

Ficha 7 - Desenvolvimento do projeto prático

Essay developed by:

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(3) Exercises

(a) Project Subject

Development of a web application for postal management, which allows managing the sending and receiving of mail, transport vehicles, post office warehouses, financial transactions, and deliveries.

The system is used by different types of users (clients, employees, and administrators) to ensure control and traceability of all postal service operations.

(b) Application Requirements

Functional Requirements

User Management (Clients and Employees)

- Register and authenticate users.
- Differentiate profiles: client, employee, administrator.

Mail Management

- Register new mail (package, letter, document, etc.).
- Associate mail with a warehouse and a user (sender/recipient).
- Update mail status (preparing, in transit, delivered, returned).

Warehouse Management

- Register and manage warehouses for each post office.

- Associate stored mail.

Vehicle and Assignment Management

- Register vehicles (type, license plate, capacity, condition).
- Assign vehicles to employees (drivers).
- Register trips (assigned deliveries).

Transaction Management

- Register shipping transactions (payments, costs, service type).
- Associate with mail and a client.

Delivery Management

- Register completed deliveries.
- Link delivery to mail, driver, and assigned vehicle.

Reports

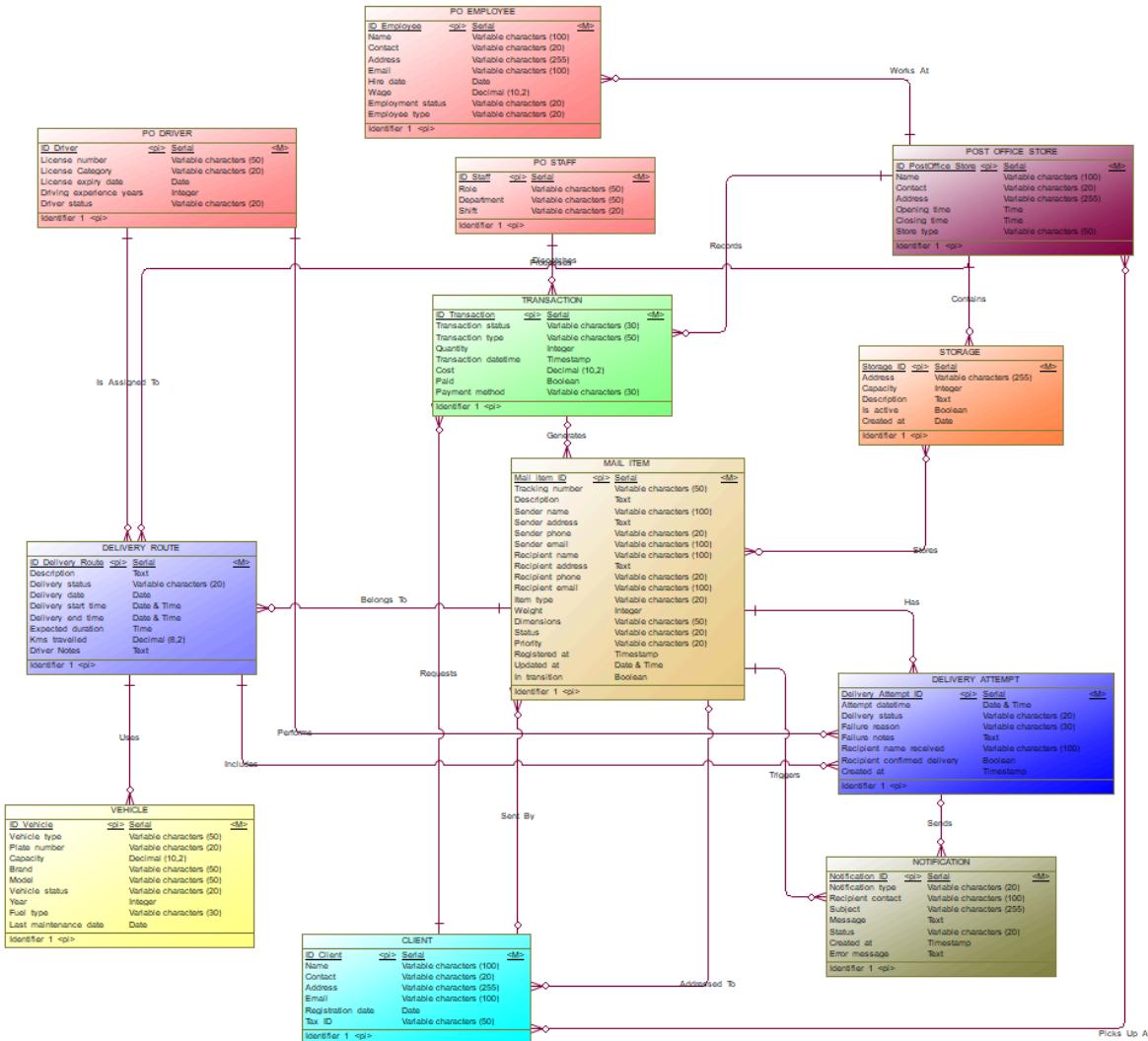
- List mail in transit, deliveries by date, financial transactions.
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Non-Functional Requirements

