

17/11/2020

World phenomena:

someone wants/needs to go to the supermarket
order in which a person does the grocery shopping
person gets to/approaches the supermarket by car/bike/on foot, ...
a person decides to buy an item
a person pays at the check-out
a person exits without buying (contained in the next one)
a person enters/exits in/from the supermarket (maybe Shared: our system sees people exiting and controls entrance flow)

Shared phenomena:

available slots for shopping (World controlled: it depends on people deciding to go or not to the shopping centre)
person books a visit (World controlled)
person gets a ticket (World controlled)
person cancels his booked visit (World controlled)
person cancels his booked ticket (World controlled)
a person waits to be called for his turn (Machine controlled)
a person knows approximate time to spend in the supermarket (World controlled)
a person knows approximate categories of items to buy (World controlled)
a person is notified for entrance (Machine controlled)

GOALS:

avoid physical lining up (*maybe this is a sub-goal of the following one*)
grant social distance outside shopping centre
manage entrances in the shopping centre (?)
avoid having crowds inside (avoid too many people inside the shopping centre)
enter in the supermarket respecting safety rules
respect security rules imposed by government (probably too general: it implies all the others)

DOMAIN ASSUMPTIONS:

1. GPS provides the exact location with an error of 10 metres at most
2. people keep at least 2 metres distance inside the supermarket
3. a ticket is associated to only one person
4. a visit is associated to only one person
5. entrance is valid only for one person
6. the supermarket has a maximum capacity for people inside
7. *people without user application can monitor entrances and estimated time (for their turn) through displays*
8. people keep at least 2 metres distance in shopping centre's proximity, while waiting or during any other activity
 - people watching the display keep at least 2 metres distance (outside the supermarket)

REQUIREMENTS:

1. the system allows users to book one or more visits
2. the system does not allow a person to enter if shopping centre's maximum capacity has been reached
3. the system does not allow for entrance a person who has not booked a visit or got a ticket
4. a user application is associated to a profile (personal profile)
5. the system allows "ticket-machine" application to get a ticket
6. the system allows a user application to get a ticket only when no other ticket is "pending" (booked but not called) for that profile
7. the system sends a notification two minutes before entrance (only in case of user application)
8. the system allows a customer to have the possibility to enter only when it is his turn and for the next ten minutes
9. the system stores reserved slots for shopping for the next month from current date and time
10. the system registers time spent inside the supermarket for every customer
11. the system allows to insert a list of items (that user would like to buy) when booking a visit
12. the system is able to build statistics (time spent in the supermarket, items/categories of items purchased)
13. the system generates a unique code associated to every ticket/visit
 - the system generates a unique QR code associated to every ticket/visit booked from user application
14. the system sends notifications basing on user's actual position and time remaining before his turn
15. the system allows users to get information about estimated time before being called
16. the mobile application enables 100% screen brightness when a QR code is displayed

Time: 2h30:

1h World and Shared phenomena

30min goals

30min domain assumptions

30min requirements

Andrea and Roberto

SCENARIOS

- **Delete a ticket reservation**

Alessandro, because of a sanitary emergency in his country, would like to avoid waiting for his turn in the supermarket's proximity. He has a smartphone and, through CLup app, decides to get a ticket: the expected time before being called is 2 hours. But in the meanwhile, he receives an important job call: he will be busy for the next four hours, so he deletes his ticket reservation through the application; the system notifies him that this operation went fine.

- **Delete a visit reservation**

Marta works from Monday to Friday as a teacher, so she usually goes to do the grocery shopping on Saturday afternoon. For this reason, she decides, using *CLup* mobile application, to book a visit to the supermarket for next Saturday, at 2pm. But as soon as she remembers that next Saturday she must pick her nephew up from school, she decides to delete her visit reservation (always with the app): the system notifies that this operation went fine, and the 2pm time slot for Saturday is now free for some other customer(s).

