MINOR-1 PROJECT

SOFTWARE REQUIREMENTS SPECIFICATION REPORT

For

MediConnect: An optimal solution based on algorithms

Submitted By-

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1. Introduction

1.1 Purpose of the Project:

In the realm of emergency healthcare, where timely response is paramount, our project endeavors to address the critical issue of extended ambulance response times in urban areas. We aim to introduce a holistic solution that not only optimizes ambulance routes but also establishes a framework for seamless communication and coordination among healthcare facilities. Our project's core purpose is to revolutionize emergency healthcare and improve patient outcomes through data-driven algorithms.

1.2 Target Beneficiary:

The primary beneficiaries of this project are the individuals in need of emergency medical assistance in urban areas. Swift ambulance responses and efficient patient transportation are essential to ensure their well-being. Additionally, healthcare facilities, including hospitals and clinics, will benefit from improved coordination and communication, which will ultimately enhance the overall emergency healthcare system.

1.3 Project Scope:

Our project focuses on two key objectives: enhancing ambulance response times and ensuring patient-centric transportation. It involves the use of sophisticated algorithms for ambulance route optimization and real-time traffic monitoring. The scope extends to the integration of medical equipment in ambulances, adherence to healthcare standards, and effective communication between ambulance and hospital staff. These efforts collectively contribute to the goal of improving emergency healthcare.

1.4 References:

Our project draws inspiration from various sources, including research papers on healthcare optimization, traffic management strategies, and communication frameworks for emergency services. Additionally, insights from healthcare professionals and emergency response experts have been instrumental in shaping our project's approach and methodology.

2. Project Description

2.1 Technology Stack:

<u>Development</u>

- Backend - Java

- Java Version - Java 20

Database

- Assumption based

Deployment

- GitHub

Software Specifications

- VS Code
- GitHub Desktop

Hardware Specifications

- 11th Gen Intel(R) Core(TM) i5-11320H @ 3.20GHz
- 8GB RAM
- 8 Core(s)
- 16 Logical Processor(s)

2.2 SWOT Analysis:

Strengths	Weakness
• Innovative tech usage for faster responses. • Scalable and sustainable. • Strong stakeholder support. • Potential to save lives and reduce costs. • Opportunity for new standards.	• Complex implementation. • Requires substantial resources. • Possible operator resistance. • Data accuracy dependency.
Opportunities	**Threats**
• Breakthrough in emergency care. • Efficiency improvements. • Expanded service reach. • Cybersecurity concerns. • Competition from alternatives.	• Disruption due to tech/regulation changes. • Risk of not meeting project goals.

Fig 1. SWOT Analysis

2.3 Project Features:

Optimized Ambulance Response:

Our project ensures that ambulances reach patients swiftly by employing real-time traffic monitoring, route optimization, and smart ambulance allocation.

Enhanced Patient Transportation:

We prioritize patient comfort and care during transit by equipping ambulances with essential medical equipment, adhering to healthcare standards, and facilitating seamless communication with hospitals.

Communication and Monitoring:

We establish robust communication channels between ambulances and healthcare facilities using telemedicine technology, vital signs monitoring, and real-time updates for better coordination among staff.

Core Algorithms:

The project leverages Dijkstra's Algorithm for ambulance route optimization, ensuring the most efficient path to patients.

Scalability and Expansion:

Designed for future growth, our project is scalable to accommodate multiple patients and can expand to serve new regions and hospitals.

User Training:

A user-centric approach is incorporated, providing extensive user training for seamless integration into healthcare systems.

2.4 Design and Implementation Constraints:

Algorithm Selection: The choice of the most suitable algorithm depends on the specific requirements and constraints of each application, making it crucial to select the right one for optimizing ambulance routes.

Graph Characteristics: Various algorithms may be better suited for scenarios with specific graph characteristics, such as negative edge weights, directed acyclic graphs, or large-scale networks.

Integration Challenges: Integrating the project into existing healthcare systems and ensuring compatibility with different hospital systems may pose implementation challenges.

Data Accessibility: The success of real-time traffic monitoring and route optimization relies on the availability of accurate and up-to-date data.

User Adoption: User training and adoption of the new system within healthcare facilities might require adjustments and support.

2.5 Design Diagrams:

PERT Chart: The Project Evaluation Review Technique (PERT) Chart provides a visual representation of the project's timeline, illustrating critical tasks, dependencies, and expected completion times.

