

# A Review of Online Voting System Security based on Cryptography

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**Abstract**—Due to their tight schedule nobody is going to the polls these days. There are numerous causes, some need to go to the polls, many of us may have to wait for long periods because of their strict schedules. So we created a voting system on the Internet. But there are some disadvantages to this system. Attackers legally receive customer passwords and use secret passwords to major sites. Consider a corporate voting system based on the web, electing a president or secretary or key managers of the organization once a year. This survey presents a secure verifiable online voting system, which allows voters to vote secretly in the public system to benefit from early voting and it will very useful in pandemic like Covid-19. The proposed system is intended to universally support the election process by using the unique identification and biometric features of the elector. A digital witness is provided to a voter by the system to check if the voting is recorded as it intends and to check whether all the registered votes are recorded. Under the well-known elliptic curve of the Diffie - Hellman hypotheses, the privacy of the proposed system is achieved. In the current system, every elector must collect and cast his or her vote at one point on election day. We will use an alternative system called cryptography in this method. Here we split the unique image into two, four, placed in separate databases. We get the original picture at any point these two offers are interwoven. It is used as a secret password when we get the original image. This system is very useful and suitable for remote voting online. This system is an electronic system so it is possible to assess it on the web via any valid personal space on the planet.

**Keywords**—Salsa20 Key Generator, Secret Password, Secret Party Name, Verification, Vote Online, Cryptography, Ensemble Advance java.

## I. INTRODUCTION

Elections are held everywhere. However, voters have to go to the polling station to cast their vote. The political membership process is exceptionally complex and many things are needed to advance voting. Large arrangements have been made to finish. It involves manual work. Government elections are held by area. To vote, the voter must be available to vote at the polling place. This may reduce voter support; Web-based voting simplifies this undertaking. Voting in Cryptography involves security and a secure system. It is important to implement such a system. This will reduce labor, make ballot easier to use and more productive. Individuals must be available at the location for selection. Cryptography is a system of encoding voter details. In this system, the client will be contacted to upload a security message and voter

details during registration. The customer will receive the security part of the security picture via email. This share will be in an encrypted format. The customer can log in to the system to change the details at any time. Only when voting, the customer must upload a security share. If the share is incorrect, the poll cannot be voted on, because the security share is generated using random pixels, so the real picture cannot be predicted. Additionally, the share cannot be retrieved by some other client or disapproved person as it will be securely sent via email. Ballot casting will only be fruitful if the correct share relating to that client is uploaded.

Fraud sends fake messages or sets up fake sites that copy. Phishing is a form of identity online identity theft in which fraudsters manipulate Internet users to submit personal information to illegal websites. Phishing tricks are usually displayed as spam or pop-up and are always difficult to identify. When fraudsters obtain your data, they can use it for all kinds of identity fraud, risking your great reputation and a great name. Fishers will become more sophisticated in the design of their fake sites. Phishing is the data of the types of fraud, so be comfortable with a variety of phishing tricks for you as well as figure out how to prepare for it. The most valid and direct way to secure a system asset is to assign it a unique name and a corresponding password.

Cryptography is the study of protecting data. It has been used as a means of safe communication between people and governmental organizations. Today, cryptography is the foundation of advanced security technologies used to secure data and assets on both open and closed networks. Belief is the process of examining the personality of a person or thing. When you confirm something, the purpose is to check that you have a real deal. It is necessary to implement their methods to determine the level of authorization of the user of the application. Applications often do this by keeping private records that include the names of customers to whom who has access. Databases applications, for example, regularly maintain private approval tables to control the fields in records that a particular client can view or modify. Few people advocate the benefits it brings, for example, mobility, openness, improved speed and accuracy in the delivery of ballots from home and the same number that it represents are concerned about the crisis, for example, inconsistent entry, breach of mystery, and ambiguity. And a change in the effect of a political race. The project focuses on the prevention of phishing attacks and secure authentication of Internet voting

systems using cryptography. Cryptography is an encryption strategy to hide data so that it can be decrypted by human vision if the right key picture is used. Cryptography is the study of protecting data. It has been used as a means of safe communication between people and governmental organizations. Today, cryptography is the foundation of advanced security technologies used to secure data and assets on both open and closed networks. Belief is the process of examining the personality of a person or thing. When you confirm something, the purpose is to check that you have a real deal. It is necessary to implement their methods to determine the level of authorization of the user of the application. Applications often do this by keeping private records that include the names of customers to whom who has access. Databases applications, for example, regularly maintain private approval tables to control the fields in records that a particular client can view or modify. Few people advocate the benefits it brings, for example, mobility, openness, improved speed and accuracy in the delivery of ballots from home and the same number that it represents are concerned about the crisis, for example, inconsistent entry, breach of mystery, and ambiguity. And a change in the effect of the political race. The project focuses on the prevention of phishing attacks and secure authentication of Internet voting systems using cryptography. Cryptography is an encryption strategy to hide data so that it can be decrypted by human vision if the right key picture is used.

