SOFTWARE REQUIREMENTS SPECIFICATION

for

Road Repair and Tracking System

Version 1.0

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1 Introduction

1.1 Purpose

The given SRS documents the requirements of a **Road Repair and Tracking System.** The purpose behind this system is to automate various book keeping activities associated with the road repairing task of the Public Works Department of the Corporation of a large city. The system aims to efficiently manage repair requests, prioritize tasks, allocate resources, and provide comprehensive statistics for effective decision-making.

1.2 Document Conventions

In this Software Requirements Specification (SRS) for the Road Repair and Tracking System (RRTS), certain conventions have been followed to ensure clarity and consistency.

Acronyms and Abbreviations:

- **RRTS:** Road Repair and Tracking System
- **SRS:** Software Requirements Specification

Priority Levels:

Requirements are assigned priority levels to indicate their relative importance. Priority levels are denoted as follows:

- **High (H):** Critical for system functionality and performance.
- **Medium (M):** Important but not critical; can be implemented in later releases.
- **Low (L):** Desirable but not essential.

Formatting:

Headings are in bold for easy identification, and subsections are numbered for a structured hierarchy.

These conventions have been applied consistently to enhance document readability and provide a standardized framework for stakeholders involved in the development and review of the RRTS.

1.3 Intended Audience and Reading Suggestions

This SRS is designed for various stakeholders involved in the development RRTS.

Audience:

- Developers: Technical specifications, system behavior.
- Project Managers: Project scope, constraints, timelines.
- Marketing Staff: User interface, user experience features.
- Users: Complaint registration, priority determination.
- Testers: Functional and non-functional requirements, test scenarios.
- Documentation Writers: Structured content for manuals.

Reading Suggestions:

1. **Overview Sections**: Introduction and System Overview.
2. **Developer Focus**: Architecture, Data Models, and Functional Requirements.
3. **Project Management**: Scope, Constraints, and Timelines.
4. **Marketing and User**s: User Interface, User Experience, and Complaint Registration.
5. **Testing**: Functional and Non-Functional Requirements, Test Scenarios.
6. **Documentation**: Overview, User Interface, User Experience.

This sequence ensures each reader extracts pertinent information aligned with their role in RRTS development and utilization.

1.4 Project Scope

The Road Repair and Tracking System (RRTS) is a comprehensive software solution designed to automate and optimize the road repair activities of the Public Works Department within a large city corporation. The system facilitates complaint registration from residents through various channels, prioritizes repair tasks based on supervisor assessments, and dynamically schedules repairs considering resource availability. Key functionalities include resource management, allowing supervisors to estimate raw material requirements, machinery, and personnel needs. The system provides real-time updates on available resources, which city administrators can modify as needed. Reporting features enable the generation of statistics for the mayor, offering insights into repairs conducted, outstanding tasks, and the utilization of manpower and machinery.

The RRTS is designed to enhance efficiency, transparency, and decision-making in road repair operations, with potential future enhancements including GIS integration and a resident-facing mobile application.

1.5 References

This Software Requirements Specification (SRS) is developed using the LaTeX template provided by jpeisenbarth, available at SRS Template. The structure and conventions of the document follow the guidelines outlined in the IEEE standard for Software Requirements Specifications, accessible at IEEE SRS document.

These resources have been instrumental in ensuring a standardized and well-organized approach to documenting the requirements for the Road Repair and Tracking System (RRTS). They provide valuable frameworks for clarity, consistency, and adherence to best practices in SRS development.

2 Overall Description

2.1 Product Perspective

The Road Repair and Tracking System (RRTS) is conceived as a standalone software solution designed to enhance and modernize the road repair activities of the Public Works Department within a large city corporation. It is not a replacement for any existing system but rather a new, self-contained product aimed at automating and optimizing the workflow associated with road repairs.

The RRTS does not belong to a specific product family but is developed to function independently, addressing the unique challenges and requirements of the city's road repair management. While the system itself is self-contained, it may interact with existing city infrastructure and databases to access relevant geographical and administrative data.

2.2 Product Functions

The **Road Repair and Tracking System (RRTS)** is designed to perform the following major functions:

- **Complaint Registration:** Allow residents to submit road repair requests through various channels, such as phone or written complaints and the clerk to add them to the system.
- **Supervisor Assessment:** Enable assigned supervisors to examine and assess reported road conditions, determining repair priorities based on severity and locality characteristics.
- **Resource Management:** Assist supervisors in estimating raw material requirements, machinery, and personnel needed for each repair task.
- **Dynamic Scheduling:** Generate optimal schedules for road repairs based on real-time data on available resources, considering priority and resource availability.
- **Resource Updates:** Allow city administrators to update information on available manpower and machines, facilitating adjustments in the system when resources change.
- **Reporting:** Allow the mayor of the city to request for various road repair statistics such as the number and type of repairs carried out over a period of time and the

repair work outstanding at any point of time and the utilization statistics of the repair manpower and machine over any period of time.

These functions collectively ensure the effective management, prioritization, and scheduling of road repair tasks, enhancing the overall efficiency of the public works department in addressing resident complaints and maintaining city infrastructure.

