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Dédicaces

Je voudrais dédier ce travail.

À mon père,

Le personne le plus chère à mon cœur. Le plus courageux, respectueux... Pour ton amour et tes sacrifices. Que Dieu te préserve et te procure santé et longue vie.

♡

À ma mère,

L'ange de ma vie, la plus tendre, la plus généreuse, la plus honorable... toujours prête à tout donner, à tout pardonner. Pour tes encouragements et tes prières. Que dieu te protège et te procure santé et longue vie.

♡

À ma sœur et mon frére

Ma fierté, ensemble nous avons grandi, nous avons ri, nous nous sommes disputés... mais jamais séparés. Pour votre amour et votre aide. Je vous souhaite le bonheur, la joie et la réussite.

♡

À moi-même, pour toutes les nuits blanches...

À mes amis qui me sont chères, Avec qui j'ai passé mes meilleurs moments, avec qui j'ai partagé des souvenirs. Amis pour la vie, amis pour toujours. Je vous aime.

Mohamed Aziz Makri

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Table des matières

General Introduction **1**

1 Project Overview **2**

1.1 Introduction to the host organization . . . 3

1.1.1 Naxxum Group . . . 3

1.2 Project presentation . . . 4

1.2.1 Project context . . . 4

1.2.2 Problem statement . . . 4

1.2.3 Analysis of the existence . . . 5

1.2.4 Proposed solution overview . . . 7

1.3 Adopted methodology . . . 7

1.3.1 Agile methodology . . . 7

1.3.2 SCRUM framework . . . 8

2 Preliminary study **11**

2.1 Requirements analysis . . . 12

2.1.1 Functional Requirements Identification . . . 12

2.1.2 Technical Requirements Identification . . . 13

2.1.3 Delivery Sequence . . . 13

2.1.4 Product Backlog . . . 13

2.2 Preliminary design . . . 16

2.2.1 Static context diagram . . . 16

2.2.2 Global use case diagram . . . 18

2.2.3 Class diagram . . . 19

2.3 Architectural design . . . 20

2.3.1 Logical architecture . . . 20

2.3.2 MVVM Architecture . . . 21

2.4 Working environment . . . 22

2.4.1 Hardware environment . . . 22

2.4.2 Used Software 22
2.4.3 Used Technologies 24

3 Release 2 **26**
3.1 Release 2 organization : 27
3.1.1 Sprint 4 : School setting management 28
3.1.2 Sprint planning 28
3.1.3 Sprint planning 29

Conclusion générale **33**

Table des figures

1.1 « Naxxum's Logo » 3
1.2 « Naxxum Organigram » 4
1.3 education.tn logo 6
1.4 Erridha 6
1.5 Pronote 6
1.6 SCRUM overview 8
1.7 Scrum team overview 9

2.1 « The delivery chain » 13
2.2 « The static context diagram » 17
2.3 « Global use case diagram » 18
2.4 « Class Diagram » 19
2.5 «Microservices architecture» 20
2.6 «Clean architecture» 21
2.7 «MVVM Architecture» 21
2.8 « characteristics of the hardware environment » 22

3.1 «Organization of Release 1» 27
3.2 «Use Case Diagram for "School setting management"» 29
3.3 «Use Case Diagram for "School setting management"» 32

Liste des tableaux

1.1 Existing Solutions 6

2.1 Product Backlog 14
2.2 The main actors 17
2.3 Used Software 23
2.4 Used technologies 24

3.1 Sprint 4 backlog 28
3.2 Textual description of the add session 30
3.3 Textual description of the Assign Teachers 31

Liste des abréviations

HTML : Hyper**T**ext **M**arkup **L**anguage

HTTP : Hyper**T**ext **T**ransfer **P**rotocol

IHM : Interface **H**omme **M**achine

ISIMa : Institut **S**uperieur d'**I**nformatique de **Ma**hdia

MVC : Model **V**iew **C**ontroller

REST : Representational **S**tate **T**ransfer

SGBD : Système de **G**estion de **B**ase de **D**onnées

SQL : Structured **Q**uery **L**anguage

UML : Unified **M**odeling **L**anguage

General Introduction

In today's fast-paced educational landscape, technology plays a pivotal role in enhancing the efficiency and effectiveness of school management. With the aim of simplifying school life and fostering a conducive learning environment, our final year project, Lumina, endeavors to leverage modern technologies to revolutionize the way educational institutions operate. Lumina is a comprehensive web and mobile application designed to streamline various aspects of school life management, catering to the needs of administrators, teachers, students, and parents alike. By harnessing the power of Artificial Intelligence and intuitive user interfaces, Lumina offers a user-friendly platform for seamless communication, organization, and access to essential information.

Our project aims to address the challenges faced by educational institutions in managing diverse tasks such as attendance tracking, grade management, communication between stakeholders, and resource allocation. Through the integration of advanced technologies, Lumina provides innovative solutions to automate routine tasks, analyze data for informed decision-making, and enhance overall productivity within schools.

The structure of our project report is delineated into six chapters, each focusing on different aspects of Lumina's development and implementation :

-In the first chapter, entitled "Project Overview", we will define the general framework of the project by first reviewing and criticizing the existing situation. Next, we propose solutions to these problems. Finally, we will detail our chosen design chosen and the formalism adopted.

- Chapter two, "Functional Study", delves into the detailed functional and non-functional requirements of Lumina, along with insights into project management methodologies, particularly utilizing the Scrum framework.

- Chapter three, "Technical study", sheds light on the technical infrastructure and environment required for the development of Lumina, including the design and development tools employed.

Chapitre 1

Project Overview

Plan

1 Introduction to the host organization 3

2 Project presentation 4

3 Adopted methodology 7

Introduction

The purpose of this chapter is to provide an overall perspective of the project. We will begin by introducing the host organization and its different departments. Next, we will give an overview of the problem that serves as the foundation for the main concept of this project, as well as the necessary tasks to address it. Lastly, we will outline the framework that will guide the project's development.

1.1 Introduction to the host organization

1.1.1 Naxxum Group

Established in 2014, Naxxum is a renowned company specializing in custom software development on a global scale. With a team of highly skilled IT experts, they utilize state-of-the-art tools and methodologies to create innovative solutions. As a prominent player in the European software development industry, Naxxum Group has gained the confidence of numerous clients across Europe, Africa, Asia, and North America. Their consistent success is evident through their impeccable track record, client recommendations, and a team of dedicated professionals.