## II. LITERATURE REVIEW

From the time it takes to the current technological development, there are online voting systems. That was clarified in this document. Develop voting plans to make more efficient voting services available with ICT resources than traditional paper-based voting methods. Voters regard themselves as consumers and it is expected that the government will make the voting business more convenient. In the past decade, various forms of electronic voting, especially as additional methods of voting for remote voting, political parties, candidates, the electoral administration, and most importantly to improve the efficiency and promise of the democratic process to the electorate have attracted considerable attention.

It allows voters to access the public algorithm and parameters to confirm their turnout.

### Three types of voting systems exist:

#### 1) System of paper voting

The paper voting system is the most common system for voting. Before the electronic voting system is implemented, it will be used. The system of paper ballot includes paper and sealed ballot. Each voter uses and does not share one ballot. This system's disadvantages are i) the time it takes; ii) the speed is low.[16]

#### 2) Electronic voting system

Electronic voting systems are electronic voting devices. A voting machine that uses an electronic voting machine to allow voters to pass on their secret ballots. The inconvenience is I poor computer science individuals cannot vote correctly, (ii) safety threats sensitive, (iii) electricity consumption at polling stations; and (iv) costs.

#### 3) Online voting system

A new platform for secure votes and voting is the online voting system. Online voting systems are a web-based voting system, which transmits votes via a web browser over the internet. Voters from all over the world are eligible to vote online.

### Security issues arising from online voting are as follows:

In general applications, password protection is high and phishing attacks are not the focus of the application. Website users are not protected efficiently from phishing.

The key proposal for ensuring a secure online polling protocol to meet privacy, anonymity, eligibility, equity, verification, and unique online voting safety requirements

To achieve reliability, eligibility, transparency, accuracy, and uniqueness of the e-vote system, two milliardaires couples have created secure online voting for identities based on cryptographic algorithms.

A secure, end-to-end verifiable, Identity-based blind signature Internet voting system: IEEE, newspapers, 2020; This document has been amended Early vote, elliptical curve cryptography, verifiable end-to-end digital signature, Internet vote system. Batch venerability. Functional digital signature used by the BLS short signature system to protect voting against any changes anonymously to issue a blank ballot to voters. Future of voting: Specifications and feasibility study of verifiable Internet vote from end to end.

Phish-haven-An Efficiency Real-Time AI Phishing URLs Detection System: IEEE, newspapers, 2020; This article changed phishing URLs generated by AI, machine learning, phishing URLs created by people, lexical features, multi-threads, HTML URL encoding. Extracts web pagecontent which is therefore ineffective in computation. Non-proactive method Needs source codes or the website's entire website content. The use of multiple threading technologies on an input unit and output unit may be further enhanced by the incorporation of unattended learning.

SeVEP: Electronic polling system secure and verifiable: 2019 IEEE, journals, Authentication modified, efficiency, electronic polling, malware, security, compliance. Authentication, electronic polling process has resource allocation polling system. Developing a working SeVEP prototype and assessing its scalability and usability for real-world use.[13]

Towards Developing a Secure and Robust Solution for E-Voting using Block-chain: 2019 IEEE, Spring, This paper modified coercion resistance problem, Blockchain, Online Voting process, Developing a Secure Solution for online Election process information and To solve coercion resistance problem to solve using cryptographic algorithms.[18]

End to End Verifiable Electronic Voting System for Shareholders: IEEE 2019, newspaper, this article amended Electronic vote, voting by shareholders, verification end-to-end, zero evidence of knowledge, Decision Diffuse the assumption by Hellman, safety evidence and verifiable electoral process. More generally, voters can leave and

leave dynamically within calculation periods if using a smartphone.

