CS 3202 – Software Engineering Project

Final report

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Table of Contents

1 Introduction

1.1 Background of the application domain/ problem

This project is about, fulfilling public transportation schedule information for all routes lively for day to day users and public transportation Commission. As a result of development of southern express way public transportation in Sri Lanka many people started using highway as solution for their travelling need. After southern highway expand into the Matara, highway bus service open for many rural areas such as Akuressa, Deniyaya, Tangalle, Katharagama etc. There are over 200 buses in different highway bus routes.

But there no proper bus schedule for these highway bus service due to high demand. When bus is crowded it leaves from bus station. If passengers come on schedule time he/she won't catch the bus. There no way to get information on that as well as get information about next bus as well. Sometimes buses are break down, no bus for that time slot.

1.2 Motivation for the selected system development

In this project I expect to develop web application for passengers where they can check the current available buses at preferred bus stations and bus schedules. Highway Express is the system that gather all the information related all the bus time keepers and bus drivers related to the highway bus services and passengers who use highway bus service and provide information that they required.

In other word, Highway express will automate the bus scheduling system and it help to find buses for bus time keepers as well as bus drivers get immediate update on bus schedule as well as passengers can get information about current buses available.

1.3 Importance and main purpose of the system

Main purpose of the system is provide bus time schedule for passengers. Because many people use highway for save the time in travelling but if buses are not available at the bus station, passengers have to wait until next bus on board. It waste of time. If passengers know correct bus time schedule they can save the time as well as catch the bus.

Second purpose is provide bus time schedule details for bus time keepers and bus drivers. Bus time keeper can update and get information on bus schedule and bus drivers get update on their bus time table. Automating the bus time schedule update system will increase the efficiency of the system as well as their time.

Third purpose is enhance the service using passenger, drivers and time keepers feed backs. Those and feedback recording is one of most important feature of the system. Those feedbacks are reviewed periodically and used to improve the systems usability and features. Passengers can give feedback on certain buses, bus stations or services. Then highway bus service authority can take actions suitably. This will enhance the public transportation of Sri Lanka by considerable amount.

1.4 Overview/ summary of the system and used approach and outcome

Highway Express is web application that a service by giving highway bus time schedule for passengers, highway bus drivers and highway bus time keepers in different perspective. It will allow bus drivers to update their current location and bus time keepers to update the schedule or

emergency situations such as a sudden bus cancellation. This system includes web application based on JSP, back end java server and MySQL database system.

2 Literature Review

2.1 Passengers

2.1.1 Search the bus schedule for preferred bus station

Passengers can search bus routes as they preferred from entering their current location and destination location on the system. All the highway bus routes includes possible bus stop in the bus routes except within highway. As well as they can search future bus time tables with possible bus information.

2.1.2 Search the current available bus at the bus station

When passenger search bus schedule on today, it will automatically display current possible buses on –board at bus station related searched bus route. Passenger can get all the relevant details about current buses.

2.1.3 Give feedback about journey.

Passenger can give general feedback on system as well as passenger can review specific bus station and bus. That information will directly review by bus admin as well as bus drivers and time keepers. Also passengers can review past passenger feedbacks and decide their journey accordingly.

2.2 Bus drivers

2.2.1 Update the bus schedule when currently at bus station

When bus time keeper call on-board to bus to bus station or time on time table, bus driver can update status about currently available at bus station. As 2.1.2 passenger can get information on that.

2.2.2 Get bus schedule for bus.

When various factors such as bus broke down, new bus add to route etc. bus time tables are changes. Bus drivers can get latest bus time table by the system.

2.3 Bus time keeepr

2.3.1 Update the bus schedule when currently at bus station

According to bus time table, bus time keeper can update status about currently available at bus station and call on-board bus. As 2.1.2 passenger can get information on that.

2.3.2 Get bus schedule for bus.

When various factors such as bus broke down, new bus add to route possible delay etc.then bus time keepers can call next buses to on-board as well as change the daily time schedule. It will automatically update the bus drivers (2.2.2)

2.4 Admin:

2.4.1 Control of the system

Admins are the people who add/ remove bus time keepers and bus drivers, add new bus route to system, allocate bus time slot to buses and control of the system. When new bus time keeper or driver wants to sign in for the system he will have to register beforehand providing certain relevant information's. Then after considering the reliability of provided information system admins would add or reject the applied driver or time keeper.

