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SCUOLA DI INGEGNERIA INDUSTRIALE
E DELL'INFORMAZIONE

Software Engineering 2 Requirements Analysis and Specification Document

Students&Companies

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1 | Introduction

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.

1.1. Purpose

1.1.1. Goals

Below there is a table that lists all the goals of the S&C system:

ID	Description
G1	Allows Companies to advertise their internship offers to find the most suitable students, with the help of recommendation
G2	Allows Students to look for internships based on their needs and find the most suitable for them, with the help of recommendation
G3	Supports selection process by helping manage interviews and also finalize the selections
G4	Provides suggestions to companies regarding how to make their offers more appealing for students
G5	Provides suggestions to students how to make their CVs more appealing for companies
G6	Allows stakeholders to monitor the progress of internships, report issues, and track outcomes
G7	Allows Universities to monitor the situation of ongoing internships and interrupt them when necessary

Table 1.1: Goals.

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 manage 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.

1.2.1. World phenomena

ID	Description
WP1	A student searches for available internships to match their career interests
WP2	A student evaluates internships to find those that align with their personal goals and skill set
WP3	A student creates or updates their CVs, reflecting their real-world skills and experiences

WP4	A student decides to apply for an internship
WP5	A company decides to offer a new internship, defining its requirements, tasks, and potential benefits
WP6	A company evaluates students and decides to accept or reject them based on their qualifications and skills
WP7	A company conducts interviews to check if students satisfies requirements for its internship and collects responses from structured questionnaires
WP8	Internships are conducted in the real world, with students actively working on company-assigned projects
WP9	A student or a company identifies and reports issues as mismatches, conflicts, or unmet expectations during the internship
WP10	A student or a company provides feedback on their internship experience, including tasks performed and learning outcomes
WP11	A university evaluates students and companies complaints and decides to interrupt or not an internship complaints

Table 1.2: World Phenomena.

1.2.2. Shared phenomena

Shared Phenomena - World Controlled

ID	Description
SP1	A user signs up to the system or logs in if already registered
SP2	A student logs in
SP3	A company logs in
SP4	An user activates a student account uploading their CV, putting his personal and academic information and selecting his career objectives
SP5	An user activates a company account uploading its information like full name, address, email and phone number
SP6	A student searches for an internships
SP7	A student searches for an internships filtering them by their needs
SP8	A student applies for an internship offer
SP9	A student writes and sends problems or complaints about an ongoing internship
SP10	A student writes and sends feedback and suggestions on how to improve a recently completed internship
SP11	A company publishes and manages internship offers
SP12	A company accepts an application arranging the interview scheduling time with student
SP13	A company contacts a student arranging the interview scheduling time

SP14	A company writes and sends problems or complaints about an ongoing internship
SP15	A company writes and sends feedback and suggestions on how to improve a recently completed internship
SP16	A university interrupts an ongoing internship due to relevant complaints

Table 1.3: World controlled shared phenomena.

Shared Phenomena - Machine Controlled

ID	Description
SP17	The system provides personalized internship recommendations to students, based on their skills, experiences, and preferences
SP18	The system provides personalized candidate recommendations to companies, based on their internship requirements and benefits offered
SP19	The system supports companies by organizing interview schedules and managing structured questionnaire responses from candidates
SP20	The system offers personalized suggestions to students on how to improve their CVs for better experience in it
SP21	The system offers personalized suggestions to companies on how to improve their job postings to attract more qualified candidates
SP22	The system notifies students about new internship opportunities that match their skills and preferences

SP23	The system notifies companies when a highly suitable student registers or becomes available for their posted internships
SP24	The system tracks and records the complaints of ongoing internships to assist university with issue resolution if necessary
SP25	The system collects feedback from students and companies to improve its recommendation algorithms and platform functionalities

Table 1.4: Machine controlled shared phenomena.

1.3. Definition, Acronyms, Abbreviations

Acronyms	**Definition**
RASD	Requirements Analysis and Specification Document
S&C	Students&Companies
CV	Curriculum Vitae

Table 1.5: Acronyms used in the document.

1.4. Revision history

- Version 1.0 - 22/12/2024

1.5. Reference Documents

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

1.6. Document Structure

- **Introduction**: The first chapter of this document is generic introduction to the goals, the phenomena and the scope of the system. It provides simple but exhaustive information about what the RASD document is going to explain in the following sections.

- **Overall Description**: A general description of the product to be,its requirements and the scenarios that might occur.
- **Specific Requirements:** All software requirements are explained using scenarios, use-case diagrams and activity diagrams. It focuses on the specific requirements and provides a more detailed analysis of external interface requirements, functional requirements and performance ones.
- **Formal Analysis Using Alloy:** This section includes Alloy code that describes the model and shows its soundness and correctness.
- **Effort Spent:** Effort spent by all team members shown as the list of all the activities done during the realization of this document
- **References:** References to documents that this project was developed upon.

2 | Overall Description

2.1. Product perspective

2.1.1. Scenarios

- **Scenario 1 : Companies Submit Internship Postings** TechCorp, a fast-growing software company, wants to attract top talent for its upcoming AI project. HR manager Alex logs into the platform, fills out a detailed form including roles such as "AI Research Intern," qualifications like "Python and machine learning basics," and perks like a monthly stipend. Alex sets the application deadline and hits "Publish," making the internship visible to thousands of aspiring developers. Alex can also modify details about the internship in order to better clarify information or make the offer more appealing to developers.
- **Scenario 2 : Students Create Profiles and Upload CVs** Emma, a computer science student, registers on the platform after her professor's recommendation. She proceeds by uploading her updated CV, enhanced thanks to the help of he platform, highlighting her achievements, such as winning a hackathon, and finally she gives her preferences for internships. The system then auto-generates a sleek profile for her, ensuring she stands out when companies view her application.
- **Scenario 3 : Students Browse and Apply for Internships** Carlos, a final-year engineering student, dreams of working in the renewable energy sector. He logs into the internship platform and clicks on "Browse Internships." Using the filters provided, he specifies his preferences: roles related to renewable energy, locations within Europe, and remote options. The platform then shows him a selected list of opportunities. One particular posting catches his eye: an internship at Solar Innovations, offering a role as an Energy Data Analyst. He clicks on the listing to read the details, which include a comprehensive description of the role, qualifications required, and benefits. Excited about the opportunity, Carlos reviews his profile to ensure everything is up to date. With a click of the "Apply" button, Carlos submits his application.

- **Scenario 4 : System Recommends Internships to Students** Jane, a computer science student, logs into the platform but feels overwhelmed by the number of postings. Uncertain of what to do, she enters the "Recommended for You" section. Here, the platform uses her profile information, like her skills, past internships, and preferences, to suggest a set of internships that best fit to her career goals.
- **Scenario 5 : Companies Receive and Review Applications** At TechApps, Sophia logs into the company dashboard to review applications for the UI/UX intern position. The system presents the list of candidates that applied for the internship, each accompanied by a profile summary. Sophia filters and ranks applications based on the required skills and qualifications. Jane's application catches her attention so she adds her to the shortlist and schedules an interview, leaving a note: "Potential strong fit—verify design process knowledge in the interview."
- **Scenario 6 :Interview Scheduling and Management** Jane is thrilled to receive an email from TechApps inviting her to an interview. The email provides a link to the platform, where she can view available time slots. Jane selects a convenient slot for the interview. The platform confirms the booking and sends her and Sophia a notification, ensuring they won't forget the appointment. On the day of the interview, both Jane and Sophia receive a reminder email with a link to the video meeting. Jane logs in 10 minutes early to prepare. The interview runs smoothly, as the system assists both Jane and Sophia by providing access to Jane's profile and portfolio during their discussion.
- **Scenario 7 : Feedback Collection:** After the interview, Sophia logs into the company dashboard to provide feedback on Jane's application. She rates Jane highly for her design skills but notes that she could improve her knowledge of user-centered design principles. Sophia's comments are saved in the system and shared with Jane as constructive feedback. Meanwhile, Jane also leaves feedback on her experience with TechApps, praising the structured interview process and mentioning how the questions helped her reflect on her skills. Both sets of feedback contribute to improving the system's recommendations for future interactions.
- **Scenario 8 : Internship Monitoring by Universities** Professor Adams oversees the internships of students from his university. He logs into the platform and accesses the "Internship Monitoring" dashboard. He sees that Jane has started her internship at TechApps and reviews the company's details and the role description to ensure it aligns with the university's educational standards. Professor Adams can view Jane's progress reports and sends her a message: "Jane, I noticed your internship involves user research. Please ensure you document your findings, as we can integrate them into your coursework

next semester."

- **Scenario 9 : Complaint Handling** A few weeks into her internship, Jane feels uncertain about the expectations for her role. She uses the platform's complaint system to raise a concern. A university representative reviews her complaint and contacts both Jane and her supervisor at TechApps. After a mediated discussion, the supervisor provides Jane with a clearer outline of her responsibilities. Jane is relieved, and the improved communication ensures the internship continues smoothly. The entire process is recorded and saved by the system for future reference.
- **Scenario 10 : System Updates Recommendations** Based on feedback collected from Jane and other users, the platform updates its recommendation algorithms. It notices that students like Jane, who excel in design but lack industry exposure, benefit most from internships that focus on mentorship and practical application. The system adjusts its filters to prioritize such opportunities for students with similar profiles, enhancing the relevance of its recommendations.
- **Scenario 11 : Post-Internship Evaluation** At the end of her internship, Jane and her supervisor complete post-internship evaluations on the platform. Jane rates the company highly for its supportive environment, while her supervisor highlights her strengths in creativity and adaptability. These evaluations are stored in the system, contributing to its database for improving internship matchmaking. Jane's positive feedback also boosts TechApps' visibility on the platform.
- **Scenario 12 : Statistical Data Analysis** The platform's analytics team compiles data on completed internships. They identify trends, such as the success rate of students in different industries and the feedback ratings for various companies. Universities use this data to adjust their curricula, ensuring students are better prepared for internships. Companies like TechApps also analyze their feedback to improve their on boarding processes.
- **Scenario 13 : Notifications and Alerts** Jane is now in her final semester, actively seeking full-time roles. The platform sends her regular notifications about new internship opportunities, application deadlines, and interview reminders. These alerts keep Jane engaged and ensure she doesn't miss out on any chance to enhance her career.

2.1.2. Class Diagrams

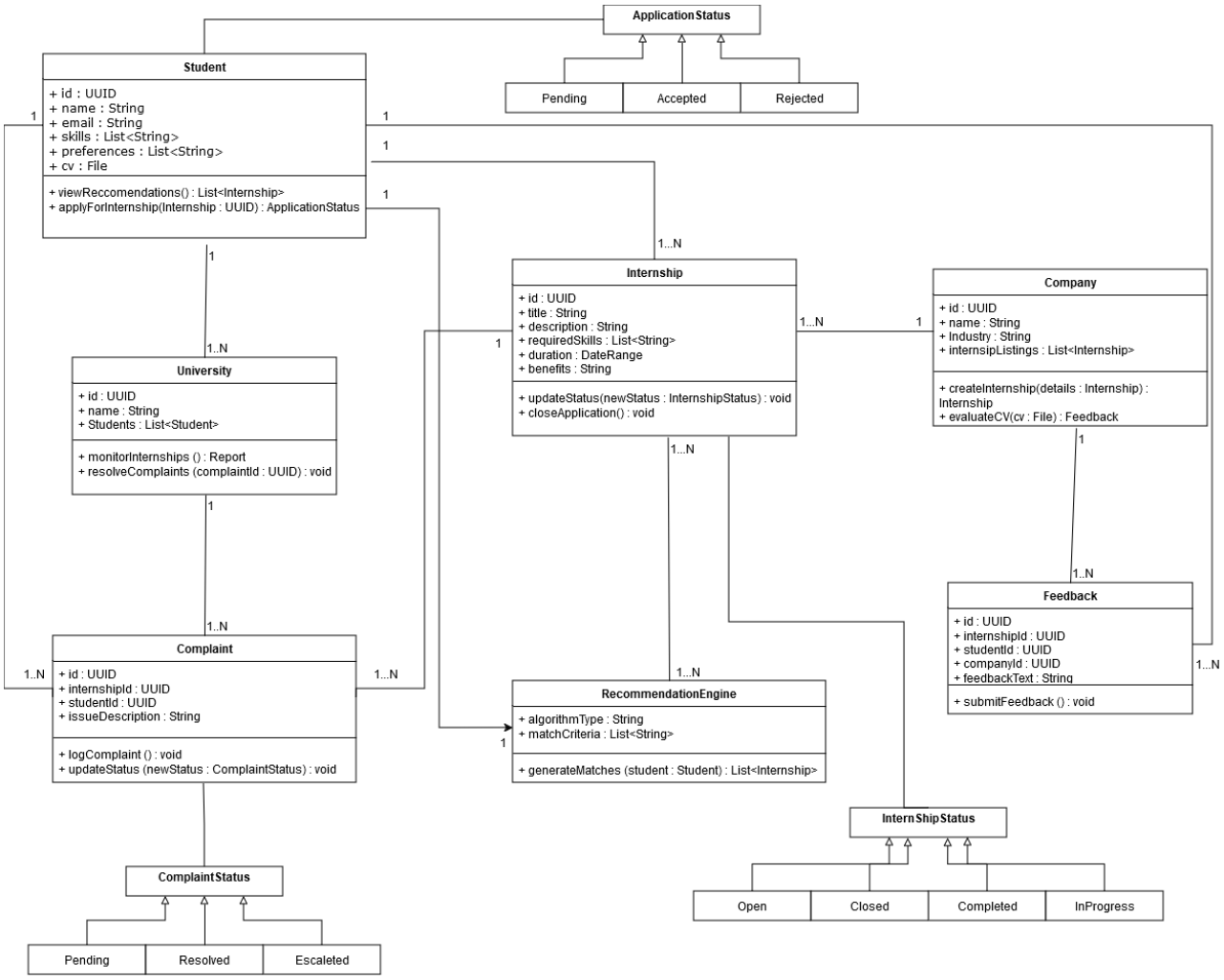

Figure 2.1: Class Diagram

2.1.3. State Diagrams

Sign-up Initially, users can create a generic account that allows them to browse available posts without the ability to post. To upgrade to a full account, they must verify their email address, select a role (either as a student or a company), and complete the required fields for their chosen role.

