

ONEDGE ENERGY

Specification-Hardening Note v0.0.4

UVS-2: Governance Axis, GOLDEN RECORD Reconciliation, and FINGERPRINT BASELINE

Normative amendment to v0.0.3; cumulative addendum to v0.0.2

Issuer:	IKKUNA SpA (STANDARDCo)
Document Type:	Normative specification-hardening note
Version:	v0.0.4
Supersedes:	v0.0.3 on the items it normatively patches; cumulative over v0.0.2
Status:	Proposed open standard; candidate specification; pre-TRL-7 validation
Intended Audience:	Banks, OEMs, project owners, operators, regulators, auditors, standard institutions, SDK implementers, counsel
Date:	May 18, 2026

Abstract

This note extends the Unified Versioning Scheme introduced in v0.0.3 (UVS-1) to a four-axis scheme (UVS-2) by adding the **Governance (G) axis**, motivated by the disclosure of the Binding Addendum No. 1 v1.3.3 between IKKUNA SpA and JAXIAV SpA. The Governance axis has been advancing independently of the Standard, Implementation, and Proof axes; UVS-2 makes that independence explicit while binding the Governance artifacts to the same SHA-256 anchoring and manifest discipline as the technical specification stack. The note then reconciles the *five* distinct definitions of GOLDEN RECORD now present across the corpus into a single normative paragraph, formalizes FINGERPRINT BASELINE as a registered STANDARDCo artifact, and adds defined-term cross-references between the technical and governance tiers.

Contents

1	Scope and Normative Status	2
2	Patch Index	2
3	UVS-2: The Governance Axis	2
3.1	Motivation	2
3.2	Definition of the Governance Axis	2
3.3	Cross-Axis Binding Rules	3
3.4	UVS-2 Mapping for the Current Corpus	4
3.5	Manifest Strengthening	4
4	GOLDEN RECORD Reconciliation	5
4.1	The Five Definitions in the Corpus	5
4.2	Canonical Definition	5
4.3	The SOVEREIGN OPERATIONAL CERTIFICATE Alias	6
5	FINGERPRINT BASELINE	6

6	Cross-Tier Defined-Term Cross-Reference	7
7	Anchoring	7
8	Summary of Normative Changes (Cumulative over v0.0.2 / v0.0.3)	7

1. Scope and Normative Status

This note is normative. It supersedes v0.0.3 on the items enumerated in Section 2. All other v0.0.2 and v0.0.3 claims remain in force unless explicitly amended here.

Capitalized keywords *MUST*, *MUST NOT*, *SHOULD*, *SHOULD NOT*, *MAY* are used in the IETF RFC 2119 / RFC 8174 sense.

2. Patch Index

v0.0.3 section	v0.0.4 disposition
“Unified Versioning Scheme (UVS-1)” / Three Versioning Axes	Extended to UVS-2 (four axes) by addition of G in Section 3.
“Initial UVS-1 Mapping”	Replaced by Section 3.4.
“Manifest” requirement	Strengthened in Section 3.5: manifest MUST include G-bindings.

New normative sections introduced by v0.0.4:

- Section 4: GOLDEN RECORD reconciliation across the five extant definitions.
- Section 5: FINGERPRINT BASELINE formalization.
- Section 6: cross-tier defined-term cross-reference.

3. UVS-2: The Governance Axis

3.1. Motivation

The repository state at v0.0.4 reveals a fourth class of artifact not previously registered under UVS-1: the *commercial and governance specification* expressed in the Binding Addendum No. 1 v1.3.3. The Addendum is technically substantive — it defines GOLDEN RECORD (fifth time), introduces FINGERPRINT BASELINE, separates *Commercial Data* / *STANDARDCo Data and Outputs* / *Operational Telemetry* into a three-bucket data-governance model, and binds the technical STANDARDCo to specific anti-blocking, anti-capture, anti-reidentification, and antitrust-safe-conduct obligations — but it is governed by an independent semver track currently at v1.3.3.

Treating the Addendum and its sister governance instruments as S-axis artifacts would force-collapse two genuinely distinct maturity processes: specification adoption (slow, public, peer-reviewable) and commercial governance (faster, party-specific, bilingual, jurisdictional). UVS-2 keeps them separate and adds a binding rule that makes the technical surface aware of governance constraints.

3.2. Definition of the Governance Axis

Definition 1 (Governance axis G). The GOVERNANCE axis tracks the commercial, contractual, and antitrust-safe-conduct specification stack. Each artifact carries an independent semantic version G-MAJOR.MINOR.PATCH[*–prerelease*]. Governance artifacts include (without limitation) Term Sheets, binding Addenda, Schedules (A–G of the Addendum and any successors), EULAs, OEM/vendor agreements, data protocols, and STANDARDCo governance charters.

