



VOLKSWAGEN GROUP
DIGITAL SOLUTIONS [INDIA]

i.mobilitython 5.0

Powered By **H2S**
HACK2SKILL

Team Details

- a. Team name: Prakhar
- b. Team leader name: Omkar Lolage
- c. Problem Statement: Predictive Parking Space Marketplace

Brief about the idea

What if parking felt as effortless as booking a cab? Our app is a **predictive parking marketplace** that shows you where a spot will be free at your ETA, lets you pre-book it with confidence, and auto-handles payments - so you just drive, park, and go.

Powered by a **spatiotemporal ML engine** that forecasts bay-level availability at your ETA with calibrated confidence, fuses live signals (ETA, events, weather, sensors), and auto-triggers **backup swaps** when risk rises.

How it works:

- **Ingests live signals** (inventory, ETA, events, weather) into a unified feature stream.
- Uses a **spatiotemporal ML model** to predict spot availability at arrival time with confidence bands.
- **Ranks parking offers by distance, price, and success probability, with EV and accessibility filters built in.**
- Lets users book guaranteed or **lower-cost “smart hold” spots**; automatically reserves a **backup** if confidence is low.
- Enables **seamless entry** via QR, NFC, or license plate, with **guided navigation** for smooth last-meter access.
- Handles payments automatically, pre-auth at booking, **capture on exit with instant receipts** and invoices.

Brief about the idea

What if **parking felt as effortless** as booking a cab? Our app is a **predictive parking marketplace that shows you where a spot will be free at your ETA**, lets you pre-book it with confidence, and auto-handles payments - so you just drive, park, and go.

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Why it works:

- Moves beyond guesswork with **calibrated probabilities**, showing users a trustworthy “**chance of spot**” instead of static pins.
- **Smart backup-swap** automatically switches to the best nearby option if the first isn’t ready, backed by an SLA to reduce failure anxiety.
- **Demand steering** through small time or price nudges smooths peaks, cutting cruising and improving availability.
- A continuous learning loop (arrivals, overstays, no-shows) refines predictions daily, boosting accuracy, utilization, and revenue.

Opportunities – USP and “How It Solves” the problem

Predictive Availability at ETA



A spatiotemporal **ML model forecasts block face availability for your exact arrival time** and displays a **calibrated probability with a confidence band** (e.g., “86% ±5%”). It fuses live signals (**ETA changes, bookings, events/weather, optional sensors**) so users see trustworthy, latest availability.

Smart Hold & Automatic Backup-Swap (Reliability)



Book with a lower-cost Smart Hold or full Guarantee. The system pre-autos payment, watches risk in transit, and **proactively activates the best nearby backup** if confidence drops - preserving price and SLA - so the journey remains reliable without over-reserving inventory.

Hardware-Lite Access & Fast Onboarding



Works day one with QR validation; plate and sensors are optional add-ons. Providers self-serve to publish locations, stalls, EV/accessible flags, pricing, and blackouts - going live in hours. Signals from devices/feeds can be ingested later to boost accuracy.

Demand Steering, EV/Accessibility & Seamless Payments



Subtle time/price nudges (e.g., arrive +10 min) raise success odds and smooth peaks; **EV and accessibility filters are first-class in every search.** Payments are pre-authorized at booking and automatically captured/refunded on exit, with instant receipts and clear status.

City-Scale Performance & Continuous Learning



Fast geospatial search (PostGIS) and hot caching keep results snappy; event-driven updates refresh availability within seconds. The **ML loop retrains from real outcomes** (arrivals, overstays, no-shows) and **hot-reloads safely**, while observability ensures stable operations as the network grows.

List of features offered by the solution

“Fast Search & Offers”

Real-time discovery

Ranked nearby options with map + list, rich cards (price, distance, rules, EV/accessible), entrance info, and quick filters for time, price cap, and amenities.

“One-Tap Booking & Payments”

Hold → confirm

Choose Guaranteed or Smart Hold, see clear price breakdown and policy, confirm with saved payment; pre-auth status shown inline with friendly error recovery.

“Provider Console & Ops”

Self-serve supply and insights

Onboard locations/stalls, set pricing/blackouts, monitor live sessions and bookings, and view utilization/revenue basics; changes reflect quickly in customer search.