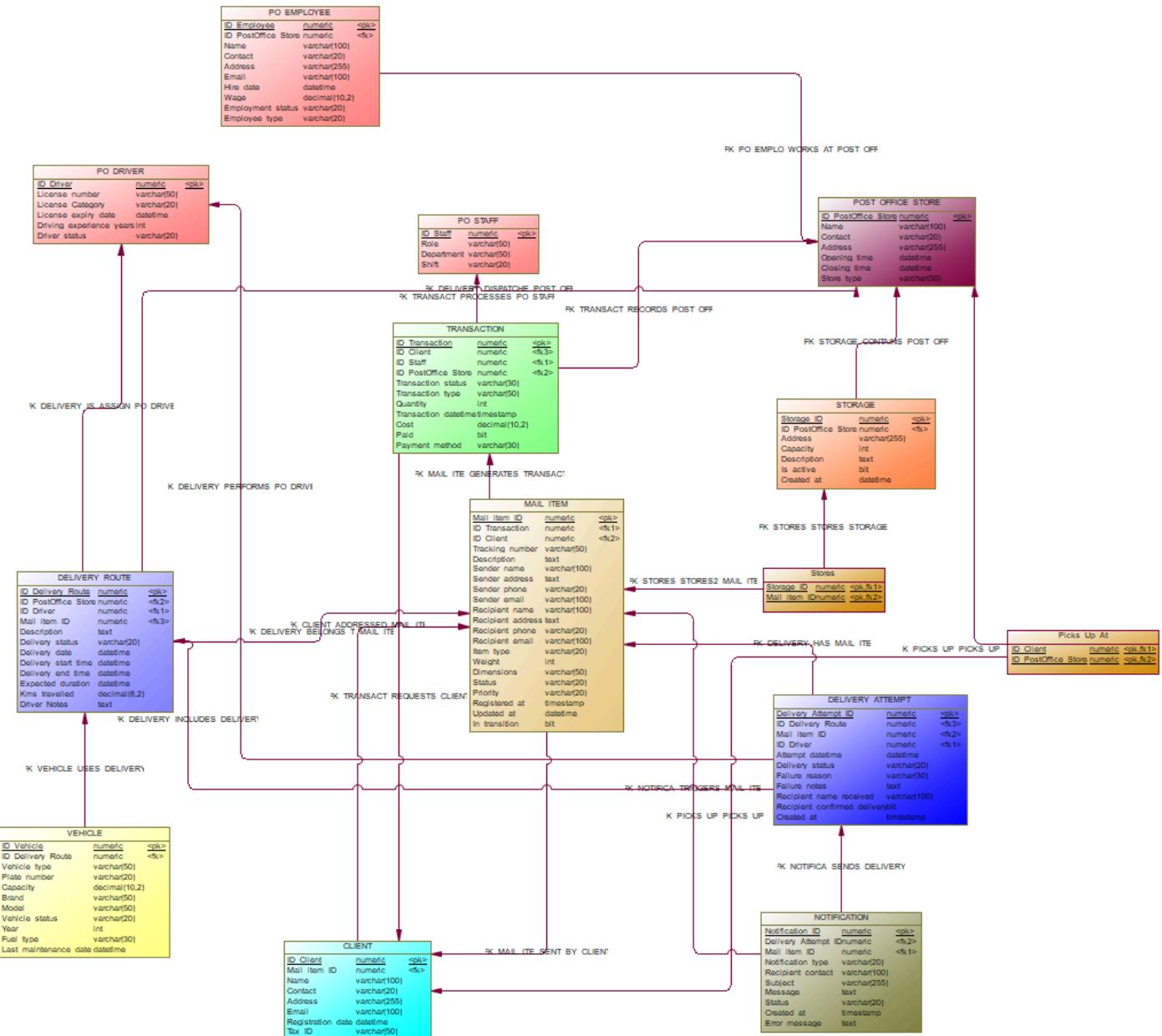
- Responsive interface.
- Relational database (MySQL/PostgreSQL).
- Secure authentication.
- Auditable records.
- Intuitive use for all profiles.