3.3. Cross-Axis Binding Rules

Requirement 1 (Defined-term parity). For any term defined in both an **S** artifact and a **G** artifact (GOLDEN RECORD, ECME Kernel, STANDARDCO, MARKETCO, *Field of Use*, *Certification Use*, *Fingerprint Baseline*, *Core Boundary Incident*, *Operational Telemetry*, *De-Identified Technical Aggregates*, *Application Layer*), the *technical content* MUST be expressed in the canonical **S** definition (Section 4 for GOLDEN RECORD being the reference example), and the **G** definition MUST be expressed as a legal restatement consistent with the canonical **S** definition. Inconsistency between the two is a **cross-tier conflict** and MUST trigger a **G**-axis errata bump or an **S**-axis amendment.

Requirement 2 (Governance binding in GOLDEN RECORD). An event-level GOLDEN RECORD commitment MUST embed a field `governance_binding` of type `bytes32` resolving (via the manifest) to a frozen **G**-version, identifying the commercial regime under which the event is issued. This field is used for forensic attribution but MUST NOT influence the ternary classification $\sigma_k(T)$.

Requirement 3 (Antitrust-safe surface). Any **S**-axis surface that grants third-party access (open interface schemas, conformance interfaces, reference validator endpoints) MUST be exposed under terms compatible with the antitrust-safe conduct provisions of the prevailing **G**-version. Access denial on grounds incompatible with the prevailing **G** version is a normative breach.

3.4. UVS-2 Mapping for the Current Corpus

Artifact	Axis	UVS-2 version
Whitepaper	S	S-0.0.2 (canonical)
Hardening note v0.0.3	S	S-0.0.3
This note (UVS-2)	S	S-0.0.4
ECME protocol specification	S	S-0.0.4 / ECME-0.2.0
Oracle-problem mitigation	S	S-0.0.4 / ZKO-0.1.0
ECME-on-BESS bridging appendix	S	S-0.0.4 / BRIDGE-0.1.0
GOLDEN RECORD Canonical Schema	S	S-0.0.4 / GRSCHEMA-1.0.0
ONEDGE-SDK bundle	I	I-1.1.0-rc2 ⊢ S-0.0.4
SDK / SPECIFICATION.md	I	I-1.1.0-rc2
SDK / SECURITY_MODEL.md	I	1.0
SDK / RUNTIME_ABI.md	I	1.0
SDK / CRYPTO_DOMAINS.md	I	1.0
SDK / XAM.md	I	1.0
Pedersen / Ristretto255 / Bulletproofs / R1CS	P	P-1.0.0
Binding Addendum No. 1	G	G-1.3.3
Schedule A (TRL-7 scope)	G	G-1.3.3 / SCHED-A
Schedule B (definitions)	G	G-1.3.3 / SCHED-B
Schedule C (governance/antitrust)	G	G-1.3.3 / SCHED-C
Schedule D (binary step-in)	G	G-1.3.3 / SCHED-D
Schedule E (confidentiality)	G	G-1.3.3 / SCHED-E
Schedule F (public claims)	G	G-1.3.3 / SCHED-F
Schedule G (modular placement)	G	G-1.3.3 / SCHED-G

3.5. Manifest Strengthening

The `onedge-manifest.json` requirement introduced in v0.0.3 is strengthened: the manifest **MUST** publish, for every **S** version, the list of compatible **I**, **P**, and **G** versions. Implementations of the SDK **MUST** refuse to issue **GOLDEN RECORD** records whose `governance_binding` does not resolve to a **G**-version listed in the manifest entry for the prevailing **S**-version. Reason code: `ERR_GOVERNANCE_BINDING_UNREGISTERED`.

4. GOLDEN RECORD Reconciliation

4.1. The Five Definitions in the Corpus

1. **Whitepaper v0.0.2 (canonical S).** “A cryptographically committed operational evidence object that classifies each certified event as compliant, breached, or opaque” — hash-chain over events, ternary classification.
2. **Oracle-problem mitigation document (canonical S / ZKO).** “A succinct Zero-Knowledge Proof confirming that a P2P convex optimization dispatch did not violate the manufacturer’s physical warranties.” — ZK-proof object, implicitly binary.
3. **ONEDGE-SDK SECURITY_MODEL.md (I).** “State root commitment (NOMT) for audit and replay.” — a Merkleized state root.
4. **ECME-on-BESS bridging appendix (S / BRIDGE).** Implicit: the GOLDEN RECORD certifies the joint state of the contractual and physical endowments under the rate-limited reaction operator.
5. **Addendum v1.3.3 Schedule B (G).** “The Sovereign Operational Certificate or equivalent evidentiary output generated by IKKUNA’s Kernel to attest operational compliance, consistency of operation, envelope adherence, or equivalent certified operating condition within IKKUNA’s methodology.”

