Project Portal

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CSCE470 – Capstone Project

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April 6, 2015

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Chapter 1

# Introduction

## 1.1 Introduction

Web applications, or "web apps", are software programs that run on a web server. They consist of diverse components including traditional and nontraditional software, interpreted scripting languages, plain hypertext markup language (HTML) files, mixtures of HTML and programs, databases, graphical images, and complex user interfaces. [1] A web application is available anywhere a connection to the internet is found. This means a web application is not tied to a specific computer like a traditional software application, allowing for more accessibility and ease of use. The user experience tends to be more consistent with a web application, because user data is processed and stored on the server and the graphical user interface (GUI) is dependent on the web browser.



Figure 1.1 - Simple Web Application Diagram by vTech Solution Inc.

The tremendous reach of Web applications into all areas of communication and commerce makes this one of the largest and most important parts of the software industry. [1] Many software companies now offer both desktop and web versions of their most popular programs. Common examples include Microsoft Office, Apple iWork, and Intuit TurboTax. In most cases, files saved in the online version are compatible with the desktop version and vice versa. For example, if you save a .TAX2013 file in TurboTax Online, you can open and edit the file with the desktop version. [2]

## 1.2 Application

For my project, I decided to create a web application. My application will be a project portal for teams working on various projects at the Department of Natural Resources (DNR). Each project will have its own project portal and will consist of three main pages. One page will have a map of the project area and the map will have the ability to change which layers are visible to the user. Another page will have a calendar object that will contain the project related activities and meetings. The final page will contain a file browsing object that will display a file location on the server that holds project related files.

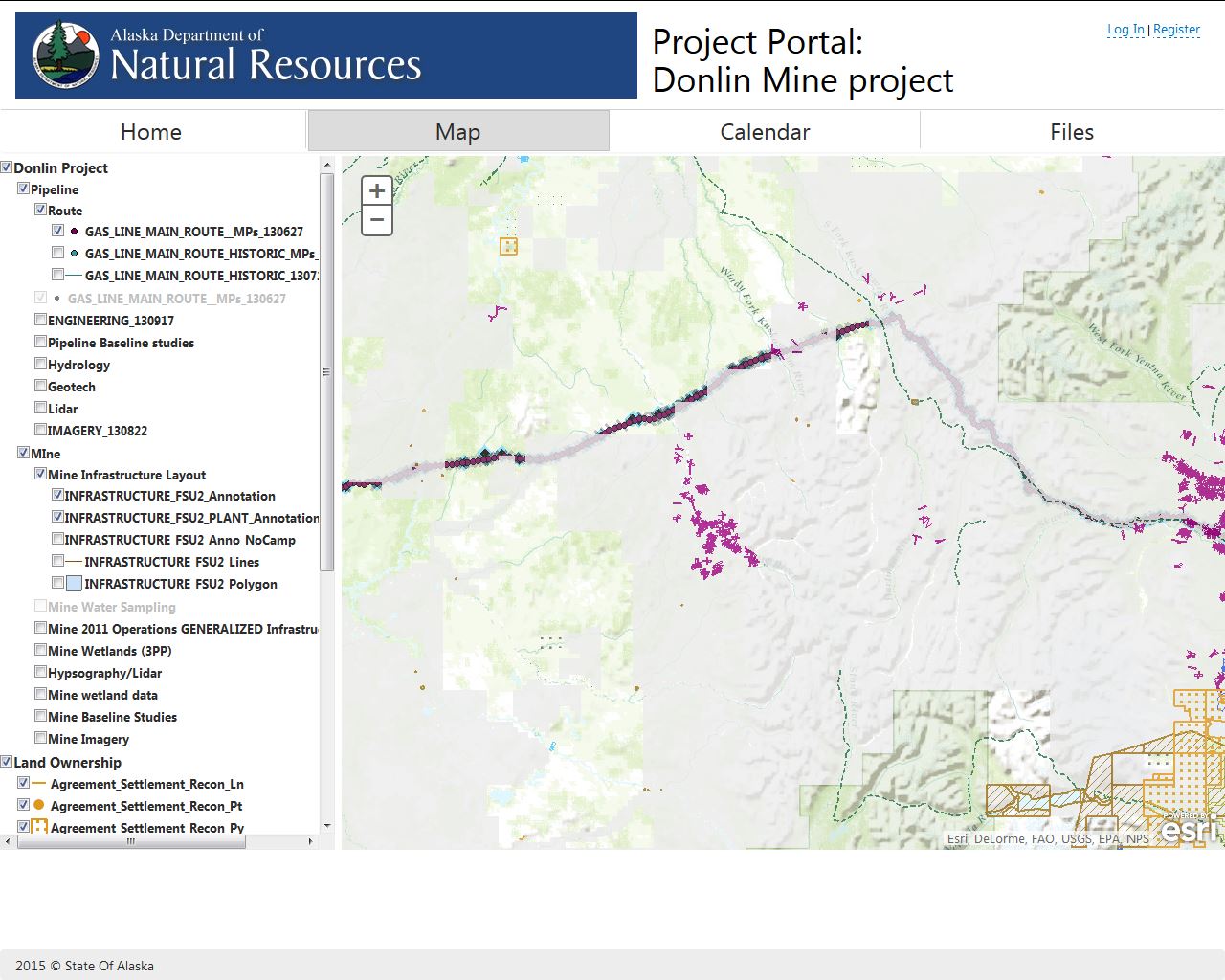
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Figure 1.2 – Sample Image of What Maps Page Would Look Like.

