EI1023 - Fonaments d'Enginyeria del Programari

Safe access to natural areas

Title	SANA
Authors	Paul Ximo Pluijter Izquierdo Francisco de Borja Viera Prieto Miguel Ángel Prosper Quíros
Group	LA3ProsperPluijterViera
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1 Introduction

The objective of this technical report is to show a project in which a product will be conceptualized, planned, analyzed and designed to solve the particular problem of safe and control access to the natural areas of the Valencian Community [1].

Firstly, the work-team for the project is defined, which is selected according to their specialities and previous work experience of the candidates. Secondly an overall context of what the project is and entails is given. Next the planification of the project is presented, including: a complete task list for the product, the risk and restrictions of them, and work breakdown structure. After that, the requirements of the platform, using both a use case diagram and unified modeling language template is defined. Then an overall analysis of the system, using a class diagram and, again, unified modeling language templates, is presented. Finally the system's class diagram is refined to be used as a design class diagram, which as a result helps towards the suggestion of a plausible proposal for the graphical user interface.

1.1 Work-team definition

The team will have the following roles assigned to each member based on the project roles definition TenStep in the sources [2] and [3]:

Project manager

Assigned: Paul Ximo Pluijter Izquierdo

Project managers lead the planning and the development of all project deliverables. Also, they are responsible for managing the work plan and the amount of time required to make the tasks and the project itself, and also the project management procedures.

The election of this role was made democratically, he was voted for his ability to organize and manage projects, even if he did not volunteer for the position initially, he ended up not rejecting it either.

System analyst

Assigned: Francisco de Borja Viera Prieto

System analysts ensure that the requirements of the clients are captured and documented correctly, so the project has a well defined course of action and client's needs are met.

He was chosen as our system analyst because of his meticulousness collecting data, as that will ensure that the product we deliver meets the client's needs and expectations exactlly.

Quality manager

Assigned: Miguel Ángel Prosper Quíros

Quality managers follow and revise the project's course to ensure all the requirements and objectives are met, paying close attention to every detail of the client's request to deliver a high-quality and accurate software.

The decision was based upon previous projects and personal experiences, since his attention to details and meticulous methods made him the ideal individual for this position and perfect fit for the project as a whole.

2 Project context

In this section an overall context of what the project is and entails is given, defining in a schematic and clear way all the information obtained from the provided sources.

Firstly an introductory context is given, followed by a case study summarizing all the source documents. Secondly defining the different roles identified providing a description and followed by the requirements associated with each of them respectively. Finally a short description of the project's and product's scope (separated into the organisational, functional and technological perspectives) is given based on those requirements.

2.1 Problem description

The government of the Valencian Community (*Comunitat Valenciana*) needed a tool or mechanism to manage their natural areas access, controlling their occupancy and services to disseminate this information (and more, for example the landscape's physical description, available establishments, etc.) to the citizens in a sustainable and transparent way. The platform also had to give citizens the ability to make reservations for subzones or plots inside of each municipality's natural areas.

The owner of this product will be the ministry of environment of the Valencian Government (*Generalitat Valenciana*), which will also be incharge of the distribution of the product, or part of the product, to the users.

2.2 Proposal

The Valencian Community has beautiful natural spaces throughout its entirety, that was the reason behind the Valencian Government wanting to launch this project consisting of a computer platform to ensure the proper use of these areas as well as proper management of them. The main intent being controlling the saturation and reducing the misuse of the areas, avoiding people entering them when they are above an appropriate and controllable safe threshold.

The platform would be managed internally by the Valencian Government as well as each city's council, and it would have an accessible website as well as an application so citizens could make reservations quickly and easily.

The ministry of the environment of the Valencian Government would be the ones to add the municipalities interested on the platform, as well as adding one or more people from the city's council as municipal managers. These municipal managers would define what could be done in every area, from restricting them to setting which kind of services will be provided by each area.

Managers needed a reliable platform in which they could modify all the parameters needed, not only that, but it had to also be fast and feature complete. Everything should be easily reached from any point and properly separated from each other, so different sections can be distinguished, not aiming for style particularly but functionality.

On the other side of the spectrum the end users (i.e. the citizens) needed access to a lot of data from each area, all the way from the type of area it is to the percentage of occupancy of the day. In addition to that, users may vary in age greatly, that is why an intuitive interface had to be developed so everyone regardless of how used to new technologies they are, while at the same time not sacrificing the information provided.

That is why the application and website would have an interface with large text and buttons by default, users would have the option to reduce the size of these if needed, but this is essential so that people with impared vision or psychomotor disabilities could use the application without any major issues. Trying to keep the interface simple enough without sacrificing the information by slicing it into several different sections that would be difficult to navigate form the home page.

2.3 Preliminary needs

In this section the potential users and roles identified are shown, followed by their responsibilities.

2.3.1 Roles and responsibilities

The potential users for this product could be classified in the following groups:

Ministry of the environment of the Valencian Government

Responsible for the global management of the platform, publicizing it and promoting it to municipalities and citizens alike. Including the registration of these municipalities and other services.

Municipal managers

Responsible for the management of the whole municipality and the application to register on the platform that needs to be communicated to the ministry of the environment of the Valencian Government.

Control staff

Responsible for controlling the area's entrances and departures of citizens, as well as modifications of reservations to ensure everything is up-to-date and the stored data reflects the current state of the area.

Citizens

Public client without managemental control of the platform that would interact with the services offered by the municipality of their choice.

2.3.2 Responsibilities

The potential responsibilities for the identified roles are the following:

Ministry of the environment of the Valencian Government

- Register the municipalities
    - Assign municipal managers
- Register seasonal service types
- Consult occupancy by area, day and time

Municipal managers

- Register the areas which compose the municipality
    - Fill in the basic data for the area
    - Register the available seasonal services
    - Mark if the area is restricted
        - Register the zones which compose the area
    - Assign the control staff for said area
- Consult occupancy by area, day and time
- Modify public's reservations

Control staff

- Modify public's reservations

Citizens

- Register on the platform
- Make reservations
- Consult occupancy by municipality and area

2.4 Goals and scope

In this section the project's and the product's objective and scope are shown.

2.4.1 Project objective and scope

The objective of this project is to make a tool (specifically, a set of applications) to control the current capacity of natural areas, control the access to these, making it easier for

the ministry of environment to disseminate information of the areas and facilitate the citizens a way to make reservations to specific zones of these natural areas.

2.4.2 Product objective and scope

In this section the product's owner objective and scope are shown.

2.4.2.1 Product owner's objectives

The objectives of the product are to add natural areas and the information of these to the system, divide the areas in several zones, control the access and the current capacity in real time of the natural areas and zones, disseminate the information of the registered areas to the citizens, allow the citizens to reserve zones of these areas and allow to the managers of the product to modify the reservations of zones of the natural areas.

2.4.2.2 Product scope

The scope of the project, based upon the description given by *Fundamentals of Software Engineering* book [4], would be approximately the following:

Organisational

The ministry of environment of the Valencian Government would be the only internal organization that would use the software, as they are the ones providing the service and platform. Meanwhile the municipal managers, control staff (being hired by them directly) and the citizens would classify as external organizations, since they use the platform's services voluntarily for their own benefit; municipal managers for the area-managing tools and citizens for the reservation of said areas.

Functional

The software would provide the means to disseminate information among municipalities and citizens of the previously mentioned natural areas. Moreover it would ease the control (i.e. the access and capacity monitoring) of these areas for municipal managers. Citizens would also benefit from it, gaining the ability to easily book zones remotely without any hassle.

Technological

The platform would be integrated with an internal or third-party mailing and database management system service for both internal and external organizational components. Additionally the front-end of the service would have to build upon several web and system-specific (e.g. Android, iOS, Windows, etc.) frameworks such as Swift and Java.

3 Preliminary planning

The following section shows all the planification of the project, including the risks and restriction of the project, a relatively detailed task list based on several documents, a work breakdown structure (WBS) making it easier to organize the project, followed by some time estimations which contains the milestones associated with this project, and finally a

work breakdown structure and gantt chart made using the data of the task list and the temporal estimation.

3.1 Risks and restrictions

The spotted risks are the following:

Risks

- Environment
  - Lack of knowledge about the competition
- Team
  - Lack of experience
- Product
  - Large amount of simultaneous end users (potential *DoS*)
- Users
  - End user accessibility issues for certain users (e.g. elderly people)
  - Different product expectations

The spotted restrictions are the following:

Restrictions

- Human resources
  - Small developer team
  - Other parallel projects
- Technological
  - Only personal or on-site equipment
  - Internet connection
- Temporary (detailed in section 3.3)

Since it is an educational project, there are no economical nor spatial restrictions.

3.2 Task definition

In this section, the definition of the activities and tasks, based on the practical homework's statements and the labor that the team made [1], is shown.

1. Project context (10 days)
   - 1.1. Define the objectives and the scope of the project (3 days)
   - 1.2. Define the objectives and the scope of the product (3 days)
     - 1.2.1. Define the product owner's objectives (1 day)
     - 1.2.2. Define the product scope (2 days)
   - 1.3. Definition of preliminary needs (3 days)
     - 1.3.1. Identification of the potential users (2 days)
     - 1.3.2. Roles and responsibilities of the potential users (1 day)
   - 1.4. Make a proposal (1 days)

2. Preliminary planning (10 days)
    2.1. Planning tasks (7 days)
        2.1.1. Definition of activities and tasks (3 days)
        2.1.2. Identification of risks and restrictions (2 days)
        2.1.3. Make a temporal estimation (1 day)
        2.1.4. Make a work breakdown structure (1 day)
    2.2. Design a gantt diagram (3 days)
        2.2.1. Find the resources (2 days)
        2.2.2. Construct the diagram (1 day)
3. Requirements definition (15 days)
    3.1. Make the use case diagram (3 days)
    3.2. Make the documentation of the use case diagram (4 days)
        3.2.1. Make the Summary of use cases and actors (2 days)
        3.2.2. Make the actor's description (1 day)
        3.2.3. Make the use case description (1 day)
    3.3. Find the data requirements (3 days)
    3.4. Validation and verification of requirements (3 days)
    3.5. Search for other requirements (2 days)
4. Analysis (14 days)
    4.1. Make the class diagram (5 days)
    4.2. Make the class diagram documentation (6 days)
    4.3. Make the class diagram validation (3 days)
5. Design (10 days)
    5.1. Design a class diagram (3 days)
        5.1.1. Define the contents of the diagram (2 days)
        5.1.2. Produce the class diagram (1 day)
    5.2. Design the graphical user interface (4 days)
        5.2.1. Make a user classification (1 day)
            5.2.1.1. Ministry of the environment of the Valencian Government (1 day)
            5.2.1.2. Municipal managers (1 day)
            5.2.1.3. Control staff (1 day)
            5.2.1.4. Public (1 day)
        5.2.2. Define the list of interfaces (4 days)

