The Sentinel Glass-Box Assurance Engine
Deterministic Regulatory Verification for AI Systems
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1. What We Do (The Value Proposition)

ARCO provides **deterministic verification** that an AI system's architecture complies with specific regulatory requirements (e.g., EU AI Act, NIST), **independent of probabilistic model outputs**.

Unlike tools or reviews that rely on statistical similarity, checklists, or human judgment alone, ARCO produces a **mathematical guarantee**: if a system is classified as high-risk, limited-risk, or non-compliant, that conclusion is a matter of logical necessity, not opinion.

This is "glass-box" compliance. Every conclusion is provable, inspectable, and auditable.

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2. What the Client Actually Buys (The Assessment Pipeline)

ARCO is delivered as a structured, three-phase assessment pipeline that moves from unstructured reality to certified regulatory truth.

Phase A: Structured Ingestion (Neuro Layer)

Input
 The client provides existing system documentation: model cards, technical specifications, intended-use descriptions, internal memos, and design artifacts.

Process
 Large language models are used **only** as candidate extractors. They scan unstructured documents to identify potential system capabilities (e.g., biometric identification, emotion recognition, profiling).

Design Principle
 LLMs are not trusted to determine compliance. They propose candidates; they never make decisions.

This phase exists to organize reality, not to judge it.

Phase B: Deterministic Verification (Symbolic Layer)

Input
 Structured candidates produced in Phase A.

Process
 Candidates are mapped into the NCOR/ARCO ontology stack, grounded in Basic Formal Ontology (BFO).

Two deterministic mechanisms are applied:

- **SHACL validation** enforces structural completeness and coherence, blocking hallucinated or underspecified claims.

- **OWL reasoning** executes formal restriction rules that logically entail regulatory classifications.

Design Principle
If the reasoner determines a system is high-risk, that result follows necessarily from the ontology and the rules. There is no statistical confidence score. There is only entailment or non-entailment.

Phase C: Assurance Output (The Artifact)

Deliverable
The ARCO Compliance Determination Certificate.

Contents

- **Classification**: High Risk / Limited Risk / Prohibited / Out of Scope

- **Formal Justification**: Human-readable explanations grounded in explicit regulatory clauses

- **Audit Trail**: A complete log of SPARQL queries and reasoning steps used to reach the determination

This artifact is suitable for internal governance, external audits, regulators, and procurement reviews.

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3. Why ARCO Wins (The Differentiator)

Approach	How It Works	Why It Fails	ARCO Advantage
Law Firms	Manual review	Slow, expensive, subjective	Deterministic, fast, auditable
Tech Consultants	RAG / LLM analysis	Probabilistic, hallucinates compliance	Logical proof, not prediction
SaaS Checklists	Self-attestation	Garbage in, garbage out	Ontological rigor, enforced structure

Sentinel does not "advise" on compliance. It **verifies** it.

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4. How It Is Offered (Commercial Packaging)

ARCO is sold as a productized assurance service, not an open-ended consulting engagement.

Tier 1: ARCO Audit

A one-time assessment of an existing system.
 Output: Compliance Determination Certificate + remediation guidance.

Tier 2: ARCO Design Partner

Integration into the client's development lifecycle.
 Output: Continuous compliance checks triggered by architectural changes.

Tier 3: ARCO Platform

Licensing of the ontology and verification engine for internal audit or governance teams.
 Output: In-house deterministic compliance capability.

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5. What Makes This Scalable

ARCO converts regulatory compliance from a human-driven process into a **repeatable verification engine**.

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6. What ARCO Is — and Is Not

- ARCO is **not** a chatbot.

- ARCO is **not** a checklist.

- ARCO is **not** probabilistic compliance.

ARCO is a **glass-box assurance engine** that proves regulatory claims by construction.

Probability is not enough.