HORIZON PROTOCOL

Whitepaper v4.0

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A decentralised coordination network for real-world missions

Built on Base L2 | USDC Escrow | EAS Attestations
github.com/HrznLabs | x.com/HrznProtocol | farcaster.xyz/hrznprotocol

Executive Summary

Horizon is a decentralised coordination network where real-world tasks become programmable missions. It enables peer-to-peer services, economic exchange, and community governance using blockchain-based escrows, reputation attestations, and modular guild structures. Horizon provides a global layer for human coordination — a network that transforms daily interactions into structured, trust-minimised cooperation.

The protocol operates through a multi-DAO governance structure with mission execution on Base as the canonical chain. A non-custodial Horizon Service orchestrates discovery, eligibility, geospatial indexing, and user experience while users retain full sovereignty over their funds, identity, and data through encrypted User Data Vaults. Authentication and wallet creation are handled through CDP (Coinbase Developer Platform) embedded wallets with ERC-4337 smart accounts, enabling gasless onboarding for users with no prior blockchain experience.

Economic sustainability is ensured through transparent fee distribution — performers retain at least 90% of mission value, with the remaining fees split across Protocol, Labs, Resolver, and Guild treasuries. The HRZN governance token (1 billion fixed supply) powers staking-based USDC yield, on-chain governance, fee discounts, and buyback-and-burn deflation, all deployed on Base Sepolia testnet.

The first commercial vertical, iTake (food delivery), is fully operational on testnet with deployed MetaDAO/SubDAO hierarchy, demonstrating the protocol's viability as real-world infrastructure.

1. Introduction

The modern world is coordinated through centralised platforms that extract value, mediate trust, and govern interactions through opaque algorithms. Gig workers, citizens, and service providers depend on infrastructures they do not own. Horizon offers an alternative: a transparent, decentralised coordination protocol where individuals and organisations create, complete, and validate missions secured by smart contracts.

Unlike traditional platforms, Horizon operates as a protocol — providing core services (identity, mission definition, escrow, reputation, governance templates, and geospatial indexing) that enable users to build their own economic and social structures. These structures can take the form of informal peer-to-peer exchanges, specialised service guilds, or fully-fledged decentralised autonomous organisations (DAOs) that operate as real-world service providers.

2. Core Concept — Missions

At the core of Horizon lies the mission: a structured task with clear parameters, stablecoin escrow, proof-of-completion, and automated settlement. Missions can represent:

- Peer-to-peer errands
- Deliveries with geofenced validation
- Small services and tasks
- Dining interactions through iTake
- Civic tasks and community contributions

Each mission becomes an entry in a decentralised reputation graph, forming long-term social capital that is portable and user-owned. Missions are discoverable through both global feeds and location-based map views, enabling proximity-aware task matching.

3. Architectural Overview

Horizon's architecture follows a hybrid model: all mission-critical logic is executed on-chain to ensure determinism and security, while off-chain systems provide indexing, orchestration, geospatial queries, and identity support for seamless user experience.

3.1 Base — Canonical Mission Engine

In Horizon v4.0, the Base blockchain serves as the exclusive execution environment for all mission logic. All mission-related actions — creation, acceptance, escrow, submission, completion, cancellation, and dispute signalling — occur within audited smart contracts deployed across three waves:

Core Contracts (v2.2, December 2025):

- **MissionFactory:** EIP-1167 clone factory for mission escrow instances with location parameters and reputation gating
- **MissionEscrow:** Per-mission escrow with full lifecycle state machine, DDR handling, and geofence compliance
- **PaymentRouter:** Deterministic fee routing with inclusive fee model guaranteeing performers >= 90%
- **GuildFactory:** Clone factory for Guild/MetaDAO/SubDAO creation
- **GuildDAO:** Guild governance with MetaDAO/SubDAO hierarchy and eligibility rules
- **ReputationAttestations:** On-chain 1-5 star ratings with IPFS comment hashes
- **DisputeResolver:** DDR-based dispute resolution with appeal mechanism and configurable timeouts
- **HorizonAchievements:** ERC-721 NFTs with soulbound support, batch minting, and XP rewards

iTake Vertical (February 2026):

