

# Performance Computation Model and Time Latency Improvement for Blockchain-Based Voting System for Elections in India

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## Abstract

Blockchain is inalterable and simple confirmable framework that has a noteworthy potential to be an option in contrast to customary races. It carries savvy answers for focal power issue as far as squares having all information in blockchain. In past decades customary races neither fulfill the residents nor government official. The democratic isn't completely made sure about, compromises security and straightforwardness of voters alongside having an excess of time to check the vote. In this paper, we proposed a model that giving the arrangement utilizing the blockchain to dispense with all drawbacks of customary decisions. The security of information, votes and voter is guaranteed in the framework. The sitting tight an ideal opportunity for result diminished fundamentally through the proposed model.

**Keywords:** Blockchain, Voting, Electronic Voting.

## 1. Introduction

Elections are one of the significant instrument to got the vote based system any nation. Elections give the opportunity to choose your preferred individual for lead the country. In this manner, it is a lot of significant for each individual of the nation to included and take part in Elections to assemble the eventual fate of the country. In any case, this is a lot of significant that political decision system must be a lot of conspicuous and reliable in its inclination. The administration association that engaged with Elections need to guarantee individuals' protection and vote's security. In addition, the political decision commission is answerable for checking the votes and delivering the outcomes however there is an opportunity of robbery or control of votes and results if commission setting aside long effort to tally the votes. The reliability of any elections is a questionable issues which depends on the territories of the elections. Particularly, those zones where the paper elections are overseen by the political elections commission. Along these lines, there is an extraordinary danger of security and protection of political elections and the votes during checking them effectively while the time is another significant factor to report the political

elections result convenient. Subsequently, in this paper an endeavor is made to elevate the security, protection and execution of the electronic democratic framework.

This is a way to deal with expel the escape clauses or disadvantages of the customary elections frameworks and attempt to profited by web based democratic framework to computerise the entire procedure. There are a few issues in traditional democratic just as electronic democratic that can be settled by the utilising the blockchain instrument that has capacity to make sure about the voter's protection and information (votes).

A blockchain instrument takes a shot at the dispersed and undeniable system framework that conjures the extremely secure exchange of squares with no go between. In this system the enlightening qualities trade carefully that can't be modify at any stage. Because of these such usefulness a blockchain can possibly turn into an option of the conventional decisions and give a savvy answer for the political elections commission where all the squares have all the information (votes) as chain that is difficult to change a data of the square which increment the security of the data that put away in it. As in conventional elections there is a lot of time required to declare the consequence of the democratic however blockchain resolve this issue by its tendency on the grounds that the last hub of the blockchain has all the data which is sufficient for checking the vote simply look the last hub and get all the data and this lessens the holding up time exponentially. In this manner, this paper proposed the arrangement explicitly for issues of customary paper elections in INDIA. Security and protection of votes and voters and the speed of checking votes and reporting the outcomes are talked about in the arrangement. An agent model of the framework is introduced in Proposed Solution segment.

## 2. Related Works

As the blockchain based democratic framework is secure and safe democratic component still it isn't broadly received by the few nations because of some exhibition and time inactivity issues in casting a ballot framework. Hence, there are a few analysts have done parcel of exploration to improve the presentation and time inertness. Let us first quickly examined some exploration works identified with blockchain based democratic framework. F. P. Hjálmarsson [1] et al have proposes a novel electronic democratic framework dependent on blockchain that tends to a portion of the impediments in existing frameworks and assesses a portion of the mainstream blockchain structures to build a blockchain-based e-casting a ballot framework and assess the capability of circulated record advances through the depiction of a contextual analysis; specifically, the procedure of a political race, and the execution of a blockchain-based application, which improves the security and diminishes the expense of facilitating an across the country political decision. A. Barne et al [2] have proposed to fathom the issues of advanced democratic by utilizing blockchain innovation. M. Pawlak et al [3] have portrayed the utilization of shrewd operators and multi-specialist framework idea for Auditable Blockchain Voting System (ABVS), which coordinates e-casting a ballot procedure with blockchain innovation into one regulated non-far off web casting a ballot framework which is start to finish unquestionable. P. Tarasov and H. Tewari [4] have introduced a methodology that included a convention created on blockchain innovation. The basic innovation utilized in the democratic framework is an installment plot, which offers secrecy of exchanges, an attribute not seen in blockchain conventions to date. Bartolucci et al [5] have talked about potential employments of the blockchain innovation to execute a protected and reasonable democratic framework and presented a mystery share-put together democratic framework with respect to the blockchain, the supposed SHARVOT convention. B. Wang et al [6] have proposed homomorphic ElGamal encryption and ring signature, an electronic democratic plan dependent on blockchain for enormous scope casting a ballot. R. Hanifatunnisa and B. Rahardjo [7] have talks about the chronicle of casting a ballot result utilizing blockchain calculation from each spot of political race and proposed a strategy dependent on a foreordained turn on the framework for

