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EXTENDING THE SOLICITATION MANAGEMENT SYSTEM:
PDF REPORTING AND DATABASE SUPPORT

A Project
Presented to the
Faculty of
California State University,
San Bernardino

In Partial Fulfillment
of the Requirements for the Degree
Master of Science
in
Computer Science

by
Chia-Ming Chang
June 2008

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PDF REPORTING AND DATABASE SUPPORT

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by
Chia-Ming Chang

June 2008

Approved by:



Dr. David Turner, Chair, Computer Science



Dr. Arturo I. Concepcion



Dr. Ernesto Gomez

June 3, 2008
Date

ABSTRACT

This project was to extend the functionalities of the Solicitation Management System (SMS) to better meet the needs of users. The SMS was first built in 2004 and was primarily used by the Office of Technology Transfer and Commercialization (OTTC), CSUSB for its solicitation activities. This time, for the 2008 Solicitation, which officially opened on 28 Jan 2008, SMS was extended and maintained to support not only OTTC, CSUSB, but also the Center for the Commercialization of Advanced Technology (CCAT), SDSU. The new functionality includes uploading various files and generation of new PDF reports based on exiting SMS. A small number of submitted proposals are selected for support. As the number of proposals grows, requests to download and upload files will be more frequent. If those proposals are stored and maintained in the database rather than directly in the file system, accessing and manipulating them are convenient. Several PDF reports were added to the system in order to present essential data to the user. The basic components of SMS include client machine, Web server, database server and document conversion server. Developing the new functionalities is based on those four components. In addition, user-friendly, quick to learn and a reliable system are also provided for this new system.

ACKNOWLEDGMENTS

I would like to acknowledge my advisor, Dr. David Turner for all the efforts that he had devoted to make this project possible. I would also like to thank him for all the time that he put into this project and for helping me whenever I ran into a problem. I would also like to thank Dr. Arturo I. Concepcion and Dr. Ernesto Gomez for serving on my committee and for giving me guidance along the way.

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CHAPTER ONE

INTRODUCTION

1.1 Purpose

The main purpose of this project is to develop new functionalities for the existing Solicitation Management System (SMS) to support OTTC, CSUSB and CCAT, SDSU for the 2008 solicitation on 28 January 2008 to improve its reporting capabilities and support the new functional requirements. The new functions include uploading announcements, instructions and proposal templates.

Implementation of these changes to the system was coordinated with the work concurrently performed by Kun-Che Chen's master project. Since the structure of the database will need to change, a database creation script will be developed. In addition to these specific tasks, re-factoring tasks were identified by Dr. Turner during code review sessions.

The existing system only supports the generation of reports in HTML format. This is very inconvenient for the OTTC and CCAT staff, since they print countless number of pages. The current process required additional time and also produces reports that are not uniform in their appearance.

To solve this problem, a function to produce nicely formatted reports in PDF format was added.

1.2 Scope

The scope of this project includes creation of new PDF reports and functions to support the management of topics and classes. The OTTC and CCAT officers are able to reuse an existing solicitation with a pool of questions when creating a new solicitation. Additionally, the scope of work includes writing database migration scripts, making user interface improvements and re-factoring code to improve maintainability.

1.3 Definition and Abbreviations

SMS - Solicitation Management System.

OTTC - Office of Technology Transfer and Commercialization.

CCAT - Center for the Commercialization of Advanced Technology

Java - Java is an object oriented programming language developed by Sun Microsystems. Java applications are capable of running on most popular computer platforms without any recompilation.

Java Servlet - A Java application that runs in a web server or application server. It provides server-side

processing which usually is used to access a database or perform e-commerce processing.

JSP - Java Server Page (JSP) is an extension of the Java server technology from Sun that provides a simple programming technology for displaying dynamic content on a web page.

JDBC - Java Database Connectivity (JDBC) is a programming interface that allows Java applications to access database through the SQL language.

MySQL - MYSQL is a software that delivers a very fast, multi-threaded, multi-user, and robust SQL (Structured Query Language) database server.

Tomcat - Tomcat is a Web application server developed by Apache Software Foundation that executes Java Servlets and JavaServlet Pages.

UML - Unified Modeling Language (UML) is a set of graphical notations as a sketch to design and describe the software system with the object-oriented style.

Use Case Diagram - Use Case Diagram is a way to describe the interactions between the users and the software system and give the information of how to use the software system.

Use Sequence Diagram - The purpose of Use Sequence Diagram is to show how the objects and the messages are passed between those objects with the use case.

1.4 Overview

The rest of this section is organized as follows. Chapter 2 gives an overall description of SMS; it describes related requirements of the software, discusses what level of proficiency is expected from users, provides some general limitations and lists factors that affect the requirements. Chapter 3 gives specific requirements that the software is expected to deliver. Functional requirements are given by various use cases. Several performance requirements and design constraints are also given. Chapter 4 presents database design. In Chapter 5, we discuss the implementation of uploading files and generating reports. Maintenance manual of the system is presented in chapter 6. Conclusions and ideas for future work are drawn in chapter 7. The final chapter includes related reference documents.

CHAPTER TWO

OVERALL DESCRIPTION

2.1 Product Perspective

SMS is aimed at organizations that have grant programs in which applicants submit project proposals. Thus this system can be used to submit and evaluate proposals. SMS should be user-friendly, quick to learn and a reliable system for the above purpose. The following section will describe how SMS operates inside various constraints.

2.1.1 System Interfaces

The system interfaces include four components: the client machine, the Web server, the database server and the document conversion server. The client will use a Web browser to access this system by HTTP protocol. The document conversion server converts word file to PDF file. Once the Web server connects to the database server through the TCP/IP protocol, the client can store and retrieve persistent data. The deployment diagram of the SMS is shown in Figure 1.

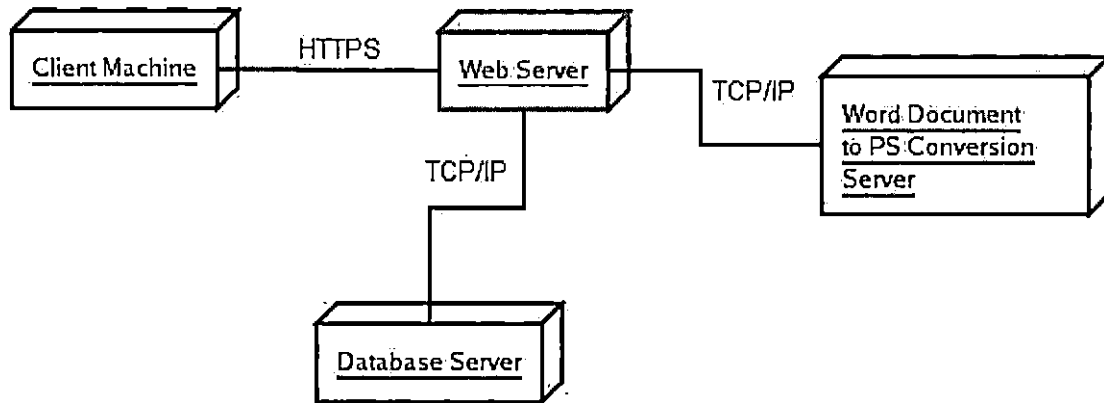


Figure 1. Deployment Diagram

2.1.2 User Interfaces

The user interface can be accessed by five different levels of users: officer, staff, administrator, applicant and evaluator. Each user has to input an user name and password to log into the system. The function of the user interface depends on the user level.

a. Officer:

- Manage Solicitations- The officers are able to list, view, create, clone, edit, and delete a solicitation.
- Manage Profile - Individual information, such as password and email, can be modified if there is any change.
- Manage Groups - The officers are able to list, view, create, edit, and delete groups. They also can

- Select the groups that are associated with this specific solicitation.
- Manage Evaluation - The officer can assign evaluators to applications according to the information provided.
- Manage Application - The officers are able to list, view, and delete applications that an applicant has submitted.
- Manage Evaluator - The officers are able to list, view, edit, and delete evaluator related information.
- Manage Applicant - The officers are able to list, view, edit, and delete applicant related information.
- Generate Report - The officers are able to generate reports for a specific solicitation.

b. Staff:

- View Solicitations - The staffs are able to list and view solicitations.
- Manage Profile - Individual information can be modified if there is any change.
- View Groups - The staffs are able to list and view groups.
- View Evaluation - The staffs are able to list and view evaluations.

- View Applications - The staffs are able to list and view applications.
- View Evaluator - The staffs are able to list and view evaluator related information.
- View Applicant - The staffs are able to list and view applicant related information.
- View Reports - The staffs are able to view the report for specific solicitations.

c. Administrator:

- Manage Officers - The administrators can view the list of officers and staff members or edit information for a specific officer or staff member. Moreover, the administrators are able to create new accounts and delete accounts for officers or staff members.
- Manage Profile - Individual information can be modified if there is any change.

d. Applicant:

- Submit Application - The applicants can submit their applications associated with the solicitation.
- Manage Profile - Individual information can be modified if there is any change.

e. Evaluator:

- Perform Evaluation - The evaluators can evaluate applications assigned to him. They will read the applicant proposal and then answer the evaluation questions assigned to the specific solicitation.
- Manage Profile - Individual information can be modified if there is any change.

2.1.3 Hardware Interfaces

The system requires no special hardware interface other than connectivity to the Internet.

2.1.4 Software Interfaces

SMS should run on any Web browser for Windows, Linux, or Mac OS. The interface will be developed by HTML, JavaScript, JSP and CSS. The server will run by using Tomcat on both Linux and windows machine.

2.1.5 Communications Interfaces

The communication interface requires any comparable Web browser such as Mozilla, Firefox and Internet Explorer.

2.1.6 Memory Constraints

The minimum amount of memory required to run SMS is 256 MB. The capacity of the secondary storage depends on how much information is entered into the system. For OTTC, a capacity of 20 GB is sufficient.

2.1.7 Operations

SMS will operate 24 hours a day, 7 days a week. The technical support will be provided by the systems administrator who works for OTTC. Backup and recovery operations will be scheduled monthly.

2.2 Product Functions

This section illustrates the interactions between the active users and the system with use cases. The system will provide different functions depending on the role of users. SMS allows users to manage information, view information, generate reports, submit applications and perform valuations. The use case diagram of SMS is presented in Figure 2.

