FindYourRoof

An application designed to help homeless individuals rebuild and thrive

Prepared by Group 16:
Revathi Dhotre
Rimsha Rizvi
Shehriar Burney
Neel Patel

CS 440 (Fall 2023)
at the
University of Illinois Chicago

Fall 2023

Table of Contents

List of Figures

List of Figures

I Project Description

1 Project Overview

FindYourRoof is an all-in-one application aimed at addressing the complex issue of homelessness in the US. It's more than just a temporary solution; it offers a structured pathway for individuals to reintegrate back into society. The platform efficiently matches individuals with suitable housing options and promising job opportunities, while also offering a secure environment for document storage and facilitating impactful mentorship connections. By weaving together these features, FindYourRoof fosters a strong connection between homeless individuals and a diverse group of stakeholders, including employers, landlords, non-profit organizations, mentors, and volunteers. This collective approach is geared towards driving significant and lasting change in society.

2 The Purpose of the Project

2a The User Business or Background of the Project Effort

The clients of FindYourRoof are Non-Profit Homeless Shelters that primarily assist homeless people find their feet back in society. With the population of homeless individuals in the US being stable at 580,000+ people for the past decade, something needs to be done to combat this complicated issue [1]. This statistic remains high due to the large amounts of challenges faced by homeless individuals when attempting to find affordable housing or employment, and we aim to combat homelessness by making these opportunities more available.

2b Goals of the Project

The main goal of FindYourRoof is to significantly improve the lives of homeless individuals and allow them to reintegrate back into society. We aim to reduce the number of homeless individuals in the US for the first time in over a decade [1] by allowing them to find employment that best suits their skills, as well as finding affordable and convenient housing. An example of a goal would be to find housing for 20% of active users within the first 4 years of launch.

2c Measurement

The success of FindYourRoof will be measured by analyzing through rigorous data analysis. We track the homeless individuals' employment and housing status of our users, enabling us to evaluate our performance based on predefined goals. For example, if our goal is to assist 20% of active users in securing housing within the first 4 years of launch, our data analysis will provide precise insights into the percentage of users who have successfully found stable housing.

3 The Scope of the Work

The business centers on resolving the homelessness crisis by furnishing individuals with the necessary resources, connections, and tools to reintegrate into society. The

specific work of FindYourRoof is to create a centralized platform where homeless people may search for potential housing choices while safely storing crucial personal documents. Additionally, it introduces them to appropriate job openings and connects them with mentors, primarily former homeless people, to help them along the way. The entire process of these individuals' reintegration is streamlined by this application, which also serves as a communication link between them and NPOs, employers, landlords, mentors, and volunteers.

3a The Current Situation

The client currently uses a combination of manual procedures and disjointed systems, The client presently relies on manual methods, disjointed systems, and direct communication to assist the homeless. Most people find housing, employment opportunities, and mentorships through recommendations, bulletin boards, or local events. NPOs frequently use written documents or simple spreadsheets to track their contributions, resulting in inefficient and time-consuming exchanges between stakeholders. Mentorship is scheduled according to immediate availability rather than a precise needs match. Homeless individuals' essential documents are stored physically, risking loss or damage. The entire process lacks centralization, streamlined digital communication, and data-driven decision-making tools.

3b The Context of the Work

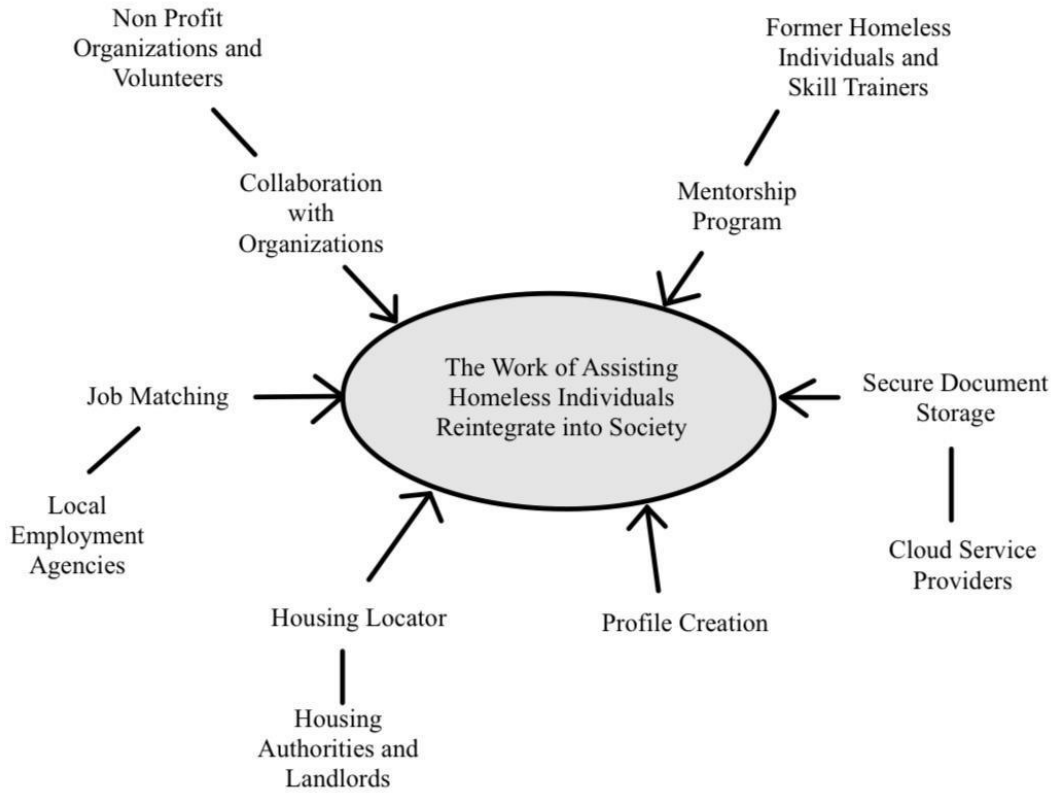


Fig 1: Context of work

FindYourRoof's primary objective is to help homeless people integrate back into society. FindYourRoof includes a number of interconnected functionalities to achieve this. Individuals can construct their own personal profiles, and the system's AI Engine uses these to match them with jobs effectively. For housing, geospatial integration streamlines the search process, leading users to potential homes based on their preferences and location. Using cloud services, the application makes sure that crucial documents are kept secure. One of its most vital offerings is the mentorship program, where mentor-mentee matchmaking is optimized using machine learning algorithms to pair individuals with suitable mentors, often those who have transitioned out of homelessness themselves. In addition, FindYourRoof creates a seamless environment for those looking for ways to rebuild their lives by bridging the gap with local nonprofits, landlords, and employment agencies. The efficiency of the system depends on both its functionality and the underlying technology that powers it.

3c Work Partitioning

	Event Name	Input and Output	Summary
1.	Profile Incompletion	The User begins profile creation (in) Reminder is sent to the user (out)	If a homeless individual starts their profile but doesn't complete it, the system sends a reminder urging them to finalize their details
2.	Expired Housing Listing	Notification sent out to the landlord (out)	When a housing listing is close to expiring, the platform notifies the landlord to update or renew the listing
3.	Mentor Inactivity	Alert the mentor and platform administrators (out)	If a mentor is inactive for a long duration, both the mentor and the admin team are alerted to ensure the mentees are not left unsupported

4.	Document Verification Pending	User uploads crucial documents (in) Request sent for verification (out)	When a homeless individual uploads important documents, the system sends a verification request to NPO members to validate authenticity
5.	Job Match Not Found	User's skills and experience entered (in) Alert to the user with suggestions or training opportunities (out)	If the platform's AI can't match a user with any current job openings, the user is alerted and provided with upcoming workshop information or other resources
6.	Inactive Housing/Job Listings	Notification to landlords and employers for updates (out)	If housing or job listings remain inactive or untouched for a while, the platform prompts landlords and employers to refresh or update the listing

Table 1: Work Partitioning Table

3d Competing Products

The FindYourRoof platform was developed with an understanding of the market gap and the unique needs of the homeless community. Although there are various platforms that appear to offer comparable solutions, none specifically addresses the comprehensive needs of the homeless community. The existing products and alternatives include:

1. General Job Portals (e.g. Indeed, LinkedIn): These platforms provide job opportunities for a wide audience. While they offer vast job listings, they are not specifically tailored for the homeless or those in immediate need of employment.

2. General Housing Portals (e.g. Zillow, Apartments.com): These platforms are designed for the general population seeking housing and don't cater specifically to affordable housing or the unique needs of the homeless community.

3. Mentorship Platforms (e.g. MentorNet): These are designed for various mentor-mentee relationships, primarily in the professional and academic sectors, but they don't focus on the challenges and intricacies faced by homeless individuals.

4. Local Non-Profit Websites: Many local non-profits might have their own websites or platforms to aid the homeless, but these often lack the integration of multiple features like job matching, mentorship, and housing, all in one platform.

4 The Scope of the Product

FindYourRoof is a versatile platform that skillfully combines various user capabilities into one cohesive experience. Upon registration, homeless users are prompted for their job preferences, skills, and housing needs, leading to immediate matches with suitable housing and job opportunities. Additionally, the app offers secure storage for vital documents. Mentors, who have transitioned from homelessness, can guide individuals by sharing experiences, setting goals, and providing resources. For NPOs, FindYourRoof serves as a hub to promote events, attract volunteers, and connect with donors, ensuring sustainable shelter operations and comprehensive assistance for the homeless.

4a Scenario Diagram(s)

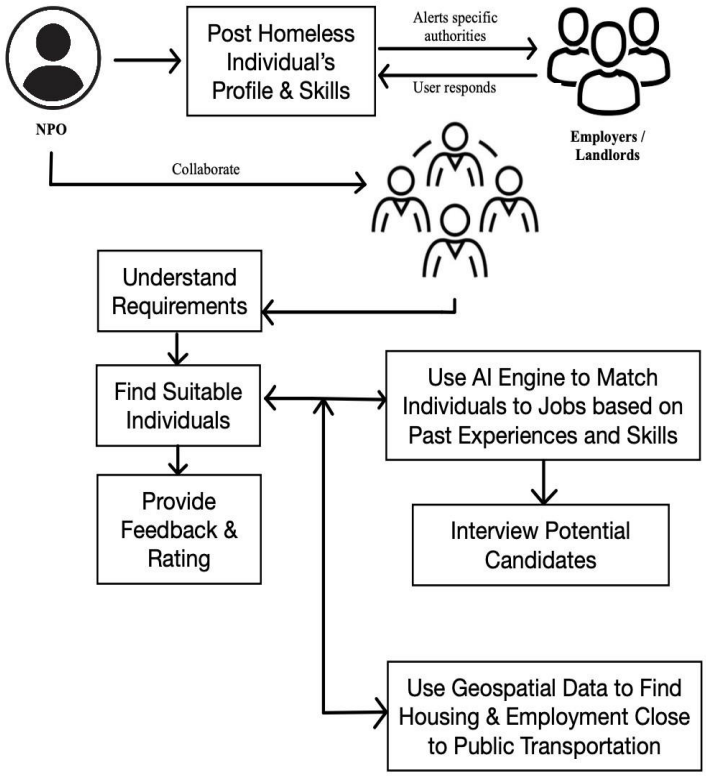


Fig 2: Scenario 1: "Job & Housing Search for Homeless Individuals"

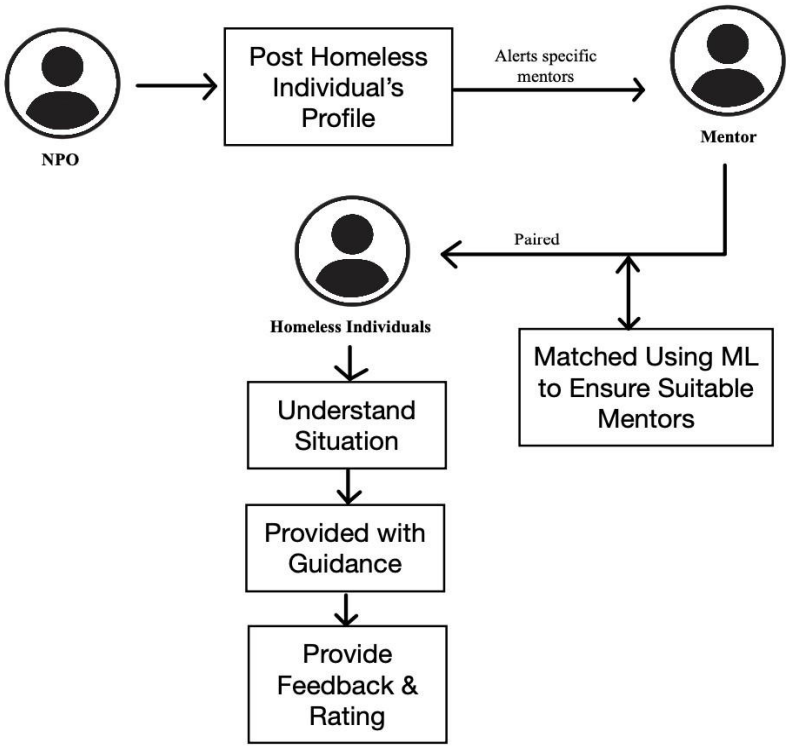


Fig 3: Scenario 2: "Mentorship Assistance for Homeless Individuals"

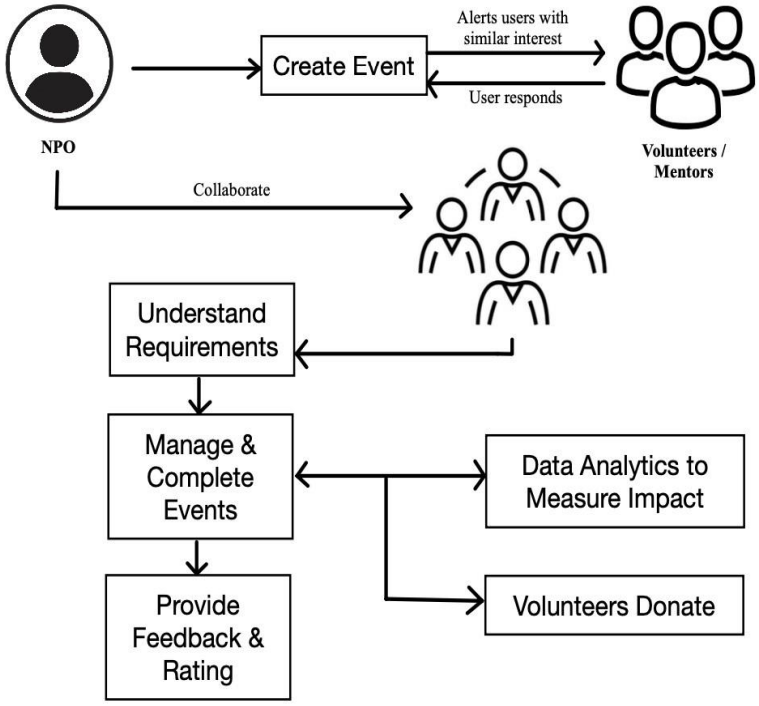


Fig 4: Scenario 3: "NPO-Hosted Events & Workshops for Aid"

4b Product Scenario List

	Scenario	External Actors	Relevant Information
1.	Incorrect or Inauthentic Document Upload	Homeless Individual	When a document appears inauthentic or incorrect, the user is alerted and asked to re-upload, while the NPO is informed of the discrepancy
2.	Housing Listing Fraud	Malicious Landlord	If a housing listing is reported or flagged as fraudulent, it's temporarily suspended for review to ensure the safety of the platform's users
3.	Job Scams or Exploitative Offers	Malicious Employer	Job postings that have been reported or flagged as potential scams are temporarily suspended for verification to protect users from deception
4.	System Outages or Technical Difficulties	External Technical Issues	When a system goes down, users are alerted and reassured that efforts are being made to quickly restore services
5.	Data Breach or Unauthorized Access	External Cyber Threat	In the event of a data breach or unauthorized access, the system urges users to take precautions, notifies them, and launches an investigation

6.	Mentor-Mentee Mismatch or Inactivity	Mentor, Homeless Individual	The platform considers rematching or interventions to maintain positive mentoring if a mismatch arises or if extended inactivity is noticed

Table 2: Product Scenario List

4c Individual Product Scenarios

The following scenarios show how the FindYourRoof dynamic platform works in real-world circumstances:

1. **New User Onboarding**: John, a recently homeless individual, heard about FindYourRoof at a local shelter. He decides to register, uploading essential documents to the encrypted cloud-based system, using the 'Upload Docs' section. He browses through available housing and job opportunities in his vicinity, using 'Housing' and 'Jobs Near Me'. Within days, he's moving into an affordable apartment and starting a part-time job with the help of an AI-driven job matching system, all coordinated through 'Direct Chat' with landlords and employers.

2. **Mentorship Connection**: Feeling isolated and confused about her future, Maria uses the 'Connect with a Mentor' feature. The platform pairs her with Sarah, a formerly homeless individual. Through 'Mentor Chat', Sarah shares valuable advice, emotional support, and networking tips, easing Maria's journey.

3. **Employer Job Listing**: Local business owner, Mrs. Thompson, wants to provide job opportunities for the homeless. She uses the 'Post a Job' feature to list openings. FindYourRoof uses its 'Job Match' AI to suggest potential candidates based on their skills and experience. Two individuals, equipped with the right skill set, get hired after coordinating interviews through the 'Schedule Interview' button - benefiting both the business and the community.

4. **Affordable Housing Listing**: Landlord Mr. Patel has several properties he wishes to rent at affordable rates to assist the homeless. He lists them via 'List Property', highlighting their proximity to public transport. He soon rents them out to individuals who discovered the listings through the 'Browse Housing' section, with finalizations done via 'Secure Lease Chat', providing the individuals with stability and a chance to rebuild their lives.

5. **Organizing Life Skill Workshops**: A non-profit organization plans a series of workshops to teach essential life skills and job readiness. They use the 'Schedule Workshop' feature to announce a life skills event. Users RSVP using the 'Join Workshop' button and access details via 'Workshop Info'. Over 50 homeless

individuals attended the workshops, gaining valuable knowledge and networking opportunities.

6. **Community Contribution**: Emma, a devoted volunteer, is inspired to donate through the 'Donate Now' button and later volunteers at a workshop by clicking on 'Volunteer Sign-up'. Her contributions directly support the platform's community-focused initiatives.

5 Stakeholders

5a The Client

The client that FindYourRoof is serving is a Non-Profit shelter that shares the same goal of helping homeless people reintegrate back into society. FindYourRoof aims to assist these shelters by providing an application that can help them connect homeless individuals with housing and employment, analyzing the progress of each user, and many more features that streamline processes for shelters. This is because it enables them to have an all-in-one solution that can assist them in managing user data and communicating with stakeholders.

5b The Customer

Non-Profit Organizations (NPOs): NPOs are at the heart of FindYourRoof's user base. They have a significant interest in the platform as it directly impacts their ability to streamline project management, find skilled volunteers, and connect with resources to fulfill their social impact missions.

5c Hands-On Users of the Product

We will have six hands-on users on FindYourRoof:

- Non-Profit Organization (NPO)
- Homeless individual
- Employers
- Landlords
- Mentor
- Volunteer

FindYourRoof will primarily be managed by the Non-Profit Organization who will be able to connect with homeless individuals, landlords, employers, volunteers and mentors. For this reason, the NPO will be one of the main end-users of our application. They are masters on the subject matter of the application but are novices when it comes to technical knowledge.

The other main users are the homeless individuals that we are helping. They would be technically novices as they likely do not have much experience with technology, and also would not have much information regarding the FindYourRoof business. Homeless individuals often also suffer from physical and mental disabilities so it is important to keep our application accessible.

5d Maintenance Users and Service Technicians

Platform Developers and IT Teams: The development team responsible for building and maintaining FindYourRoof is a critical stakeholder group. Their expertise ensures the platform's functionality, security, and scalability. They ultimately would be maintaining the application after release.

5e Other Stakeholders

Volunteers and Social Impact Professionals: Individuals seeking opportunities to make a difference and contribute their skills. They are also responsible for helping and managing events like workshops or training that would be conducted by NPO for the welfare of homeless individuals. They are interested in finding meaningful projects, collaborating with NPOs, and participating in social impact initiatives through FindYourRoof.

Social Workers: Social workers play a crucial role in the social impact sector. They may use FindYourRoof to identify resources, connect with NPOs, and engage in projects aimed at improving the well-being of their clients, homeless individuals and communities.

Philanthropic Groups: Organizations and individuals engaged in philanthropy and grant-making have a vested interest in FindYourRoof. They may use the platform to identify NPOs aligned with their philanthropic goals and support impactful projects.

Employers: Employers seeking to contribute to their communities by providing job opportunities for disadvantaged populations, such as homeless individuals, are stakeholders. They can use FindYourRoof to identify potential candidates and collaborate with relevant NPOs. Either way, they can also conduct training and workshops aiming to hire these homeless individuals.

Homeless Individuals and Vulnerable Populations: They are the beneficiaries of the platform's initiatives. They have a direct interest in accessing stable housing, training programs, and employment opportunities facilitated by FindYourRoof.

Community Advocacy Groups: Organizations advocating for the rights and well-being of homeless individuals and disadvantaged communities may closely monitor and engage with FindYourRoof to ensure that it aligns with their advocacy goals.

Donors and Funding Sources: Individuals and organizations providing financial support to NPOs may use FindYourRoof to identify promising projects and organizations to fund.

Public Sector Entities: Government agencies at various levels may have an interest in FindYourRoof, especially if it complements their efforts to address social issues like unemployment, homelessness, and poverty.

Landlords: Landlords who are willing to accommodate their homes to the benefit of NPOs to provide shelter to homeless individuals are also the stakeholders of FindYourRoof.

These diverse stakeholders are essential for the successful development, adoption, and impact of FindYourRoof, as their collective involvement contributes to achieving its social impact goals.

