Software Requirements Specification

for

Road Repair And Tracking System(RRTS)

Version 1.0

Prepared by

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Contents

Revisions

Version	Primary Author(s)	Description of Version	Date Completed
1.0	All	Added FRs and NFRs section.	06/02/2025
2.0	All	Introduction and description and Finalization of SRS	11/02/2025

1 Introduction

1.1 Document Purpose

The **Road Repair and Tracking System (RRTS)** is designed to **streamline and automate** the reporting, tracking, and management of road repair activities. It enables residents to submit repair requests, supervisors to assess road conditions and allocate resources, and administrators to oversee repair operations and generate reports.

The primary objectives of the system are:

- **Efficiently handle repair requests** by digitizing submission, tracking, and updates.
- **Improve road condition assessment** through structured reporting and prioritization.
- **Optimize resource allocation** (materials, machinery, workforce) for timely repairs.
- **Enhance transparency** by allowing real-time tracking of repair progress.
- **Generate insightful reports and analytics** to aid decision-making.

1.2 Product Scope

The RRTS is a **web-based application** accessible via desktop and mobile devices. It serves **three main user roles**:

- **Residents:** Submit repair requests and track their status.
- **Supervisors:** Assess road conditions, assign priority levels, and manage repairs.
- **Administrators:** Oversee operations, manage resources, and generate reports.

Key functionalities include:

1. **User Management** – Account creation, role-based permissions.
2. **Repair Request Handling** – Request submission, tracking, and updates.
3. **Road Condition Assessment** – Inspection-based prioritization.
4. **Resource Management** – Allocation of materials, machines, and personnel.
5. **Scheduling & Execution** – Automated scheduling with real-time modifications.
6. **Tracking & Reporting** – Live repair status, analytics, and performance tracking.

The system ensures **efficient road repair operations**, reducing delays and improving urban infrastructure maintenance.

1.3 Definitions, Acronyms and Abbreviations

- **RBAC:** Role-Based Access Control
- **GIS:** Geographic Information System (for location tracking)
- **UI/UX:** User Interface/User Experience
- **NFR:** Non-Functional Requirement
- **FR:** Functional Requirement

1.4 References

- [City Infrastructure Management Guidelines]
- [Municipal Road Maintenance Standards]
- [ISO 25010 Software Quality Standards]

1.5 Overview

This **Software Requirements Specification (SRS)** document is structured as follows:

- **Section 2: Overall Description** – System perspective, functionality, user roles, and constraints.
- **Section 3: Specific Requirements** – Detailed functional and non-functional requirements.
- **Section 4: Supporting Information** – Additional details, assumptions, and dependencies.
- **Section 5: Appendices (if applicable)** – Supporting documents and references.

2 Overall Description

2.1 Product Perspective

The **Road Repair and Tracking System (RRTS)** is a web-based system designed to streamline the reporting, tracking, and management of road repair activities. It acts as a centralized platform for residents, supervisors, and administrators, ensuring effective communication and resource allocation.

The system replaces manual and inefficient methods, such as paperwork and calls, with a **digital workflow** that automates repair request handling, resource estimation, scheduling, and tracking.

Key characteristics:

- **Web-based** for accessibility across devices
- **Role-based access control (RBAC)** for different users
- **Automated scheduling and resource management**
- **Real-time tracking and status updates**

2.2 Product Functionality-

The system provides the following core functionalities:

1. **User Management**
    - Creation and management of user accounts
    - Role-based permissions (Residents, Supervisors, Administrators)
2. **Repair Request Handling**
    - Residents submit repair requests with details (location, severity, etc.)
    - Unique tracking ID assigned to each request
    - Status tracking throughout the process
3. **Road Condition Assessment**
    - Supervisors inspect roads and update condition reports
    - Assign priority based on severity and locality type

4. **Resource Estimation and Allocation**
    - Supervisors estimate materials, machinery, and personnel needed
    - Allocation of resources based on priority and availability
5. **Repair Scheduling and Execution**
    - Automatic scheduling based on priority and available resources
    - Supervisors can update schedules in real time
6. **Tracking and Monitoring**
    - Live status tracking of repair progress
    - Updates on estimated completion time and delays
7. **Reporting and Analytics**
    - Generate reports on repairs, backlog, and resource utilization
    - Performance analytics for better decision-making.

2.3 User Characteristics

1. **Residents**
    - Primary users submitting repair requests
    - Track the status of submitted requests
    - User-friendly interface for accessibility
2. **Supervisors (Municipal Engineers/Inspectors)**
    - Assess road conditions and assign repair priorities
    - Estimate required materials, machinery, and workforce
    - Modify and manage repair schedules
3. **Administrators**
    - Oversee the entire system and manage resources
    - Update available resources (new machines, personnel)
    - Generate and analyze reports

Each user role has distinct permissions, ensuring secure and efficient operations.

2.4 Constraints

- **Hardware Requirements**: Users must have access to a device (PC, tablet, or mobile) with a compatible web browser.
- **Role-Based Access Control (RBAC)**: Different users (residents, supervisors, administrators) will have restricted permissions based on their roles to ensure security and prevent unauthorized modifications.
- **Scalability Limitation**: The initial deployment will support a limited number of concurrent users and repair requests. Future scalability will require additional infrastructure.
- **GIS Integration**: The system relies on Geographic Information System (GIS) data for accurate location tracking of road conditions and repair sites.
- **Data Entry Accuracy**: Road condition assessments and repair requests depend on the accuracy of the data entered by users.
- **Regulatory Compliance**: The system must comply with municipal and national regulations regarding infrastructure management and data privacy.
- **Resource Availability**: The scheduling and execution of repairs are dependent on the availability of materials, machines, and workforce.
- **System Uptime**: The system must maintain a minimum uptime of 99% to ensure reliability and continuous operation.
- **Security Standards**: The system must implement encryption, authentication, and audit logging to protect sensitive data and prevent unauthorized access.

