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SCUOLA DI INGEGNERIA INDUSTRIALE
E DELL'INFORMAZIONE

Requirement Analysis and Specification

Computer Science and Engineering

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1 Introduction

1.1. Purpose

The purpose of the system Student&Companies (S&C) is to help matching university student who are looking for internship with companies that are offering them. The matching system is based on the experiences, skills and attitudes of individual students which are compared with the projects and terms offered by the various companies. There are two ways in which students can get an internship: one is by being proactive and initiating the application process and the other is by being recommended to a company by the platform.

The goals of the S&C platform are:

G1: Students can insert their experiences, skills and attitudes in the InitialForm

G2: Companies can post the projects students will work on during their internships (specifying topics, tasks and technologies) with the relative compensation and benefits

G3: Students can initiate the process by going through the available internships

G4: Students can be notified when an internship that might interest them becomes available

G5: Companies can be notified about the availability of students corresponding to their needs

G6: Students and companies can accept or decline a recommendation

G7: Companies can interview students

G8: Students and Companies can monitor the execution and the outcomes of the selection procedure

G9: Students can report on a logbook the daily situation of the internship

G10: Universities can monitor the status of the internship

G11: Companies can complain about the current status of the internship

G12: Students can complain about the current status of the internship

1.2. Scope

Students that use the platform are enrolled in a university and are looking for an internship. Companies use the platform to advertise the internship they are offering.

The platform integrates its login and registration process with an existing Single Sign-On (SSO) system, which handles user authentication.

The platform asks a series of questions, through an InitialForm, to students that want to send their CV. Once the student decides they want to contact a company, the system will generate a personalized and editable CV, tailored to the company's requirements. Furthermore it helps companies to make their project descriptions more appetizing for students.

A personalized homepage will be created by the system for both students and companies based on the information they supplied during the registration.

Students can be proactive when looking for an internship by going through the personalized list of available experiences but also can be notified by the system when an internship that might interest them becomes available.

The system also notifies companies about the availability of student's CVs corresponding to their needs.

When these suggestions are accepted by the two parties, a contact is established. After a contact is created, the selection process starts.

During the process companies interview students to determine if the students will be a good fit with the company and for the internship.

The system will also support the selection process by allowing companies to set up, conduct and manage the interviews. At the end of the process it will also help finalize the selections.

To collect data the system asks students and companies to provide feedback or suggestions regarding the internships.

The system provides all interested parties with tools to track and monitor the execution and outcomes of the matchmaking process. It also provide spaces where interested parties can register complaints, communicate problems and provide information regarding the status of the ongoing internship.

Universities can monitor the status of internships. They are responsible for handling complaints, especially when one of the two parties want to interrupt the internship.

The following table identifies the controlling party for phenomena between world (W) and machine (M) and whether the phenomena is shared or not (Y/N).

Phenomena	Controlled by	Shared
A user wants to log in to the platform	W	N
A company wants to create a new internship	W	N
A student wants to insert information to create his CV	W	N
A student wants to look for an internship	W	N
The system creates a personalized CV	M	Y
The system makes a suggestion to produce a more appealing project description	M	Y
The system notifies a student when an internship that may interest him becomes available	M	Y
The system notifies a company when a student's CV corresponding their needs is available	M	Y
The system starts a selection process when two related suggestions are accepted by the two parties	M	N
The system supports the selection process by setting up, conducting and managing the interviews.	M	Y
At the end of the process the system will also help finalize the selections	M	Y
The system asks to a student to provide a feedback or a suggestion about the internship	M	Y
The system asks to a company to provide a feedback or a suggestion about the internship	M	Y
The system shows the current state of the matchmaking process	M	Y
Any user can write in the "Report Area" section	W	Y
The University handles a complaint	W	Y
Any user can interrupt the internship	W	N

Table 1.1

1.3. Definitions, Acronyms, Abbreviations

1.3.1. Definitions

Curriculum Vitae (CV): A brief account of a person's education, qualifications and previous occupations, typically sent with a job application.

Students&Companies: A platform designed to help students and businesses to find an internship.

Single Sign On (SSO) : A way to login into the system using the credentials offered by the University or the company.

Internship: The position of a student or trainee who works in an organization, in order to gain work experience or satisfy requirements for a qualification.

Recommendation: The process of informing students and companies when an interesting internship becomes available or about the availability of a student CVs corresponding to the needs of a company.

Project: set of tasks the company assign to their internee.

Task: a piece of work.

Interviews: A meeting between the student and the company where the student can demonstrate that they are a good fit for the company's internship.

Feedback: Information about how the internship is going from both of the parties.

Report Area: A space where a student or a company can complain, communicate problems, and provide information about the current status of the ongoing internship.

My CV: Section of the website where the student is able to create their CV.

InitialForm: a form fillable after opening the "My CV" section for the first time. Here the student insert information that will create a personalized CV.

Logbook: a journal that a student writes to update the university on the internship status.

1.3.2. Acronyms

SSO: Single Sign On

API: Application Programming Interface

CV: Curriculum Vitae

S&C: Students&Companies

IDE: Integrated Development Environment

1.3.3. Abbreviations

e.g.: For example

w.r.t.: With reference to

1.4. Revision history

- **1.0** (21th December 2024) - Initial release
- **1.1** (27th January 2025) - Use case label fix

1.5. Reference Documents

Specification document: *"Assignment RDD AY 2024-2025"*

UML official specification: `https://www.omg.org/spec/UML/`

Alloy official documentation: `https://alloytools.org/documentation.html`

1.6. Document Structure

1. **Section 1: Introduction**
   This section exposes the purpose and the scope of the system explaining the goals of the project and including the analysis of the world and the shared phenomena. It also contains the definitions of acronyms and abbreviations to ensure the document is not ambiguous.
2. **Section 2: Overall Description**
   This section contains a high-level description of the product prospective including scenarios and details regarding the shared phenomena and a domain model expressed through class and state diagrams. It also includes a list of the product functions with the most important requirements and categories of use cases. It also contains the main assumptions, dependencies and constraints.
3. **Section 3: Specific Requirements**
   This section describes the specific requirements, in particular there are details on all aspects that may be useful for the development team. It provides external interface requirements, which include user, hardware, software and communication interfaces. Finally, it describes performance and functional requirements, through the use of use case diagrams, use cases, related sequences, activity diagrams, and mapping on requirements.
4. **Section 4: Formal Analysis using Alloy**
   This section provides a formal analysis using the alloy language with a brief presentation of the main objectives driving the formal modeling activity. This is included

to prove the correctness and soundness of the system.

2 | Overall Description

2.1. Product perspective

2.1.1. Scenarios

1. **Student's first platform access**
   Alessandro Sesenna is a Computer Science student who wants to register with the S&C platform to start looking for internship projects. After entering the URL in the web Browser (such as Mozilla Firefox, Internet Explorer, etc.) the user needs to authenticate through the university's Single Sign On system. When the authentication process ends, the system recognizes that this is his first access and redirects him to an initial page. Here, Alessandro is asked to decide among different options about his favorite academic interests. The system has already selected a list of possible fields of interest, based on Alessandro's course of study, which the platform received upon the first registration. Among the options he selects "Data Science", "SQL programming" and "DataBase management". Once this is done, the system creates an ad-hoc homepage containing the various offers, previously posted by companies, ordered by suitability with his chosen interests. Alessandro won't be able to send a contact request to the companies shown in the homepage until he has completed the "My CV" procedure.

2. **Student inserts his CV information in the InitialForm**
   Federico Ferri is a student who is attending a university and has already registered with the S&C platform. Federico wants to find an internship, so he logs into the system and is initially shown his personalized homepage. He starts scrolling through the various opportunities and notices an offer that is interesting to him. When he clicks on the contact button, the systems shows a pop-up, in which it is written that to communicate with a company is mandatory to first insert his information in the section "My CV". Federico clicks the button on the popup which redirects him to the "My CV" section. This opens a form which will require the user to fill the following fields:

   (a) Personal information (Name field, Contact information, Personal ambitions, etc.)

   (b) Education (Academic background and Achievements)

   (c) Work Experience (Job Title, Company Name, Duration, Technologies used, etc.)

   (d) Technical and soft skills

(e) Project and Research (Projects/Research title, Duration, Description, etc.)

(f) Extracurricular activities (Activity name, Organization/ Event, Achievements, etc.)

(g) Certification and training (Certification Name, Provider, Validity, etc.)

(h) Languages (Language, proficiency level, certification, etc.)

(i) Internship availability (here the student indicates whether he's willing to do an unpaid internship)

(j) Additional Information (Interests, reference contacts, etc.)

After filling all the fields the system will show a message confirming the success of the operation.

3. **Student search through the internships and contact the company**
Nicolò Bilzi is a computer engineering student and is looking for a company specialized in data analysis to do his first summer internship. After registering at S&C, choosing his favorite fields (big data, data science and data engineering) and filling the information in the 'My CV' section, Nicolò opens his homepage. On the homepage he can see several internship possibilities, and in particular Nicolò decides to click on the contact button next to the "Azure" company offer, which explains they are looking for a data engineer position to do a data manipulation project. After clicking the contact button the site automatically generates a personalized CV for the company that posted the advertisement and lets Nicoló revise it before sending it. If Nicoló approves the document, he will proceed to send it. Once the company sees his CV, and considers it valid, the two parties can agree on next steps. Instead, if the company doesn't consider the CV valid, they can discard the profile of Nicoló by clicking on the "discard" button.

4. **A company publishes an advertisement about the internships they are offering**
Alex Zurlini is an employee of "AudioServizi" company, which is looking for an electronic engineer to assign a project about headphones battery durability. His company has been already registered in the S&C platform, so he logs in using his business credentials. Alex logs into the system and the personalized homepage with a list of potential students for their internship is shown. At the left upper corner, the user is able to open a sidebar, where, among the many choices, decides to click on the "Create Job Opportunity" button. This screen bring Alex to a form, which includes the following fields:

(a) Title

(b) Job description (where he is assisted by the system, which utilizes AI to suggest an appropriate job description)

(c) Requirement (e.g. computer science degree, economics degree, etc.)

(d) Internship Duration (e.g. six months, one year, etc.)

(e) Internship availability (two options where the employee selects if the internship is paid)

(f) Other useful information (free text area)

Since they are looking for a figure to work on small battery research, puts in the *"Title"* field *"Electronics engineer"* and, below, in the *"Job Description"* field, assisted by the platform, puts *"Searching for an electronic engineer to commit to our research project on the durability of headphone batteries"*. A bachelor's degree in electronic engineering is required, so he selects it from the checkbox list that appears after clicking the *"Requirement"* field. After selecting the duration of the position, the pay of the internship and adding additional useful information, he publishes the position by clicking on the *"Publish"* button below the form. Once this is done, students that have registered on the system and meet the requirements in electronics engineering and indicated their interest in this subject will receive a notification of the available internship.

5. **A student receive a notification about the availability of an internship that might interest her**
   Paola Rossi is a university student and when she registered to S&C, among other preferences, she selected "robotics". A company called "Robotics S.P.A." posts the availability of an internship regarding the usage of robots in a medical environment on the platform. Since Paola selected "robotics" as a preference she receives a notification on her email. Since she's interested she clicks on the link at the end of the email and is redirected to the company's offer page. After reading all the information, she decides to contact the company. Since Paola has already completed her "My CV" section, she will be able to decide whether to contact the company by clicking on the contact button or simply be redirected to their homepage. The first option creates a personalized CV, shows it to Paola for reivew and, if everything is fine, send it to the company.

6. **A company receives a notification about the availability of a student CV corresponding to their needs**
   Giuseppe Latino is an HR representative for "Computerz SPA" and is subscribed to S&C, where his company has opened an internship position. Francesco Damante is a computer science student who has just subscribed to the platform and completed his "My CV" section. He has characteristics that perfectly correspond to what Giuseppe's company were searching for. Giuseppe receives an email notification, that recommends Francesco's profile for the internship they are offering. Once he opens it by clicking on the "View profile" button the system brings him to Francesco's presentation page. To contact him Giuseppe clicks on the button next

to Francesco's name and a chat interface comes up. From this page he can start to exchange messages with him and arrange a meeting to do interviews and see if he fits the company's requirements.

7. **Student gives final feedback about the internship**
   Roberta Maniero has just finished her internship at the company "Dassault Systemes" and would like to leave a review of her experience. She opens the S&C website and after logging in, opens the sidebar and selects the 'Report' button. The system automatically recognizes that the internship has ended and shows her a form to fill out entitled "Give us your final feedback". Here, Roberta writes down everything she liked, what she learned and what she would improve about her experience. To submit feedback, Roberta presses the "Submit" button.

8. **The University receives the request to end an internship from a student and contacts the company to end it**
   Isacco Robuschi works as an employee at Politecnico Di Milano. He receives an email that informs him about a new complaint by one of the university's students. He clicks on the "See complaint" button. This opens a page that shows what the student has complained about. After reading the complaint which includes a request to end the internship, he clicks on the student name in the upper part of the page. This opens the student's profile for him where he finds the company contacts above the student name in his homepage. After discussing with the company the reasons behind this situation, they agree to end the internship. To do so, Isacco needs to open the student homepage and click on the "Terminate Internship" button. The platform will then ask him if he really wants to continue this process, to which he'll clicks the "Yes" button that will end the internship between the student and the company.

9. **Student complains with the university on the "Report Area" about his ongoing internship**
   Francesco Castellante is a Mechanic Engineering student and is conducting an internship with "Pipes S.P.A" which is a company that builds and sells pipes all around the world. Once Francesco signs in with S&C, he selected as a preference "mechanics" and "3D design" hoping to find an internship that will help him optimize his skills in that field. Unfortunately, the company who accepted him is in a difficult period and all the employee are occupied so they aren't able to offer him the support needed. Instead of guiding him through the work, they told him to watch tutorials about how to use the technologies he has to employ to do the project they assigned to him. The problem is that the tutorials aren't as efficient as someone, who knows how the technology work explaining the basic functionalities and why things need to be done in a specific way. Since Francesco is a hard worker and wants this internship to be as educational as possible, he would like to file a complaint, hoping to prompt the company to assign him an employee that teaches him how

to do this type of job. To do so, the platform offers two different sections, viewable after opening the toolbar, called "Report Area", where he can communicate with the university, and "Chat", where he can write to the employee responsible for his internship. Since he has already tried to speak with the HR manager of the company, and nothing changed, he decided to report it through the "Report Area" section. After writing his complaint and sending it, he needs to wait for an answer from the university.

10. **The company complains about the student taking the internship**
Marco Carta is a manager at the company 'QS Informatics' and supervises the work of Mirko Soragna, a computer engineering student, participating at their internship project as an aspirant data scientist. However, after following Mirko's work for two weeks, Marco realises that Mirko's programming skills aren't sufficient to do the job they assigned him. Marco therefore wants to contact Mirko's university to inform them that "QS Informatics" intend to terminate the internship. Marco, after logging into the S&C platform, opens the sidebar and clicks on the 'Report Area' button. Here the site shows him the complete list of students who are doing an internship at his company. Marco then clicks on the name of 'Mirko Soragna', and is directed to his profile's page. Here Marco clicks on the "Report" button. This brings him to a page where he can insert the report on Mirko's work and describe all the details regarding his request to terminate the collaboration. After sending it, the site will send a notification to the university which will contact the student and inform him of the termination.