Figure 1.1 : « Naxxum's Logo »

1.1.1.1 Host company organogram

Our internship was part of the Diamond Cruises unit activities as shown in the picture below :

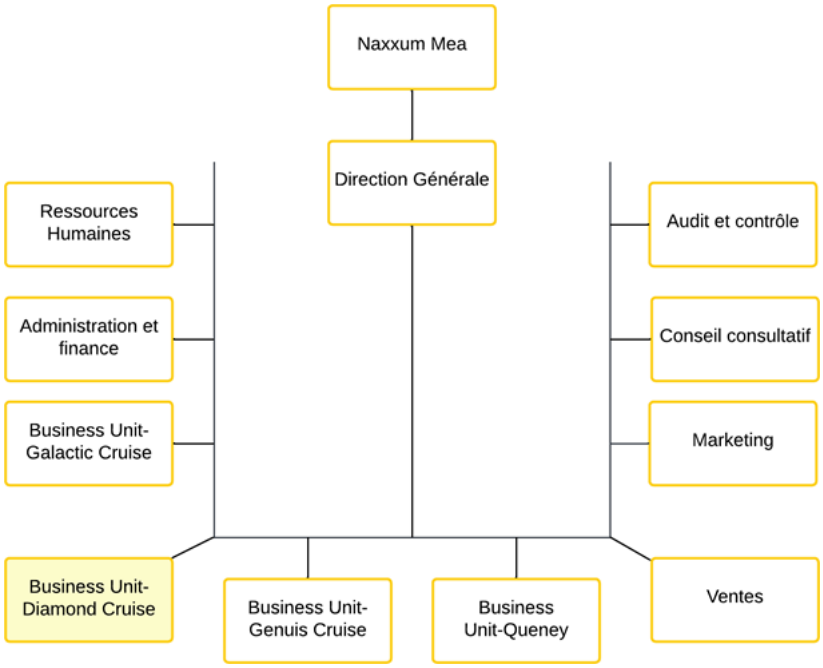

Figure 1.2 : « Naxxum Organigram »

1.2 Project presentation

1.2.1 Project context

In today's digital age, school management applications have become an essential tool for educational institutions around the world. These platforms serve as integrated hubs that enable efficient communication, streamline management processes, and improve the overall educational experience for students, teachers, and parents.

This project aims to develop a web and mobile platform for managing school resources within academic institutions. The platform is designed to provide a variety of services specifically tailored to various stakeholders such as administrators, parents, students, and teachers.

1.2.2 Problem statement

Lumina is a private preparatory school with 270 students and 34 teachers. This educational institution has noticed a distinct lack and decline in school life management. This issue is triggered when students have no online resources to access their courses or timetables. Given the huge impact this period of life has on teenagers, a school application will engage them and encourage them on their educational journey. In addition, it is crucial for parents to participate in surveys, be involved in

their children's academic journey, and be updated with the latest school news. The issue at hand was how to increase the efficiency and transparency of school life management for all students, parents, teachers, and school administrators. This challenge also included identifying the most appropriate technology and architecture to develop a robust and scalable solution. The aim was to ensure data security and a user-friendly interface, taking into account the diversity of devices and browsers used by end users.

1.2.3 Analysis of the existence

In this context, several existing websites and platforms address similar challenges. We chose the most popular Tunisian websites dedicated to preparatory schools, which are :

— **Education.tn :** is a digital platform operated by the Ministry of Education in Tunisia. It functions as a centralized hub for educational resources, information, and services designed for students, teachers, and educational stakeholders across the country.

— **Erridha :** is an independent educational website for an institution based in Tunisia. It provides a comprehensive educational program for students of various age groups, typically spanning from primary to secondary levels.

— **Pronote :** is an education management software widely used in French schools. It makes it easier to manage student data, including grades, attendance, class schedules, and communication between teachers, students, and parents. The platform provides a centralized system for school management, helping to streamline various academic and administrative tasks.

In this section, we will explore these websites, offering insights for comparison and informed decision-making. This information will be presented in a table for a clearer and more comprehensive view :

Tableau 1.1 : Existing Solutions

Solution	Features	Disadvantages
Figure 1.3 : education.tn logo	**User-Friendly :** It offers easy navigation and a guided experience. **Online registry :** Public school students sign up online instead of the on-campus registration process.	**Limited access :** It lacks comprehensive automation and access to courses and timetables. **Web only :** It is not accessible from mobile devices.
Figure 1.4 : Erridha	**Cross-platform :** Available as a web and mobile application. **Basic school life Features :** It enables the parents and students to review their scores, homework, and school information.	**Lack of AI integration :** Eriadh misses AI-driven features.
Figure 1.5 : Pronote	**Cross-platform.** **AI integration :** It leverages AI in different features.	**Performance Issues :** The website can sometimes experience slow loading times, especially during peak usage periods..

Upon thorough examination of numerous websites and applications, our findings indicate that the restricted compatibility of these platforms with diverse devices and browsers has the potential to hinder user acceptance, thereby compromising their efficacy and inclusivity. Moreover, the absence of a sturdy framework in the development of these apps contributes to an unsatisfactory and sluggish user experience. As a consequence, educators and administrators frequently opt for manual, on-campus procedures, shying away from utilizing these platforms.

1.2.4 Proposed solution overview

By utilizing appropriate technologies and implementing a well-crafted IT system, our solution endeavors to address the aforementioned challenges. Our goal is to create a solution that is not only user-friendly and practical but also affordable and feasible for educational institutions to adopt.

— **Data centralization :** is a powerful practice that allows you to store data in a single location, providing direct access.

— **Availability on all devices :** To ensure all teenagers have complete access to their school supplies, this application is developed for both computers and mobile phones.

— **Intelligent app :** With the integration of artificial intelligence, many new features are available on the app.

— **Better Cost Control :** If the budget is limited or shortfall the project can be stopped.

1.3 Adopted methodology

IT projects are becoming increasingly complex due to the diverse needs and specifications that are crucial during project development. As a result, computer scientists have reimagined project management methods. Adopting a structured development approach is essential for maintaining a high level of software quality. A well-defined methodology allows for better estimation, delivers stable systems, keeps the customer informed, creates a clear understanding of future tasks, and identifies obstacles early for timely adjustments.

1.3.1 Agile methodology

Definition An agile method is an iterative and incremental approach conducted in a collaborative spirit with just the right amount of formality. It produces a high-quality product while accommodating evolving customer needs. Thanks to the agile method, stakeholders (Administrators, Teachers, Parents, Students) of this application gain better visibility into data management compared to a traditional method. Involving those in need in the process allows the team to receive regular feedback and directly apply necessary changes. This method aims to accelerate software development. Additionally, it ensures the production of functional software throughout its development. In essence, the agile methodology aims to have :

— **Better quality of communication** : The customer has the possibility to clarify or modify its fur and custom needs.

— **Better visibility** : The client has better visibility on the progress of their project.

— **Better product quality** : Tests are carried out continuously.

— **Better cost control** : The project can be stopped due to a lack of budget.

1.3.2 SCRUM framework

1.3.2.1 Definition

SCRUM is an agile framework that follows an iterative and incremental process. A SCRUM project consistently follows a well-defined sequence of events to manage the development of complex products. It emphasizes the relative effectiveness of management and product development practices, enabling continuous improvement.

