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Software Requirements Specification

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Changelog

Name	Date	Changes Performed	Version
Raúl Viruet	12/8/18	Began Elaboration of SRS part 3.3	1.0
Manuel Seda	12/11/18	Started sections 2.3, 2.4, 2.5 Started a unified document in Latex	1.1
Raúl Viruet	12/12/18	Elaboration of Database Mockup. Add ER Diagram to databse requirements. Add datatypes utilized in several database components. Current work moved from MS Word to LaTeX. (Part 3.4)	1.2
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Raúl Viruet	12/20/18	Added Cover Page	1.23
Manuel Seda	1/2/19	Added Version Number to Cover Page Spruced up some tables	1.25

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1 Introduction

1.1 Purpose

The purpose of this document is to provide a detailed description of the specifications and requirements of the system to be designed. In it, the characteristics, functions, and interfaces of the system are described. In addition, the user's restrictions on the system are indicated. The Software Requirements Specifications (SRS) document follows the standards of the Institute of Electrical and Electronics Engineers (IEEE). The audience of the document are the clients and / or administrators of the Maritime Transport Authority (MTA), and the developers of the Lambda Solutions Group (LSG).

1.2 Scope

The name proposed for the system is Tickets VC Islands and it will be an improvement to the sale of tickets for trips to the islands-municipality of Vieques and Culebra. The intention of the system is to organize and expedite the sale of tickets to passengers (residents and visitors).

The proposed system may:

- Provide users with a simple and quick method of buying their travel tickets.
- Provide a database, that is a collection of information, in which each of the residents who use maritime transport are registered.

The proposed system will not be able to:

- Apply any type of discount to any passenger.
- Make any type of refund.

The benefits that the system will provide are short and long term, and the beneficiaries will be the passengers and MTA administrators.

Benefits for passengers:

- Speed – The time of purchase of a ticket must be one minute per passenger.
- Convenience – The passenger can buy the ticket at any time before the time of travel.

Benefit for administrators:

- Cost Effectiveness – Thirty-five percent of reduction in cost because the updated system will require less functional employees. These savings will become evident after the fifth year of running.
- Reliability – Probability that this system works or develops a certain function, under fixed conditions and during a certain period.
- Time Efficiency – More tickets sold in less time.

The objective is to implement the system proposed by LSG in each of the terminals of the MTA.

The goal is to provide a new ticketing system that will be quick and easy to use for the convenience of passengers, especially for island-municipality residents.

System Specifications:

- Hardware:
  - Touch Screen Device
  - Printer
  - Camera equipped Device
- Software:
  - Database System
  - Web Page
  - QR Code Generator

1.3 Definitions, Acronyms and Abbreviations

In the following tables, definitions, acronyms, and abbreviations of important terms mentioned in the document will be provided.

1.4 Definitions, Acronyms and Abbreviations

In this section definitions, acronyms, and abbreviations of important terms mentioned in the document will be provided. In Table 1.1 the definitions will be found, in Table 1.2 the acronyms, and in Table 1.3 the abbreviations.

Term	Defintions
completed transaction	A completed transaction is considered a transaction that underwent all necessary verification and integrity constraints. Furthermore data on the database must be successfully updated.
database	a collection of information that is organized so it can be easily accessed, managed and updated [1]
ectcetera	a number of other things or persons unspecified [2]
hardware	the physical aspect of computers, telecommunications, and other devices [3]
hash	a function that converts one value to another [4]
HTML	the standard markup language for creating Web pages [5]
IEEE	he world's largest technical professional organization dedicated to advancing technology for the benefit of humanity [6]
interface	a device or program enabling a user to communicate with a computer [7]
LSG	the name of the company that is proposing this system
MTA	a government-owned corporation of Puerto Rico charged with providing maritime transportation services for cargo and passengers within Puerto Rico and the island-municipalities of Vieques and Culebra [8]
QR code	a type of 2D bar code that is used to provide easy access to information through a smartphone [9]
query	a database query can be either a select query or an action query. A select query is a data retrieval query, while an action query asks for additional operations on the data, such as insertion, updating or deletion [10]
server	a computer that provides data to other computers [11]

software	a general term for the various kinds of programs used to operate computers and related devices [12]
TVCI	the name of the system proposed by LSG
URL	the address of a resource on the Internet; it indicates the location of a resource as well as the protocol used to access it [13]
Web page	a set of data or information which is designed to be viewed as part of a website [14]

Table 1.1: Terms & Definitions

Term	Acronym
HTML	Hyper Text Markup Language
IEEE	Institute of Electrical and Electronics Engineers
LSG	Lambda Solutions Group
MTA	Maritime Transport Authority
QR code	Quick Response code
SRS	Software Requirements Specifications [15]
TBA	To Be Announced
TBD	To Be Decided
TVCI	Tickets VC Islands
URL	Uniform Resource Locator

Table 1.2: Terms & Acronyms

Term	Abbreviation
etcetera	etc.

Table 1.3: Terms & Abbreviations

1.5 References

The following references use the IEEE citation format.

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[10] Margaret Rouse, "Definition Query." https://searchsqlserver.techtarget.com/definition/query. Online, Acessed: 2018-12-15.

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[13] techopedia, "Uniform Resource Locator (URL)." https://www.techopedia.com/definition/1352/uniform-resource-locator-url. Online, Acessed: 2018-12-15.

[14] Collins English Dictionary, "Definition of 'web page'." https://www.collinsdictionary.com/dictionary/english/web-page. Online, Acessed: 2018-12-15.

[15] Inflectra, "What are System Requirements Specifications/Software (SRS)?." https://www.inflectra.com/ideas/topic/requirements-definition.aspx. Online, Acessed: 2018-12-15.