5f User Participation

The creation of FindYourRoof relies heavily on user input. In the beginning, user feedback is crucial to understanding the specific demands within the industry, especially from NPOs and volunteers. Through surveys, interviews, and focus groups, this input influences the final product. Users participate in prototyping and testing as the product develops to improve usability and usefulness. Though technological feasibility must be taken into account, they can affect how features are prioritized. Stakeholders confirm that the product satisfies their needs during the user acceptance testing process. Continuous platform enhancement is facilitated by feedback tools such as surveys and support requests. Additionally, users contribute to the effectiveness of support materials and play a crucial role in identifying bugs or issues.

5g Priorities Assigned to Users

In the development of FindYourRoof, it's important to acknowledge that not all users have the same level of importance or influence on the project. Prioritizing users helps ensure that the platform meets the needs of those who are most critical to its success.

Non-Profit Organizations (NPOs) (High):

NPOs are the primary beneficiaries and users of FindYourRoof. Their successful use of the platform is critical for achieving the project's social impact goals. As such, their needs, feedback, and requirements should take precedence in development decisions. Prioritizing NPOs means focusing on features and functionalities that streamline project management, volunteer engagement, and collaboration within the platform.

Volunteers and Social Impact Professionals (High): Volunteers and social impact professionals are essential contributors to the platform's success. They provide the skills, expertise, and labor needed to execute social impact projects. Prioritizing this user group involves creating a user-friendly experience, facilitating seamless project matching, and ensuring that the platform meets their expectations for meaningful engagement.

Homeless Individuals (High): FindYourRoof's mission includes assisting homeless individuals and vulnerable populations. Their well-being and access to resources are central to the platform's social impact goals. Prioritizing this user group means ensuring that features related to housing, training, and employment opportunities are well-designed, accessible, and responsive to their needs.

Employers (Moderate): Employers play an important role in providing job opportunities and financial support. While their involvement is crucial, their needs may be somewhat secondary to those of NPOs, volunteers, and beneficiaries. Prioritizing this group involves features that facilitate connections and partnerships but may not be as central as the core functions for NPOs and volunteers.

Landlords (Moderate): Landlords play a crucial part as they help secure affordable housing for homeless individuals. Even though their needs are important as they allow us to house a homeless individual, their needs are still secondary to the NPOs and the homeless individual themselves.

Mentors (Moderate): Mentors can leverage FindYourRoof to connect with homeless individuals and help guide them through their journey. Ideally, the mentors would be former homeless to increase the chances of relatability and encouragement to the homeless individual.

Platform Developers and IT Teams (High - During Development): The development team is essential for building and maintaining the platform. Their priorities during the development phase are critical. However, once the platform is live, user needs and feedback from other user groups should take precedence.

6 Mandated Constraints

6a Solution Constraints

The security of our data is a crucial factor for the success of FindYourRoof. This is particularly important due to the Document Repository feature, which encourages homeless individuals to store critical documents (ie. identification cards). Failure to meet this requirement could have severe consequences, potentially exposing homeless individuals to identity theft and exacerbating their already challenging circumstances.

The application also must not require a high-performance system and should work with a low-end device, as well as being available on multiple platforms. This is because our constraint requirements must meet what our user base has access to, which will be lower-end devices. Hence, FindYourRoof must be available as a web application as well as an Android mobile application.

6b Implementation Environment of the Current System

The implementation environment of the current system for FindYourRoof encompasses the physical and technical infrastructure required to support the platform's operation.

FindYourRoof is run on a serverless environment in Amazon AWS. The application has a connected database, API connections, and secure firewalls.

Below is a detailed explanation of the key components of the implementation environment:

Servers: FindYourRoof is likely to be hosted on Amazon AWS, ensuring that it is run on a serverless platform.

Database Servers: A robust database infrastructure is essential for storing user data, project information, and other critical data. This may include relational databases like MySQL or PostgreSQL.

APIs: FindYourRoof may incorporate RESTful or GraphQL APIs for communication between different components of the system and third-party integrations.

Firewalls: Network firewalls are essential for protecting the system from unauthorized access and cyberattacks.

The implementation environment described above forms the technical foundation for the FindYourRoof platform. It is critical to ensure that this environment is configured, maintained, and secured effectively to support the platform's functionality and meet the needs of non-profit organizations, volunteers, and other stakeholders.

6c Partner or Collaborative Applications

Partner or collaborative applications refer to external software or platforms that FindYourRoof must be compatible with or integrate with to enhance its functionality and user experience. These applications enable data exchange, interoperability, and extended capabilities. Here are some examples of partner or collaborative applications that FindYourRoof may need to interface with:

Microsoft Excel: FindYourRoof may require the ability to import and export data in Microsoft Excel format (.xlsx) to facilitate data sharing and reporting with users who rely on Excel for data analysis and visualization.

Payment Gateways: There will be a feature that utilizes payment gateways to allow donation payments to be processed.

Geolocation Services: Collaborative applications that provide geolocation services and maps (e.g., Google Maps) can enhance the platform's ability to locate and visualize social impact projects and events.

Customer Relationship Management (CRM) Systems: Integrating with CRM systems like Salesforce can help NPOs manage donor relationships, track interactions, and maintain accurate contact information.

Volunteer Management Software: Integration with volunteer management solutions allows NPOs to efficiently track volunteer availability, skills, and contributions within FindYourRoof.

Each of these partner or collaborative applications serves a specific purpose in enhancing the functionality and usability of FindYourRoof. Compatibility and seamless integration with these external tools and services can significantly enrich the user experience and extend the platform's capabilities for non-profit organizations, volunteers, and other stakeholders.

6d Off-the-Shelf Software

Commercial off-the-shelf solutions are integrated into FindYourRoof to provide specific functionalities, save development time, and leverage proven software capabilities.

Database Management System (DBMS): A commercial DBMS is essential for managing structured data within the platform. Microsoft SQL Server or Oracle Database could be chosen for their robust data management capabilities.

Web Server Software: Commercial web server software such as Microsoft Internet Information Services (IIS) or Nginx may be used to host and serve web applications, including the front end of FindYourRoof.

Communication and Messaging Tools: Commercial messaging and communication platforms like Slack, Microsoft Teams, or Zoom may be integrated for real-time communication and collaboration features within FindYourRoof.

Analytics and Reporting Tools: Commercial analytics and reporting software like Tableau or Power BI may be utilized for advanced data analysis, visualization, and reporting capabilities.

Customer Relationship Management (CRM) Systems: Commercial CRM systems like Salesforce or Microsoft Dynamics CRM may be integrated to manage donor relationships, track interactions, and improve engagement.

These off-the-shelf software components are strategically selected to enhance the capabilities and performance of FindYourRoof while reducing development efforts and costs. Integration with commercial software solutions ensures reliability, scalability, and access to specialized features that benefit non-profit organizations, volunteers, and other stakeholders using the platform.

6e Anticipated Workplace Environment

The anticipated workplace environment for FindYourRoof is a critical consideration, as it impacts the design, usability, and functionality of the platform. Understanding the human factors and conditions in which the product will be used ensures that it meets the needs and expectations of the users. Here are key aspects of the anticipated workplace environment:

Mobile Accessibility: Given the dynamic nature of social impact work, users are likely to access FindYourRoof via mobile devices, such as smartphones and tablets. Mobile responsiveness and a dedicated mobile app (if applicable) are essential.

Limited Connectivity: Some users may have limited internet connectivity, especially in remote or underserved areas. The platform should consider offline functionality or data synchronization when connectivity is intermittent.

Accessibility Needs: Users with diverse abilities may interact with FindYourRoof. The platform should adhere to accessibility standards to accommodate individuals with disabilities, including those using screen readers or alternative input devices.

Understanding these aspects of the anticipated workplace environment helps guide the design and development of the application to ensure that it is user-friendly and accessible.

6f Schedule Constraints

Schedule constraints in the development of FindYourRoof dictate when specific tasks, milestones, and the overall project must be completed. These constraints are essential for project planning, resource allocation, and meeting client expectations. Here are some key schedule constraints:

Client Deadlines: The client would have set specific deadlines for the completion of FindYourRoof, aligning with grant cycles, funding availability, or other external factors. Adhering to client deadlines is critical to meet the client's objectives and expectations. Failure to do so can result in missed opportunities for funding or support.

Regulatory Compliance Deadlines: Compliance with regulatory requirements may impose specific deadlines. Meeting compliance deadlines is essential to avoid legal penalties and maintain trust among users and stakeholders.

Testing and Quality Assurance: Rigorous testing and quality assurance phases should be scheduled to identify and address issues before launch.

Marketing and Outreach: Marketing and outreach activities, including promotional campaigns and user training, should align with the platform's launch and updates.

Version Updates and Maintenance: The platform's schedule should account for periodic version updates and ongoing maintenance to address issues, add new features, and enhance security.

6g Budget Constraints

This plays a significant role in shaping the development of FindYourRoof. These limitations define the financial resources available for the project and influence decisions related to scope, resource allocation, and project management. Here are key budget constraints associated with the development of FindYourRoof:

Fixed Budget: The client or funding source has allocated a fixed budget for the development of FindYourRoof. Adhering to the fixed budget is essential, requiring careful cost management, prioritization of features, and efficient resource utilization throughout the project.

Resource Costs: The budget must cover various resource costs, including personnel salaries, subcontractor fees, hardware and software expenses, and licensing fees for commercial software components.

Third-Party Costs: The integration of third-party services or solutions, such as payment gateways, geolocation services, or cloud hosting, may incur additional costs.

Contingency Funds: A portion of the budget may need to be allocated for contingency or unforeseen expenses that may arise during the project.

Scalability and Future Costs: The budget should consider the scalability of the platform and anticipate future operational costs beyond the development phase.

7 Naming Conventions and Definitions

7a Definitions of Key Terms

FindYourRoof: The all-in-one application designed to assist homeless individuals in finding affordable housing, employment opportunities, and communication with mentors and support networks.

AI Engine: The artificial intelligence system used for job matching, which matches individuals based on their skill sets, past experiences, and training needs.

Document Repository: An encrypted cloud-based system where individuals can securely store critical personal documents.

Geospatial Integration: A system that uses location data to find nearby housing and jobs for homeless people, especially close to bus or train stops.

Cloud Service Providers: Companies that give online storage and service where data and software can be accessed from anywhere with a network.

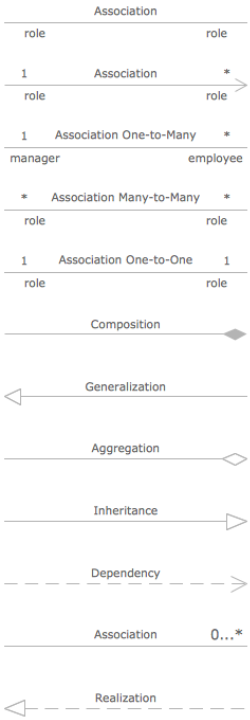
Progress Tracker: A tool within the application that allows homeless individuals to monitor and visualize their progress toward stable housing and employment.

Volunteer: Individuals who can donate to Non-Profit Organizations and participate in workshop events.

Mentor: Individuals who offer one-on-one guidance and support to homeless individuals through the application.

7b UML and Other Notation Used in This Document

Relations between classes are defined using the following symbols :



To define the visibility of the corresponding item:

Character	Icon for field	Icon for method	Visibility
-			private
#			protected
~			package private
+			public

7c Data Dictionary for Any Included Models

The information that is recorded in the application of various users includes:

1. Homeless Individual Profile: Name, Contact Information, Personal Information (e.g., age, gender), Date joined, Employment History, Employment Status, Skills and Training, Housing Preferences, Housing Status, Progress Tracker Data that tracks their journey from the starting date of their application to their current use, Document Repository (critical documents)
2. Non-Profit Organization Member Profile: Name, Contact Information, Role within the organization, Data on individuals being assisted, Workshop Events (creation and scheduling), Communication Records with Landlords and Employers

3. Employer Profile: Name, Contact Information, Job Listings, Communication Records with Non-Profit Organizations, Job Candidate Applications
4. Landlord Profile: Name, Contact Information, Housing Listings, Communication Records with Non-Profit Organizations, Housing Applications
5. Mentor Profile: Name, Contact Information, Areas of Expertise, Communication Records with Homeless Individuals
6. Volunteer Profile: Name, Contact Information, Donation Records, Participation in Workshop Events

The overall data storage and flows involve:

1. Job-Matching Data: User profiles matched based on skill sets, past experiences, and training needs.
2. Document Repository Data: Encrypted cloud-based storage for critical personal documents of homeless individuals.
3. Mentor Matching Data: Complex machine learning data for matching individuals with suitable mentors.
4. Geospatial Data: Data related to housing and employment options near public transportation.
5. Workshop Event Data: Information on workshop events, including schedules, topics, and participant details.
6. Communication Records: Logs of communication between various user types (NPOs, Employers, Landlords, Mentors) and Homeless Individuals.

Technical Specifications for Interfaces involve:

1. User Registration and Login Interface: Capturing user data for registration and authentication.
2. Profile Editing Interface: Allows users to update their profiles and preferences.
3. Job and Housing Application Interfaces: Allows users to apply for jobs and housing.
4. Communication Interface: Provides messaging and communication features.

Document Upload and Access Interface: Allows users to upload and access critical documents securely.

8 Relevant Facts and Assumptions

8a Facts

Non-profit organizations are actively engaged in addressing homelessness. In many urban areas, there is a significant shortage of affordable housing units, leading to increased homelessness rates. This shortage can be exacerbated by factors like rising property prices and limited low-income housing options. According to the U.S. Department of Housing and Urban Development (HUD), on any given night in the United States, there are approximately 580,000 people experiencing homelessness [1].

Homeless individuals often face barriers to employment, such as a lack of a stable address and access to necessary resources like transportation and work attire. Non-profit organizations are actively engaged in addressing homelessness. They often have valuable data and insights into the needs and challenges faced by homeless individuals.

8b Assumptions

One of our main assumptions is that Non-Profit Organizations (NPOs) have sufficient resources, including staff and funding, to effectively manage and support homeless individuals through the platform. The second assumption is that homeless individuals and other users have access to the internet through mobile devices or public facilities, as the application relies on online interactions. Another assumption is the availability and reliability of public transportation services in the areas where users are seeking housing and employment. The success of Geospatial Integration relies on this assumption.

II Requirements

9 Product Use Cases

9a Use Case Diagrams

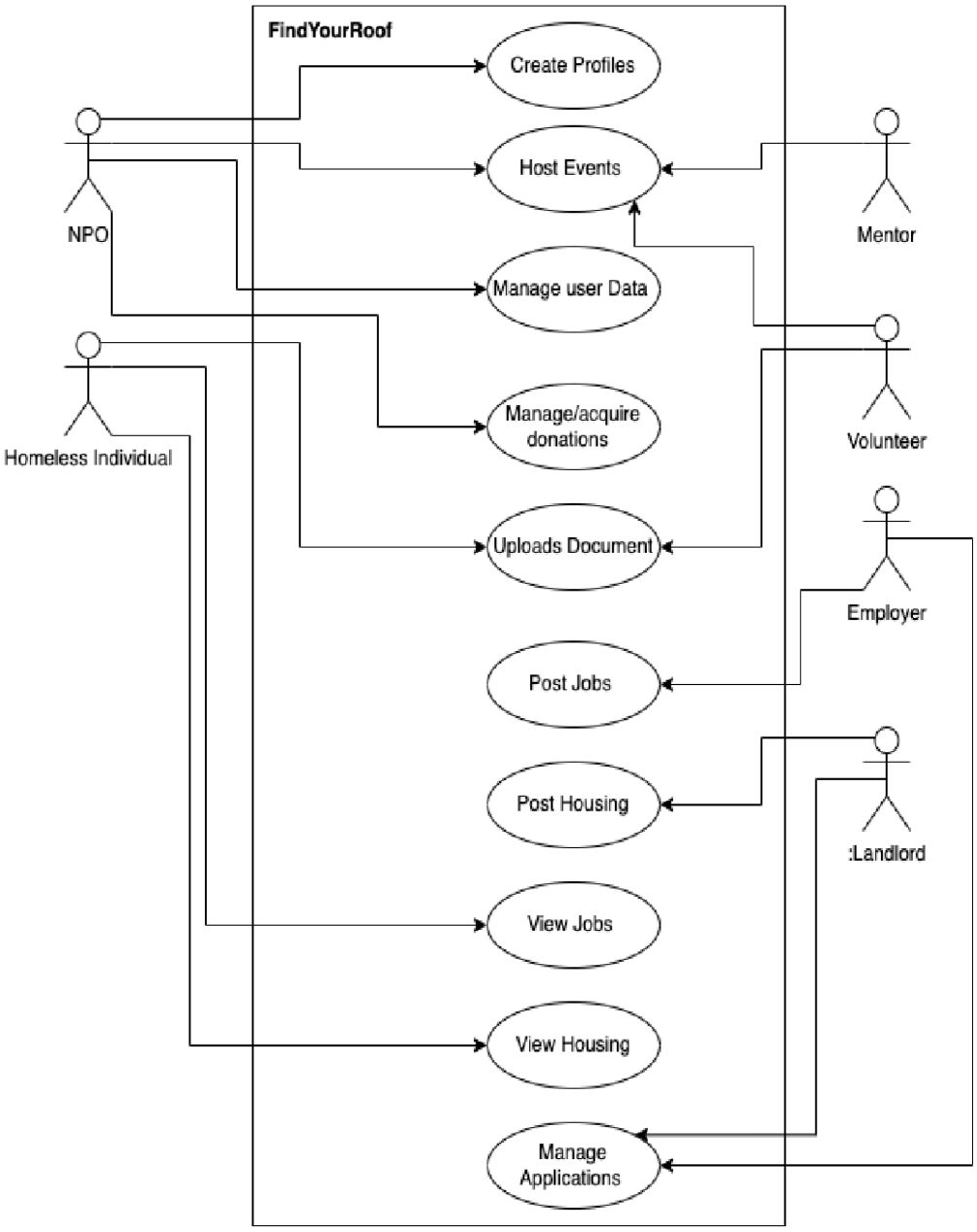


Fig 5: Use-Case Diagram

9b Product Use Case List

#ID	Usecase Name	Description
01	Homeless individual searches for housing	This use case explains how a Non-Profit Organization (NPO) identifies and registers a homeless person who then utilizes the FindYourRoof platform to look for housing. The person signs in, adjusts search parameters, and peruses the available listings. When a listing meets their requirements, they can apply, and the system notifies property managers and landlords. For those who have registered, NPO members can offer confirmation or recommendations.
02	Homeless individual needs medical attention	In this use case, a homeless individual, who already has a FindYourRoof profile, seeks medical assistance due to a lack of resources. The individual initiates the process by logging into the platform, where they are guided to provide necessary background information. The system then analyses the responses and matches the individual with an available mentor or social worker. Communication is facilitated through an in-app messaging facility, where the mentor and individual discuss the requirements. Depending on the issue, the mentor may suggest an in-person meeting or set up online consultations.

03	NPO hosts an event (workshop/ medical camp)	In this use case, an event for homeless people is organized by a Non-Profit Organization (NPO). The nonprofit organization posts an event on FindYourRoof, complete with the event's date, time, location, and description. The event page is published by the system, enabling people to check it over and sign up for attendance. Medical facilities and volunteers are also welcome to sign up to help with the event. Reminders are sent to registered attendees by the system, which also creates an attendance list.
04	NPO identifies talented individuals to provide job assistance	In this use case, the Non-Profit Organization (NPO) helps unemployed people locate steady work. When someone uses the app to apply for job aid, they are the ones who start the process. Potential employers who have collaborated with FindYourRoof are recommended to view the individual's profile by the NPO. Companies consider the applicant's application before making a hiring choice. The app's job applications portion serves as the NPO's means of notifying the selected applicant. Employers schedule interviews through FindYourRoof's messaging feature, and the platform automatically notifies users when interviews are scheduled on calendars. If the candidate is chosen, the system logs job placement information, and the NPO actively monitors the application process. The NPO also offers career support based on each person's needs.

05	NPO launches targeted homeless outreach campaign	In order to enhance homeless people's access to services, a Non-Profit Organization (NPO) launches a focused outreach effort in this use case. Utilizing data analysis to pinpoint service gaps, the NPO launches the outreach effort on FindYourRoof first. The technology notifies volunteers about the campaign, who work with the NPO to pinpoint regions where there are homeless people. When volunteers visit these locations, they urge the homeless to utilize the FindYourRoof app to get the resources they need. People can connect with necessary services with the aid of this outreach. Using combined data, the NPO monitors the campaign's effects; the trends that emerge guide future strategic planning and resource distribution. Governmental organizations are also involved in enhancing public services for the homeless community.

06	Donors contribute to NPO's initiatives	In this use case, a Non-Profit Organization (NPO) initiates a fundraising campaign to attract donors for specific initiatives aimed at helping the needy. The NPO specifies campaign details, including the fundraising goal, timeframe, and expected impact. The system notifies the fundraising campaign to volunteers and potential donors. The NPO shares the campaign through integrated social media tools to attract donors to the FindYourRoof platform. Donors are notified and can browse the campaign page and choose contribution options. They make online contributions through integrated payment processing. The system records donor details and contribution amounts, which the NPO uses to expand services to the homeless community. Donors have the option to be displayed on the contributors' page.
07	Social Worker enrols disable person in existing initiatives	In this use case, a client who is physically disabled and already registered with FindYourRoof asks a social worker for help in enrolling in government programs like the Supplemental Nutrition Assistance Program. The client starts the process by using the FindYourRoof portal to make an appointment with a social worker. The social worker looks into the customer's background to find out which initiatives they qualify for and then assigns the client to the closest Non-Profit Organization (NPO) site. The social worker gathers the required data about the client, starts the application procedure on the client's behalf, and helps the client finish it. The completed application is sent for approval to the relevant agencies.