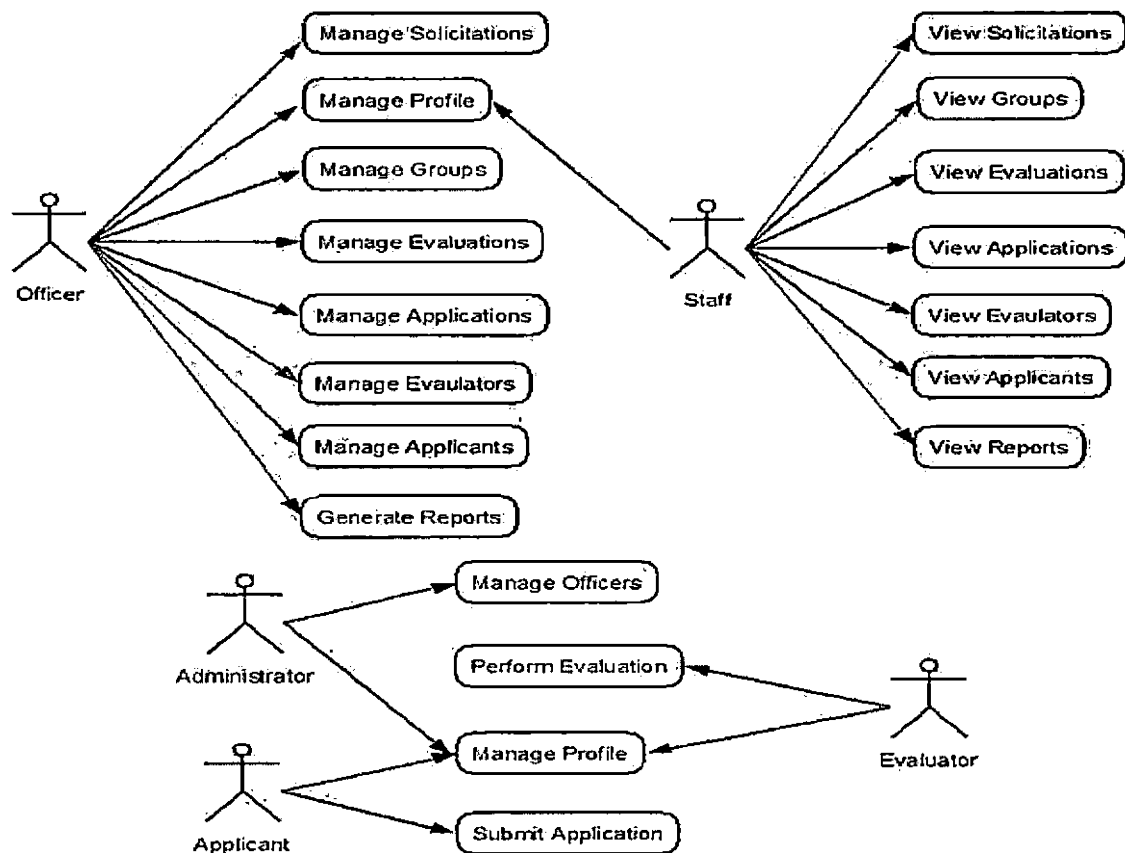


Figure 2. Use Case Diagram

2.3 User Characteristics

Users should be familiar with SMS related terminology such as solicitation, application, etc. Users do not need to learn a new set of commands in order to start using SMS. For a short learning period, the staff should be able to learn how to use SMS quickly. The help system provides additional instructions and/or guidance. If the user enters incorrect

information, such as wrong number of telephone digits, the system will report the problem with an error message.

2.4 Constraints

The SMS system should handle at least 100 users or applicants simultaneously.

2.5 Assumption and Dependencies

Full functionality of SMS is dependent on the availability of Internet connection. SMS is built using various libraries; the dependencies of this system are the dependencies of the libraries that we are using.

CHAPTER THREE

SOFTWARE REQUIREMENTS SPECIFICATION

3.1 External Interface Requirements

3.1.1 User Interfaces

There are five different users: officer, staff, administers applicants and evaluators. Each of these users interacts with the system in a different way. The officers will be able to access all data and functionality of the system. This means they will have complete control over the functions. The staffs only can access their own information and view the information but not modify it. The administrators will be able to add and delete the officers and the staffs.

3.1.1.1 Login Page. To access the system, the users have to provide their username and password. Once validating their username and password, the homepage is displayed based on users' role. If the users forget their passwords, the link of "Forget Password" will help them obtain the password by the emails. A list of instructions and guidelines are presented in this page. See Figure 3.

http://ccatsofcal.org/portal/

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CCAT SoCal Center for Commercialization of Advanced Technology Southern California

New To CCAT? Please Register > **CCAT Home**

- [Steps to Submit a New Grant Application](#)
- [Register as a New Evaluator](#)
- [Steps to Modify or Complete an Existing Grant Application](#)
- [Recover a Forgotten Username or Password](#)
- [Submission Deadlines](#)
- [Proposal Document Guidelines](#)

Registered User - Please Login

User Name:	<input type="text"/>
Password:	<input type="password"/> <input type="button" value="Login"/>
Forgot Password?	New User? Register First

Steps to Submit a New Grant Application

1. If you have a username and password (from the current or previous solicitation), then login. Otherwise, [register a new username and password](#).
2. Select the solicitation for which you wish to submit an application.
3. Read the Instructions, which describe the format of your proposal and what to include in it.
4. After you have developed a proposal in accordance with the Instructions, log back into the system and choose the function to submit a new application. (Multiple submissions are allowed.)

Steps to Modify or Complete an Existing Grant Application

1. Login with established username and password. (If you forgot your password, then click [here](#).)
2. Select a solicitation for which you have a pending grant application.

Figure 3. Login Page

3.1.1.2 Registration Page. There are two roles of users in this page: the applicants and the evaluators. When the users decide their roles and fill in all necessary information, they will be allowed to browse the specific home page. Figure 4 shows registration page.

http://localhost:8080/ntc/Viewer/select_role_page.jsp?roleId=40440727A230219730773F0330A028

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Southern California

Register New Account.

Step 1. Proposer or Evaluator? Step 2. Account Information

Cancel

You can create an account as either a proposer or evaluator.

☒ Proposer
You will be applying for an active solicitation.

☐ Evaluator
You have been asked by CCAT staff to be an evaluator.

Continue

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Figure 4. Registration Page

After users click the link where they belong, the registration page will be shown. See Figure 5 and Figure 6.

http://ocw.hawaii.edu/ocw/registration/select_role_action

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Southern California

Register New Account

Step 1: Proposer or Evaluator? (Step 2: Account Information)

Contact Information

Title

First name

Last name

Street address

City

State

Zip code

County

Figure 5. Registration Page1

http://aces.hesd0002/sbtd/ra/ra/ra/select_role_action

County
[]

Primary telephone
([]) [] - [] ext.: []

Secondary telephone (Optional)
([]) [] - [] ext.: []

Email
[]

A valid email address is required to complete registration.

Email address
[]

No, enter email address
[]

User ID & Password

Create User Name
[]

Create Password
[]
6 character minimum.

Re-enter Password
[]

Please write down your User Name and Password, because they are required to log back into the system.

[Submit]

Figure 6. Registration Page2

3.1.1.3 User Home Page. The administrators are allowed to create the new staff or officer and edit or delete their account in administrator home page. The administrator home page is shown in Figure 7.

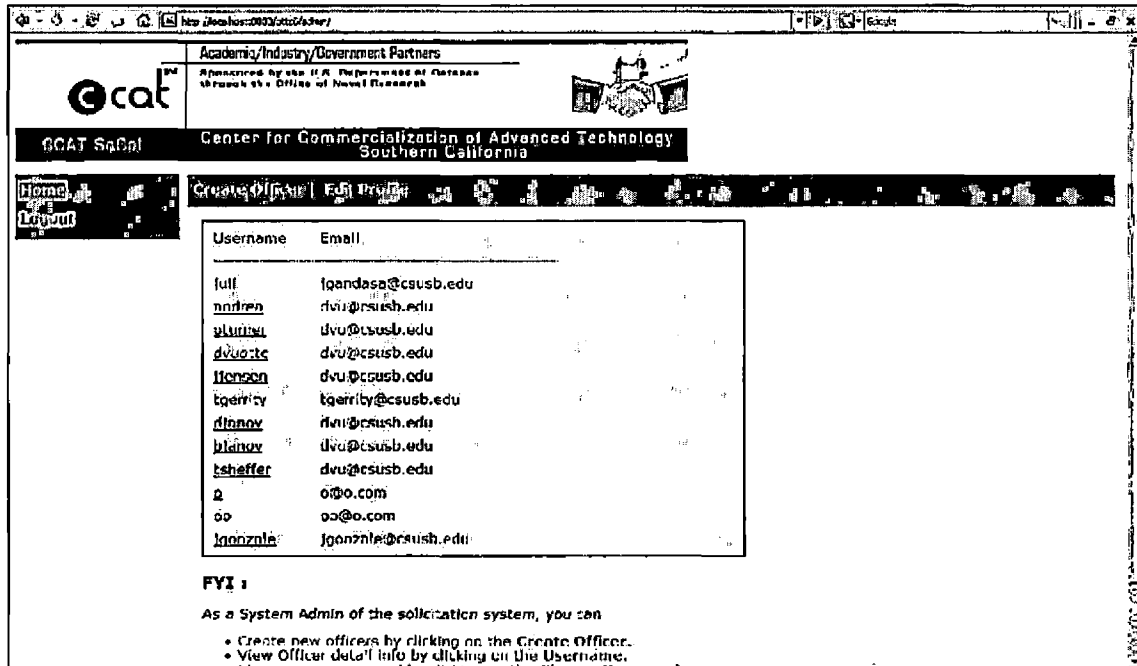


Figure 7. Administrator Home Page

In the officer home page shown in Figure 8, the officers can view all the solicitations with hyperlinks. The detailed information is shown by clicking the link with the names of solicitation. The left bar shows the links of management of the applicants, evaluators and staffs. Meanwhile officer can create solicitation and initial system setup and modify his or her personal profile.

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Southern California

List Solicitations

Solicitation Title	Submission Deadline	Evaluation Deadline	Status	View Announcement	View Instructions	View Proposal Template
2009-01-09	2009-01-09	2009-01-17	active	Unavailable	View	Unavailable
2009-01-21	2009-01-21	2009-02-13	closed	Unavailable	Unavailable	Unavailable
2009-03-16	2009-03-16	2009-03-21	closed	Unavailable	Unavailable	Unavailable
2009-04-18	2009-04-18	2009-04-23	closed	Unavailable	Unavailable	Unavailable
2007-02-08	2007-02-08	2007-02-23	active	Unavailable	Unavailable	Unavailable
2007-02-27	2007-02-27	2007-03-27	active	Unavailable	Unavailable	Unavailable
2007-01-16	2007-01-16	2007-01-24	active	Unavailable	Unavailable	Unavailable
2006-04-29	2006-04-29	2006-05-09	active	View	View	Unavailable
2006-01-10	2006-01-10	2006-01-17	active	View	View	View
2006-01-21	2006-01-21	2006-02-23	unpublished	Unavailable	Unavailable	Unavailable
2006-01-31	2006-01-31	2006-02-23	active	View	Unavailable	Unavailable
2006-01-13	2006-01-13	2006-02-13	active	View	View	View
2006-01-24	2006-01-24	2006-02-24	unpublished	View	View	View
2006-02-13	2006-02-13	2006-03-13	active	View	View	View
2006-02-13	2006-02-13	2006-03-14	active	View	View	View
2006-02-21	2006-02-21	2006-03-21	unpublished	Unavailable	Unavailable	Unavailable

FYI:

• To view the detail of each solicitation, and your applications under each solicitation, please click on the solicitation title.