5.2.2.1. Login (1 day)
5.2.2.2. Registration and confirmation (2 day)
5.2.2.3. Consult occupancy (1 day)
5.2.2.4. Register municipalities (2 day)
5.2.2.5. Register municipal managers for municipalities (1 day)
5.2.2.6. Register seasonal service types (1 day)
5.2.2.7. Register areas of municipalities (2 day)
5.2.2.8. Register seasonal services of areas (1 day)
5.2.2.9. Photo gallery of areas (1 day)
5.2.2.10. Register zones of areas (2 day)
5.2.2.11. Register control staff for areas (1 day)
5.2.2.12. Create reservation (2 day)
5.2.2.13. Modify reservation (1 day)
5.2.3. Make some graphical screen design examples (3 days)
5.2.3.1. Paper prototype (3 days)

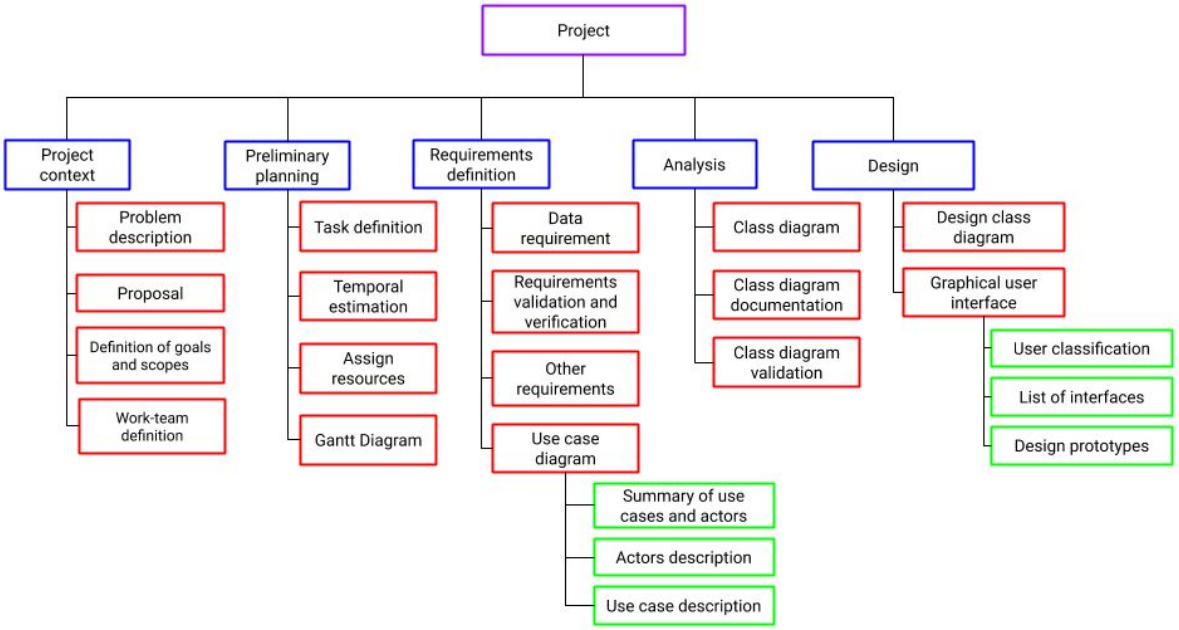
3.3 Temporal estimation

In this section, the temporal estimation of the project, based upon the documents the teacher shared with the students in the Virtual Classroom [4] and [5], is shown.

- Project beginning 08/10/2020 - 23/10/2020 (10 days)
- Project planning 24/10/2020 - 06/11/2020 (10 days)
- Requirements definition with UML and MD 07/11/2020 - 27/11/2020 (15 days)
- Analysis with UML and MD 28/11/2020 - 18/12/2020 (14 days)
- Design 19/12/2020 - 18/01/2021 (10 days)

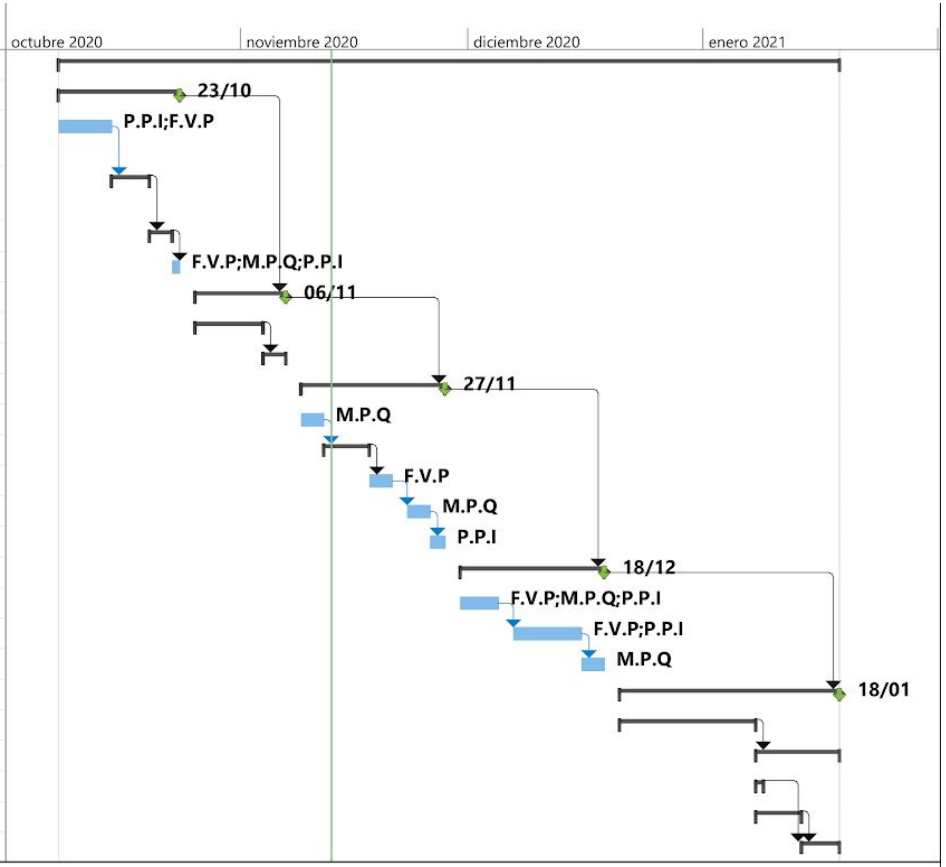
3.4 Work breakdown structure

In this section, the Work Breakdown Structure (WBS), based upon the activities and tasks of the project, is shown.


Project
Project context
Problem description
Proposal
Definition of goals and scopes
Work-team definition
Preliminary planning
Task definition
Temporal estimation
Assign resources
Gantt Diagram
Requirements definition
Data requirement
Requirements validation and verification
Other requirements
Use case diagram
Summary of use cases and actors
Actors description
Use case description
Analysis
Class diagram
Class diagram documentation
Class diagram validation
Design
Design class diagram
Graphical user interface
User classification
List of interfaces
Design prototypes

3.5 Gantt chart

Id	Nombre de tarea	Duración	Comienzo
1	**Project**	**59 días**	**jue 08/10/20**
2	**Project context**	**10 días**	**jue 08/10/20**
3	Define the objectives and the scope of the project	3 días	jue 08/10/20
4	**Define the objectives and the scope of the product**	**3 días**	**jue 15/10/20**
7	**Definition of preliminary needs**	**3 días**	**mar 20/10/20**
10	Make a proposal	1 día	vie 23/10/20
11	**Preliminary planning**	**10 días**	**lun 26/10/20**
12	**Planning tasks**	**7 días**	**lun 26/10/20**
17	**Design a gantt diagram**	**3 días**	**mié 04/11/20**
20	**Requirements definition**	**15 días**	**lun 09/11/20**
21	Make the use case diagram	3 días	lun 09/11/20
22	**Make the documentation of the use case diagram**	**4 días**	**jue 12/11/20**
26	Find the data requirements	3 días	mié 18/11/20
27	Validation and verification of requirements	3 días	lun 23/11/20
28	Search for other requirements	2 días	jue 26/11/20
29	**Analysis**	**14 días**	**lun 30/11/20**
30	Make the class diagram	5 días	lun 30/11/20
31	Make the class diagram documentation	6 días	lun 07/12/20
32	Make the class diagram validation	3 días	mié 16/12/20
33	**Design**	**10 días**	**lun 21/12/20**
34	**Design a class diagram**	**3 días**	**lun 21/12/20**
37	**Design the graphical user interface**	**7 días**	**vie 08/01/21**
38	**Make a user classification**	**1 día**	**vie 08/01/21**
43	**Define the list of interfaces**	**4 días**	**vie 08/01/21**
56	**Make some graphical screen design examples**	**3 días**	**jue 14/01/21**



Proyecto: SANA - Project planning
Autor: LA3ProsperPluijterViera
Fecha: vie 13/11/20

Tarea	Resumen inactivo	Tareas externas	
División	Tarea manual	Hito externo	
Hito	solo duración	Fecha límite	
Resumen	Informe de resumen manual	Progreso	
Resumen del proyecto	Resumen manual	Progreso manual	
Tarea inactiva	solo el comienzo		
Hito inactivo	solo fin		