Table 3: Product Usecase List

9c Individual Product Use Cases

Use case ID: 01 **Name:** Homeless individual searches for housing

Pre-conditions:

- Homeless individual should be identified by NPO and register the individual on FindyourRoof
- Housing listings have been posted by landlords/property managers

Post-conditions:

- Individual has viewed and applied to housing listings matching their criteria

Initiated by: Homeless Individual

Triggering Event: Homeless individual logs into FindYourRoof and navigates to the housing search page to find a place to live

Additional Actors:

- Landlords/Property Manager
- Non-Profit Organization (NPO) members

Sequence of Events:

1. Homeless individual logs into FindYourRoof and navigates to the Housing Search page
2. System displays search filters and map view for housing listings
3. Individual enters search criteria (location, duration, availability, etc.) and applies filters
4. System queries database and displays listings matching the search criteria
5. Individual browses listings and identifies ones of interest
6. System displays full details of selected listings
7. Individual reviews listings and selects ones to apply for
8. System records housing applications and notifies landlords/property managers
9. NPO members provide verification or recommendations for individuals registered with their organization

Alternatives:

- Individual saves it to review later before applying
- No listings match individual's criteria so system provides suggestions to broaden search

Exceptions:

- System error prevents loading of listings
- Listings contain inaccurate or outdated information

Use case ID: 02 **Name:** Homeless individual needs medical attention

Pre-conditions:

- Individual has a FindYourRoof profile
- Available mentors/social workers are registered on the platform

Post-conditions:

- Individual is matched to an appropriate mentor/social worker

Initiated by: Homeless Individual

Triggering Event: Homeless individual needs medical assistance due to lack of resources

Additional Actors:

- Non-Profit Organization (NPO) members
- Social Workers/ Mentors

Sequence of Events:

1. Homeless individual logs into FindYourRoof and navigates to the Assistance Page
2. System prompts individual to provide background information.
3. Individual completes the background questions provided in the form
4. System analyzes responses and matches individual to available mentor.
5. System introduces mentor and individual via in-app messaging facility
6. Mentor and individual discuss the requirements.
7. Based on the issue, mentor suggests in-person meeting time, or sets up online consultations.

Alternatives:

- Individual pauses and completes background questions later.

Exceptions:

- No mentor match found so NPO staff manually match individual.

Use case ID: 03 **Name:** NPO hosts an event (workshop/medical camp)

Pre-conditions:

- NPO has scheduled an event for homeless individuals ● Event details are posted on FindYourRoof

Post-conditions:

- Homeless individuals have attended the event and got benefitted

Initiated by: Non-Profit Organization

Triggering Event: NPO creates event that benefit the homeless individuals

Additional Actors:

- Volunteers
- Medical Institutions

Sequence of Events:

1. NPO creates event posting with date, time, location, description.
2. System publishes workshop event page.
3. Individuals review event, register attendance.
4. Volunteers sign up to assist with workshop.
5. System compiles attendance list, sends reminders.
6. NPO downloads attendance list to prepare materials.
7. Individuals and volunteers attend event.

Alternatives:

N/A

Exceptions:

- Low registration leads NPO to reschedule event.

Use case ID: 04 **Name:** NPO identifies talented individuals to provide job assistance
Pre-conditions:

- Individual should be registered with the NPO
- Employers should be partnered with FindYourRoof

Post-conditions:

- Individual is successfully hired into a stable job

Initiated by: Homeless Individual

Triggering Event: NPO identifies job requirement for jobless and talented individuals

Additional Actors:

- Employers

Sequence of Events:

1. Jobless individual applies for job assistance in app.
2. NPO recommends individual's profile to the employer.
3. Employer reviews homeless job seeker's application and posts the hiring decision.
4. If an individual is selected, then NPO notifies the individual under job applications section.
5. Employer arranges interview through FindYourRoof messaging facility.
6. System sends an automated calendar notification to individual regarding interview date and time.
7. NPO tracks the job application process.
8. If selected, the system records job placement data.
9. NPO provides career support to individual, based on requirement.

Alternatives:

- Job coaching could be provided.

Exceptions:

- Individual cannot attend the interview.

Use case ID: 05 **Name:** NPO launches targeted homeless outreach campaign
pre-conditions:

- NPO has gathered data on local homeless population needs

post-conditions:

- Targeted outreach improves homeless individuals' access to services provided by NPO

Initiated by: Non-Profit Organization
Triggering Event: NPO analyzes its data to identify service gaps
Additional Actors:

- Homeless individuals
- Government agencies
- Volunteers

Sequence of Events:

1. NPO creates targeted outreach campaign on FindYourRoof.
2. System shares campaign with volunteers.
3. NPO and Volunteers collaborate to identify slum areas
4. Volunteers visit slum areas and encourage homeless individuals to use FindYourRoof application for available services.
5. Individuals connect to needed services through outreach.
6. NPO tracks campaign impact with integrated data.
7. Trends inform future strategic policy and resource allocation.
8. Government agencies improve public services for homeless.

Alternatives:

- Government agencies identify data metrics on FindYourRoof and take necessary actions.

Exceptions:

- Government agencies may not take necessary actions on time.

Use case ID: 06 **Name:** Donors contribute to NPO's initiatives
pre-conditions:

- Donors should be registered on FindYourRoof to contribute to NPO ● NPO identifies a specific funding need

post-conditions:

- Targeted initiatives attract new donors

Initiated by: Non-Profit Organization
Triggering Event: NPO requires funds to help the needy people
Additional Actors:

- Potential donors
- Volunteers

Sequence of Events:

1. NPO specifies details like fundraising goal, timeframe, impact.
2. System notifies the fundraising campaign with volunteers, potential donors
3. NPO shares campaign through integrated social media tools to get donors on FindYourRoof platform
4. Donors in app get notified and browse campaign page and contribution options.
5. Donors make online contributions through integrated payment processing.
6. System records donor details and contribution amounts.
7. NPO uses funds to expand services to homeless community.
8. Donors are displayed on contributors' page, if they are willing to.

Alternatives:

- Volunteers can encourage donors to use FindYourRoof application for making contributions to any initiative of their interests.

Exceptions:

- Payment Processing Delays

Use case ID: 07 **Name:** Social Worker enrolls disable person in existing initiatives
pre-conditions:

- Handicapped client needs assistance
- Client should be enrolled With FindYourRoof
- Client should be eligible for certain government initiatives (Ex: Supplemental Nutrition Assistance Program)

post-conditions:

- Client is successfully enrolled in eligible initiatives

Initiated by: Client

Triggering Event: Meeting with client to review assistance options

Additional Actors:

- Physically Handicapped Person (Client)
- NPO

Sequence of Events:

1. Client makes appointment with Social Worker through FindYourRoof
2. Social worker assigns the client to nearest NPO in that location
3. Social worker verifies the client background and suggests all the initiatives client is eligible for.
4. Social worker collects needed client information.
5. Social worker initiates application on client's behalf.
6. Social worker completes application process with client.
7. Application is submitted to appropriate agencies for approval.
8. Client is officially enrolled and can access benefits.

Alternatives:
N/A

Exceptions:
N/A

10 Functional Requirements

R1 - Housing Search

Description: The system shall allow homeless individuals to search for available housing listings based on criteria such as location, rent range, duration etc.

Rationale: This is a core functionality that enables individuals to find and apply for suitable housing.

Fit Criterion: Individuals can successfully view and filter listings and apply to housing opportunities that match their needs.

Acceptance Tests: T1, T2

R2 - Medical Assistance Request

Description: The system shall allow homeless individuals to request medical assistance by providing background details which will be used to match them to a social worker or mentor.

Rationale: This provides a way for vulnerable individuals to get health/medical help.

Fit Criterion: Individuals are matched to appropriate mentors/social workers who can assist with medical needs.

Acceptance Tests: T3

R3 - Event Hosting

Description: The system shall allow NPOs to create and manage events like workshops and medical camps, including registration, reminders, attendance tracking etc.

Rationale: This supports NPOs in organizing impactful events for the homeless community.

Fit Criterion: NPOs are able to successfully create event listings, compile attendance, send reminders and track participation.

Acceptance Tests: T4

R4 - Job Assistance

Description: The system shall allow NPOs to recommend registered homeless individuals to employers and assist with the job application process including tracking status and scheduling interviews.

Rationale: This helps capable individuals gain employment.

Fit Criterion: Individuals can apply for jobs on the platform and NPOs can facilitate the hiring process through to placement.

Acceptance Tests: T5

R5 - Outreach Campaign Management

Description: The system shall allow NPOs to create targeted outreach campaigns to improve homeless individuals' access to services, and share these campaigns with volunteers to collaborate.

Rationale: This expands NPOs' ability to reach and assist the homeless.

Fit Criterion: NPOs can successfully create, target, share and analyze outreach campaigns on the platform.

Acceptance Tests: T6

R6 - Donation Management

Description: The system shall allow NPOs to create fundraising campaigns with goals and impact details to attract donor contributions through integrated payment processing.

Rationale: This provides NPOs with an efficient way to raise funds for initiatives.

Fit Criterion: NPOs can create and share campaigns, while donors can browse campaigns and make online contributions.

Acceptance Tests: T7

R7 - Social Services Enrollment

Description: The system shall allow social workers to enroll qualified homeless individuals in government social service programs by initiating applications on their behalf.

Rationale: This simplifies the enrollment process for social assistance.

Fit Criterion: Social workers can verify eligibility, collect information, and submit applications for approval and enrollment.

Acceptance Tests: T8

11 Data Requirements

R8 - User Profile Data

Description: The system shall allow different user types (homeless individuals, NPO members, social workers etc.) to create profiles containing relevant data such as name, contact info, skills, needs etc.

Rationale: Capturing appropriate profile data enables customized experiences and matched services.

Fit Criterion: All user types can create profiles with fields tailored to their role and needs.

Acceptance Tests: T9, T10

R9 - Housing Listing Details

Description: Housing listings shall include key details like location, size, rent, duration, amenities, accessibility features, landlord contact etc.

Rationale: This data ensures listings provide sufficient information for individuals to evaluate suitability.

Fit Criterion: Housing listings contain the necessary details in a standardized structure.

Acceptance Tests: T11

R10 - Secure Document Storage

Description: The system shall securely store personal documents uploaded by homeless individuals such as ID cards, health records, proof of homelessness etc.

Rationale: Secure document storage preserves important records and protects privacy.

Fit Criterion: Uploaded documents are encrypted and accessible only to authorized users.

Acceptance Tests: T12

R11 - Event Details

Description: Event listings shall include key details like title, date/time, location, description, eligibility criteria, registration instructions etc.

Rationale: This provides sufficient information for individuals to evaluate and register for events.

Fit Criterion: Event listings contain the necessary standardized details.

Acceptance Tests: T13

R12 - Job Listing Details

Description: Job listings shall include key details like title, responsibilities, qualifications, salary, location, employer contact etc.

Rationale: This provides sufficient information for individuals to evaluate job suitability.

Fit Criterion: Job listings contain the necessary standardized details.

Acceptance Tests: T14

R13 - Campaign Details

Description: Outreach campaign listings shall include goal, timeframe, target population, geographic area, services promoted etc.

Rationale: This data helps volunteers effectively support campaign execution.

Fit Criterion: Campaign listings provide sufficient standardized details.

Acceptance Tests: T15

R14 - Donation Details

Description: Donation records shall include donor name, contact info, contribution amount, date, nonprofit recipient etc.

Rationale: This data helps NPOs track fundraising efforts.

Fit Criterion: Donations are recorded with required details in a standard format.

Acceptance Tests: T16

R15 - Mentor Matching Details

Description: The system shall capture details about individuals' needs, background, preferences etc. to effectively match them with appropriate mentors.

Rationale: Capturing relevant data leads to better mentor-mentee fits.

Fit Criterion: Mentor matching incorporates all necessary data points.

Acceptance Tests: T17

R16 - Medical Assistance Request Details

Description: Medical assistance requests shall capture key details like symptoms, conditions, disabilities, medications, contact info, etc.

Rationale: This data enables proper assistance routing and follow-up.

Fit Criterion: Medical requests include all relevant standardized details.

Acceptance Tests: T18

R17 - Social Services Application Details

Description: Applications for social services shall pre-fill with individual profile data and capture any additional details required by specific programs.

Rationale: Pre-filled applications reduce friction in the enrollment process.

Fit Criterion: Applications contain pre-populated data as well as any supplemental program-specific fields.

Acceptance Tests: T19

R18 - Platform Analytics Data

Description: The system shall aggregate usage data to generate insights on platform engagement, campaigns, resources access etc.

Rationale: Analytics identify trends and inform strategic decisions.

Fit Criterion: The system collects and aggregates key metrics on user behaviors and activity.

Acceptance Tests: T20

12 Performance Requirements

12a Speed and Latency Requirements

R19 - Housing Search Response Time

Description: The housing search results page shall load within 5 seconds after filters are applied.

Rationale: Minimizing latency provides good user experience.

Fit Criterion: The results page consistently loads in under 5 seconds.

Acceptance Tests: T21

R20 - Mentor Matching Time

Description: The system shall identify and assign an appropriate mentor to an individual in need within 2-3 minutes of their request being submitted.

Rationale: Timely access to mentorship is important.

Fit Criterion: Mentor assignment takes place in under 3 minutes from the initial request.

Acceptance Tests: T22

R21- Job Application Response Time

Description: The system shall notify applicants of job application status within 1-2 weeks of submission.

Rationale: Timely feedback on job applications is important.

Fit Criterion: Job application status notifications occur within 3 business days.

Acceptance Tests: T23

R22 - Donation Processing Time

Description: The system shall process and confirm online donations within 24 hours of transaction.

Rationale: Fast donation processing improves user experience.

Fit Criterion: Donations are confirmed within 1 hour.

Acceptance Tests: T24

12b Precision or Accuracy Requirements

R23 - Housing Search Results Relevance

Description: The housing search algorithm shall return results with at least 80% relevance to the searcher's specified criteria and preferences.

Rationale: Highly relevant search results improve the individual's ability to identify suitable housing options.

Fit Criterion: 80% of the listings returned meet the searcher's criteria based on location, rent, amenities etc.

Acceptance Tests: T25

R24 - Donation Reporting Precision

Description: Donation reporting shall reflect exact contribution amounts with no rounding or truncation of transaction details.

Rationale: Precise donation data is critical for nonprofit accounting.

Fit Criterion: All reported donation amounts match the complete transaction details.

Acceptance Tests: T26

R25 - Outreach Campaign Targeting Precision

Description: Outreach campaign targeting shall reach at least 70% of intended individuals based on geography, needs, demographics etc.

Rationale: Precise targeting increases campaign effectiveness.

Fit Criterion: 80% of targeted users fit the defined audience.

Acceptance Tests: T27

12c Capacity Requirements

R26 - Maximum Concurrent Housing Searches

Description: The system shall support up to 5000 concurrent housing searches.

Rationale: Enables large numbers of individuals to search listings simultaneously.

Fit Criterion: 5000 housing searches can execute concurrently with acceptable latency.

Acceptance Tests: T28, T29

R27 - Maximum Mentor Recommendations

Description: The system shall be able to recommend up to 1000 mentor matches per day.

Rationale: Allows large volume of individuals to be matched to mentors daily.

Fit Criterion: System can successfully complete 1000 mentor recommendations in a 24-hour period.

Acceptance Tests: T30

R28 – Processing Donations

Description: The system shall be able to process up to 500 donations per minute.

Rationale: Allows high volume of donations without any lag

Fit Criterion: The system shall be tested under a simulated load of 500 donation transactions per minute.

Acceptance Tests: T31

13 Dependability Requirements

13a Reliability Requirements

R29 - Housing Search Reliability

Description: The housing search function shall be available 99.9% of the time, measured monthly. No more than 1% of searches shall return erroneous results.

Rationale: Reliable search is critical for individuals seeking housing.

Fit Criterion: Housing search uptime is ≥99.9% monthly. Error rate is ≤1% of searches.

Acceptance Tests: T32

R30 - Mentor Matching Reliability

Description: The mentor matching system shall recommend an appropriate mentor with no more than 2% match failures monthly.

Rationale: Reliable mentor matches are important for assisting individuals.

Fit Criterion: ≥98% successful mentor matches monthly.

Acceptance Tests: T33

R31 - Donation Processing Reliability

Description: The donation processing system shall successfully process 99.95% of transactions with no more than 0.05% failure rate monthly.

Rationale: Reliable donation processing enables fundraising.

Fit Criterion: ≥99.95% successful monthly transactions.

Acceptance Tests: T34

13b Availability Requirements

R32 - Overall Platform Availability

Description: The FindYourRoof platform shall be available for use 99.5% of the time measured monthly.

Rationale: High availability is critical for serving the homeless community.

Fit Criterion: Platform uptime is ≥99.5% monthly.

Acceptance Tests: T35

R33 - Housing Search Availability

Description: The housing search functionality shall be available for use 99.8% of the time measured weekly.

Rationale: Constant access to search is needed by individuals seeking housing.

Fit Criterion: Search uptime is ≥99.8% weekly.

Acceptance Tests: T36

R34 - Donation Processing Availability

Description: The donation processing system shall be available 99.9% of the time measured daily.

Rationale: High donation processing availability enables ongoing fundraising.

Fit Criterion: Donation processing uptime is ≥99.9% daily.

Acceptance Tests: T37

R35 - Mentor Matching Availability

Description: The mentor matching system shall be available for use 99.5% of the time measured monthly.

Rationale: Continuous access is important for individuals seeking guidance.

Fit Criterion: Mentor matching uptime is ≥99.5% monthly.

Acceptance Tests: T38

13c Robustness or Fault-Tolerance Requirements

R36 - Offline Housing Search

Description: The housing search functions shall provide basic search capabilities if internet connectivity is lost.

Rationale: Enables limited search ability when offline.

Fit Criterion: Users can search cached listings and filters work in offline mode.

Acceptance Tests: T39

R37 - Mentor Matching Degradation

Description: The system shall recommend the most suitable fallback mentors if the optimal match is unavailable due to system failures.

Rationale: Provides mentoring guidance even during degradations.

Fit Criterion: Next best available mentors are recommended when ideal matches fail.

Acceptance Tests: T40

R38 - Donation Processing Queue

Description: The system shall queue failed donations for automated retry/processing upon restoration of functionality.

Rationale: Retries failed donations when issues are fixed.

Fit Criterion: Donations are queued and retried after failures.

Acceptance Tests: T41

13d Safety-Critical Requirements

R39 - Housing Inspection Verification

Description: The system shall verify housing units have passed inspections before listing them as available.

Rationale: Ensures safety of housing options.

Fit Criterion: All listed properties have passed inspections.

Acceptance Tests: T42

R40 - Job Site Safety

Description: The system shall only list jobs that adhere to workplace safety regulations.

Rationale: Avoids recommending unsafe work environments.

Fit Criterion: All jobs pass safety vetting before listing.

Acceptance Tests: T43

14 Maintainability and Supportability Requirements

14a Maintenance Requirements

R41 - Housing List Updates

Description: Housing listings must be updated or removed by landlords within 7 days of a change in availability.

Rationale: Ensures accurate listings.

Fit Criterion: Outdated listings are refreshed within 7 days.

Acceptance Tests: T44

R42 - Profile Data Updates

Description: Users must be able to update their name, contact information, or other profile data within the app.

Rationale: Allows users to maintain current profiles.

Fit Criterion: Users can successfully edit all key profile fields.

Acceptance Tests: T45

R43 - Application Version Upgrades

Description: The application software should be upgradeable to new versions without service interruption or data loss.

Rationale: Allows new features and fixes to be deployed.

Fit Criterion: Upgrades are completed without downtime or data impact.

Acceptance Tests: T46

R44 Event Detail Updates

Description: NPOs must be able to edit event listings up to 24 hours prior to event start.

Rationale: Allows flexibility in event management.

Fit Criterion: Listings can be edited without issue up to 24 hours before event.

Acceptance Tests: T47

R45 - Donation Tracking

Description: Donation and campaign data must persist and remain reportable for at least 2 years.

Rationale: Retaining data allows ongoing fund analysis.

Fit Criterion: Donation data is available consistently for 2+ years.

Acceptance Tests: T48

R46 - Application Backup

Description: Administrative users must be able to perform periodic backups of application data.

Rationale: Preserves data integrity and provides restoration ability.

Fit Criterion: Backup capability is functional and available to admins.

Acceptance Tests: T49

14b Supportability Requirements

R47 - User Documentation

Description: The system shall provide user guides, help documentation, and FAQs accessible within the application.

Rationale: Provides self-serve support resources.

Fit Criterion: Users can easily access documentationcovering core system functionality.

Acceptance Tests: T50

R48 In-App Chat Support

Description: The system shall provide chat-based support for users' questions and issues.

Rationale: Allows real-time assistance.

Fit Criterion: Chat support is available and facilitates issue resolution.

Acceptance Tests: T51

R49 - Email Support

Description: Users must be able to submit support tickets via email for assistance.

Rationale: Provides an alternative communication channel.

Fit Criterion: Email support channel is operational and responsive.

Acceptance Tests: T52

14c Adaptability Requirements

R50 - Mobile Application

Description: The system shall provide a mobile application compatible with Android and iOS.

Rationale: Supports access across devices.

Fit Criterion: The mobile apps are functional on Android and iOS with core features.

Acceptance Tests: T53

R51 - Browser Compatibility

Description: The web application shall support leading desktop and mobile browsers like Chrome, Firefox, Safari.

Rationale: Provides consistent experience across browsers.

Fit Criterion: Application is fully functional on all supported browsers.

Acceptance Tests: T54

R52 OS Compatibility

Description: The system shall be compatible with Windows and macOS operating systems.

Rationale: Enables access from different desktop OS's.

Fit Criterion: Full intended functionality on supported OSes.

Acceptance Tests: T55

R53 - Offline Access

Description: The system shall provide limited offline functionality via cached data on mobile devices.

Rationale: Supports use with intermittent connectivity.

Fit Criterion: Key features available offline on mobile, data sync when reconnected.

Acceptance Tests: T56

R54 - Cloud Platform

Description: The system shall be deployable on other major cloud platforms like Microsoft Azure or Google Cloud.

Rationale: Avoids vendor lock-in.

Fit Criterion: System is fully deployed and operational on additional cloud platforms.

