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SCUOLA DI INGEGNERIA INDUSTRIALE
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Software Engineering II
Computer Science and Engineering

Design Document
Students&Companies

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Contents

1 | Introduction

1.1. Purpose

The *Students&Companies (S&C)* platform bridges the gap between university students seeking internships and companies offering them. It simplifies the process of matching students with internship opportunities based on their skills, experiences, and preferences, as well as companies' requirements and offered benefits.

The software involves three main actors: **students**, **companies**, and **universities**.

- **Students** use the platform to search and apply for internships, submit their CVs, and receive recommendations tailored to their profiles.
- **Companies** advertise internships, specify requirements, and manage the selection process for suitable candidates.
- **Universities** monitor the execution of internships and handle complaints or issues that may arise.

S&C features a **recommendation system** that matches students and internships using mechanisms ranging from keyword-based searches to advanced statistical analyses. The platform also facilitates communication, supports the selection process, and tracks internship progress to ensure transparency for all involved parties.

1.2. Scope

The Students&Companies (S&C) platform is a web application designed to facilitate communication and matchmaking between university students seeking internships and companies offering them. The platform simplifies and automates the process by enabling students to explore and apply for internships, while also allowing companies to advertise their openings and identify suitable candidates. Additionally, a sophisticated recommendation system enhances the user experience by automatically suggesting relevant matches to both students and companies based on their preferences and requirements.

This document aims to outline the key architectural decisions behind the design and implementation of the S&C platform. Given the diverse user base, which includes students, companies, and universities, and the need for simultaneous interaction among these parties, a web application was chosen as the foundation. Its accessibility and ease of use ensure a seamless experience for users across various locations and devices.

The complexity of the platform, along with the distinct functionalities it provides—such as recommendations, selection processes, and feedback collection—led to the choice of a microservices architecture. This architectural style was selected due to its ability to offer scalability, flexibility, resilience, and modularity. Each microservice operates independently, allowing for targeted scaling based on demand, individual updates and deployments, and clear separation of responsibilities. The result is a system that is both maintainable and adaptable to evolving requirements.

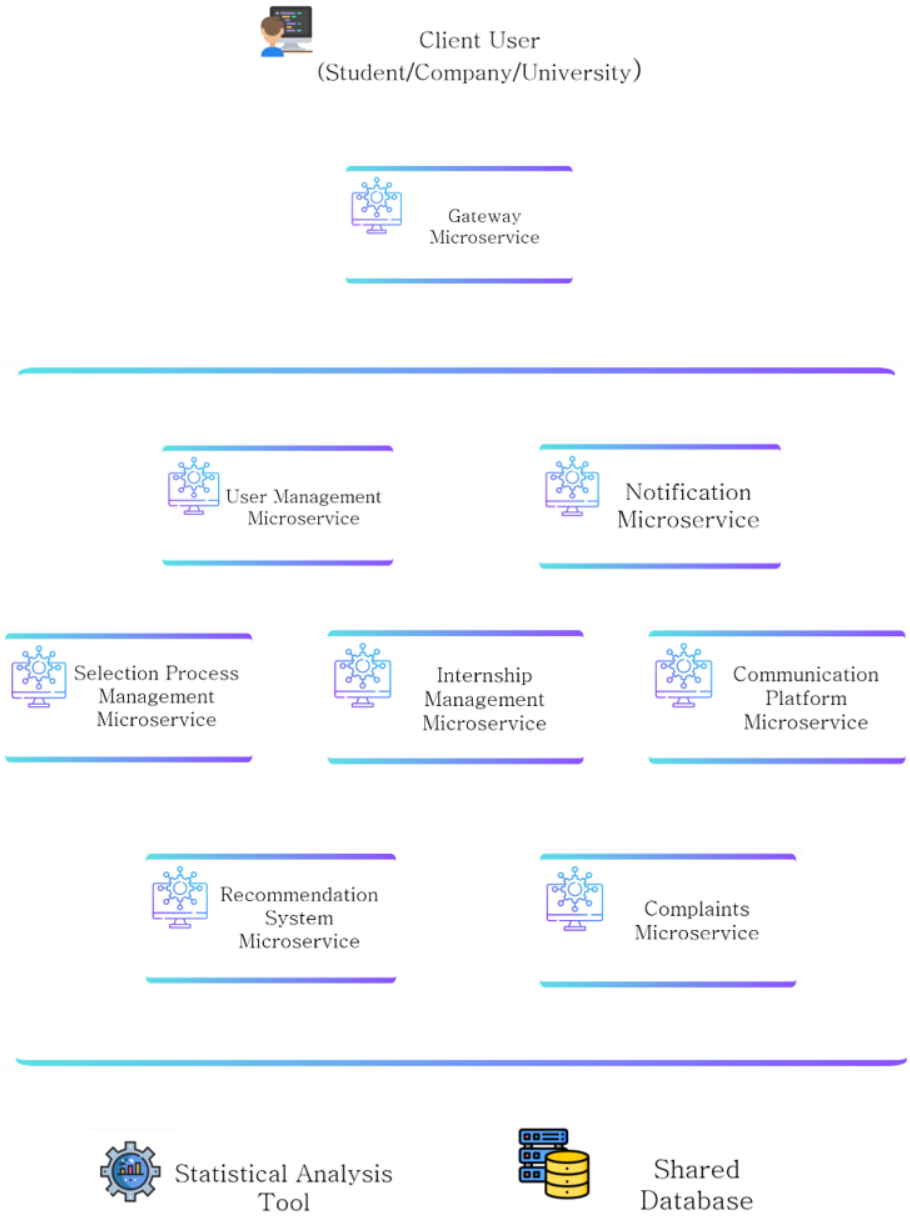
From a deployment perspective, the system adopts a three-tier architecture. The user client layer represents the web and mobile interfaces used by students, companies, and universities. The server layer hosts all microservices, which manage the business logic and application functionality. Finally, the shared database layer ensures consistency in data storage, maintaining information about users, internships, recommendations, and feedback.