“Session Control & Exit”

Manage your stay

Live timer, extend stay, cost estimator, gentle overstay/grace alerts; end session to auto capture/refund and receive an itemized receipt instantly.

“Guided Arrival & Access”

Navigate and validate

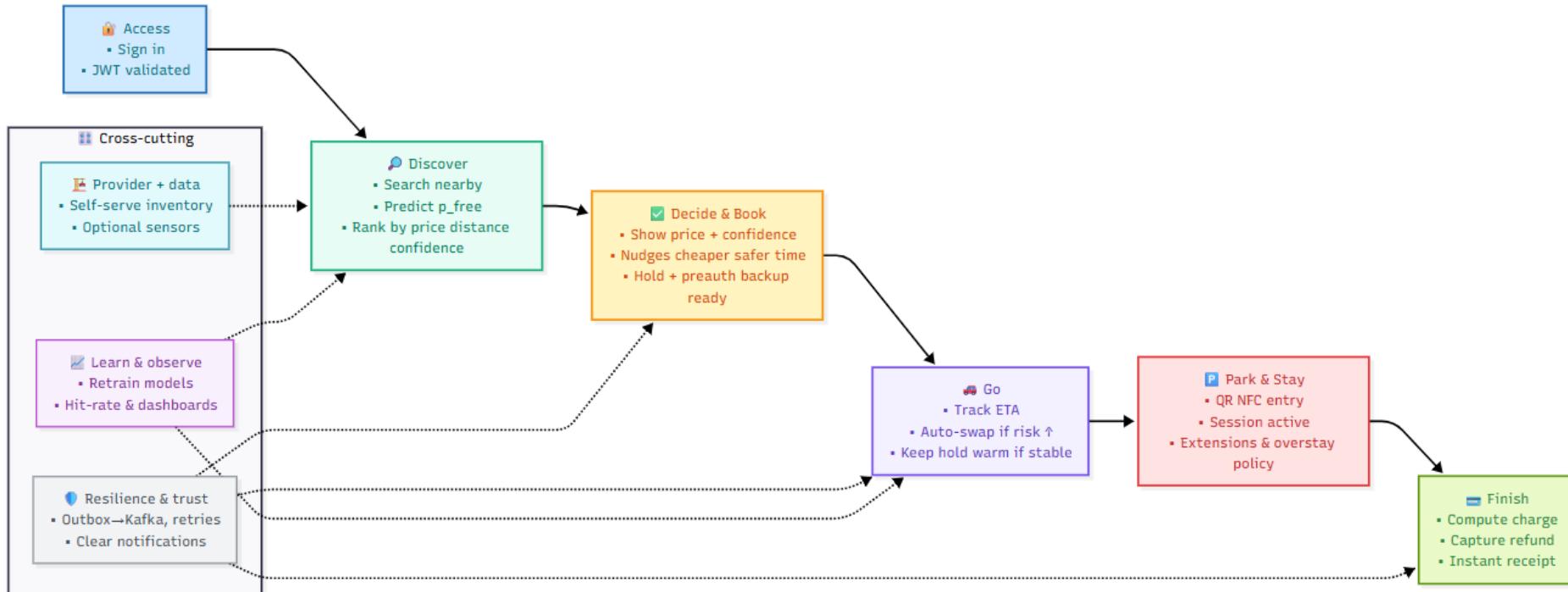
Turn-by-turn to the correct entrance, arrival checklist, and hardware-lite access via QR/NFC (plate entry fallback); bay/level guidance on success.

“Proactive Alerts & Support”

Stay informed end-to-end

Clear notifications for confirmations, swap notices, reminders, and extension prompts; instant receipts and quick help.

Process flow diagram or Use-case diagram



ParkHub

- Dashboard
- Inventory
- Pricing & Rules
- Live Sessions
- Bookings
- Analytics**
- Team

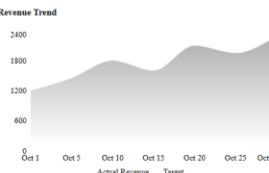
Arg Revenue Day
\$1,245
+4.5% vs last period

Arg Occupancy
78%
+1.2% vs last period

Arg Session Duration
2h 42m
+12 min vs last period

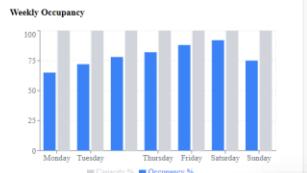
Customer Retention
72%
+0.1% vs last period

