

Software System Architecture Document (SSAD)

Healthy Kids Zone Survey App

Team 14

Name	Primary Role	Contact Email
Jessie Kim	Client	JKim@chc-inc.org
Joseph Martinez	Client	JMartinez2@chc-inc.org
Malcolm Carson	Client	MCarson@chc-inc.org
Yang Wang	Project Manager	wang195@usc.edu
Chad Honkofsky	IIV&V/QFP	honkofsk@usc.edu
Xu Zhang	Builder (Front-end Designer)	zhangxu@usc.edu
Chenglun Wang	Tester	wang358@usc.edu
Junjun Ji	Builder (Mobile Designer)	junjunji@usc.edu
Ye Tao	Builder (Back-end Designer)	taoye@usc.edu

Version History

Date	Author	Version	Changes made	Rationale
10/16/2013	Qianu Liao	1.0	<ul style="list-style-type: none"> System Context Diagram 	<ul style="list-style-type: none"> Consolidated System Context Diagram to match OCD
10/17/2013	Qianyu Liao	1.1	<ul style="list-style-type: none"> System Users Behavior 	<ul style="list-style-type: none"> Consolidated System Users Behavior to match OCD
10/17/2013	Qianyu Liao	1.2	<ul style="list-style-type: none"> System Use Case 	<ul style="list-style-type: none"> Consolidated use cases to match OCD
10/18/2013	Qianyu Liao	1.3	<ul style="list-style-type: none"> System Use Case 	<ul style="list-style-type: none"> Consolidated use cases to match OCD
10/18/2013	Qianyu Liao	1.4	<ul style="list-style-type: none"> System Use Case 	<ul style="list-style-type: none"> Consolidated use cases to match OCD
10/18/2013	Qianyu Liao	1.5	<ul style="list-style-type: none"> System physical architecture 	<ul style="list-style-type: none"> Consolidated use cases to match the clients requirement
10/19/2013	Qianyu Liao	1.6	<ul style="list-style-type: none"> Add Survey Monkey to System Context Diagram 	<ul style="list-style-type: none"> Added System Context Diagram to match Client Requirement
10/20/2013	Qianyu Liao	2.1	<ul style="list-style-type: none"> Reduce Use Case 	<ul style="list-style-type: none"> Reduced use cases to match ARB Review
11/20/2013	Qianyu Liao	2.2	<ul style="list-style-type: none"> Modify use case, physical architecture 	<ul style="list-style-type: none"> Modified use cases and physical architecture to match DCR Review
11/27/2013	Qianyu Liao	2.3	<ul style="list-style-type: none"> Rewrite the SSAD 	<ul style="list-style-type: none"> Rewrite the SSAD document to match the DCR Review and prepare for the development phase
11/28/2013	Qianyu Liao	2.4	<ul style="list-style-type: none"> Modify Artifact and Information Diagram 	<ul style="list-style-type: none"> To satisfy the requirement
12/09/2013	Qianyu Liao	2.5	<ul style="list-style-type: none"> Add the NDI/NCS evaluation part to SSAD 	<ul style="list-style-type: none"> To complete the whole SSAD
02/09/2014	Ye Tao	3.0	<ul style="list-style-type: none"> Update Artifact and Information Diagram and System Behavior 	<ul style="list-style-type: none"> To comply with the system requirement
02/17/2014	Ye Tao	3.1	<ul style="list-style-type: none"> Update Artifact and Information Diagram and System Behavior 	<ul style="list-style-type: none"> To comply with the system requirement
04/02/2014	Ye Tao	3.2	<ul style="list-style-type: none"> Update diagrams and related explanations 	<ul style="list-style-type: none"> Follow TA's instruction about fonts and notations

Table of Contents

SOFTWARE SYSTEM ARCHITECTURE DOCUMENT (SSAD)	I
VERSION HISTORY	II
TABLE OF CONTENTS	III
TABLE OF TABLES	IV
TABLE OF FIGURES	V
1. <i>Introduction</i>	1
1.1 Purpose of the SSAD	1
1.2 Status of the SSAD	1
2. <i>System Analysis</i>	2
2.1 System Analysis Overview	2
2.1.1 System Context	2
2.1.2 Artifacts and information	3
2.1.3 Behavior	4
3. <i>NDI/NCS Interoperability Analysis</i>	17
3.1 Introduction	17
3.1.1 COTS / GOTS / ROTS / Open Source / NCS	17
3.1.2 NDI/NCS Evaluation	17
3.2 System Structure	18
4. <i>Class Design</i>	22
4.1 Interface Classes	22
4.2 Process Realization	23
4.2.1 Render Survey Import Page	23
5. <i>Architectural Styles, Patterns and Framework</i>	25

Table of Tables

<i>Table 1: Context Summary.....</i>	<i>3</i>
<i>Table 2: Artifact and Information Summary.....</i>	<i>4</i>
<i>Table 3: Use Case Description.....</i>	<i>5</i>
<i>Table 4: Use Case Description.....</i>	<i>6</i>
<i>Table 5: Use Case Description.....</i>	<i>6</i>
<i>Table 6: Use Case Description.....</i>	<i>7</i>
<i>Table 7: Use Case Description.....</i>	<i>7</i>
<i>Table 8: Use Case Description.....</i>	<i>8</i>
<i>Table 9: Use Case Description.....</i>	<i>9</i>
<i>Table 10: Use Case Description.....</i>	<i>9</i>
<i>Table 11: Use Case Description.....</i>	<i>10</i>
<i>Table 12: Use Case Description.....</i>	<i>10</i>
<i>Table 13: Use Case Description.....</i>	<i>11</i>
<i>Table 14: Use Case Description.....</i>	<i>11</i>
<i>Table 15: Use Case Description.....</i>	<i>11</i>
<i>Table 16: Use Case Description.....</i>	<i>12</i>
<i>Table 17: Use Case Description.....</i>	<i>13</i>
<i>Table 18: Use Case Description.....</i>	<i>14</i>
<i>Table 19: Use Case Description.....</i>	<i>14</i>
<i>Table 20: Use Case Description.....</i>	<i>15</i>
<i>Table 21: Use Case Description.....</i>	<i>15</i>
<i>Table 22: Use Case Description.....</i>	<i>15</i>
<i>Table 23: Use Case Description.....</i>	<i>16</i>
<i>Table 24: NDI/NCS Product List.....</i>	<i>17</i>
<i>Table 25: Comparison of hybrid mobile app platform.....</i>	<i>17</i>
<i>Table 26: Comparison of survey application.....</i>	<i>18</i>
<i>Table 27: Hardware Component Description.....</i>	<i>19</i>
<i>Table 28: Software Component Description.....</i>	<i>20</i>
<i>Table 29: Design Class Description.....</i>	<i>22</i>
<i>Table 30: Architectural Styles, Patterns, and Frameworks.....</i>	<i>25</i>

Table of Figures

<i>Figure 1: System Context Diagram</i>	<i>2</i>
<i>Figure 2: Artifact and Information Diagram.....</i>	<i>4</i>
<i>Figure 3: Process Diagram</i>	<i>5</i>
<i>Figure 4: Hardware component Diagram.....</i>	<i>19</i>
<i>Figure 5: Software component Diagram.....</i>	<i>20</i>
<i>Figure 6: Deployment Diagram.....</i>	<i>21</i>
<i>Figure 7: Design Class Diagram.....</i>	<i>22</i>
<i>Figure 8: Render Survey Import Page Sequence Diagram</i>	<i>24</i>
<i>Figure 9: Survey Import Sequence Diagram.....</i>	<i>24</i>

1. Introduction

1.1 Purpose of the SSAD

The purpose of the SSAD is to document the results of the object-oriented analysis and design (OOA&D) of the website being developed. The SSAD is used by the developer as reference to the system architecture. The website being developed should be faithful to the architecture specified in the SSAD. Furthermore, the SSAD is used by the maintainer and clients to help understand the structure of the system once the proposed website is delivered.