- **DeliveryMissionFactory:** Clone factory for delivery-specific escrows
- **DeliveryEscrow:** Multi-stop delivery with GPS tracking, tipping, and package handling
- **DeliveriesDAO:** Insurance pool for courier protection
- **ReputationOracle:** Off-chain composite scoring with on-chain relay, five tiers (0-1000)

3.2 Horizon Service — Non-Custodial Orchestration

Horizon Service is a modular monolith comprising 37 NestJS modules with 40 database models (PostgreSQL + PostGIS), organised into functional groups with clear interface boundaries. It handles:

- Indexing mission events from Base in real time
- Constructing mission feeds with weighted ranking (reward, urgency, distance, XP match, reputation, preference)
- Evaluating eligibility (XP level, NFTs, guild membership, reputation score, builder score)
- Managing the 25-level XP progression system
- Operating the composite reputation oracle (reliability, quality, speed, volume)
- Processing geospatial queries via PostGIS (ST_DWithin, ST_Distance, ST_Contains)
- Validating geofenced mission acceptance and proof-of-presence
- Real-time WebSocket updates via Socket.IO and Redis Pub/Sub
- Managing challenges, streaks, surge windows, and collectible drops
- Authenticating users via SIWE, Email OTP, Google, and Apple Sign-In
- Encrypting and storing User Data Vaults (AES-256-GCM)
- Generating NFT metadata and IPFS pinning

Critical constraint: Horizon Service never controls user funds and cannot alter mission state. Its trust model is strictly non-custodial.

3.3 Map Layer — Location-Based Coordination

The Map Layer enables location-aware mission discovery and geofenced task validation:

- **PostGIS Backend:** PostgreSQL spatial indexing with geography(Point, 4326) type
- **Mapbox Integration:** Client-side rendering with offline map support
- **WebSocket Architecture:** Real-time mission and performer location updates via Socket.IO and Redis Pub/Sub with geohash-based area subscriptions
- **Geofence Validation:** Server-side PostGIS validation of performer proximity (configurable 50m-5km radius, default 500m, with grace period)
- **Marker Clustering:** Supercluster algorithm for dense mission areas (triggered at 100+ markers)
- **Privacy Precision:** Coordinate obfuscation with four levels (exact, block, neighbourhood, approximate)

Location data is encrypted at rest, retention-limited (30 days), and subject to explicit user opt-in for live tracking features.

3.4 Client Applications

- **Mobile App:** React Native 0.81 + Expo 54 with 57+ screens across 5 tabs (Explore, Missions, Guilds, Map, Profile), featuring full iTake customer and courier flows, gamification screens, dispute management, and comprehensive settings
- **Dashboard:** Next.js internal operations tool with 12 pages (orders, menu, analytics, reviews, payouts, staff, promotions, governance, token economics, settings)
- **SDK:** TypeScript SDK (v0.1.0) with 8 contract ABIs, typed constants, network helpers, and utility functions for external developer integration

3.5 Six-Layer Architecture

- **Blockchain Layer:** Mission escrows, payments, attestations, governance, token economics (Base canonical)
- **Protocol Layer:** Contract suite for mission lifecycle, guild formation, dispute handling, delivery escrow
- **Data Layer:** IPFS metadata, indexed events, encrypted User Data Vaults, geospatial indexes
- **Geospatial Layer:** PostGIS, WebSocket real-time updates, marker clustering, geofence validation
- **Client Layer:** Mobile app, restaurant dashboard, guild admin panels, map views
- **Vertical Modules:** iTake (food delivery), ridesDAO (ride-sharing, design phase), BuildDao (construction, conceptual)

4. Mission Lifecycle

The mission lifecycle is fully governed by transparent on-chain logic with deterministic state transitions:

1. **Creation:** Poster defines mission parameters (including optional location, geofence, and reputation minimums) and deposits USDC or EURC reward into escrow. The MissionFactory enforces protocol-level auto-gating: missions >= 500 USDC require a minimum reputation score of 200.

