CommuteX: UAE Smart Commuting Platform

Innovation Hackathon – Zayed University
Developed by: Manar Omar, Salma Roshdy, and Rana Alsattari (Ajman University)

Team Id: IH25077

Problem Statement

Every weekday, heavy inflows from Sharjah, Ajman, Abu Dhabi → Dubai overload E11 (SZR), E311, Al Ittihad during 7–9 AM / 5–7 PM. The result is 30–45 minutes lost per commuter, higher CO_2, parking stress, and elevated peak-hour accident risk despite strong metro/bus investments. Government needs a scalable, data-driven way to cut cars at the gate, nudge behaviour, and align with Net Zero 2050.

Proposed Solution

CommuteX is an RTA-aligned platform that fuses AI carpooling, Smart Park & Ride hubs, a traffic forecast dashboard, and a rewards economy (points redeemable for Salik/Nol/RTA parking/ADNOC fuel). Passengers find/Book seats; Drivers post trips and earn; both accrue points. Parking at hubs is points-paid (cashless).

Key Capabilities

- AI Carpool & Matching: corridor-aware trip discovery; safe, verified drivers.

- Dynamic Forecast Page: time-slider heatmap, jam factor, speed/volume KPIs, and policy tips.

- Pricing & Split: car-type + km → total fare, carpool discount, fair split per rider (driver gets 65%).

- Rewards/Tiers: points for ≥3 riders, Park & Ride, off-peak shifts; vouchers for Salik/Nol/ADNOC; hub parking via points.

Approach

Product & UX

- Tabs: Passenger / Driver / Hubs / Forecast / Copilot (dark UI).

- Passenger: Plan & Book; Wallet; Redeem vouchers; Park & Ride booking.

- Driver: Post/Manage trips; Booking requests; Earnings & settlements.

- Forecast: animated heatmap, "Worst Corridor", Avg Speed, Jam ≥7/10 count, recommendations.

System Architecture (backend view)

- Mobile/Web App ↔ Trip Posting & Scheduler, Seat/Booking Manager, Fare & Points Calculator, Wallets, Notifications.

- AI Core: Route & Match Engine, Pricing & Split Service, Rewards Engine, Policy Control, Fraud & Compliance Guard over User & Trips DB, Traffic & Corridor Data, CO_2 & Telemetry.

- Gov/Partner APIs: RTA Policy & Analytics dashboard, UAE Pass, ADNOC Rewards, RTA Parking, Salik, Nol.
  (Architecture aligns with the supplied [system diagram](#).)

Technology Stack

- Frontend: React 18, TypeScript, Vite, React Router v6, Tailwind CSS, shadcn/ui, Lucide, Sonner, date-fns.

- Visualization: (demo) heatmap & charts integrated in Forecast tab.

- Backend: Node.js + Express (Netlify Functions), REST API.

- Data/State: Type-safe models (User, Trip, Booking, Voucher, Reward); in-memory/seeded demo with upgrade path to PostgreSQL/Supabase.

- Deployment: Netlify (CI/CD), optional Fly.io dev instance.

- Dev tooling: pnpm, PostCSS, TS compiler, Vite SWC.

Core Logic

- **Fare** = (baseFare(carType) + perKm(carType)*distanceKm) ÷ passengers × (1 − carpoolDiscount)
  Defaults: Sedan 10 + 1.5/km; SUV 15 + 2/km; Minivan 20 + 2.5/km; **discount 10%**.

- **Driver payout**: 80% of rider fares; platform 20%.

- **Rewards**: ≥3 riders **+80 pts**, Park & Ride **+40 pts**; tiers **BRONZE/SILVER/GOLD/PLATINUM** with bonuses.

- **Parking via Points**: hubs expose parking_points_cost; deduction → voucher/confirmation; bonus for mode-shift.

Outcome

- **25%** peak-hour congestion at Dubai entry corridors.

- **15–20%** central-Dubai parking demand.

- **~100,000 tons CO_2/year** avoided (mode shift + pooling).

- **Safer peaks** via fewer cars and data-led routing; stronger public-transport uptake.

- **Policy agility**: RTA can toggle time-based toll discounts and incentives from the forecast console.

The End