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Figure 8. Officer Home Page

The functionality of staff home page is almost the same as the officer's home page except that the staffs can only list and view information. The staff home page is shown below.

The screenshot shows a web browser window with the URL <http://localhost:8082/acc/acc.asp>. The page header includes the Ccat logo and the text "Academic/Industry/Government Partners", "Sponsored by the U.S. Department of Defense through the Office of Naval Research", and "Center for Commercialization of Advanced Technology Southern California". A sidebar on the left contains links: "List Solicitations", "View Applications", "View Evaluations", "System Setup", "Personal Profile", and "Logout". The main content area is titled "List Solicitations" and contains a table with the following data:

Solicitation Title	Submission Deadline	Evaluation Deadline	Status	View Announcement	View Instructions	View Proposal Template
DO 2003 O1/A and DO 2003 C1C	2003-01-03	2003-01-17	active	Unavailable	View	Unavailable
Defense Solicitation Issues	2003-01-31	2003-02-11	closed	Unavailable	Unavailable	Unavailable
Defense Solicitation March 2003	2003-03-19	2003-03-31	closed	Unavailable	Unavailable	Unavailable
August 2003 - Supplier and	2003-08-18	2003-10-22	closed	Unavailable	Unavailable	Unavailable
Supplier	2003-08-03	2003-08-23	active	Unavailable	Unavailable	Unavailable
August 2003 Solicitation	2003-08-27	2003-09-27	active	Unavailable	Unavailable	Unavailable
Data Test	2003-01-14	2003-01-24	active	Unavailable	Unavailable	Unavailable
Test	2003-01-23	2003-02-23	active	View	View	Unavailable
Initial	2003-01-10	2003-01-17	active	View	View	View
Initial	2003-01-31	2003-02-23	unpublished	Unavailable	Unavailable	Unavailable
Initial	2003-01-11	2003-01-29	active	View	Unavailable	Unavailable
Initial	2003-01-14	2003-02-22	active	View	View	View
Initial	2003-01-14	2003-01-24	unpublished	View	View	View
Initial	2003-01-19	2003-01-21	active	View	View	View
Initial	2003-01-19	2003-01-19	active	View	View	View
Initial	2003-01-21	2003-01-22	unpublished	Unavailable	Unavailable	Unavailable

NOTE:
To view the details of each solicitation, and your applications under each solicitation, please click on the solicitation.

Figure 9. Staff Home Page

In evaluator home page, the lists of the applications are displayed. The evaluator can do evaluations in this page. Moreover, the proposal, evaluation and application information from the applicants can be viewed.

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Applications
Areas of Expertise
Personal Info
Logout

Your Assigned Applications

Application Title	Evaluation Deadline		Evaluation Status
Test new SMS	2008-05-24	Start Evaluation	Not Started
test COI	2008-05-24	Start Evaluation	Not Started
cool technology	2008-05-16	View Evaluation	Finished
another cool technology	2008-05-16	Start Evaluation	Not Started
test cool technology	2008-05-16	Start Evaluation	Not Started
sol 1	2008-05-28	Start Evaluation	Not Started
sol 2	2008-05-28	Start Evaluation	Not Started

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Figure 10. Evaluator Home Page

The active solicitations can be applied or viewed by the applicants. Once the applicants select the applications they plan to apply, they can submit a new proposal or resubmit the modified proposal before the deadline. The applicant home page is shown in Figure 11.

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Solicitations Login

Personal Info

All Active Solicitations

Solicitation Title	Deadline	Submitted Applications	View Announcement	View Instructions	View Proposal Template
test	2008-02-26	0	View	View	Unavailable
robotics	2008-02-31	2	View	Unavailable	Unavailable
test2	2008-02-13	0	View	View	View

FYI:

- To view the detail of each solicitation, and your proposals under each solicitation, please click on the solicitation title.
- The number of submitted applications indicates how many applications you have submitted for each solicitation.

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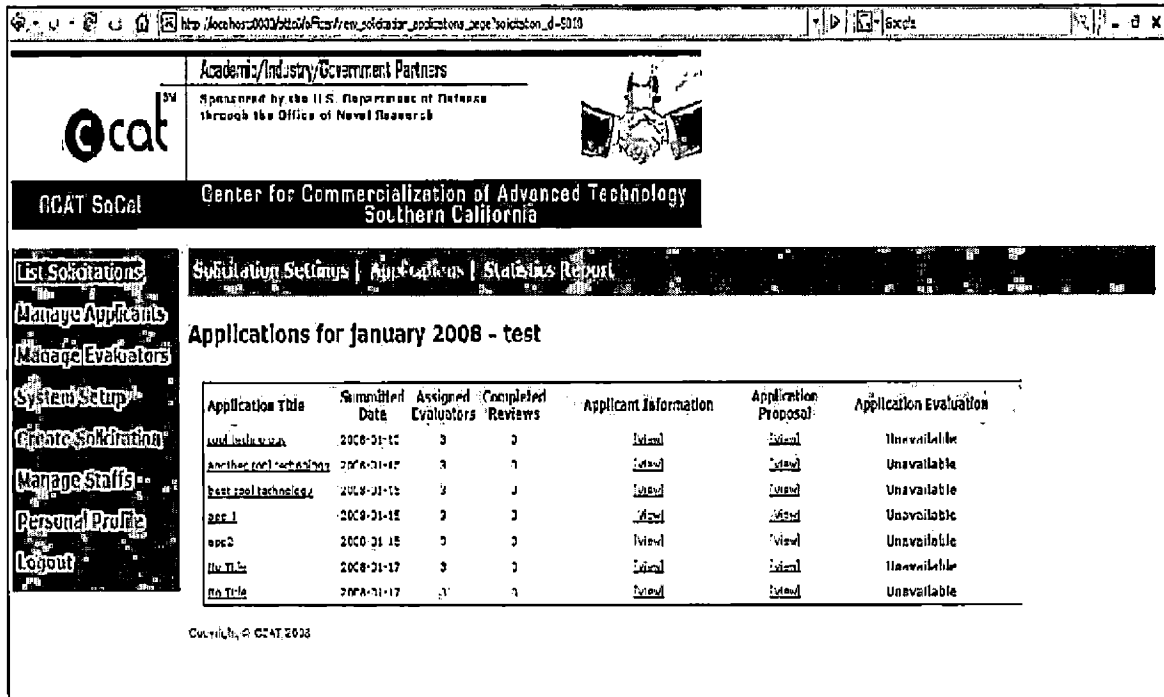
Figure 11. Applicant Home Page

3.1.1.4 Clone Solicitation Page. The system provides a clone function for when the officer wants to create a new solicitation. Once the checkbox is checked, the questions associated with the existing solicitation will automatically copy to the new solicitation.

The screenshot shows a web browser window with the URL `http://localhost:2002/htdocs/Forms/create_solicitation_page`. The page header includes the CCAT logo and text: "Academic/Industry/Government Partners", "Sponsored by the U.S. Department of Defense through the Office of Naval Research", and "CCAT SoCal Center for Commercialization of Advanced Technology Southern California". A sidebar on the left contains a menu with items: "List Solicitations", "Manage Applicants", "Manage Evaluators", "System Setup", "Create Solicitation", "Manage Staffs", "Personal Profile", and "Logout". The main content area features a "Copy Previous Solicitation" checkbox and a "Create A New Solicitation" section. This section contains the following form fields: "Solicitation Title:" (text input), "Submission Deadline:" (text input with a "Pick a date" example of 12/25/2008), "Evaluation Deadline:" (text input with a "Pick a date" example of 12/31/2008), and "Status:" (a dropdown menu currently showing "Unpublished"). A "Save" button is located at the bottom right of the form. The footer of the page reads "Copyright © CCAT 2008".

Figure 12. Officer Clone Questions of Solicitation

3.1.1.5 Generate PDF Report Page. In the "list solicitations" page, the officers can generate nicely formatted reports in PDF format for applicant information, application proposal and evaluations.



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OCAT SoCal Center for Commercialization of Advanced Technology Southern California

List Solicitations
Manage Applicants
Manage Evaluators
System Setup
Create Solicitation
Manage Staffs
Personal Profile
Logout

Solicitation Settings | Applications | Statistics Report

Applications for January 2008 - test

Application Title	Submitted Date	Assigned Evaluators	Completed Reviews	Applicant Information	Application Proposal	Application Evaluation
and technology	2008-01-10	3	0	View	View	Unavailable
Another cool technology	2008-01-17	3	1	View	View	Unavailable
Best cool technology	2008-01-15	3	1	View	View	Unavailable
app 1	2008-01-15	3	0	View	View	Unavailable
app 2	2008-01-15	3	0	View	View	Unavailable
the title	2008-01-17	3	0	View	View	Unavailable
No Title	2008-01-17	3	1	View	View	Unavailable

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Figure 13. Generate PDF Report

3.1.1.6 System Setup Page. The following figure shows all functions of system setup. There are area of expertise, classes, tracks, awards, applicant information questions and evaluation form questions. By accessing this page, the officers can manipulate all questions as a pooling. Once creating a solicitation, the officers are able to select specified questions from this questions pooling.