Acceptance Tests: T57

R55 - API Expansion

Description: The system shall support the addition of new external APIs for extended capabilities.

Rationale: Accommodates third-party integrations.

Fit Criterion: New APIs can be implemented and leveraged without issues.

Acceptance Tests: T58

14d Scalability or Extensibility Requirements

R56 - User Load

Description: The system shall support up to 50,000 active users with room to scale higher.

Rationale: Allows user growth over time.

Fit Criterion: Application performs well with 50,000+ concurrent users.

Acceptance Tests: T59

R57 - Data Volume

Description: The database and servers shall be able to scale to handle 100TB+ of data as needed.

Rationale: Provides headroom for usage growth.

Fit Criterion: System performs well as database storage approaches 100TB.

Acceptance Tests: T60

14e Longevity Requirements

R58 - Supported Versions

Description: The system shall receive critical security and bug fix updates for a minimum of 3 years from each major version release.

Rationale: Ensures continued operability over time.

Fit Criterion: Patches and hotfixes are delivered as needed during the 3-year window.

Acceptance Tests: T61

R59 - Hardware Lifespan

Description: Server and networking hardware utilized shall have a minimum lifespan of 5 years before needing replacement.

Rationale: Reduces refresh costs.

Fit Criterion: Hardware operates without performance degradation for 5+ years.

Acceptance Tests: T62

15 Security Requirements

15a Access Requirements

R60 - Housing Search Access

Description: Only verified homeless individuals shall have access to housing search functions.

Rationale: Protects access to limited housing resources.

Fit Criterion: Unverified users cannot access housing search.

Acceptance Tests: T63

R61 - User Profile Data Access

Description: Users can only view their own profile data. NPO staff can view profiles of their organization's members.

Rationale: Enforces profile data privacy.

Fit Criterion: Users and NPO staff can only access appropriate profiles.

Acceptance Tests: T64, T65

R62 - Donor Data Access

Description: Only authorized nonprofit staff can view donor contact and contribution information.

Rationale: Protects donor data.

Fit Criterion: Donor details restricted to authorized staff.

Acceptance Tests: T66, T67

R63 - Event Registration Access

Description: Only NPO staff can manage event registration and attendance, regular users can only view events.

Rationale: Controls event management.

Fit Criterion: Event management restricted to NPO staff.

Acceptance Tests: T68, T69

R64 - Job Management Access

Description: Only approved partners like NPO staff and employers can manage job listings and applications.

Rationale: Controls job posting and management.

Fit Criterion: Job management is restricted to authorized partners.

Acceptance Tests: T70, T71

R65 - Social Services Application Access

Description: Only verified social workers can initiate and submit applications on behalf of clients.

Rationale: Ensures proper enrollment access.

Fit Criterion: Social workers have exclusive app access.

Acceptance Tests: T72, T23

15b Integrity Requirements

R66 - Housing Listing Data Integrity

Description: Housing listing data shall be protected from unauthorized modification or corruption.

Rationale: Preserves integrity of critical housing data.

Fit Criterion: Housing listings can only be edited by authorized users.

Acceptance Tests: T74, T75

R67 - User Profile Data Integrity

Description: User profile data shall be protected from unauthorized modification, deletion or theft.

Rationale: Secures sensitive user data.

Fit Criterion: Profiles can only be changed by profile owners.

Acceptance Tests: T76, T77

R68 - Donation Data Integrity

Description: Donation data shall be protected from corruption, loss or falsification.

Rationale: Protects critical donation data.

Fit Criterion: Donations can only be changed through restricted interfaces.

Acceptance Tests: T78, T79

15c Privacy Requirements

R69 - Housing Application Privacy

Description: Housing applications and associated personal data shall be accessible only to the applicant and housing provider.

Rationale: Protects sensitive applicant information.

Fit Criterion: Applications are only visible to involved parties.

Acceptance Tests: T80, T81

R70 - Medical Information Privacy

Description: User medical data shall be available only to the user and authorized medical professionals assisting them.

Rationale: Protects HIPAA-regulated health data.

Fit Criterion: Medical data access is restricted appropriately.

Acceptance Tests: T82

R71 - Donor Data Privacy

Description: Donor contact information and contribution history shall be accessible only to authorized nonprofit staff.

Rationale: Protects donor data.

Fit Criterion: Donor information is properly restricted.

Acceptance Tests: T83, T84

15d Audit Requirements

R72 - Event Registration Auditing

Description: The system shall audit event registrations including attendee, event, date/time, and registration status.

Rationale: Provides auditable records of event registrations.

Fit Criterion: Required event registration details are audited.

Acceptance Tests: T85, T86

R73 - Social Services Application Auditing

Description: Completed social services applications shall be auditable showing client, program, social worker, date/time, status.

Rationale: Provides auditable records of assistance applications.

Fit Criterion: Required application details are audited.

Acceptance Tests: T87, T88

R74 - Medical Assistance Request Auditing

Description: Medical assistance requests shall be auditable showing client, date/time, symptoms, responder etc.

Rationale: Provides audit trail for tracking and follow-up.

Fit Criterion: Required request details are audited.

Acceptance Tests: T89, T90

15e Immunity Requirements

R75 - Malware Protection

Description: The system shall employ antivirus software and malware protection to prevent infection from viruses, worms, and other malicious code.

Rationale: Guards against malware disruptions.

Fit Criterion: Malware protection blocks identified threats.

Acceptance Tests: T91, T92

16 Usability and Humanity Requirements

16a Ease of Use Requirements

R76 - Intuitive Navigation

Description: The system shall provide an intuitive and consistent navigation design across all user types.

Rationale: Enables ease of learning and usage.

Fit Criterion: Users are able to navigate core workflows easily with minimal guidance.

Acceptance Tests: T93

R77 - Responsive Design

Description: The system shall provide a mobile-friendly responsive design adapting layouts and elements to any screen size.

Rationale: Accommodates usage across devices.

Fit Criterion: Application automatically adapts and functions correctly on different device form factors.

Acceptance Tests: T94

R78 - Contextual Help

Description: The system shall provide context-specific help information to guide users in completing tasks and address errors.

Rationale: Assists users and reduces confusion.

Fit Criterion: Relevant help displays for major workflows and error states.

Acceptance Tests: T95

16b Personalization and Internationalization Requirements

R79 - User Preferences

Description: Users must be able to set language, notification, and other preferences that persist across sessions.

Rationale: Provides personalized experience.

Fit Criterion: User preferences are saved and applied consistently.

Acceptance Tests: T96

R80 - Translation Support

Description: The system shall allow all UI text and user communications to be translated into multiple languages.

Rationale: Expands access across geographies.

Fit Criterion: Full UI and correspondence translation is supported.

Acceptance Tests: T97

R81 - Location-Based Preferences

Description: The system shall allow users to set their location to customize options like currency, date format, etc.

Rationale: Provides locally relevant defaults.

Fit Criterion: Location-based preferences are applied appropriately.

Acceptance Tests: T98

16c Learning Requirements

R82 - Intuitive Workflow Design

Description: Core workflows shall be designed intuitively to allow new users to easily understand the steps without training.

Rationale: Improves learnability.

Fit Criterion: Users can complete critical tasks on their own without guidance.

Acceptance Tests: T99

R83- Interactive Tutorials

Description: The system shall provide interactive step-by-step tutorials explaining key features.

Rationale: Reinforces learning for visual learners.

Fit Criterion: Tutorials walk users through major functionality interactively.

Acceptance Tests: T100

R84 - Tooltips

Description: The UI shall provide tooltips to explain the purpose of various buttons, controls and options.

Rationale: Reduces ambiguity for new users.

Fit Criterion: Relevant tooltips are provided throughout the application.

Acceptance Tests: T101

16d Understandability and Politeness Requirements

R85 - Clear Language

Description: All system instructions, messages, and notifications shall use clear, concise language tailored to end users.

Rationale: Avoids confusion and improves comprehension.

Fit Criterion: Users understand prompts, notifications, instructions etc.

Acceptance Tests: T102

R86 - Intuitive Terminology

Description: The system shall use intuitive terms familiar to users

Rationale: Makes the system more understandable.

Fit Criterion: Users comprehend all terms used throughout the system.

Acceptance Tests: T103

R87 - Respectful Tone

Description: All language used shall maintain a polite, respectful tone appropriate for diverse audiences.

Rationale: Maintains an inclusive environment.

Fit Criterion: No rude, hostile, or inappropriate language is present.

Acceptance Tests: T104

16e Accessibility Requirements

R88: Accessibility for searching any service

Description: The system should provide accessibility features that enable individuals with disabilities, including those with visual impairments or motor impairments, to get assistance on the application. This includes providing alternative text for images, keyboard navigation, and compatibility with screen readers.

Rationale: Ensuring accessibility is essential to ensure that all homeless individuals, regardless of their disabilities, can access housing resources.

Fit Criterion: The system must comply with WCAG 2.1AA accessibility standards.

Acceptance Tests: T105

16f User Documentation Requirements

R89: User Documentation for Housing Search

Description: The software should provide user documentation in the form of an online help center accessible from within the application. This documentation will include step-by-step guides on how to use the housing search feature, apply filters, save listings for later, and troubleshoot common issues. The documentation should be available in both text and audio formats.

Rationale: User documentation is essential to help all users, including those who may be less familiar with technology or have disabilities, effectively use the housing search feature.

Fit Criterion: The user documentation should be easily accessible through the application's help center, available in multiple formats, and cover all essential user actions.

Acceptance Tests: T106, T107

R90: User Documentation for Donations

Description: The software should offer user documentation within the application's help center, guiding users on how to make contributions to NPO initiatives, understand fundraising goals, and address common donation issues.

Rationale: User documentation should be available in both text and audio formats. User documentation is vital to assist users, including those with varying levels of technological familiarity or disabilities, in contributing to NPO initiatives.

Fit Criterion: The user documentation must be easily accessible, cover all significant user actions, and be available in both text and audio formats.

Acceptance Tests: T108

16g Training Requirements

R91 - Name: Training for Housing Search

Description: Users, especially those with limited technology experience or disabilities, will require training resources accessible within the application. The training materials will include video tutorials, interactive guides, and written instructions on how to effectively use the housing search feature, apply filters, save listings, and navigate the application using accessibility features.

Rationale: Training is necessary to ensure that all users, including those with disabilities, can utilize the housing search feature effectively and independently.

Fit Criterion: The training materials must be easily accessible from within the application, cover all essential user actions, and be available in various formats to accommodate different learning preferences.

Acceptance Tests: T109, T110, T111

17 Look and Feel Requirements

17a Appearance Requirements

R92: Appearance of application

Description: The application's visual appearance must align with the established branding guidelines, using a color scheme, fonts, and logos consistent with the organization's visual identity. This includes using a calming and inclusive color palette to ensure a welcoming and easy-to-read interface.

Rationale: Consistent branding and a user-friendly appearance can help build trust and ensure that the application is appealing and accessible to all users, including those with disabilities.

Fit Criterion: The application's user interface must adhere to the organization's branding guidelines in terms of color scheme, fonts, and logo placement.

Acceptance Tests: T112, T113, T114

17b Style Requirements

R93: Style for Housing Search

Description: The style of the application should convey professionalism and user-friendliness to make users feel that the platform is a trustworthy and accessible resource. It should use clean, uncluttered design elements and language that is clear and easy to understand, promoting a sense of security and ease of use.

Rationale: The chosen style is essential for building trust and ensuring users, including those with disabilities, feel comfortable using the housing search feature.

Fit Criterion: The style of the application should be assessed based on its clarity, professionalism, and user-friendliness.

Acceptance Tests: T115

18 Operational and Environmental Requirements

18a Expected Physical Environment

R94: Expected Physical Environment for Housing Search

Description: The product is expected to operate in a diverse range of physical environments, including urban and suburban areas. It should be accessible from various devices, such as smartphones, tablets, and computers.

Rationale: Homeless individuals may access the application from different locations, and it should be adaptable to various physical environments to ensure accessibility for users in need.

Fit Criterion: The product should function effectively in both urban and suburban areas and be accessible from various devices.

Acceptance Tests: T116, T117

18b Requirements for Interfacing with Adjacent Systems

R95: Interface with Housing Listings

Description: The application must be able to interface with partner applications or systems that provide housing listings. It should have the capability to retrieve and display the housing listings seamlessly within the application.

Rationale: To ensure that homeless individuals have access to up-to-date housing information, the application needs to interface with external systems that provide housing listings.

Fit Criterion: The application should successfully retrieve and display housing listings from the partner systems without errors or delays.

Acceptance Tests: T118, T119

18c Productization Requirements

R96: Distribution and Installation

Description: The application should be distributed through app stores (e.g., Apple App Store, Google Play Store) and be available for download and installation on various platforms, including iOS and Android. The installation process should be straightforward, and the application should provide clear instructions for first-time users.

Rationale: To reach a wide audience, the application needs to be available on popular app stores and have a user-friendly installation process.

Fit Criterion: The installation process should take no more than 1 minute for average users. Instructions for first-time users should be easy to understand.

Acceptance Tests: T120. . .

18d Release Requirements

R97: Release Cycle for Housing Search

Description: The product shall follow an agile release cycle with regular updates and improvements. Releases will take the form of software updates delivered through app stores (e.g., Apple App Store, Google Play Store).

Rationale: Regular updates are essential to address user feedback, fix issues, and introduce new features. The form of releases through app stores ensures easy access for users.

Fit Criterion: The product should release updates at least every three months, and each release should include bug fixes, feature enhancements, or improvements based on user feedback.

Acceptance Tests: T121, T122

19 Cultural and Political Requirements

19a Cultural Requirements

R98: Cultural Sensitivity

Description: The product should be culturally sensitive and avoid any content or language that could be considered offensive or disrespectful to various cultural groups, including homeless individuals and landlords/property managers.

Rationale: Cultural sensitivity is essential to ensure the product is inclusive and respectful of diverse cultural backgrounds and beliefs.

Fit Criterion: The product should undergo a cultural sensitivity review and receive approval from relevant cultural experts or focus groups.

Acceptance Tests: T123, T124

19b Political Requirements

R99: Stakeholder Reporting

Description: The product should provide reporting capabilities that allow key stakeholders, such as government agencies or funding entities, to access data on housing search activities and outcomes to meet their reporting requirements.

Rationale: Fulfilling stakeholder reporting requirements is essential to maintain positive relationships with these entities and ensure continued support.

Fit Criterion: The product should have a reporting module that generates data reports according to stakeholder specifications.

Acceptance Tests: T125, T126

20 Legal Requirements

20a Compliance Requirements

R100: Compliance with Funding Entity Policies

Description: The product should comply with all policies and regulations set forth by funding entities, including government agencies or private organizations that provide financial support to the project.

Rationale: Ensuring compliance with funding entity policies essential to maintain a positive relationship with these entities and secure ongoing financial support for the project.

Fit Criterion: The product's features, data collection, and reporting mechanisms should align with the policies and regulations of the funding entities. Regular audits should confirm compliance.

Acceptance Tests: T127, T128

20b Standards Requirements

R101: Data Security Standards

Description: The product should conform to industry-standard data security and privacy standards, such as ISO 27001, to protect the personal information and data of users.

Rationale: Data security standards are essential to safeguard user data and maintain trust in the product.

Fit Criterion: The product's data security measures should align with the specified standards, and regular security audits should confirm compliance.

Acceptance Tests: T129, T130

R102: Healthcare Data Standards

Description: The product should conform to healthcare data standards, such as HL7, to ensure the interoperability and secure exchange of medical information.

Rationale: Healthcare data standards are essential for seamless data sharing and collaboration among healthcare providers.

Fit Criterion: The product's data exchange capabilities should align with the specified healthcare data standards, and interoperability tests should confirm compliance.

Acceptance Tests: T131, T132

R103: Payment Processing Standards

Description: The product should conform to payment processing standards, such as PCI DSS, to ensure secure and compliant handling of online donations and financial transactions.

Rationale: Payment processing standards are essential to protect financial data and maintain donor trust.

Fit Criterion: The product's payment processing procedures should align with the specified standards, and regular security audits should confirm compliance.

Acceptance Tests: T133, T134

21 Requirements Acceptance Tests

21a Requirements – Test Correspondence Summary

	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15	R16	R17	R18	R19	R20	R21	R22	R23	R24	R25	R26	R27	R28	R29	R30	R31	R32	R33	R34	R35
T1	X																																		
T2	X																																		
T3		X																																	
T4			X																																
T5				X																															
T6					X																														
T7						X																													
T8							X																												
T9								X																											
T10								X																											
T11									X																										
T12										X																									
T13											X																								
T14												X																							
T15													X																						
T16														X																					
T17															X																				
T18																X																			
T19																	X																		
T20																		X																	
T21																			X																
T22																				X															
T23																					X														
T24																						X													
T25																							X												
T26																								X											
T27																									X										
T28																										X									
T29																										X									
T30																											X								
T31																												X							
T32																													X						
T33																														X					
T34																															X				
T35																																X			
T36																																	X		
T37																																		X	

B	AJ	AK	AL	AM	AN	AO	AP	AQ	AR	AS	AT	AU	AV	AW	AX	AY	AZ	BA	BB	BC	BD	BE	BF	BG	BH	BI	BJ	BK	BL	BM	BN	BO	BP
	R34	R35	R36	R37	R38	R39	R40	R41	R42	R43	R44	R45	R46	R47	R48	R49	R50	R51	R52	R53	R54	R55	R56	R57	R58	R59	R60	R61	R62	R63	R64	R65	R66
T37	X																																
T38		X																															
T39			X																														
T40				X																													
T41					X																												
T42						X																											
T43							X																										
T44								X																									
T45									X																								
T46										X																							
T47											X																						
T48												X																					
T49													X																				
T50														X																			
T51															X																		
T52																X																	
T53																	X																
T54																		X															
T55																			X														
T56																				X													
T57																					X												
T58																						X											
T59																							X										
T60																								X									
T61																									X								
T62																										X							
T63																											X						
T64																												X					
T65																												X					
T66																													X				
T67																													X				
T68																														X			
T69																														X			
T70																															X		
T71																															X		
T72																																X	
T73																																X	

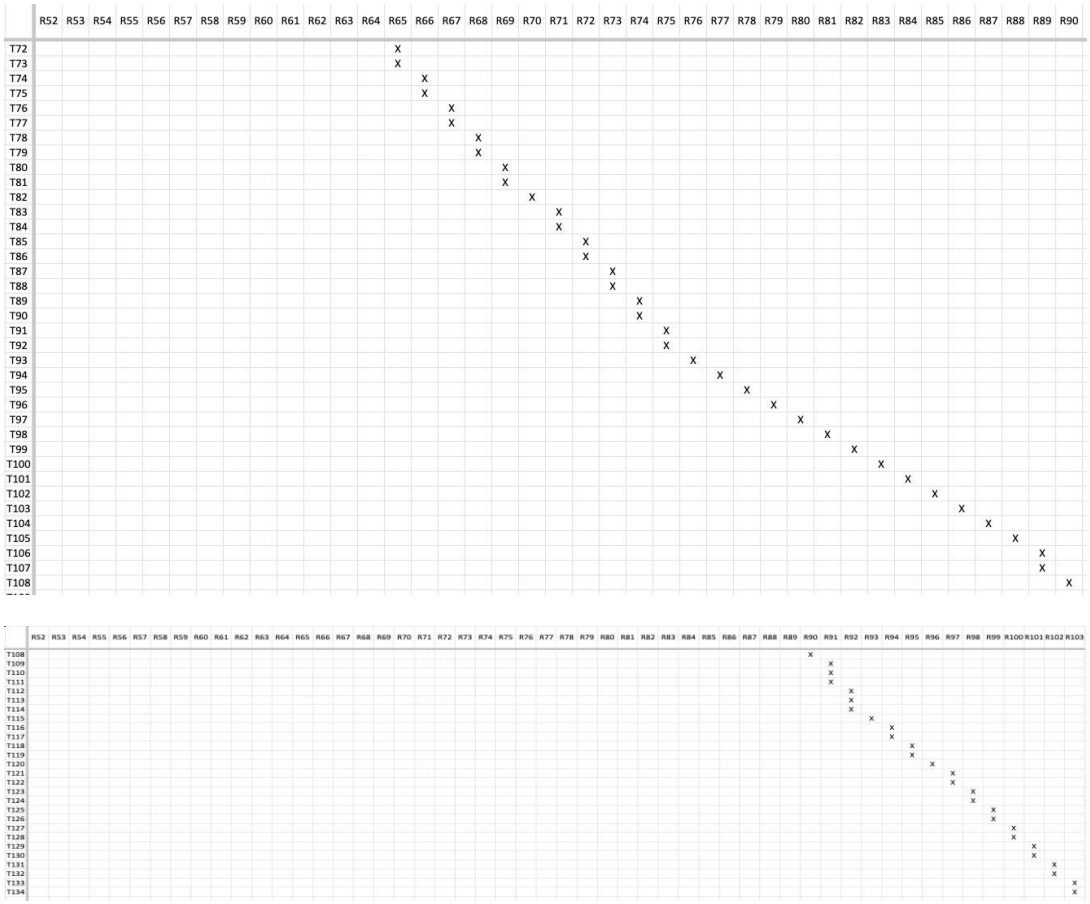


Table 4 - Requirements - Acceptance Tests Correspondence

21b Acceptance Test Descriptions

T1: Validate that homeless users are able to search and filter housing listings with various criteria such as location, rent range, amenities etc.

T2: Validate that housing search results accurately match the applied filters and display the expected listings.

T3: Validate that the system correctly matches individuals to appropriate mentors based on background details provided in medical assistance requests.

T4: Validate that NPOs are able to create event listings with all necessary details, and track registration/attendance.

T5: Validate that the job application workflow is functioning from listing to interview scheduling to status notifications.

T6: Validate NPOs can create and launch targeted outreach campaigns that become visible to intended users.

T7: Validate the end-to-end donation process from campaign creation to online contributions.

T8: Validate that social workers can initiate pre-filled applications that get correctly submitted for processing.

T9: Validate expected profile fields are present for different user types during profile creation.

