

Warehouse to Lastmile Coordination Platform

Course: Fundamentals of Full Stack Development

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Problem Statement:

The Warehouse to Last-Mile Coordination Platform is designed to support and coordinate logistics operations from shipment initiation at the warehouse through transit handling and final delivery to the customer.

The system enables different stakeholders—warehouse administrators (external warehouse partners who are given authorized access to the platform and operate shipments directly within the system), transit hub managers, local delivery agencies, and customers—to interact with shipment-related processes such as inventory management, scanning operations, delivery execution, exception handling (RTO), tracking, and customer support within a single platform.

Functional Requirements:

Authentication & Authorization

- The system shall provide authentication and role-based authorization to control access to system functionalities for all user roles, including Warehouse Admins, Transit Hub Managers, Delivery Agencies, and Customers.

Order Review & Shipment Initiation (Warehouse Admin)

- The system shall allow a Warehouse Admin to retrieve shipment initiation requests from respective order platforms, review order details, and either accept or reject an order with a recorded reason.
- Upon acceptance of an order, the system shall initiate a shipment by validating shipment details, generating a unique tracking ID, and initializing the shipment status.
- The system shall notify the customer about shipment initiation by providing the tracking ID through integrated notification services.

Inventory Management (Warehouse & Transit Hub)

- The system shall allow authorized users to view and manage inventory at warehouses and transit hubs.
- The system shall automatically update inventory records based on shipment initiation, in-scan events, out-scan events, delivery completion, and return-to-origin (RTO) processing.

Scanning Operations & Shipment Movement

- The system shall record in-scan and out-scan details for shipments at warehouses, transit hubs, and during last-mile delivery operations.
- The system shall automatically update shipment movement status based on recorded scan events.
- The system shall generate pre-alert information from outbound scan details to support shipment forwarding and downstream transit planning.

Delivery Management (Local Delivery Agency)

- The system shall allow local delivery agencies to view shipments assigned for last-mile delivery.
- The system shall allow delivery agencies to update delivery outcomes, including successful delivery with proof of delivery or delivery failure with appropriate remarks.

Return to Origin (RTO)

- The system shall allow delivery agencies to initiate Return to Origin (RTO) requests for undeliverable shipments.
- The system shall track RTO shipments and update shipment status and inventory information until the shipment reaches the origin warehouse.

Shipment Tracking (Customer)

- The system shall allow customers to track shipments using a tracking ID and view the current shipment status and last known location.
- The system shall automatically update customer-visible tracking information based on scan events and GPS tracking data.

Customer Care Support

- The system shall allow customers to raise shipment-related support requests using a tracking ID, classify the requests, provide automated assistance or escalation, and notify customers of the resolution status.

Non-Functional Requirements:

Performance

- The system shall update shipment status, tracking information, and customer support interactions within an acceptable response time after scan events, GPS updates, or user actions.

Availability

- The system shall be available for continuous operation across all warehouses, transit hubs, and delivery agencies, except during scheduled maintenance windows.

Security

- The system shall ensure secure access to system data and functions through authentication, authorization, and secure communication mechanisms across all stakeholder organizations.

Reliability

- The system shall reliably store and retrieve shipment, inventory, delivery, and customer support data without data loss, even under concurrent access by multiple stakeholders.

Usability

- The system shall provide a consistent and user-friendly interface for all user roles across warehouses, transit hubs, delivery agencies, and customers.

Scalability (Multi-Stakeholder Support)

- The system shall support concurrent operations of multiple warehouses, transit hubs, and delivery agencies without degradation in performance or data consistency.

