



ON THE DESIGN AND IMPLEMENTATION OF A BLOCKCHAIN ENABLED E-VOTING APPLICATION WITHIN IOT-ORIENTED SMART CITIES

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Abstract:-- E-Voting is a form of voting in which the individuals are able to cast their votes online, through a web interface. Through the use of online voting, the voter navigates to the designated election site using a web browser on an ordinary PC. The individual then authenticates himself or herself before the system enables the voter to view the ballot displayed on the screen. The voter is then permitted to select their chosen candidate and then cast the votes which would then be sent to the election server for processing. In “E-Voting” a voter can use his\her voting right online without any difficulty. He\She has to fill a registration form to register himself\herself. All the entries is checked by the DATABASE which has already all information about the voter. If all the entries are correct then a USER ID and PASSWORD is given to the voter, by using that ID and PASSWORD he\she can use his\her vote. If conditions are wrong then that entry will be discarded.

The project is designed with a modular approach and the number of modules is decided as per the requirements of the organization. The three modules are administrator module, nominee/candidate module and the general voter module. The administrator has total authority of the organization and maintains all the aspects. The user has the provision to view the list of all candidates and results as well as vote for the desired candidates. The voting system currently being used by the association is a paper based system, in which the voter simply picks up ballots sheets from electoral officials, tick off who they would like to vote for, and then cast their votes by merely handing over the ballot sheet back to electoral official. The electoral officials gather all the votes being cast into a ballot box. At the end of the elections, the electoral officials converge and count the votes cast for each candidate and determine the winner of each election category.

The Nominee details will be updated by the admin for the post of board of director and manager. The candidate will submit their own details and the admin maintain all of background details of the particular nominee and uploaded their information in correct procedure. In order to, the user or voter can view the nominee details. The user after their registration only can logon for voting. The user will view nominee details with their image before they can vote. After knowing the nominee details the user can logon for voting. They should vote for board of director and the manager in the association. The count will taken for each voting. After voting the particular person/user cannot logon to vote again.

Keyterms: Blockchain framework, E-Voting application, Internet of Things

I. INTRODUCTION

We are living in the era of cutting -edge technologies. The fourth industrial revolution is already happening with diverse fields including government sectors. In the last decades, many of the governments has begun being used to Electronics voting systems on their elections. Among the countries, Estonia was the very earliest adopter an electronic voting system for its national wide elections in the modern world. After that, the electronics voting system was used for an open and fair vote in Nigeria.

Switzerland was the very first time user for their state election and Norway was adapted to their council election. For the traditional voting system to compare with an electronic voting system, basically two system to their work likely to similar. Moreover, this electronic technique does provide reliable, secure, fair services than the traditional ballot system. But the traditional electronic system does not provide anonymity and integrity whereas blockchain-based e-voting can be solved these problems. Rowena Cullen. Presented a comparative study among democracy-based countries that have a certain amount of democracy between 167 countries out of 200 countries.



To provide democracy, the government shall take some essentials to care such as security, health, education, international relation, tax, and other benefits for the peoples. The Election Commission has constructed the election process more operational in different governmental organizations.

1.1 Block Chain

Blockchain seems complicated, and it definitely can be, but its core concept is really quite simple. A blockchain is a type of database. To be able to understand blockchain, it helps to first understand what a database actually is.

A database is a collection of information that is stored electronically on a computer system. Information, or data, in databases is typically structured in table format to allow for easier searching and filtering for specific information. What is the difference between someone using a spreadsheet to store information rather than a database. Spreadsheets are designed for one person, or a small group of people, to store and access limited amounts of information.

In contrast, a database is designed to house significantly larger amounts of information that can be accessed, filtered, and manipulated quickly and easily by any number of users at once.

- Ledger: It is a file that is constantly growing.
- Permanent: It means once the transaction goes inside a blockchain, you can put up it permanently in the ledger.
- Secure: Blockchain placed information in a secure way. It uses very advanced cryptography to make sure that the information is locked inside the blockchain.
- Chronological: Chronological means every transaction happens after the previous one.
- Immutable: It means as you build all the transaction onto the blockchain, this ledger can never be changed.

