



Smart City Collaborative Dashboard (SCCD)

Overview

In the age of rapid urban development, managing a city's operations effectively requires seamless coordination across various departments, real-time data visibility, and strong citizen engagement. Your task is to design and develop a web-based **Smart City Collaborative Dashboard (SCCD)** that enables municipal authorities, departments, and citizens to interact and collaborate in real time. This platform should act as a central hub for monitoring, reporting, decision-making, and analytics related to city operations, with an added focus on Augmented Reality (AR) to enhance user interaction and data accuracy.

Goal

Build a feature-rich, real-time web platform with AR capabilities, where multiple user roles can manage, monitor, and interact with data relevant to smart city services. The platform must be scalable, secure, and user-friendly, with a focus on real-time updates, collaboration, and immersive experiences.

User Roles and Responsibilities

The platform must support the following user roles, each with specific permissions and functionalities:

1. Admin

- **Manage Users:** Create, edit, delete, and deactivate user accounts for Department Officials and Citizens.
- **Manage Roles:** Define and assign roles (e.g., Department Official, Citizen) and set permissions for each role.
- **Assign Tasks:** Assign specific tasks or responsibilities to Department Officials (e.g., overseeing a particular project or handling issues in a specific area).
- **Permissions Control:** Grant or restrict access to different parts of the system based on user roles.
- **Full System Analytics:** Access comprehensive analytics and reports across all departments and city operations.

2. Department Officials (e.g., Transport, Sanitation, Health)

- **Manage Department-Specific Data:** Upload reports, update project statuses, manage resources, and handle data relevant to their department.
- **Communicate with Other Departments and Admin:** Use the internal chat system to coordinate, share information, and collaborate on cross-departmental issues.
- **Issue Management:** View, assign, and update the status of issues reported by citizens (e.g., assign field workers, mark issues as resolved).
- **AR Field Assistance:** Use AR to view real-time data overlays while in the field (e.g., issue locations, infrastructure details).

3. Citizens

- **Report City Issues:** Submit detailed reports of city issues (e.g., potholes, broken streetlights) with support for location tagging (via map or AR), descriptions, categories, and media attachments (photos/videos).
- **Track Updates:** View the status of their reported issues (e.g., Pending, Assigned, In Progress, Resolved) and receive notifications on progress.
- **Vote on Proposals:** Participate in public polls and vote on city improvement proposals posted by the Admin. View real-time voting results and deadlines.
- **AR Issue Reporting:** Use AR to report issues more accurately by capturing and categorizing issues in real-time.

Core Features to Implement

The platform must include the following core features, ensuring real-time collaboration, data management, and AR integration:

1. Real-Time Issue Reporting & Tracking

- **Citizen Reporting:** Citizens can report issues via a user-friendly form or through AR:
 - **Form-Based Reporting:** Includes location (map integration), description, category, and media uploads.
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- **AR-Based Reporting:** Citizens can use their mobile device's camera to capture issues. The AR system should automatically detect the issue type and estimate its severity or size using image recognition.
- **Issue Workflow:** Each reported issue must follow a status pipeline:
 - **Pending → Assigned → In Progress → Resolved.**
- **Department Management:** Department Officials can:
 - View all issues relevant to their department.
 - Assign issues to field workers or other team members.
 - Update issue statuses and add comments or resolution details.
- **Citizen Tracking:** Citizens can track the status of their reported issues and receive notifications (via push or email) when updates occur.

2. Interactive City Map View

- **Map Visualization:** Display all active issues, proposals, and other city data (e.g., utility statuses, traffic conditions) on an interactive map.
- **Clustering:** Use clustering to group nearby issues for better visualization in areas with high issue density.
- **Filters:** Allow users to filter map data by:
 - Issue type (e.g., potholes, sanitation).
 - Status (e.g., Pending, Resolved).
 - Department (e.g., Transport, Health).
 - Date range.
- **Marker Details:** Clicking on a map marker should display detailed information about the issue or data point (e.g., description, status, assigned department).

