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MILANO 1863

SCUOLA DI INGEGNERIA INDUSTRIALE
E DELL'INFORMAZIONE

Software Engineering 2

Design Document

Students & Companies

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1 | Introduction

1.1. Purpose

In the real world, the process of finding suitable candidates for internships is often a complex and time-consuming task for companies, while university students face significant challenges in identifying opportunities that align with their skills, interests, and career aspirations. Companies must consider numerous applications, many of which may not meet their requirements, and produce internship descriptions that attract the right talent. However, students are often left to navigate partial information sources, leading to inefficiencies and missed opportunities. This disparity between the supply and demand for internships is caused by the lack of "ad hoc" tools to support efficient matchmaking. The success of an internship is often guaranteed by factors such as the relevance of candidates' skills to the offered projects, the clarity of internship descriptions, and the availability of resources such as mentorship and training. Without a straight process, companies may struggle to identify candidates who fit their needs, and students may find it difficult to show their potential. These challenges highlight the need for a unified platform that bridges the gap between students and companies, providing a mutually beneficial ecosystem where both parties can connect, evaluate, and collaborate. S&C comes as a solution to address these pain points, offering a structured approach to simplifying and optimizing the internship process for all involved stakeholders.

1.2. Scope

The S&C platform serves as a comprehensive system for matching students with internships and supporting related workflows. It acts as a hub for collaboration and interaction among three primary user groups: students, companies, and universities. Students are the primary user group, using the platform to create detailed profiles, upload and maintain updated CVs, search for internships manually, or receive personalized recommendations that better suit their academic background, skills, and preferences. They can also apply to internships, participate in interviews with the help of the platform, and finally provide feedback on their experiences, thereby contributing to the platform's constant improvement. Companies utilize S&C to man-

age their internship offerings and streamline recruitment. They can advertise internships with comprehensive descriptions, specifying required skills and qualifications, and benefit from a recommendation system that identifies suitable candidates. Companies can also review applications, shortlist applicants and schedule interviews within the platform. For post-selection, they can provide feedback on students' performance, helping refine the matching algorithms, and contributing to system insights. Universities play a crucial supervisory role, ensuring the integrity and success of internships. They monitor ongoing internships, address complaints raised by students or companies, and analyze trends to enhance their internship programs. In addition, universities use the platform to ensure compliance with educational and legal standards, providing a secure and supportive environment for all parties involved. Through the integration of these interactions, the S&C platform simplifies the internship process while creating a cooperative environment that mutually supports students, companies, and universities.

1.3. Definition, Acronyms, Abbreviations

Acronyms	Definition
DD	Design Document
S&C	Students&Companies
CV	Curriculum Vitae
DBMS	Data Base Management System
API	Application Programming Interface
REST	Representational State Transfer

Table 1.1: Acronyms used in the document.

1.4. Revision history

- Version 1.0 - 07/01/2025

1.5. Reference Documents

- Specification Document : "Assignment RDD AY 2024-2025"
- "CreatingDD" (lecture slides)

1.6. Document Structure

- **Introduction:** The first chapter provides an overview of the purpose, scope, and objectives of the Design Document. It also introduces the definitions, acronyms and abbreviations used throughout the document and explains the structure.
- **Architectural Design:** This chapter describes the overall system architecture, including component diagrams, deployment views, run-time views, and the interfaces between components. It points out how the system architecture supports the requirements.
- **User Interface Design:** This chapter focuses on the design of user interfaces. Includes an overview of the main UI elements, descriptions of each interface, and how they interact with the system to support user experience.
- **Requirements Traceability:** This section maps the system's requirements to the design elements, ensuring that all requirements are covered and showing how the design fulfills them.
- **Implementation, Integration and Test Plan:** This chapter presents the implementation strategy, the integration plan, and the testing approach. Details how the system components will be developed, combined and verified to ensure a functional and robust product.
- **Effort Spent:** A summary of the contributions and time spent by each team member during the development of the Design Document.
- **References:** A list of references to all documents, articles, and tools that informed the creation of this Design Document.

2 | Architectural Design

2.1. Overview

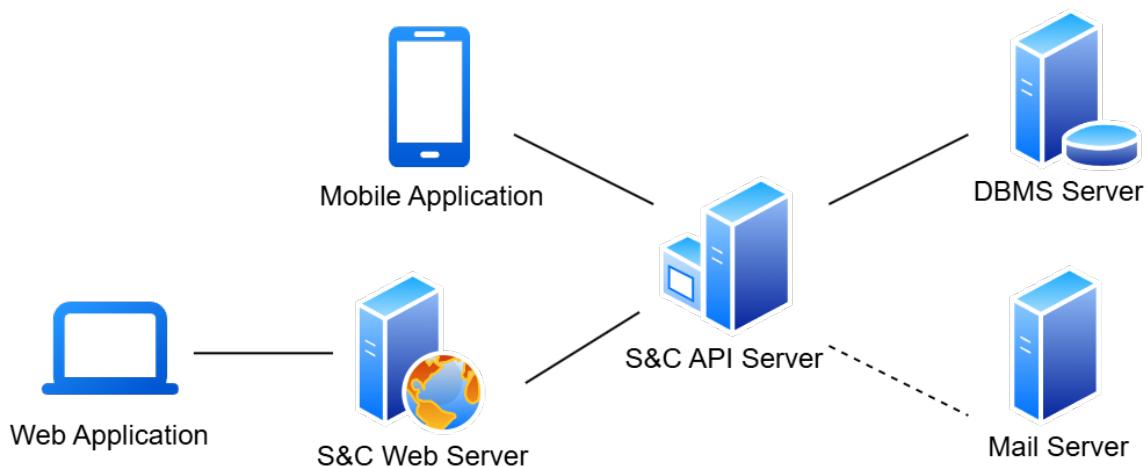


Figure 2.1: S&C architecture overview

The S&C system is designed using a layered client-server architecture. The system is structured into distinct components, each responsible for specific functionalities such as user management, internship matching, notification handling, and feedback processing. Communication between these components is facilitated through RESTful APIs. This architecture ensures modularity, scalability, and ease of maintenance, allowing for efficient handling of user interactions and system operations.

Client side:

- **Web Application:** serves as the primary user interface for accessing the S&C platform. It allows all users (students, companies, and universities) to connect to the system and perform essential operations such as registration, login, and profile management. Through the WebApp, students can search for available internships, apply for them, and track the status of their applications and active internship. Companies can create, update, and manage internship offers, while universities can monitor internship statuses and handle

complaints or issues raised during internship. The platform also allows users to create or modify their profiles, including CVs and skills, and manage preferences for internship notifications. The WebApp is designed to be responsive and accessible from any modern browser, offering a smooth experience on both desktop and mobile devices.

- **Mobile Application:** provides a dedicated and optimized version of the S&C platform for mobile users. It is designed to offer a seamless and intuitive experience for users on the go. Students can easily search for and apply to internships, receive push notifications about new internship offers or application updates, and monitor the status of their applications. Companies can also use the mobile application to create and manage internship offers; however, for tasks that require detailed data entry or management, the desktop version is more convenient and suitable for their needs. In contrast, the mobile application is primarily designed for students who require quick access to the platform's functionalities. The mobile app supports real-time notifications and is available on both iOS and Android, ensuring accessibility and connectivity for all users.

Server side:

- **Web Server:** manages communication with users by receiving and processing their requests. It acts as the gateway between the user and the system, ensuring that all incoming requests are appropriately handled. Additionally, it performs load balancing, distributing incoming traffic across multiple replicas of the S&C Server to ensure scalability and high availability. The Web Server also handles user sessions, ensuring that users' activities are properly tracked and maintained throughout their interaction with the platform.
- **S&C API Server:** is the core component of the system, responsible for processing all requests and managing the primary business functionalities. It hosts the components that handle specific tasks such as user management, internship offers, matchmaking, notifications, and feedback processing. The server acts as the central point of communication between the client applications and the DBMS. All client requests (from the WebApp and Mobile Application) are routed to the appropriate component through a centralized API Gateway, which manages request routing, authentication, and load balancing. To ensure reliability, scalability, and high availability, this Server is deployed across multiple machines or containers. Communication between components can be handled via RESTful APIs for synchronous operations or message brokers (e.g., Apache Kafka) for asynchronous tasks.
- **DBMS Server:** stores all persistent data related to users, students, companies, internships, and interactions within the system. It acts as the primary repository for critical system information, including user profiles, internship offers, applications, feedback, and

complaints. The DBMS Server is designed for data integrity, consistency, and quick retrieval of large datasets. It is optimized for performance and supports complex queries needed for matchmaking, reporting, and analytics.

2.2. Component View

This section presents a detailed breakdown of the components in the system, including their responsibilities, interfaces, and interactions.

2.2.1. Component Diagram

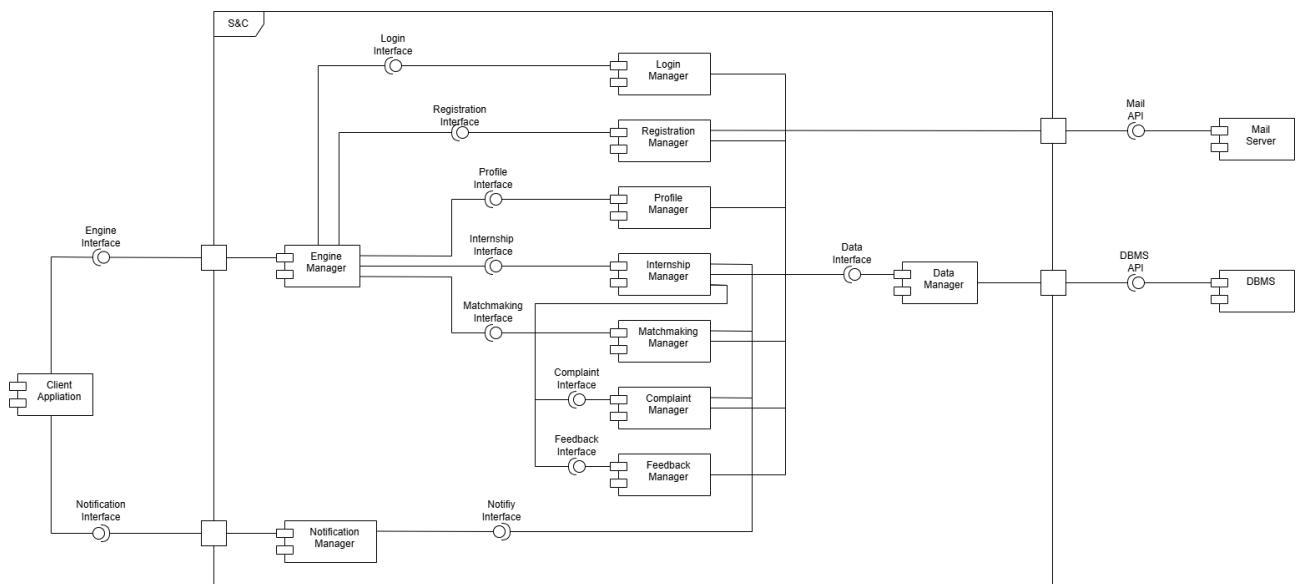


Figure 2.2: S&C component diagram

2.2.2. Components Description

The components are:

- **Client Application:** is the central access point for users to interact with the system. It provides the user interface through which users can perform key actions, such as logging into their accounts, registering as new users, managing personal information, submitting feedback, and accessing internship opportunities. The Client Application acts as the bridge between the user and the underlying services, sending requests to appropriate components and receiving responses to display the necessary information to the user.
- **Engine Manager:** serves as the core orchestration component within the system. It

receives and processes user requests originating from the Client Application and coordinates the execution of these tasks by delegating them to appropriate services, such as the Login Manager, Internship Manager, or Notification Manager. By managing inter-component communication, the Engine Manager ensures the system operates efficiently and cohesively.

- **Login Manager:** handles the entire user authentication process. It verifies credentials provided during the login attempt by querying the DBMS to check for valid user data. If the credentials match, the Login Manager grants access to the system, ensuring that only authorized users can interact with protected services. It also manages failed login attempts, providing appropriate feedback to the user.

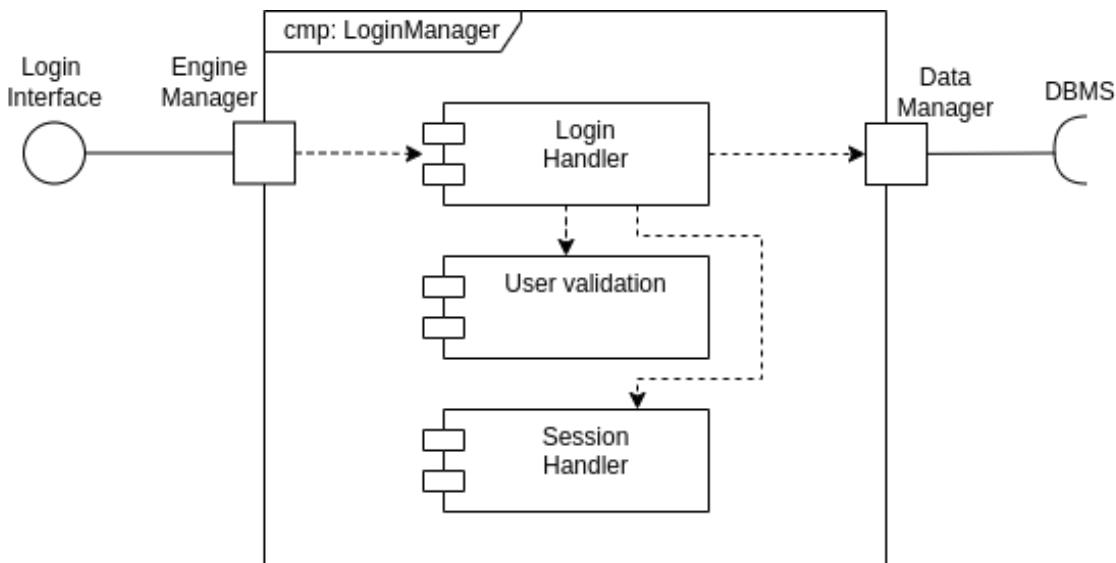


Figure 2.3: Login manager component diagram

- **Registration Manager:** oversees the user registration process, enabling new users to create accounts within the system. It validates user-provided input (e.g., name, email, password) and securely communicates with the DBMS to store new account details. Additionally, it can trigger email confirmations through the Mail Server to verify user identities and ensure secure onboarding.

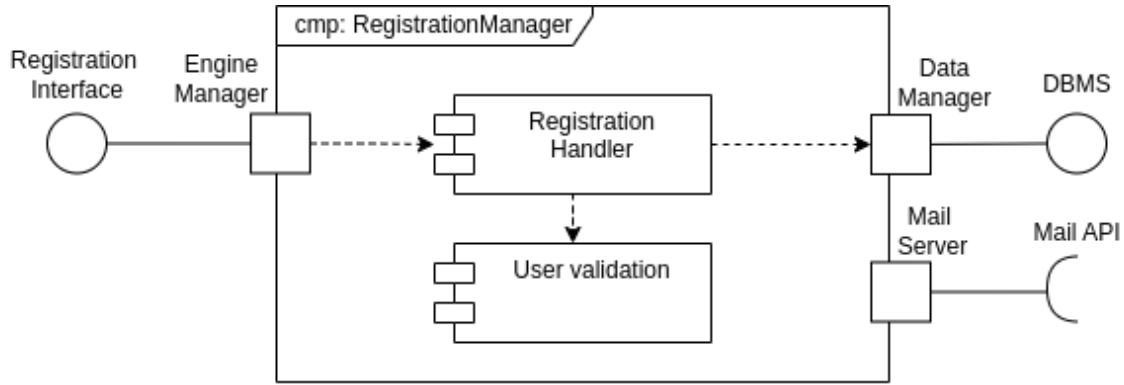


Figure 2.4: Registration manager component diagram

- **Profile Manager:** is responsible for handling all operations related to user profiles. It allows users to retrieve, view, and update personal data such as contact details, resumes, or preferences. This component ensures the integrity of profile updates by interacting directly with the DBMS to persist changes. It acts as a crucial service for maintaining user data consistency across the platform.