Secure Online Voting System Using VC: 2018 IEEE, Spring, this paper modified and using Visual cryptography, security share, voting system. Secure a voting process for using Cryptography task scenario and Improvement in an existing algorithm.

A Scheme for Three-Way Secure and Verifiable E-Voting: 2019 IEEE, journal, This paper modified and using Electronic Voting, Anonymity, Verifiability, and Paillier Cryptosystem, Homomorphic Encryption process on the distributed implementation of Three way Secure and Verifiable Election process.[21]

The Security Issues of The Online Voting System: While inheritance of such items in the source code is not acceptable, the root of the security problems which have occurred have not only been attributed to outsiders (for example voters and attackers) but also to insiders (for example program developers and administrators). These mistakes caused a vote system crash.

The solutions suggested for stopping these attacks have therefore been outlined. To prevent hackers from getting into the voting system over a network we can, for example, develop our system to transmit data without a network. Another example is to limit voting to unique input data to prevent command injection.

### III. METHODOLOGY

The rapid development of technologies and Internet popularity lead to the digitization of diverse types of technology, such as electronic commerce, e-democracy, e-government, etc. To minimize costs and red tape in public departments, the contemporary states are seeking to provide people who can participate and benefit from online services by increasing the number of activities associated with this new medium. Electronic voting is one of the most important Internet-related activities. The modern recently We consider the same methodology as the one we discussed for estimating the operating machine cycles (for example, private and public operations based on Salsa20 algorithm, operations on elliptic curve and pairing).

For example, (1) use of electronic voting can reduce or eliminate undesirable human errors, (2) in addition to its reliability, the online voting system does not need geographical proximity of voters which increase the number of participating voters, (3) e-voting saves a lot of time for voters and reduce a cost when counting the voted ballots.

#### 3.1) What approach is taken by the author

Once all the nodes of the network are running, a new user can connect to the server. The user registers a non-anonymous user (using Adhar Card, phone, password, etc), and performs the login. The user produces an RSA key pair locally (private key & public key). With the Public-Key server, the user blinds his public key. The public key of the user is blinded and forwarded to the server.[16]

The server Blind Signs the Public-Key blinded from the user and returns it to the user. The user unblinds the Public-Key signed by the server, and now has the Public-Key Blind Signed by the server. The user sends the Public-Key blind signed to the p2p network. The peers verify that the Public-Key Blind Signed is correctly signed by the server, if it is, they add the Public-Key to the Ethereum Blockchain, inside a new block.

#### 3.2) Our approach

As per recent research RSA method to secure data with blind signature has some flaws and can be cracked using high-end computational devices. So we will be using a more secure Salsa20 security algorithm which is found more to be more secure than an existing algorithm like RSA and AES. Also, Salsa20 is more FAST and lightweight than RSA and AES. Salsa20 is FAST in terms of encrypting and decrypting. This means it can encrypt more messages per cycle compare to RSA and AES. Also, it is lightweight means it requires less computational resources compared to others. Despite such benefits, Salsa20 provides better security.

## IV. REQUIREMENT ANALYSIS

Before designing a voting system, a complete and detailed set of requirements must be developed. The design requirements for the online voting system are divided into 2 groups during this work: the general one and the system one. The general requirements of any voting system are complied with. The requirements of a system are, on the other hand, essential for the development of a developed system. System-specific requirements, on the other hand, are system-specific demands. Allow system requirements specific to the system:

- i. Multi-user: Many voters can vote simultaneously;
- ii. Accessibility: System access can be accessed by voters in any location using secure internet and/or mobile devices.

#### Design of the system framework:

The framework was designed to define the frameworks for the application. The structure for the defined objective is the emerging framework of this design process. The infrastructural model architecture in which models are developed is an integral component of the model design.

Based on the earlier (the study was not published), in comparison to cryptography, it can be seen that the cryptographic algorithms of voice data packets using serpent damage or loss of some packages during shipping. No Voice Data Packet Loss occurs when you push to talk to the algorithm salsa20.

And the salsa20 algorithm in another previous study Implementing the security and SMS is found to be relatively short in Salsa20 encryption and decryption.

This experimental test enables analysis of salsa20 Stream cipher algorithm as a cryptographic sound data packet algorithm. From Table 1. we can see that the first packet encryption process is Salsa 20 Faster than the decryption process.