A blockchain is a chain of blocks which contain information. Each block records all of the recent transactions, and once completed goes into the blockchain as a permanent database. Each time a block gets completed, a new block is generated.

1.2 E-Voting System

eVote is an election system that facilitates voters to record their secure and secret ballot electronically. It has a friendly user interface and enables voters to cast their votes in few simple steps. We ensure the authenticity of the voters and the votes cast by them along with non-traceability of the casted vote.

It renders Simple and Accessible voter experience that eventually increases voter engagement and turnout. Auditable, Easy To Use, Secure and Reliable is what sets eVote apart from its competitors.

eVote has facilitated several organizations, across a wide range of industries to conduct hassle-free electronic voting with utmost security and integrity.

Some of our fortes include outstanding and prompt customer support, highly secure and trustworthy elections and last but not the least; our potential to be able to tabulate expeditious and accurate results.

1.3 Blockchain-Based E-Voting System

Moving voting online can make the process more comfortable, more flexible, and accessible to more people. However, current electronic voting systems are also vulnerable to data compromise and voting result manipulations.

A blockchain can help in addressing these risks. This technology has the potential for enhancing the security of voters' personal data, increasing the transparency of the voting process, and making it easier to verify election results.

In this article, we discuss the main pros and cons of using blockchain technology for voting. We also list aspects to keep in mind when developing a blockchain-based voting solution.

1.3.1 Challenges of modern e-voting systems

Online voting is the reality today. Numerous countries around the globe, including several states in the US, Brazil, India, and Estonia already allow their citizens to vote using voting machines or even via the internet.

However, there are also those who don't support the implementation of online voting. Some researchers express concerns regarding higher risks of fraud, impersonation, and ballot secrecy violations with online voting. Others emphasize the increased cybersecurity risks posed by online voting compared to traditional approaches.

Overall, there are four essential challenges that should be dealt with when implementing an online voting system:

- Security
- Voter authentication
- Accessibility
- Voter anonymity

1.3.2 Pros of blockchain-based e-voting

As a distributed ledger, a blockchain offers several crucial advantages for e-voting systems:



- Resistance to cyberattacks
- Immutable data records
- Transparent transaction history
- Voter anonymity

A blockchain is distributed among multiple nodes and therefore has no single point of failure. As a result, blockchain-based election systems are more likely to be resilient against denial of service, database deletion, and other cyberattacks.

In previous works we used, the current voting system used in India. In this system vote is cast using electronics ballot. In this we cast our vote in an electronics machine. This is a group of some counter and registers. This voting system is quite easy, simple. It has advantage like mobility, secure, flexibility for election commission. But in today world all people are so much busy that they don't have time to vote. This paper presents a perspective in the electronic voting process. That includes but not limited to identifying the polling process, The polling process the actual voting process used on the polling day. However, The E-Voting system should allow anonymity during and after the election and only listed users can cast their votes.

To overcome above drawbacks, this proposed framework is used a novel schemes named as Biometric online voting system with biometric fingerprint using aadhaar card. It determines the particular voter by his/her fingerprint whether he/she is a valid voter or not. It allows particular voter to cast the vote online. The polling process continues until the voting time ends and update the database in the server. Biometric online voting system uses aadhaar card to retrieve the complete details about the voter. And the votes are stored in a blockchain server and viewed to the public this ensure a trustworthy environment.

II. REVIEW OF LITERATURE

On the Design and Implementation of a Blockchain Enabled E-Voting Application Within IoT-Oriented Smart Cities [1] A smart city refers to an intelligent environment obtained by deploying all available resources and recent technologies in a coordinated and smart manner. Intelligent sensors (Internet of Things (IoT) devices) along with 5G technology working mutually are steadily becoming more pervasive and accomplish users' desires more effectively. Among a variety of IoT use cases, e-voting is a considerable application of IoT that relegates it to the next phase in the growth of technologies related to smart cities. In conventional applications, all the devices are often assumed to be cooperative and trusted.

