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MILANO 1863

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SOFTWARE ENGINEERING 2 PROJECT  
A.Y. 2020-21

**Customers Line-up**  
**Requirements Analysis and Specifications**  
**Document**

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# Chapter 1

## Introduction

### 1.1 Purpose

#### 1.1.1 General Purpose

The main scope of this document is to define requirements for the application development, in order to make a correct project planification. To do this, we will analyze:

- System;
- Functional and unfunctional requirements;
- Constraints;
- Relationships between stakeholders;
- Possible scenarios and tests;

These will be shown using different types of languages, starting from the natural language to the structured languages such as Alloy and UML. Below, we will define the context in which our application will be developed. During Sars-Cov-2 emergency, several countries imposed the lockdown in order to hinder the virus diffusion. People had to change their habits, in fact they could go out only for necessary needs, such as going to the supermarket or pharmacy. A lot of rules were introduced: not only using the masks or clean your hands but also keeping a social distance. For instance people must pay attention while they're entering in the market due to the long queue, which could increase the possibility of virus diffusion. This fact obliged people to stay for a long time standing up and waiting their turn losing a lots of time.

### 1.1.2 Goals

- G1** User enters once arrived at the market
- G2** Put a limit to the number of Users in the market
- G3** Smart User can make a Reservation
- G4** Smart User can make a Visit
- G5** Mobile User can make a Reservation
- G6** Mobile User can make a Visit
- G7** Smart User can cancel a Booking
- G8** Mobile User can cancel a Booking

## 1.2 Scope

The aim of the project is to develop an application which, thanks to an intuitive interface, will avoid a long waiting outside the market. The application will provide a QR code as a virtual ticket on your own smartphone and to wait easily at home or everywhere instead of doing the physical queue for minutes or hours. In addition it will provide the position in queue and the time estimation of your turn. The system will generate a QR code for the authentication at the entry, in order to verify the position in the queue. Moreover, the application gives the possibility to "book a visit" for who indicates the approximate expected duration of the visit and how many products they'll buy.

Although the reservation is made entirely with your smartphone, the market gives anyway the possibilities to provide the ticket locally on site, acting as proxies for the customers. This is mostly for aged people who are technologically backward or has no smartphone. Once this procedure is completed, a SMS will be sent to the customers for noticing their turn. [todo]

In order to achieve the goal, we define the World, Machine and Shared Phenomena, which are really crucial to describe the system. They're characterized by fact that the first and the second ones are not visible among them; so we need a link between them which is represented by the Shared phenomena.

### 1.2.1 World

It's the portion of system to be developed. The main *World Phenomena* are:

- Punctuality;
- Loss of connection;
- Respecting social distance;

- Shopping duration;
- Checking temperature;
- Respecting social distance;

### 1.2.2 Machine

It represents the portion of system to be developed. The main *Machine Phenomena* are:

- Average of shopping time;

### 1.2.3 Shared Phenomena

They're phenomena shared between the World and the Machine which are controlled or observed by the system. In this scenario mainly are:

- Book/delete a visit in the supermarket;
- Get a virtual ticket;
- Send a notice;
- Send a SMS;

## 1.3 Definitions, Acronyms, Abbreviations

### 1.3.1 Definitions

- **Mobilephone:** Elettronic device without CLup App;
- **Smartphone:** Elettronic devide with Clup App;
- **CLup App:** It's the application described in this document. It's an application used to make and manage Booking in order to go grocery shopping;
- **User:** Generic customer who plan to shop in the market. He could be a Smart or Mobile User;
- **Smart User:** User who has got CLup App and so he's able to manage Booking by himself;
- **Mobile User:** User who hasn't got CLup App and so he's not able to manage Booking by himself. For instance could be an User who has a dated mobile phone or simply he doesn't install the CLup App. A Mobile User allows a Receptionist to manage his booking by calling a telephone number by interacting with him;

- **Shopping Size:** It's the dimension of the grocery shopping. It could be *Small, Medium, Large* depending on the number of items that is going to be purchased;
- **Booking:** It indicates the generic appointment of a User in the market. It could be a Reservation or a Visit;
- **Reservation:** It's a type of Booking. Users simply book a seat at the market's queue. In addition User have to indicate the Shopping Size;
- **Visit:** It's a Booking planned in advance by Users. It is planned by putting the date and the range time in which the User is going grocery shopping. In addition User have to indicate the Shopping Size;
- **Reader:** It reads QRCode at the market's entrance. It allows User to go in;
- **Booking submitted:** It means that the QRCode referred to the actual Booking is already submitted in the Reader;
- **Visit activated:** It's a Visit which already booked but not yet submitted by the User;
- **Reservation activated:** It's a Reservation which already booked but not yet submitted by the User;
- **Waiting Time:** It's the time estimated by the system in which, by prevision, an User waits before he enters in the market;
- **Shopping Time:** It's the time needed by a User to complete his own grocery shopping;
- **Closure Time:** It's the range time in which the market is closed;

### 1.3.2 Acronyms

- **RASD:** Requirement Analysis and Specification Document;
- **HW:** Hardware;
- **SW:** Hardware;
- **API:** Application Programming Interface;

### 1.3.3 Abbreviations

- **App:** Application;

- 1.4 Revision history
- 1.5 Reference Documents
- 1.6 Document Structure



## Chapter 2

# Overall Description

### 2.1 Product perspective

The aim is to build a system that manage the users' reservations and grants the possibility of booking the place in queue without wasting time while they're waiting their own turn outside the market.

–The system have to provide User information about queue's dynamic in real time (i.e the number of people ahead and the time estimation before his own turn). – To do this, the application should try, in the best way, to estimate the time that the customers will spend in the shop, in order to notify in time users who are waiting their turn.

The application analyses the customers' statistics and computes the average shopping time. The calculation considers the time range between the moments in which the User goes in and out.

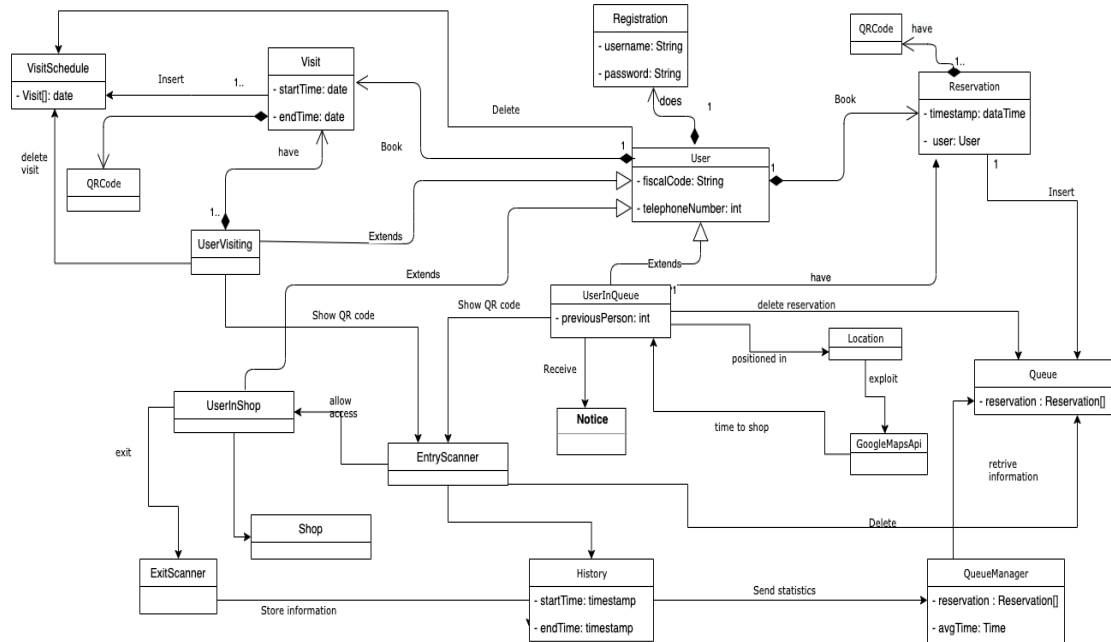
In this way, the customers in queue will be notified in time and will be able to use GoogleMaps APIs to compute the path for arriving in time to market. The choice of using Google Maps APIs derives from the easy usability, frequency update and very large documentation.