1.6 Overview

he following sections of this document, contain the specific requirements that need to be addressed in order to develop and operate this system successfully.
Chapter 2 of this document is dedicated to proportioning an **Overall Description** of the system. It includes a description of the types of interfaces the system will interact with, description of the functional aspects of this system, types of user this system supports, constraints when developing this system and a list of assumptions that should be met.

Chapter 3 focuses on the specific requirements of the system such as interfaces this system possess, data validation mechanisms and a description on how said data should be entered in the system. Chapter 3 also details how data is stored and accessed to/from a database, which is required to operate the system. A list of both hardware and software requirements will be documented on Chapter 3, as well as certain attributes this system will achieve.

Chapter 4 is an appendix for all other materials not covered in the previous chapters. It may include graphics, tables or other relevant material.

2 Overall Description

2.1 Product Perspective

Here it is shown that the proposed system has benefits compared to the systems that are currently implemented:

Pros	**Cons**
Completely cloud based	Dependent on as table internet connection
Prioritizes residents for secure travel	Vulnerable to crashes
Complete web-based system for more secure purchases	
Accurate schedule with precise times	
Tickets purchasable online	

Table 2.1: Tickets VC Islands Pros & Cons

Pros	**Cons**
Offline system which is not in danger of server crashes	Inaccurate schedule
	First come first serve ticket system
	Must arrive to station to purchase tickets
	Poor customer service

Table 2.2: Current Ticketing System

Pros	**Cons**
Electronic system, similar to our concept	Prone to outages
Specialized Ticketing Hardware	First come first serve ticket system
	Most machines are damaged
	More than 10 years old

Table 2.3: *Tren Urbano* Ticketing System

2.1.1 System Interfaces

The system is designed with user friendliness as the main priority. To maximize the ease of use for the user, it will contain one easy log in screen followed by a screen that will allow the user to buy a ticket for the trip he/she wants.

2.1.2 User Interfaces

The software will consist of a log in screen to provide user credentials. Once logged-in, the user may browse the current schedule with the seat availability. The user will be able to reserve a seat by purchasing a ticket.

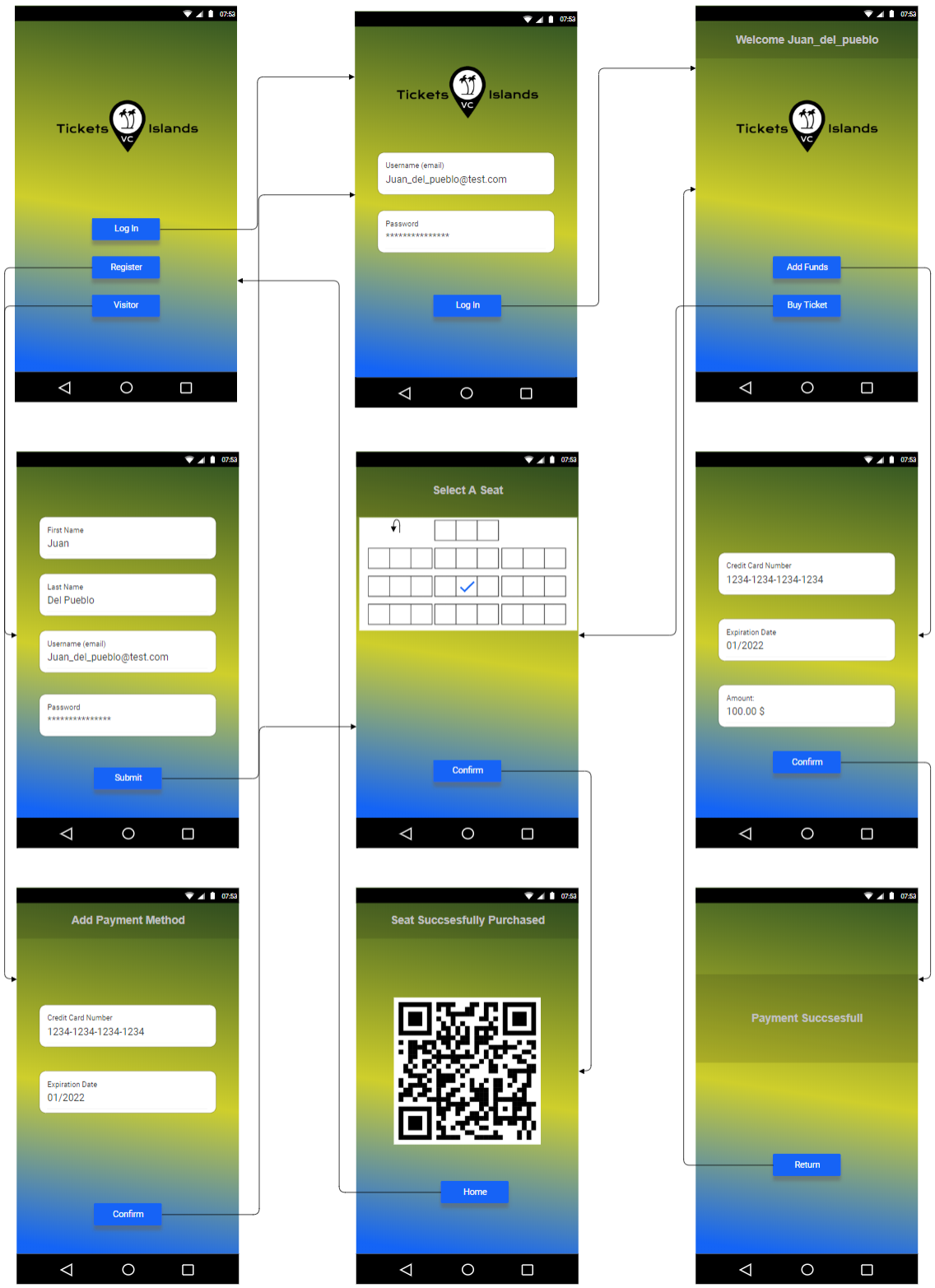

Figure 2.1: GUI

2.1.3 Hardware Interfaces

The users of the Ticket VC Islands service will be able to connect to the interfaces of the product using their personal computers and or the touch screen available at the stations, the mouse and keyboard form the users personal computer will be utilized to browse and interact with the system while in the station there will be a touchscreen to do the same, there will be a camera to scan the QR codes and the printer to print the tickets to board.

