The Private Higher School

of Engineering and Technologies

Engineering Internship Report

By

BORJI Dhia

Developing a Web Messaging Application for the Medical Sector

Professional Supervisor: **Borji Taoufik**

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Acknowledgments

I would like to express my sincere thanks and gratitude to all those who provided the necessary assistance for the successful completion of my internship.

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General Introduction

As part of my academic training and in order to consolidate theoretical knowledge with practical experience, I carried out a two-month internship from July 1st, 2025 to August 31st, 2025. This internship provided a valuable opportunity to discover the professional environment and to apply my skills in software development within a real-world project.

The main objective of this internship was the design and implementation of a web application named **SANAD**, dedicated to the medical field. The application aims to facilitate secure communication among healthcare professionals. It allows users to exchange instant messages, share files, create group discussions, organize online meetings through audio and video calls, and manage events using an integrated calendar.

This project is part of a context where secure and efficient communication is essential in the healthcare sector, ensuring effective coordination between doctors and ultimately improving the quality of patient care. SANAD is intended to be a professional alternative to conventional messaging tools by offering features specifically tailored to the needs of medical staff.

This report is structured as follows: the first chapter introduces the company and provides a general description of the developed application. The second chapter outlines both the functional and non-functional requirements, along with the project management methodology adopted. The third chapter presents the UML diagrams and showcases the interfaces created. Finally, the conclusion summarizes the outcomes of this experience and highlights potential future improvements for the application.

Chapter 1

General Context

Plan

Introduction

The Ministry of Health Information Technology Center (CIMS), established under Law No. 92-19 of February 3, 1992 as a non-administrative public institution reporting directly to the Ministry of Health, plays a fundamental role in the advancement of e-health in Tunisia. We are a major player, committed to the development and deployment of cutting-edge hospital information systems and digital services. Our missions are not limited to simple technological development; we also offer essential support to public healthcare institutions, from design to implementation, while ensuring ongoing assistance and specialized training.

1.1 Organisme d'accueil [1]

This Figure 4.9 represents the CIMS logo .

Figure 1.1: organization logo

1.2 Main missions

- Carrying out strategic studies and studies relating to applications
- Development of computer applications
- Operation, support and maintenance of networks and computer equipment
- Providing Internet Service
- Administration, installation, operation of computer systems and equipment

Conclusion

In this first chapter, we presented the hosting organization, the Ministry of Health Information Technology Center (CIMS). We highlighted its key role in promoting e-health in Tunisia through the design, development, and implementation of advanced hospital information systems and digital services. By carrying out strategic studies, developing applications, ensuring network and system maintenance, and providing training and support to healthcare institutions, CIMS contributes significantly to the modernization of the healthcare sector.

This contextualization provides a solid foundation for understanding the environment in which the internship was conducted, as well as the motivations behind the development of the SANAD application, which will be introduced in the following sections.

Chapter 2

Project Presentation

Plan

Problematic

Effective communication is a critical component of healthcare delivery. In medical environments, timely and secure exchange of information between doctors, nurses, and other staff can directly impact patient care and operational efficiency. Existing messaging and communication platforms, such as commercial instant messaging apps, are often not tailored to the specific needs of healthcare professionals. They may lack proper prioritization for urgent messages, secure handling of sensitive patient data, or integration with hospital workflows.

At the Ministry of Health Information Technology Center (CIMS), it was identified that the medical staff required a custom communication solution designed specifically for their environment. The main challenge was to provide a platform that ensures secure, real-time, and organized communication, while respecting privacy regulations and facilitating collaboration among healthcare teams.

The SANAD application was therefore conceived to address this need: to create a dedicated messaging system that combines security, prioritization of messages, and usability for medical professionals. This problematic highlights the necessity of designing a solution tailored to the unique requirements of the healthcare sector, rather than relying on generic communication tools.

Study of Existing Solutions

In order to better understand the context and the needs of medical staff, we analyzed some existing messaging platforms that could serve as alternatives to SANAD.

HeadsApp

HeadsApp provides a secure messaging platform specifically targeting professionals. It allows users to exchange messages in real time, offering some level of privacy and organizational features. However, HeadsApp does not currently support group sessions, audio calls, or video calls, which are essential features for effective communication within a hospital environment, especially for discussing urgent patient cases or coordinating care among multiple staff members.

WhatsApp

Currently, many doctors in Tunisian hospitals use WhatsApp for communication. While WhatsApp provides instant messaging, voice, and video calls, it is not designed for the specific needs of medical

environments. One major drawback is the lack of message prioritization and professional data management. Sensitive patient information may be at risk due to limited control over data storage and security, and urgent messages can easily be overlooked among personal conversations.

Requirements Analysis

In order to design and implement the SANAD application, we identified both functional and non-functional requirements. The functional requirements describe the essential services that the system must provide, while the non-functional requirements focus on the quality attributes and constraints of the system.

Functional Requirements

The main functional requirements of the SANAD application are:

- **User authentication:** Secure registration and login system for doctors, nurses, and administrators.
- **Messaging:** Real-time text messaging between medical staff.
- **Message prioritization:** Categorization of messages into three levels: normal, medium, and urgent.
- **Group communication:** Ability to create group chats for departments or teams.
- **File sharing:** Sending medical documents and images securely.
- **Audio and video calls:** One-to-one call functionality to facilitate remote discussions.
- **Notifications:** Instant alerts for new messages, calls, or urgent notifications.
- **Administration:** Role management for administrators to control user access and monitor usage.