2.5 Assumptions and Dependencies

- Users (residents, supervisors, administrators) are expected to have basic digital literacy.
- Accurate road condition assessments depend on supervisor inspections.
- The system will integrate with GIS/maps for precise location tracking.
- Sufficient resources (materials, machines, personnel) must be available to execute repairs on schedule.

3 Specific Requirements

3.1 Functional Requirements

3.1.1 User Management

- **FR1:** The system must allow the creation, modification, and deletion of user accounts (e.g., residents, supervisors, administrators).
- **FR2:** The system must support role-based access control (RBAC), ensuring users have appropriate permissions (e.g., residents can only submit requests, supervisors can assess and manage repairs).

3.1.2 Repair Request Management

- **FR3:** The system must allow residents to submit repair requests, including details like road location, description, severity.
- **FR4:** The system must generate a unique ID for each repair request to track and manage it throughout the process.
- **FR5:** The system must allow residents and city officials to track the status of repair requests (pending, under review, in progress, completed).

3.1.3 Road Condition Assessment

- **FR6:** Supervisors must be able to input and update the road's condition based on their inspection.
- **FR7:** Supervisors must be able to assign a priority level for each repair request based on the road condition and its locality type (e.g., commercial, residential).

3.1.4 Resource Estimation

- **FR8:** Supervisors must estimate the quantity of raw materials required for each repair task.
- **FR9:** Supervisors must estimate the type and number of machines required for the repair.
- **FR10:** Supervisors must estimate the type and number of personnel required to carry out the repairs.

3.1.5 Resource Allocation

- **FR11:** The system must allow the allocation of available resources (personnel, machinery, materials) to each scheduled repair based on priority and availability.
- **FR12:** The system must track and update the usage of resources during the repair process (e.g., machine hours, manpower hours, material usage).

3.1.6 Resource Update

- **FR13:** The system must allow administrators to update available resources (personnel, machines, and materials) whenever changes occur.
- **FR14:** If there is an update to resource availability (e.g., new machine or personnel added), the system must automatically reschedule repairs based on the updated resource data.

3.1.7 Scheduling

- **FR15:** The system must generate a repair schedule based on repair priorities, available resources, and estimated repair time.
- **FR16:** The system must allow supervisors to modify and update repair schedules based on real-time conditions (e.g., resource unavailability or emergencies).

3.1.8 Tracking Repair Status

- **FR17:** The system must track and display the progress of ongoing repairs, including the percentage of work completed, estimated completion date, and any delays.
- **FR18:** The system must allow supervisors to update the status of repairs (e.g., "in progress," "completed") and record the actual resources used.

3.1.9 Reporting & Analytics

- **FR19:** The system must generate reports detailing the number and types of repairs carried out over a specific period.
- **FR20:** The system must provide statistics on the outstanding repair requests and the current repair backlog.
- **FR21:** The system must offer performance analytics, including resource utilization rates (e.g., machine hours, personnel hours), and trends over time.