2.3 User Classes and Characteristics

The **Road Repair and Tracking System (RRTS)** is designed to accommodate different user classes with distinct characteristics. The identified user classes are as follows:

1. **Residents:**
   - **Characteristics:** Infrequent users, varying technical expertise.
   - **Usage:** Submit road repair requests through phone or written complaints.
2. **Clerks:**
   - **Characteristics:** Frequent users, moderate technical expertise.
   - **Usage:** Enter resident complaints into the system.
3. **Supervisors:**
   - **Characteristics:** Frequent users, moderate to high technical expertise.
   - **Usage:** Examine reported road conditions, prioritize repair tasks, estimate resource requirements.
4. **City Administrators:**
   - **Characteristics:** Infrequent users, high technical expertise.
   - **Usage:** Update information on available manpower and machines, review and adjust resource data.
5. **Mayor:**
   - **Characteristics:** Infrequent users, varying technical expertise.
   - **Usage:** Request and review road repair statistics and reports for decision-making.

While all user classes are important, residents and supervisors represent primary users, as residents initiate repair requests, and supervisors play a crucial role in assessing and prioritizing repair tasks.

2.4 Operating Environment

The **Road Repair and Tracking System (RRTS)** consists of:

- **Web App:** Accessed via web browsers for complaint submission.
- **Mobile App:** Designed for iOS and Android for supervisor assessments.
- **Backend:** Operates in the cloud for data storage and application logic.

The system is designed to function seamlessly in diverse environments, enhancing accessibility and usability.

2.5 Design and Implementation Constraints

The system will use **GoLang** for backend implementation and **HTMX with Javascript** for frontend.

2.6 Assumptions and Dependencies

The success of the **Road Repair and Tracking System (RRTS)** is contingent on certain assumptions and dependencies:

- **Assumptions:**
  - Supervisors will manually enter data from their conclusions after examination.
  - Residents will actively engage with the system to report road repair issues.
  - The availability of a stable internet connection for real-time updates and data synchronization.
- **Dependencies:**
  - Use of AI/ML for ease of detection of need for road repairs leading to automation and decrease manual load over supervisors.
  - The successful implementation and integration of third-party components, such as the chosen cloud infrastructure for the backend and web frameworks like React and HTMX for frontend development.
  - Availability of external geographic information systems (GIS) for potential future integration.

3 External Interface Requirements

3.1 User Interfaces

The **Road Repair and Tracking System (RRTS)** incorporates various user interfaces tailored for specific user roles:

1. **Resident Interface:** A web-based form enabling residents to submit repair requests.
2. **Clerk Interface:** Secure login for clerks, facilitating data entry and complaint management.
3. **Supervisor Interface:** Mobile app for supervisors to assess road conditions, prioritize repairs, and update task statuses.
4. **Administrator Interface:** Web-based interface for city administrators to manage resources in real-time.
5. **Mayor Interface:** Dashboard for the mayor to access comprehensive reports and statistics for decision-making.

3.2 Communications Interfaces

Communication within the **RRTS** relies on a stable internet connection. Specific protocols, such as **HTTP**, may be used for data transfer between the user interfaces and the backend. Security measures, including encryption, will be implemented to protect sensitive information during communication. Furthermore technologies such as **Asynchronous API** and **Websockets** will be used for real-time updates to the software.

3.3 Software Interfaces

The software interfaces of the **RRTS** include:

- **Backend Implementation:** Utilizing **GoLang** for server-side logic.
- **Frontend Framework:** Developed using **React** (JavaScript Framework) and **HTMX** for the web application.
- **Database Management System (DBMS):** Compatible with **MySQL**, **PostgreSQL**, or **SQLite** for data storage.

3.4 Hardware Interfaces

The **RRTS** supports standard hardware configurations, including desktop computers, laptops, and mobile devices for supervisors. The application's performance may be influenced by the hardware specifications of end-user devices, particularly mobile devices.

4 Functional Requirements

The **Road Repair and Tracking System (RRTS)** is designed to perform the following major functions:

4.1 Authentication

Description and Priority

Authentication is a fundamental function to ensure secure access to the system and **grant user roles based on it**. It is of High priority to safeguard sensitive information and system functionalities.

Stimulus/Response Sequences

Stimulus: User attempts to log into the system.
Response: System validates the provided credentials and grants **access or roles** if authentication is successful.

Functional Requirements

- **REQ-1:** Provide a secure login interface for all users.
- **REQ-2:** Implement **a role-based authentication** to distinguish between resident, clerk, supervisor, and administrator roles.
- **REQ-3:** Store user credentials securely using encryption techniques.

4.2 Complaint Registration

Description and Priority

Residents can submit road repair requests through various channels, such as phone or written complaints. Clerks are responsible for adding these requests to the system. This function is of High priority to ensure a prompt and efficient complaint registration process.

Stimulus/Response Sequences

Stimulus: Resident initiates a road repair request through phone or written complaint. **Response:** Clerk logs into the system and adds the resident's complaint, assigning a unique identifier.