1.2 Status of the SSAD

The current version of the SSAD is 3.0 and it is at the end of the Rebaselined Foundation phase. At this point, all sections of the document are filled out with system context diagram, system behavior diagram, use case diagram, component diagram, deployment diagram, class diagram and sequence diagram. Team is actively exploring NDI, NCS and the selected architecture (3-tier architecture) and prototyping the system using it. Thus this document reflects current understanding of the developing system and the high risk features, and is an agreement with current prototype.

2. System Analysis

2.1 System Analysis Overview

The primary purpose of Healthy Kids Zone Survey App is to map and assess physical assets and detriments to health as part of our initiative to reduce rates of obesity and hypertension in South Los Angeles. The Healthy Kids Zone Survey App System allows administrator to import the survey from survey monkey application (the administrator should create the survey on the survey monkey first), configure the connection between school, path and survey, and then the administrator could export the survey results. The Healthy Kids Zone Survey App System allows user take survey on their mobile app easily. Figure 1 is the System Context Diagram. Table 1 is the diagram summary.

2.1.1 System Context

Visual Paradigm for UML Standard Edition(University of Southern California)

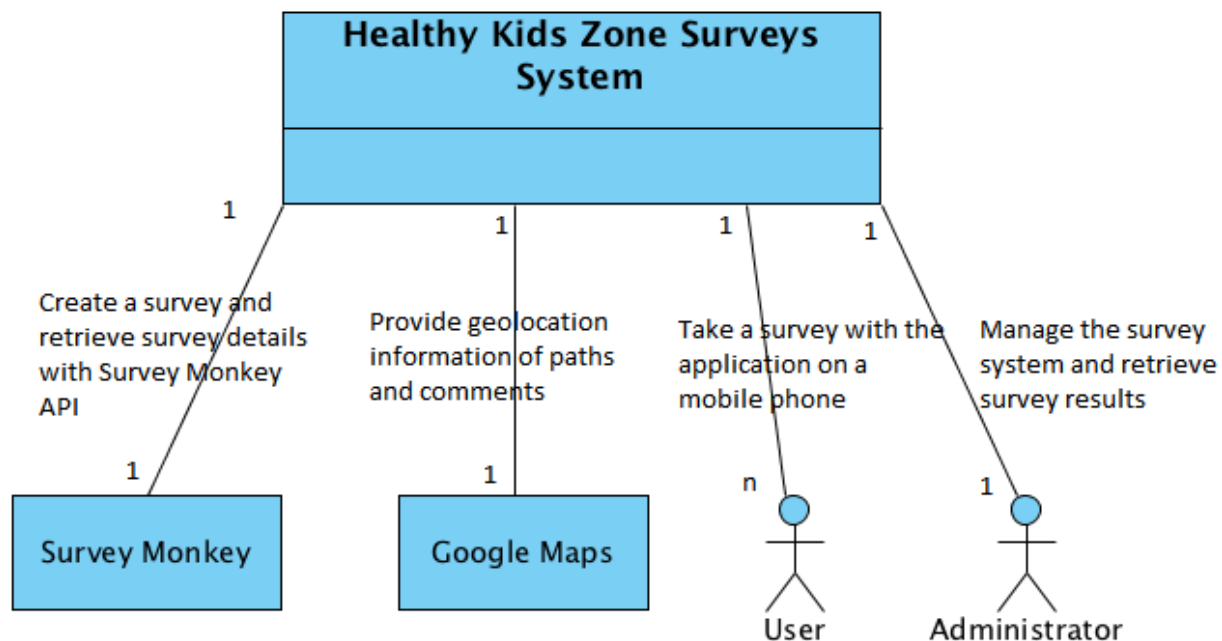


Figure 1: System Context Diagram

Table 1: Context Summary

Actor	Description	Responsibilities
Healthy Kids Zone Survey System	The new system our team will build	<ul style="list-style-type: none">• The website system will be used by administrator to import survey, configure the connection between schools, paths and surveys, and export survey results• The mobile app system will be used by users to take survey easily
Administrator	People who use the Healthy Kids Zone website system and manage the system.	<ul style="list-style-type: none">• Import survey from survey monkey• Configure the connection between school, path and survey• Export the survey results
User	People who use the Healthy Kids Zone survey app to take survey	<ul style="list-style-type: none">• Take survey
Survey Monkey	An application that the administrator could create survey An API that the website system could retrieve the surveys list and details	<ul style="list-style-type: none">• Create survey• Retrieve survey details
Google Maps	An API that the administrator could draw the path coordinates An API that the users could add markers and comments	<ul style="list-style-type: none">• Draw path coordinates• Add markers and comments

2.1.2 Artifacts and information

Figure 2 illustrates the data structure of our system.