every hub in the worked of blockchain. R. Krimmer et al [8] have talked about the utilization of e-deciding in favor of the decisions to the Austrian Federation of understudies.

### 3. Experimental Study

Electronic Voting is the new period of the election of any nation which is broadly considered however embraced by certain nations in nowadays wherein INDIA is one of them. There are casting a ballot is done through electronic democratic machine. The way toward casting a ballot through the EVM is extremely straightforward, the voter go to the surveying stall as per their surveying territory alongside voter ID gave by the legislature of INDIA. The voter ID is confirmed by the surveying official and permit the voter to give the vote through the Electronic Voting Machine (EVM) and not permitted if the voter ID isn't checked. The vote is put away in the memory that is introduced in the democratic machine. The checking of casting a ballot is start after certain days when all the EVM have been gathered by the administration to its focal Warehouse and the aftereffects of casting a ballot is reported subsequent to finishing the tallying of votes. The checking of votes is done physically so there are as yet an opportunity to miscalculating the votes or altering the votes during the tallying. Subsequently, handle these dangers of miscalculating or abusing the votes another democratic methodology is prepared to begin for example I-casting a ballot (web casting a ballot) which is blockchain based election approach.

#### 3.1. Blockchain Based Election System

The blockchain based election framework has not been applied generally yet. This methodology is applied in constrained nations, South Korea is one of them which applied this methodology of election and reach to an effective resolutions in year 2017. Thusly, it is an endeavor to present another methodology of I-Voting a ballot (Blockchain based elections) in INDIA. The working instrument of Blockchain Based elections is represented in figure 3.1.1.

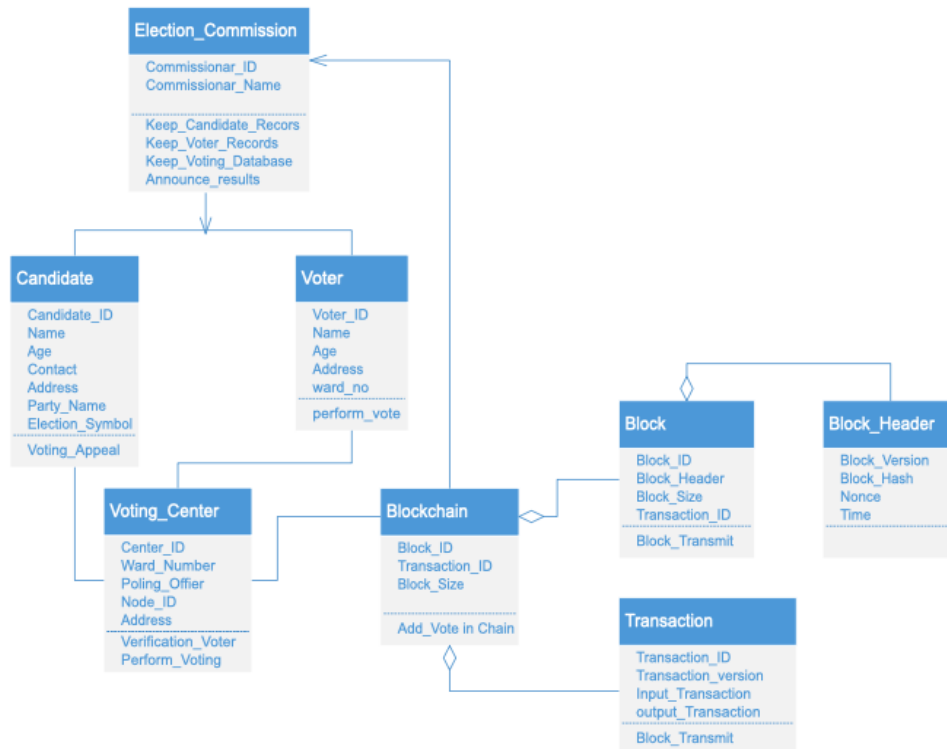


Figure 3.1. 1. Class Diagram for i-Voting System (Blockchain Based Election)

