

**Tribhuvan University**

**Faculty of Humanities and Social Sciences**

**A Project Report on**

**Rapid Reach**

**(Real-Time Emergency Locator)**

**Submitted to**

**BCA department**

**Nepal Kasthamandap College**

***In partial fulfilment of the requirements for the bachelor’s in computer application***

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Chapter 1 Introduction

1.1 Introduction

Rapid Reach is a real-time emergency locator platform designed to connect users with nearby essential services when urgency strikes. Whether someone needs a hospital, police station, fire service, ambulance, or blood bank, the website provides instant access based on the user's current location. It simplifies the process of finding help by allowing users to search by category and view crucial details such as distance, availability, and working hours.

The platform also includes features like “Call Now” functionality, verified service status, and user ratings to ensure quick and reliable support. By offering accurate and up-to-date information in just a few clicks, Rapid Reach empowers people to take fast action in critical situations, saving valuable time and potentially lives.

1.2 Problem Statement

In the context of Nepal, peoples are facing numerous challenges related to health services. The problems such as:

* No centralized platform for services like Fire Department, Health Service and Police Departments.
* Lack of real-time access and direct communication.
* Delay in response time.

1.3 Objectives

The objectives of this project which are mainly focused are mentioned below:

* To develop a real-time live tracking system for ambulance, fire truck and police vehicle.
* To reduce emergency response time by applying call now feature.
* To recommend nearby departments like hospitals, fire department and police department along with vehicles services like ambulance, fire truck and police vehicle.

1.4 Scope and Limitation

1.4.1 Scopes

* It provides the services with the help of real-time search, location and contact.
* It displays essential details like availability, working hours, distance, verification status, and ratings.
* It enables direct calling to emergency services from within the platform.

1.4.2 Limitations

* It does not provide medical, legal, or emergency advice.
* It is only made for two municipality including Kathmandu and Chandragiri.

1.5 Development Methodology

The Agile methodology will be used for the system because in “Agile method” the task breaks into smaller iterations, or parts do not directly involve long term planning. In agile method the system can change requirements, even in later stages and can be kept things simple as possible.

A diagram of a software development model

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**Figure 1.1: Agile Methodology**

1.6 Report Organization

**Introduction**

It outlines the main goals of the project and the specific criteria that must be met during its execution.

**Background Study and Literature Review**

It involves examining the current system, conducting a detailed analysis, and gaining a comprehensive understanding of its history and context.

**System Analysis and Design**

It outlines both the functional and non-functional requirements of the system, including data modelling, process workflows, database schemas, and the overall architectural design.

**Implementation and Testing**

It specifies the tools and technologies that will be utilized for the system's development, along with the testing procedures to be followed, including the creation and execution of test cases.

**Conclusion and Future Recommendation**

It provides a comprehensive summary of the project through documentation, highlighting key features and suggesting areas for potential system improvement.

Chapter 2 Background Study and Literature Review

2.1 Background Study

In Nepal, timely access to emergency services such as hospitals, ambulances, police stations, fire services, and blood banks is crucial but often challenging. Many people struggle to quickly find and contact the nearest emergency help due to a lack of centralized, real-time information. This problem is more pronounced in rural and remote areas, where digital infrastructure and service visibility are limited, leading to dangerous delays during critical situations.

Currently, individuals rely on outdated directories, word-of-mouth, or random internet searches, which are inefficient and unreliable when every second counts. Even in urban areas, the absence of verified, up-to-date details about service availability, working hours, and direct contact options causes confusion and mistrust. This gap in emergency response accessibility puts lives at risk and highlights the urgent need for a comprehensive digital solution.

Rapid Reach is developed to address these challenges by providing a real-time emergency locator platform that connects users with verified emergency services based on their location. With features like live GPS tracking, categorized searches, instant calling, and information on working hours and ratings, Rapid Reach empowers users to act quickly and confidently during emergencies. By enhancing accessibility and trust, Rapid Reach aims to improve emergency response outcomes and save lives across Nepal.

