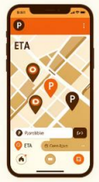
Smart Parking Management System

Real-time occupancy • Online bookings • Reduced congestion

Customer Experience — Mobile Front End



Find & Reserve

Map view • Real-time availability • Instant booking

Check-in / Check-out

QR access • Automated time logs

Dashboard

Booking history • Payment receipts • Vehicle profiles

Admin Portal — Operations

Slot Management

View / Reserve / Release slots

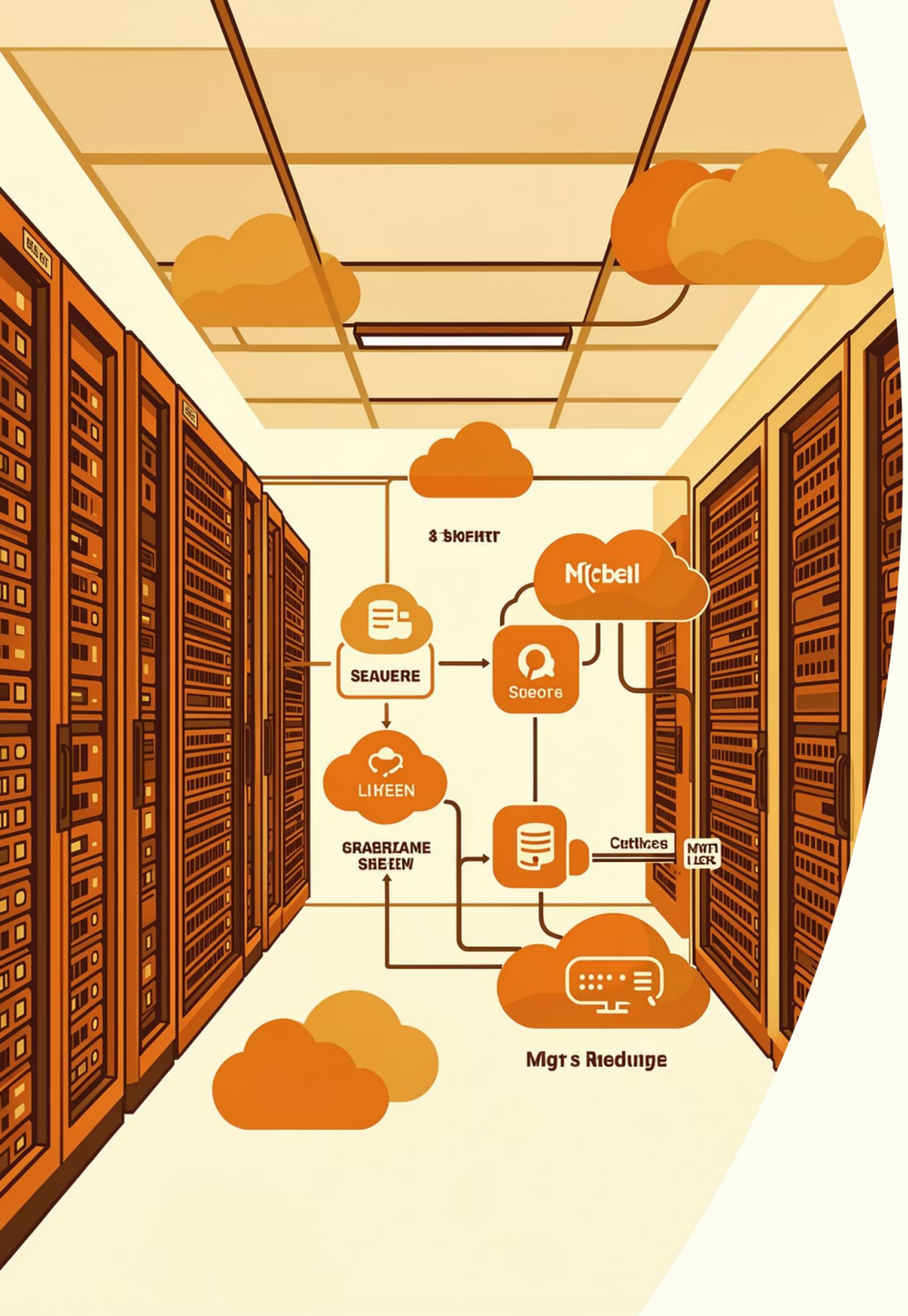
Pricing