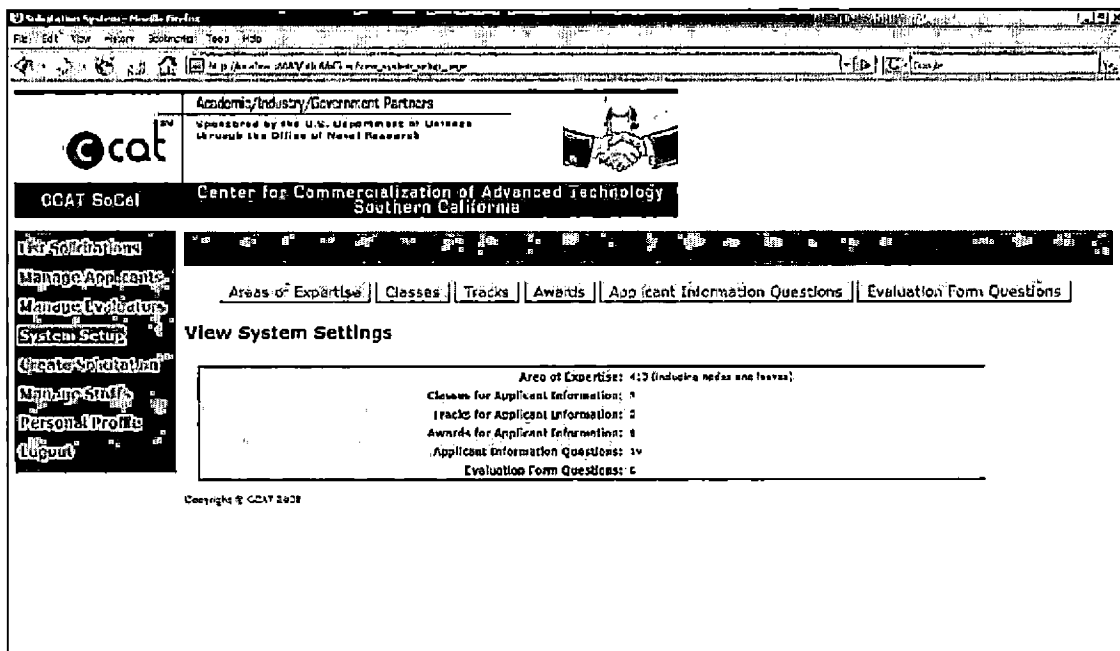


Figure 14. System Setup

3.1.1.7 Upload Files Page. Figure 15, 16 and 17 display the interface of the upload files. Each file requires specified file types. For example, announcement and instructions are Adobe PDF document. Microsoft word document is required for the proposal templates.

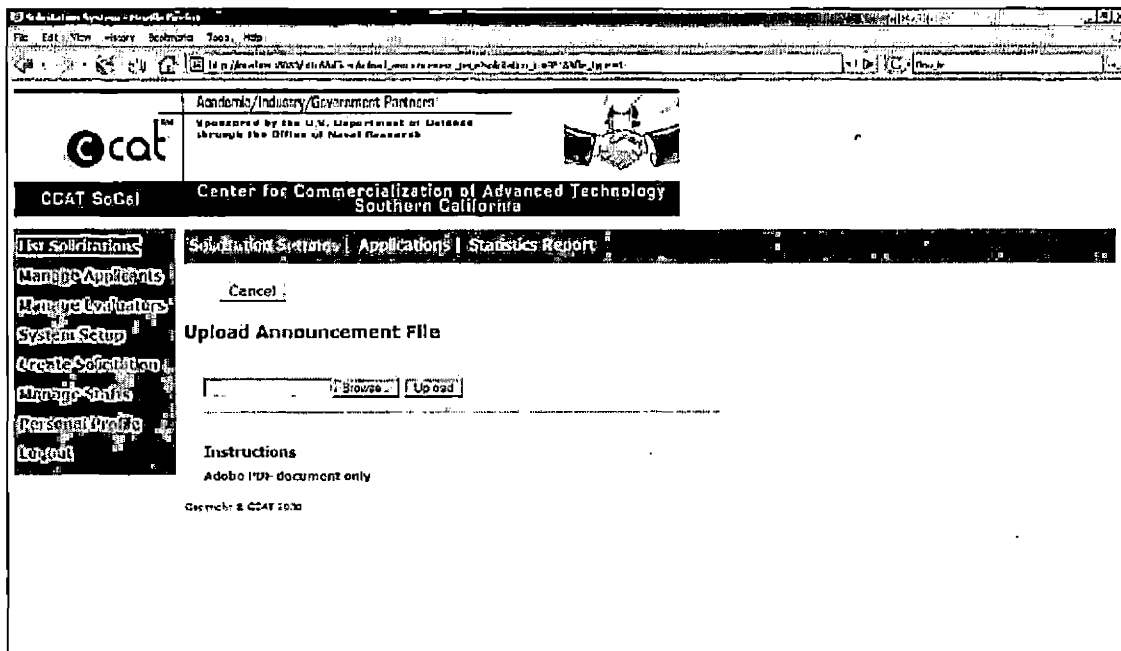


Figure 15. Upload Announcement Pages

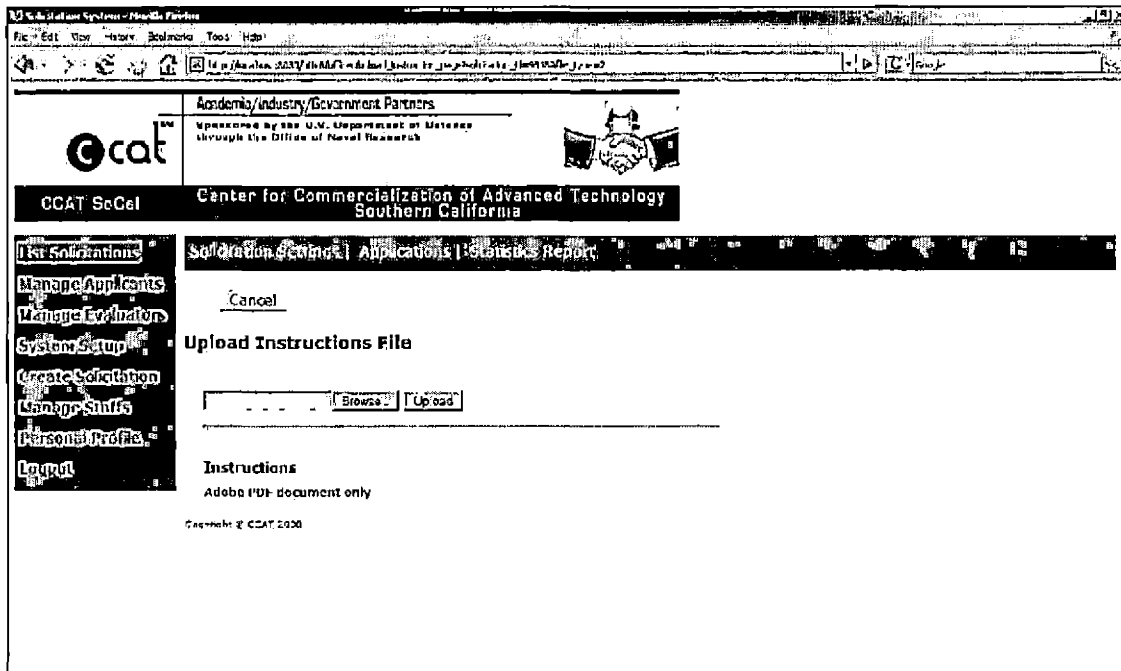


Figure 16. Upload Instructions Page

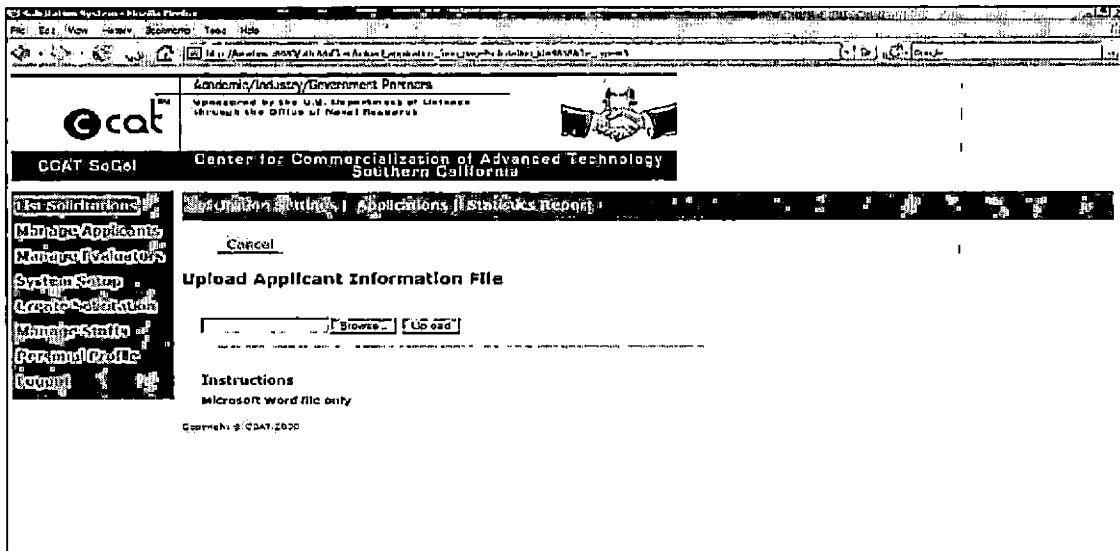


Figure 17. Upload Proposal Template Page

3.1.2 Hardware Interfaces

The system must be on a computer connected to the Internet. SMS will function on Windows XP, Mac OSX, and Linux

Minimum PC Requirements: 800Mhz processor and 1G of RAM.

3.1.3 Software Interfaces

SMS operates through the user's web browser. The user must use one of the following web browsers: Internet Explorer 6.x or higher, Fire fox 1.5.x or higher and must have JavaScript enabled. The server must have Linux, Tomcat, MySQL and JSP installed.

3.1.4 Communications Interfaces

The system requires the users to be connected to the internet with a connection of at least 384 Kbps (DSL). They may be connected wirelessly or through their NIC (Network Interface Card)

3.2 Functional Requirements

3.2.1 Open Solicitation

Figure 18 shows how to open a new solicitation. The officers have to provide the details of this solicitation such as the date of submissions deadline and evaluation deadline. Before activating this solicitation, the officer need to assign the applicant and evaluation questions and then upload required files.

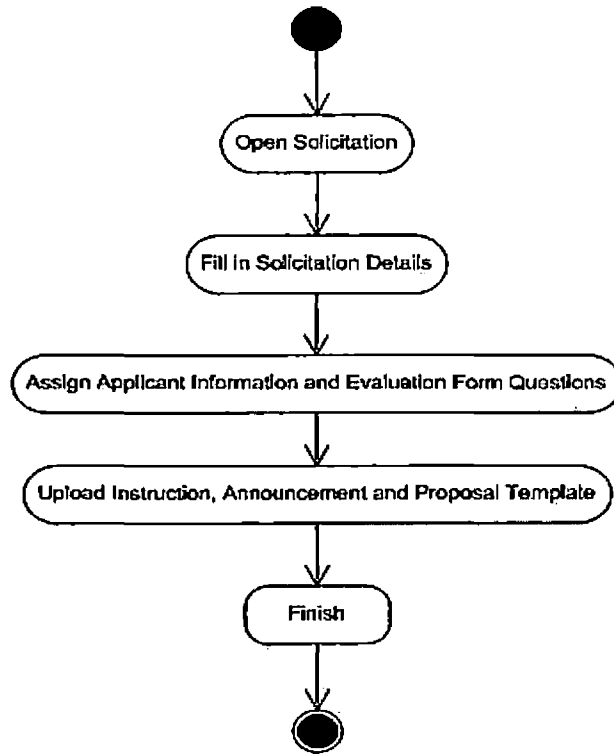


Figure 18. Open Solicitation Activity Diagram

3.2.2 Submit Proposal

The applicants are able to apply applications according to open solicitations. After inputting their personal information and select the technology areas they will be allowed to upload the new proposal or replace the old one.