T10: Validate profile data is correctly stored and displayed back to users.

T11: Validate housing listings contain required standardized details.

T12: Validate confidential documents are encrypted and accessible only to authorized users.

T13: Validate event listings contain required standardized details.

T14: Validate job listings contain required standardized details.

T15: Validate outreach campaign listings contain required standardized details.

T16: Validate donation data is accurately recorded and stored.

T17: Validate expected criteria are used by system for mentor matching.

T18: Validate medical requests collect and store required details.

T19: Validate system pre-fills social services applications with user profile data.

T20: Validate expected platform analytics data is aggregated by the system.

T21: Validate housing search results page loads within 5 seconds of filtering.

T22: Validate mentors are assigned within 24 hours of a request.

T23: Validate job application status notifications occur within 3 days.

T24: Validate donations are confirmed within 1 hour of transaction

T25: Confirm updated listings display accurately.

T26: Verify associated details are tracked and reportable.

T27: Verify backup archives can be restored to recreate application state

T28: Load test housing search with 5000 concurrent users and confirm acceptable latency.

T29: Load test housing search with 600 concurrent users and confirm degraded performance.

T30: Recommend mentors to 1000 individuals in 24 hours and confirm successful matching.

T31: Load test donation processing with 500 donations/min and confirm SLA met.

T32: Measure housing search uptime percentage each month. Search is considered unavailable if it produces errors or fails to load results. Pass criteria:

≥99.9% uptime

T33: Analyze mentor matches made each month and identify any unsuitable or inappropriate recommendations. Pass criteria: ≥98% successful matches

T34: Submit test donations and monitor failed transactions due to errors, denial etc. Pass criteria: ≥99.95% successful transactions

T35: Monitor platform uptime percentage each month. Pass criteria: ≥99.5% uptime

T36: Measure weekly uptime percentage for housing search. Pass criteria: ≥99.8% uptime

T37: Monitor daily uptime percentage for donation processing. Pass criteria: ≥99.9% uptime

T38: Monitor monthly uptime percentage for mentor matching. Pass criteria: ≥99.7% uptime

T39: Disable network and verify cached housing search still functions. Pass Criteria: Able to search cached listings offline.

T40: Simulate failure of top mentor recommendation and validate fallback mentor. Pass Criteria: Next best mentor assigned appropriately.

T41: Submit donations during failure, validate queuing, confirm processing after restoration. Pass Criteria: Donations processed properly after retry.

T42: Validate inspection status integrated from housing authority before listing properties. Pass Criteria: No unverified properties listed.

T43: Validate workplace safety compliance before listing job opportunities. Pass Criteria: No unsafe jobs listed.

T44: Verify system identifies listings as outdated

T45: Confirm updated profile data displays correctly.

T46: Confirm upgrade completes successfully without issues.

T47: Validate that changes successfully save and display accurately

T48: Verify associated details are tracked and reportable.

T49: Initiate admin data backup according to schedule. Resolve errors if any.

T50: Validates availability and coverage of documentation.

T51: Validates responsiveness and problem-solving via chat.

T52: Validates ticket handling and resolution via email

T53: Validates mobile app functionality on both platforms.

T54: Confirms operation across browser types.

T55: Validates usage on Windows and macOS.

T56: Validates offline usage on mobile.

T57: Validates functionality on alternate cloud hosting.

T58: Confirms new APIs integrate smoothly.

T59: Validates application performance under expected user load.

T60: Confirms performance with large simulated dataset

T61: Validates updates are received and applied with no issues.

T62: Confirms hardware reliability over time.

T63: Validate authentication and verification required to access housing search functions.

T64: Verify users can only view their own profiles.

T65: Confirm NPO staff access to respective member profiles, and admin access to all profiles.

T66: Validate donor data access controls for staff roles.

T67: Confirm donor data is not visible to unapproved users.

T68: Verify NPO staff have full access to manage events.

T69: Confirm regular users can only view event details.

T70: Validate job posting and management access for partners.

T71: Regular users cannot manage job listings/apps.

T72: Confirm social workers can submit applications.

T73: Other users cannot access application system.

T74: Validate only landlords can edit their listings.

T75: Attempt unauthorized edits and confirm failure.

T76: Verify users can edit their own profiles.

T77: Attempt unauthorized profile edits and confirm failure.

T78: Confirm donation edits only possible through admin screens.

T79: Attempt donation data tampering and verify failure.

T80: Validate housing applications are restricted between applicant and NPO.

T81: Unauthorized users cannot access applications.

T82: Confirm medical information is private between user, mentor and assigned medical professional(s).

T83: Validate donor data access limited to nonprofit admins.

T84: General users cannot access protected donor details.

T85: Validate auditing of event registrations with needed fields.

T86: Confirm ability to retrieve registration audit records.

T87: Verify auditing of applications with necessary fields.

T88: Confirm ability to access application audit records.

T89: Validate auditing of medical requests with needed fields.

T90: Confirm ability to retrieve medical request audit records.

T91: Validate installation and updates of antivirus software.

T92: Attempt to infect system with malware and verify blocking.

T93: Validates navigation and workflow completeness.

T94: Confirms responsive adaptation across screen sizes.

T95: Validates contextual help content.

T96: Validates preferences are saved and take effect.

T97: Verifies UI and emails display properly when translated.

T98: Validates location settings adapt UI elements as expected.

T99: Validates task completion without training.

T100: Confirms tutorial content quality and utility.

T101: Verifies presence of tooltips.

T102: Validates clarity of language used in system communications.

T103: Confirms common terminology is leveraged.

T104: Checks language used for positive tone.

T105: Test with screen reader software to ensure all essential information is read aloud.

T106: Test the accessibility of user documentation, ensuring that it is navigable with screen readers.

T107: Verify that all critical aspects of using the search feature are covered in the documentation.

T108: Confirm that the documentation comprehensively covers donation-related tasks

T109: Verify that users can access the training materials directly from the application.

T110: Assess the comprehensiveness of training materials by confirming they cover all key features.

T111: Ensure training materials are available in multiple formats, such as video, text, and interactive guides.

T112: verify that the application's color scheme aligns with the branding guidelines.

T113: Confirm that the chosen fonts are consistent with the organization's visual identity.

T114: Ensure that the organization's logo is appropriate displayed on the application.

T115: Verify that the application's design is clean and uncluttered.

T116: Test the application's performance in both urban and suburban areas to ensure consistent functionality.

T117: Verify that the application is accessible from a range of devices commonly used by the target audience.

T118: Verify that the application can fetch housing listings from partner systems.

T119: Ensure that the retrieved housing listings are displayed accurately within the application.

T120: Verify that the application can fetch housing listings from partner systems. Ensure that the retrieved housing listings are displayed accurately within the application.

T121: Verify that the product releases updates every three months or sooner.

T122: Review the release notes for each update to confirm bug fixes, feature enhancements, or improvements based on user feedback.

T123: Conduct a cultural sensitivity review of the product to identify potential issues.

T124: Seek feedback and approval from cultural experts or focus groups to ensure the product respects various cultural groups.

T125: Verify that the reporting module can generate reports in the required format.

T126: Ensure that key stakeholders can access and retrieve reports as needed.

T127: Conduct audits to verify compliance with funding entity policies.

T128: Ensure that data collection and reporting features adhere to the specified regulations.

T129: Conduct a security audit to verify compliance with data security standards.

T130: Ensure that user data is protected according to industry standards.

T131: Conduct interoperability tests to verify compliance with healthcare data standards.

T132: Ensure that medical data can be securely exchanged in accordance with the standards.

T133: Conduct security audits to verify compliance with payment processing standards.

T134: Ensure that financial transactions are processed securely in accordance with industry standards.

III Design

22 Design Goals

The key design goals are:

User-Friendliness: The system should have an intuitive, easy-to-use interface to accommodate the needs of homeless individuals who may have limited technical familiarity. Components like contextual help, interactive tutorials, responsive design are important.

Accessibility: The system needs to be accessible to users with disabilities through features like screen reader support, keyboard navigation and alternative text for images. This aligns with requirements around serving vulnerable populations.

Security: Secure handling of sensitive user data, especially documents, profiles and medical information, is critical. Goals around encryption, access controls, compliance with standards, and auditing are key.

Reliability: High system reliability and uptime is needed to consistently serve the homeless community. Requirements highlight the need for redundancy, failover capabilities and robustness.

Interoperability: Integration with external systems like housing listings, payment gateways, etc. is important for unified and streamlined experiences. Open API and loose coupling should be supported.

Scalability: The system needs to scale up to thousands of users and large data volumes to manage growth over time. Cloud deployment and stateless architecture can facilitate scalability.

Speed and Performance: Reasonable latency thresholds are specified for functions like housing search and mentor assignment, highlighting the goal for a responsive user experience even at scale.

The core design focuses on an accessible, easy-to-use, speedy and reliable platform that keeps sensitive data secure and integrates with external systems - all the while maintaining the agility to scale up. The specific requirements help shape these overarching design optimization targets.

23 Current System Design

The project goals and requirements imply that FindYourRoof will be designed as an entirely new platform tailored exactly to the use cases, workflow integration requirements, and societal impact aims outlined.

24 Proposed System Design

24a Initial System Analysis and Class Identification

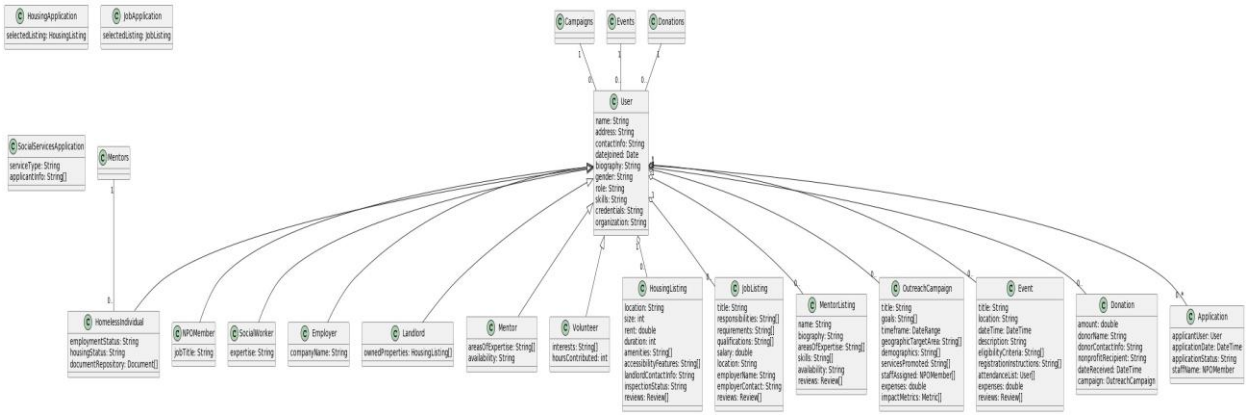
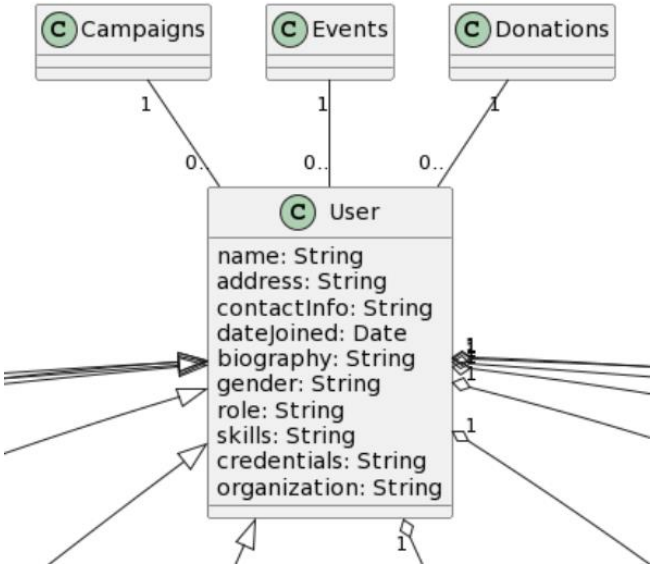
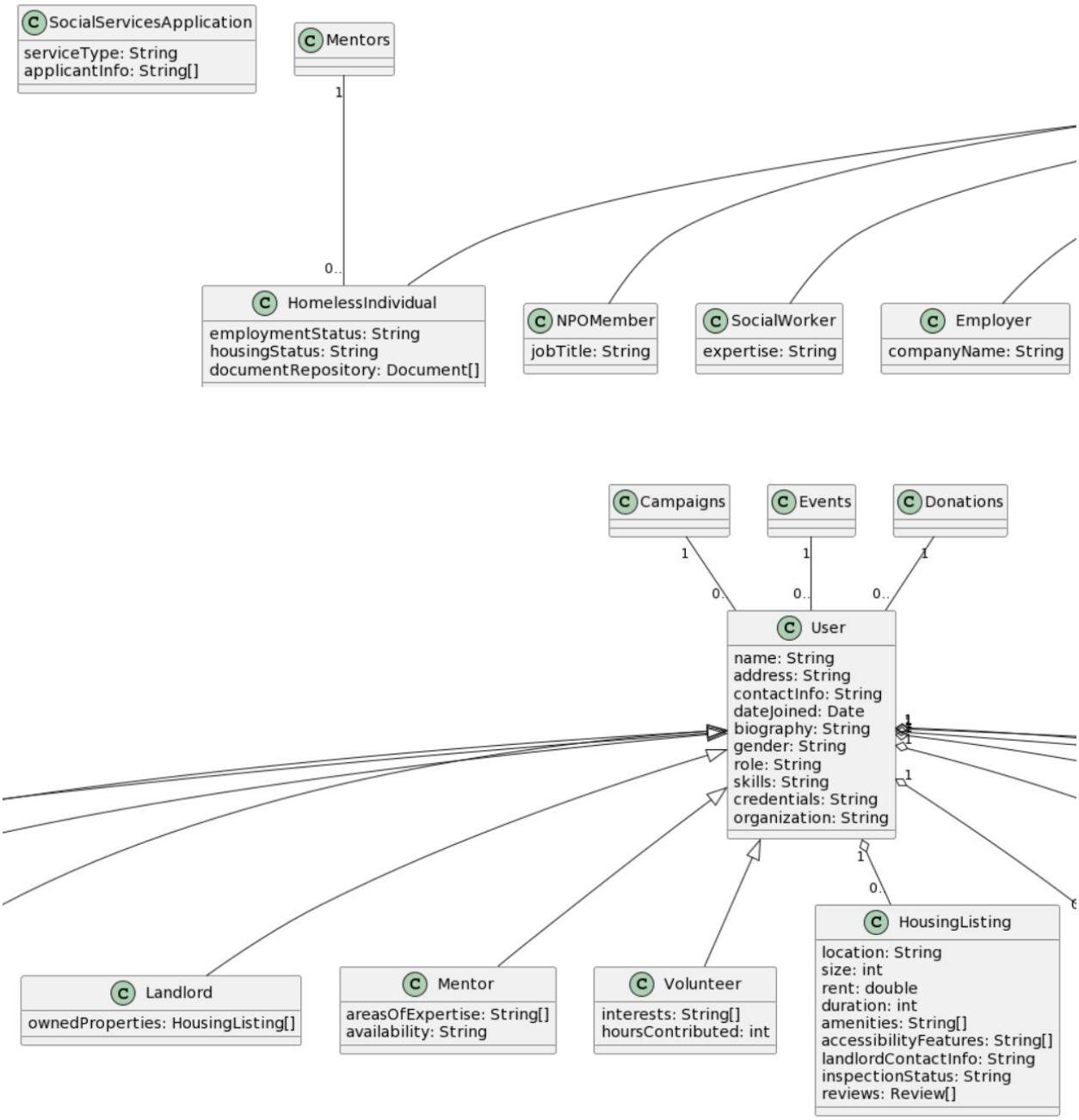
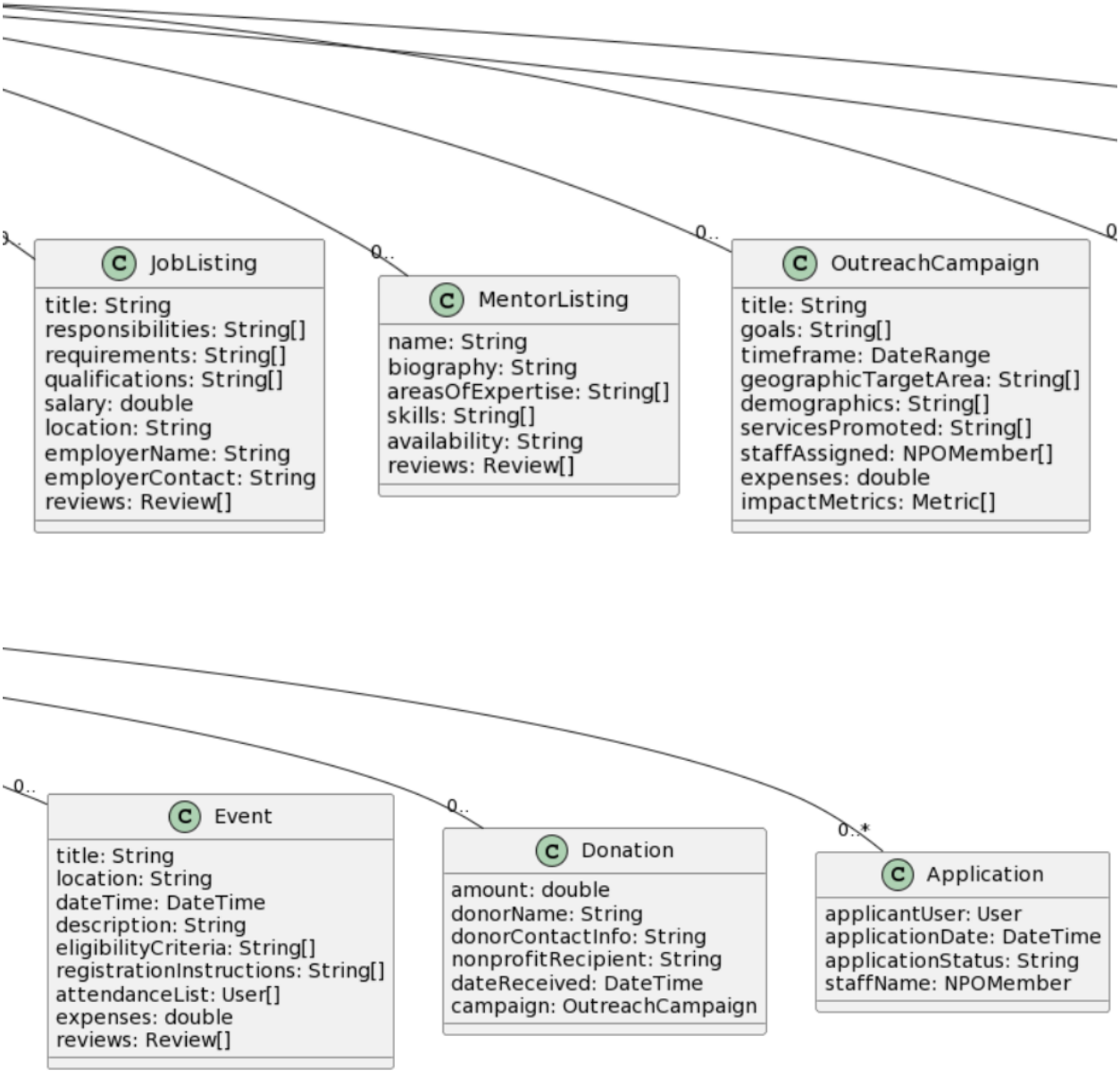


Fig 6: Full Class Diagram

CLASS WISE DIAGRAMS




SocialServicesApplication
serviceType: String
applicantInfo: String[]
Mentors
1
0..
HomelessIndividual
employmentStatus: String
housingStatus: String
documentRepository: Document[]
NPOMember
jobTitle: String
SocialWorker
expertise: String
Employer
companyName: String
Campaigns
Events
Donations
User
name: String
address: String
contactInfo: String
dateJoined: Date
biography: String
gender: String
role: String
skills: String
credentials: String
organization: String
Landlord
ownedProperties: HousingListing[]
Mentor
areasOfExpertise: String[]
availability: String
Volunteer
interests: String[]
hoursContributed: int
HousingListing
location: String
size: int
rent: double
duration: int
amenities: String[]
accessibilityFeatures: String[]
landlordContactInfo: String
inspectionStatus: String
reviews: Review[]


JobListing
title: String
responsibilities: String[]
requirements: String[]
qualifications: String[]
salary: double
location: String
employerName: String
employerContact: String
reviews: Review[]
MentorListing
name: String
biography: String
areasOfExpertise: String[]
skills: String[]
availability: String
reviews: Review[]
OutreachCampaign
title: String
goals: String[]
timeframe: DateRange
geographicTargetArea: String[]
demographics: String[]
servicesPromoted: String[]
staffAssigned: NPOMember[]
expenses: double
impactMetrics: Metric[]
Event
title: String
location: String
dateTime: DateTime
description: String
eligibilityCriteria: String[]
registrationInstructions: String[]
attendanceList: User[]
expenses: double
reviews: Review[]
Donation
amount: double
donorName: String
donorContactInfo: String
nonprofitRecipient: String
dateReceived: DateTime
campaign: OutreachCampaign
Application
applicantUser: User
applicationDate: DateTime
applicationStatus: String
staffName: NPOMember