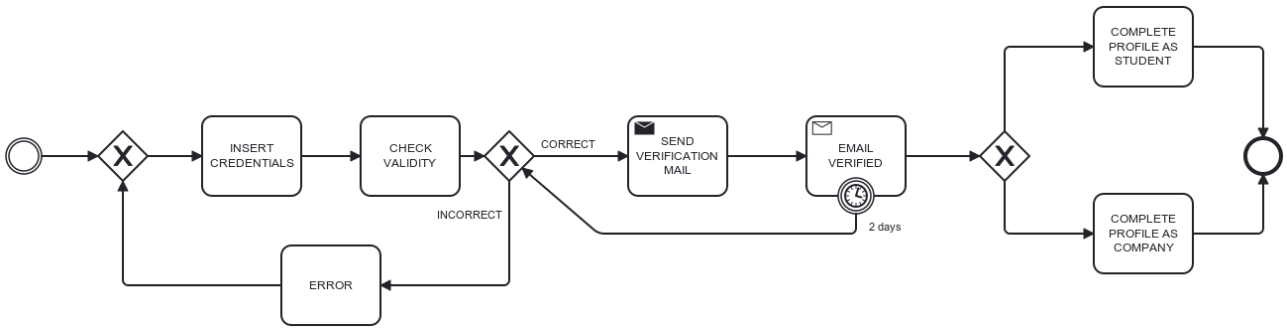

Figure 2.2: Sign-up state diagram

Login During login, the system verifies the user's credentials to ensure they are correct. Upon successful authentication, the user is redirected to their personalized homepage.

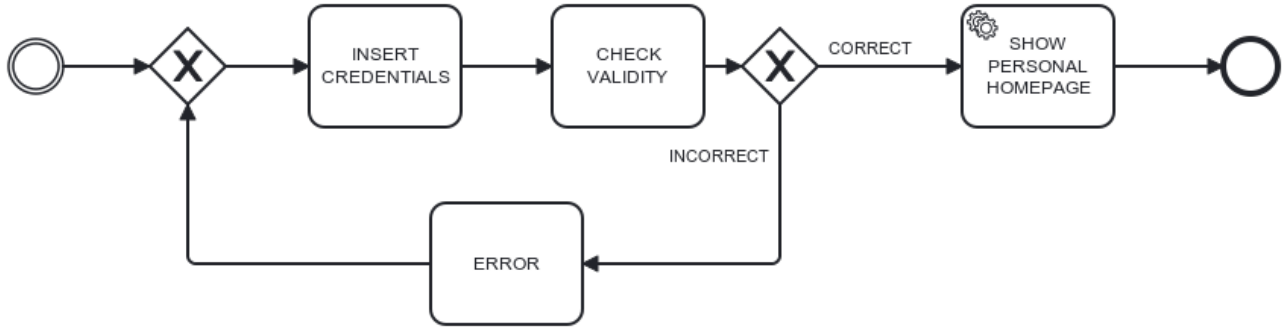

Figure 2.3: Login state diagram

Apply for an internship The student reviews their recommended internships. If they decide to apply for one, they must contact the company, which will proceed to schedule an interview. If the interview is successful and both parties agree, the internship will be communicated to the university.

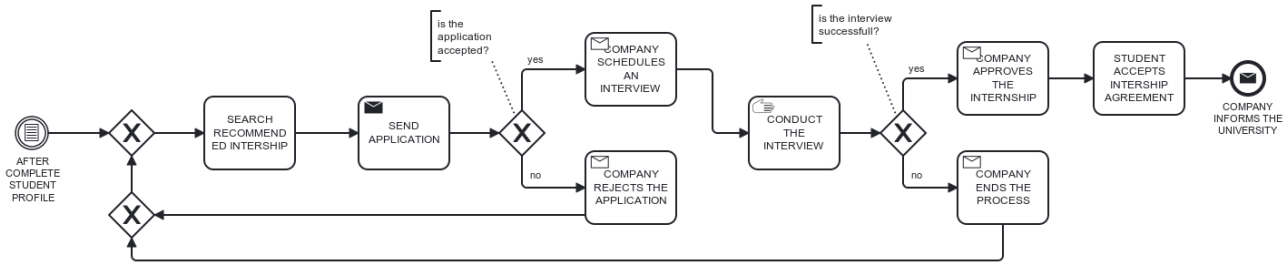

Figure 2.4: Application state diagram

Complaints handling Both students and companies can submit a complaint during the internship. The university evaluates the complaint to determine whether intervention is nec-

essary. If no intervention is required, the process ends without further action. However, if intervention is necessary, the university attempts to mediate between the parties to resolve the issue. If mediation is successful, the process concludes, and the internship continues as usual. On the other hand, if mediation fails or the issue remains unresolved, the university decides to terminate the internship. Before finalizing the termination, the university ensures that both parties are informed about the decision.

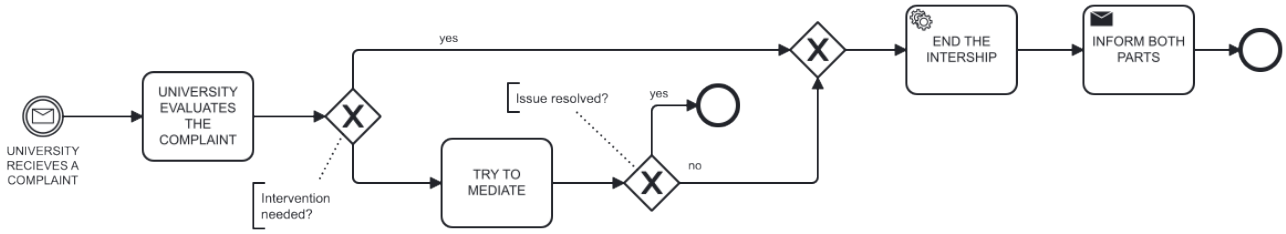

Figure 2.5: Complaint diagram

2.2. Product functions

Here's the main functions of S&C system:

Register to the platform The S&C platform allows user to register, providing username and password. While registering to the system, users must first declare that they have read and understood the Privacy Statement. They are also required to accept the Terms and Conditions, which request consent for the acquisition and processing of their personal data for the purpose of using the platform's matching analysis and statistics.

Upgrade to Student account The S&C platform allows students to register. During the registration process, users are required to provide the following information:

Field	**Note**
Full name	
Password	Security standards check
Academic email address	Checking an existing university domain
Attending university	automatically populated field
Phone number	
Postal Code	Matching parameter

Upgrade to Company account The S&C platform allows companies to register. During the registration process, users are required to provide the following information:

Field	Notes
Full name	
Password	Checking security standards
Office address	Matching parameter
Office phone number	Optional

Post an internship A button within the company's dashboard that opens a form for creating and submitting a new internship posting, including fields for job title, description, requirements, salary, and duration

Check recommended internships A searchable and filterable page accessible to all users, displaying a list of internships with brief descriptions and company details.

Apply for an internship A button on each internship's detail page that triggers a form submission, allowing students to send their application with a personalized message and resume upload.

Evaluate an application A company dashboard feature showing a list of received applications with applicant details, resumes, and the option to accept, reject, or schedule interviews.

Schedule an interview An action available on an application detail page that opens a scheduling form, allowing the company to set the interview's date, time, and mode.

Submit a complaint A button in the dashboard (available to students and companies) that opens a form for submitting a formal complaint, including issue details.

Submit a feedback A post-internship form accessible to both students and companies where they can rate the experience, provide comments, and suggest improvements for future internships.

2.3. User characteristics

The actors of the application are the following:

- **Registered User**: A single person registered in the platform before selecting their role (Student or company). This type of user has limited access to the platform: they can

browse published internships to view basic information, but they cannot interact with them. To unlock advanced features, the user must complete the registration process by selecting their role.

- **Student**: A single person registered as a student on the platform. Their aim is to find internships aligned with their academic background, skills, and career goals. They need only an active account, an internet connection, and access to a digital CV.
- **Company**: An organization of people registered on the platform. Its goal is to publish internship opportunities, examine applications, and hire suitable candidates. It requires an active account, an internet connection, and major internship details.
- **University**: A career services representative with a passive role on the platform. Universities are contacted only if an internship goes wrong or complaints emerge from companies or students. Their task is to review the situation and, if necessary, interrupt the internship. They need access to relevant student and company data.

2.4. Assumptions, dependencies and constraints

ID	Description
D1	Internship descriptions are comprehensive and reliable
D2	CVs accurately reflect students' skills and experiences
D3	Universities actively oversee internships and intervene when necessary
D4	Companies manage interview timelines and conduct them professionally
D5	Users provide meaningful feedback to improve the system
D6	Problems are reported in a timely manner by all parties
D7	The platform supports high user traffic without performance issues

Table 2.1: Domain Assumptions.

3 Specific Requirements

3.1. External Interface Requirements

3.1.1. User Interfaces

The platform will provide different interfaces for each one of its three primary user groups: students, companies, and universities. Each interface will be role-specific in order to facilitate interactions. The student interface will include a dashboard summarizing recommended internships, application statuses, and interview schedules; there will be also a profile editor for updating academic details, skills, and preferences; every student will be provided a search interface with filters (e.g., location, skills, duration) to browse available internships. The company interface will feature tools to create, edit, and manage internship postings; a dashboard to view applications, candidates lists and scheduled interviews. The university interface will instead include a dashboard displaying active internships, student feedback and complaint statuses; the university interface is equipped with tools to analyze trends and generate reports on internship outcomes as well as a complaint resolution module to address issues raised by students or companies.

3.1.2. Hardware Interfaces

S&C system consists of both a mobile application and a Web App, making it highly accessible and versatile. So the platform only requires a smartphone or a computer with an internet connection. It does not require any specific hardware interface. This ensures that the system is easy to use and widely available.

3.1.3. Software Interfaces

In order to work correctly, the system will need to integrate with a few software components; here they are listed in detail:

- **Database Systems:** To store user profiles, internship details, application records, and feedback securely.

- **Email and Notification APIs:** To send updates and reminders to users about critical events such as deadlines or feedback.
- **Statistical Analysis Tools:** To extract meaningful data from user interactions and feedback.

3.1.4. Communication Interfaces

The platform will support secure communication protocols to facilitate data exchange and guarantee privacy. The user will use internet access to access the platform and use the functionalities, such as logging in, contacting other users and reporting feedback on interviews or students. The platform must be HTTPS compliant in order to work on the web properly and to be safe.

3.2. Functional Requirements

3.2.1. Requirements

ID	Description
R1	S&C system allows unregistered users to sign-up.
R2	S&C system allows registered users to verify their email address.
R3	S&C system allows registered users to login.
R4	S&C system allows registered users to edit their account details.
R5	S&C system allows registered users to delete their account.
R6	S&C system allows registered users to view posted internships on the platform.
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.
R9	S&C system allows registered users to update their notifications preferences.
R10	S&C system allows Students to view a personalized dashboard in their home-page.
R11	S&C system allows Students to explore available internships.
R12	S&C system allows Students to view available internships ordered by the best matching, based on a matching score system.
R13	S&C system allows Students to change the default order.
R14	S&C system allows Students to apply filters on the view of the available internships.
R15	S&C system allows Students to receive notification when a new internship matching their profile is posted.
R16	S&C system allows Students to view the details of a specific internship page.
R17	S&C system allows Students to apply for an internship.
R18	S&C system allows Students to view sent applications.
R19	S&C system allows Students to monitor the status of an application.
R20	S&C system allows Students to withdraw a sent application.
R21	S&C system allows Students to confirm their participation of a scheduled interview via a notification interface.

R22	S&C system allows Students to decline an interview offer via a notification interface.
R23	S&C system sends automated reminders to Students for upcoming interview deadlines.
R24	S&C system allows Students to review the agreements of an internship before accepting.
R25	S&C system allows Students to file a complaint.
R26	S&C system allows Students to submit feedback after completing an internship.
R27	S&C system allows Companies to post internship offers by providing detailed information
R28	S&C system allows Companies to edit an internship's post.
R29	S&C system allows Companies to delete an internship's post.
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.
R31	S&C system allows Companies to review the applications for an internship.
R32	S&C system allows Companies to view internship's applications ordered by the best match.
R33	S&C system allows Companies to receive notification when a new students with an high matching score has applied.
R34	S&C system allows Companies to propose a date to a student to schedule an interview.

R35	S&C system allows Companies to prepare a standardized set of questions to be proposed to all candidates for a specific internship.
R36	S&C system allows Companies compare the answers from all candidates to facilitate the selection process.
R37	S&C system allows Companies to reject a students after the interview.
R38	S&C system allows Companies to start an internship.
R39	S&C system allows Companies to view active internships.
R40	S&C system allows Companies to file a complaint.
R41	S&C system allows Companies to submit feedback after completing an internship.
R42	S&C system allows universities to login to the system providing credentials.
R43	S&C system allows universities to collect complaints raised by Students.
R44	S&C system allows universities to collect complaints raised by Companies.
R45	S&C system allows universities to mediate between Student and Company after a complaint.
R46	S&C system improves recommendation accuracy by considering user feedback on previous internships.
R47	S&C system periodically updates internship recommendations based on new data from Students and Companies.
R48	The S&C system provides Students suggestions on creating an effective CV, enhancing their chances of getting a match and receiving a positive evaluation during the company selection process.

R49	The S&C system provides Companies suggestions on creating an effective post for an internship, enhancing their chances of getting a match.

