SE2 Requirement Analysis and Specification Document

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Contents

1 Introduction

1.1 Purpose

This document represents the Requirement Analysis and Specification Document (RASD). The main goal of this document is to completely describe the system in terms of functional and non-functional requirements, analyse the real need of the customer to modelling the system, show the constraints and the limit of the software and simulate the typical use cases that will occur after the development. This document is intended to all developer and programmer who have to implement the requirements, to system analyst who want to integrate other system with this one, and could be used as a contractual basis between the customer and the developer.

1.2 Scope

The scope of MyTaxiService is to manage a taxi service in a more efficient way, along with an emprovement in the interaction between the customers and the service providers.
In particular, the following goals have be highlighted by the stakeholders:

1.2.1 Goals

1. Providing the passenger a ***simplified access*** for making real-time **requests** for the taxi service, according to appropriate ***usability metrics***.

2. Providing the passenger the possibility to **reserve** a taxi for a later moment.

3. Providing the passenger a clear confirmation of the taxi ride hes requesting for.

4. Providing the passenger an estimation of the **waiting time** for a taxi ride.

5. Providing the taxi drivers a ***simplified access*** for receiving and handling transportation requests from the passengers.

6. Guaranteeing a fair management of the taxi queue, in term of minimizing the passenger ***waiting time***.

7. Providing ***system developers*** a programmatic interface to further extend the system.

1.2.2   Actors and Stakeholders

Customer The person(s) who requested the developing of the system. Also referred as Government in the assignment text.

Passenger The person who avails of the taxi service, in particular those who make a request for a Taxi ride.

Taxi Driver The employee which is in charge to meet the passenger and take him to the desired location

User General term for describing whoever interacts with the system interfaces. It can be a passenger, a taxi driver, a system developer, a system administrator, etc.

System Developers The persons which are qualified and in charge to extend the present system with additional features or services

System Administrator : The persons in charge to manage the relationship between the transportation service and the system. For example a system administrator could register new taxi drivers profiles, manage the passenger profiles or manage data backups.

1.3   Definitions, Acronyms, Abbreviations

1.3.1   Definitions

Simplified Access Human-to-Machine interaction that satisfy some usability metrics

Usability Metric Precise measurable requirements that an interface has to satisfy in order to provide an efficient and easy experience to the user.

Waiting time Time in minutes between the submission of a request and the arrival of a taxi.

Request *(when made by the passenger to the taxi service)* In this document we refer to a *request* when the passenger's intent is to meet the taxi as soon as possible.

Reservation In this document we refer to a *reservation* when the passenger's intent is to meet the taxi at a precise moment in the future

1.3.2 Acronyms

1.3.3 Abbreviations

1.4 Reference Documents

- Specification Document: Assignments 1 and 2 (RASD and DD).pdf.

- Specification Document:Project Description And Rules.pdf

- IEEE Std 830-1998 IEEE Recommended Practice for Software Requirements Specifications.

1.5 Document Overview

The following part of this document will focus on a deeper analysis of the goals highlighted by the stakeholders in addition to some assumptions that must hold in order to keep the system properties valid. The last part of the document will exhibit the software requirements that resulted from the goals examination along with some scenario and use cases that will offer the stakeholders a better comprehension of the final system.

2 Overall description

This section will cover the overall description of the product. In particular it will put this product into the perspective of other products or systems.

2.1 Product Perspective

The MyTaxiService system will partially replace any former traditional system that is based on phone calls with a new interactive system based on mobile and web interfaces.

The decision of completely dismissing the former phone call system in favor to the new one will be left to the customer, since MyTaxiService requires the passengers to access a web interface or a mobile application, which is still generally not accessible by some users.