SCRUM consists of several elements : the SCRUM Team and its associated roles, events, artifacts, and rules, which are detailed in the following figure :

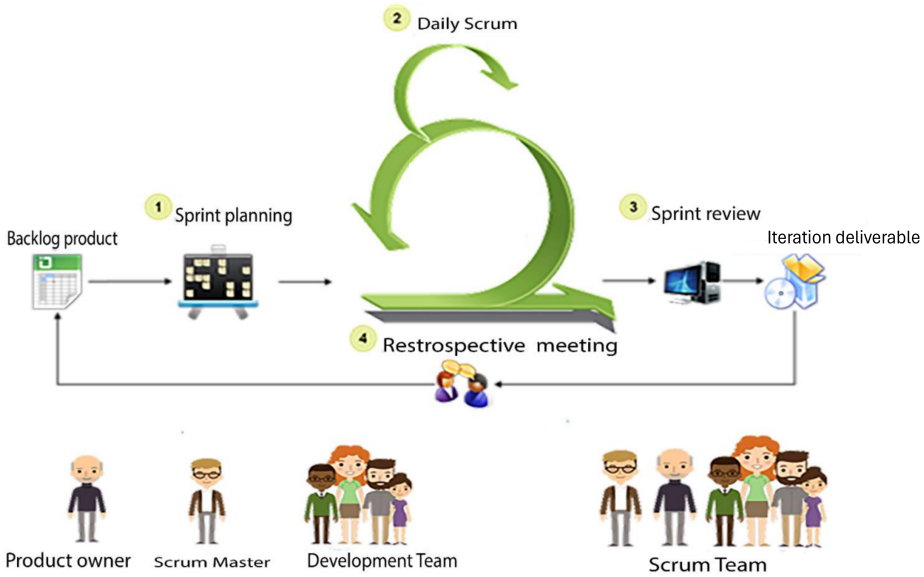

Figure 1.6 : SCRUM overview

1.3.2.2 Scrum team

The main unit of SCRUM is the Scrum Team. In a Scrum Team, there are no sub-groups or levels of hierarchy. It operates as a unified group of professionals dedicated to achieving a single goal : the Product Goal. Each member holds a significant role, as shown in the following image :

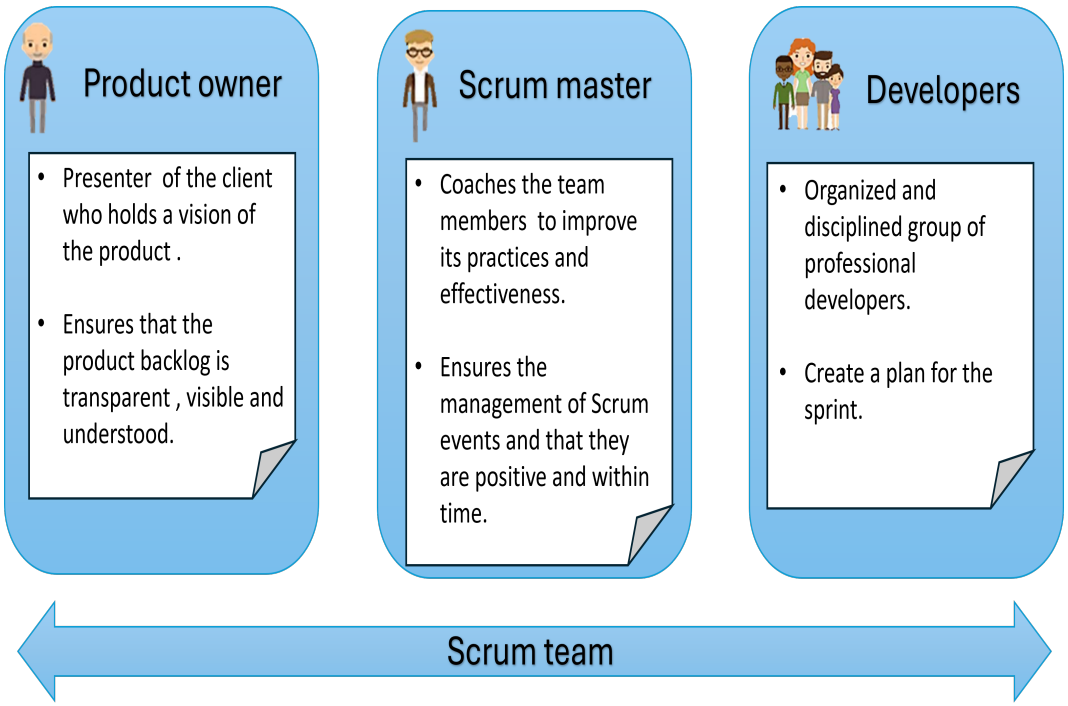

Figure 1.7 : Scrum team overview

1.3.2.3 Scrum events

Sprint Planning

This initial Agile meeting takes place at the beginning of the iteration, where the team decides which user stories will be included in the development cycle.

Daily Meeting

This is the most hands-on meeting in the Agile cycle. It happens daily, lasts 15 minutes, and involves the entire development team. Each team member has 2 minutes to discuss : — What they accomplished the previous day. — Their planned tasks for the current day. — Any challenges or issues they are facing.

Sprint Review

This meeting concludes the development iteration. The Scrum team presents its work to the

stakeholders to demonstrate that all developed features meet the specifications. Each user story is carefully reviewed, and a demonstration is provided

Sprint Retrospective

In this chapter, we have placed our subject within its broader context, identified the problem, and proceeded with an analysis of our proposed solution. We have outlined what is necessary to address the requirements in a concise and effective manner.

Chapitre 2

Preliminary study

Plan

1 Requirements analysis 12

2 Preliminary design 16

3 Architectural design 20

4 Working environment 22

Introduction

After giving an overview of the general framework of our project, this chapter dives into the functional intricacies. This is no mere exploration ; we will set out on a journey through the "functional" lens. It's a behind-the-scenes tour in which we introduce the key players, describe vivid images with use case diagrams, and choreograph the system sequence. So, fasten your seat-belts, we're going to unfold the functional story, layer by layer, in this chapter of discovery and definition

2.1 Requirements analysis

This phase includes understanding, expressing, verifying, and formulating requirements. To clarify the needs of the application's users correctly and accurately, we will formally disclose the functional and non-functional requirements that the system must meet.

2.1.1 Functional Requirements Identification

Functional requirements represent the expectations of each stakeholder in the application to be developed. Any conceptual solution must first meet functional requirements to delimit the application's functional perimeter and control the traceability of requirements during the development phase.

Our application must meet the following functional requirements to ensure it effectively addresses the needs of its users and stakeholders :

- **User Account and Role Management :** Enable creation, modification, and deletion of user accounts and assign appropriate roles to users.
- **Attendance and Lateness Tracking :** Monitor and record student attendance and instances of lateness.
- **Assignment and Resource Publication :** Allow teachers to publish assignments and educational resources for students to access.
- **Grade and Evaluation Consultation :** Provide a system for students and parents to view grades and evaluations...
- **Timetable Management :** Facilitate the creation and management of school timetables.
- **School Data Management :** Handle the management of various school data, ensuring it is organized and easily accessible.