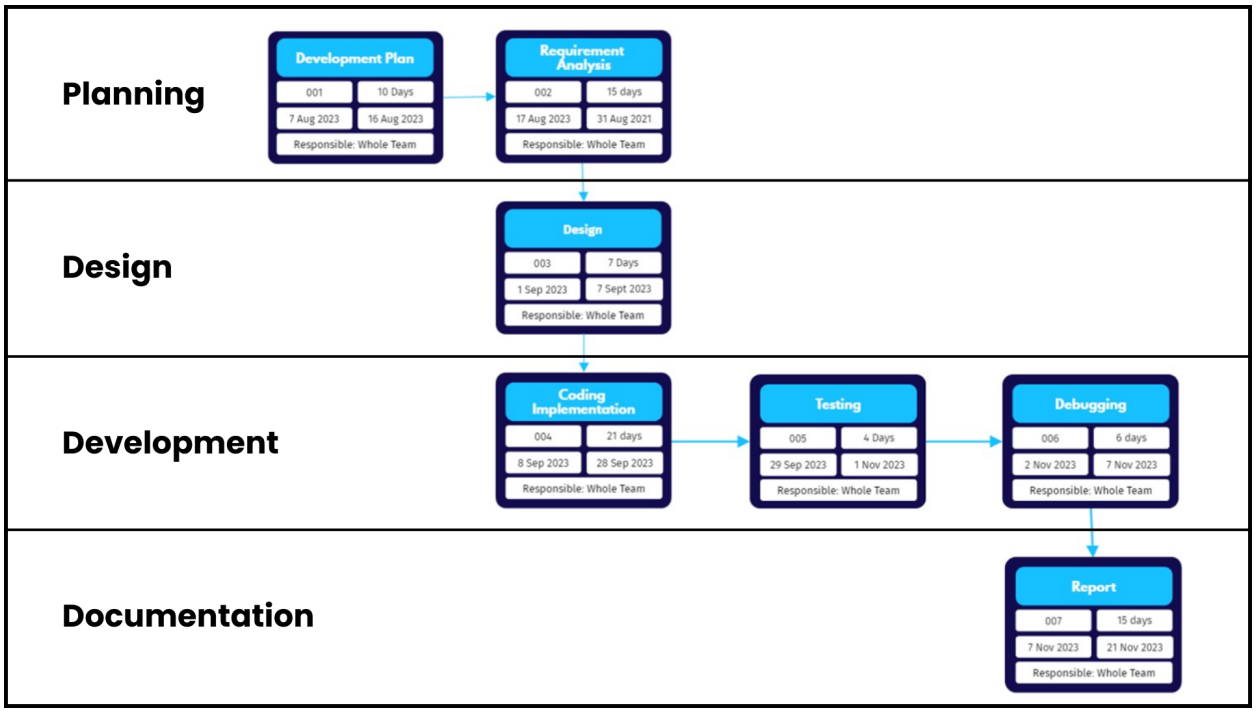

Fig 2: Program Evaluation Review Technique Chart

Block Diagram: A Block Diagram visually outlines the core components of the project, highlighting the flow of work and interactions between modules.