The project will therefore consists in releasing a web application and a mobile app which are not integrated with any other existing taxi management service. The system is created to improve the possibility to connect with the taxi service for requesting a taxi, that is based on phone calls. With this system, the taxi service can provide a fast and innovative system that allow to manage the user request rapidly, without any loss of time. Both the mobile application and the web interface are connected to the central system and allow the user to know in real time the waiting time, the taxi occupation and their location, and allows to make a taxi request receiving a rapid response. The application will furthermore provide a programmatic interface for the integration with future systems and extensions. /newline
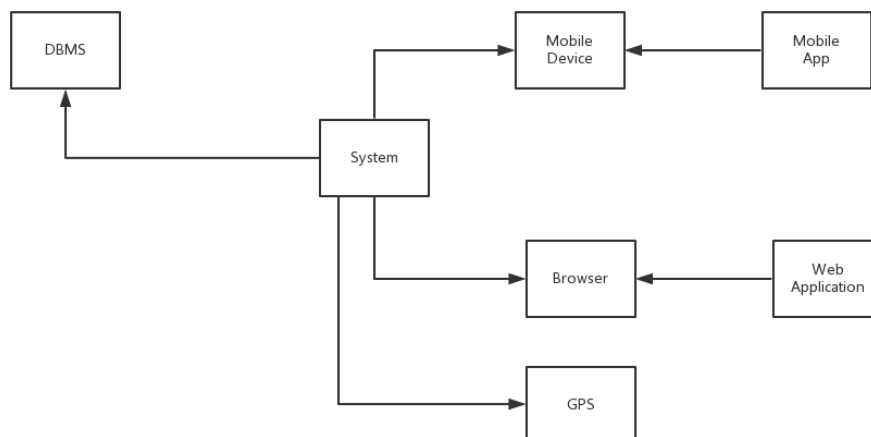
2.1.1 System Interfaces

1. MyTaxiService mobile application will run on tablets and smartphones

2. MyTaxiService web application will run on every terminal which is provided an internet connection and a web browser

2.1.2 User Interfaces

Both the web and mobile applications will have a similar user interface, rearranged to fit the device screen.

1. **Application for passengers**

   - It has to provide a **login page** that allows users to be recognized by the system, along with a registration form that let the user to sign up to the service and a link for resetting the user password. In the home page after the login, it is possible to see the map of the zone in which the user is and the taxis that are nearby, along with a menu for accessing the other functionalities. If a taxi is available, the user can request a ride by selecting the button "Call Now". If a taxi is not available, a text message will display the estimated waiting time and the button will let the user to queue. When the user select the request button, a **confirmation dialog** will ask the user to insert the precise meeting location and, in the case the user is making a reservation, the meeting time. After the user has made a taxi request, the system will show directly in the home page the estimated waiting time for that request. In the case he has made a reservation, the home page is steal usable for making a request, while clicking on **"your reservation"** a page will display the current reservation status.
   - **Passenger menu**
     Home Shows the home page from which is possible to make a new request or check the arrival time and the taxi code of the pending request.
     Your Reservation Shows the list of pending reservations along with the status or estimated arrival time/taxi code.
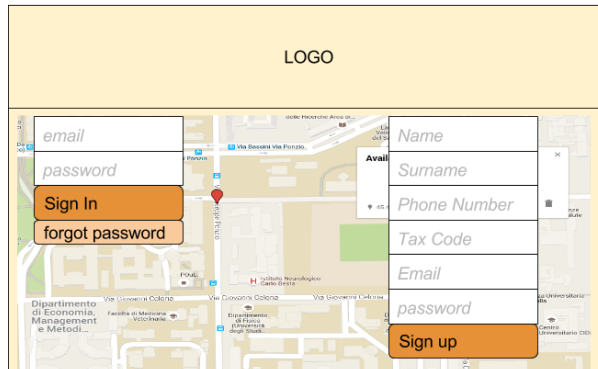   **Reserve a Taxi** Display the **confirmation dialog** in which the passenger can set the meeting time and location
     Your Account Lead to the account administration page in which the user can show and edit his account
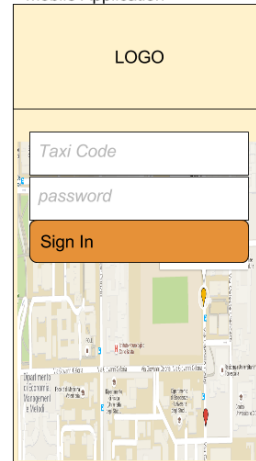   **Logout** Ends the session and leads to the login page

2. Example of the mobile application for passengers:
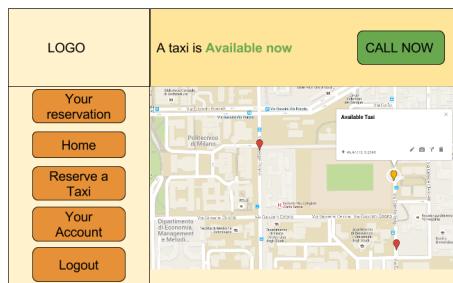
Login Page for passengers - Web Application

