

Final Documentation

Alliance Data: Mobile Labor Statistics Application

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1.Introduction

1.1. Purpose and Scope

The purpose of the document is to define the roles of each member. Along with this we will identify our goals, deliverables, potential risks, professional standards, and hardware/software requirements.

This is a web application that can run in Desktop and Mobile Web Browsers to display data in graphical and table formats. The data to be displayed is pulled from Bureau of Labor Statistics and displayed in a neat manner.

Team 2 of UTD's Software Engineering Project will be developing a web application to access labor statistics. The system will support Windows 7 machines and iPhone browsers. The project will be sponsored by Alliance Data.

1.2. Product Overview (including capabilities, scenarios for using the product, etc.)

This product will be intended for use by Mr. Buchmiller and his peers at Alliance Data to improve the efficiency in retrieving business data and reports from various websites. As of now, Mr. Buchmiller and his peers have to manually go get the data from various websites and create a spreadsheet or powerpoint to capture the data. This product will be used to reduce the time and effort required to retrieve that data. This product will collect quantitative data from those websites that are capable of an automated system accessing it and will provide the options to view the data in different formats. This product will be in a form of a mobile web application that will be compatible with iOS mobile devices.

1.3. Structure of the Document

The document describes the project management plan, requirements, architecture, design, and then testing. Each section describes the phase in greater detail.

1.4. Terms, Acronyms, and Abbreviations

Data Set	Selected data from a specific website for a specific topic. For example, unemployment from the U.S Bureau of Labor Statistics website.
Data Point	A point on the graph that represents specific data. For example, unemployment rate for July 2016.

Metrics	A measurement for comparison or trends. For example, unemployment rate in 2009 vs unemployment rate in 2015.
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2. Project Management Plan

2.1 Project Organization

2.1.1 Organization

Alliance Data

2.1.2 People Involved

Jeff Buchmiller (Sponsor)

Catherine Jojo (Team Leader)

Azeem Ali

James Ballard

Christie Baker

Mehmet Ekizoglu

2.1.3 Roles

Jeff Buchmiller is the sponsor of the Labor Statistics Application. Jeff presents the business needs for the project to the development team.

Catherine Jojo is the team leader because she was voted upon and has previous experience with project leadership. Her role is to make sure the project is on track and organize whatever is necessary for the project.

Azeem Ali is the requirement engineer because he has past experience with the requirements engineering. He will be leading the requirements phase and is responsible for the documentation throughout the project.

Christie Baker is the architect for the project because she has past experience in software architecture. Christie Baker will be leading the architecture creation for the project.

James Ballard is the development lead of the project because he has the most experience with development. James will be responsible for the team's division of work for development.

Mehmet Ekizoglu is the testing lead because he has past experience in testing and wants to learn more about the area. Mehmet will decide what testing methods will be used and lead executing these test.

Although each member is given a lead role for each part of the project, all members are expected to contribute to all sections. The purpose of having a lead is to give direction to each phase of the project. Each member has a say in every part of the project. In order to accomplish the sharing and communication required for jointly completing tasks, documents will be stored in a Google Drive folder and code will be maintained in GitHub. Changes made to documents will be done on the Google Drive, and therefore will be up to date in real time. Based on the specific role of the member they will lead the associated deliverable. The project lead will coordinate meeting times and work with deliverable lead. % members need to review the final deliverable before it may be turned in (in particular the deliverable lead and the project lead). Project lead will keep an up to date communication with the sponsor. Before each deliverable is considered final it will be sent to sponsor for review.

2.2 Life Cycle Model Used

Waterfall will be the lifecycle used because the deliverables are set up in a linear fashion. Waterfall process means we will begin with requirements, then architecture, then design, then implementation, and finally testing. Each phase must be completed to the full extent before moving to the next phase of the project. Each phase will have a set deadline and deliverable.

2.3 Risk Analysis

One risk faced is that most of the websites required are inaccessible by an automated system due to Java updates and reCaptcha blocks. In this case, we would get the data from all the websites that are accessible. For websites that are inaccessible by an automated system, necessity of the website will be assessed and for needed websites we will display the website reducing the steps for the user.

Another risk is a member of the group dropping the course. This risk is not particularly likely. We can reduce this risk by planning out the project ahead of time, making the project less stressful for individual team members.

Another potential risk is the sponsor being unavailable. This risk is not particularly likely. We can reduce this risk by scheduling ahead with Jeff. Also, the sponsor has made it clear that emails are usually a good way to get in contact with him, so if a face to face meeting is not coming together correspondence can occur through emails.

Sources being updated, removed, or changed after the development phase is complete is another risk faced in this project. The sources may not be compatible with our application anymore. This risk has a high potential. We reduce this risk by finding a standard way the data is used and using that to get the data for our system.

Hardware or software not being operable or not available is another risk faced. The sponsor mentioned that any servers or software is fairly restricted due to security reasons. Databases would have to be local. The project will be made according to what is allowed by the company.

2.4 Hardware and Software Resource Requirements

2.4.1 Hardware

iPhone is how the application will be accessed.
Windows 7 Machine is a way the application will be accessed
Windows 7 Machine to store a database locally.
Computer to allow for development.

2.4.2 Software

Working Web Browser with JavaScript Plugins is a requirement by the business.
SQL for the database.
Tomcat 7 for the server.
GitHub to allow for source control.
Eclipse Java EE IDE for development.
Google Drive to collaborate on documentation.
Notepad for front end development.
StarUML for documentation diagrams.
GroupMe for communication.
Chrome Development Tools for web development.

All team members but James were new to using Eclipse Java EE IDE. This required learning how to use the interface along with integrating github with it. Azeem was new to web development. Catherine learned how to set-up the Tomcat 7 server.

2.5 Deliverables, Schedule

Deliverables

Project Management Plan
Requirements Documentation
Architecture Documentation
Detailed Design Documentation
Testing Plan
Full Development Project
Final Project Report

Final Project Presentation
Final Project Demonstration

2.5.1 Schedule

Item	Date	People Involved
Introduction Meeting	1/20	Team + Jeff
Group Meeting	1/23	Team
Project Management Plan	1/27	Team
Requirements Meeting (w/Jeff @UTD)	1/27 @2	Team + Jeff
Requirements Meeting	2/3 @2	Team
Requirements Documentation	2/10	Team
Architecture Meeting	2/10 @2	Team
If need be Architecture Meeting (w/Jeff)	2/17 @2	Team + Jeff
Architecture Documentation	2/24	Team
Design Meeting (w/Jeff)	2/24 @2	Team + Jeff
Design Meeting	3/3 @2	Team
Begin Implementation	3/3	Team
Detailed Design Documentation	3/17	Team
Testing Meeting	3/31 @2	Team
Testing Plan	4/07	Team
Project Presentation w/Jeff	4/14 @2	Team + Jeff
Presentation Meeting	4/21 @2	Team
Final Project Report	4/28	Team
Final Project Demonstration	4/28	Team

*Other internal meetings as needed

2.6 Monitoring, Reporting, and Controlling Mechanisms

The documents specified in the previous section will be the management reports. These will be sent to Jeff to show him the progress of events occurring. The reports will be used to monitor the status of our project. If reports are delivered on time then we will assure that our project is being developed in a timely manner. Each member in the group will be responsible for their section. The sections are defined in the roles above.

2.7 Professional Standards

All team members are required to actively participate in all discussions, meetings, and deliverables. This includes, showing up to meetings on time, actively participating in discussions and providing new ideas as well as qualitative feedback, and being responsible for the completion of their part of the deliverables. All team members are expected to ethically do their own work on the deliverables and avoid any conflicts of interests or scholastic dishonesty dilemmas.

Refer to Appendix A for more details

2.8 Impact of the Project on Individuals and Organizations

This project's biggest impact is on the development team. The development team is teaching many technical skills to the development team. It has taught the whole team how to develop a website from the backend to the front end.

Azeem and Christie were able to improve their skills in front end development. They also got to experiment with user experience when trying to find the interface that the customer liked. They learned to use the D3 library to create advanced web graphics.

Mehmet, James, and Catherine improved their skills in back end development. They worked to create an application to put a post request then inserts the data into a database. They also worked with setting up a servlet that allows the data to be pulled for the front end.

The second biggest organization impacted by the project is Alliance Data. This application eases the jobs of many of the employees at Alliance Data. The application allows the employees to quickly access public data that is needed for their business. It depicts information in graphs and table form for the employees. They can easily copy this data to put into presentations.