Blockchain for Electronic Voting System [2] Blockchain technology came into the ground to overcome these issues and offers decentralized nodes for electronic voting and is used to produce electronic voting systems mainly because of their end-to-end verification advantages. This technology is a beautiful replacement for traditional electronic voting solutions with distributed, non-repudiation, and security protection characteristics. The following article gives an overview of electronic voting systems based on blockchain technology. The main goal of this analysis was to examine the current status of blockchain-based voting research and online voting systems and any related difficulties to predict future developments. This study provides a conceptual description of the intended blockchain-based electronic voting application and an introduction to the fundamental structure and characteristics of the blockchain in connection to electronic voting.

Secure Digital Voting System based on Blockchain Technology [3] Blockchain is a disruptive technology of current era and promises to improve the overall resilience of e-voting systems. This paper presents an effort to leverage benefits of blockchain such as cryptographic foundations and transparency to achieve an effective scheme for e-voting. The proposed scheme conforms to the fundamental requirements for e-voting schemes and achieves end-to-end verifiability. The paper presents details of the proposed e-voting scheme along with its implementation using Multichain platform. The paper presents in-depth evaluation of the scheme which successfully demonstrates its effectiveness to achieve an end-to-end verifiable e-voting scheme.

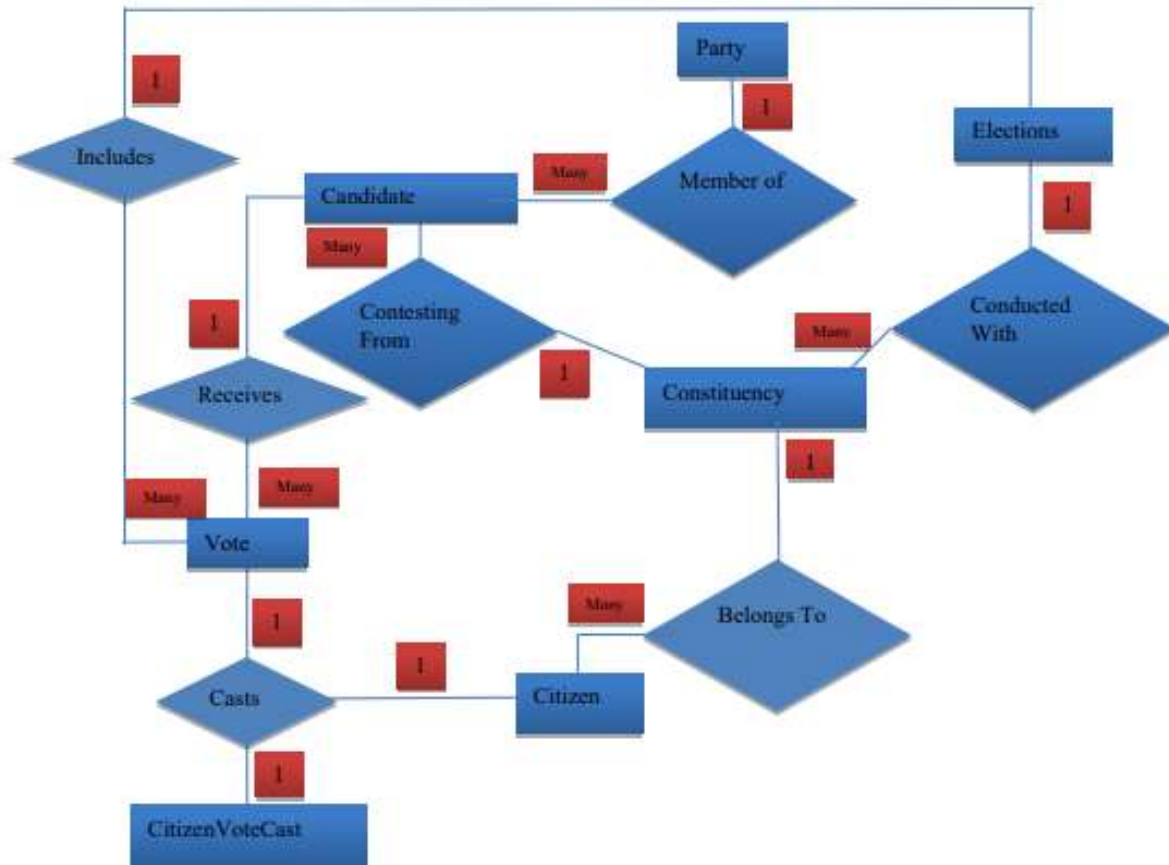
A Novel Technique for E-Voting System Using Blockchain [4] Now-a-days the online voting system has been highly developed and the election parties and public needs the quick result for the new administration. This paper presents secure electronic voting system that gives the fairness and privacy of current voting scheme, whereas providing the transparency and adaptability offered by electronic systems has been a challenge for an extended time. A novel technique for e-voting system using blockchain addresses a number of the restrictions in existing systems and evaluates a number of the popular blockchain frameworks of constructing a novel e-voting system.

