Park & Ride: Smart Parking & Last-Mile Connectivity

AN MVP FOR EFFICIENT URBAN MOBILITY

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PROBLEM STATEMENT

- Rapid urban growth has led to severe congestion around metro stations, especially during peak hours.
- Lack of smart parking systems forces commuters to waste time circling for vacant spots, increasing carbon emissions.
- No real-time integration between parking and last-mile services (like cabs, shuttles, e-rickshaws), leading to missed connections and user frustration.
- Manual or static pricing systems do not adapt to demand/supply fluctuations, causing underutilization or overpricing.
- Absence of automation and visibility in booking/check-in/out processes results in operational inefficiencies and poor user experience.

SOLUTION OVERVIEW

- A fully functional web-based MVP crafted, unifying smart parking and last-mile connectivity into one seamless urban mobility solution.
- **Smart Parking Booking**

  -Book available parking slots in real-time based on metro station selection.
- **License Plate Recording (LPR - Mocked)**

  -Captures vehicle number during booking to simulate automatic slot rec
- **Last-Mile Ride Booking**

  -Seamless cab, shuttle, or e-rickshaw booking right after parking.
- **Real-Time Status Updates Our Numbers**

  -Instant slot availability updates using backend sync and database changes.
- **End-to-End Simulation**

  -Built to demonstrate a complete urban commute experience — from parking to final ride.

TECH STACK

Frontend

HTML5, CSS3
JavaScript (Vanilla JS)
Font Awesome (for icons)

Backend

Java + Spring Boot
REST APIs
JWT Authentication

Database and Others

MySQL Workbench
WebSocket (for live slot updates)
LocalStorage (for token + offline mode)

FEATURES IMPLEMENTED

- Secure User Registration & Login (JWT-based)
- Real-Time Parking Availability by Station
- Slot Booking with License Plate Input
- Ride Booking with Time & Vehicle Type
- Live Booking Sync (WebSocket)
- Basic Error Handling + Offline Support