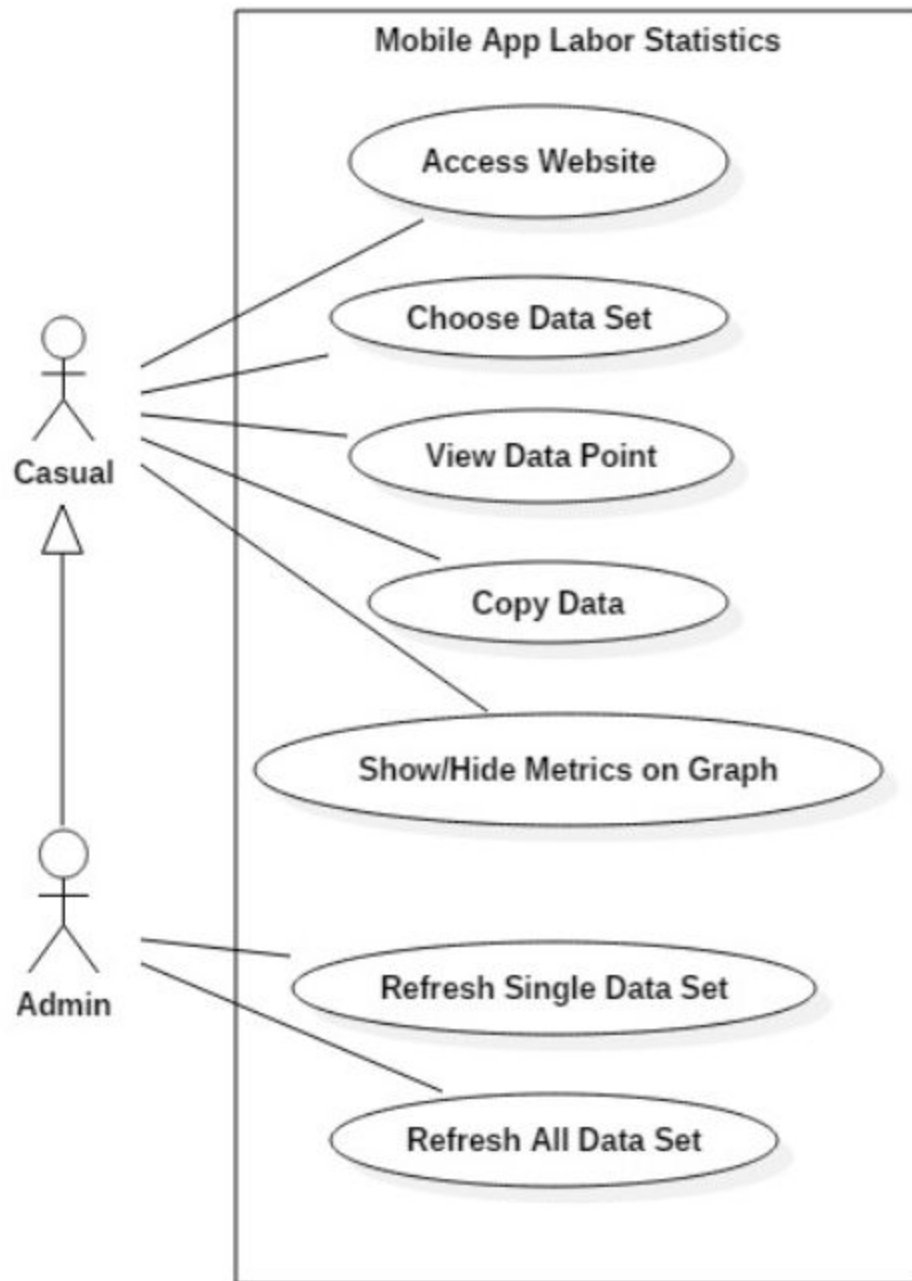
3.Requirements Specifications

3.1. Stakeholders for the system

Stakeholder Group	Role on Project	Main Interests
Jeff Buchmiller/ Alliance Data	Sponsor	To receive a working product that meets all the specified requirements.
Professor Wong/ UT Dallas	Project Coordinator	To ensure that the project deliverables are on time, to evaluate the success of the project, and to provide a grade for the group.
Team 2 (Catherine, Azeem, Christie, Scotty, Mehmet)	Team Members	To deliver a working product that meets all requirements and receive a good grade for the senior project.

3.2. Use case model

3.2.1. Graphic use case model



3.2.2. Textual Description for each use case

Use Case 1: Access Website	
Participating Actors	Admin, User
Entry Condition(s)	User gets the link to access the website based off of the role he/she has in the application/ website
Normal Flow of Events	The user then accesses the website.
Exit Conditions	The user successfully accesses the website.
Exceptions (Alternate Flow of Events)	The website is inaccessible.
Special Requirements	Multiple users shall be able to access the website at the same time.

Use Case 2: Choose Data Set	
Participating Actors	Admin, User
Entry Condition(s)	The user successfully accesses the website
Normal Flow of Events	<ol style="list-style-type: none">1. A menu displays the different data sets2. The user clicks on a data set to display3. The data set is displayed
Exit Conditions	The system successfully displays the data set.
Exceptions (Alternate Flow of Events)	Data is unavailable due to website error. Data is being refreshed so is temporarily unavailable.
Special Requirements	The system shall only display formatted data from a certain set of resources that it is able to gain access to.

Use Case 3: View Data Point	
Participating Actors	Admin, User
Entry Condition(s)	The user successfully views a data set.
Normal Flow of Events	<ol style="list-style-type: none"> 1. The graph displays the data set. 2. The user clicks or hovers on the data point. 3. The graph displays the value of the data point.
Exit Conditions	The system displays a specific data point.
Exceptions (Alternate Flow of Events)	<p>Some links on the data points are non-responsive at times.</p> <p>A graph is not displayed in a proper format.</p>
Special Requirements	The system shall display a line graph rather than a bar of statistics.

Use Case 4: Copy Data	
Participating Actors	Admin, User
Entry Condition(s)	The user has selected a data set
Normal Flow of Events	<ol style="list-style-type: none"> 1. The user clicks to copy the data 2. The user acquires the data
Exit Conditions	The user has a copy of the formatted data
Exceptions (Alternate Flow of Events)	The data is being refreshed and errors occur
Special Requirements	The user shall be able to copy the entire graph.

Use Case 5: Refresh Single Data Set	
Participating Actors	Admin
Entry Condition(s)	The user successfully accesses a data set.
Normal Flow of Events	<ol style="list-style-type: none"> 1. The data set is displayed 2. The user clicks the refresh button 3. The data set information is refreshed.
Exit Conditions	The data set is successfully refreshed.
Exceptions (Alternate Flow of Events)	Data from a specific website is not available so data does not get refreshed.
Special Requirements	<p>Only authorized users can refresh data.</p> <p>The system shall limit the authorized users to refresh data one at a time.</p> <p>The system accessibility shall not be affected by refresh.</p>

Use Case 6: Refresh All Data Sets	
Participating Actors	Admin
Entry Condition(s)	The user successfully accesses the website.
Normal Flow of Events	<ol style="list-style-type: none"> 1. The menu displays data sets and refresh button. 2. The user clicks the refresh button 3. The system pulls the most recent data for all data sets and displays.
Exit Conditions	The data sets are successfully refreshed.
Exceptions (Alternate Flow of Events)	Data from some websites is not available so data does not get refreshed from those specific websites.
Special Requirements	<p>Only authorized users can refresh data.</p> <p>The system shall limit the authorized users to refresh data one at a time.</p> <p>The system accessibility shall not be affected by refresh.</p>

Use Case 7: Show/ Hide Metrics on Graph	
Participating Actors	Admin, User
Entry Condition(s)	The user successfully accesses data set with options for metrics
Normal Flow of Events	<ol style="list-style-type: none"> 1. The data set is displayed with options to show or hide metrics 2. The user selects which metrics to display or hide 3. The system updates the graph and table with the selected metrics
Exit Conditions	The graph successfully displays added/removed metrics and the table also updated accordingly.
Exceptions (Alternate Flow of Events)	The metrics are not updated in the graph and errors occur.
Special Requirements	The user should be able to display up to five metrics on the graph.