2.1.2 Technical Requirements Identification

Technical requirements describe all the conditions needed to ensure that the system functions properly and to improve the quality of the application's services for the user.
Our system must meet the following criteria :

- **Availability :** To ensure that the system is accessible and operational when needed by users.
- **Security :** To protect sensitive information and ensure that only authorized users can access certain functionalities.
- **Scalability :** To handle a growing number of users and data efficiently without degrading performance.
- **Portability :** To allow the system to be used on various platforms and devices, ensuring wider accessibility.
- **Performance :** To provide a responsive and smooth user experience, especially when handling large volumes of data.

2.1.3 Delivery Sequence

The increments were delivered according to delivery milestones known as "Releases". This report has opted to organize the chapters according to Releases, as shown in the following graph :

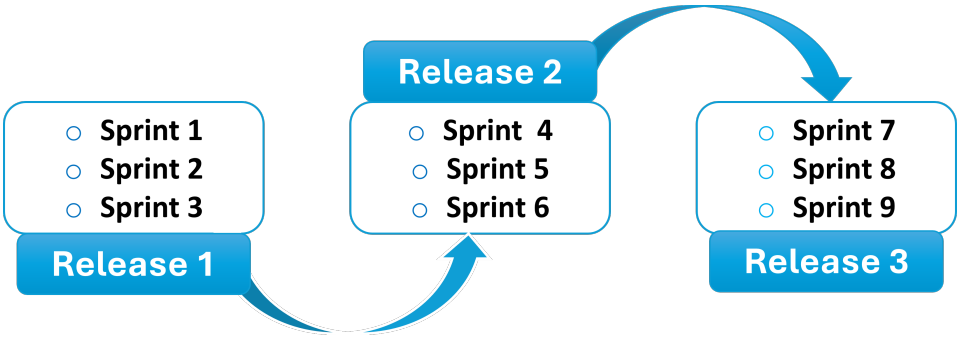

Figure 2.1 : « The delivery chain »

2.1.4 Product Backlog

The "Product Backlog" is an ordered list of everything that might be required in the product and is the sole source of requirements for all changes to be made.

Tableau 2.1 : Product Backlog

Sprint Name	User Stories	Description	Complexity	Priority	Sprint
Authentication	login	As a user, I want to log in to my account	Medium	High	1
	Reset password	As a user, I want to reset my password when I forget it.			
Notification management	Consult notification	As a user, I should be able to view my notification.	High	Low	2
	add events	As an admin, I should be able to notify school events.			
Account management	Manage users' accounts	As an admin, I should be able to add user accounts manually and from Excel.	Low	Medium	3
	Consult accounts	As an admin, I want to be able to view the list of teachers, students, and parents in my school.			
Timetable management	Manage sessions	As an admin, I should be able to add, modify and delete sessions manually.	Medium	High	4
	Mangage school subjects	As an admin I want to be able to add, modify, and delete subjects.			
	Assign teachers	As an admin I want to be able to assign a teacher to each grade level.			

Sprint Name	User Stories	Description	Complexity	Priority	Sprint
School setting management	manage classes	As an admin, I want to add and modify grade levels in school.	High	High	5
	Add classrooms	As an admin, I want to add levels and classrooms in my school.			
	Add school information	As an admin, I want to share important news and updates with all users.			
Attendance management	Add attendances	As a teacher, I should be able to save my students' attendances in my session manually.	Medium	Medium	6
	View attendances	As a student and a parent I want to get an overview of the student's attendance.			
Manage educational resources	Manage folders	As a teacher, I should be able to manage my folders in which I may depose some content.	High	High	7
	file documents	As a user, I should be able to upload educational documents.			
	Consult educational content	As a student, I should be able to access courses.			

Sprint Name	User Stories	Description	Complexity	Priority	Sprint
Manage school evaluations	Manage marks	As a user, I want to consult and manage marks for each subject and session.	Medium	High	8
	Add observation	As a teacher, I should be able to affect a textual description of student behavior in sessions.			
	Consult marks	As a student, I want to view all my exam results and marks.			
Quiz feature and application deployment	Generate quizzes with AI	As a teacher, I should be able to generate quizzes from my courses for my students.	Medium	Low	9
	Pipeline CI/CD for deployment	Implement a CI/CD deployment pipeline to automate the deployment process and ensure consistent and efficient releases.			

2.2 Preliminary design

2.2.1 Static context diagram

This UML diagram shows the relationship of the various actors to the system. It specifies the number of instances of each actor linked to the system.

The main actors of our system are :

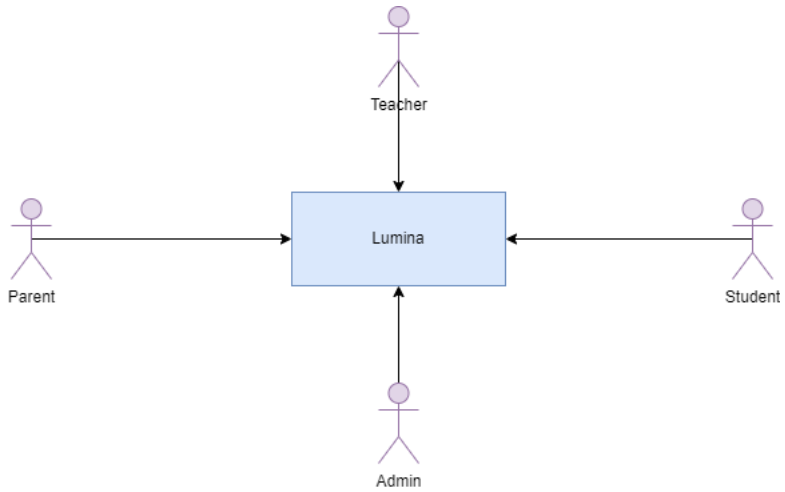

Figure 2.2 : « The static context diagram »

Actor	**Role**
Admin	Responsible for school information management and administrative functions .
Parent	Responsible for monitoring his children through the application .
Teacher	Downloads homework, lessons, and learning resources and assesses students .
Student	Is the main actor that will be tracked by his parents and check his evaluations .

Tableau 2.2 : The main actors

2.2.2 Global use case diagram

The use case diagram consists of looking at the system to be built from the outside, from the user's point of view, and the functionalities he expects from it. The following figure describes the different actors and the functionalities of the system.