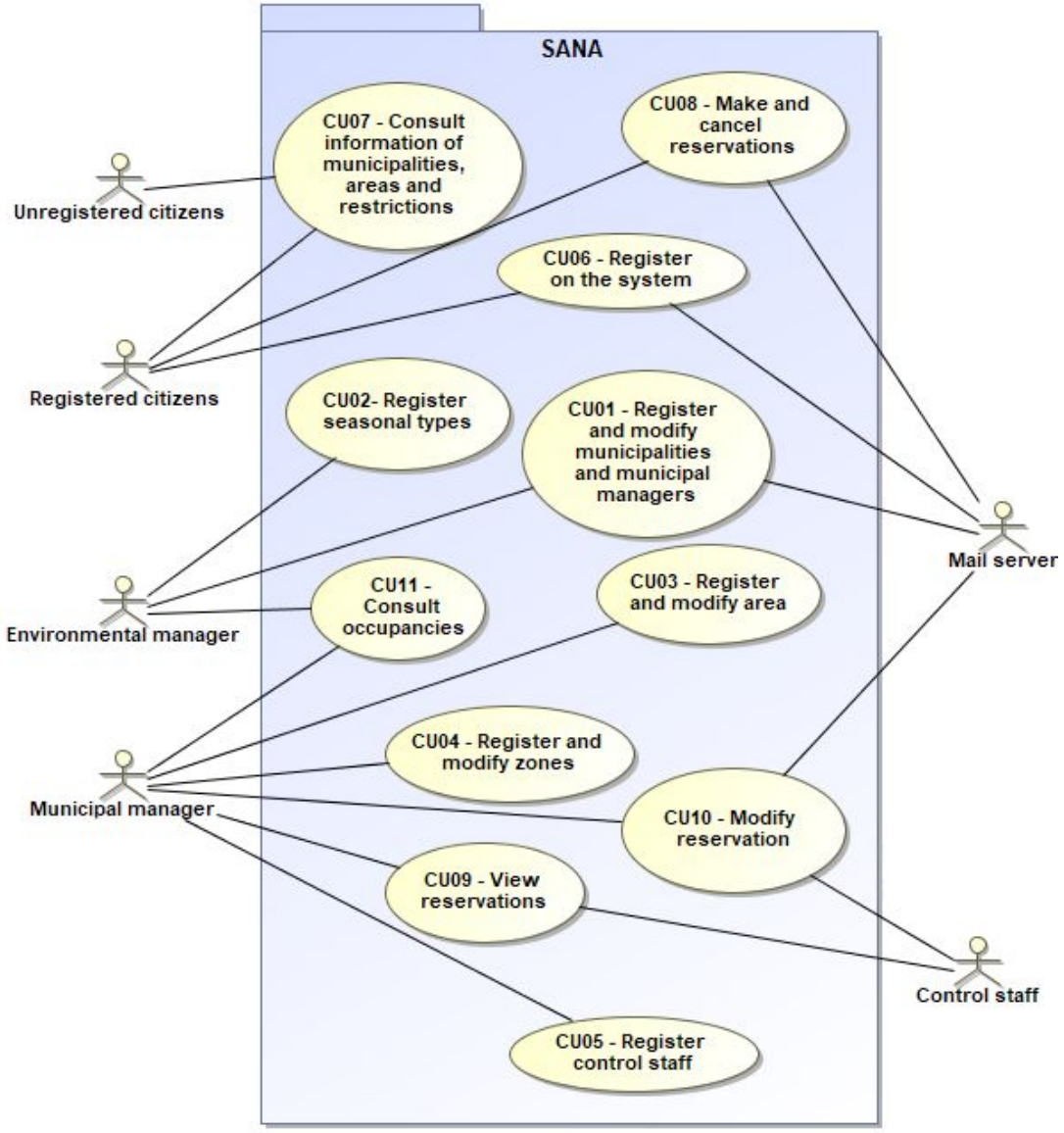
4 Requirements definition

The following section shows the requirements definition of the platform [1], by that meaning the specific conditions and interactions the product will have with the end-users of the platform, utilizing a use case diagram [6] and the unified modeling language templates provided by the teachers [7].

Firstly, the definition of the actors, followed by the use case and their relations with the diagram. After that, the documentation of all the use cases will be presented. Finalizing with the definition of the product's data requirement.

4.1 Use case diagram

In this section a use case diagram is shown which has been created with the *MagicDraw* tool provided for the project.



4.2 Use case documentation

In this subsection the interactions with the product will be shown.

4.2.1 Actor description

In this section, the actors summary, with their description and primary use case, are shown.

Environmental manager

Description	Responsible for managing and regulating the environmental decisions of the Valencian Community and defining the policies and regulations for the recovery, conservation and protection of the environment.
Primary use cases	● CU01 - Register and modify municipalities and municipal managers ● CU02 - Register service types ● CU10 - Consult occupancies

Municipal manager

Description	Responsible for managing and regulating the environmental decisions of a municipality.
Primary use cases	● CU03 - Register and modify areas ● CU04 - Register and modify zones ● CU05 - Register control staff ● CU09 - View reservations ● CU10 - Modify reservation ● CU11 - Consult occupancies

Control staff

Description	Responsible for controlling the occupancy and solving possible conflicts in a municipal area.
Primary use cases	● CU09 - View reservations ● CU10 - Modify reservation

Registered citizen

Description	Person who is registered on the system.
Primary use cases	● CU06 - Register on the system ● CU07 - Consult information of municipalities, areas and restrictions ● CU08 - Make and cancel reservations

Unregistered citizen

Description	Person who is not registered on the system.
Primary use cases	● CU07 - Consult information of municipalities, areas and restrictions

Mail server

Description	System responsible for automatically sending emails.
Primary use cases	● CU01 - Register and modify municipalities and municipal managers ● CU03 - Register and modify areas and zones ● CU06 - Register on the system ● CU08 - Make and cancel reservations ● CU10 - Modify reservation

4.2.2 Use case documentation

In this subsection the documentation of all the use cases are shown.

UC01 - Register and modify municipalities

Author	Miguel Ángel Prosper Quíros
Reviewer	Paul Ximo Pluijter Izquierdo
Source	SANA - Cas pràctic [1]
Creation date	10/11/2020
Revision date	23/11/2020
Description	Enables the environmental manager to register municipalities. Municipality names must be unique. Removal of municipalities is also permitted.
Goal	Enable the registration, modification and deletion of municipalities.
Assumption	The environmental manager is already present on an interface with the capabilities of adding or modifying a municipality.
Precondition	Environmental managers must be registered.
Actors	● Environmental manager
Event flow (creation)	1. The environmental manager requests a new municipality. 2. The system asks for a municipality name. 3. The environmental manager fills in the name of the municipality.

	4. The system saves the new municipality name.
Alternative event flow (signed down)	1. The environmental manager selects delete on the municipality. 2. The system removes all municipal managers as in step 3 and removes the municipality.
Exceptional event flow (creation errors)	1. The environmental manager requests a new municipality. 2. The system asks for a municipality name. 3. The environmental manager fills in the municipality name. 4. The system refuses as the name is already in use by another municipality.

UC02 - Register and modify municipal managers

Author	Miguel Ángel Prosper Quíros
Reviewer	Paul Ximo Pluijter Izquierdo
Source	SANA - Cas pràctic [1]
Creation date	10/11/2020
Revision date	23/11/2020
Description	Enables the environmental manager to register municipal managers. Municipal managers can only be assigned to a municipality if they are not registered already to another municipality. Notifications must be sent on assignment and deletion of a municipal manager. Removal of municipal managers is also permitted.
Goal	Enable the registration, modification and deletion of municipal managers.
Assumption	The environmental manager is already present on an interface with the capabilities of adding or modifying a municipal manager.
Precondition	The environmental manager and the municipality must be registered.
Actors	● Environmental manager ● Mail server
Event flow (creation)	1. The environmental manager fills in the name of a municipal manager and selects add. 2. The system saves the new municipal manager and notifies the mail server to inform the manager.
Alternative event flow	1. The environmental manager selects delete on one of

(signed down)	the municipal managers. 2. The system removes the municipal manager and notifies the mail server to inform the manager.
Exceptional event flow (creation errors)	1. The environmental manager fills in the name of a municipal manager and selects add. 2. The system refuses as the municipal manager does not exist or is already assigned to a municipality.

UC03 - Register service types

Author	Miguel Ángel Prosper Quíros
Reviewer	Paul Ximo Pluijter Izquierdo
Source	SANA - Cas pràctic [1]
Creation date	10/11/2020
Revision date	23/11/2020
Description	Enables the environmental manager to register service types. Service types must be unique. Removal of service types is also permitted if no municipal service has it assigned at the time.
Goal	Enable the registration and deletion of service types.
Assumption	The environmental manager is already present on an interface with the capabilities of adding or modifying service types.
Precondition	Environmental managers must be registered.
Actors	● Environmental manager
Event flow (creation)	1. The environmental manager fills in the service type name. 2. The system saves the new service type.
Alternative event flow (deletion)	1. The environmental manager selects signed down on the service type. 2. The system signed down the service type.
Exceptional event flow (creation errors)	1. The environmental manager fills in the service type name. 2. The system refuses as the name is already in use by another service type.

UC04 - Register and modify area

Author	Paul Ximo Pluijter Izquierdo
Reviewer	Francisco de Borja Viera Prieto

Source	SANA - Cas pràctic [1]
Creation date	10/11/2020
Revision date	24/11/2020
Description	Enables the municipal manager to register areas. Areas names must be unique. Removal of areas are also permitted.
Goal	Enable the registration, modification and deletion of areas.
Assumption	Municipal manager is already present on an interface with the capabilities of adding or modifying an area.
Precondition	Municipal manager and the municipality must be registered.
Actors	• Municipal manager
Event flow (creation / modification)	1. The municipal manager requests a new area or modify area. 2. The system asks for an area name. 3. The municipal manager fills in the name of the area. 4. The system saves the area name.
Alternative event flow (deletion)	1. The municipal manager selects signed down on the area. 2. The system signed down the area.
Exceptional event flow (creation errors)	1. The municipal manager requests a new area. 2. The system asks for an area name. 3. The municipal manager fills in the area name. 4. The system refuses as the name is already in use by another area.

UC05 - Register and modify zones

Author	Paul Ximo Pluijter Izquierdo
Reviewer	Francisco de Borja Viera Prieto
Source	SANA - Cas pràctic [1]
Creation date	10/11/2020
Revision date	24/11/2020
Description	Enables the municipal manager to register zones. Removal of zones are also permitted.
Goal	Enable the registration, modification and deletion of zones.
Assumption	The municipal manager is already present on an interface with the capabilities of adding or modifying a zone.

Precondition	The municipal manager, the municipality and the restricted area must be registered.
Actors	• Municipal manager
Event flow (creation)	1. The municipal manager fills in the name of a zone and selects add. 2. The system saves the new zone.
Alternative event flow (deletion)	1. The municipal manager selects signed down on one of the zones. 2. The system signed down the desired zone.
Exceptional event flow (creation errors)	1. The municipal manager fills in the name of a zone and selects add. 2. The system refuses as the zone is already assigned to this area.