2. **Discovery:** Missions appear in the global feed (weighted ranking algorithm), optionally on curated Guild Boards, and in location-based map views for nearby performers.

3. **Acceptance:** Eligible performer accepts mission (based on XP level, reputation tier, guild membership, and location proximity); if geofenced, performer must be within the defined radius; escrow locks.

4. **Execution:** Performer completes task and submits proof (photo, QR, NFC tap, geolocation, structured data); location-based missions validate geofence compliance via PostGIS.

5. **Verification:** Poster validates proof; approval triggers settlement.

6. **Settlement:** PaymentRouter distributes funds — performer receives at least 90%, with protocol fees carved from the gross amount.

7. **Reputation:** Both parties rate each other (simultaneous reveal); XP awarded; reputation oracle updated; EAS attestation created (off-chain by default, optionally on-chain).

8. **Disputes:** If raised, both parties deposit DDR (5%); ResolversDAO-governed resolution with 48-hour appeal window; loser pays LPP (2%).

4.1 Mission States

Missions transition through: None -> Open -> Accepted -> Submitted -> Completed/Cancelled/Disputed. Each transition is enforced by MissionEscrow with strict invariants (reward immutable, performer immutable after acceptance, geofence compliance enforced).

4.2 Multi-Token Support

The protocol accepts both USDC and EURC as payment tokens. The PaymentRouter maintains a whitelist of accepted tokens, and MissionFactory accepts a `paymentToken` parameter during creation.

5. Economic Model

Horizon's economic model is built on the principle that coordination should be fair and financially transparent.

5.1 Inclusive Fee Structure

All fees are carved from the gross mission reward using an inclusive model with a guaranteed performer floor:

Fee	Rate	Recipient
Protocol Fee	2.5%	Protocol Treasury
Labs Fee	2.5%	Labs Treasury
Resolver Fee	2.0%	Resolver Treasury
MetaDAO Fee	0-1.0%	MetaDAO Treasury (if applicable)
SubDAO Fee	0-2.0%	SubDAO Treasury (if applicable)
Performer	**>= 90%**	**Mission Performer**
Maximum Total Fees	**10%**	

The performer floor of 90% is enforced on-chain. Total fees can never exceed 10% of the gross reward.

5.2 Fee Settlement Paths

PaymentRouter provides four settlement functions:

Function	Use Case
`settlePayment()`	Solo missions (no guild) — 7% fixed fees
`settlePaymentWithGuildFee()`	Guild missions — 7% fixed + guild fee (capped)
`settlePaymentWithHierarchy()`	Vertical missions (MetaDAO/SubDAO) — 7% fixed + hierarchy fees (max 10% total)
`settleRestaurantOrder()`	Restaurant orders — hierarchy with restaurant-specific routing

5.4 Dynamic Dispute Reserve (DDR)

Alongside the reward, the Poster may be required to deposit a Dynamic Dispute Reserve (DDR = 5% of reward). The DDR is never charged unless a dispute occurs. If the mission completes normally, the full DDR is refunded.

5.5 Loser-Pays Penalty (LPP)

If a dispute occurs, a Loser-Pays Penalty of 2% is applied to the losing party. DDR pool distribution: 70% to winner, 20% to resolver, 10% to protocol.

5.6 DDR Timeout Protection

To prevent fund-freeze attacks, DDR deposits have configurable timeouts (default 24 hours, range 12h-7d). If a party fails to deposit DDR within the timeout, the dispute auto-resolves in favour of the depositing party. Guild-level timeout overrides are supported.

6. Reputation System

6.1 Composite Reputation Oracle

Reputation scores are computed from four weighted components, producing a 0-1000 composite score:

Component	Measurement
Reliability	Completion rate: completed / (completed + cancelled)
Quality	Average rating normalised to 0-1
Speed	On-time completion rate
Volume	Mission count (logarithmic curve)

Five Tiers:

Tier	Score Range
Newcomer	0-199
Bronze	200-399
Silver	400-599
Gold	600-799
Diamond	800-1000

Reputation is computed off-chain and relayed on-chain via the ReputationOracle contract (batch update support for gas efficiency). Scores are available per-guild and globally.

6.2 XP as Contribution Indicator — 25-Level Progression

XP is earned by completing missions, contributing to guild operations, engaging in disputes, and achieving milestones. XP is non-transferable and non-speculative. The system uses an exponential curve with ~18% growth per level:

Level	XP Required	Title	Unlock
1	0	Newcomer	Basic access
5	625	Explorer	Join guilds
10	3,900	Adventurer	Create guilds
13	7,800	Navigator	Curator eligible
15	11,700	Pioneer	Resolver eligible
25	65,200+	Legend	Maximum tier

6.3 Gamification Framework

Challenges: Guild-scoped challenges with four types (VOLUME, SPEED, RATING, CATEGORY). XP rewards and optional achievement NFT unlock on completion.

Streaks: Consecutive-day activity tracking with escalating XP bonuses (3-6 days +5 XP, 7-13 days +10 XP, 14-29 days +15 XP, 30+ days +25 XP). One-time streak protection mechanic that recharges after 5 missions.

Surge Windows: Scheduled and reactive XP multipliers, scoped by region. Reactive surges trigger dynamically based on supply/demand metrics.

Collectible Drops: Time-limited NFT drops with supply limits and multi-criteria eligibility (XP level, reputation tier, guild membership, required achievements).

6.4 NFTs and Achievements

- **Soulbound Achievements (ERC-721):** Non-transferable proof of accomplishment across five tiers (Bronze through Diamond). Categories: Mission milestones, Performance, Guild, Seasonal, Special. Each achievement type carries an XP reward.
- **Tradeable Collectibles:** Cosmetic NFTs with limited supply, eligibility criteria, and time-windowed drops.

6.5 EAS Attestations

Mission outcomes generate Ethereum Attestation Service records with four schema types: MISSION_COMPLETED, DISPUTE_RESOLVED, GUILD_MEMBERSHIP, and SKILL_VERIFIED. Attestations are off-chain by default (gasless), with optional on-chain anchoring. These form portable, verifiable social capital.

7. Multi-DAO Governance

Horizon governance is distributed across specialised DAOs with on-chain governance powered by the HorizonGovernor contract.

7.1 On-Chain Governance (HorizonGovernor)

Parameter	Value
Framework	OpenZeppelin Governor v5
Voting Power	sHRZN (staked HRZN via ERC20Votes)
Voting Delay	1 day
Voting Period	5 days
Proposal Threshold	100,000 HRZN
Quorum	4% of total supply
Timelock	2-day minimum delay

7.2 ProtocolDAO

Governs system-wide parameters via HorizonGovernor proposals:

- Protocol fee rates and routing configuration
- Contract upgrade permissions
- XP/NFT reward template approval
- Protocol Treasury management
- Geospatial feature parameters

7.3 ResolversDAO

Governs dispute resolution independently:

- Resolver registry maintenance and quality standards
- DDR/LPP parameter configuration
- Slashing rules and neutrality enforcement

7.4 GuildDAOs

Govern mission curation and community coordination:

- Curate missions through Guild Boards (including location-based curation)
- Define eligibility rules (XP, NFTs, reputation, location, sHRZN stake)

- Manage guild treasuries and define operating zones (circle and polygon geofencing)
- Assign curator and officer roles
- Four proposal types: Zone, Governance, Feature, Treasury

7.5 MetaDAO/SubDAO Hierarchy

Guilds support a two-tier hierarchy enabling vertical-specific governance:

- **MetaDAO:** Vertical-level DAO (e.g., iTakeMetaDAO for food delivery). Fee: 0-1%.
- **SubDAO:** Business-level DAO under a MetaDAO (e.g., AtobaDAO restaurant). Fee: 0-2%.
- Fee flow: SubDAO + MetaDAO fees are deducted from the performer share within the 10% total cap.