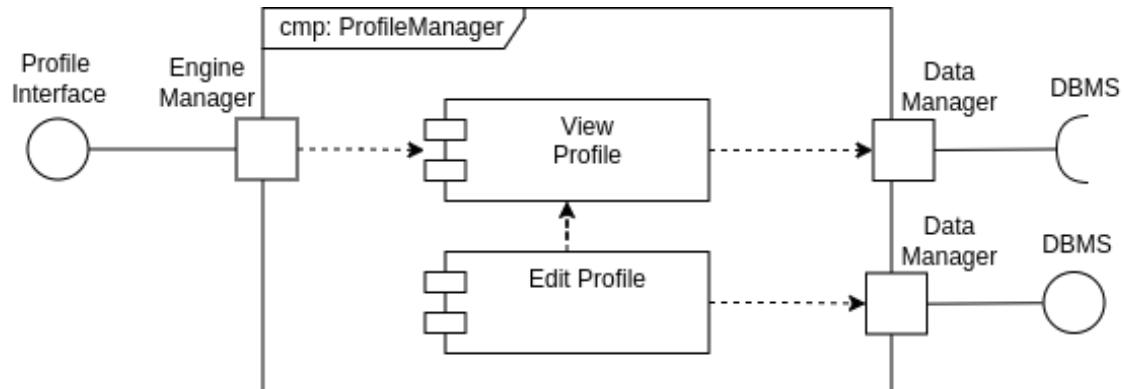


Figure 2.5: Profile manager component diagram

- **Internship Manager:** manages all operations related to internship opportunities. It allows system administrators to create, update, and delete internship postings while enabling users to search for and apply to available positions. It interacts with the DBMS to persist internship data, including details like job descriptions, requirements, and application deadlines. This service ensures up-to-date internship information is always available to users.

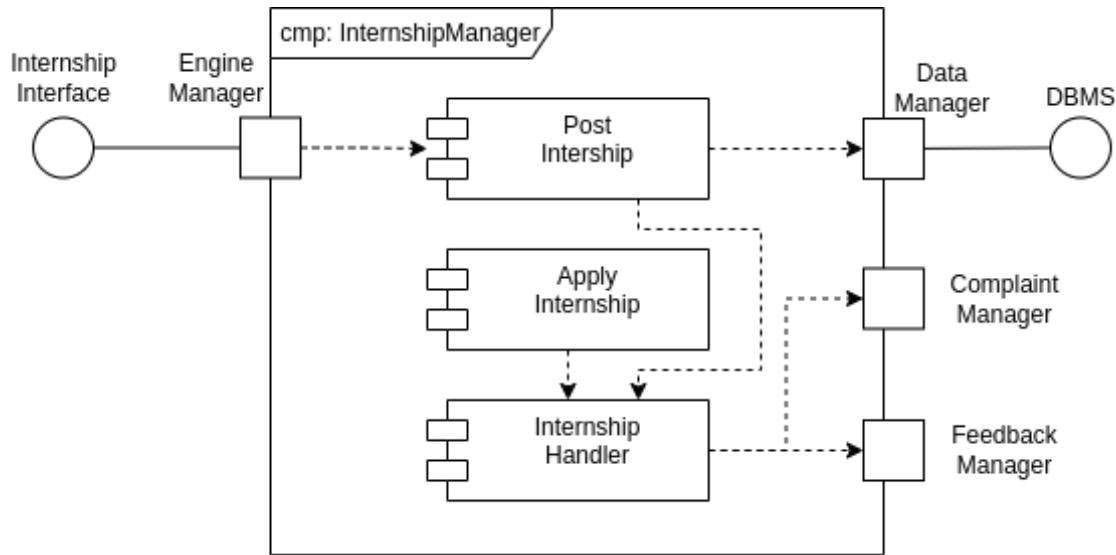


Figure 2.6: Internship manager component diagram

- **Matchmaking Manager:** is a specialized component that aligns user profiles with suitable internship opportunities. It leverages user data—such as resumes, preferences, and skills—and compares it with internship requirements stored in the DBMS. By running matching algorithms, it identifies relevant opportunities for users and generates recommendations, streamlining the search process for internships.
- **Complaint Manager:** allows users to report issues, concerns, or grievances within the system. It provides a structured mechanism to log complaints, which are stored in the DBMS for review and resolution by administrators. The Complaint Manager ensures that user-reported problems are tracked and appropriately addressed to improve overall user satisfaction.

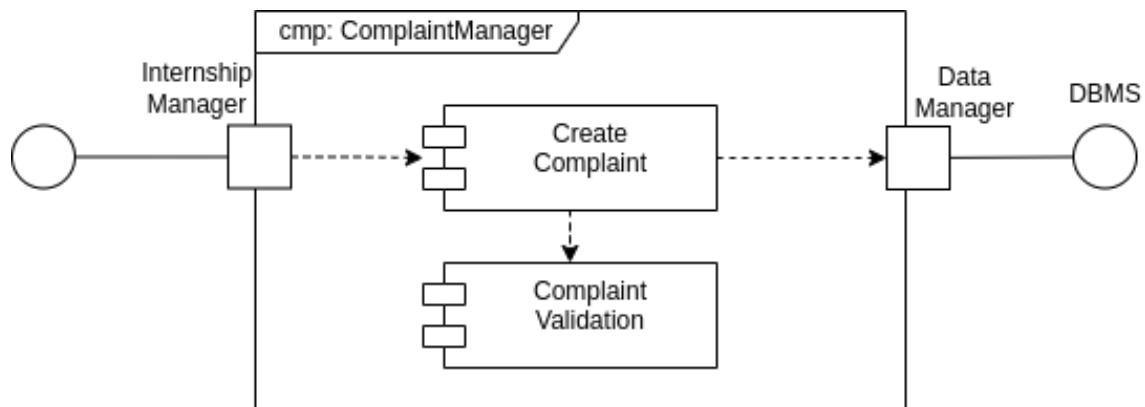


Figure 2.7: Complaint manager component diagram

- **Feedback Manager:** is responsible for collecting and managing feedback submitted by

users. It allows users to share their experiences or provide evaluations of system services. The component interacts with the DBMS to store feedback, which can later be analyzed to identify areas for improvement. This ensures continuous enhancement of the system based on user input.

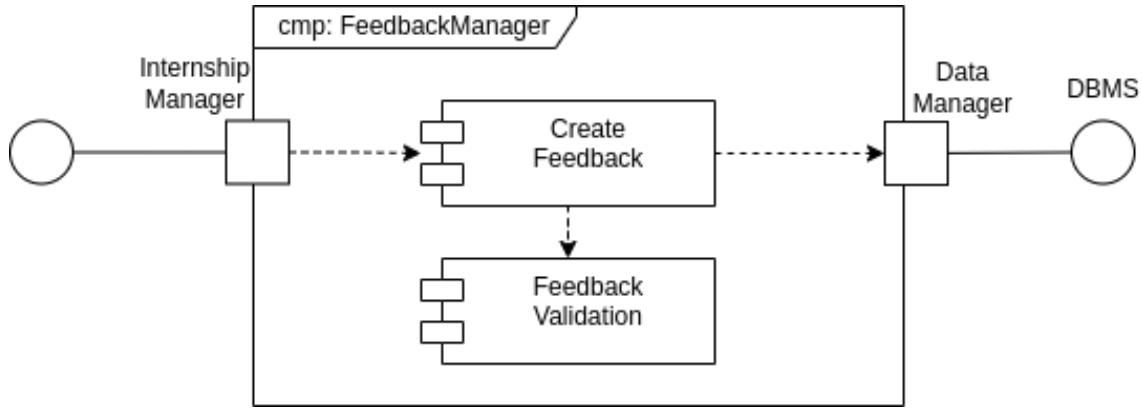


Figure 2.8: Feedback manager component diagram

- **Notification Manager:** handles the delivery of system notifications to users. It processes requests from other components, such as the Engine Manager or Complaint Manager, to notify users about updates, events, or critical actions requiring attention. Notifications can be sent via in-app messages or through integration with the Mail Server for email delivery. This component ensures users remain up to date with relevant information.
- **Data Manager:** acts as the intermediary layer responsible for managing communication between components and the DBMS. It handles data retrieval, insertion, and updates, ensuring that services have seamless access to accurate and consistent data. The Data Manager ensures the integrity and security of the system's database operations, facilitating efficient data management.
- **DBMS:** serves as the centralized data repository for the system. It stores all essential information, including user credentials, profiles, internship postings, complaints, and feedback. The DBMS ensures data persistence, consistency, and availability, enabling components to query and update data as needed. It forms the backbone of the system's data management architecture.

2.3. Deployment View

The deployment view describes how the system is physically deployed and the interactions between its components.

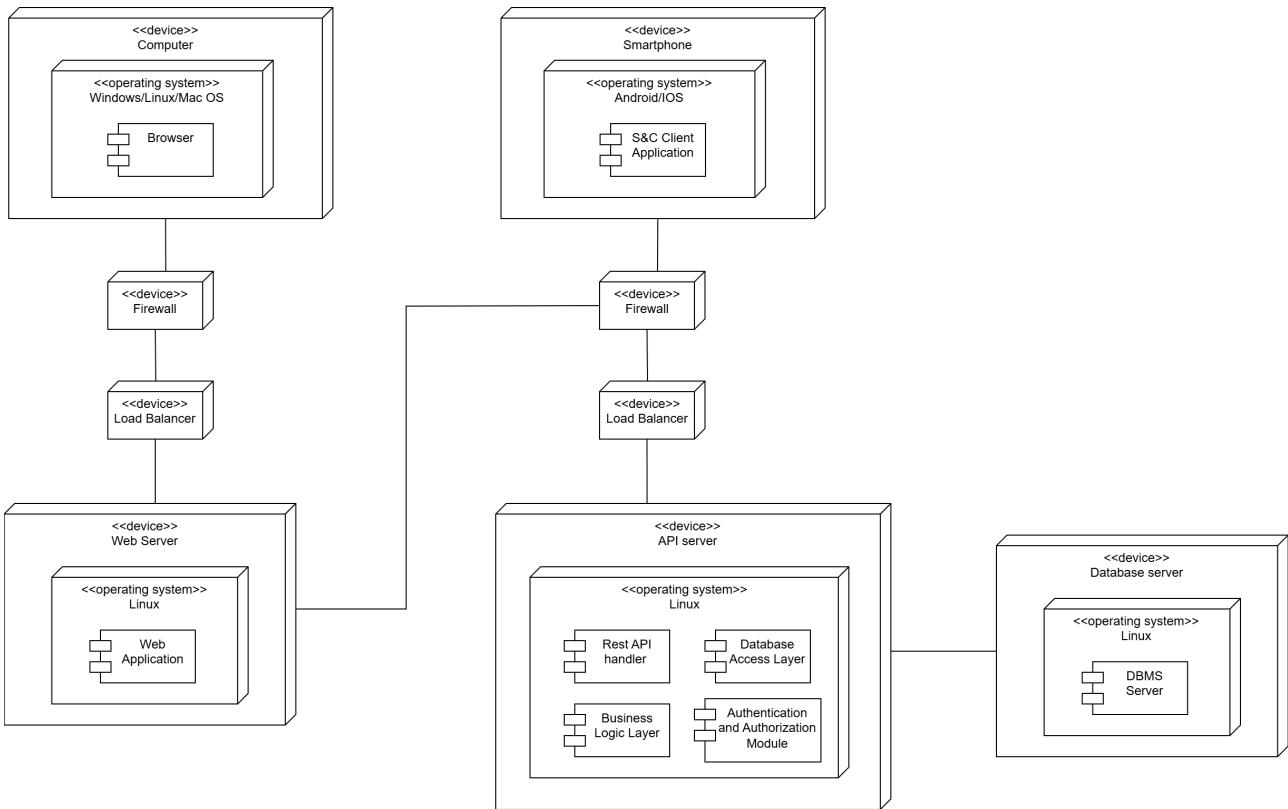


Figure 2.9: Deployment view diagram

Client Devices

The system supports two types of client devices:

- Computers: users can access the system via browsers on devices running different operating systems. The browser-based interface ensures cross-platform compatibility and ease of access.
- Smartphones: Users on Android or iOS can interact with the system through a dedicated S&C Client Application, offering a mobile-friendly experience with tailored functionalities.

Firewall

The communication between the client devices and the backbend system is safeguarded by a Firewall. It filters incoming and outgoing traffic, protecting the system from unauthorized access, malicious attacks and data breaches.

Load Balancer

The Load Balancer is used to maintain system availability and performance by distributing incoming request across multiple backend servers. This ensures that non single server becomes a bottleneck, improving reliability and accommodating high traffic volumes.

Web Server

It serves as the entry point for users interacting via browser. It hosts the Web Application which handles the frontend functionality, rendering the user interface and responding to user actions and session management, maintaining session continuity for user logged in via web browsers.

API Server

The S&C API Server is the heart of the system's backend logic. It is composed by several key components:

- Rest API Handler: acts as the communication bridge between client requests and backend logic, ensuring proper routing and handling of API calls.
- Business Logic Layer: implements the core system functionalities such as processing user actions, handling workflows and executing business rules.
- Database Access Layer: provides a secure and optimized interface for querying and updating data in the database server.
- Authentication and Authorization Module: enforces user authentication and role-based permissions to protect sensitive operations and data.

Database server

The Database server manages the system's data using a DBMS.

2.4. Runtime View

In this section, S&C system are presented through sequence diagrams. Initially, the actions of the S&C system are shown from the perspective of the student user, such as logging in, applying for internships, updating their profile, and managing their preferences. Then, the actions are presented from the perspective of the company user, which involve more business-oriented functionalities, such as managing internship offers, reviewing applications, and scheduling interviews. Finally, university ones, such as the internship interruption.

UC1 - User registration

The figure shows the registration process for students and companies. Once the request is sent it will automatically start the process of authentication which is managed by the Registration manager. The process continues with the student/company filling in the necessary information in order to successfully create the users profile. As soon as the form is submitted and sent to the registration manager, the database is checked to control whether another user with the same information already exists on the platform. If there is no user with the same credentials then a new user is created and added to the corresponding table.

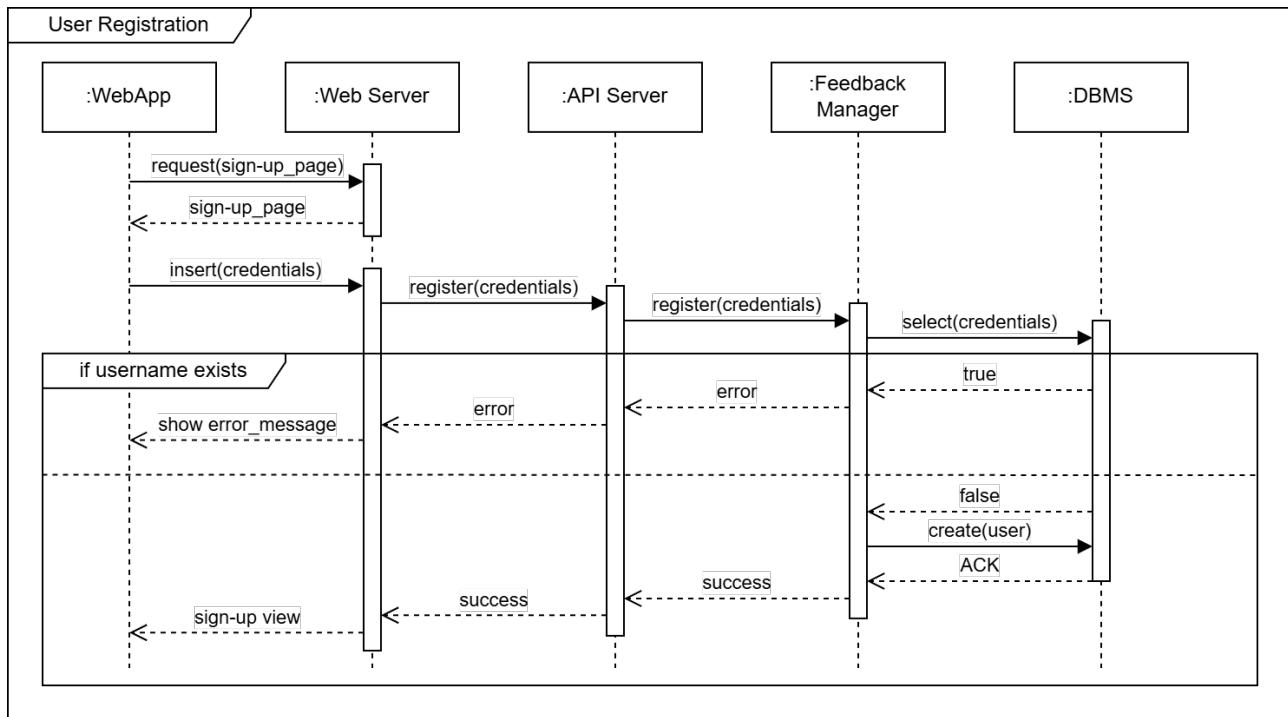


Figure 2.10: Student Registration

UC2 - User, student, company or university login

The figure shows the process of a user login. Even if the information of every user has been stored in a separate database, one for each type of user, the process is the same.