UC06 - Register control staff

Author	Paul Ximo Pluijter Izquierdo
Reviewer	Francisco de Borja Viera Prieto
Source	SANA - Cas pràctic [1]
Creation date	10/11/2020
Revision date	24/11/2020
Description	Enables the municipal manager to register control staff. The same control staff cannot be assigned to multiple overlapping schedules. Removal of control staff is also permitted.
Goal	Enable the registration and deletion of control staff.
Assumption	The municipal manager is already present on an interface with the capabilities of adding or modifying control staff.
Precondition	Municipal managers and control staff must be registered.
Actors	• Municipal manager
Event flow (creation)	1. The municipal manager fills in the control staff's data. 2. The system saves the new control staff.
Alternative event flow (deletion)	1. The municipal manager selects delete on the control staff's data. 2. The system removes the control staff of that area.
Exceptional event flow (creation errors)	1. The municipal manager fills in the control staff's data. 2. The system refuses as the control staff is already registered in some other area with that same schedule.

UC07 - Register on the system

Author	Francisco de Borja Viera Prieto
Reviewer	Miguel Ángel Prosper Quíros
Source	SANA - Cas pràctic [1]
Creation date	10/11/2020
Revision date	24/11/2020
Description	Enables lagal aged unregistered citizens to register into the platform with their identification data and place of residence, becoming registered citizens with a newly created citizen code and pin.
Goal	Enable unregistered citizens become registered.
Assumption	The citizen is already present on an interface with the capabilities of registering them in the platform.
Precondition	The citizen must be unregistered and be of legal age with some valid identification data and a place of residence.
Actors	● Unregistered citizens ● Mail server
Event flow (creation)	1. The citizen fills in the identification data and a place of residence. 2. The system saves the user, presents a uniquely generated citizen code and a pin and notifies the mail server to send them a copy of the presented data.
Exceptional event flow (creation errors)	1. The citizen fills in the identification data and a place of residence. 2. The system refuses as the data is invalid.

UC08 - Consult information of municipalities, areas and restrictions

Author	Miguel Ángel Prosper Quíros
Source	SANA - Cas pràctic [1]
Creation date	10/11/2020
Goal	Enables citizens to consult information about municipalities, areas, restrictions and their associated features and current occupation.
Actors	● Unregistered citizens ● Registered citizens

UC09 - Make and cancel reservations

Author	Francisco de Borja Viera Prieto
Reviewer	Miguel Ángel Prosper Quíros
Source	SANA - Cas pràctic [1]
Creation date	10/11/2020
Revision date	24/11/2020
Description	Enables registered citizens to make and consult reservations to restricted natural areas on a predefined set of dates and times, including adding additional competitions. Removal of reservations is also permitted.
Goal	Enables registered citizens to make, consult and cancel reservations to restricted natural areas.
Assumption	User is already on an interface with the capabilities of managing reservations.
Precondition	User is already registered.
Actors	● Registered citizens ● Mail server
Event flow (creation)	1. The citizen selects their desired restricted natural area. 2. The system responds with a reservation form for the area. 3. The citizen fills in the prefered date, time and zones from a predefined list along with the number of companions that will be present. 4. The system saves the reservation, generates a QR code for the zone entry and notifies the mail server to send them a copy of the presented data.
Alternative flow of events (deletion)	1. The citizen selects delete on the reservation data. 2. The system removes the reservation of the platform and notifies the mail server to send the summary of the interaction.
Exceptional event flow (creation errors)	1. The citizen selects their desired restricted natural area. 2. The system responds with a reservation form for the area. 3. The citizen fills in the prefered date, time and zones from a predefined list along with the number of companions that will be present. 4. The system refuses as the requirements can not be met because of the limited capacity.

UC10 - View reservations

Author	Miguel Ángel Prosper Quíros
Source	SANA - Cas pràctic [1]
Creation date	10/11/2020
Goal	Enables viewing access to all reservations of the assigned area or all the areas in the case of the municipal manager.
Actors	• Municipal manager • Control staff

UC11 - Modify reservations

Author	Paul Ximo Pluijter Izquierdo
Source	SANA - Cas pràctic [1]
Creation date	10/11/2020
Goal	Enables editing access to all reservations of the assigned area or all the areas in the case of the municipal manager, notifying via mail if modified.
Actors	• Municipal manager • Control staff

UC12 - Consult occupancies

Author	Francisco de Borja Viera Prieto
Source	SANA - Cas pràctic [1]
Creation date	10/11/2020
Goal	Enables managers to consult information about the municipality's occupation on specific dates and real-time.
Actors	• Environmental manager • Municipal manager

4.3 Data requirements

In this subsection the data requirements of the different classes are shown.

DR01 - Municipal manager

Author	Francisco de Borja Viera Prieto
Reviewer	Miguel Ángel Prosper Quiros

Source	SANA - Cas pràctic [1]
Creation date	25/11/2020
Revision date	09/12/2020
Description	Identifies a particular municipal manager.
Data	Name, identification, phone, mail and the period it is active.

DR02 - Municipality

Author	Francisco de Borja Viera Prieto
Reviewer	Miguel Ángel Prosper Quiros
Source	SANA - Cas pràctic [1]
Creation date	25/11/2020
Revision date	09/12/2020
Description	Identifies a particular municipality and the period it is active.
Data	Name and the period it is active.

DR03 - Municipal area

Author	Miguel Ángel Prosper Quiros
Reviewer	Paul Ximo Pluijter Izquierdo
Source	SANA - Cas pràctic [1]
Creation date	25/11/2020
Revision date	25/11/2020
Data	Name, location, terrain type, physical characteristics, description, size, facilities, comments, images and the period it is active.
Description	Identifies a particular area of a municipality and the period it is active.
Comments	• The type of area could be one of: beach, river, pond, lake, forest or other. • Physical characteristics could be one or more of: sand, stones, rocks or other.

DR04 - Service

Author	Francisco de Borja Viera Prieto
Reviewer	Paul Ximo Pluijter Izquierdo
Source	SANA - Cas pràctic [1]
Creation date	25/11/2020
Revision date	09/12/2020
Description	Identifies the service type and their work hours.
Data	Type, schedule and period it is active.

DR05 - Restriction schedule

Author	Paul Ximo Pluijter Izquierdo
Reviewer	Francisco de Borja Viera Prieto
Source	SANA - Cas pràctic [1]
Creation date	25/11/2020
Revision date	09/12/2020
Description	Identifies the restriction dates and times.
Data	Time and period it is active.

DR06 - Control staff

Author	Paul Ximo Pluijter Izquierdo
Reviewer	Francisco de Borja Viera Prieto
Source	SANA - Cas pràctic [1]
Creation date	25/11/2020
Revision date	09/12/2020
Description	Identifies a particular control staff.
Data	Name, identification and period it is active.

DR07 - Zone[1]

Author	Miguel Ángel Prosper Quiros
Reviewer	Paul Ximo Pluijter Izquierdo

Source	SANA - Cas pràctic [1]
Creation date	25/11/2020
Revision date	25/11/2020
Data	Location, capacity and period it is active.
Description	Identifies a particular zone of an area and the period it is active.

DR08 - Registered citizen

Author	Paul Ximo Pluijter Izquierdo
Reviewer	Miguel Ángel Prosper Quiros
Source	SANA - Cas pràctic [1]
Creation date	25/11/2020
Revision date	25/11/2020
Data	Name, DNI/NIE, birthdate, mail, place of residence and period it is active.
Description	Identifies a particular citizen.
Comments	• The place of residence is composed by: the address, the town and the country. • DNI being the national identity document for spanish citizens and NIE the foreign identity document respectively. • The saving of the data on the system must be done following the spanish data protection act [8].

DR09 - Reservation

Author	Francisco de Borja Viera Prieto
Reviewer	Paul Ximo Pluijter Izquierdo
Source	SANA - Cas pràctic [1]
Creation date	25/11/2020
Revision date	25/11/2020
Data	Number of people, access and exit times.
Description	Identifies a reservation and the amount of people that could be present.

Comments	• Time meaning how long the reservation will last.
Documents	QR code image.

DR10 - Mail account

Author	Paul Ximo Pluijter Izquierdo
Reviewer	Francisco de Borja Viera Prieto
Source	SANA - Cas pràctic [1]
Creation date	25/11/2020
Revision date	09/12/2020
Description	Information related to the registration information of a municipal manager or citizen account.

DR11 - Mail reservation

Author	Miguel Ángel Prosper Quiros
Reviewer	Paul Ximo Pluijter Izquierdo
Source	SANA - Cas pràctic [1]
Creation date	25/11/2020
Revision date	09/12/2020
Description	Information related to the current state of a reservation.

4.4 Technological requirements

In this section, the main technological requirements are reported, which are:

- **Network connection**: to update the occupancy in real time and the general interoperability between the platforms devices.
- **Mail server**: to send information about the registrations of the citizens and municipal manager, and for modification in reservations status (made either by a municipal manager or a control staff).
- **Database server**: to access and organize all the plataform's information.
- **QR readers**: to allow access to reserved zones to the registered users.
- **Panels**: to show information in real-time about the areas and zones.
- **Computers (PC, tablets, phones)**: for the internal use platform.

