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- RASD -

Requirements Analysis and
Specification Document

Computer Science and Engineering

Software Engineering II

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1 Introduction

1.1 Purpose

CLup is a mobile service usable through app, made both for store managers and customers. The main purpose of CLup is to facilitate customers to book a visit to a store and, on the other hand, to help store managers to observe the new strict rules due to Coronavirus.

A customer can book a visit, specifying preferred date and hour, and possibly the list of item they want to purchase (or the category to which they belong); the app should generate a QR code that the customer will have to use to enter and exit from the store. CLup should also estimates the waiting time before his visit, and allows store managers to monitor entrances.

1.2 Scope

The software wants to give users the possibility to book their visit in the supermarket, in this way the store manager can regulate the flow of people.

The main functionalities offered by CLup are:

- **Manage of lining up of the store**: the app will manage the accesses to the store, based on numbered tickets released to people. When it's the turn of a person, it will be authorized to enter the shop. Futhermore, the store manager is able to manage the access and the affluency to the store.
- **Booking visit**: users can book a visit at the store, in a certain time frame decided in the booking process. For them, there is no requirement of ticket, since are able to access the store only scanning the QR Code at the store entrance. The system will grant access if the time of entering is correct.
- **Alternatives**: the app is able to suggest other stores options and time if some store is full, or comfortable times aren't available at the moment of the booking.

1.2.1 World Phenomena

WP1	A user enters a supermarket
WP2	A user waits in a lineup
WP3	A user exits the supermarket
WP4	A certain number of people is inside the supermarket
WP5	A certain number of people is at a specific repart of the supermarket

1.2.2 Shared Phenomena

SP1	The user gets a ticket/QR
SP2	The user books a visit to the store
SP3	The store generates in presence a ticket
SP4	The user comes to knows how much time they have to wait before entering
SP5	The users know how many people there are in a store at a certain moment
SP6	The user scan the QR code and enters in the supermarket
SP7	The user scan the QR code and exits from the supermarket
SP8	The user can indicate the categories of items that he intend to buy

1.2.3 Goals

G1	Allow customers to select a store and book a spot on the queue from CLup app
G2	Allow customers to book a spot on the queue from a physical ticket dispenser
G3	Allow store managers to regulate the influx of people in the building
G4	Suggest days in which the selected store has the least amount of reservations
G5	Suggest to reserve a spot in a store with a fewer number of reservations
G6	Notify the user when they should go to the place
G7	Generate a waiting time before turns
G8	Generate visit plan depending on customers' preferences
G9	Generates the estimated visit time based on previous visits

1.3 Definitions, Acronyms, Abbreviations

1.3.1 Definitions

QR Code	Bidimensional bar code that allows the user to check-in/check-out
Customer	The clients of the store, that uses the application part reserved to bookings
Store manager	The user that access to stores' bookings and occupancy, in order to manage the flow of customers
QR Code Reader	Device used to scan customers' QR Code
Totem	Electronic device that allows customers to book a store visit, allowing them to specifiy the same parameters that can be inserted through the app
QR Code Printer	Device used to print QR Code at the stores
Repart	Part of the store that contains the same category of products

1.3.2 Acronyms

RASD	Requirement Analysis and Specification Document
ETA	Estimated Time of Arrival
GPS	Global Positioning System

1.3.3 Abbreviations

WPn	World phenomena number n
SPn	Shared phenomena number n
Gn	Goal number n
Rn	Requirement number n

1.4 Revision History

Version	Date	Changelog
1.0	10/11/2020	Overview of the specifications and definitions of Goals and World and Shared Phenomena
1.1	13/11/2020	Detailed analysis of the functioning of the software in all its aspects

1.5 Reference Documents

1.6 Document Structure

2 Overall Description

2.1 Product Perspective

In Figure ??? is reported an UML Class Diagram that represents the domain of the application with main concepts and data involved, including their relationships.

The store managers registers to the application providing all necessary information and can decide at a later stage to modify the capability options (regarding each department of the store). The customer simply downloads the application on his device to be able to use it. Here we can identify the main aspects related to CLup:

- The customer can generate a reservation, choosing between the registered chain store (and one of their specific store) or a normal store, a time slot and, optionally, the departments that they want to access; CLup will retrieve a ticket containing the number of the reservation and a QR code.
- The customer can entry in the store where he has a reservation (on the right time slot) scanning the QR code with a totem/the help of a store manager.