2.1.4 Software Interfaces

The software tools that will interact with the system are the following:

Software	Description
MySQL	Database Management software that is utilized to update and maintain the database which holds the information of the residents which created accounts on the system.
Web Browser	An internet browser which will be utilized to reach and use the web-based system.
Email	Emails will be used to create and access the residents accounts as their usernames.

Table 2.4: Software interfaces

2.1.5 Communication Interfaces

This system will be linked in a wireless network interface for access in multiple locations. it will also be linked to a cloud system to access the database. The system will communicate with the email to determine the owner of the account if the primary actor is a resident.

2.1.6 Memory Constraints

The website will be beginning with a light amount of 16gb of primary with 64 for secondary memory. This two will checked twice a month to verify if more than what's given is needed.

Item	Main Memory	Secondary Memory
Browser	16GB	64GB

2.1.7 Operations

There are 4 types of users that will be interfacing with the system, and they are the following:

- **Tourist:** has only the benefit of buying tickets directly from the server.
- **Resident:** Has the benefit of having a personal account with the username and password, will also have the benefit of having a secondary payment method which is an account inside the user where they can deposit funds
- **MTA Clerk:** Has complete control over the system which includes controlling the percentage of separated seats for residents, price of tickets, schedule seating and account balances.
- **MTA Usher:** Validates the tickets.

2.1.8 Site Adaptation Requirements

The site will work on any operating system which was updated form the 2013 onwards, which includes:

- Windows 7, 8, 8.1, 10
- android 4.4.4 and newer

- Mac OS X 10.9 and newer
- iOS 6 and newer And on any respective browser which supports the latest css and a minimum of HTML5

2.2 Product Functions

This section will show the use case diagrams:

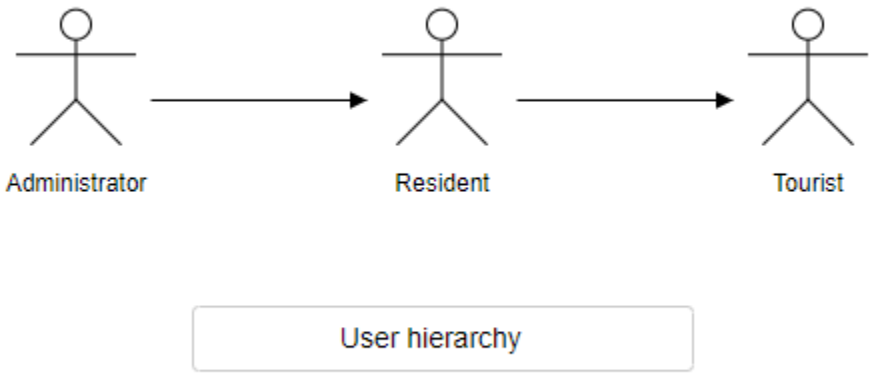

Figure 2.2: Use-case Diagram 1

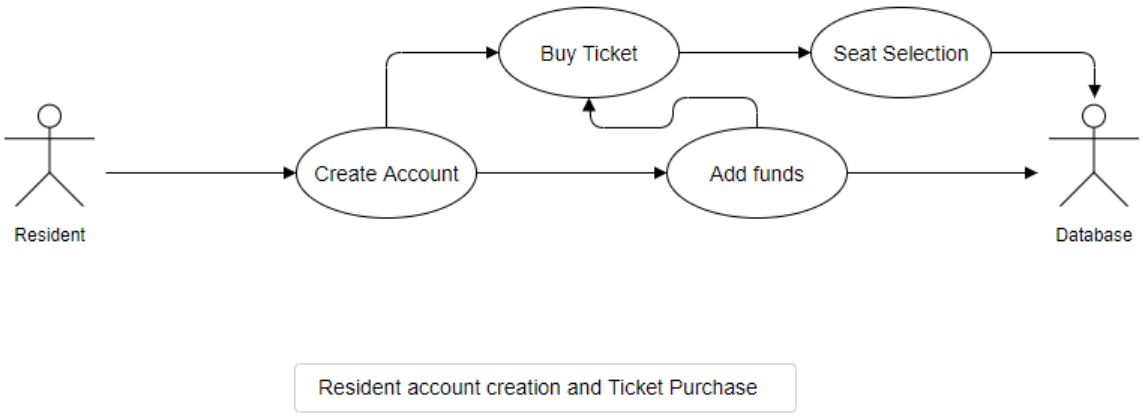

Figure 2.3: Use-case Diagram 2

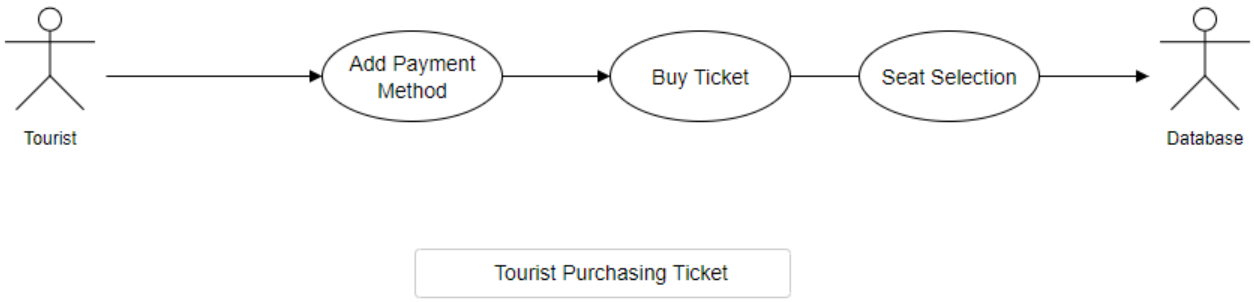

Figure 2.4: Use-case Diagram 3

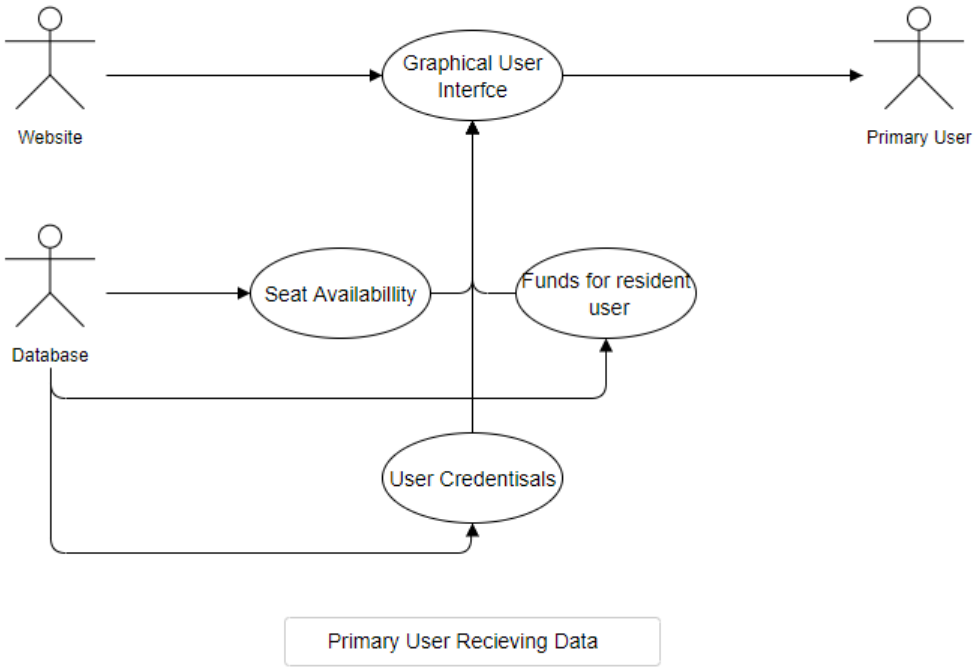

Figure 2.5: Use-case Diagram 4

2.3 User Characteristics

Three types of users will utilize the product. These users will use different sections of the system that will help fulfill the roles we have defined for them. All users must know to read and write.

- **Boat Passengers** - the main users of this product. Because these passengers can be of any age, profession, age, social status, academic preparation, etc; the only requirement needed is that the user

is able to read and that they have a basic familiarity with computer systems. They also must be able to follow basic instructions to complete the necessary steps to create a user account, purchase a ticket and confirm the purchase. These passengers will be divided into two categories to determine their priority: normal passengers and passengers who are residents of Vieques or Culebra.

- **MTA Ushers** - these ushers will use devices capable of reading QR codes to confirm a ticket's validity. The minimum educational preparation expected is the minimum one for service employees: a high school education. They must have basic experience with computerized devices to be able to use an application to scan QR codes.
- **MTA Clerks** - they will have a private section in the system so they can assign resident status to a user's account. The minimum expected preparation is once again high school. They must validate the passenger's status as a resident by checking the relevant documentation produced by the passenger.

2.4 Constraints

The project's design revolves around the following constraints:

- **Regulatory Policies** - the project as a whole must comply with local, state and federal regulatory policies
- **Hardware Limitations** - the project's scope will be limited by whichever hardware platform is chosen by the client
- **Interfaces to Other Applications** - this project's software will depend on many other applications such as MySQL, libsodium, etc.
- **Reliability Requirements** - because the project provides a service that will be used by the client's customers, the software solution provided must be of the utmost reliability
- **Criticality of the Operation** - the system is the linchpin of the operation, thus it is mission critical and must be stable, reliable and efficient
- **Security & Safety Considerations** - the system will process sensitive information, such as payment methods, and the user's personal data; this data cannot be compromised under any circumstances

2.5 Assumptions and Dependencies

The following assumptions and dependencies shaped the way the project was conceived. Any major change will cause a redesign of the system.

- **wireless internet connection** - the system is based on a web page. Because of this, an internet connection is needed for the system to work. A wireless internet connection is the simplest way to connect most electronics under consideration.
- **power source** - although many hardware platforms run on batteries, they still run out of power. Therefore, the system depends on a steady power source to ensure continuous operation.
- **connection to a remote server** - the system depends on a database to be able to perform its operations. This database will be housed on a remote server and we must be able to connect with it.
- **internet browser** - to avoid being constrained by a single hardware platform or operating system, we based our system on a web page. To ensure a smooth user experience, we need that the chosen platform has a relatively recent internet browse.
- **html5** - we will use the tools and standards provided by html5.

- **hashing library** - because of constraints, we are unable to build our own secure hashing algorithm. Therefore we will use a reputable hashing library such as libsodium.
- **employees available to validate tickets** - out current vision of the systems assumes manual intervention from MTA employees to validate the tickets for a particular trip.
- **eployees available to validate a resident passenger's status** - out current vision of the systems assumes manual intervention from MTA employees to validate a passenger's claim that he/she lives in Vieques or Culebra.
- **camera equipped computing devices** - our design assumes that employees will use smart-phone cameras (or a similar device) to scan a ticket's validity QR code.
- **printer** - our system requires a printer so the tickets purchased by the user can be printed

2.6 Apportioning of Requirements

Some future additions for the system can be:

- A greater variety of payment methods
- Automatic ticket verification turnstiles
- Reusable Ticket Cards

3 Specific Requirements

This section contains a more detailed description of all the software requirements that would enable designers and testers to appropriately apply the ideas stated here. This includes descriptions of inputs and outputs to and from the system, as well as the functions the system performs in reaction to these.