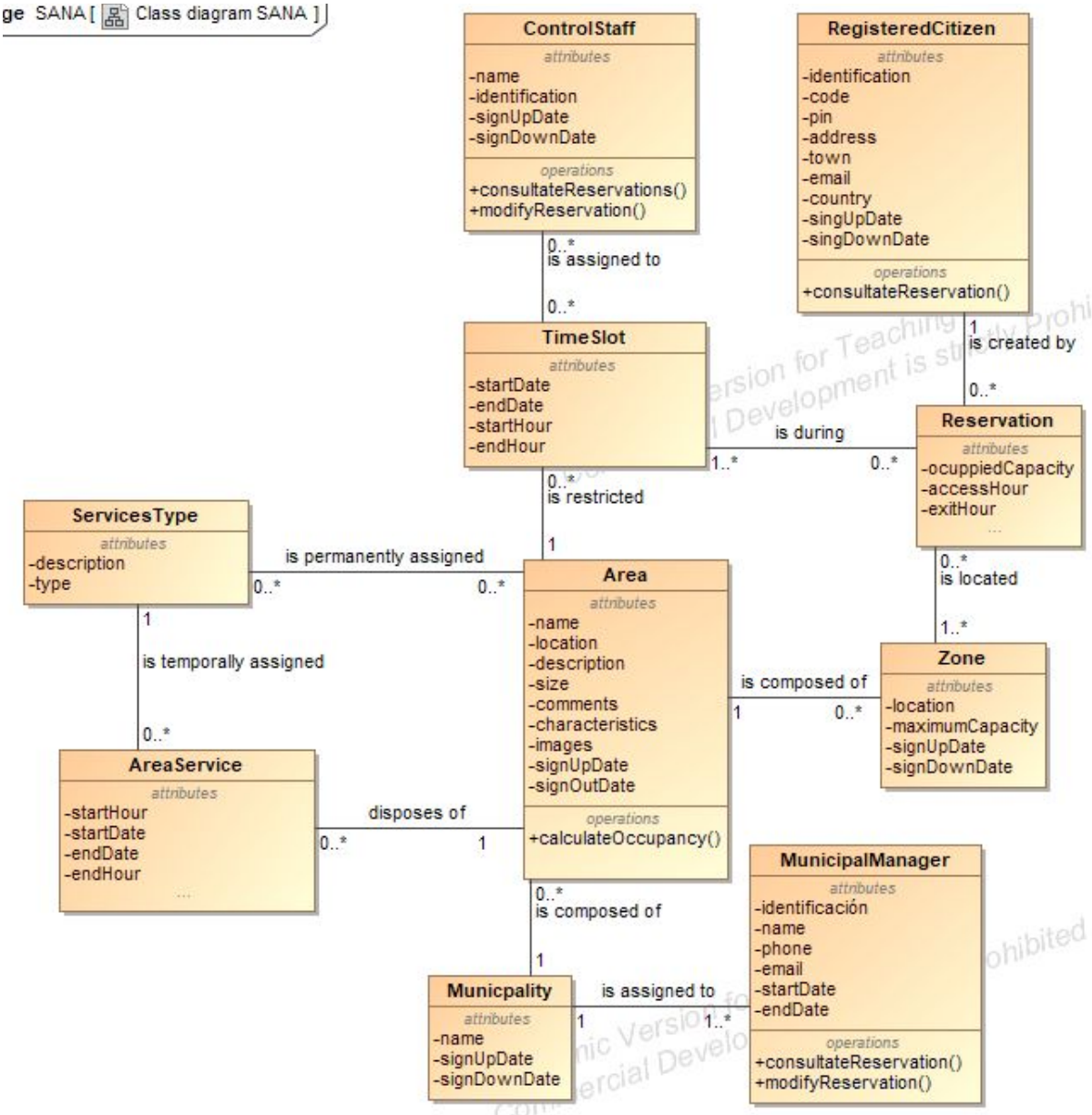
5 Analysis

The following section shows the overall analysis of the system [1], by that meaning the class diagram and short description of the classes along with their corresponding attributes, using a class diagram [4] and the unified modeling language templates provided by the teachers [9].

Firstly, a class diagram of the system, in which is represented the attributes, operations and relations between the distinct main instances of the project, is shown. After that, comes the description of the classes section, in which these instances are described. Finally, the association descriptions, where the relations between the classes are described and explained, are shown.

5.1 Class diagram

In this section a class diagram is shown which has been created with the *MagicDraw* tool provided for the project.



5.2 Class diagram documentation

5.2.1 Class description

In this section, the class description is shown.

Municipal manager

Author	Miguel Ángel Prosper Quíros
Reviewer	Paul Ximo Pluijter Izquierdo
Source	SANA - Cas pràctic [1]
Creation date	9/12/2020
Revision date	15/12/2020
Description	An instance of the class represents a person who is responsible for managing and regulating the environmental decisions of a municipality.
Validation	Is required by the owner of the product. Represents the manager of the product that only manages the municipality.
Example	Fernando Navarro Cueva, delegate of environment of Castellón's government [9].

Control staff

Author	Miguel Ángel Prosper Quíros
Reviewer	Paul Ximo Pluijter Izquierdo
Source	SANA - Cas pràctic [1]
Creation date	9/12/2020
Revision date	15/12/2020
Description	An instance of the class represents a person who is responsible for controlling the occupancy and solving possible conflicts in a municipal area.
Validation	Is required by the owner of the product. Represents the person who controls the occupancy of an area and solves possible conflicts.
Example	A person similar to a security guard.

Registered citizen

Author	Miguel Ángel Prosper Quíros

Reviewer	Francisco de Borja Viera Prieto
Source	SANA - Cas pràctic [1]
Creation date	9/12/2020
Revision date	15/12/2020
Description	An instance of the class represents a person who is registered on the system.
Validation	Represents a person who is registered on the product.
Example	A person who wants to reserve a zone of an area.

Service type

Author	Paul Ximo Pluijter Izquierdo
Reviewer	Miguel Ángel Prosper Quíros
Source	SANA - Cas pràctic [1]
Creation date	9/12/2020
Revision date	15/12/2020
Description	An instance of the class represents a type of service a municipality may offer in the area (e.g., lifeguard, playroom, first aid).
Validation	Represents the different services that an area provides.
Example	The parking of an area.

Municipality

Author	Paul Ximo Pluijter Izquierdo
Reviewer	Miguel Ángel Prosper Quíros
Source	SANA - Cas pràctic [1]
Creation date	9/12/2020
Revision date	15/12/2020
Description	An instance of the class represents a particular administrative subdivision which is managed by a municipal manager.
Validation	Is required by the owner of the product. Represents a territory of Valencia.
Example	The municipality of Paterna.

Area

Author	Paul Ximo Pluijter Izquierdo
Reviewer	Miguel Ángel Prosper Quíros
Source	SANA - Cas pràctic [1]
Creation date	9/12/2020
Revision date	15/12/2020
Description	An instance of the class represents a subdivision of a municipality.
Validation	Is required to allow the municipal managers to particular sections of their municipality.
Example	Castellon's beach.

Area service

Author	Paul Ximo Pluijter Izquierdo
Reviewer	Miguel Ángel Prosper Quíros
Source	SANA - Cas pràctic [1]
Creation date	9/12/2020
Revision date	15/12/2020
Description	An instance of the class represents a facility a municipality may offer in a particular area.
Validation	Is required to allow the registration of temporal services to a particular area.
Example	Lifeguard is only present during the morning.

Time slot

Author	Francisco de Borja Viera Prieto
Reviewer	Miguel Ángel Prosper Quíros
Source	SANA - Cas pràctic [1]
Creation date	9/12/2020
Revision date	15/12/2020
Description	An instance of the class represents the dates and time slots a particular restricted area is open for.

Validation	Is required to only allow reservations during prefefined slots of time.
Example	Valencia's park is open from 7ap to 10pm during summer.

Zone

Author	Francisco de Borja Viera Prieto
Reviewer	Paul Ximo Pluijter Izquierdo
Source	SANA - Cas pràctic [1]
Creation date	9/12/2020
Revision date	15/12/2020
Description	An instance of the class represents a subdivision of a municipal restricted area.
Validation	Is required to maintain a record of reservation locations and their associated capacity limit.
Example	Plot A3 of Valencia's park has a capacity of 100 people.

Reservation

Author	Francisco de Borja Viera Prieto
Reviewer	Paul Ximo Pluijter Izquierdo
Source	SANA - Cas pràctic [1]
Creation date	9/12/2020
Revision date	15/12/2020
Description	An instance of the class represents an agreement made by a registered citizen for particular zones for some predefined time.
Validation	Is required as is needed to keep track of occupation of an area.
Example	Paul Ximo Pluijter Izquierdo made a reservation for 3 people on Castellon's beach during the morning of 2 of April.

5.2.2 Association description

In this section, the association description, with their corresponding classes, are shown.

Is assigned to (control staff)

Author	Francisco de Borja Viera Prieto

Reviewer	Paul Ximo Pluijter Izquierdo
Source	SANA - Cas pràctic [1]
Creation date	15/12/2020
Revision date	16/12/2020
Description	This association represents the control staff members that are assigned to a restricted area. This allows them to access reservations during the assigned schedule.
Validation	This association is needed to assign control staff members to restricted areas and control their schedule.

Is created by

Author	Francisco de Borja Viera Prieto
Reviewer	Miguel Ángel Prosper Quíros
Source	SANA - Cas pràctic [1]
Creation date	16/12/2020
Revision date	16/12/2020
Description	This association represents the ownership of a reservation to a particular registered citizen.
Validation	This association is needed to allow registered citizens to make reservations.

Is located

Author	Francisco de Borja Viera Prieto
Reviewer	Paul Ximo Pluijter Izquierdo
Source	SANA - Cas pràctic [1]
Creation date	16/12/2020
Revision date	16/12/2020
Description	This association represents which zones are reserved in the reservation.
Validation	This association is needed to keep track of which zones will be reserved, which also helps in keeping track of the capacity of the zone.

Is during

Author	Francisco de Borja Viera Prieto
Reviewer	Paul Ximo Pluijter Izquierdo
Source	SANA - Cas pràctic [1]
Creation date	16/12/2020
Revision date	16/12/2020
Description	This association represents the schedule that a reservation has.
Validation	This association is needed to allow reservations to have a defined time limit.

Is restricted

Author	Paul Ximo Pluijter Izquierdo
Reviewer	Francisco de Borja Viera Prieto
Source	SANA - Cas pràctic [1]
Creation date	16/12/2020
Revision date	16/12/2020
Description	This association represents the relation between an area and the different schedules than that area is restricted.
Validation	This association is needed to represent the different lapses of time where it is possible to make a reservation.

Disposes of

Author	Paul Ximo Pluijter Izquierdo
Reviewer	Francisco de Borja Viera Prieto
Source	SANA - Cas pràctic [1]
Creation date	16/12/2020
Revision date	16/12/2020
Description	This association represents the different services temporal services an area has.
Validation	This association is needed to allow the area to have temporal services.

Is temporarily assigned

Author	Paul Ximo Pluijter Izquierdo
Reviewer	Francisco de Borja Viera Prieto
Source	SANA - Cas pràctic [1]
Creation date	16/12/2020
Revision date	16/12/2020
Description	This association represents the different types of services that an area has temporarily assigned.
Validation	This association is needed to allow the existence of temporal services.

Is permanently assigned

Author	Paul Ximo Pluijter Izquierdo
Reviewer	Francisco de Borja Viera Prieto
Source	SANA - Cas pràctic [1]
Creation date	16/12/2020
Revision date	16/12/2020
Description	This association represents the different types of services that an area has permanently assigned.
Validation	This association is needed to allow the existence of permanente services.

Is composed of (area-zone)

Author	Miguel Ángel Prosper Quíros
Reviewer	Paul Ximo Pluijter Izquierdo
Source	SANA - Cas pràctic [1]
Creation date	16/12/2020
Revision date	16/12/2020
Description	This association represents a subdivision of an area.
Validation	This association is needed to allow the registration of each zone of a restricted area.

Is composed of (municipality-area)

Author	Miguel Ángel Prosper Quíros
Reviewer	Paul Ximo Pluijter Izquierdo
Source	SANA - Cas pràctic [1]
Creation date	16/12/2020
Revision date	16/12/2020
Description	This association represents a subdivision of a municipality.
Validation	This association is needed to allow the registration of each natural area of a municipality.

