SagaChain

Ecosystem

SagaStandards SagaChain
SagaEnterprise
PraSaga Foundation

SDO

Base Class Tree

Universal Blockchain-Native SDO Infrastructure

54 Classes | 8 Domains | sagachain/node:v4.10

Prepared for: SDO Leadership, Technology & Architecture Committees

Domain: examples.saga_sdo.base

Extends to: examples.saga_sdo.ieee.org (94 classes)

 May 2026

The foundation every SDO needs. Already running.

WHAT IT IS

A Universal Pattern Library for Every SDO

Not IEEE-specific. Not ISO-specific. The structural logic every standards body shares.

A governing body has seats, a quorum, a chair, and passes resolutions

A standard begins as a work item, is balloted, and is published

A member has a grade, an application history, and a dues obligation

A committee has a charter, submits reports, and tracks action items

A vote has a ballot, a tally, and a certified result

A budget has a unit, an approval, and a financial report

All of it is on-chain, permanent, and auditable in the SDO base layer.

THE SCOPE

54 Classes · 8 Domains · One Universal Base

Every class is reusable. Every capability is composable. Zero duplication.

Governance	Membership	Standards	Committees
5+ classes	5 classes	13 classes	8 classes

Voting	Financial	Org Units	Mixins
7 classes	8 classes	8 classes	6 classes

SPClassObject — registry singletons. Grade defs, committee bases, voter eligibility.

NFA — transferable ledger assets. Member records, director seats, published standards.

THE PROBLEM

Structural Fragility in SDO Governance

A problem that worsens with scale — and every serious SDO faces it.

No Shared Identity Layer

One member — four separate records in four systems. When their grade changes, reconciliation is manual. Chain of custody maintained by process, not architecture.

Standards State Underdetermined

Work item through ballot through publication crosses dozens of handoffs. At any moment the authoritative status of a standard may be ambiguous — resolving it requires staff inquiry.

Governance Not Machine-Verifiable

Resolutions recorded in minutes, entered by staff, approved at the next meeting. No party outside the organization's trusted perimeter can independently verify a governance decision.

Financial Authorizations Lack Provenance

Budget approvals and endowment distributions are authorized by governing bodies but recorded in financial systems not linked to the governance records that authorized them.

ARCHITECTURE

The Mixin Architecture

Six composable mixins — one implementation each, shared by all 54 classes. Zero duplication.

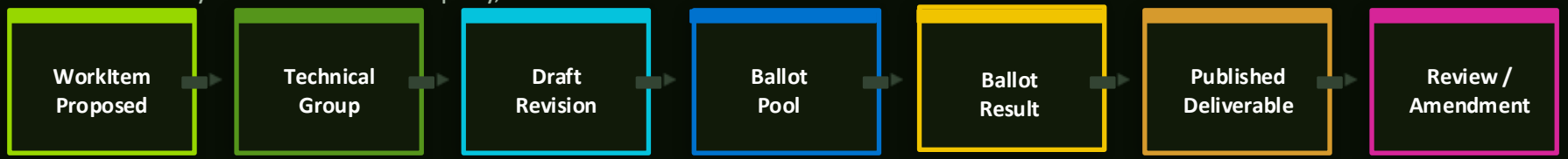
EnclaveMixin	Encrypted key-value store for sensitive data	`enclave_data`
Documentable	Append-only off-chain document hash registry	`doc_uri_hashes`
Statusable	Lifecycle status with full history trail	`status, status_history`
Auditable	Append-only action log for every mutation	`audit_log`
Timestampable	Creation and last-update epoch tracking	`created_epoch, updated_epoch`
Linkable	Keyed map of LOID references to other objects	`links`

A class like ClassSDOGoverningBodyBase inherits SPClassObject + all 6 mixins — full capability, zero duplicate code.

STANDARDS DOMAIN

12 Classes · Machine-Verifiable Lifecycle

The state of any standard is a chain query, not a staff email.



All approval thresholds: integers · required_approval_pct_x100 = 6667 means 66.67% · No floats. No rounding errors.

From Work Item to Publication

- ClassSDOWorkItem: proposed → approved (with approving_body_loid)
- ClassSDOTechnicalGroup: forming → active → disbanded
- ClassSDOBallotPool: required_return_pct_x100 + required_approval_pct_x100
- ClassSDOVoterEligibility: unique SPClassObject exception — registry entry, not transferable
- ClassSDOBallotResult: return_pct_x100, approval_pct_x100, approval_met certified on-chain

After Publication

- ClassSDOPublishedDeliverable: NFA + EnclaveMixin for distribution_keys & royalty_schedule
- ClassSDODeliverableAmendment: effective epoch, approved_by_loid linked to resolution
- ClassSDODeliverableWithdrawal: formal record with superseded_by_loid
- ClassSDODeliverableReview: 5yr / 10yr / mandatory — outcome_code: reaffirm | revise | withdraw
- ClassSDORecirculation: tracks ballot recirculation after comment resolution

STANDARDS REVENUE

Per-Transaction PSC Royalty Model

ClassSDOStandardRoyalty: protocol-enforced fee collection, zero off-chain infrastructure.