2.5 System engineer

2.5.1 Add new features, repair system break downs and handle errors

System engineer will periodically review user feedbacks, and considering admins requests he will add possible new features to the system or upgrade the system. He will also repair the system in break downs or when a possible error occurred in the system.

3 System Models

3.1 System Requirement

Functional Requirements of highway express bus schedule automation system can described under data to be entered into the system, operations performed by each screen, work-flows performed by the system, system reports or other outputs, system meets applicable regulatory requirements. In web application main operation is search bus schedule for passengers.

Use case: **passenger use case diagram**

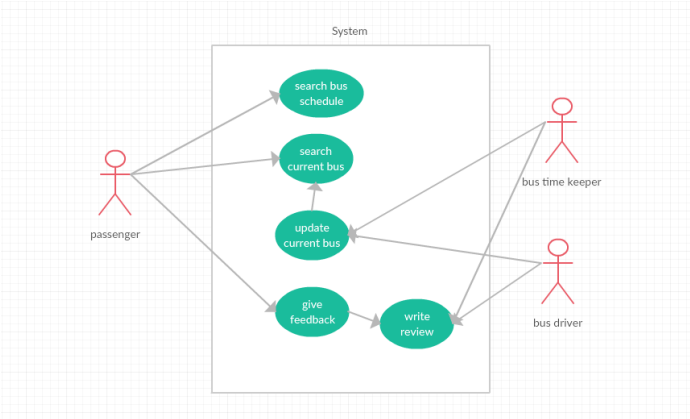


Figure 1- passenger use case

Brief Description:

In figure 1 show that all the use cases related with bus passenger. Bus passenger can search the bus schedule by select the bus route and input date. Then it display all the buses with time. In search current bus use case, passenger can search current bus available at bus route which he/she selected. As shown in diagram it related with update current bus in

bus driver and bus time keeper. Bus driver or bus time keeper update the current bus available at bus station then passengers allow to perform search current bus use case.

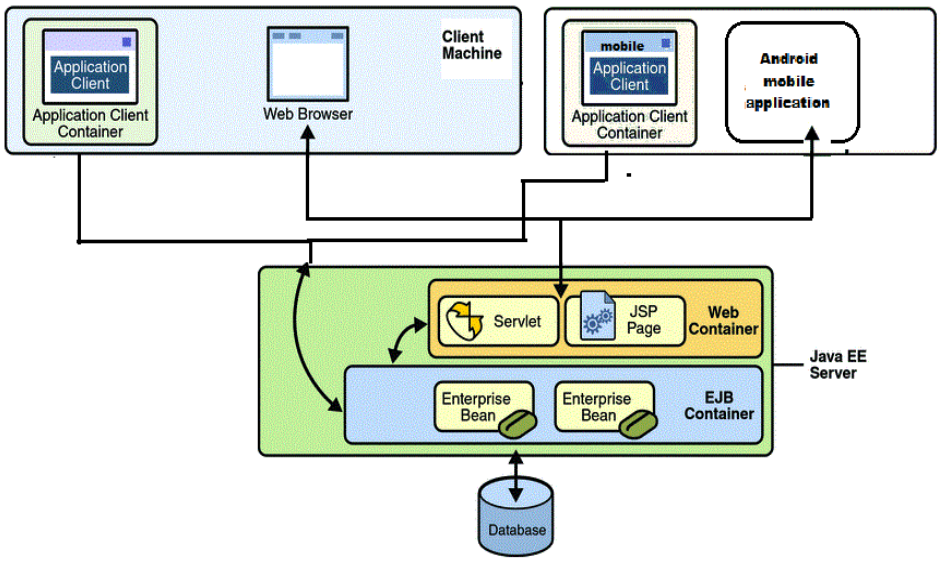
As well as give feedback use case passenger can update feedback on specific bus service or bus station. Then that information relevant for perform write review use case in bus time keeper and bus driver. Bus driver and bus time keeper can reply on feedback that given to them.

Non-functional requirements cover all the remaining requirements which are not covered by the functional requirements. They specify criteria that judge the operation of a system, rather than specific behaviours.

Availability: system will hosted through very reliable web service provider. Web service provider shall provide storage of all databases on redundant computers with automatic switchover, provide for replication of databases to off-site storage locations and provide RAID V disk stripping on all database storage disks.