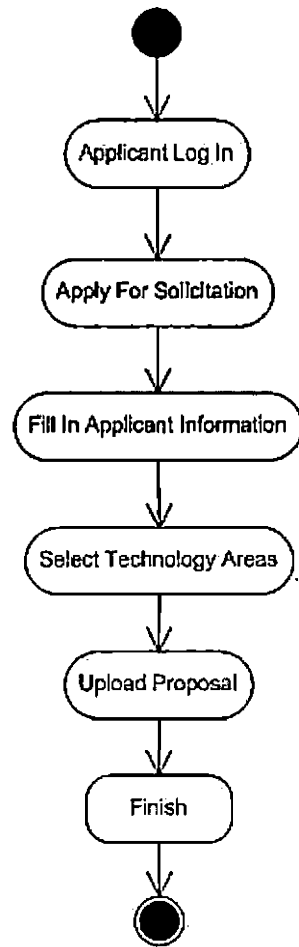


Figure 19. Submit Proposal Activity Diagram

3.2.3 Assign Evaluator

Firstly, the officers select the application from a list of solicitations. Then they can assign evaluators for the application they already selected. Once the application has been assigned, the evaluators can start to evaluate the proposal.

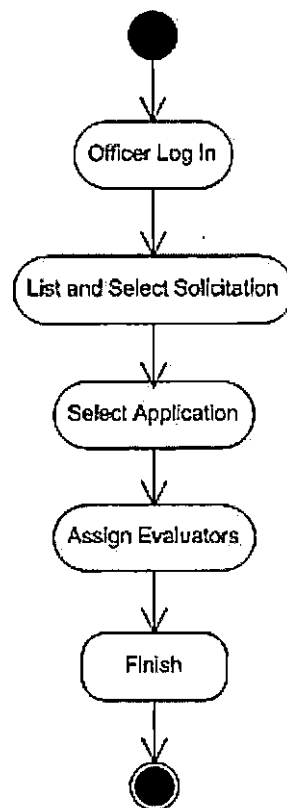


Figure 20. Assign Evaluator Activity Diagram

3.2.4 Evaluate Proposal

Figure 21 shows how an evaluator evaluates a proposal. As shown, when the evaluator logs in the Web page successfully, he or she can select the assigned applications. During the starting evaluation, the scores and comments are given by the evaluator. After that, the process of evaluation is finished. The staffs only can do the view and list functions; however, an officer can do and generate reports for a specific solicitation.

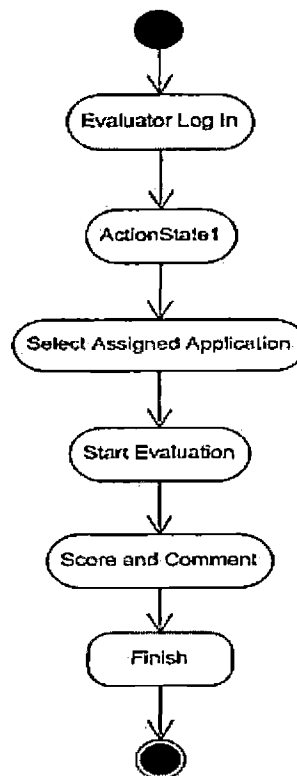


Figure 21. Evaluate Proposal Activity Diagram

3.2.5 Registration

The new users can be divided by two groups. One is the evaluator and another is the applicant. Based on their roles, different registration activities are processed. For example, the evaluators not only have to fill in information but also select their areas of expertise. While the applicants just only fill in information. The activity diagram of registration is shown in Figure 22.

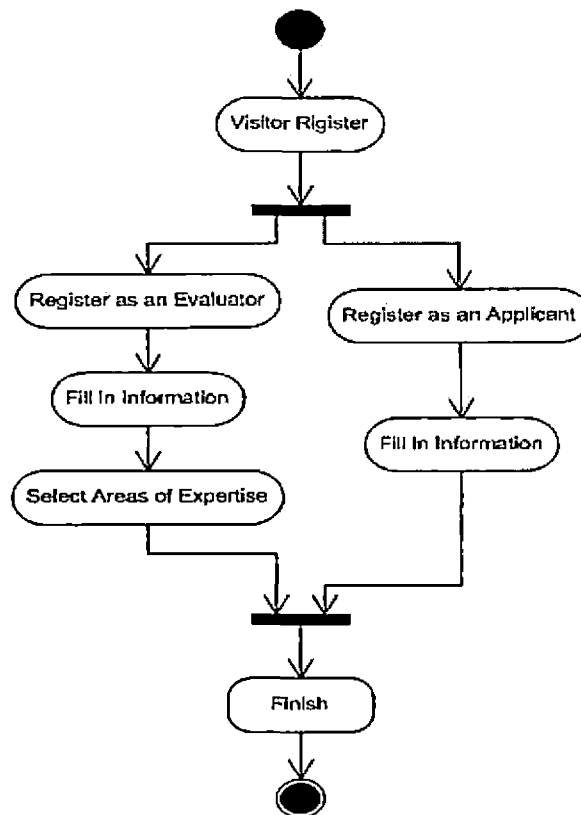


Figure 22. Registration Activity Diagram

3.3 Performance Requirements

When loading Web pages, time should be from 5 to 10 seconds. Generating all reports, running document conversion, and uploading file have to maintain within 30 seconds.

3.4 Design Constraints

The programmer, during its design, should use only currently available computers as a server. The developer should use the latest and/or most mature technology to design the system and JSP to write the view component of the web application.

3.5 Software System Attributes

3.5.1 Reliability

A web server with the capability to run both JSP and Java will be required to assure that all code is fully functional.

3.5.2 Availability

Stored on a server with World Wide Web access, the scheduling tool will be available 24 hours a day, 7 days a week.

3.5.3 Security

SMS will employ measures to encrypt password information. The server will be placed in a secure location where unauthorized personnel will not have access to it.

3.5.4 Maintainability

The model-view-controller design pattern will be used to allow us to make changes to the user interface without impacting the data handling. This also allows data to be reorganized without changing the user interface. Code will be well documented and will be written to be reusable in the future, if need be.

3.5.5 Portability

All code can be moved to a different web server and be fully functional given that the new server complies with all of the software and hardware requirements contained within this document.

3.6 Software System Attributes

There are no other requirements.

CHAPTER FOUR
DATABASE DESIGN

4.1 Data Analysis

In this chapter, the database design for SMS is represented by entity relationship(ER) diagram. The types of binary relationships are also described for each database table. The ER diagram is shown in Figure 23.

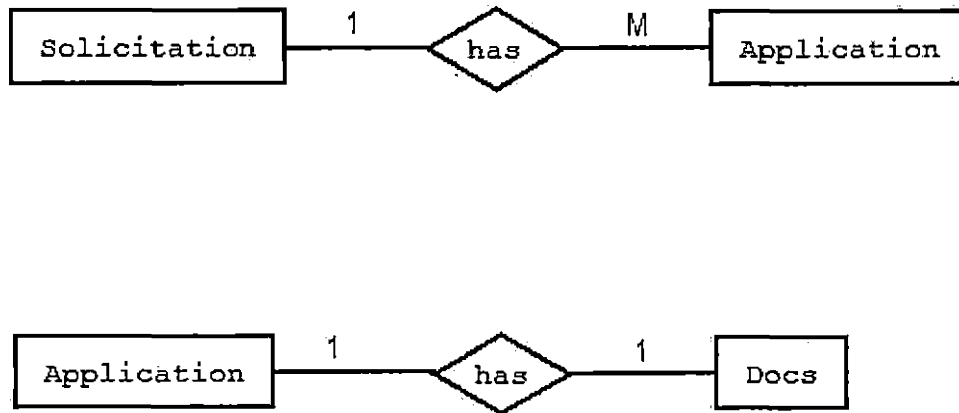


Figure 23. Entity Relationship Diagram

The relationship between Solicitation and Application entities is one-to-many relationship. This means that one solicitation can have many applications. However, an Application can be defined as having one to one relationship with Docs. Only one application is involved in Docs.

4.2 Database Schema Logical Models

In order to implement upload file functions, three new fields which are announcement, instructions and app_form have to be created in Solicitation table. Meanwhile a new Docs table will be created for uploading proposals. The schema of solicitation and docs tables are shown below. The attribute "ID" is the primary key.

Field Names of Table Solicitation	
<u>ID</u>	TITLE
STATUS	SUBMISSION_DEADLINE
EVALUTATION_DEADLINE	ANNOUNCEMENT
INSTRUCTIONS	APP_FORM

Field Names of Table Docs	
<u>APPLICATION_Id</u>	TYPE_ID
SUB_ID	DOC_DATE
DOC_TITLE	DOC

Figure 24. Database Relational Schema

4.3 Data Type and Details

The tables in Figure 25 and 26 show the field name, type, size, constraints and the memo for all attributes. The field name indicates each attribute's name in the table. The constraints show the definition of key and domains. For example, PK means primary key while FK means foreign key. In Solicitation table, ID is a primary key and unique identifier. Memo can represent the meaning of value for application views. If a record's TYPE_ID is 0 in Docs table, this means the document type for this record is proposal.

Table Description	Solicitation information			
Field Name	Type	Size	Constraints	Memo
ID	NUMBER		PK, identity	
TITLE	VARCHAR	255		
STATUS	VARCHAR	255		
SUBMISSION_DEADLINE	DATA	8	0000-00-00	
EVALUATION_DEADLINE	DATA	8	0000-00-00	
ANNOUNCEMENT	BLOB			
INSTRUCTIONS	BLOB			
APP_FROM	BLOB			

Figure 25. Structure of Table Solicitation

Table Description	Docs information			
Field Name	Type	Size	Constraints	Memo
APPLICATION_ID	NUMBER		PK FK(Application)	
TYPE_ID	NUMBER		PK	0 for proposal
SUB_ID	NUMBER		PK, identity	
DOC_DATE	DATA	8	0000-00-00	
DOC_TITLE	VARCHAR	200		
DOC	BLOB			

Figure 26. Structure of Table Docs

CHAPTER FIVE
SYSTEM ARCHITECTURE

An overview of the new system architecture of PDF reports and upload functions are presented in Figure 27 and Figure 28 with their class diagrams. The following sections will describe the details of how those functions work.