Non-Functional Requirements

The non-functional requirements ensure the quality and reliability of the SANAD application:

- **Security:** End-to-end encryption to protect sensitive medical communications and Cookies to store the access token to prevent XSS attacks(Cross-Site Scripting).
- **Performance:** The application must support real-time communication with minimal latency.
- **Usability:** A simple and intuitive interface adapted to the workflows of medical staff.
- **Portability:** Accessible across web and mobile platforms to adapt to different usage contexts.

Methodology

SCRUM Methodology

To ensure an efficient and well-structured development process, we adopted the **SCRUM methodology**, an Agile framework that emphasizes iterative progress, collaboration, and adaptability.

SCRUM is based on dividing the project into short development cycles called *sprints*, usually lasting two to four weeks. Each sprint delivers a functional increment of the application, allowing the team to gather feedback, make adjustments, and ensure that the product evolves in line with user needs. This approach is particularly well-suited to software development projects where requirements may evolve over time.

The main roles in SCRUM are:

- **Product Owner:** Defines the vision of the product and prioritizes features in the Product Backlog.
- **Scrum Master:** Ensures that the team correctly applies SCRUM principles and removes any obstacles.
- **Development Team:** Responsible for implementing features and delivering increments at the end of each sprint.

We chose SCRUM for this internship project because it provides flexibility, encourages regular communication with stakeholders (in this case, CIMS supervisors), and ensures that the application can be incrementally built and improved. Given the complexity of SANAD — which integrates secure messaging, calls, group management, and prioritization of notifications — SCRUM enabled us to gradually refine features while keeping the project aligned with the initial objectives.

Workflow

Tableau 2.1: SCRUM Workflow During Internship

Week	Tasks Completed
Week 1	Created system diagrams and sorted application requirements and specifications.
Week 2	Designed user interfaces using Figma.
Week 3	Implemented authentication logic in the backend and developed the corresponding frontend interfaces.
Week 4	Built the admin dashboard.
Week 5	Developed user-to-user messaging logic and interfaces.
Week 6	Created group session management and group messaging functionality.
Week 7	Integrated audio and video call features into user-to-user messaging.
Week 8	Implemented event management logic and corresponding interfaces.

2.1 System Architecture

2.1.1 Logical Architecture

The logical architecture of the application follows a three-tier structure:

- **Frontend (React.js)**: Provides the user interface, handles user interaction, and communicates with the backend through REST APIs and WebSockets.
- **Backend (Node.js with Express)**: Implements the business logic, manages authentication, user roles, messaging, and events. Exposes APIs for data exchange with the frontend.
- **Database (PostgreSQL)**: Stores persistent data such as user information, authentication tokens, messages, and events.

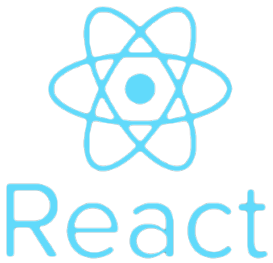
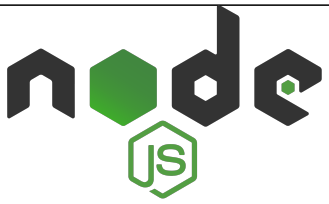
2.1.2 Physical Architecture

The physical architecture is based on a client–server model:

- **Client Layer**: Doctors, nurses, and admins access the system through a web browser.
- **Application Layer**: The Node.js/Express server hosts the backend logic and communicates with both the clients and the database.
- **Data Layer**: A PostgreSQL server ensures secure and persistent data storage.

2.1.3 Work Environment :

Tableau 2.2: Languages and Frameworks used in the project

Language/Framework	Logo	Description
React.js		A popular JavaScript library for building dynamic and responsive user interfaces. It enables the creation of reusable UI components and efficient rendering using a virtual DOM.
Node.js		A runtime environment that allows the execution of JavaScript code on the server side. It is used in combination with Express to build the backend APIs and real-time communication features.
Express.js		A lightweight and flexible web framework for Node.js, used to build REST APIs and manage server-side routing, middleware, and application logic.

Language/Framework	**Logo**	**Description**
PostgreSQL		A powerful open-source relational database management system (RDBMS) used to securely store structured data such as users, messages, and events.
JavaScript		The main programming language used across the application stack for both frontend (React) and backend (Node.js/Express).