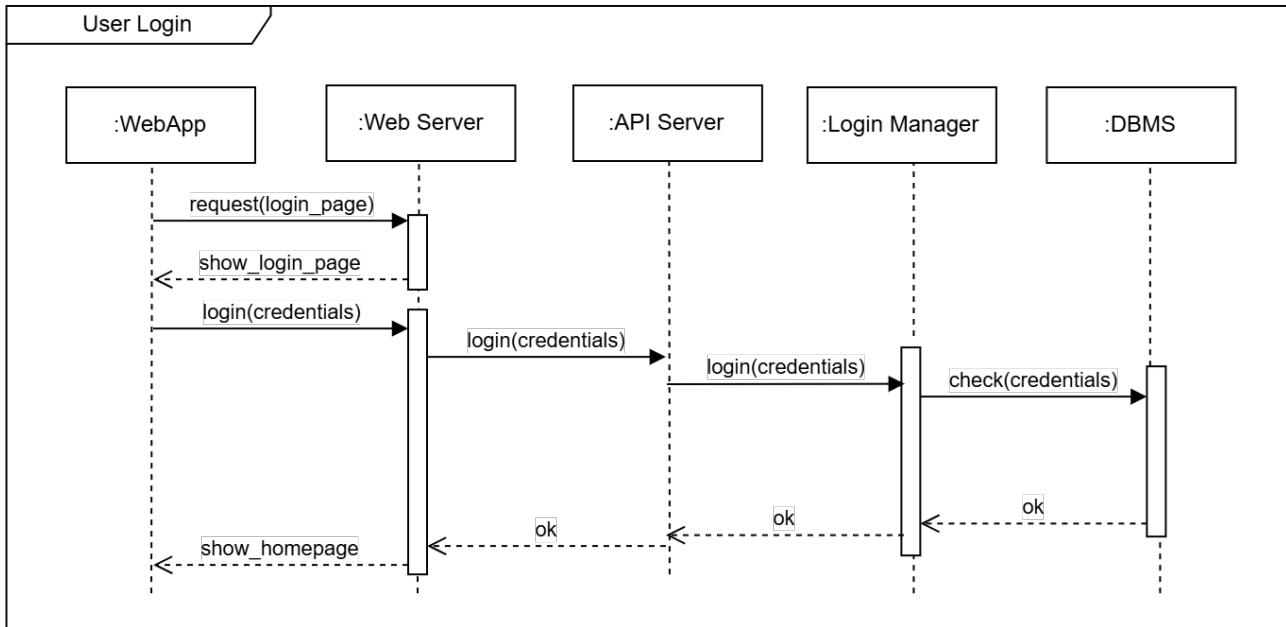


Figure 2.11: User Login

UC3 - Student's account activation

The figure shows the process of upgrading an account from standard registered user to a verified students account. After inserting the additional details required to do the upgrade correctly and after checking that there are no other students with the same credentials the Notification manager proceeds to send an email containing a verification link that the student must press in order to confirm the upgrade.

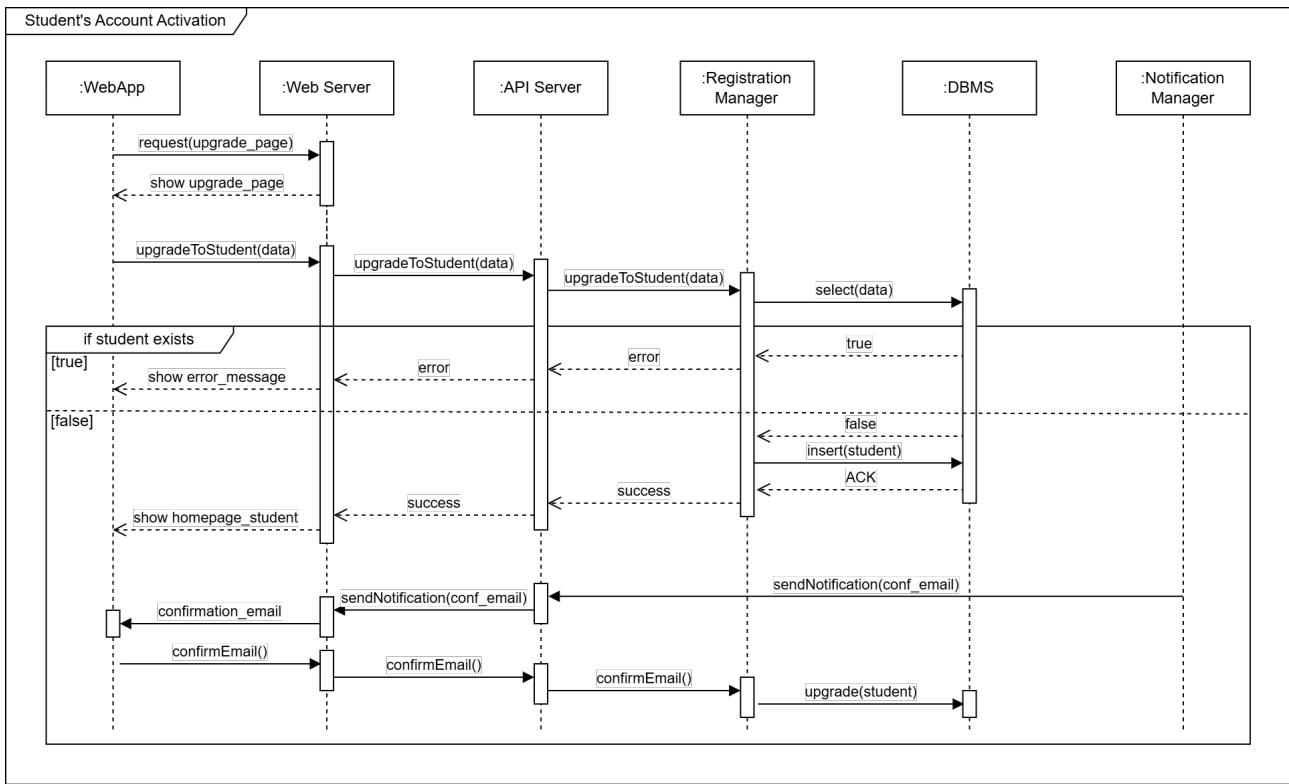


Figure 2.12: Student's Account Activation

UC4 - Student modifies their profile or updates their CV

The diagram outlines the process for updating a student's profile. The WebApp sends requests to the Web Server and forwards them to the API Server. For CV updates or personal data changes, the Profile Manager processes the requests and updates the DBMS. Success or error messages are sent back to the WebApp for display.

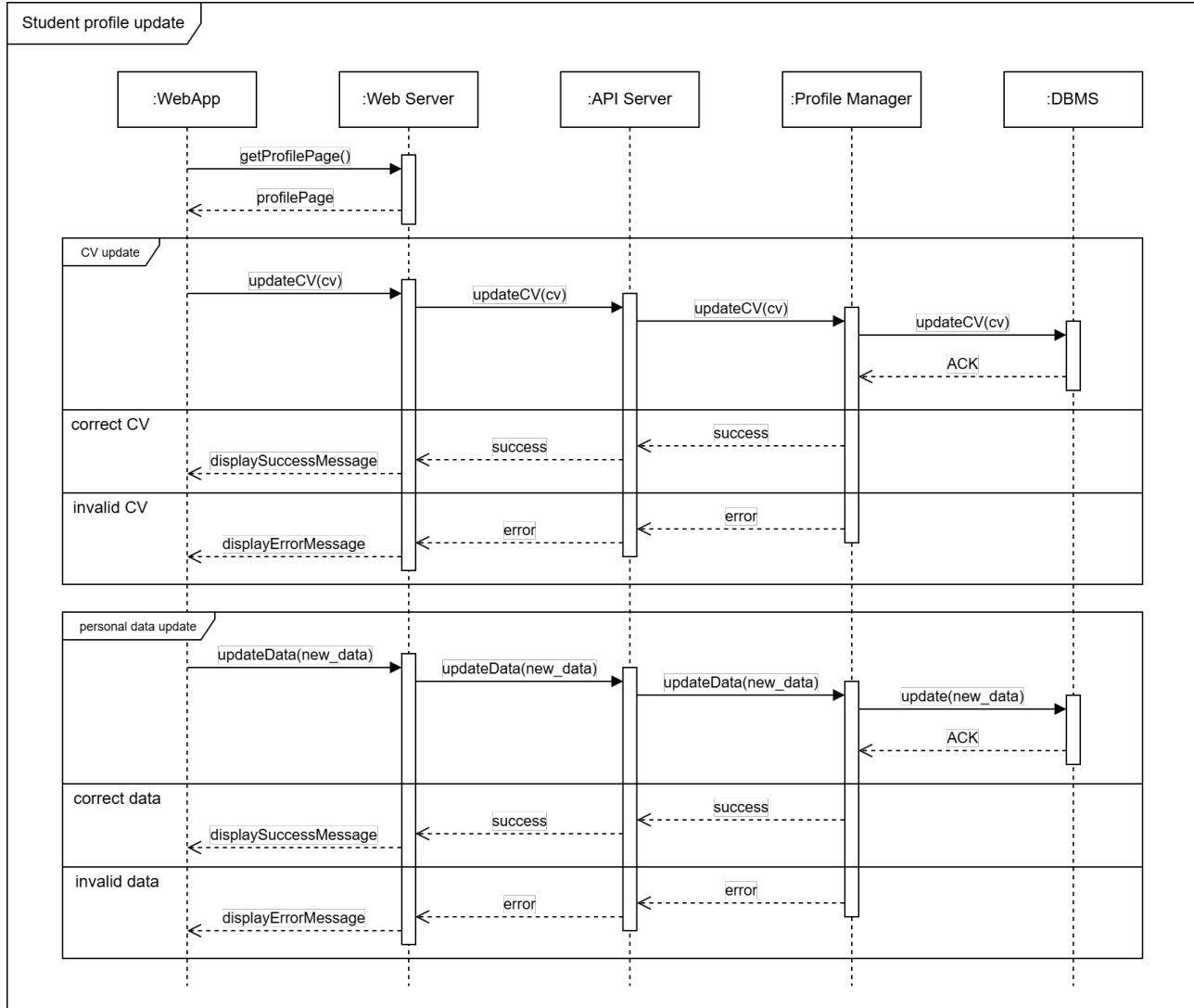


Figure 2.13: Student's Profile Update

UC5 - UC6 - UC7 - Student checks available offers, opens the details page of an internship post, and sends an application for it

The diagram shows the application process for internships. The WebApp requests internship details through the Web Server, which retrieves them via the API Server from the Internship Manager and DBMS. After reviewing, the student sends an application, which is processed and stored. Feedback on success or errors is then displayed to the student.

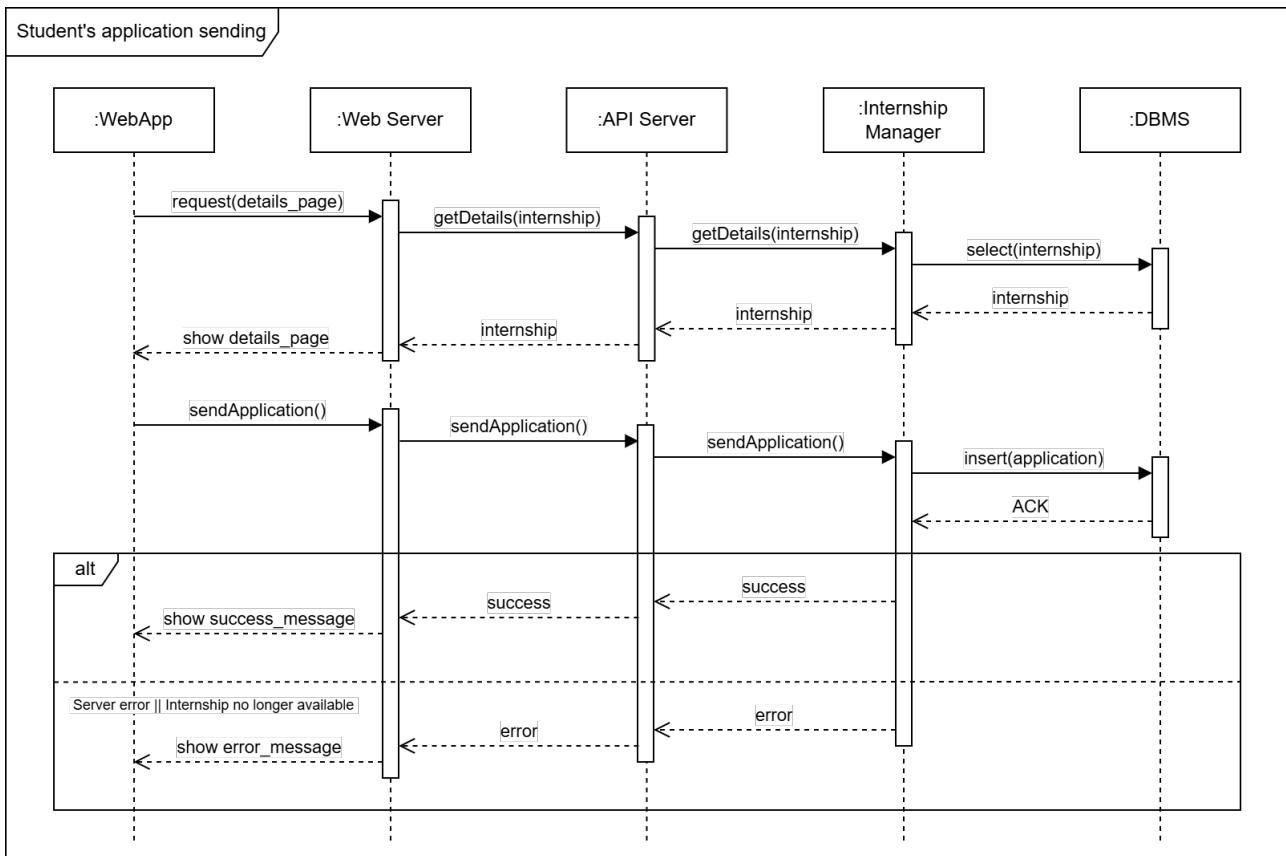


Figure 2.14: Student's Application sending Update

UC8 - Student accepts or denies an interview schedule proposal from the company

The diagram illustrates the process for a student's schedule response. Notifications are sent from the Internship Manager through the API Server to the WebApp. The student can either accept or reject the schedule. The respective action triggers an action, processed by the Internship Manager and reflected in the DBMS. A confirmation message is then displayed to the student on the WebApp.