Table 3.1: Requirements

3.2.2. Use case diagrams

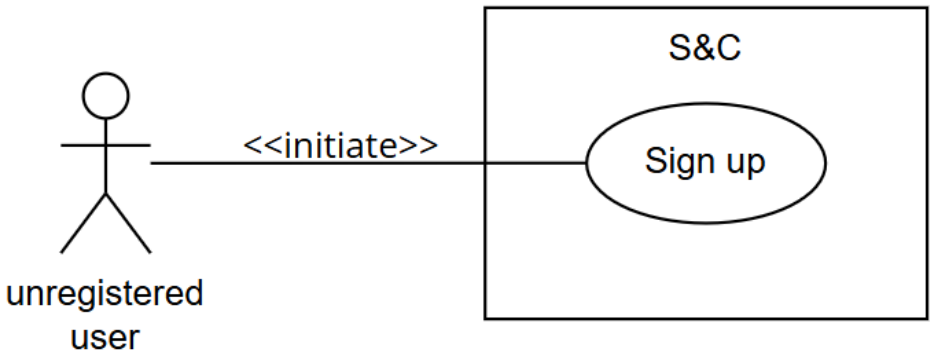

Figure 3.1: Unregistered user use case diagram

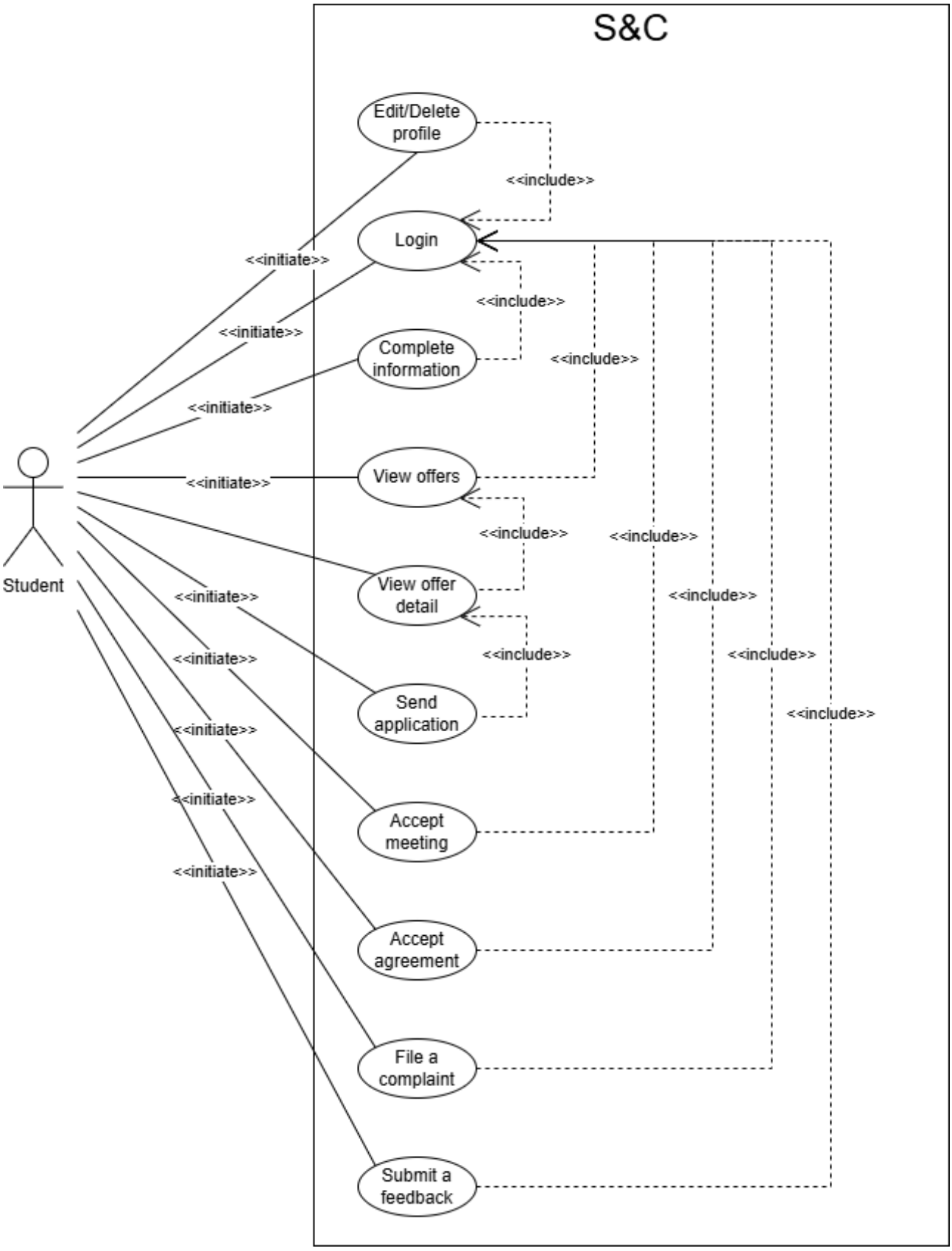

Figure 3.2: Student use case diagram

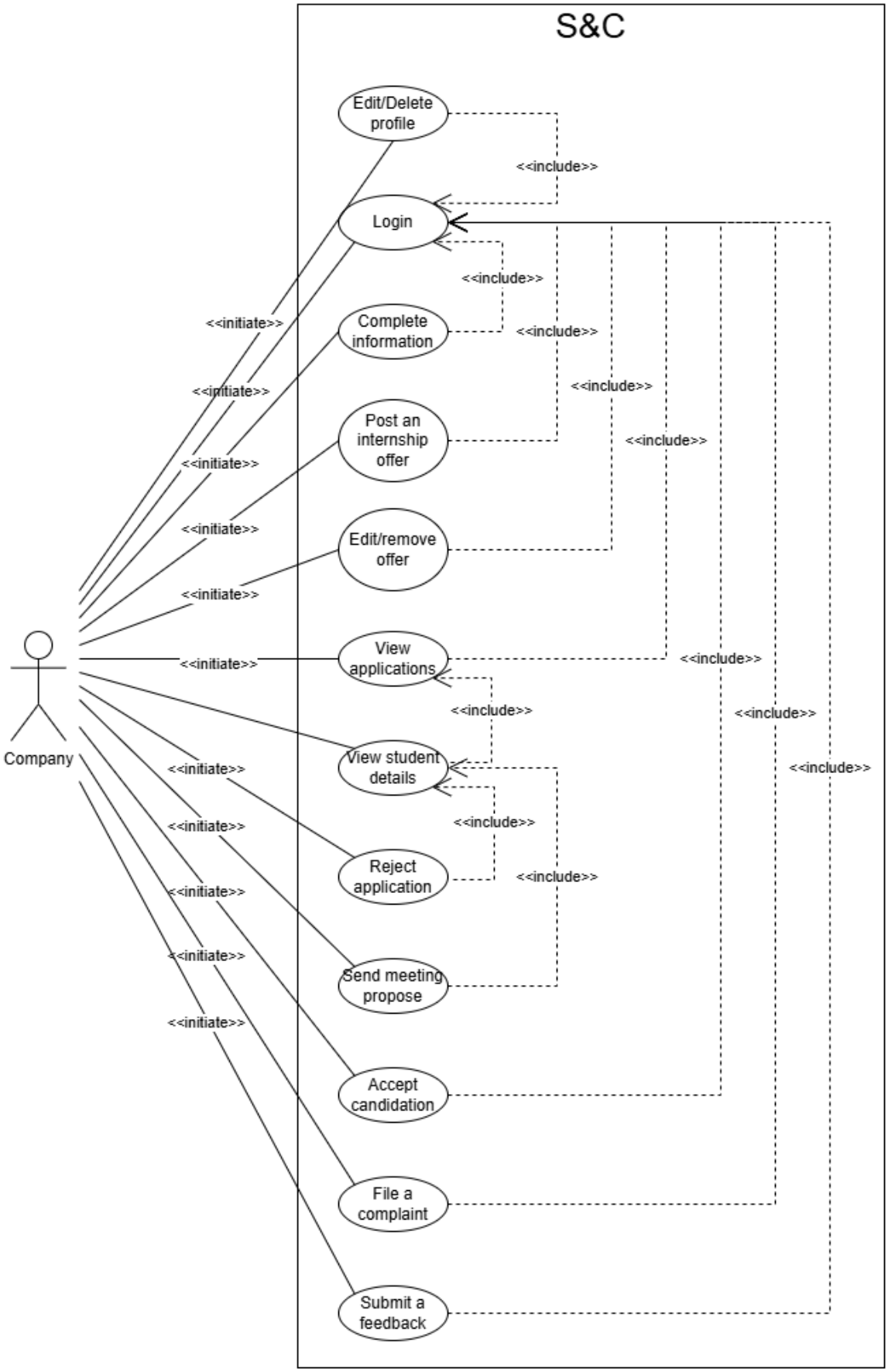

Figure 3.3: Company use case diagram

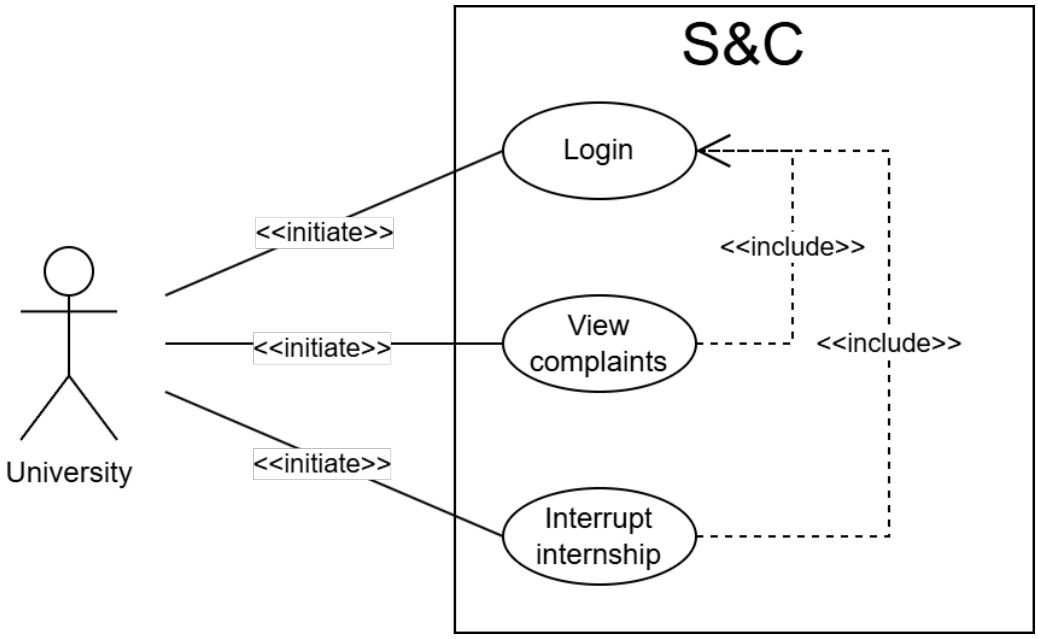

Figure 3.4: University use case diagram

3.2.3. Use cases

UC1 - User registration

Actor	Unregistered User
Entry Condition	The user does not have an account and clicks the "Sign Up" button to create a new one.
Event Flow	1. The unregistered user opens the S&C application and clicks the "Sign Up" button. 2. The user fills out all mandatory fields (email, password) and confirms the password. 3. The user agrees to the "Terms & Conditions" and "Privacy Policy" by checking the corresponding boxes. 4. The user presses the "Sign Up" button to submit the registration form. 5. The S&C system sends a confirmation email to the provided email address. 6. The user completes the registration by clicking the confirmation link in the email.
Exit Condition	The user's account is successfully created and they can log into the system.
Exceptions	1. One or more mandatory fields are empty.

2. An account with the same email already exists.

3. The user has not checked the "Terms & Conditions" or "Privacy Policy" boxes.

Table 3.2: Unregistered User registration process

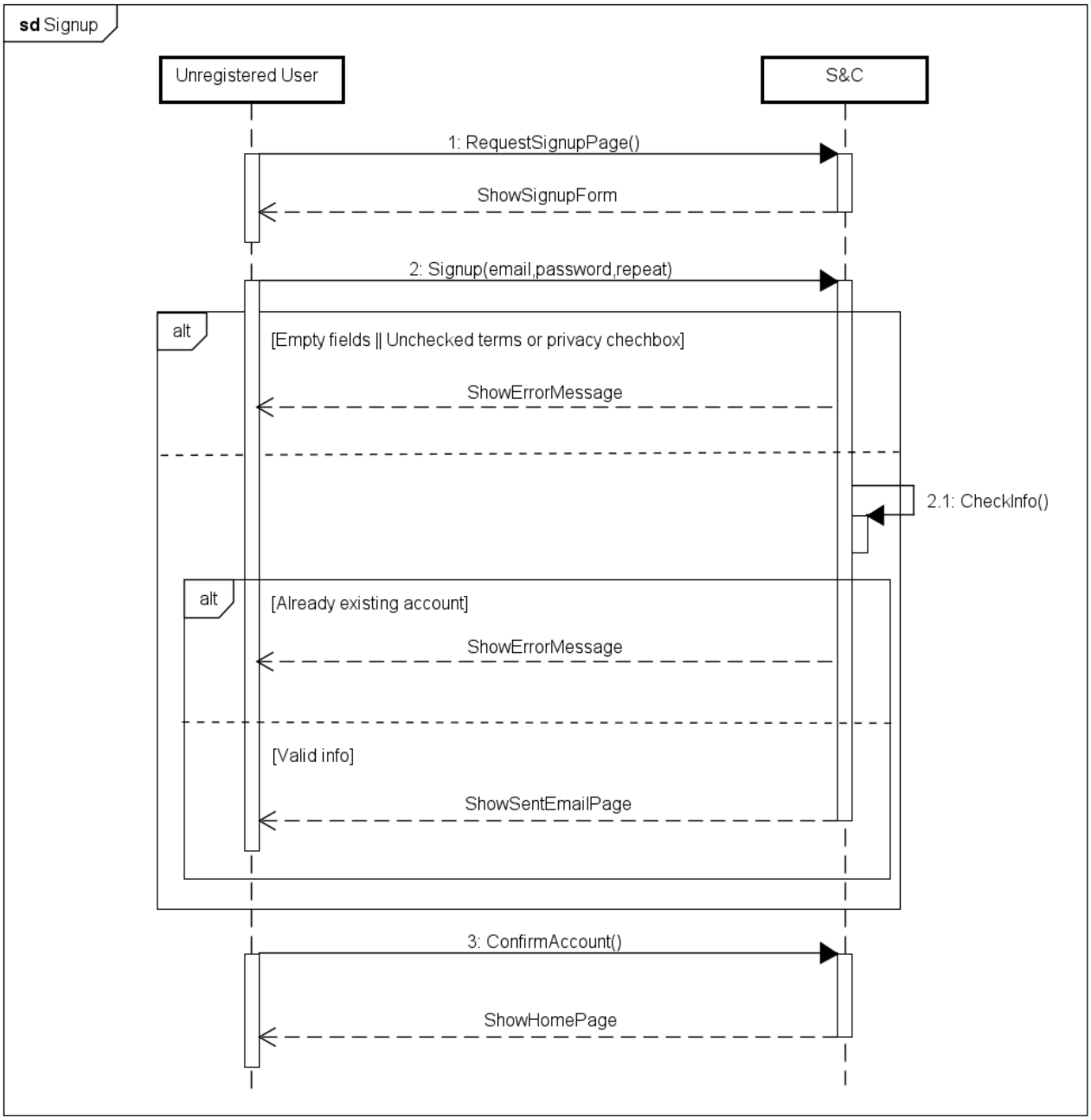

Figure 3.5: User registration sequence diagram

UC2 - User, student, company or university login

Actor	Registered user (student, company, or university).
Entry Condition	A user with an existing account clicks the "Login" button to access the homepage of the S&C platform.
Event Flow	1. The user enters their credentials (email, password) in the login form. 2. The user presses the "Login" button. 3. The S&C system validates the provided credentials.
Exit Condition	If the credentials are correct, the user is redirected to the homepage.
Exceptions	1. The provided email is not registered in the platform. 2. The provided password is incorrect. 3. One or both fields (email or password) are left empty.

Table 3.3: Registered user logs in.