In current innovation, blockchain is the most noticeable option of the conventional races for protection, security and consistency. For planning a protected blockchain in a vigorously populated nations think about numerous angles. First factor is human for such a framework, human impedance is completely precluded. In this manner, there are number of hubs (PCs) are viewed as that are near human interface. There no other information is considered aside from the vote that framework invigorate the to prevent from taking votes or evolving votes. The subsequent factor is to shielding the framework from programmers and ensured that one voter can cast a ballot just one time. As the vote is projected by the voter, the political race commission will be educated about the vote without uncovering the data about the vote. At that point political race commission award the consent to voter cast the vote. It is preposterous to expect to cast a ballot over and over by the voter in light of the fact that the elections commission give an electorate information of voters. Albeit a programmer is gotten the resident data and entered to the framework, he can't cast a ballot more than one time. It is beyond the realm of imagination to anybody to change in the acknowledged exchange in the blockchain on the grounds that in blockchain each exchange is associated or identified with the past exchange. In this manner, the democratic is a lot of dependable in blockchain innovation instead of conventional decisions in light of the fact that the blockchain is so much predictable. On the off chance that the programmers hacked the framework for controlling in casting a ballot distinguished promptly because of an incredible synchronization between hubs.

### *3.2. State Transitions of Blockchain Based Election System (i-Voting)*

The Government (election commission) in this framework gives the approval to the residents of the nation that they can play out the vote at the democratic focuses. Additionally, the election commission and residents of the nation's decide the up-and-comers that will be taking an interest in that political decision. The voting booth data, up-and-comers and resident polling station connection will be given by the election commission which is the confided in party in the races. After resident's vote, it is added to the blockchain that is proposed in this examination work and any vote has an assurance from the framework about being changeless. Since a chain contains all the resident votes namelessly toward the finish of the elections, the official outcomes will be reported inside minutes after the election ends. Any concerning outsider can get the chain and tally the decisions in favor of being certain that casting a ballot is truly trusted.

The state transition or state chart diagram is represented here in the figure 3.1.2. that shows the transition of states at any time. The citizen/voter is an initial or starting state where the voter went to the voting center where the citizens are verified by checking the pooling officer if the citizen found right the voter allowed to perform the vote by choosing their favorite candidate and the choice of the voters are saved in the blockchain and send to send to central voting warehouse for counting at same time and announcing the result of the election in a quick time.