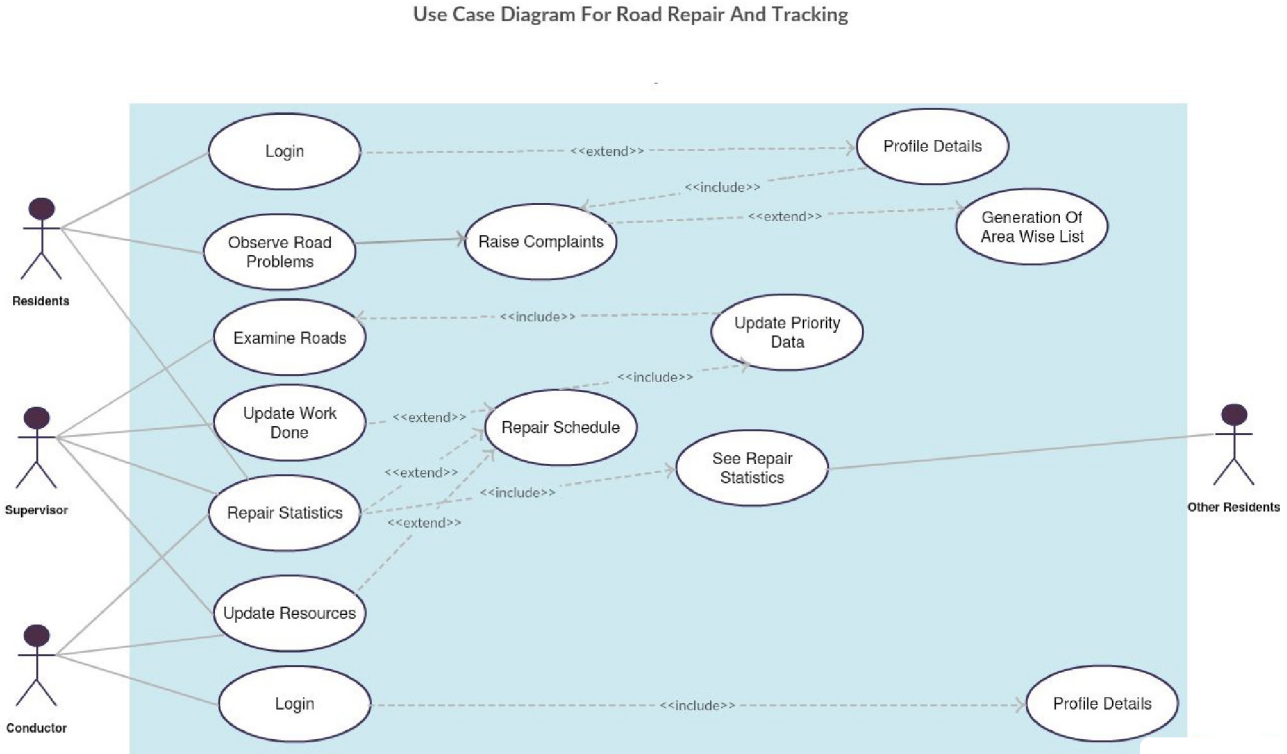
3.2 Use Case Model

3.2.1 Actors:

1. **Residents**:
    - Observe road problems
    - Raise complaints
    - Update profile details
    - Generate area-wise lists
2. **Supervisor**:
    - Examine roads
    - Update work done
    - Repair statistics
    - Update resources
    - View repair schedule
3. **Conductor**:
    - Repair schedule
    - Update priority data
    - See repair statistics
4. **Other Residents**:
    - View repair statistics
    - Profile details

3.2.2 Use Cases:

1. **Login**:
    - Included in all user interactions.
2. **Raise Complaints**:
    - Includes "Observe Road Problems."
    - Extended by "Generation of Area Wise List."
3. **Repair Schedule**:
    - Includes "Update Priority Data."
    - Extended by "Update Work Done" and "Repair Statistics."
4. **See Repair Statistics**:
    - Extended by "Update Resources."



4 Other Non-functional Requirements

4.1 Performance Requirements

- **NFR1:** The system must process and respond to user requests (e.g., submitting a repair request, fetching a report) within 3-5 seconds under normal load.
- **NFR2:** The system must be able to handle multiple concurrent users without significant degradation in performance.

4.2 Scalability

- **NFR3:** The system must be scalable to accommodate an increasing number of repair requests and users as the city grows, without needing a significant redesign.
- **NFR4:** The system must be able to handle peak loads, such as after major events or adverse weather conditions, without performance degradation.
- **NFR5:** The system should allow for easy addition of new features or modules (e.g., integration with other municipal services, new reporting functionalities).

4.3 Security

- **NFR6:** The system must ensure data security by using encryption to protect sensitive information such as user data, repair requests, and resource details.
- **NFR7:** The system should implement role-based access control (RBAC) to limit access to specific features based on user roles.
- **NFR8:** The system must have strong authentication mechanisms (e.g., multi-factor authentication) to secure user accounts.
- **NFR9:** The system must log user actions (e.g., data updates, repair status changes) to maintain an audit trail for security and compliance purposes.

4.4 Usability

- **NFR10:** The system must feature an intuitive, user-friendly interface for all user roles (residents, supervisors, administrators).
- **NFR11:** The system should offer an easy-to-navigate dashboard that provides quick access to key features (e.g., repair request status, scheduling, resource management).

- **NFR12:** The system must be accessible on both desktop and mobile devices, with responsive design to ensure a good user experience across devices.
- **NFR13:** The system must provide clear and concise visualizations (e.g., charts, graphs) for reports and analytics, ensuring users can easily interpret data.
- **NFR14:** The system must support multi-language functionality to accommodate residents and staff from diverse linguistic backgrounds.

6 Data Dictionary

1. Repair Request Table

Attribute	Data Type	Description
Request_ID	Integer (Primary Key)	Unique identifier for each repair request.
Resident_Name	String	Name of the resident who raised the request.
Location	String	Location of the road requiring repair (could be street name, coordinates, or area).
Severity_Level	String (Enum)	Severity of the road condition (e.g., low, medium, high).
Request_Date	Date	Date when the repair request was raised.
Description	Text	Detailed description of the road condition and required repair.
Status	String (Enum)	Current status of the repair request (e.g., pending, in progress, completed).

2. Supervisor Table

Attribute	Data Type	Description
Supervisor_ID	Integer (Primary Key)	Unique identifier for each supervisor.
Name	String	Name of the supervisor.
Branch	String	Branch or suburb the supervisor is responsible for.

3. Priority Table

Attribute	Data Type	Description
Priority_ID	Integer (Primary Key)	Unique identifier for each priority level.
Priority_Level	String (Enum)	Level of priority assigned (e.g., high, medium, low).

4. Resource Table

Attribute	Data Type	Description
Resource_ID	Integer (Primary Key)	Unique identifier for each resource (raw material, machine, or personnel).
Resource_Type	String (Enum)	Type of resource (e.g., material, machine, personnel).
Resource_Description	String	Description of the resource (e.g., machine type, material name).
Quantity	Integer	Quantity of the resource available.