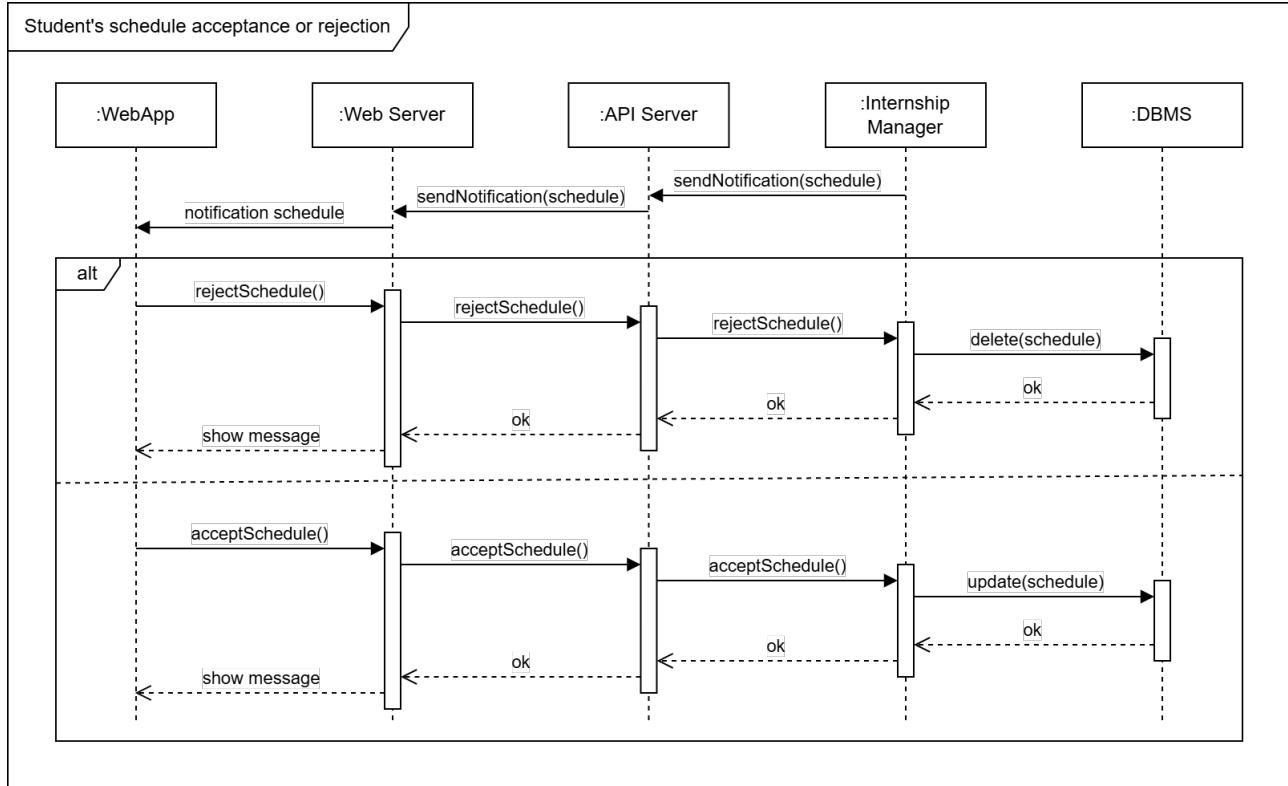


Figure 2.15: Student's Application sending Update

UC9 - Student accepts or denies the start of the internship

The diagram illustrates the process for the final decision of a student. The student receives a notification to confirm or reject the start of the internship, following the positive decision of the company after the interview. If the student accepts, the confirmation is sent through the Web Server and API Server to the Internship Manager, which updates the database to finalize the start. If the student rejects, a similar process is followed to record the rejection in the database. In both scenarios, a success message is displayed.

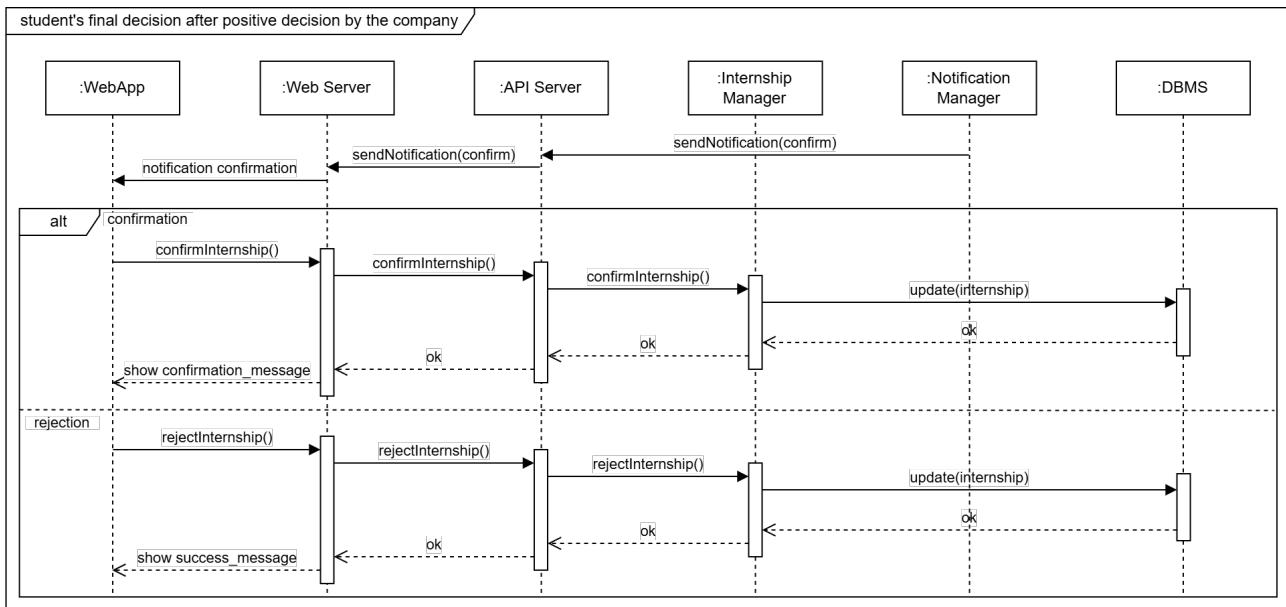


Figure 2.16: Student's Application sending Update

UC10 - Company's account activation

The figure shows the process of upgrading an account from standard registered user to a verified company account. The process consists of inserting the additional details required to do the upgrade correctly and checking that there are no other companies with the same credentials.

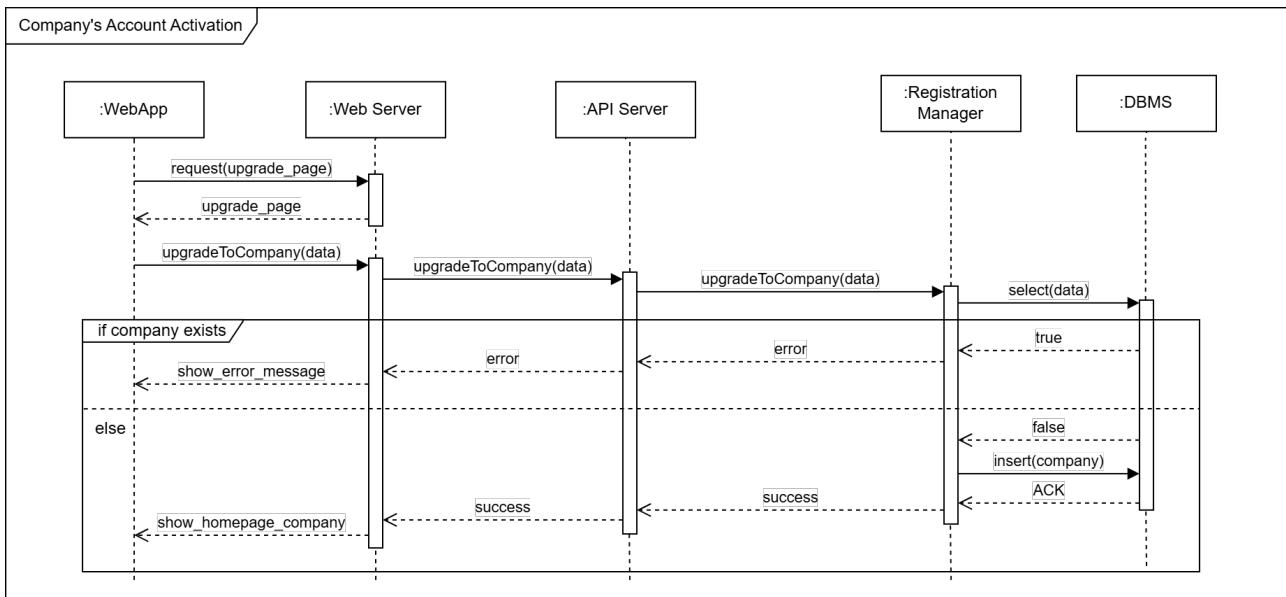


Figure 2.17: Company Account Activation

UC11 - Company's profile modification

The diagram shows the process for updating a company's profile. The company accesses its profile page to modify its information. After making the desired changes, the updated data are sent through the Web Server and API Server to the Profile Manager. The Profile Manager validates the modifications and updates the database. In case of a successful completion, a confirmation message is displayed to the company. In case of errors, an error message is shown instead.

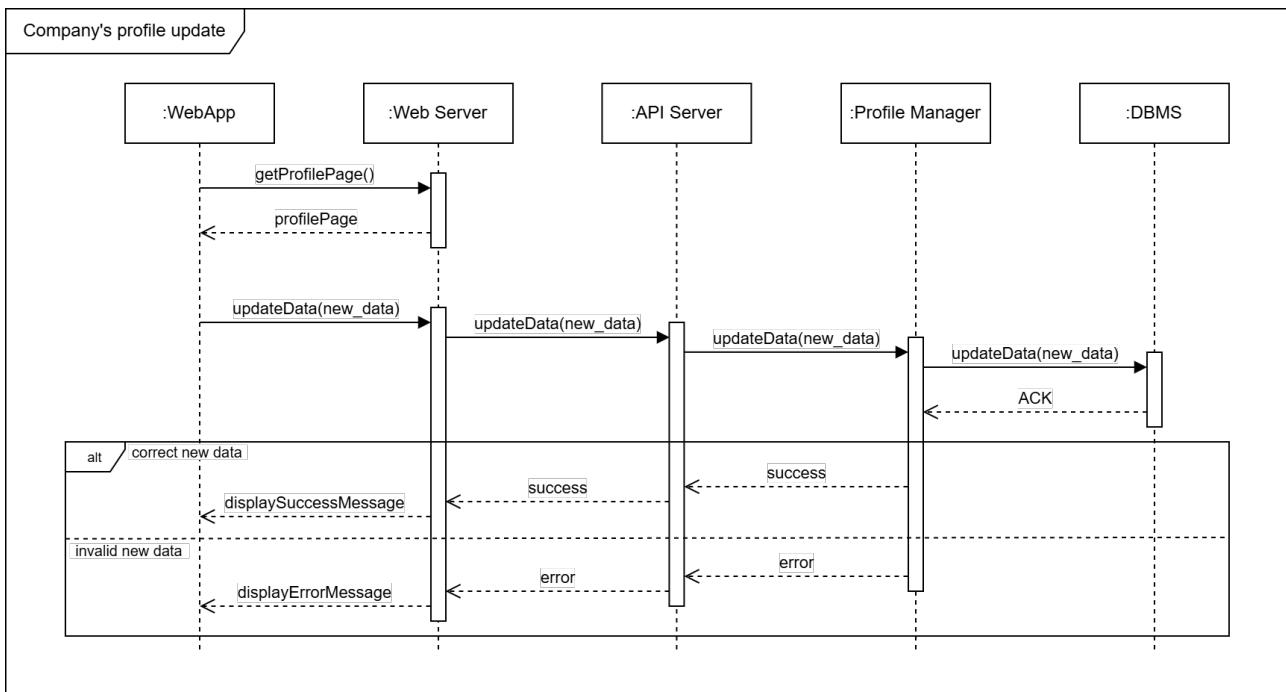


Figure 2.18: Company's Profile Update

UC12 - Company posts a new internship The figure shows the process of posting a new internship offer by a company. The company accesses the dedicated page with a form, fills in all the fields, and submits the required data. After the request is submitted to the Web Server and API Server, it is forwarded to the Internship Manager. The Internship Manager validates the data and proceeds to insert it into the database. In case of successful completion, a confirmation message is displayed to the company. In case of errors, an error message is shown instead.

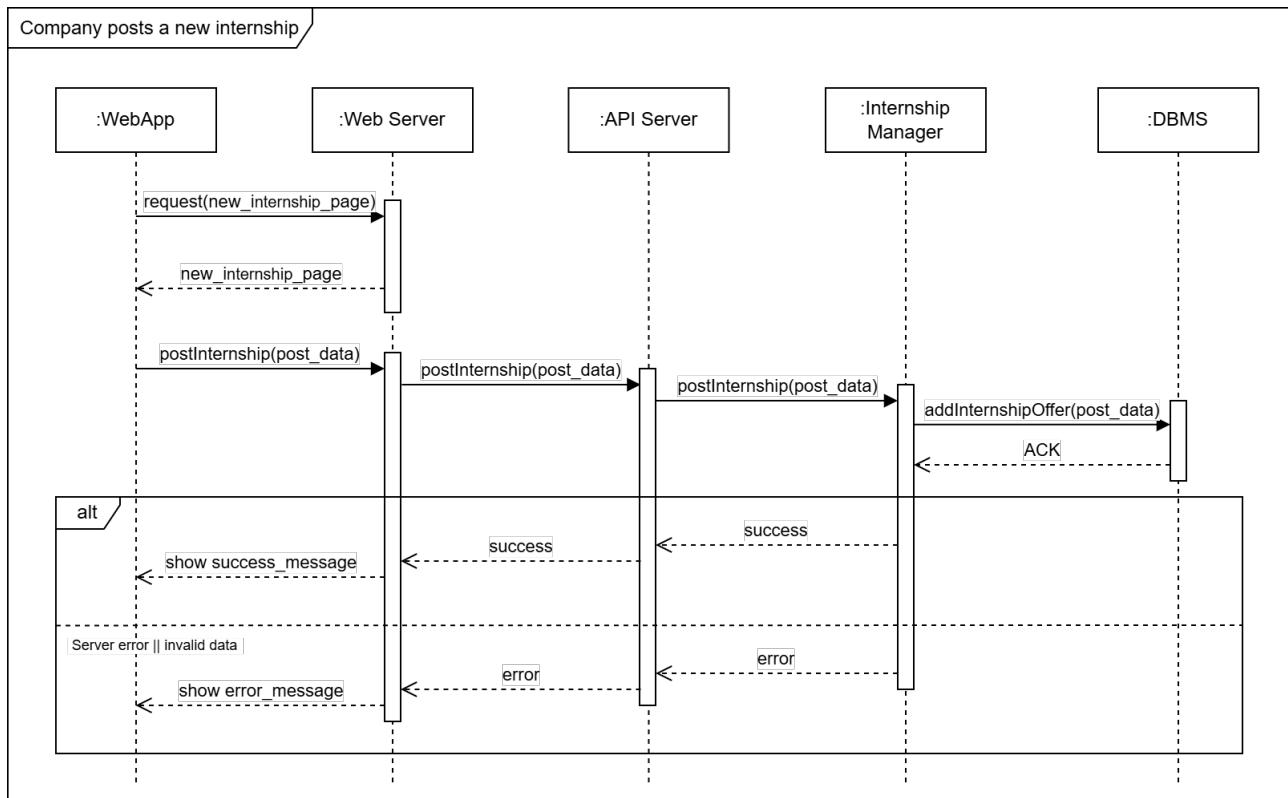


Figure 2.19: Company new offer posting

UC13 - The company accepts an application or identifies a promising student and proposes a schedule for the interview

The diagram illustrates the process where a company selects candidates for an internship, views a student's details, and proposes a schedule. The WebApp communicates with the Web Server, API Server, and respective managers (Matchmaking, Profile, Internship) to retrieve data and submit the schedule. Success or error messages are displayed based on the operation outcome.

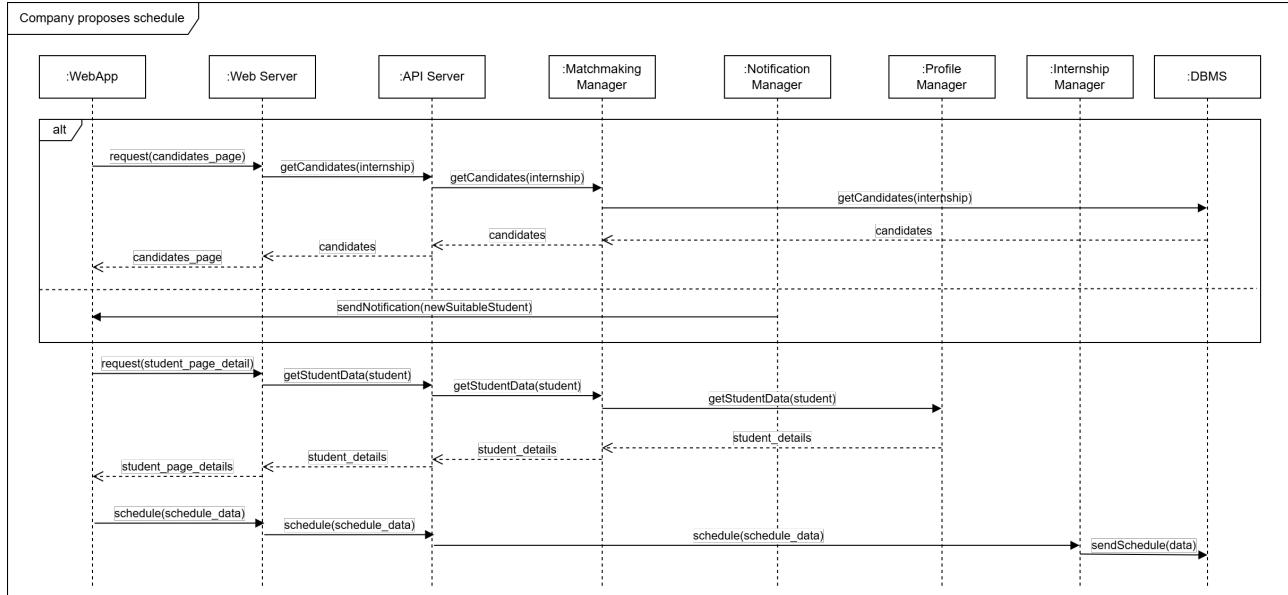


Figure 2.20: Company schedule interview

UC14 - Student or Company submits a complaint about an ongoing internship

The figure shows the process of submitting a new complaint on an internship by a student or a company. The student or company submits it through the platform. The complaint is sent via the Web Server and API Server to the Complaint Manager, which logs the issue in the database. After the complaint is recorded, the Complaint Manager sends a notification through the Notification Manager to the student's university to alert them about the new complaint. The system then confirms the submission with a success message or informs the user of any errors encountered during the process.