In Security wise the system shall not leave any cookies on the customer's computer containing the user's password. The system shall not leave any cookies on the customer's computer containing any of the user's confidential information

3.2 System Design



In figure 1, this system will consist of two parts: one mobile application and one web portal. The mobile application mainly used bus time keepers and bus drivers to update schedule information to

database. As well as it has functionality to browse bus schedule for passengers and view related information.
Web application is mainly for passengers to search information about highway buses. As well as it has all the functionalities for bus drivers and bus time keepers to log and view, update the information. There are 3 type of characters involving to the system.

- Highway bus passengers
- Bus Drivers
- Bus time keepers

Highway Express is provide all the functionalities related with highway bus scheduling. Bus time keepers and bus drivers update current situation of leaving and arrived buses information. Highway bus passengers can easily search highway bus schedule, select bus and get more details (for book the seat) as well as passengers can update review of highway bus journey experience and bus driver and time keeper can view it and improve the quality of service.

As show in diagram, JSP web pages call servlet classes by post method. The POST method transfers information via HTTP headers. The information is encoded as described in case of GET method and put into a header called QUERY_STRING. Then servlet call the relevant web page and forward input to the page. Because we cannot sent database result set from servlet. Servlet do is get inputs and forward in to page. When page load page call the controller methods and get data from controller classes. There are controllers for bus route, bus, bus driver, trip etc. controller established database connection with database and get relevant data from database by executing quires. Then when can write java code inside the JSP pages. We can display result set using java code.

