
Software Requirements Specification

By

CLONS5

Prepared by

**Chan Jia Le, Jaryl
Lin Xiang
Ong Wei Xuan Justin
Ng Soon En, Joel
Seah Wei Hong**

Lab Group: SEP2

28/10/2020

Table of Contents

Introduction	1
Purpose	1
Document Conventions	1
Intended Audience and Reading Suggestions	1
Product Scope	2
Overall Description	3
Product Perspective	3
Product Functions	3
User Classes and Characteristics	3
Operating Environment	4
Design and Implementation Constraints	4
Assumptions and Dependencies	4
External Interface Requirements	5
User Interfaces	5
Main map interface	5
Map interface Layers	6
Carpark map layer	7
Traffic images layer	8
Traffic Alerts layer	9
ERP Gantry layer	11
Software Interfaces	12
Communications Interfaces	12
System Features	13
Car Park Information	13
Description and Priority	13
Stimulus/Response Sequences	13
Functional Requirements (REQ)	13
ERP Gantries Information	14
Description and Priority	14
Stimulus/Response Sequences	14
Functional Requirements (REQ)	14
View Images of Traffic Conditions	14
Description and Priority	14
Stimulus/Response Sequences	14
Functional Requirements (REQ)	14

Alert of Road Incidents	15
Description and Priority	15
Stimulus/Response Sequences	15
Functional Requirements (REQ)	15
Use Last Available Data	15
Description and Priority	15
Stimulus/Response Sequences	15
Functional Requirements (REQ)	15
Other Nonfunctional Requirements	16
Safety Requirements	16
Software Quality Attributes	16

Revision History

Name	Date	Reason For Changes	Version
All Members	28/10/20	Initial Documentation	1.0
All Members	01/11/20	Updated additional section 2 and 3	1.1
All Members	03/11/20	Finalise section 4	1.2
All Members	12/11/20	Completed all documentation	1.3

1. Introduction

1.1 Purpose

The purpose of the software requirement specification (SRS) is to provide in-depth information on the website CarHub. The SRS will provide descriptions on the features of the website, the functional and nonfunctional requirements will include the operating environment, design and implementation constraints. In addition, it will also include details of both front and back end.

1.2 Document Conventions

For Header sections, the first header will be in font size 18, and in font style of Times New Roman.

Font size of subsequent header sections will decrease by 2 respectively.

The body paragraph of the sections will be written in font size 12, and in font style of Time News Roman.

Figures or diagrams used in the documentation of SRS will be in italics and bolded.

1.3 Intended Audience and Reading Suggestions

This Software Requirement document is intended for developers, project managers and testers.

Developers can review and provide feedback on website functions, and understand which sections of the website can be improved on to implement additional details and capabilities.

Project managers would be able to plan, organize and direct the progress of our website according to the functions. They would also be able to determine our deadline for each phase of development and allocate budget based on the scope of our website.

Testers will be equipped with knowledge of the specific targeted functions that our website plans to deliver. This is to provide them with information to give productive reviews on how well our website meets the requirements, allowing them to provide feedback on how to improve our website.

1.4 Product Scope

The objective of CarHub is to allow drivers to navigate smoothly without the hassle of checking car park, ERP and traffic information separately on other platforms.

By providing their location to the application, drivers can instantly access road information around them while driving. This provides convenience to the drivers and is an efficient way for them to view road information while they are driving.

In addition, another goal is to improve safe driving as the user does not need to manually search for road information while driving, which would be dangerous at times.

The corporate goals are to integrate map navigation to provide directions for users, as well as to expand our application to other countries in future.

2. Overall Description

2.1 Product Perspective

Our product is self-contained. It would require access to government APIs such as LTA Datamall to retrieve real-time data including car park availability and traffic conditions. We incorporated this data into our website to implement the various features as stated in the functional requirements section in this Software Requirement document.

2.2 Product Functions

The Carpark Availability functionality displays the location of nearby car parks and the number of available lots.

ERP function displays all ERP gantries, along with their corresponding rates and whether they are active.

Traffic Images function displays real-time traffic images along various expressways and checkpoints.

The Alert function displays a notification to inform drivers that a road incident has occurred at a particular road, junction or expressway.

2.3 User Classes and Characteristics

We have classified our user into 3 classes:

1. Driver/Motorist: Road information is required before/while driving
2. Rail-hailing drivers: Need ERP information to let passengers know about the extra charge
3. Non-driver: To provide road information to the driver

Our application can be used by any user with or without a driving licence as the main purpose is to access road information for the driver. Even a user without a driving licence or a passenger is able to use our application just by providing the information to the driver as needed. Our application is more essential for user classes 1 and 2 as it provides convenience to the driver and more importantly, ensures a safe driving environment. User class 3, although not as high a priority as user classes 1 and 2, will still be able to use our application to provide assistance to the driver.