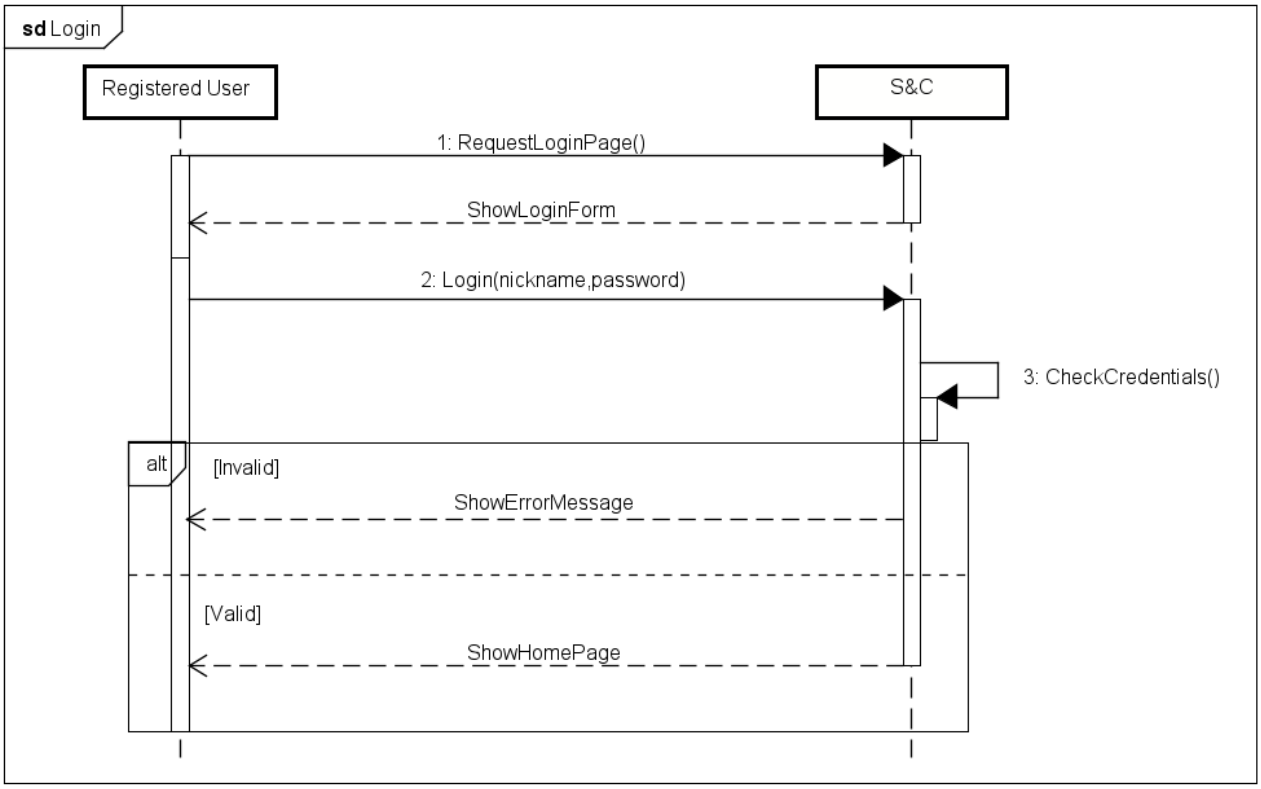

Figure 3.6: Login sequence diagram

UC3 - Student's account activation

Actor	Registered User
Entry Condition	The user wants to upgrade their account to a student account to unlock full access to the platform's features.
Event Flow	1. The user presses the upgrade account button on the homepage. 2. The user selects the "Student Account" option. 3. The user fills out all mandatory fields (name, surname, academic email, phone number, postal code). 4. The user uploads their CV in PDF format. 5. The user selects their internship goals from a provided checklist. 6. The user presses the "Upgrade Account" button. 7. The system validates the entered information and uploaded CV. 8. If the information is valid, the system sends a confirmation email to verify the academic email address' validity. 9. The user clicks on the confirmation link in the email to complete the activation process.
Exit Condition	The user's account is successfully upgraded to a student account, granting access to additional features.
Exceptions	1. One or more mandatory fields are left empty. 2. The uploaded CV is not in the correct PDF format. 3. The CV file is missing during the upload process. 4. The entered information fails validation checks. 5. An account with the provided academic email address already exists.

Table 3.4: User upgrades their account to a Student Account

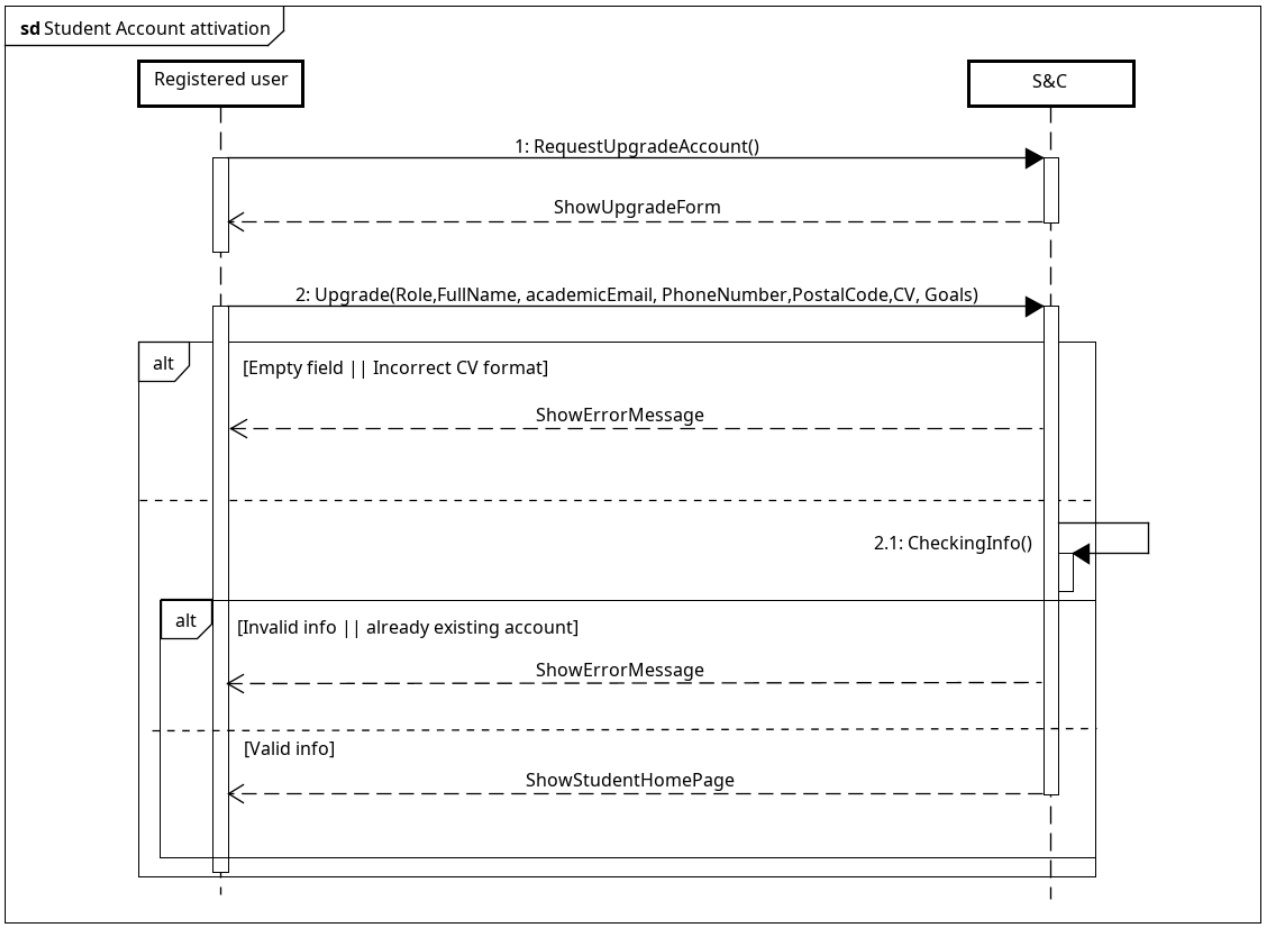

Figure 3.7: Student account activation sequence diagram

UC4 - Student modifies their profile or updates CV.

Actor	Student
Entry Condition	The student needs to modify their profile or wants to update their CV.
Event Flow	1. The student clicks on the "Profile" button. 2. The student modifies the form with the correct data. 2b. The student updates their CV with the suggestions offered by the S&C system to ensure that the system can interpret the included data correctly. 3. The student clicks on the "Update Profile" button.
Exit Condition	The S&C system registers the updated data and displays a success message.
Exceptions	1. One or more mandatory fields are left empty. 2. The uploaded or updated CV is not in the correct PDF format.

3. The entered information fails validation checks.

Table 3.5: Student updates their profile or CV.

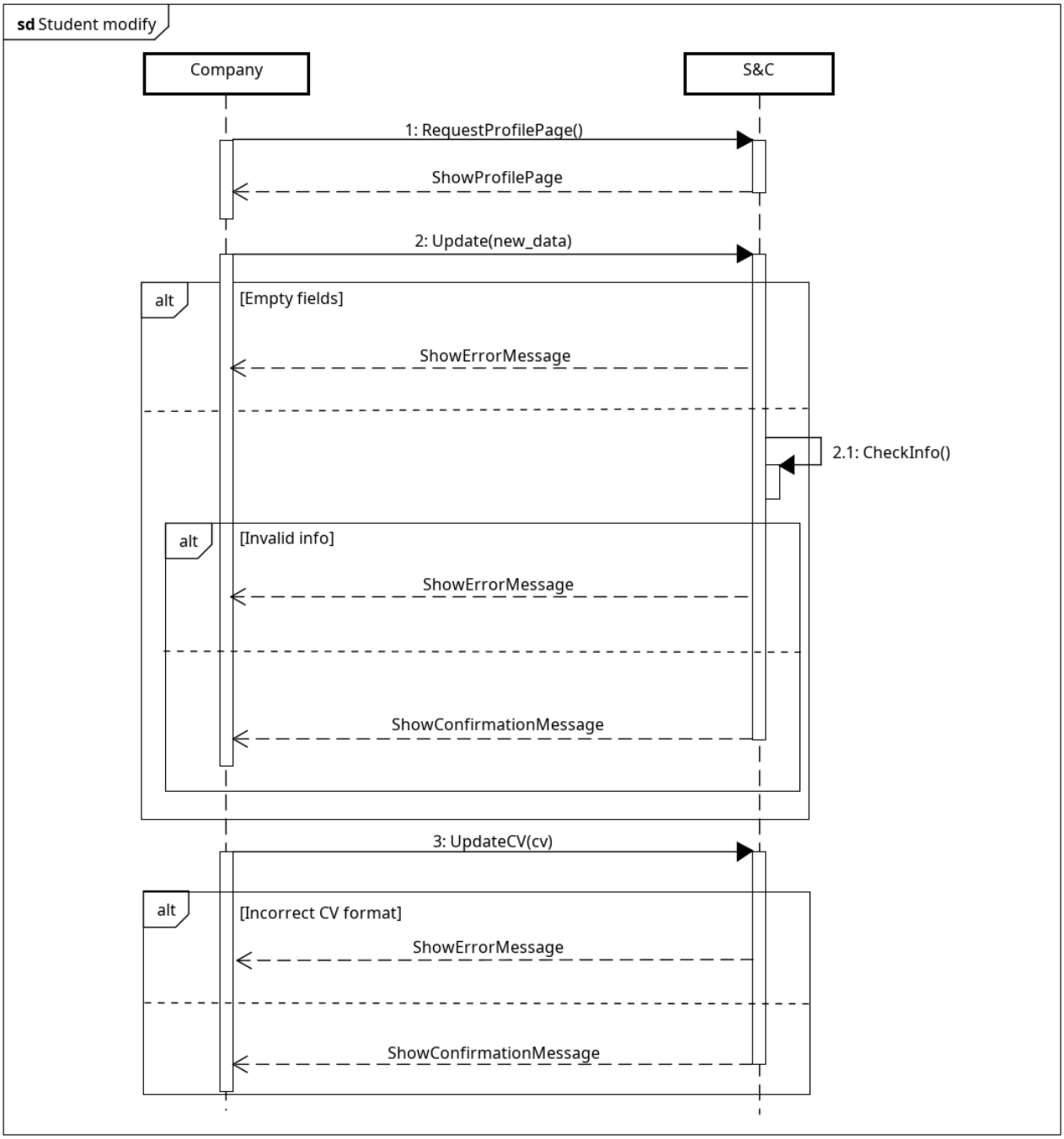

Figure 3.8: Student's profile update sequence diagram.

UC5 - Student checks available offers.

Actor	Student
Entry Condition	1. The student logs in or he student clicks the "Home Page" button.
Event Flow	1. The student enters the S&C system by logging in. 2. If the student is on a different page, they click the "Home Page" button.
Exit Condition	The S&C system displays the student's personalized recommended internships.
Exceptions	System error during page loading or redirection.

Table 3.6: Student checks available offers.

UC6 - Student opens details page of an internship post.

Actor	Student
Entry condition	The student wants to view all the details about an internship they find interesting.
Event Flow	1. Student enters S&C system logging in. 2. The student searches through the list of available internships, aiming to find one that matches their interests and preferences. 3. Student clicks on its box.
Exit condition	The S&C system displays all the details of the selected internship.
Exceptions	System cannot elaborate available internships.

Table 3.7: Student views offer details.

UC7 - Student sends an application for an internship.

Actor	Student
Entry Condition	The student wants to apply for a specific internship offer.
Event Flow	1. The student navigates to the internship offer by clicking on its box. 2. The student clicks the "Apply to this internship" button.

	3. The system prompts for confirmation, and the student clicks the "Confirm" button to submit the application.
Exit Condition	The system displays a success message confirming that the application was submitted.
Exceptions	1. The system is unable to process the application due to a technical issue. 2. The internship offer is no longer available.