When the Salsa20 algorithms are being implemented to speak, there is a delay of 1.9 seconds, but the push to talk application doesn't change performance.

Encryption & decryption of voice data Packs is successful because the encrypted voice data packets on the Android Smartphone can be heard using Salsa20 algorithms.

The bits Modified from the bits of the normal audio data packet with bits of the encrypted audio data packets can be seen from an avalanche effect test. We know that salsa20 has good performance to secure voice data packets based on the Avalanche effect's value.[19]

## V. SOFTWARE REQUIREMENT

To test this framework, the software has been developed and deployed. The program is based on Java, Spring Tool, XAMPP server, HTTP SMS gateway. Windows XP, Windows10, and others.

### Evaluation and performance checks:

User understanding of the system is developed following experimental use to determine if the core values required in the voting system have been developed in accordance with the online voting system. The following research questions arose in connection with guided questions whether the developed online voting system meets the desired general safety requirements of voting systems:

- i. Can a vote be unreserved? "Integrity" requirement,
- ii. Is it possible to verify who electors claim to be? "Authenticity" requirement.
- iii. Is it possible to vote only once by eligible voters through the developed online voting system? "Democracy Requirement."
- iv. Can no polling be ensured by the developed online voting system.

liked to the electorate or any other voter? Requirement for "Privacy".

## VI. SYSTEM DESIGN

The system has three modules such as:

- admin module,
- client module and
- server module.

The application requires the user to register and then register with the same username and password. The user must then choose the candidate to vote for. After the user clicks on the

'Vote' buttons, his e-mail id will be transmitted to him, whereas share2 will be downloaded automatically on the server.

Certified users will be shown a captcha that users must use properly. Properly entered into the voter details, the user's vote will be successfully registered.

To approximate the computer cycles consumed by operations using a highly verifiable safe online voting system in which each elector is authenticated using a unique identifier provided by the relevant authority and his biometric details (for example, private and public operations based on RSA, operations on elliptic curve and pairing). The appropriate cryptographic operations' notations and the number of computer cycles they absorb. Our system's success in comparison to other systems. The suggested method and system are based on ECDL and GDH problems and use elliptic curve cryptography. The security of the systems is focused on the discrete logarithm problem (DLP) and integer factorization problems, and they are based on the standard RSA public-key cryptosystem (IFP). The ECC-based operations (scalar multiplication and addition) are more efficient than the RSA-based operations.

### 6.1 Requirements for an election system

Researchers also defined a series of specifications for a reliable electronic voting protocol in this framework.

### 6.2 Security Requirements

Since the internet seems to be an unstable place, protection plays an essential role in every voting method, particularly e-voting. For the electronic voting framework to function without bugs, it must be applied according to safe design. Despite the system's difficulty of architecture and execution, it seems that certain principles are universally agreed upon as the minimum security specifications for electronic voting.

### 6.3 System-Wide requirements

In this section, the system-wide requirements for implementing voting protocols are discussed-Voter conveniently: Voters should be able to vote without consulting the voting authorities and complete the voting procedures with the bare minimum of skills and equipment-Voter mobility: Voters should be able to vote from either location without restriction. The scheme is successful if the number of electors and the authorities' involvement in the protocols is equal to the computing and communications resources.

Salsa20 is Daniel J. Bernstein's software-oriented stream cipher. The algorithm can support 128-bit and 256-bit keys. The updated state is used as a 512-bit keystream output following  $r$  iterations of the Salsa20/ $r$  round function. Each output block is an independent key, nonce, and counter combination and, since there is no link between blocks, the

Salsa20 operation is similar to a block cipher operation in counter mode.

Analysis: Salsa20 underwent significant cryptographic analysis over the years following its publication. While several attacks on smaller versions of the cipher have been found, there is no better attack than an exhaustive key search on either of the Salsa20.

**STREAM CIPHER WITH SYMMETRIC SECRET KEY**

Key length = 32 bytes

**VII. THE SYSTEM ARCHITECTURE**

For found detection and prevention, we are proposing a new method for detecting phishing websites. Our method uses cryptography and it is based on an Anti-phishing providing authentication scheme. The proposed system can be divided into two Flowcharts one is Registration Flowchart and the second is Login Flowchart.