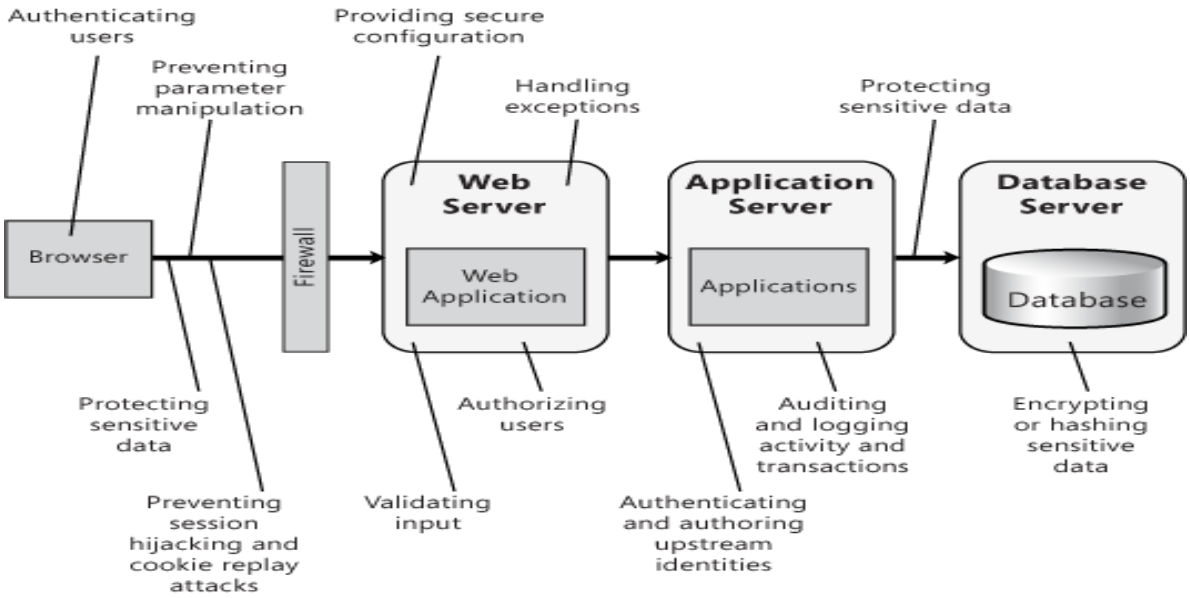
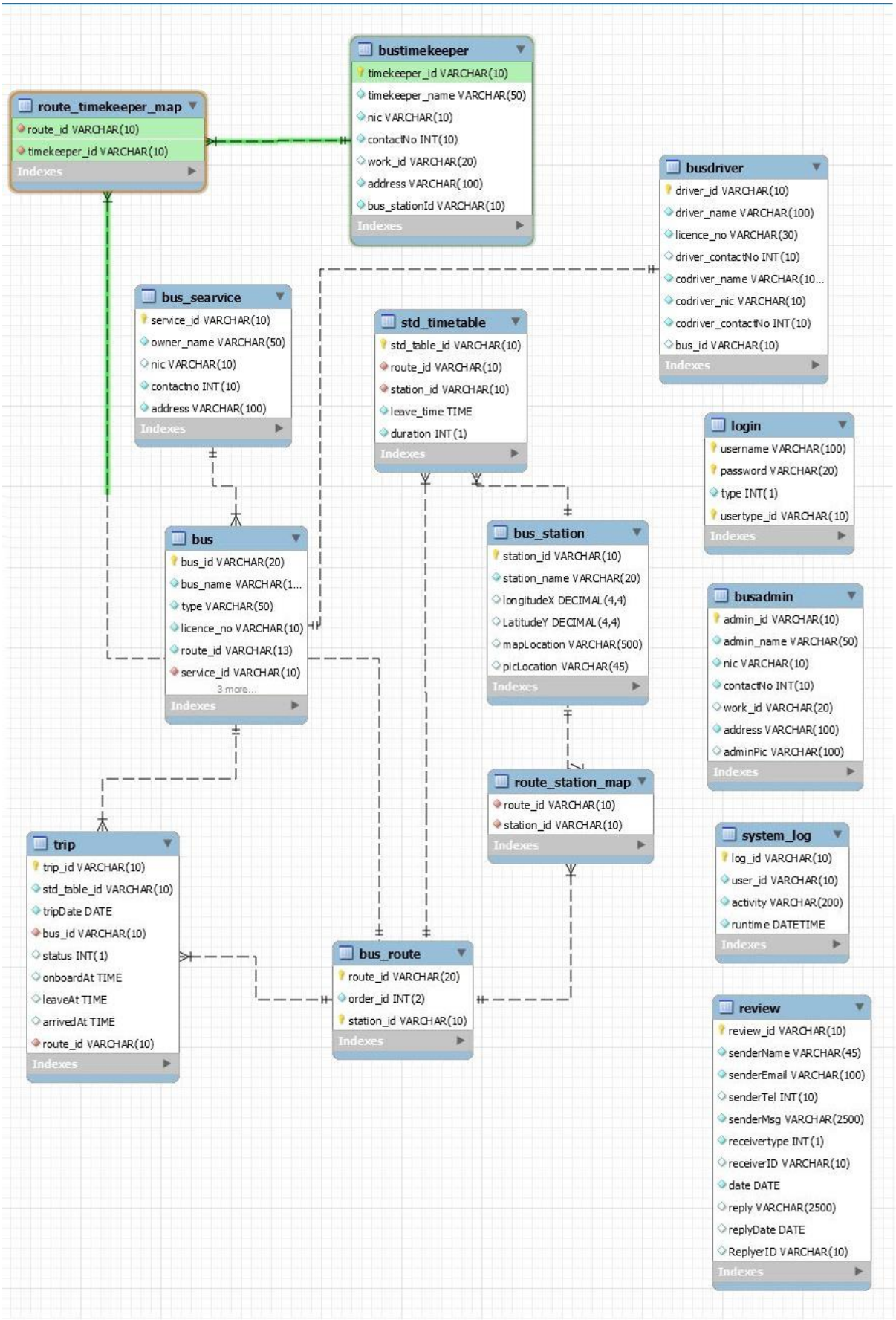


Figure 2

As figure 1 diagram, Highway express bus schedule automation system web application based on JSP and java. When passengers log in to the system, mainly they can search bus schedule, when bus schedule request by giving start point, end point and data input data get by web server and sent it to application server that servlet. Then application server request result from database and sent it back in to the web server and display it.

3.3 Database Design



4 System Implementation

4.1 Implementation Procedure

Highway express bus schedule automation system based on java/ JSP web application. The JSP container is responsible for intercepting requests for JSP pages. This tutorial makes use of Apache which has built-in JSP container to support JSP pages development. A JSP container works with the Web server to provide the runtime environment and other services a JSP needs. It knows how to understand the special elements that are part of JSPs.