Is assigned to (municipal manager)

Author	Miguel Ángel Prosper Quíros
Reviewer	Francisco de Borja Viera Prieto
Source	SANA - Cas pràctic [1]
Creation date	16/12/2020
Revision date	16/12/2020
Description	This association represents which municipality is assigned to a disting municipal manager.
Validation	This association is needed to allow registered municipal managers to register and manage the natural areas of a municipality.

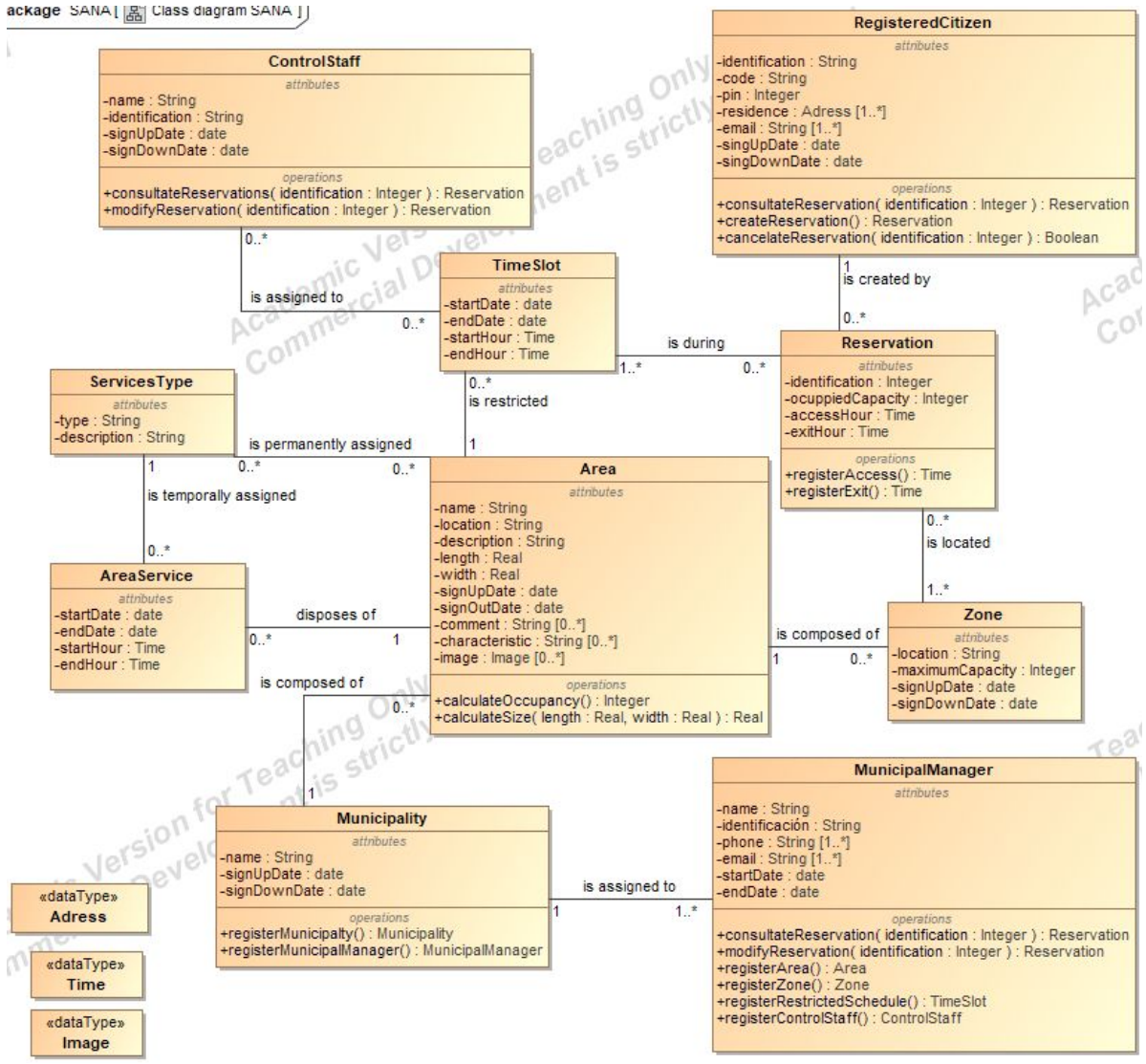
6 Design

The following section refines the system's [1] class diagram [4] and suggests an interface proposal for the final product based on the recommendations of the teachers.

Firstly a design class diagram of the system, in which is represented the attributes, operations and relations between the distinct main instances of the project, and the data types of said attributes, is shown. After that comes the graphical user interface, in which the user classification is determined, including their level of expertise. Then a list of interfaces is presented where its type and the users which are going to use it is shown. Finally some design examples of particular interfaces are included, using the tools provided [10].

6.1 Design class diagram

In this section a design class diagram where variables types are defined, is shown.



6.2 Graphical user interface

In this section different aspects of the graphical user interface are shown, such as user classification, a list of interfaces, and graphical screen design examples.

6.2.1 User classification

In this subsection the abbreviation, which will be used in the next section, and the profile of the users are shown.

User	Profile	Abbreviation
Unregistered citizen	Novice	UC

Registered citizen	Novice	RC
Control Staff	Expert and frequent	CS
Municipal manager	Expert and frequent	MM
Environmental manager	Expert but eventual	EM

6.2.2 List of interfaces

In this subsection the interface as well as its type and the users who use it are shown.

Interface Name	**Interface Type**	**Users**
Action confirmation	Output	All
Error message	Output	All
Login	Input	RC, CS, MM, EM
Register user	Detailed input	UC
Register confirmation	Output	RC
Environmental menu	Output	EM
Municipalities manager	Detailed output	EM
Register municipality	Input	EM
Register municipal manager	Detailed input	EM
Register service types	Input	EM
Modify municipality	Detailed input	MM
Register control staff	Detailed input	MM
Create reservation	Detailed input	RC
Reservation confirmation	Output	RC
Modify reservation	Detailed input	CS, MM
View and cancel reservation	Detailed output	RC, CS, MM
Area manager	Detail output	MM
Register and modify area	Detailed input	MM
Modify images	Input	MM

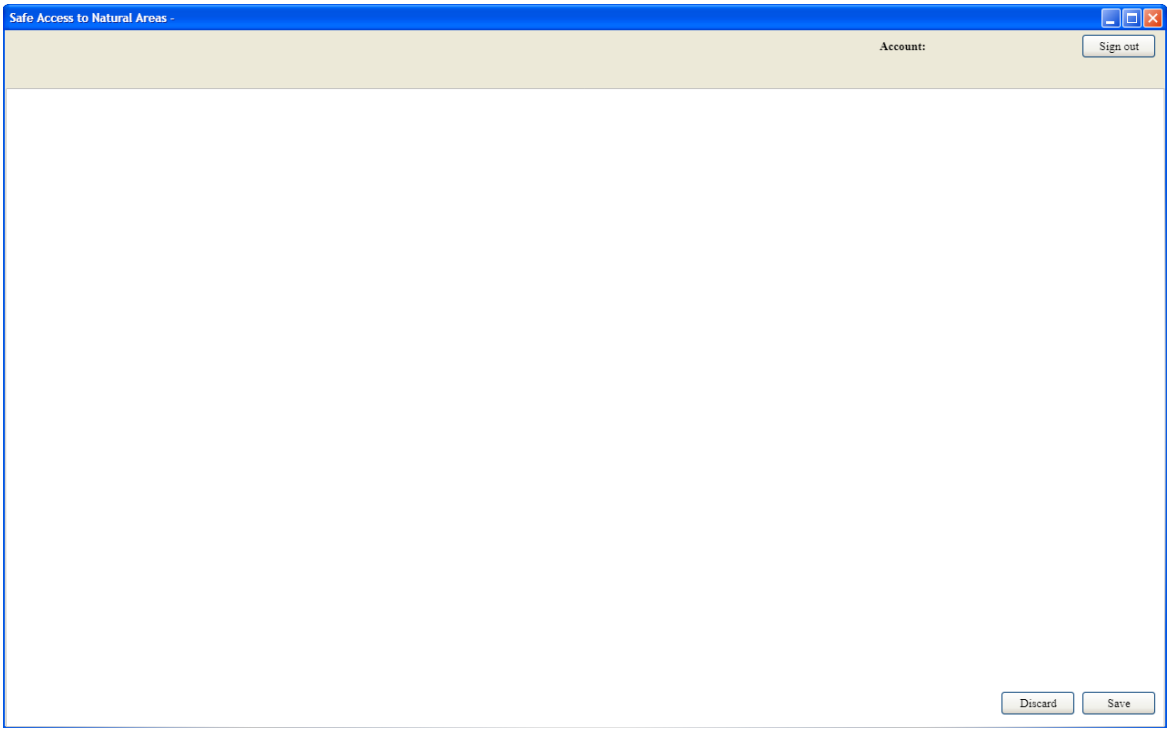
Modify services	Input	MM
Modify time slots	Input	MM
Modify zones	Input	MM
Consult occupancy statistics	Detailed output	All
Consult area information	Detailed output	All
Consult municipality	Detail output	All