Login Page for Passenger Mobile Application
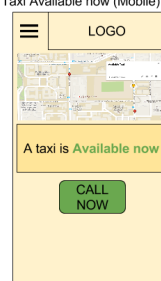
Passenger Home - Taxi Available now (Web Application)
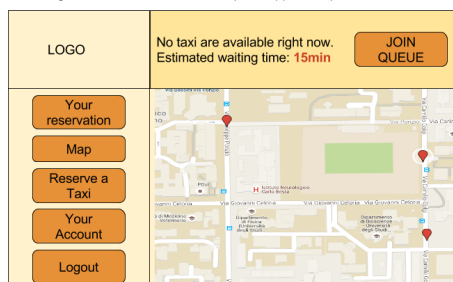
A taxi is **Available now**   CALL NOW

Passenger Home Taxi Available now (Mobile)
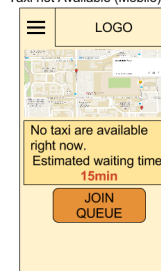
A taxi is **Available now**

CALL NOW

Passenger Home - Taxi not Available (Web Application)
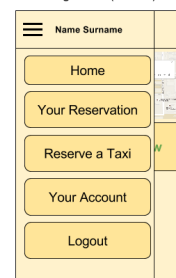
No taxi are available right now.
Estimated waiting time: **15min**   JOIN QUEUE

Your reservation
Map
Reserve a Taxi
Your Account
Logout

Passenger Home Taxi not Available (Mobile)

No taxi are available right now.
Estimated waiting time: **15min**
JOIN QUEUE
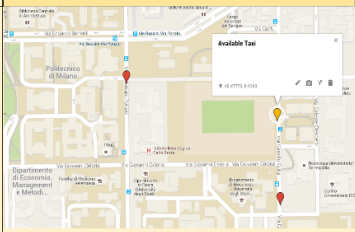
Sliding Menu (Mobile)

Name Surname

Home

Your Reservation

Reserve a Taxi

Your Account

Logout

Confirmation Dialogs (Various Cases) - (Both Mobile and Web)

Delayed Reservation Dialog	Taxi request Dialog	Taxi request Dialog
When *23/10/2015* *13:00*	When: in 15 minutes	When: NOW
Where *Via Golgi, 23*	Where *Via Golgi, 23*	Where *Via Golgi, 23*
Confirm Cancel	Confirm Cancel	Confirm Cancel

Your Reservation (Request Pending)

3. **Application for System Administrators (Web)**

   - From the same **login page** for the users, system administrators can access the administration page by inserting their login data. From the administration panel the user can see the list of all the taxis and their current status. From the menu they can access the log page from which it is possible to read all the system history, the account administrator page or the backup/restore facility.

4. **Example of the web application for administrators:**

Administration - Taxi Management (Web Application)

LOGO	Taxi Management			Add New
	Code	**Status**	**Location**	**Manage**
Taxi Management	1234	On Ride	Via Bonardi (45.479281, 9.227633)	Edit
Logs				
Account Management	1423	Pending	Piazza Bottini (45.484268, 9.236227)	Edit
Backups				
Logout	4321	Offline	N.A.	Edit

Administration - Logs

LOGO	Logs	Download
Taxi Management	[26/11/2015 12:36] Taxi 1423 logged in from Piazza Bottini (45.4792482,9.2011928) [26/11/2015 12:37] Taxi 1234 accepted ride #123747 [26/11/2015 12:37] Taxi 6516 completed ride #123746 in Piazza Piola (45.4792482,9.2011928) and is now pending [26/11/2015 12:38] Security: Taxi 4321 login failed from 8.8.8.8. Remaining retries: 3.	
Logs		
Account Management		
Backups		
Logout		

5. **Application for taxi drivers (Mobile)**

   - The taxi drivers have a particular login page that allows them to access by taxi code/email and password.
     The taxi application interface is as simple as can be, for avoiding loss of time and incomprehensions. In the homepage the user

can see a map of the newarby area. When a request arrives, the user is notified about the time and location of the request. Two buttons allow to accept/decline the request, and when a request is accepted the taxi driver can state he completed the ride or release the ride for another drive.

