TJHSST Computer Systems Lab Senior Research Project Final Proposal Design and Implementation of an extensible, modular, web-based class-room supplement 2008-2009

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Abstract

Blackboard, Fairfax County's current Academic Suite and one of the most commonly used Class-room supplements in education, is disliked by many students and teachers as well as containing many security vulnerabilities. The Goal of this project is to develop an extensible, modular, web-based replacement for Blackboard which will incorporate Blackboard's functionality as well as additional features. By building an extensible and modular replacement what will run on a standard LAMP (Linux, Apache, MySQL, and PHP) Server, this project will hopefully be much easier to maintain, secure, and add additional functions to.

Keywords: software design, software engineering, application, web-based

1 Introduction - Elaboration on the problem statement, purpose, and project scope

1.1 Scope of Study

Subjects that will require further study and investigation will be Object-Oriented Programming, Web-design standards, and web-site interface design. Features that will need to be implemented include a system for creating classes and enrolling students in classes, class announcements, files, assignments, grade-books, links and staff information. Additional possible features include an integrated testing system, a student global calendar, and an iodine integration module.

1.2 Expected results

By the end of the year, I hope to have a working Blackboard equivalent that could be deployed for TJ or FCPS for the coming school year. Ideally this project would be kept extensible (perhaps through a testing copy) so that future students could add and request features that they wanted as well as file bug reports and provide feedback so that the project continues to improve. This will hopefully give both myself and future students actual experience working with a web application (similar to Iodine but built on a newer foundation).

1.3 Type of research

This project is pure applied research. This project is motivated by a need for a less expensive and more flexible alternative to the current solution, Blackboard. While Blackboard is corporately maintained and licensed, it has a number of security holes, bugs, and design flaws that annoy many of its users.

2 Background and review of current literature and research

The closest project I have found to this one is another CSL Research project from 2001 called IOTA (Interactive Online Teaching Assistant). While this

project did not reach production quality, there was a lot of interest generated by the concept. Other examples of products in this field include Blackbaord (the current FCPS solution) and Moodle (An open-source course management system). All three of these other examples have their strengths and weakenesses. Another related project, though not with the same objective, is Iodine. While Iodine is not a course management system, it does implement a modular design, an integrated authentification system, and several other features that would be useful to have in a course management system.

3 Procedures and Methodology

By the end of the 1st Quarter, I plan to have the site's kernel finished as well as the security, database, and user management modules. These modules will form the core of the site's functionality. Then throughout the rest of the year I will continue to add modules that will provide additional functions to the site. These modules will include announcements, files, assignments, calendars, as well as other planned and suggested modules.

This modular design and construction is one of the strengths of this design in that most of the site can be stable and working with only the latest module being in an unstable site. Therefore a stable, deployable solution can be created at any time simply by disabling the offending module in the kernel. Also a bug in one module is unlikely to affect the other modules (with the exception of the core security and database modules which is why I've been so thoroughly testing them).

The only data that will need to be input will be a set of fake students, teachers, and classes which can be easily generated by a script and added to the database. Once the site has a few more functions, I plan to start testing with actual students and teachers in simulated classes. This will allow me to get feedback from the people who would be most using the site.

I have several methods for testing my site. Security-wise I have several programs that I run against my site that attempt to breach the site's security using some of the most common methods for hacking sites. Bug-wise I test each feature rigorously, attempting to access it in odd ways and using my program both in intended and unintended ways to see how it behaves. I also plan to beta-test various builds on some of my friends and fellow students to get additional feedback and eyes looking at the code as well as the overall design.

My program requires a server with Apache2, PHP5, MySQL, and the Smarty Template engine installed as well as the Mercurial Code Version System to download the source code. Code-wise the program uses a modular design that requires features to be implemented in modules and then added to the kernel in order to function.

4 Expected Results

Through this project, I hope to provide TJ with an open-source, modular, and extendable alternative to Blackboard. This will allow for quicker bug-fixes and feature requests to be addressed more quickly as well as allowing integrated authentification (one username and password for all school systems).