(c) Modelos de Dados

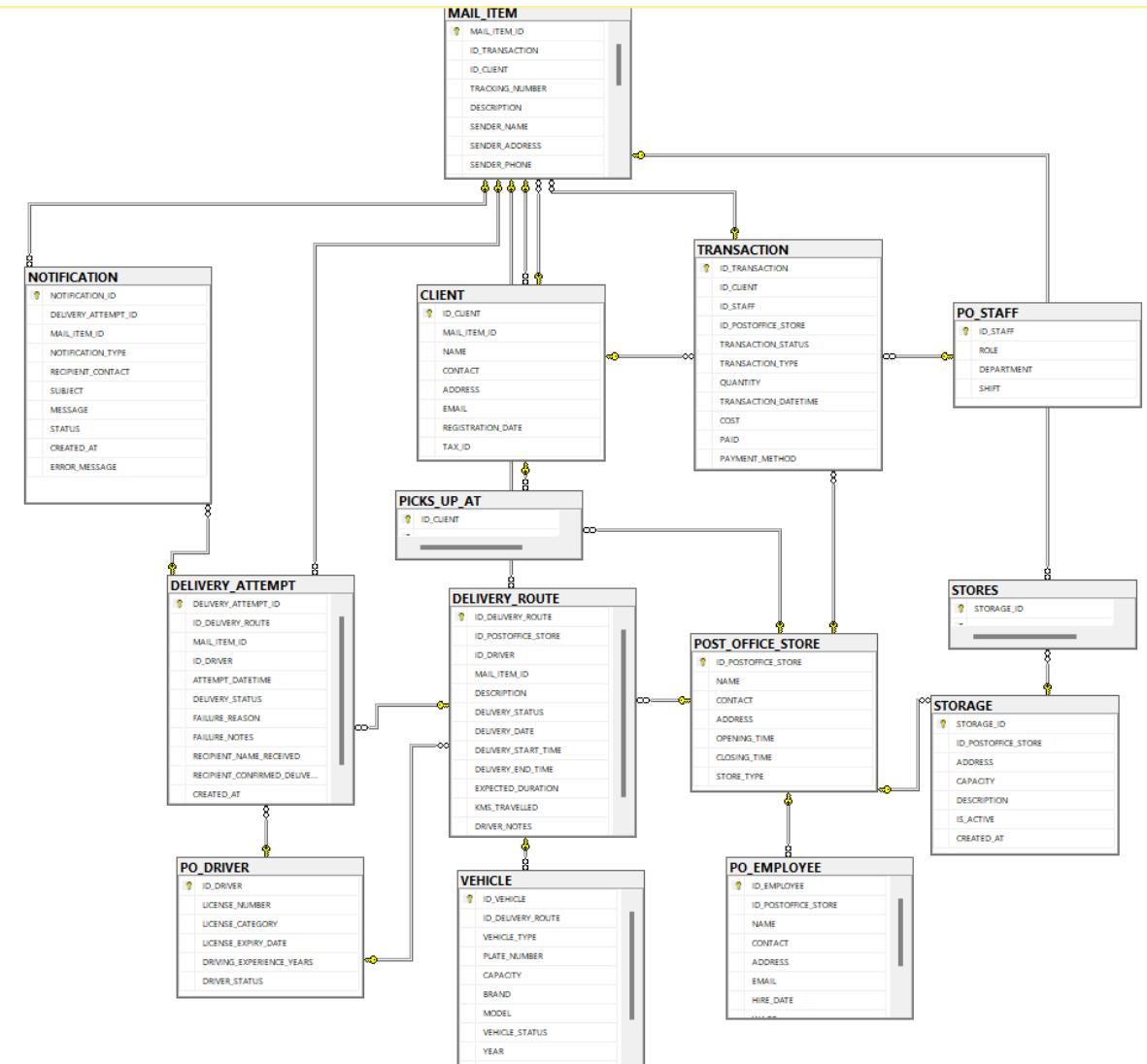
1. Conceptual Data Model (CDM)