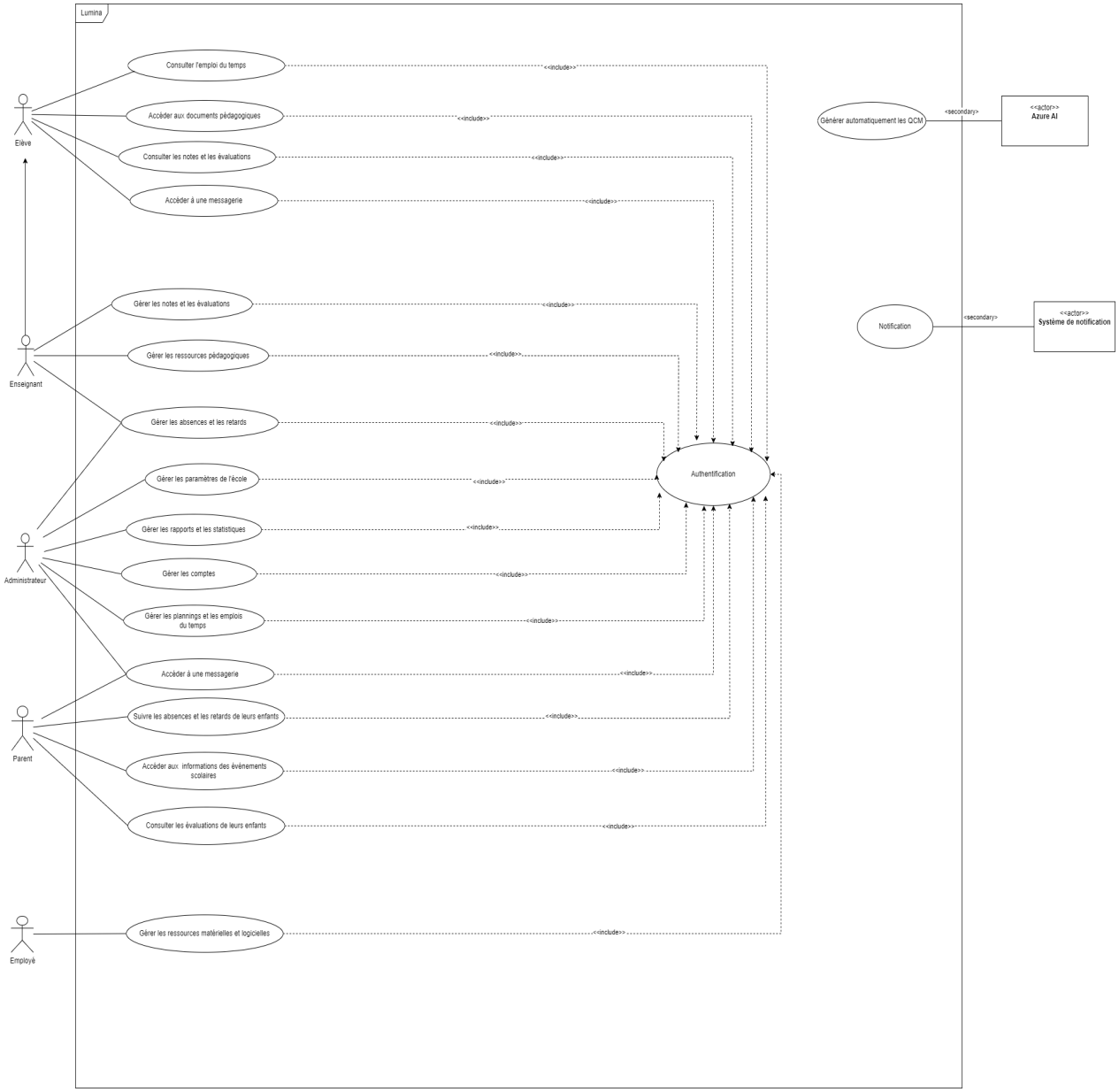

Figure 2.3 : « Global use case diagram »

2.2.3 Class diagram

The class diagram is provided to decide which entities or business concepts will be brought into play in the application. Its main purpose is to provide a static, global vision of the business in the form of classes. Through this diagram, we need to be able to identify the business context of the application.

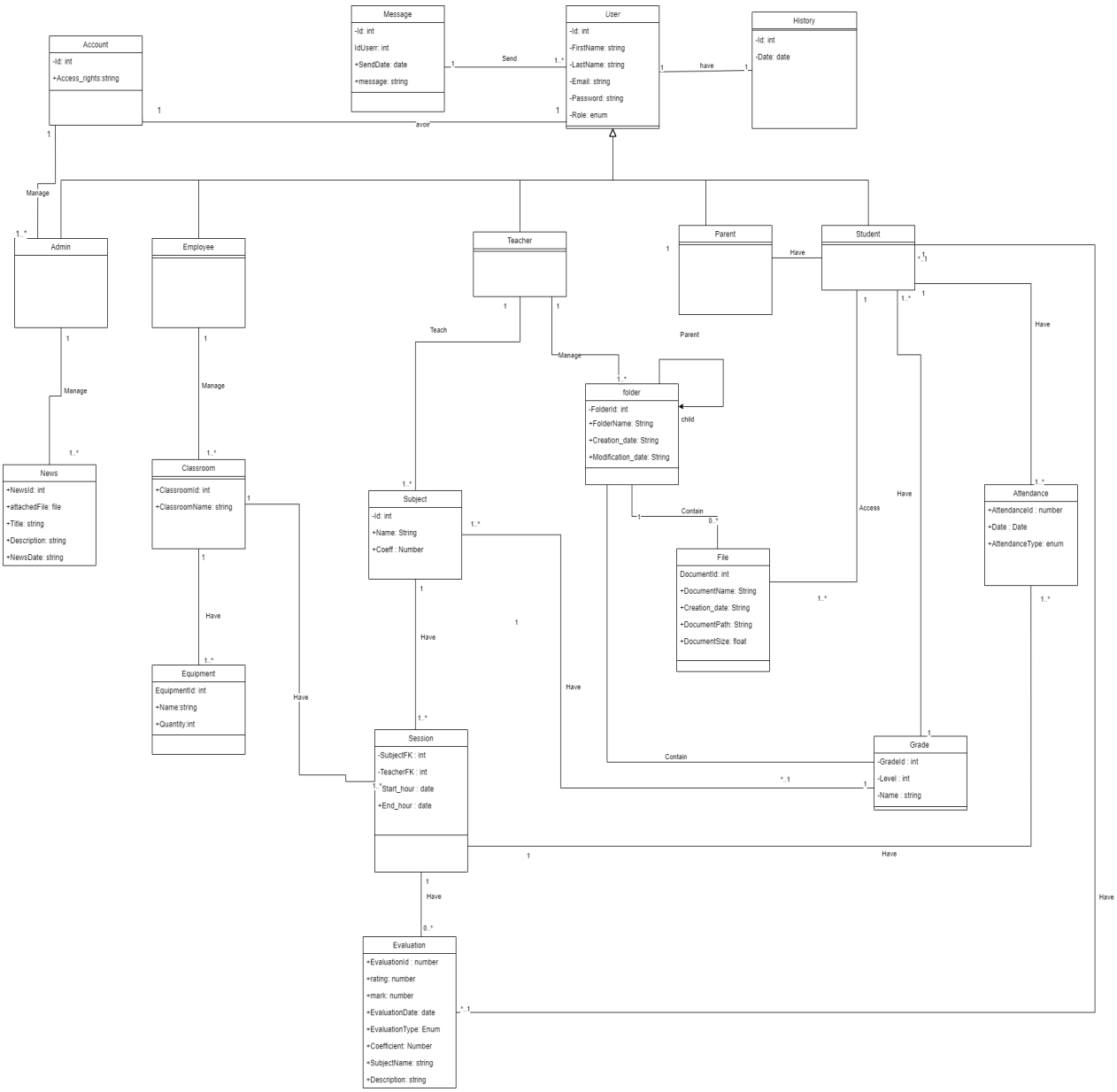

Figure 2.4 : « Class Diagram »

2.3 Architectural design

2.3.1 Logical architecture

Microservices architecture is a design method for creating a single application as a collection of small, independent services. Each service runs within its process and communicates with other services using lightweight mechanisms. This architectural style emphasizes creating highly maintainable, testable, and loosely coupled services. These services can be developed, deployed, and scaled independently, promoting greater flexibility and scalability. By focusing on specific business capabilities, microservices enable modularity and enable development teams to work more autonomously. This approach supports continuous delivery and deployment, significantly improving the efficiency and responsiveness of the development process.