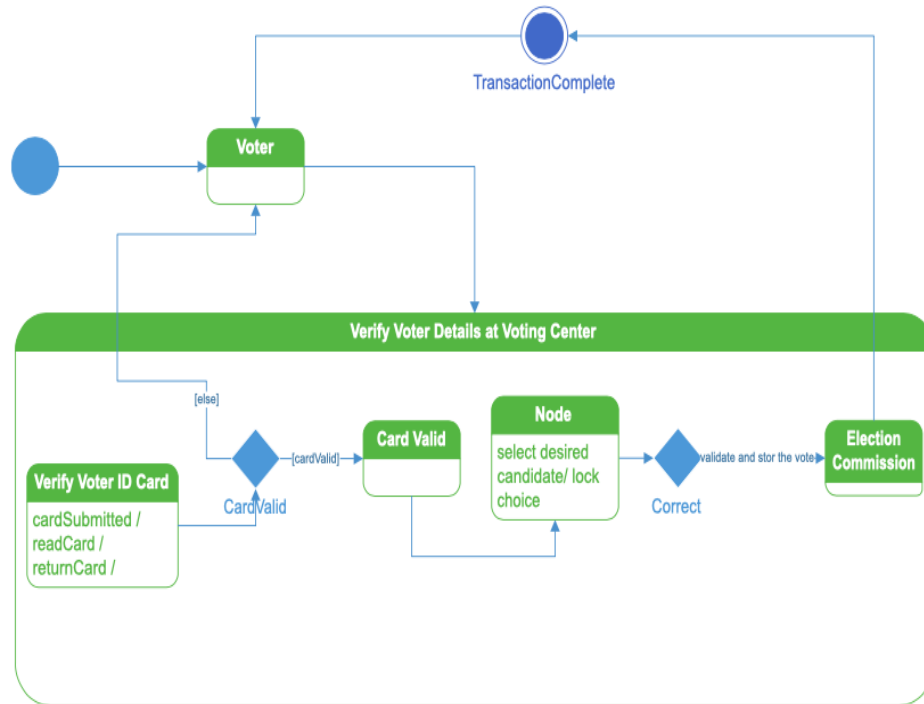


Figure 3.1.2. State Diagram for Blockchain Based Election System

### 3.3. Layered Architecture and Time Latency

A system is proposed here that has a layered structure. The layers of the system are dependent on the necessity of the country; for providing a fast, consistent and secure system, designed it into a layered manner. Reasons behind using a layered architecture are explained below in detail. Suppose the whole country represented the voting on a single blockchain, the performance of the system would be affected because of huge number of ballots and the distances of the voting centers. These factors cause the latency, the time latency is the major problem when the country under the same blockchain. In INDIA the expected time latency would be much more higher than the expected time because INDIA is a Highly populated country that consists of thousands of voting centers where voting is performed at the same time at each center. Therefore, synchronization of the system would take lots of time. So, in order to decrease time latency, the blockchains are distributed over the states or stages of voting. From initial state/stage to final state/stage, there will be different chains at each state/stage, and connections between state/stage will be provided with a secure system.

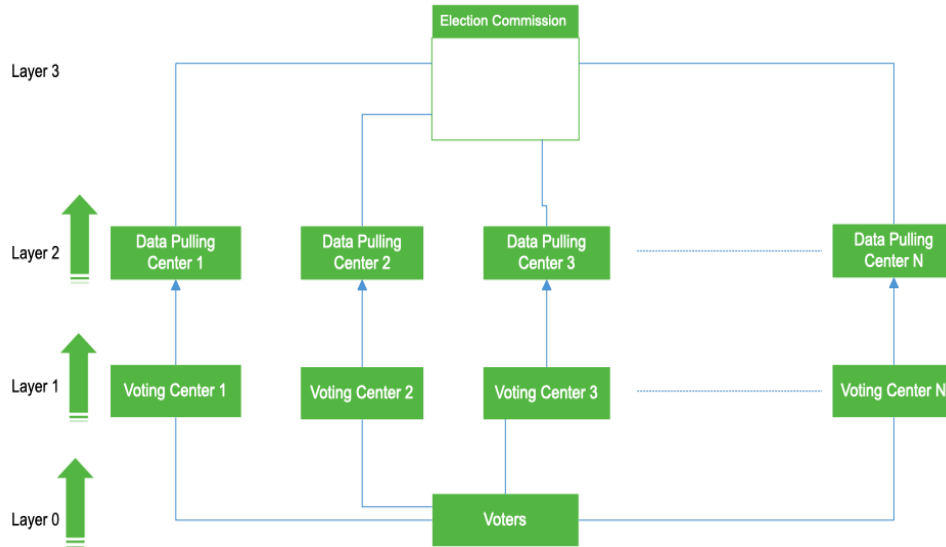


Figure 3.3.1. 3-Layer Architecture for I-Voting System

A 3-layer architecture for i-voting system is represented in figure 3.3.1. at the first layer there will be a chain that containing the several nodes known as voting centers. The voters perform their vote here after the verification by the polling officer. As there are limited numbers of nodes in every voting center and there are many voting centers in all the country. So synchronization will take adequate amount of time on that the chain will perform the voting without any latency. For that arranged the number of nodes in good patter. A system is try to build here which working on the government system that hold the voting data that was performed by the voter into Central voting data warehouse. In that system only those voters can vote who have authenticated ID proof issued by the government and one voter can give one vote only at a time, no proxy voting and tampering voting is done. When the voting process authenticated and satisfied, the voter can perform the vote otherwise voter has the choice to not give the vote anybody.

At the second layer, a cluster of chains is taken here that stored the data which coming from the first layer where blockchain technology used to make system consistent. At the second layer there are adequate numbers of nodes according to the country's population. Therefore, huge improvement in performance of the system due to increased number of nodes decreases the time latency. Hence the performance improved exponentially as the number of nodes are increased at layer 1 and layer 2.