2. Physical Data Model (PDM)



3. Logical Data Model (LDM)



d) Database objects

Students : David González & Diego Alonso

TABLES

The PO_EMPLOYEE table stores information about all employees working in the postal service, including their personal details, contact information, employment dates, and work status. This table serves as the main repository for personnel management across all post office operations.

The PO_DRIVER table contains specialized information for delivery drivers, including their license details, driving experience, and current driver status. This table supports the management of driver qualifications and availability for delivery assignments.

The PO_STAFF table manages information about postal staff working inside post offices, including their roles, departments, and work shifts. This supports the organization of internal post office operations and staff scheduling.

The CLIENT table stores information about customers who use the postal services, including their contact details, addresses, and registration information. This table facilitates customer relationship management and service tracking.

The POST_OFFICE_STORE table manages data about all postal branches in the network, including their locations, operating hours, contact information, and branch types. This enables efficient management of the postal office network.

The STORAGE table represents the physical storage areas within each post office, tracking capacity, location details, and operational status. This supports organized management of mail items within each branch's storage facilities.

The MAIL_ITEM table is the central repository for all postal items including letters, packages, and documents. It stores comprehensive information about each item, including tracking data, sender and recipient details, physical specifications, and delivery status throughout the shipping process.

The DELIVERY_ROUTE table manages delivery routes that group multiple mail items for efficient distribution. It contains route details, schedules, status information, and performance metrics to optimize logistics operations.

The DELIVERY_ATTEMPT table records individual delivery efforts for mail items, capturing attempt timestamps, delivery outcomes, recipient confirmations, and any delivery issues encountered. This provides detailed tracking of the delivery process.

The TRANSACTION table handles all financial operations related to postal services, recording payment information, transaction types, costs, and payment status. This ensures accurate financial tracking and accounting.

The VEHICLE table maintains information about the vehicle fleet used for postal deliveries, including specifications, capacity, maintenance records, and operational status. This supports effective fleet management and maintenance scheduling.

The NOTIFICATION table manages communication with customers about their mail items, storing notification types, recipient contacts, message

content, and delivery status. This facilitates customer updates throughout the delivery process.

VIEWS

The vw_ActiveDeliveries view displays all currently active delivery routes with their real-time status, assigned drivers, and vehicle information. This provides operational staff with immediate visibility into ongoing delivery activities.