Dynamic charges · Time-based rules

Reports

Utilization, revenue, incidents

Integrates with sensors, payment gateway, and enforcement tools



Backend Architecture

Database

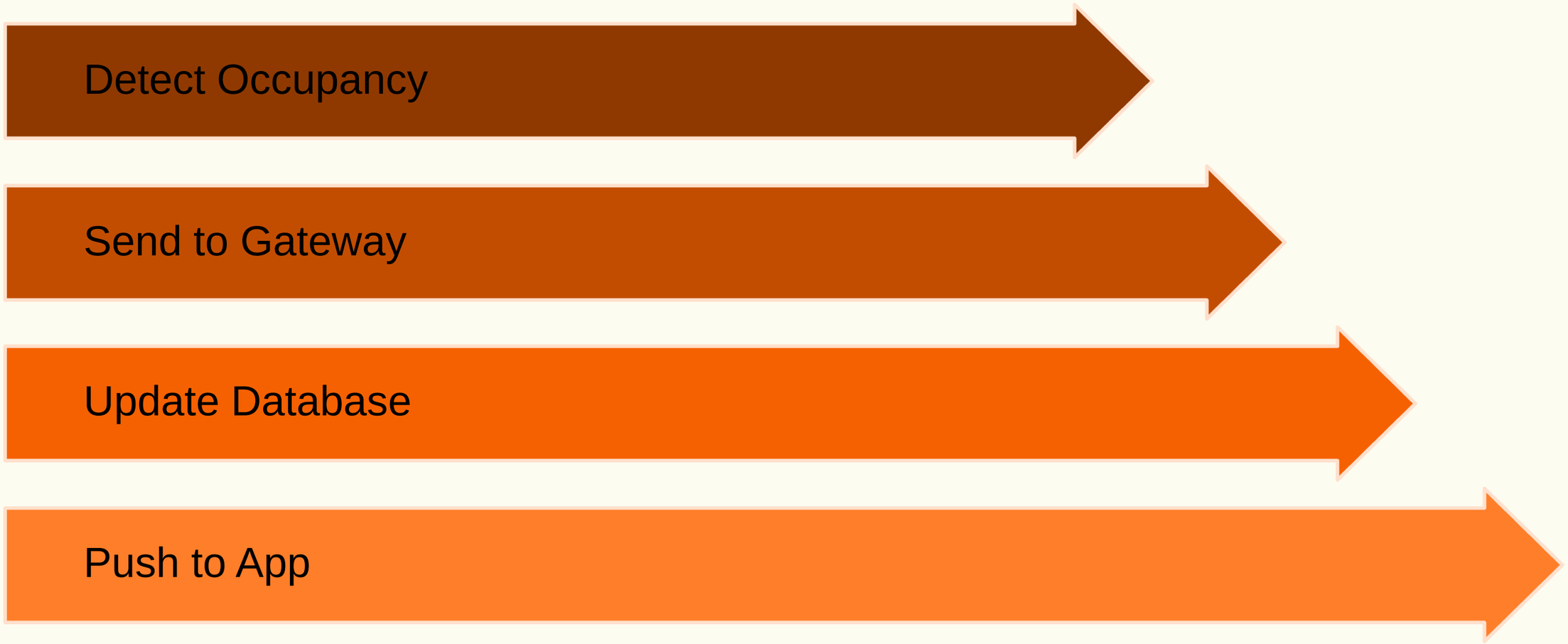
MongoDB — flexible, geo-indexed parking data

Auth

Firebase Authentication — secure logins

API Layer

Java Spring microservices • REST / WebSocket for real-time updates

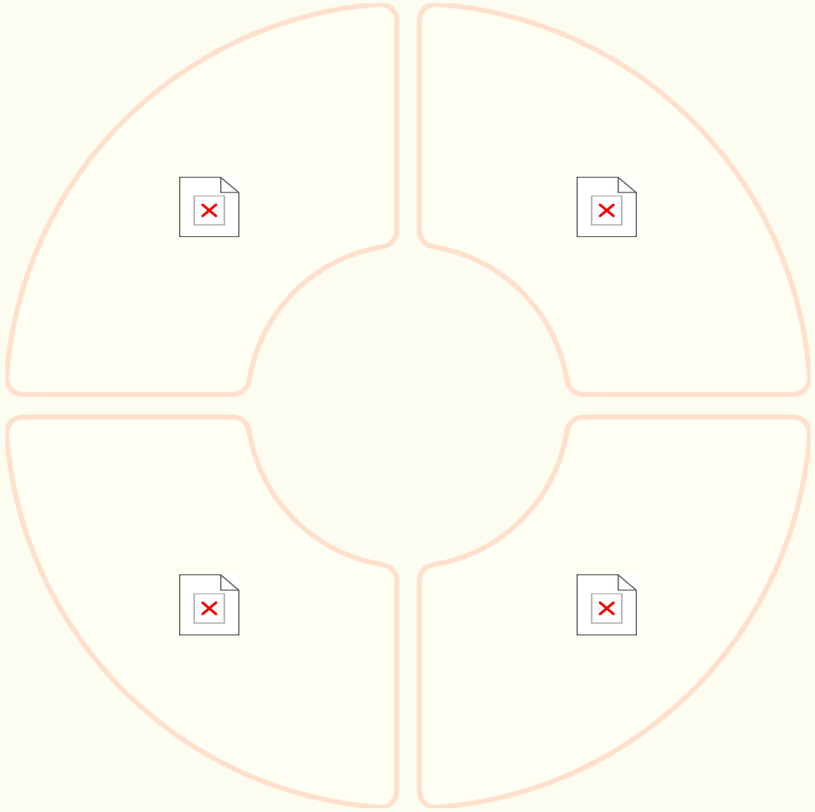


End-to-end real-time pipeline. Low-latency updates via WebSocket.