A web application can be created using a number of different languages and technologies. The project portal will be primarily built using ASP.NET and C# for server side code. HTML and JavaScript will be utilized to perform client side page rendering services. The file browser and calendar will use third-party libraries from DevExpress.

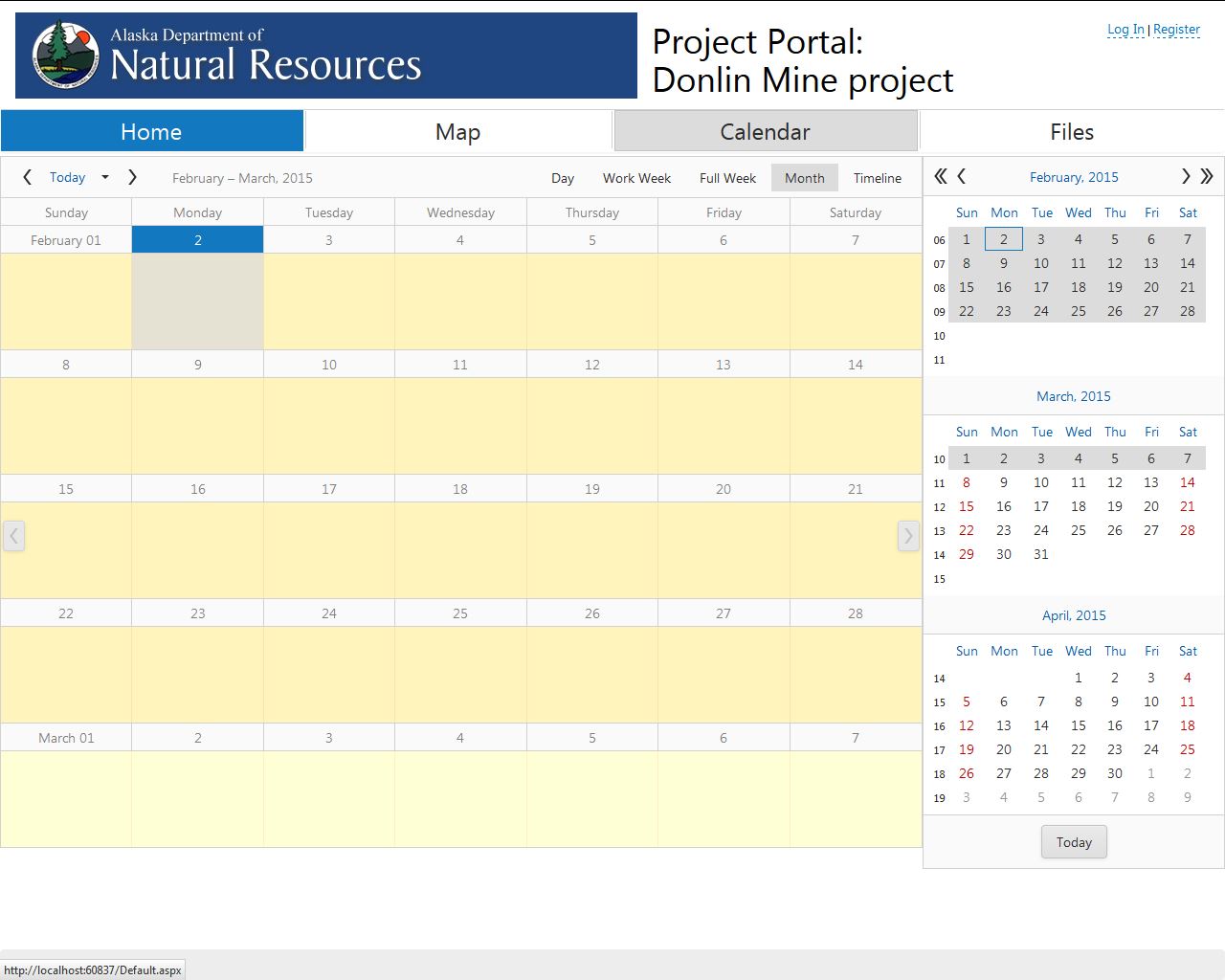


Figure 1.3 – Sample Image of What Calendar Page Would Look Like.

Security requirements can be summarized in two sentences:

* Information should be disclosed only to those meant to see it.
* Actions should be performed only by those authorized to perform them.

Sound simple? So why, with such straightforward goals, is network security deemed one of the tougher areas of computer science? The difficulty lies in the very nature of the goals we’ve defined. While other areas of computer science aim to enable a certain feature, security is the art of prohibiting unauthorized individuals from reaching beyond the permissions they have been granted. All possible attacks must be considered, analyzed, and prevented. [3] The project portal will utilize user login authentication to provide a minimum level of security. This could be upgraded in the future to use the lightweight directory access protocol (LDAP) user credentials that already exist within the State of Alaska system.