These are not five different objects. They are five *projections* of one object onto five different surfaces (mathematical, cryptographic, software, market, contractual).

4.2. Canonical Definition

Definition 2 (GOLDEN RECORD, canonical). The GOLDEN RECORD is a typed quadruple

$$GR := (\text{Commitment}, \text{Classification}, \text{Provenance}, \text{Binding})$$

where:

- **Commitment** is a cryptographic commitment to the event-level state, dispatch, telemetry, envelope, transition, and proof artifact (canonical byte layout per the GOLDEN RECORD Canonical Schema, hashed under the registered P-version);
- **Classification** is the ternary outcome $\sigma_k(T) \in \{\text{Compliant}, \text{Breach}, \text{Opacity}\}$, with the explicit minimum required Provenance Tier T and the attained tier $\tau(y_k)$;
- **Provenance** is the chain of attestation artifacts that justify $\tau(y_k)$ (signing root, freshness anchor, continuity proof for $\tau = 4$);
- **Binding** is the cross-axis binding (S, I, P, G) identifying the regimes under which the record was issued.

Principle 1 (Projection identity). The five extant descriptions of GOLDEN RECORD enumerated above are projections:

- Whitepaper projection = $\text{Classification} \oplus \text{Commitment}$;
- Oracle-paper projection = the proof artifact embedded in **Commitment** via π_k ;
- SDK SECURITY_MODEL.md projection = the NOMT root of the aggregated $\{GR_k\}_{k \in \mathcal{K}}$;

- Bridge projection = the input state $\{x^{\text{ctr}}, x^{\text{phys}}\}$ feeding **Commitment**;
- Addendum projection = the contractual-evidentiary view of **Classification** for the purposes of OEM warranty, lender, and insurer reliance ($\equiv$ SOVEREIGN OPERATIONAL CERTIFICATE).

Requirement 4 (Single canonical reference). Future S-axis revisions of the whitepaper, the ECME specification, the Oracle paper, and the bridging appendix MUST replace their local restatement of the GOLDEN RECORD with a normative reference to Definition 2. Future G-axis revisions MUST replace the Schedule-B restatement with a citation to the same canonical definition, while preserving the bilingual contractual phrasing.

4.3. The SOVEREIGN OPERATIONAL CERTIFICATE Alias

The term SOVEREIGN OPERATIONAL CERTIFICATE used in Addendum v1.3.3 §6B.1 and Schedule B is an *alias* of GOLDEN RECORD for contractual purposes. UVS-2 v0.0.4 declares this alias normative and binds the alias to the canonical GOLDEN RECORD via the manifest.

5. FINGERPRINT BASELINE

The Addendum references “FINGERPRINT BASELINES” as a member of STANDARDCo Data and Outputs without defining it technically. UVS-2 supplies the missing technical definition.

Definition 3 (FINGERPRINT BASELINE). A FINGERPRINT BASELINE for an asset a is a tuple

$$FB_a := (\theta_a, \tau_a^{\min}, \nu_a, h_{\theta_a}, t_a^0)$$

where:

- θ_a is the declared physical-model parameter vector for asset a (capacity, thermal capacitance, equivalent resistance curves, C-rate envelope, OEM warranty parameters);
- $\tau_a^{\min}$ is the minimum Provenance Tier under which θ_a MAY be referenced by a GOLDEN RECORD event;
- ν_a is the asset-identification nullifier (one-shot temporal-right primitive, consistent with the Oracle-paper §3.4);
- $h_{\theta_a} = H_P(\text{encode}(\theta_a))$ is the canonical hash of the parameter vector under the prevailing P-version;
- t_a^0 is the issuance block height (or VDF anchor) of the FINGERPRINT BASELINE.

Requirement 5 (FINGERPRINT BASELINE binding in GOLDEN RECORD). A GOLDEN RECORD event MUST embed a reference to the FINGERPRINT BASELINE active at $t_a^0 \leq k$ for the asset under certification. A GOLDEN RECORD that references a FINGERPRINT BASELINE whose hash h_{θ_a} does not appear in the STANDARDCo FINGERPRINT BASELINE registry MUST be rejected with **ERR_FB_UNREGISTERED**.