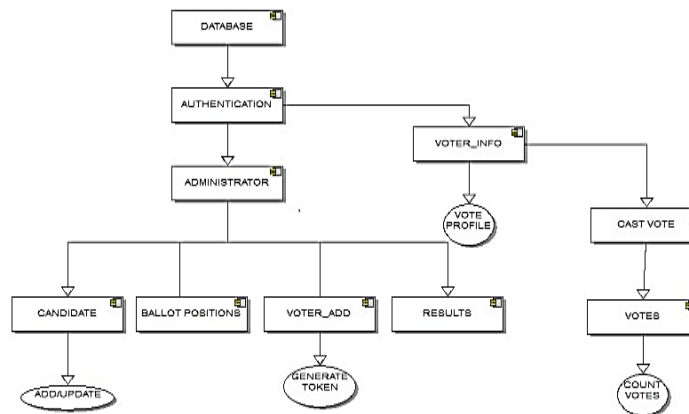


Fig. 1 System Architecture[14]

**7.1. Registration Flowchart**

The text of these images is the password for the user when the flowchart is registered. The image is divided between the user and the server. The image is shared. The user will share the user with the login Flowchart for further verification. The details of voters are also stored as confidential data for the current website database.

**7.2. Login Flowchart**

The first user to request a user name (user id) in the login phase is a user name. Then the users requested to enter their share with him. This share is forwarded to the server where every user stays the share and share stored in the website dataset for the security of each user.

Authentication is the process by which the person claims to be. The user id is sent to the server for this purpose and the appropriate password will be retrieved from the database. Now you compare the password of the user and the password of the database. Thus you can check whether the website is a real/secure website or a phishing website using the username

or password generated by stacking two shares and also check whether the user is authenticated or not.

**7.3. Datasets**

The online voting system uses an online voting database consisting of two datasets:

Login details – The table contains registered user/voter logs and passwords with appropriate user names. It has voters/user contacts, telephone, and e-mail addresses as well.

Voting details - The candidate record and the voters who voted for the candidate shall be included. Its main key is the ID field that is also necessary for counting votes.

**VIII. PERFORMANCE ANALYSIS**

This compares our system and its performance with the related online voting systems. Assume that Weil is defined by the PBC library's Type-F (BN curve), 256-bit-group pairing, and 512-bit embedded pairing with RSA-identical security level.

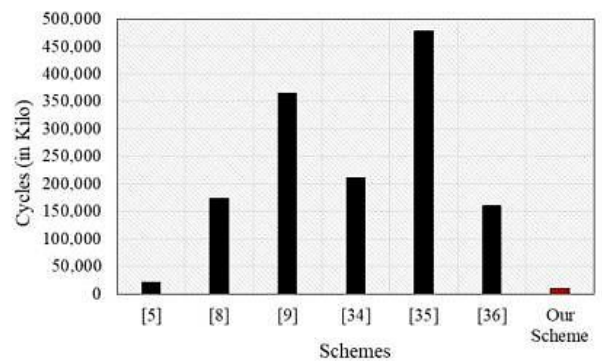


Fig 2 Our scheme and other schemes are costing the calculation[22]

Implementing and comparing the performance of our proposed online voting system to the corresponding machine cycle schemes obtained through simulation. We consider estimation of the operational machine cycles (for example, private and public operations based on curve and pairing, RSA operations on elliptic).

These systems are based on the traditional public-key system Salsa20 based on the discrete logarithm (DLP) system and are safe (IFP). Compared to Salsa20 it can be seen that the ECC (scalar multiplication and supplement) operation is efficient.

**IX. CONCLUSION AND FUTURE WORK**

The cryptographic online voting system overcomes restrictions on the traditional voting system. This system offers more safety and takes a while. There is also no chance of voting fraud. There is a significant reduction in the money spent on security. This method aims primarily to provide full privacy to voters and to ensure that the online voting system is coordinated optimally. The fundamental idea of this system is to use a strong voting authentication security mechanism. Visual encryption encrypts information and can decrypt it without mathematical calculations. People with an internet

connection at home can vote at the polls without any problems. Visual cryptography is used to conduct elections fairly easily and efficiently using these internet-based voting systems since voters can vote from the point of view in which they operate using the online voting system. Various advantages include low costs and increased voting attendance online voting. Online voting offers This online voting system takes careful account of safety and human factors, and in particular, ensures that the electorate has reliable and intuitive indications on the validity of the vote. The system we proposed to provide voters with mutual authentication and choosing with visual encryption.

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