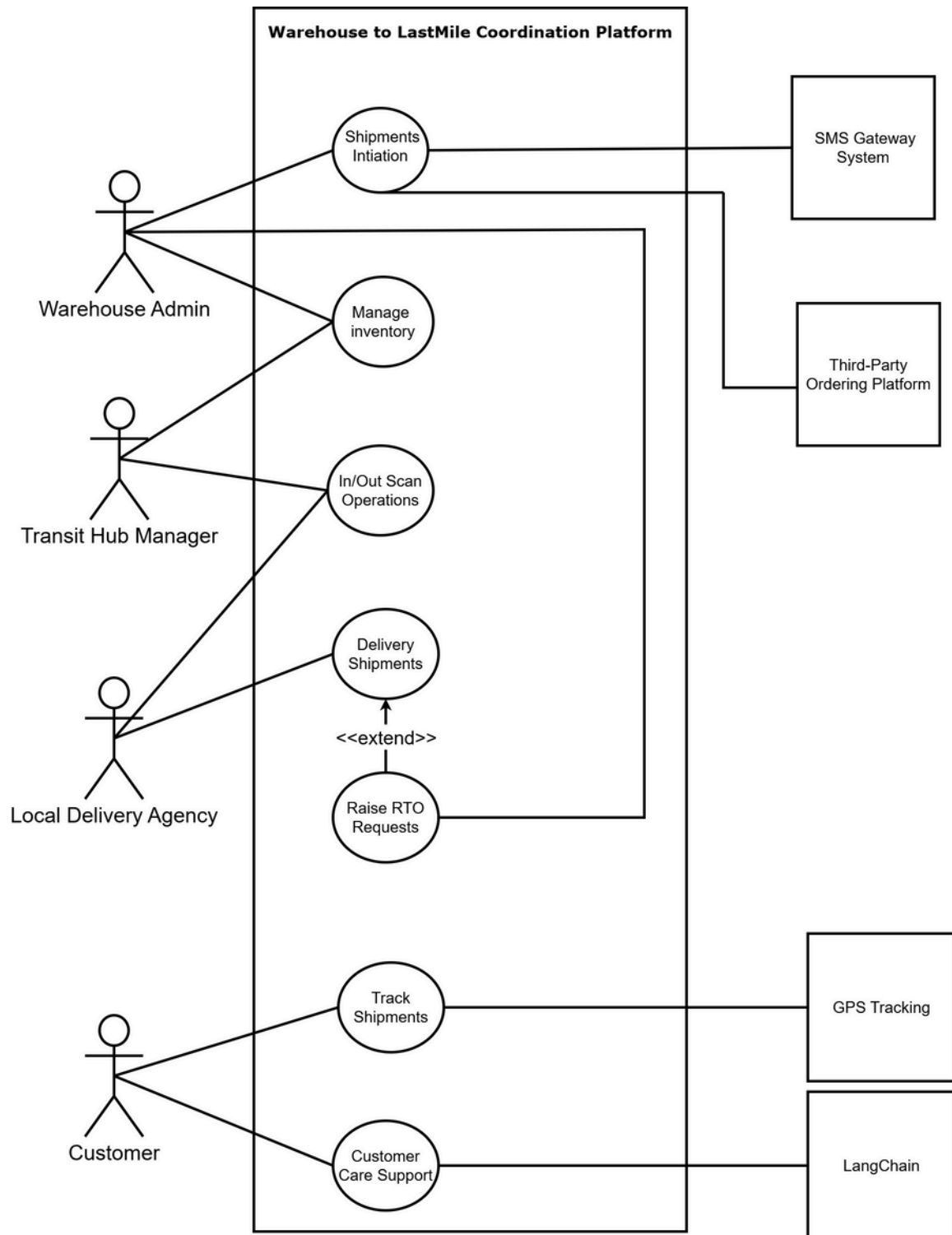
Maintainability

- The system shall support maintenance, configuration updates, and onboarding of new stakeholder organizations without disrupting ongoing operations.

Integration

- The system shall integrate with external systems such as SMS Gateway services and GPS Tracking systems to support notifications and real-time shipment tracking.

