University of Idaho
CS481: Senior Design

Idaho Department of Health and Welfare

Time, Accounting, and Reporting System

prepared for

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1 Introduction

1.1 Identification

This Software Design Document pertains to the Idaho Department of Health and Welfare Time, Accounting, and Reporting System. Project development for Fall Semester, 2011 is executed by Scott Beddall, Brett Hitchcock, Chaylo Laurino, and Alex Nilson. The advisor for the project from the University of Idaho is Gregory Donohoe. Our project sponsor and primary client from the Idaho Department of Health and Welfare is Don Moroeux.

1.2 Document Purpose, Scope, and Intended Audience

1.2.1 Document Purpose

This document's sole purpose is to outline the scope of Idaho TARS. This outline includes, but is not limited to:

- Development Decisions and Rationale.
- Architectural Specifications.
- Detailed Design Information.
- Locations of Other Project Resources.

1.2.2 Intended Audience for Document

Though the TARS is to be fully prototyped by the end of 2011, it will not be completed. With that being the case, this document is aimed at any future developers or users of Idaho TARS.

1.3 Software Purpose, Scope, and Intended Users

1.3.1 Software Purpose

Idaho TARS is intended to provide time and resource tracking for contractor/non-contractor work efforts within the Idaho Department of Welfare. Work efforts must be added to time-bounded project PCA codes and approved by users with sufficient privileges. Project summaries, cost totals,user logs, and other information will then be available within TARS.

1.3.2 Software Scope/Context

The Idaho Department of Health and Welfare currently is utilizing a resource called Mariner for project management. The IDHW's needs, however, are significantly less than the capabilities that Mariner provides. Portfolio and Resource Management, Planning, and other features of Mariner are being paid for, but being left unused. This is where the creation of the Time, Accounting, and Reporting System is merited.

1.3.3 Intended Users for the Software

Intended Users of Idaho TARS are the staff and employees of the Idaho Department of Health and Welfare as well as their contractors.

1.4 Definitions, Acronyms, and Abbreviations

This table will expand dramatically when documenting the MVC modules.

MVC	Model View Controller. A design pattern used for content focused websites.
TARS	Time, Accounting, and Reporting System.
PCA Code	Position Classification Allocation Code.
SQL	Structured Query Language. Used for input and retrieval of data from a SQL database.
IDHW	Idaho Deparment of Health and Welfare
Work Effort	A project. Has one or more assigned PCA Codes and a list of associated work tasks.
MVC	Model-View-Controller.
Database Connection String	A formatted line of text that contains all location information for a SQL database.

1.5 Document Overview

Section 2 describes software constraints imposed by the operation environment, system requirements, and user characteristics. After this it will identify the system stakeholders and list/describe their concerns.

Section 3 of this document describes the system and software architecture from several viewpoints, including, but not limited to, the developer's view and the user's view.

Section 4 provides detailed design descriptions for every component defined in the architectural view(s).

Sections 5 provides traceability information connecting the original specifications (referenced above) to the architectural components and design entities identified in this document.

Section 6 and beyond are appendices including original information and communications used to create this document.

2 Software Requirements, Constraints, and User Characteristics

Check the requirements_summary.docx for an extensive list of requirements.

3 Software Architecture

3.1 Server Architecture - Microsoft Internet Information Services 7

One of the IDHW's requirements for the this project is the use of Windows Server infrastructure. In this case the TARS development team will use Microsoft IIS7. Microsoft's Internet Information Services server is a modular, intuitive server application. New considerations must now be applied, however. IIS7, being a Microsoft product, uses Microsoft development software. Namely:

- C#
- ASP.NET
- Visual Basic/VB.NET
- .NET Development Framework

TARS will be developed using all these technologies, as well as the IIS7 Model-View-Controller application. The MVC application will be described in detail in the next section.

3.2 Model-View-Controller

Most of the heavy-lifting for TARS will be present in the display and interaction with large amounts of data. This problem is what the Model-View-Controller design pattern was created for. The idea is that each word in the acronym: Model, View, and Controller each represent a component that handles a different aspect of the display process.

Advantage of Model-View-Controller architecture:

- Separates the user interface from the logic used in the database.
- Allows for independant development, testing, and maintenance of these seperate parts of the application.

3.2.1 Controller

A Controller receives input from the user and converts it to instructions for the Model and View components. Most MVC's use the first argument after the website URL as the controller call. In our case:

```
http://idahotars.com/home
```

Will load the "home" controller.

