

# An Improved Faculty Senate Election System

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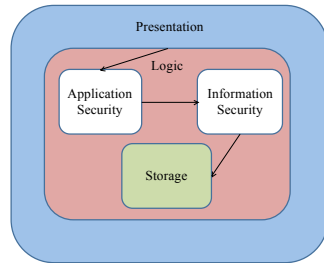
Abstract

In this research, we proposed an e-voting architecture that integrates two major aspects of e-voting protocol. Secure coding provides defense against certain exploits while information security deals with confidentiality, integrity and availability of information.

## Redesigned System

- Improved security features
- Addressed voter privacy concerns
- Separated user identification from vote registration
- Modularized functionality
- Made codebase easy to read and more maintainable
- Reduced/Limited security vulnerabilities

## A Layered Architecture



- Application was based on a three-tier architecture used commonly in web-based system
- Application security protects the system
- Information security protects the user

## Voting Protocol Components

(based on Fujioka et al.)

- Accuracy
  - No invalid votes
  - Eligible voters can only vote once
  - Votes cannot be altered
- Fairness
  - All tallies are secret until voting completes
- Privacy
  - No one can link a ballot to a voter
- Verifiability
  - Anyone can verify the accuracy of the votes
- Robustness
  - No one can cause a major disruption in the voting process

## Application Environment

- An SSL certificate is used to encrypt transmissions between the client and the system
- Both applications run inside a slightly modified LAMP (Linux, Apache, MySQL, PHP) stack
- Vote Counter was built using the Zend Framework

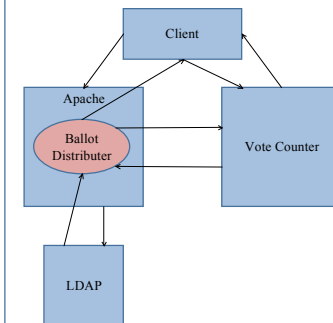
## Zend Framework

- A set of loosely-coupled object-oriented components written in PHP
- Open source, community driven
- Provides secure database interaction interfaces
- Allows for easy set-up of three-tier MVC architecture
- Can customize functionality

Privacy concern - User login information does not pass through the application

Ease of use - Vacancy Set-up

## System Components



- Ballot Distributer
  - In conjunction with the Apache web server, this verifies the user's identity
  - Anonymizes the user before sending them to the Vote Counter
- Vote Counter
  - Where the user enters his/her vote
  - Performs the tallying process
- University LDAP server
  - Provides a database of authorized users
- Apache Web Server
  - Provides the public interface through which both the Ballot Distributer and Vote Counter are accessed
  - Aids the Ballot Distributer with authentication

