

M.Sc. Computer Science and Engineering

Software Engineering 2 Project

**Requirements Analysis and Specification Document**



Leoni Luca, Locarno Silvia, Minotti Luca

23th December 2020

GitHub Repository: https://github.com/lucagrammer/LeoniLocarnoMinotti

Version 1.0

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**Chapter 1**

# 1 Introduction

This document constitutes the Requirement Analysis and Specification Document (RASD). Its purpose is to analyse the requirements that will lay the foundations of application services, to specify the application domain, the entities involved and their relationship, to clearly explain the objectives, the constraints and the features that are going to be implemented.

## Purpose

In the midst of the Coronavirus outbreak even shopping at grocery stores and supermarkets has proven to be a problem due to interpersonal distancing rules and building access restrictions. In fact, this typically results in long lines forming outside, which is less than ideal for avoiding crowds.

CLup is a software with the aim of managing in a simple but effective way the queues to access the stores, allowing users to queue directly from the application and receive a notification just in time to physically reach the store. Furthermore, CLup allows users to book a visit to a specific store on a specific date or, in the case that this is not possible, recommends alternative slots or similar less crowded stores. Finally, users can also be notified of the availability of slots in the day/time range in which they typically shop. On the other hand, supermarket managers can easily keep access data under control and effortlessly ensure compliance with safety regulations.

~~Coronavirus emergency placed restrictions in our routines. Daily activities, such as going to grocery stores has become a real challenge. Indeed, supermarkets need to restrict access to their stores to avoid having crowds inside. CLup is an application with the aim of managing lines at the grocery stores in real-time.~~

### Goals

1. Allows managers to regulate the influx of the people in their store.
2. Allows to avoid the formation of long lines outside supermarkets. ~~Allow people to avoid the line outside of stores for hours.~~
   1. Allows customers to line up from their home.
   2. Allows people who don’t have access to the required technology to line up physically from a store.
3. Allows managers to keep access data under control. ~~Allow the store to collect data about customers’ access through QR codes.~~
4. Allows customers to constantly check the estimated waiting time to enter a specific store.
5. Allows customers to be notified when their number is close to being called, taking into account the time to get to the shop.
6. Allows customers to book a visit to a specific store in a specific date.
7. Suggests customers alternative slots for visiting a specific store.
8. Suggest customers similar stores if the preferred one does not have slots available for booking. ~~Suggests customers different stores if the preferred one is not available.~~
9. Provides the user periodic notifications of available slots in the day/time range they usually shop.

## Scope

According to the World and Machine paradigm, introduced by M. Jackson and P. Zane, we can identify the Machine as the System to be developed and the environment, in which CLup will be used, as the World. The separation between these two concepts allows us to classify the phenomena into two different categories.

### World and Shared phenomena

***World phenomena***, events that take place in the real world and that the machine cannot observe.

* The User needs to buy goods at a supermarket.
* The User goes to a store without lining up from his home using CLup.
* The Manager wants to monitor the entrances to his shop.

***Shared phenomena***, events that involve both the real world and the machine. They could take place in the real world and be observed by the machine, or they could occur inside the machine and have an impact in the real world.

* The User signs up to the application or logs in if already registered.
* The Manager registers his store to the application.
* The System assigns a number to a User that gives his position in the queue of a store.
* The System sends an alert to a User inviting him to reach the selected store.
* The User books a visit to a specific store in a specific date.
* The User indicates the approximate expected duration of the visit.
* The User indicates the categories of items he intends to buy.
* The System suggests to a User an alternative slot.
* The System suggests to a User similar less crowded stores.
* The System sends notifications of available slots in day/time range.
* The System generates the QR codes necessary to enter a store.
* The User uses a QR code to enter the store.
* The Manager displays the access data of his store.
* The Guest receives a ticket from a physical ticket dispenser located in front of the shop.