24b Dynamic Modelling of Use-Cases

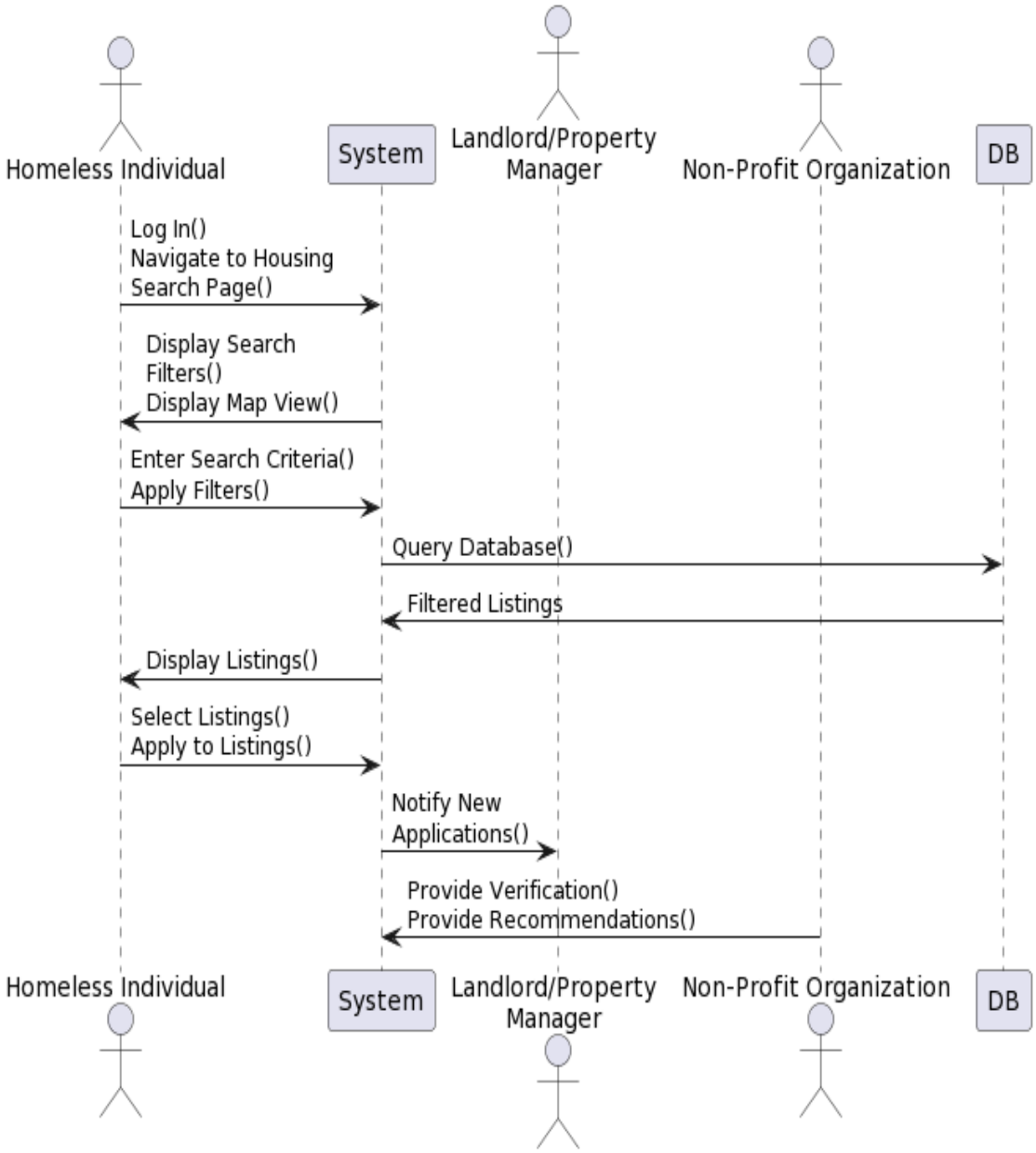


Fig 7: UseCase1 – Sequence Diagram

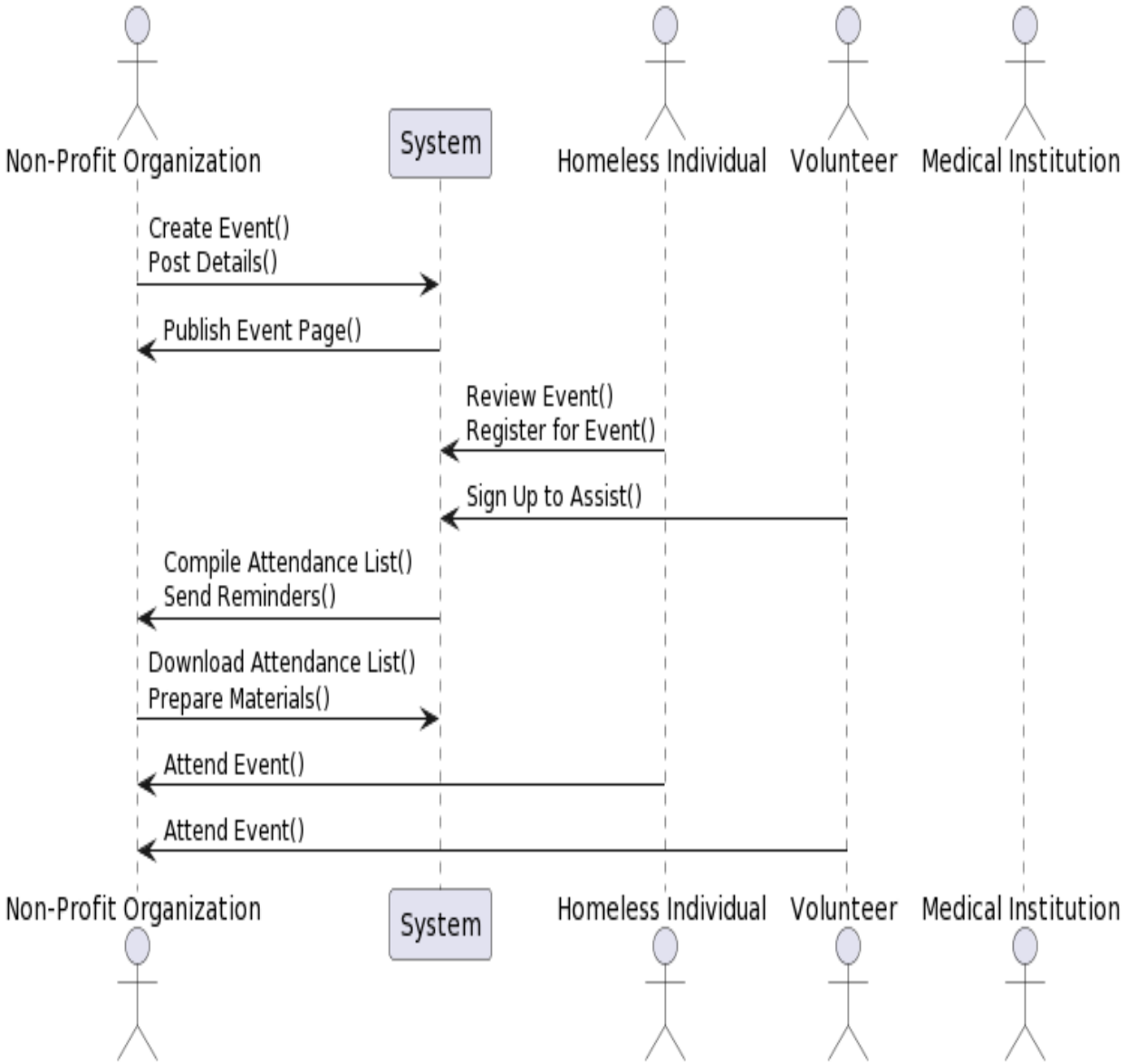


Fig 8: UseCase2 – Sequence Diagram

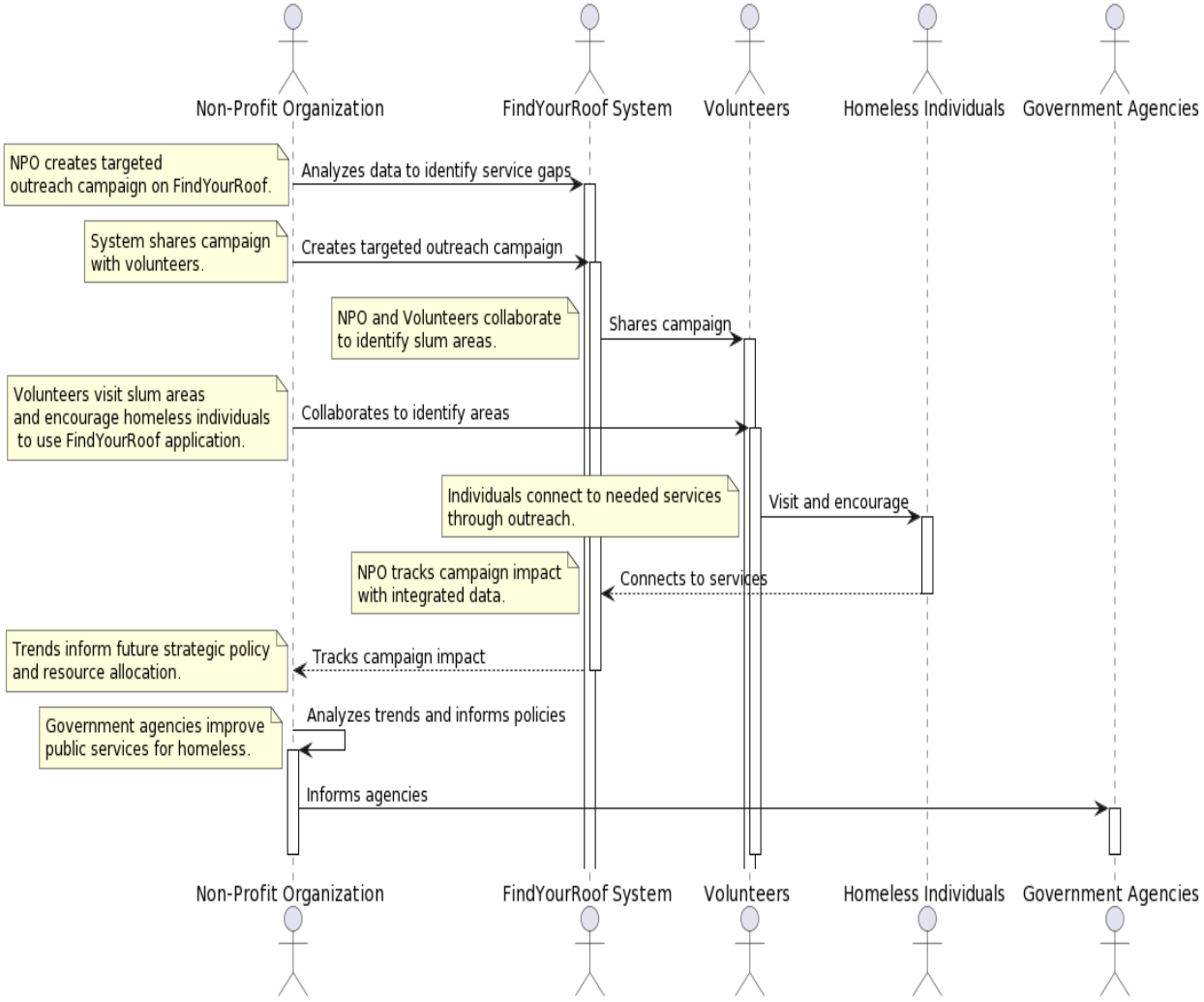


Fig: UseCase3 – Sequence Diagram

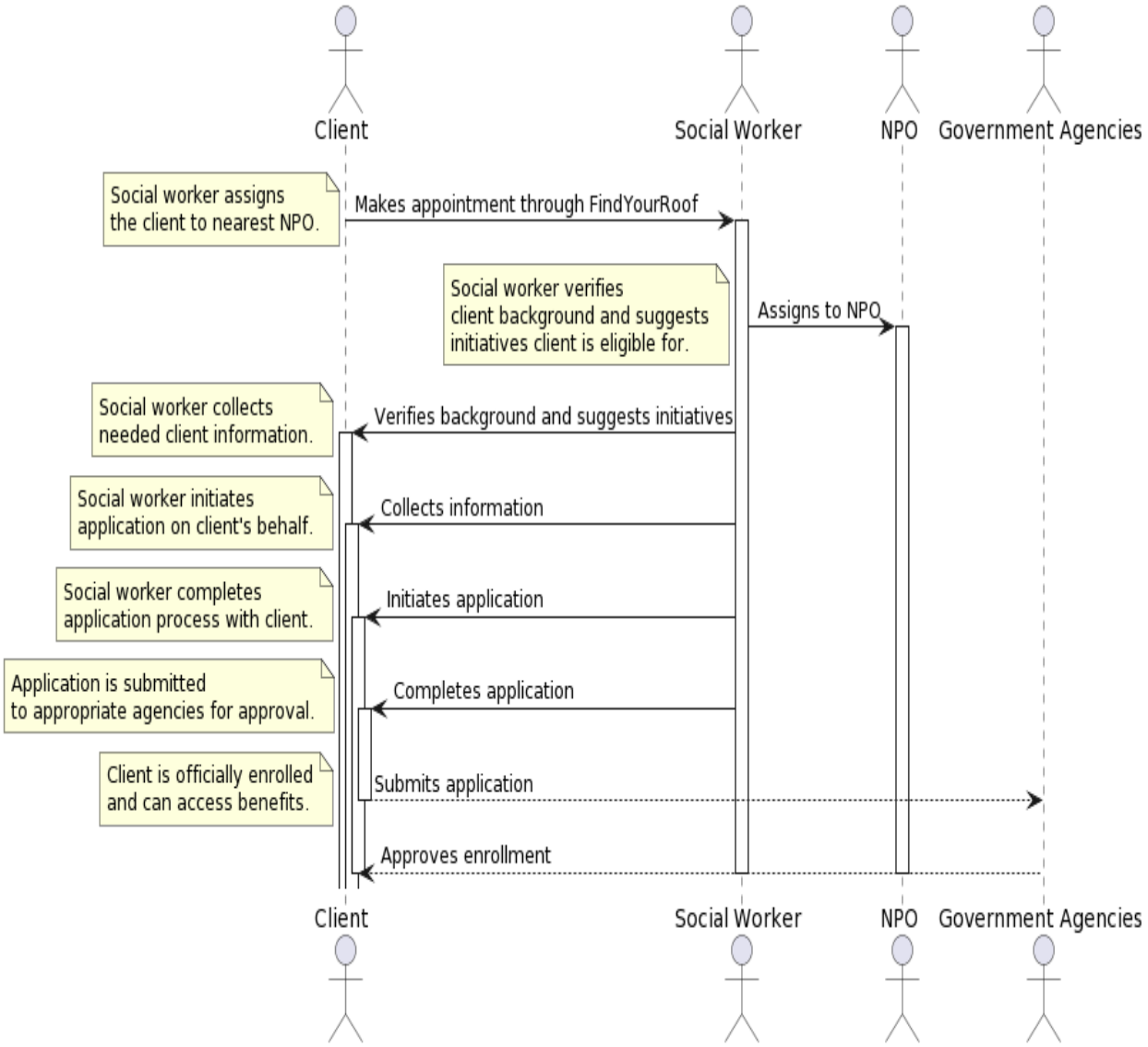


Fig: UseCase4 – Sequence Diagram

24c Proposed System Architecture

As per the scope and functionalities of the application, an architecture that can effectively manage user interactions, data storage, and system scalability is crucial. Considering the complexity and diverse set of stakeholders involved, a **Service-Oriented Architecture (SOA)** could be an appropriate choice for this project.

Justification for SOA:

1. Modularity and Scalability:

Service-based Approach: SOA allows the platform to be divided into independent services (e.g., housing service, job service, mentorship service) that can be developed, deployed, and scaled independently. This modularity enhances flexibility and scalability.

2. Interoperability and Integration:

Integration with Diverse Stakeholders: SOA facilitates seamless integration with various stakeholders like NPOs, mentors, employers, and homeless individuals. Each stakeholder group can interact with specific services tailored to their needs.

3. Loose Coupling:

Decoupled Services: Services in SOA are loosely coupled, meaning changes in one service don't directly impact others. This enables easier maintenance, updates, and improvements without disrupting the entire system.

4. Flexibility and Reusability:

Reusable Services: Components and functionalities can be reused across different parts of the platform. For instance, a document management service can be utilized by both NPOs and homeless individuals for document verification and storage.

5. Scalability and Performance:

Scalability Options: SOA allows horizontal scaling by deploying multiple instances of services to handle increased load or user base. It can utilize cloud-based solutions to ensure better performance.

6. Security and Governance:

Centralized Security Measures: Security measures, access controls, and governance policies can be centralized and enforced across services, ensuring data integrity and privacy.

Components in Service Oriented Architecture:

1. **Service Components**: Housing Service, Job Service, Mentorship Service, Document Management Service, User Authentication Service, etc.
2. **Middleware or Integration Layer**: Handles communication between services, ensuring smooth interaction and data exchange.
3. **User Interface Layer**: Interfaces for different stakeholders (web interface, mobile app) interacting with respective services.
4. **Database or Data Storage**: Centralized or distributed databases storing information relevant to different services.

This architecture allows FindYourRoof to effectively cater to the complex needs of multiple stakeholders while maintaining flexibility, scalability, and interoperability. Each service encapsulates specific functionalities, allowing for easier management, maintenance, and future enhancements. Additionally, it facilitates efficient communication and interaction among stakeholders, promoting the platform's primary objectives of addressing homelessness by connecting individuals with resources and opportunities.

24d Initial Subsystem Decomposition

1. **User Management Subsystem**:

Description: Responsible for handling user-related functionalities, including registration, authentication, and profile management.

Key Responsibilities:

User registration and authentication.

Profile creation, updates, and viewing.

User type identification and access control.

2. **Resource Management Subsystem**:

Description: Manages resources crucial for homeless individuals, including housing, job opportunities, and documents.

Key Responsibilities:

Housing management: Listing, matching, and availability.

Job management: Listing, matching, and skill-based recommendations.

Document management: Verification, storage, and access.

3. **Stakeholder Interaction Subsystem**:

Description: Facilitates interaction between various stakeholders involved in the platform, such as NPOs, mentors, employers, and volunteers.

Key Responsibilities:

NPO management: Event creation, volunteer coordination, and progress tracking.

Mentorship coordination: Connecting mentors with mentees, guidance sharing.

Employer engagement: Job postings, candidate review, and hiring processes.

4. System Integration Subsystem:

Description: Handles integration and communication between different subsystems and services within the platform.

Key Responsibilities:

Middleware for communication between subsystems.

Integration of diverse functionalities and services.

Ensuring data exchange and consistency between subsystems.

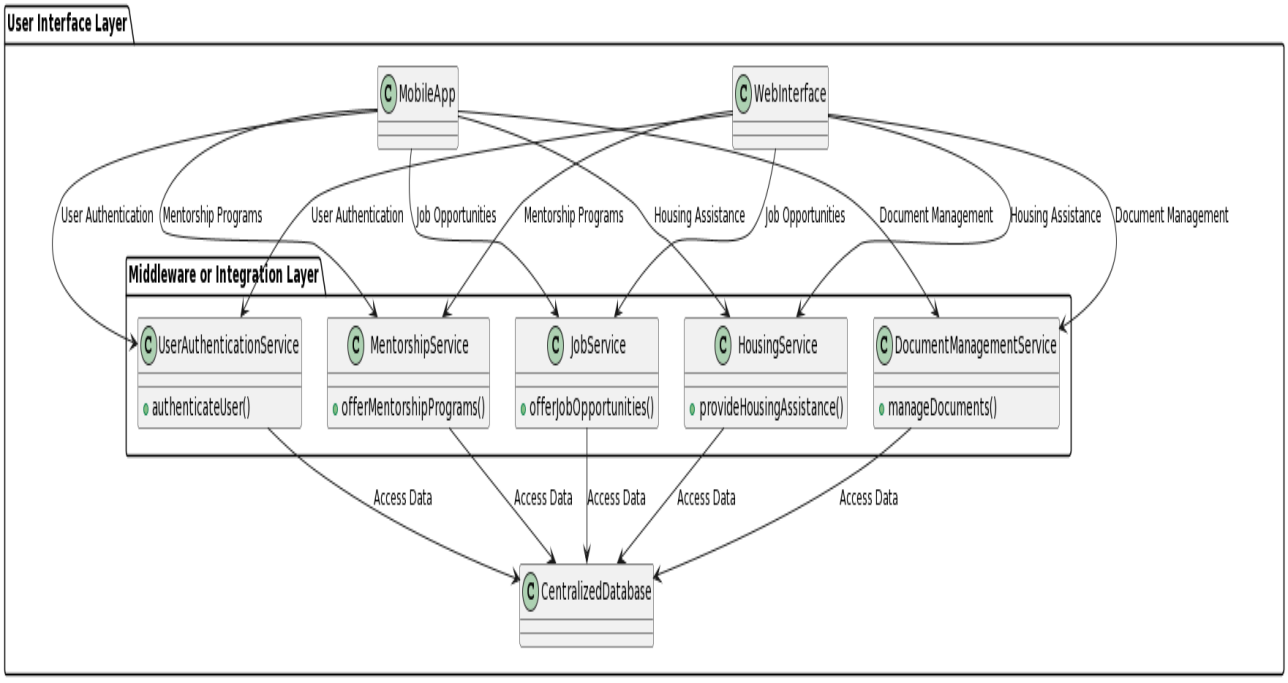
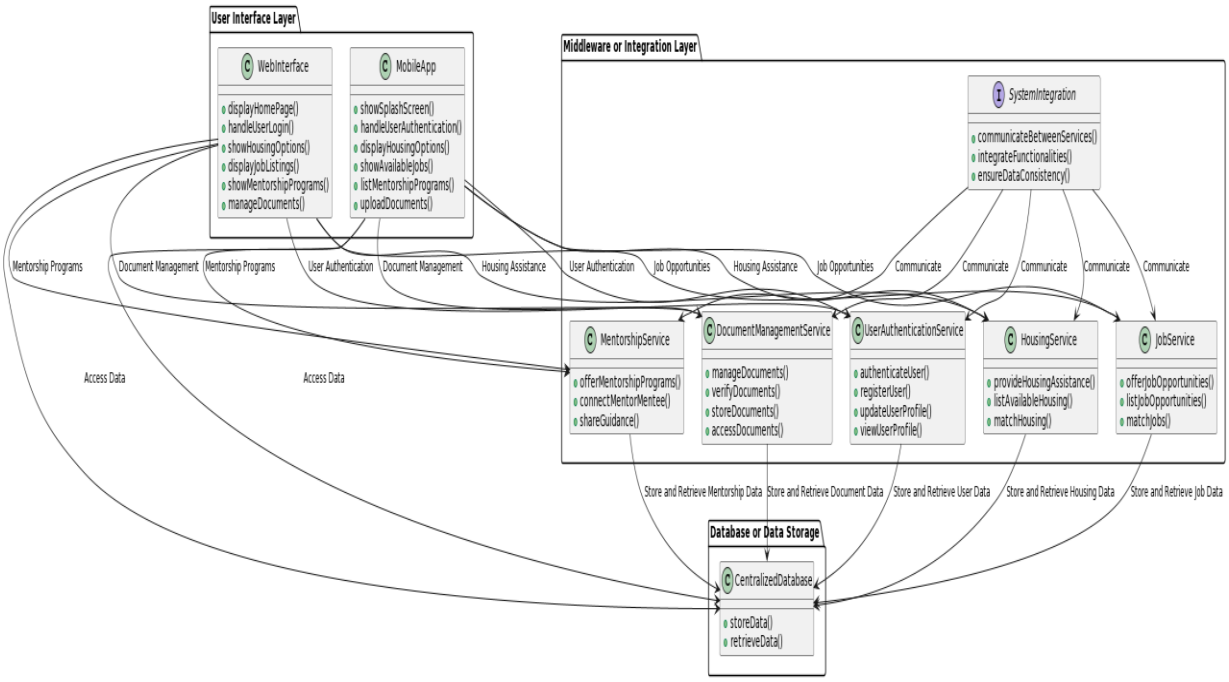


Fig 11: Subsytems



25 Additional Design Considerations

25a Hardware / Software Mapping

Hardware Components:

Server Cluster: Represents a cluster of servers hosting different services.