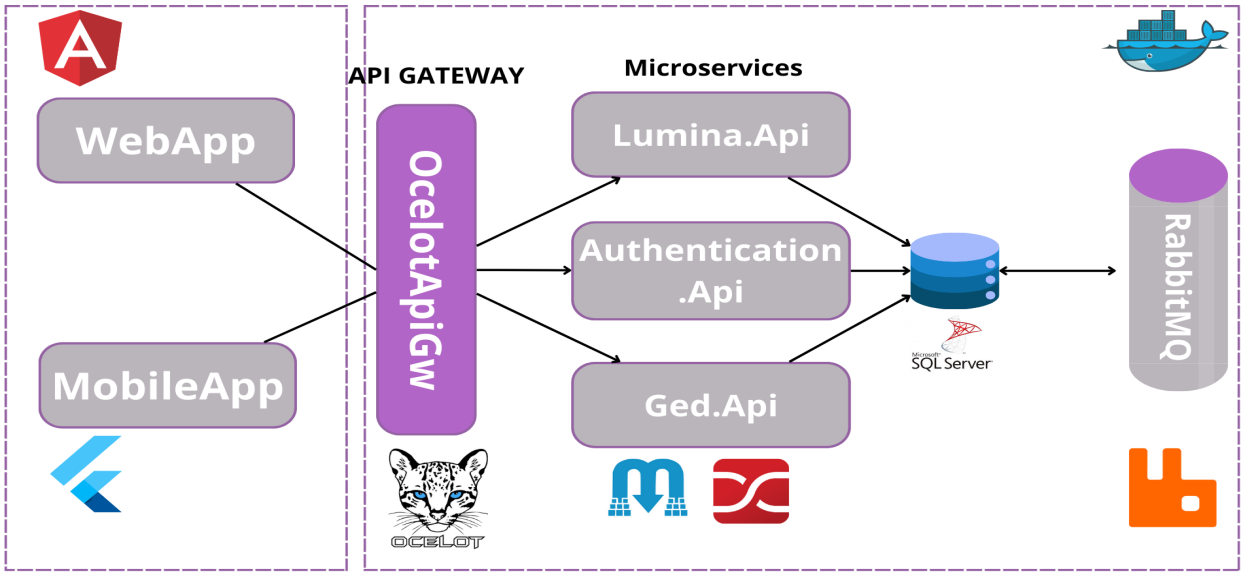

Figure 2.5 : «Microservices architecture»

The four main layers are :

- **The Api layer :** refers to a part of the system that exposes the functionalities and inter-faces needed to communicate with the outside world, whether with other systems, clients or users.
- **The Domain layer :** contains the application's business logic and business entities.
- **The Infrastructure layer :** contains the technical elements required to run the application, such as databases and services.
- **The Application layer :** The Application layer is the bridge between the domain layer and

the infrastructure layer. It facilitates communication between the layers and does not contain complex business logic. business logic.

Here's a diagram showing the Clean architecture of a microservice, highlighting the different layers and their relationships.

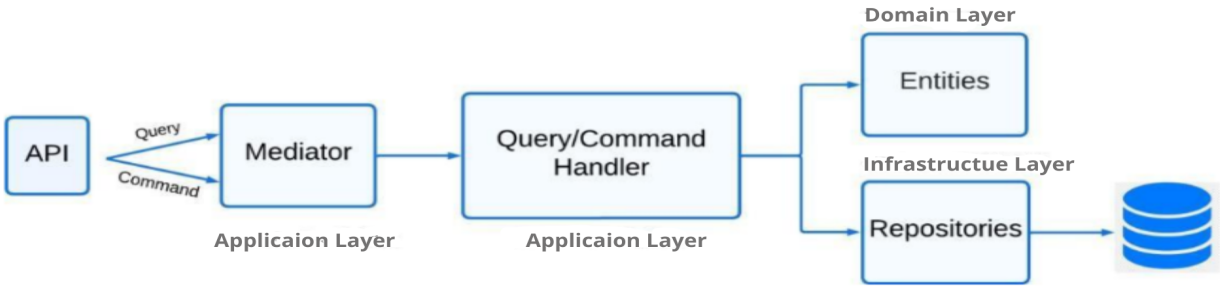

Figure 2.6 : «Clean architecture»

2.3.2 MVVM Architecture

- **The model :** represents the application's data and business logic.
- **The view :** is responsible for the application's user interface.
- **The model view :** acts as a link between the view and the model. It exposes the data and commands required for the user interface.

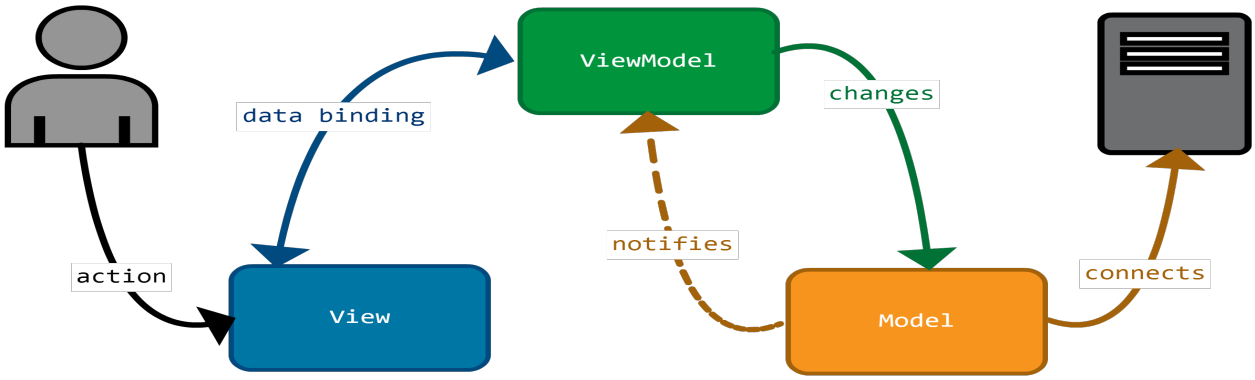

Figure 2.7 : «MVVM Architecture»

2.4 Working environment

2.4.1 Hardware environment

The hardware environment used during the development of this solution is an ASUS Tuf fx504 computer with the following characteristics :

