



## United Parcel Service Operations System – Business Requirements

### 1. Introduction

This application models the operational workflow of a package delivery system inspired by UPS, focusing on the management of customers, packages, drivers, vehicles, and orders. It aims to replicate real world scenarios in package delivery, tracking, and logistics using a structured database driven approach.

### 2. Data

This system will store entities and attributes of:

1. Package
  - a. PackageID, TrackingNumber, Weight, Dimensions, ServiceType, Status, DeclaredValue, CustomerID
  - b. Example: 10015, 1Z999AA10123456789, 3.5 kg, 30x20x15 cm, UPS Next Day Air®, In Transit, \$150.00, 2905723
2. Customer
  - a. CustomerID, Name, Address, PhoneNumber, Email, PreferredDeliveryLocation
  - b. Example: 2905723, James Iona, 5390 Pacific Avenue Jamestown WA, (429) 559-9120, JIona@gmail.com, Front Door
3. Order
  - a. OrderID, OrderDate, TotalCost, ServiceType, CustomerID
  - b. Example: 45672, 2025-01-09, \$29.99, UPS Ground, 2905723
4. Driver
  - a. DriverID, EmployeeName, EmployeeNumber, ContactNumber, AssignedHubID, AssignedVehicleID
  - b. Example: D1001, Mark Spencer, 987654321, (555) 123-4567, H002, V245
5. Vehicle
  - a. VehicleID, VehicleType, LicensePlate, CurrentMileage, MaintenanceStatus, HubID
  - b. Example: V245, Package Car, ABC1234, 12,000 miles, Needs Maintenance, H002
6. DeliveryRoute
  - a. RouteID, DriverID, StartPoint, EndPoint, EstimatedDuration, RouteDistance
  - b. Example: R303, D1001, 5390 Pacific Avenue, 7427 Parkview Rd, 1.5 hours, 45 miles
7. Stop
  - a. StopID, StopOrder, StopAddress, StopType, PackageID, RouteID
  - b. Example: S002, 1, 5390 Pacific Avenue Jamestown WA, Pickup, 10015, R303
8. Hub
  - a. HubID, Location, Region, Capacity, HubManagerID

- b. Example: H002, 53690 Olympic View Road, Northwest Region, 12,000 packages/day, M002
- 9. WarehouseInventory
  - a. InventoryID, PackageID, WarehouseLocation, StorageType
  - b. Example: WI012, 10015, A5-12, Fragile Storage
- 10. Shipment
  - a. ShipmentID, ShipmentType, SourceHubID, DestinationHubID, Status, ShipmentDate
  - b. Example: S1001, International, H002, H005, Shipped, 2025-01-06
- 11. TrackingStatus
  - a. TrackingID, PackageID, Location, Timestamp, Status
  - b. Example: T4001, 10015, 7427 Parkview Rd, 2025-01-06 10:00, In Transit
- 12. Recipient
  - a. RecipientID, Name, Address, ContactNumber, DeliveryInstructions, PackageID
  - b. Example: R1012, Sarah Lee, 5001 Willow Lane, (555) 234-5678, Leave at front porch, 20015
- 13. Billing
  - a. BillingID, OrderID, PaymentMethod, Amount, BillingDate, PaidStatus
  - b. Example: B5201, 45672, Credit Card, 29.99, 2025-01-06, Paid
- 14. EmployeeSchedule
  - a. ScheduleID, EmployeeID, WorkDate, ShiftTime, Role
  - b. Example: ES3001, 7983430, 2025-01-09, 9:00 AM - 5:00 PM, Driver
  - c. Example: ES3002, 6934865, 2025-01-09, 4:40 AM - 9:30 PM, Package Handler
- 15. IncidentReport
  - a. ReportID, DriverID, IncidentDate, IncidentType, Description, Resolution
  - b. Example: IR9001, D1001, 2025-01-05, Collision, Minor collision with a parked vehicle, Vehicle repair initiated
- 16. ServiceType
  - a. ServiceID, Description, DeliveryTimeframe, BaseCost, PriorityLevel
  - b. Example: ST001, Standard Delivery, 5-7 business days, 5.00, Standard
- 17. PriorityLevel
  - a. PriorityID, Description, DeliveryGuarantee
  - b. Example: P001, Standard, No Guarantee
- 18. CustomerFeedback
  - a. FeedbackID, CustomerID, FeedbackDate, Rating, Comments
  - b. Example: CF1001, 2905723, 2025-01-07, 5, Excellent service, arrived on time and in perfect condition

### **3. Scenarios / Simple Queries**

This system's main audience are employees of UPS, although there are queries customers can make.

#### **1. Track a Package**

A customer, even if not registered, can track their package using the tracking number. By entering the tracking number, they can view the current status, location, and estimated delivery date of their package.

## *2. Schedule a Pickup*

A registered customer can schedule a pickup for a package they wish to send. They need to specify the pickup location, preferred date, time, and package details. The system ensures that a pickup cannot be scheduled if the location is outside the service area.

## *3. Register a Customer*

A new customer can register by providing their name, address, phone number, and email.

## *4. Driver Login*

A Driver can log into the system using their employee ID.

## *5. Delivery Summary*

A customer can view the details of their package delivery, including the recipient's signature, delivery time, and any delivery notes. This is available after the package has been marked as delivered.

## *6. Cancel Pickup Request by Customer*

A customer decides not to send a package they had scheduled for pickup, they can cancel their request through the system.

## *7. Reschedule a Delivery by Customer*

A customer who missed their package delivery can reschedule it for a new date and time. The system ensures the new delivery date is within the service schedule and notifies the driver of the change.

## **4. Analytical Queries**

### *1. Pinpoint Hubs with Significant Shipping Delays*

Identify hubs where more than 10% of shipments were delayed in the past month to uncover bottlenecks in the delivery network.

### *2. Evaluate Top-Performing Drivers*

Find drivers who completed the most deliveries with positive customer ratings over the last three months for potential rewards or recognition.

### *3. Streamline Inefficient Delivery Routes*

Locate routes with the greatest average distance between stops and suggest improvements to save fuel and reduce delivery times. Track the average distance between stops on each route over the past six months and identify routes where the distance has significantly increased or decreased.

### *4. Predict Shipment Delays*

Use past data to predict delays based on weather, traffic, or hub efficiency to help improve planning and customer expectations.

### *5. Assess Delivery Accuracy Rates*

Measure how often packages are delivered to the correct address on the first attempt to identify training or system improvement needs.

## 5. Business Logic

Finally, here are some examples of business logic in this System.

A customer can track a package using its unique tracking number. The system checks the package's current status from the TrackingStatus table, displaying the latest status and location based on real-time data (e.g., whether it's in transit or delivered).

A driver logs in using their employee ID, and the system checks their credentials. If valid, the driver gains access to the relevant data, such as assigned routes and vehicle details.

After a package is marked as delivered, the system allows the customer to view the delivery summary, which may include the recipient's signature, delivery time, and delivery notes.

When a new customer registers, the system creates a new entry in the Customer table. The system enforces that each customer has a unique email address, even if other contact details (like address or phone number) overlap with other customers.