2.1.2. Domain class diagram

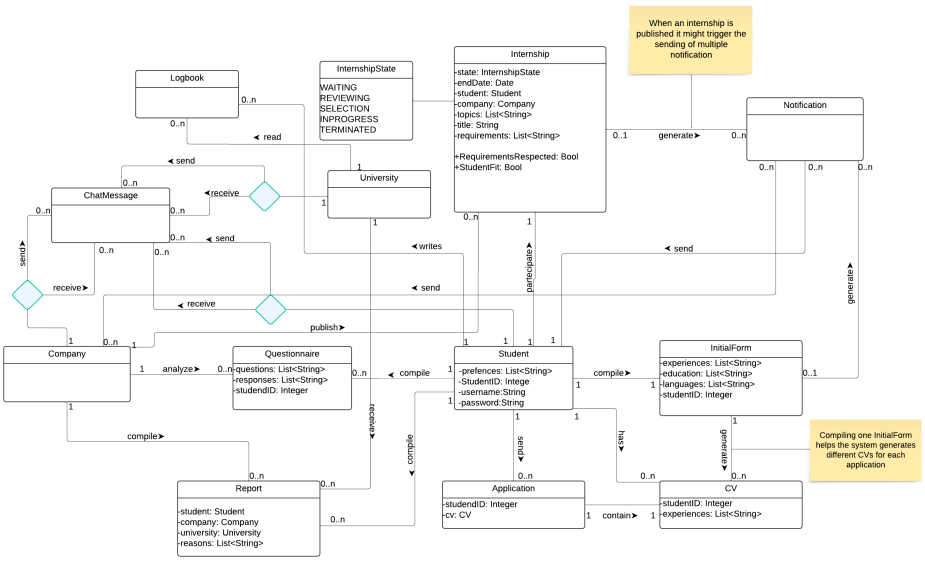


Figure 2.1: Class Diagram.

2.1.3. State diagrams

The following discusses how the state of internships and complaints evolves in time, in order to have a better understanding of their lifecycle in the model.

Internship

When an internship is created by a company, it starts in a Waiting state. During this phase, students can: receive a notification about the publication of the internship, see it in their personalized homepage or can be contacted directly by the company. From the Waiting state there are two different ways of progressing. If the company contacted the student, this means that the internship enters directly the Selection state. Instead if it is the student who contacted them, it enters the Reviewing state. Here the company makes sure that the requirements listed in the published internship are respected by reading the student's CV and looking at his profile. If the answer to the check is negative, it goes back to the Waiting State. Instead, if the check is positive, the selection state is reached. Here it starts in a Contacting state where the company and the student through the platform chat section arrange a date for the interview. Once they come to an agreement, the meeting will be posted along with the link for the virtual room in the calendar of both of the parties. During this phase the student will also be asked to answer a questionnaire. Once the date for the interview comes the selection process reaches the Interviewing state. After the interview is finished, it will reach the Evaluating state where the company determines if the student is fit for the project. If he/she's fit, the internship will start and reach the InProgress state. Instead, if it doesn't, the internship will return to the waiting state. In the InProgress state it is explained with the use of substates that from a working phase if the company/student complains, the internship enters a Complaining state. From here the flow can either go back to the Working State or directly to the Terminated state if the complaint contains a termination request. From the Working state once the internship reaches its end, it will reach the Terminated state.

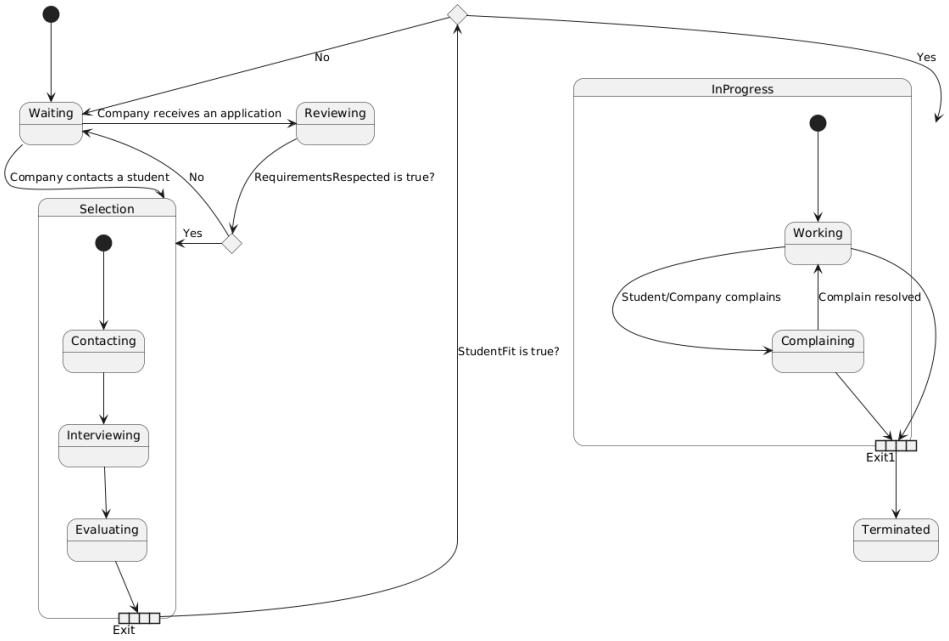


Figure 2.2: Internship state diagram.

Complaint

There are two ways of complaining, one is by opening the chat section which will permit the student and the company to communicate and resolve minor issues without involving the university. And the other one is by opening the Report Area which is a page where one of the two parties can directly communicate with the university. In this state chart, we'll analyze the processes of the second option. When a user goes to the "Report Area" section it starts the complaint process which begins from a Sending state in which the user can write all the reasons of his complaint. Once the text is well written and complete the user can send it. Once it is sent, it goes to the Reading state where the complaint sent can be read. If it is a termination request, the university, which manages the interruption of the internships, will contact both parties and let them know the collaboration is ended, represented by the Terminated state. Instead, if it is a solvable situation, from the Reading state it will move to the Resolving state where the parties will start to communicate and try to come up with a solution. If the problem is addressed, the complaint will reach the Solved state and the internship can continue (in the internship statechart it will go back to the Working state), instead if a solution isn't found, the internship will terminate and the complain will reach the Terminated state.

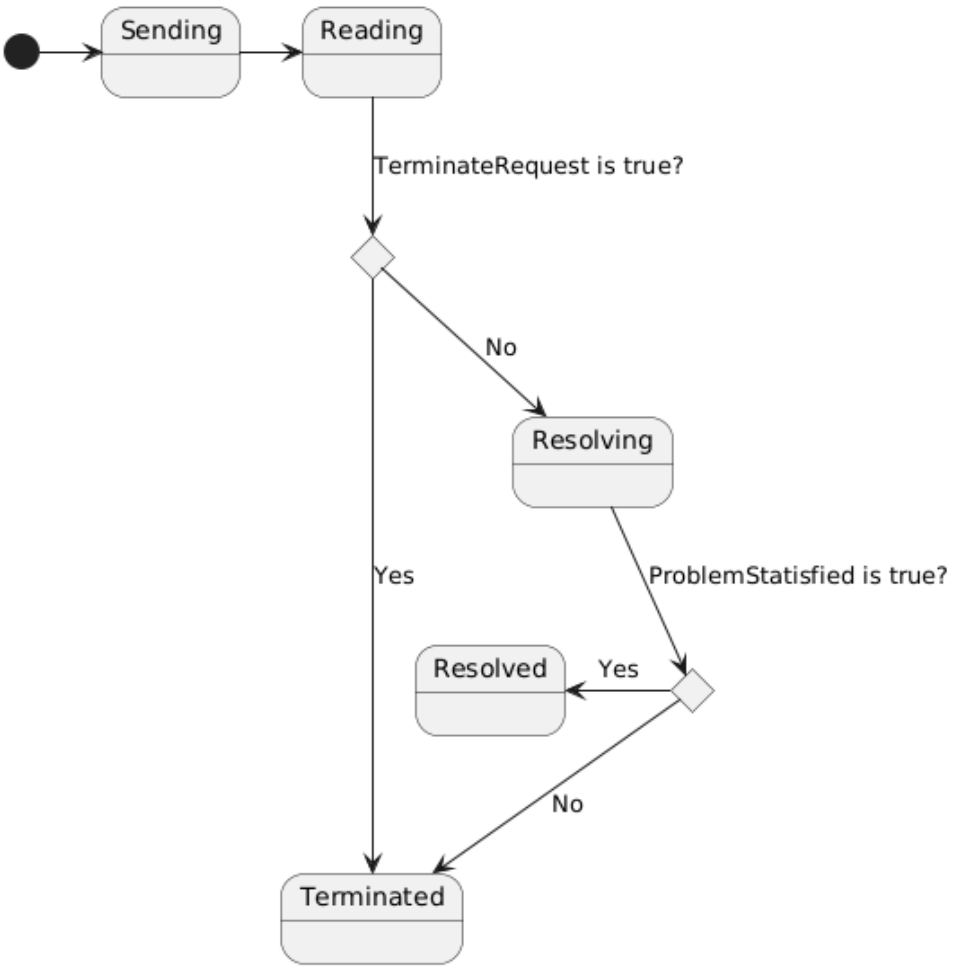


Figure 2.3: Complaint state diagram.

2.2. Product Functions

2.2.1. Reccomendation

The Recommendation Function is a core feature of the S&C platform that facilitates the matching process between students and companies by suggesting the most suitable opportunities based on the characteristics and preferences of both parties. For students the system analyzes their profiles, including their CV, skills, education, work experience, and preferences (e.g., type of internship, location, industry). Based on this data, it creates a personalized homepage where the upper internships showed are the ones that align closely with the student's qualifications and interests. Instead, for companies, the system evaluates the requirements specified in their internship offer, such as required skills, educational background, and job type. It then recommends students whose profiles best meet these criteria, providing companies with a personalized homepage of potential candidates. The recommendation process uses automated algorithms based on statistical analysis, keyword matching and possibly machine learning to identify relevant matches. Whenever a new student registers to the platform, insert his CV's information and is appetizing for a company, the system will send a notification to the company. The same

happens when a company registers and posts an internship offer that might interest a student based on his topic preferences, in this case the system will send a notification to the student and update his homepage. The Recommendation Function ensures that students are connected with internships that suit their career goals while helping companies find candidates who match their needs, creating an efficient and effective matchmaking system.

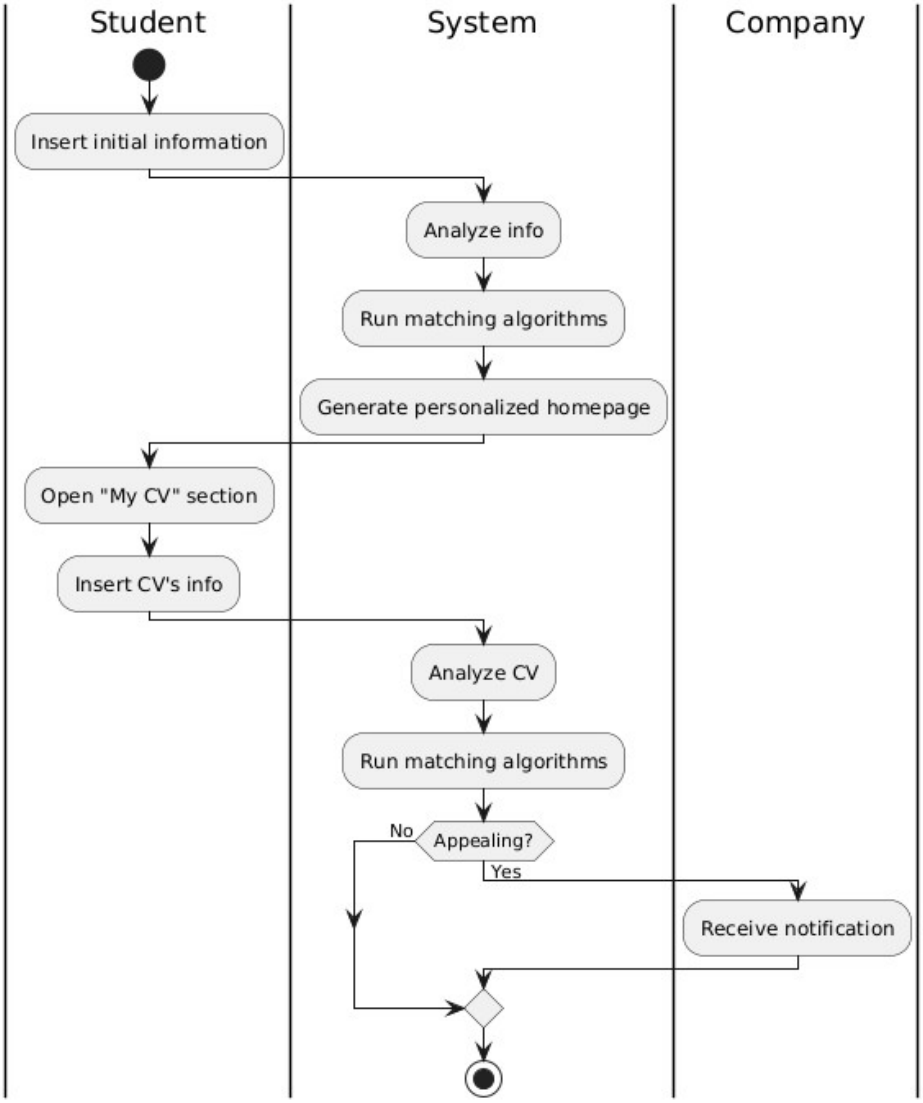


Figure 2.4: Reccomandation activity diagram.

2.2.2. Selection

The Selection Function is used by companies and manages the steps through which companies evaluate and decide which students are fit to take parts to their internship programs. With this function the platform facilitates the evaluation, interview scheduling, and final selection of candidates in an efficient and organized manner. Is used by companies which firstly review and evaluate students applications. Once they select the student that is fit for their project, they can start by contacting them and, through the platform functionalities, start to arrange meeting interviews. The selection process follows these steps; 1. Contacting: where companies evaluate and contact the student who sends them an

application or directly contact a student that caught their attention in their personalized homepage. 2. Interviewing: once they select a student they send them a questionnaire and an interview request to see if the student can be a good fit for their project. 3. Evaluating: After the interview process, if the student is fit, through the contact page offered by the platform, they can submit a formal request to start the internship with the selected student.