Moreover, it will be possible to book a visit choosing the date and time in advance (of some days?). In this case, users will also have to indicate an approximation of the shopping time.

The time will be splitted into 30 minutes slots, and customers will choose which they want among the free ones.

In the UML diagram below will be list the main classes in order to understand how the whole system works.

Figure 2.1: Class diagram with UML



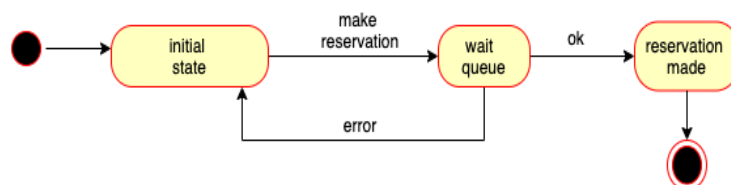
As we can see from the class diagram in figure 3.18, the user can book once or a visit or a reservation. In both cases will be provide him a QRcode, which will be submit to enter in the market. If the the User decided to undo his reservation in the queue could do it by making a cancellation from the application.

Moreover, if the User allows to share his position, the system will notice him in advance due to his punctuality.

In addition the system will notice the User through an SMS or a notice when it's almost his turn (10-15 minutes before).

Now we will analyze the interaction between the User and the system, in order to understand possible criticities.

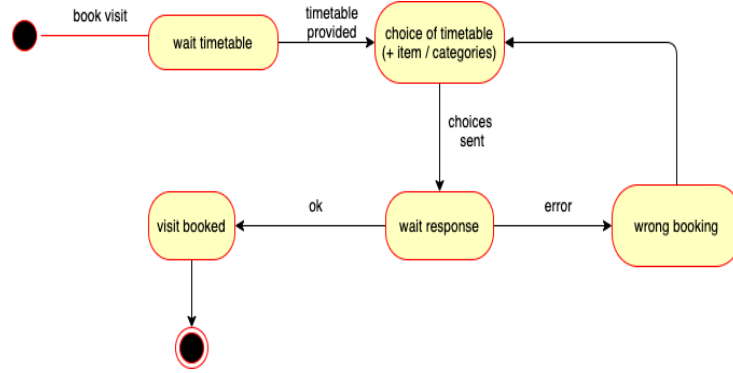
Figure 2.2: State diagram of the reservation in the queue



In the Figure 2.2 first state diagram it can be observed how a generic User can

make a reservation thorough the system. It's sufficient making this action to be added in queue to enter in the market.  
 If something goes wrong the User will be redirect to the home screen (initial state).  
 Usually the system reject the request if the market is next to closure (or for logistic problem).

Figure 2.3: State diagram of booking a visit



The Figure 2.3 explains instead how to book a visit in the market. Once the timetable is provided, the User have to select the range time of the visit and the items that he wants to purchase.

If the choice made by the user is wrong (i.e timetable's slot full), the system notify him; the User will try again until his choice is correct.

## 2.2 Product functions

### 2.2.1 Queue Manager

The most important function is the *Queue Manager* because it must avoid the users waiting too much time their turn due to a wrong use of notifications. [TODO] In fact, it have to foresee, through statistics from users' information, the correct time in which the users will enter in the market once arrived. This can be done thanks to the notifications sent to the user It will also have to understand when accept and when refuse reservations, according to shop closing time and the number of people in queue.

### 2.2.2 Data Collection

The *Data Collection* is essential for the correct behavior of the Queue Manager described previously, because it will have to provide precise dates according

to client's information. Therefore, the system will have to ask clients precise questions according to keep useful informations for estimating the shopping time into the supermarket, without violating users' privacy.

In order to achieve this goal, it needs to oblige the user to register himself in the system and to check the item to allow the processing of his personal data, necessary to reserve virtually the seat in the queue.

One of the possible information asked could be the dimension of the expenses, which can be estimate by the number of item that are going to be purchased. This will be used, with the entry time, to track the number of user inside the market who is finishing. Then will be possible to notify in advance users in queue about the closeness of their turn.

## 2.3 User characteristics

We distinguish the actors into our application based on actions and interactions with the external world:

- *User*: he's a client who has signed in the system and he can book a visit or take his queue number.
- *UserInQueue*: he's a User who has taken his own turn in queue and he's waiting for the system notification
- *UserVisiting*: he's a User who has booked a visit and he's still waiting for entering into the supermarket.
- *UserInShop*: he's a client who has taken his own queue ticket or he has booked a visit. After that he is arrived at the supermarket, he has scanned the QR code and he has entered into the shop.

## 2.4 Assumptions, dependencies and constraints

### 2.4.1 Assumptions

- D1** The system delete the Reservation the Smart User accumulates a delay to reach the market greater than 10 minutes
- D2** The system delete the Reservation the Mobile User accumulates a delay to reach the market greater than 15 minutes
- D3** The system handles the threshold number of Users allowed in the market
- D4** The Smart User have to be connected to Internet through Wi-Fi/Cellular network
- D5** The Mobile User have to be connected to Internet through his own mobile operator
- D6** A Visit is associated to a Date and a period of time (start/end time);

- D7** A Booking is associated to one and only one QRCode
- D8** User must have one and only one Visit activated;
- D9** User must have one and only one Reservation activated
- D10** A Booking belongs to one and only one User
- D11** The Waiting Time plus the Shopping Time mustn't exceed the Closure Time
- D12** In each Date and Slot Time must contain at most N Visits

## Chapter 3

# Specific Requirements

### 3.1 External Interface Requirements

The following mockups provide a model of graphic interface that will show our program.

We will create a user interface that will be user friendly in order to be easy to use also from non-technical users.

The mockups has the aim to illustrate the main aspects of the CLup and the Receptionist's app.

#### 3.1.1 User Interfaces

The following mockups show the main operation allowed by Clup to the Smart User:

Figure 3.1: Login: Users already registered signs in with their credential.

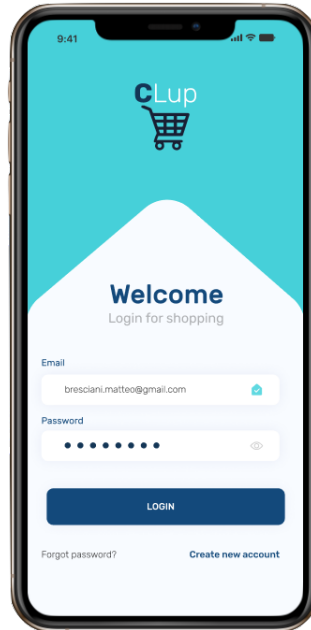
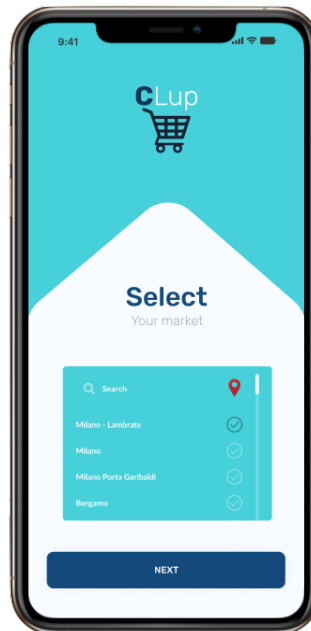


Figure 3.2: Market selection: After the login, the user have to select in which market wants to go shopping, due to his position.