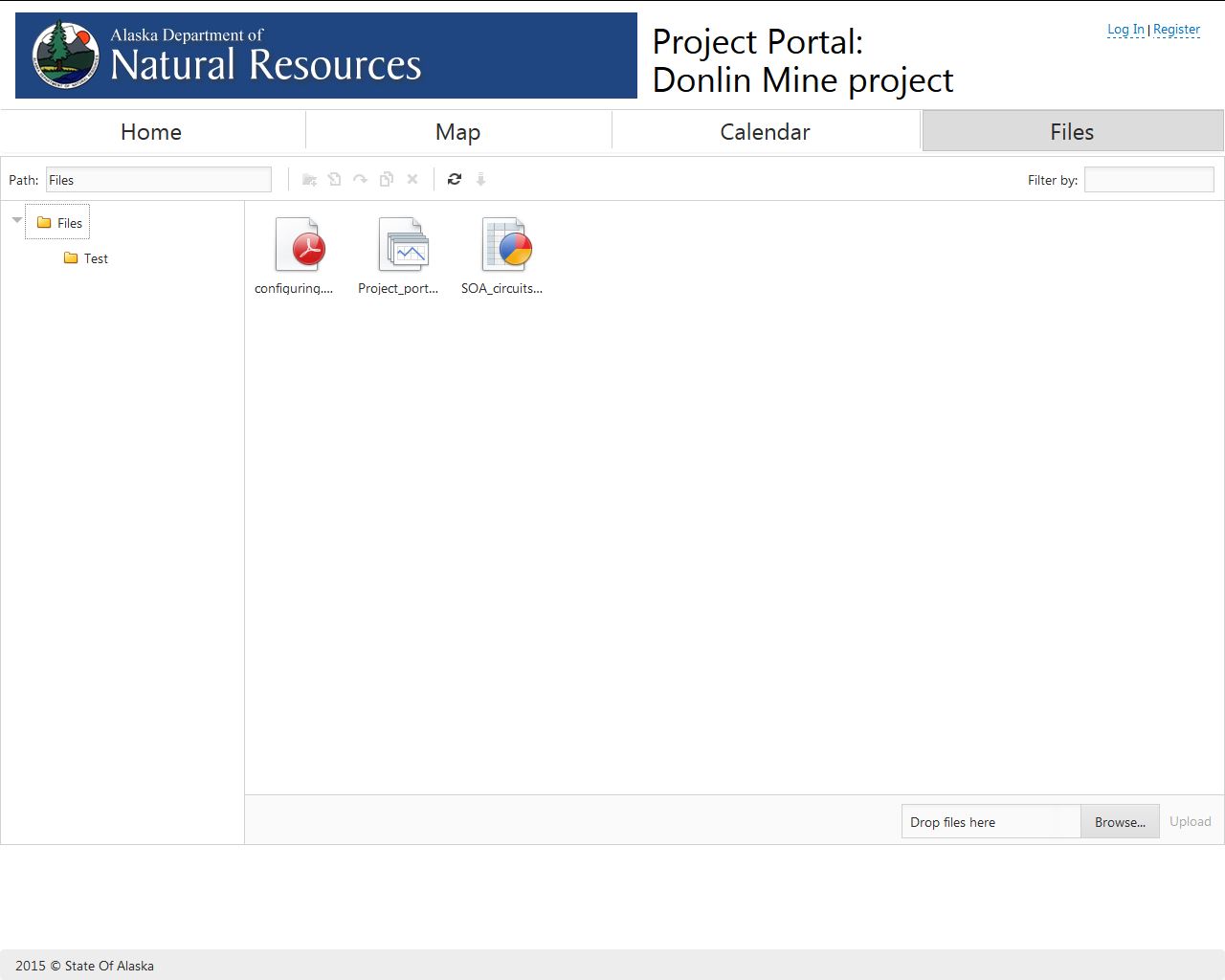


Figure 1.4 – Sample Image of What Files Page Would Look Like.

In Anchorage, .NET is the preferred language for websites and web applications.According to GeoNorth, an Anchorage software development company: “.NET is one of the development languages of choice for high usage sites and sites with complex business rules and workflows.  Because it is a compiled language, it can be many times faster than PHP, ColdFusion, or other languages. You may have also heard of ASP.NET, which is the 'web design' portion of .NET, and works in conjunction with C# or VB.NET. If you want a fast site that can scale, or if you have complex business rules that need a lot of CPU power behind them, .NET is the way to go. Many of our Anchorage clients in Alaska use .NET, and we have deployed enterprise solutions as well as small websites and even handheld applications.” [4]

## 1.3 Motivation

My primary motivation for this project comes from the fact that I am currently employed at DNR and my department manager asked me if I wanted to do this project. I really wanted to do a project that was going to be very practical and this project allows me to do just that. The project portal is likely to be implemented within the DNR system shortly after its completion and thorough testing. Working with DNR on this project gives me greater access to resources and a knowledge base that would not be available to me otherwise. Doing this project for DNR also gives me the opportunity to work on the project while at work, allowing me to better use my time.

My secondary motivation for wanting to do this project was because my department manager wanted the project done in .NET. I have not used .NET before and am unfamiliar with its features. .NET seems to be used almost exclusively here in Anchorage. Therefore it was important to me to learn how to use it in order to increase my job marketability. Creating web applications is one of the things I am interested in doing for a job, thus being able to put a project like this within my portfolio was very compelling for me.