Functional Requirements

- **REQ-4:** Provide a secure login for clerks to access the system.
- **REQ-5:** Implement a user-friendly interface for clerks to add resident complaints.
- **REQ-6:** Assign a unique identifier to each registered road repair request.

4.3 Supervisor Assessment

Description and Priority

Assigned supervisors can examine and assess reported road conditions, determining repair priorities based on severity and locality characteristics. This function is of High priority to enable efficient on-site assessments.

Stimulus/Response Sequences

Stimulus: Supervisor logs into the system and selects an assigned area for assessment. **Response:** System displays road conditions, allowing the supervisor to prioritize repairs.

Functional Requirements

- **REQ-7:** Implement a secure login mechanism for supervisors.
- **REQ-8:** Present a user-friendly interface displaying road conditions and assessment options.
- **REQ-9:** Allow supervisors to prioritize repairs and update task statuses.

4.4 Resource Management

Description and Priority

This function assists supervisors in estimating raw material requirements, machinery, and personnel needed for each repair task. It is of Medium priority, contributing to effective **resource planning and allocation.**

Stimulus/Response Sequences

Stimulus: Supervisor initiates a request for resource estimation in the system.
Response: System provides estimates for raw materials, machinery, and personnel required.

Functional Requirements

- **REQ-10:** Provide an interface for supervisors to input repair task details.
- **REQ-11** Utilize historical data to assist in estimating resource requirements.

4.5 Dynamic Scheduling

Description and Priority

Generate optimal schedules for road repairs based on real-time data on available resources, considering priority and resource availability. This function is of High priority, ensuring efficient utilization of available resources.

Stimulus/Response Sequences

Stimulus: System receives updated repair task details and resource availability.
Response: System generates and updates repair schedules based on priority and resource availability.

Functional Requirements

- **REQ-12:** Continuously monitor real-time data on available resources.
- **REQ-13:** Utilize scheduling algorithms to optimize repair task assignments.

4.6 Resource Updates

Description and Priority

Allow city administrators to update information on available manpower and machines, facilitating adjustments in the system when resources change. This function is of Medium priority, supporting system adaptability.

Stimulus/Response Sequences

Stimulus: Administrator logs into the system to update resource information.
Response: System processes updates and adjusts scheduling and resource allocation accordingly.

Functional Requirements

- **REQ-14:** Provide a secure login for city administrators to access resource management features.
- **REQ-15:** Implement an intuitive interface for administrators to update resource information.
- **REQ-16:** Automatically adjust scheduling and resource allocation based on updates.

4.7 Reporting

Description and Priority

Allow the mayor of the city to request various **road repair statistics** over time, including the number and types of repairs carried out, outstanding repair tasks, and utilization statistics of repair manpower and machinery. This function is of High priority, supporting informed decision-making.

Stimulus/Response Sequences

Stimulus: Mayor initiates a request for road repair statistics through the system.
Response: System generates and displays comprehensive reports as per the mayor's request.

Functional Requirements

- **REQ-17:** Provide a secure login for the mayor to access reporting features.
- **REQ-18:** Implement a user-friendly interface for specifying report criteria.
- **REQ-19:** Generate and display detailed reports on road repair statistics.

5 Other Nonfunctional Requirements

5.1 Performance Requirements

The **Road Repair and Tracking System (RRTS)** is expected to meet the following performance requirements:

- **Real Time Updates:** The data and complaints should be **updated in real-time** for better accuracy and interaction.
- **Response Time:** The system should respond to user interactions within 2 seconds to ensure a seamless user experience.
- **Scalability:** The system should handle a minimum of 1000 simultaneous user connections without significant performance degradation.
- **Data Processing:** The system should process and generate scheduling reports for repair tasks within 5 minutes of receiving updated information.

5.2 Safety Requirements

The safety requirements for the **RRTS** include:

- **Data Integrity:** The system must ensure the integrity of resident-submitted data and prevent unauthorized modifications.
- **Access Control:** Role-based authentication is implemented to restrict access to sensitive functionalities, ensuring data privacy and preventing misuse.

5.3 Security Requirements

To ensure the security and privacy of data in the **RRTS**, the following requirements are defined:

- **User Authentication:** Users must authenticate using a secure login interface with encrypted credentials.
- **Role-Based Access Control:** The system employs role-based access control to distinguish between resident, clerk, supervisor, and administrator roles, ensuring that each user has appropriate access permissions.
- **Data Encryption:** Sensitive data, including user credentials, must be stored and transmitted using encryption techniques to prevent unauthorized access.

5.4 Software Quality Attributes

The software quality attributes for the **RRTS** are defined as follows:

- **Usability:** The system prioritizes ease of use to facilitate efficient complaint registration and resource management.
- **Reliability:** The system must be reliable, ensuring consistent performance and accurate processing of repair task information.
- **Maintainability:** The system design should facilitate easy maintenance, allowing for updates and modifications without causing disruptions.

5.5 Business Rules

The **RRTS** adheres to the following business rules:

- **Role-Based Functionality:** Only administrators can update resource information, supervisors can assess road conditions, clerks can register complaints, and residents can submit repair requests.
- **Data Validity:** The system enforces data validation rules to ensure the accuracy and completeness of information entered by users.