

KRYONIS SOVEREIGN SYSTEMS LIMITED

The Bio-Attestation Control Plane

Bridging Autonomous Agents and Biological Capital

BCCS Protocol Whitepaper v1.2

March 2026

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Executive Summary

The agentic economy is accelerating. Autonomous AI agents are gaining financial identity - wallets, payment rails, policy engines, and delegated authority to transact independently. Coinbase, Visa, Stripe, Skyfire, and dozens of infrastructure providers are building the financial plumbing for machine-to-machine commerce.

Yet this entire infrastructure assumes a digital-to-digital world. The majority of real economic value on Earth, however, is biological. Forests, permafrost, soil systems, genetic resources, agricultural commodities, marine ecosystems, and biomass flows represent trillions in unrealized capital. These assets are not binary. They are analog, probabilistic, and thermodynamically unstable - governed by entropy, not code.

No infrastructure currently exists to let autonomous agents verify, value, and transact biological assets with cryptographic confidence. This is the Thermodynamic Oracle Problem: how does deterministic code trust entropic reality?

KRYONIS has developed the Bio-Capital Classification Standard (BCCS) - a verification, policy, and state-transition protocol that bridges autonomous agents and biological capital. BCCS introduces the Bio-Asset Identification Number (BAIN ID); an 8-state lifecycle model tracking biological assets through their full thermodynamic journey; Proof-of-Physical-State (PoPS) DePIN consensus; and a machine-readable policy engine governing agent permissions.

BCCS is not a marketplace, a token, or a wallet. It is the mandatory control plane - the layer that makes biological capital legible to autonomous systems.

1. The Thermodynamic Oracle Problem

Every major economic platform shift has required solving a trust problem specific to its medium. The internet economy solved trust through SSL cryptography. The mobile economy solved friction through biometric tokenization. The agentic economy is solving delegation - proving what a machine is authorized to do on behalf of a principal.

But all solutions share one assumption: the asset being transacted is digitally deterministic. Biological assets violate this assumption fundamentally. A forest sequesters carbon at varying rates. Permafrost stores methane in thermodynamic states shifting across decades. Soil microbiomes degrade or regenerate in ways resisting snapshot measurement.

The current bridge is the "PDF Oracle" - a human auditor produces a static certificate treated as ground truth for years. Four fatal flaws: latency (weeks to months), cost (thousands per audit), corruptibility (auditors can be influenced), and staleness (fiction the moment state shifts). For autonomous agents requiring cryptographic certainty, architecturally incompatible.

1.1 Why Current Infrastructure Cannot Bridge This Gap

Agent wallets (Coinbase, Turnkey) secure keys but cannot ingest biological data. Payment rails (Skyfire, Stripe) route value but have no physical verification layer. Oracle networks (Chainlink) deliver data feeds but a sensor reading is not attestation. The missing layer is a control plane that classifies biological assets, assigns identifiers, tracks state transitions, and exposes machine-readable policy objects.

2. The Bio-Attestation Control Plane

BCCS is a verification, policy, and state-transition protocol that sits between biological reality and digital infrastructure as the translation layer neither side provides.

2.1 Architecture Overview

Component	Function
BAIN ID	Unique 21-character immutable identifier encoding jurisdiction, asset class, registration date, and sequence. State is never embedded in the identifier.
8-State Lifecycle	Dynamic model: Registered, Active, Suspended, Migrating, Dormant, Degraded, Depleted, Archived. Captures full thermodynamic reality including seasonal cycles, spatial operations, and terminal destruction.
PoPS Consensus	Proof-of-Physical-State: decentralized Validator Nodes cross-reference Oracle claims against satellite, thermal, and research data. Backed by \$BQRY staking and algorithmic slashing.
Policy Engine	Machine-readable authorization: permitted actions, required verification level, counterparty constraints, escalation triggers, and liability allocation per asset state.
Interop Layer	Standard API for agent wallets, settlement systems, RWA platforms, treasury tools, sovereign registries, and insurance underwriters.

3. BAIN ID - Bio-Asset Identification Number

Every financial system requires a canonical identifier. Equities have ISIN. Bank transfers have SWIFT/BIC. Biological assets have none. BAIN ID fills this void. A 21-character immutable string encoding jurisdiction, asset class, registration date, and sequence. The identifier never changes - state is a property, not identity. Spatial operations (Split/Merge) create child IDs with inherited lineage.

3.1 Asset Classification Taxonomy

Seven canonical classes: Forest Carbon Systems (FRCS), Permafrost Reserves (PFRS), Soil Microbiome Systems (SOIL), Marine Ecosystems (MARE), Agricultural Production (AGRI), Genetic/Biodiversity Resources (GENE), and Biomass Energy Flows (BIOM). Each has defined measurement parameters and state-transition rules.

4. The 8-State Lifecycle Model

Digital assets have two states: exist or not. Biological assets exist on a thermodynamic continuum and can be destroyed. The BCCS 8-state model captures this as a formal state machine.

Code	State	Definition	Agent Permission
01	Registered	BAIN ID assigned. Class documented.	Informational queries only.
02	Active	Verified. PoPS producing attestation.	Full transactions. Collateral. Securitization.
03	Suspended	Anomaly detected. Investigation.	Freeze. Re-verification required.
04	Migrating	Physical transition. Split/Merge.	Read-only until complete.
05	Dormant	Seasonal low-activity. Reduced monitoring.	Restricted. No new origination.
06	Degraded	Below viability. Recovery protocol.	Emergency only. Positions flagged.
07	Depleted	Irrecoverable destruction. Terminal.	No action. Historical record only.
08	Archived	Clean exit. Data preserved.	Read-only. BAIN ID retired.