2.2 Literature review

The Nepal Ambulance Service (NAS) is a non-profit initiative dedicated to the establishment of an emergency medical response system (EMS) in the greater Kathmandu and Patan municipalities, later to be expanded nationwide. This system will provide rapid ambulance transport to hospitals along with life-saving medical care by trained emergency medical technicians (EMTs) for sick and injured people regardless of ability to pay. NAS aims to operate fully equipped and staffed ambulances via a central dispatch facility with radio communication between area hospitals and ambulances in order to ensure rapid transport and treatment for individual patients. NAS EMTs will be trained by Stanford University School of Medicine (USA) experts from Stanford Emergency Medicine International (SEMI). [1]

Ashal Chhimeki Nepal-ACN (Good Neighbours Nepal-GNN) is a non-government organization, established in 2002 at Kathmandu, Nepal with the aim of transforming the community for the sustainable development holistically. The major areas of interventions are Livelihood, Health, Gender Equality & Social Inclusion, Sanitation & WASH, Education, Network building and Partnerships, Emergency response, and Advocacy. Nepal remains one of the poorest countries in the world where 25% of the people are living on less than 100 Rupees (less than $1) a day. Hence, GNN seeks to work on supporting marginalized people in the overall community development. In addition to this, GNN also provides relief support during natural disasters such as the recent earthquake we faced in 2015. The projects are designed on need based principle outlined by the target group/community. [2]

Hospital for Advanced Medicine & Surgery (HAMS) is a multi-disciplinary tertiary care hospital situated in Dhumbarahi, Kathmandu. With over 25 years of experience and expertise, we have been providing quality and affordable healthcare to the community. We are proud of our highly experienced clinicians, technicians & administrators, backed by state-of-the-art technology and dependable infrastructure. Our hospital is fostered by highly trained and caring nurses who strive to give you the best patient care and experience the town has to offer. [3]

Alka Hospital, established in 2006, evolved from Alka Pharmacy (1995) and Alka Polyclinic (2000). With 100 beds, advanced diagnostic, curative facilities, and a commitment to quality healthcare. To Start with, Alka hospital had its footprints in the form of Alka Pharmacy that was established in 2052 BS (1995 AD) with the aim of supplying sufficient and proper quality medicine to the People within its vicinity. Within two year, with god's grace and endless effort of the staff, the management team thought to expand its services resulting the alka poly clinic (2057BS,2000AD) along with its pharmacy. [4]

The Nepal Police, established in 1951, plays a crucial role in maintaining law and order, ensuring public safety, and upholding the rule of law in Nepal. Scholarly literature highlights the organization's efforts in modernizing its services, especially in response to evolving security challenges and democratic transitions. Studies have examined its role during periods of political instability, the civil conflict (1996–2006), and its reforms in community policing and human rights training. However, critiques often focus on issues of corruption, political interference, and inadequate resources, which hinder effective service delivery. Recent research also emphasizes the importance of institutional reform and capacity-building to enhance public trust and accountability within the force. [5]

Existing blood management system in Nepal is manual, cumbersome and inefficient. Most blood banks record the information on blood collection/supply manually in registers. Maintaining blood stock inventory is tedious with laborious back-office paperwork and managing information on availability and shortage of blood is a tall task. A social initiative for a smart, transparent and holistic blood management service from collection to supply. When it comes to blood, right information at the right time can be the answer to a life and death situation. [6]

Chapter 3: System Analysis and Design

3.1 System Analysis

The system analysis of the system is done by conducting requirement analysis and feasibility analysis as follows:

3.1.1 Requirement Analysis

Requirements analysis is a crucial step for determining the success of a system or software project. Requirements are generally split into two types.

**a. Functional requirements**

**For User:**

* User can register and login the system through email and password.
* User can locate nearby services by the help of Haversine Algorithm.
* User can contact to available services from Call Now feature.

**For Hospitals:**

* Hospital’s user can locate nearby users.
* The name of the Hospital will be displayed in the map along with location.
* The operating hours will be displayed.