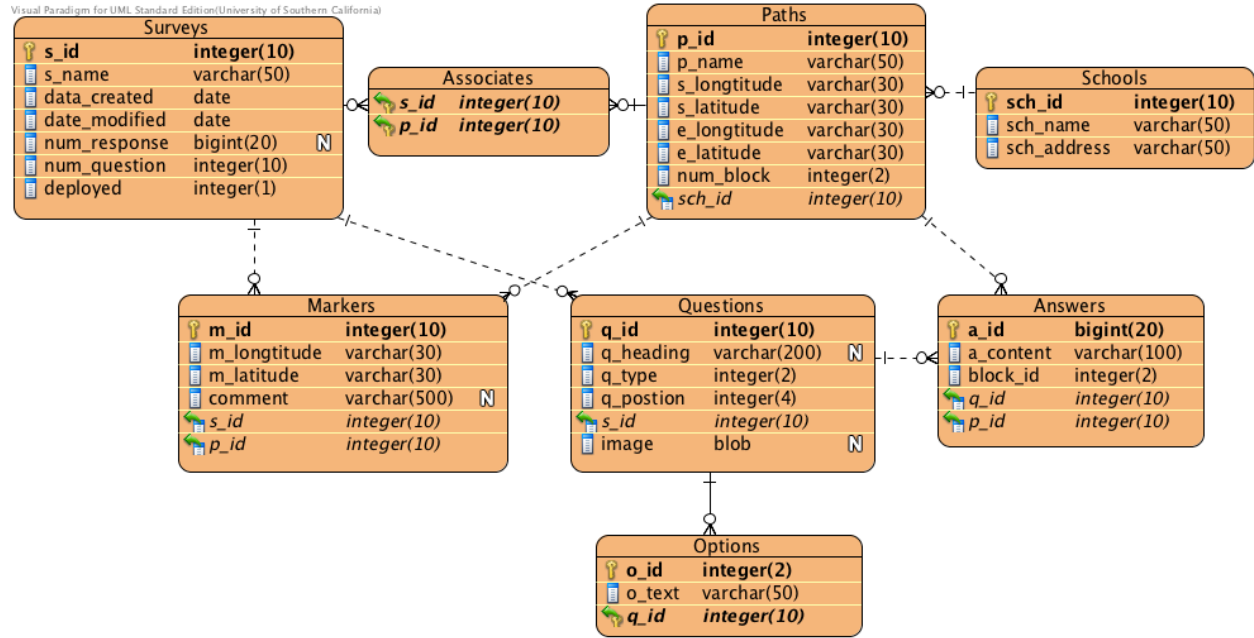


Figure 2: Artifact and Information Diagram

Table 2: Artifact and Information Summary

Artifact	Purpose
ATF-1: School	School information the administrator adds through the website
ATF-2: Path	Path coordinates the administrator selects on the Google Map
ATF-3: Survey	General information about survey which is retrieved from Survey Monkey API
ATF-4: Associate	Based on our requirements, one survey can be used in many paths; one path can contain many surveys. They are many-to-many relationship, so we generate a new table to store the relations.
ATF-5: Question	Question information in the survey which is retrieved from Survey Monkey
ATF-6: Option	Option information of multiple choice question in the survey which is retrieved from survey monkey
ATF-7: Answer	Answer information sent from mobile application.
ATF-8: Marker	To store markers that our app system provide

2.1.3 Behavior

Figure 3 illustrates the behaviors of users and administrators.

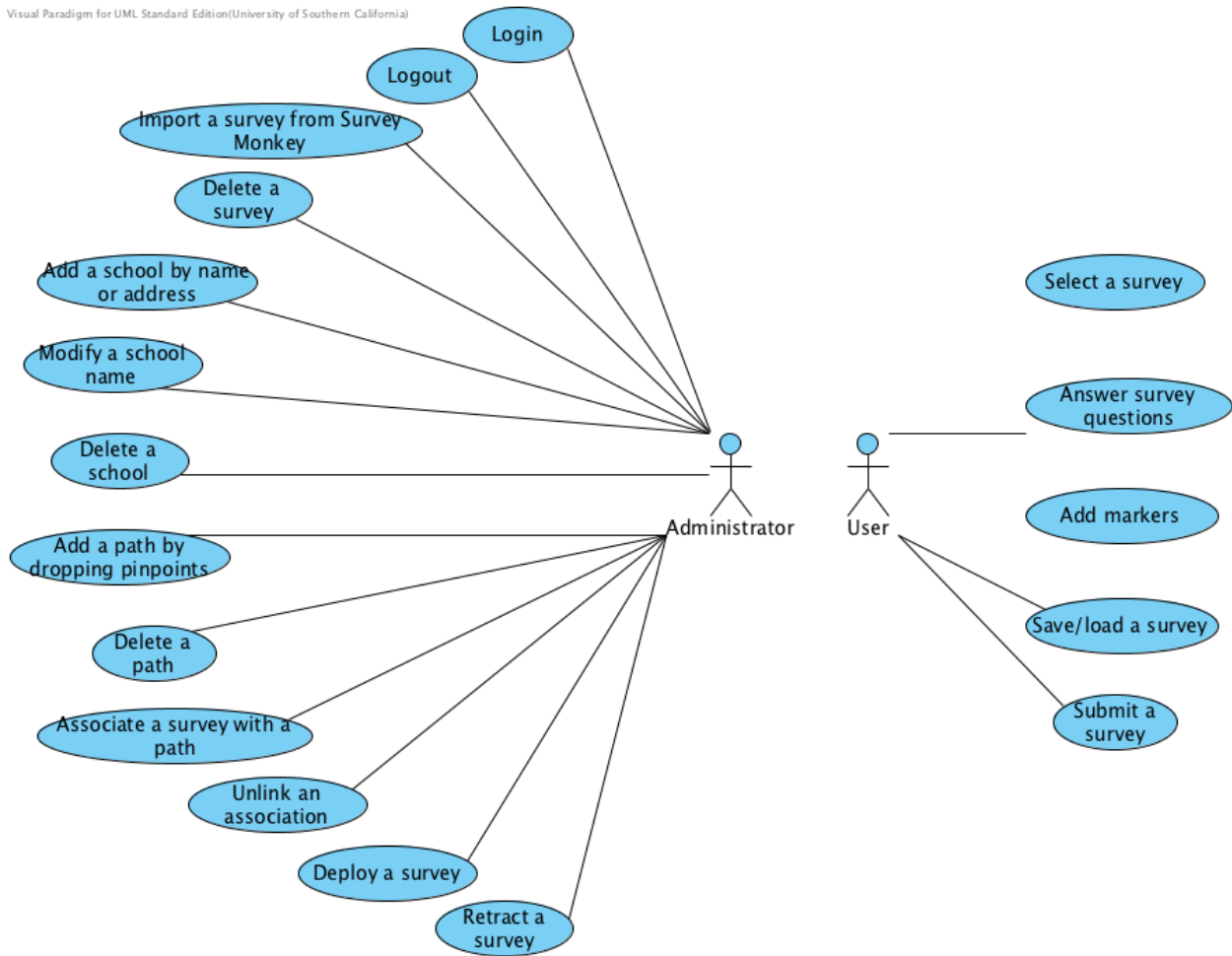


Figure 3: Process Diagram

2.1.3.1 Administrator use cases

Table 3: Use Case Description

Identifier	UC-1: Main page		
Pre-conditions	Administrator is logged into the system.		
Post-conditions	Administrator is logged out of the system.		
Typical Course of Action		Actor Input	System Response
	1	Administrator clicks logout button	
	2		System logs user out and redirects him to HKZ login page

Table 4: Use Case Description

Identifier	UC-2-1: Administrator imports a survey.		
Pre-conditions	Administrator is logged into the system. The system shows the survey import page.		
Post-conditions	The survey detail is retrieved from Survey Monkey and inserted into the database.		
Typical Course of Action		Actor Input	System Response
	1		Load survey list from API and DB and display the survey import page
	2	User click the import button of a survey	
	3		Retrieve the survey detail from Survey Monkey, check it and insert data to database
Exceptional Course of Action	1	User is going to import an invalid survey (Mal-formatted survey, survey missing critical information or survey with unsupported questions)	
	2		Retrieve the survey detail from Survey Monkey check it and prompt an error message

Table 5: Use Case Description

Identifier	UC-2-2: Administrator deletes a survey.		
Pre-conditions	Administrator is logged into the system. The system shows the survey deletion page.		
Post-conditions	The survey and all related answers are deleted from the database.		
Typical Course of Action -1		Actor Input	System Response
	1		Load survey list from database and display survey deletion page
	2	User click the delete button of a survey	
	3		Check the database whether there are answers under this survey. If so, prompt a

			confirm message to the administrator that it is an irreversible operation
	4	User click confirm button	
	5		Delete the survey from database
Typical Course of Action -2	4	User click cancel button	
	5		Return to the survey deletion page
Exceptional Course of Action	1		If there is no answer under the survey to be deleted, delete the survey without confirmation

Table 6: Use Case Description

Identifier	UC-3-1: Administrator adds a school.		
Pre-conditions	Administrator is logged into the system. The system shows the school adding page.		
Post-conditions	A school (including school name, address and location information) is added and inserted into the database.		
Typical Course of Action		Actor Input	System Response
	1		Display the school adding page
	2	User types in the school name and address and then click add button	
	3		Retrieve the school information from the database. Check if there is a school with the same name and address. If not, insert the school name and address into the database.
Exceptional Course of Action	1		If there is a school with the same name and address in the database, prompt an alert that the school is already in the database.