The Degraded and Depleted states are the critical innovations. In legacy systems, a carbon credit maintains face value even if the forest burned. In BCCS, degradation triggers automatic enforcement. If irrecoverably destroyed, the asset transitions to Depleted - terminal, no further economic activity.

The entropic ledger principle: biological tokens must degrade unless continuous verification confirms their state, and must die when the biology dies.

5. Proof-of-Physical-State (PoPS)

BCCS introduces a novel DePIN consensus mechanism where decentralized Validator Nodes algorithmically cross-reference Oracle claims against independent data streams.

5.1 Three-Tier Verification

Remote sensing (satellite, SAR) for macro monitoring. Sensor networks (soil spectrometers, bioacoustic arrays, eDNA) for continuous meso-level data. Accredited physical inspectors for ground-truth. No single tier is sufficient. BCCS requires multimodal triangulation that detects inconsistencies and triggers escalation.

5.2 Cryptoeconomic Security

PoPS is secured through \$BQRY on Base. Oracles stake \$BQRY to submit data - no fiat fees. Fraudulent data triggers algorithmic slashing. No single node, data source, or agent can corrupt the biological record.

5.3 Scalability Through Existing Networks

The model accredits existing scientific networks rather than building from scratch. Founding Oracles are subsidized through the Ecosystem Grant treasury (20% of \$BQRY supply), removing all fiat-fee friction from institutional onboarding.

6. The Policy Engine

The policy engine answers: "Am I permitted to do this, with this asset, in this state, under these conditions?" Policy objects define permitted actions, required verification level, counterparty constraints, escalation triggers, and liability allocation. Agents receive a complete policy envelope with every state query.

6.1 Why Policy Is the Moat

In the agentic economy, policy infrastructure captures the most value. Wallets are containers. Payment rails are commoditized. The policy layer becomes mandatory once real liability is at stake. For biological capital, stakes are orders of magnitude higher than digital transactions.

7. Integration with the Agentic Economy

Infrastructure	BCCS Integration
Agent Wallets	Query state and policy before executing bio-asset transactions. Enforce BCCS policy as pre-transaction gate.
Payment Rails	Verify BAIN ID and state before clearing. Suspended/Degraded triggers automatic settlement freeze.
Oracle Networks	Existing providers serve as remote sensing tier feeding data into BCCS state evaluation.
Treasury Systems	Integrate state feeds for bio-asset portfolio valuation and compliance reporting.
Insurance/Reinsurance	Parametric products trigger on state transitions. Degradation auto-initiates claims.
Sovereign Registries	Adopt BCCS as classification and verification standard for national biological capital.

8. Protocol Economics: \$BQRY Token

Deployed on Base (Coinbase L2). Total supply: 1 Billion \$BQRY, hard-capped, ERC-20. Three utility pillars: Oracle staking (supply locked), algorithmic slashing (supply burned), agentic gas (continuous demand). Triple-sink mechanism drives structural deflation.

8.1 Capital Formation

Genesis Validator License Sale: tiered ERC-721 NFTs on Base. License holders operate PoPS nodes and earn 45% of emissions. Alpha tier Q3 2026 at \$1,000 USDC. Target: \$20M+.

8.2 Distribution

Allocation	Share	Vesting
Validator Node Emissions	45%	6-year halving schedule. No cliff.
Ecosystem & Oracle Grants	20%	10% at TGE. 90% milestone-locked.
Core Team & Contributors	15%	12-month cliff. 36-month linear.
Strategic Backers (VC)	12%	6-month cliff. 24-month linear.
Public Sale & Liquidity	8%	100% at TGE.

9. Strategic Context

9.1 The Empty Intersection

The agent economy (Coinbase, Skyfire, Turnkey, Visa, Stripe) has no biological verification. Natural capital initiatives (Open Forest Protocol, Chainlink Climate Oracles) have no agent integration. The intersection is structurally empty.

9.2 Why Now

Agent infrastructure decisions made in 2026 will be difficult to reverse. Bioeconomy policy is accelerating (EU Biotech Act, sovereign commitments). Reinsurers lack real-time ground-truth data for biological risk.

9.3 Competitive Landscape

No entity occupies the bio-attestation control plane. Adjacent: Chainlink (feeds, not attestation), Open Forest Protocol (MRV, not agent-integrated), Planet Labs (sensing, not policy), Toucan/KlimaDAO (tokenization, not verification). BCCS builds the layer they all need.

10. Roadmap

Phase	Timeline	Deliverables
Foundation	Q2 2026	BAIN ID spec. 8-state model. API v1.0. Founding Oracle partnerships via Ecosystem Grants. Base testnet.
Genesis	Q3 2026	Validator License Sale: Alpha/Beta. First 100 BAIN IDs. AI verification agent v1. Partnership framework.
Launch	Q4 2026	TGE on Base. Gamma/Delta tiers. PoPS v1 mainnet. Bioclearing v1. First data licensing.

Scale	2027	Epsilon tier. Ethereum bridge. Governance. 1,000+ BAIN IDs. Oracle networks. Insurance integration.
Standard	2028+	Reference standard for bio-attestation. Multi-jurisdictional. Deflationary Equilibrium.

11. The Mandate

The agentic economy will not remain digital-only. Autonomous systems will inevitably interact with biological capital. The question is not whether, but whether with a trusted standard or ad hoc approximations.

The first infrastructure provider to build a verified, agent-operated pipeline for biological assets will capture a foundational position in what could become a multi-trillion dollar bioeconomy. That is the position KRYONIS intends to hold.

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