- **Entrance in the grocery**

Matteo is waiting in his car just outside his favourite grocery. Using *CLup* app on his smartphone, he has already got a ticket and his turn is approaching: he knows it thanks to the notification, received a few minutes ago. When it is time to enter, a new notification arrives and Matteo opens the app: he sees the QR code for entrance and a message telling him that it is his turn; QR code will expire in 10 minutes, as shown by another message (in the upper part of the smartphone's screen).

Matteo gets out of the car and enters the supermarket by showing his QR code to the scanner at the entrance: doors open and he can get into the grocery.

- **Suggest an alternative**

Andrea would like to go to his usual grocery, Esselunga (very close to his house), tomorrow at 5pm. It is very important to go tomorrow, because he has almost nothing in the fridge and his wife is complaining a lot about this fact.

Andrea uses *CLup* app on his smartphone to book a visit for tomorrow: he selects his usual supermarket, date and time for the visit. Unfortunately, a message tells him that there is no availability for his request; anyway, the system suggests him another date for his favourite Esselunga (in two days' time, always at 5pm) or another Esselunga shop (a little bit further from his house, but not very distant), available tomorrow at 5pm. Since it is very important for him to do the grocery shopping tomorrow, he accepts this latter advice: he books a visit for tomorrow at 5pm at the suggested Esselunga shop.

- **Get a ticket from ticket machine**

Antonio, an eighty-year-old man without a smartphone, approaches a grocery shop on foot, with the intention to buy all necessary for next week. Given the current rules about safety distance, he knows that he must get a ticket (for entrance) at one of the ticket machines outside the supermarket: he selects "Ticket" option on the touchscreen (wearing disposable gloves available near the

ticket machine itself) and a ticket with a QR code is printed, together with a 6-digits number identifying his turn; in addition, the screen shows a message telling him that the expected waiting time before his turn is 15 minutes. Antonio decides to walk around and comes back after 10 minutes; two (more) minutes later, his turn comes and the identification number appears on the waiting-screen at the top level of the queue. The man approaches the shop's entrance and shows his QR code (on paper) to the scanner positioned there: doors open and he can get into the supermarket.

- **Book a visit from ticket machine**

Lucia is a seventy-year-old woman without a smartphone. She decides to go to the grocery shop to buy food for the next few days and, given the current rules about safety distance, she knows that she must get a ticket (for entrance) at one of the ticket machines. She approaches the ticket machine, but she reads on its screen a message saying "Expected waiting time for tickets is: 4 hours". Of course, 4 hours are much more than what Lucia was expecting, so she decides to book a visit for another day: she selects "Visit" on the ticket machine's touchscreen, then selects Friday (from the calendar appearing) at 3pm. The machine confirms her reservation, printing a ticket with a QR code and a receipt. Lucia goes back home: she will come to the supermarket on Friday.

- **Available slot suggestion**

Marco is used to going to the grocery shop close to his house on Saturday afternoon; he always books a visit using *CLup* application on his smartphone, in order to avoid crowds and respect social distance. Due to his high number of reservations in the last months, the system knows Marco's habits about grocery shopping: in fact, the man receives a notification on Monday about an available slot for next Saturday at 4pm. As soon as Marco sees the notification on his smartphone, he fills all requested data for the reservation and books the suggested visit for Saturday: in this way, his habits will continue to be respected also for this week.

- **Notification based on GPS position**

Antonella has a very busy life, with two little children and a full-time job. Three days ago, she used *CLup* application for booking a visit to her usual supermarket: her turn is today at 4pm. However, her busy life has made her forget about the reservation, and at 3.30pm she is still totally unaware of it. But her smartphone has GPS services running, so at 3.32pm she receives a notification about the approaching turn: so, she immediately gets dressed and goes to the supermarket (approximate time from home to the shop is 10 minutes by car: this information is known by the system thanks to GPS position). She is able to get there at 3.55pm, totally in time for her turn.