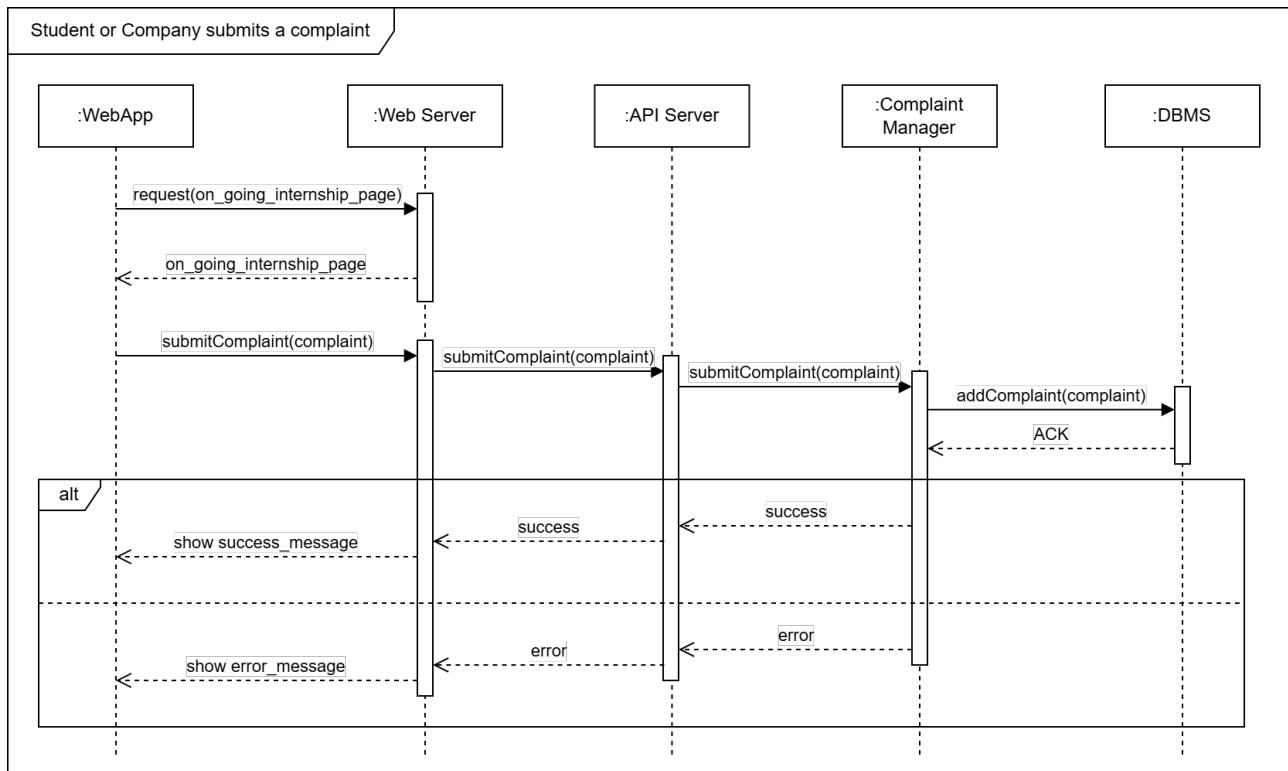


Figure 2.21: Company new offer posting

UC15 - Student or Company submits a feedback about a terminated internship

The figure shows the process of submitting a feedback on a terminated internship by a student or a company. The student or company submits it through the platform. The feedback is processed via the Web Server and API Server and stored in the database by the Feedback Manager. After successfully recording the feedback, the system confirms the submission with a success message or informs the user of any errors. Additionally, the Feedback will be used for future analysis and reference.

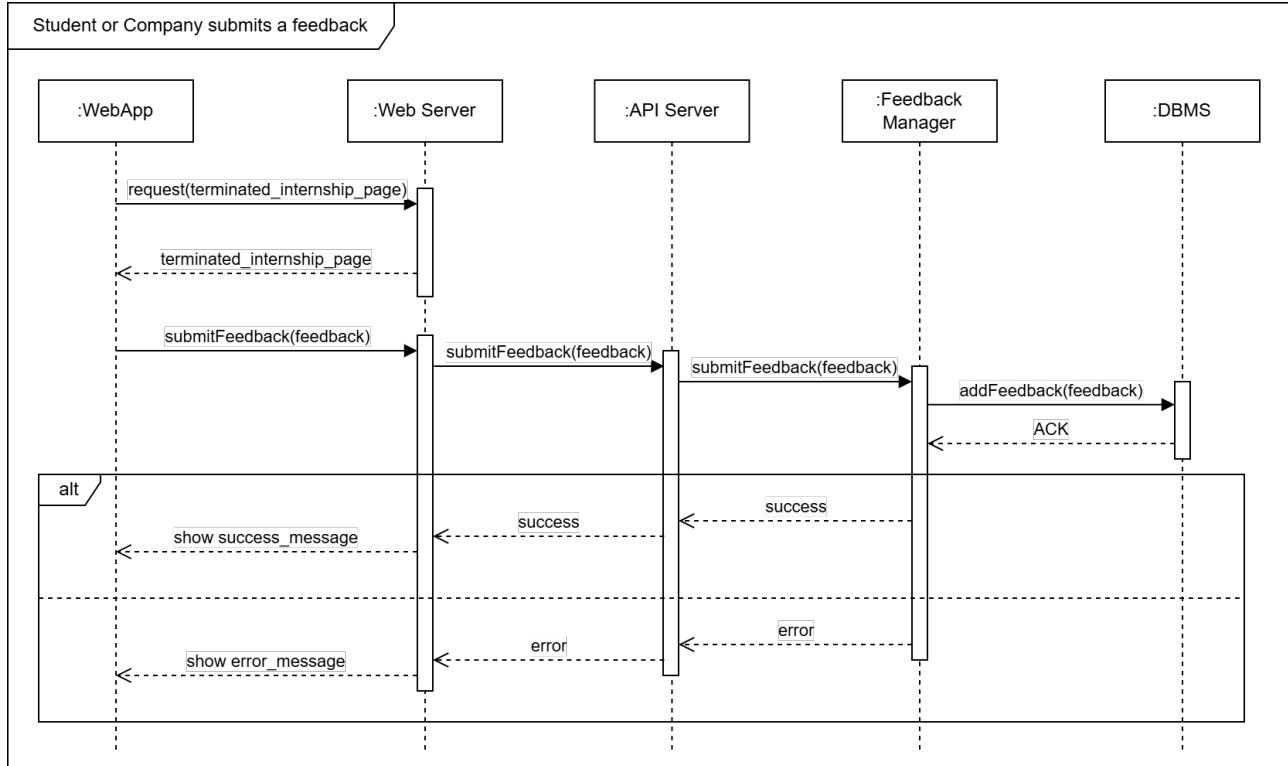


Figure 2.22: Company new offer posting

UC16 - University decides to interrupt an internship due to relevant complaints

The figure shows the process of interrupting an internship. The university reviews relevant complaints about an ongoing internship and decides to interrupt it. The decision is submitted through the platform and processed via the Web Server and API Server. The Internship Manager updates the database to mark the internship as interrupted and notifies both the company and the student about the decision. A confirmation message is displayed to the university upon successful completion.

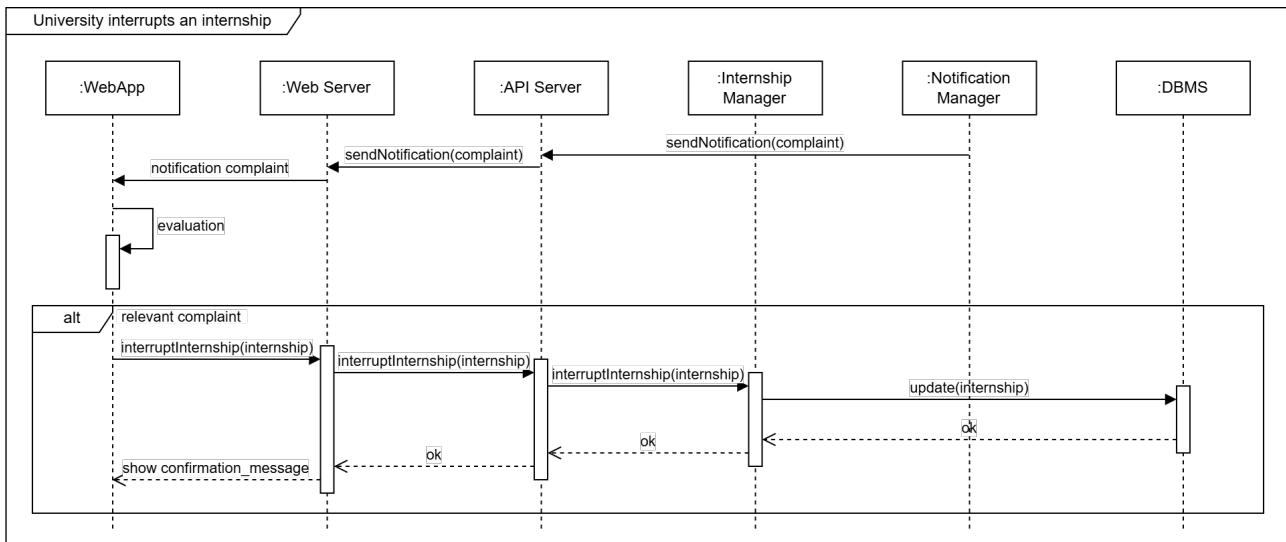


Figure 2.23: Company new offer posting

2.5. Component Interfaces

Login manager

- *login(String username, String password): boolean*

Registration manager

- *register(String name, String surname, String email) : Boolean*
- *upgradeToStudentAccount(User user, String name, String surname, String academicEmail, String phoneNumber, String postalCode, File CV, List<String> goals): boolean*
- *upgradeToCompanyAccount(User user, String fullName, String phoneNumber, String officeAddress): boolean*

Profile manager

- *getStudentData(Student student): Student*
- *updateStudentData(Student student, String name, String surname, String academicEmail, String phoneNumber, String postalCode, List<String> goals): boolean*
- *updateStudentCV(Student student, File CV): boolean*
- *getCompanyData(Company company): Company*

- `updateCompanyData(Company company, String fullName, String phoneNumber, String officeAddress): boolean`

Internship manager

- `addInternshipOffer(Company company, String projectDescription, String role, String address, Float salary, Int numberOfStudents, List<String> skills, String weeklySchedule, List<String> benefits): boolean`
- `updateInternshipOffer(Internship internship, String projectDescription, String role, String address, Float salary, Int numberOfStudents, List<String> skills, String weeklySchedule, List<String> benefits): boolean`
- `deleteInternshipOffer(Internship internship): boolean`
- `acceptApplication(Application application): boolean`
- `sendSchedule(Internship internship, Student student, String schedule): boolean`
- `rejectApplication(Application application): boolean`
- `confirmInternship(Internship internship, Student student): boolean`
- `rejectInternship(Internship internship, Student student): boolean`

Matchmaking manager

- `generateRecommendationsForStudent(Student student): List<Internship>`
- `generateRecommendationsForStudent(Internship internship): List<Student>`
- `findBestMatch(Student student): Internship`
- `findBestMatch(Internship internship): Student`
- `getCandidates(Internship internship): List<Student>`

Complaint manager

- `submitComplaint(Internship internship, Student student, String complaintText): boolean`
- `submitComplaint(Internship internship, Company company, String complaintText): boolean`
- `getComplaintStatus(Complaint complaint): ComplaintStatus`
- `getCompliantsByInternship(Internship internship): List<Complaint>`
- `interruptInternship(Internship internship, String reason): boolean`

Feedback manager

- *submitFeedback(Internship internship, Student student, String feedbackText): boolean*
- *submitFeedback(Internship internship, Company company, String feedbackText): boolean*
- *getFeedbackByInternship(Internship internship): List<Feedback>*
- *analyzeFeedback(Feedback feedback): boolean*

Notification manager

- *sendNotification(User user, NotificationType type, String message): boolean*
- *getNotifications(User user): List<Notification>*

2.6. Selected Architectural Styles and Patterns

2.6.1. 3-tiered Architecture

The architectural style chosen is 3-tiered architecture, which provides significant benefits such as modularization into three distinct layers:

- Web and Mobile Client : This is the presentation tier and gives access to the user interface. The web application provides the user interface through a browser, utilizing technologies like HTML, CSS, and JavaScript for dynamic and interactive content. The mobile application delivers a native or hybrid experience, optimized for smaller screens and supporting additional functionalities like push notifications.
- The S&C API server : This is the middle tier, responsible for implementing the business logic of the system. It handles tasks such as user authentication, internship matching, and processing of user actions. The application server communicates with the database server and ensures the seamless operation of system workflows.
- The database server : This is the backend of the application, powered by a Database Management System (DBMS) like MySQL. It stores and manages all system data, including user profiles, internship postings, applications, complaints and feedback, ensuring data integrity and quick retrieval for the application server.

2.7. Other Design Decisions

This section is focused on explaining the design decisions that have been implemented in order to make the system work correctly.

2.7.1. Availability

Load balancing is implemented to create a system with a high availability and capable of handling a large amount of concurrent requests efficiently. In addition to this, it is crucial to incorporate replication mechanism in order to eliminate single points of failure and enhance system reliability.

2.7.2. Data Storage

Data storage is managed through the use of a database to store the personal information of users, students, universities and companies. Additionally, auxiliary data structures are used in order to make query performance better.

3 | User Interface Design

In this section, an overview of the user interface of the S&C system is presented. The focus is primarily on the user experience, with secondary attention given to the user interface. Although the interface has been carefully designed, it remains subject to refinement based on feedback from usability testing and focus groups. The mock-ups shown below include both the desktop browser version and the mobile application version, allowing us to showcase the interface for both Student and Company users. The desktop version provides full access to all functionalities, while the mobile version, designed to be fully responsive, ensures a seamless experience across devices regardless of screen size or user type.

3.1. General overview

The image below illustrates the structure of the pages accessible within the S&C application. All pages are accessible only after logging into the main login page, which serves as a gateway separating Student, Company and University dashboards.