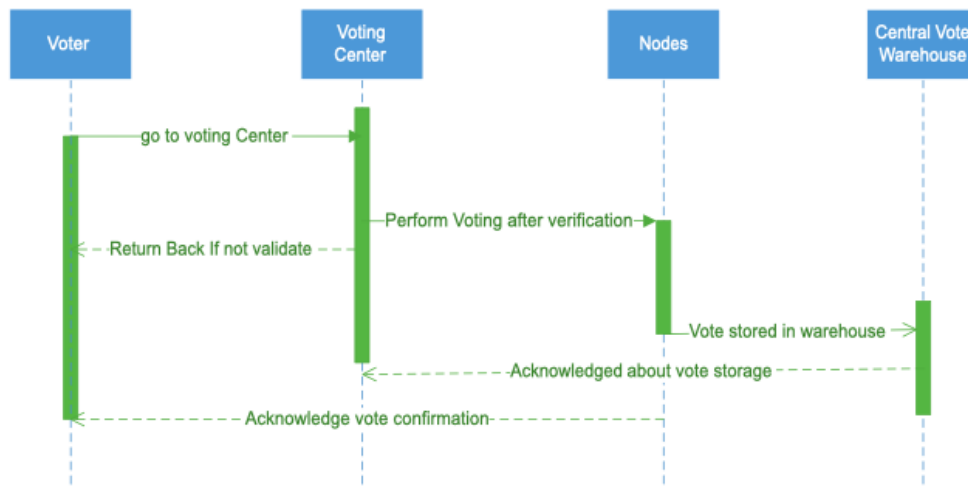


Figure 3.3.2. Sequence Diagram for Blockchain Based Election System

The communication between these layers are done periodically through the communication protocols, so there is a time delay between each synchronization of layers because a huge complexity between these synchronization layers if every vote consider at the same time, a deadlock situation may arise. For country like India the synchronization time of voting more than 5 minutes i.e. each node send the chain data to the upper layer nodes (voting centers) through a synchronization algorithm.

### 3.2. *Algorithm for Synchronization*

The nodes (Voting Centers) of the selected area using the same blockchain, so each node having a file that store the numbers of votes accepted from the upper layer at previous synchronization step. The voting is stopped for very short time due to voter is verified by the polling officer this took some time almost 3 to 5 minutes and then resynchronize the blockchain data between layers. The consistency of data is verified which is arrived from the lower layer to upper chain. If the consistency is confirmed the data (vote) is accepted and updated this into the file attached with this node. The nodes always know that how many votes are accepted at both layers and update the blockchain which is further considered as a transaction block.

The inconsistent data arrived from various machines to the upper layer considered with extra care. If the data not satisfying the consensus the data will not accepted and liable to decline. For the safe side the same data send to the upper layer for consistency satisfaction. This process continue until the consistency of votes are satisfied at each layers. Therefore, the election related data are stored in blocks which are categorized into two type such as: first one for building blockchain at lower layer that stored voter information, ballot box information and prev\_hash info that is used when creating block which is added to blockchain. The block synchronization algorithm is represented below:

#### **Step 1: Authentication of voter**

- *Nodes (Voting Centers) gets the login details of voter and send them the central voting warehouse system along with voting center ID..*
- *Central Voting warehouse System (Government) validate the voter details (login details, voter info, node\_id).*

#### **Step 2: Voting**

- *Let vote → Block, vote= (voter\_id + election candidate)*
- *add(vote, chain) Block is added to blockchain*
- *Block information is updated to all the nodes (voting Centers)*
- *Acknowledged the vote and update the voter's information(voter\_id, voter List, update) in central voting warehousing system.*

#### **Step 3: Vote Counting Process**

- *Get the candidates list*
- *Count the votes (Blocks) and determine the results*  
*Result → Count (Blocks, Candidates)*
- *Recheck the final blockchain by third party for any anomalies in blocks counting.*

#### **Step 4: Exit**

## 4. Conclusion and Future Scope

Democracies depend on trusted elections and citizens should trust the election system for a strong democracy. However traditional paper based elections do not provide trustworthiness. In this paper, we proposed a blockchain based e-voting system which provides trusted, secure and fast voting system for India. Proposed system is suitable to apply in another country whereas

integration is a hard work since each country has different laws and election system changes between countries. For the future work, system can be applied for a use case and measurements can be taken to compare if the calculations hold. Synchronization and consensus algorithms can be discussed and improved for better performance and security.

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