3.1 External Interfaces

This section delves into the inputs and outputs of software systems, whether as a visitor, resident or system administrator.

Name of item	Sign in Administrator
Description of Purpose	It allows the authorized employee to create an administrator account in order to register the residents in the database.
Source of Input or Destination of output	The administrator must provide the following information: name, initial of the middle name, surname, email, password and date of birth, and the employee ID number, these data will be entered in a space already provided.
Valid range, accuracy, and/or tolerance	First name: cannot exceed 10 characters. Initial: cannot exceed 1 character. Last name: cannot exceed 20 characters. Email: cannot exceed 30 characters. Password: cannot be less than 8 characters or more than 20 Employee ID: cannot exceed 10 characters. Date of birth: cannot exceed 8 characters.
Timing	Communicating with the database and setting up the account should not be more than 10 seconds 90% of the time.
Data Format	Text must be alphanumeric values.
Command Format	The start interface will only respond once all the text fields have been completed. After this, all you have to do is press the register button to complete the registration process.
Final Message	A window will appear with the message "Your account has been created successfully".

Table 3.1: Sign-in Administrator Interface

Name of Item	Log-in Administrator
Description of Purpose	Allows the administrator to access the system database.
Source of Input or Destination of output	The administrator enters data for email and password in two text fields
Valid range, accuracy, and/or tolerance	Email: cannot exceed 30 characters. Password: cannot be less than 8 characters or more than 25
Timing	Communicating with the database and setting up the account should not be more than 10 seconds 98% of the time.
Relationship to other inputs/outputs	This interface depends on the administrator having created an account with the appropriate email and password in the registration interface.
Data Format	Text must be alphanumeric values.
Command Format	The login interface will only respond once the two text fields are completed. After this, the administrator must press the Log On button.
End Messages	Log in: A text box with the message "Welcome" appears and a menu to confirm the command.

Table 3.2: Log-in Administrator Interface

Name of item	Sign in as resident
Description of Purpose	It allows the resident to create an account in order to recharge his card in the system and benefit from preferential treatment.
Source of Input or Destination of output	The residents of the municipality provide the administrator with the following information: name, initial of the middle name, surname, email, password and date of birth, these will be entered into a space already provided.
Valid range, accuracy, and/or tolerance	First name: cannot exceed 10 characters. Initial: cannot exceed 1 character. Last name: cannot exceed 20 characters. Email: cannot exceed 30 characters. Password: cannot be less than 8 characters or more than 20 Date of birth: cannot exceed 8 characters.
Timing	Communicating with the database and setting up the account should not be more than 10 seconds 90% of the time.
Data Format	Text must be alphanumeric values.
Command Format	The sing in interface will only respond once all the text fields have been completed. After this, the administrator can press the register key so that the resident is registered.
Final Message	A window will appear with the message "Your account has been created successfully".

Table 3.3: Sign-in Resident Interface

Name of item	Log-in as resident
Description of Purpose	Allows user to access the menu for the resident.
Source of Input or Destination of output	User enters data for email and password into two text fields
Valid range, accuracy, and/or tolerance	Email: cannot exceed 30 characters. Password: cannot be less than eight characters or more than 25 characters
Timing	Communicating with the database and setting up the account should not be more than 10 seconds 98% of the time.
Relationship to other inputs/outputs	This interface depends on the user having created an account with the appropriate email and password in the registration interface that will be made by the administrator.
Data Format	Text must be alphanumeric values.
Command Format	Sign in interface will respond only once the two text fields are filled. After this, user must press the Log in button.
End Messages	Log in: A text box with the message "Welcome" appears and a menu to confirm the command.

Table 3.4: Log-in resident Interface

Name of item	Language options
Description of Purpose	Allows the user to select the language of their preference
Source of Input or Destination of output	The user selects one of the two language options that are on the screen.
Valid range, accuracy, and/or tolerance	Language option: The user can't exceed more than one option.
Timing	Communicating with the database and setting up the account should not be more than 15 seconds 95% of the time.
Relationship to other inputs/outputs	This interface depends on the database having the correct item data to provide the "Option Language" command
Data Format	Default format
Command Format	The interface of "Language Option" responds once the user selects with his finger one of the two options provided.

Table 3.5: Language options interface

Name of item	Resident or tourist option
Description of Purpose	Allows the user to select one of the following two options: Visitor or Resident
Source of Input or Destination of output	The user selects one of the two options that are on the screen.
Valid range, accuracy, and/or tolerance	Resident or tourist option: The user can't exceed more than one option.
Timing	Communicating with the database and setting up the account should not be more than 15 seconds 95% of the time.
Relationship to other inputs/outputs	This interface depends on the database having the correct item data to provide the "Resident or tourist command
Screen Format	Default format
Data Format	The interface of "Resident or tourist" responds once the user selects with his finger one of the two options provided.
Command Format	Allows the user to identify himself as a tourist or as a resident

Table 3.6: Resident or tourist option Interface

Name of item	Destination Option
Description of Purpose	It allows the user to select the destination to which he wishes to go, Vieques or Culebra.
Source of Input or Destination of output	The user selects one of the two options ("Vieques or Culebra") that are on the screen.
Timing	Communicating with the database and setting up the screen should not take more than 10 seconds 90% of the time.
Relationship to other inputs/outputs	This interface depends on communications with the database.
Screen Format	70% of the screen will be used to show the destinations; The rest will consist of two buttons.
Data Format	Destination options: The options will be highlighted on the screen.
Command Format	The destination option will give access to the "Buy ticket" interface when selected.