7.6 Horizon Labs DAO

Ensures long-term sustainability: protocol development, security audits, reference clients, SDKs, vertical modules, and infrastructure operations.

8. Identity & Onboarding

8.1 CDP Embedded Wallets

Horizon uses Coinbase Developer Platform (CDP) embedded wallets for zero-friction onboarding:

1. User signs up with email, Apple, or Google
2. CDP creates an embedded ERC-4337 smart account (Coinbase Smart Wallet) — no seed phrase
3. All on-chain interactions go through this smart account
4. Paymaster infrastructure sponsors gas for new user transactions

Authentication methods: Email OTP (6-digit, 10-minute expiry), Apple Sign-In, Google OAuth, and SIWE (Sign-In With Ethereum, EIP-4361 compliant) for existing wallet holders.

8.2 Gasless Onboarding

The smart wallet architecture is compatible with ERC-4337 Paymasters. When active, the protocol pays gas for users' initial transactions, enabling a fully gasless onboarding experience. Users see no gas fees — they can accept missions, submit work, and claim rewards without holding ETH. As users earn USDC, they may optionally fund their own gas.

All protocol contracts (MissionEscrow, PaymentRouter, etc.) are compatible with smart account callers. ERC20Permit on HRZN enables gasless token approvals.

8.3 User Data Vaults

All user-generated data is stored inside encrypted User Data Vaults (AES-256-GCM, PBKDF2 key derivation). Users maintain full ownership and may export data at any time, grant permissioned access with granular controls, and revoke permissions. Location data is subject to 30-day retention limits. GDPR-compliant export in JSON/CSV formats.

8.4 Identity Resolution

The identity module resolves ENS names (Ethereum mainnet) and Basenames (Base L2), supports multi-wallet linking with signature verification, and caches identity data with 24-hour TTL.

9. Security Model

9.1 Smart Contract Security

- Deterministic mission state transitions with strict invariants
- Reentrancy guards and role-based access control (OpenZeppelin)
- USDC/EURC-only escrow to minimise volatility
- Slither and Aderyn static analysis in CI pipeline (0 high, 0 medium findings)
- Foundry fuzz testing at 10,000 runs per test
- PauseRegistry: global and per-contract pause with circuit breaker (auto-pauses if >30% of balance drains in one transaction)

9.2 Device Attestation

- **Android Play Integrity API:** Validates app authenticity and device integrity
- **iOS DeviceCheck:** Tamper-resistant device validation
- **Web-based Attestation:** Passkeys and WebAuth

9.3 Location Validation

- GPS sanity checks against historical performer movement patterns
- Geofenced mission acceptance with configurable grace periods (default 100m)

- QR-code scans for proof-of-presence
- NFC tap-based proof-of-presence for iTake restaurants
- Movement pattern analysis for anomaly detection

9.4 Non-Custodial Guarantee

Horizon Service cannot modify mission state, move funds, override DAOs, or access user data without permission. Location queries cannot profile or track users without explicit consent.

10. Vertical Example — iTake (Deployed)

iTake is a fully operational food delivery vertical deployed on Base Sepolia, demonstrating Horizon's commercial extensibility.