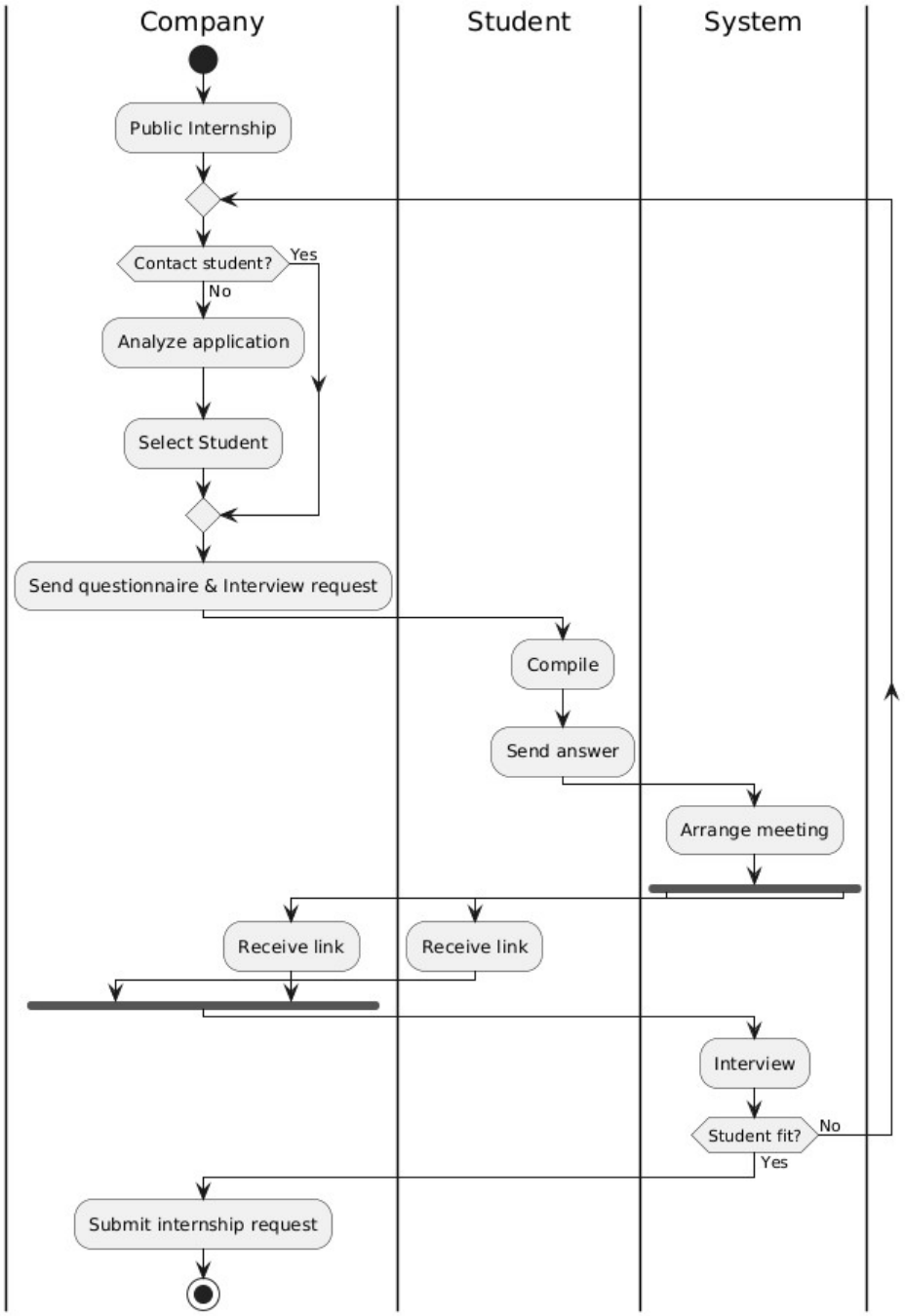


Figure 2.5: Selection activity diagram.

2.3. User charateristics

2.3.1. Student

The student is a client who is able to access the S&C platform through the SSO login. They use the platform with the goal of finding an interesting internship project to work on and learn new technologies used in a work environment. Their participation goes through several stages: first they sign into the platform, then they compile a form which asks them various information that will help S&C to create their CVs. So every time a student wants to contact a company, the system will create a personalized CV tailored for the company needs. Each student receives also a notification every time a company posts an announcement on the platform, where the requirements fit the ones described by the student in his CV.

2.3.2. Company

The company is a client which represents a business entity that uses the S&C platform to connect with students that might join their internship project programs. Companies use the platform to contribute to the students growth by offering them a real work experience. Their involvement takes place in several stages: it begins by creating a job opportunity, where they provide the title, a quick description of the internship they are offering, requirements and duration of the internships. They can manage the entire recruitment process through the platform. They can provide feedback on the student's performance during the internship or at the end of it but, more importantly, they can propose changes to the system to improve the recruitment efficiency. They can also make complaints about the student's work and ask for the termination of the internship or, more likely, contact the university to ensure that the issues that arise during the internship are addressed effectively. Each company receive a notification every time a student with the correct attributes for their project registers to the platform. The involvement of the companies helps strengthen the connection between schools and the workplace.

2.3.3. University

The university is a client that monitors and supports students during their internship. Its role is to ensure that student's learning experiences align with their educational goals and that internships meet the required standards. But also that their students are doing their job in a meticulous way by being notified from the companies when something doesn't add up. Their involvement consists in monitoring each student's progress during the internship and ensure that the experience provides meaningful learning opportunities. They are also responsible for handling complaints or issues that may arise during the internship, including resolving cases that require the internship to be interrupted.

2.4. Assumptions dependencies and constrains

The following domain assumptions must hold in the world:

D1: Students are enrolled in the university.

D2: The university and the company have an existing authetication system that can be used by the S&C platform.

D3: Students, company employee and university employee have an account on the existing authentication system.

D4: A student can conduct only one internship at a time.

D5: When a student or a company decides to terminate an internship there won't be a way to change the decision made.

D6: The matching algorithm and the analysis tool works well.

D7: The personalized CVs generated are well done.

D8: The recommended job description is well written.

D9: A student can write only one logbook at a time.

3 | Specific Requirements

3.1. External Interface Requirements

3.1.1. User Interfaces

Figure 3.1: Login page

Figure 3.2: Student Sidebar

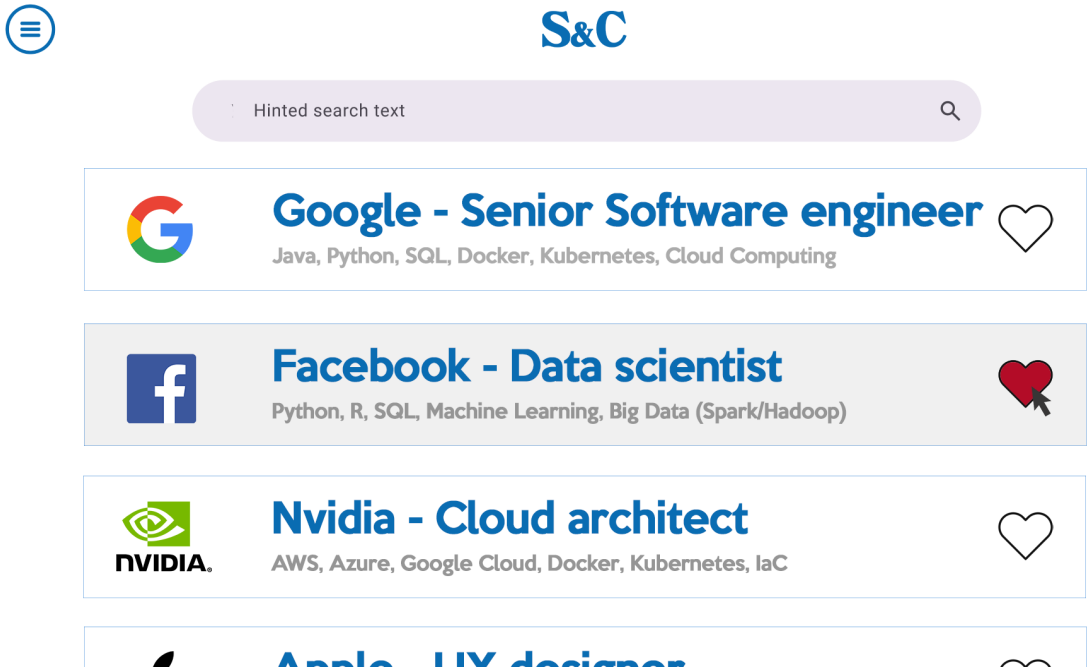


Figure 3.3: HomePage Student

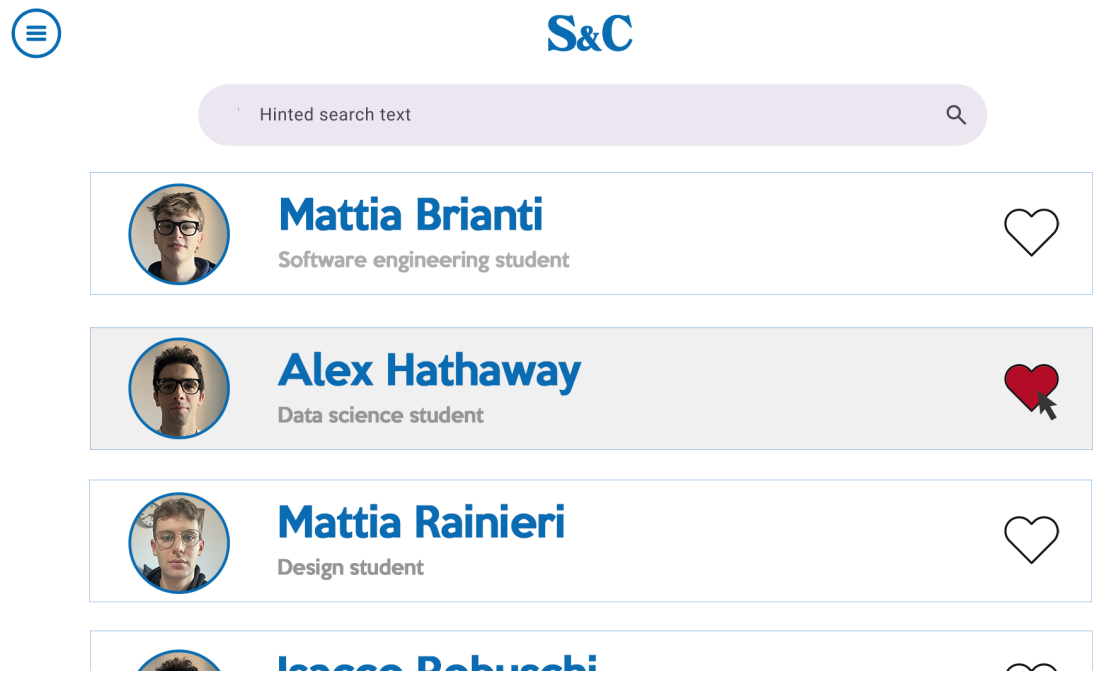


Figure 3.4: HomePage Company

3.1.2. Hardware Interfaces

The system does not need any specific hardware, each user will need a browser with an Internet connection in order to communicate with the platform's servers.

3.1.3. Software Interfaces

1. **Videocall meeting**
2. **AI tool for matchmaking**
3. **Databases Interface**

3.1.4. Comunication Interfaces

1. **eduGAIN Radius** - in order to allow a native single sign-on for all European universities. [1]
2. **OAuth2** - is a very commonly used standard in the enterprise environment, to consent the adoption of Single Sign On (SSO) with external platform.
3. **HyperText Transfer Protocol over Secure Socket Layer (HTTPS)** - used for all communications between client and server.
4. **Simple Mail Transfer Protocol (SMTP)** - , a standard protocol for email transmission, which is used by this platform to send notifications through email.

3.2. Functional Requirements

R1: The system shall allow users to log in with SSO.

R2: The system shall allow the student to provide information for their CVs.

- **R2.1**: The system shall allow the students to specify their personal information, like name, contact and personal ambition.
- **R2.2**: The system shall allow the students to specify their education experience, including their academic background.
- **R2.3**: The system shall allow the students to specify their past work experience, specifying job title, company name, duration and technologies used.
- **R2.4**: The system will allow students to specify their technical and soft skills.
- **R2.5**: The system shall allow the students to specify their project and research, including the title, duration and description
- **R2.6**: The system shall allow the students to specify their extracurricular activities, including the name, organization and achievements.
- **R2.7**: The system will allow students to specify their knowledge of languages, including the level and any certifications.
- **R2.8**: The system shall allow students to specify their availability.
- **R2.9**: The system will allow the students to add additional information.

R3: The system shall allow the students to join an internship.

- **R3.1**: The system shall help the students to create a customized CV for each company.

R4: The system shall allow the students to be notified when a new applicable internship becomes available.

R5: The system shall allow the company employee to create an internship.

- **R5.1**: The system shall allow the company employee to specify the title of the internship.
- **R5.2**: The system shall allow the company employee to specify the description, helped by an AI, of the internship.
- **R5.3**: The system shall allow the company employee to specify the requirement of the internship.
- **R5.4**: The system shall allow the company employee to specify the duration of the internship.

R5.5: The system shall allow the company employee to specify the availability of the internship.

R5.6: The system shall allow the company employee to specify other information about the internship.

R6: The system shall allow the company employee to be notified when a new potentially interesting student becomes available.

R7: The system shall allow the student to view a personalized homepage after inserting his CV's information.

R8: The system shall allow the company employee to view a personalized homepage after publishing an internship.

R9: The system shall allow the company to write a complaint to the university.

R10: The system shall allow the students to write a complaint to the university.

R11: The system shall allow students to chat with his company.

R12: The system shall allow companies employee to chat with his trainee.

R13: The system shall allow universities employee to chat with his students.

R14: The system shall allow the student to insert initial information.

R15: The system shall allow the student and the company to arrange a meeting.

R16: The system shall send a meeting link for the interview to the student and the company.

R17: The system shall allow the student to write on a logbook to inform the university on the status of his internship.

3.2.1. Use case diagrams

Student

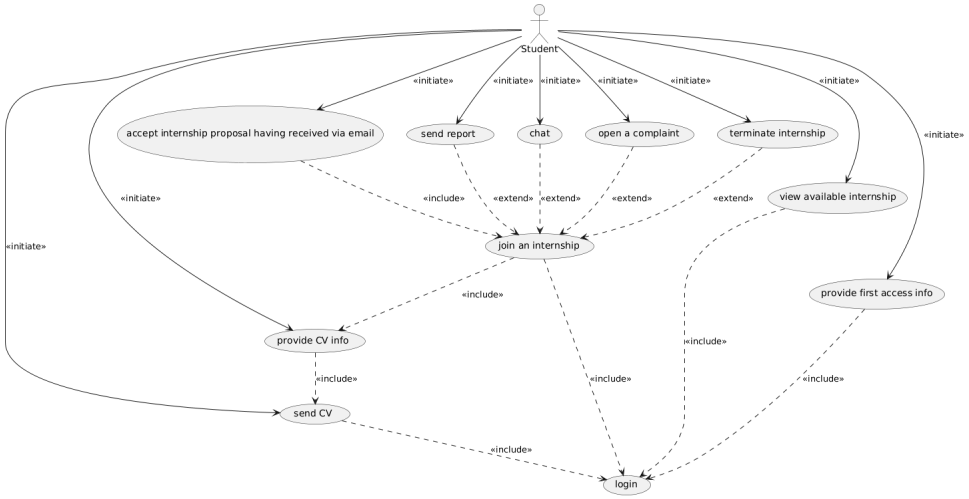


Figure 3.5: Student's use case diagram.