Chapter 3

Project Conception

Plan

3.1 Project Conception :

3.1.1 Use Case Diagram

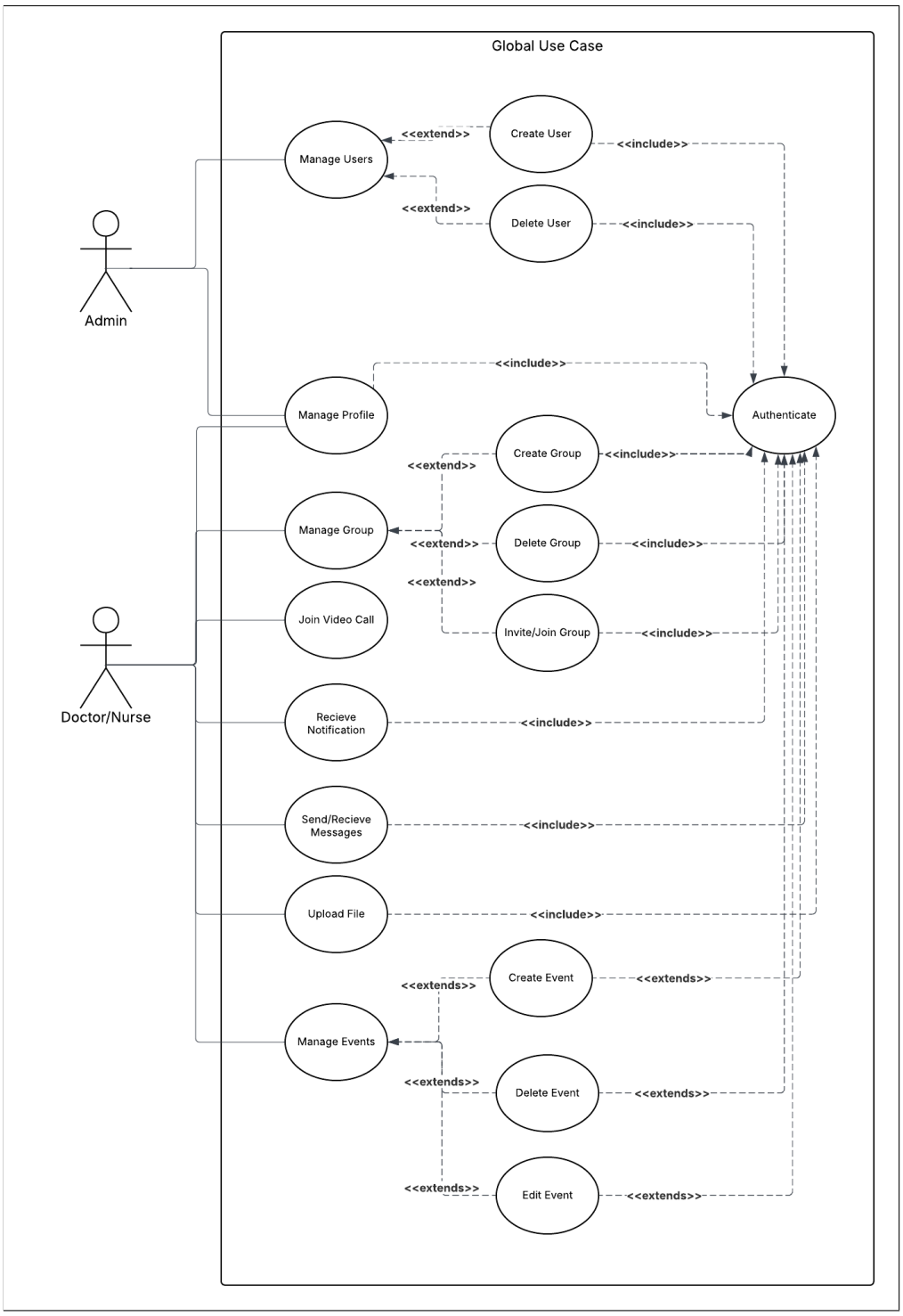


Figure 3.1: Use Case Diagram

3.1.2 Class Diagram

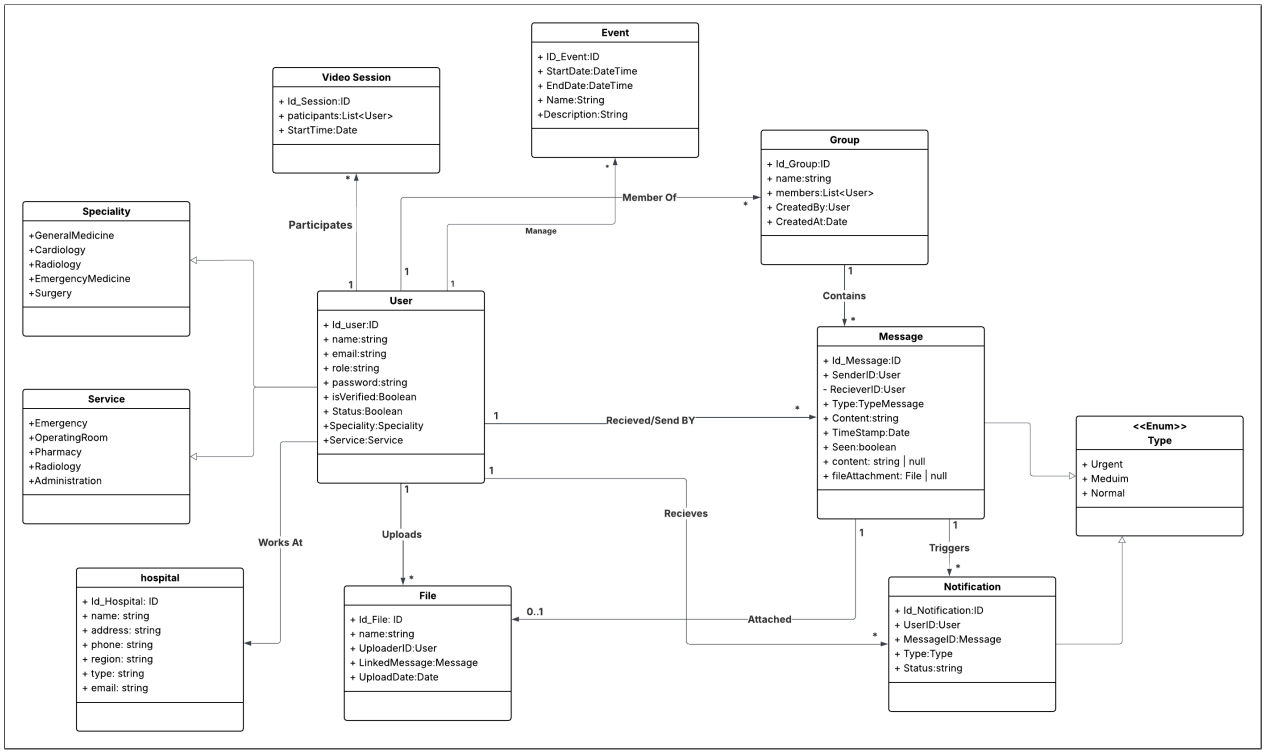


Figure 3.2: Class Diagram

Chapter 4

Realisation

Plan

4.1 Signin Interface :

L'interface de connexion permet aux utilisateurs enregistrés d'accéder à la plateforme en saisissant leur email et leur mot de passe. Elle assure la sécurité grâce à la validation des données et à la