KRYONIS SOVEREIGN SYSTEMS LIMITED

BAIN ID

Technical Specification

Bio-Asset Identification Number

Schema, Format, and Protocol Rules

Biological Computing Control Standard (BCCS) — Document 02

Version 2.0 | April 2026

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1. Purpose and Scope

This document defines the formal specification for the Bio-Asset Identification Number (BAIN ID) — the canonical identifier system for biological assets within the BCCS protocol. BAIN ID serves the same structural function for biological capital that ISIN serves for securities, SWIFT/BIC for bank routing, and ISO 6346 for shipping containers.

BAIN ID is not a transferable digital asset. It is a protocol-level reference key — a structured, machine-readable string that uniquely links a physical biological asset to its digital state record, verification history, and economic identity within any system that implements the BCCS protocol. The on-chain registry entry on Base serves as the cryptographic anchor for each BAIN ID.

2. BAIN ID Format

A BAIN ID is a fixed-structure alphanumeric string of 21 characters. A BAIN ID is fully immutable once assigned. Identity is permanent; state is dynamic.

2.1 Structure

Segment	Length	Name	Description	Example
1	3	**Region**	ISO 3166-1 alpha-3 country code	BRA
2	2	**Asset Class**	BCCS biological taxonomy code	TF
3	12	**Unique ID**	Cryptographic hash (lowercase hex)	7f3a9c2b1e4d
4	4	**State Checksum**	Verification hash of last confirmed state	A1C7

`BRA-TF-7f3a9c2b1e4d-A1C7`

Display format uses hyphens as separators. Canonical machine form is 21 contiguous characters: BRATF7f3a9c2b1e4dA1C7. Systems must accept both forms.

2.2 Example BAIN IDs

BAIN ID	Reading
BRA-TF-7f3a9c2b1e4d-A1C7	Brazil, Tropical Forest, verified stable
CAN-PF-8b2e4f1a9c3d-F2E8	Canada, Permafrost Reserve, verified stable
NOR-ME-3d7c1e9f4b2a-9B3D	Norway, Marine Ecosystem, verified growing
IDN-SM-5a9d2c7e1f3b-D4A6	Indonesia, Soil Microbiome, active monitoring
FIN-TF-1c4b8e3a7d2f-7E1C	Finland, Temperate Forest, dormant (seasonal)

2.3 Immutability Guarantee

BAIN IDs are strictly immutable. Once assigned, the first three segments (Region, Asset Class, Unique ID) never change. The State Checksum updates with each verified state transition. An asset’s current lifecycle state, confidence score, and permissions are properties of the asset record, queried through the BCCS API.

3. Asset Classification Taxonomy

The BCCS asset classification uses a 2-character code identifying the biological asset class:

Code	Asset Class	Description
TF	Tropical/Temperate Forest	Standing forest assessed for carbon sequestration, biodiversity, ecosystem services
PF	Permafrost Reserve	Permafrost formations assessed for methane and carbon storage stability
SM	Soil Microbiome	Soil systems assessed for organic carbon and microbial health
ME	Marine Ecosystem	Coastal and open-water ecosystems: mangroves, seagrass, coral, kelp
AG	Agricultural System	Managed agricultural land assessed for sustainable yield and soil health
GR	Genetic Resource	Genetic material, seed banks, microbial libraries, biodiversity repositories
BM	Biomass Energy	Biomass production systems assessed for energy yield and emissions

New asset classes may be added through BCCS protocol governance. Each requires a unique 2-character code, formal definition, and verification requirements.

4. The 8-State Lifecycle Model

Code	State	Description
01	**Unverified**	Asset identified and BAIN ID assigned on-chain. No verification data yet.
02	**Verified-Stable**	Verified and within expected biological parameters. Monitoring active.
03	**Verified-Growing**	Verified with positive trajectory. Biomass/health metrics improving.
04	**Verified-Declining**	Verified with negative trajectory. Degradation detected but recoverable.
05	**Verified-Critical**	Below minimum viability threshold. Urgent intervention indicated.
06	**Verified-Dormant**	Natural low-activity period (seasonal). Monitoring at reduced cadence.
07	**Verified-Transitioning**	Spatial operation in progress (Split/Merge between jurisdictions).
08	**Decommissioned**	Terminal state. Irrecoverable destruction or clean protocol exit. Archived.

4.1 State Transition Rules

Every state transition requires consensus from at least 2 of 3 verification tiers (satellite, ground sensor, physical inspection). Transitions have a minimum evidence threshold (configurable per asset class), a challenge period (validators can dispute with counter-evidence), and a finality period. The State Checksum in the BAIN ID updates with each confirmed transition.

4.2 State Decay Rule

Biological assets are entropic. Active assets must be re-verified within a defined validity window. If not re-verified, the asset transitions to Unverified automatically:

Asset Class	Re-verification Window	Decay Transition
TF (Forest)	12 months	Verified → Unverified
PF (Permafrost)	24 months	Verified → Unverified
SM (Soil)	6 months	Verified → Unverified
ME (Marine)	12 months	Verified → Unverified
AG (Agriculture)	6 months	Verified → Unverified
GR (Genetic)	36 months	Verified → Unverified
BM (Biomass)	6 months	Verified → Unverified

5. API Query Schema

Endpoint	Method	Description
/bain/{id}/state	GET	Current lifecycle state, confidence, last verification, decay deadline
/bain/{id}/history	GET	Full state-transition history with timestamps and evidence hashes
/bain/{id}/verify	POST	Submit verification claim from accredited oracle. Requires evidence.
/bain/{id}/lineage	GET	Spatial lineage: parent, children, split/merge events

/bain/register	POST	Register new biological asset and assign BAIN ID
/bain/{id}/split	POST	Execute spatial split. Retire parent, create children.
/bain/merge	POST	Execute spatial merge. Retire sources, create parent.
/bain/query	POST	Batch query: state for multiple BAIN IDs in single request

All queries are priced in $BCCS. Free tier available for testnet and academic research.

6. Spatial Operations

Split: when a biological asset physically divides, the parent BAIN ID transitions to Verified-Transitioning, child BAIN IDs are issued, and the parent moves to Decommissioned. Each child inherits verification history up to the split date.

Merge: when adjacent assets are consolidated, source BAIN IDs transition to Verified-Transitioning, a new parent BAIN ID is issued, and sources are Decommissioned. All spatial operations create an immutable lineage chain.

7. Validation Rules

Rule	Check	Failure Action
Format	Matches 3+2+12+4 = 21 character pattern	Reject as malformed
Region	Valid ISO 3166-1 alpha-3 code	Reject as invalid region
Asset Class	Registered BCCS 2-char code	Reject as unrecognized
Unique ID	12 lowercase hex characters	Reject as invalid ID
Checksum	4 uppercase alphanumeric characters	Reject as invalid checksum
Terminal	Asset not Decommissioned (08)	Block transaction

8. Governance and Ownership

The BAIN ID specification is proprietary intellectual property of KRYONIS Sovereign Systems Limited, Hong Kong. During the foundational phase, taxonomy governance, registrar authorization, and version control are managed by KRYONIS.

The governance roadmap includes migration to a multi-stakeholder consortium model once the specification reaches maturity and the verification network is operational. This transition establishes an independent standards body with representation from accredited oracles, institutional adopters, and sovereign registries. Backward compatibility is maintained across all versions.

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