Table 7: Use Case Description

Identifier	UC-3-2: Administrator deletes a school.
-------------------	---

Pre-conditions	Administrator is logged into the system. The system shows the school deletion page.		
Post-conditions	The school and all related answers are deleted from the database.		
Typical Course of Action		Actor Input	System Response
	1		Load school list from the database and display the school deletion page
	2	User clicks the delete button of a school	
	3		Check the database whether there are answers under this school. If so, prompt a confirm message to the administrator that it is an irreversible operation
	4	User clicks confirm button	
	5		Delete the school from the database
Typical Course of Action -2	4	User click cancel button	
	5		Return to the school deletion page
Exceptional Course of Action	1		If there is no answer under the school to be deleted, delete the school without confirmation

Table 8: Use Case Description

Identifier	UC-3-3: Administrator modifies a school name.		
Pre-conditions	Administrator is logged into the system. The system shows the school modify page.		
Post-conditions	The school name is modified in the database.		
Typical Course of Action		Actor Input	System Response
	1		Load school list from the database and display the school modify list including school name and address
	2	User select a school and types in the school name and then click add button	
	3		Update the school name in the database

Table 9: Use Case Description

Identifier	UC-4-1: Administrator adds a path.		
Pre-conditions	Administrator is logged into the system. The system shows the path adding page.		
Post-conditions	The selected path is inserted into the database.		
Typical Course of Action		Actor Input	System Response
	1		Load school list from the database and display the school list, a text box for path name and a map
	2	Select one of the schools	
	3		Pin location of the school in the map
	4	Drop a starting point and an ending point in the map, type in path name and click confirm	
	5		Insert the information of path name and location to database

Table 10: Use Case Description

Identifier	UC-4-2: Administrator deletes a path.		
Pre-conditions	Administrator is logged into the system. The system shows the path deletion page.		
Post-conditions	The selected path is deleted from the database.		
Typical Course of Action		Actor Input	System Response
	1		Load school list from the database and display the path deletion page
	2	Selects a school from the list.	
	3		Load path list from the database and display path list related to the selected school.
	4	Clicks the delete button of a path	
	5		Check the database whether there are answers under this path. If so, prompt a confirm message to the administrator that it is an irreversible operation
	6	Clicks confirm button	

	7		Delete the path and answers related to the path from the database.
Exceptional Course of Action	1		If there is no answer under the path to be deleted, delete the path without confirmation

Table 11: Use Case Description

Identifier	UC-5-1: Administrator associates a path with a survey.		
Pre-conditions	Administrator is logged into the system. The system shows the association page.		
Post-conditions	The selected path is associated with the selected path and the association is inserted into the database.		
Typical Course of Action		Actor Input	System Response
	1		Load survey list and school list from the database and display the association page
	2	Select survey name and school name from the lists.	
	3		Load path list from the database
	4	Select path name from the list and click associate button.	
	5		Check if there is already an association between the path and the survey. If not, insert an association to the database

Table 12: Use Case Description

Identifier	UC-5-2: Administrator unlinks an association.		
Pre-conditions	Administrator is logged into the system. The system shows the association page.		
Post-conditions	The association is deleted from the database.		
Typical Course of Action		Actor Input	System Response
	1		Load association list from the database and display the association deletion page
	2	Select an association from the list and click unlink	
	3		Delete the association from

		the database
--	--	--------------

Table 13: Use Case Description

Identifier	UC-6-1: Administrator deploys a survey.		
Pre-conditions	Administrator is logged into the system. The system shows the survey deployment page.		
Post-conditions	The survey is marked deployed in the database.		
Typical Course of Action		Actor Input	System Response
	1		Load survey list from the database and display the survey deployment page
	2	User click the deploy button of a survey	
	3		Update the survey to deployed in the database.

Table 14: Use Case Description

Identifier	UC-6-2: Administrator retracts a survey.		
Pre-conditions	Administrator is logged into the system. The system shows the survey deployment page.		
Post-conditions	The survey is marked undeployed in the database.		
Typical Course of Action		Actor Input	System Response
	1		Load survey list from the database and display the survey deployment page
	2	User click the retract button of a survey	
	3		Update the survey to undeployed in the database.

Table 15: Use Case Description

Identifier	UC-7: Administrator exports a survey.		
Pre-conditions	Administrator is logged into the system. The system shows the survey export page.		
Post-conditions	The selected survey information is export into a csv format file.		
Typical Course of Action		Actor Input	System Response
	1		Load survey list from the database and display the survey export page

	2	User click the export button of a survey	
	3		Retrieve the survey detail from the database. Construct a survey report containing all the answers grouped by location information in csv format
Exceptional Course of Action	1		1 stands for yes, and 0 stands for no. Missing information should be marked as -9 in the report

2.1.3.2 Mobile user use cases

Table 16: Use Case Description

Identifier	UC-8: User starts a new survey.		
Pre-conditions	The application shows the application homepage.		
Post-conditions	Information of the selected survey is retrieved from the database and system jumps into a question category page of the selected survey.		
Typical Course of Action		Actor Input	System Response
	1	User click the new survey button	
	2		Send request and retrieve school, path and survey list from the server and display a school list
	3	Select a school in the list	
	4		Display a path list of the selected school
	5	Select a path in the list	
	6		Display a survey list with surveys associated with the selected path
	7	Select a survey in the list	
	8		Send request and retrieve the selected survey from the server and display a category page with a question list

Table 17: Use Case Description

Identifier	UC-9-1: User answers survey questions.		
Pre-conditions	The application shows the question page.		
Post-conditions	The answer to the question is stored in temporary storage on the phone, waiting to be submitted.		
Typical Course of Action -1		Actor Input	System Response
	1		Displays a question with multiple choice (single answer)
	2	Clicks one of the answers.	
	3		The answer appears chosen. Updates the answer in the temporary storage file.
Typical Course of Action -2	1		Displays a question with multiple choice (multiple answer)
	2	Clicks a collection of the answers	
	3		The answers are chosen. Updates the answer in the temporary storage file
Typical Course of Action -3	1		Displays a comment question with an edit box
	2	Types in comments in the edit box	
	3		Updates the answer in the temporary storage file
Typical Course of Action -4	1		Displays a tally question with a number, a plus and a minus mark
	2	Clicks on plus or minus	
	3		Updates the answer in the temporary storage file
Exceptional Course of Action -1	1	Click the function bar	
	2		Display a function menu including show map, save, quit without saving and submit
	3	Click one of these choices	
	4		Jump to execute corresponding feature