9:41 CLup

### Registration

Compile with your information

Name

Surname

Date of Birth  ☒ Male ☐ Female

Fiscal Code

Address

Telephone Number

NEXT

(a) Page 1.

9:41 CLup

### Registration

Compile with your information

Username

Password

Confirm Password

☒ I agree to the Terms of Service and the CLup privacy policy

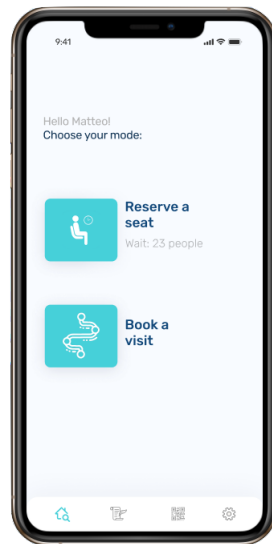
REGISTER

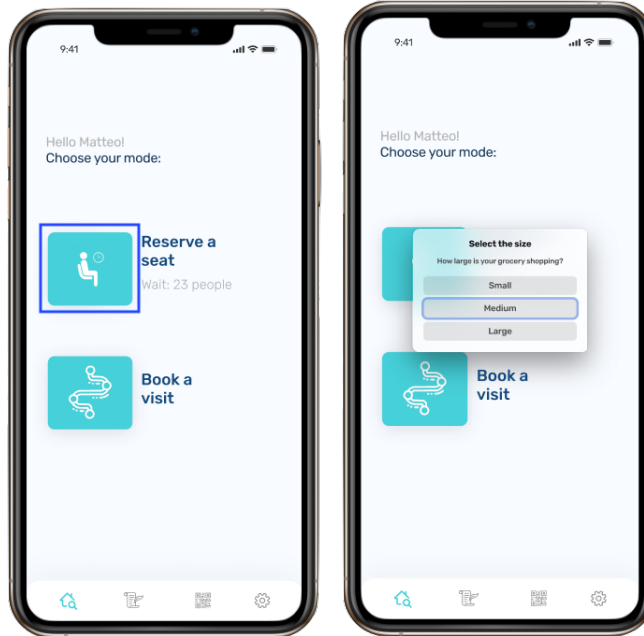
(b) Page 2

Figure 3.3: Registration: Users not registered can register himself putting his own data, e-mail and password. In addition Users have to accepts the Term of Service and the CLup privacy policy to proceed.

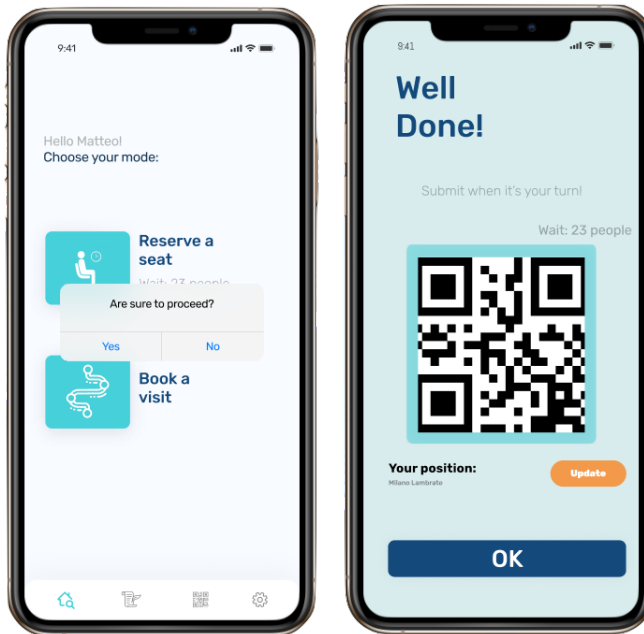


Figure 3.4: Home: Homepage of CLup from which the User can select to book a Visit or a Reservation.



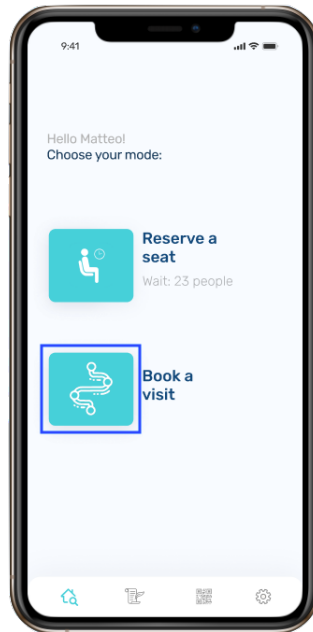


(a) User chooses Reservation (b) Grocery shopping size selection

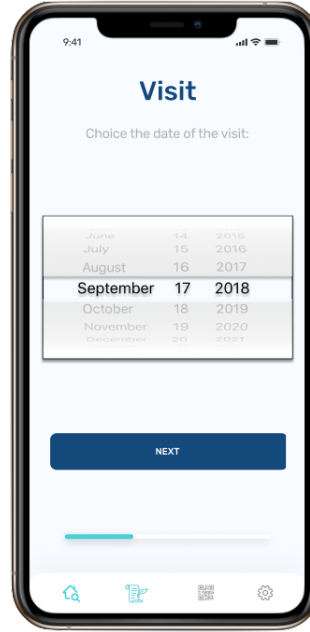


(c) Booking confirm (d) Reservation's QRCode is provided

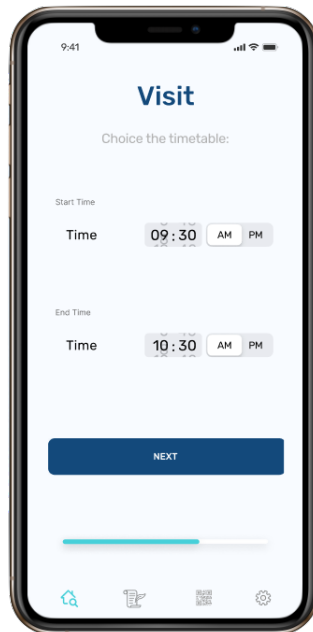
Figure 3.5: Reservation: The Smart User can book a Reservation following the following steps.



