Politecnico di Milano

Dipartimento di Elettronica, Informazione e Bioingegneria

CLup
Requirements Analysis and Specification Document

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1. Introduction

1.1 Purpose

During the ongoing COVID-19 pandemic, social distancing has proven to be a valuable tool to reduce the diffusion of the virus among the population. To enforce this kind of behaviour, governments around the world adopted strict lockdown policies, allowing people out of their homes only to carry out essential tasks. Grocery shopping has proven to be a challenging situation to regulate, due to the need for both restricting access to the shops and avoiding the formation of crowded queues outside of them.

To maximize the accesses to the store while preserving a safe environment and to ease visit planning, the store customer should be provided with a way to express preferences for a time slot and to indicate the approximate duration of his visit. Moreover, the accesses across different stores and day or time ranges should be balanced by proactively suggesting possible alternatives. Overall, each process should be easy to use to include all demographics.

The goal of the following document is to provide a comprehensive description of requirements and specification for the software-to-be under analysis. Relevant use cases and models will be addressed through the use of natural language, UML, and Alloy. Choices made regarding the interpretation, the problem under analysis and the related software-to-be will be clearly stated by the creators of this document, along with their rationale.

1.1.1 Goals

ID	Goal
G1	The number of people in the store should be compliant with the country's regulation.
G2	The distance between people in the store should be compliant with the country's regulation.
G3	Store managers should be able to regulate the influx of customers to the store.
G4	Every customer should be able to access a store.
G5	Every customer should be able to access a store in a first come, first served order.
G6	The distance between people in proximity to the store should be compliant with the country's regulation.
G7	Customers should be evenly distributed across the stores adopting the system.
G8	Customers should be evenly distributed across the available time slots.
G9	Customers should access a store in an acceptable time slot.
G10	Customers should access a store at an acceptable location.
G11	If available, customers should access the store in the preferred time slot.
G12	Customers should access the store at the preferred location.

1.2   Scope

1.2.1   Product

CLup is a system that allows to handle access to supermarkets when the flux of people is restricted. In particular, it allows customers to line-up remotely (i.e., without being physically in a line outside the supermarket) and suggests them the right time to go to the supermarket without having to form a queue outside.

CLup allows customers either to request access to the supermarket as soon as possible, or to book in advance an access to the supermarket at a given slot of date and time. In both cases, the system aims at preventing overcrowding in each area of the building. Access to the supermarket is granted only when using the system so that CLup can actively monitor the number of people inside the building.

If many people are in a queue for the same access slot, CLup gives the customers possible alternatives about slots or supermarket that are less crowded. Moreover, upon customer request, it can proactively inform them if there are available slots in a given day or time range.

The main interface between CLup and the user is assumed to be an IT device with an Internet connection. However, since not all people may have access to such technologies, the system can be used, with limited functionalities, just through a standard telephone line or in presence.

The system is completed by an administrational dashboard that allows store managers to monitor the accesses to the supermarkets in real-time and to manage the queuing parameters, such as the maximum number of people allowed in the building at the same time.

1.2.2   World and Shared phenomena

1.2.2.1   World phenomena

ID	Phenomenon
WP1	The customer needs to go grocery shopping.
WP2	The customer arrives at the supermarket.
WP3	The customer asks to line up to a store assistant (fallback method).
WP4	The customer leaves the supermarket.
WP5	The local authority asks the store manager to report how many people are inside the building.
WP6	The local authority asks the store manager to increase or decrease the maximum number of people allowed inside the building.

1.2.2.2 Shared phenomena - controlled by the World

ID	Phenomenon
SP1	The customer asks the system to line up and enter the supermarket as soon as possible through an IT device.
SP2	The customer asks the system to book an entrance at the supermarket at a given date and time through an IT device.
SP3	The customer asks the system to line up and enter the supermarket as soon as possible through a standard telephone line.
SP4	The customer asks the system to book an entrance at the supermarket at a given date and time through a standard telephone line.
SP5	The store assistant asks the system to line up a customer, to let them enter the supermarket as soon as possible.
SP6	The customer asks the system to print the receipt of a request made by telephone with an on-site device.
SP7	The customer informs the system on the estimated duration of the visit to the supermarket.
SP8	The customer informs the system on the categories of products they intend to buy.
SP9	The customer scans the QR code receipt at the entrance of the supermarket.
SP10	The customer scans the QR code receipt at the exit of the supermarket.
SP11	The store manager queries the system for the number of people inside the building.
SP12	The store manager informs the system on the maximum number of people allowed inside the building.