Exceptional Course of Action -2	1	Click category button	
	2		Jump to question category list

Table 18: Use Case Description

Identifier	UC-9-2: User navigates in the category list.		
Pre-conditions	The system shows a question category list of the selected survey.		
Post-conditions	The system jumps into the selected question page.		
Typical Course of Action		Actor Input	System Response
	1		Display a question category list
	2	Click a question type (Block/Tally/Other)	
	3		Display a question list of selected question type
	4	Click a question in the list	
	5		Jump into question page of the selected question

Table 19: Use Case Description

Identifier	UC-10: User adds a marker.		
Pre-conditions	The system shows a map of the selected path.		
Post-conditions	Marker location and comments are inserted into database.		
Typical Course of Action		Actor Input	System Response
	1		Display a map of the selected path
	2	Right click on the map to create a marker	
	3		Display a comment box over the map
	4	Type in comments with respect to the marker (For example, report some hazard)	
	5		Send the comment text to the server and the server insert data into the database
Exceptional Course of Action	1	User types in comment over 500 characters.	
	2		Display an error message that character number is over-limited

Table 20: Use Case Description

Identifier	UC-11-1: User saves a survey to the mobile device.		
Pre-conditions	The system shows a function menu in question or category page.		
Post-conditions	Answers to the ongoing survey are stored in the mobile device.		
Typical Course of Action		Actor Input	System Response
	1	User clicks the save button in function menu	
	2		Store the temporary file to app storage.
Exceptional Course of Action	1	The mobile device is out of available space.	
	2		Display an error message that the device does not have enough space.

Table 21: Use Case Description

Identifier	UC-11-2: User loads an existing survey from the mobile device.		
Pre-conditions	The system shows the application homepage.		
Post-conditions	Survey answers and questions are retrieved from local storage of the mobile device and the system shows a question page.		
Typical Course of Action		Actor Input	System Response
	1	User clicks the load survey button in homepage	
	2		Load and continue a survey from record file in app storage. Jump to question category page.
Exceptional Course of Action	1	There is no existing survey saved in the device.	
	2		Display an error message that no saved survey is found.

Table 22: Use Case Description

Identifier	UC-12-1: User submits a survey.		
Pre-conditions	The system shows a function menu in question or category page.		

Post-conditions	The survey answers are submitted to the server and inserted into the database.		
Typical Course of Action		Actor Input	System Response
	1	User clicks the submit button in function menu	
	2		Check whether all the questions are answered. If so, send the answer to the server. The server inserts the answer into the database.
Exceptional Course of Action	1		If some of the answers are unanswered, prompt a message that finish the survey first and then try again.

Table 23: Use Case Description

Identifier	UC-12-2: User relinquishes a survey.		
Pre-conditions	The system shows a function menu in question or category page.		
Post-conditions	The survey answers are deleted and the system returns to the application homepage.		
Typical Course of Action		Actor Input	System Response
	1	User clicks the quit without saving button in function menu	
	2		Display a confirmation that it will delete all the answers and quit.
	3	Click confirm button.	
	4		Delete the temporary file and return to the homepage.

3. NDI/NCS Interoperability Analysis

3.1 Introduction

In this project, Healthy Kids Zone Survey App will retrieve the survey detail info from Survey Monkey API and use Google Map to define the path for the survey.

3.1.1 COTS / GOTS / ROTS / Open Source / NCS

Table 24: NDI/NCS Product List

NDI/NCS Products	Purposes
Survey Monkey	Help administrator to create survey Retrieve survey detail info from Survey Monkey API
PhoneGap / JQuery Mobile	A framework to develop a hybrid mobile app
Google Map	Administrator can define the path coordinates on the map User can add markers and comments on the map
MySQL	To store survey data
Apache web server	Such as, provide different languages compiling, font-end and back-end communication, data transmission service

3.1.2 NDI/NCS Evaluation

Table 25: Comparison of hybrid mobile app platform

NDI/NCS	Pros	Cons
Titanium	<ol style="list-style-type: none">1. Rapid prototyping;2. Native UI;3. native app performance, we did the tab transition prototype comparison with other platform to prove that;4. accessible to device features, we did the taking picture prototype to prove it;	<ol style="list-style-type: none">1. Only compatible with Android and IOS and BlackBerry. However, our clients only require us to develop the mobile app based on the android platform
PhoneGap	<ol style="list-style-type: none">1. Rapid testing and deployment;2. Access basic native functionality;3. Relatively flat learning curve.	<ol style="list-style-type: none">1. Poor performance especially in the automation, transition and tabs change. , we

		proved it by prototyping. Basically, it need 0.5 minute more than Titanium);
Sencha Touch	<ol style="list-style-type: none"> 1. Mainly based on Ext JS, cool UI; 2. Good performance. 	<ol style="list-style-type: none"> 1. Relatively steep learning curve if you don't have a good background knowledge with JavaScript 2. Sencha Touch IDE is a paid application. We did not have enough budgets to pay for that;

Table 26: Comparison of survey application

NDI/NCS	Pros	Cons
Survey Monkey	<ol style="list-style-type: none"> 1. Our clients have bought the Survey Monkey already. 	<ol style="list-style-type: none"> 1. We need to create the tally type of question by ourselves.
Qualtrics	<ol style="list-style-type: none"> 1. Qualtrics supports more than 200 types of questions, includes the tally type. 2. Qualtrics has mobile Qualtrics version, so we might only need to put a little efforts on building the UI of the mobile app 	<ol style="list-style-type: none"> 1. Qualtrics is a paid application, and we do not have budgets to afford that;

3.2 System Structure

Figure 4,5 and 6 illustrate the system structure.