## 1.4 Recent Developments



Figure 1.5 – Mobile web development diagram from Techworldsoft.com

The web development sector is always changing an updating with the invention of new technology. The biggest recent change in the web application development area is the addition of mobile computing. Mobile computing presents several challenges for traditional web developers including higher latency wireless networks, small memories, and smaller screen sizes. Mobile devices force web developers to think about things they have never had to think about before. Web applications must now take into account the type of device being used to determine the best experience for the user. Mobile devices with high-latency connections, slower CPUs, and less memory need to be catered to just as much as desktops with wired connections, fast CPUs, and almost endless memory. Web developers now more than ever need to pay close attention to how they craft interfaces, given these constraints. Byte counts, request counts, memory usage, and execution time all need to be considerations as web development for mobile devices continues to evolve. [5]

## 1.5 Licensing

Project Portal will use a BSD 3-clause license. This will allow me to limit my liability and the State of Alaska’s liability. It also makes it clear than no warranty is provided and that names referenced within cannot be used for promoting a new product containing the code. The code for Project Portal will be completely open source, however databases and files accessed by the code may contain proprietary data. DNR has requested that when source code is shown that references to server names be removed for security reasons.

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Chapter 2

# System Integration and Modeling/Methodology

## 2.1 System Model

Project Portal is using a design based off of the client-server model. This model specifically describes the interactions between a client computer and a server. The model Project Portal will be using has essentially three different areas that work together to make the application run. I will refer to these areas as client-side, server-side, and back-end.

### 2.1.1 Client-Side

The first area is the “client-side”, which is the technical way to refer to the user’s local machine that they will be using to access the application. Within the local machine, the user will be using a web browser as the main tool to connect to my application. The web application begins when the user enters the address into the web browser. The web browser then sends a request to the web server for the data required to display the application to the user. The web browser will then receive the data from the server which will contain instructions on how to display the graphical user interface as well as scripts that need to be processed from the user’s machine. Client-side scripts are written in some type of scripting language like JavaScript and interact directly with the page’s HTML elements like text boxes, buttons, list-boxes and tables. HTML and CSS (cascading style sheets) are also used in the client. In order for client-side code to work, the client’s internet browser must support these languages.

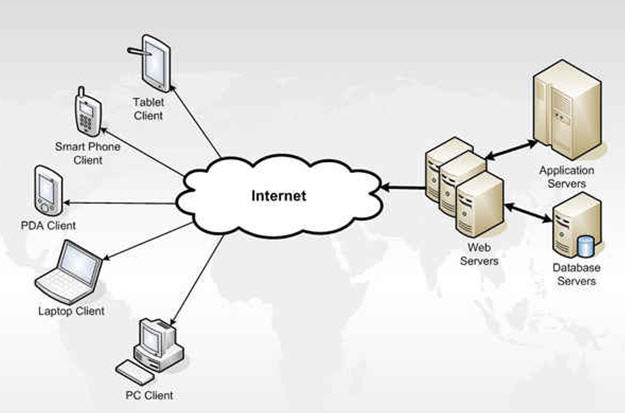


Figure 2.1 - Simple Web Application Model Diagram from techrepublic.com.

There are many advantages to client-side scripting including faster response times, a more interactive application, and less overhead on the web server. Client-side code is ideal for when the page elements need to be changed without the need to contact the database. A good example would be to dynamically show and hide elements based on user inputs. One of the most common examples is input validation. [6] Project Portal is designed to work with the Google Chrome, Microsoft Internet Explorer, and Mozilla Firefox Browsers. Each of the browsers may display certain elements of the web application differently, however the overall look and feel of the web application will be preserved.

### 2.1.2 Server-Side

The second area is the web server area. A web server is a computer remotely located at a company’s chosen location that is specifically designed to handle requests from client. The requests can be for either data to be sent back to the client or data to be processed by the server. Server-side processing is used to interact with permanent storage like databases or files. The server can also render pages to the client and process user input. Server-side processing happens when a page is first requested and when pages are posted back to the server. Examples of server-side processing are user validation, saving and retrieving data, and navigating to other pages. [6] Project Portal will use Microsoft Internet Information Services (IIS) as the web server. The IIS web server will host all of the server-side code and do all the server side processing.