Company employee

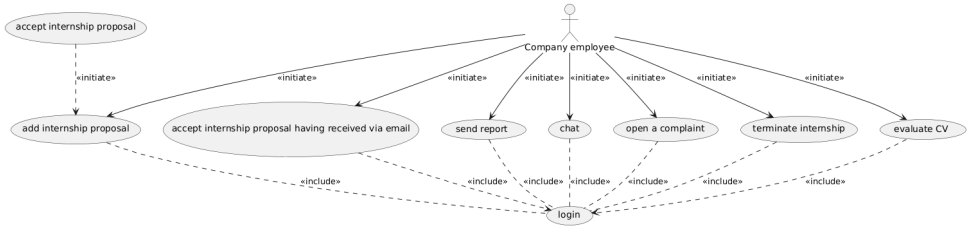


Figure 3.6: Company employee's use case diagram.

University employee

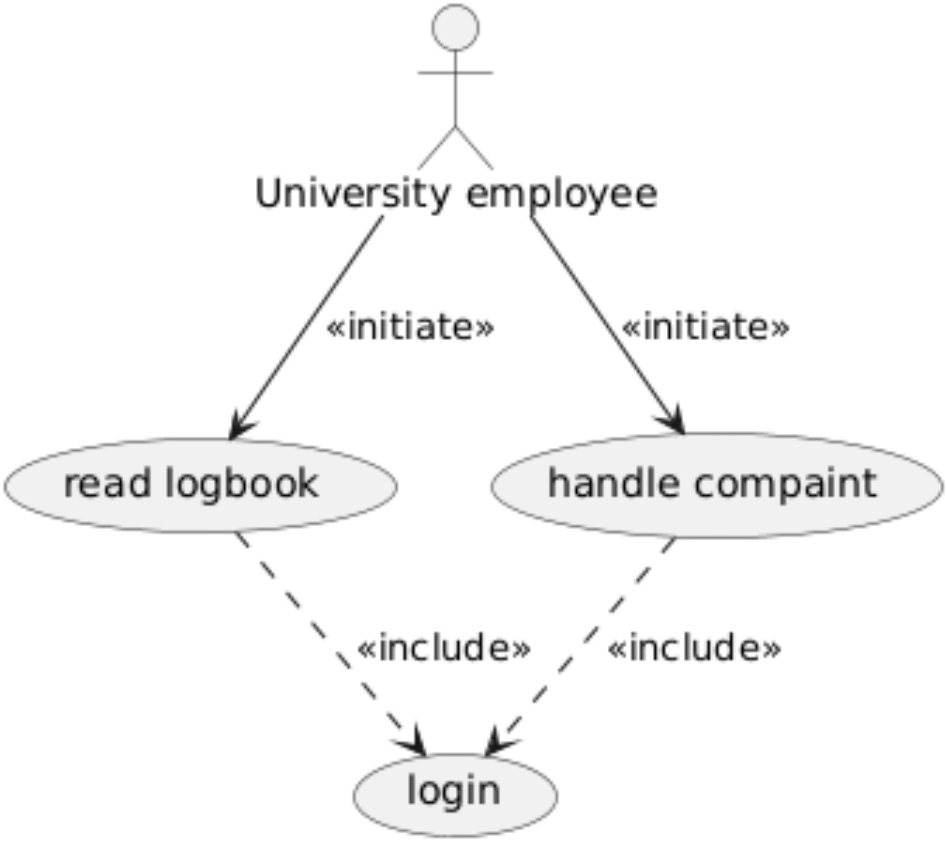


Figure 3.7: University employee's use case diagram.

3.2.2. Use cases

UC1

Name	Student's first platform access
Actor	Student
Entry condition	• Student has never accessed the platform
Event flow	1. The student, who has an internet connection, inserts the URL in the browser. 2. The student clicks on the login button. 3. The student inserts his email and will be redirected to the university SSO. 4. The students selects his academic interests.
Exit condition	The student is redirected to the homepage
Exception	Student's credentials are not valid. In this case a pop up will be shown with a message to that effect.

Table 3.1: Student's first platform access

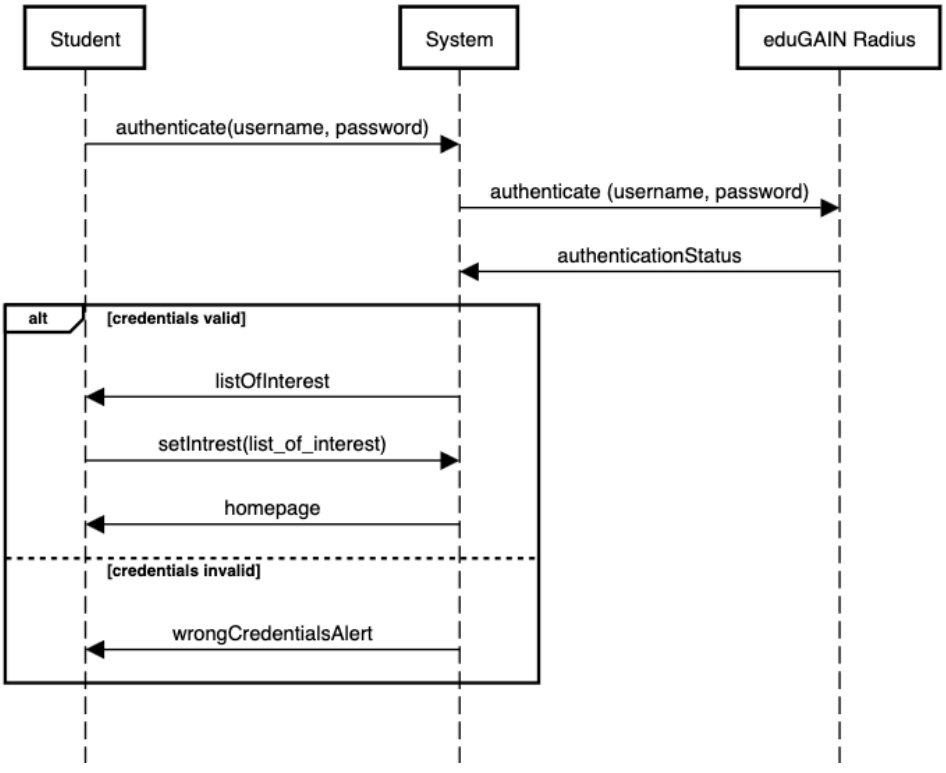


Figure 3.8: Student's first platform access.

UC2

Name	Student inserts his CV information in the InitialForm
Actor	Student
Entry condition	• Student is already logged in • Student has never provided his information in "My CV" section
Event flow	1. The student press on the contact button. 2. The student, altered by a pop-up, follows the redirect to the "My CV" page. 3. The student fills out the form. 4. The student click on the save button.
Exit condition	The system will show a message confirming the success of the operation.
Exception	Student misses to compile some fields. In this case, an alert pop-up is shown.

Table 3.2: Student inserts his CV information in the InitialForm.

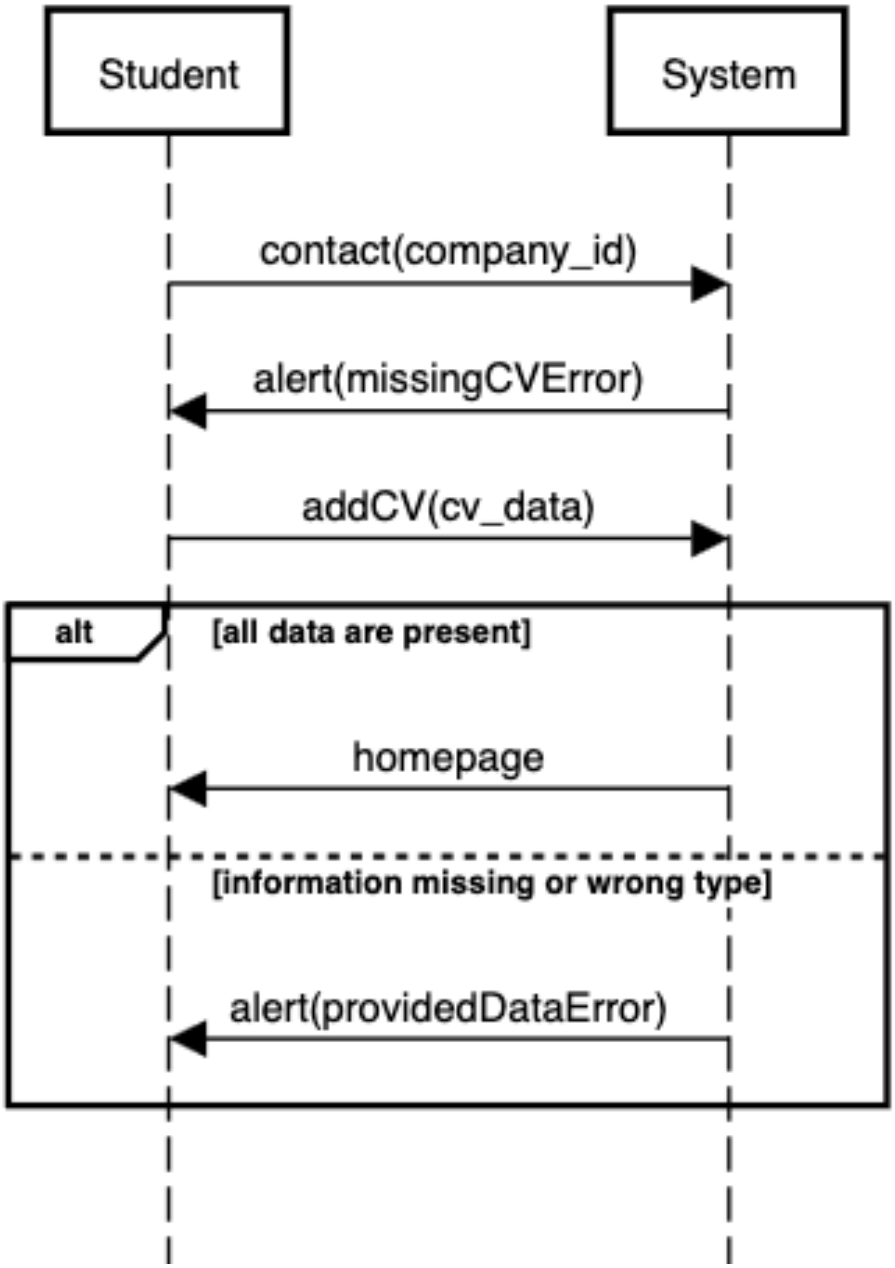


Figure 3.9: Student inserts his CV information in the InitialForm.

UC3

Name	Student search and contact the company
Actor	Student, Company Employee
Entry condition	• Student is already logged in • Student has already compiled his Curriculum Vitae
Event flow	1. The student opens the homepage. 2. The student clicks on contact button next to the interested company. 3. The platform generates a customized CV. 4. The student reads the proposal customized and send it. 5. The company receives the customized CV.
Exit condition	The company employee approves the student's CV.
Exception	• The student does not approve the customized CV proposed by the platform. In this case, the student manually modifies it. • The company employee does not approve the student's CV. In this case, the employee can reject the proposal.

Table 3.3: Student search and contact the company.

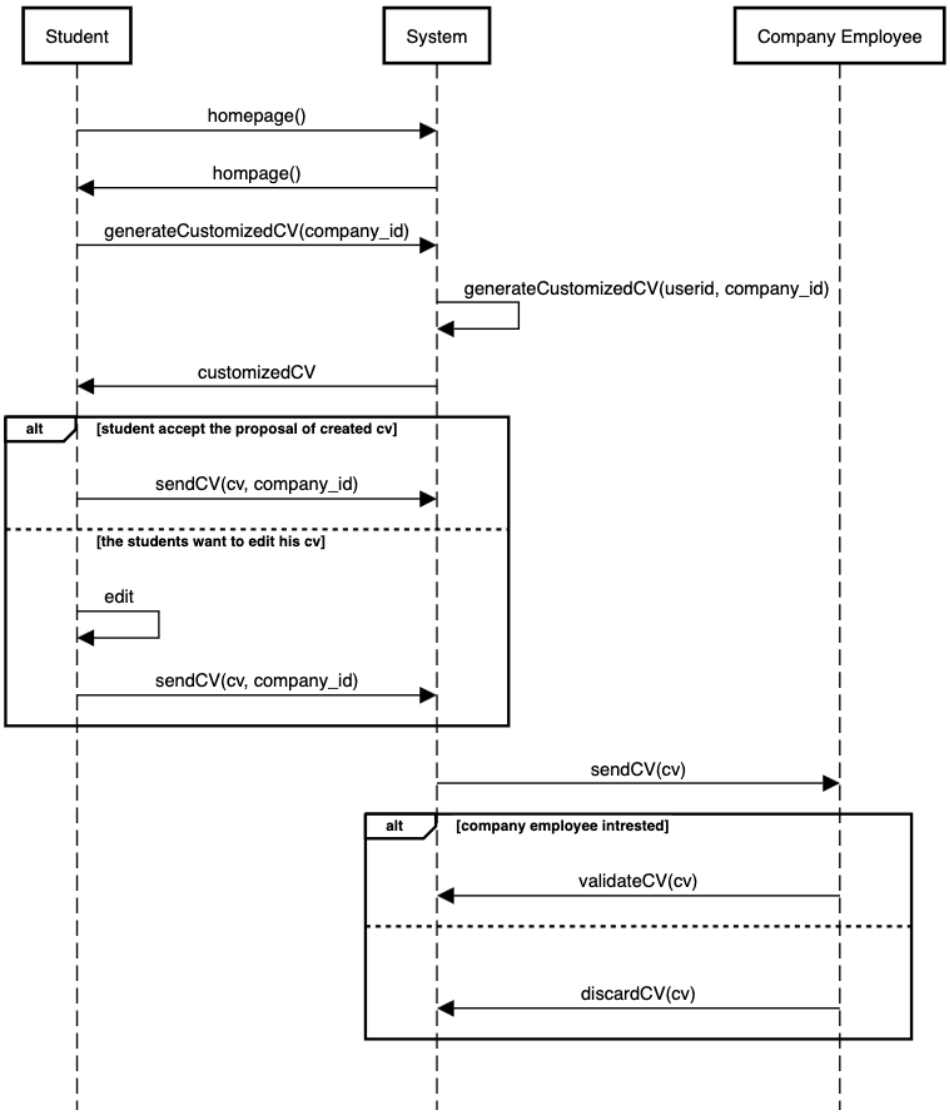


Figure 3.10: Student search and contact the company.

UC4

Name	A company publishes an advertisement about the internships they are offering
Actor	Company Employee, Student possibly interested on that opportunity.
Entry condition	• Company was already approved on the platform
Event flow	1. The company employee logs in using his company's credentials. 2. The company employee opens the "Create Job Opportunity" page. 3. The company employee inserts all the information requested into the platform. 4. A successful message is shown, and, after a couple of seconds, the company employee is redirected to the homepage.
Exit condition	Interested students receive a notification
Exception	Company employee has not completed all fields in the form. In this case, an alert message is shown.

Table 3.4: A company publishes an advertisement about the internships they are offering.