**For Ambulance:**

* The ambulance user’s locations will be tracked live.
* The ambulance user will be contacted by nearby users.
* The ambulance can locate nearby hospitals and users.

**For Police Department:**

* Department’s user can locate nearby emergency.
* Department can contact to police vehicle crews.
* Department’s will be contacted by users.

**For Police Vehicles:**

* The vehicles crew’s location will be tracked live.
* The vehicles crew will be informed when a nearby emergency is occurred.
* In emergency situations the vehicles crew’s can call for backup from department.

**For Fire Department:**

* The fire department will be notified or called for emergency.
* The fire department will dispatch vehicles for rescue to the location.
* The fire department can track the live location of fire truck.

**For Fire Truck:**

* The vehicles crew’s location will be tracked live.
* The vehicles crew will be informed when a nearby emergency is occurred.
* In emergency situations the vehicles crew’s can call for backup from department.

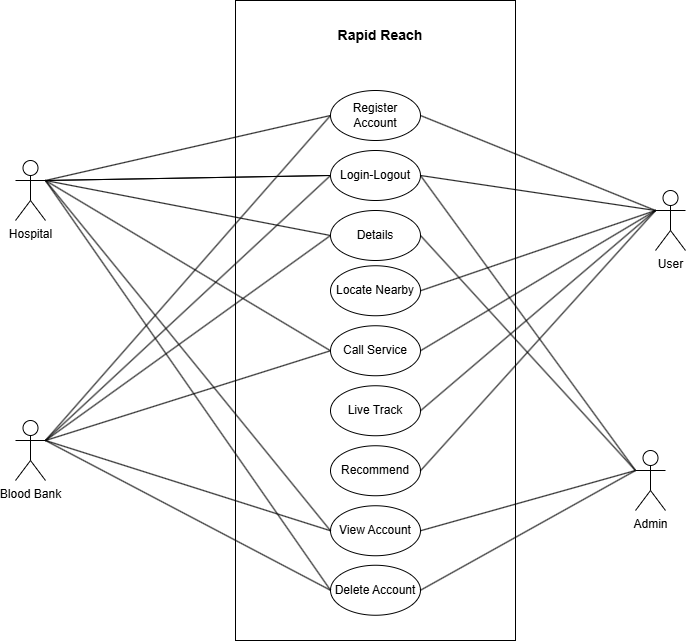
**For Blood Bank:**

* The name of the Blood Bank will be displayed in the map along with location.
* The Blood bank will be contacted by users and hospital’s users for blood.
* The operating hours will be displayed.

**For Admin:**

* Admin can login to the system.
* Admin can see the total number of accounts.
* Admin will be allowed to manage accounts.
* Admin can view the live tracker.

**Use Case Diagram (Hospital and Blood Bank)**

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**Figure 3.2: Use case diagram for Hospital and Blood Bank of Rapid Reach**