PublishedDeliverable

fee_schedule_loid

→

ClassSDOStandardRoyalty

saga_domain | beneficiary_loid
fee_model_code: FLAT_PER_TXN |
PCT_OF_VALUE
flat_fee_psc (int) |
pct_of_value_x10000 (int)

→ PSC credited

FLAT_PER_TXN

Fixed PSC amount per transaction

flat_fee_psc = 500 → 500 PSC minor units/txn

Use case: per-query access to standards data, machine-readable standards APIs

PCT_OF_VALUE

Percentage of transaction PSC value

pct_of_value_x10000 = 250 → 0.025%

Use case: high-value asset transfers governed by published standards

Lifecycle: draft → active | inactive · **Guard:** effective_epoch required before activate() · All fee fields: integers — no floats ever

GOVERNANCE & VOTING

Tamper-Evident Decisions · Integer Thresholds

Governance Domain (5 Classes)

GoverningBodyBase	SPClassObject · seat_count, quorum_count, has_quorum()
DirectorSeat	NFA · seat transfers with full appointment history
OfficerRole	NFA · role_code, officer_loid, term epochs
BodyMeeting	NFA · meeting_type, quorum_met, minutes_hash
BodyResolution	NFA · votes_for/against/abstain, resolution_text_hash
BodyCharter	NFA · versioned, supersedes_loid

Voting Domain (7 Classes)

- ClassSDOBallot: required_approval_pct_x100 integer (6667 = 66.67%)
- ClassSDOMotion: introduced → seconded → tabled | withdrawn | voted
- ClassSDOVotingRecord: voter_loid, vote_value, proxy_loid per vote
- ClassSDOTally: approval_pct_x100, quorum_met, outcome on-chain
- ClassSDOElection: full timeline — nomination_open through certified
- ClassSDOCandidacy + ClassSDOElectionResult: seat_loid certified on-chain
- ClassSDOPetition: NFA + EnclaveMixin for signature_registry

MEMBERSHIP & COMMITTEES

Member Records · Grade Elevation · Committee Governance

Membership lifecycle (ClassSDOMemberRecord is NFA — travels with the member):

pending → active → suspended → lapsed → terminated

Grade Elevation chain — ClassSDOGradeElevation links:

from_grade_loid → to_grade_loid → application_loid → approved_by_loid → effective_epoch

CommitteeBase

- SPClassObject — persistent registry entity
- sunset_epoch for time-limited committees
- committee_type_code: standing | ad_hoc | subcommittee
- Subtypes: Standing, AdHoc, Subcommittee

CommitteeCharter

- NFA — versioned, supersedes_loid tracked
- charter_text_hash on-chain
- draft → approved → superseded | withdrawn
- Traversable charter history

ActionItem

- SPClassObject with due_epoch & priority_code
- open → in_progress → complete | overdue | cancelled
- Missed deadlines permanently recorded
- No silent rescheduling possible

FINANCIAL DOMAIN

8 Classes · Integer-Exact · Provenance-Complete

0	0	4	8
Float Fields in Any Class	PII Fields On-Chain	EnclaveMixin Financial Classes	Financial Classes Total

Budget, Dues & Expense

- ClassSDOBudgetUnit: approved_budget_minor_units integer linked to approving_body_loid
- ClassSDODuesTier: annual_dues_minor_units — USD 225 = 22500, never 225.00
- ClassSDOExpenseClaim: claimant_loid → approved_by_loid → receipt_hash → paid
- ClassSDODuesExemption: exemption_pct_x100 = 10000 means full waiver

Reports, Reserves & Endowments

- ClassSDOFinancialReport: NFA + EnclaveMixin — totals public, detailed_schedule in enclave
- ClassSDOReservePolicy: minimum_reserve_pct_x100 & target_reserve_pct_x100 as integers
- ClassSDOEndowmentFund: NFA + EnclaveMixin — investment_details & custodian_info protected
- ClassSDOBankAccount: NFA + EnclaveMixin — account_number_hash, routing_hash, institution_hash

ARCHITECTURE

Five Structural Strengths

Universal Extensibility

Any SDO builds on top with thin wrappers. IEEE's 94 classes add 3-5 fields per base class. ISO, IEC, ETSI, ANSI follow the same pattern.

Root Type Discipline

SPClassObject and NFA never mixed. Multiple SDO trees coexist on the same chain without root conflicts. The chain knows which objects are registries vs assets.

Mixin Composition

All 54 classes share audit, status, timestamp, document, enclave, and link through mixins. One implementation. Zero version skew between classes.

Integer Arithmetic

approval_pct_x100 = 6667 is unambiguous. 0.6667 is not. The SDO base layer makes floating-point comparison bugs architecturally impossible.

Privacy by Architecture

No base class field can hold PII. All party refs are LOIDs. Sensitive data uses EnclaveMixin. Privacy compliance is the path of least resistance.