Time: 1h30

Andrea and Roberto

19/11/2020

USE-CASES

1) Registration of guest

ID	UC1
Name	Registration of guest
Actors	Guest
Entry condition	<ul style="list-style-type: none">• Guest has the internet connection available• Guest has downloaded CLup app on his smartphone
Event flow	<ol style="list-style-type: none">1. Guest unlocks his smartphone2. Guest opens CLup app3. Guest sees the home page of the app4. Guest clicks on "Sign up" button5. Guest inserts email, name and surname in appropriate fields6. Guest chooses his password for the service, according to security standards7. Guest clicks on "Confirm" button8. The system confirms registration with an email; in the meanwhile, the app goes back to the home page9. Guest opens the email and validates his registration by opening the suggested link
Exit condition	<ul style="list-style-type: none">• The guest becomes a user and is now able to login and use the application services
Exceptions	<ol style="list-style-type: none">1. Guest does not fill some of the mandatory fields (email, name, surname, password)2. Password does not match security standards3. Email is already registered in the system's DB4. Guest inputs a non-valid email address5. Email does not exist <p>In cases 1,2,3,4, the system will not let "Confirm" button to be pressed until all fields are correctly filled in In case 5, guest will never receive an email, so he will never be able to complete registration</p>

2) User login

ID	UC2
Name	User login
Actors	User
Entry condition	<ul style="list-style-type: none"> • User has the internet connection available • User has downloaded CLup app on his smartphone • User is registered to the service
Event flow	<ol style="list-style-type: none"> 1. User unlocks his smartphone 2. User opens CLup app 3. User sees the home page of the app 4. User clicks on "Sign in" button 5. User inserts email and password in appropriate fields 6. User clicks on "Confirm" button 7. The system checks for a matching with all registered users (with their passwords) in the DB 8. The system confirms login and goes back to the home page
Exit condition	<ul style="list-style-type: none"> • The user is logged in • The user can use all CLup services
Exceptions	<ol style="list-style-type: none"> 1. User does not fill some of the mandatory fields (email, password) 2. The system does not find a matching with registered users (and corresponding passwords) in the DB <p>In case 1, the system will not let "Confirm" button to be pressed until all fields are correctly filled in</p> <p>In case 2, the system notifies an error message and goes back to the login page (where to insert again email and password)</p>

3) User gets a ticket

ID	UC3
Name	User gets a ticket
Actors	User
Entry condition	<ul style="list-style-type: none"> • User has the internet connection available • User has downloaded CLup app on his smartphone • User is registered to the service • User is logged in

Event flow	<ol style="list-style-type: none"> 1. User unlocks his smartphone 2. User opens CLup app 3. User sees the home page of the app 4. User clicks on "Get a ticket" button 5. User selects supermarket from the list, directly or after searching 6. User clicks "Confirm" button 7. The system notifies "Success" message and displays expected waiting time before being called
Exit condition	<ul style="list-style-type: none"> • User has a reservation through ticket • User sees the ticket in the home page of CLup application
Exceptions	<ol style="list-style-type: none"> 1. No more tickets are available for current day and selected supermarket <p>In this case, refer to use-case 4) *</p>

4) User receives suggestions after failure in getting a ticket

ID	UC4
Name	User receives suggestions after failure in getting a ticket
Actors	User
Entry condition	<ul style="list-style-type: none"> • User has the internet connection available • User has downloaded CLup app on his smartphone • User is registered to the service • User is logged in
Event flow	<ol style="list-style-type: none"> 1. User unlocks his smartphone 2. User opens CLup app 3. User sees the home page of the app 4. User clicks on "Get a ticket" button 5. User selects supermarket from the list, directly or after searching 6. User clicks "Confirm" button 7. The system shows a message, telling the user about no availability for the current day and inviting him to book a visit 8. The system suggests to get a ticket for the closest supermarket (with respect to the selected one) still available for current day
Exit condition	<ul style="list-style-type: none"> • A suggestion is shown to the user

Exceptions	Some tickets are available for current day and selected supermarket In this case, refer to use-case 3) *
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5) User books a visit