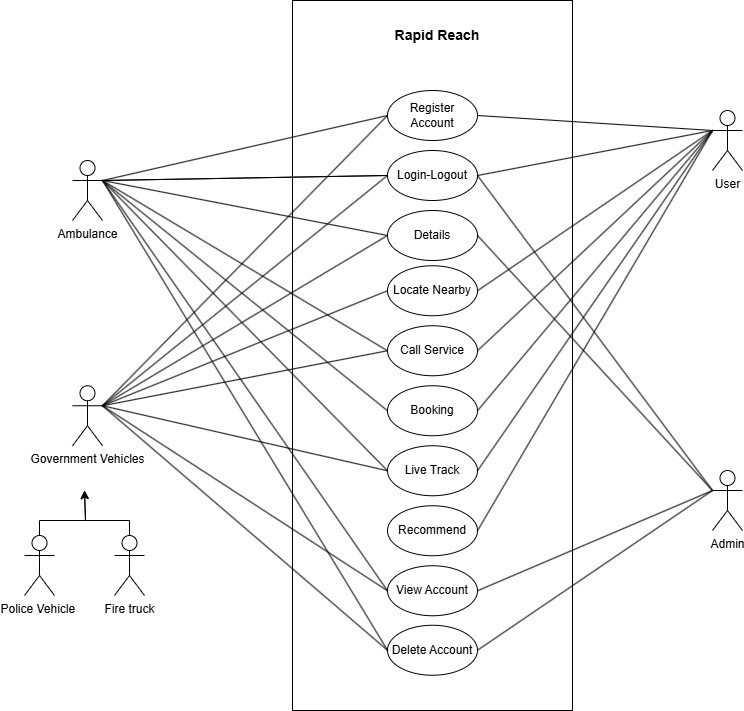
**Use Case Diagram**

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**Figure 3.3: Use case diagram for Police Department and Fire Department of Rapid Reach**

**Use Case Diagram**

****

**Figure 3.4: Use case diagram for Police Vehicle, Fire Truck and Ambulance of Rapid Reach**

**b. Non-Functional Requirement**

**i. Availability**

It will be available as a website. The system works on multiple web browsers like Chrome, Mozilla Firefox and Opera and will be available 24 hours when is deployed.

**ii. Security**

The system has accounts for its users and only authorized users can access the system with username and password. The register system contains form validations so that non-authorized users cannot access.

**iii. Performance**

This system will be designed for smooth performance with optimization and good response.

**b. Feasibility Study**

**i. Technical feasibility**

The website will be developed with the help of MERN Stack along with the help of Haversine and Priority scoring Algorithms for better user experience which helps to recommend nearby services along with top rated services.

**ii. Operational feasibility**

The help of current developing tools and deployment tools the web site can run smoothly in both desktop devices along with mobile devices.

**iii. Economic feasibility**

As per the research, system doesn’t need any funding while it is being developed. However, to build the system it needs software like Visual Studio Code which is free on website.

**iv. Schedule feasibility**

The scheduled time for the project can be seen below with the help of Gantt Chart table.

3.3 High level design of the system

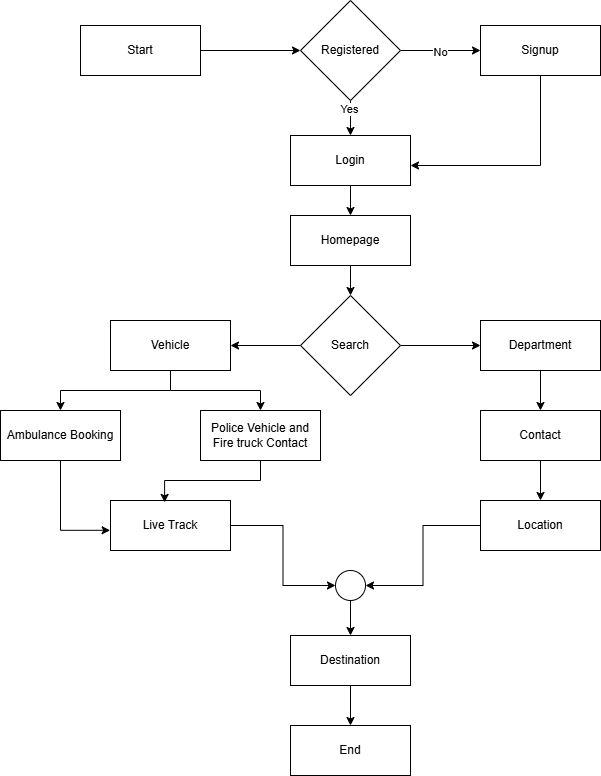
3.3.1 Methodology and Working Mechanism of the Proposed System

Rapid Reach is a web-based real-time emergency locator system built using the MERN stack, designed to assist users in finding nearby emergency services quickly and efficiently. Users can access categorized listings of essential services such as hospitals, police stations, fire services, ambulances, and blood banks based on their current location. The platform offers features like live location detection, distance display, working hours, service availability, verified status, and direct “Call Now” functionality for rapid response. Built with MongoDB for dynamic and scalable data storage, Express and Node.js for a secure backend, and React for a fast and intuitive frontend, Rapid Reach ensures a seamless user experience during emergencies. All service data and user interactions are securely managed and stored, providing reliable access to life-saving information when it matters most.

