MobilityWeave Architectural Document: Preamble

1. Application Context

Context

MobilityWeave is the AI-orchestrated core technology for MobilityCorp, a greenfield EU-headquartered mobility provider launching in 2025 with initial fleets of 500 scooters/e-bikes + 50 cars/vans per country (France, Germany, Denmark). It enables seamless multi-modal shared mobility (scooters, e-bikes, EVs, vans) via predictive routing, edge intelligence, and equitable integrations, targeting 60% EU market share by 2030 through PPPs and fractal scaling from pilots to global ecosystems. Built on microservices, federated ML (PyTorch/Flower), and IoT (MQTT/5G V2X), it federates OMF/GBFS APIs for MaaS interoperability, emphasizing resilience (95% uptime), equity (40% non-citizen coverage), and sustainability (30% emission cuts).

Problems to be Resolved

- **Vehicle Availability**: Mismatched supply-demand leads to 30% "no vehicle" complaints; lacks real-time forecasting for user needs.
- **EV Charge Depletion**: Frequent mid-trip failures (20% opex drag); no prioritized battery swaps for high-usage assets.
- **Low Repeat Usage**: 70% ad-hoc rides; insufficient habit-building for daily commutes, capping LTV at 40% below peers.

MobilityWeave resolves these via predictive rebalancing (30% utilization boost), edge ML for battery prioritization (40% fewer depletions), and mood-optimized nudges (35% repeat growth).

Personas

Persona	Description	Goals	Pain Points

Elena the Explorer	32yo tourist (e.g., Barcelona to Lyon); eco-curious, app-savvy.	Effortless cultural multi-modal loops.	Jet-lag overwhelm; fragmented apps.
Carlos Georges	37yo expat commuter (Danish in Lyon); bike enthusiast.	Reliable daily chains with hygge flow.	Weather disruptions; ad-hoc availability.
Mia the Roadtripper	40yo family mom (Miami/Orlando vacationer); budget-conscious.	Flexible one-way EV family hauls.	Long-distance sprawl; family equity barriers.
Fran the Franchisee	45yo suburban operator; B2B-focused.	Easy ops dashboards for rebalances.	Maintenance backlogs; regulatory audits.

User Flows

High-level flows design for <5s latency, fractal from edge to cloud:

1. **Booking & Routing**: User app query → Edge telemetry + GTFS fusion → AI Tapestry Builder generates mood-optimized path (e.g., Elena: AR airport-to-hotel chain) → Unlock via QR/NFC.
2. **Mid-Trip Adaptation**: IoT anomaly (e.g., low battery) → Resilience Module reroutes (Carlos: rain pivot to van) → Equity Optimizer applies subsidies → Nudge via app/voice.
3. **Usage & Feedback**: Drop-off at hub → Federated learning updates habits → Green credits for balanced usage (Mia: family loop reward) → MMF audit loop.
4. **Admin Oversight**: Franchise dashboard → Predictive heatmap → Auto-rebalance queue → PPP report export.

Business Modelling

MobilityCorp Growth Model: 10-year phased fractal rollout (greenfield capex €150M, 40% IRR by Year 3). Revenue: 50% rentals (Weave-optimized), 30% PPP concessions , 20% data/B2B subs (€2B+ annual by 2035). Impacts: 1M daily users (50/50 citizen/non-citizen), €500M externalities (congestion/health savings), 50% multimodality shift.

Phase (Years)	**Scale**	**Key Metrics**

1-2: Genesis	1.5K units/3 countries	€20M rev; 25% equity access.
3-5: Forge	15K units/10 countries	€200M annual; 30% emissions ↓.
6-10: Tapestry	100K+ units/global	€2B+ annual; 60% market share.

PBB (Product Backlog Building) Canvas Summary

Product: MobilityWeave – AI MaaS ecosystem for resilient urban flows.
Problems: Congestion gaps (30% abandonment), equity exclusion (40% underserved), digital decay (70% post-contract waste).
Expectations: Seamless chains (<2 mins handoff), adaptive AI (20% accuracy gains), long-term evolution (MMF auto-updates).
Personas: As above.
Features: AI Weave Engine (tapestries, federated learning), Tiered Hubs, Equity Toolkit, MMF Dashboard.
PBIs (Top 5 Prioritized, MoSCoW/Must, Effort in SPs):

- PBI-001: As Elena, AR trails for seamless navigation (AC: GTFS integration, <5% error; 8 SP).
- PBI-002: As Carlos, Habit Harvester for auto-chains (AC: ML post-3 trips, 95% uptime; 5 SP).
- PBI-003: As Fran, IoT predictive maintenance (AC: <10% downtime; 13 SP).
- PBI-011: As Elena, Mood-optimized routing (AC: Quiz ML, >4.5/5 satisfaction; 8 SP).
- PBI-014: As Elena, Equity subsidies for low-access zones (AC: 30% uptake; 7 SP).

Total Backlog: 30+ PBIs, 250 SP (5-6 sprints for MVP).