RELATIONSHIPS

LOID Graph: Machine-Traversable Governance Chain

Every arrow is a LOID SagaField. Chain traversal = LOID lookups. No joins. No manual reconciliation.

```
ClassSDOGoverningBodyBase  --appoints-->     ClassSDOOfficerRole
                           --schedules-->    ClassSDOBodyMeeting
                           --passes-->       ClassSDOBodyResolution
                           --governed_by-->  ClassSDOBodyCharter

ClassSDOMemberRecord       --has_grade-->    ClassSDOMemberGradeBase
ClassSDOMemberApplication  --if_approved-->  ClassSDOGradeElevation
                                             --> ClassSDOMemberRecord

ClassSDOWorkItem           --developed_by->  ClassSDOTechnicalGroup
                           --balloted_via->  ClassSDOBallotPool
                                             --> ClassSDOBallotResult
                                                 --> ClassSDOPublishedDeliverable

ClassSDOCommitteeBase      --submits-->      ClassSDOCommitteeReport
                           --issues-->       ClassSDOActionItem

ClassSDOBudgetUnit         --reported_in-->  ClassSDOFinancialReport
ClassSDOOrgUnitBase        --allocated-->    ClassSDOOrgUnitBudget
                           --bounded_by-->   ClassSDOGeographicBoundary
```

From a published standard → authorizing work item → every ballot → approving resolution: a single LOID chain. No database joins.

DEMO

What the Demo Proves

56	3	8	✓
Objects On-Chain	Enclave Round-Trips	Domains Demonstrated	All Asserts Passed

Governance, Standards & Membership

- Governing body: seat_count, quorum_count, has_quorum() verified
- Director seat: appoint(director_loid, term_start, term_end), vacate()
- Member record: pending → activated → suspended → reinstated
- Grade elevation: from_grade → to_grade linked to application + approving body
- Work item → technical group → Draft 1 → ballot pool → result → published

Voting, Financial & Org Units

- Ballot: required_approval_pct_x100 = 5001 (simple majority) → certified
- Election: nomination_open → voting_closed → result certified with seat_loid
- Budget unit: proposed → approved → active; budget in minor units
- Financial report: integer revenue/expense/surplus; enclave_set('detailed_schedule',...)
- Bank account: enclave_set('account_number_hash',...) / enclave_get → assert equal

MULTI-SDO OPPORTUNITY

The Multiplier Effect

The SDO base layer is the multiplier. Each new SDO class tree built on top brings another organization's governance on-chain at a fraction of the cost of building from scratch.

IEEE

94 classes already running. Extends WorkItem → PAR, TechnicalGroup → WorkingGroup, BodyResolution → SASB approval

ISO

Extend ClassSDOWorkItem into DIS/FDIS lifecycle. ClassSDOTechnicalGroup into ISO TC/SC structure

ETSI

Extend ClassSDOTechnicalGroup into ETSI ISG and TC structure. ClassSDOBodyResolution for OP approvals

ANSI

Extend ClassSDOBodyResolution with ANSI accreditation workflow. ClassSDOOrgUnitBase for SDO members

SDO Base Layer vs. Typical Governance Software:

COMPLIANCE

Privacy · Financial Integrity · Architecture

Privacy Compliance

- No PII in any field — compliant by design, not policy
- GDPR: LOIDs deregistrable without modifying chain history
- EnclaveMixin: encrypted side-channel for sensitive data
- Documents: SHA-256 content hashes; no raw content on-chain
- Subclasses adding PII fields are immediately identifiable

Financial Integrity

- All money: _minor_units integers — no floats, ever
- All thresholds: _pct_x100 integers — 6667 = 66.67%
- Every budget links to approving_body_loid
- Every expense links to approved_by_loid + receipt_hash
- Dues: annual_dues_minor_units, not annual_dues

Architecture Rules

- Root discipline: SPClassObject vs NFA never mixed
- 6 mixin classes — composed, zero code duplication
- Immutability: corrections via amendment/supersession
- Defined status machines with legal transitions for all entities
- CABSL-1.0 · sagachain/node:v4.10

ROADMAP

Implementation Roadmap

1	M 1-4	Standards	Real-time standard status — read-only public endpoint, no staff inquiry needed
2	M 3-6	Governance	Body meetings, resolutions, and vote outcomes permanently on-chain
3	M 5-9	Membership	Grade elevation chains on-chain; member self-service grade verification portal
4	M 8-12	Financial	Budget approvals, dues records, expense claims all traceable from chain
4	M 8-12	Org Units	National body and chapter lifecycle tamper-evidently recorded
5	M 10-18	Multi-SDO	First partner SDO class tree built on base layer — generalization demonstrated

Phases overlap. Each delivers independent value. No subsequent phase required for prior phase to be useful.

The base layer is built.

The reference implementation (IEEE) is running.

The generalization path is clear.

1	2	3	4	5
Architecture Review 60-min walkthrough with IT & arch leadership	Pilot Domain Standards recommended for Phase 1	Integration Mapping iMIS, standards platform, financial ERP	Custodian Accounts Designate LOIDs per enclave class	Multi-SDO Engagement Identify first partner SDO for co-development

examples.saga_sdo.base · CABSL-1.0 · sagachain/node:v4.10 · SagaChain Implementation Team