3.3.2 Flowchart

A flowchart is used in our system to show the diagram that displays how the data flows through the system and how decisions affected this process. There are four flowcharts in this system.

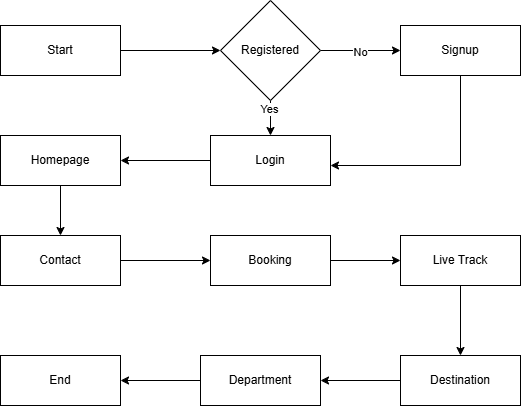
**User (Flowchart)**



**Figure 3.5: Flowchart of the User for Rapid Reach**

This diagram is a flowchart showing the user journey in the "Rapid Reach" application. It outlines the sequence of steps a user follows, starting from launching the app to reaching their destination. The process begins with a check on whether the user is registered. If not, they are directed to sign up. If registered, they log in and access the homepage. From there, users can perform a search that branches into different services like locating vehicles, booking, tracking live movement, accessing building details, contact info, and location services. All paths eventually lead to identifying the destination and ending the session.

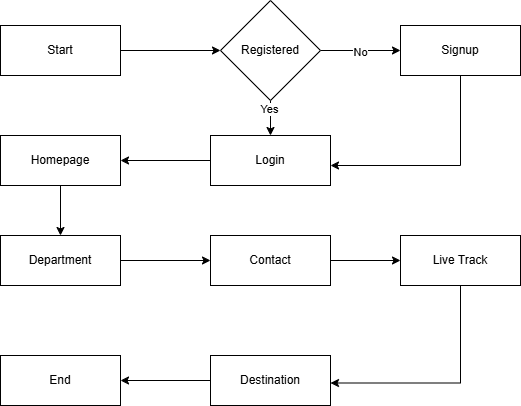
**Ambulance (Flowchart)**



**Figure 3.6: Flowchart of the Ambulance for Rapid Reach**

It begins with the Start point, followed by a decision node checking if the user is Registered. If not, the user is directed to Signup; if yes, they proceed to Login. After logging in, the user reaches the Homepage and can then choose between different functionalities like Contact, Live Track, Building, and Destination. All flows ultimately lead to the End of the session. This chart helps outline the core navigation and decision points in a user-friendly and logical sequence.

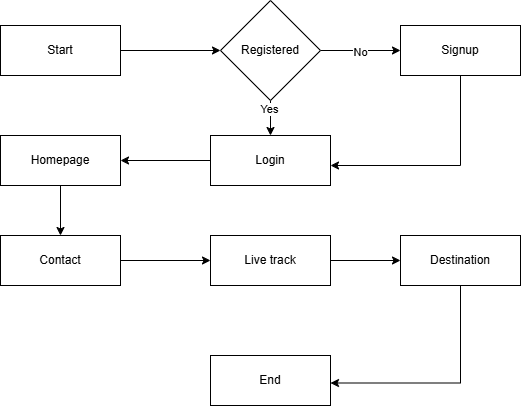
**Fire Truck (Flowchart)**



**Figure 3.7: Flowchart of Fire Truck**

The Fire Truck starts the same as the others, but it is controlled by the fire department. As shown in the figure it starts with registering, login and then redirect to homepage then contacted by the department which follows the live tracker to reach emergency destination.