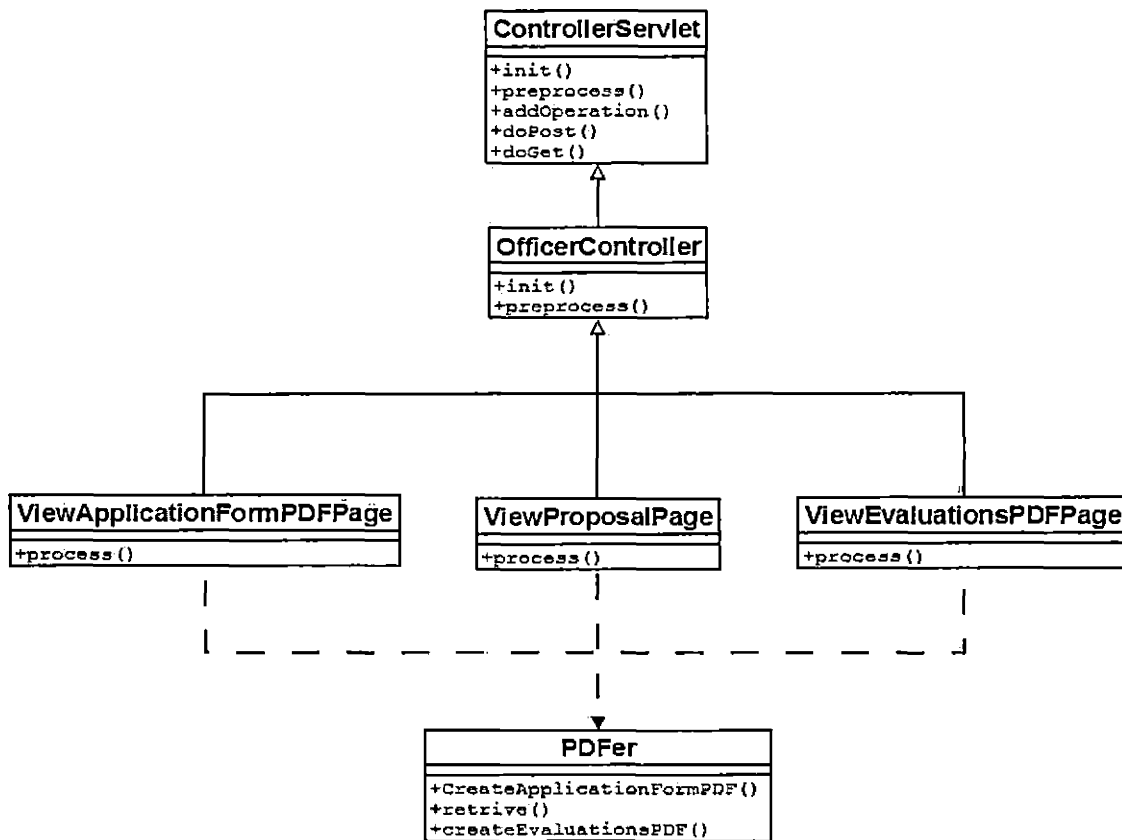


Figure 27. Class Diagram of PDF Reports

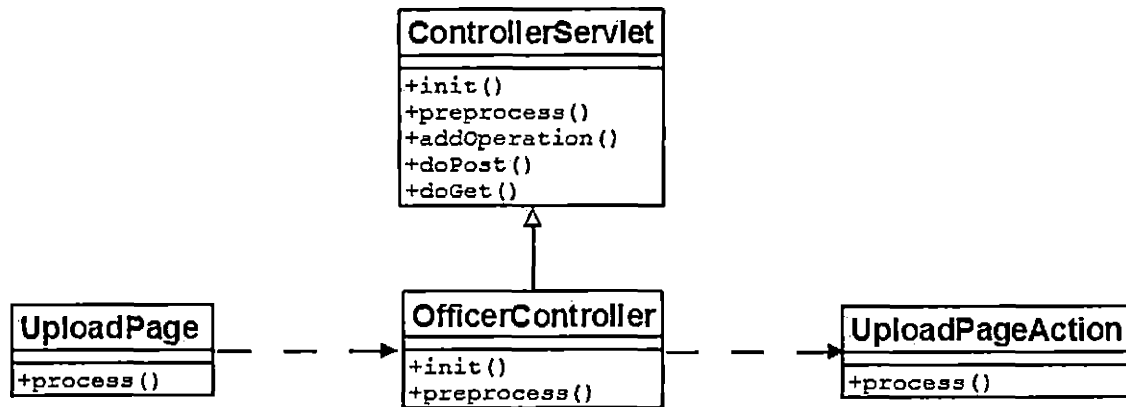


Figure 28. Class Diagram of Upload Functions

5.1 Object-Oriented Persistence

5.1.1 Persistent Objects

The persistent object is like a box that can hold the information data and is divided into several sections to fit different data. In addition, there must be several different kinds of boxes for different purposes. The data needs to be placed in exactly the right box. Then, those boxes will be saved into the storage called a database for further usage.

The classes that represent persistent objects in this system include User, Applicant, Evaluator, Application, Evaluation, Solicitation, Award, ApplicationGroup, Proposal, TechArea and BusArea. The class diagram is shown below. It is obvious that all the persistent objects are inherited from the `PersistentObject` class which has the "id" attribute. This attribute is a Long variable, which is used

for identification. The diagram is used for the description of the dependencies. Therefore, those classes do not contain all the attributes and methods in detail.

The User class is used to hold the information of basic users, including: admin, staff and officer. The information includes the username, password, email and role type.

Figure 29 shows that the Applicant and Evaluator classes are associated with the User class. Both of these classes have a one-to-one relationship with the User class, because they have a User variable inside to save the basic user information.

The Solicitation class holds the information of the solicitation including the title, deadline, etc.

The Application class is used for applicant's application. It includes proposal, evaluation, etc. and associated with many classes.

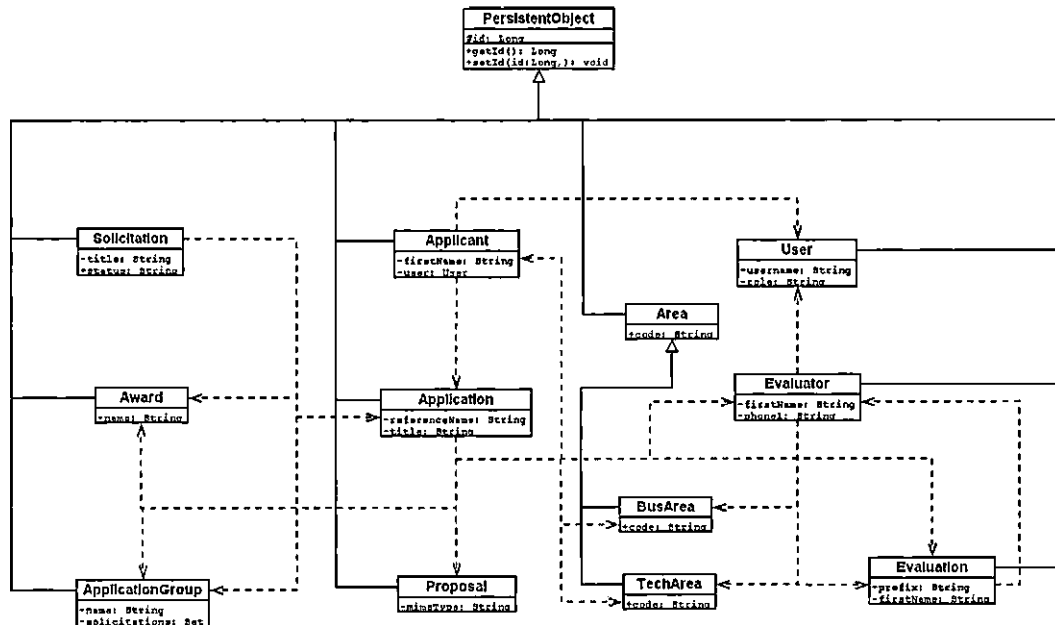


Figure 29. Persistent Objects Class Diagram

5.1.2 Persistent Data Access Object

Persistent Object Data Access Object (DAO) is the way to interact with the database. A simple DAO handles the following operations: create, edit, find, list, update and delete methods in a single session. With the feature of persistent Object DAO, the programming time will be saved. This means that the database connection codes and operation codes are reusable. Moreover, it is not necessary to maintain query strings manually.

Figure 30 illustrates the class diagram of the data access diagram. All DAOs inherit from the ParentDAO and

include the basic methods such as delete and create. For some special purposes, subclass can override these methods.

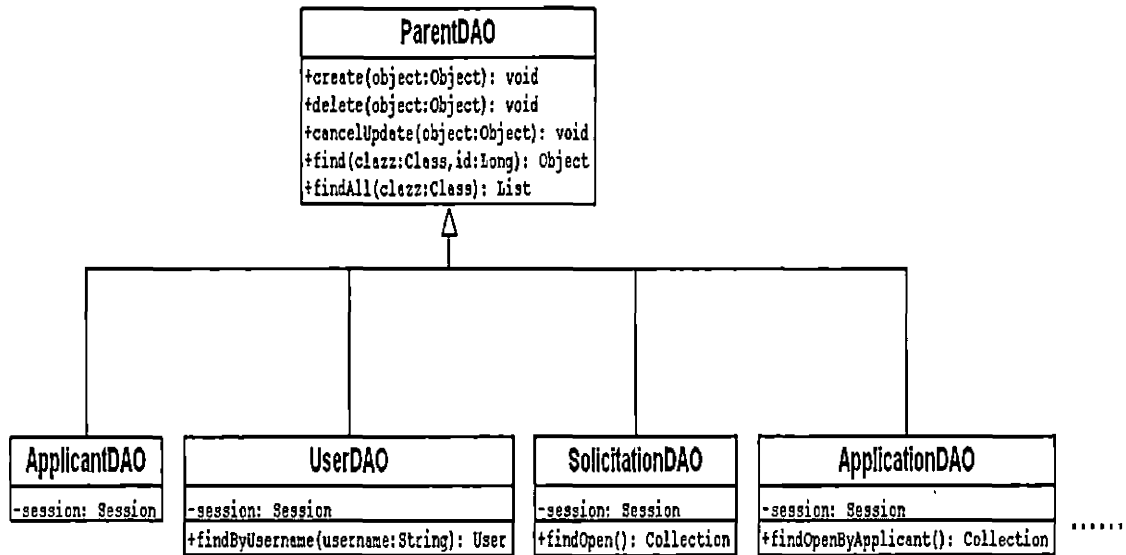


Figure 30. Data Access Objects Class Diagram

5.2 PDF Reports

5.2.1 Applicant Information

ViewApplicationFormPDFPage class is used to generate reports for the officers. First, this class calls ApplicationDAO to obtain the Applicant object. This means that the getApplicant method is called to get background information of the applicant. After that, if the status of this applicant is complete, the Web page will show the whole information related to this applicant. When view applicant information is processed, the Locker class will set the read lock by calling setReadLock method. Then, the PDFer will call the setHead method to set the header of the HTTP response. Then, ViewApplicationFormPDFPage calls the CreateApplicationFormPDF method of the PDFer class to get the applicant information and generate the PDF report. Finally, it unlocks the read lock.