gestion des erreurs en cas de mauvaises informations d'identification. Une fois authentifiés, les utilisateurs peuvent naviguer en toute transparence sur l'application.

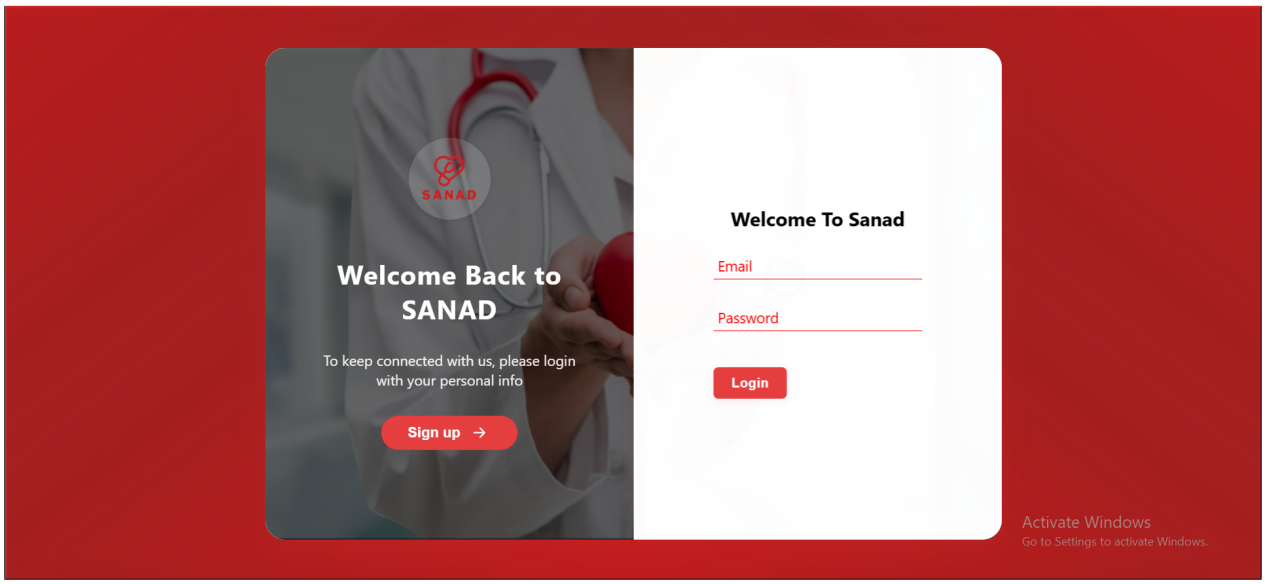


Figure 4.1: Signin Interface

4.2 Singup Page :

L'interface d'accueil est conçue pour être à la fois informative et accueillante, permettant à l'utilisateur de comprendre rapidement l'identité de l'entreprise et de naviguer facilement vers les fonctionnalités principales de l'application.