2.4 Operating Environment

CarHub was developed and tested on the following platforms:

- Google Chrome Version 86

2.5 Design and Implementation Constraints

CarHub relies on external APIs for information. As such, the accuracy and availability of CarHub depends on the external services.

2.6 Assumptions and Dependencies

Assumptions:

Users must know how to use a modern device, navigate and understand English which is the language medium for the application. Users must also be responsible for their own safety when using our application to navigate to their desired destination. In addition, users must have a stable internet connection as well and the information from our API must be accurate for optimal road information.

Dependencies:

CarHub requires OpenStreetMap and government APIs for providing the necessary information to users. For a better utilization of our application, it also requires the user's location to display nearby road information. Lastly, a stable internet connection is required for the website.

3. External Interface Requirements

3.1 User Interfaces

Our User interface is built around 3 key principles.

1. It must be clear in visual appearance, concept and wording.
2. Visual elements must be understandable and related to real world concepts and function.
3. Interface words and text should be simple, unambiguous and free of computer jargon. Any possible unclear terms will be explained in Appendix A (Glossary).

3.2 Main Map Interface

The picture below would be the main map interface where the user will be navigating on.



Figure 3.2: Main Map Interface

3.2.1 Map Interface Layers

Figure 3.2.1 below represents the controls for the user to interact with the map.

The '+' and '-' icon allows the user to zoom in and zoom out respectively.

The first icon (car logo) refers to the carpark layer. When users click on the car logo, car parks will be displayed on the map interface.

The second icon (camera logo) refers to the traffic image layer. When users click on the camera logo, traffic image camera icons will appear on the map interface.

The third icon (exclamation mark logo) refers to the traffic alert layer. When users click on the exclamation mark logo, traffic alert icons will appear on the map interface.

The last icon (gate logo) refers to the ERP gantry layer. When users click on the gate logo, ERP gantry icons will appear on the map interface.



Figure 3.2.1: Map interface Layers

3.2.2 Carpark Map Layer

The carpark layer will display the available carparks on the map interface.

If the user is zoomed out, carparks that are close to each other will be clustered into a circle with numbers indicating the total number of available carpark lots in it. This is shown in **Figure 3.2.2a**. This limits the number of car park icons displayed at any time, reducing screen clutter.

When the user continues to zoom in, the clusters of car parks will separate into individual car park icons as indicated in **Figure 3.2.2b**. The individual car park icons will show the name of the car park which refers to the location where the car park is at. In addition, the available car park lots for that specific car park will be displayed too.



Figure 3.2.2a



Figure 3.2.2b

3.2.3 Traffic Images Layer

The traffic images layer will display images of major roads on the map interface. Every traffic image icon represents an image of the specific road. When the user clicks on a specific traffic image icon, the traffic image will pop out to show the current traffic flow.

This is shown in **Figure 3.2.3a** and **Figure 3.2.3b**



Figure 3.2.3a

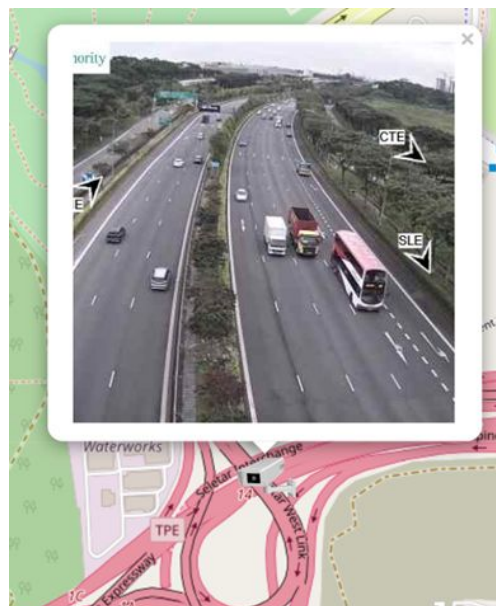


Figure 3.2.3b

3.2.4 Traffic Alerts Layer

The traffic alert layer will display various traffic incidents on the map interface. Traffic incidents and accidents are represented by the yellow exclamation mark in a circle with a red background icon. Meanwhile, roadworks are represented by the tool icon.