Revenue Trend



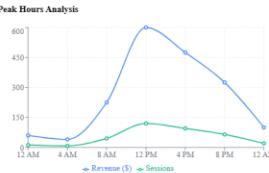
Actual Revenue Target

Weekly Occupancy



Day	Capacity %	Occupancy %
Monday	60	70
Tuesday	75	70
Wednesday	75	75
Thursday	75	78
Friday	75	78
Saturday	85	80
Sunday	75	70

Peak Hours Analysis



Revenue (\$) Sessions

Customer Segmentation



Segment	Percentage
New Customers	20%
Returning	52%
VIP	28%

Mock – UI for Provider Web Application

ParkHub

- Dashboard
- Inventory
- Pricing & Rules
- Live Sessions
- Bookings
- Analytics**
- Team

Team & Admin
Manage team members and access permissions

Name	Email	Role	Status	Last Active	Actions
admin1	admin1@parkhub.com	Admin	Active	2 hours ago	
manager	manager1@parkhub.com	Manager	Active	30 minutes ago	
operator1	operator1@parkhub.com	Operator	Active	1 hour ago	
operator2	operator2@parkhub.com	Operator	Inactive	3 days ago	

Recent Activity

- admin1 Updated pricing rules 2 hours ago
- manager Added new parking lot 4 hours ago
- operator1 Processed payment 6 hours ago
- admin1 Invited operator2 1 day ago

Roles & Permissions

- Admin**
 - View all scores
 - Manage team
 - View analytics
 - Configure settings
- Manager**
 - View all data
 - Manage bookings
 - View analytics
 - Limited settings
- Operator**
 - View sessions
 - Process payments
 - Issue reports

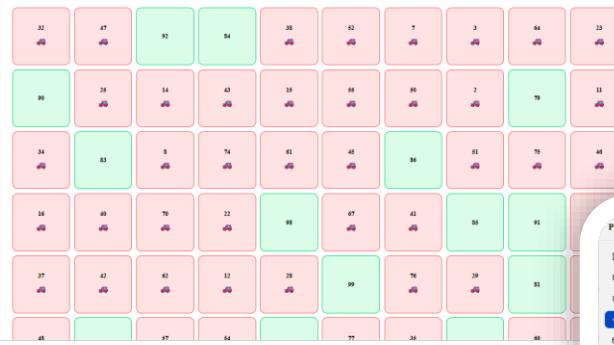
ParkHub

- Dashboard
- Inventory
- Pricing & Rules
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Downtown Lot A
123 Main St

Total Capacity: 100 | Occupied: 78 | Available: 22 | Occupancy Rate: 78%

Parking Spots



ParkHub

- Dashboard
- Inventory
- Pricing & Rules
- Live Sessions**
- Bookings
- Analytics
- Team