3.3. Rationale for your use case model

We chose to have two types of users in the web application. The admin user and the casual user. The reasoning behind this is because the sponsor did not want everyone to have access to all the features and wanted two different roles for different members inside the organization. The casual user will have access to all the data within the application as well as the option to show/hide metrics and copy the data. The casual users will not have access to refresh the data. This is so that the data is not being refreshed unnecessarily and only authorized members of the organization can use that feature. The administrator user will have access to all the features that the casual user has as well as access to refresh single data sets and all data sets at once.

3.4. Non-functional requirements

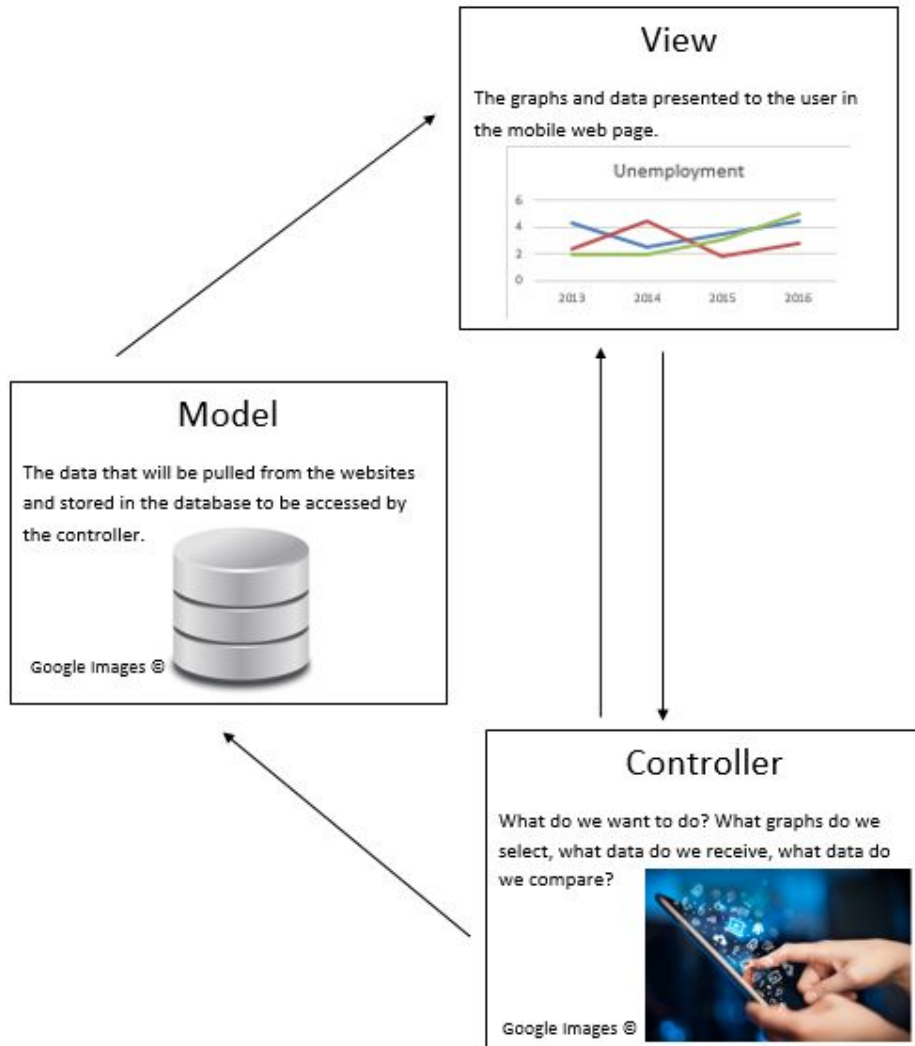
Category	Non-Functional Requirement
Compatibility	The system shall be a web site accessible from both iOS devices and windows machines
Compatibility	The system shall be a web site that is supported by multiple web browsers

	including but not limited to Safari, IE, and Chrome.
Security	The system shall have different user roles so access to certain items can be limited
Usability	The system shall allows users to understand errors within a minute
Availability	The system shall be up 99% of the time
Performance	The system shall take less than an hour to refresh all the data sets via the refresh all tab.
Accessability	The system shall allow multiple users to access the site
Accessability	The system shall be a site that is supported by a single server
Usability	The system shall allow users to understand how to use the system within 2 minutes of explorations
Accessability	The system shall still be accessible when the data sets are being refreshed
Efficiency	The system shall redirect to the data page and pull up the data within 5 seconds of user request.
Usability	95% of all users shall be able to access the desired data within 5 minutes of first use without requiring assistance.

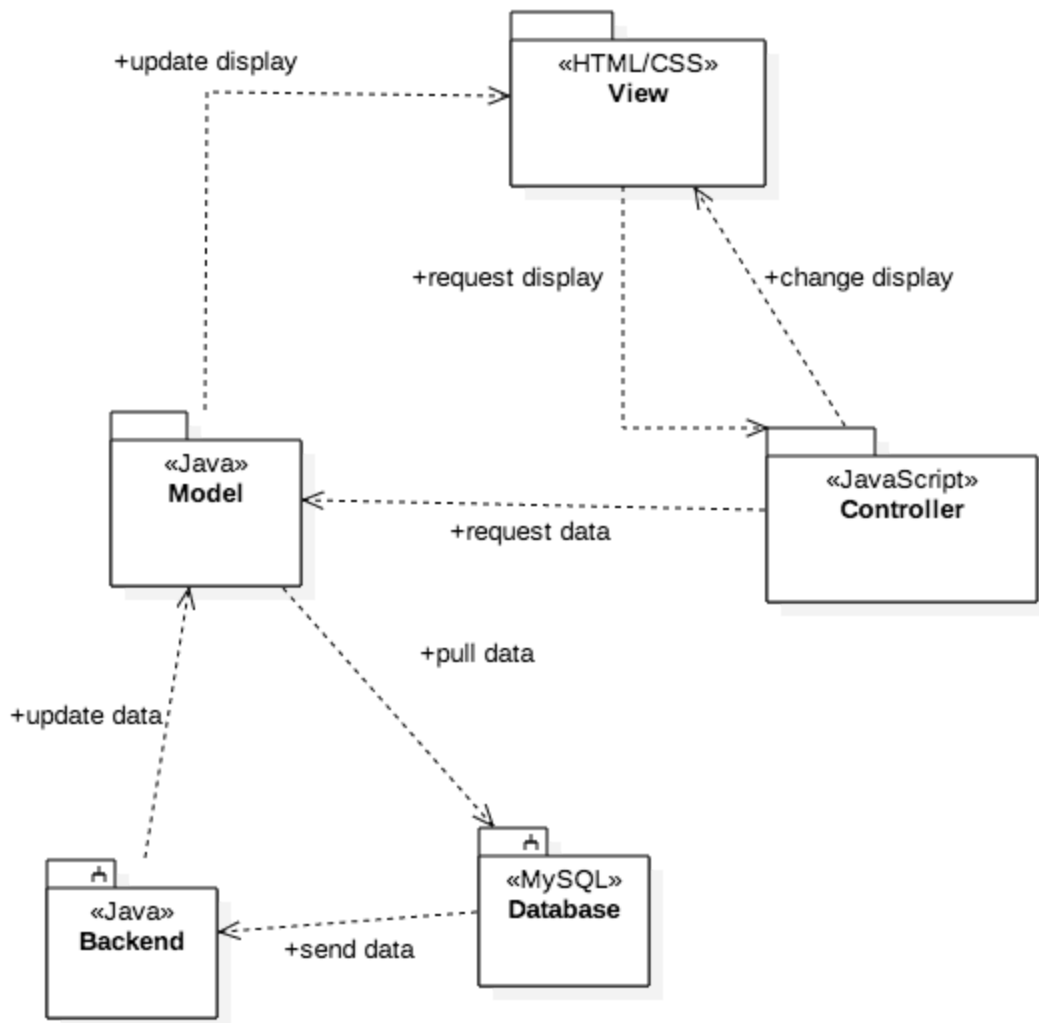
4.Architecture

4.1 Architectural Style(s) Used

The Model View Controller style is the chosen architecture for the application. MVC focuses on updating the model based on the view the user wants. It suits our needs due to the visual nature of our website and the practicality of separating the data from the user directly. The Model component represents the database that we will be pulling data to and from. The View is the site interface that the user will see and grab the data from. The controller handles queries and retrieving the data pulled from the target sites.