The vw_DriverPerformance view summarizes key performance indicators for delivery drivers, including completed deliveries, success rates, and efficiency metrics. This supports management evaluation and operational decision-making.

The vw_AvailableVehicles view shows vehicles currently available for assignment by filtering out those in maintenance or already assigned to active routes. This supports efficient resource allocation and scheduling.

The vw_StorageCapacity view monitors storage utilization across all post office branches, showing available capacity and current occupancy levels. This helps optimize space management and resource planning.

STORED PROCEDURES

The sp_RegisterMailItem procedure handles the complete process of registering new mail items, including validation of sender and recipient information and automatic tracking number generation.

The sp_AssignDriverToRoute procedure manages the assignment of drivers to delivery routes, performing availability checks and schedule conflict prevention to ensure proper resource allocation.

The sp_UpdateDeliveryStatus procedure processes delivery status updates, validating status transitions and updating timestamps throughout the delivery lifecycle.

The sp_ProcessTransaction procedure handles financial transaction processing, including payment validation and status updates for postal services.

The sp_OptimizeRouteAssignment procedure analyzes and optimizes the assignment of vehicles and drivers to delivery routes based on capacity constraints and operational efficiency.

FUNCTIONS

The fn_CalculateShippingCost function computes shipping costs based on item weight, dimensions, service type, and delivery requirements to ensure accurate and consistent pricing.

The fn_GetDriverEfficiency function returns comprehensive efficiency metrics for specific drivers, calculating performance scores based on delivery history and success rates.

The fn_CheckVehicleCapacity function determines whether a vehicle can accommodate additional mail items by calculating current load versus maximum capacity, preventing overloading.

The fn_ValidateDriverLicense function verifies driver license validity and checks compatibility with assigned vehicle types to maintain operational standards.

TRIGGERS

The trg_UpdateMailItemStatus trigger automatically updates mail item status based on delivery attempt outcomes, ensuring consistent status tracking throughout the delivery process.

The trg_CheckVehicleMaintenance trigger validates vehicle maintenance status and generates maintenance alerts when vehicles require service, ensuring fleet reliability.

The trg_ValidateDriverAvailability trigger ensures driver availability before assigning drivers to new delivery routes, preventing scheduling conflicts.

The trg_AuditVehicleAssignments trigger creates comprehensive audit records for all vehicle assignment changes, tracking modifications for operational oversight.

(e) Tipos de Utilizadores

The System Administrator is responsible for overseeing the entire postal service operation, ensuring all components work together efficiently and maintaining the overall system integrity.

Postal Staff members are employees who work inside post office locations, handling customer service, processing mail items, managing financial transactions, and coordinating with other operational areas.

Delivery Drivers are personnel specialized in transporting mail items from post offices to their final destinations, following designated routes and ensuring timely and secure delivery to recipients.

Customers are individuals or businesses that utilize postal services to send and receive mail items, interacting with the system to manage their shipping needs and track delivery progress.

(f)

Web Application Structure

Login / Register

- Description: User authentication
- Requirements: Connects with User table
- Student: Pedro Monteiro

Dashboard (Admin)

- Description: General statistics
- Requirements: SQL queries and reports
- Student: Rodrigo Rolo

(Admin) Warehouse Management

- Description: CRUD for warehouses
- Requirements: Admin only
- Student: Pedro Monteiro

Mail Management

- Description: CRUD + statuses
- Requirements: Associates warehouses and users
- Student: Rodrigo Rolo

Vehicle Management

- Description: CRUD for vehicles and assignments
- Requirements: Links with drivers
- Student: Pedro Monteiro

Transaction Management

- Description: Register payments
- Requirements: Connects with mail
- Student: Rodrigo Rolo

Deliveries

- Description: List pending/completed deliveries
- Requirements: Drivers and employees
- Student: Pedro Monteiro

Client Profile

- Description: History ,payments and mail item tracking
- Requirements: Clients
- Student: Rodrigo Rolo