Whenever there is any new traffic alert, a text box and a sound cue will pop out at the top right corner of the map interface. The text box will contain the type of traffic incident with a brief description of what happened and where the traffic incident is at. When the user clicks on the traffic alert pop out box, the map interface will guide the user to the location where the traffic alert is at.

The traffic alert icon will disappear only when the traffic incident or roadwork is resolved. The latest alerts will be retrieved every minute.

This is shown in *Figure 3.2.4a* and *Figure 3.2.4b*

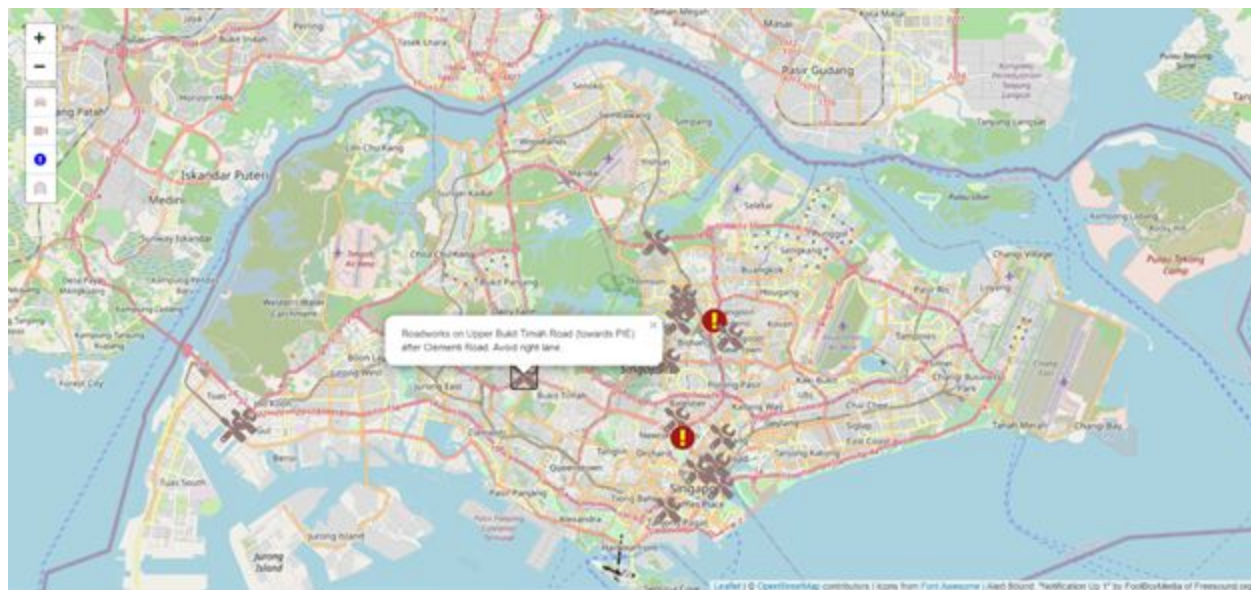


Figure 3.2.4a

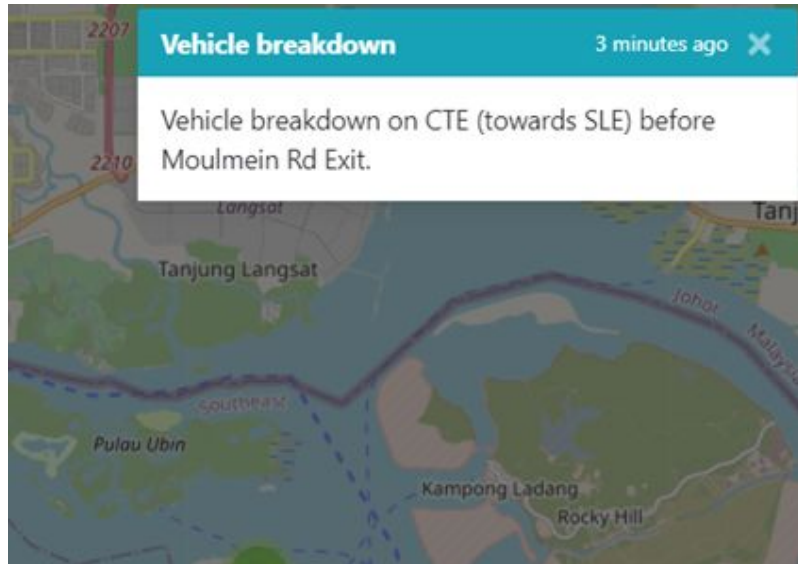


Figure 3.2.4b

3.2.5 ERP Gantry Layer

The ERP Gantry layer will display all of the ERP Gantries on the map interface.