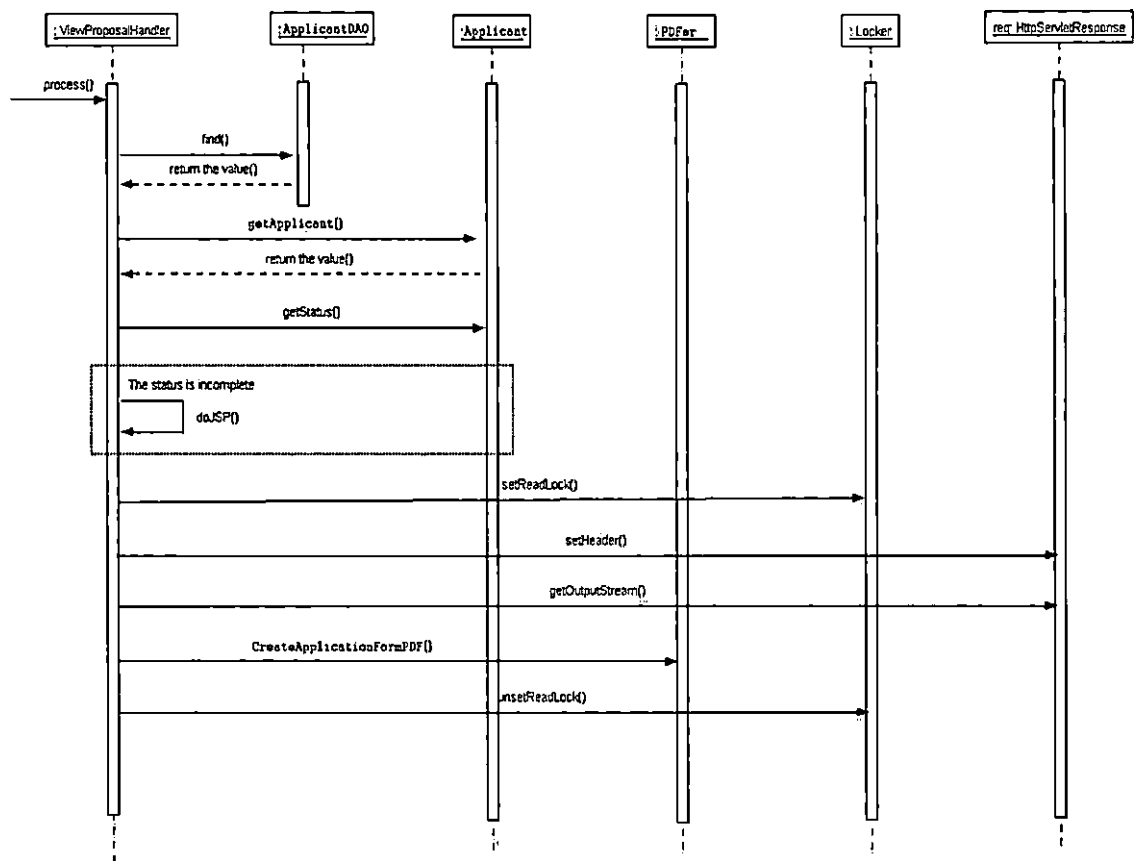


Figure 31. ViewApplicationFormPDFPage Sequence Diagram

5.2.2 Application Proposal

ViewProposalPage is used to display the applicant's proposal as PDF file. First, it calls ApplicationDAO to obtain the Application object and then calls the getDOC method in the Application object to get the proposal of this application. Then, the ViewProposalPage class will check the application status to see if the status is incomplete or not. When the status is incomplete, the Web page will show the message of incomplete message and stop all the process. After passing the checking, the Locker class will set the read lock by calling setReadLock method. Then, the ViewProposalPage class will call the setHead method to set the header of the HTTP response. Then, ViewProposalPage calls the retrieve method of the PDFer class to insert the application referenceNumber into the content and generate the report. Finally, it unlocks the read lock.

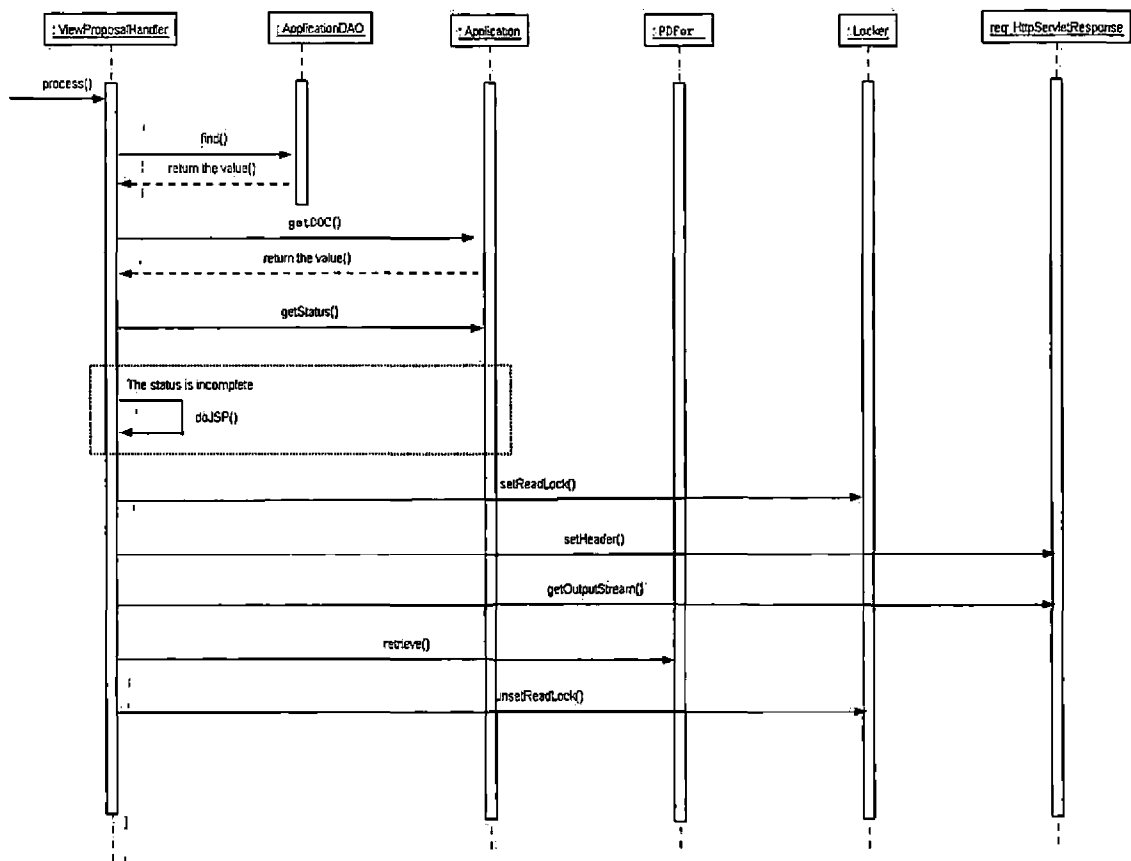


Figure 32. ViewProposalPage Sequence Diagram

5.2.3 Application Evaluations

ViewEvaluationsPDFPage class is similar in the process to ViewApplicationFormPDFPage and ViewProposalPage class. The main purpose of ViewEvaluationsPDFPage class is to display the scores and evaluation questions, after the proposal is evaluated. Next, find Application object and Evaluation object associated with Evaluation object. Then based on information from Application and Evaluation, the evaluation report is generated by createEvaluationsPDF method.

5.3 Upload Functions

There are two types of upload functions in this system: uploads of PDF documents and upload of Microsoft Word documents. For uploading announcements and instructions, the system only allows the officers to upload Adobe PDF documents. When uploading proposal templates, the system only allows Microsoft Word files.

Firstly, the UploadFileAction processes the parseMultipartRequest method for the incoming file. Once this file is validated, the parseMultipartRequest method will parse the file. Then, the system stores the file in a folder temporarily. Once the HttpServletRequest object will receive the fileItem, formFields and all the attributes from

the Web page with id, cancel-button and file type, etc, the getParameter method can get those attribute directly. Based on the file type, UploadFileAction can decide to implement which upload functions. The pseudo code of this method is shown below.

```
SWITCH(fileType){
CASE 1:
    IF (mimeType.equals("application/pdf")) THEN
        updateAnnouncement(solicitation);
    BREAKS;
CASE 2:
    IF (mimeType.equals("application/pdf")) THEN
        updateInstruction(solicitation);
    BREAK;
CASE 3:
    IF (mimeType.equals("application/msword") ) THEN
        updateAppForm(solicitation);
    BREAK;
}
```

The following figures describe UploadFileAction sequence diagrams for announcement, instructions and proposal template.

5.3.1 Upload Announcement

If the file type of the incoming file is 0, the `updateAnnouncement` method will be called. Then the `solicitationDAO` is going to store this file as blob type in the Solicitation table.