Live Sessions

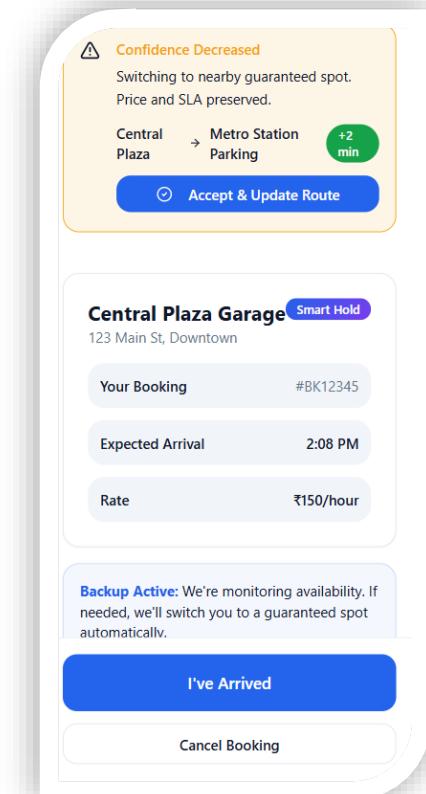
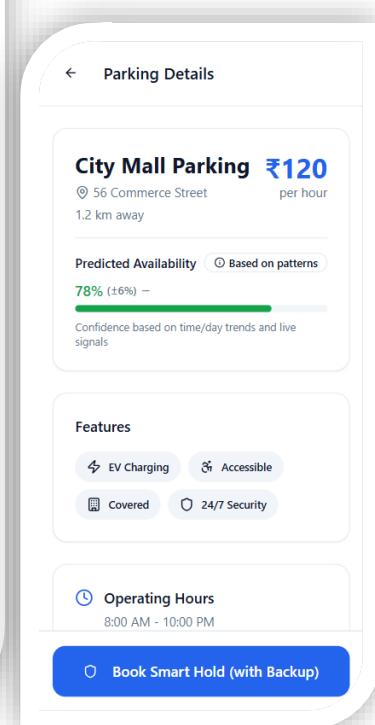
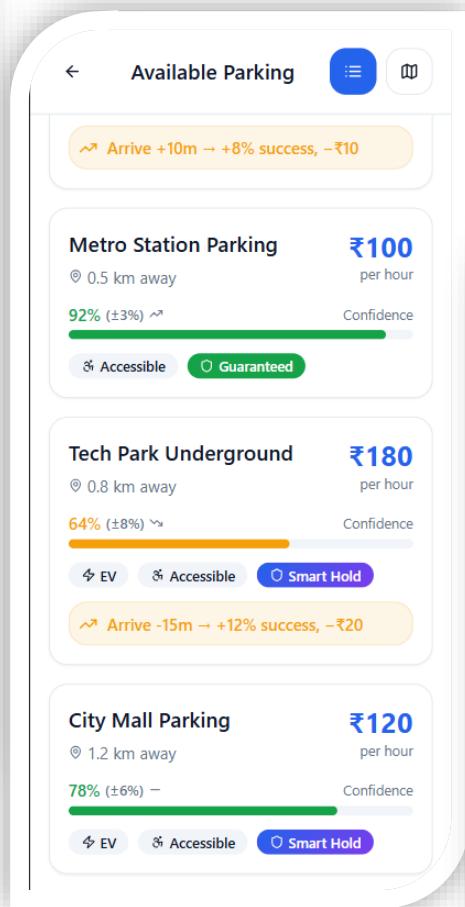
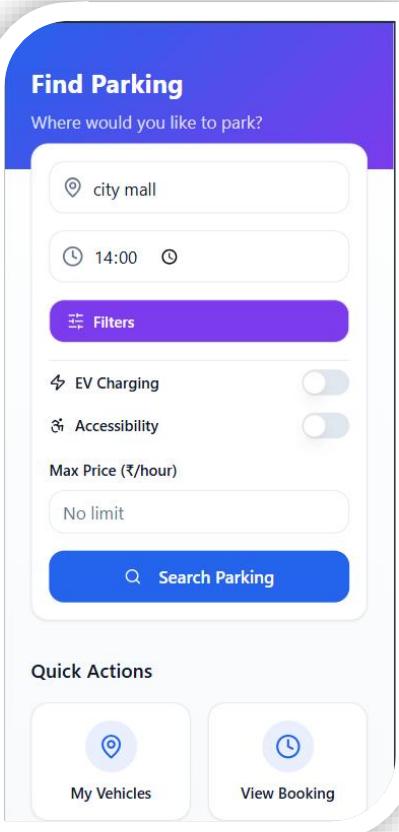
Monitor active parking sessions in real-time