6.2.3 Graphical screen design examples

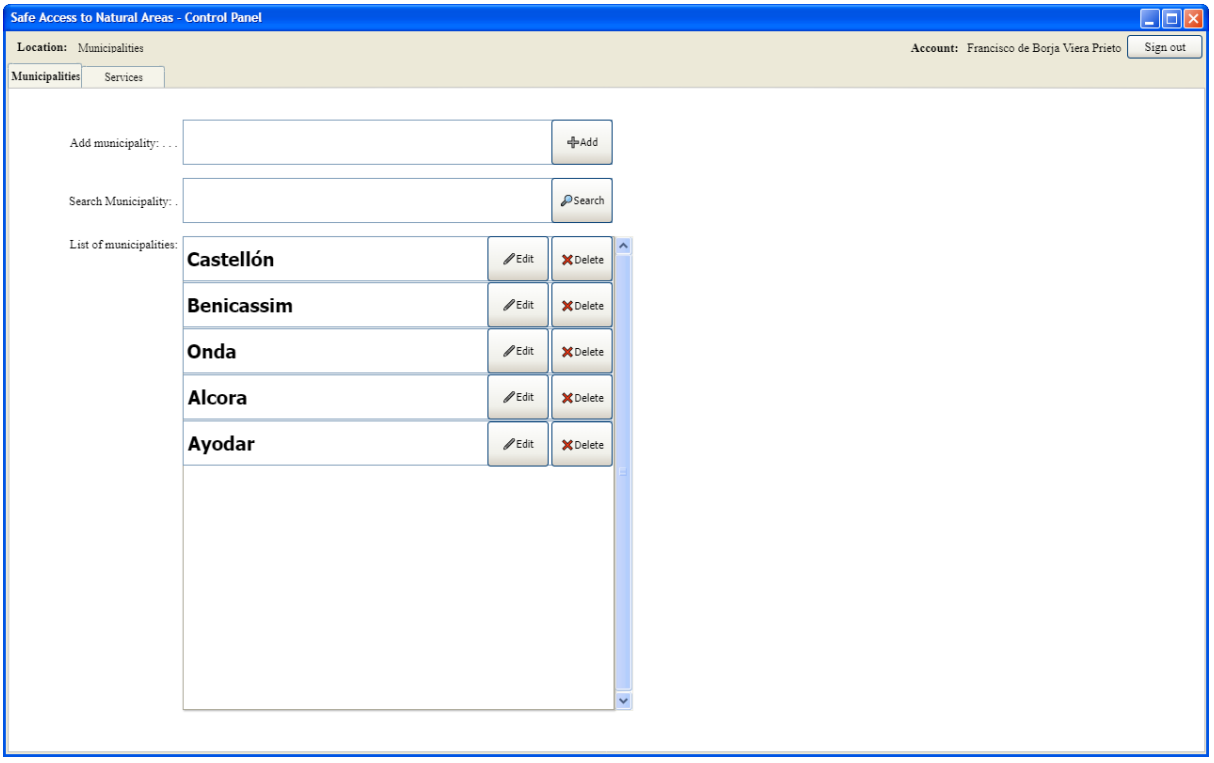
In this subsection some graphical interfaces based on the previous section are shown.

Basic template

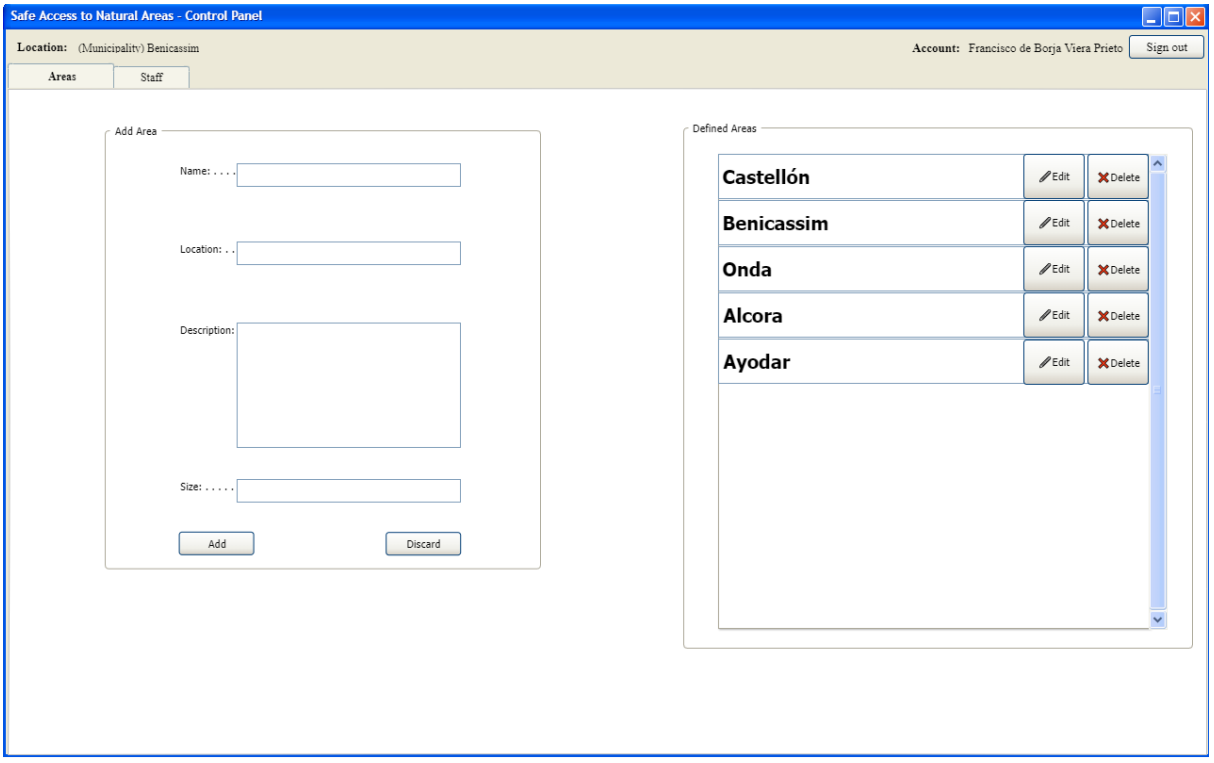
In this section the basic template that will be used in the different user interfaces is shown. The template was made with an open source tool named *Pencil* [10].