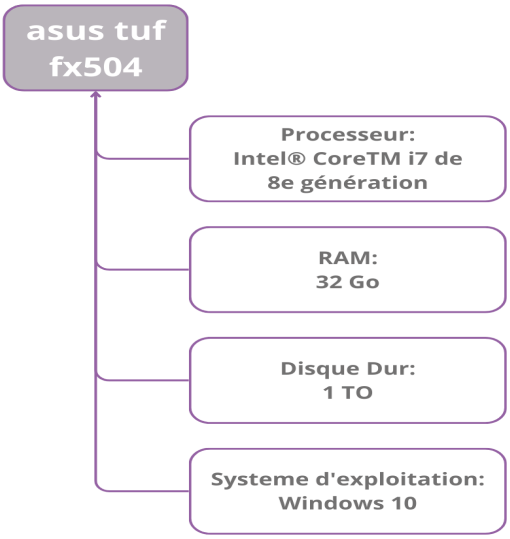

Figure 2.8 : « characteristics of the hardware environment »

2.4.2 Used Software

these are the used software during the development of our solution :

Software	Description	Purpose
	Is a code editor that offers features like syntax highlighting, debugging, version control, and extensions.	I used this software to develop the front-end of the application

Software	Description	Purpose
	Is an advanced integrated development environment by Microsoft, offering robust tools for coding, debugging, and deploying applications across various platforms.	I used this software to develop the back-end of the application
	Is a Microsoft tool for configuring, managing, and administering SQL Server databases. It provides a graphical interface for database development, querying, and analysis.	I used this software for data visualization
Lucidchart	is a web-based diagramming tool that allows users to create flowcharts, diagrams, and visual representations of data and processes collaboratively.	I used this software to create the design diagrams for the project.
Azure DevOps	Deliver value to your users faster by using proven agile tools to plan, track and comment on work between teams.	I used Azure Devops to plan smarter, collaborate better and deliver faster.
	Is a vector graphics editor and prototyping tool. It is primarily web-based, with some offline functionality enabled.	I used this software to create the interface mock-ups for the Projetc.

Tableau 2.3 : Used Software

2.4.3 Used Technologies

while building our project we used cutting-edge technologies to effectively meet our goal. The used technologies to implement this solution are :

Technology	**Description**
Angular	Is an open-source web framework for building dynamic single-page applications with responsive and interactive user interfaces. .
.NET	Is a flexible framework for developing various applications, including web, desktop, and mobile, with a strong emphasis on efficiency, scalability, and security.
TypeScript	An open-source programming language developed by Microsoft to improve and secure the production of JavaScript code.
Bootstrap	It's a framework that brings together a set of tools for creating website designs.
Angular Material	Is a set of design rules proposed by Google that apply to the graphical interface.
Html 5	A hypertext markup language used to create and structure a website.

Tableau 2.4 : Used technologies

Conclusion

This chapter contains the work plan, the Product Backlog, as well as a preliminary design and a presentation of the architecture adopted. Finally, the various tools used for this project are illustrated. What follows is the realization of the first release.

Chapitre 3

Release 2

Plan

1 Release 2 organization : 27

Introduction

Building on the foundation of Release 1, this chapter focuses on the implementation of Release 2. We will detail the phases of its development, from requirement refinement to design improvements, implementation, and testing. Each phase will be discussed to illustrate the steps taken to enhance and expand the product's functionalities. Additionally, this chapter will outline the objectives for Release 2, demonstrating how it contributes to our overall product goals.

3.1 Release 2 organization :

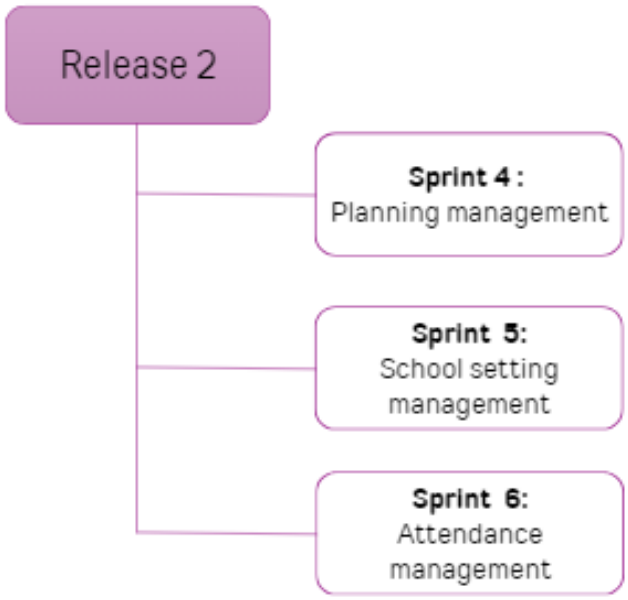

Figure 3.1 : «Organization of Release 1»

This second release focuses on school setting management and educational resources management within our application. These features are prioritized to enhance the overall functionality and usability of the system, catering to the needs of administrators and educators. In each Sprint, we will proceed as follows :

— **Sprint Planning** : Identifying the Sprint Goal and Sprint Backlog

— **Sprint Design** : Modeling the Sprint

— **Sprint Review** : Demonstration of the increment

— **Sprint Retrospective** : Developing an improvement plan

3.1.1 Sprint 4 : School setting management

The primary focus of Sprint 4 is on implementing school setting management functionalities. This sprint aims to provide administrators with the tools to efficiently manage the administrative tasks of their school along with the student's attendance management. Prior to starting this sprint, the team meticulously curated a set of User Stories to guide the development phase, ensuring that the functionalities align with the needs of school administrators.

3.1.2 Sprint planning

During our sprint planning meeting, our Scrum team determined the most important features for this sprint. The user stories that make up the backlog for sprint 4 are outlined and described in the table provided below.

Tableau 3.1 : Sprint 4 backlog

	Feature	**ID**	**User Story**
A	Planning management	A.1	As an admin, I want to add sessions they can be displayed in a timetable.
		A.3	As an admin, I should be able to affect subjects for each grade.
		A.2	As an admin, I need to assign teachers to each subject.
		A.4	As an admin, I should be able to affect a group of students to precise grades and manage them.
		A.5	As an admin, I should be able to delete a session.
		A.6	As an admin, I should be able to update a session.
		A.7	As an admin, I should be able to delete a subject.

3.1.3 Sprint planning

In this part, we will introduce the UML conceptual design of sprint 4, including the use case diagram, and sequence diagram.