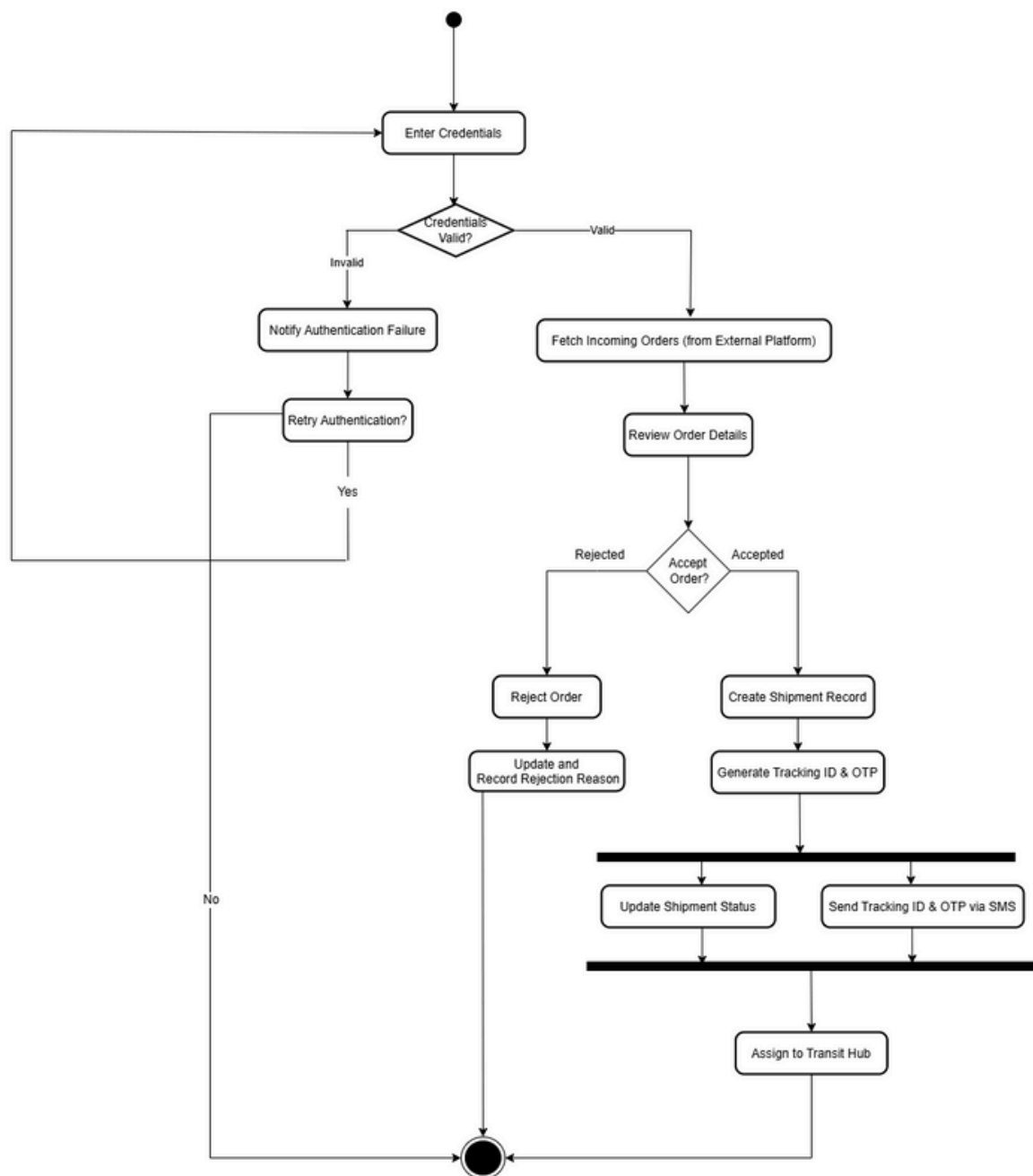
Use-Case Diagram:



Activity Diagrams:

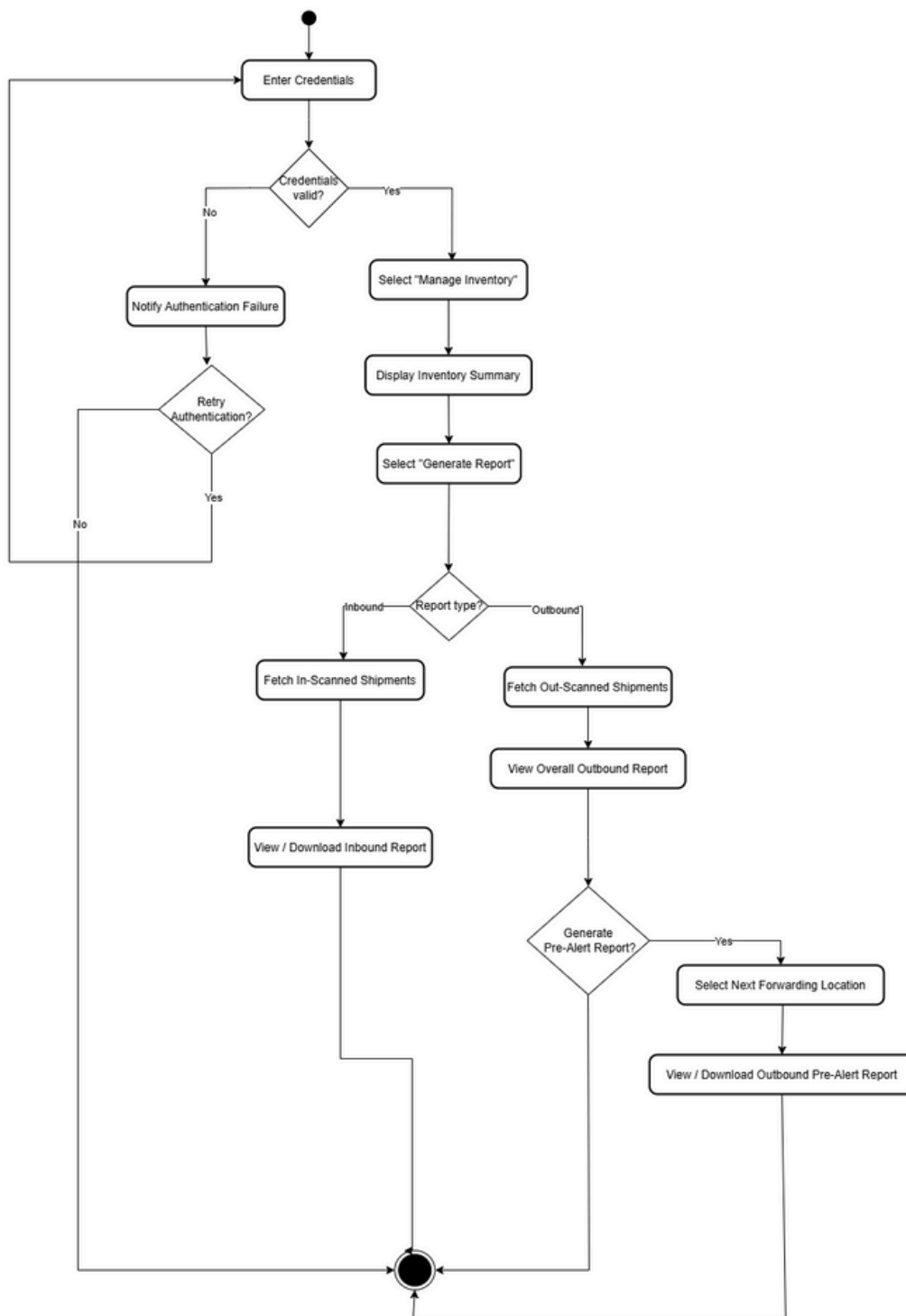
Shipments Initiation

Shipment Initiation



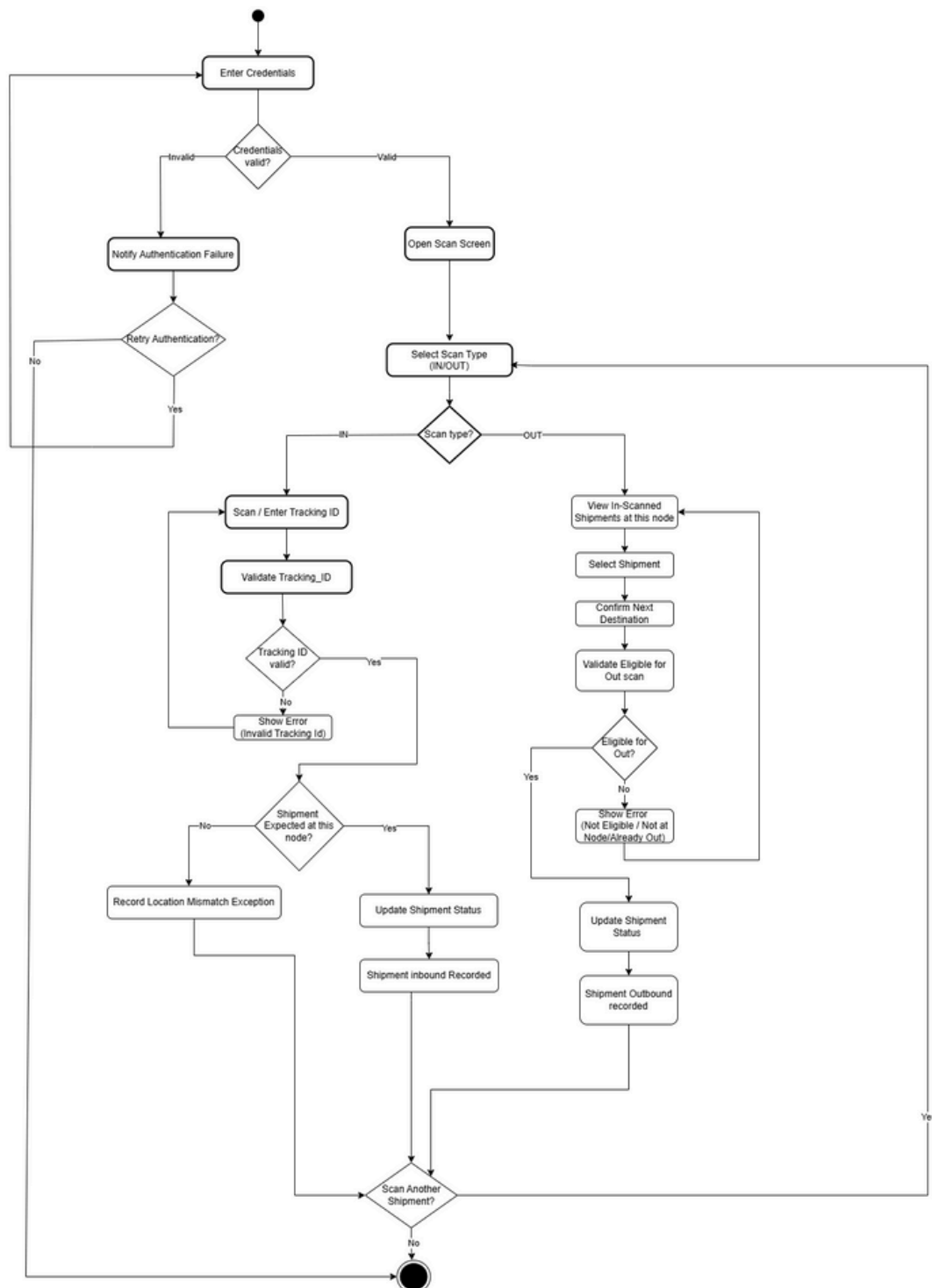
