

# SMA-SIB

Irreversible Semantic Memory for High Sensitivity AI Systems

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## Purpose

SMA-SIB defines a reference architecture for AI systems that must reason across interactions without becoming repositories of sensitive, discoverable, or reconstructable information. Privacy is enforced structurally: sensitive specifics are never representable in persistent form.

## Core Invariant

*No stored representation may correspond to a unique real-world entity, event, utterance, or timeline — even under full system compromise.*

This invariant applies equally to memory stores, logs, caches, backups, telemetry, crash dumps, and analytics pipelines.

## Architectural Principle

Most AI systems store high-fidelity representations and attempt to protect them through governance, access control, or retention policies. SMA-SIB inverts this model: specificity is destroyed at encoding time, making reconstruction mathematically impossible rather than operationally prohibited. This is not encryption, anonymization, or access control — it is irreversible semantic representation.

## The Semantic Irreversibility Boundary (SIB)

SMA-SIB enforces irreversibility across three planes:

### 1. Shape Identity

Inputs are collapsed into canonical semantic equivalence classes. Many distinct inputs map to the same representation. Proper nouns, identifiers, and numeric specificity are not persistable.

### 2. Topology

Relationships are represented via domain co-membership, not causal or temporal graphs. Narrative reconstruction and event sequencing are structurally impossible.

### 3. Time & Activation

Temporal and frequency signals are stored only as coarse buckets (e.g., RECENT / MODERATE / DISTANT; LOW / MEDIUM / HIGH), preventing timeline recovery.

## Enforcement Model

The Semantic Irreversibility Boundary is implemented as a one-way projection. Residual information is discarded, not protected. Compliance can be validated using adversarial probes that attempt reconstruction from stored state and must fail above chance.

## Intended Domains

- Healthcare and clinical systems
- Defense and intelligence analysis
- Legal reasoning and discovery-sensitive workflows
- Financial compliance and fraud analysis
- Governance and policy deliberation

## Non-Goals

- Episodic or verbatim recall
- Personalization or consumer memory
- Audit trails or compliance logging
- Systems requiring precise names, dates, or quantities
- It is not a product, framework, or SDK

## Status

SMA-SIB is a frozen reference architecture. It exists to be discoverable and usable when irreversible semantic memory becomes a necessity rather than an option.

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Repository

[github.com/leenathomas01/SMA-SIB-Irreversible-Semantic-Memory-for-High-Sensitivity-AI-Systems](https://github.com/leenathomas01/SMA-SIB-Irreversible-Semantic-Memory-for-High-Sensitivity-AI-Systems)

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