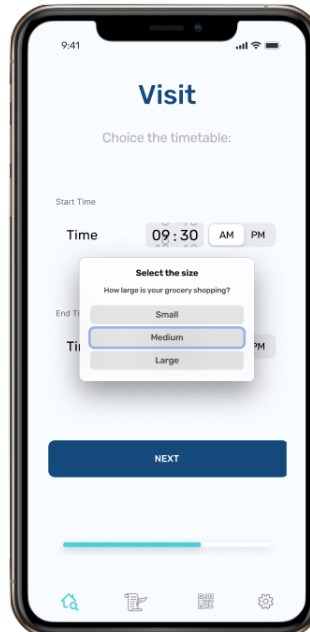
(a) Smart User chooses Visit



(b) Date selection



(c) Time period selection

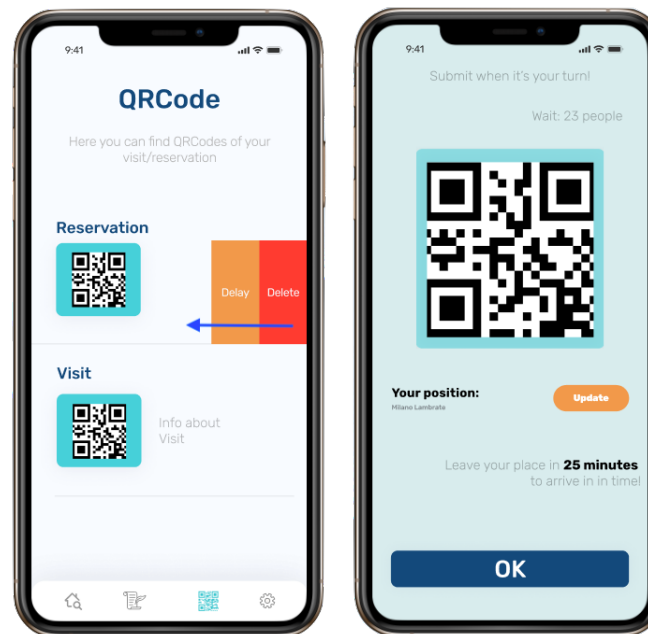


(d) Grocery shopping size selection.

Figure 3.6: Visit: The Smart User can book a Visit following the following steps. At the end Visit's QRCode is provided.



(a) Smart User has booked only Reservation  
(b) Smart User has booked both Visit and Reservation

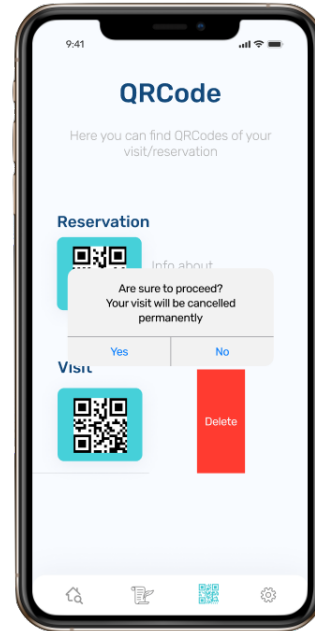


(c) Smart User manage his Reservation  
(d) Smart User visualize his own Booking's QRCode

Figure 3.7: QRCode section: in this section the user can manage his booking. A Smart User can cancel, delay (only for Reservation), or visualize his QRCode in order to access to the market.



(a) Delay confirmation of a Reservation

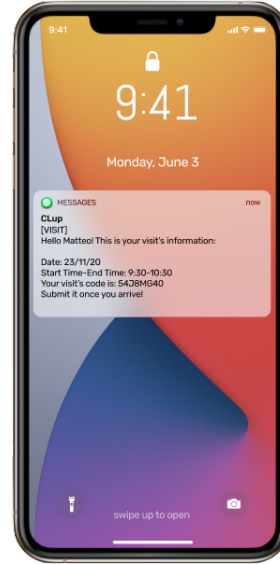


(b) Cancellation confirmation of a Visit

Figure 3.8: Cancel and Delay action: A alert will showed to Smart User to confirm his action.



(a) A notification is sent to a Smart User to inform him to leave in order to reach the market in time.



(b) An SMS is sent to a Mobile User with booking information of his Visit. In particular contains the Booking's schedule and the Identification Code to submit.

Figure 3.9: Notification and SMS: User receive his information about his Booking depending on whether is a Smart or Mobile User.

### 3.1.2 Receptionist Interfaces

The following mockups show the main operation allowed by Receptionist through his application to manage Booking of the Mobile Users.

Figure 3.10: Receptionist signs in with their credential.

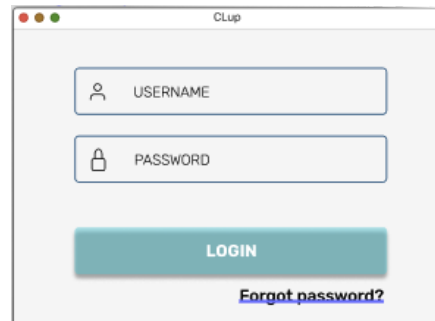


Figure 3.11: Receptionist can register a new Mobile User or select a new one if it's already registered.

**cLup**

Compile with customer's information:

Name

Surname

Date of Birth ☒ Male ☐ Female

Fiscal Code

Address

Telephone Number

REGISTER USER

USER ALREDY REGISTERED

Figure 3.12: Receptionist selects the Mobile User if he's already registered.

Search

	NAME	ADDRESS	FISCAL CODE	DATE OF BIRTH	STATUS
<input type="checkbox"/>	<b>Matilde A Napolitani</b> 306-655-9238	Via Venezia 3, Mangone	EC75640986	12/14/1987	SELECT
<input type="checkbox"/>	<b>Vittoria G Loggia</b> 0357 3730679	Via Nazario Sauro 120, Ciniello Balsamo	CM92721873	11/17/1959	SELECT
<input checked="" type="checkbox"/>	<b>Cristoforo A Fiorentino</b> 0311 8617669	Via Nazario Sauro 116, Limbo	IY2163667	10/5/1955	SELECT
<input type="checkbox"/>	<b>Silvia M Nucci</b> 0357 3730679	Via San Pietro Ad Aram 62, Sulbiate	KJ96738010	3/31/1959	SELECT
<input type="checkbox"/>	<b>Matilde A Napolitani</b> 0399 7572441	Via Venezia 3, Mangone	EC75640986	12/14/1987	SELECT
<input type="checkbox"/>	<b>Alba L Lucciano</b> 0399 7572441	Via San Pietro Ad Aram 97, Villa Raverio	JN72860047	4/10/1958	SELECT
<input type="checkbox"/>	<b>Matilde A Napolitani</b> 0349 7392400	Via Venezia 3, Mangone	EC75640986	12/14/1987	SELECT
<input type="checkbox"/>	<b>Norberto F Manfrin</b> 0357 3730679	Via San Cosmo fuori Porta Nolana 143, Milano	SN60976052	1/10/1985	SELECT
<input type="checkbox"/>	<b>Milena A Foliero</b> 0347 5572047	Via San Pietro Ad Aram 93, Settala	FL80465076	8/16/1955	SELECT
<input type="checkbox"/>	<b>Ester B Mazzi</b> 0374 3131371	Via San Pietro Ad Aram 103, Usmate	VW39138258	5/22/1977	SELECT
<input type="checkbox"/>	<b>Pancrazio A Colombo</b> 306-655-9238	Via San Cosmo fuori Porta Nolana 6, Palazzolo Milanese	GR79312980	3/4/1961	SELECT

CUSTOMERS: 708 Rows per page: 11 1-11 of 708

Figure 3.13: Receptionist can manage Mobile User's Booking.

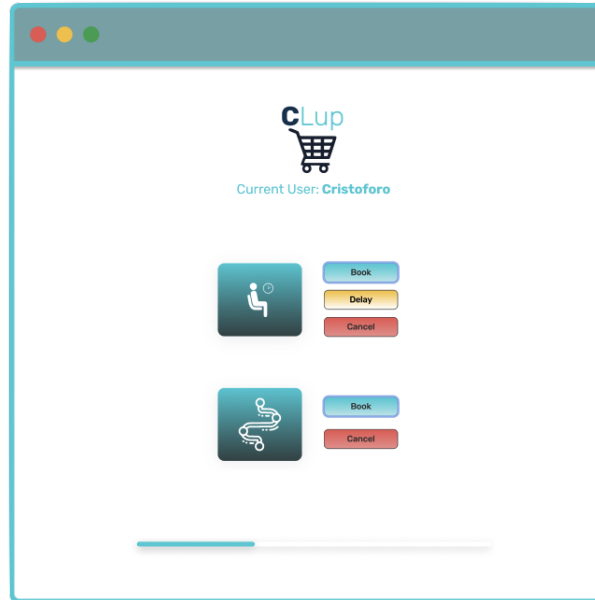


Figure 3.14: Receptionist selects the grocery shopping size told by Mobile User.