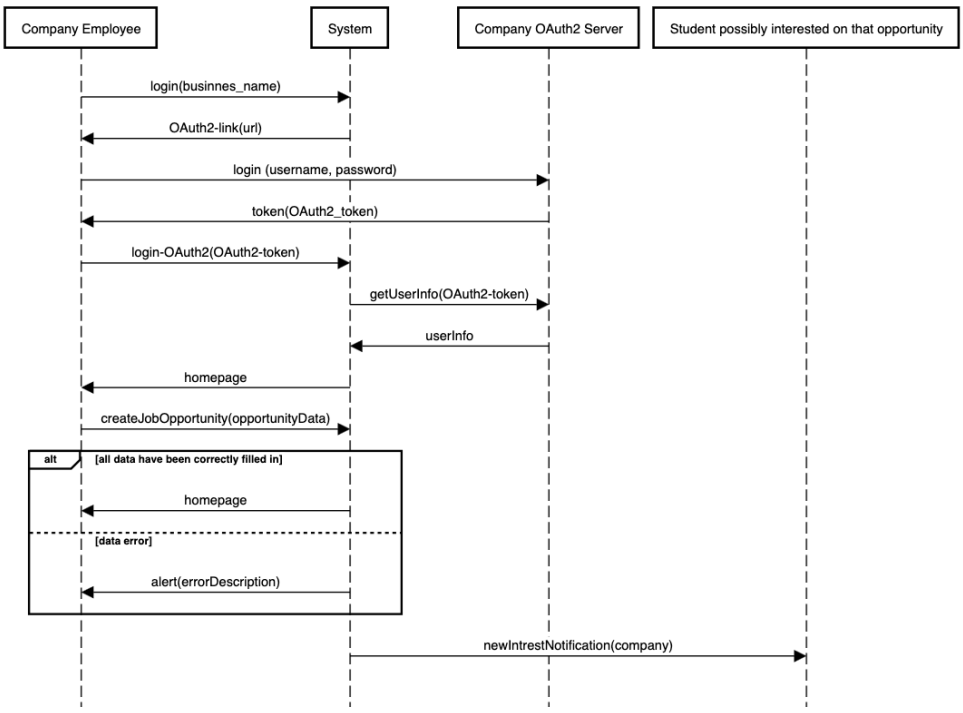


Figure 3.11: A company publishes an advertisement about the internships they are offering.

UC5

Name	Student search through the internships and contact the company
Actor	Student, Company Employee
Entry condition	• Student is already logged in • Student has already compiled his Curriculum Vitae • A Company has published an internship that may interest the student.
Event flow	1. The student receive an email. 2. The student click on the link contained in the email. 3. The student is interested on that specific internship, so he presses the "Contact" button. 4. The student approves the custom generated CV.
Exit condition	Student clicks the "Send" button.
Exception	• The student is not interested in the proposed internship. In this case, the student simply ignores the notification. • The student does not approve the customized CV proposed by the platform. In this case, the student must manually modify it.

Table 3.5: Student searches through available internships and contacts the company.

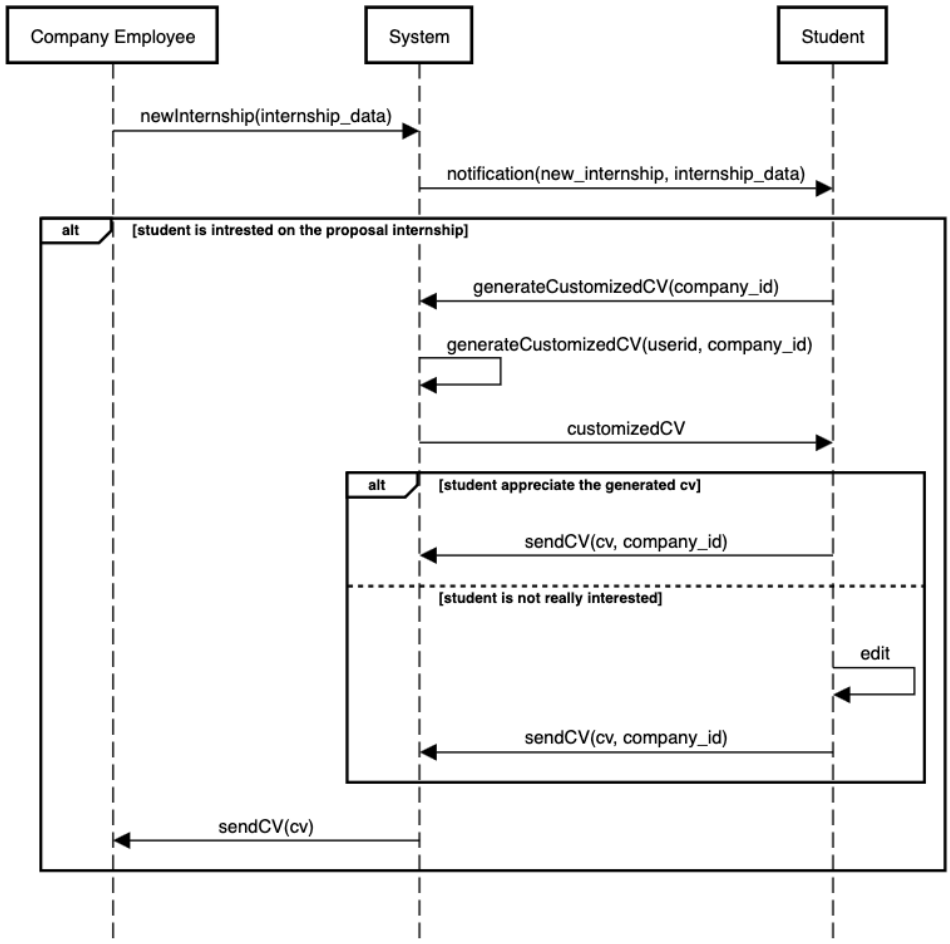


Figure 3.12: Student search through the internships and contact the company.

UC6

Name	A company receives a notification about the availability of a student CV corresponding to their needs
Actor	Student, Company Employee
Entry condition	• Students has just completed his "My CV" section
Event flow	1. The system will start a matchmaking process between the student and opened internship positions. 2. The system sends a notification to all of the company employees who may be interested in the new student. 3. The company employee, who receives the notification, clicks on the "View Profile" button to obtain more detailed information about his CV. 4. The company employee clicks on send message, near the student name, to contact him.
Exit condition	The company employee sends a message to the student
Exception	The company employee does not really feel interested in the student's proposal. In this case, he just ignores the mail.

Table 3.6: A company receives a notification about the availability of a student CV corresponding to their needs.

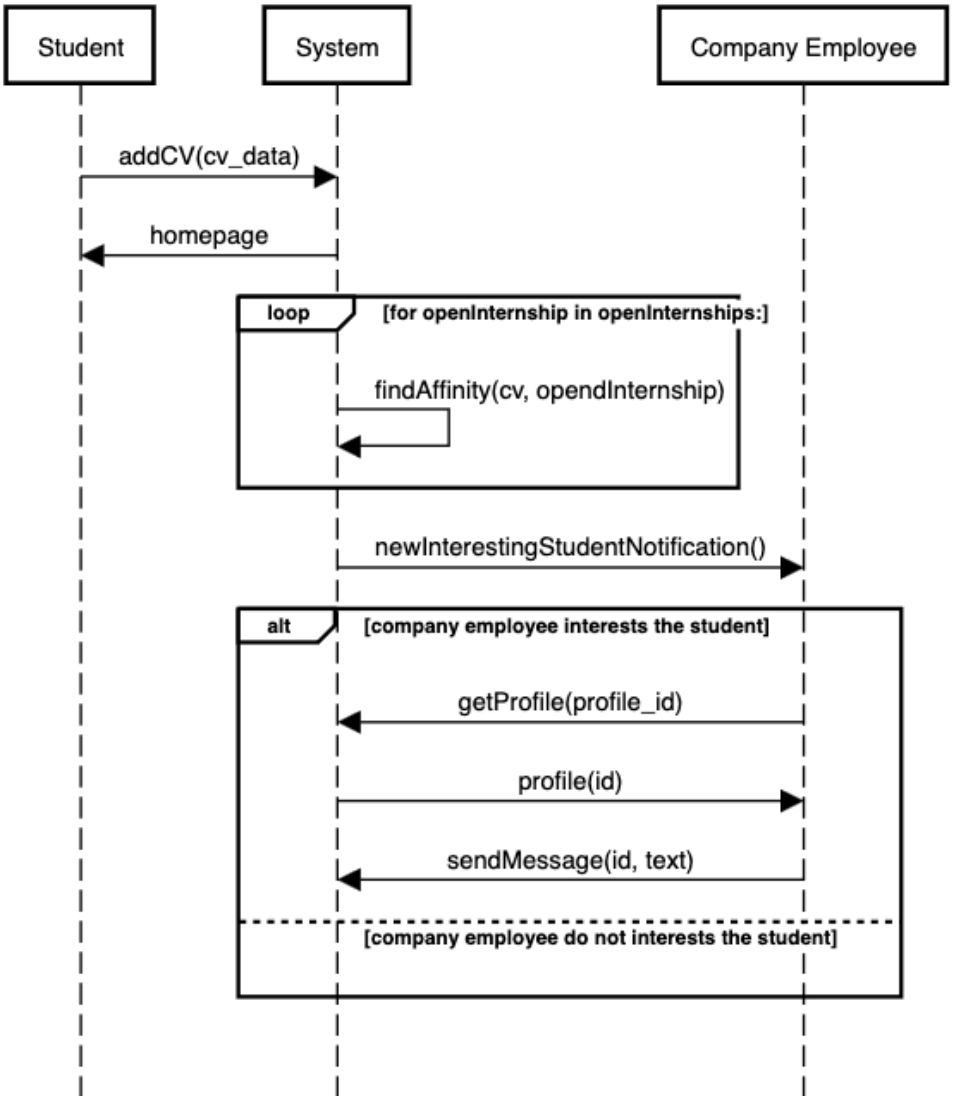


Figure 3.13: A company receives a notification about the availability of a student CV corresponding to their needs.

UC7

Name	Student gives final feedback about the internship
Actor	Student
Entry condition	• Student has just finished his internship
Event flow	1. The student opens the sidebar and click on "Report" button. 2. The system recognizes that he has just finished an internship, so shows the "Give us your final feedback" form. 3. The student fills the form.
Exit condition	Click on "Submit" button
Exception	The student does not want to provide his feedback. In this case, no actions are required.

Table 3.7: Student gives final feedback about the internship.

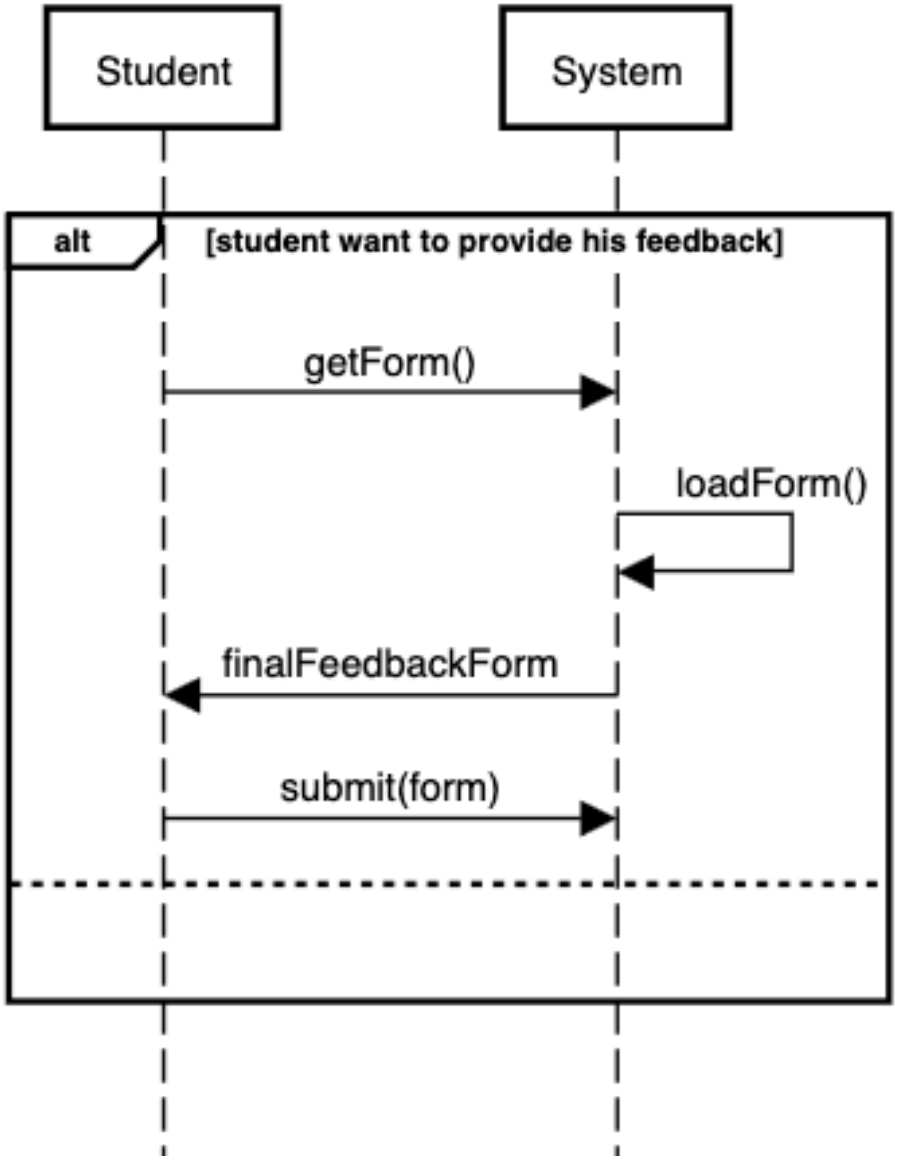


Figure 3.14: Student gives final feedback about the internship.

UC8

Name	The University receive the request to end an internship from a student and contacts the company to end it
Actor	University employee
Entry condition	• University employee receives an email
Event flow	1. The university employee clicks on the "See complaint" button in the email, so a new page is opened. 2. The university employee opens the student's profile by clicking on his name. 3. The university employee clicks on "Terminate Internship" button.
Exit condition	The university employee confirms the pop-up.
Exception	

Table 3.8: University receive the request of ending an internship from a student and contacts the company to end it.