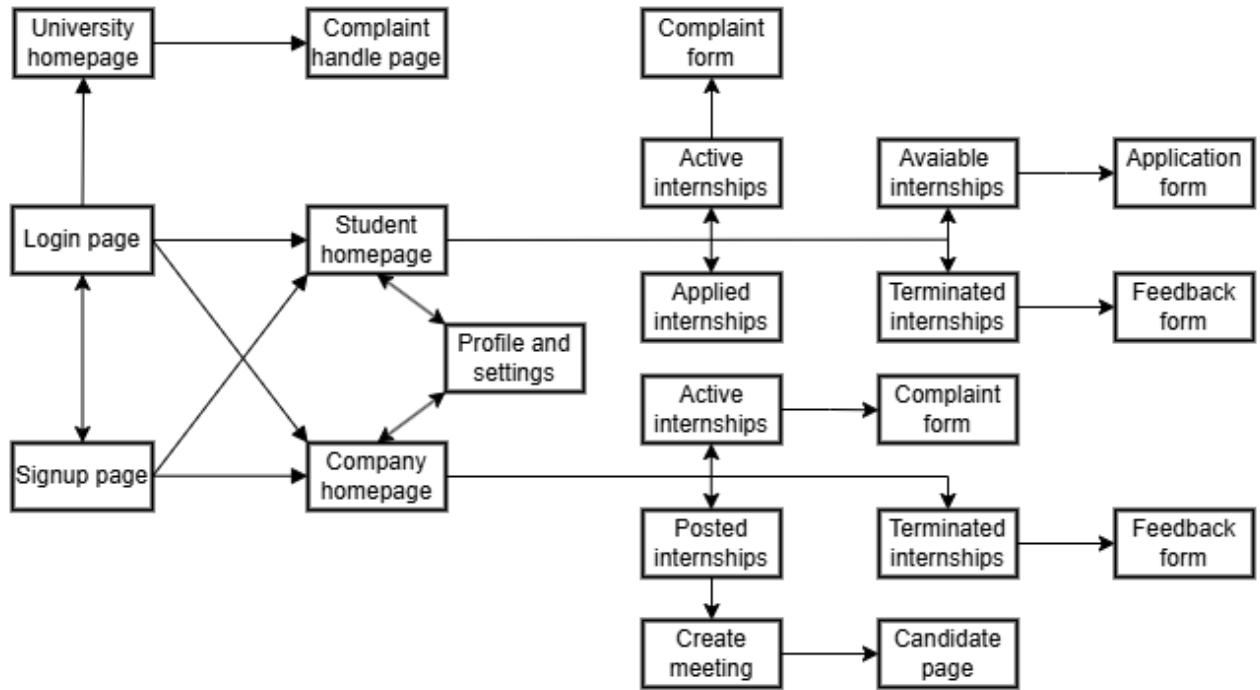


Figure 3.1: S&C overview

As previously mentioned, the login section is the entry point for users, allowing them, upon successful authentication, to access their respective dashboards and interact with the system's features. In S&C, there are three primary types of dashboards corresponding to the three main user roles involved in the system's processes: Students, Companies and Universities.

While the dashboards slightly differ in their aesthetic choices (such as color schemes), they maintain a consistent structure and layout. This design decision was made to optimize development by relying on reusable components, ensuring a scalable and maintainable interface that can be efficiently updated over time.

From the Company dashboard, the following pages can be accessed:

- Company Profile Management – For updating and managing company information
 - Post a New Internship and Manage Existing Internships – To create internship opportunities and oversee the ones already posted.
 - View Applications and Contact Students – To review applications submitted by students and/or initiate communication with potential candidates.
 - Submit a Complaint for Active Internships – A page dedicated to reporting issues related to ongoing internships.

- Submit Feedback for Terminated Internships – A page for providing feedback on completed internships.

From the Student dashboard, the following pages can be accessed:

- Student Profile Management – To update personal details, academic information, and preferences.
- Internship Search and Application – To browse available internships and submit applications.
- Submit a Complaint for Active Internships – To report issues or challenges encountered during an ongoing internship.
- Submit Feedback for Terminated Internships – To provide feedback about completed internship experiences.

From the University dashboard, the following page can be accessed:

- Complaint Management – To review and handle complaints submitted by students enrolled at the university regarding their ongoing internships.

Additionally, both dashboards provide users with targeted notifications relevant to their role. All the pages outlined above will be described in greater detail in the following sections.

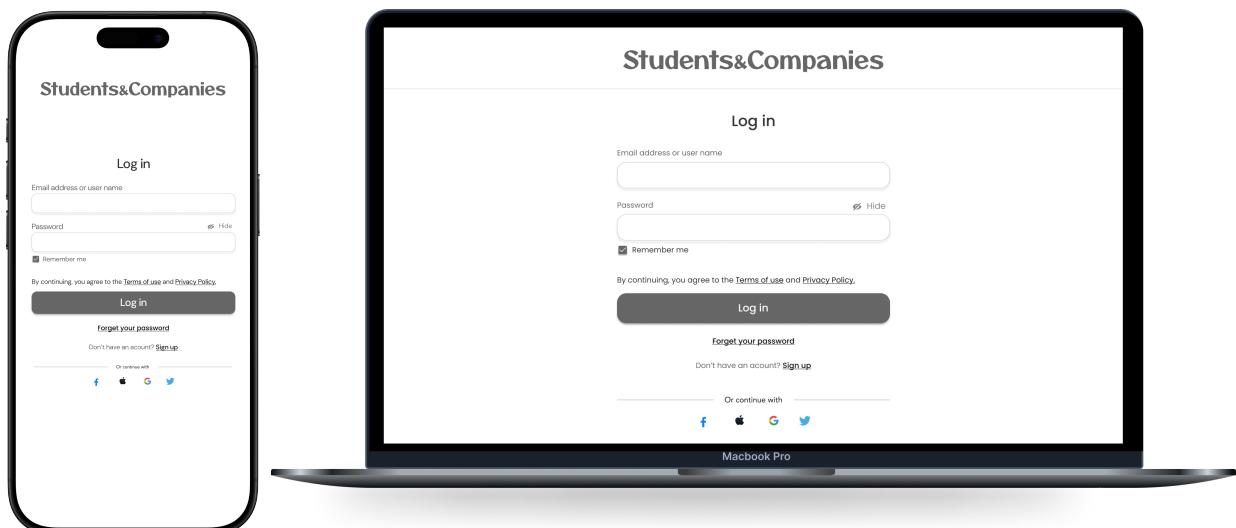


Figure 3.2: S&C Login Page

3.1.1. Registration Interface

The registration interface is designed to allow users, whether students or companies, to create an account on the S&C platform. The mockup showcases a simple and intuitive form where users are required to input their email address and choose a secure password, which must be confirmed by re-entering it. To proceed, users must also agree to the platform's Terms and Conditions and Privacy Policy by selecting the appropriate checkboxes.

Once the form is submitted, the system sends a confirmation email to the address provided by the user. This email contains a unique link that, when clicked, activates the user's account.

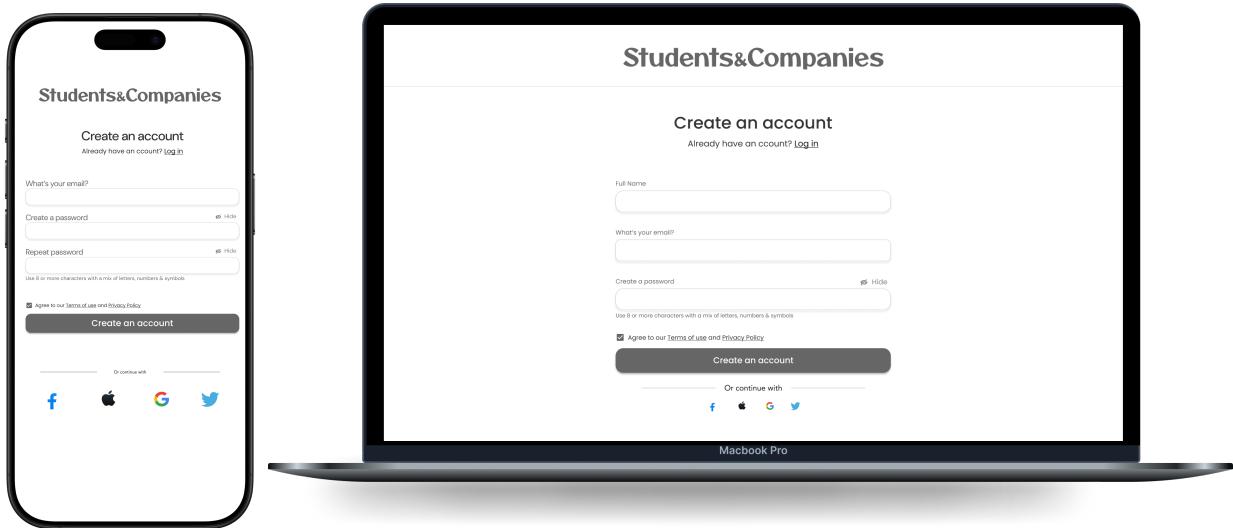


Figure 3.3: S&C student account activation

3.1.2. Upgrade to Student Account Interface

Registered users who have not yet selected a role can access this page by clicking "Upgrade account" on the generic homepage and then selecting "Upgrade to student." Here, they can complete the registration by filling out all the required fields, as personal data, goals and uploading their CV, in the form or return to the homepage without completing the action.

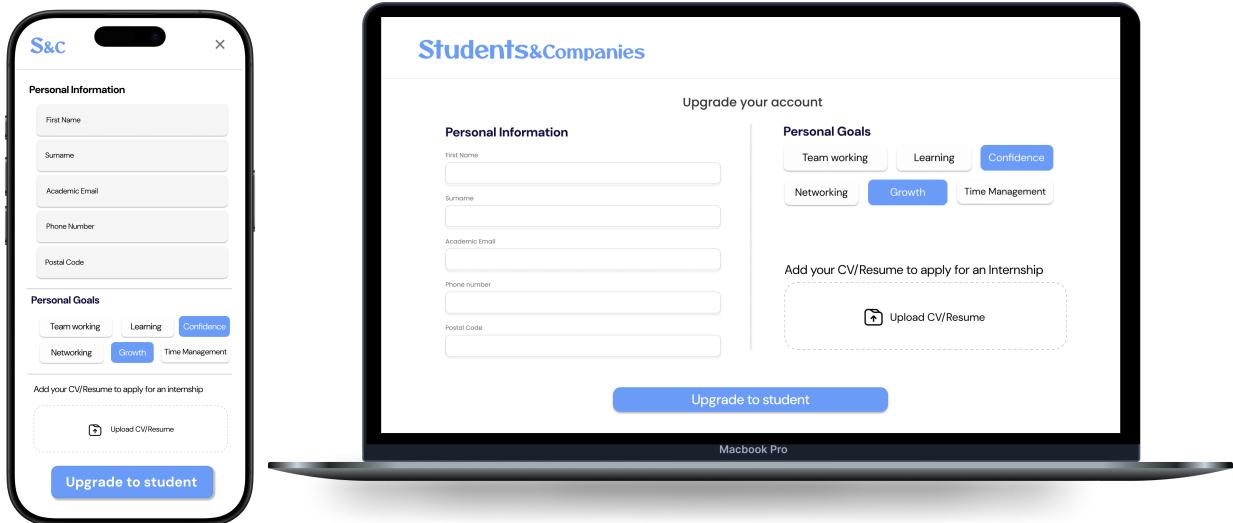


Figure 3.4: S&C student account activation

3.1.3. Upgrade to Company Account Interface

Registered users who have not yet selected a role can access this page by clicking "Upgrade account" on the generic homepage and then selecting "Upgrade to company." Here, they can complete the registration by filling out all the required fields about company's data in the form or return to the homepage without completing the action.

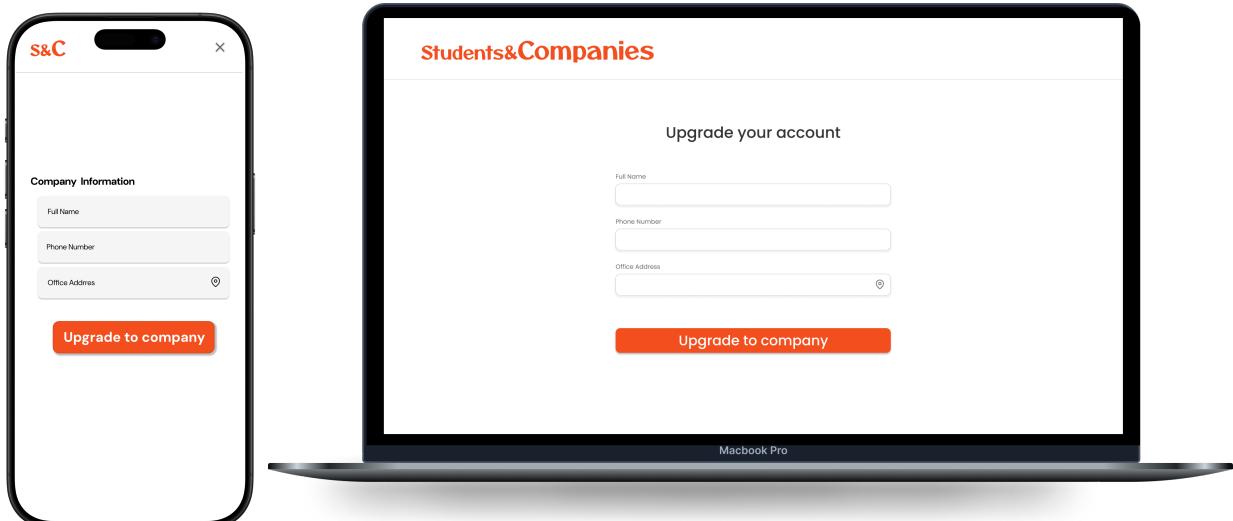


Figure 3.5: S&C company account activation design

3.2. Student Dashboard Interface

Students can access this page after logging in or activating their student account. On this page, they can browse all available internships. By default, internships are displayed in order of the highest compatibility, quantified by a score out of 10. The highest score, shown first, represents the best match. On this page the student can:

- Open the Internship's details page by clicking an internship tab.
- Switch between available, active, applied, or terminated internships by using the submenu bar.
- Change the listing order (e.g., by distance or highest salary) by clicking the "sort" button.
- Apply filters to exclude posts based on specific characteristics (e.g., distance range, salary range) by clicking the "filter" button.
- Search for companies by name or requested role by typing it in the search bar.
- See all notifications by clicking on notification button.
- Open the edit profile page by clicking the profile picture or "profile" text.

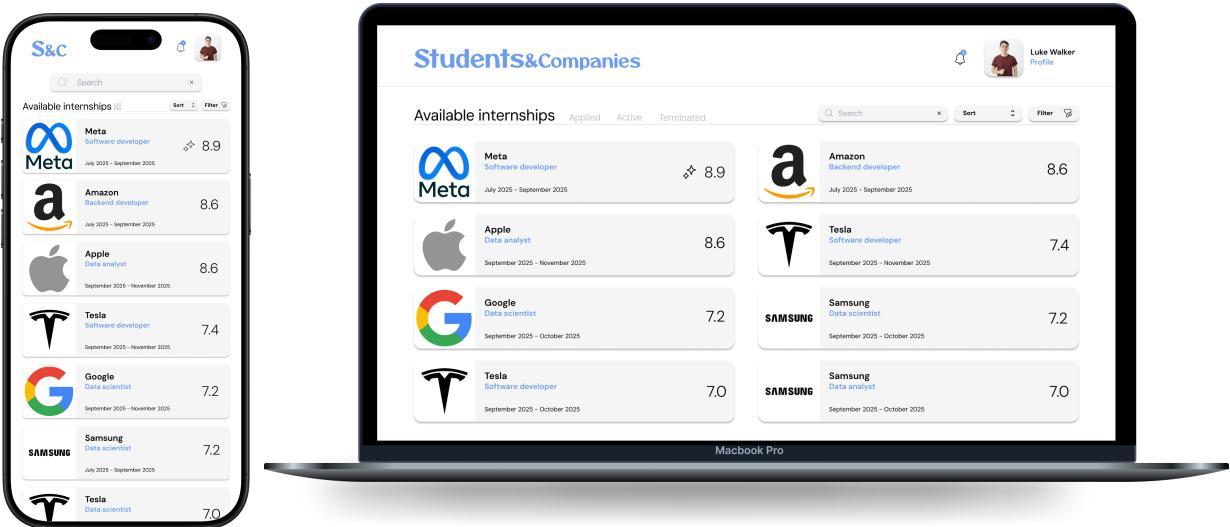


Figure 3.6: S&C student homepage design

3.2.1. Edit Profile Interface

Students can access this page by clicking the profile picture or "Profile" text on their homepage. On this page, they can update their personal information by completing the desired fields in the

form or upload a new CV file using the dedicated input field. The system provides personalized suggestions based on the current CV to enhance its appeal to companies and improve compatibility with the matching algorithm. Updating personal information and uploading a new CV are independent actions. Changes are submitted to the system only after clicking the confirmation button. Students can also navigate back to the homepage without saving any changes.