3.1.3.1 Refined Use case diagram

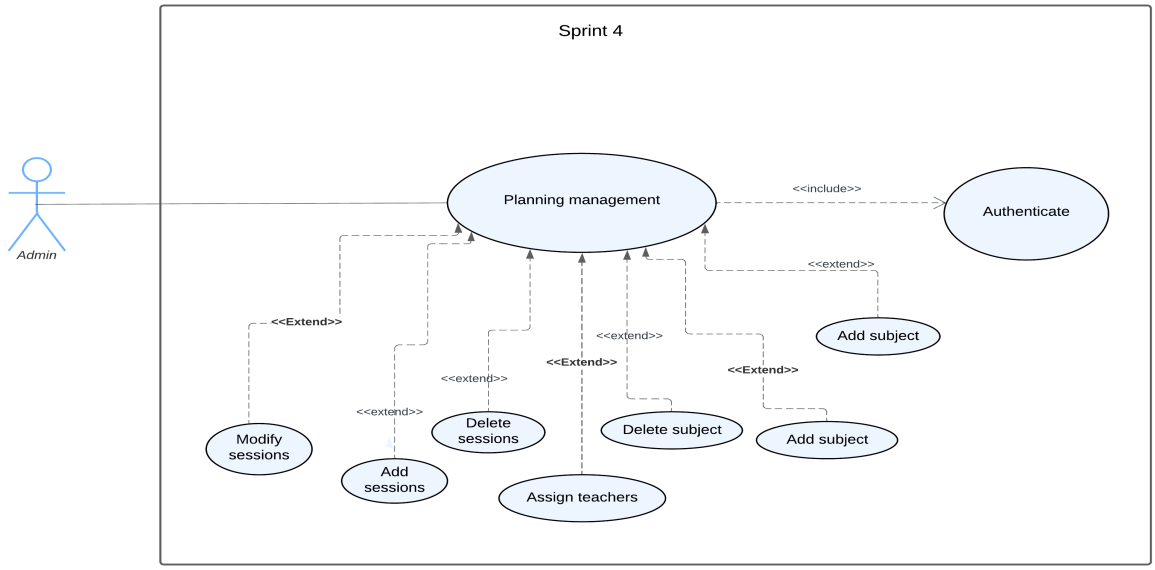

Figure 3.2 : «Use Case Diagram for "School setting management"»

The Table below presents a textual description of the use case "Add session" :

Tableau 3.2 : Textual description of the add session

Use Case : Add Session	
Actors	Admin
Pre-condition	Admin is connected
Post-condition	Session added
Nominal Scenario	1. The admin enters session's end and start hours 2. The admin chooses the grade 3. The admin chooses the subject 4. The admin chooses the classroom 5. The system verifies the data 6. The system create the session
Alternative Scenario	1.1 The admin fills out the form with incorrect data 1.2 The system verifies the data 1.3 The system shows an error message

The next Table presents a textual description of the use case "Add session" :

Tableau 3.3 : Textual description of the Assign Teachers

Use Case : Assign Teachers	
Actors	Admin
Pre-condition	Admin is connected
Post-condition	Teacher assigned to subject
Nominal Scenario	1. The admin selects the class in which he will assign a teacher 2.The admin add the subject of that teacher 3. The admin chooses which teacher will be assigned to that subject 4. The system verifies the data 5. The system create the session
Alternative Scenario	1.1 The admin fills out the form with incorrect data 1.2 The system verifies the data 1.3 The system shows an error message

3.1.3.2 Sequence Diagram for School setting management

In the main sequence diagrams for sprint 4, we delineate the interactions between various system components to achieve the desired functionalities. These diagrams illustrate the sequential flow of operations triggered by user actions or system events :

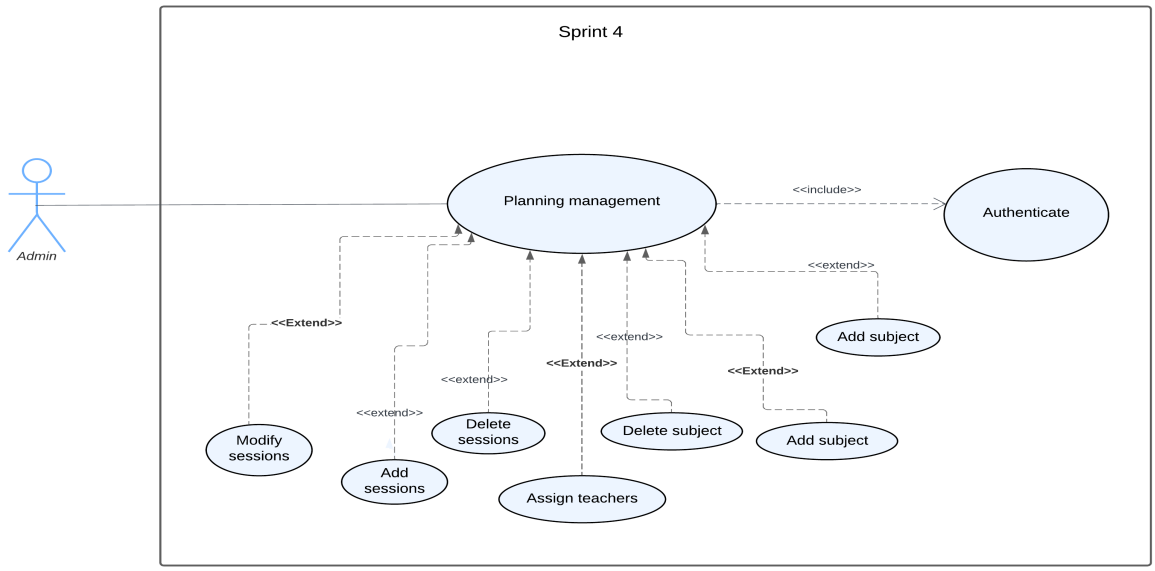

Figure 3.3 : «Use Case Diagram for "School setting management"»

Conclusion générale

Dans le cadre du notre projet de fin d'étude au sein de « ISIMA» en vue de l'obtention du diplôme de licence fondamentale en sciences de l'informatique nous avons conçu et développé une application mobile et web pour la résolution du panne des voitures en se basant sur l'Intelligence Artificielle. Le présent document est une présentation du travail réalisé, il détaille toutes les étapes par lesquelles nous avons passé pour arriver au résultat voulu .

Les fonctionnalités prévues de notre application mobile et web « tanobil » ont été réalisées, à savoir la création et la publication des nouveauté , la résolution des panne et enfin, En conformant la rapidité et la simplicité. Cependant, nous n'avons pas terminé la fixation des rendez-vous avec le garagiste.

Ce travail, était d'une valeur qui mérite l'attention dans la mesure où il nous a permis, d'une part, d'élargir nos connaissances de conception et de développement web et mobile à travers une gamme de technologies, notamment Python, Flutter, Laravel, Flask , Deep Learning et Tensorflow, et d'autre part, de toucher les problèmes et les risques du domaine pour pouvoir les adapter et les corriger, notamment la sécurité et la validité de l'application. Ainsi, ce travail est une initiation d'une nouvelle startup prenant compte de l'Intelligence Artificielle, et ça représente une valeur ajoutée importante pour une personne non experte dans ce domaine.

Néanmoins, notre travail n'a pas pris fin. En fait, une amélioration de notre application serait d'abord de compléter les fonctionnalités manquantes. Puis, d'intégrer d'autres fonctionnalités comme la location et vente des voiture ou des pièces de rechange , integration du map pour la localistion des garagiste ,etc ..