3. Admin Dashboard

- **Visual Analytics:** Provide a comprehensive dashboard with:
 - Charts and graphs (e.g., bar charts for issue counts, line graphs for resolution times).
 - Heatmaps to visualize issue density across the city.
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- Key Performance Indicators (KPIs) such as average issue resolution time, department response rates, and citizen engagement metrics.
- **Department Performance Insights:** Compare departments based on metrics like:
 - Number of issues resolved.
 - Average response time.
 - Citizen satisfaction ratings (if implemented).
- **Custom Reports:** Allow Admins to generate custom reports based on selected metrics and time frames.

4. Communication Module

- **Internal Chat System:** Enable real-time communication between Department Officials and the Admin.
 - Support for group chats (e.g., department-wide) and direct messages.
 - Option to attach files or screenshots.
- **Notifications:** Send push and email notifications to citizens for:
 - Updates on their reported issues.
 - New proposals or polls posted by the Admin.
 - Reminders for voting deadlines.

5. Public Polling and Proposal Voting

- **Proposal Creation:** Admins can create proposals for city improvements or policy changes, including:
 - Title and description.
 - Voting deadline.
 - Optional media or documents.
- **Citizen Voting:** Citizens can vote on proposals (e.g., Yes/No or multiple-choice options).
- **Real-Time Results:** Display live voting results and countdowns to deadlines.
- **Transparency:** Ensure voting is transparent, with results visible to all users.

6. Department Task Automation (Bonus)

- **Rule-Based Automation:** Implement automation rules to streamline department workflows.
 - Example: Automatically assign a field worker when the number of pending issues in a specific area exceeds a threshold (e.g., 5 issues).
 - Example: Auto-escalate unresolved issues after a set period (e.g., 48 hours).

AR Integration for Enhanced City Interaction

To make the platform more immersive and efficient, the SCCD must include Augmented Reality (AR) features that allow citizens and department officials to interact with city data and infrastructure in real time. The AR component should be accessible via mobile devices and integrated seamlessly with the web-based dashboard.

AR Features to Implement:

AR-Based Issue Reporting for Citizens

- Citizens can use their mobile device's camera to capture and report issues (e.g., potholes, graffiti) in real-time.
- The AR system should automatically detect the type of issue and estimate its severity or size using image recognition.
- Location data should be captured accurately using the device's GPS and AR positioning, with an option for manual correction.
- Reported issues must sync immediately with the dashboard's issue tracking system.

AR Field Assistance for Department Officials

- Department officials can use AR to view overlays of city data while in the field, such as:
 - Locations and statuses of nearby reported issues.
 - Historical data or maintenance records for specific infrastructure.
 - Step-by-step repair instructions or safety guidelines.
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- The AR interface should allow officials to update issue statuses or add notes directly from the field.

AR Data Visualization for Admins (Optional)

- Admins can use AR to visualize city data in 3D, such as holographic maps showing issue densities, traffic patterns, or utility statuses.
- This feature should provide an immersive way to analyze data and identify trends or areas needing attention.

Technical Challenges and Requirements:

- **Device Compatibility:** The AR features must work on a range of mobile devices, from high-end smartphones to mid-range models, ensuring broad accessibility.
- **Data Accuracy:** Implement mechanisms to handle inaccuracies in AR data (e.g., GPS drift, image recognition errors), such as allowing manual corrections or using machine learning for continuous improvement.
- **Real-Time Syncing:** Ensure that data captured or updated via AR is synced in real-time with the web dashboard, maintaining consistency across all user roles.
- **Security and Privacy:** Address privacy concerns by anonymizing any captured images or videos and obtaining user consent where necessary. Ensure that AR data is securely transmitted and stored.
- **Performance Optimization:** Optimize the AR experience to minimize battery drain and ensure smooth performance, even in areas with poor network connectivity.

Integration with Existing Features:

- The AR component must integrate seamlessly with the core features of the dashboard, such as issue tracking, map visualization, and communication modules.
- For example, an issue reported via AR should appear on the interactive city map and trigger notifications to the relevant department officials.

Deliverables

- A fully functional web-based dashboard with AR integration and all core features implemented.



- Source code hosted on a version control platform (e.g., GitHub, GitLab).
- A live demo or deployed version of the platform (e.g., on Heroku, Vercel, or AWS).
- Comprehensive documentation, including setup instructions, API documentation, and user guides for each role, including AR features.