

main

1 Branch

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<> Code

Rodrigo-P-C

docs: fix bidirectional arrows in mermaid diagram

ed29edc · 3 days ago

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README

Smart Last-Mile Logistics System (VRP Optimization)

A full-stack logistics platform designed to optimize delivery routes for small-to-medium businesses. It solves the **Vehicle Routing Problem (VRP)** with real-world constraints (security waypoints) and features an **Offline-First** mobile application for drivers.

TECHFASTAPI | REACT NATIVE | OR-TOOLS | GOOGLE CLOUD

🎯 Key Features

- 📍 **Intelligent Route Optimization:** Uses **Google OR-Tools** to calculate the most efficient delivery sequence, minimizing distance and time.
- 🛡️ **Security Constraints:** Implements hard constraints (e.g., Mandatory Security Checkpoints in high-risk zones like Huichapan) directly into the routing algorithm.
- 📱 **Offline-First Mobile App:** React Native app capable of syncing data seamlessly. Drivers can complete deliveries and capture proof-of-delivery even without internet access.
- 📊 **Dynamic Dashboard:** Real-time visualization of orders, prospects, and routes using Google Sheets as a flexible, zero-cost database.
- 🧾 **Automated Invoicing:** Generates PDF receipts and WhatsApp logs automatically upon delivery completion.

🔧 Technology Stack

Component	Tech	Description
Backend	Python, FastAPI	High-performance API handling VRP logic and data sync.
Optimization	Google OR-Tools	Constraint programming solver for complex routing logistics.
Mobile App	React Native (Expo)	Cross-platform driver application with background sync.
Database	Google Sheets API	Cloud-native, user-friendly database for easy client management.
Geospatial	Google Maps API	Places, Directions, and Distance Matrix for precise navigation.

🏗️ Architecture

Mobile App (Driver)

Sync / Offline

Optimization Engine

FastAPI Backend

OR-Tools Engine

Solve VRP

Optimized Route

Read / Write

Calculate Matrix

Google Sheets DB

Google Maps API

📦 Installation & Setup

Backend

- Clone the repo and navigate to root.
- Create a virtual environment:

```
python -m venv venv
source venv/bin/activate
```
- Install dependencies:

```
pip install -r requirements.txt
```
- Setup `.env` file with your API Keys (Google Maps, Sheets ID).
- Run the server:

```
uvicorn app.main:app --reload
```

Mobile

- Navigate to `/mobile`.
- Install dependencies:

```
npm install
```
- Run on device/simulator:

```
npx expo start
```

💡 About the Project

Developed as a solution to modernize logistics for local distributors (e.g., Dairy/Gas industries), focusing on UX and robustness against network failures.

About

Sistema de logística de última milla con optimización de rutas (VRP) y sincronización offline

Readme

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