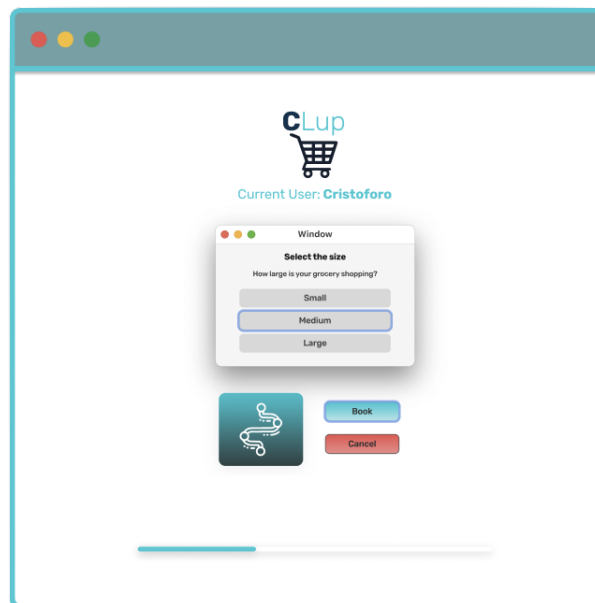
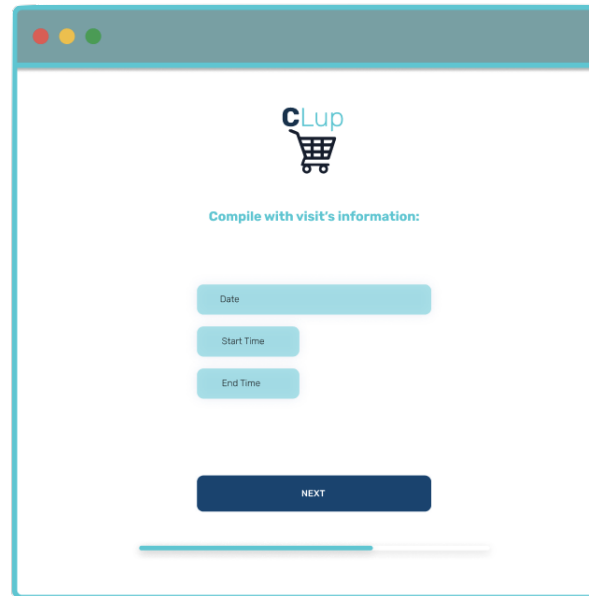


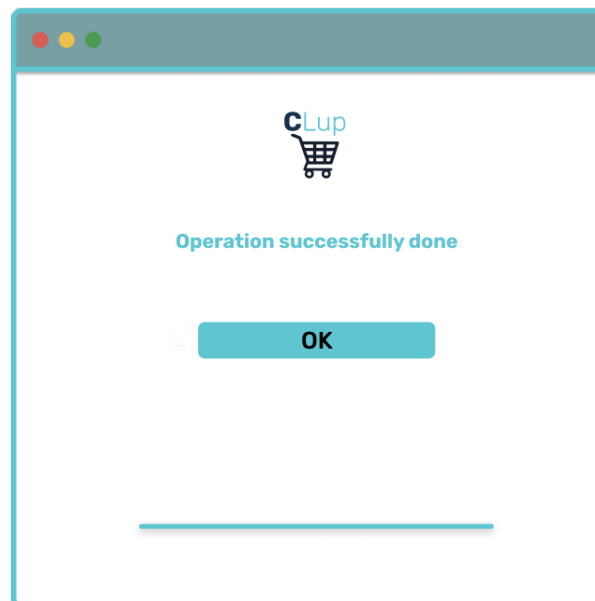


Figure 3.15: Receptionist inserts visit information told by Mobile User.



The screenshot shows a mobile application window with a teal header bar containing three colored dots (red, yellow, green). The main content area is white and features the 'Clup' logo at the top, which consists of the text 'Clup' in a teal font next to a shopping cart icon. Below the logo, the text 'Compile with visit's information:' is displayed in a teal font. Underneath this text are three stacked, light blue rectangular input fields labeled 'Date', 'Start Time', and 'End Time'. Below these fields is a dark blue rectangular button with the word 'NEXT' in white capital letters. At the bottom of the screen, there is a horizontal progress bar with a teal segment on the left and a white segment on the right.

Figure 3.16: Booking made by Receptionist is finished.



### 3.1.3 Hardware Interfaces

CLup is a SW application which has the aim to book and manage appointments at the market. So the app requires a Smartphone with internet connection due to send any request to CLup servers for any Bookings. Then, Smartphone should have also a GPS services that allows the system to estimate the User's time necessary to reach the market. But this is not mandatory due to a proper functioning of CLup. In addition, the supermarket will have two scanners in order to validate the reservation:

- One at the entry, that will read QR code and will confirm client reservations in case they will be valid.  
The scanner will reject reservation if QR code will result invalid or will have passed to much time from its call.
- One at the exit, that when clients will finish shopping allow them to exit to supermarket opening the doors.  
Another features of exit QR code is to monitor the numbers of client into the shop.

The scanners will be used to obtain useful information about client shopping time

### 3.1.4 Software Interfaces

### 3.1.5 Communication Interfaces

Every User and Receptionist uses a HTTPS protocol to make request to CLup's servers. In this way informations sent are safe due to encryption. [...]

## 3.2 Functional Requirements

- R1** Smart User received a notification due to reach the market
- R2** Mobile User received a SMS due to reach the market;
- R3** The system provide the time estimation to reach the market;
- R4** The User chooses the start and end time of the Visit;
- R5** The User can postpone his turn by 10 turns;
- R6** The system get the entrance time by a User when submits his own QRCode;
- R7** The system get the exit time by a User when submits his own QRCode;
- R8** The system provides the number Users in queue;
- R9** The system provides the estimation time of leaving to reach the market in time;

- R10** The Smart User must be registered;
- R11** The Smart User must be already logged in;
- R12** The Mobile User must be registered;
- R13** The Mobile User provide personal data to the Receptionist;
- R14** User have to choose the size of his grocery shopping between Shopping size
- R15** The User must select a date in which the market is opened;
- R16** The User must select a start and end time available;
- R17** The Mobile User calls the Receptionist;
- R18** The system provides Smart User the Booking's QRCode in CLup application;
- R19** The system provides Mobile User the Booking's Identification Code through SMS;
- R20** Smart User have to be recognized at the entrance;
- R21** User must have an activated Visit not yet submitted;
- R22** User must have an activated Reservation not yet submitted
- G1** User enters once arrived at the market
  - R1** Smart User received a notification due to reach the market;
  - R2** Mobile User received a SMS due to reach the market;
  - R3** The system provide the time estimation to reach the market;
  - R4** The User chooses the start and end time of the Visit;
  - R5** The User can postpone his turn by 10 turns;
  - R8** The system provides the number Users in queue;
  - D1** The system delete the Reservation the Smart User accumulates a delay to reach the market greater than 10 minutes
  - D3** The system handles the threshold number of Users allowed in the market
  - D4** The Smart User have to be connected to Internet through Wi-Fi/Cellular network
  - D5** The Mobile User have to be connected to Internet through his own mobile operator
- G2** Put a limit to the number of Users in the market
  - R4** The User chooses the start and end time of the Visit;

