

E - Voting System for Sri Lankan Provincial Council Elections

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ABSTRACT

Electronic voting is a popular method of obtaining peoples choices and preferences online. E-Voting Systems allows casting votes electronically and counting votes using electronic devices. Although many countries use electronic voting systems, more countries including Sri Lanka still use manual systems. This research work focuses on introducing a web based voting system for Sri Lanka to facilitate the people to online voting in Sri Lankan Provincial Council elections. This system ensures voters to entertain freedom of voting while facilitating the casting online. It has a simple, easy-to-follow structure with less complexity for naïve voters. In order to enhance the security of the system measures such as voter authentication and disabling of casting if frauds were detected are added. Administrative tasks such as viewing, adding or loading, deleting, and updating details can be done by specially defined set of users. The system also provides utilities for online calculation process with the capability of calculating the seats for a specific provincial council election and generating a variety of summery reports.

KEYWORDS: Electronic voting, Online voting and counting, Sri Lankan Election System

INTRODUCTION

A Voting System allows the voters to choose between options, mainly where candidates are selected to the government administrative offices such as the Parliament, Provincial Councils, etc. It contains rules and regulations for valid voting. In the Sri Lankan Elections System, these rules and regulations are decided and published by the Office of the Commissioner of the Elections.

A Voting System provides a ballot, which is a technique used to record choices made by voters. In simplest elections a ballot is cast on a ballot sheet, an official document, where each voter marks cast his or her vote to the preferred candidate of their choice.

Depending on the type of Election, different method for casting a ballot is used.

The concepts of E-Governance that have been recently emerging among the Information and Communication research community provides different computer solutions to many areas related to governmental affairs.

Voting System in Sri Lanka

The existing election system in Sri Lanka is totally a manual system conducted under the command and administration of the Department of Elections, Sri Lanka. Sri Lankan elections employ preferential vote technique where the voters are allowed to show their preference over the candidates in a party of their elect.

There is a special approach of selecting members for the Provincial Council in accordance with Article 1988 (55) of the Constitution for the provincial election. The seats for the provincial council are decided according to the population distribution among the districts. The seats are given for the parties who obtained maximum votes as (a) terms of Article 58 (1) of the Constitution.

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In the existing system, it is necessary for the voters to be physically present in their respective Polling Center on the day of election in order to cast the vote, unless permission is obtained specially to cast a postal vote. Furthermore, the only available remote voting process is the Postal Voting, which is a lengthy, expensive and strictly formal affair. The counting process is also a total manual system which employs numbers of civil servants in a tiresome effort of counting physically.

Vote casting is done using the ballot sheets made of papers. Every voter gets a separate ballot sheets, which contributes to a considerable proportion of the election expenses. This sheet is a one-time usable one yet must have to be repeated in every election. An online vote casting can completely cut out such expenses which can be a huge advantage.

Further to these difficulties, the online vote casting system is a remarkable solution to the following issues of the existing system

- No computerized system available for the voting process in Sri Lankan Provincial Elections.
- High potential for election frauds.
- Distant and voters abroad cannot vote in elections.
- Time consuming Counting process causing delays in issuing results.
- High probability of human error in counting process and multitasking of works.
- Inability of disabled and physically impaired people to reach to the polling station.
- High expenses for Labor, Transport, Security, Food and Lodging
- Need to evacuate the polling stations prior to election causing difficulties as many of these are mostly schools and other public premises

The e-voting system designed in this project caters to many of the requirements

like casting, individual access and casting of vote, ability of enabling and disabling the casting according to clock, etc.

METHODOLOGY AND DATA COLLECTION

The E-voting System development was mainly done following the concepts of Rapid Application Development (RAD) approaches (Whitten et al, 2004). Since the functional requirements of both the existing and new systems are mainly based on requirements that are already decided by the Central Government's Elections System, the requirements analysis of the new system was focused on the functional requirements of an online voting system. This requirement gathering was done according to the requirement gathering techniques defined in the Software Development Life Cycle (SDLC) (Sommerville, 2008). Functional requirements that are common to online voting applications were studied to adhere to the requirements of a local election. New system was designed and developed adhering to Rapid Application Development (RAD) approaches (Whitten et al, 2004) to be aligned with the time constraints of the project.