- The customer exit the store reusing the QR code, notifying the application that a new spot in now free (on certain department).

The UML does not include every class of the actual implementation of the system.

2.1.1 UML Description

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2.1.2 State Charts

Now we are going to examine some essential aspects of the application, modelling their behaviours and showing the evolutin over time of their states through adequate state diagrams, which are reported below.

2.2 Product Functions

In this section are described the functions of the software.

- **Book a visit**

  This is the main functionality of the software and allows to brand's customers to book a visit to the supermarket. To do this, the user has two options:

  1. **Book a visit with the app**:
     The app allows to brand's customers to book a visit in a store of their preference.
     First of all, the user can choose a specific store from the nearest ones to him (retrieved by GPS), or he can select a specific one from a list. Then he has to indicate the categories of items that he intend to buy in the store, so that it's possible to optimize the waiting time, or they may skip the process, booking a visit to the whole store, but this may lead to greater waiting time, because they can enter the store only when all the reparts are free at the same time. At this point, the software shows at the user the time table highlighting the days and the time slots available, in such a way as to allow the user to select the best option for him. If the options do not satisfy the user, he can ask the application for help to find other supermarkets with more comfortable hours. At the end, a QR Code and a line-up number is generated and the ETA of entering is shown. Depending on the position of the client (retrieved by GPS), and the preferred option of reaching the supermarket (eg. on foot, by car or public transport), the app will notify the client when he can exit home, to arrive in time to enter the supermarket, without losing its turn and avoiding long waiting times.

If a reservation process is interrupted in the middle, the user will be able to resume it reopening the app.

2. **Book without the app**:
   If for some reasons the user isn't able to obtain a ticket on the app, he can obtain it at a totem positioned at the store entry, with the same process on the app, but without suggesting other chains' stores. At the end of the process, the user must specify his Name, Surname and Mobile Phone in order to confirm the reservation, due to contact tracing requirements. These reservations then will appear in the accounts associeted to the given phone number.

- **Cancel a reservation**

  If the user can not reach the store in time, he can decide to cancel the booked visit. In this case the software delete the customer from the queue and rearrange the last one.

- **Check-inCheck-out**:

  At the store entries and exities, users have to scan their QR Codes to respectively Check-in and Check-Out in the supermarket. This is required to avoid bookings cancels, and to make statistics of time clients need to end the shopping.

- **Store Capacity**:

  The app, also, allows store managers to see the store's affluency and to modify the store capacity in every single repart. When a repart capacity is changed, the latest overflowing bookings will be canceled, and a notify is sent to the customer, proposing him other comfortable options for the same preferences.

2.3 User Characteristics

CLup gives access to two different sets of functionalities based on the two different category of users:

- **Customer**: Allows user to book a visit to the supermarket. The software generates a QR Code that the user can use to enter in the supermarket. The user can indicate the exact list of items that he intends to purchase, or, at least, the categories of items that he intends to buy and, also, he can indicates the approximate expected duration of the visit. Moreover, the user can see the ETA to enter the store.

- **Store Manager**: The Store Manager Can view information about the store, in particular he can access to the reservations made by users to predict the future affluency and check the level of affluency in the store (and also in specific zones of the store)

2.4 Assumptions, Dependencies, Constraints

2.4.1 Domain Assumptions

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3 Specific Requirements

3.1 External Interface Requirements

3.1.1 User Interfaces

3.1.2 Hardware Interfaces

3.1.3 Software Interfaces

3.1.4 Communication Interfaces

3.2 Functional Requirements

3.2.1 List of Requirements

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3.2.2 Mapping

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3.2.3 Use Cases

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3.2.4 Sequence Diagram

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3.2.5 Scenarios

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3.3 Performance Requirements

3.4 Design Costraints

3.4.1 Standards Compliance

3.4.2 Hardware Limitations

3.4.3 Any Other Constraint

3.5 Software System Attributes

3.5.1 Reliability

3.5.2 Availability

3.5.3 Security

3.5.4 Maintainability

3.5.5 Portability

3.6 Additional Specifications

extra

4 Formal Analysis Using Alloy

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6 References