Key Features — At a Glance

Real-time Availability

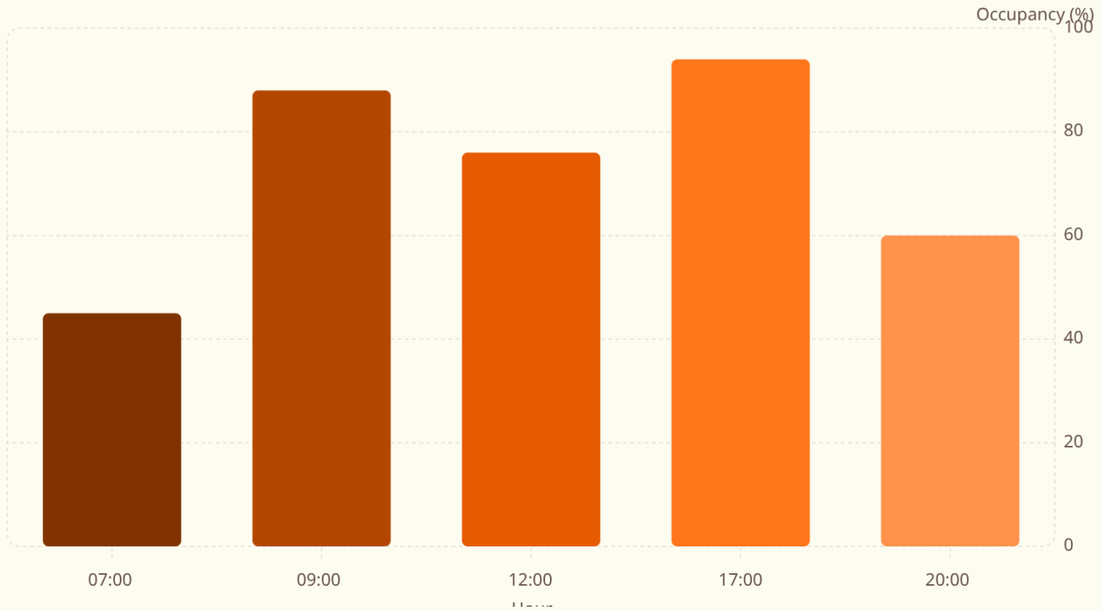
Online Booking



Utilization Analytics

Guidance & Routing

Designed for city-scale deployment and operator control

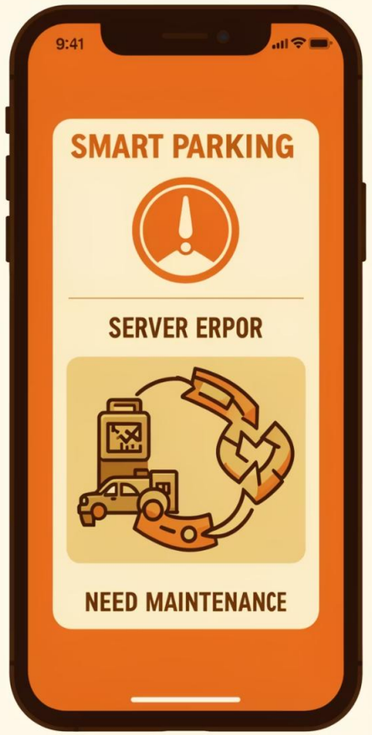


Utilization Pattern — Peak Hours

Data informs dynamic pricing, enforcement scheduling, and transit planning. Target: smooth peak congestion.

Benefits for Cities & Users

- Saves time & fuel — lower emissions
- Reduces cruising traffic and congestion
- Improves space utilization and revenue
- Digital records → fewer manual errors



Risks & Limitations

Connectivity

Requires stable internet / cellular coverage

Costs

Installation & ongoing maintenance

Reliability & Security

Redundancy, backups, and data protection needed

Mitigations: offline caching, SLA-backed connectivity, encrypted data storage

Next Steps & Recommendation

Pilot

Small district deployment · 3 months

Scale

Phase rollout · integrate enforcement

Optimize

Dynamic pricing · analytics-driven policy

Proposal: pilot with 200 sensors, operator dashboard, and public app. Budget estimate and timeline available on request.