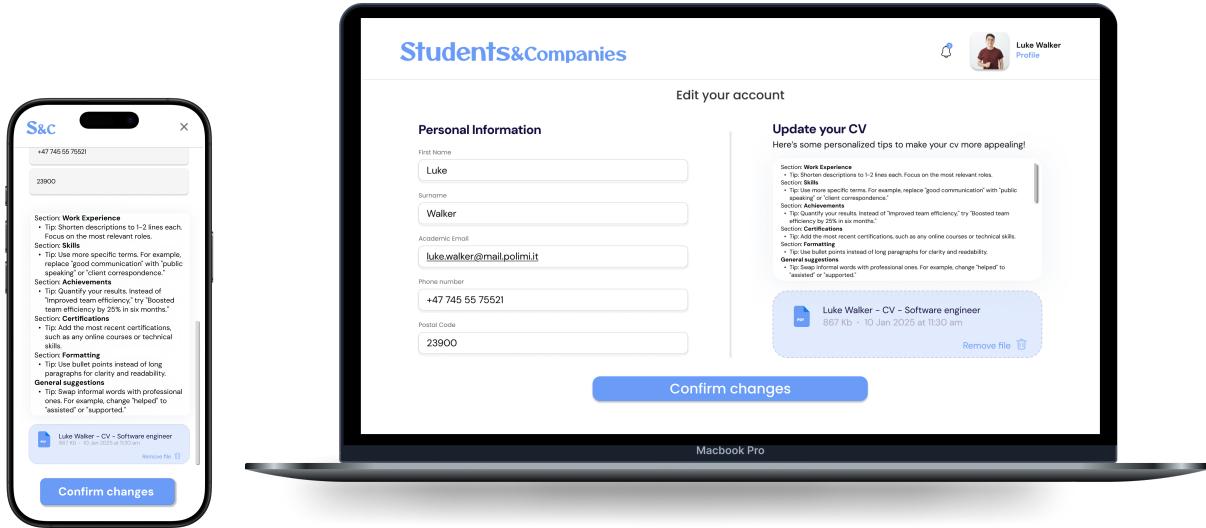


Figure 3.7: S&C internship details design

3.2.2. Internship Details Interface

Students can access this page by clicking on one of the internship offer boxes on their homepage. On this page, they can read all the details about the internship and, if interested, decide to submit their application by clicking the respective button. This action will send a notification to the company, which can then choose whether to accept it or not. The details are displayed on the right half of the page, so students can directly view other internship offers by clicking on another box, as their list remains open on the left half. After clicking the submit application button, the student is brought back to their homepage.

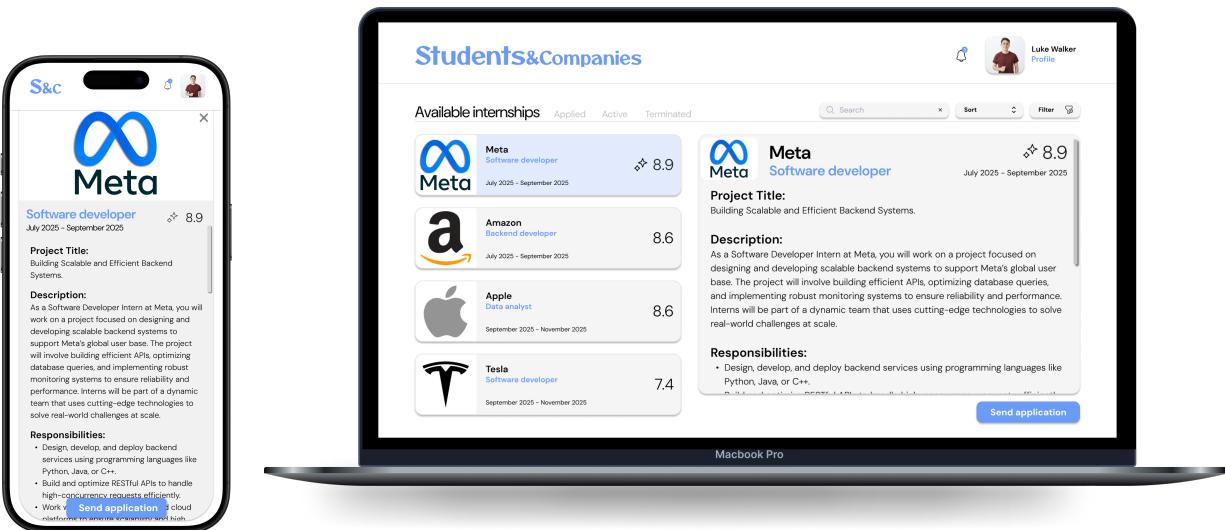


Figure 3.8: S&C internship details design

3.2.3. Submit a Complaint/Feedback Interface

Students can access this page by clicking the "Make a Complaint" button after opening the details of an ongoing Internship in the "Active Internships" section of their homepage. On this page, they can review the internship details agreed upon before starting and submit a complaint by completing all the required fields in the form. Alternatively, they can return to the homepage without taking any action.

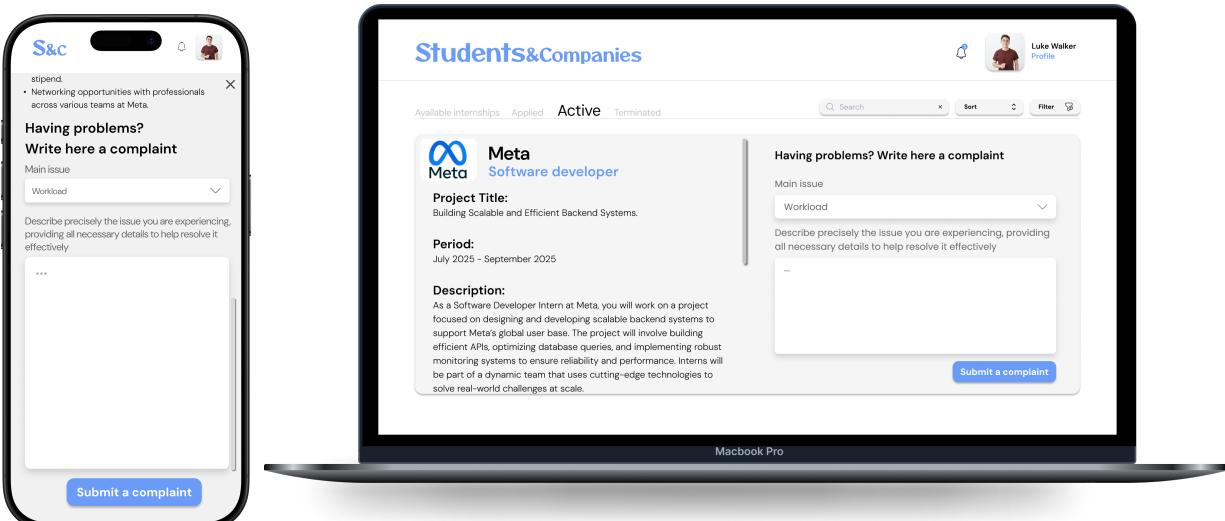


Figure 3.9: S&C internship details design

3.3. Company interface

Companies can access this page after logging in or activating their company account. On this page, they can review all their posted internships. On this page, they can also:

- Open the details of an Internship by clicking its tab.
- Open the details of an Internship for modifications by clicking the edit button on its tab.
- Open the candidates page for an Internship by clicking the "Find Students" button on its tab opens.
- Switch between posted, active, or terminated internships by using the sub-menu bar.
- Change the listing order (e.g., by name or date) by clicking on the "sort" button.
- Apply filters to exclude posts based on specific characteristics (e.g., role requested, salary range) by clicking on the "filter" button.
- Searching for internships by role name by typing it in the search bar.
- Display all notifications by clicking on the notifications button.
- Open the edit profile page by clicking the profile picture or profile text.

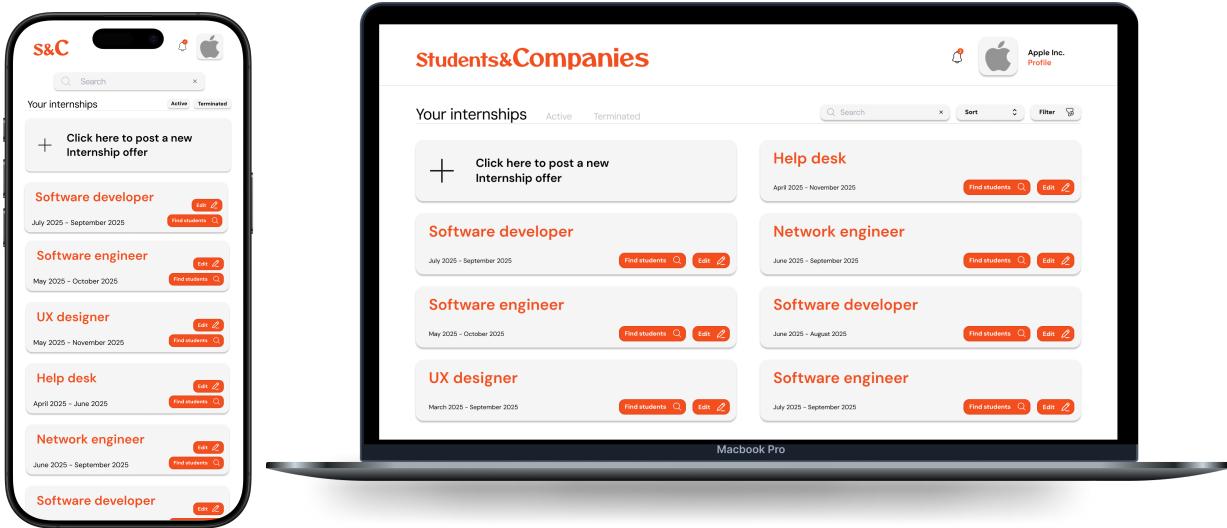


Figure 3.10: S&C company homepage design

3.3.1. Internship Creation and Posting Interface

After clicking the "+" button on the homepage, the company is directed to this page where they can create a new internship post. Here, they can complete a new Internship offer post creation by filling out all the required fields in the form or return to the homepage without completing the action.

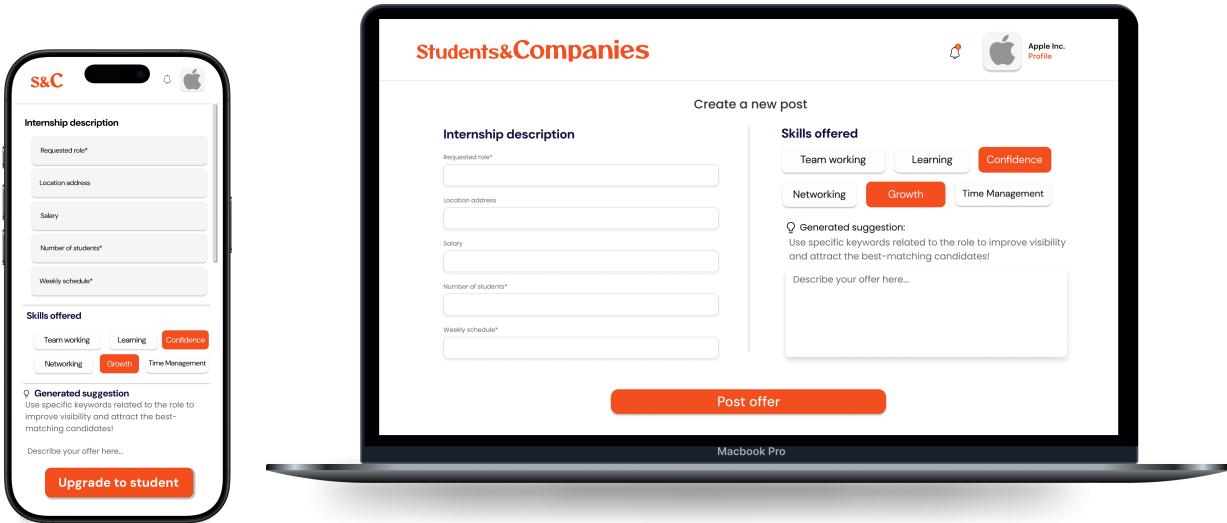


Figure 3.11: S&C company candidates for an internships design

3.3.2. Applicants and Candidates Manager Interface

After clicking the "Find students" button on the homepage, the company is directed to this page where they can find the most suitable students for their internship. The applicants are listed first, followed by others ordered by the matchmaking score. On this page they can:

- Open the student's details page by clicking the student's box.
- Download directly a CV of a specific student by clicking on the "View CV" button in the student's box.
- Change the listing order (e.g., by name or age) by clicking on the "sort" button.
- apply filters to exclude students based on specific characteristics (e.g., role or university attended) by clicking on the "filter" button.
- Search for students by name by typing it in the search bar.

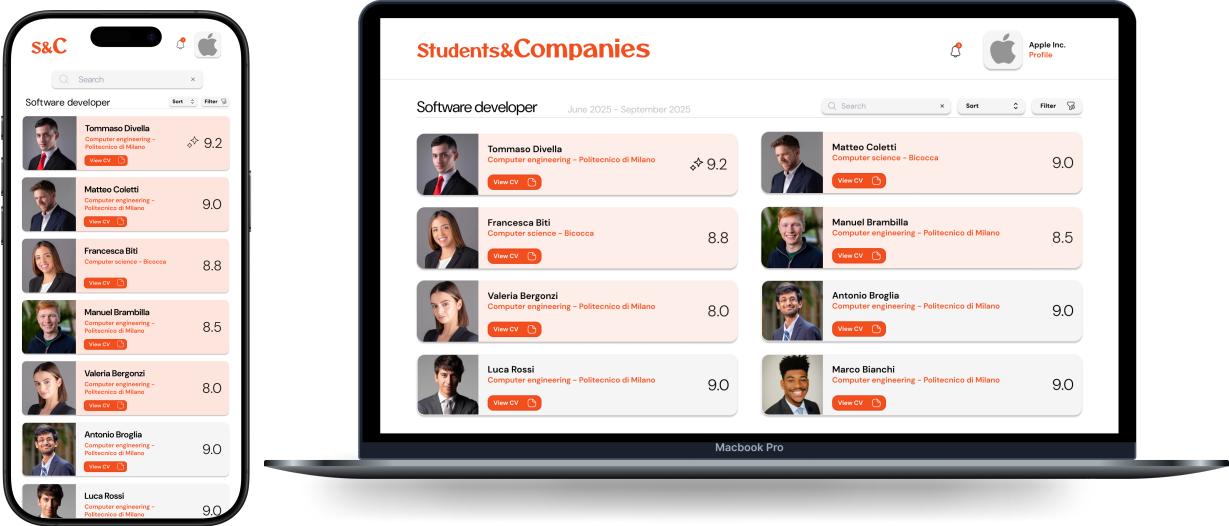


Figure 3.12: S&C company candidates for an internships design

3.3.3. Applicant/Candidate Details Interface

The company can access this page by clicking the student's box on their candidates page for an internship. On this page, they can read all the details about the candidate and, if interested, decide to open the pop-up where they can propose a meeting for an interview by clicking the respective button. The details are displayed on the right half of the page, so the company can directly view other candidates' details by clicking on another box, as their list remains open on the left half.

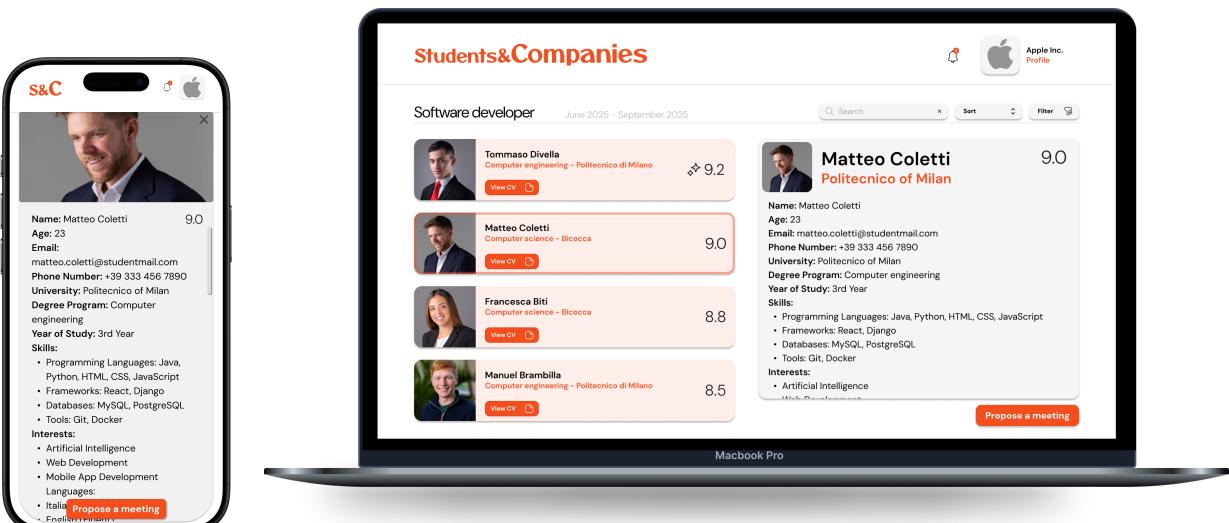


Figure 3.13: S&C company candidates for an internships design

3.3.4. Propose a Meeting Interface

This pop-up is shown to the company after they click on the "Propose a meeting" button. Here, they can select a day to schedule a meeting for the selected candidate by clicking on a day in the calendar and entering a start time and end time. The already occupied days are displayed. Before submitting the proposal, the company must write a message for the candidate. This action will send a notification to the student, who can then choose whether to accept it or not. After clicking the "Send schedule" button, the company is brought back to their homepage.