Requirement 6 (FINGERPRINT BASELINE revocation). STANDARDCo MAY publish a FINGERPRINT BASELINE revocation list. Events committed after the revocation block of h_{θ_a} MUST be rejected with **ERR_FB_REVOKED**. Revocation MUST NOT retroactively invalidate GOLDEN RECORD records committed prior to the revocation block.

6. Cross-Tier Defined-Term Cross-Reference

The table below resolves each cross-tier defined term to its canonical source under UVS-2. Where a term appears in both the technical (S) and governance (G) tiers, the technical canonical source governs the technical content and the governance source governs the contractual content (Requirement 1).

Term	Canonical technical source	Governance source
GOLDEN RECORD / SOVEREIGN OPERATIONAL CERTIFICATE	Def. 2 (this note)	Addendum, Schedule B
ECME Kernel	ECME-0.2.0	Addendum, Schedule B
STANDARD Co	Whitepaper v0.0.2	Addendum, §2A
MARKET Co	Whitepaper v0.0.2	Addendum, §§2A, 7
Field of Use	— (governance term)	Addendum, Schedule B
Certification Use	— (governance term)	Addendum, Schedule B / §6B
FINGERPRINT BASELINE	Def. 3 (this note)	Addendum, §2B.3, Schedule B
Core Boundary Incident	— (governance term)	Addendum, §7C
Operational Telemetry	v0.0.3 Provenance Tier τ	Addendum, §2B.4
De-Identified Technical Aggregates	v0.0.3 §4 (commitment domain)	Addendum, §2B.5
Application Layer	— (governance term)	Addendum, §2.2, Schedule B
Provenance Tier τ	v0.0.3 §4.2	— (technical term)
Provenance Predicate P_T	v0.0.3 §5	— (technical term)

7. Anchoring

For the v0.0.4 release, the SHA-256 anchor set is:

Artifact	SHA-256
OnEdge_Energy_Whitepaper_v0.0.2.tex	7bd53dc50a5ab6627550faa61fae118dcd6cfd09ae4d10b3ceb22067c2edc896
ecme_v0_2_final_with_refs_updated.tex	fed4cad8840cf3a3956d5d233175425bcf0d385c85c1c7c8347fecbc3c026168
Oracle_problem_mitigation.tex	954e3cb2341792ae47c354c3d15f4e0378fc08df2a372bacf85626a3d480dd64
ECME_on_BESS.tex	1e6c6a3b540808d42d2a63d2fd3f92d4663dca89e52d09c61525cc9a0337ca1b
onedge-sdk-spec-bundle.zip	565b0e1c9fb20e16335eec3e5034a12dee389a201e951bb8fe0c125c7a11573c
OnEdge_Energy_SpecHardening_v0.0.3.tex	ba60e1fbef24ce22eebbf311c7c870345fecab6c1a5fbd92cbceb90e2d2ac02
Addendum_No1_v1.3.3..._clean.tex	efe1fa9cce0c31a02443e164af2749bc515d534b54d11720f35dca519e8509b5

The canonical onedge-manifest.json for S-0.0.4 SHALL be published alongside this note and is authoritative over the above in the event of any discrepancy.

8. Summary of Normative Changes (Cumulative over v0.0.2 / v0.0.3)

1. Adds the Governance axis **G** to UVS, producing UVS-2 with the four-tuple (S, I, P, G).
2. Registers the Binding Addendum No. 1 v1.3.3 and its seven Schedules as **G-1.3.3**.
3. Mandates a **governance_binding** field of **bytes32** in every event-level **GOLDEN RECORD** commitment, resolving to a manifest-registered **G** version.
4. Defines the canonical **GOLDEN RECORD** as the typed quadruple (Commitment, Classification, Provenance, Binding) and declares the five extant descriptions to be projections of it.

5. Declares SOVEREIGN OPERATIONAL CERTIFICATE a normative alias of GOLDEN RECORD for contractual purposes.
6. Defines FINGERPRINT BASELINE as a registered STANDARDCo artifact and binds every GOLDEN RECORD to a manifest-registered FINGERPRINT BASELINE.
7. Adds the cross-tier defined-term cross-reference of Section 6.
8. Adds three SDK reason codes to be merged into a future RUNTIME_ABI.md release: ERR_GOVERNANCE_BINDING_, ERR_FB_UNREGISTERED, ERR_FB_REVOKED.

Disclaimer

This document is a normative specification-hardening note prepared by IKKUNA SpA for discussion and adoption purposes. It does not constitute legal, financial, investment, regulatory, engineering, tax, or professional advice. ONEDGE ENERGY remains a proposed open standard and candidate specification in pre-TRL-7 validation status.