Web server creates the web page using JSP as with a normal page, your browser sends an HTTP request to the web server. The web server recognizes that the HTTP request is for a JSP page and forwards it to a JSP engine. This is done by using the URL or JSP page which ends with .jsp instead of .html. The JSP engine loads the JSP page from disk and converts it into a servlet content. This conversion is very simple in which all template text is converted to println ( ) statements and all JSP elements are converted to Java code that implements the corresponding dynamic behaviour of the page. The JSP engine compiles the servlet into an executable class and forwards the original request to a servlet engine.

A part of the web server called the servlet engine loads the Servlet class and executes it. During execution, the servlet produces an output in HTML format, which the servlet engine passes to the web server inside an HTTP response. The web server forwards the HTTP response to your browser in terms of static HTML content. Finally web browser handles the dynamically generated HTML page inside the HTTP response exactly as if it were a static page.

4.2 Materials

In this system I used bus time keeper's current time tables from bus stations, some of the bus drivers, bus time keepers and passengers' information to determine the need for the system and the usability of the system. Additionally those data was used to add the most needed features to the system.

Also used data from national transport commission (NTC) to identify main bus routes. Additionally the system helped to identify number of buses, types of busses plus bus service going on a certain rout per day.

NTC also provided the policies between bus services, drivers, and conductors. This helped to identify the environment system deployed and to identify features and usability of the system.

4.3 Main Interfaces

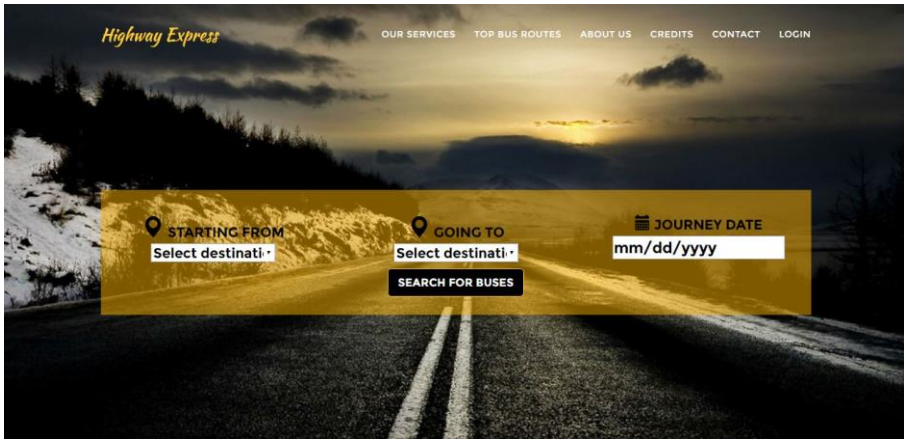


Figure 3 - main web search

As shown in figure 2 main page contain search bus schedule for passengers. As well as menu bar guide the passengers in to top bus routes and about web site details as well as login for the admin, bus driver and bus time keeper.
When passenger select bus route and data result set shown in the figure 3 passenger dashboard.

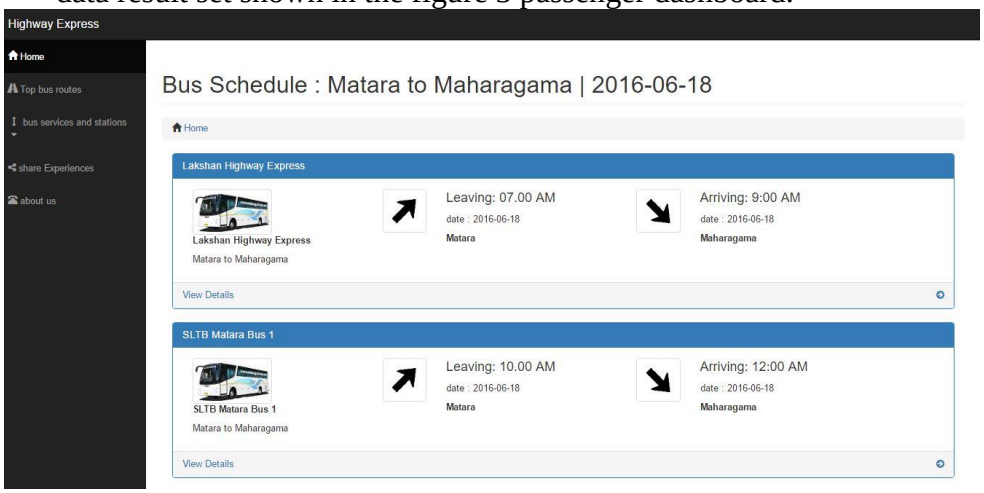


Figure 4- passenger dashboard

As shown in the figure 3 when passenger select bus route it will show trip data relevant to that bus route at data date. All the highway bus schedule shown with bus details. Then passenger can get more details about relavent bus he/she want. In passenger dashboard it allow user to view top bus routes as well as view the bus details and bus station and write a review on that.