- R6** The system get the entrance time by a User when submits his own QRCode;
- R7** The system get the exit time by a User when submits his own QRCode;
- R9** The system provides the estimation time of leaving to reach the market in time;
- G3** Smart User can make a Reservation
  - R8** The system provides the number Users in queue;
  - R10** The Smart User must be registered;
  - R11** The Smart User must be already logged in;
  - R12** The Mobile User must be registered;
  - R15** The User must select a date in which the market is opened;
  - R18** The system provides Smart User the Booking's QRCode in CLup application;
  - D4** The Smart User have to be connected to Internet through Wi-Fi/Cellular network
  - D7** A Booking is associated to one and only one QRCode
  - D9** User must have one and only one Reservation activated
  - D10** A Booking belongs to one and only one User
- G4** Smart User can make a Visit
  - R10** The Smart User must be registered;
  - R11** The Smart User must be already logged in;
  - R12** The Mobile User must be registered;
  - R14** User have to choose the size of his grocery shopping between Shopping size
  - R15** The User must select a date in which the market is opened;
  - R16** The User must select a start and end time available;
  - R18** The system provides Smart User the Booking's QRCode in CLup application;
  - D4** The Smart User have to be connected to Internet through Wi-Fi/Cellular network
  - D6** A Visit is associated to a Date and a period of time (start/end time);
  - D7** A Booking is associated to one and only one QRCode
  - D8** User must have one and only one Visit activated;

**D12** In each Date and Slot Time must contain at most N Visits

**G5** Mobile User can make a Reservation

**R8** The system provides the number Users in queue;

**R10** The Smart User must be registered;

**R11** The Smart User must be already logged in;

**R12** The Mobile User must be registered;

**R13** The Mobile User provide personal data to the Receptionist;

**R14** User have to choose the size of his grocery shopping between Shopping size

**R17** The Mobile User calls the Receptionist;

**R19** The system provides Mobile User the Booking's Identification Code through SMS;

**R20** Smart User have to be recognized at the entrance;

**D5** The Mobile User have to be connected to Internet through his own mobile operator

**G6** Mobile User can make a Visit

**R10** The Smart User must be registered;

**R11** The Smart User must be already logged in;

**R12** The Mobile User must be registered;

**R13** The Mobile User provide personal data to the Receptionist;

**R14** User have to choose the size of his grocery shopping between Shopping size

**R15** The User must select a date in which the market is opened;

**R16** The User must select a start and end time available;

**R17** The Mobile User calls the Receptionist;

**R19** The system provides Mobile User the Booking's Identification Code through SMS;

**R20** Smart User have to be recognized at the entrance;

**G7** Smart User can cancel a Booking

**R10** The Smart User must be registered;

**R11** The Smart User must be already logged in;

**R12** The Mobile User must be registered;

- R21** User must have an activated Visit not yet submitted;
- R22** User must have an activated Reservation not yet submitted
- D4** The Smart User have to be connected to Internet through Wi-Fi/Cellular network
- G8** Mobile User can cancel a Booking
  - R10** The Smart User must be registered;
  - R11** The Smart User must be already logged in;
  - R12** The Mobile User must be registered;
  - R13** The Mobile User provide personal data to the Receptionist;
  - R17** The Mobile User calls the Receptionist;
  - R21** User must have an activated Visit not yet submitted;
  - R22** User must have an activated Reservation not yet submitted
  - D5** The Mobile User have to be connected to Internet through his own mobile operator

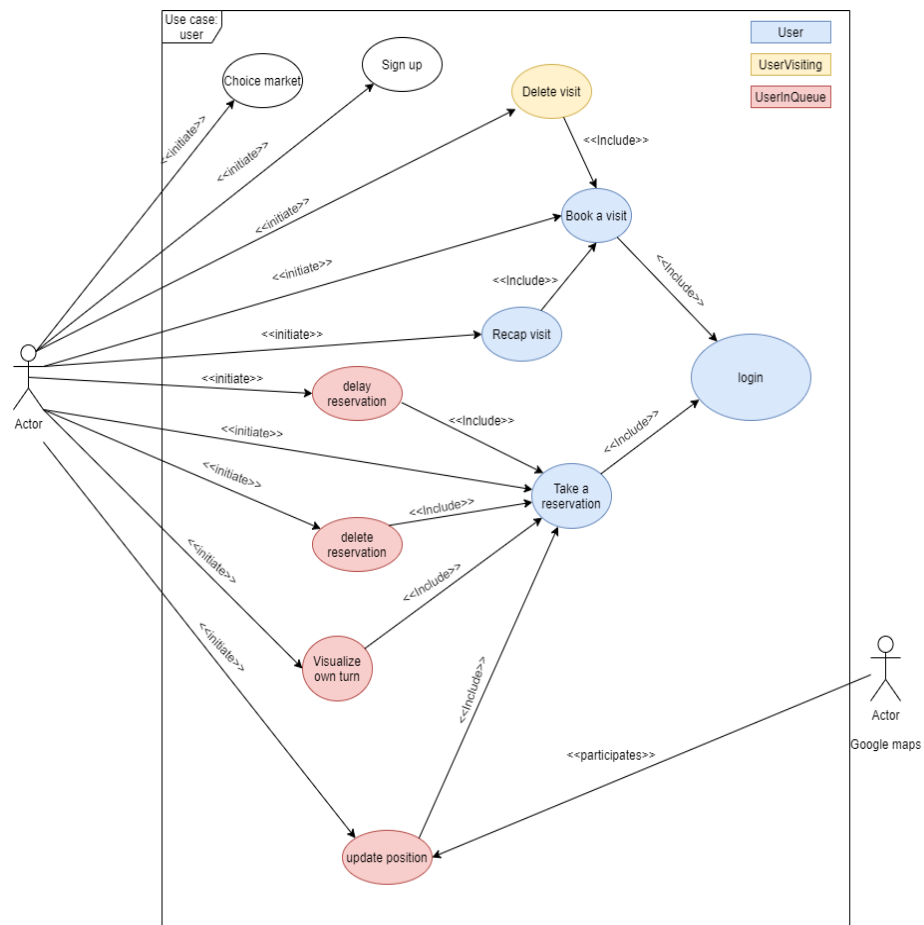
Giovanna, a career woman who is always in trouble to find free time, needs to go grocery shopping for her family. Indeed, once she finished working, she goes to the market and, due to the lockdown, have to wait in line for hours to have access to it. The result is that, coming back home later, she can't put some time in her children. However, in the past days, she discovered CLup App which allows her to book a visit in the market in advance, by only putting the range time available and the size of the expenditure. In this way, Giovanna will save a lot of time and will stay longer with her children, instead of waiting in line outside the market.

Nevertheless, due to Covid-19 emergency, the market will be always filled.

Jonhathan, on the advice of his grandchild, bought a new smartphone. In addition started using it and installing usefull applications like CLup. In particular, with it, he'll be able to make a reservation in market's queue. In this way, CLup will notify him when, accordingly to his position, leave to get the market in time for his turn. Finally, once he arrived, can go in there by simply scanning the QRCode sent before. At the end Jonhathan will go shopping without waiting on feet his turn during a cold winter's day. Gustavo, an elderly person, he discovered recently a new time saver and usefull service at the market. It consists in booking a visit at the market by simply calling the number found in an advertisement. Due to the fact that Gustavo is sick of waiting too much in the queue, decides to call this market number to book the visit. On the other side Marta, a gentle receptionist who works for the market, answers to Gustavo's call; she takes care of the registration of his own data, the credentials and the all visit information (i.e data and range time).