Data collection of this project had a specific face. As for most of the main data inputs must be coming from Elections Department and are highly classified, the data collection of the system was limited to user information collection. Therefore, in this project the primary data (Rabianski, 2003) were kept as data that can be uploaded as external files recruited from the Elections Department and secondary data (Rabianski, 2003) were collected by studying the Elections System.

The vote casting process was identified by specifically analyzing the manual system. The different user levels and their privileges in the online version were also identified mainly by studying the different roles in the local government election process.

Special functional requirements like online user authentication, login and session control and loading pre-compiled data prior to the election had to be specially introduced to the online version of vote casting. Furthermore, some new non functional requirements like limited and restricted access, multi user facilities, data encryption, highest reliability and unauthorized access restrictions were also introduced to the new system. Most of these functional and non functional requirements are maintained by external entities and authorities in the existing voting process. Figure 1 shows the overall UML usecase diagram (Booch et al, 2003) of the new automation system.

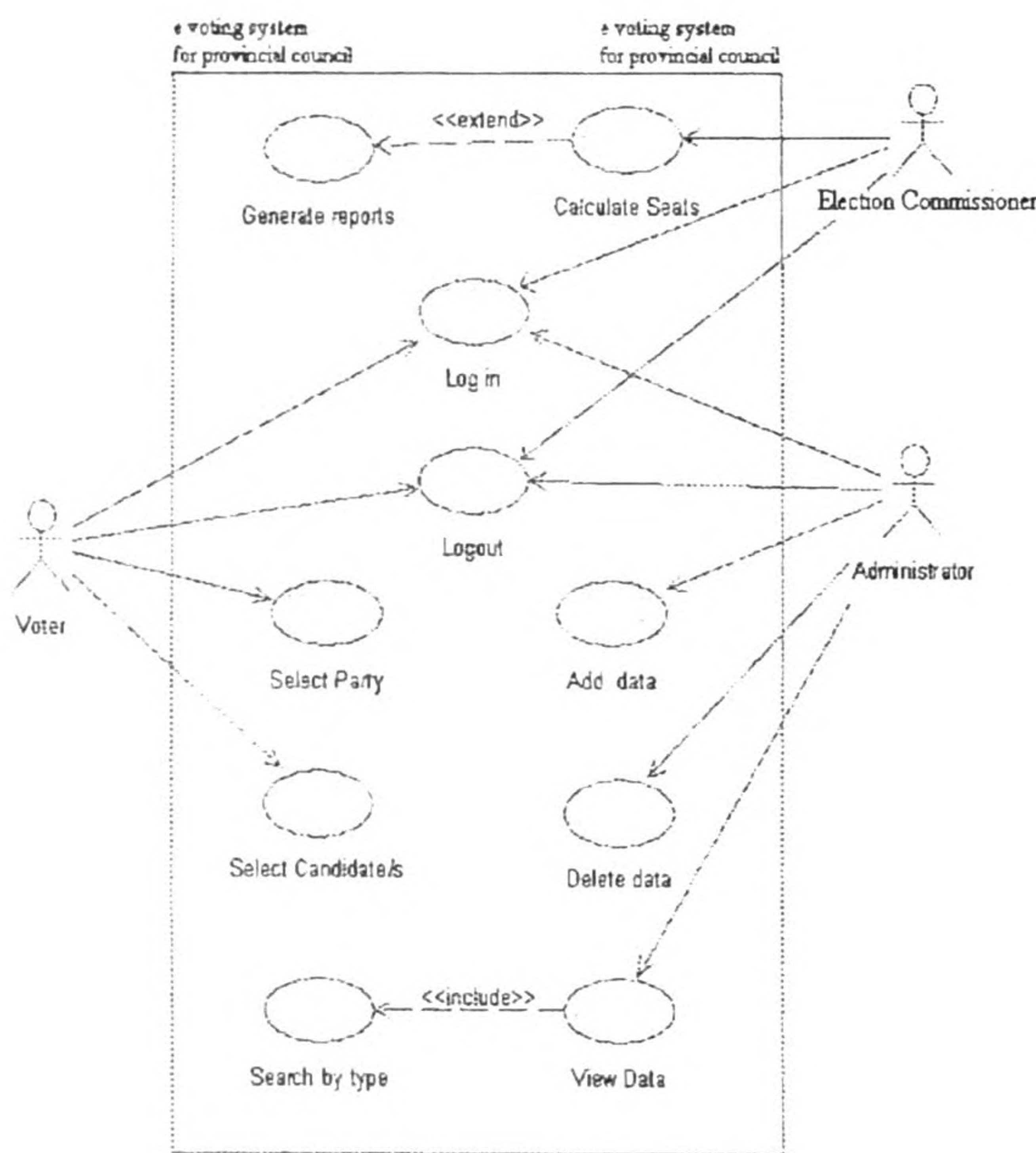


Figure 3. Use case Diagram of the new system

The Elections Commissioner has been identified as an actor to the system representing his office to define the input data. The actor Administrator is a reputed Civil Servant equivalent to a Government Agent (GA) acting as Rating Officer (RO) during election. Actor Voter represents the general public who is has obtained

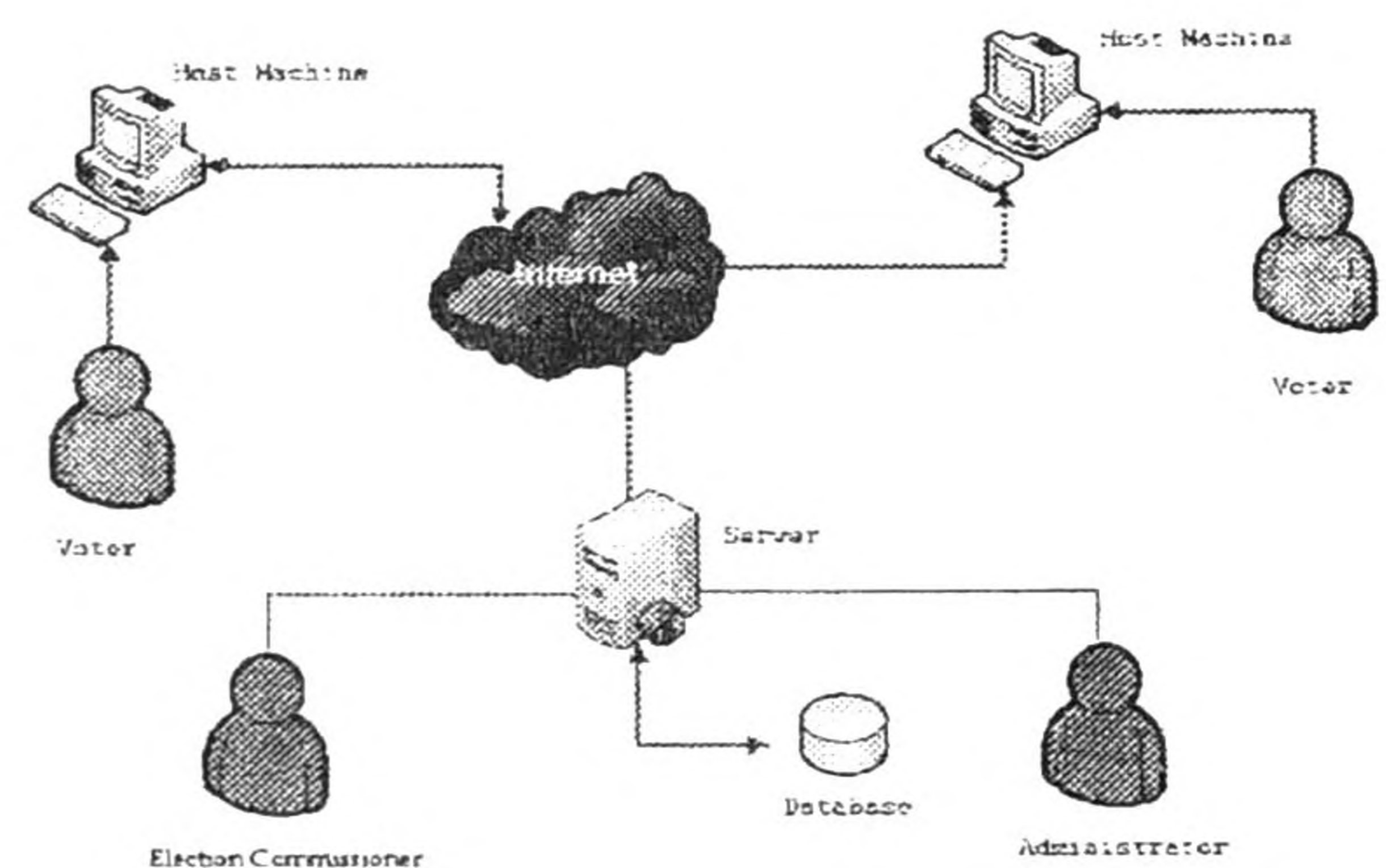
eligibility to cast the vote at a given Election.