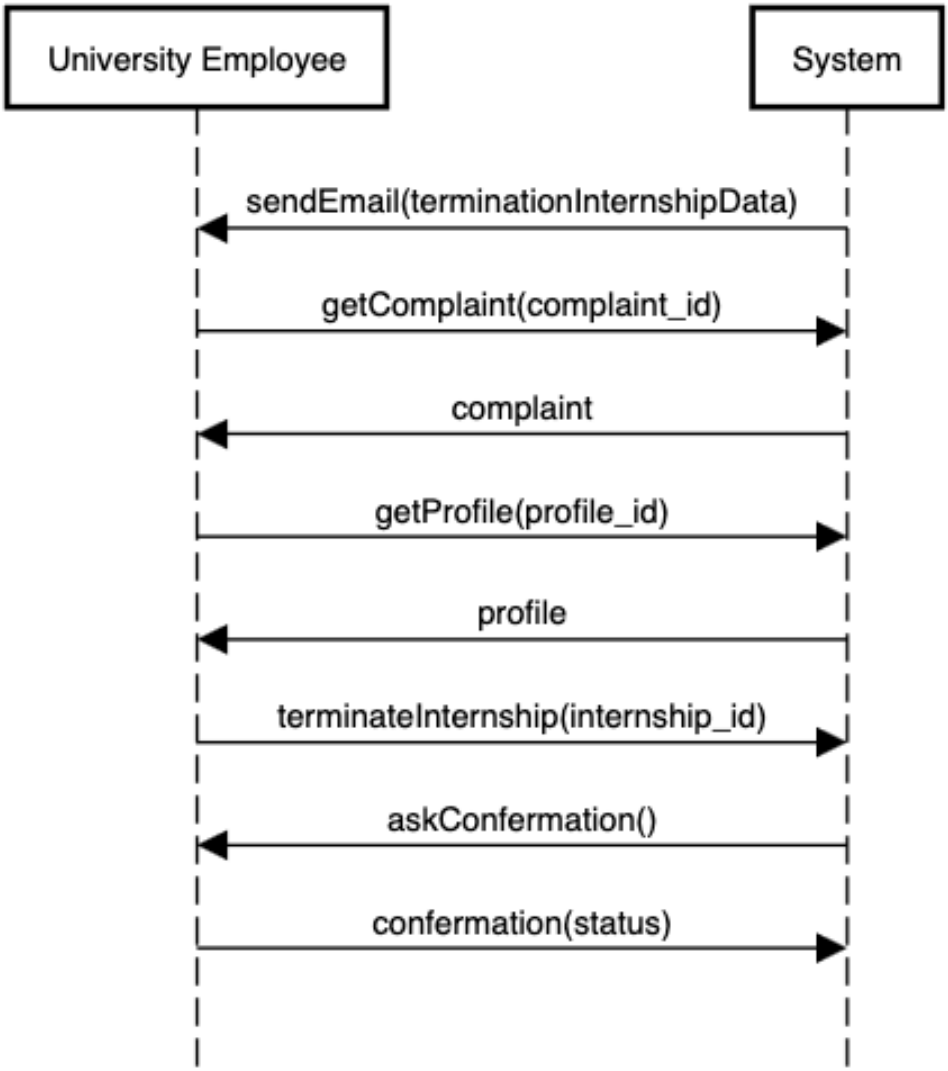


Figure 3.15: University receive the request of ending an internship from a student and contacts the company to end it.

UC9

Name	Student complains with the university on the "Report Area" about his ongoing internship
Actor	Student
Entry condition	• The student is not satisfied with his internship
Event flow	1. The students open the S&C portal and opens the "Report Area" page. 2. The student completes the form.
Exit condition	Click on "Submit" button
Exception	The student wants re-try to communicate with his company. In this case, the student will send a message through the chat.

Table 3.9: Student complains with the university on the "Report Area" about his ongoing internship.

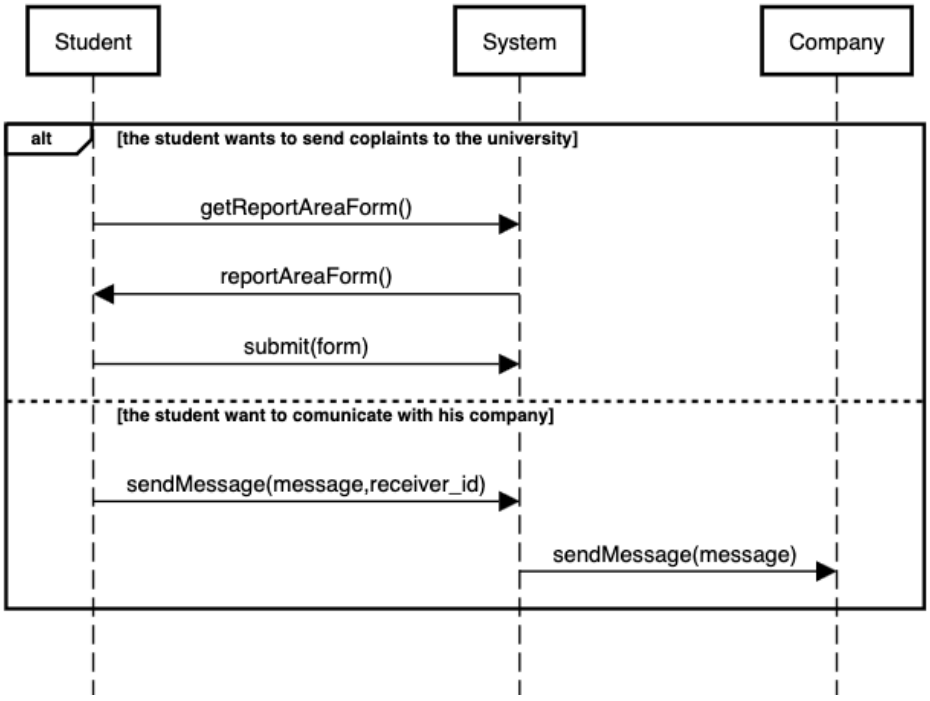


Figure 3.16: Student complains with the university on the "Report Area" about his ongoing internship.

UC10

Name	The company complains about the student in the internship
Actor	Company employee, university employee
Entry condition	• The company is not satisfied with the student internship
Event flow	1. The company employee open the S&C portal and opens the "Report Area" page. 2. The company employee selects the involved student's name. 3. The company employee clicks on "Report" button in student's page. 4. The company employee now can fill out the form, describing the problem details. 5. The company employee clicks on "Submit" button
Exit condition	The University receives a notification about the report.
Exception	Some form values are missing. In this case, an alert pop-up will be shown.

Table 3.10: The company complains about the student taking the internship.

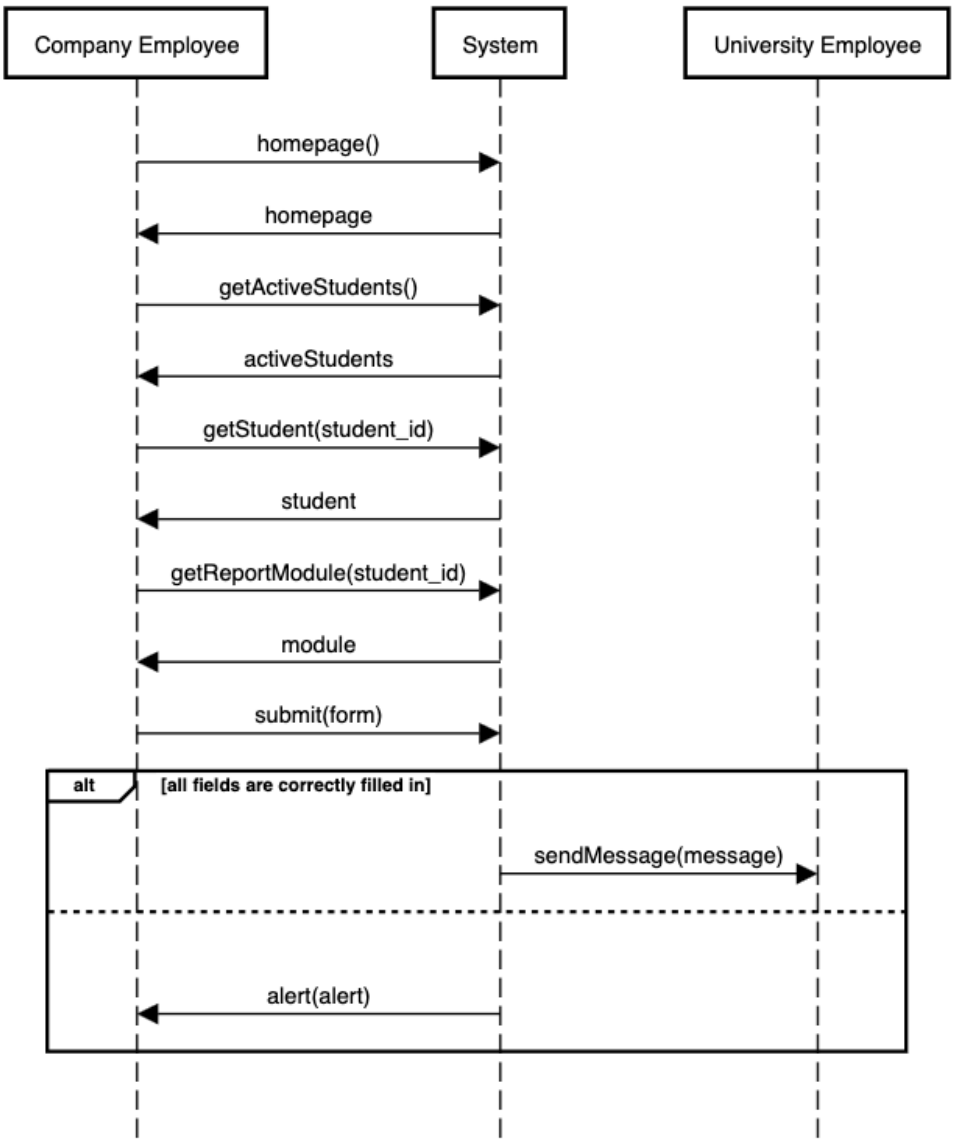


Figure 3.17: The company complains about the student taking the internship.

3.2.3. Requirements mapping

This section shows how the $R \wedge D \models G$ holds. In particular, the following traceability matrix associates domain assumptions and requirements to goals. After that, to facilitate reading, the text of all the assumptions and all the requirements related to each goal is reported.

Goal ID	Requirement ID	Domain assumption ID
G1	R1, R2, R2.1, R2.2, R2.3, R2.4, R2.5, R2.6, R2.7, R2.8, R2.9	D1, D2, D3
G2	R1, R5, R5.1, R5.2, R5.3, R5.4, R5.5, R5.6	D1, D2, D3
G3	R1, R5,R5.2, R5.3, R5.4, R5.5, R5.6 R13	D1, D2, D3, D6, D8
G4	R1, R4, R5, R5.1, R5.2, R5.3, R5.4, R5.5, R5.6	D1, D2, D3, D6
G5	R1, R2, R2.1, R2.2, R2.3, R2.4, R2.5, R2.6, R2.7, R2.8, R2.9, R5, R5.1, R5.2, R5.3, R5.4, R5.5, R5.6, R6	D1, D2, D3, D6
G6	R1, R2, R2.1, R2.2, R2.3, R2.4, R2.5, R2.6, R2.7, R2.8, R2.9, R4, R5, R5.1, R5.2, R5.3, R5.4, R5.5, R5.6, R6, R7, R8	D1, D2, D3, D6
G7	R1, R2, R2.1, R2.2, R2.3, R2.4, R2.5, R2.6, R2.7, R2.8, R2.9, R5,R5.1, R5.2, R5.3, R5.4, R5.5, R5.6, R11, R12	D1, D2, D3
G8	R1, R2, R2.1, R2.2, R2.3, R2.4, R2.5, R2.6, R2.7, R2.8, R2.9, R3, R5, R5.1, R5.2, R5.3, R5.4, R5.5, R5.6, R12, R13, R15, R16	D1, D2, D3,
G9	R1, R2, R2.1, R2.2, R2.3, R2.4, R2.5, R2.6, R2.7, R2.8, R2.9, R3, R5, R5.1, R5.2, R5.3, R5.4, R5.5, R5.6,R7, R17	D1, D2, D3, D9
G10	R1, R3, R5, R5.1, R5.2, R5.3, R5.4, R5.5, R5.6 R9, R10, R13, R17	D1, D2, D3, D9
G11	R1, R3, R5, R5.1, R5.2, R5.3, R5.4, R5.5, R5.6, R9, R12	D1, D2, D3, D5
G12	R1, R2, R2.1, R2.2, R2.3, R2.4, R2.5, R2.6, R2.7, R2.8, R2.9, R3, R5, R5.1, R5.2, R5.3, R5.4, R5.5, R5.6, R10, R11, R12, R13	D1, D2, D3, D5

Table 3.11: Traceability matrix

G1: Students can insert their experiences, skills and attitudes in the InitialForm

R1: The system shall allow users to log in with SSO.

R2: The system shall allow the student to provide information for their CVs.

R2.1: The system shall allow the students to specify their personal information, like name, contact and personal ambition.

R2.2: The system shall allow the students to specify their education experience, including their academic background.

R2.3: The system shall allow the students to specify their past work experience,

specifying job title, company name, duration and technologies used.

R2.4: The system will allow students to specify their technical and soft skills.

R2.5: The system shall allow the students to specify their project and research, including the title, duration and description

R2.6: The system shall allow the students to specify their extracurricular activities, including the name, organization and achievements.

R2.7: The system will allow students to specify their knowledge of languages, including the level and any certifications.

R2.8: The system shall allow students to specify their availability.

R2.9: The system will allow the students to add additional information.

D1: Students are enrolled in the university.

D2: The university and the company have an existing authetication system that can be used by the S&C platform.

D3: Students, company employee and university employee have an account on the existing authentication system.

G2: Companies can post the projects students will work on during their internships (specifying topics, tasks and technologies) with the relative compensation and benefits

R1: The system shall allow users to log in with SSO.

R5: The system shall allow the company employee to create an internship.

R5.1: The system shall allow the company employee to specify the title of the internship.

R5.2: The system shall allow the company employee to specify the description, helped by an AI, of the internship.

R5.3: The system shall allow the company employee to specify the requirement of the internship.

R5.4: The system shall allow the company employee to specify the duration of the internship.

R5.5: The system shall allow the company employee to specify the availability of the internship.

R5.6: The system shall allow the company employee to specify other information about the internship.

D1: Students are enrolled in the university.

D2: The university and the company have an existing authetication system that can be used by the S&C platform.

D3: Students, company employee and university employee have an account on the existing authentication system.

G3: Students can initiate the process by going through the available internships

R1: The system shall allow users to log in with SSO.

R5: The system shall allow the company employee to create an internship.

R5.1: The system shall allow the company employee to specify the title of the internship.

R5.2: The system shall allow the company employee to specify the description, helped by an AI, of the internship.

R5.3: The system shall allow the company employee to specify the requirement of the internship.

R5.4: The system shall allow the company employee to specify the duration of the internship.

R5.5: The system shall allow the company employee to specify the availability of the internship.

R5.6: The system shall allow the company employee to specify other information about the internship.

R13: The system shall allow universities employee to chat with his students.

D1: Students are enrolled in the university.

D2: The university and the company have an existing authetication system that can be used by the S&C platform.

D3: Students, company employee and university employee have an account on the existing authentication system.

D6: The matching algorithm and the analysis tool works well.

D8: The recommended job description is well written.

G4: Students can be notified when an internship that might interest them becomes available

R1: The system shall allow users to log in with SSO.

R4: The system shall allow the students to be notified when a new applicable internship becomes available.

R5: The system shall allow the company employee to create an internship.

R5.1: The system shall allow the company employee to specify the title of the internship.

R5.2: The system shall allow the company employee to specify the description, helped by an AI, of the internship.

R5.3: The system shall allow the company employee to specify the requirement of the internship.

R5.4: The system shall allow the company employee to specify the duration of the internship.

R5.5: The system shall allow the company employee to specify the availability of the internship.

R5.6: The system shall allow the company employee to specify other information about the internship.

D1: Students are enrolled in the university.

D2: The university and the company have an existing authetication system that can be used by the S&C platform.

D3: Students, company employee and university employee have an account on the existing authentication system.