4.2 Architectural Model



4.3 Technology, Software, and Hardware Used

HTML/CSS coupled with d3, a javascript library, will be used to display the data, structure the pages, and create visualizations. The rest of the JavaScript will be used to send and receive requests for the data from the server, which pulls from the defined source sites. Java and a MySQL database will be used for the backend, hosted on a Tomcat server.

Technology: JavaScript plus d3, HTML, CSS, Java, SQL

Software: MySQL, Eclipse, Tomcat

Hardware: Windows 10 or 7 Computer, iOS mobile device

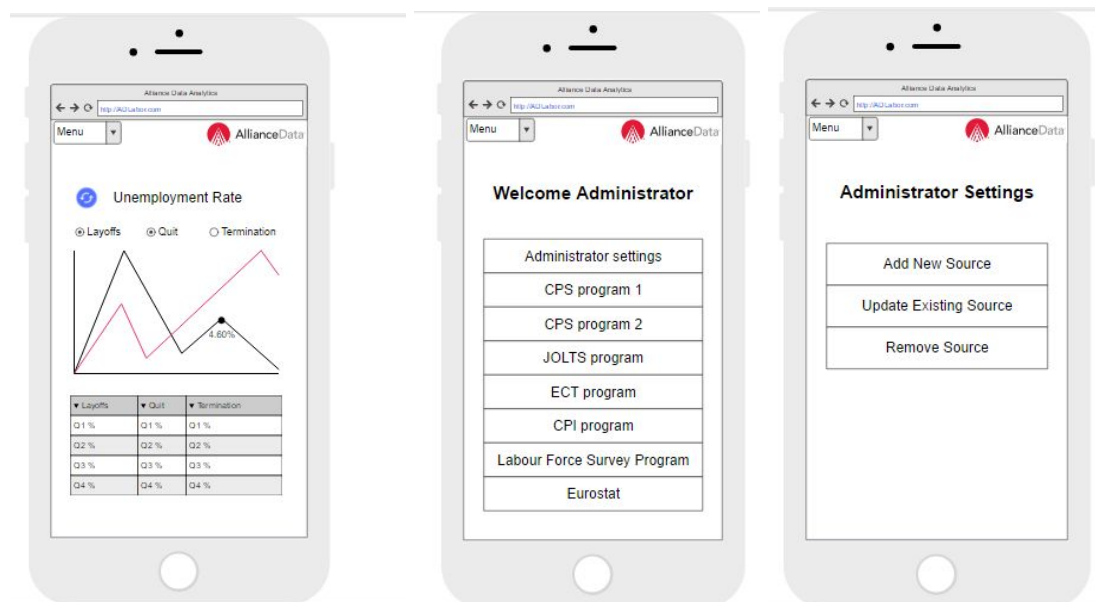
When the application is trying to access information in the server the view will make a request to a Servlet which returns data in a JSON format. The servlet will make a request to a Java backend which will access a database or pull data programmatically if needed. The queried data will propagate back to the view to be displayed.

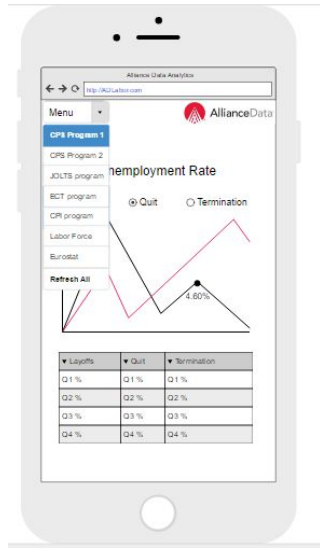
4.4 Rationale For Your Architectural Style and Model

The reason that we decided to use an MVC architecture for our project is because the application has a strong need to have information to be constantly displayed and updated. To increase the amount of modularity inside of the application, the MVC model will make the application simpler to maintain and design. The data stays separate from the user and there exists a controlled flow of information.

