

Kerberos based Electronic Voting System

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ABSTRACT

An electronic voting (e-voting) system is a voting system in which the election data is recorded, stored and processed primarily as digital information. There have been several studies on electronic voting technology embracing both electronic means of casting a vote and electronic means of counting votes. In this paper we have proposed a model 'KBEVS' which provides voter an alternative way of voting irrespective of the locations. Voter simply performs some steps to do voting without knowing the backward processes that are taking place. This model can be used along with the existing technologies as an option.

Keywords: KBEVS, Kerberos, AS, PAN card, VS

1. INTRODUCTION

Traditional voting systems which were generally paper based election; the electorates cast their votes to select their candidates. The electorates in the presence of certified representatives simply deposit their designated ballots in sealed boxes. At the end of the day these sealed boxes under the supervision of security persons, carried to counting place. At counting place, all these boxes are officially opened and votes counted manually in presence of certified representatives of all candidates. But this voting system has several problems in real life. This type of voting system involves cost, large number of resources, counting errors, erroneous judgment due to counting errors, long duration from planning to result and several other issues. To overcome these issues, in recent years, electronic voting system has largely replaced traditional hand-counted paper ballots in most states and countries. Several concepts have been proposed such as E-voting, I-voting, Cell phone E-voting and Post-voting in USA, UK and several European countries [1].

In this paper, we have proposed a model KBEVS which uses concept of Kerberos. Electorates have to download an application on their mobile, with the help of this application they can vote without knowing the background processes that are taking place. This model of electronic voting system enhances the security features, prevention against malicious attacks and gives flexibility. Finally this model can be used along with other existing electronic voting systems as an option, depending upon the electorates whatever option he may choose. The option may include by going to the voting centre or by simply the place where you are, with the help of your mobile.

2. RELATED WORKS

The construction of electronic voting system is one of the most challenging security-critical tasks because of the need of finding a trade-off between many seemingly contradictory security requirements like primary vs. audibility.

Electronic voting systems for electorates have been in use since 1960s when punched cards systems debuted [3]. Fulton and De Kalb countries in Georgia were the first jurisdictions to use punch cards and computer tally machines when they adopted the system for the 1964 primary election.

In 1996, some variations of the punch card system were used by 36.3% of registered voters in the United States. In again in 1996, 24.6% of registered voters in the United States for the 1996 presidential election used Marksense system (Optical Scan) [3].

In 2003, Estonia initiated the project of e-voting. The aim was to implement e-voting in the elections of local government councils in 2005. In January 2004, a group of American Security Experts revealed the security reports of Secure Electronic Registration and Voting Experiments (SERVE) [2]. The SERVE system was planned for deployment in the 2004 primary and general elections and allows eligible voters to vote electronically via internet. But because of the security issues, security experts recommended that SERVE should shut down (2004).

In 2004, Electronic Voting Machine ("EVM") is being used in Indian General and States Elections to implement electronic voting in part from 1999 elections and in total since 2004 elections.

The most recent configuration is the evolution of voting systems is known as Direct Recording Electronic (DRE). In this, voter's choices are stored in the machines via a memory cartridge, diskette or smart card and added to the choices of all other voters. Thus, a single machine is used for composition, casting, and recording of votes. Still there are various researches in developing such an electronic voting system that can be robust, efficient, secure, scalable, reliable, usable, and consistent.

3. THE PROPOSED E-VOTING SYSTEM

We have proposed E-voting system named KBEVS. This system procedure is carried out in mainly three stages: registration, voting & completion. These three stages of proposed model are illustrated in later section described below. We try to understand these three stages one by one.

A. Registration

The electorate, who is interested in electronic voting system, sends SMS to authentication server. The SMS include electorate name plus PAN card number. The authentication server may receive three things, electorate name, PAN card number & corresponding phone number from which this message has received.