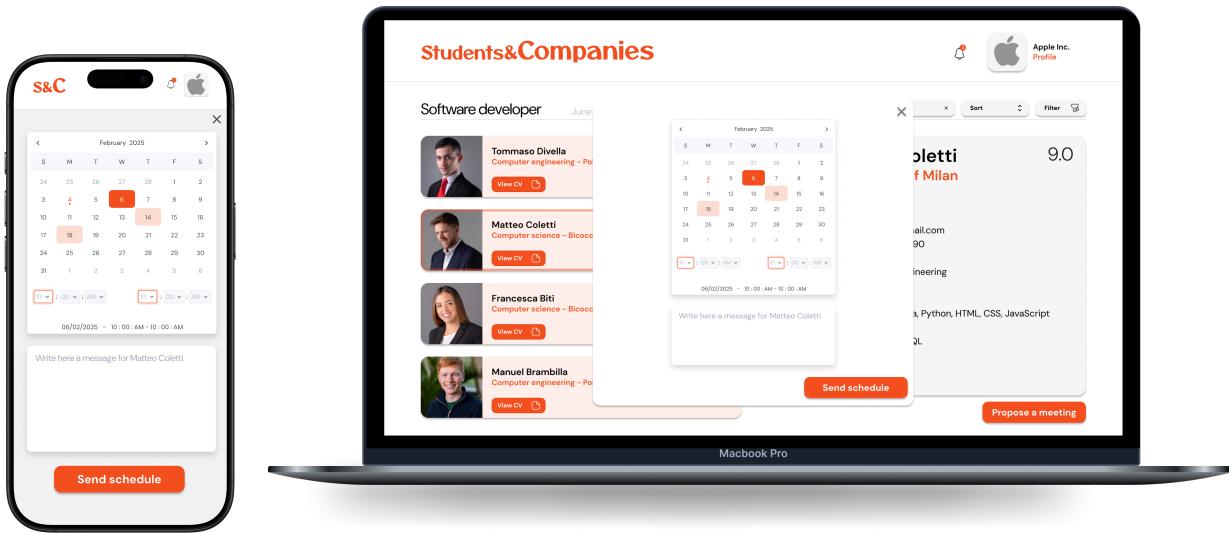


Figure 3.14: S&C company candidates for an internships design

3.4. University Interface

Universities can access this page after logging in with the provided credentials. On this page, they can browse all current internships for their students and see if there are complaints on them. The click of the notification button displays all the complaint notifications and the click of the "Review complaint" button opens the complaint handling page.

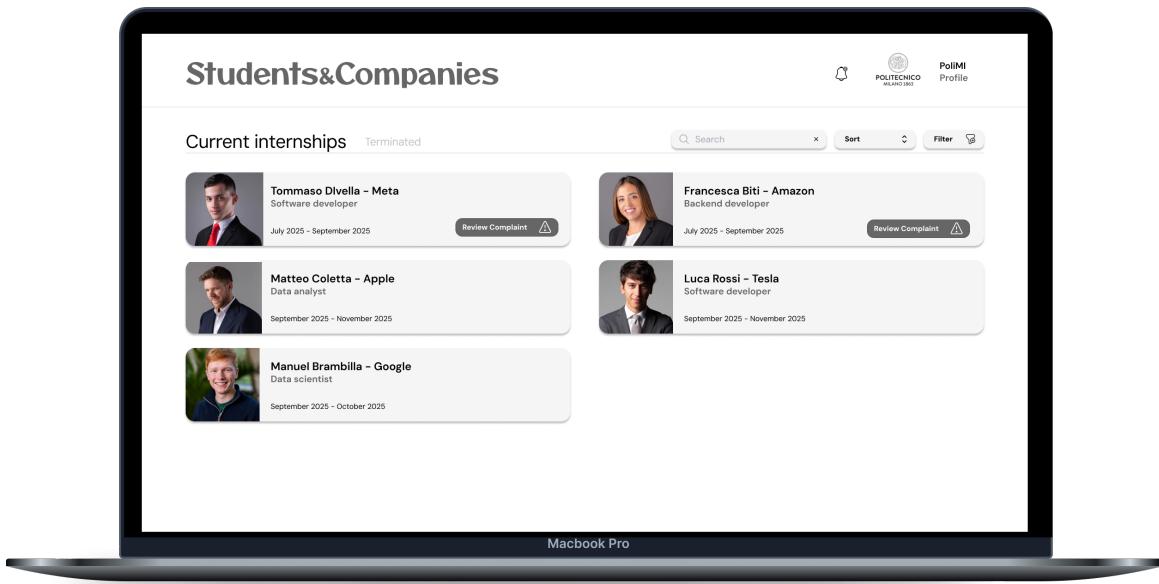


Figure 3.15: S&C university homepage

Complaint Manager Interface

The complaint handling page is opened on half page. The university, after reasoning about the new complaint from student or company, can decide if it's enough relevant to interrupt the internship or not, "resolving" it. These actions can be done by clicking on the designated button. After doing one of these, the university goes back to the homepage.

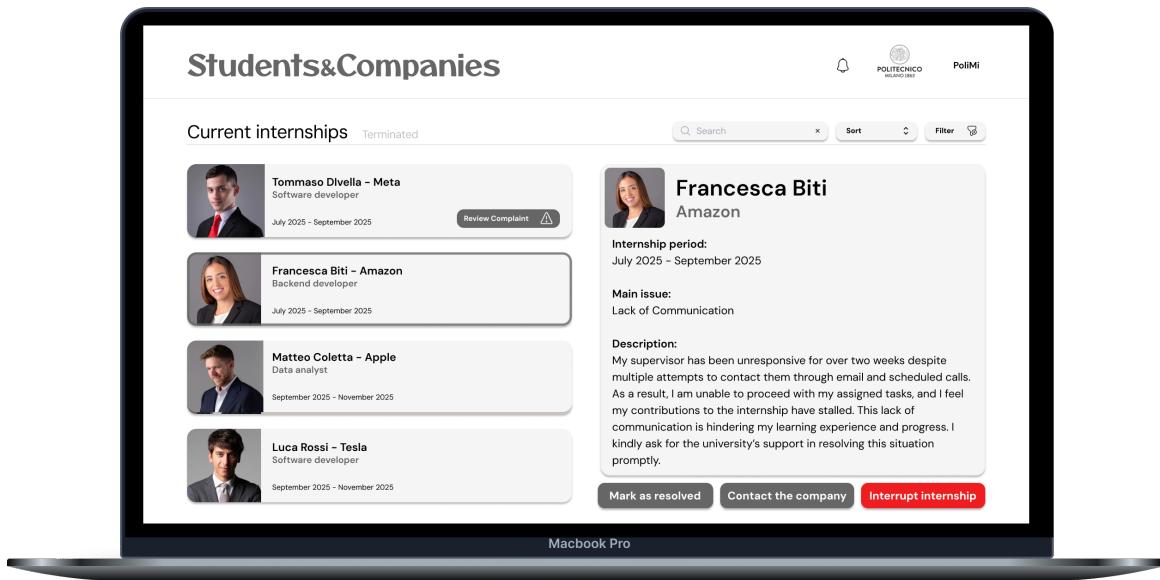


Figure 3.16: S&C university complaint handling page

4 | Requirements Traceability

This chapter shows how the functional and non-functional requirements of the S&C system described in the RASD are met. In section 4.1 we describe the mapping between the requirements found and commented in section 3.2.1 of the document RASD with the components identified in section 2.2 of this document.

Registration Manager	[R1] S&C system allows unregistered users to sign-up. [R2] S&C system allows registered users to verify their email address.
Login Manager	[R3] S&C system allows registered users to login.
Profile Manager	[R4] S&C system allows registered users to edit their account details. [R5] S&C system allows registered users to delete their account. [R7] S&C system allows registered users to upgrade to a Student account or a Company account. [R8] S&C system allows registered users to verify their current academic status by validating their institutional email address.
Notification Manager	[R8] S&C system allows registered users to verify their current academic status by validating their institutional email address. [R9] S&C system allows registered users to update their notifications preferences. [R15] S&C system allows Students to receive notification when a new internship matching their profile is posted. [R19] S&C system allows Students to monitor the status of an application. [R21] S&C system allows Students to confirm their participation of a scheduled interview via a notification interface.

	<p>[R22] S&C system allows Students to decline an interview offer via a notification interface.</p> <p>[R23] S&C system sends automated reminders to Students for upcoming interview deadlines.</p> <p>[R26] S&C system allows Students to submit feedback after completing an internship.</p> <p>[R28] S&C system allows Companies to edit an internship's post.</p> <p>[R33] S&C system allows Companies to receive notification when a new students with an high matching score has applied.</p> <p>[R36] S&C system allows Companies compare the answers from all candidates to facilitate the selection process.</p> <p>[R44] S&C system allows universities to collect complaints raised by Companies.</p>
Matchmaking Manager	<p>[R6] S&C system allows registered users to view posted internships on the platform.</p> <p>[R11] S&C system allows Students to explore available internships.</p> <p>[R12] S&C system allows Students to view available internships ordered by the best matching, based on a matching score system.</p> <p>[R13] S&C system allows Students to change the default order.</p> <p>[R14] S&C system allows Students to apply filters on the view of the available internships.</p> <p>[R38] S&C system allows Companies to start an internship.</p>
Internship Manager	<p>[R6] S&C system allows registered users to view posted internships on the platform.</p> <p>[R16] S&C system allows Students to view the details of a specific internship page.</p> <p>[R17] S&C system allows Students to apply for an internship.</p> <p>[R18] S&C system allows Students to view sent applications.</p> <p>[R20] S&C system allows Students to withdraw a sent application.</p> <p>[R27] S&C system allows Companies to post internship offers by providing detailed information.</p> <p>[R28] S&C system allows Companies to edit an internship's post.</p> <p>[R29] S&C system allows Companies to delete an internship's post.</p>

	[R36] S&C system allows Companies compare the answers from all candidates to facilitate the selection process.
Complaint Manager	[R25] S&C system allows Students to file a complaint. [R30] S&C system allows Companies to identify the most suitable students on the platform for their internship posts, even if the students have not applied.
Feedback Manager	[R24] S&C system allows Students to review the agreements of an internship before accepting. [R34] S&C system allows Companies to propose a date to a student to schedule an interview.

Table 4.1: Mapping between components and requirements.

5 | Implementation, Integration and Test Plan

5.1. Development Process

The four levels that make up the system can be implemented in parallel and integrated at the end of development together with the External Systems. This choice is motivated by the different nature of the various tiers and by the need to speed up the development process to solve the problems associated with gathering applications and internships information. The business logic layer is the most critical and difficult to implement, and the following sections focus on its development. A good approach would be **Bottom-Up** since starting with the primitive components provided by the developing language and building the system until all the functionalities and properties are created and implemented. Every built element can be used can be then used to build more complex and powerful elements until the whole system is completed.

5.2. Implementation Plan

This section outlines the implementation strategies employed to develop, integrate, and test the various components. The approach combines the advantages of bottom-up and threaded strategies. The threaded strategy is effective because it makes progress visible to users and stakeholders. While it reduces the need for drivers, it does introduce greater complexity in the integration process. The top-down methodology will be applied by first creating a basic framework and incrementally adding more complex functionalities as validated thread units. This strategy enables different teams to work independently on specific tasks, facilitating parallel development. Once validated, each unit will be integrated into the overall software architecture.

- Login, Registration and Profile Manager (LRC) : This module is necessary for the correct configuration of the S&C system allowing all the other components to be stored or used in the correct way.

- Internship Manager (I) : The implementation of this module should follow the "Login, Registration and Profile Manager" one. Essential to keep everything in order.
- Matchmaking Manager (M) : The development of this module is critical since all the computation regarding what need to be shown to the users depends on this. Despite this it heavily relies on communicating with the Database and with the previous managers.
- Complaint and Feedback Manager (CF) : This modules add an additional function that is easier to implement than the notification manager.
- Notification Manager (N) : This component, despite adding only marginal or additional functions, is quite complex to implement correctly therefore its construction can be delayed till the entire system is built in order to assess its functionality when all other components are working.
- Data Manager (DB) : All the components of the application server rely on this element in order to communicate with the Database. Its of crucial importance that this model is well constructed.

With all this information about the single components we can create an order that should simplify the implementations of the various elements.

Component	Implementation Complexity
LRC	Medium
I	Medium
M	High
CF	Medium
N	High
DB	Low

Table 5.1: Components implementation complexity.

5.3. System testing

System testing aims to ensure the S&C platform delivers a reliable, secure, and efficient experience for all involved users: students, companies, and universities. It also verifies compliance with functional and nonfunctional requirements, particularly by focusing on the platform's key functionalities, such as matchmaking, recommendations, feedback collection, and complaint management.

- Functional Testing: When performing this kind of test it is important to verify if the functional requirements are fulfilled or not. The most effective way to achieve this is to test the software as described in the use cases in the RASD document and verify that everything works as expected.
- Performance Testing: The main objective of this type of test is to detect bottlenecks that could affect response time, efficiency and throughput. It is also possible to detect hardware/network issues in inefficient algorithms or find optimization possibilities. To perform this type of verification it's necessary to load the system with an expected heavy workload, then measure and compare the performance with the expected one and finally identify optimization possibilities.
- Usability Testing: it is a method of testing the features of a website, app, or other digital product by observing real users as they attempt to complete tasks on it.
- Load Testing: With load testing we can expose some bugs such as memory leaks, buffer overflow or memory mismanagement. This type of tests is useful for identifying the upper bound of the components used. To perform this kind of tests it's mandatory to look at how the system behaves under increasing workload until it can easily support said workload for a defined amount of time.
- Stress Testing: This test aims at verifying if the system recovers correctly and efficiently after failure.

5.4. Additional Specifications on Testing

During system development, it is of extreme importance to gather continuous feedback from both users and stakeholders. This feedback should be sought every time a new feature is implemented in order to find problems or features that don't satisfy either groups and that could damage the usability or profitability of the software/platform. Additionally, during the alpha testing phase, it is essential to assess the satisfaction levels of participants selected. To achieve this, it is helpful to involve professionals, such as psychologists, who have experience in designing appropriate questions in order to obtain meaningful feedback from testers. The alpha testing phase plays a critical role in identifying malfunctions and issues prior to beta testing. Beta testing, in turn, allows real users to interact with the product in a production environment, helping to uncover any bugs or issues before the product's general release. Testing remains important even after the application is released, as logs generated after release and during use should be sent to developers. These logs provide valuable data for debugging and improving the application.

6 | Effort Spent

Member of group	Effort spent	
Belfiore Mattia	Introduction	1h
	Architectural Design	10h
	User Interface Design	10h
	Requirement Traceability	4h
	Impl., Integr. and Test Plan	4h
	Reasoning	5h
Benedetti Gabriele	Introduction	1h
	Architectural design	14h
	User interface design	13h
	Requirement traceability	1h
	Impl., Integr. and Test Plan	1h
	Reasoning	5h
Buccheri Giuseppe	Introduction	1h
	Architectural design	12h
	User interface design	14h
	Requirement traceability	1h
	Impl., Integr. and Test Plan	1h
	Reasoning	5h

Table 6.1: Effort spent by each member of the group.

7 | References

7.1. Paper references

- ISO/IEC/IEEE 29148-2018. Standard on requirement engineering.

7.2. Used tools

- **GitHub** for the project's version control.
- **Draw.io** for UML diagrams.
- **Figma** for interface designs.
- **Notion** for notes sharing.
- **OverLeaf** as collaborative online LaTex editor.
 - PoliMi PhD Thesis Template on OverLeaf.

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