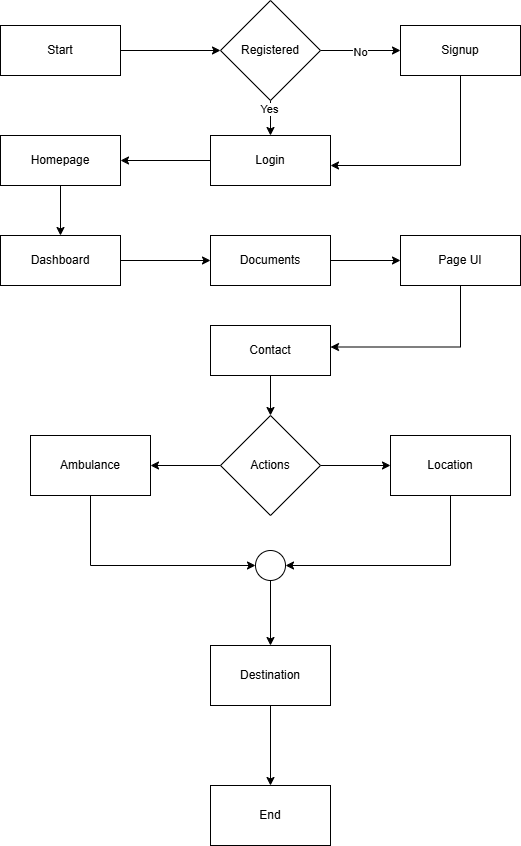
**Police Vehicle (Flowchart)**



**Figure 3.8: Flowchart of Police Vehicle**

It begins with the Start point, followed by a decision node checking if the user is Registered. If not, the user is directed to Signup; if yes, they proceed to Login. After logging in, the user reaches the Homepage and can then choose between different functionalities like Contact, Live Track, Building, and Destination. All flows ultimately lead to the End of the session. This chart helps outline the core navigation and decision points in a user-friendly and logical sequence

**Hospital (Flowchart)**



**Figure 3.9: Flowchart of the Building for Rapid Reach**

It begins with a decision point where users are either directed to sign up if they aren't registered or proceed to login if they are. Once logged in, users land on the homepage, from which they can access different sections such as Contact, Vehicle, Destination, and Building. The flow ensures logical transitions, guiding users seamlessly through the platform while maintaining clarity in their journey. It effectively maps out the core steps in user interaction and engagement.

**Fire Department (Flowchart)**

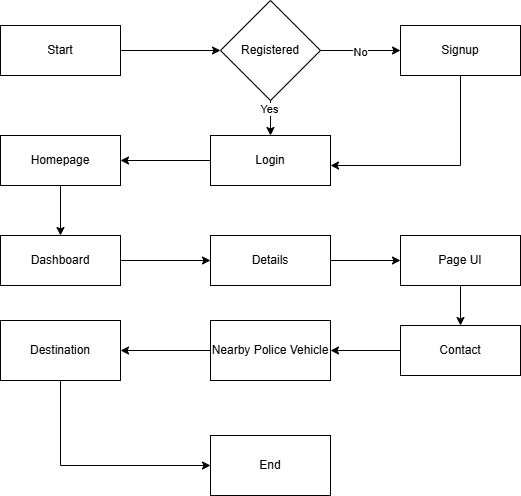
A screenshot of a computer screen

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**Figure 3.10: Flowchart of Fire Department**

It begins with a decision point where users are either directed to sign up if they aren't registered or proceed to login if they are. Once logged in, users land on the homepage, from which they can access different sections such as Contact, Vehicle, Destination, and Building. The flow ensures logical transitions, guiding users seamlessly through the platform while maintaining clarity in their journey. It effectively maps out the core steps in user interaction and engagement.