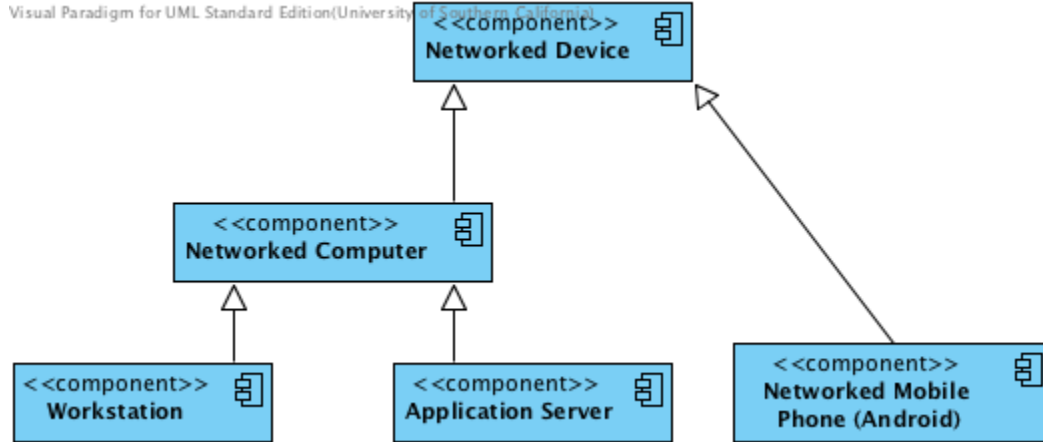


Figure 4: Hardware component Diagram

Table 27: Hardware Component Description

Hardware Component	Description
Networked Computer	A computer that is connected to other networked computers through the internet. In our system, every computer will be networked in this manner.
Application Server	A networked computer which provides applications to workstations. In our system, this will be the server our software will be deployed on.
Workstation	A networked computer which is used to access services on the internet. In our system, this will be a computer used by people at home or in an office to interact with the timeline application server.
Networked Mobile Phone	A mobile phone built on a mobile operating system, with more advanced computing capability and connectivity than a feature phone
Networked Device	The device supporting the system to work, such as a router

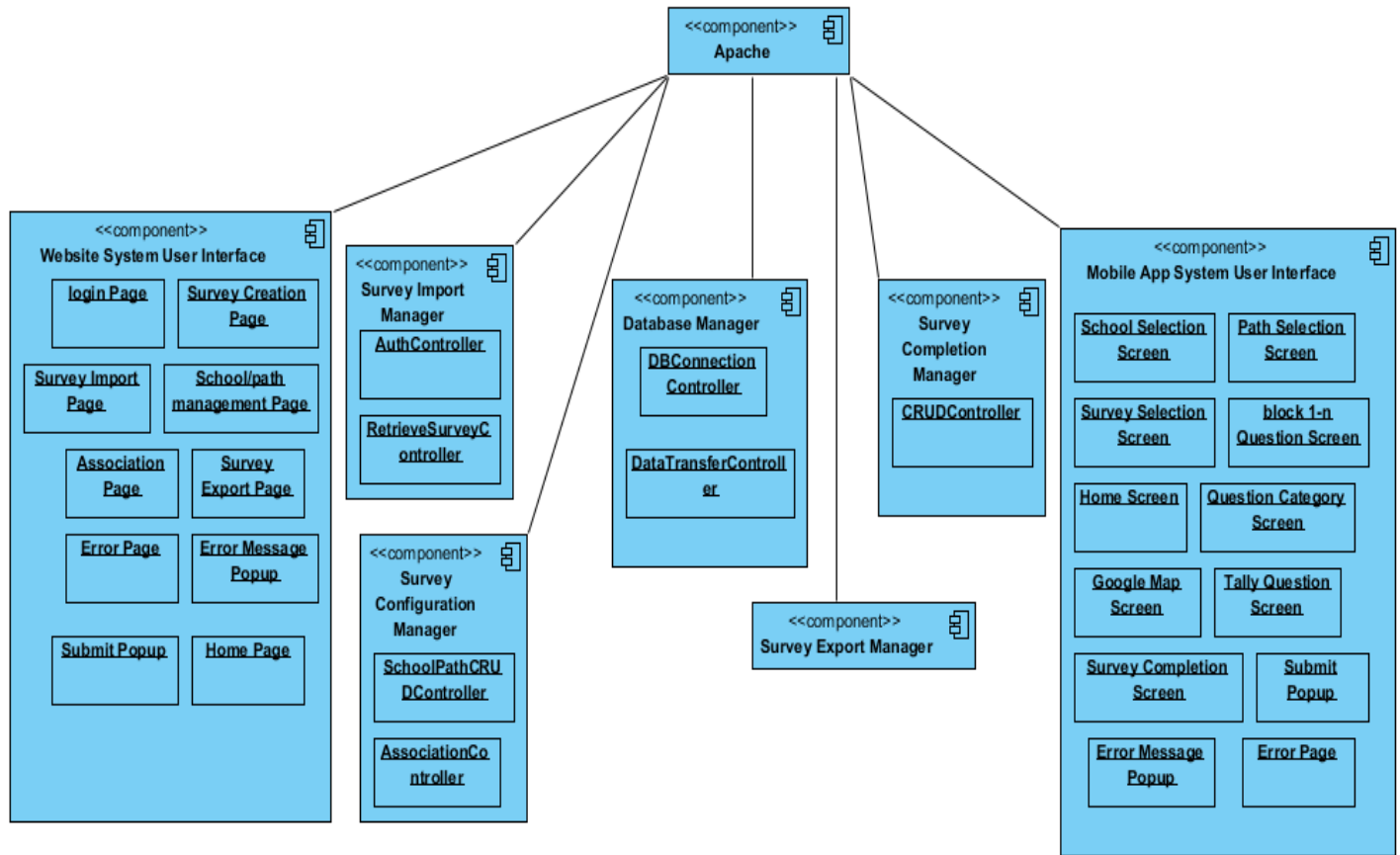


Figure 5: Software component Diagram

Table 28: Software Component Description

Software Component	Description
Website User Interface	The HTML and PHP pages and forms that users of the system interact with directly
Survey Import Manager	The part of the system that used to retrieve survey detail from survey monkey and then import survey
Survey Configuration Manager	Manage the school and paths, such as, add, delete, modify, create, and associate the connection between school, path and surveys
Database Manager	Control the database connection
Survey Export Manager	Export the survey results by CSV file format
Survey Completion Manager	Loading schools, paths, surveys from database and then insert the survey results to database, help users to complete the survey.
Mobile App System User Interface	The HTML and JS pages and forms that users of the system interact with directly
Apache	Such as, provide different languages compiling, font-end and back-end communication, data transmission service