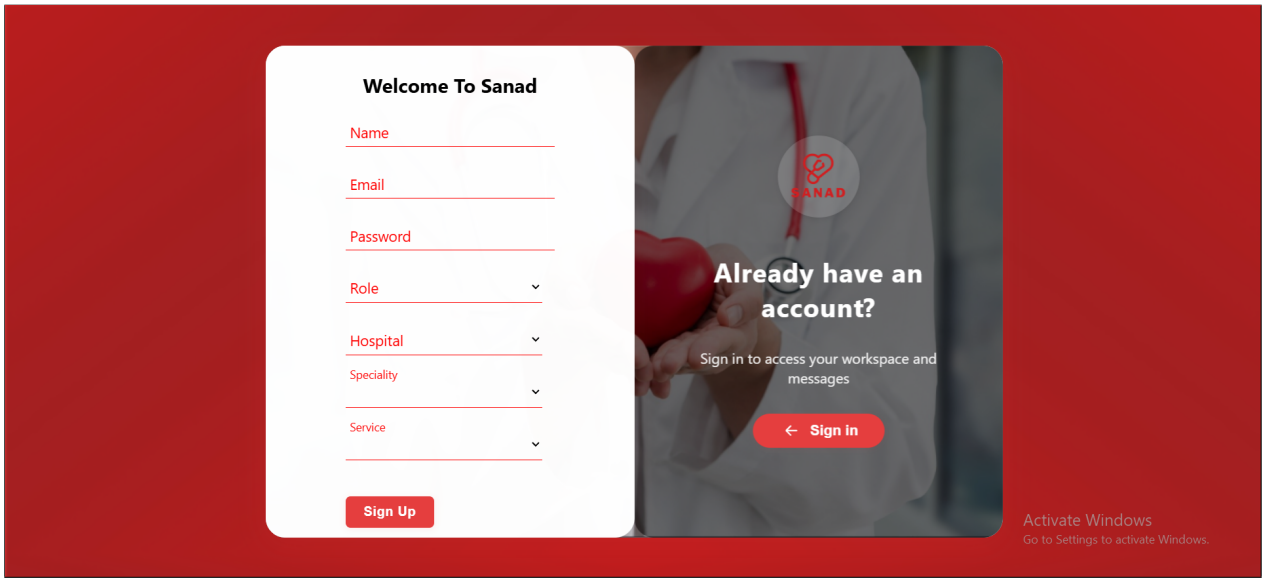


Figure 4.2: Signup Page

4.3 Home Page:

Cette interface d'ajout PC de l'application permet à l'utilisateur de saisir manuellement les informations d'un PC lorsqu'il n'est pas trouvé dans la base de données.

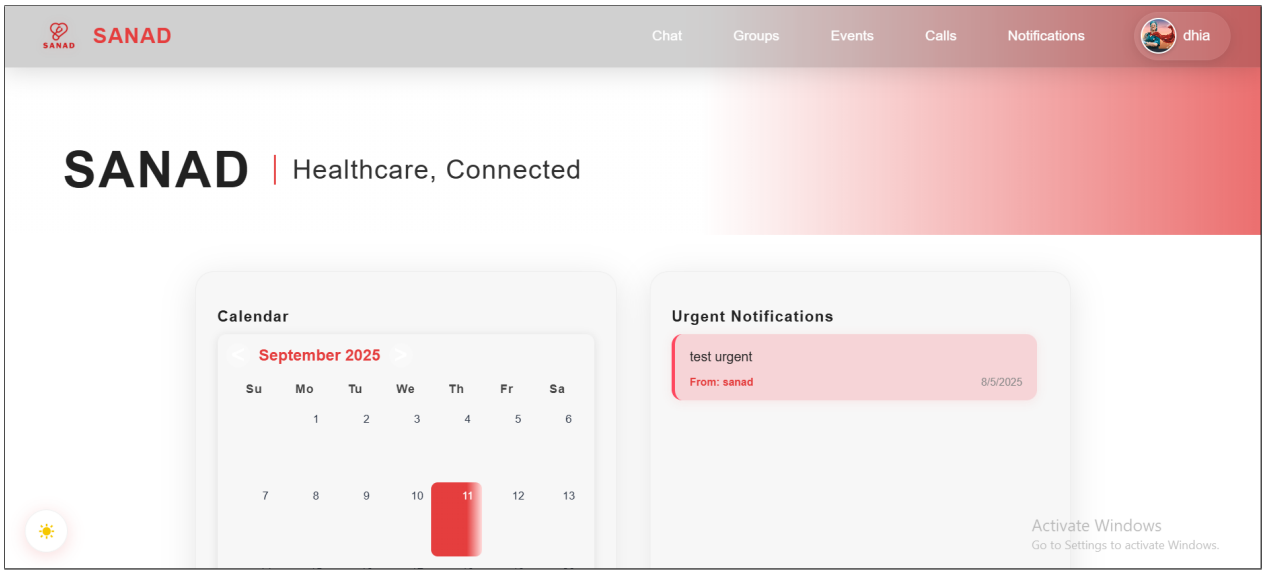


Figure 4.3: Home Page

4.4 Profile Page:

L'interface de modification d'un PC permet à l'utilisateur de mettre à jour les informations d'un PC déjà enregistré dans la base de données.