Software: Application servers like Apache Tomcat, Microsoft IIS.

Database Servers: Hosts databases for various services and data storage.

Software: MySQL, PostgreSQL, MongoDB.

Cloud Infrastructure: Provides scalable and on-demand resources for certain services.

Software: AWS, Azure, Google Cloud.

Client Devices: End-user devices accessing services.

Software: Web browsers, Mobile apps.

Subsystems (Services):

User Management Service:

- Manages user profiles, authentication, and authorization.
- Deployed on the Server Cluster.

Housing and Job Search Service:

- Handles housing and job-related queries and matches.
- Deployed on the Server Cluster or Cloud Infrastructure.

Document Repository Service:

- Provides secure storage for user documents.
- Utilizes Cloud Infrastructure for storage.

Communication Subsystems:

HTTP/HTTPS Protocols:

- Facilitates communication between client devices and services.
- Ensures secure data transmission over the network.

Service-to-Service Communication Protocols:

- Enables interaction between different services within the architecture.
- Examples: RESTful APIs, SOAP, messaging queues.

Database Connectivity:

- Allows services to interact with database servers for data retrieval and storage.

Cloud Service APIs:

- Used by services to communicate with cloud infrastructure for resources like storage and computing power.

The deployment diagram showcases how the various services or subsystems within the SOA are deployed onto specific hardware components, emphasizing the decentralized nature of the architecture. Communication between these services relies on established protocols and connectivity interfaces to enable seamless interaction and interoperability within the system.

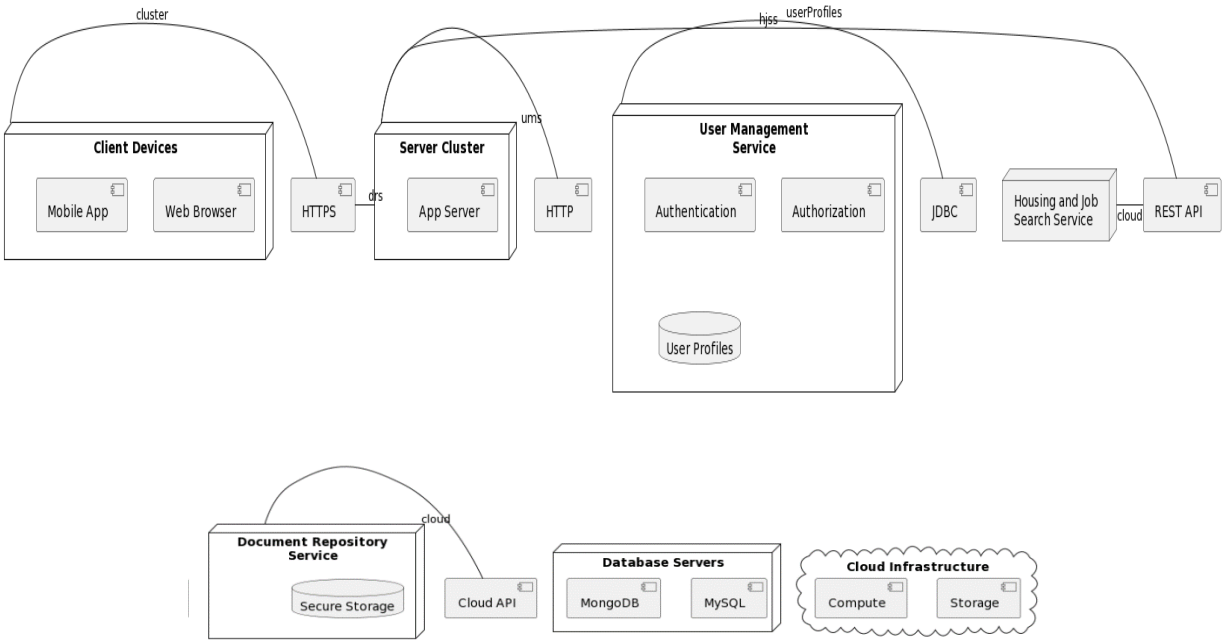


Fig 12: Deployment Diagram

25b Persistent Data Management

For persistent data management, several classes and subsystems are crucial to store and retrieve data when the system shuts down and restarts.

Data Access Objects (DAOs):

- Responsible for interacting with the database or data storage.
- Classes that encapsulate the logic required to access specific data sources.

Database or Storage Handler Classes:

- Interface between the application and the underlying data storage.
- Manage connections, transactions, and queries to retrieve or store data.

Serialization and Deserialization Components:

- Classes responsible for converting objects into a format suitable for storage (serialization) and restoring objects from storage (deserialization).
- Often utilized to persist complex object structures into files or databases.

Persistent Data Model Classes:

- Represent the data entities that need to be persisted.

- Correspond to the structure and attributes of data stored in the database or other storage mediums.

Cache Management Classes:

- Manage in-memory caches for frequently accessed or critical data.
- Ensure efficient access and reduce the need for repeated fetching of data from storage.

Configuration Management Subsystem:

- Handles the settings, preferences, and configurations required for data storage and retrieval.
- Manages parameters like connection strings, storage locations, and caching settings.

25c Access Control and Security

User Authentication: Includes classes responsible for user login, validation, and session management.

Role-based Access Control (RBAC): Implementing user roles and permissions to control access to system features and data.

Authorization and Permission Management: Access Control Lists (ACLs) or Permissions Classes: Determine what actions or data specific users or user roles are allowed to access or modify.

Authorization Handlers: Validate user permissions against requested actions.

Data Encryption: Classes for encrypting sensitive information stored in the database or during transmission.

Key Management: Subsystems responsible for securely managing encryption keys and certificates.

Secure File Handling: Classes responsible for ensuring the security of documents uploaded by users, including encryption, access controls, and storage.

25d Global Software Control

Configuration Management:

- Configuration Control Classes: Manage system configurations, settings, and parameters.
- Version Control Subsystems: Track and manage different versions of the software and its components.

System Monitoring and Diagnostics:

- Monitoring Agents: Classes responsible for real-time monitoring of system performance, resource usage, and health.
- Diagnostics and Troubleshooting: Subsystems that identify, analyze, and resolve system issues and errors.

Error Handling and Exception Management:

- Error Handling Classes: Manage exceptions, errors, and their graceful handling within the system.
- Exception Loggers: Capture and report exceptions for analysis and resolution.

System Health and Performance Tracking:

- Performance Monitoring Classes: Monitor and measure system performance, identifying bottlenecks or inefficiencies.
- Health Check Subsystems: Assess the overall health and status of system components.

System Configuration and Deployment:

- Deployment Handlers: Classes responsible for deploying new versions or updates to the system.
- Configuration Deployers: Manage the rollout of new configurations or changes across the system.

25e Boundary Conditions

1. **Startup Procedures:**

- StartupManager Class: Manages system initialization processes, ensuring necessary components are initialized correctly during startup.
- ConfigurationLoader: Loads initial configurations and settings upon system startup.
- SystemInitializer: Coordinates the startup sequence of subsystems and services.

2. **Shutdown and Cleanup:**

- ShutdownHandler Class: Manages the graceful shutdown of the system, ensuring proper closure of resources and connections.
- DataBackupSubsystems: Perform data backups or finalization routines before shutdown for data consistency.
- ResourceReleaser: Releases allocated resources, connections, and memory upon system shutdown.

- 3. **Configuration File Management:**
  - ConfigFileManager: Handles the creation, reading, updating, and deletion of configuration files.

- PersistentDataHandler: Manages the persistence and integrity of critical system data during shutdown and startup.

4. **Database Management:**
- DatabaseMaintenanceSubsystems: Handle database shutdown, startup, backup, and recovery operations.
- DatabaseConfigurator: Manages database configurations and connections during system operations.

5. **Abnormal Shutdown Handling:**
- ExceptionHandler: Detects abnormal system termination and triggers recovery or logging mechanisms to handle potential data corruption or loss.
- RecoveryModule: Recovers critical data or configurations in case of abrupt shutdowns or failures.

25f User Interface

Dashboard:

- Central hub displaying key information.
- Quick access to housing listings, job opportunities, and mentorship programs

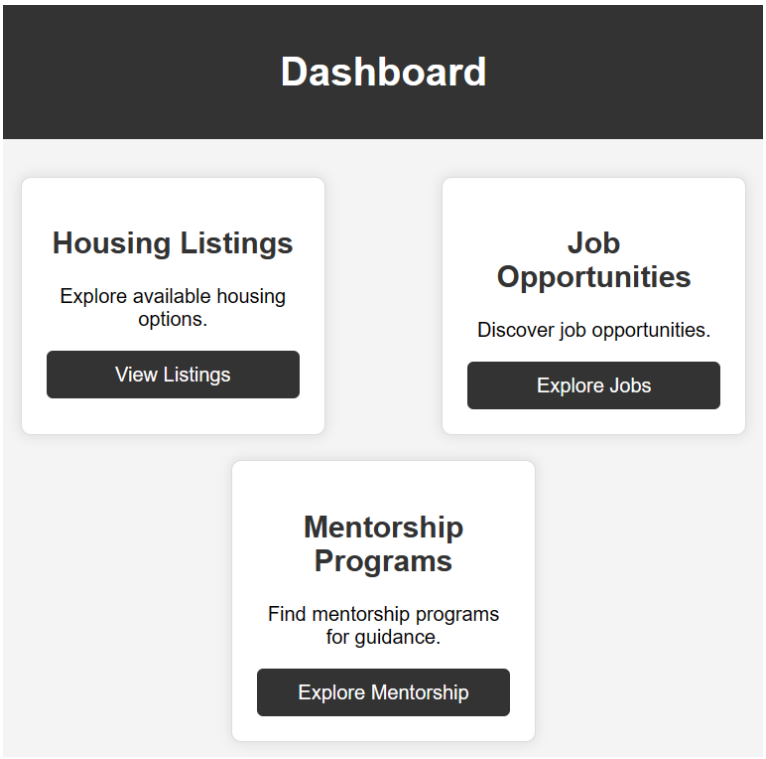


Fig 13: Dashboard

User Profile:

- Profile creation and editing functionalities.
- Sections for personal details, skills, and preferences.

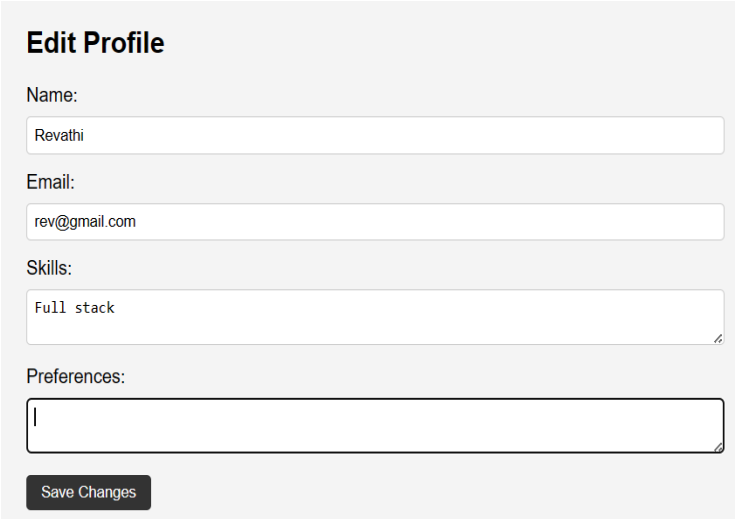


Fig 14: User profie

Housing Search:

- Interactive map for geospatial integration.
- Filters for preferences like affordability and proximity to public transport.

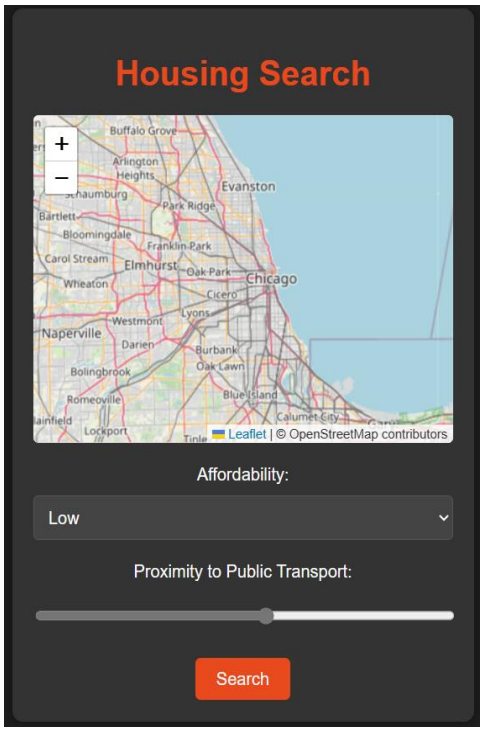


Fig 15: Housing Search

Job Search:

- AI-driven job matching interface.
- Skill entry and suggestions for skill improvement.

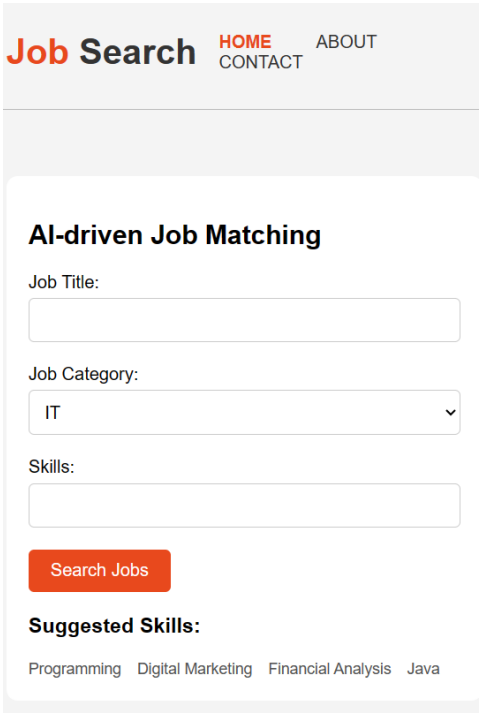


Fig 16: Job Search

Mentorship:

- Matching algorithm for connecting mentors and mentees.
- Chat interface for communication.

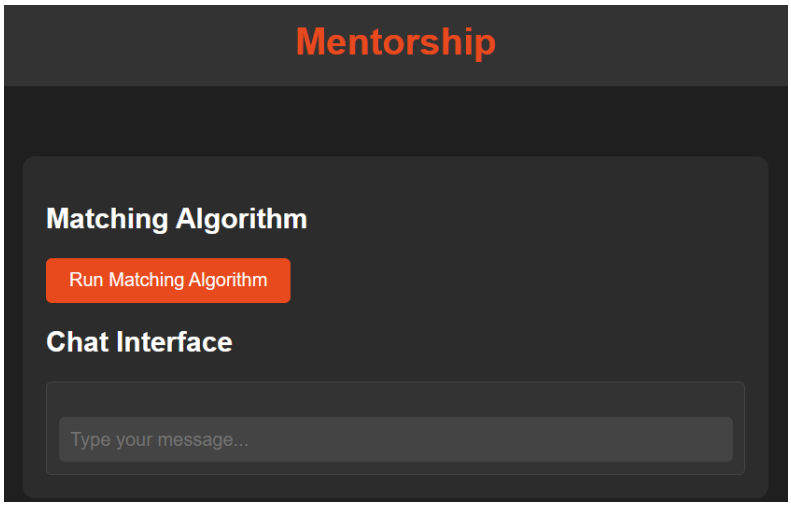


Fig 17: Mentorship

Notifications:

- Alerts for incomplete profiles, expiring listings, and inactivity.
- Push notifications for real-time updates.

Document Repository:

- Secure cloud-based storage.
- Upload and verification features.

Events and Workshops:

- Calendar for scheduling and viewing upcoming events.
- RSVP and participation options.

Donation and Volunteer:

- Donation button with payment gateway integration.
- Volunteer sign-up and information.

UIController Class:

- Manages interactions between the user and the interface.
- Orchestrates data flow and updates between different UI components.

Notification Manager:

- Handles the generation and display of notifications.
- Monitors events and triggers relevant notifications.

Map Interface:

- Integrates with geospatial services for housing and event mapping.
- Provides an interactive map for user interaction.

Chat Interface:

- Manages real-time chat functionalities for mentorship and communication.
- Ensures secure and smooth messaging.

Document Upload Manager:

- Handles document uploads and verification processes.
- Communicates with the backend for storage and validation.

Event Calendar:

- Manages scheduling and viewing of events and workshops.
- Allows users to RSVP and interact with event details.

25g Application of Design Patterns

Observer Pattern:

- Use Case: Employed for the notification system.
- Description: Allows a subject (e.g., a user's profile) to notify multiple observers (e.g., notification manager, UI components) about state changes without coupling the subject to the observers.

Strategy Pattern:

- Use Case: Applied in the recommendation system.
- Description: Enables dynamic selection of algorithms for job and mentorship recommendations. Strategies for matching can be easily swapped, promoting flexibility.

Decorator Pattern:

- Use Case: Implemented for user profiles.
- Description: Facilitates the dynamic addition of responsibilities to user profiles. For example, additional fields or features can be added without modifying the base user profile class.

Singleton Pattern:

- Use Case: Utilized for the access control subsystem.
- Description: Ensures a single point of control for access management. There is a single instance responsible for handling access requests, preventing multiple instances that could lead to inconsistencies.

State Pattern:

- Use Case: Applied in the user authentication process.
- Description: Represents various states in the authentication flow. Transitioning between states (e.g., logged in, logged out) is managed more explicitly, improving the system's maintainability.

Factory Method Pattern:

- Use Case: Employed for creating instances of event objects.
- Description: Defines an interface for creating event objects but lets subclasses alter the type of events that will be created. This provides a way to delegate the instantiation of specific event types to derived classes.