IMPLEMENTATION ENVIRONMENT

This web based electronic voting system has been developed using HTML and PHP as the programming languages and is compatible with MySQL server which has been used to implement the database. PHP is an open source programming language providing many features to develop good web based system with high security (w3schools, 2010). Since there is a special calculation process for selecting candidates for the provincial council, unique coding is developed for performing calculation. All the software used is platform independent. Therefore computers with any browser interface can run the system.

Figure 2 shows the system architecture. It runs with the Internet as the backbone of access. Many polling stations in a particular district have a number of client machines which the voters use to vote. Separate servers are maintained for each district. Every client machine in a polling district is connected to a server of that district which is then connected to a centrally located server.

Figure 2. System architecture



System Security- Sessions

Special feature of the dynamic web page, sessions are specially used in the algorithms as protection tool and data transmission mode in PHP. For the voting

procedure, session variables are used to pass the information such as user name, password and status of the voting. Mainly status (session variable) is used to identify whether the voter is already voted or not. Initially the status variable is initialized to zero (0) and after voted it changes to one (1). When a voter login to the system, the status variable is checked and if it is zero, voter can proceed or else voter cannot login. So many data such as variables used in consecutive pages are being passed during the system is working. This feature is very useful to reduce the length of coding.

RESULT AND DISCUSSION

Time consumed in the vote casting process is individual. Yet the new system maintains a session expiring sequence to maintain the system security. The average time taken for an individual to cast a vote in a polling booth can be reduced to a maximum of 60 seconds in the new system. System also uses the existing identification codes like National Identity Card number in the authentication, thereby excluding the need to go for lengthy and costly user registration processes in online access control.

The remarkable effectiveness within the new system is at the counting process. In the current system, the counting process takes 12 or more hours to generate the first result. In the case of counting preferential votes, this process may take several days. In the new system, the counting and calculating process is completed within 60 seconds with no additional cost, which is a remarkable efficiency. Furthermore, the current process recruits many employees where as the online version does not need any additional human involvement in the counting process.

Compared to the existing manual process, the new systems also minimizes the under voting and over voting which may result in a spoiled vote, eliminate election fraud, decrease the pollution of ballots and

finally saves voters' time to access polling stations for casting the votes.

As further improvement to the e-voting system implemented, a more secured voter identification process can be introduced. For example, a secret code (which can be use as a password) can be distributed among the voters prior to the election or dynamic questions can be asked as passwords. Furthermore, a mobile application for easy access by the voters and technologies to access the system by physically disabled people can be introduced. The system can also be enhanced to use touch screens which can be an optimal solution to disabled and illiterate people.

Amongst the limitations of the new system, the probability for a bottle neck can arise when thousands of voters access the system simultaneously. Multi-user environment technologies would be recommendable to handle such situations.

CONCLUSION

An electronic voting system is developed. The advantages and disadvantages of the existing manual system are discussed. The possible enhancements along with new functionalities are implemented in the new e-voting system. Software development principles and/or concepts which are used in the development process are also presented.

The improvement in the presented e-voting system is analysed. The new system would be an optimal solution to the time consuming and costly elections procedure in Sri Lanka.

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