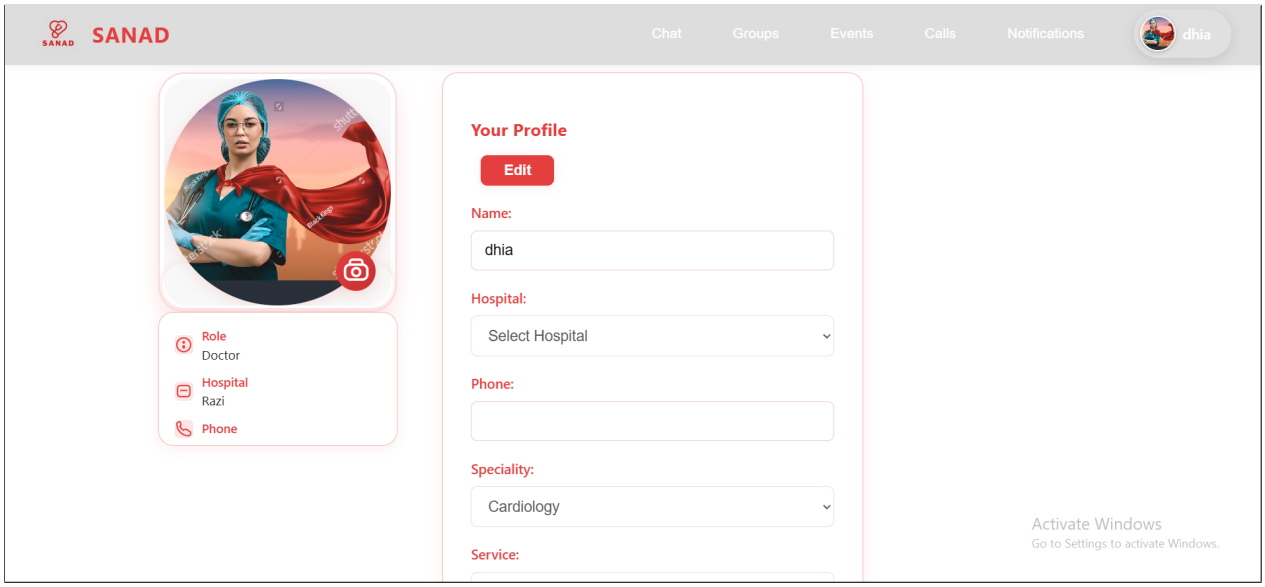


Figure 4.4: Profile Page

4.5 Chat Interface:

L'interface de modification d'un PC permet à l'utilisateur de mettre à jour les informations d'un PC déjà enregistré dans la base de données.

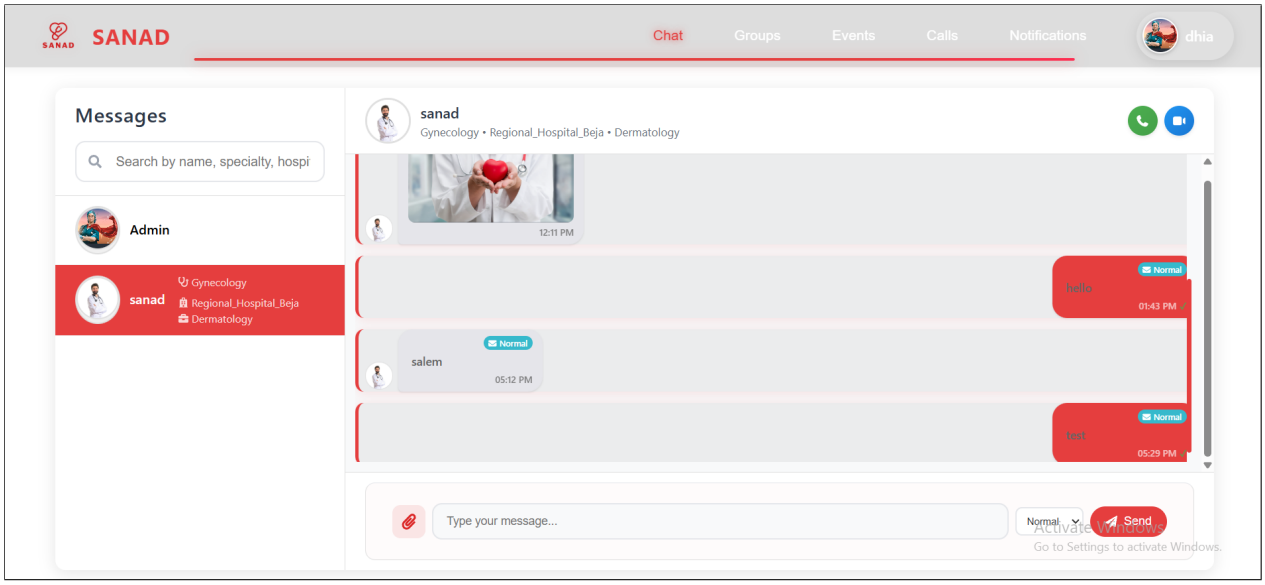


Figure 4.5: Chat Interface

4.6 Group Interface:

L'interface de modification d'un PC permet à l'utilisateur de mettre à jour les informations d'un PC déjà enregistré dans la base de données.