To manage interactions between microservices, the platform uses a combination of communication patterns based on specific functional needs. For real-time or asynchronous interactions, an event-driven communication model is employed. In this approach, some microservices act as event publishers while others function as consumers. For example, the Notification Microservice processes events related to complaints, messages, and new recommendations, while other services publish events to reflect changes in system states, such as the pubblication of a new message on the communication platform or the acceptance of a student for an interview.

For functionalities that do not require immediate interactions, synchronous communication mechanisms are used. This includes scenarios such as retrieving a list of internships or submitting CVs, where sequential processing and immediate feedback are necessary. The combination of event-driven and synchronous communication ensures that the system remains both responsive and straightforward to use, catering to the dynamic needs of its users.

All these architectural choices are just mentioned here to provide an overview of the system; they will be better explained and unpacked down the line of this document. The

following image shows the major components of the Students&Companies system.



1.3. Definitions, Acronyms, Abbreviations

1.3.1. Definitions

A brief list of the most meaningful and relevant terms and synonyms used in this document is reported here, in order to make reading process smoother and clearer:

Term	Definition
Internship, Placement, Work-Experience	A temporary work opportunity offered by a company, designed for students to gain practical experience in a professional environment while applying their academic knowledge.
CV, Resume	A document created by a student containing their personal information, skills, educational background, and work experience, used to apply for internships or jobs.
Recommendation System, Suggestion System	A feature of the platform that identifies and matches suitable internships for students or suitable candidates for companies based on their profiles, preferences, and requirements.
Student Profile	A digital representation of a student within the system, containing personal details, uploaded CVs, skills.
Company Profile	A digital representation of a company within the system, containing details about the company, uploaded projects or internships.
Recommendation Process	The sequence of steps executed by the system to align the skills and preferences of students with the requirements of available internships offered by companies.
Feedback, Suggestions	Information collected from students and companies during the selection process and the internship to refine the matching system and improve user satisfaction.

Term	Description
Communication Space, Chat Feature, Messaging System	A feature in the platform that allows students, companies, and universities to interact and share important updates or resolve concerns.
Selection Process	A phase in which companies evaluate student applications, conduct interviews, and finalize the selection of candidates for internships.
Interview Setup, Interview Management	The process supported by the system to schedule, conduct, and manage interviews between companies and students.
Monitoring by University	The process where the university oversees the activities and outcomes of student internships and intervenes if necessary.
Complaint Resolution	The process of identifying and addressing issues raised by students or companies during or after the internship period.
Submission Deadline, Application Deadline	The last date for students to submit applications for an internship or for companies to post available projects on the platform.
Notification System, Alert System	A functionality in the platform that keeps users informed about new opportunities, deadlines, or important events.
Platform, System, Application	All synonyms for the software platform being developed to manage the interactions and processes related to internships.
Statistical Analysis	The process by which the system evaluates collected feedback and interactions to improve its recommendation algorithms and user experience.
Architectural Style	A way of designing a system that defines general principles and patterns for how different parts should interact and be organized.

Term	Description
Structure/View	A representation of a system that highlights specific aspects, such as how components are connected, how they interact, or how they are distributed across different locations.
Component	An independent part of a system that performs a specific function and can often be reused in different systems or contexts.
API	A set of rules and tools that allow different software programs to communicate and share information or functionality with each other.
RESTful API	A type of API that uses standard web protocols like HTTP to let systems access and manipulate resources, following specific guidelines for simplicity and scalability.
Web Application	A program accessed through a web browser that combines client-side and server-side resources to provide interactive features and services.
Microservice	A design approach where a system is divided into small, self-contained services that handle specific tasks and can be developed, deployed, and updated independently.
Three-tier architecture	A system divided into three parts: one for displaying information to users (presentation), one for processing logic (application), and one for managing and storing data (database).
Event-Driven Architecture	A system where actions are triggered by events, such as a notification being sent when a user performs a specific action.
Synchronous communication among microservices	A communication method where one service sends a request to another and waits for the response before continuing.