Gustavo will be notified about the appointment with an SMS on his mobilephone in time. In addition the SMS will provide the schedule for the visit and the code which will be submitted at the entrance.

Figure 3.17: Use case USER



## Use cases

Name	Login
Actor	User
Entry condition	<ul style="list-style-type: none"> <li>• The user has register</li> <li>• The user opened the application</li> </ul>
Events flow	<ul style="list-style-type: none"> <li>• The user open the application</li> <li>• Enters username and password</li> <li>• Click “Login button”</li> </ul>
Exit condition	User log in
Exceptions	<ul style="list-style-type: none"> <li>• User enters wrong username</li> <li>• User enters wrong password</li> </ul>

Name	Sign up
Actor	User
Entry condition	<ul style="list-style-type: none"> <li>• User enters for the first time on the app</li> <li>• The user hasn’t registered</li> </ul>
Events flow	<ul style="list-style-type: none"> <li>• The user selects “Create new account” option</li> <li>• The user enters required fields</li> <li>• The user accepts CLup privacy policy</li> <li>• The user clicks “Register” button</li> </ul>
Exit condition	The users is registered
Exceptions	<ul style="list-style-type: none"> <li>• The users has already been registered</li> <li>• The user did not accept CLup privacy policy</li> <li>• The user enters username that has already been used</li> <li>• The user enters prohibited characters</li> </ul>



Name	Book a visit
Actor	User
Entry condition	<ul style="list-style-type: none"> <li>• The user has logged in</li> </ul>
Events flow	<ul style="list-style-type: none"> <li>• The user click on Home Page</li> <li>• Click on “Book a visit” button</li> <li>• Select the visit date</li> <li>• Select the visit time</li> <li>• Insert shopping size</li> <li>• Click on “Next” button</li> </ul>
Exit condition	The user book a visit
Exceptions	

Name	Take reservation
Actor	User
Entry condition	<ul style="list-style-type: none"> <li>• The user has logged in</li> </ul>
Events flow	<ul style="list-style-type: none"> <li>• The user click on “Home Page” menù</li> <li>• Click on “Reserve a seat” button</li> <li>• Confirm the reservation</li> </ul>
Exit condition	<ul style="list-style-type: none"> <li>• The user has been queued</li> <li>• The QR code has been associated with user</li> </ul>
Exceptions	The shop is closed

Name	Delete Visit
Actor	UserVisiting
Entry condition	<ul style="list-style-type: none"> <li>• The user has logged in</li> <li>• The user took a visit</li> </ul>
Events flow	<ul style="list-style-type: none"> <li>• The user clicks on “QR code” menù</li> <li>• The visits and reservation are listed</li> <li>• The user clicks on “Delete” button near the visit</li> <li>• The user confirms the cancellation</li> </ul>
Exit condition	<ul style="list-style-type: none"> <li>• The system delete user visit</li> <li>• The system make available date and time of user visit</li> </ul>
Exceptions	

Name	Delete reservation
Actor	UserInQueue
Entry condition	<ul style="list-style-type: none"> <li>• The user has logged in</li> <li>• The user took a reservation</li> </ul>
Events flow	<ul style="list-style-type: none"> <li>• The user clicks on “QR code” menù</li> <li>• The visits and reservation are listed</li> <li>• The user clicks on “Delete” button near the reservation</li> <li>• The user confirms the cancellation</li> </ul>
Exit condition	The system delete user reservation
Exceptions	

Name	Delay reservation
Actor	UserInQueue
Entry condition	<ul style="list-style-type: none"> <li>• The user has logged in</li> <li>• The user took a reservation</li> </ul>
Events flow	<ul style="list-style-type: none"> <li>• The user clicks on “QR code” menù</li> <li>• The visits and reservation are listed</li> <li>• The user clicks on “Delay” button near the reservation</li> <li>• The user confirms the delay</li> </ul>
Exit condition	<ul style="list-style-type: none"> <li>• The user turn will be shift ten places after.</li> <li>• The delay button will be disabled.</li> </ul>
Exceptions	<ul style="list-style-type: none"> <li>• The user queue is too small</li> <li>• The user delay function has already been used</li> </ul>

Name	Recap visit
Actor	User
Entry condition	The user has logged in
Events flow	The user click on “history” menù
Exit condition	The visits and reservation are listed
Exceptions	

Name	Visualize own turn
Actor	UserInQueue
Entry condition	<ul style="list-style-type: none"> <li>• The user has logged in</li> <li>• The user took a reservation</li> </ul>
Events flow	The user clicks on “history” menù
Exit condition	The system show the user turn near the reservation QR code
Exceptions	

Name	Update position
Actor	UserInQueue
Entry condition	<ul style="list-style-type: none"> <li>• The user has logged in</li> <li>• The user took a reservation</li> </ul>
Events flow	<ul style="list-style-type: none"> <li>• The user clicks on “QR code” menù</li> <li>• The user clicks on “Update position”</li> </ul>
Exit condition	The system calculate the number of customers in queue after which will send the message
Exceptions	<ul style="list-style-type: none"> <li>• GPS position too far from supermarket</li> <li>• Invalid GPS position</li> <li>• GPS is inactive</li> </ul>

Name	Choice market
Actor	User
Entry condition	User login for the first time on the app
Events flow	<ul style="list-style-type: none"> <li>• Select the supermarket</li> <li>• Click “Next” to confirm</li> </ul>
Exit condition	The system calculate the number of customers in queue after which will send the message
Exceptions	The user is linked to supermarket

### 3.2.1 Reception

#### Scenarios

##### Scenario 1

Gustavo, an elderly person, he discovered recently a new time saver and usefull service at the market.

It consists to book a visit at the market by simply calling the number found in an advertisement.

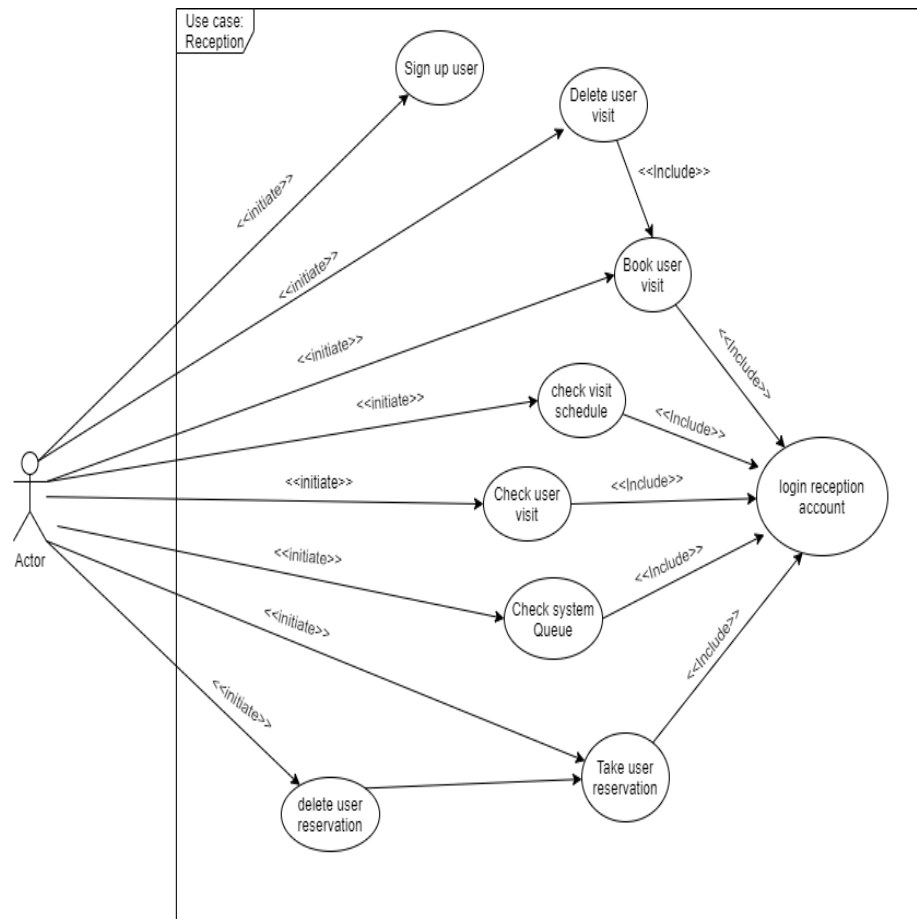
Due to the fact that Gustavo is sick of waiting too much in the queue decide to call this market number to book the visit.