Municipalities manager



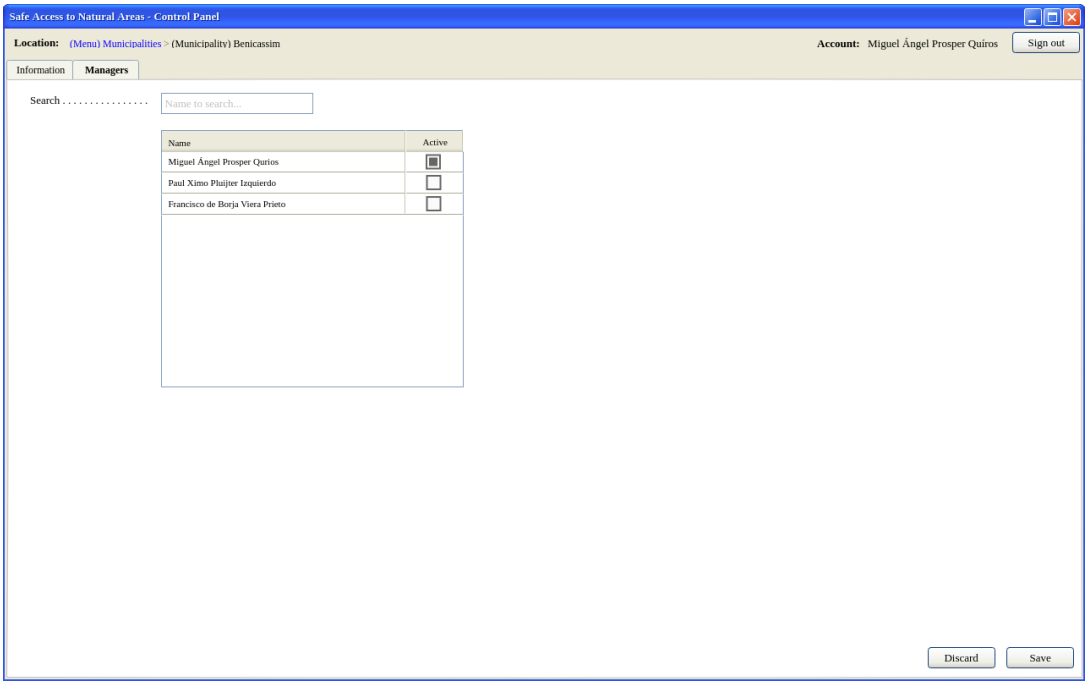
Modify municipality



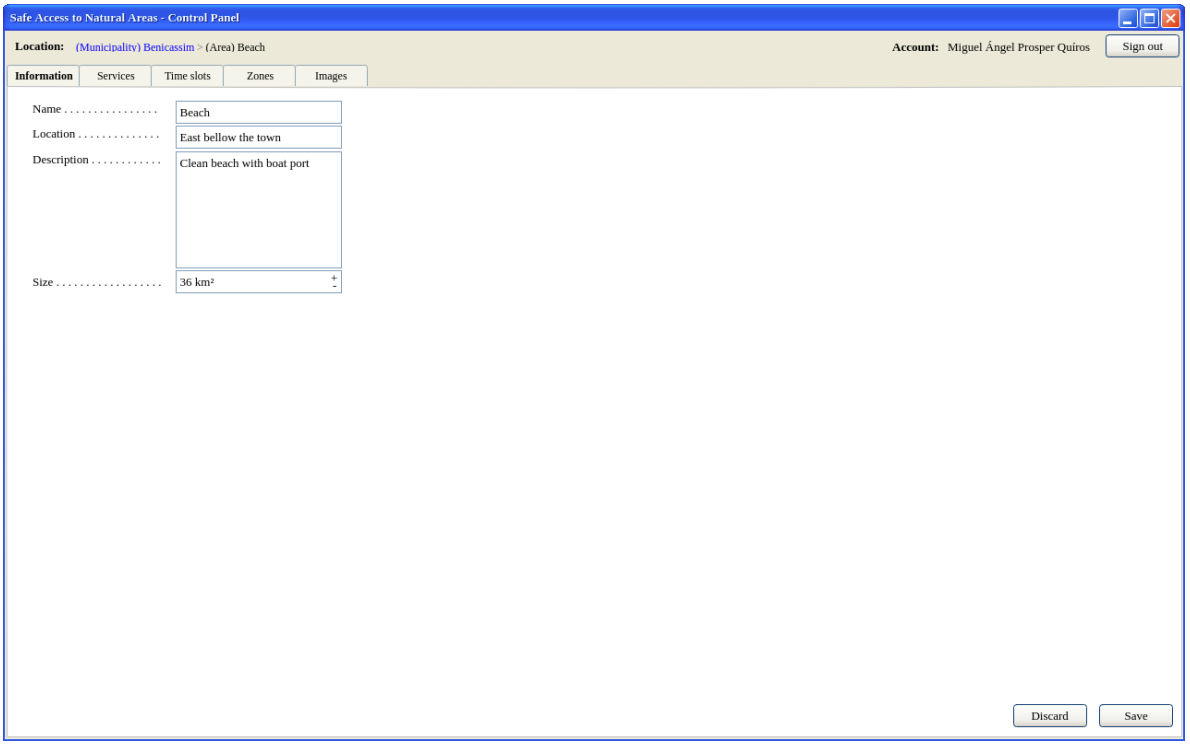
Create reservation

Reservation confirmation

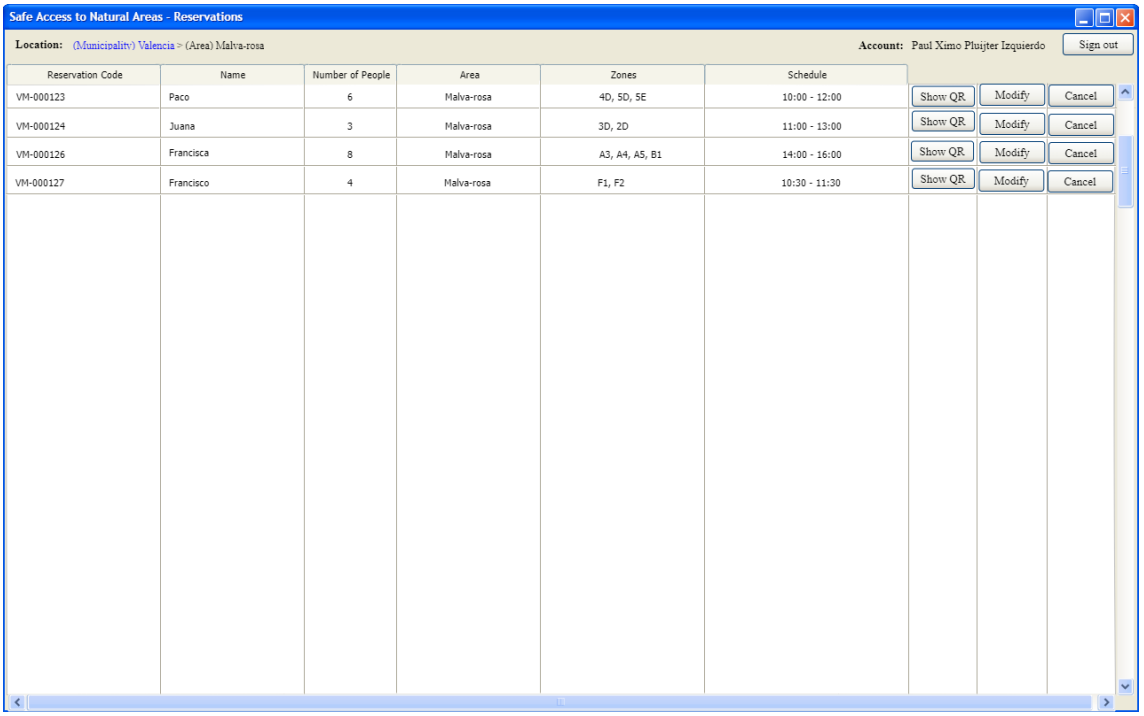
Modify area



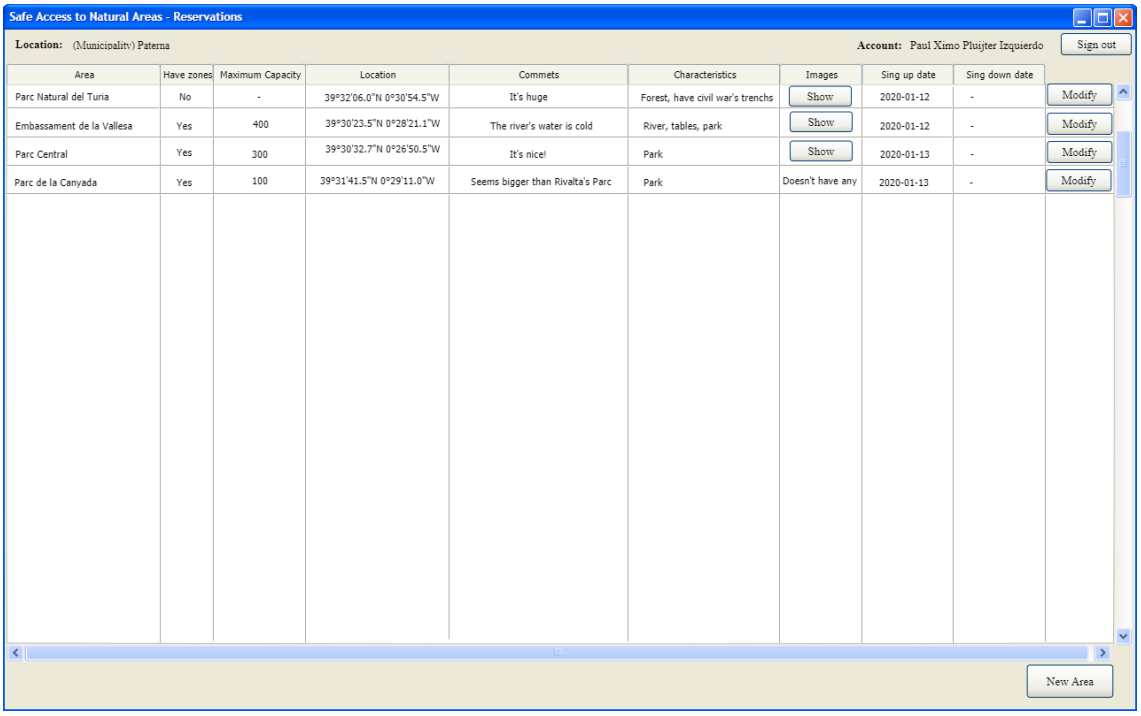
Register municipal manager



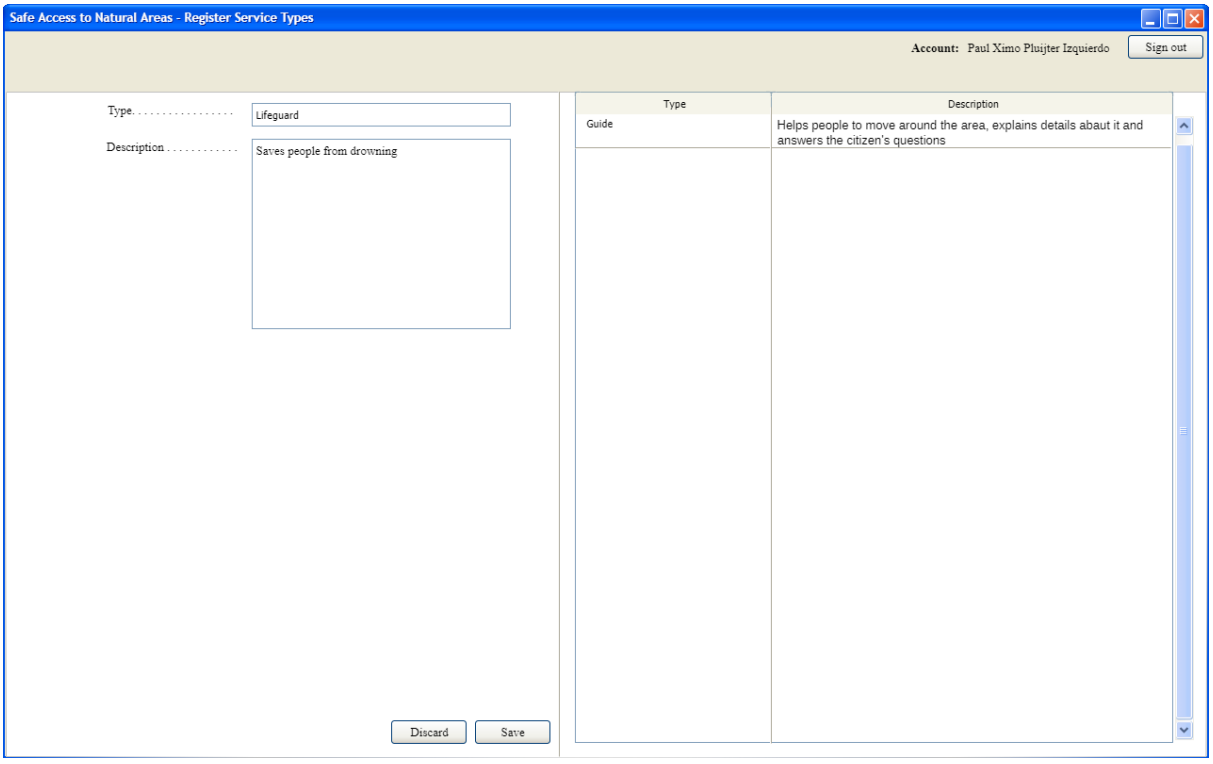
View and cancel reservations



Area manager



Register service types



7 Conclusions

During the development of this document the project has been conceptualized, planned and designed thoughtly. The understanding of these topics, which are much more involved than one might think at first glance, has improved over time.

Sections identifying and annotating the desires of the product and the project as a whole were the easiest to complete to a high level of accuracy and precision. Meanwhile the following which could be seen as more subjective, such as the architectural and graphical design, might not reach the same level of clarity and correctness as the previous ones.

However, overall, this document should be enough to ensure an efficient, usable and maintainable software to the client, which will meet all the explicit and hidden requirements given. Nonetheless refinement of the final sections as previously stated is recommended, as this might result in an improvement to the project, allowing for a better overall experience.

8 References

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2 TenStep. 408.0 Project Roles and Responsibilities. (last view 21/10/2020)
https://www.lifecyclestep.com/open/408.0LifecycleRoles.htm

3 TenStep. Glossary (last view 22/10/2020)
http://tenstep.com/glossary/

4 Fonaments d'enginyeria del programari. C. Campos Sancho; R. Grangel Seguer; V. Nebot Romero (last view 23/01/2021)
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5 Google spreadsheet of the subject's temporal estimation (last view 03/11/2020)
https://docs.google.com/spreadsheets/d/1DLLdnGr9eE8FEChG-d0KB6ojpnYZ2dwIpqVMv7Ayoeo/edit#gid=131728324

6 Use Case Specification Report. Example generated with MagicDraw UML (last view 28/12/2020)
https://docs.google.com/document/d/1WODvD4lnDZjgyWFGe-Exp3l3n17OoHdYx1yTPE7EuWI/edit?usp=sharing

7 Campos, C. Aula Virtual Ei1023. Plantilles per a documentar requisits de dades i altres requisits (last view 29/12/2020)
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8 Spanish Data Protection Act (Ley Orgánica de Protección de Datos y Garantía de Derechos Digitales, *LOPDGDD*) (last view 29/11/2020)
https://www.boe.es/buscar/act.php?id=BOE-A-2018-16673

9 Castellón government website (last view 12/12/2020)
http://www.castello.es/web30/pages/contenido_web20.php?cod0=7&cod1=44&cod2=153

10 Pencil website, open-source GUI prototyping tool that's available for all platforms (last view 17/01/2021)
http://pencil.evolus.vn/