Table 3.7: Destination Option for Tourist Interface

Name of item	destination option
Description of Purpose	It allows the user to select the destination to which he wishes to go, Vieques or Culebra.
Source of Input or Destination of output	The user selects one of the two options ("Vieques or Culebra") that are on the screen.
Timing	Communicating with the database and setting up the screen should not take more than 10 seconds 90% of the time.
Relationship to other inputs/outputs	This interface depends on communications with the database.
Screen Format	70% of the screen will be used to show the destinations; The rest will consist of two buttons.
Data Format	Destination options: The options will be highlighted on the screen.
Command Format	The destination option will give access to the "Buy ticket or recharge" interface when selected.

Table 3.8: Destination option for Resident Interface

Name of item	Buy ticket for tourist
Description of Purpose	It allows the tourist to see the ticket information and select the purchase option.
Source of Input or Destination of output	The system displays a description and price information collected from the database. The user has the option to buy the item.
Timing	Communicating with the database and setting up the screen should not take more than 10 seconds 95% of the time.
Relationship to other inputs/outputs	This interface depends on communications with the database and having the number of tickets available.
Screen Format	85% of the screen will be used to show the destinations; The rest will consist of two buttons.
Data Format	The amount of tickets available will appear on the right side of the screen for the tourist to choose how many to buy.
Command Format	The "buy tickets option" will respond once the desired amount of tickets is selected and the "Buy" button is clicked.

Table 3.9: Buy ticket for tourist interface

Name of item	Resident buy or recharge
Description of Purpose	Allows the user to select one of the following two options: Buy or Recharge
Source of Input or Destination of output	The user selects one of the two options that are on the screen.
Valid range, accuracy, and/or tolerance	Buy or Recharge option: The user can't exceed more than one option.
Timing	Communicating with the database and setting up the account should not be more than 15 seconds 95% of the time.
Relationship to other inputs/outputs	This interface depends on the database having the correct item data to provide the "Buy or Recharge command
Screen Format	Default format
Data Format	The interface of "Buy or Recharge" responds once the user selects with his finger one of the two options provided.
Command Format	Allows the resident to select if he is going to recharge his account or if he is going to buy a ticket

Table 3.10: Resident buy or recharge option Interface

Name of item	Buy ticket for Resident
Description of Purpose	It allows the Resident to see the ticket information and select the purchase option.
Source of Input or Destination of output	The system displays a description and price information collected from the database. The user has the option to buy the item.
Timing	Communicating with the database and setting up the screen should not take more than 10 seconds 95% of the time.
Relationship to other inputs/outputs	This interface depends on communications with the database and having the number of tickets available.
Screen Format	85% of the screen will be used to show the destinations; The rest will consist of two buttons.
Data Format	The amount of tickets available will appear on the right side of the screen for the tourist to choose how many to buy.
Command Format	The "buy tickets option" will respond once the desired amount of tickets is selected and the "Buy" button is clicked.

Table 3.11: Buy ticket for Resident interface

Name of item	Recharge for resident
Description of Purpose	Allows the resident to recharge their account balance
Source of Input or Destination of output	The resident enters the amount you want to recharge, selects the payment method and enters the information for payment. The address entry information and payment method will use text fields. The selection of the payment method will use radio buttons.
Valid range, accuracy, and/or tolerance	Address: cannot exceed 50 characters. Payment method: Card number cannot exceed 15 characters.
Timing	Communicating with the database and setting up the screen should not take more than 10 seconds 90% of the time.
Relationship to other inputs/outputs	This interface depends on the communications with the database and it having the correct items to display.
Screen Format	80% of the screen will be used to display the item list; the rest will have buttons, dropdown lists, and text fields for other interfaces.
Data Format	Recharge for resident: must be radio buttons Recharge for resident: If credit card, card number must be number values. If PayPal, must be alphanumeric values for email and password.
Command Format	The "Recharge for resident" interface will respond only once all fields are filled and selected correctly. After this, user must press the Finish button.

Table 3.12: Recharge for resident Interface

Name of item	Close
Description of Purpose	Allows user to exit the system.
Timing	Communicating with the database and setting up the screen should not take more than 10 seconds 90% of the time.
Screen Format	80% of the screen will be used to display the item list; the rest will have buttons, dropdown lists, and text fields for other interfaces.

Table 3.13: Close

Name of item	Tablet (Hardware)
Description of Purpose	Allows users to access the Tickets VC Island system.
Source of Input or Destination of output	The system displays all the interfaces that compose the system. The hardware is the source of all inputs and displays all the outputs on the screen.
Timing	Communicating with the database and setting up the screens should not take more than 10 seconds 90% of the time.
Relationship to other inputs/outputs	This interface depends on the communications with the database and it having the correct items to display.
Screen Format	80% of the screen will be used to display the list of items; The rest will have buttons and text fields for other interfaces.

Table 3.14: Hardware Interface

Name of item	MySQL (Software)
Description of Purpose	Supervises the storage of the database necessary for the management of the system. In it, passenger quantities, user information and purchase are stored, added, edited or deleted.
Source of Input or Destination of output	The database is affected by inputs sent from the user through the server. After all actions are performed, the database sends the desired information to the system.
Timing	Communication between the database and the system, and vice versa, should not take more than 10 seconds 90% of the time.
Relationship to other inputs/outputs	This interface depends on the connection between the system inputs, outputs, and the database.