Figure 5- top bus routes

As mention in above top bus route interface provide quick access to the standard time table on relevant bus route. It provide standard bus time table in end to end bus stations.

5 System Testing and Analysis

5.1 Testing approach

A test approach is the test strategy implementation of a project, defines how testing would be carried out. Test approach has two techniques:

Proactive - An approach in which the test design process is initiated as early as possible in order to find and fix the defects before the build is created.

Reactive - An approach in which the testing is not started until after design and coding are completed.

5.2 Unit Testing

A select number of methods will be tested in a couple of classes with black and white box testing to ensure that they function correctly. Highway Express Bus schedule automation web application based on front end JSP and back end java. It's there not good way to test JSPs mainly, because they were developed before unit testing became a focus of development.

Most of the time testing Servlets and JSP's via 'Integration Tests' rather than pure Unit Tests. There are a large number of add-ons for JUnit/TestNG available including:

- HttpUnit (the oldest and best known, very low level which can be good or bad depending on your needs)
- HtmlUnit (higher level than HttpUnit, which is better for many projects)
- JWebUnit (sits on top of other testing tools and tries to simplify them - the one I prefer)
- WatiJ and Selenium (use your browser to do the testing, which is more heavyweight but realistic)

5.3 Aspects related to performance, security, failures

System responds to users search for bus services in real time. Also drivers and bus time keepers can update the current situation in real time and they can access information relevant in real time. Therefore efficiency of the system is high.
Since the information accessed by the users are updated by drivers and time keepers in real time the reliability of the system is high.
System have a user session for admins, bus drivers and time keepers to system. It will do a validation of user before logging to the system. Therefore unreliable people cannot update the system.

Practically bus drivers and time keepers might not be able to update system due to various situation such as lack of technical knowledge. This might lead to system errors and less reliability of information. Also it will take a while to make every bus driver and time keeper to start using the system. Hence it might be problematic at first.

6 Conclusion and Future Work

6.1 Conclusion

Highway Express Bus schedule system is web application which provide highway bus time schedule for passengers, bus drivers and bus time keepers in different way. In other word, automate the manual current system that follows in a favourable manner to all kinds of users. Main purpose of the Highway Express is to get highway bus schedule from bus drivers and bus time keepers and provide information to passengers.

Highway express provide information about all the bus routes related with southern express way. Passengers can easily get information about new bus routes and get update on it. As well as passengers can get information on currently available bus at bus station. Then they can reserve seats in the buses.

System update the all the bus departure time, arrive time and count of buses and information related with bus services and provide performance on each bus as well as bus route. System admin can monitor the performance of each bus route and take decision on it.

Another important thing is feedback system. Passengers allow to give feedback on each bus as well as each bus station. Then system can improve quality of the highway bus service.

6.2 Interesting observations, new questions, and future work.

When national holidays, Bank holidays or weekend occur I observed that huge boost in highway bus users from Colombo area to other provinces where highway bus route exist. In such days there was lag between highway bus users and bus services. Due to this passengers face to very uncomfortable situations. Some time they may have to wait more than hour in queue to get on to a bus.

Past data was kept in the highway express system as a log. It would be better if those data could use to forecast such passenger boost situation before hand and try to avoid huge lag between buses and passengers by increasing number of buses in the bus routes and supply passengers with booking beforehand. As well as we can identify bus routes where number of passengers are less and wise versa.

It is less practical for bus drivers and time keepers to log to the system in real time and update information to the system and get information from the system since it is a web application. It would be better if mobile application is developed along with the web application.

As future works I expect to develop mobile application suitable for the highway express where it can be used by bus drivers, bus time keepers and passengers.

7 Reference

National transportation commission: *http://www.ntc.gov.lk/*
Related systems:
http://www.eservices.railway.gov.lk/schedule/homeAction.action?lang=en
https://www.busbooking.lk/