5. Repair Schedule Table

Attribute	Data Type	Description
Schedule_ID	Integer (Primary Key)	Unique identifier for each repair schedule.
Request_ID	Integer (Foreign Key)	Foreign key referencing the repair request.
Scheduled_Start_Date	Date	Date when the repair work is scheduled to start.
Scheduled_End_Date	Date	Date when the repair work is scheduled to be completed.
Assigned_Supervisor_ID	Integer (Foreign Key)	Foreign key referencing the supervisor assigned to the repair.
Assigned_Personnel	String	Personnel assigned to the repair task (can be multiple).
Assigned_Machines	String	Machines assigned to the repair task (can be multiple).

6. Administrator Table

Attribute	Data Type	Description
Admin_ID	Integer (Primary Key)	Unique identifier for each administrator.
Name	String	Name of the administrator.
Role	String	Role of the administrator (e.g., resource manager, city planner).

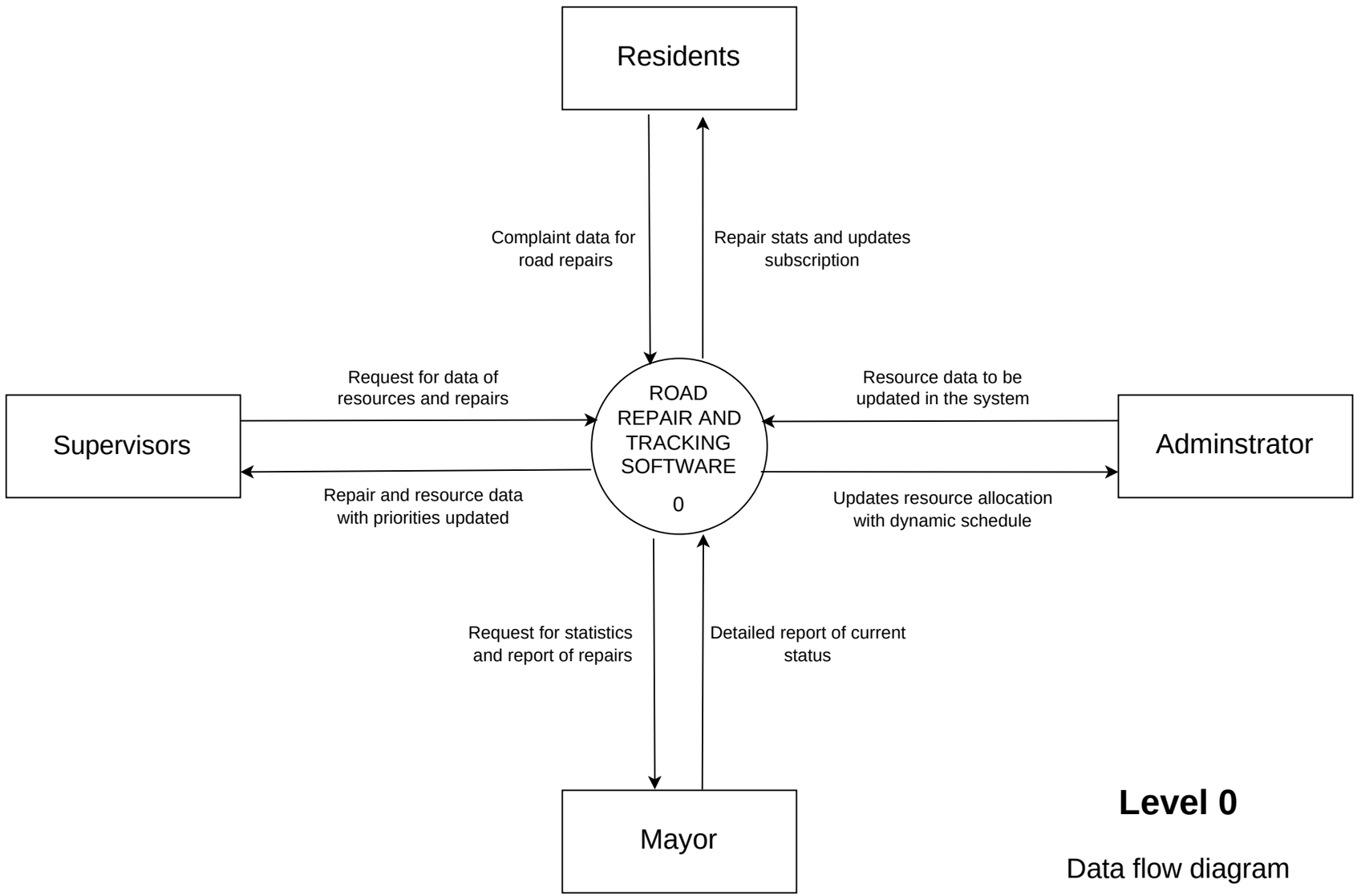
7. Repair Statistic Table

Attribute	Data Type	Description
Statistic_ID	Integer (Primary Key)	Unique identifier for each repair statistic record.
Total_Repairs	Integer	Total number of repairs carried out over a period.
Outstanding_Repairs	Integer	Number of repairs still outstanding at a given time.
Resource_Utilization	String	Statistics of resource usage over a period (e.g., machines and personnel utilized).

8. Audit Logs Table

Attribute	Data Type	Description
Log_ID	Integer (Primary Key)	Unique identifier for each log entry.
Action_Timestamp	Timestamp	Timestamp of when the action was performed.
Action_Performed	String	A description of the action performed (e.g., resource added, schedule updated).
Performed_By	String	User who performed the action.