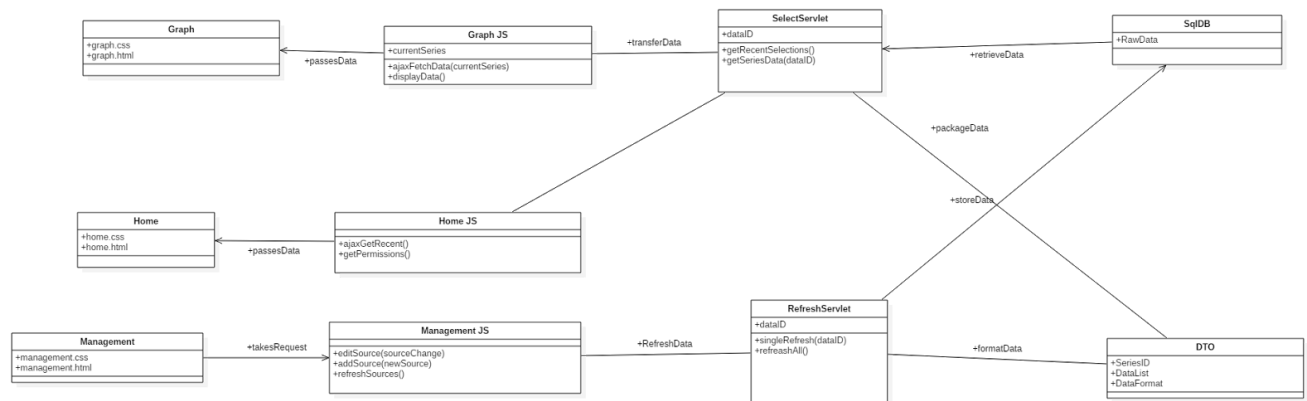
5. Design

5.1 Design

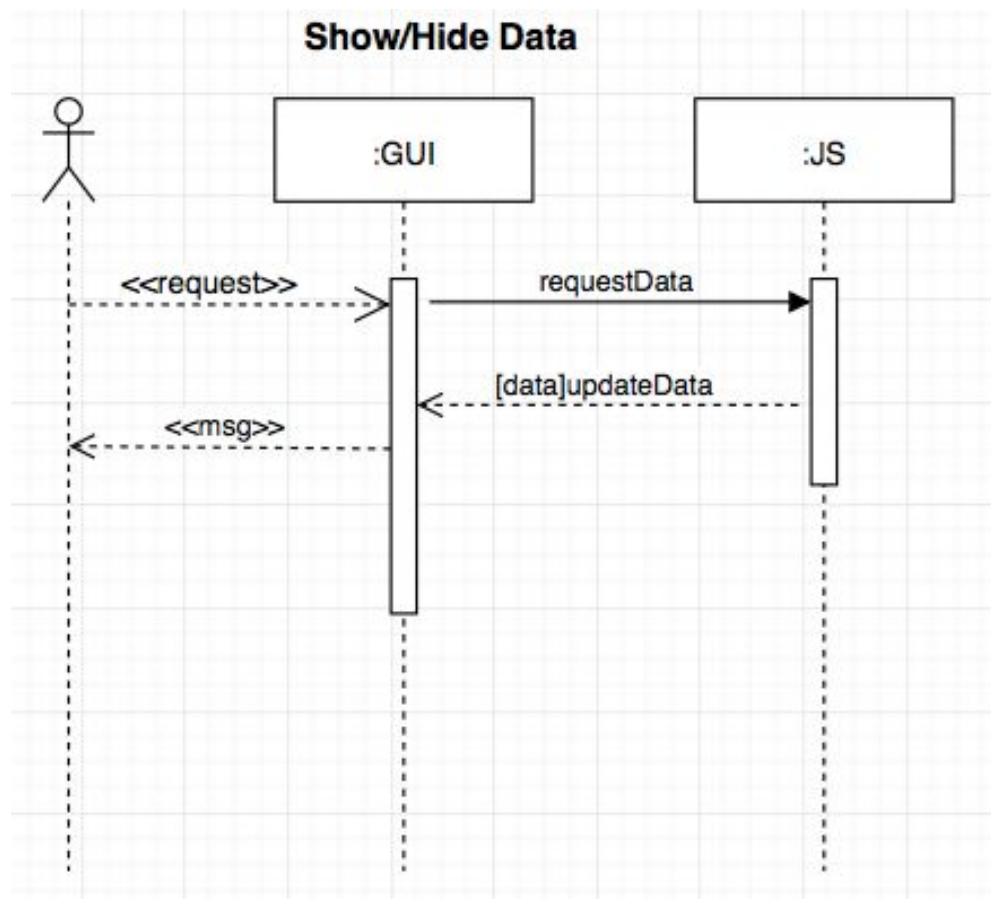




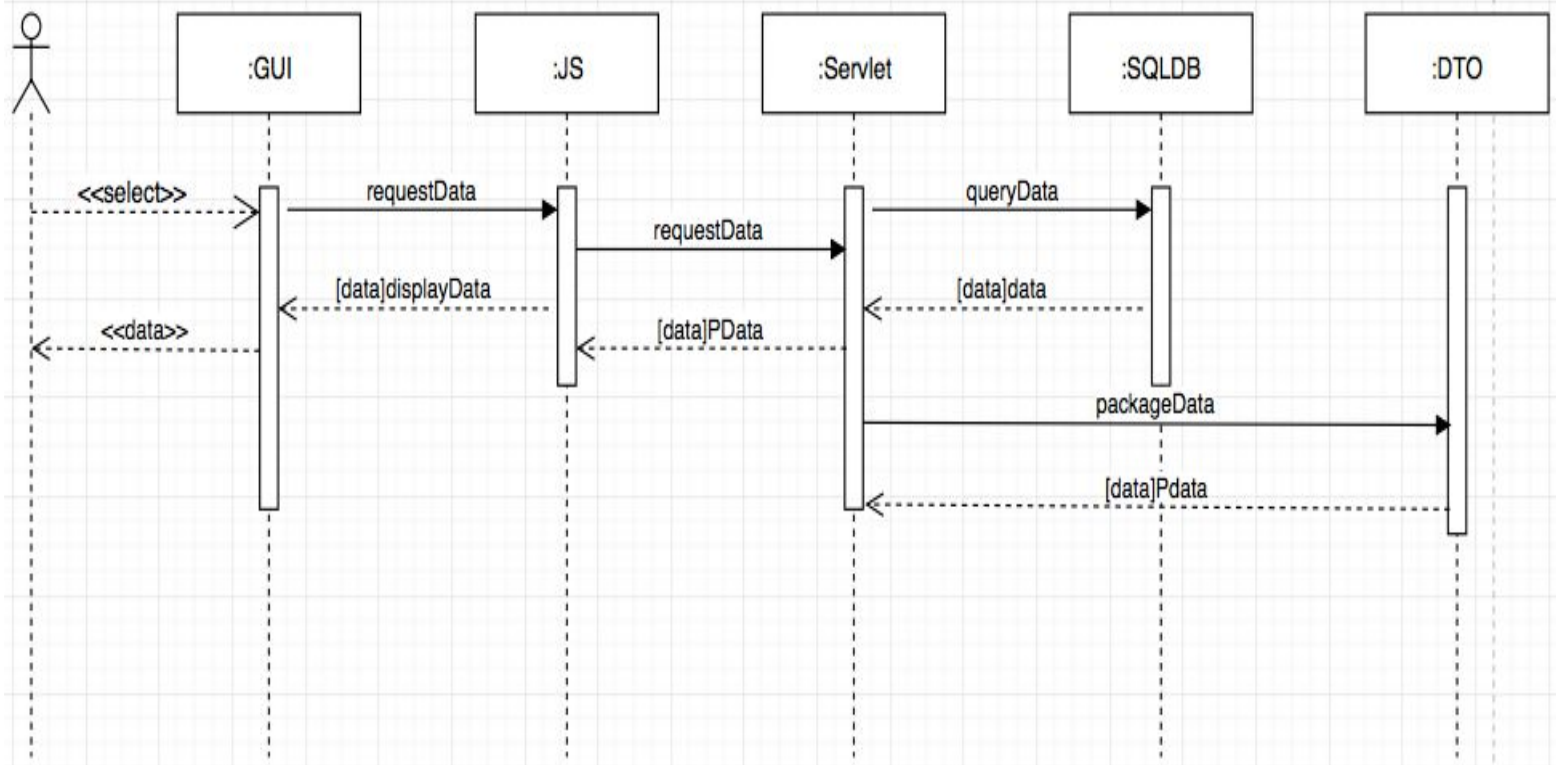
5.2 Static Model Class Diagrams



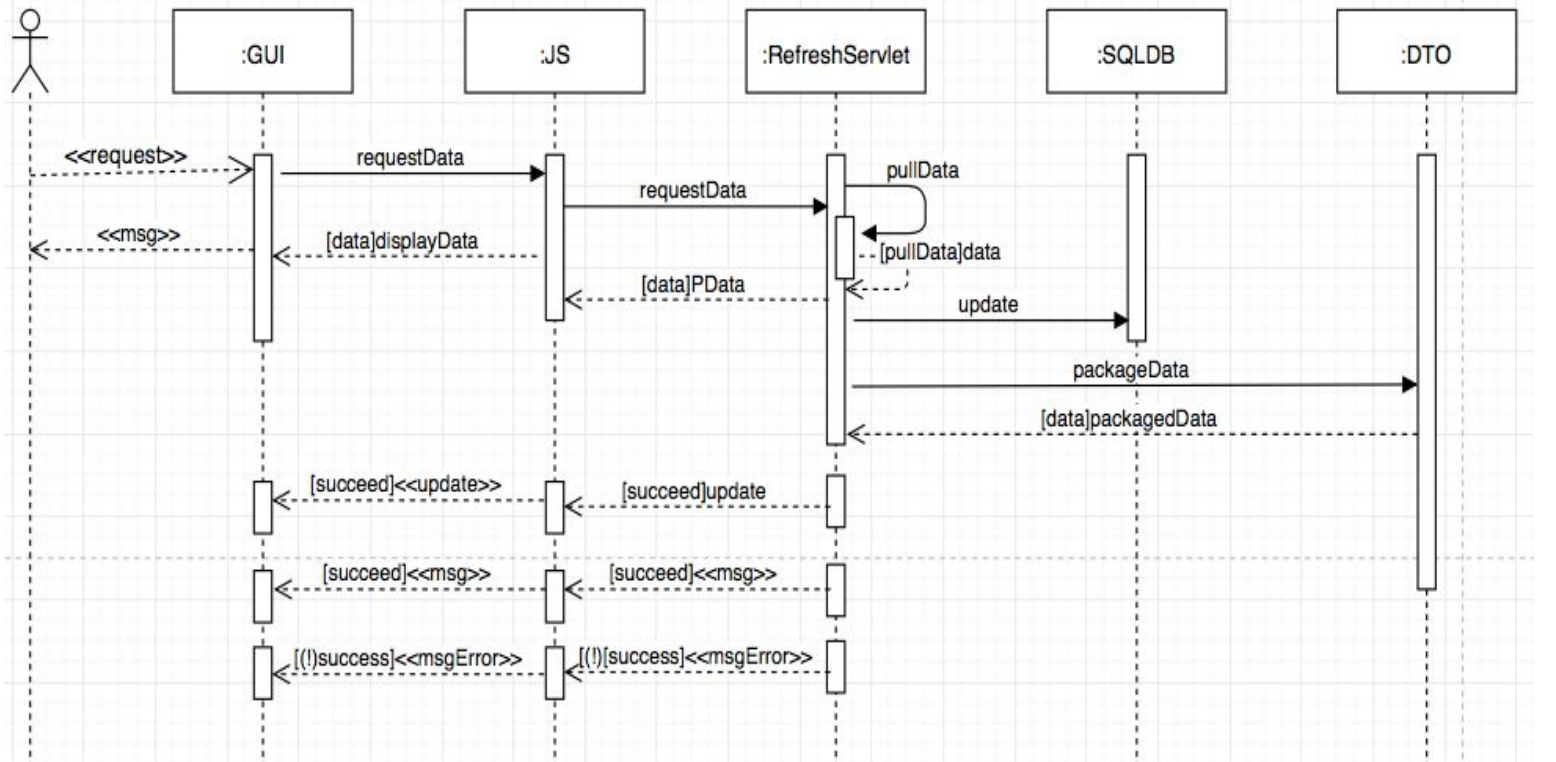
5.3 Dynamic Model Sequence Diagrams



Select Data



Refresh Data



5.4 Traceability from Requirements to Detailed Design Model

Functional Requirements	Design Specs (Seq. Diagram)
Access Website	Select Data
Choose Data Set	Select Data
View Data Point	Select Data
Copy Data	Select Data
Refresh Single Point	Refresh Data
Refresh Data Set	Refresh Data
Refresh All Data	Refresh Data
Show Metrics on Graph	Show/Hide Data
Hide Metrics on Graph	Show/Hide Data

