1. Inventory Management Module (Objective 1)

Goal: Track stock accurately and in real-time.

Inventory table.

-item\_id (Primary Key, unique identifier)

-name (String, item name)

-SKU (String, Stock Keeping Unit)

-location\_id (Foreign Key, links to warehouse\_locations table)

-quantity (Integer)

-barcode (String, stores the barcode value)

-last\_updated (Timestamp)

Key Functionality:

Endpoint:inventory items (GET, POST)

-GET: Retrieve a list of all items or a specific item by ID.

-POST: Add a new item to inventory.

Endpoint: inventory update (POST)

-Receives data from a barcode scanner.

-Updates the quantity of an item at a specific location.

-Real-Time Updates: Implement WebSockets to push inventory changes to a dashboard in real-time.

2. Location & Route Optimization Module (Objective 2)

Goal: Determine the best storage locations and the fastest retrieval routes.

Warehouse\_locations table

-location\_id (Primary Key)

-aisle (String)

-shelf (String)

-popularity\_score (Integer, updated by the Demand Forecasting module)

Key Functionality:

Location Optimization:

-Introduce a "Hot Aisle" System for New, fast-moving items to be stored in easily accessible locations.

The popularity score from the forecasting module will determine this.

Route Optimization:

-Implement a shortest path algorithm to calculate the most efficient route for a worker to pick multiple items from a list.

Endpoint: route optimization (POST)

Takes a list of "item\_ids" as input.

Returns a list of "location\_ids" in the optimal picking order.

3. Predictive Maintenance Module (Objective 3)

Goal: Predict equipment failure before it happens.

Equipment table

-equipment\_id (Primary Key)

-type (String, For example 'forklift', 'conveyor\_belt')

-status (String, 'operational', 'maintenance\_needed')

-last\_maintenance (Timestamp)

-next\_maintenance\_prediction (Timestamp)

-Database Schema (sensor\_data table):

-data\_id (Primary Key)

-equipment\_id (Foreign Key)

-timestamp (Timestamp)

-temperature (Float)

-usage\_hours (Float)

Key Functionality:

Data Pipeline:

Endpoint:Maintenance sensor (POST)

-Receives sensor data from IOT devices.

-Saves the data to the sensor\_data table.

Machine Learning Model:

4. Demand Forecasting & Optimization Module (Objective 4)

Goal: Predict future demand and streamline operations.

Key Functionality:

Data Preparation:

A Celery task will periodically pull historical sales data from the order database.

Use pandas to clean and format the data for the model.

Forecasting Model:

Train a time-series model on the prepared data.

The model will forecast demand for each SKU for the next week, month.

Endpoint:Demand forecasts (GET)

Returns demand predictions for specified items and timeframes.

Actionable Insights:

The forecasts will be used to automatically adjust reorder points and the popularity\_score in the warehouse\_locations table.