ROAD REPAIR AND TRACKING SYSTEM

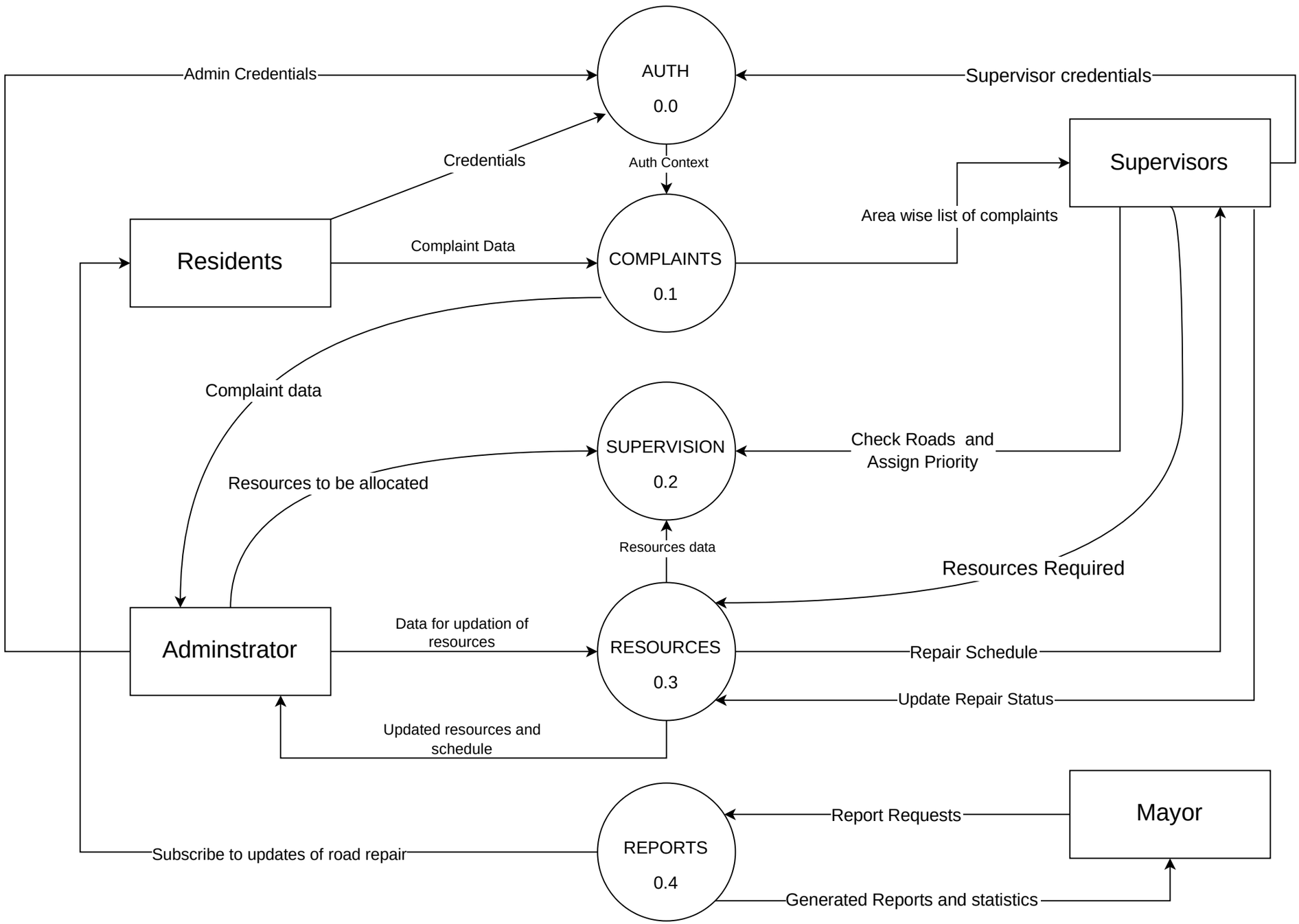


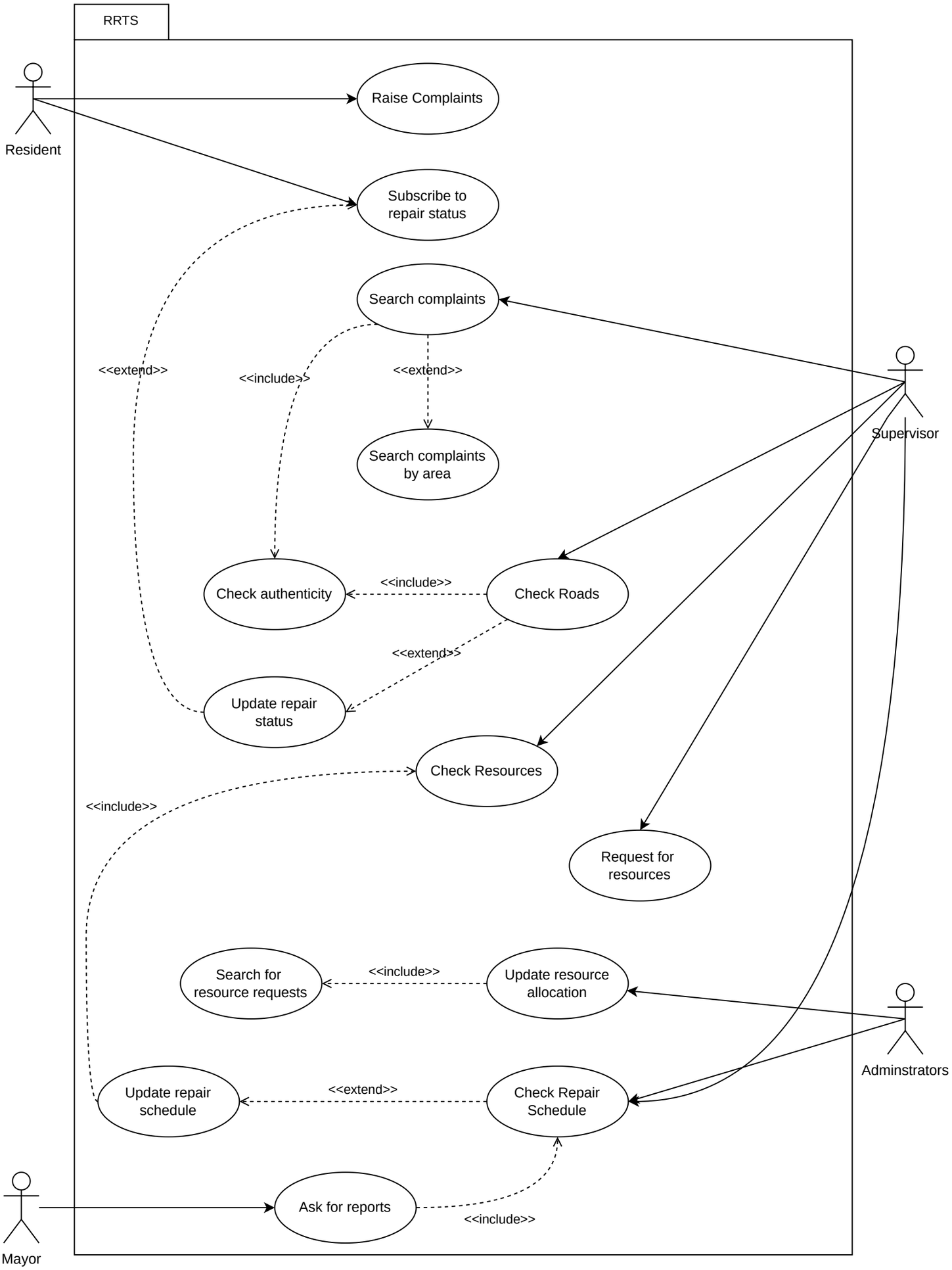
Level 0

Data flow diagram

Level 1

Data flow diagram




RRTS
Resident
Raise Complaints
Subscribe to repair status
Search complaints
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<<include>>
<<extend>>
Search complaints by area
Supervisor
Check authenticity
<<include>>