6.Test Plan

6.1 Requirements/Specifications-Based System Level Test Cases

Following order of final use cases along with the detailed descriptions of test cases to be used in the final testing phase of the project:

Admin Page

1. Access Data Set (i.e. Website Access to display all data sets)
 - a. Access Website on Chrome Desktop
 - b. Access Website on Firefox Desktop
 - c. Access Website on Chrome Mobile
2. Choose Data Set
 - a. Choose US employment on Chrome Desktop
 - b. Choose Labor force on Chrome Desktop
 - c. Choose JOLTS on Chrome Desktop
 - d. Choose Costs on Chrome Desktop
 - e. Choose Inflation on Chrome Desktop

- f. Choose US employment on Firefox Desktop
 - g. Choose Labor force on Firefox Desktop
 - h. Choose JOLTS on Firefox Desktop
 - i. Choose Costs on Firefox Desktop
 - j. Choose Inflation on Firefox Desktop
 - k. Choose US employment on Chrome Mobile
 - l. Choose Labor force on Chrome Mobile
 - m. Choose JOLTS on Chrome Mobile
 - n. Choose Costs on Chrome Mobile
 - o. Choose Inflation on Chrome Mobile
3. View Data Point
- a. View Data Point in US Employment on Chrome Desktop
 - b. View Data Point in Labor Force on Chrome Desktop
 - c. View Data Point in US JOLTS on Chrome Desktop
 - d. View Data Point in US Costs on Chrome Desktop
 - e. View Data Point in Inflation on Chrome Desktop
 - f. View Data Point in US Employment on Firefox Desktop
 - g. View Data Point in Labor Force on Firefox Desktop
 - h. View Data Point in US JOLTS on Firefox Desktop
 - i. View Data Point in US Costs on Firefox Desktop
 - j. View Data Point in Inflation on Firefox Desktop
 - k. View Data Point in US Employment on Chrome Mobile
 - l. View Data Point in Labor Force on Chrome Mobile
 - m. View Data Point in US JOLTS on Chrome Mobile
 - n. View Data Point in US Costs on Chrome Mobile
 - o. View Data Point in Inflation on Chrome Mobile
4. Copy Data
- a. Copy Table to Clipboard in US Employment on Chrome Desktop
 - b. Copy Table to Clipboard in Labor Force on Chrome Desktop
 - c. Copy Table to Clipboard in JOLTS on Chrome Desktop
 - d. Copy Table to Clipboard in Costs on Chrome Desktop
 - e. Copy Table to Clipboard in Inflation on Chrome Desktop
 - f. Copy Table to Clipboard in US Employment on Firefox Desktop
 - g. Copy Table to Clipboard in Labor Force on Firefox Desktop
 - h. Copy Table to Clipboard in JOLTS on Firefox Desktop
 - i. Copy Table to Clipboard in Costs on Firefox Desktop
 - j. Copy Table to Clipboard in Inflation on Firefox Desktop
 - k. Copy Table to Clipboard in US Employment on Chrome Mobile
 - l. Copy Table to Clipboard in Labor Force on Chrome Mobile
 - m. Copy Table to Clipboard in JOLTS on Chrome Mobile
 - n. Copy Table to Clipboard in Costs on Chrome Mobile
 - o. Copy Table to Clipboard in Inflation on Chrome Mobile
5. Refresh Single Data Set

- a. Refresh US Employment on Chrome Desktop
 - b. Refresh Labor Force on Chrome Desktop
 - c. Refresh JOLTS on Chrome Desktop
 - d. Refresh Costs on Chrome Desktop
 - e. Refresh Inflation on Chrome Desktop
 - f. Refresh US Employment on Firefox Desktop
 - g. Refresh Labor Force on Firefox Desktop
 - h. Refresh JOLTS on Firefox Desktop
 - i. Refresh Costs on Firefox Desktop
 - j. Refresh Inflation on Firefox Desktop
 - k. Refresh US Employment on Chrome Mobile
 - l. Refresh Labor Force on Chrome Mobile
 - m. Refresh JOLTS on Chrome Mobile
 - n. Refresh Costs on Chrome Mobile
 - o. Refresh Inflation on Chrome Mobile
6. Refresh All Data Sets
- a. Refresh all data sets on Chrome Desktop
 - b. Refresh all data sets on Firefox Desktop
 - c. Refresh all data sets on Chrome Mobile
7. Show/Hide metrics on graph
- a. US Employment on Chrome Desktop
 - i. Hide all metrics (i.e. Show 0)
 - ii. Show 1 metric (i.e. Hide 6)
 - iii. Show 2 metrics (i.e. Hide 5)
 - iv. Show 3 metrics (i.e. Hide 4)
 - v. Show 4 metrics (i.e. Hide 3)
 - vi. Show 5 metrics (i.e. Hide 2)
 - vii. Show 6 metrics (i.e. Hide 1)
 - viii. Show 7 metrics (i.e. Hide 0)
 - b. Labor Force on Chrome Desktop
 - i. Hide all metrics (i.e. Show 0)
 - ii. Show 1 metric (i.e. Hide 0)
 - c. JOLTS on Chrome Desktop
 - i. Hide all metrics (i.e. Show 0)
 - ii. Show 1 metric (i.e. Hide 4)
 - iii. Show 2 metrics (i.e. Hide 3)
 - iv. Show 3 metrics (i.e. Hide 2)
 - v. Show 4 metrics (i.e. Hide 1)
 - vi. Show 5 metrics (i.e. Hide 0)
 - d. Costs on Chrome Desktop
 - i. Hide all metrics (i.e. Show 0)
 - ii. Show 1 metric (i.e. Hide 2)
 - iii. Show 2 metrics (i.e. Hide 1)

- iv. Show 3 metrics (i.e Hide 0)
- e. Inflation on Chrome Desktop
 - i. Hide all metrics (i.e. Show 0)
 - ii. Show 1 metric (i.e. Hide 0)
- f. US Employment on Firefox Desktop
 - i. Hide all metrics (i.e. Show 0)
 - ii. Show 1 metric (i.e. Hide 6)
 - iii. Show 2 metrics (i.e. Hide 5)
 - iv. Show 3 metrics (i.e Hide 4)
 - v. Show 4 metrics (i.e. Hide 3)
 - vi. Show 5 metrics (i.e. Hide 2)
 - vii. Show 6 metrics (i.e. Hide 1)
 - viii. Show 7 metrics (i.e. Hide 0)
- g. Labor Force on Firefox Desktop
 - i. Hide all metrics (i.e. Show 0)
 - ii. Show 1 metric (i.e. Hide 0)
- h. JOLTS on Firefox Desktop
 - i. Hide all metrics (i.e. Show 0)
 - ii. Show 1 metric (i.e. Hide 4)
 - iii. Show 2 metrics (i.e. Hide 3)
 - iv. Show 3 metrics (i.e Hide 2)
 - v. Show 4 metrics (i.e. Hide 1)
 - vi. Show 5 metrics (i.e. Hide 0)
- i. Costs on Firefox Desktop
 - i. Hide all metrics (i.e. Show 0)
 - ii. Show 1 metric (i.e. Hide 2)
 - iii. Show 2 metrics (i.e. Hide 1)
 - iv. Show 3 metrics (i.e Hide 0)
- j. Inflation on Firefox Desktop
 - i. Hide all metrics (i.e. Show 0)
 - ii. Show 1 metric (i.e. Hide 0)
- k. US Employment on Chrome Mobile
 - i. Hide all metrics (i.e. Show 0)
 - ii. Show 1 metric (i.e. Hide 6)
 - iii. Show 2 metrics (i.e. Hide 5)
 - iv. Show 3 metrics (i.e Hide 4)
 - v. Show 4 metrics (i.e. Hide 3)
 - vi. Show 5 metrics (i.e. Hide 2)
 - vii. Show 6 metrics (i.e. Hide 1)
 - viii. Show 7 metrics (i.e. Hide 0)
- l. Labor Force on Chrome Mobile
 - i. Hide all metrics (i.e. Show 0)
 - ii. Show 1 metric (i.e. Hide 0)