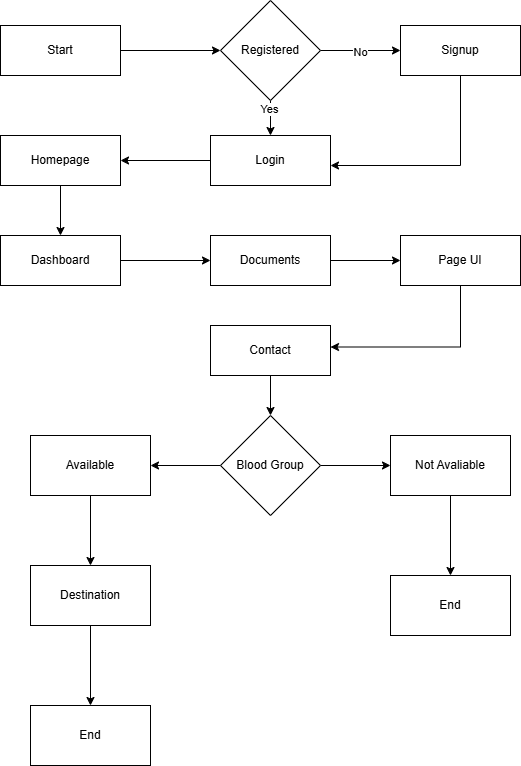
**Police Department (Flowchart)**



**Figure 3.11: Flowchart of Police Department**

This flowchart illustrates a user’s pathway through a multi-featured web app. Starting with registration or login, the user lands on the homepage and can explore various sections like the dashboard, personal or system details, UI components, and destination services. It also includes access to nearby police vehicle info suggesting emergency support and a contact page for communication. The flow ends when the user has completed their interaction, showcasing a comprehensive yet intuitive user journey.

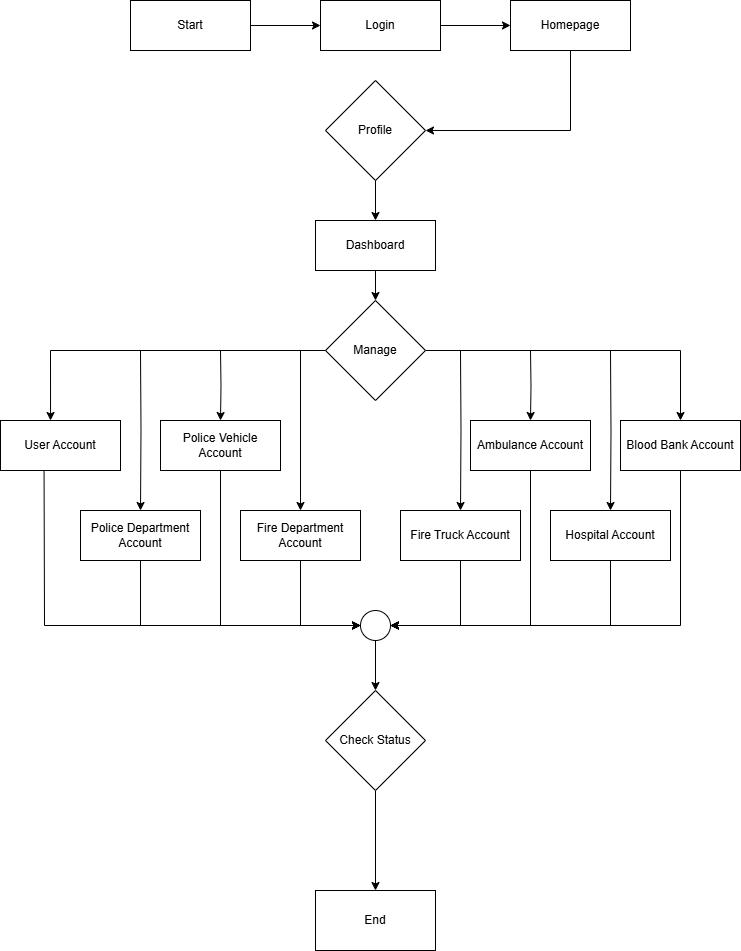
**Blood Bank (Flowchart)**



**Figure 3.12: Flowchart of Blood Bank**

This flowchart outlines a user’s interaction with a web application, starting with a check for registration. If unregistered, the user signs up; otherwise, they proceed to login. Once logged in, they access the homepage, then navigate through the dashboard, documents section, and contact page. A key decision point checks if the required blood group is available if yes, the user proceeds to the destination page; if not, the process ends. It’s a logical, user-centric journey tailored for something like a blood donation or medical platform.