Table 3.8: Student sends an application for an internship

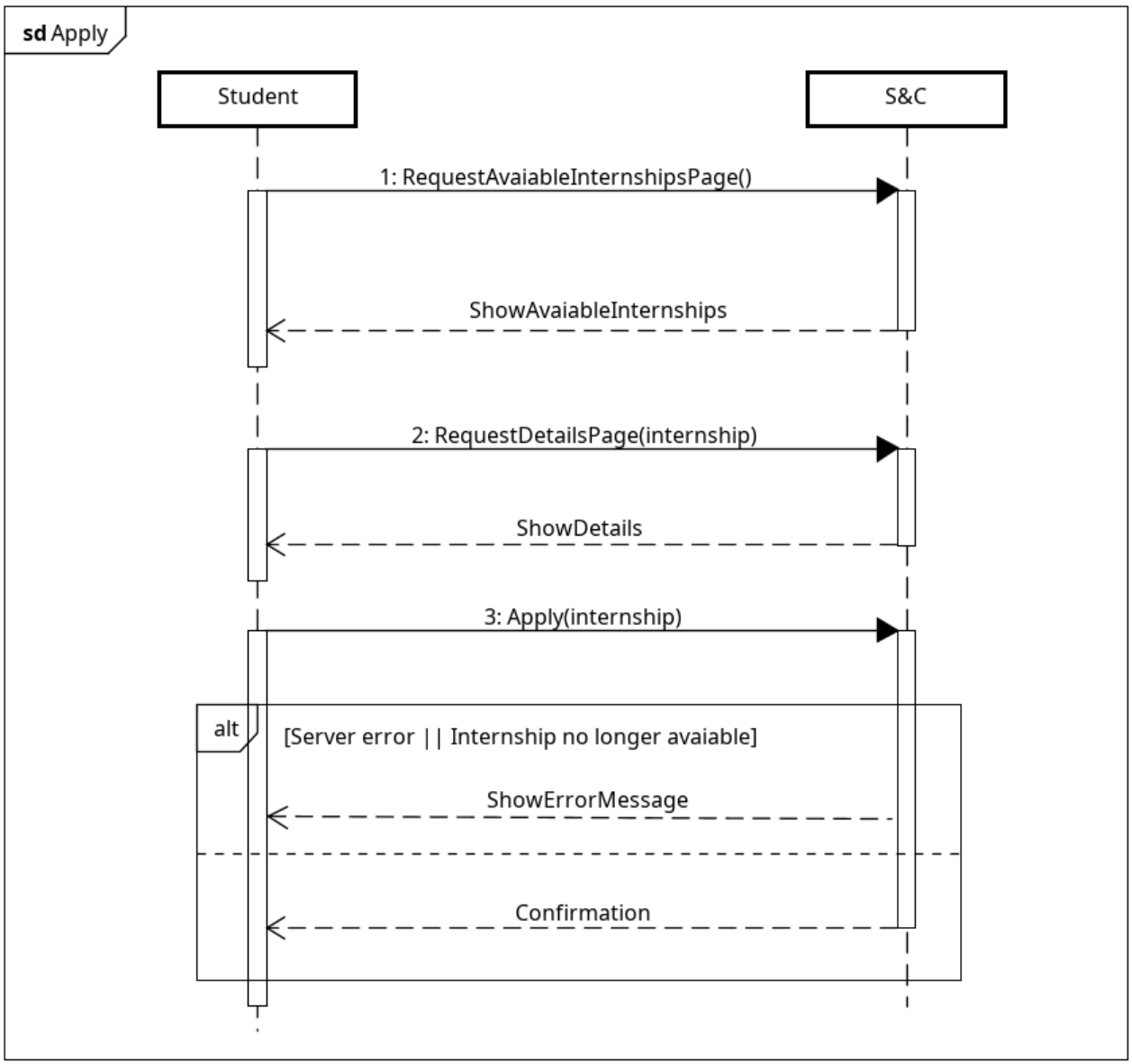

Figure 3.9: [UC 5-6-7] Student application sending path sequence diagram

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

Actor	Student
Entry Condition	The student receives a notification about an interview schedule proposed by the company.
Event Flow	1. The system sends a notification to the student about the interview schedule.

	2. The student clicks on the notification, opening a pop-up page displaying the schedule details. 3. If the student agrees with the schedule, they click the "Accept" button. 4. If the student disagrees, they provide a reason in the designated text field and click the "Deny" button.
Exit Condition	The system displays a confirmation message indicating that the student's decision (acceptance or denial) has been successfully registered.
Exceptions	1. Schedule Not Available: The company cancels or updates the proposed schedule before the student views it.

Table 3.9: Student accepts or denies an interview schedule proposal

UC9 - Student accepts or denies the start of the internship.

Actor	Student
Entry Condition	The student receives a notification about the company's positive decision after the interview process.
Event Flow	1. The system notifies the student of the company's decision to offer them the internship. 2. The student clicks on the notification, opening a pop-up page with options to proceed. 3. If the student agrees to start the internship, they click the "Confirm" button. 4. If the student declines the offer, they provide a reason in the designated text field and click the "Deny" button.
Exit Condition	The system registers the student's decision (acceptance or denial) and displays a success message confirming the action.

Table 3.10: Student Accepts or Denies the Start of an Internship

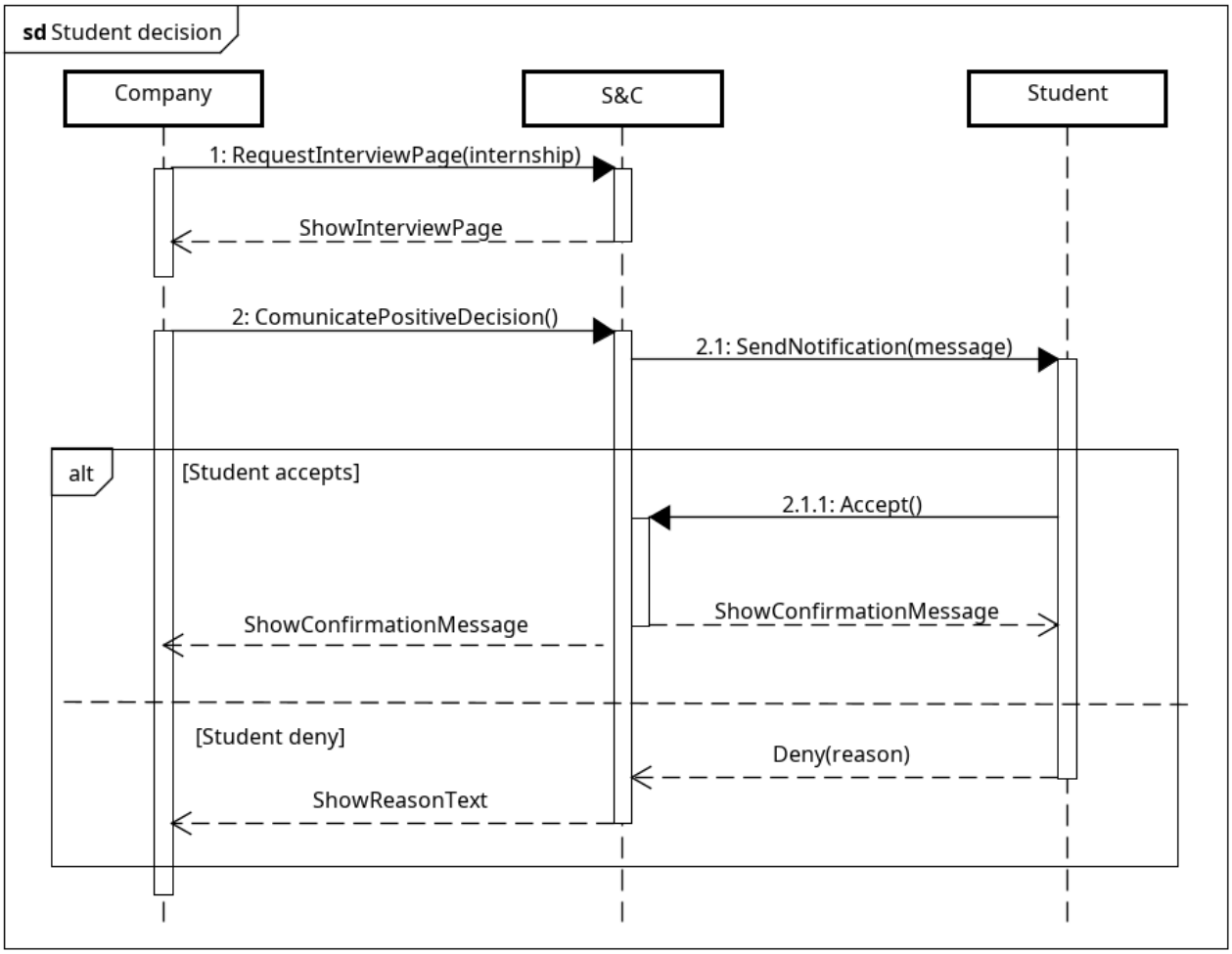

Figure 3.10: Student's response to internship proposal sequence diagram

UC10 - Company's account activation

Actor	Registered User
Entry Condition	The user wants to upgrade their account to a company account to unlock full access to the platform's features.
Event Flow	1. The user presses the "Unlock full experience" button on the homepage. 2. The user selects the "Company Account" option. 3. The user fills in all mandatory fields (full name, phone number, office address). 4. The user presses the "Upgrade Account" button. 5. The system validates the entered information.

Exit Condition	The user's account is successfully upgraded to a company account, granting access to additional features.
Exceptions	1. One or more mandatory fields are left empty. 2. The entered information fails validation checks.

Table 3.11: User upgrades their account to a Company Account

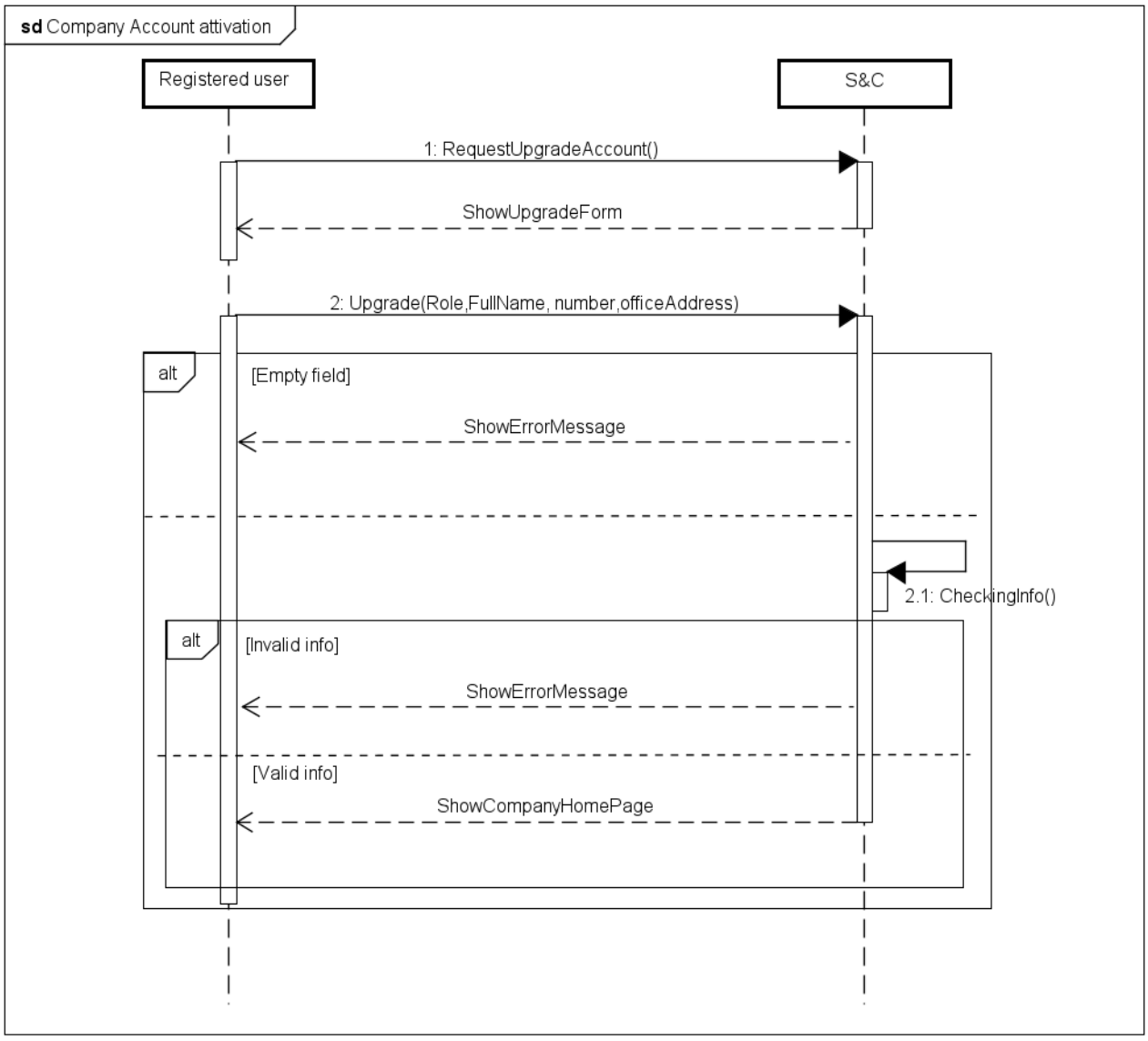

Figure 3.11: Student account activation sequence diagram

UC11 - Company modifies their profile.

Actor	Company
Entry Condition	The company needs to update their profile because some information is incorrect or out of date.
Event Flow	1. The company clicks on the "Profile" button. 2. The company modifies the form with the correct data. 3. The company clicks on the "Update Profile" button.
Exit Condition	The S&C system registers the updated data and displays a success message.
Exceptions	1. One or more mandatory fields are left empty. 2. The entered information fails validation checks.

Table 3.12: Company updates their profile.