B. Voting stage

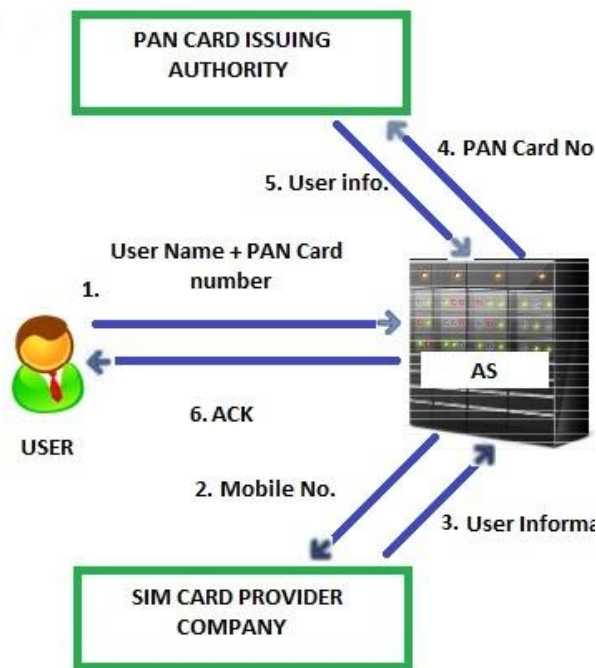


Fig. 1. Registration Stage

Now authentication server will send this PAN card number to PAN card issuing authority. PAN card issuing authority will send necessary information such as electorate's name, father's name, date of birth, permanent address, e-mail id etc. Authentication server will also ask from SIM card Provider Company for electorate information by sending the electorate's phone number. The SIM card provider company corresponding to that phone number will send electorate information which includes electorate's name, father's name, date of birth, permanent address, PAN card number, e-mail id etc., common to that send by PAN card issuing authority. The authentication server will verify information provided by both the sources. After successful verification has been performed, the authentication server will send acknowledgement to electorate. This acknowledgement will assure electorate about successful registration.

A question that comes to our mind, suppose an electorate changes his/her mobile number then? In that case electorate has to send a SMS to authentication server. The SMS include electorate name, PAN card number & old number (which the electorate has already registered for e-voting). The above procedure is performed. If successful registration is done, then authentication server will send acknowledgement back to electorate. This will confirm the electorate about successful update.

After this whole procedure is performed successfully the electorate will receive electorate id and password on their e-mail id.