On the other side Marta, a gentle receptionist who works for the market, answers to Gustavo's call; she takes care of the registration of his own data, the credentials and the all visit information (i.e data and range time).

Gustavo will be notified about the appointment with an SMS on his mobilephone in time.

In addition the SMS will provide the schedule for the visit and the code which will be submitted at the entrance.

Figure 3.18: Use case RECEPTION



## Use cases

Name	Sign up user
Actor	Reception
Entry condition	<ul style="list-style-type: none"> <li>• The receptionist has logged in</li> <li>• The user has not registered</li> </ul>
Events flow	<ul style="list-style-type: none"> <li>• The receptionist asks required information to do registration</li> <li>• The receptionist fills the fields</li> <li>• The receptionist confirms the registration</li> </ul>
Exit condition	The user has registered
Exceptions	<ul style="list-style-type: none"> <li>• The phone cuts out</li> <li>• The user has already registered</li> </ul>

Name	Delete user visit
Actor	Reception
Entry condition	<ul style="list-style-type: none"> <li>• The receptionist has logged in</li> <li>• The user wants delete a visit</li> </ul>
Events flow	<ul style="list-style-type: none"> <li>• The receptionist asks user information</li> <li>• The receptionist asks visit information</li> <li>• The receptionist checks the visit on the menù</li> <li>• Delete user visit clicking “delete” button</li> </ul>
Exit condition	The user visit is deleted
Exceptions	The user has not booked any visits

Name	Book user visit
Actor	Reception
Entry condition	<ul style="list-style-type: none"> <li>• The receptionist has logged in</li> <li>• The user must be registered</li> </ul>
Events flow	<ul style="list-style-type: none"> <li>• The receptionist asks the credentials</li> <li>• The receptionist enters the credentials in the system to check registration</li> <li>• Click “select” button on user row</li> <li>• Click “book a visit” button</li> <li>• The receptionist check free slot and agree with user date and time</li> <li>• Enter date,start time, end time</li> <li>• The receptionist confirms the visit</li> </ul>
Exit condition	The user book a visit
Exceptions	The phone cuts out

Name	Check user visit
Actor	Reception
Entry condition	<ul style="list-style-type: none"> <li>• The receptionist has logged in</li> <li>• The user must be registered</li> </ul>
Events flow	<ul style="list-style-type: none"> <li>• The receptionist check user registration</li> <li>• The receptionist check user visits</li> </ul>
Exit condition	The system list all user visits
Exceptions	<ul style="list-style-type: none"> <li>• The user does not exist</li> <li>• The user has not booked any visits</li> </ul>

Name	Check visit schedule
Actor	Reception
Entry condition	The receptionist has logged in
Events flow	<ul style="list-style-type: none"> <li>• The receptionist click on calendar</li> <li>• The system lists all free dates</li> <li>• The receptionist click on date</li> </ul>
Exit condition	The system lists all date free slot
Exceptions	

Name	Check system queue
Actor	Reception
Entry condition	The receptionist has logged in
Events flow	The receptionist clicks on “Check queue”
Exit condition	The system lists all user in queue information
Exceptions	The queue is empty

Name	Take user reservation
Actor	Reception
Entry condition	<ul style="list-style-type: none"> <li>• The receptionist has logged in</li> <li>• The user must be registered</li> </ul>
Events flow	<ul style="list-style-type: none"> <li>• The receptionist asks the credentials</li> <li>• The receptionist enters the credentials in the system to check registration</li> <li>• Click “select” button on user row</li> <li>• Click “reserve a sit” button</li> <li>• The receptionist confirms the reservation</li> </ul>
Exit condition	The user has been queued
Exceptions	The queue is full

Name	Delete user reservation
Actor	Reception
Entry condition	<ul style="list-style-type: none"> <li>• The receptionist has logged in</li> <li>• The user must be registered</li> </ul>
Events flow	<ul style="list-style-type: none"> <li>• The receptionist asks user information</li> <li>• The receptionist checks the reservation on the menù</li> <li>• Delete user reservation clicking “delete” button</li> </ul>
Exit condition	The user reservation is deleted
Exceptions	The user has not booked any reservation



Name	Login reception account
Actor	Reception
Entry condition	The receptionist open desktop app
Events flow	<ul style="list-style-type: none"> <li>• The receptionist enter the credentials to log in</li> <li>• Click on “Sign in” button</li> </ul>
Exit condition	The receptionist has logged in
Exceptions	<ul style="list-style-type: none"> <li>• Wrong password</li> <li>• Wrong username</li> </ul>

### 3.3 Performance Requirements

### 3.4 Design Constraints

#### 3.4.1 Standards compliance

Especially, the system will be released in the main digital distribution platform (such as App Store or Google Play). So it must follow their guidelines in order to have a proper and a lawful distribution. In addition, due to the fact that it retrieves and analyses many sensitive data, application must respect the main privacy guidance. In particular in Europe must follow the General Data Privacy Regulation (GDPR), due to a safe and aware processing of data.

#### 3.4.2 Hardware limitations

- 2G/3G/4G/5G connection: they're essential due to server connection to compile booking request;
- GPS: it's used to allow user to estimate the time spending to reach the market in time. But it's not mandatory for booking;

#### 3.4.3 Any other constraint

There are no other constraint.

### 3.5 Software System Attributes

#### 3.5.1 Reliability

The application have to provide user the possibility to book both reservation and visit successfully. [TODO]

### **3.5.2 Availability**

Due to the fact that nowadays grocery shopping is available almost all day, the availability of the system is very high. So the required availability is close to 99%. However, the reservation function has a lower availability because of the inability to book a seat in queue if the market is closed in some hours of the day.

### **3.5.3 Security**

Security is one of the most critical aspect of CLup. So User's sensitive data are stored safely DBMS accessible only by strict level of privilege. In addition, communication towards the application server (like login or booking requests) are implemented using HTTPS protocol, which, with TLS protocol, ensure the encryption of every packets.

### **3.5.4 Maintainability**

The application implementation must be oriented towards an high scalability in order to guarantee an efficient and cheaper maintenance. This could be done by using design patterns.

### **3.5.5 Portability**

The system must be smoothly portable almost the main smartphone on the market. So CLup must be distributed for the main mobile operating system (i.e App Store and Google Play), coding it with program language such as Android or Swing. In addition CLup Guest, the application used by receptionist to book visit and reservation of the Users not register, must be compatible with the main Operating system such as Windows and Mac OS X. [todo]

## Chapter 4

# Formal Analysis Using Alloy

## Chapter 5

# Effort Spent

## Chapter 6

## References