6. **Example of the mobile application for taxi drivers:**
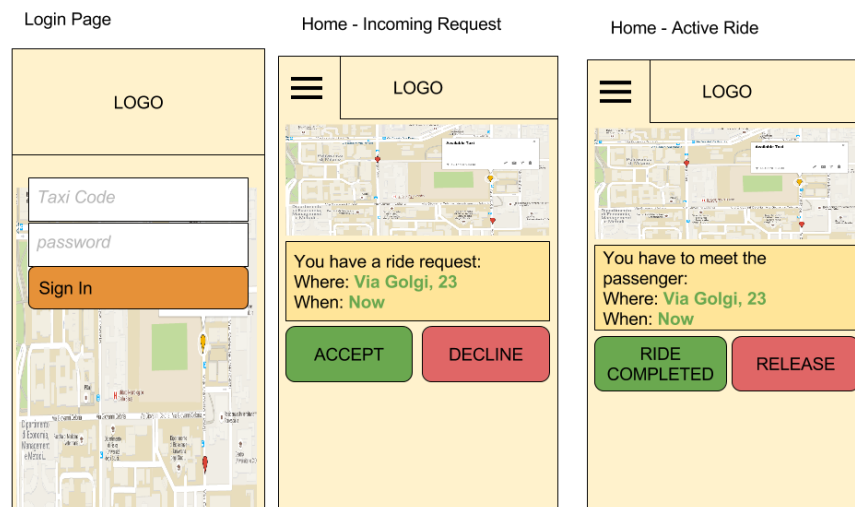
2.1.3 Hardware Interfaces

The MyTaxiService mobile application will require a smartphone or tablet and will support the most common screen resolutions.
For the correct functionality of MyTaxiService mobile and web application (both for passenger and taxi drivers) the device will be required to support the GPS localization and a WiFi or data internet connection.

2.1.4 Software Interfaces

- MyTaxiService Application Server

    - Database Management System (DBMS):

    Name : MySQL.

    Version : 5.6.19

    Source : http://www.mysql.it/

– Application server:

Name : Jboss application server J2EE open source.

Source : http://www.jboss.org/

– Operative Systems:

∗ : Ubuntu/Debian Linux

∗ : Windows Server, Windows 7, Windows 8, Windows 10

• MyTaxiService Application Server

– Mobile Application

OS : Android 4.4.2 or higher, iOS, Windows Mobile.

– Web Application

Web Browsers : Chrome, Firefox, Safari, Opera, Internet Explorer

Other : JRE 1.7 or higher

2.1.5 Communications Interfaces

The communication between the server and mobile application will make use of the following ports:

Protocol	Application	Port
TCP	HTTP	80
TCP	HTTPS	443
TCP	DBMS	3306

The default communication protocol will be HTTPS.

2.1.6 Memory Constraints

The suggested memory requirements are:

• Application Server

Main Memory : 4GB

Secondary Memory : 2GB

• Mobile Application

Main Memory : 500Mb

Secondary Memory : 100Mb

2.1.7 Operations

In this section will be described what operations each kind of user can do by interacting with the system interface:

1. Passengers (Web and Mobile Application)

   Registration The user can create a new account filling in his personal informations

   Login The user can access the main page by inserting his email and password.

   Map The user can visualize the map of the zone he is in.

   Request The user can request a taxi immediately, or adding to the queue according to the taxi availability

   Reservation The user can make a reservation of a taxi ride for a later moment

   Pending Reservation The user can visualize data such the estimated taxi arrival time about the reservation he made and cancel a reservation.

   Information The user can access some information about the system usage and rules

   Profile The user can access its profile personal data

   Logout The user can logout from the system

2. Taxi Drivers (Mobile Application Only)

   Login The user can access the main page by inserting his taxi code and password. This will state the availability of accepting requests.

   Map The user can see a map of the nearby area. When a request arrives the map will show the meeting point

   Request Incoming The user can accept or refuse an incoming request

   Active Ride The user can complete a ride when the passenger is at his desired location, or release the ride to another taxi driver if some unexpected event occurs.

   Logout The user can logout from the system and state his unavailability of taking requests.

3. System Administrators (Web Interface Only)

   Login The user can login and access the administration page

Taxi Management The user can acess the list of all active and unactive taxi accounts. He can Add and Remove taxi driver accounts or change their passwords.

Account Management The user can access user profiles to provide support to end users and reset their passwords.

Logs The user can view and download the logs associated to each accepted/refused request, all ride data such passenger account, departure/arrival date and location, and the taxi driver who made the ride.

Backup/Restore The user can make security backups of account data and restore them.

4. System Operations

Store user information Creates or updates a passenger profile

Store taxi information Creates or updates a taxi profile

Update Map Update the map every 30 seconds with each taxi location

Registration Confirmation The system sends a confirmation email to the user upon registration

Request Confirmation The system sends a confirmation email about the acceptance of a taxi request

Reservation Confirmation The system sends a confirmation email about the acceptance of a taxi reservation

Reservation Reminder The system sends a remainder email to the user who reserved a taxi 2 hour before the meeting time

Time estimation The system estimate the time needed to move by car from a location A to a location B. It can make use of external map services for this purpose.

