23DCS033

A city municipality is implementing a Smart Waste Management System (SWMS) to improve the efficiency of waste collection and promote cleanliness. The system leverages IoT-enabled smart bins installed across various city zones. These bins detect their fill level and send real-time data to a centralized system. The data helps in optimizing waste collection routes and scheduling pickups. A mobile and web interface will be used by various stakeholders to interact with the system. Design Task: You are assigned to design the functional model of the Smart Waste Management System that integrates IoT technology, mobile access, and role based interaction. Part 1: Identify System Actors and Use Cases

• List at least four key actors in the system. • Identify core and supporting use cases associated with each actor.

Part 2: Develop a UML Use Case Diagram • Prepare a UML Use Case Diagram showing: o Actors and their interactions with the system. o Use advanced relationships: ▪ «include» ▪ «extend» ▪ Generalization

Part 3: Analyze Behavior Patterns • Briefly explain how the IoT sensors interact with the system (you can show them as an external system or actor). • Highlight how the system ensures real-time alerts and optimized routing.

Part 4: Extension • Suggest at least two future enhancements (e.g., AI-based route prediction, citizen reward points for cleanliness feedback).

Part -1:

There is 4 major Actor is :

1. **Municipal Admin**

2.Waste Collection Staff

3. **Citizen/User**

4. **IoT Smart Bin System (External System)**

1: Municipal Admin:

- View city-wide bin
- Assign collection routes to workers
- Generate reports on waste trends
- Schedule maintenance or pickup
- Manage user and worker accounts

S**upporting Use Cases:**

- Manage zones and bin locations
- Receive alerts for overflow or malfunction
- Analyze route efficiency

2. Waste Collection Worker

Core Use Cases:

- View assigned pickup route on map
- Mark bin as "Collected"
- Receive and acknowledge alerts
- Report damaged or inaccessible bins

Supporting Use Cases:

- Update bin status manually if needed
- View collection history/log

3. Citizen/User

Role: Access information, request services, and report cleanliness issues.

Core Use Cases:

- View bin status in neighborhood (clean/overflowing)
- Report uncollected or overflowing bins
- Raise service request
- Receive notifications about delays or changes in schedule

Supporting Use Cases:

- Rate waste collection service
- Submit feedback or complaint

4. Smart Bin (IoT Device)

Role: Automatically monitor and communicate bin fill-level and health status.

Core Use Cases:

- Detect fill-level in real-time
- Send data to central server
- Trigger alerts if overflowing or jammed
- Monitor temperature/smell

Supporting Use Cases:

- Update battery or sensor status
- Sync last cleaned/collected timestamp

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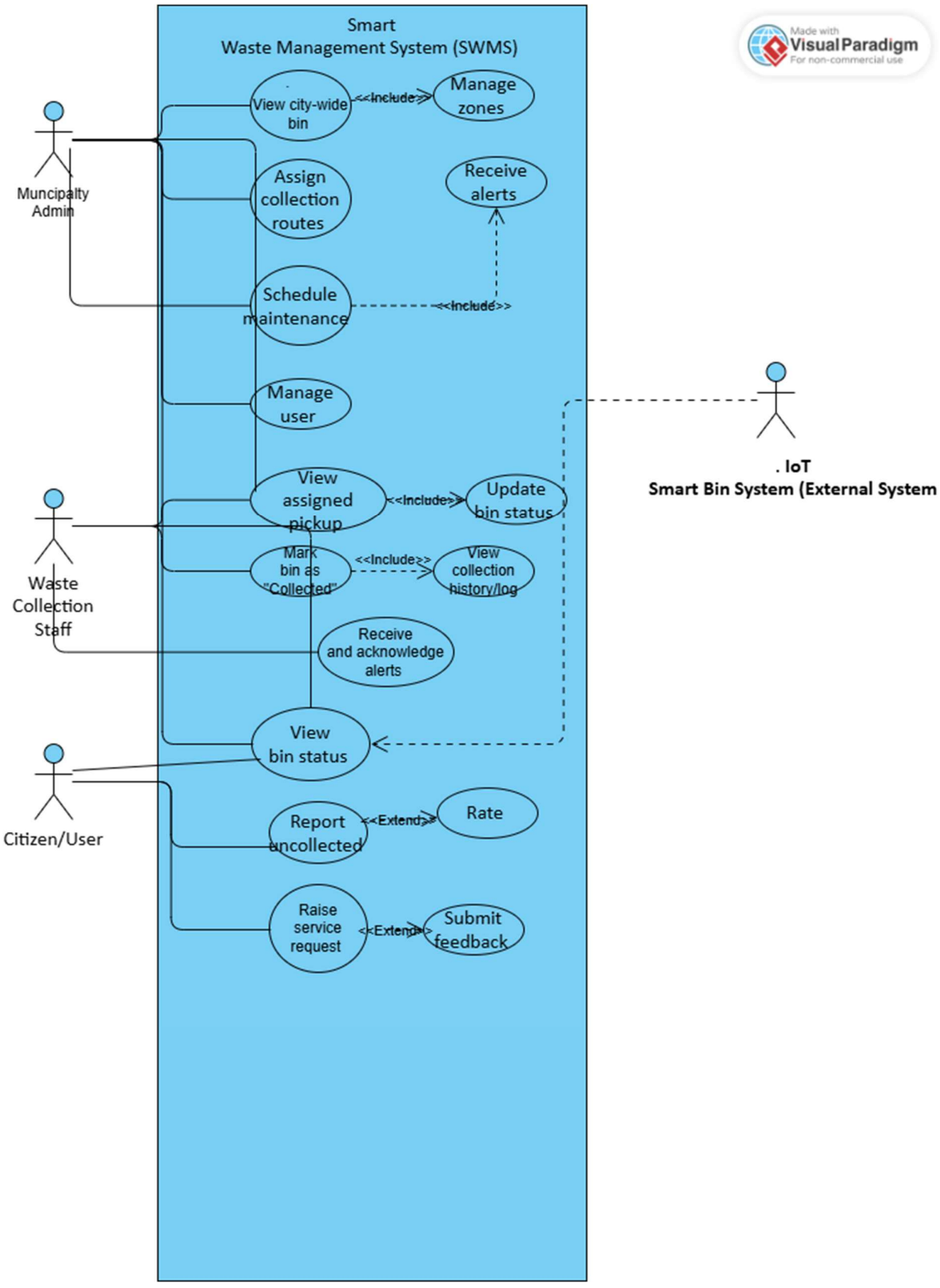
Smart
Waste Management System (SWMS)
View city-wide bin
<<Include>>
Manage zones
Assign collection routes
Receive alerts
Schedule maintenance
<<Include>>
Manage user
View assigned pickup
<<Include>>
Update bin status
Mark bin as "Collected"
<<Include>>
View collection history/log
Receive and acknowledge alerts
View bin status
Report uncollected
<<Extend>>
Rate
Raise service request
<<Extend>>
Submit feedback
Muncipalty Admin
Waste Collection Staff
Citizen/User
. IoT
Smart Bin System (External System
Made with VisualParadigm
For non-commercial use

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Part-3:

In Iot device are important to detect the wast manegment how many wast is collected and how many bin are the full it go to the report to the manegment and the workers so it should pickup the wast and make it empty

PART-4:

1- **Citizen Reward System**: in this when the citizen make the complain and the by the iot it show that the bin is full than citizen must earn the rewards

2-AI-Based Route Prediction:

Instead of just reacting to bin fill levels, the system could predict future waste accumulation using machine learning models