LOOK FOR NOTE #

ID	UC5
Name	User books a visit
Actors	User
Entry condition	<ul style="list-style-type: none"> • User has the internet connection available • User has downloaded CLup app on his smartphone • User is registered to the service • User is logged in
Event flow	<ol style="list-style-type: none"> 1. User unlocks his smartphone 2. User opens CLup app 3. User sees the home page of the app 4. User clicks on "Book a visit" button 5. User selects desired day on the appeared calendar, then the time for the visit 6. User selects the supermarket from the list, directly or after searching 7. User clicks "Confirm" button 8. The system notifies "Success" message
Exit condition	<ul style="list-style-type: none"> • User has a visit reservation • User sees booked visit in the home page of CLup application • User sees booked visit in "Visits" section of the application
Exceptions	<ol style="list-style-type: none"> 1. No availability for selected supermarket, day and time (for time, with an "error" of ± 30 minutes) <p>In this case, refer to use-case 6)</p>

6) User receives suggestions after failure in booking a visit

ID	UC6
Name	User books a visit
Actors	User

Entry condition	<ul style="list-style-type: none"> • User has the internet connection available • User has downloaded CLup app on his smartphone • User is registered to the service • User is logged in
Event flow	<ol style="list-style-type: none"> 1. User unlocks his smartphone 2. User opens CLup app 3. User sees the home page of the app 4. User clicks on "Book a visit" button 5. User selects desired day on the appeared calendar, then the time for the visit 6. User selects the supermarket from the list, directly or after searching 7. User clicks "Confirm" button 8. The system shows a message telling the user about no availability for selected day, time (± 30 minutes) and supermarket 9. The systems suggests the user available slots for: same supermarket, same day and different hour (± 2 hours); same supermarket, same hour and different day (± 2 days); same day, same hour, different supermarket (among the five closest to the selected one)
Exit condition	<ul style="list-style-type: none"> • User has a visit reservation • User sees booked visit in the home page of CLup application • User sees booked visit in "Visits" section of the application
Exceptions	<ol style="list-style-type: none"> 1. Availability for selected supermarket, day and time (for time, with an "error" of ± 30 minutes) <p>In this case, refer to use-case 5)</p>

7) User deletes a ticket reservation

ID	UC7
Name	User deletes a ticket reservation
Actors	User
Entry condition	<ul style="list-style-type: none"> • User has the internet connection available • User has downloaded CLup app on his smartphone • User is registered to the service • User is logged in • User has got a ticket for current day and his turn has

	not come yet
Event flow	<ol style="list-style-type: none"> 1. User unlocks his smartphone 2. User opens CLup app 3. User sees the home page of the app 4. User clicks the button to see all his reservations in the home page of the application 5. User clicks the deletion button for the ticket he wants to delete 6. The system shows "Are you sure you want to delete your ticket?" message dialog 7. User clicks "Yes" button 8. The system notifies "Success" message
Exit condition	<ul style="list-style-type: none"> • User has no tickets for the current day anymore • User does not see any ticket in the home page of CLup application
Exceptions	

8) User deletes a visit reservation

ID	UC8
Name	User deletes a visit reservation
Actors	User
Entry condition	<ul style="list-style-type: none"> • User has the internet connection available • User has downloaded CLup app on his smartphone • User is registered to the service • User is logged in • User has booked a visit and his turn has not come yet
Event flow	<ol style="list-style-type: none"> 1. User unlocks his smartphone 2. User opens CLup app 3. User sees the home page of the app 4. User clicks the button to see all his reservations in the home page of the application 5. User clicks the deletion button for the visit he wants to delete 6. The system shows "Are you sure you want to delete your visit?" message dialog 7. User clicks "Yes" button 8. The system notifies "Success" message

Exit condition	<ul style="list-style-type: none"> • User does not have the selected visit anymore • User does not see the selected visit in the home page of CLup application
Exceptions	

NOTES

** the situation is completely described in another use-case, so read and refer only to it
 # should we add to the event flow the possibilities users have to include the estimated time of his visit and the categories of product he's going to buy?*

Time: 1h30 19/11/2020
 Andrea and Roberto

Time: 30min 20/11/2020
 Andrea

Time: 30min 20/11/2020
 Roberto

PRODUCT FUNCTIONS

- **Get a ticket**

Users who want to reserve a ticket for accessing the supermarket, without lining up physically, can get it using *CLup* service. The functionality of getting a ticket can be achieved in two ways: the first one is using a smartphone/tablet, the second one with a ticket machine (outside the grocery shop).