Manage Inventory

Manage Inventory



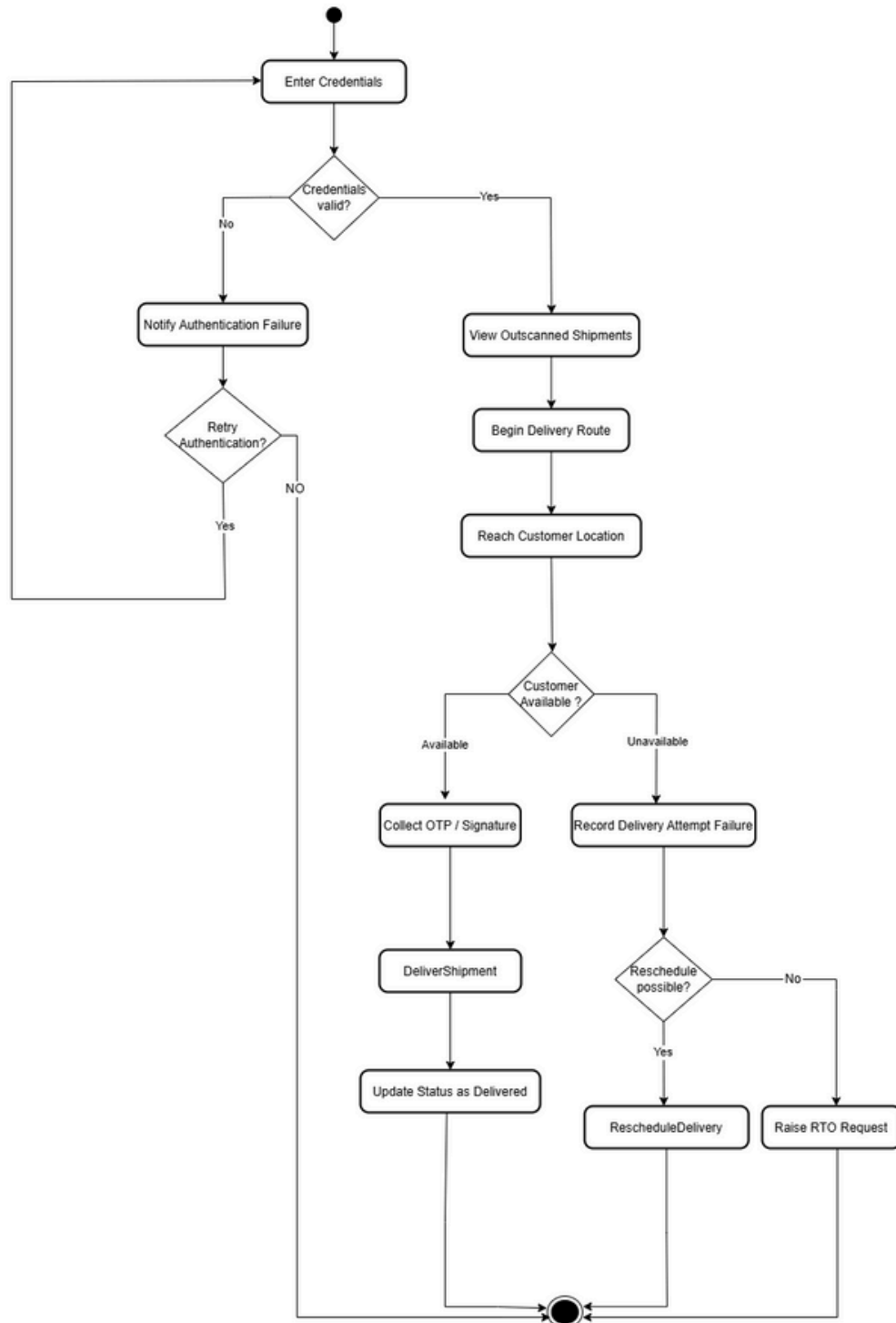
InOut Scan Operation