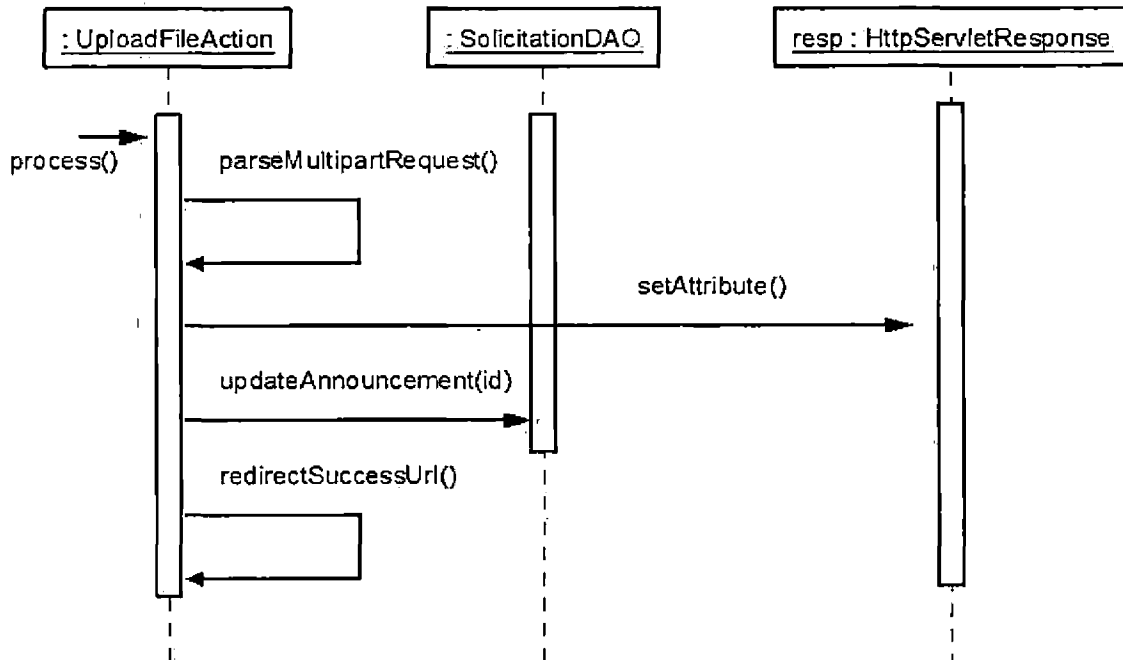


Figure 33. Upload Announcement Sequence Diagram

5.3.2 Upload Instructions

When the file type is 1, the updateInstructions will be executed. Then this instructions will be stored into the Solicitation table.

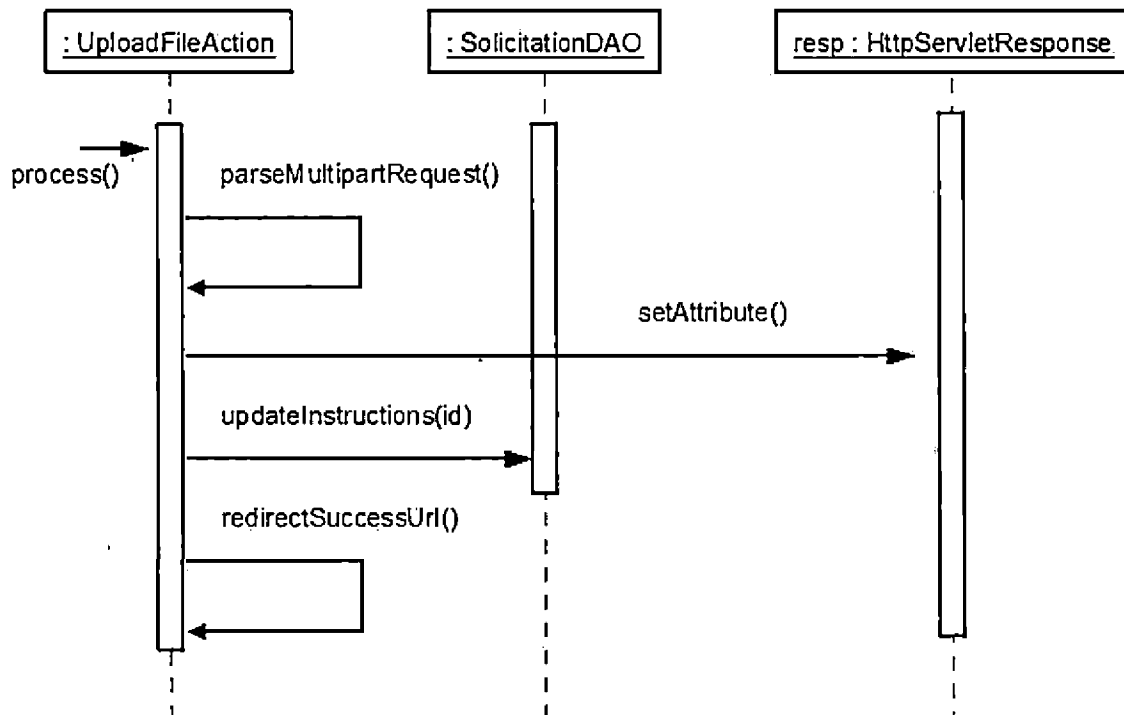


Figure 34. Upload Instructions Sequence Diagram

5.3.3 Upload Proposal Template

This method is similar to upload functions of announcement and instruction. The only different thing is the file type for the proposal is 2.

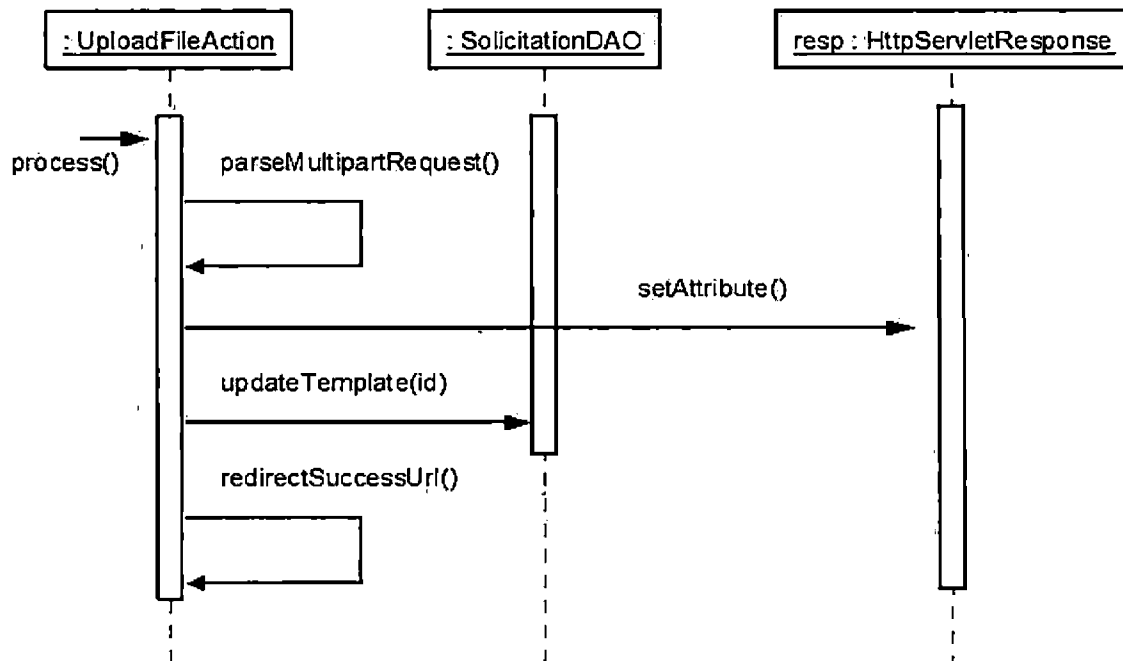


Figure 35. Upload Proposal Template Sequence Diagram

CHAPTER SIX

MAINTENANCE MANUAL

This chapter contains detailed instructions and procedures for installation and maintenance of SMS. Once the system crashed, the administrator can follow the guidelines to restore the system. The first section provides the guidelines of how to install the necessary software. The descriptions of installation are presented in the following section.

6.1 Software Requirements

In order make sure SMS works properly, this section lists the software required to operate SMS. Installing either Oracle or MySQL database is acceptable.

6.1.1 Microsoft Windows

Install legal Windows XP or Windows Server 2000.

6.1.2 Microsoft Office

Install legal Microsoft 2003 office or Microsoft 2007.

6.1.3 Tomcat

To install the Tomcat Web server, locate and run the file apache-tomcat-5.5.23.exe on the CD. Optionally, visit <http://www.mysql.com>, and download the most recent release version of Tomcat.

6.1.4 Oracle Database

In order to install the latest version of Oracle server, visit <http://www.oracle.com/>. Then download the file OracleXEUniv.exe and run it. This file can also be found on CD.

6.1.5 MySQL Database

Install the latest version of MySQL server. Visit <http://www.mysql.com>. Download the file mysql-essentail-5.0-win32.msi and run it. This file can also be found on CD.

6.1.6 Adobe Universal PostScript Driver

Install the Adobe Universal PostScript Windows Driver by the file winsteng.exe on the CD and then input "sms" as printer name.

6.1.7 Java Runtime Environment

To install the J2SE JDK, locate and run the file jdk-6u4-windows-i586-p.exe on the CD. Otherwise, visit <http://java.sun.com>, and download the file of J2SE JDK 6.0.

6.2 Installation Information

There are several instructions for the SMS installation. The first step is to create a new folder called c:\temp. This folder is used to temporally hold post script files, when Microsoft word documents are converted to Adobe PDF documents. The next step is to make sure that sms.log file

exits the output folder under c:\tomcat\logs\. Finally, copy sms.xml to the localhost folder under c:\tomcat\conf\Catalina\localhost. If needed, change configurations to match specified requirements such as IP addresses of Document Conversion and email server.

CHAPTER SEVEN

CONCLUSION AND FUTURE DIRECTIONS

7.1 Conclusion

The Solicitation Management System improves the processing of solicitations for the Office of Technology Transfer and Commercialization (OTTC), CSUSB and the Center for the Commercialization of Advanced Technology (CCAT), SDSU for the solicitation, which opened on 28 January 2008. Based upon the feedback received from the OTTC, the new version of the system represents an improvement over the previous version. By adding the new upload function, it is more efficient and easier to maintain the system.

In the Solicitation Management System, the officer is able to upload of announcement, instructions and proposal template for each solicitation according its class and topic. This can be processed from Web interface directly. This is a great benefit to the officer, when managing solicitation.

First, because all necessary information of the solicitation can be viewed online, there is no need to wait for the paperwork by mail.

Second, all the information required for the solicitation is typed into the system through various interfaces. As a result, the staff is no longer needed to

type information into the computer. This is a significant time saving feature.

Finally, the officers can more easily maintain information for solicitations. Different solicitations may have different announcements, instructions and proposal formats. Based on the requirements, the officers can use upload file functions to update the newer information. This is a feature that eliminates duplicates and redundant files in the solicitation process

With the time saving and user friendly features that this system provides, the officers can upload different contents of files for each solicitation with minimum effort.

7.2 Future Directions

As future work, we plan to simplify the existing database schemas to improve the reliability and consistence. This means if in the future, new functionalities are added, the database schemas will be least effected. In addition, the document conversion process has to be re-examined and improved in order to avoid dead locks when abnormal conditions occur.

Finally, a new function of e-mail notice for each applicant and evaluator would be the future work. The future applicant can receive brief descriptions of the active

solicitation. If the applicant wants to know more information, he or she can click a link within the e-mail to access the related Web pages. When the evaluator is assigned to evaluate a proposal, the notification will be sent by e-mail.

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