**Admin (Flowchart)**



**Figure 3.13: Flowchart of the Admin for Rapid Reach**

This flowchart represents a structured process involving a series of decisions and actions. It starts with a decision point, directing users based on whether they are registered or not. If not, they are guided to the signup process; otherwise, they proceed to the login step. After logging in, users navigate through key sections like vehicles and buildings, eventually reaching the endpoint. Additional nodes such as homepage, contact, and destination allow for flexible interactions within the system. This visualization effectively maps out user journeys, ensuring a seamless flow through the platform.

3.3.3 Gantt Chart

The Gantt chart is used in our system to show time period of our work. The Gantt chart is used to show what work is done on a specific time period. The Gantt chart contains planning, research, design, implementation, follow up and documentation. The Gantt chart was created using Microsoft Word in our system as seen in the table below.

**Table 3.1: Gantt chart Table for Rapid Reach**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Task | May  10 | May  30 | June  15 | June  26 | July  27 | Aug  3 | Aug  15 | Estimation |
| Planning |  |  |  |  |  |  |  | 20 days |
| Research |  |  |  |  |  |  |  | 15 days |
| Design |  |  |  |  |  |  |  | 25 days |
| Implementation |  |  |  |  |  |  |  | 35 days |
| Testing |  |  |  |  |  |  |  | 25 days |
| Documentation |  |  |  |  |  |  |  | 120 days |

3.4 Algorithm

Algorithms are used in websites to deliver functionality, personalization, performance, and security.

3.4.1 Haversine Algorithm

The Haversine formula is used to calculate the great-circle distance between two points on the surface of a sphere given their latitude and longitude. It’s commonly used in navigation and geolocation.

**Haversine Formula**

* ϕ1,ϕ2 be the latitudes of point 1 and point 2 (in radians)
* 𝜆1, 𝜆2 be the longitudes of point 1 and point 2 (in radians)
* *r* is the radius of the Earth (mean radius ≈ 6,371 km)

Then the Haversine formula is:

**Where:**

* Δ𝜙 = 𝜙2 − 𝜙1
* Δ𝜆 = 𝜆2 − 𝜆1
* *d* is the distance between the two points (along the surface of the sphere)

3.4.2 Priority Scoring Algorithm

A Priority Scoring Algorithm is used to assign priority levels to tasks, issues, customers, or tickets based on multiple weighted factors. It’s common in project management, customer support, incident handling, and business decision-making.

**Priority Score Formula:**

* 𝑛 be the number of factors (criteria)
* x be the score for the -th factor
* w be the weight assigned to the -th factor (where

or written out:

Chapter 4 Expected Outcome

4.1 Conclusion

Rapid Reach addresses a critical need for a fast, reliable, and user-friendly emergency response tool, especially in regions like Nepal where access to real-time emergency information is often limited. By centralizing essential services such as hospitals, police stations, fire services, ambulances, and blood banks, the platform empowers users to act swiftly during emergencies and reduces the time taken to reach help.

With features like location-based search, verified listings, service availability, and instant calling, Rapid Reach offers a practical solution to improve public safety and emergency responsiveness. Built on the MERN stack, it ensures a scalable, secure, and responsive experience, providing users with dependable access to life-saving information when it matters most.

4.2 Possible Outcome

The implementation of Rapid Reach is expected to significantly improve public access to emergency services by reducing the time taken to locate and contact nearby help. Users will benefit from real-time, location-based information that enhances their ability to make quick decisions during emergencies. The platform will also support emergency service providers by increasing their visibility and helping people reach them more efficiently.

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