If a ERP Gantry is not active, its icon will be faded. Once an ERP is active, its icon will change to blue and display the specific ERP Gantry charge.

This is shown in **Figure 3.2.5a** and **Figure 3.2.5b**

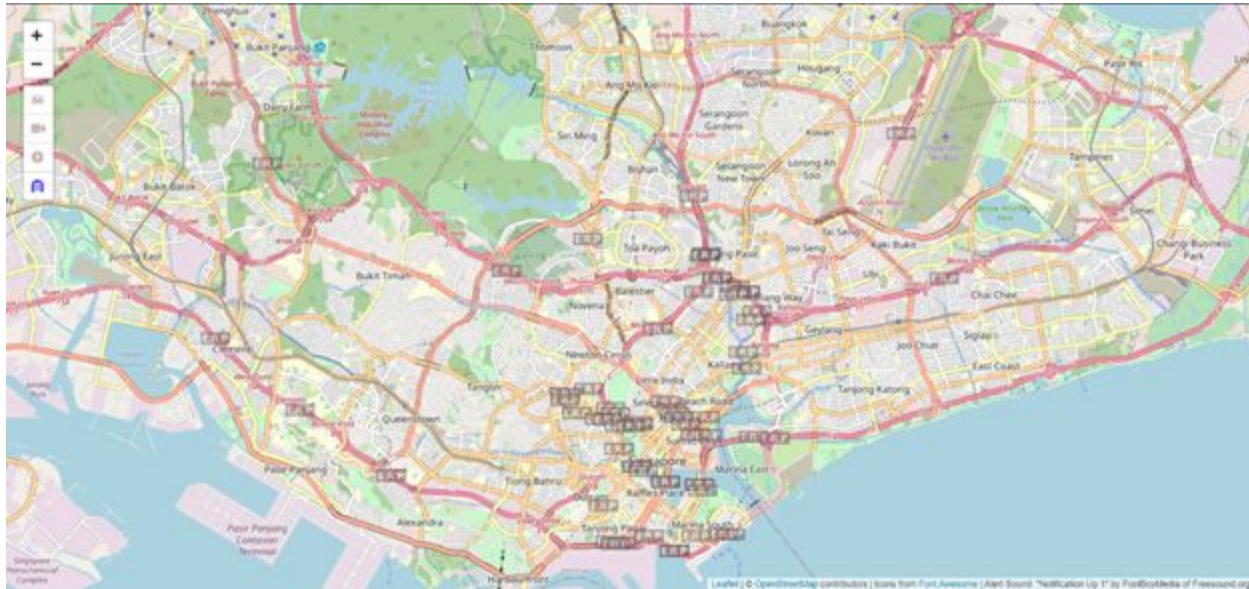


Figure 3.2.5a



Figure 3.2.5b

3.3 Software Interfaces

The following APIs are used by the application:

1. Data.gov.sg: To retrieve available car park lots.
2. DataMall: To retrieve available car park lots, ERP gantries, Traffic Incidents and Images.
3. OpenStreetSpace: To retrieve the map tiles.

3.4 Communications Interfaces

Retrieval of information from the external APIs will be done over HTTP. Some of the APIs require an access token, which the application will be pre-configured with.

The LTA DataMall API is only available over HTTP which could lead to interception or modification of data to/from the API by a malicious third party. However, this is outside of our control.

4. System Features

Our website consists of four system use cases that provide the basic functional requirements. In this section, the various functional requirements will be explained in depth where each use case will have their description and priority together with preconditions and postconditions.

4.1 Car Park Information

4.1.1 Description and Priority

Allow users to view the number of available parking lots in a radius of 5 kilometers around their location.

Priority: High.

4.1.2 Stimulus/Response Sequences

User action: Allows sharing of location using user's geographical location

System response:

1. Retrieves user location
2. Load latest information from LTA datamall and Data.gov.sg
3. Filters information for car parks in a 5km radius around the User's location
4. Display availability of car parks on the map

User action: Interact with the map by clicking on the colored bubble icon

System response: System will zoom into the map displaying information with more details

4.1.3 Functional Requirements (REQ)

REQ-1 : The website must display information about car parks in a 5km radius around user

REQ-2 : The website must display the number of available lots in base 10

4.2 ERP Gantries Information

4.2.1 Description and Priority

The website allows the user to view information about the ERP gantries, consisting of the toll rates and operating hours.

Priority: High.

4.2.2 Stimulus/Response Sequences

User Action:

View ERP gantries selected by the user.

System Response:

Display corresponding to all ERP gantries information on the map interface.