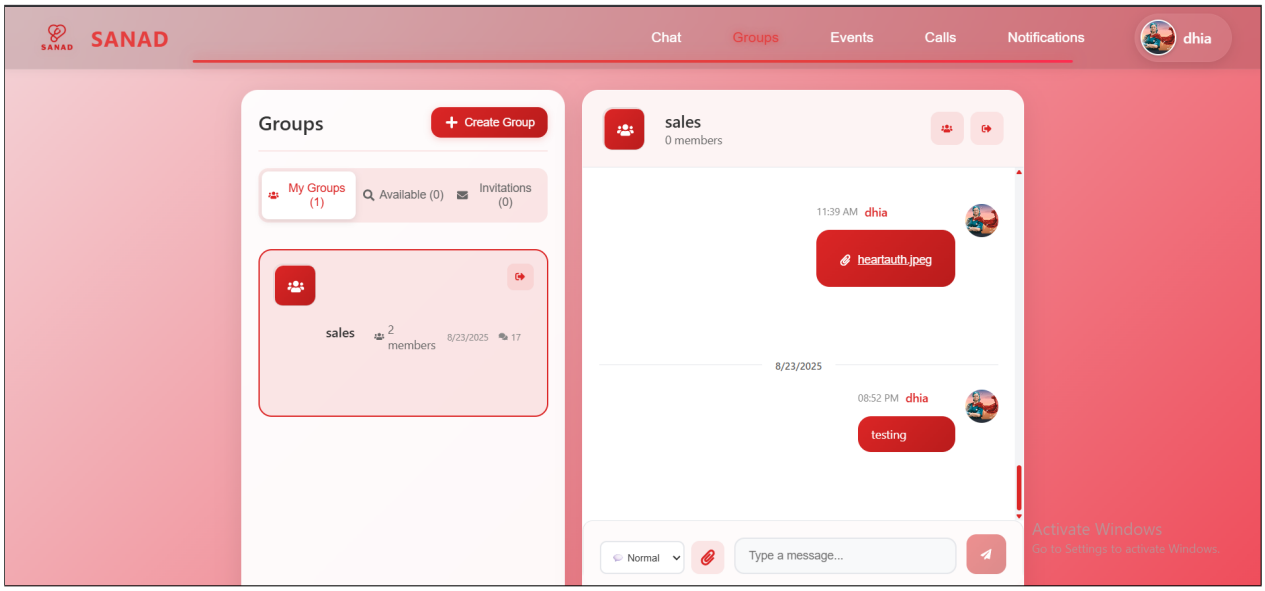


Figure 4.6: Group Interface

4.7 Event Interface:

L'interface de modification d'un PC permet à l'utilisateur de mettre à jour les informations d'un PC déjà enregistré dans la base de données.

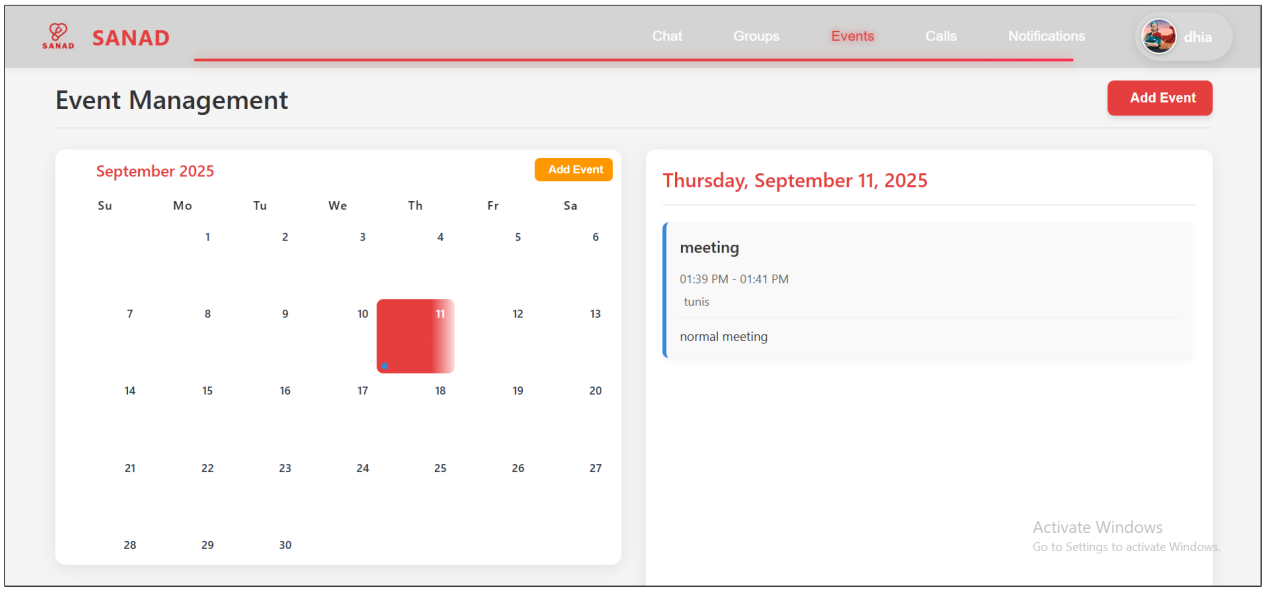


Figure 4.7: Event Interface

4.8 Notification Interface:

L'interface de modification d'un PC permet à l'utilisateur de mettre à jour les informations d'un PC déjà enregistré dans la base de données.