Table 3.15: MySQL Interface (Software)

Name of item	Eclipse (Software)
Description of Purpose	Software with which the system is programmed. The Java language is used to encode the VC Island Tickets software.
Source of Input or Destination of output	The system is affected by inputs sent from the user through the server. After all actions are performed, the database sends the desired information to the system.
Timing	Communication between the database and the system, and vice versa, should not take more than 10 seconds 90% of the time.
Relationship to other inputs/outputs	This interface depends on the connection between the system inputs, outputs, and the database.

Table 3.16: Eclipse Interface (Software)

3.2 Functions

This section contains all the functional and quality requirements of the application. Gives a detailed description of the application and all its features.

Stage: System and tourist

- The system asks the tourist to enter their name, surnames, email and a temporary password.
- The tourist enters all the information required by the system.
- The system asks you to confirm (submit).
- The tourist confirms the information.
- The system asks the tourist seat selection.
- The tourist enters the selection of the seat.
- The system asks the tourist for confirmation.
- The tourist makes the confirmation.
- The system asks the tourist the destination and asks him to select the time of departure and return.
- The tourist enters the destination, time of departure and return.

- The system asks the tourist for confirmation.
- The tourist confirms the information provided.
- The system asks the tourist for the payment method he wants to use.
- The tourist enters the data of the payment method.
- The system processes the payment.
- The system issues the ticket printing for the tourist.
- The tourist takes the ticket.
- The system returns to the main page.

Stage: System and Resident

- The system asks the resident to enter their email and their password.
- The resident enters his email and his password.
- The system asks for the confirmation (Login).
- The resident confirms the information.
- The system asks the resident seat selection.
- The resident enters the selection of the seat.
- The system asks the resident for confirmation
- The resident makes the confirmation
- The system asks the resident for the destination and asks him to select the time of departure and return.
- The resident enters the destination, time of departure and return.
- The system asks the resident for confirmation
- The resident confirms the information provided
- The system asks the resident to make the payment or reload account.
- The resident takes the option to recharge
- The system asks the resident to enter the information of the method with which he wants to recharge (Visa) the account and how much he wants to recharge.
- The resident gathers the information required by the system
- The system asks the resident for confirmation to process the recharge.
- The resident enters the recharge confirmation.
- The system processes the recharge.
- The system asks the resident for confirmation to return to the ticket purchase area.
- The resident enters the confirmation.
- The system returns to the ticket purchase area.
- The system asks the tourist for a ticket confirmation.

- The resident enters the confirmation.
- The system processes the payment
- The system issues the ticket printing for the resident
- The resident takes his ticket
- The system returns to the main page.

Stage: System and administrator

- The system asks the administrator to enter their username and password.
- The administrator enters his username and password.
- The system asks the administrator for confirmation (Login).
- The administrator confirms the information.
- The system provides the information provided.
- The system gives the administrator access.
- The system asks the administrator name, surname, email, resident's password.
- The administrator enters the name, surname, email, password of the resident.
- The system asks the administrator for confirmation (add to database).
- The administrator makes the confirmation.
- The system prospects the information provided by the administrator.
- The system adds the information provided by the resident's administrator to the database.

3.3 Performance Requirements

The system will comply with the following performance requirements:

- There will be a total of eight (8) physical terminals across the entire operation. Four (4) of said terminals will be available at mainland, specifically at the Ceiba docks. At Vieques and Culebra there will be two (2) terminals available at each of the aforementioned locations, on the dock area. It's worth noting however that generally, one of the terminals at each of the locations will only be accessible by staff members that will be accepting cash as payment method for the purchase of tickets, or balance refill in case of resident accounts.
- The system will be available for all user account types (Boat Passagers, Port Authority Users and Port Authority Clerks) during standard operation hours (From 12:00 AM to 7:00 PM Sunday to Saturday).
- The system will support up to ten (10) simultaneous users across all available terminals. This includes terminals situated at either Vieques, Culebra or the mainland terminals at Ceiba docks. Remote access is supported for administrative purposes.
- After data is validated, 85% of transactions should be committed in less than ten(10) seconds. The remainder 15% of transactions may take no longer than 30 seconds before system times out said transaction. Completed transactions are defined in table 1.1.

3.4 Logical Database Requirements

Database will encompass considerations for both travelers (namely either tourists or residents) and the ships used by said travelers. This consideration is in effect for easy modifications in case problems arise from eternal sources (For example, a number of boats are not available).
There will be a total of 3 tables in the database. These tables are namely **Users, Boat** and **Ticket** tables.