Check Roads
<<extend>>
Update repair status
Check Resources
<<include>>
Request for resources
Search for resource requests
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Update resource allocation
Adminstrators
Update repair schedule
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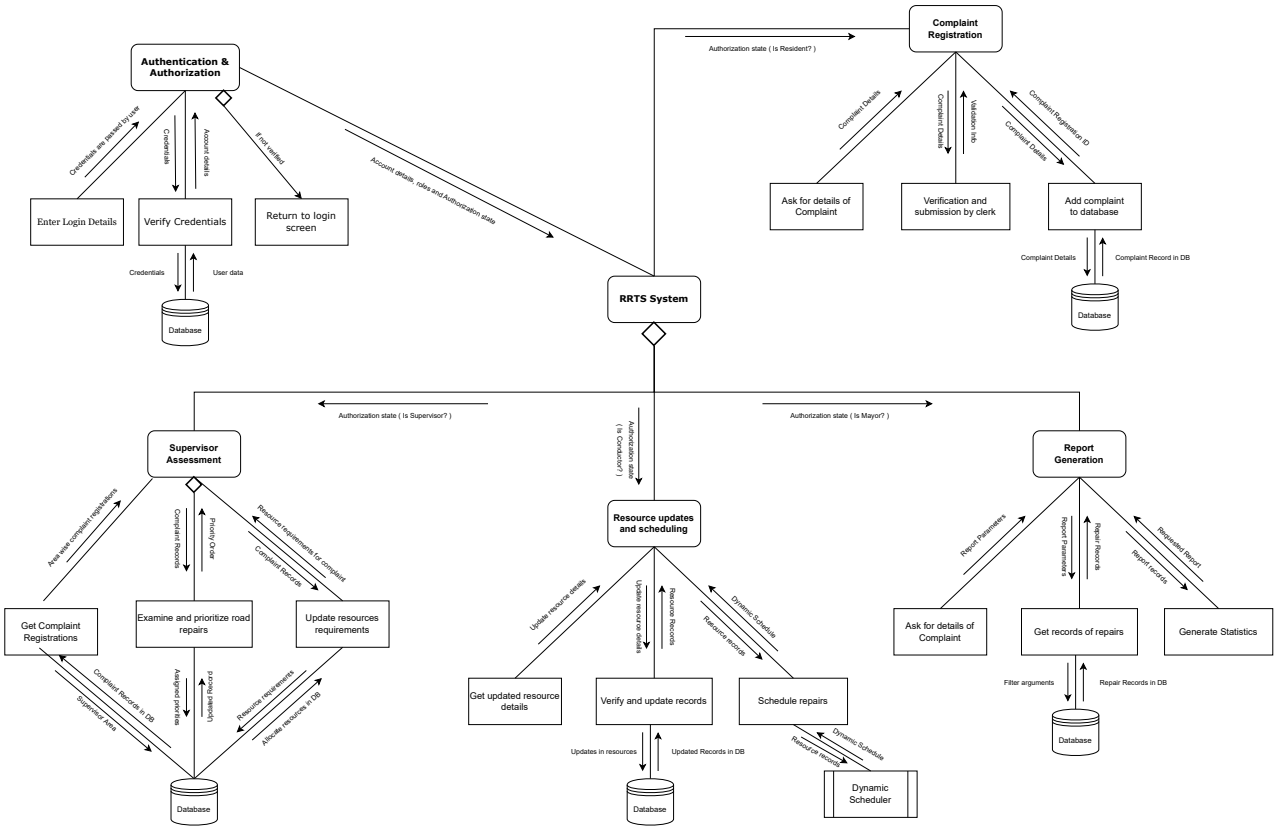
Check Repair Schedule
Mayor
Ask for reports
<<include>>