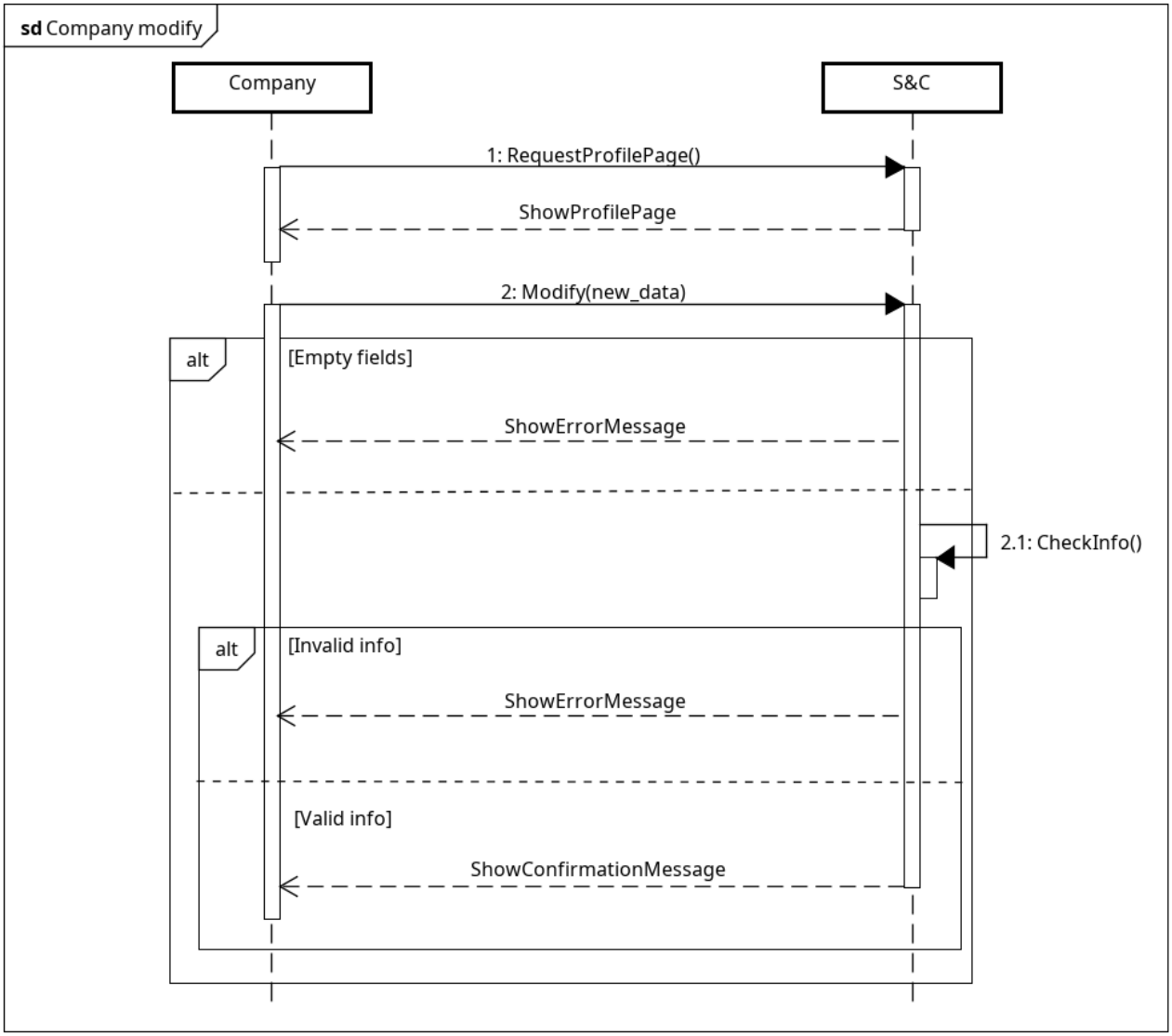

Figure 3.12: Company's profile update sequence diagram

UC12 - Company posts a new internship offer

Actor	Company
Entry Condition	The company decides to create and publish a new internship offer to attract suitable candidates.
Event Flow	1. The company presses the "+" button on the homepage.

	2. The company fills out the internship offer form, inserting project description, requested role, location address (if different from the default office address), salary (if applicable), number of students (if more than one is required), skills the student will gain, weekly schedule, benefits offered as mentorship, training opportunities, etc. This process is assisted by system-generated suggestions designed to make the post more appealing and engaging for students 3. The company reviews the information and clicks the "Post offer" button.
Exit Condition	The system successfully registers the new internship offer and displays a confirmation message. The offer becomes visible to students.
Exceptions	1. One or more mandatory fields in the form are left empty.

Table 3.13: Company posts a new internship offer

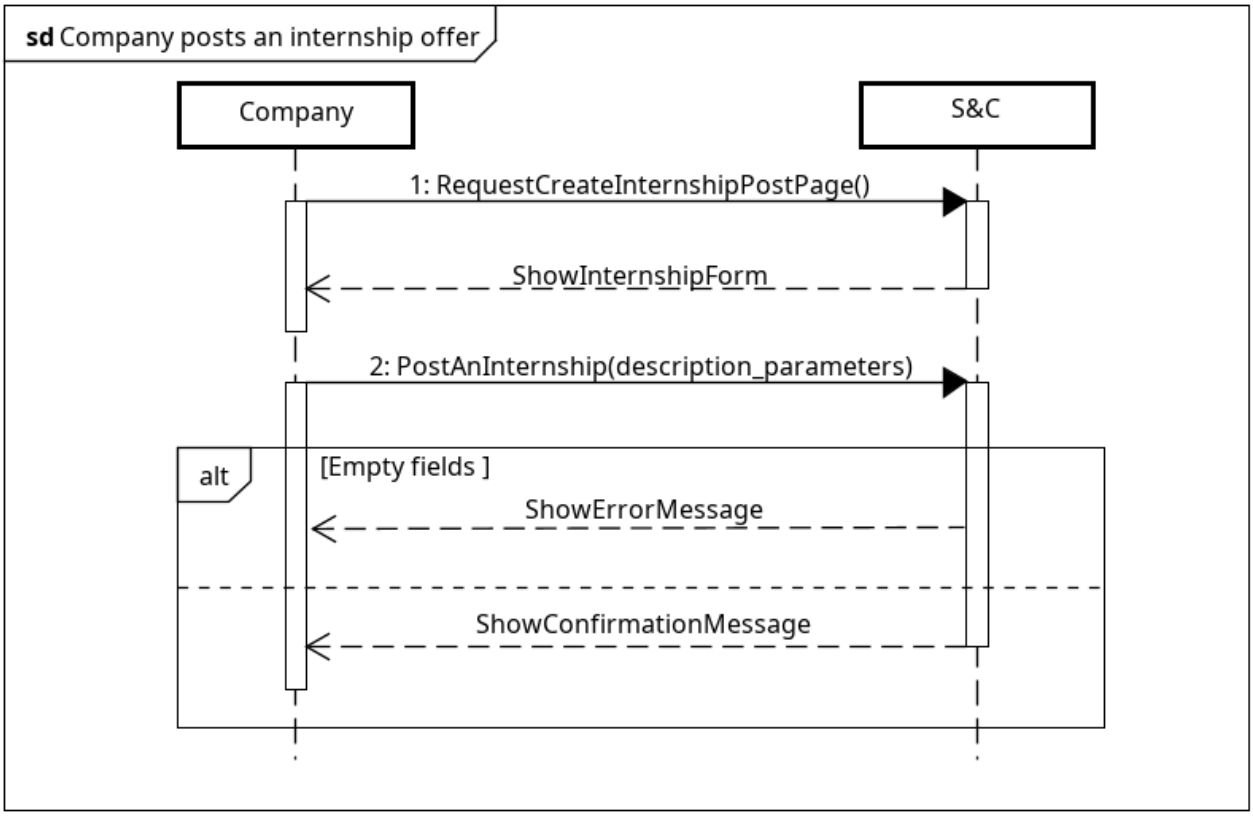

Figure 3.13: Company internship post creation sequence diagram

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

Actor	Company
Entry Condition	1. The company is notified about a new application from a suitable student. 2. The company decides to accept an application from a student. 3. The company identifies a promising student directly from the system, even if the student has not sent an application.
Event Flow	1. The company clicks on the notification received about a matching student's application. 1b. Alternatively, the company navigates to the internship offer, clicks on the its box and selects the student's profile. 1c. As another option, the company searches for the student's profile from the internship offer and selects it. 2. The system displays the student's detailed profile page. 3. The company clicks the "Propose interview" or "Contact student" button. 4. A pop-up form appears, allowing the company to schedule an interview. 5. The company completes the form with details such as date and time of the interview, format (in-person, video call), additional comments or instructions (if any). 6. The company clicks the "Send proposal" button.
Exit Condition	The system successfully registers the interview proposal and notifies the student. A confirmation message is displayed to the company.
Exceptions	1. One or more mandatory fields in the interview scheduling form are left empty. 2. The student is already engaged in another internship or is unavailable.

Table 3.14: The company accepts an application or identifies a promising student and proposes a schedule for the interview

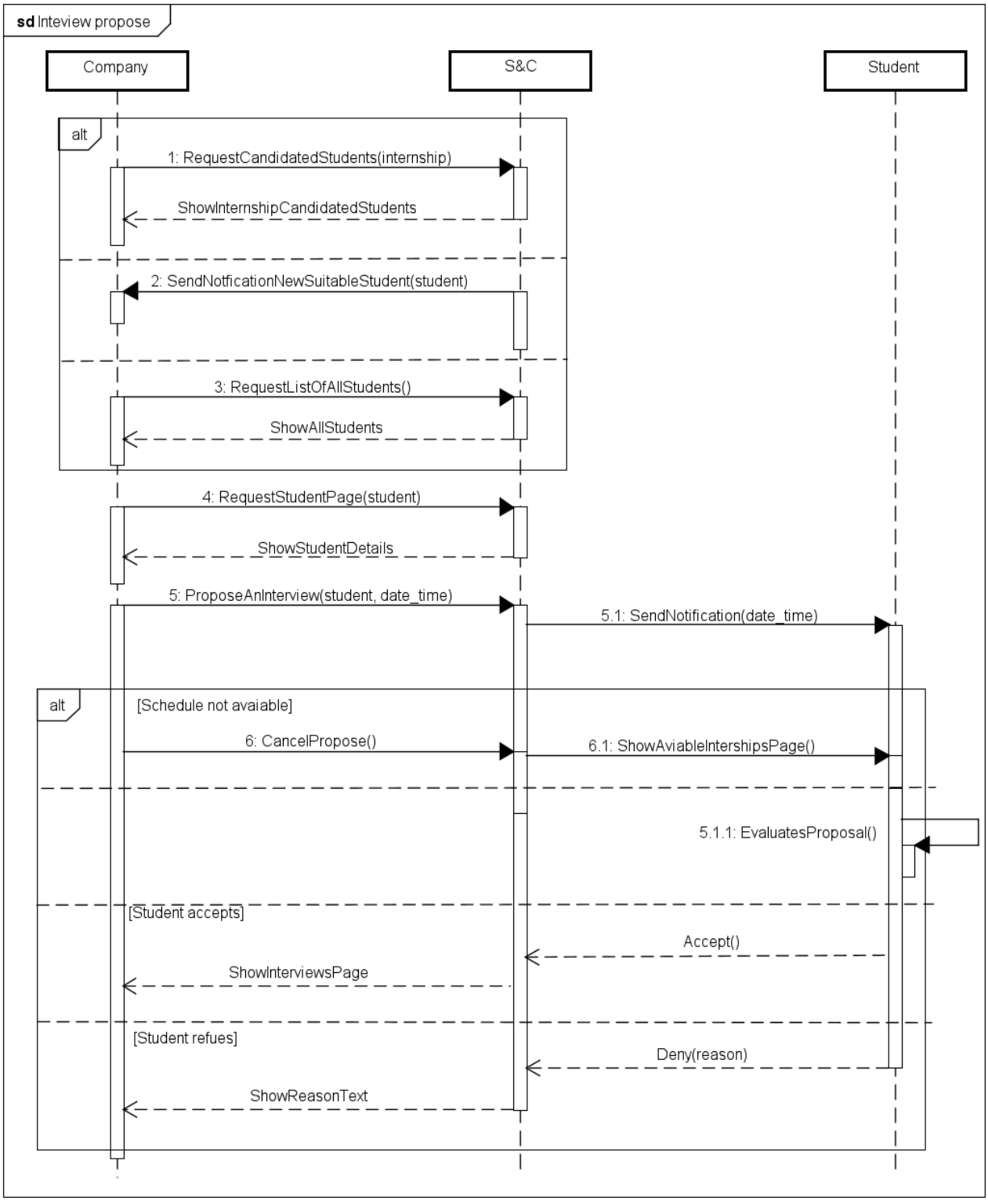

Figure 3.14: [UC 8-13] Interview propose path sequence diagram

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

Actor	Student or Company
Entry Condition	The actor identifies a problem or negative aspect of their ongoing internship and wants to notify the university.
Event Flow	1. The actor navigates to the "ongoing internship" tab. 2. The actor fills out the complaint form, providing details about the issue. 3. The actor clicks the "Submit" button to send the complaint.
Exit Condition	The system successfully registers the complaint and confirms its submission to the university.

Table 3.15: Student or Company submits a complaint about an ongoing internship

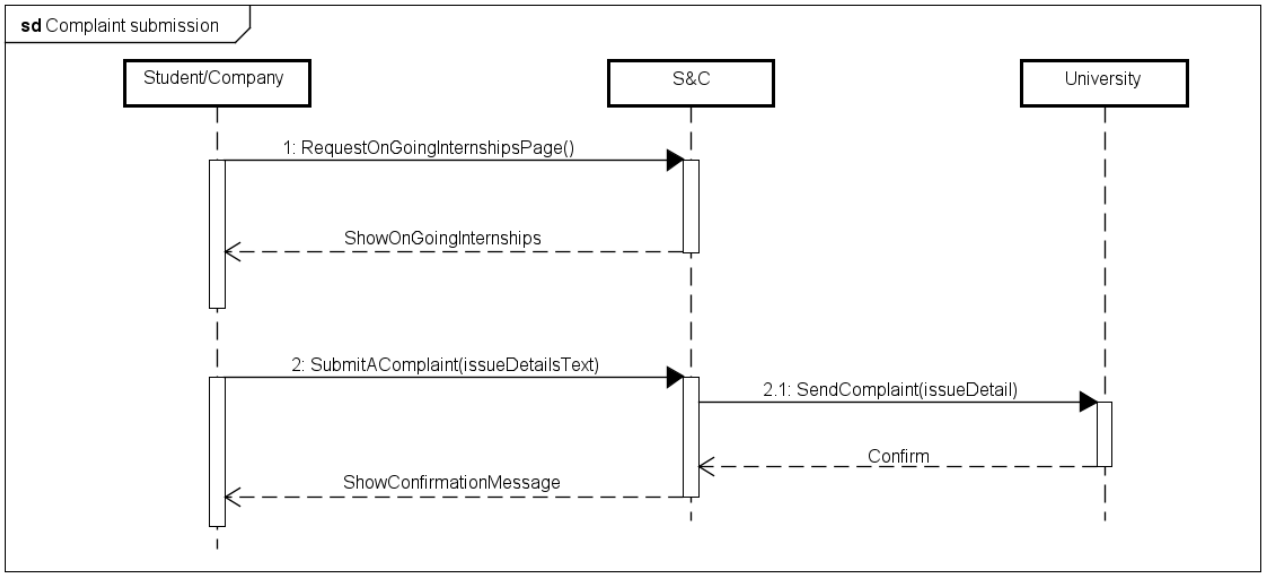

Figure 3.15: Student/Company complaint submission sequence diagram

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

Actor	Student or Company
Entry Condition	The internship has been terminated and an actor wants to provide feedback to help improve the system's recommendations.
Event Flow	1. The actor navigates to the "terminated internships" section.

	2. The actor selects the relevant internship from the list. 3. The actor fills out the feedback form, providing details about their experience, including pros, cons, and suggestions. 4. The actor clicks the "Submit feedback" button to send it.
Exit Condition	The system successfully registers the actor's feedback, which is used to refine the recommendation algorithm and enhance future matches.