10.1 Deployed DAO Hierarchy

Entity	Type	Fee
iTakeMetaDAO	MetaDAO	0.5%
AtobaDAO	SubDAO (Portuguese cuisine)	2%
LisboaCafe	SubDAO (cafe)	2.5%

10.2 Order State Machine

10.3 Fee Distribution (Validated)

For a EUR 15 delivery:

Recipient	Rate	Amount
Courier (performer)	90.5%	EUR 13.58
SubDAO	2%	EUR 0.30
MetaDAO	0.5%	EUR 0.075
Protocol Treasury	2.5%	EUR 0.375
Resolver	2%	EUR 0.30

10.4 Features

- Full menu system with dietary tags, allergens, and customisations
- Dynamic delivery fees with demand multiplier (1x-2x)
- Real-time GPS tracking via WebSocket + Redis Pub/Sub (10-second update interval)
- DeliveriesDAO insurance pool for courier protection
- EURC and USDC payment support
- Courier assignment and delivery tracking with GPS audit trail
- 9 mobile screens (restaurant browser, menu, cart, checkout, order tracking, courier dashboard, available orders, active deliveries, courier onboarding)
- Restaurant dashboard for order management, menu CRUD, payouts, and analytics

11. Roadmap

Phase 1 — Foundation (COMPLETE, Q1 2026)

- **M1 (Feb 17):** Contract security hardening. 8 core contracts deployed on Base Sepolia. Slither/Aderyn CI pipeline. PauseRegistry circuit breaker. 57+ mobile screens.
- **M2 (Feb 18):** DisputeResolver, EAS attestations, composite reputation oracle, gamification framework (challenges, streaks, surge windows, collectible drops), 25-level XP system, CDP embedded wallets.
- **M3 (Feb 19):** iTake food delivery vertical — full E2E on testnet. iTakeMetaDAO + 2 SubDAOs deployed. Delivery escrow, insurance pool, real-time GPS tracking.
- **Mpc (Feb 20):** Mobile platform completeness — all 57+ screens, guild join flow.

Phase 2 — Economics + Growth (IN PROGRESS, Q1 2026)

- **M4:** Grant applications (7 drafted across Base, Thrive, Arbitrum, Circle, Questbook). Growth templates and onboarding guides for Portugal beachhead.
- **M5 (Feb 21):** HRZN token stack deployed to Base Sepolia — governance, staking, fee distribution, buyback-and-burn. 8 token contracts.

Phase 3 — Seasons + Audit (PLANNED, Q2 2026)

- M6: Seasonal progression system with per-season XP multipliers and leaderboard resets
- Professional smart contract audit (critical path to mainnet; budget $18-22K)
- SDK v1.1.0 with expanded documentation

Phase 4 — Mainnet Launch (PLANNED, Q2-Q3 2026)

- Gnosis Safe multisig treasuries (Protocol DAO 4/7, Resolvers DAO 3/5, Labs DAO 3/5)
- Mainnet contract deployment on Base
- Token Generation Event: HorizonToken deployed, vesting schedules activated
- Retroactive airdrop (Month 3 post-TGE)

Phase 5 — Liquidity + Second Vertical (PLANNED, Q3-Q4 2026)

- Optional LBP on Fjord Foundry
- Protocol-Owned Liquidity on Aerodrome with veAERO strategy
- ridesDAO vertical development (comprehensive design analysis complete)
- Cross-chain deployment evaluation (Arbitrum)

Phase 6 — Scale (PLANNED, 2027)

- BuildDao vertical (construction/maintenance)
- Full DAO governance handoff (Month 12+ post-TGE)
- Additional verticals
- Traditional payment integration
- Decentralisation of Horizon Service (community indexers)

12. Conclusion

Horizon provides a foundation for a new kind of digital society: one where coordination is transparent, performers retain at least 90% of the value they create, disputes are self-funded by participating parties, location-based services respect user privacy, and users retain sovereignty over their identity, reputation, and data.

The protocol has moved beyond theory. With 20+ smart contracts deployed on Base Sepolia, a fully operational food delivery vertical, a governance token with staking and buyback economics, and a mobile application with 57+ screens, Horizon demonstrates that decentralised coordination infrastructure can serve real-world commerce today.

Through missions, guilds, multi-DAO governance, token-aligned incentives, and geospatial coordination, Horizon weaves together a global network of meaningful cooperation — where every task completed builds portable reputation, every fee is transparent, and every participant has a voice in governance.