Structure Chart



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ER Diagram

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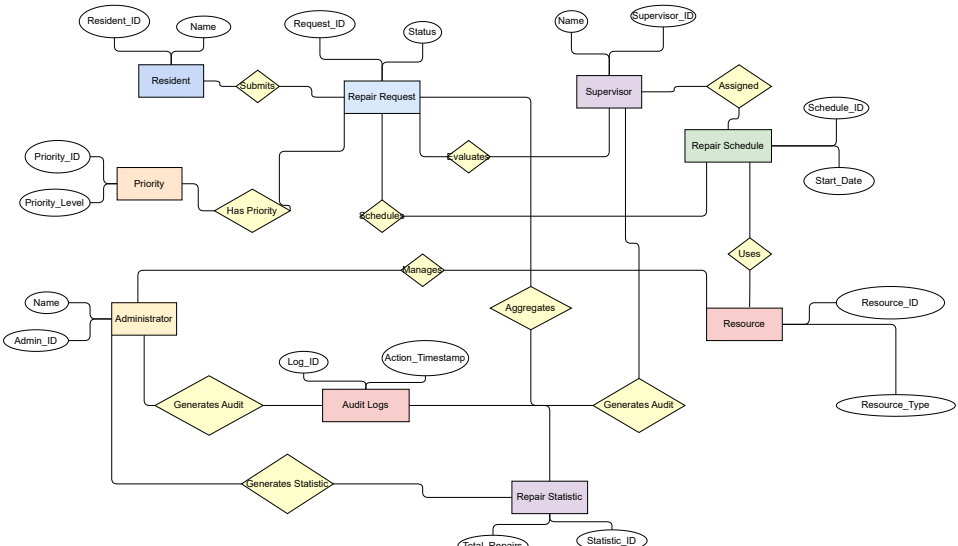