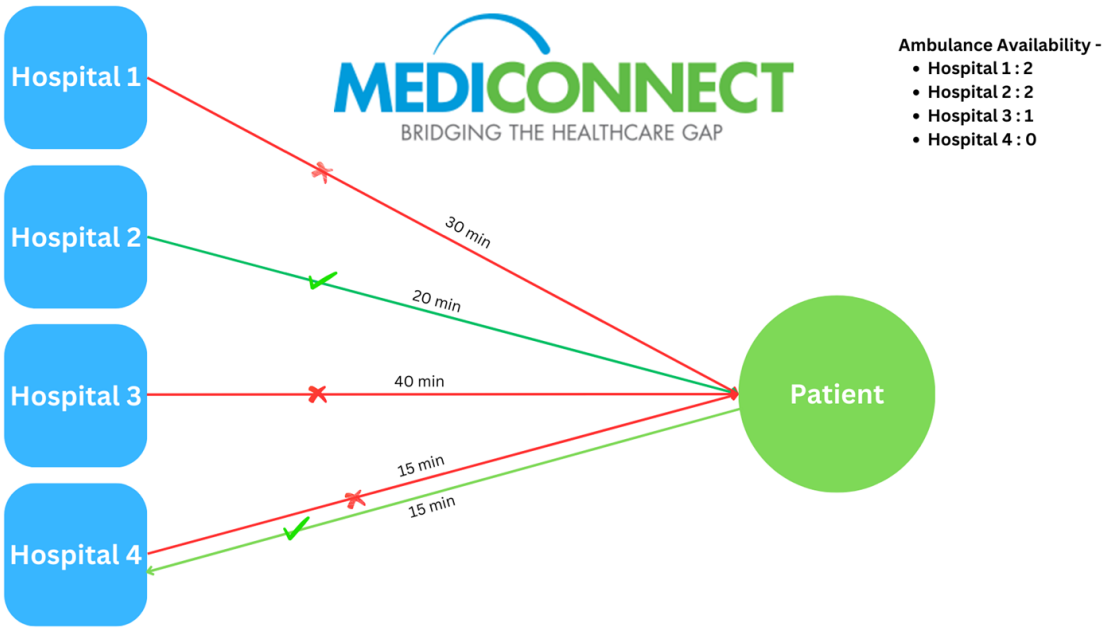

Fig 3: Block Diagram depicting the Project work

System Flow Diagram: The Overall System Flow Diagram divides the project into two main objectives: Objective 1 focusing on ambulance response optimization and Objective 2 emphasizing patient-centric transportation.

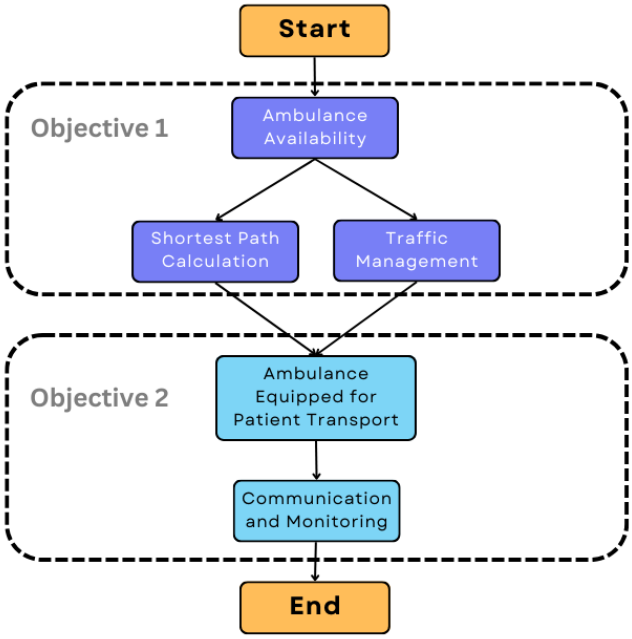

Fig 4: Overall System Flow

3. System Requirements

3.1 User Interface:

User-Friendly Dashboard: The project features an intuitive dashboard for easy navigation, enabling healthcare staff and dispatchers to efficiently manage ambulance services.

Real-Time Monitoring: Users can access real-time traffic information, ambulance availability, and patient status, ensuring swift and informed decisions.

Emergency Alerts: The system provides an alert mechanism for immediate response during critical situations, enhancing user interaction and response times.

3.2 Protocols:

Communication Protocols: The project uses secure communication protocols to enable real-time updates and coordination between ambulances and healthcare facilities.

Data Exchange Protocols: Robust data exchange protocols ensure seamless sharing of critical information, including patient details and ambulance locations.

Emergency Response Protocols: The system integrates emergency response protocols for handling urgent medical situations effectively and ensuring quick ambulance dispatch.

4. Non-functional Requirements

4.1 Performance requirements:

Response Time: The system must respond swiftly to user interactions, ensuring minimal delays in ambulance dispatch and critical communication.

Scalability: MediConnect should be scalable to accommodate increased users, ambulances, and healthcare facilities while maintaining optimal performance.

Traffic Analysis: Real-time traffic analysis and route optimization algorithms must provide quick results, aiding in efficient ambulance response.

4.2 Security requirements:

Data Encryption: Patient information and critical data must be encrypted to protect patient privacy and ensure confidentiality.

Access Control: Role-based access control should restrict system access, allowing authorized personnel to view sensitive data and make decisions.

Audit Trail: The system must maintain an audit trail of all activities, enhancing accountability and security.

4.3 Software Quality Attributes:

Reliability: MediConnect should provide a reliable and consistent service, ensuring that ambulances are dispatched promptly and patients receive timely care.

Usability: The user interface must be user-friendly, promoting ease of use for healthcare staff and dispatchers.

Scalability: The project's architecture should be scalable, supporting future expansion to additional regions and healthcare facilities.

Maintainability: The system should be designed for easy maintenance, with regular updates and improvements to enhance its performance and features.

Availability: MediConnect must maintain high availability to ensure that ambulance services are accessible at all times, especially during emergencies.