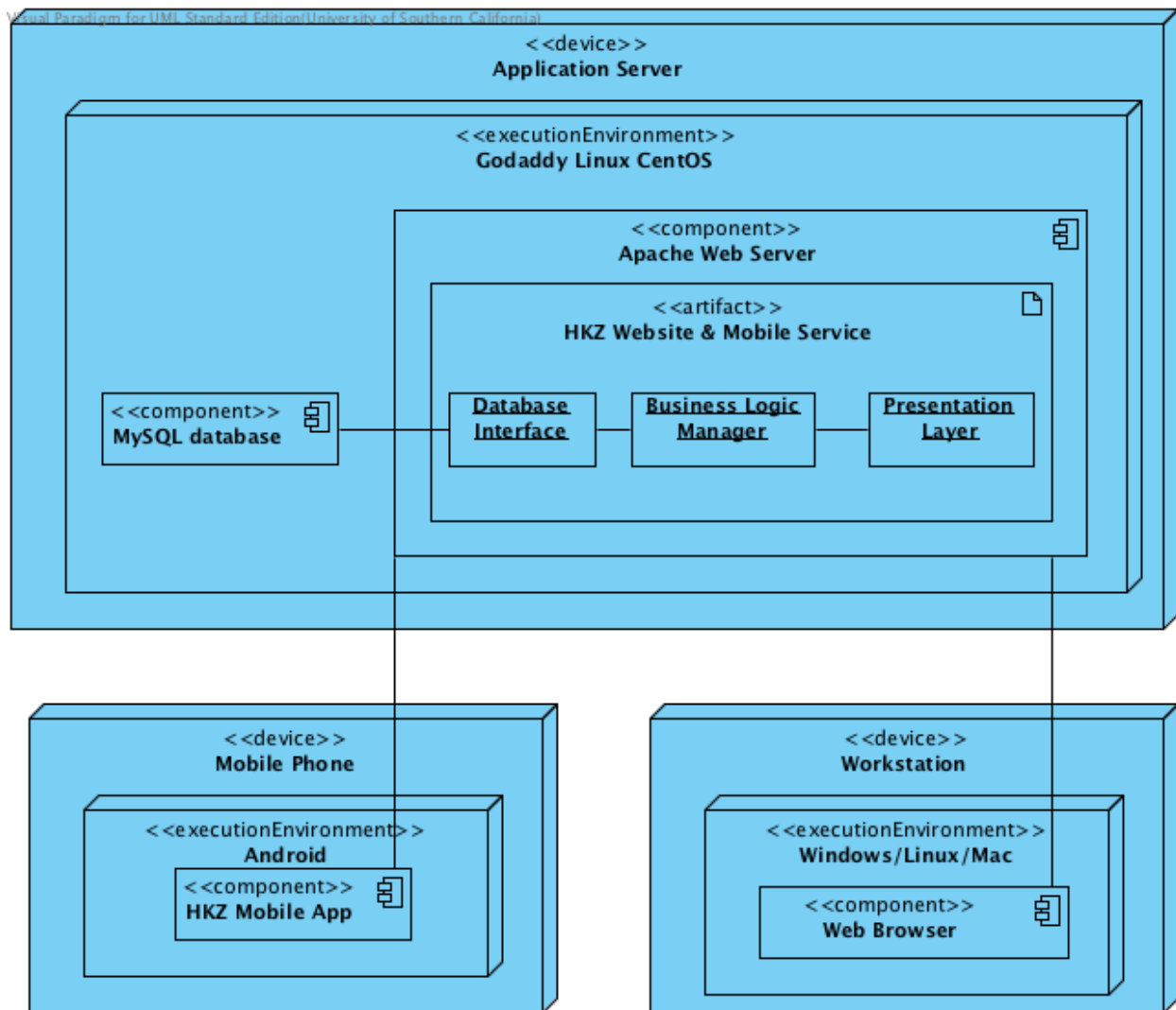


Figure 6: Deployment Diagram

4. Class Design

4.1 Interface Classes

Visual Paradigm for UML Standard Edition (University of Southern California)

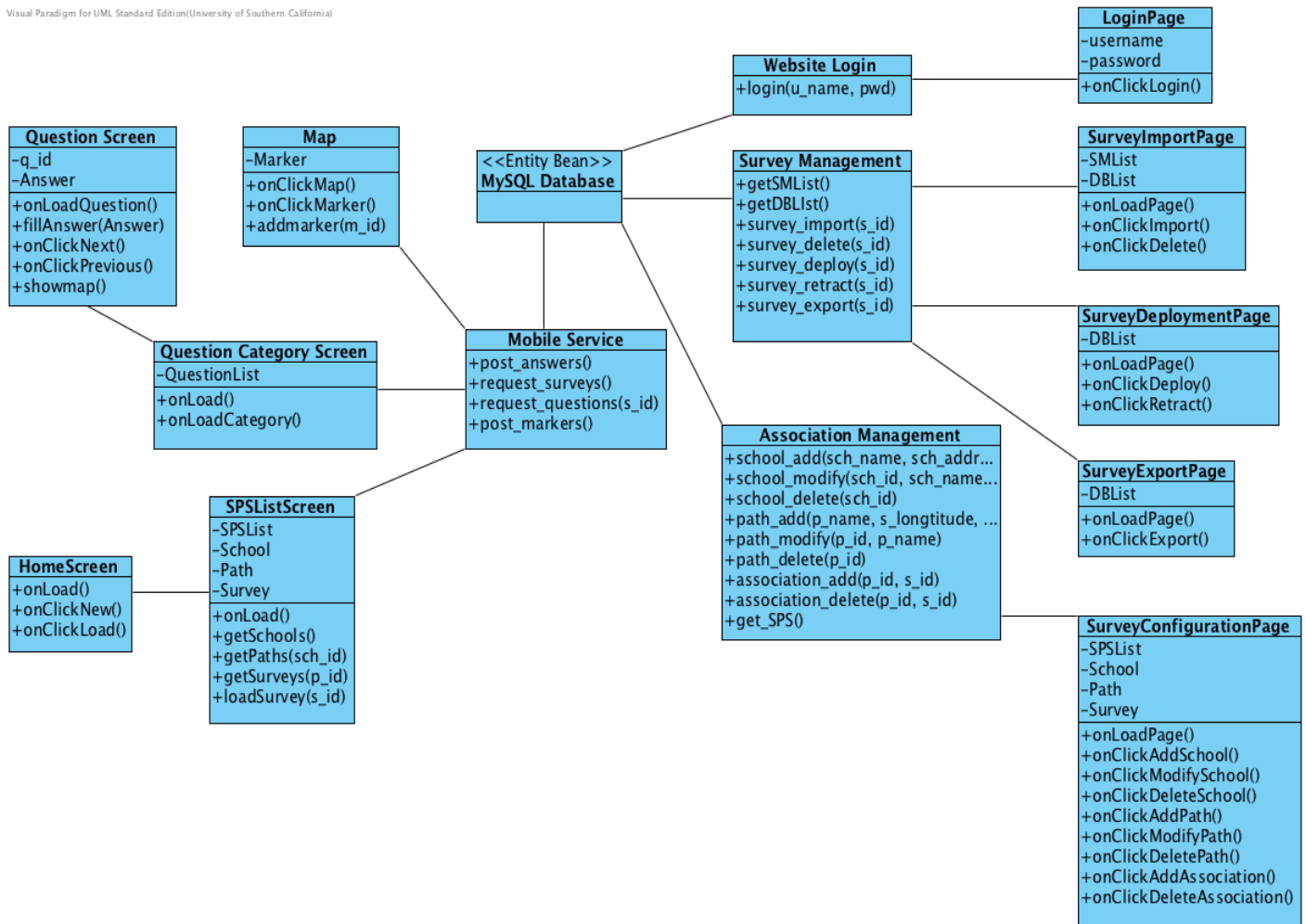


Figure 7: Design Class Diagram

Table 29: Design Class Description

Class	Type	Description
Home page	Boundary	Main page of the website system
Login page	Boundary	Page with a login form
Survey creation page	Boundary	Page that redirect user to survey monkey.com
Survey import page	Boundary	Page that import survey
School and path management page	Boundary	Page that administrator could add/delete/modify school and path
Associate connection page	Boundary	Page that administrator could associate the connection between school, path and survey

Survey export page	Boundary	Page that administrator could export survey results
School selection screen	Boundary	Screen that user can select a school
Path selection screen	Boundary	Screen that user can select a path
Survey selection screen	Boundary	Screen that user can select a survey
Question category screen	Boundary	Screen that user can view all the question type
Block 1-n question screen	Boundary	Screen that user answer the question for each block
Tally question screen	Boundary	Screen that user answer the question of tally type
Home screen	Boundary	Main page of the mobile app system
Google Map screen	Boundary	Screen that user can see the path of the survey and add marker/comment to the map
Survey completion screen	Boundary	Screen that user submit the survey successfully

4.2 Process Realization

The Process Realization diagrams show sequences for the most risky use cases. These are the use cases that, if implemented wrong, would cause the whole system or major parts of it to fail or at least to not work as expected (as opposed to those use cases whose faulty implementation would be contained to themselves).