IN/OUT SCAN



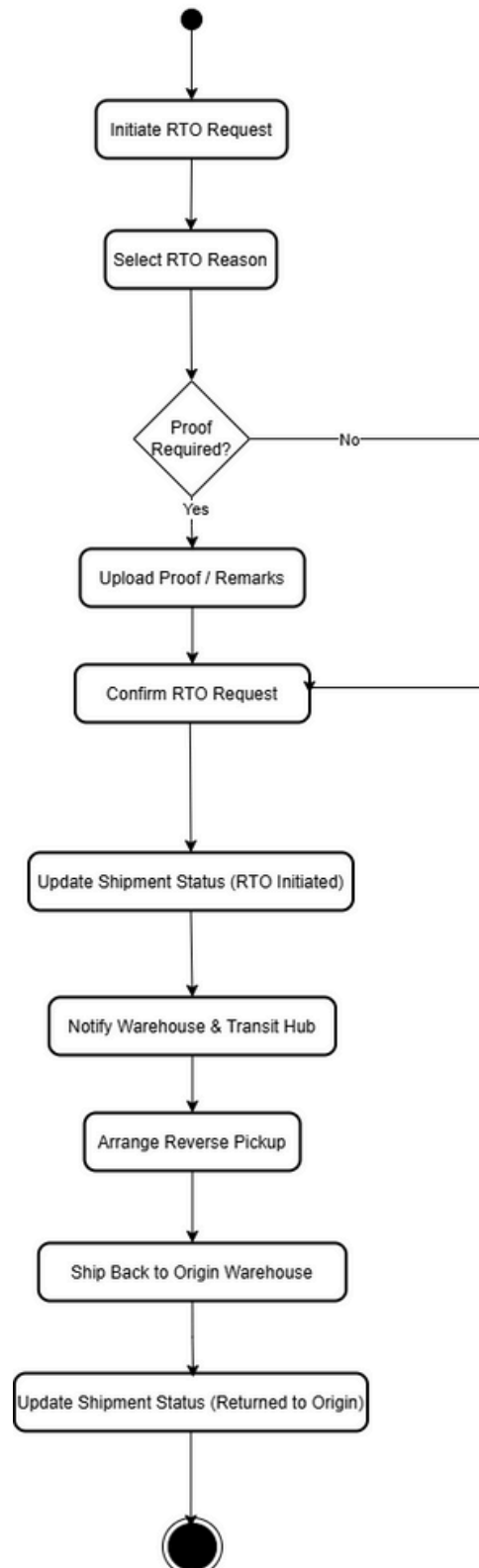
Delivery Shipments

Delivery Shipment