List View Map View

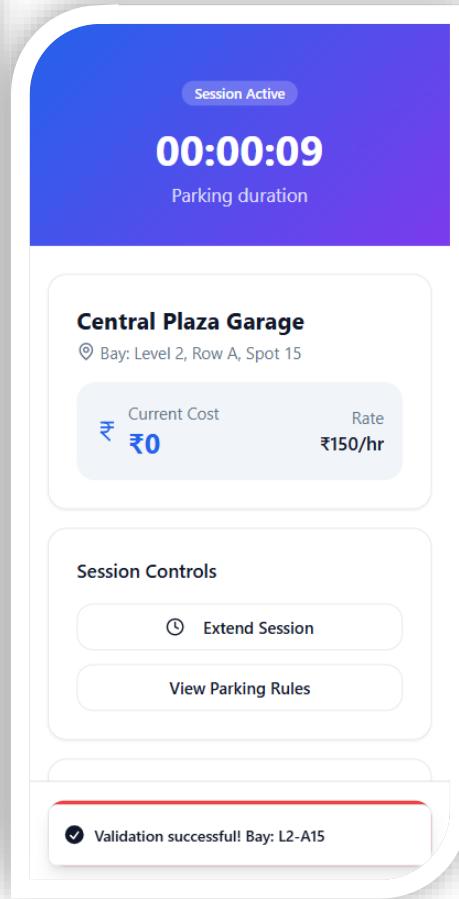
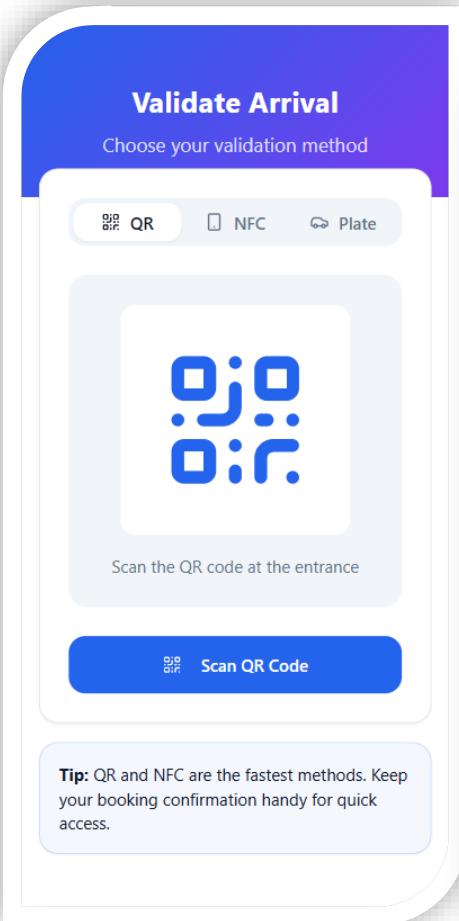
Active Sessions	Avg Duration	Current Revenue	Warnings
342	2h 34m	\$4,275	5

Customer	Location	Duration	Ext. Cost	Status	Actions
user1 Blue Tesla Model 3	Lot A - A-42	2h 15m	\$11.25	● Active	
user2 Red Honda Civic	Lot B - B-19	3h 05m	\$15.00	● Active	
user3 Black BMW X3	Lot A - A-15	4h 45m	\$23.75	● Exceeding	
user4 White Audi A4	Lot C - C-33	1h 30m	\$7.00	● Active	
user5 Grey Toyota Camry	Lot B - B-45	7h 15m	\$26.25	● Exceeding	