1.2.2.3 Shared phenomena - controlled by the Machine

ID	Phenomenon
SP13	The system shows the user a QR code as a receipt of a request performed through an IT device.
SP14	The system prints through an on-site device a QR code as a receipt of a request performed through a standard telephone line.
SP15	The system prints through an on-site device a QR code as a receipt of a request performed through the on-site device itself.
SP16	The system informs the customer that it's time to go to the supermarket to take advantage of the requested slot.
SP17	The system allows a customer to enter the supermarket.
SP18	The system gives the customer suggestions on less crowded slots or supermarkets.
SP19	The system informs the customer that a specific time slot in a range they chose in advance is available

1.3 Definitions, acronyms, abbreviations

1.3.1 Definitions

Dashboard A panel usually containing instruments and controls.

Demographic The statistical characteristics of human populations (such as age or income) used especially to identify markets.

Fallback method A method used as reserve.

Lockdown policy A lockdown policy is a requirement for people to stay where they are, usually due to specific risks to themselves or to others if they can move freely.

Social distancing In public health, social distancing, also called physical distancing, is a set of non-pharmaceutical interventions or measures intended to prevent the spread of a contagious disease by maintaining a physical distance between people and reducing the number of times people come into close contact with each other.

1.3.2 Acronyms

CLup Customers Line-up

COVID-19 COronaVIrus Disease 2019.

DA Domain Assumption

G Goal.

IT device Information Technology device.

QR code Quick Response code.

RASD Requirements Analysis and Specification Document.

SP Shared Phenomenon.

UML Unified Modeling Language.

WP World Phenomenon.

1.3.3 Abbreviations

1.4 Revision history

Version	Date	Notes
V1.0	TBD	Initial release.

1.5   Reference documents

- **Alloy documentation**
- **R&DD Assignment AY 2020-2021**
- **The world and the machine** by M. Jackson
- **UML documentation**

2. Overall description

2.1 User characteristics

The following users are addressed by the application:

- Supermarket's customers: people of any age, gender, nationality, and education interested in accessing the store. This includes people with physical or visual disabilities.

- Store managers: employees whose responsibility is to monitor and regulate the flow of people inside the supermarket.

- Store assistants: employees in charge of releasing the queue ticket to customers requesting them on-site.

- Store cashiers: employees in charge of scanning tickets at the time of checkout to register exits of the customers.

2.2 Assumptions, dependencies and constraints

2.2.1 Domain assumptions

ID	Domain assumption
DA1	The number of people who can access the store is either decided by the authorities, or by the manager, respecting the law.
DA2	Customers won't try to bypass the store access control measures.
DA3	The population is evenly distributed on the territory among store locations.
DA4	All customers who enter the supermarket check out with a human or automatic cashier.
DA5	All customers only visit the areas of the supermarket containing the item categories they declared when reserving their entrance through the system.
DA6	Customers will not form crowds outside of the store, if the queue is moderately long.
DA7	Few people do not have an IT device with support for Internet connectivity or a standard telephone line.

3. Effort spent

3.1 Andrea Riva

Date	Effort spent (h)	Notes
17/10/2020	0.5	Introduction briefing
09/11/2020	3.0	Scope
14/11/2020	1.0	Harmonization and task appointing meeting
14/11/2020	1.5	Initial version of class diagrams
18/11/2020	0.5	Reviews
18/11/2020	1.5	External interfaces
21/11/2020	1.0	Harmonization and task appointing meeting
21/11/2020	2.0	Mockups
22/11/2020	0.5	Fixes and general improvements

3.2 Alessandro Sanvito

Date	Effort spent (h)	Notes
10/10/2020	1.0	Project set-up
17/10/2020	0.5	Introduction briefing
17/10/2020	0.5	Purpose description
10/11/2020	0.5	Scope review
11/11/2020	2.0	Purpose description
14/11/2020	1.0	Harmonization and task appointing meeting
16/11/2020	1.5	Introduction complete and store state machine
18/11/2020	0.5	Domain assumptions review
21/11/2020	1.0	Harmonization and task appointing meeting
22/11/2020	1.0	Product functions definition

3.3 Luca Vecchio

Date	Effort spent (h)	Notes
17/10/2020	0.5	Introduction briefing
11/11/2020	0.5	PR review
11/11/2020	0.5	User characteristics
14/11/2020	1.0	Harmonization and task appointing meeting
21/11/2020	1.0	Harmonization and task appointing meeting