Blockchain-Based E-Voting System [5] aims to evaluate the application of blockchain as service to implement distributed electronic voting systems. The paper elicitates the requirements of building electronic voting systems and identifies the legal and technological limitations of using blockchain as a service for realizing such systems. The paper starts by evaluating some of the popular blockchain frameworks that offer blockchain as a service. We then propose a novel electronic voting system based on blockchain that addresses all limitations we discovered.



III. PROPOSED SYSTEM

The proposed system is the Biometric online voting system with biometric fingerprint using aadhaar card. It determines the particular voter by his/her fingerprint whether he/she is a valid voter or not. It allows particular voter to cast the vote online. The polling process continues until the voting time ends and update the database in the server. Biometric online voting system uses aadhaar card to retrieve the complete details about the voter. And the votes are stored in a blockchain server and viewed to the public this ensure a trustworthy environment.



3.1 Block Diagram

Proposed Methodologies

3.1. USER MODULE - User interface consists of a login name and unique password using which he/she can login into the online E-Voting system. This will be supplied by the administrator to the user. Once the user has logged in, he has the privilege to view the names of the candidates listed by the administrator, view the results after the termination date of the election. The user module constitutes only one sub module:

CANDIDATE REGISTRATION - This facilitates of voter view the register form are enter the details and finally submit the details within check the details in administrator so your particular details are true accept the registration. Otherwise cross check the details, this details are false immediately reject your registration.

LOGIN - Each voter is provided with unique username and password manually by the administrator. The voter uses the username and password for login and exercise the fundamental right of E-Voting. If incorrect username and password entered, the access to is denied to the user. And also voter is allowed to vote only once. This is the security feature provided against external access of the system. After login the voter enters the voter home page, which provides the links.

E-VOTING SYSTEM - This provides the voter with a list of candidate with in his/her constituency along with selection option (radio button) to select the preferred candidate from the list. If the E-Voting date is before termination date, the vote goes valid else goes invalid.



VIEW RESULTS - This provides graphical and user friendly representation of the votes obtained by each candidate. It includes the percentage of the votes obtained by each candidate. But the result can be viewed only after the termination date of the election.

LOGOUT - This provides an option for the voter to quit the session, while in the voter home page.

3.2 ADMINISTRATOR MODULE

Administrator interface consists of a login name and unique password using which admin can login into the online E-Voting system. Administrator has the main control of the system. By logging into the page it can perform the following tasks.

ADD CONSTITUENCY - Here the election to be conducted is selected. To add an election the constituency should be selected and termination date of election should be specified.

VOTERS LIST - Here we can view the voters list. Each constituency will be having separate voters list.

CANDIDATE LIST - The list of candidates participating in the election can be seen. It includes the candidates name, party name and party symbol.

