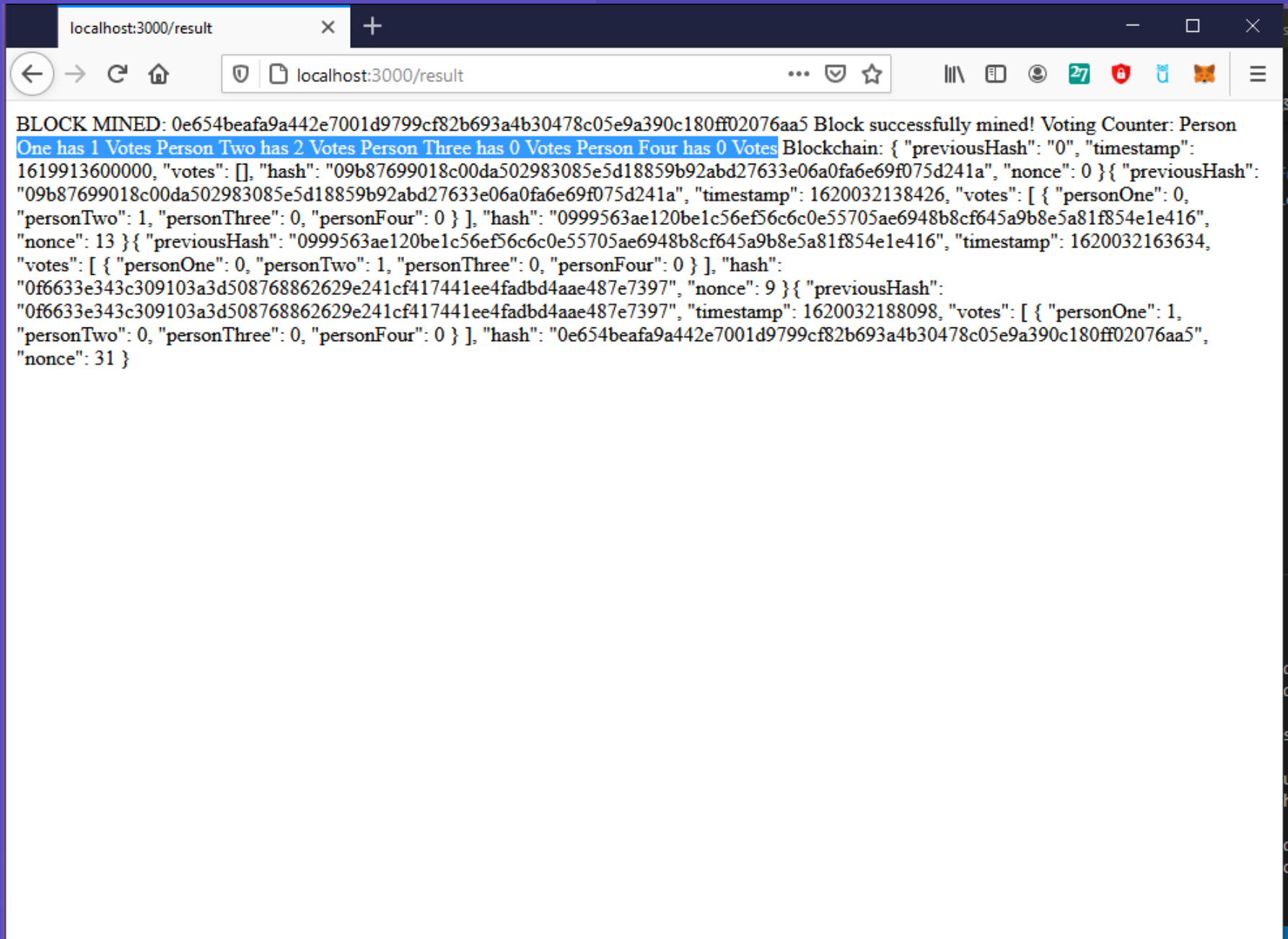
I believe that works of art should be supported by members of a community as important symbols of cohesive community.

Submit your vote

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Results

Storing of
Vote's
information



```
BLOCK MINED: 0e654beafa9a442e7001d9799cf82b693a4b30478c05e9a390c180ff02076aa5 Block successfully mined! Voting Counter: Person One has 1 Votes Person Two has 2 Votes Person Three has 0 Votes Person Four has 0 Votes Blockchain: { "previousHash": "0", "timestamp": 1619913600000, "votes": [], "hash": "09b87699018c00da502983085e5d18859b92abd27633e06a0fa6e69f075d241a", "nonce": 0 } { "previousHash": "09b87699018c00da502983085e5d18859b92abd27633e06a0fa6e69f075d241a", "timestamp": 1620032138426, "votes": [ { "personOne": 0, "personTwo": 1, "personThree": 0, "personFour": 0 } ], "hash": "0999563ae120be1c56ef56c6c0e55705ae6948b8cf645a9b8e5a81f854e1e416", "nonce": 13 } { "previousHash": "0999563ae120be1c56ef56c6c0e55705ae6948b8cf645a9b8e5a81f854e1e416", "timestamp": 1620032163634, "votes": [ { "personOne": 0, "personTwo": 1, "personThree": 0, "personFour": 0 } ], "hash": "0f6633e343c309103a3d508768862629e241cf417441ee4fadbd4aae487e7397", "nonce": 9 } { "previousHash": "0f6633e343c309103a3d508768862629e241cf417441ee4fadbd4aae487e7397", "timestamp": 1620032188098, "votes": [ { "personOne": 1, "personTwo": 0, "personThree": 0, "personFour": 0 } ], "hash": "0e654beafa9a442e7001d9799cf82b693a4b30478c05e9a390c180ff02076aa5", "nonce": 31 }
```

Conclusion

- In this project, we introduced a blockchain-based electronic voting system that utilizes smart contracts to enable secure and cost-efficient election while guaranteeing voters privacy.
- This project explores the potential of blockchain technology and its usefulness in the e-voting scheme. The blockchain will be publicly verifiable and decentralised in a way that no one will be able to corrupt it.

Future Scope

This project can be extended to android application for better reach and scalability.

Aadhaar API can be used for building the database of citizens extracting information about phone number linked with their Aadhaar.

For fast voter's authentication, fingerprints can be verified with voter's Aadhaar.

References

- [1] T. Kohno, A. Stubblefield and A.D. Rubin, "A security analysis of E-voting system", Technical Report by U.S. Department of Defence's FVAP.
- [2] Pavi Saraswat, Kanika Garg and Sachin Bisht, "Comparative Analysis on E-voting systems", International Conference on IoT(Smart Innovations),2019.
- [3] Himanshu Agarwal and S.K. Vivek, "A Secure e-Government's e-Voting System", International Conference on Inventive Computing Applications, 2020 published in IEEE.
- [4] Vaibhav Anasune and Pradeep Choudhari, "E-voting systems using Blockchain", International Research Journal of Engineering and Technology, 2019.

The background is a solid blue color with a light blue grid pattern. There are abstract shapes in the corners: a dark blue triangle in the top-left and a large, light blue curved shape in the top-right. In the bottom-left, there are two overlapping light blue curved shapes.

Thank You