G5: Companies can be notified about the availability of students corresponding to their needs

R1: The system shall allow users to log in with SSO.

R2: The system shall allow the student to provide information for their CVs.

R2.1: The system shall allow the students to specify their personal information, like name, contact and personal ambition.

R2.2: The system shall allow the students to specify their education experience, including their academic background.

R2.3: The system shall allow the students to specify their past work experience, specifying job title, company name, duration and technologies used.

R2.4: The system will allow students to specify their technical and soft skills.

R2.5: The system shall allow the students to specify their project and research, including the title, duration and description

R2.6: The system shall allow the students to specify their extracurricular activities, including the name, organization and achievements.

R2.7: The system will allow students to specify their knowledge of languages, including the level and any certifications.

R2.8: The system shall allow students to specify their availability.

R2.9: The system will allow the students to add additional information.

R5: The system shall allow the company employee to create an internship.

R5.1: The system shall allow the company employee to specify the title of the internship.

R5.2: The system shall allow the company employee to specify the description, helped by an AI, of the internship.

R5.3: The system shall allow the company employee to specify the requirement of the internship.

R5.4: The system shall allow the company employee to specify the duration of the internship.

R5.5: The system shall allow the company employee to specify the availability of the internship.

R5.6: The system shall allow the company employee to specify other information about the internship.

D1: Students are enrolled in the university.

D2: The university and the company have an existing authetication system that can be used by the S&C platform.

D3: Students, company employee and university employee have an account on the existing authentication system.

D6: The matching algorithm and the analysis tool works well.

G6: Students and companies can accept or decline a recommendation

R1: The system shall allow users to log in with SSO.

R2: The system shall allow the student to provide information for their CVs.

R2.1: The system shall allow the students to specify their personal information, like name, contact and personal ambition.

R2.2: The system shall allow the students to specify their education experience, including their academic background.

R2.3: The system shall allow the students to specify their past work experience, specifying job title, company name, duration and technologies used.

R2.4: The system will allow students to specify their technical and soft skills.

R2.5: The system shall allow the students to specify their project and research, including the title, duration and description

R2.6: The system shall allow the students to specify their extracurricular activities, including the name, organization and achievements.

R2.7: The system will allow students to specify their knowledge of languages, including the level and any certifications.

R2.8: The system shall allow students to specify their availability.

R2.9: The system will allow the students to add additional information.

R5: The system shall allow the company employee to create an internship.

R5.1: The system shall allow the company employee to specify the title of the internship.

R5.2: The system shall allow the company employee to specify the description, helped by an AI, of the internship.

R5.3: The system shall allow the company employee to specify the requirement of the internship.

R5.4: The system shall allow the company employee to specify the duration of the internship.

R5.5: The system shall allow the company employee to specify the availability of the internship.

R5.6: The system shall allow the company employee to specify other information about the internship.

R6: The system shall allow the company employee to be notified when a new potentially interesting student becomes available.

R7: The system shall allow the student to view a personalized homepage after inserting his CV's information.

R8: The system shall allow the company employee to view a personalized homepage after publishing an internship.

D1: Students are enrolled in the university.

D2: The university and the company have an existing authetication system that can be used by the S&C platform.

D3: Students, company employee and university employee have an account on the existing authentication system.

D6: The matching algorithm and the analysis tool works well.

G7: Companies can interview students

R1: The system shall allow users to log in with SSO.

R2: The system shall allow the student to provide information for their CVs.

R2.1: The system shall allow the students to specify their personal information, like name, contact and personal ambition.

R2.2: The system shall allow the students to specify their education experience, including their academic background.

R2.3: The system shall allow the students to specify their past work experience, specifying job title, company name, duration and technologies used.

R2.4: The system will allow students to specify their technical and soft skills.

R2.5: The system shall allow the students to specify their project and research, including the title, duration and description

R2.6: The system shall allow the students to specify their extracurricular activities, including the name, organization and achievements.

R2.7: The system will allow students to specify their knowledge of languages, including the level and any certifications.

R2.8: The system shall allow students to specify their availability.

R2.9: The system will allow the students to add additional information.

R5: The system shall allow the company employee to create an internship.

R5.1: The system shall allow the company employee to specify the title of the internship.

R5.2: The system shall allow the company employee to specify the description, helped by an AI, of the internship.

R5.3: The system shall allow the company employee to specify the requirement of the internship.

R5.4: The system shall allow the company employee to specify the duration of the internship.

R5.5: The system shall allow the company employee to specify the availability of the internship.

R5.6: The system shall allow the company employee to specify other information about the internship.

R11: The system shall allow students to chat with his company.

R12: The system shall allow companies employee to chat with his trainee.

D1: Students are enrolled in the university.

D2: The university and the company have an existing authetication system that can be used by the S&C platform.

D3: Students, company employee and university employee have an account on the existing authentication system.

G8: Students and Companies can monitor the execution and the outcomes of the selection procedure

R1: The system shall allow users to log in with SSO.

R2: The system shall allow the student to provide information for their CVs.

R2.1: The system shall allow the students to specify their personal information, like name, contact and personal ambition.

R2.2: The system shall allow the students to specify their education experience, including their academic background.

R2.3: The system shall allow the students to specify their past work experience, specifying job title, company name, duration and technologies used.

R2.4: The system will allow students to specify their technical and soft skills.

R2.5: The system shall allow the students to specify their project and research, including the title, duration and description

R2.6: The system shall allow the students to specify their extracurricular activities, including the name, organization and achievements.

R2.7: The system will allow students to specify their knowledge of languages, including the level and any certifications.

R2.8: The system shall allow students to specify their availability.

R2.9: The system will allow the students to add additional information.

R5: The system shall allow the company employee to create an internship.

R5.1: The system shall allow the company employee to specify the title of the internship.

R5.2: The system shall allow the company employee to specify the description, helped by an AI, of the internship.

R5.3: The system shall allow the company employee to specify the requirement of the internship.

R5.4: The system shall allow the company employee to specify the duration of the internship.

R5.5: The system shall allow the company employee to specify the availability of the internship.

R5.6: The system shall allow the company employee to specify other information about the internship.

R12: The system shall allow companies employee to chat with his trainee.

R13: The system shall allow universities employee to chat with his students.

R15: The system shall allow the student and the company to arrange a meeting.

R16: The system shall send a meeting link for the interview to the student and the company.

D1: Students are enrolled in the university.

D2: The university and the company have an existing authetication system that can be used by the S&C platform.

D3: Students, company employee and university employee have an account on the existing authentication system.

G9: Students can report on a logbook the daily situation of the internship

R1: The system shall allow users to log in with SSO.

R2: The system shall allow the student to provide information for their CVs.

R2.1: The system shall allow the students to specify their personal information, like name, contact and personal ambition.

R2.2: The system shall allow the students to specify their education experience, including their academic background.

R2.3: The system shall allow the students to specify their past work experience, specifying job title, company name, duration and technologies used.

R2.4: The system will allow students to specify their technical and soft skills.

R2.5: The system shall allow the students to specify their project and research, including the title, duration and description

R2.6: The system shall allow the students to specify their extracurricular activities, including the name, organization and achievements.

R2.7: The system will allow students to specify their knowledge of languages, including the level and any certifications.

R2.8: The system shall allow students to specify their availability.

R2.9: The system will allow the students to add additional information.

R3: The system shall allow the students to join an internship.

R5: The system shall allow the company employee to create an internship.

R5.1: The system shall allow the company employee to specify the title of the internship.

R5.2: The system shall allow the company employee to specify the description, helped by an AI, of the internship.

R5.3: The system shall allow the company employee to specify the requirement of the internship.

R5.4: The system shall allow the company employee to specify the duration of the internship.

R5.5: The system shall allow the company employee to specify the availability of the internship.

R5.6: The system shall allow the company employee to specify other information about the internship.

R7: The system shall allow the student to view a personalized homepage after inserting his CV's information.

R17: The system shall allow the student to write on a logbook to inform the university on the status of his internship.

D1: Students are enrolled in the university.

D2: The university and the company have an existing authetication system that can be used by the S&C platform.

D3: Students, company employee and university employee have an account on the existing authentication system.

D9: A student can write only one logbook at a time.

G10: Universities can monitor the status of the internship

R1: The system shall allow users to log in with SSO.

R3: The system shall allow the students to join an internship.

R5: The system shall allow the company employee to create an internship.

R5.1: The system shall allow the company employee to specify the title of the internship.

R5.2: The system shall allow the company employee to specify the description, helped by an AI, of the internship.

R5.3: The system shall allow the company employee to specify the requirement of the internship.

R5.4: The system shall allow the company employee to specify the duration of the internship.

R5.5: The system shall allow the company employee to specify the availability of the internship.

R5.6: The system shall allow the company employee to specify other information about the internship.

R9: The system shall allow the company to write a complaint to the university.

R10: The system shall allow the students to write a complaint to the university.

R13: The system shall allow universities employee to chat with his students.

R17: The system shall allow the student to write on a logbook to inform the university on the status of his internship.

D1: Students are enrolled in the university.

D2: The university and the company have an existing authetication system that can be used by the S&C platform.

D3: Students, company employee and university employee have an account on the existing authentication system.

D9: A student can write only one logbook at a time.

G11: Companies can complain about the current status of the internship

R1: The system shall allow users to log in with SSO.

R3: The system shall allow the students to join an internship.

R5: The system shall allow the company employee to create an internship.

R5.1: The system shall allow the company employee to specify the title of the internship.

R5.2: The system shall allow the company employee to specify the description, helped by an AI, of the internship.

R5.3: The system shall allow the company employee to specify the requirement of the internship.

R5.4: The system shall allow the company employee to specify the duration of the internship.

R5.5: The system shall allow the company employee to specify the availability of the internship.

R5.6: The system shall allow the company employee to specify other information about the internship.

R9: The system shall allow the company to write a complaint to the university.

R12: The system shall allow companies employee to chat with his trainee.

D1: Students are enrolled in the university.

D2: The university and the company have an existing authetication system that can be used by the S&C platform.

D3: Students, company employee and university employee have an account on the existing authentication system.

D5: When a student or a company decides to terminate an internship there won't be a way to change the decision made.

G12: Students can complain about the current status of the internship

R1: The system shall allow users to log in with SSO.

R2: The system shall allow the student to provide information for their CVs.

R2.1: The system shall allow the students to specify their personal information, like name, contact and personal ambition.

R2.2: The system shall allow the students to specify their education experience, including their academic background.

R2.3: The system shall allow the students to specify their past work experience, specifying job title, company name, duration and technologies used.

R2.4: The system will allow students to specify their technical and soft skills.

R2.5: The system shall allow the students to specify their project and research, including the title, duration and description

R2.6: The system shall allow the students to specify their extracurricular activities, including the name, organization and achievements.

R2.7: The system will allow students to specify their knowledge of languages, including the level and any certifications.

R2.8: The system shall allow students to specify their availability.

R2.9: The system will allow the students to add additional information.

R3: The system shall allow the students to join an internship.

R5: The system shall allow the company employee to create an internship.

R5.1: The system shall allow the company employee to specify the title of the internship.

R5.2: The system shall allow the company employee to specify the description, helped by an AI, of the internship.

R5.3: The system shall allow the company employee to specify the requirement of the internship.

R5.4: The system shall allow the company employee to specify the duration of the internship.

R5.5: The system shall allow the company employee to specify the availability of the internship.

R5.6: The system shall allow the company employee to specify other information about the internship.

R10: The system shall allow the students to write a complaint to the university.

R11: The system shall allow students to chat with his company.

R12: The system shall allow companies employee to chat with his trainee.

R13: The system shall allow universities employee to chat with his students.

D1: Students are enrolled in the university.

D2: The university and the company have an existing authetication system that can be used by the S&C platform.

D3: Students, company employee and university employee have an account on the existing authentication system.

D5: When a student or a company decides to terminate an internship there won't be a way to change the decision made.

3.3. Performance Requirements

The system must be sized according to the number of users who will use it. Since the system operations are pretty lightweight, the hardware required should be minimal.

3.4. Design Constraints

3.4.1. Standards Compliance

In order to make the software as compatible and secure as possible, the following standards have been chosen:

1. Accessibility Standard - The entire system complies with the Web Content Accessibility Guidelines (WCAG) so that the system is compatible with systems with limited hardware and software.
2. REST API - API programming interface that follows the design principles of the REST architectural style, which stands for REpresentational State Transfer.
3. Security Algorithm - The system uses the best security standards available today, such as TLS over HTTP (HTTPS) and Secure Shell Protocol (SSH) with exclusive authentication via RSA with a 4096-bit key.
4. OpenAPI (Swagger) - The specification creates a RESTful interface for easily devel-

oping and consuming an API by effectively mapping all the resources and operations associated with it.

5. Privacy - The platform is fully GDPR compliant, showing what cookies the system will save.

3.4.2. Hardware limitations

Each user must have an electronic device with an Internet connection that allows him/her to access the S&C website. No particular hardware characteristics are required, but a stable Internet connection and a screen capable of displaying web pages. The device used by the user will allow him/her to view, access and modify the various sections of the platform. It will also be possible to receive notifications directly.

3.5. Software System Attributes

3.5.1. Reliability

The S&C platform does not manage critical operations. If any operations fail they can be re-executed without any particular consequences. For example, if the submit of an internship request fails, the company can resubmit the request.

3.5.2. Availability

The system should always be available. The only downtime allowed is between 1 am and 5 am when students and employee are usually not studying nor working. The platform shall therefore guarantee 99% (two-nines) of availability.

3.5.3. Security

Communication between the user and the S&C platform is encrypted and data are protected by all possible security means to prevent cyber attacks. Furthermore, students cannot access data to which they are not authorised. For instance, they cannot access other students' data or see the logbooks of other internships. Companies are also not allowed to view the data of other companies or their interns.

3.5.4. Maintainability

The system must be divided into modules, which makes it scalable and reusable and therefore easier to maintain and replace in the case of failures. Ordinary maintenance is performed during night hours, when students and workers do not usually access the platform

3.5.5. Portability

The S&C platform does not need any special hardware or software, as it is easily accessible from any operating system with a web browser. A mobile application could also be developed to make access easier for users in a variety of conditions and locations.