- m. JOLTS on Chrome Mobile
 - i. Hide all metrics (i.e. Show 0)
 - ii. Show 1 metric (i.e. Hide 4)
 - iii. Show 2 metrics (i.e. Hide 3)
 - iv. Show 3 metrics (i.e. Hide 2)
 - v. Show 4 metrics (i.e. Hide 1)
 - vi. Show 5 metrics (i.e. Hide 0)
- n. Costs on Chrome Mobile
 - i. Hide all metrics (i.e. Show 0)
 - ii. Show 1 metric (i.e. Hide 2)
 - iii. Show 2 metrics (i.e. Hide 1)
 - iv. Show 3 metrics (i.e. Hide 0)
- o. Inflation on Chrome Mobile
 - i. Hide all metrics (i.e. Show 0)
 - ii. Show 1 metric (i.e. Hide 0)

User Page:

- 8. Access Data Set (i.e. Website Access to display all data sets)
 - a. Access Website on Chrome Desktop
 - b. Access Website on Firefox Desktop
 - c. Access Website on Chrome Mobile
- 9. Choose Data Set
 - a. Choose US employment on Chrome Desktop
 - b. Choose Labor force on Chrome Desktop
 - c. Choose JOLTS on Chrome Desktop
 - d. Choose Costs on Chrome Desktop
 - e. Choose Inflation on Chrome Desktop
 - f. Choose US employment on Firefox Desktop
 - g. Choose Labor force on Firefox Desktop
 - h. Choose JOLTS on Firefox Desktop
 - i. Choose Costs on Firefox Desktop
 - j. Choose Inflation on Firefox Desktop
 - k. Choose US employment on Chrome Mobile
 - l. Choose Labor force on Chrome Mobile
 - m. Choose JOLTS on Chrome Mobile
 - n. Choose Costs on Chrome Mobile
 - o. Choose Inflation on Chrome Mobile
- 10. View Data Point
 - a. View Data Point in US Employment on Chrome Desktop
 - b. View Data Point in Labor Force on Chrome Desktop
 - c. View Data Point in US JOLTS on Chrome Desktop
 - d. View Data Point in US Costs on Chrome Desktop
 - e. View Data Point in Inflation on Chrome Desktop
 - f. View Data Point in US Employment on Firefox Desktop

- g. View Data Point in Labor Force on Firefox Desktop
 - h. View Data Point in US JOLTS on Firefox Desktop
 - i. View Data Point in US Costs on Firefox Desktop
 - j. View Data Point in Inflation on Firefox Desktop
 - k. View Data Point in US Employment on Chrome Mobile
 - l. View Data Point in Labor Force on Chrome Mobile
 - m. View Data Point in US JOLTS on Chrome Mobile
 - n. View Data Point in US Costs on Chrome Mobile
 - o. View Data Point in Inflation on Chrome Mobile
11. Show/Hide metrics on graph
- a. US Employment on Chrome Desktop
 - i. Hide all metrics (i.e. Show 0)
 - ii. Show 1 metric (i.e. Hide 6)
 - iii. Show 2 metrics (i.e. Hide 5)
 - iv. Show 3 metrics (i.e. Hide 4)
 - v. Show 4 metrics (i.e. Hide 3)
 - vi. Show 5 metrics (i.e. Hide 2)
 - vii. Show 6 metrics (i.e. Hide 1)
 - viii. Show 7 metrics (i.e. Hide 0)
 - b. Labor Force on Chrome Desktop
 - i. Hide all metrics (i.e. Show 0)
 - ii. Show 1 metric (i.e. Hide 0)
 - c. JOLTS on Chrome Desktop
 - i. Hide all metrics (i.e. Show 0)
 - ii. Show 1 metric (i.e. Hide 4)
 - iii. Show 2 metrics (i.e. Hide 3)
 - iv. Show 3 metrics (i.e. Hide 2)
 - v. Show 4 metrics (i.e. Hide 1)
 - vi. Show 5 metrics (i.e. Hide 0)
 - d. Costs on Chrome Desktop
 - i. Hide all metrics (i.e. Show 0)
 - ii. Show 1 metric (i.e. Hide 2)
 - iii. Show 2 metrics (i.e. Hide 1)
 - iv. Show 3 metrics (i.e. Hide 0)
 - e. Inflation on Chrome Desktop
 - i. Hide all metrics (i.e. Show 0)
 - ii. Show 1 metric (i.e. Hide 0)
 - f. US Employment on Firefox Desktop
 - i. Hide all metrics (i.e. Show 0)
 - ii. Show 1 metric (i.e. Hide 6)
 - iii. Show 2 metrics (i.e. Hide 5)
 - iv. Show 3 metrics (i.e. Hide 4)
 - v. Show 4 metrics (i.e. Hide 3)

- vi. Show 5 metrics (i.e. Hide 2)
 - vii. Show 6 metrics (i.e. Hide 1)
 - viii. Show 7 metrics (i.e. Hide 0)
- g. Labor Force on Firefox Desktop
 - i. Hide all metrics (i.e. Show 0)
 - ii. Show 1 metric (i.e. Hide 0)
- h. JOLTS on Firefox Desktop
 - i. Hide all metrics (i.e. Show 0)
 - ii. Show 1 metric (i.e. Hide 4)
 - iii. Show 2 metrics (i.e. Hide 3)
 - iv. Show 3 metrics (i.e. Hide 2)
 - v. Show 4 metrics (i.e. Hide 1)
 - vi. Show 5 metrics (i.e. Hide 0)
- i. Costs on Firefox Desktop
 - i. Hide all metrics (i.e. Show 0)
 - ii. Show 1 metric (i.e. Hide 2)
 - iii. Show 2 metrics (i.e. Hide 1)
 - iv. Show 3 metrics (i.e. Hide 0)
- j. Inflation on Firefox Desktop
 - i. Hide all metrics (i.e. Show 0)
 - ii. Show 1 metric (i.e. Hide 0)
- k. US Employment on Chrome Mobile
 - i. Hide all metrics (i.e. Show 0)
 - ii. Show 1 metric (i.e. Hide 6)
 - iii. Show 2 metrics (i.e. Hide 5)
 - iv. Show 3 metrics (i.e. Hide 4)
 - v. Show 4 metrics (i.e. Hide 3)
 - vi. Show 5 metrics (i.e. Hide 2)
 - vii. Show 6 metrics (i.e. Hide 1)
 - viii. Show 7 metrics (i.e. Hide 0)
- l. Labor Force on Chrome Mobile
 - i. Hide all metrics (i.e. Show 0)
 - ii. Show 1 metric (i.e. Hide 0)
- m. JOLTS on Chrome Mobile
 - i. Hide all metrics (i.e. Show 0)
 - ii. Show 1 metric (i.e. Hide 4)
 - iii. Show 2 metrics (i.e. Hide 3)
 - iv. Show 3 metrics (i.e. Hide 2)
 - v. Show 4 metrics (i.e. Hide 1)
 - vi. Show 5 metrics (i.e. Hide 0)
- n. Costs on Chrome Mobile
 - i. Hide all metrics (i.e. Show 0)
 - ii. Show 1 metric (i.e. Hide 2)

- iii. Show 2 metrics (i.e. Hide 1)
 - iv. Show 3 metrics (i.e Hide 0)
- o. Inflation on Chrome Mobile
 - i. Hide all metrics (i.e. Show 0)
 - ii. Show 1 metric (i.e. Hide 0)

Test Case ID	Description	Expected Results
1a - 1c	Admin website Access	Pass/Fail
2a - 2o	Admin access to a specific data set's graph	Pass/Fail
3a - 3o	Admin view a data point on the graph	Pass/Fail
4a - 4o	Admin copy data from the table	Pass/Fail
5a - 5o	Admin a single data set refresh	Pass/Fail
6a - 6c	Admin all data sets refresh	Pass/Fail
7a(i) - 7o(ii)	Admin show/hide metric(s) in a graph	Pass/Fail
8a - 8c	User website Access	Pass/Fail
9a - 9o	User access to a specific data set's graph	Pass/Fail
10a - 10o	User view a data point on the graph	Pass/Fail
11a(i) - 11o(ii)	User show/hide metric(s) in a graph	Pass/Fail

6.2 Traceability of Test Cases to Use Cases

Since there are so many test cases we will map note multiple test cases in one column and map them into the table below.