Table 3.16: Student or Company submits feedback about a terminated internship

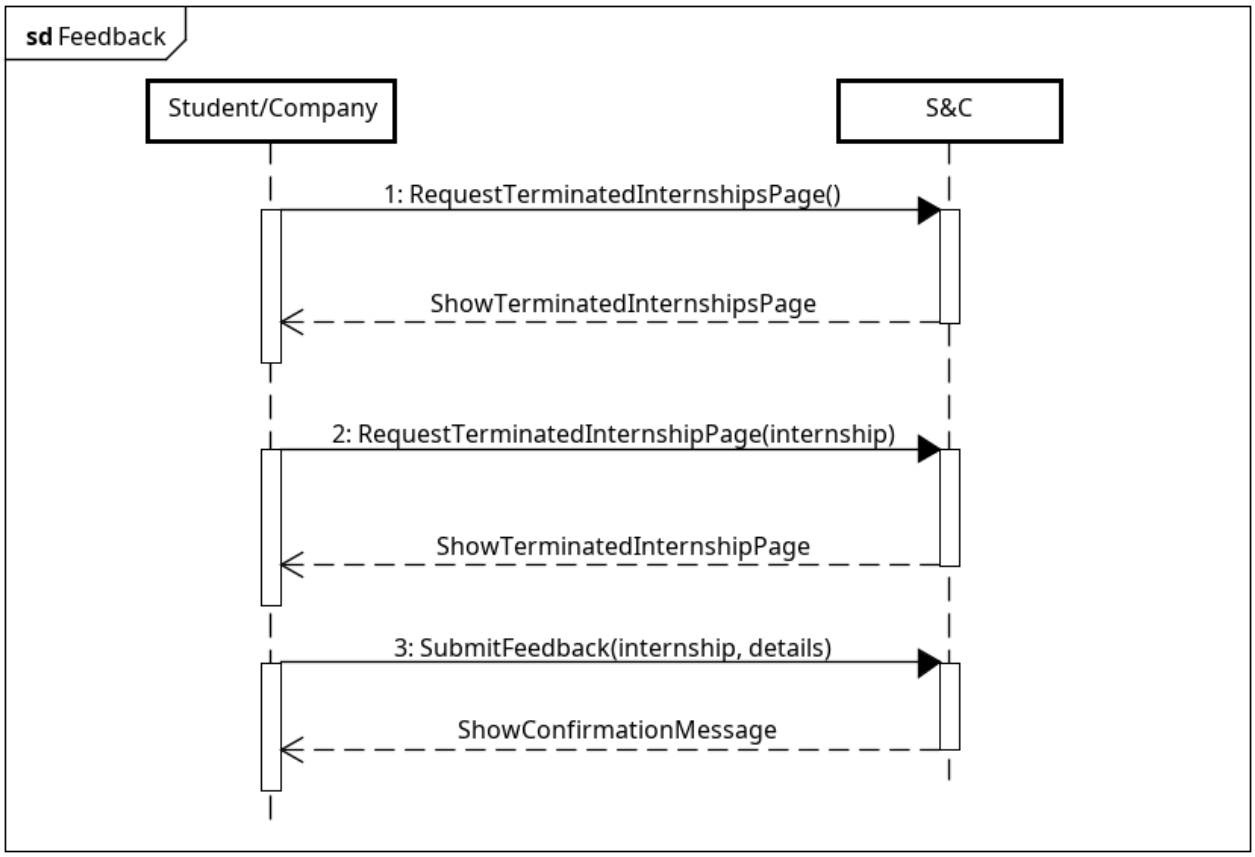

Figure 3.16: Student/Company feedback submission sequence diagram

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

Actor	University
Entry Condition	1. The university is notified about a complaint concerning an ongoing internship. 2. The university determines that the issue reported is significant enough to warrant the termination of the internship.
Event Flow	1. The university clicks on the notification related to the complaint. 1b. Alternatively, the university navigates to the "Current internships" list and selects the internship. 2. The system displays the details of the internship and the associated complaint(s). 3. The university clicks the "Interrupt internship" button. 4. A confirmation pop-up appears, and the university provides a reason for the interruption in a text field. 5. The university clicks "Confirm" to finalize the decision.
Exit Condition	The system successfully registers the decision and sends notifications to both the company and the student, detailing the reason for the termination.

Table 3.17: University Decides to Interrupt an Internship Due to Relevant Complaints

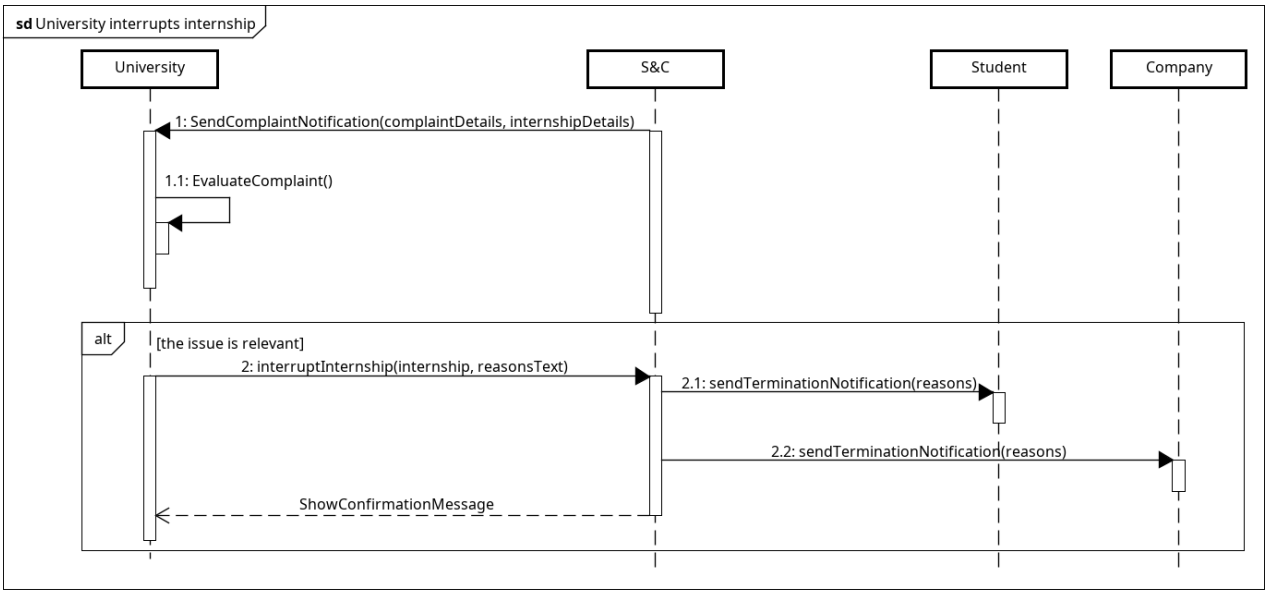

Figure 3.17: University internship interrupt sequence diagram

3.2.4. Mapping on goals

- **G1 - Allows Companies to advertise their internship offers to find the most suitable students, with the help of recommendation.**
  - R1: S&C system allows unregistered users to sign-up.
  - R2: S&C system allows registered users to verify their email address.
  - R6: S&C system allows registered users to view posted internships on the platform.
  - R27: S&C system allows Companies to post internship offers by providing detailed information.
  - R28: S&C system allows Companies to edit an internship's post.
  - R29: S&C system allows Companies to delete an internship's post.
  - 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.
  - R47: S&C system periodically updates internship recommendations based on new data from Students and Companies.
  - R49: S&C system provides Students suggestions on creating an effective CV, enhancing their chances of getting a match and receiving a positive evaluation during the company selection process.
- **G2 - Allows Students to look for internships based on their needs and find the most suitable for them, with the help of recommendation.**
  - R4: S&C system allows registered users to edit their account details.
  - R7: S&C system allows registered users to upgrade to a Student account or a Company account.
  - R9: S&C system allows registered users to update their notifications preferences.
  - R10: S&C system allows Students to view a personalized dashboard in their homepage.
  - R11: S&C system allows Students to explore available internships.
  - R12: S&C system allows Students to view available internships ordered by the best matching, based on a matching score system.
  - R13: S&C system allows Students to change the default order.

  - R14: S&C system allows Students to apply filters on the view of the available internships.
  - R15: S&C system allows Students to receive notification when a new internship matching their profile is posted.
  - R16: S&C system allows Students to view the details of a specific internship page.
  - R33: S&C system allows Companies to receive notification when a new student with a high matching score has applied.
  - R46: S&C system improves recommendation accuracy by considering user feedback on previous internships.
  - R47: S&C system periodically updates internship recommendations based on new data from Students and Companies.
  - R48: S&C system provides Students suggestions on creating an effective CV,enhancing their chances of getting a match and receiving a positive evaluation during the company selection process.

- **G3 - Supports selection process by helping to manage interviews and also finalize the selections.**
  - R17: S&C system allows Students to apply for an internship.
  - R18: S&C system allows Students to view sent applications.
  - R19: S&C system allows Students to monitor the status of an application.
  - R20: S&C system allows Students to withdraw a sent application.
  - R21: S&C system allows Students to confirm their participation of a scheduled interview via a notification interface.
  - R22: S&C system allows Students to decline an interview offer via a notification interface.
  - R24: S&C system allows Students to review the agreements of an internship before accepting.
  - R31: S&C system allows Companies to review the applications for an internship.
  - R32: S&C system allows Companies to view internship's applications ordered by the best match.

  - R34: S&C system allows Companies to propose a date to a student to schedule an interview.
  - R35: S&C system allows Companies to prepare a standardized set of questions to be proposed to all candidates for a specific internship.
  - R36: S&C system allows Companies to compare the answers from all candidates to facilitate the selection process.
  - R37: S&C system allows Companies to reject a student after the interview.

- **G4 - Provides suggestions to companies regarding how to make their offers more appealing for students.**
  - R27: S&C system allows Companies to post internship offers by providing detailed information.
  - R46: S&C system improves recommendation accuracy by considering user feedback on previous internships.
  - R49: S&C system provides Companies suggestions on creating an effective post for an internship, enhancing their chances of getting a match.

- **G5 - Provides suggestions to students ho w to make their CVs more appealing for companies.**
  - R3: S&C system allows registered users to login.
  - R4: S&C system allows registered users to edit their account details.
  - R8: S&C system allows registered users to verify their current academic status by validating their institutional email address.
  - R48: S&C system provides Students suggestions on creating an effective CV,enhancing their chances of getting a match and receiving a positive evaluation during the company selection process.

- **G6 - Allows stakeholders to monitor the progress of internships, report issues, and track outcomes.**
  - R5: S&C system allows registered users to delete their account.
  - R23: S&C system sends automated reminders to Students for upcoming interview deadlines.
  - R26: S&C system allows Students to submit feedback after completing an internship.

  - R38: S&C system allows Companies to start an internship.
  - R39: S&C system allows Companies to view active internships.
  - R40: S&C system allows Companies to file a complaint.
  - R41: S&C system allows Companies to submit feedback after completing an internship.
  - R43: S&C system allows universities to collect complaints raised by Students.
  - R44: S&C system allows universities to collect complaints raised by Companies.

- **G7 - Allows Universities to monitor the situation of ongoing internships and interrupt them when necessary.**
  - R3: S&C system allows registered users to login.
  - R25: S&C system allows Students to file a complaint.
  - R42: S&C system allows universities to login to the system providing credentials.
  - R45: S&C system allows universities to mediate between Student and Company after a complaint.

Requirement	G1	G2	G3	G4	G5	G6	G7
R1	✓						
R2	✓						
R3					✓		✓
R4		✓			✓		
R5						✓	
R6	✓						
R7		✓					
R8					✓		
R9		✓					
R10		✓					
R11		✓					
R12		✓					
R13		✓					
R14		✓					
R15		✓					
R16		✓					
R17			✓				
R18			✓				
R19			✓				
R20			✓				
R21			✓				
R22			✓				

R23						✓	
R24			✓				
R25							✓
R26						✓	
R27	✓			✓			
R28	✓						
R29	✓						
R30	✓						
R31			✓				
R32			✓				
R33		✓					
R34			✓				
R35			✓				
R36			✓				
R37			✓				
R38						✓	
R39						✓	
R40						✓	
R41						✓	
R42							✓
R43						✓	
R44						✓	
R45							✓

R46		✓		✓			
R47	✓	✓					
R48		✓			✓		
R49	✓			✓			

Table 3.18: Traceability Matrix for Goals and Requirements

3.3. Performance Requirements

The platform has to guarantee good performances in order to work efficiently and correctly for a great number of users (Universities, Students and Companies). In order to achieve this the response time must be lower than a second, this is due to the fact that the user's connection to the platform can be slow and the loading times can subsequently increase in an exponential way.

3.4. Design Constraints

3.4.1. Standard compliance

The S&C platform adheres to regulations and standards to ensure data privacy and usability. It complies with the General Data Protection Regulation (GDPR) for secure handling of personal data, including student CVs and company profiles. Additionally, all communications use HTTPS to guarantee secure data transmission, and the international format for date and time is adopted to ensure clarity and consistency across different regions.

3.4.2. Hardware limitations

Here we have a short list of the hardware features that a user should have to use the platform without encountering major problems:

- The user must have a device with a good internet connection this means that the device in question should be compatible with at least one of the following standards : 3G, 4G, 5G, IEEE 802.11 or IEEE 802.3. Both wired and wireless connections must be guaranteed during the usage of the platform.

- The user must have a device with good hardware features such as a processor with high performance

3.4.3. Any Other Constraint

In a way, the system ought to give top priority to how user-friendly it is, providing interfaces that feel easy to learn for students, companies, and universities alike for things like uploading resumes, handling internships, and sorting out complaints. It ensures compatibility with APIs that support future features (e.g. AI-based recommendations). The architecture must be as scalable as the platform itself increases in the number of users. The platform should also be integrated with specific tools in order to make the feedback and complaint system robust.

3.5. Software system attributes

3.5.1. Reliability

The system has to be reliable since it will have to run without stopping for a long period of time. To ensure this feature the platform must have some sort of replication and consistency policy to avoid system crash. In addition to this it is a good practice to have offline backups of the system for recovering information in case of data loss.

3.5.2. Availability

The system must guarantee an availability of 99% to support its users effectively, especially during peak usage periods like internship deadlines. To achieve this, single points of failure must be avoided and load balancing techniques should be used.

3.5.3. Security

User data, including personal information and CVs, must be protected using encryption methods for stored data and secure transmission protocols. The platform must implement measures to prevent unauthorized access and ensure the integrity and confidentiality of user information.

3.5.4. Maintainability

The system must be easily maintainable with well-documented code and routine testing procedures. At least 75% of the code, excluding the UI, must have test coverage to facilitate debugging and future development and expansion of the platform.

3.5.5. Portability

As a platform that includes both a web application and a mobile application, the system must function correctly across various devices and environments. The web application should be compatible with major browsers, such as Chrome, Firefox, and Safari, ensuring accessibility on desktop and mobile browsers alike. Additionally, the mobile application must provide a seamless user experience on both iOS and Android devices. This compatibility guarantees usability for a wide range of users, regardless of their chosen device or access method.