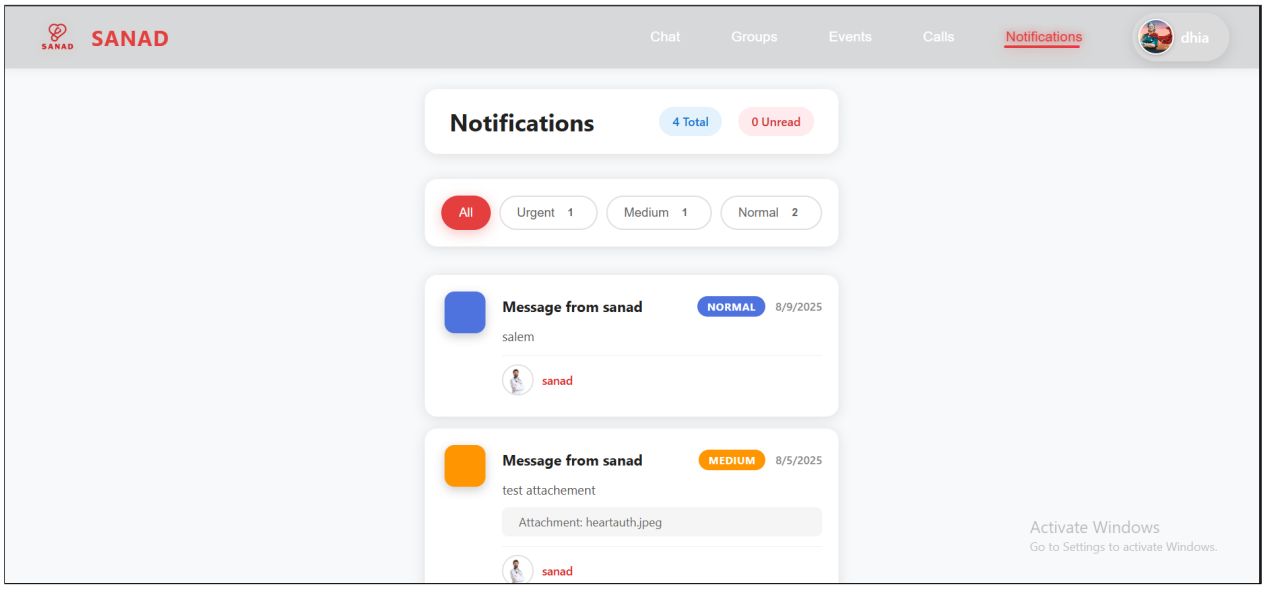


Figure 4.8: Notification Interface

4.9 Admin User Management Interface:

L'interface de modification d'un PC permet à l'utilisateur de mettre à jour les informations d'un PC déjà enregistré dans la base de données.

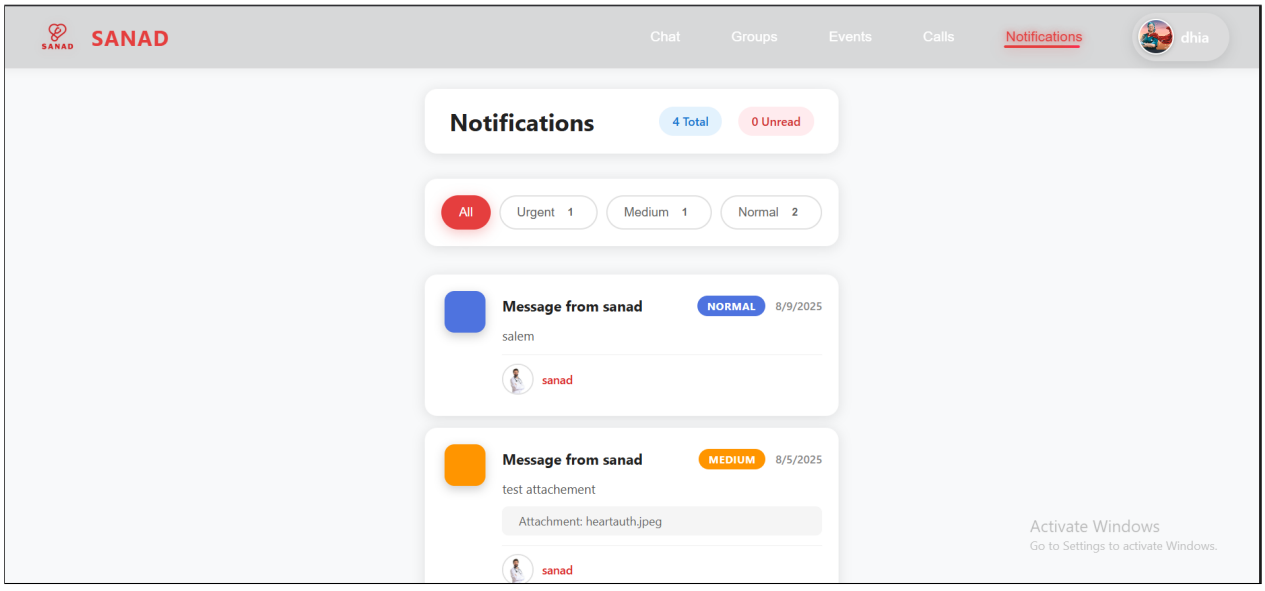


Figure 4.9: Admin User Management Interface

Conclusion

This internship, carried out from July 1st, 2025 to August 31st, 2025 at the Ministry of Health Information Technology Center (CIMS), represented a valuable professional and technical experience. It allowed me to apply the theoretical knowledge acquired during my studies, while deepening my skills in software engineering, web development, and Agile project management. The development of the SANAD application gave me the opportunity to face real-world challenges, ranging from system design to the implementation of secure communication features tailored for medical staff.

The report was structured into three main chapters. The first chapter presented the hosting organization, CIMS, its missions, and an introduction to the SANAD project, highlighting the need for a custom communication platform for healthcare professionals. The second chapter focused on the conception phase, where the functional and non-functional requirements were detailed, supported by UML diagrams, and organized under the SCRUM methodology. The third chapter was dedicated to the realization process, presenting the technical implementation as well as screenshots of the application's main interfaces and functionalities.

In conclusion, this internship was highly beneficial both professionally and technically. It strengthened my ability to work in an Agile context, improved my design and development skills, and provided me with hands-on experience in building a complete web application that responds to concrete professional needs. Beyond technical aspects, this experience also enhanced my adaptability, problem-solving skills, and teamwork, which are essential qualities for my future career as an engineer.