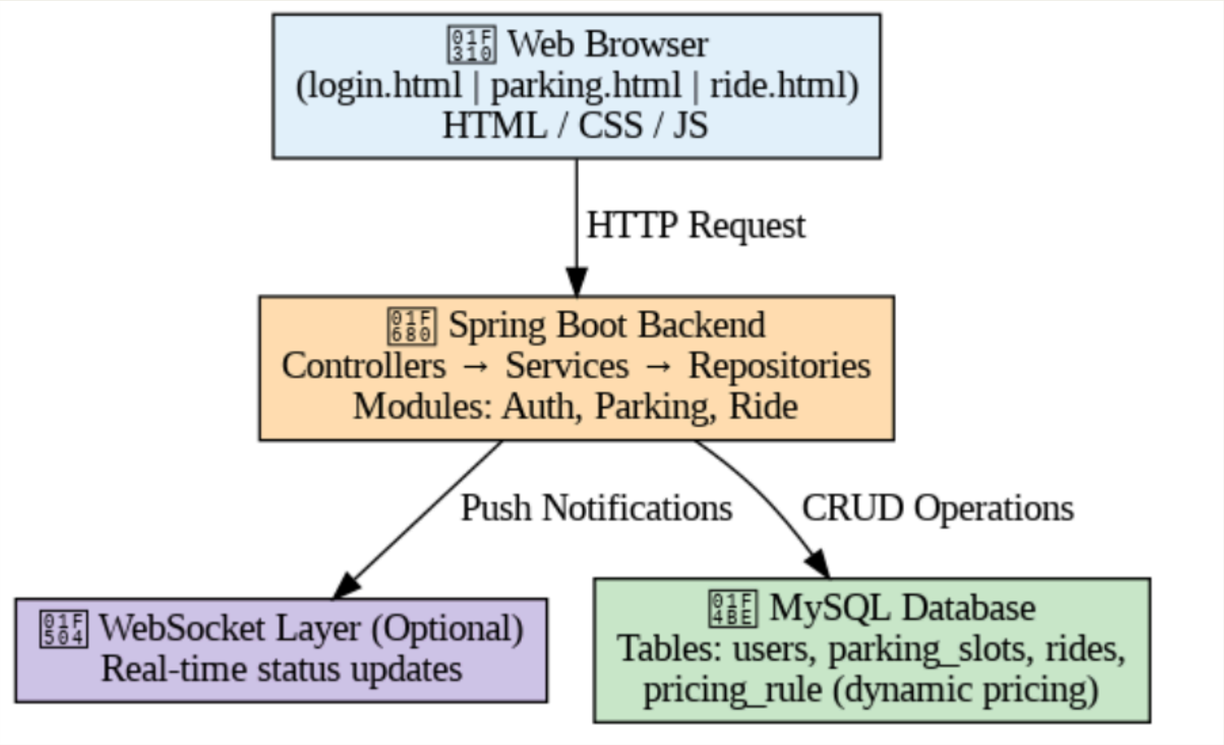
Ingoude Company

CORE MODULES BREAKDOWN

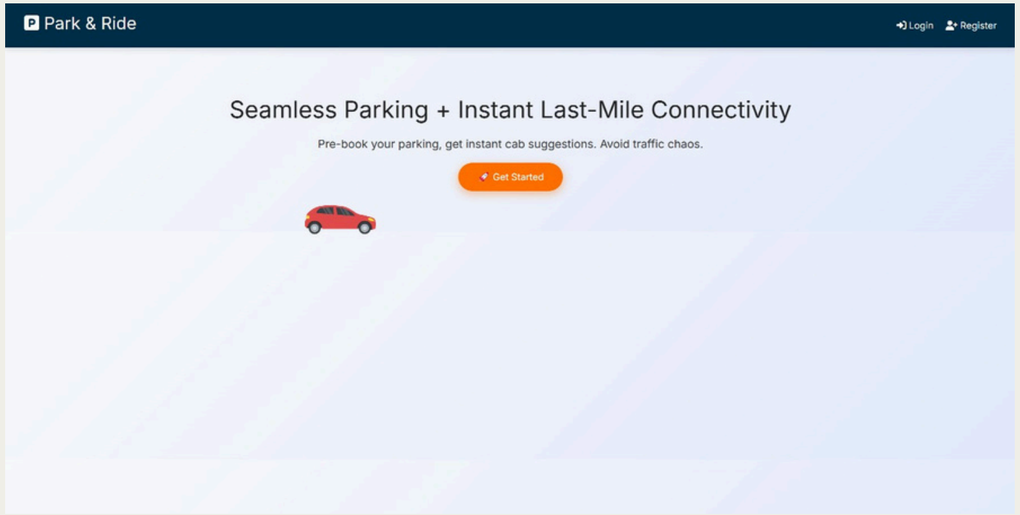
Module	Description
Auth	Register/Login, JWT Token
Parking	Show stations, available slots, book slot
LPR	License plate stored in DB on booking
Ride Booking	Pickup, drop, type, time
Dynamic Pricing	Schema created (logic to be integrated)
Offline Mode	Token check via localStorage

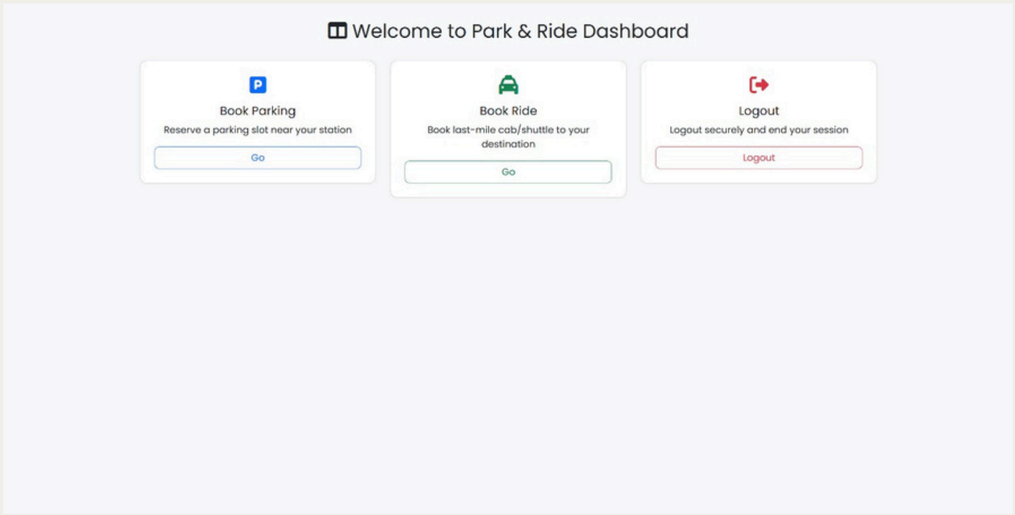
ARCHITECTURE DIAGRAM

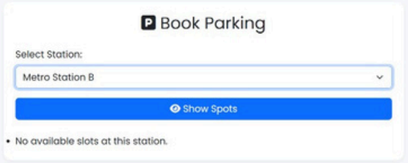
- Web Browser → Frontend (HTML/CSS/JS)
- REST API Calls
- Spring Boot Backend → Controllers → Services → Repositories
- DB Access (JPA)
- MySQL Database (Users, Slots, Rides, Pricing Rules)
- WebSocket broadcasting for real-time status

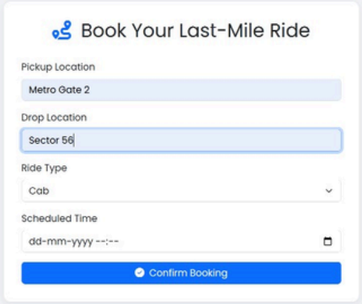


DEMO HIGHLIGHTS









FUTURE SCOPE

- **Advanced Dynamic Pricing**

-Incorporate real-time demand-supply and occupancy-based fare adjustments using AI models.

- **Live License Plate Recognition (LPR)**

- Integrate OpenCV or cloud-based LPR APIs to automate vehicle check-ins and exits.

- **Mobile App Integration**

- Build a companion app for parking alerts, ride tracking, and ticketless check-ins.

- **Public Transit Integration**

- Link with metro/bus APIs to sync ride timings with parking and shuttle availability.

- **Predictive Analytics Dashboard**

- Forecast peak usage hours and optimize slot distribution using ML-based demand prediction.

Thank you!