Below the UML Entity Relationship Diagram of the database

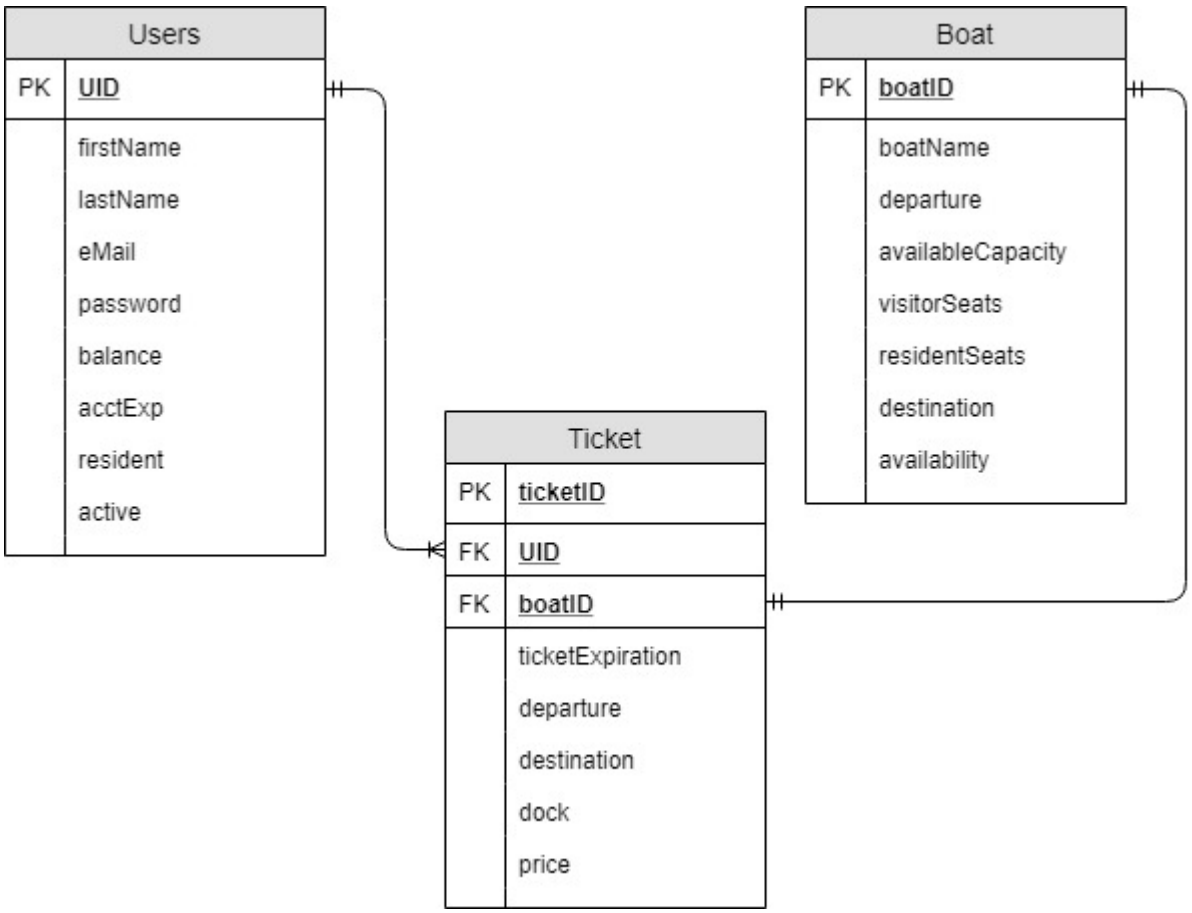

Figure 3.1: Datatypes for each element, for each Table

Attribute	Data Type	Constraints
UID	Integer	PK, NN
firstName	VARCHAR(20)	NN
lastName	VARCHAR(20)	NN
eMail	VARCHAR(50)	
password	VARCHAR(50)	NN
balance	DOUBLE	NN
acctExp	TIMESTAMP	NN
active	BOOLEAN	NN
resident	BOOLEAN	NN
destination	VARCHAR(10)	NN

Table 3.17: Users Table

Attribute	Data Type	Constraints
boatId	INTEGER	PK, NN
boatName	VARCHAR(20)	
departure	TIMESTAMP	
availableCapacity	INTEGER	
visitorSeats	INTEGER	
residentSeats	INTEGER	
destination	VARCHAR(10)	
availability	BOOLEAN	NN

Table 3.18: Boat Table

Attribute	Data Type	Constraints
ticketId	VARCHAR(20)	PK, NN
UID	INTEGER	NN
departure	VARCHAR(10)	NN
destination	VARCHAR(10)	NN
boatId	INTEGER	NN
ticketExpiration	TIMESTAMP	NN
ticketPrice	DOUBLE	NN

Table 3.19: Ticket Table

3.5 Design Constraints

Our system is web based so it can be hosted virtually on any device, as log as said device can interface with a printer and a camera.

CPU	AMD A4-3300 / Intel Celeron G440
RAM	4GB DDR3 Memory
Storage	120GB
OS	Windows XP SP1/ Linux Mint 19.1
Web Browser	Mozilla Firefox 64.0/ Google Chrome 70.0.3
Printer	POS Printer with Dot Matrix printing capability
Screen	Touch Screen Enabled Display

Table 3.20: Minimal System Recommendations

We recommend however, the use of an android tablet because of it's versatility. An android tablet can read QR codes, interface with a printer, and can access the target URL of our system. We recommend a tablet device that complies with the following minimal specifications:

Chipset	Snapdragon 625/ Kirin 650 / Mediatek MT8176
RAM	4GB
Storage	16GB
Camera Resolution	8MP
OS	Android 4.4 - KitKat
Web Browser	Firefox 64.0.1 / Google Chrome 71.0.3578 / Opera 49.2.2361
Size	9.5 Inches
Printer	POS Printer with Dot Matrix printing capability

Table 3.21: Recommended System Specifications - Android Tablet Device

3.5.1 Standards Compliance

The system must comply with the following standards

Standard	**Used For**
WiFi 802.11b	Connecting to the internet wirelessly

Table 3.22: Standards Compliance

3.6 Software System Attributes

In this section we will discuss some important and required attributes for the software's objectives to be achieved.

3.6.1 Reliability

At the time specified for the deployment of the software, the program would be at its fully functionality previously specified, and it would ready to start operating.

3.6.2 Availability

In case the software crashes or it doesn't meet with the functionality specified, the software would specify the problem to the user and will inform the technical support about the problem the system is facing. The technical support will determine how long it would take to fix the problem. Once it's fixed, we will inform the user when the system is ready to work again.

3.6.3 Security

The software will count with numerous types of security, including security certificates, log histories of the user and the action they've done. The management group would have rights over the employee's users and the server, where the application would be hosted, would be completely secure with SSL Certificate. All the data to be transmitted would be encrypted, end to end, as well as the data in the database, all would be encrypted.

3.6.4 Maintainability

Since the software system would be hosted in a web server, the maintenance of the application would be easy, the development team can connect the server, implement the changes, once everything is set, the changes would take effect live.

3.6.5 Portability

The portability of the software is not complicated, because is a web-based application, all we need is a server to host the application with the specified requirement for the application fully work.