4.2.3 Functional Requirements (REQ)

REQ-1 : The website must display all the ERP gantries.

REQ-2 : The website must display the ERP rates in Singapore Dollars (SGD) .

REQ-3 : The website must display the operating time of the ERP gantries.

4.3 View Images of Traffic Conditions

4.3.1 Description and Priority

The website will display road traffic conditions using traffic images provided by real-time sources using a live traffic camera.

Priority: High.

4.3.2 Stimulus/Response Sequences

User Action: User clicks on a traffic icon on the map interface

System response:

Website will retrieve traffic images from the data source.

Website will display traffic images in a pop up box.

4.3.3 Functional Requirements (REQ)

REQ-1 : The website must be able to display the traffic conditions of the specific road within 15 seconds

4.4 Alert of Road Incidents

4.4.1 Description and Priority

Users will be informed of new incidents on the road.

Priority: High

4.4.2 Stimulus/Response Sequences

System response:

1. Website will retrieve traffic alerts from the API source, LTA DataMall.
2. Website will display traffic alerts in a pop up box.

4.4.3 Functional Requirements (REQ)

REQ-1 : The website must highlight road incidents on the map

REQ-2: The website must be able to display new traffic incidents in a pop up box with an audible notification.

4.5 Use Last Available Data

4.5.1 Description and Priority

Most recent available data will be returned to the user

4.5.2 Stimulus/Response Sequences

System response:

1. System cache data retrieved from the APIs.
2. If the data happens to be not available, the system will show the last available data to the user.

4.5.3 Functional Requirements (REQ)

REQ-1: The website must be able to display most recent available information in an event when the data happens to be not available.

5. Other Nonfunctional Requirements

5.1 Safety Requirements

Users should refrain from using the website too frequently while driving on the road.

- When the user first enters the website, the website will show a message pop up reminding users not to use the website when they are currently driving.

5.2 Software Quality Attributes

- **Maintainability**

- Usage of comments to assist in debugging and to allow developers to know which aspects of the website can be amended or improved.
- The usage of Single Responsibility Principle makes it such that our classes cohesive. Therefore, whenever we need to implement additional functions, there will be no ripple effect.

- **Portability**

- The web application is supported on mobile devices, though the use of a web browser.
- Users can access the application from any location they are at.

- **Reliability**

- Data should always be available to the users
- In the event that data is unavailable, the web application will use the most recent cache data.

- **Security Requirements: Privacy**

- User locations will not be stored in our system to respect our users' privacy.

- **Usability**

- The system must be accessible on both desktop and mobile devices.
- This is to provide flexibility for the user as they can use either one of the platforms.

Appendix A: Glossary

<u>Term</u>	<u>Description</u>	<u>Entity Class</u>
<i>User Location</i>	Current geographical position of the user relative to the map. May change dynamically as the user moves around.	-
<i>Car park</i>	A designated location for drivers to park their vehicles. Payment for parking of the vehicles depends on how long the vehicle is parked for.	Carpark
<i>Expressway</i>	A major stretch of road in which there are no traffic lights and more lanes than usual. The speed limits on expressways are also higher than on regular roads.	-
<i>ERP Gantries</i>	Short for Electronic Road Pricing. ERP gantries are overhead gates on expressways under which vehicles pass through. Upon passing through the ERP gantry, credit is deducted from the vehicle's Cash Card.	ERPGantry
<i>Rates</i>	Used for ERP gantries, rates define the amount of money or credit the user needs to pay in order to use the car park or pass through the ERP gantry. Rates for car parks are listed for use per hour, and rates for ERP gantries are rated for each time the vehicle passes under it.	-

<i>Traffic Condition</i>	Current state of the roads in Singapore. Examples of changes to traffic conditions include road accidents, traffic congestion, breakdowns, and road closures.	-
<i>Road incident</i>	An event that may cause congestion on the roads for a period of time. Includes accidents, breakdowns, or unscheduled road works.	TrafficAlert
<i>Images of Traffic conditions</i>	A photo that displays the condition of the road. It shows the user whether the road is congested or clear. It may also display accidents or vehicle breakdowns on the road.	TrafficImage
<i>Woodlands and Tuas Checkpoints</i>	Immigration checkpoints in Singapore with immigration officers that control the flow of vehicles travelling into Singapore or vehicles travelling out of Singapore. They are major areas for drivers who are looking to travel out of Singapore.	-
<i>LTA DataMall</i>	Platform operated by the Land Transport Authority where data is published.	-
<i>Data.gov.sg</i>	Platform operated by GovTech where data is published.	-