Term	Description
Asynchronous communication among microservices	A communication method where one service sends a request and does not wait for a response, allowing the system to handle tasks more flexibly.

1.3.2. Acronyms

A list of acronyms used throughout the document for simplicity and readability:

- RASD - Requirements Analysis and Specification Document
- DD - Design Document
- S&C - Students & Companies
- API - Application Programming Interface
- UI - User Interface
- UML - Unified Modeling Language
- DB - Database
- DBMS - Database Management System

1.4. Reference Documents

Here's a list of reference documents that have been used in order to shape the Design Document of the *Students&Companies* system. In the following, all external sources of information that have contributed to the design of this document are mentioned.

1. Stakeholders' specification provided by the R&DD assignment for the Software Engineering II course at Politecnico Di Milano for the year 2024/2025.
2. "29148-2018, ISO/IEC/IEEE International Standard, Systems and software engineering, Life cycle processes, Requirements engineering", by IEEE, 2018.
   Link: `https://ieeexplore.ieee.org/document/8559686`
3. UML specifications, version 2.5.1.
   Link: `https://www.omg.org/spec/UML/2.5.1/About-UML`
4. Alloy documentation, version 6.1.0.8.
   Link: `https://alloy.readthedocs.io/en/latest/`

1.5. Document Structure

The Design Document for the Student&Company project are organized into five primary parts: the first is the introduction, while the remaining four each focus on a specific aspect of the system's overall design, which will help facilitate the development and final implementation of the product.

The **Introduction** serves to provide a concise overview of the project, detailing the objectives and goals that are to be accomplished through its development, as outlined earlier in the RASD.

Moving on, Section 2, titled **Architectural Design**, is the most critical design-related section and aims to present the software architecture of Student&Company through various views and structural representations. This section is divided into multiple parts:

The first part, Overview, delivers a high-level summary of the core components of the system and how they interact with each other, explained in an informal notation that makes the structure more accessible.

The second part, Component View, presents the first of the architectural structures, the Component & Connector structure, which is crucial for demonstrating the system's components from a dynamic perspective and the way in which they collaborate to meet the final objectives; it largely uses UML component diagrams to convey these interactions.

The Deployment View, the third part, focuses on the deployment structure of Student&Company, illustrating how the software components correspond to the physical hardware that will run the application. The mapping between the software and hardware is illustrated with UML deployment diagrams, which are extremely helpful in visualizing this relationship.

Then, the Runtime View follows, employing sequence diagrams to describe the flow of events and interactions within the system's components, ensuring consistency with the previously discussed sections.

The Component Interfaces section comes next, where a detailed specification of the important methods and functions exposed by each interface of the system's components is provided, making sure to cover all relevant aspects.

The final part of Section 2 discusses the Selected Architectural Styles and Patterns, offering a review of the primary architectural styles and patterns, followed by a detailed explanation of why they were selected for this particular project.

Section 3, on **User Interface Design**, shifts focus to the design of user interfaces (UI), offering guidelines for UI designers on how the final application should appear, including color schemes, the placement of key UI elements, and also the logical role that these interfaces play in the development process, clarifying what functionalities they provide to the user.

Following this, Section 4, which covers **Requirement Traceability**, provides a matrix that clearly shows how the requirements for Student&Company, which were previously

drawn up, map onto the components discussed in earlier sections of the document, ensuring that all requirements are adequately addressed by the system.

Finally, Section 5, **Implementation, Integration, and Test Plan**, explains the strategy for implementing the system, detailing the order in which the components will be developed, the approach for integrating new sub-components into the application as it progresses, and the testing strategy to ensure that all components work seamlessly together within the system.

2 | Architectural Design

2.1. Overview

2.1.1. High Level View

2.2. Component View

2.2.1. RESTful APIs Component Diagram

2.2.2. Service Discovery Component Diagram

2.2.3. Event-Driven Pattern Components

2.2.4. Data Layer Access Component Diagram

2.2.5. User Interfaces Component Diagram

2.3. Deployment View

2.3.1. High-Level Deployment View

2.3.2. Detailed Deployment View

2.4. Run Time View

2.5. Component Interfaces

2.6. Selected Architectural Styles and Patterns

2.6.1. Database Management

3 | Specific Requirements

3.1. External Interface Requirements

3.1.1. User Interface

3.1.2. Hardware Interfaces

3.1.3. Software Interfaces

3.2. Functional Requirements

3.2.1. Use Case Diagrams

3.2.2. Use Cases

3.2.3. Sequence Diagrams

4 | Requirements Traceability

5 | Implementation, Integration and Test plan

5.1. Overview

5.2. Implementation Plan

5.2.1. Features Identification

5.2.2. Components Integration and Testing

5.3. System Testing

6 | Effort Spent

7 | References

8 | Per fare prove

Ciao ragazzi come va?

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Tabella tipo 2:

Bibliography

[1] Simone. provabibliografia, 2024.

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