Cashphalt Parking Platform – Production Requirements Document (PRD)

Version: v1.8 (Final – Extension Support)
Status: Production-Ready MVP
Purpose: This document defines the complete, production-grade requirements for building the Cashphalt parking platform. It consolidates all functional, operational, and architectural decisions and serves as the single source of truth for implementation using Antigravity.

1. PRODUCT VISION

Cashphalt is a multi-tenant, production-grade parking payments and parking management platform. It enables property owners and managers to monetize parking using QR codes and SMS-initiated flows, apply dynamic pricing, and actively monitor parking operations in real time.

The platform is payment- and compliance-focused rather than enforcement-focused. Multiple concurrent parking sessions are allowed per space or lot.

2. GUIDING PRODUCTION PRINCIPLES

- Server-authoritative logic for pricing, discounts, session state, and extensions
- Immutable financial and pricing records
- Stripe webhooks as the source of truth for payment outcomes
- Strict tenant isolation across all layers
- Safe failure handling (no free or untracked parking)
- Environment parity across local, staging, and production

3. IN-SCOPE FEATURES (PRODUCTION MVP)

Included:
- Multi-tenant organizations
- Spot-based and lot-based parking allocation modes (non-exclusive)
- In-platform QR code generation for printed signage (non-rotating)
- Text-to-Park (SMS initiation → secure web payment link)
- Dynamic pricing by date, day, and time
- time based and flat pricing (30-minute increments)
- Property-level maximum booking duration (hard cap)
- Session extension capability (within max duration)
- Discount and free parking codes, vouchering system

- Stripe payments (Apple Pay + cards)
- Parking management dashboard (live operations)
- Revenue reporting and CSV exports
- Revenue split configuration (90/10, 95/5 etc.) with stripe integration for payouts.
- Email and SMS confirmations, reminders
- Observability and audit logging

Explicitly Excluded (v1):
- Refunds
- Subscriptions or permits
- Parking enforcement or capacity restriction logic
- License plate recognition or cameras
- Native mobile applications
- Offline parking sessions

4. USER ROLES & ACCESS CONTROL
Roles:
- Platform Super Admin
- Organization Admin / Property Owner / Manager
- Organization Staff (read-only)
- Customer (Driver)

All permissions are enforced server-side and scoped by organization.

5. PROPERTY CONFIGURATION
Each property must define:
- Timezone (required, authoritative)
- Parking allocation mode:
  - Spot-Based
  - Zone-Based
- Maximum booking duration in hours (required, hard cap)
- QR enabled (boolean)
- SMS enabled (boolean)

The maximum booking duration may be adjusted by admins or property owners/managers and applies to both initial bookings and extensions.

6. PARKING ALLOCATION MODES (NON-EXCLUSIVE)

Spot-Based:
- Parking sessions reference a labeled space
- Multiple concurrent sessions may exist for the same space
- No exclusivity or blocking is enforced

Zone-Based:
- Parking sessions reference the property
- No capacity limits are enforced
- Unlimited concurrent sessions allowed

7. QR CODE GENERATION (PRINTED SIGNAGE)
- QR codes are generated within Cashphalt
- QR codes are stable, non-rotating, and designed for printed signage
- One QR per space (spot-based)
- One or more QR codes per lot (lot-based)
- Download formats: PNG and SVG
- Bulk ZIP export per property
- QR codes may be disabled if a space or property is deactivated

8. DYNAMIC PRICING
Pricing Rules:
- Property-scoped
- Priority-based
- Date range, day-of-week, and time window constraints
- Overnight windows supported

Pricing Types:
- Per-hour (60-minute increments only)
- Flat rate

Pricing is evaluated server-side and locked at session creation.

9. BOOKING DURATION & EXTENSIONS
- Duration granularity: 30-minute increments
- Each property defines a maximum booking duration (hard cap)
- Customers may extend an active session as it approaches expiration
- Extensions are allowed only if the total booked duration does not exceed the property-defined maximum

- Extensions are priced using the pricing rules active at the time of extension
- Flat pricing extensions may be allowed or disallowed based on property configuration (default: allowed)

10. DISCOUNT & FREE PARKING CODES
Discount Types:
- Percentage
- Fixed amount
- Free parking (100%)

Rules:
- One code per session
- Applied after pricing calculation
- Discount codes may be applied only at initial booking (not during extensions)
- Free parking bypasses Stripe but still creates a session
- Usage limits and expiration supported

11. PARKING SESSIONS
Sessions record:
- Organization and property
- Parking space (nullable for lot-based)
- Entry method (QR or Text To Park)
- Pricing rule snapshot (immutable)
- Discount snapshot (immutable)
- Start/end times
- Total duration (hours)
- Status lifecycle: created, pending_payment, active, expired

Extensions update end_time and total duration but preserve the original pricing snapshot history.
Multiple active sessions may exist for the same space or property.

12. PAYMENTS (STRIPE)
- Stripe is the only payment processor
- Apple Pay and card supported
- No refunds in MVP
- Stripe webhooks drive state changes
- Idempotent webhook handling required

- Extensions generate additional payment intents as needed

13. PARKING MANAGEMENT DASHBOARD
The dashboard provides real-time operational visibility.

Includes:
- Property overview (total sessions, active, expiring, expired, revenue)
- Space-level views (spot-based) showing all sessions per space
- Lot-level views (lot-based) showing aggregate activity
- Visual indicators for overlapping sessions (informational only)
- Active/expired sessions table
- Filters by property, status, and entry method

The dashboard is informational only and does not enforce parking rules.

14. CUSTOMER FLOWS
QR Flow:
Scan → pricing → duration (within max) → discount (optional) → pay → confirm → extend if needed

SMS Flow:
Text keyword → receive secure link → web booking & payment → confirm → extend if needed

All payments occur via secure web pages, not SMS.

15. NOTIFICATIONS
Customers:
- Email confirmation (required)
- SMS confirmation
- Extension confirmation messages
- Expiration reminder email and SMS messages

Admins (optional):
- Daily summaries

16. SECURITY & COMPLIANCE

- Strict tenant isolation
- Non-guessable QR and SMS tokens
- Rate limiting on public endpoints
- No card data stored
- Audit logs for pricing, discount, and extension events

17. OBSERVABILITY & OPERATIONS
- Centralized logging
- Stripe webhook logs
- Error tracking
- Environment separation: local, staging, production

18. ANTIGRAVITY USAGE
- Antigravity used for development acceleration only
- All code committed to standard Git repository
- No proprietary runtime dependencies
- All logic reviewable and testable

19. ACCEPTANCE CRITERIA
- Property-level maximum booking duration enforced as a hard cap
- Session extensions allowed within maximum duration
- QR and SMS flows behave identically post-initiation
- Dynamic pricing and discounts are deterministic
- Dashboard accurately reflects overlapping sessions
- Multiple sessions per space and lot supported
- Tenant isolation verified
- Production reliability demonstrated