4 | Formal analysis using alloy

This section describes the entire model formally using the alloy language. In particular, we aim to model the relationships between entities that are used in the management of internships, such as students, companies and universities. Furthermore, we aim to ensure consistency by introducing the constraints that enable the creation and management of all processes in the system

4.1. Alloy Code

```
open util/ordering[DateTime]

sig DateTime{}

sig Student {
        initialForm: set InitialForm,
        cv: set CV,
        application: set Application,
        preferences: Preferences,
        currentInternship: lone Internship,
        matchedInternships: set Internship,
        notifications: set Notification,
        university: one University,
        reportAuthor: set Report,
        questionnaireAuthor: set Questionnaire,
        messageAuthor: set ChatMessage,
        messageReceiver: set ChatMessage,
        logbook: set Logbook
} {
        all i: InitialForm | i in initialForm  ⇔  i.author = this
        all c: CV | c in cv  ⇔  c.owner = this
        all a: Application | a in application  ⇔  a.student = this
        all i: Internship | i in currentInternship  ⇔  i.currentStudent = this
        all i: Internship | i in matchedInternships  ⇔  i.matchedStudents = this
        all r: Report | r in reportAuthor  ⇔  r.author = this
        all q: Questionnaire | q in questionnaireAuthor  ⇔  q.author = this
        all c: ChatMessage | c in messageAuthor  ⇔  c.author = this
        all c: ChatMessage | c in messageReceiver  ⇔  c.receiver = this
        all l: Logbook | l in logbook  ⇔  l.author = this

        //For each student doing an internship implies that they have the CV
        all i: Internship | (i in currentInternship or (i in matchedInternships
        and i.state ≠ Waiting))
                implies (some cv and cv.owner = this)

        //When an internship becomes InProgress, it is removed from matchedInternships
        //and becomes a CurrentInternship
        all i: Internship | i in matchedInternships and i.state = InProgress implies (
        i not in matchedInternships and (no currentInternship ⟹ currentInternship = i))

        //When an internship changes to Terminated status,
        //it is deleted from the student's currentInternship
        all i: Internship | i in currentInternship and i.state = Terminated
                implies no currentInternship
```

```
        //For every CV of the student, the student must be linked
        //to the corresponding Application
        all c: CV | c in cv implies one a: Application | a.cv = c and a.student = this
}

sig Notification {}
sig Preferences{}

sig InitialForm {
        author: one Student,
        cvGenerated: set CV
} {
        all s: Student | s in author  <=>  s.initialForm = this
        all c: CV | c in cvGenerated  <=>  c.initialForm = this
        all c: CV | c in cvGenerated implies c.owner.initialForm = this
}

sig CV {
        owner: one Student,
        application: one Application,
        initialForm: one InitialForm
}{
        all s: Student | s in owner  <=>  s.cv = this
        all a: Application | a in application  <=>  a.cv = this
        all i: InitialForm | i in initialForm  <=>  i.cvGenerated = this
}

sig Application {
        student: one Student,
        cv: one CV,
        internship: one Internship
} {
        all s: Student | s in student  <=>  s.application = this
        all c: CV | c in cv  <=>  c.application = this
        all i: internship | i in internship  <=>  i.applications = this
}

sig Company {
        internshipsCreated: set Internship,
        messageAuthor: set ChatMessage,
        messageReceiver: set ChatMessage,
        questionnaireAnalyzer: set Questionnaire,
        reportAuthor: set Report,
        notifications: Notification,
} {
        all i: Internship | i in internshipsCreated  <=>  i.company = this
        all c: ChatMessage | c in messageAuthor  <=>  c.author = this
        all c: ChatMessage | c in messageReceiver  <=>  c.receiver = this
        all q: Questionnaire | q in questionnaireAnalyzer  <=>  q.receiver = this
        all r: Report | r in reportAuthor  <=>  r.author = this
}

sig Internship {
        applications: set Application,
        state: InternshipState,
        currentStudent: lone Student,
        matchedStudents: set Student,
        company: Company,
        description: String,
        monitor: lone University
} {
        all a: Application | a in applications  <=>  a.internship = this
```

```
        all s: Student | s in currentStudent  <=>  s.currentInternship = this
        all s: Student | s in matchedStudents  <=>  s.matchedInternships = this
        all c: Company | c in company  <=>  c.internshipsCreated = this
        all u: University | u in monitor  <=>  u.monitoredInternship = this
        description = "Description"

        //The status of an internship is InProgress only
        //if it is a currentInternship of a student
        state = InProgress
                implies some s: Student | this = s.currentInternship
        //The status of an internship cannot be Reviewing or Selection
        //if there are no students who have it in matchedInternships
        (state = Reviewing or state = Selection)
                implies some s: Student | this in s.matchedInternships
        //The University must only be present if the status is in Progress
        state = InProgress implies some monitor
}

sig University {
        students: set Student,
        reportsReceived: set Report,
        monitoredInternship: set Internship,
        messageAuthor: set ChatMessage,
        messageReceiver: set ChatMessage,
        logbook: set Logbook
} {
        all s: Student | s in students  <=>  s.university = this
        all r: Report | r in reportsReceived  <=>  r.receiver = this
        all i: Internship | i in monitoredInternship  <=>  i.monitor = this
        all c: ChatMessage | c in messageAuthor  <=>  c.author = this
        all c: ChatMessage | c in messageReceiver  <=>  c.receiver = this
        all l: Logbook | l in logbook  <=>  l.reader = this
}

sig Report {
        author: one (Student + Company),
        receiver: one University,
} {
        all s: Student | s in author  <=>  s.reportAuthor = this
        all c: Company | c in author  <=>  c.reportAuthor = this
        all u: University | u in receiver  <=>  u.reportsReceived = this
}

sig Questionnaire {
        author: one Student,
        receiver: one Company
} {
        all s: Student | s in author  <=>  s.questionnaireAuthor = this
        all c: Company | c in receiver  <=>  c.questionnaireAnalyzer = this
}

sig ChatMessage {
        author: one (Student + Company + University),
        receiver: one (Student + Company + University)
} {
        all s: Student | s in author  <=>  s.messageAuthor = this
        all c: Company | c in author  <=>  c.messageAuthor = this
        all u: University | u in author  <=>  u.messageAuthor = this
        all s: Student | s in receiver  <=>  s.messageReceiver = this
        all c: Company | c in receiver  <=>  c.messageReceiver = this
        all u: University | u in receiver  <=>  u.messageReceiver = this

        //A user may not write messages to a user of the same type
```

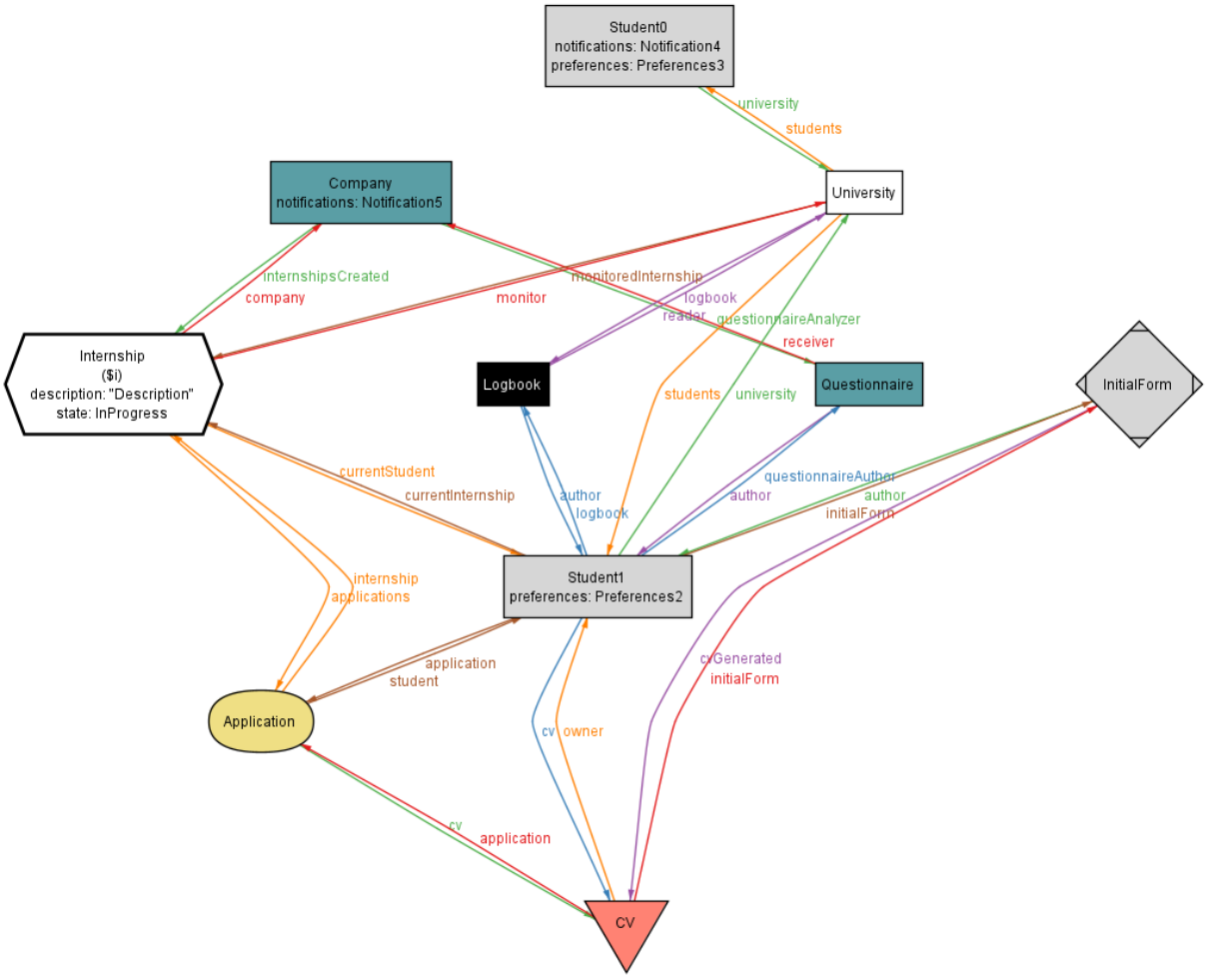
```
        all s: Student | s in author implies s.messageReceiver in
                (Company.messageReceiver + University.messageReceiver)
        all c: Company | c in author implies c.messageReceiver in
                (Student.messageReceiver + University.messageReceiver)
        all u: University | u in author implies u.messageReceiver in
                (Student.messageReceiver + Company.messageReceiver)
}

sig Logbook {
        author: one Student,
        reader: one University
} {
        all s: Student | s in author  ⇔  s.logbook = this
        all u: University | u in reader  ⇔  u.logbook = this
}

// States for internship
enum InternshipState { Waiting, Reviewing, Selection, InProgress, Terminated }
```

4.2. Models

Student participates in an internship

This model was generated using:

```
run {
    #Student = 2
    #Company = 1
    #Internship = 1
    some i: Internship | i.state = InProgress
    #Preferences ≥ 4
} for 10
```

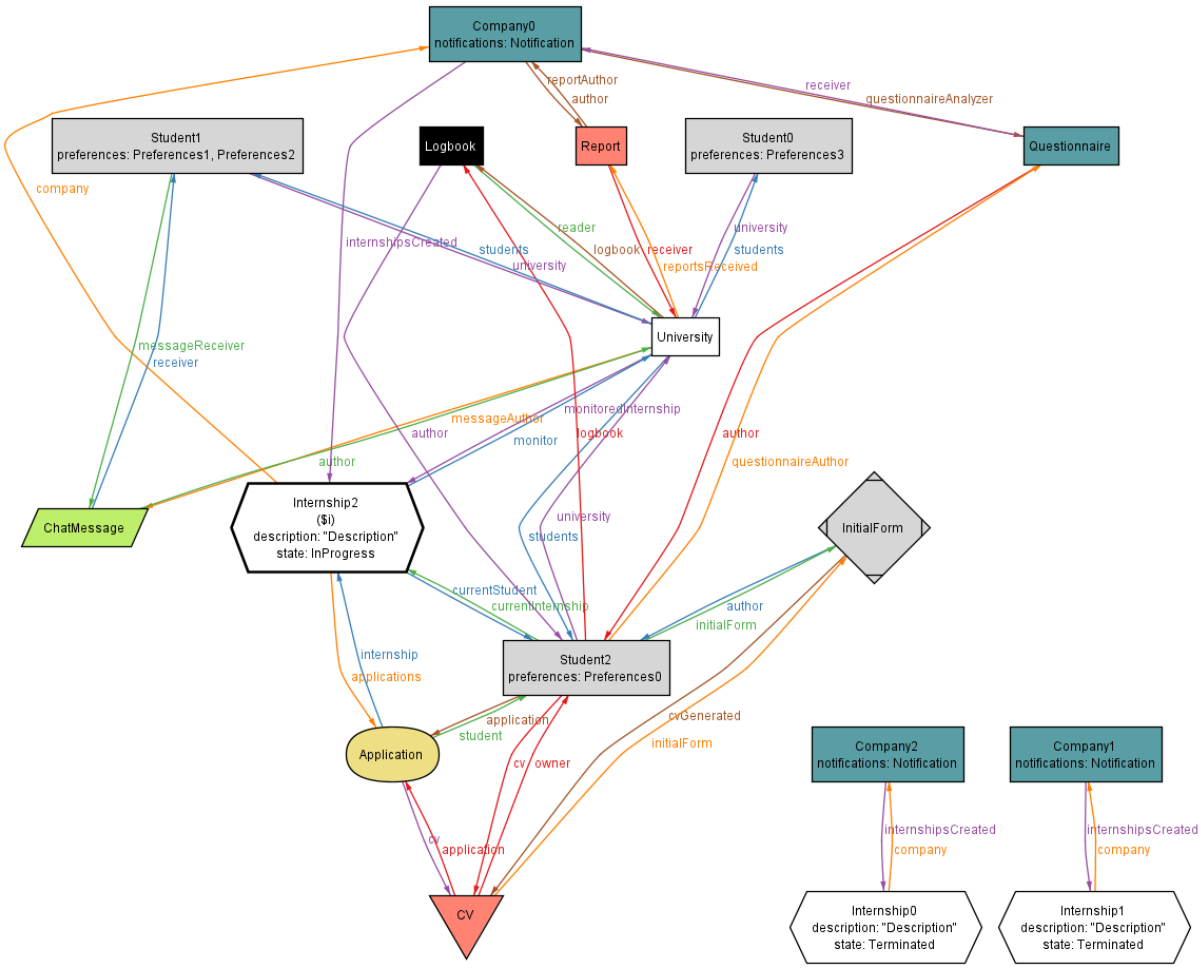


This diagram shows us 2 students belonging to the same university. One of the two students is doing an internship at a company, and it shows us that this student had to fill out an 'Initial Form' in order to produce the CV that was used to make the application. The student also had to fill in a questionnaire at the selection stage and now has a logbook where he notes what he does in the company.

Company makes a report

This model was generated using:

```
run {
    #Student = 3
    #Company = 3
    #Internship = 3
    some i: Internship | i.state = InProgress
    #Preferences ≥ 4
    #ChatMessage ≥ 1
    #Report = 1
} for 10
```



This diagram shows us Student2 doing the Internship2, and he has in fact filled in an InitialForm and made the application (thus generating a CV). We also see that Company0, responsible for Internship2 has made a report to the university, probably reporting insufficient work by the student. We also see that Student1 has communicated with his university via chat. Finally, we can see that 2 other companies have created 2 internships which are now both terminated and therefore no longer have students

5 | Effort spent

Member of group	Chapter	Time spent
Mattia Brianti	Introduction	8h
	Overall Description	7h
	Specific Requirements	2h
	Formal analysis using alloy	9h
Alex Hathaway	Introduction	8h
	Overall Description	9h
	Specific Requirements	6h
	Formal analysis using alloy	2.5h
Mattia Rainieri	Introduction	8h
	Overall Description	8h
	Specific Requirements	9h
	Formal analysis using alloy	4h

Table 5.1: Time spent by each member of group.

Bibliography

[1] eduGAIN Radius. URL https://edugain.org/.

[2] OAuth 2.0. URL https://oauth.net/2/.

[3] PlantUML. URL https://plantuml.com/.

List of Figures

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