Tickets correspond to "virtual" lining up: when someone gets a ticket, he becomes the last one to wait in the queue; when time slots finish for the current day (according to the supermarket's opening hours), no more tickets are assigned. A relevant aspect is that visits fill the same queue as tickets, but they can be reserved in advance (so, also some days/weeks before the date of the visit itself). Every customer can download *CLup* application on a mobile device; in order to get a ticket with the app, the guest needs to be registered and specify which grocery shop he wants to visit.

In alternative, a person can go directly to the supermarket and get his ticket (if available for that day) using a ticket machine: in this case, there is no need to specify the grocery shop (implicit: it is the closest one), nor to be registered; tickets are printed on paper in the form of QR code, with the addition of a 6-digits number identifying the turn in the waiting queue.

- **Book a visit**

Users, through *CLup* service, can book a visit for accessing the supermarket, avoiding physical lining up. The functionality of booking a visit can be achieved in two ways: the first one is using a smartphone/tablet, the second one with a ticket machine (outside the grocery shop).

Every guest can download *CLup* mobile application; in order to book a visit with the app, he needs to be registered and specify which grocery shop he wants to visit, in which day and time. A user might also specify the approximate duration of his visit and the categories of items he is going to buy, in order to help the system to coordinate other customers' visits/entrances with tickets.

Alternatively, a visit can be booked directly from outside the supermarket, using a ticket machine: in this case, there is no need to be registered, nor to specify the grocery shop; visit reservations are printed on paper in the form of QR code (with the addition of a reservation receipt containing all relevant information: supermarket, date, time).

- **Delete a reservation**

Users can delete reservations connected to a ticket or to a booked visit. In order to do so with the mobile application, the user should open the page regarding information about his tickets/visits and select the one he wants to delete.

The equivalent operation can be performed for tickets or visits booked using a ticket machine: the customer should scan the printed QR code with the machine's scanner.

- ***CLup* suggestion mechanism**

The system, for registered customers using the mobile application, is able to suggest time slots (for visits) based on specific users' habits. In particular, *CLup* stores all data about customers, days and time for visits, as well as most visited

supermarkets; analyzing this data, the application can send customized notifications when an attractive visit can be booked.

Other features for suggestions include giving alternatives after failures in getting a ticket or booking a visit (because no slots are available): for tickets, the system proposes to get one in the closest supermarket (with respect to the selected one) still available for current day; for visits, suggestion coincides with the proposal of a slot for a different hour/a different day/a close supermarket. These features are available only for customers using the mobile application.

- ***CLup* avoids people crowding inside the supermarket**

The system can manage slots according to known (or inferred) duration of customers' visits and categories of items to buy. The general idea is that, knowing more information, *CLup* can more precisely stagger reservations in order to avoid crowds inside the supermarket. Data is collected by the system; the user can specify it (approximate visit duration and categories of items) when booking a visit. This feature is customized for mobile application users; for customers without the app, estimations are performed (based on average data).

- ***CLup* sends notifications (based on GPS position)**

The system, for registered customers using the mobile application and having an active GPS connection on their smartphones, is able to notify them when their reservation (ticket or visit) is approaching. In particular, *CLup* computes time to get to the supermarket from the user's actual position, and sends him a notification so that he can get on time to the grocery shop.

If GPS connection is not active, the user still receives notifications about an approaching reservation, but only in predefined times.

Which transportation means should be considered? Car, walking, ...? Maybe ask the user (or calculate only car time, but in any case we have to specify).