System Support Operation **Backup Database** The system make a backup of the database and logs

Restore Database The system make a restore of a previous backup of the database

2.2 Product Functions

This section will list the general functions of the system, with an eventual reference to the goal they contribute to satisfy.

1. *Relative to goal **1***: The system shall provide the passengers both a web and a mobile application with equivalent functionalities for requesting a ride

2. *Relative to goal **5***: The system shall provide a mobile application for taxi drivers, in which they can inform the system about their availability and confirm or refuse the proposed request.

3. *Relative to goal **6***: The system shall associate a queue of taxis to each zone according to the GPS location of the taxis

4. *Relative to goals **3** and **4***: The system shall provide a response to the passenger who requested a ride, the notification will contain the code of the taxi that accepted the request and the estimated waiting time.

5. *Relative to goal **7***: The system shall comprehend a programmatic interface that offer the access for the main functionality of the system itself.

6. *Relative to goal **2***: The system interface for passengers shall provide the functionality of taxi reservation for rides that will take place after 2 hours. The information required by the system include the origin and destination and the departure date.

7. Relative to goal **6** and security: The system shall keep track of any active ride, along with the current taxi position and provide an history.

8. *Relative to goal **5** and Administration*: The system should provide a web interface for system administrators, in which they can manage the taxi drivers and the passenger profiles

9. *Relative to goal **3*** The system sends a remainder email or push notification to the user who reserved a taxi 2 hour before the meeting time, just after that it has assigned a taxi to that request.

10. *Relative to goal **6***: The system should manage exceptional situations such the availability of taxis or accidents/vehicle failures.

11. **Not provided functionality**: The system will not manage the payment for the taxi, which will occour directly to the taxi driver via cash or credit card and it will be managed separately by the transportation company

2.3   User charateristics

There are 4 types of system users:

passenger Who access the system for requesting a transportation. For this purpose, the user must have an internet connection on his smartphone or computer. In the case he's using a smartphone, the user can have the MyTaxiService application installed or using the web interface. For using the web interface the user must have a compatible browser.

Taxi Driver Who provide the transportation to the passengers. The user interacts with the system for receiving transportation tasks. The user will be provided a compatible device in advance, and must be in possess of his login credentials, which are generated by the system and managed by system administrators.

System Administrator Who manages the transportation service. The system administrator is in charge to give support to taxi drivers and passengers, in particular to create and supervise taxi drivers' accounts. It's the only figure that have access to the system logs and taxi managements.

System Developers Who is in charge to further extends the system. System developers will make use of this document and the Design document for planning the addition of new functionalities.

2.4 Constraints

2.4.1 Regulatory Policies

The system shall comply with the following regulatory policies:

- CODICE IN MATERIA DI PROTEZIONE DEI DATI PERSONALI "Decreto legislativo 30 giugno 2003, n. 196"

2.4.2 Reliability Requirements

- In case of system faliure, the system must be recoverable from a previous backup

- The system infrastructure (data centers, servers, network infrastructures, etc) must be sized accordingly to the expected user base size.

2.4.3 Criticality of the application

The main criticalities of this project are:

- The compliance of the interface according to the usability metrics explained in section 3.

- The fair management of taxis. In particular the system must not waste resources such as not reallocating unemployed taxi when necessary and must allocate requests according to well defined precedence rules.

A failure in one or more of this criticalities will lead to the loss of clients.

2.4.4 Safety and Security Consideration

MyTaxiService should comply to the serurity statements listed above:

- Only logged users can request a taxi ride. This is for preventing any malicious behaviour in which unknown users can make taxi request without making use of the transportation service.

- At the time of registration, a user must read and accept any privacy policy about the user data management

- The system must undertake to not divulge the user data to third parties, in addition the user data will be used only for the supply of the service

- For the reason stated before, the passenger must supply at least:
  - Name
  - Surname
  - e-mail address
  - Phone number or Tax Code
  - Password

- While the taxi drivers must supply at least:
  - Taxi Code
  - e-mail address
  - Phone number or Tax Code
  - Password

- The system should therefore warn the user about the regulation policy about false impersonation.

- The system will hash the user password before storing it into the database, preventing unauthorized access in the case of data leak.

- The system will ask the user the email address or the phone number in order to reset his password. The new password will be sent on the user e-mail address.