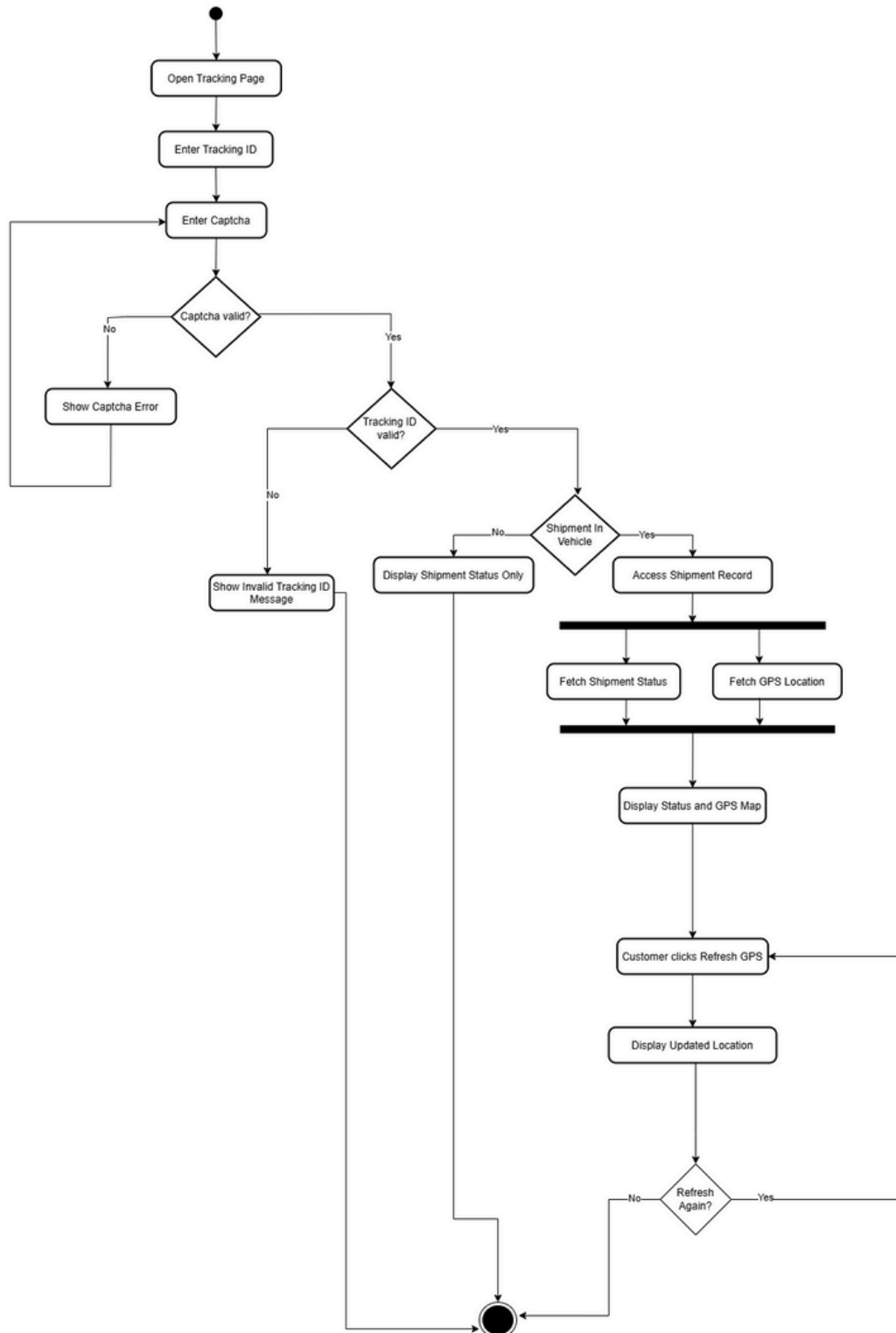
Raise RTO Requests

RTO Request



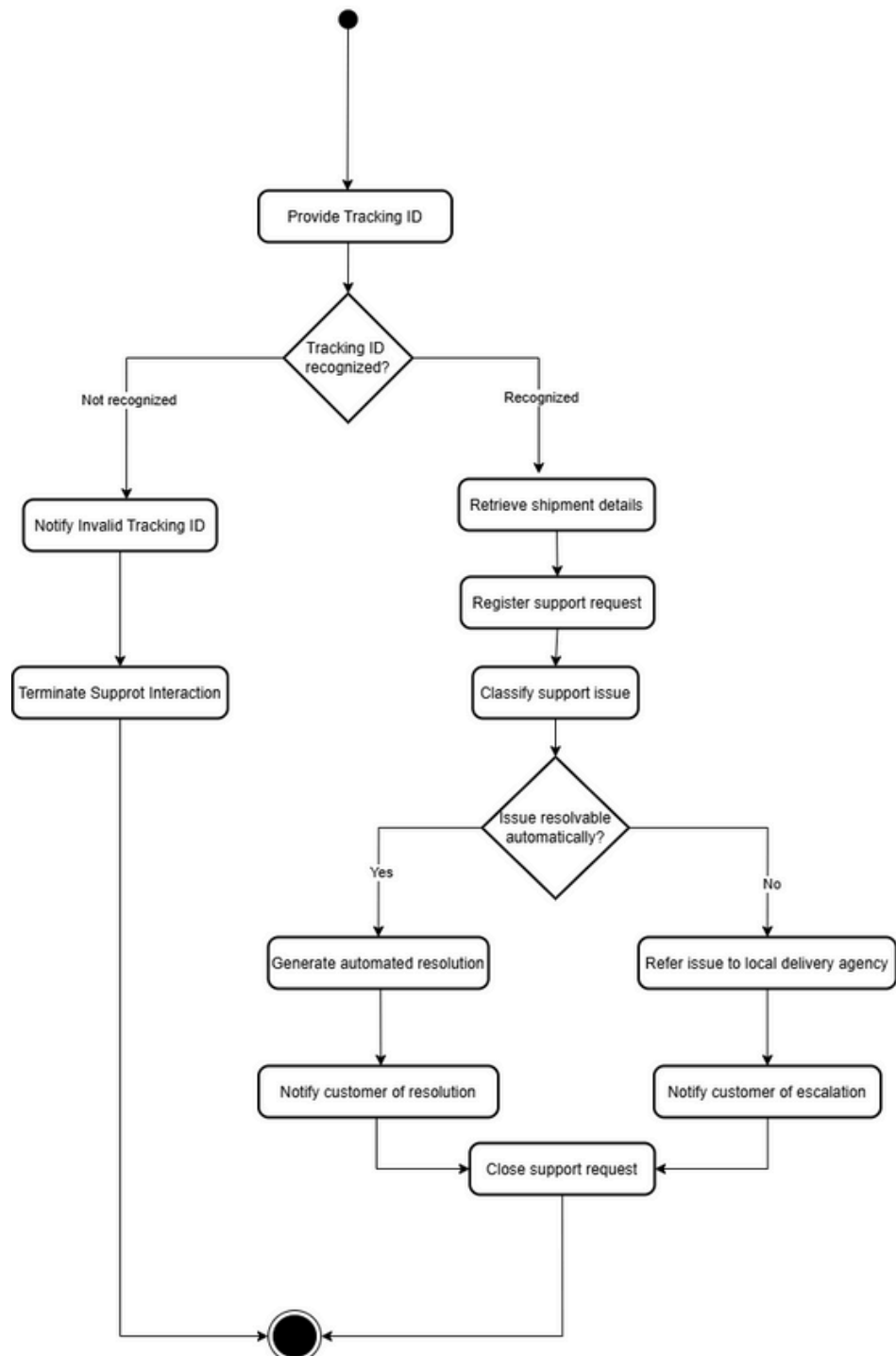
Track Shipment

Customer Shipment Tracking



Customer Care Support

Customer Care Support



Sequence Diagram:

