

Cloud based e-Voting: One Step Ahead for Good Governance in India

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ABSTRACT

This paper presents an effective secure and fear free e-voting model based on cloud computing. On implementation it will facilitate those voters who are willing but not in the position to cast their votes owing to their absence from head quarter for reasons beyond their control. In this paper e-Voting model has been integrated with AADHAR CARD or Unique Identification (UID) card data base using cloud. By integrating e-Voting model with cloud infrastructure and AADHAR CARD database, percentage of polling would increase and can provide authentic electoral voting mechanism to satisfy the need of the voters. Cloud computing would also accelerates the e-Voting system because of the new architecture and secure technology. It would enable users and developers to utilize computing resources that are virtualized and serve the needs of the voters via the internet.

Keywords

e-Voting, Web services, Cloud computing, Aadhar Card Database.

1. INTRODUCTION

Cloud computing is a new technology that provides the computing platform for sharing resources that includes infrastructures, software, data centres, applications, and business processes. It is a paradigm that focuses on sharing data and computations over a scalable network of nodes. These nodes include end user, computers, data centers and cloud services. Cloud computing provides the computer technology via the internet. It enables users and developers to utilize computing resources that are virtualized.

According to National Institute of Standards and Technology, USA (NIST) "Cloud computing is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction"[1].

e-Voting and cloud computing are well established concept as an individual so far, there is a considerable space to incorporate the e-Voting with cloud computing to make it success, an integration approach can certainly be proved as a better and efficient election process.

An election is the "formal choosing of a person for an office, dignity, or position of any kind; usually by the votes of a constituent body" [2][3].

For any democratic country, the election plays an important role in the formation of the government.

There are two types of popular voting systems in India that are being used. The first is Paper Ballot Voting System, in which votes are casted and counted manually using paper ballots and the second is the e-Voting.

2. e- VOTING

e-Voting is an election system that allow voter to cast his/her secret ballot electronically. Electronic voting technology can include punched cards, optical scan voting system and specialized voting kiosks (including self-contained Direct Recording Electronic Voting System, or DRE). It can also involve transmission of ballots and votes via telephones, private computer networks, or the internet [4].

In general, two main types of e-Voting can be identified [4]:

- e-Voting which is physically supervised by representatives of governmental or independent electoral authorities (e.g. electronic voting machines located at polling stations);
- remote e-Voting where voting is performed within the voter's sole influence, and is not physically supervised by representatives of governmental authorities (e.g. voting from one's personal computer, mobile phone, television via the internet (also called i-voting).

Being computer aided method Electronic voting can speed the counting of ballots, reduce election cost and can provide improved and easy accessibility for disabled voters. In 2004, India had adopted Electronic Voting Machines (EVM) for its election in parliament. The Electronic Voting Machines (EVM), which contains two devices, one device is the Ballot unit that is used by the voter and is connected by a five meter cable with another unit, called Control Unit that is operated by the polling officer. The ballot unit has a Blue Button for every candidate and the voter can press any button of his/her choice. During the election process the Polling Officer will press the ballot button from the control unit, this will enable the voter to cast his vote by pressing the blue button on the ballot unit against the candidate and symbol of his/her choice[5]. A ballot unit is connected to the control unit and in one control unit, 4 ballot units can be connected. In a ballot unit, there is a provision for 16 candidates, and if the candidates are more than 16 then another ballot unit is connected to the control unit. So in all, 64 candidates can be attached, and if candidates are more than 64 in a particular election then another control unit needs to be used.[6]

The working of EVM is centered for one particular booth and records the votes polled only on that booth. The polling by the EVM and paper ballot voting system needs to check the identity of the voter with the help of electoral rolls available with the polling party and produced by the voter ID card or other documents as and when prescribed by the Election Commission of India. The finger nail tip of the voter is also coloured / marked by the particular marking ink to prove the evidence that he/she has casted the vote.

It is the concern of the government that polling percentage remains at most 60-65% in most of the elections and the possible reasons for that may be (i) that the public in general has not emerged as they have no interest in polling (ii) they have interest but are not in a position to cast their votes owing to their absence from head-quarters for reasons beyond their control. Previously for the officials, busy in election duties were authorized to exercise their franchise by postal ballot but this arrangement is seldom used and for masses no remedy is provided till date. In this context, the use of AADHAR CARD database, cloud computing and other ICT tools can be used.

Aadhaar[7] is a 12 digit Individual Unique Identification (UID) number issued by the Unique Identification Authority of India (UIDAI) on behalf of the Government of India. The UIDAI's mandate is to issue every resident a unique identification number linked to the resident's demographic and biometric information, by which they can use to identify themselves anywhere in India, and to access a host of benefits and services. The card not only has complete data of citizens viz. Name, DOB, Address, PAN No., Bank Account number etc but also has a unique record of the iris images and scanned image of all hand fingerprint which have a unique feature of that human beings. So the authority maintains a database of all residents' biometric and other data. Aadhaar data can be used for e-Voting with the use of cloud computing. There is a considerable space to incorporate the voting with cloud computing to make it a success. An integration approach can certainly be proved to be a better and efficient solution.

There exists an ample amount of work on e-Voting but still there is a considerable scope to extend in this field especially in terms of cloud computing. There is no holistic work and approach suggested to exploit the cloud service in terms of e-voting therefore this paper is an attempt to provide an innovative and efficient model for e-Voting.

3. BENEFITS OF CLOUD COMPUTING IN e-VOTING

The benefits of cloud computing are:

- Cloud helps in analyzing large amount of data and in detecting any discrepancy and redundancy[8], provides mechanism to enhance the security and reliability of data to validate the voter from AADHAR database and to collect and count the votes in Election Commission data center.
- Cloud provides the location independent platform for the communication using fast reliable internet with efficient fast computing power so that a user can work at anytime from anywhere using the Web to cast the vote. [9].
- Cloud virtualization technology allows backup and restoring [10].
- Cloud helps to provide the quality services at the time of high load by using the number of resources. Cloud

computing supports mechanism and policies for the distribution of load among the resources.

- e-Voting applications can be speedup using the cloud architecture that provides more powerful servers, more memory, CPU, and fast storage device. The goal of cloud computing is to apply super computing power to perform trillions of computations per second.

For the implementation of successful e-voting, using the concept of cloud we are providing here theoretical framework of cloud based e-Voting. This paper proposes an architectural framework of e-Voting which will be helpful to make e-voting services more effective and realistic using cloud services in terms computational efficiency.

4. A PROPOSED MODEL FOR e-VOTING SYSTEM IN INDIA

In Electronic election process or e-Voting, involves three basic steps:

1. Election Booth Setup
2. Voting
3. Result

Election Booth Set-Up: For the purpose of election set-up we need a polling officer, who will setup an election booth for eligible voters and provide the required infrastructure for scanning iris and fingerprint with the computer.

Voting: Voters will cast their vote through voting website and the system will authenticate their identity. If authentication was successful, the voter will be allowed to cast their votes. He/she can do this by clicking on the election and a electronic ballot will appear. When he/she submits a ballot, the results are encrypted and kept anonymous. The voter is issued a token number and is now blocked from voting for this election again.

Result: Once voting has ended, the results are immediately tabulated. The declaration of results will be done by Election commission. For any dispute the results are made available to anyone who will be able to verify the results by their token number through the voting website.

Based on the above mechanism the proposed model will have three functional modules namely:-

i) **User Request and Authentication (URA):** When a user request from any of the polling centres of the country then the system will asks the UID No. and scan iris and fingerprint of both the hands. The User Authentication Server (UAS) would validate and verify the users authenticity by interfacing the UID card i.e. AADHAR CARD database. Once the user authentication is done, then the voter is connected to election commission polling server and e-ballot paper is loaded on to the registered computer of their area (e.g native place) that is mention in the aadhar (UID)'s Permanent address. Then the voters fill in the e-ballot or cast their votes to the candidate of the his/her choice. All votes remain secret while the voting takes place and are submitted in encrypted form to the election commission polling server. The election commission polling server verifies the legitimacy of the voter and generates a token to the voter. Suppose that if a voter has already voted, then the server will not allow the voter to cast the vote.

ii) **Vote Counting Server (VCS):** It is the server that receives the authentic casted vote after generation of the token

by the Election commission server. The VCS collects the count of the votes to provide the result.

iii) **Service Management (SM):** The above certified and mapped service is then dealt with according to the consumer or end user satisfaction level. The model will essentially

monitor the mapped service in terms of authenticity, privacy, security, service delivery time and quality. The model would also be responsible for secured service by fetching and delivering the service through secured transmission channel ensuring the user satisfaction.

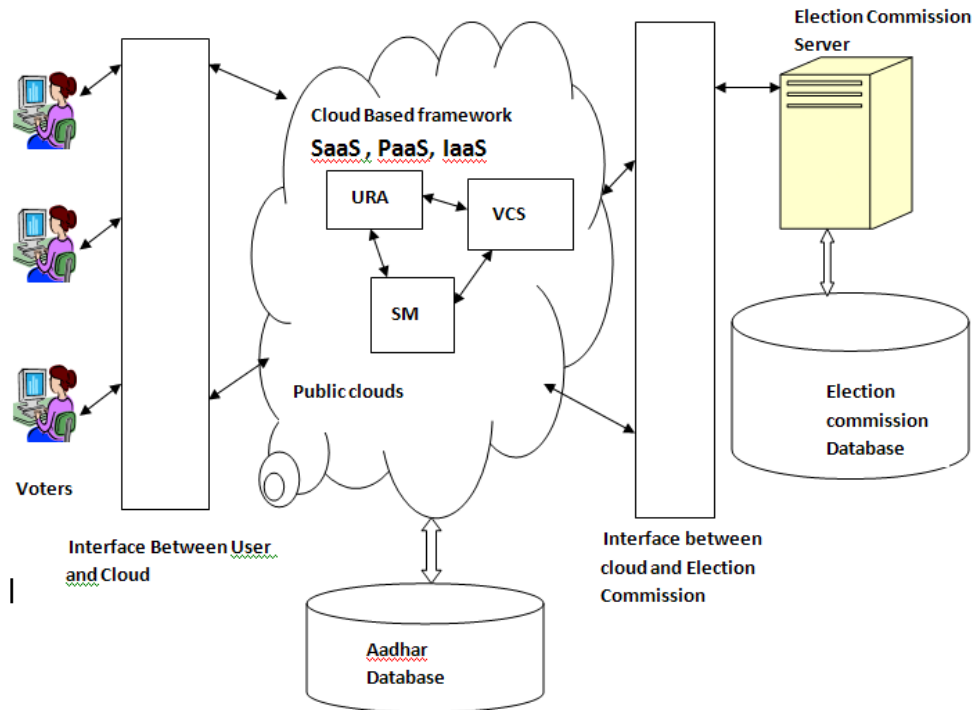


Fig. 1: Proposed Framework Model for e –Voting

In the above proposed model Fig. 1, a cloud based model is used that provides the computing platform for sharing the infrastructures, software, applications and resources (e.g.

networks, server, services) for the quick, reliable, authentic and secure services.

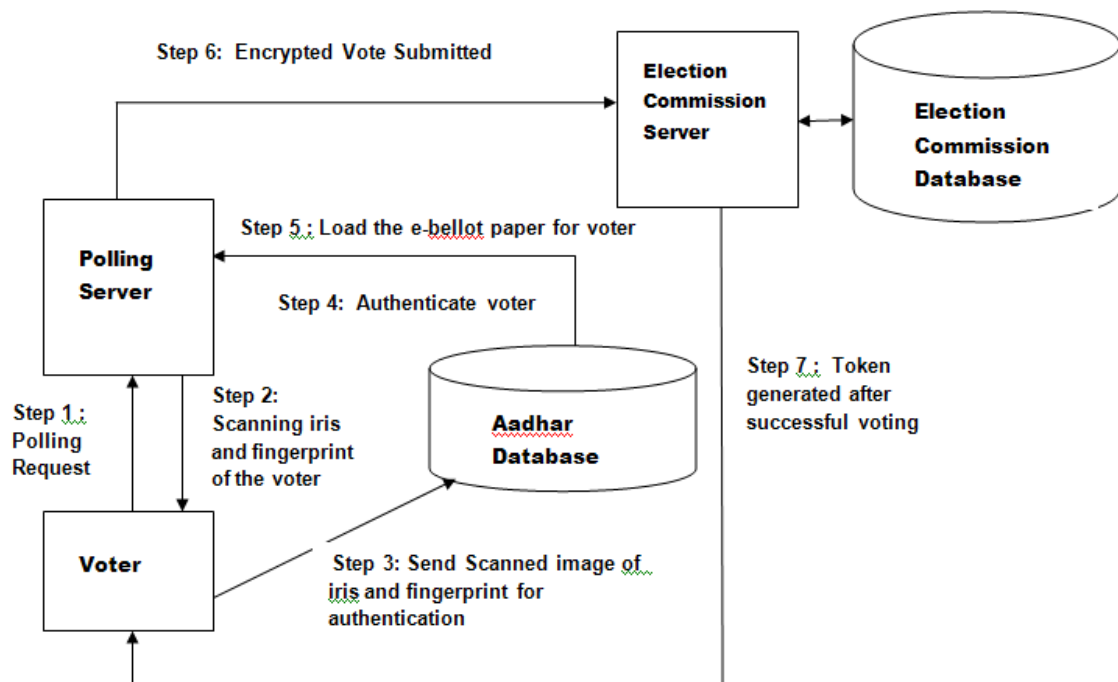


Fig 2: Service Request & Delivery in Proposed e-Voting

Fig. 2 states that when the voter requests for the voting, first the service provider authenticates the voter and provides the e-ballot paper, then the vote is submitted in encrypted form to the Election Commission Server on that a token is generated by ECS to the voter after successful submission.

Architecture in Fig. 2 of the e-Voting using cloud technology provides the following solutions to overcome the deficiency in the existing system [11].

- e-Voting, reduces the expenses of voting by reducing the cost of printing and distribution of the paper ballots, creating the polling booths, & their polling parties expenses .
- The proposed model provides the facility to those voters who are not in the position to cast their votes owing to their absence from head- quarters. It is useful for the officials busy in election duties, jobs, education and other reasons beyond their control.
- It will provide speed, privacy, authenticity, user friendly environment to the voter. Depending on the the number of computers and internet connectivity and speed, a number of users can cast votes at one time, At any polling booth .
- e-Voting is user friendly and authentic, so only authorised user can cast their votes, the casted vote is encrypted & thus security is enhanced . Being a user friendly & secure system it encourages the voters to cast votes & thus increase voter participation.
- e-Voting proposed system is directly connected to the election commission server so the system is fair and accurate and all the authentication is done by Aadhaar database so it is more authentic.
- e-Voting proposed system provides the facility to record the individual's vote and count accurately. So the result can be declared quickly.

5. CONCLUSION

In this paper, cloud based e-Voting system is proposed. This framework provides an user friendly system using the newly developed technology, cloud computing and provides better and secure ways to implement e-Voting services to the voters who are not able to cast their vote at the booth, due to unavoidable circumstances. It will also provide better services at the time of high load; it will distribute the load among the resources. This cloud architectural framework will benefit the e-Voting in reducing the operational cost and provide authentic, fast, secure and privacy to the voters. The above proposed system also has some limitations. First the voter should also be familiar with the working of computers and second is the internet connectivity and computers availability in remote centres. To overcome this facilities by availing the services of educational institutions spread all parts of India can be used, and by this the more than hundreds of voters may cast their vote at one point. The services of banks i.e. their VSAT connections and UPS may be used for Election Day in remote areas where the power is not available.

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