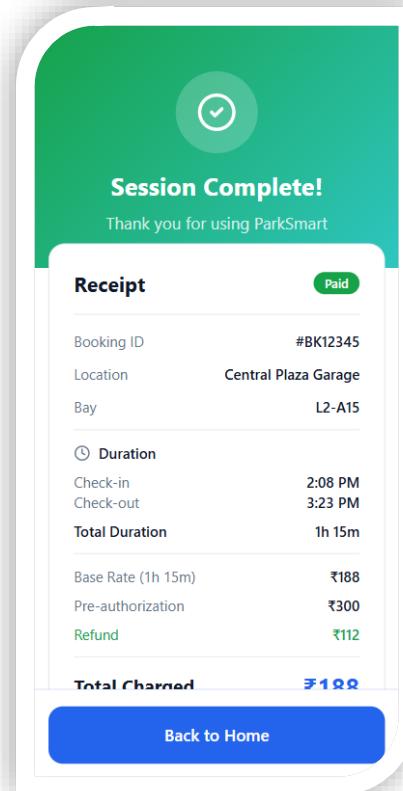
Mock – UI for Provider Web Application



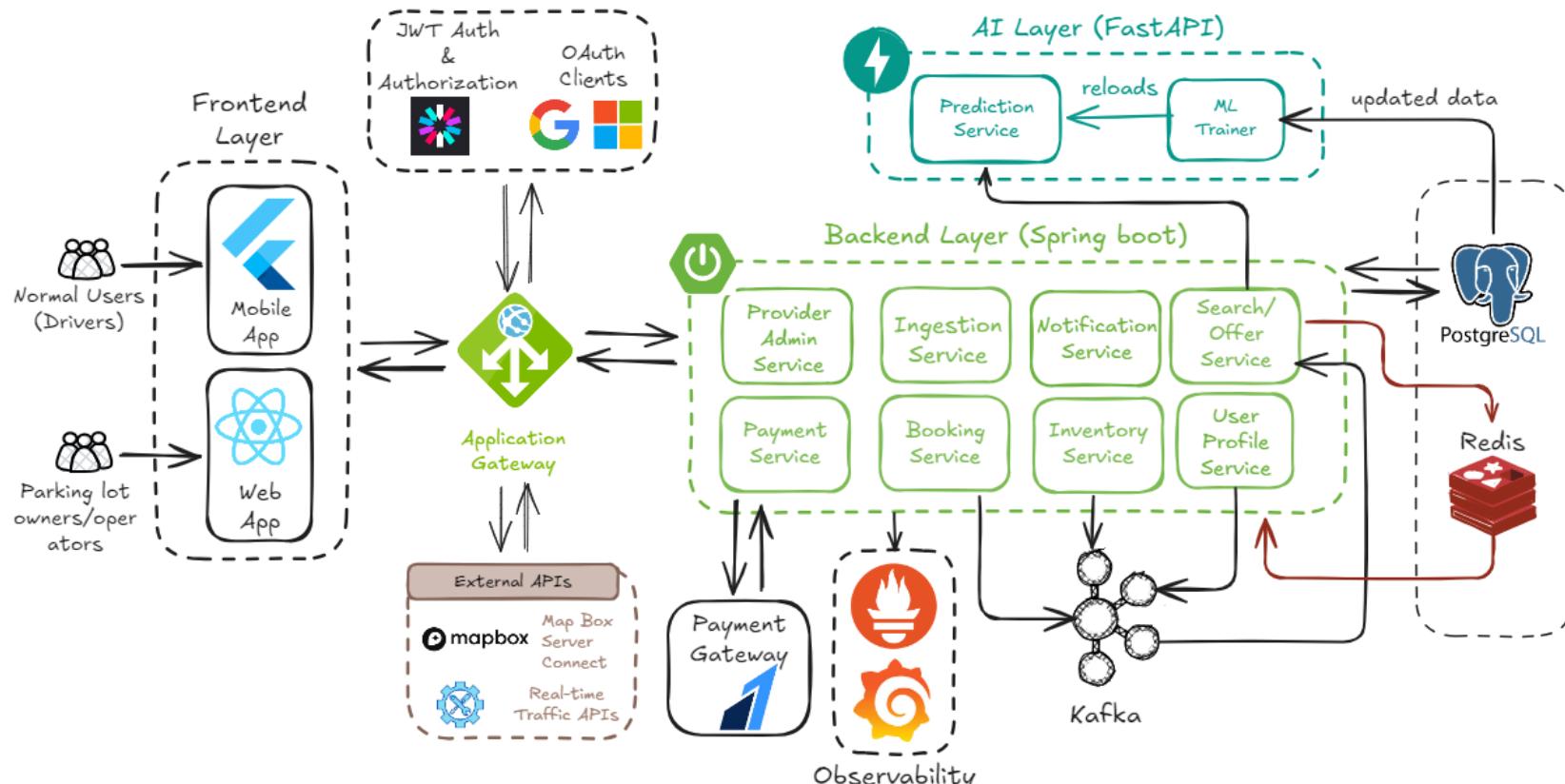
Mock – UI of Users(car-owners) Mobile App



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Architecture diagram of the proposed solution



Technologies to be used in the solution



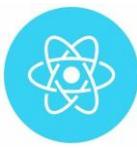
Flutter:

Cross-platform driver app for search, booking, validation, and receipts.



PostgreSQL/MySQL:

System of record with geospatial queries for nearby inventory.



React.js:

Lightweight and interactive for provider web portal for onboarding, pricing, and live operations.



Redis

Hot cache for availability, short-lived holds, sessions, and rate limits.



Spring boot:

Stateless microservices with secure API routing and rate limiting.



FastAPI (Python) + PyTorch/XGBoost

Real-time prediction API with offline training and hot-reload.



JWT/OAuth:

Centralized authentication/authorization with roles and token issuance.



Kafka

Event backbone for bookings, payments, inventory updates, and telemetry.



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THANK YOU