4 | Formal Analysis Using Alloy

4.1. Objectives of the analysis

In this section, a presentation of the formal modeling activity has been created using the Alloy formal notation with the main goal of describing the domain and the properties of the system. The objective of this is to model and formally represent all the users (University, Student, Company, and regular User) and everything related to Internships and Internship Offers as well as the main constraints which regard all the entities mentioned.

```
-- SIGNATURES
open util/integer

sig User {
    email: one Email,
    password: one Password
}

sig Student extends User {
    name: one Name,
    surname: one Surname,
    academicEmail: one Email,
    university: one University,
    phoneNumber: one PhoneNumber,
    postalCode: one PostalCode,
    cv: one CV,
    goals: set Goal,
    matches: set Match,
    ongoingInternship: lone Internship,
    terminatedInternships: set Internship,
}
```

```
sig Company extends User {
    fullName: one FullName,
    phoneNumber: one PhoneNumber,
    officeAddress: one OfficeAddress,
    postedOffers : set InternshipOffer
}

sig University extends User {
    ongoingInternships: set Internship,
    terminatedInternships: set Internship
}

sig Internship {
    company: one Company,
    student: one Student,
    status: one Status,
    complaints: set Complaint,
    feedback: set Feedback,
    offer: one InternshipOffer
}

sig InternshipOffer {
    project: one Project,
    role: one Text,
    officeAddress: one OfficeAddress,
    numStudents: lone Int,
    salary: lone Salary,
    skills: set Skill,
    schedule: one Schedule,
    benefits: set Benefit,
    applicants: set Student,
    selectedStudents: set Student
}

sig Match {
    student: one Student,
    score: one Score,
    offer: one InternshipOffer
}
```

```
sig Complaint {
    student: lone Student,
    company: lone Company,
    internship: one Internship,
    text: one Text
}

sig Feedback {
    student: lone Student,
    company: lone Company,
    internship: one Internship,
    text: one Text
}

abstract sig Email {}
abstract sig Password {}

abstract sig Name {}
abstract sig Surname {}
abstract sig PhoneNumber {}
abstract sig PostalCode {}
abstract sig CV {}
abstract sig Goal {}

abstract sig FullName {}
abstract sig OfficeAddress {}
abstract sig Project {}
abstract sig Salary {}
abstract sig Skill {}
abstract sig Schedule {}
abstract sig Benefit {}

abstract sig Score {}

abstract sig Text {}

abstract sig Status {}
one sig Proposed, Ongoing, Terminated extends Status {}
```

```
-- FACTS

-- Only one status can be applied to each internship at a time
fact internshipHasOneStatus {
    all i: Internship | one i.status
}

-- There must be no users using the same email
fact noUsersWithSameEmail {
    no disj u1, u2: User | u1.email = u2.email
}

-- There must be no Students using the same academic email
fact noStudentsWithSameAcademicEmail {
    no disj s1, s2: Student | s1.academicEmail = s2.academicEmail
}

--A terminated internship can be found in the university parameter of the student who
    completed it
fact terminatedInternshipConsistency {
    all i: Internship |
        i.status = Terminated implies
        one u: University | i in u.terminatedInternships
}

-- An academic email used by a student cannot be used as a general email by another user
fact academicEmailConsistency {
    no disj s: Student, u: User |
        s.academicEmail = u.email
}

--The ongoin Internship must be reflected in the student parameters
fact ongoingInternshipStatusConsistency {
    all i: Internship |
        i.status = Ongoing implies i.student.ongoingInternship = i
}

-- There must be no Students using the same phone number
```

```
fact noStudentsWithSamePhoneNumber {
    no disj s1, s2: Student | s1.phoneNumber = s2.phoneNumber
}

-- There must be no Companies using the same phone number or office address
fact noDuplicatedCompanies {
    no disj c1, c2: Company | c1.phoneNumber = c2.phoneNumber
        or c1.officeAddress = c2.officeAddress
}

-- A student cannot have more than one ongoing internship
fact oneOngoingInternshipPerStudent {
    all s: Student | lone s.ongoingInternship
}

-- A student cannot apply for the same internship offer more than once
fact uniqueApplications {
    all s: Student, o: InternshipOffer |
        s in o.applicants implies lone o.applicants & s
}

-- A student cannot choosen for the same internship offer more than once
fact noDuplicateApplications {
    all o: InternshipOffer |
        all s: Student |
            s in o.applicants implies s not in o.selectedStudents
}

--An InternshipOffer can only belong to a single company
fact eachOfferBelongsToOneCompany {
    all o: InternshipOffer | one c: Company | o in c.postedOffers
}

-- An internship can only reference an offer posted by the associated company
fact internshipOfferCompanyConsistency {
    all i: Internship |
        i.offer in i.company.postedOffers
}
```

```
-- A match must involve a valid student and a valid offer
fact validMatchReferences {
    all m: Match |
        m.student in Student and m.offer in InternshipOffer
}

-- A student cannot have multiple matches for the same offer
fact uniqueMatchPerStudentOffer {
    no disj m1, m2: Match |
        m1.student = m2.student and m1.offer = m2.offer
}

-- A student cannot apply for internships they are already matched with
fact noApplicationsForMatchedInternships {
    all m: Match |
        m.student !in m.offer.applicants
}

--An ongoing or terminated internship has already selected some applicants
fact selectedApplicantsNotEmpty {
    all i: Internship |
        i.status in Ongoing + Terminated implies some i.offer.selectedStudents
}

-- Complaints must always reference their related internship
fact complaintConsistency {
    all c: Complaint |
        c.internship.student = c.student and
        c.internship.company = c.company
}

-- Feedback must always reference its related internship
fact feedbackConsistency {
    all f: Feedback |
        f.internship.student = f.student and
        f.internship.company = f.company
}

-- Both the student and the company must provide feedback for terminated internships
```

```
fact feedbackCompleteness {
    all i: Internship |
        i.status = Terminated implies
        some f1,f2 : Feedback |
      f1.internship = i and f2.internship = i and f1.student != none and
          f2.company != none
}

-- A terminated internship must belong to the student's terminated internships set
fact terminatedInternshipsTracking {
    all i: Internship |
        i.status = Terminated implies i in i.student.terminatedInternships
}

-- Universities can only manage internships they are assigned to
fact universityInternshipOwnership {
    all u: University |
        u.ongoingInternships + u.terminatedInternships in Internship
}

-- the number of selected applicants must be less than or equal to the number of open
    positions
fact selectedStudentsLimit {
    all o: InternshipOffer |
        #o.selectedStudents <= o.numStudents
}

-- Only ongoing internships can be assigned to a university
fact universityOngoingInternshipTracking {
    all i: Internship |
        i.status = Ongoing implies i in University.ongoingInternships
}

--If an internship offer has multiple positions open then all the individual internships are
    the same and have the same status at all time
fact consistentInternshipsForOffer {
    all o: InternshipOffer |
        o.numStudents > 1 implies
        all i1, i2: Internship |
```

```
        i1 != i2 and i1.offer = o and i2.offer = o implies {
            // Internships connected to the same offer have the same status
            i1.status = i2.status and
            // Internships connected to the same offer have the same parameters (except
                student)
            i1.company = i2.company and
            i1.complaints = i2.complaints and
            i1.feedback = i2.feedback and
            // Students must be different
            i1.student != i2.student
        }
}

-- No offer can have selected students exceeding the number of required students
fact noExceedSelectedStudents {
    all o: InternshipOffer |
        (o.numStudents != none implies #o.selectedStudents <= o.numStudents) or
   (o.numStudents = none implies #o.selectedStudents <= 0)
}

-- PREDICATES

pred UsersWorld{
    #Student = 5
   #Company = 4
   #University = 2
}
run UsersWorld for 8

pred InternshipsWorld {
    #Internship >= 3
    #InternshipOffer >= 3
    #Company >= 2
}
run InternshipsWorld for 5

pred ApplicationsWorld {
    #Student >= 3
    #Internship >= 3
```

```
    #InternshipOffer >= 3
}
run ApplicationsWorld for 5

pred FeedbackComplaintWorld {
    #Company >= 3
    #University >= 2
    #Feedback >= 2
    #Complaint >= 2
}
run FeedbackComplaintWorld for 5
```

4.2. Metamodels and Examples

4.2.1. General

This model shows the entire system and all the complex relations among its parts. It can be quite useful to better understand how the single parts interact with each other.

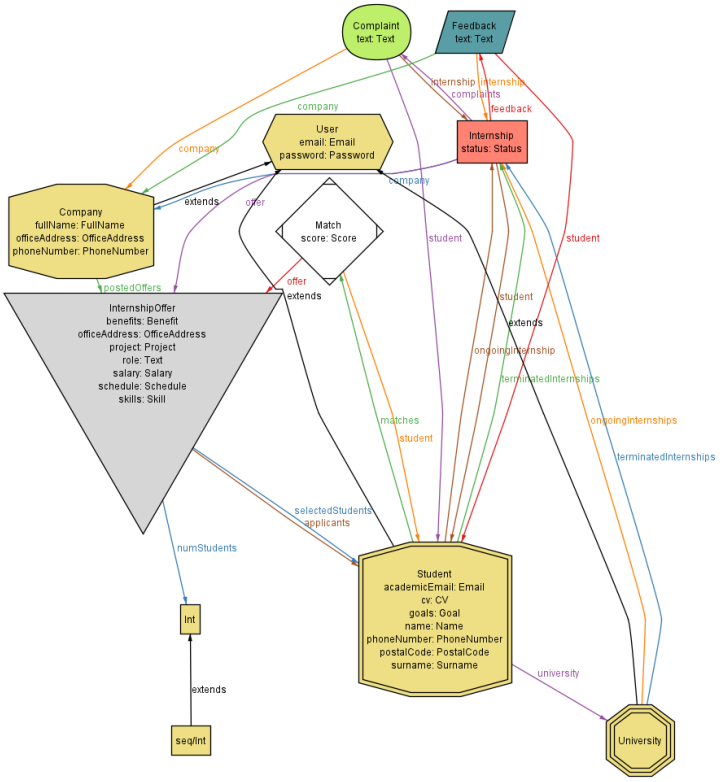

Figure 4.1: metamodel of the entire system

4.2.2. Users

This model describes the basic properties of each user, independently from their type (University, Company, Student), without making any connection to other entities. From this model the concept of the user who doesn't belong to one of the three groups that are able to interact with the platform is removed because it can not have relationships with any of the entities in the system.

4.2.3. Internships and Internship offers

This model describes the basic properties of the Internship and InternshipOffer entities.

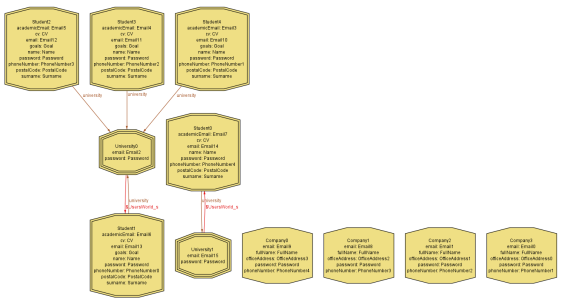

Figure 4.2: pred "UsersWorld" model

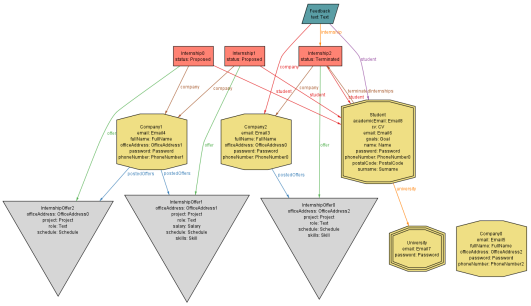

Figure 4.3: pred "InternshipsWorld" model

4.2.4. Students applying to internships

This model describes the interaction between Student, Internship and InternshipOffer when students start to apply to a specific offer.

4.2.5. Feedback and Complaint

This model describes the relations between feedback and complaint entities and the other components of the system.

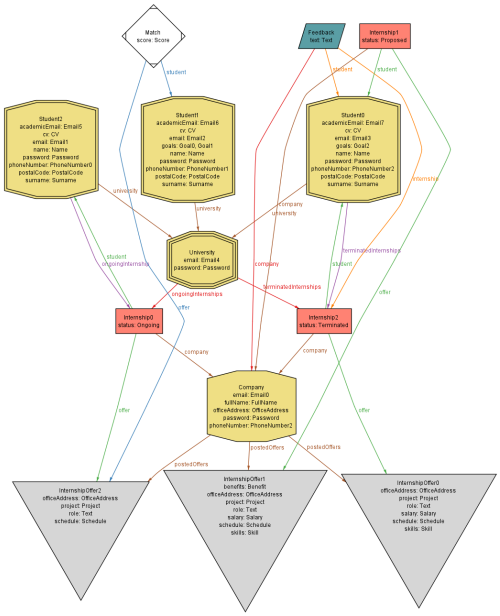

Figure 4.4: Pred "ApplicationWorld" model

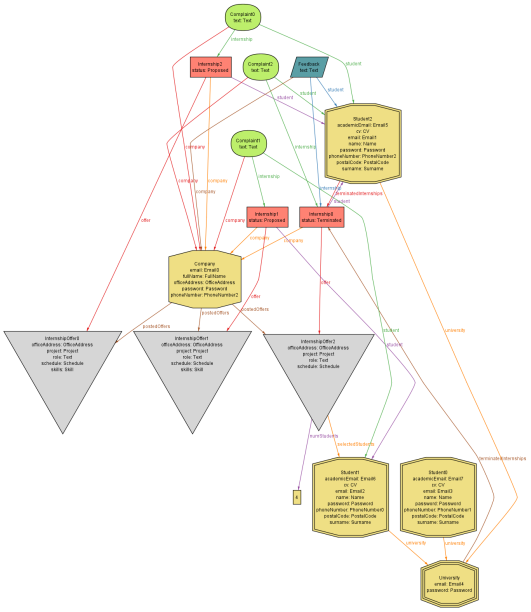

Figure 4.5: Pred "FeedbackComplaintWorld" model

5 | Effort Spent

Member of group	Effort spent	
Belfiore Mattia	Introduction	2h
	Overall description	7h
	Specific requirements	13h
	Formal analysis	7h
	Reasoning	7h
Benedetti Gabriele	Introduction	5h
	Overall description	2h
	Specific requirements	18h
	Formal analysis	4h
	Reasoning	7h
Buccheri Giuseppe	Introduction	3h
	Overall description	5h
	Specific requirements	18h
	Formal analysis	1h
	Reasoning	9h

Table 5.1: Effort spent by each member of the group.

6 References

6.1. Paper references

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

6.2. Used tools

- **GitHub** for the project's version control.
- **AstahUML** for UML diagrams.
- **draw.io** for use case diagrams.
- **bpmn.io** for state diagrams.
- **Notion** for notes sharing.
- **OverLeaf** as collaborative online LaTex editor.
  - PoliMi PhD Thesis Template on OverLeaf
- **Alloy** for formal analysis.

List of Figures

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