Time: 1h30

Andrea and Roberto

21/11/2020

3.1.1 USER INTERFACES

3.1.1.1 CLup mobile application interface

- **Home page**

The home page of CLup application for logged users shows the following options:

- get a ticket
- book a visit
- see list of reservations
- manage user (login/logout)

If a user is not logged, CLup shows only the sign up page.

- **Get a ticket**

This page allows users to choose the supermarket from a list (where customers can also search). Once the grocery store is chosen, users should only confirm to get the ticket reservation.

A message shows expected time before being called at the selected grocery shop (if already selected), too.

- **Sign up/sign in**

This page allows users to register to the system or log in (if already registered). The user interface allows to insert the email and password; in case of sign up, also name and surname must be added.

Also fidelity card? It can be useful only if you integrate CLup data with data acquired at the check-out: in this way, you have categories of items purchased by the user. But you we do this, we must specify this part

- **Book a visit**

The page allows users to choose the supermarket from a list (where customers can also search), the day and the time for the visit from a calendar. In addition, there are two optional fields for the duration of the visit and the categories of items to buy: both duration and categories should be chosen from a predefined list.

- **See reservation**

The page allows users to get information about estimated remaining time before the turn (in case of ticket) or day and time of the visit; there is an option for deleting the reservation, too.

Also an option for updating/adding duration and categories?

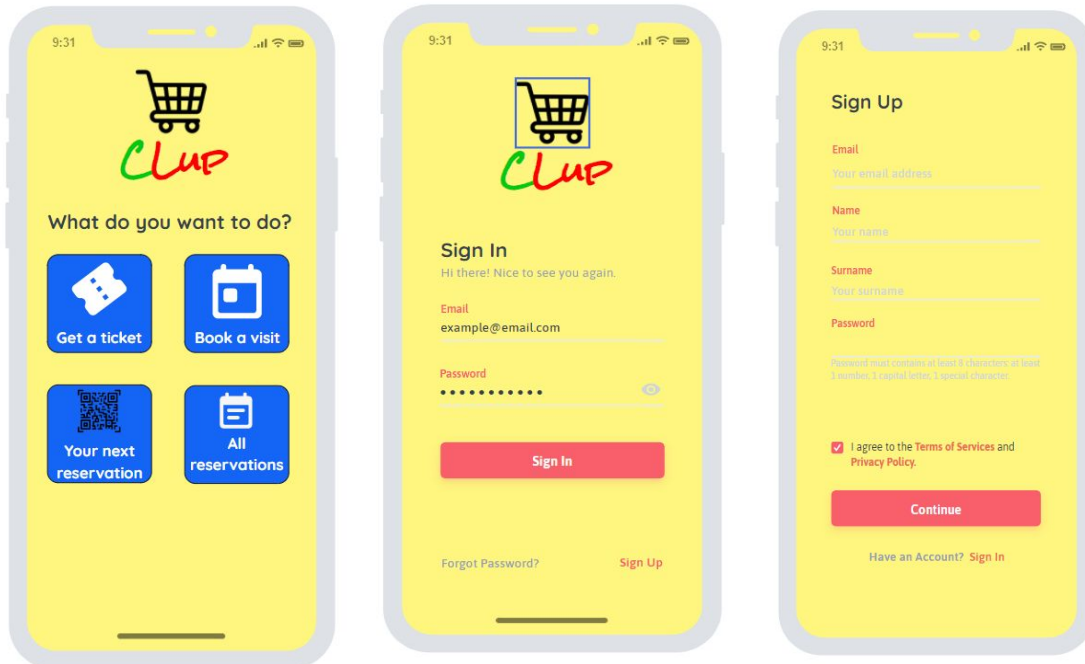
3.1.1.1 CLup ticket machine interface

- **Home page**

The home page of CLup ticket machine system shows the following options:

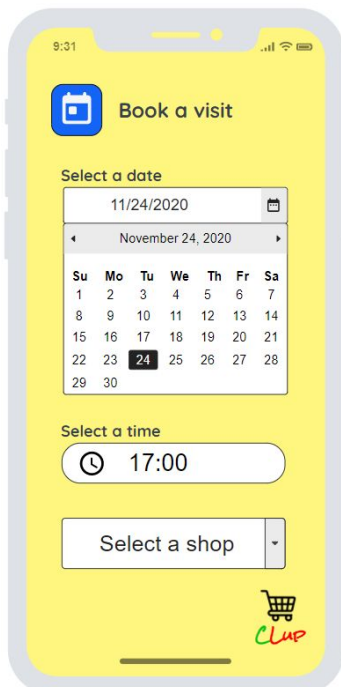
- get a ticket
- book a visit
- delete a reservation

Customers do not need to register or log in (in fact, there is no option for it).



- **Book a visit**

The page allows users to select the day and the time for the visit from a calendar. In addition, there is an optional field for the duration of the visit (from a predefined list).



3.1.2 HARDWARE INTERFACES

Users must have a mobile device (smartphone/tablet) equipped with a GPS system and mobile data (Internet connection).

Ticket machines are equipped with a touchscreen display, a QR code scanner and Internet access.

A QR code scanner is present at the grocery store's entrance: it is a scanner which can be activated through a movement sensor on the upper part of it. The scanner is connected with the supermarket's doors, which open when an active QR code has been scanned.

Screens for displaying turns outside the grocery store must be big enough so that reading from 15 metres distance is possible.

Same for QR code scanners at exit doors? We must decide whether to have them (maybe useful for some reasonments about crowded areas, based on known categories of items users buy), or rely only on numbers (and a person exits after he pays at the check-out: wait two minutes and call the next).

3.1.4 COMMUNICATION INTERFACES

HTTPS protocol is used to grant secure data transmission over the Internet.

3.3 PERFORMANCE REQUIREMENTS

The system should be able to answer a ticket/visit reservation request in less than 10 seconds. In case there is no availability for the requested reservation, it should provide appropriate suggestions in a reasonable time (together with the requested answer or at most 3 seconds later). Moreover, the system should delete a reservation (when requested) in less than 5 seconds.

CLup, after monitoring client's visit time and duration habits, should be able to mine them within 3 days.

The system should monitor GPS positions of users who have a reservation in the next hours, in order to be able to send notifications according to requirements.

3.4 DESIGN CONSTRAINTS

3.4.1 Standards compliance

There is no particular necessity to deviate from usual web-standards suggested by the World Wide Web Consortium (W3C); for this reason, the development of the system should follow W3C recommendations.

Any further compliance, if needed, will be specified during the design analysis.

3.4.2 Hardware limitations

The mobile application can be installed only on a smartphone/tablet equipped with a

GPS system and the possibility to activate mobile data.

Time: 2h

Andrea and Roberto

3.5 SOFTWARE SYSTEM ATTRIBUTES

3.5.1 Reliability

Customers Line-up should be available 24/7 in order to book visits and manage reservations whenever users want. However, the crucial time in which the system should work coincides with supermarkets' opening hours: for this reason, 4-6 hours of maintenance do not represent a problem, if programmed outside opening hours.

3.5.2 Availability

CLup does not have a very critical nature (it is not connected with emergency situations); however, in case the system is down during opening hours, supermarket's business becomes much more complicated: entrances have to be managed directly from its employees and ticket reservations become impossible; the only thing employees could do is to guarantee the entrance to an appropriate number of people that are waiting outside, without realizing any other feature that the software system guarantees. For these reasons, 95% availability of the system should be guaranteed.

3.5.3 Security

The system uses HTTPS for a secure communication between users and the server. Moreover, all passwords are encrypted and, in case of recovery, they are not sent in clear.

Possible additional choices will be discussed in the *Design Document*.

3.5.4 Maintainability

Code should follow good software engineering practices and be properly commented. In addition, the use of proper design patterns, as suggested in the *Design Document*, is mandatory.

3.5.5 Portability

Customers Line-up is a mobile application: to ensure an high grade of portability between Android and iOS an hybrid framework must be used to build the frontend.

Time: 1h

Andrea and Roberto

Time: 1h Roberto images