	Test Case 1a - 1c	Test Case 2a - 2o	Test Case 3a - 3o	Test Case 4a - 4o	Test Case 5a - 5e	Test Case 6a - 6c	Test Case 7a(i) - 7o(ii)	Test Case 8a - 8c	Test Case 9a - 9o	Test Case 10a - 10o	Test Case 11a(i) -11o(i) i)
UC1	X							X			
UC2		X							X		
UC3			X							X	
UC4				X							
UC5					X						
UC6						X					
UC7							X				X

6.3 Techniques Used for Test Generation

There are various Test Case Generation techniques. In order to automate the test cases, two main approaches are given. The first one is to design the test cases from requirements and design specifications. The second approach is generating test cases by using code which we will not do here in this project. [1]

We generated our test cases using our design specifications and requirements (more specifically use cases and use case graph). Black-box testing is used to translate requirements to specific test cases. As a primary approach for testing, we used the use case testing technique where each use case is tested on a transaction by transaction basis including the extensions or exceptions as named in this document.

Compatibility testing across web browsers is also needed. For this particular project, we want our website to work with at least two of the following: Firefox, Chrome and/or Internet Explorer 11, and at least one of the following: Safari Mobile or Google Chrome Mobile.

May further testing be required we are considering to use Equivalence Partitioning test technique for it. Equivalence partitioning is usually a lot faster than other Black-Box testing specific techniques.

IEEE defines Software Quality by the following definitions: [2]

- The degree to which a system, component, or process meets specified requirements.
- The degree to which a system, component, or process meets customer or user needs or expectations.

When measuring the quality of our tests we aimed to meet or exceed customer needs or expectations without exhausting all of our options.

6.4 Assessment of Goodness of your Test Suite

“When using use cases to drive testing, it's important to understand that there are no industry standards for coverage.” [3] In use case testing there are several factors are taken into account in determining the quality and correctness of our project. The ones we've taken into account include:[4]

1. Number of requirements
2. Average number of test cases performed per requirement
3. Total number of test cases performed for all requirements
4. Number of total test cases blocked
5. Number of total test cases passed
6. Number of total test cases failed
7. Total number of defects identified
8. Critical defects count
9. Low defects count

As also mentioned in the previous section of this document, we want our website to work with at least the following: Firefox Desktop, Google Chrome Desktop, Google Chrome Mobile.

Therefore the values used in test case development will be as follows:

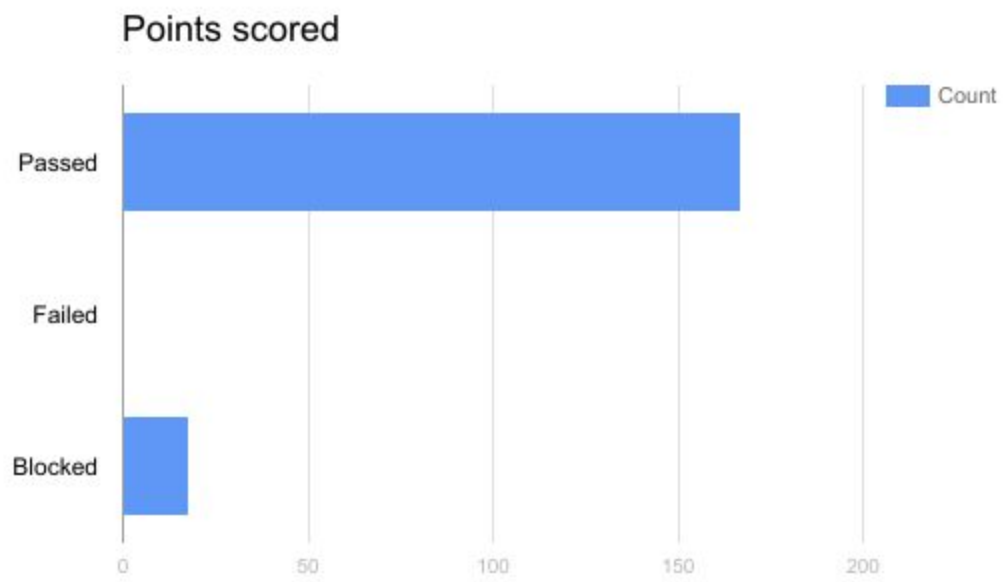
- Number of requirements = 7
- Average number of test cases performed per requirement = $185 \text{ total test cases} / \text{per } 7 \text{ requirements} = 26$
- Total number of test cases performed for all requirements = 185
- Total number of test cases blocked = 15 (Admin Refresh Single Data Set) + 3 (Admin Refresh All Data Sets) = 18. Refresh in reality works, it is sending data and requesting back from the server. However new data used by our programs is entered/updated every month, so basically from the perspective of a tester, we can not actually see anything changing, hence we say these test cases are blocked due to time constraints.

We summarize these metrics into a table below:

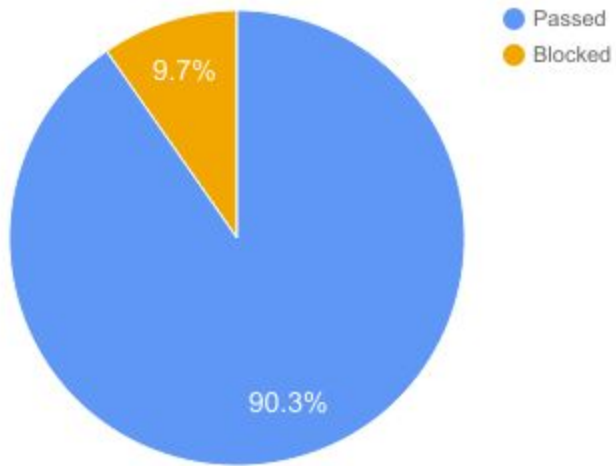
Sequence Number	Testing Metric	Data retrieved during test case development & execution
1	Number of requirements	7
2	Average number of test cases performed per requirement	26
3	Total number of test cases performed for all requirements	185
4	Number of total test cases blocked	18
5	Number of total test cases passed	167
6	Number of total test cases failed	0
7	Total number of defects identified	0
8	Critical defects count	0
9	Low defects count	0

Test Execution Results:

- Percentage of test cases Passed = (No. of Test cases Passed / Total no. of Test cases Executed) * 100.
 - So we have : $(167 / 185) * 100 = 90.3\%$
- Percentage of test cases Failed = (No. of Test cases Failed / Total no. of Test cases Executed) * 100.
 - So we have: $(0 / 185) * 100 = 0\%$
- Percentage of test cases Blocked = (No. of Test cases Blocked / Total no. of Test cases Executed) * 100.
 - So we have: $(18 / 185) * 100 = 9.7\%$
- Defect Density = Number of defects identified / size(Number of requirements)
 - $0/7 = 0\%$



Test Execution Status



Appendix A.

The following provides a professional standards guideline for the teams. This guideline may be tailored. The professional standards must be agreed upon by each member in the team.

Guideline:

On the first occurrence of unacceptable behavior, determine the circumstances involved, resolve the problem, and document the event in the meeting minutes.

On a second occurrence, notify the instructor of the problem. A meeting will be set up to evaluate the situation and resolve the problem.

On a third occurrence, again notify the instructor of the problem. A meeting will be set up to evaluate the situation and resolve the problem. At this point, the team will have the *option* of removing the team member. If removed, then the team member receives a pro-rated grade based on the number of weeks they have participated in the group.

Examples of unacceptable behavior may include not delivering on time, delivering poor quality work, missing team meetings, being unprepared for team meetings, disrespectful or rude behavior, etc. Reasons such as "too busy" or "I forgot", or "my dog ate my design model" are unacceptable.

Valid reasons that must be considered include those listed for obtaining an incomplete standing in a course (illness, death in the family, travel for business or academic reasons, etc.)

Acknowledgment

References

1. Hooda, Itti, and Rajender Chhillar. "A Review: Study of Test Case Generation Techniques."International Journal of Computer Applications 107.16 (2014): 33-37.
2. "IEEE Standard for Software Quality Assurance Processes - IEEE Xplore Document." IEEE Standard for Software Quality Assurance Processes - IEEE Xplore Document.
3. "Test Metrics and Use Case Coverage during Testing." SearchSoftwareQuality.
4. "Important Software Test Metrics and Measurements – Explained with Examples and Graphs." Software Testing Help Important Software Test Metrics and Measurements Explained with Examples and Graphs Comments.