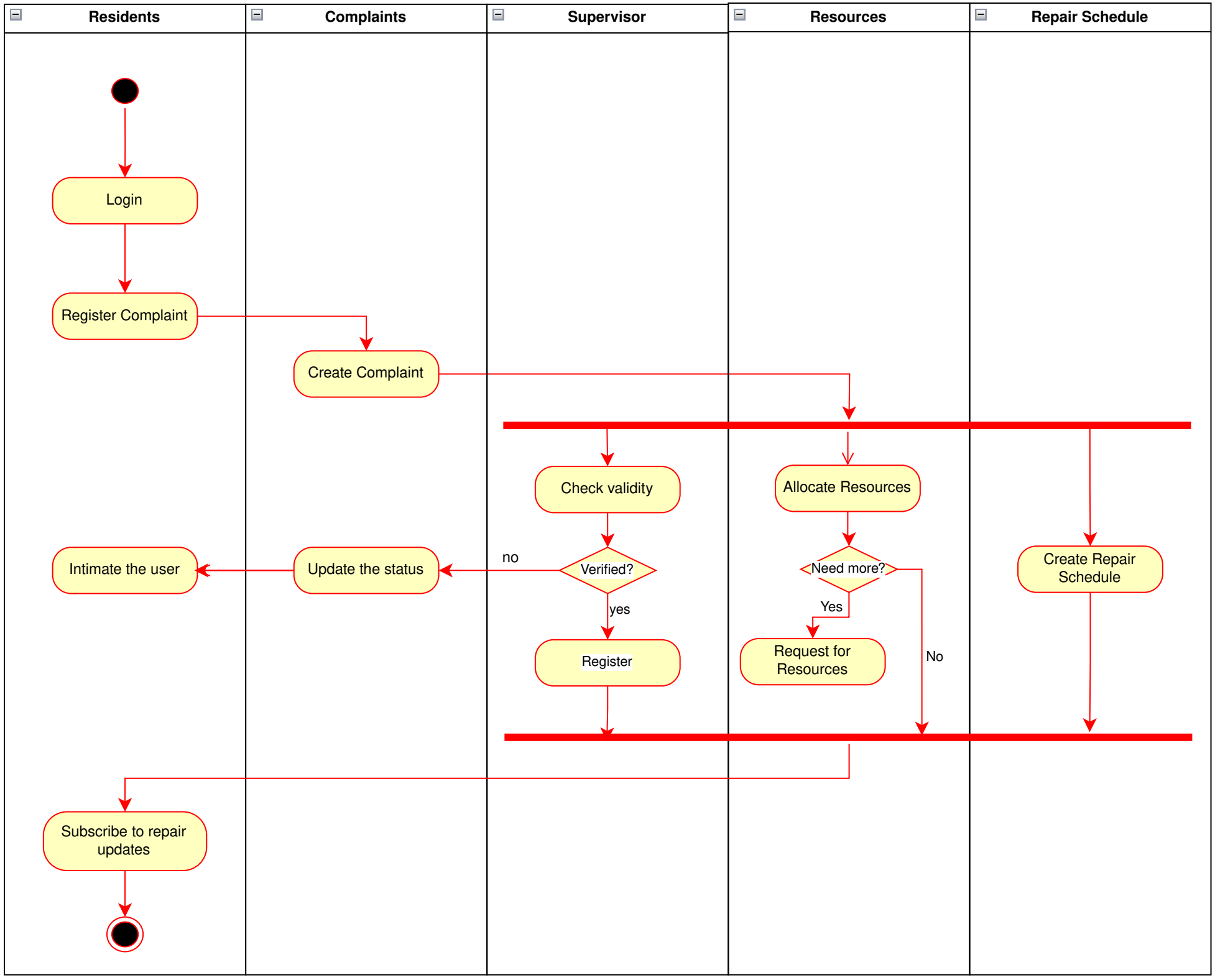

ACTIVITY DIAGRAM

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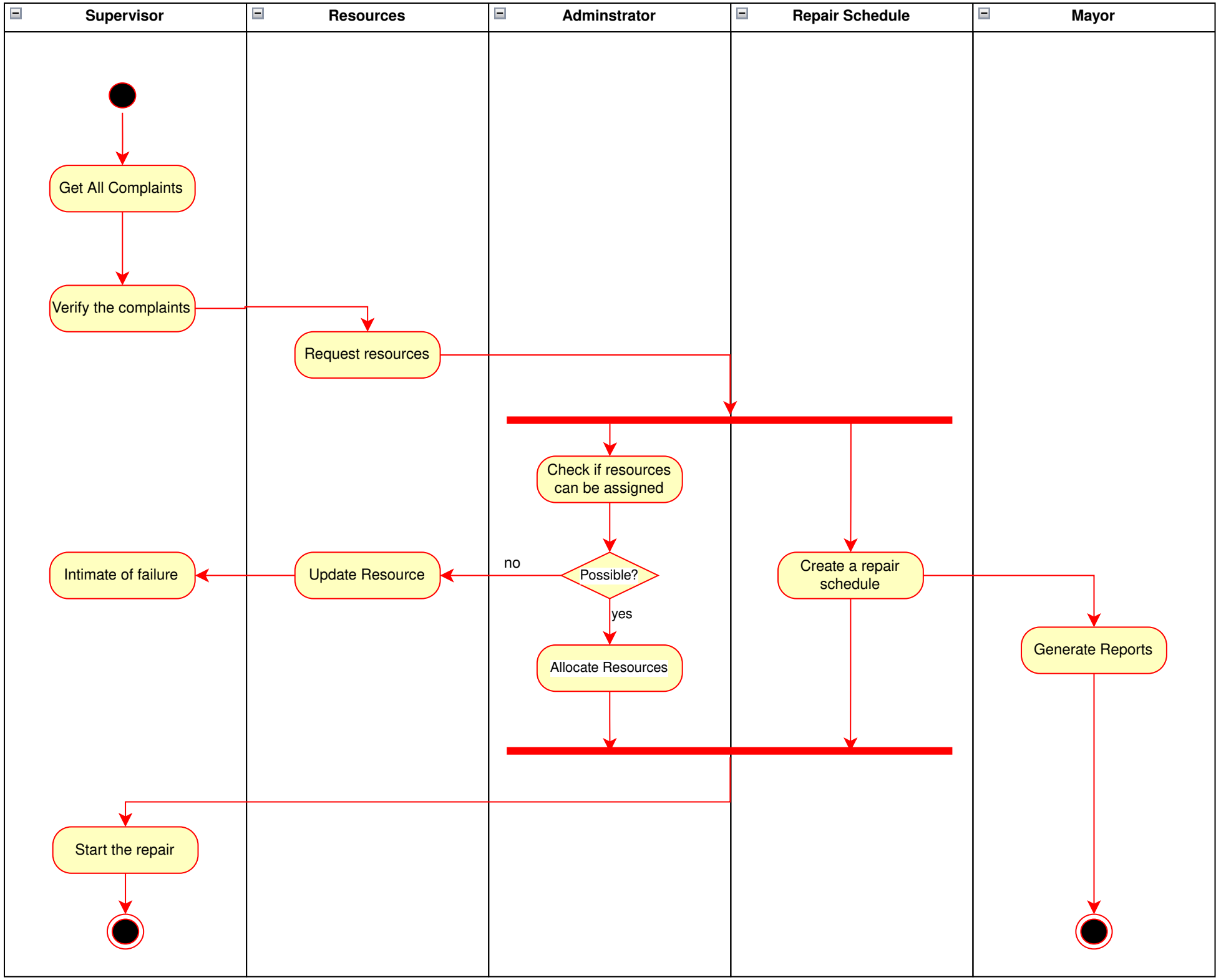
Supervisor
Resources
Adminstrator
Repair Schedule
Mayor
Get All Complaints
Verify the complaints
Request resources
Check if resources can be assigned
no
Possible?
yes
Allocate Resources
Intimate of failure
Update Resource
Create a repair schedule
Generate Reports
Start the repair

Class diagram

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