- In the case of taxi drivers, the password is generated by the system and it's updated periodically. The taxi drivers will receive their new password by email.

- Every request must be associated to the user identity and kept in a log for security reasons and kept available for judicial authorities.

2.5 Assumptions and Dependancies

2.5.1 Assumptions

1. The city is already divided in Taxi Zones of approximately 2x2 km each.

2. Taxis or Taxi Drivers are assumed to be in possession of a mobile device that 1) have GPS functionalities and 2) is capable of establishing an internet connection with the facility in which the system is hosted. In the case one of these assumption does not hold, the Taxi driver must contact his referent in order to solve the issue.

3. The number of taxi in service are at least equal to the number of zones. **Rationale**: In this way, in the case that a zone queue is empty, an incoming request is guaranteed to be served by at least one taxi in an estimable time by propagating the request to adjacent zone and forwarding the request to the nearest first taxi that is available.

4. The service is currently running a traditional system based on phone calls

5. The payment will occur directly to the taxi driver by cash or credit card and it will be managed by the transportation company

6. The taxi drivers should not know in advance what the ride destination will be. The passenger informs directly the taxi driver about the desired arrival location.

7. The taxi Drivers are supposed to accept one request or reservation at a time.

8. The maximum time length of a ride is 1 hour and 45 minutes.

3   Specific Requirements

3.1   External Interfaces

3.2   Functions

This section will list specific functional requirements needed in order to accepting and processing inputs and processing and generating the outputs.

1. *Relative to goal __6__*: The mobile application for Taxi Drivers shall transmit the taxi GPS location to the system every 30 seconds, in order to keep the taxi queues updated.

2. *Relative to goal __6__*: When a taxi becomes available, the system shall store the taxi identifier in the queue of the corresponding zone

3. *Relative to goal __6__*: When a request arrives from a certain zone and there is at least one available taxi in that zone, the system shall forward it to the first taxi queuing in that zone.

4. *Relative to goal __6__*: Upon an incoming request, If the Taxi Drivers confirms the system shall inform the passenger, if he doesnt confirm then the system will forward the request to the next driver in queue and move the taxi driver which refused in the last position in the queue.

5. *Relative to goal __3__*: The passenger will be informed of any unexpected event by email if he made the request via the web interface and via email and push notification if hes using the mobile application.

6. *Relative to goal __3__*: In any case, the passenger can check the request details and information by accessing the web or mobile interface

7. *Relative to goal __6__*: If the taxi driver who accepted a request is unable to reach the passenger in a reasonable amount of time (i.e. due to an accident or a vehicle failure) then the taxi driver should be able to release its request. The request is forwarded to the first available taxi and the passenger will receive an update about the new taxi code and the new estimated waiting time.

8. *Relative to goal __2__*: The reservation request is accepted only if it is made at least two hours before the ride. An earlier reservation should be made impossible to select from the GUI and double checked in the backend.

9. *Relative to goals __6__ and __2__*:For guaranteeing the precedence of reservation over real-time requests, a reservation is forwarded to a taxi 2 hours before the meeting time: in this way the taxi will result not available

for eventual real-time requests (which has a maximum time length, as stated in the assumption **??**) that occur in the meanwhile and the request will be forwarded to the next taxi. The taxi is supposed to be at the meeting point at least 10 minutes before the meeting time.

10. *Relative to goal **6***: Along with the taxi queue, there will be a Request Queue, with a FIFO policy. In this way, the first passenger who makes a real-time request is the first that is served by the first available taxi.

11. *Relative to goal **1***: The system should provide passengers a "password reset" service.

12. *Relative to goal **1***: The system should let the user cancel a previous reservation he made until 2 hours before the meeting time.

13. *Relative to goal **3***: The system will send notification to a user as soon as the request has been accepted by a taxi driver

14. The GPS localization of the passenger is used merely for providing a better GUI experience (i.e. showing the right portion of the map) and it is an optional requirement for the passenger. The actual localization occurs by the information that the user provides by inserting the meeting location while making a request.

3.3 Performance Requirements

3.4 Logical Database Requirements

3.5 Design Constraints

3.5.1 Standard Compliance

3.6 Software System Attributes

3.6.1 Reliability

3.6.2 Availability

3.6.3 Security

1. The login information and the user data must be kept safe by the system. In particular, the user data can be accessed only by the user itself or a system administrator, which can see and edit the entire user profile except the password.

2. A taxi request or reservation can be made only by registered and logged users, in order to avoid unintentional or malicious requests.