3.2.2 Model

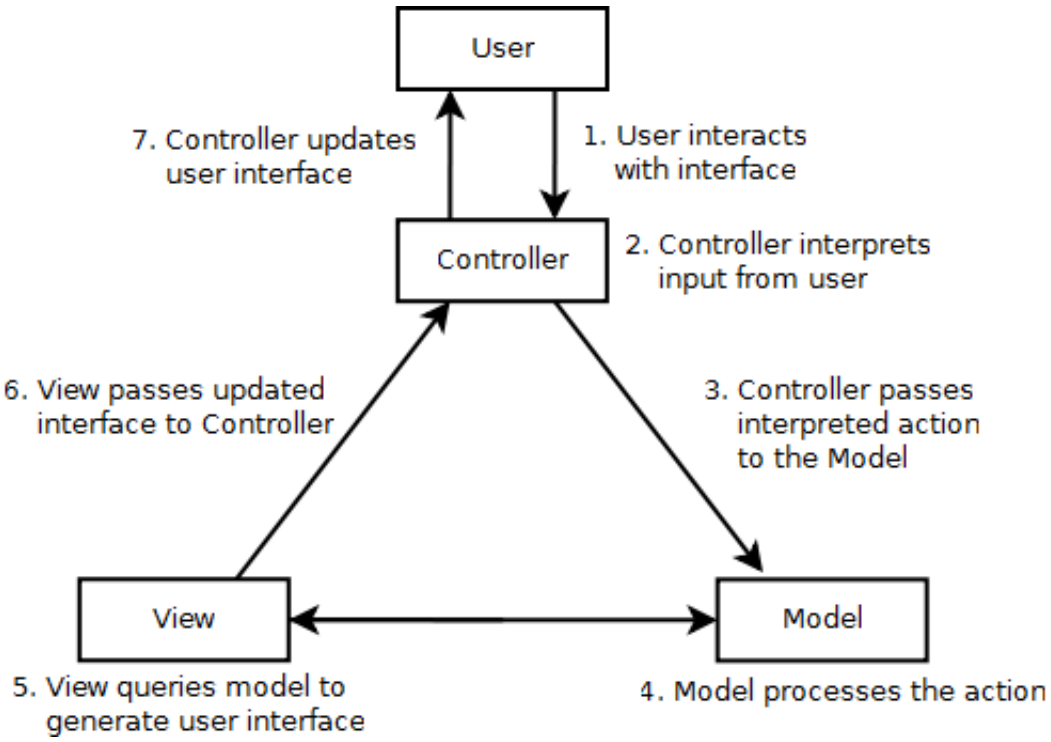
The Model manages database queries and assembles data for use elsewhere in the MVC.

3.2.3 View

View renders the data received from the Model into a viewable web page.

3.3 SQL2008 Database

Though IIS can utilize any format of SQL Database, the IDHW requires that TARS use SQL2008. Any queries made by the MVC will be carried out by the "Model" component of the MVC.



3.4 Active Directory

The IDHW uses Microsoft Active Directory for their user authentification. With that infrastructure already in place, it is logical to use the same for Idaho TARS. To authenticate users of TARS, there will be three new Active Directory groups added: TARSAdmin, TARSManager, and TARSUser. If a given user is part of any of these three groups, they will be allowed access to TARS based upon their group.

3.5 Security

While Idaho TARS will be used internally, there is still a security risk. The system may not be dealing with any highly confidential info, but TARS will have access to government resources like the IDHW Active Directory and I-Time interfaces. To prevent easy exploitation of the TARS databases, all queries to the database will be centralized in Model. This will will not only make the team's code simpler, but also make it more secure. Centralized queries allow us to easily adopt a strong security stance. Namely, all input from anywhere on the browser will be treated as "tainted." This tainted input will not be used for any queries on the SQL2008 database until it has been filtered.

3.6 Browser Interface

Though it is probably already indicated by the server architecture, the development team must make it clear that this software is being developed for a web interface. This will eliminate many of the dependencies that are inherent to a system launched from a binary. The development team is developing this project to meet the following end system requirements:

- 1024x768 monitor resolution
- Google Chrome
- Mozilla Firefox

- Internet Explorer 7 and up
- Safari
- Compliant with W3C standards

4 Design Descriptions

4.1 Model-View-Controller Modules

4.1.1 Global Scripts and Config Files

4.1.2 Controllers

These controllers do not yet have a finalized set of associated functions and variables. When these are complete a full description will reside here.

- HomeController
- UserController
- ManagerController
- AdminController

The home controller our default page in the case that a user is not logged in. It provides the entry point.

UserController inherits from the default MVC Controller class as well as providing basic functionality for a normal user.

ManagerController inherits from UserController, but adds a couple more abilities that managers need as per the requirements specification.