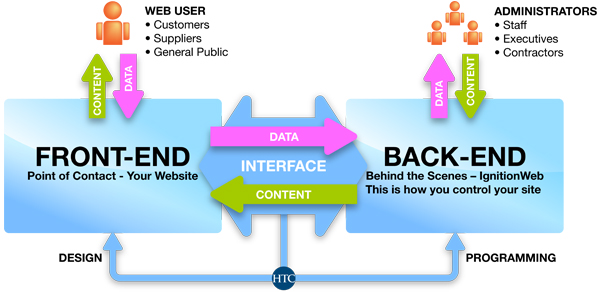


Figure 2.2 - Example Front-end Vs Back-end Diagram from 3nytechnology.com

### 2.1.3 Back-end

The third area is the back-end. This area is typically comprised of database and file servers that are not directly accessed by the user, but support the web server. The database servers store user data as well as data required for the web application’s operation. The file server is used as a repository to store and retrieve any files that may be needed by the user or the web application. Project Portal will use a virtual server running an Oracle database. For the file server, Project Portal will use a Microsoft Windows Server 2012 R2. The file server will be used to handle the files from the file browser page. In addition to database and file servers, Project Portal will use a Microsoft Exchange Server for mail, calendar, and contacts services as well as and ArcGIS server for published map services. The exchange server will handle and return the calendar data to the calendar page of the web application. All of these servers already exist within the DNR ecosystem.



Figure 2.3 - ArcGIS Diagram from ESRI

## 2.2 Technologies and Components

Project Portal weaves together many different technologies in order to create the final product. These technologies and components come from both the software and hardware groups.

### 2.2.1 Software

Hypertext Transfer Protocol (HTTP) is used to create connections between the client and the server as well as describe how the data will be transmitted. HTTP is an application-level protocol for distributed, collaborative, hypermedia information systems. It is a generic, stateless, protocol which can be used for many tasks beyond its use for hypertext, such as name servers and distributed object management systems, through extension of its request methods, error codes and headers. [7] Project Portal relies on this technology for communication between the user’s computer and the web server.

The ESRI ArcGIS API is used to display a map as well as the related layers for the map in Project Portal. ArcGIS is a geographic information system (GIS) for working with maps and geographic information. It is used for: creating and using maps; compiling geographic data; analyzing mapped information; sharing and discovering geographic information; using maps and geographic information in a range of applications; and managing geographic information in a database. [8]

DevExpress offers feature-complete UI controls, enterprise-ready reporting systems, IDE productivity tools and business application frameworks for Visual Studio. Our technologies help you build your best, see complex software with greater clarity, increase your productivity and create stunning touch-enabled applications for Windows, Web and next generation Mobile platforms - without limits or compromise. [9] DevExpress UI controls are used to make the calendar object as well as the file browsing object.

### 2.2.2 Hardware



Figure 2.4 – Windows Server 2012 Logo from Microsoft

The web server will be using Microsoft’s IIS server that is built into Windows Server 2012 R2. Internet Information Services (IIS) for Windows® Server is a flexible, secure and manageable Web server for hosting anything on the Web. From media streaming to web applications, IIS’s scalable and open architecture is ready to handle the most demanding tasks. [10]



Figure 2.5 – Gantt Chart for Project Portal

The Gantt chart shows the proposed tasks for Project portal. Each task has a starting and end date. They are then charted chronologically with the arrows showing that the prior task must be completed before the start of the indicated task. The red tasks indicate that those tasks are critical to the completion of the project.

## 2.3 Agile Methodology

The Agile methodology is a technique for project design. The key concept in Agile is that the developer works closely with the customer to develop small tasks that are completed in frequent intervals. These intervals are small for example two weeks. Keeping the intervals small allows for the development design to be flexible enough to change with customer requirements. This method is much more flexible than the typical approach of the waterfall method which requires the design be specified in the beginning and does not leave much room for change in design.

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For project code please see:

https://github.com/YukonJack777/CSCE470-Capstone/tree/master/projectsuite