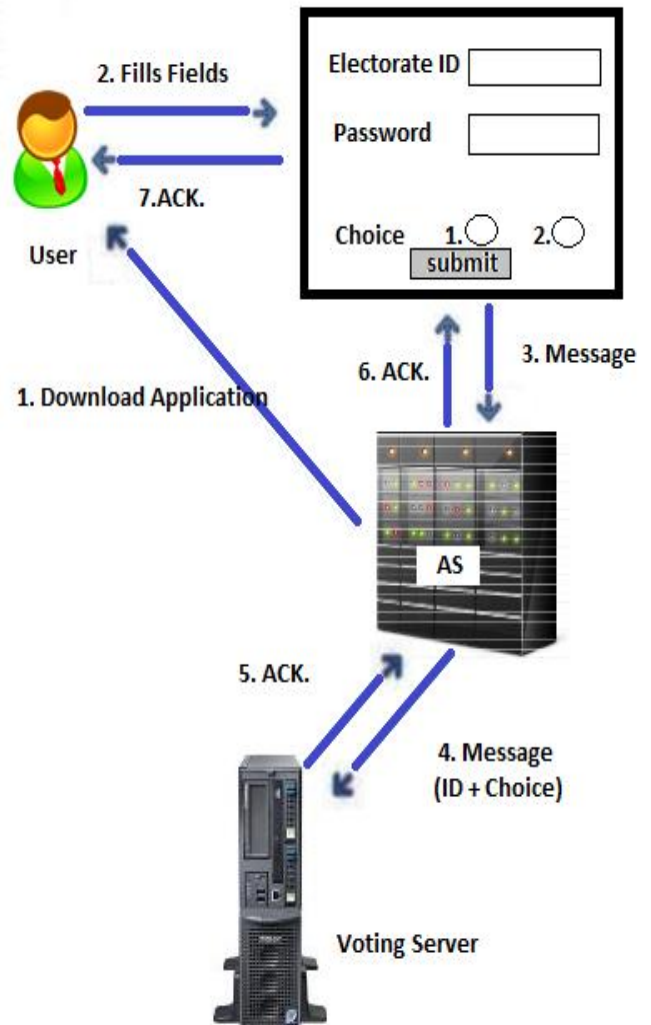


Fig. 1. Voting Stage

In this phase, the voting is performed. The AS will send an application to electorate on their mobile phone. The electorate has to install that application on their mobile phone. After successful installation, an icon will be created. When electorate wants to do voting, he/she simply clicks on that icon. After clicking on that icon, electorate interface will appear. Electorate has to enter his/her user ID, password and his/her choices. After that he/she will press submit button. After pressing submit button, an encrypted message (SMS) will be generated and send to AS. AS will decrypt the received message and perform verification operation. If verification is successfully performed, then authentication server will generate an encrypted message that contains user ID and choice, he/she has selected. This encrypted message will then send to voting server. The voting server will decrypt the message and record the vote of electorate. If verification procedure of an electorate fails then electorate will receive an acknowledgement. The acknowledgement will contain message according to the kind of failure that occurs during verification process.

C. Completion

After successful completion of voting phase, the VS will send an acknowledgement to AS. AS, on the other hand will send acknowledgement back to electorate. This will assure electorate about their successful vote.

4. THE PROPOSED E-VOTING ALGORITHM

The steps of KBEVS model are given below:

A. Registration Stage

- 1) Electorate E_i sends its name N_i and PAN card number P_i in message M_i i.e.

$$M_i = f(N_i, P_i)$$

for $i = 1, 2, 3 \dots$ electorate population

- 2) AS receives message M_i along with E_i mobile number.
- 3) AS sends message M_i^1 to PAN card issuing authority i.e.

$$M_i^1 = f(P_i)$$
- 4) AS also sends message M_i^2 to SIM card provider company i.e.

$$M_i^2 = f(N_i, \text{mobile phone number})$$
- 5) AS verifies E_i is eligible to vote, E_i is valid and has not applied for registration.
- 6) AS will update his database and sends ACK to electorate.

B. Voting Stage

- 1) Electorate E_i fills entries and press submit button.
- 2) Pressing submit button will generate encrypted message i.e.

$$M_i^E = f(E_i \text{ ID, password, } C_j)$$

C_j refers choices, $i=1,2,\dots$ no. of choices available.

- 3) AS receives M_i^E and perform verification.
- 4) AS sends encrypted message M_i^{E1} to VS.

$$M_i^{E1} = f(E_i \text{ ID, choice})$$
- 5) VS records votes, sends ACK to AS which again forwards ACK to E_i .

5. CONCLUSION

The use of new technologies to support voting has been and is the subject of great debate. Several people advocate the benefits it can bring such as improved speed and accuracy in counting, accessibility, voting from home. Many are also concerned with the risks it poses, such as unequal access (digital divide), violation to secrecy and anonymity, alteration of the results of an election (because of malicious attacks, bad design/coding, or procedural weaknesses) [7]. Electronic voting systems have been introduced to improve the voting process. They also could lead to increased voter turnout, thus supporting democratic process.

In this paper, we have proposed a KBEVS model, which can tackle all earlier issues encountered in a conventional (manual) voting system. KBEVS model provides comfortable facility to the busy electorates to vote. They (electorate) do not have to visit on voting centre to cast their vote. They have to perform some simple steps on their mobile phone to cast their votes. This model also motivates people those who avoid visiting to voting center to

cast their vote. We have proposed this model to increase the participation of busy electorate, so that their valuable vote can help in supporting democratic process. With the use of an e-voting system, as the one proposed in this paper, many of the issues, that have challenged traditional voting systems in the past, are bound to be resolved providing peace of mind to both electorates and election candidates. This model is transparent, secure, easy to understand and can be implemented as an option with the other existing technologies.

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