The sub-modules of administrator are:

1. E-VOTING STRUCTURE - Here the eligible voters who are permitted to login to the system can utilize the right to vote. Each voter can register a single vote to a candidate's favour in his/her constituency. The security measures taken within the system prevents them from exercising their votes again i.e. the second vote by the same user goes invalid. The starting and ending dates of the election are specified by the administrator. The user must have an identity card and he must be in voters list.
2. VOTERS REGISTRATION - The registration procedure of all the eligible voters. This registration process is done by the administrator. According to voters database each voter is provided with a unique identification codes which includes username and password. The details of the voters include username, password, name, address, gender, constituency, image etc. With the voter registration, thus producing the voter list with the given information of the voters. The voter list can be viewed by anyone accessing the webpage. The admin can view the voter list with in his homepage.
3. CANDIDATE REGISTRATION - The registration of the candidates in each constituency is done by the administrator. The details of the candidate includes name, address, gender, his/her constituency, party and image. With the candidate registration, thus producing the candidate list with the given information of the candidates. The candidate list can be viewed by admin and the vote within their respective homepages. According to candidates database (manual) each details of the candidates are stored in database controlled by the admin including candidates details.
4. COUNTING & CATEGORIZATION OF RESULTS - When the voter votes, the number of votes obtained by the selected candidate is incremented by 1. The result is published only after the E-Voting process is over. It is accessible from the next day after the termination date. Here we depict the result in the graphical representation according to the percentage of vote obtained by the candidate. Result can be viewed by everyone who visits into the site without any authentication problem. A link to view the result is kept in the index page and both admin and voter can view the result in their respective homepages. When the user clicks the result link, before the termination date of the election, "Result not Published yet" Message will be displayed. The result comes with their party symbol on the top of the graph representing the percentage of vote obtained by each candidate.

3.3 Cloud Server Module

In this module, we consider the server to be semi-trusted, i.e., honest but curious as those in and. That means the server will try to find out as much secret information in the stored voting information as possible, but they will honestly follow the protocol in general. On the other hand, some users will also try to access the files beyond their privileges.

For example, a pharmacy may want to obtain the prescriptions of patients for marketing and boosting its profits. To do so, they may collude with other users, or even with the server. In addition, we assume each party in our system is preloaded with a public/private key pair, and entity authentication can be done by traditional challenge-response protocols.

ATTRIBUTE BASED ACCESS POLICY MODULE - In our framework, there are multiple SDs, multiple owners, multiple AAs, and multiple users. In addition, two ABE systems are involved. We term the users having read and write access as data readers and contributors, respectively.

BLOCK CHAIN MODULE - In this Block chain module, block chain is implemented for all login form, Vote information, and for Candidate information. The time stamp and block chain is implemented for all the histories.



IV. CONCLUSION

By doing this project we were able to bring a new system for online national E-Voting for our country. With the advent of technology and Internet in our day to day life, we were able to offer advanced E-Voting system to voters both in the country and outside through our online E-Voting system.

Top 4 Reasons to Move to the Online E-Voting Platform

1. Efficient and Cost Effective: The system offers significant cost benefits over paper elections in a vote to vote comparison. It saves an organization the cost of creating, printing and postage, since everything can be handled electronically. Online elections reduce the use of paper and the amount of work for both the organization, as well as voters.

2. Intelligent: The Online E-Voting Platform offers intelligent ballots, smart checklist features, vote tallying, tabulation and reporting. These functions are automatic and do not need to be assigned to personnel in-house. Additionally, it allows administrators to create rules on ballots so that voters cannot cast invalid votes, nor do they need to be checked while counting.

3. Easy and convenient: The Online E-Voting Platform offers the easiest and most convenient method for administrators and voters alike. For administrators, the process of setting up a ballot and conducting an election is simple and manageable.

The other advantages that the system offers are:

- Efficient data storage and Intelligent Management.
- Accuracy, real-time response and user friendliness.

Future Enhancements

In future we can add an SMS query also. ie we will get the result updates at the time of counting. To receive the SMS we need to register with our mobile number in the site.

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