## 1.3 Definitions, Acronyms, Abbreviations

### 1.3.1 Definitions

* **Guest**: a person who has not the access to the required technology.
* **User**: a person that use the application and their functionalities.
* **QR** **Code**: quick response code, a type of matrix barcode.
* **Physical Ticket Dispenser**: a computer connected to the CLup application that distributes physical tickets to guests.

### 1.3.2 Acronyms

* **RASD**: Requirement Analysis and Specification Document.
* **UML**: Unified Modelling Language.
* **API**: Application Programming Interface.

### 1.3.3 Abbreviations

* **[G.i]**: i-th goal.
* **[R.i]**: i-th requirement.
* **[D.i]**: i-th domain assumption.
* **[UC.i]**: i-th use case.

## Revision History

|  |  |  |  |
| --- | --- | --- | --- |
| **Version** | **Date** | **Authors** | **Summary** |
| 1.0 | --/--/2020 | Leoni Luca  Locarno Silvia  Minotti Luca | First release |

## Reference Documents

* Specification document: Project Assignment A.Y. 2020-2021.pdf
* Software Engineering 2 course slides
* Previous project examples:
* Specification document: Mandatory Project Assignment A.Y. 2019-2020.pdf
* RASD to be analyzed.pdf
* IEEE Standard on Requirement Engineering (ISO/IEC/IEEE 29148)

## 1.6 Document Structure

This document is structured as follows:

1. ***Introduction*** A general introduction to the goals, the phenomena and the scope of the system-to-be. It aims giving general but exhaustive information about what this document is going to explain.
2. ***Overall Description*** A general description of the product to be and its requirements. This section provides several information that are explained in detail in Section 3.
3. ***Specific Requirements*** All software requirements are explained using scenarios, use-case diagrams and activity diagrams. Non-functional and functional requirements are also cited.
4. ***Formal Analysis using Alloy*** This section includes Alloy code that describes the model and shows its soundness and correctness.
5. ***Effort spent*** Effort spent by all team members shown as the list of all the activities done during the realization of this document.
6. ***References*** References of documents that this project was developed upon.

**Chapter 2**

# 2 Overall Description

## 2.1 Product Perspective

## 2.2 Product Functions

## 2.3 User Characteristics

## 2.4 Assumptions, Dependencies and Constraints

### 2.4.1 Domain Assumptions

### 2.4.2 Dependencies

### 2.4.3 Constraints

**Chapter 3**

# 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 Scenarios

### 3.2.2 Use Case Diagrams

### 3.2.3 Use Case Analysis

### 3.2.4 Sequence Diagrams

### 3.2.5 Requirements

### 3.2.6 Satisfying Goals

## 3.3 Performance Requirements

## 3.4 Design Constraints

### 3.4.1 Standard compliance

### 3.4.2 Hardware limitations

### 3.4.3 Any other constraint

## 3.5 Design Constraints

### 3.5.1 Reliability

### 3.5.2 Availability

### 3.5.3 Security

### 3.5.4 Maintainability

### 3.5.5 Portability

**Chapter 4**

# 4 Formal Analysis using Alloy

## 4.1 Alloy model

### 4.1.1 Analysis results

## 4.2 Graph

**Chapter 5**

# 5 Effort Spent

The following tables summarize the effort spent by each member of the team to create the RASD document.

## 5.1 Leoni Luca

|  |  |
| --- | --- |
| **Description of the task** | **Hours** |
| Discussion about the Assignment 2020-2021 | 1 |
| Document structure and Scope and Purpose | 2 |

## 5.2 Locarno Silvia

|  |  |
| --- | --- |
| **Description of the task** | **Hours** |
| Discussion about the Assignment 2020-2021 | 1 |
| Document structure and Scope and Purpose | 2 |

## 5.3 Minotti Luca

|  |  |
| --- | --- |
| **Description of the task** | **Hours** |
| Discussion about the Assignment 2020-2021 | 1 |
| Document structure and Scope and Purpose | 2 |

**Chapter 6**

# 6 References