26 Final System Design

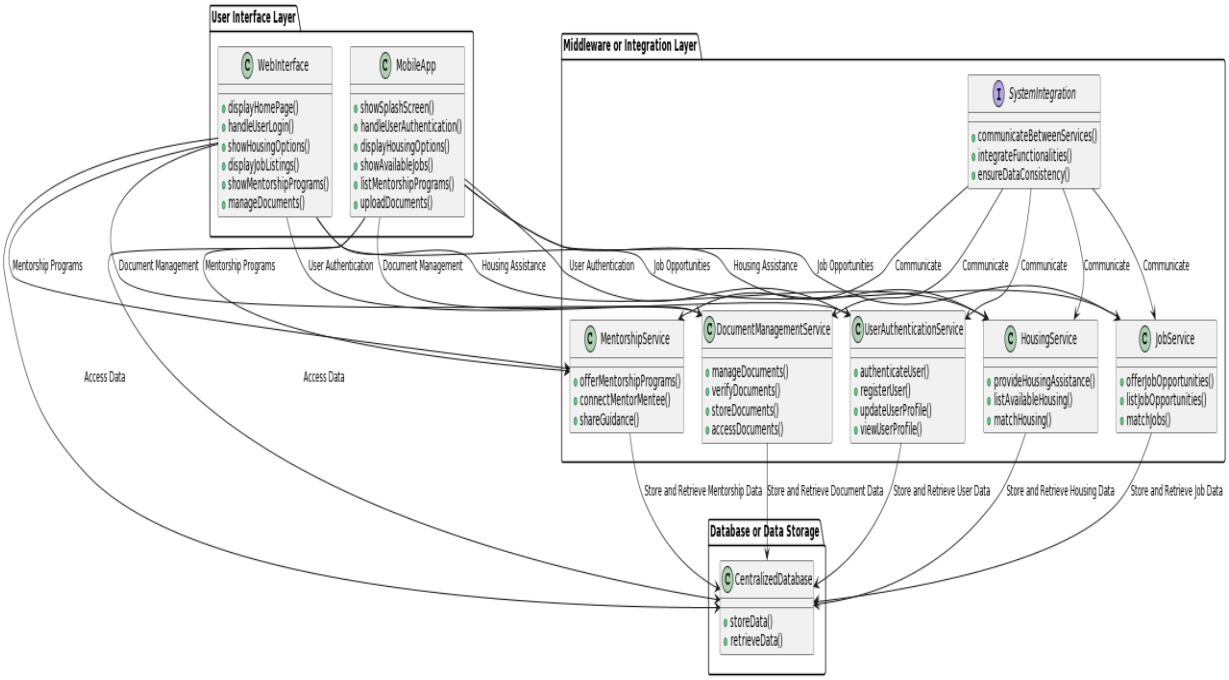
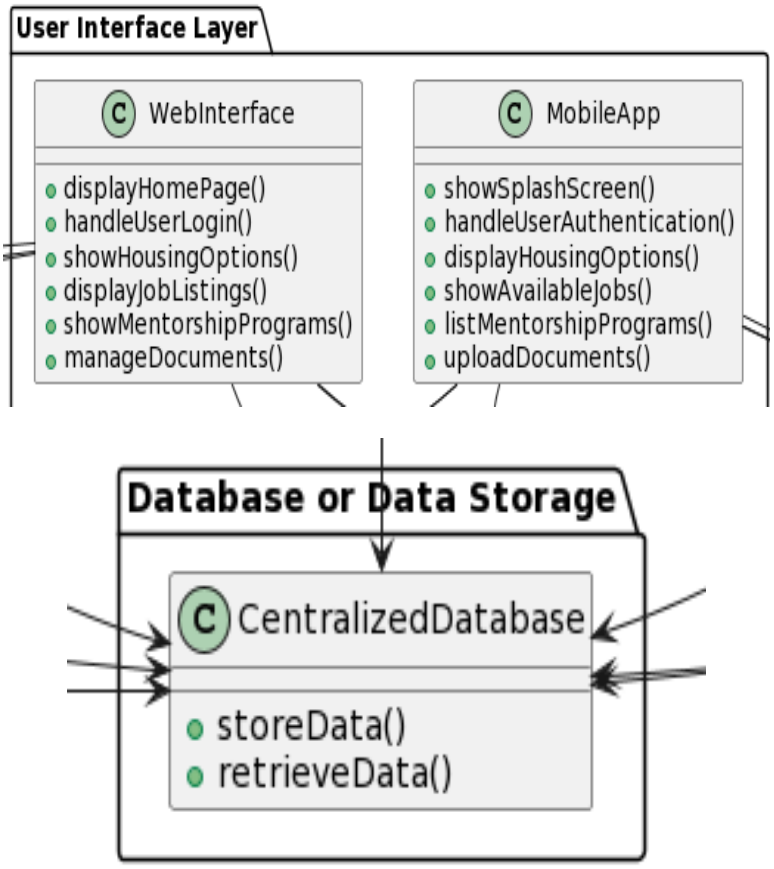
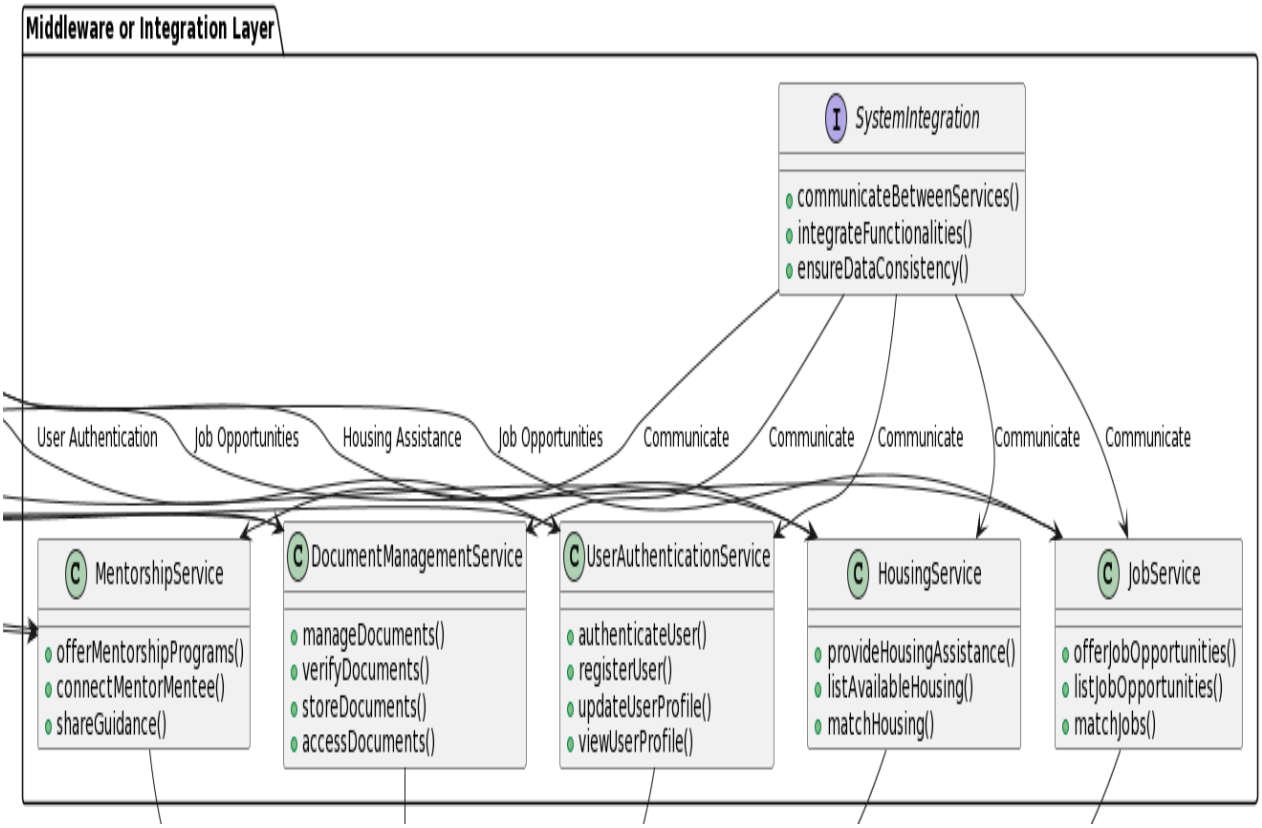


Fig 18 : Overall System Design





27 Object Design

27a Packages

Package 1: user_management

- User Class
- Profile Class
- Authentication Class

Package 2: notification_system

- NotificationManager Class
- Notification Class

Package 3: recommendation_engine

- Recommender Class
- Strategy Interface
- Recommendation Class

Package 4: access_control

- AccessController Class
- Permission Class

Package 5: ui_controller

- ViewController Class
- Command Interface
- State Interface

Package 6: data_persistence

- DatabaseManager Class
- PersistentData Class
- FileHandler Class

Package 7: global_software_control

- GlobalController Class
- ServiceMonitor Class
- Logger Class

Package 8: boundary_conditions

- StartupManager Class
- ShutdownManager Class
- ConfigFileManager Class

Package 9: user_interface

- UserInterface Class
- UIComponents Class
- MockupManager Class

27b Subsystem I – User Management

User Management Service:

- Manages user profiles, authentication, and authorization.
- Deployed on the Server Cluster.

Housing and Job Search Service:

- Handles housing and job-related queries and matches.
- Deployed on the Server Cluster or Cloud Infrastructure.

Document Repository Service:

- Provides secure storage for user documents.

- Utilizes Cloud Infrastructure for storage.

    - getInterests(): string[] - Retrieves user interests.

27c Subsystem II – Resource Management Subsystem

1. Resource Management Subsystem:

Description: Manages resources crucial for homeless individuals, including housing, job opportunities, and documents.

Key Responsibilities:

Housing management: Listing, matching, and availability.

Job management: Listing, matching, and skill-based recommendations.

Document management: Verification, storage, and access.

27d Subsystem III – Stakeholder Interaction Subsystem

Description: Facilitates interaction between various stakeholders involved in the platform, such as NPOs, mentors, employers, and volunteers.

Key Responsibilities:

NPO management: Event creation, volunteer coordination, and progress tracking.

Mentorship coordination: Connecting mentors with mentees, guidance sharing.

Employer engagement: Job postings, candidate review, and hiring processes.

27e Subsystem IV – System Integration Subsystem

Description: Handles integration and communication between different subsystems and services within the platform.

Key Responsibilities:

Middleware for communication between subsystems.

Integration of diverse functionalities and services.

Ensuring data exchange and consistency between subsystems.

IV Project Issues

28 Open Issues

Following are the possible open issues:

- Performance Optimization: Determining the most efficient algorithms for recommendation generation and data retrieval.
- Security Review: Conducting a comprehensive security audit to identify potential vulnerabilities in the authentication system.
- User Interface Enhancement: Refining the user interface based on usability testing and feedback from stakeholders.
- Integration Challenges: Addressing complexities in integrating the recommendation engine with existing modules.
- Scalability Concerns: Planning for system scalability as user numbers grow.
- Error Handling Strategies: Developing robust error handling mechanisms for various system states.
- Testing Strategy: Defining a comprehensive testing approach to ensure all functionalities are thoroughly tested.

29 Off-the-Shelf Solutions

- Authentication Services: Explore integrating OAuth or similar authentication frameworks for secure user authentication instead of building a custom solution.
- Database Solutions: Consider using established database systems like MongoDB or PostgreSQL to manage complex data structures efficiently.
- Recommendation Engines: Evaluate third-party recommendation engines (such as TensorFlow or Apache Mahout) that align with project requirements to minimize development time.
- User Interface Libraries: Utilize frontend frameworks like React or Angular for building interactive and responsive user interfaces, reducing development effort.
- Communication Protocols: Investigate using established protocols like WebSocket or MQTT for real-time communication between server and clients.

29a Ready-Made Products

- Cloud Services: Consider using AWS, Azure, or Google Cloud Platform for scalable infrastructure and various services like AI/ML, databases, and serverless computing.
- Identity and Access Management (IAM) Solutions: Products like Okta or Auth0 provide robust identity solutions with features for user management and authentication.
- Monitoring and Analytics Tools: Solutions such as Splunk or ELK Stack can offer comprehensive log management, analytics, and real-time monitoring functionalities.
- Enterprise Resource Planning (ERP) Systems: Established systems like SAP or Oracle ERP can cover various business processes, offering modules for finance, HR, and inventory management.

- Customer Relationship Management (CRM) Software: Salesforce or HubSpot CRM provides solutions for managing customer interactions and sales processes.

29b Reusable Components

- Logging Libraries: Utilize established logging frameworks like Log4j or Serilog for efficient and structured logging throughout the application.
- UI Component Libraries: Bootstrap, Material-UI, or Tailwind CSS provide pre-designed UI components for consistent and responsive user interfaces.
- Database ORM Libraries: Libraries like Hibernate (for Java) or Sequelize (for Node.js) simplify database interaction by providing object-relational mapping capabilities.
- Security Libraries: Utilize cryptographic libraries like Bouncy Castle or libraries providing OAuth/OpenID Connect for secure authentication and authorization.
- Testing Frameworks: Frameworks like JUnit, PyTest, or Jasmine offer robust testing capabilities for unit, integration, and end-to-end testing.

29c Products That Can Be Copied

- Internal Frameworks or Libraries: Previously developed in-house frameworks, utility libraries, or tool sets that can be reused across projects.
- Code Templates or Generators: Custom code templates or generators created in earlier projects for repetitive tasks or specific functionalities.
- Configuration Files or Project Structures: Standardized project configurations, directory structures, or build scripts that proved effective in past projects.
- Prototypes or Proof of Concepts: Components or modules from past prototypes that demonstrated efficient solutions for particular features or modules.

30 New Problems

The new problems that can be expected are:

Integration Challenges: Integrating new subsystems or components with existing systems might pose compatibility issues or require significant modifications to the current infrastructure.

Performance Bottlenecks: As the system grows or accommodates more users, certain areas might face performance issues, especially if not anticipated during design.

Security Vulnerabilities: Implementing new features or subsystems could introduce security loopholes if not thoroughly assessed and tested.

Maintenance Complexity: Adding new subsystems or modules might increase the complexity of system maintenance, especially if proper documentation or modular design is lacking.

Scalability Concerns: If the system needs to scale rapidly due to increased demand or data volume, its architecture might need adjustments to handle the load efficiently.

User Adoption Challenges: Users might face difficulties in adapting to the new system, leading to resistance or initial productivity drops.

Dependency Risks: Relying on external components, libraries, or services might introduce risks related to their reliability, support, or changes in their functionality.

30a Effects on the Current Environment

The introduction of a new system could indeed impact the current working environment:

- Training Needs: Employees might require training to adapt to the new system, impacting their workflow during the learning curve.
- Change in Processes: The new system might necessitate alterations in established processes or procedures, potentially causing temporary disruptions.
- Productivity Dips: Initially, while employees familiarize themselves with the new system, there could be a decrease in productivity.
- Resistance to Change: Some individuals might resist adopting the new system, affecting their efficiency or enthusiasm in performing tasks.
- Collaboration Shifts: If the system modifies how data is shared or accessed, it could alter collaboration methods among team members.
- Dependency on Technology: Reliance on the new system might increase, affecting how tasks are executed and making employees more dependent on technology.

30b Effects on the Installed Systems

The implementation of a new system might affect other hardware or software systems in several ways:

- Integration Challenges: Compatibility issues might arise when integrating the new system with existing hardware or software. This could lead to unexpected errors or disruptions in functionality.
- Resource Allocation: The new system might demand more resources (such as increased processing power, memory, or network bandwidth), potentially affecting the performance of existing systems if not adequately managed.
- Interoperability Concerns: Incompatibility between the new system and existing systems might hinder data exchange or communication, impacting overall system functionality.
- Security Risks: The introduction of a new system might expose vulnerabilities or weak points in the existing infrastructure, potentially increasing the risk of security breaches or data loss.
- Dependency Impact: Should the new system replace or significantly alter existing processes, dependencies on current systems might change, impacting their functionality or usefulness.

30c Potential User Problems

Potential user problems with a new system could include:

- Learning Curve: Users might face challenges in adapting to the new system, especially if it has a different interface or workflow compared to what they are familiar with.
- Resistance to Change: Users may resist using the new system due to habits, preferences, or a lack of understanding of its benefits, which could impact adoption rates.
- Reduced Productivity: Initially, while users are learning the new system, there might be a temporary decrease in productivity as they adjust to the changes.
- Feature Expectations: Users might have specific expectations or requirements that the new system doesn't meet, leading to dissatisfaction.
- User Interface Issues: If the user interface is not intuitive or user-friendly, it could lead to frustration and decreased efficiency.

30d Limitations in the Anticipated Implementation Environment That May Inhibit the New Product

Limitations in the anticipated implementation environment can impact the new product:

- Environmental Conditions: Harsh weather conditions (extreme temperatures, humidity) might affect hardware reliability if the system is deployed in an outdoor or rugged environment.
- Power Supply: Unreliable or intermittent power sources could disrupt the system's functionality, requiring backup power solutions or modifications to handle power fluctuations.
- Network Connectivity: Limited or unstable network connectivity can affect system communication in distributed setups, necessitating optimizations for offline functionality or resilient network handling.
- Security Risks: In environments with high security risks (e.g., cyber threats), additional measures might be required to protect sensitive data and ensure system integrity.
- Space Constraints: Limited physical space might impact the deployment of hardware components, especially in compact or crowded areas.
- Regulatory Compliance: Environmental regulations, standards, or legal restrictions specific to the implementation site might impose limitations on certain aspects of the system.

30e Follow-Up Problems

Follow-up problems that could arise include:

- Maintenance Challenges: Over time, the system may face maintenance challenges, such as the need for regular updates, bug fixes, and hardware replacements. This could strain resources and impact system availability.
- Scalability Issues: As the user base or data volume grows, the system may encounter scalability issues. Ensuring the architecture and infrastructure can handle increased loads is essential.

- Integration Difficulties: Integrating the new system with existing software or hardware may pose challenges, especially if there are compatibility issues or differing protocols.
- User Training: If the new system introduces a significant departure from existing workflows, user training may be required. Resistance to change among users could affect the system's successful adoption.
- Data Migration Problems: Transitioning from an old system to a new one may involve data migration. Ensuring a smooth transfer of data without loss or corruption is crucial.
- Unforeseen Dependencies: Dependencies on external systems, services, or components may not be apparent initially. Changes in these dependencies could impact the system's performance and reliability.
- Budget Overruns: Unforeseen expenses during development, deployment, or maintenance phases could lead to budget overruns, affecting the overall cost-effectiveness of the project.

31 Migration to the New Product

Not Applicable

32 Risks

Potential risks that could affect the project's success include:

- Technological Risks: Dependence on new or unproven technologies may lead to unexpected technical challenges, compatibility issues, or performance bottlenecks.
- Security Vulnerabilities: Inadequate security measures could expose the system to cyber threats, data breaches, or unauthorized access, compromising sensitive information.
- Resource Constraints: Insufficient budget, time, or skilled personnel could hinder the project's progress or quality of implementation.

33 Costs

Estimating the costs for this project involves considering various aspects:

- Development Costs: This includes expenses related to hiring developers, designers, and engineers, as well as software licenses, development tools, and infrastructure.
- Resource Costs: Hardware, servers, networking equipment, and other physical resources needed for deployment and testing.
- Operational Costs: Expenses for ongoing operations, maintenance, updates, and support after the system goes live.
- Time and Manpower: Estimation of the time required for development, testing, and deployment, considering the number of team members and their hourly rates.
- Training and Adoption: Costs associated with training users or stakeholders to use the new system and potential productivity loss during the transition phase.

34 Waiting Room

Technology Exploration: Stay updated with the latest technologies and methodologies that might enhance the project's efficiency, scalability, or user experience.

35 Ideas for Solutions

The potential ideas for solutions include:

- Language and Framework: Consider utilizing languages and frameworks best suited for the project's needs. For instance, Python or JavaScript frameworks for versatility, Java for enterprise applications, or Go for performance-critical systems.
- IDE and Development Tools: Recommend IDEs (Integrated Development Environments) like Visual Studio Code, IntelliJ IDEA, or Eclipse, considering their robust debugging and coding assistance features.
- Database Systems: Suggest appropriate database systems based on requirements, such as PostgreSQL for relational data, MongoDB for NoSQL needs, or Redis for caching requirements.
- Version Control and Collaboration: Encourage the use of version control systems like Git for collaborative development, ensuring code management, branching, and merging capabilities.
- Testing Frameworks: Propose testing frameworks like JUnit for Java, pytest for Python, or Jasmine for JavaScript to facilitate automated testing and ensure code reliability.
- Cloud Services: Consider integrating cloud services like AWS, Azure, or Google Cloud for scalability, reliability, and access to a wide array of tools and services.
- Security Libraries: Recommend incorporating security libraries such as OWASP for web security or Bcrypt for encryption to bolster application security.
- Performance Monitoring: Suggest tools for performance monitoring and profiling, such as New Relic or Datadog, to optimize system performance.
- Containerization and Orchestration: Propose containerization tools like Docker and orchestration frameworks like Kubernetes for easy deployment, scaling, and management of applications.
- Continuous Integration/Continuous Deployment (CI/CD) Tools: Recommend CI/CD tools like Jenkins, GitLab CI/CD, or Travis CI for automating build, test, and deployment processes.

36 Project Retrospective

The key takeaways include:

- Clear Requirements Gathering: The initial phase of requirement gathering and analysis was thorough, ensuring a solid foundation for design and development.
- Structured Design Approach: The use of systematic design methodologies, such as UML diagrams and architectural planning, helped in visualizing the system effectively.
- Collaborative Environment: Team collaboration and communication were strong, allowing for effective sharing of ideas and problem-solving.

- Adoption of Best Practices: Leveraging industry best practices and design patterns helped in creating a scalable and maintainable system.
- Adaptability: The project team demonstrated flexibility in adapting to changes and evolving requirements, ensuring alignment with client needs..

V Glossary

1. Class: A blueprint for creating objects, defining their properties (attributes), and behaviors (methods).
2. UML (Unified Modeling Language): A standardized visual modeling language used for specifying, visualizing, constructing, and documenting software systems.
3. Deployment Diagram: A diagram that shows the physical arrangement of software components on hardware nodes.
4. Client-Server Architecture: A network architecture where client computers request services or resources from server computers.
5. Microservices Architecture: A software architecture where applications are built as a collection of loosely coupled services.
6. Singleton Design Pattern: A design pattern ensuring a class has only one instance and provides a global point of access to it.
7. Agile Methodology: An iterative approach to software development emphasizing flexibility, customer collaboration, and incremental delivery.
8. API (Application Programming Interface): A set of rules and protocols that allows different software applications to communicate with each other.
9. MVC (Model-View-Controller): An architectural pattern separating an application into three interconnected components: Model (data), View (UI), and Controller (logic).
10. Data Persistence: The ability of data to outlast the process that created it, often achieved through storage in databases or files.
11. Encryption: The process of converting data into a code to prevent unauthorized access.
12. Risk Management: The process of identifying, assessing, and mitigating potential risks that could affect the project.
13. Continuous Integration (CI): A development practice where developers integrate code into a shared repository frequently, often several times a day.
14. API Gateway: An intermediary between clients and backend services, managing requests, and handling security, load balancing, and more.
15. GUI (Graphical User Interface): The visual part of a computer program that allows users to interact using graphical elements.
16. Homelessness: The state of lacking permanent housing and being unable to secure or maintain housing due to financial or other constraints
17. Affordable housing: Housing deemed affordable based on an individual or family's income, often costing no more than 30% of monthly income.
18. Case manager: A social services professional who coordinates services and resources to assist homeless individuals.
19. Transitional housing: Temporary accommodations provided with support services to facilitate the movement of homeless individuals to permanent housing.
20. Supported employment: Employment assistance programs that provide additional supports like training and counseling to individuals facing challenges getting hired.

VI References / Bibliography

[1] Robertson and Robertson, Mastering the Requirements Process.

[2] A. Silberschatz, P. B. Galvin and G. Gagne, Operating System Concepts, Ninth ed., Wiley, 2013.

[3] J. Bell, "Underwater Archaeological Survey Report Template: A Sample Document for Generating Consistent Professional Reports," Underwater Archaeological Society of Chicago, Chicago, 2012.

[4] M. Fowler, UML Distilled, Third Edition, Boston: Pearson Education, 2004.

VII Index