4.2.1 Render Survey Import Page

This shows the administrator need to import survey from survey monkey and db, which is what our capability of whole survey creation process to administrator rests on.

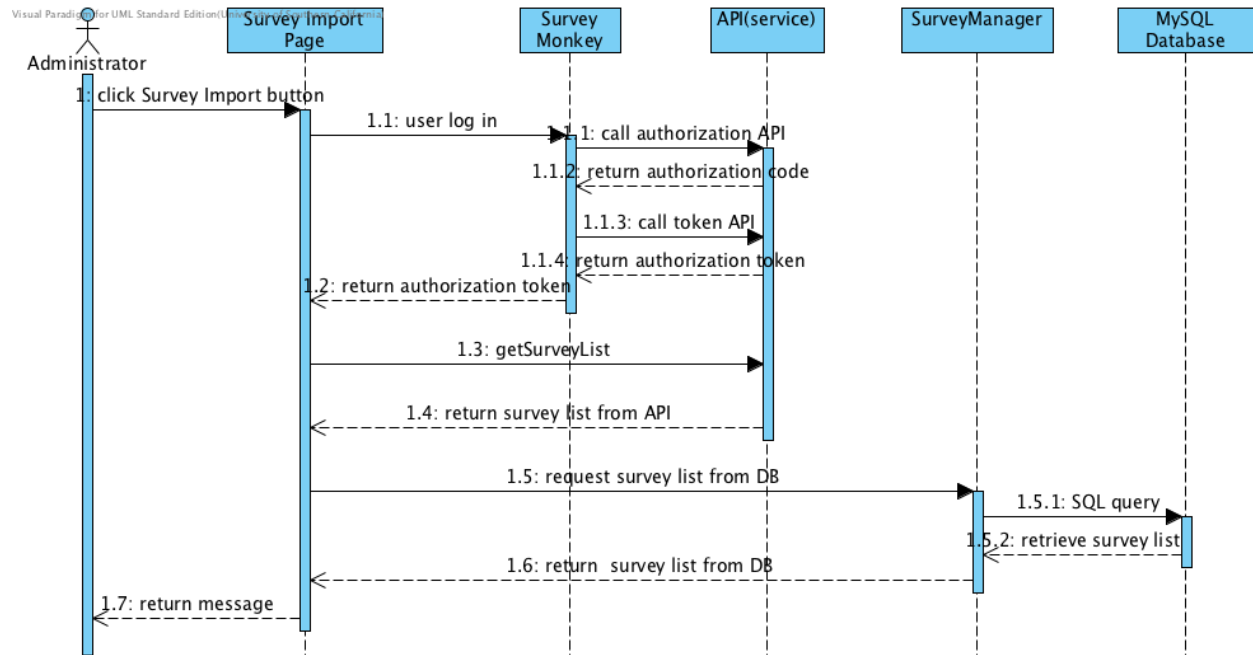


Figure 8: Render Survey Import Page Sequence Diagram

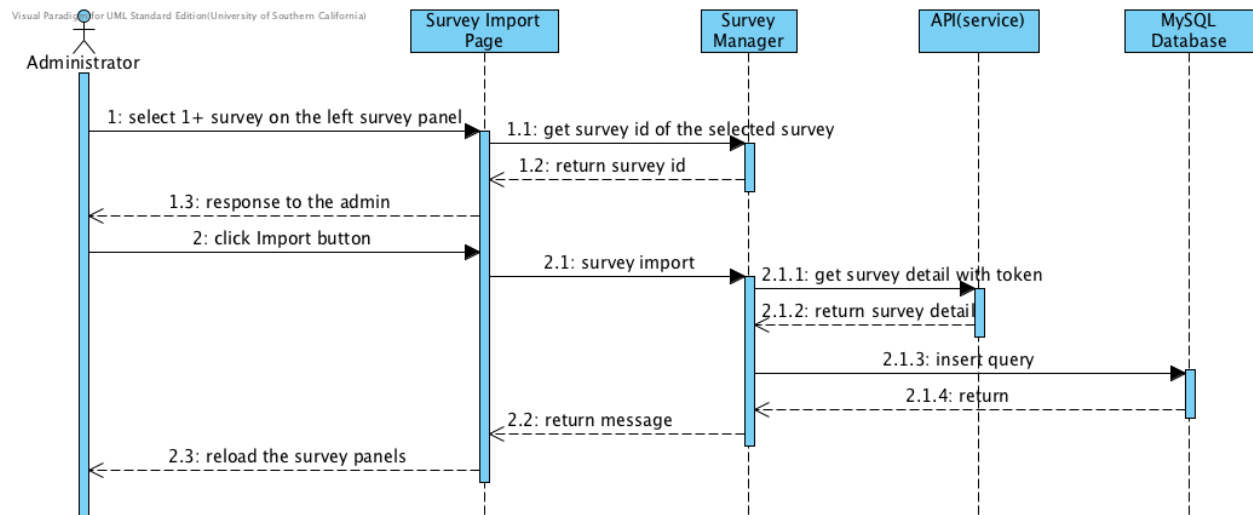


Figure 9: Survey Import Sequence Diagram

5. Architectural Styles, Patterns and Framework

Table 30: Architectural Styles, Patterns, and Frameworks

Name	Description	Benefits, Costs, and Limitations
Three-tier Architecture	<p>Three-tier architecture is an architectural style and a design pattern that separates the presentation of data, business logic and the data itself into tiers that, in the case of our system, reside on two different systems and are managed with three different applications:</p> <ul style="list-style-type: none"> • All data is presented within web browsers on networked machines that will in most cases be offsite. • The business logic platform will be Apache running on Linux CentOS • The data will be managed using a MySQL database running on Linux CentOS on the same virtual machine as Apache (this is based on the setup of the physical system) 	<p>Benefits:</p> <ul style="list-style-type: none"> • Individual tiers can be modified independently from the rest of the system without breaking it (less coupled than a monolithic architecture) • Enforces separation of data, business logic and presentation on the developers, thereby making them create code that is more easily maintained because its functionality is more easily understood due to its impact being more localized within the system. <p>Cost:</p> <ul style="list-style-type: none"> • There is no specific cost required. • Limitations: Potential limited speed losses when data which is transferred between the browser and the database and vice versa has to pass through the separate business layer and has to be replicated in the database and the servlet container