

CommuteX: UAE Smart Commuting Platform

Innovation Hackathon – Zayed University

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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 CO₂, 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, CO₂ & 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

- **Languages:** JavaScript, TypeScript, Python, SQL
- **Frontend:** React.js, Tailwind CSS, Mapbox (maps), Recharts (charts)
- **Backend:** Node.js with Express.js, Python (FastAPI for forecasting)
- **Database:** PostgreSQL (production), SQLite (demo)
- **AI & Forecasting:** pandas, NumPy, scikit-learn, Prophet
- **Deployment:** Netlify (frontend), Render/Fly.io (backend)
- **Tools:** GitHub, VS Code, Postman

Core Logic

- **Fare** = $(\text{baseFare}(\text{carType}) + \text{perKm}(\text{carType}) * \text{distanceKm}) \div \text{passengers} \times (1 - \text{carpoolDiscount})$
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 \rightarrow voucher/confirmation; bonus for mode-shift.

Outcome

- **25%** peak-hour congestion at Dubai entry corridors.
- **15–20%** central-Dubai parking demand.
- **~100,000 tons CO₂/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