AdminController inherits from ManagerController, inheriting all functionality as well as providing any and all administrative functions that are needed by TARS admin. Having these inherited privileges ensures that forced permission traversals will be almost impossible.

```
Home Controller //Default controller called when visited TARS
                //for the first time or when not logged in.

User Controller
 -> ManagerController
  -> AdminController
```

4.1.3 Models

- AccountModels (provided by IIS7 MVC)
- History
- Hours
- PcaCode
- PCAWE

- WorkEffort

These items do not inherit from the default Model class. In addition, each class has an associated DbContext class in the same file. Example:

```
public class PCA_CodeDBContext : DbContext
{
   public DbSet<PcaCode> PCA_CodeList { get; set; }
}
```

These connections are not conventional classes or objects. To indicate this, their naming conventions are slightly more verbose. A DbContext creates a new context instance that utilizes an existing Database Connection String (located inside web.config) to create a connection to a SQL Database.

4.1.4 Views

- Every controller has an associated View. Located in their respective folders. Manager example:

  `Views/Manager/___.cshtml`

4.2 SQL2008 Database Schema and Interface Description

As mentioned above in the Software Architecture section, TARS will use a SQL2008 database to store all interactions other than User Info (handled by Active Directory). Before outlining the Database Schema, it would be wise to fully describe the thought process of the development team.

Stripped down to its most base parts, TARS is simply a database interface through which users can log and retrieve hours to and from work efforts. These "Work Efforts" are simply general projects that can have hours of contractor/non-contractor work added to their totals. For instance, there might be a Work Effort that is assigned its own unique ID and whos description is "Document the latest changes to the TARS SDD." Any employees who wish to log their hours will find the Work Effort's ID, add their hours along with other relevant data, and submit their entire timesheet for approval.

The Work Effort to "Document the latest changes to the TARS SDD." now has hours logged on it and waiting for approval. A user with the correct Active Directory permissions (part of group TARSManager or TARSAdmin) can now go check the status of the Work Effort, and approve any pending hours waiting on it. The development team has chosen to add all hours, approved or not, to the Work Effort's database table. A simple boolean present as a column in the table will ensure that filtering by approved/unapprooved will be a simple task.

Unfortunately, the process is not done. Now that a Work Effort has hours charged to it, how can the accounting department charge these expenses? The simple answer is, they can't yet. To provide that functionality, PCA Codes must be assigned. This introduces another database table, as one PCA Code may have multiple Work Effort associations; just as one Work Effort may be associated with multiple PCA Codes.

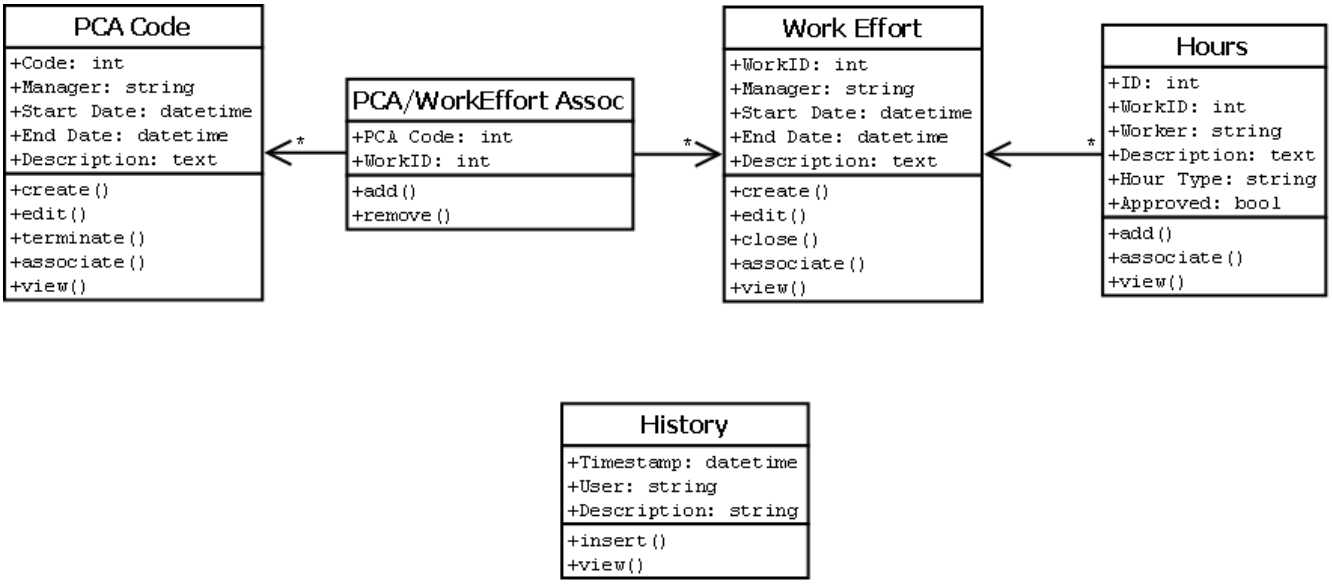
One final note about the Work Efforts and PCA Codes is needed. The requirements state that they both must be time-bounded, capable of early expiration, and renewable.

Through discussion of the above situations and processes, the development team settled on the following database schema. These are no final by any means, as a design is rarely finalized before development has commenced.

Addendum for 11/1/2011. The stakeholders introduced the concept of "tasks." There will be a default

set of tasks for every work effort, but members of the "administrator" Active Directory group will have the ability to add or remove these "tasks" from a given work effort. Instead of having a separate "tasks" table for each work effort, the TARS team members will simply store the list of tasks in a comma separated string; using string manipulation to retrieve, edit, and read the list.

4.2.1 TARS Database Schema



4.3 Naming Conventions

All defined classes and objects will use capitalized camelcase, with their first letter a capital as well.

Local Variables and instances of classes will use camelcase also, neglecting the capitalization of their first letter.

```
class Manager : Controller
{
    public int id;
    public bool approved = FALSE;
    public string hoursType;
}
```

5 Tracability Information

All effort on the project may be tracked via the project GitHub repository: github.com/ICBM/TARS

The project website resides at: http://seniordesign.engr.uidaho.edu/2011-2012/CostManagement/

Client requirements changes will be handled via email. Current progress on requirements as well as the requirements changelog is available at: github.com/ICBM/TARS/blob/master/doc/requirements_summary.docx

6 Appendix A: Use Cases

More might be required here.

Login

1. Click the "Login" button
2. Enter username and password
3. Hit Enter or click "Submit"
4. System authenticates and redirects to home page.

Adding new PCA code.

1. Select "Add PCA"
2. System loads PCA form
3. Fill in form, including time bounds for the PCA code
4. Press "Submit"
5. System updates tables and redirects to new PCA display page
6. A request to the financial department will be automatically dispatched. PCA codes are not actually generated by TARS.

Deactivating PCA code

1. Select desired PCA code
2. System loads PCA display page
3. Click deactivate
4. Confirm deactivation.
5. System updates tables and locks PCA code.

Adding Work Effort

1. Select "Add Work Effort"
2. System loads Work Effort form
3. Fill in form
4. Associate desired PCA code or codes, if multiple PCA codes are chosen a percentage of work effort may be set for each
5. Associate entity or entities
6. Click "Submit"
7. System updates tables and redirects

Edit/Update Employee/Contractor Data

1. Select desired entity
2. System pulls data from database and loads Entity Form
3. Edit/Update as desired
4. Click "Update"
5. System updates table and redirects.

The system must allow for future time entry

1. Select "Add Work Effort"
2. Fill in form, making sure to add the effort to the correct date.
3. Click "Submit"

All data for reporting shall be extracted via external source (EDW. Excel, etc.).

1. Under a given PCA code or work effort, select "Get Data Report".
2. The system will then generate a copy of the data in EDW or Excel format.
3. User saves the copy at a destination of their choosing.

Must allow users to create a view of their I-Time timesheet.

1. User logs in.
2. On the user's personal page, select "Get I-Time Report".
3. The system will then generate a copy of the data for viewing.

Must have a sort and group function that allows work effort to be grouped by application, division, manager, etc.

1. User logs in.
2. User selects "My Work Efforts"
3. System generates list of all work efforts related.
4. User selects to sort by name, application, etc.
5. System sorts and redisplays work efforts in the proper order.

The system must allow a user the ability to create a custom view of the data.

1. User selects a PCA code or Work Effort code
2. User selects "Get Data Report".
3. User enters custom settings and hits "Select".
4. System generates report.

Must allow users to easily size windows

1. User resizes browser, which will resize the web interface.

The system shall provide search/find functionality to locate work efforts, with minimal amount of navigation (less than 5 clicks per important action)

1. User logs in.
2. User navigates to a work effort by...
    - Clicking on a link in the "My Recent Work" bar.
    - Entering a Work Effort code or PCA code in the Search bar on the top.

7 Appendix B: Reference Links

Unit Testing ASP.NET MVC
http://msdn.microsoft.com/en-us/magazine/dd942838.aspx

SQL2008 integration w/ IIS7 MVC reference
http://blog.evonet.com.au/post/Setting-up-SQL-Server-2008-for-an-ASPNET-website-on-IIS-70.aspx

SQL2008 Studio Manager
http://www.microsoft.com/download/en/details.aspx?id=7593

SQL2008 Server
http://www.microsoft.com/download/en/details.aspx?id=1695

Apache Directory Server (LDAP stand-in for Active Directory)
http://directory.apache.org/apacheds/1.5/

Apache Directory Studio (Essential Client for Managing ApacheDS)
http://directory.apache.org/studio/

Write an LDAP interface in C#
http://www.youcanlearnseries.com/programming%20Tips/CSharp/LDAPReader.aspx